

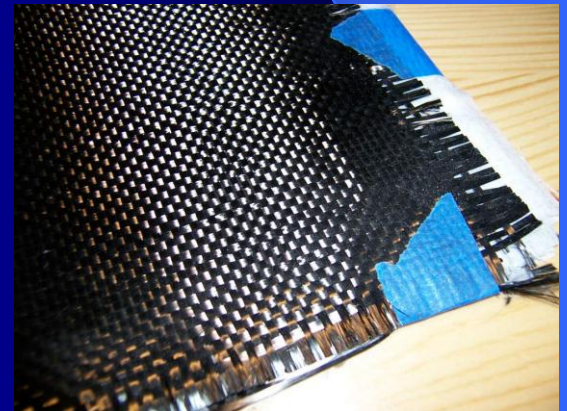
CFRP-COMPONENTS IN ASTRONOMICAL INSTRUMENTS

Ralf-Rainer Rohloff
Konstruktion

ASTRO TECH TALK

Introduction

- Carbonfaserverstärkter Kunststoff (CFK)
- Carbon-Fiber-Reinforced Plastic (CFRP)
- Carbon oder Karbon
- Composite material (fiber and epoxy)
- Wet process (Nasslaminierverfahren)
- Prepregs (Press- oder Autoklavverfahren)
- Winding process (pipes)
- High fiber volume content needed
- Pioneers: Aerospace, space, sports (Formula One)

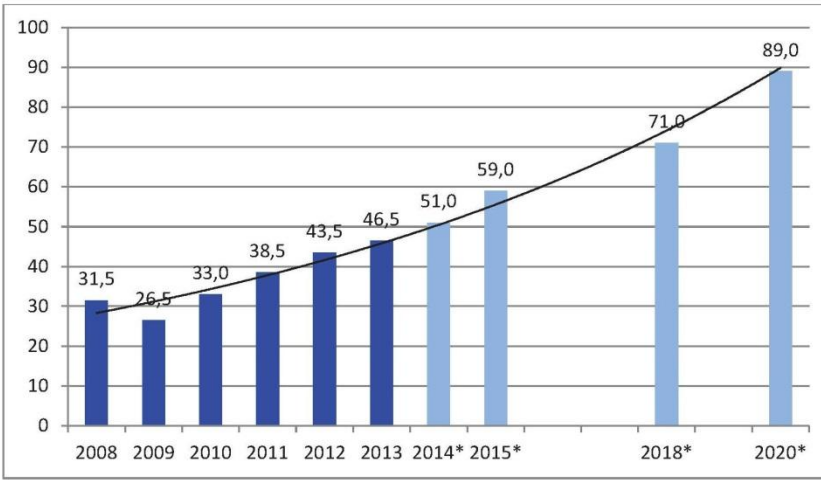


Introduction



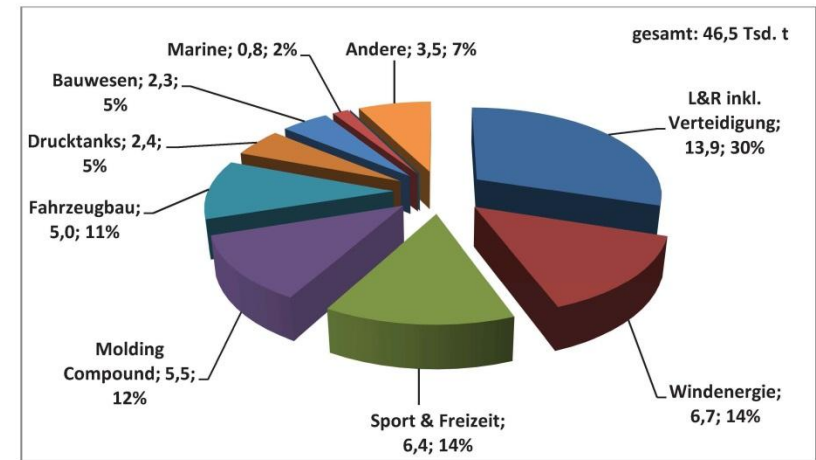
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Introduction



Global demand for carbon fibers
(thousand metric tons)

* Composites Marktbericht 2014



Global demand (application)

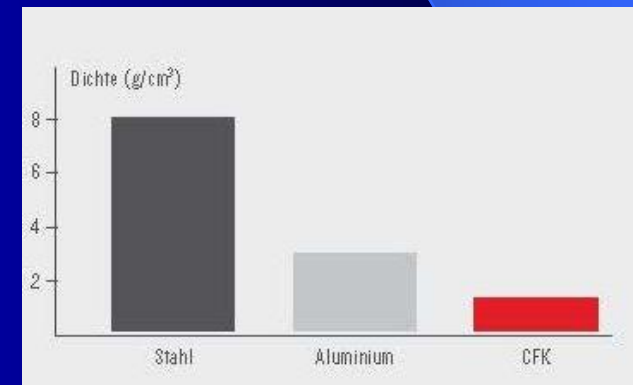
Introduction



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Introduction - Properties

- High specific stiffness (E-modulus / density) →
- High modulus of elasticity
- Low thermal expansion
- Good damping
- X-Ray transparent



Introduction - Properties

50 % CFRP !



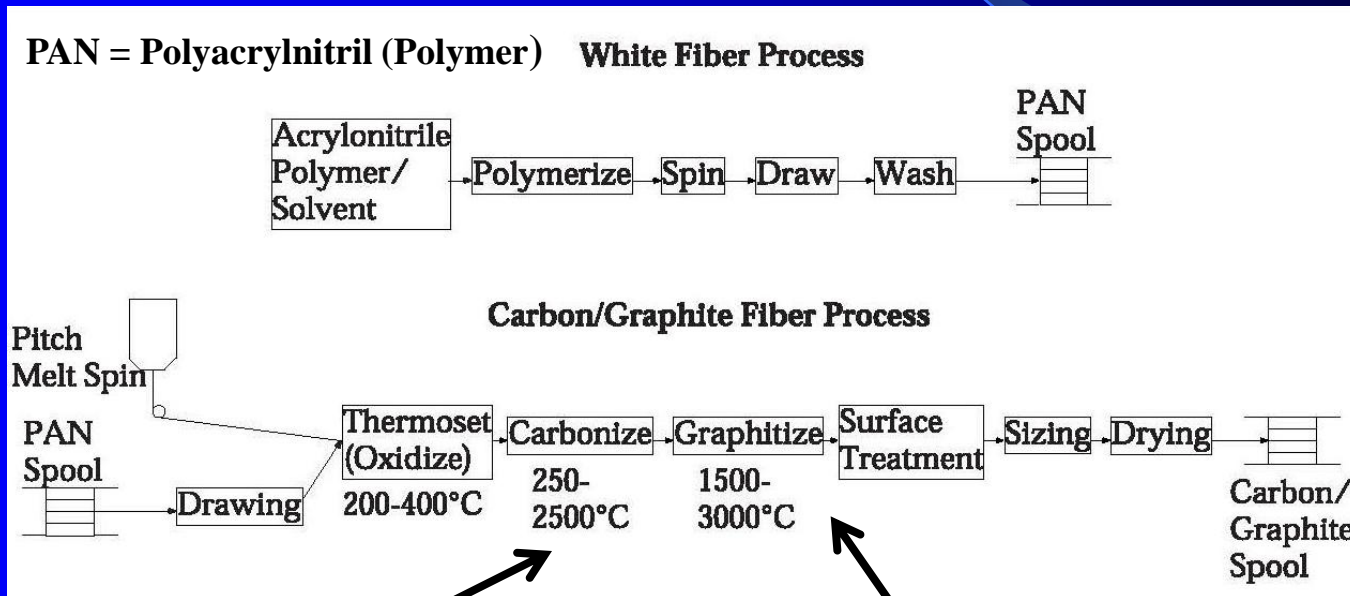
Problems:

- Experience (manufacturing and service)
- Interfaces between different materials
- Impact resistance
- Health monitoring



Introduction - Fiber Process

MIL-HDBK-17-3F:

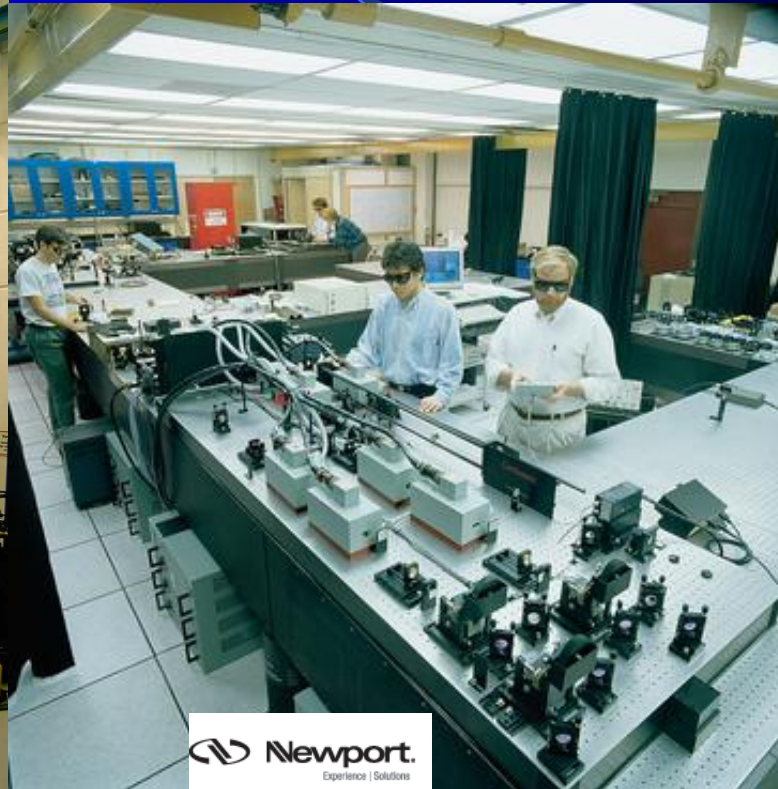
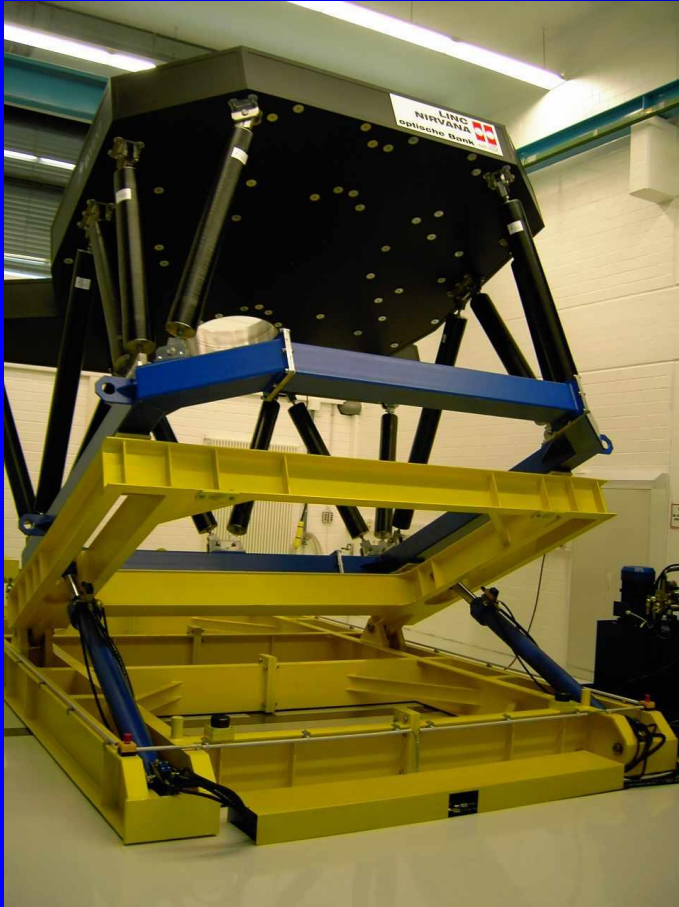


Pyrolyse

(Carbonisierung = Abspaltung
aller Elemente bis auf Hauptanteil
Kohlenstoff)

Verstreckung (Anlegen
einer Zugspannung
→ Höhere Festigkeit)

MPIA – LN



LN Optical Bench (CFRP) $m = 1250 \text{ kg}$

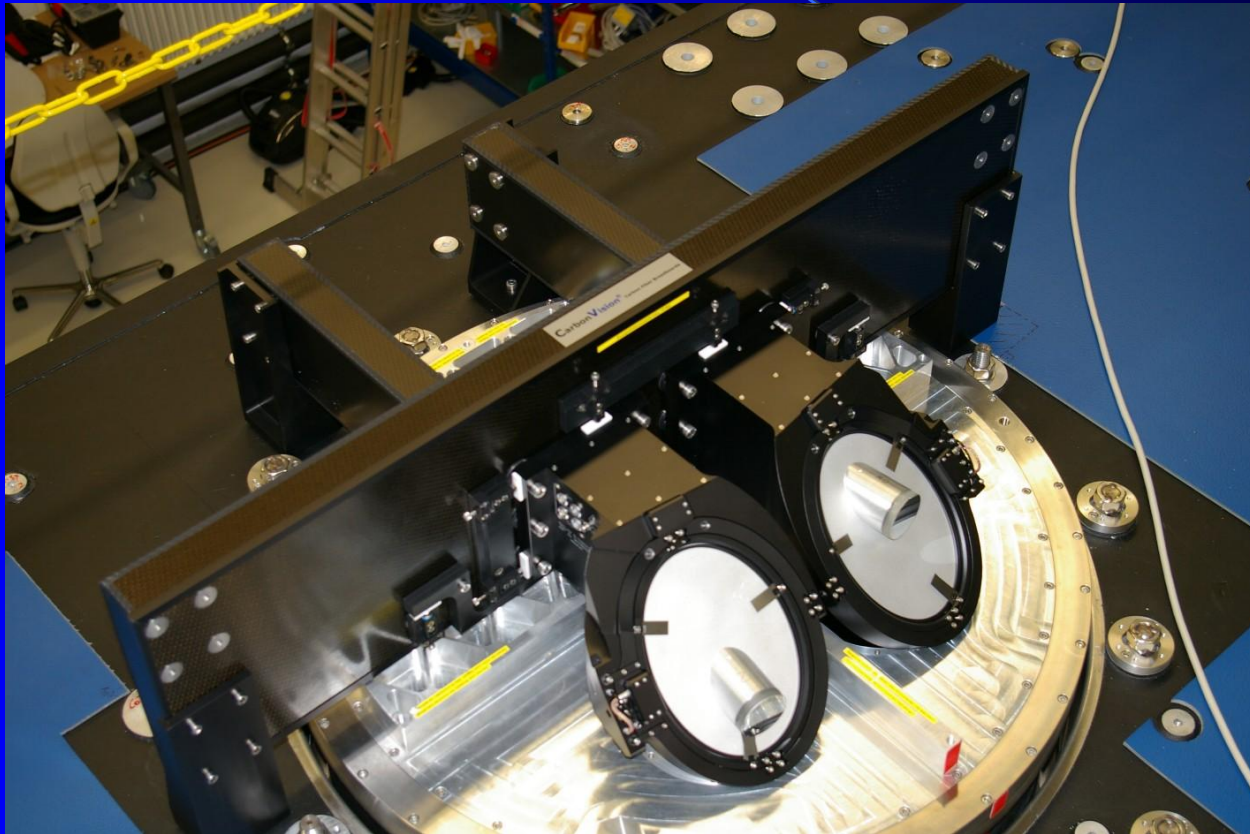
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MPIA - LN



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MPIA - LN



LN Dichroic Mount

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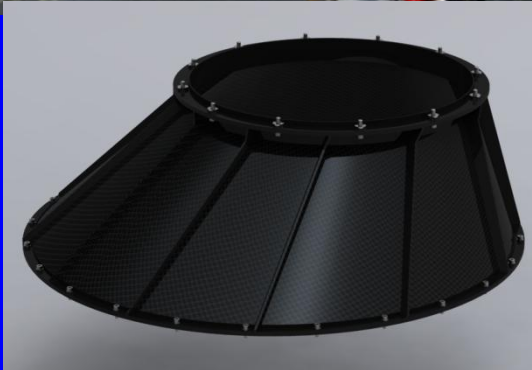
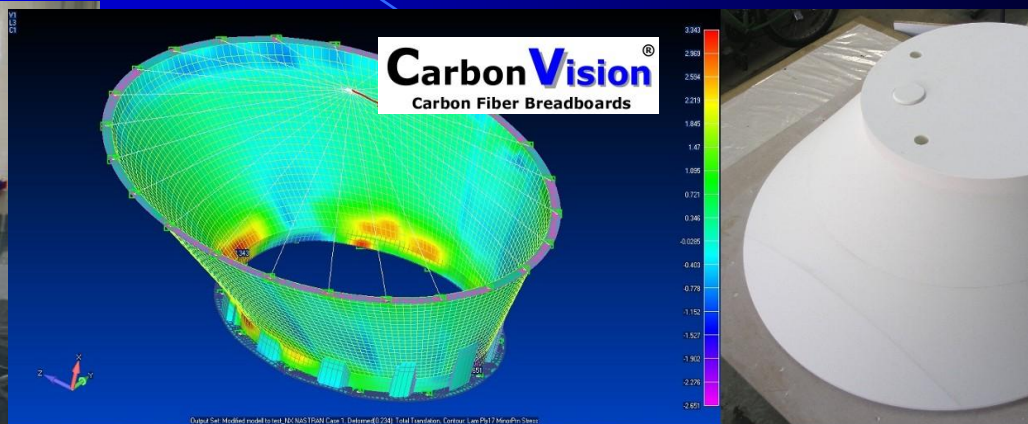
MPIA - LN

Sensor Mount



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MPIA - PANIC

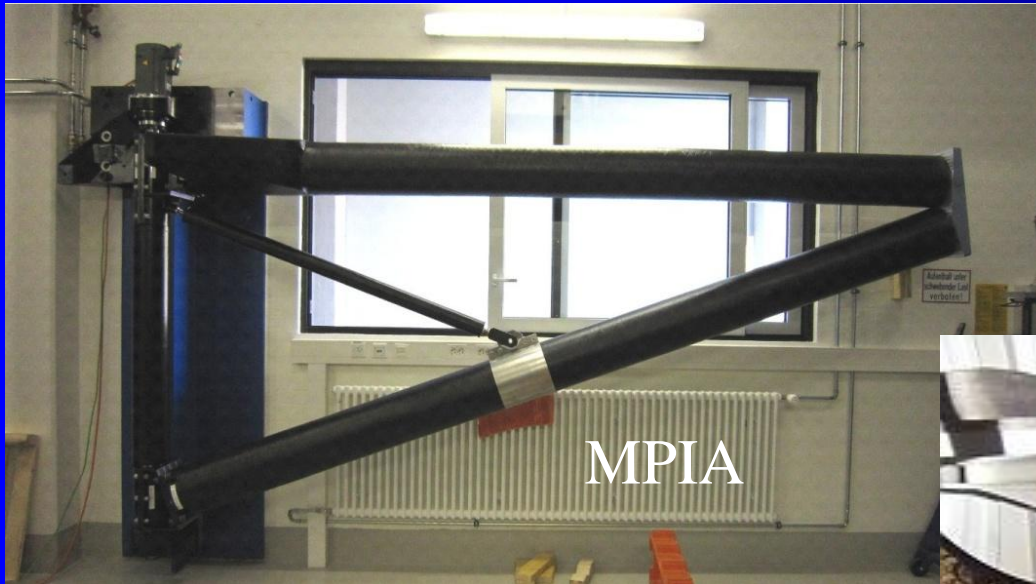


Weight limit
2,2 m Telescope

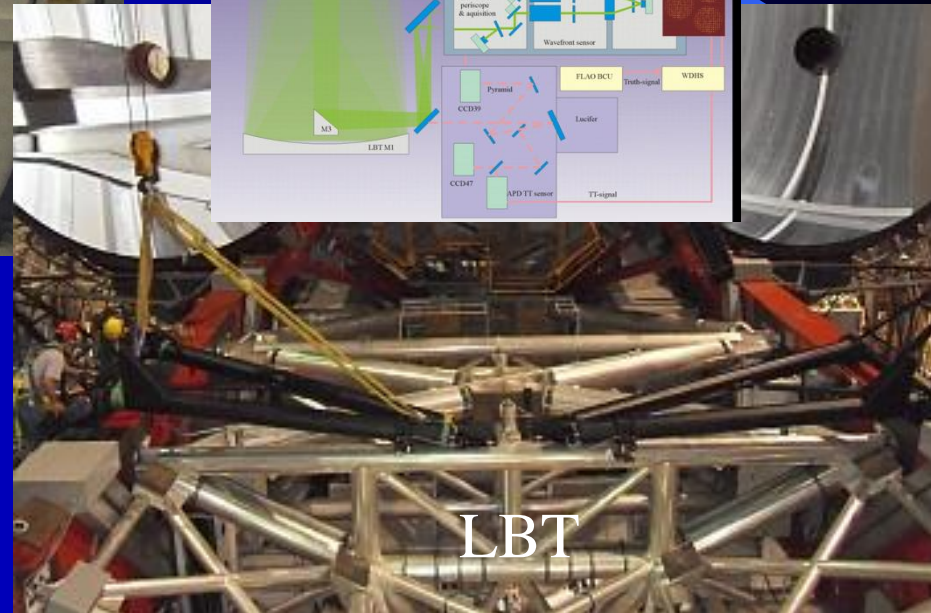
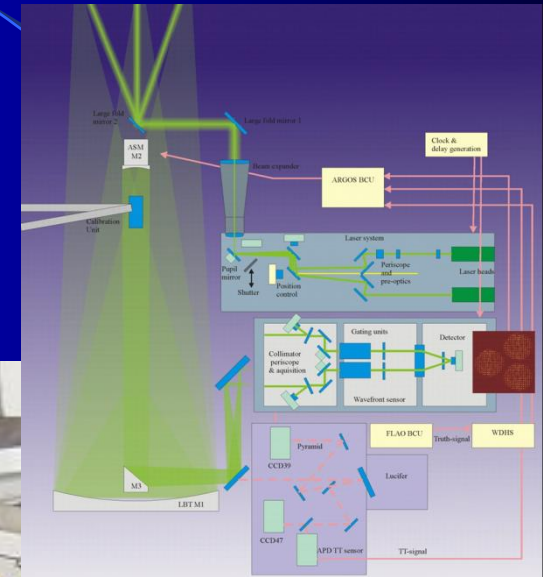
Telescope Adapter

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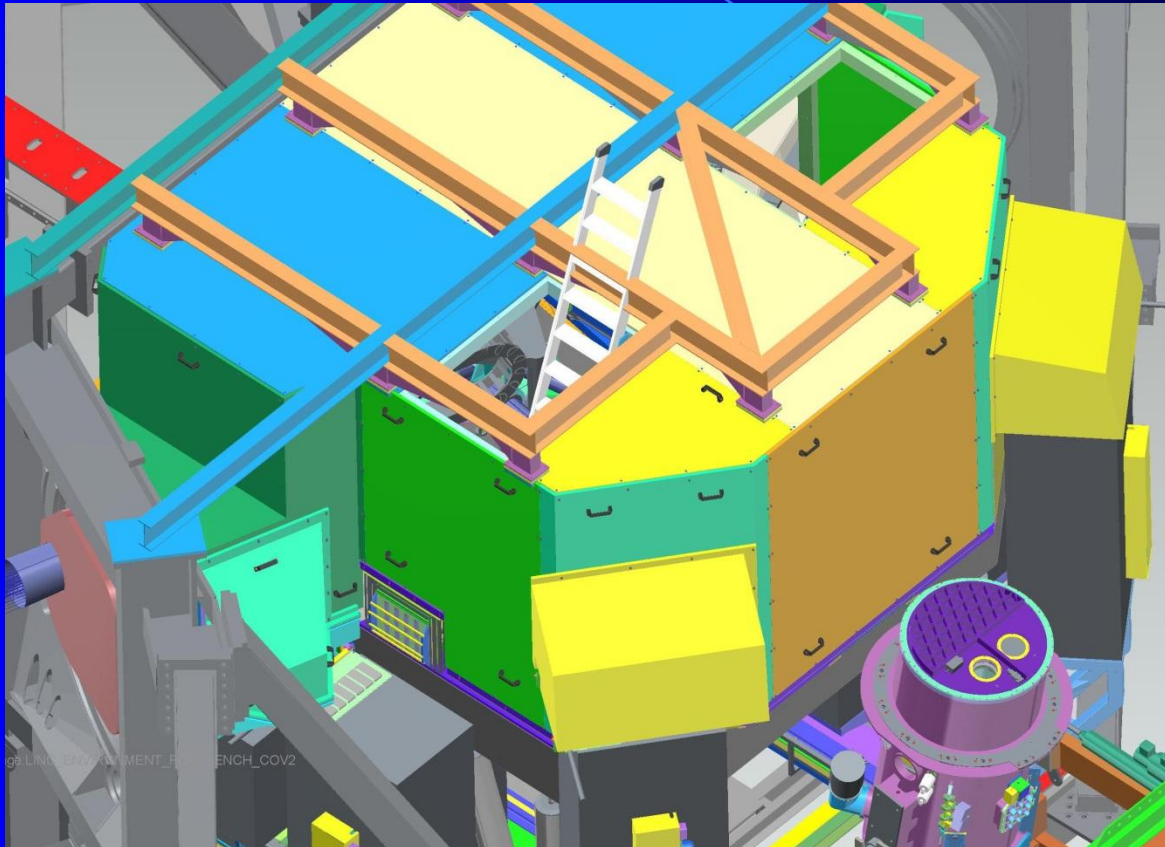
MPIA - ARGOS



Calibration Unit
Swing Arm



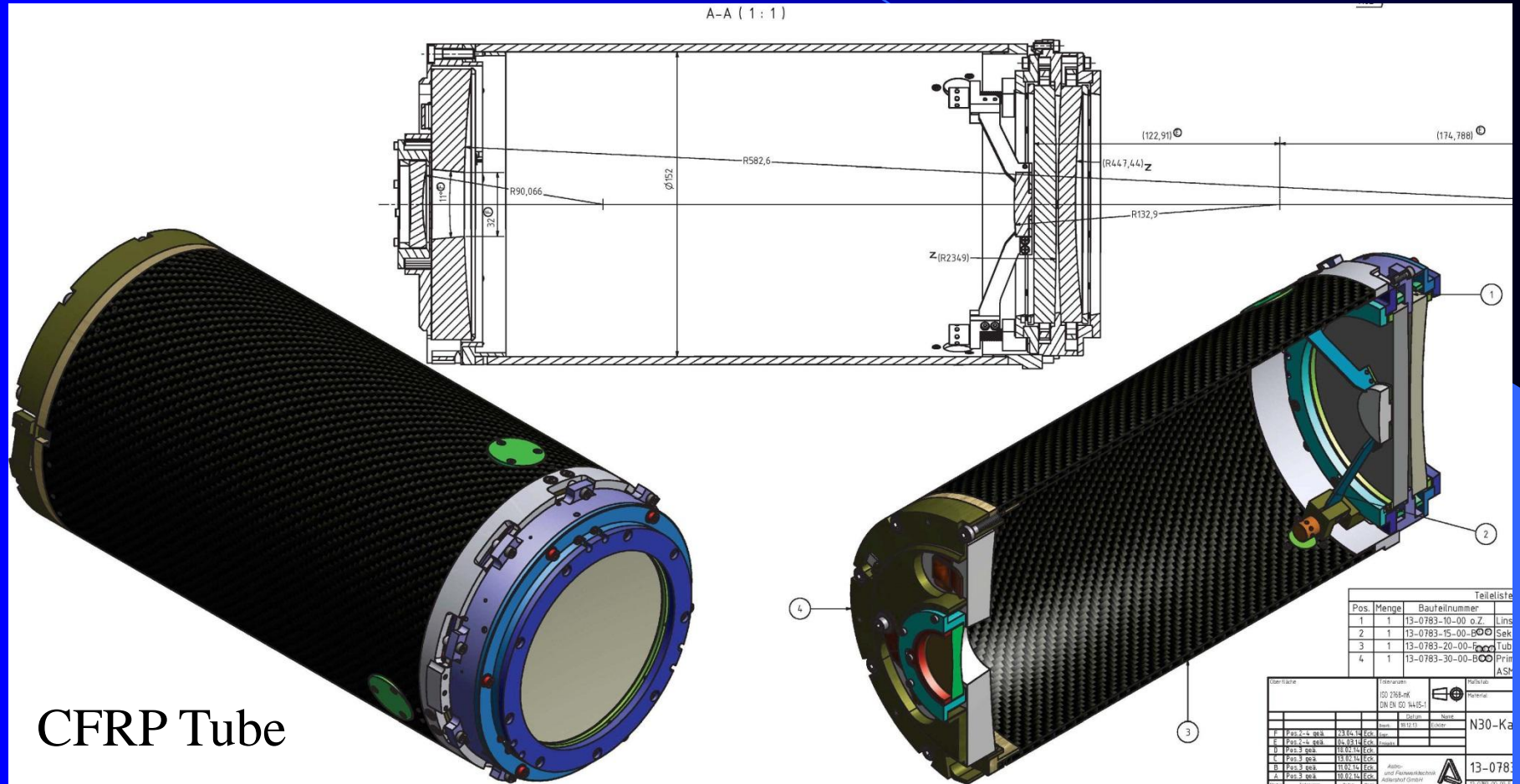
MPIA - LN



LN - Cover

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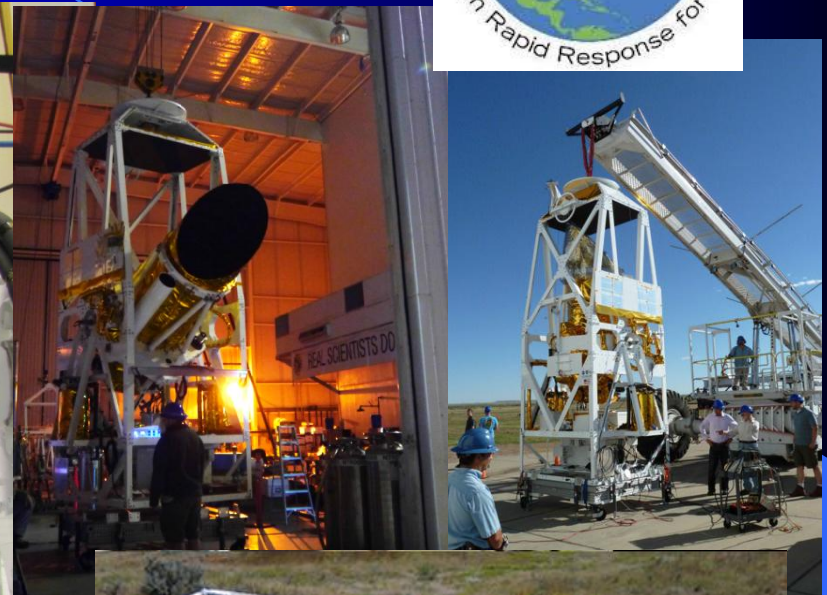
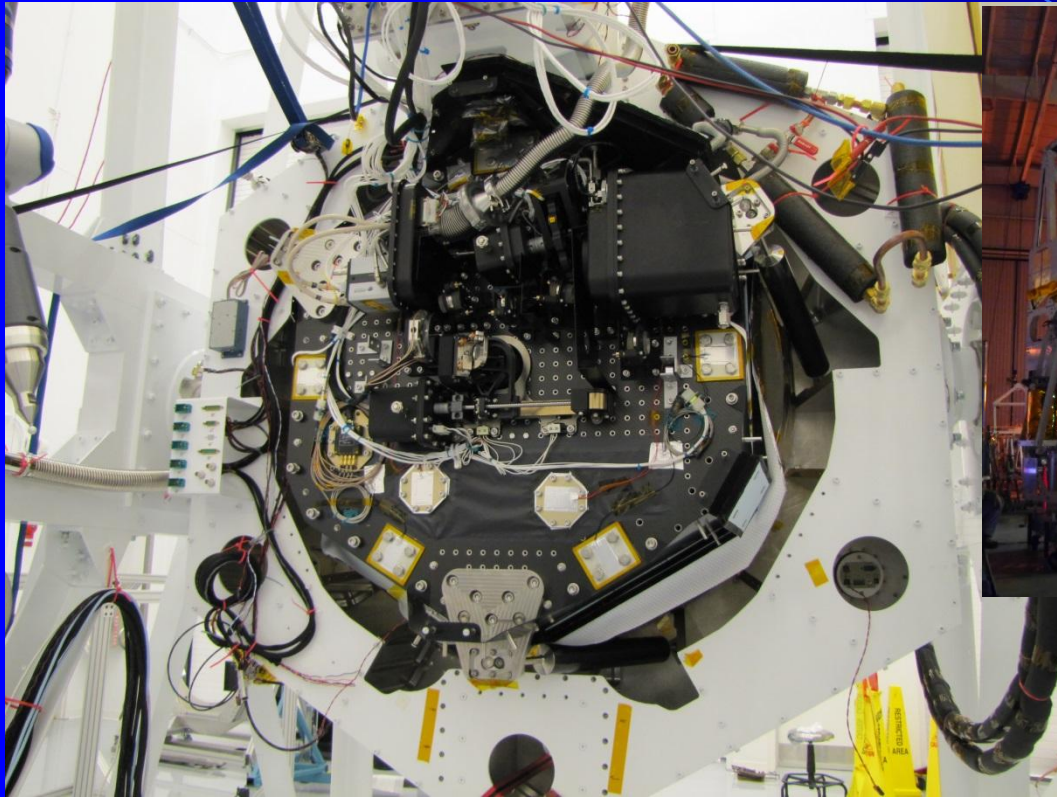
MPIA – LUCI (N30)



Zerodur Mirror System

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BRRISON



“Giant NASA Balloon Mission to See Comet ISON Suffers Telescope Glitch”

Ballon-Experiment Comet ISON (SOUTHWEST RESEARCH INSTITUTE, USA)

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SUBARU – Spectrograph Table

Spectrograph Mechanical Layout

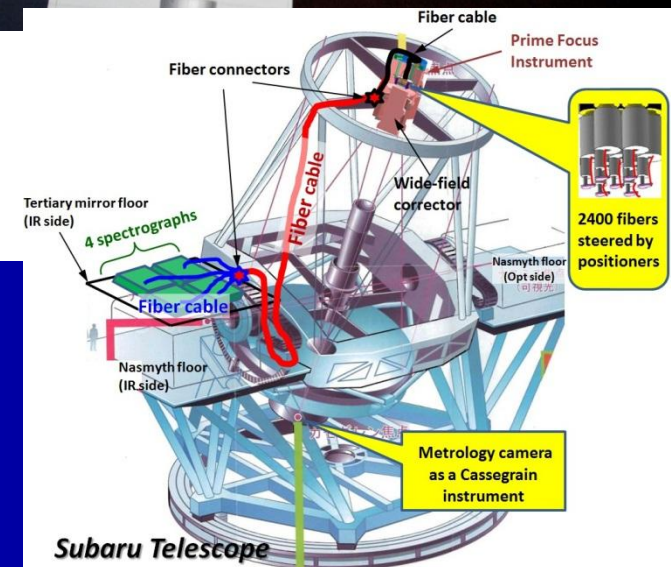
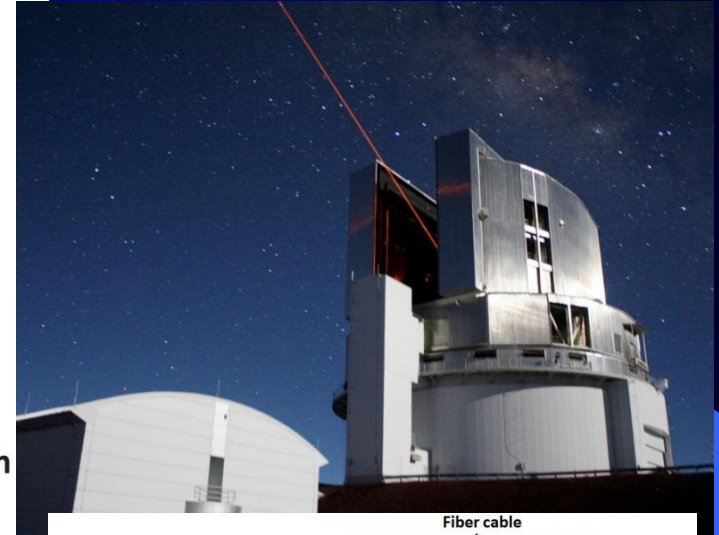
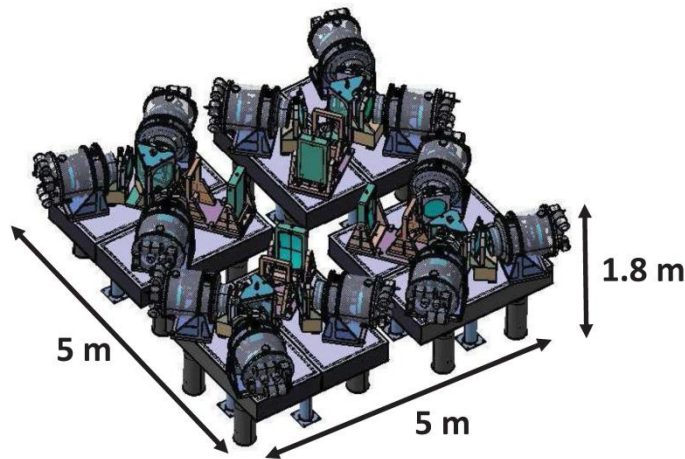
Each spectrograph carries
3 vacuum Schmidt
cameras, f/1.10, with a
275mm beam.

Modular design of
cryostats

CCDs cooled to 163 K
IR arrays cooled to 110K

Footprint 5 x 5 m
Height 1.8 m

Minimize alignment
activities at summit



CFRP-Tables Subaru Telescope
Mauna Kea

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SUBARU – Spectrograph Table

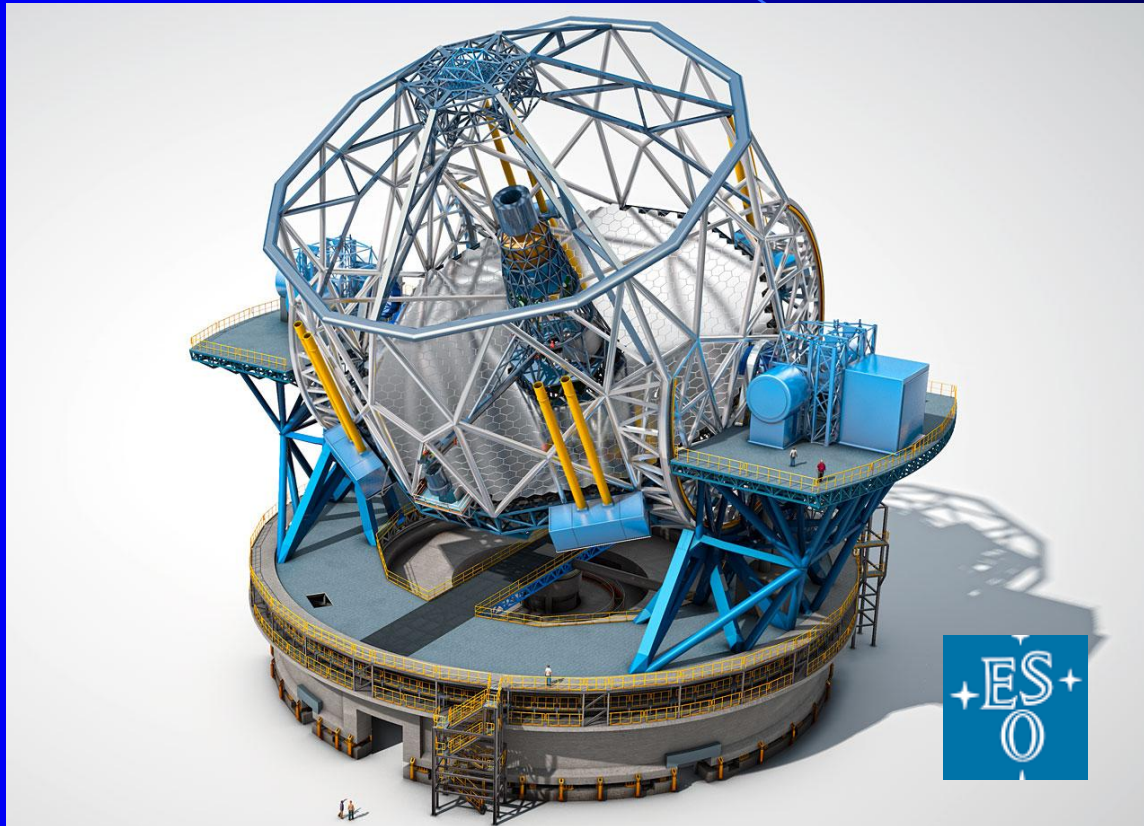


TROPOS - LIDAR System



LIDAR System (Leibnitz Institut für Troposphärenforschung)

Outlook



E-ELT Secondary Mirror Base Plate ?

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Vielen Dank für die Aufmerksamkeit !

