

Talking Through The Birds

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August 10, 2021



Youth on the Air

Activities for the Next Generation of
Amateur Radio Operators in the Americas

Presentation Scope

Types of Satellites

Low Cost OTA

Satellite Pass Checklist

Awards

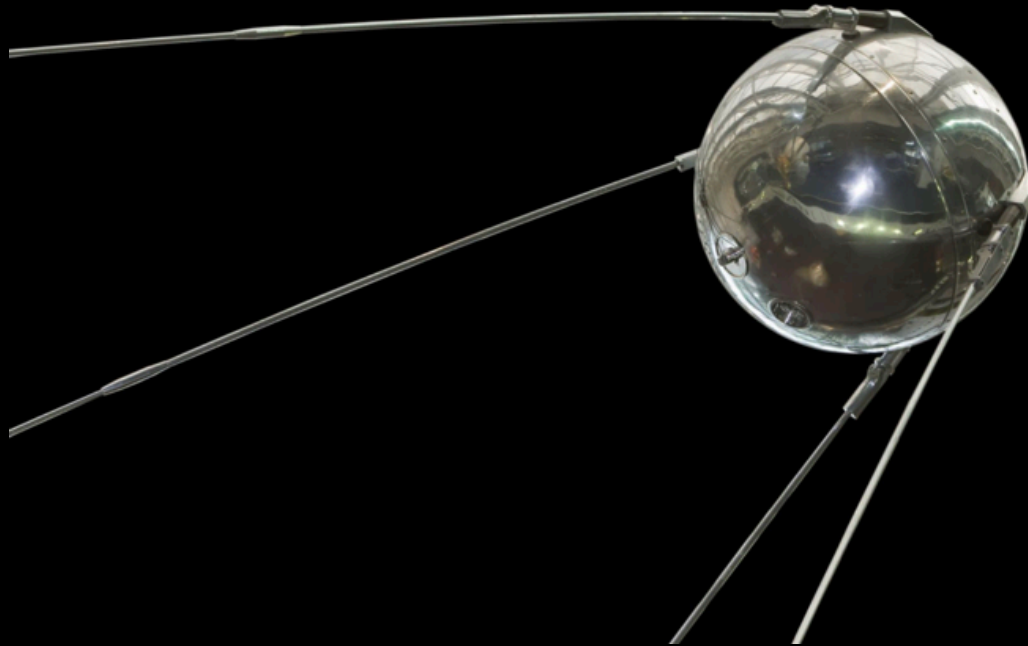
Connecting Off Satellites



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From Sputnik I to OSCAR Satellites



<https://www.nationalgeographic.com/science/2018/10/news-sputnik-world-space-week-soviet-union-russia/>



<https://amsat-uk.org/2018/01/26/ao-92-open-for-amateur-radio-use/>



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AMSAT



<https://www.amsat.org/>

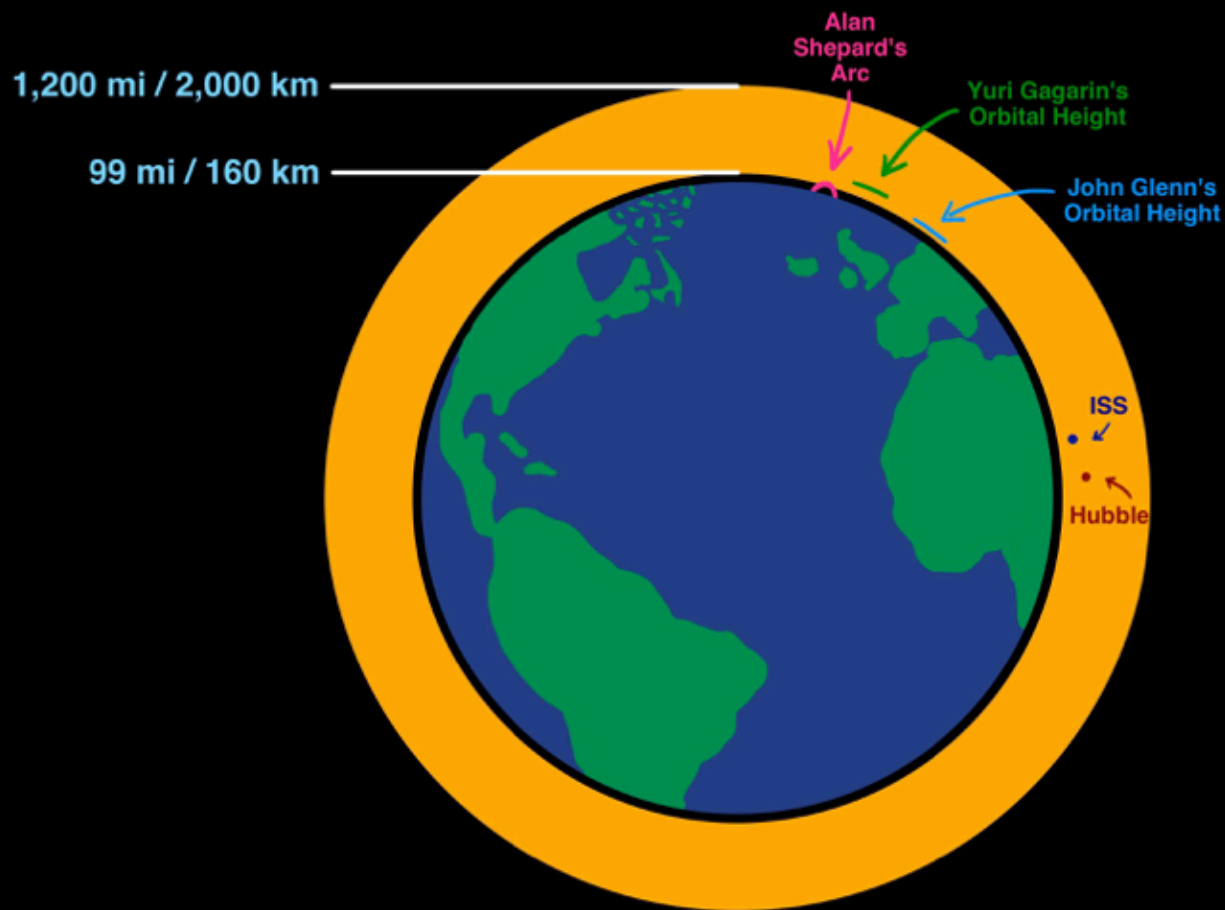


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Low Earth Orbit (LEO)

All sizes to scale



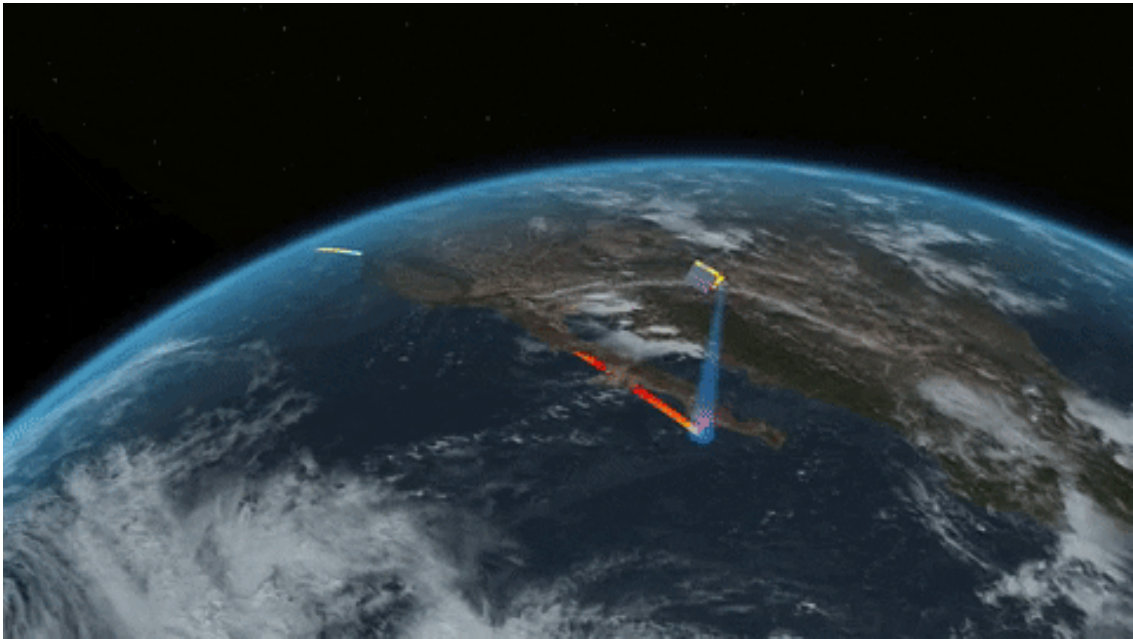
waitbutwhy.com



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Orbital Period = Time to complete one trip around the earth



- All current satellites in LEO
- Orbital period: 88-127 minutes

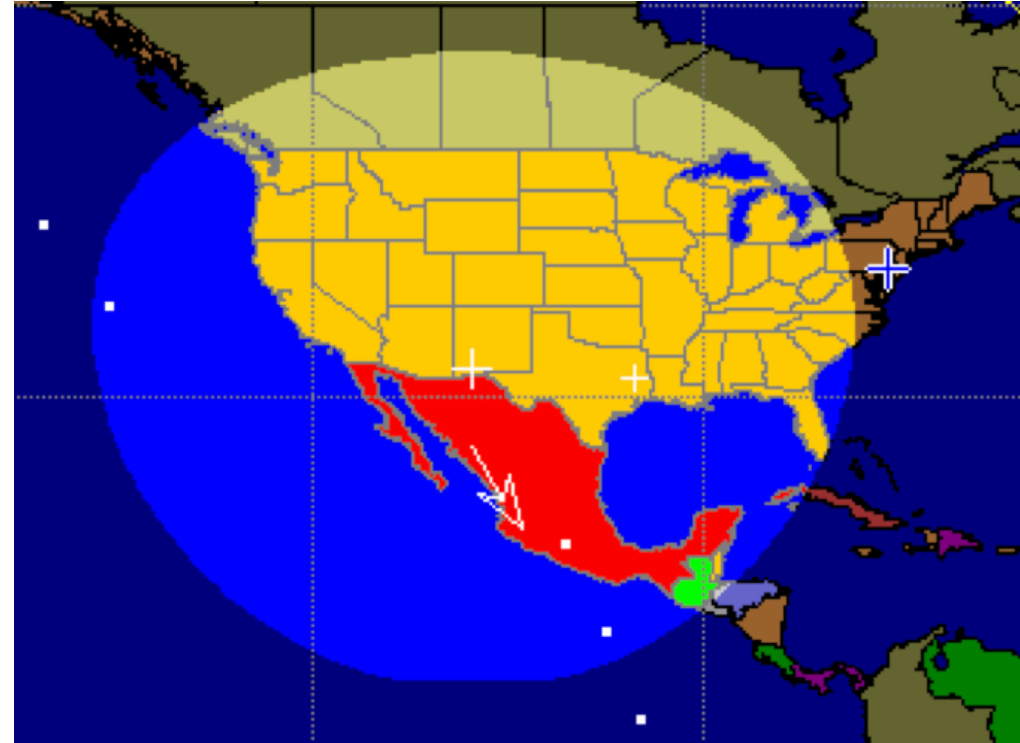


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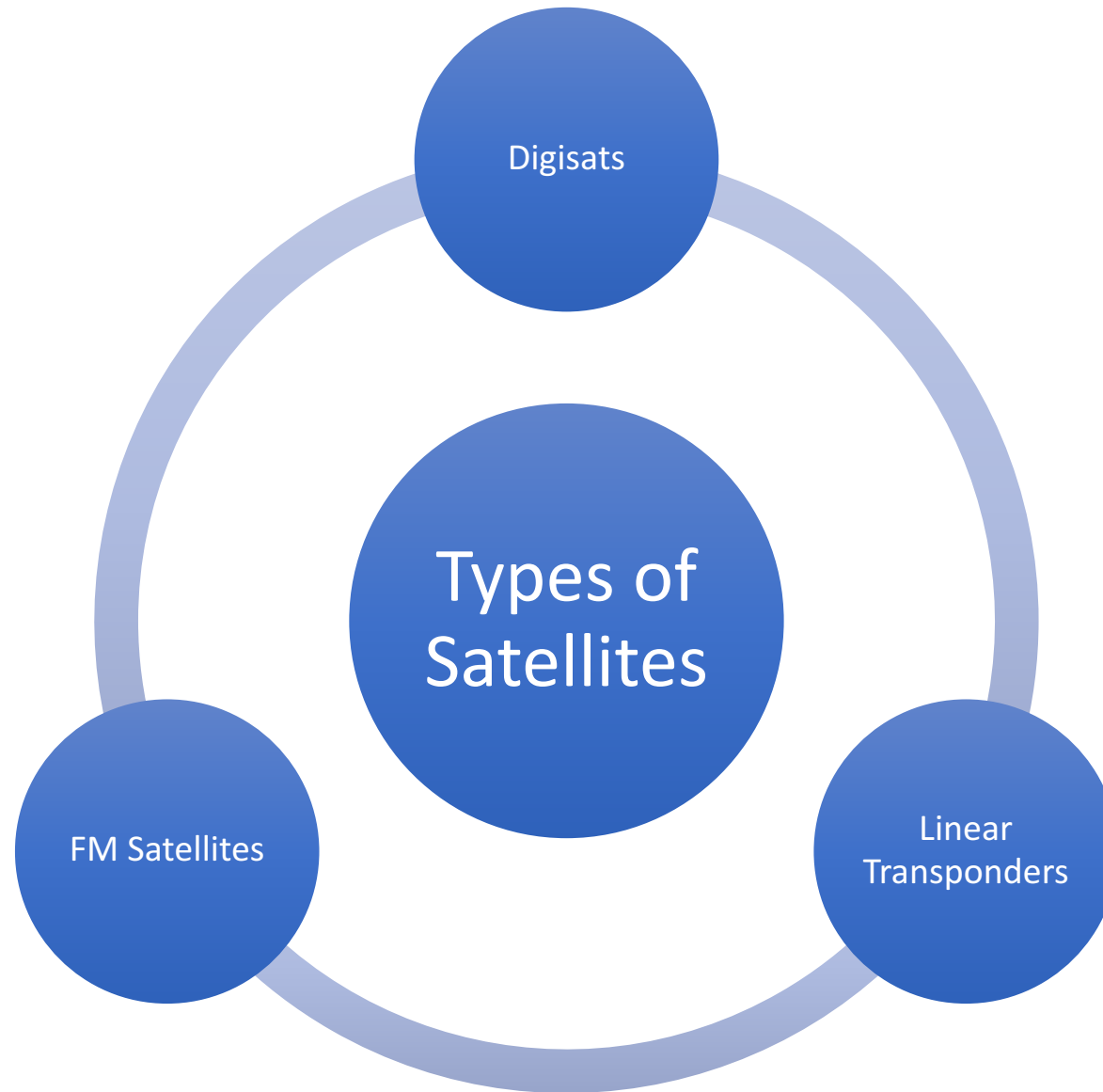
QSOs occur when we are in a satellite's footprint

- Footprint varies per pass due to earth's rotation
- One satellite can have ~8 passes per day at varying times & elevations



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Digisats

- Digital Modes
- 2m Simplex
- Equipment: 1 HT & Directional Antenna



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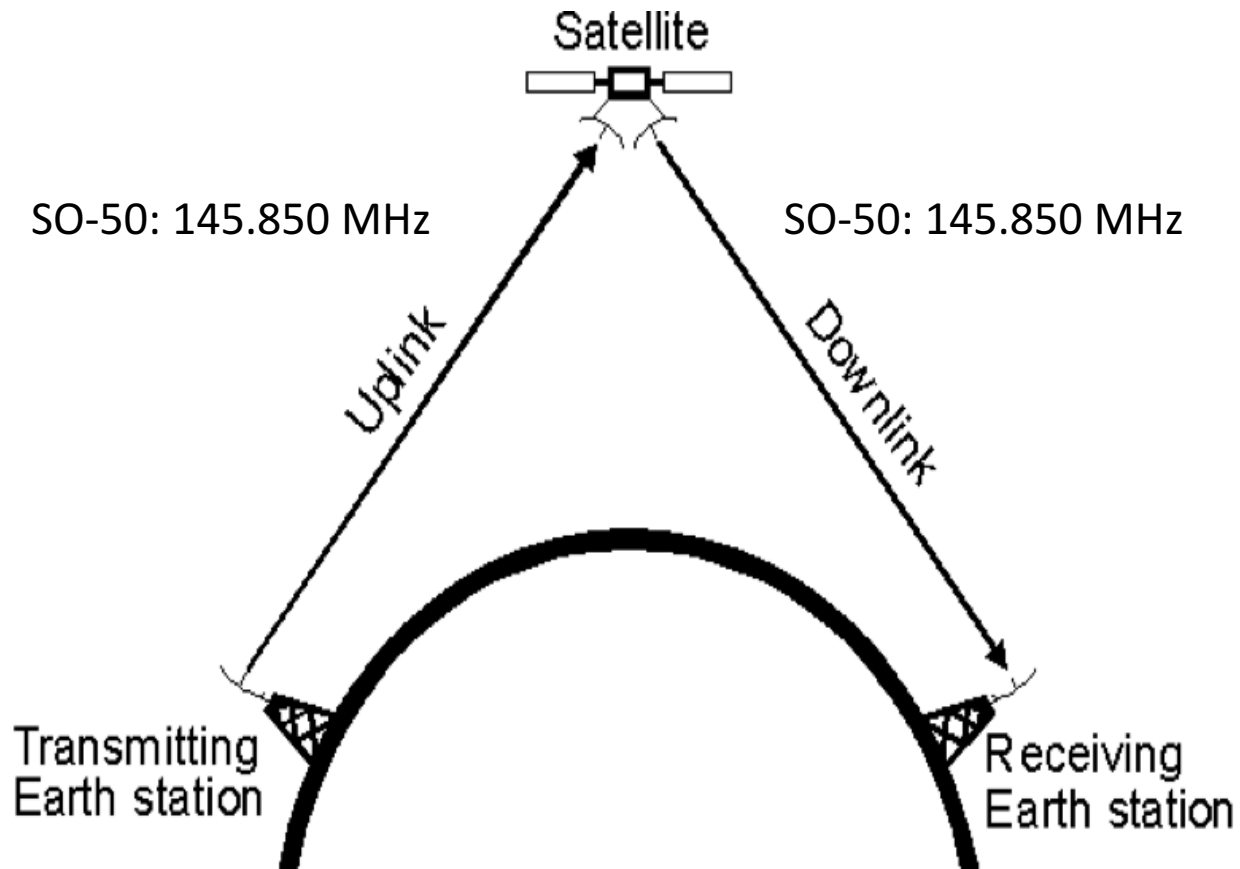
Digipeater Available on the ISS



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FM Satellites



- 5 active FM satellites
 - Some only active on a schedule
- Orbiting Repeaters
- Cross-Band Repeaters
 - U/V: TX on 2m, RX on 70cm
 - V/U: TX on 70cm, RX on 2m
- Transmit = uplink,
- Receive = downlink
- CTCSS Tone Required



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SO-50

SO-50, AO-27	67 Hz	
Preset #3	Up (FM)	Down (FM)
AOS		436.805
2		436.800
Mid	145.850	436.795
4		436.790
LOS		436.785

- Mode U/V
 - TX on 2m, RX on 70cm

AO-91

AO-91	67 Hz	
Preset #2	Up (FM)	Down (FM)
AOS	435.240	
2	435.245	
Mid	435.250	145.960
4	435.255	
LOS	435.260	

- Mode V/U
 - TX on 70cm, RX on 2cm



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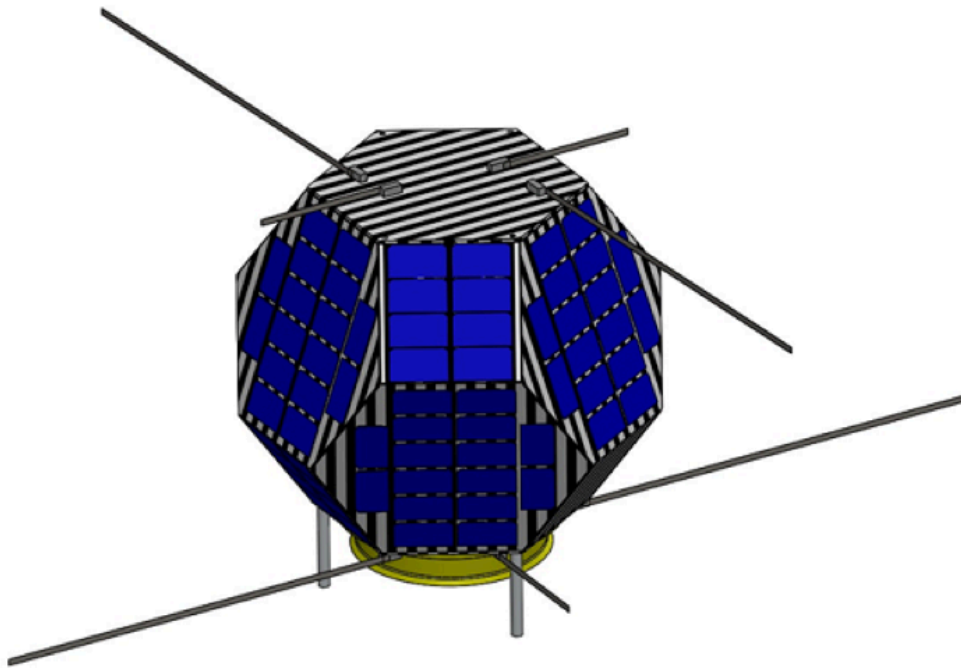
FM Satellites are great
to start with and fun to
operate on!



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Linear Transponders



- Cross-band QSOs
- USB, LSB, CW, Digital
- Built for entire range of frequencies
 - A satellite passband
- Passbands range from 20-100 kHz

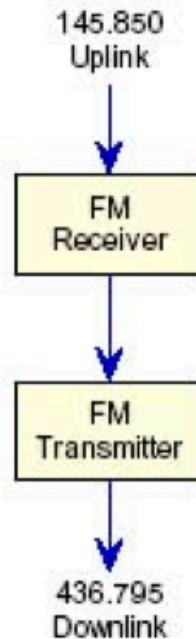


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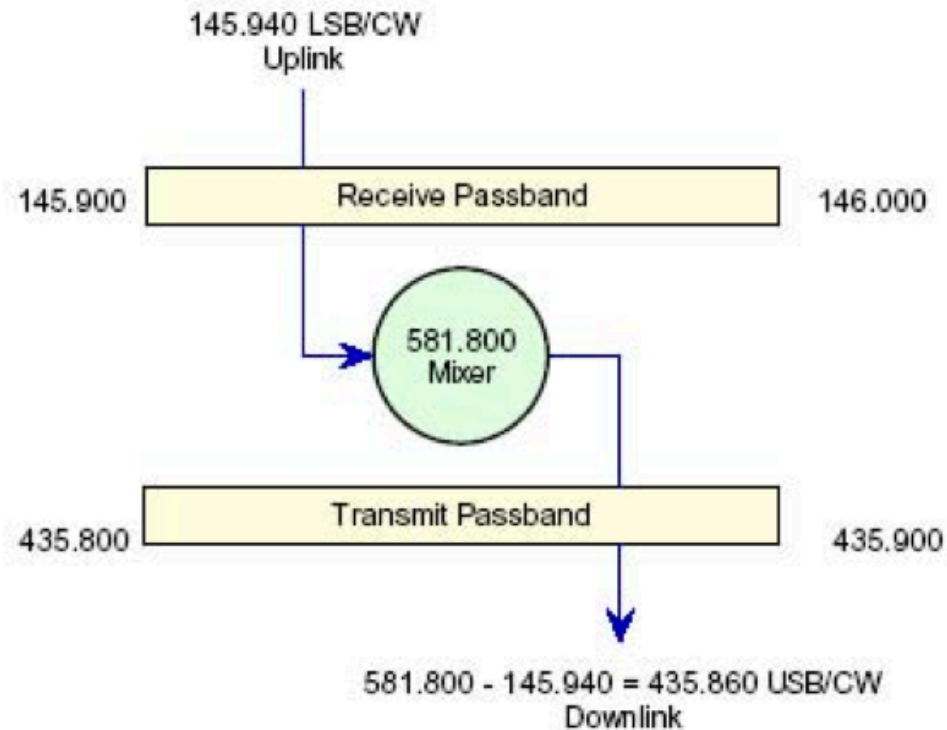
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FM Repeater vs Linear Transponder

Single Channel NFM Repeater



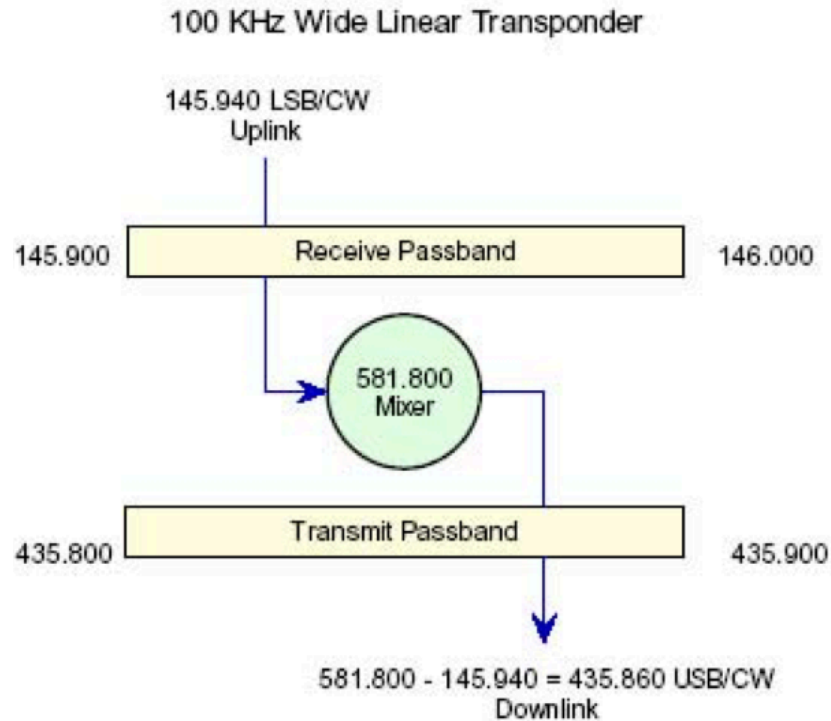
100 KHz Wide Linear Transponder



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Types of Linear Satellites



Courtesy of Emily, WOEEC

Non Inverting

- TX USB High End Passband
- RX USB High End Passband

Inverting

- TX LSB Low End Passband
- RX USB High End Passband



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Linear Transponders are an upgrade from FM sats due to generally greater footprints and more space for QSOs in the passband



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Why I Like Satellites

- Bounce signals of moving target
- Talk anywhere in constantly changing footprint
- Multi-task to TX/RX with multiple radios and track satellite
- Communicate accurately at fast pace
- Doppler Effect challenge

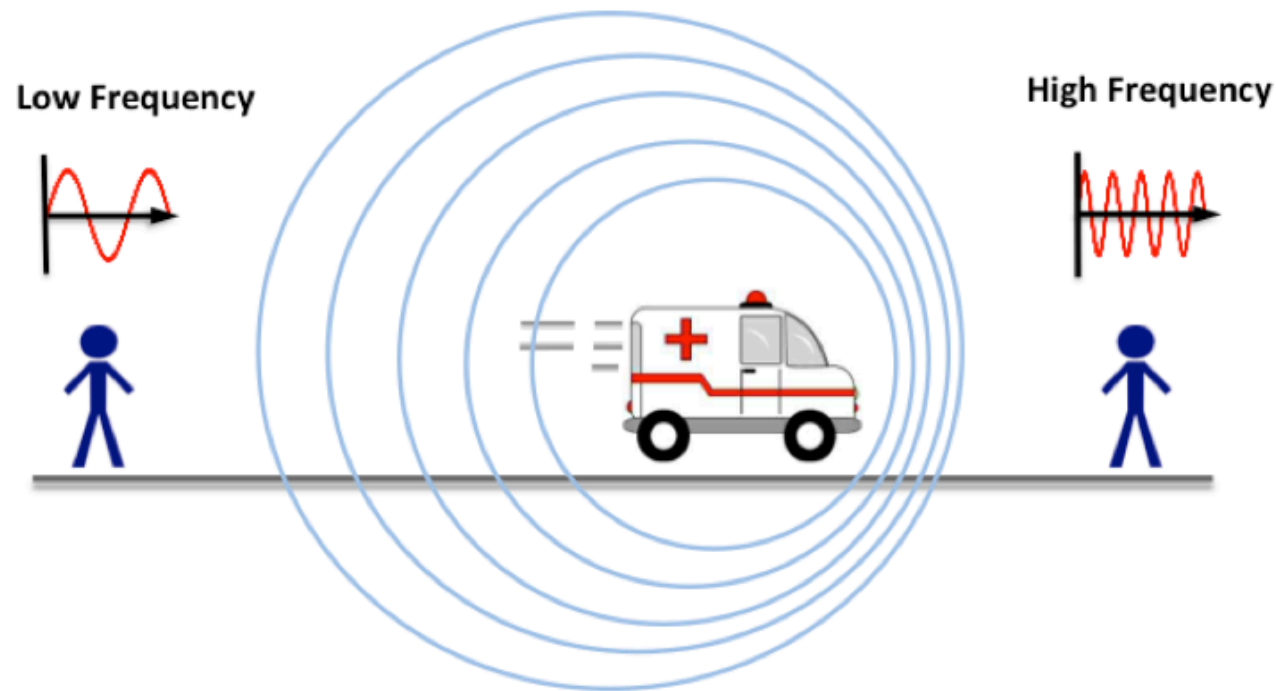


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Doppler Effect: A characteristic of a moving signal

Doppler Effect



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Doppler Effect on SO-50

Ch #	Name	TX Freq	CTCSS (TX)	RX Freq
101	SO50ON	145.850	74.4	436.810
102	SO50-1	145.850	67.0	436.810
103	SO50-2	145.850	67.0	436.805
104	SO50-3	145.850	67.0	436.800
105	SO50-4	145.850	67.0	436.795
106	SO50-5	145.850	67.0	436.790
107	SO50-6	145.850	67.0	436.785
108	SO50-7	145.850	67.0	436.780



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Doppler Effect on Linear Transponders



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Situational Awareness is Imperative



- FM Pass: Don't call CQ
- Linear pass: Spread out in passband, free to call CQ



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Satellites Gear Checklist

Item	Options	Price
Directional Antenna	Yagi - Arrow, Elk	\$152
VHF/UHF Radios	Any brand	\$25 - \$400 Entry level
Low Loss Coax	RG58, Wireman #118, HRO, Etc	\$5
SMA to BNC Connectors	Multiple	\$6
Duplexer (optional)	Arrow, MFJ	\$34
Satellite Pass Prediction Software	Multiple	Free
Grid Square Prediction	Multiple	Free
Compass	Physical compass, phone app	Free
Voice Recorder	Separate recorder, phone app	\$45
	Total Cost:	\$250 - \$600



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Directional Antenna: Elk or Arrow Handheld



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VHF/UHF Radios

- Handhelds or base station
 - Icom
 - Kenwood
 - Yaesu
 - Baofeng



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Operating Full Duplex
is CRITICAL



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Linear Satellites: Radios with SSB/CW/Digital Capability on VHF/UHF

- Yaesu FT817 or FT818
- Yaesu FT-847 (full duplex)
- Icom 7300 (full duplex)
- Icom 910
- Icom 705
- Mix and match to get full duplex as needed



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Low Loss Coax, Connectors, Duplexer as needed

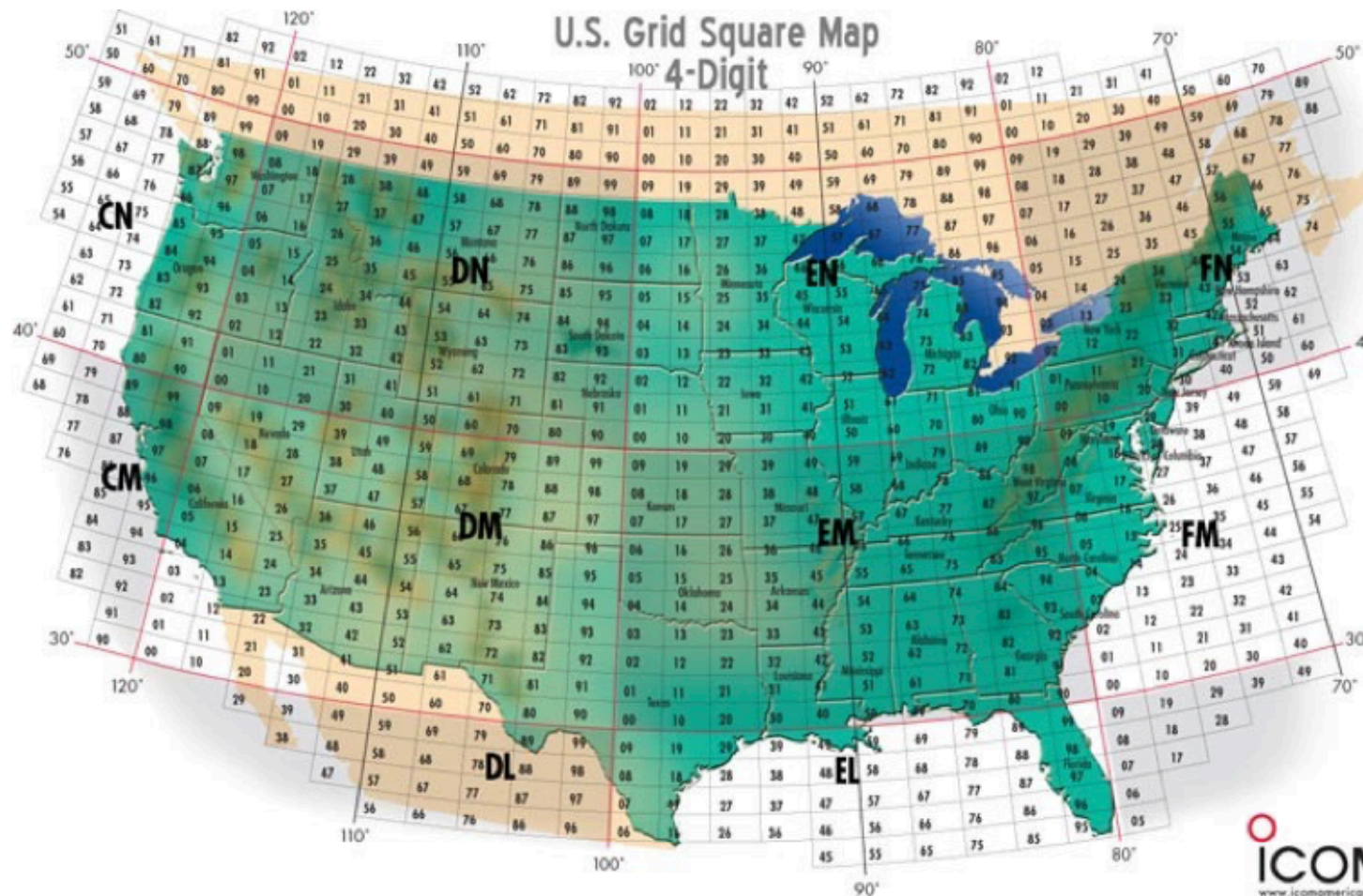
- Low loss coax like RG58, Wireman #118, HRO Equivalent
- Standardize with BNC Connectors
- One Radio
 - Duplexer connects antenna elements to radio
- Two Radios
 - Duplexer + coax
 - 2 lengths of coax



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Maidenhead Grids



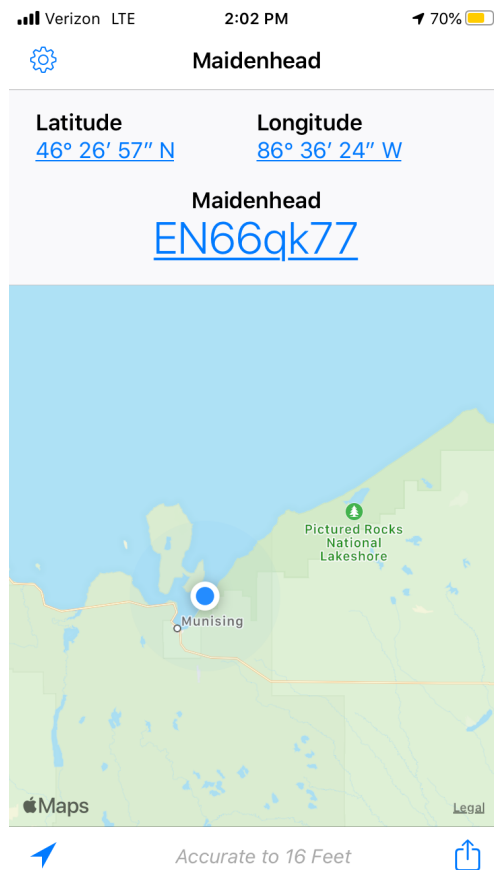
- First two letters :10 degree by 20 degree fields
- Sub fields, 00-99 per letter combination: 1 degree latitude by 2 degrees longitude



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Determining Your Grid Square



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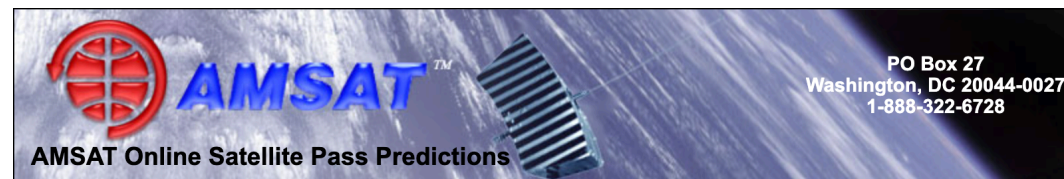
Pass Prediction - AMSAT:

<https://www.amsat.org/track/index.php>

AMSAT Online Satellite Pass Predictions - SO-50

[View the current location of SO-50](#)

Date (UTC)	AOS (UTC)	Duration	AOS Azimuth	Maximum Elevation	Max El Azimuth	LOS Azimuth	LOS (UTC)
12 Jul 21	04:09:52	00:12:05	176	21	118	47	04:21:57
12 Jul 21	05:49:29	00:13:12	230	38	316	26	06:02:41
12 Jul 21	07:33:15	00:09:04	286	6	327	11	07:42:19
12 Jul 21	11:01:34	00:05:53	354	2	20	46	11:07:27
12 Jul 21	12:40:55	00:12:27	341	19	38	108	12:53:22
12 Jul 21	14:20:59	00:13:58	324	60	249	159	14:34:57
12 Jul 21	16:03:29	00:07:51	291	4	251	222	16:11:20
13 Jul 21	02:57:57	00:06:21	131	3	105	73	03:04:18
13 Jul 21	04:33:52	00:13:19	199	54	116	37	04:47:11
13 Jul 21	06:15:14	00:12:06	252	18	310	20	06:27:20
13 Jul 21	08:00:39	00:05:48	312	2	338	4	08:06:27
13 Jul 21	11:25:55	00:09:22	349	7	29	74	11:35:17
13 Jul 21	13:05:32	00:13:39	335	38	59	129	13:19:11
13 Jul 21	14:46:09	00:12:58	315	24	259	181	14:59:07
14 Jul 21	03:19:56	00:11:01	164	14	105	53	03:30:57
14 Jul 21	04:58:38	00:13:27	220	58	301	29	05:12:05
14 Jul 21	06:41:39	00:10:04	275	9	333	13	06:51:43
14 Jul 21	10:11:13	00:04:25	357	1	23	35	10:15:38
14 Jul 21	11:50:24	00:11:42	343	14	41	98	12:02:06
14 Jul 21	13:30:19	00:14:02	328	89	140	150	13:44:21



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.

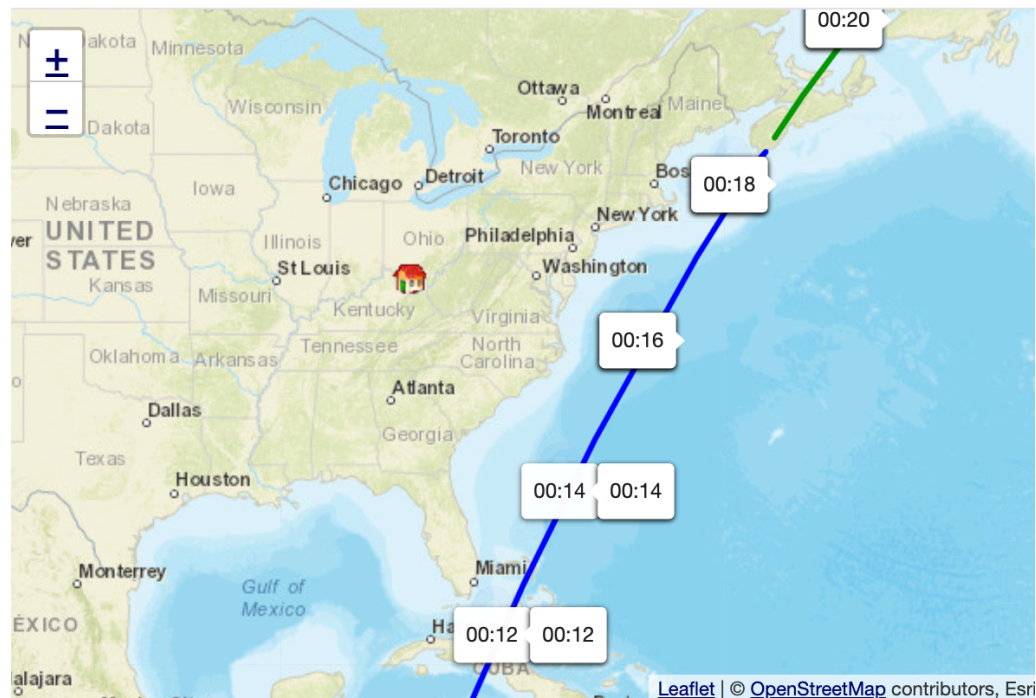
Show Predictions for:	SO-50	for Next	10	Passes
Calculate Latitude and Longitude from Gridsquare:	em79ti	Calculate Position		
Or				
Enter Decimal Latitude:	39.3542	North		
Enter Decimal Longitude:	84.375	West		
Elevation in meters AMSL:	0			
<input type="button" value="Predict"/>				
<input type="checkbox"/> Save my location for later use				



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Pass Prediction N2YO: <https://www.n2yo.com/>



N2YO.com Tracking **23565** objects as of 12-Jul-2021
HD Live streaming from Space Station
2.2.2 objects crossing your sky now

ISS will cross your sky
in 0h 57m 1s

Find a satellite... Search
N2YO.com on Facebook Advanced

Home Most tracked Just launched Satellites on orbit Alerting tools More stuff Sign in

AMATEUR RADIO SATELLITES

There are a few satellites specifically designed to be used by amateur radio (licensed) operators. You can check the status and communication frequencies of all active amateur radio satellites on the following web pages: [DK3WN](#), [JE9PEL](#).
Satellites marked with support uplink communication in amateur radio bands.
Ham radio exclusive: [Amateur radio satellite passes for the next 6 hours](#)




The table is sortable. Please click on the header for ascending/descending sorting.

Name	NORAD ID	Int'l Code	Status	Beacon (MHz)	Period [minutes]	Action
3CAT-2	41732	2016-051B	Inactive		94.2	TRACK IT
AALTO 1	42775	2017-036L	Active	437.220	94.6	TRACK IT
AAU CUBESAT	27846	2003-031G	Inactive		101.2	TRACK IT
AAUSAT CUBESAT 2	32788	2008-021F	Active		96.3	TRACK IT
AAUSAT-4	41460	2016-025E	Active	437.425	95.3	TRACK IT
AAUSAT3	39087	2013-009B	Inactive	437.425	100.3	TRACK IT
ACRUX 1	44369	2019-037E	Inactive		93	TRACK IT
AENEAS	38760	2012-048C	Inactive		95.5	TRACK IT
AEROCUBE 2	31133	2007-012R	Inactive		98.7	TRACK IT
AISAT	40054	2014-034B	Inactive	437.511	97.4	TRACK IT
AIST 1	39492	2013-078C	Inactive	435.265	96.8	TRACK IT
AIST 1	39492	2013-078C	Inactive		96.8	TRACK IT

10-DAY PREDICTIONS

Object name **SAUDISAT 1C** [Live tracking](#) | [More info](#)
Catalog # 27607 2002-058C
Observing location 98.103.41.194
Observing coord. Lat: 39.34°, Lng: -84.41° [Change](#)
Local time zone GMT -4

Uplink (MHz): 145.850
Downlink (MHz): 436.795
Beacon (MHz):
Mode: FM_tone 67.0Hz
Call sign:
Status: **Active**

Visible passes		AM/PM time		UTC		Print as PDF		
Start 		Max altitude			End 		All passes	
Date, Local time	Az	Local time	Az	EI	Local time	Az	Mag 	Info
12-Jul 00:10	S 175°	00:15	ESE 111°	21°	00:21	NE 48°	-	Map and details
12-Jul 01:49	SW 230°	01:56	NW 308°	39°	02:02	NNE 25°	-	Map and details



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Pass Prediction Software List

- AMSAT: <https://www.amsat.org/track/index.php>
- N2YO: <https://www.n2yo.com/>
- Gpredict: <http://gpredict.oz9aec.net/>
- MacDoppler: <https://www.dogparksoftware.com/MacDoppler.html>

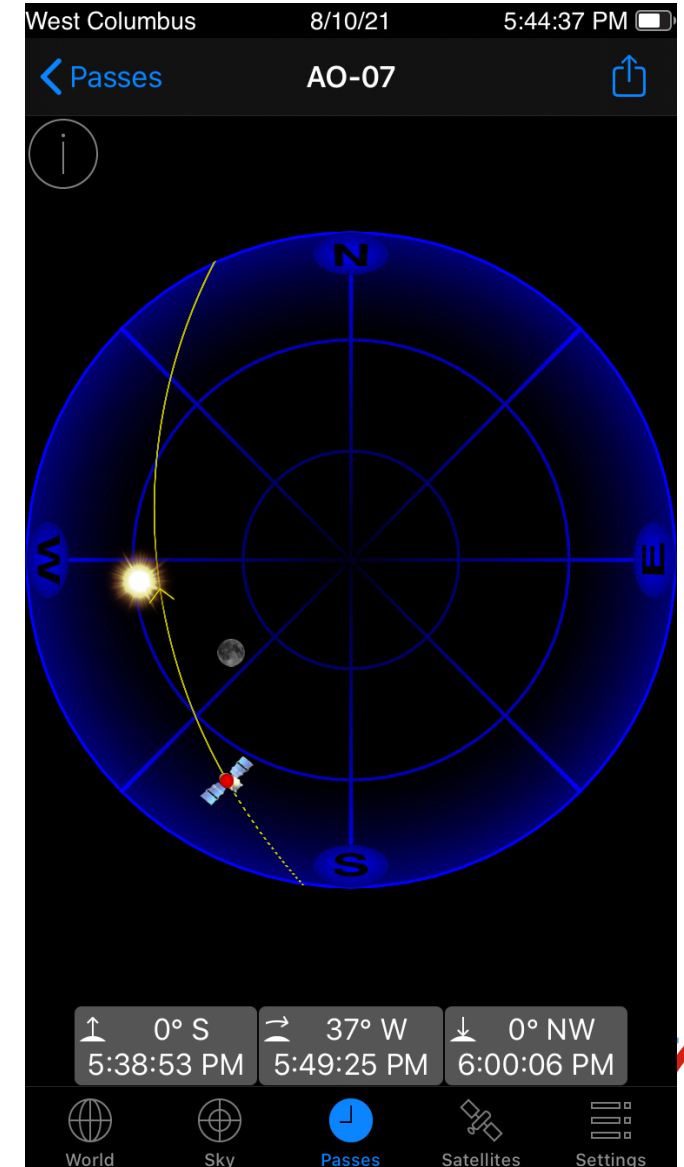
- GoSatWatch (iPhone)
- AmsatDroid (Android)
- ISS Detector (Both)



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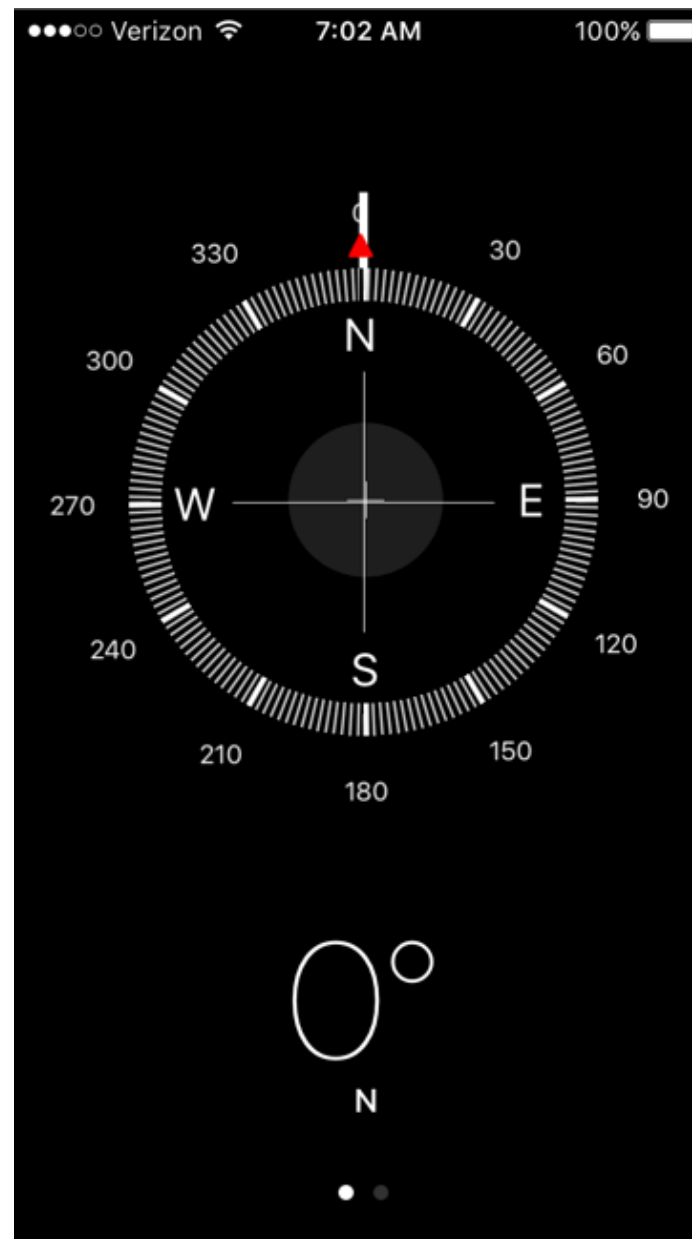
Pass Prediction – iPhone Apps



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Compass



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Voice Recorder



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Logging Satellite Passes

TQSL

N3FJP

The screenshot shows the TQSL application window. The main menu bar includes 'File', 'Station Location', 'Callsign Certificate', and 'Help'. Below the menu is a tabbed interface with 'Log Operations', 'Station Locations', and 'Callsign Certificates'. On the left side, there are four icons with corresponding labels: 'Sign a log and...', 'Sign a log and...', 'Create an ADIF...', and 'Log in to the L...'. The 'QSO Data' dialog box is open, displaying the following fields and controls:

- Call Sign:** A text box containing 'J/E2NCO'.
- UTC Date (YYYY-MM-DD):** A text box containing '2020-07-04'.
- UTC Time (HHMM):** A text box containing '04:05:30Z'.
- Mode:** A dropdown menu set to 'FM'.
- Band:** A dropdown menu set to '70CM (420-450 mHz)'.
- RX Band:** A dropdown menu set to '2M (144-148 mHz)'.
- Frequency (MHz):** An empty text box.
- RX Frequency (MHz):** An empty text box.
- Propagation Mode:** A dropdown menu set to 'Satellite'.
- Satellite:** A dropdown menu set to '[AO-92] AMSAT-OSCAR 92 (Fox-1D)'.

Below the dropdowns, it says '30 QSO Records'. There are four navigation buttons: a double left arrow, a single left arrow, a text box containing '16', a single right arrow, and a double right arrow. At the bottom of the dialog are two buttons: 'Add QSO' and 'Delete'. The main application window has a 'Status Log' section at the bottom left.

NS3IP's Amateur Contact Log 6.4 www.n3fjp.com

File Edit Settings Clear CallBook List Search Awards eLogs Recall Net View Help

Recent Contacts Last 50 All 50 Listed Items

Edit Contact

Rec# Call

Call	Date	Time On	Band	Mode	Power	RST Sent	RST Rec	Country
WY7AA	2019/03/19	16:16:00	70	FM				USA
Name Rec	State	County Rec	Frequency	Grid Rec	NPOTA	Time Off	QSL Rec	QSL Sent
CO		WASHINGTON					<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Rec Conf By	Sent Conf By							
L	L							
Comments								
<input type="button" value="Less"/> <input type="button" value="Cancel"/> <input type="button" value="Done"/>								
Age	ARCI	Category	Check	Class	Contest ID	Continent	County Sent	CQ Zone
						NA		04
DXCC ADIF #	Fists	Grid Sent	IARU Zone	Initials	IOTA	ITU Zone	Lighthouse	Mode (tst)
291						07		PH
Name Sent	Operator	QSL \$/R	Other3	Other4	Other5	Other6	Other7	Other8
PC Name	Precedence	Prefix	Points	Prop Mode	QTH Group	Sat Name	Section	Serial Rec
		WY7	0					
Serial Sent	State Pr Cont	State Pr Cnt #	Station	Trans ID #	10 - 10			
		CO						

☐ Default to Full Form on Open

<https://www.magicbug.co.uk/cloudlog/>

<https://twitter.com/WD9EWK/status/976839455658176513>



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What do we talk about?

Potential QSO on a busy pass

- KX9X, this is KM4LAO
- KM4LAO, this is KX9X, EN50
- QSL Sean, I'm in EM79!
- QSL, Ruth

AO92 06/23 0311z		
KJ4EU	3:14	EM56
N5LEX	3:14	FM13
N5BO	3:14	EM66
W4ZXT	3:15	EM77
NOTEL	3:16	EM40
ND0C	3:16	EN23
K4DCA	3:16	FM18
N2FYA	3:17	FN41
WE4B	3:17	EM62
KB3IAI	3:18	FM19
KG4KAW	3:20	FM17
KC9BKA	3:21	EN64
AE0CM	3:21	EN34
KI7UXT	3:22	DN17



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Home Grid Stations and Rovers



DD1US



Kylee, KE0WPA

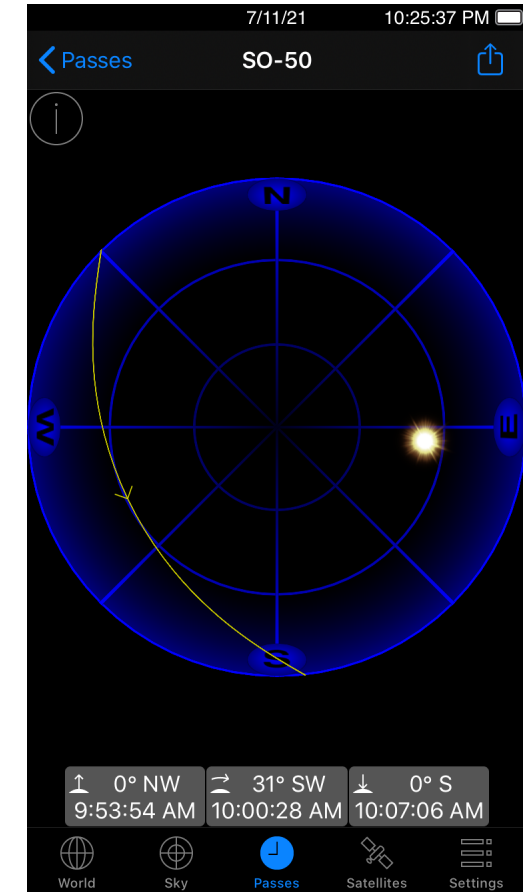


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Satellite Pass Checklist Part 1- Pre Pass

- Choose a satellite and pass to operate on
- Determine operating location based on direction and elevation of pass
- Gather equipment and charge radios
- Make sure FM frequencies are programmed in radio memory



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Satellite Pass Checklist Part 2 - Pre Pass

- Walk/Drive to operating site
- Assemble antenna and connect radios
- Mark AOS, Peak Elevation, and LOS
- Start recording, state date and time, grid square, callsign, and satellite



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Satellite Pass Checklist Part 3 – Mid Pass

- Track where the satellite should until you hear it
- Listen until you get the rhythm of pass
 - Listen for other rovers, special events, try to understand who is on the air
- Call someone directly or just transmit your callsign and gridsquare
- Repeat for the entire pass

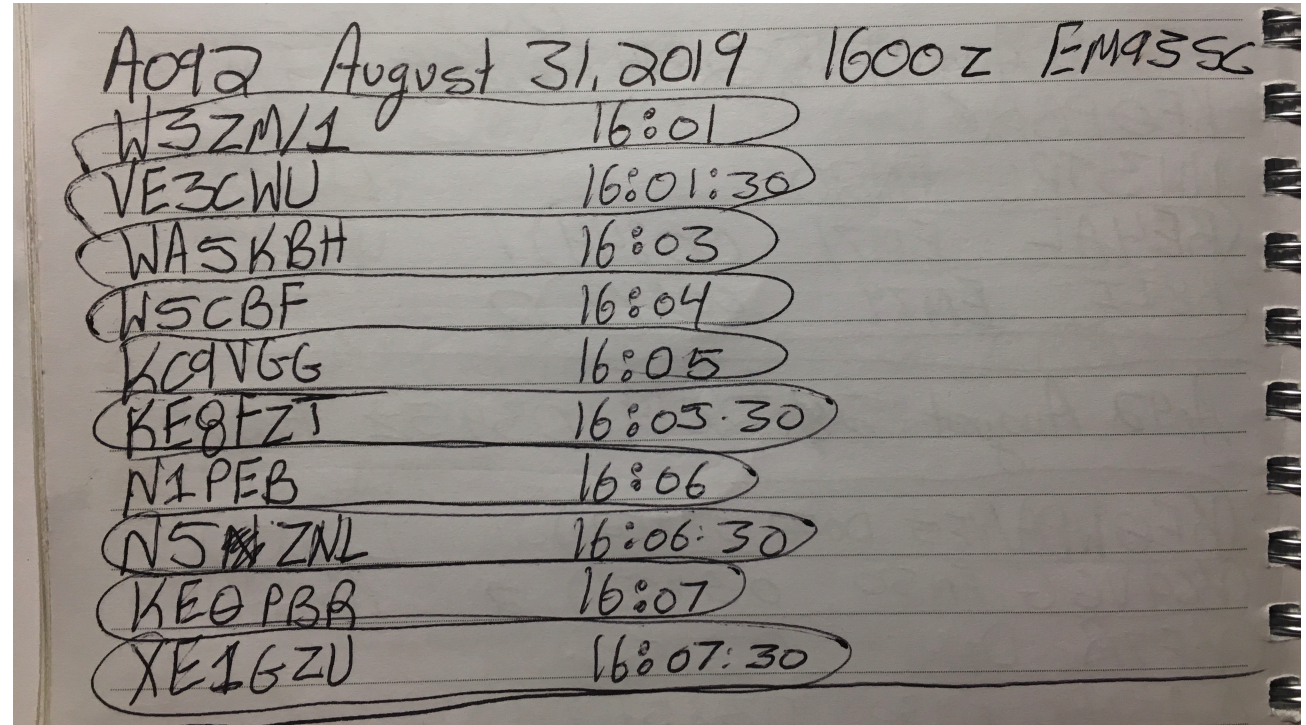


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Satellite Pass Checklist Part 4 – Post Pass

- Transcribe recording
- Log contacts
- Upload to LOTW for confirmation and award credit
- Send QSL cards as desired



A photograph of a handwritten log in a spiral-bound notebook. The log is titled 'A092 August 31, 2019 1600Z EM43SC'. It lists ten satellite contacts, each circled with a pen. The contacts are: W3ZM/1 at 16:01, VE3CWU at 16:01:30, WA5KBH at 16:03, W5CBF at 16:04, KC9VGG at 16:05, KE8FZT at 16:05:30, N1PEB at 16:06, N5ZNL at 16:06:30, KE0PBB at 16:07, and XE1GZU at 16:07:30.

A092 August 31, 2019 1600Z EM43SC	
W3ZM/1	16:01
VE3CWU	16:01:30
WA5KBH	16:03
W5CBF	16:04
KC9VGG	16:05
KE8FZT	16:05:30
N1PEB	16:06
N5ZNL	16:06:30
KE0PBB	16:07
XE1GZU	16:07:30



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Successful Contact



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Satellite Linear Tips

- Use KE0PBR Frequency List
- Track satellite using app
 - Often most beneficial to find the beacon first
- Pick downlink or uplink on 2m, set that freq on radio, and lock it
- Scroll uplink or uplink to corresponding 70cm frequency and be prepared to adjust for Doppler
- Find yourself on the passband and try not to step on others
 - Soft whistles help sometimes, or “testing 1,2,3”
 - Operators know it can be hard to find yourself, so be patient
 - If you don’t find yourself, go back to the starting frequency and slowly change the freq until you do
- Start calling CQ to make contacts!



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Satellites Linear Frequencies

CAS-4A		Preset #8			Beacon:	145.855
AOS	U L p S B	435.200	435.205	435.210	435.215	435.220
2		435.205	435.210	435.215	435.220	435.225
Mid		435.210	435.215	435.220	435.225	435.230
4		435.215	435.220	435.225	435.230	435.235
LOS		435.220	435.225	435.230	435.235	435.240
VHF	Down USB	145.880	145.875	145.870	145.865	145.860



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Amateur Radio Operators in the Americas

Linear Satellite Pass Video

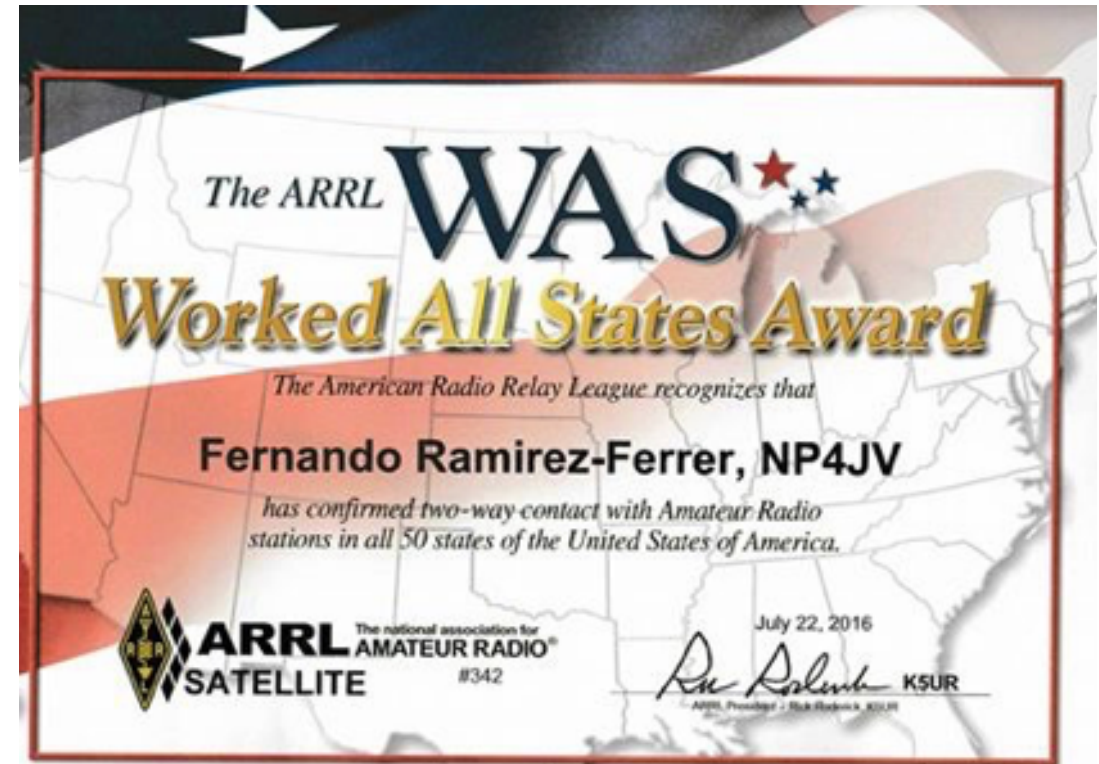
<https://youtu.be/cwtmP1sDL9g?t=115>



Youth on the Air

Activities for the Next Generation of
Amateur Radio Operators in the Americas

Earning Standard Awards



Youth on the Air

Activities for the Next Generation of
Amateur Radio Operators in the Americas

Earning Customized Awards



Mitch Ahrenstorff

@AD0HJ

Updated (ADØ)² Awards List 04/12/20: Work both Ron @ad0dx and Mitch @AD0HJ on the same satellite pass to add your callsign to this list. The (ADØ)² Awards Committee will issue a serialized QSL Award Card upon confirmation. 😊 #ad0squared

ADØ ² Awards							
#	CALL	DATE	TIME	MODE	TIME	MODE	TIME
1	AD0HJ	04/12/20	17:00	SSB	04/12/20	SSB	17:00
2	AD0HJ	04/12/20	17:00	SSB	04/12/20	SSB	17:00
3	AD0HJ	04/12/20	17:00	SSB	04/12/20	SSB	17:00
4	AD0HJ	04/12/20	17:00	SSB	04/12/20	SSB	17:00
5	AD0HJ	04/12/20	17:00	SSB	04/12/20	SSB	17:00
6	AD0HJ	04/12/20	17:00	SSB	04/12/20	SSB	17:00
7	AD0HJ	04/12/20	17:00	SSB	04/12/20	SSB	17:00
8	AD0HJ	04/12/20	17:00	SSB	04/12/20	SSB	17:00
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99	AD0HJ	04/12/20	17:00	SSB	04/12/20	SSB	17:00
100	AD0HJ	04/12/20	17:00	SSB	04/12/20	SSB	17:00

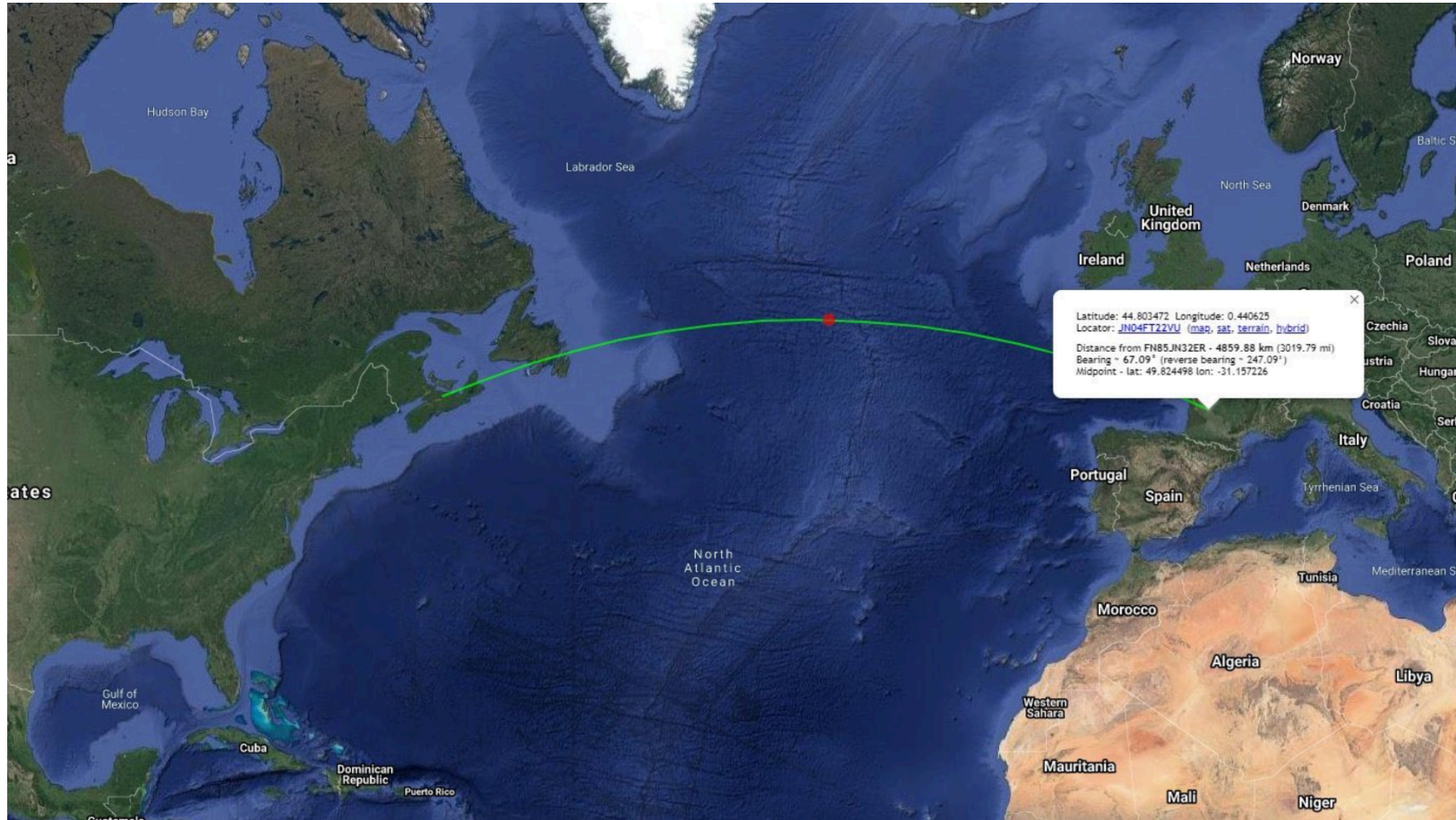
Work All Bakersfield Award
When you make contact with KF6JOQ and N6AJ on a single satellite ,you will receive one of the WABA cards.



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Activities for the Next Generation of
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AMSAT Distance Records



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AMSAT Rover Award



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13th Annual 13 Colonies Special Event

Independence Week Celebration July 1 - 7 2021



COLONIAL TALL SAILING SHIPS



2021



Colony call	State	satop call	satop name
K2A	New York	W2JV	Peter Portanova
K2B	Virginia	KS1G	Stephan Greene
K2C	Rhode Island	N1KM	Mark Dieterich
K2D	Connecticut	NU1U	Ant Lefebvre
K2E	Delaware	KB2M	Jeff Griffin Sr
K2F	Maryland	N3CAL	Calvin Spreitzer
K2G	Georgia	K4RGK	Daryl Young
K2H	Massachusetts	KC1DKY	Nicholas Mollo
K2I	New Jersey	WO2T	Al Rossi
K2J	North Carolina	KG4AKV	John Brier
K2K	New Hampshire	AB1OC	Fred Kemmerer
K2L	South Carolina	K4YYL	Art Balz
K2M	Pennsylvania	K3STL	John Hoffman
WM3PEN	Philadelphia bonus	W3YP	Villanova University ARC



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Connections On The Air: AMSAT Net

The Houston AMSAT Net is happening tonight on *AMSAT* EchoLink Conference Node #101377 at 8 pm CDT (0100Z). Looking forward to catching up on the latest #AMSAT news from Marty #WV5Y. Live stream is an option also: listen.ehhh.us:8000/amsat.   [#amsat](#) [#echolink](#) [#sstvtuesday](#)



Houston AMSAT Net



Live Tuesday Evenings 8PM Central Time
Heard locally in Houston on 145.19 Repeater
Back up repeater 145.45 MHz FM Repeater

(Wednesday 0100 UTC March-September, 0200 UTC October-February)



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Amateur Radio Operators in the Americas

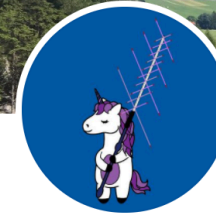
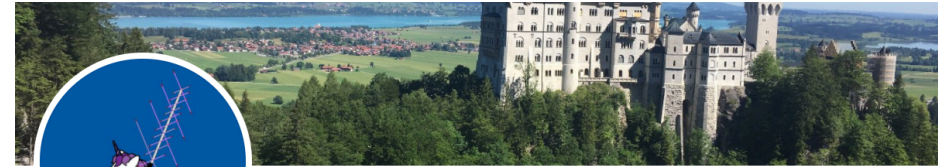
Twitter for Hams



Randy NDOC
@randy_NDOC



What do you do when you are roving and there are simultaneous FM and linear passes? Pull out the 2nd Arrow and have at it! [@kylee_ke0wpa](#)



Edit profile

Ruth
@KM4Ruth

Amateur Radio op KM4LAO. Active on HF & satellites! Kettering University (K8HPS) Class of 2021. B.S. MechE & Engineering Physics w/ Acoustics minor.



Nancy N9NCY
@Nancy_N9NCY Follows you

Following

Musician & jazz vocalist. Backpacker/camper/hiker, & MN Twins fan. Recent ham radio Technician license. Interested in SOTA/satellites/roving!



Ria Jairam - N2RJ
@RiaJairam Follows you

Following

#Trini, #hamradio op. N2RJ, #ARRL/Foundation Director, Unix nerd, video creator, drone enthusiast, EE, maker, shaker, stirrer 🇩🇪 🇮🇳 🇺🇸 🇬🇧



John VE1CWJ
@ve1cwj Follows you

Following



KB9STR - Keith
@Kb9Str Follows you

Following



Nestor N6CKC
@n6ckc Follows you

Following

Satellite enthusiast, high frequency addict.



AD5JK
@AD5JK Follows you

Following

Account for my radio adventures (satellites and digital modes mostly). LotW for all logging.



Youth on the Air

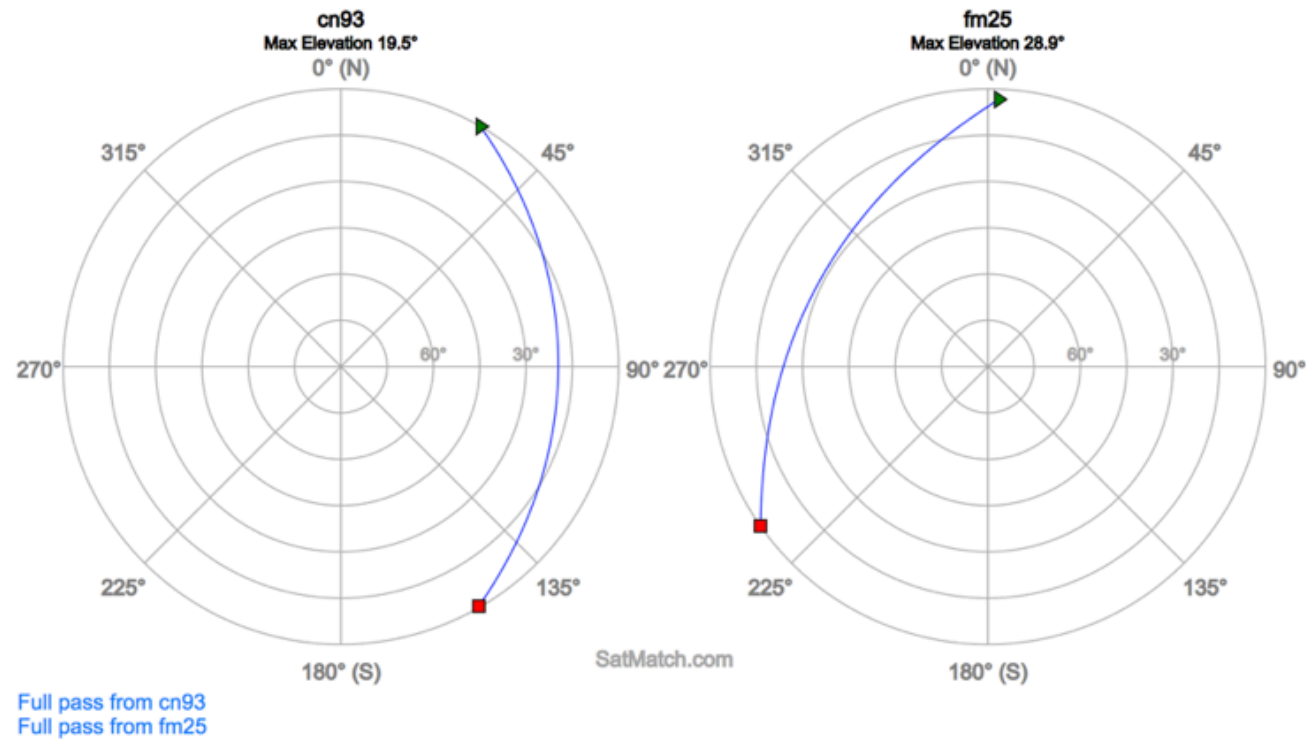
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SatMatch

Overlapping pass between cn93 and fm25 (4021km) using AO-07

Overlap lasts 19 min 52 seconds starting 2020-06-24 at 10:22:49Z

AO-07 on 2020-06-24 at 10:22:49Z

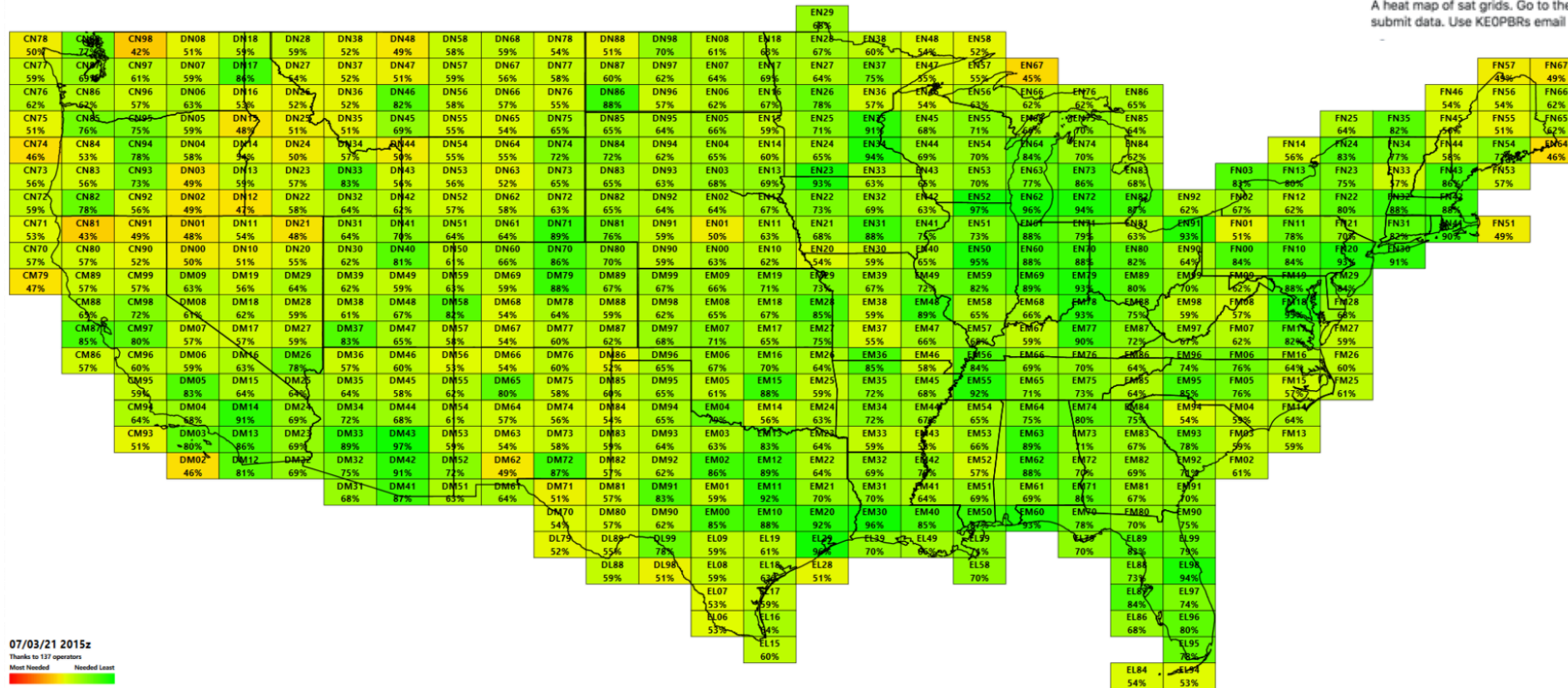


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GridMaster Heat Map

Gridmaster 488



General Links

- AMSAT Homepage
 - <https://www.amsat.org/>
- Paul, KE0PBR's frequency Excel spreadsheet
 - <https://ke0pbr.wordpress.com/2018/12/31/my-frequency-cheat-sheet/>
- FM Satellite Frequency Summary
 - <https://www.amsat.org/fm-satellite-frequency-summary/>
- OSCAR Satellite Status Page
 - <https://www.amsat.org/status/>
- AMSAT UK
 - <https://amsat-uk.org/>



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Satellites are...

Accessible

Affordable

Fantastically Fun

Challenging

Connecting with
Community

Always Providing
Learning
Opportunities

... for everyone!



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Questions?



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