

Minutes of the meeting on RPT, hosted by PTB on 16th and 17th of January 2017

People attending the meeting:

R. Nolte, D. Radeck, L. Zavorka and Q. Ducasse for PTB

J. Heyse for JRC Geel

S. Amaducci, L. Cosentino, P. Finocchiaro, A. Manna and C. Massimi for INFN

Agenda

0) NEXT MEETING on Monday 30th of January at 11:00 (R. Nolte will send instructions via e-mail).

1) Progress with data analysis (after the collaboration meeting in November 2016)

PTB group:

- Comparison of the output of the MC simulations and the experimental data at different energies: 50, 100, ... 600 MeV (+/- 5%). Overall good agreement but (i) MC shows more deuterons than experimental data for high energies → model on nuclear reactions on C clearly wrong; (ii) the band attributable to multiple scattering ($\Delta E \sim \text{constant}$, i.e. protons which are not stopped in the E detector) is much larger in MC than in the data → to be investigated.
- Comparison of the flux obtained using the 10-mm thick polyethylene and the n_TOF Evaluated flux (2011), in the energy region between 50 and 600 MeV: the shape is reproduced but the absolute value is about 20% lower. A cross-check of the beam-monitoring information is needed (PKUP Vs Protons, PKUP Vs SiMon). A. Manna will take care and report in the next meeting.
- Experimental data obtained with a 500 μm -thick Si-diode 3x3 cm: signals from the preamp (Canberra 2006) no saturation and no oscillation after gamma-flash.

INFN group:

- Calibration with standard gamma-ray sources Cs, Y, AmBe (at CERN in December).
- Calibration with protons $E=62$ MeV (at LNS in December) → Energy resolution much better than 10%.
- Study of the light collection in the PMT depending on the impact position of the proton beam: differences of the order of 1% for the 3- and the 6-cm thick scintillators. The problem for the first scintillator (0.5-cm thick) has to be investigated.
- In program: extraction of flux, in order to have data to compare for INTC proposal and estimation of needed protons for ITNC proposal.

2) Plans and schedule

Developments of RPT:

- Both detectors need to improve the energy resolution/light collection in order to better identify particles.
- Si diodes to be used as the first stage of the RPT are mandatory for (i) the measurement at low energy (10-20 MeV) and for reducing the background induced by np scattering in the scintillator.
- Alignment/Set-up:
 - Construction of a “reference plane” that will be aligned relative to the beam line by CERN personnel, dimensions according to sketch by R. Nolte so that three RPTs can be mounted and aligned → when can the construction be mounted and aligned, how long does that take, best not during our beam time but before restart after winter break
 - Issue with the alignment of the detectors (geometric i.e. laser-based system and beam line i.e. gafchromic film). From a sensitivity study by R. Nolte, the alignment is required

with a precision better than 1 mm. C. Massimi will start a discussion with people at CERN and report in the next meeting.

- Re-Thinking on angle of measurements or the possibility of using more than one angle
→ C. Massimi talks to A. Verntura about data and uncertainties- probably need of new radiators

Dates:

- We all agreed that in the 2nd test, the setup must be very similar to the one foreseen for the final experiment with at least the two RPTs with a radiator each, best a set-up of three RPTs with three radiators. Therefore, a prototype of the Fission Chamber (FC) must be ready and put in the beam. In addition the two RPTs will look at two different polyethylene samples 2- and 6-mm thick (as this configuration double the counting rate). If in the next 2 weeks we find the required support for the construction of the FC, we will propose to make the 2nd test (5E17 protons assigned) at the end of the capture campaign (~ end of June). If not, we will propose October.

3) Fission Chamber

Availability of U235 deposits

- J. Heyse reported on the possibility of having 5 to 10 pure ^{235}U samples (5 cm diameter?) prepared by vacuum deposition from JRC-Geel, each one will be $400\ \mu\text{g}/\text{cm}^2$ -thick on thin Aluminium backings. The minimum possible thickness of the backings has to be evaluated with the sample preparation. We expect that these samples can be prepared in 6-12 months.
- R. Nolte has calculated that using 6 samples, the count rate from the fission detector will be about 1/2 of the count rate of the recoil proton detector.
- At PTB, 6 ^{235}U deposits on a 0.1-mm thick Al-backings are already available and can be used in the 2nd test in the fission detector. The technical quality of the layers, in particular their homogeneity, is sufficient for the test but probably not for the final measurement

Construction of the chamber

- The scattering chamber for housing the fission detector must be prepared. A drawing by the group of R. Nolte is available. In the next 2 weeks, Cosentino, Heyse and Nolte will verify the possibility of producing such a chamber in their lab.
- R. Nolte talks to RP about restrictions concerning window width etc.

4) Document for INTC (proposal)

Preparation of the document

- We all agreed to present the proposal to INTC during the next meeting in June. This requires the discussion of the proposal in the next n_TOF collaboration meeting in April. Therefore the proposal has to be distributed to the whole collaboration by the last week of March.
- C. Massimi will take care of collecting the documents and prepare a first draft.
- With respect to the Letter of Intent, the proposal should also contain same information about the np scattering evaluation. Alberto Ventura will be asked to take care of the evaluation of the uncertainty related to the cross-section.

5) AOB

PhD project at PTB

PTB can grant one PhD scholarship on this project with R. Nolte as coordinator.

R. Nolte will distribute the presentations. Online meetings in a PTB meeting room on DFNVC will be used for further coordination. R. Nolte will distribute the relevant URL to all participants. The next online meeting will be on Monday, 30 January at 11:00 CEWT.