



COMETS - Comets Observation & Mapping Enhanced THZ Spectrometer

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Target: Comets/asteroids (either flyby or orbit); subsurface temperature mapping, water mapping, composition (D/H ratios, abundance of major volatiles, etc.) . In addition, COMETS can be used for water plumes detection Ocean Worlds.

Science:

- COMETS will allow for the first time to obtain maps of inner coma gases and temperatures at the same time and rotation phase.
- This will allow to constrain coma models, rather than relying on their extrapolation to interpret the data obtained.
- COMETS dual-band large band receivers will largely expand on number of species studied.

Objectives:

- To develop the first all-solid-state room-temperature Schottky diode based dual-band multi-pixel heterodyne receiver front-end
- To enable high-resolution ($\lambda/\Delta\lambda > 10^6$) fast mapping of cometary comas and surfaces, as well as other planetary bodies: Enceladus/Europa.
- COMETS will feature two bands integrated on a compact packaging (210-240 GHz & 500-580 GHz) with 16-pixel each.

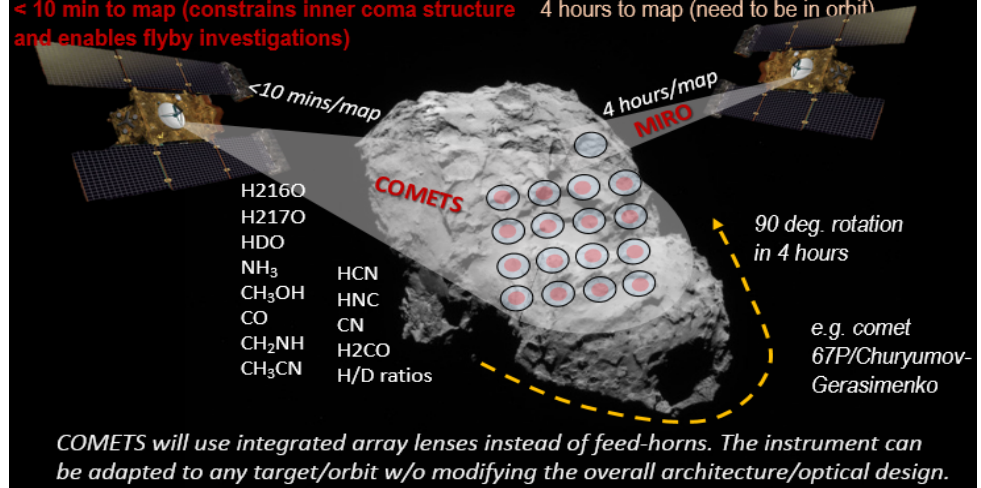
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COMETS (this work)

First mapping capable THz planetary instrument
 16-pixel high resolution heterodyne receivers
 Dual wide-band receivers: 210-240 & 532-588 GHz
 Mass per pixel: 1 Kg (**x10 improvement**)
 DC power per pixel: 1.1 W (**x44 improvement**)
 DSB Tsys: 1500 K at 560 GHz (**x3 improvement**)
< 10 min to map (constrains inner coma structure and enables flyby investigations)

MIRO on Rosetta (State-of-the-Art)

No mapping,
 1-pixel high-resolution heterodyne receiver
 Dual narrow-band receivers: 190 & 562 GHz
 Mass per pixel: 10 Kg
 DC power per pixel: 44 W
 DSB Tsys: 5000 K at 560 GHz
 4 hours to map (need to be in orbit)



Key Milestones:

- Year 1: Complete fabrication of Schottky diode devices
I&T of prototype single-pixel dual band receiver
 - Year 2: Complete design & fab of Silicon lens array
I&T of dual-band 16-pixel receiver
 - Year 3: Full characterization of 16-pixel dual band LO
Full characterization of 16-pixel dual band mixers
Full I&T of COMETS 16-pixel RFE
- TRL 2 to 4