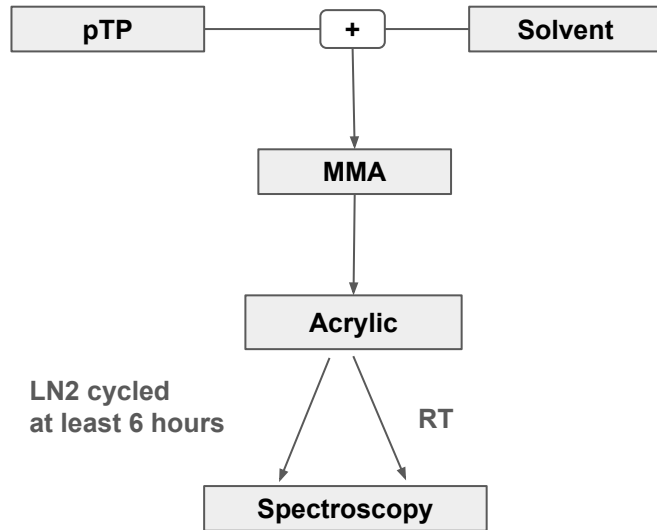


Update on the photodetector R&D

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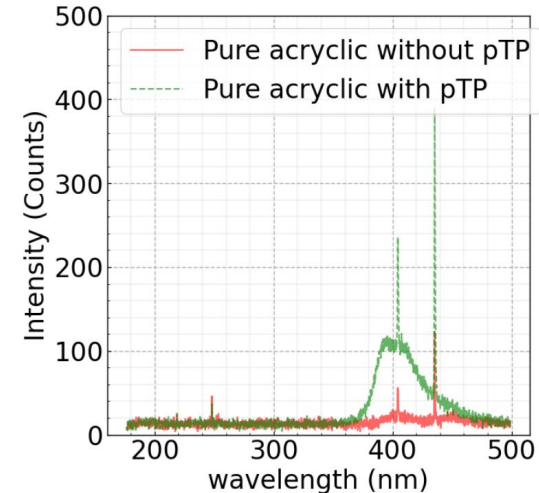
Motivation

- Developing a p-terphenyl (pTP) coating technique for APEX mass production using chemical deposition
- Simplify the detector design



Summary of previous status

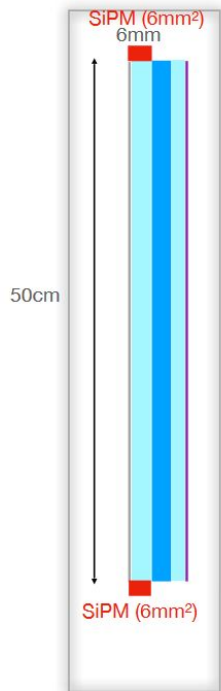
- The solvability of pTP in toluene as a solvent has been demonstrated
- The light shift from the chemical deposited pTP has been demonstrated



Proposed design of the Light trap

Proposed light trap in 2ton

[Reflector - WLS2 - LAr - PMMA - WLS1]
VIKUITI foil - PMMA (doped) - LAr - PMMA - pTP film



1st PMMA (for pTP deposit):

- Thickness of the acrylic: 5.5mm
- Thickness of the pTP in terms of density:
proposed = 100 - 200 $\mu\text{g}/\text{cm}^2$

2nd PMMA (blue WLS):

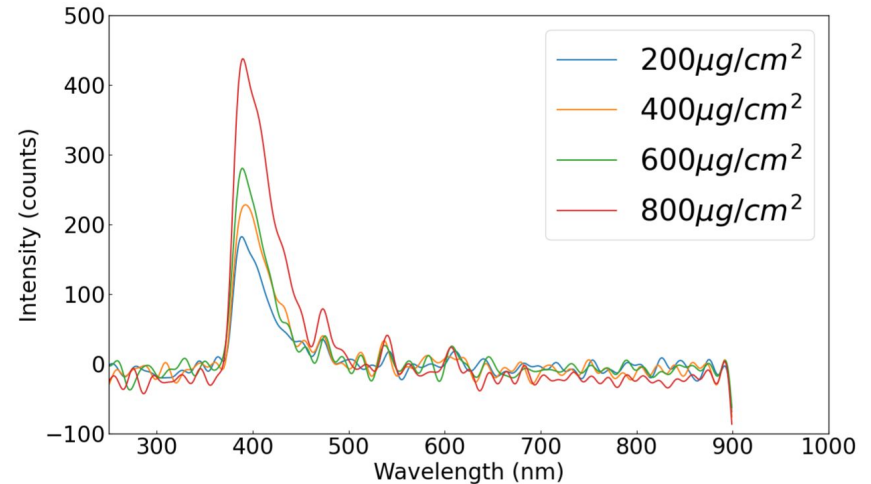
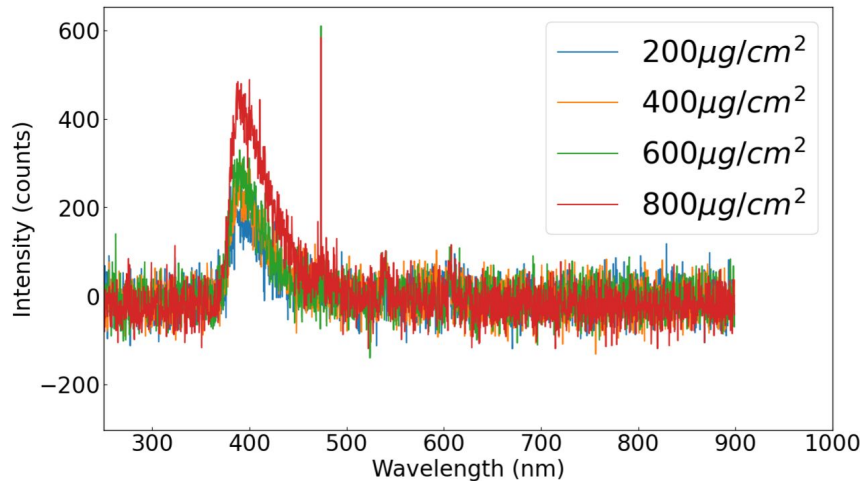
- Thickness of the acrylic: 5.5mm

Layer of LAr:

- Proposed thickness: 2mm

Chemical deposition of pTP on the PMMA

- We want to know the best concentration of pTP needed for the first wavelength shifting using the chemical deposition
- The concentration of pTP dissolved in the solvent was gradually increased from goal density $200\mu\text{g}/\text{cm}^2$ to $800\mu\text{g}/\text{cm}^2$ by $200\mu\text{g}/\text{cm}^2$



- The intensities are increasing with the concentration of pTP

pTP coating for the 50cm x 50cm acrylic

1st PMMA (for pTP deposit):

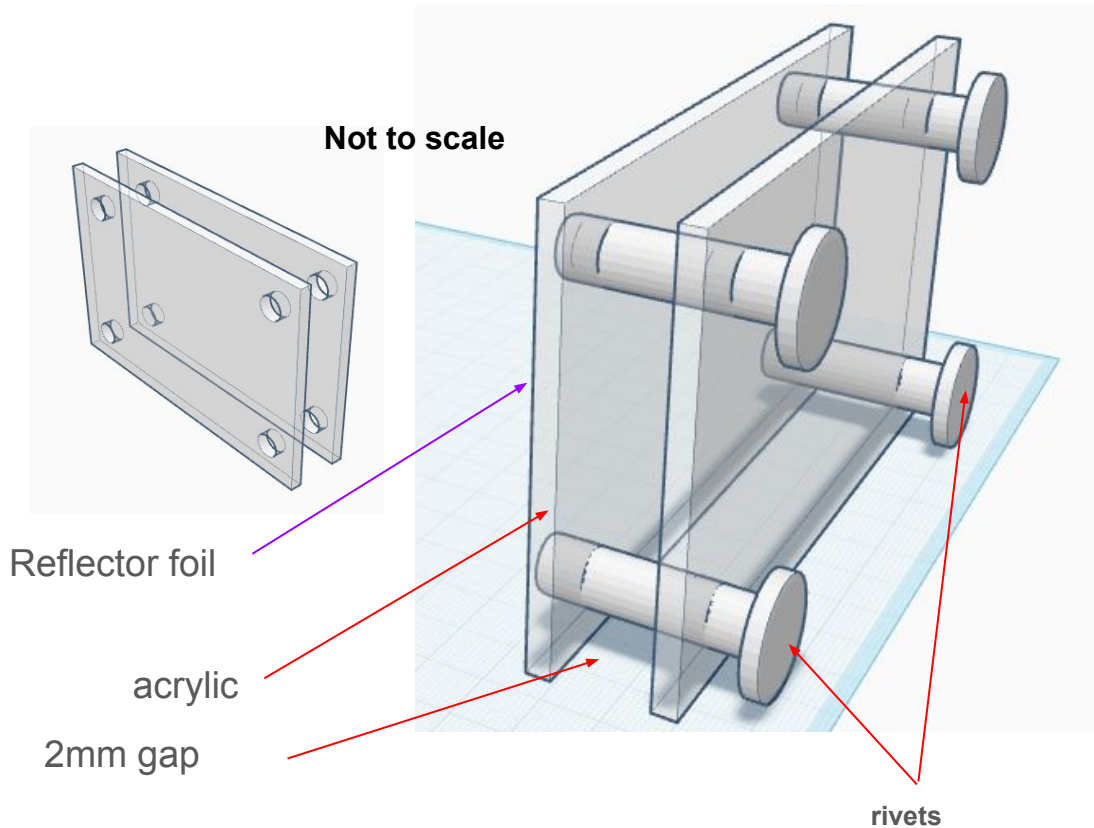
- to get $200 \mu\text{g}/\text{cm}^2$: we need 500mg of pTP, ~210mL of toluene, and ~130mL of MMA
 - The amount of MMA is still to be understood

Method of coating:

- Small sample: we brush the solution to the sample
- Large sample (50cm x 50cm): automated spray coating
 - Atomizer with an automated controller



Proposed design of the Light trap : using rivets



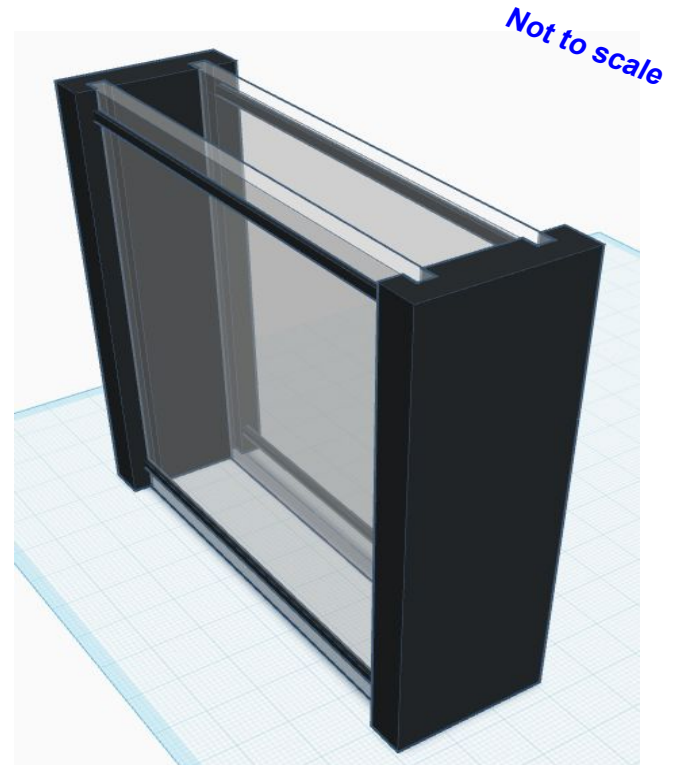
Are the 4 rivets at each corner enough to hold the two 50cm x 50cm acrylics at a 2 mm distance between each other ?

- The SiPM will be mounted on the edge of the second acrylic

Proposed design of the Light trap : using a frame

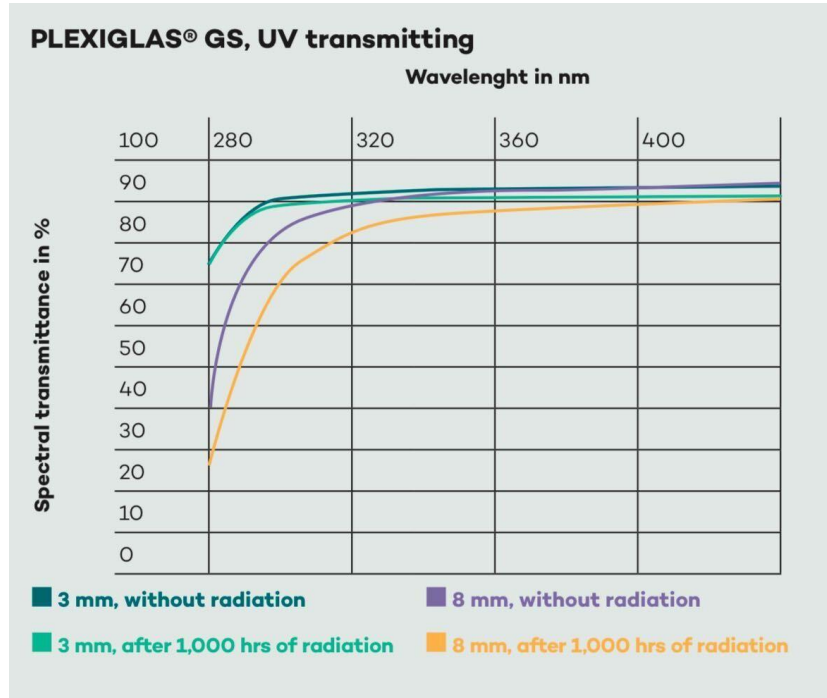
- Frame with two gaps to slide the acrylics.
- Distance between the two gaps: 2mm

We need to understand which design to choose: as simple as possible while maintaining the structure



Different thickness of the acrylic

- First prototype: acrylic with 5.5 mm thickness
- We are in touch with the company Polyvantis for a 3mm and 8mm thickness with very good transmittance



Summary and next steps

- The intensity of the shifted light increases with the p-terphenyl dissolved in the solvent
- Two designs with rivets and a frame for the first prototype have been proposed

Next steps:

- Develop the automated spray coating method
- Understand the effect of MMA under fixed toluene and pTP
- Practice the spray coating on the 50cm x 50cm acrylic using the $200\mu\text{g}/\text{cm}^2$ concentration of pTP
- Assemble the first prototype with the chosen design.