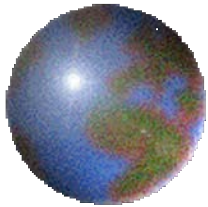


OCA: Muriel Ravet; Etienne Samain; Robert Dalla; Jean Louis Oneto; Jocelyn Paris;
Jean Marie Torre; Jean François Mangin; Gwenaëlle Aridon

CNES: Patrick Aubry; Philippe Guillemot

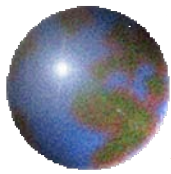
Czech Technical University: Ivan Prochazka



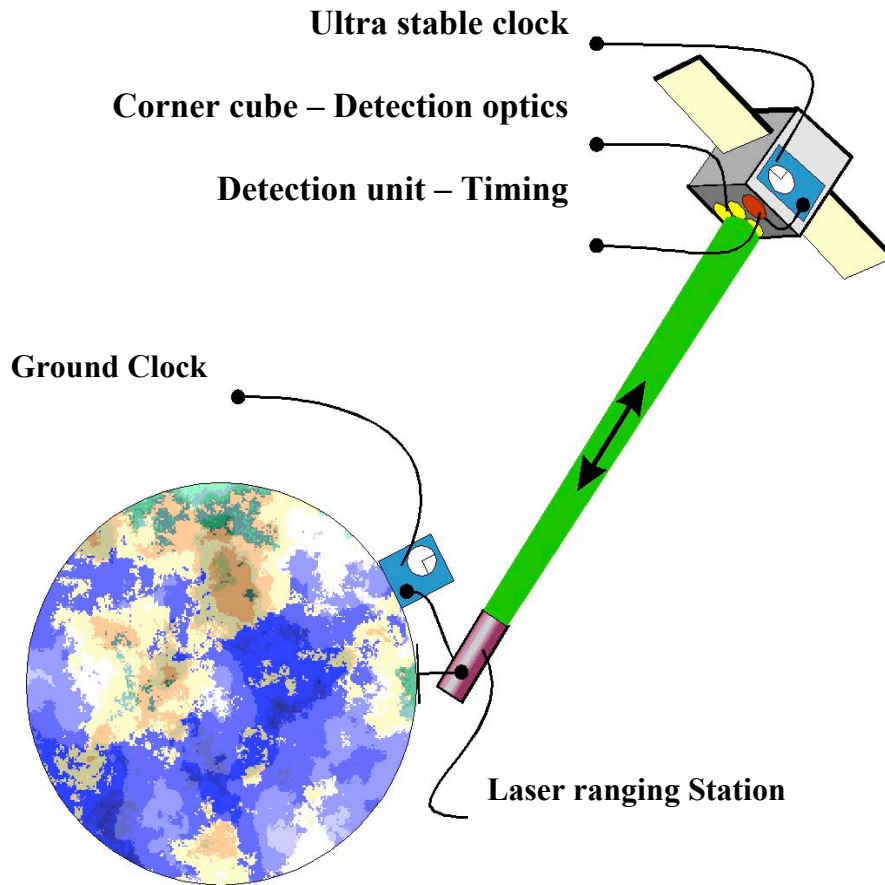
*Time Transfert by Laser Link
(T2L2) :
Optics of the Space Segment*

Muriel RAVET

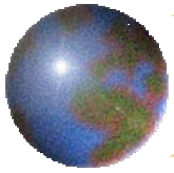
OCA



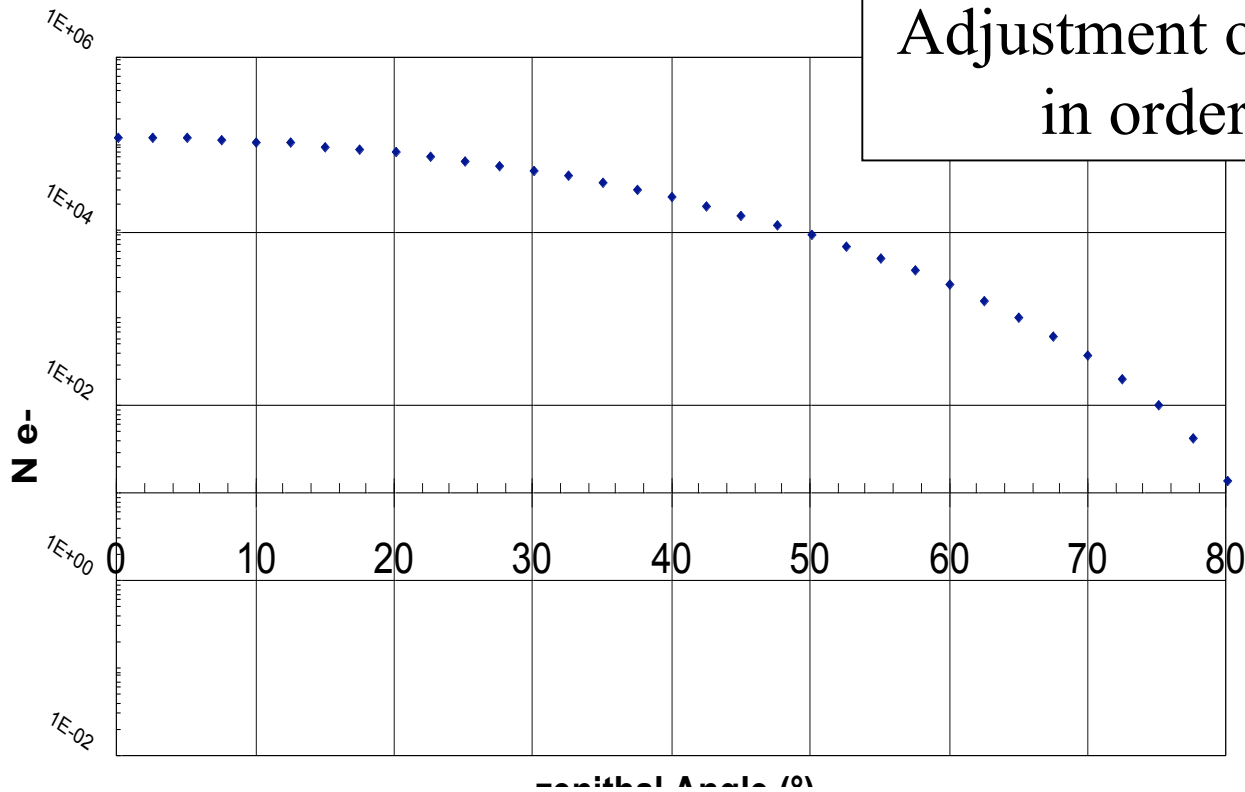
Principle of T2L2



- ✚ T2L2 on board
Microsat Myriade
- ✚ Altitude = 800 km
- ✚ Field of Views = 120°



Link Budget

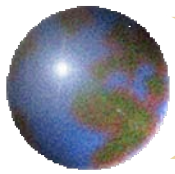


Adjustment of optical parameters
in order to get photons



- ☉ Detection Unit :
 - Field of views
 - Surface of detection

- ☉ Reflection Unit :
 - Size
 - Shape
 - Refractive index



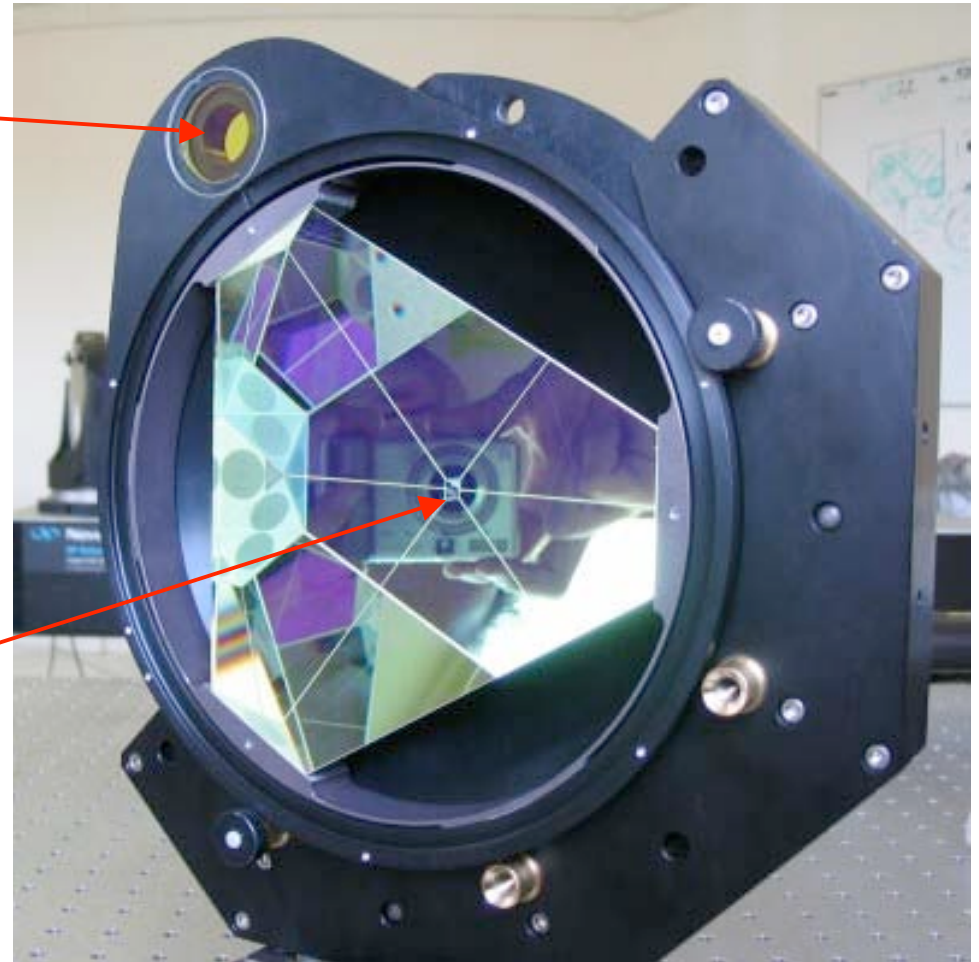
The Reflection Unit

Linear detection
optics

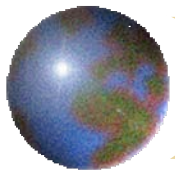
$n = 1.8$

Aluminium
protected coating

Corner cube
vertex
truncated



⊕ Angle errors $\varepsilon_{\beta} \sim 0.7''$ \Rightarrow a deviation of $\alpha \sim 2''$



Speed aberration ϕ_s

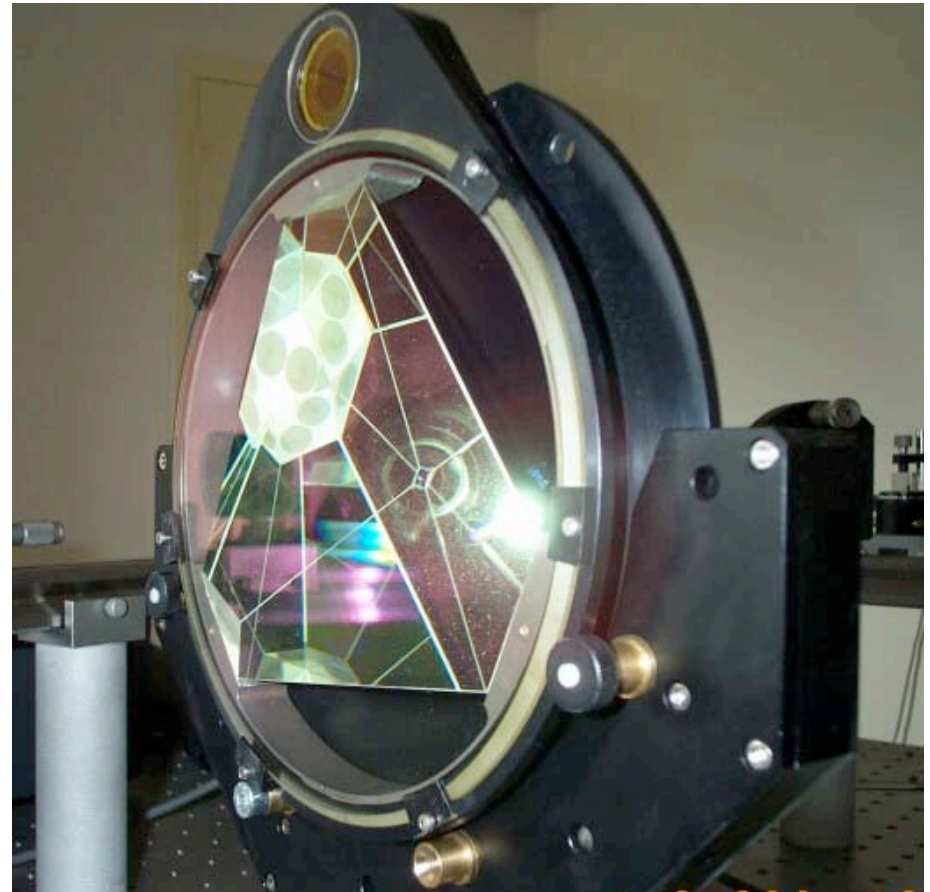
✚ At 800 km $\longrightarrow \phi_s = 10''$

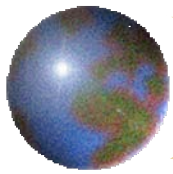
✚ Method of compensation:
Cylindrical Lens

✚ $R_c = 1.6 \text{ Km}$

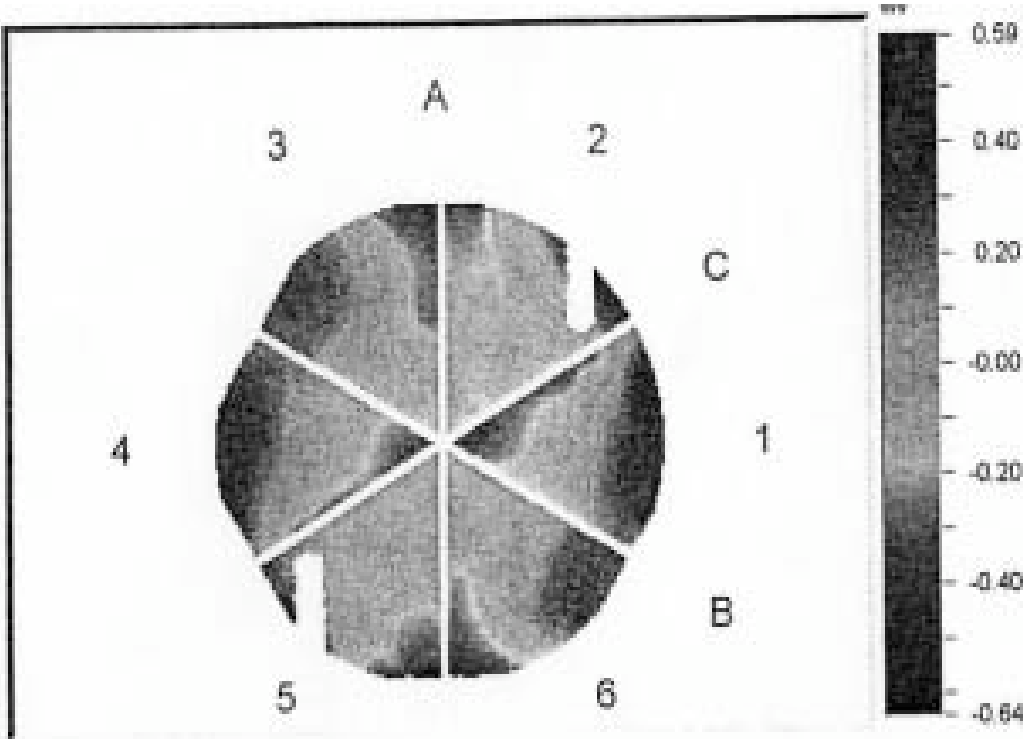
✚ $n = 1.8$

✚ $D = 140 \text{ mm}$





Interferometric Analysis



⊕ **Input face :**

Surface Accuracy : $\lambda/2$ (P-V)
Surface Quality : 40/20

⊕ **Output face :**

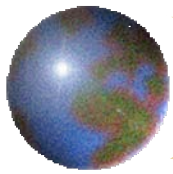
Surface Accuracy : $\lambda/4$ (P-V)
Surface Quality : 10/5

⊕ **Reflective faces :**

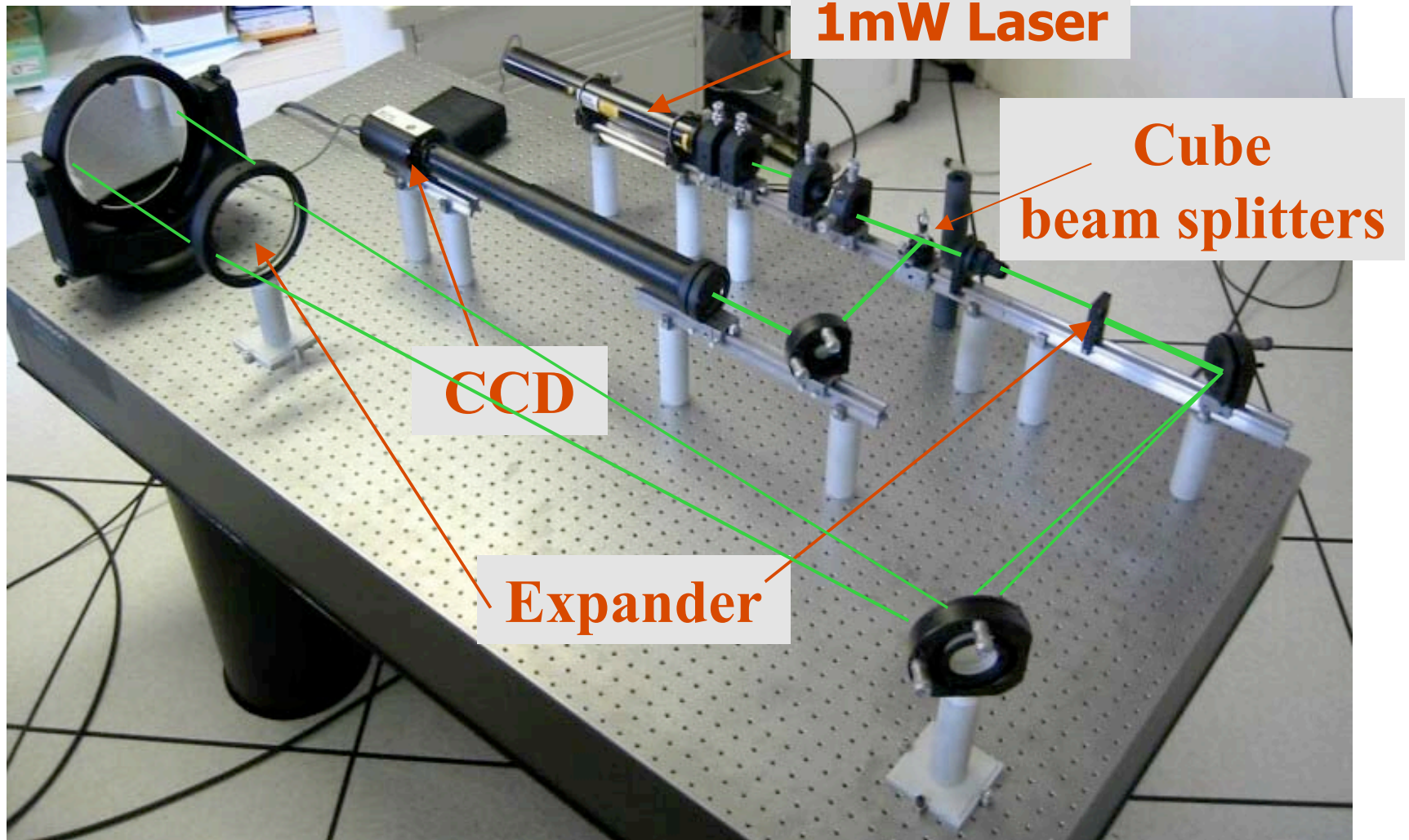
Surface Accuracy : $\lambda/6$ (P-V)
Surface Quality : 40/20

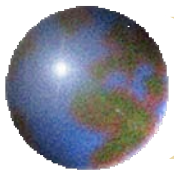
Wave reflected by
the Corner Cube:
 1.28λ



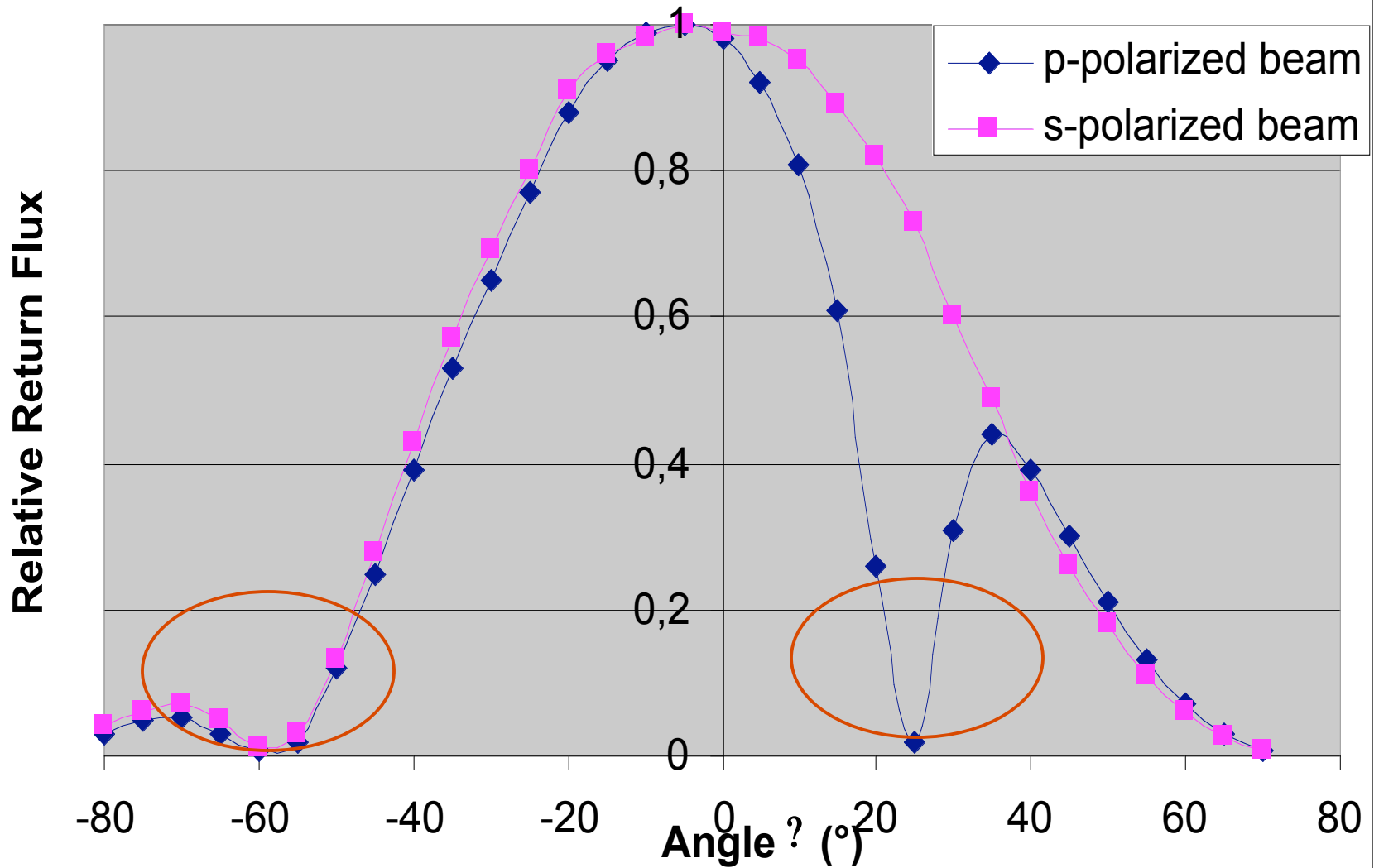


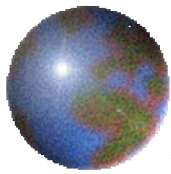
Polarization Experiment





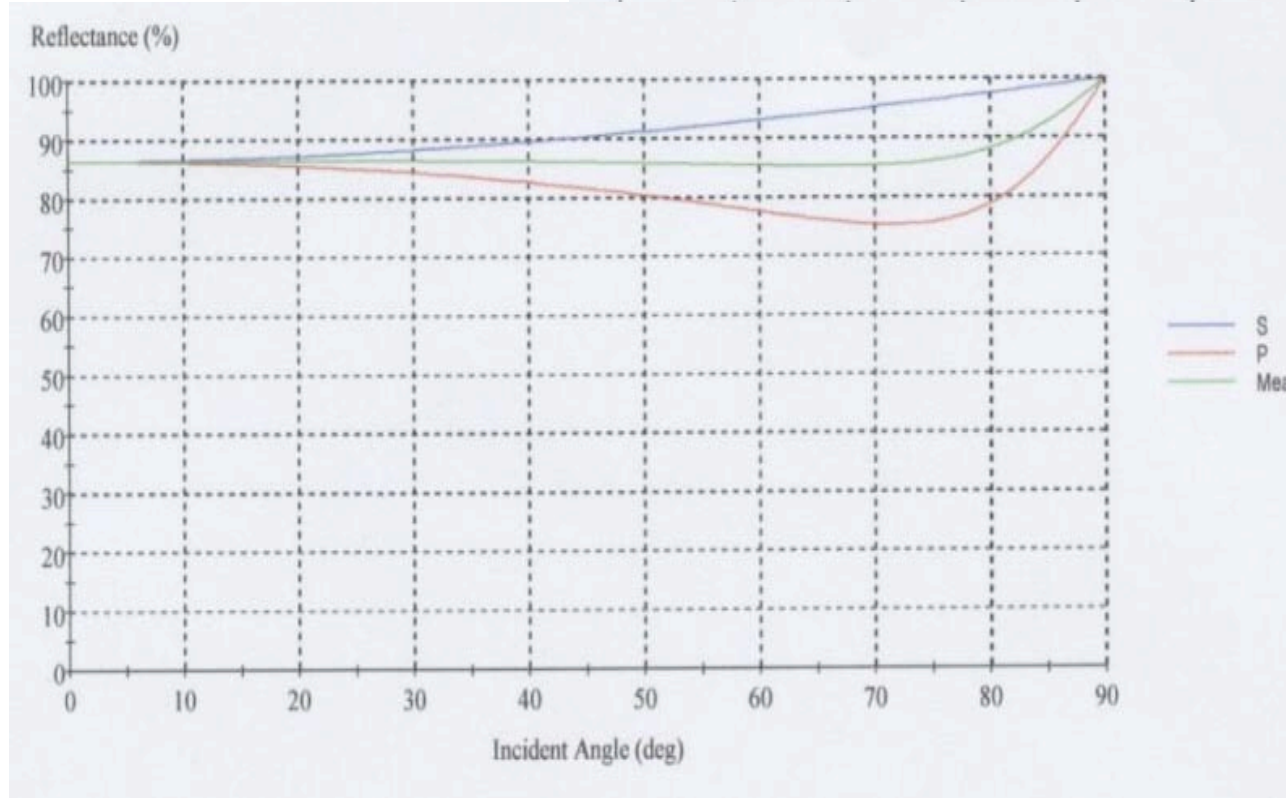
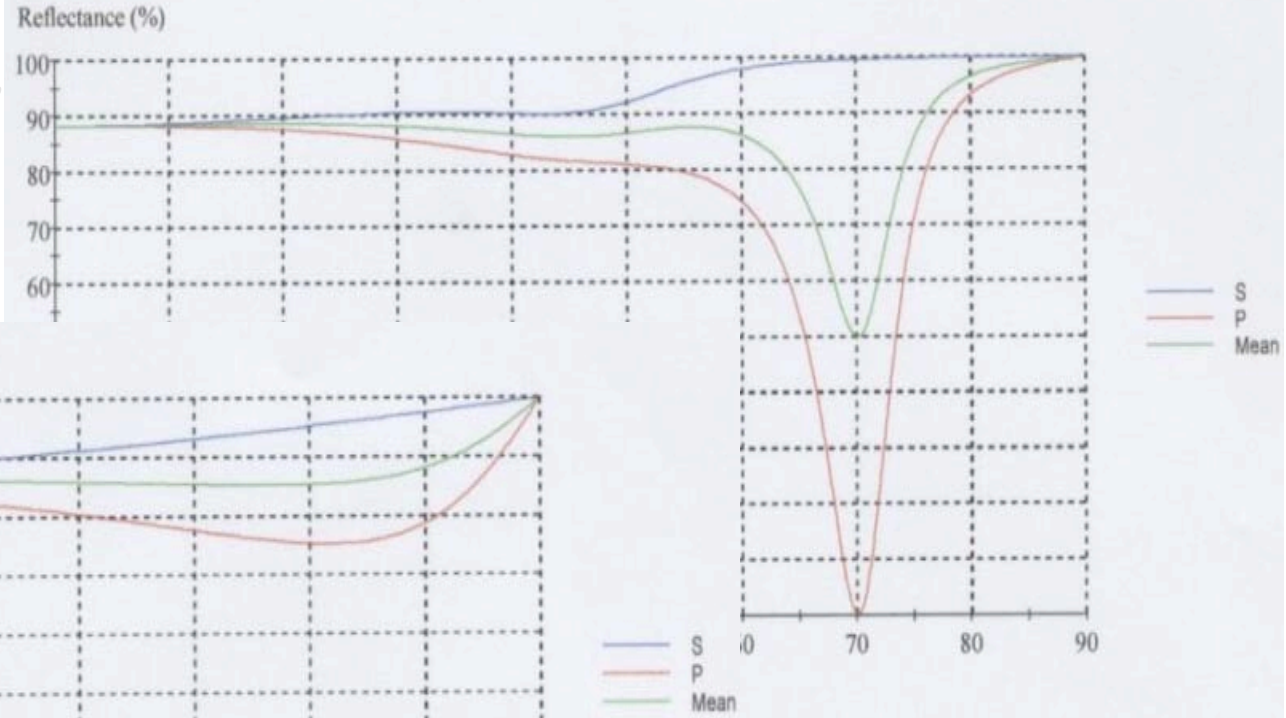
Results of Polarization study



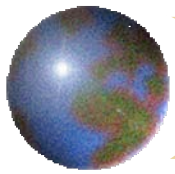


Reflectance factor

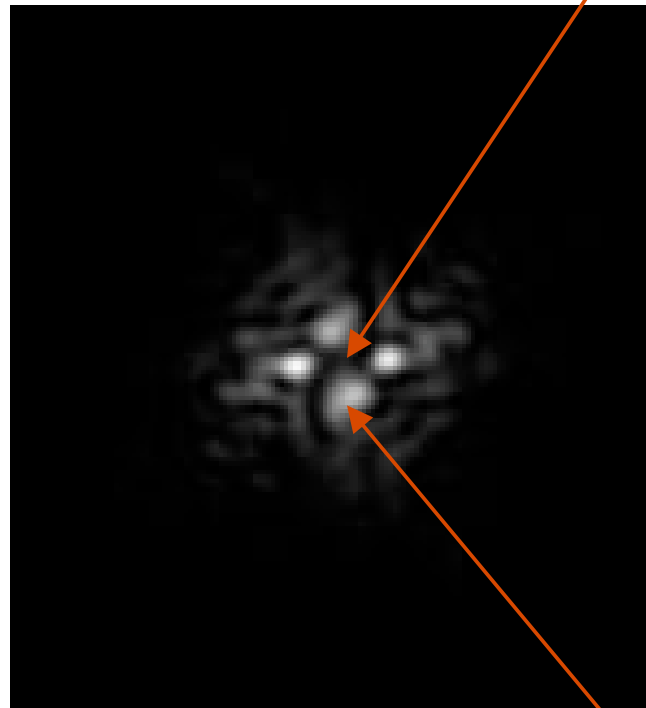
for Primary Layer
Al2O3=205mm



for Primary Layer
Al2O3=0mm



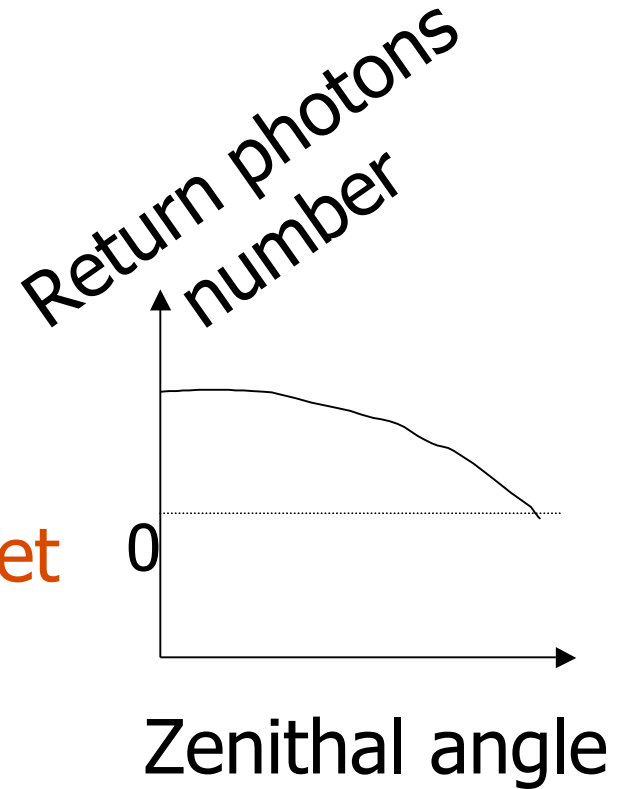
Diffraction spots – Real link budget

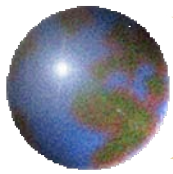


Incident
position of
laser station

Calculation
➡
Real Link budget

Position of laser
station for return spot
of diffraction





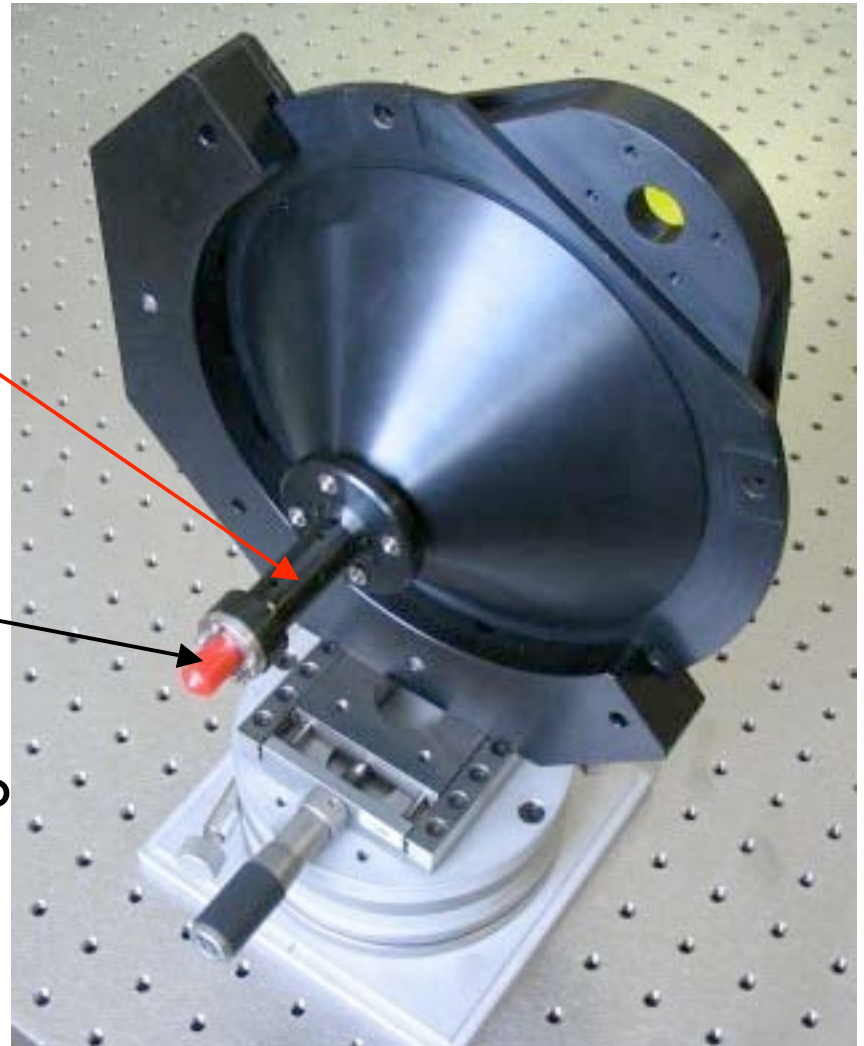
The detection Optic

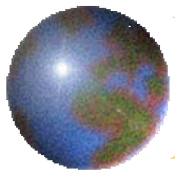
A coupling
optic

A multimode graded
index fiber

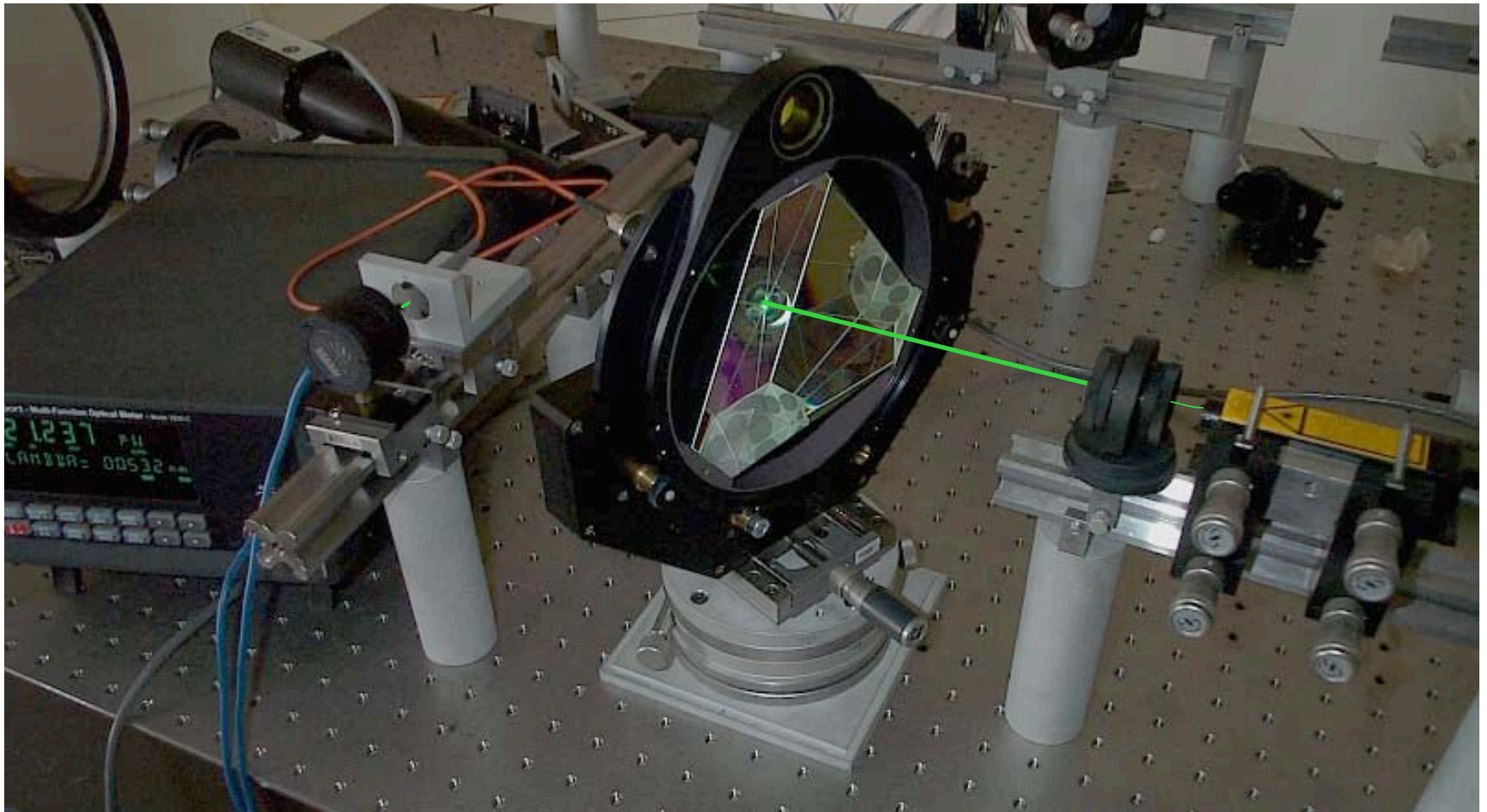
$$ON = 0.29 \quad \longrightarrow \quad \theta_f = 34^\circ$$

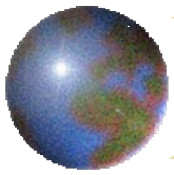
$$D_{\text{core}} = 100 \mu\text{m}$$



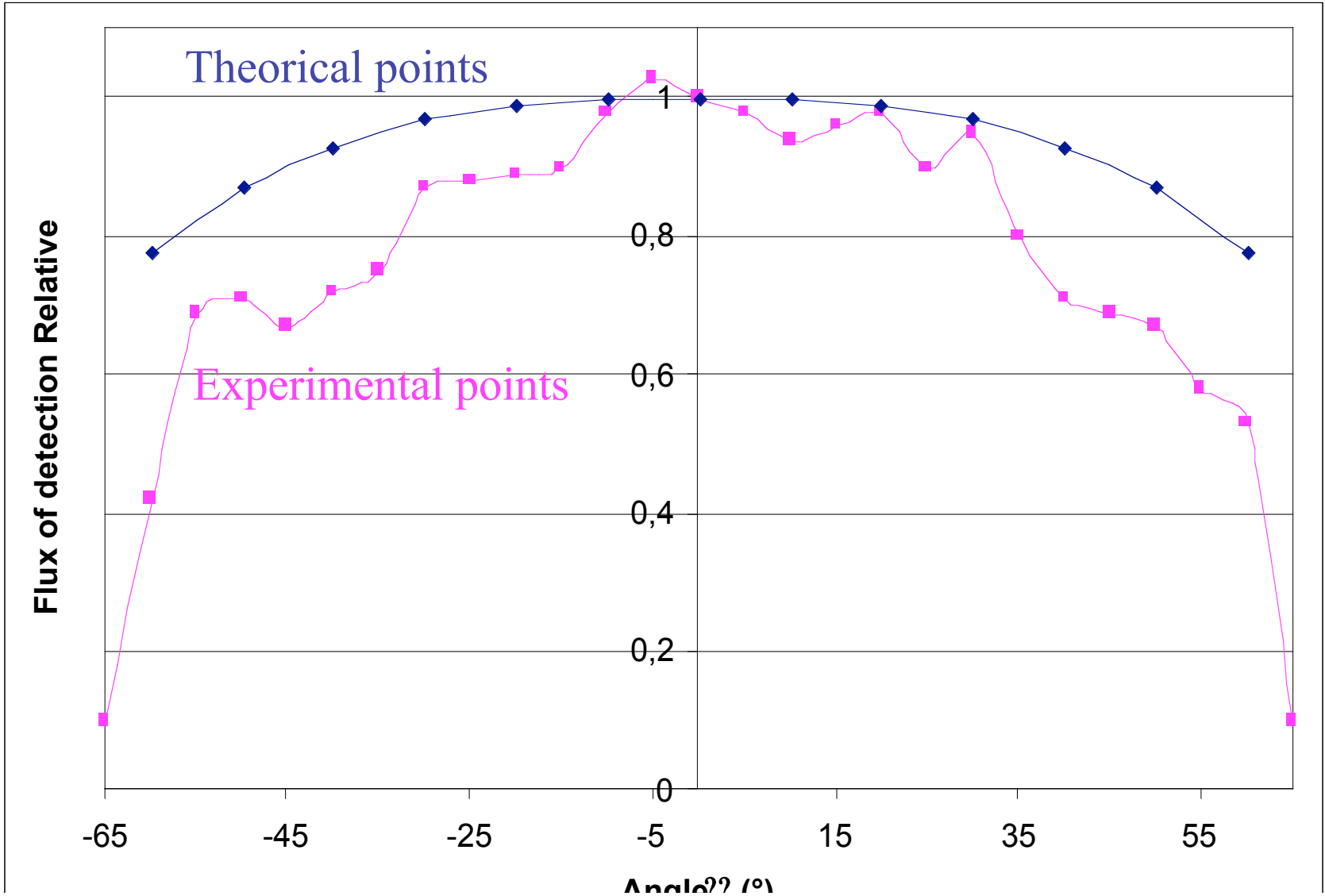


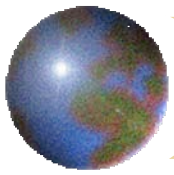
Output flux of the detection fiber



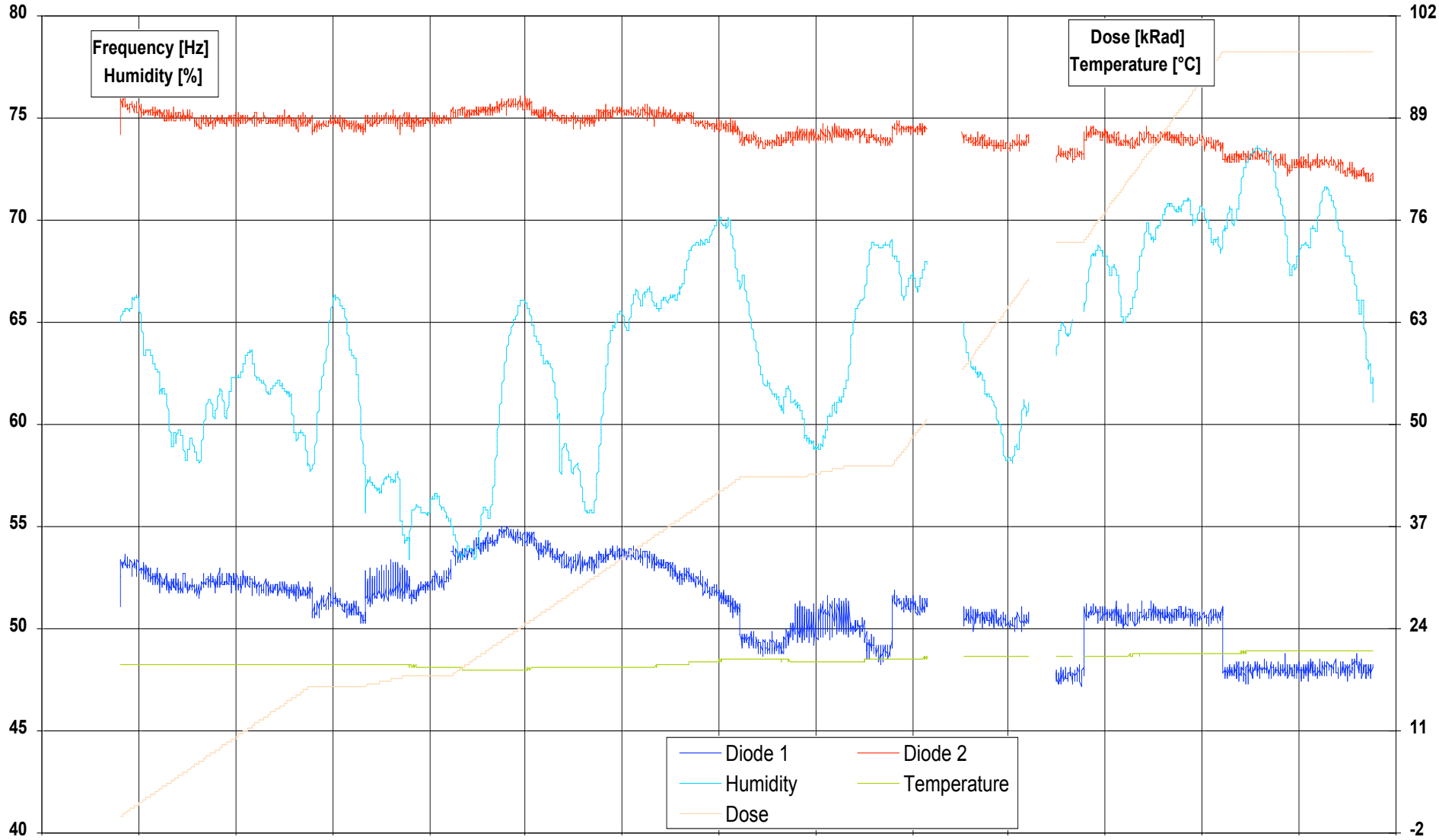


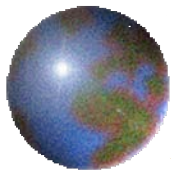
Experimental measures





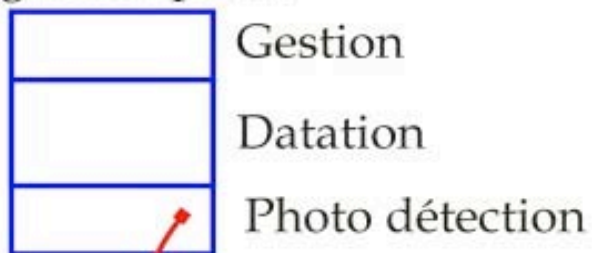
K14 Photodiode : Experimental Results



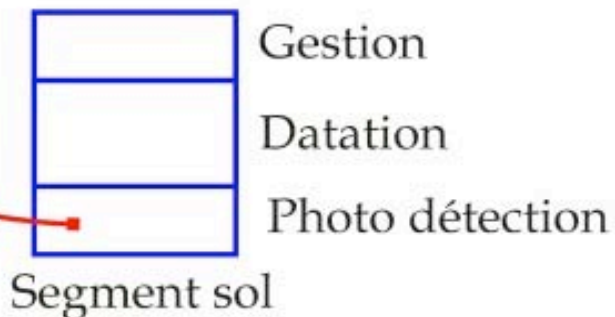
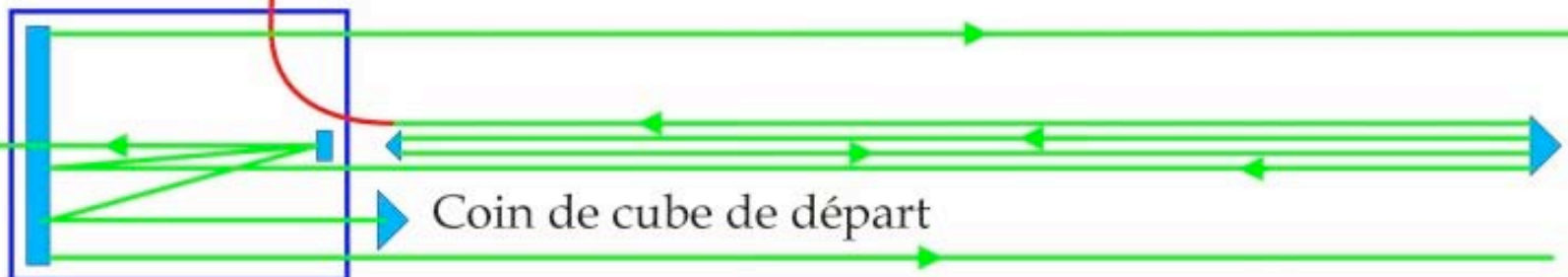


Perspectives...

Segment spatial



First Time Transfert
at ground



First results last week !