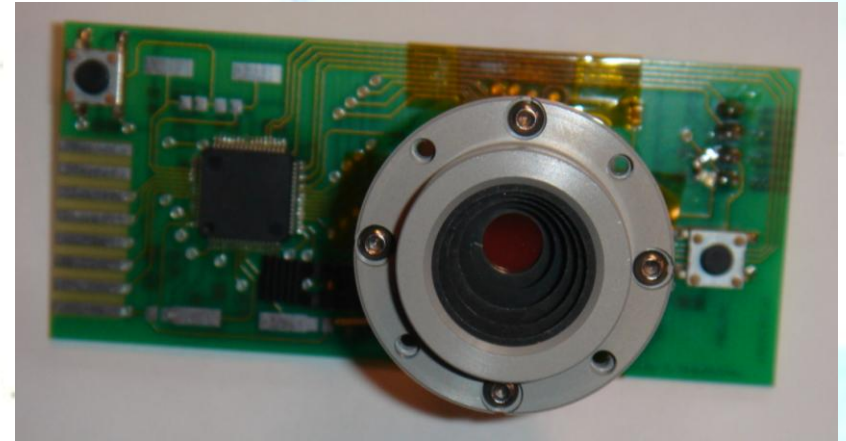


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N. Scheidegger

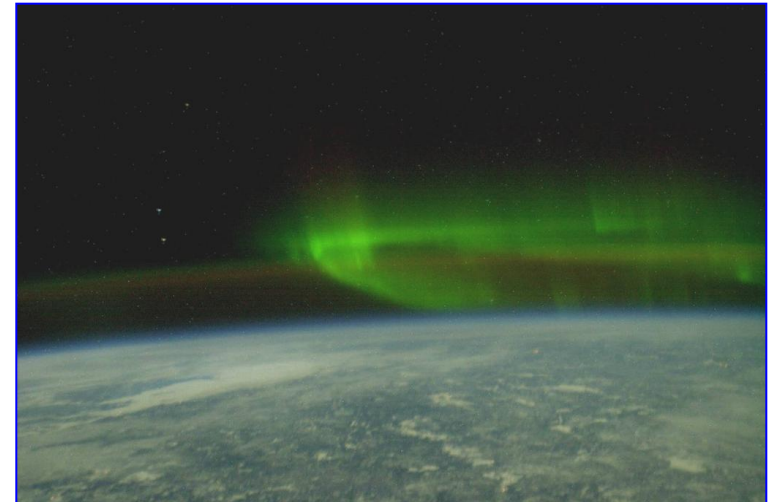


Payload Optics and Structures

Science Objectives

Measure the airglow emission in the upper atmosphere at 100 km altitude to :

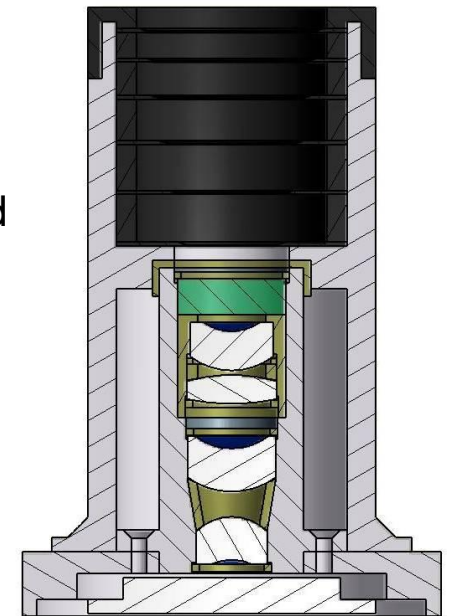
- Demonstrate the feasibility of using airglow as a basis for a low-cost earth sensor
- Validate the established airglow model or bring additional information about airglow dependence on
 - latitude
 - altitude
 - local solar time



nightglow and aurora borealis

Driving Requirements

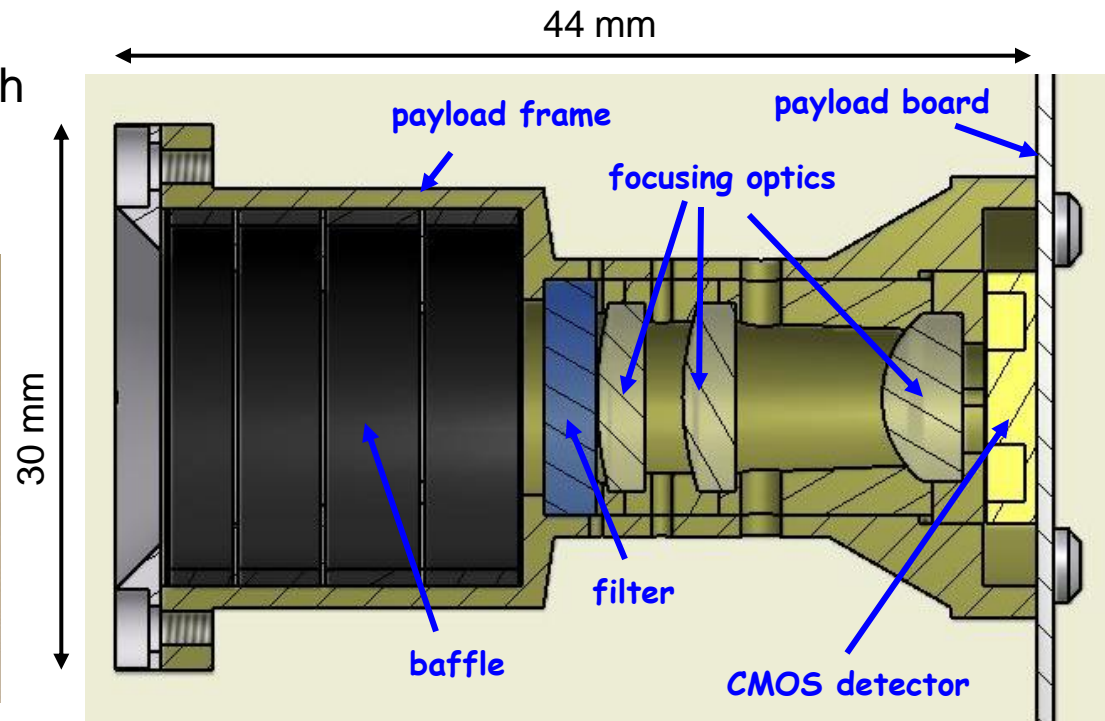
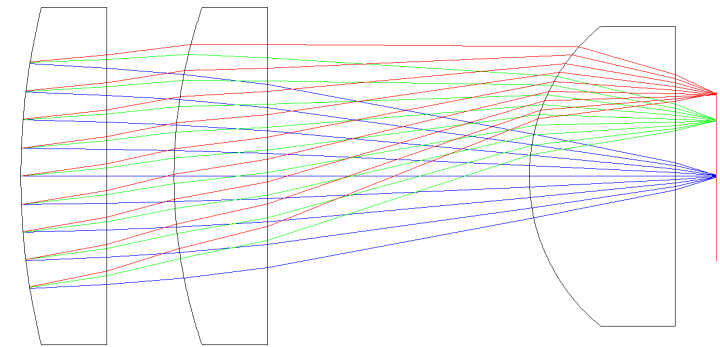
- Payload may be a technology demonstrator of the AIREs earth sensor based on airglow
 - Observes the emission at 762 nm with a bandwidth between 10 nm and 40 nm
 - Has a spatial resolution of at least 0.3° and a FOV of 25°
 - Can perform science mission with the sun no closer than $[30]^\circ$ from its boresight.
- Physical constraints
 - Volume: 30 x 30 x 65 mm³ for the optics
80 x 35 x 15 mm³ for the payload board
 - Mass: < 50 g



optics of the AIREs earth sensor

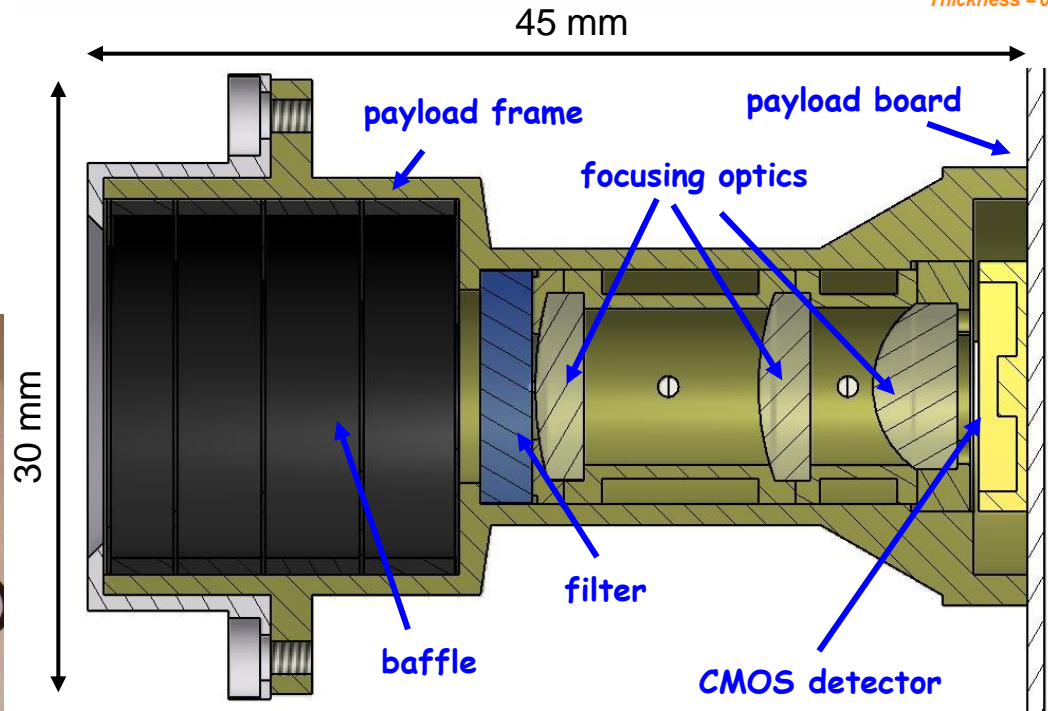
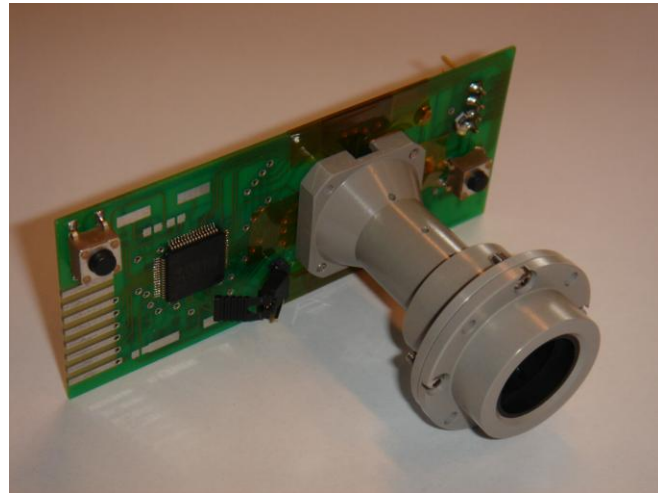
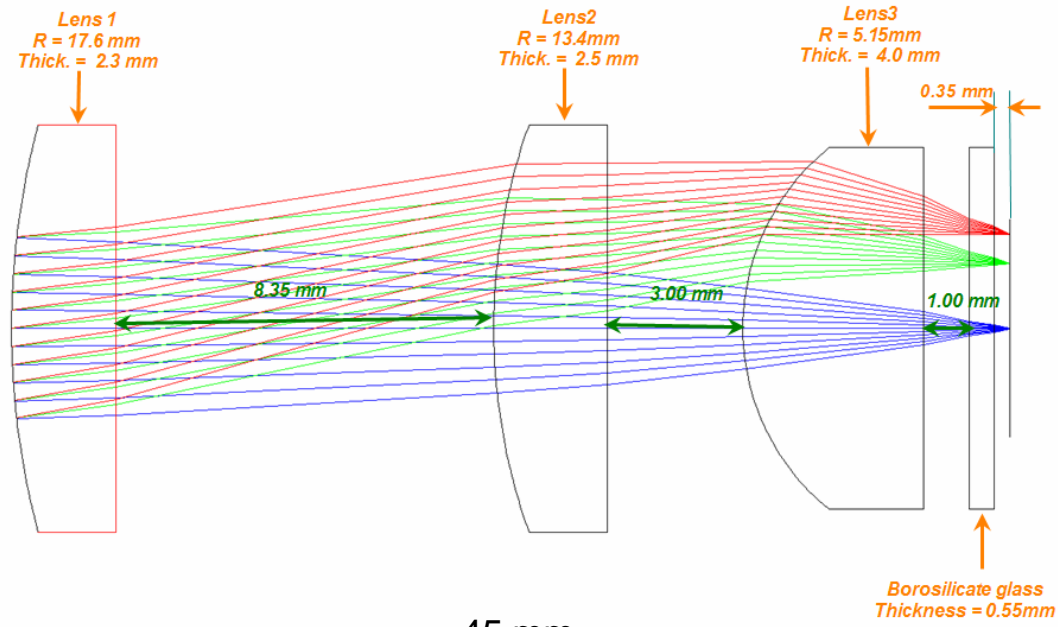
Design Description: Optical System

- Triplet design with off-the-shelf components
- FOV 18.8° x 25°
- Resolution 0.16°/pixel
- Baffle for a solar exclusion angle of 30° with an attenuation factor of 10⁻⁴
- Filter with a central wavelength at 767 nm and a bandwidth of 20 nm



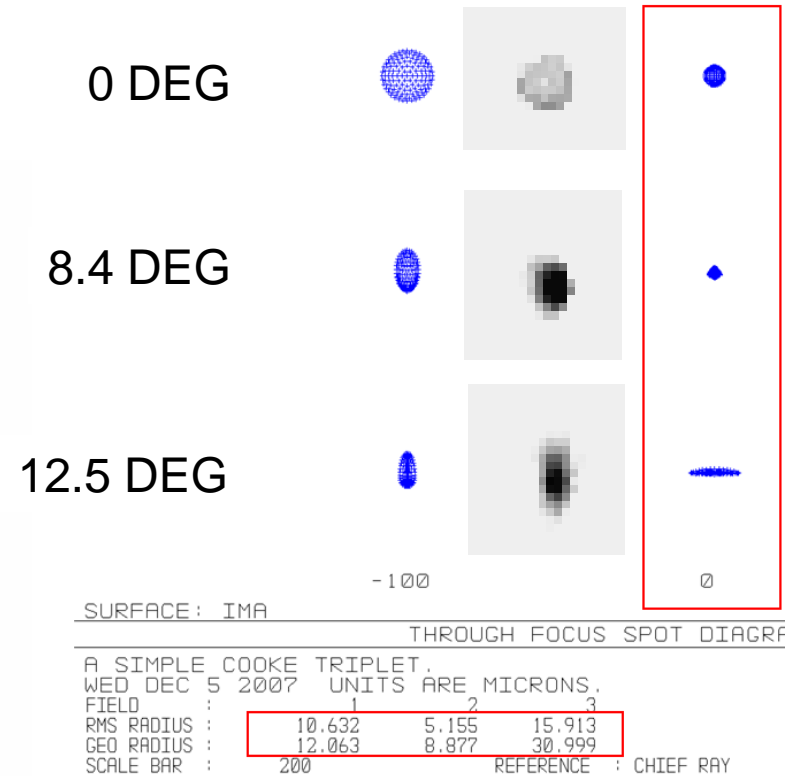
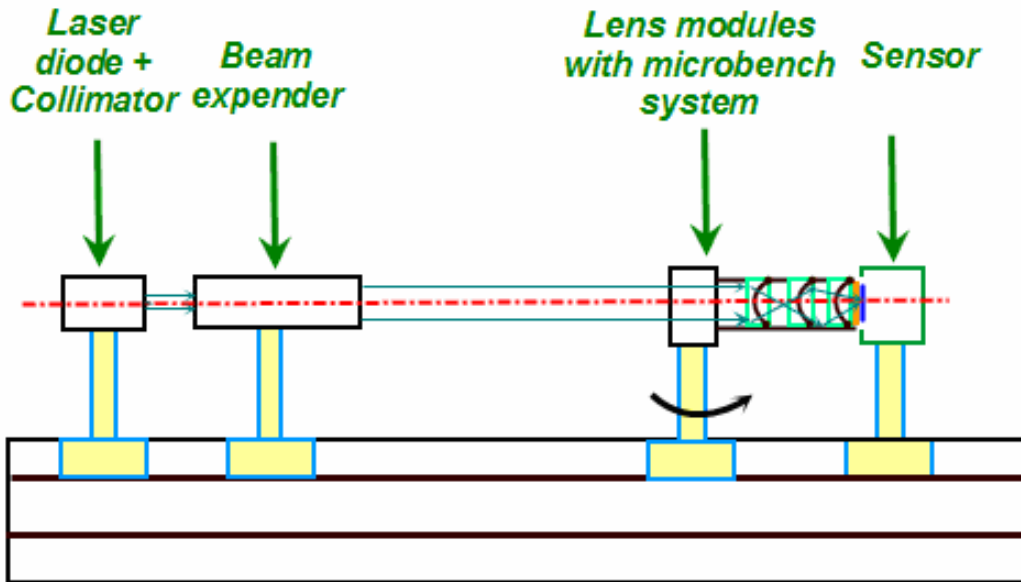
Design Modifications:

- PL holding
- Position of the lenses
- Holding system of the lenses



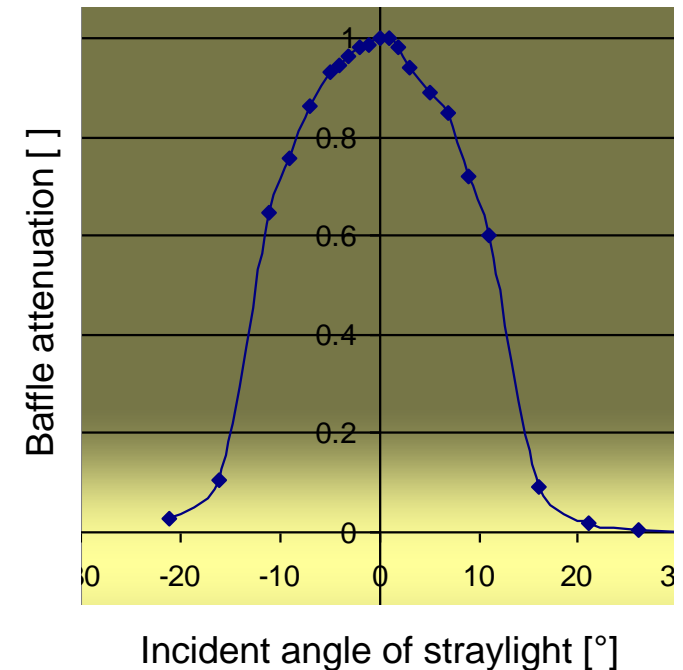
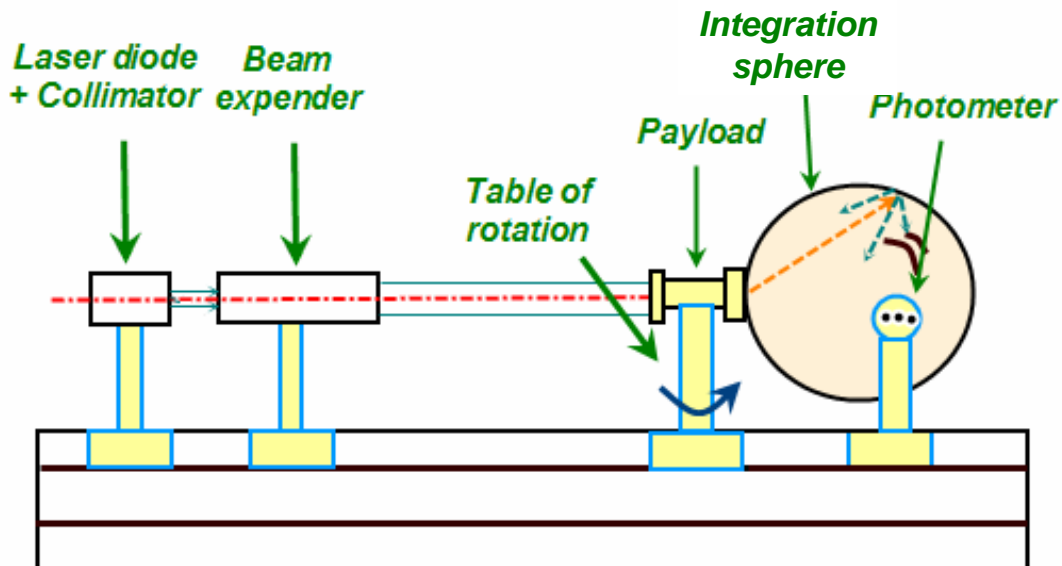
Test: Performance of the PL Optics

- Purpose: characterise the optical system (focus, ghost images, tolerances on the assembly)
- Test condition: room temperature, dark room
- Test results: only focus was tested, shape and size of the spot corresponds to simulations



Test: Performance of the Baffle

- Purpose: measure the attenuation factor of the baffle
- Test condition: room temperature, dark room
- Test results: measured reflectivity of the baffle surfaces: 15 %, baffle attenuation factor = 0.02 (corresponding to the theory, but lower than expected)



Planned Tests

- 2nd testing on the performance of the optics
 - focus
 - ghost images
 - tolerances on the assembly
 - temperature tolerance of the optical system (done on the assembled payload)
- 2nd testing of the attenuation factor of the baffle
 - after surface treatment of the baffle parts



Image taken with the SwissCube payload

Design Issues and Open Questions / Risks, Potential Solutions

- How to verify performance of the overall payload vs. temperature ?
- Thermal isolation ?

Conclusions and Future Work

Element	Design and Development	Manufacturing/ Purchasing	Testing
Payload structure (including baffle)	Completed	Completed	In progress, to be finished by mid June
Optics (without filter)	Completed	Completed	In progress, to be finished by mid June
Filter	Completed	Completed	-

Questions ?

Aiglow Model

Intensity of the airglow

Integration time

