Title (WP21)	Detectors
Responsible	Nigel Rhodes
Period	August 2013 – June 2014
Activity type	**RTD**
Tasks	**Task 21.1 Development of scintillation detectors** **21.1.1 Detector Hardware development m24** **21.1.2 Electronics hardware development m36** ISIS electronics, which was an adaptation of existing ISIS hardware, was completed by month 24 as envisaged. The latest ASIC based Jülich electronics hardware is in production. **21.1.3 Signal processing development m36** In progress. Both ISIS and Jülich have working signal processing routines based on pattern recognition and centre weighting respectively. **21.1.4 Evaluation of SiPM potential m48** Showing good progress. Stackable electronics has been developed and demonstrated and a concept for a stackable detector has been concieved. **21.1.5 Evaluation of final detectors and report m48** Not yet started **Task 21.2 Development of gas detectors based on solid ^{10}B converter** **21.2.1 Optimisation of substrate and ^{10}B production parameters m36** TUM concluded that there was little difference in neutronic performance between coatings produced by Linkoping, Tokyo and TUM. Also that there are no significant differences in performance between coatings produced by DC sputtering and electron beam evaporation,EBE. EBE takes significantly longer, therefore to date DC sputtering is preferred. Linköping has the capability to cater, at least, for research quantities of coatings. TUM to confirm that the aging task has been completed. **21.2.2 Exploration of alternative production techniques m36** HZB is developing an atmospheric pressure plasma technique as a alternative to magnetron sputtering for the production of B_4C coatings. A microwave atmospheric plasma system has been set up and the first B_4C coatings have been produced on silicon. These have been examined by SEM and compared with B_4C coatings produced by High Power Impulse Magnetron Sputtering, HiPIMS. The challenge is to optimise process parameters to produce high quality coatings when depositing at a high rate. BNC has produced components for a 2D MWPC for evaluating the neutron response of the coatings produced in this sub task. The components have been delivered to HZB and the detector has been constructed. It has been shown to work well with a $^{10}B_4C$ reference convertor and is available for the

	evaluation of the neutronic performance of new coatings. Work has to finish in January, when Andriy will take up a new appointment. **21.2.3 Measurements with a test detector m12** **21.2.4 Concept study for a large area detector** **a) Based on macro grooved structures with wire readout m48** Work is well underway to produce a MWPC based on the macrogrooved structure developed in task 2.2.1. The MWPC has an active area of 40 cm x 40 cm with two sets of wires and three converter layers. In-beam tests at the TREFF instrument at FRM2 are foreseen for the upcoming reactor cycle starting in autumn 2014 **b) Based on layered structure with micromegas readout m48** A post doc started at IFRU in October. Detector simulations have been carried out and a single detector unit has been designed and is in production. Covering 7 x 7 cm^2 and containing 5 layers of $^{10}B_4C$, it is expected to have a detection efficiency of ~ 20% at 1.8 Å. Lab tests with a neutron source are scheduled for the summer with neutron beam tests at ORPHEE to follow. **Complete** **Ongoing** **Not yet started**
Deviations from Description of work (Annex 1) & corrective action	There are no further deviations of the tasks described in Annex 1 other than those already documented in the first periodic report, months 1 – 18.

Deliverable	Due date	Expected/ Achieved Date
D21.12	10	12 Small size test detector produced
D21.1	24	24 STFC detector hardware produced
D21.2	24	24 Jülich detector hardware produced
D21.3	24	24 Report on STFC and Jülich detector hardware
D21.4	24	24 ISIS electronics system completed
D21.8	24	24 Interim report on SiPM detector performance
D21.5	36	Expected 36 Jülich electronics system completed
D21.6	36	Expected 36 Report on STFC and Julich detector electronics
D21.7	36	Expected 36 Report on signal processing development
D21.10	36	Expected 36 Report on production parameter and substrate performance
D21.11	36	Expected 36 Report on exploration of alternative

		production techniques
D21.13	36	Expected 36 Experimental report on converter investigation
D21.10	48	Expected 48 Report on scintillation detector performance
D21.14	48	Expected 48 Concept study for large area detector based on macrogrooved MWPC
D21.15	48	Expected 48 Concept study for large area detector based on micromegas

A) Total Person Months (PM) allocated to project (including facility contribution) per contributing partner (Annex 1, Part A, p.96)

B) Total staff effort charged to project per contributing partner (Annex 1, Part B p.32)

C) Staff effort charged to project in period (Months 19 – 28)

Beneficiary	**A**	**B**	**C**
STFC 2	**30**	**19**	**11.5**
TUM 3	**31**	**20**	
Jülich 4	**29**	**19**	
HZB 6	**36**	**24**	**10.5**
CEA 7	**12**	**7**	**8**
BNC RISP 10	**18**	**9**	
CNR 14	**24**	**12**	
ILL 1	**0**	**0**	**0**
ESS 18	**0**	**0**	**0**

Meetings/Conferences/Workshops attended (financed by NMI3)

Internal meetings (...participants,organising beneficiary etc)

Detector JRA meeting Saclay (CEA) 26 March 2014

22 staff attended

Any external conferences attended?