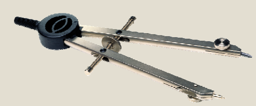
PARIS

PHOTON ARRAY FOR STUDIES WITH RADIOACTIVE ION AND STABLE BEAMS

- ***Dorothée Lebhertz***
  Spherical designs and application to the radiative capture case
- ***Anil Kumar Gourishetty***
  G4 simulations of a single LaBr3 detector and large NaI(Tl) detector arrays
- ***Dipak Chakrabarty***
  GDR experiment with an ideal six-box two-layered detector array: an EGS simulation
- ***Michal Ciemala***
  Energy resolution changes in phoswitch like detector
- ***Olivier Stézowski***
  Response function at high multiplicity : first algorithms

- ***Jonathan Strachan***
  Review of Mechanical options for PARIS

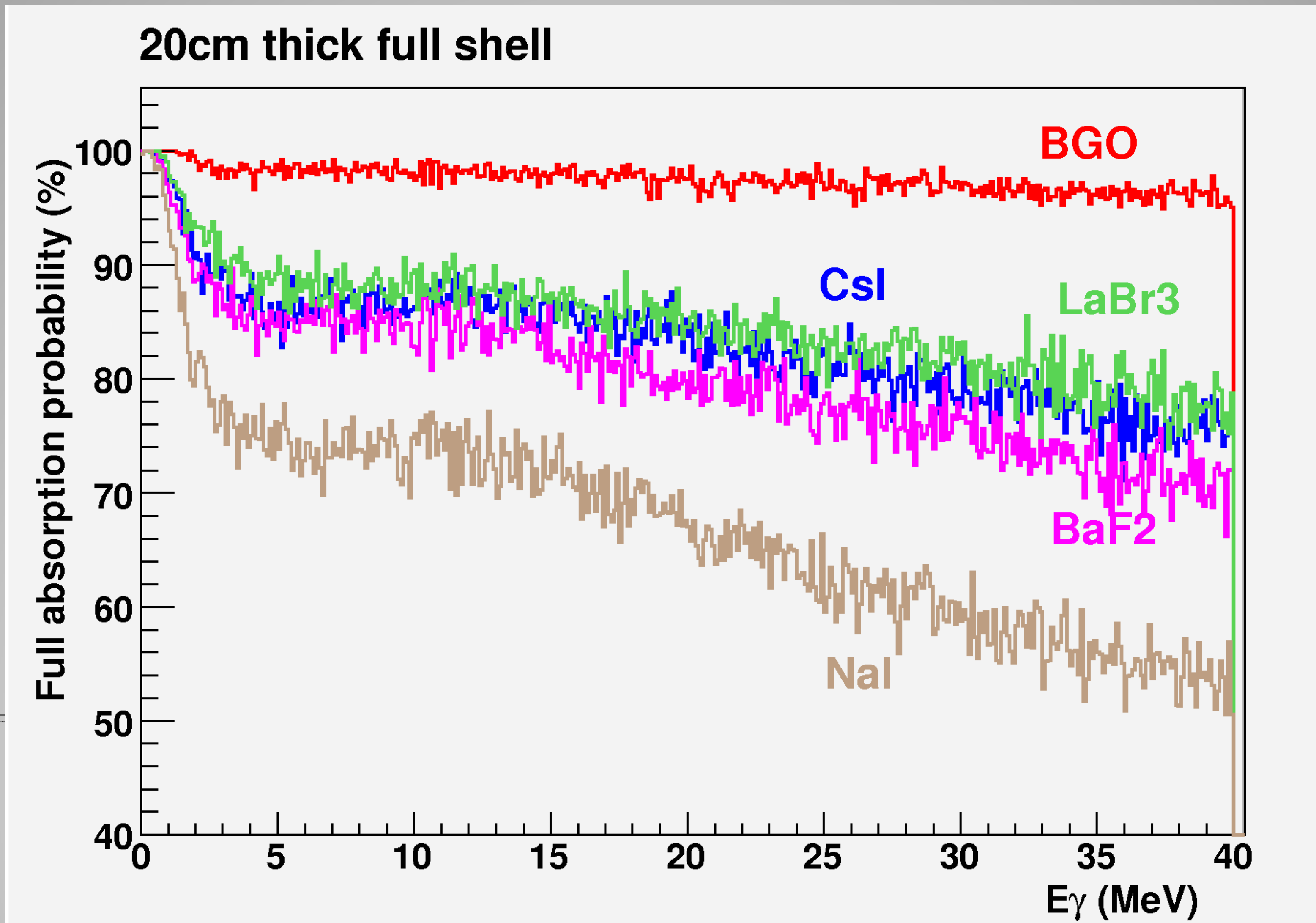


Simulations & mechanical design WGs

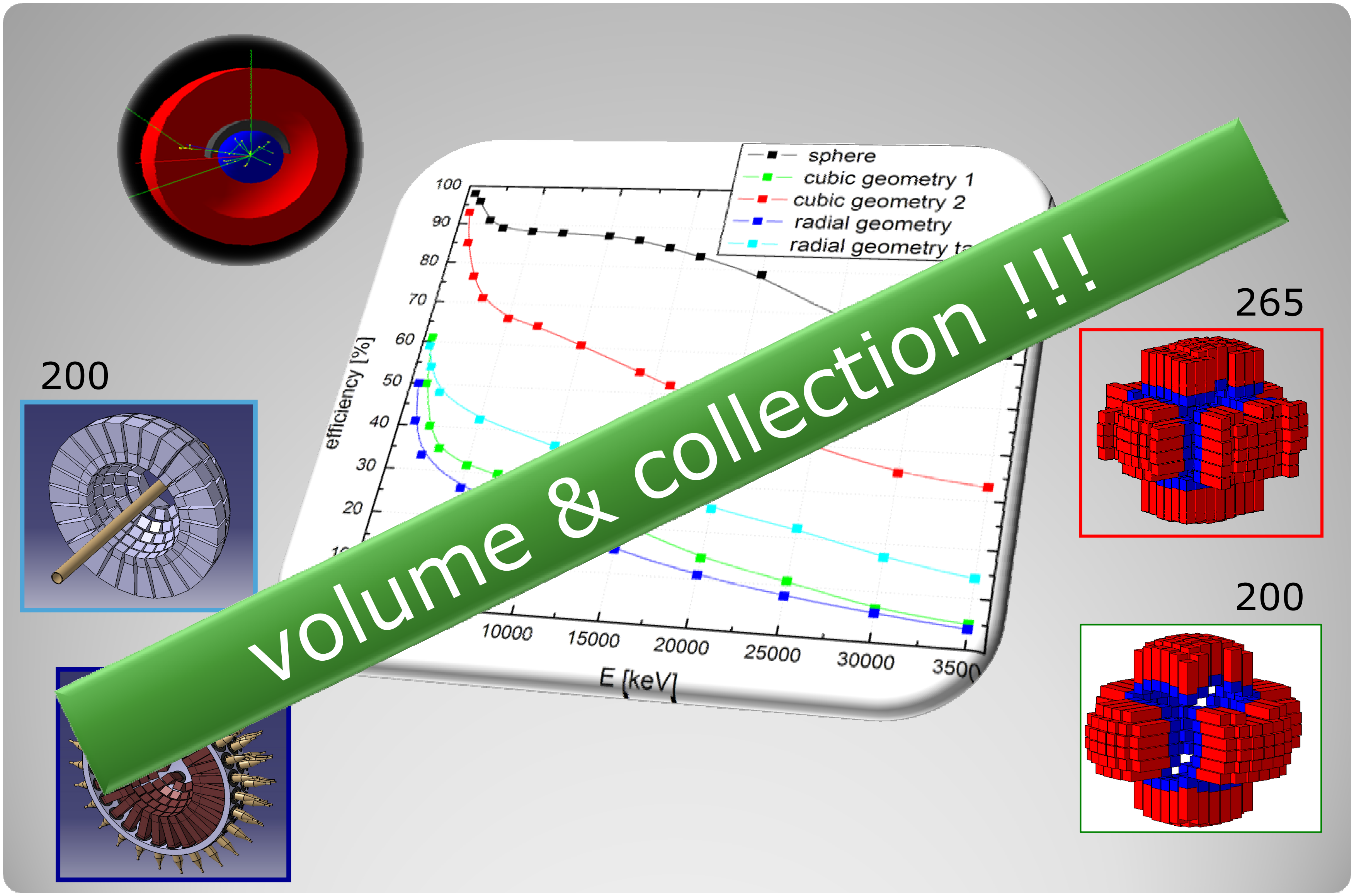
List of requirements related to the different physics cases to be addressed at PARIS

Physics Case	Recoil mass	v/c [%]	E_g range [MeV]	DE_g/E_g [%]	DE_{sum}/E_{sum} [%]	DM_g	W coverage	DT [ns]	Ancillaries	Comments
Jacobi transition	40-150	<10	0.1-30	4	<5	4	2p-4p	<1	AGATA HI det.	High eff. Beam rej.
Shape Phase Diagram	160-180	<10	0.1-30	6	<5	4	2p-4p	<1	HI det.	High eff. Differential method Beam rej.
Hot GDR in n-rich nuclei	120-140	<11	0.1-30	6	<8	4	2p-4p	<1	HI det.	Beam re.
Isospin mixing	60-100	<7	5-30	6	-	-	4p	<1	HI det.	High eff. Beam rej.
Reaction dynamics	160-220	<7	0.1-25	6-8	<8	4	2p	<1	n-det. FF det.	Complex coupling
Collectivity vs. multi-fragmentation	120-200	<8	5-30	5	-	-	2p	<1	LCP det. HI det.	Complex coupling
Radiative capture	20-30	<3	1-30	<4	5	-	4p	<1	HI det.	High eff.
Multiple Coulex	40-60	<7	2-6	5	-	-	2p	<5	AGATA CD det.	Complex coupling
Astrophysics	16-90	0.1	0.1-6	6	5	-	4p	<1	Outer PARIS shell as active shield	High eff. Back-ground
Shell structure at intermediate energies (SISSI/LISE)	16-40	20-40	0.5-4	3	-	-	3p	<<1	SPEG or VAMOS	High eff. Low I_{beam} g-g coinc
Shell structure at low energies (separator part of S^3)	30-150	10-15	0.3-3	3	-	-	3p	<<1	Spectrometer part of S^3	High eff. Low I_{beam} g-g coinc
Relativistic Coulex	40-60	50-60	1-4	4	-	1	Forward 3p	<<1	AGATA HI analyzer	Ang. Distr. Lorentz boost

Requirements from the physics cases



Algo depends on the physics cases !



Efficiency @ multiplicity 1

List of requirements related to the different physics cases to be a

Physics Case	Recoil mass	v/c [%]	E_g range [MeV]	DE_g/E_g [%]	[illegible]	[illegible]	W coverage	DT [ns]	Ancillaries	Comments
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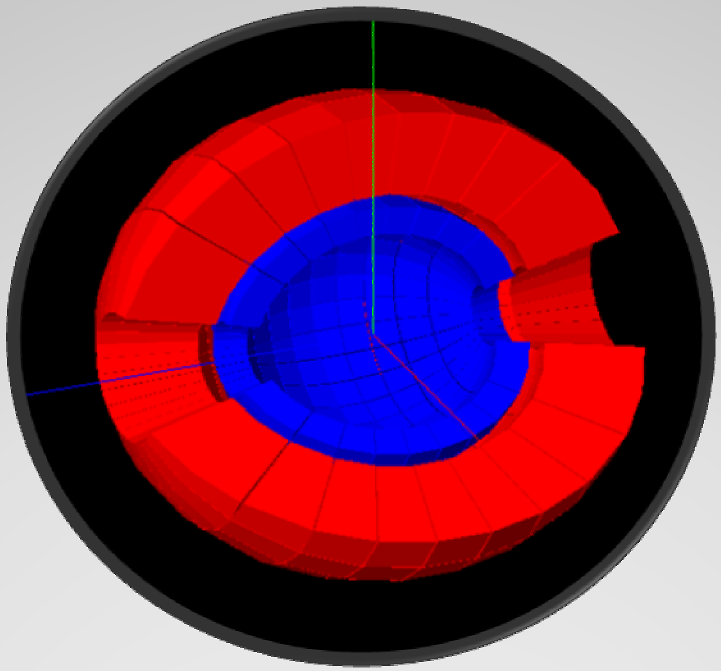
Relativistic Coulex	40-60	50-60	1-4	4 ✗	-	1	Forward 3p	<<1	AGATA HI analyzer	Ang. Distr. Lorentz boost

Doppler versus Opening Angle !!

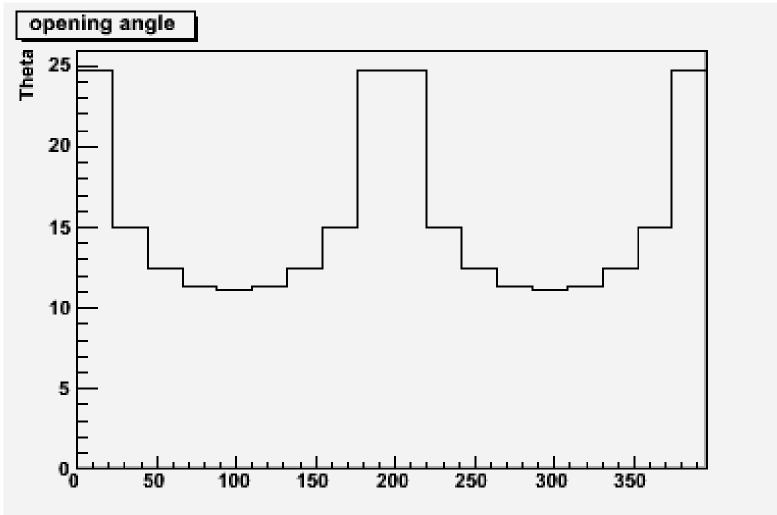
Requirements from the physics cases

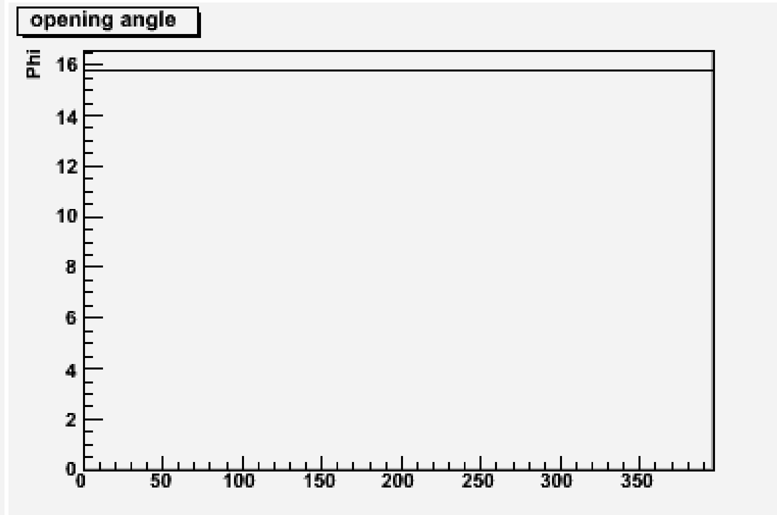
Geometry / Generator / Reconstruction

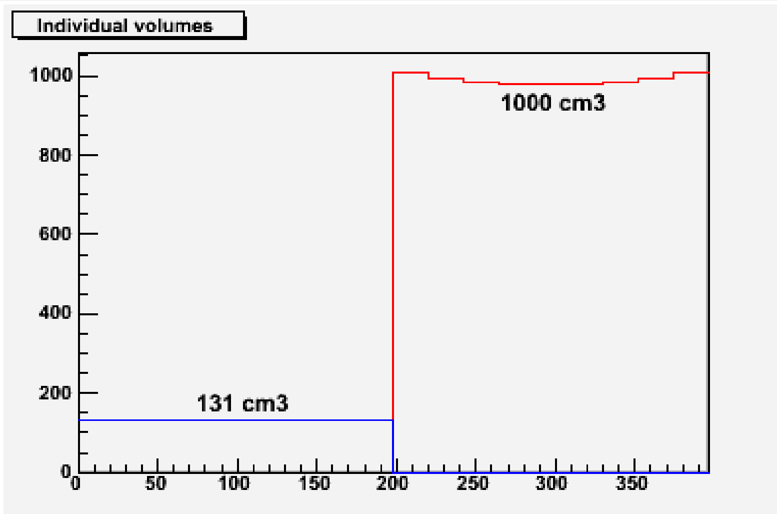


Study at high multiplicity

Segmented geometry







Beam pipe : 5 cm radius

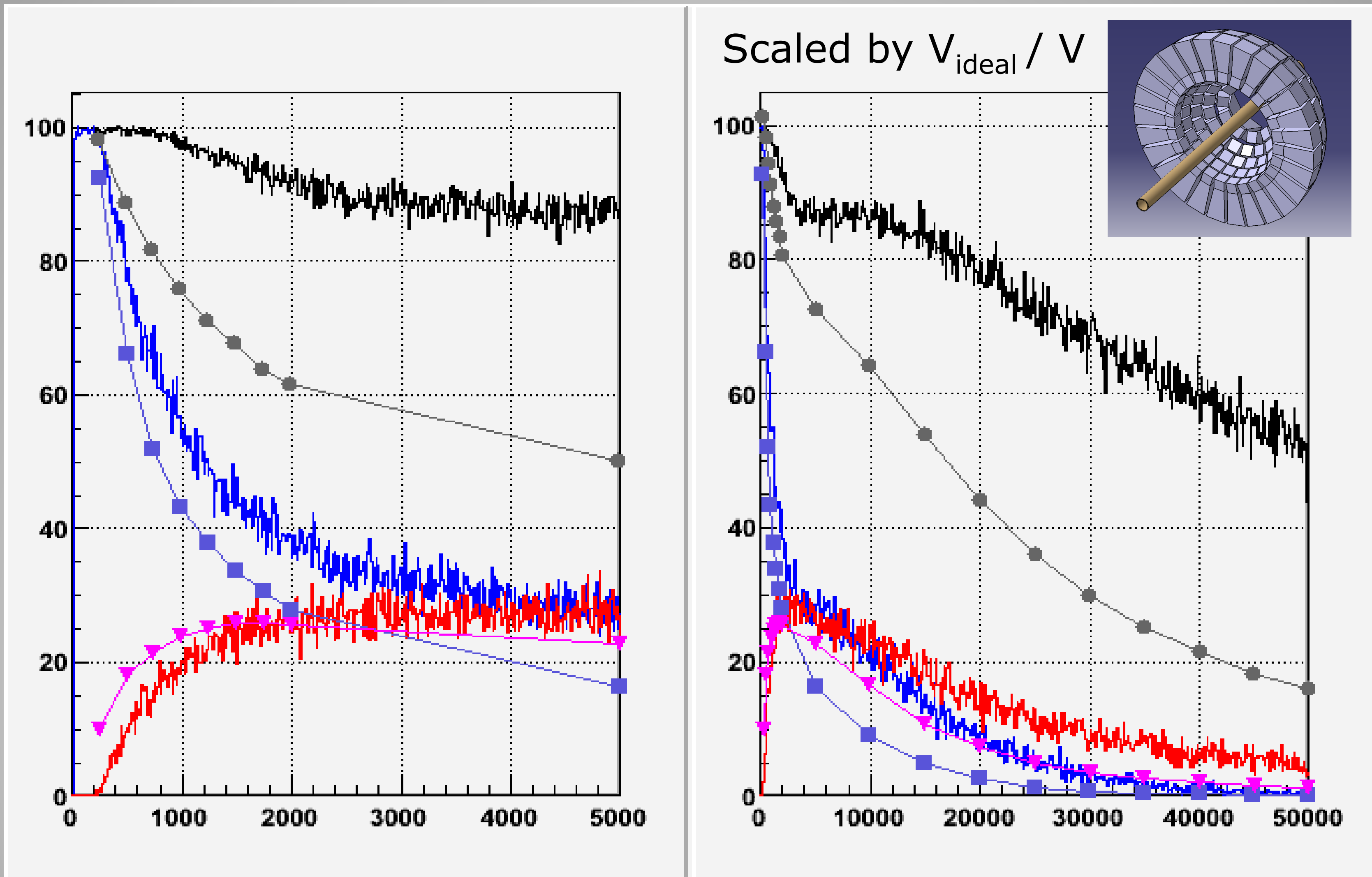
Separation between two inner elements 2mm

396 cells (9x22)

Total Volume of Shell 1 0.888106 % of 29.2084 dm3

Total Volume of Shell 2 0.888779 % of 220.261 dm3

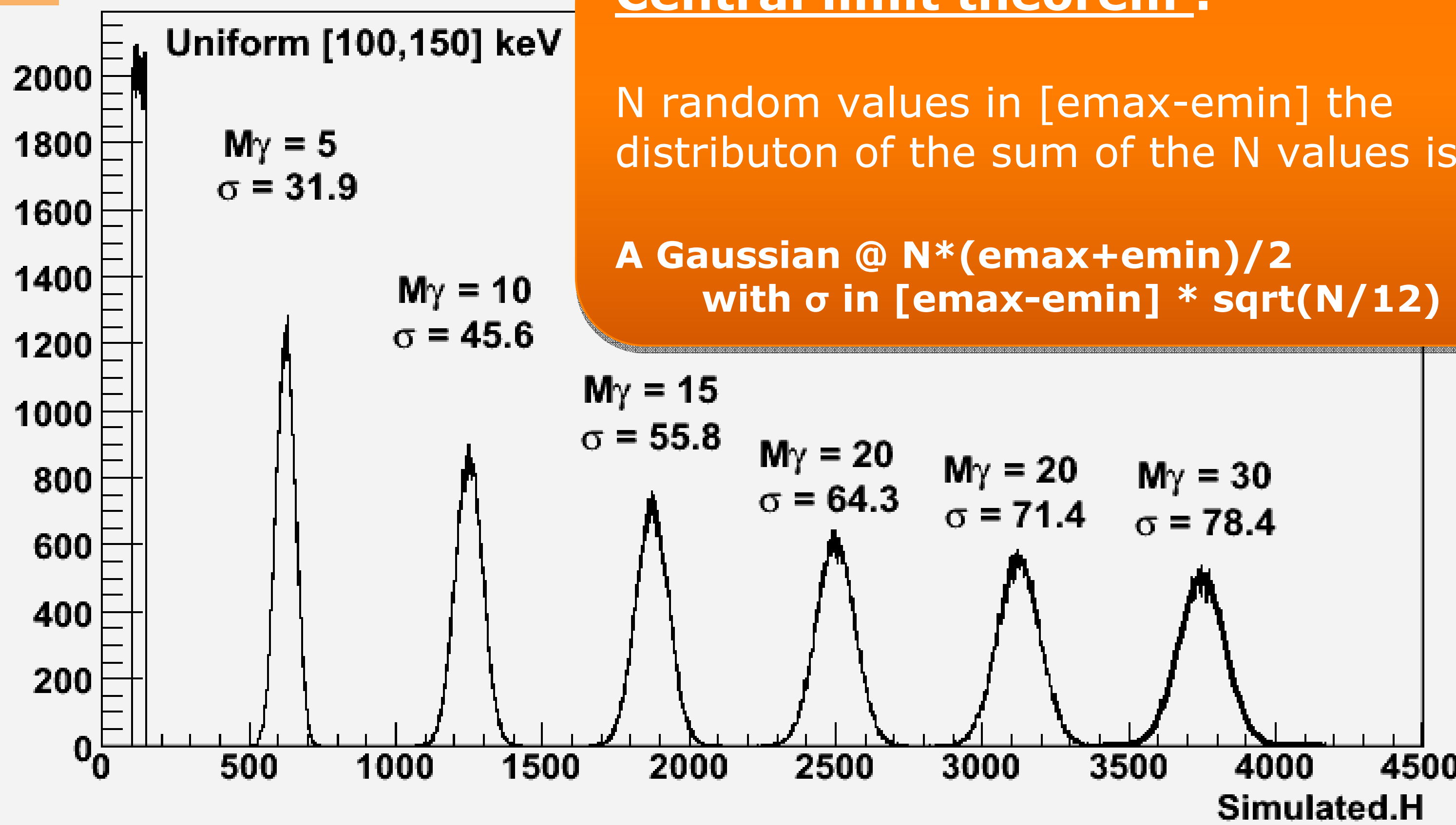
2''*2''*2'' @ 18.8cm + 2''*2''*6''



Full absorption @ multiplicity 1

Mult {5, 10, 15, 20, 25, 30} over an uniform distribution [0,1.5 MeV]
No Doppler, source @ the center

Ex



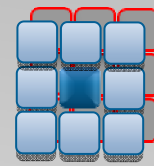
Central limit theorem :

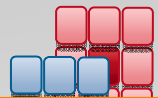
N random values in [emax-emin] the distributon of the sum of the N values is:

A Gaussian @ N*(emax+emin)/2 with σ in [emax-emin] * sqrt(N/12)

Generator

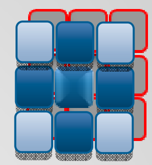
RawPerformances : one element = one γ –ray

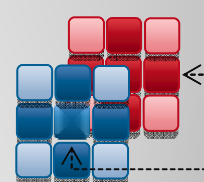
- 0_0 : only the first shell 

- 1_0 : both shells 

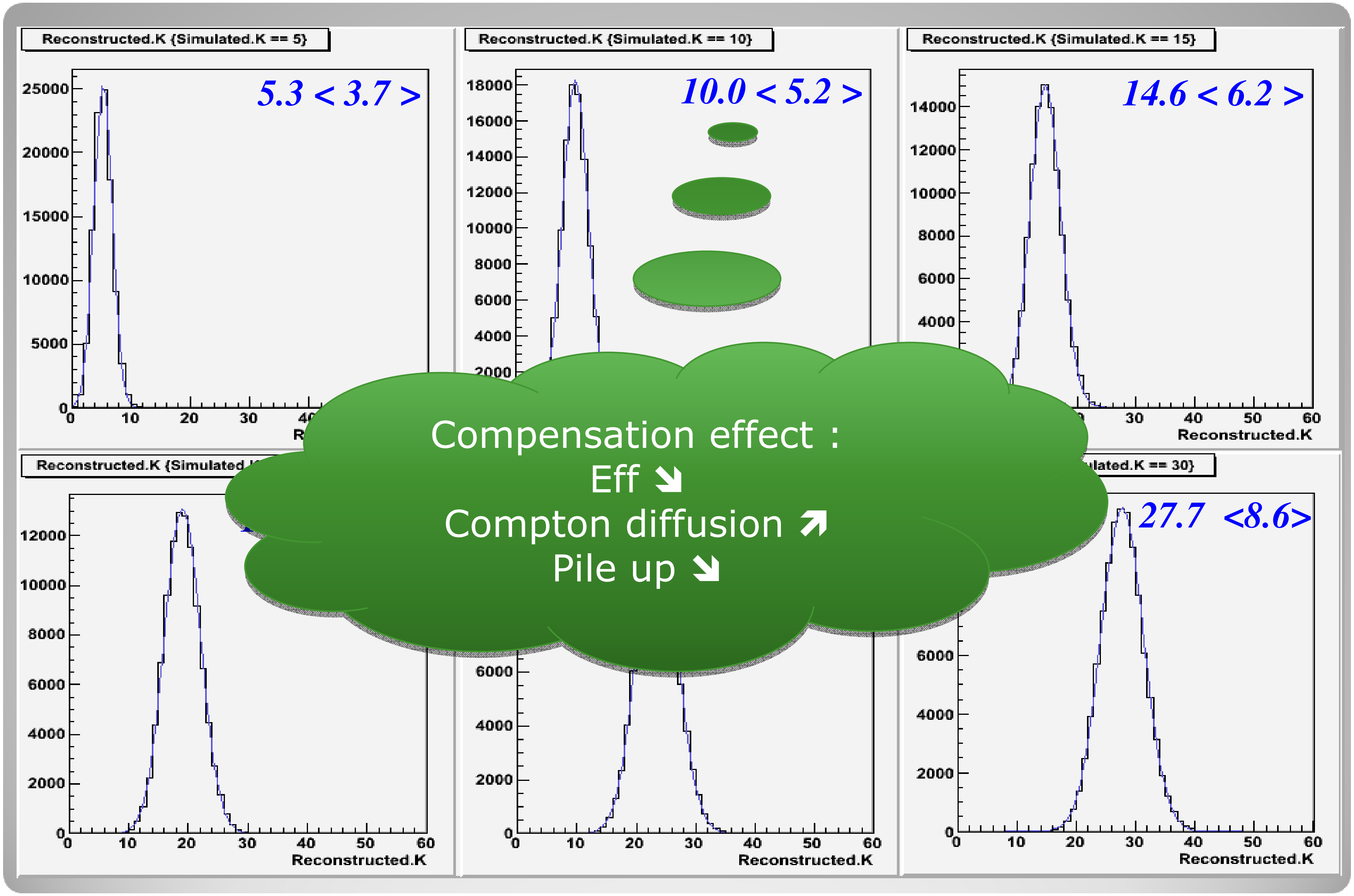
H : detected energy
K : reconstructed multiplicity

AddBac
(start

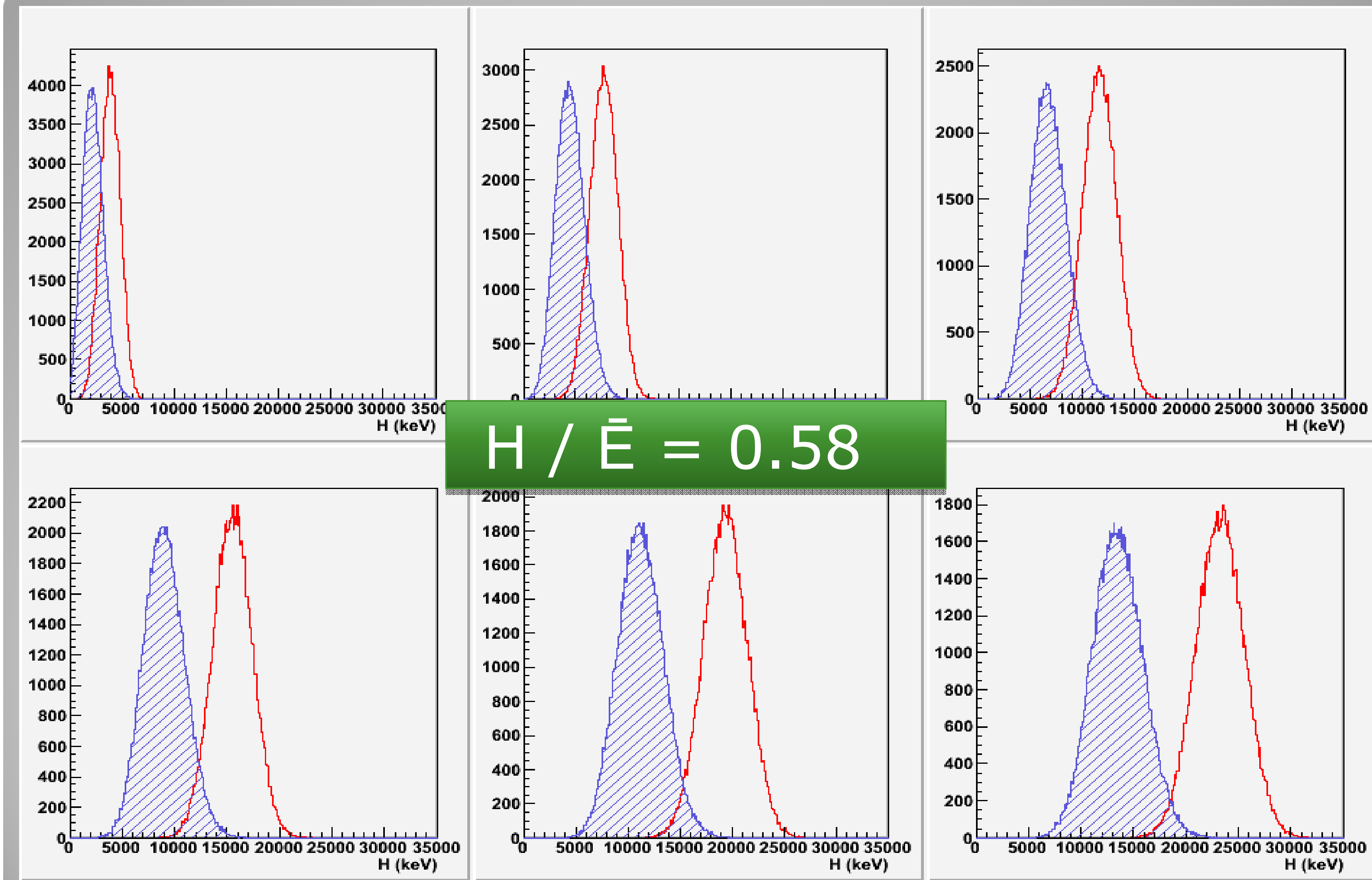
0_0 : closest only in the first shell 

1_0 : + addback between the 2 shells 

Different clustering methods

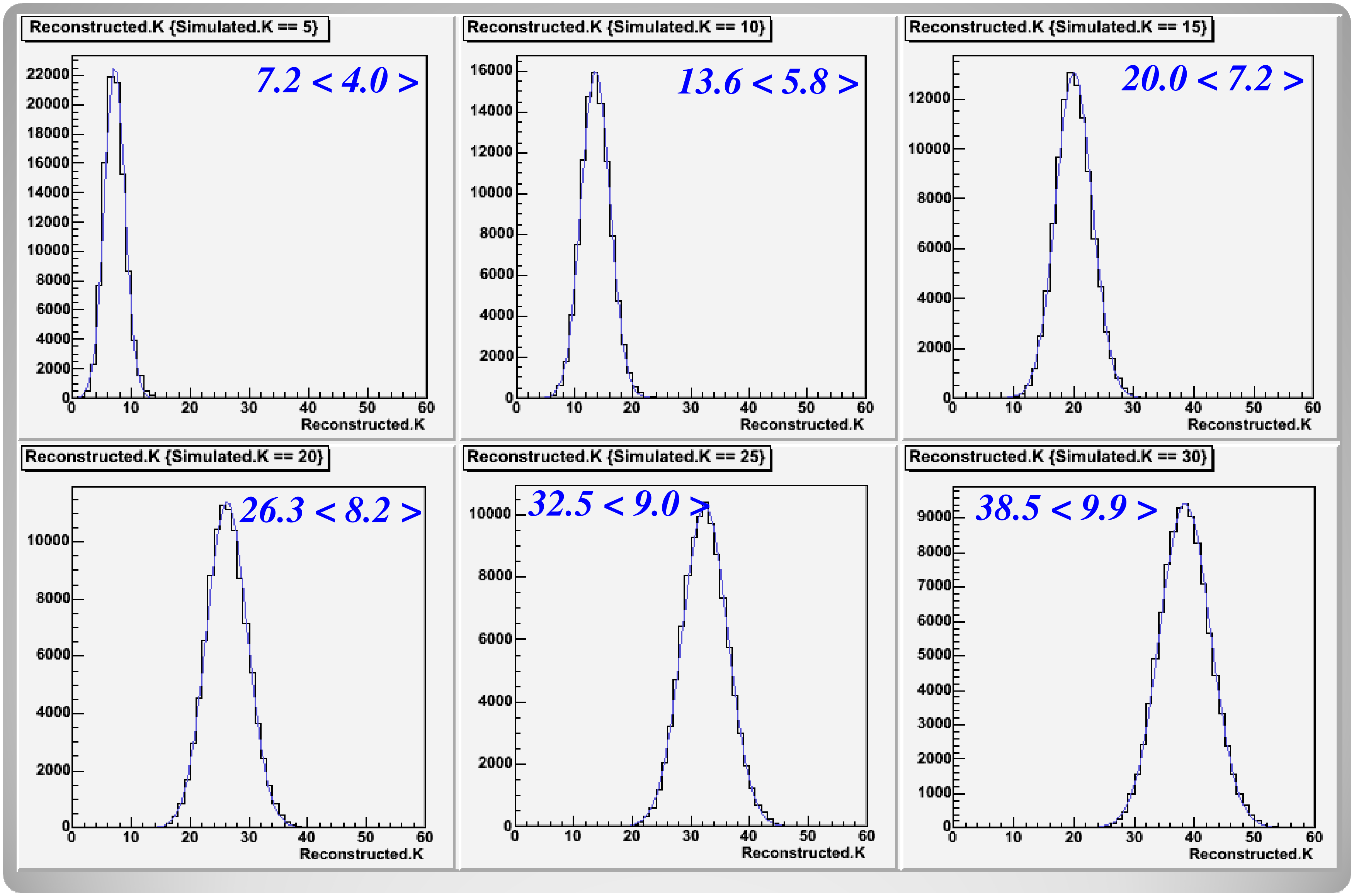


K with RawPerformances0_0



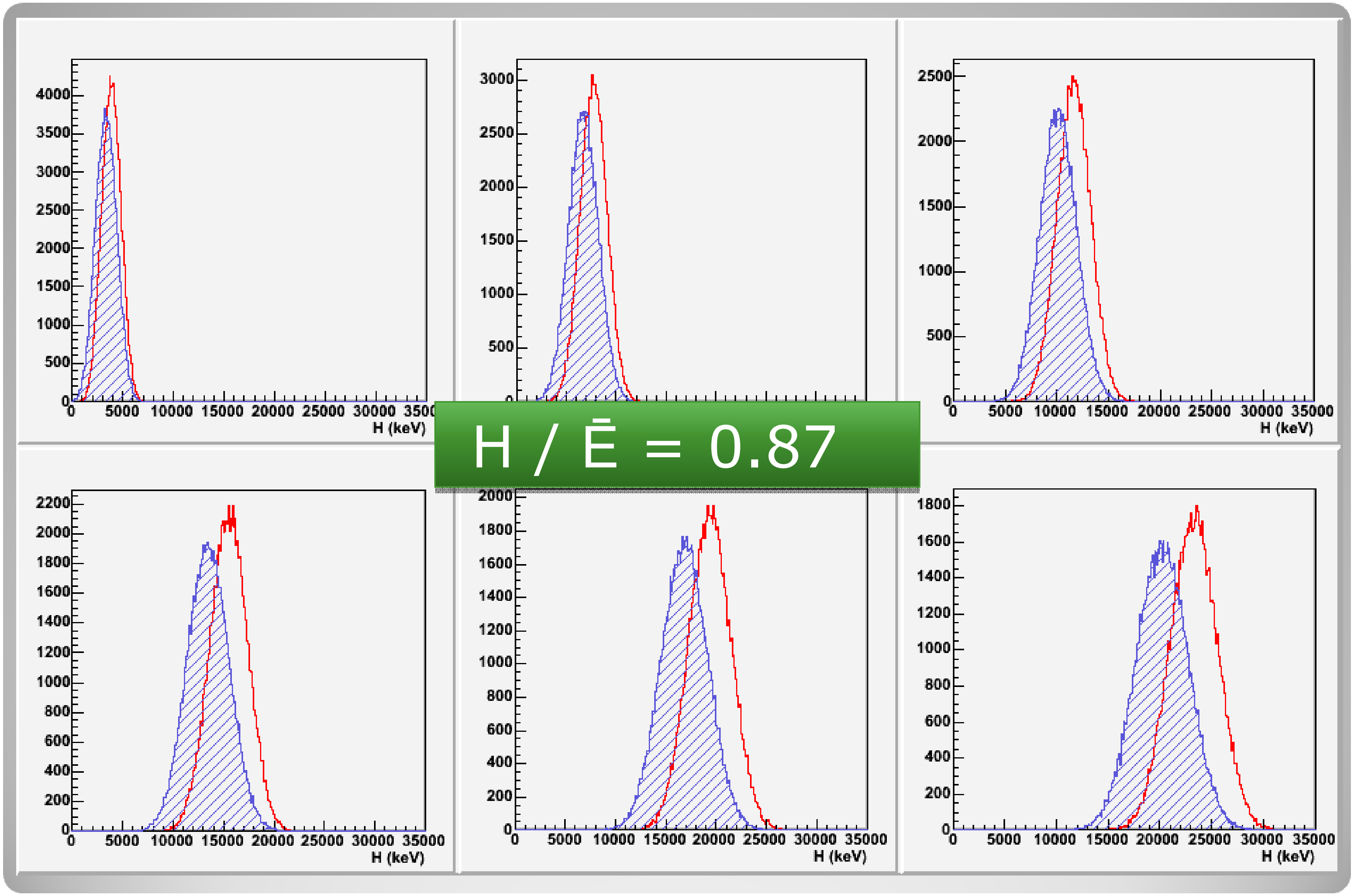
H / Ē = 0.58

H with RawPerformances0_0

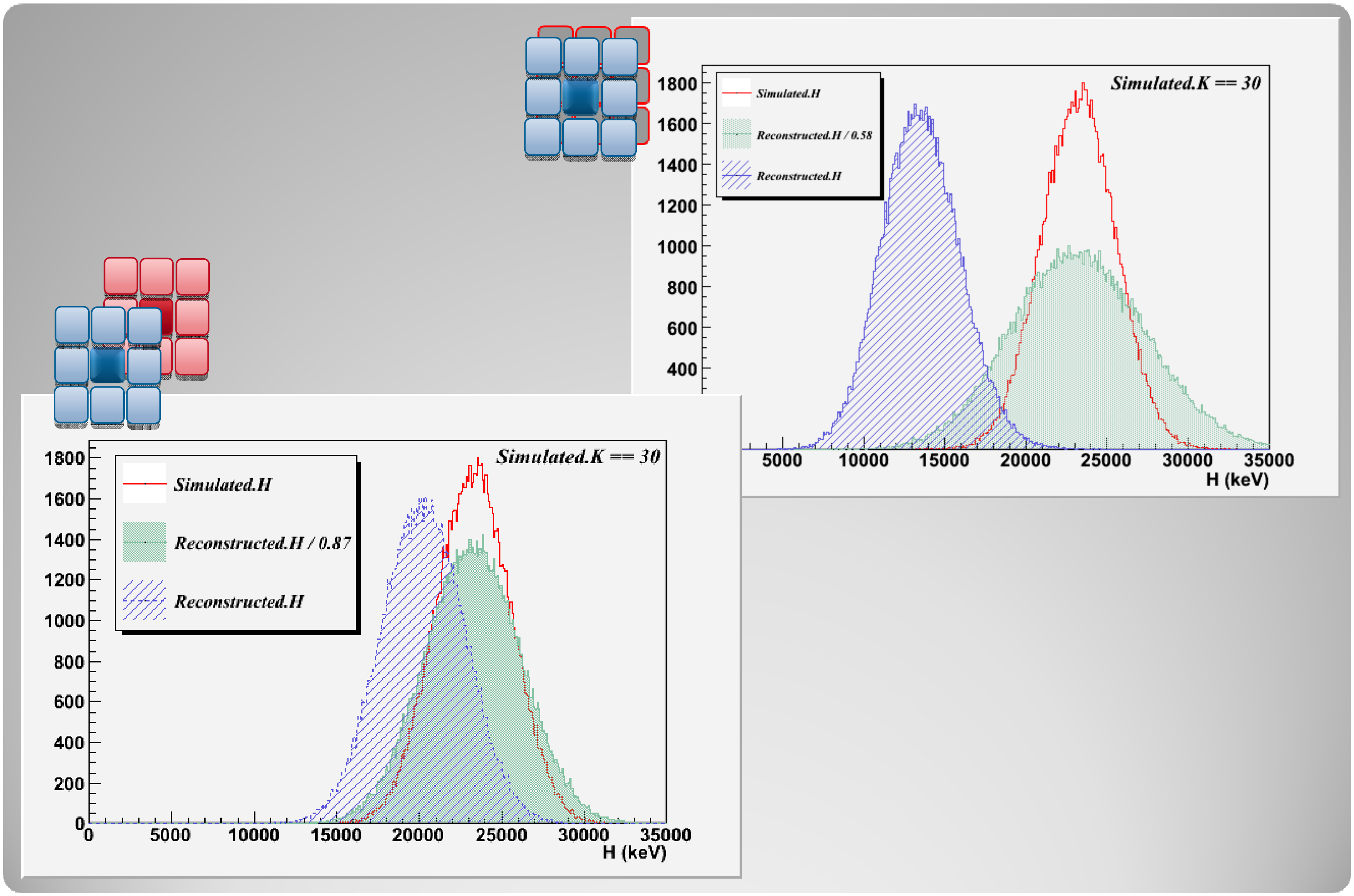


K with RawPerformances0_1

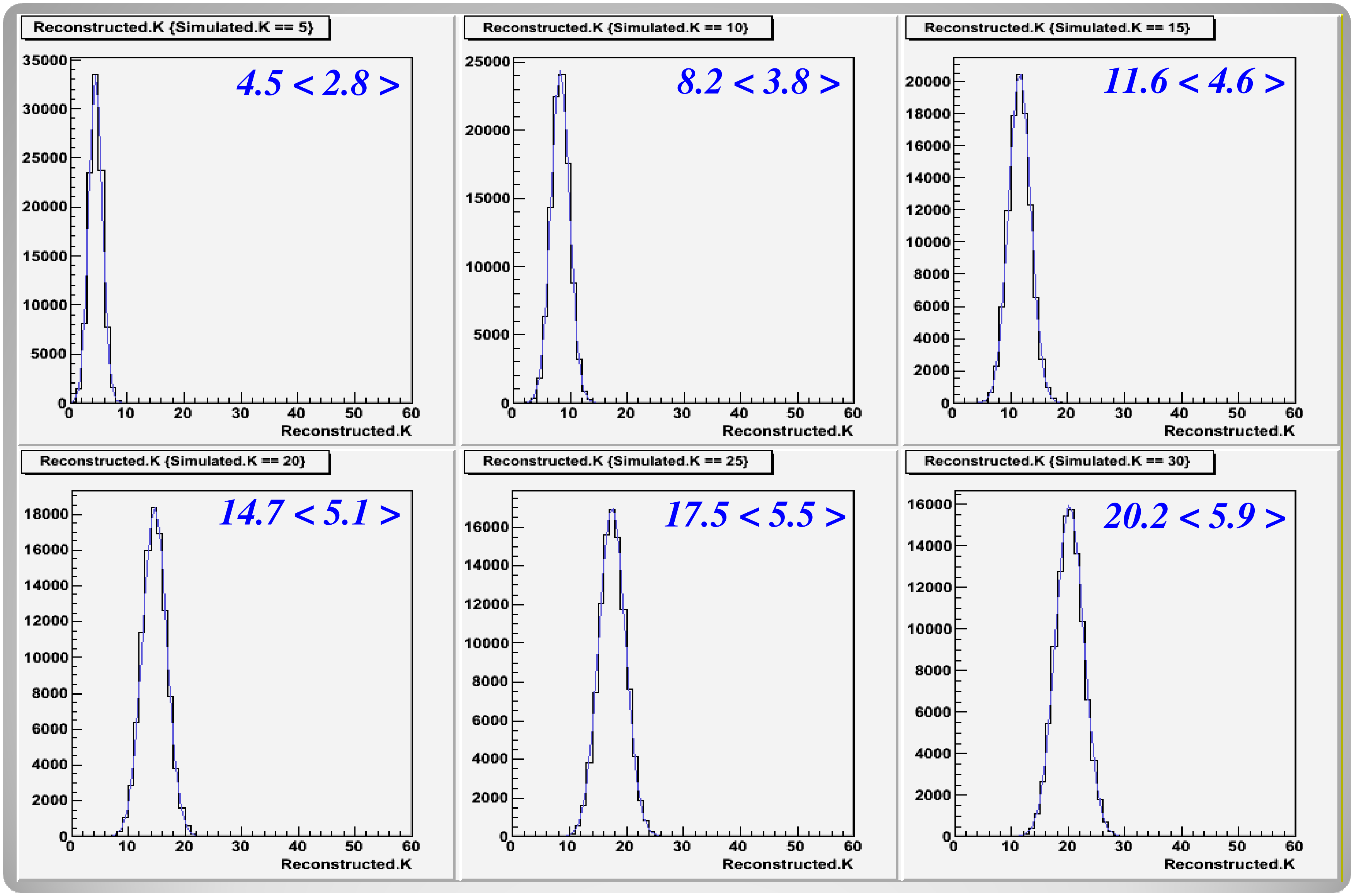
H with RawPerformances0_1



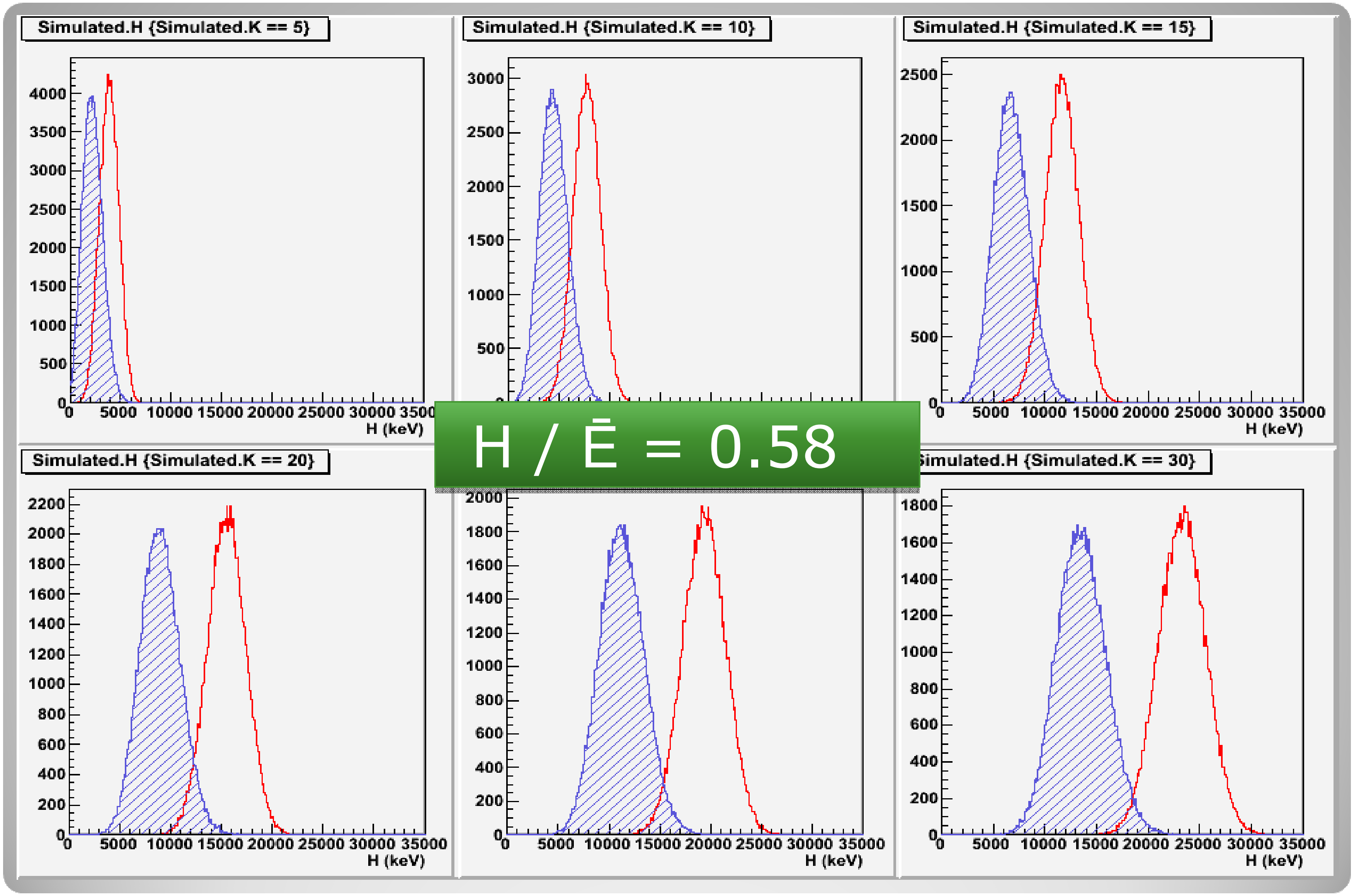
H / Ē = 0.87



Simulated.K == 30
Simulated.H
Reconstructed.H / 0.58
Reconstructed.H
H (keV)
Simulated.K == 30
Simulated.H
Reconstructed.H / 0.87
Reconstructed.H
H (keV)

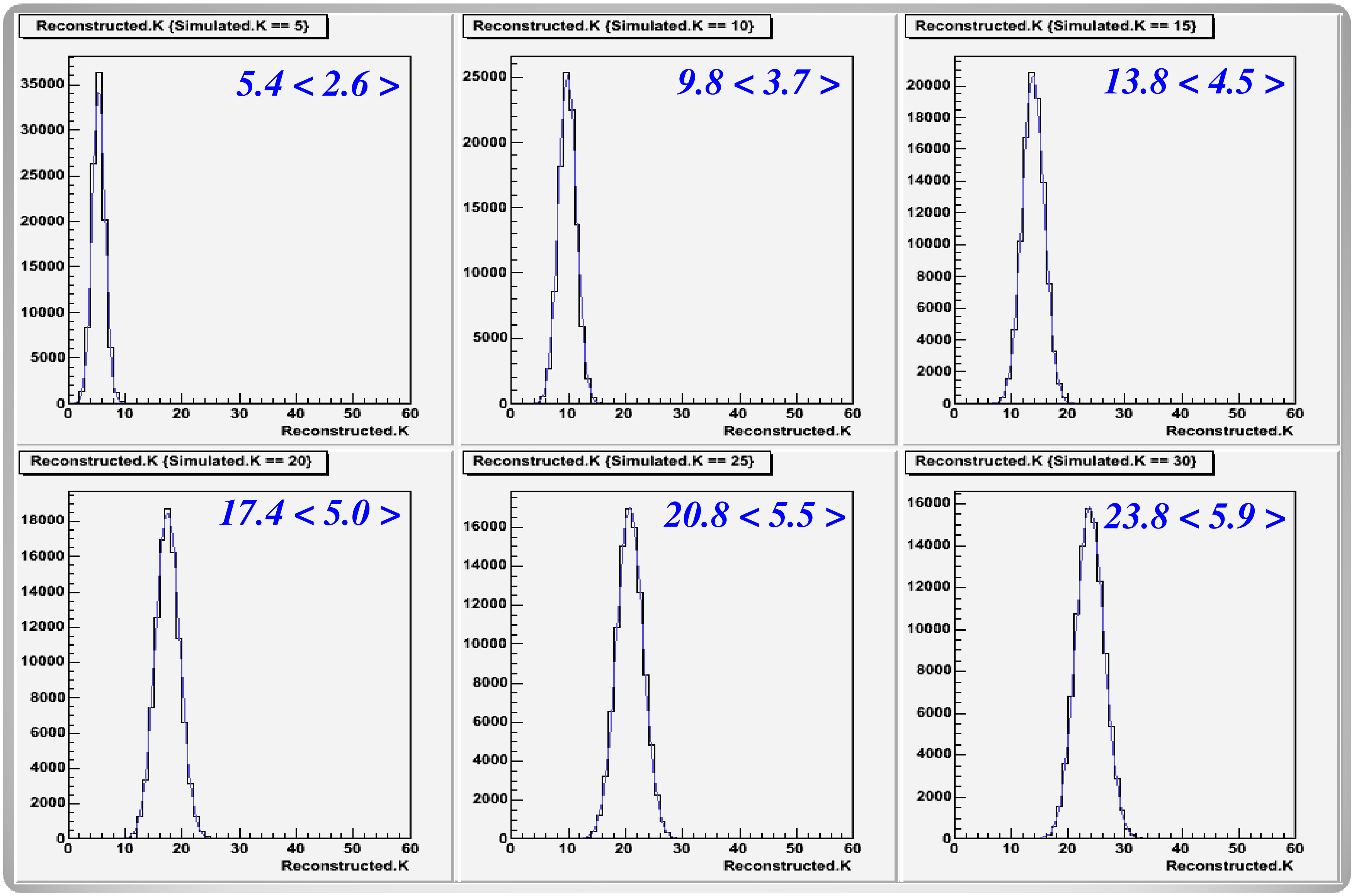


K with AddBack1_0

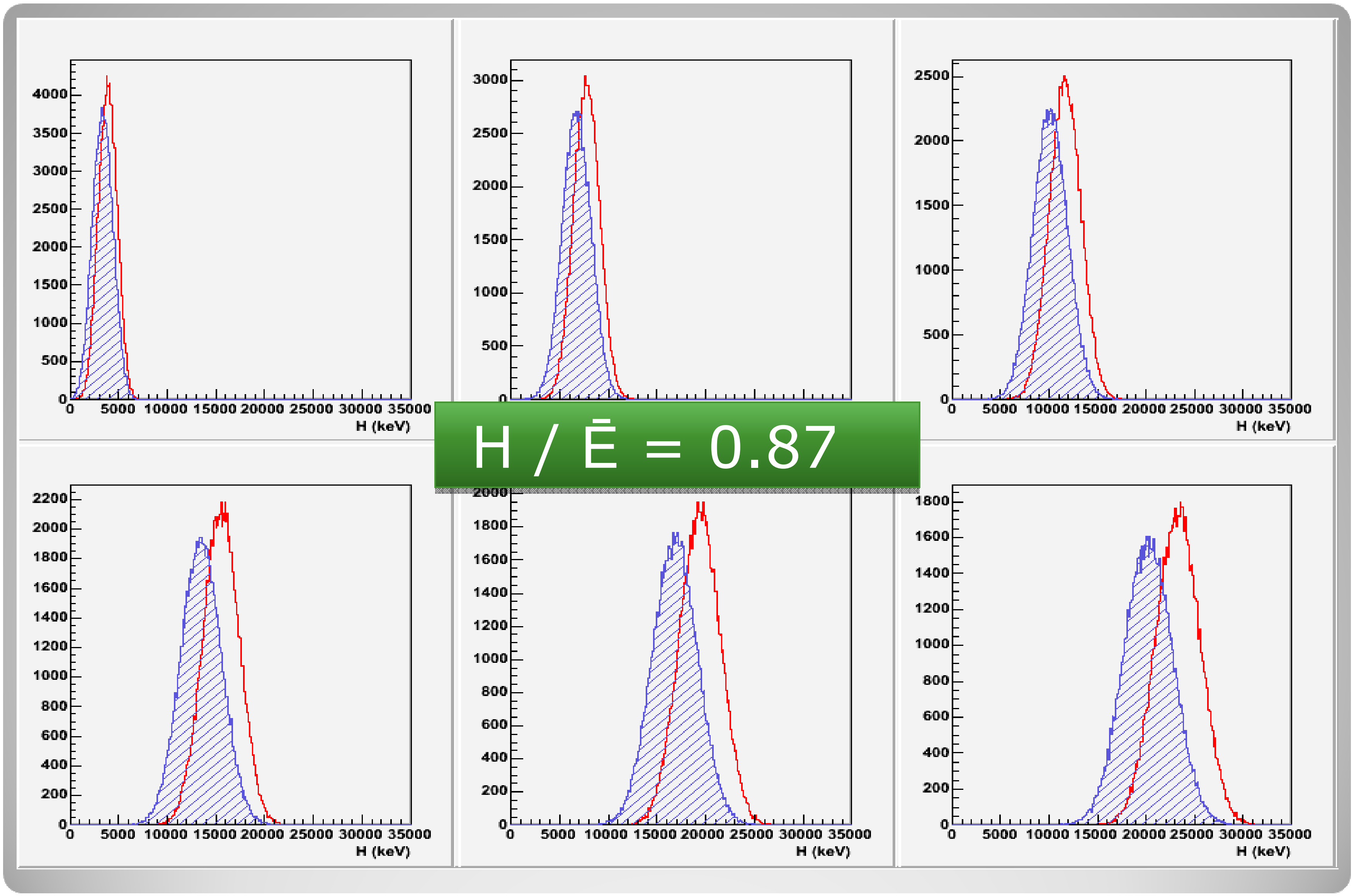


H / Ē = 0.58

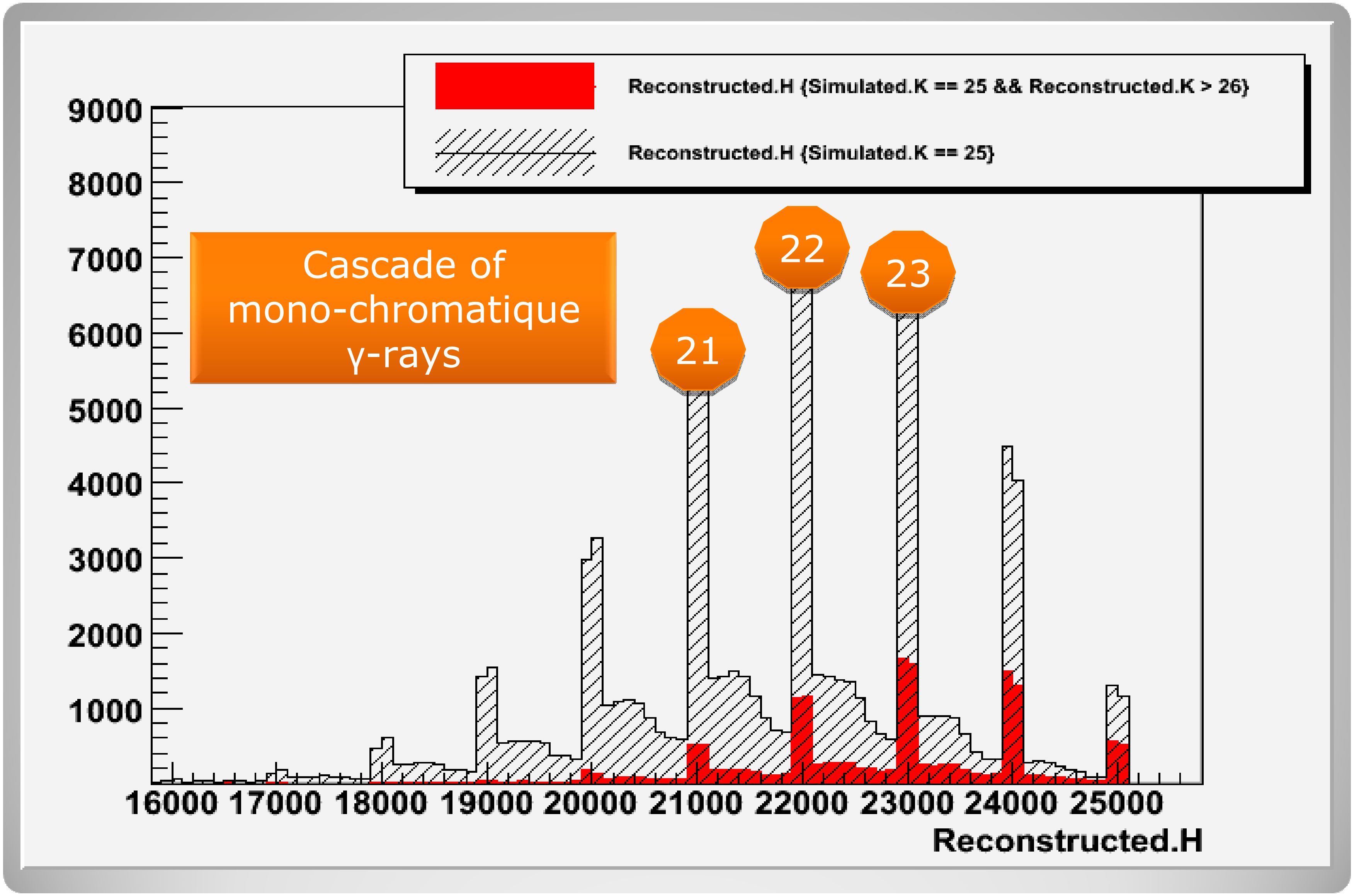
H with AddBack1_0



K with AddBack1_1



H with AddBack1_1

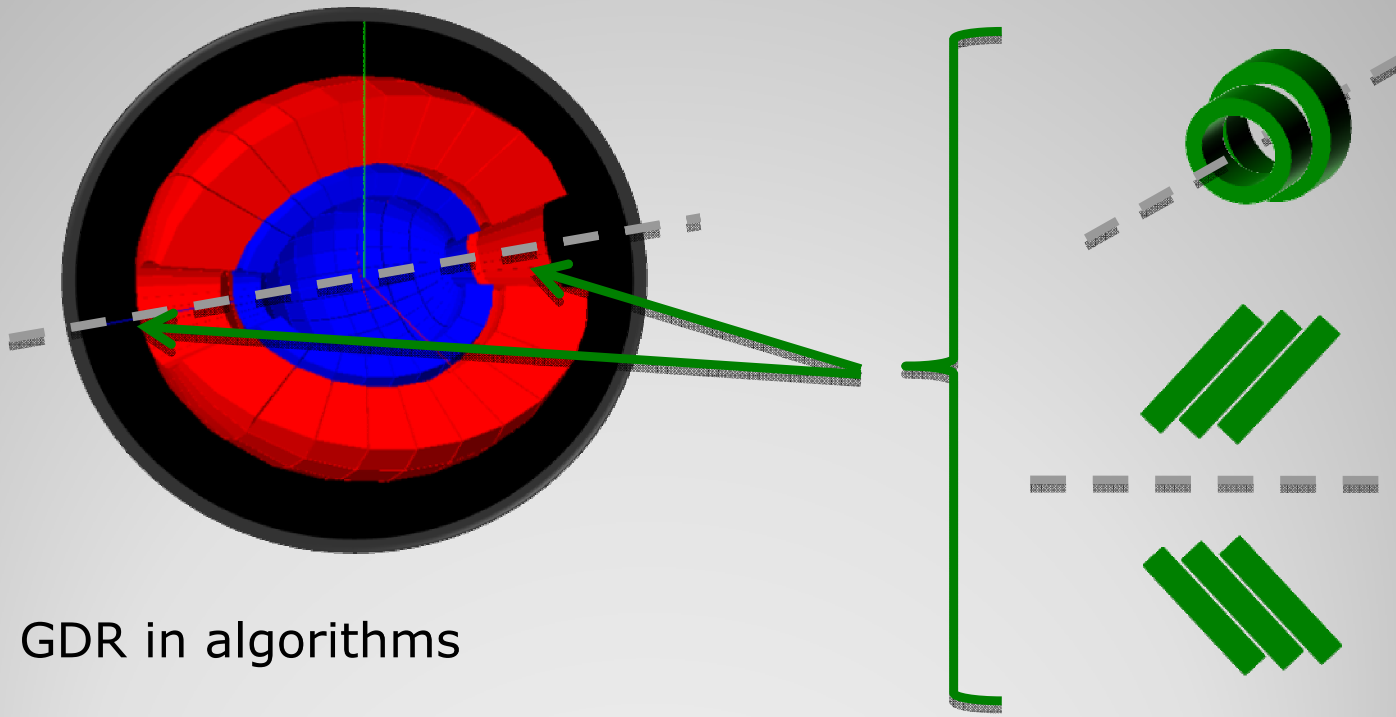


Resolution depends on efficiency !

❖**Expected resolutions {H,K} not reached !!**

❖More studies concerning the resolution on {H,K}

- depends on the full efficiency ➔ ***ENDCAP***
- Test other clustering methods



❖Add GDR in algorithms

❖P/T and Photopic at low multiplicity 1➔ 5 (spectroscopy)

Conclusions

What could/should be done ???

Discussions

Different clustering methods

RawPerformances : one element = one γ -ray

- **0_0 : only the first shell**
- **1_0 : both shells**