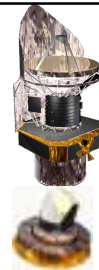


The Promise of FIRST

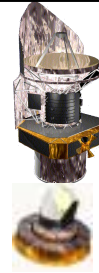
The FIRST Mission Implementation Status and Schedule

T. Passvogel



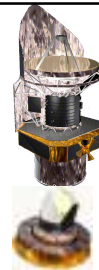
Overview

- **FIRST/Planck Programme**
- **Mission Description - Orbit**
- **Launch Configuration**
- **Planck Spacecraft**
- **FIRST Spacecraft**
- **Implementation Status**



FIRST/Planck Programme

- **Two Missions**
 - FIRST the fourth Cornerstone Mission of the Horizon 2000 longterm programme of ESA
 - Planck, the third Medium Mission of Horizon 2000
- **Two Spacecraft**
 - Three axis stabilised pointing Observatory
 - Low spin sky scanning survey mission
- **Two Cryogenic Payloads**
 - He II cryostat with temperatures down to 1.7 K, coolers down to 0.3 K
 - Passive cooling to 60 K and coolers down to 0.1 K
- **One Launcher**
 - ARIANE V with single launch for both Spacecraft
- **One Programme**
 - One ESA project team, One prime Contractor, Commonality enforced



FIRST/Planck Project Organisation

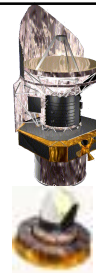
FIRST/Planck as International Co-operation

- **ESA**
 - Responsibility for the Mission
- **Partners**
 - Principal Investigator Groups
 - Science teams for both missions
 - Spacecraft Contractor
 - Launcher Authority (ARIANESPACE)
 - Spacecraft and Science Operation Teams
- **Co-Operations**
 - FIRST Telescope (NASA/JPL - US)
 - Planck Telescope Reflectors (DK - Planck)

Launch Configuration - The Carrier

Characteristics at launch

- Total Height: 11 m
- Launch mass: 5300 kg
- Separation interfaces at Launcher and upper Planck SVM interface
- Separation of FIRST from Planck upon AR5 command
- Separation of Planck from AR5 in a standard way



12 December 2000

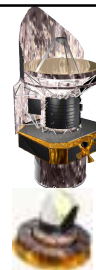
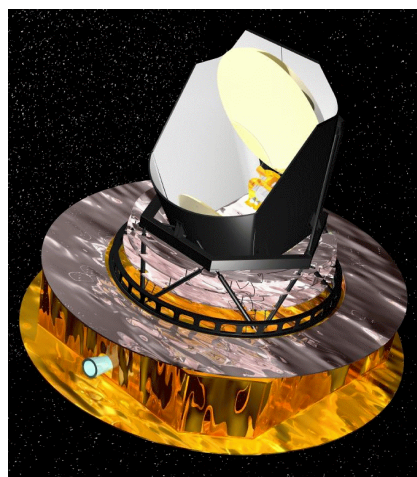
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Planck Spacecraft

Characteristics

- Survey mission
- Submillimeter to millimeter (30 GHz - 900 GHz)
- Orbit around L₂
- Autonomous operation (21h - 3h)
- Low spin (1 revolution/minute)
- Operational lifetime at L₂ - two sky surveys
- Passive cooling to below 60 K
- Mass: 1450 kg
- Power: 1200 W
- Height: 4.5 m



12 December 2000

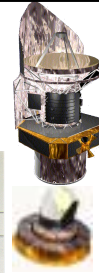
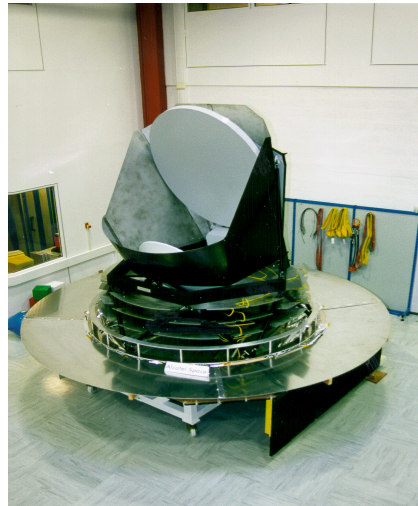
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Planck Payload Module

Characteristics

- Passively cooled to below 60 K
- Aplanatic Telescope (1.5m optical aperture)
- Thermal fluctuations minimised
- Main components
 - SVM shield
 - V-groove shield
 - Structures - shield support
 - Telescope Baffle (radiator)
- Cooler for instruments
 - 20 K H₂ Sorption Cooler
 - 4 K JT mechanical cooler
 - 0.1 K Dilution Cooler



12 December 2000

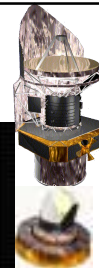
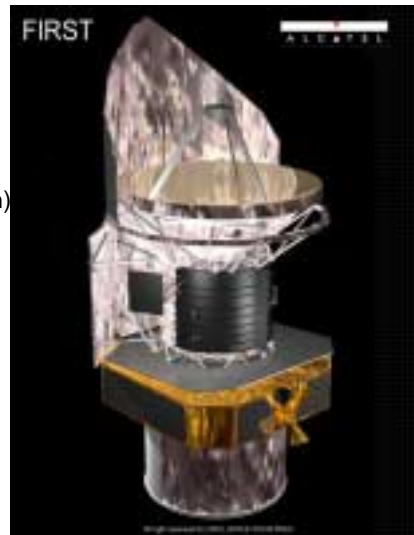
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FIRST Spacecraft

Characteristics

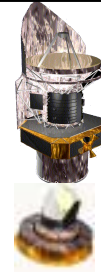
- Multi user observatory mission
- Far infrared/submillimeter (60 - 670 μm)
- Orbit around L₂ (1.5 million km from Earth)
- Autonomous operation (21h - 3h)
- 3.5 m Diameter Telescope
- Operational lifetime at L₂ > 3 years
- Helium cryostat
- High accuracy pointing
- Mass: 3300 kg
- Power: 1750 W
- Height: 9.3 m



12 December 2000

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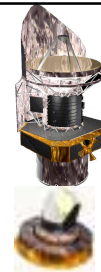


FIRST Telescope

- FIRST Telescope characteristics:

Size:	3.5 m diameter
Performance (WFE):	10 μm rms, 6 μm rms as a goal
Temperature:	70 K - 90 K operational
Total mass:	< 280 kg

- Telescope mounted on top of the cryostat, launched warm, cooling in orbit
- Protected from the sun by a sunshield to achieve adequate thermal environment
- **Baseline: Telescope contribution to ESA from NASA**



FIRST Development

- **Maximise** advantages of **commonalities** between FIRST and Planck
- **Separate** spacecraft - **same** timeframe - **common** development
- **Major Elements** of spacecraft development
 - **FIRST Cryostat** derived from ISO - use experience, reduce risks
 - Instrument **Qualification Models** tested for performance in '**system**' environment
 - Critical items of the **SVM qualified prior** to build of **Flight Model**
 - **FIRST Telescope** is a **critical** development with **dedicated pre-development**



Implementation Status

Scientific Instruments

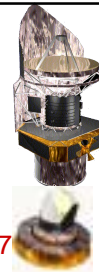
Design Phase started after selection in May 1998

All FIRST and Planck Instruments approach Hardware Phase now

Need dates to achieve launch on 15th February 2007:

Qualification Models - April 2003 to ESA

Flight Models - July 2004 to ESA



Implementation Status

Spacecraft Development

Launch.....15th February 2007

Launch Campaign

- Shipment to Kourou
- Carrier System Testing
- Carrier integration
- Spacecraft Testing
- Spacecraft Integration
- Module Testing
- Module Integration

Instrument Flight Model delivery --- July 2004

Qualification.....early 2004

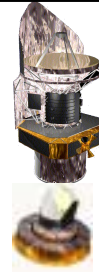
- Qualification Module Testing
- Qualification Module Integration

Instrument Qualification Model delivery --- April 2003

Manufacturing complete.....early 2003

Design complete.....mid 2002

→ Start Design.....June 2001



Implementation Status

Invitation to Tender for Spacecraft Development - 1st September 2000

Proposals from Industry due - 4th December 2000

Evaluation of Proposals and Selection of Prime Contractor

Start Development - 1st June 2001

Launch 15.02.2007