

AMSAT-Italia

**“SPAZIO E
RADIOAMATORI”**

Fabio Azzarello

IW8QKU



Propagazione

onde corte

- **lunga distanza**
 - variazioni giorno/notte
 - variazioni stagionali

onde ultracorte

- **breve distanza**
 - risente degli ostacoli

microonde

- **portata ottica**
 - risente degli ostacoli
 - varia su condizioni meteo



Propagazione

- evanescenza (fading)
- disturbi atmosferici
- perturbazioni dal Sole

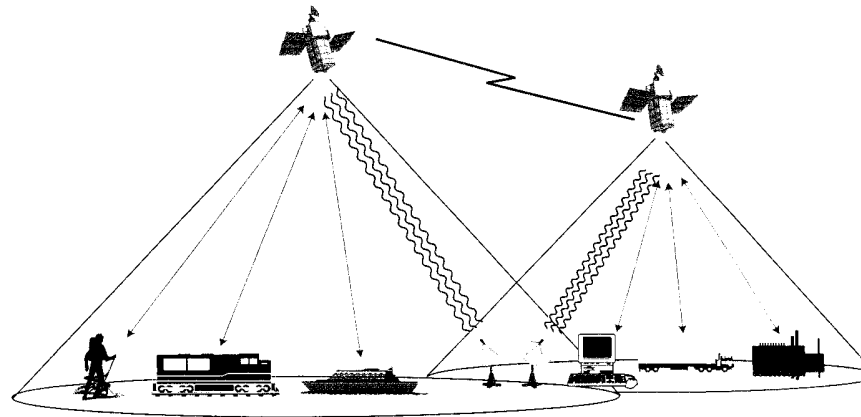
...problemi per comunicazioni stabili



Soluzione

SATELLITI

- Ripetitori posti in posizione “unica” per la loro altezza
- Distanze e percorsi dei segnali ben noti
- Accessibilità simultanea da punti geograficamente distanti





SATELLITI

Tipo

- comunicazioni
- analisi della superficie
 - fotografia
 - radar-mapping
- analisi dell'atmosfera
 - meteorologia
 - monitoraggio ozono
- studio dello spazio
 - misure
 - osservazioni

Suddivisione in categorie

- commerciali
 - (comunicazione, dati, TV, radio)
- militari
 - (spia, comunicazione, gps)
- scientifici
 - (studio dello spazio e della terra)
- radioamatoriali



SATELLITI

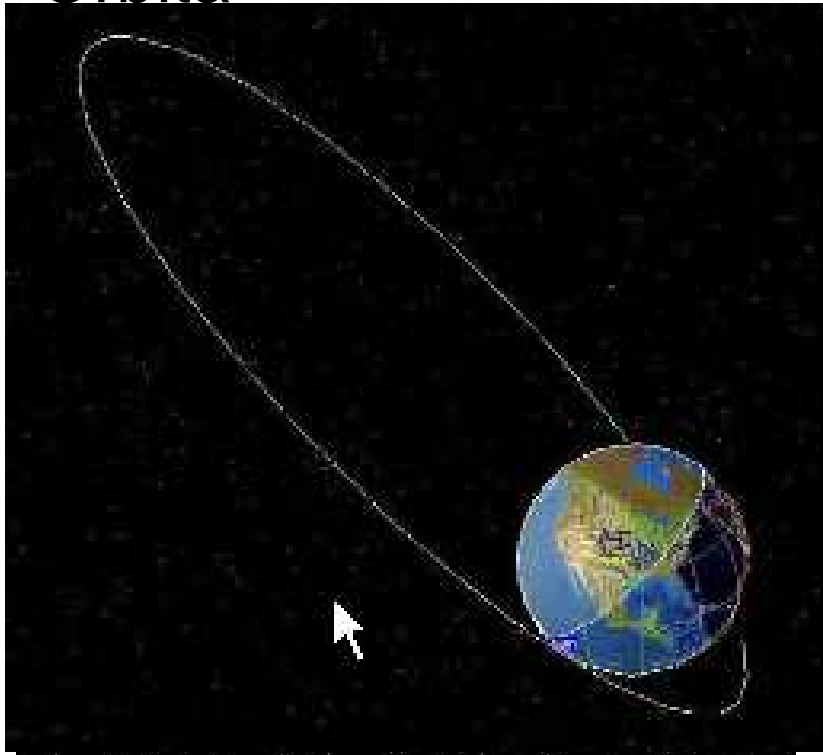
Durata Operativa

- Legata al tipo di carico (payload)
- legata all'orbita
- legata ai sistemi di alimentazione di bordo



SATELLITI

Orbita



- Circolare
 - bassa (LEO)
 - media (MEO)
 - alta (HEO)
 - Solare Sincrona (FO29)
 - “Dawn to Dusk” (AO7)
 - “Inclinata” (SO50, ISS)
- Ellittica “Molniya” (AO40)
- Geostazionaria (GEO)



Satelliti Radioamatoriali

- La storia inizia il 12 dicembre 1961 con il lancio di OSCAR I (Orbiting Satellite Carrying Amateur Radio)
- *lo stesso giorno, sessanta anni prima, Guglielmo Marconi, autodefinitosi "radio-amatore" effettuava la prima trasmissione radio transatlantica*
- *ad oggi, sono 59 gli OSCAR lanciati, diversi RS...*
- nel settembre 1993 è stato lanciato anche un OSCAR italiano:

ITAMSAT (ITalian AMateur SATellite) – IO26



Satelliti Radioamatoriali

- Progettati e realizzati da radioamatori
- messi in orbita mediante vettori di organismi nazionali
- gestiti da gruppi di radioamatori (stazioni di comando)
- utilizzati dai radioamatori di tutto il mondo senza limitazioni

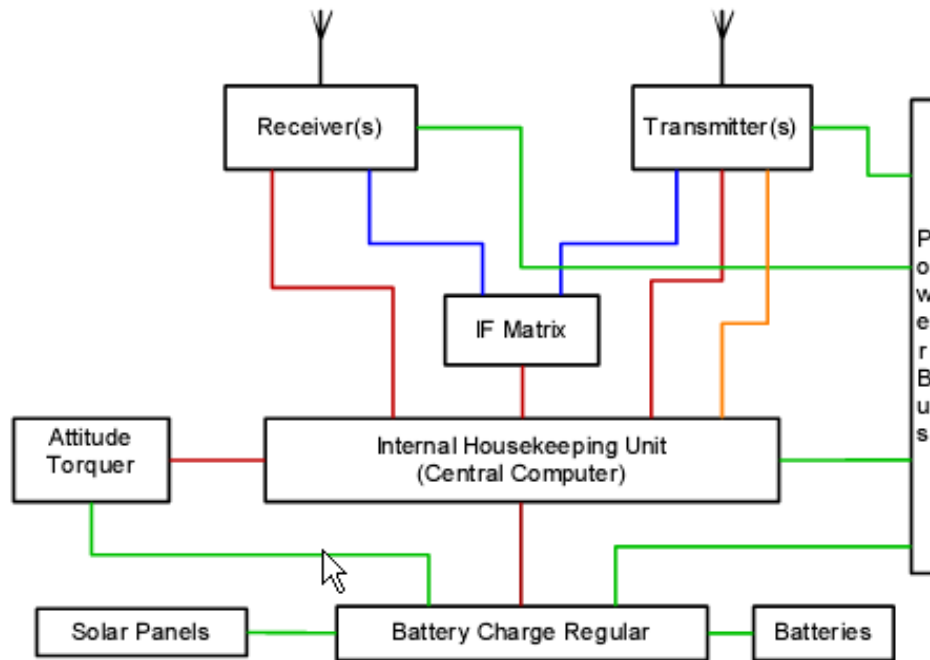


Satelliti Radioamatoriali

- impiego per comunicazioni a distanza
 - analogiche
 - digitali
- controllo e comando a distanza
 - telemetria
 - telecomando



Satelliti Radioamatoriali

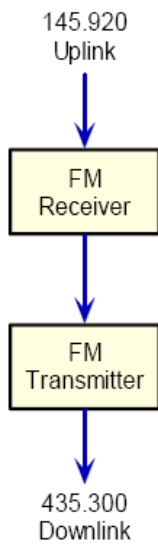


- Ricevitori e trasmettitori operanti simultaneamente su bande diverse
- trasposizione in frequenza dei segnali
- ampia larghezza di banda
 - da 30 a 800KHz (superiore ad un singolo canale standard)
 - possibilità di far transitare più segnali simultaneamente (collegamenti multipli e simultanei)
- Transponder lineare
- possibilità di controllo e autoregolazione

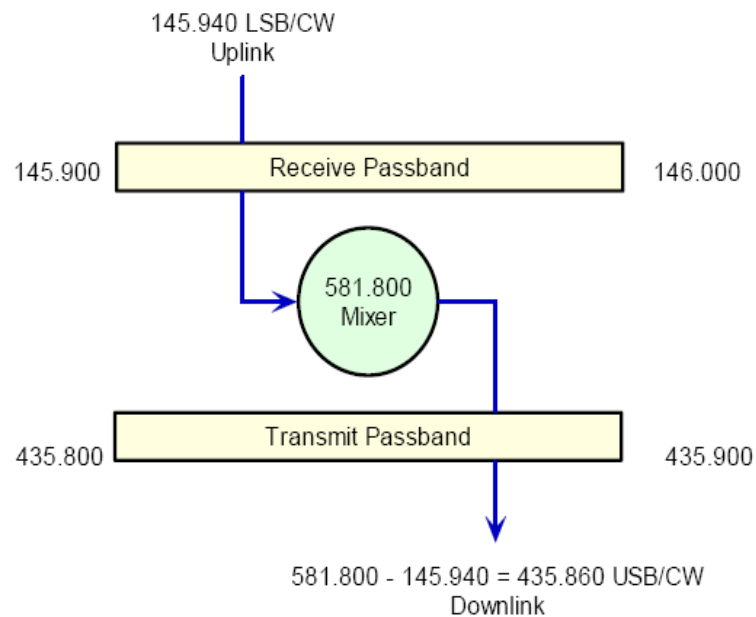


Satelliti Radioamatoriali

Single ch Repeater



Transponder





Satelliti Radioamatoriali

Modi Operativi

- Combinazione di bande per i sistemi di bordo

V=2m

C=7.5cm

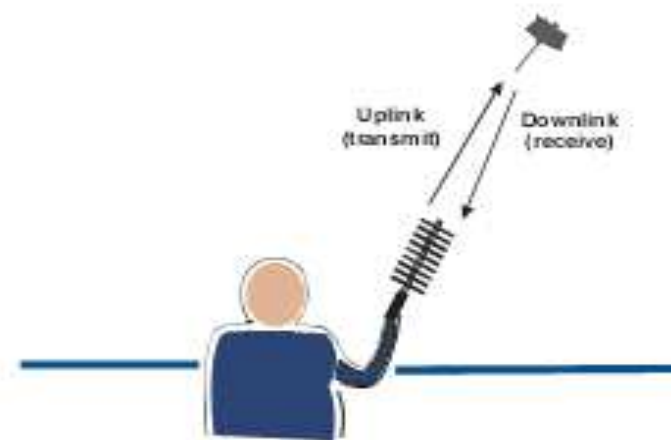
U=70cm

X=3cm

L=23cm

K=1.5cm

S=13cm



Traditional LEO Modes:

Mode A = 10m/2m

Mode B = 2m/70cm

Mode J = 70cm/2m



Satelliti Radioamatoriali

Fuji-OSCAR 29 (JAS-2)

- Built by Japan Amateur Radio League
- Launched July 1996 into a polar orbit
- Mode JA Linear Transponder
 - 145.900-146.000 LSB/CW Uplink
 - 435.800-435.900 USB/CW Downlink
 - Inverting
- Digital Store and Forward BBS (non-operational)
- Digitalker





Satelliti Radioamatoriali

AMSAT OSCAR - 7

- Launched Nov 1974 into sun-synchronous orbit
- Mode A Linear Transponder
 - 29.450 USB/CW Downlink
 - 145.900 USB/CW Uplink
- Mode B Linear Transponder
 - 145.950 USB/CW Downlink
 - 432.150 LSB/CW Uplink
- Battery failure in 1981, resurrected 2002
- Operational only in sunlight (no batteries)





Satelliti Radioamatoriali

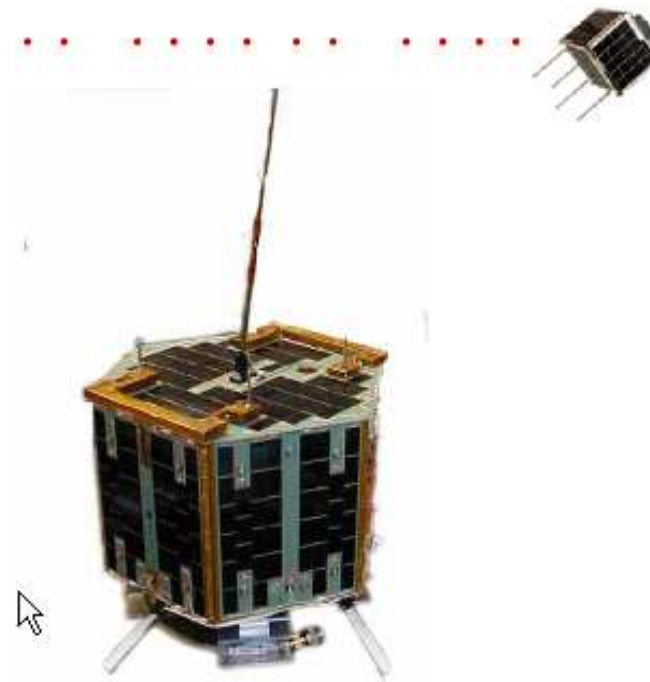
Packet Satellites

APRS Digipeaters

- PacSAT (AO-16)
- ISS (Zarya)

Bulletin Boards

- UOSat-5 (UO-22)
- ISS (Zarya)
- GerwinSat (GO-32)
- TuingSat (MO-46)
- Echo (AO-51)

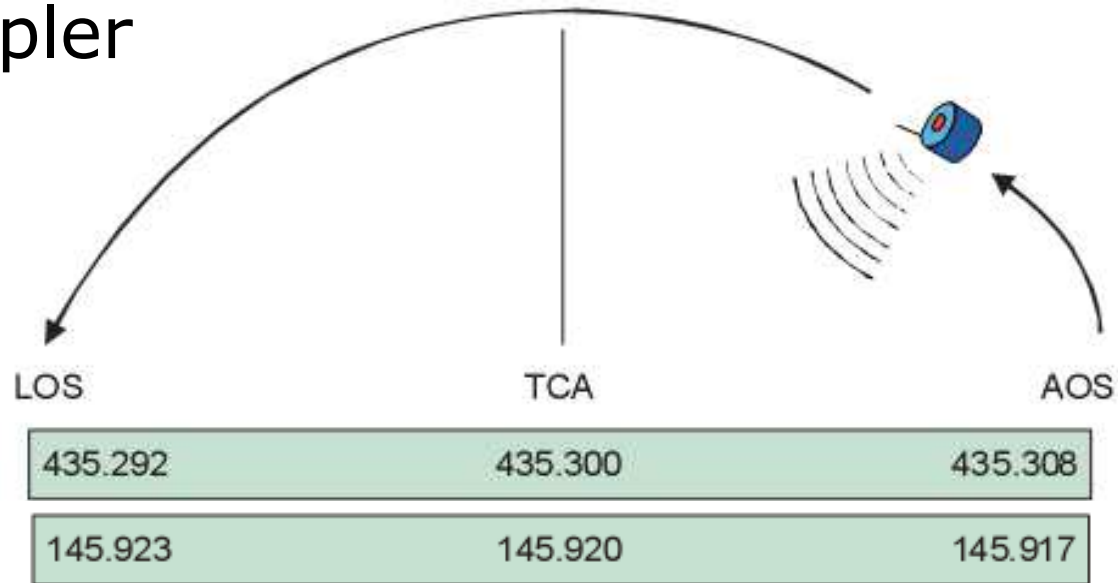


Sapphire (NO-45)



Satelliti Radioamatoriali

Doppler





Satelliti Radioamatoriali

...usare i SATELLITI è difficile?
...usare i SATELLITI è costoso?

NO!



Stazione minima

RTX: Handheld oppure all mode
2m/70cm;

Antenna: Arrow antenna;

...e un pò di pazienza!



Satelliti Radioamatoriali

Stazione Tipo


- RTX e/o convertitori
- Antenne Yagi, Elica
- Preamplificatori
- Rotori di Zenith ed Azimuth
- Sistema “Tracking”
- TNC o soundcard (TLM, PKT)





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Sezione: Passes



850 Sligo Ave. Suite 600
Silver Spring, MD 20910
1-888-322-6728

AMSAT Online Satellite Pass Predictions

Launch Pad Navigator Sat Status Keps Passes News Store Members Contact Us Return

AMSAT Online Satellite Pass Predictions

Please select a satellite and provide your latitude, longitude and elevation or calculate them from your grid square. If you choose we will save your position information in a cookie on your system for future predictions.

Show Predictions for: AO-51 for Next 10 Passes

Calculate Latitude and Longitude from Gridsquare: jm78tc Calculate Position

Or

Enter Decimal Latitude: 38.1042 North

Enter Decimal Longitude: 15.625 East


Elevation (Metres): 25

Predict

Save my location for later use

**example XX.xxxxx

For the best in full featured tracking software visit [The AMSAT Store](#)



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AMSAT Online Satellite Pass Predictions

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AMSAT Online Satellite Pass Predictions - AO-51

[View the current location of AO-51](#)

Date (UTC)	AOS (UTC)	Duration	AOS Azimuth	Maximum Elevation	Max El Azimuth	LOS (UTC)	LOS (UTC)
27 Nov 06	17:28:39	00:10:06	108	9	67	14	17:38:45
27 Nov 06	19:04:46	00:14:05	167	87	283	348	19:18:51
27 Nov 06	20:46:37	00:09:13	229	7	271	314	20:55:50
28 Nov 06	07:13:48	00:13:53	23	33	112	172	07:27:41
28 Nov 06	08:52:53	00:13:03	358	24	298	226	09:05:56
28 Nov 06	16:53:03	00:04:36	72	1	59	33	16:57:39
28 Nov 06	18:25:57	00:13:27	145	35	56	357	18:39:24
28 Nov 06	20:05:19	00:12:38	201	20	261	331	20:17:57
29 Nov 06	06:35:14	00:11:55	35	14	96	148	06:47:09
29 Nov 06	08:13:15	00:14:18	8	58	283	204	08:27:33

Your results are shown above

Use the form below to request more pass predictions

Show Predictions for: AO-51 for Next 10 Passes

Calculate Latitude and Longitude from Gridsquare: jm78tc Calculate Position

Or

Enter Decimal Latitude: 38.1042 North

Enter Decimal Longitude: 15.625 East

Elevation (Metres): 25


Predict

Save my location for later use

**example XX.xxxxx



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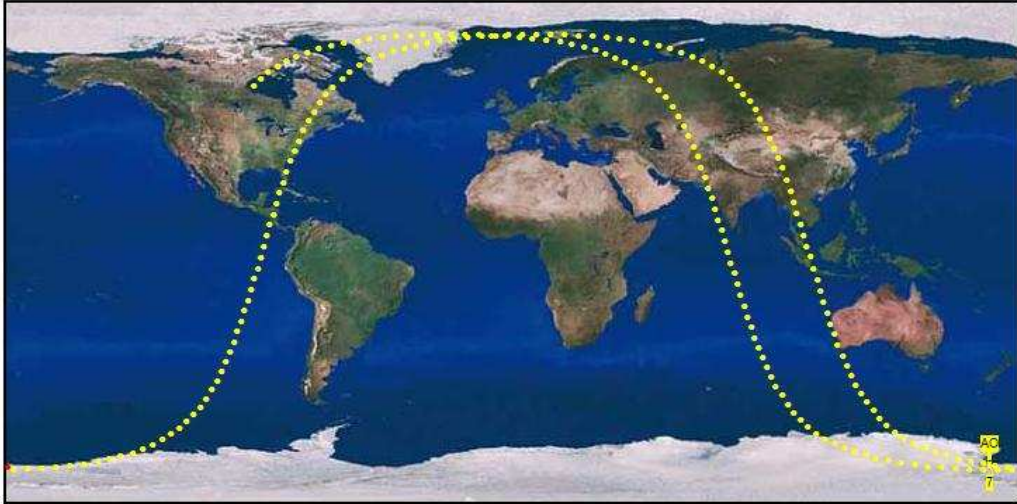
**AMSAT**TM

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Silver Spring, MD 20910
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Satellite Tracking for AO-7

Launch Pad	Navigator	Sat Status	Keps	Passes	News	Store	Members	Contact Us	Return
------------	-----------	------------	------	--------	------	-------	---------	------------	--------

Current Position of AO-7
Mon, 27 Nov 2006 12:46:09 UTC (13:46:09 local time)
Current Location: 170.5E 77S



Select a Different Satellite:

Note: Position is approximate and depends on your computer's performance.

For the best in full featured tracking software visit [The AMSAT Store](#)



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Sezione:

Sat Status

E' possibile
informazioni
sullo stato
operativo dei
satelliti

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Satellite Status

[Launch Pad](#) | [Navigator](#) | [Sat Status](#) | [Keps](#) | [Passes](#) | [News](#) | [Store](#) | [Members](#) | [Contact Us](#) | [Return](#)

Operational OSCAR Satellite Status Summary

[All OSCAR Satellites](#) | [Future Satellites](#) | [Satellite Frequencies](#) | [Satellite Chronology](#)

Operational [▲] | Semi-Operational [▶] | Non-Operational [▼] | Future Launch [▲] | Unknown [?]

Name	Beacons	HF	VHF	UHF	L-Band	S-Band	C-Band	X-Band	K-Band	APRS	Packet	Schedule
HO-59	▲			▲							▲	
CO-56	▶			▶	?							
CO-58	▲			▲								
VO-52	▲		▲	▲								
RS-22			▲	▲								
AO-51	▲	▲	▲	▲	▲	▲					▲	AO-51 Schedule
CO-57	▲			▲								
CO-55	▲			▲							▲	
SO-50			▲	▲								
NO-44			▶	▼								
ARISSE			▲	▲						▲	▲	
SO-33	▶	▼	▼	▶	▼							
GO-32			▼	▼	▼							GO-32 Site
FO-29	▲		▲	▲							▼	
FO-28			▲	▲								
IO-26			▼	▶								
LO-19	▲		▼	▼								
AO-16			▲	▲		▼						
UO-11			▶			▼						
AO-10	▶		▼	▼								
AO-7	▶	▶	▶	▶		▼						AO-7 Log and Resource Site

Note: Arrows indicate subsystem health, not uplink or downlink. For frequency information click on the satellite name.

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Updated 0 Apr, 2006



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Selezionando

*Satellite
Frequencies*

437.1020	437.1020	Weber-OSCAR 18	Imaging Downlink	FM	Non-Operational
437.1250	437.1250	LUSAT-OSCAR 19	TLM Beacon Downlink	FM	Operational
437.1500	437.1500	LUSAT-OSCAR 19	PacSat BBS Downlink	FSK	Non-Operational
437.2500	437.2500	eXpress-OSCAR 53	PacSat BBS Uplink	FSK	Non-Operational
	437.2500	eXpress-OSCAR 53	FM Voice Repeater Uplink	FM	Non-Operational
437.2750	437.2750	HITSat-OSCAR 59	TLM Beacon Downlink	FM	Operational
437.3050	437.3050	nCUBE1	TLM Beacon Downlink	FM	Non-Operational
	437.3050	ICE Cube 1	TLM Beacon Downlink	FM	Non-Operational
437.3250	437.3250	Malaysian-OSCAR 46	Packet Downlink	FSK	Unknown
	437.3250	Malaysian-OSCAR 46	Packet Downlink	FSK	Unknown
	437.3250	CP2	TLM Beacon Downlink	FM	Non-Operational
	437.3250	CP2	TLM Beacon Downlink	FM	Non-Operational
437.3450	437.3450	CubeSat-OSCAR 58	Telemetry Downlink	FM	Operational
437.3850	437.3850	CubeSat-OSCAR 56	TLM Beacon Downlink	CW	Operational
	437.3850	KUTESat	TLM Beacon Downlink	FM	Non-Operational
437.4000	437.4000	UoSAT-OSCAR 36	PacSat BBS Downlink	FSK	Non-Operational
	437.4000	CubeSat-OSCAR 55	Telemetry Downlink	FM	Operational
	437.4000	Weber-OSCAR 39	Packet Downlink	FSK	Non-Operational
437.4050	437.4050	Voyager	TLM Beacon Downlink	FM	Non-Operational
	437.4050	LIBERTAD-1	APRS Downlink	AFSK	Operational
437.4250	437.4250	ICE Cube 2	TLM Beacon Downlink	FM	Non-Operational
	437.4250	HITSat-OSCAR 59	Packet Downlink	FM	Operational
437.4650	437.4650	CubeSat-OSCAR 58	Beacon Downlink	FM	Operational



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Sezione:

KEPS

E' possibile
scaricare i
dati orbitali in
formato TLE

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Keplerian Elements

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Keplerian elements are the inputs to a standard mathematical model of spacecraft orbits. With the "keps", the correct time, and your station location, you can compute when the satellite will be in view and where to point your antennas. See also the [tutorial on Keplerian elements](#) and the [explanation of the formats in detail](#) used in these files.

If you really want to know the mathematics behind the elements, see [Spacetrack Report No. 3](#) from NORAD (1.1 megabytes in PDF format). Most amateur radio tracking programs use a simplified version of the simplest model described in this report.

Current Kep Downloads

AMSAT publishes Keplerian elements weekly. Here are the current bulletins:

- [AMSAT \(verbose\) format elements](#) for all satellites of interest to radio amateurs (updated 22 Nov, 2006)
- [NASA \(2-line\) format elements](#) for all satellites of interest to radio amateurs (updated 22 Nov, 2006)
- [Bare NASA \(2-line\) format elements](#) for all satellites of interest to radio amateurs (updated 22 Nov, 2006)

You can receive these bulletins regularly by e-mail by subscribing to the [KEPS mailing list](#).

Keps in PDB Format

You can also download keps in PDB format suitable for PocketSat for PalmOS PDA.

- [Download PDB Keplerian Elements](#) (updated 22 Nov, 2006)

Orbital State Vectors

Orbital State Vectors describe the Position and Velocity of spacecraft at some specified Epoch time. For further information, see the [State Vector](#) tutorial.

Space Shuttle Orbital Data

Space Shuttle orbital data is available during missions. Keplerian elements are available from NASA, CelesTrak and Space-Track (see links below.) The orbital state vectors for Space Shuttle missions are also [available from NASA](#)

Other Sources



File TLE

```
nasa.all - WordPad
File Edit View Insert Format Help
[Icons]

SB KEPS @ AMSAT $ORBO6326.N
2Line Orbital Elements 06326.AMSAT

HR AMSAT ORBITAL ELEMENTS FOR AMATEUR SATELLITES IN NASA FORMAT
FROM WA5QGD FORT WORTH,TX November 22, 2006
Send SUBSCRIBE KEPS/UNSUBSCRIBE KEPS to majordomo@amsat.org only
BID: ORB06326.N

DECODE 2-LINE ELSETS WITH THE FOLLOWING KEY:
1 AAAAAU 00 0 0 BBBB.BBBBBBBB .CCCCCCC 00000-0 00000-0 0 DDDZ
2 AAAAA EEE.EEEE FFF.FFFF GGGGGG HHH.HHHH III.IIII JJ.JJJJJJ KKKKKZ
KEY: A-CATALOGNUM B-EPOCHTIME C-DECAY D-ELSETNUM E-INCLINATION F-RAAN
G-ECCENTRICITY H-ARGPERIGEE I-MNANOM J-MNMOTION K-ORBITNUM Z-CHECKSUM

TO ALL RADIO AMATEURS BT

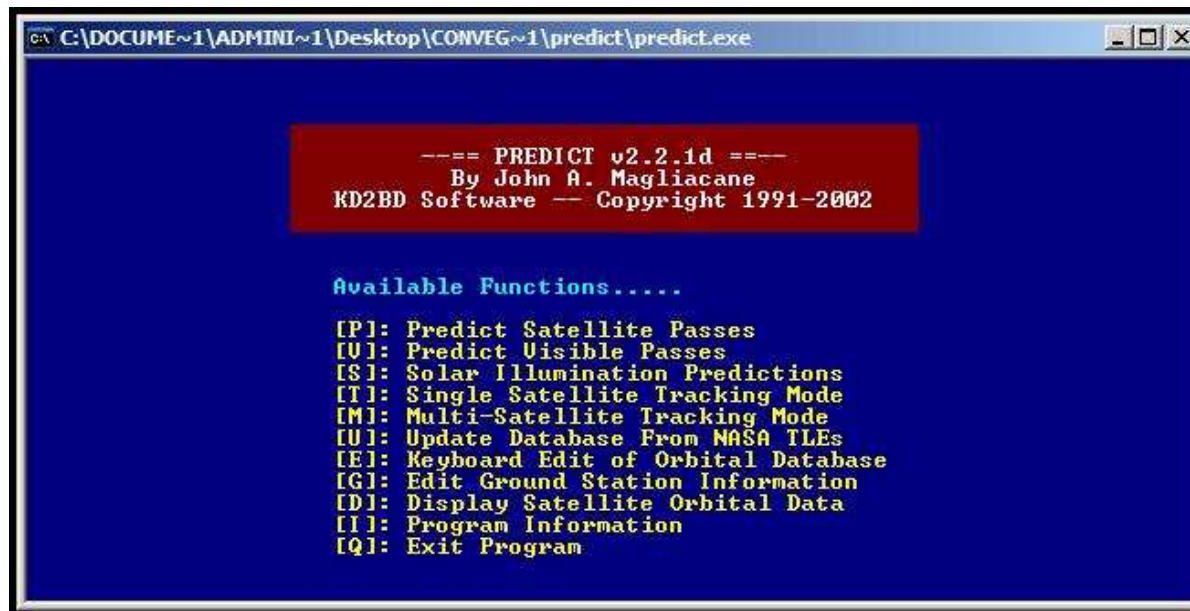
AO-07
1 07530U 74089B 06324.68701763 -.00000028 00000-0 10000-3 0 07359
2 07530 101.5480 003.5885 0011900 301.9750 058.0163 12.53571715464993
UO-11
1 14781U 84021B 06325.90464329 .00000320 00000-0 50225-4 0 2311
2 14781 098.2028 339.4572 0010005 115.7755 244.4474 14.79487944219088
RS-10/11
1 18129U 87054A 06325.76434625 .00000022 00000-0 79186-5 0 1507
2 18129 082.9276 211.5903 0012700 021.7850 338.3841 13.72780774972779
RS-15
1 23439U 94085A 06324.55699050 -.00000039 00000-0 10597-3 0 00068
2 23439 064.8210 344.3283 0165487 227.2321 131.4581 11.27551817490173
FO-29
1 24278U 96046B 06325.91236815 .00000058 00000-0 97493-4 0 3701
2 24278 098.5223 308.7008 0349779 260.6650 095.4792 13.52925729506871
SO-33
1 25509U 98061B 06324.67880400 .00000152 00000-0 19955-4 0 07981
2 25509 031.4334 324.5929 0355224 044.4942 318.3646 14.28137359421420
VO-52
1 28650U 05017B 06326.33642855 .00000012 00000-0 83204-5 0 4852
2 28650 097.8573 036.4344 0026860 204.9750 155.0120 14.81211680 83798
AO-16
1 20439U 90005D 06325.60238738 .00000033 00000-0 27459-4 0 8991
2 20439 088.1882 326.7141 0011827 084.8528 275.4026 14.31740408878841

For Help, press F1
```



Software di predizione

PREDICT di John Magliacane KD2BD

A screenshot of a Windows command prompt window running the PREDICT software. The window title is "C:\DOCUME~1\ADMINI~1\Desktop\CONVEG~1\predict\predict.exe". The main content is a blue screen with white text. At the top, a red box contains the text: "==== PREDICT v2.2.1d ====
By John A. Magliacane
KD2BD Software — Copyright 1991-2002". Below this, the text "Available Functions....." is displayed in blue. A list of functions follows in white text: [P]: Predict Satellite Passes, [U]: Predict Visible Passes, [S]: Solar Illumination Predictions, [T]: Single Satellite Tracking Mode, [M]: Multi-Satellite Tracking Mode, [U]: Update Database From NASA TLEs, [E]: Keyboard Edit of Orbital Database, [G]: Edit Ground Station Information, [D]: Display Satellite Orbital Data, [I]: Program Information, [Q]: Exit Program.

```
C:\DOCUME~1\ADMINI~1\Desktop\CONVEG~1\predict\predict.exe

==== PREDICT v2.2.1d ====
By John A. Magliacane
KD2BD Software — Copyright 1991-2002

Available Functions.....

[P]: Predict Satellite Passes
[U]: Predict Visible Passes
[S]: Solar Illumination Predictions
[T]: Single Satellite Tracking Mode
[M]: Multi-Satellite Tracking Mode
[U]: Update Database From NASA TLEs
[E]: Keyboard Edit of Orbital Database
[G]: Edit Ground Station Information
[D]: Display Satellite Orbital Data
[I]: Program Information
[Q]: Exit Program
```



Software PREDICT

[G]

Ground
Station Info

```
C:\DOCUME~1\ADMINI~1\Desktop\CONVEG~1\predict\predict.exe

* Ground Station Location Editing Utility *

Station Callsign : IW8QKU
Station Latitude : 38.06
Station Longitude : 15.65
Station Altitude : 25
UTC Hour Offset : 1.0

Enter the callsign of your ground station
```

[U]

Satellite DB
Update da
file TLE

```
C:\DOCUME~1\ADMINI~1\Desktop\CONVEG~1\predict\predict.exe

* Keplerian Database Auto Update Utility *

--> nasa.all_

Enter NASA Two-Line Element Source File Name
```



Software PREDICT

[D]

Display
Satellite
Orbital Data

```
C:\DOCUME~1\ADMINI~1\Desktop\CONVEG~1\predict\predict.exe

Orbital Data For AO-51 / Catalog Number 28375
Issued 6 days ago on Wed 22Nov06 03:59:40 UTC

Reference Epoch      : 06 326.16643135
Inclination          : 98.1434 deg
RAAN                 : 10.8302 deg
Eccentricity         : 0.0084883
Arg of Perigee       : 89.1253 deg
Mean Anomaly         : 271.9662 deg
Mean Motion          : 14.40542993 rev/day
Decay Rate           : 4.5e-07 rev/day/day
Ndot/6 Drag          : 0 rev/day/day/day
Bstar Drag Factor    : 2.6196e-05 1/earth radii
Semi-Major Axis      : 7134.7714 km
Apogee Altitude      : 817.1965 km
Perigee Altitude     : 696.0724 km
Anomalistic Period   : 99.9623 mins
Nodal Period         : 100.0206 mins
Orbit Number         : 12590
Element Set Number   : 681

<< Press Any Key To Continue >>
```



Software PREDICT

[P]

Predict
Satellite
Passes

```
C:\DOCUME~1\ADMINI~1\Desktop\CONVEG~1\predict\predict.exe

                          Select a Satellite:

[A]: A0-51           [I]: A0-16           [Q]: S0-50
[B]: A0-07           [J]: L0-19           [R]: C0-55
[C]: U0-11           [K]: A0-27           [S]: C0-57
[D]: RS-10/11       [L]: I0-26           [T]: C0-56
[E]: RS-15           [M]: P0-28           [U]: H0-59
[F]: F0-29           [N]: G0-32           [V]: P0-34
[G]: S0-33           [O]: M0-46           [W]: ISS
[H]: U0-52           [P]: N0-44           [X]: O0-38

<< Enter Selection - Press [ESC] To Exit >>
```

```
C:\DOCUME~1\ADMINI~1\Desktop\CONVEG~1\predict\predict.exe

Starting UTC Date and Time for Predictions of A0-51
Format: 27Nov06 20:38:49 -or- 27Nov06

Enter Start Date & Time >>

Default is 'NOW'
```



Software PREDICT

[P]

Predict
Satellite
Passes

The screenshot shows a terminal window titled "C:\DOCUME~1\ADMINI~1\Desktop\CONVEG~1\predict\predict.exe". The window displays a table of satellite passes for station IW8QKU on Monday, November 27, 2006. The table has the following columns: Date, Time, El, Az, Phase, Lat, Long, Range, and Orbit. The data is as follows:

Date	Time	El	Az	Phase	Lat	Long	Range	Orbit
Mon 27Nov06	20:45:14	0	153	216	14	4	3127	12672
Mon 27Nov06	20:46:48	6	150	220	20	5	2502	12672
Mon 27Nov06	20:48:20	14	145	224	25	6	1899	12672
Mon 27Nov06	20:49:50	27	136	227	31	8	1360	12672
Mon 27Nov06	20:51:13	43	112	231	36	9	984	12672
Mon 27Nov06	20:52:21	51	66	234	40	10	888	12672
Mon 27Nov06	20:53:21	41	30	236	43	11	1013	12672
Mon 27Nov06	20:54:31	27	11	239	48	13	1336	12672
Mon 27Nov06	20:55:54	15	2	243	52	15	1826	12672
Mon 27Nov06	20:57:23	7	357	247	58	18	2404	12672
Mon 27Nov06	20:58:54	1	354	251	63	21	3018	12672
Mon 27Nov06	20:59:04	0	354	251	64	22	3087	12672
Mon 27Nov06	22:25:25	0	210	216	15	29	3120	12673
Mon 27Nov06	22:26:59	5	219	220	20	30	2634	12673
Mon 27Nov06	22:28:31	9	232	224	26	31	2230	12673
Mon 27Nov06	22:30:03	13	250	228	31	33	1962	12673
Mon 27Nov06	22:31:33	15	271	232	37	34	1885	12673

More? [y/n] >>



Software PREDICT

[T]

Single
Satellite
Tracking
Mode

Satellite	Direction	Velocity	Footprint	Altitude	Slant Range
3.47 S.	157.04 Az	16756 mi	3656 mi	462 mi	3157 mi
359.97 W.	-14.18 El	26967 km	5884 km	744 km	5081 km

Eclipse Depth	Orbital Phase	Orbital Model	Squint Angle	AutoTracking
+11.27°	203.2	SGP4	N/A	Not Enabled

Sun	Orbit Number: 12672	Moon
268.66 Az	Next AOS: Mon 27Nov06 20:45:15 UTC	213.79 Az
-34.21 El	Spacecraft is currently in eclipse	+31.18 El



Software PREDICT

[M]

Multi-
Satellite
Tracking
Mode

PREDICT Real-Time Multi-Tracking Mode
Current Date/Time: Mon 27Nov06 20:41:03

Satellite	Az	El	Lat	Long	Range	Satellite	Az	El	Lat	Long	Range
AO-51	157	-12	-1	0	4816 M	PO-28	338	-19	73	97	5920 D
AO-07	165	-29	-34	358	8609 D	GO-32	156	-32	-31	349	8118 D
UO-11	250	+6	30	36	2277 U	MO-46	332	-38	51	147	8751 D
RS-10/11	160	-46	-57	339	10495 D	NO-44	241	-33	-12	76	8322 D
RS-15	36	-31	46	254	9755 D	SO-50	344	+62	41	17	716 N
PO-29	39	-49	26	239	10937 D	CO-55	207	-20	-11	37	6091 D
SO-33	287	-80	-31	175	13628 D	CO-57	230	-6	13	42	4046 D
UO-52	161	-58	-73	309	11557 D	CO-56	349	-12	75	44	4579 D
AO-16	73	-74	-25	228	13068 D	HO-59	189	-29	-25	25	6956 D
LO-19	41	-73	-12	217	13026 D	PO-34	104	-18	16	328	5292 N
AO-27	313	-16	54	83	5483 D	ISS	283	-55	-3	131	10820 D
IO-26	241	-28	-6	69	7424 D	OO-38	337	-23	70	115	6533 D

Upcoming Passes

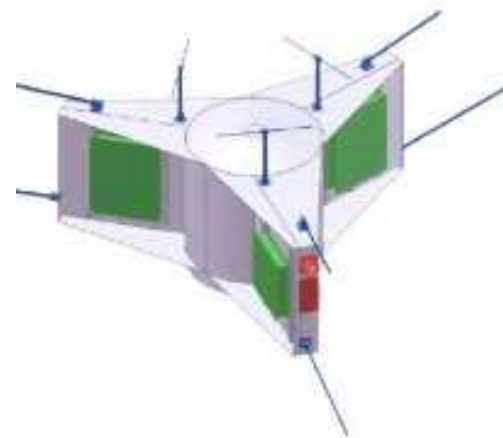
Satellite	Time	Event
CO-57	Mon 27Nov06 20:44:30 UTC	on
AO-51	Mon 27Nov06 20:45:15 UTC	on
CO-55	Mon 27Nov06 20:51:58 UTC	on

Sun
268.76 Az
-34.34 El

Moon
213.95 Az
+31.11 El



Opportunita' future



P3E Concept Drawing
courtesy of AMSAT-DL



Siti Utili:

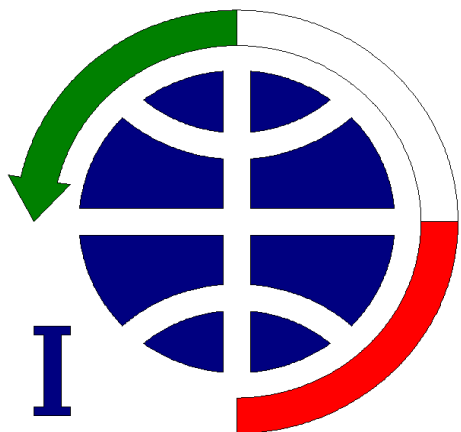
www.amsat.org

www.amsat.it

Per il software:

<http://www.amsat.org/amsat-new/tools/softwareArchive.php>

<http://www.qsl.net/kd2bd/predict.html>



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