

# **The KID French SAT**

A. Catalano  
on behalf of the Collaboration

# Why a KID French SAT ?

---

- **Improving Science**

An High Frequency (200-400GHz) can give to the whole project a more precise measurement of the contamination of galactic dust emissions which currently constitutes one of the most limiting factors for CMB B-mode observations.

- **Improving French Technology**

Demonstration of 100% French technology in one of the reference CMB projects for the next 10 years.

- **« Improving » French community**

With a significant hardware involvement we could consolidate the scientific impact of the French community in SO.

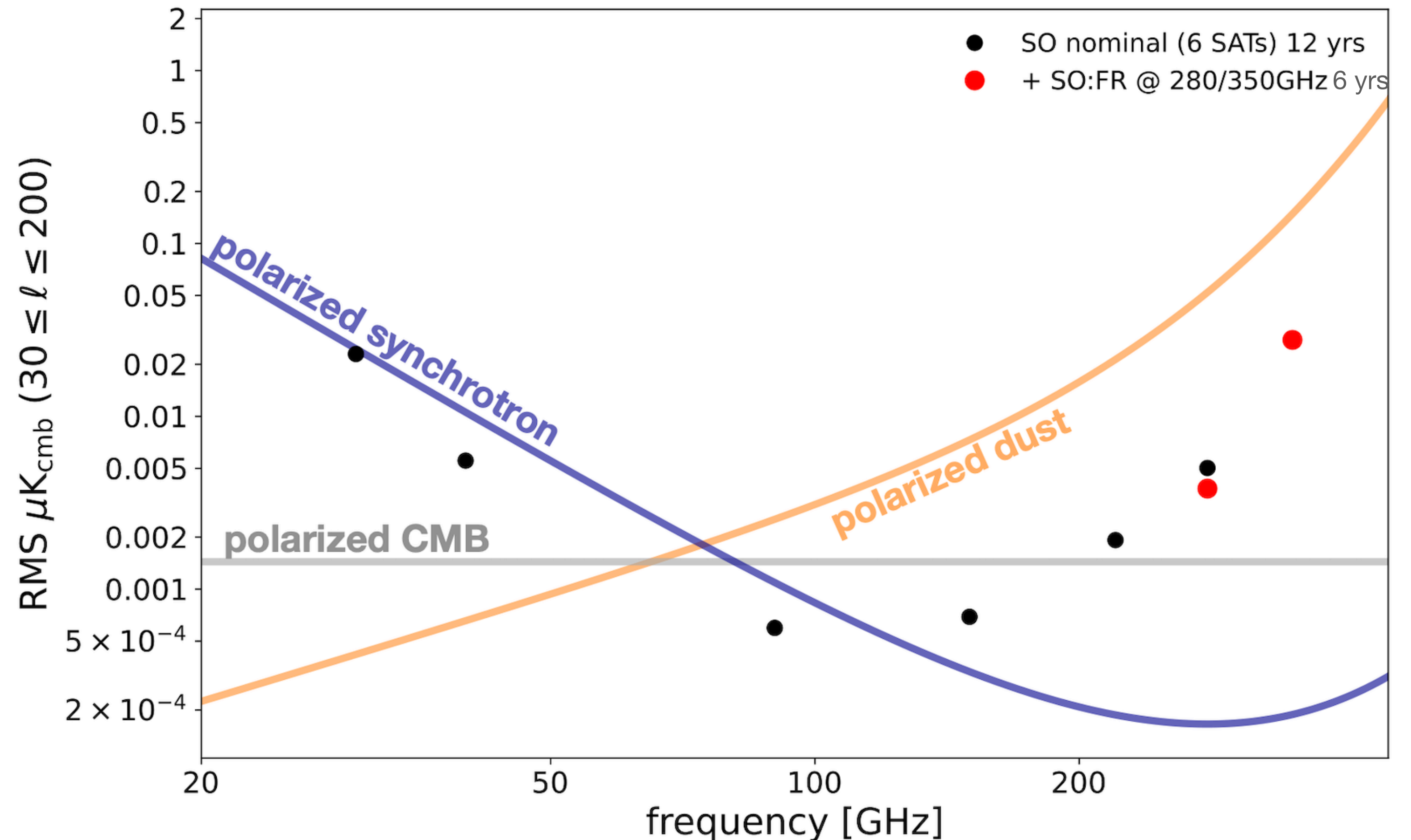
# Science case: Forecast

Component separation can be understood through two analysis steps:

- Characterization of the foreground SEDs
- Linear combination of frequency maps to suppress foreground contaminants

## An additional High Frequency SAT:

- Increase the lever arm on the dust SED fit
- Lower the noise on the dust template

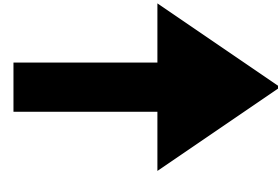




# Current Collaboration

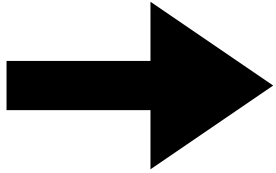
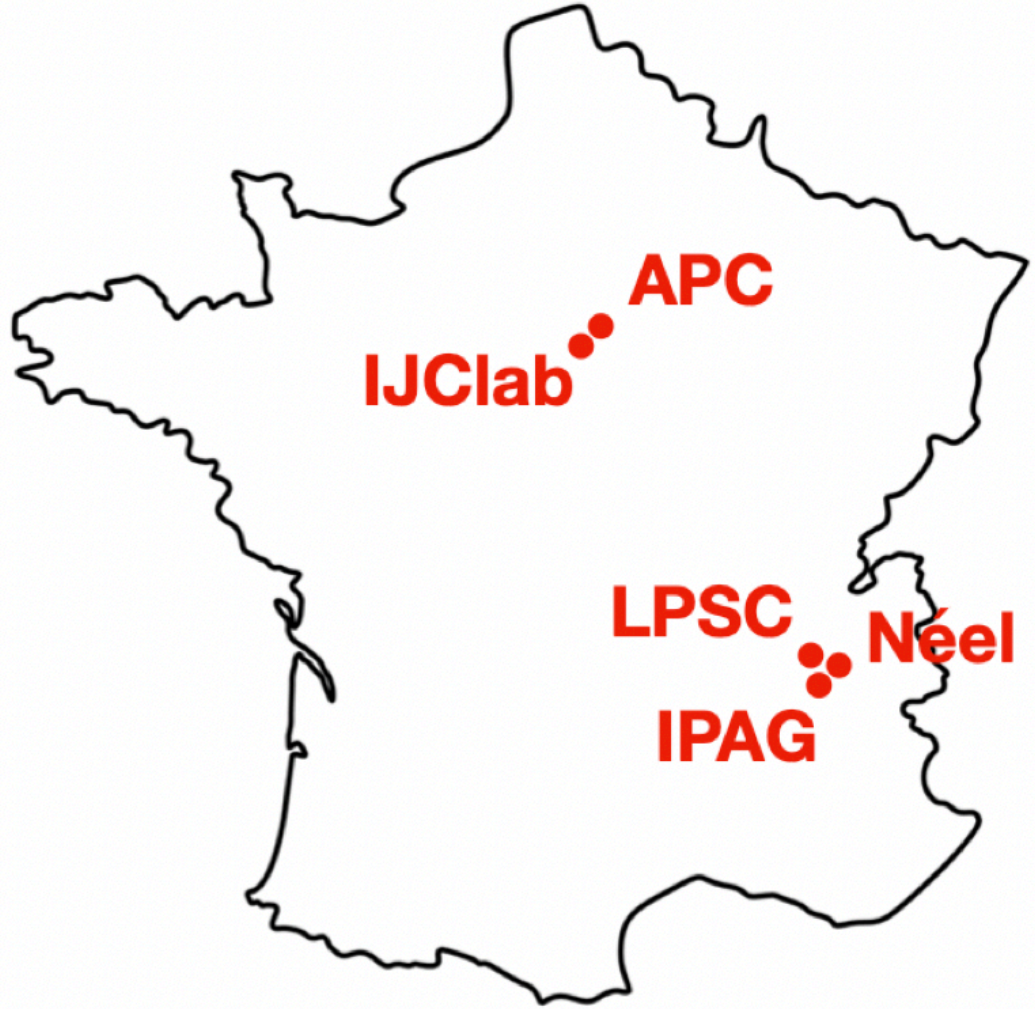
**GROUPEMENT D'INTÉRÊT SCIENTIFIQUE KIDS**

*Développement de matrices de Détecteurs à Inductance Cinétique et de leur Électronique multiplexée*



**Detectors**

**Readouts**



**Cryostat**

**Optics**

**Acquisition Soft.**

**Integration**

**Calibration**

**Platform**

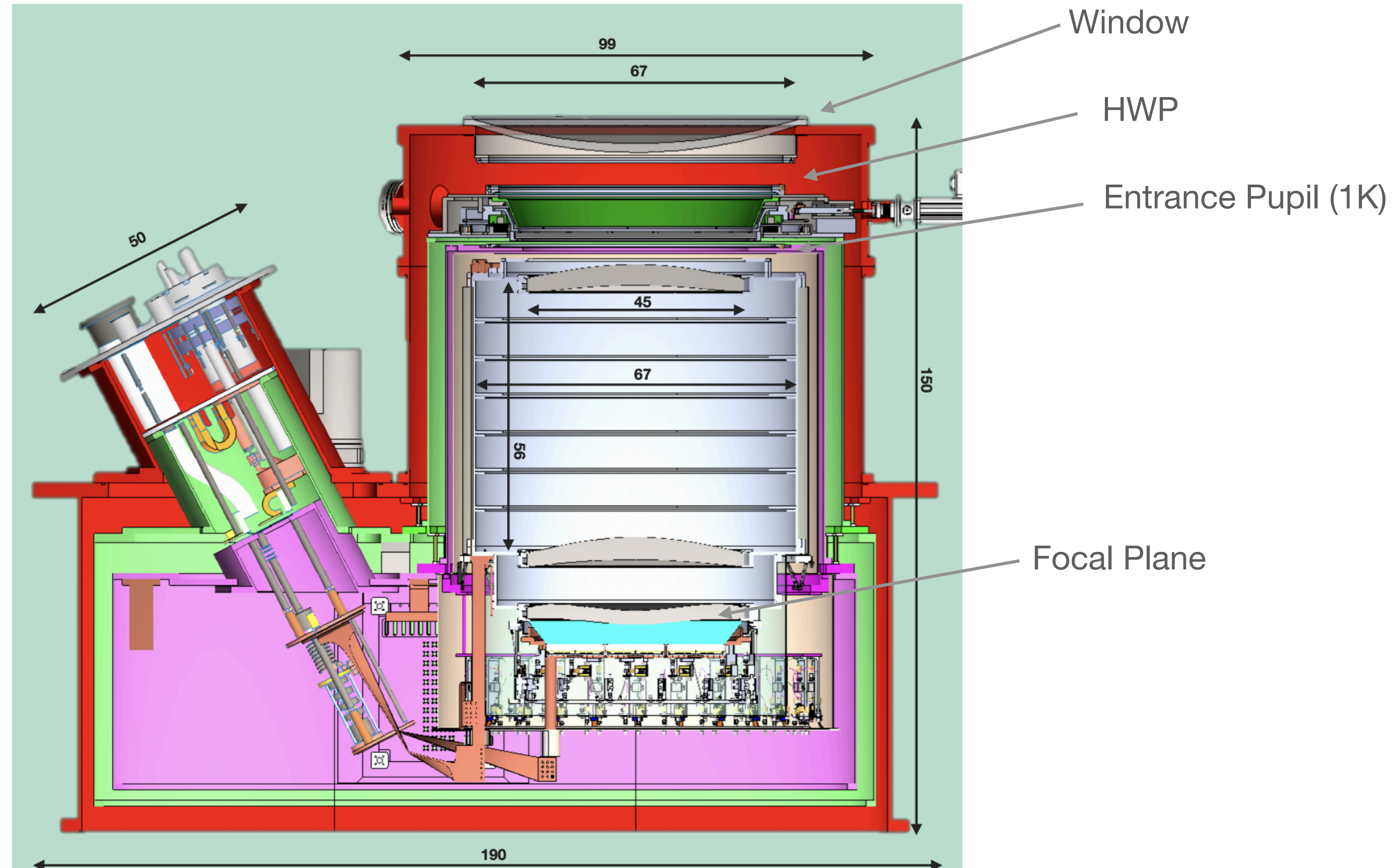
**Data Management**



# Technology: Instrumental view

## Key points:

- High Frequency Bands (200-400 GHz)
- Same Dilution.
- Cryostat Screen as close as possible to the US/UK Nominal.
- LEKID Technology (filled array configuration)



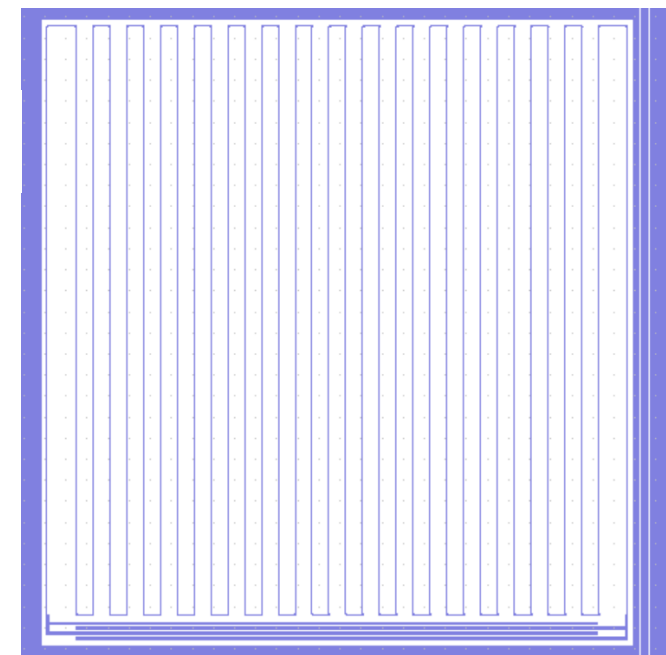
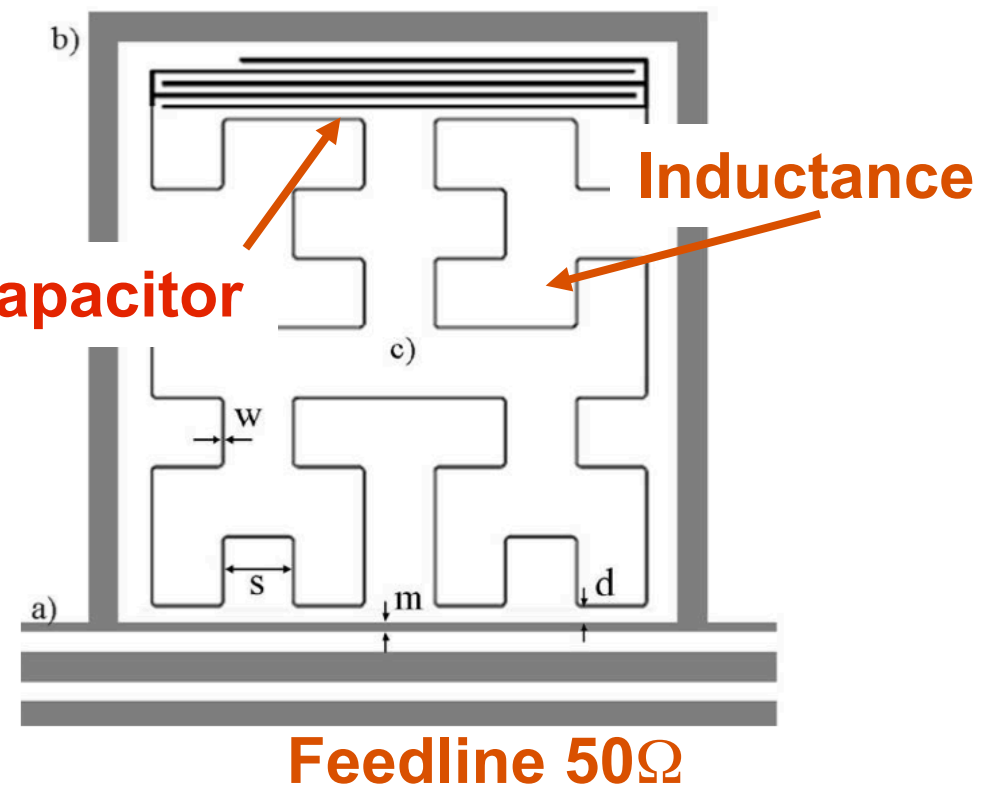


# KID Configuration for polarimetry

## Lumped Element KID

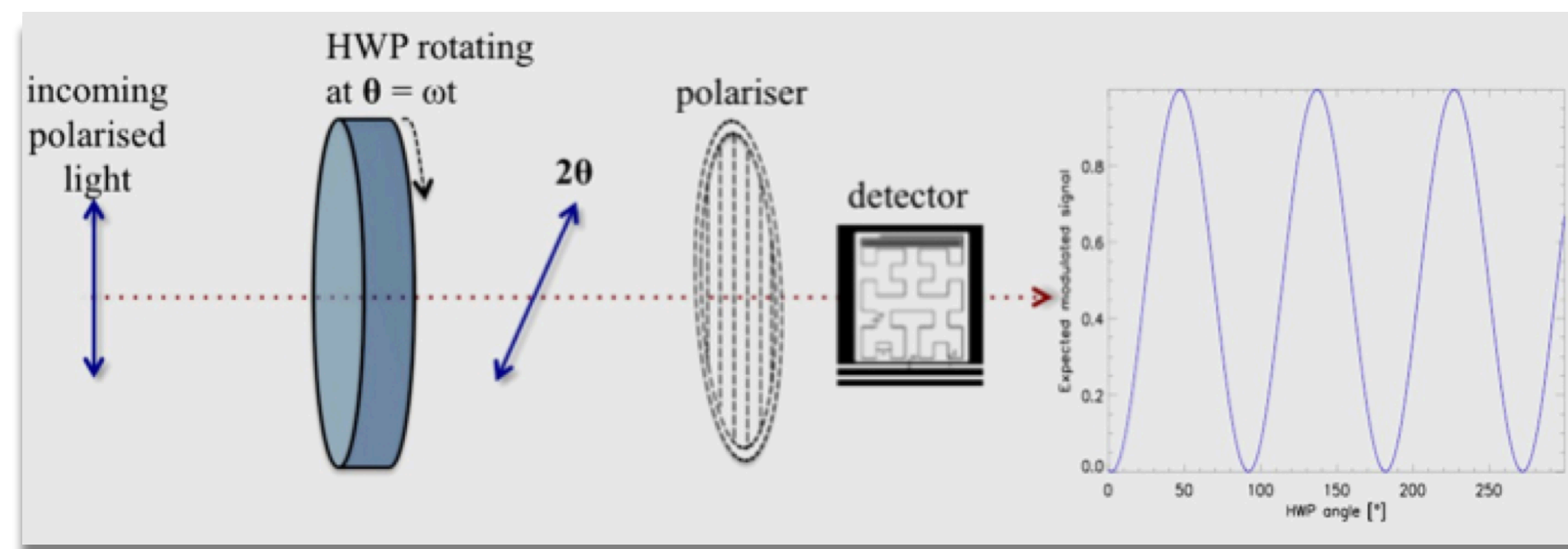
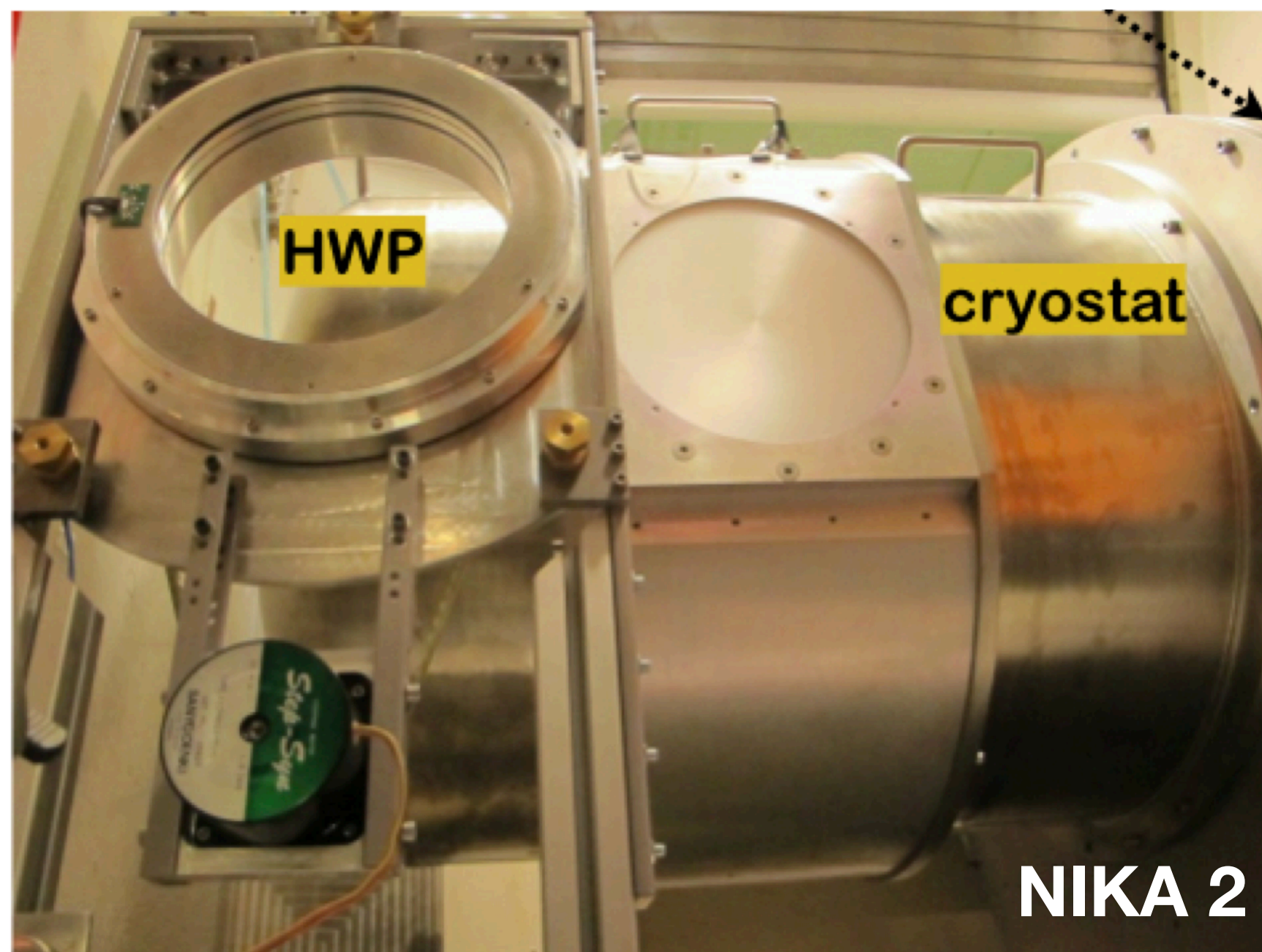
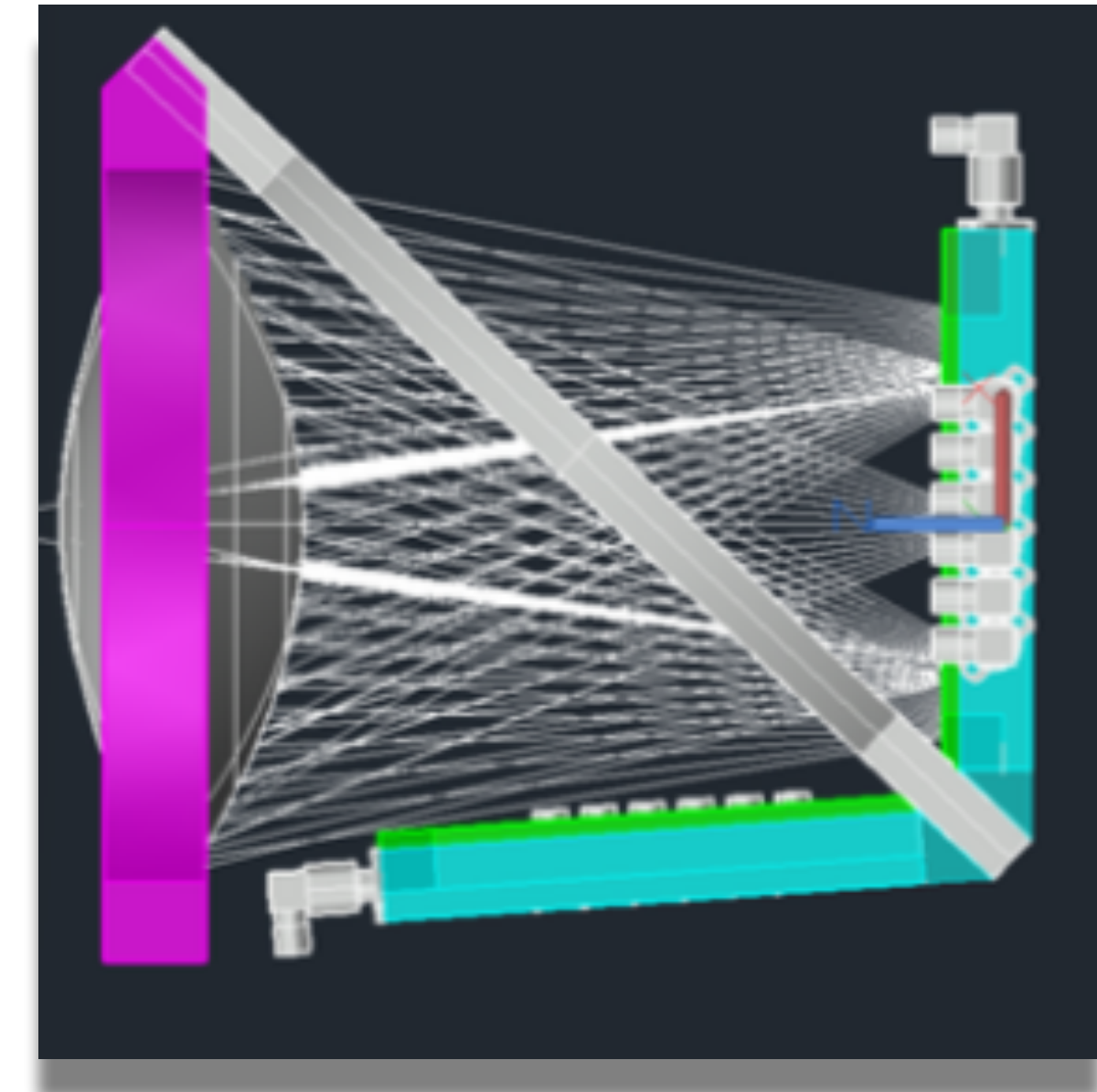
Dual Polarisation  
(3rd-order Hilbert pattern)

Single Polarisation



### Filled arrays LEKID:

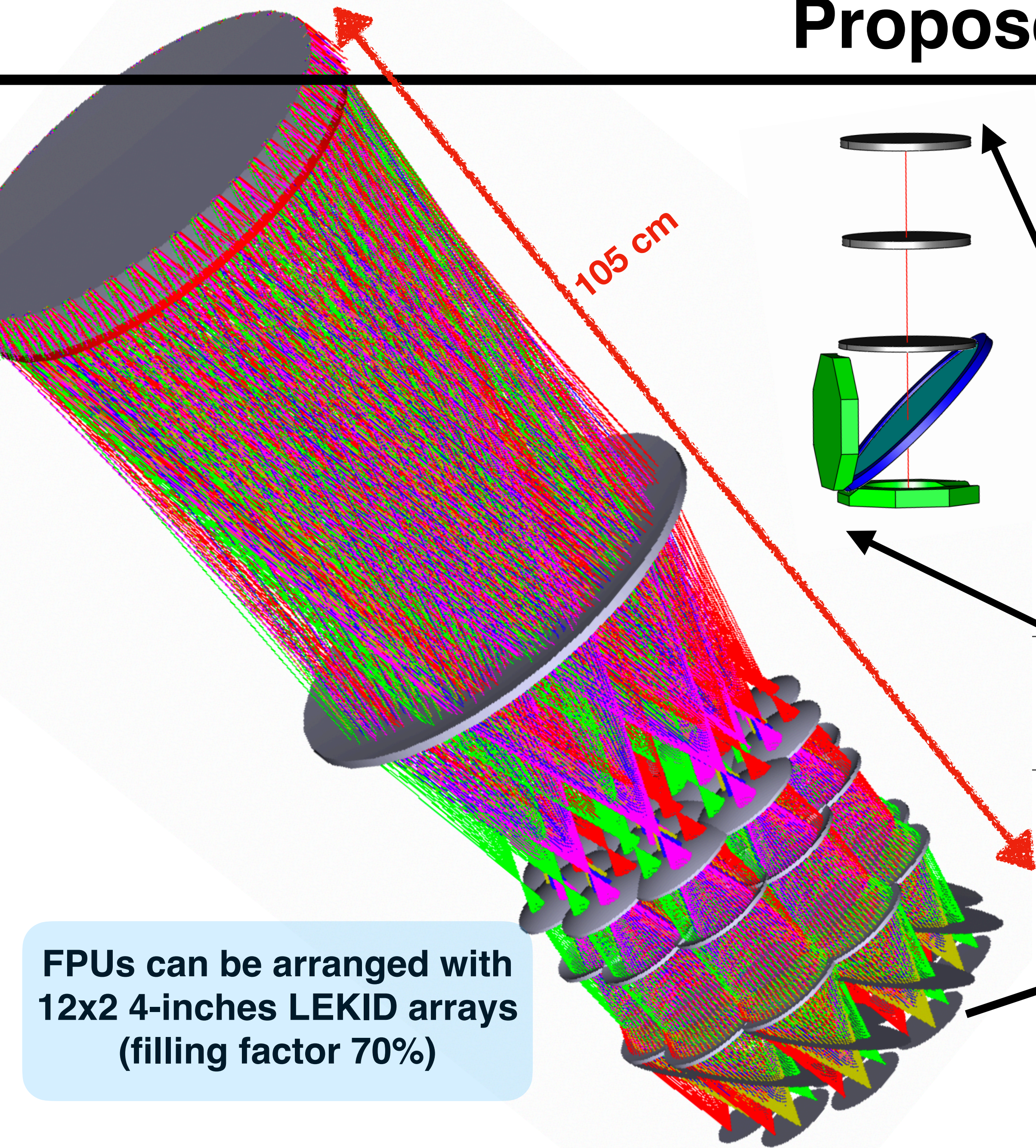
- Large filling factor
- Very high quantum efficiency in a 30% mm-band
- Easy to fabricate



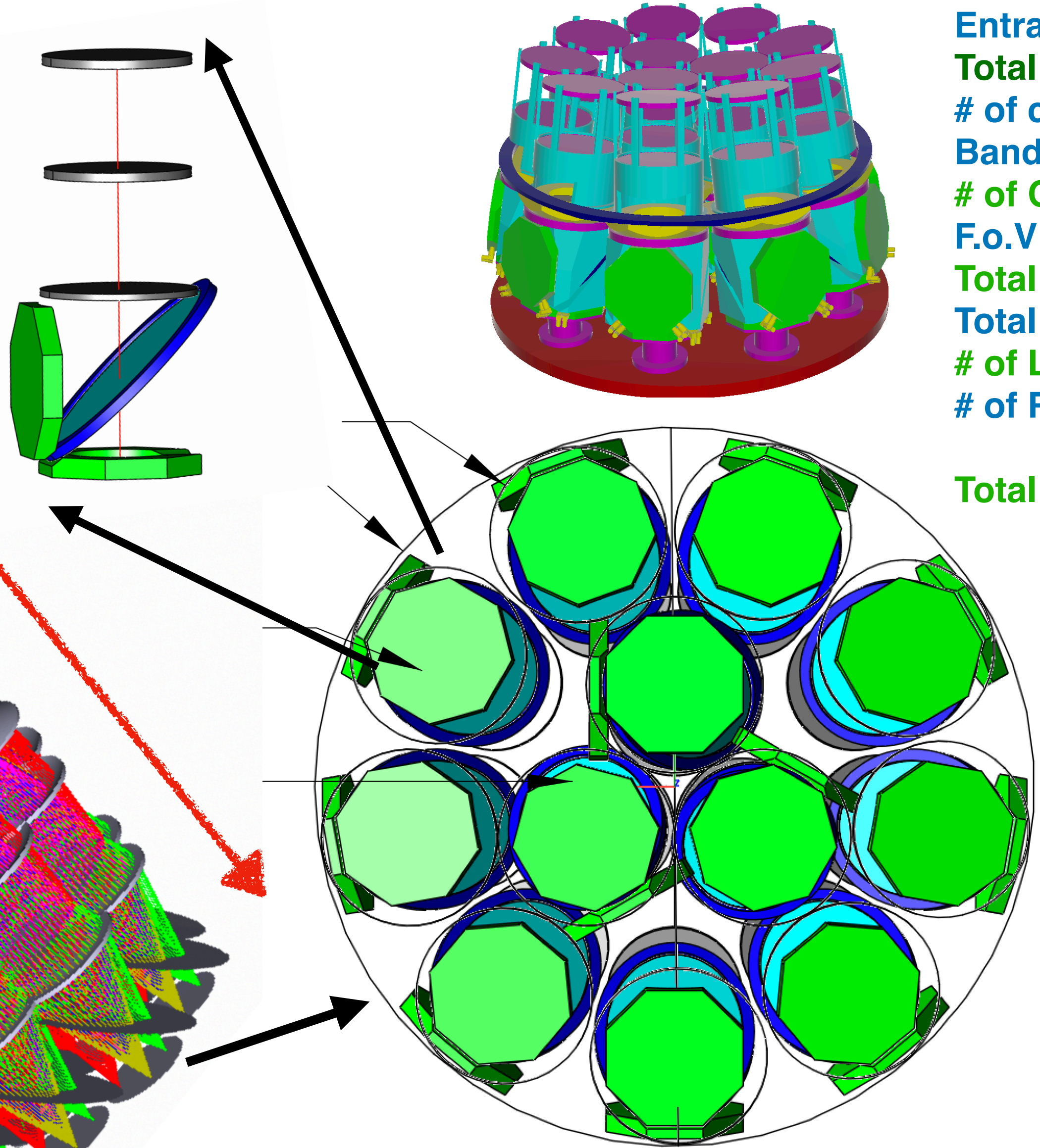
Continuous Rotation of an HWP permits quasi-simultaneous Observations of I,Q,U Stokes parameters



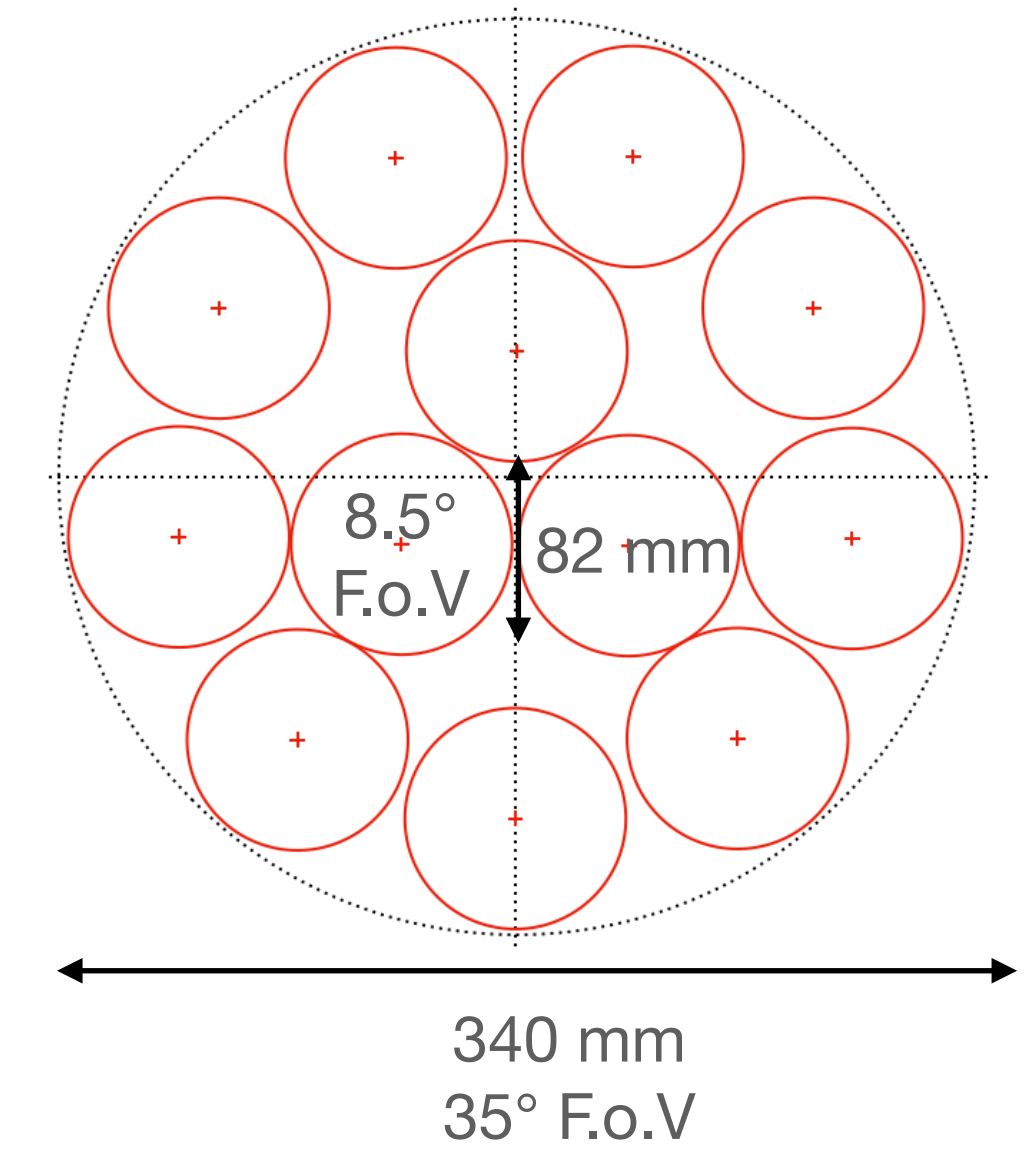
# Proposed Solution



FPU's can be arranged with 12x2 4-inches LEKID arrays (filling factor 70%)



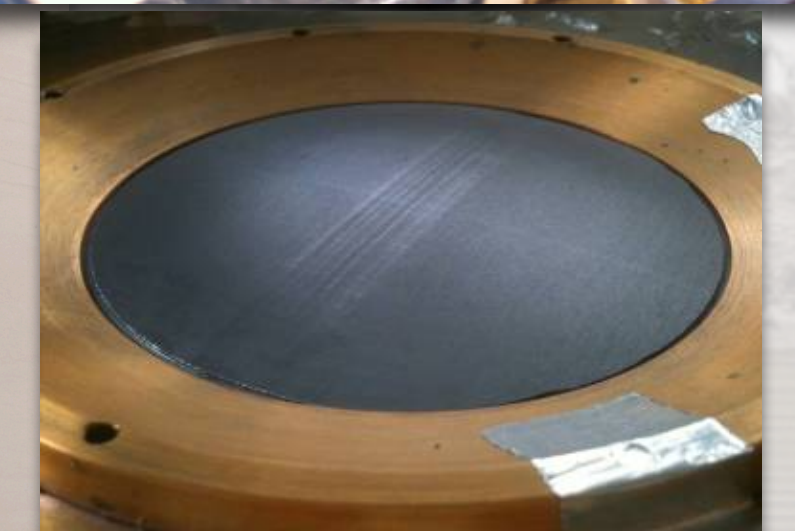
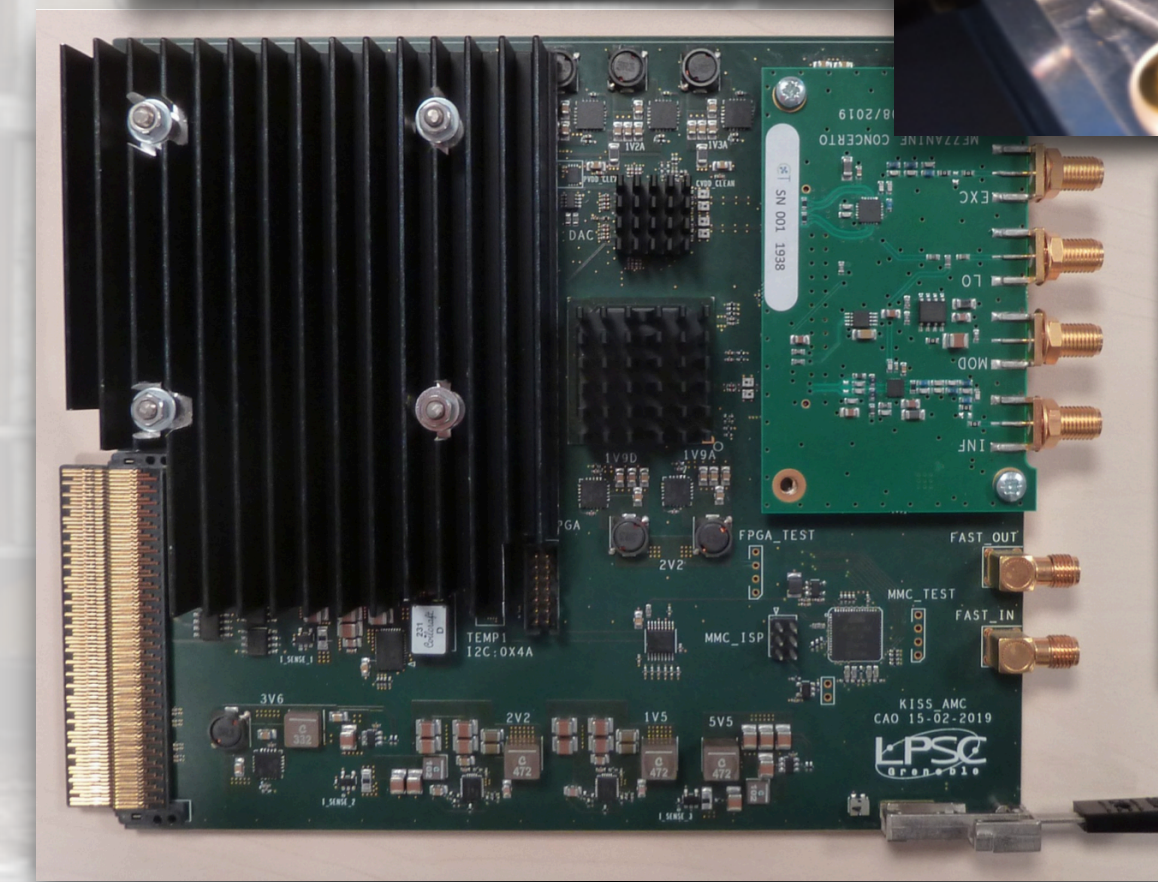
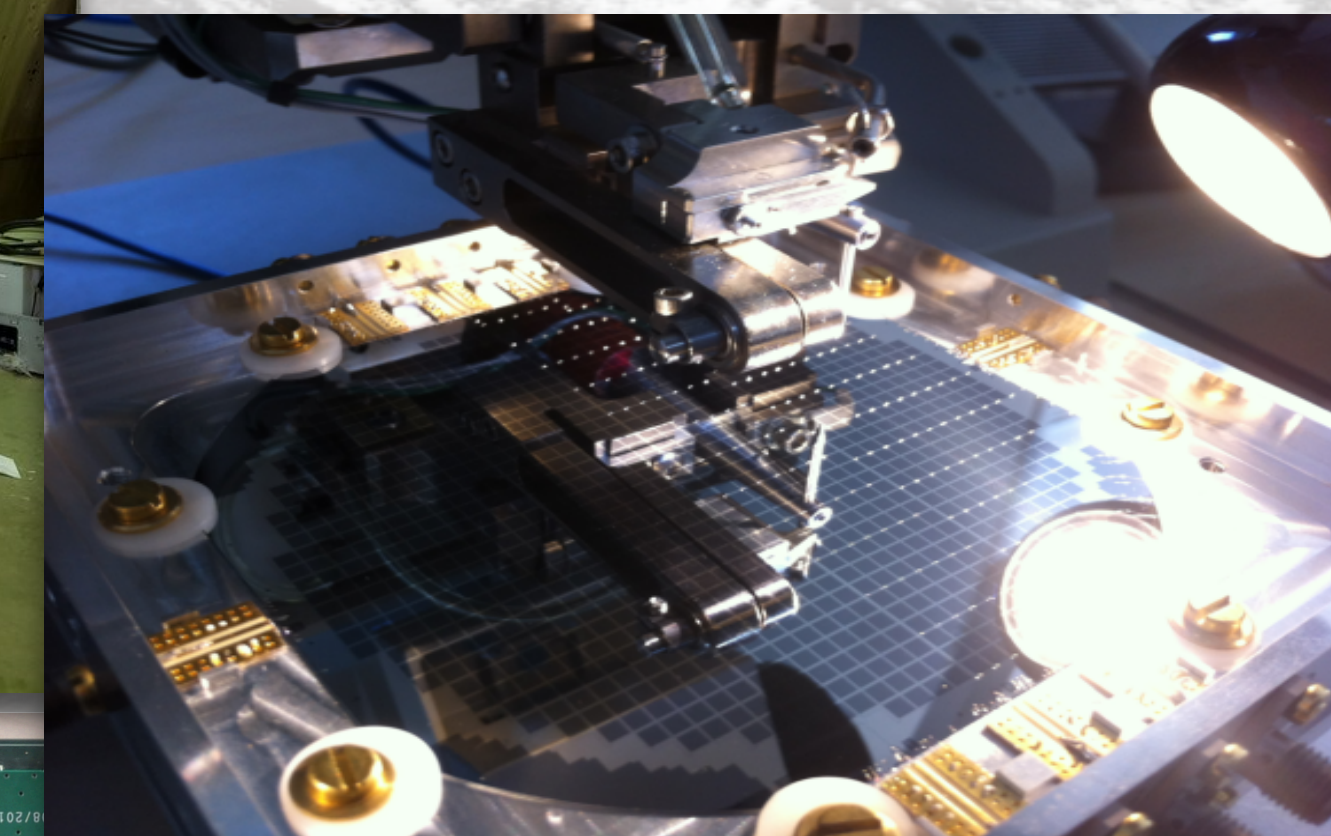
- Entrance Pupil = 420 mm
- Total F.o.V. = 35 Deg.
- # of channels = 2
- BandPass = 200-400 GHz
- # of Optical Tubes = 12
- F.o.V per Tube = 8.5 Deg
- Total # of Si lenses per Tube = 5
- Total # of Det. ~ 30k
- # of LEKID array = 24 (4-inches wafer)
- # of Readout Boards = 48  
(multiplex. Factor ~ 500)
- Total Data Rate ~ 100 MBytes/s





# Technological Effort

- **Platform:** Same Platform and shield from US fabricated in Germany (Vertex) → **Management**
- **Cryostat:** Same Cryostat from US with custom screens → **Management  
Design  
Integration  
Testing**
- **Detectors:** kpixel arrays → **Design  
Fabrication  
Testing**
- **Readouts:** About 50 Boards in 5-8 crates → **Design  
Fabrication  
Testing**
- **Optics:** HWP  
Si Lenses  
Filters → **Management  
Design  
Fabrication  
Testing**
- **Soft & Data:** Data Acqu.  
Real Time  
Data Manag. → **Management  
Develop.**





# Status & Perspectives

- **Potential Funding**

Participation to the CNRS *Accélération de la recherche à risque (ARR)* program to desing, install and commissioning the KID French SAT.

- **Discussion with SO steering committee**

Several discussions already done to find a common consensus on the project, at instrumental level (cryogenics, detectors, optical configuration, etc.) and on the scientific case. A review is planned on December the 7th.

- **Need to broaden current collaboration**

The instrument is supposed to run for about 10 years. Ensuring the operations, the analysis and the science data production is a big deal!