

Call (QSO) the International Space Station via Amateur Radio

Don't miss the chance to get in touch with the ISS astronauts!

Learning targets: Discover the world of the International Space Station and of satellite communications - learn how to build simple antennas for VHF-UHF reception.

Description: The international Space Station is equipped with a transceiver that allows astronauts to communicate with radio amateurs and, thanks to them, Scouts, Guides, schools and other educational institutions. Astronauts mostly answer only to scheduled contacts, but it's always possible to make an attempt to contact them. Even when they are not active at the radio, their transceiver can work as a radio repeater, so that if you send a radio message to the ISS then the ISS irradiates the messages to the face of Earth in front of itself. In this way, the ISS can be used to contact people that would be unreachable in a direct ground-to-ground communication, because of obstacles and of the curvature of Earth. Whatever you want to do, remember that the ISS transceiver/repeater works on different frequencies for transmitting and receiving. The Uplink frequency (145.99 MHz) is the one Earthlings should use to send radio messages to the ISS; the downlink frequency (437.8 MHz) is the one to be used to listen to ISS messages. Detailed and updated information can be found here:

- <https://www.amsat.org/>
- <https://www.ariss.org/>
- <https://amsat-uk.org/>

In particular, ARISS is in charge of organizing radio contacts with the ISS.

Timings and ISS path: The ISS orbit is such that the space station completes an orbit of Earth every 90 minutes. In practice, the ISS will be visible from a point on the ground for not more than 12-15 minutes. This is also the limit of your potential conversation, so be concise. Several programs (eg gpredict) and mobile phone apps can be easily found and used to get the ISS pass predictions and the exact path of the ISS above the point of observation. Remember that these predictions are based on orbit information that should be regularly downloaded from the web, at least weekly. The easiest way to start is to use an amsat web tool available at <https://www.amsat.org/track/index.php> . You will have to enter your longitude and latitude data, that can be easily found from Google Maps. Here is an example of predictions:

AMSAT Online Satellite Pass Predictions - ISS							
View the current location of ISS							
Date (UTC)	AOS (UTC)	Duration	AOS Azimuth	Maximum Elevation	Max El Azimuth	LOS Azimuth	LOS (UTC)
31 Jul 21	16:17:58	00:10:56	251	58	344	62	16:28:54
31 Jul 21	17:55:25	00:10:33	282	27	13	71	18:05:58
31 Jul 21	19:32:40	00:10:47	297	38	30	96	19:43:27
31 Jul 21	21:09:33	00:10:47	296	49	204	134	21:20:20
31 Jul 21	22:47:13	00:07:45	277	7	236	185	22:54:58
01 Aug 21	13:54:49	00:09:38	197	16	137	72	14:04:27
01 Aug 21	15:30:35	00:10:58	242	83	319	62	15:41:33
01 Aug 21	17:07:54	00:10:37	276	29	7	67	17:18:31
01 Aug 21	18:45:17	00:10:39	295	31	27	88	18:55:56
01 Aug 21	20:22:12	00:10:56	298	79	217	124	20:33:08

AOS and LOS mean Acquisition Of Signal and Loss Of Signal, respectively. The first refers to the point and time from which the ISS appears from the horizon, the second refers to the point and the time of disappearance. With a compass and the azimuth data, it will be easy to locate these points. Regarding time, be careful of the fact that they are given in UTC, Universal Coordinated Time. Check how this time is related to your time zone and to the season. For example, in the CEST time zone (Germany, Italy, etc.), 8:00 UTC means 9:00 (+1:00) in winter, but 10:00 (+2:00) in the summer. Several websites at the present time can help you identify the correct offset to apply.

A really important information is given by the maximum elevation (data are in degrees from the horizon). If the maximum elevation is below 30°, it's quite unlikely that you can catch the ISS, since several obstacles may be present above the horizon. Also, at low elevation values the distance between your position and the ISS is larger. Attempts to contact the ISS should be made at high points, where the horizon is not blocked by trees, buildings or even hills and mountains.

The transceiver: Contacts with the ISS can only be made by licensed ham radio operators. Contact your nearest ham radio association to get instrumentation and practical support. During the contact, you may need to slightly adjust the transmission/reception frequencies, because of the Doppler effect caused by the extreme speed of the ISS.

The antenna: Uplink and downlink frequencies that two different YAGI antennas must be built and operated to follow the ISS position. In these articles you can find details on how to build them:

- <https://www.amsat.org/articles/n2spi/JulAug06AmsatJournal.pdf>
- <https://www.amsat.org/articles/n2spi/SepOct06AmsatJournal.pdf>
- <https://www.amsat.org/articles/n2spi/NovDec06AmsatJournal.pdf>