New Plastic Scintillators for future Light-based detectors

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PEN is a good candidate for new scintillators* [3];

PET has a good recovery [4].

Possibly radiation-harder;

	PEN	BC-408	PET
Light Output (photons/MeV)	~10500	~10000	~2200
Wave length máx. emission (nm)	425	425	370

PEN - Polyethylene naphthalate
PET - Polyethylene terephthalate

*Competitive light yield;

Manufacturing

samples produced at IPC/UMinho

Phase 1

Extrusion of tape sample

- PEN
- PET
- PET:PEN (90:10)
- PET:PEN (50:50)
- PET:PEN (10:90)

Phase 2

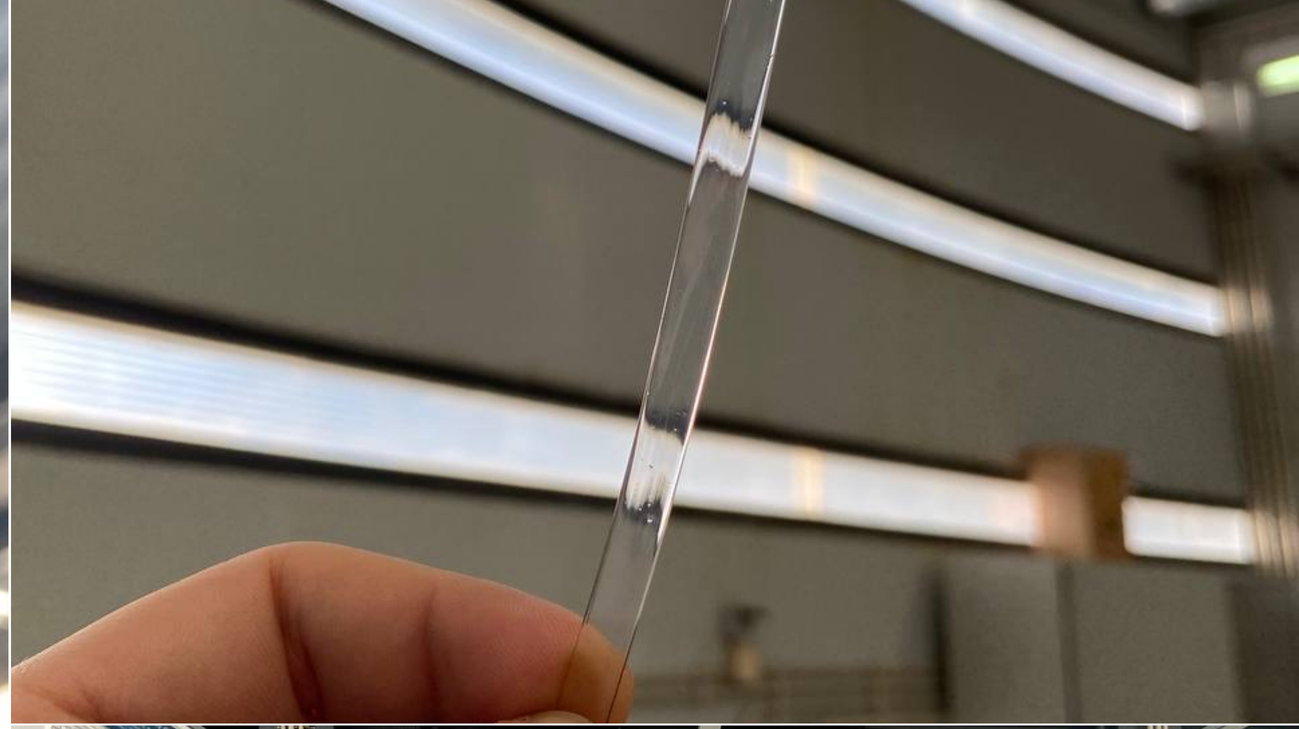
First injection of the butterfly sample

- PEN
- PET

Phase 3

Optimised injection

- PEN
- PET



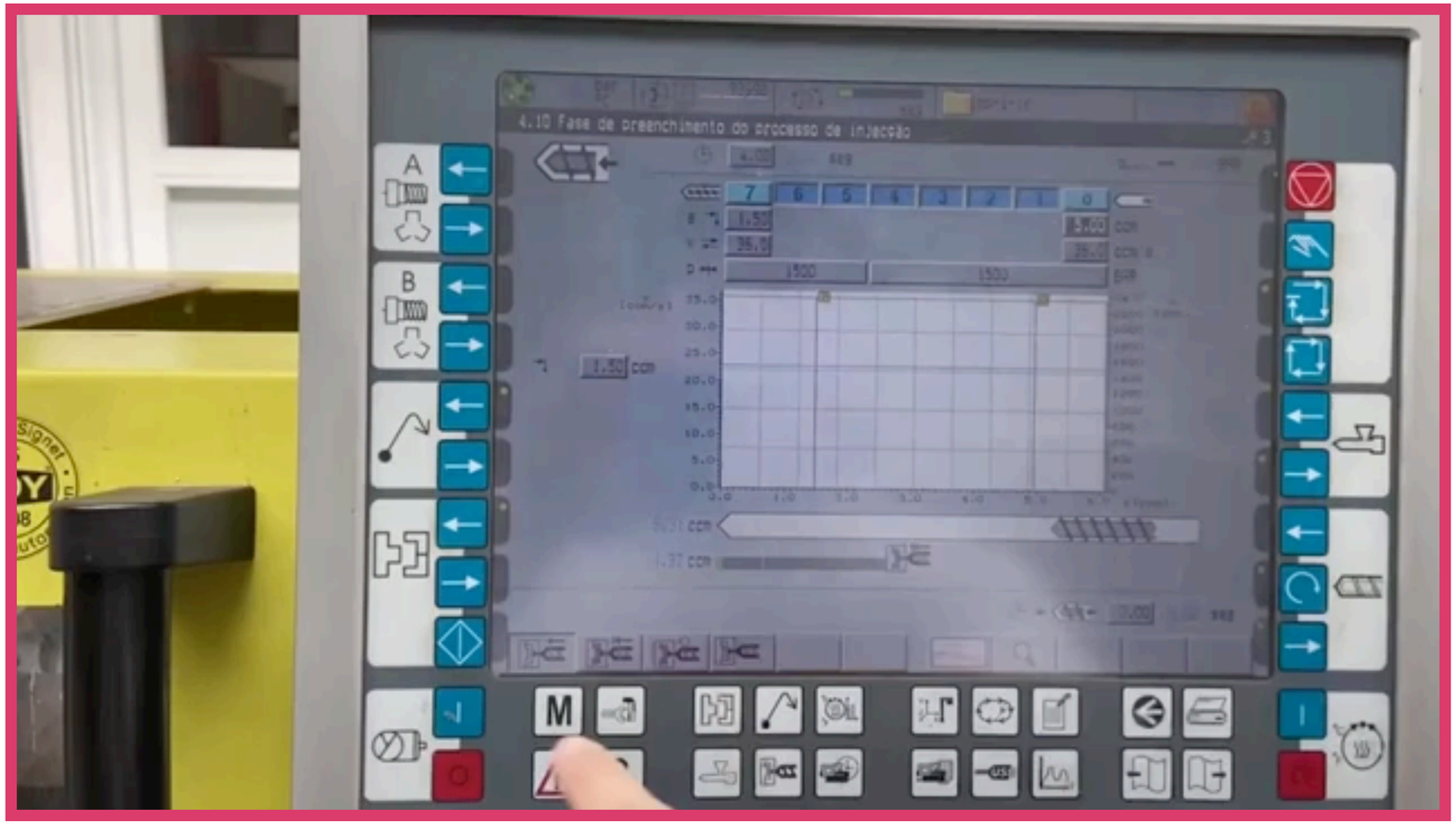

Procan ALPHA

Injection Moulding

samples produced at IPC/UMinho using BOY 12A

Parameters

- Dosing
- Injection speed
- Pressure
- Cooling time
- Cooling temperature
- Melting temperature
- Mold Polishing

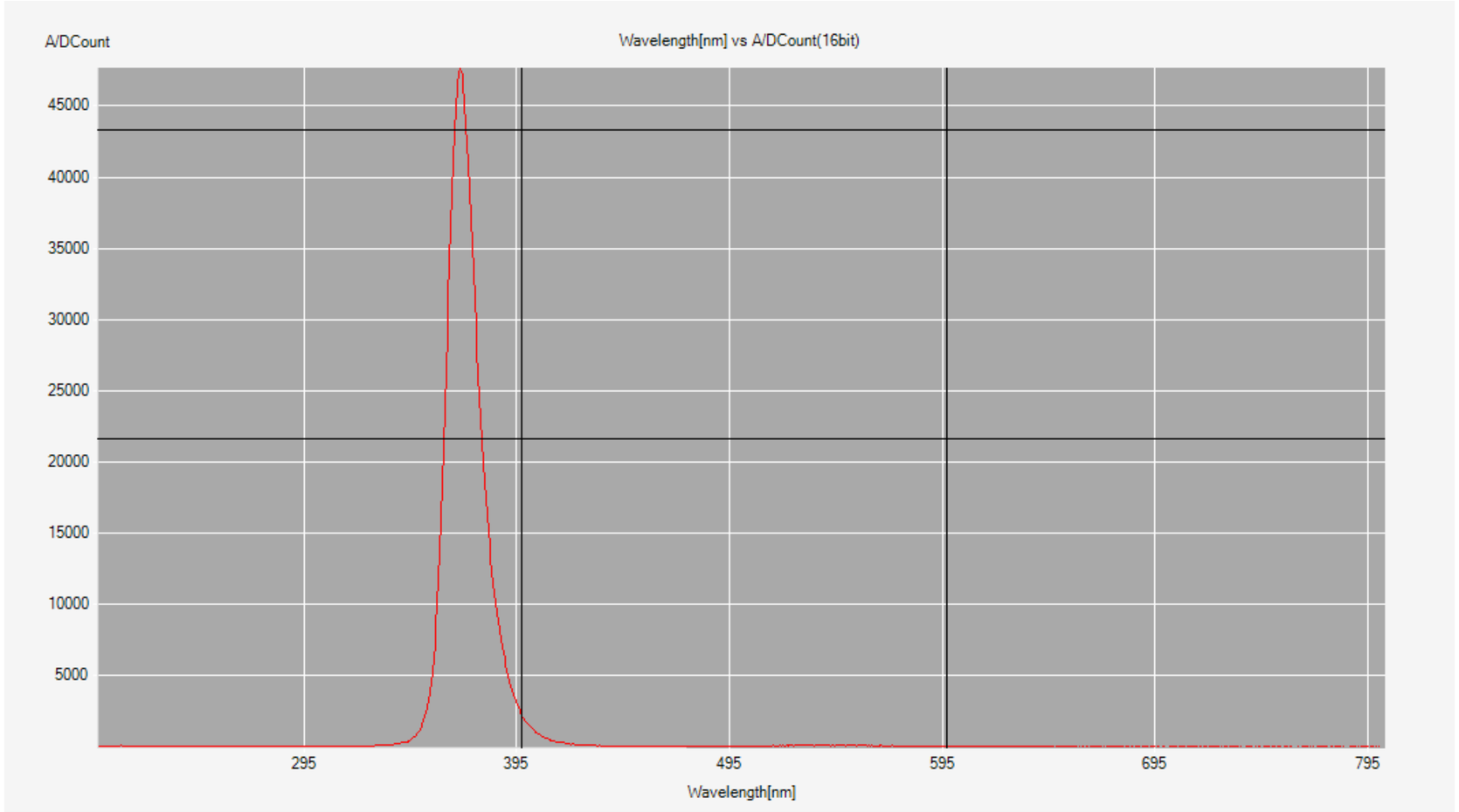


Characterisation Process

Emission spectrum & Light Response

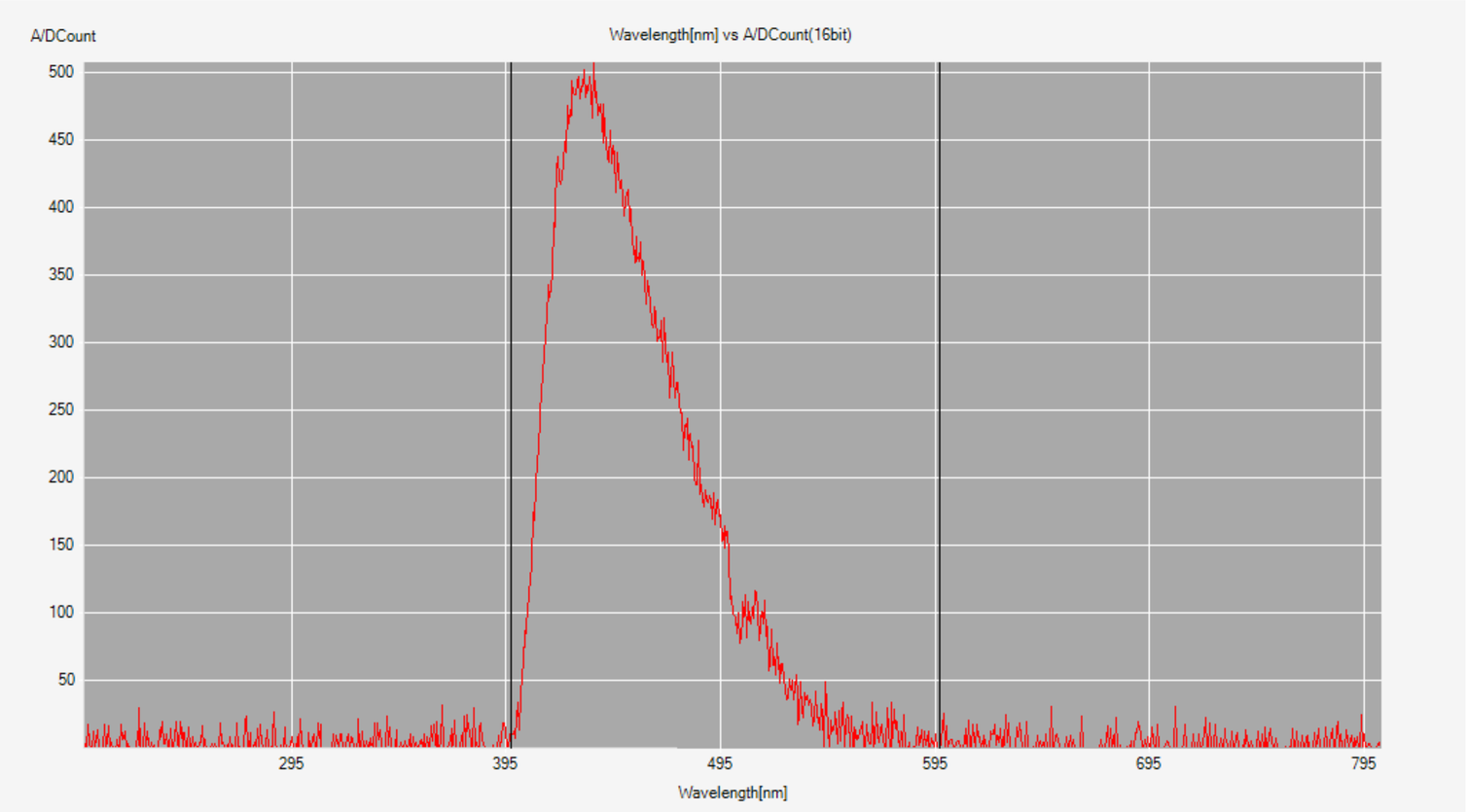
Optical Characterisation

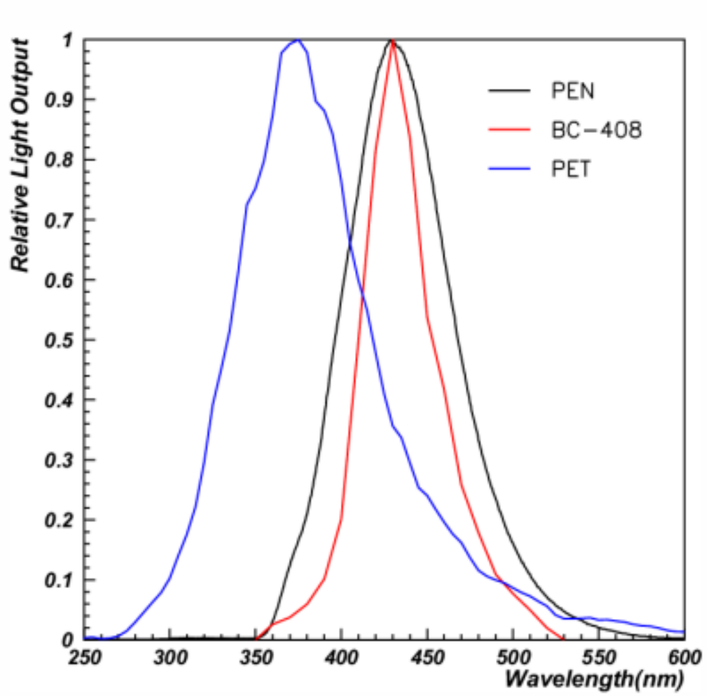
Emission spectrum of Light source



Optical Characterisation

Emission spectrum of PEN sample (Phase 3)

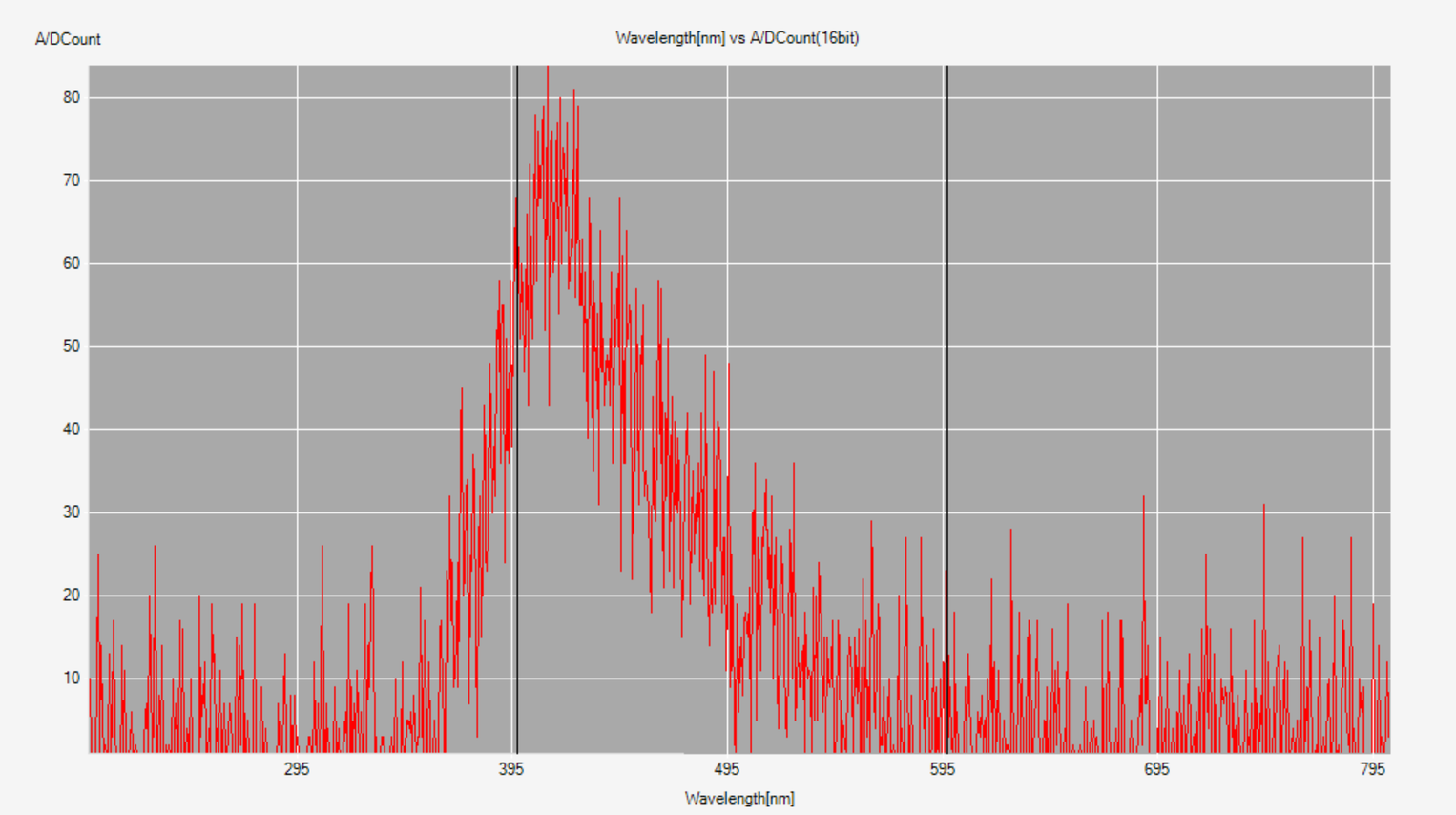


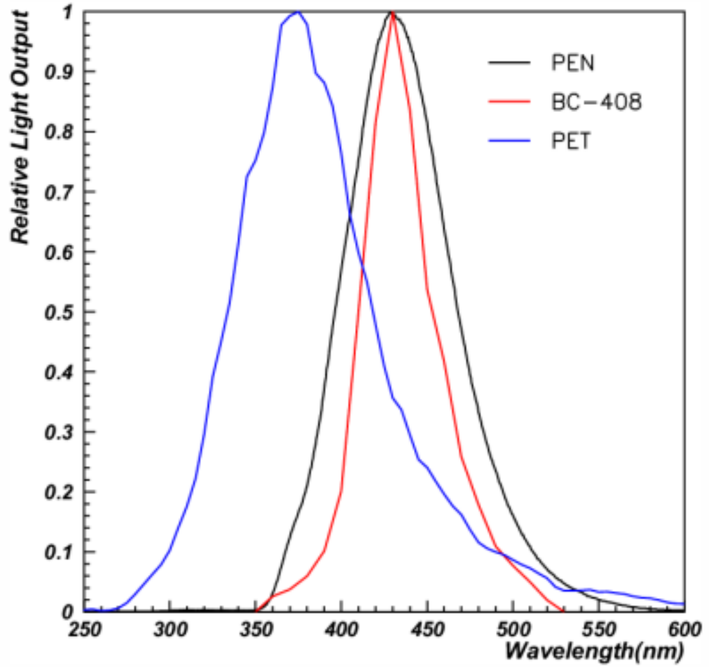


WL máx. Emission ~ 425 nm

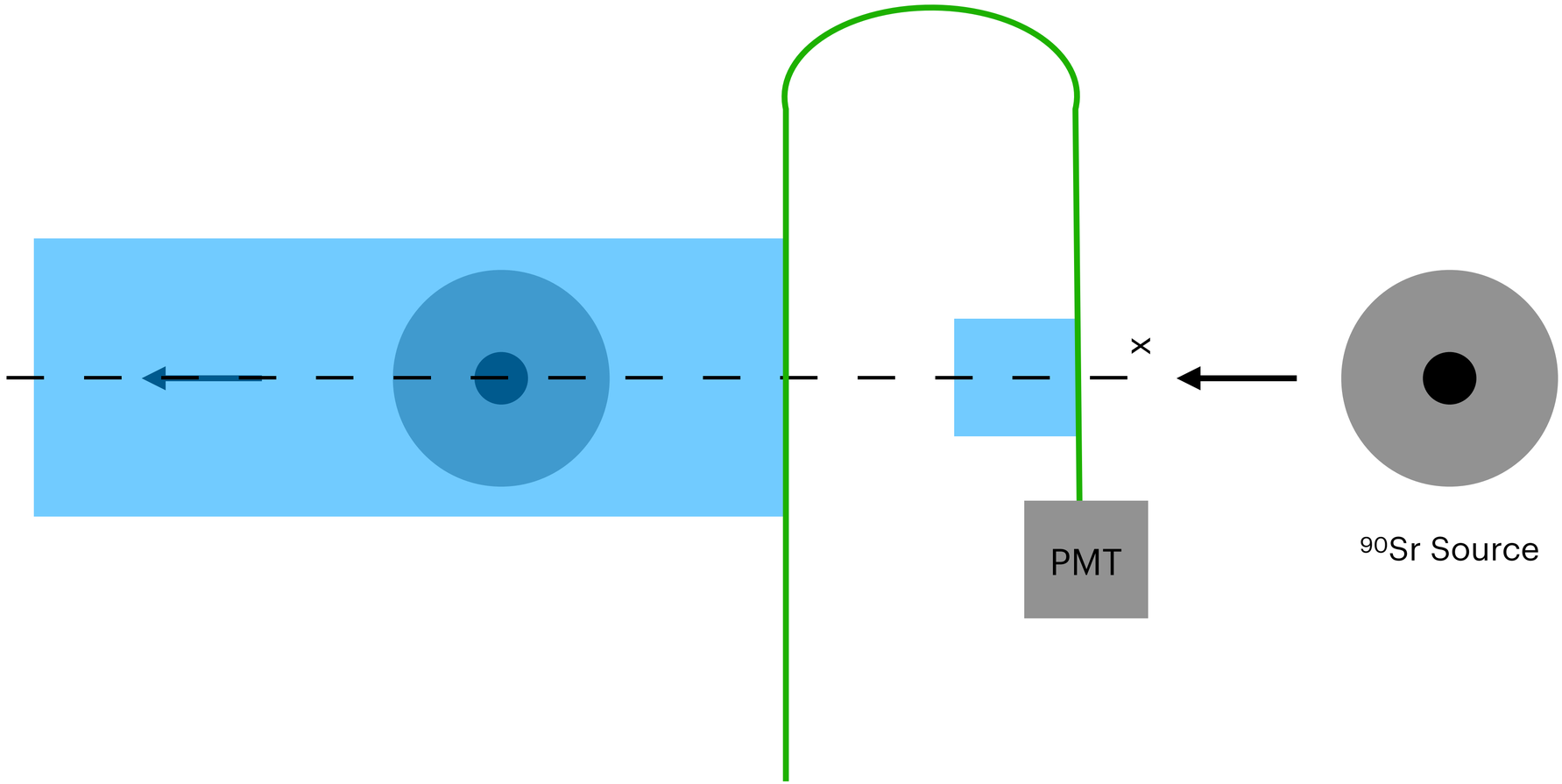
Optical Characterisation

Emission spectrum of PET sample (Phase 3)





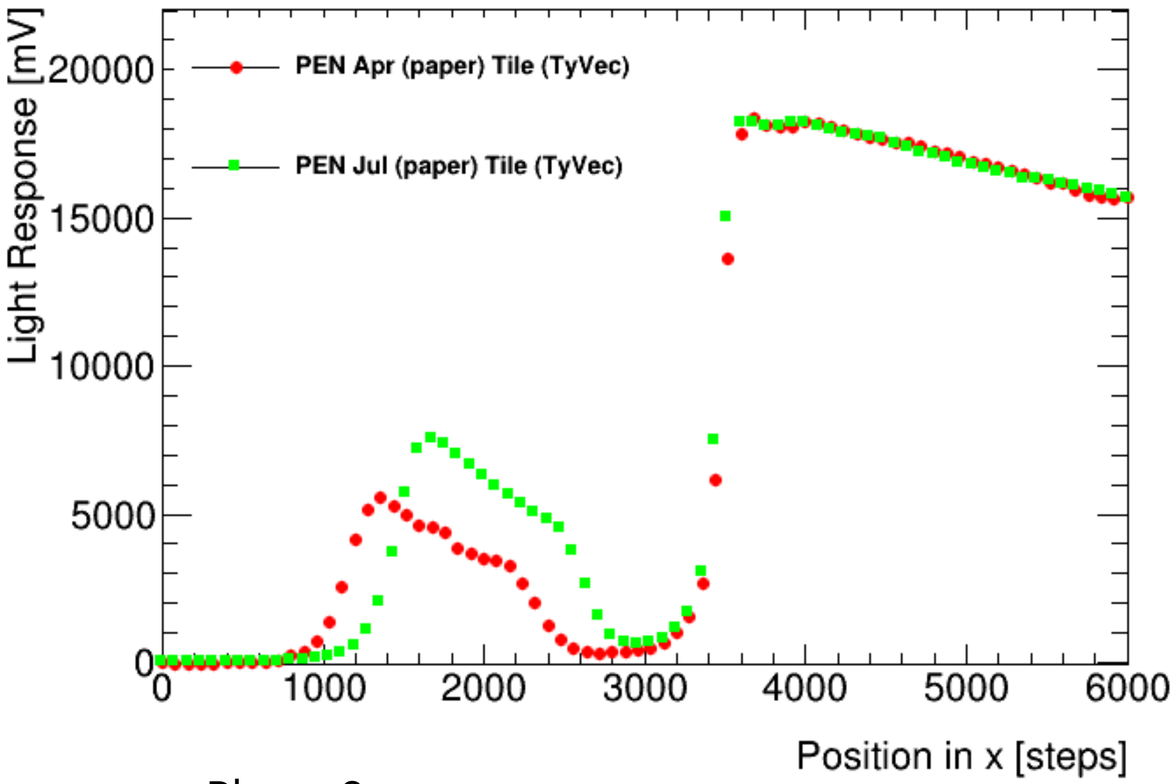
Optical Characterisation
Setup

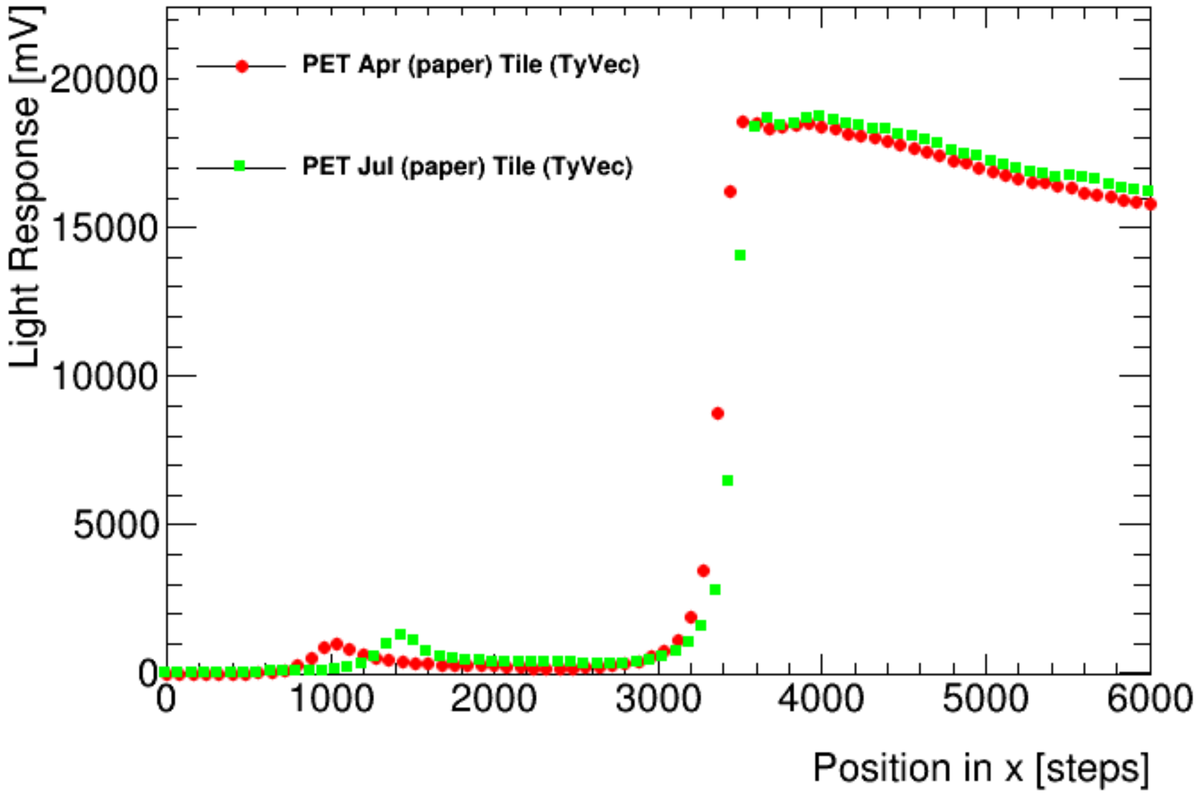


PMT Hamamatsu operated at ~800 V (better relation signal/noise)

Light Response

Phase 2 Vs 3 (PEN & PET)





- Phase 2
- Phase 3

+28%

PEN light output

7x

PEN/PET light output

What’s next?

PET/PEN blend

Tune machine parameters for transparency

Optical characterisation