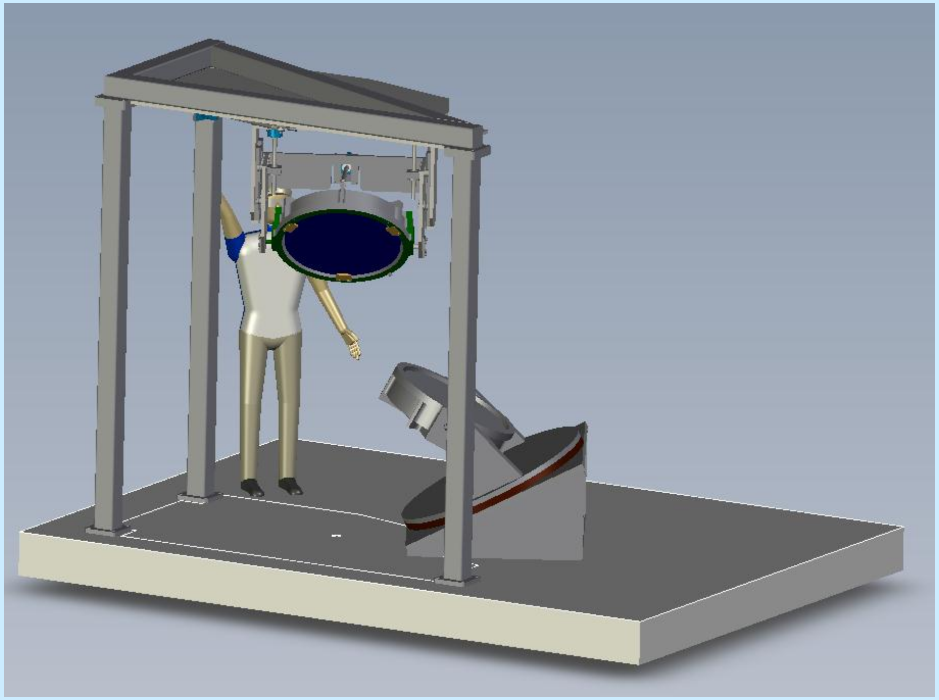
Physikalisch-Meteorologisches Observatorium Davos
World Radiation Center

# The New Heliostat System at PMOD/WRC



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# Outline

1. Why a new Heliostat
2. Site Evaluation
3. Design Considerations / Technical Issues
4. Current Design Status
5. Timeline/Outlook

# Renovation of the Institute Building

Physikalisch
Meteorologisches
Observatorium Davos
(PMOD)
World Radiation Center

since 1907

Renovation of the building
2010-2012

Old Heliostat was removed

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# Why a new Heliostat?

- Replacement of the old heliostat ->sunlight in the new **clean room**
- The radiometry community needs a high **quality light source** for the characterisation of absolute radiometers, in addition to existing laser facilities (TRF).
  - Only the sun can provide the right **beam geometry** for stray light experiments.
  - The Heliostat beam has a **broad band**, solar like spectrum instead of just one wavelength

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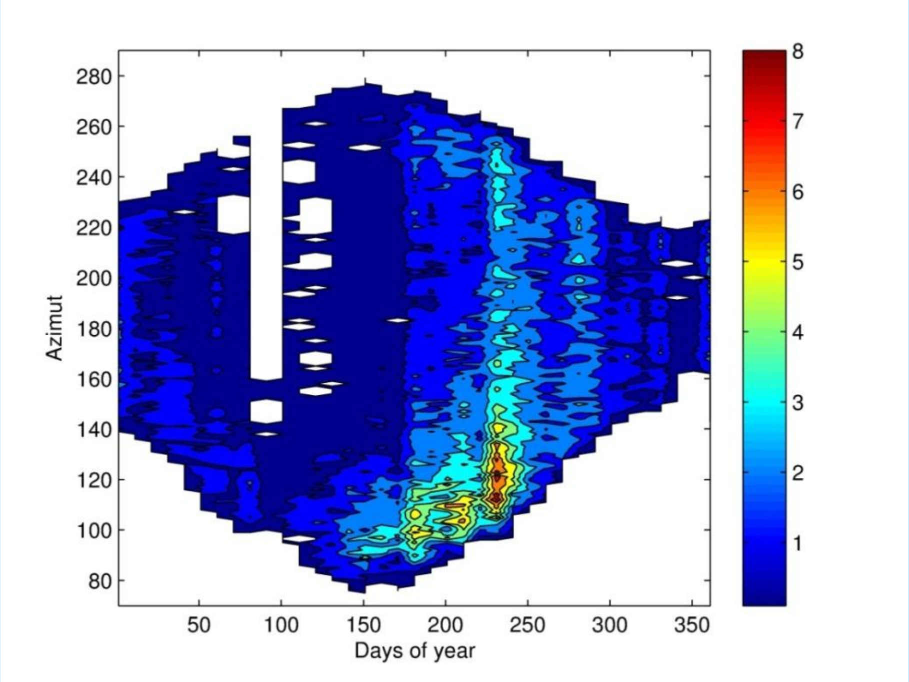
# Site Evaluation

Close to Lab vs. view of the sun




Position at south east face (cut at Az 213) will loose only 15 % of possible data

# Design considerations

- Optimize the field of view as seen from the laboratory
- Optimize incidence angle (mirror surface)
- Optimize for "continuous" motion
- Avoid singularities in system coordinates

=>Design with a **27 deg tilted axis** tracking mirror (looking upwards)
fixed mirror (looking downwards yields a horizontal beam.

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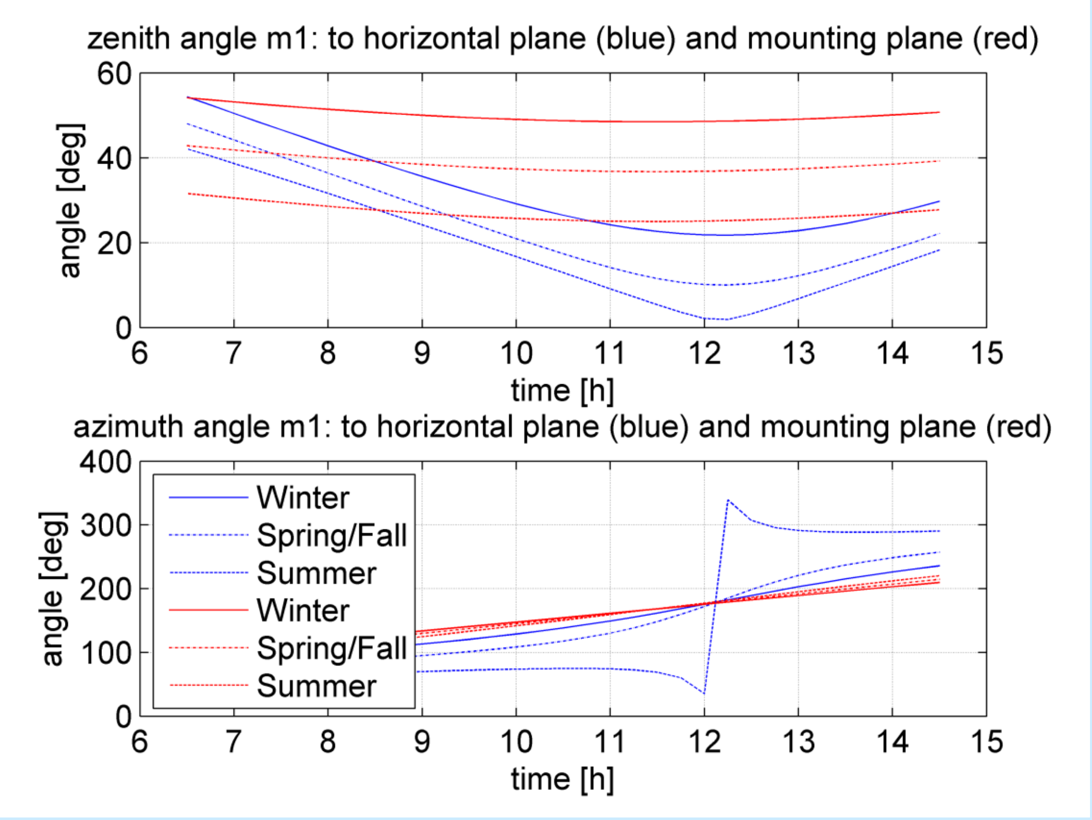
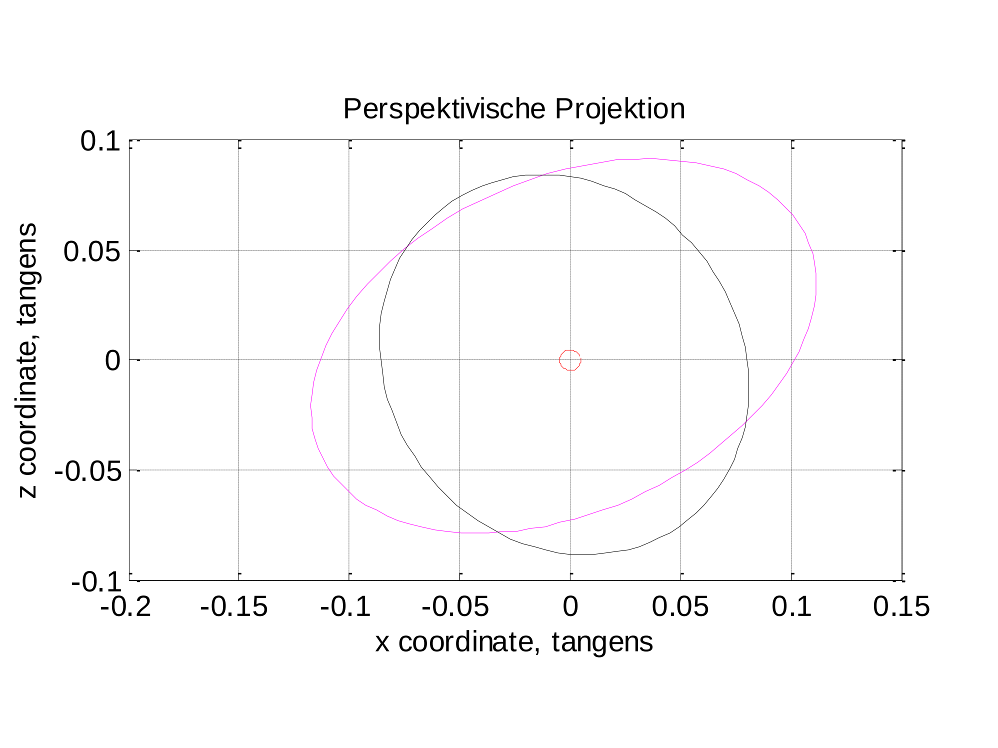
# Tracking and Motion

- Motor: Stepper with harmonic drive Gearbox
- 19 bit Encoder for rough positioning
- Sun sensor for active tracking
- CAN-bus
- Control software in matlab



# Examples Field of view

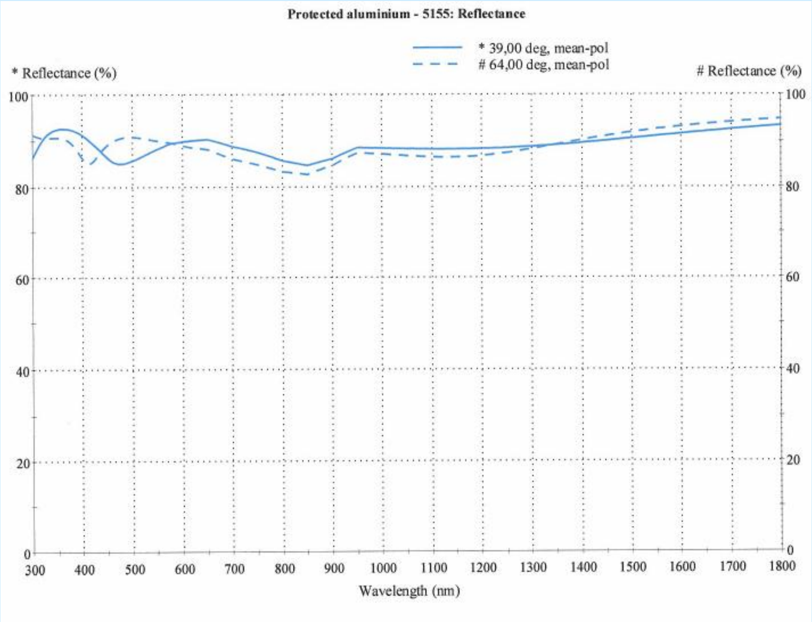
- Field of view optimized for PMO6 Radiometer (short distances and good incidence angle)




FoV seen from the Lab (2.5 m behind secondary mirror)

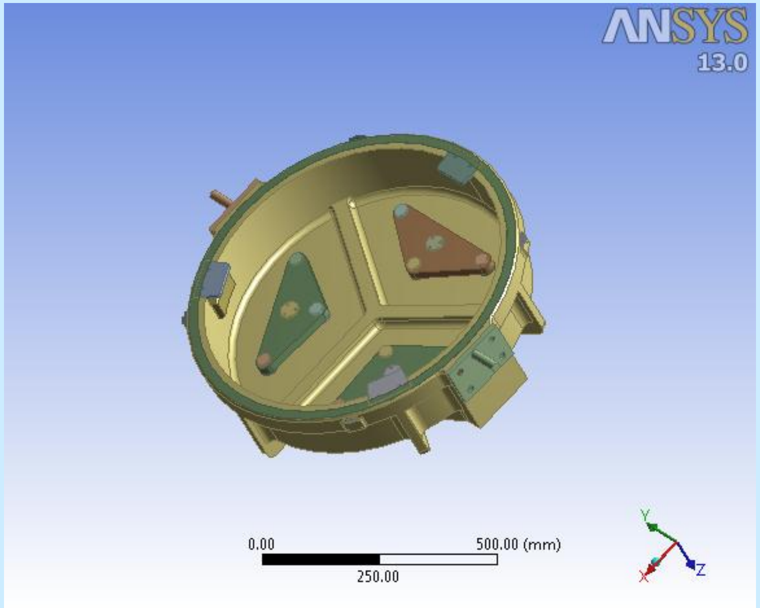
# The Mirrors

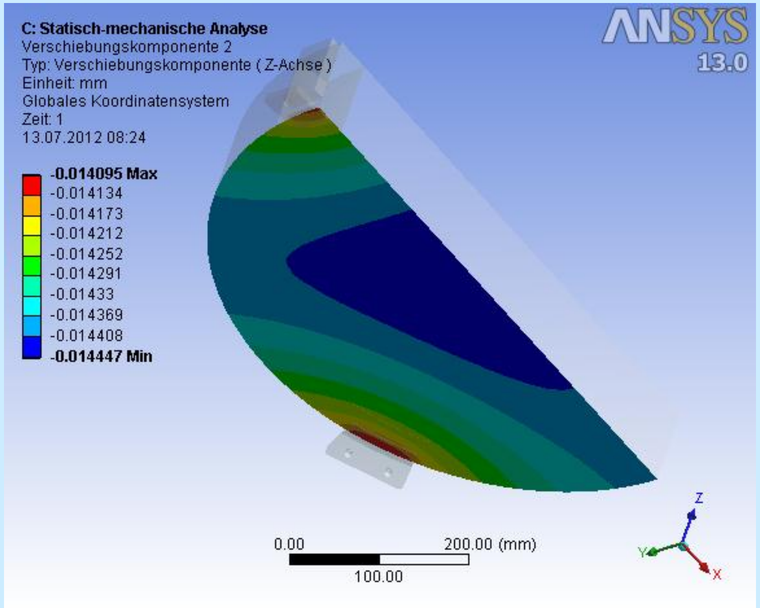
- 650 mm diam
- 100 mm thickness
- Aluminium coated Zerodur (Ceramic)
- Flat to 25 nm rms (manufacturing)
- No focussing effects!
- Special mounting is needed to compensate for self gravity deformation



# Mounting of the mirrors

- Triple Tripod system to mount the primary mirror.
- Gravity compensation included in shape of the secondary mirror (~300 nm)

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# Current Status

**Current Status of the Project:**

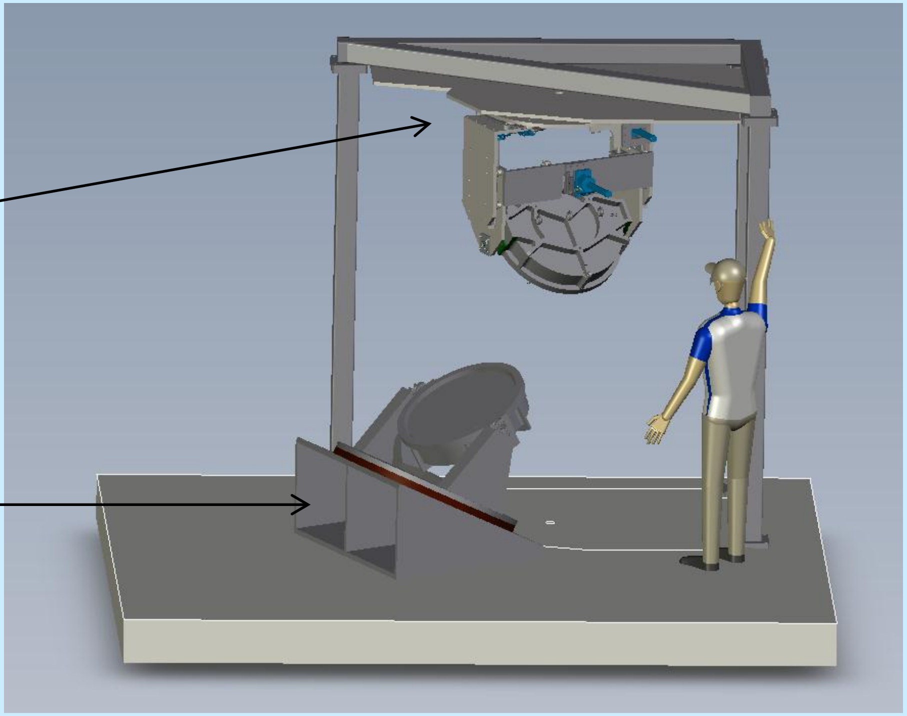
Mirror Frames:
Design completed (In House)

Secondary Mirror Mounting:
Design by an external Company

Tracking Mirror Mounting
and Motion Control:
Design in House

Mirrors are in the fine
grinding process

Software prototype is
written



# Timeline / Outlook

- 2011: Baseline Design, Site Evaluation Fundraising (SNF, BBL & anonymous sponsor)
- 2012: Final Design, Manufacturing, First Installations
- 2013 Final Installation, Commissioning Characterisation Experiments of the DARA absolute radiometer

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Thank you for your attention!

And Thanks to all the contributors of the project!

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