

European Summer School

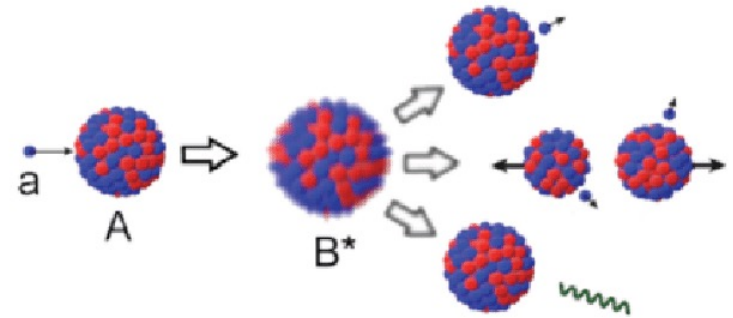
Lab Work n°1 :
Characteristics comparison of different photon detectors



Which detector for which applications ?

What are important characteristics for gamma detectors ?

- Resolution (Energy and spatial)
- Efficiency (Geometry and Intrinsic)
- Energy range
 - For gamma spectroscopy → ~10 keV – 10/40 MeV



Some technologies available : Scintillators

NaI



CeBr3

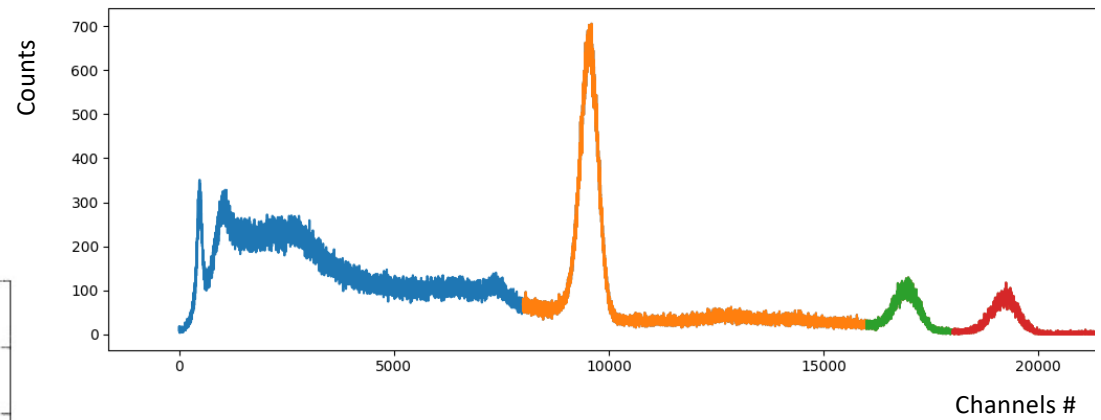
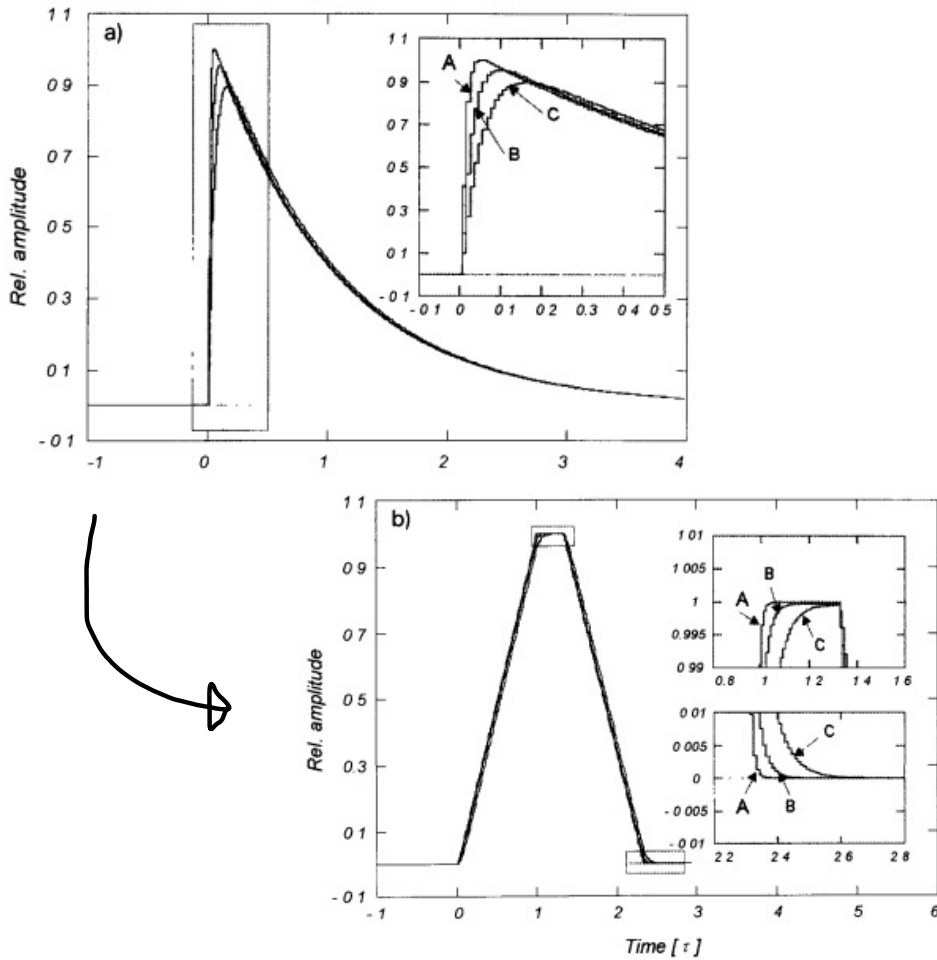


& Semi conductors

HPGe



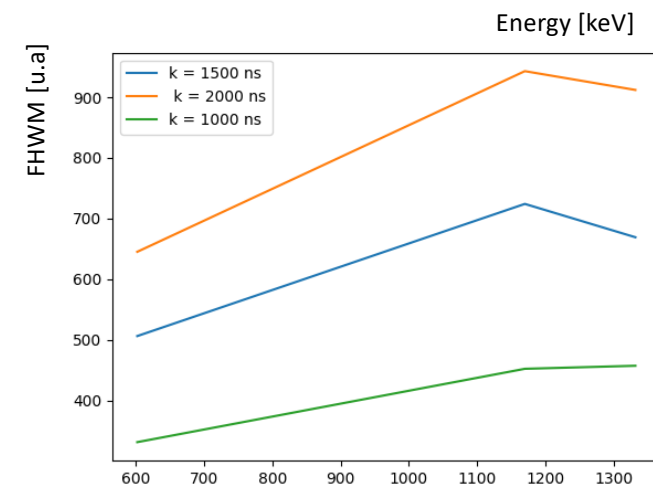
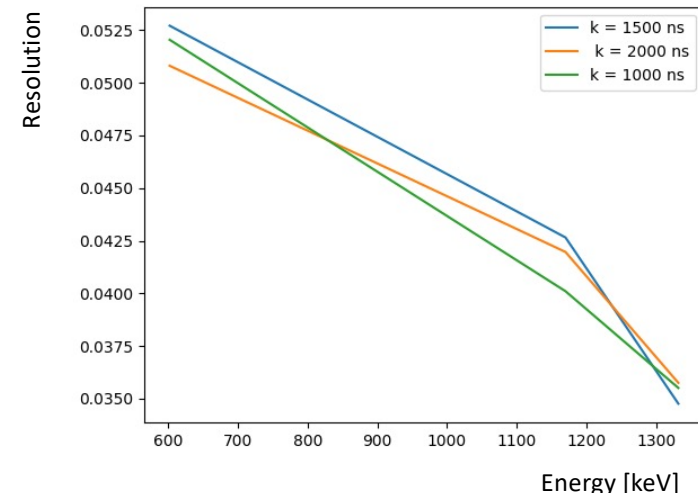
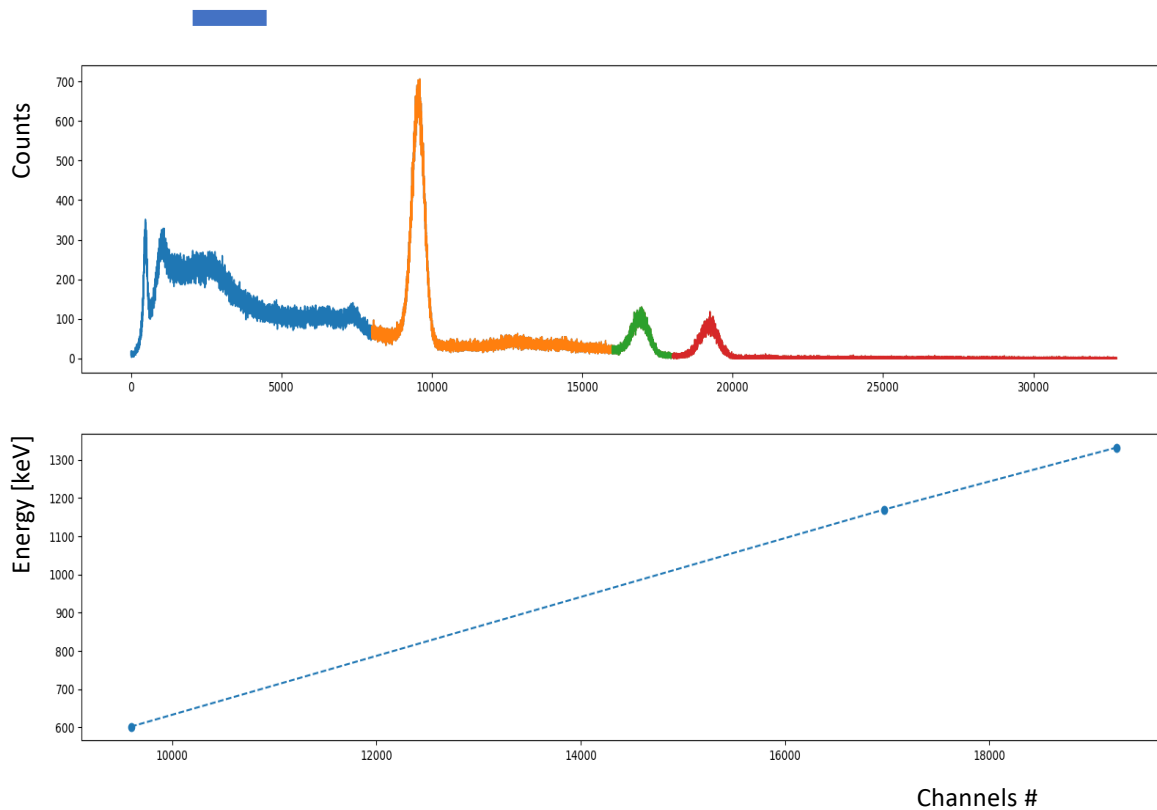
Digital Pulse Processing (DPP) : Jordanov algorithm [10.1016/0168-9002\(94\)91652-7](https://doi.org/10.1016/0168-9002(94)91652-7)



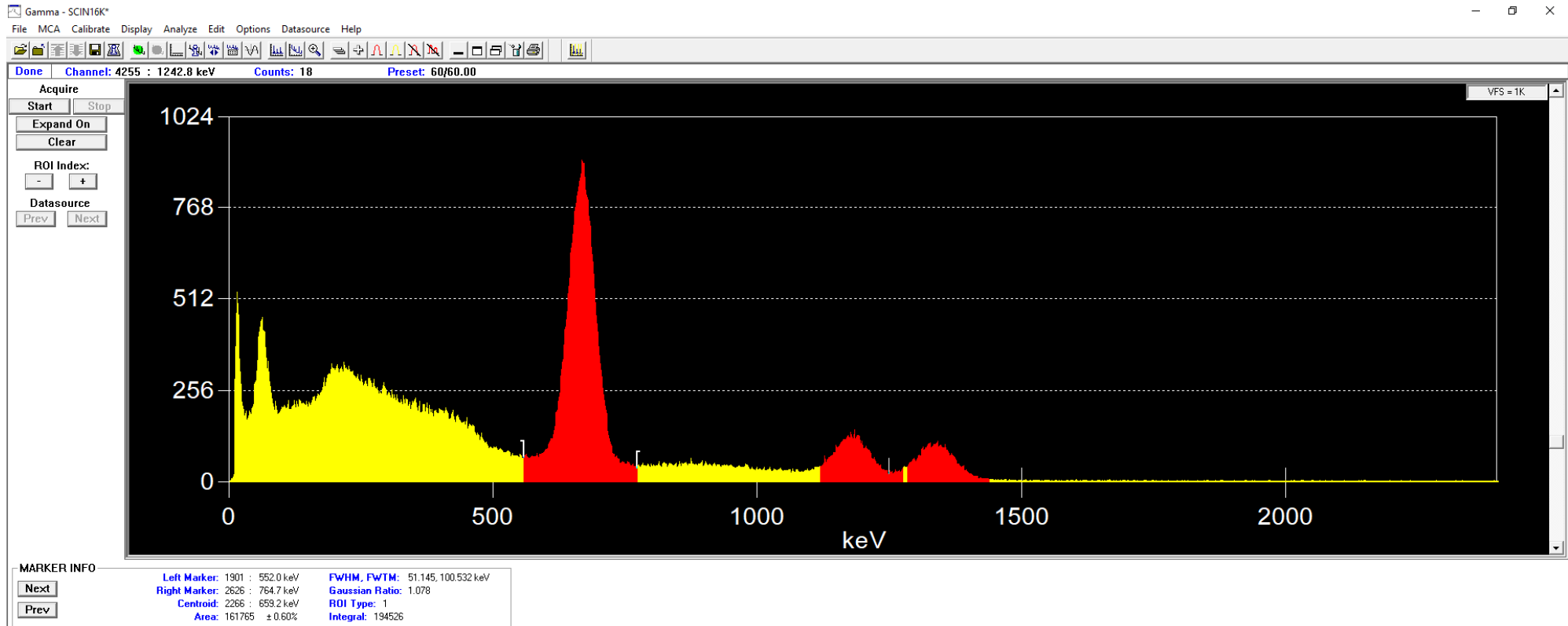
Lab Work #1

06/07/2024

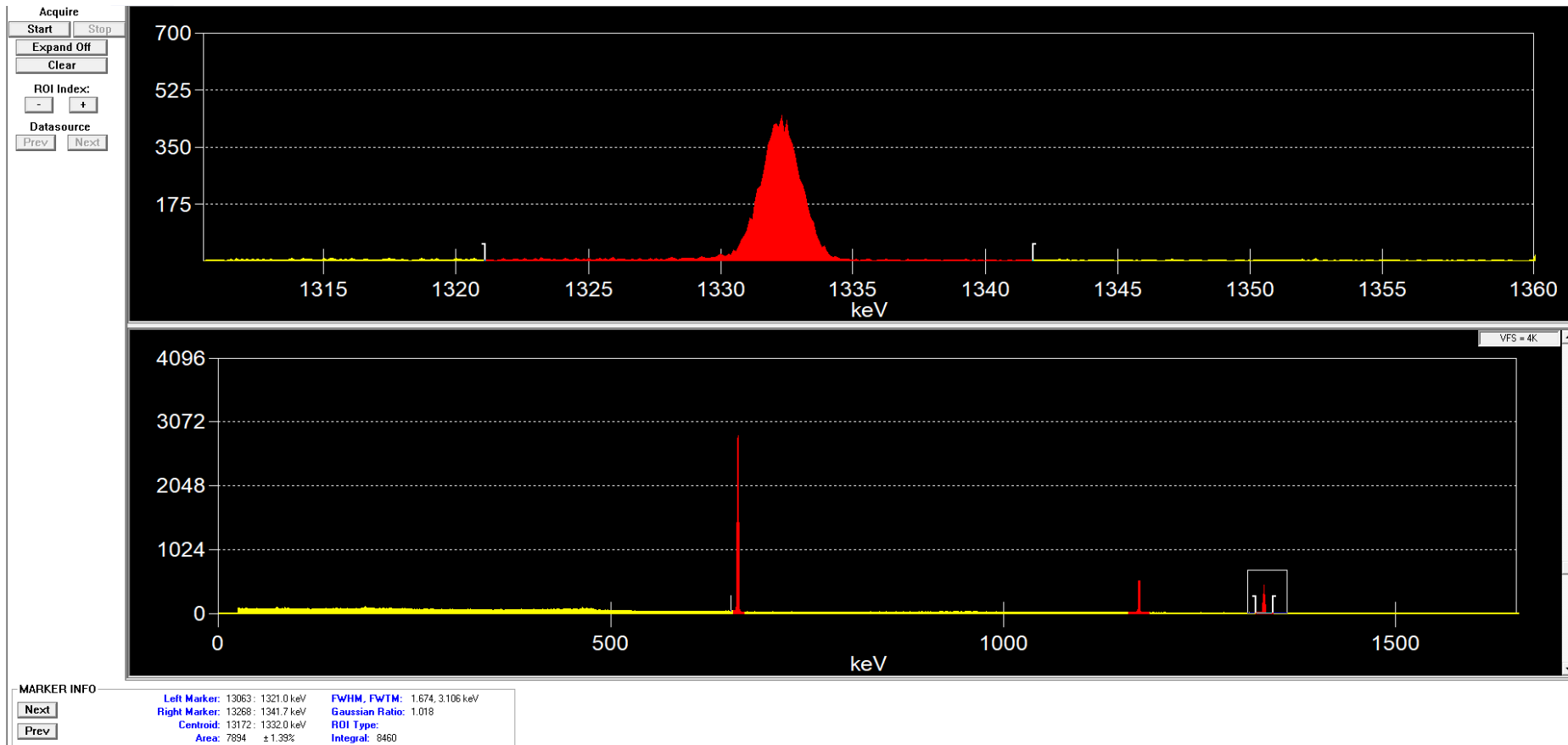
CeBr3 detector : calibration & resolution



NaI detector acquisition



HPGe acquisition



Summary of characteristics

Is it logic ?

Higher density so CeBr3 better than NaI
Both scintillators -> photo multiplier
(35% of efficiency for best ones)

So Ge better because with E field
collection of e- better ☺

	HPGe	CeBr3	NaI
Efficiency	-	++	+
Resolution	~0,2 %	~3-4 %	~7%
Rise time	~10 μ s	~70 ns	~150 ns
Advantages	<ul style="list-style-type: none"> High Energy resolution 	<ul style="list-style-type: none"> Short rise time -> High counting rate High efficiency 	<ul style="list-style-type: none"> Cheap Moderate efficiency
Disadvantages	<ul style="list-style-type: none"> Low counting rate Very expensive <ul style="list-style-type: none"> Fragile 	<ul style="list-style-type: none"> Expensive 	<ul style="list-style-type: none"> Low energy resolution
Application	<ul style="list-style-type: none"> Spectroscopy Identification of radionuclei 	<ul style="list-style-type: none"> γ multiplicity \rightarrow spectroscopy-ish <ul style="list-style-type: none"> Time measurement \rightarrow particle identification 	<ul style="list-style-type: none"> γ multiplicity Total energy of gammas

THANKS !

