



# 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

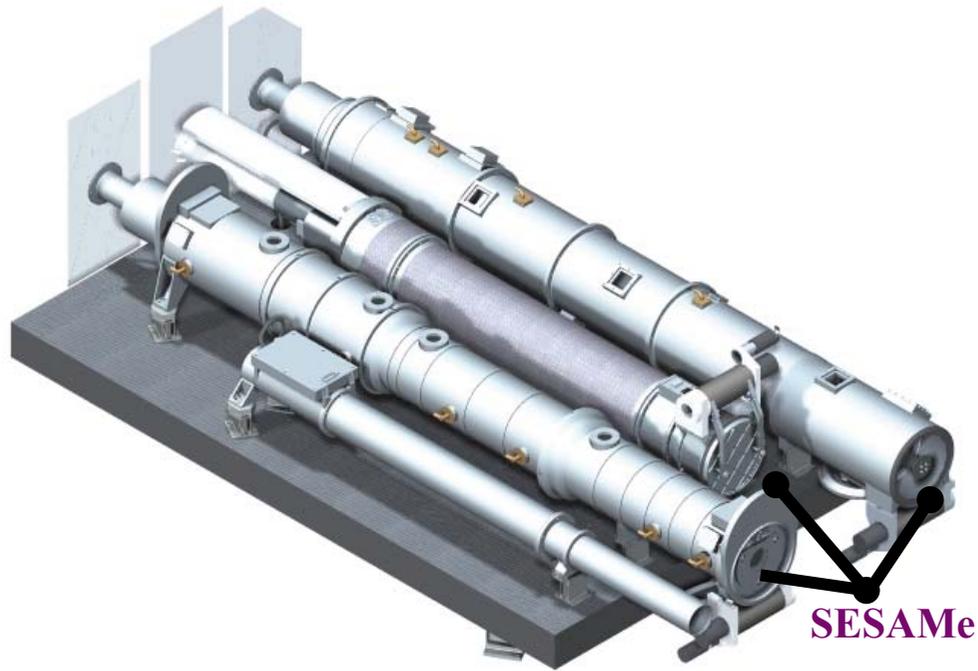
- development of methods to analyse CME
- S/W for data presentation and visualisation

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

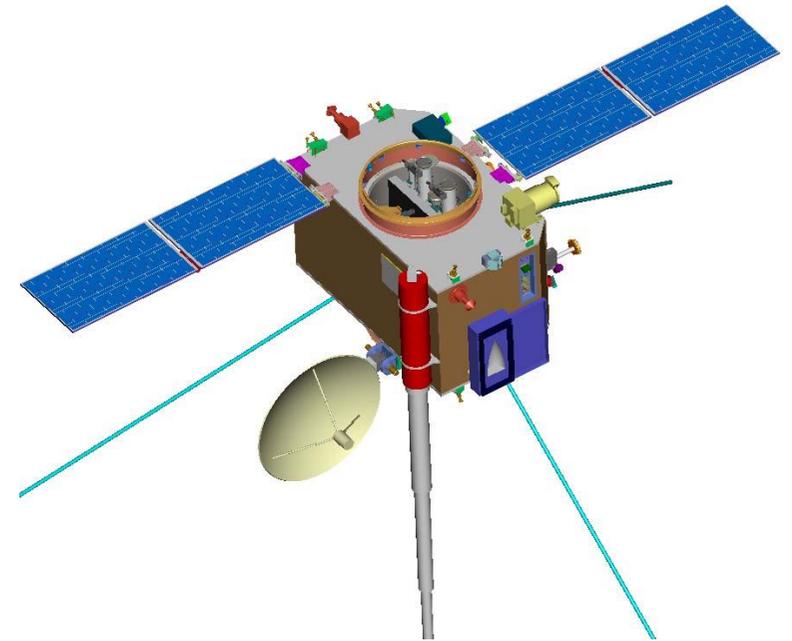
**(PLASTIC)** - calibration of detectors



## 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**

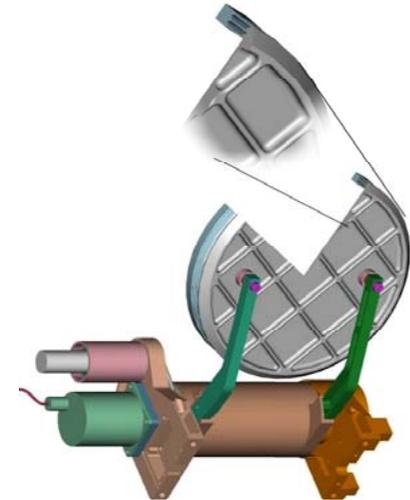
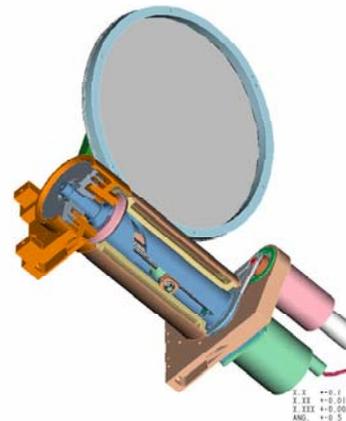
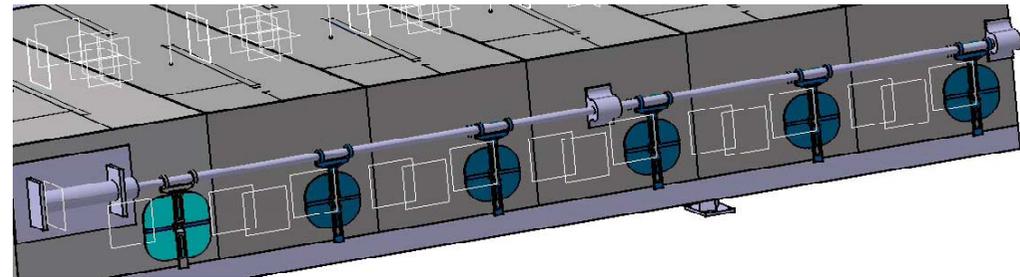
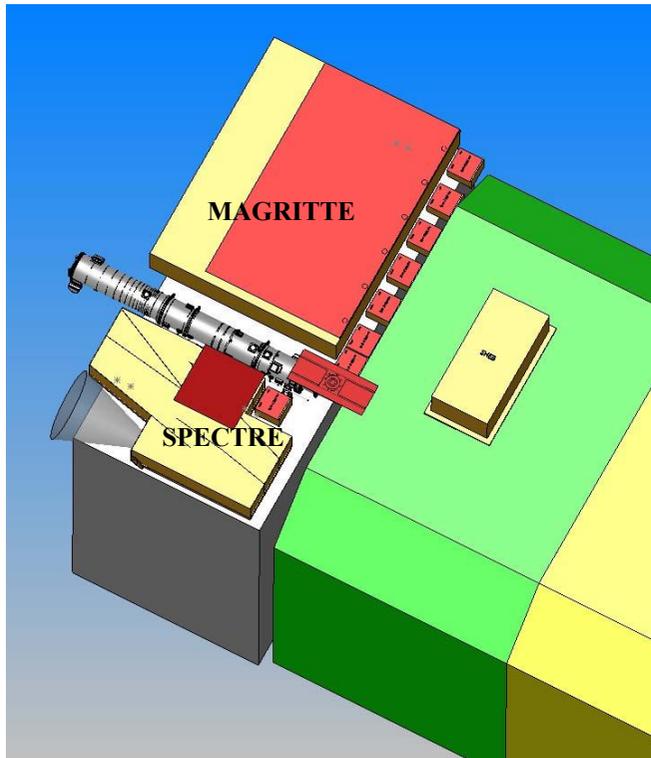
DLR/ESA; Status: in development; on ISS solar platform



## SDO SHARPP subsystems

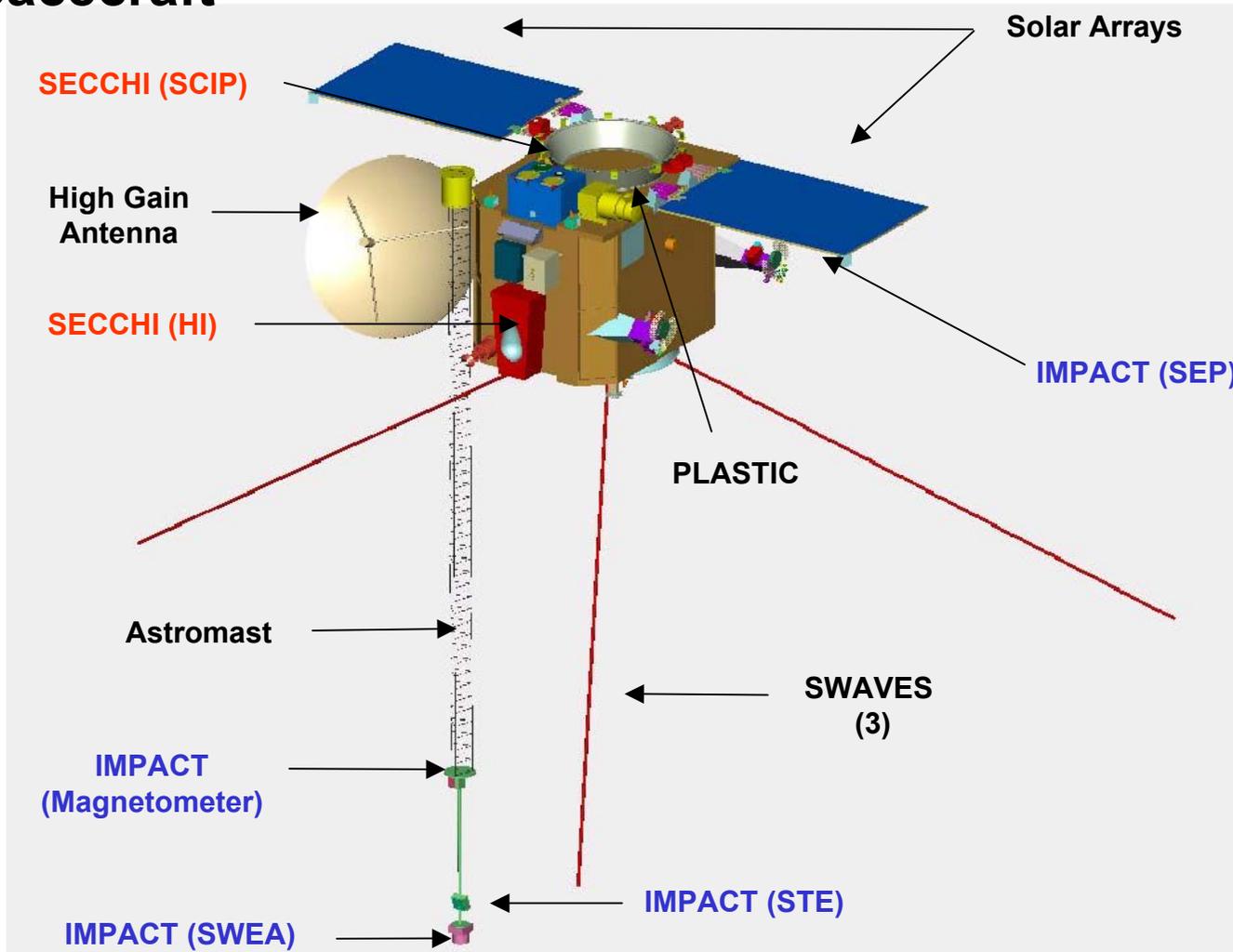
## Aperture door mechanisms

and 7 shutters as proposed MP Ae contribution



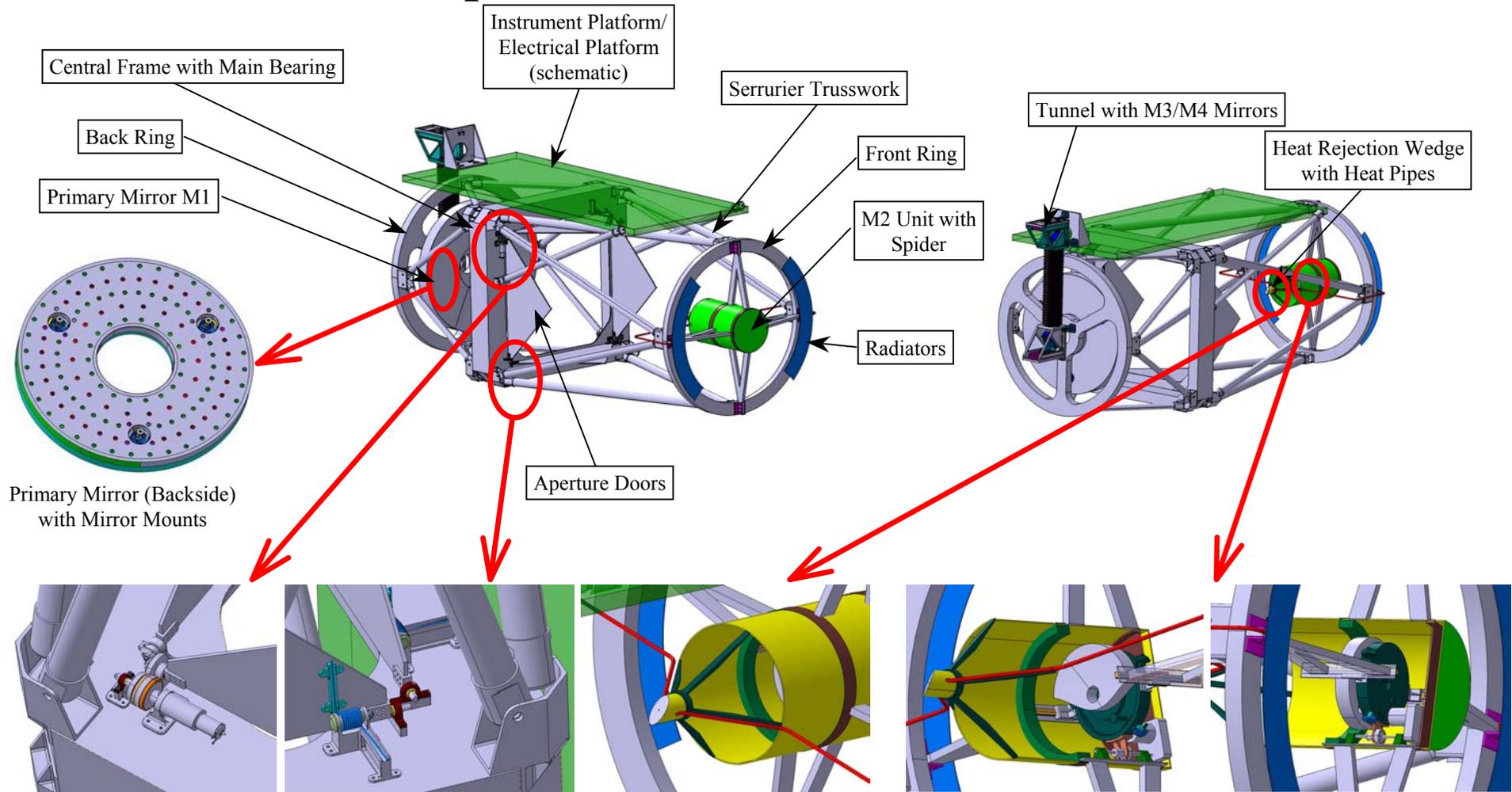


# STEREO Spacecraft





# SUNRISE Main Telescope



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

Heat Rejection Wedge  
with Heat Pipes

M2- Mechanism  
(Tube and M2 cut)