KG
11365
334

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03

H. C. O.

East Transit

1867 May 31

to

1867 Nov. 5

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RG 11365.334

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Harvard College Observatory

Time Book

May 31 1867 to Nov. 5 1867.

with Frodsham's

description of South Clock.

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1907phae.proj.335L

KG 11365. 334 φ = 42 22 49

Star	δ June 9	φ − δ	log A	B	log B	log C
δ Ophiuchi	−3 20 55	45 43 44	9.8556 +717		9.8446 −8556 +699	0.0007 −156 1.001
α Virginis	−10 28 6	52 50 55	9.9088 +811	614	9.7883	0.0073 C=1.017
ζ Virginis	+0 5 2	+42 17 47	9.8280 +673	740	9.8690	0.0000 1.000
η Urs Maj	49 58 50	−7 36 1	9.3332n −206	1.542	0.1880	0.1918 1.555
η Bootis	19 3 57	+23 18 52	9.6219 +419	972	9.9875	0.0245 1.058
α Bootis	19 52 37	+22 30 12	9.6096 +407	982	9.9923	0.0267 1.063
τ Herculis	46 38 1	−4 15 12	9.0335n −108	1.452	0.1621	0.1633 1.456
η Herculis	39 10 44	+3 12 5	8.8576 +072	1.288	0.1099	0.1106 1.290
κ Ophiuchi	+9 35 9	+32 47 40	9.7398 +549	853	9.9308	0.0061 1.014
d Herculis	33 45 53	+8 36 56	9.2557 +180	1.190	0.0753	0.0802 1.203
β Draconis	52 24 10	−10 1 21	9.4552n −285	1.614	0.2079	0.2146 1.639
γ Draconis	51 30 26	−9 7 37	9.4063n −255	1.586	0.2004	0.2059 1.607
α Lyrae	38 39 47	+3 43 2	8.9191 +083	1.277	0.1064	0.1073 1.280
β Lyrae	33 12 41	+9 10 8	9.2799 +190	1.180	0.0719	0.0775 1.196
γ² Urs Min	72 18 38	−29 55 49	0.2153n −1.642	2.852	0.4551 ·245	3.291 0.5173
α Draconis	65 0 54	−22 38 5	9.0596n −911	2.186	0.3395 413i = ·188	2.368 0.3743
ε Urs Min	76 17 26	−33 54 37	0.3719n −2.355	3.501	0.5443 ·301	4.220 0.6253
~~ζ Urs Min~~ 15 Draconis	~~72 18 38~~	~~−29 55 49~~	~~0.2153n −1.642~~	~~2.852~~	~~0.4551 ·245~~	~~3.291 0.5173~~
~~ε Urs Min~~	69 3 31	−26 40 42	0.0990n −1.256	2.500	0.3979 ·215	2.798 0.4468
ε Urs Min	82 15 14	−39 52 25	0.6772n −4.755	5.692	0.7553 ·490	7.418 0.8703
22 Camel. L.C.	110 38 27	−68 15 38	0.4208 +2.635	1.051	0.0215n ·090	−2.837 0.4528 n
50 Draconis	75 16 34	−32 53 45	0.3298n −2.137	3.304	0.5190 ·284	3.935 0.5949
δ Urs Min	86 36 21	−44 13 32	0.0711n −1.178	1.020	0.0829 ·104	1.689 1.2276
	δ June 29					
μ Bootis	37 50 54	+4 31 55	9.0002 +100	1.263	0.1012	1.267 0.1026
α Coronae	27 10 2	+15 12 47	9.4698 +295	1.085	0.0353	1.124 0.0508
α Serpentis	+6 50 52	+35 31 57	9.7674 +5815	826	9.9136	1.007 0.0031
ε Serpentis	+4 52 54	+37 29 55	9.7860 +611	796	9.9011	1.004 0.0016
α Aquilae	+8 31 22	+33 51 27	9.7507 +5163	840	9.9241	1.011 0.0048
τ Aquilae	+6 54 30	+35 28 19	9.7668 +585	820	9.9140	1.008 0.0032
Groomb. 2320	68 9 54	−25 47 5	0.0680n −1.169	2.421	0.3840 ·208	2.688 0.4295
ζ Urs Min June 9	78 12 19	−35 49 30	0.4569n −2.843	3.845	0.5082 ·301	4.454 0.6895

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Intervals determined by micrometer screw;

1 rev. assumed = $3^{s}.2040$ from star transits
an independent determ. gave 3·2043

Date				
Observer				
Illumin'n			37·860	37·860
			35·171	73·031
Star		B	32·660	105·691
Mag.			29·994	135·685
δ			27·233	162·918
Wire	a		21·707	184·625
"	b		19·015	203·640
"	c	C	16·221	219·861
			13·607	233·468
"	1		10·938	244·406
"	2			
"	3		5·514	249·920
"	4		−2·730	252·650
"	5	D	+0·045	252·605
			2·614	249·991
"	d		5·462	244·529
"	e			
"	f		10·897	233·632
			13·605	220·027
Sum		E	16·377	203·650
Mean			18·985	184·665
			21·664	163·001
Red'n to				
m			27·111	135·890
n. tan. δ			29·927	105·963
c. sec. δ		H	32·625	73·338
			35·340	37·998
r			37·998	0·000
T				
a				
Δ T				

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Date		1867 May 31			May 31			May 31			
Observer		G M S									
Illumin'n		E			E			W			
Star		α Can. Ven			Polaris 2 C			λ Lassiop 2 C			
Mag.											
δ											
Wire	a										
"	b										
"	c										
"	1	12	49 50	57.5				13	21	22.0	
"	2		5D	0.8						29.9	
"	3			4.2	13	10	40.0			37.2	
"	4			8.0			51.2			45.3	
"	5			11.5						53.4	
"	d										
"	e										
"	f										
Sum				22.0						187.8	
Mean		12	5D	4.40	13	10	45.6	13	21	37.56	
Red'n to											
m				+ 40			+ .40			+ 37	
n. tan. δ				+ 04			+ 15.5			+ 1.33	
c. sec. δ				+ 86			− 27.1			+ 1.90	
r				+ 1.30			− 11.20			+ 3.60	
T		12	50	5.70	13	10	34.40	13	21	41.16	
a		12	49	49.48	1	10	15.72	1	21	23.24	
Δ T											

E	W	N	C	NE	NN
− 15.32 =	Δ T	− .10 n	+ 1.29 c	+1.5	0.0
− 30.28 =	"	−41.83 n	−40.93 c		
− 14.69 =	"	− 3.60 n	+ 2.87 c	+52.9	13.0
− 16.23 =	"	+ .28 n	− 1.56 c	− 4.5	0.1
Polaris wt of 1/5 −6.06 =	.2 Δ T	− 8.37 n	− 8.19 c	+50.7	70.0
				+100.6	83.1

Δ T = −18.29 n = −0.37 c = +0.66 2/1 E.

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Date		May 31	
Observer			
Illumin'n		W	
Star		η Urs. Maj	
Mag.			
δ			
Wire	a		
"	b		
"	c		
"	1	13 42 26.7	
"	2	31.0	
"	3	35.3	
"	4	39.5	
"	5	44.0	
"	d		
"	e		
"	f		
Sum		176.5	
Mean		13 42 35.30	
Red'n to			
$\overline{m}$		+37	
n . tan. δ		−10	
c . sec. δ		−1.03	
τ		−0.76	
T		13 4 34.54	
a		13 42 19.44	
Δ T			

NC	CE	CC	WE	WW	WN	WC
−0.1	−19.8	1.7	−15.3	1.00	−0.10	+1.29
−10.3	−42.2	8.2	−14.7	1.00	−3.60	+2.87
−0.4	+25.3	2.4	−16.2	1.00	+0.28	−1.56
+68.5	+49.6	+67.1	−6.1	0.00	−1.67	−1.64
+57.7	+12.9	79.6	−52.3	3.0	−5.1	+1.0

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Date		June 4			June 4			June 4			
Observer		G M S									
Illumin'n		E			E			W			
Star		η Bootis			α Draconis			α Draconis			
Mag.											
δ											
Wire	a										
"	b										
"	c										
				35·3							
"	1	13	48	~~38·4~~	13	59	38·1	14	2	37·3	
"	2			38·4			44·8			31·1	
"	3			41·1			51·1			24·8	
"	4			43·9			57·6			18·3	
"	5			47·0							
"	d										
"	e										
"	f										
Sum				205·7			191·6			111·5	
Mean		13	48	41·14	13	59	~~38·12~~ 47·90	14	2	27·88	
							14			7·89	
Red'n to											
$\overline{m}$				− 03						− 03	
n . tan. δ				+ 19						− 42	
c . sec. δ				− 16						− 05	
r				00						− 50	
T		13	48	41·14			14 1			7·39	
a		13	48	22·90			14 0			49·04	
Δ T				− 18·24						− 18·35	

n = − 0·34 from i Cass wf. & mean of α Drac & 5 Urs Min

ΔT = − 18·20 at $14^h\ 10^m$

Collimation, roughly determined from the three reversals. (mean of 25 wires)

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Date		June 4			June 4			June 4				
Observer												
Illumin'n		W			W			E				
Star		α Bootis			ι Cassiop			ι Cassiop.				
Mag.					2 & C			2 & C				
δ												
Wire	a											
"	b											
"	c											
					reverse order			reverse order				
"	1	14	10	1·3			17·1	14	19	34·7		
"	2			58·3			9·9			41·7		
"	3			55·5		17	3·6			48·6		
"	4			52·7			56·4			55·6		
"	5	14	9	49·4	14	16	49·9		20	2·1		
"	d											
"	e											
"	f											
Sum				277·2			16·9			242·7		
Mean		14	9	55·54	14	17	3·38	14	19	48·54		
						14	18	25·96				
Red'n to												
$\overline{m}$				− 03						− 03		
n . tan. δ				+ 19						+ 1·10		
c . sec. δ				+ 11						+ 05		
										+ 1·12		
τ				+ 27						~~1·08~~		
										27·08		
T		14	9	55·81			14	18	~~24·88~~			
a		14	9	37·54			2	18	8·90			
Δ T				− 18·27						− 18·18		

a = about $0^s.22$ E of S.

$= -\frac{0^s.05}{2p.E.u.c.}$ A previous determination gave $-0^s.15$

Mean of 25 8 of 5 middle wires seem

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Date		June 4	June 4
Observer		G M S	
Illumin'n		E	W
Star		5 Hrs. Min	5 Hrs Min
Mag.			
δ			
Wire	a		
"	b		
"	c		
"	1	14 25 31.7	14 30 52.0
"	2	42.6	40.9
"	3	55.3	29.4
"	4	26 5.9	18.1
"	5	17.8	30 6.0
"	d		
"	e		
"	f		
Sum		273.3	146.4
Mean		14 25 54.66	14 30 29.28
		14 28 11.97	
Red'n to $\tilde{m}$			− 03
n . tan. δ			− 1.09
c . sec. δ			− 08
			− 1.20
r			~~+98~~
			10.77
T		14 28	
a		14 27 52.80	
Δ T			− 17.97

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Date		June 4			June 4			
Observer		G M S			G M S			
Illumin'n		W			W			
Star		κ Ophiuchi			γ Draconis			
Mag.								
δ								
Wire	a							
"	b							
"	c							
"	1	16	51	37.1	17	53	43.2	
"	2			40.0			47.4	
"	3			43.0			51.8	
"	4			45.6			56.3	
"	5			48.3		54	0.9	
"	d							
"	e							
"	f							
Sum				214.0			259.6	
Mean		16	51	42.80	17	53	51.92	
Red'n to								
$\overline{m}$				+02			+02	
n . tan. δ				+26			−10	
c . sec. δ				+10			+16	
r				+38			+08	
T		16	51	43.18	17	53	52.00	
a		16	51	24.72	17	53	33.80	
Δ T				−18.44			−18.20	

$\Delta T = -18.32$ at $17^h\ 30^m$

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Date		June 5	June 5	June 5
Observer		G M S		
Illumin'n		E	W	W
Star		γ^2 Urs Min	γ^2 Urs Min	ζ Urs Min
Mag.				
δ				
Wire	a			
"	b	15 19 41·3	22 57·0	
"	c	50·7	48·0	
"	1	20 8·5	30·0	20·7
"	2	17·1	21·3	15 48 8·5
"	3	25·7	22 12·9	56·0
"	4			41·9
"	5			15 47 28·8
"	d			
"	e			
"	f			
Sum		23·3	169·2	275·9
Mean		15 20 4·66	15 22 33·84	15 47 55·18
		15 21 19·25		15 49 14·95
Red'n to $\overline{m}$			+08	+10
n . tan. δ			−54	−93
c . sec. δ				
τ			−46	−83
T		15 21 18·79		15 49 14·12
a		15 21 0·43		15 48 56·04
Δ T			−18·36	−18·08

$n = -\cdot 24$

$\Delta T = -18\cdot 22$ at $15^h\,0^m$

Collimation from γ^2 & ζ Urs Min −·09 Zp. E.
Used as −·12 Zp E

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Date		June 5	June 5	June 5
Observer				
Illumin'n		E	E	E
Star		ζ Ursæ Min	δ Ophiuchi	τ Herculis
Mag.				
δ				
Wire	a			
"	b			
"	c			
"	1	15 50 8·2	16 7 37·4	16 15 57·2
"	2	21·1	40·3	16 1·3
"	3	34·7	42·9	5·1
"	4	47·4	45·5	9·1
"	5	51 2·2	48·6	13·3
"	d			
"	e			
"	f			
Sum		173·6	214·7	26·0
Mean		15 50 34·72	16 7 42·94	16 16 5·20
		15 49 14·95		
Red'n to				
$\overline{m}$ ____			+ 14	+ 14
n . tan. δ			+ 23	− 03
c . sec. δ			− 12	− 17
r			+ 25	− 06
T			16 7 43·19	16 16 5·14
a			16 7 25·08	16 15 46·79
Δ T			−18·11	−18·35

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Date		June 5	June 5	June 5
Observer		G M S		
Illumin'n		E	W	W
Star		γ^2 Urs Min	γ^2 Urs Min	ζ Urs Min
Mag.				
δ				
Wire	a			
"	b	15 19 41·3	22 57·0	
"	c	50·7	48·0	
"	1	20 8·5	30·0	20·7
"	2	17·1	21·3	15 48 8·5
"	3	25·7	22 12·9	56·0
"	4			41·9
"	5			15 47 28·8
"	d			
"	e			
"	f			
Sum		233·3	169·2	275·9
Mean		15 20 4·66	15 22 33·84	15 47 55·18
		15 21 19·25		15 49 14·95
Red'n to				
$\overline{m}$			+08	+10
n . tan. δ			−54	−93
c . sec. δ				
r			−46	−83
T		15 21 18·79		15 49 14·12
a		15 21 0·43		15 48 56·04
Δ T			−18·36	−18·08

$n = -\cdot 24$

$\Delta T = -18\cdot 22$ at $15^h\,0^m$

Collimation from γ^1 & ζ Urs Min $-\cdot 09$ 2h. E.

Used as $-\cdot 12$ 2h E

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Date		June 5	June 5	June 5
Observer				
Illumin'n		E	E	E
Star		ζ Ursæ Min	δ Ophiuchi	τ Herculis
Mag.				
δ				
Wire	a			
"	b			
"	c			
"	1	15 50 8.2	16 7 37.4	16 15 57.2
"	2	21.1	40.3	16 1.3
"	3	34.7	42.9	5.1
"	4	47.4	45.5	9.1
"	5	51 2.2	48.6	13.3
"	d			
"	e			
"	f			
Sum		173.6	214.7	26.0
Mean		15 50 34.72	16 7 42.94	16 16 5.20
		15 49 14.95		
Red'n to				
$\overline{m}$ ____			+ 14	+ 14
n . tan. δ			+ 23	− 03
c . sec. δ			− 12	− 17
τ			+ 25	− 06
T			16 7 43.19	16 16 5.14
a			16 7 25.08	16 15 46.79
Δ T			−18.11	−18.35

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Date		June 6			June 6			June 6					
Observer		G M S											
Illumin'n		W			W			E					
Star		η Ursæ Maj			α Draconis			α Draconis					
Mag.													
δ													
Wire	a												
"	b												
"	c												
"	1	13	42	27·8	13	59	36·8			36·9			
"	2			32·3			43·3			30·4			
"	3			36·7			49·7			24·6			
"	4			40·8			56·3			18·2			
"	5			45·2		0	2·5	14	2	11·8			
"	d												
"	e												
"	f												
Sum				182·8			248·6			121·9			
Mean		13	42	36·56	13	59	49·72	14	2	24·38			
					14	1	7·05						
Red'n to													
$\bar{m}$				− 03			+ 02						
n . tan. δ				− 11			− 48						
c . sec. δ				+ 12									
τ				−02			−46						
T		13	42	36·54	14	1	6·59						
a		13	42	19·32	14	0	48·98						
Δ T				−17·22			17·61						

$n = -0.38$ from the circumpolars

$\Delta T = -17.53$ at $14^h\ 0^m$

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Date		June 6			June 6			June 6			
Observer Illumin'n		E			E			W			
Star Mag. δ		α Bootis			ν Cassiop 2 C			ν Cassiop 2 C			
Wire	a										
"	b										
"	c										
"	1	14	10	0·9	14	16	49·3	14	19	1·8	
"	2			57·9			56·0			54·8	
"	3			55·0		17	2·2			48·9	
"	4			52·2			8·8			41·7	
"	5	14	9	49·2			15·9			34·8	
"	d										
"	e										
"	f										
Sum				275·2			12·2			242·0	
Mean		14	9	55·04	14	17	2·44	14	19	48·40	
					14	18	25·42				
Red'n to $\overline{m}$ n . tan. δ c . sec. δ				+ 06 + 1·21 − 12			+ 03 + 1·23				
r				+ 15			+ 1·26				
T		14	9	55·19	14	18	26·68				
a		14	9	37·53	2	18	9·06				
Δ T				− 17·66			− 17·62				

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Date		June 10	June 10	June 10
Observer		G M S		
Illumin'n		W	W	W
Star		β Draconis	α Ophiuchi	ω Draconis
Mag.				
δ				
Wire	a			
"	b			
"	c			D₁ – D₅
"	1	17 27 36·9	17 28 59·8	17 37 48·7
"	2	41·6	29 3·0	56·8
"	3	46·1	5·5	38 4·7
"	4	50·3	8·2	12·2
"	5	54·9	11·4	19·3
"	d			
"	e			
"	f			
Sum		229·8	27·9	21·7
Mean		17 27 45·96	17 29 5·58	17 38 4·34
Red'n to				+ 70
m		– 05	– 05	– 08
n . tan. δ		– 18	+ 30	– 75
c . sec. δ			+52 +43	+1·35 +1·40
		+ 80	+ 48	+1·30
r		+46	+68	+1·03
		+ 57	+ 73	+1·17
T		17 27 46·53	17 29 6·31	17 38 5·51
a		17 27 28·25	17 28 48·05	17 37 47·43
Δ T		– 18·28	–18·26	–18·08

c from ω Draconis + 0·50 Lh. W

n = – 0·45 from ω Drac. & α Oph.

ΔT = – 18·20 at $17^h\ 45^m$

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Date		June 10	June 10	June 10
Observer				
Illumin'n		E	E	E
Star		ω Draconis	μ Herculis	γ Draconis
Mag.				
δ				
Wire	a			
"	b			
"	c	$B_5 - B_1$		
"	1	52·7	42·7	54 1·8
"	2	45·0	39·6	57·1
"	3	38·1	36·4	52·9
"	4	30·4	33·4	48·3
"	5	17 39 23·0	17 41 30·2	17 53 43·8
"	d			
"	e			
"	f			
Sum		189·2	182·3	263·9
Mean		17 39 37·84	17 41 36·46	17 53 52·78
Red'n to		−1 30·19		
m		+ 02	+02	+02
n . tan. δ		− 75	+17	− 26
c . sec. δ		~~−1·05~~	~~−47~~	~~−67~~
		−1·46	−58	−83
r		~~+ 31·97~~	~~·88~~	
		−1 32·33	−39	−97
T		17 38 5·51	17 41 36·07	17 53 51·81
a			17 41 17·61	17 53 33·87
Δ T			−18·46	−17·94

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1867phae.proj..335L

Date		June 11			June 11			June 11			
Observer		G M S									
Illumin'n		W			E			E			
Star		η Urs. Maj			η Bootis			α Draconis			
Mag.											
δ											
Wire	a										
"	b										
"	c							$7_5 - 7_2$			
"	1	13	42	28·4			47·3				
"	2			32·8			44·4			58·2	
"	3			37·1			41·3			51·9	
"	4			41·0			38·5			45·4	
"	5			45·6	13	48	35·4	13	59	39·0	
"	d										
"	e										
"	f										
Sum				184·9			206·9			194·5	
Mean		13	42	36·98	13	48	41·38	13	59	48·62	
								14		7·77	
Red'n to											
m				− 12			− 02			− 05	
n . tan. δ				− 14			+ 28			− 62	
c . sec. δ				+ 78			− 53				
r				+ 52			− 27			− 67	
T		13	42	37·50	13	48	41·11	14	1	7·10	
a		13	42	19·23	13	48	22·85	14	0	48·83	
Δ T				− 18·27			− 18·26			− 18·27	

Coll about + 0·50 Lp W from α Draconis

n = − 0·50 from α Drac & η Bootis

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Date		June 11			June 11			June 11			
Observer											
Illumin'n		W			E			E			
Star		α Draconis			α Bootis			θ Bootis			
Mag.											
δ											
Wire	a										
"	b										
"	c	$\mathcal{F}_2 - \mathcal{F}_5$									
"	1					10	1·8			10·0	
"	2	14	2	17·3			58·8			5·3	
"	3			23·8			56·1		21	0·7	
"	4			30·3			53·2			56·6	
"	5			36·3	14	9	50·0	14	20	51·4	
"	d										
"	e										
"	f										
Sum				107·7			279·9			4·0	
Mean		14	2	26·92	14	9	55·98	14	21	0·80	
Red'n to											
$\bar{m}$							− 02			− 04	
n . tan. δ							+ 28			− 20	
c . sec. δ							− 53			− 82	
r							− 27			− 1·06	
T					14	9	55·71	14	20	59·74	
a					14	9	37·49	14	20	41·72	
Δ T							− 18·22			− 18·02	

$\Delta T = -18{\cdot}21$ at $14^h\ 0^m$

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Date		June 14			June 14			June 14		
Observer		G M S								
Illumin'n		W E			W E			W E		
Star		~~η Herculis~~			~~κ Ophiuchi~~			ω Draconis		
Mag.		β Draconis			α Ophiuchi					
δ										
Wire	a									
"	b									
"	c							$\varepsilon_5 - \varepsilon_1$		
"	1	1'	56·2			11·9			37·4	
"	2		51·7			9·0			29·3	
"	3		47·1			6·3			22·2	
"	4		42·8			3·7			14·7	
"	5	17 27	38·0		17 29	0·4		17 37	7·1	
"	d									
"	e									
"	f									
Sum			235·8			31·3			110·7	
Mean		17 27	47·16		17 29	6·26		17 37	22·14	
Red'n to									+45·13	
$\bar{m}$			+ 03			+ 03			+ 02	
n . tan. δ			− 12			+ 20			− 49	
c . sec. δ			−1·01			− 65			−1·72	
r			−1·10			− 42			+42·94	
T		17 27	46·06		17 28	5·84		17 38	5·08	
a		17 27	28·26		17 28	48·08		17 37	47·43	
Δ T			−17·80			−17·76			−17·65	

c = − 0·60 Δ E from ω Draconis

n = − 0·29 from " & α Ophiuchi

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1867phae.proj.:335L

		June 14	June 14	June 14
Date				
Observer				
Illumin'n		W	W	W
Star		w Draconis	κ Ophiuchi	d Herculis
Mag.				
δ				
Wire	a			
"	b			
"	c	$\varepsilon_1 - \varepsilon_5$		
"	1	17 38 34.3	16 51 36.3	16 56 54.7
"	2	41.8	39.2	58.1
"	3	49.3	42.0	57 1.3
"	4	56.3	44.7	4.3
"	5	39 3.9	47.7	7.8
"	d			
"	e			
"	f			
Sum		245.6	209.9	6.2
Mean		17 38 49.12	16 51 41.98	16 57 1.24
Red'n to		-45.13		
$\overline{m}$ ____		-05	-02	-02
n . tan. δ		-49	+21	+07
c . sec. δ		+1.60	+58	+70
r		-44.07	+77	+75
T		17 38 5.05	16 51 42.75	16 57 1.99
a			16 51 24.80	16 56 43.98
Δ T			-17.95	-18.01

$\Delta T =$ -17.83 at $17^h\ 30^m$

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Date				
Observer				
Illumin'n		W.	W.	W.
Star		α Ophiuchi	ω Draconis	ν Herculis
Mag.				
δ				
Wire	a			
"	b			
"	c			
"	1	17 28 56.80	17 37 42.76	
"	2	29 0.40	52.75	17 41 29.72
"	3	4.24	38 2.37	33.36
"	4	8.00	12.76	37.60
"	5	29 11.60	23.00	41.62
"	d			
"	e			
"	f			
Sum		21.04	133.64	142.30
Mean		17 29 4.21	17 38 2.73	17 41 35.58
Red'n to				
m				
n . tan. δ				
c . sec. δ				
r				
T				
a				
Δ T				

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Date				
Observer				
Illumin'n		10.		
Star		γ Draconis	Frodsham 3242	Frodsham 3220
Mag.				
δ				
Wire	a			
"	b			
"	c			
"	1	17 53 38.00	9 36 0.40	9 39 0 88
"	2	43.72	10.20	10 88
"	3	49.44	20.32	30 88
"	4	55.36	30.40	40 00
"	5	53 1.32	40.40	40 88
			50.45	52 24
"	d			
"	e			
"	f			
Sum		187.84	152.17	153.76
Mean		17 53 44.57	9 36 25.36	39 25.63
Red'n to				
m				
n. tan. δ				
c. sec. δ				
τ				
T				
a				
Δ T				

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Mdis. level = 0ˢ.072

Preliminary computation

(For diaphragm, see beginning of this volume)

2 inequality = ˢ.043

Date		June 4		
Observer		S MS		
Illumin'n		E	E	W
Star		η Bootis	α Draconis	α ~~Bootis~~ Draconis
Mag.				
δ				
Threads obs'd.		$\mathcal{F}_5 - B_1$	$\mathcal{F}_5 - E_1$	$\mathcal{F}_2 - \mathcal{F}_5$
Wire	a			
Mean of threads	b	13 47 41.21	14 0 10.53	14 2 27.72
" "	c			
Eq. Reduction to mean			+ 24.453	− 33.972
log " " "	1		1.3883	1.5311
log " "	2			
log sec δ	3		0.3743	
"	4			
log Red. to mean	5		1.7626	1.9054
Red to mean	d		+ 57.89	− 80.43
" "	e			
Reduced mean	f	13 47 41.21	14 1 8.42	14 1 7.49
b ~~Sum~~		+ .006	+ .006	− .022
~~Mean~~				
Bb		+ 01	+ 01	− 05
Red'n to mean corrected for b		13 47 41.22	14 1 8.43	14 1 7.44
~~n. tan. δ~~				
c. sec. δ		− 18		
Δa		+17	− 35	
τ		− 05		
		41.21	7.58	
T		13 48	14 1	
a		13 48 22.90	14 0 49.03	
Δ T		− 18.31	− 18.55	

		A	ε	A²	Aε	
η Bootis	− 18.14	+ 42	+ 46	18	18	4Δ'T − 2.44a = 0
α Draconis	− 18.91	− 91	− 33	83	30	− 2.44 " + 6.75
α Bootis	− 18.09	+ 41	+ 49	17	20	
5 Urs Min	− 19.17	− 2.36	− 59	5.57	1.39	a = + 39
	− 18.58	− 2.44		6.75	2.07	

4Δ'T − 61 a = + 0

− 61 " + 6.75 a = 2.07

" + .09 a = 0

log a = 9.4809 a = .30

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of Clock Corrections. Camb.-Seaton 1867

Also for values of $A = \sin(\varphi - \delta) \sec \delta$
$B = \cos(\varphi - \delta) \sec \delta$
$C = \sec \delta$

Date				
Observer				
Illumin'n		W	E	W
Star		α Bootis	5 Urs Min	5 Urs Min
Mag.		~~5 Urs Min~~	~~κ Ophiuchi~~	~~γ Draconis~~
δ				
		$B_3 - F_5$	$F_5 - F_1$	$E_3 - F_5$
Wire	a			
"	b	14 9 58.85	14 25 54.70	14 30 7.86
"	c			
		−3.175	+32.600	−27.503
"	1	0.5017	1.5132	1.4394
"	2			
"	3	0.0267	6.6253	
"	4			
"	5	0.5284	2.1385	2.0647
"	d	~~+~~ 3.38	+2 17.55	−1 56.04
"	e	9 55.47	12.25	
"	f	14 ~~10 3.23~~	14 28 ~~11.95~~	14 28 11.82
Sum		−.022	+.007	−.050
Mean		−02	+03	−18
Red'n to				
m		14 9 55.45	14 28 12.28	14 28 11.64
n. tan. δ				
c. sec. δ		+18		
		+17	−90	
r				
		55.80	11.06	
T		14 9 ~~55.75~~	14 28 ~~11.25~~	
a		14 9 37.54	14 27 52.79	
Δ T		−18.26	−18.27	

ΔT −18.30 at $14^h\ 0^m$ = −18.34

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Date		June 4						
Observer		G M S						
Illumin'n		w			w			
Star		κ Ophiuchi			γ Draconis			
Mag.								
δ		$B_1 - T_5$			$B_1 - T_5$			
Wire	a			42.91				
"	b	16	51	[illegible]	17	53	51.90	
"	c							
"	1							
"	2							
"	3							
"	4							
"	5							
"	d							
"	e			42.91				
"	f	16	51	[illegible]	17	53	51.90	
Sum				+.198			+.188	
Mean								
Red'n to				+13			+30	
m		16	51	[illegible]	17	53	52.20	
n. tan. δ				43.04				
c. sec. δ				+17			+27	
				+[illegible]22			−10	
r				+33			+19	
				43 32				
T		16	51	[illegible]	17	53	52.39	
a		16	51	24.72	17	53	33.80	
Δ T				−18.70			−18.57	

$\Delta T = -18.62$ at $17^h\ 30^m$

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Date		June 5		
Observer				
Illumin'n		W	W	E
Star		α Bootis	5 Urs. Min.	5 Urs Min
Mag.				
δ		$B_1 - F_5$	$B_1 - C_5$	$C_5 - B_1$
Wire	a			29 55
"	b	14 9 55·29	14 26 28·71	14 ~~30~~ +·36
"	c		+ 24·441	− 24·441
"	1		1·3881	1·3881
"	2			
"	3		0·6253	
"	4			
"	5		2·0034	2·0034
"	d		+1 43·12	−1 43·12
"	e			
"	f		·83	
Sum		+087	+ 080	+ 123
Mean		+ 09	+ 28	+ 44
Red'n to				
m		14 9 55·38	14 28 12·11	14 28 12·66
n. tan. δ				
c. sec. δ		+18 +20	− 1·20 ~~−·59~~	
r				
T		14 9 55·76	14 28 11·18	
			14 27 52·72	
a		14 9. 37·54	~~+5 21 0·35~~	
Δ T		− 1822	− 18·46	

α Bootis	− 18·02	+74	+41	17	30	$6\Delta'\pi - 5·84\,a = 0$
5 Urs Min	− 19·66	−90	−2·36	5·57	2·12	$-5·84$ " $+17·14\,a = +5·80$
γ^2 " "	− 19·21	−45	−1·64	2·69	73	
ζ " "	− 19·37	−61	−2·86	8·18	200	$a = +$ 125,51
δ Ophiuchi	− 17·81	+95	+72	52	68	
τ Herculis	− 18·52	+24	−11	1	− 3	
	− 18·76		− 5·84	17·14	5·80	

6 Δ

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Date		June 5		
Observer		GMS		
Illumin'n		E	W	W
Star		γ^2 Urs Min	γ^1 Urs Min	ζ Urs Min
Mag.				
δ				
		$\mathcal{F}_2 - \mathcal{E}_1$	$\mathcal{E}_3 - \mathcal{F}_5$	$\mathcal{C}_3 - C_5$
Wire	a			
"	b	15 19 14·89	15 21 49·22	15 47 55·19
"	c			
		+19·795	−27·503	+16·298
"	1	1·2966	1·4394	1·2121
"	2			
"	3	0·5173		0·6895
"	4			
"	5	1·8139	1·9567	1·9016
"	d	+1 5·15	−1 30·51	+1 19·73
"	e			
"	f			
Sum		+080	+050	+060
Mean				
Red'n to		+23	+14	+24 ~~+17~~
m		15 20 20·27	15 21 18·85	15 49 15·16
n . tan. δ				
c . sec. δ		−84		~~1·47~~
τ				~~14·70~~
T		15 21 18·72		15 49 13·94
a		15 21 0·35		15 48 56·04
Δ T		−18 37		−17·90

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Date				
Observer				
Illumin'n		$\mathcal{E}$	$\mathcal{E}$	$\mathcal{E}$
Star		ζ Ursæ Min	8 Ophiuchi	τ Herculis
Mag.				
δ		$C_5 - B_1$	$\mathcal{F}_5 - B_1$	$\mathcal{F}_5 - B_1$
Wire	a			
"	b	15 51 14.76	16 7 42.99	16 16 5.39
"	c			
		−24.441		
"	1	1.3881		
"	2			
"	3			
"	4			
"	5	2.0776		
"	d	−1 59.58		
"	e			
"	f			
Sum		+120	+115	+110
Mean				
		~~+48~~		
Red'n to		~~+34~~	+08	+16
m		15 49 15.66	16 7 ~~42.99~~ 43.07	16 16 5.55
n. tan. δ			−17	−24
c. sec. δ			+38	−06
τ				
T			16 7 43.28	16 16 5.25
a			16 7 25.09	16 15 46.79
ΔT			−18.17	−18.46

ΔT at $15^h\,25^m$ = −18.34 rejecting ζ Ursæ Min.

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Date		June 5		
Observer		G M S		
Illumin'n		E W	W E	E
Star		~~22 camel b O~~	~~22 camel b E~~	α Lyrae
Mag.		δ Urs Min	δ Urs Min	
δ		$C_1 - C_5$	$C_4 - C_1$	$F_5 - B_1$
Wire	a			
"	b	18 11 15·24	18 20 57·16	18 32 46·85
"	c			
		+16·298	−17·638	
"	1	1·2121	1·2465	
"	2			
"	3	1·2276		
"	4			
"	5			
		2·4397	2·4741	
"	d			
"	e	+4 35·22	−4 57·96	
"	f			
Sum		+087	+137	+144
Mean				
Red'n to		+89	+1·40	+18
m		18 15 51·35	18 16 0·60	18 32 47·03
n . tan. δ				
c . sec. δ				−21
		−7·42		+05
τ		~~18 15 48·43~~		
T		18 15 48·35		18 32 46·87
a		18 15 30·28		18 32 28·51
Δ T		18·27		18·36

$\Delta T = -18{\cdot}25$ at $18^h\ 30^m$

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Date				
Observer				
Illumin'n		E	E	W
Star		β Lyrae	50 Draconis	50 Draconis
Mag.				
δ				
		$D_1 - B_1$	$F_5 - E_1$	$E_1 - F_5$
Wire	a			
"	b	18 45 57·80	18 49 26·80	18 52 38·17
"	c			
		−22·720	+24·453	−24·453
"	1	1·3564	1·3883	1·3883
"	2			
"	3	0·0775	0·5949	
"	4			
"	5	1·4339	1·9832	1·9832
"	d			
"	e	−27·15	+1 36·20	−1 36·20
"	f			
Sum		+144	+144	+115
Mean				
Red'n to		+17	+46	+37
m		18 45 30·82	18 51 3·46	18 51 2·34
n. tan. δ				
c. sec. δ		−20		
		+12	−1·37	
r				
			1·56	
T		18 45 30·74	18 51 ~~1·68~~	
a		18 45 12·49	18 50 43·43	
Δ T		18·25	18·13	

δ Ups Mi −25·70
α Lyrae −18·31
β " −18·13
50 Draconis −19·47

a = +·63

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Date	June 6			
Observer	G M S			
Illumin'n	W	W	W	
Star	α Virginis	ζ Virginis	η Urs Maj	
Mag.				
δ	$B_1 - F_5$	$B_1 - F_5$	$B_1 - F_5$	
Wire : a				
" b	13 18 30·34	13 28 14·08	13 42 36·67	
" c				
" 1				
" 2				
" 3				
" 4				
" 5				
" d				
" e				
" f				
Sum	−03	−05	−04	
Mean	−02	−04	−06	
Red'n to m	13 18 30·32	13 28 14·04	13 42 36·61	
Aa n. tan. δ	+35	+29	−09	
c. sec. δ	+17	+17	+26	
τ				
T	30·84	14·50	36·78	
a	13 18 13·35	13 27 56·93	13 42 19·32	
Δ T	−17·49	−17·57	−17·46	

α Virg	−17·14	+37	+81	66	30	
ζ "	−17·28	+23	+67	45	15	$5\Delta T + 43a = 0$
η Urs Maj	−17·55	−04	−21	4	1	$+43 \quad +2{\cdot}92a = 1{\cdot}25$
α Drac	−18·12	−61	−1·26	1·59	77	
α Bootis	−17·46	+05	+42	18	2	$a = +{\cdot}43$
	−17·51		~~+85~~ +43	2·92	1·25	

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Date				
Observer				
Illumin'n		W	E	E
Star		α Draconis	α Draconis	α Bootis
Mag.				
δ				
		$B_1 - C_5$	$C_3 - B_1$	$T_5 - B_1$
Wire	a			55·13
"	b	14 0 9·00	14 2 12·38	14 9 ~~57·53~~
"	c			
		+ 24·441	−27·483	
"	1	1·3881	1·4391	
"	2			
"	3	0·3743		
"	4			
"	5	1·7624	1·8134	
"	d			
"	e	+ 57·86	− 1 5·07	
"	f			
Sum		− 01	+ 04	+ 04
Mean		− 02	+ 09	+ 04
Red'n to				
m		14 1 6·84	14 1 7·40	14 9 ~~57·57~~
n. tan. δ		− 54		55·17
c. sec. δ				+ 18
				− 18
r				
T		6·58		55·17
a		14 0 49·00		14 9 37·53
Δ T		− 17·58		− 17·64

$\Delta T = -17^s.55$ at $13^h 45^m$

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Date		June 6	June 6	June 6
Observer		G M S		
Illumin'n		W	E	W
Star		ζ Ursæ Min	ζ Ursæ Min	τ Herculis
Mag.				
δ				
		$E_3 - D_5$	$C_1 - B_1$	$B_1 - F_5$
Wire	a			
"	b	15 48 47.72	15 51 46.85	16 16 4.48
"	c			
		+5.111	−30.771	
"	1	0.7085	1.4881	
"	2			
"	3	0.6895		
"	4			
"	5	1.3980	2.1776	
"	d			
"	e	+25.00	−2 30.54	
"	f			
Sum		+06	+12	+05
Mean		+24	+48	
		+17	+34	+07
Red'n to				
m ε		15 [illegible] 12.96	15 [illegible] 16.29	16 16 4.55
n. tan. δ		−95		00
c. sec. δ		[illegible]		+24
τ				
T		13.67	[illegible]	4.79
a		15 48 56.00		16 15 46.79
Δ T		−17.67		−18.00

			A	A²		
ζ Ursæ Min	−18.62	−63	−2.86	8.18	1.81	6 Δ'T − 3.43 a = 0
τ Herc	−18.00	−01	−11	01	00	−3.43 + 10.11 = 2.70
15 Drac.	−18.41	−42	−1.26	1.59	53	
η Herc.	−17.64	+35	+07	6	02	a = +33
κ Oph.	−17.41	+58	+55	30	32	
d Herc	−17.85	+14	+18	3	02	
	−17.99		−3.43	10.11	2.70	

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Date		June 6		
Observer				
Illumin'n		W	W	E
Star		15 Draconis	η Herculis	κ Ophiuchi
Mag.		~~η Herculis~~	~~+5 Draconis~~	~~η Herculis~~
δ		$D_2 - F_5$	$B_3 - F_5$	$F_5 - B_3$
Wire	a			
"	b	16 29 26·18	16 38 39·88	16 51 42·24
"	c	−17·851		
"	1	1·2517		
"	2			
"	3	0·4468		
"	4			
"	5	1·6985		
"	d			
"	e	H − 49·94		
"	f			
Sum		+05	+04	+10
Mean		+12	+05	+09
Red'n to				
m		16 28 36·36	16 38 39·93	16 51 42·33
n. tan. δ		−14	+12	+19
c. sec. δ		+46	+22	−17
r				
T		36·68	40·27	42·35
a		16 28 18·41	16 38 22·51	16 51 24·75
Δ T		−18·27	−17·76	−17·60

$\Delta T = -17.86$ at $16^h 30^m$

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Date		June 6			
Observer		G M S			
Illumin'n		E			
Star		d Herculis			
Mag.					
δ		$7_5 - 8_1$			
Wire	a				
"	b	16 57	1·86		
"	c				
"	1				
"	2				
"	3				
"	4				
"	5				
"	d				
"	e				
"	f				
Sum			+12		
Mean			+14		
Red'n to					
m		16 57	2·00		
n . tan. δ			+06		
c . sec. δ			−20		
r			1·86		
T					
a		16 56	43·95		
Δ T			17·91		

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Date		June 10									
Observer		G M S									
Illumin'n		W			W			E			
Star		α Virginis			ζ Virginis			η Urs. Maj.			
Mag.											
δ		B, – F5			B, – F5			~~F5 – B,~~ ~~B, – F5~~			
Wire	a										
"	b	13	18	31·11	13	28	14·91	13	42	38·17	
"	c										
"	1										
"	2										
"	3										
"	4										
"	5										
"	d										
"	e										
"	f										
Sum				– 13			– 13			– 11	
Mean				– 08			– 10			– 17	
Red'n to											
m		13	18	31·03	13	28	14·81	13	42	38·00	
n . tan. δ				+ 17			+ 17			~~– 26~~	
c . sec. δ				~~+ 33~~			~~+ 58~~			~~– 78~~	
A a				~~+ 16~~			~~+ 07~~			~~– 12~~	
r				+ 38			+ 31			– 10	
				31 58			15·29			37·64	
T				~~31·36~~			~~15·05~~			~~37·62~~	
a		13	18	13·32	13	27	56·90	13	42	19·25	
				– 18·26			– 18·39				
Δ T				~~– 18·04~~			~~– 18·15~~			– 18·37	

α Vir	– 18·21	– 17·88	+ 34	+ 81	66	+ 28	
ζ "	– 18·41	– 18·08	+ 14	+ 67	45	+ 09	6 Δ'T + 1·19 a = 0
η Urs Maj	– 17·97	– 18·49	– 27	– 21	04	+ 06	1·19 " + 2·33 a = + 99
η Bootis	– 17·80	– 18·15	+ 07	+ 42	18	+ 03	
α Drac.	– 18·32	– 18·71	– 49	– 91	83	+ 44	a = + ·47
α Bootis	– 18·00	– 18·00	+ 22	+ 41	17	+ 09	
		– 18·22			~~+ 35~~	2·33	+ 99
					+ 1·19		

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Date		June 10		
Observer		G M S		
Illumin'n		E	E	W
Star		η Bootis	α Draconis	α Draconis
Mag.				
δ		$\mathcal{F}_5 - B_1$, $B_1 + 17$	$\mathcal{F}_5 - E$,	$\mathcal{F}_4\ \mathcal{F}_5$
Wire	a			
"	b	13 48 41·30	14 0 . 10·55	14 2 33·24
"	c			
			+24·453	−36·669
"	1		1·3883	1·5643
"	2			
"	3		6·3743	
"	4			
"	5		1·7626	1·9386
"	d		+57·89	−1 26·82
"	e			
"	f			
Sum		−11	−11	−13
Mean		−11	−23	−28
Red'n to				
m		13 48 41·19	14 1 8·21	14 1 6·14
n . tan. δ		−18		
c . sec. δ		−18	−39	+1·18
A a			7·82	7·32
r		+20	−42	
T		41·21	7·15	
a		13 48 22·86	14 0 48·86	No α
Δ T		−18·35	−18·29	

$\Delta T = -18{\cdot}31$ at $13^h\ 45^m$

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Date			
Observer			
Illumin'n		W	
Star		α Bootis	
Mag.			
δ			
		$B_1 - F_5$	
Wire	a		
"	b	14 9 55.11	
"	c		
"	1		
"	2		
"	3		
"	4		
"	5		
"	d		
"	e		
"	f		
Sum		−14	
Mean		−14	
Red'n to			
m		+4 9 54.97	
n . tan. δ		+53	
c . sec. δ		+20	
r		~~5.70~~	
T		55.70	
a		14 9 37.50	
Δ T		−18.20	

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Date		June 10									
Observer		G M S									
Illumin'n		W			E			σ	E		
Star		η Herculis			κ Ophiuchi			d Herculis			
Mag.											
δ											
		$B_1 - F_5$			$F_5 - B_1$			$E_5 - B_1$			
Wire	a										
"	b	16	38	40·24	16	51	43·37	16	57	12·65	
"	c										
										−8·150	
"	1									0·9112	
"	2										
"	3									0·0802	
"	4										
"	5									0·9914	
"	d									−9·80	
"	e										
"	f										
Sum				−05			−01			00	
Mean											
				−06			−09			00	
Red'n-to											
m		16	38	40·18	16	51	43·28	16	57	2·85	
n . tan. δ				+02			+12			+04	
c . sec. δ				+64			−51			−60	
r											
T				40·84			42·89			2·29	
a		16	38	22·52	16	51	24·78	16	56	43·97	
Δ T				−18·32			−18·11			−18·32	

η Herculis	−18·30	+17	+07	00	01	$5\Delta'T - 4·23 =$	0
κ Oph	−17 99	+48	+55	30	26	−4·23 +22·97 =	4·52
d Herc	−18·28	+19	+18	03	03		
ε Urs Min	−19·36	−89	−4·75	22·58	4·23	a = +'23	
β Draco	−18 43	+04	−28	08	−01		
	−18·47		−4·23	22·97	4·52		

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Date				
Observer				
Illumin'n		E	W	W
Star		ε Ursæ Min.	ε Ursæ Min.	β Draconis
Mag.				
δ		$D_4 - C_3$	$F_1 - F_5$	$B_1 - E_5$
Wire	a			
"	b	17 1 0.72	17 4 6.03	17 27 32.56
"	c			
		~~+~~ 6.622	−32.600	+8.150
"	1	0.8210	1.5132	0.9112
"	2			
"	3	0.8703		0.2146
"	4			
"	5	1.6913	2.3835	1.1258
"	d	~~+~~ 49.12	−4 1.80	+13.36
"	e			
"	f			
Sum		00	−06	−04
Mean		00	−34	−06
Red'n to				
m		17 0 11.60	+7 0 3.89	17 27 25.86
n. tan. δ		−1.09		−06
c. sec. δ				+82
r				
T		6.65		46.62
a		16 59 48.38		17 27 28.25
Δ T		−18.27		−18.37

$\Delta T =$ −18.28 at $17^h\ 0^m$

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Date		June 11									
Observer		G M S									
Illumin'n		W			W			W			
Star		α Virginis			ζ Virginis			η Urs. Maj.			
Mag.											
δ		$B_1 - F_5$			$B_1 - F_5$			$B_1 - F_5$			
Wire	a										
"	b	13	18	30·73	13	28	14·46	13	42	36·98	
"	c										
"	1										
"	2										
"	3										
"	4										
"	5										
"	d										
"	e										
"	f										
Sum				−08			−08			−08	
Mean				−05			−07			−13	
Red'n-to											
m		13	18	30·68	13	28	14·39	13	42	36·85	
n . tan. δ				+ 40			+ 32			−10	
c . sec. δ				+ 52			+ 50			+ 78	
r											
T				31·60			15·21			37·53	
a		13	18	13·31	13	27	56·89	13	42	19·23	
Δ T				−18·29			−18·32			−18·30	

α Virg	−17·89	+17	+81	66	+14	$4\Delta T' + 1{\cdot}68\,a = 0$
ζ "	−18·00	+06	+67	45	+04	$1{\cdot}68 \cdot +1{\cdot}32 = +29$
η U M	−18·40	−34	−21	04	+07	
α Drac	[−17·83]					$a = +{\cdot}48$
α Bootis	−17·97	+09	+41	17	+04	
	−18·06		+1·68	1·32	+29	

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Date				
Observer				
Illumin'n		~~W~~ E	W	E
Star		α Draconis	α Draconis	α Bootis
Mag.				
δ				
		$\mathcal{J}_5 - E_1$	$\mathcal{J}_2 - \mathcal{J}_5$	$\mathcal{J}_5 - B_1$
Wire	a			
"	b	14 0 9·03	14 2 26·96	14 9 56·00
"	c			
		+24·453	−3·3·972	
"	1	1·3883	1·5311	
"	2			
"	3	0·37 43		
"	4			
"	5	1·7626	1·9054	
"	d	+57·89	−1 20·43	
"	e			
"	f			
Sum		−01	−05	−01
Mean		−02	−11	−01
Red'n to				
m		14 1 6·90	14 1 6·42	14 9 55·99
n . tan. δ				+20
c . sec. δ				−53
τ				
T				55·66
a		14 0 48·83.		14 9 37·49
Δ T				−18·17

$\Delta T = -18\cdot27$ at $13^h\ 45^m$

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Date		June 11		
Observer		G M S		
Illumin'n		W	W	E
Star		τ Herculis	15 Draconis	15 Draconis
Mag.				
δ		$B_1 - 7_5$	$C_2 - C_5$	$C_5 - B_1$
Wire	a			
"	b	16 16 4·53	16 27 53·68	16 29 46·62
"	c		+ 14·945	
			~~+ 13·589~~	− 24·441
"	1		~~+ 1332~~	1·3881
"	2		1·1746	
"	3		0·4468	
"	4		1·6214	
"	5		~~+ 5800~~	1·8349
			+ 41·82	
"	d		~~+ 38·02~~	− 1 8·37
"	e			
"	f			
Sum		− 01	− 04	− 02
Mean		− 01	− 10	− 05
Red'n to				
m		16 16 4·52	16 28 ~~31·60~~	16 28 38·20
n. tan. δ		− 02	35·40	
c. sec. δ		+ 73	− 24	
r				
T		5·23	36·56	
a		16 15 46·78	16 28 18·37	
Δ T		− 18·45	− 18·19	

τ Herc	−18·47	−19	−11	01	+02
15 Drac	−18·43	−15	−1·26	1·59	+19
η Herc	−18·19	+09	+07	00	+01
κ Oph.	−18·03	+25	+55	30	+14
d Herc	−18·26	+02	+18	03	00
	−18·28		−57	1·93	+36

$\therefore 5\Delta T - 57a = 0$

$-57\Delta T + 1{\cdot}93 = +36$

$a = +19$

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Date								
Observer								
Illumin'n		E			E		W	
Star		η Herculis			κ Ophiuchi		d Herculis	
Mag.								
δ								
		$\mathcal{F}_5 - B_1$			$\mathcal{F}_5 - B_1$		$B_1 - \mathcal{F}_5$	
Wire	a							
"	b	16	38	41.39	16	51	43.35	16	57	1.71
"	c									
"	1									
"	2									
"	3									
"	4									
"	5									
"	d									
"	e									
"	f									
Sum				−03			−03			−06
Mean				−04			−03			−07
Red'n to m		16	38	41.35	16	51	43.32	16	57	1.64
n. tan. δ				+01			+10			+04
c. sec. δ				−64			−51			+60
τ										
T				40.72			42.91			2.28
a		16	38	22.52	16	51	24.78	16	56	43.98
Δ T				−18.20			−18.13			−18.30

$\Delta T = -18.25$ at $16^h 30^m$

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Date	June 14			
Observer	G M S			
Illumin'n	ε	ε	ε	
Star	α Virginis	ζ Virginis	η Ursæ Maj	
Mag.				
δ	$\mathcal{F}_5 - \mathcal{B}_1$	$\mathcal{F}_5 - \mathcal{B}_1$	$\mathcal{F}_5 - \mathcal{B}_1$	
Wire a				
" b	13 18 31·26	13 28 14·94	13 42 37·80	
" c				
" 1				
" 2				
" 3				
" 4				
" 5				
" d				
" e				
" f				
Sum	00	00	00	
Mean	00	00	00	
Red'n to				
m	13 18 31·26	13 28 14·94	13 42 37·80	
n . tan. δ	+ 24	+20	−06	
c . sec. δ	− 51	− 50	− 78	
τ				
T	30·99	14·64	37·96	
a	13 18 13·29	13 27 56·87	13 42 19·18	
Δ T	−17·70	−17·77	−17·78	

α Virg	−17·46	+20	+81	66	+16	6 ΔT +·84 = 0
ζ "	−17·57	+09	+67	45	+06	+84 +2·15 ·60
η Urs Maj	−17·84	−18	−21	04	+04	
η Bootis	−17·50	+07	+07	00	00	a = +·30
α Drac	−17·97	−31	−91	83	+28	
α Bootis	−17·51	+15	+41	17	+06	
	−17·66		+84	2·15	+60	

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Date				
Observer				
Illumin'n		W	W	E
Star		η Bootis	α Draconis	α Draconis
Mag.				
δ		$B_1 - F_5$	$B_1 - C_5$	$C_5 - B_1$
Wire	a			
"	b	13 48 39.93	14 0 7.74	14 2 5.88
"	c			
			+24.441	−24.441
"	1		1.3881	1.3881
"	2			
"	3		0.3743	
"	4			
"	5		1.7624	1.7624
"	d		+57.86	~~+~~ 57.86
"	e			
"	f			
Sum		−05	−06	−03
Mean		−05	−13	−07
Red'n to		39.88	14 1 5.47	14 1 7.95
m		13 48		
n. tan. δ		+02	−27	
c. sec. δ		+53		
r				
T		40.43	6.44	
a		13 48 22.82	14 0 48.74	
Δ T		−17.61	−17.70	

$\Delta T = -17.70$ at $13^h\ 45^m$

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Date		June 14
Observer		G M S
Illumin'n		W
Star		α Bootis
Mag.		
δ		$B_1 - 7_5$
Wire	a	
"	b	14 9 54·53
"	c	
"	1	
"	2	
"	3	
"	4	
"	5	
"	d	
"	e	
"	f	
Sum		−08
Mean		−08
Red'n to		14 9 54·45
m		
n . tan. δ		+12
c . sec. δ		+53
r		
T		55·10
a		14 9 37·47
Δ T		−17·63

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Date		June 14		
Observer				
Illumin'n		W	W	W
Star		η Herculis	κ Ophiuchi	d Herculis
Mag.				
δ		$B_1 - 7_5$	$B_1 - 7_5$	$B_1 - 7_5$
Wire	a			
"	b	16 38 39.71	16 51 42.00	16 57 1.30
"	c			
"	1			
"	2			
"	3			
"	4			
"	5			
"	d			
"	e			
"	f			
Sum		−02	−01	−01
Mean		−03	−01	−01
Red'n to m		16 38 39.68	16 51 41.99	16 57 1.29
n. tan. δ		~~+02~~	~~+21~~	~~+06~~
c. sec. δ		+64	+51	+60
Aa		+02	+16	+05
r			66	1.94
T		40.36	42.79	~~1.99~~
a		16 38 22.52	16 51. 24.80	16 56 43.99
Δ T		−17.82	−17.86	−17.95

							4.23	0
η Herc	−17.80	+36	+07	00	03	5 ΔT + ~~XX~~ a =		~~4.23~~
κ Oph	−17.70	+46	+55	30	25.01		~~4.23~~	~~22.97~~
d Herc.	−17.90	+26	+18	03	05		+22.97a	+5.78
ε U M	−19.40	−1.24	−4.75	22.56	5.93	~~= 14.53~~		
β Drac	−17.99	+17	−28	08	−48		a = +3	
	−18.16	~~+XX~~	−4.23	22.97	5.78			

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Date		June 14		
Observer		G M S		
Illumin'n		W	E	E
Star		ε Ursæ Min	ε Ursæ Min	β Draconis
Mag.				
δ		$D_1 - E_2$	$B_5 - B_1$	$Z_5 - D_1$
Wire	a	29.58		
"	b	17 0 ~~12.43~~	17 4 13.08	17 27 20.34
"	c			
		−3.483	−32.584	+16.294
"	1	0.5420	1.5130	1.2121
"	2			
"	3	0.8703		0.2146
"	4			
"	5	1.4123	2.3833	1.4267
"	d	−25.84	−41.68	+26.71
"	e			
"	f			
Sum		−01	+03	+02
Mean		−06	+17	+03
Red'n to				
m		17 0 ~~16.53~~	17 0 11.57	17 27 ~~28.37~~
n . tan. δ		3.68		47.08
c . sec. δ		~~2.52~~		−82
Aa		~~1.19~~		Aa −08 ~~07~~
r		−1.42		
		6.20 ~~6.43~~		
T		~~5.11~~		46.18
a		16 59 48.23		17 27 28.27
Δ T		−17.97		−17.91

ΔT = −17.90 at $17^h\ 0^m$

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Date				
Observer Illumin'n				
Star Mag. δ				
Wire a " b " c " 1 " 2 " 3 " 4 " 5 " d " e " f				
Sum Mean				
Red'n to m n . tan. δ c . sec. δ				
τ				
T a				
Δ T				

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Date		June 29		
Observer		J W		
Illumin'n		E	W	W
Star		5 Urs Min	5 Urs Min	μ Bootis
Mag.				
δ		$\mathcal{F}_5 - \mathcal{F}_1$	$\mathcal{F}_1 - \mathcal{F}_5$	$B_1 - \mathcal{F}_5$
Wire	a			
"	b	14 25 55.06	14 30 27.32	15 19 48.58
"	c			
		+32.600	−32.600	
"	1	1.5132	1.5132	
"	2			
"	3	0.6253		
"	4			
"	5	2.1385	2.1385	
"	d	+2 17.55	−2 17.55	
"	e			
"	f			
Sum		−16	−21	−21
Mean		−56	−38	−26
Red'n to				
m		14 28 12.61	14 28 9.39	15 19 48.32
n. tan. δ		−69		+03
c. sec. δ				+42
r				
T		10.31		48.77
a		14 27 51.14		15 19 29.84
Δ T		−19.17		−18.93

5 Urs Min	−19.86	−67	−2.36	5.57	1.57
μ Bootis	−18.90	+29	+10	01	03
α Coronae	−19.06	+13	+30	09	04
α Serpentis	−19.09	+10	+58	34	06
ε Serpentis	−19.04	+15	+61	37	09
	−19.19		−77	6.38	1.79

$5\Delta T - 77a = 0$ $\quad a = +29$

$-77 + 6.38 = 1.79$

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Date			
Observer Illumin'n	E	E	E
Star Mag. δ	α Coronae $F_5 - B_1$	α Serpentis $F_5 - B_1$	ε Serpentis $F_5 - B_1$
Wire a " b " c	15 29 25·00	15 38 4·87	15 44 33·06
" 1 " 2 " 3 " 4 " 5			
" d " e " f			
Sum	−16	−16	−16
Mean	−17	−14	−13
Red'n to m	15 29 24·83	15 38 4·73	15 44 32·93
n. tan. δ	+09	+17	+18
c. sec. δ	−37	−33	−33
r			
T	24·55	4·57	32·78
a	15 29 5·40	15 37 45·31	15 44 13·56
Δ T	−19.15	−19·26	−19·22

$\Delta T =$ −19·15 at $15^h\ 0^m$

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Date		June 29		
Observer		J W		
Illumin'n		W	E	W
Star,		Groomb 2320	β Doomb 2320	β Draconis
Mag.			$B_5 - B_2$?	
δ		$B_1 - B_5$	~~$B_4 - B_1$~~	$B_1 - F_5$
Wire	a			
"	b	16 4 51.74	16 7 44.99	17 27 47.08
"	c		−31.264	
		+32.584	~~33.921~~	
"	1	1.5130	~~+5305~~	
"	2		1.4950	
"	3	0.4295		
"	4		1.9245	
"	5	1.9425	~~1.9600~~	
			−1 24.04	
"	d	+1 27.60	~~+1 31.20~~	
"	e			
"	f			
Sum		−17	−13	−17
Mean		−41	−31	−27
Red'n to				
m		16 6 18.93	16 6 ~~+3 48~~ 20.64	17 27 46.81
n. tan. δ				+55
c. sec. δ		~~+21~~		−05
	Aa	−22		
r				
T		19.56		47.31
a		16 6 0.33		17 27 28.26
Δ T		−19.23		−19.05

$\Delta T = -19.19$ at $18^h\ 15^m$

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Date			
Observer			
Illumin'n	W	W	W
Star	α Lyrae	α Aquilae	τ Aquilae
Mag.	some other star.		α Cygni
δ			
	$B_1 - F_5$	$B_1 - F_5$	$B_1 - F_5$
Wire a			
" b	18 32 19.67	19 44 39.15	19 58 0.04
" c			
" 1			
" 2			
" 3			
" 4			
" 5			
" d			
" e			
" f			
Sum	−17	−13	−17
Mean	−21	−10	−14
Red'n to m	18 32 19.46	19 44 39.05	19 57 59.90
n. tan. δ			
c. sec. δ	+ 43	+ 34	+ 34
	XX	+11	+11
r			
T		39.50	0.35
a	18 32 28.80	19 44 20.20	19 57 41.17
Δ T		−19.30	−19.18
			A^2

Groombr. 2320	−19.45	−25	−1.17	+29	1.37
β Draconis	−19.10	+10	−28	−03	08
α Lyrae	~~−09~~				
α Aquilae	−19.19	+01	+56	+06	37
τ Aquilae	−19.07	+13	+58	+07	33
	−19.20		−31	+39	2.09

$4\Delta T' - 31\,a = 0$

$-31 + 2.09\,a = +39$ $\qquad a = +19$

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Collimation

Date				ε − w	2C	c	wt.
		June 4	α Draconis	+ 0·99	4·74	·21	
			5 Urs. Min	+ 0·64	8·44	·08	
Observer							
Illumin'n		5	5 Urs Min	+ 0·55	8·44	·07	
			γ² Urs Min	+ 1·42	6·58	·22	
Star			ζ Urs Min	+ 0·50	9·78	·05	
Mag.			δ Urs Min	+ 9·25	~~16·89~~ 33·78	·28	
δ			50 Draconis	+ 1·12	7·87	·14	
Wire	a	6	α Draconis	+ 0·56	4·74	·12	
"	b		ζ Urs Min	+ 3·33	9·78	·34	
"	c						
		10	α Draconis	+ 2·07	4·74	·44	
"	1		ε Urs Min	+ 7·71	14·84	·52	
"	2						
"	3	11	α Draconis	[+ 0·48]			
"	4		15 Draconis	+ 2·80	5·60	·50	
"	5						
		14	α Draconis	+ 2·48	4·74	·52	
"	d		ε Urs Min	+ 7·89	14·84	·54	
"	e						
"	f	29	5 Urs Min	+ 3·22	8·44	·38	
			Groomb 2320	+ 1·71	5·38	·32	
Sum							
Mean							
		June 4, 5, 6, before α Drac			c ·17	or 1/6	
Red'n to							
m		6 after α Drac, 10, 11, 14,			·50	1/2	
n. tan. δ							
c. sec. δ		29			·35	1/3	
r							
T							
a							
Δ T							

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Clock Corrections
should be all increased algebraically by .02
diurnal aberr. having been omitted.

Date		log hourly rate				No stars
Observer		9.079	June 4	14h 0m	−18·34 ± ·07	4
Illumin'n				17 30	−18·64 ± 06	2
Star		8·443	5	15 15	−18·34 ± 06	5
Mag.				18 30	−18·25 ± 05	4
δ						
		9·052	6	13 45	−17·55 ± 03	5
Wire	a			16 30	−17·86 ± 12	6
"	b					
"	c	7·965	10	13 45	−18·31 ± 03	6
				17 0	−18·28 ± 04	5
"	1					
"	2	7·862	11	13 45	−18·27 ± 03	4
"	3			16 30	−18·25 ± 06	5
"	4					
"	5	8·789	14	13 45	−17·70 ± 03	6
				17 0	−17·90 ± 03	5
"	d					
"	e	8·090	29	15 0	−19·15 ± 06	5
"	f			18 15	−19·19 ± 05	4
Sum						
Mean						
Red'n to						
m						
n . tan. δ						
c . sec. δ						
r						
T						
a						
Δ T						

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Date				
Observer				
Illumin'n				
Star				
Mag.				
δ				
Wire	a			
"	b			
"	c			
"	1			
"	2			
"	3			
"	4			
"	5			
"	d			
"	e			
"	f			
Sum				
Mean				
Red'n to				
m				
n . tan. δ				
c . sec. δ				
r				
T				
a				
Δ T				

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Date				
Observer Illumin'n				
Star Mag. δ				
Wire	a			
"	b			
"	c			
"	1			
"	2			
"	3			
"	4			
"	5			
"	d			
"	e			
"	f			
Sum Mean				
Red'n to m n . tan. δ c . sec. δ				
τ				
T				
a				
Δ T				

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Date

Observer
Illumin'n

Star
Mag.
δ

Wire	a
"	b
"	c
"	1
"	2
"	3
"	4
"	5
"	d
"	e
"	f

Sum
Mean

Red'n to
m
n . tan. δ
c . sec. δ

τ

T

a

Δ T

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Date			
Observer Illumin'n			
Star Mag. δ			
Wire a " b " c " 1 " 2 " 3 " 4 " 5 " d " e " f			
Sum Mean			
Red'n to m n . tan. δ c . sec. δ			
τ			
T a			
Δ T			

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Date		July 14					
Observer		G M S					
Illumin'n		W			E		
Star		α Lyrae			β Lyrae		
Mag.							
δ							
		D Tally					
Wire	a						
"	b						
"	c						
"	1	18	32	34·5			33·3
"	2			38·2			29·9
"	3			41·9			26·6
"	4			45·3			23·4
"	5			48·6	18	45	20·1
"	d						
"	e						
"	f						
Sum				208·5			133·3
Mean				41·70			26·66
Red'n to							
m	Bb			− 28			− 21
n. tan. δ	Aa			+02			+05
c. sec. δ				+ 42			− 36
r							
T		18	32	41·86	18	45	26 14/~~07~~
a		18	32	28·83	18	45	12·88
Δ T				− 13·03			− 13·26

a assumed +·25

ΔT at $18^h\,40^m$ = − 13·15

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Date			July 15					
Observer			S M S					
Illumin'n			E			W		
Star			α Lyrae			β Lyrae		
Mag.								
δ								
Wire	a							
"	b							
"	c							
"	1			49·1	18	45	19·0	
"	2			45·4			22·0	
"	3			42·0			25·5	
"	4			38·7			28·6	
"	5	18	32	34·9			32·0	
"	d							
"	e							
"	f							
Sum				210·1			127·1	
Mean		18	32	42·02	18	45	25·42	
Red'n to m				− 25			− 29	
n . tan. δ				+ 02			+ 05	
c . sec. δ				− 42			+ 36	
r				− 65			+ 12	
T		18	32	41·37	18	45	25·54	
a		18	32	28·83	18	45	12·89	
Δ T				− 12·54			− 12·65	

ΔT at 18 40 = − 12·60

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1867phae.proj..335L

Date		July 16						
Observer		S M S			S M S			
Illumin'n		W			E			
Star		α Lyrae			β Lyrae			
Mag.								
δ								
Wire	a							
"	b							
"	c							
"	1	18	32	33·1			32·0	
"	2			36·8			28·8	
"	3			40·6			25·7	
"	4			43·9			22·2	
"	5			47·8	18	45	19·0	
"	d							
"	e							
"	f							
Sum				202·2			127·7	
Mean		18	32	40·44	18	45	25·54	
Red'n to								
m	Bb			−23			−16	
n. tan. δ	Aa			+02			+05	
c. sec. δ				+42			−36	
τ				+21			−47	
T		18	32	40·65	18	45	25·07	
a		18	32	28 82	18	45	12·89	
Δ T				−11·83			−12·18	

ΔT at 18 40 = −12·00

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Date		July 23	July 23	July 23
Observer		G M S		
Illumin'n		E	W	W
Star		γ Aquilae	α Aquilae	ε Draconis
Mag.				
δ				
Wire	a			
"	b			
"	c			
"	1	15·9	19 44 25·6	19 48 35·2
"	2	13·0	28·2	43·7
"	3	10·2	31·1	51·5
"	4	7·8	33·8	59·1
"	5	19 40 4·9	36·8	49 7·7
"	d			
"	e			
"	f			
Sum		51·9	155·5	257·2
Mean		19 40 10·38	19 44 31·10	19 48 51·44
Red'n to				
~~m~~	Bb	−·10	− 18	− 56
~~n. tan. δ~~	Aa	+ 02	− ~~02~~	+ 04
c. sec. δ		− 37	+ 33	+ 96
		+ ~~33~~	− ~~37~~	+ ~~107~~
r		− ~~45~~	+ ~~19~~	+ ~~36~~
		− 49	+ 13	+ 44
T		19 40 ~~9·93~~	19 44 ~~31·27~~	19 48 51·80
		9·89	31·23	51·88
a		19 39 59·00	19 44 20·46	19 48 41·05
Δ T		−10·89	−10·77	−10·83

a = ~~+~~ 02 from ε Drac. and mean of the others

ΔT at 19h 45m = −10·83

	δ	φ−δ	A	B	C
γ Aq.	+10 17 46	32 5	3 +540	861	1·016
α Aq.	+8 31 25	32 51	24 +563	840	1·011
ε Dr.	69 55 58	−27 33	9 −1·347	2·582	2·914

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Date		July 28			July 28			
Observer		G M S			G M S			
Illumin'n		W			E			
Star		α Lyrae			β Lyrae			
Mag.								
δ								
Wire	a							Molyneux
"	b							
"	c							
							30·0	
"	1	18	32	31·7			26·8	
"	2			35·1			23·4	
"	3			38·6			20·4	
"	4			42·2			17·0	
"	5			45·8	18	45	~~11·5~~	
"	d							
"	e							
"	f							
Sum				193·4			117·6	
Mean		18	32	38·68	18	45	23·52	
Red'n to								
m	Bb			−22			−18	
n. tan. δ	Aa			−02			−06	
c. sec. δ				+42			−44	
r				+18			−68	
T		18	32	38·86	18	45	22·84	
a		18	32	28·77	18	45	12·85	
Δ T				~~+~~10·09			~~+~~9·99	

ΔT at $18^h\ 40^m$ = ~~+~~10·04

Pocket Chron.. Molyneux 1481

10	13	30		18	38	12·0		10	27	15		18	52	16·2		10	27	15		18	53	12·7
		36				18·0				20				21·2				20				17·5
		42				24·0				25				26·3				25				22·7
		48				30·0				30				31·3				30				27·8
		54				36·0																
14		0				42·0																

Clock

Frodsham 3242

Frodsham 3220

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Date			
Observer Illumin'n			
Star Mag. δ			
Wire a			
" b			
" c			
" 1			
" 2			
" 3			
" 4			
" 5			
" d			
" e			
" f			
Sum Mean			
Red'n to m n . tan. δ c . sec. δ			
r			
T			
a			
Δ T			

~~Chron time~~	~~10~~	~~13~~	~~42~~	~~10~~	~~27~~	~~20~~		
Clock time	18	38	42·00	18	52	21·25	18	53	17·68
Corr			−10·04			−10·04			−10·04
	15	~~29~~ 33	~~55·89~~ 51·80	15	~~29~~ 33	~~55·89~~ 51·80	15	~~29~~ 33	~~55·89~~ 51·80
			56·75			54·52			54·37
	10	13	20·51	10	26	57·53	10	23	53·81
		~~8~~	~~32·82~~						
Corr to chron			−39·49			−22·47			+33·81

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Date	July 29			
Observer	9 M S			
Illumin'n	E			
Star	α Lyrae	Fr. 3220		
Mag.				
δ				
Wire a		9 55 35	18 25 25·2	
" b		40	30·2	
" c		45	35·2	
		50	40·2	
" 1	46·6	55	45·2	
" 2	42·9			
" 3	39·4			
" 4	35·9	Fr 3242		
" 5	18 32 32·3			
		10 8 10	18 37 5·2	
" d		15	10·1	
" e		20	15·1	
" f		25	20·1	
		30	25·1	
Sum	197·1			
Mean	18 32 39·42			
		Mol. 1481		
Red'n to		10 11 0	18 39 25·8	
m	−20	6	32·0	
n . tan. δ	−02	12	37·9	
c . sec. δ	−47	18	43·9	
		24	50·0	
r	−69			
T	18 32 38·73			
a	18 32 28·76			
Δ T	−9·97			

3220		3242		Mol.	
corr. for t.	18 25 25·23	18 37 5·15		18 39 27·95	
	15 29 55·89	15 29 55·89		15 29 55·89	
	58·90	56·99		56·60	
	9 56 20·02	10 7 58·03		10 10 20·44	
	+35·02	−21·97		−51·56	

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Date		Aug 6	Aug 6	Aug 6
Observer		G M S		
Illumin'n		E	E	W
Star		γ Aquilae	α Aquilae	ε Draconis
Mag.				
δ		10 17 48	8 31 29	69 56 3
Wire	a			
"	b	B Tally	B Tally	F, 2
"	c			
"	1	49·9	11·0	19 50 9·8
"	2	47·2	8·3	18·4
"	3	44·5	5·7	
"	4	41·8	3·1	
"	5	19 40 39·1	19 45 0·3	
"	d	222·5	28·4	
"	e	19 40 44·50	19 45 5·68	19 50 14·10
"	f	− 32·584	− 32·584	− 28·519
		log 51300		45513
		log sec 00705	00482	46458
Sum		red −33·12	− 32·95	− 1 23·12
Mean		25		
		19 40 11·38	19 44 32·73	19 48 50·98
Red'n to m		− 15	− 15	− 32
n. tan. δ		− 02	− 02	+ 04
c. sec. δ		− 37	− 37	+ 96
r		− 54	− 54	+ 68
T		19 40 10·84	19 44 32·19	19 48 51·66
a		19 39 59·02	19 44 20·49	19 48 40·82
Δ T		− 11·82	− 11·70	10·84 ?

Δ T at $19^h\ 45^m$ = − 11·70

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Date				
Observer				
Illumin'n				
Star		Fredsham 3242	3220	3220
Mag.				
δ				
Wire	a	$11^h\ 10^m$	$11^h\ 10^m$	11 40
"	b	50^s — 70^s	50 — 70	20 — 40
"	c			
"	1	11 20 26·7	20 12 36·9	20 42 12·0
"	2	31·7	41·9	16·8
"	3		47·0	21·9
"	4	41·8	52·0	26·8
"	5	46·7	57·0	32·0
"	d			
"	e			
"	f			
Sum				
Mean		20 11 36·72	20 12 46·96	20 42 21·90
		−11·70		
Red'n to		20 11 25·02	20 12 35·26	20 42 10·20
m		14 58 28·61	14 58 28·61	14 58 28·61
n. tan. δ		41·54	41·37	36·50
c. sec. δ				
		11 10 35·17	11 11 45·21	11 41 15·31
τ				
T				
a		11 11 0	11 11 0	11 40 30
Δ T		−24·83	+45·21	+45·31

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Date				
Observer Illumin'n				
Star Mag. δ		Aug 7		
Wire	a	8421		
"	b			
"	c	3 55	15-35	
"	1	12 57	31.34	
"	2		36.54	
"	3		41.6	
"	4		46.6	
"	5		51.7	
"	d			
"	e			
"	f			
Sum				
Mean		12 57	41.54	
			-11.80	
Red'n to m		12 57	29.74	
		14 54	32.70	
n. tan. δ			1 52.63	
c. sec. δ				
		3 53	55.08	
r				
T		[illegible]		
a		3 55	25.	
Δ T			1 29.92	
			2 16.0	
			46.1	
			1 29.9	

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Date		Aug 8					
Observer		GMS					
Illumin'n		W			E		
Star		μ^1 Herculis			γ Draconis		
Mag.							
δ							
Wire	a	17	40	46·9 49·6			47·6 43·1
"	b			52·6 55·6			38·9 34·9
"	c			58·8			30·4
			41	5·0 8·0			21·5 17·1
"	1			11·2 13·9			12·6 8·4
"	2			17·2		54	4·0
"	3			23·0 26·2			55·5 51·0
"	4			29·4 32·7			46·5 42·3
"	5			35·7			37·7
"	d			42·0 44·8			29·0 24·7
"	e			47·9 50·9			20·1 16·0
"	f			54·0			11·9
			42	0·2 3·3		53	3·0 58·7
Sum				6·6 9·3			54·1 49·9
Mean				12·6		52	45·7
				737·4			1164·8
Red'n to		17	41	29·50	17	53	46·58
m				− 16			− 25
n . tan. δ				− 01			+ 08
c . sec. δ				+ 40			− 59
r				+ 23			− 76
T		17	41	29·73	17	53	45·82
a		17	41	17·47	17	53	33·43
Δ T				− 12·26			− 12·39

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1867phae.proj..335L

Date											
Observer											
Illumin'n											
Star		Frodsh. 3220			3242			8421			
Mag.											
δ		8^h 54^m 45^s		−35	8	56	40 − 60	8	58	55 − 75	
Wire	a										
"	b										
"	c										
"	1	18	3	36·0	18	4	49·2	18	5	54·0	
"	2			41·0			54·2			59·0	
"	3			46·0		5	59·3		6	4·0	
"	4					5	4·2			9·0	
"	5			56·0			9·2			14·0	
"	d										
"	e										
"	f										
Sum											
Mean		18	3	46·00	18	4	59·22	18	6	4·00	
Red'n to		18	3	33·68	18	4	46·90	18	5	51·68	
m		14	50	36·81	14	50	36·81	14	50	36·81	
n. tan. δ			1	2·49		1	2·28		1	2·11	
c. sec. δ											
r											
T		8	55	12·98	8	56	25·99	8	57	30·60	
a		8	54	25	8	56	50	8	59	5	
Δ T			+	47·98			− 24·01		−1	34·40	

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1867phae.proj..335L

Date		Aug 9					
Observer		G M S					
Illumin'n		E				W	
Star		τ Aquilae				κ Cephei	
Mag.							
δ							
Wire	a						
"	b						
"	c						
"	1		59.5	20	13	10.2 ~~22.8~~	
"	2		56.6			22.8	
"	3		53.8			36.5	
"	4		51.3			48.3	
"	5	19 57	48.3		14	0.7	
"	d						
"	e						
"	f						
Sum			269.5			178.5	
Mean		19 57	53.90	20	13	35.70	
Red'n to							
m	Bb		− 10			− 61	
n.tan.δ	Aa		∓ 08			+ 37	
c.sec.δ			− 37			+1.42	
τ			−55			+1.18	
T		19 57	53.35	20	13	36.88	
a		19 57	41.51	20	13	25.04	
Δ T			−11.84			−11.84	

$a = \overline{+}.14$

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1867phae.proj..335L

Date											
Observer											
Illumin'n											
Star		Frodsh 3220			8421			Bond 236			
Mag.		10^h	54^m		10^h	57^m		20^h	18^m		
δ		5^s –	25^s		10^s –	30^s		0^s –	20^s		
Wire	a										
"	b										
"	c										
"	1	20	7	43·1	20	8	26·8	20	15	56·6	
"	2			48·1			31·9		16	1·7	
"	3			53·2			36·9			6·5	
"	4			58·2			42·0			11·5	
"	5		8	3·2			47·1			16·5	
"	d										
"	e										
"	f										
Sum											
Mean		20	7	53·16	20	8	36·94				
Red'n to		20	7	42·32	20	8	25·10				
m		14	46	40·90	14	46	40·90				
n. tan. δ				42·15			42·03				
c. sec. δ											
r		14	47	23·05	14	47	22·93				
T		10	55	4·37	10	55	48·03				
a		10	54	15	10	57	20				
Δ T			+	49·37		1	31·97				

Aug 10

East A. 12 46 10·0
14 42 44·99
3 – 11·85
28 33·14
1 54·51
3 30 37·65
3 32 15·
– 1 37·35

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1867phae.proj..335L

East Transit.

		Aug 16	Aug 16	Aug 16
Date				
Observer		G M S		
Illumin'n		E	E	E
Star		δ Draconis	α Aquilae	β Aquilae
Mag.				
δ				
Wire	a			
"	b			
"	c			
"	1	19 12 26·0	19 44 24·3	19 48 53·5
"	2	35·6	27·9	57·1
"	3	44·8	31·6	49 0·9
"	4	54·6	35·2	4·6
"	5	13 3·8	38·9	8·0
"	d			
"	e			
"	f			
Sum		224·8	157·9	4·1
Mean		19 12 44·96	19 44 31·58	19 49 0·82
Red'n to				
$\overline{m}$		+ 68	+ 68	+ 68
n . tan. δ		+ 66	− 33	− 34
c . sec. δ		− 79	− 28	− 28
r		+ 55	+ 07	+ 06
T		19 12 45·51	19 44 31·65	19 49 0·88
a		19 12 34·29	19 44 20·46	19 48 49·63
Δ T		− 11·22	− 11·19	− 11·25

$n = + \cdot 44$

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1867phae.proj..335L

Date											
Observer											
Illumin'n											
Star		Frodsh. 8421				8421			Frodsh. 3220		
Mag.									~~5h 3m 0s 30s~~		
δ		5h	3m	0s-20s	5h	45m	35s-55s		9	23	35-55
Wire	a										
"	b										
"	c										
"	1	19	3	0·5	19	46	42·7		19	4	41·5
"	2			5·8			47·7				46·5
"	3			10·7			52·6				51·5
"	4			15·9			57·8				56·6
"	5			20·6		46	2·6			5	1·5
"	d										
"	e										
"	f										
Sum											
Mean		19	3	10·70	19	45	52·68		19	4	51·52
Red'n to		19	2	59·48	19	45	41·46		19	4	40·30
m		14	19	9·54	14	19	9·54		14	19	9·54
n. tan. δ				52·75			~~46 58~~				52·47
c. sec. δ							45·76				
							55·30				
r		14	20	2·29	14	19	~~56 12~~		14	20	2·01
							36 76				
T		9	23	1·77	10	5	~~37 58~~		9	24	42·31
a		5	3	10	5	45	45		9	23	45
Δ T		4	19	51·77	+4	19	51·76				+ 57·31

Aug 17 3220 2 44 8·8 corr + 58·13
8421 10 25 20 AM
True time 2 45 6·93
4 19 46·93

10 29 50 Clock 12 32 38·0 | 3220 | 3 56 8·93
30 40 33 28·3 | 8421 | 11 37 20
10 30 15 12 33 3·15 | | 3 57 6·9
12 32 ~~51~~·93 | | 4 19 46·9
14 15 13·63
56·67

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1867phae.proj..335L

Date		Aug 18	Aug 18	
Observer		G M S		
Illumin'n		E		
Star		α' Herculis	b Ophiuchi	Fk 1ª
Mag.				
δ				
Wire	a			
"	b			
"	c			
"	1	17 8 40.7	17 18 21.1	
"	2	44.5	25.1	
"	3	48.1	29.0	
"	4	52.0	33.0	
"	5	55.6	37.0	
"	d			
"	e			
"	f			
Sum		240.9	145.2	
Mean		17 8 48.18	17 18 29.04	
Red'n to				
m		+ 77	+ 77	
n . tan. δ		− 18	− 38	
c . sec. δ		−29	− 31	
r		+30	+08	
T		17 8 48.48	17 18 29.12	
a		17 8 37.06	17 18 17.70	
Δ T		− 11.42	− 11.42	

$n = +.28$

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1867phae.proj..335L

Date	Aug 18		
Observer			
Illumin'n			
Star	Frodsham 3220	Frodsh. 8421	Bond 236
Mag.			
δ	7 21 35 – 55	7 22 (30 35 40	60 70) 20 19 10 – 30
Wire a			20 16 38.0
" b			43.0
" c			47.9
			53.0
" 1	17 10 17.3	17 11 9.0	57.8
" 2	22.3	14.0	
" 3	27.2	19.1	mean Clock – Chron
" 4	32.2	39.1	20 +6 47.94
" 5	37.1	49.0	20 16 36.56
			20 19 20
" d			corr – 2 43.64
" e			
" f			21 28 40 – 60
Sum			21 26 5.9
Mean	17 10 27.22	17 11 39.04	11.0
			17.8
Red'n to	17 10 15.80	17 11 27.62	22.9
m			27.8
n . tan. δ	14 11 17.73	14 11 17.73	21 26 17.88
c . sec. δ	1 11.21	1 11.02	21 26 6.28
			21 28 50
τ	14 12 28.94	14 12 28.75	– 2 43.72
T	7 22 44.74	7 23 56.37	
a	7 21 45	7 23 0	
Δ T	+ 59.74	+ 56.37	

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1867phae.proj..335L

Date		Aug 19		Aug 19		
Observer		GMS		—		
Illumin'n						
Star		γ Draconis		22 Camelop. 2C		
Mag.						
δ						
Wire	a					
"	b					
"	c					
"	1	17 53	33·7	18 4	4·6	
"	2		39·2		14·4	
"	3		45·5		24·8	
"	4		51·0		35·0	
"	5		57·2		45·2	
"	d					
"	e					
"	f					
Sum			226·6		124·0	
Mean		17 53	45·32	18 4	24·80	
Red'n to m			+7·7		+7·7	
n. tan. δ			+1·0		−1·25	
c. sec. δ			−4·5		+7·9	
r			+3·2		+3·1	
T		17 53	45·74	18 4	25·11	
a		17 53	33·15	6 4	12·50	
Δ T			−12·59		−12·61	

$n = +\,'35$

$\Delta T = -12\cdot60$

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1867phae.proj..335L

Date								
Observer								
Illumin'n								
Star		Frodsh. 8421			3220			
Mag.								
δ		7	56	0 − 20	7	57	25 − 45	
Wire	a							
"	b							
"	c							
"	1	17	48	38·0	17	50	12·7	
"	2			42·9			17·6	
"	3			47·8			22·7	
"	4			53·2			27·7	
"	5			58·0			32·7	
"	d							
"	e							
"	f							
Sum								
Mean		17	48	47·78	17	50	22·68	
Red'n to		17	48	35·18	17	50	10·08	
m								
n. tan. δ		14	7	21·82	14	7	21·82	
c. sec. δ			1	4·94		1	4·68	
τ		14	8	26·76	14	8	26·50	
T		7	57	1·94	7	58	36·58	
a		7	56	10	7	57	35	
Δ T			+	51·94		+ 1	1·58	

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1867phae.proj..335L

Date		Aug 20			Aug 20					
Observer		S			S					
Illumin'n		E								
Star		α Cygni			γ Cygni			East Clock		
Mag.										
δ								20	32	10−30
Wire	a									
"	b									
"	c									
"	1	20	36	57.7	20	52	17.3	20	32	10.6
"	2		37	2.4			22.4			12.6
"	3			8.0			26.8			14.6
"	4			13.1			32.0			16.6
"	5			18.2			36.8			18.6
"	d									
"	e									
"	f									
Sum				39.4			135.3			
Mean		20	37	7.88	20	52	27.06			
Red'n to m				+.81			+.81			
n . tan. δ				+.02			+.02			
c . sec. δ				−.39			−.36			
r				+.44			+.43			
T		20	37	8.32	20	52	27.49			
a		20	36	57.09	20	52	16.17			
Δ T				−11.23			−11.32			

n assumed +.30

ΔT ~~South~~ block at 20 45 −11.28

East block −10.68

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1867phae.proj..335L

Date							
Observer							
Illumin'n							
Star		8421			3220		
Mag.							
δ		10	32	30-50	10	33	20-40
Wire	a						
"	b						
"	c						
"	1	20	29	28·8	20	30	29·3
"	2			28·0			34·5
"	3			32·9			39·5
"	4			38·1			44·8
"	5			42·9			49·6
"	d						
"	e						
"	f						
Sum				197			
Mean		20	29	32·94	20	30	39·54
Red'n to m		20	29	21·66	20	30	28·26
n. tan. δ		14	3	25·92	14	3	25·92
c. sec. δ				38·60			38·42
τ		14	4	4·52	14	4	4·34
T		10	33	26·18	10	34	32·60
a		10	32	40	10	33	30
Δ T				+46·18		+1	2·60

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1867phae.proj..335L

Date		Aug 21			Aug 21			Aug 21		
Observer		S M S								
Illumin'n		E								
Star		γ Aquilae			α Aquilae			ε Draconis		
Mag.										
δ										
Wire	a									
"	b									
"	c									
"	1	19	40	2·2	19	44	23·5	19	48	29·4
"	2			5·8			27·4			40·1
"	3			9·5			30·9			50·3
"	4			13·0			34·7		49	1·3
"	5			16·8			38·1			12·0
"	d									
"	e									
"	f									
Sum				47·3			154·6			253·1
Mean		19	40	9·46	19	44	30·92	19	48	50·62
Red'n to										
m				+85			+85			+85
n . tan. δ				−22			−23			+55
c . sec. δ				−28			−28			−82
r				+35			+34			+58
T		19	40	9·81	19	44	31·26	19	48	51·20
a		19	39	58·96	19	44	20·43	19	48	40·37
Δ T				−10·85			−10·83			−10·83

$n = +30$

$\Delta T = -10·83$

~~South~~

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1867phae.proj..335L

Date									
Observer									
Illumin'n									
Star		East Clock			8421			3220	
Mag.									
δ		19	37	46 – 54	9	41 – 30 – 50		9	42	25 – 45
Wire	a									
"	b									
"	c									
"	1	19	37	46·6	19	42	6·4	19	43	23·2
"	2			48·6			11·4			28·1
"	3			50·5			16·2			33·1
"	4			52·5			21·7			38·3
"	5			54·6			26·7			43·3
"	d									
"	e									
"	f									
Sum										
Mean		19	37	50·56	19	42	16·48	19	43	33·20
Red'n to										
m		19	37	39·72	19	42	5·64	19	43	22·36
n. tan. δ										
c. sec. δ		~~13~~	~~59~~	~~30·01~~	13	59	30·01	13	59	30·01
							46·34			46·14
r					14	0	16·35	14	0	16·15
T					9	42	21·99	9	43	38·51
a					9	41	40	9	42	35
Δ T							+ 41·99		+ 1	3·51

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1867phae.proj..335L

Date		Aug 24		
Observer		S M S		
Illumin'n		E		
Star		α Cygni		
Mag.				
δ				
Wire	a			
"	b			
"	c			
"	1	20	36	57.0
"	2		37	2.1
"	3			7.2
"	4			[12.2]
"	5			17.3
"	d			
"	e			
"	f			
Sum				35.8
Mean		20	37	7.16
Red'n to				
m	assumed			+ 85
n. tan. δ				+ 02
c. sec. δ				− 39
r				+ 48
T		20	37	7.64
a		20	36	57.11
Δ T				− 10.53

Error clocks (South − East) + 0.13

ΔT East Clock − 10.40

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1867phae.proj..335L

Date								
Observer								
Illumin'n								
Star		East clock	Jr. 3220			8421		
Mag.								
δ			10	26	0 – 20	10	27	40 – 60
Wire	a							
"	b							
"	c							
"	1		20	38	57·0	20	39	57·0
"	2				1·9			1·9
"	3				7·0 ~~6·9~~			6·9
"	4				12·0 ~~11·9~~			11·9
"	5				17·1			16·8
"	d							
"	e							
"	f							
Sum			20	39	700	20	40	6·90
Mean								
Red'n to			20	38	56·47	20	39	56·37
m								
n . tan. δ			13	47	42·29	13	47	42·29
c . sec. δ					~~36·87~~ 37·013			~~36·74~~ 36·87
τ			13	48	~~19·16~~ 19·32	13	48	~~19·00~~ 19·16
T			10	27	~~15·63~~ 15·79	10	28	~~15·37~~ 15·53
a			10	26	10	10	27	50
Δ T				+1	5·79			+25·53

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1867phae.proj..335L

Date		Aug 25					
Observer		S					
Illumin'n		E					
Star		α Cygni			ν Cygni		
Mag.							
δ							
Wire	a						
"	b						
"	c						
"	1	20	36	57.2	20	52	16.5
"	2		37	2.0			21.5
"	3			7.1			26.1
"	4			12.5			30.9
"	5			17.5			35.9
"	d						
"	e						
"	f						
Sum				36.3			130.9
Mean		20	37	7.26	20	52	26.18
Red'n to							
m				+77			+77
n.tan.δ				+02			−02
c.sec.δ				−39			−37
r				+40			+38
T		20	37	7.66	20	52	26.56
a		20	36	57.10	20	52	16.14
Δ T				−10.56			−10.41

ΔT (south clock) −10.48

S − E +0.27

ΔT (east clock) −10.21

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1867phae.proj..335L

Date								
Observer								
Illumin'n								
Star		Fr. 3220			Fr. 8421			
Mag.								
δ		10	21	20–40	10	23	5–25	
Wire	a							
"	b							
"	c							
"	1	20	38	13·8	20	39	11·6	
"	2			18·8			16·5	
"	3			23·9			21·7	
"	4			28·9			26·6	
"	5			33·9			31·8	
"	d							
"	e							
"	f							
Sum								
Mean		20	38	23·86	20	39	21·64	
Red'n to		20	38	13·38	20	39	11·16	
m								
n. tan. δ		13	43	46·38	13	43	46·38	
c. sec. δ				37·14			36·99	
r		13	44	23·52	13	44	23·37	
T		10	22	36·90	10	23	34·53	
a		10	21	30	10	23	15	
Δ T			+1	6·90			+19·53	

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1867phae.proj..335L

Date		Aug 26			Aug 26			
Observer								
Illumin'n		ε						
Star		α Cygni			γ Cygni			
Mag.								
δ								
Wire	a							
"	b							
"	c							
"	1	20	36	56.9	20	52	16.7	
"	2		37	1.9			21.5	
"	3			6.9			26.2	
"	4			12.1			30.9	
"	5			17.1			35.8	
"	d							
"	e							
"	f							
Sum				34.9			131.1	
Mean		20	37	6.98	20	52	26.22	
Red'n to								
m				+ 94			+ 94	
n. tan. δ				+ 02			− 02	
c. sec. δ				− 39			− 37	
r				+ 57			+ 55	
T		20	37	7.55	20	52	26.77	
a		20	36	57.09	20	52	16.13	
Δ T				− 10.46			− 10.64	

ΔT (South clock) − 10.55

S − E + 55

ΔT (East clock) − 10.00

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1867phae.proj..335L

Date								
Observer								
Illumin'n								
Star		Fr. 3220			Fr. 8421			
Mag.								
δ		10	17	50-70	10	19	50-70	
Wire	a							
"	b							
"	c							
				40·5				
"	1	20	38	45·5	20	39	48·5	
"	2			50·5			53·3	
"	3			55·5			58·3	
"	4			0·5		40	3·3	
"	5						8·3	
"	d							
"	e							
"	f							
Sum		20	38	50·50	20	39	58·34	
Mean								
Red'n to		20	38	39·95	20	39	47·79	
m								
n. tan. δ		13	39	50·47	13	39	50·47	
c. sec. δ				37·07			36·89	
r		13	40	27·54	13	40	27·36	
T		10	19	7·49	10	20	15·15	
a		10	18	0	10	20	0	
Δ T			+1	7·49			+15·15	

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1867phae.proj..335L

Date		Aug 27			Aug 27			Aug 27		
Observer		S								
Illumin'n		E								
Star		α Cygni			μ Aquarii			γ Cygni		
Mag.										
δ										
Wire	a									
"	b									
"	c									
"	1	20	36	56·7	20	45	34·7	20	52	16·5
"	2		37	2·0			38·2			21·4
"	3			6·9			42·0			26·1
"	4			12·0			45·5			30·9
"	5			17·2			49·2			35·8
"	d									
"	e									
"	f									
Sum				34·8			209·6			130·7
Mean		20	37	6·96	20	45	41·92	20	52	26·14
Red'n to										
m				+ 68			+ 68			+ 68
n . tan. δ				+ 03			− 10			− 02
c . sec. δ				− 39			− 28			− 37
r				+32			00			+29
T		20	37	7·28	20	45	41·92	20	52	26·43
a		20	36	57·08	20	45	31·67	20	52	16·13
Δ T				10·20			−10·25			− 10·30

n = +·37

ΔT (South clock) −10·25
+ ·93

" east clock − 9·32

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1867phae.proj..335L

Date								
Observer								
Illumin'n								
Star		Fr. 3220			8421			
Mag.								
δ								
Wire	a							
"	b							
"	c							
"	1	20	38	22·0	20	39	33·5	
"	2			27·1			38·5	
"	3			32·1			43·3	
"	4			37·1			48·4	
"	5			42·1			53·3	
"	d							
"	e							
"	f							
Sum		20	38	32·08				
Mean					20	39	43·40	
Red'n to m		20	38	21·83	20	39	33·15	
n. tan. δ		13	35	54·56	13	35	54·56	
c. sec. δ				37·12			36·93	
τ		13	36	31·68	13	36	31·49	
T		10	14	53·51	10	16	4·64	
a		10	13	45	10	15	55	
Δ T			+ 1	8·51			+ 9·64	

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1867phae.proj..335L

Date	Aug 28		
Observer			
Illumin'n			
Star	α Cygni	μ Aquarii	χ Cygni
Mag.			
δ			
Wire a			
" b			
" c			
" 1	20 36 56·8	20 45 34·7	20 52 16·8
" 2	1·8	38·3	21·4
" 3	7·0	42·0	26·2
" 4	12·0	45·7	30·9
" 5	17·0	49·3	35·8
" d			
" e			
" f			
Sum	37 34·6	210·0	131·1
Mean	20 36 6·92	20 45 42·00	20 52 26·22
Red'n to m	+ 85	+ 85	+ 85
n . tan. δ	+ 03	− 46	− 02
c . sec. δ	− 39	− 28	− 37
r	+ 49	+ 11	+ 46
T	20 37 7·41	20 45 42·11	20 52 26·68
a	20 36 57·07	20 45 31·67	20 52 16·12
Δ T	− 10·34	− 10·44	− 10·56

n = + ·43

ΔT (S. clock) −10·45
S − E + 1·10
ΔT (E clock) + 9·35

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1867phae.proj..335L

Date								
Observer								
Illumin'n								
Star		Fr. 3220			8421			
Mag.								
δ								
Wire	a							
"	b							
"	c							
"	1	20	38	3·9	20	39	33·4	
"	2			8·9			38·3	
"	3			14·0			43 3	
"	4			19·0			48·2	
"	5			24·0			53·5	
"	d							
"	e							
"	f							
Sum								
Mean		20	38	13·96	20	39	43·34	
Red'n to m		20	38	3·51	20	39	32·89	
n. tan. δ		13	31	58·65	13	31	58·65	
c. sec. δ				37·14			36·90	
r		13	32	35·79	13	32	35·55	
T		10	10	39·30	10	12	8·44	
a		10	9	30	10	12	5	
Δ T			+1	9·30			+3·44	

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1867phae.proj..335L

Date		Aug 30			Aug 30			Aug 30		
Observer		G M S								
Illumin'n		E								
Star		α Cygni			μ Aquarii			γ Cygni		
Mag.										
δ										
Wire	a									
"	b									
"	c									
"	1	20	36		20	45	35.0	20	52	16.9
"	2						38.6			22.0
"	3			07.1			42.1			26.2
"	4			12.0			45.9			31.0
"	5			17.5			49.7			36.0
"	d									
"	e									
"	f									
Sum							211.3			132.1
Mean					20	45	42.26	20	52	26.42
Red'n to										
m							+77			+77
n . tan. δ							−40			−02
c . sec. δ							−28			−37
r							+09 35			+38
T					20	45	42.87	20	52	26.80
a		20	36	57.05	20	45	31.66	20	52	16.10
Δ T							−10.69			−10.70

ΔT = −10.69 70 n = +.37
E Clock S−E +0.00
ΔT −9.69 70

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1867phae.proj..335L

Date						
Observer						
Illumin'n						
Star		Jr 8421		3220		
Mag.						
δ						
Wire	a					
"	b					
"	c					
"	1	20 40	34.0	20 41	37.9	
"	2		38.8		43.0	
"	3		43.9		[48.2]	
"	4		49.0		52.9	
"	5		54.3		58.0	
"	d					
"	e					
"	f					
Sum			220.0		240.0	
Mean		20 40	44.00	20 41	~~48.00~~	47.95
		20 40	33.34	20 41	~~37.34~~	37.29
Red'n to m		13 24	6.84	13 24	6.84	
n. tan. δ			36.77		36.59	
c. sec. δ						
τ		13 24	43.61	13 24	43.43	
T		10 5	16.95	10 6	20.##	72
a		10 5	25	10 5	10	
Δ T			−8.05	+1	10.72	

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1867phae.proj..335L

Date		Aug 31	Aug 31
Observer		S	
Illumin'n			
Star		μ Aquarii	γ Cygni
Mag.			
δ			
Wire	a		
"	b		
"	c		
"	1	20 45 34.7	20 52 16.7
"	2	38.3	21.6
"	3	41.9	26.1
"	4	45.6	30.9
"	5	49.2	35.7
"	d		
"	e		
"	f		
Sum		209.7	131.0
Mean		20 45 41.94	20 52 26.20
Red'n to m		+77	+77
n. tan. δ		−29	−01
c. sec. δ		−28	−37
r		+20	+39
T		20 45 42.14	20 52 26.59
a		20 45 31.65	20 52 16.09
Δ T		−10.49	−10.50

$n = +.27$

$\Delta T = -10.50$ (S clock)
$S-E \quad +.82$
$\Delta T \quad -9.68$ (E clock

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1867phae.proj..335L

Date			
Observer Illumin'n			
Star Mag. δ			
Wire a " b " c " 1 " 2 " 3 " 4 " 5 " d " e " f			
Sum Mean			
Red'n to m n . tan. δ c . sec. δ			
τ			
T a Δ T			

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1867phae.proj..335L

Date	Sept 1	Sept 1	Sept 1
Observer			
Illumin'n			
Star	α Cygni	μ Aquarii	ν Cygni
Mag.			
δ			
Wire a			
" b			
" c			
" 1	20 36 56·8	20 45 34·7	20 52 16·7
" 2	37 2·0	38·3	21·4
" 3	7·0	42·0	26·1
" 4	12·2	45·7	30·9
" 5	17·0	49·5	35·7
" d			
" e			
" f			
Sum	35·0	210·2	130·8
Mean	20 37 7·00	20 45 42·04	20 52 26·16
Red'n to m			
n. tan. δ	+86	+86	+86
c. sec. δ	+03	− 46	−02
	−39	− 28	− 37
r	+ 50	+12	+47
T	20 37 7·50	20 45 42·16	20 52 26·63
a	20 36 57·02	20 45 31·64	20 52 16·08
Δ T	−10·48	−10·52	−10·55

$n = +·43$

$\Delta T = -10·52$ (S clock)
$S-E \quad +·61$
$\Delta T = -9·91$ (E clock)

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1867phae.proj..335L

Date							
Observer							
Illumin'n							
Star		Fr. 8421			3220		
Mag.							
δ							
Wire	a						
"	b						
"	c						
"	1	20	39	16·5	20	40	21·3
"	2			21·3			26·3
"	3			26·3			31·2
"	4			31·2			36·3
"	5			36·3			41·2
"	d						
"	e						
"	f						
Sum		20	39	26·32	20	40	31·26
Mean							
Red'n to		20	39	15·80	20	40	20·74
m							
n. tan. δ		13	16	15·03	13	16	15·03
c. sec. δ				36·97			36·80
r		13	16	52·00	13	16	51·83
T		9	56	7·80	9	57	12·57
a		9	56	30	9	56	0
Δ T				− 22·20		+ 1	12·57

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1867phae.proj..335L

Date		Sept 3						
Observer								
Illumin'n								
Star		η Cygni				236		
Mag.								
δ								
Wire	a							
"	b							
"	c							
"	1	20	36	56·5		19	14	58·4
"	2		37	1·8			15	3·3
"	3			6·9				8·3
"	4			11·9				13·3
"	5			17·0				18·4
"	d							
"	e							
"	f							
Sum				34·1				
Mean		20	37	6·82		19	15	8·34
Red'n to				+ 85				
m				+ 85				
n . tan. δ				+ 03				
c . sec. δ				− 39				
τ				+ 49				
T		20	37	7·31		19	14	58·01
a		20	36	56·98		19	15	20
Δ T				− 10·33				− 22·0

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1867phae.proj..335L

Date								
Observer								
Illumin'n								
Star		Fr. 8421			3220			
Mag.								
δ								
Wire	a							
"	b							
"	c							
"	1	20	38	49·5	20	40	4·8	
"	2			54·6			10·0	
"	3			59·4			14·9	
"	4		39	4·8			19·9	
"	5			9·7			24·9	
"	d							
"	e							
"	f							
Sum								
Mean		20	38	59·60	20	40	14·90	
Red'n to		20	38	49·10	20	40	4·40	
m								
n . tan. δ		13	8	23·22	13	8	23·22	
c . sec. δ				37·05			36·85	
r		13	9	0·27	13	9	0·07	
T		9	47	49·37	9	49	4·47	
a		9	48	20	9	47	58	
Δ T				−30·63			+1 14·47	

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1867phae.proj..335L

Date			Sept 4			Sept 4			Sept 4		
Observer			S								
Illumin'n											
Star			α Cygni			μ Aquarii			γ Cygni		
Mag.											
δ											
Wire	a										
"	b										
"	c										
"	1		20	36	56·6	20	45	34·3	20	52	16·5
"	2			37	1·6			38·1			21·5
"	3				6·6			41·9			26·2
"	4				12·0			45·4			31·0
"	5				17·0			49·3			35·8
"	d										
"	e										
"	f										
Sum					33·8			209·0			131·0
Mean			20	37	6·76	20	45	41·80	20	52	26·20
Red'n to											
m					+77			+77			+77
n . tan. δ					+02			−31			−01
c . sec. δ					−39			−28			−37
τ					+41			+18			+39
T			20	37	7·17	20	45	41·98	20	52	26·59
a			20	36	56·98	20	45	31·63	20	52	16·04
Δ T					−10·19			−10·35			−10·55

n = +·28

ΔT = −10·36 (mean of last ten determinations = −10·47)

S−E +·72

East Clock − 9·64

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1867phae.proj..335L

Date												
Observer												
Illumin'n												
Star		Fr. 8421			3220			3242				
Mag.												
δ												
Wire	a											
"	b											
"	c											
"	1	20	38	49·1	20	40	21·7	21	0	8·1		
"	2			54·2			26·7			13·0		
"	3			59·3			31·8			18·1		
"	4		39	4·5			36·9			23·0		
"	5			9·4			41·9			28·1		
"	d											
"	e											
"	f											
Sum				296·5								
Mean		20	38	59·30	20	40	31·80	20	0	18·06		
Red'n to m		20	38	48·83	20	40	21·33	21	0	7·59		
n. tan. δ		13	4	27·31	13	4	27·31	13	4	27·31		
c. sec. δ				37·05			36·80			33·56		
r		13	5	4·36	13	5	4·11	13	5	0·87		
T		9	43	53·19	9	45	25·44	10	5	8·46		
a		9	44	30	9	44	10	10	6	0		
Δ T				— 36·81			+ 1 15·44			— 51·54		

Sclock

~~230~~ 236

21	32	12·5	21	32	30
		17·5			35
		22·5			40
		27·5			45
		32·4			50

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1867phae.proj..335L

Date		Sept 6			Sept 6			Sept 6	
Observer									
Illumin'n									
Star		α Cygni			φ Aquarii				
Mag.									
δ									
Wire	a								
"	b								
"	c								
"	1	20	36	56·9	20	45	35·0		
"	2		37	1·7			38·7		
"	3			7·1			42·2		
"	4			12·1			45·9		
"	5			17·5			49·7		
"	d								
"	e								
"	f								
Sum				35·3			211·5		
Mean		20	37	7·06	20	45	42·30		
Red'n to									
m				+ 79			+ 79		
n . tan. δ				+ 05			− 63		
c . sec. δ				− 39			− 28		
τ		20	37	7·51	20	45	42·18		
T									
a		20	36	56·95	20	45	31·62		
Δ T				− 10·56			− 10·56		

n = + ·59
S − E + 19
ΔT (E. Clock) − 10·37

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1867phae.proj..335L

Date											
Observer											
Illumin'n											
Star		Fr. 8421			3220			3212			
Mag.											
δ											
Wire	a										
"	b										
"	c										
"	1	20	38	9·5	20	39	20·5	20	40	25·0	
"	2			14·3			25·3			30·1	
"	3			19·3			30·5			35·1	
"	4			24·3			35·5			40·1	
"	5			29·2			40·5			45·1	
"	d										
"	e										
"	f										
Sum											
Mean		20	38	19·32	20	39	30·46	20	40	35·08	
Red'n to		20	38	8·76	20	39	19·90	20	40	24·52	
m			56	35							
n. tan. δ		12		50	12	56	35·50	12	56	35·50	
c. sec. δ				37·16			36·96			36·79	
r		12	57	12·66	12	57	12·46	12	57	12·29	
T		9	35	~~31·98~~ 21·42	9	36	~~42·92~~ 32·36	9	37	~~47·37~~ 36·81	
a		9	36	10	9	35	15	9	38	10	
Δ T				−48·58		+ 1	17·36			−33·19	

Clock.

236

20 41 18·2
23·2
28·3 41 55
33·1
38·3

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Date		Sept 9					
Observer							
Illumin'n							
Star		Fr. 8421					
Mag.							
δ							
Wire	a						
"	b						
"	c						
		add 26^s					
"	1	15 1	10·4		15 12	38·2	
"	2		15·4			43·1	
"	3		20·4			48·2	
"	4		25·3			53·3	
"	5		30·3		12	58·1	
"	d						
"	e						
"	f						
Sum			46				
Mean		15 1	~~30~~·36		15 12	48·18	
			35				
Red'n to		15 1	~~9~~·86		15 12	37·68	
m		12 44	47·79		12 44	47·79	
n. tan. δ							
c. sec. δ		1	32 30		+ 1	30·49	
τ		12 46	20·00		12 46	18·28	
			55·95				
T		3 ~~17~~	~~30·02~~		~~23~~ 58	~~55~~·96	
a		3 49	0		~~3~~ 0	0	
Δ T		— 1	4·05		~~+~~ 1	4·04	

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1867phae.proj..335L

Date	Sept 1
Observer	
Illumin'n	
Star	
Mag.	
δ	
Wire a	
" b	
" c	
" 1	
" 2	
" 3	
" 4	
" 5	
" d	
" e	
" f	
Sum	
Mean	
Red'n to	
m	
n . tan. δ	
c . sec. δ	
r	
T	
a	
Δ T	

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1867phae.proj..335L

Date			Sept 11			Sept 11			Sept 11		
Observer			S								
Illumin'n			E								
Star			α Lyrae			μ Aquarii			γ Lyrae		
Mag.											
δ											
Wire	a										
"	b										
"	c										
"	1		20	36	58·0	20	45	36·1	20	52	18·2
"	2			37	3·2			39·9			23·0
"	3				8·1			43·5			27·8
"	4				13·3			47·1			32·5
"	5				18·3			50·8			37·3
"	d										
"	e										
"	f										
Sum					40·9			217·4			138·8
Mean			20	37	8·18	20	45	43·48	20	52	27·76
Red'n to											
m					+ 79			+ 79			+ 79
n . tan. δ					+ 03			~~+ 03~~ 44			− 02
c . sec. δ					− 39			− 28			− 37
								+ 07			
r					+ 43			~~+ 43~~			+ 40
								43·55			
T			20	37	8·61	20	45	~~43·96~~	20	52	28·16
a			20	36	56·87	20	45	31·57	20	52	15·95
Δ T					− 11·74			− 11·98			− 12·21

n = + 41
Δ T = − 11·98
S − E + 1·34

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1867phae.proj..335L

Date		Sept 11				
Observer						
Illumin'n						
Star		Fr. 32442			236	
Mag.						
δ						
Wire	a					
"	b					
"	c					
"	1	20 39	2·0	20 40	22·8	
"	2		7·0		27·8	
"	3		12·1		32·7	
"	4		17·1		37·8	
"	5		22·1		42·7	
"	d					
"	e					
"	f					
Sum						
Mean		20 39	12·06	20 40	32·76	
Red'n to m		20 39	0·08	20 40	20·78	
n. tan. δ		12 36	55·97	X2 B		
c. sec. δ			37·02			
r		12 37	32·99			
T		9 16	33·07	9		
a		9 17	15	20 41	20	
Δ T			— 41·93		— 59·22	

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1867phae.proj..335L

Date		Sept 12			Sept 12			Sept 12.			
Observer		S									
Illumin'n		E									
Star		α Lyrae			μ Aquarii			γ Lyrae			
Mag.											
δ											
Wire	a										
"	b										
"	c										
"	1	20	36	58·2	20	45	36·3	20	52	18·1	
"	2		37	3·5			39·9			22·9	
"	3			8·3			43·7			27·7	
"	4			13·5			47·2			32·6	
"	5			18·6			50·9			37·0	
"	d										
"	e										
"	f										
Sum				42·1			218·0			138·3	
Mean		20	37	8·42	20	45	43·60	20	52	27·66	
Red'n to m				+80			+80			+80	
n. tan. δ				+01			−47			−02	
c. sec. δ				−39			−28			−37	
r				+45			+25			+41	
T		20	37	8·87	20	45	43·65	20	52	28·07	
a		20	36	56·84	20	45	31·57	20	52	15·94	
Δ T				−12·03			−12·08			−12·13	

n = +·2543

ΔT = −12·08

S − E +63

East Clock −11·45

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1867phae.proj..335L

Date											
Observer											
Illumin'n											
Star		Fr. 8421					3242				
Mag.											
δ											
Wire	a										
"	b										
"	c										
"	1	20	38	55·1		20	40	6·5			
"	2		39	0·1				11·4			
"	3			5·1				16·4			
"	4			10·0				21·6			
"	5			15·0				26·5			
"	d										
"	e										
"	f										
Sum											
Mean		20	39	5·06		20	40	16·48			
Red'n to		20	38	52·98		20	40	4·40			
m		~~12~~									
n. tan. δ		12	33	0·07		12	33	0·07			
c. sec. δ				37·03							
r											
T											
a											
Δ T											

236

Clock	20	41	17·0	5 comp	22	17	16·7	5 comp.	0	5	46·3	10 comp
236	20	42	10		22	18	10		0	6	40	
			− 53·0				−53·3				− 53·7	

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1867phae.proj..335L

Date		Sept 14			Sept 14			Sept 14			
Observer		S									
Illumin'n		E									
Star		α Cygni			μ Aquarii			γ Cygni			
Mag.											
δ											
Wire	a										
"	b										
"	c										
"	1	20	36	58·8	20	45	36·6	20	52	18·3	
"	2		37	3·6			40·2			23·1	
"	3			8·9			43·9			27·8	
"	4			13·6			47·4			32·6	
"	5			18·9			51·1			37·6	
"	d										
"	e										
"	f										
Sum				43·8			219·2			139·4	
Mean		20	37	8·76	20	45	43·84	20	52	27·88	
Red'n to m				+ 49			+ 49			+ 49	
n . tan. δ				+ 03			− 44			− 02	
c . sec. δ				− 50			− 36			− 47	
r				+02			− 31			00	
T		20	37	8·78	20	45	43·53	20	52	27·88	
a		20	36	56·80	20	45	31·55	20	52	15·91	
Δ T				−11·98			−11·98			−11·97	

n = + 41
ΔT = − 11·98
S − E = + 0·05
E Clock −11·93

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1867phae.proj..335L

Date								
Observer								
Illumin'n								
Star		Fr. 8421			3242			
Mag.								
δ								
Wire	a							
"	b							
"	c							
"	1	20	39	0·6	20	40	56·0	
"	2			5·7		41	1·0	
"	3			10·6			6·0	
"	4			15·9			11·0	
"	5			20·8			16·0	
"	d							
"	e							
"	f							
Sum								
Mean		20	39	10·72		41	6·00	
Red'n to		20	38	58·74	20	40	54·02	
m								
n. tan. δ		12	25	8·25	12	25	8·25	
c. sec. δ				37·02			36·71	
r		12	25	45·27	12	25	44·96	
T		9	4	44·01	9	6	38·98	
a		9	6	10	9	7	25	
Δ T			− 1	25·99			− 46·02	

Clock 18 54 43·0 .5 comp. 20 19 47·7 5 comp
236 18 55 45 20 20 50

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1867phae.proj..335L

Date		Sept 15			Sept 15			Sept 15			
Observer		S									
Illumin'n		E									
Star		α Cygni			μ Aquarii			ν Cygni			
Mag.											
δ											
Wire	a										
"	b										
"	c										
"	1	20	36	58·3	20	45	36·4	20	52	18·2	
"	2		37	3·3			43·6			23·0	
"	3			8·7			47·3			27·8	
"	4			13·6			50·9			32·5	
"	5			18·8						37·2	
"	d										
"	e										
"	f										
Sum				427			218·2			138·7	
Mean		20	37	8·54	20	45	43·64	20	52	27·74	
Red'n to											
m				+ 77			+ 77			+ 77	
n. tan. δ				+ 03			− 41			− 62	
c. sec. δ				− 50			− 36			− 47	
r				+ 30			00			+ 28	
T		20	37	8·84	20	45	43·64	20	52	28·02	
a		20	36	56·78	20	45	31·54	20	52	15·89	
Δ T				−12·06			−12·10			−12·13	

n = + 38
Δ T = −12·10
S − E = − ·72
E Clock −12·82

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1867phae.proj..335L

Date				
Observer				
Illumin'n				
Star		Fr. 3242		
Mag.				
δ				
Wire	a			
"	b			
"	c			
"	1	20	41	55·1
"	2		42	0·2
"	3			5·2
"	4			10·2
"	5			15·2
"	d			
"	e			
"	f			
Sum				
Mean				5·18
Red'n to m		20	41	53·08
n. tan. δ		12	21	12·35
c. sec. δ				36·55
r		12	21	48·90
T		9	3	42·98
a		9	4	30 ~~20~~ 40
Δ T				−48·02

236	20	48	0		21	57	30		23	47	50
Clock	20	46	50·90		21	56	20·50		23	46	40·03

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1867phae.proj..335L

Date		Sept 16										
Observer		S										
Illumin'n		W										
Star		α Cygni				ν Cygni				σ^2 Urs Maj		
Mag.												
δ												
Wire	a											
"	b											
"	c											
"	1	20	36	57.1		20	52	17.1		20	59	32.5
"	2		37	2.0				21.9				42.4
"	3			7.2				26.9				51.5
"	4			12.3				31.7			59	1.1
"	5			17.6				36.1				10.9
"	d											
"	e											
"	f											
Sum				36.2				133.7				258.4
Mean		20	37	7.24		20	52	26.74		20	58	51.68
Red'n to												
m				+ 90				+ 90				+ 90
n. tan. δ				+ 02				− 02				−1.10
c. sec. δ				+ 46				+ 43				− 86
r				+ 1.38				+ 1.31				−1.06
T		20	37	8.62		20	52	28.05		20	58	50.62
a		20	36	56.76		20	52	15.88		8	58	38.79
Δ T				− 11.86				−12.17				− 11.83

n = + .33 from σ^2 Urs Maj & α Cephei
ΔT = − 12.02 " α and ν Cygni (− 11.96 from all)
S − E = − 1.05
ΔT (E Clock) ~~−12.19~~ −13.07

n = .312 by least squares.

Assume n = + 62

+.05	−11.89	10	100	Sum of squares
−.03	−12.08	−28	784	11073
−2.07	−10.86	+93	8649	nearly the
−.21	−12.01	−22	484	same as
+.10	−12.13	−34	1156	for n = +

		tan δ			
−11.84	+30	+08	0240	64	0.5164
−12.19	−05	05	0025	25	1.0818
−12.93	−79	−3.34	26386	11156	9.4293 log n
−12.22	−08	− 34	0272	1156	n = + .279
−11.53	+61	+.97	5917	9409	by least squares
−12.14	−5	−54	3.2840	12.2210	

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1867phae.proj..335L

Date											
Observer											
Illumin'n											
Star		ζ Cygni			α Cephei			Fr. 3242			
Mag.											
δ											
Wire	a										
"	b										
"	c										
"	1	21	7	22·2	21	15	22·9	20	48	0·8	
"	2			26·2			30·2			5·9	
"	3			30·5			37·9			10·9	
"	4			34·7			45·7			16·0	
"	5			38·8			53·4			20·9	
"	d										
"	e										
"	f										
Sum				152·4			190·1				
Mean		21	7	30·48	21	15	38·02			10·90	
Red'n to								20	47	58·88	
m				+90			+90				
n. tan. δ				−11			+32	12	17	16·44	
c. sec. δ				+37			+70			35·55	
r				+1·16			+1·92	12	17	51·99	
T		21	7	31·64	21	15	39·94	9	5	50·87	
a		21	7	19·53	21	15	28·09	9	6	40	
Δ T				−12·11			−11·85			−49·13	

Sept 17 Fr 8421 15 39 13·40

15 39 1·30

12 13 20·53

1 26·17

12 14 46·70

3 53 48·00

3 53 35

+13·00

n tan δ ΔT

+02 −11·86 +14 196

−01 −12·18 −18 324

−90 −12·03 −03 9

−09 −12·13 −13 169

+26 −11·79 +21 441

−12·00 1215

11 89

assume +62.

n = +54

+900 +04 −11·88 02 4

−25 −02 −12·17 31 961

6241 −180 −11·13 73 5329

64 −18 −12·04 18 324

3721 +52 −12·05 19 361

10951

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1867phae.proj..335L

Date	Sept 18	Sept 18	Sept 18
Observer	S		
Illumin'n	W		
Star	α Cygni	μ Aquarii	ν Cygni
Mag.			
δ			
Wire a			
" b			
" c			
" 1	20 36 57.0	20 45 35.3	20 52 17.1
" 2	37 2.0	39.0	21.9
" 3	7.1	42.7	26.7
" 4	12.5	46.3	31.3
" 5	17.5	49.9	36.1
" d			
" e			
" f			
Sum	36.1	213.2	133.1
Mean	20 37 7.22	20 45 42.64	20 52 26.62
Red'n to			
m	+ 96	+ 96	+ 96
n . tan. δ	+ 03	− 36	− 02
c . sec. δ	+ 46	+ 33	+ 43
r	+ 1.45	+ 93	+ 1.37
T	20 37 8.67	20 45 43.57	20 52 27.99
a	20 36 56.72	20 45 31.51	20 52 15.84
Δ T	− 11.95	− 12.06	− 12.15

n = + .33
ΔT = − 12.05
− 1.83

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1867phae.proj..335L

Date								
Observer								
Illumin'n								
Star		Fr. 3242			236		236	
Mag.								
δ								
Wire	a							
"	b							
"	c							
"	1	20	39	50·0	20	40	42·1	3
"	2			55·1			·1	
"	3		40	0·0			·1	
"	4			5·1			·1	
"	5			10·1			·1	
"	d							
"	e							
"	f							
Sum								
Mean				0·06	20	40	52·10	
Red'n to m		20	39	48·01				
n. tan. δ		12	9	24·63				
c. sec. δ				36·89				
r		12	10	1·52				
T		8	49	49·53				
a		8	50	40	20	42	15	
Δ T				− 50·47				

3 34 16·00 5 comp. 5 4 45·92
3 35 40 5 6 10

1 24·00 1 24·08

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1867phae.proj..335L

Date	Sept 19			
Observer	S			
Illumin'n	W			
Star	α Lyrae		μ Aquarii		ν Lyrae	
Mag.						
δ						
Wire a						
" b						
" c						
" 1	20 36 56·9		20 45 35·2		20 52 17·0	
" 2	37 2·1		39·0		22·0	
" 3	7·1		42·7		26·7	
" 4	[12·3]		46·2		31·4	
" 5	17·4		49·9		36·2	
" d						
" e						
" f						
Sum	35·8		213·0		133·3	
Mean	20 37 7·16		20 45 42·60		20 52 26·66	
Red'n to						
m	+ 85		+ 85		+ 85	
n . tan. δ	+ 02		− 33		− 02	
c . sec. δ	+ 46		+ 33		+ 43	
r	+ 1·33		+ 85		+ 1·26	
T	20 37 8·49		20 45 43·45		20 52 27·92	
a	20 36 56·70		20 45 31·50		20 52 15·83	
Δ T	− 11·79		−11·95		− 12·09	

n = + 31

ΔT = −11·94

S−E − 2·58

East Clock −14·52

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1867phae.proj..335L

Date											
Observer											
Illumin'n											
Star		Fr. 3242				236					
Mag.											
δ											
Wire	a										
"	b										
"	c										
"	1	20	39	9.6	19	23	18.5	20	13	48.4	
"	2			14.7			23.5			53.4	
"	3			19.9			28.5			58.4	
"	4			24.8			33.5			3.4	
"	5			29.6			38.4			8.4	
"	d										
"	e										
"	f										
Sum											
Mean				19.72	19	23	28.48	20	13	58.40	
Red'n to m		20	39	7 78	19	23	16.54	20	13	46.46	
n. tan. δ		12	5	28.72							
c. sec. δ				37.00							
r		12	6	5.72							
T		8	45	13.50							
a		8	46	5	19	24	55	20	15	25	
Δ T				−51.50		−1.	38.46		−1	38.54	

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1867phae.proj..335L

Date		Sept 22									
Observer		S									
Illumin'n		W									
Star		α Leyyri				μ Aquarii				ν Leyyri	
Mag.											
δ											
Wire	a										
"	b										
"	c										
"	1	20	36	57.5	20	45	35.9	20	52	17.3	
"	2		37	2.3			39.4			22.0	
"	3			7.7			43.1			26.9	
"	4			12.7			46.7			31.7	
"	5			17.8			50.5			36.4	
"	d										
"	e										
"	f										
Sum				38.0			215.6			134.3	
Mean		20	37	7.60	20	45	43.12	20	52	26.86	
Red'n to											
m				+94			+94			+94	
n . tan. δ				+04			−50			−02	
c . sec. δ				+46			+33			+43	
r				+1.44			+77			+1.35	
T		20	37	9.04	20	45	43.89	20	52	28.21	
a		20	36	56.63	20	45	31.46	20	52	15.77	
Δ T				−12.41			−12.43			−12.44	

n = + 45
ΔT = − 12.43
S − E − 3.80
E Clock −16.23

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1867phae.proj..335L

Date				Sept 23
Observer				
Illumin'n				
Star		Fr 3242		Fr. 8421
Mag.				
δ				
Wire	a			
"	b			
"	c			
"	1	20 47 33·7		16 1 58·2
"	2	38·9		3·3
"	3	43·9		8·2
"	4	48·9		13·2
"	5	53·9		18·0
"	d			
"	e			
"	f			
Sum				
Mean		43·86		16 2 8·18
Red'n to m		20 47 31·43		16 1 55·65
n. tan. δ		11 53 41·00		11 49 45·09
c. sec. δ		35·62		1 22·42
τ		11 54 16·62		11 51 7·51
T		8 41 48·05		3 53 3·16
a		8 42 45		3 52 50
Δ T		−56·95		+13·16

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1867phae.proj..335L

Date		Sept 23								
Observer		S								
Illumin'n		W								
Star		α Cygni			μ Aquarii			ν Cygni		
Mag.										
δ										
Wire	a									
"	b									
"	c									
		20	36	57·3	20	45	35·9	20	52	17·5
"	1		37	2·7			39·0			22·0
"	2			7·6			43·1			27·0
"	3			12·4			46·9			31·4
"	4			17·9			50·6			36·2
"	5									
"	d									
"	e									
"	f									
Sum				37·9			215·5			134·1
Mean		20	37	7·58	20	45	43·10	20	52	26·82
Red'n to										
m				+88			+88			+88
n . tan. δ				+04			−51			−02
c . sec. δ				+46			+33			+43
r				+1·38			+70			+1·29
T		20	37	8·96	20	45	43·80	20	52	28·11
a		20	36	56·60	20	45	31·44	20	52	15·75
Δ T				−12·36			−12·36			−12·36

n = +47
ΔT = −12·36
S−E −3·98
E. block −16·34

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1867phae.proj..335L

Date								
Observer								
Illumin'n								
Star			Yr. 3242				8421	
Mag.								
δ								
Wire	a							
"	b							
"	c							
				43·0				
"	1	20	47	48·0	20	49	1·0	
"	2			53·0			5·9	
"	3						10·9	
"	4			3·0				
"	5							
"	d							
"	e							
"	f							
Sum								
Mean		20	47	53·00	20	49	5·93	
Red'n to m		20	47	40·64	20	48	53·57	
n. tan. δ		11	49	45·09	11	49	45·09	
c. sec. δ				35·60			35·46	
τ		11	50	20·69	11	50	20·49	
T		8	38	1·33	8	39	14·06	
a		8	39	0	8	39	0	
Δ T				~~+33~~			+14·06	
				− 58·67				

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1867phae.proj..335L

Date		Sept 24		
Observer		S		
Illumin'n		W		
Star		α Cygni	μ Aquarii	ν Cygni
Mag.				
δ				
Wire	a			
"	b			
"	c			
"	1	20 36 57.2	20 45 35.6	20 52 17.1
"	2	37 2.4	39.2	21.9
"	3	7.3	43.0	26.9
"	4	12.3	46.5	31.4
"	5	17.4	50.1	36.2
"	d			
"	e			
"	f			
Sum		36.7	214.4	133.5
Mean		20 37 7.34	20 45 42.88	20 52 26.70
Red'n to m		+ 1.03	+1.03	+1.03
n. tan. δ		+ 04	− 46	−02
c. sec. δ		+ 46	+33	+43
r		+ 1.53	+ 90	+ 1.44
T		20 37 8.87	20 45 43.78	20 52 28.14
a		20 36 56.59	20 45 31.43	20 52 15.73
Δ T		− 12.28	−12.35	−12.41

n = + 42
ΔT = − 12.35
S − ε − 4.78
ε Clock − 17.13

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1867phae.proj..335L

Date				
Observer				
Illumin'n				
Star				
Mag.				
δ				
Wire	a			
"	b			
"	c			
"	1	20	40	5·5
"	2			10·6
"	3			15·3
"	4			20·5
"	5			25·5
"	d			
"	e			
"	f			
Sum				
Mean				15·48
Red'n to				
m		20	40	3·13
n . tan. δ		11	45	49·19
c . sec. δ				36·85
τ		11	46	26·04
T		8	26	29·17
a		8	27	30
Δ T			— 1	0·83

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1867phae.proj..335L

Date		Sept 27		
Observer		S		
Illumin'n		W		
Star		α Cygni	μ Aquarii	ν Cygni
Mag.				
δ				
Wire	a			
"	b			
"	c			
"	1	20 36 57·2	20 45 35·9	20 52 17·2
"	2	37 2·8	39·4	22·0
"	3	7·8	43·0	26·9
"	4	12·6	46·5	31·7
"	5	17·8	50·4	36·5
"	d			
"	e			
"	f			
Sum		38·2	215·2	134·3
Mean		20 37 7·64	20 45 43·04	20 52 26·86
Red'n to				
m		+90	+90	+90
n. tan. δ		+03	−37	−02
c. sec. δ		+46	+33	+43
r		+1·39	+86	+1·31
T		20 37 9·03	20 45 43·90	20 52 28·17
a		20 36 56·52	20 45 31·39	20 52 15·67
Δ T		−12·51	−12·51	−12·50

n = +34
ΔT = −12·51
= −ε −7·07
ε Cwdk −19·58

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1867phae.proj..335L

Date				
Observer				
Illumin'n				
Star		Fr 3242		8
Mag.				
δ				
Wire	a			
"	b			
"	c			
"	1	20 42	44·1	
"	2		49·1	
"	3		54·1	
"	4		59·1	
"	5	43	4·1	
"	d			
"	e			
"	f			
Sum				
Mean			54·10	
Red'n to		20 42	41·59	
m				
n . tan. δ		11 34	1·47	
c . sec. δ			36·42	
		11 34	37·89	
r		~~43~~	~~19·48~~	
T		8 17	19·48	
a		8 18	25	
Δ T		− 1	5·52	

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1867phae.proj..335L

Date		Sept 29									
Observer		S									
Illumin'n		W									
Star		α Cygni			μ Aquarii			ν Cygni			
Mag.											
δ											
Wire	a										
"	b										
"	c										
"	1	20	36	57.8	20	45	36.3	20	52	17.9	
"	2		37	3.0			40.0			22.7	
"	3			8.1			43.6			27.3	
"	4			13.1			47.2			32.1	
"	5			18.2			51.1			37.0	
"	d										
"	e										
"	f										
Sum				40.2			218.2			137.0	
Mean		20	37	8.04	20	45	43.64	20	52	27.40	
Red'n to											
m				+1.10			+1.10			+1.10	
n.tan.δ				+04			−48			−02	
c.sec.δ				+46			+33			+43	
r				+1.60			+95			+1.51	
T		20	37	9.64	20	45	44.59	20	52	28.91	
a		20	36	56.47	20	45	31.36	20	52	15.63	
Δ T				−13.17			−13.23			−13.28	

n = + 44
ΔT = −13.23
S−E −8.22
E Clock −21.45

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1867phae.proj..335L

Date				Sept 30		
Observer						
Illumin'n						
Star		Fr. 3242		8421		
Mag.						
δ						
Wire	a					
"	b					
"	c					
"	1	20 42	28.5	13 56	49.3	
"	2		33.5		54.3	
"	3		38.5		59.3	
"	4		43.5	57	4.3	
"	5		48.5		9.2	
"	d					
"	e					
"	f					
Sum						
Mean		20 42	38.50		59.28	
					85	
Red'n to		20 42	25.27	13 56	45.~~78~~	
m			26 9.66			
n. tan. δ		11 ~~22~~	~~13.76~~	11 22	13.76	
c. sec. δ			36 48		1 42.92	
			26 46.12			
r		11 ~~22~~	~~50 22~~	11 23	56.68	
			9 11.39			
T		8 ~~5~~	~~15 49~~	1 20	42.53	
a		8 10	20	1 20	45	
Δ T			−1 8.61		−2.47	

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1867phae.proj..335L

Date		Oct 1						
Observer		S						
Illumin'n		W						
Star		α Cygni				ν Cygni		
Mag.								
δ								
Wire	a							
"	b							
"	c							
"	1	20	36	57.9		20	52	18.0 ~~27~~
"	2		37	3.2				22.9
"	3			8.3				27.7
"	4			13.7				32.2
"	5			18.6				37.0
"	d							
"	e							
"	f							
Sum				41.7				137.8
Mean		20	37	8.34		20	52	27.56
Red'n to								
m				+81				+81
n . tan. δ				+04				−02
c . sec. δ				+46				+43
r				+1.31				+1.22
T		20	37	9.65		20	52	28.78
a		20	36	56.42		20	52	15.59
Δ T				−13.23				−13.19

ΔT = −13.21

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1867phae.proj..335L

Date				
Observer				
Illumin'n				
Star		Fr. 3242		
Mag.				
δ				
Wire	a			
"	b			
"	c			
"	1	20	48	17.2
"	2			22.2
"	3			27.2
"	4			32.2
"	5			37.2
"	d			
"	e			
"	f			
Sum				
Mean		20	48	27.20
Red'n to m		20	48	13.99
n. tan. δ		11	18	17.85
c. sec. δ				35.51
τ		11	18	53.36
T		8	7	7.35
a		8	8	20
Δ T			−1	12.65

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1867phae.proj..335L

Date		Oct 3
Observer		S
Illumin'n		W
Star		α Cygni (extremely faint through clouds.)
Mag.		
δ		
Wire	a	
"	b	
"	c	
"	1	20 36 58·7
"	2	37 3·5
"	3	8·5
"	4	13·4
"	5	18·7
"	d	
"	e	
"	f	
Sum		42·8
Mean		20 37 8·56
Red'n to		
m		+77
n . tan. δ		+04
c . sec. δ		+46
r		+1·27
T		20 37 9·83
a		20 36 56·37
Δ T		−13·46

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1867phae.proj..335L

Date				
Observer				
Illumin'n				
Star		Fr. 3242		
Mag.				
δ				
Wire	a			
"	b			
"	c			
"	1	20	39	9·5
"	2			14·5
"	3			19·5
"	4			24·5
"	5			29·5
"	d			
"	e			
"	f			
Sum				
Mean				19.48
Red'n to		20	39	6·02
m				
n . tan. δ		11	10	26·05
c . sec. δ				37·00
r		11	11	3·05
T		7	50	9·07
a		7	51	25
Δ T			−1	15·93

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1867phae.proj..335L

Date		Oct 6										
Observer		S										
Illumin'n		W										
Star		γ Cygni			61' Cygni			ζ Cygni				
Mag.												
δ												
Wire	a											
"	b											
"	c											
"	1	20	52	17.9	21	1	2.0	21	7	22.8		
"	2			22.6			6.7			27.0		
"	3			27.5			11.0			31.1		
"	4			32.2			15.7			35.4		
"	5			37.0			20.3			39.9		
"	d											
"	e											
"	f											
Sum				137.2			55.7			156.2		
Mean		20	52	27.44	21	1	11.14	21	7	31.24		
Red'n to												
m				+75			+75			+75		
n. tan. δ				−02			−05			−12		
c. sec. δ				+43			+42			+38		
τ				+1.16			+1.12			+1.01		
T		20	52	28.60	21	1	12.26	21	7	32.25		
a		20	52	15.47	20	0	58.82	21	7	19.23		
Δ T				−13.13			−13.44			−13.02		

ΔT = −13.20

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1867phae.proj..335L

Date							Oct 8			
Observer										
Illumin'n										
Star										
Mag.										
δ			Fr. 3242							
Wire	a									
"	b									
"	c									
"	1	21	3	40·0			16	58	39·6	
"	2			45·0					44·5	
"	3			50·1					49·8	
"	4			55·1					54·6	
"	5			0·1					59·8	
"	d									
"	e									
"	f									
Sum		~~21~~	~~4~~	~~50~~			~~16~~	~~58~~	~~4~~	
Mean		21	3	50·06			16	58	49·66	
Red'n to		21	3	36·86			16	58	36·46	
m										
n. tan. δ		10	58	38·32			10	50	46·51	
c. sec. δ				32 ~~87~~ 99				1	13·13	
r		10	59	11·~~11~~ 31			10	51	59·64	
T		8	2	48·~~00~~ 17			3	50	36·10	
a		8	4	10			3	50	15	
Δ T			−1	21·83					+21·10	

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1867phae.proj..335L

Date		Oct 10
Observer		S
Illumin'n		W
Star		α Cygni
Mag.		
δ		
Wire	a	
"	b	
"	c	
"	1	20 36 57.0
"	2	2.0
"	3	7.1
"	4	12.1
"	5	17.2
"	d	
"	e	
"	f	
Sum		~~3 7.08~~
Mean		20 37 7.08
Red'n to		
m		+.85
n . tan. δ		+.04
c . sec. δ		+.46
r		+1.35
T		20 37 8.43
a		20 36 56.19
Δ T		−12.24

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1867phae.proj..335L

Date				
Observer				
Illumin'n				
Star		Fr 3242		
Mag.				
δ				
Wire	a			
"	b			
"	c			
"	1	20	41	7·0
"	2			11·8
"	3			16·9
"	4			21·9
"	5			27·0
"	d			
"	e			
"	f			
Sum				
Mean		20	41	16·92
Red'n to m		20	41	4·68
n. tan. δ		10	42	54·69
c. sec. δ				36·67
τ		10	43	31·36
T		7	24	36·04
a		7	26	5
Δ T			−1·	28·96

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1867phae.proj..335L

Date		Oct 14		
Observer		S		
Illumin'n		W		
Star		η Aquarii	ζ Pegasi	ν Cephei
Mag.				
δ				
Wire	a			
"	b			
"	c			
"	1	22 28 38·4	22 34 56·8	22 44 54·1
"	2	41·9	35 4·0	45 3·2
"	3	45·6	7·8	11·7
"	4	49·2	11·3	20·5
"	5	52·9		29·5
"	d			
"	e			
"	f			
Sum		228·0	20·6	59·0
Mean		22 28 45·60	22 35 4·12	22 45 11·80
Red'n to				
m		+ 1·13	+ 1·13	+ 1·13
n. tan. δ		− 46	− 36	+ 64
c. sec. δ		+ 33	+ 33	+ 80
r		+ 1·00	+ 1·10	+ 2·57
T		22 28 46·60	22 35 5·22	22 45 14·37
a		22 28 34·17	22 34 52·69	22 45 1·89
Δ T		− 12·43	− 12·53	− 12·48

η = + 50

Δ T = − 12·48

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1867phae.proj..335L

Date					Oct 15			
Observer								
Illumin'n								
Star		Molyneux						
Mag.			1481			1481		
δ					3	59	14-26	
Wire	a							
"	b							
"	c	22	30	35·8				
				39·7				
"	1			43·6	17	24	57·0	
"	2					25	1·0	
"	3	22	31	21·8			4·9	
"	4			25·9			8·9	
"	5			30·0				
				33·9				
"	d							
"	e							
"	f							
Sum				~~81~~				
Mean		22	31	21·81	17	25	0·95	
Red'n to m		22	31	9·33	17	24	48·47	
n . tan. δ		10	27	11·06	10	23	15·15	
c . sec. δ				18·64		1	8·84	
r		10	27	29·70	10	24	23·99	
							12·46	
T		~~9~~ 8	58	39·03	3	59	~~8·46~~	
a		8	59	0	3	59	18	
							5	
Δ T				−20·97			− ~~9~~ 4·54	

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1867phae.proj..335L

Date		Oct 16		
Observer		S		
Illumin'n		W		
Star		ι Cephei	α Psc. Aust.	α Pegasi
Mag.				
δ				
Wire	a			
"	b			
"	c			
"	1	22 44 53·7	22 50 23·4	22 58 14·8
"	2	45 2·6	27·7	18·2
"	3	10·7	31·9	22·0
"	4	20·1	36·0	25·8
"	5	28·5	40·3	29·7
"	d			
"	e			
"	f			
Sum		55·6	159·3	110·5
Mean		22 45 11·12	22 50 31·86	22 58 22·10
Red'n to m		+69	+69	+69
n. tan. δ		+617	−78	−34
c. sec. δ		+79	+38	+34
r		+2·15	+29	+69
T		22 45 13·27	22 50 32·15	22 58 22·79
a		22 45 1·83	22 50 20·72	22 58 11·34
Δ T		−11·44	−11·43	−11·45

$n = +\cdot 52$
$\Delta T = -11\cdot 44$

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1867phae.proj..335L

Date				
Observer				
Illumin'n				
Star				
Mag.				
δ				
Wire	a			
"	b			
"	c			
"	1			
"	2			
"	3			
"	4			
"	5			
"	d			
"	e			
"	f			
Sum				
Mean				
Red'n to				
m				
n . tan. δ				
c . sec. δ				
τ				
T				
a				
Δ T				

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1867phae.proj..335L

Date		Oct 17		
Observer		S		
Illumin'n		W		
Star		ι Cephei	α Piscis Aust	α Pegasi
Mag.				
δ				
Wire	a			
"	b			
"	c			
"	1	22 44 53·7	22 50 23·3	22 58 14·7
"	2	45 2·7	27·4	18·3
"	3	11·3	31·7	22·0
"	4	19·9	36·0	25·9
"	5	28·9	40·1	29·7
"	d			
"	e			
"	f			
Sum		56·5	158·5	110·6
Mean		22 45 11·30	22 50 31·70	22 58 22·12
Red'n to				
m		+99	+99	+99
n . tan. δ		+49	−57	−25
c . sec. δ		+79	+38	+34
r		+·227	+80	+1·08
T		22 45 13·57	22 50 32·50	22 58 23·20
a		22 45 1·80	22 50 20·71	22 58 11·33
Δ T		−11·77	−11·79	−11·87

n = +38
ΔT = −11·81

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1867phae.proj..335L

Date			
Observer Illumin'n			
Star Mag. δ			
Wire a			
" b			
" c			
" 1			
" 2			
" 3			
" 4			
" 5			
" d			
" e			
" f			
Sum Mean			
Red'n to m n . tan. δ c . sec. δ			
τ			
T a			
Δ T			

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1867phae.proj..335L

Date		Oct 23							
Observer		S							
Illumin'n		W							
Star			α Pisc. Aust.			α Pegasi			
Mag.									
δ									
Wire	a								
"	b								
"	c								
"	1		22	50	21·9	22	58	13·2	
"	2				25·9			16·6	
"	3				29·9			20·6	
"	4				34·3			24·1	
"	5				38·6			28·0	
"	d								
"	e								
"	f								
Sum					150·6			102·5	
Mean			22	50	30·12	22	58	20·50	
Red'n to									
m					+59			+59	
n . tan. δ					−52			−23	
c . sec. δ					+38			+34	
r					+45			+70	
T			22	50	30·57	22	58	21·20	
a			22	50	20·63	22	58	11·27	
Δ T					−9·94			−9·93	

$n = +35$
$\Delta T = -9.94$

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1867phae.proj..335L

Date											
Observer											
Illumin'n											
Star		Molyneux 1481			Fr. 32 42				1481		
Mag.											
δ											
Wire	a										
"	b										
"	c	22	51	26·9							
				30·9					1		
"	1			34·9	22	52	36·7	18	7	17·0	
"	2			38·6			40·6			21·0	
"	3			43·0			46·7			27·0	
"	4			47·0			51·6			31·0	
"	5						56·7			35·0	
"	d										
"	e										
"	f										
Sum											
Mean		22	51	34·93	22	52	46 66	18	7	17·0	
Red'n to											
m		22	51	24·99	22	52	36·72	18	7	7·30	
n. tan. δ		9	51	47·90	9	51	47·90	9	47	51·99	
c. sec. δ				15·32			15·13		1	1·90	
r		9	52	3·22	9	52	3·03	9	48	53·89	
							39·75				
T		8	43	28·21	8	44	~~33 69~~	3	56	1·19	
a		8	43	38	8	46	30	3	56	0	
Δ T				− 9·79		− 1	50·25			+1·19	

− 1 52·5
− 1 51·5
+ 1·0

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1867phae.proj..335L

Date		Oct 28		
Observer		A		
Illumin'n		E		
Star		ω Piscium	α Androm	γ Pegasi
Mag.				
δ				
Wire	a			
"	b			
"	c			
"	1	23 52 33·1	0 1 34·7	0 6 27·5
"	2	37·1	38·8	31·1
"	3	40·3	43·0	35·0
"	4	43·9	46·8	38·8
"	5	47·4	51·0	42·4
"	d			
"	e			
"	f			
Sum		201·8	214·3	174·8
Mean		23 52 40·36	0 1 42·86	0 6 34·96
Red'n to				
m		+75	+75	+75
n . tan. δ		−32	−15	−26
c . sec. δ		−50	−57	−50
r		−07	+03	−01
T		23 52 40·~~43~~ 29	0 1 42·89	0 6 34·95
a		23 52 32·15	0 1 34·63	0 6 26·71
Δ T		−8·~~28~~ 14	−8·26	−8·24

n = +40 assumed

ΔT = −8·21

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1867phae.proj..335L

Date		Oct 28 29		
Observer				
Illumin'n				
Star		Fr. 8421		
Mag.				
δ				
Wire	a			
"	b			
"	c			
"	1	18	15	46·0
"	2			51·1
"	3			55·9
"	4		16	1·0
"	5			5·9
"	d			
"	e			
"	f			
Sum				
Mean		18	15	55·98
Red'n to m		18	15	48·03
n . tan. δ		9	28	12·46
c . sec. δ			1	0·48
r		9	29	12·94
T		3	45	0·97
a		3	45	10
Δ T				−9·03

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1867phae.proj..335L

Date		Nov 5		
Observer		S		
Illumin'n		W		
Star		α Lyrae	Fr 3242	Fr 8421
Mag.				
δ				
Wire	a			
"	b			
"	c			
"	1	18 32 22·0	18 35 13·0	18 36 1·6
"	2	26·4	18·0	6·8
"	3	30·9	23·0	11·7
"	4	35·8	28·0	16·8
"	5	40·2	33·1	21·7
"	d			
"	e			
"	f			
Sum		155·3		
Mean		18 32 31·06	18 35 23·02	18 36 11·72
Red'n to			18 35 16·94	18 36 5·64
m		+76	41·11	
n. tan. δ		−04	9 0 ~~25~~ 41·11	9 0 41·11
c. sec. δ		+90	57·29	57·15
r		+1·62	3 36 55·34	3 37 43·90
T		18 32 32·68		
a		18 32 26·60	3 39 10	3 37 50
Δ T		−6·08	−2 14·66	−6·10

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Goodsham 8421

270 | 15·46 | 57
135
196

Date		Aug. dec		
Observer		Aug 18·31	+56·37	4·34
Illumin'n		19·33	+51·94	5·19
		20·44	+46·18	4·36
Star		21·40	+41·99	5·43
Mag.		24·43	+25·53	5·00
δ		25·43	+19·53	4·38
		26·42	+15·15	5·51
Wire	a	27·42	+9·64	6·20
"	b	28·42	+3·44	5·74
"	c	30·42	−8·05	7·08
		Sept 1·41	−22·20	4·22
"	1	3·41	−30·63	6·18
"	2	4·41	−36·81	5·88
"	3	6·40	−48·58	
"	4	9·18	−1 4·04	
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BY SPECIAL APPOINTMENT

CHARLES FRODSHAM,

Chronometer Maker,

CLOCK MAKER TO THE QUEEN,

SUCCESSOR TO ARNOLD, A.D. 1843, AND TO B. L. VULLIAMY, PALL MALL, 1854

No. 84, STRAND, CORNER OF CECIL STREET, LONDON.

MARINE & POCKET CHRONOMETERS, PLAIN & REPEATING WATCHES,

SPLIT SECONDS WATCHES. Church and Turret Clocks. ASTRONOMICAL CLOCKS, ETC.

CLOCKS WOUND, ETC., BY THE YEAR

The British Government have been pleased to award Messrs. Arnold and Charles Frodsham the sum of £3,170 for the excellence of the principle of their time keepers.

Professor Joseph Winlock &c &c &c

To CHARLES FRODSHAM.

1867				
July 11	To a first class Astronomical Regulator with 12 inch Sidereal dial - large Steel jar pendulum - Jewelled pallets, scape, and verge holes - pinions of 16. Fitted with Galvanic apparatus complete (£95) Charles Frodsham - No 1327	90	"	"
	3 packing cases and packing - - - - - - - - - -	3	10	"
	A deal Travelling case with lock and key for the movement, for the convenience of transport in the event of repairs being required with internal fitting to, &c, (The Key of this case is packed with the pendulum) - - - - - - - - - - - - - - -	1	17	6
	Consuls Certificate - - - - - - - - - - - - - -		11	6
	Freight and Shipping expenses - - - - - - - - -		4	1
	Insurance - - - - - - - - - - - - - - - - - - -	5	7	8
		£100	15	2

	ins		
Total length of Pendulum mean time - - - -	43.850		
ditto - - - of Jar - - - - - - - - - - - - - -	9.250		
Diameter of bob - - - - - - - - - - - - - - -	7.820		
ditto - - - of rod - - - - - - - - - - - - - -	.320		
ditto - - - of bob inside - - - - - - - - - -	2.400		
Length of pendulum Spring - Length .600 Breadth .460 Thick	.006		
Weight of Column of Mercury - - - - - - - - -	7.300		
Weights of - - - ditto - - - - - - - - - - - -	lbs 19		
Total weight of Pendulum - - - - - - - - - - -	lbs 23 oz 9½		
Angle of escapement - - - - - - - - - - - - -	.900		
Teeth embraced - - - - - - - - - - - - - - - -	10		
Weight of motive weight - - - - - - - - - - -	lbs 7		
Arc of vibration on each side of zero - - - - - -	1.90		
With galvanic in action - - - - - - - - -	1.90		
Without - - ditto - - - - - - - - - - - -	1.90		
Value of each division - - - - - - - - - - - -	.700		

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No 1 Case contains the movement

Directions for unpacking No 1

First take off the front – then the two inside pieces –

afterwards lift off the top which presses on the clock;

and the Movement and Seat board will pull out together

No 2. Contains the mahogany case, and Key of the movement case

No 3 Contains the pendulum

No 4 Contains the Mercury.

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