Benchmarking reality versus simulation in AGATA

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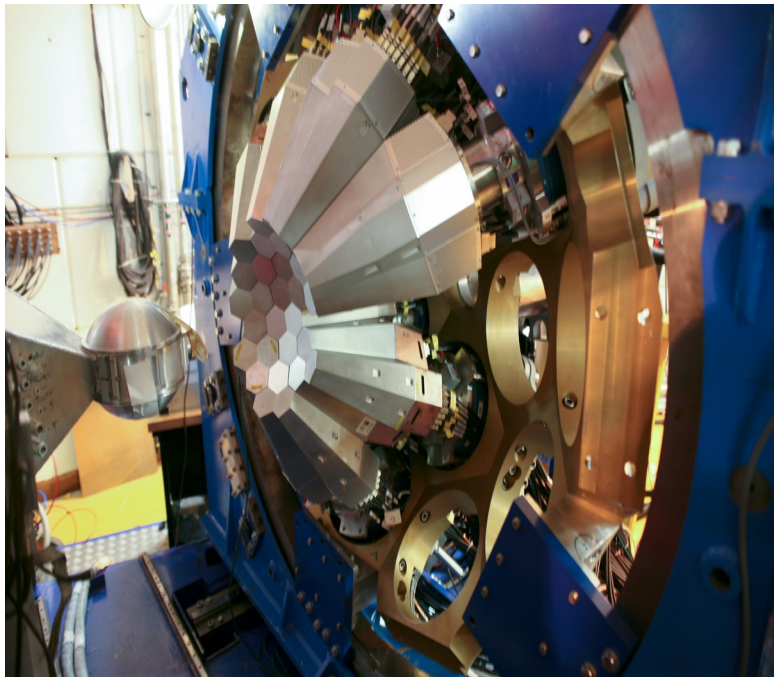
First AGATA and GRETINA collaboration meeting
Argonne, December 5-7, 2016

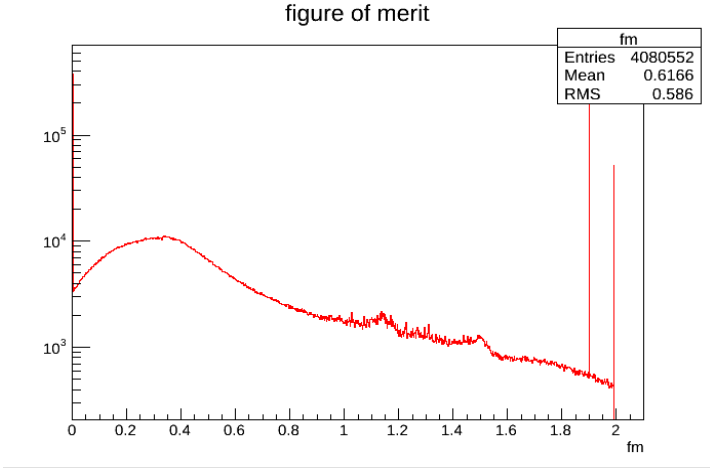
Performance of AGATA@GANIL with ^{60}Co source

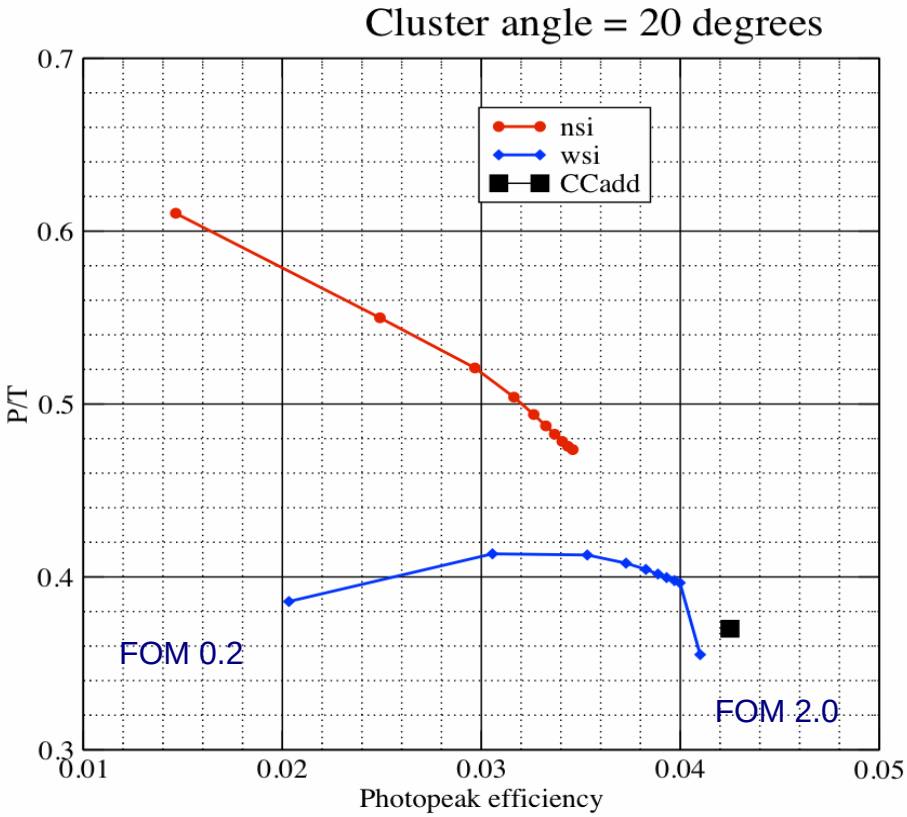


29 crystals

	SPM cal	CSM cal	SPM sum
ϵ_P(pure)	4.26(12)%	4.48(15)%	4.00(16)%
$(P/T)^{obs}$	0.328(5)	0.324(5)	0.184(5)
$(P/T)^{true}$	0.371(5)	0.370(5)	0.363(5)
$\epsilon_{track,nsi}$	82(1)%	81(1)%	82(1)%
$\epsilon_{track,wsi}$	95(1)%	94(1)%	95(1)%
C_s	0	0	0.307(5)
C_0	1.0275(2)	1.05(2)	1.109(2)

Abs_Eff_tracked= 3.86 % P/T=41% FOM cut=1.0
Abs_eff_tracked=3.29% P/T= 49%
no single interaction





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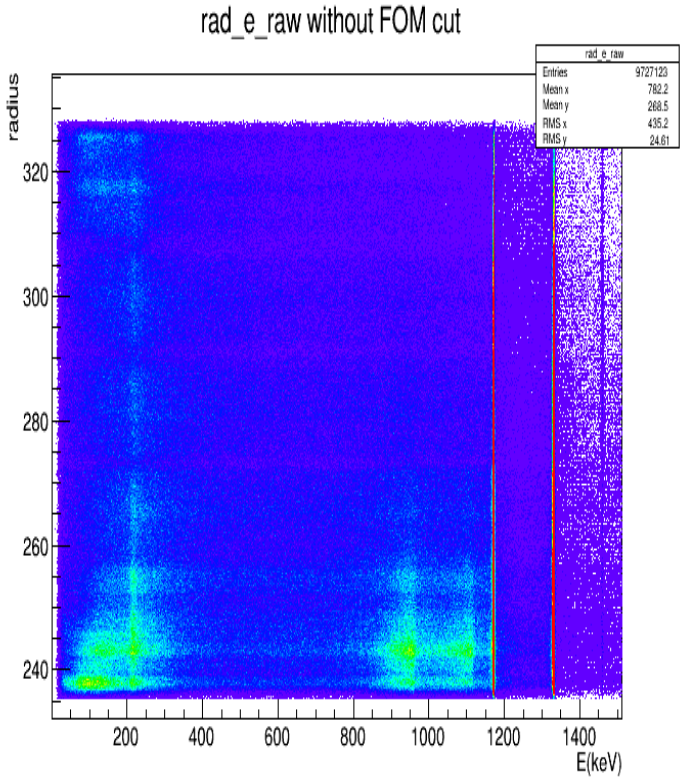
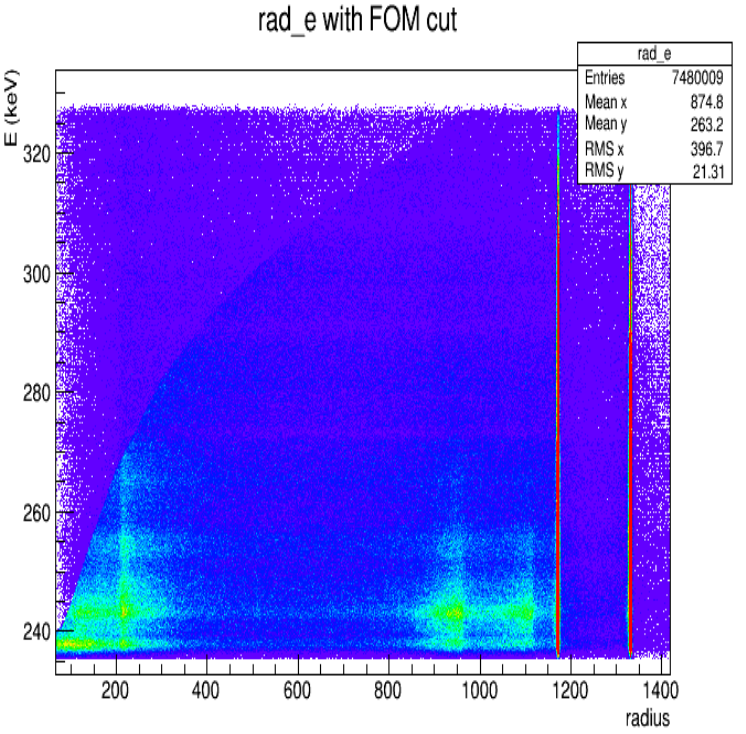
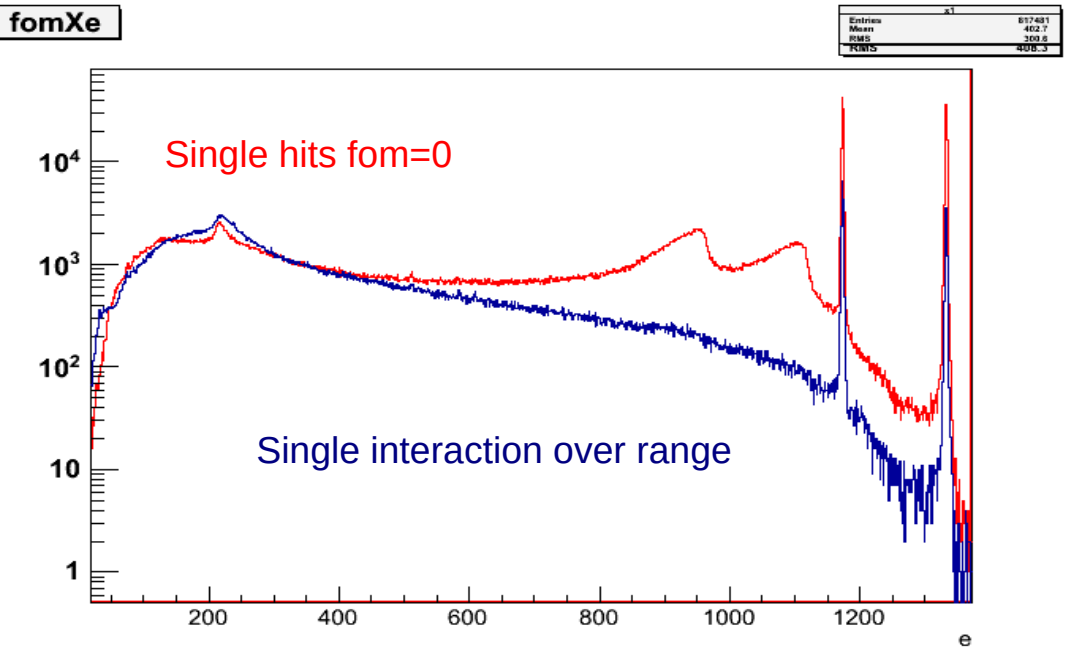
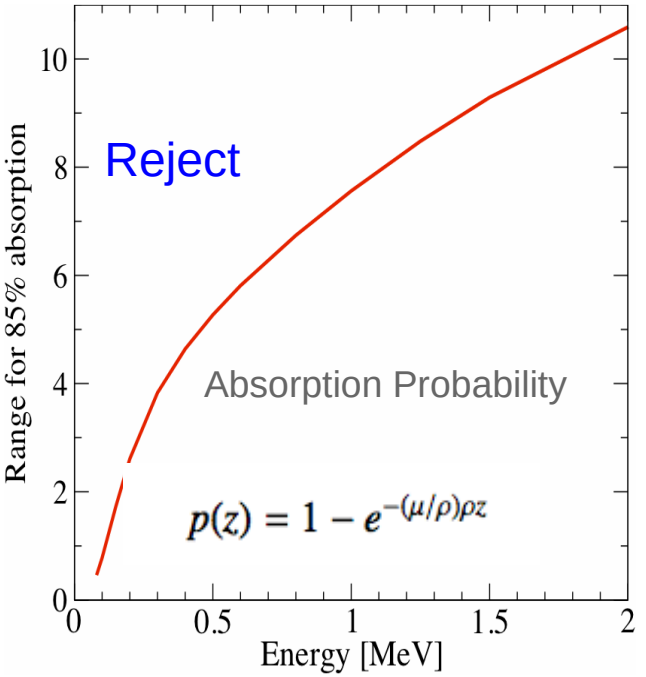
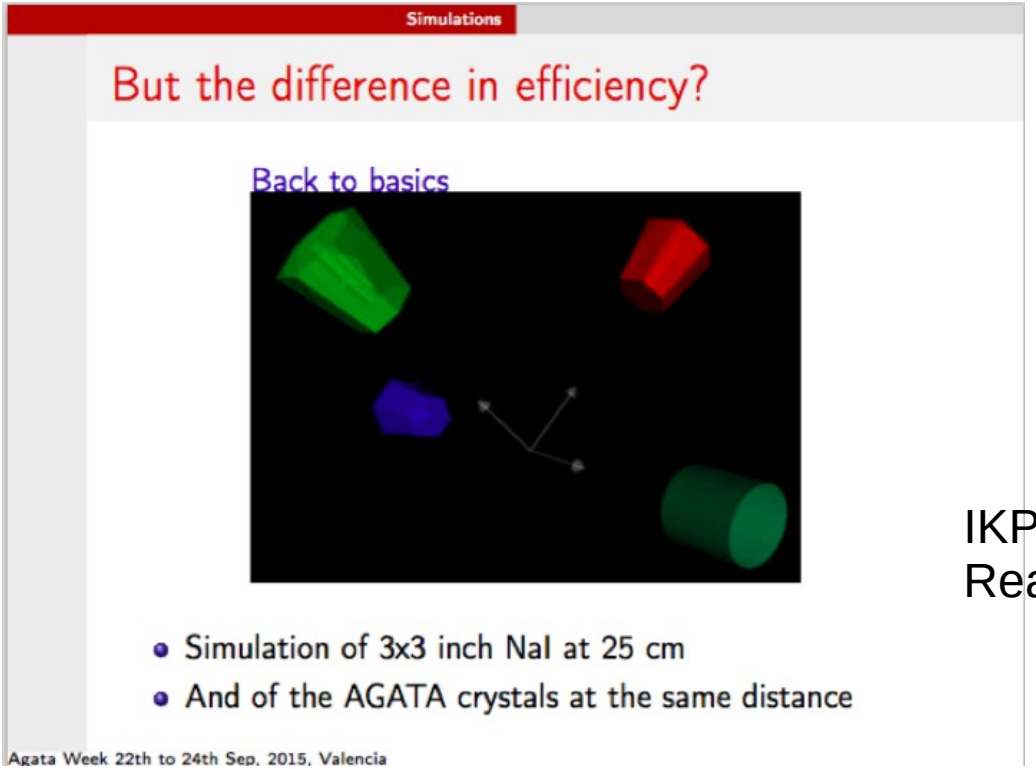
Torben showed how we can improve the P/T









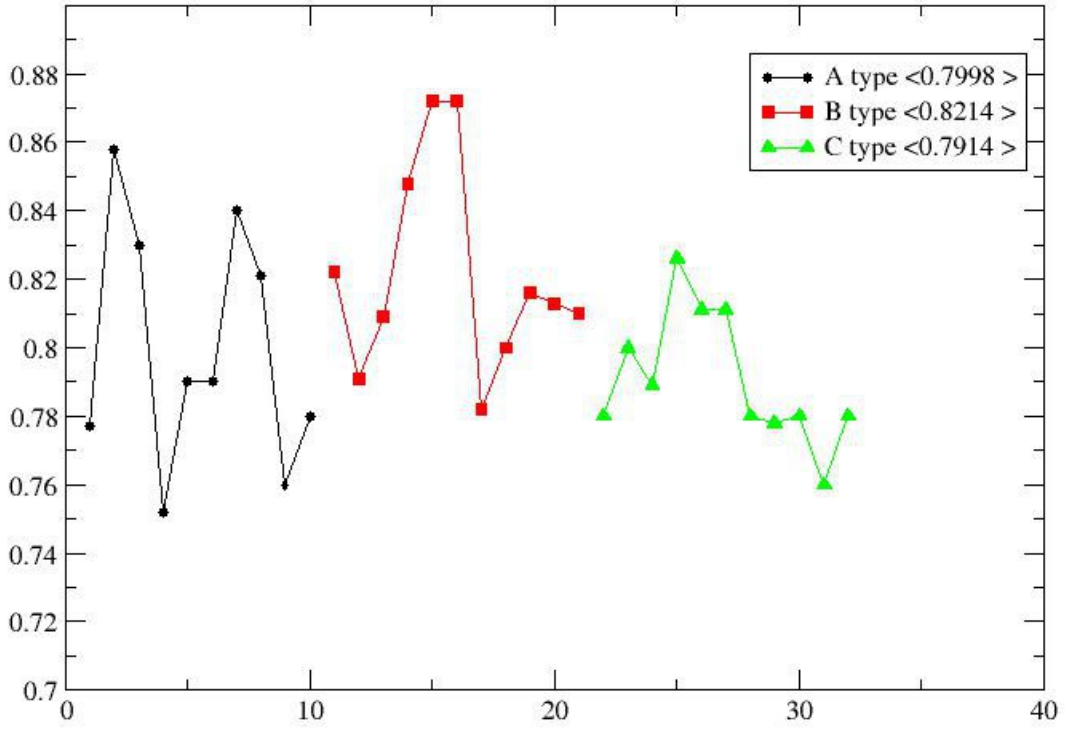


Efficiency of single crystals

	A	B	C	NaI
Abs Eff [$^{0}/_{00}$]	1.12	1.14	1.12	1.31
Relative[%]	85.9	87	85.8	100

IKP Cologne Values : 71 to 86%
Real NaI efficiency 1.2×10 −3 cps/Bq at 25 cm

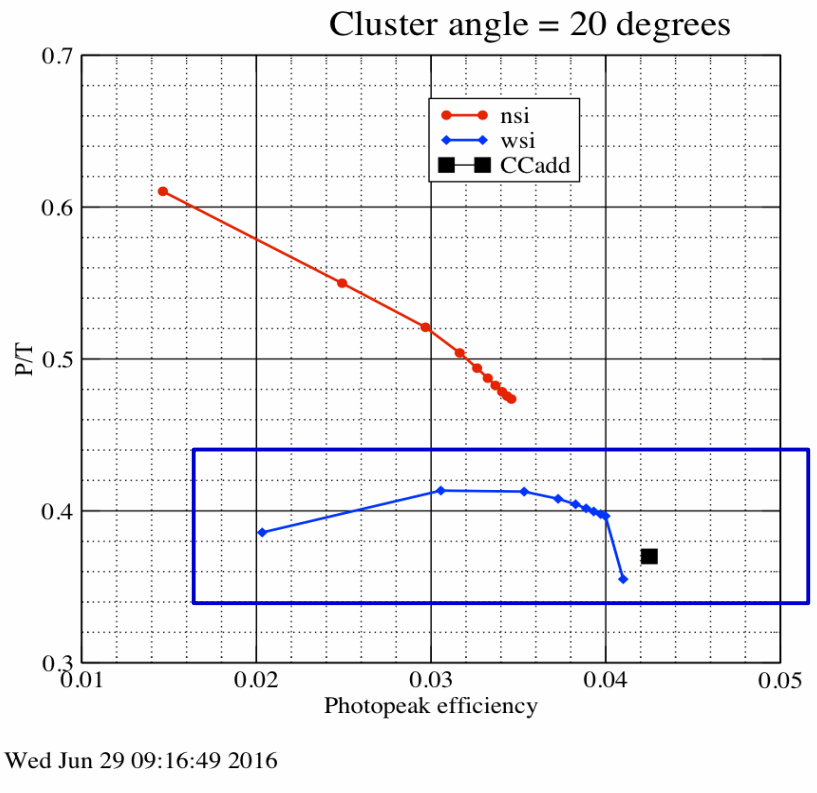
From J. Lunguvall

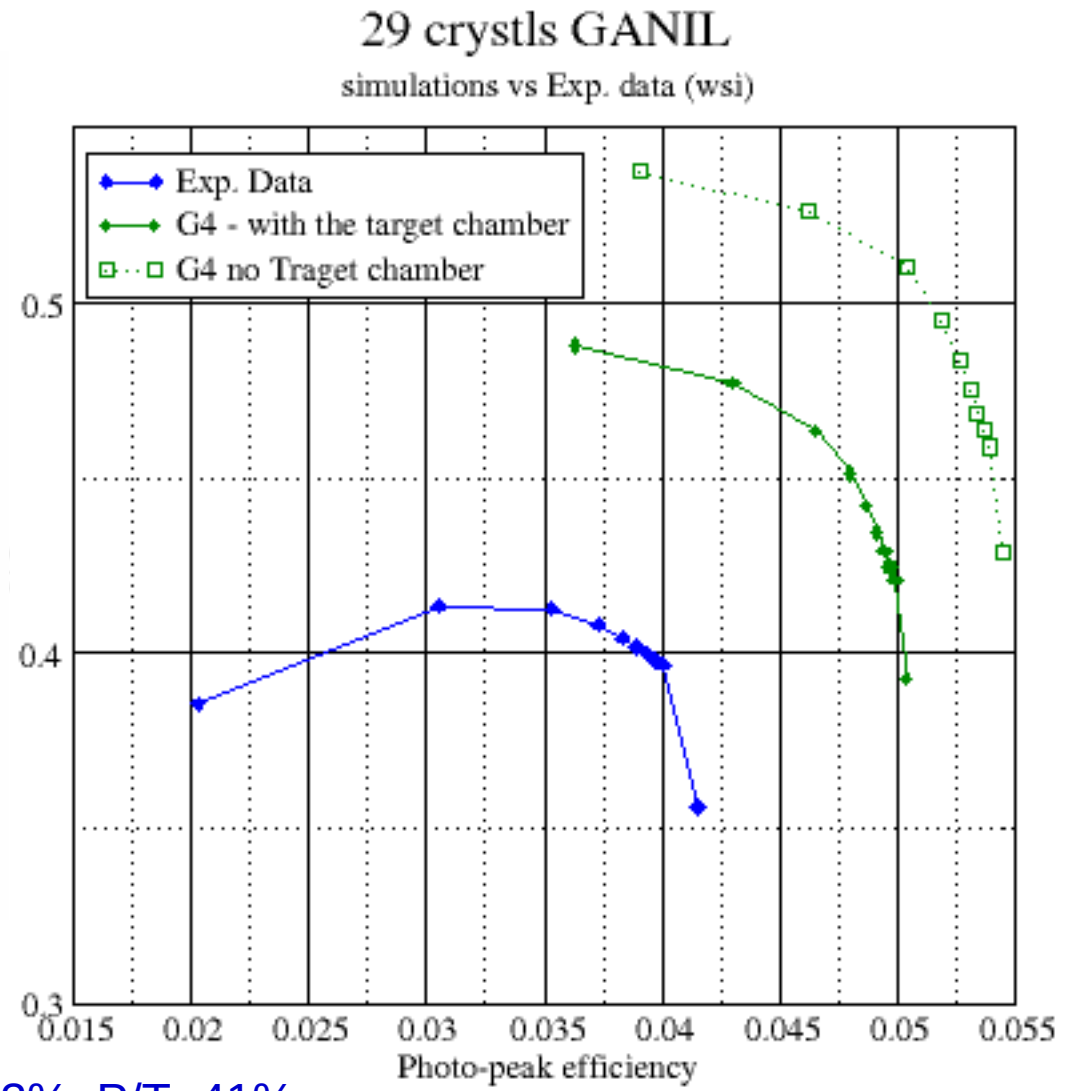


Relative efficiencies as given
By Canberra for the 32 crystals
In the AGATA array @GANIL

Mean value : 80.4 %
Compared to 86.2 % G4

Same plot as before : AGATA
Data at GANIL – 29 crystals



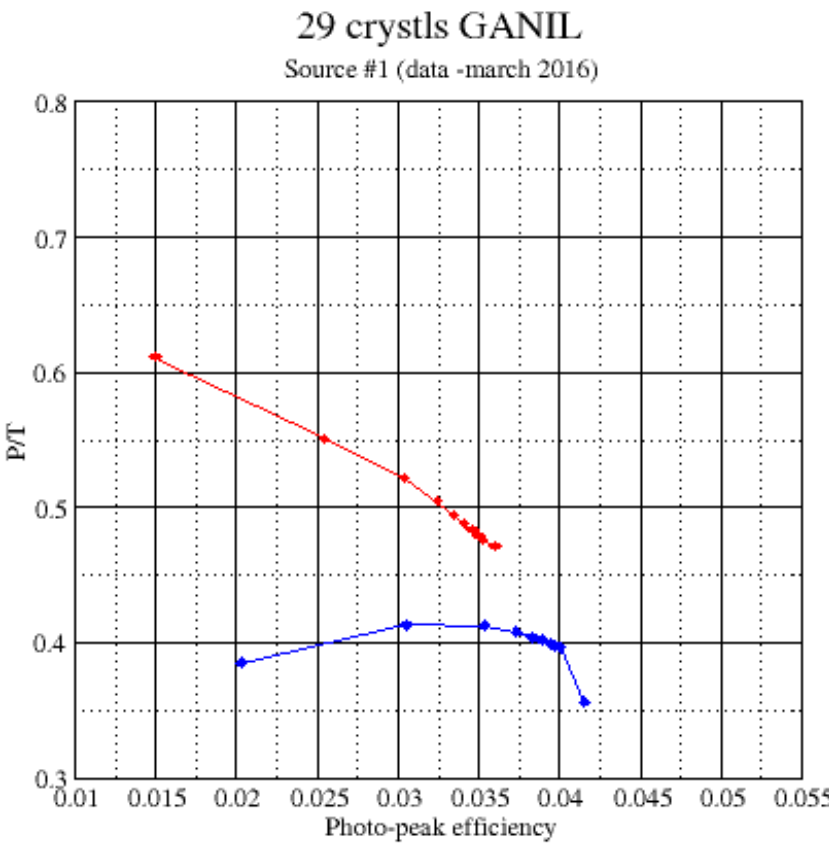


Tracked FOM cut = 1

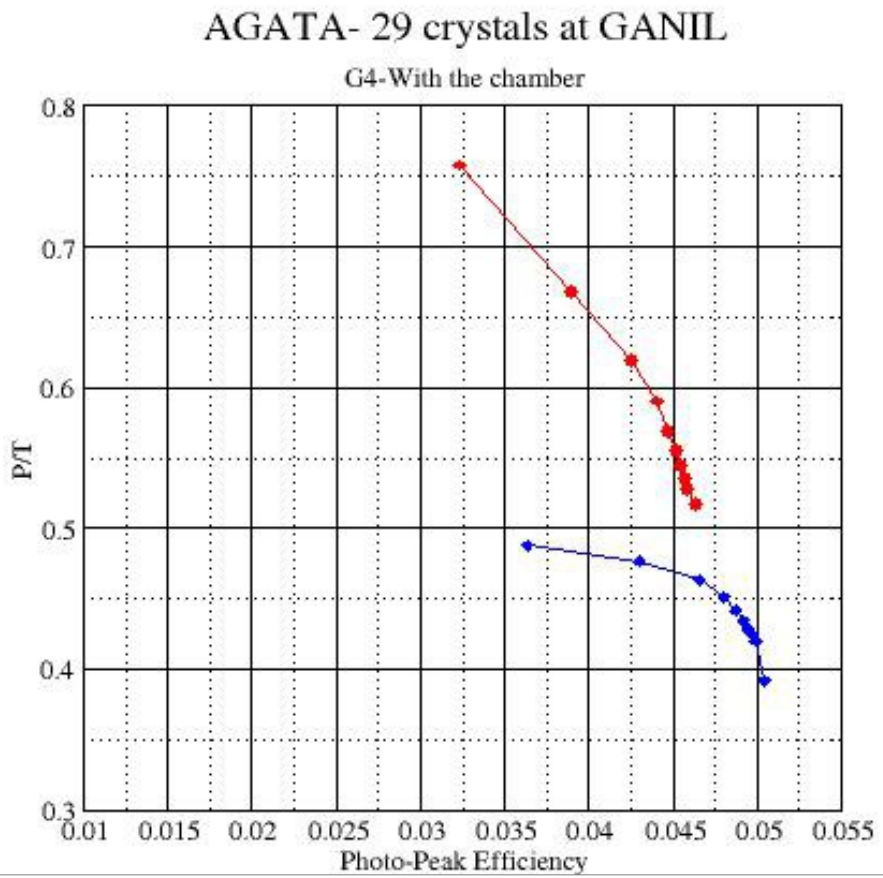
Data → Eff= 3.83% P/T=41%
G4 with the chamber ->Eff= 4.8% P/T= 44%
Non realistic G4 5.2 48
G4 Simulated data provide by M. Labiche
Calorimetric : Exp data 4.37% 38% G4 (chamber in) 5.18% 44%

60Co source

Experimental data



G4 Simulations

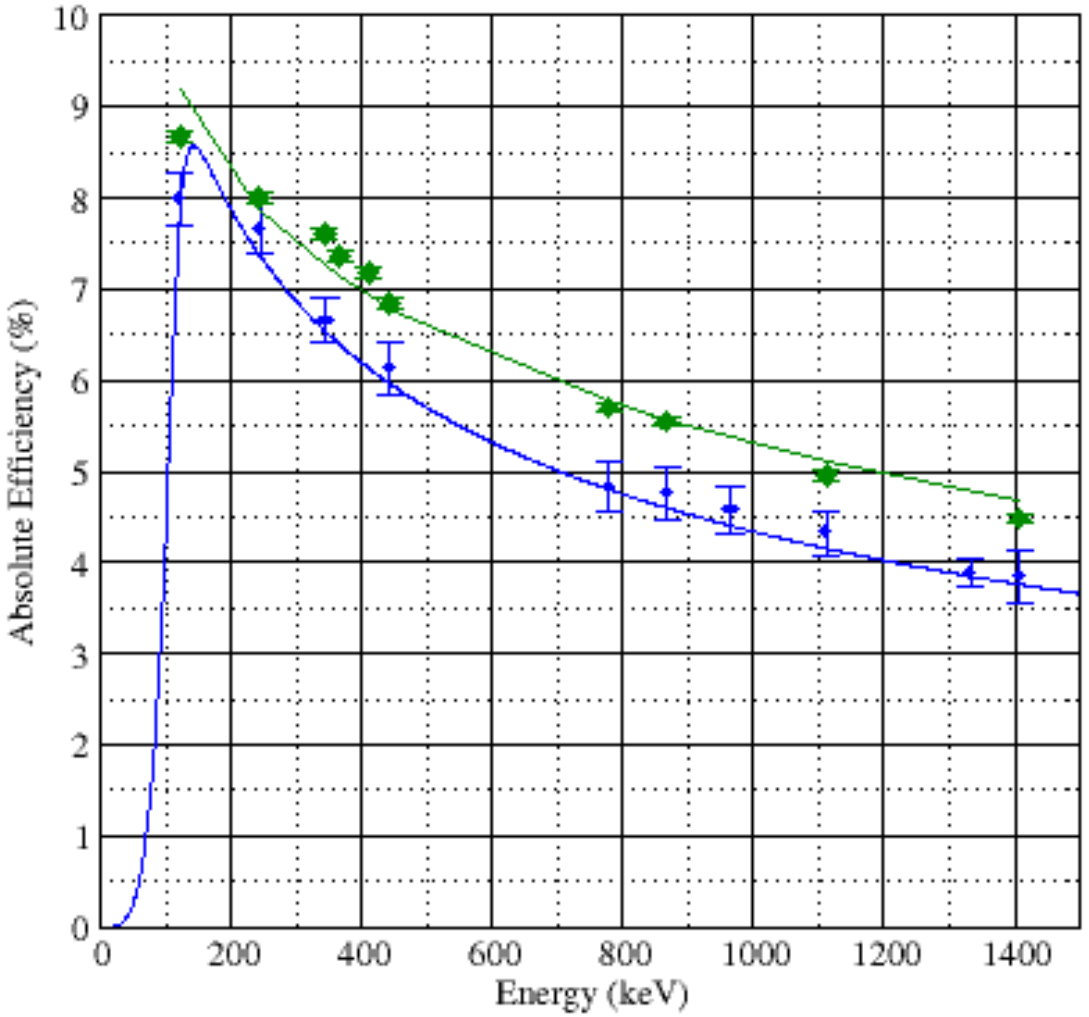


Exp. Data	G4		Exp/G4 Eff P/T
Abs_Eff= 3.83 P/T=41%	Abs_Eff=4.87%	P/T= 44%	15-20%, 7%
Abs_eff=3.29% P/T= 49 %	Abs_Eff= 4.46%	P/T=57%	25-27%, 15%

FOM cut=1

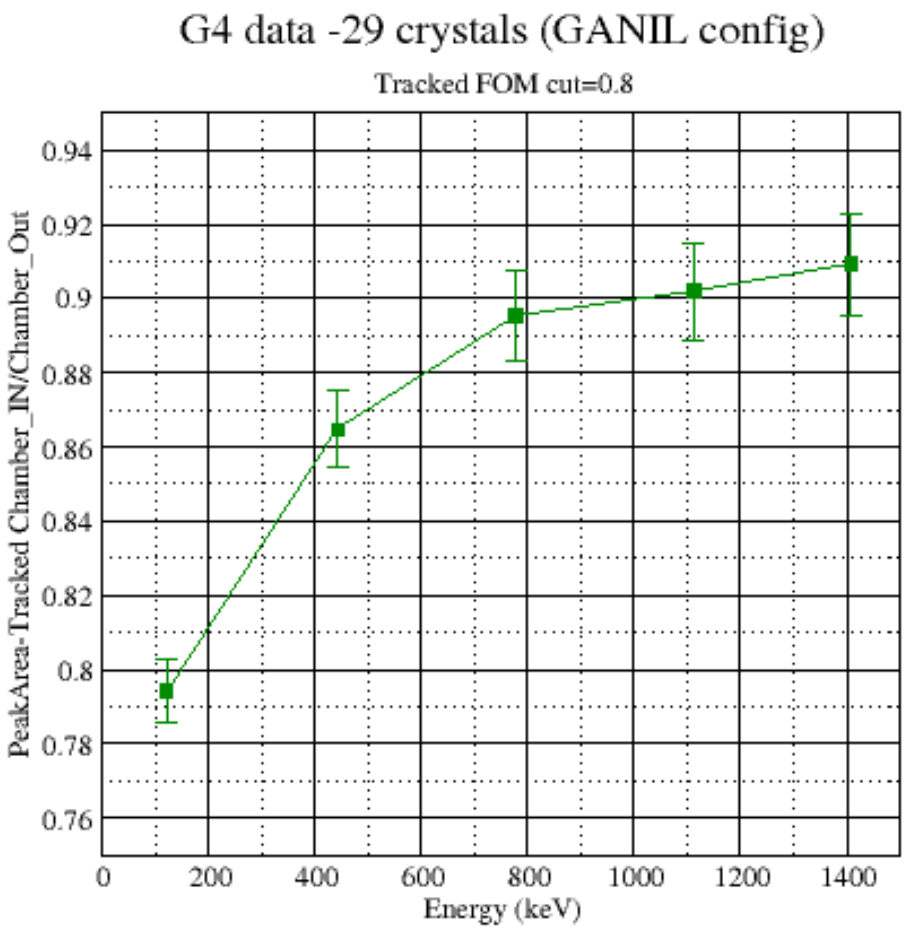
152Eu source : Experimental data / simulated

5% @121 keV vs 15% @1.3 MeV



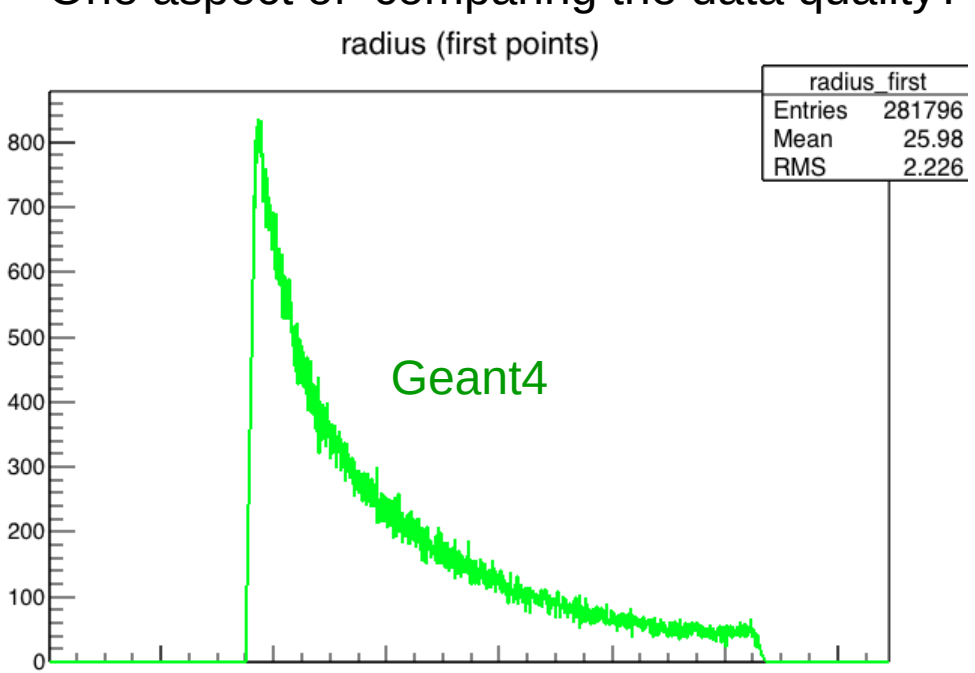
Peak area (G4 with the chamber)/Peak area (G4 without the chamber)

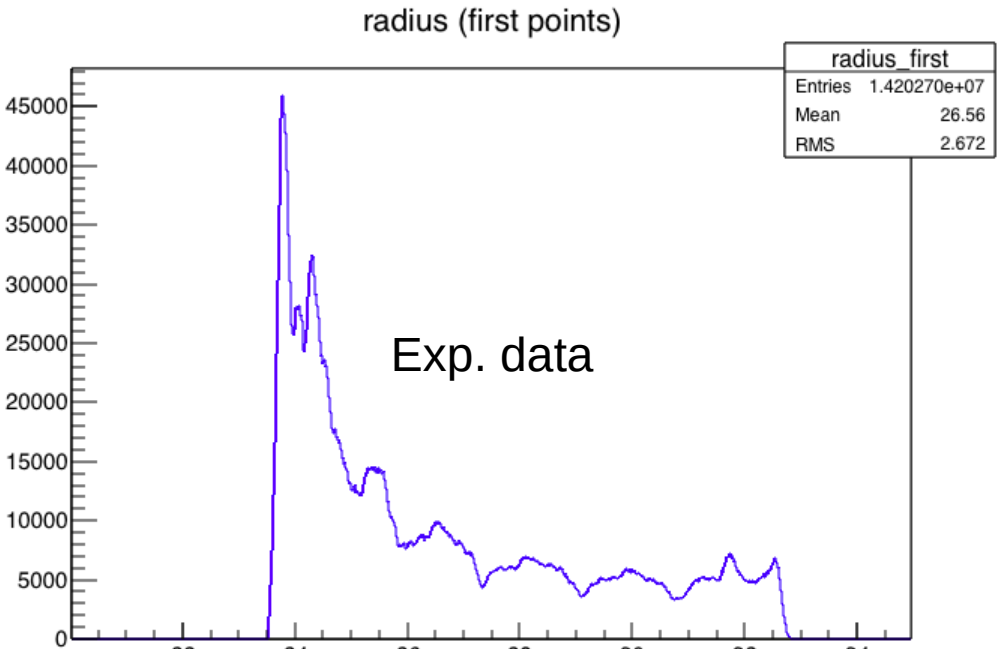
t

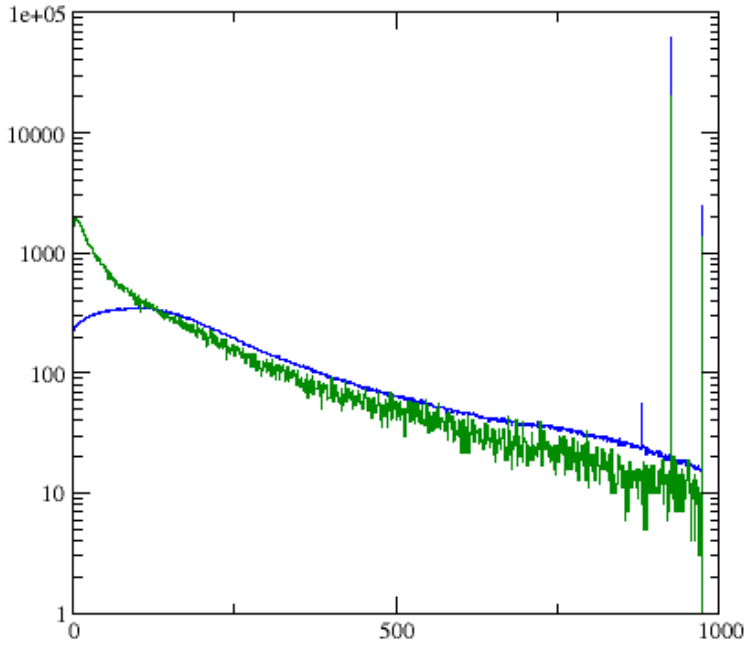


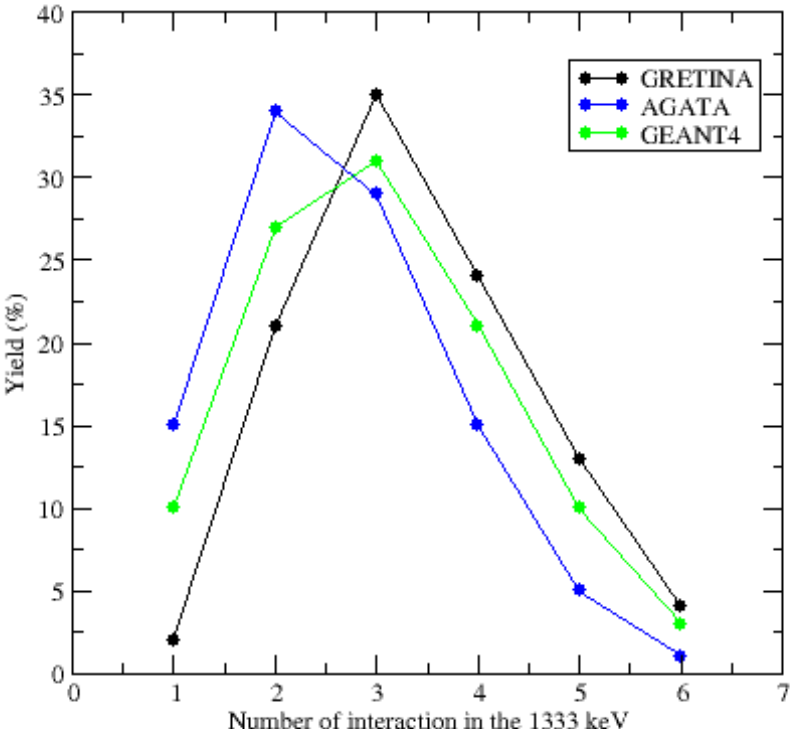
Simulations need more ingredients/”improvement”

One aspect of comparing the data quality?



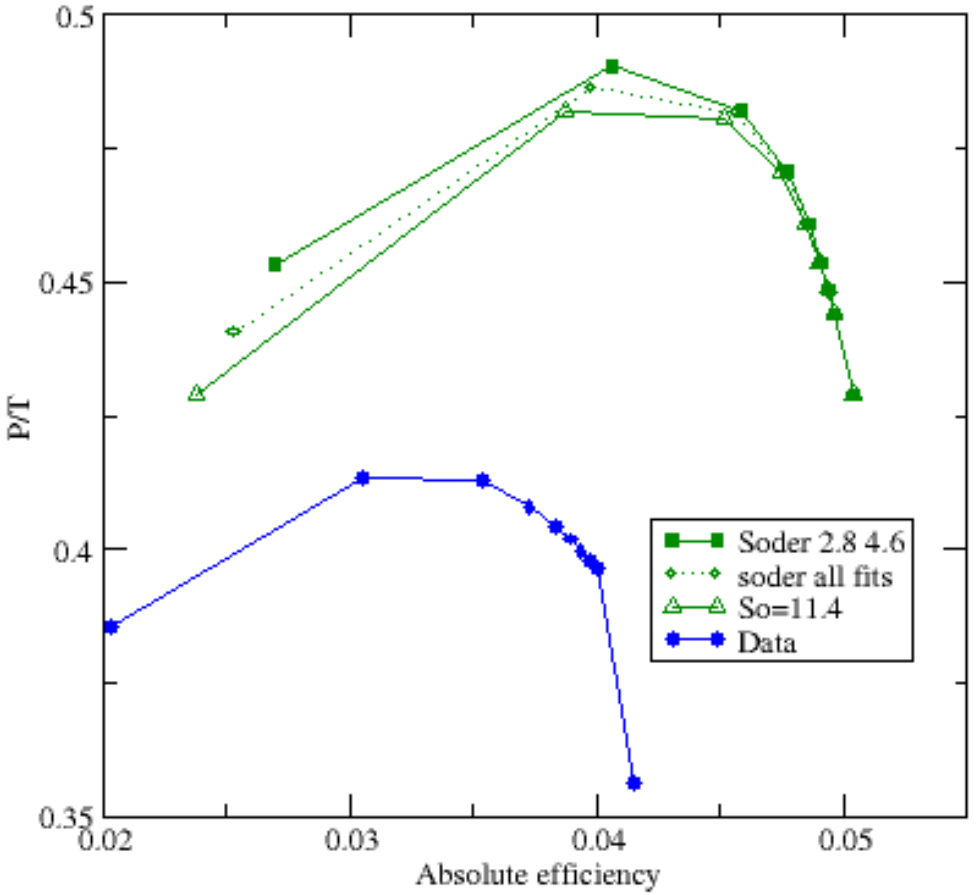


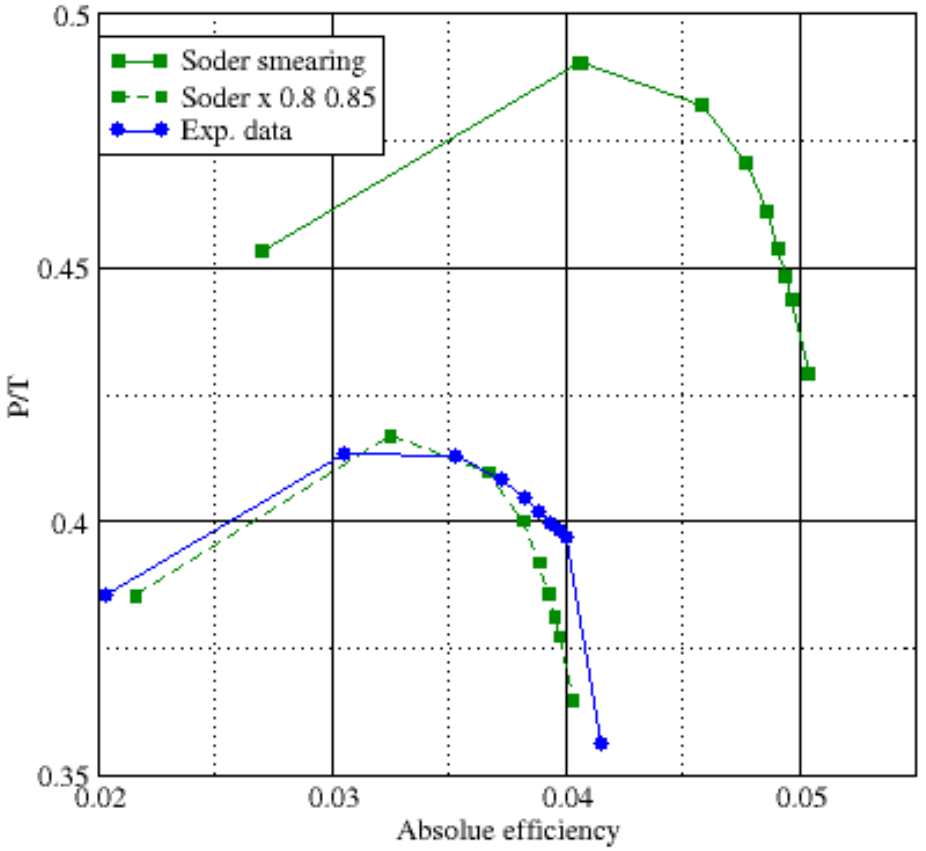




60Co source

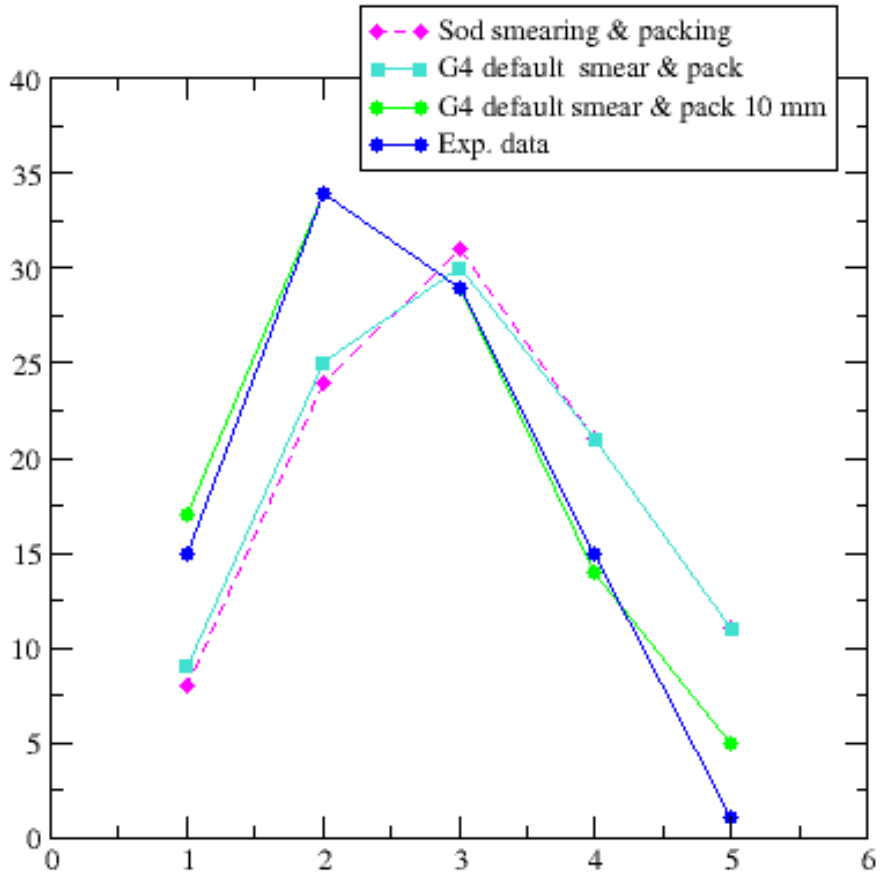
Position smearing effect based on measurement



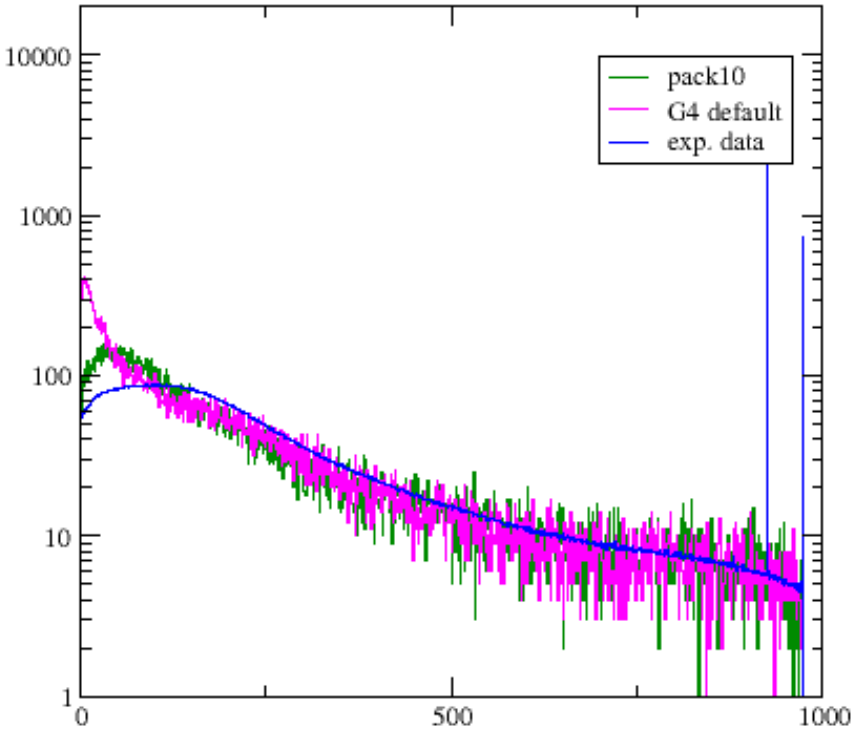


$$W_p(E_p) = w_0 + w_1\sqrt{\frac{100\ \text{keV}}{E_p}} \qquad s(E_p) = s_0\sqrt{\frac{100\ \text{keV}}{E_p}}.$$

Tracked # of interaction distribution



Tracking FOM



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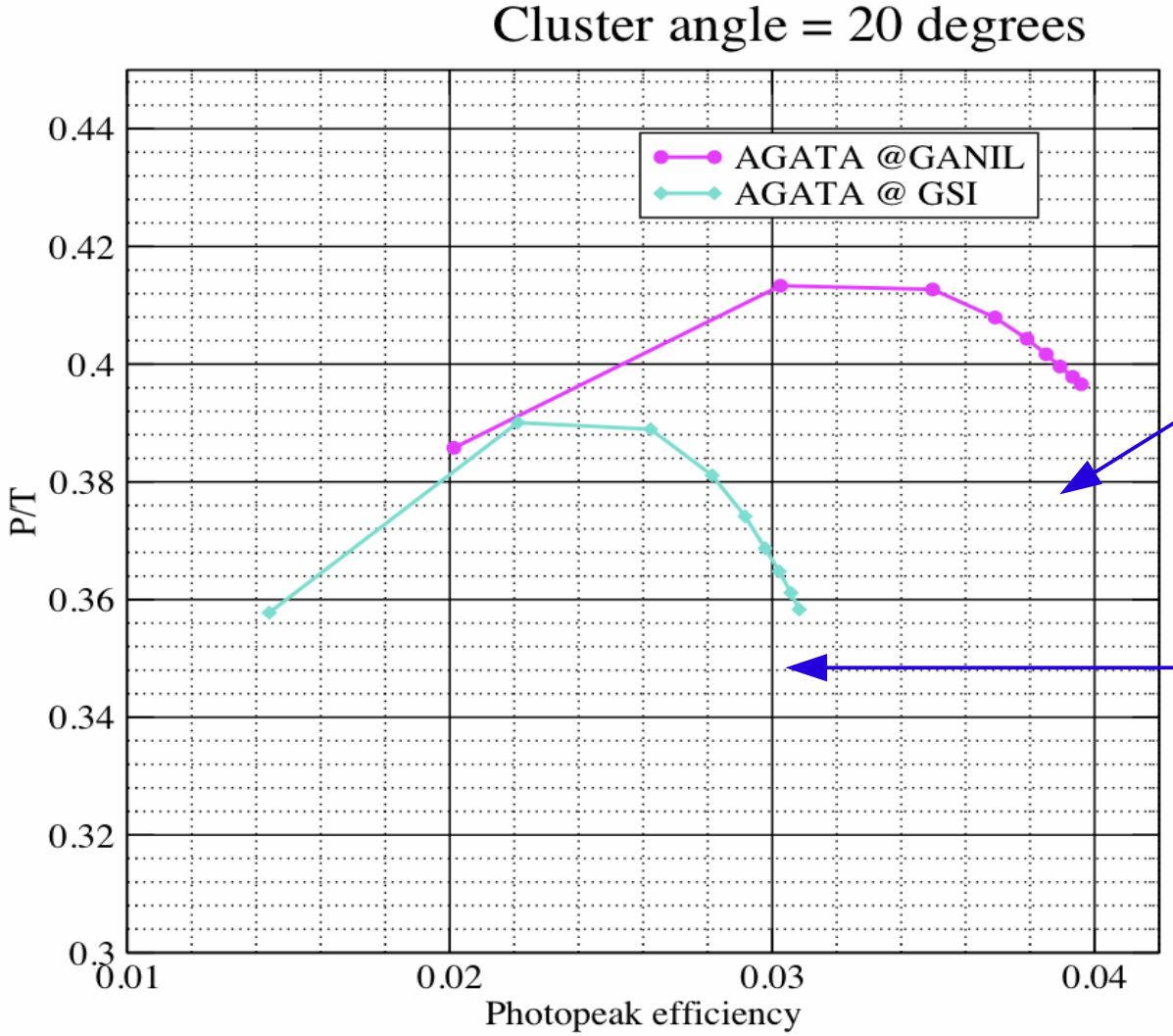
AGATA GSI & GANIL

Tracked data including single interactions



FOM =0.8
Eff=3.7 % P/T= 41%

FOM=0.8
Eff=2.8 % P/T= 38%

Scaling :
21/29 * 3.7% = 2.7 %

Need simulations including every thing to conclude and compare things