

Talking Through The Birds

Ruth Willet, KM4LAO

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

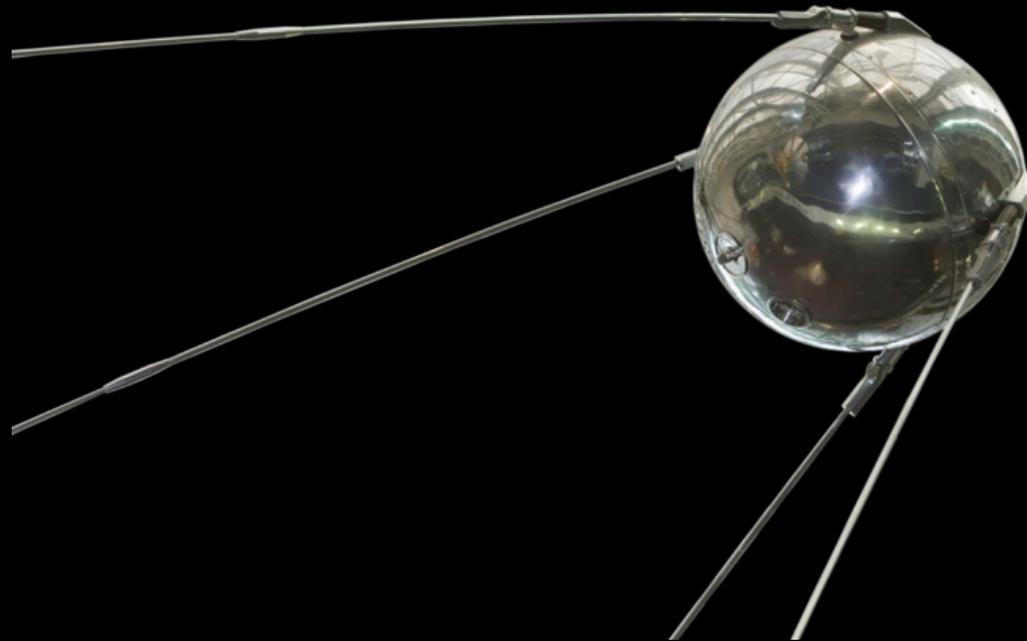
Connecting Off Satellites



Youth on the Air

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

From Sputnik I to OSCAR Satellites



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



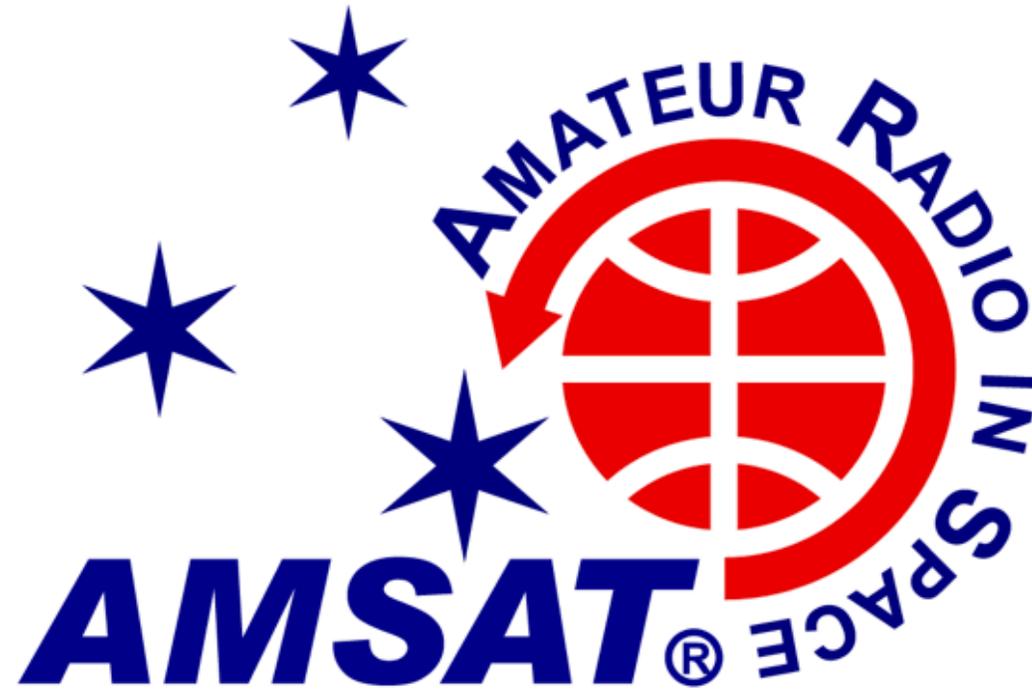
<https://amsat-uk.org/2018/01/26/ao-92-open-for-amateur-radio-use/>



Youth on the Air

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

AMSAT



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

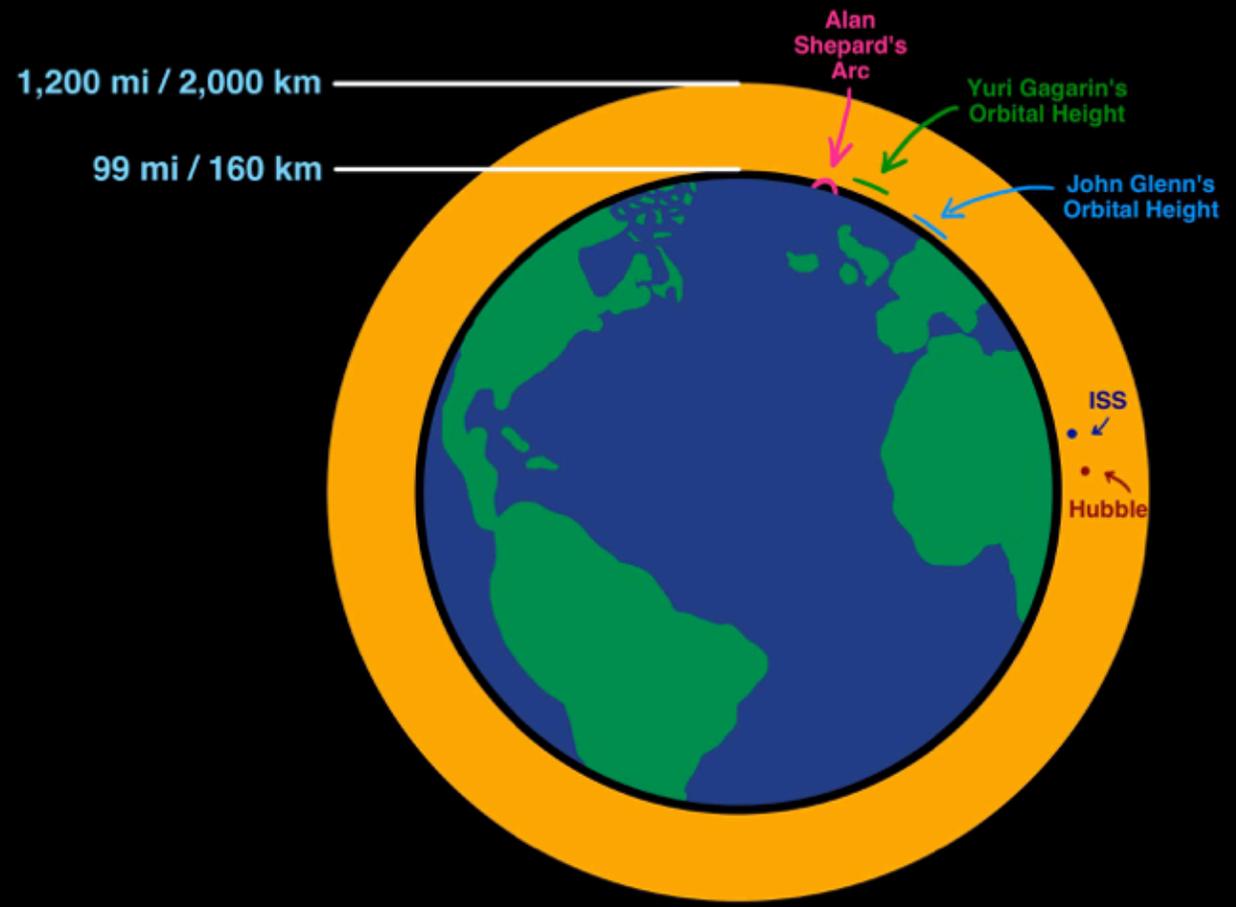


Youth on the Air

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

Low Earth Orbit (LEO)

All sizes to scale



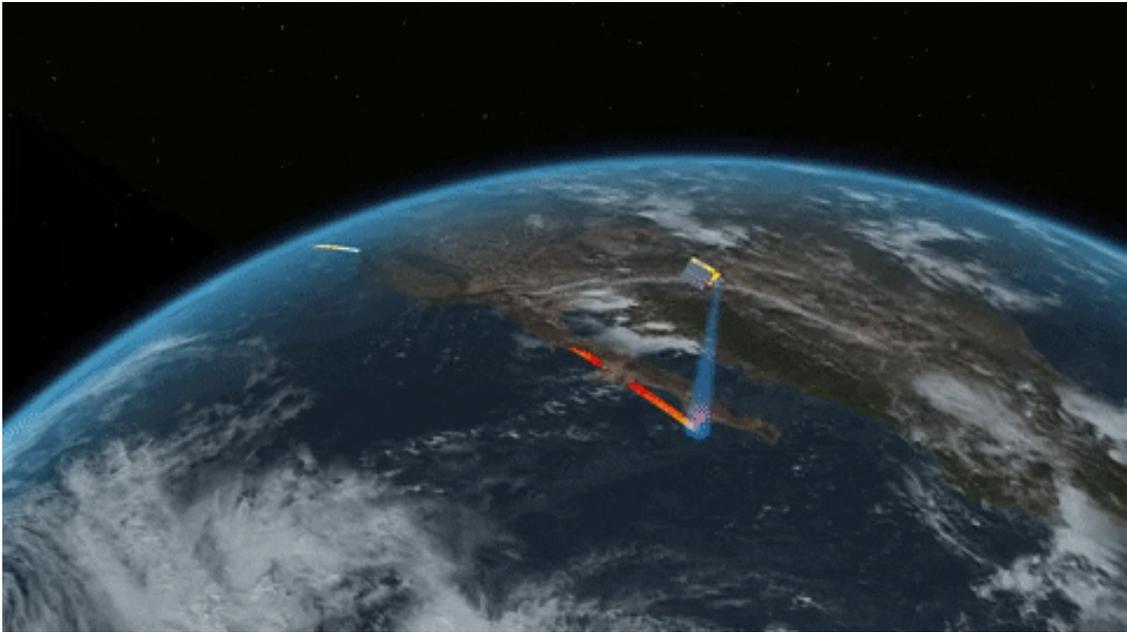
waitbutwhy.com



Youth on the Air

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

Orbital Period = Time to complete one trip
around the earth



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

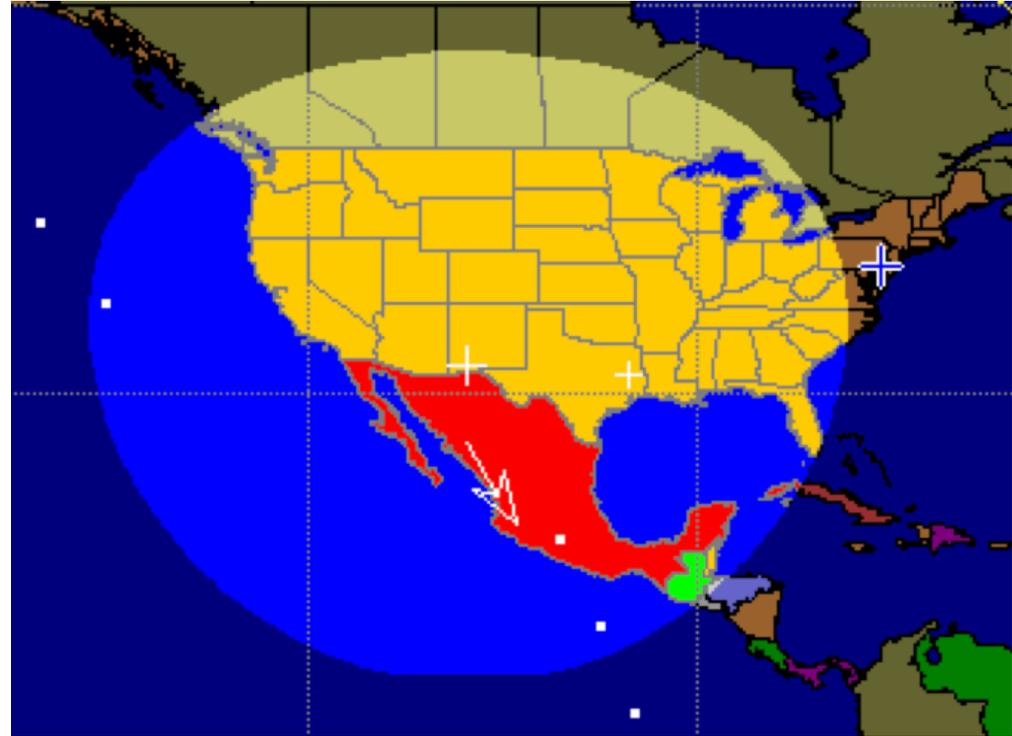


Youth on the Air

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

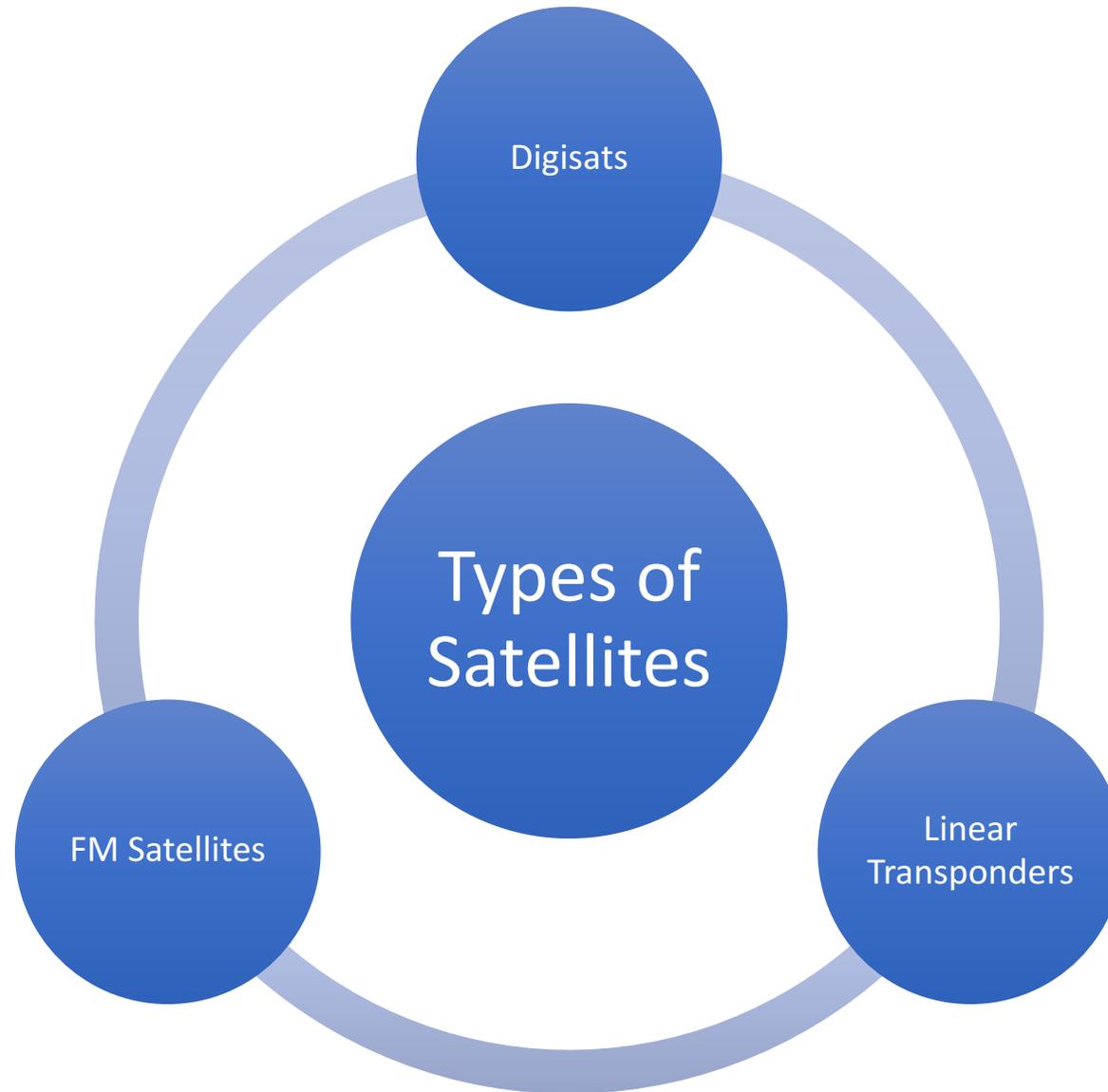
QSOs occur when we are in a satellite's footprint

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



Youth on the Air

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



Youth on the Air

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



Digisats

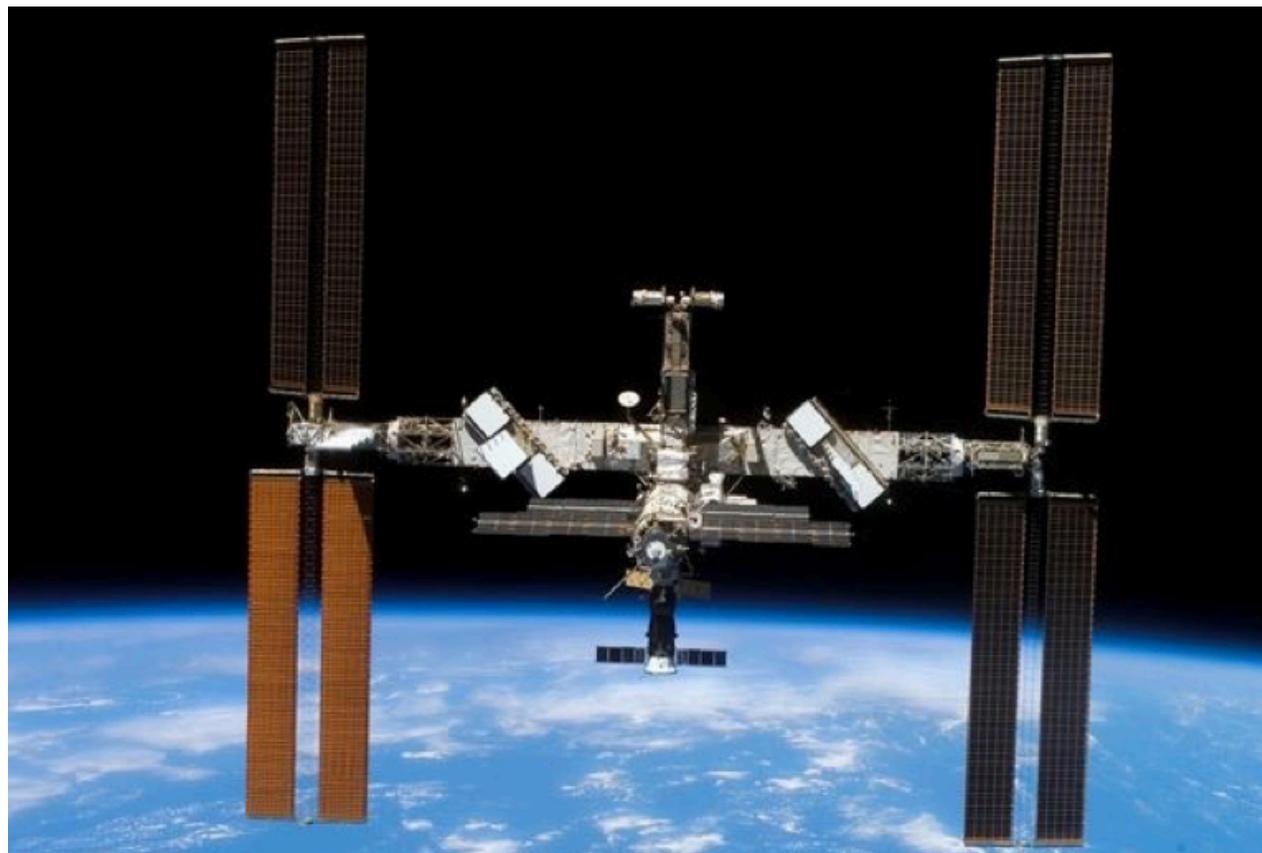
- Digital Modes
- 2m Simplex
- Equipment: 1 HT & Directional Antenna



Youth on the Air

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

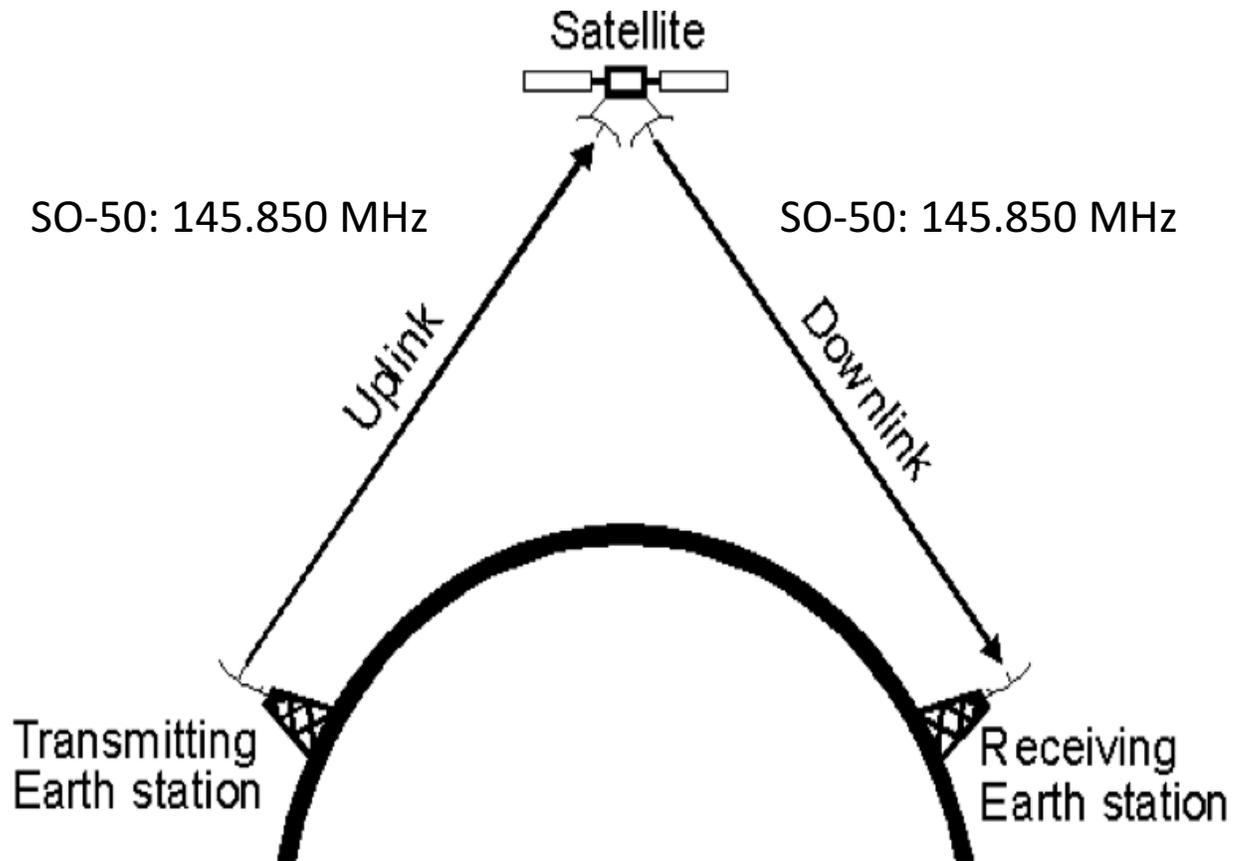
Digipeater Available on the ISS



Youth on the Air

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

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



Youth on the Air

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

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



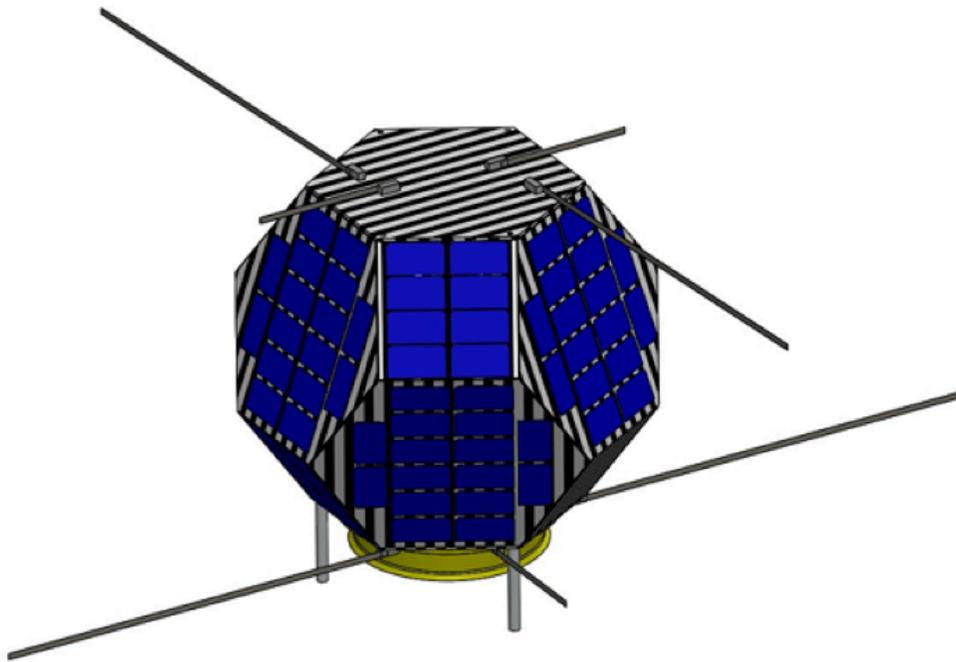
FM Satellites are great to start with and fun to operate on!



Youth on the Air

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

Linear Transponders



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

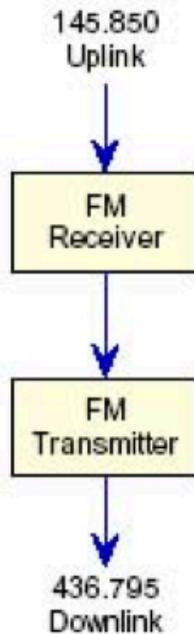


Youth on the Air

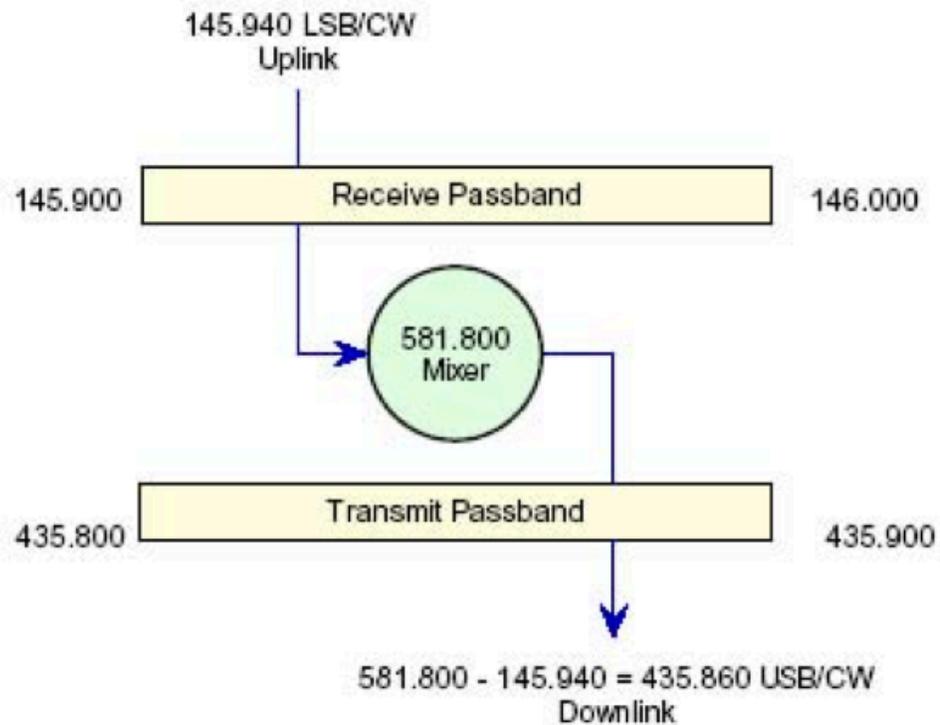
Activities for the Next Generation of
Amateur Radio Operators in the Americas

FM Repeater vs Linear Transponder

Single Channel NFM Repeater



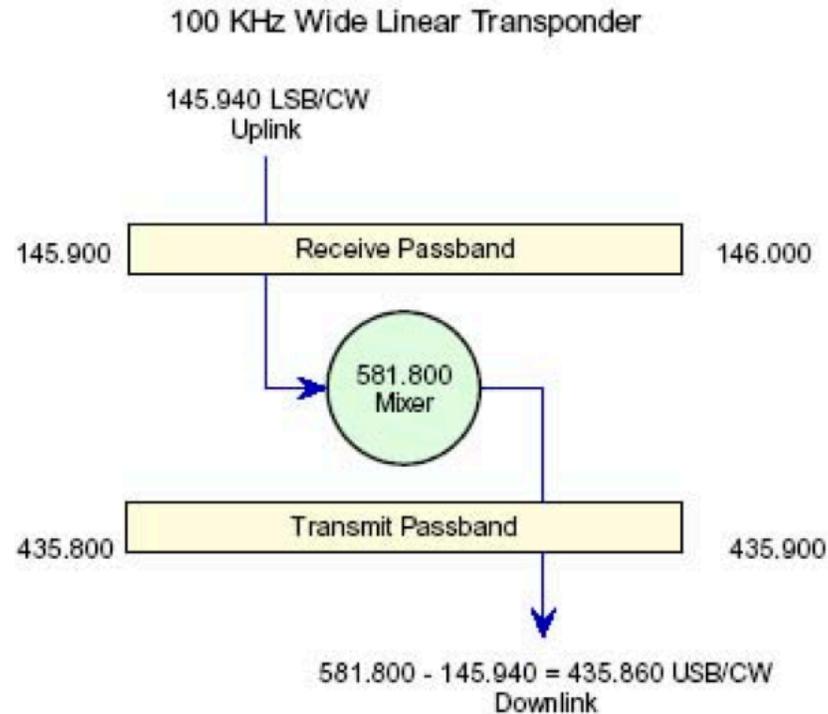
100 KHz Wide Linear Transponder



Youth on the Air

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

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



Youth on the Air

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

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



Youth on the Air

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

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

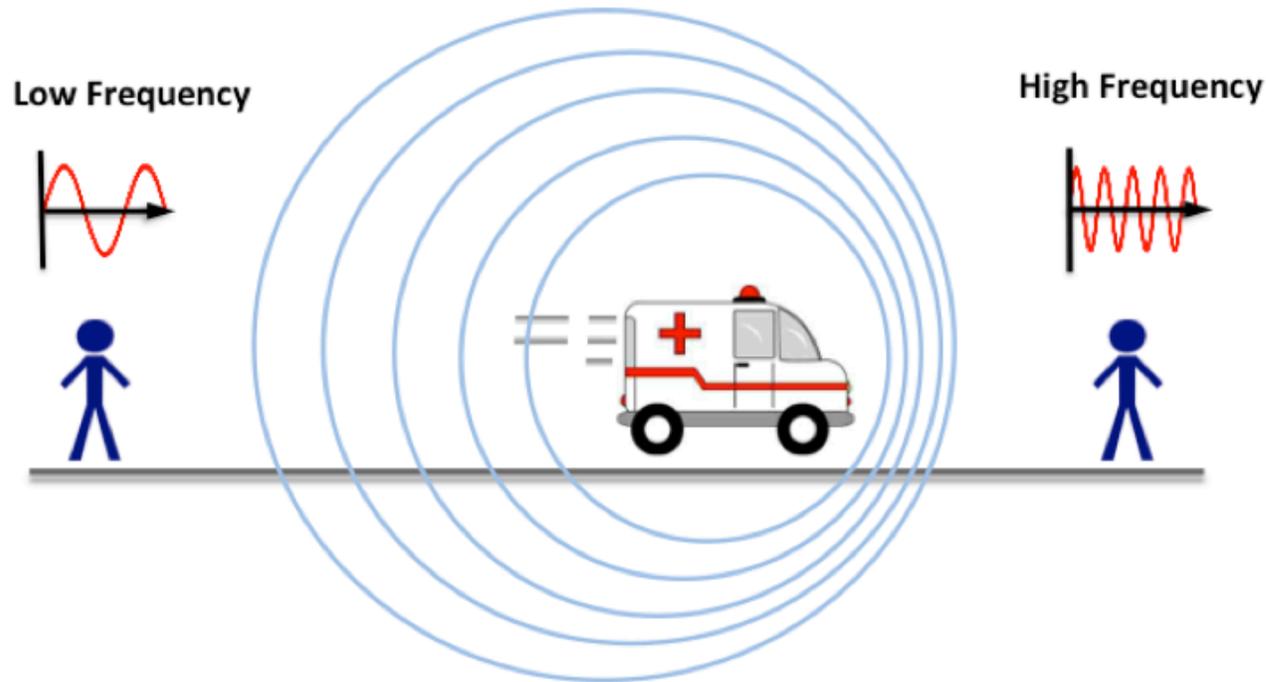


Youth on the Air

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

Doppler Effect: A characteristic of a moving signal

Doppler Effect



Youth on the Air

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

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



Youth on the Air

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

Doppler Effect on Linear Transponders



Youth on the Air

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

Situational Awareness is Imperative



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



Youth on the Air

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

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



Youth on the Air

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

Directional Antenna: Elk or Arrow Handheld



Youth on the Air

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



VHF/UHF Radios

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



Youth on the Air

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



Operating Full Duplex
is CRITICAL



Youth on the Air

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



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



Youth on the Air

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

Low Loss Coax, Connectors, Duplexer as needed

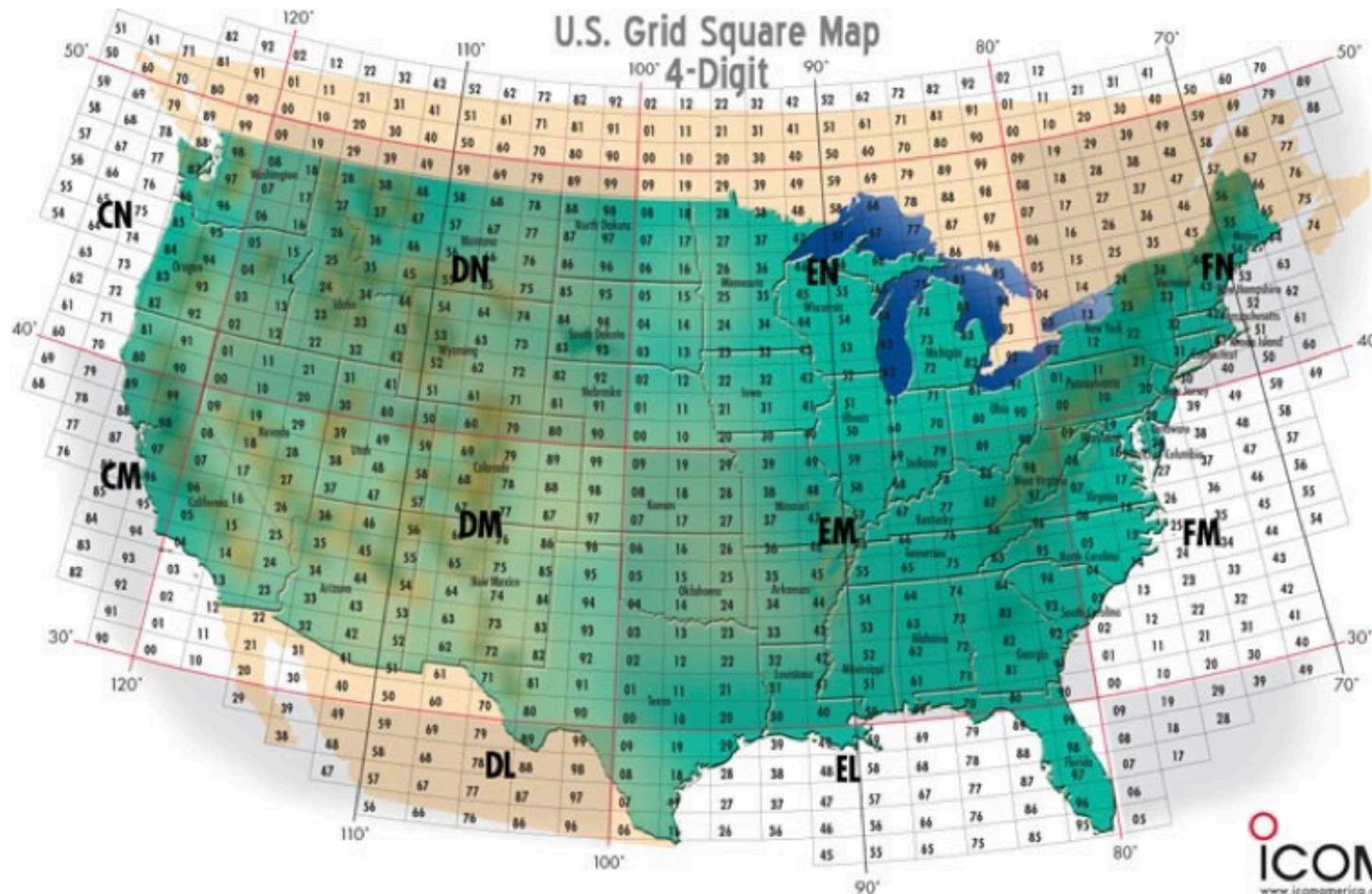
- Low loss coax like RG58, Wireman #118, HRO Equivalent
- Standardize with BNC Connectors
- One Radio
 - Duplexer connects antenna elements to radio
- Two Radios
 - Duplexer + coax
 - 2 lengths of coax



Youth on the Air

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

Maidenhead Grids



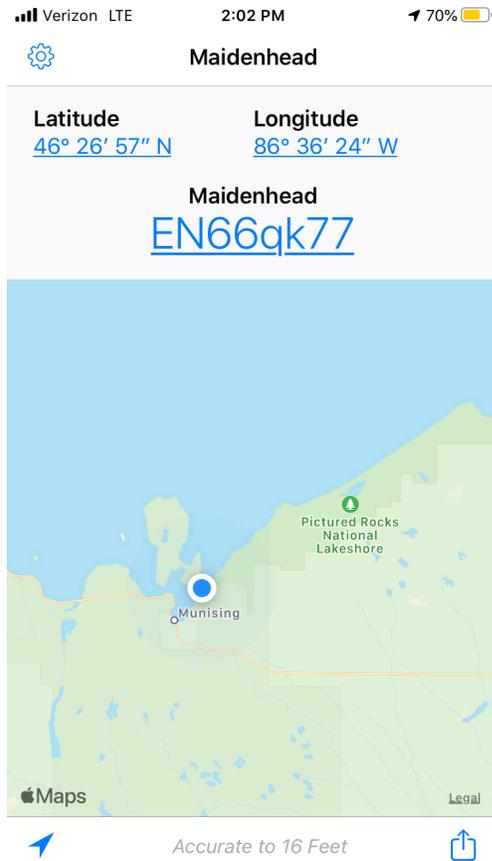
- First two letters :10 degree by 20 degree fields
- Sub fields, 00-99 per letter combination: 1 degree latitude by 2 degrees longitude



Youth on the Air

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

Determining Your Grid Square



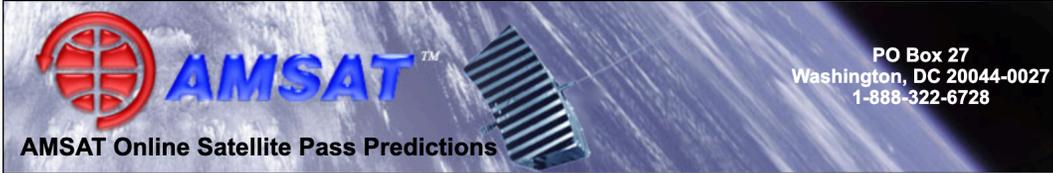
Youth on the Air

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

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

PO Box 27
Washington, DC 20044-0027
1-888-322-6728

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

Predict

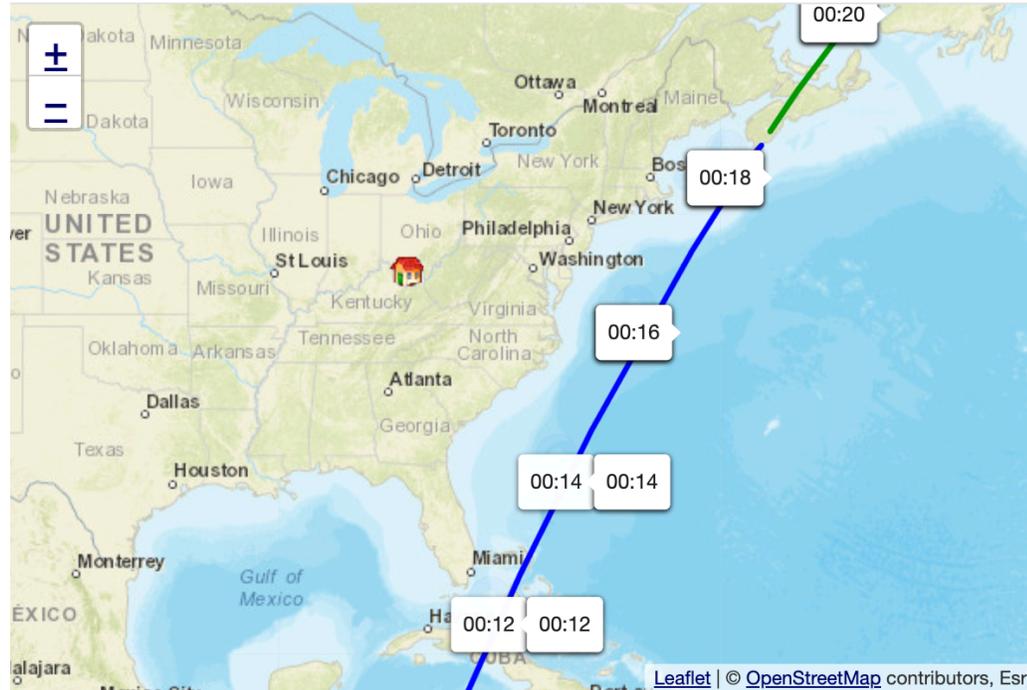
Save my location for later use



Youth on the Air

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

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 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 **C** 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



Youth on the Air

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

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>

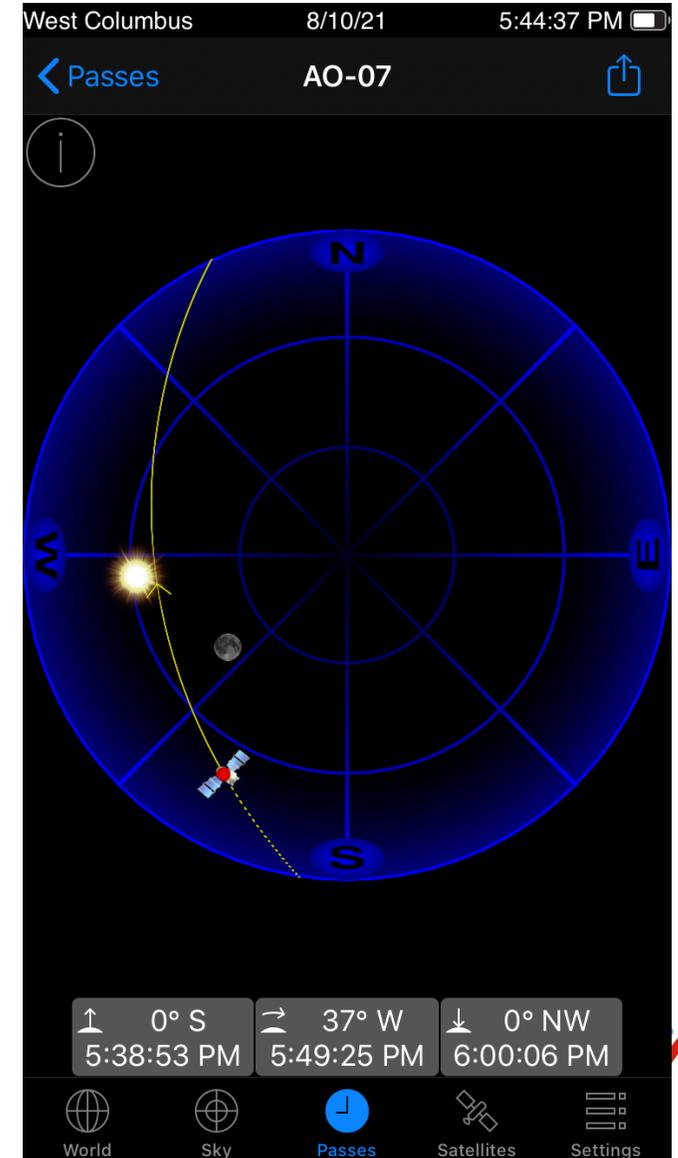
- GoSatWatch (iPhone)
- AmsatDroid (Android)
- ISS Detector (Both)



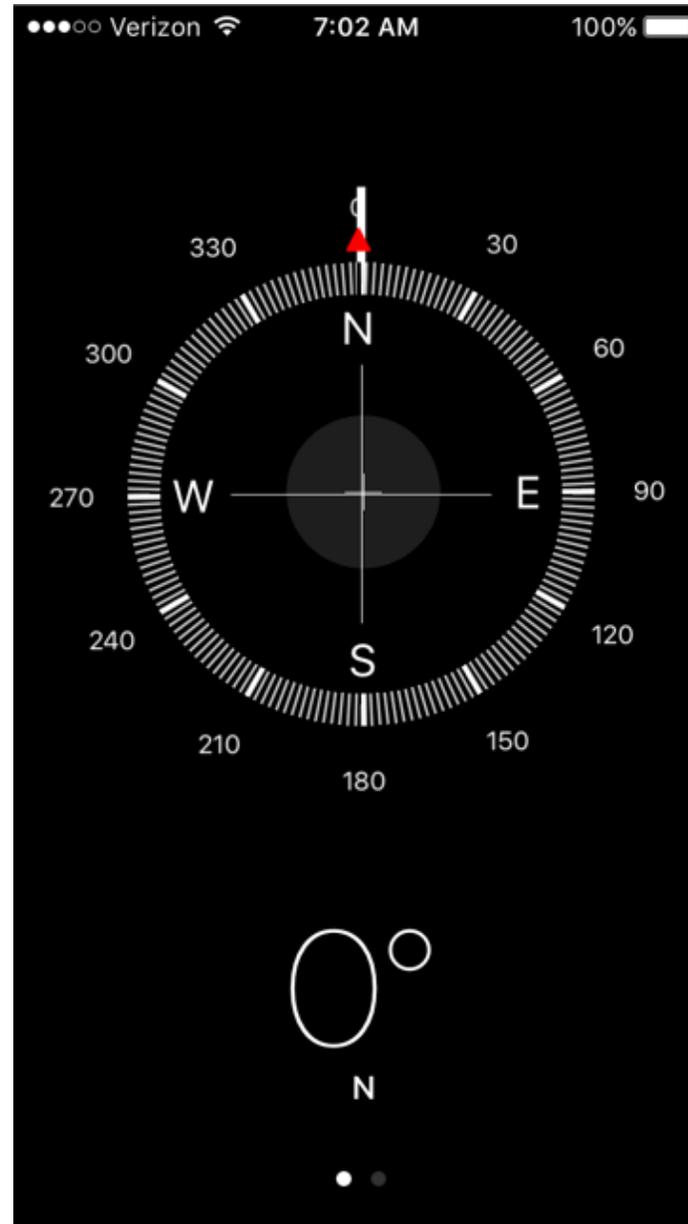
Youth on the Air

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

Pass Prediction – iPhone Apps



Compass



Youth on the Air

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

Voice Recorder



Youth on the Air

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

Logging Satellite Passes

TQSL

N3FJP

QSO Data

Call Sign: WE2NCO

UTC Date (YYYY-MM-DD): 2020-07-04

UTC Time (HHMM): 04:05:30Z

Mode: FM

Band: 70CM (420-450 mHz)

RX Band: 2M (144-148 mHz)

Frequency (MHz):

RX Frequency (MHz):

Propagation Mode: Satellite

Satellite: [AO-92] AMSAT-OSCAR 92 (Fox-1D)

30 QSO Records

16

Add QSO Delete

Help Cancel OK

Recent Contacts

Rec#	Call	Date	Time On	Band	Mode	Power	RST Sent	RST Rec	Country
4966	KN8FE								
4965	G0ABI								
4964	K9UJ								
4963	W1OH								
4962	VA3NN								
4961	K4RG								
4960	N4DC								
4959	KK4YE								
4958	K2MTS								
4957	VA3NN								
4956	W4BF								
4955	K0FFY								
4954	K0FFY								
4953	WY7AA	2019/03/19	16:16:00	70	FM				USA
4952	VA3NN								
4951	K8YSE								
4950	KJ4EL								

Call

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 (1st)
291					07		PH

Name Sent

Operator	QSL S/R	Other3	Other4	Other5	Other6	Other7	Other8

Call

PC Name	Precedence	Prefix	Points	Prop Mode	QTH Group	Sat Name	Section	Serial Rec
		WY7	0					

Name

Serial Sent	State Pr Cont	State Pr Cnt #	Station	Trans ID #	10 - 10
			CO		

Ready to begin!

LogData.mdb

Log Contact

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

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



Youth on the Air

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

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
NDOC	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



Youth on the Air

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

Home Grid Stations and Rovers



DD1US



Kylee, KE0WPA

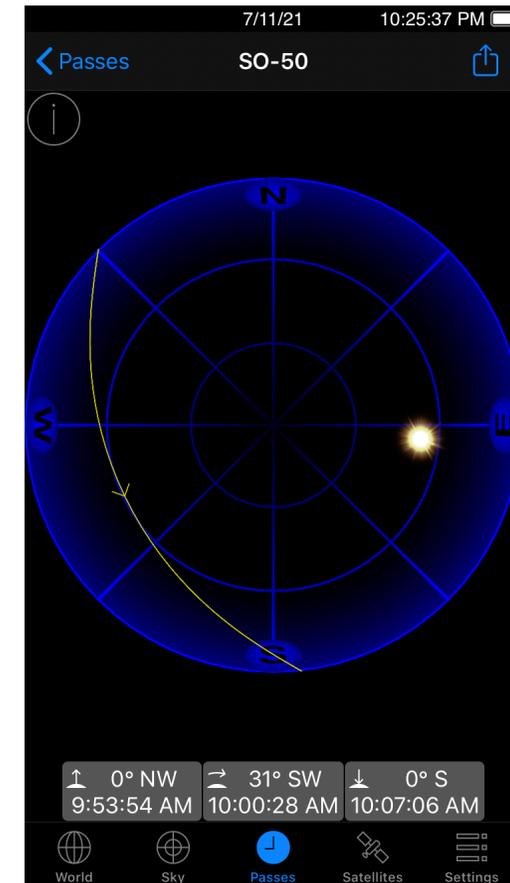


Youth on the Air

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

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



Youth on the Air

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

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



Youth on the Air

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

Satellite Pass Checklist Part 3 – Mid Pass

- Track where the satellite should be 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

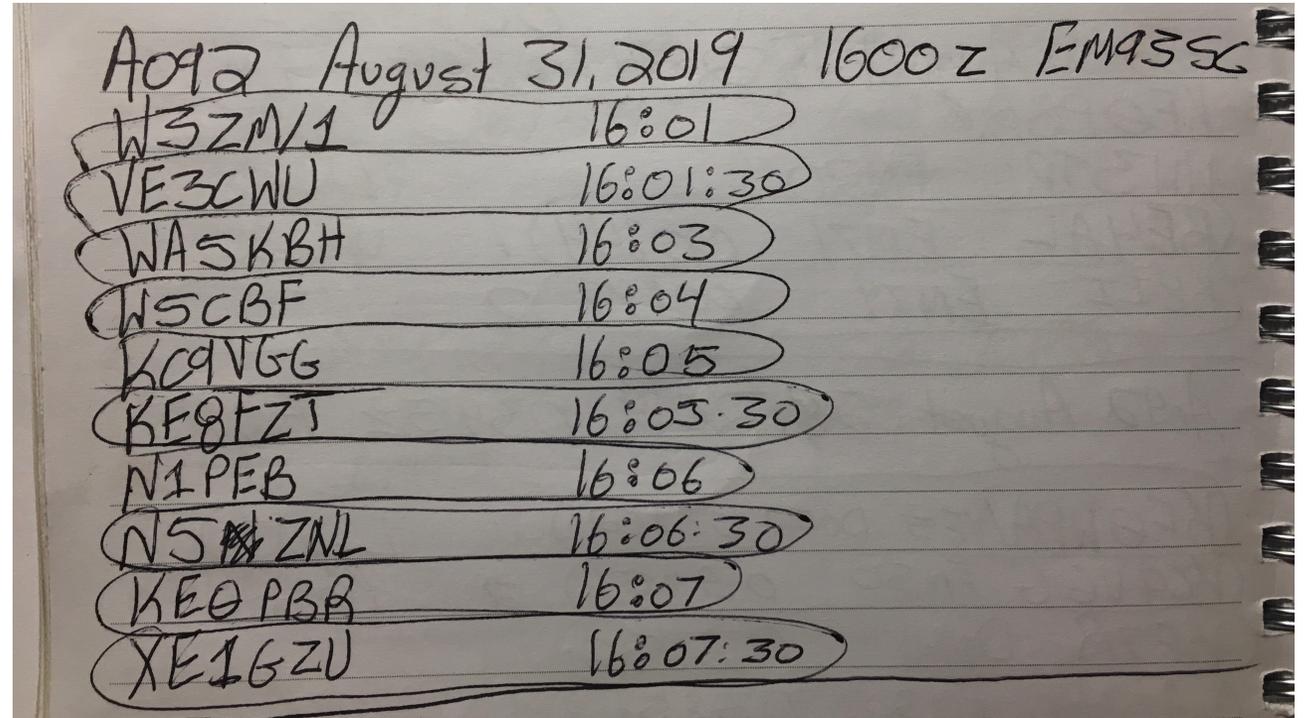


Youth on the Air

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

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 notebook. The log is titled 'A092 August 31, 2019 1600z EM955C'. It lists ten contacts with their call signs and times, each circled in black ink. 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, KE8FZI at 16:05:30, N1PEB at 16:06, N5ZNL at 16:06:30, KE0PBB at 16:07, and XE1GZU at 16:07:30.

Call Sign	Time
W3ZM/1	16:01
VE3CWU	16:01:30
WA5KBH	16:03
W5CBF	16:04
KC9VGG	16:05
KE8FZI	16:05:30
N1PEB	16:06
N5ZNL	16:06:30
KE0PBB	16:07
XE1GZU	16:07:30



Youth on the Air

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

Successful Contact



Youth on the Air

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



Youth on the Air

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

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!



Satellites Linear Frequencies

CAS-4A		Preset #8			Beacon:	145.855
AOS	U p L 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



Youth on the Air

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

Linear Satellite Pass Video

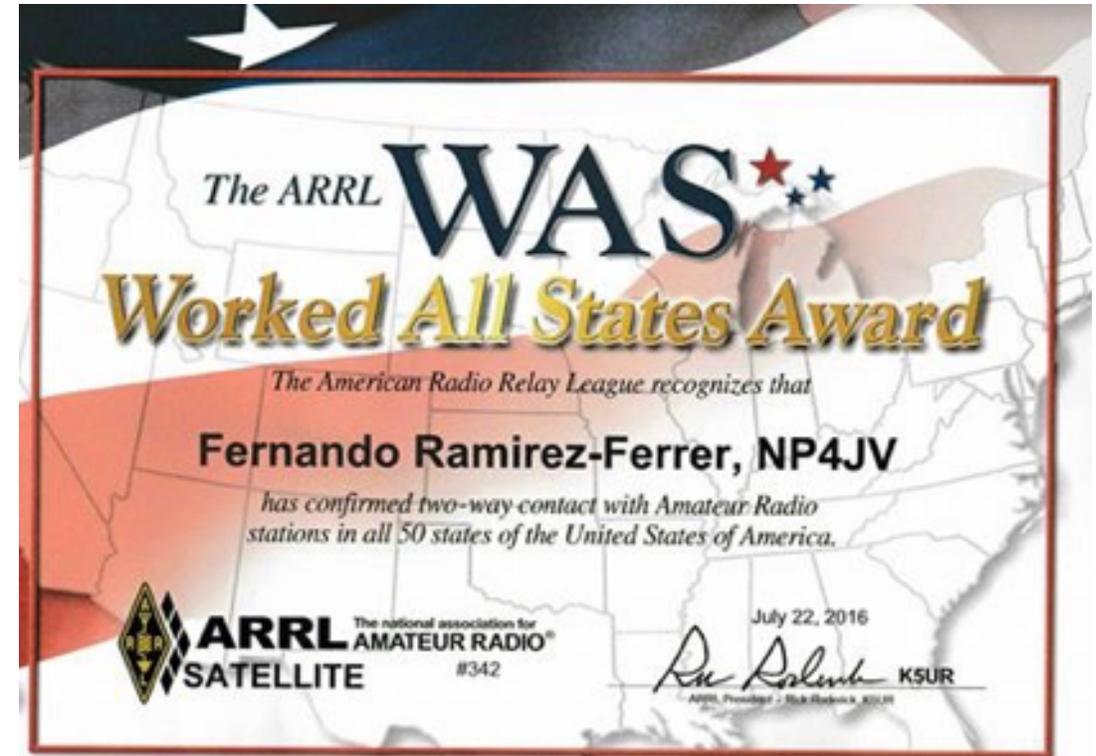
<https://youtu.be/cwtmP1sDL9g?t=115>



Youth on the Air

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

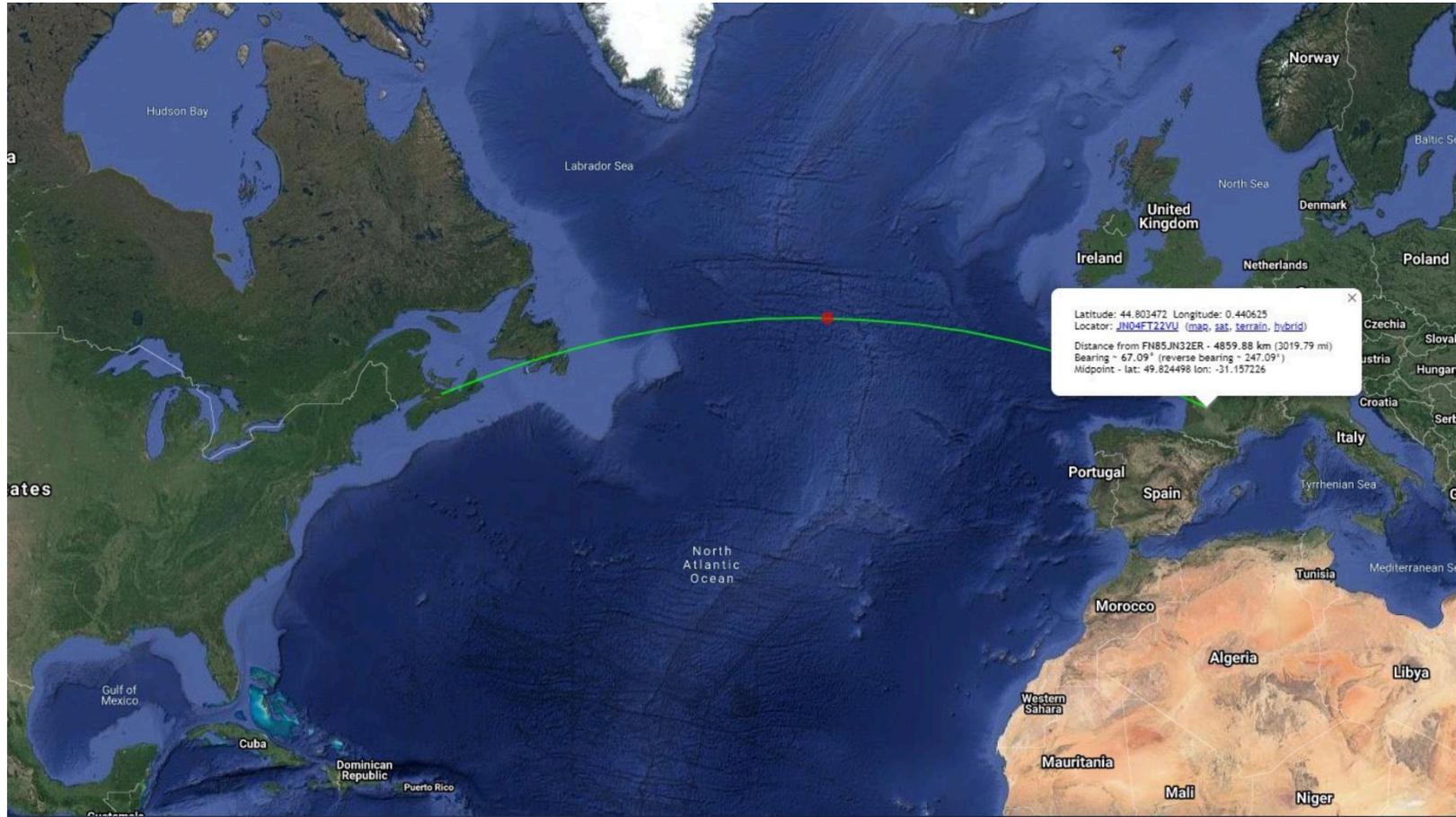
Earning Standard Awards



Youth on the Air

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

AMSAT Distance Records



Youth on the Air

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

AMSAT Rover Award



Youth on the Air

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

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



Youth on the Air

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

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)



Youth on the Air

Activities for the Next Generation of
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

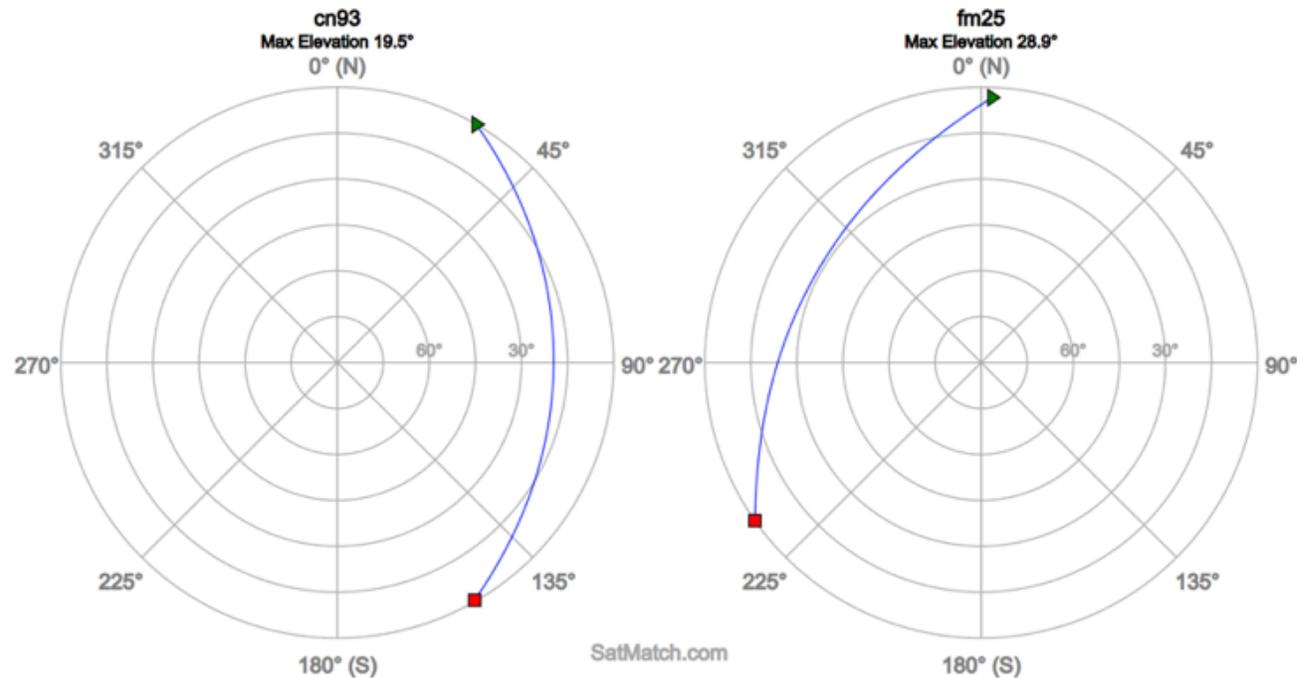
Activities for the Next Generation of
Amateur Radio Operators in the Americas

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



Full pass from cn93
Full pass from fm25

SatMatch.com



Youth on the Air

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

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/>



Youth on the Air

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

Satellites are...

Accessible

Affordable

Fantastically Fun

Challenging

Connecting with
Community

Always Providing
Learning
Opportunities

... for everyone!



Youth on the Air

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



Questions?



Youth on the Air

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