Current status of the space mission Millimetron

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on behalf of project participants

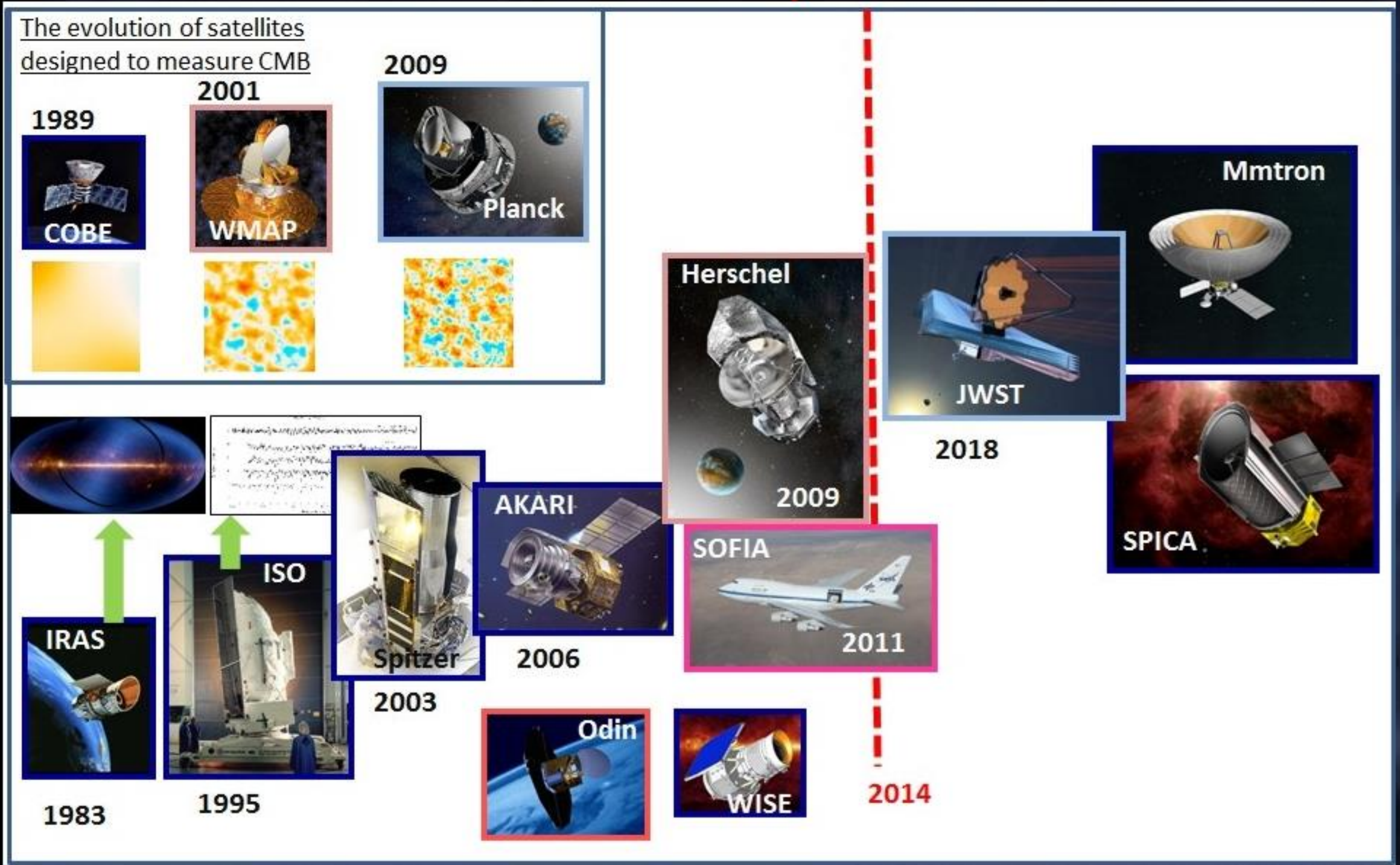
image by A. Ermash

Two modes of operation

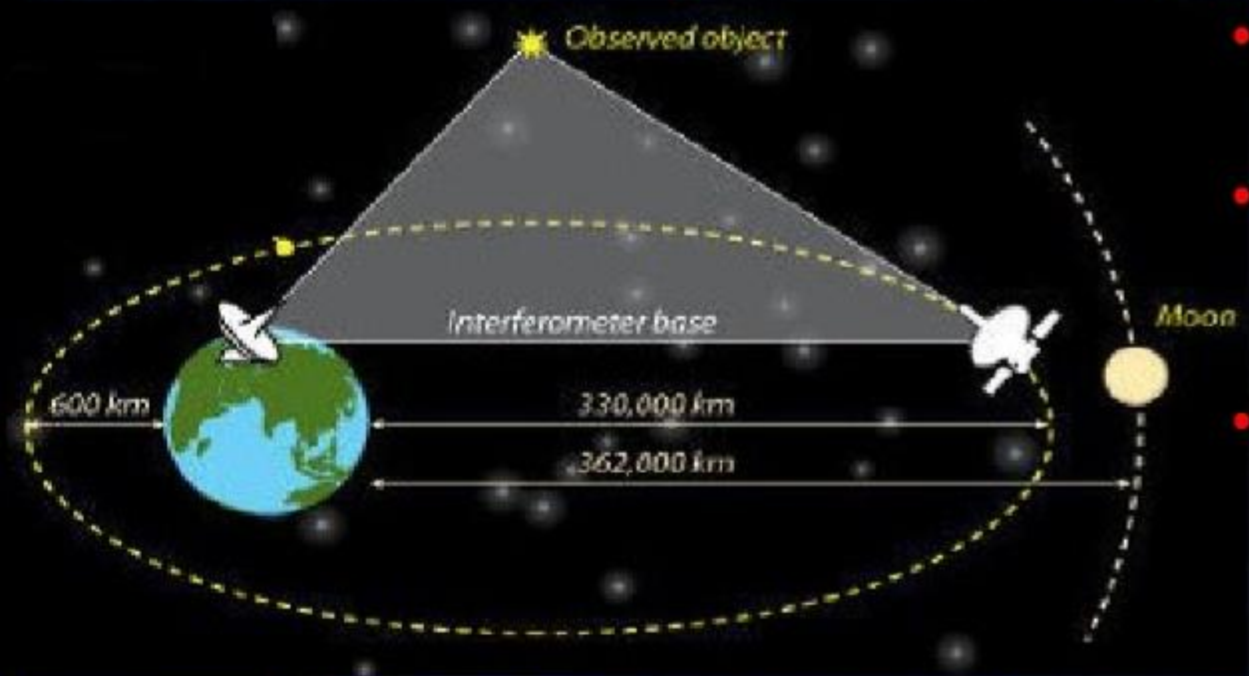
- Cool Single Dish for the Cold Universe

- Space-Earth Very Long Base Interferometry for the Hot Universe

Mmtron – after the previous FIR/Submm/Mm Space Missions



Radioastron space mission (launched 2011)



- Largest interferometer ~30 Earth diameters
- Antenna 10m, wavelengths 1.3 – 90 cm
- Unique instrument for AGNs, masers & pulsars

- Results:
  - ISM properties – 'interstellar interferometer' will be possible
  - AGNs – very high brightness temperatures
  - 20 μas resolution reached

Science with Millimetron

I. General Relativity tests, physics near black hole horizon and physics of accretion and acceleration (mainly in SVLBI mode);

II. Formation and interaction of the InterStellar Medium, stars and planets (single dish mode);

III. Cosmology: the Dark Matter and Dark Energy; cosmological evolution of galaxies (single dish mode);

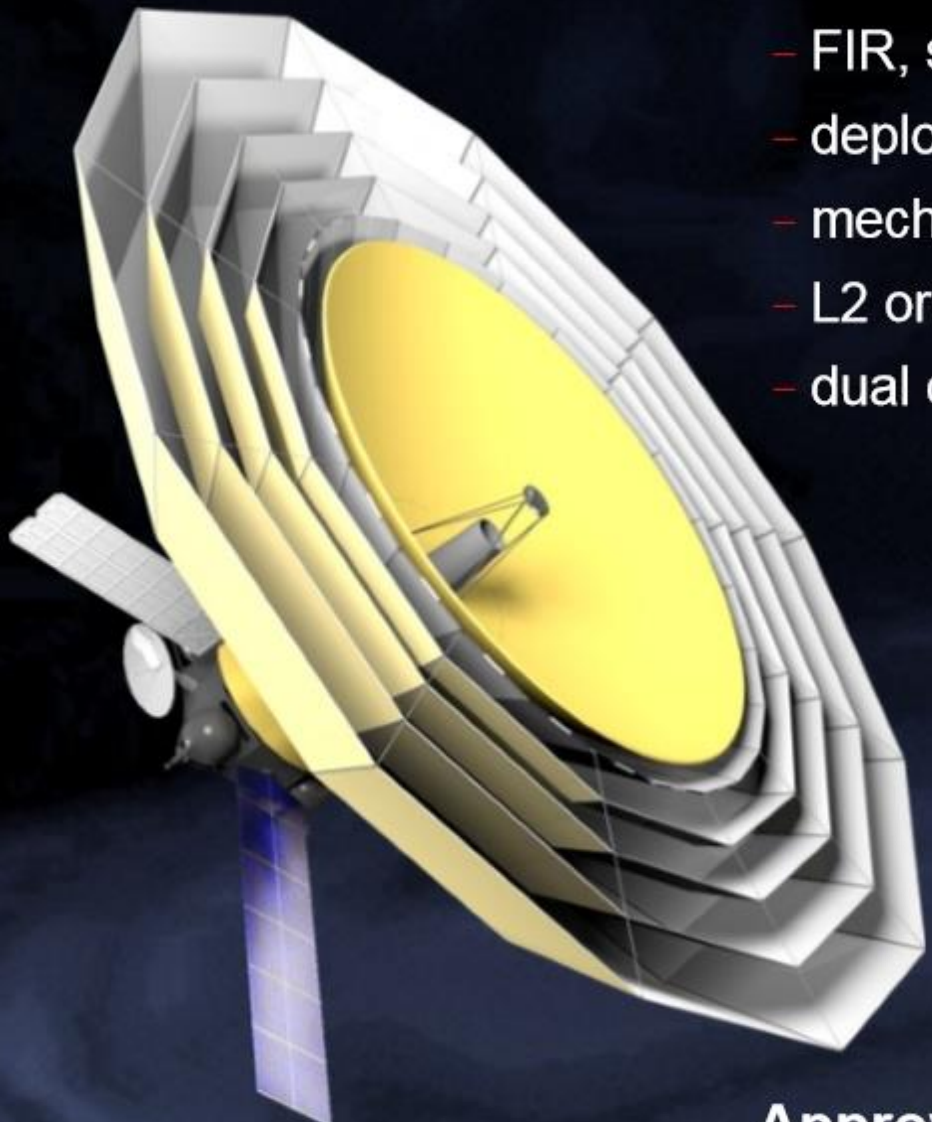
IV. Rapid events and bursts, including GRBs, SNe, pulsars (both modes);

Single dish mode requirements: sensitivity 10000 times better than that of Herschel, angular resolution 3 times higher. Wide spectral coverage, polarimetry.

SVLBI requirements: angular resolution 100 times higher than for the Earth-based VLBI

Millimetron summary

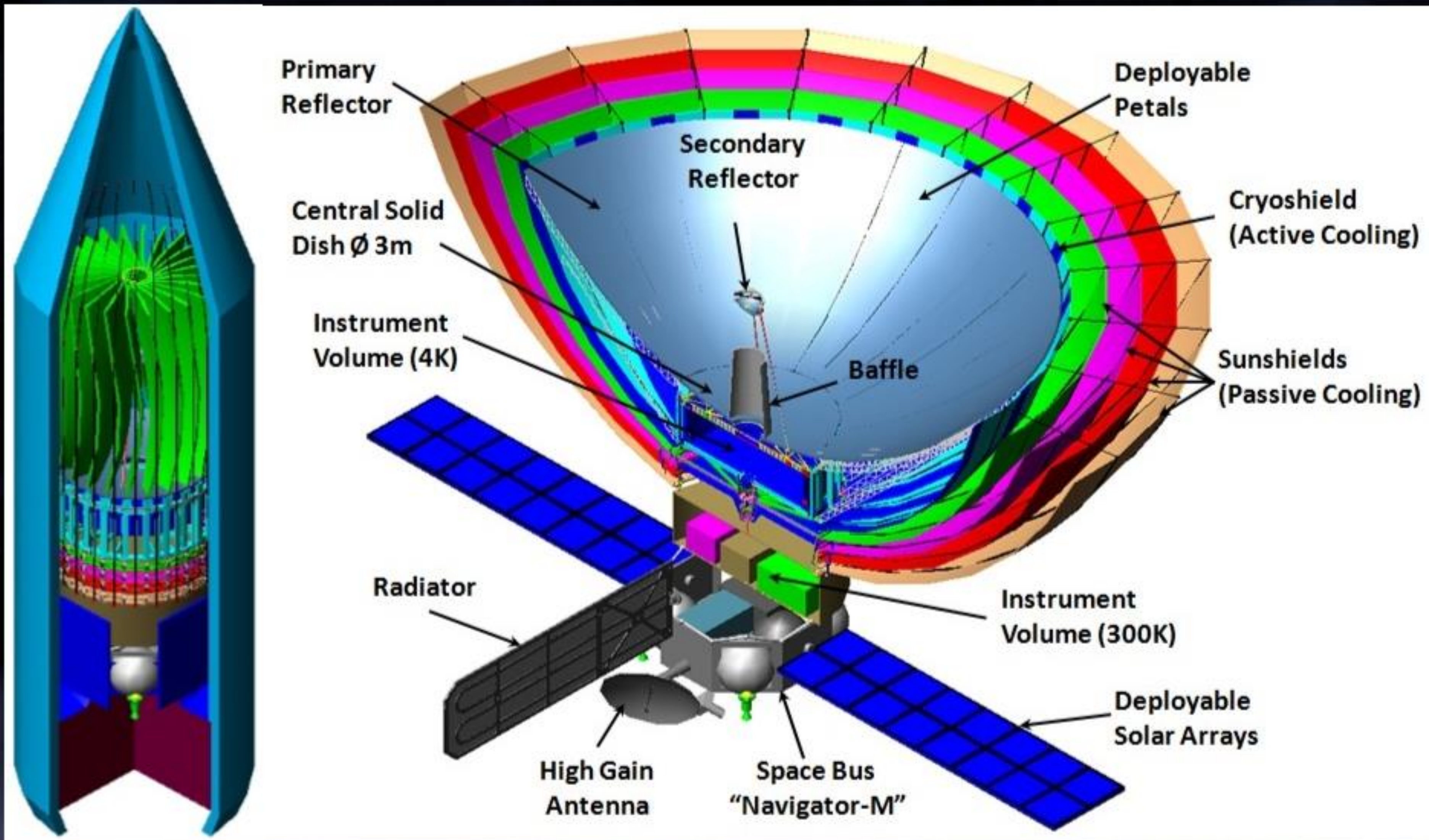
- **First 10m class space telescope for**
  - FIR, submm & mm range, difr. limit 80 μm
  - deployable & adjustable in orbit
  - mechanically cooled (<10K) with post-cryo life
  - L2 orbit
  - dual operation modes:
    - SVLBI for 0.8 - 17 mm
    - Single dish for 0.050 – 3 mm with observatory-style (Herschel) state-of-the-art instrumentation



Spacecraft in Phase B,
Scientific payload in Phase A
Launch date >2020
Life time 10 yr, at cryo >3 yr.

Approved & supported by Roskosmos.

General design



Scientific equipment

- SVLBI for 18 – 355 GHz (602-720, 787-950 ??)
- SACS – Short wave Array Camera/Spectrometer (50 – 450 µm)
- LACS – Long wave Array Camera/Spectrometer (300 – 3000 µm)
- MHIFI – Mmtron Heterodyne Instrument for the Far Infrared (56 – 540 µm)

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