

**Phobos-Grunt (2011-065A / 37872)**  
**Estimated Time and Location of Orbit Manoeuvres**  
**TLE Intersection and Theoretical**  
 Ted Molczan, 2012 Jan 30

TLE Epoch - UTC				Intersection <sup>1</sup>		MET	Interval	TLE Intersection			Theoretical			
#	Pre-manoevre		Post-manoevre		UTC		h	h	v <sup>2</sup> deg	ψ <sup>3</sup> deg	ΔV m/s	v <sup>2</sup> deg	ψ <sup>3</sup> deg	ΔV m/s
1	11314.77184893	Nov 10 18:31	11314.95914282	Nov 10 23:01	11314.84184028	Nov 10 20:12	47.9		12	33.4	1.8	18	36.9	1.5
2	11315.20886687	Nov 11 05:00	11315.83319279	Nov 11 19:59	11315.22211806	Nov 11 05:19	57.1	9.1	43	50.0	2.0	60	51.2	1.3
3	11315.83319279	Nov 11 19:59	11316.83198086	Nov 12 19:58	11315.96603009	Nov 11 23:11	74.9	17.9	8	35.0	1.4	37	49.3	1.3
4	11317.01923030	Nov 13 00:27	11317.51854193	Nov 13 12:26	11317.09312500	Nov 13 02:14	102.0	27.1	23	46.4	1.7	21	45.0	1.6
5	11318.01776824	Nov 14 00:25	11319.07858799	Nov 15 01:53	11317.99912037	Nov 13 23:58	123.7	21.7	204	-48.5	2.2	176	-33.6	2.0
6	11319.45294171	Nov 15 10:52	11320.26397368	Nov 16 06:20	11319.61592593	Nov 15 14:46	162.5	38.8	165	-31.5	2.0	176	-38.8	2.1
7	11320.95017989	Nov 16 22:48	11321.19968266	Nov 17 04:47	11320.90509259	Nov 16 21:43	193.5	30.9	38	50.2	2.4	31	51.1	2.2
8	11322.75889401	Nov 18 18:12	11323.81919508	Nov 19 19:39	11322.68038194	Nov 18 16:19	236.1	42.6	194	-51.5	2.5	177	-47.3	2.5
9	11324.06863358	Nov 20 01:38	11324.38045015	Nov 20 09:07	11323.96035880	Nov 19 23:02	266.8	30.7	17	51.2	1.3	19	50.6	1.3
10	11324.69226042	Nov 20 16:36	11325.19110916	Nov 21 04:35	11324.83714120	Nov 20 20:05	287.8	21.0	33	43.8	3.0	35	42.9	2.6
											20.3			18.3

<sup>1</sup> Intersection between pre and post-manoevre TLEs is the apparent time of manoeuvre, assuming a single impulse.

<sup>2</sup> True anomaly at manoeuvre.

<sup>3</sup> Latitude at manoeuvre.