

FP7 W22.3

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Task 22.3 Outline and Partners

Outline of Tasks

Explore options of light readout devices

Develop and provide appropriate front end pulse processing electronics

Develop and provide appropriate read out electronics

Partners

STFC

TUM

CNR

FZJ



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Task 22.3: Tools

Construction of small detectors for light readout and electronic development study

Originally Sub task 22.2.6, M22.2.6.1 with STFC in charge

This task is now being carried out mainly by TUM



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Task 22.3 Breakdown

Readout Device Investigation

Explore the potential of different PMTs

Single cathode PMTs

Window type i.e. quartz, blue and red

Cathode area

Packing arrangement

PS PMTs

Round, Square

MA PMTs

16, 64, 64 flat panel, 256 flat panel

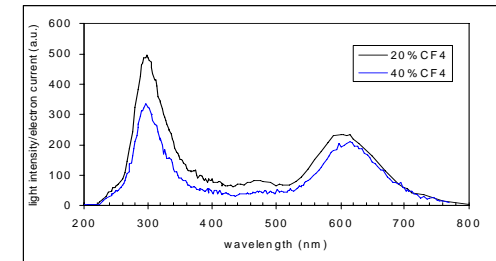
Explore the potential of alternative readout devices

APDs

SiPMTs

Hybrid PMTs

Other?



Initially use digitizer systems to capture detector responses as a means of evaluating performance of different readout systems



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Task 22.3 Breakdown

Development of suitable signal processing algorithms

The captured digitised detector data sets can be used to develop appropriate signal processing algorithms

Electronics

Develop suitable

Voltage divider networks,

Front end electronics

Signal processing hardware to carry out neutron identification and position reconstruction in real time and display to a PC

Use results in the production of a scalable demonstrator detector produced in Task 22.2 (M 22.7.1)



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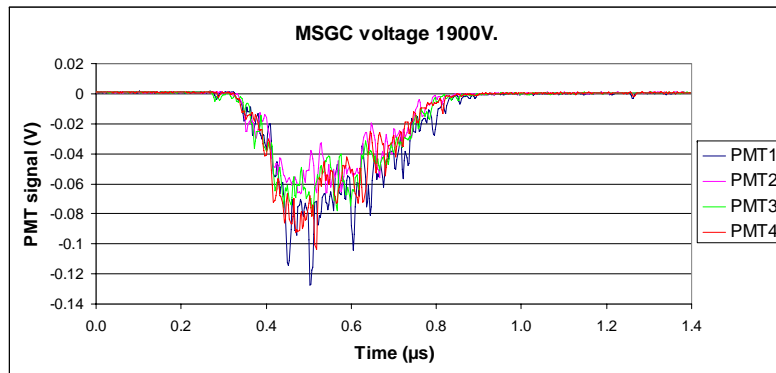
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Task 22.3: Deliverables

Deliverable	Description	Month
22.2.6	Construction of small prototype for light readout study	10
22.3.1.1	Experimental report on PMT anger camera	28
22.3.2.1	Experimental report on PS and MA PMTs	28
22.3.3.1	Experimental report on innovative light detecting devices	36
22.3.4.1	Evaluation report on processing schemes	28
22.3.6.1	Front end pulse processing report	30
22.3.7.1	Readout electronics architecture report	30
22.3.7.2	Hardware implementation report	40



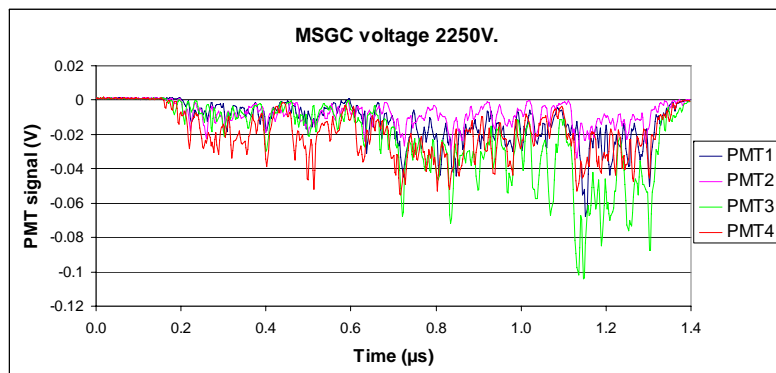
GSPC output signals



BIDIM 80 1900 V 3He/CF4 2b / 2b

MSGC virtual

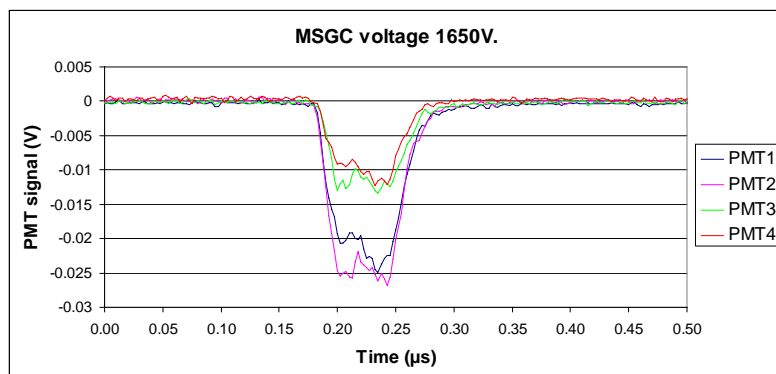
➤ **> 300 ns long**



BIDIM 80 2250 V 3He/CF4 2b / 2b

MSGC virtual

➤ **> 1 μs long**



LIP GSPC 1650 V 3He/CF4 2b / 3b

MSGC real

➤ **60 ns long**



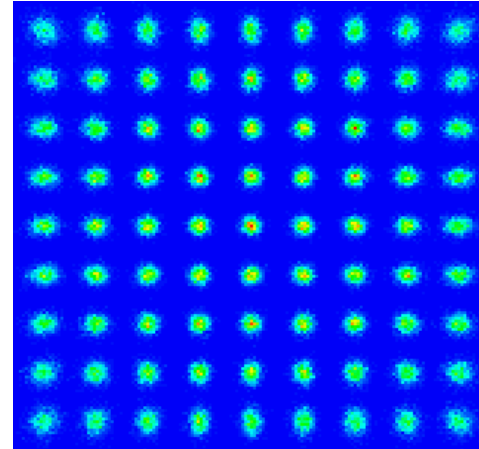
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GSPC Simulation and measurement

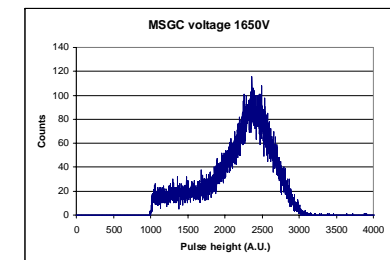
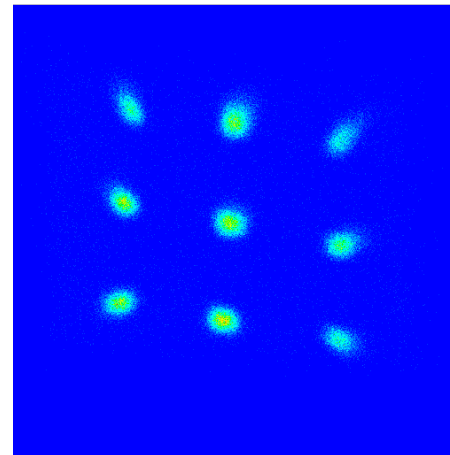
Simulation

- 36mm MSGC-PMT gap.
- 2x2, 30 mm \varnothing PMT.
- 2E6 photons/neutron.
- Holes on 4.3mm pitch.
- FWHM in centre 1.4mm
- **Measurements close to simulation**



Measurement

- 1650V LIP
- MSGC-PMT gap 27.35 mm
- Holes on 4.3mm pitch
- FWHM in centre 1.6mm



Other ideas / tasks

Use of external shuttering

Improve contrast variation

Effect of varying MSGD / PMT window

Do we realise anticipated performance gains

Simulation Package

Use to predict trends and efficiency of experiments

Action; ISIS to distribute Erik's contrast variation simulations to date.

Use of solid scintillators

Can we relate the light output differences to performance gain

Algorithm development

Digitisers allow development by repeated use of the same data



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