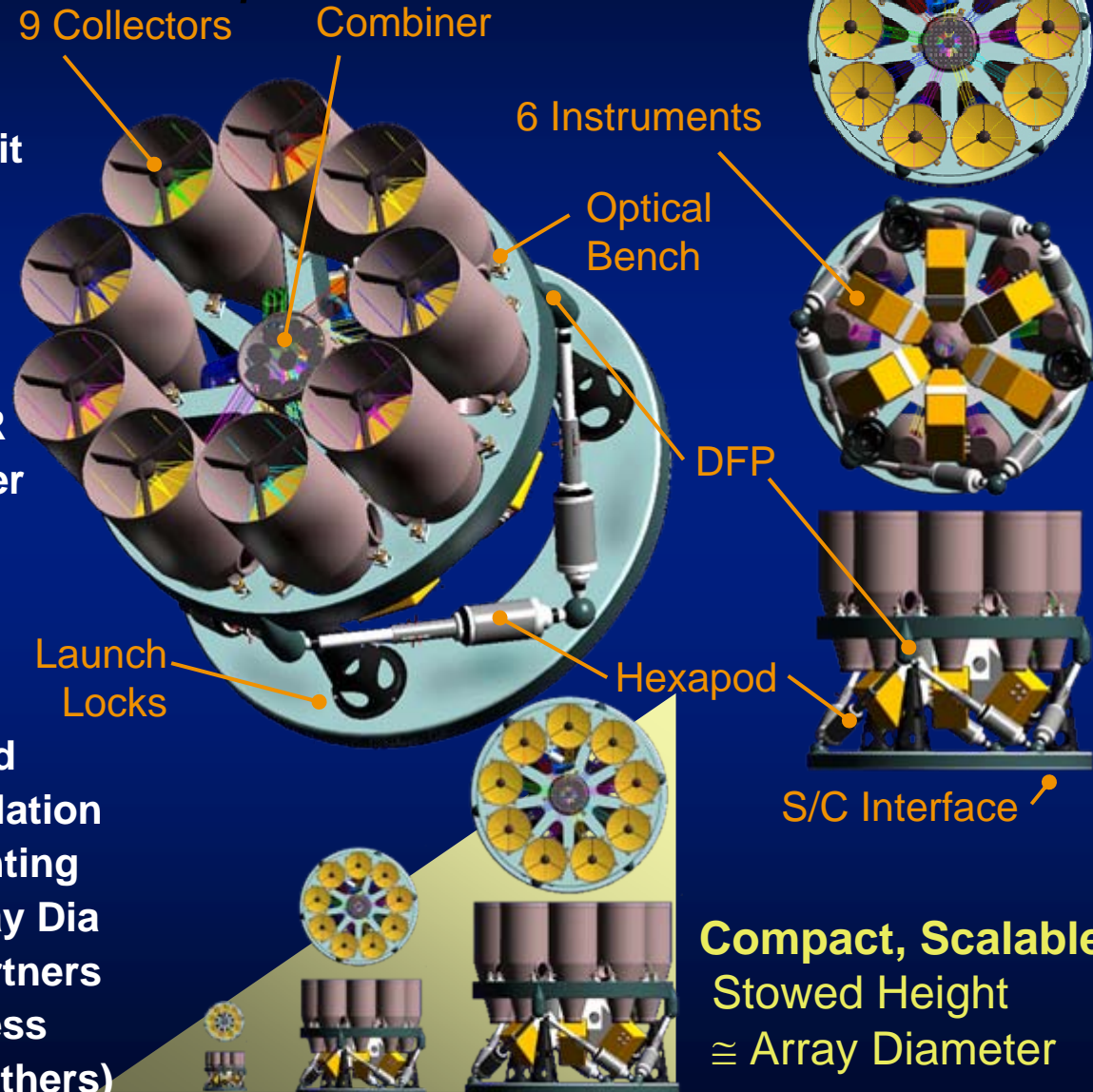


MIDAS Advanced Remote Sensing Payload

Multiple Instrument Distributed Aperture Sensor

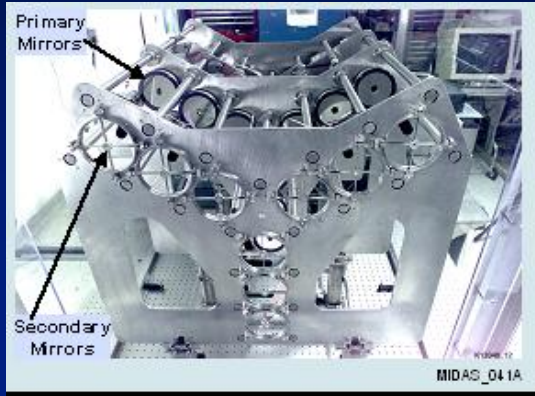
- **Multi-Functional Payload**
 - Broadband 0.3-14 μm Imager
 - Phased to Array Diffraction Limit
 - Concurrent Multispectral
 - Individual Wide Area Surveys
 - 1nm Hyperspectral FTIS Imager
- **Active Remote Sensing**
 - LIDAR, Vibrometry, Optical SAR
 - 3D LADAR & Polarimetric Imager
 - Laser Active Spectroscopies
 - Multiple Phased Lasers
 - Optical Com Transceiver
- **Low Risk Development**
 - Pre-integrated Compact Payload
 - >60dB Broadband Vibration Isolation
 - Autonomous E-O, WFS&C, Pointing
 - Scalable Payload 0.5 to 5m Array Dia
 - 6 Tailored Instruments from Partners
 - LM Heritage, Testbeds, Readiness
 - Multiple Mission Uses (NASA, others)



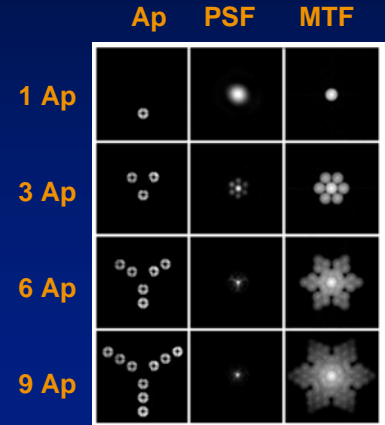
Compact, Scalable
 Stowed Height
 \cong Array Diameter

Distributed Aperture Imaging Heritage

Multi-Ap Testbed



- 65 cm Synthetic Aperture
- 150 micro-rad phased FOV
- Coherent phase diversity active control
- Resolves to diffraction limit of array's synthetic aperture



Zarifis et. al. 1999

STAR-9 Testbed



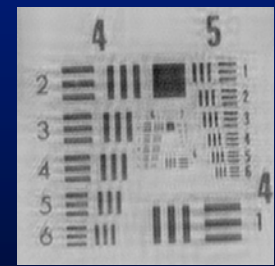
US Patent 5,905,591

- 61 cm Synthetic Aperture
- 0.08 waves WFE at 635 nm
- 1 milli-radian phased FOV
- Coherent phase diversity active control
- Resolves to diffraction limit of array's synthetic aperture

Unresolved Point Source MTF



Diffraction Limited Imaging



Kendrick et. al. 2005 (submitted)

MIDAS Payload

MIDAS Imager

- Payload is optics, relays and SI's integrated by optical bench
- Low, medium & high resolution imaging
- Coarse to fine resolution spectroscopy
- Multiple complementary SI's
- Steerable collectors (option)
- Autonomous WFS&C focusing directly from extended scene information
- Low inertia (particularly V2 & V3)
 - Compact height \approx array diameter
 - Mass balanced CG at DFP mounts

DFP Pointing Stabilization

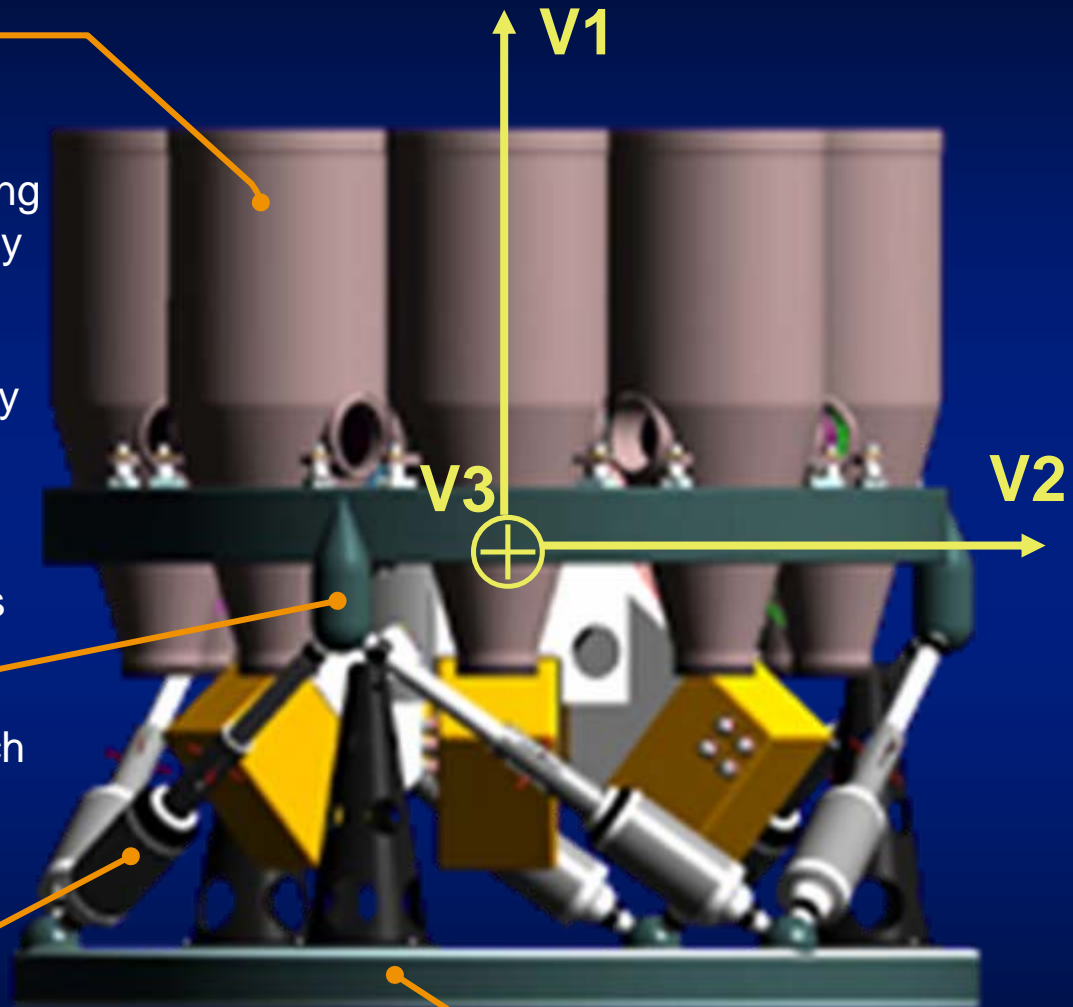
- DFP at I/F of Hexapod to Optical Bench
- Rapid precision pointing of MTA
- >60 dB broadband isolation of MTA
- Rapid fine pointing and scanning

Hexapod Scan Platform

- Accurate positioning of coarse scan
- Slowly scans across FOR
- Accurately positions dwells

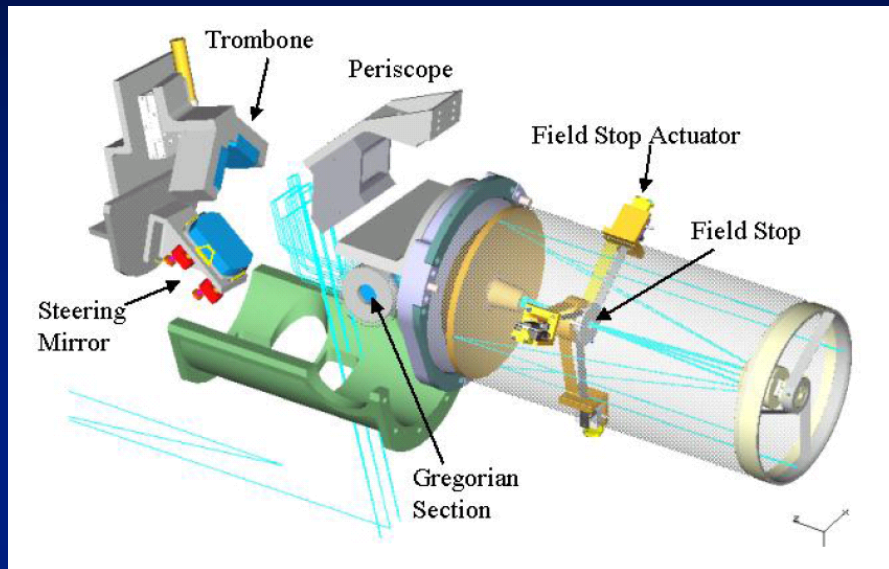
Spacecraft Interface

- Simple, clean interfaces

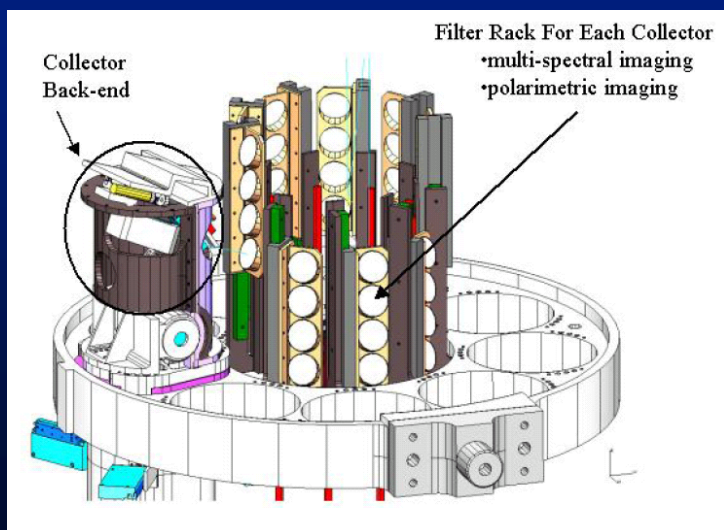
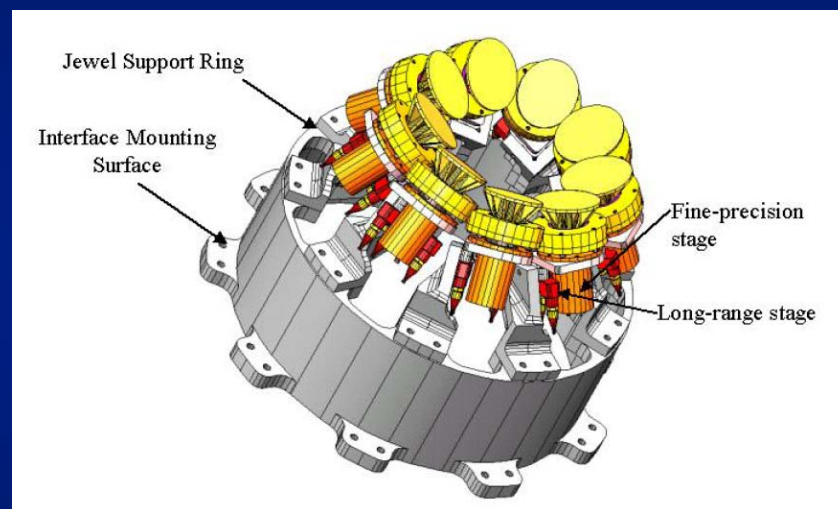


Electro-Optical Control Design

Four-Mirror Cassegrain Gregorian Collector



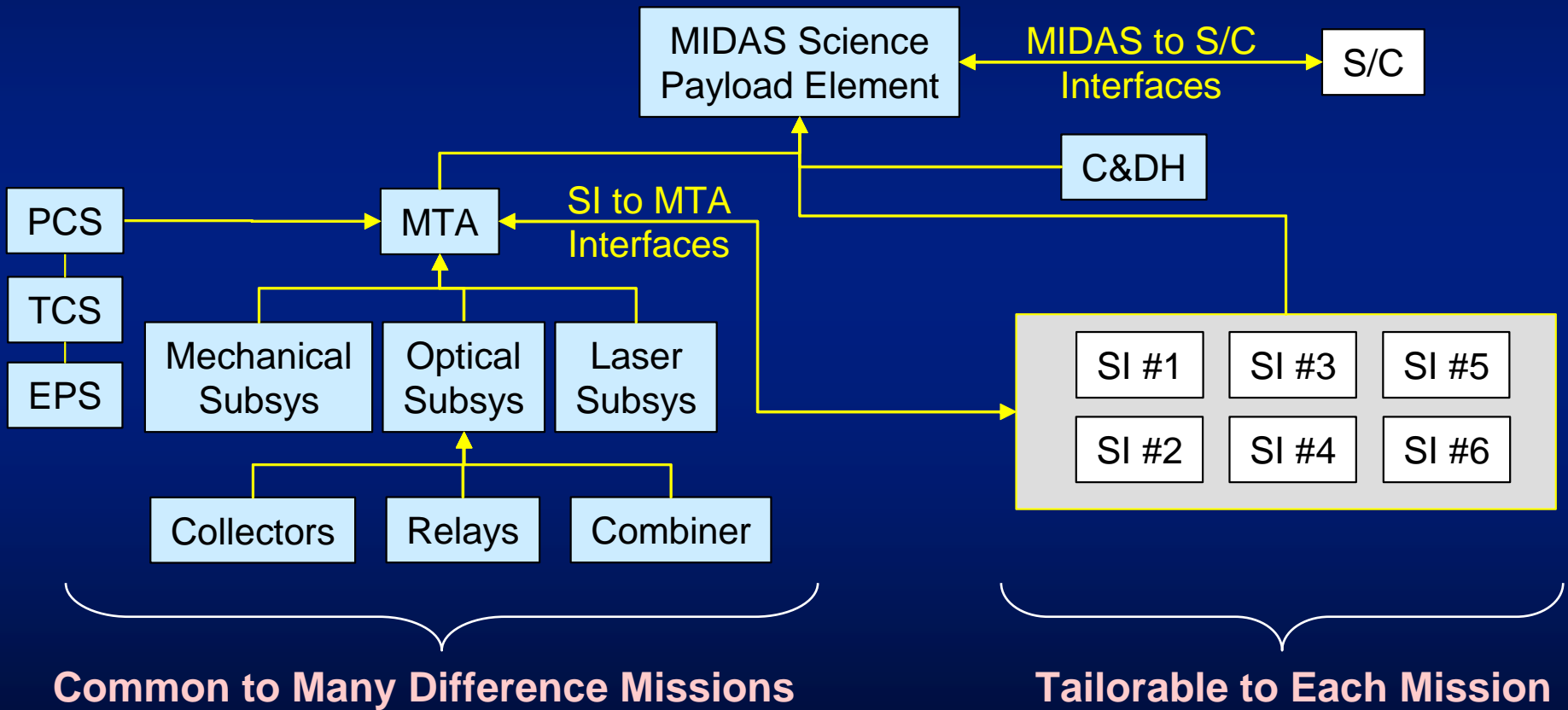
Active Electro-Optical Combiner Jewel



Multispectral Filter Rack Assembly

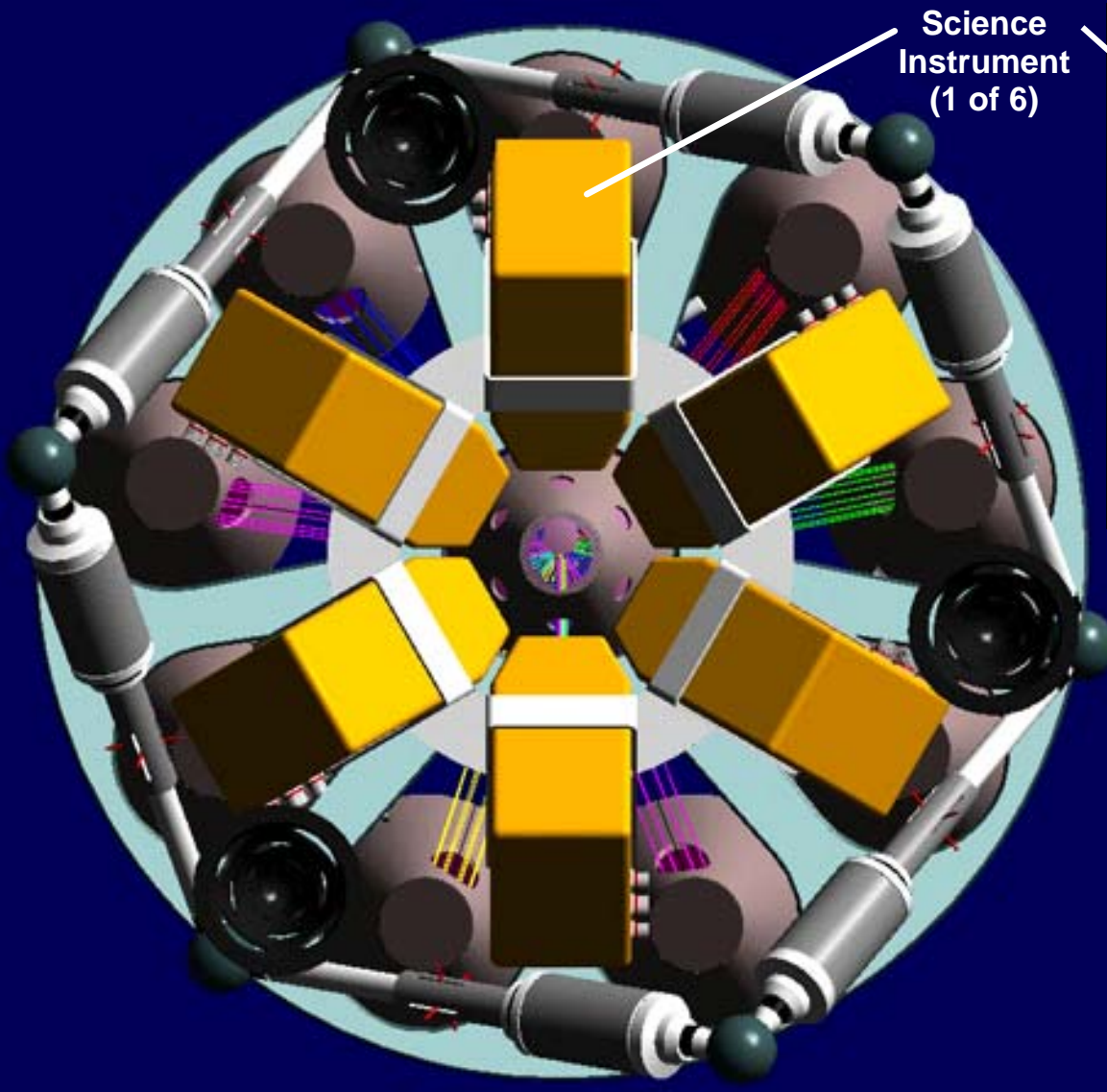
Smith et al, 2005

Modular, Flexible Architecture

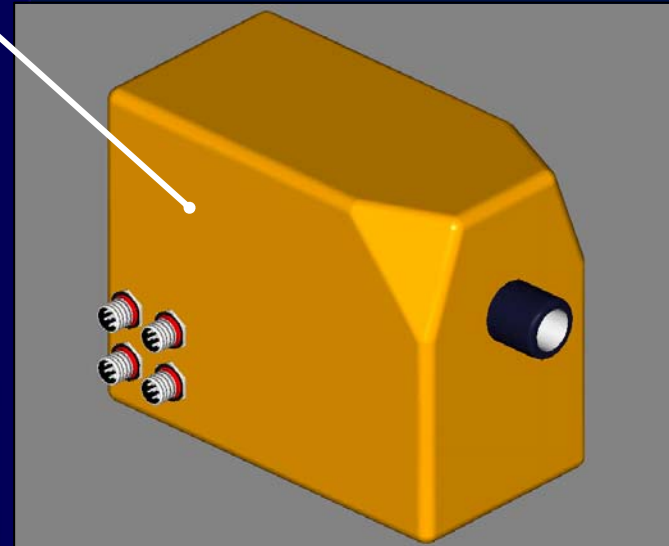


Stubbs et al, 2004

Mission-Specific Instrument Tailoring



Science
Instrument
(1 of 6)



Imaging SI's

- UV, VIS/NIR, SWIR, MIR Spectrometer SI's

- UV/VIS, NIR, SWIR, MIR

Other SI's

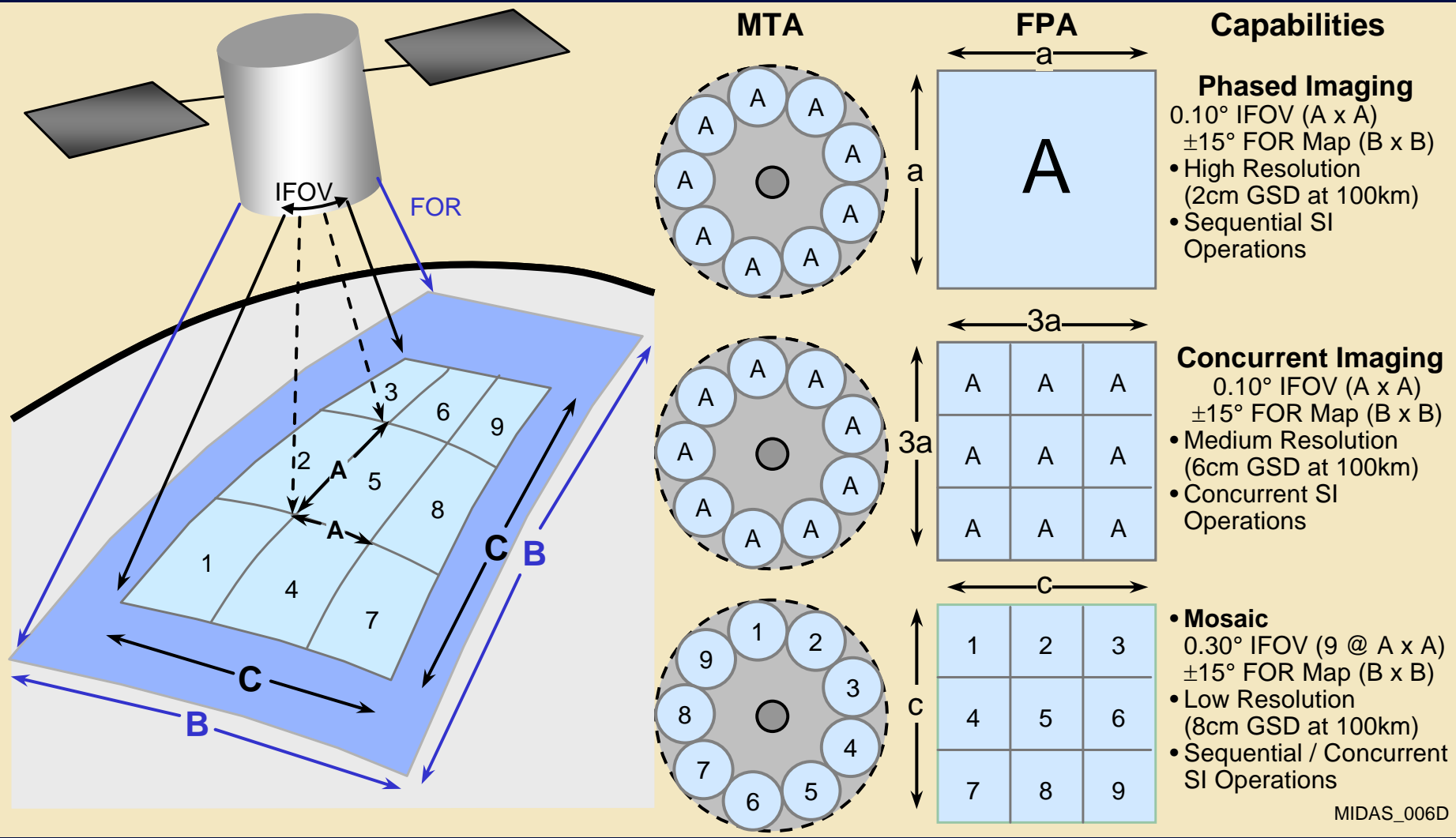
- Polarimetric sensors

- Active imaging sensors

- Lasercom Xmtr/Rcvr modules

Stubbs et al, 2004

MIDAS Passive Imaging Modes

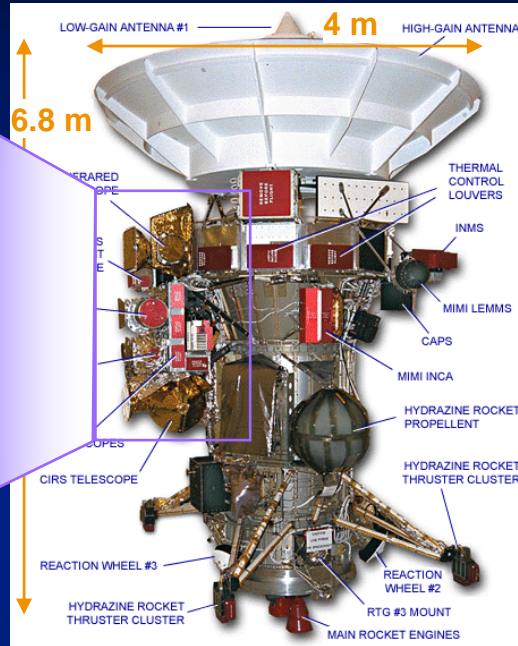
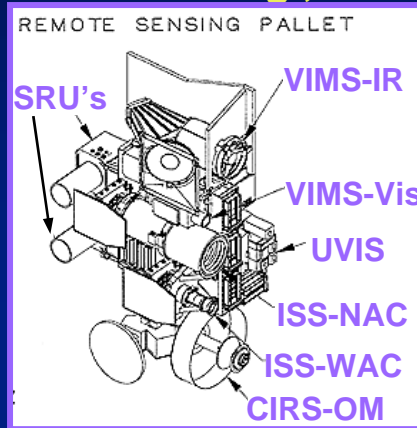


Pitman et al 2004

Making the Flagship Case for Europa

Cassini Optical Remote Sensing Pallet

183. kg , 155. W



Jaffe & Herrell 1996

MIDAS 1m
(to Cassini S/C scale)



~200 kg
~150 W
~0.8 m³

- Common boresighted SI's
- Body mounted w/o articulation
- Precise alignment, RT to cryo

- Modular, preintegrated payload
- Isolated from S/C and articulated
- EO adjustable alignment & control

High Capability Instruments Like MIDAS Could Enhance Case for Flagship Mission

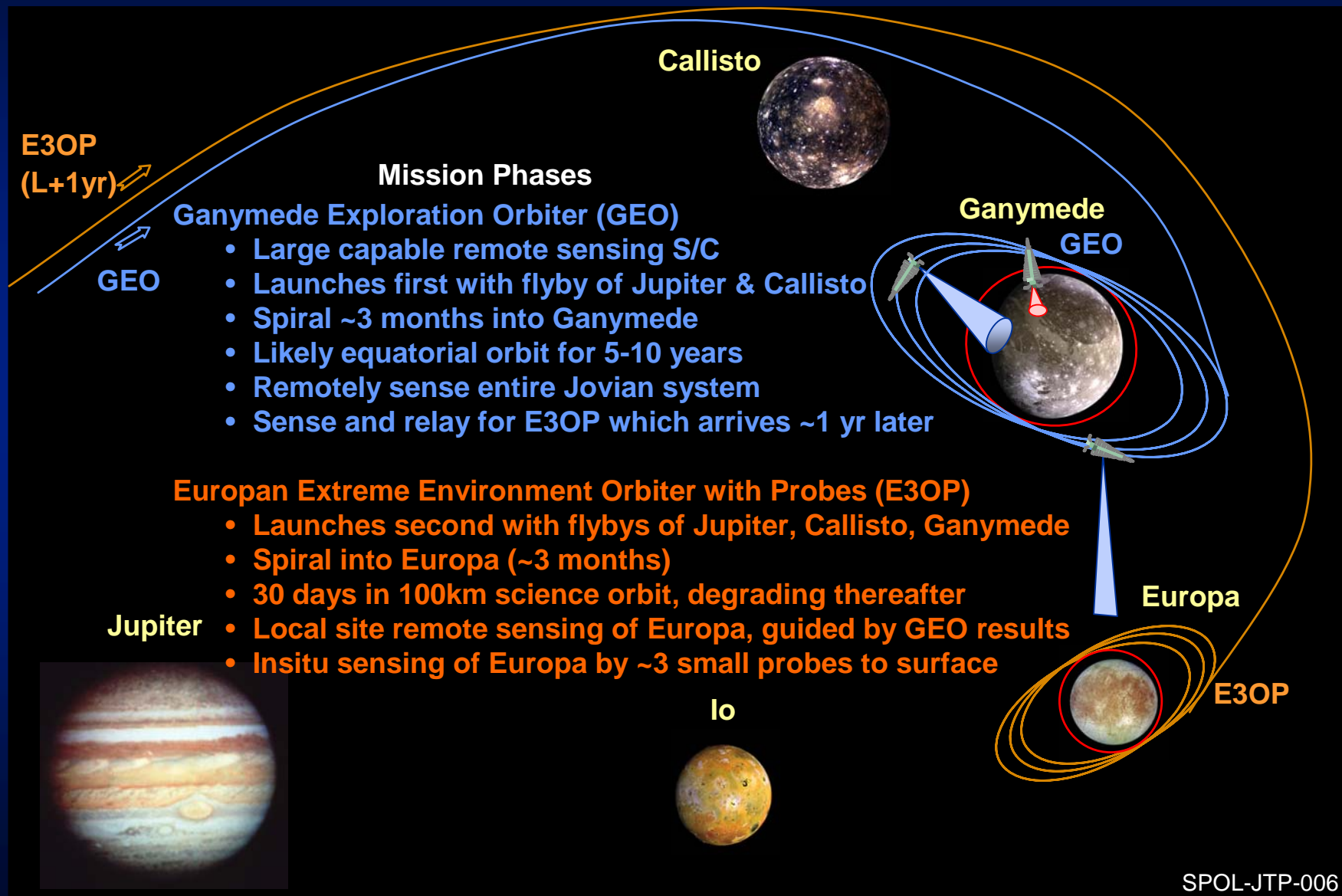
Long Duration Remote Sensing of Jovian System (from outside Europa's high rad zone)

- All Jupiter icy moons: global 50 m/px multispectral imaging & 1 nm hyperspectral FTIS
- Jupiter (200m/px) and Io (75 m/px) multispectral & 1nm hyperspectral FTIS

Detailed Remote Sensing of Europa over 30° FOR from 100 km Science Orbit

- Regional wide-area surveys: 15 cm/px imaging, multispectral, active sensing
- Local 9-channel concurrent sensing: 10 cm/px imaging, multispectral, active sensing
- Local phased-array sensing: 3 cm/px imaging & 1nm hyperspectral FTIS, active sensing

Notional GEO-E3OP Mission Concept



SPOL-JTP-006

MIDAS Imaging from Ganymede Orbiter

Europa	Io	Callisto	Jupiter
25-125m visible	35-175m visible	45-225m visible	60-300m visible
80-400m SWIR	125-625m SWIR	150-750m SWIR	200m-1km SWIR

