

**"Pseudo-MPEC" for P/21**Created 2018 Apr 19 21:31:43 UT using [Find\\_Orb](#)

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**Astrometry:**

<a href="#">0021P</a>	KC2018	02	12.84024	17	43	07.40	-01	00	39.3	19.5	To@8744	<a href="#">Q11</a>
<a href="#">0021P</a>	KC2018	02	12.85270	17	43	08.57	-01	00	33.8		o@8744	<a href="#">Q11</a>
<a href="#">0021P</a>	KC2018	02	13.82010	17	44	38.58	-00	53	31.5		o@8744	<a href="#">Q11</a>
<a href="#">0021P</a>	KC2018	02	13.84504	17	44	40.90	-00	53	20.7	19.3	To@8744	<a href="#">Q11</a>
<a href="#">0021P</a>	KC2018	02	15.37478	17	47	03.23	-00	41	49.7	20.3	Nq@8744	<a href="#">W96</a>
<a href="#">0021P</a>	KC2018	02	15.38077	17	47	03.79	-00	41	46.6	20.4	Nq@8744	<a href="#">W96</a>
<a href="#">0021P</a>	KC2018	02	15.38676	17	47	04.31	-00	41	43.9	20.2	Nq@8744	<a href="#">W96</a>
<a href="#">0021P</a>	KC2018	02	21.75339	17	56	57.43	+00	10	18.4		q@8744	<a href="#">Q11</a>
<a href="#">0021P</a>	KC2018	02	21.77759	17	56	59.66	+00	10	31.5	19.3	Tq@8744	<a href="#">Q11</a>
<a href="#">0021P</a>	KC2018	03	13.81461	18	28	06.23	+03	44	39.2		q@9215	<a href="#">Q11</a>
<a href="#">0021P</a>	KC2018	03	13.82603	18	28	07.26	+03	44	47.5		q@9215	<a href="#">Q11</a>
<a href="#">0021P</a>	KC2018	03	13.83602	18	28	08.16	+03	44	55.9	18.6	Tq@9215	<a href="#">Q11</a>
<a href="#">0021P</a>	KC2018	03	15.37236	18	30	30.99	+04	04	48.7	18.6	Nq@9215	<a href="#">W96</a>
<a href="#">0021P</a>	KC2018	03	15.37764	18	30	31.48	+04	04	53.2	18.4	Nq@9215	<a href="#">W96</a>
<a href="#">0021P</a>	KC2018	03	15.38291	18	30	31.93	+04	04	57.6	18.7	Nq@9215	<a href="#">W96</a>
<a href="#">0021P</a>	NC2018	03	17.76352	18	34	12.94	+04	36	41.0	18.3	Nq@9215	<a href="#">Q62</a>
<a href="#">0021P</a>	NC2018	03	17.76922	18	34	13.43	+04	36	46.2	18.3	Nq@9215	<a href="#">Q62</a>
<a href="#">0021P</a>	KC2018	03	24.16442	18	44	05.53	+06	08	10.9	20.1	Nq@9215	<a href="#">A77</a>
<a href="#">0021P</a>	KC2018	03	24.17019	18	44	05.86	+06	08	18.0	19.1	Nq@9215	<a href="#">A77</a>
<a href="#">0021P</a>	KC2018	04	12.10941	19	13	04.92	+11	35	50.6	18.1	N	<a href="#">I81</a>
<a href="#">0021P</a>	KC2018	04	12.11303	19	13	05.33	+11	35	54.8	18.2	N	<a href="#">I81</a>
<a href="#">0021P</a>	KC2018	04	12.11665	19	13	05.65	+11	35	59.2	18.5	N	<a href="#">I81</a>
<a href="#">0021P</a>	KC2018	04	18.12022	19	22	12.03	+13	38	38.4	16.6	N	<a href="#">I81</a>
<a href="#">0021P</a>	KC2018	04	18.12384	19	22	12.37	+13	38	44.0	16.6	N	<a href="#">I81</a>
<a href="#">0021P</a>	KC2018	04	18.12745	19	22	12.63	+13	38	48.6	17.0	N	<a href="#">I81</a>
<a href="#">0021P</a>	KC2018	04	18.13891	19	22	13.74	+13	39	03.2	17.1	N	<a href="#">970</a>
<a href="#">0021P</a>	KC2018	04	18.14424	19	22	14.23	+13	39	10.4	17.4	N	<a href="#">970</a>
<a href="#">0021P</a>	KC2018	04	19.08845	19	23	39.98	+13	59	20.6	15.2	N	<a href="#">K02</a>
<a href="#">0021P</a>	KC2018	04	19.09929	19	23	40.98	+13	59	33.1	17.5	N	<a href="#">K02</a>

**Station data:**

- (970) [Chelmsford \(N51.7448 E0.4954\)](#) UK. Observer N. James. 0.28-m f/10 Schmidt-Cassegrain + CCD.
- (A77) [Observatoire Chante-Perdrix, Dauban \(N43.9997 E5.6475\)](#) France.
- (I81) Tarbatness Observatory, Portmahomack ([N57.84417 W3.79889](#)) UK.
- (K02) Eastwood Observatory, Leigh on Sea ([N51.56885 E0.66761](#)) UK.
- (Q11) Shinshiro ([N34.98435 E137.52069](#)) Japan.
- (Q62) iTelescope Observatory, Siding Spring ([S31.27336 E149.06442](#)) Australia/NSW. 0.50-m f/6.8 astrograph + CCD + focal reducer, 0.70-m f/6.6 astrograph + CCD.
- (W96) CAO, San Pedro de Atacam ([since 2013](#)) (S22.95357 W68.17994) Chile.

**Orbital elements: P/21**

Perihelion 2018 Sep 10.289243 +/- 0.00494 TT = 6:56:30 (JD 2458371.789243)

Epoch 2018 Apr 19.0 TT = JDT 2458227.5 Earth MOID: 0.0178 Ju: 0.2576  
M 338.29375 +/- 0.017 [Find\\_Orb](#)  
n 0.15043566 +/- 0.000121 Peri. 172.80601 +/- 0.022  
a 3.50134986 +/- 0.00188 Node 195.40505 +/- 0.0052  
e 0.7105116 +/- 7.74e-5 Incl. 32.00080 +/- 0.0013  
P 6.55 M(N) 13.1 K 10.0 U 6.7  
q 1.01359997 +/- 0.000302 Q 5.98909975 +/- 0.00349  
From 29 observations 2018 Feb. 12-Apr. 19; mean residual 0".67

**Residuals in arcseconds:**

<a href="#">180212</a>	<a href="#">Q11</a>	.33-	.20-	<a href="#">180313</a>	<a href="#">Q11</a>	.16+	1.5-	<a href="#">180412</a>	<a href="#">I81</a>	.37+	.27+
<a href="#">180212</a>	<a href="#">Q11</a>	.02-	.08-	<a href="#">180313</a>	<a href="#">Q11</a>	.10-	.72-	<a href="#">180412</a>	<a href="#">I81</a>	.25+	.39+
<a href="#">180213</a>	<a href="#">Q11</a>	.18+	.09+	<a href="#">180315</a>	<a href="#">W96</a>	.12+	.38-	<a href="#">180418</a>	<a href="#">I81</a>	.12-	1.1-
<a href="#">180213</a>	<a href="#">Q11</a>	.45+	.12-	<a href="#">180315</a>	<a href="#">W96</a>	.20+	.02-	<a href="#">180418</a>	<a href="#">I81</a>	.08+	.09-
<a href="#">180215</a>	<a href="#">W96</a>	.40-	.48+	<a href="#">180315</a>	<a href="#">W96</a>	.30-	.24+	<a href="#">180418</a>	<a href="#">I81</a>	.86-	.10-
<a href="#">180215</a>	<a href="#">W96</a>	.30-	.84+	<a href="#">180317</a>	<a href="#">Q62</a>	.00	.41-	<a href="#">180418</a>	<a href="#">970</a>	.21+	.52-
<a href="#">180215</a>	<a href="#">W96</a>	.80-	.80+	<a href="#">180317</a>	<a href="#">Q62</a>	.49-	.14+	<a href="#">180418</a>	<a href="#">970</a>	.39+	.12-
<a href="#">180221</a>	<a href="#">Q11</a>	.87+	.77-	<a href="#">180324</a>	<a href="#">A77</a>	1.3+	.64+	<a href="#">180419</a>	<a href="#">K02</a>	.10+	1.1+
<a href="#">180221</a>	<a href="#">Q11</a>	.66+	.38-	<a href="#">180324</a>	<a href="#">A77</a>	1.7-	2.5+	<a href="#">180419</a>	<a href="#">K02</a>	.48+	.37-
<a href="#">180313</a>	<a href="#">Q11</a>	.46+	1.1-	<a href="#">180412</a>	<a href="#">I81</a>	.84-	.35+				

**Ephemerides for (970) Chelmsford:**

Date (UTC)	RA	Dec	delta	r	elong	mag	'/hr	PA	"	sig	PA
2018 04 20	19 25 02.719	+14 18 59.57	1.7535	2.0687	93.2	17.5	1.29	45.2	0.2	155	
2018 04 21	19 26 33.394	+14 40 49.56	1.7371	2.0596	93.5	17.4	1.29	44.8	0.2	157	
2018 04 22	19 28 04.021	+15 02 55.21	1.7207	2.0506	93.9	17.4	1.30	44.4	0.2	159	
2018 04 23	19 29 34.608	+15 25 16.54	1.7044	2.0415	94.2	17.4	1.31	44.0	0.3	161	
2018 04 24	19 31 05.161	+15 47 53.58	1.6883	2.0324	94.6	17.3	1.31	43.6	0.3	162	
2018 04 25	19 32 35.687	+16 10 46.34	1.6722	2.0234	94.9	17.3	1.32	43.2	0.3	163	
2018 04 26	19 34 06.195	+16 33 54.86	1.6562	2.0143	95.2	17.2	1.33	42.8	0.4	164	
2018 04 27	19 35 36.691	+16 57 19.16	1.6404	2.0052	95.5	17.2	1.33	42.4	0.4	165	
2018 04 28	19 37 07.182	+17 20 59.26	1.6246	1.9960	95.8	17.2	1.34	42.0	0.5	166	
2018 04 29	19 38 37.675	+17 44 55.18	1.6090	1.9869	96.1	17.1	1.35	41.6	0.5	167	
2018 04 30	19 40 08.177	+18 09 06.95	1.5935	1.9778	96.4	17.1	1.35	41.2	0.6	168	
2018 05 01	19 41 38.694	+18 33 34.57	1.5781	1.9686	96.7	17.0	1.36	40.9	0.7	169	
2018 05 02	19 43 09.232	+18 58 18.05	1.5627	1.9595	97.0	17.0	1.37	40.5	0.7	170	
2018 05 03	19 44 39.797	+19 23 17.37	1.5475	1.9503	97.2	17.0	1.38	40.1	0.8	171	
2018 05 04	19 46 10.394	+19 48 32.53	1.5325	1.9411	97.5	16.9	1.38	39.7	0.9	171	
2018 05 05	19 47 41.032	+20 14 03.49	1.5175	1.9319	97.7	16.9	1.39	39.4	0.9	172	
2018 05 06	19 49 11.715	+20 39 50.21	1.5026	1.9228	98.0	16.8	1.40	39.0	1.0	173	
2018 05 07	19 50 42.451	+21 05 52.65	1.4879	1.9136	98.2	16.8	1.40	38.7	1.1	174	
2018 05 08	19 52 13.247	+21 32 10.73	1.4732	1.9044	98.5	16.7	1.41	38.3	1.2	174	
2018 05 09	19 53 44.112	+21 58 44.40	1.4587	1.8951	98.7	16.7	1.42	38.0	1.3	175	
2018 05 10	19 55 15.055	+22 25 33.55	1.4443	1.8859	98.9	16.7	1.43	37.6	1.4	176	
2018 05 11	19 56 46.083	+22 52 38.09	1.4300	1.8767	99.1	16.6	1.43	37.3	1.5	176	
2018 05 12	19 58 17.208	+23 19 57.90	1.4159	1.8675	99.3	16.6	1.44	37.0	1.6	177	
2018 05 13	19 59 48.440	+23 47 32.84	1.4018	1.8582	99.5	16.5	1.45	36.7	1.7	178	
2018 05 14	20 01 19.793	+24 15 22.78	1.3879	1.8490	99.7	16.5	1.45	36.3	1.8	178	
2018 05 15	20 02 51.280	+24 43 27.54	1.3740	1.8397	99.8	16.4	1.46	36.0	1.9	179	
2018 05 16	20 04 22.917	+25 11 46.94	1.3603	1.8305	100.0	16.4	1.47	35.7	2.0	179	
2018 05 17	20 05 54.723	+25 40 20.81	1.3468	1.8212	100.2	16.4	1.48	35.4	2.2	0	
2018 05 18	20 07 26.718	+26 09 08.95	1.3333	1.8120	100.3	16.3	1.48	35.2	2.3	1	
2018 05 19	20 08 58.924	+26 38 11.17	1.3200	1.8027	100.4	16.3	1.49	34.9	2.4	1	
2018 05 20	20 10 31.368	+27 07 27.27	1.3067	1.7934	100.6	16.2	1.50	34.6	2.6	2	
2018 05 21	20 12 04.074	+27 36 57.08	1.2936	1.7841	100.7	16.2	1.50	34.4	2.7	2	
2018 05 22	20 13 37.072	+28 06 40.39	1.2807	1.7749	100.8	16.1	1.51	34.1	2.9	3	
2018 05 23	20 15 10.389	+28 36 37.04	1.2678	1.7656	100.9	16.1	1.52	33.9	3.1	3	
2018 05 24	20 16 44.055	+29 06 46.84	1.2551	1.7563	101.0	16.0	1.53	33.7	3.2	4	
2018 05 25	20 18 18.102	+29 37 09.60	1.2424	1.7470	101.1	16.0	1.53	33.4	3.4	4	
2018 05 26	20 19 52.559	+30 07 45.13	1.2299	1.7377	101.1	16.0	1.54	33.2	3.6	5	
2018 05 27	20 21 27.460	+30 38 33.24	1.2176	1.7285	101.2	15.9	1.55	33.0	3.8	6	
2018 05 28	20 23 02.837	+31 09 33.72	1.2053	1.7192	101.2	15.9	1.55	32.8	4.0	6	
2018 05 29	20 24 38.723	+31 40 46.36	1.1931	1.7099	101.3	15.8	1.56	32.7	4.3	7	
2018 05 30	20 26 15.155	+32 12 10.93	1.1811	1.7006	101.3	15.8	1.57	32.5	4.5	7	
2018 05 31	20 27 52.168	+32 43 47.19	1.1692	1.6913	101.3	15.7	1.57	32.3	4.7	8	
2018 06 01	20 29 29.801	+33 15 34.89	1.1574	1.6821	101.3	15.7	1.58	32.2	5.0	8	