RIPTIDE

June 2024

Gen-Z **Learner's Dictionary**

Grindset: v. *intr. è* il mindset per il grind ahah grind è tipo macinare ma si usa anche per dire che ti metti sotto a lavorare. Tutti i veri sigma hanno il grindset.

RIPTIDE
(LAB report)

1) New optics characterization

2) Can we count α emission? (No)

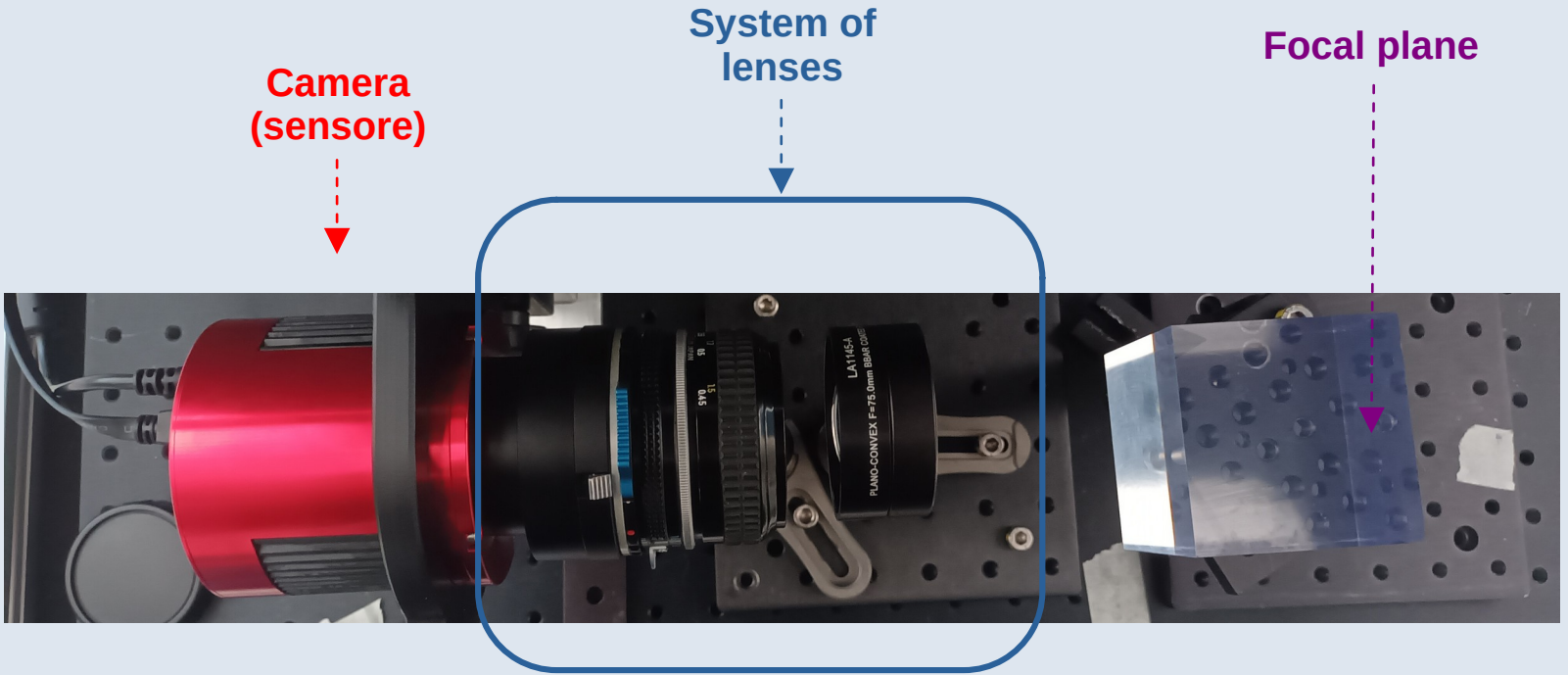
3) Sensor characterization using diffraction pattern

1) New optics
Objective

- To characterize FOV, DOF and *luminosity* of the camera.

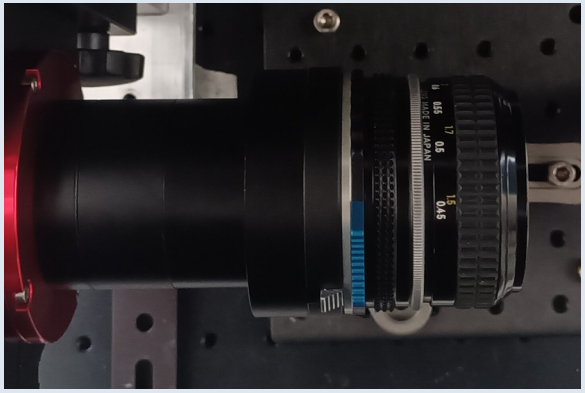
Definitions:
FOV: Field of View (Area di campo che riesco a vedere)
DOF: Depth of Focus (Profondità di campo – zona che riesco a mettere a fuoco)
Luminosity: The amount of light produced by a point source in focal plane that is collected by the optics.

1) New optics Setup



1) New optics
Different optics

Optics + spacer
(see next slides)

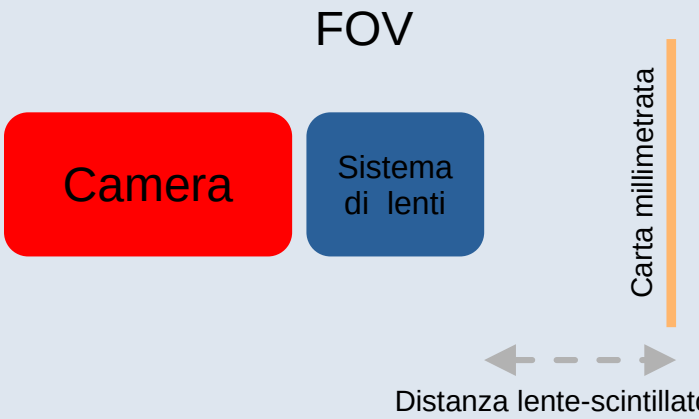


Optics

Two convex lenses
(see next slides)

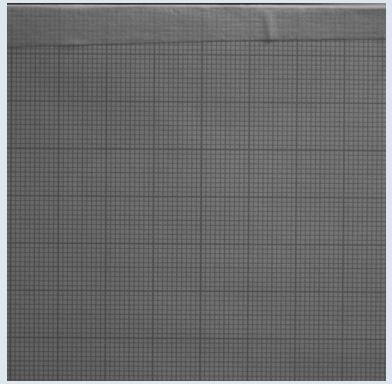
1) New optics
FOV and DOF

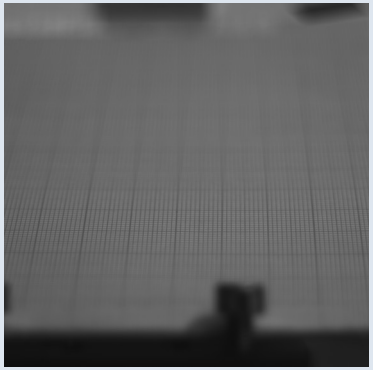
- FOV and DOF measured for each system of lenses



1) New optics
FOV and DOF

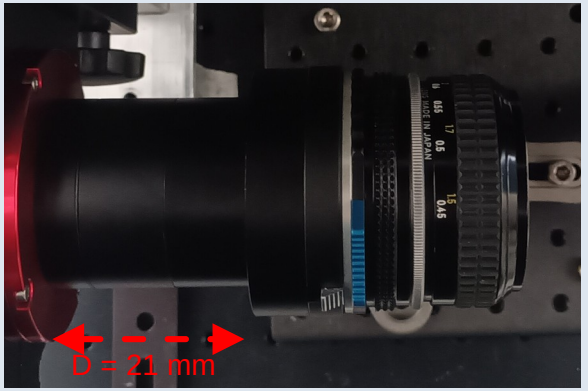
- *Lens-focal plane distance: 40 cm*
- *FOV: 80x80 mm*
- *DOF: ~30 mm*





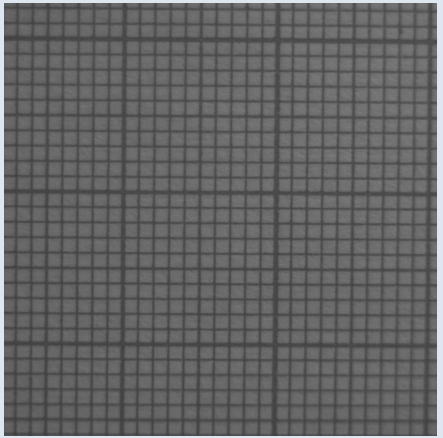
NB: di questo setup non è stata misurata la luminosità del setup perché la sorgente è troppo lontana (>40cm), quindi l'angolo solido era troppo piccolo

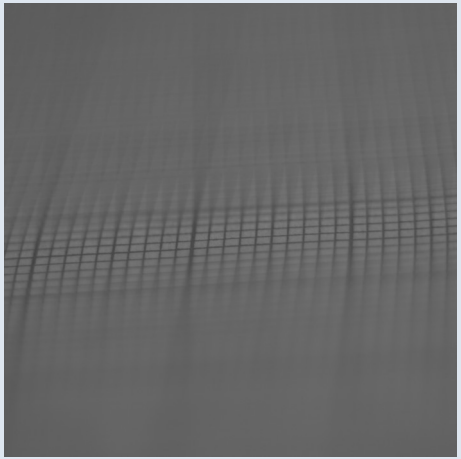
1) New optics
FOV and DOF



Per D = 21 mm

- *Lens-focal plane distance: 18 cm*
- *FOV: 30x30 mm*
- *DOF: ~10 mm*

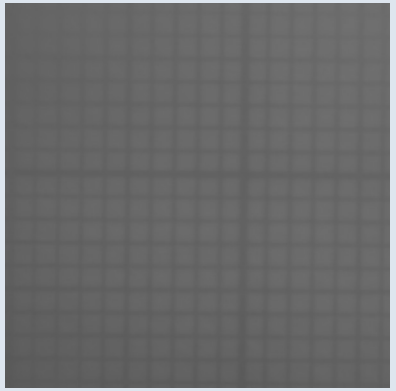




1) New optics
FOV and DOF

Per F1 = 75mm , F2 = 100 mm

- *Lens-focal plane distance: 18 cm*
- *FOV: 15x15 mm*
- *DOF: ~15/20 mm*

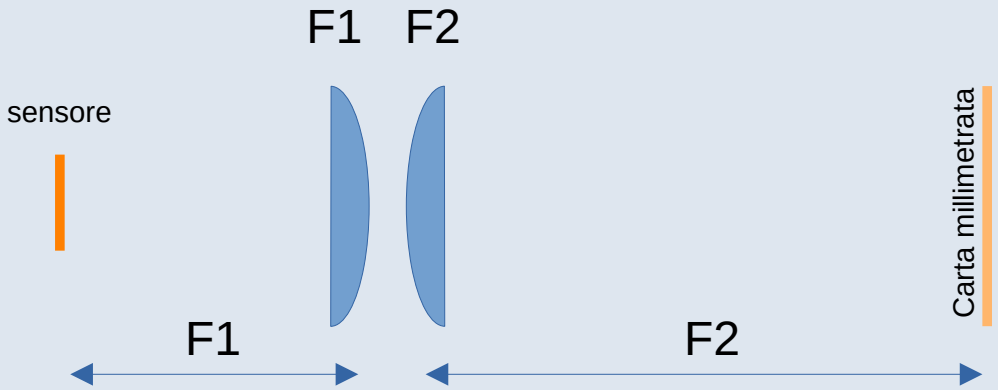


1) New optics more on two lenses

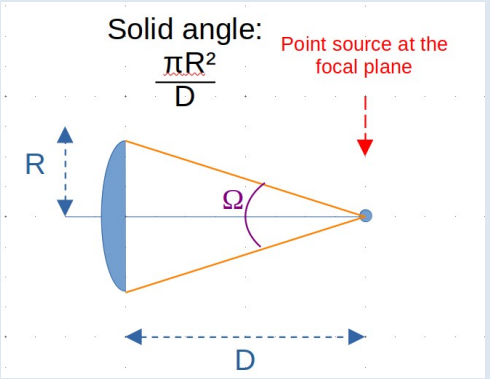
- The idea behind is the Ramsden eyepiece (RE) http://hyperphysics.phy-astr.gsu.edu/hbase/geoopt/eyepiece.html but, differently from RE, it has F1 ≠ F2
- Different values of F1 and F2 have been tested in order to find the best configuration

F1 = 75 mm
F2 = 100, 125, 200 mm

NB: F1 e F2 sono le lunghezze focali delle diverse lenti



1) New optics
Summary of setups



Tipologia lente	FOV (mm²)	DOF (mm)	Lens-focal plane distance (mm)	Solid angle (rad)	μ ± σ
Optics	80x80	~30	400	~0.004	
Optics + distan (21 mm)	30x30	~10	180	~0.02	
Due lenti: F75-F100	15x15	~17	~100	~0.19	
Due lenti: F75-F125	20x20	~30	~125	~0.13	
Due lenti: F75-F200	30x30	~40	~200	~0.05	

Lens radius: 25mm
Optics radius: 15mm

1) New optics
point source light acquisition

- With an α-source in the focal plane, 10 frames per configurations have been applied at different times (T) ad EM-Gain (G) values:

T = from 100 to 1000 ms + 2000 ms

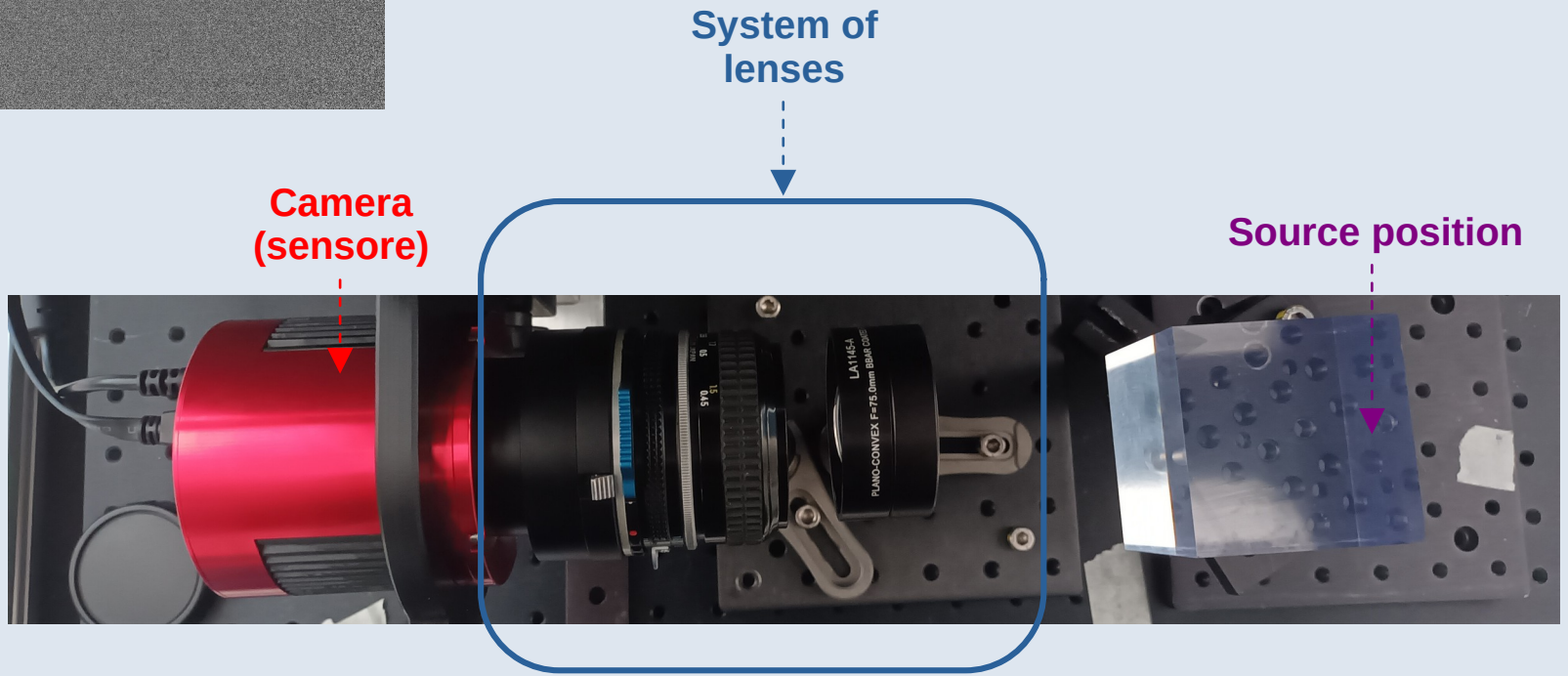
G = from 100 to 600 dB

1) New optics
point source light acquisition

EM-Gain: 500 dB
Time exposure: 2000 ms

This result is the mean of 10 frames.

NB: these data are still to be analyzed

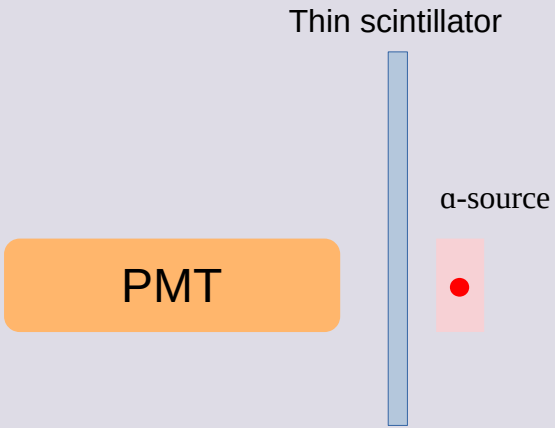


2) Can we count α emission? (No)

To understand whether it is possible to count the α-emission, we put the PMT face to face with the source, spaced with a thin scintillator.

Three measures:

- α-source Am241
- γ-source Cs137
- only with the scintillator (Dark current of the PMT + muons)



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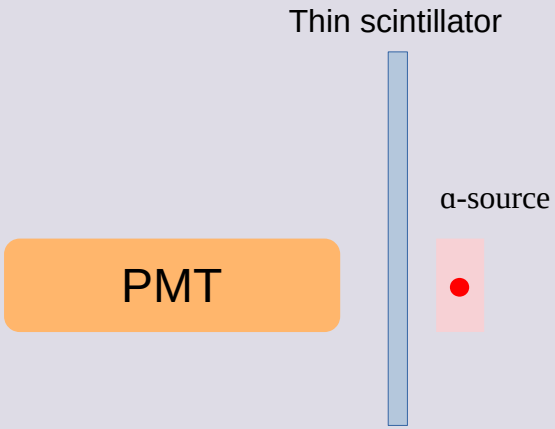
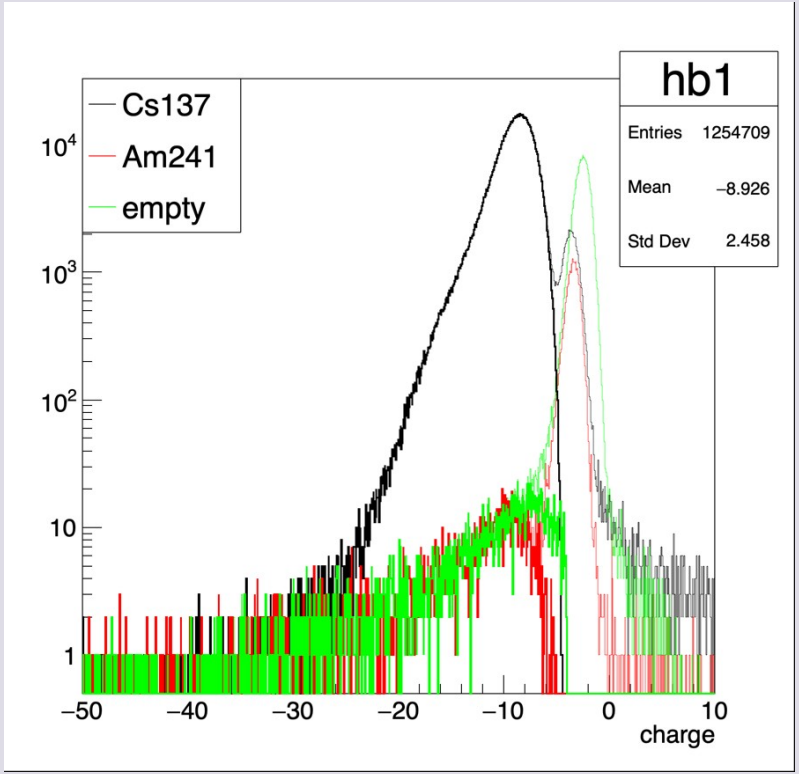


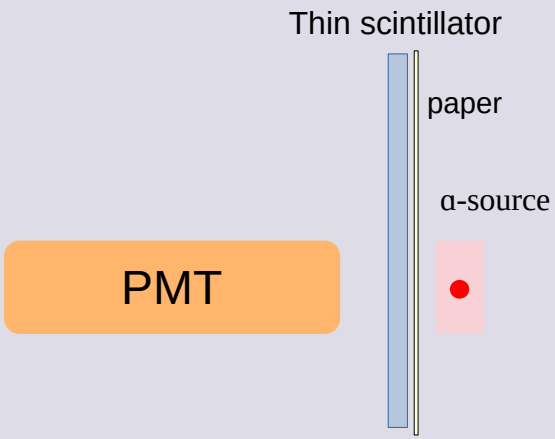


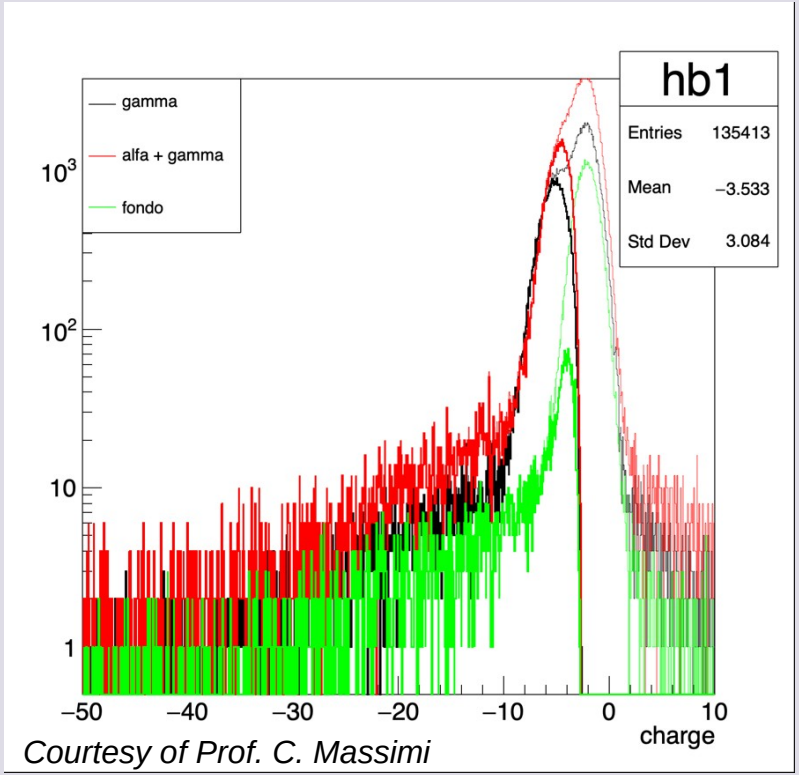
2) Can we count α emission? (No)

To understand whether it is possible to count the α-emission, we put the PMT face to face with the source, spaced with a thin scintillator.

Other three measures:

- α-source Am241
- α-source Am241 + sheet of paper (to stop α)
- only with the scintillator (Dark current of the PMT + muons)





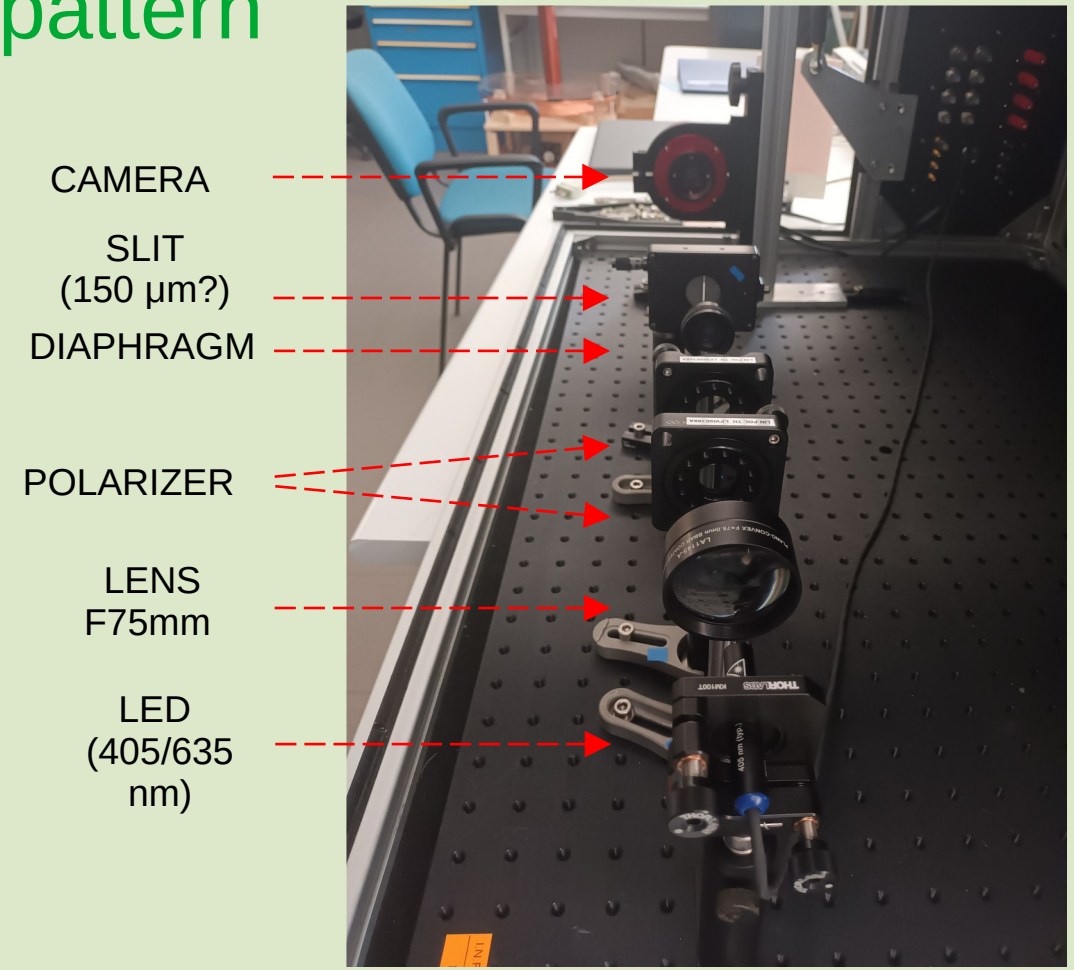
Courtesy of Prof. C. Massimi

3) Sensor characterization using diffraction pattern

- Distance slit-camera : 30.5 cm

We first counted the amount of photons / second with a photodiode as near as possible of the slit.

Then we looked at the diffraction figure in the camera sensor



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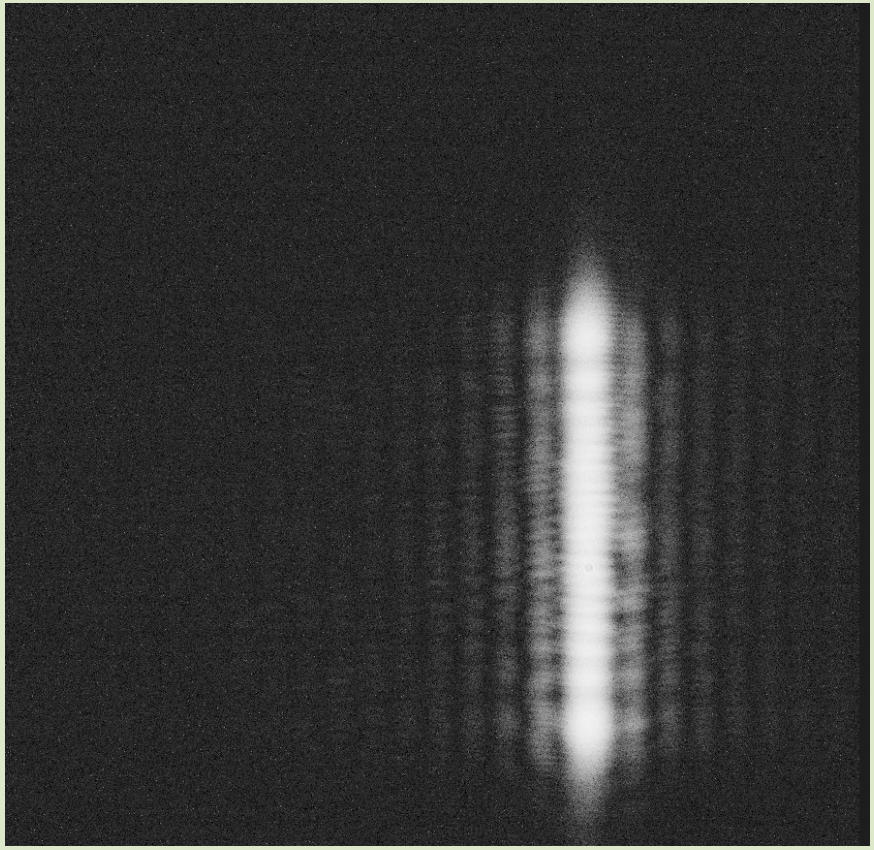

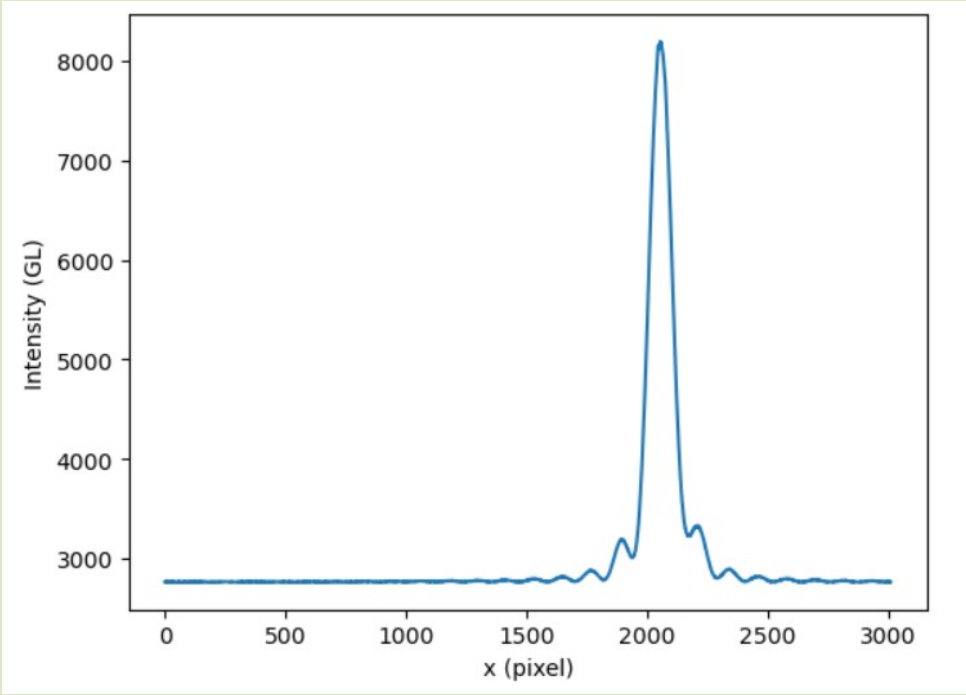

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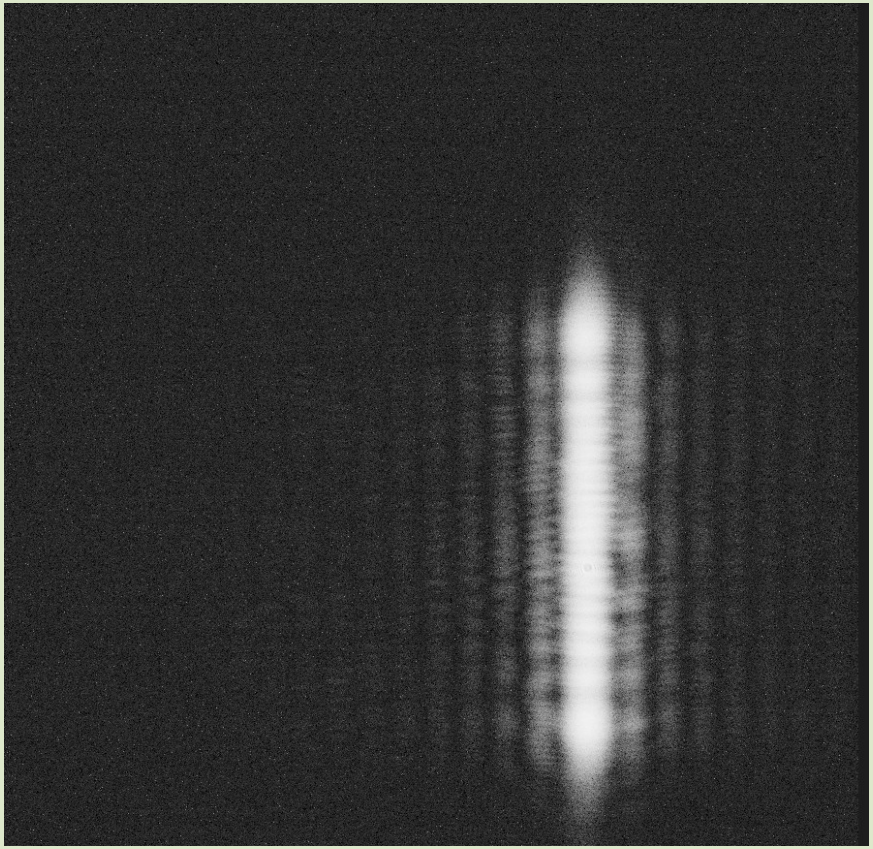

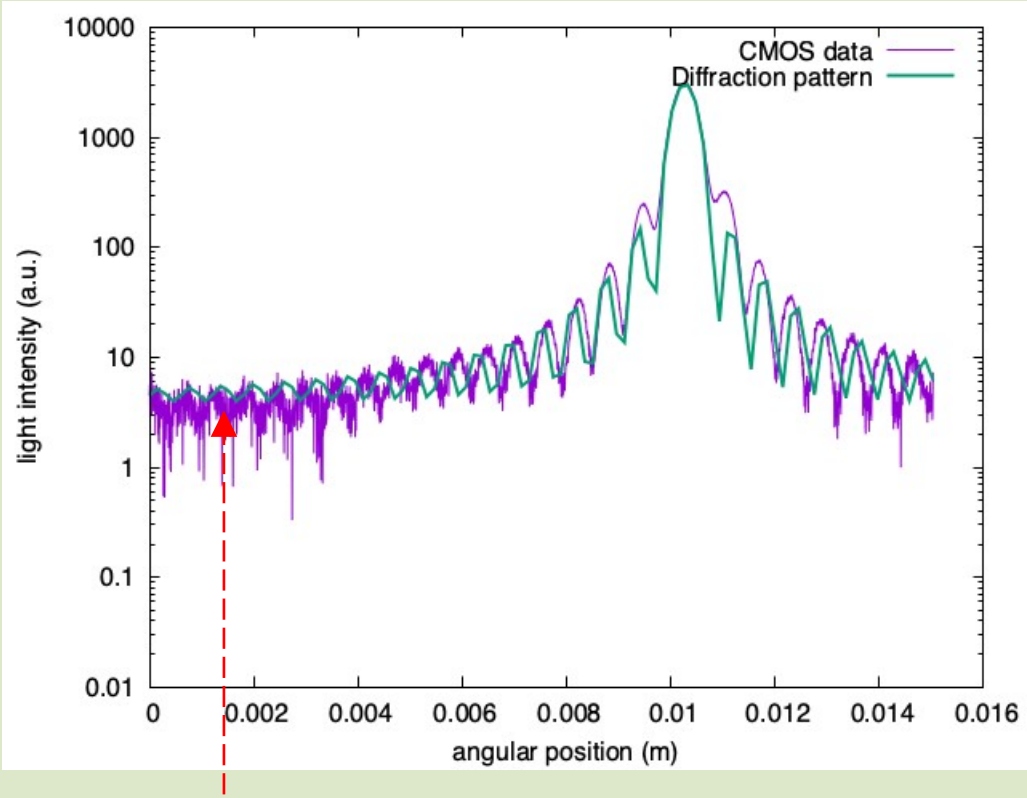

First estimation ~ 20 photons / pixel (TROPPI)

THE END

Are we ready for the MCP?
- Sensor: OK
- Optics: OK
- Lenses: OK
- Trigger: OK (*up to the second*)

TO DO:
- data analysis of everything (*next month(s)*)

Setup 2