



Solar System Exploration in Germany

German Space Program (Key points)

- **Formation and development of the Solar System
Formation of stars and planets**
- **Comparison of terrestrial planets with Earth**
- **The Sun and its influence on interplanetary medium and
the planets especially the Earth**
- **Upper atmosphere: state and dynamics**
- **Search for signs of life**



Solar System Exploration in Germany

Competence and perspectives

- **Scientific community in Max-Planck-Institutes, universities, and research institutes**
- **Active in most fields of solar system research**
- **Realisation of spaceborne experiments mostly in cooperation**
- **Technological competence for forefront instrumentation both in science institutes and in industry**
- **Position paper for Solar Research is in Preparation**



The Sun and its influence on Earth

2005/6 **SUNRISE** - spektropolarimetric observations

DLR/NASA ; Status: development; Balloon-borne 1m-class telescope)

2005 **STEREO** - 3-Dimensional Observation of coronal mass ejections

NASA; Status: development; D-participation: contributions to several experiments

2001 **HESSI** – particle acceleration and energy transportation in solar events

NASA; Status: in operation; D-participation: data analysis and ground station

2000 **CLUSTER** – Influence of the solar wind on the Earth's atmosphere

ESA; Status: 4 spacecraft in operation; D-participation: several instruments

1995 **SOHO** – high-resolution spectroscopy of solar atmosphere and corona

ESA/NASA; Status: in operation; D-participation: several instruments

1990 **Ulysses** – Observation of the solar environment outside of the ecliptic

ESA; Status: in operation; D-participation: several instruments



German contributions to STEREO

SECCHI - Entrance apertures for coronagraph and EUV-cameras

- development of methods to analyse CME
- S/W for data presentation and visualisation

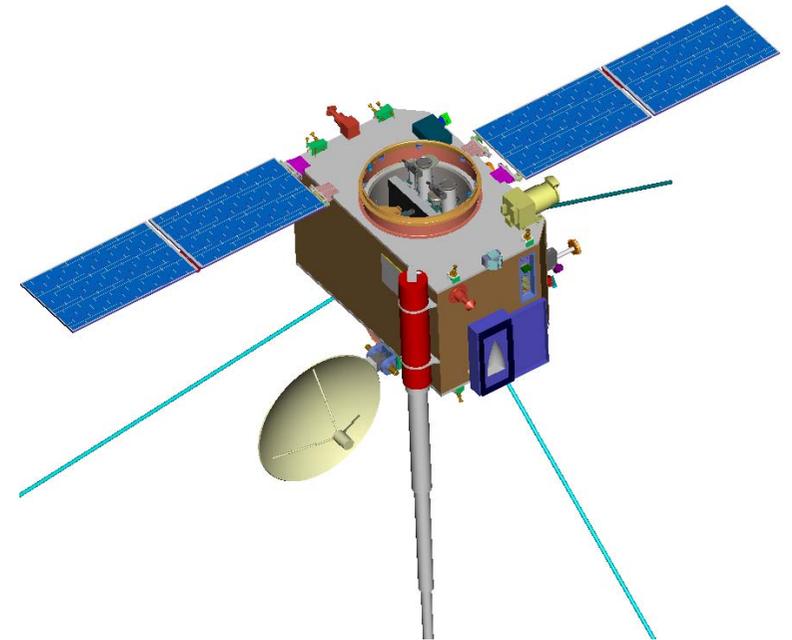
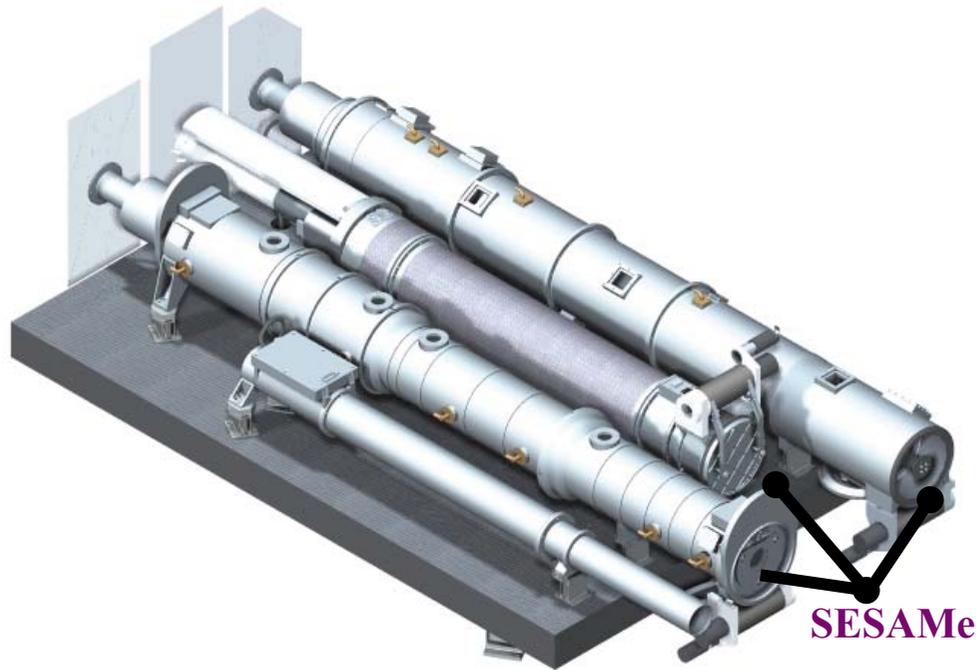
IMPACT - Development of the Solar Electron and Proton Telescope (SEPT)
- Time-of-flight electronics for the suprathermal ion telescope/
TOF-mass-spectrometer (SIT)

(PLASTIC) - calibration of detectors



Sun Centered Imaging Package (SCIP)

STEREO Spacecraft





Sunrise Science Goals

- **resolve the magnetic structure on spatial scales of > 30 km**
- **study the dynamics and the full life cycle of flux concentrations**
- **provide crucial information about the evolution of magnetic flux and the solar dynamo**

Sunrise Main Requirements

- **sufficient field of view (magnetic connectivity: 30000 km) \rightarrow 1-m telescope**
- **time resolution 5 s and coverage up to days**
- **measurement of 3D-distribution of B vector, v, T**
- **high-cadence imaging of different layers**



Future Missions and participations

2012 Solar Orbiter – Exploration of the Sun from close distance

ESA; Status: preparation; D-participation: TBD

2011/12 BepiColombo – Opportunity for experiments near the Sun

ESA/ISAS; Status: preparation; D-participation: TBD

2008 MMS – Magnetospheric multiscale mission

NASA; Status: proposed; D-participation: TBD

2007 SDO – Influence of Solar Variations to life on Earth

NASA; Status: in preparation; D-participation: in discussion

2006 THEMIS – Time History of Events and Macroscale Interactions during Substorms

NASA; Status: in preparation; D-participation: under consideration

(2005) SOL-ACES - Measurement of UV-fluxes from the Sun

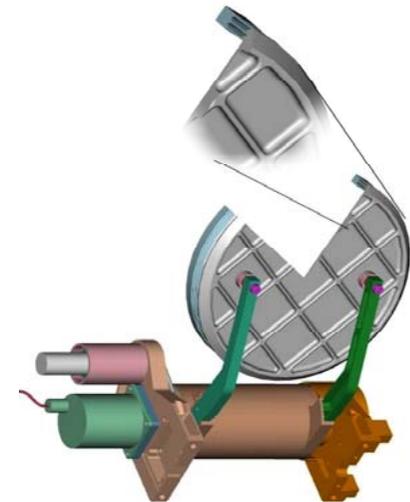
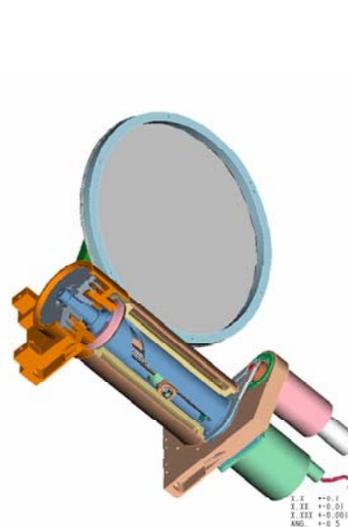
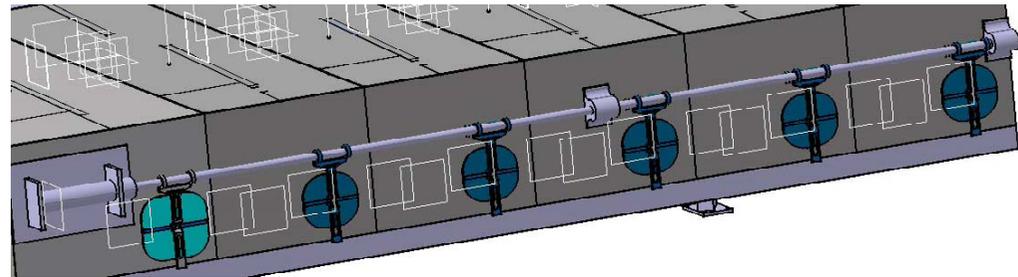
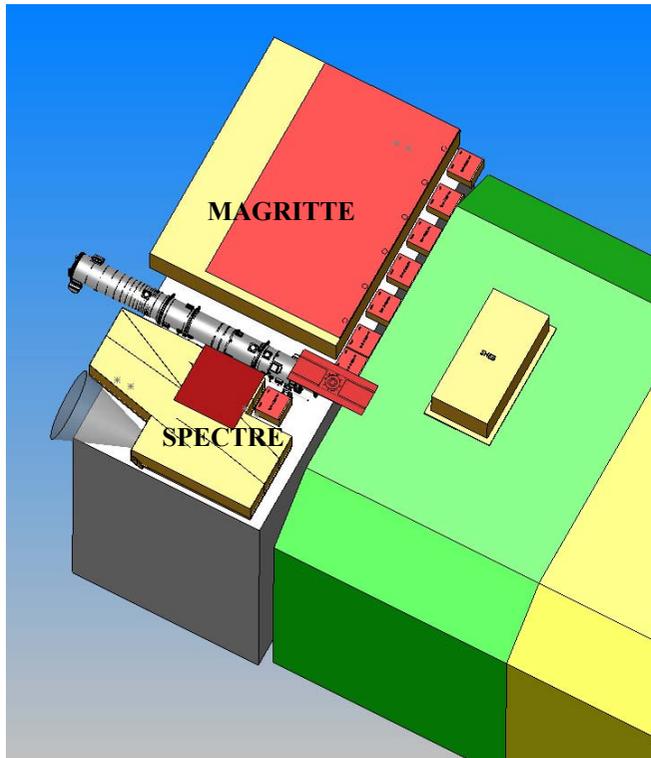
DLR/ESA; Status: in development; on ISS solar platform



SDO SHARPP subsystems

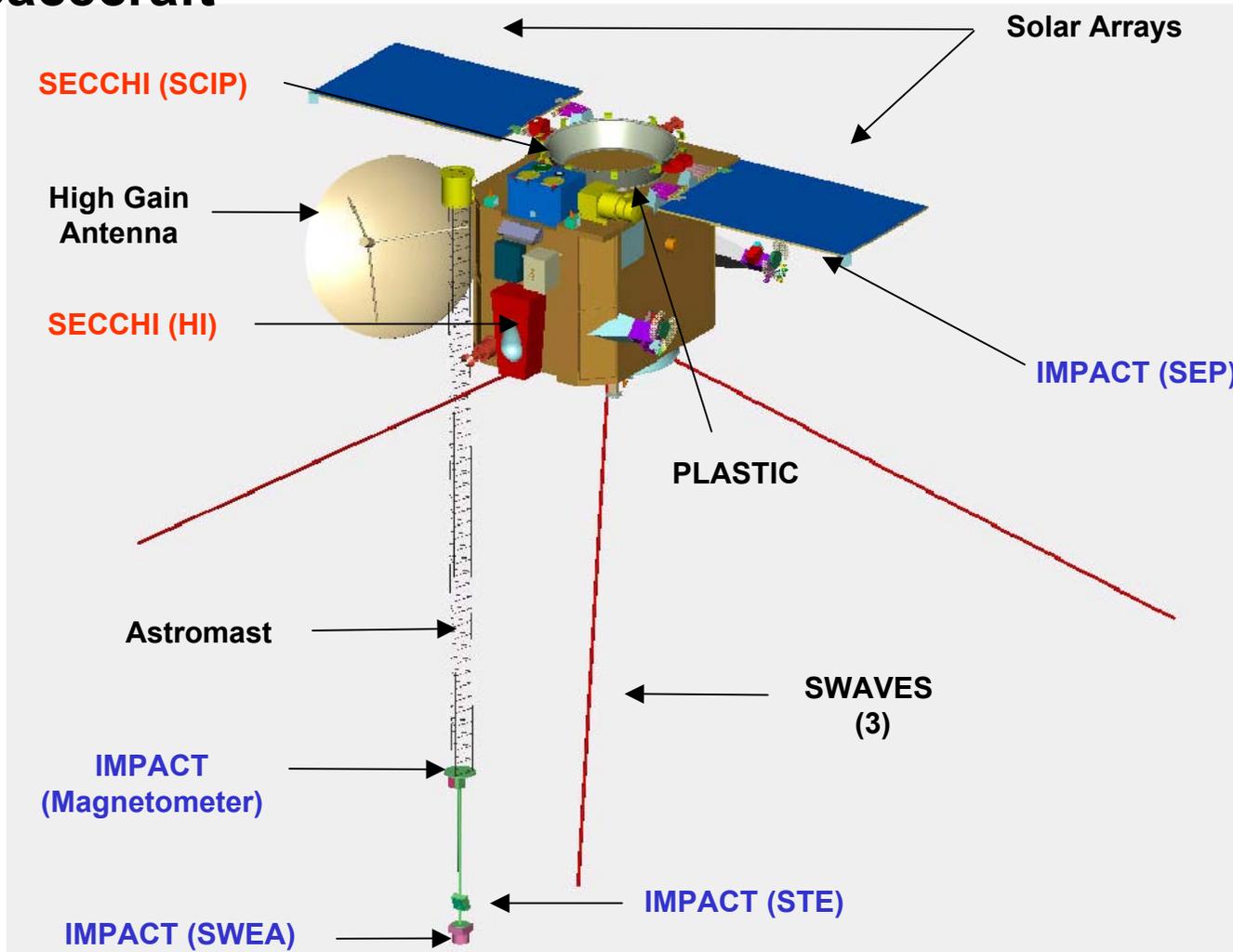
Aperture door mechanisms

and 7 shutters as proposed MP Ae contribution



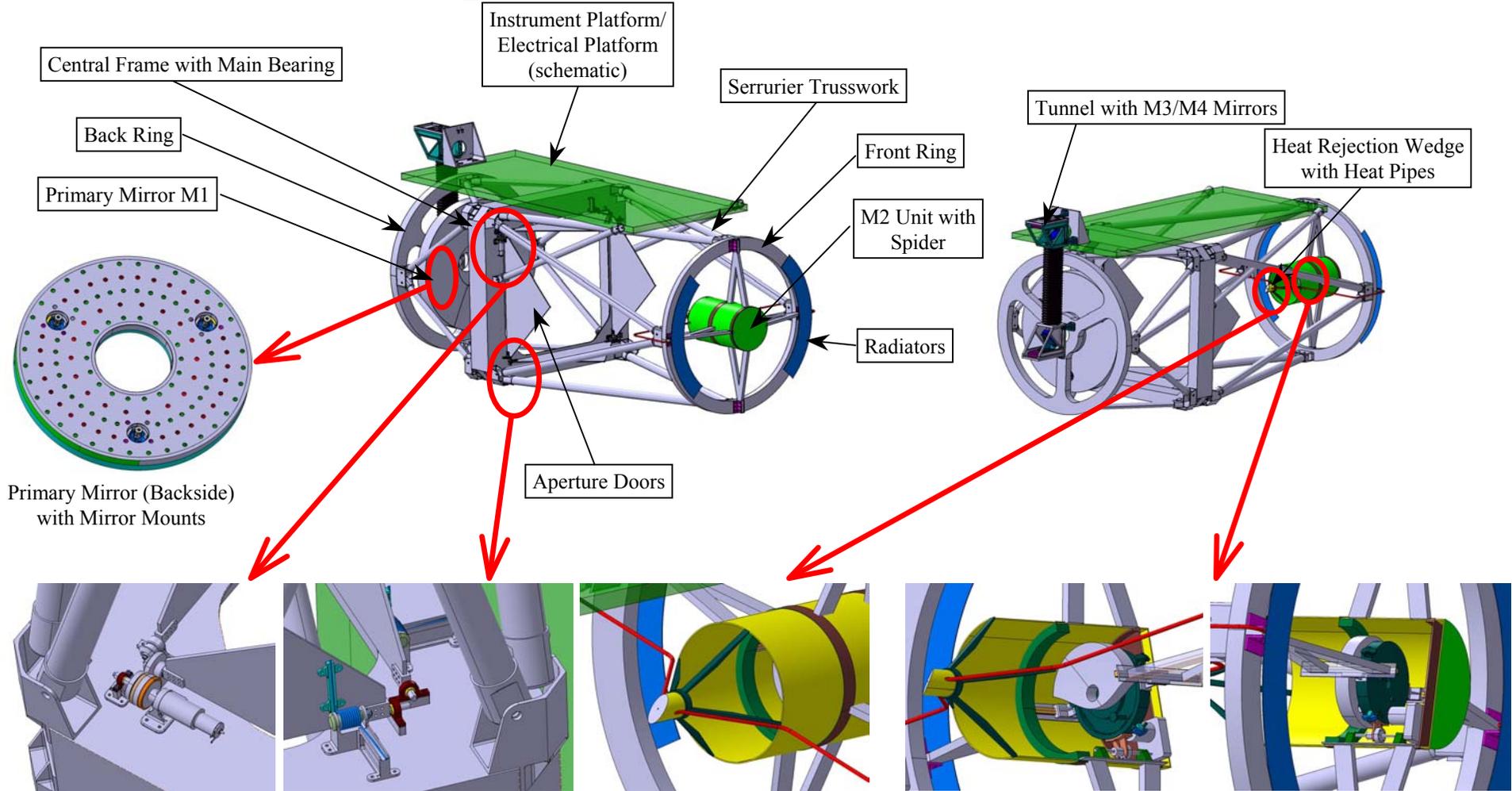


STEREO Spacecraft





SUNRISE Main Telescope



Aperture Door Mechanism
ILWS, Nizza, 14./15. 04. 2003

Heat Rejection Wedge
with Heat Pipes

M2- Mechanism
(Tube and M2 cut)