

## SSTV Pictures via the ARISSat-1 RADIOSKAF-V KEDR Transponder

by Farrell Winder, W8ZCF, fwinder@fuse.net

The ARISSat-1 RADIOSKAF-V KEDR satellite was hand launched from the ISS by Sergei Volkov, RU3DIS, and Alexander Samokutyaev on August 3, 2011 and re-entered the Earth's atmosphere on January 4, 2012. It went down in the Atlantic Ocean west of Angola.

The transponder section of this satellite provided a very challenging, exciting and educational experience during its life in orbit. Three stations, as discussed in this paper, have reported sending and having pictures received via the transponder. However, many CW/Voice contacts were reported.

### A Challenge was Introduced

While the 2 m section of the satellite provided easy copy of on board recordings of FM Voice, SSTV [1] and Telemetry, this was not the case when trying to receive signals from the transponder. Just prior to launch of the satellite during their EVA, the Cosmonauts reported that the 70 cm antenna was missing. It apparently was inadvertently broken off. After discussion and a lengthy delay, it was decided to go ahead and launch with the missing antenna. It is estimated by Lou McFadin, W5DID, ARISS Engineering Hardware Manager, that there were about 1.5 inches of RF sensitive length remaining inside the Delrin (nonconductive) support base. This length calculates to about 1/16 wavelength that was capable of receiving incoming transmissions. The greatest

challenge was therefore presented in getting a signal from Earth to the remainder of the 70 cm antenna on the satellite.

Many attempts were made from my station trying to contact voice and CW signals, which were heard very weakly. Many replies made to identifiable signals did result in 2 confirmed contacts, one to Robert Atkinson, K9OIM, Almo, KY and one to Peter Portanova, WB2OQQ, Massapequa, NY.

### Success of SSTV Pictures

On August 9, 2011 Henk Hamoen, PA3GUO, in the Netherlands sent an SSTV picture of his call sign through the transponder and received back a copy at his station. (See Photo 1.) This gave me a great incentive to also try SSTV. My son, Jeff Winder, KB8VCO, and I spent time at NASA Houston working on SuitSat-1 and were very interested in this reconfigured satellite. We teamed together on November 12, 2011 to manage all the variables and succeeded in sending and receiving an image of my automobile license plate through the transponder. (See Photo 2).

My setup used two computers with MMSSTV software, one to transmit, the other to receive. The antennas used were an M Squared 2MCP14 for 2 m and a stacked pair of K1FO antennas for 70 cm. The antennas were manually controlled, closely following the changing azimuth presentation from Nova for Windows. Two Yaesu 736's were used, one to transmit and one to receive.

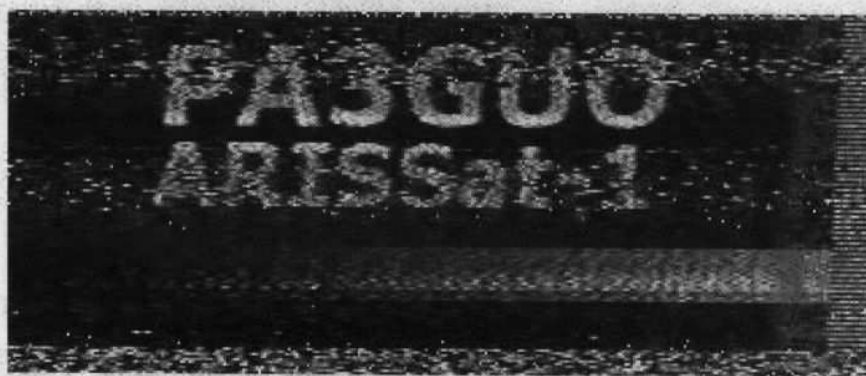
The beginning 70 cm transmitter frequency setting was 435.750 MHz LSB. Power out to the antenna on SSB voice ranged 20-100 watts peak with a higher average on SSTV. The 2 m receiver was fixed at 145.930 MHz USB.

### Managing Doppler

Doppler control was a very difficult factor with the small signal return. After many tries, a technique was devised to locate the correct signal frequency return which would place the sync for the R36 format at the proper place on the MMSSTV spectrogram to initiate the start of the received image. This was done by first transmitting the 1750 Hz signal in the MMSSTV program and receiving its return, adjusting the transmitter frequency to center it as close as possible to the 1750 position as depicted on the MMSSTV spectrogram. Once located the SSTV picture was immediately started. The resulting R 36 sync pulse appearing at 1200 Hz was then used as the primary "beacon" for Doppler control. This was still difficult as the returning sync pulse often became embedded in noise and Doppler adjustment was lost. It was very evident that the effective receive position of the shortened 70 cm antenna on the satellite had to be aligned as nearly perfect as possible with the transmitting antenna on Earth. QSB on the return signal indicated that there was possibly some tumble or spin of the satellite and therefore the sensitive position of the receive antenna was not always in view which made its position critical to receive an R36 picture (36 seconds duration).

### Two More Successful Pictures

Additional SSTV transmissions from my station in December resulted in pictures being received, one at my location and one by Doug Papay, KD8CAO, Zeeland, Michigan. (See Photo 3.) As may be noted, KD8CAO's picture was the best of those received. He had a special cavity filter which I believe enhanced his S/N ratio. Two other stations received fairly good parts of the transmitted pictures of my call sign. These are Burns Fisher, W2BFJ, Brookline, NH and Jerry Pixton, W6IHG, Strasburg, VA. Complete pictures were not possible probably due to my inability to correct Doppler of my transmissions along with further correction of Doppler at remote receiving locations. Paul Williamson, KB5MU's 'One Rule



**SSTV Transmission via ARISSat-1/Radioscaf-B**  
**Radio Station: PA3GUO, The Netherlands**  
**09 August 2011, 02:58 UTC**  
**Uplink 435.75 MHz (LSB), Downlink 145.9 MHz (USB)**

Photo 1: TX and RX by Henk Hamoen, PA3GUO, The Netherlands.





Photo 2: TX and RX by W8ZCF / KB8VCO, Cincinnati, OH. November 12, 2011, 19:08 GMT.

for Doppler Tuning' was used by changing only the 70 cm transmitter frequency at my station.

A third station, Roland Zurmely, PY4ZBZ, Minas Gerais, Brazil sent an image via the transponder on December 12, 2011. He received back a Pic Fall transmission using an SDR-IQ (SDR Software Defined Radio with Spectrum Analyzer and Panoramic Adapter). (See Photo 4.) It is remarkable that he used only 18 watts into a 6 element UHF Yagi. PY4ZBZ is also to be noted for his excellent Web page: (<http://www.qsl.net/py4zbz/arissat.htm>) of ARISSat-1 covering its performance while in space. He is also to be recognized for his development of SSTV software, DIGTRAX.

#### A Bit of DX

DX was not, in my endeavors, a goal through the transponder. However, on January 3, 2012 at 18:16 UTC, Kerry LaDuke, WC7V, in Livingston, MT reported receiving my CW call sign from Cincinnati, Ohio. The distance between us is 2261 km (1405 miles). On December 18, 2011 Hank Cantrell, W4HTB, Bowling Green, KY, 182 miles, reported receiving my signal, and I heard a signal, but a two-way contact was not verified. On one try, W4HTB was able to transmit and hear his own call.

#### Recognition of Success of Satellite

Much recognition must be given for the success of this satellite to Lou McFadin,

W5DID, ARISS Hardware Engineering Manager and his Team. This would include Steve Bible, N7HPR, and his Engineering group at Microchip Technology Inc. in Arizona. Great thanks also to Sergey Samburov, RV3DR, Chief of Cosmonaut

Amateur Radio Department, Korolev, Russia for his original concept of SuitSat-1 and the testing of ARISSAT-1 RADIOSKAF-V KEDR. Also thanks to Valery Pikkiev, UA3WBV, and his group at KURSK University for the on board Science Experiment equipment to measure the vacuum of space.

AMSAT is also to be commended for the many articles, specifications and updates of progress of this satellite over some 4+ years of engineering and development. Tony Monteiro, AA2TX, Vice President of the AMSAT Engineering Group and his team are to be recognized for implementing the first successful use of SDX (Software Defined Transponder) in an Amateur Radio satellite.

We trust that AMSAT, ARISS and RSC-Energia, Russia will be able to develop and launch other similar satellites in the near future.

#### References

- [1] See: [www.amsat.org/amsat/ariss/SSTV](http://www.amsat.org/amsat/ariss/SSTV) and [www.ariss-sstv.blogspot.com](http://www.ariss-sstv.blogspot.com) for many of the excellent Earth Pictures taken by the on board 4 cameras and also the stored pictures which were transmitted via the 2 meter FM down-link section of this satellite.



Photo 3: TX by W8ZCF. RX by Doug Papay, KD8CAO, Zeeland, MI.



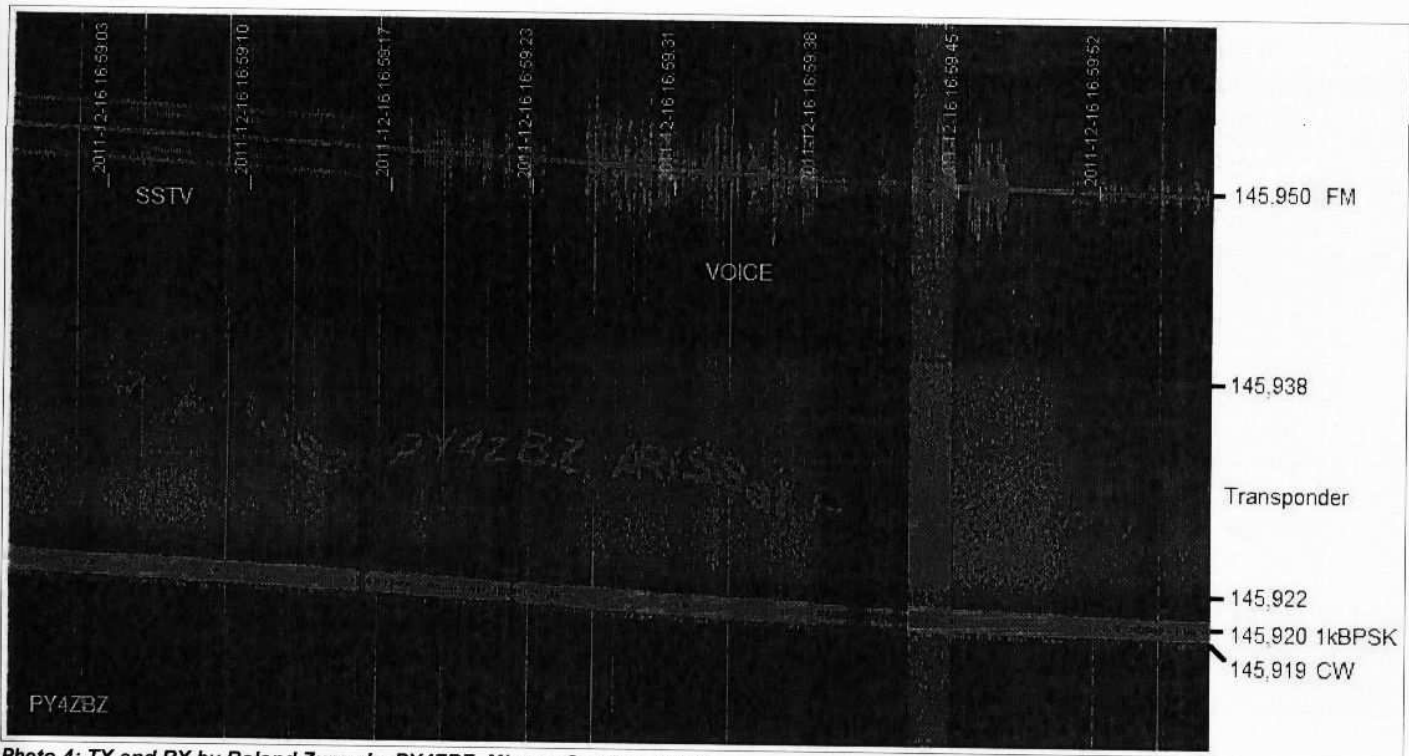


Photo 4: TX and RX by Roland Zurmely, PY4ZBZ, Minas Gerais, Brazil.

