

In beam PET data analysis and filtering

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In-beam PET operating workflow



Data with proton beams

Date	Data set	Treatment	Phantom
2016/02/07	fantoccio A	2D slices, E=75 MeV, E=105 MeV/u	Homogeneous PMMA
2016/02/07	fantoccio B	2D slices, E=75 MeV, E=105 MeV/u	PMMA with air gap
2016/02/07	fantoccio D	Real treatment plan, E = 76-124 MeV/u	Homogeneous PMMA
2016/04/03	fantoccio 1	2D slice, E=144.5 MeV/u	Homogeneous PMMA
2016/04/03	ossoaria	2D slice, E=144.5 MeV/u	PMMA with bone and air gap
2016/04/03	fantoccio 2	Real treatment plan, E = 75-134 MeV/u	Homogeneous PMMA
2016/04/03	rando	Real treatment plan, E = 75-134 MeV/u	Rando
2016/06/07	cubo2-5	3D cube, 6x6x6cm ³ , E = 129-164 MeV/u	Homogeneous PMMA
2016/06/07	pt1-2-3-4	Real treatment plan, E = 83-150MeV/u / E = 62-129MeV/u	Homogeneous PMMA
2016/06/08	fetta 1-8	2D slice, 6x6cm ² / 8x8 cm ² , E=144.5 MeV/u	Homogeneous PMMA







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TOT window calibration (1)



TOT window calibration (2)



Shift of the photopeak position wrt the position during calibration with Ge rods was detected during in-beam acquisition.

chip	channel	mean Ge rods	Mean proton beam
0	43	495.6	505
1	33	378.7	391.6
2	4	351.8	364.6
3	54	380.7	393

During in-beam acquisitions, at the FPGA Tx level, a "large" TOT window is used to be sure to acquired all events of interest.

2016, 6th June \rightarrow TOT window +/- 40

Lutetium background (1)

Evaluation of Lutetium background contribution: two equivalent intervals of time before the treatment (background) and during after-treatment were analysed.



Lutetium background (2)



TOT spectra in coincidence (1)



TOT spectra in coincidence (2)



TOT spectra in coincidence (3)



Photopeak event selection example (1)



TOT window of 10% wrt the photopeak

TOT window of 6.7% wrt the photopeak

Simulation

Data set: fantoccio 2 (beam test April 3^{rd} , 2016), protons, real treatment plan, $E_{min} = 75 \text{ MeV/u}$, $E_{max} = 134 \text{ MeV/u}$

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Photopeak event selection example (2)



3D image comparison



Real treatment plan comparison (1)

Real treatment plan comparison (2)

Real treatment plan comparison (2)

Real treatment plan comparison (3)

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Real treatment plan comparison (3)

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Real treatment plan comparison (4)

Chips with anomalous response (1)

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Chips with anomalous response (2)

Backup slides

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TOT window calibration

PET image comparison

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Profile analysis

PMMA phantom

PMMA phantom

PMMA + air gap phantom

PMMA + air gap phantom

