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XZ Dra: observations spanning 70 years*

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XZ DRA: OBSERVATIONS SPANNING 70 YEARS

Abstract

During the past seventy years a great number of observations of XZ Dra have been collected at Konkoly Observatory. Here we publish 344 visual observations made by L. Detre in the years 1932 and 1934, 4440 photographic magnitudes obtained in the years 1935–1957, 40 white light photoelectric data from 1957, and 6066 $UBV(RI)_{\rm C}$ observations made between 1958–1988, and further CCD observations from 2001. All published observations are reviewed and the times of light maximum of XZ Dra are collected as well. New normal maxima have been determined in order to follow the star's long-term period changes.

Key words: Stars – variable: RR Lyrae; stars – individual: XZ Dra – Techniques: photometric – Techniques: radial velocities

INTRODUCTION

The variability of XZ Dra (AN 433.1928, BD+64°1332, GSC 04225–00305, HIP 94134, $\alpha_{2000} = 19^{\rm h}9^{\rm m}42\overset{\rm s}{.}6$, $\delta_{2000} = 64°51'32''$) was discovered by Schneller (1929) on Babelsberg plates. Soon after its discovery, Beyer (1934) made the first thorough investigation of the star's light variation. He confirmed the RR Lyrae type variability suspected by the discoverer (Schneller, 1931) and already took notice of the large scatter of observations around light maximum. Balázs & Detre (1941) based on their preliminary study demonstrated that the star had, indeed, strong light curve variation with a period of 76 days.

Since the early studies a great number of observations have been made on XZ Dra by different observers. In this paper we publish the visual, photographic, photoelectric and CCD observations obtained at Konkoly Observatory during the past 70 years and carry out a rigorous treatment and elaboration of all published observations.

Here we also publish radial velocity measurements taken at the Dominion Astrophysical Observatory (DAO, Canada) in 1971.

OBSERVATIONS

Visual Data

During the years 1931–1937 visual observations of a number of RR Lyrae stars were carried out by L. Detre at Konkoly Observatory. The 20cm Heyde-Refractor equipped with a Graff-type wedge photometer was used. A detailed description of the instrument and the observational procedure adopted is given in the paper of Detre & Lassovszky (1939).

One of Detre's program stars was XZ Dra, which was extensively observed in the years 1932–1934: 344 visual estimates were obtained during 20 nights. Detre's original visual observations are listed in Table 1. The comparison stars he used were BD+64°1331

(=TYC 4225_0931_1), TYC 4225_1323_1 and BD+64°1335 (=TYC 4225_0331_1) with visual magnitudes $V_{\rm vis}$=8.61, 10.27 and 10.61, respectively.

Table 1. Visual observations of XZ Dra

2426825 +
0.4014 10.02
0.4278 10.06
0.4306 10.05
0.4333 10.27
0.4354 10.27
0.4375 10.12
0.4396 10.22
0.4722 10.31
0.4743 10.33
0.4764 10.37
0.4785 10.36
0.4806 10.35
0.4819 10.50
0.5104 10.66
0.5128 10.56
0.5160 10.54
0.5174 10.57
0.5194 10.42
0.6215 10.47
0.5396 10.45
0.5417 10.36
0.5438 10.31
0.5458 10.22
0.5479 10.40
0.5500 10.33

2426826 +
0.3160 10.07
0.3181 9.92
0.3201 9.91
0.3215 9.95
0.3639 9.85
0.3660 9.78
0.3681 9.93
0.3701 9.90
0.3715 10.03
0.3757 10.02
0.3785 10.19
0.3806 10.09
0.4035 9.95
0.4063 10.11
0.4076 10.27
0.4097 10.32
0.4125 10.22
0.4146 10.20

2426827 +
0.3292 10.10
0.3319 10.08
0.3340 10.16
0.3361 10.14
0.3597 10.14
0.3625 10.09
0.3646 10.31
0.3674 10.32
0.3694 10.11
0.3708 10.06
0.4042 10.31
0.4063 10.28
0.4090 10.35
0.4118 10.45
0.4132 10.42
0.4153 10.48
0.4451 10.55
0.4472 10.56
0.4493 10.51
0.4514 10.46
0.4549 10.55
0.4563 10.43
0.4875 10.72
0.4896 10.65
0.4917 10.60
0.4958 10.60
0.4979 10.81
0.5000 10.76

2426828 +
0.3354 10.12
0.3375 10.16
0.3403 10.25
0.3424 10.20
0.3444 10.28
0.3465 10.35
0.3486 10.24
0.3972 10.62
0.3986 10.61
0.4007 10.61
0.4028 10.59
0.4049 10.47
0.4076 10.49
0.4222 10.57
0.4243 10.50
0.4264 10.56
0.4285 10.61
0.4299 10.66
0.4451 10.71
0.4465 10.60
0.4486 10.58
0.4500 10.72
0.4639 10.59
0.4667 10.53
0.4681 10.42
0.4701 10.62

2426831 +
0.3243 10.42
0.3264 10.55
0.3285 10.48
0.3313 10.30
0.3326 10.52
0.3347 10.54

2426832 +
0.3264 10.61
0.3285 10.48
0.3306 10.69
0.3326 10.62
0.3340 10.63

2426835 +
0.3208 10.59
0.3229 10.56
0.3257 10.77
0.3278 10.53
0.3299 10.52
0.3319 10.55
0.3347 10.49
0.3368 10.47
0.3389 10.53
0.3410 10.39
0.3431 10.42
0.3647 9.93
0.3694 9.90
0.3785 9.77
0.3806 9.64
0.3826 9.71
0.3854 9.79
0.3875 9.82
0.3896 9.74
0.3824 9.86
0.3938 9.92
0.3951 9.87

2426889 +
0.3722 10.52

2426945 +
0.3931 10.42
0.3951 10.53
0.3979 10.57
0.4000 10.42
0.4028 10.51
0.4049 10.43
0.4083 10.44
0.4104 10.28
0.4125 10.17
0.4146 10.18
0.4167 10.13
0.4188 10.03
0.4208 10.03
0.4229 9.88
0.4250 10.01
0.4271 9.86
0.4292 9.84
0.4333 9.84
0.4375 9.78
0.4403 9.73
0.4444 9.65
0.4479 9.72
0.4514 9.64
0.4528 9.63
0.4549 9.70
0.4570 9.66
0.4583 9.86
0.4611 9.88
0.4632 9.80

2426957 +
0.3743 9.81
0.3785 9.83
0.3813 9.84
0.3833 9.99
0.3854 9.98
0.3875 9.95
0.3993 9.93
0.4007 9.98
0.4021 10.02

2426960 +
0.4854 10.75
0.4889 10.57
0.4903 10.32
0.4924 10.54
0.4944 10.36
0.4958 10.45
0.4986 10.33
0.5000 10.50
0.5028 10.38
0.5063 10.43
0.5083 10.38
0.5104 10.42
0.5118 10.70
0.5139 10.64
0.5160 10.71
0.5174 10.59

2427161 +
0.2993 10.20

0.3014 9.99
0.3035 9.85
0.3063 9.83
0.3083 9.80
0.3104 9.68

2427206 +
0.3306 10.76
0.3326 10.52
0.3347 10.72
0.3368 10.60
0.3389 10.62
0.3417 10.63
0.3438 10.77
0.3458 10.68
0.3734 10.53
0.3764 10.58
0.3785 10.77
0.3806 10.75
0.3826 10.63
0.3847 10.70
0.3868 10.78
0.3889 10.71
0.3910 10.80
0.3924 10.70
0.3944 10.59
0.3965 10.75
0.3986 10.77

2427209 +
0.3292 10.86
0.3306 10.73
0.3326 10.77
0.3340 10.86
0.3368 10.87

0.3389 10.81
0.3403 10.89
0.3424 10.92
0.3438 10.92
0.3465 10.90
0.3479 10.68
0.3500 10.76
0.3528 10.82
0.3542 10.83
0.3556 10.81
0.3576 10.84
0.3590 10.79
0.3611 10.84
0.3632 10.92
0.3653 10.64
0.3681 10.82
0.3736 10.39
0.3764 10.48
0.3778 10.55
0.3792 10.56
0.3806 10.43
0.3833 10.39
0.3854 10.37
0.3868 10.32
0.3889 10.28
0.3910 10.22
0.3931 10.23
0.3944 10.29
0.3958 10.25
0.3979 10.04
0.3993 10.15

2427216 +
0.3493 10.62
0.3514 10.62

0.3535 10.60
0.3563 10.65
0.3583 10.70
0.3604 10.74
0.3625 10.68
0.3653 10.60
0.3667 10.60
0.3694 10.74
0.3715 10.70
0.3736 10.65
0.3757 10.68
0.3778 10.70
0.3799 10.66
0.3819 10.70
0.3847 10.71
0.3868 10.67
0.3889 10.65
0.3910 10.58
0.3931 10.74
0.3951 10.70
0.3979 10.66
0.4000 10.53
0.4021 10.70
0.4042 10.71
0.4069 10.69
0.4090 10.82
0.4111 10.67
0.4139 10.72
0.4160 10.67
0.4215 10.70
0.4236 10.56
0.4257 10.67
0.4278 10.77
0.4306 10.73

0.4326 10.70

2427225 +
0.3618 10.68
0.3639 10.51
0.3660 10.56
0.3681 10.53
0.3701 10.61
0.3729 10.61
0.3750 10.47
0.3771 10.51
0.3792 10.61
0.3819 10.65
0.3840 10.56
0.3868 10.72
0.3896 10.69
0.3917 10.58

2427230 +
0.3694 10.45
0.3715 10.35
0.3736 10.27
0.3764 10.27
0.3799 9.95
0.3833 10.03
0.3868 9.75
0.3896 9.86
0.3931 9.72
0.3965 9.67
0.3995 9.56
0.4021 9.53
0.4049 9.60
0.4111 9.48
0.4132 9.63
0.4153 9.66

0.4174 9.61
0.4201 9.51
0.4243 9.66
0.4271 9.61
0.4306 9.71

2427232 +
0.3542 9.89
0.3563 9.83
0.3590 9.92
0.3611 10.01
0.3639 10.04
0.3660 9.96
0.3681 10.20
0.3694 10.13
0.3715 10.02
0.3736 10.08
0.3764 10.07
0.3778 10.07
0.3806 10.14
0.3826 10.17
0.3854 10.29

2427244 +
0.3806 10.18
0.3833 10.35

2427556 +
0.3229 9.52
0.3250 9.51
0.3271 9.43
0.3292 9.57
0.3313 9.49
0.3333 9.41
0.3361 9.76

Photographic Material

A new 16cm astrograph was installed and extensive photographic observational program was started at Konkoly Observatory in 1934 in order to study the period changes and the light curve variations of RR Lyrae stars. The large focal ratio (f/14) made the telescope very suitable to series of exposures, usually several dozens of exposures were taken on each plate (for detailed description of the instrument and the observational method see Balázs & Detre, 1938).

The photographic observations of XZ Dra was commenced by Júlia Balázs in 1936 and carried out by the staff of the observatory. Until 1945 (between JD 2428356 and 2431708) Eastman 40 photographic plates were used. Later, between 1951 and 1957 (JD 2433896

and 2436142), aged Agfa Astro and Guilleminot Superfulgur plates were only available, therefore these photographic observations had inferior quality.

Throughout the photographic observations of XZ Dra three minutes exposure time was applied. Altogether 4440 utilizable exposures were taken on 188 plates during 100 nights.

Table 2. Comparison stars for photographic measurements

Tycho number	α_{2000} h m s	δ_{2000} ° ′ ″	$B_{\rm T}$ [mag]	$B_{\rm pg}$ [mag]
4224_0047_1	19 04 14.729	+65 12 19.26	9.271	
4224_0467_1	19 06 02.748	+65 26 30.43	11.073	
4224_0561_1	19 04 42.387	+64 53 17.32	10.404	
4224_0631_1	19 04 19.948	+65 25 45.13	11.455	
4224_0695_1	19 05 50.344	+65 36 10.57	10.322	
4224_0849_1	19 04 07.779	+65 02 50.19	9.948	
4224_1255_1	19 04 44.353	+65 01 45.92	9.335	
4224_1781_1	19 05 38.254	+64 27 13.48	9.887	
4224_2009_1	19 08 08.749	+64 22 56.27	9.564	
4225_0056_1	19 12 34.496	+65 22 03.77	10.181	9.80
4225_0117_1	19 11 16.524	+65 19 48.15	11.062	
4225_0141_1	19 16 57.381	+65 10 27.28	10.448	
4225_0197_1	19 16 42.116	+65 33 09.75	10.190	
4225_0404_1	19 16 22.759	+65 07 11.05	11.037	
4225_0419_1	19 09 56.270	+65 23 06.02	10.132	9.63
4225_0622_1	19 10 53.788	+65 31 27.22	10.692	10.39
4225_0742_1	19 11 40.660	+64 52 33.00	11.125	
4225_0931_1	19 09 14.637	+65 11 45.50	9.153	8.74
4225_1010_1	19 15 42.572	+65 07 49.02	9.895	
4225_1029_1	19 09 33.376	+65 19 59.44	10.879	10.51
4225_1096_1	19 11 10.372	+65 14 44.35	11.361	
4225_1323_1	19 10 50.282	+64 51 15.61	11.157	10.85
4229_0479_1	19 13 27.931	+65 41 40.94	10.421	

The plates were digitized by an Umax PowerLook 3000 commercial scanner in 2001, making 1200 dpi 8 bits FITS format output images. This resolution yielded stellar images with 3-5 pixels full width at half maximum (FWHM).

Aperture photometry (IRAF*/DAOPHOT/PHOT) of 23 or less comparison stars and the variable were derived. The comparison stars, covering about 1.5 magnitude range, were chosen among the stars given in Table 2. All those were used which could be measured reliable. Typically at least 15 comparison stars determined the magnitudes of the variable during each observational run.

Tycho $B_{\rm T}$ magnitudes of the comparison stars were adopted (ESA, 1997, Høg *et al.*,

*IRAF is distributed by the NOAO, operated by the Association of Universities for Research in Astronomy Inc., under contract with the NSF.

2000) for transforming the intensities (the plate densities) to magnitudes by fitting third or fourth order polynomials. Six of these comparison stars were originally used to define a photographic sequence. Their photographic $B_{\rm pg}$ magnitudes were determined from two plates of the North Polar Sequence taken in 1936 and 1939. These $B_{\rm pg}$ values (also given in Table 2) define a $0.^{\rm m}35$ brighter magnitude scale than the $B_{\rm T}$ magnitudes (if TYC 4225_0419_1 with its discrepant $0.^{\rm m}5$ magnitude difference is omitted). Thus the final magnitudes were shifted by $0.^{\rm m}35$ in order to match the photographic B scale of the early photographic studies. The errors of the photographic measurements range between $0.^{\rm m}05$ and $0.^{\rm m}20$ depending mostly on the quality of the plate material and its development.

The photographic observations are given in Table 3.

Table 3. Photographic observations of XZ Dra

2428356 +
0.489 10.372
0.491 10.351
0.492 10.403

2428365 +
0.436 9.528
0.439 9.699
0.441 9.669
0.443 9.698
0.445 9.678
0.447 9.753
0.449 9.794
0.451 9.766
0.453 9.842
0.455 9.748
0.457 9.729
0.459 9.746
0.461 9.855
0.464 9.906
0.466 9.971
0.468 9.860
0.470 9.943

2428392 +
0.369 10.712
0.371 10.785
0.373 10.802
0.375 10.712
0.378 10.790
0.382 10.718
0.384 10.777
0.386 10.695
0.388 10.694

2428397 +
0.332 9.726
0.334 9.611
0.336 9.826
0.338 9.840
0.340 9.671
0.342 9.783
0.344 9.791
0.346 9.915
0.348 9.830
0.350 9.760
0.353 9.798
0.355 9.789
0.357 9.788
0.359 9.844
0.362 9.793
0.364 9.850
0.366 10.058
0.368 10.038
0.370 9.935
0.372 9.970
0.374 9.888
0.376 10.003
0.378 10.104
0.380 9.987
0.382 9.928
0.384 9.962

2428402 +
0.451 10.731
0.454 10.786
0.456 10.737
0.469 10.700
0.476 10.760
0.479 10.629
0.481 10.654
0.483 10.607
0.490 10.521
0.492 10.463
0.494 10.474
0.496 10.448
0.498 10.441
0.500 10.406
0.502 10.418
0.504 10.299
0.506 10.350
0.508 10.361
0.510 10.208
0.513 10.247
0.515 10.233
0.517 10.169
0.519 10.183
0.521 10.185

2428404 +
0.445 10.020
0.448 10.025
0.450 9.997
0.452 9.843
0.454 9.930
0.456 9.920
0.458 9.976
0.460 9.878
0.463 9.856
0.465 9.879
0.467 9.846
0.469 9.912
0.471 9.832
0.473 9.868
0.475 9.745
0.477 9.872
0.479 9.895
0.481 9.786
0.483 9.914
0.485 9.887
0.488 9.865
0.490 9.808
0.492 9.896
0.494 9.953
0.496 9.960

2428427 +
0.271 10.999
0.273 10.823
0.275 10.781
0.277 10.564
0.279 10.653
0.281 10.670
0.283 10.665
0.286 10.699
0.288 10.530
0.290 10.626
0.292 10.596
0.294 10.646
0.296 10.586
0.298 10.574
0.300 10.446
0.302 10.368
0.304 10.281
0.306 10.315
0.308 10.225
0.311 10.252
0.313 10.250
0.315 10.049
0.317 10.035
0.319 10.033
0.321 10.009
0.323 9.891

2428431 +
0.368 10.628
0.370 10.579
0.372 10.688
0.374 10.685
0.376 10.640
0.379 10.708
0.381 10.579
0.383 10.691
0.385 10.664
0.387 10.725
0.389 10.721
0.391 10.721
0.393 10.675
0.395 10.700
0.397 10.664
0.399 10.675
0.401 10.718
0.404 10.629
0.406 10.635
0.408 10.681
0.410 10.632
0.412 10.625
0.414 10.620
0.416 10.758
0.418 10.700
0.420 10.797

0.422 10.824
0.424 10.730
0.426 10.621
0.429 10.694
0.431 10.800
0.433 10.712
0.435 10.773
0.437 10.789
0.439 10.633
0.441 10.772
0.443 10.729
0.445 10.783
0.447 10.742
0.449 10.706
0.451 10.749
0.454 10.693
0.456 10.761
0.458 10.810
0.460 10.740
0.462 10.663
0.464 10.714
0.467 10.703
0.470 10.730
0.472 10.739
0.474 10.760
0.476 10.785
0.479 10.785
0.481 10.795
0.483 10.769
0.486 10.758
0.489 10.770
0.491 10.781
0.493 10.764
0.495 10.868
0.499 10.746
0.501 10.850
0.504 10.703
0.506 10.885
0.508 10.737
0.510 10.922
0.512 10.713
0.515 10.738
0.517 10.831

2428784 +
0.335 10.297
0.337 10.257
0.339 10.128
0.341 10.298
0.343 10.271
0.345 10.431
0.347 10.309
0.349 10.316
0.351 10.297
0.353 10.380
0.355 10.351
0.357 10.337
0.360 10.348
0.362 10.330
0.364 10.333
0.366 10.303
0.368 10.292
0.370 10.473
0.372 10.245
0.374 10.418
0.376 10.445
0.378 10.328
0.380 10.480
0.382 10.348
0.385 10.502
0.387 10.390
0.389 10.434
0.391 10.524
0.393 10.374
0.395 10.412
0.397 10.496
0.399 10.557
0.401 10.392
0.403 10.457
0.405 10.664
0.407 10.556
0.410 10.574
0.412 10.493
0.414 10.537
0.416 10.465
0.418 10.530
0.420 10.586
0.422 10.542
0.424 10.691
0.426 10.513
0.428 10.588
0.430 10.628
0.432 10.668
0.435 10.530
0.437 10.507
0.439 10.619
0.441 10.498
0.443 10.720
0.445 10.609
0.447 10.505
0.449 10.577
0.451 10.671
0.453 10.789
0.455 10.615
0.458 10.604
0.460 10.688
0.462 10.669
0.464 10.685
0.466 10.517

2429084 +
0.366 10.505
0.369 10.361
0.371 10.311
0.373 10.202
0.375 10.315
0.377 10.220
0.379 10.159
0.381 10.183
0.383 10.238
0.385 10.086
0.387 10.072
0.389 10.111
0.391 10.073
0.394 10.027
0.396 9.934
0.398 9.988
0.400 9.983
0.402 9.869
0.404 9.858
0.406 9.838
0.408 9.718
0.410 9.681
0.412 9.862
0.414 9.713
0.416 9.770
0.419 9.853
0.421 9.752
0.423 9.652
0.425 9.748
0.428 9.665
0.431 9.801
0.433 9.755
0.435 9.717
0.438 9.823
0.440 9.868
0.442 9.865
0.444 9.854
0.446 9.869
0.448 9.857
0.450 9.814
0.453 9.863
0.455 9.911
0.457 9.970
0.468 9.835
0.470 9.898
0.472 9.803
0.474 9.960
0.476 9.918
0.478 9.941
0.480 9.981
0.482 9.976
0.484 10.078
0.487 10.029
0.489 9.999
0.491 10.039
0.493 10.066
0.512 10.178
0.514 10.231
0.516 10.112
0.518 10.286
0.520 10.202
0.522 10.236
0.524 10.200
0.526 10.331
0.528 10.192
0.530 10.302
0.532 10.226

2429102 +
0.394 10.691
0.396 10.774
0.398 10.692
0.400 10.596
0.402 10.528
0.405 10.808
0.407 10.891
0.421 10.803
0.423 10.711
0.425 10.680
0.427 10.838
0.429 10.711
0.431 10.752
0.433 10.620
0.436 10.922
0.440 10.674
0.442 10.709
0.444 10.719
0.446 10.714
0.449 10.654
0.451 10.644
0.453 10.760
0.455 10.695
0.457 10.766
0.461 10.656
0.463 10.796
0.465 10.543
0.468 10.778
0.470 10.587
0.472 10.629
0.480 10.388
0.483 10.380
0.485 10.236

2429113 +
0.360 10.923
0.362 10.840
0.364 10.755
0.366 10.810
0.368 10.834
0.370 10.822
0.372 10.820
0.374 10.747
0.376 10.884
0.379 10.854
0.381 10.814
0.383 10.901
0.385 10.886
0.387 10.810
0.389 10.919
0.391 10.805
0.393 10.869
0.397 10.774
0.399 10.868
0.401 10.860

0.404 10.919
0.406 10.918
0.408 10.844
0.410 10.795
0.412 10.833
0.414 10.830
0.416 10.669
0.418 10.767
0.422 10.737
0.424 10.823
0.426 10.760
0.429 10.788
0.431 10.690
0.433 10.683
0.435 10.747
0.437 10.643
0.439 10.682
0.441 10.581
0.443 10.455
0.445 10.512
0.447 10.418
0.449 10.449
0.454 10.287
0.456 10.180
0.458 10.060
0.460 10.055
0.462 10.056
0.468 10.008
0.470 9.949
0.472 9.856
0.474 9.842
0.476 9.760
0.479 9.675
0.481 9.744
0.483 9.639
0.485 9.766
0.487 9.702
0.489 9.688
0.491 9.683
0.493 9.799
0.495 9.668
0.497 9.650
0.499 9.663

2429141 +
0.512 10.727
0.514 10.798
0.516 10.838
0.519 10.817
0.521 10.751
0.523 10.772
0.525 10.912
0.527 10.748
0.529 10.816
0.531 10.722
0.533 10.742
0.535 10.825
0.537 10.707
0.539 10.794
0.541 10.594
0.544 10.604
0.546 10.615
0.548 10.466
0.550 10.546
0.552 10.492
0.554 10.439
0.556 10.390
0.558 10.447
0.560 10.357
0.562 10.287
0.564 10.233
0.566 10.221
0.569 10.125
0.571 10.224
0.573 10.135
0.575 10.095
0.577 9.956
0.579 10.014
0.583 9.826
0.585 9.832

2429284 +
0.465 10.935
0.467 10.705
0.469 10.819
0.472 10.779
0.474 10.773
0.476 10.881
0.478 10.856
0.480 10.617
0.482 10.791
0.484 10.707
0.486 10.776
0.488 10.498
0.490 10.733
0.492 10.637
0.494 10.480
0.496 10.768
0.499 10.719
0.501 10.471
0.503 10.574
0.505 10.637
0.507 10.561
0.509 10.473
0.511 10.303
0.513 10.419
0.515 10.467
0.517 10.430
0.520 10.291
0.522 10.303
0.526 10.010
0.532 10.052
0.534 9.979
0.536 9.849
0.538 9.810
0.540 9.857
0.542 9.774
0.546 9.706
0.555 9.407
0.557 9.308
0.559 9.712
0.561 9.367
0.563 9.799
0.565 9.419
0.567 9.731
0.569 9.659
0.571 9.620
0.574 9.733
0.576 9.785
0.578 9.730
0.580 9.854
0.582 9.875
0.584 9.835
0.586 10.058
0.590 9.979
0.593 9.890

2429292 +
0.537 10.856
0.539 10.856
0.541 10.869
0.543 10.658
0.545 10.916
0.547 10.853
0.549 10.947
0.551 10.877
0.553 10.978

2429295 +
0.414 10.812
0.416 10.796
0.418 10.562
0.420 10.792
0.422 10.753
0.424 10.671
0.426 10.737
0.428 10.805
0.430 10.708
0.432 11.002
0.439 10.859
0.441 10.686
0.444 10.968
0.446 10.736
0.448 10.691
0.452 10.722
0.454 10.780
0.456 10.541
0.458 10.644
0.464 10.383
0.466 10.354
0.468 10.439
0.470 10.185
0.472 10.355
0.474 10.046
0.476 10.118
0.478 10.104
0.480 10.160
0.482 9.937
0.489 9.715
0.491 9.828
0.494 9.654
0.496 9.494
0.498 9.690
0.500 9.497
0.502 9.694
0.504 9.731
0.506 9.514
0.508 9.562
0.514 9.489
0.516 9.529
0.519 9.444
0.522 9.535
0.524 9.680
0.526 9.647
0.528 9.443
0.530 9.500
0.532 9.632
0.534 9.722
0.541 9.807
0.543 9.762
0.545 9.864
0.547 9.884
0.549 9.790
0.551 9.953
0.553 9.776
0.555 10.006
0.557 9.862
0.559 9.877
0.565 9.986
0.567 9.891
0.569 9.970
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0.573 9.921
0.576 9.960
0.578 9.912
0.580 10.011
0.582 9.956
0.584 9.955
0.589 10.025
0.592 10.089
0.594 10.037
0.598 10.136
0.600 10.133
0.602 10.098
0.604 10.108
0.606 10.134
0.608 10.128
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0.615 10.217
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0.619 10.125
0.627 10.225
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0.631 10.166
0.633 10.329

0.635 10.366
0.637 10.164
0.639 10.327
0.642 10.210
0.644 10.351
0.646 10.460
0.648 10.316
0.650 10.273
0.652 10.247
0.654 10.277
0.656 10.357
0.658 10.284
0.660 10.408
0.663 10.394
0.665 10.448
0.667 10.380

2429304 +
0.476 10.810
0.478 10.795
0.480 10.827
0.482 10.674
0.484 10.669
0.486 10.571
0.488 10.783
0.490 10.712
0.492 10.597
0.494 10.602
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0.505 10.465
0.509 10.400
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0.513 10.344
0.515 10.229
0.517 10.333
0.519 10.186
0.521 10.062
0.523 10.037

2429365 +
0.483 10.754
0.485 10.849
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0.489 10.843
0.491 10.793
0.494 10.449
0.496 10.520
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0.500 10.611
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0.506 10.400
0.509 10.348
0.511 10.293
0.513 10.351
0.515 10.256
0.517 10.316
0.519 10.252
0.521 10.147
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0.538 9.783
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0.574 9.464
0.576 9.482
0.578 9.623
0.580 9.487
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0.584 9.661
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0.589 9.629
0.591 9.632
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0.595 9.756
0.597 9.676
0.600 9.679
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0.604 9.726
0.606 9.708

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0.448 10.700
0.450 10.631
0.453 10.556
0.455 10.514
0.457 10.566
0.459 10.419
0.461 10.485
0.463 10.461
0.465 10.401
0.467 10.351
0.469 10.324
0.471 10.266
0.473 10.189
0.475 10.010
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0.480 9.917
0.482 9.869
0.484 9.901
0.486 9.740
0.488 9.638
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0.505 9.514
0.508 9.516
0.510 9.461
0.512 9.503
0.514 9.468
0.516 9.597
0.519 9.521
0.521 9.526
0.523 9.563
0.525 9.491
0.527 9.698
0.529 9.459
0.531 9.559
0.533 9.548
0.535 9.661
0.537 9.671
0.539 9.658
0.541 9.583
0.544 9.646

2429376 +
0.389 10.891
0.391 10.742
0.393 10.872
0.395 10.877
0.397 10.902
0.399 10.733
0.401 10.728
0.403 10.758
0.405 10.703
0.407 10.853
0.409 10.862
0.412 10.825
0.414 10.822
0.416 10.895
0.418 10.800
0.420 10.788
0.422 10.879
0.424 10.805
0.426 10.855
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0.433 10.798
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0.437 10.736
0.439 10.629
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0.444 10.526
0.446 10.536
0.448 10.549
0.450 10.604
0.452 10.434
0.454 10.530
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0.458 10.401
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0.519 9.705
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0.539 9.734
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0.544 9.746
0.546 9.785
0.548 9.803
0.550 9.882
0.552 9.810
0.554 9.894
0.556 9.762
0.558 9.861
0.560 9.777
0.564 9.800
0.566 9.857
0.569 9.883
0.571 9.919

0.573 9.951
0.575 9.864
0.577 9.910
0.579 10.108
0.581 9.989
0.583 9.981
0.585 9.950

2429377 +
0.333 10.595
0.335 10.740
0.337 10.906
0.339 10.792
0.341 10.748
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0.346 10.792
0.348 11.098
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0.358 10.769
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0.411 10.439
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0.415 10.232
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0.421 10.169
0.423 10.094
0.425 10.078
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0.438 9.881
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0.455 9.685
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0.459 9.486
0.464 9.588
0.466 9.681
0.469 9.681
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0.479 9.629
0.481 9.658
0.483 9.618
0.485 9.732
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0.489 9.764
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0.496 9.694
0.498 9.681
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0.502 9.810
0.504 9.873
0.506 9.861
0.508 9.820
0.510 9.789
0.512 9.816
0.514 9.883
0.516 9.881
0.519 9.964
0.521 9.911
0.523 9.995
0.525 9.900
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0.533 9.957
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0.554 10.099
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0.560 10.156
0.562 10.204
0.564 10.178
0.570 10.285
0.572 10.288
0.574 10.315

2429378 +
0.333 10.720
0.335 10.760
0.338 10.720
0.340 10.780
0.342 10.793
0.344 10.637
0.346 10.539
0.348 10.380
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0.363 10.413
0.365 10.310
0.367 10.279
0.369 10.333
0.372 10.314
0.374 10.271
0.376 9.969
0.378 10.068
0.380 10.053
0.382 10.063
0.384 9.926
0.386 10.046
0.388 9.864
0.390 9.824
0.392 9.921
0.394 9.805
0.397 9.776
0.399 9.703
0.401 9.665
0.403 9.850
0.405 9.647
0.407 9.584
0.409 9.710
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0.413 9.582
0.415 9.695
0.417 9.712
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0.422 9.657
0.424 9.677
0.426 9.692
0.428 9.789
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0.432 9.780
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0.438 9.759
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0.442 9.767
0.444 9.741
0.447 9.856
0.449 9.803
0.454 9.879
0.465 9.852
0.467 9.921
0.469 9.986
0.472 9.767
0.474 9.945
0.476 9.959
0.478 10.043
0.480 9.825
0.482 10.105
0.484 9.850
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0.509 10.164
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0.519 10.240
0.522 10.214
0.524 10.302
0.526 10.283
0.528 10.305
0.530 10.220
0.532 10.251
0.534 10.302
0.536 10.287
0.538 10.262
0.540 10.388
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0.547 10.220
0.549 10.422
0.551 10.550
0.553 10.384
0.555 10.462
0.557 10.238
0.559 10.385
0.561 10.353
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0.565 10.505
0.567 10.494
0.569 10.448
0.572 10.434
0.574 10.504
0.576 10.418

2429449 +
0.364 10.466
0.366 10.419
0.368 10.407
0.370 10.397
0.372 10.282
0.374 10.190
0.376 10.091
0.378 10.109
0.380 10.105
0.382 9.902
0.387 9.846
0.389 9.788
0.391 9.791
0.394 9.736

0.396 9.769
0.398 9.635
0.400 9.617
0.402 9.565
0.404 9.639
0.406 9.646
0.412 9.564
0.414 9.532
0.416 9.654
0.418 9.631
0.420 9.647
0.422 9.552
0.424 9.583
0.426 9.680
0.428 9.689
0.430 9.672
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0.437 9.651
0.439 9.658
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0.447 9.800
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0.453 9.778

2429458 +
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0.381 10.906
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0.387 10.667
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0.410 10.398
0.412 10.506
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0.458 9.740
0.460 9.700
0.462 9.767
0.465 9.742
0.467 9.671
0.469 9.727
0.471 9.868
0.473 9.849
0.475 9.794
0.477 9.773
0.479 9.741
0.481 9.803
0.483 9.871
0.489 9.765
0.491 9.926
0.493 9.772
0.495 9.734
0.498 9.999
0.500 9.933
0.502 9.782
0.504 9.964
0.506 9.944
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0.510 9.914
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0.514 10.057
0.517 10.054
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0.521 9.978
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0.525 9.991
0.527 9.985

2429465 +
0.425 10.836
0.427 10.711
0.429 10.864
0.431 10.893
0.433 10.886
0.435 10.766
0.438 10.865

2429467 +
0.431 10.556
0.433 10.650
0.435 10.625
0.438 10.529
0.440 10.582
0.442 10.645
0.444 10.675
0.446 10.441
0.448 10.579
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0.458 10.402

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0.435 10.022
0.437 10.012
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0.456 9.903
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0.462 9.924
0.464 9.909
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0.474 9.913
0.476 9.898
0.479 9.801
0.481 9.868
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0.485 9.802
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0.493 9.925
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0.539 10.258

2429518 +
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0.307 10.656
0.309 10.656
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0.318 10.692
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0.322 10.724
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0.330 10.887
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0.334 10.784
0.337 10.784
0.339 10.828
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0.343 10.763
0.345 10.661
0.347 10.725
0.349 10.658
0.351 10.850
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0.355 10.856
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0.399 10.800
0.401 10.896
0.403 10.829
0.405 10.898
0.407 10.868
0.409 10.859
0.412 10.959
0.414 10.776
0.416 10.837
0.418 10.791

0.420 10.881
0.422 10.763
0.428 10.726
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2429519 +
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2429690 +
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0.543 9.804
0.546 9.784

0.548	9.910	0.455	9.810	0.556 10.227	0.591	9.832	0.446 10.107
0.550	9.842	0.457	9.781	0.558 10.148	0.593	9.729	0.448	9.952
0.552	9.936	0.459	9.828	0.560 10.242	0.595	9.722	0.450 10.001
0.555	9.930	0.462	9.921	0.562 10.210	0.597	9.711	0.452	9.977
0.557	9.930	0.464	9.850	0.564 10.237	0.600	9.861	0.458	9.911
0.559	9.949	0.466	9.843	0.567 10.227	0.602	9.877	0.460	9.840
0.561	9.775	0.468	9.751	0.569 10.231	0.604	9.900	0.462	9.849
0.563	10.019	0.470	9.831	0.571 10.262	0.606	9.910	0.464	9.868
0.565	10.082	0.472	9.760		0.608	10.011	0.466	9.735
0.567	9.927	0.474	9.838	2429699 +	0.610	9.920	0.469	9.726
0.569	9.955	0.476	9.956	0.514 10.407	0.612	9.930	0.471	9.763
0.571	10.137	0.478	9.872	0.516 10.300	0.614	9.940	0.473	9.787
0.573	9.920	0.480	9.851	0.518 10.246	0.616	9.904	0.475	9.730
0.575	9.995	0.482	9.803	0.520 10.233	0.618	9.894	0.477	9.723
0.578	10.023	0.484	9.897	0.522 10.141	0.620	9.942	0.479	9.753
0.580	10.058	0.487	9.837	0.525 10.088	0.622	9.955	0.481	9.736
0.582	9.991	0.489	9.840	0.527 10.100	0.625	10.054	0.483	9.775
0.584	9.957	0.491	9.953	0.529 10.061	0.627	10.129	0.485	9.783
0.586	9.969	0.493	9.967	0.531 9.935	0.629	10.115	0.487	9.760
0.588	10.024	0.495	9.878	0.533 10.035	0.631	10.075	0.489	9.745
0.590	10.150	0.498	9.901	0.535 10.022	0.633	10.089	0.491	9.758
0.592	10.044	0.500	9.958	0.537 10.006			0.494	9.766
0.594	10.123	0.502	9.887	0.539 9.906	2429701 +		0.496	9.782
0.596	10.108	0.504	9.933	0.541 9.951	0.396 10.655		0.498	9.881
0.598	10.131	0.506	10.010	0.543 9.880	0.398 10.737		0.500	9.941
0.600	10.093	0.508	10.007	0.545 9.960	0.400 10.625		0.502	9.901
0.603	10.128	0.510	9.980	0.547 9.819	0.402 10.593		0.504	9.868
0.605	10.125	0.512	9.926	0.550 9.815	0.404 10.494		0.506	9.826
0.607	10.148	0.514	10.033	0.552 9.829	0.406 10.690		0.508	9.854
0.609	10.165	0.516	10.024	0.554 9.724	0.408 10.553		0.510	9.939
0.611	10.203	0.519	10.030	0.556 9.737	0.410 10.535		0.512	9.935
0.613	10.203	0.521	10.066	0.558 9.750	0.412 10.505		0.514	9.923
0.615	10.215	0.523	10.060	0.560 9.631	0.414 10.623		0.516	9.984
0.617	10.218	0.525	10.077	0.562 9.691	0.416 10.481		0.519	9.927
0.619	10.243	0.527	10.081	0.564 9.697	0.418 10.551		0.521	9.957
0.621	10.257	0.529	10.089	0.566 9.526	0.421 10.473		0.523	9.974
0.623	10.353	0.531	10.024	0.568 9.664	0.423 10.455		0.525	9.957
0.625	10.426	0.533	10.063	0.570 9.648	0.425 10.387		0.527	9.970
0.628	10.344	0.535	10.095	0.572 9.576	0.427 10.285		0.529	10.014
0.630	10.245	0.537	10.104	0.575 9.658	0.429 10.392		0.531	10.013
0.632	10.326	0.539	10.149	0.577 9.652	0.431 10.287		0.533	10.077
		0.541	10.179	0.579 9.780	0.433 10.260		0.535	10.030
2429691 +		0.544	10.166	0.581 9.694	0.435 10.128		0.537	10.083
0.447	9.892	0.546	10.147	0.583 9.674	0.437 10.171		0.539	9.986
0.449	9.977	0.550	10.088	0.585 9.647	0.439 10.128		0.541	10.149
0.451	9.930	0.552	10.138	0.587 9.609	0.441 10.083		0.544	10.009
0.453	9.922	0.554	10.249	0.589 9.727	0.444 10.138		0.546	10.039

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0.546 10.600
0.548 10.666
0.550 10.699
0.552 10.684
0.554 10.618
0.556 10.550
0.558 10.725
0.560 10.802
0.562 10.723
0.564 10.658
0.567 10.684
0.569 10.616
0.573 10.589
0.575 10.650
0.577 10.662
0.579 10.611
0.581 10.691
0.583 10.824
0.585 10.659
0.587 10.792
0.590 10.604
0.592 10.701
0.596 10.658
0.598 10.627
0.600 10.654
0.602 10.716
0.604 10.717
0.606 10.670
0.608 10.706
0.610 10.767
0.612 10.712
0.615 10.667
0.617 10.742
0.619 10.720
0.621 10.731
0.623 10.700
0.625 10.733
0.627 10.713
0.629 10.750
0.631 10.642
0.633 10.678
0.635 10.706

2430467 +
0.311 10.214
0.313 10.231
0.315 10.210
0.317 10.134
0.319 10.267
0.322 10.155
0.324 10.198
0.326 10.228
0.328 10.185
0.330 10.304
0.332 10.225
0.334 10.283
0.336 10.365
0.338 10.352
0.340 10.401
0.343 10.412
0.345 10.386
0.347 10.472
0.349 10.453
0.394 10.551
0.396 10.610
0.398 10.582
0.400 10.568
0.402 10.666
0.404 10.642
0.406 10.589
0.408 10.703
0.410 10.623
0.413 10.620
0.415 10.668
0.417 10.671
0.419 10.674
0.421 10.616
0.423 10.683
0.425 10.670
0.427 10.669
0.429 10.631
0.431 10.605
0.433 10.705

2430514 +
0.371 9.786
0.373 9.756
0.375 9.762
0.377 9.661
0.379 9.629
0.381 9.708
0.383 9.604
0.385 9.710
0.387 9.710
0.389 9.665
0.391 9.693
0.393 9.600
0.395 9.671
0.398 9.602
0.400 9.738
0.402 9.626
0.404 9.752
0.406 9.724
0.408 9.783
0.410 9.680
0.412 9.716
0.414 9.838
0.416 9.659
0.418 9.787
0.420 9.740
0.423 9.757
0.425 9.813
0.427 9.752
0.429 9.868
0.431 9.872
0.433 9.856
0.435 9.906

2431330 +
0.334 10.549
0.336 10.624
0.338 10.616
0.340 10.599
0.342 10.494
0.344 10.533
0.346 10.570
0.348 10.495
0.350 10.501
0.352 10.553
0.354 10.662
0.357 10.580
0.359 10.566
0.361 10.594
0.363 10.715
0.368 10.706
0.370 10.642
0.372 10.616
0.375 10.625
0.377 10.621
0.379 10.667
0.381 10.699
0.383 10.777
0.385 10.721
0.387 10.676
0.390 10.869
0.392 10.572
0.394 10.700
0.396 10.707
0.398 10.713
0.400 10.555
0.402 10.632
0.404 10.729
0.407 10.764
0.409 10.572

0.414 10.681
0.416 10.703
0.418 10.662
0.420 10.578
0.422 10.594
0.425 10.797
0.427 10.791
0.431 10.799
0.433 10.679
0.435 10.706
0.437 10.638
0.439 10.753
0.441 10.698
0.443 10.761
0.445 10.776
0.447 10.578
0.450 10.630
0.452 10.788
0.454 10.761
0.456 10.797
0.458 10.744
0.460 10.652
0.462 10.744
0.464 10.822
0.466 10.653
0.468 10.718
0.470 10.759
0.472 10.689
0.475 10.698
0.482 10.726
0.484 10.771
0.486 10.644
0.488 10.637
0.490 10.847
0.492 10.789
0.494 10.695
0.496 10.734
0.498 10.898
0.500 10.851
0.502 10.616
0.504 10.608
0.507 10.738
0.509 10.922
0.511 10.867
0.513 10.699
0.515 10.737
0.517 10.865

0.519 10.751
0.521 10.739
0.523 10.759
0.525 10.812
0.527 10.780
0.529 10.849
0.532 10.929
0.534 10.811
0.536 10.873
0.538 10.845
0.540 10.773
0.542 10.876
0.544 10.772
0.546 10.793
0.548 10.732
0.550 10.668
0.552 10.898
0.554 10.842
0.557 10.754
0.559 10.657
0.561 10.760
0.563 10.723
0.565 10.609
0.567 10.579
0.569 10.729
0.571 10.655
0.573 10.550
0.575 10.542
0.577 10.488
0.579 10.371
0.582 10.461
0.584 10.373

2431331 +
0.344 10.668
0.346 10.627
0.348 10.713
0.350 10.725
0.352 10.727
0.354 10.761
0.357 10.674
0.359 10.658
0.361 10.690
0.363 10.675
0.368 10.683
0.370 10.690
0.372 10.747

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0.376 10.653
0.378 10.682
0.380 10.651
0.382 10.655
0.384 10.655
0.386 10.761
0.392 10.751
0.394 10.572
0.396 10.662
0.398 10.765
0.400 10.633
0.402 10.741
0.405 10.708
0.407 10.663
0.409 10.737
0.411 10.716
0.413 10.712
0.415 10.751
0.417 10.752
0.419 10.696
0.421 10.677
0.426 10.648
0.428 10.692
0.430 10.641
0.432 10.668
0.434 10.754
0.436 10.737
0.438 10.707
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0.447 10.779
0.449 10.760
0.451 10.811
0.453 10.722
0.455 10.809
0.457 10.737
0.459 10.725
0.461 10.779
0.463 10.821
0.466 10.773
0.471 10.775
0.473 10.737
0.475 10.807
0.477 10.830
0.480 10.840

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0.484 10.749
0.486 10.857
0.488 10.811
0.490 10.856
0.492 10.651
0.494 10.848
0.496 10.914
0.498 10.774
0.500 10.817
0.502 10.735
0.504 10.731
0.507 10.879
0.509 10.779
0.511 10.711
0.513 10.694
0.515 10.770
0.517 10.724
0.519 10.729
0.521 10.617
0.523 10.538
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0.527 10.561
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0.532 10.508
0.534 10.466
0.536 10.478
0.538 10.479
0.540 10.441
0.544 10.268
0.546 10.230
0.548 10.003
0.550 10.138
0.552 10.123
0.555 10.117
0.557 9.992
0.559 10.007
0.561 10.005
0.563 9.900
0.565 9.830
0.567 9.785
0.569 9.812
0.571 9.727
0.573 9.805

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0.274 10.113

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0.278 9.989
0.280 9.946
0.282 9.944
0.284 9.925
0.286 9.883
0.288 9.900
0.290 9.855
0.292 9.739
0.294 9.799
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0.423 10.370
0.425 10.332
0.427 10.411
0.429 10.353
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0.433 10.306
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0.446 10.482
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0.463 10.608
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0.467 10.547
0.469 10.624
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0.474 10.649
0.476 10.610
0.478 10.633
0.480 10.475
0.482 10.516
0.484 10.571
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0.490 10.602
0.492 10.607
0.494 10.558
0.496 10.546

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0.519 10.560
0.521 10.673
0.523 10.660
0.526 10.525
0.528 10.645
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0.532 10.759
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0.538 10.608
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0.542 10.763
0.544 10.734
0.546 10.660
0.548 10.675
0.551 10.678
0.553 10.816
0.555 10.513
0.557 10.542
0.559 10.682
0.561 10.817
0.563 10.662
0.565 10.626
0.567 10.727
0.569 10.849
0.571 10.744
0.573 10.684
0.576 10.514
0.578 10.643
0.580 10.646
0.582 10.735
0.584 10.643

2431349 +
0.271 10.094
0.273 10.192
0.275 10.087
0.277 10.104
0.279 10.129
0.281 10.188
0.283 10.146
0.285 10.138
0.287 10.143
0.289 10.205
0.292 10.149
0.294 10.119
0.296 10.238
0.298 10.333
0.336 10.290
0.338 10.402
0.340 10.434
0.342 10.397
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0.363 10.537
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0.367 10.499
0.369 10.509
0.371 10.416
0.373 10.547
0.376 10.612
0.384 10.463
0.386 10.564
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0.390 10.637
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0.396 10.496
0.398 10.497
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0.403 10.473
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0.407 10.642
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0.411 10.666
0.413 10.517
0.415 10.644
0.417 10.653
0.419 10.829
0.421 10.716
0.423 10.487
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0.428 10.604
0.430 10.749
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0.444 10.604
0.446 10.756
0.448 10.709
0.451 10.872
0.453 10.692
0.455 10.829
0.457 10.827
0.459 10.687
0.461 10.603
0.463 10.824
0.465 10.591
0.467 10.782
0.469 10.776
0.471 10.623
0.473 10.695
0.476 10.670
0.478 10.845
0.480 10.721
0.482 10.668
0.485 10.687

2431350 +
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0.476 10.796
0.478 10.742
0.480 10.779
0.482 10.844
0.485 10.815
0.487 10.796
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0.491 10.821
0.493 10.817
0.495 10.804
0.497 10.822
0.499 10.812
0.501 10.740
0.503 10.853
0.505 10.887
0.507 10.739
0.510 10.872
0.514 10.876
0.516 10.851
0.518 10.740
0.520 10.810
0.522 10.728
0.524 10.721
0.526 10.827
0.528 10.866
0.530 10.751
0.532 10.788
0.535 10.628
0.537 10.742
0.539 10.656
0.541 10.761
0.543 10.632
0.545 10.743
0.547 10.710
0.549 10.716
0.551 10.664
0.553 10.691
0.555 10.663
0.557 10.522
0.560 10.610
0.562 10.518
0.564 10.521
0.566 10.429
0.568 10.504
0.570 10.424
0.572 10.487
0.574 10.429
0.576 10.523
0.578 10.278
0.580 10.397
0.582 10.320
0.585 10.292
0.587 10.292
0.589 10.403
0.591 10.274
0.593 10.293
0.595 10.347

2431352 +
0.435 10.819
0.437 10.821
0.439 10.823
0.441 10.791
0.443 10.746
0.445 10.788
0.447 10.772
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0.453 10.716
0.455 10.759
0.458 10.704
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0.462 10.711
0.464 10.697
0.466 10.643
0.468 10.600
0.470 10.608
0.472 10.653
0.474 10.571
0.476 10.623
0.478 10.557
0.480 10.535
0.482 10.514
0.485 10.446
0.487 10.384
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0.501 10.319
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0.505 10.205
0.507 10.249
0.510 10.257
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0.514 10.217
0.516 10.137
0.518 10.097
0.520 10.093
0.522 10.033
0.524 10.076
0.526 10.077
0.532 9.911
0.534 9.903
0.536 9.872
0.538 9.758

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0.553 9.869
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0.557 9.835
0.560 9.859
0.562 9.841
0.564 9.899
0.566 9.891
0.568 9.843
0.570 9.773
0.572 9.831
0.574 9.878
0.576 9.779
0.578 9.863
0.580 10.037
0.582 9.961
0.585 9.935
0.587 10.027
0.589 9.963
0.591 10.024
0.593 10.165
0.595 10.131
0.597 10.002
0.599 9.958
0.601 9.998
0.603 9.961
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0.610 9.999
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0.616 10.137
0.618 10.231
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0.622 10.144
0.624 10.124

2431353 +
0.404 10.642
0.406 10.635
0.408 10.616
0.410 10.669
0.412 10.667
0.415 10.610
0.417 10.491
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0.423 10.375
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0.431 10.449
0.433 10.395
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0.454 10.131
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0.471 9.861
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0.475 9.902
0.480 9.911
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0.486 9.774
0.490 9.827
0.492 9.840
0.494 9.795
0.496 9.812
0.499 9.733
0.501 9.750
0.503 9.682
0.505 9.830
0.507 9.758
0.509 9.758
0.511 9.934
0.513 9.841
0.515 9.914
0.517 9.874
0.519 9.880
0.522 9.932
0.524 9.895
0.526 9.863
0.528 10.039
0.531 9.960
0.533 10.022
0.535 9.974
0.537 10.009
0.539 10.029
0.541 9.987
0.543 9.892
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0.547 10.087
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0.551 10.063
0.553 10.093
0.556 10.034
0.558 10.242
0.560 10.082
0.562 10.166

2431354 +
0.450 9.708
0.452 9.729
0.454 9.770
0.456 9.774
0.458 9.864
0.460 9.730
0.462 9.874
0.465 9.887
0.467 9.990
0.469 9.833
0.471 9.775
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0.477 9.877
0.479 9.962
0.481 9.917
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0.490 10.036
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0.544 10.308
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0.567 10.409
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0.573 10.405

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0.366 10.209
0.369 10.117
0.371 10.004
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0.377 9.987
0.379 10.032
0.381 9.959
0.383 9.894
0.385 9.914
0.387 9.970
0.389 9.837
0.391 10.011

2431376 +
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0.261 10.701
0.264 10.944
0.266 10.817
0.268 10.814
0.270 10.816
0.272 10.876
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0.276 10.799
0.278 10.760
0.280 10.903
0.282 10.934
0.284 10.636
0.286 10.842
0.289 10.745
0.291 10.883
0.293 10.648
0.295 10.957
0.297 10.750

2431700 +
0.331 10.770
0.333 10.755
0.335 10.688
0.340 10.753
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0.344 10.659
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0.356 10.506
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0.360 10.214
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0.417 9.680
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0.421 9.686
0.423 9.574
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0.427 9.689
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0.487 10.127

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0.510 10.481
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0.514 10.267
0.516 10.378
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0.524 10.427

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0.365 10.867
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0.377 10.823
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0.398 10.832
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0.402 10.726

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0.419 10.814
0.421 10.783
0.423 10.637
0.425 10.656
0.427 10.713
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0.435 10.659
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0.442 10.436
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0.464 9.911
0.466 9.843
0.468 9.774
0.470 9.798
0.472 9.780
0.474 9.750
0.476 9.714
0.478 9.608
0.480 9.668
0.482 9.701
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0.487 9.570
0.489 9.628

2433896 +
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0.469 10.751
0.471 10.659
0.473 10.757
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0.477 10.779
0.479 10.861

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0.483 10.825
0.485 10.788
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0.490 10.846
0.492 10.783
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0.498 11.015
0.500 10.937
0.502 10.685
0.504 10.782
0.506 10.791
0.508 10.967
0.510 10.819
0.513 10.877
0.515 10.804
0.517 10.873
0.519 10.640
0.521 10.717
0.523 10.724
0.525 10.756

2434197 +
0.456 10.679
0.458 10.638
0.460 10.681
0.462 10.624
0.464 10.440
0.466 10.540
0.469 10.566
0.471 10.476
0.473 10.518
0.475 10.576
0.477 10.519
0.479 10.726
0.481 10.860
0.483 10.518
0.485 10.723
0.487 10.598
0.489 10.552
0.491 10.750
0.494 10.682
0.496 10.686
0.498 10.729
0.500 10.690
0.502 10.723

0.504 10.568
0.506 10.695
0.508 10.653
0.510 10.689
0.512 10.712
0.514 10.714
0.516 10.707
0.519 10.722
0.521 10.609
0.523 10.681
0.525 10.807
0.527 10.669
0.529 10.734
0.531 10.860

2434199 +
0.370 10.524
0.404 10.552
0.451 10.571

2434230 +
0.428 10.873
0.469 10.796
0.507 10.817
0.561 10.190

2434234 +
0.347 10.614
0.349 10.455
0.351 10.469
0.353 10.436
0.355 10.493
0.357 10.401
0.359 10.260
0.361 10.135
0.363 10.299
0.365 10.298
0.367 10.331
0.369 10.298
0.371 10.084
0.373 10.255
0.375 10.103
0.378 10.060
0.380 10.178
0.382 10.192
0.387 10.001
0.389 10.105
0.391 9.985

0.393 10.028
0.395 10.011
0.397 9.982
0.399 10.032
0.401 10.034
0.403 9.995
0.405 9.997
0.407 9.892
0.409 9.885
0.412 9.843
0.414 9.904
0.416 9.902

2434241 +
0.438 10.672
0.440 10.711
0.441 10.714
0.443 10.745
0.445 10.879
0.447 10.777
0.449 10.620
0.452 10.642
0.454 10.648
0.456 10.879
0.458 10.732
0.460 10.712
0.462 10.912
0.464 10.660
0.466 10.874
0.468 11.037
0.470 10.736
0.472 10.897
0.474 10.984
0.477 10.990
0.479 10.953
0.481 10.662
0.483 10.494
0.485 10.537
0.487 10.504
0.489 10.539
0.491 10.715
0.493 10.632
0.495 10.520
0.497 10.466
0.499 10.737
0.502 10.572
0.504 10.569
0.506 10.625
0.507 10.522
0.510 10.489
0.512 10.359
0.514 10.418
0.516 10.318
0.518 10.388
0.520 10.244
0.522 10.191
0.524 10.154
0.527 10.181
0.529 10.097
0.531 10.167
0.533 10.213
0.535 10.220
0.537 10.142
0.539 10.017
0.541 9.999
0.543 9.969
0.545 9.790
0.555 9.826
0.557 9.680
0.559 9.746
0.561 9.807
0.563 9.929
0.565 9.856
0.568 9.945
0.570 9.998
0.572 9.778
0.574 9.795
0.576 9.627
0.578 9.892
0.580 10.011
0.582 9.804

2434253 +
0.389 10.813
0.391 10.887
0.393 10.901
0.396 10.825
0.398 10.987
0.400 10.901
0.402 10.761
0.404 10.803
0.406 10.915
0.408 10.815
0.410 10.840
0.412 10.681
0.414 10.817
0.416 10.635
0.418 10.764
0.420 10.674
0.423 10.714
0.425 10.614
0.427 10.648
0.429 10.698
0.431 10.605
0.433 10.456
0.435 10.474
0.437 10.438
0.439 10.389
0.441 10.145
0.443 10.317
0.445 10.215
0.448 10.180
0.450 10.041
0.452 9.909
0.454 9.823
0.456 9.690
0.458 9.629
0.460 9.587
0.462 9.514
0.464 9.397
0.466 9.634
0.468 9.523
0.470 9.635
0.473 9.648
0.475 9.664
0.477 9.704
0.479 9.704
0.481 9.688
0.483 9.620
0.485 9.676
0.487 9.628
0.489 9.742
0.491 9.731
0.495 9.673
0.497 9.719
0.499 9.831
0.501 9.808
0.503 9.702

2434264 +
0.385 10.526
0.387 10.403
0.390 10.365
0.392 10.486
0.394 10.444
0.396 10.457
0.398 10.339
0.400 10.296
0.402 10.273
0.404 10.461
0.406 10.189
0.408 10.218
0.410 10.188
0.412 10.115
0.415 10.234
0.417 9.947
0.419 9.906
0.421 9.924
0.423 9.996
0.425 9.659
0.427 9.700
0.429 9.424
0.431 9.437
0.433 9.433
0.435 9.420
0.437 9.499
0.440 9.498
0.442 9.533

2434294 +
0.366 10.591
0.369 10.483
0.371 10.507
0.373 10.486
0.375 10.429
0.377 10.517
0.379 10.499
0.381 10.473
0.383 10.505
0.385 10.574
0.387 10.481
0.389 10.470
0.391 10.401
0.394 10.307
0.396 10.633
0.398 10.281
0.400 10.301
0.402 10.110
0.404 10.200
0.406 10.176

2434455 +
0.416 10.546
0.418 10.442
0.421 10.504
0.424 10.426
0.427 10.510
0.430 10.319
0.432 10.312
0.435 10.299
0.438 10.246
0.441 10.122
0.443 10.232
0.446 10.043
0.449 10.050
0.452 9.965
0.455 10.018
0.458 9.820
0.460 9.926
0.463 9.890
0.466 9.885
0.468 9.759
0.471 9.663
0.474 9.640
0.477 9.646
0.480 9.581
0.483 9.482
0.486 9.555
0.489 9.540
0.491 9.462
0.494 9.522
0.497 9.596
0.500 9.562
0.502 9.577
0.505 9.550
0.508 9.527
0.511 9.589
0.514 9.527
0.516 9.529
0.519 9.639
0.522 9.646
0.525 9.653
0.527 9.719
0.530 9.599

2434476 +
0.434 9.946
0.437 9.839
0.440 9.887
0.442 9.700
0.445 9.757
0.448 9.631
0.451 9.472
0.453 9.515
0.456 9.435
0.459 9.419
0.462 9.326
0.465 9.414
0.467 9.349
0.470 9.410
0.473 9.572
0.476 9.674
0.479 9.683
0.481 9.456
0.484 9.645
0.487 9.687

2434486 +
0.426 10.705
0.429 10.566
0.432 10.449
0.434 10.410
0.437 10.344
0.440 10.282
0.443 10.395
0.445 10.061
0.448 9.907
0.451 9.855
0.454 9.968
0.457 9.673
0.459 9.474
0.462 9.271
0.465 9.244
0.468 9.409
0.470 9.240
0.473 9.236
0.476 9.242
0.479 9.186
0.482 9.385
0.484 9.359
0.487 9.411
0.490 9.432

2434488 +
0.324 10.564
0.327 10.607
0.330 10.530
0.332 10.340
0.335 10.280
0.338 10.312
0.341 10.242
0.344 10.395
0.346 10.193
0.349 10.099
0.352 9.972
0.355 9.960
0.357 9.851
0.360 9.682
0.363 9.544
0.366 9.336
0.369 9.331
0.371 9.135
0.374 9.078
0.377 9.110
0.380 9.059
0.382 9.130

2434504 +
0.501 10.791
0.503 10.793
0.506 10.734
0.509 10.620
0.512 10.762
0.515 10.575
0.517 10.566
0.520 10.504
0.523 10.498
0.526 10.381
0.528 10.257
0.531 10.050
0.533 10.013
0.537 10.087
0.540 9.926
0.542 9.836

2434515 +
0.451 10.793
0.454 10.790
0.457 10.662
0.459 10.820
0.462 10.484
0.465 10.434
0.468 10.501
0.470 10.480
0.473 10.539
0.476 10.175
0.479 10.316
0.482 10.242
0.484 10.186
0.487 9.990
0.490 9.996
0.493 9.927
0.495 9.738
0.498 9.798
0.501 9.839
0.504 9.834
0.507 9.651
0.509 9.494
0.512 9.571
0.515 9.468
0.517 9.338
0.520 9.415
0.523 9.291
0.526 9.274
0.529 9.335
0.532 9.223
0.534 9.282
0.537 9.311
0.540 9.343

2434546 +
0.487 9.711
0.489 9.583
0.492 9.530
0.495 9.349
0.498 9.459
0.501 9.324
0.503 9.480
0.506 9.353
0.509 9.512
0.512 9.502
0.514 9.438
0.517 9.466
0.520 9.455
0.523 9.378
0.526 9.416
0.528 9.524

2434575 +
0.469 10.676
0.472 10.774
0.475 10.806
0.477 10.836
0.480 10.779
0.483 10.878
0.486 11.051
0.489 10.864
0.491 10.924
0.494 10.840
0.497 10.774
0.500 10.701
0.502 10.783
0.505 10.859
0.508 10.772
0.511 10.737
0.514 10.839
0.516 10.654
0.519 10.644
0.522 10.647
0.525 10.644
0.527 10.572
0.530 10.594
0.533 10.460
0.536 10.394
0.539 10.266
0.541 10.501
0.544 9.967
0.547 9.995
0.550 9.670
0.552 9.713

2434589 +
0.325 10.326
0.328 10.472
0.331 10.214
0.334 9.880
0.336 10.185
0.339 10.051
0.342 9.782
0.345 9.998
0.347 9.945
0.350 9.988
0.353 9.652
0.356 9.639
0.359 9.567
0.361 9.641
0.364 9.551
0.369 9.573
0.370 9.626
0.372 9.453
0.375 9.631
0.382 9.298
0.384 9.555
0.399 9.496
0.402 9.377
0.404 9.400

2434599 +
0.346 9.988
0.349 10.003
0.352 10.110
0.355 9.752
0.358 9.859
0.360 9.744
0.363 9.717
0.366 9.560
0.369 9.776
0.371 9.839
0.374 9.564
0.377 9.650
0.380 9.569
0.383 9.714
0.385 9.643
0.388 9.510
0.391 9.467
0.394 9.395
0.396 9.388
0.399 9.527
0.402 9.545
0.405 9.580
0.408 9.617
0.410 9.584
0.413 9.476
0.416 9.483

2434605 +
0.533 10.280
0.536 10.152
0.539 10.186
0.542 10.047
0.544 10.068
0.547 9.952

0.550 9.885
0.553 9.870
0.556 9.915
0.558 9.920
0.561 9.835
0.564 9.861
0.567 9.841
0.569 9.766
0.572 9.758
0.575 9.673
0.578 9.747
0.581 9.703
0.583 9.723
0.586 9.691

2434626 +
0.468 10.496
0.471 10.766
0.473 10.845
0.476 10.851
0.479 10.925
0.482 11.088
0.484 10.898
0.487 10.481
0.490 10.880
0.493 10.398
0.496 10.893
0.498 10.671
0.501 10.352
0.503 10.223

2434627 +
0.472 10.275
0.475 10.179
0.478 10.092
0.481 10.029
0.483 9.823
0.486 9.732
0.489 9.570
0.492 9.507
0.494 9.546
0.497 9.393
0.500 9.337
0.503 9.362
0.506 9.337
0.508 9.259
0.511 9.270
0.514 9.268
0.517 9.337
0.519 9.319

2435377 +
0.428 10.812
0.431 10.769
0.434 10.781
0.437 10.716
0.439 10.737
0.442 10.655
0.445 10.633
0.448 10.678
0.450 10.464
0.453 10.602
0.456 10.502
0.459 10.372
0.462 10.254
0.464 10.279
0.470 9.932
0.473 10.171
0.475 9.972
0.478 9.975
0.481 9.950
0.484 9.892
0.487 9.874
0.489 9.757
0.492 9.711
0.495 9.775
0.498 9.845
0.500 9.618
0.503 9.909
0.506 9.567
0.509 9.509
0.512 9.765
0.514 9.597
0.517 9.587
0.520 9.620
0.523 9.594
0.525 9.493
0.528 9.628
0.531 9.561
0.534 9.602
0.537 9.612
0.539 9.752
0.542 9.741

2435421 +
0.232 10.825
0.235 10.942
0.238 10.774
0.241 10.754
0.263 10.656
0.266 10.592
0.268 10.581
0.271 10.615
0.274 10.504
0.277 10.524
0.279 10.518
0.282 10.263
0.285 10.330
0.288 10.318
0.291 10.333
0.293 10.170
0.296 10.128
0.299 10.132
0.302 10.150
0.304 10.045
0.307 9.996
0.310 9.833
0.313 9.935
0.316 9.842
0.318 9.867
0.321 9.635
0.324 9.608
0.327 9.597
0.330 9.813
0.332 9.607
0.335 9.664
0.338 9.471
0.341 9.565
0.343 9.663
0.346 9.598
0.349 9.583
0.352 9.688
0.354 9.700
0.357 9.711
0.360 9.688

2435622 +
0.375 10.569
0.378 10.511
0.381 10.381
0.383 10.433
0.386 10.210
0.389 10.038
0.392 9.952
0.394 10.012
0.397 9.891
0.400 9.687
0.403 9.635
0.406 9.581
0.408 9.457
0.411 9.361
0.414 9.470
0.417 9.236
0.419 9.283
0.422 9.202
0.425 9.253
0.428 9.265
0.431 9.252
0.433 9.292
0.437 9.182
0.440 9.231
0.442 9.398
0.445 9.344
0.451 9.257
0.453 9.495
0.456 9.290
0.460 9.273
0.463 9.416
0.466 9.488
0.469 9.631
0.471 9.464
0.474 9.696
0.477 9.735
0.480 9.585
0.485 9.599
0.487 9.600
0.491 9.618
0.494 9.601
0.496 9.684
0.499 9.737

2435682 +
0.377 10.858
0.380 10.765
0.383 10.846
0.385 10.739
0.388 10.726
0.391 11.072
0.394 10.538
0.403 10.914
0.406 10.596
0.408 10.347
0.411 10.431
0.414 10.454
0.417 10.115
0.419 10.207
0.424 10.138
0.426 9.991
0.429 9.788
0.432 9.669
0.435 9.517
0.437 9.536
0.440 9.414
0.444 9.410
0.447 9.176
0.451 9.354
0.454 9.339
0.457 9.303
0.460 9.249
0.462 9.424
0.467 9.409
0.480 9.391
0.483 9.192
0.485 9.417
0.488 9.517
0.491 9.557
0.495 9.462
0.498 9.673
0.501 9.889
0.504 9.644
0.506 9.955
0.509 9.707
0.513 9.662
0.516 10.180
0.519 9.832
0.522 10.173

2435732 +
0.470 9.948
0.473 10.009
0.476 9.893
0.479 9.952
0.481 9.995
0.484 9.876
0.487 9.972

0.490 9.851
0.493 9.926
0.495 10.082
0.498 9.964
0.501 9.956
0.504 10.017
0.507 10.015
0.509 10.127
0.512 10.002
0.515 10.028
0.518 10.027
0.520 9.962
0.523 10.086
0.526 10.150
0.529 10.096
0.531 10.115
0.534 10.139
0.537 10.187
0.540 10.055
0.543 10.025

2435756 +
0.283 10.090
0.286 9.873
0.288 9.915
0.291 9.822
0.294 9.703
0.297 9.690
0.299 9.648
0.302 9.680
0.305 9.528
0.308 9.511
0.311 9.522
0.313 9.410
0.316 9.538
0.318 9.487
0.322 9.642
0.324 9.531
0.327 9.516
0.329 9.513
0.332 9.692
0.335 9.679
0.338 9.681
0.340 9.619
0.343 9.672
0.347 9.862
0.352 9.829
0.355 9.848
0.358 9.947
0.361 9.820
0.363 9.975
0.366 9.839
0.369 9.741
0.372 9.996
0.374 9.920

2435933 +
0.487 10.782
0.490 10.882
0.492 10.715
0.495 10.759
0.498 10.786
0.501 10.795
0.503 10.783
0.506 10.668
0.509 10.593
0.512 10.543
0.515 10.452
0.517 10.570
0.520 10.489
0.523 10.520
0.526 10.576
0.531 10.297
0.534 10.267
0.537 10.134
0.540 10.088
0.545 10.107
0.548 10.016
0.551 9.792
0.553 9.816
0.556 9.642
0.559 9.593
0.562 9.563
0.565 9.408
0.567 9.494
0.570 9.381
0.573 9.340
0.576 9.434
0.578 9.304
0.581 9.305

2436005 +
0.439 10.871
0.441 10.678
0.443 10.871
0.446 10.885
0.448 10.917
0.450 10.818
0.453 10.830
0.455 10.799
0.457 10.715
0.459 10.605
0.461 10.851
0.464 10.762
0.466 10.760
0.468 10.620
0.470 10.725
0.472 10.775
0.475 10.521
0.477 10.540
0.479 10.669
0.481 10.594
0.483 10.480
0.485 10.371
0.489 10.680
0.491 10.506
0.493 10.533
0.495 10.515
0.498 10.408
0.501 10.427
0.503 10.341
0.505 10.354
0.507 10.308
0.509 10.230
0.512 10.048
0.514 9.939
0.516 9.865
0.519 9.833
0.521 9.817
0.525 9.744
0.527 9.619
0.529 9.556
0.531 9.409
0.533 9.397
0.536 9.543
0.538 9.599

2436007 +
0.435 9.162
0.438 9.090
0.441 9.202
0.444 9.460
0.447 9.339
0.449 9.397
0.452 9.572
0.455 9.524
0.458 9.492
0.461 9.585
0.464 9.490
0.467 9.473
0.469 9.640
0.472 9.650
0.475 9.498
0.478 9.544
0.481 9.538
0.483 9.653
0.486 9.530

2436038 +
0.380 9.973
0.382 9.852
0.385 9.757
0.388 9.709
0.392 9.492
0.395 9.430
0.398 9.564
0.420 9.643
0.423 9.816
0.426 9.832
0.430 9.773
0.432 9.834
0.435 9.788
0.438 9.913
0.441 9.795
0.443 9.840
0.446 9.964
0.449 10.087
0.452 10.001

2436069 +
0.317 10.475
0.320 10.603
0.322 10.495
0.347 10.270
0.352 10.123
0.355 9.973
0.358 9.923
0.361 9.905
0.363 9.634
0.366 9.695
0.369 9.740
0.386 9.665
0.388 9.769
0.391 10.031

2436077 +
0.398 11.087
0.401 10.870
0.404 10.819
0.407 10.824
0.410 10.817
0.413 10.758
0.416 10.782
0.418 10.751
0.425 10.641
0.427 10.718
0.430 10.640
0.433 10.596
0.436 10.412
0.439 10.490
0.441 10.253
0.444 10.310
0.447 10.349
0.452 10.071
0.455 10.030
0.458 10.009
0.461 9.981
0.464 9.666
0.469 9.679
0.475 9.305
0.477 9.339
0.480 9.288
0.483 9.280
0.486 9.270
0.489 9.391
0.491 9.425
0.494 9.246
0.500 9.350
0.502 9.270
0.508 9.441
0.511 9.422
0.514 9.401
0.517 9.550
0.520 9.370
0.523 9.616

0.525 9.933
0.528 9.848
0.532 10.107
0.534 9.890
0.537 9.807
0.540 9.811

2436087 +
0.424 10.424
0.427 10.482
0.430 10.361
0.433 10.483
0.435 10.463
0.440 10.290
0.443 10.286
0.446 10.164
0.449 10.233
0.451 10.078
0.456 10.258
0.458 10.032
0.461 10.157
0.464 9.762
0.467 9.863
0.470 9.574
0.470 9.689
0.473 9.594
0.476 9.620
0.478 9.536
0.481 9.584
0.485 9.600
0.488 9.730
0.491 9.619
0.494 9.530
0.496 9.600
0.501 9.385
0.504 9.336
0.507 9.210
0.510 9.448
0.512 9.469
0.517 9.487
0.519 9.630
0.522 9.358
0.525 9.590
0.528 9.565
0.532 9.594
0.535 9.650
0.537 9.704
0.540 9.782
0.543 9.813

2436100 +
0.270 10.813
0.273 10.939
0.275 10.869
0.278 10.631
0.281 10.745
0.284 10.617
0.286 10.571
0.289 10.631
0.292 10.524
0.295 10.408
0.298 10.328
0.301 10.406
0.304 10.392
0.307 10.051
0.309 10.274
0.312 10.369
0.315 10.237
0.318 10.299
0.320 10.043
0.323 9.913
0.326 10.006
0.329 9.843
0.332 10.070
0.334 9.745
0.337 9.960
0.340 9.786
0.343 10.033
0.345 10.075
0.357 9.444
0.365 9.433

2436109 +
0.332 10.513
0.335 10.337
0.338 10.492
0.340 10.400
0.343 10.479
0.346 10.326
0.349 10.473
0.351 10.264

2436128 +
0.336 10.895
0.338 10.822
0.341 10.763
0.344 10.663
0.347 10.856
0.349 10.940
0.352 10.834
0.355 10.868
0.358 10.694
0.361 10.574
0.363 10.487
0.366 10.717
0.369 10.712
0.372 10.594
0.375 10.663
0.379 10.456
0.381 10.709
0.384 10.588
0.388 10.608
0.393 10.530
0.395 10.708
0.398 10.628
0.401 10.408
0.404 10.415
0.406 10.440
0.409 10.353
0.412 10.311
0.415 10.175
0.418 10.209
0.421 10.205
0.424 10.074
0.427 9.933
0.429 9.962
0.433 10.050
0.438 9.813
0.440 9.934
0.443 9.742
0.446 9.685
0.449 9.857
0.452 9.764
0.454 9.812
0.457 9.705
0.460 9.653
0.463 9.833
0.466 9.833
0.469 9.836
0.472 9.829
0.474 9.927
0.478 9.751
0.481 9.887
0.483 9.771
0.486 9.786
0.489 9.716
0.492 9.840
0.495 9.857
0.497 9.907
0.500 9.966

2436131 +
0.231 10.695
0.234 10.635
0.236 10.738
0.239 10.874
0.242 10.674
0.245 10.650
0.247 10.516
0.250 10.466
0.253 10.275
0.256 10.240
0.259 10.295
0.261 10.143
0.267 10.018
0.270 10.103
0.272 10.118
0.275 10.104
0.278 9.968
0.281 9.983
0.284 9.907
0.286 9.702
0.289 9.896
0.292 9.830
0.295 9.753
0.297 9.539
0.300 9.543
0.303 9.401
0.306 9.531
0.309 9.500
0.311 9.488
0.314 9.416
0.318 9.426
0.320 9.434
0.323 9.467
0.326 9.351
0.329 9.444
0.332 9.368
0.334 9.635
0.337 9.560
0.340 9.575
0.343 9.560
0.345 9.696
0.348 9.741
0.351 9.620
0.354 9.706

2436142 +
0.228 10.568
0.232 10.303
0.235 10.350
0.238 10.290
0.240 10.264
0.243 10.317
0.246 10.345
0.249 10.113
0.252 9.940
0.255 9.817
0.258 9.962
0.261 9.820
0.264 9.871
0.268 9.784
0.271 9.548
0.274 9.548
0.277 9.580
0.279 9.630
0.283 9.682
0.286 9.599
0.288 9.531
0.291 9.588
0.294 9.753
0.297 9.641
0.300 9.690
0.303 9.711
0.306 9.891
0.308 9.762
0.312 9.798
0.315 9.779
0.318 9.838
0.320 9.733
0.323 9.795
0.326 9.830

Photoelectric Data

The first photoelectric measurements of XZ Dra were made at Konkoly Observatory during the night April 27/28 1957 (JD=2435956). At the Newtonian focus of the 60cm Newton-Cassegrain telescope an RCA 1P21 photomultiplier was employed without any filter. During this night BD+64°1327 (=TYC 4224_0707_1) was used as a comparison star.

From 1958 the star was observed through the conventional filters of the UBV system. After the aluminization of the mirror of the 60cm telescope in 1963 an EMI 9052 B tube was used. Since 1972 photoelectric observations were also made close to the UBV system with the 50cm Cassegrain telescope at Konkoly Observatory's mountain station at Piszkéstető. At this location we used an integrating photometer equipped with an unrefrigerated EMI 9058 QB photomultiplier.

In 1988 on three nights XZ Dra was also measured by the Konkoly Observatory's 1m RCC telescope equipped with a thermoelectrically cooled $UBV(RI)_{\rm C}$ photon counting photometer furnished with an EMI 9659 QB tube.

Throughout our photoelectric photometry GSC 04225-01323 (=TYC 4225_1323_1) was chosen as a comparison star (except the first night, see above). The brightness and colours of this star were given by Sturch (1966) as:

$$V = 10.493 \quad B - V = 0.572 \quad U - B = 0.041.$$

Table 4. Telescope constants for photoelectric data.

Year	ε	μ	ψ	r	i	Telescope*
1958	−0.12	0.91				NC
1961	−0.15	1.10				NC
1966	−0.13	1.17				NC
1969	−0.065	1.10	1.14			NC
1970	−0.10	1.11	1.03			NC
1971	−0.12	1.13				NC
1972	−0.105	1.115	1.065			NC
1973	−0.11	1.11	1.065			NC
1974	−0.16	1.07	1.07			NC
1974	0.08	0.93	1.21			C**
1975	−0.16	1.07	1.07			NC
1976	−0.17	1.08				NC
1978	−0.165	1.075				NC
1983	−0.06	1.20	0.86			C
1984	−0.06	1.20	0.86			C
1985	−0.128	1.187	1.106			C
1988	−0.029	0.973	1.109	1.112	1.094	RCC

*NC = 60cm Newton–Cassegrain telescope, Budapest,
C = 50cm Cassegrain telescope, Piszkéstető Mountain Station,
RCC = 1m Ritchey–Chrétien–Coudé telescope, Piszkéstető Mountain Station.

**On JD = 2442279.

The photoelectric observations have been transformed into the UBV system in the traditional way (see e.g. Hardie, 1962). The actual transformation coefficients for different epochs and telescopes are shown in Table 4. The accuracy of the photoelectric observations depending on the sky conditions ranged typically between $0.^{m}002$–$0.^{m}010$ in B, V, R_C and $0.^{m}01$–$0.^{m}02$ in U and I_C. As the mirror has been aluminized only since 1963 the transformation of the early observations (before 1963) into the UBV system is rather uncertain.

Altogether 6106 photoelectric data were obtained. In Tables 5.a–f all these measurements are listed in the sense variable−comparison for unfiltered, U, B, V, R_C and I_C measurements, respectively.

Table 5.a Photoelectric differential observations of XZ Dra without filter

2435956 +		0.4055	0.492	0.4243	0.151	0.4432	0.084	0.4620	0.188
0.3905	0.580	0.4068	0.460	0.4257	0.140	0.4449	0.096	0.4638	0.176
0.3916	0.557	0.4115	0.315	0.4270	0.121	0.4468	0.095	0.4652	0.195
0.3929	0.558	0.4126	0.293	0.4309	0.104	0.4481	0.104	0.4668	0.203
0.3941	0.539	0.4154	0.274	0.4324	0.111	0.4524	0.123	0.4682	0.218
0.3952	0.536	0.4171	0.271	0.4338	0.100	0.4537	0.128		
0.4004	0.530	0.4181	0.253	0.4352	0.093	0.4551	0.127		
0.4024	0.525	0.4218	0.183	0.4367	0.101	0.4564	0.142		
0.4043	0.496	0.4230	0.183	0.4416	0.084	0.4576	0.156		

Table 5.b Photoelectric differential U observations of XZ Dra

2440541 +		2440676 +		0.5934	−0.911	0.5383	−0.202	0.4586	−0.671
0.2319	−0.203	0.5184	−0.080	0.5955	−0.932	0.5408	−0.229	0.4628	−0.774
0.2340	−0.245	0.5246	−0.118	0.5996	−0.943	0.5438	−0.355	0.4649	−0.895
0.2382	−0.366	0.5309	−0.164	0.6017	−0.949	0.5459	−0.376	0.4690	−0.947
0.2403	−0.399	0.5371	−0.182	0.6059	−0.972	0.5501	−0.534	0.4711	−1.074
0.2444	−0.501	0.5392	−0.192	0.6080	−0.988	0.5522	−0.579	0.4753	−1.164
0.2465	−0.643	0.5434	−0.236	0.6121	−0.980	0.5563	−0.803	0.4774	−1.307
0.2507	−0.725	0.5455	−0.281	0.6142	−0.975	0.5584	−0.818	0.4815	−1.469
0.2528	−0.776	0.5496	−0.327	0.6184	−0.973	0.5626	−0.950	0.4836	−1.458
0.2569	−0.853	0.5517	−0.355	0.6219	−0.972	0.5647	−1.083	0.4878	−1.461
0.2590	−0.904	0.5559	−0.385	0.6240	−0.963	0.5688	−1.302	0.4912	−1.436
0.2632	−0.996	0.5580	−0.413			0.5709	−1.346	0.4954	−1.355
0.2653	−1.019	0.5621	−0.481	2440707 +		0.5744	−1.487	0.4975	−1.333
0.2694	−1.079	0.5642	−0.499	0.5091	0.033	0.5765	−1.491		
0.2715	−1.095	0.5684	−0.563	0.5133	0.062	0.5807	−1.483	2442279 +	
0.2757	−1.127	0.5705	−0.611	0.5154	0.057	0.5828	−1.459	0.4882	0.009
0.2778	−1.171	0.5746	−0.693	0.5195	0.054			0.4993	−0.037
0.2819	−1.177	0.5767	−0.726	0.5216	0.036	2440780 +		0.5094	−0.296
0.2840	−1.190	0.5809	−0.746	0.5258	−0.023	0.4440	−0.317	0.5199	−0.648
0.2882	−1.154	0.5830	−0.795	0.5279	−0.044	0.4461	−0.371	0.5285	−0.962
0.2903	−1.166	0.5871	−0.853	0.5320	−0.062	0.4503	−0.434	0.5379	−1.003
		0.5892	−0.897	0.5341	−0.107	0.4524	−0.509	0.5469	−0.975

0.5567 −0.877

2445609 +
0.2844 −0.900
0.2857 −0.916
0.2870 −0.922
0.2884 −0.976
0.2897 −0.983
0.2955 −1.020
0.2969 −1.027
0.2982 −1.017
0.2996 −1.041
0.3009 −1.019
0.3062 −1.007
0.3075 −0.991
0.3089 −0.996
0.3102 −0.981
0.3115 −0.954

2445791 +
0.3604 −0.872
0.3617 −0.865
0.3631 −0.854
0.3644 −0.865
0.3658 −0.825
0.3784 −0.805
0.3797 −0.804
0.3810 −0.762
0.3824 −0.742
0.4110 −0.410
0.4124 −0.387
0.4137 −0.390
0.4150 −0.380
0.4163 −0.421
0.4177 −0.381
0.4191 −0.359
0.4204 −0.362
0.4218 −0.375
0.4231 −0.338
0.4369 −0.355
0.4382 −0.365
0.4396 −0.365
0.4409 −0.333
0.4423 −0.321
0.4436 −0.336
0.4449 −0.336
0.4464 −0.346

0.4476 −0.326
0.4490 −0.339
0.4563 −0.284
0.4577 −0.301
0.4590 −0.309
0.4604 −0.289
0.4617 −0.292
0.4631 −0.292
0.4644 −0.280
0.4658 −0.296
0.4671 −0.283
0.4684 −0.294
0.4742 −0.322
0.4755 −0.293
0.4768 −0.325
0.4781 −0.337
0.4795 −0.321
0.4809 −0.345
0.4822 −0.321
0.4836 −0.313
0.4849 −0.359
0.4862 −0.356
0.5216 −0.156
0.5230 −0.167
0.5243 −0.163
0.5257 −0.172
0.5270 −0.141
0.5283 −0.138
0.5297 −0.134
0.5310 −0.137
0.5324 −0.123
0.5337 −0.097
0.5402 −0.116
0.5416 −0.115
0.5429 −0.081
0.5442 −0.090
0.5456 −0.091
0.5469 −0.092
0.5483 −0.115
0.5496 −0.102
0.5510 −0.088
0.5523 −0.067
0.5598 −0.076
0.5611 −0.078
0.5624 −0.022
0.5638 −0.017
0.5651 −0.029

0.5665 −0.027
0.5678 0.011
0.5691 0.006
0.5705 −0.017
0.5718 −0.040
0.5782 −0.065
0.5796 −0.057
0.5809 −0.040
0.5822 0.006
0.5849 0.008

2445806 +
0.5200 −0.362
0.5213 −0.402
0.5226 −0.394
0.5240 −0.403
0.5253 −0.442
0.5309 −0.522
0.5323 −0.559
0.5337 −0.542
0.5350 −0.580
0.5364 −0.608
0.5418 −0.756
0.5431 −0.767
0.5444 −0.794
0.5458 −0.833
0.5471 −0.862
0.5522 −0.878
0.5536 −0.877
0.5549 −0.873
0.5563 −0.899
0.5576 −0.897
0.5633 −0.876
0.5646 −0.890
0.5660 −0.883
0.5673 −0.898
0.5687 −0.887
0.5739 −0.879
0.5753 −0.884
0.5766 −0.867
0.5779 −0.872
0.5793 −0.852
0.5844 −0.833
0.5858 −0.837
0.5941 −0.737
0.5954 −0.705
0.5967 −0.720

0.5981 −0.708

2446193 +
0.4381 −0.340
0.4394 −0.340
0.4408 −0.393
0.4421 −0.385
0.4434 −0.400
0.4489 −0.470
0.4502 −0.486
0.4516 −0.527
0.4529 −0.556
0.4543 −0.555
0.4595 −0.655
0.4608 −0.668
0.4621 −0.693
0.4635 −0.713
0.4648 −0.708
0.4700 −0.770
0.4714 −0.798
0.4727 −0.802
0.4740 −0.810
0.4754 −0.808
0.4812 −0.839
0.4825 −0.855
0.4839 −0.855
0.4852 −0.869
0.4866 −0.876
0.4923 −0.888
0.4936 −0.892
0.4950 −0.899
0.4963 −0.885
0.4977 −0.883
0.5037 −0.896
0.5050 −0.893
0.5063 −0.883
0.5077 −0.884
0.5090 −0.880
0.5145 −0.840
0.5158 −0.818
0.5172 −0.824
0.5185 −0.807

2447306 +
0.4916 0.053
0.4929 −0.011
0.5054 0.033

0.5067 0.007
0.5118 −0.060
0.5131 0.020
0.5187 −0.235
0.5253 −0.256
0.5266 −0.131
0.5317 −0.258
0.5330 −0.275
0.5382 −0.467
0.5395 −0.504
0.5448 −0.510
0.5460 −0.561
0.5509 −0.719
0.5522 −0.780

2447360 +
0.3671 −0.057
0.3684 −0.094
0.3740 −0.097
0.3753 −0.130
0.3804 −0.186
0.3816 −0.194
0.3865 −0.229
0.3930 −0.326
0.3943 −0.330
0.3956 −0.350
0.4028 −0.479
0.4042 −0.509
0.4055 −0.548
0.4113 −0.688
0.4126 −0.733
0.4181 −1.017
0.4194 −1.095
0.4247 −1.465
0.4260 −1.510
0.4316 −1.537
0.4329 −1.537
0.4386 −1.507
0.4483 −1.386
0.4510 −1.359
0.4585 −1.244
0.4640 −1.266
0.4653 −1.250

2447462 +
0.3529 −0.577
0.3539 −0.606

0.3587 −0.620	0.3785 −0.999	0.3931 −1.155	0.4051 −1.135	0.4186 −1.090
0.3598 −0.617	0.3796 −1.003	0.3942 −1.153	0.4062 −1.145	0.4197 −1.069
0.3661 −0.754	0.3844 −1.128	0.3989 −1.126	0.4126 −1.125	0.4241 −1.061
0.3672 −0.776	0.3855 −1.115	0.4000 −1.123	0.4137 −1.119	0.4251 −1.036

Table 5.c Photoelectric differential B observations of XZ Dra

2436410 +	0.3838 −1.065	0.4532 −0.695	0.4517 0.030	0.5510 −1.148
0.4215 −0.036	0.3859 −1.097	0.4626 −0.805	0.4538 0.006	0.5528 −1.183
0.4246 −0.036	0.3879 −1.110	0.4663 −0.850	0.4558 −0.008	0.5547 −1.200
0.4278 −0.039	0.3931 −1.120	0.4730 −0.899	0.4598 −0.031	0.5586 −1.249
0.4341 −0.045	0.3956 −1.120	0.4758 −0.919	0.4616 −0.032	0.5605 −1.272
0.4397 −0.024	0.3984 −1.109	0.4781 −0.957	0.4635 −0.048	0.5623 −1.270
0.4429 −0.024	0.4015 −1.099	0.4842 −1.014	0.4672 −0.024	0.5642 −1.252
0.4457 −0.053	0.4043 −1.054	0.4868 −1.020	0.4690 −0.029	0.5677 −1.221
0.4531 −0.080		0.4900 −1.033	0.4709 −0.039	0.5691 −1.189
0.4575 −0.125	2436420 +	0.4935 −1.046	0.4732 −0.038	0.5705 −1.156
0.4611 −0.162	0.4812 −0.439	0.4958 −1.072	0.4751 −0.035	0.5724 −1.148
0.4681 −0.232	0.4837 −0.474	0.4989 −1.072	0.4831 −0.008	0.5740 −1.130
0.4721 −0.274	0.4870 −0.508	0.5020 −1.058	0.4850 −0.008	0.5782 −1.109
0.4753 −0.349	0.4937 −0.572	0.5076 −1.029	0.4892 −0.029	0.5836 −1.067
0.4816 −0.433	0.4962 −0.657	0.5107 −0.997	0.4910 −0.028	
0.4846 −0.462	0.4991 −0.681	0.5133 −0.965	0.4947 −0.087	2436451 +
0.4878 −0.504	0.5015 −0.689	0.5197 −0.941	0.4963 −0.110	0.4490 −0.053
0.4941 −0.601	0.5063 −0.750	0.5242 −0.935	0.4982 −0.126	0.4511 −0.072
0.4966 −0.632	0.5093 −0.760	0.5277 −0.912	0.5000 −0.131	0.4530 −0.073
0.4989 −0.685	0.5126 −0.808	0.5334 −0.875	0.5038 −0.152	0.4540 −0.085
0.5050 −0.800	0.5150 −0.827	0.5370 −0.854	0.5056 −0.179	0.4567 −0.094
0.5073 −0.818	0.5249 −0.965		0.5074 −0.205	0.4604 −0.115
0.5098 −0.871	0.5278 −1.018	2436443 +	0.5093 −0.211	0.4623 −0.139
0.5151 −0.985	0.5303 −1.032	0.3648 −0.289	0.5111 −0.221	0.4639 −0.159
0.5181 −1.042		0.3683 −0.325	0.5130 −0.225	0.4674 −0.203
0.5209 −1.088	2436421 +	0.3711 −0.366	0.5149 −0.229	0.4690 −0.220
0.5269 −1.113	0.3959 −0.139	0.3780 −0.526	0.5190 −0.265	0.4704 −0.250
0.5293 −1.093	0.3989 −0.153	0.3803 −0.573	0.5209 −0.286	0.4740 −0.285
0.5320 −1.079	0.4017 −0.195	0.3836 −0.652	0.5227 −0.316	0.4756 −0.309
0.5376 −1.058	0.4047 −0.221	0.3912 −0.796	0.5246 −0.353	0.4772 −0.333
0.5404 −1.040	0.4072 −0.228	0.3940 −0.862	0.5264 −0.365	0.4819 −0.485
0.5494 −1.025	0.4126 −0.247	0.3968 −0.944	0.5283 −0.375	0.4840 −0.514
0.5522 −1.018	0.4152 −0.281	0.4030 −1.023	0.5301 −0.417	0.4862 −0.546
0.5550 −0.997	0.4175 −0.301	0.4058 −1.046	0.5343 −0.471	0.4904 −0.636
	0.4225 −0.312	0.4086 −1.060	0.5364 −0.540	0.4929 −0.691
2436413 +	0.4250 −0.325	0.4155 −1.066	0.5382 −0.622	0.4958 −0.759
0.3709 −0.956	0.4274 −0.376	0.4190 −1.046	0.5401 −0.687	0.5001 −0.883
0.3730 −0.953	0.4341 −0.433		0.5419 −0.750	0.5030 −0.974
0.3751 −0.968	0.4379 −0.444	2436450 +	0.5438 −0.844	0.5052 −1.005
0.3796 −1.012	0.4408 −0.515	0.4459 0.071	0.5456 −0.916	0.5092 −1.121
0.3817 −1.055	0.4464 −0.624	0.4477 0.070		0.5112 −1.197

0.5137 −1.235
0.5226 −1.184
0.5249 −1.172
0.5277 −1.156

2436454 +
0.2906 −0.009
0.2932 −0.024
0.2950 −0.030
0.2987 −0.047
0.3006 −0.054
0.3022 −0.073
0.3064 −0.082
0.3084 −0.096
0.3106 −0.100
0.3158 −0.127
0.3182 −0.134
0.3204 −0.158
0.3248 −0.235
0.3271 −0.262
0.3291 −0.292
0.3338 −0.353
0.3361 −0.397
0.3384 −0.426
0.3431 −0.488
0.3454 −0.555
0.3477 −0.601
0.3522 −0.716
0.3551 −0.773
0.3576 −0.819
0.3620 −0.921
0.3639 −0.981
0.3661 −1.023
0.3704 −1.149
0.3727 −1.214
0.3750 −1.259
0.3791 −1.268
0.3810 −1.262
0.3831 −1.227
0.3868 −1.204

2436463 +
0.3598 −0.062
0.3656 −0.096
0.3704 −0.101
0.3718 −0.108
0.3732 −0.120
0.3770 −0.171
0.3788 −0.199
0.3807 −0.251
0.3844 −0.314
0.3862 −0.350
0.3881 −0.369
0.3920 −0.437
0.3939 −0.483
0.3957 −0.518
0.3996 −0.600
0.4015 −0.652
0.4033 −0.694
0.4070 −0.791
0.4089 −0.814
0.4108 −0.850
0.4145 −0.929
0.4163 −1.004
0.4182 −1.060
0.4219 −1.171
0.4237 −1.244
0.4256 −1.296
0.4292 −1.309
0.4309 −1.302
0.4327 −1.293
0.4369 −1.262
0.4388 −1.257
0.4406 −1.232
0.4443 −1.200
0.4462 −1.171

2436474 +
0.3675 −0.978
0.3699 −1.010
0.3752 −1.051
0.3772 −1.073
0.3795 −1.080
0.3840 −1.120
0.3865 −1.151
0.3893 −1.141
0.3948 −1.140
0.3976 −1.130
0.4004 −1.105
0.4066 −1.087
0.4094 −1.047
0.4122 −1.042

2436475 +
0.2820 −0.197
0.2872 −0.300
0.2893 −0.366
0.2916 −0.419
0.2957 −0.503
0.2977 −0.535
0.3018 −0.616
0.3056 −0.689
0.3076 −0.745
0.3132 −0.879
0.3159 −0.983
0.3187 −1.015
0.3239 −1.111
0.3267 −1.152
0.3295 −1.141
0.3364 −1.176
0.3392 −1.184
0.3413 −1.175
0.3461 −1.182

2436486 +
0.2454 −0.521
0.2470 −0.537
0.2489 −0.597
0.2530 −0.637
0.2551 −0.689
0.2573 −0.703
0.2622 −0.759
0.2644 −0.782
0.2668 −0.791
0.2723 −0.847
0.2748 −0.886
0.2770 −0.901
0.2818 −0.974
0.2844 −0.974
0.2866 −0.982
0.2918 −1.030
0.2941 −1.033
0.2963 −1.039

2436503 +
0.4080 −0.648
0.4122 −0.686
0.4142 −0.713
0.4184 −0.750
0.4204 −0.790
0.4224 −0.816
0.4263 −0.830
0.4284 −0.861
0.4302 −0.914
0.4344 −0.911
0.4390 −0.907
0.4432 −0.977
0.4456 −1.003
0.4479 −1.012
0.4528 −1.039
0.4554 −1.045
0.4576 −1.050
0.4623 −1.023
0.4644 −1.019

2436506 +
0.2137 −0.076
0.2173 −0.099
0.2190 −0.099
0.2224 −0.088
0.2239 −0.102
0.2255 −0.104
0.2291 −0.116
0.2308 −0.144
0.2326 −0.169
0.2381 −0.204
0.2397 −0.223
0.2433 −0.260
0.2452 −0.276
0.2471 −0.300
0.2509 −0.361
0.2527 −0.395
0.2544 −0.440
0.2580 −0.512
0.2621 −0.596
0.2682 −0.677
0.2698 −0.693
0.2733 −0.703
0.2758 −0.722
0.2774 −0.742
0.2811 −0.793
0.2830 −0.799
0.2848 −0.839
0.2889 −0.876
0.2905 −0.926
0.2923 −0.942
0.2960 −0.977
0.2978 −0.978
0.2997 −1.000
0.3052 −1.041
0.3070 −1.046
0.3104 −1.053
0.3126 −1.049
0.3148 −1.073
0.3225 −1.017
0.3245 −1.022
0.3288 −0.982
0.3310 −0.953

2436514 +
0.3666 −0.465
0.3684 −0.498
0.3703 −0.550
0.3740 −0.635
0.3758 −0.654
0.3777 −0.696
0.3814 −0.781
0.3832 −0.829
0.3851 −0.878
0.3888 −0.997
0.3906 −1.060
0.3925 −1.090
0.3962 −1.105
0.3980 −1.116
0.3999 −1.120
0.4117 −1.094
0.4135 −1.081

2437348 +
0.5400 −0.192
0.5462 −0.183
0.5527 −0.142
0.5596 −0.128
0.5664 −0.124
0.5812 −0.109
0.5879 −0.112
0.5935 −0.062
0.6004 −0.069
0.6131 −0.016
0.6276 −0.006
0.6347 0.017
0.6415 0.048
0.6495 0.049
0.6572 0.045

2437465 +
0.4639 −0.701

0.4665 −0.796
0.4678 −0.812
0.4707 −0.887
0.4724 −0.935
0.4740 −0.981
0.4774 −1.041
0.4789 −1.059
0.4802 −1.064
0.4835 −1.119
0.4851 −1.110
0.4870 −1.128
0.4900 −1.157
0.4916 −1.157
0.4932 −1.171
0.4965 −1.158
0.4981 −1.158
0.5001 −1.158
0.5035 −1.158
0.5055 −1.147
0.5076 −1.139
0.5121 −1.133
0.5137 −1.110
0.5150 −1.111
0.5183 −1.102
0.5200 −1.106
0.5219 −1.081
0.5255 −1.067
0.5270 −1.060
0.5290 −1.060
0.5358 −1.019
0.5379 −0.980

2437467 +
0.4047 −1.196
0.4096 −1.167
0.4116 −1.145
0.4162 −1.118
0.4182 −1.091
0.4203 −1.085
0.4259 −1.076
0.4280 −1.064
0.4300 −1.061
0.4342 −1.041
0.4363 −1.012
0.4384 −0.999
0.4436 −0.998
0.4457 −0.989
0.4491 −0.973

2437475 +
0.4074 −0.133
0.4091 −0.158
0.4111 −0.165
0.4147 −0.176
0.4176 −0.198
0.4195 −0.201
0.4266 −0.275
0.4284 −0.288
0.4303 −0.330
0.4353 −0.373
0.4386 −0.421
0.4407 −0.449
0.4460 −0.527
0.4478 −0.575
0.4497 −0.588
0.4548 −0.658
0.4570 −0.717
0.4589 −0.737
0.4622 −0.777
0.4640 −0.823
0.4661 −0.839
0.4712 −0.932
0.4730 −0.941
0.4748 −0.961
0.4780 −1.010
0.4797 −1.035
0.4804 −1.028
0.4833 −1.055
0.4869 −1.088
0.4888 −1.106
0.4902 −1.103
0.4945 −1.116
0.4973 −1.101
0.5000 −1.093
0.5049 −1.099
0.5077 −1.078
0.5132 −1.069
0.5181 −1.055

2437486 +
0.3818 −0.267
0.3841 −0.284
0.3860 −0.313
0.3899 −0.364
0.3913 −0.372
0.3932 −0.394
0.3975 −0.458
0.3991 −0.455
0.4008 −0.492
0.4048 −0.525
0.4065 −0.551
0.4088 −0.608
0.4125 −0.660
0.4144 −0.659
0.4162 −0.689
0.4204 −0.762
0.4221 −0.791
0.4237 −0.823
0.4272 −0.854
0.4305 −0.889
0.4319 −0.896
0.4367 −0.953
0.4388 −0.980
0.4404 −0.987
0.4446 −0.995
0.4462 −1.014
0.4476 −1.031
0.4510 −1.047
0.4531 −1.052
0.4548 −1.053
0.4592 −1.077
0.4626 −1.069
0.4640 −1.087
0.4679 −1.091
0.4700 −1.080
0.4719 −1.088
0.4763 −1.060
0.4777 −1.057
0.4807 −1.035
0.4851 −0.996
0.4869 −1.006
0.4897 −0.979
0.4978 −0.905
0.4992 −0.905
0.5006 −0.884
0.5061 −0.863
0.5131 −0.848
0.5196 −0.785
0.5305 −0.714
0.5331 −0.696
0.5353 −0.686
0.5405 −0.677
0.5426 −0.676
0.5456 −0.656

2439391 +
0.4062 −0.195
0.4081 −0.224
0.4144 −0.288
0.4170 −0.312
0.4223 −0.345
0.4248 −0.377
0.4328 −0.525
0.4349 −0.554
0.4396 −0.614
0.4416 −0.659
0.4434 −0.674
0.4486 −0.740
0.4504 −0.779
0.4528 −0.799
0.4570 −0.882
0.4587 −0.924
0.4602 −0.947
0.4635 −0.973
0.4650 −0.989
0.4671 −1.004
0.4706 −1.006
0.4739 −1.014
0.4776 −1.016
0.4810 −1.012
0.4848 −1.016
0.4865 −1.014
0.4882 −1.014
0.4916 −0.986
0.4931 −0.976
0.4949 −0.978
0.4991 −0.967
0.5009 −0.949
0.5025 −0.943
0.5064 −0.932
0.5082 −0.919
0.5097 −0.903

2439402 +
0.4050 −0.622
0.4077 −0.681
0.4133 −0.811
0.4154 −0.873
0.4209 −0.991
0.4237 −1.064
0.4300 −1.182
0.4321 −1.202
0.4383 −1.227
0.4411 −1.228
0.4473 −1.209
0.4543 −1.175
0.4564 −1.174
0.4619 −1.143
0.4647 −1.099
0.4695 −1.066
0.4716 −1.061
0.4765 −1.032
0.4800 −1.008

2439403 +
0.3112 0.062
0.3126 0.058
0.3140 0.055
0.3182 0.018
0.3202 0.011
0.3223 −0.001
0.3258 −0.012
0.3272 −0.018
0.3293 −0.065
0.3341 −0.120
0.3362 −0.136
0.3376 −0.154
0.3411 −0.209
0.3432 −0.216
0.3453 −0.241
0.3487 −0.303
0.3508 −0.320
0.3529 −0.368
0.3564 −0.442
0.3591 −0.516
0.3612 −0.602
0.3647 −0.749
0.3668 −0.835
0.3682 −0.871
0.3716 −0.907
0.3730 −0.920
0.3744 −0.961
0.3772 −1.040
0.3786 −1.082
0.3800 −1.122

0.3834 −1.169
0.3848 −1.181
0.3869 −1.197
0.3897 −1.213
0.3911 −1.214
0.3932 −1.224
0.3959 −1.221
0.3980 −1.215
0.3994 −1.213
0.4029 −1.199
0.4050 −1.200
0.4064 −1.189
0.4098 −1.152
0.4112 −1.135
0.4126 −1.134
0.4161 −1.106
0.4175 −1.097
0.4196 −1.092
0.4223 −1.066
0.4244 −1.055
0.4258 −1.047

2440494 +
0.5097 0.007
0.5111 −0.014
0.5153 −0.018
0.5174 −0.046
0.5313 −0.218
0.5340 −0.229
0.5354 −0.260
0.5382 −0.327
0.5424 −0.445
0.5438 −0.457
0.5479 −0.498
0.5493 −0.529
0.5612 −0.791
0.5626 −0.820
0.5667 −0.941
0.5681 −0.985
0.5723 −1.028
0.5737 −1.034

2440500 +
0.2600 −0.567
0.2614 −0.586
0.2628 −0.640
0.2656 −0.681
0.2670 −0.716
0.2684 −0.729
0.2711 −0.777
0.2725 −0.807
0.2739 −0.871
0.2767 −0.979
0.2781 −1.016
0.2795 −1.073
0.2822 −1.108
0.2836 −1.109
0.2850 −1.103
0.2878 −1.119
0.2892 −1.143
0.2906 −1.155
0.2933 −1.149
0.2947 −1.160

2440504 +
0.5416 −0.424
0.5430 −0.438
0.5444 −0.471
0.5471 −0.524
0.5485 −0.560
0.5499 −0.565
0.5527 −0.628
0.5541 −0.660
0.5555 −0.705
0.5583 −0.786
0.5597 −0.814
0.5611 −0.860
0.5638 −0.937
0.5652 −0.948
0.5666 −0.974
0.5694 −1.027
0.5708 −1.020
0.5722 −1.033
0.5749 −1.061
0.5763 −1.067
0.5777 −1.077
0.5805 −1.101
0.5819 −1.112
0.5833 −1.106
0.5860 −1.113
0.5874 −1.117
0.5888 −1.106

2440516 +
0.4028 −0.144
0.4056 −0.159
0.4070 −0.166
0.4084 −0.178
0.4111 −0.186
0.4125 −0.202
0.4139 −0.212
0.4167 −0.216
0.4181 −0.216
0.4195 −0.216
0.4222 −0.227
0.4236 −0.231
0.4250 −0.245
0.4278 −0.256
0.4292 −0.256
0.4306 −0.268
0.4333 −0.286
0.4347 −0.294
0.4361 −0.314
0.4389 −0.346
0.4403 −0.356
0.4417 −0.373
0.4444 −0.375
0.4458 −0.397
0.4472 −0.413
0.4500 −0.492
0.4514 −0.503
0.4528 −0.531
0.4569 −0.592
0.4583 −0.619
0.4597 −0.641
0.4625 −0.697
0.4639 −0.722
0.4653 −0.734
0.4681 −0.773
0.4695 −0.776
0.4709 −0.777
0.4736 −0.800
0.4750 −0.810
0.4764 −0.827
0.4792 −0.868
0.4806 −0.876
0.4820 −0.910
0.4847 −0.951
0.4861 −0.972
0.4875 −0.977
0.4903 −0.977
0.4917 −0.985
0.4931 −0.989
0.4958 −0.986
0.4972 −1.001
0.4986 −0.999
0.5014 −0.987
0.5028 −0.988
0.5042 −0.982
0.5069 −0.981
0.5083 −0.981
0.5097 −0.976
0.5125 −0.973
0.5139 −0.973
0.5153 −0.958

2440528 +
0.3181 −0.027
0.3195 −0.020
0.3209 −0.021
0.3237 −0.051
0.3251 −0.060
0.3265 −0.067
0.3293 −0.079
0.3307 −0.089
0.3321 −0.083
0.3348 −0.089
0.3362 −0.098
0.3376 −0.105
0.3404 −0.143
0.3418 −0.156
0.3432 −0.171
0.3459 −0.189
0.3473 −0.197
0.3487 −0.206
0.3515 −0.236
0.3529 −0.247
0.3543 −0.270
0.3570 −0.310
0.3584 −0.334
0.3598 −0.350
0.3626 −0.407
0.3640 −0.432
0.3654 −0.458
0.3681 −0.533
0.3695 −0.549
0.3709 −0.571
0.3737 −0.599
0.3751 −0.612
0.3765 −0.619
0.3793 −0.686
0.3807 −0.712
0.3821 −0.749
0.3848 −0.805
0.3862 −0.825
0.3876 −0.838
0.3904 −0.884
0.3918 −0.917
0.3932 −0.939
0.3959 −0.974
0.3973 −0.991
0.3987 −1.008
0.4015 −1.038
0.4029 −1.052
0.4043 −1.058
0.4070 −1.085
0.4084 −1.088
0.4098 −1.090
0.4126 −1.092
0.4140 −1.097
0.4154 −1.102
0.4182 −1.104
0.4196 −1.099
0.4210 −1.093

2440530 +
0.2626 −0.286
0.2640 −0.318
0.2654 −0.349
0.2682 −0.381
0.2696 −0.389
0.2710 −0.401
0.2738 −0.442
0.2752 −0.456
0.2766 −0.473
0.2793 −0.554
0.2807 −0.599
0.2821 −0.613
0.2849 −0.672
0.2863 −0.706
0.2877 −0.732
0.2904 −0.807
0.2918 −0.825
0.2932 −0.854
0.2960 −0.890
0.2974 −0.930

0.2988 −0.955
0.3015 −0.983
0.3029 −1.001
0.3043 −1.012
0.3071 −1.059
0.3085 −1.076
0.3099 −1.109
0.3140 −1.108
0.3154 −1.100
0.3168 −1.094
0.3196 −1.085
0.3210 −1.086
0.3224 −1.089
0.3251 −1.084
0.3265 −1.083
0.3279 −1.081

2440541 +
0.2326 −0.270
0.2347 −0.299
0.2389 −0.388
0.2410 −0.429
0.2451 −0.527
0.2472 −0.580
0.2514 −0.690
0.2535 −0.746
0.2576 −0.832
0.2597 −0.882
0.2639 −1.020
0.2660 −1.070
0.2701 −1.142
0.2722 −1.173
0.2764 −1.242
0.2785 −1.261
0.2826 −1.238
0.2847 −1.245
0.2889 −1.200
0.2910 −1.181

2440676 +
0.5177 −0.072
0.5239 −0.097
0.5302 −0.124
0.5364 −0.170
0.5385 −0.192
0.5427 −0.244
0.5448 −0.269
0.5489 −0.322
0.5510 −0.340
0.5552 −0.387
0.5573 −0.414
0.5614 −0.443
0.5635 −0.477
0.5677 −0.565
0.5698 −0.603
0.5739 −0.664
0.5760 −0.705
0.5802 −0.750
0.5823 −0.791
0.5864 −0.832
0.5885 −0.866
0.5927 −0.927
0.5948 −0.943
0.5989 −0.980
0.6010 −0.995
0.6052 −1.029
0.6073 −1.031
0.6114 −1.035
0.6135 −1.020
0.6177 −1.005
0.6212 −0.986
0.6233 −0.965

2440707 +
0.5077 0.033
0.5098 0.035
0.5140 0.028
0.5161 0.036
0.5202 0.037
0.5223 0.030
0.5265 −0.032
0.5286 −0.052
0.5327 −0.102
0.5348 −0.122
0.5394 −0.185
0.5415 −0.224
0.5445 −0.284
0.5466 −0.344
0.5508 −0.454
0.5529 −0.508
0.5570 −0.689
0.5591 −0.774
0.5633 −0.930
0.5654 −1.044
0.5695 −1.191
0.5716 −1.254
0.5751 −1.376
0.5772 −1.408
0.5814 −1.419
0.5835 −1.413

2440709 +
0.4150 0.012
0.4164 0.012
0.4191 0.002
0.4205 0.006
0.4233 0.000
0.4247 0.011
0.4275 0.005
0.4289 0.001
0.4316 −0.015
0.4330 −0.019
0.4358 −0.043
0.4372 −0.070
0.4400 −0.104
0.4414 −0.123
0.4441 −0.160
0.4455 −0.185
0.4483 −0.256
0.4497 −0.282
0.4525 −0.360
0.4539 −0.391
0.4566 −0.452
0.4580 −0.476
0.4608 −0.571
0.4622 −0.629
0.4650 −0.747
0.4664 −0.803
0.4691 −0.902
0.4705 −0.951
0.4733 −1.055
0.4747 −1.096
0.4775 −1.165
0.4789 −1.222
0.4816 −1.290
0.4830 −1.330
0.4858 −1.372
0.4872 −1.390
0.4900 −1.390
0.4914 −1.397
0.4941 −1.381
0.4955 −1.367
0.4983 −1.353
0.4997 −1.344
0.5025 −1.309
0.5039 −1.292
0.5066 −1.282
0.5080 −1.273
0.5108 −1.260
0.5122 −1.249

2440731 +
0.3400 −0.151
0.3414 −0.176
0.3442 −0.220
0.3456 −0.250
0.3484 −0.273
0.3498 −0.296
0.3524 −0.340
0.3538 −0.364
0.3566 −0.400
0.3580 −0.439
0.3608 −0.484
0.3622 −0.520
0.3649 −0.576
0.3663 −0.609
0.3691 −0.664
0.3705 −0.690
0.3733 −0.728
0.3747 −0.762
0.3774 −0.810
0.3788 −0.838
0.3816 −0.900
0.3830 −0.933
0.3858 −0.980
0.3872 −1.005
0.3899 −1.048
0.3913 −1.058
0.3941 −1.097
0.3955 −1.104
0.3983 −1.138
0.3997 −1.147
0.4024 −1.173
0.4038 −1.175
0.4066 −1.174
0.4080 −1.178

2440751 +
0.3579 −0.339
0.3593 −0.342
0.3635 −0.375
0.3648 −0.384
0.3683 −0.410
0.3697 −0.420
0.3732 −0.468
0.3746 −0.486
0.3781 −0.530
0.3795 −0.561
0.3822 −0.587
0.3836 −0.617
0.3864 −0.662
0.3884 −0.696
0.3912 −0.740
0.3926 −0.771
0.3961 −0.813
0.3975 −0.844
0.4010 −0.913
0.4031 −0.950
0.4065 −0.992
0.4079 −1.000
0.4107 −1.013
0.4121 −1.025
0.4149 −1.035
0.4163 −1.040
0.4190 −1.048
0.4204 −1.041
0.4232 −1.044
0.4246 −1.044
0.4280 −1.045
0.4294 −1.038
0.4322 −1.022
0.4336 −1.013
0.4364 −1.008
0.4378 −1.002
0.4405 −0.991
0.4419 −0.981
0.4447 −0.962
0.4461 −0.950
0.4489 −0.930
0.4503 −0.918

2440780 +
0.4447 −0.308
0.4469 −0.355
0.4510 −0.440
0.4531 −0.491

0.4572 −0.602	0.4701 −0.124	0.3938 −1.180	0.3413 −1.271	0.2517 −0.016
0.4593 −0.646	0.4728 −0.174	0.3979 −1.269	0.3441 −1.257	0.2531 −0.014
0.4635 −0.758	0.4742 −0.196	0.3993 −1.323	0.3455 −1.247	0.2559 0.011
0.4656 −0.821	0.4756 −0.201	0.4007 −1.344	0.3469 −1.242	0.2573 0.026
0.4697 −0.952	0.4784 −0.240	0.4049 −1.371	0.3496 −1.224	0.2587 0.021
0.4718 −1.028	0.4798 −0.252	0.4063 −1.374	0.3510 −1.220	0.2614 0.034
0.4760 −1.147	0.4839 −0.359	0.4077 −1.386	0.3524 −1.208	0.2628 0.029
0.4781 −1.225	0.4853 −0.392	0.4139 −1.377	0.3552 −1.174	0.2649 0.030
0.4822 −1.313	0.4867 −0.424	0.4153 −1.364	0.3566 −1.162	0.2684 0.029
0.4843 −1.344	0.4895 −0.477	0.4167 −1.357	0.3580 −1.134	0.2698 0.026
0.4885 −1.360	0.4909 −0.505	0.4201 −1.338		0.2712 0.043
0.4919 −1.341	0.4950 −0.586	0.4215 −1.311	2440937 +	0.2740 0.032
0.4961 −1.307	0.4964 −0.630	0.4229 −1.300	0.2209 −0.292	0.2754 0.036
0.4982 −1.287	0.4978 −0.651	0.4292 −1.218	0.2223 −0.320	0.2768 0.038
	0.5006 −0.719	0.4306 −1.211	0.2237 −0.332	0.2795 0.038
2440821 +	0.5020 −0.749	0.4320 −1.202	0.2265 −0.361	0.2809 0.034
0.4096 −0.415	0.5034 −0.786		0.2279 −0.383	0.2823 0.037
0.4117 −0.437	0.5062 −0.833	2440925 +	0.2293 −0.424	0.2858 0.036
0.4166 −0.511	0.5076 −0.860	0.2656 0.054	0.2320 −0.484	0.2878 0.037
0.4186 −0.551	0.5090 −0.895	0.2670 0.055	0.2334 −0.509	0.2899 0.030
0.4228 −0.667	0.5117 −0.957	0.2684 0.048	0.2348 −0.538	0.2934 0.038
0.4249 −0.690	0.5131 −0.982	0.2711 0.061	0.2369 −0.581	0.2948 0.030
0.4305 −0.782	0.5145 −1.012	0.2725 0.067	0.2383 −0.605	0.3198 −0.047
0.4326 −0.806	0.5173 −1.047	0.2739 0.050	0.2397 −0.653	0.3212 −0.049
0.4423 −0.941	0.5187 −1.068	0.2788 0.037	0.2425 −0.720	0.3222 −0.058
0.4444 −0.963	0.5201 −1.088	0.2802 0.031	0.2439 −0.786	0.3249 −0.088
0.4492 −1.010	0.5228 −1.121	0.2816 0.041	0.2453 −0.838	0.3263 −0.117
0.4513 −1.020	0.5242 −1.129	0.2843 0.022	0.2467 −0.919	0.3277 −0.137
0.4583 −1.057	0.5256 −1.125	0.2857 0.018	0.2481 −0.960	0.3305 −0.184
0.4631 −1.094	0.5284 −1.107	0.2871 0.015	0.2495 −1.003	0.3320 −0.219
0.4652 −1.097	0.5298 −1.105	0.3107 −0.352	0.2529 −1.093	0.3336 −0.248
0.4749 −1.089	0.5312 −1.100	0.3121 −0.409	0.2543 −1.151	0.3360 −0.306
0.4770 −1.075	0.5353 −1.052	0.3135 −0.448	0.2557 −1.169	0.3371 −0.328
0.4839 −1.019	0.5367 −1.044	0.3163 −0.517	0.2584 −1.242	0.3383 −0.358
0.4860 −1.008	0.5388 −1.018	0.3177 −0.572	0.2640 −1.293	0.3408 −0.406
0.4916 −0.932	0.5402 −1.014	0.3191 −0.646	0.2668 −1.292	0.3419 −0.424
0.4937 −0.888	0.5416 −1.005	0.3218 −0.775	0.2682 −1.292	0.3431 −0.443
0.5062 −0.756		0.3232 −0.840	0.2696 −1.283	0.3455 −0.493
0.5083 −0.724	2440863 +	0.3246 −0.917	0.2723 −1.272	0.3469 −0.515
	0.3757 −0.587	0.3274 −1.036	0.2737 −1.265	0.3488 −0.563
2440840 +	0.3771 −0.618	0.3288 −1.078	0.2751 −1.245	0.3507 −0.607
0.4590 −0.018	0.3785 −0.694	0.3302 −1.134	0.2779 −1.207	0.3520 −0.631
0.4617 −0.030	0.3826 −0.855	0.3329 −1.185	0.2793 −1.199	0.3534 −0.655
0.4631 −0.041	0.3840 −0.917	0.3343 −1.218	0.2807 −1.187	0.3557 −0.732
0.4645 −0.073	0.3854 −0.978	0.3357 −1.236		0.3569 −0.748
0.4673 −0.088	0.3903 −1.097	0.3385 −1.266	2441249 +	0.3580 −0.772
0.4687 −0.097	0.3924 −1.141	0.3399 −1.271	0.2503 −0.006	0.3605 −0.865

0.3618 −0.904	0.3036 −0.599	0.5488 −0.710	2441591 +	0.2549 −0.925
0.3628 −0.939	0.3048 −0.639	0.5516 −0.874	0.4550 −0.462	0.2556 −0.953
0.3652 −0.997	0.3088 −0.733	0.5530 −0.945	0.4564 −0.486	0.2580 −1.026
0.3666 −1.017	0.3100 −0.752	0.5558 −1.083	0.4591 −0.510	0.2587 −1.063
0.3679 −1.051	0.3110 −0.771	0.5571 −1.174	0.4605 −0.520	0.2594 −1.081
0.3705 −1.087	0.3165 −0.922	0.5599 −1.220	0.4633 −0.553	0.2622 −1.138
0.3721 −1.103	0.3178 −0.985	0.5613 −1.267	0.4647 −0.578	0.2629 −1.154
0.3734 −1.114	0.3190 −1.014	0.5641 −1.305	0.4675 −0.630	0.2639 −1.205
0.3764 −1.134	0.3219 −1.093	0.5655 −1.329	0.4689 −0.647	0.2664 −1.244
0.3777 −1.142	0.3233 −1.104	0.5683 −1.361	0.4716 −0.687	0.2678 −1.273
0.3791 −1.154	0.3281 −1.153	0.5697 −1.359	0.4730 −0.722	0.2685 −1.289
0.3823 −1.167	0.3294 −1.161	0.5724 −1.356	0.4758 −0.758	0.2712 −1.323
0.3839 −1.169	0.3306 −1.170	0.5738 −1.351	0.4772 −0.783	0.2722 −1.340
0.3854 −1.169	0.3338 −1.176	0.5766 −1.334	0.4800 −0.842	0.2733 −1.344
0.3886 −1.173	0.3352 −1.180	0.5780 −1.322	0.4814 −0.881	0.2761 −1.346
0.3902 −1.172	0.3366 −1.178	0.5808 −1.305	0.4841 −0.932	0.2775 −1.343
0.3914 −1.161	0.3399 −1.174	0.5822 −1.287	0.4855 −0.952	0.2789 −1.343
0.3941 −1.158	0.3411 −1.167		0.4883 −0.989	0.2816 −1.329
0.3955 −1.146	0.3426 −1.159	2441589 +	0.4897 −1.015	0.2826 −1.323
0.3972 −1.136	0.3455 −1.144	0.5597 −0.595	0.4925 −1.023	0.2837 −1.314
0.4007 −1.095	0.3470 −1.127	0.5611 −0.620	0.4939 −1.031	0.2865 −1.277
0.4028 −1.075	0.3480 −1.123	0.5639 −0.665	0.4966 −1.046	0.2872 −1.263
0.4044 −1.070		0.5653 −0.683	0.4980 −1.050	0.2882 −1.241
	2441539 +	0.5681 −0.730	0.5008 −1.049	
2441250 +	0.5016 −0.053	0.5695 −0.758	0.5022 −1.055	2441622 +
0.2285 0.056	0.5030 −0.042	0.5722 −0.814	0.5050 −1.054	0.4313 −0.221
0.2299 0.050	0.5058 −0.057	0.5736 −0.823	0.5064 −1.052	0.4327 −0.252
0.2370 0.057	0.5072 −0.051	0.5764 −0.888	0.5091 −1.046	0.4354 −0.284
0.2384 0.065	0.5099 −0.046	0.5778 −0.917	0.5105 −1.039	0.4368 −0.320
0.2397 0.073	0.5113 −0.058	0.5806 −0.944	0.5133 −1.029	0.4396 −0.384
0.2601 0.025	0.5141 −0.045	0.5820 −0.965	0.5147 −1.013	0.4410 −0.408
0.2615 0.017	0.5155 −0.055	0.5847 −1.006	0.5175 −1.011	0.4438 −0.453
0.2628 0.006	0.5183 −0.080	0.5861 −1.021	0.5189 −1.002	0.4452 −0.473
0.2679 −0.021	0.5197 −0.094	0.5889 −1.038	0.5216 −0.985	0.4479 −0.527
0.2691 −0.027	0.5224 −0.131	0.5903 −1.041	0.5230 −0.976	0.4493 −0.565
0.2705 −0.028	0.5238 −0.154	0.5931 −1.064		0.4521 −0.639
0.2750 −0.080	0.5266 −0.170	0.5945 −1.085	2441606 +	0.4535 −0.661
0.2763 −0.104	0.5280 −0.195	0.5972 −1.082	0.2400 −0.413	0.4563 −0.742
0.2775 −0.113	0.5307 −0.259	0.5986 −1.076	0.2407 −0.450	0.4577 −0.772
0.2833 −0.205	0.5321 −0.273	0.6014 −1.078	0.2417 −0.471	0.4604 −0.858
0.2858 −0.252	0.5349 −0.334	0.6028 −1.078	0.2441 −0.540	0.4618 −0.876
0.2896 −0.324	0.5363 −0.363	0.6056 −1.074	0.2455 −0.567	0.4646 −0.943
0.2907 −0.343	0.5391 −0.420	0.6070 −1.065	0.2462 −0.602	0.4660 −0.972
0.2961 −0.460	0.5405 −0.450	0.6111 −1.038	0.2490 −0.671	0.4688 −1.009
0.2973 −0.488	0.5433 −0.490	0.6139 −1.034	0.2504 −0.721	0.4702 −1.038
0.2985 −0.508	0.5447 −0.528	0.6153 −1.013	0.2511 −0.761	0.4729 −1.071
0.3024 −0.571	0.5474 −0.645		0.2539 −0.893	0.4743 −1.101

0.4771 −1.139
0.4785 −1.145
0.4813 −1.182
0.4827 −1.193
0.4854 −1.206
0.4868 −1.209
0.4896 −1.206
0.4910 −1.209
0.4938 −1.208
0.4952 −1.196
0.4979 −1.186
0.4993 −1.184
0.5021 −1.169
0.5035 −1.151

2441772 +
0.5138 −0.134
0.5152 −0.170
0.5180 −0.189
0.5194 −0.205
0.5221 −0.257
0.5235 −0.297
0.5263 −0.343
0.5277 −0.385
0.5305 −0.417
0.5319 −0.459
0.5346 −0.502
0.5360 −0.521
0.5388 −0.561
0.5402 −0.584
0.5430 −0.649
0.5444 −0.686
0.5471 −0.736
0.5485 −0.760
0.5513 −0.814
0.5527 −0.852
0.5555 −0.953
0.5569 −1.011
0.5596 −1.085
0.5610 −1.123
0.5638 −1.188
0.5652 −1.219
0.5680 −1.264
0.5694 −1.277
0.5721 −1.284
0.5735 −1.298
0.5763 −1.297

0.5777 −1.286
0.5805 −1.272
0.5819 −1.257
0.5846 −1.242
0.5860 −1.232

2441803 +
0.4687 −0.337
0.4704 −0.359
0.4731 −0.405
0.4741 −0.418
0.4757 −0.434
0.4767 −0.445
0.4785 −0.465
0.4799 −0.475
0.4812 −0.493
0.4826 −0.501
0.4840 −0.523
0.4854 −0.549
0.4874 −0.558
0.4888 −0.589
0.4907 −0.615
0.4921 −0.630
0.4943 −0.654
0.4957 −0.670
0.4978 −0.695
0.4992 −0.711
0.5013 −0.742
0.5023 −0.761
0.5041 −0.788
0.5048 −0.794
0.5068 −0.809
0.5078 −0.819
0.5096 −0.820
0.5103 −0.826
0.5124 −0.857
0.5138 −0.871
0.5152 −0.885
0.5166 −0.907
0.5187 −0.931
0.5201 −0.958
0.5215 −0.972
0.5229 −0.988
0.5242 −0.995
0.5256 −1.012
0.5270 −1.024
0.5280 −1.033

0.5298 −1.050
0.5312 −1.053
0.5333 −1.065
0.5347 −1.065
0.5360 −1.061
0.5374 −1.053
0.5388 −1.051
0.5402 −1.047
0.5423 −1.031
0.5433 −1.026
0.5451 −1.020
0.5465 −1.009
0.5485 −1.003
0.5499 −1.006
0.5520 −1.001
0.5534 −0.995
0.5554 −0.989
0.5568 −0.980
0.5582 −0.975
0.5596 −0.970
0.5617 −0.958
0.5631 −0.949
0.5652 −0.945
0.5666 −0.943
0.5680 −0.931
0.5694 −0.930
0.5715 −0.908
0.5729 −0.904

2441815 +
0.4052 −0.525
0.4059 −0.542
0.4080 −0.581
0.4094 −0.613
0.4114 −0.641
0.4128 −0.655
0.4148 −0.687
0.4155 −0.716
0.4184 −0.761
0.4198 −0.782
0.4219 −0.832
0.4229 −0.860
0.4253 −0.893
0.4263 −0.903
0.4298 −0.947
0.4305 −0.967
0.4322 −0.984

0.4336 −1.002
0.4357 −1.024
0.4371 −1.033
0.4392 −1.061
0.4406 −1.071
0.4427 −1.084
0.4441 −1.084
0.4468 −1.090
0.4478 −1.104
0.4503 −1.102
0.4510 −1.094
0.4537 −1.092
0.4544 −1.093
0.4572 −1.069
0.4586 −1.068
0.4607 −1.066
0.4616 −1.060
0.4641 −1.042
0.4648 −1.032
0.4670 −1.031
0.4684 −1.024
0.4712 −1.010
0.4719 −1.004
0.4739 −0.998
0.4753 −0.985
0.4774 −0.964
0.4788 −0.950

2441833 +
0.5006 −0.115
0.5020 −0.134
0.5041 −0.164
0.5055 −0.183
0.5075 −0.208
0.5089 −0.221
0.5110 −0.252
0.5124 −0.292
0.5145 −0.322
0.5159 −0.350
0.5180 −0.373
0.5194 −0.405
0.5214 −0.434
0.5228 −0.462
0.5249 −0.518
0.5263 −0.550
0.5284 −0.606
0.5298 −0.655

0.5319 −0.739
0.5333 −0.778
0.5353 −0.870
0.5367 −0.922
0.5388 −1.001
0.5402 −1.070
0.5423 −1.145
0.5437 −1.172
0.5458 −1.219
0.5472 −1.243
0.5492 −1.266

2441835 +
0.4201 −0.235
0.4215 −0.260
0.4239 −0.296
0.4250 −0.305
0.4278 −0.349
0.4292 −0.397
0.4319 −0.459
0.4333 −0.505
0.4361 −0.591
0.4375 −0.616
0.4403 −0.719
0.4413 −0.771
0.4441 −0.939
0.4451 −0.992
0.4489 −1.173
0.4503 −1.207
0.4531 −1.264
0.4545 −1.296
0.4573 −1.330
0.4587 −1.352
0.4601 −1.358
0.4632 −1.365
0.4646 −1.367
0.4674 −1.370
0.4688 −1.362
0.4711 −1.338
0.4722 −1.330
0.4749 −1.320
0.4763 −1.309
0.4795 −1.294
0.4809 −1.281
0.4840 −1.264
0.4854 −1.246
0.4881 −1.226

0.4895 −1.211
0.4917 −1.187
0.4931 −1.177

2441905 +
0.4628 −0.391
0.4642 −0.414
0.4669 −0.484
0.4679 −0.505
0.4701 −0.545
0.4711 −0.581
0.4738 −0.633
0.4750 −0.679
0.4776 −0.734
0.4784 −0.784
0.4809 −0.882
0.4818 −0.907
0.4840 −1.020
0.4850 −1.050
0.4870 −1.106
0.4880 −1.129
0.4910 −1.169
0.4920 −1.191
0.4944 −1.228
0.4954 −1.240
0.4977 −1.246
0.4986 −1.253
0.5010 −1.250
0.5021 −1.254
0.5044 −1.254
0.5054 −1.257
0.5074 −1.253
0.5086 −1.243
0.5107 −1.228
0.5118 −1.226
0.5142 −1.223
0.5153 −1.213
0.5176 −1.195
0.5186 −1.194

2441915 +
0.4494 −0.094
0.4501 −0.102
0.4522 −0.114
0.4536 −0.121
0.4557 −0.145
0.4571 −0.154
0.4591 −0.170
0.4605 −0.185
0.4633 −0.209
0.4647 −0.250
0.4671 −0.277
0.4685 −0.290
0.4709 −0.323
0.4723 −0.337
0.4747 −0.386
0.4757 −0.400
0.4876 −0.637
0.4886 −0.663
0.4913 −0.745
0.4923 −0.786
0.4945 −0.837
0.4955 −0.872
0.4980 −0.929
0.4987 −0.953
0.5008 −1.015
0.5018 −1.048
0.5043 −1.091
0.5064 −1.140
0.5087 −1.192
0.5112 −1.230
0.5133 −1.265

2441918 +
0.3216 −0.187
0.3228 −0.208
0.3256 −0.243
0.3270 −0.259
0.3291 −0.290
0.3303 −0.305
0.3334 −0.347
0.3348 −0.369
0.3376 −0.430
0.3390 −0.466
0.3418 −0.537
0.3447 −0.602
0.3480 −0.685
0.3508 −0.725
0.3522 −0.762
0.3546 −0.790
0.3556 −0.800

2441933 +
0.5641 −0.157
0.5650 −0.175
0.5669 −0.197
0.5678 −0.213
0.5696 −0.248
0.5705 −0.260
0.5724 −0.286
0.5733 −0.308
0.5752 −0.359
0.5761 −0.364
0.5780 −0.426
0.5789 −0.455
0.5808 −0.515
0.5817 −0.540
0.5863 −0.780
0.5872 −0.845

2441934 +
0.5145 −0.138
0.5173 −0.199
0.5200 −0.262
0.5252 −0.359
0.5259 −0.384
0.5280 −0.430
0.5287 −0.455
0.5302 −0.489
0.5339 −0.553
0.5367 −0.601
0.5395 −0.647
0.5423 −0.704
0.5450 −0.750
0.5478 −0.811
0.5506 −0.900
0.5534 −0.960
0.5562 −1.027
0.5589 −1.075
0.5617 −1.101
0.5645 −1.115
0.5673 −1.132
0.5700 −1.140
0.5727 −1.148
0.5759 −1.141
0.5777 −1.123
0.5812 −1.117

2441938 +
0.3676 −1.040
0.3690 −1.058
0.3724 −1.104
0.3738 −1.115
0.3769 −1.131
0.3783 −1.135
0.3822 −1.156
0.3839 −1.152
0.3870 −1.140
0.3884 −1.138
0.3926 −1.126
0.3940 −1.118
0.3981 −1.091
0.3998 −1.089

2441939 +
0.2849 −0.434
0.2863 −0.454
0.2884 −0.476
0.2898 −0.496
0.2919 −0.532
0.2933 −0.553
0.2953 −0.593
0.2967 −0.620
0.2988 −0.656
0.3002 −0.677
0.3023 −0.701
0.3037 −0.725
0.3058 −0.765
0.3072 −0.790
0.3092 −0.828
0.3106 −0.846
0.3127 −0.889
0.3141 −0.915
0.3162 −0.973
0.3176 −1.003
0.3197 −1.037
0.3211 −1.060
0.3231 −1.095
0.3245 −1.111
0.3266 −1.120
0.3280 −1.134
0.3301 −1.148
0.3315 −1.157
0.3335 −1.159
0.3349 −1.155
0.3370 −1.161
0.3384 −1.159
0.3405 −1.156
0.3419 −1.148
0.3440 −1.143
0.3454 −1.120
0.3474 −1.112
0.3488 −1.098
0.3509 −1.088
0.3523 −1.087
0.3544 −1.080
0.3558 −1.070

2441949 +
0.2846 −0.502
0.2857 −0.515
0.2877 −0.550
0.2891 −0.570
0.2916 −0.623
0.3030 −0.760
0.3058 −0.789
0.3085 −0.815
0.3113 −0.833
0.3141 −0.865
0.3169 −0.901
0.3195 −0.924
0.3224 −0.950
0.3252 −0.991
0.3280 −1.010
0.3308 −1.020
0.3335 −1.035
0.3363 −1.036
0.3445 −1.027
0.3474 −1.017
0.3502 −0.989
0.3530 −0.980
0.3558 −0.975
0.3585 −0.947
0.3641 −0.891

2441990 +
0.2642 −0.130
0.2659 −0.133
0.2691 −0.134
0.2705 −0.150
0.2735 −0.164
0.2752 −0.188
0.2781 −0.232
0.2795 −0.248
0.2822 −0.298

0.2839 −0.330
0.2867 −0.372
0.2877 −0.385
0.2920 −0.466
0.2947 −0.521
0.2954 −0.560
0.2975 −0.624
0.2989 −0.684
0.3017 −0.780
0.3024 −0.830
0.3045 −0.965
0.3052 −0.987
0.3072 −1.126
0.3079 −1.149
0.3100 −1.215
0.3107 −1.222
0.3128 −1.230
0.3135 −1.228
0.3156 −1.263
0.3163 −1.269
0.3184 −1.308
0.3191 −1.314
0.3211 −1.325
0.3218 −1.329
0.3239 −1.351
0.3246 −1.359
0.3267 −1.364
0.3274 −1.358
0.3295 −1.349
0.3309 −1.323
0.3336 −1.308
0.3350 −1.301
0.3378 −1.273
0.3392 −1.262
0.3420 −1.241
0.3434 −1.218
0.3461 −1.201
0.3475 −1.184

2442147 +
0.4804 −0.002
0.4818 0.010
0.4846 −0.003
0.4860 0.010
0.4971 −0.024
0.4985 −0.031
0.5026 −0.049

0.5040 −0.063
0.5082 −0.110
0.5096 −0.127
0.5123 −0.166
0.5137 −0.172
0.5186 −0.242
0.5200 −0.260
0.5214 −0.298
0.5228 −0.325
0.5262 −0.385
0.5276 −0.405
0.5318 −0.466
0.5332 −0.502
0.5373 −0.566
0.5387 −0.598
0.5415 −0.656
0.5429 −0.723
0.5464 −0.809
0.5478 −0.864
0.5512 −0.957
0.5526 −1.014
0.5561 −1.126
0.5575 −1.157
0.5610 −1.217
0.5624 −1.251
0.5658 −1.276
0.5672 −1.287
0.5714 −1.290
0.5728 −1.284
0.5762 −1.285
0.5776 −1.285
0.5811 −1.273
0.5825 −1.267
0.5853 −1.237
0.5867 −1.226
0.5901 −1.204
0.5915 −1.176
0.5936 −1.149
0.5950 −1.142

2442201 +
0.3722 −0.718
0.3736 −0.725
0.3770 −0.809
0.3784 −0.827
0.3812 −0.903
0.3826 −0.941

0.3854 −1.014
0.3868 −1.041
0.3895 −1.086
0.3909 −1.109
0.3937 −1.133
0.3951 −1.151
0.3986 −1.159
0.4000 −1.163
0.4027 −1.163
0.4076 −1.152
0.4090 −1.150
0.4118 −1.136
0.4132 −1.128
0.4167 −1.124
0.4180 −1.118
0.4208 −1.098
0.4222 −1.093
0.4257 −1.081
0.4271 −1.073
0.4312 −1.053
0.4354 −1.011
0.4368 −1.005
0.4403 −0.954
0.4417 −0.950

2442220 +
0.4278 −0.223
0.4306 −0.279
0.4334 −0.369
0.4348 −0.394
0.4362 −0.436
0.4389 −0.501
0.4403 −0.548
0.4417 −0.576
0.4445 −0.665
0.4459 −0.712
0.4473 −0.743
0.4501 −0.853
0.4515 −0.906
0.4529 −0.931
0.4556 −1.005
0.4570 −1.044
0.4584 −1.107
0.4612 −1.174
0.4626 −1.206
0.4640 −1.223
0.4667 −1.270

0.4681 −1.290
0.4695 −1.299
0.4723 −1.294
0.4737 −1.293
0.4751 −1.293
0.4778 −1.281
0.4792 −1.271
0.4806 −1.271
0.4834 −1.260
0.4848 −1.245
0.4862 −1.232
0.4889 −1.205
0.4903 −1.191
0.4917 −1.188

2442242 +
0.3521 −0.579
0.3531 −0.622
0.3576 −0.725
0.3586 −0.755
0.3604 −0.799
0.3614 −0.823
0.3632 −0.865
0.3642 −0.895
0.3660 −0.926
0.3670 −0.940
0.3688 −0.972
0.3708 −1.016
0.3757 −1.098
0.3776 −1.115
0.3813 −1.129
0.3850 −1.125
0.3868 −1.122
0.3887 −1.116
0.3906 −1.098
0.3924 −1.098

2442260 +
0.4185 −0.337
0.4199 −0.345
0.4227 −0.354
0.4241 −0.358
0.4268 −0.372
0.4282 −0.401
0.4310 −0.440
0.4324 −0.463
0.4352 −0.488

0.4366 −0.500
0.4393 −0.544
0.4407 −0.562
0.4435 −0.592
0.4449 −0.610
0.4477 −0.631
0.4491 −0.637
0.4518 −0.647
0.4532 −0.670
0.4560 −0.698
0.4574 −0.714
0.4602 −0.743
0.4609 −0.750
0.4630 −0.771
0.4640 −0.788
0.4660 −0.801
0.4674 −0.818
0.4699 −0.849
0.4713 −0.878
0.4741 −0.906
0.4751 −0.919
0.4778 −0.940
0.4792 −0.945
0.4817 −0.948
0.4831 −0.957
0.4866 −0.967
0.5056 −0.998
0.5084 −0.983
0.5098 −0.973
0.5123 −0.965

2442269 +
0.4872 −0.353
0.4900 −0.390
0.4914 −0.415
0.4942 −0.443
0.4956 −0.461
0.4980 −0.505
0.4994 −0.535
0.5018 −0.566
0.5032 −0.590
0.5074 −0.649
0.5098 −0.684
0.5108 −0.693
0.5133 −0.720
0.5144 −0.739
0.5168 −0.770

0.5179 −0.792
0.5202 −0.831
0.5213 −0.861
0.5237 −0.903
0.5244 −0.913
0.5272 −0.952
0.5283 −0.970
0.5307 −0.994
0.5314 −0.996
0.5341 −1.010
0.5352 −1.022
0.5376 −1.025
0.5387 −1.028
0.5411 −1.035
0.5418 −1.032
0.5445 −1.033
0.5459 −1.036
0.5487 −1.033
0.5494 −1.029
0.5518 −1.021
0.5529 −1.025
0.5557 −1.012
0.5591 −1.000
0.5598 −1.001

2442279 +
0.4852 −0.059
0.4865 −0.074
0.4877 −0.076
0.4891 −0.094
0.4905 −0.088
0.4964 −0.147
0.4977 −0.163
0.4989 −0.173
0.5003 −0.216
0.5014 −0.224
0.5067 −0.351
0.5078 −0.380
0.5090 −0.400
0.5103 −0.443
0.5113 −0.457
0.5184 −0.644
0.5196 −0.658
0.5207 −0.688
0.5260 −0.882
0.5271 −0.908
0.5281 −0.926

0.5294 −0.974
0.5304 −0.990
0.5354 −1.090
0.5365 −1.099
0.5376 −1.129
0.5386 −1.146
0.5397 −1.177
0.5444 −1.233
0.5455 −1.235
0.5465 −1.235
0.5476 −1.235
0.5487 −1.221
0.5538 −1.183
0.5548 −1.180
0.5558 −1.172
0.5568 −1.173
0.5578 −1.170
0.5589 −1.166

2442303 +
0.3439 −0.429
0.3453 −0.440
0.3480 −0.465
0.3490 −0.473
0.3512 −0.500
0.3518 −0.508
0.3539 −0.538
0.3545 −0.550
0.3566 −0.571
0.3573 −0.586
0.3594 −0.636
0.3604 −0.664
0.3629 −0.727
0.3639 −0.756
0.3668 −0.805
0.3679 −0.840
0.3709 −0.970
0.3733 −1.022
0.3743 −1.045
0.3765 −1.077
0.3776 −1.109
0.3800 −1.150
0.3807 −1.160
0.3827 −1.165
0.3837 −1.159
0.3855 −1.155
0.3866 −1.154

0.3887 −1.152
0.3897 −1.151
0.3918 −1.151
0.3928 −1.159
0.3950 −1.152

2442636 +
0.3601 −0.231
0.3610 −0.266
0.3655 −0.289
0.3665 −0.293
0.3711 −0.327
0.3719 −0.330
0.3748 −0.343
0.3756 −0.346
0.3782 −0.351
0.3808 −0.369
0.3835 −0.420
0.3842 −0.427
0.3860 −0.486
0.3868 −0.504
0.3889 −0.531
0.3922 −0.541
0.3929 −0.534
0.3948 −0.542
0.3958 −0.546
0.3980 −0.576
0.4020 −0.618
0.4046 −0.642
0.4085 −0.688
0.4138 −0.751
0.4147 −0.763
0.4168 −0.778
0.4175 −0.793
0.4199 −0.808
0.4234 −0.843
0.4252 −0.853
0.4259 −0.869
0.4286 −0.918
0.4306 −0.928
0.4314 −0.941
0.4334 −0.939
0.4342 −0.939
0.4399 −0.985
0.4425 −0.975
0.4460 −0.982
0.4486 −0.970

0.4510 −0.946
0.4518 −0.962
0.4541 −0.945
0.4567 −0.932
0.4576 −0.920

2442948 +
0.4865 −0.271
0.4879 −0.290
0.4907 −0.327
0.4948 −0.362
0.4962 −0.382
0.4997 −0.408
0.5025 −0.439
0.5039 −0.472
0.5072 −0.524
0.5086 −0.562
0.5115 −0.633
0.5129 −0.648
0.5163 −0.659
0.5205 −0.703
0.5219 −0.724
0.5253 −0.771
0.5293 −0.805
0.5306 −0.812

2443660 +
0.3494 −0.001
0.3534 0.012
0.3584 −0.002
0.3626 0.005
0.3665 −0.007
0.3747 −0.001
0.3790 −0.005
0.3838 −0.029
0.3889 −0.017
0.3945 −0.057
0.4042 −0.097
0.4084 −0.163
0.4168 −0.297
0.4205 −0.428
0.4218 −0.457
0.4247 −0.503
0.4260 −0.548
0.4287 −0.579
0.4301 −0.630
0.4330 −0.736

0.4342 −0.759
0.4369 −0.862
0.4385 −0.933
0.4411 −1.054
0.4431 −1.136

2443700 +
0.3937 −0.091
0.3951 −0.110
0.3978 −0.118
0.3992 −0.116
0.4020 −0.136
0.4034 −0.134
0.4062 −0.165
0.4076 −0.188
0.4145 −0.250
0.4187 −0.293
0.4201 −0.307
0.4228 −0.328
0.4242 −0.345
0.4270 −0.376
0.4284 −0.399
0.4312 −0.427
0.4326 −0.440
0.4353 −0.465
0.4367 −0.482
0.4395 −0.524
0.4409 −0.552
0.4437 −0.580
0.4451 −0.602
0.4478 −0.628
0.4520 −0.689
0.4534 −0.720
0.4576 −0.783
0.4603 −0.854
0.4617 −0.868
0.4645 −0.926
0.4659 −0.954
0.4687 −0.999
0.4701 −1.011
0.4728 −1.039
0.4742 −1.040
0.4770 −1.067
0.4784 −1.061
0.4812 −1.074
0.4853 −1.059
0.4867 −1.053

0.4895 −1.032
0.4909 −1.030
0.4951 −1.018
0.4978 −1.012
0.4992 −0.998
0.5020 −0.985
0.5062 −0.971
0.5076 −0.957
0.5103 −0.941
0.5117 −0.932

2443720 +
0.4571 −0.587
0.4598 −0.640
0.4620 −0.698
0.4638 −0.731
0.4648 −0.755
0.4666 −0.815
0.4675 −0.840
0.4694 −0.895
0.4703 −0.915
0.4722 −0.991
0.4731 −1.020
0.4749 −1.070
0.4759 −1.109
0.4780 −1.149
0.4793 −1.180
0.4821 −1.217
0.4835 −1.247
0.4863 −1.268
0.4877 −1.271
0.4905 −1.275
0.4918 −1.274
0.4953 −1.262
0.4988 −1.238
0.5002 −1.229
0.5030 −1.220
0.5043 −1.208
0.5071 −1.188
0.5085 −1.172

2443730 +
0.4575 −0.241
0.4603 −0.288
0.4617 −0.306
0.4644 −0.354
0.4658 −0.375
0.4686 −0.437
0.4699 −0.481
0.4724 −0.531
0.4735 −0.563
0.4761 −0.654
0.4773 −0.690

2443732 +
0.3614 −0.109
0.3631 −0.143
0.3692 −0.272
0.3713 −0.346
0.3747 −0.411
0.3761 −0.431
0.3817 −0.584
0.3831 −0.618
0.3931 −1.083
0.3990 −1.234
0.4005 −1.306
0.4046 −1.392

2443743 +
0.3261 −0.249
0.3273 −0.262
0.3295 −0.302
0.3306 −0.327
0.3329 −0.373
0.3340 −0.403
0.3389 −0.469
0.3399 −0.516
0.3419 −0.575
0.3429 −0.628
0.3452 −0.688
0.3462 −0.715
0.3486 −0.719
0.3496 −0.749
0.3518 −0.855
0.3529 −0.903
0.3552 −0.985
0.3562 −1.008
0.3592 −1.067
0.3603 −1.087
0.3630 −1.128
0.3658 −1.163
0.3668 −1.180
0.3694 −1.198
0.3729 −1.206
0.3740 −1.197
0.3765 −1.193
0.3789 −1.189
0.3815 −1.185

2443763 +
0.3355 −0.431
0.3405 −0.537
0.3458 −0.616
0.3493 −0.678
0.3516 −0.718
0.3546 −0.773
0.3563 −0.794
0.3596 −0.850
0.3619 −0.895
0.3653 −0.939
0.3671 −0.968
0.3701 −1.001
0.3719 −1.020
0.3750 −1.036
0.3820 −1.045
0.3853 −1.041
0.3872 −1.030
0.3909 −1.021
0.3928 −1.004
0.3961 −0.990
0.3977 −0.979
0.4033 −0.928

2445609 +
0.2839 −1.098
0.2852 −1.122
0.2866 −1.152
0.2879 −1.173
0.2893 −1.188
0.2951 −1.239
0.2965 −1.252
0.2978 −1.256
0.2991 −1.256
0.3005 −1.256
0.3057 −1.251
0.3071 −1.247
0.3084 −1.239
0.3098 −1.229
0.3111 −1.210

2445791 +
0.3600 −1.075
0.3612 −1.070
0.3626 −1.068
0.3640 −1.069
0.3653 −1.061
0.3779 −0.985
0.3793 −0.976
0.3806 −0.967
0.3820 −0.951
0.4106 −0.645
0.4119 −0.645
0.4132 −0.631
0.4146 −0.619
0.4159 −0.618
0.4173 −0.607
0.4186 −0.602
0.4199 −0.589
0.4213 −0.588
0.4227 −0.581
0.4365 −0.563
0.4378 −0.559
0.4392 −0.553
0.4405 −0.542
0.4418 −0.524
0.4432 −0.518
0.4445 −0.517
0.4460 −0.518
0.4472 −0.516
0.4485 −0.508
0.4559 −0.459
0.4572 −0.458
0.4586 −0.458
0.4599 −0.448
0.4612 −0.442
0.4626 −0.434
0.4640 −0.431
0.4653 −0.431
0.4667 −0.436
0.4680 −0.431
0.4737 −0.413
0.4750 −0.414
0.4764 −0.413
0.4777 −0.422
0.4791 −0.421
0.4804 −0.420
0.4817 −0.415
0.4831 −0.412
0.4845 −0.414
0.4858 −0.415
0.5212 −0.247
0.5225 −0.247
0.5239 −0.251
0.5252 −0.246
0.5266 −0.247
0.5279 −0.243
0.5292 −0.242
0.5306 −0.233
0.5319 −0.224
0.5332 −0.223
0.5398 −0.222
0.5411 −0.217
0.5425 −0.214
0.5438 −0.205
0.5451 −0.197
0.5465 −0.192
0.5478 −0.193
0.5492 −0.190
0.5505 −0.189
0.5519 −0.189
0.5593 −0.186
0.5607 −0.186
0.5620 −0.173
0.5634 −0.168
0.5647 −0.149
0.5660 −0.137
0.5674 −0.138
0.5687 −0.139
0.5701 −0.136
0.5714 −0.155
0.5778 −0.156
0.5791 −0.156
0.5805 −0.156
0.5818 −0.139
0.5845 −0.129

2445806 +
0.4754 −0.039
0.4767 −0.049
0.4780 −0.048
0.4794 −0.062
0.4807 −0.066
0.4865 −0.107
0.4878 −0.119
0.4892 −0.130
0.4905 −0.137

0.4918 −0.147
0.4976 −0.189
0.4989 −0.202
0.5003 −0.211
0.5016 −0.215
0.5084 −0.300
0.5097 −0.324
0.5111 −0.342
0.5124 −0.351
0.5195 −0.457
0.5209 −0.485
0.5222 −0.517
0.5235 −0.543
0.5249 −0.565
0.5305 −0.684
0.5319 −0.718
0.5332 −0.733
0.5345 −0.761
0.5359 −0.784
0.5413 −0.884
0.5427 −0.907
0.5440 −0.921
0.5453 −0.942
0.5467 −0.964
0.5518 −1.027
0.5531 −1.038
0.5545 −1.051
0.5558 −1.067
0.5572 −1.082
0.5628 −1.112
0.5642 −1.123
0.5655 −1.133

0.5669 −1.147
0.5682 −1.138
0.5735 −1.135
0.5748 −1.130
0.5762 −1.122
0.5775 −1.117
0.5788 −1.111
0.5840 −1.077
0.5853 −1.064
0.5867 −1.058
0.5936 −1.006
0.5950 −0.999
0.5963 −0.998
0.5976 −0.984

2446193 +
0.4376 −0.435
0.4390 −0.451
0.4403 −0.462
0.4417 −0.488
0.4430 −0.499
0.4484 −0.581
0.4498 −0.609
0.4511 −0.632
0.4525 −0.661
0.4538 −0.695
0.4590 −0.779
0.4603 −0.807
0.4617 −0.826
0.4630 −0.851
0.4643 −0.865
0.4696 −0.933
0.4709 −0.952

0.4722 −0.973
0.4736 −0.984
0.4749 −0.993
0.4808 −1.035
0.4821 −1.048
0.4834 −1.049
0.4847 −1.057
0.4861 −1.061
0.4919 −1.070
0.4932 −1.062
0.4945 −1.065
0.4959 −1.060
0.4972 −1.051
0.5032 −1.042
0.5046 −1.037
0.5059 −1.038
0.5072 −1.032
0.5086 −1.022
0.5141 −1.001
0.5154 −0.991
0.5167 −0.977
0.5181 −0.968

2447306 +
0.4919 0.044
0.4932 0.055
0.4984 0.048
0.4996 0.049
0.5057 0.025
0.5070 0.027
0.5121 0.015
0.5134 0.010
0.5190 −0.081

0.5203 −0.105
0.5256 −0.172
0.5269 −0.179
0.5320 −0.262
0.5333 −0.282
0.5385 −0.431
0.5398 −0.446
0.5451 −0.480
0.5463 −0.546
0.5512 −0.675
0.5525 −0.735

2447360 +
0.3674 −0.027
0.3687 −0.064
0.3743 −0.063
0.3756 −0.063
0.3807 −0.122
0.3819 −0.139
0.3868 −0.172
0.3881 −0.176
0.3933 −0.269
0.3946 −0.286
0.3959 −0.305
0.4031 −0.422
0.4045 −0.429
0.4058 −0.492
0.4116 −0.646
0.4129 −0.687
0.4184 −0.950
0.4197 −1.032
0.4250 −1.307
0.4263 −1.340

0.4319 −1.381
0.4332 −1.380
0.4389 −1.375
0.4486 −1.323
0.4499 −1.284
0.4513 −1.283
0.4588 −1.200
0.4643 −1.182
0.4656 −1.174

2447462 +
0.3532 −0.502
0.3542 −0.519
0.3590 −0.565
0.3601 −0.592
0.3664 −0.710
0.3675 −0.740
0.3788 −0.945
0.3799 −0.956
0.3847 −1.032
0.3858 −1.049
0.3934 −1.079
0.3945 −1.081
0.3992 −1.087
0.4003 −1.087
0.4054 −1.079
0.4065 −1.080
0.4129 −1.044
0.4140 −1.041
0.4189 −1.010
0.4200 −1.017
0.4244 −0.975
0.4254 −0.976

Table 5.d Photoelectric differential V observations of XZ Dra

2436410 +
0.4230 0.064
0.4263 0.076
0.4322 0.057
0.4386 0.083
0.4414 0.065
0.4443 0.062
0.4515 0.058
0.4560 0.016
0.4591 −0.005
0.4665 −0.068
0.4701 −0.104

0.4730 −0.139
0.4795 −0.211
0.4832 −0.245
0.4860 −0.303
0.4927 −0.357
0.4952 −0.379
0.4978 −0.396
0.5036 −0.454
0.5061 −0.514
0.5084 −0.549
0.5138 −0.650
0.5168 −0.686

0.5195 −0.741
0.5258 −0.781
0.5281 −0.768
0.5306 −0.758
0.5390 −0.721
0.5420 −0.716
0.5480 −0.698
0.5508 −0.692
0.5536 −0.681
0.5563 −0.671

2436413 +
0.3699 −0.622

0.3720 −0.641
0.3741 −0.664
0.3786 −0.673
0.3806 −0.681
0.3827 −0.682
0.3848 −0.690
0.3869 −0.725
0.3921 −0.733
0.3942 −0.736
0.3970 −0.736
0.3998 −0.727
0.4029 −0.717

2436420 +
0.4824 −0.220
0.4851 −0.255
0.4882 −0.275
0.4948 −0.323
0.4975 −0.375
0.5025 −0.434
0.5078 −0.479
0.5111 −0.533
0.5138 −0.562
0.5162 −0.579
0.5235 −0.664

0.5261 −0.674
0.5289 −0.699
0.5318 −0.720

2436421 +
0.3973 −0.070
0.4004 −0.089
0.4033 −0.092
0.4060 −0.113
0.4085 −0.104
0.4188 −0.130
0.4236 −0.154
0.4261 −0.185
0.4287 −0.211
0.4393 −0.313
0.4424 −0.340
0.4480 −0.398
0.4516 −0.444
0.4547 −0.483
0.4612 −0.523
0.4643 −0.554
0.4677 −0.581
0.4744 −0.611
0.4768 −0.614
0.4793 −0.632
0.4854 −0.639
0.4885 −0.661
0.4913 −0.682
0.4945 −0.699
0.4974 −0.721
0.5001 −0.705
0.5032 −0.696
0.5093 −0.667
0.5121 −0.651
0.5147 −0.646
0.5220 −0.620
0.5260 −0.583
0.5291 −0.564
0.5353 −0.548
0.5388 −0.517
0.5419 −0.500

2436443 +
0.3634 −0.110
0.3669 −0.135
0.3697 −0.172
0.3766 −0.289
0.3794 −0.357
0.3822 −0.375
0.3898 −0.505
0.3926 −0.563
0.3954 −0.619
0.4016 −0.712
0.4044 −0.728
0.4072 −0.762
0.4134 −0.782
0.4169 −0.770

2436450 +
0.4468 0.151
0.4487 0.153
0.4526 0.144
0.4549 0.142
0.4568 0.119
0.4607 0.105
0.4626 0.098
0.4644 0.092
0.4681 0.086
0.4699 0.097
0.4718 0.093
0.4741 0.098
0.4822 0.136
0.4841 0.103
0.4859 0.105
0.4901 0.085
0.4920 0.050
0.4938 0.036
0.4956 0.035
0.4973 0.022
0.4991 0.019
0.5010 0.020
0.5047 −0.001
0.5065 −0.012
0.5084 −0.019
0.5102 −0.028
0.5121 −0.054
0.5139 −0.066
0.5158 −0.074
0.5199 −0.087
0.5218 −0.109
0.5237 −0.126
0.5255 −0.152
0.5274 −0.192
0.5292 −0.236
0.5311 −0.266
0.5355 −0.331
0.5373 −0.394
0.5392 −0.422
0.5410 −0.480
0.5429 −0.598
0.5447 −0.679
0.5519 −0.853
0.5537 −0.891
0.5556 −0.898
0.5595 −0.955
0.5614 −0.945
0.5632 −0.922
0.5651 −0.904
0.5684 −0.871
0.5698 −0.852
0.5712 −0.827
0.5731 −0.829
0.5760 −0.815
0.5818 −0.792
0.5853 −0.757

2436451 +
0.4500 0.037
0.4521 0.038
0.4540 0.000
0.4559 −0.001
0.4577 −0.026
0.4614 −0.035
0.4630 −0.060
0.4648 −0.077
0.4682 −0.104
0.4697 −0.114
0.4712 −0.136
0.4748 −0.160
0.4764 −0.214
0.4780 −0.235
0.4828 −0.311
0.4851 −0.360
0.4874 −0.412
0.4917 −0.478
0.4946 −0.556
0.4973 −0.589
0.5020 −0.652
0.5045 −0.702
0.5060 −0.754
0.5101 −0.851
0.5124 −0.870
0.5146 −0.876
0.5236 −0.868
0.5261 −0.856
0.5285 −0.833

2436454 +
0.2920 0.069
0.2941 0.063
0.2958 0.067
0.2996 0.057
0.3015 0.061
0.3035 0.071
0.3074 0.071
0.3093 0.070
0.3120 0.058
0.3170 0.032
0.3192 0.016
0.3214 −0.021
0.3260 −0.042
0.3280 −0.060
0.3302 −0.081
0.3350 −0.135
0.3371 −0.189
0.3397 −0.235
0.3442 −0.302
0.3465 −0.354
0.3489 −0.396
0.3538 −0.470
0.3564 −0.505
0.3588 −0.545
0.3629 −0.623
0.3650 −0.674
0.3672 −0.726
0.3716 −0.847
0.3740 −0.866
0.3763 −0.877
0.3801 −0.894
0.3820 −0.885
0.3842 −0.874
0.3878 −0.848

2436463 +
0.3573 0.075
0.3649 0.049
0.3697 0.019
0.3711 0.010
0.3725 0.007
0.3760 −0.052
0.3779 −0.064
0.3797 −0.097
0.3834 −0.139
0.3853 −0.160
0.3872 −0.188
0.3911 −0.243
0.3929 −0.291
0.3948 −0.300
0.3987 −0.345
0.4006 −0.394
0.4024 −0.439
0.4061 −0.481
0.4080 −0.540
0.4098 −0.571
0.4135 −0.627
0.4154 −0.684
0.4172 −0.727
0.4209 −0.814
0.4228 −0.890
0.4246 −0.913
0.4284 −0.945
0.4300 −0.941
0.4318 −0.938
0.4360 −0.920
0.4378 −0.907
0.4397 −0.896
0.4434 −0.878
0.4452 −0.863

2436474 +
0.3656 −0.655
0.3688 −0.696
0.3710 −0.723
0.3763 −0.755
0.3785 −0.771
0.3805 −0.785
0.3850 −0.791
0.3879 −0.802
0.3907 −0.791
0.3962 −0.770
0.3990 −0.738
0.4018 −0.726
0.4080 −0.698
0.4108 −0.684
0.4136 −0.680

2436475 +
0.2807 −0.010
0.2860 −0.085
0.2883 −0.143
0.2905 −0.176
0.2947 −0.246
0.2965 −0.290
0.3008 −0.377
0.3041 −0.427
0.3066 −0.454
0.3118 −0.550
0.3145 −0.602
0.3173 −0.676
0.3225 −0.737
0.3253 −0.760
0.3281 −0.786
0.3333 −0.826
0.3378 −0.807
0.3402 −0.821
0.3451 −0.814

2436486 +
0.2462 −0.261
0.2479 −0.293
0.2498 −0.318
0.2542 −0.388
0.2561 −0.410
0.2584 −0.433
0.2632 −0.494
0.2655 −0.514
0.2681 −0.525
0.2735 −0.550
0.2758 −0.589
0.2780 −0.589
0.2830 −0.620
0.2856 −0.631
0.2878 −0.643
0.2953 −0.654
0.2977 −0.665

2436503 +
0.4091 −0.334
0.4132 −0.409
0.4152 −0.453
0.4194 −0.514
0.4214 −0.541
0.4233 −0.554
0.4274 −0.574
0.4292 −0.580
0.4312 −0.585
0.4358 −0.581
0.4380 −0.598
0.4402 −0.601
0.4445 −0.655
0.4467 −0.682
0.4491 −0.703
0.4544 −0.706
0.4564 −0.720
0.4596 −0.706
0.4633 −0.708
0.4655 −0.700

2436506 +
0.2146 0.062
0.2182 0.070
0.2199 0.061
0.2231 0.020
0.2247 0.006
0.2263 0.013
0.2298 −0.002
0.2316 −0.001
0.2371 −0.041
0.2390 −0.048
0.2405 −0.057
0.2443 −0.090
0.2461 −0.115
0.2481 −0.162
0.2519 −0.180
0.2536 −0.204
0.2552 −0.213
0.2588 −0.296
0.2611 −0.296
0.2670 −0.385
0.2690 −0.449
0.2707 −0.451
0.2767 −0.459
0.2783 −0.480
0.2820 −0.510
0.2839 −0.523
0.2857 −0.548
0.2897 −0.578
0.2914 −0.592
0.2933 −0.607
0.2968 −0.629
0.2987 −0.638
0.3008 −0.663
0.3043 −0.695
0.3061 −0.697
0.3077 −0.701
0.3114 −0.719
0.3138 −0.730
0.3161 −0.727
0.3208 −0.714
0.3236 −0.706
0.3254 −0.700
0.3300 −0.670
0.3320 −0.664

2436514 +
0.3675 −0.301
0.3693 −0.337
0.3712 −0.400
0.3749 −0.438
0.3767 −0.475
0.3786 −0.502
0.3823 −0.550
0.3841 −0.598
0.3860 −0.646
0.3897 −0.736
0.3916 −0.759
0.3934 −0.768
0.3971 −0.787
0.3990 −0.794
0.4008 −0.792
0.4126 −0.787
0.4145 −0.773

2437348 +
0.5407 0.021
0.5469 0.043
0.5537 0.026
0.5603 0.032
0.5671 0.012
0.5826 0.041
0.5886 0.043
0.5941 0.034
0.6013 0.012
0.6138 0.080
0.6284 0.095
0.6355 0.142
0.6424 0.155
0.6502 0.182
0.6582 0.188

2437465 +
0.4645 −0.441
0.4671 −0.470
0.4686 −0.487
0.4716 −0.538
0.4731 −0.568
0.4748 −0.587
0.4782 −0.653
0.4796 −0.672
0.4810 −0.679
0.4843 −0.711
0.4863 −0.707
0.4877 −0.707
0.4908 −0.704
0.4924 −0.707
0.4940 −0.724
0.4972 −0.721
0.4991 −0.709
0.5008 −0.718
0.5045 −0.718
0.5062 −0.707
0.5086 −0.705
0.5128 −0.680
0.5144 −0.685
0.5157 −0.679
0.5191 −0.669
0.5212 −0.674
0.5228 −0.666
0.5262 −0.649
0.5280 −0.644
0.5300 −0.641
0.5368 −0.613
0.5390 −0.603

2437467 +
0.4061 −0.730
0.4106 −0.709
0.4130 −0.700
0.4172 −0.688
0.4193 −0.680
0.4214 −0.677
0.4269 −0.676
0.4290 −0.667
0.4311 −0.660
0.4352 −0.641
0.4373 −0.627
0.4394 −0.613
0.4446 −0.598
0.4478 −0.586
0.4502 −0.575

2437475 +
0.4082 0.027
0.4101 0.035
0.4120 0.011
0.4158 0.012
0.4187 −0.005
0.4205 −0.034
0.4274 −0.087
0.4293 −0.106
0.4313 −0.109
0.4363 −0.154
0.4396 −0.173
0.4417 −0.193
0.4470 −0.248
0.4486 −0.251
0.4509 −0.272
0.4560 −0.359
0.4579 −0.360
0.4598 −0.388
0.4632 −0.430
0.4650 −0.456
0.4672 −0.470
0.4721 −0.528
0.4738 −0.551
0.4757 −0.561
0.4788 −0.595
0.4820 −0.607
0.4879 −0.645
0.4895 −0.646
0.4910 −0.649
0.4955 −0.660
0.4987 −0.655
0.5011 −0.652
0.5063 −0.646
0.5087 −0.637
0.5143 −0.630

2437486 +
0.3806 −0.035
0.3829 −0.073

0.3851 −0.079
0.3889 −0.097
0.3906 −0.118
0.3923 −0.130
0.3967 −0.163
0.3984 −0.190
0.4000 −0.201
0.4039 −0.233
0.4057 −0.240
0.4077 −0.260
0.4116 −0.308
0.4134 −0.323
0.4154 −0.344
0.4194 −0.407
0.4213 −0.425
0.4230 −0.442
0.4264 −0.476
0.4280 −0.481
0.4312 −0.509
0.4355 −0.526
0.4378 −0.535
0.4395 −0.545
0.4413 −0.555
0.4453 −0.578
0.4469 −0.608
0.4485 −0.615
0.4522 −0.619
0.4538 −0.629
0.4561 −0.636
0.4619 −0.635
0.4633 −0.627
0.4647 −0.628
0.4686 −0.628
0.4705 −0.629
0.4728 −0.623
0.4770 −0.616
0.4800 −0.606
0.4816 −0.602
0.4862 −0.589
0.4878 −0.587
0.4909 −0.580
0.4985 −0.541
0.4999 −0.531
0.5022 −0.536
0.5094 −0.521
0.5169 −0.507
0.5218 −0.465
0.5321 −0.410
0.5342 −0.401
0.5364 −0.401
0.5415 −0.382
0.5443 −0.368
0.5469 −0.359

2439391 +
0.4069 −0.030
0.4099 −0.069
0.4155 −0.129
0.4180 −0.143
0.4230 −0.192
0.4256 −0.203
0.4337 −0.327
0.4356 −0.337
0.4405 −0.406
0.4422 −0.443
0.4441 −0.469
0.4493 −0.530
0.4517 −0.561
0.4533 −0.559
0.4577 −0.598
0.4591 −0.603
0.4608 −0.598
0.4641 −0.607
0.4656 −0.637
0.4677 −0.634
0.4710 −0.653
0.4744 −0.669
0.4781 −0.652
0.4817 −0.655
0.4854 −0.652
0.4872 −0.653
0.4887 −0.643
0.4921 −0.627
0.4938 −0.622
0.4954 −0.633
0.4997 −0.616
0.5014 −0.620
0.5031 −0.605
0.5068 −0.607
0.5087 −0.590
0.5103 −0.571

2439402 +
0.4057 −0.336
0.4084 −0.409
0.4140 −0.524
0.4161 −0.567
0.4216 −0.666
0.4244 −0.721
0.4307 −0.789
0.4328 −0.810
0.4390 −0.834
0.4418 −0.849
0.4480 −0.859
0.4508 −0.856
0.4550 −0.838
0.4577 −0.829
0.4626 −0.789
0.4654 −0.776
0.4702 −0.729
0.4723 −0.721
0.4779 −0.699
0.4807 −0.682

2439403 +
0.3119 0.139
0.3133 0.147
0.3147 0.129
0.3189 0.106
0.3209 0.106
0.3230 0.089
0.3265 0.084
0.3286 0.081
0.3300 0.071
0.3348 0.026
0.3369 0.006
0.3383 −0.011
0.3418 −0.043
0.3439 −0.066
0.3460 −0.087
0.3494 −0.127
0.3522 −0.154
0.3536 −0.210
0.3578 −0.307
0.3598 −0.330
0.3619 −0.400
0.3654 −0.501
0.3675 −0.572
0.3689 −0.572
0.3723 −0.602
0.3737 −0.611
0.3751 −0.658
0.3779 −0.683
0.3793 −0.709
0.3814 −0.752
0.3841 −0.785
0.3862 −0.793
0.3876 −0.802
0.3904 −0.808
0.3918 −0.813
0.3937 −0.809
0.3973 −0.786
0.3987 −0.796
0.4001 −0.783
0.4043 −0.765
0.4057 −0.763
0.4071 −0.760
0.4105 −0.742
0.4119 −0.732
0.4140 −0.729
0.4168 −0.716
0.4189 −0.717
0.4203 −0.712
0.4237 −0.711
0.4251 −0.697
0.4265 −0.680

2440494 +
0.5104 0.081
0.5118 0.063
0.5243 −0.029
0.5271 −0.048
0.5306 −0.061
0.5320 −0.083
0.5389 −0.216
0.5431 −0.268
0.5445 −0.262
0.5486 −0.340
0.5500 −0.402
0.5619 −0.548
0.5633 −0.574
0.5688 −0.716
0.5730 −0.734
0.5744 −0.740

2440500 +
0.2607 −0.397
0.2621 −0.420
0.2635 −0.425
0.2663 −0.451
0.2677 −0.471
0.2691 −0.494
0.2718 −0.523
0.2732 −0.548
0.2746 −0.590
0.2774 −0.691
0.2788 −0.685
0.2802 −0.712
0.2829 −0.731
0.2843 −0.729
0.2857 −0.741
0.2885 −0.792
0.2899 −0.783
0.2913 −0.820
0.2940 −0.824
0.2954 −0.813

2440504 +
0.5423 −0.258
0.5437 −0.278
0.5451 −0.299
0.5478 −0.337
0.5492 −0.357
0.5506 −0.365
0.5534 −0.429
0.5548 −0.449
0.5562 −0.500
0.5590 −0.567
0.5604 −0.615
0.5618 −0.634
0.5645 −0.684
0.5659 −0.699
0.5673 −0.719
0.5701 −0.739
0.5715 −0.743
0.5729 −0.755
0.5756 −0.764
0.5770 −0.783
0.5784 −0.783
0.5812 −0.773
0.5826 −0.771
0.5840 −0.770
0.5867 −0.768
0.5881 −0.767
0.5895 −0.768

2440516 +

0.4007	0.014
0.4021	0.008
0.4035	0.010
0.4063	0.012
0.4077	0.012
0.4091	−0.004
0.4118	−0.007
0.4132	−0.012
0.4146	−0.030
0.4174	−0.032
0.4188	−0.038
0.4202	−0.043
0.4229	−0.075
0.4243	−0.094
0.4257	−0.099
0.4285	−0.098
0.4299	−0.107
0.4313	−0.115
0.4340	−0.124
0.4354	−0.129
0.4368	−0.150
0.4396	−0.173
0.4410	−0.201
0.4424	−0.210
0.4451	−0.231
0.4465	−0.249
0.4479	−0.271
0.4507	−0.298
0.4521	−0.304
0.4535	−0.320
0.4576	−0.364
0.4590	−0.373
0.4604	−0.385
0.4632	−0.424
0.4646	−0.434
0.4660	−0.453
0.4688	−0.493
0.4702	−0.507
0.4716	−0.520
0.4743	−0.528
0.4757	−0.528
0.4771	−0.565
0.4799	−0.568
0.4813	−0.585
0.4827	−0.588
0.4854	−0.621
0.4868	−0.640
0.4882	−0.647
0.4910	−0.649
0.4924	−0.651
0.4938	−0.648
0.4965	−0.650
0.4979	−0.660
0.4993	−0.663
0.5021	−0.651
0.5035	−0.655
0.5049	−0.668
0.5076	−0.663
0.5090	−0.643
0.5104	−0.648
0.5132	−0.617
0.5146	−0.617
0.5160	−0.605

2440528 +

0.3188	0.083
0.3202	0.085
0.3216	0.078
0.3244	0.085
0.3258	0.076
0.3272	0.072
0.3300	0.039
0.3314	0.068
0.3328	0.062
0.3355	0.059
0.3369	0.056
0.3383	0.042
0.3411	0.009
0.3425	−0.005
0.3439	−0.009
0.3466	−0.021
0.3480	−0.040
0.3494	−0.044
0.3522	−0.058
0.3536	−0.083
0.3550	−0.106
0.3577	−0.139
0.3591	−0.158
0.3605	−0.165
0.3633	−0.225
0.3647	−0.240
0.3661	−0.255
0.3688	−0.304
0.3702	−0.324
0.3716	−0.341
0.3744	−0.383
0.3758	−0.383
0.3772	−0.399
0.3800	−0.435
0.3814	−0.457
0.3828	−0.467
0.3855	−0.506
0.3869	−0.537
0.3883	−0.554
0.3911	−0.578
0.3925	−0.603
0.3939	−0.618
0.3966	−0.643
0.3980	−0.660
0.3994	−0.676
0.4022	−0.702
0.4036	−0.711
0.4050	−0.713
0.4077	−0.732
0.4091	−0.733
0.4105	−0.745
0.4133	−0.751
0.4147	−0.751
0.4161	−0.754
0.4189	−0.758
0.4203	−0.742
0.4217	−0.739

2440530 +

0.2633	−0.103
0.2647	−0.141
0.2661	−0.167
0.2689	−0.187
0.2703	−0.217
0.2717	−0.236
0.2745	−0.250
0.2759	−0.270
0.2773	−0.297
0.2800	−0.333
0.2814	−0.351
0.2828	−0.369
0.2856	−0.405
0.2870	−0.421
0.2884	−0.454
0.2911	−0.496
0.2925	−0.509
0.2939	−0.529
0.2967	−0.578
0.2981	−0.602
0.2995	−0.627
0.3022	−0.661
0.3036	−0.662
0.3050	−0.676
0.3078	−0.709
0.3092	−0.726
0.3106	−0.745
0.3147	−0.732
0.3161	−0.729
0.3175	−0.730
0.3203	−0.726
0.3217	−0.720
0.3231	−0.721
0.3258	−0.717
0.3272	−0.721
0.3286	−0.720

2440541 +

0.2333	−0.077
0.2354	−0.113
0.2396	−0.197
0.2417	−0.231
0.2458	−0.329
0.2479	−0.362
0.2521	−0.446
0.2542	−0.501
0.2583	−0.561
0.2604	−0.613
0.2646	−0.708
0.2667	−0.732
0.2708	−0.790
0.2729	−0.833
0.2771	−0.850
0.2792	−0.858
0.2833	−0.827
0.2854	−0.817
0.2896	−0.802
0.2917	−0.798

2440676 +

0.5170	0.044
0.5232	0.032
0.5295	−0.009
0.5357	−0.032
0.5378	−0.037
0.5420	−0.058
0.5441	−0.079
0.5482	−0.094
0.5503	−0.118
0.5545	−0.163
0.5566	−0.176
0.5607	−0.208
0.5628	−0.241
0.5670	−0.288
0.5691	−0.330
0.5732	−0.377
0.5753	−0.395
0.5795	−0.471
0.5816	−0.487
0.5857	−0.526
0.5878	−0.536
0.5920	−0.580
0.5941	−0.609
0.5982	−0.645
0.6003	−0.657
0.6045	−0.674
0.6066	−0.673
0.6107	−0.689
0.6128	−0.688
0.6170	−0.673
0.6198	−0.657
0.6226	−0.647

2440707 +

0.5084	0.112
0.5105	0.132
0.5147	0.134
0.5168	0.132
0.5209	0.141
0.5230	0.135
0.5272	0.116
0.5293	0.106
0.5334	0.065
0.5355	0.026
0.5401	−0.011
0.5422	−0.052
0.5452	−0.095
0.5473	−0.122
0.5515	−0.243
0.5536	−0.314

0.5577	−0.410	0.4879	−0.961	0.4073	−0.775	2440780 +		0.4624	0.096
0.5598	−0.446	0.4907	−0.958	0.4087	−0.768	0.4454	−0.164	0.4638	0.084
0.5640	−0.620	0.4921	−0.950			0.4476	−0.202	0.4652	0.072
0.5661	−0.724	0.4948	−0.943	2440751 +		0.4517	−0.252	0.4680	0.049
0.5702	−0.873	0.4962	−0.941	0.3586	−0.079	0.4538	−0.287	0.4694	0.044
0.5723	−0.914	0.4990	−0.931	0.3600	−0.099	0.4579	−0.369	0.4708	0.009
0.5758	−0.959	0.5004	−0.924	0.3642	−0.120	0.4600	−0.393	0.4735	−0.003
0.5779	−0.971	0.5032	−0.916	0.3655	−0.150	0.4642	−0.475	0.4749	−0.028
0.5821	−0.976	0.5046	−0.901	0.3690	−0.162	0.4663	−0.532	0.4763	−0.047
0.5842	−0.973	0.5073	−0.894	0.3704	−0.186	0.4704	−0.636	0.4791	−0.076
		0.5087	−0.882	0.3739	−0.211	0.4725	−0.709	0.4805	−0.096
2440709 +		0.5115	−0.875	0.3753	−0.214	0.4767	−0.839	0.4846	−0.187
0.4157	0.151	0.5129	−0.855	0.3788	−0.259	0.4788	−0.884	0.4860	−0.214
0.4171	0.160			0.3802	−0.280	0.4829	−0.958	0.4874	−0.234
0.4198	0.156	2440731 +		0.3829	−0.307	0.4850	−0.979	0.4902	−0.273
0.4212	0.138	0.3407	0.010	0.3843	−0.319	0.4905	−0.971	0.4916	−0.304
0.4240	0.111	0.3421	0.008	0.3871	−0.359	0.4926	−0.945	0.4957	−0.367
0.4254	0.110	0.3449	−0.002	0.3891	−0.378	0.4968	−0.899	0.4971	−0.380
0.4282	0.107	0.3463	−0.011	0.3919	−0.434	0.4989	−0.886	0.4985	−0.406
0.4296	0.081	0.3491	−0.056	0.3933	−0.446			0.5013	−0.470
0.4323	0.089	0.3505	−0.072	0.3968	−0.517	2440821 +		0.5027	−0.485
0.4337	0.076	0.3531	−0.117	0.3982	−0.532	0.4103	−0.279	0.5041	−0.513
0.4365	0.042	0.3545	−0.156	0.4017	−0.596	0.4124	−0.290	0.5069	−0.549
0.4379	0.032	0.3573	−0.183	0.4038	−0.616	0.4172	−0.333	0.5083	−0.580
0.4407	−0.009	0.3587	−0.211	0.4072	−0.623	0.4193	−0.360	0.5097	−0.612
0.4421	−0.037	0.3615	−0.255	0.4086	−0.635	0.4235	−0.398	0.5124	−0.671
0.4448	−0.035	0.3629	−0.273	0.4114	−0.640	0.4256	−0.424	0.5138	−0.686
0.4462	−0.076	0.3656	−0.315	0.4128	−0.648	0.4312	−0.502	0.5152	−0.697
0.4490	−0.116	0.3670	−0.352	0.4156	−0.655	0.4333	−0.534	0.5180	−0.718
0.4504	−0.129	0.3698	−0.391	0.4170	−0.670	0.4430	−0.627	0.5194	−0.740
0.4532	−0.167	0.3712	−0.421	0.4197	−0.659	0.4451	−0.655	0.5208	−0.750
0.4546	−0.192	0.3740	−0.446	0.4211	−0.667	0.4499	−0.698	0.5249	−0.766
0.4573	−0.259	0.3754	−0.479	0.4239	−0.664	0.4520	−0.703	0.5263	−0.767
0.4587	−0.277	0.3781	−0.525	0.4253	−0.661	0.4569	−0.740	0.5291	−0.744
0.4615	−0.372	0.3795	−0.544	0.4287	−0.673	0.4638	−0.779	0.5305	−0.736
0.4629	−0.406	0.3823	−0.584	0.4301	−0.664	0.4659	−0.782	0.5319	−0.730
0.4657	−0.471	0.3837	−0.595	0.4329	−0.650	0.4756	−0.734	0.5346	−0.717
0.4671	−0.504	0.3865	−0.623	0.4343	−0.647	0.4777	−0.713	0.5360	−0.716
0.4698	−0.603	0.3879	−0.641	0.4371	−0.643	0.4846	−0.699	0.5374	−0.705
0.4712	−0.633	0.3906	−0.679	0.4385	−0.646	0.4867	−0.661	0.5395	−0.705
0.4740	−0.700	0.3920	−0.692	0.4412	−0.640	0.4923	−0.621	0.5409	−0.696
0.4754	−0.730	0.3948	−0.721	0.4426	−0.632	0.4944	−0.593	0.5423	−0.695
0.4782	−0.811	0.3962	−0.733	0.4454	−0.620	0.5069	−0.500		
0.4796	−0.860	0.3990	−0.759	0.4468	−0.613	0.5090	−0.490	2440863 +	
0.4823	−0.900	0.4004	−0.769	0.4495	−0.600			0.3764	−0.441
0.4837	−0.911	0.4031	−0.770	0.4510	−0.598	2440840 +		0.3778	−0.477
0.4865	−0.942	0.4045	−0.771			0.4597	0.128	0.3792	−0.497

0.3833	−0.585	0.3336	−0.832	0.2800	−0.820	0.3541	−0.425	0.2929	−0.204
0.3847	−0.625	0.3350	−0.854	0.2814	−0.812	0.3564	−0.488	0.2979	−0.294
0.3861	−0.665	0.3364	−0.866			0.3575	−0.500	0.3042	−0.387
0.3910	−0.765	0.3392	−0.868	2441249 +		0.3586	−0.527	0.3055	−0.408
0.3931	−0.784	0.3406	−0.862	0.2510	0.094	0.3612	−0.577	0.3094	−0.480
0.3945	−0.804	0.3420	−0.860	0.2524	0.098	0.3624	−0.596	0.3105	−0.508
0.3986	−0.869	0.3448	−0.841	0.2538	0.101	0.3635	−0.628	0.3116	−0.516
0.4000	−0.904	0.3462	−0.840	0.2566	0.107	0.3662	−0.672	0.3172	−0.626
0.4014	−0.919	0.3476	−0.838	0.2580	0.101	0.3673	−0.693	0.3184	−0.639
0.4056	−0.942	0.3503	−0.831	0.2594	0.097	0.3685	−0.713	0.3196	−0.672
0.4070	−0.948	0.3517	−0.826	0.2621	0.100	0.3712	−0.750	0.3227	−0.728
0.4084	−0.953	0.3531	−0.813	0.2635	0.103	0.3728	−0.755	0.3239	−0.738
0.4146	−0.942	0.3559	−0.788	0.2656	0.103	0.3741	−0.767	0.3253	−0.755
0.4160	−0.934	0.3573	−0.782	0.2691	0.099	0.3772	−0.774	0.3287	−0.790
0.4174	−0.922	0.3587	−0.776	0.2705	0.104	0.3785	−0.788	0.3300	−0.796
0.4208	−0.898			0.2719	0.104	0.3798	−0.782	0.3311	−0.801
0.4222	−0.880	2440937 +		0.2747	0.101	0.3830	−0.791	0.3344	−0.796
0.4236	−0.861	0.2216	−0.092	0.2761	0.111	0.3844	−0.794	0.3361	−0.798
0.4299	−0.805	0.2230	−0.114	0.2775	0.121	0.3860	−0.799	0.3372	−0.791
0.4313	−0.783	0.2244	−0.162	0.2802	0.118	0.3893	−0.795	0.3405	−0.790
0.4327	−0.773	0.2272	−0.195	0.2816	0.108	0.3907	−0.794	0.3417	−0.784
		0.2286	−0.221	0.2830	0.113	0.3920	−0.788	0.3431	−0.782
2440925 +		0.2300	−0.234	0.2865	0.124	0.3946	−0.787	0.3463	−0.775
0.2663	0.084	0.2327	−0.272	0.2906	0.160	0.3962	−0.777	0.3475	−0.771
0.2677	0.088	0.2341	−0.284	0.2941	0.166	0.3979	−0.772	0.3485	−0.770
0.2691	0.088	0.2355	−0.314	0.2955	0.161	0.4020	−0.757		
0.2718	0.100	0.2376	−0.356	0.2976	0.161	0.4035	−0.749	2441539 +	
0.2732	0.108	0.2390	−0.386	0.3205	0.030	0.4054	−0.730	0.5023	0.039
0.2746	0.114	0.2404	−0.447	0.3217	0.031			0.5037	0.053
0.2795	0.117	0.2432	−0.501	0.3228	0.033	2441250 +		0.5065	0.037
0.2809	0.115	0.2446	−0.557	0.3256	0.042	0.2309	0.108	0.5078	0.041
0.2823	0.129	0.2460	−0.612	0.3270	0.031	0.2323	0.118	0.5106	0.052
0.2850	0.126	0.2474	−0.658	0.3281	−0.006	0.2378	0.132	0.5120	0.040
0.2864	0.134	0.2488	−0.683	0.3315	−0.032	0.2390	0.142	0.5148	0.040
0.2878	0.123	0.2502	−0.730	0.3330	−0.079	0.2404	0.132	0.5162	0.032
0.3114	−0.170	0.2536	−0.793	0.3339	−0.101	0.2608	0.135	0.5190	0.003
0.3128	−0.225	0.2550	−0.836	0.3367	−0.138	0.2621	0.124	0.5204	−0.024
0.3142	−0.247	0.2564	−0.850	0.3376	−0.148	0.2636	0.121	0.5231	−0.037
0.3170	−0.347	0.2591	−0.861	0.3389	−0.158	0.2684	0.097	0.5245	−0.047
0.3184	−0.367	0.2647	−0.882	0.3413	−0.192	0.2697	0.089	0.5273	−0.053
0.3198	−0.424	0.2675	−0.868	0.3424	−0.212	0.2711	0.080	0.5287	−0.065
0.3225	−0.498	0.2689	−0.862	0.3437	−0.227	0.2757	0.038	0.5314	−0.109
0.3239	−0.546	0.2703	−0.861	0.3462	−0.262	0.2769	0.007	0.5328	−0.131
0.3253	−0.611	0.2730	−0.860	0.3481	−0.299	0.2837	−0.048	0.5356	−0.164
0.3281	−0.698	0.2744	−0.851	0.3494	−0.324	0.2864	−0.094	0.5370	−0.200
0.3295	−0.755	0.2758	−0.845	0.3512	−0.375	0.2901	−0.158	0.5398	−0.225
0.3309	−0.783	0.2786	−0.828	0.3527	−0.414	0.2914	−0.178	0.5412	−0.257

0.5440 −0.319
0.5454 −0.364
0.5481 −0.419
0.5495 −0.489
0.5523 −0.606
0.5537 −0.648
0.5565 −0.771
0.5578 −0.809
0.5605 −0.859
0.5620 −0.874
0.5648 −0.922
0.5662 −0.928
0.5690 −0.952
0.5704 −0.954
0.5731 −0.953
0.5745 −0.949
0.5773 −0.934
0.5787 −0.923
0.5815 −0.895
0.5829 −0.876

2441589 +
0.5604 −0.348
0.5618 −0.359
0.5646 −0.407
0.5660 −0.421
0.5688 −0.458
0.5702 −0.474
0.5729 −0.518
0.5743 −0.553
0.5771 −0.593
0.5785 −0.624
0.5813 −0.665
0.5827 −0.667
0.5854 −0.675
0.5868 −0.689
0.5896 −0.694
0.5910 −0.706
0.5938 −0.709
0.5952 −0.720
0.5979 −0.717
0.5993 −0.707
0.6021 −0.694
0.6035 −0.686
0.6063 −0.666
0.6077 −0.657
0.6104 −0.650
0.6118 −0.644
0.6146 −0.631
0.6160 −0.617

2441591 +
0.4557 −0.221
0.4571 −0.238
0.4598 −0.265
0.4612 −0.281
0.4640 −0.323
0.4654 −0.338
0.4682 −0.354
0.4696 −0.373
0.4723 −0.393
0.4737 −0.423
0.4765 −0.463
0.4779 −0.476
0.4807 −0.509
0.4821 −0.538
0.4848 −0.560
0.4862 −0.590
0.4890 −0.611
0.4904 −0.625
0.4932 −0.641
0.4946 −0.645
0.4973 −0.648
0.4987 −0.661
0.5015 −0.665
0.5029 −0.666
0.5057 −0.670
0.5071 −0.667
0.5098 −0.664
0.5112 −0.667
0.5140 −0.663
0.5154 −0.659
0.5182 −0.651
0.5196 −0.636
0.5223 −0.617
0.5237 −0.613

2441606 +
0.2403 −0.200
0.2414 −0.214
0.2421 −0.237
0.2448 −0.294
0.2458 −0.310
0.2469 −0.345
0.2497 −0.395
0.2507 −0.430
0.2518 −0.472
0.2546 −0.543
0.2553 −0.605
0.2560 −0.629
0.2583 −0.677
0.2590 −0.708
0.2601 −0.732
0.2625 −0.799
0.2636 −0.818
0.2643 −0.842
0.2671 −0.877
0.2681 −0.893
0.2692 −0.900
0.2719 −0.923
0.2726 −0.928
0.2740 −0.937
0.2768 −0.934
0.2782 −0.935
0.2796 −0.920
0.2823 −0.900
0.2831 −0.884
0.2844 −0.872
0.2868 −0.843
0.2879 −0.824
0.2886 −0.816

2441622 +
0.4320 −0.108
0.4334 −0.109
0.4361 −0.144
0.4375 −0.175
0.4403 −0.217
0.4417 −0.233
0.4445 −0.270
0.4459 −0.283
0.4486 −0.329
0.4500 −0.351
0.4528 −0.425
0.4542 −0.458
0.4570 −0.491
0.4584 −0.511
0.4611 −0.557
0.4625 −0.594
0.4653 −0.644
0.4667 −0.660
0.4695 −0.688
0.4709 −0.710
0.4736 −0.731
0.4750 −0.748
0.4778 −0.782
0.4792 −0.827
0.4820 −0.840
0.4834 −0.849
0.4861 −0.855
0.4875 −0.866
0.4903 −0.862
0.4917 −0.869
0.4945 −0.860
0.4959 −0.855
0.4986 −0.849
0.5000 −0.846
0.5028 −0.842

2441772 +
0.5145 −0.050
0.5159 −0.072
0.5187 −0.105
0.5201 −0.126
0.5228 −0.148
0.5242 −0.165
0.5270 −0.185
0.5284 −0.226
0.5312 −0.252
0.5326 −0.270
0.5353 −0.296
0.5367 −0.321
0.5395 −0.368
0.5409 −0.388
0.5437 −0.410
0.5451 −0.438
0.5478 −0.475
0.5492 −0.504
0.5520 −0.559
0.5534 −0.601
0.5562 −0.669
0.5576 −0.693
0.5603 −0.784
0.5617 −0.816
0.5645 −0.835
0.5659 −0.857
0.5687 −0.879
0.5701 −0.880
0.5728 −0.888
0.5742 −0.902
0.5770 −0.894
0.5784 −0.889
0.5812 −0.879
0.5826 −0.871
0.5853 −0.849
0.5867 −0.833

2441803 +
0.4694 −0.151
0.4711 −0.178
0.4738 −0.218
0.4745 −0.221
0.4764 −0.231
0.4771 −0.235
0.4792 −0.239
0.4802 −0.241
0.4819 −0.248
0.4829 −0.255
0.4847 −0.271
0.4861 −0.274
0.4881 −0.282
0.4895 −0.295
0.4914 −0.314
0.4928 −0.324
0.4950 −0.353
0.4964 −0.364
0.4985 −0.380
0.4999 −0.411
0.5020 −0.449
0.5027 −0.458
0.5044 −0.470
0.5055 −0.475
0.5075 −0.481
0.5082 −0.484
0.5099 −0.501
0.5110 −0.517
0.5131 −0.549
0.5141 −0.559
0.5159 −0.580
0.5173 −0.588
0.5194 −0.607
0.5204 −0.619
0.5222 −0.626
0.5232 −0.634
0.5249 −0.641

0.5259 −0.639
0.5277 −0.644
0.5284 −0.651
0.5305 −0.659
0.5319 −0.666
0.5340 −0.669
0.5350 −0.669
0.5367 −0.667
0.5377 −0.659
0.5395 −0.649
0.5409 −0.648
0.5430 −0.653
0.5437 −0.649
0.5458 −0.639
0.5472 −0.641
0.5492 −0.637
0.5506 −0.644
0.5527 −0.640
0.5541 −0.639
0.5561 −0.637
0.5571 −0.636
0.5589 −0.630
0.5603 −0.631
0.5624 −0.631
0.5638 −0.627
0.5659 −0.613
0.5669 −0.610
0.5687 −0.587
0.5701 −0.593
0.5722 −0.577
0.5736 −0.586

2441815 +
0.4055 −0.347
0.4066 −0.367
0.4087 −0.382
0.4101 −0.390
0.4121 −0.410
0.4130 −0.423
0.4151 −0.441
0.4162 −0.453
0.4191 −0.482
0.4205 −0.518
0.4226 −0.552
0.4233 −0.564
0.4260 −0.595
0.4267 −0.607

0.4301 −0.642
0.4312 −0.661
0.4329 −0.674
0.4339 −0.681
0.4364 −0.696
0.4374 −0.699
0.4399 −0.707
0.4409 −0.711
0.4434 −0.713
0.4448 −0.715
0.4475 −0.718
0.4482 −0.720
0.4506 −0.722
0.4517 −0.718
0.4540 −0.709
0.4551 −0.704
0.4579 −0.691
0.4593 −0.688
0.4614 −0.682
0.4620 −0.683
0.4644 −0.672
0.4651 −0.670
0.4677 −0.660
0.4691 −0.649
0.4715 −0.636
0.4726 −0.631
0.4746 −0.623
0.4760 −0.622
0.4781 −0.621
0.4795 −0.614

2441833 +
0.5013 −0.035
0.5027 −0.048
0.5048 −0.061
0.5062 −0.074
0.5082 −0.076
0.5096 −0.077
0.5117 −0.087
0.5131 −0.093
0.5152 −0.123
0.5166 −0.148
0.5187 −0.172
0.5201 −0.202
0.5221 −0.225
0.5235 −0.248
0.5256 −0.273

0.5270 −0.304
0.5291 −0.367
0.5305 −0.410
0.5326 −0.466
0.5340 −0.516
0.5360 −0.569
0.5374 −0.610
0.5395 −0.707
0.5409 −0.738
0.5430 −0.781
0.5444 −0.799
0.5465 −0.846
0.5479 −0.862
0.5499 −0.869

2441835 +
0.4208 −0.088
0.4222 −0.109
0.4246 −0.143
0.4257 −0.159
0.4285 −0.181
0.4299 −0.209
0.4326 −0.249
0.4340 −0.282
0.4368 −0.344
0.4378 −0.376
0.4410 −0.467
0.4420 −0.502
0.4444 −0.634
0.4458 −0.691
0.4482 −0.778
0.4496 −0.837
0.4524 −0.880
0.4538 −0.883
0.4566 −0.905
0.4580 −0.910
0.4594 −0.920
0.4625 −0.920
0.4639 −0.931
0.4667 −0.921
0.4681 −0.922
0.4708 −0.910
0.4718 −0.891
0.4746 −0.873
0.4756 −0.872
0.4788 −0.860
0.4802 −0.855

0.4833 −0.832
0.4847 −0.831
0.4871 −0.826
0.4888 −0.825
0.4913 −0.803
0.4924 −0.796

2441905 +
0.4635 −0.192
0.4649 −0.212
0.4674 −0.244
0.4682 −0.267
0.4704 −0.326
0.4715 −0.353
0.4745 −0.421
0.4757 −0.439
0.4781 −0.519
0.4789 −0.541
0.4813 −0.589
0.4823 −0.620
0.4845 −0.697
0.4856 −0.740
0.4873 −0.780
0.4885 −0.802
0.4915 −0.825
0.4927 −0.840
0.4947 −0.833
0.4960 −0.844
0.4981 −0.849
0.4993 −0.857
0.5016 −0.857
0.5026 −0.860
0.5049 −0.870
0.5059 −0.867
0.5079 −0.868
0.5090 −0.862
0.5113 −0.854
0.5125 −0.848
0.5149 −0.836
0.5159 −0.829
0.5181 −0.817
0.5191 −0.815

2441915 +
0.4497 0.047
0.4508 0.041
0.4529 0.029

0.4539 0.019
0.4564 0.016
0.4574 −0.011
0.4598 −0.022
0.4612 −0.030
0.4640 −0.057
0.4654 −0.067
0.4678 −0.085
0.4688 −0.089
0.4716 −0.128
0.4730 −0.144
0.4754 −0.171
0.4764 −0.197
0.4879 −0.380
0.4890 −0.411
0.4916 −0.461
0.4930 −0.482
0.4952 −0.545
0.4962 −0.566
0.4983 −0.608
0.4994 −0.648
0.5015 −0.715
0.5025 −0.740
0.5047 −0.784
0.5071 −0.812
0.5090 −0.829
0.5119 −0.862
0.5140 −0.877

2441918 +
0.3223 −0.080
0.3237 −0.090
0.3263 −0.101
0.3275 −0.114
0.3296 −0.122
0.3313 −0.137
0.3341 −0.162
0.3355 −0.190
0.3383 −0.240
0.3397 −0.263
0.3421 −0.304
0.3454 −0.354
0.3487 −0.421
0.3515 −0.476
0.3525 −0.494
0.3553 −0.522
0.3560 −0.546

2441933 +
0.5646 −0.039
0.5655 −0.043
0.5674 −0.060
0.5683 −0.066
0.5701 −0.090
0.5710 −0.108
0.5729 −0.125
0.5738 −0.149
0.5757 −0.186
0.5766 −0.194
0.5785 −0.238
0.5794 −0.242
0.5813 −0.307
0.5821 −0.330
0.5868 −0.476
0.5877 −0.499

2441934 +
0.5148 −0.002
0.5176 −0.053
0.5203 −0.122
0.5255 −0.191
0.5262 −0.214
0.5283 −0.250
0.5290 −0.272
0.5315 −0.294
0.5342 −0.332
0.5370 −0.386
0.5398 −0.437
0.5426 −0.470
0.5453 −0.520
0.5481 −0.552
0.5509 −0.610
0.5537 −0.668
0.5565 −0.729
0.5592 −0.761
0.5620 −0.782
0.5651 −0.788
0.5734 −0.792
0.5755 −0.789
0.5780 −0.773
0.5815 −0.758

2441938 +
0.3683 −0.687
0.3697 −0.695
0.3731 −0.699
0.3745 −0.712
0.3776 −0.726
0.3793 −0.736
0.3829 −0.735
0.3846 −0.735
0.3877 −0.714
0.3891 −0.705
0.3933 −0.690
0.3950 −0.688
0.3988 −0.656
0.4005 −0.640

2441939 +
0.2856 −0.188
0.2870 −0.211
0.2891 −0.224
0.2905 −0.250
0.2926 −0.267
0.2940 −0.292
0.2960 −0.326
0.2974 −0.349
0.2995 −0.370
0.3009 −0.405
0.3030 −0.446
0.3044 −0.463
0.3065 −0.484
0.3079 −0.511
0.3099 −0.545
0.3113 −0.580
0.3134 −0.621
0.3148 −0.633
0.3169 −0.663
0.3183 −0.674
0.3204 −0.699
0.3218 −0.715
0.3238 −0.722
0.3252 −0.731
0.3273 −0.746
0.3287 −0.755
0.3308 −0.759
0.3322 −0.762
0.3342 −0.769
0.3356 −0.759
0.3377 −0.762
0.3391 −0.751
0.3412 −0.757
0.3426 −0.749
0.3447 −0.742
0.3461 −0.737
0.3481 −0.726
0.3495 −0.720
0.3516 −0.709
0.3530 −0.699
0.3551 −0.685
0.3565 −0.677

2441949 +
0.2850 −0.308
0.2861 −0.336
0.2884 −0.345
0.2895 −0.368
0.2919 −0.382
0.3037 −0.493
0.3065 −0.521
0.3092 −0.537
0.3120 −0.554
0.3148 −0.569
0.3176 −0.606
0.3202 −0.617
0.3231 −0.631
0.3259 −0.650
0.3287 −0.667
0.3315 −0.673
0.3342 −0.684
0.3370 −0.697
0.3452 −0.674
0.3481 −0.664
0.3509 −0.660
0.3537 −0.652
0.3565 −0.648
0.3592 −0.618
0.3648 −0.604

2441990 +
0.2652 −0.030
0.2666 −0.037
0.2698 −0.042
0.2712 −0.048
0.2745 −0.057
0.2759 −0.080
0.2788 −0.108
0.2802 −0.109
0.2832 −0.154
0.2843 −0.163
0.2870 −0.201
0.2884 −0.212
0.2927 −0.259
0.2950 −0.305
0.2957 −0.330
0.2982 −0.383
0.2996 −0.446
0.3020 −0.513
0.3027 −0.542
0.3048 −0.627
0.3055 −0.687
0.3075 −0.770
0.3082 −0.819
0.3103 −0.835
0.3110 −0.842
0.3131 −0.831
0.3138 −0.835
0.3159 −0.888
0.3166 −0.897
0.3187 −0.926
0.3194 −0.926
0.3214 −0.926
0.3221 −0.928
0.3242 −0.933
0.3249 −0.936
0.3270 −0.930
0.3277 −0.928
0.3302 −0.917
0.3316 −0.914
0.3343 −0.906
0.3357 −0.901
0.3385 −0.891
0.3399 −0.876
0.3427 −0.855
0.3441 −0.843
0.3468 −0.814
0.3482 −0.808

2442147 +
0.4811 0.144
0.4825 0.150
0.4853 0.156
0.4866 0.143
0.4978 0.130
0.4992 0.116
0.5033 0.117
0.5047 0.109
0.5089 0.066
0.5103 0.065
0.5130 0.015
0.5144 −0.002
0.5193 −0.056
0.5207 −0.070
0.5221 −0.097
0.5235 −0.109
0.5269 −0.159
0.5283 −0.175
0.5325 −0.228
0.5339 −0.254
0.5380 −0.328
0.5394 −0.363
0.5422 −0.419
0.5436 −0.465
0.5471 −0.558
0.5485 −0.594
0.5519 −0.701
0.5533 −0.730
0.5568 −0.788
0.5582 −0.810
0.5617 −0.862
0.5631 −0.896
0.5665 −0.911
0.5679 −0.918
0.5721 −0.916
0.5735 −0.912
0.5769 −0.916
0.5783 −0.915
0.5818 −0.905
0.5832 −0.897
0.5860 −0.856
0.5874 −0.835
0.5908 −0.810
0.5922 −0.786
0.5943 −0.758
0.5957 −0.756

2442201 +
0.3729 −0.439
0.3743 −0.478
0.3777 −0.541
0.3791 −0.571
0.3819 −0.614
0.3833 −0.646

0.3861 −0.683
0.3875 −0.704
0.3902 −0.749
0.3916 −0.766
0.3944 −0.789
0.3958 −0.797
0.3993 −0.808
0.4007 −0.811
0.4048 −0.809
0.4083 −0.809
0.4097 −0.805
0.4125 −0.806
0.4139 −0.802
0.4173 −0.800
0.4187 −0.798
0.4215 −0.785
0.4229 −0.762
0.4264 −0.739
0.4278 −0.729
0.4312 −0.725
0.4361 −0.693
0.4375 −0.675
0.4410 −0.641
0.4424 −0.637

2442220 +
0.4285 −0.111
0.4313 −0.139
0.4341 −0.198
0.4355 −0.227
0.4369 −0.259
0.4396 −0.307
0.4410 −0.355
0.4423 −0.392
0.4452 −0.450
0.4466 −0.486
0.4480 −0.519
0.4508 −0.586
0.4522 −0.604
0.4536 −0.632
0.4563 −0.702
0.4577 −0.720
0.4591 −0.755
0.4619 −0.820
0.4633 −0.847
0.4647 −0.863
0.4674 −0.902

0.4688 −0.927
0.4702 −0.933
0.4730 −0.935
0.4744 −0.926
0.4758 −0.916
0.4785 −0.895
0.4799 −0.883
0.4813 −0.866
0.4841 −0.854
0.4855 −0.847
0.4869 −0.837
0.4896 −0.816
0.4910 −0.806
0.4924 −0.801

2442242 +
0.3526 −0.316
0.3535 −0.333
0.3581 −0.449
0.3590 −0.472
0.3609 −0.512
0.3618 −0.522
0.3637 −0.562
0.3646 −0.589
0.3665 −0.621
0.3674 −0.642
0.3693 −0.679
0.3713 −0.700
0.3762 −0.754
0.3781 −0.762
0.3818 −0.777
0.3855 −0.783
0.3873 −0.774
0.3892 −0.765
0.3911 −0.770
0.3929 −0.756

2442260 +
0.4192 −0.102
0.4206 −0.107
0.4234 −0.120
0.4248 −0.122
0.4275 −0.148
0.4289 −0.173
0.4317 −0.214
0.4331 −0.235
0.4360 −0.264

0.4372 −0.290
0.4400 −0.314
0.4414 −0.328
0.4442 −0.352
0.4456 −0.352
0.4484 −0.356
0.4498 −0.351
0.4525 −0.373
0.4539 −0.400
0.4567 −0.431
0.4581 −0.463
0.4605 −0.495
0.4612 −0.514
0.4633 −0.536
0.4643 −0.540
0.4667 −0.568
0.4681 −0.589
0.4706 −0.614
0.4720 −0.619
0.4744 −0.634
0.4758 −0.644
0.4785 −0.646
0.4799 −0.651
0.4824 −0.663
0.4838 −0.682
0.4872 −0.704
0.5063 −0.732
0.5091 −0.726
0.5105 −0.715
0.5130 −0.713

2442269 +
0.4879 −0.153
0.4907 −0.199
0.4917 −0.214
0.4949 −0.252
0.4963 −0.270
0.4987 −0.293
0.4997 −0.316
0.5025 −0.341
0.5039 −0.356
0.5078 −0.391
0.5101 −0.431
0.5113 −0.447
0.5140 −0.465
0.5151 −0.478
0.5175 −0.513

0.5182 −0.533
0.5209 −0.563
0.5216 −0.575
0.5240 −0.624
0.5251 −0.649
0.5276 −0.663
0.5287 −0.671
0.5310 −0.681
0.5321 −0.687
0.5345 −0.689
0.5356 −0.694
0.5380 −0.695
0.5390 −0.699
0.5414 −0.694
0.5425 −0.700
0.5452 −0.702
0.5463 −0.703
0.5490 −0.702
0.5501 −0.701
0.5525 −0.699
0.5536 −0.698
0.5564 −0.697
0.5594 −0.691
0.5601 −0.690

2442279 +
0.4847 0.085
0.4860 0.081
0.4874 0.080
0.4886 0.080
0.4900 0.055
0.4957 0.043
0.4972 0.022
0.4986 0.024
0.4999 0.012
0.5010 −0.017
0.5064 −0.098
0.5074 −0.109
0.5086 −0.139
0.5098 −0.173
0.5109 −0.192
0.5181 −0.344
0.5193 −0.369
0.5203 −0.376
0.5256 −0.528
0.5267 −0.556
0.5278 −0.574

0.5288 −0.598
0.5301 −0.637
0.5351 −0.700
0.5362 −0.719
0.5372 −0.738
0.5383 −0.754
0.5393 −0.775
0.5440 −0.812
0.5450 −0.827
0.5462 −0.824
0.5472 −0.821
0.5484 −0.818
0.5535 −0.796
0.5545 −0.782
0.5554 −0.781
0.5565 −0.773
0.5575 −0.768
0.5585 −0.762

2442303 +
0.3446 −0.174
0.3460 −0.193
0.3487 −0.214
0.3494 −0.224
0.3515 −0.260
0.3522 −0.262
0.3542 −0.290
0.3548 −0.298
0.3570 −0.329
0.3577 −0.336
0.3601 −0.368
0.3607 −0.382
0.3636 −0.450
0.3646 −0.464
0.3672 −0.504
0.3682 −0.537
0.3716 −0.660
0.3736 −0.698
0.3750 −0.742
0.3769 −0.773
0.3783 −0.775
0.3804 −0.782
0.3814 −0.792
0.3834 −0.787
0.3841 −0.790
0.3862 −0.786
0.3869 −0.789

0.3890 −0.798
0.3900 −0.798
0.3921 −0.793
0.3932 −0.799
0.3957 −0.806

2442636 +
0.3606 −0.034
0.3614 −0.033
0.3632 −0.043
0.3639 −0.050
0.3660 −0.048
0.3668 −0.065
0.3689 −0.080
0.3696 −0.071
0.3715 −0.078
0.3760 −0.124
0.3786 −0.136
0.3805 −0.147
0.3814 −0.159
0.3839 −0.194
0.3846 −0.212
0.3864 −0.269
0.3873 −0.287
0.3894 −0.318
0.3904 −0.310
0.3925 −0.319
0.3933 −0.324
0.3962 −0.322
0.3983 −0.324
0.3990 −0.332
0.4011 −0.358
0.4036 −0.383
0.4060 −0.409
0.4115 −0.470
0.4123 −0.470
0.4143 −0.481
0.4152 −0.488
0.4172 −0.485
0.4180 −0.490
0.4204 −0.498
0.4230 −0.517
0.4282 −0.595
0.4291 −0.606
0.4310 −0.627
0.4339 −0.650
0.4346 −0.650

0.4443 −0.715
0.4464 −0.698
0.4472 −0.701
0.4498 −0.670
0.4514 −0.650
0.4522 −0.639
0.4546 −0.619
0.4580 −0.602

2442948 +
0.4872 −0.089
0.4886 −0.100
0.4914 −0.135
0.4928 −0.143
0.4955 −0.169
0.4990 −0.205
0.5004 −0.239
0.5032 −0.261
0.5046 −0.281
0.5079 −0.331
0.5093 −0.350
0.5122 −0.348
0.5136 −0.348
0.5184 −0.388
0.5226 −0.446
0.5260 −0.456
0.5299 −0.487
0.5312 −0.521

2443660 +
0.3501 0.119
0.3541 0.097
0.3590 0.119
0.3637 0.083
0.3672 0.097
0.3754 0.093
0.3798 0.098
0.3846 0.098
0.3899 0.049
0.3955 0.009
0.4003 −0.006
0.4049 −0.026
0.4090 −0.043
0.4212 −0.189
0.4225 −0.211
0.4253 −0.243
0.4268 −0.307

0.4295 −0.369
0.4309 −0.377
0.4335 −0.442
0.4349 −0.508
0.4376 −0.601
0.4391 −0.631
0.4423 −0.765
0.4438 −0.831

2443700 +
0.3944 0.050
0.3958 0.051
0.3985 0.048
0.3999 0.028
0.4041 0.021
0.4083 −0.005
0.4110 −0.049
0.4124 −0.059
0.4152 −0.083
0.4166 −0.094
0.4194 −0.109
0.4208 −0.113
0.4235 −0.143
0.4249 −0.159
0.4277 −0.181
0.4291 −0.196
0.4319 −0.231
0.4333 −0.264
0.4360 −0.278
0.4374 −0.303
0.4402 −0.326
0.4416 −0.328
0.4444 −0.352
0.4485 −0.378
0.4499 −0.401
0.4527 −0.419
0.4541 −0.431
0.4569 −0.474
0.4583 −0.515
0.4610 −0.527
0.4624 −0.539
0.4652 −0.572
0.4666 −0.602
0.4694 −0.656
0.4708 −0.678
0.4735 −0.691
0.4749 −0.704

0.4777 −0.698
0.4791 −0.712
0.4819 −0.708
0.4833 −0.704
0.4860 −0.695
0.4874 −0.689
0.4902 −0.674
0.4916 −0.665
0.4944 −0.660
0.4958 −0.655
0.4985 −0.646
0.4999 −0.642
0.5027 −0.639
0.5069 −0.615
0.5083 −0.600
0.5110 −0.594
0.5124 −0.578

2443720 +
0.4578 −0.368
0.4592 −0.383
0.4615 −0.408
0.4624 −0.430
0.4643 −0.470
0.4652 −0.477
0.4671 −0.509
0.4680 −0.538
0.4708 −0.610
0.4726 −0.685
0.4736 −0.717
0.4754 −0.761
0.4763 −0.776
0.4787 −0.804
0.4800 −0.824
0.4828 −0.857
0.4842 −0.866
0.4870 −0.885
0.4884 −0.888
0.4912 −0.889
0.4925 −0.890
0.4967 −0.868
0.4995 −0.844
0.5009 −0.831
0.5037 −0.814
0.5050 −0.803
0.5078 −0.779
0.5092 −0.774

2443730 +
0.4582 −0.052
0.4610 −0.093
0.4624 −0.129
0.4651 −0.162
0.4665 −0.192
0.4693 −0.272
0.4703 −0.302
0.4730 −0.352
0.4740 −0.385
0.4766 −0.429
0.4778 −0.457

2443732 +
0.3639 0.018
0.3700 −0.091
0.3754 −0.174
0.3770 −0.216
0.3824 −0.362
0.3841 −0.423
0.3938 −0.756
0.3998 −0.908
0.4012 −0.927
0.4052 −0.983

2443743 +
0.3267 −0.088
0.3278 −0.101
0.3300 −0.140
0.3311 −0.161
0.3334 −0.192
0.3344 −0.212
0.3393 −0.267
0.3403 −0.282
0.3424 −0.335
0.3433 −0.352
0.3456 −0.413
0.3491 −0.439
0.3500 −0.444
0.3524 −0.549
0.3534 −0.591
0.3557 −0.636
0.3569 −0.659
0.3598 −0.691
0.3607 −0.709
0.3634 −0.747
0.3662 −0.800

0.3673 −0.812
0.3710 −0.839
0.3734 −0.840
0.3745 −0.835
0.3782 −0.818
0.3809 −0.811
0.3820 −0.799

2443763 +
0.3359 −0.226
0.3368 −0.246
0.3398 −0.284
0.3413 −0.316
0.3449 −0.364
0.3508 −0.437
0.3523 −0.463
0.3555 −0.490
0.3572 −0.523
0.3608 −0.558
0.3626 −0.576
0.3662 −0.611
0.3681 −0.621
0.3709 −0.641
0.3727 −0.657
0.3768 −0.672
0.3811 −0.682
0.3830 −0.685
0.3862 −0.681
0.3880 −0.676
0.3920 −0.666
0.3938 −0.659
0.3971 −0.630
0.3987 −0.627
0.4044 −0.594

2445609 +
0.2835 −0.687
0.2848 −0.711
0.2862 −0.738
0.2875 −0.753
0.2888 −0.779
0.2947 −0.820
0.2960 −0.826
0.2974 −0.835
0.2987 −0.832
0.3000 −0.832
0.3053 −0.829

0.3066 −0.816
0.3080 −0.811
0.3093 −0.813
0.3106 −0.808

2445791 +
0.3595 −0.729
0.3609 −0.725
0.3622 −0.713
0.3635 −0.713
0.3648 −0.700
0.3775 −0.609
0.3789 −0.599
0.3802 −0.592
0.3815 −0.587
0.4101 −0.357
0.4115 −0.353
0.4128 −0.351
0.4142 −0.348
0.4155 −0.343
0.4168 −0.341
0.4182 −0.333
0.4195 −0.330
0.4209 −0.325
0.4222 −0.324
0.4360 −0.324
0.4374 −0.326
0.4387 −0.326
0.4401 −0.324
0.4414 −0.324
0.4427 −0.317
0.4441 −0.313
0.4454 −0.312
0.4468 −0.304
0.4481 −0.302
0.4555 −0.265
0.4568 −0.256
0.4581 −0.246
0.4595 −0.248
0.4608 −0.247
0.4622 −0.238
0.4635 −0.244
0.4648 −0.242
0.4662 −0.243
0.4676 −0.240
0.4733 −0.235
0.4746 −0.231

0.4760 −0.236
0.4773 −0.232
0.4786 −0.228
0.4800 −0.229
0.4813 −0.228
0.4827 −0.227
0.4840 −0.228
0.4853 −0.223
0.5208 −0.120
0.5221 −0.112
0.5234 −0.111
0.5248 −0.108
0.5261 −0.112
0.5275 −0.110
0.5288 −0.104
0.5301 −0.096
0.5315 −0.097
0.5328 −0.096
0.5393 −0.076
0.5407 −0.078
0.5420 −0.075
0.5434 −0.066
0.5447 −0.069
0.5461 −0.063
0.5474 −0.062
0.5487 −0.067
0.5501 −0.060
0.5514 −0.050
0.5589 −0.040
0.5602 −0.038
0.5616 −0.034
0.5629 −0.024
0.5643 −0.024
0.5656 −0.025
0.5669 −0.002
0.5683 0.010
0.5696 0.009
0.5710 −0.001
0.5773 −0.005
0.5787 −0.005
0.5800 −0.005
0.5814 0.006
0.5840 0.019

2445806 +
0.4749 0.103
0.4763 0.099

0.4776 0.077
0.4789 0.071
0.4802 0.065
0.4861 0.045
0.4874 0.038
0.4887 0.026
0.4901 0.035
0.4914 0.016
0.4971 −0.019
0.4984 −0.032
0.4998 −0.062
0.5012 −0.075
0.5025 −0.087
0.5079 −0.129
0.5093 −0.142
0.5106 −0.159
0.5120 −0.165
0.5133 −0.192
0.5191 −0.238
0.5204 −0.252
0.5218 −0.265
0.5231 −0.290
0.5244 −0.309
0.5301 −0.382
0.5314 −0.399
0.5328 −0.422
0.5341 −0.435
0.5355 −0.455
0.5409 −0.533
0.5422 −0.568
0.5436 −0.589
0.5449 −0.614
0.5462 −0.633
0.5513 −0.677
0.5527 −0.689
0.5540 −0.705
0.5554 −0.713
0.5567 −0.725
0.5624 −0.729
0.5637 −0.730
0.5651 −0.728
0.5664 −0.734
0.5678 −0.727
0.5731 −0.711
0.5744 −0.713
0.5757 −0.704
0.5771 −0.711

0.5784 −0.707
0.5835 −0.683
0.5849 −0.677
0.5862 −0.672
0.5932 −0.643
0.5945 −0.641
0.5959 −0.633
0.5972 −0.629

2446193 +
0.4372 −0.201
0.4385 −0.212
0.4398 −0.229
0.4412 −0.241
0.4426 −0.253
0.4480 −0.318
0.4493 −0.328
0.4507 −0.359
0.4520 −0.368
0.4534 −0.389
0.4586 −0.451
0.4599 −0.465
0.4612 −0.492
0.4626 −0.506
0.4639 −0.513
0.4691 −0.571
0.4705 −0.588
0.4718 −0.596
0.4732 −0.617
0.4745 −0.628
0.4803 −0.667
0.4816 −0.673
0.4830 −0.678
0.4843 −0.682
0.4857 −0.689
0.4914 −0.693
0.4927 −0.695
0.4941 −0.686
0.4954 −0.681
0.4968 −0.680
0.5028 −0.671
0.5041 −0.669
0.5055 −0.655
0.5068 −0.658
0.5081 −0.650
0.5136 −0.627
0.5150 −0.615

0.5163 −0.606
0.5176 −0.596
0.5190 −0.578

2447306 +
0.4921 0.147
0.4934 0.144
0.4986 0.157
0.4998 0.152
0.5059 0.123
0.5072 0.131
0.5123 0.126
0.5136 0.103
0.5192 0.071
0.5205 0.053
0.5258 −0.012

0.5271 −0.008
0.5322 −0.079
0.5335 −0.096
0.5387 −0.214
0.5400 −0.224
0.5453 −0.254
0.5465 −0.309
0.5514 −0.413
0.5527 −0.442

2447360 +
0.3676 0.094
0.3689 0.078
0.3745 0.053
0.3758 0.053
0.3809 0.020

0.3821 0.010
0.3870 −0.019
0.3883 −0.018
0.3935 −0.093
0.3948 −0.097
0.3961 −0.121
0.4033 −0.216
0.4047 −0.242
0.4060 −0.264
0.4118 −0.380
0.4131 −0.396
0.4186 −0.621
0.4199 −0.668
0.4252 −0.902
0.4265 −0.923
0.4321 −0.953

0.4334 −0.949
0.4391 −0.944
0.4488 −0.905
0.4501 −0.866
0.4515 −0.867
0.4590 −0.789
0.4645 −0.782
0.4658 −0.769

2447462 +
0.3534 −0.264
0.3544 −0.297
0.3592 −0.308
0.3603 −0.319
0.3666 −0.433
0.3677 −0.445

0.3790 −0.607
0.3801 −0.615
0.3849 −0.673
0.3860 −0.679
0.3936 −0.710
0.3947 −0.712
0.3994 −0.733
0.4005 −0.725
0.4056 −0.712
0.4067 −0.712
0.4131 −0.681
0.4142 −0.669
0.4191 −0.656
0.4202 −0.660
0.4246 −0.634
0.4256 −0.630

Table 5.e Photoelectric differential R_C observations of XZ Dra

2447306 +
0.4924 0.159
0.4937 0.176
0.4989 0.169
0.5001 0.172
0.5062 0.158
0.5075 0.157
0.5126 0.152
0.5139 0.137
0.5195 0.102
0.5208 0.097
0.5261 0.048
0.5274 0.043
0.5325 −0.031
0.5338 −0.043

0.5390 −0.128
0.5403 −0.137
0.5456 −0.155
0.5468 −0.188
0.5517 −0.272
0.5530 −0.300

2447360 +
0.3679 0.120
0.3692 0.123
0.3748 0.110
0.3761 0.105
0.3812 0.073
0.3824 0.059
0.3873 0.035
0.3886 0.035

0.3938 −0.032
0.3951 −0.038
0.3964 −0.040
0.4036 −0.120
0.4050 −0.134
0.4063 −0.161
0.4121 −0.268
0.4134 −0.298
0.4189 −0.471
0.4202 −0.487
0.4255 −0.710
0.4268 −0.713
0.4324 −0.734
0.4337 −0.732
0.4394 −0.732

0.4491 −0.679
0.4504 −0.664
0.4518 −0.667
0.4593 −0.600
0.4648 −0.577
0.4661 −0.536

2447462 +
0.3537 −0.150
0.3547 −0.173
0.3595 −0.163
0.3606 −0.225
0.3669 −0.285
0.3680 −0.293
0.3793 −0.429
0.3804 −0.438

0.3852 −0.482
0.3863 −0.499
0.3939 −0.508
0.3950 −0.510
0.3997 −0.525
0.4008 −0.529
0.4059 −0.519
0.4070 −0.510
0.4134 −0.490
0.4145 −0.486
0.4194 −0.487
0.4205 −0.486
0.4249 −0.464
0.4259 −0.450

Table 5.f Photoelectric differential I_C observations of XZ Dra

2447306 +
0.4926 0.180
0.4939 0.196
0.4991 0.155
0.5003 0.155
0.5064 0.180
0.5077 0.169
0.5128 0.166
0.5141 0.162
0.5197 0.162

0.5210 0.162
0.5263 0.162
0.5276 0.162
0.5327 0.041
0.5340 0.048
0.5392 −0.016
0.5405 −0.003
0.5458 −0.071
0.5470 −0.047
0.5519 −0.177

0.5532 −0.165

2447360 +
0.3681 0.152
0.3694 0.130
0.3750 0.123
0.3763 0.132
0.3814 0.114
0.3826 0.100
0.3875 0.104

0.3888 0.096
0.3940 0.050
0.3953 0.046
0.3966 0.034
0.4038 −0.035
0.4052 −0.046
0.4065 −0.069
0.4123 −0.163
0.4136 −0.179
0.4191 −0.324

0.4204 −0.292
0.4257 −0.482
0.4270 −0.509
0.4326 −0.503
0.4339 −0.505
0.4396 0.505
0.4493 −0.442
0.4506 −0.447
0.4520 −0.453
0.4595 −0.397

0.4650 −0.393	0.3597 −0.049	0.3806 −0.289	0.3999 −0.339	0.4147 −0.316
0.4663 −0.393	0.3608 −0.064	0.3854 −0.314	0.4010 −0.333	0.4196 −0.306
	0.3671 −0.118	0.3865 −0.339	0.4061 −0.337	0.4207 −0.298
2447462 +	0.3682 −0.111	0.3941 −0.317	0.4072 −0.352	0.4251 −0.275
0.3539 −0.033	0.3795 −0.285	0.3952 −0.350	0.4136 −0.317	0.4261 −0.258
0.3549 −0.076				

CCD Observations

CCD observations were obtained on 5 nights in July–August 2001, with the 60/90/180cm Schmidt telescope at Piszkéstető Mountain Station of the Konkoly Observatory. A Photometrics CCD camera with a thermoelectrically cooled Kodak KAF-1600 1024 × 1536 chip yielded a $19' \times 28'$ field of view, with $1.''0$/pixel resolution. Standard Johnson V filter was used and the total amount of frames were 405. The typical exposition time was between 30 and 15 sec. To the calibration process of the camera and other technical details see Bakos (2000).

Since there were no pattern in the bias images, we applied a simple zero offset value subtraction to the frames determined from their overscan area. Common flat field corrections were carried out using calibration images taken of the sky during twilight. Other corrections were unnecessary.

Finally, aperture photometry (IRAF/DAOPHOT/PHOT) was accomplished to obtain instrumental magnitudes. The relative magnitudes Var−Comp (=TYC 4225_1323_1, the same comparison star used for photoelectric observations) are shown in Table 6. We note here, that the colour system satisfyingly realizes the international one without any transformation (see Benkő *et al.*, 2001). The accuracy of the individual points is estimated to be $\pm 0.^{\rm m}002$ from the IRAF noise statistics.

On 8$^{\rm th}$ July 134 frames of the field of XZ Dra were taken with 60 sec exposition time yielding good enough signal-to-noise ratio to measure the fainter stars as well. This enabled us to check the constancy of the neighbouring stars. The ISIS-2.1 program package was applied as a realization of the Image Subtraction Method (Alard & Lupton 1998, Alard 2000) to find possible variable stars. Except XZ Dra, we could not detect variability of any of the stars shown in Fig 1. during this night. Based on the other nights' observations longer term variability of the brighter objects were not found either.

On two nights in July, 2001 we observed XZ Dra with the second small Hungarian Automatic Telescope (HAT-2) during its test run phase. About the HAT project see Bakos (2001a,b) The fully automatized observatory was equipped with a 0.1m diameter, f/10 Maksutov MT0 lens, and an amateur Meade Pictor 416xte CCD camera (512×768 9μm pixels). The system yielded a resolution of $1.''85$ per pixel, and FOV of $\sim 16' \times 24'$. 47 frames of the field of XZ Dra were taken with I filter. After standard bias, dark and skyflat calibration, aperture photometry was performed. The relative instrumental i magnitudes are given in Table 7 (XZ Dra−TYC 4225_1323_1).

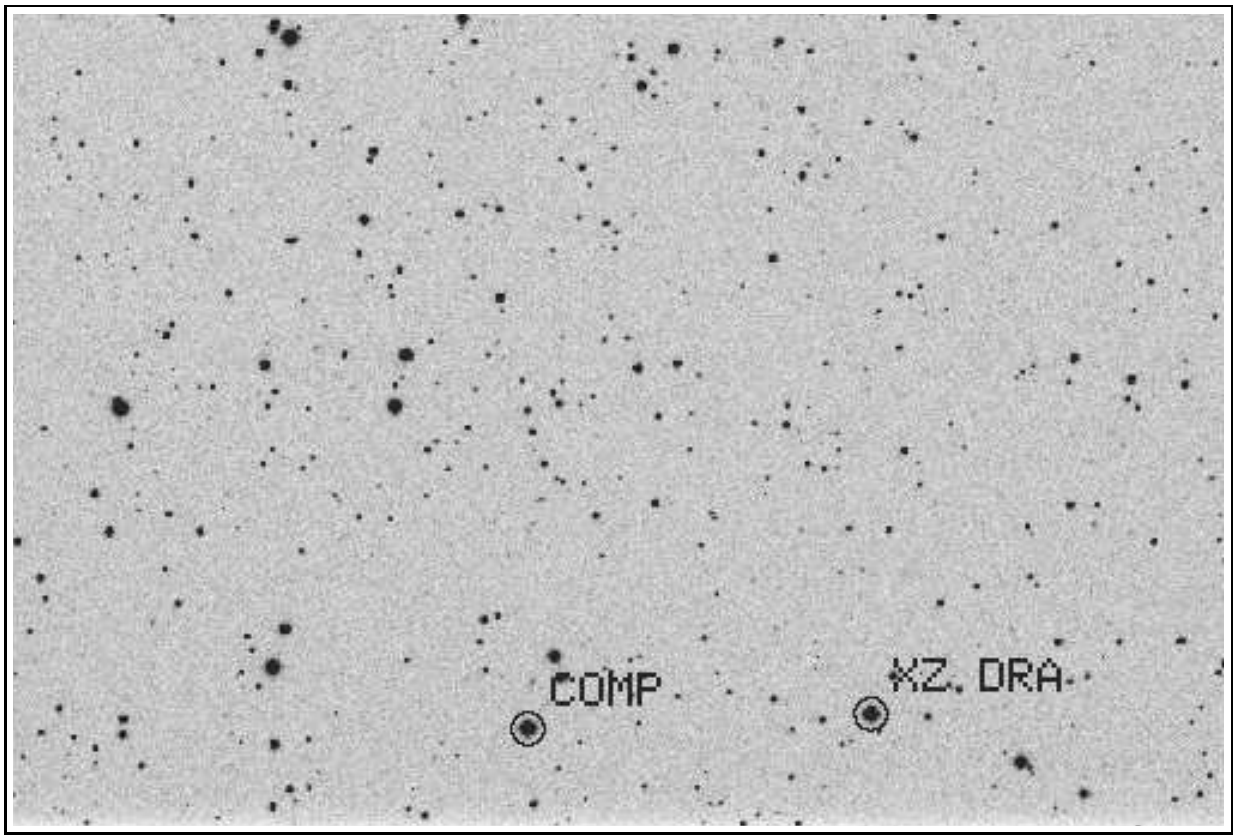

Figure 1: 60 sec exposition V filter CCD frame taken with the Schmidt telescope. XZ Dra and the photoelectric/CCD comparison TYC 4225_1323_1 are marked. North is up, east is to the left.

Table 6. Differential CCD V observations of XZ Dra

2452100 +		0.3947	0.025	0.4201	0.044	0.4464	0.091	0.4702	0.144
0.3699	−0.001	0.3960	0.024	0.4215	0.043	0.4480	0.095	0.4714	0.150
0.3712	−0.004	0.3973	0.023	0.4227	0.043	0.4493	0.093	0.4735	0.153
0.3730	0.002	0.3986	0.024	0.4240	0.046	0.4505	0.100	0.4747	0.152
0.3743	0.006	0.3999	0.023	0.4253	0.044	0.4517	0.101	0.4759	0.155
0.3755	0.006	0.4012	0.023	0.4266	0.048	0.4529	0.104	0.4772	0.157
0.3768	0.004	0.4025	0.022	0.4279	0.050	0.4542	0.107	0.4784	0.158
0.3781	0.008	0.4037	0.024	0.4292	0.051	0.4554	0.112	0.4796	0.160
0.3794	0.009	0.4050	0.026	0.4305	0.057	0.4566	0.108	0.4809	0.161
0.3807	0.013	0.4063	0.026	0.4318	0.057	0.4579	0.116	0.4821	0.165
0.3820	0.013	0.4076	0.026	0.4341	0.065	0.4591	0.116	0.4833	0.161
0.3833	0.014	0.4089	0.026	0.4353	0.066	0.4603	0.124	0.4845	0.168
0.3846	0.018	0.4102	0.028	0.4367	0.066	0.4615	0.123	0.4858	0.165
0.3858	0.015	0.4114	0.032	0.4379	0.070	0.4628	0.129	0.4870	0.168
0.3871	0.020	0.4137	0.034	0.4392	0.068	0.4640	0.138	0.4882	0.167
0.3884	0.019	0.4150	0.035	0.4405	0.069	0.4652	0.143	0.4895	0.171
0.3897	0.017	0.4163	0.038	0.4425	0.084	0.4665	0.136	0.4907	0.169
0.3910	0.022	0.4176	0.034	0.4438	0.075	0.4677	0.141	0.4919	0.165
0.3934	0.019	0.4189	0.040	0.4451	0.083	0.4689	0.148	0.4931	0.164

0.4944	0.172	0.5563	−0.485	0.4962	−0.262	0.4317	0.046	0.4342	−0.094		
0.4956	0.169	0.5574	−0.511	0.4973	−0.277	0.4328	0.044	0.4355	−0.083		
0.4968	0.168	0.5585	−0.537	0.4984	−0.298	0.4339	0.026	0.4368	−0.090		
0.4994	0.162	0.5595	−0.563	0.4995	−0.340	0.4350	0.024	0.4381	−0.085		
0.5006	0.167	0.5606	−0.583	0.5018	−0.411	0.4362	0.002	0.4393	−0.083		
0.5018	0.167	0.5617	−0.601	0.5036	−0.466	0.4373	−0.005	0.4406	−0.083		
0.5031	0.164	0.5630	−0.620			0.4384	−0.018	0.4419	−0.082		
0.5043	0.166	0.5641	−0.640	2452102 +		0.4395	−0.032	0.4432	−0.073		
0.5055	0.159	0.5651	−0.655	0.3412	0.070	0.4406	−0.042	0.5670	0.054		
0.5068	0.157	0.5662	−0.675	0.3423	0.076	0.4417	−0.070	0.5687	0.054		
0.5080	0.153	0.5711	−0.744	0.3434	0.069	0.4428	−0.084	0.5692	0.061		
0.5092	0.147	0.5733	−0.761	0.3445	0.073	0.4440	−0.094	0.5698	0.061		
0.5104	0.143	0.5744	−0.765	0.3456	0.079	0.4451	−0.122	0.5704	0.059		
0.5117	0.138	0.5755	−0.771	0.3468	0.077	0.4462	−0.127	0.5717	0.062		
0.5129	0.134	0.5791	−0.783	0.3479	0.086	0.4484	−0.152	0.5730	0.065		
0.5141	0.125	0.5802	−0.777	0.3490	0.088	0.4495	−0.190	0.5743	0.068		
0.5154	0.116	0.5813	−0.784	0.3501	0.083	0.4518	−0.210	0.5756	0.067		
0.5166	0.108	0.5825	−0.787	0.3512	0.097	0.4529	−0.234	0.5769	0.078		
0.5178	0.104	0.5835	−0.794	0.3523	0.091	0.4551	−0.309	0.5781	0.076		
0.5190	0.089	0.5846	−0.779	0.3534	0.094			0.5802	0.078		
0.5203	0.087	0.5858	−0.782	0.3545	0.096	2452138 +		0.5815	0.085		
0.5215	0.068			0.3556	0.098	0.3953	−0.160	0.5828	0.097		
0.5227	0.056	2452101 +		0.3568	0.097	0.3972	−0.144	0.5841	0.097		
0.5253	0.031	0.4688	0.137	0.3579	0.099	0.3987	−0.143	0.5854	0.100		
0.5265	0.017	0.4702	0.127	0.3590	0.107	0.4013	−0.135	0.5867	0.104		
0.5277	0.005	0.4713	0.128	0.3601	0.108	0.4026	−0.135	0.5880	0.105		
0.5289	−0.015	0.4724	0.119	0.3612	0.107	0.4051	−0.133	0.5892	0.108		
0.5300	−0.025	0.4736	0.110	0.3623	0.110	0.4064	−0.132	0.5905	0.112		
0.5312	−0.043	0.4747	0.111	0.3642	0.120	0.4077	−0.129	0.5918	0.108		
0.5324	−0.053	0.4758	0.099	0.3653	0.114	0.4090	−0.127	0.5931	0.115		
0.5336	−0.073	0.4769	0.082	0.3664	0.115	0.4103	−0.121	0.5944	0.110		
0.5347	−0.087	0.4780	0.087	0.3675	0.120	0.4116	−0.130	0.5957	0.110		
0.5359	−0.099	0.4791	0.066	0.4145	0.164	0.4129	−0.123	0.5970	0.120		
0.5403	−0.180	0.4803	0.058	0.4156	0.167	0.4142	−0.121	0.5982	0.123		
0.5414	−0.204	0.4814	0.049	0.4167	0.154	0.4154	−0.115				
0.5425	−0.222	0.4825	0.037	0.4178	0.155	0.4182	−0.112	2452140 +			
0.5436	−0.249	0.4836	0.017	0.4190	0.143	0.4195	−0.112	0.2984	−0.141		
0.5448	−0.279	0.4847	0.011	0.4201	0.138	0.4208	−0.113	0.2995	−0.143		
0.5459	−0.307	0.4859	−0.019	0.4212	0.139	0.4221	−0.107	0.3014	−0.142		
0.5470	−0.324	0.4870	−0.021	0.4223	0.127	0.4234	−0.102	0.3026	−0.137		
0.5481	−0.343	0.4881	−0.053	0.4234	0.120	0.4247	−0.094	0.3037	−0.136		
0.5492	−0.364	0.4892	−0.073	0.4245	0.114	0.4260	−0.106	0.3048	−0.131		
0.5503	−0.387	0.4903	−0.087	0.4256	0.105	0.4272	−0.097	0.3059	−0.134		
0.5520	−0.407	0.4917	−0.123	0.4267	0.105	0.4285	−0.099	0.3070	−0.125		
0.5531	−0.428	0.4928	−0.147	0.4279	0.088	0.4298	−0.095	0.3081	−0.121		
0.5541	−0.443	0.4939	−0.176	0.4290	0.077	0.4316	−0.091	0.3092	−0.118		
0.5552	−0.468	0.4951	−0.213	0.4306	0.066	0.4329	−0.093	0.3103	−0.125		

0.3114 −0.119	0.3345 −0.091	0.3544 −0.061	0.3757 −0.039	0.3993 0.005
0.3125 −0.122	0.3356 −0.082	0.3555 −0.070	0.3768 −0.037	0.4004 −0.005
0.3137 −0.116	0.3367 −0.083	0.3566 −0.058	0.3779 −0.039	0.4016 0.009
0.3169 −0.111	0.3378 −0.080	0.3578 −0.058	0.3803 −0.034	0.4027 0.006
0.3180 −0.110	0.3389 −0.074	0.3589 −0.056	0.3814 −0.033	0.4038 0.006
0.3191 −0.105	0.3400 −0.076	0.3600 −0.056	0.3824 −0.024	0.4049 0.014
0.3202 −0.107	0.3411 −0.076	0.3611 −0.061	0.3835 −0.024	0.4060 0.017
0.3214 −0.102	0.3428 −0.079	0.3622 −0.058	0.3846 −0.023	0.4071 0.017
0.3225 −0.102	0.3439 −0.078	0.3633 −0.057	0.3857 −0.029	0.4082 0.022
0.3236 −0.096	0.3450 −0.070	0.3644 −0.047	0.3867 −0.020	0.4093 0.014
0.3247 −0.103	0.3461 −0.073	0.3682 −0.044	0.3878 −0.029	0.4104 0.018
0.3258 −0.099	0.3472 −0.072	0.3693 −0.048	0.3889 −0.017	0.4116 0.019
0.3269 −0.092	0.3483 −0.068	0.3703 −0.044	0.3900 −0.013	0.4127 0.026
0.3300 −0.089	0.3494 −0.073	0.3714 −0.043	0.3949 −0.012	0.4138 0.027
0.3311 −0.085	0.3505 −0.067	0.3725 −0.046	0.3960 −0.009	0.4149 0.030
0.3322 −0.088	0.3516 −0.067	0.3736 −0.042	0.3971 −0.007	0.4160 0.030
0.3334 −0.089	0.3528 −0.070	0.3746 −0.037	0.3982 0.007	

Table 7. Differential CCD i observations of XZ Dra

2452124 +	0.4307 −0.334	0.3639 −0.438	0.4119 −0.272	0.4677 −0.101
0.4067 −0.420	0.4349 −0.364	0.3667 −0.426	0.4148 −0.248	0.4706 −0.126
0.4110 −0.398		0.3783 −0.419	0.4254 −0.235	0.4872 −0.056
0.4137 −0.407	2452125 +	0.3850 −0.272	0.4298 −0.212	0.4903 −0.094
0.4162 −0.437	0.3060 +0.198	0.3903 −0.502	0.4352 −0.189	0.4933 −0.044
0.4183 −0.499	0.3179 +0.187	0.3931 −0.470	0.4404 −0.150	0.4996 −0.059
0.4204 −0.359	0.3235 +0.135	0.3959 −0.430	0.4456 −0.156	0.5075 −0.044
0.4224 −0.440	0.3474 −0.190	0.3988 −0.443	0.4519 −0.133	0.5104 −0.027
0.4245 −0.365	0.3530 −0.258	0.4027 −0.201	0.4576 −0.135	0.5133 −0.016
0.4287 −0.401	0.3581 −0.366	0.4071 −0.201	0.4648 −0.144	0.5133 −0.016

Radial Velocity Measurements

During eight nights in 1971 XZ Dra was observed spectroscopically with the 2131 spectrograph at the Cassegrain focus of the 72 inch telescope of the DAO (Dominion Astrophysical Observatory, Canada). 26 spectrograms were obtained in order to determine the radial velocity variation. The spectra, at the dispersion of 60 Å/mm, were taken on baked Eastman Kodak IIaO emulsion. The lines measured and the wavelengths accepted for them were chosen from those adopted at DAO. Standard-velocity stars were observed on some of the nights that spectrograms were obtained of XZ Dra. Velocities of these stars, measured in the adopted wavelength system, showed a satisfactory freedom from systematic errors.

Values of radial velocities of XZ Dra are presented in Table 8 (Col. 2,6). In the table the Julian date of the middle of exposures (Col. 1,5), the internal mean error of the velocities (Col. 3,7) and the number of lines measured (Col. 4,8) are also given.

Table 8. Radial velocities of XZ Dra

HJD 2440000+	$v_{\rm rad}$ [km/s]	σ [km/s]	n	HJD 2440000+	$v_{\rm rad}$ [km/s]	σ [km/s]	n
1078.782	−50.5	3.3	17	1147.933	−59.4	5.3	16
1078.805	−71.1	5.2	17	1147.966	−43.8	5.4	13
1078.829	−65.6	4.4	17	1157.799	−5.1	3.9	16
1097.844	−64.0	5.4	16	1157.845	−22.1	3.8	16
1097.869	−62.7	3.4	17	1157.878	−38.1	4.0	16
1097.898	−63.7	3.5	17	1157.905	−70.8	4.3	14
1097.930	−55.2	3.9	17	1157.930	−62.5	3.9	17
1107.778	−7.0	4.3	17	1168.726	−12.6	7.3	14
1107.837	−55.4	6.6	16	1177.710	−22.5	8.0	9
1107.882	−53.0	3.6	17	1177.909	−58.9	4.0	16
1147.800	−7.4	4.9	16	1186.811	−23.3	8.2	7
1147.862	−40.6	4.5	17	1186.965	−39.6	3.7	14
1147.897	−71.8	3.4	14	1187.009	−49.1	5.1	6

TIMES AND MAGNITUDES OF LIGHT MAXIMA AND O−C VALUES

The times and magnitudes of light maxima from the Konkoly photographic (Table 9.a), photoelectric B, V and CCD (Table 9.b) data were determined from polynomial fits to the data around maxima. The maximum magnitudes were obtain by adopting Struch's (1966) $V = 10.493$, $B = 11.065$ magnitudes for the comparison star.

In Table 10.a and 10.b individual and normal maxima and O−C values derived from all the available published measurements are listed. Both professional and amateur observations are regarded, but only those which have publicly available references. The GEOS RR Lyrae database* lists some further unpublished amateur (visual) observations which we have not included in our compilation. From multicolor observations B data were considered. The only published measurements of XZ Dra that is not included in either of the tables is that of Butler *et al.* (1982). These observations cover the linear part of the descending branch on two successive nights and no unambiguous normal maxima could have been extrapolated from these data.

In each cases when not only maxima timings but the original observations were also given, individual maxima times and normal maxima were independently determined. In Tab 10.a–b these values are given instead of the originally published data. This causes very small if any difference in the cases of individual maxima, but may lead to significantly different normal values.

Individual maxima were determined by polynomial fitting of the data around maximum values with the exception of Batyrev's (1955) measurements, where the times of the brightest magnitudes were taken as estimates of O−C values. Wenske (1982) gave the times of the mean magnitudes on the ascending branch instead of the maxima. These

*http://www.upv.es/geos/

Table 9.a Times and magnitudes of photographic maxima

pg maxima HJD 2400000+	[mag]	pg maxima HJD 2400000+	[mag]	pg maxima HJD 2400000+	[mag]
28404.476	9.84	29720.532	9.43	34599.395:	9.44
29084.424	9.70	29721.482	9.48	34605.586:	9.69
29113.498:	9.65	29730.543:	9.36	34627.510	9.26
29284.558	9.40	29732.452	9.50	35377.510	9.58
29295.518	9.50	29734.346	9.46	35421.338	9.59
29365.559	9.42	30514.393	9.66	35622.423	9.24
29366.503	9.48	31352.547	9.77	35682.460	9.28
29376.515	9.55	31353.503	9.78	35732.488:	9.94
29377.461	9.57	31700.386	9.31	35756.313	9.50
29378.418	9.61	34234.412:	9.88	35933.580:	9.31
29449.414	9.58	34241.558	9.82	36005.532:	9.45
29458.466	9.71	34253.463	9.57	36007.437:	9.13
29468.460	9.82	34264.432	9.41	36038.395	9.50
29518.499:	9.60	34455.491	9.53	36069.364:	9.59
29519.463	9.53	34476.463	9.38	36077.485	9.29
29520.401	9.71	34486.472	9.22	36087.505	9.44
29527.545	9.76	34488.379	9.05	36100.365:	9.43
29691.469	9.81	34515.531	9.25	36128.458	9.74
29699.568	9.62	34546.502:	9.41	36131.325	9.40
29701.476	9.74	34589.382:	9.42	36142.275	9.58

values were shifted by $0.^{\rm d}027$ (the mean value of the time difference between the timings of the mean magnitude on the ascending branch and the maximum [$\Delta T = \overline{T_{\rm max} - T_{\rm med}}$] determined from the Budapest photoelectric B observations) to estimate the times of maxima. It has to be emphasized, however, that these transformed values are not true maxima times, since depending on the Blazhko phase, the actual value of ΔT can differ by $\pm 0.^{\rm d}015$ from $0.^{\rm d}027$.

An $8^{\rm th}$ order Fourier fit to the Budapest photographic observations between HJD 2430433 and 2431708 were regarded as a basic normal light curve using $P=0.^{\rm d}4764955$ period. These data cover the whole pulsational period well, and in this interval no definite period change has been observed. The normal maximum of these data was determined to be at HJD=2431244.383, at the mid-time of the observations. This normal epoch corresponds thus to a calculated maximum and not to real observations. All the O−C values were accordingly calculated by using the ephemeris:

$$\mathrm{MaxHJD} = 2431244.383 + 0.^{\rm d}4764955 \times \mathrm{E} \qquad (1)$$

In Table 10.a all the individual maxima timings (Col. 1,5) found in the literature and given in the present paper, O−C values (Col. 2,6), type of detector (Col. 3,7), and references (Col. 4,8) are given.

Normal maxima were determined from measurements of one or two observing season(s) but there were also some cases when only a few nights' (sometimes consecutive)

Table 9.b Times and magnitudes of photoelectric maxima

B maxima		V maxima		B maxima		V maxima	
HJD 2400000+	[mag]	{HJD}*	[mag]	HJD 2400000+	[mag]	{HJD}*	[mag]
36410.5253	9.951	.5251	9.711	41249.3860	9.891	.3852	9.692
36413.3927	9.941	.3924	9.759	41250.3344	9.886	.3344	9.687
36421.4972	9.992	.4972	9.780	41539.5695	9.702	.5700	9.537
36443.4126	9.996	.4129	9.712	41589.5960	9.980	.5958	9.776
36450.5613	9.795	.5601	9.543	41591.5045	10.010	.5047	9.825
36451.5162	9.836	.5165	9.604	41606.2756	9.711	.2760	9.555
36454.3776	9.794	.3784	9.596	41622.4890	9.850	.4888	9.624
36463.4280	9.750	.4275	9.548	41772.5747	9.769	.5750	9.597
36474.3893	9.935	.3877	9.698	41803.5347	9.996	.5345	9.826
36475.3386	9.883	.3370	9.668	41815.4484	9.967	.4484	9.772
36486.2980:	10.025:	.2980:	9.825:	41833.5500:	9.795:	.5500:	9.620:
36503.4562	10.014	.4550	9.778	41835.4641	9.697	.4643	9.569
36506.3130	10.008	.3145	9.766	41905.5046	9.808	.5050	9.625
36514.4016	9.947	.4006	9.699	41915.5140:	9.805:	.5140:	9.615:
37465.4948	9.903	.4957	9.772	41934.5722	9.919	.5700	9.698
37467.4040:	9.865:	.4050:	9.760:	41938.3821	9.912	.3818	9.756
37475.4946	9.956	.4950	9.834	41939.3350	9.904	.3348	9.731
37486.4665	9.968	.4592	9.860	41949.3367	10.032	.3375	9.804
39391.4767	10.045	.4765	9.831	41990.3254	9.692	.3253	9.560
39402.4404	9.835	.4460	9.638	42147.5715	9.772	.5714	9.575
39403.3939	9.840	.3921	9.688	42201.4016	9.898	.4019	9.678
40500.2947:	9.897	.2930:	9.666	42220.4715	9.768	.4720	9.558
40504.5845	9.949	.5824	9.713	42242.3829	9.935	.3844	9.714
40516.4990	10.062	.4999	9.828	42260.4980:	10.055	.4980:	9.758
40528.4163	9.964	.4160	9.737	42269.5440	10.030	.5452	9.790
40530.3118	9.955	.3118	9.750	42279.5459	9.830	.5466	9.668
40541.2790	9.810	.2783	9.638	42303.3830:	9.906	.3900:	9.690
40676.6093	10.028	.6105	9.806	42636.4427	10.089	.4432	9.778
40707.5803	9.640	.5810	9.516	43700.4801	10.000	.4802	9.783
40709.4894	9.667	.4897	9.539	43720.4906	9.789	.4906	9.604
40731.4080:	9.887	.4070	9.718	43732.4050:	9.665:	.4050:	9.510:
40751.4215	10.018	.4211	9.825	43743.3720	9.864	.3726	9.652
40780.4874	9.707	.4871	9.510	43763.3808	10.018	.3825	9.809
40821.4660	9.967	.4651	9.715	45609.2994	9.808	.2994	9.659
40840.5249	9.933	.5250	9.728	45806.5680	9.922	.5665	9.759
40863.4094	9.682	.4096	9.540	46193.4902	9.999	.4901	9.798
40925.3400	9.787	.3393	9.618	47360.4319	9.684	.4321	9.543
40937.2661	9.769	.2655	9.611	47462.3998	9.976	.4000	9.763
				52100.		.5828	9.706†

*{HJD} denotes the fractional part of HJD. The integer part can be read form the same line in Col. 1,5.

† CCD V observation

observations defined the normal values. The most deviant points were omitted from each data set. The observations were folded by the period given in Eq. (1) and were fitted both vertically (magnitude-shifts to compensate the differences of the different photometric systems) and horizontally (phase-shifts which can be regarded as O−C value) to the basic light curve applying a standard least squares method. In this way we could eliminate the problem of the different magnitude scales, and the effect of the different shapes of the light curves in different wavelengths. The normal maximum times were then calculated at the mean Julian date of the observations by using these overall phase shift values and ephemeris Eq. (1).

In Table 10.b normal maxima timings (Col. 1), O−C values (Col. 2), the first and the last dates of the observations (Col. 3), number of measurements (Col. 4), type of detector (Col. 5), and references (Col. 6) are listed. The references of those data which were taken from the literature and not directly determined from the original observations (due to the lack of published data) are denoted by asterisks both in Table 10.a and 10.b. Maximum times which seems to give erroneous O−C values are in parentheses, independently whether or not they were published as uncertain values.

Table 10.a O−C values calculated from observed maxima[†]

HJD 2400000+	O−C [d]	det.	ref.	HJD 2400000+	O−C [d]	det.	ref.
25850.445:	−0.009	vis	8	27556.327:	0.019	vis	19
25936.241:	0.018	vis	8	27618.277	0.025	vis	38*
26025.343:	0.015	vis	8	27619.230	0.025	vis	38*
26298.360:	0.000	vis	8	27625.418	0.018	vis	38*
26478.488:	0.013	vis	8	27628.270	0.011	vis	38*
(26624.338:	0.055	vis	8)	27629.221	0.009	vis	38*
26835.381	0.011	vis	19	27974.221	0.027	vis	38*
26945.452	0.011	vis	19	27979.450:	0.014	vis	38*
26957.374:	0.021	vis	19	27980.399	0.010	vis	38*
27161.311:	0.018	vis	19	27983.263	0.015	vis	38*
27230.411	0.026	vis	19	27984.218	0.017	vis	38*
27300.450	0.020	vis	41	27994.229	0.022	vis	38*
27301.400:	0.017	vis	41	28003.268	0.007	vis	38*
27302.357	0.021	vis	41	28004.225	0.011	vis	38*
27309.507	0.024	vis	41	28005.183	0.016	vis	38*
27310.465	0.029	vis	41	28395.417	0.001	vis	38*
27311.408	0.019	vis	41	28396.383	0.014	vis	38*
27312.369	0.027	vis	41	28398.275	0.000	vis	38*
27313.314	0.019	vis	41	28399.230	0.002	vis	38*
27324.277	0.022	vis	41	28400.187	0.006	vis	38*
27332.373	0.018	vis	41	28404.476	0.006	pg	39
27353.340	0.019	vis	41	28407.330:	0.001	vis	38*
27354.290:	0.016	vis	41	28409.235	0.000	vis	38*

[†]Reference list can be found at the end of Table 10.b

Table 10.a continued

HJD 2400000+	O−C [d]	det.	ref.	HJD 2400000+	O−C [d]	det.	ref.
29084.424	−0.005	pg	39	34520.291	0.001	vis	6
29113.498:	0.003	pg	39	34546.502:	0.005	pg	39
29284.558	0.001	pg	39	34589.382:	0.001	pg	39
29295.518	0.002	pg	39	34599.395:	0.007	pg	39
29365.559	−0.002	pg	39	34600.352	0.011	vis	6
29366.503	−0.011	pg	39	34605.586:	0.004	pg	39
29376.515	−0.006	pg	39	34612.263	0.010	vis	6
29377.461	−0.013	pg	39	34620.352	−0.002	vis	38
29378.418	−0.009	pg	39	34621.308	0.001	vis	38
29449.414	−0.010	pg	39	34627.510	0.009	pg	39
29458.466	−0.012	pg	39	34627.512	0.011	vis	38
29468.460	−0.024	pg	39	34631.339	0.026	vis	38
29518.499:	−0.017	pg	39	34632.287	0.021	vis	38
29519.463	−0.006	pg	39	34637.522	0.015	vis	38
29520.401	−0.021	pg	39	34638.475	0.015	vis	38
29527.545	−0.025	pg	39	34639.426:	0.013	vis	38
29691.469	−0.015	pg	39	34640.379	0.013	vis	38
29699.568	−0.017	pg	39	34641.338	0.019	vis	38
29701.476	−0.015	pg	39	34644.203	0.025	vis	6
29720.532	−0.018	pg	39	34651.346	0.020	vis	38
29721.482	−0.021	pg	39	34652.298	0.019	vis	38
29730.543:	−0.014	pg	39	34659.440	0.014	vis	38
29732.452	−0.011	pg	39	34662.306	0.021	vis	38
29734.346	−0.023	pg	39	34674.213	0.015	vis	38
30514.393	0.001	pg	39	34680.418	0.026	vis	38
31352.547	0.000	pg	39	34683.285	0.034	vis	6
31353.503	0.003	pg	39	34684.197:	−0.007	vis	38
31700.386	−0.003	pg	39	34943.425:	0.007	vis	38
34234.412:	0.020	pg	39	34945.334	0.010	vis	38
34241.558	0.018	pg	39	34953.443	0.019	pg	5*
34253.463	0.011	pg	39	34973.437	0.000	vis	6
34264.432	0.021	pg	39	34986.305	0.003	vis	6
34338.311	0.043	vis	6	35008.232	0.011	vis	6
34339.238	0.017	vis	6	35377.510	0.005	pg	39
34455.491	0.005	pg	39	35421.338	−0.005	pg	39
34476.463	0.011	pg	39	35622.423	−0.001	pg	39
34486.472	0.014	pg	39	35682.460	−0.002	pg	39
34488.379	0.015	pg	39	35732.488:	−0.006	pg	39
34510.281	−0.002	vis	6	35756.313	−0.006	pg	39
34515.531	0.006	pg	39	35933.580:	0.005	pg	39

Table 10.a continued

HJD 2400000+	O−C [d]	det.	ref.	HJD 2400000+	O−C [d]	det.	ref.
35956.441	−0.006	pe	40	38146.425	0.005	pg	58
36005.532:	0.006	pg	39	38883.539	−0.020	vis	10*
36007.437:	0.005	pg	39	38883.542	−0.017	vis	10*
36038.395	−0.009	pg	39	38945.491	−0.012	vis	10*
36069.364:	−0.012	pg	39	38945.497	−0.006	vis	10*
36077.485	0.008	pg	39	38945.500	−0.003	vis	10*
36087.505	0.022	pg	39	39031.728	−0.021	pe	23
36100.365:	0.016	pg	39	39352.411	−0.019	vis	4*
36128.458	−0.004	pg	39	39391.477	−0.026	pe	40
36131.325	0.004	pg	39	39402.440	−0.022	pe	40
36142.275	−0.005	pg	39	39403.392	−0.023	vis	11*
36289.541:	0.024	pg	58	39403.394	−0.021	pe	40
36410.525	−0.022	pe	40	(39403.419	0.004	vis	11*)
36413.393	−0.013	pe	40	39405.294	−0.027	vis	11*
36421.497	−0.010	pe	40	39405.295	−0.026	vis	11*
36443.413	−0.012	pe	40	39406.262	−0.012	vis	11*
36450.561	−0.012	pe	40	39406.269	−0.005	vis	11*
36451.516	−0.010	pe	40	40384.503	−0.017	pe	57*
36454.378	−0.007	pe	40	40385.462	−0.011	pe	57*
36463.428	−0.010	pe	40	40385.466	−0.007	pe	48*
36474.389	−0.009	pe	40	40386.427	0.001	pe	48*
36475.339	−0.012	pe	40	40434.523:	−0.029	pe	57*
36486.298:	−0.012	pe	40	40435.485	−0.020	pe	57*
36503.456	−0.008	pe	40	40444.539	−0.019	pe	57*
36506.313	−0.010	pe	40	40446.442	−0.022	pe	57*
36514.402	−0.021	pe	40	40456.447	−0.024	pe	57*
36850.340	−0.013	vis	2*	40467.420	−0.010	pe	57*
36851.293	−0.013	vis	2*	40500.295:	−0.013	pe	40
36852.249	−0.010	vis	2*	40504.585	−0.012	pe	40
36899.424	−0.008	vis	2*	40516.499	−0.010	pe	40
37465.495	−0.013	pe	40	40528.416	−0.005	pe	40
37467.404:	−0.010	pe	40	40530.312	−0.015	pe	40
37475.495	−0.020	pe	40	40539.364	−0.017	pe	57*
37486.467	−0.007	pe	40	40541.279	−0.008	pe	40
37914.361	−0.006	vis	47*	40676.609	−0.002	pe	40
37914.365	−0.002	vis	47*	40707.580	−0.004	pe	40
37914.366	−0.001	vis	47*	40709.489	−0.001	pe	40
37914.368	0.001	vis	47*	40731.408:	0.000	pe	40
(37941.365	−0.162	vis	44*)	40751.422	0.001	pe	40
37945.339	0.000	vis	44*	40769.520	−0.008	pe	49*

Table 10.a continued

HJD 2400000+	O−C [d]	det.	ref.	HJD 2400000+	O−C [d]	det.	ref.
40780.487	0.000	pe	40	41595.309	0.014	pe	57*
40812.404	−0.009	vis	12*	41603.415	0.020	pe	57*
40821.466	0.000	pe	40	41604.371	0.023	pe	57*
40840.525	−0.001	pe	40	41606.276	0.022	pe	40
40844.335	−0.003	pe	49*	41612.473	0.024	pe	57*
40851.493	0.008	pe	57*	41622.489	0.034	pe	40
40852.427:	−0.011	pe	57*	41636.288	0.015	pe	57*
40853.388	−0.003	pe	49*	41772.575	0.024	pe	40
40853.393	0.002	pe	57*	41785.425	0.009	pe	57*
40863.409	0.011	pe	40	(41795.390	−0.033	vis	13*)
40916.287	−0.002	pe	57*	41803.535	0.012	pe	40
40925.340	−0.002	pe	40	41815.448	0.012	pe	40
40935.358	0.010	pe	57*	41833.550:	0.008	pe	40
40937.266	0.012	pe	40	41835.464	0.016	pe	40
40955.365	0.004	pe	57*	41895.488	0.001	pe	57*
40966.313	−0.008	pe	57*	41905.505	0.012	pe	40
41074.492	0.007	pe	57*	(41906.499	0.053	pe	57*)
41074.496	0.011	vis	12*	41907.408	0.009	pe	57*
41075.452	0.014	vis	12*	41915.514:	0.014	pe	40
41075.454	0.016	vis	12*	41917.422	0.016	pe	57*
41085.460	0.015	pe	57*	41934.572	0.012	pe	40
41093.558	0.013	pe	57*	41936.468	0.002	pe	57*
41095.950	0.023	pe	46	41938.382	0.010	pe	40
41187.428	0.013	pe	57*	41939.335	0.011	pe	40
41216.490	0.009	pe	57*	41949.337	0.006	pe	40
41229.364	0.018	pe	57*	(41957.421	−0.010	pe	57*)
41240.329	0.023	pe	57*	41987.466	0.015	pe	57*
41249.386	0.027	pe	40	41990.325	0.015	pe	40
41249.393	0.034	vis	12*	42147.572	0.019	pe	40
41250.334	0.022	pe	40	42159.471	0.006	pe	57*
41439.496	0.015	pe	57*	42201.402	0.005	pe	40
41470.480	0.027	pe	57*	42208.548	0.004	pe	57*
41511.448	0.016	pe	57*	42219.517	0.013	pe	57*
41539.570	0.025	pe	40	42220.472	0.015	pe	40
41541.478	0.027	pe	57*	42242.383	0.007	pe	40
41550.518	0.014	pe	57*	(42251.396:	−0.033	vis	13*)
41552.435	0.025	pe	57*	42251.429	0.000	pe	57*
41589.596	0.019	pe	40	42260.498:	0.016	pe	40
41591.505	0.022	pe	40	42269.544	0.008	pe	40
41593.399	0.010	pe	57*	42279.546	0.004	pe	40

Table 10.a continued

HJD 2400000+	O−C [d]	det.	ref.	HJD 2400000+	O−C [d]	det.	ref.
42280.500	0.005	pe	57*	47432.381	0.016	vis	31*
42303.383:	0.016	pe	40	47462.400	0.016	pe	40
42636.443	0.006	pe	40	47470.493	0.009	vis	24*
42698.386	0.004	pe	57*	47471.459	0.022	vis	24*
42710.297	0.003	pe	57*	47471.473	0.036	vis	24*
42739.371	0.011	pe	57*	47480.522	0.031	vis	24*
42840.390	0.013	vis	14*	47612.494:	0.014	vis	32*
42895.181	0.007	vis	18	(47910.277	−0.013	vis	32*)
42896.135	0.008	vis	18	47947.497:	0.041	pe	29
43248.275	0.017	vis	18	47966.535	0.019	vis	24*
43249.202	−0.009	vis	18	48028.484	0.024	vis	24*
43255.391	−0.014	vis	18	48036.100	0.016	pe	29
43256.343	−0.015	vis	18	(48037.507	−0.007	vis	24*)
43257.302	−0.009	vis	18	48096.149:	0.026	pe	29
43260.174	0.004	vis	18	48347.260:	0.024	pe	29
43277.332	0.008	vis	18	48496.410:	0.031	pe	29
43278.276	−0.001	vis	18	48632.212:	0.032	pe	29
43287.342	0.012	vis	18	48829.465	0.016	pg	25*
43297.343	0.006	vis	18	49439.365	0.001	vis	33*
43298.293	0.003	vis	18	(49573.416	0.157	pg	25*)
43308.316	0.020	vis	18	49893.481	0.017	pg	26*
43700.480	0.028	pe	40	49903.494	0.024	pg	26*
43720.491	0.026	pe	40	(49922.577	0.047	vis	25*)
43732.405:	0.028	pe	40	49934.455	0.013	pe	1*
43743.372	0.036	pe	40	49945.417	0.015	pg	26*
43763.381	0.032	pe	40	50079.298	0.001	vis	34*
43795.305	0.031	vis	15*	50247.520	0.020	pg	26*
45280.496	−0.015	vis	9*	50288.510	0.031	vis	35*
45609.299	0.006	pe	40	50331.383	0.020	pg	26*
45806.568	0.006	pe	40	50593.459	0.023	vis	35*
46193.490	0.014	pe	40	50594.405	0.016	vis	35*
(47107.438	0.043	vis	30*)	50727.350	0.019	vis	35*
47180.334	0.035	vis	30*	50756.413	0.016	vis	35*
(47275.572	−0.026	pg	31*)	51080.426	0.012	vis	36*
47276.574	0.023	vis	24*	51362.494	−0.006	vis	37*
47296.582	0.019	pg	31*	51425.402	0.005	vis	37*
47360.432	0.018	pe	40	52100.583	−0.008	ccd	40
47369.502	0.035	vis	24*	52124.418	0.002	ccd	40
47379.505	0.031	vis	31*	52125.365	−0.004	ccd	40
(47391.433	0.047	vis	31*)				

Table 10.b O−C values calculated from normal points

HJD 2400000+	O−C [d]	time range [JD/year]	n	det.	ref.†
(15267.573	0.084	14000−20800		pg	45*)
(20787.670	−0.019	20800−23000		pg	45*)
(23052.533	0.061	23000−25500		pg	45*)
25749.435	−0.002	25503−25951	19	pg	51
25875.718	0.010	25500−29500		pg	45*
25890.481	0.001	25721−26127	71	vis	8
26275.483	−0.005	26001−26506	30	pg	51
26440.374	0.019	26196−26642	65	vis	8
26865.401	0.012	26825−26960	185	vis	19
26957.367	0.014	26928−26985	16	vis	8
26987.397	0.025		248	vis	59*
27230.409	0.024	27161−27556	159	vis	19
27318.566	0.029	27300−27354	94	vis	41
27622.565	0.024	1934		vis	52*
27985.645	0.015	1935	200	vis	53*
28363.503	0.012	1936	179	vis	54*
28501.681	0.006	28356−28784	263	pg	39
28614.618	0.014	27198−29903	562	vis	20*
29287.412	−0.004	29084−29378	789	pg	39
29596.648	−0.014	29449−29734	1162	pg	39
30461.499	−0.002	30433−30514	178	pg	39
31345.396	−0.004	31330−31376	702	pg	39
31703.732	0.007	31700−31708	148	pg	39
33740.789	0.046	33661−33796	11	pg	58
34206.306	0.027	33896−34294	276	pg	39
34338.766	0.021	34335−34339	35	vis	6
34538.886	0.012	34455−34627	306	pg	39
34610.374	0.027	34509−34719	137	vis	6
34641.339	0.020	34599−34686	414	vis	38
34943.431	0.013	34935−34947	62	vis	38
35005.376	0.014	34971−35072	117	vis	6
35399.424	0.000	35377−35421	81	pg	39
35690.563	0.000	35622−35756	147	pg	39
36031.749	0.016	1952−1960	255	pg	50*
36074.626	0.008	35933−36142	388	pg	39
36224.724	0.010	36077−36344	21	pgv	58
36229.489	0.010	36074−36347	32	pg	58
36331.447	−0.002	36041−36518	98	vis	43
36370.511	−0.011	36370−36371		pe	27*
36458.664	−0.009	36410−36514	392	pe	40
36834.629	0.001	36819−36848	18	pg	58

Table 10.b continued

36837.480	−0.005	36819−36848	10	pgv	58
36851.294	−0.012	36850−36852	43	vis	3*
36893.232	−0.005	36876−36904	24	vis	3*
37055.700	−0.022	36728−37228	116	vis	43
37464.537	−0.018	37348−37486	154	pe	40
37728.531	−0.003	37458−37964	129	vis	43
38317.486	0.004	38198−38700	66	vis	43
38634.344	−0.008	38530−38709	47	pg+pe	28,55
39018.393	−0.014	38935−39425	46	vis	43
39399.583	−0.020	39391−39403	106	pe	40
40037.616	−0.015	39675−40420	17	vis	43
40684.715	0.003	40494−40937	600	pe	40
41112.630	0.025	41064−41133	75	pe	46
41249.386	0.027	41249−41250	115	pe	40
41413.296	0.023	41375−41425	114	vis	7*
41550.534	0.030	1972		pg	56*
41802.592	0.022	41539−41990	636	pe	40
41928.372	0.007	1973		vis	42*
41928.374	0.009	1973−1974		vis	21*
42238.581	0.017	42147−42303	280	pe	40
42638.365	0.022		90	vis	17*
42638.366	0.023		75	vis	16*
42725.540	−0.002	42636−42948	63	pe	40
42895.192	0.018	42894−42898	55	vis	18
(43043.337	−0.028		75	vis	17*)
43272.579	0.020	43248−43308	315	vis	18
43717.641	0.035	43660−43763	177	pe	40
45864.703	0.009	45609−46193	193	pe	40
45870.408	−0.004	1984		vis	22*
47376.640	0.025	47306−47462	71	pe	40
48032.770	0.021	47865−48176	49	pe	29
48330.588	0.029	48209−48462	38	pe	29
48742.743	0.016	48519−49019	31	pe	29
52115.368	0.006	52100−52140	405	ccd	40

†1 Agerer & Hübscher (1996), 2 Ahnert (1961a), 3 Ahnert (1961b), 4 Ahnert (1967), 5 Alania (1956), 6 Batyrev (1955), 7 Berdnikov (1977), 8 Beyer (1934), 9 Böhme (1983), 10 Braune & Hübscher (1967), 11 Braune *et al.* (1970), 12 Braune *et al.* (1972), 13 Braune *et al.* (1977), 14 Braune *et al.* (1979), 15 Braune *et al.* (1981), 16 Busch (1976), 17 Busch (1979), 18 Dyachenko (1982), 19 Konkoly vis, 20 Dziewulski (1953), 21 Firmanyuk *et al.* (1975), 22 Firmanyuk *et al.* (1985), 23 Fitch *et al.* (1966), 24 GEOS NC 650, 25 Vandenbroere (1997), 26 Vandenbroere (1998), 27 Geyer (1961), 28 Harding & Penston (1966), 29 ESA (1997), 30 Hübscher & Lichtenknecker (1988), 31 Hübscher *et al.* (1989), 32 Hübscher *et al.* (1990), 33 Hübscher *et al.* (1994), 34 Hübscher & Agerer (1996), 35 Hübscher *et al.* (1998), 36 Hübscher *et al.* (1999), 37 Hübscher *et al.* (2000), 38 Klepikova (1958), 39 Konkoly pg, 40 Konkoly pe & CCD, 41 Lange (1938), 42 Lange *et al.* (1976), 43 Lebedev (1975), 44 Oburka (1965), 45 Payne-Gaposchkin (1954), 46 Penston (1973), 47 Pohl & Kizilirmak (1964), 48 Popovici (1970), 49 Popovici (1971), 50 Satyvaldyev (1962), 51 Schneller (1931), 52 Soloviev (1934), 53 Soloviev (1936), 54 Soloviev (1937), 55 Sturch (1966), 56 Tsessevich (1974), 57 Wenske (1982), 58 Zaleski (1965), 59 Kharadse (1933).

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