

## Observations of artificial satellites (\*)

*from 1 Sept. 1960 to 31 Aug. 1962*

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SUMMARY. --- The following publication gives the results of photographic observations of artificial satellites made at Asiago during the second and third year of this programme. The fixed camera technique and that with moving film (the latter still in its experimental stage) have been used.

RIASSUNTO. — La seguente nota riporta i risultati delle osservazioni fotografiche di satelliti artificiali, fatte ad Asiago durante il secondo e terzo anno di questo programma. Sono state usate le tecniche della camera fissa e quella del film mobile (quest'ultima ancora in fase sperimentale).

The second and third year of observations, which are summarized in this report, cover the period 1 September 1960 to 31 August 1962.

As stated in previous papers <sup>(1)</sup> <sup>(2)</sup>, a great number of satellite passages, even visible to naked eye, are not recordable by a stationary K-37 camera. The limiting magnitude for satellites whose angular velocity, relative to the observer, is about 0°.5/sec, can hardly reach 3.0-3.5. It is for this that a tracking method has been devised to record faint satellites by transporting the film at such a velocity that for a 7° arc of the satellite's motion its image is formed almost in the same point on the emulsion, in the centre of the field of the camera <sup>(3)</sup> <sup>(4)</sup>. This latter is oriented so that the motion of its film is parallel to that of the satellite.

Four faint satellites, which did not produce any trail in the stationary configuration, have been recorded by moving the film, though the

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(\*\*) Sezione di Asiago del Centro di Studio del CNR per l'Astrofisica. Lavoro eseguito con il contributo del CNR.

driving system could not follow the satellite motion exactly. Even with a tracking error of 4%, a satellite as faint as 5.5 magnitude has been recorded. With an electronically controlled driving mechanism, capable of a tracking error lower than 1%, satellites as faint as the 7-8th magnitude may be recorded.

The table summarizes the work of observation. 21 different satellites have been observed. Positive results were obtained from 14 of them. Predictions were also arranged for some other satellites, that were not photographed owing to bad weather. The total number of obtained photographs was 198. On 123 of them trails were found, with 62% positive results. By excluding the very bright satellite 1960 Iota 1 (Echo 1), the photographs were 97 and the trails 22, with 23% favourable cases. The total number of calculated positions was 186. The accuracy for the positions given in the horizontal system is rather poor, about 0.5.

Preliminary data on the recorded trails were transmitted to Space Track Control Center, Bedford, Massachusetts, and later to Goddard Space Flight Center, Greenbelt, Maryland, and to Cosmos, Moscow.

The observing work was carried out by Mr. V. Pertile and by the writer. Pertile and Rigoni were in charge of the mechanical control of the instruments.

During the last months the ephemerides issued by the U.S. Air Research Centers were found to be very accurate. The predicted times of satellite passages agreed within a few seconds with the observed passages. In the first year of our programme the differences were some times as large as 90 seconds or more. Almost all of the predicted passages occurred within the 7° field of the finding binocular attached to the camera, by using the methods described in (5). This suggests that Schmidt telescopes, with focal ratio 2.5 (or faster) and 6° field, are well suitable for photographic tracking of satellites, even without a rotating shutter. With the help of a 7° finder the timing may be obtained manually. The 400/500/1.000 mm Schmidt telescope of Asiago might record satellites as faint as 5.5 magnitude at 0.5/sec, with a gain of two magnitudes on the K-37 camera. Another suitable telescope is the 200/300/300 mm Schmidt, with field flattening lens, reported in the "Astro 60" catalogue of Zeiss, Jena. This very fast telescope ( $f/d = 1.5$ ) could record satellites as faint as 4.5 magn. at 0.5/sec, i.e. one magnitude fainter than that obtainable with the K-37 camera. It allows for moving the plate holder in order to follow the satellite motion, thus increasing the efficiency of the system in tracking faint satellites.

ASTROPHYSICAL OBSERVATORY - Asiago (Italy) Lat. + 45°51'43".2 ± 0".4 — Long. — 0<sup>h</sup>46<sup>m</sup>06<sup>s</sup>.89 ± 0<sup>s</sup>.02 — Alt. 1036.6

PRELIMINARY POSITIONS OF ARTIFICIAL SATELLITES OBSERVED FROM SEPTEMBER 1, 1960 TO AUGUST 31, 1962

Satellite	Date	Film No.	U.T.(O)	1950.0		Remarks
				Decl. (h)	R.A. (A)	
<i>1960 Gamma 1</i> (Rocket body Transit 1B) Launch: 13 Apr. 1960 Decay : 18 Aug. 1961 Photographs: 10 Visual observ.: 6 Recorded trails.: 1 Phot. Positions: 3	22 Jan. 1961	195	17 36 16.23	+ 55°18'	05 05.6	Pulsating. Brightest magn.: 2.5
			17 36 25.67	+ 54 26	05 45.5	
			17 36 40.10	+ 52 02	06 35.1	
<i>1960 Sigma 1</i> (Discoverer XVIII) Launch : 7 Dec. 1960 Decay : 2 Apr. 1961 Photographs: 1 Visual observ.: 1 Recorded trails.: none Phot. Positions: none	27 Jan. 1961	197	16 58 14	h 37°5	A. 253°	Twilight glow. Magn.: 1.5 Vel. 1°.5/s. No trail. No further passages occurred for Asiago.
<i>1961 Zeta 1</i> (Discoverer XXI) Launch: 18 Feb. 1961 Decay : 20 Apr. 1962 Photographs: 3 Visual observ.: 2 Recorded trails.: 1 Phot. Positions: 2	13 Aug. 1961	286	2 32 57.39	+ 21 22	21 23.3	Long trail
			2 33 40.07	+ 27 47	20 54.4	

Satellite	Date	Film No.	U.T.(O)	1950.0		Remarks
				Decl. (h)	R.A. (A)	
1961 <i>Lambda 1</i> (Discoverer XXIII) Launch: 8 Apr. 1961 Decay : 16 Apr. 1962 Photographs: 5 Visual observ.: 2 Recorded trails.: 1 Phot. Positions: 1	16 Jun. 1961	254	0 38 50	h 38°	A 255	Magn.: 4.3 Vel. 0° .45/s Tracking film. No trail. Time difference from Spadats prediction: (O-C) = + 3 <sup>m</sup> 10 <sup>s</sup> .
	20 Jun. 1961	262	1 21 53.28	+ 16 02	15 48.7	Pulsating between 6 & 4 magn. Vel. 0° .37/s Tracking film with error 4%. The sat. produced a trail only during film motion.
1961 <i>Epsilon 1</i> (Discoverer XX) Launch: 17 Feb. 1961 Decay : 28 Jul. 1962 Photographs: 1 Visual observ.: 1 Recorded trails.: 1 Phot. Positions: 2	1 Sep. 1961	291	( 19 44 24.78 ( 19 44 30.27	+ 34 58 + 37 31	22 05.7 22 15.5	
	23 May 1962 7 Jul. 1962	340 352	20 32 12.61 20 33 43.24	- 04 53 + 29 37	11 25.3 17 16.9	Magn.: 3-4. Faint trail. Pulsating. Period deduced on photographic trail: 0° .4.
1962 <i>Nu 2</i> (Rocket body Cosmos III) Launch: 24 Apr. 1962 Decay : 5 Aug. 1962 Photographs: 1 Visual observ.: 2 Recorded trails.: 1 Phot. Positions: 1						

Satellite	Date	Film No.	U.T.(O)	1950.0		Remarks
				Decl. (h)	R.A. (A)	
1962 <i>Theta</i> 1 (Cosmos I)  Launch: 16 Mar. 1962 Decay : 25 May 1962 Photographs: 3 Visual observ.: 3 Recorded trails.: none Phot. positions : none	7 Apr. 1962	325	2 37 25.0	h 48°	A 25°	Magn.: 7-8. No trail. Magn.: 8. No trail.
	11 Apr. 1962	329	2 40 35.9	h 39°	A 103	
1962 <i>Theta</i> 2 (Rocket body Cosmos I)  Launch: 16 Mar. 1962 Decay : 18 Jun. 1962 Photographs: 5 Visual observ.: 4 Recorded trails.: 2 Phot. positions: 2	8 Apr. 1962	327	3 22 06.9	+ 24 04	13 19.5	Pulsating 2.5-4.0 magn. Pulsating. Magn. 2-4. Magn.: 3.5, pulsating. No trail. Magn.: 4-5. Veils. No trail.
	12 Apr. 1962	330	2 11 30.78	+ 57 50	13 44.8	
	5 May 1962	338	20 44 03.1	h 37°.5	A 27°	
	8 Jun. 1962	439	2 04 36.2	h 28°	A 91	
1960 <i>Epsilon</i> I (Sputnik IV cabin)  Launch: 15 May 1960 In orbit. Photographs: 15 Visual observ.: 11 Recorded trails.: 4 Phot. positions: 6	30 Dec. 1960	188	17 10 50.6	+ 41 42	6 10.3	Magn.: 4.0. No trail. Magn.: 6.7. No trail. Magn.: 4.5. Veils. No trail. Faint long trail. Magn.: 4.5  Out of binocular's field.  No trail. Magn.: 2.5 No trail.
	16 Mar. 1961	231	18 58 13.0	h 29°	A 225°.4	
	20 Apr. 1961	240	1 49 37	h 37°.5	A 213	
	1 Jun. 1961	250	21 21 12.6	h 79°	A 234	
	7 Aug. 1961	277	2 40 29.89	+ 5 26	21 27.2	
	29 Aug. 1961	289	19 19 41.37	+ 51 51	18 39.2	
	28 Nov. 1961	301	19 19 45.43	+ 48 43	18 52.4	
	2 Apr. 1962	324	19 19 47.95	+ 46 52	18 59.5	
	25 Apr. 1962	333	16 28	h 83°	A 55°	
			18 30 16.68	+ 12 07	10 02.5	
		19 32 34.0	h 29°	A 230°		

Satellite	Date	Film No.	U.T.(O)	1950.0		Remarks
				Decl. (h)	R.A. (A)	
1960 <i>Epsilon 3</i> (Metal object Spu. IV) Launch: 15 May 1960 In orbit. Photographs: 13 Visual observ.: 8 Recorded trails.: 3 Phot. positions: 4	5 Oct. 1960	163	18 15 33.5	+ 51 35	1 04.4	Faint trail. Ang. vel. 0°.7/s
	2 Jun. 1961	251	21 13 42.8	h 39°.5	A 229	Veils.
	15 Dec. 1961	304	5 16 26.(0)	+ 6 56	9 50.7	Faint trail: posit. uncertain
	23 Jan. 1962	305	(17 36 05.70	+ 32 00	3 42.9	Magn.: 4
	10 Apr. 1962	328	(17 36 16.13	+ 34 36	3 55.8	Magn.: 3.0. No trail.
			19 14 11.9	h 75°	A 305	
1960 <i>Eta 3</i> (Rocket body Transit-2A) Launch: 22 Jun. 1960 In orbit. Photographs: 9 Visual observ.: 7 Recorded trail: 1 Phot. positions: 1	27 Jun. 1960	97	22 44 54	h 36°	A 58°	Tracking film system. Magn.: 5.0. Vel. 0°.5/s. Film nel. 0°.47/s. Tracking error 6%. A trail was recorded only during the motion of the film.
	1 Jul. 1961	263	21 15 33.67	+ 35°02'	18 40.3	
1960 <i>Iota 1</i> (Echo 1) Launch: 12 Aug. 1960 In orbit Photographs: 101 Visual observ.: 101 Recorded trails.: 101 Phot. positions: 157	4 Aug. 1961	274	22 07 15.7	h 70°	A 345°	Stationary film. Magn.: 4.5.
	7 Sep. 1960	154	(19 14 30.1	+ 33°59'	16 09.0	Mean magnitude = 0.
			(19 55 24.7	+ 34 58	17 03.6	
	10 » »		(18 45 05.4	+ 32 37	14 12.1	
			(18 46 14.4	+ 36 40	15 03.9	
11 » »		(18 25 22.1	+ 40 50	17 06.8		
11 » »		(18 26 05.3	+ 38 45	18 08.1		
11 » »		159	18 32 00.5	+ 01 04	22 22.0	Trail without timing breakings, for photometric purposes only.

Satellite	Date	Film No.	U.T.(O)	1950.0		Remarks
				Decl. (h)	R.A. (A)	
1960 Iota 1 (cont'd)	12 Sep. 1960	160	(20 03 20.1 20 04 59.0)	+ 16 17 + 12 34	15 37.2 16 39.7	
	13 » »	161	(19 41 18.7 19 41 58.9)	+ 15 49 + 14 05	15 54.2 16 21.4	
	18 Oct. 1960	165	(03 24 43.6 03 26 27.4)	+ 14 27 + 20 38	07 22.9 08 29.4	
	22 » »	167	(01 42 41.7 01 44 42.4)	+ 13 34 + 18 11	07 40.9 08 41.2	
	31 » »	168	(01 52 04.9 01 57 42.2)	+ 43 20 + 25 01	08 19.6 10 54.4	
	7 Nov. 1960	169	(02 45 51.1 02 47 13.5)	+ 44 56 + 40 51	05 55.1 07 12.3	
	14 » »	170	18 43 05.5	— 29 56	22 54.9	(O-C) (Sp. Track prediction): — 4 <sup>m</sup> 30 <sup>s</sup> .
	18 » »	171	18 50 53.3	— 13 47	21 52.0	As above
	20 » »	172	(17 54 59.8 17 56 00.5)	— 06 19 — 00 18	23 12.7 23 52.3	
	25 » »	173	(17 30 53.9 17 31 23.4)	+ 19 37 + 22 22	23 23.7 23 52.5	
	26 » »	174	(18 59 52.6 19 02 39.9)	+ 16 39 + 36 48	19 54.1 21 29.0	
	29 » »	175	(17 32 46.4 17 33 29.3)	+ 39 37 + 43 01	22 31.1 23 34.3	
	30 » »	176	(17 01 41.7 17 02 23.1)	+ 32 25 + 37 20	21 47.3 22 43.2	
	1 Dec. 1960	177	18 35 55.4	+ 53 36	00 36.6	
	2 » »	178	(18 04 59.8 18 05 41.5)	+ 53 29 + 50 23	00 34.3 01 41.5	

Satellite	Date	Film No.	U.T.(O)	1950.0		Remarks
				Decl. (h)	R.A. (A)	
1960 Iota 1 (cont'd)	3 Dec. 1960	179	{ 17 32 14.4 17 33 50.1	+ 49 10 + 53 03	21 23.7 00 22.5	
	4 » »	180	{ 17 00 37.6 17 01 37.1	+ 45 07 + 51 42	20 39.3 22 22.3	
	7 » »	181	{ 17 30 19.2 17 31 24.3	+ 53 41 + 47 04	23 12.4 01 06.6	
	11 » »	182	{ 17 24 27.4 17 25 14.2	+ 39 00 + 33 30	23 27.9 00 33.3	
	15 » »	184	17 16 27.6	+ 10 46	00 05.5	
	21 » »	185	{ 17 56 16.9 17 59 04.3	— 09 15 — 21 50	20 48.6 22 19.9	
	23 » »	186	{ 16 49 04.2 16 50 26.1	— 09 41 — 16 47	20 45.7 21 40.5	
	28 Jan. 1961	198	{ 03 45 04.06 03 46 18.82	+ 47 03 + 41 10	12 51.5 14 21.8	
	5 Feb. 1961	200	{ 20 05 37.07 20 05 57.96	— 18 11 — 17 01	05 16.7 05 23.5	
	8 » »	201	{ 18 23 28.89 18 24 44.90	— 01 55 + 02 31	07 29.0 07 58.0	
	9 » »	202	{ 19 46 22.76 19 47 02.58	+ 03 15 + 06 24	05 26.7 05 45.5	
	10 » »	203	{ 19 12 26.22 19 14 25.22	+ 09 57 + 17 47	06 34.6 07 41.0	
	11 » »	204	{ 18 36 16.47 18 36 48.66	+ 06 11 + 08 27	06 32.3 06 48.7	
	12 » »	205	{ 20 03 18.76 20 04 32.97	+ 32 36 + 36 47	06 21.3 07 19.6	
14 » »	206	{ 18 50 02.06 18 50 34.02	+ 20 51 + 23 07	05 45.2 06 05.3		



Satellite	Date	Film No	U.T.(O)	1950.0		Remarks
				Decl. (h)	R.A. (A)	
<i>1960 Iota 1</i> (cont'd)	15 Feb. 1961	207	{ 18 12 17.75 18 14 26.36	+ 08 48	04 48.7	
	16 » »	208	{ 19 40 15.18 19 41 24.71	+ 37 50 + 42 54	04 57.7 05 57.8	
	17 » »	209	{ 19 04 28.42 19 04 54.33	+ 37 22 + 39 08	05 19.3 05 42.1	
	18 » »	211	{ 18 28 07.91 18 28 15.86	+ 33 20 + 33 54	05 12.4 05 19.0	Not reduced.
	18 » »	212	18 29			
	19 » »	213	{ 17 52 02.57 17 52 29.22	+ 29°36' + 31 20	05 15.3 05 38.0	Not reduced.
	19 » »	214	19 57			Test for tracking film system
	24 » »	217	18 57			Test tracking film system.
	25 » »	218	18 21			Test tracking film system.
	26 » »	219	19 49			Tracking film system.
	4 Mar. 1961	221	18 14 28.04	+ 43 48	04 58.7	Poor trail. Tracking film.
	4 » »	223	20 18 33.38	+ 11 39	06 00.5	Tracking film.
	6 » »	224	{ 19 04 40.70 19 07 37.01	+ 22 04 + 13 17	05 14.1 06 41.3	Poor trail. Tracking film.
	7 » »	226	20 28			Veils. No stars near the trail.
	9 » »	227	{ 19 20 33.33 19 22 50.16	+ 02 23 - 07 00	05 17.2 06 25.6	
	1 May 1961	241	{ 22 59 03.68 22 59 40.80	+ 41 17 + 43 13	14 27.1 15 11.2	Full Moon.
	3 » »	243	20 35 45.59	+ 27 47	15 28.6	Full Moon. Veils. Poor trail.
	5 » »	244	{ 21 24 07.04 21 24 34.03	+ 44 05 + 44 41	14 04.3 14 35.6	Veils.
	7 » »	245				

Satellite	Date	Film No.	U.T.(O)	1950.0		Remarks
				Decl. (h)	R.A. (A)	
1960 Iota 1 (cont'd)	9 May 1961	246	{ 21 13 56.74 21 15 04.12	+ 52 38	13 41.8	
	10 » »	247	{ 21 37 30.63 21 38 01.44	+ 52 02	15 18.1	
	12 » »	248	{ 22 27 44.43 22 28 30.66	+ 51 59	13 40.1	
	2 Aug. 1961	272	{ 21 53 15.86 21 53 50.18	+ 49 42	14 23.4	
	4 » »	273	{ 20 35 17.27 20 37 01.94	+ 47 50	14 03.7	
	5 » »	274b	19 59	+ 49 04	15 05.1	
	5 » »	275	22 01	+ 49 04	19 34.4	
	6 » »	276	21 22	+ 49 41	20 24.1	
	7 » »	278	{ 20 48 26.40 20 49 29.95	+ 30 <sup>o</sup> 54'	16 57.3	Not reduced.
	8 » »	279	{ 22 10 02.58 22 11 53.35	+ 40 46	18 55.5	Not reduced.
	9 » »	280	{ 21 31 42.42 21 33 27.53	+ 36 49	22 10.1	Not reduced.
	10 » »	282	{ 20 55 03.08 20 55 54.80	+ 49 06	22 53.9	
	11 » »	284	20 16	+ 45 57	18 21.1	
	17 » »	287	{ 20 31 46.37 20 32 30.05	+ 50 47	20 58.3	
	28 » »	288	{ 19 31 47.96 19 33 31.41	+ 49 37	17 45.1	
	29 Oct. 1961	293	{ 18 20 49.96 18 21 15.63	+ 51 56	20 27.4	
				+ 47 27	19 56.2	
				+ 38 48	21 06.6	Not reduced.
				+ 35 35	18 12.1	
				+ 04 34	19 06.6	
				— 04 10	15 46.6	
				— 03 46	17 00.3	
				— 01 31	23 14.2	
					23 28.6	

Satellite	Date	Film No.	U.T.(O)	1950.0		Remark.	
				Decl. (h)	R.A. (A)		
1960 Iota 1 (cont'd)	31 Oct. 1961	294	(18 53 30.51 18 54 05.45 18 10 47.54 18 12 14.83 17 26 55.03 17 28 23.78 17 16 52.10 17 17 16.96 17 57 39.99 17 58 21.06 18 29 25.49 18 29 39.27 18 09 54.79 18 10 36.61 19 13 25.67 19 15 19.92 18 26 39.66 18 27 56.93 18 06 48.24 18 07 15.07 17 20 34.59 17 21 19.34 18 34 15.57 18 35 00.92 19 03 00.12 19 03 59.00 18 43 35.74 18 44 26.45	+ + + + + + + + + + + + + + + +	04 27 06 29 04 32 12 37 01 52 06 06 11 56 14 15 53 27 52 33 44 21 43 29 02 <sup>003</sup> ' 06 01 16 15 24 02 11 37 17 00 19 30 21 31 15 54 18 37 33 38 37 26 47 48 49 52 50 02 51 55	21 36.1 21 57.2 22 27.0 23 28.3 22 30.4 23 26.7 22 21.5 22 41.5 21 52.3 23 04.7 22 35.1 22 54.5 20 35.8 21 03.0 04 23.8 05 33.9 04 42.0 05 28.6 04 06.3 04 24.8 04 37.3 05 05.3 03 25.2 04 09.6 03 54.1 05 02.5 03 16.0 04 18.7	
		1 Nov. 1961	296				
		2 » »	297				
		5 » »	298				
		15 » »	299				
		17 » »	300				
		28 » »	302				
		23 Jan. 1962	306				
		24 » »	307				
		27 » »	309				
		28 » »	310				
		29 » »	311				
		31 » »	313				
		3 Feb. 1962	314				

Eclipse in the field.

Satellite	Date	Film No.	U.T.(O)	1950.0		Remarks
				Decl. (h)	R.A. (A)	
<i>1960 Iota 1</i> (cont'd)	6 Feb. 1961	315	(18 23 19.32 18 25 15.07	+ 52 25 + 51 31	03 52.2 05 05.6	
	14 » »	316	(18 16 26.63 18 17 38.03	+ 33 38 + 28 51	03 27.0 04 31.7	
	18 » »	318	(19 11 10.84 19 15 11.15	+ 08 36 — 06 45	02 08.1 04 08.0	
	24 Apr. 1962	332	20 04 43.2	+ 51 32	12 19.9	
	27 » »	334	(19 46 22.23 19 47 43.39	+ 47 13 + 38 32	13 23.7 14 31.2	
	5 May 1962	337	(19 33 58.47 19 34 33.62	+ 34 28 + 31 49	10 47.6 11 20.9	
	28 Jun. 1962	350	(20 48 52.7 20 49 26.8	+ 25 32 + 28 00	19 44.3 20 12.5	
	6 Jul. 1962	351	(23 19 19.77 23 19 46.28	+ 49 50 + 50 22	19 05.1 19 40.7	
	7 » »	353	(22 27 17.05 22 27 58.47	+ 40 <sup>00</sup> 1' + 43 22	17 21.5 18 03.9	
	9 » »	355	(22 20 59.38 22 51 18.49	+ 52 00 + 52 16	18 39.6 19 07.0	
	10 » »	356	21 58			
	11 » »	357	21 08			
	25 » »	358	21 45			
	26 » »	360	20 54			
	31 » »	363	20 44			
	31 » »	364	20 47			
	8 Aug. 1962	365	(20 07 27.9 20 08 20.3	— 15 52 — 19 36	14 46.2 15 10.3	

Only one star near to the trail  
Veils. No stars close to the trail.

No stars close to the trail.  
No stars close to the trail.  
Moon. Poor images.

No stars close to the trail.

Satellite	Date	Film No.	U.T.(O)	1950.0		Remarks
				Decl. (h)	R.A. (A)	
<p><i>1960 Iota 2</i> (Rocket body Echo 1) Launch: 12 Aug. 1960 In orbit. Photographs: 2 Visual observ.: 1 Recorded trails.: none. Phot. positions.: none.</p>	17 Feb. 1961	210	19 44 29.4	h 70°	A 267°3	Magn.: 7.7. No trail.
<p><i>1960 Nu 2</i> (Rocket body Courier 1) Launch: 4 Oct. 1960 In orbit. Photographs: 4 Visual observ.: 3 Recorded trails.: none Phot. positions.: none</p>	17 Jan. 1961 18        " 7 Mar. 1961	193 194 225	17 31 03.5 18 24 36.1 18 37 27.6	h 13°5 h 12° h 14°	A 334° A 348° A 341°	Magn.: 5. No trail. Magn.: 7-8. No trail. Magn.: 7-8. Tracking film system; vel. 0°.2/s. No trail.
<p><i>1961 Alfa I</i> (Samos II) Launch: 31 Jan. 1961 In orbit. Photographs: 8 Recorded trails.: 2 Phot. positions.: 2 Visual observ.: 5</p>	15 Jun. 1961	253	22 39 58.1	+ 46°30'	17 55.4	Orbit inclination 97°.40; retrograde motion. Magn.: 2.9. Vel. 0°.88/s. Tracking film velocity 1°.17/s. Tracking error: 30%. Only during the motion of the film the satellite gave a photographic trail. Tracking film. Vel. 0°.84/s Magn.: 3.5. Only during the motion of the film the satellite produces a trail.
	8 Jul. 1961	266	22 51 27.06	+ 44 41	16 50.4	
	6 Jun. 1962	348	22 31 51.5	h 72°	A 323°	

Satellite	Date	Film No.	U.T.(O)	1950.0		Remarks
				Decl. (h)	R.A. (A)	
<p><i>1961 Delta I</i> (Explorer IX)</p> <p>Launch: 16 Feb. 1961 In orbit. Photographs: 4 Visual observ.: 4 Recorded trails.: none Phot. positions: none</p>	15 . 1961	230	19 31 06.4	h 46°.1	A 330°	Magn.: 5.5. Tracking film. Vel. 0°.1/s. Fog. No trail.
<p><i>1961 A-Epsilon I</i> (Discoverer XXXIV)</p> <p>Launch: 5 Nov. 1961 In orbit. Photographs: 5 Visual observ.: 5 Recorded trails.: 2 Phot. positions: 3</p>	<p>14 Mar. 1962 15   "   "   " 31 May 1962 1 Jun. 1962</p>	<p>322 323 341 343</p>	<p>18 54 04.3 18 47 42.1 21 05 46.50 ( 20 42 21.38   20 42 39.60</p>	<p>h 29° h 24° + 39 23 + 05 36 + 13 14</p>	<p>A 86° A 112°05 14 51.1 15 38.8 15 54.1</p>	<p>Magn.: 3. No trail. Magn.: 4. No trail. Magn.: 3.5. Long faint trail. Magn.: 3.5.</p>
<p><i>1962 Iota I</i> (Cosmos II)</p> <p>Launch: 6 Apr. 1962 In orbit. Only one visual observ.</p>	5 Jun. 1962		20 44 00	h 45°	A 241	Magn.: 7.5. No exposure.

Satellite	Date	Film No.	U.T.(O)	1950.0		Remarks
				Decl. (h)	R.A. (A)	
1962 Iota 2 (Rocket body Cosmos II) Launch: 16 Apr. 1962 In orbit. Photographs: 4 Visual observ.: 3 Recorded trails.: none Phot. positions: none	5 Jun. 1962	346	22 30 59	h 44°	A 273°	Magn.: 5.5.; pulsating. No trail. It appeared weaker than other Cosmos rockets because of its actual higher altitude, about 1000 Km.
	3 Jun. 1962	345	20 43 51.2	h 32°	A 275	Magn.: 3.5, pulsating slowly. No trail.
1962 Sigma I Launch: 15 May 1962 In orbit. Photographs: 2 Visual observ.: 2 Recorded trails.: 1 Phot. positions: 1	6 » »	347	20 45 49.48	+ 43°50'	14 45.2	Magn.: 3. Vel. 1° 3/s.
	20 Aug. 1962	370	19 33			No trail.
1962 A-Gamma I (U.S. Launch) Launch: 28 Jun. 1962 In orbit. Photographs: 2 Visual observ.: 2 Recorded trails.: 1 Phot. positions: 1	20 » »	371	19 34 05.98	+ 71 01	19 11.3	

Satellite	Date	Film No.	U.T.(O)	1950.0		Remarks
				Decl. (h)	R.A. (A)	
<p><i>1962 Upsilon 2</i> (Rocket body Cosmos 5)</p> <p>Launch: 28 May 1962 In orbit. Photographs: 1 Visual observ.: 1 Recorded trail.: none Phot. positions: none</p>	23 Aug. 1962	372	19 52 57.8	h 54°	A 237°	No trail. Delay on Spadats predictions: 5 <sup>m</sup> .
Unidentified object	26 Jul. 1962	361	20 55 01	h 25°	A 300°	Magn.: -0.5; red-orange colour. The photograph trail exhibit a cuspid. Angular velocity: in center 0°.2/s. Very likely aircraft trail. Among satellites, attention must be paid to: 1962 Omega 1, 1962 A-Zeta 2.

Attempted observations on the following satellites proved unsuccessful:

1960 Zeta : 5th Magn.: very low object for Asiago.

1960 Pi 1 : no sighting.

1961 Omicron 1 : no sighting.

1961 Omicron 2 : Doubtful sighting.

1962 A-Delta 1 : 6th. Magn.

1962 A-Delta 2 : no sighting.

1962 A-Mu 1 : (Vostok III): 2d magn.; the sky was very bright. Only a rough position obtained.

i.e.: 14 Aug. 1962, UT 19 12<sup>m</sup>, h 85°, A .235°.



## GENERAL REFERENCES

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