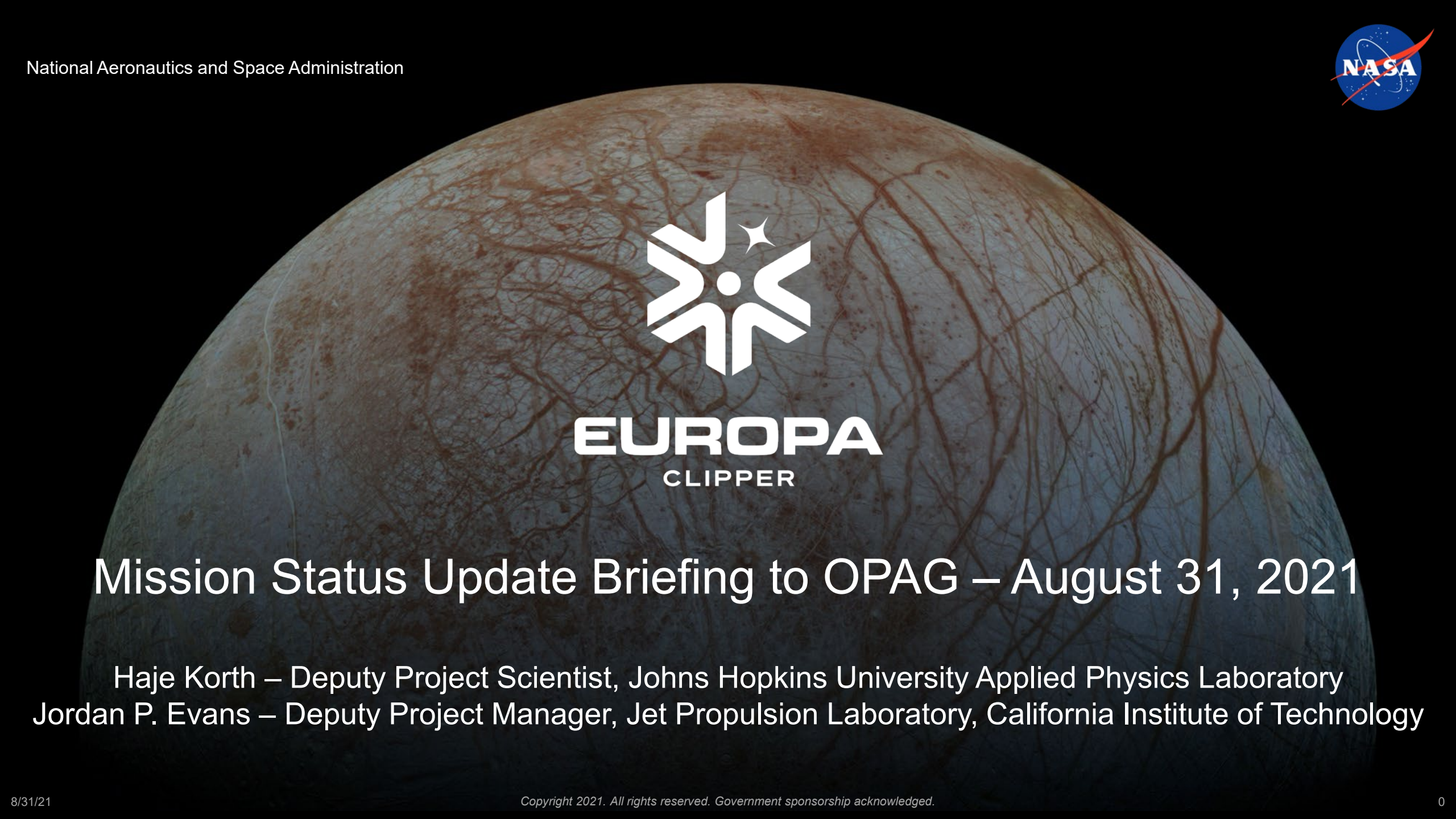
National Aeronautics and Space Administration



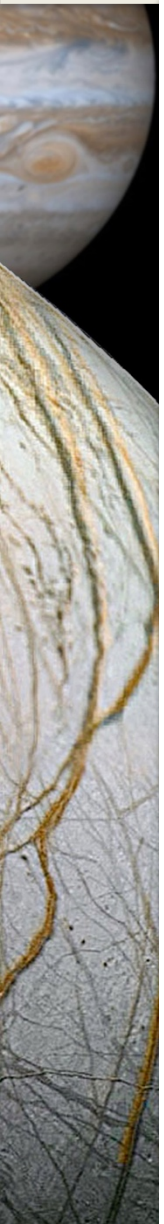
Mission Status Update Briefing to OPAG – August 31, 2021

Haje Korth – Deputy Project Scientist, Johns Hopkins University Applied Physics Laboratory
Jordan P. Evans – Deputy Project Manager, Jet Propulsion Laboratory, California Institute of Technology

Current Project Status

- On July 23, NASA announced the selection of SpaceX's Falcon Heavy rocket to provide launch services for Europa Clipper in October 2024!
- Europa Clipper team is focused on completing our flight hardware and software developments and delivering them to Assembly, Test and Launch Operations (ATLO)
  - Fabrication, integration and test of the core structural elements is well underway (Propulsion Module, Avionics Vault, Nadir Deck, RF Module and HGA)
  - Electronics are finalizing designs and building Engineering Models and/or Flight Models
  - Instruments are in various stages of flight build, integration, and test
  - ATLO starts in early March 2022
- As part of the Science Tour Selection Process, in June-July, Project Science Group assessed 6 Mars-Earth Gravity Assist (MEGA) 2024 tours and provided feedback and recommended adjustments to Mission Design on a subset of the tours
- Preparations are underway for our System Integration Review November 15-19
  - Review will be followed by the outbrief process and Key Decision Point D (KDP-D)
- The entire project continues to make great technical progress, despite COVID-19 impacts

Project Schedule



Status Date: 6/27/21

FY13 | FY14 | FY15 | FY16 | FY17 | FY18 | FY19 | FY20 | FY21 | FY22 | FY23 | FY24 | FY25

2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025

PRE-PHASE A | PHASE A (20 mo) | PHASE B (30 mo) | PHASE C (27 mo) | PHASE D (34 mo) | E

NASA Reviews
Project Reviews
PCR MCR | KDP-A | 2/17 KDP-B | 1/17 SRR/MDR | 8/18 Project PDR | 8/19 KDP-C | 6/19 Delta Project PDR | Project CDR 12/20 | 2/22 KDP-D | SIR 11/21 | ORR 7/24 | MRR 9/24 | PSR 4/24 | 11/24 KDP-E | LRD 10/24

05 Payload
Select | IARs | REASON Delta IAR 11/17 | I-PDRs 5/18 | I-CDRs 3/19 | 10/20 | EIS | MISE | REASON | Step 1 AO RIs | Instruments

06 Spacecraft
L3 FS Req (Baseline) | L3 FS Req (BL Rev C) | FS PDR 10/17 | L3 FS Req (BL Rev D) | Fault Mgmnt PDR 5/18 | Fault Mgmt CDR 10/20 | FS CDR 12/20

Power — PDR 1/18 | CDR 10/20 | PCDA EM | PCDA FM 101

Mechanical — PDR 2/18 | Harness PDR 9/18 | CDR 12/19 | Harness CDR 2/20 | Nadir Platform | Harness | LSA | LVA

Avionics — PDR 5/18 | CDR 11/20 | Vault | ECE EM2 | ECE1 | ECE 2 | FSW | SSE | REU 2

Telecom — PDR 3/18 | CDR 3/19 | RF Module | HGA Assembly | Antenna Cluster

Thermal — PDR 2/18 | CDR 2/20 | CDR2 10/20 | Radiator | Heater Block | IPA

GNC — PDR 2/18 | CDR 7/19 | IMU | SRU | DSS | RWA

ECM — CDR 10/20 | ECM MagBoom w/Sensors | ECM EU

Prop Module — PDR 7/17 | PM Mech CDR 6/18 FREEZE | CDR 10/18 | 7/19 | PME CDR | PME #1 | PME #2 | Propulsion Module

Solar Array — PME PDR | SA Req Rvw | SA PDR | SA IDR | Delta SA PDR/IWR | SA CDR#1 | SA CDR#2 | Solar Arrays

Propulsion SS — 6/17 PDR | 3/18 FREEZE | 6/18 CDR | Prop S/S to APL

RadMon — 1/20 RadMon CDR | RadMon

Avionics Test Bed — AVSTB2 Ready | AVSTB1 Ready

STB #1

STB #2

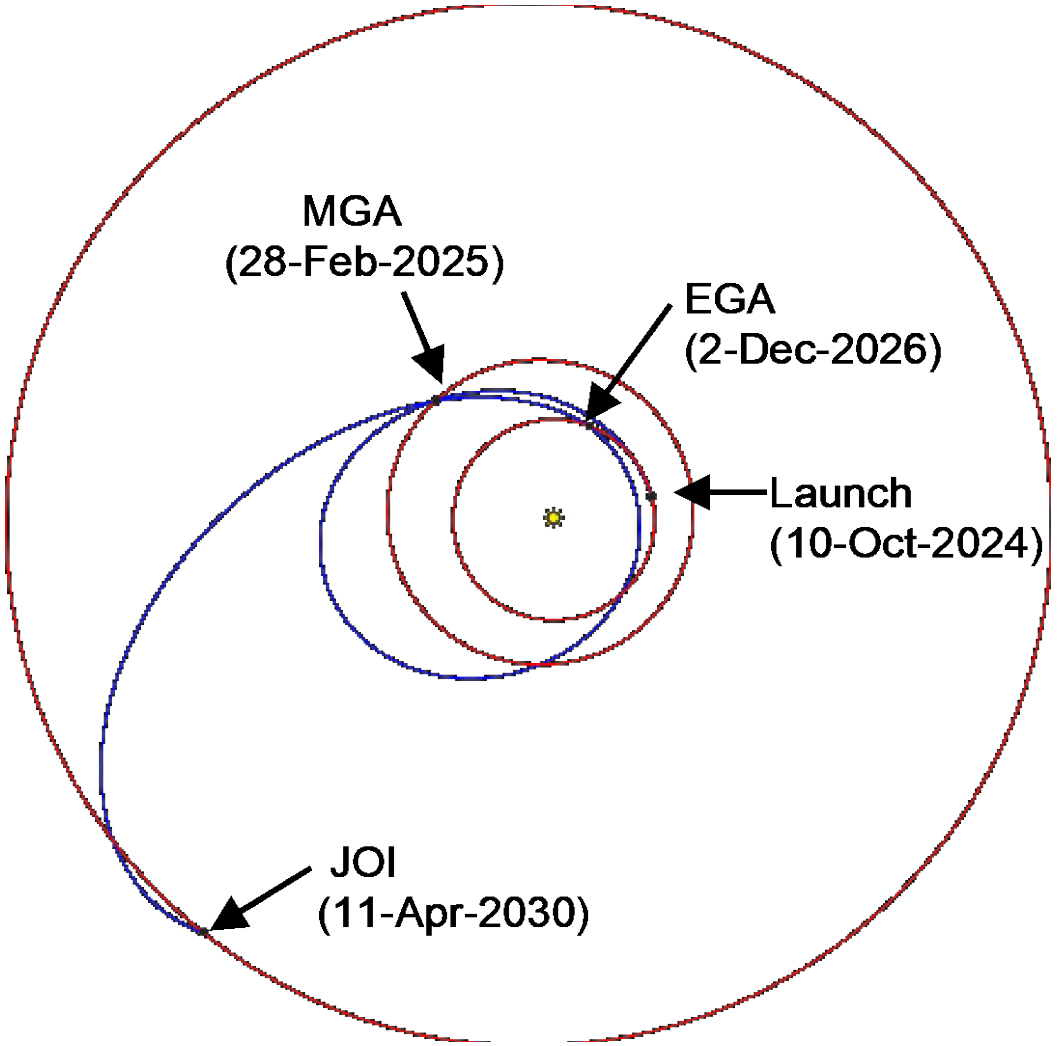
FS I&T | Ship KSC

Launch Campaign

07/09/12 Mission System
07 MOS/ 09 GDS/ 12 MS — MS PDR 6/18 | MS CDR 9/20

Launch Vehicle Integration Summary

- The requirements and RFP that led to the July 23, 2021 Launch Vehicle award announcement were constructed for the NASA Launch Services Program (LSP) to procure a Commercial Launch Vehicle (CLV) to meet Clipper's as-designed/as-built requirements
- At the time of the LV Request for Proposal (RFP), the nominal timeline we were planning for Mission Integration activities with the selected Launch Vehicle was 30 months
  - NASA Launch Services Program was outstanding in their management of the procurement and, as a result, we have a 38-month Mission Integration timeline (providing margin and earlier mitigation of any risks that we may encounter along the way)
- Technical Interchange meetings with KSC LSP and SpaceX began August 20th
- Full Kickoff meeting is September 16th at SpaceX, Hawthorne, CA
- Europa Clipper will lift off from the historic Pad-39A at KSC during the launch period from October 10-30, 2024!



MEGA24 Opening Day in Launch Period: 10 Oct 2024

Phase E/F Costing Process

- In preparation for System Integration Review (SIR) in November, the Europa Clipper project is honing its costs for Phases E (Operations) and F (Closeout)
- Realistic Phase E/F costs must reflect the current mission scope and schedule, which have evolved since earlier mission phases
- The Europa Clipper Project Office convened a review on Aug. 10 – 11 to obtain external feedback on the in-progress Phase E/F planning and is incorporating the board's feedback
- Challenges for science team cost planning include:
  - 10 science investigation teams
  - Shift of launch date from 2022 to 2024
  - Long cruise time (2 years quiet cruise now planned)
  - Significant cost inflation to 2034
- A range of mission operations, ground data systems, management, and science scope options are being considered and evaluated

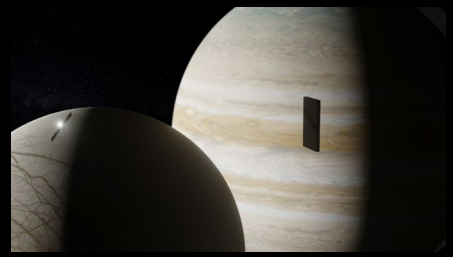
Remote Project Science Group Meeting #10
21–25 June 2021

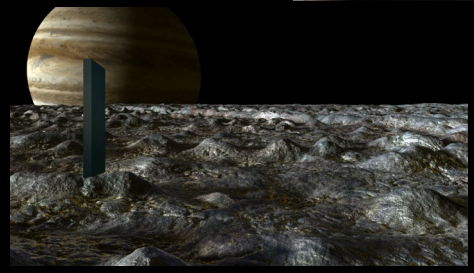
Agenda Topics:

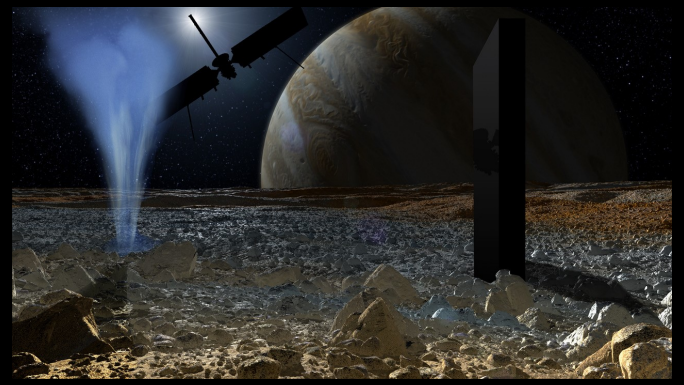
- Town Hall status updates by Project Science, Project Management, HQ, Payload, and Flight System
- Roundtable discussions: Investigations and Technical Topics
- Phase E costing status
- Evaluation of tour candidates for System Integration Review
- Reconciliation and change in the post-COVID era
- Thematic Working Group and Focus Group breakout discussions, followed by reports out
- Social Events (coffee chats, meet-up hosted by postdocs)

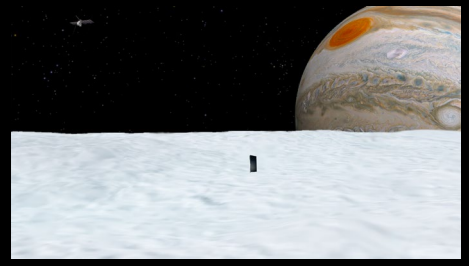
Meeting format:

- 5 days, 5 hours/day, maximizing participation across time zones
- Live discussions, utilizing Mentimeter for questions
- Lessons learned from PSG #9: more breaks, fewer tools, no pre-recorded presentations





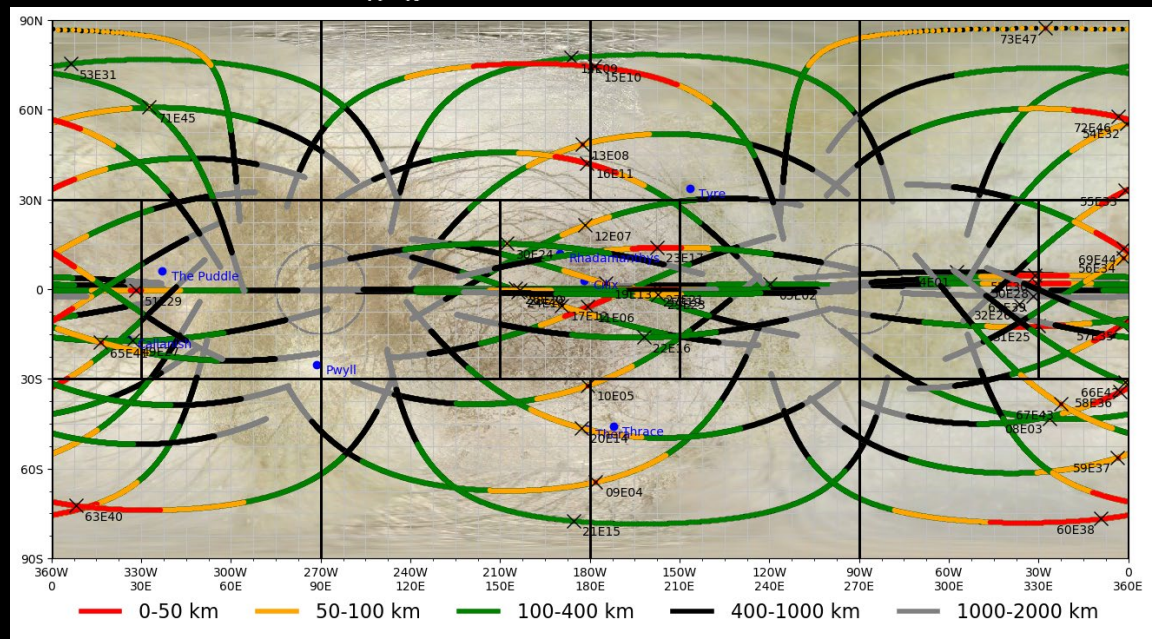




SIR Tour Evaluation in Progress

- MEGA trajectory provides for arrival at Jovian system (Jupiter Orbit Insertion) in 2030
- Six candidate tours have been analyzed by the Project Science Group (PSG)
- Leading candidate tour options include both 4:1 and 6:1 Europa:Clipper orbit resonances
- Number of Europa flybys is about 50 with slight variations among tours
- Minor tweaks recommended by the PSG to improve science return are presently being considered for implementation by the Mission Design team
- PSG will evaluate updated tours in September
- Tour selection in early October prior to System Integration Review (SIR) in November

~50 Europa Flybys
~5 Ganymede Flybys
~10 Callisto Flybys

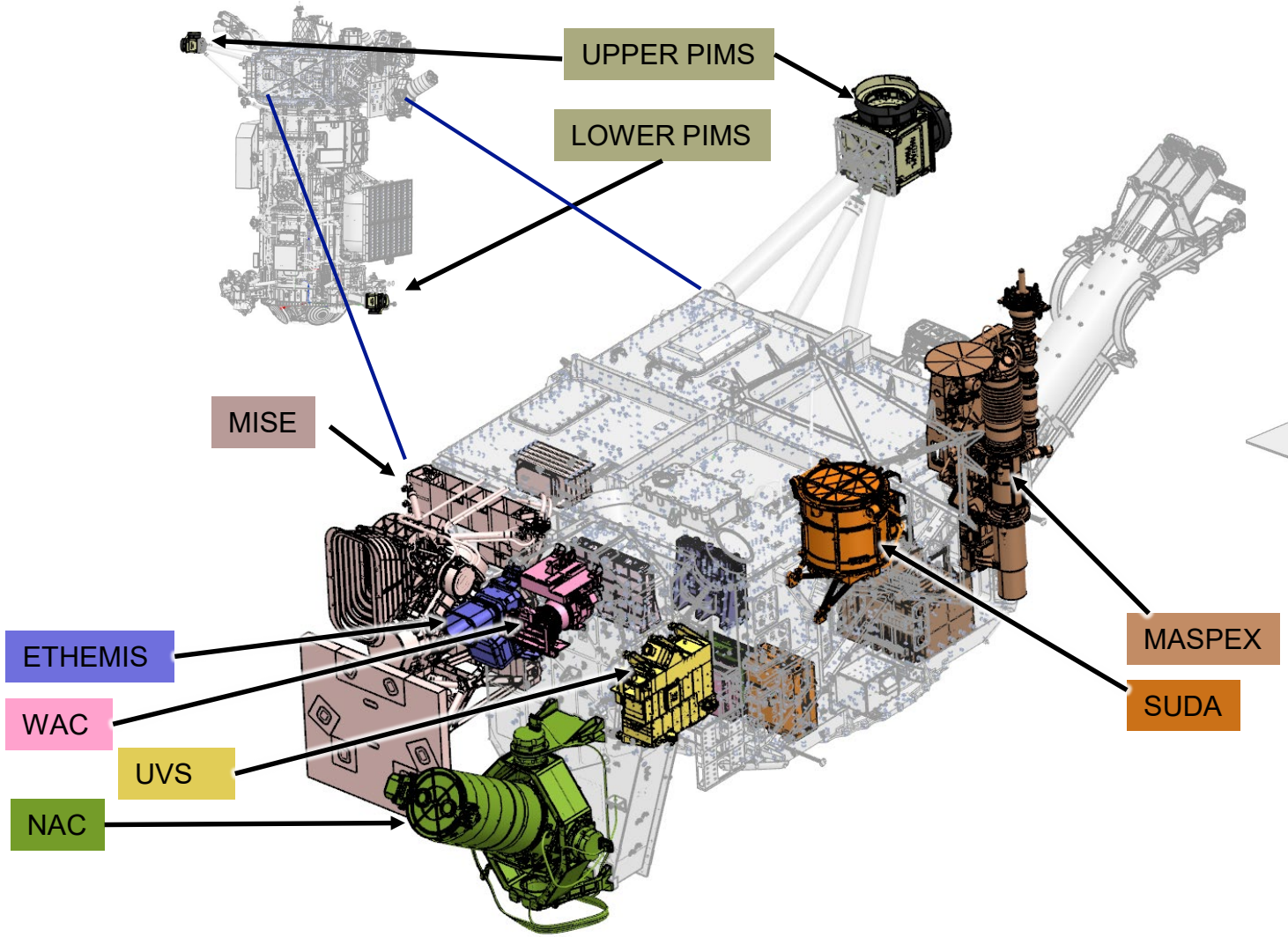


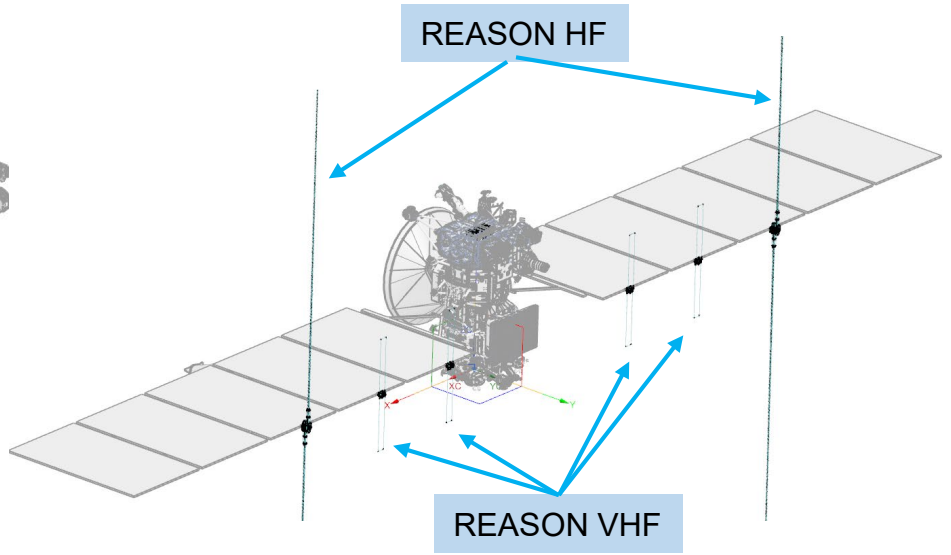
Space Science Reviews Topical Collection

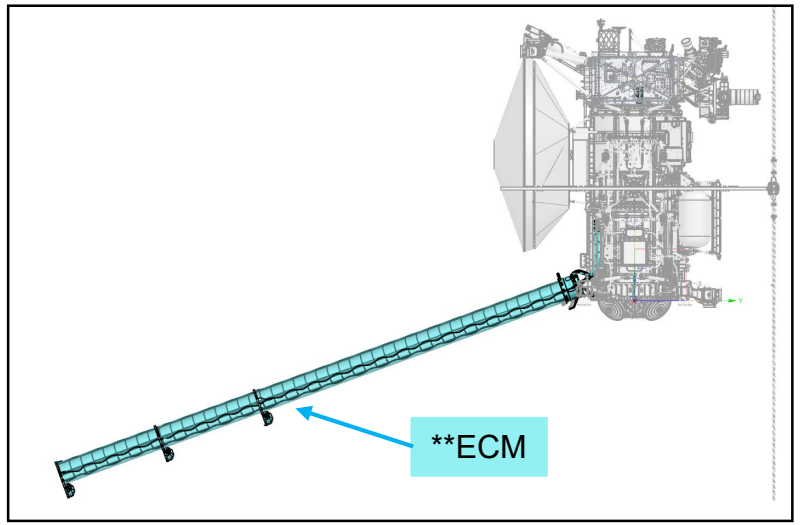
- The Europa Clipper project will publish a Space Science Reviews Topical Collection entitled “Europa Clipper: A Mission to Explore Ocean World Habitability” (Guest Editors: David Senske and Haje Korth)
- Papers will cover mission science overview, flight system, mission system, instruments, other investigations, and Thematic Working Group science
- All Thematic Working Groups have provided first drafts of manuscripts and received feedback from guest editors
- Some milestone dates have been adjusted to not interfere with instrument delivery dates
- Topical Issue scheduled for completion in Q1 of 2022

Table of Content

Payload Accommodation







** ECM Managed under the Flight System

Payload Highlights

Europa Clipper Magnetometer (ECM)

TL: Margaret Kivelson, University of Michigan

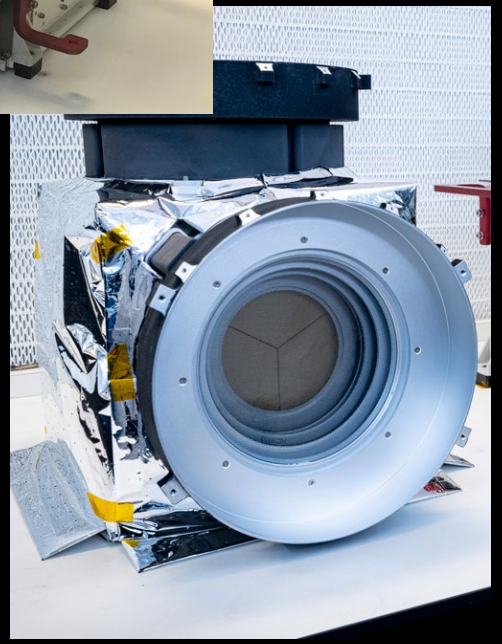
FM fluxgate bare sensors (above)

fully assembled pathfinder sensor (left)

Plasma Instrument for Magnetic Sounding (PIMS)

PI: Joseph Westlake, Johns Hopkins APL

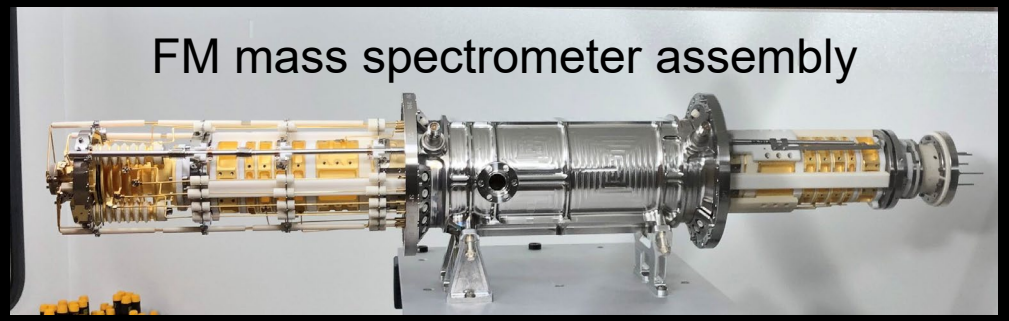
FM PIMS sensors (above)



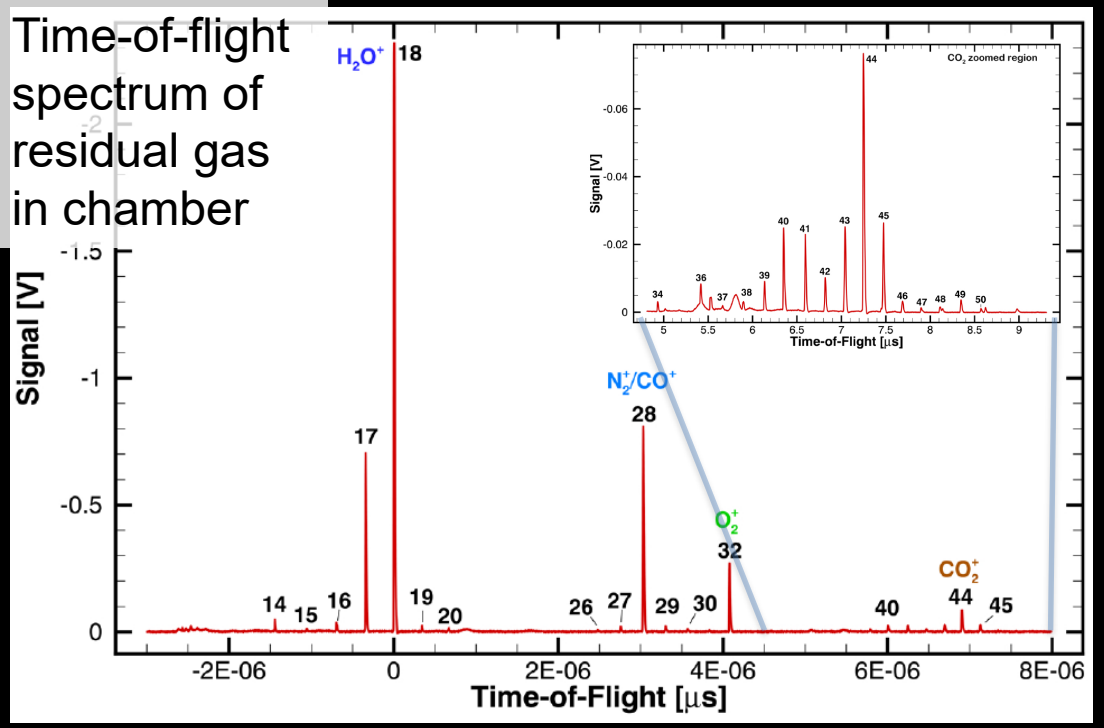
Blanketed sensor with Cover removed (right)

Payload Highlights

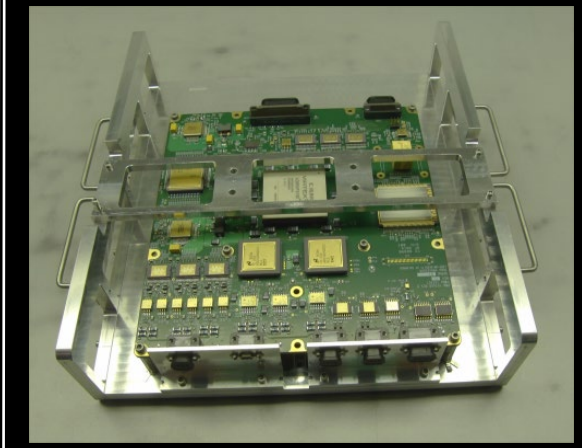
MAss Spectrometer for Planetary EXploration (MASPEX), PI: James Burch, Southwest Res. Inst.



Time-of-flight spectrum of residual gas in chamber

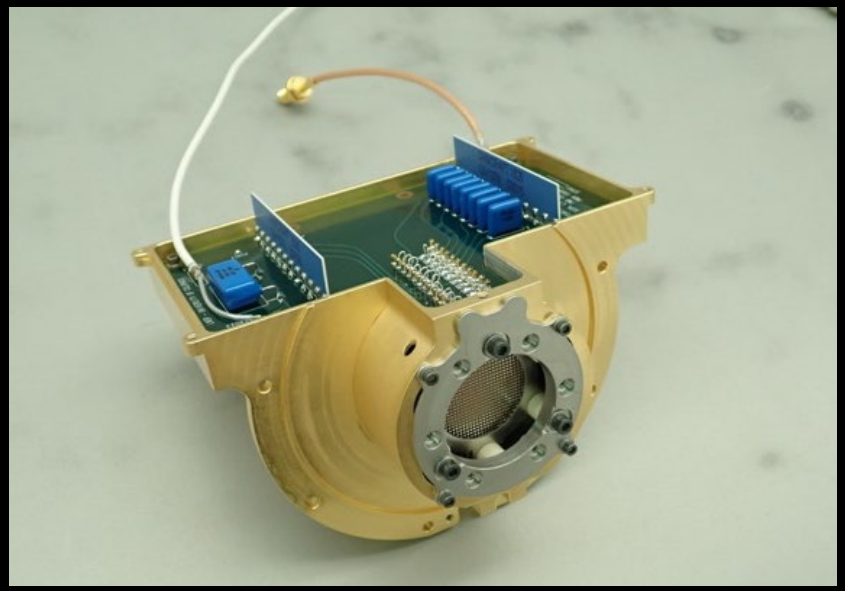


SUrface Dust Analyzer (SUDA)
PI: Sascha Kempf, University of Colorado



FM Processor (left)

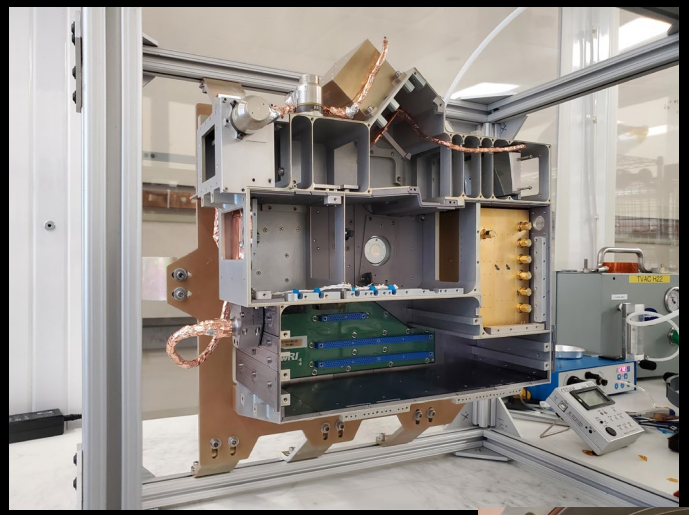
FM detector stack with boards (below)



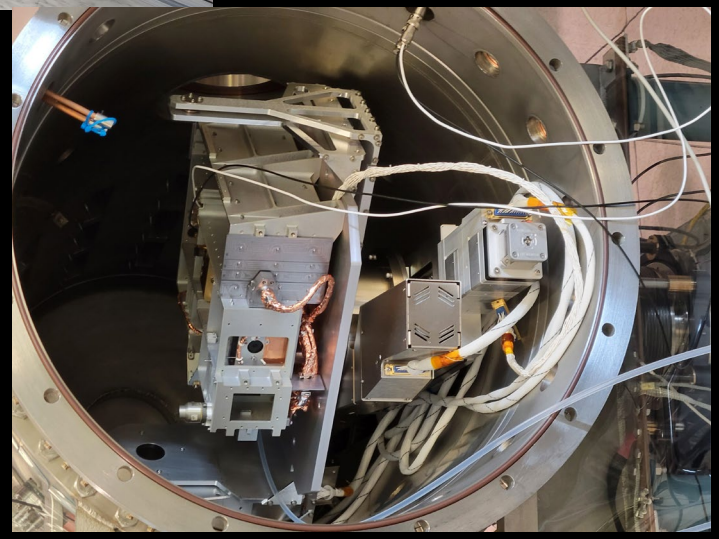
Payload Highlights

Europa Ultraviolet Spectrograph (Europa-UVS)

PI: Kurt Retherford, Southwest Research Institute



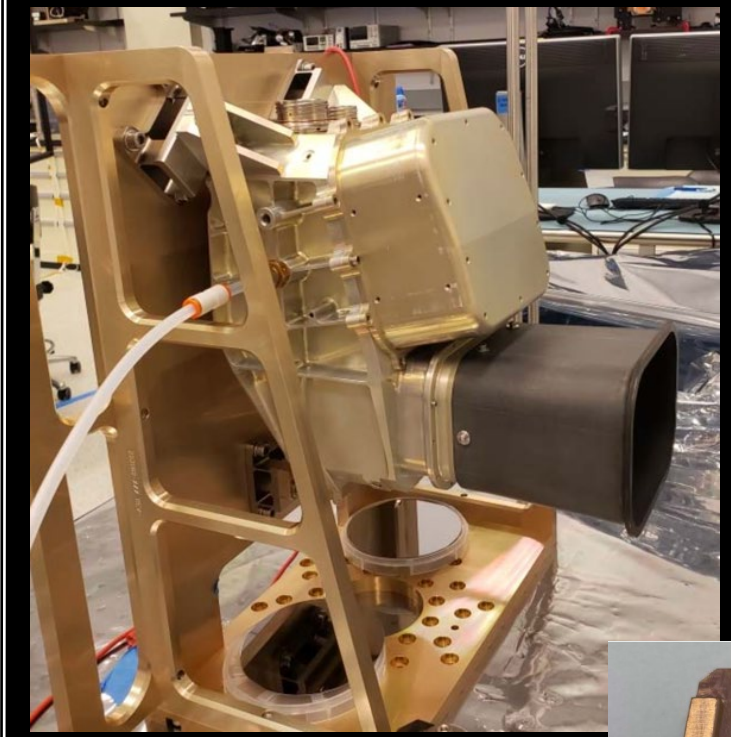
FM instrument housing, partially populated (left)



FM instrument in vacuum chamber (right)

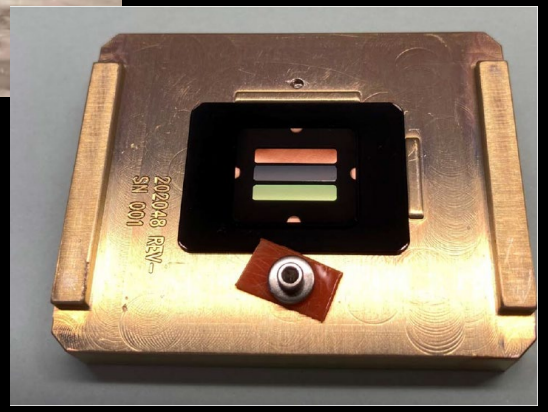
Europa Thermal Imaging System (E-THEMIS)

PI: Phil Christensen, Arizona State University



FM instrument (left)

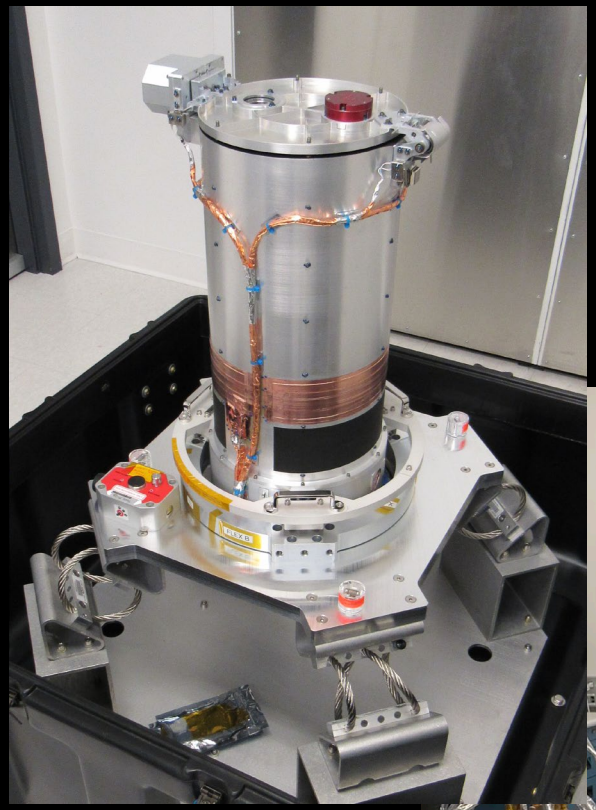
FM filter assembly (right)



Payload Highlights

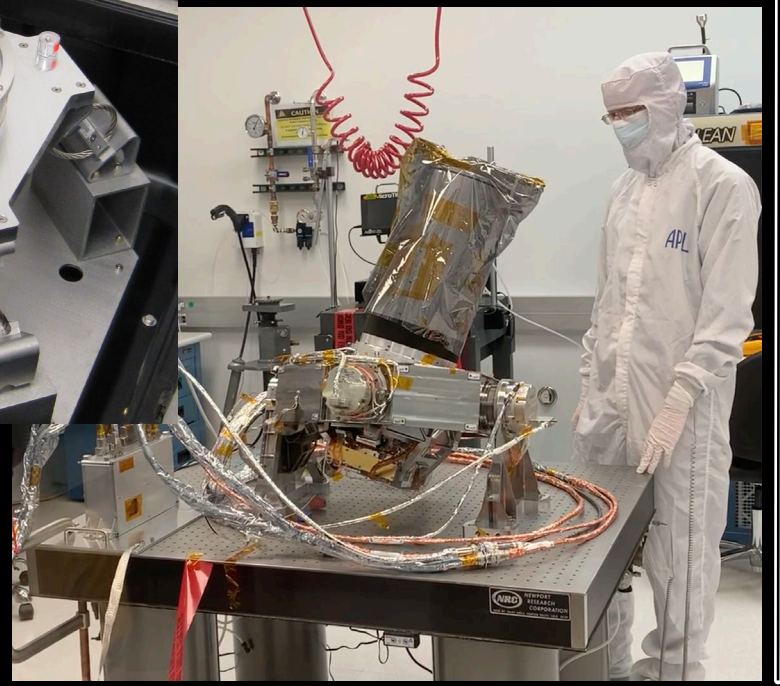
Europa Imaging System (EIS)

PI: Zibi Turtle, Johns Hopkins APL



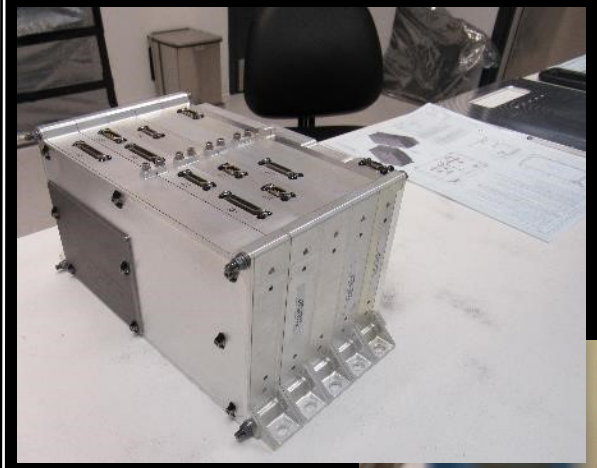
NAC FM optical telescope assembly (left)

NAC EM end-to-end test (below)



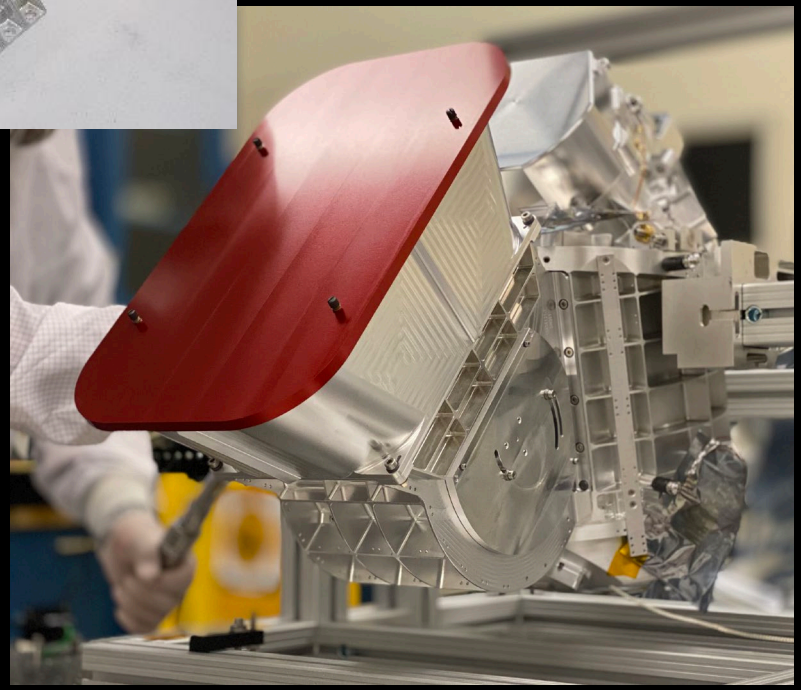
Mapping Imaging Spectrometer for Europa (MISE)

PI: Diana Blaney, Jet Propulsion Laboratory



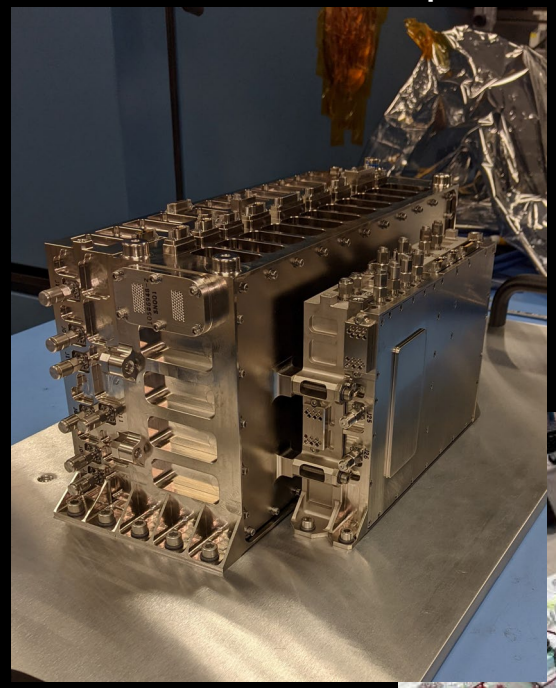
FM data processing unit (left)

FM optical bench (below)



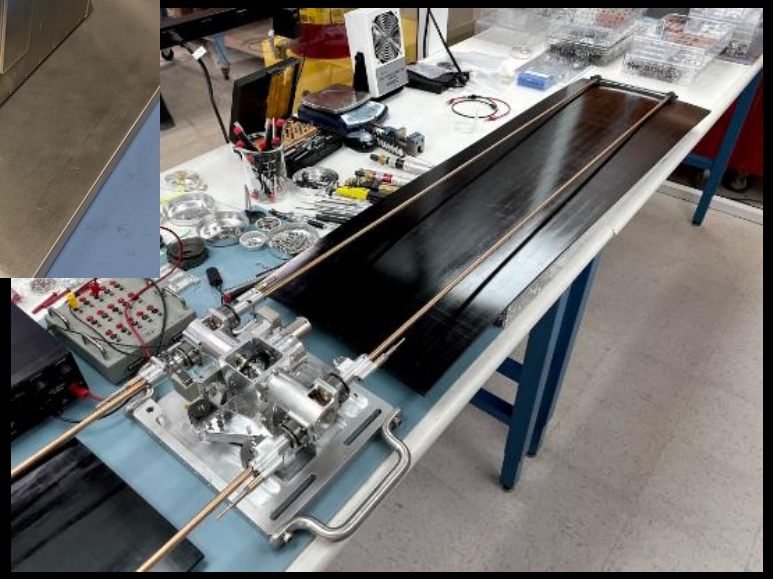
Payload Highlights

Radar for Europa Assessment and Sounding: Ocean to Near-surface (REASON)
PI: Don Blankenship, Univ. of Texas

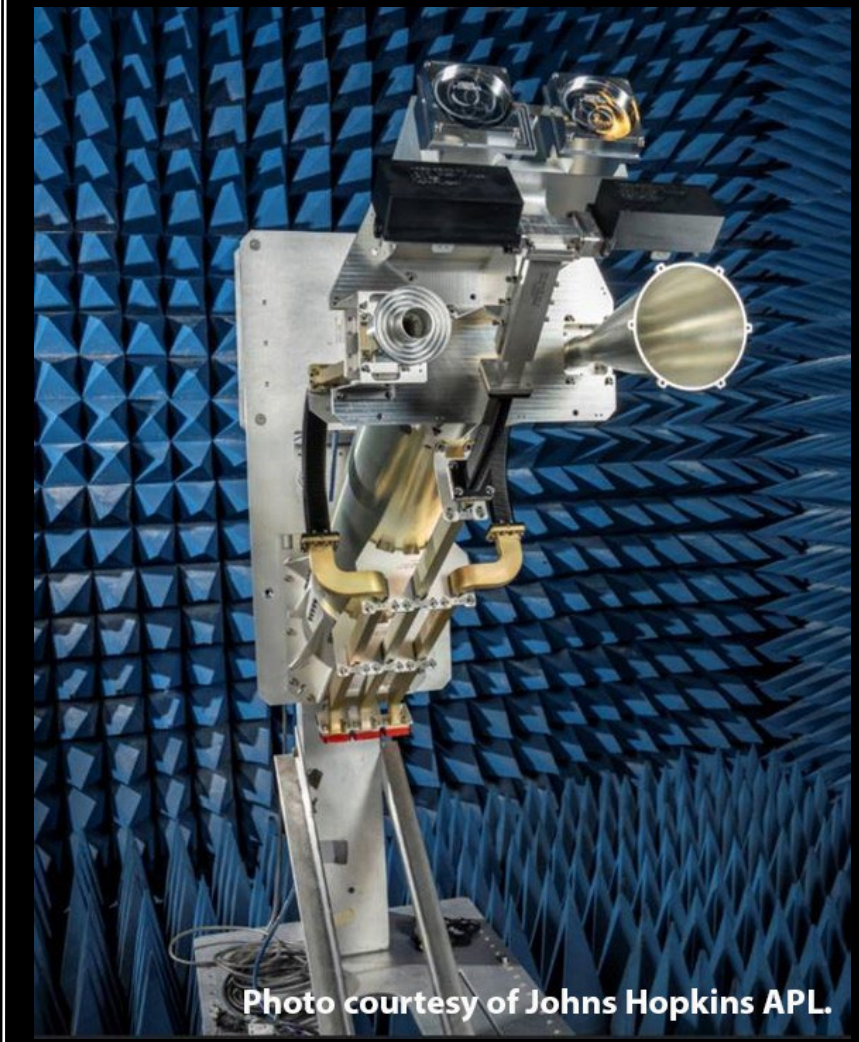


FM HF electronics (left)

Deployed EM VHF antenna (below)



Gravity and Radio Science (G/RS)
TL: Erwan Mazarico, GSFC



FM low gain and fan-beam antennas

Spacecraft Highlights

Spacecraft Highlights

EUROPA

CLIPPER