

The background is a deep blue gradient with a subtle pattern of white stars. Overlaid on the left side are several white circular and semi-circular lines, some with arrows indicating a clockwise direction. A prominent circular scale with numerical markings from 140 to 260 in increments of 10 is visible. Other smaller circular elements, some with dashed lines and arrows, are scattered across the left half of the image.

TRY AMATEUR SATELLITES

PETER GOODHALL, 2E0SQL

WHY USE AMATEUR RADIO SATELLITES?

IT WORKS WHEN HF IS BROKEN

WHY USE SATELLITES?

- It's an available tool in the hobby to provide contacts, even when HF propagation is terrible it's possible to carry on!
- It's FUN! Passes can be fast paced and, if FM crowded however, with experience, they become less daunting.
- If you have limited space at home it's possible to get on air, you don't need 15 feet long yagis.
- If you're into awards, there are plenty to choose from.
- Using low power 2.5w, you can speak to someone in the USA using a simple antenna. (may require a 4am wake up)
- Still get excited after 5 years of doing it, when you work someone right at the edge of a satellite footprint.



WHAT SATELLITES ARE OPERATIONAL?

ACTIVE AMATEUR RADIO SATELLITES

FM

- SO-50
- AO-85
- Lilacsat-2

SSB/CW

- AO-7
- AO-73
- FO-29
- UKube-1
- XW-2A
- XW-2C
- XW-2F
- LO-87

APRS/PSK31

- ISS
- NO-44
- NO-84 (PSK & APRS)

AMSAT Live OSCAR Satellite Status Page

Created to give a single global reference point for all users in the Amateur Satellite Service to show the most up-to-date status of satellites reported in real time by users around the world. Please help others and keep it current every time you access a bird. For reporting without affecting the real data, please select the dummy-satellites AO-98 and AO-99.

Transponder/Repeater active	Telemetry/Beacon only			No signal	Conflicting reports	ISS Crew (Voice) Active		
Name	Oct 7	Oct 6	Oct 5	Oct 4	Oct 3	Oct 2		
CUTE-1	2211	1111	1111	111	112	1	1211	
IKube-1	1	1 1 121	1 1 2	11	1 132 2	1 11 22	2	
acSat-2	2	231 1243121	31 1 1	2	211	1111	1 2 2	1
AO-7		3	21	1 21	1 23	121131	2 122	
AO-7	221	1 1	1	1 1	51 33343231	111	22	1
XI-V					11	1		
UO-11								
FO-20				1				
FO-29	343	1 2 2322331	3 1 24734 24	111 2121 42	3435444	2 1213	335732	
XW-2A	2 11	11 1122 22	2 313123 1	1 33 12 11	2 121	2	225122	
XW-2B					1			1
XW-2C	411	1 1 22 112	2 1246 12 1	1541 2 21	242 21	1	23212	1
XW-2D			1					
XW-2F	211	3 112	2 234 222 11	361 2 22 1 242 23		4212	1	
NO-44			1	11	1		2	
SO-50	521 21	25 123 13	383 42	147 233	12 1452442	3	533142112	1
AO-73	112	111 31 21	13 321	12 1314 43	113 123 23	121	31224211	
EO-79	1		1	1		11	11	
AO-85		22 231	142 2 11	221151 11	62121 1	3322 1 31	24	
IO-86				1				
LO-87			1	1				
AO-98				1				
AO-99	1							
Delfi-C3	1	11 1 2	1 1 2	11 1 1	11	1	1	
ISS-FM					1			
84_Digi						1		
XI-IV	121	1111	1111	111	112	1	1211	
34_PSK		1	1			1		
CHIFAT1		1		1 1 1	1		1	
S-DATA		1535	1 1155	1	2521 1	1662	122123	1
S-DATV				1				

Hover mouse over number for more data. Satellites do not appear if they have no data available.

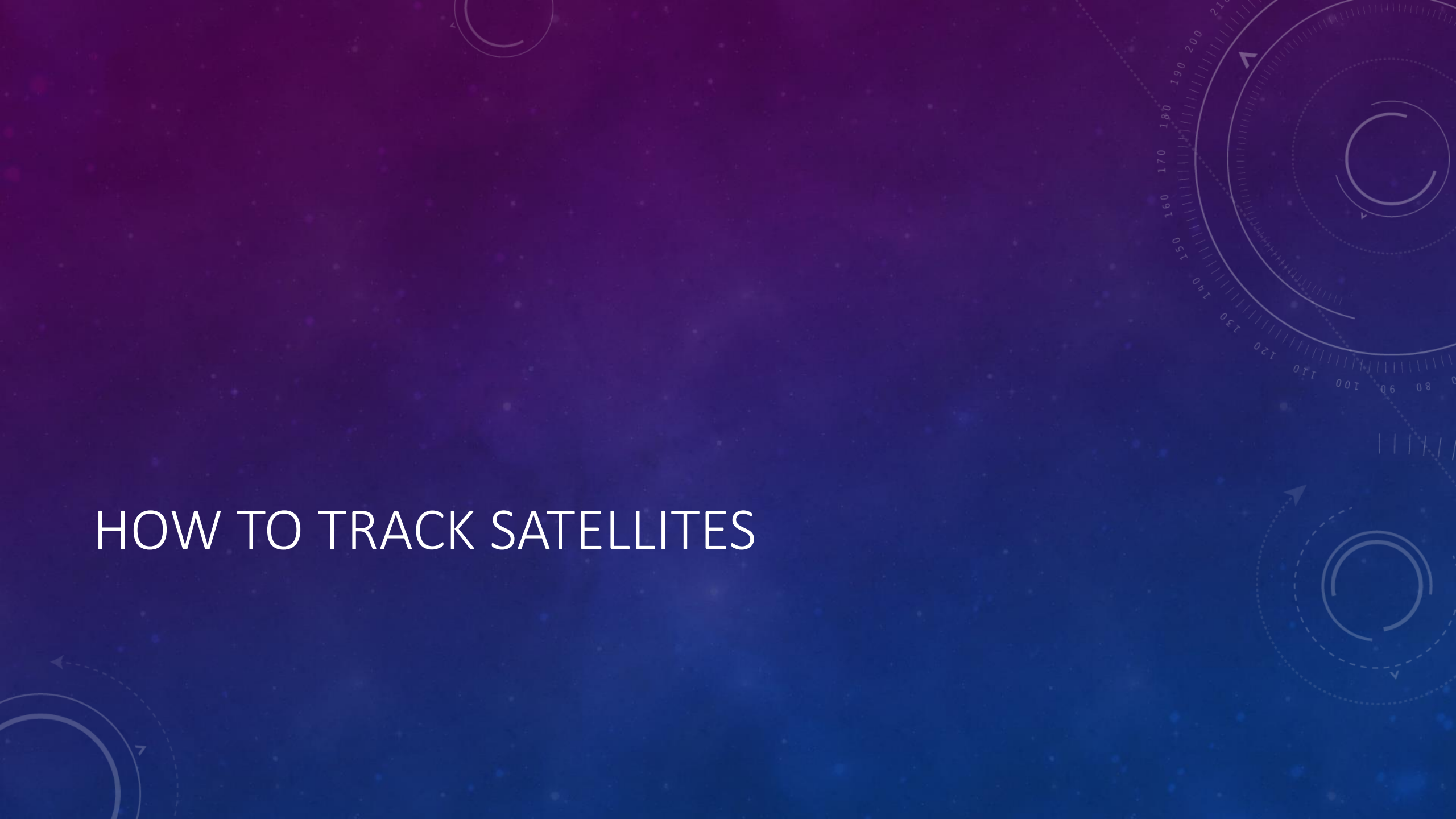
AMSAT STATUS PAGE

<http://www.amsat.org/status>

PLENTY OF OTHER PLACES TO FIND STATUS INFORMATION

- Twitter @amsat, @amsat-uk
- Twitter hashtag #amsat
- AMSAT NA Newsgroup
- AMSAT Facebook Page

HOW TO TRACK SATELLITES



SATELLITE TRACKING (DESKTOP)

Windows

SatPC32

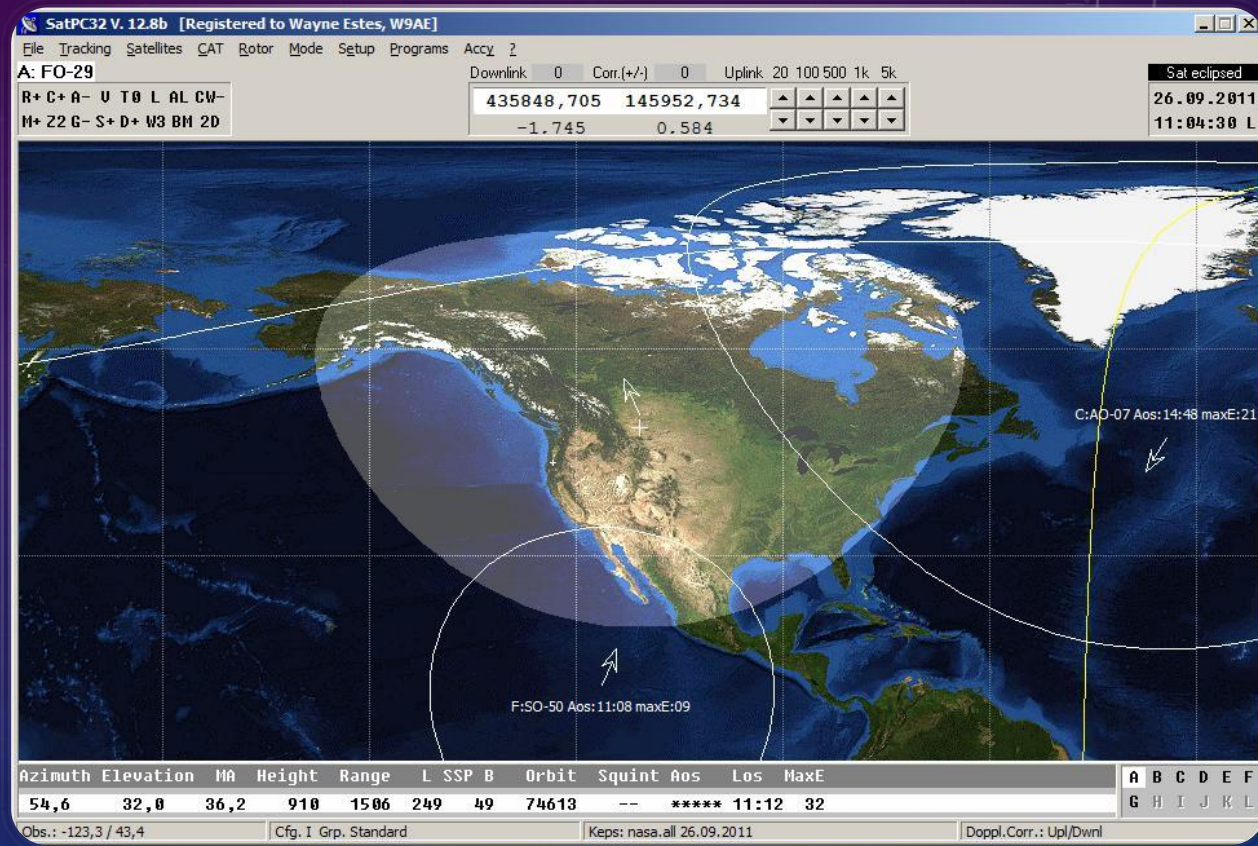
GPredict

Orbitron

Apple

MacDoppler

GPredict



SATELLITE TRACKING (MOBILE)

Android

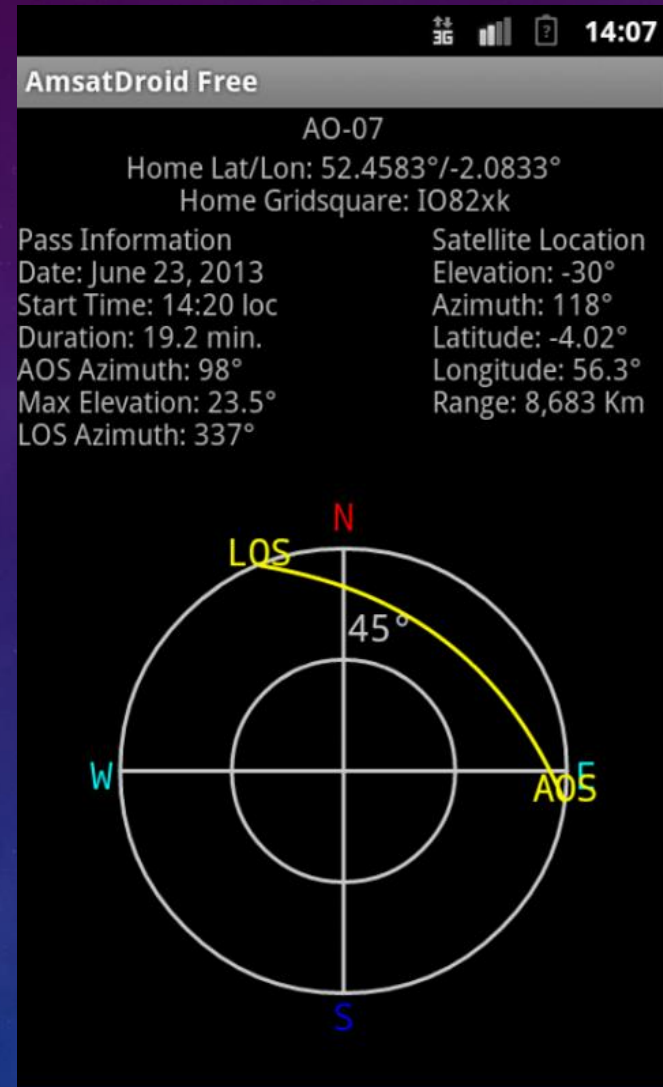
AMSATDroid

Heavens Above

iOS

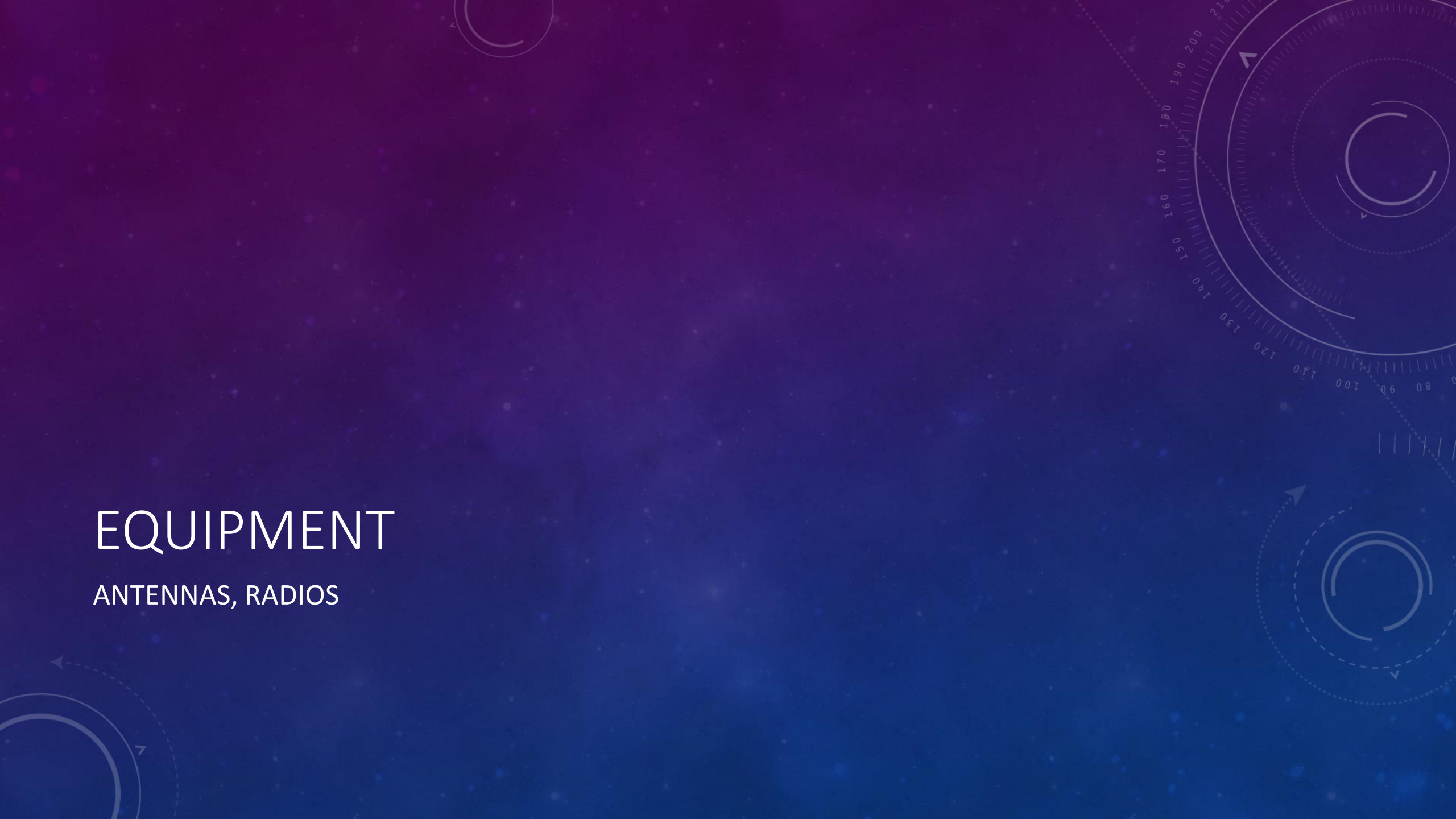
GoSatWatch

Ham sat



EQUIPMENT

ANTENNAS, RADIOS



ANTENNA CHOICES - HANDHELD

Commercial antenna choice is normally either the Arrow or ELK Antenna.

However, if you're trying to do things on the cheap, there's some good designs online. Popular design at the moment is M1GEO's design, WA5VJB, CJU and Ioio Antennas.



ANTENNAS - FIXED

- Fixed antennas for home can be chosen from a large range, from standard yagis to crossed yagis.
- The commonly chosen antennas types are the Wimo X-Quads, M2 Yagis sold by AMSAT NA.



DUPLEXERS

- Most handhelds only have one antenna socket, so you'll probably need one.
- Allows you to remove some of the desense if operating duplex.



DECIDING ON THE RADIO

DUPLEX OR SEMI DUPLEX?



DUPLEX OR SEMI DUPLEX?

Semi-Duplex

- You can't hear yourself on the downlink.
- Can cause chaos on FM satellites with people CQing or calling over each other.
- Reasonably OK for SSB/CW satellites if you place yourself away from the central part of the transponder.

Duplex

- You can hear yourself on the satellites downlink.
- Reduces QRM from yourself if you're calling on top of another QSO.
- Easy to make frequency adjustments.

DUPLEX OPERATION



DUPLEX OPERATION - HANDHELDS

- Best supported handheld is the Kenwood TH-D72
- Other radios available, but out of production e.g ICOM IC-W2A, IC-W32 and others.
- Other option is two cheap handhelds like Baofengs, Wouxon or the other major brands.



DUPLEX OPERATION - MOBILE RADIOS

- Quite a few mobile FM radios support duplex operation.
- Kenwood, ICOM and Yaesu have radios available.





DUPLEX OPERATION – BASE STATION RADIO

- Base station radios that fully support satellite use tend to be promoted as satellite radios.
- Current radios are the Kenwood TS-2000 or the ICOM IC-9100
- Issue with TS-2000 of a birdie on the SO-50 downlink.
- Plenty of other radios available on second hand market
 - ICOM IC-910, IC820, IC821H, IC-970
 - Kenwood TS-790
 - Yaesu FT-726, FT-736, FT-847
 - Commonly see two FT-817s used together

SEMI-DUPLEX RADIOS



SEMI DUPLEX RADIOS

- Semi duplex – you only hear the downlink and not your transmitted signal.
- Handheld that supports split operation between 2m & 70cms.
- SSB/CW Radios that support split operation.
- Common Radios
 - ICOM IC-706
 - FT-817, FT-857, FT-897, FT-991

SOFTWARE DEFINED RECEIVERS

- Commonly seeing Software Defined Receivers being used as the downlink for satellite operation.
 - Allows you to see the whole satellite passband which can be useful.
 - Ability to record the pass and listen later or decode telemetry.
 - Could be a cheap way to get a duplex satellite radio setup.
- Commonly used SDRs
 - Funcube Dongle
 - SDR Play
 - Airspy
 - Cheap DVB-T dongles



OPERATING FM SATELLITES



OPERATING FM SATELLITES

- Decide which satellite you want to operate via for example SO-50 or AO-85.
- Use whichever tracking program you decide on to make sure you know when the next pass is. Careful to make sure you have the time right and the tracking TLEs up to date.
- You'll probably want to make sure your radio is programmed with memory channels. You'll find a range of charts available on the AMSAT NA and AMSAT UK website.
- With SO-50 make sure to remember that the satellite "might" not be on until you transmit a 74.4 Hz CTCSS tone at it. Once the satellite is on, all that's needed is a constant 67 Hz tone.



DO NOT CALL THROUGH THE SATELLITE IF YOU
CAN'T HEAR IT!



DO NOT USE EXCESSIVE POWER!

YOU ONLY NEED LOW POWER FOR SATELLITES.

OPERATING FM SATELLITES

- Usual exchanges on satellites is a arbitrary signal report and in Europe 6 letter maidenhead square.
- For example:
ON5NY 2E0SQL 59 IO91JS
- Logging on the fly can be hard. Normally best to use a digital audio recorder, this can even be your mobile phone if you're portable.
- Confirmation of QSOs is normally done via ARRLs LoTW, eQSL or Paper QSL Cards.
- Most logging software supports storing the satellite QSO properly with the satellite name and mode. This should be included on any QSL card.



OPERATING SSB/CW SATELLITES

The background is a deep blue gradient filled with numerous small, light blue dots, resembling a starry night sky. Overlaid on this are several faint, white technical diagrams. In the top right, there is a large circular scale with degree markings from 0 to 210, accompanied by concentric circles and arrows indicating rotation. In the bottom right, another circular diagram features concentric circles and a dashed arrow. In the bottom left, a partial circular diagram with an arrow is visible. These elements suggest a theme of navigation, astronomy, or satellite technology.

OPERATING SSB/CW SATELLITES

Inverting Transponder

- Inverting transponders have an uplink on one sideband and the downlink produces an opposite sideband.
- Normally USB is used on the downlink & LSB for uplink.
- As your transmit signal moves up in frequency the downlink moves down in frequency.

Non-Inverting Transponder

- Non-inverting transponders have an uplink in one sideband and it downlinks in the same sideband.
- Not used much at the moment only AO-7 when it's in mode A, with 2m up and 10m down.

FAIR GREATER CHOICE AVAILABLE

AO-7, AO-73, FO-29, UKUBE-1, XW-2A, XW-2C, XW-2F, LO-87

OPERATING SSB SATELLITES

- You have to remember that, with SSB/CW satellites, the transponder supports multiple QSOs; so everyone will spread out across the downlink.
- Decide which satellite you want to operate and make sure you have checked the uplink and downlink frequencies .
- Passband will be anything from 20kHz to 100 kHz wide, so remember to listen.
- Normally the upper part of a transponder is used for SSB and the lower for CW; although this can vary depending on the operator.
- Unlike FM satellites, you can call CQ and hopefully someone will call you.
- Standard contacts are similar to FM with signal reports and grid square although, as you aren't clogging up a downlink, you can pass further information.



DO NOT USE EXCESSIVE POWER!!!

YOU ONLY NEED LOW POWER FOR SATELLITES.

OPERATING SSB/CW SATELLITES – ABILITY TO WORK FURTHER AFIELD

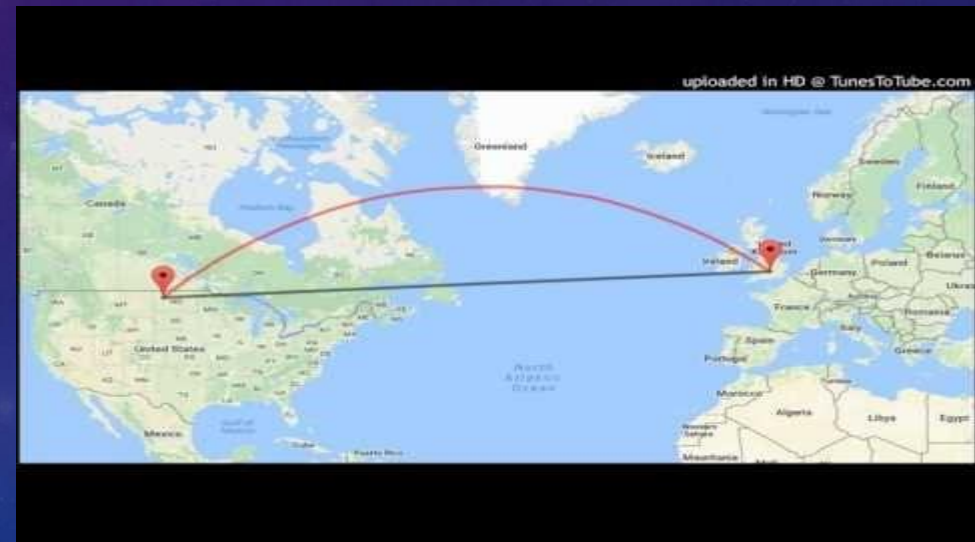
- With SSB satellites, you have the ability to work further afield stations. For example, it's reasonable to be able to expect to work North America on AO-7 and FO-29.
- It's possible to work east coast of North America, on Ukube-1 I've worked FP/NJ7H.

FO-29 RECORDINGS

MU0WLV works KO4MA



2E0SQL works NJ7H

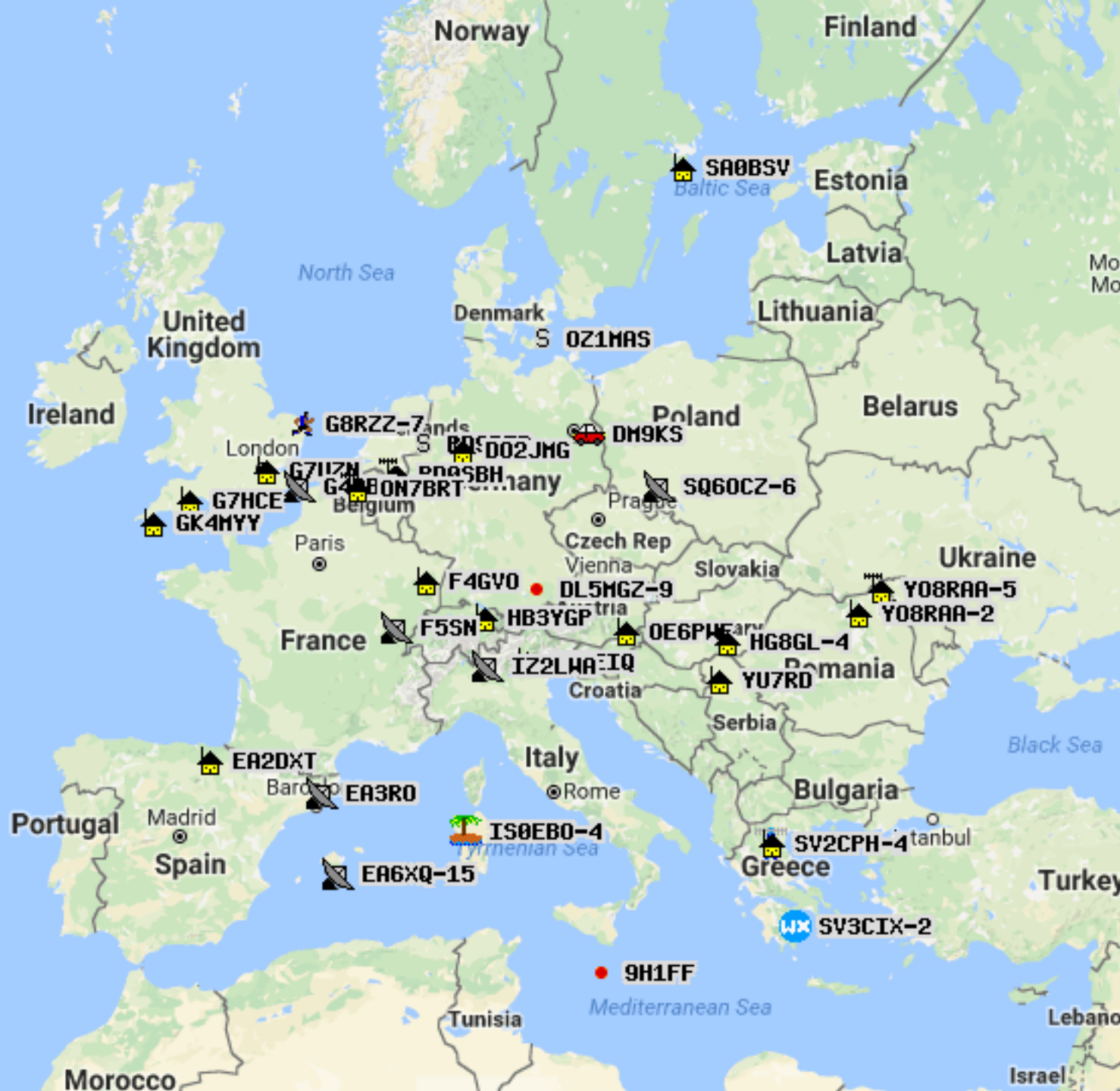


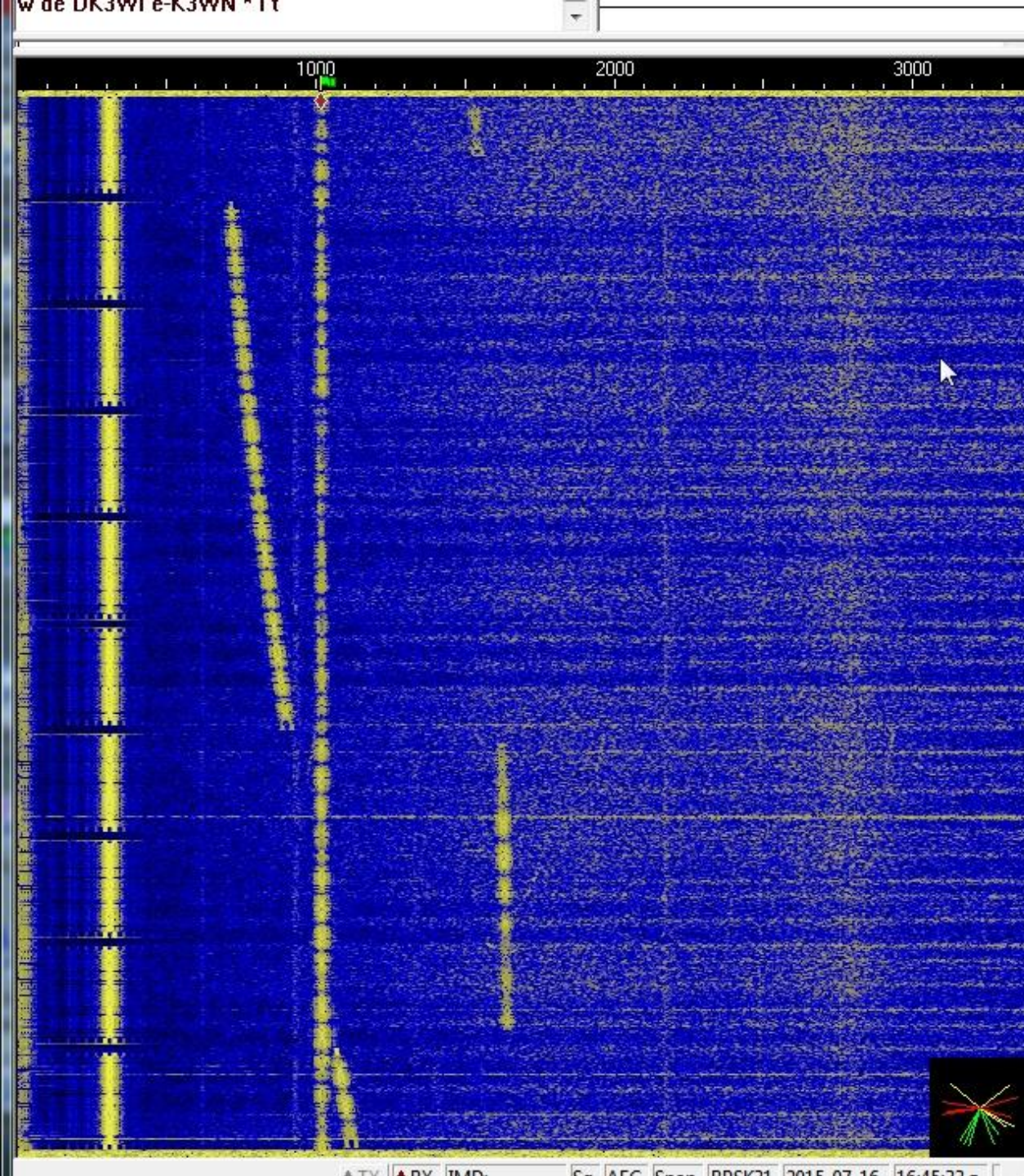
APRS & PSK31

BASIC OVERVIEW OF ISS AND NO-84 PSK TRANSPONDER

APRS VIA SPACE

- Both the ISS and NO-84 have APRS digipeaters on-board.
- PATH normally ***ARISS or APRSAT.***
- NO-84 Digi is turned off when it's low on power.








NO-84 – PSK31 TRANSPONDER

- NO-84s primary payload is a PSK transponder, with an uplink on 28.120MHz USB. Downlink is 435.350MHz FM.
- Can be accessed easily using a 10m GP and suitable yagi antenna on 70cms.
- KOSM developed DopplerPSK for transmit which automatically corrects the uplink frequency for Doppler so you have a steady signal on the downlink.
- Receiving is best done using a Digipan or FL-Digi which include a browser style decoding.
- Generally accepted that you transmit 100% of the pass and person calls you on another spot.
- **Needs used more!**


RANDOM TWITTER COMMENTS

**John Worsnop**
@g4bao



Just worked ON5AV on quite a low elevation SO-50 pass. [#gettingthehangofthis](#) [#sats](#) Bit like HF contests QSOs with added waving of antenna!

5:11 PM - 4 Oct 2016

**Adam @MU0WLV** 8:42pm

The achievement of building the antenna and it actually working

5w can transit +4000 miles trans Atlantic with no special conditions

It's not hf

It doesn't need large antennas

It can be done for under 30 quid with a homebrew and a baofeng

It (in my experience) has a very tolerant community very willing to help especially if you are a new grid/dxcc ;-)

It's just a buzz every time still ATM

Really want a home set up.

Further Information:-

AMSAT NA: <http://www.amsat.org>

AMSAT Status Page: <http://www.amsat.org/status/>

AMSAT UK: <https://amsat-uk.org>

QUESTIONS

CAN ALWAYS TWEET ME @2E0SQL