Contribution ID: **152** Type: **talk**

Synthesis And Characterization Of The Plastic Scintillators For The Total-Body J-PET Scanner

Friday, 28 June 2019 14:15 (20 minutes)

Jagiellonian Positron Emission Tomograph (J-PET) is a PET scanner based on plastic scintillators [1]. The aim of the J-PET Collaboration is to build a modular, light and portable PET scanner for the total body examination. Currently we are building prototype modules consisting of 500 and 1000 mm long plastic scintillator strips with silicon photomultipliers coupled at both ends [2].

Result of styrene and vinyltoluene polymerization will be presented. The time-temperature cycles were established for polymerization in small cylinders as well as for polymerization in the glass mold allowing to manufacture long plastic scintillator strips. A new method developed for the fast quality control of plastic scintillator strips was successfully applied during J-PET prototype building and will be introduced. The new scintillator was manufactured via bulk polymerization of vinyltoluene and the optimal concentration of the 2-(4-styrylphenyl)benzoxazole wavelength shifter [3]. The light yield for the best sample was established to be equal 10 000 photons per MeV. Obtained plastic scintillators were optimized for short rise and decay times needed in time of flight PET detectors. The rise time and decay time of the developed plastic scintillator were determined to be 0.5 ns and 1.9 ns, respectively.

With high technical attenuation length (TAL) more photons propagating along scintillator strip is reaching silicon photomultipliers at both ends thus increasing time resolution of the J-PET scanner. The aim of TAL measurement is to determine technical light attenuation length value of commercially available plastic scintillator strips and selecting the best type for J-PET scanner construction. A few models of plastic scintillators obtained from different manufacturers were tested. All strips have the same rectangular cross-section and dimensions 6x24x1000 mm^3. TAL determination method is based on fast scanning of scintillator strip by UV lamp with 365 nm wavelength of maximum emission and reading light signal by silicon photodiode. Results of TAL measurements will be compared to manufacturer's specifications.

[1] J-PET: P. Kowalski et al., Phys. Med. Biol., 63 (2018) 165008
[2] J-PET: P. Moskal et al., Phys. Med. Biol., 61 (2016), 2025-2047
[3] J-PET: A. Wieczorek et al., PLoS ONE, 12:11: e018672 (2017), 1-16

Primary author: KAPŁON, Łukasz (Jagiellonian University)

Presenter: KAPŁON, Łukasz (Jagiellonian University)

Session Classification: Friday