T3E

Main Parameters and Instrumentation of Millimetron Space Mission.

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***Abstract*—Millimetron (official RosKosmos name "Spectrum-M") is a part of ambitious program called Spectrum intended to cover the whole electromagnetic spectrum with world class facilities. It is an approved mission included in Russian space program with the launch date in 2017..2019 time frame.**

The Millimetron satellite has a deployable 12 m diameter antenna with inner solid 4..6 m dish and a rim of petals. The mirror design is largely based on Radioastron mission concept that will be launched in 2009. If the antenna is passively cooled by radiation to open space, it would operate at approx. 50 K surface temperature, due to presence of a deployable three layer radiation screen. As a goal, there is a consideration of active cooling of antenna to 4 K, but this will depend on resources available to the project. Lagrangian libration point L2 considered for Millimetron orbit.

There are four groups of scientific instruments envisioned:

- **SVLBI instruments Space-Earth VLBI. It will allow to achieve unprecedented spatial resolution. Millimetron mission will attempt to achieve a mm/submm wave SVLBI. For that purpose, a SVLBI instrument covering selected ALMA bands and a standard VLBI band is envisioned, accompanied by a maser reference oscillator, a data digitizing and memory system, and a high speed data transmission link to ground. The ALMA bands can be extended to cover water lines if detector technology allows. Type of detector – heterodyne.**
- **Photometer/polarimeter. Recent progress in direct detector cameras with low spectral resolution, allows to propose a large format (5-10 kPixel) photometer camera on board of Millimetron mission. This camera can cover 0.1 - 2 THz region (with adequate amount of pixels per each subband).**
- **Wide band moderate resolution imaging spectrometer. Wide band moderate R = 1000 imaging spectrometer type instrument similar to SPICA SAFARI is planned, taking advantage of large cooled dish. It will cover the adequate spectral range allowable by antenna and will also work below 1 THz, as no ground instrument can have a cold main dish.**
- **High resolution spectrometer. For high resolution spectroscopy a heterodyne instrument is proposed, conceptually similar to HIFI on Herschel. This instrument will cover interesting frequency spots in 0.5..4 THz frequency range (using central part of antenna for higher frequency). It is sure that advances in LO and mixer technology will allow this frequency coverage.**