Biggest Radio-Telescope in Northern Europe, the RT-32 in Latvia

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Hidden in the dense coastal forests of Slītere a mysterious ex-Soviet spy center is now used for science. Almost everyone including me who entered the site of the two large radio telescopes called Irbene, are amazed by the surrealistic atmosphere of the abandoned ghost town and two large radio dish antennas in the middle of nowhere. This article will tell more about this site; see also [1].

As the Cold War between the US and USSR entered the space age, the need for Space espionage led to the Soviets designing ways to track and decode signals from US satellites. The project began in 1967 when the remote areas of the Ventspils district were allocated for secret buildup of a site codenamed “Starlet”. The location was chosen because of low population and dense forest areas of Slītere that also were part of the Soviet border zone – ensuring that no strangers could ever discover it.

Figure 1 ~ RT-32 in Irbene near Ventspils, Latvia. The basement contains a workshop, the control center, sleeping rooms, a kitchen, a living room and a restroom.

The main object at the site for space intelligence was a 32 m, fully steerable parabolic, centimeter-wave range antenna (RT-32, figure 1) and a 16 m diameter antenna (RT-16, figure 2). The bigger one is the largest radio telescope in northern Europe and the world’s eighth largest. Both facilities are connected with an underground tunnel. In Soviet times there were more than two such antennas – six were later disassembled by the Soviets.

A secret town was built around the antennas for working staff and guards. A 9-story apartment block, barracks, kindergarten and even a school was built there. The working staff could not leave the town without special permissions and the army guards made sure no one ever got close to the site. It is still not widely known what the Soviet KGB (Committee for State Security, or secret service) was doing there. The radio telescopes were probably used to spy on NATO space communications, satellites, space craft and also aircraft. It is said that the antennas were so sensitive that they could track a mobile phone signal if it was sent from one of Saturn’s moons and that it could follow aircraft that fly near the horizon. The great importance that the Soviet secret service gave to this site was clearly shown after the fall of the Soviet Union in 1991. As in the case of the Skrunda Radar Station (also in Latvia) the Russian government wanted to keep this site in their possession for an unlimited time. However, the Latvian government demanded they leave all Soviet facilities at once.

Figures 2a,b ~ Latvia with the main city Riga in the center of the left map, Irbene with RT-32 and RT-16 on the right Google map.

The site was only revealed to the public in 1993. When Latvian members of the office for controlling the withdrawal of the Russian army entered the site, to their astonishment, they found members of the Russian Federal Security Service (FSB) rushing to disable everything on the site. The FSB removed all the smaller antennas and left only the two bigger ones. However, the FSB made them unusable by cutting all the cables, hammering nails in the wires and spilling acid into equipment. Worse than that, some leading figures of the Latvian delegation, in the talks for the Soviet withdrawal, suggested the two remaining antennas be destroyed in the same matter as the Skrunda Radar Station. The historian and diplomat Mārtiņš Virsis was one of them who nearly convinced the Prime Minister Valdis Birkavs to do this. However, the antennas were rescued from destruction by political pressure from Latvian scientists who recognized their importance for their studies. However, it was a heavy start, as the Russians had damaged both facilities and left no blueprints or information about how they worked.

Figure 3 ~ RT-16 in Irbene near Ventspils, Latvia. The basement contains a workshop, the control center, sleeping rooms, a kitchen, a living room, offices and a restroom.

In 1994 the site was taken over by the Latvian Academy of Sciences. At that time antenna renewal work started and in December the power was restored. In 1995 the damage made by the Russians was slowly remediated – the nails were removed and acid-damaged equipment was repaired. In September 1995, the Latvian Academy of Sciences decided to found “Ventspils International Radio Astronomy Centre” (VIRAC) as a working unit inside the Academy. In 1996 the first space signals were tracked – the Moon and Sun – and radio emissions at 12.2 GHz during the partial solar eclipse were monitored. In 1997 the receiver for 10.5 to 11.5 GHz was completed. In 1999 the revival of the RT-16 antenna began. In the last decade the VIRAC became connected to the

Venstpils University. The restoration work continued and today both antennas are fully operational, but more work still needs to be done to comply with international standards. The latest news about VIRAC's work was the tracking of near-to-Earth asteroid DA14 in 16 February 2013, proving that the VIRAC can now took part in important space research projects.

Figure 4 ~ The author in the control center of RT-32. The heavy old stuff will be soon replaced by new PC-controlled hardware.

VIRAC works together with other space centers in the European Union and Russia. VIRAC has shown how limited funds and knowledge can be used to restore the seemingly unusable ex-Soviet site and used for civil matters. Visits to VIRAC itself are still possible, but it is recommended to not spend too much time around the ghost town Starlet. Surely, many people want to experience the feel of Chernobyl, but recent events show that Starlet is no longer safe to foreign visitors. However, despite that, the Venstpils Space Center will have a future and its place on the map.

Currently VIRAC receives about 5 million € from the European Infrastructure Funds to completely refurbish the radio telescopes, mainly repairing rusty components, realigning dish antenna panels and repainting the structures and panels as well as installing new cryogenically-cooled receivers for the 6 GHz band.

In the beginning of June 2014 I traveled to Irbene to measure the radio interference (RFI) levels at the prime focus to help decide whether the radio telescope could be used for cosmological radio observations (figures 4, 5, 6 and 7). The plan is to prepare a feasibility study to answer questions about daily variation of RFI, stability of positioning, instrument reliability and instrument sensitivity, etc. Some measurement results are shown in figures 8 and 9.

Figure 5 ~ The author while climbing up to the prime focus with a spectrum analyzer and an antenna in his pockets.

Figure 6 ~ Inside the 32 m dish with a view of the secondary focus. This cabinet will later contain the horn feeds and the cryo-cooled receivers. Colleague Vladislavs is discussing RFI issues with other colleagues inside the enclosure. The RFI level at the secondary focus is much lower than on the prime focus because the deep dish acts like a shield against terrestrial RFI.

Figure 7 ~ View from the secondary focus to the prime focus hosting the hyperbolic mirror. The author slightly suffering from high altitude sickness measures RFI in the frequency range 10 MHz up to 2700 MHz.

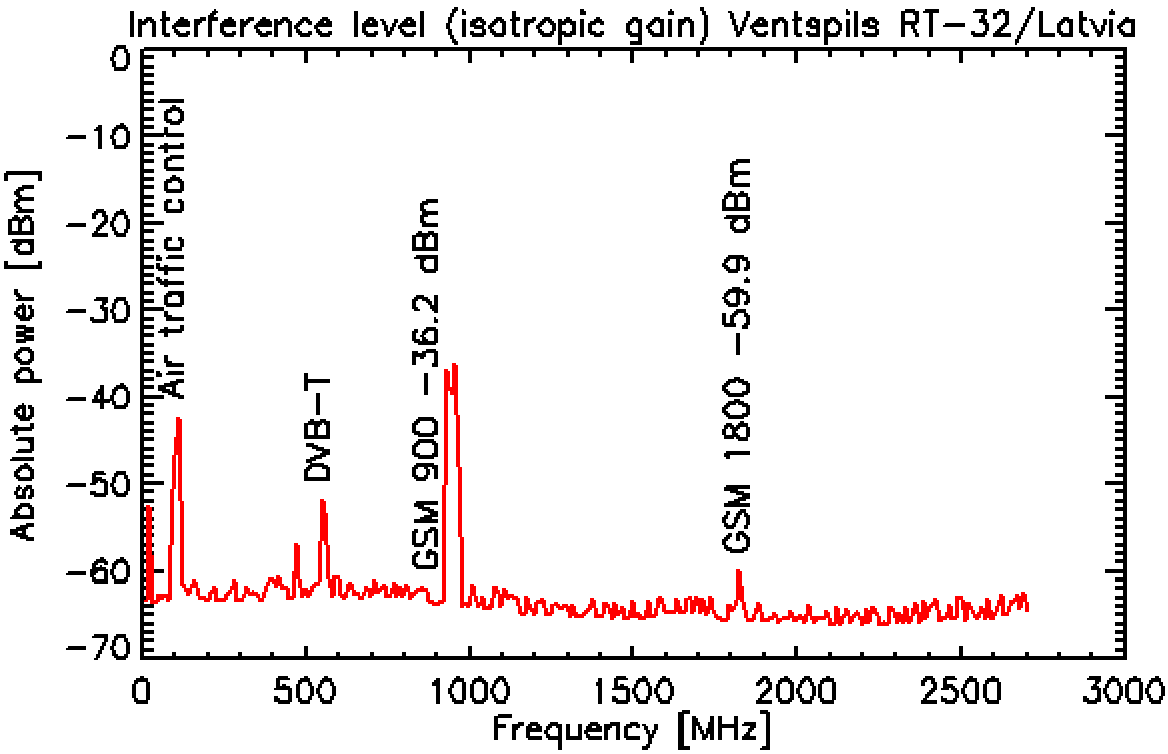

Figure 8 ~ Spectral overview at the prime focus from 10 MHz to 2700 MHz. The frequency range 1000 MHz up to 1600 MHz is quite clean.

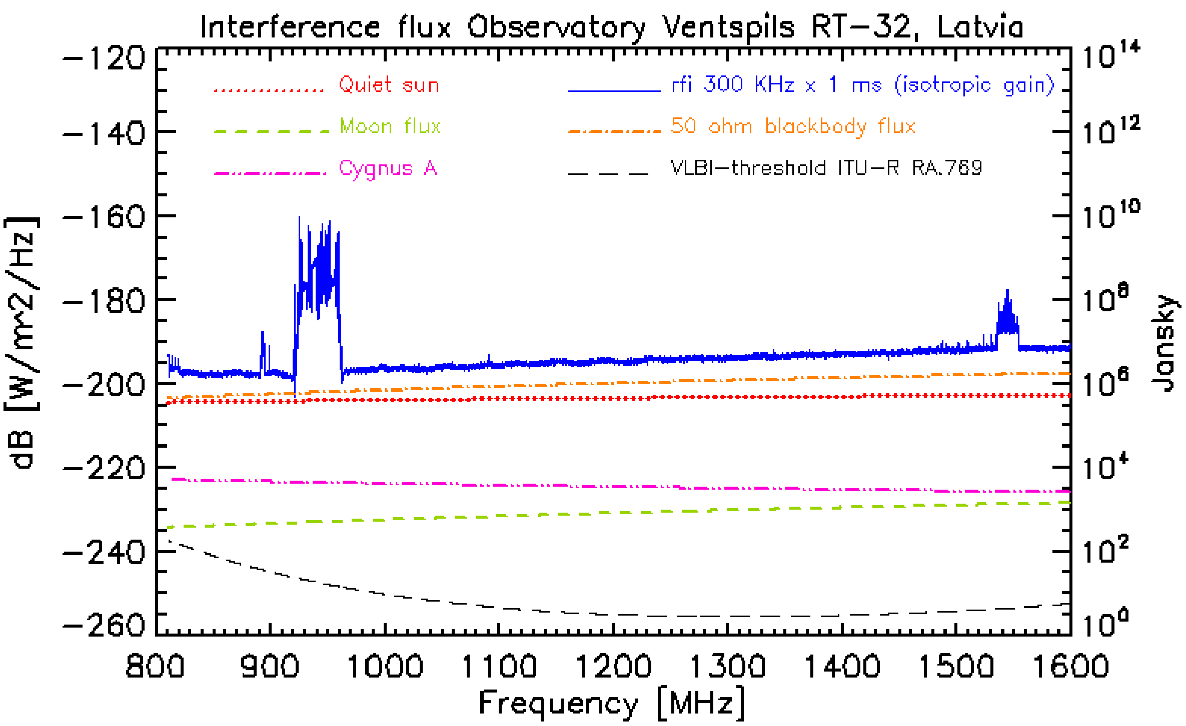

Figure 9 ~ High resolution spectrum 800 MHz up to 1600 MHz with 300 KHz bandwidth, 1ms integration time on an omni-directional antenna. Around 900 MHz we see quite strong mobile phone activity. The remaining L-band is very clean, ideal for 21 cm observations. Measurements were conducted with an omni directional antenna, heterodyne-down-converter and a Callisto spectrometer.

[1] Historical information from here: https://latvianhistory.wordpress.com/tag/ventspils-space-center/

Meet the author: Christian Monstein is a native of Switzerland and lives in Freienbach. He obtained Electronics Engineer, B.S. degree at Konstanz University, Germany. Christian is a SARA member since 1987 and is licensed as amateur radio operator, HB9SCT. He has experience designing test systems in the telecommunications industry and is proficient in several programming languages including C and C++. He presently works at ETH-Zürich on the design of digital radio spectrometers (frequency agile and FFT) and is responsible for the hardware and software associated with the e-CALLISTO Project. He also has participated in the European Space Agency space telescope Herschel (HIFI), European Southern Observatory project MUSE for VLT in Chile, and NANTEN2 (delivery of the radio spectrometer for the Submillimeter Observatory at Pampa la Bola, Chile). Currently he is quite involved to prepare the radio telescopes for cosmological test observations. He plays also the role of a coordinator of SetiLeague in Switzerland and he is representing Switzerland within Commission for Radio Astronomy Frequencies (CRAF). Email: monstein@astro.phys.ethz.ch