Radio frequency interference at QUASAR Network Observatories and next generation system for geodetic VLBI

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Several main principles are assumed as a basis of the new generation Russian VLBI network [1]:

• *The network should have maximum longitudinal separation of sites for precise determination of Universal Time;*

• *Infrastructure of new observatories should be similar to the one of the QUASAR" Network.*

• *Equipment of observatories should be compatible with the VLBI2010 system and that of the "Quasar" Network;*

From our point of view, there are fundamental limitations on possibility to realize this project – money and RFI environment.

First, you must construct new fast VLBI2010 antennas near the current location of the QUASAR network observatories or near the places with high organized infrastructure – communications etc. The places planned for first two radio telescopes (TTW- type, *Vertex Antennentechnik* GmbH) are Badary and Zelenchukskaya observatories.

The second is an automatic consequence of the first - RFI environment at the QUASAR network observatories or in some other places where new antennas can be placed is far from ideal [2, 3].

This is especially true for frequency S-band (2.15 ÷ 2,5GHz). As shown by measuring the RFI in "Svetloe" observatory in other frequency bands (3 ÷ 12 GHz) RFI level does not exceed the allowable values.

More detail RFI measurement in other places will be done in the near future.

Last time S-band is subjected by interference from UMTS mobile base station (BS): 1885÷ 2025MHz (from HS to BS) and 2110 ÷ 2200 MHz (from BS to HS). For example, spectrograms of S-band receiver IF signal of RT-32 Zelenchukskaya observatory are presented in fig.1. The same RFI situation is typical for all QUASAR network observatories.

There is one more strong RFI source in Badary observatory - DORIS transmitter at f1 = 2036.25MHz.

In practice, to reduce the impact of this RFI, and ensure the success of the standard VLBI observations, we are forced to install (after LNA) an additional low-pass filter and thus to limit the low frequency of the receiver IF bandwidth by value 2190MHz- see right spectrogram on fig.1.

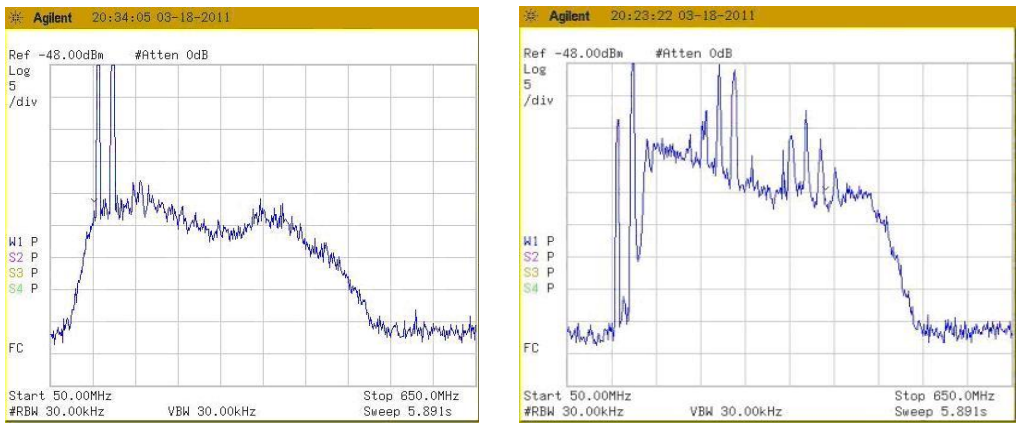

Fig1. Left: 13 cm receiver IF signal, left polarization, and right polarized signal (right) accompanied by wireless broadband access signal (?).

In the near future LTE- system is often branded "4G", appear in the range 2500 ÷ 2700MHz (this project is started in Moscow region in April 2012!) and we will have only 250 ÷ 300 MHz RFI-free bandwidth.

To ensure compatibility of observatory equipment with VLBI 2010 system we have two possibilities:

- *to use narrow band feed + LNA*
- *wide band feed + LNA (+ RFI filtering system) [4]. .*

The first looks more realistic. From our point of view, the only way to find practical solution for realization VLBI2010 system – is to use "narrow band technique", presented in [1, 5].

We have considered the problems associated with low-frequency range. All of the above should be applied to the X band, where there are radars - active sources of impulsive RFI. This fact also indicates a preference for the approach proposed (for more detail see poster [5]).

References

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