

The “Millimetron” project, a future space telescope mission.

G.N. Gol'tsman and “Millimetron” collaborators.

Astro Space Center of Lebedev Physical Institute, RAS

The goal of the Millimetron project is to develop a space observatory operating in the millimeter, sub-millimeter and infrared wavelength ranges using a 12-m actively cooled telescope in a single-dish mode and as an interferometer with the space-ground and space-space baselines (the later after the launch of the second identical space telescope). The Millimetron's main reflector and other optics will be cooled down to 4K thus enabling astronomical observations with super high sensitivity in MM and subMM (down to nanoJansky level). Heterodyne observations in an interferometer mode at frequencies 0.1-1 THz will provide super high angular resolution. The main instruments, planned to be installed are wide-range imaging arrays, radiometers with spectrometers and polarimeters, VLBI heterodyne receivers, and Mikelson type interferometer devices. Wide-range MM and subMM imaging arrays and spectrometers will be based on a superconducting hot electron direct detectors with Andreev mirrors operating at 0.1 K. Such detectors are the best candidates to reach the noise equivalent power level of 10^{-19} - 10^{-20} W/ $\sqrt{\text{Hz}}$. Heterodyne receivers will be both SIS based superconducting integrated receiver with flux-flow oscillator as LO (0.1-0.9 THz range) and HEB based receivers using multiplied Gunn oscillator as LO for 1-2 THz range and quantum cascade lasers as LO for 2-5 THz range. For observations in middle IR region there will be installed large arrays of superconducting single photon detectors, providing imaging with very high dynamic range and ultimate sensitivity.