Current Status of ISS Stations

as of 03/31/2020

Columbus Module radios:

- Ericsson VHF- Packet system active.
- Ericsson UHF- Stowed.
- MarconISSta - Temp. stowed.
- IORS - Stowed. Procedures going through initial review this week.

Service Module radios:

- Kenwood D700, station #1 (delivered in 2003) - Stowed.
- Kenwood D700, station #2 (delivered in 2008) -Stowed.
- Kenwood D710E (delivered in 2014 for MAI-SSTV) – Supporting Russian scheduled voice contacts. Continuing to support all USOS school contacts.

Contact the ISS

Some ISS crew members make random, unscheduled, amateur radio voice contacts with earth-bound radio amateurs, often called "hams". They can make radio contacts during their breaks, pre-sleep time and before and after mealtime. Astronauts have contacted thousands of hams around the world. The work schedules of the ISS crew dictate when they are able to operate the radios. The crew's usual waking period is 0730 - 1930 UTC. The most common times to find a crew member making casual periods are about one hour after waking and before sleeping, when they have personal time. They're usually free most of the weekend, as well. (The current crew work schedule is published on the NASA website.)

The crew can operate the 2-meter packet radio in unattended mode, and hams can make contacts with the ISS station when the crew members are working. Hams can also communicate with each other using the ISS packet (computer) radio mode, or receive slow scan television mode images. It all depends on what equipment is in service in space.

A typical ground station for contacting the ISS station includes a 2-meter FM transceiver and 25-100 watts of output power. A circularly polarized crossed-Yagi antenna capable of being pointed in both azimuth (North-South-East-West) and elevation (degrees above the horizon) is desirable. But successful contacts have even been made with vertical and ground plane antennas.

When the astronauts put out a CQ call they also use 145.800 MHz FM but operate “split” listening for replies 600 kHz lower on 145.200 MHz. If you are lucky and hear them calling CQ just remember to activate your rigs repeater shift to ensure you reply on the correct frequency. You should never transmit on 145.800 MHz.

Frequencies in Use

The following frequencies are currently used for Amateur Radio ISS contacts (QSOs):
Voice and SSTV Downlink: 145.80 (Worldwide)
Voice Uplink: 144.49 for ITU Regions 2 and 3 (The Americas, and the Pacific and Southern Asia)
Voice Uplink: 145.20 for ITU Region 1 (Europe, Russia and Africa)
VHF Packet Uplink and Downlink: 145.825 (Worldwide)
UHF Packet Uplink and Downlink: 437.550
UHF/VHF Repeater Uplink: 145.99 (PL 67 Hz)
UHF/VHF Repeater Downlink: 437.80

For a description of ITU regions, consult the ITU map.

Most ARISS operations are split-frequency (each station uses separate receive and transmit frequencies). The downlink is the earth station's receiving frequency. The uplink is the earth station's transmitting frequency. Earth stations can listen to the downlink frequency and transmit on the uplink frequency when the ISS is in range and crew members are on the air. Please do not transmit on the ISS downlink frequency.

Call Signs in Use

The following call signs are available for use on the ISS:

- Russian: RS0ISS
- USA: NA1SS
- European: DP0ISS, OR4ISS, IR0ISS

Packet Station Mailbox: RS0ISS-11 and RS0ISS-1

Other call signs may come into use as the station and crew change.

Doppler Shift

The International Space Station is traveling around the Earth at over 28,000 km/h. This high speed makes radio signals appear to shift in frequency, a phenomenon called Doppler Shift.

This Doppler shift will cause the ISS transmit frequency of 145.800 MHz to look as if it is 3.5 kHz higher in frequency, 145.8035, when ISS is approaching your location. During the 10 minute pass the frequency will move lower shifting a total of 7 kHz down to 145.7965 as the ISS goes out of range. To get maximum signal you ideally need a radio that tunes in 1 kHz or smaller steps to follow the shift but in practice acceptable results are obtained with the radio left on 145.800 MHz.

Radios, Modes and Antennas on the ISS

The ISS amateur radios are Ericsson MP-X handheld radios, a Kenwood TM D700 and a Kenwood D710.

Two hand-held Ericsson (M-PA Series) transceivers are on board in the ISS Columbus module: a VHF radio that receives and transmits FM voice or packet radio signals in the 2-meter (144 to 146 MHz) Amateur Band, and a UHF radio that receives and transmits FM voice or packet radio signals in the 70 centimeter (435-438 MHz) Amateur Band. Both radios are Ericsson (M-PA) series commercial grade radios. These radios look identical in size and features, but are specially tuned to support the
different bands. Up to 5 Watts of output power is available on any one of 64 possible channels.

The Kenwood TM-D700 radio. located in the ISS FGB Service Module (Zarya), supports 2 meter (144-146 MHz) and 70 cm (435-438 MHz) operation. This radio provides a higher output power capability (restricted to a maximum of 25 Watts in ISS operation) supporting FM and packet operations. The higher power capability allows nearly horizon-to-horizon signal reception using simple hand-held radios or scanners. A set of 5 default options, or Programmable Memories, are embedded in the D700 to support ISS operations.

There are numerous channels programmed in the radios. Two of these channels on the 2 meter radio band support voice operations (145.80 down/144.49 up for ITU Regions 2 &3 & 145.80 down/145.20 up for ITU Region 1). It is necessary to use two uplink frequencies to operate in accordance with region-to-region IARU band plan differences.

The crew switches between one frequency to the other; scanning is not used. For example, if a crew member begins a QSO over the US, they can track US stations until they hit the Atlantic and then they will quickly lose US stations. They can then switch over to the other frequency and pick up stations in Europe or Africa.

Packet Operations

There is one radio on the ISS that operates as a packet digipeater. The Ericsson HT is about 5W and uses RS0ISS. It will respond to the alias "ARISS". With the Ericsson, you'll have better luck using more power and, if you have it, FM Narrow mode.

For information about using the ISS packet system, check out this resource provided by JoAnne Maenpaa, K9JKM.

SSTV Operations

Slow Scan Television (SSTV) images can be transmitted from the International Space Station. An SSTV system is an integral part of one of the ARISS ham radio stations, NA1SS/ RS0ISS in the Service Module. It transmits and receives JPEG still images.This system utilizes the Kenwood D700 and D710 radios and the ARISS antennas mounted on the Service Module. The SSTV equipment also includes SpaceCam and MMSSTV software, a radio/computer interface module and data cables. A Kenwood VC-H1 is also used to provide near real-time automatically transmitted images (usually earth views) once every 3 minutes, when active.

A Kenwood D710 radio located in the Service Module was deployed by the Russian Space Agency, Energia to provide extended support of imaging experiments using various SSTV formats. It employs SpaceCam and MMSSTV software to transmit stored images.

In preparation for future ISS SSTV events, a video demonstration of receiving SSTV from the ISS was created by avid ARISS supporter, John Brier, KG4AKV. In addition, John has provided an excellent online tutorial explaining in more detail how to configure a simple system to acquire and view the SSTV images. Links to both can be found at https://www.youtube.com/watch?v=7to9uX1sWC4 and https://spacecomms.wordpress.com/iss-sstv-reception-hints/.

To view, or submit, SSTV received images transmitted from the ISS and to follow SSTV operations, check out the ISS SSTV blog site.

HamTV System

Currently unavailable

Antennas

A set of four antenna systems are deployed in the ISS Service Module supporting the current installation of the Kenwood D700 and D710 radios. Each of the four antennas can support amateur radio operations on multiple frequencies and allow for simultaneous automatic and crew-tended operations. Having four antennas also ensures that ham radio operations can continue aboard the station should one or more of the antennas fail. Three of the four antennas are identical and each can support both transmit and receive operations on 2 meter, 70 cm, L band and S band. They also support reception for the station's Russian Glisser TV system, which is used during spacewalks. The fourth antenna has a 2.5-meter (8 foot) long vertical whip that can be used to support High Frequency (HF) operations, particularly on 10 meters. Currently, one of the 3 VHF/UHF antennas is disconnected and the HF antenna has no radio hardware available for use.

Two antennas are installed in the Columbus module, currently serving the Ericcson radios deployed there. Frequencies available for transmission to and from Columbus are 2 meters, 70 centimeters, L-band and S-band. These antennas will also support the Ham TV DATV transmitter.