

Search for New Sites for THz Observations in Eurasia

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For the ground support of the planned submillimeter wave space VLBI mission (“Millimetron”) an extended network of ground-based facilities operating in this band is needed. Nowadays the number of such observatories is scarce and our goal is to search for appropriate sites in Eurasia. For this purpose during the last two years we performed measurements of atmospheric transparency at millimeter waves at several promising sites. The main measurement tool was the mm-wave radiometric “tau-meter” developed at IAP RAS. It determines the total absorption of millimeter waves at zenith by using the atmospheric dip method. [1]

The first expedition for the astroclimate exploration took place in July 2012. The absorption was measured at the foot of the glacier Mus-Khaya at an altitude of 2000 meters above sea level. The value of absorption amounted to about 0.09 Nep for a few hours, that corresponds to about 5 mm of precipitated water vapor (PWV). Probably in the winter at -50°C the absorption should be substantially lower.

In the central part of Russia, on the contrary, the absorption value does not drop below 0.12 Nep even in the clear frosty day. The unsuitability of this climate zone for mm-wave observations was shown by measurements in Pushchino in March 1013. [2]

Then we explored the site of the RT-70 radio telescope construction on the Suffa plateau in Uzbekistan at the altitude of about 2400 m. The similar radiometric system, but functioning in dual-band (2 and 3 mm) mode, was commissioned in the Suffa observatory in October 2013. The preliminary measurements in mid-November have shown the values of about 0.1 Nep, that corresponds to about 4 mm PWV at an altitude of the Suffa plateau. The results of long-term astroclimate monitoring are expected.

One of the promising locations for mm-waves observations is North Caucasus near the Special Astrophysical Observatory. There are several areas in highland located higher than 2700 meters above sea level with a potentially good astroclimate. The preliminary measurements during several days in December at different altitudes (2000-2700m) have shown stable values of absorption and low amount of water. The regular astroclimate monitoring occurs at the moment.

Furthermore the seasonal variations of PWV were approximately calculated for every place we traveled. Knowing the PWV, the forecast of total absorption for other atmospheric windows (2.0; 1.3 and 0.87 mm) was calculated. Using available information about measured absorption, PWV, height, etc., we can make conclusions about the suitability of the place to locate mm- and sub mm- wave range observatory.

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References

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