

25th July 2023

pTP and DF characterization results

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Outline

Measurements summary

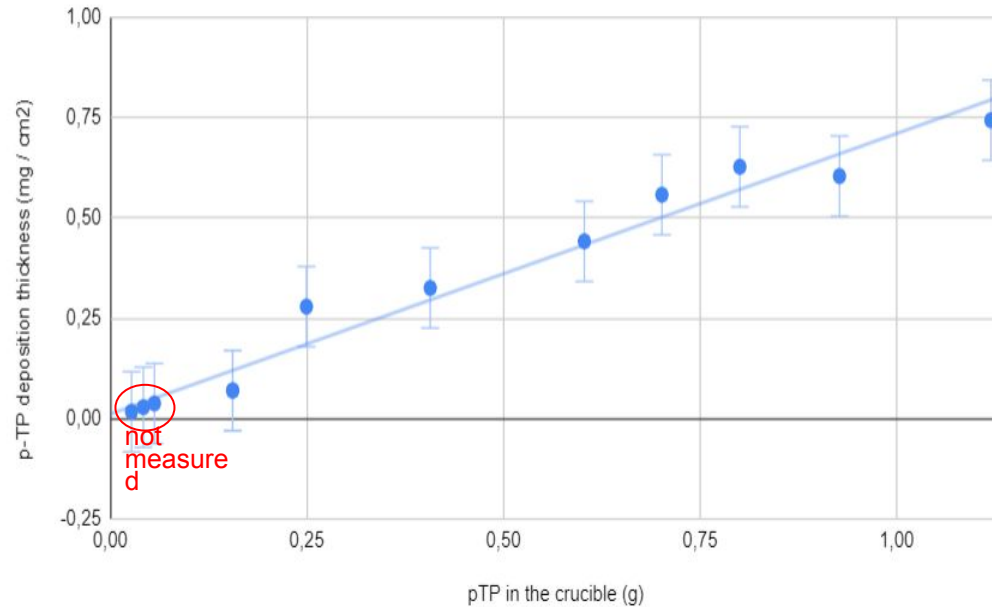
1. pTP deposition thickness
2. pTP efficiency VS thickness
3. DF efficiency measurement
 - a. samples distribution (16 samples from ZAOT may 2022)
 - b. sample homogeneity (single sample measured in 5 spots)
 - c. new pTP deposition (for comparison with Campinas deposition)

pTP thickness

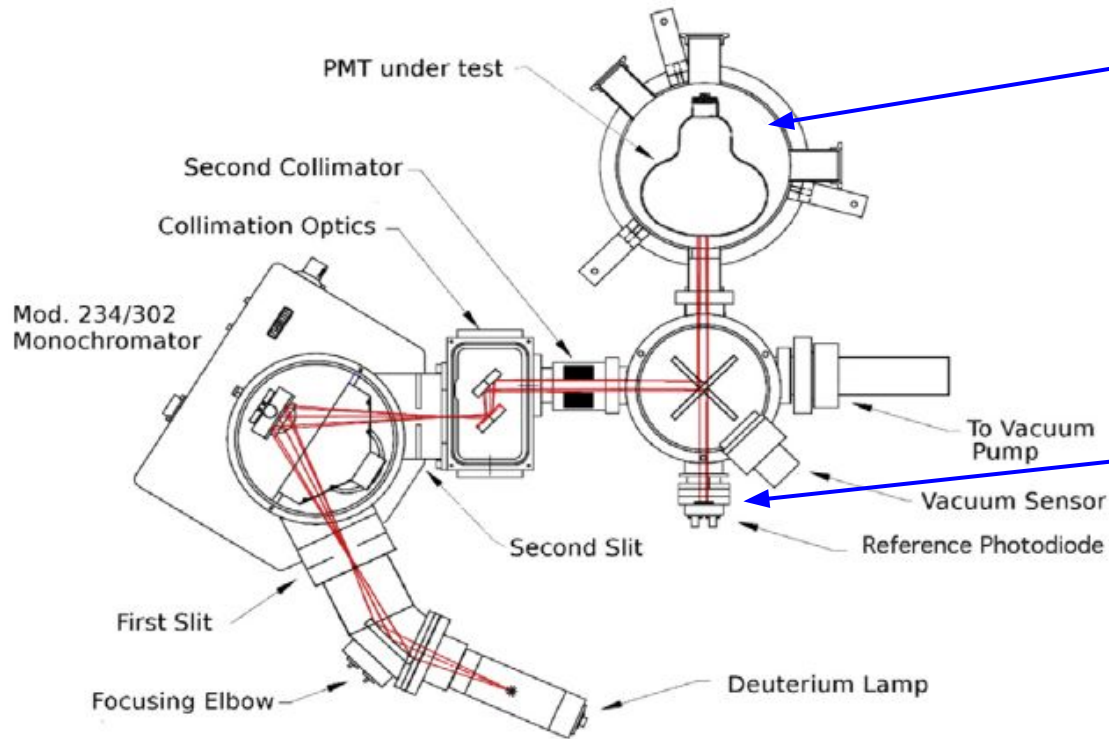


We have an apparatus to perform pTP depositions.

Used to evaporate **pTP on 1"-diameter 1mm-thick fused silica windows**, one per evaporation, at $T=235\text{ }^{\circ}\text{C}$.



VUV measurement strategy



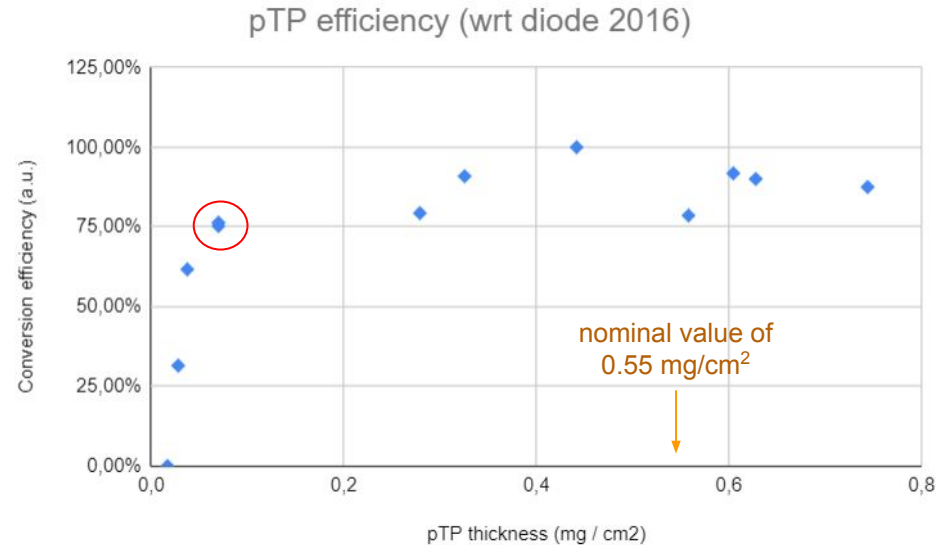
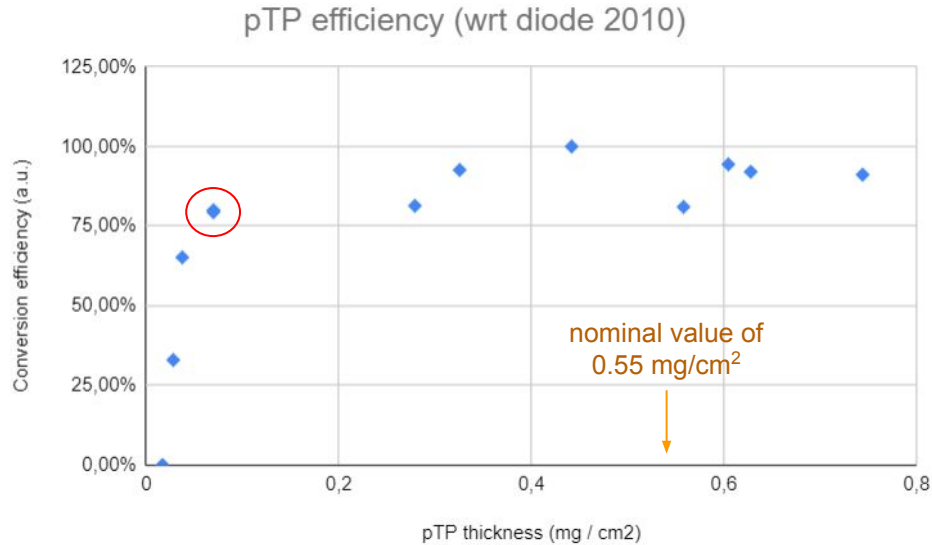
The **sample chambre** contains the PMT and sample (*window+pTP or window+pTP+DF*)

A **picoammeter** is used to measure both the PMT and the reference diode currents.

The current from the **diode** is used to compensate the lamp ageing, which constantly reduces the primary light (128 nm). For consistency check we repeated all the measurements with two different diodes

pTP efficiency VS thickness - *RELATIVE*

- Good consistency between the two diodes
- Efficiency plateau is reached between 100 and 200 $\mu\text{g}/\text{cm}^2$
- Good reproducibility (see red circle containing two measurements of the same sample)

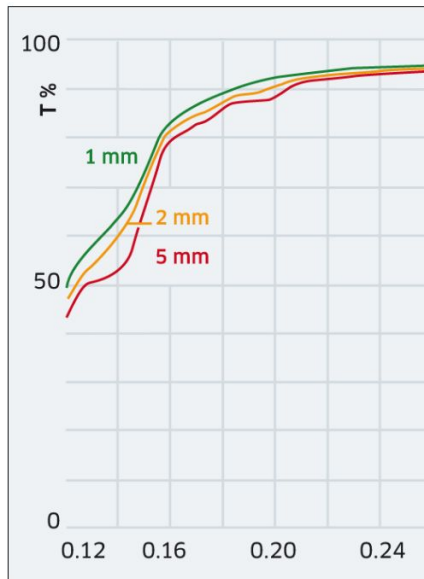


pTP efficiency VS thickness - *ABSOLUTE*

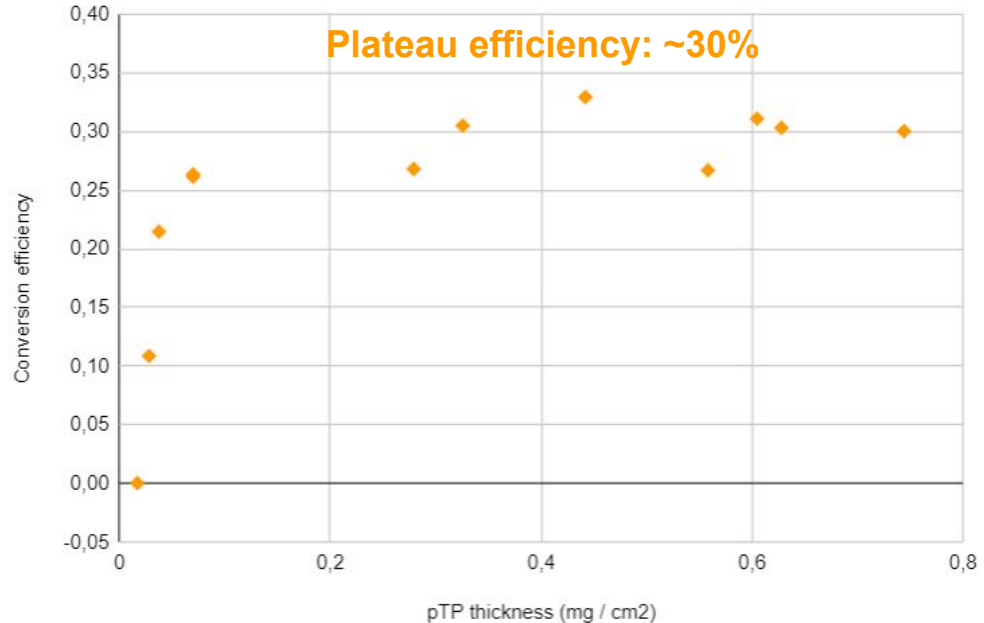
Absolute efficiency has been estimated by measuring the PMT current with no sample (pure 128 nm primary light) and assuming the following:

- **Same Q.E.** at 128 nm and 300-350 nm
- Transmission efficiency for 1 mm thick PMT window @ 128 nm of: **55%**
- Transmission efficiency for 1 mm thick PMT window @ 300-350 nm of: **95%**

(Reference diodes still used for source intensity normalization)



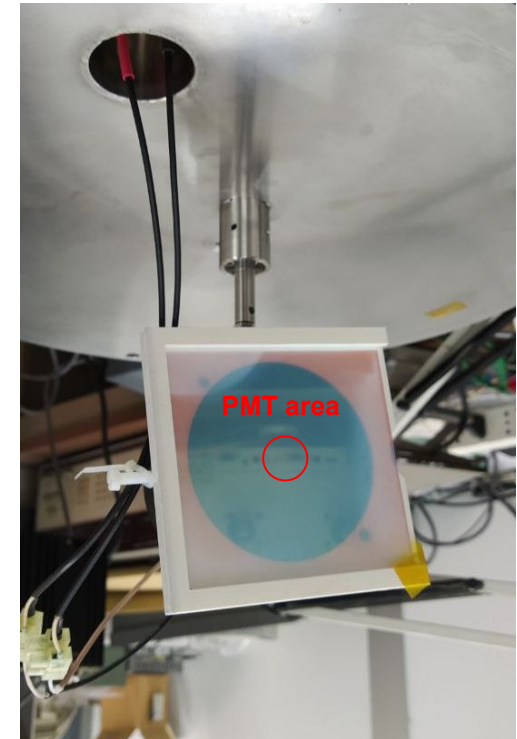
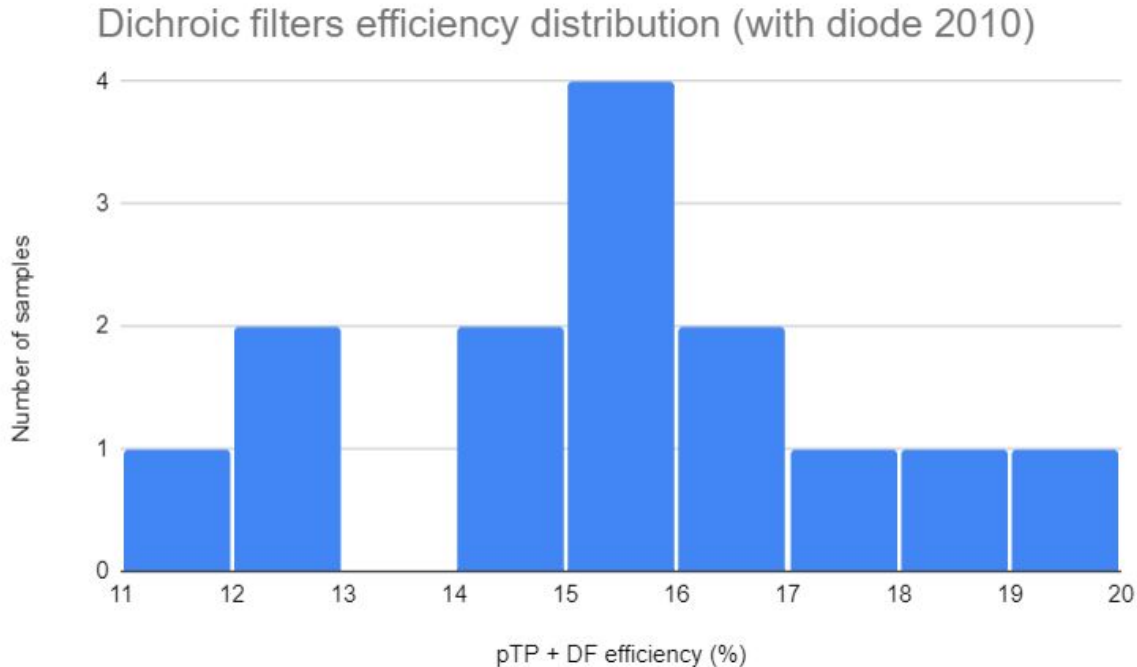
Transmission curve of Magnesium Fluoride



ZAOT - may 2022 dichroic filters

Efficiency evaluated on a circular area 1" in diameter, in the center of the filter.

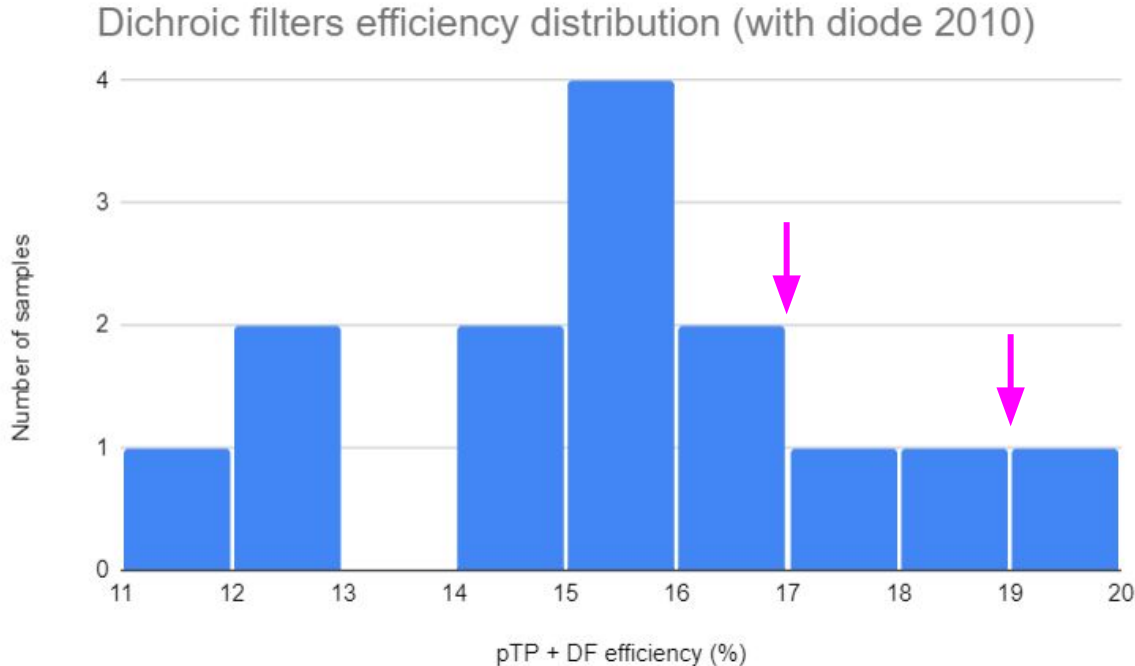
Samples: 14 filters by may 2022 ZAOT production (97 x 97 mm²), these are the ones with parasitic multilayer on the front side



ZAOT - may 2022 dichroic filters

Efficiency evaluated on a circular area 1" in diameter, in the center of the filter.

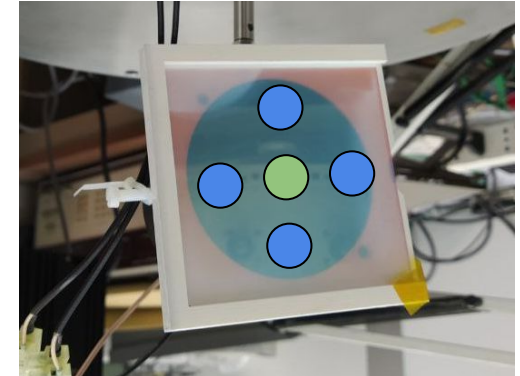
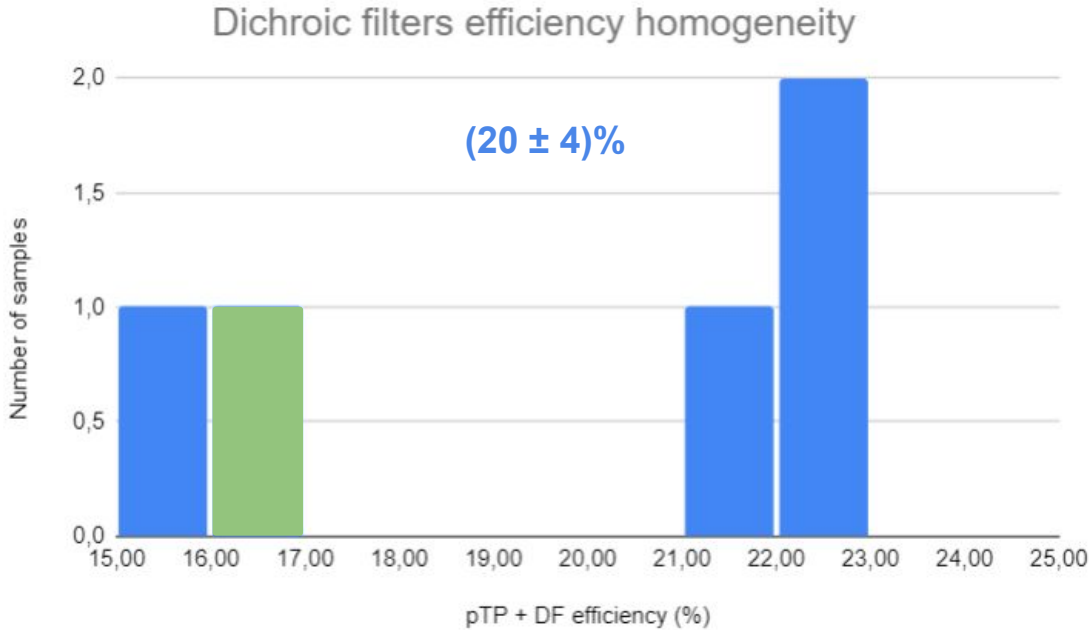
Samples: 14 filters by may 2022 ZAOT production (97 x 97 mm²), these are the ones with parasitic multilayer on the front side



The **two samples without parasitic multilayer** gave 17% and 19% efficiency (100 x 77 mm²)

DF homogeneity (Campinas pTP)

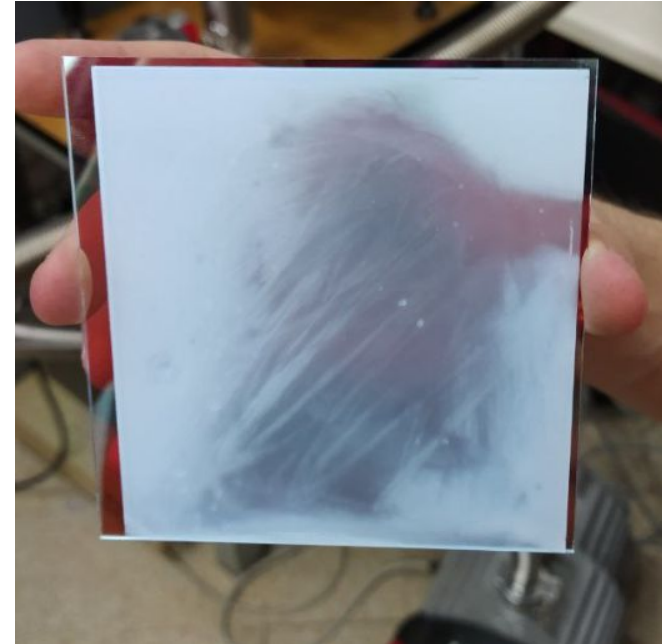
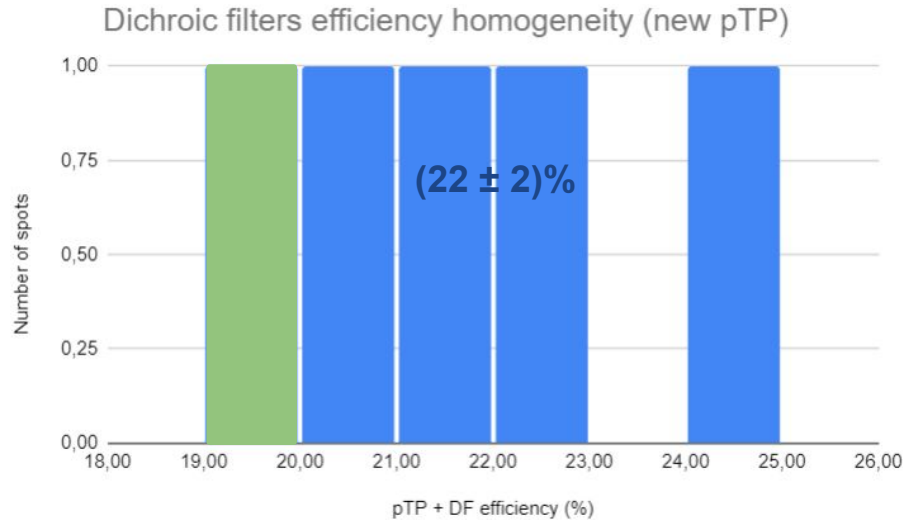
Efficiency evaluated on a circular area 1" in diameter, in 5 different positions



The central value was previously 20%... why?

DF homogeneity (new pTP)

We cleaned the original pTP from one of the ZAOT filters, and repeated the deposition.
Obtained thickness is $520 \mu\text{g}/\text{cm}^2$

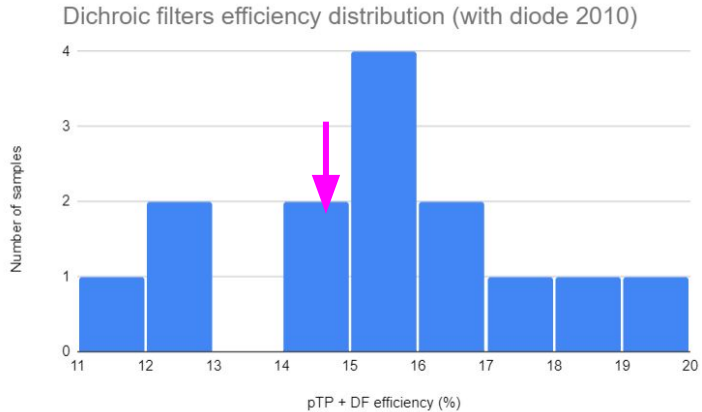


The central position now gave 19.9%.
With previous deposition is was 15.7%

“bad” deposition

pTP deposition clearly damaged (filter from OPTO, spring 2021)

The central position gave 14.7%
(not a big effect when compare to
other filters...)



Summary

1. pTP efficiency VS thickness:

30% efficiency plateau is reached **between 100 and 200 $\mu\text{g}/\text{cm}^2$**

2. DF efficiency measurement:

- efficiency distribution of 16 samples from ZAOT may 2022 (measured at the filter center):

values **from 11% to 20%** \rightarrow **(15 \pm 2)%**

- sample homogeneity (single sample measured in 5 spots):

values **from 15% to 23%** \rightarrow **(20 \pm 4)%**

- new pTP deposition measured again if 5 spots:

values **from 19% to 25%** \rightarrow **(22 \pm 2)%**