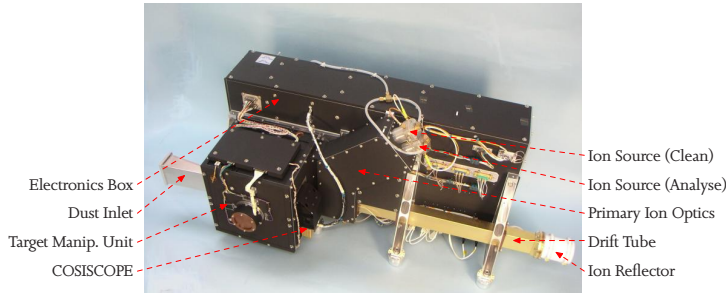


COSIMA

Cometary Secondary Ion Mass Analyser for the ESA Mission ROSETTA

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The COSIMA Instrument



COSIMA's Scientific Objectives

Target: Comet 67P/Churyumov-Gerasimenko

- Analysis of the elemental composition (and isotopic composition of some key elements) of cometary grains.
- Chemical characterisation of the main organic components, present homologous and functional groups.
- Mineralic and petrographic characterisation of the inorganic phases—all related to solar system chemistry.

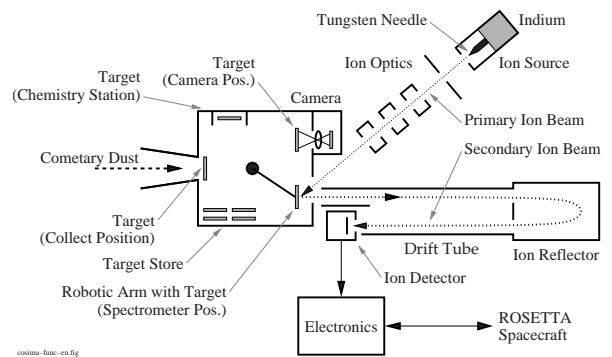
COSIMA Specifications

Atomic mass range	1...4000 Da
Relative atomic mass resolution m/dm at $m = 300$	>2500
COSIMA instrument mass	19.8 kg
Indium ion pulse duration	≈5 ns
Indium ion energy	8 keV
Power consumption from 28 V DC	20.4 W

The COSIMA Team

- vH&S** The von Hoerner & Sulger GmbH is prime contractor and responsible for the overall design, management, production, and qualification testing.
- MPE** The Max-Planck-Institut für extraterrestrische Physik (MPE), Garching, Germany, then with Director Prof. G. Haerendel, hosted the PI Dr. Jochen Kissel, contributed TMU and mechanical systems.
- BUGH** The Bergische Universität und Gesamthochschule Wuppertal (BUGH) participated in development of the data acquisition unit TDC.
- FMI** The Finnish Meteorological Institute (FMI), Helsinki, Finland, provided the GSE and the COSIMA flight software.
- Krueger** The Ingenieurbüro Dr. Franz Krueger, Darmstadt, Germany, provided cleanliness analyses, scientific methods for spectra interpretation, and developmental effort for collector targets.
- IAS** The Institut d' Astrophysique Spatiale (IAS), Orsay, France, developed the COSISCOPE camera and the power converters.
- ARCS** The Österreichisches Forschungszentrum Seibersdorf Ges. m. b. H. (ARCS), Austria, provided the Primary Ion Sources (PIS).
- IWF** The Institut für Weltraumforschung (IWF), Graz, Austria, developed the HV supply for the PIS.
- LPCE** The Laboratoire de Physique & Chimie de l'Environnement (LPCE), Orleans, France, provided the primary ion optics (PIBS).
- Neubiberg** The Universität der Bundeswehr, Neubiberg, Germany, provided collector targets.
- Nylander** Nyle Utterback, Santa Barbara, CA, did the ion optics design.
- Münster** The Institut für Planetologie, Münster, Germany, performed TOF-SIMS analysis of analogs for scientific and instrumental comparison.
- MPAe** The Max-Planck-Institut für Aeronomie (MPAe), Katlenburg-Lindau, provides science operations.

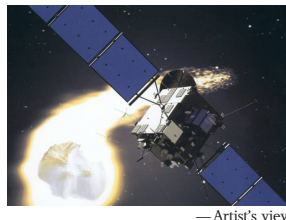
COSIMA Functional Principle



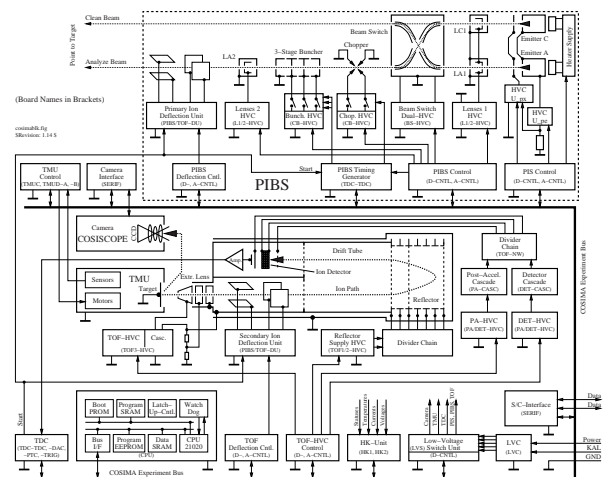
The ROSETTA Spacecraft



ROSETTA at Comet



COSIMA Block Diagram



COSIMA Timeline

- 1992** ESA performs Pre-Study for new Cometary Mission "ROSETTA". Dr. J. Kissel, MPK Heidelberg, presents dust mass spectrometer concept based on CoMA/CRAF (NASA mission, canceled).
- Sep. 1993** ESA selects ROSETTA as new "Cornerstone Mission."
- June 1994** Dr. Kissel contacts institutes for contributions, prepares exp. proposal "COSIMA" to ESA.
- Dec. 1995** ESA selects COSIMA for the ROSETTA mission.
- Summer 1996** vH&S starts development of COSIMA exp. model.
- 1998** vH&S receives contract for the COSIMA flight model.
- July 2002** vH&S delivers the COSIMA flight model (XM) to ESTEC.
- Jan. 2003** ROSETTA launch (Kourou) postponed by ESA.
- July 2003** COSIMA emitter maintenance session at GSC, Kourou.
- 26 Feb. 2004** Planned launch date.
- Aug. 2014** Arrival (prelim.) at comet 67P/Churyumov-Gerasimenko.

COSIMA Measurement Principle

- Cometary dust is collected on targets, which are stored in Target Manipulation Unit (TMU).
- The dust grains are located by microscopic camera COSISCOPE.
- A pulsed primary Indium ion beam partially ionises the dust grains.
- The secondary ions (pos. or neg., selectable) are accelerated by electrical fields, and travel well-defined distance through drift tube and ion reflector.
- A multisphere plate with dedicated amplifier is used to detect the ions.
- The arrival times of the ions are digitised and accumulated into 2 ns bins.
- The mass spectra are calculated from the time-of-flight spectra.

The COSIMA Investigation

COSIMA has been proposed, developed, and delivered by an international team of 39 investigators. The PI Jochen Kissel (MPAe) and 4 CoPIs Yves Langevin (IAS), Rita Schulz (ESTEC), Johan Silén (FMI), and Hanna von Hoerner (vH&S) are leading the investigation. Funding comes from DARA/DLR and the respective other national agencies. The special support by ESTEC in a critical situation before delivery is gratefully acknowledged.

COSIMA Contact, Links

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- MPE Homepage** <http://www.mpe.mpg.de>
- FMI COSIMA Homepage** <http://www.geo.fmi.fi/PLANETS/Cosima.html>
- ROSETTA Homepage** <http://rosetta.esa.int>