

Current Status of the ISS ATV Projects.

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- During the 2004 ARISS meeting in the Netherlands, two different groups proposed different Amateur Radio Television projects. Both groups are now working together to find a single working solution for an ATV system on the International Space Station.

Goal:

- Develop an affordable and technically competent ATV transponder solution for the ISS.

Observations

- The system must be easy to install on the ISS.

Whilst the system will not be an entry level system for Amateur Radio users it must be affordable to the general amateur radio community.

Background:

- Several clubs have been experimenting with putting ATV in Space for the past 15 years. The Space Shuttle has successfully demonstrated AM-ATV using vestigial sideband transmissions on two missions on the 70cm band.

- So far no one has come up with a workable, affordable and legal solution for ATV in space. Standard ATV systems now in use work over line of sight paths on earth but do not scale very well when the path lengths are extended to 400 - 1500 miles.

- The team based in the UK with the support of BATC (British Amateur Television Club and AMSAT-UK) has been focusing on solving the problems with FM-ATV and Wideband Digital ATV.

- The MarexMG team headed by Miles Mann WF1F, is focusing on Compressed Digital ATV (narrow band) and one-way VSB experiments.

ATV Modes:



FM-ATV:

This mode uses analogue FM which is already in worldwide use by Amateurs for terrestrial ATV on 23cms and above and was used by early satellite television direct to users systems

Bandwidth typically required 14 - 20 MHz

Video Quality: Broadcast Quality

Digital ATV (Wide Band):

- This mode is identical to the format currently used worldwide by satellite television direct to users systems and is being adopted by amateurs in Europe
Bit rates are between 2 - 8 megabits per second
RF Bandwidth typically 4 - 16 MHz
Video Quality: Selectable, from VHS quality to better than standard broadcast.

VSB-ATV:

- This is the same analog format used by most terrestrial broadcast systems at this time and is directly compatible with standard TV sets. (but will be discontinued in Europe within the next 5/10 years)
RF Bandwidth typically 6 MHz
Video Quality: Broadcast quality
- But note the PAL/NTSC/SECAM 625/525 worldwide incompatibility

CD-ATV (Compressed Digital ATV)

- This is a new mode, similar to Web Video formats. The Quality and Frame rate is reduced to fit into a smaller Bit Rate. RF Bandwidth at 128k bits, 130 KHz
Video Quality: Web quality 5 - 7.5 Frames per second

Limitation:

- To install hardware on the ISS we will have to deal with many limitations imposed by not only the associated space agencies, but also with ITU radio regulations.

ITU Band limitations

- 2.4 GHz, 50MHz of band available for 2-way space operations (2400-2450MHz)
- 1.2 GHz, 10 MHz of band available for Earth to Space (one-way) space operations, 1260 -1270 MHz
- 70cm Band, 3 MHz of band available for 2-way space operations 435.000 - 438.000 MHz

ISS limitations

- For 70cm and below we have been informed of a 25 watt power output limitation. We have not been informed of the limits on 1.2 or 2.4 GHz. It is therefore assumed that the power levels will be lower and a design limitation of approximately 10 watts ERP is assumed for the design

- The size of antennas on the ISS will also be a factor in designing the ATV system. We have assumed that we will be using low gain patch antennas for 1.2 - 2.4 GHz band on ISS. With a typical gain of between 0 and 3dBic

Current Status:



MarexMG demonstrated the ability of CD-ATV with a Beta version of the Icom ID-1 Data Radio. This radio will support 128kbit data clock with an actual throughput of over 15kbits of real data. Only the audio portion was demonstrated.

Current Status:Cont.

- The current version of the Icom ID-1 will only operate on the 1.2 GHz band. Which means that the ID-1 can not be used as a transmitter from the ISS. This portion of the project is on hold until we find an affordable data radio what will support 70 cm.

Digital ATV (Wide Band):

- The UK team with support from ARISS have been striving to calculate a realistic Link-Budget set of parameters. In simple terms, the Link-Budget is very important because it will tell us the size of the antenna needed to hear the ATV signal. If the ground segment antenna required to receive ISS ATV signals is too big, then the project would be impractical.

- The current iteration of the link budget spreadsheet is available from g3vzv@amsat.org who would be delighted to receive assistance to demonstrate whether or not the numbers are valid