Neutrino hardware group

Projects review

Example update

Objective: measure the average volume of the british potato (target Nature)

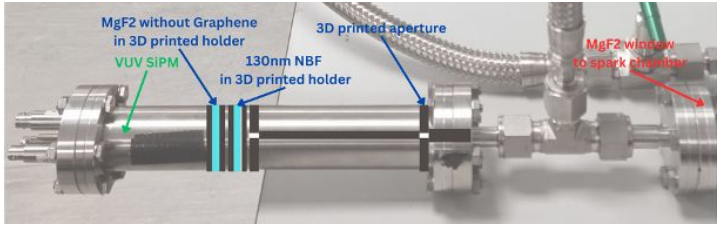
Milestones:

- Buy a significant number of british potatoes ✓
- Build the setup (a calibrated bucket) ✓
- Measure the displaced water volume by the potatoes, for a significant number of potatoes. X

Potential bottlenecks:

- Migue eating the potatoes (we have to hide the potatoes from him)

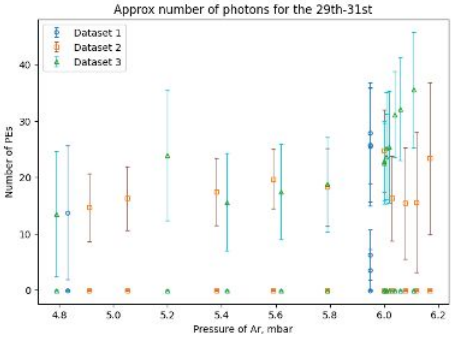
Flashlamp update



Objective: have the argon pulses fully characterised, measure transparency of graphene, and take measurements with the aSe boards

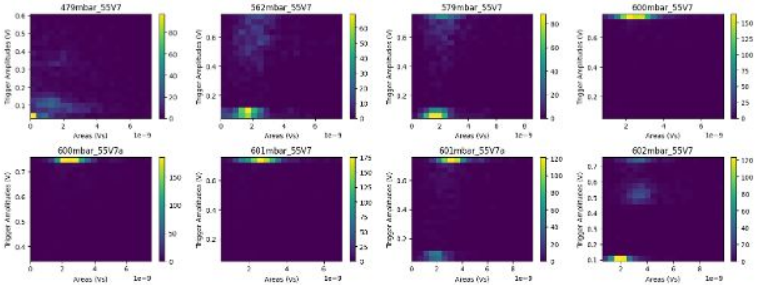
Milestones:

- Purchase necessary components ✓
- Build set-up ✓
- Initial characterisation ✓
- Two population analysis (high and low trigger) ⚠ (this week)
- Preliminary measurement of the transparency of graphene X
- Power on and readout from aSe boards X



Potential bottlenecks:

- Hardware components running out
- or needing replacement



Monochromator update

Objective: Have a device to select wavelength for VUV sources from 110-400 nm.

Milestones:

- Get monochromator (mid-end October) ⏳
- Get deuterium lamp (slowly conversations with hamamatsu) ⏳
- Get vacuum box (in conversations with Justo, may be worth to branch) ⏳
- Get stepper motors and motion stages (mphys)
    - Some small piezoelectric motors in the house: with Josh' prototype ✓
    - Need to decide the rest of the big moving parts (should wait for vacuum box to be decided) ?
- Commissioning X

Potential bottlenecks:

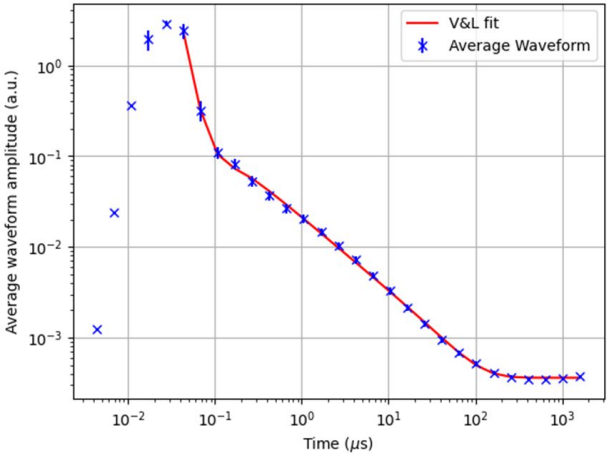
- VUV source
- Output setup

TPB Project update

Objective: Observe a delayed component in TPB shifting of 178 nm VUV (xenon).

Milestones:

- Observe delay in direct alpha scintillation. ✓
- Characterise the flashlamp's pulse shape. 
- Recreate average waveform of shifted 128 nm. **X**
- Produce average waveform of shifted 178 nm. **X**



Potential bottlenecks / delays:

- Seeing argon's secondary component with the VUV SiPM / PMT*
- Understanding the flash lamp spectrum (monochromator).

SiPM Dark Count + Kr S1 project

Objective: characterize the DC at different temperatures and determine if S1 of Kr events could be detected in TP.

Milestones:

- Choose a device to measure humidity and temperature at Climate Chamber (5th floor). ✓
- Perform a run with just a dark box and check conditions. X
- Perform a run with just the SiPMs to check DC. X
- Run with SiPMs + controlled light source. X

Potential bottlenecks / delays:

- The CC is from the ATLAS group and therefore they have priority to use it.

PDCs update

Objective: Nobel prize (1 at least)

Milestones:

- LED comparisons: mature ✓
- Plastic scintillator: TBD before December
    - Get the scintillator: in the house ✓
    - Mount the scintillator: scary, waiting for 3D-printer designs X
    - Muon tracks: need more PDCs X
    - Calorimetry: decide what sources X
- Paper

Potential bottlenecks:

- wire soldering
- mounting the scintillators

α-project update

Objective: characterize the (α,n) (α,γ) reactions in argon (and maybe xenon).

Milestones:

- Get neutron/gamma detectors. ✓
- Get beamline facility (with plan B for target). ✓
- Get funding. ?
- Move from conceptual to technical design for the gaseous target. 
- Test the target

Potential bottlenecks:

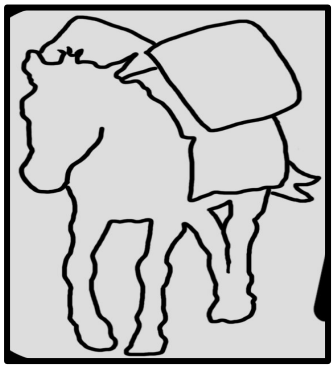
- Risk assessments.

nu-ZOO update

Objective: develop CARP & MULE to more usable states.

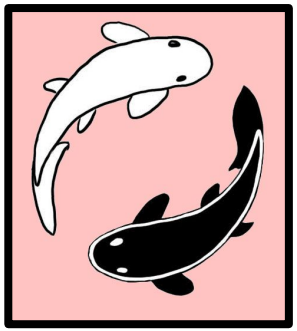
Milestones:

- initial prototyping of CARP implemented ✓
- MULE WD1 & WD2 decoding implemented ✓
- OCTOPUS: introduction to working with nu-ZOO ✓
- MULE PRs currently waiting for review X
- CARP incomplete X



Potential bottlenecks:

- The maintainers limited time (Brais and I (John))



Dense Tracking Plane Update

Objective: Develop and utilise three different prototypes of a dense silicon tracking plane

Milestones:

- Prototypes assembled ✓
- Calibrated ✓
- x-y setup assembled ✓
- Vary z and take data **X**
- Compare pixel pitches **X**
- Compare VUV SiPMs with TPB coated visible SiPMs **X**

Potential bottlenecks:

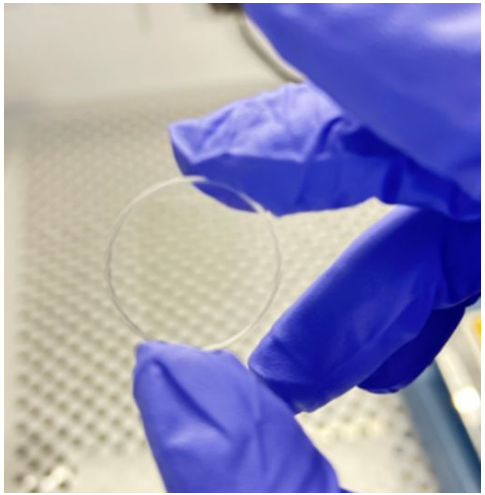
- Boards/SiPMs proving to be unreliable
- Boards will need to be taken to Edinburgh to be coated

Trivial transfer of graphene on MgF_2 & characterization for VUV detectors

Objective: Successful transfer, corresponding characterization, measurement of transparency

Milestones:

- Purchase of TTG graphene sample ✓
- Transfer the target sample on Si/SiO_2 substrate and do characterization, including OM, Raman, AFM, SEM, Ellipsometer. ✓
- Transfer to MgF_2 and do corresponding characterization, OM, Raman, AFM, SEM ✓
- Feedback of measurement of the transparency of graphene ?
- Etch away the transferred graphene film X
- Improve the quality of the TTG transfer X
- Try the bilayer of graphene films. X



Potential bottlenecks:

- The result of Graphene transparency for VUV
- The etch process (clean remove)

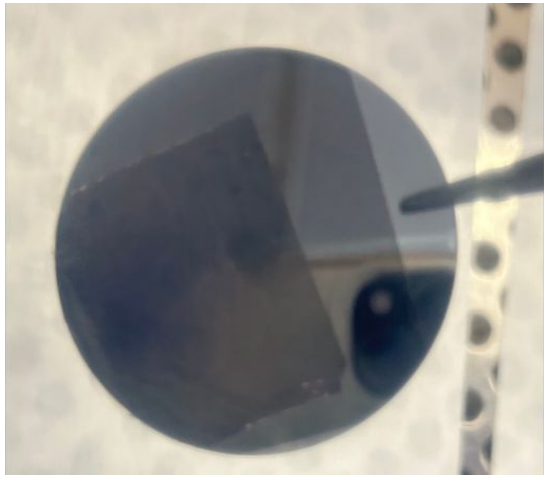
Graphene on aSe

Objective: Successful and repeatable transfer, corresponding characterization

Milestones:

- TTG graphene sample ✓
- Transfer graphene on aSe. In process (There is graphene can be confirmed)
- Characterization of transferred sample (In process)
- Raman In process
- AFM**X**
- SEM ?

- Sheet resistance **X**



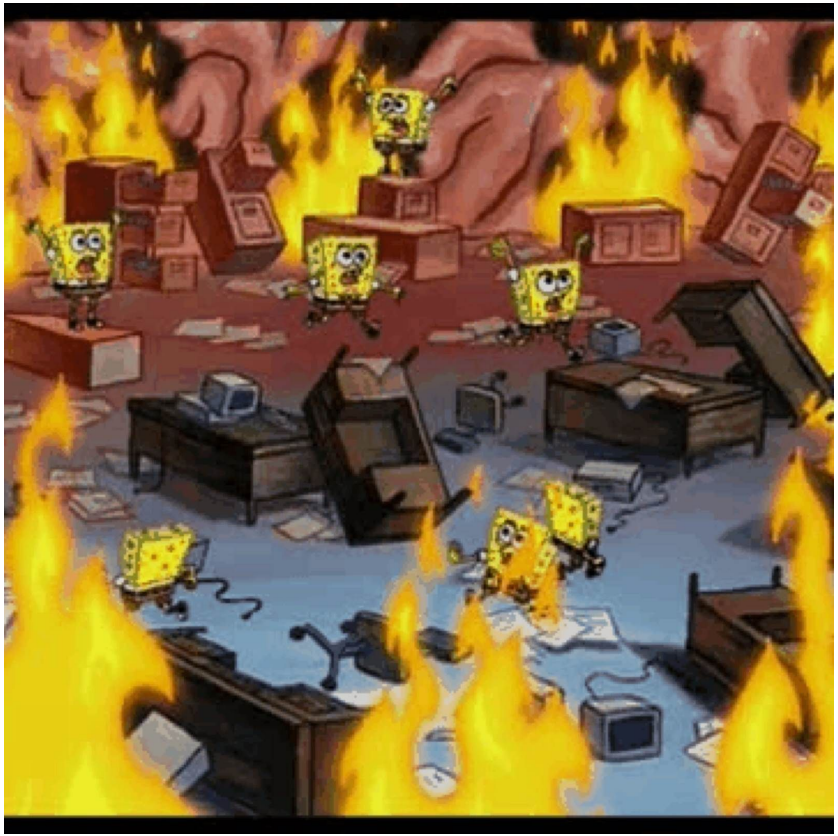
Potential bottlenecks:

- Fully cover of graphene films on aSe (surface roughness, low baking temperature)
- Characterization due to the sensitive of aSe (easy to evaporation)

Weekly Progress/To Do

- Connected CAEN digitiser to Mark's servers.
- Have run a simple python script using py-caen-felib that plots signal generator input in real time.
- Have written a C script using caen-felib to read digitiser data and print to console.
- Have integrated this C script into MIDAS, allowing for efficient compression and storage of digitiser data.
- This week: read data from compressed midas files into python (h5/numpy arrays) and plot.
- Start implementing Fourier transforms on digitiser data within MIDAS.

Boring RA moment



Victim A	Victim B	Victim C	Victim D
Chemicals	Vacuum	Cryo	Pressure
Radiation	HVV	General	PC use
		Hand tools	3D printer

			Risk assessments								
		Name	General	Hand Tools	PC use	HHV	Cryo	Vacuum	Radiation	Chem	3D printer
Lab	B.56	Noble elements	In place	In place	In place	In place	In place	In place	In place	Being i…	In place
	1.02	Dark Room	In place	In place	In place	Not ne…	Not ne…	Not ne…	Not ne…	Not ne…	Not ne…
	1.04	Pixel	In place	In place	In place	In place	In the f…	In the f…	In the f…	Not ne…	Not ne…