Investigation of the stilbene scintillator detector @ Acculinna-2

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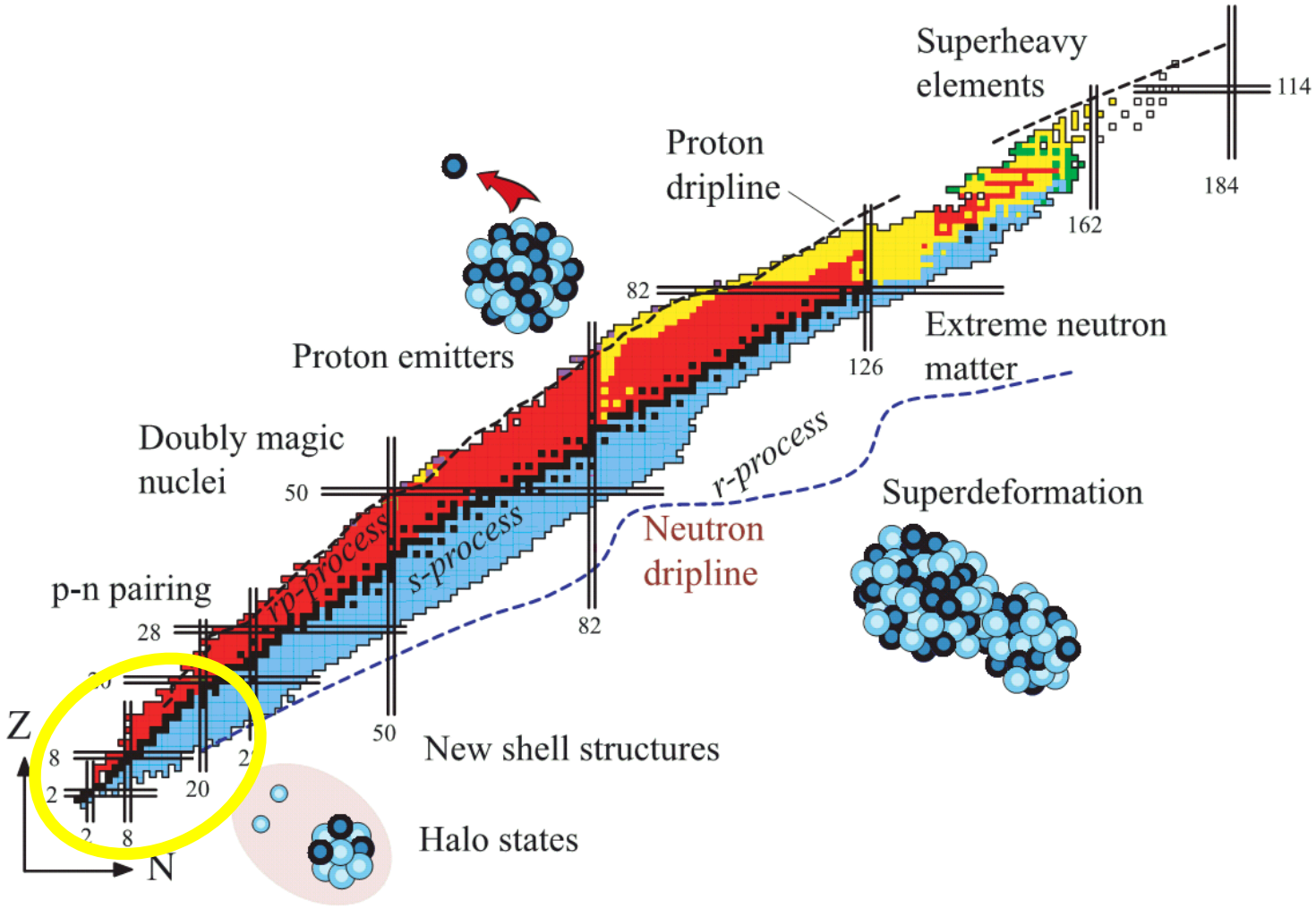
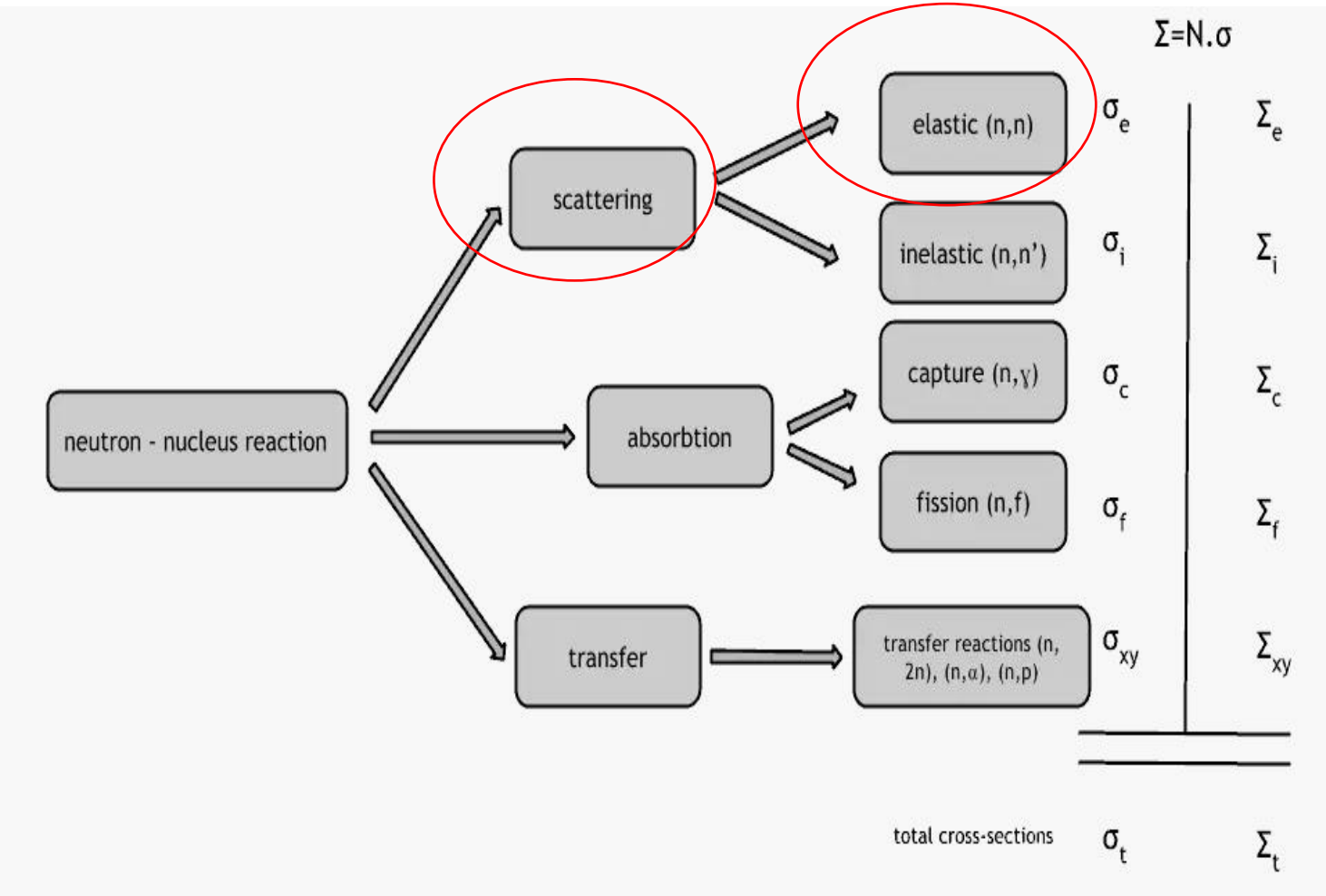
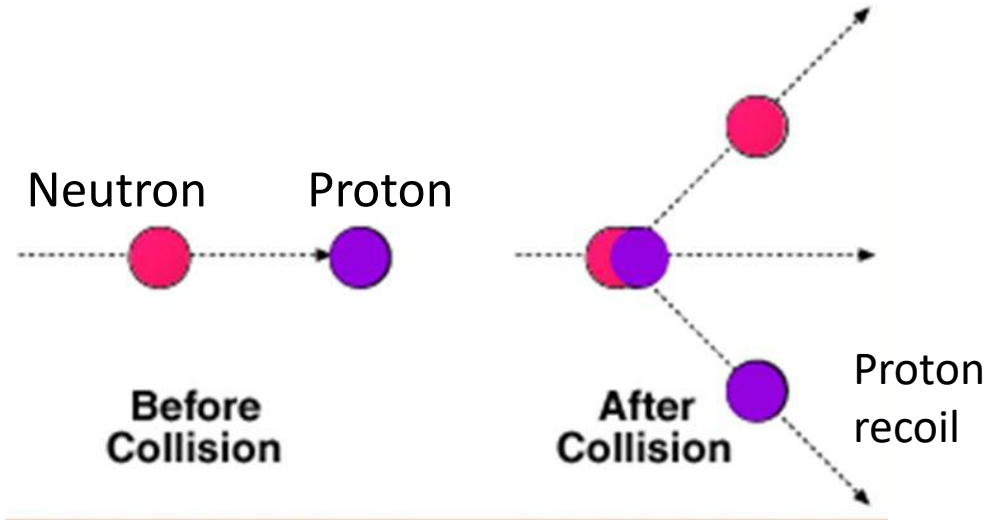
LIGHT EXOTIC NUCLEI @ ACCULINNA-2



Acculinna-2 Light & super light exotic nuclei,
neutron-rich nuclei, e.g. hydrogen **(^{5,7}H)** and helium **(^{8,10}He)** isotopes)

NEUTRON INTERACTIONS WITH MATTER





In elastic scattering reaction,
incident neutron can transfer almost
all of its energy to proton in 1 collision (A = 1)

Proton recoil detector

ORGANIC SCINTILLATORS

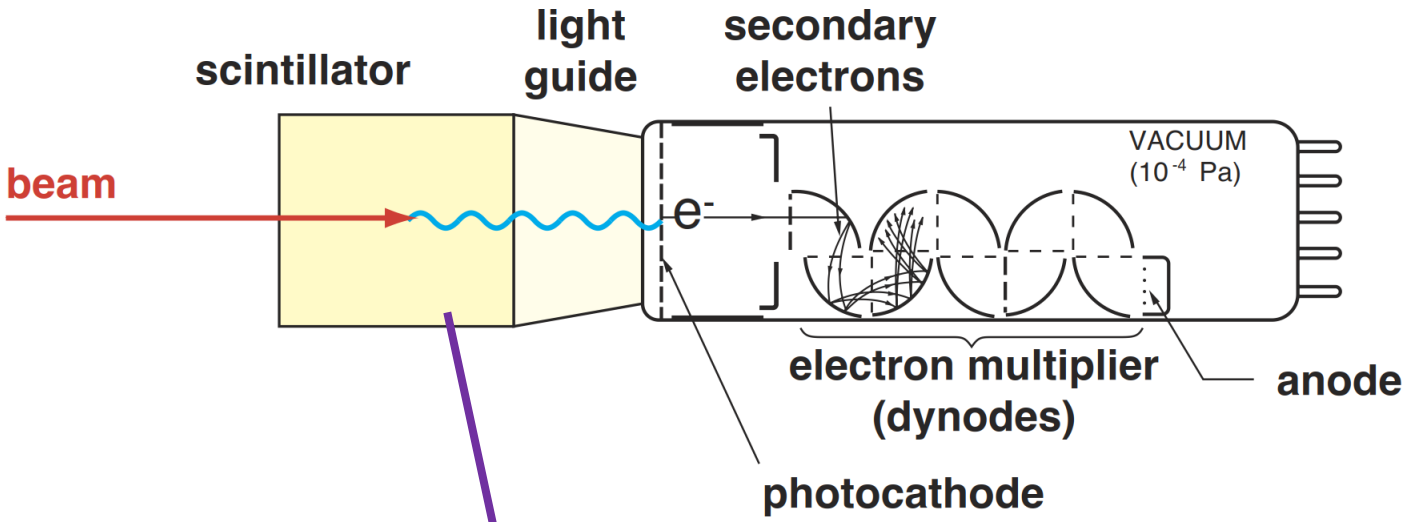
Substance, formula or brand	Density, g/cm3	Decay time, ns (fast component)	Wavelength in the maximum of the spectrum, nm	Light output relative to anthracene, %
Anthracene C14H10	1.25	30	445	100
Stilbene C14H12, single crystal	1.16	6	410	56
Plastic EJ276 (or EJ299-33A)	1.896	13	425	56
Liquid BC501A (or NE213)	0.901	3.2	425	78

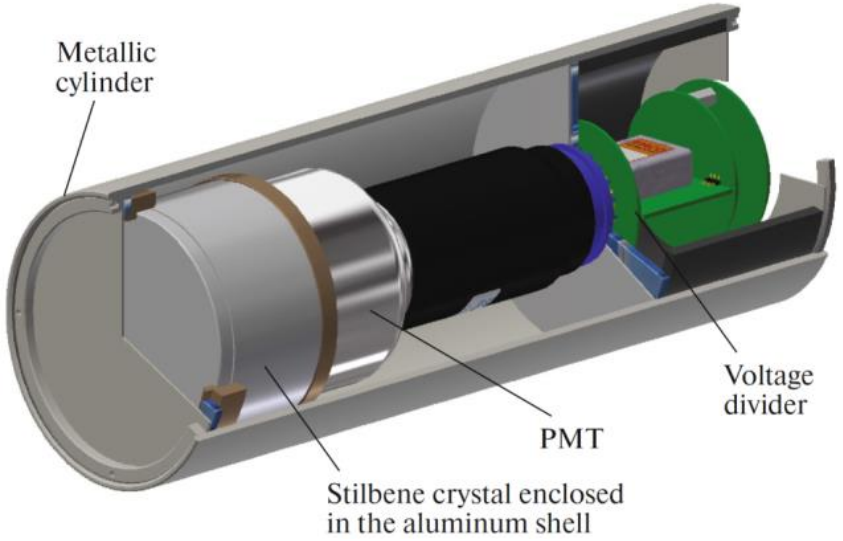
(a) Crystals

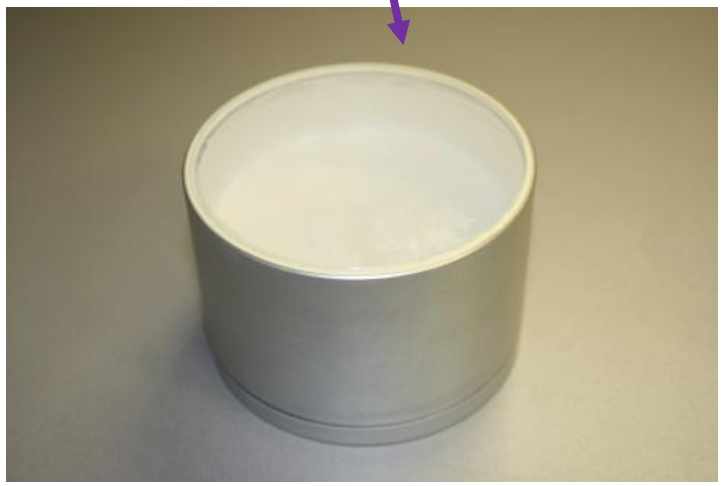
(b) Plastic (BC404) and Stilbene

(c) Liquid

SCINTILLATOR DETECTORS





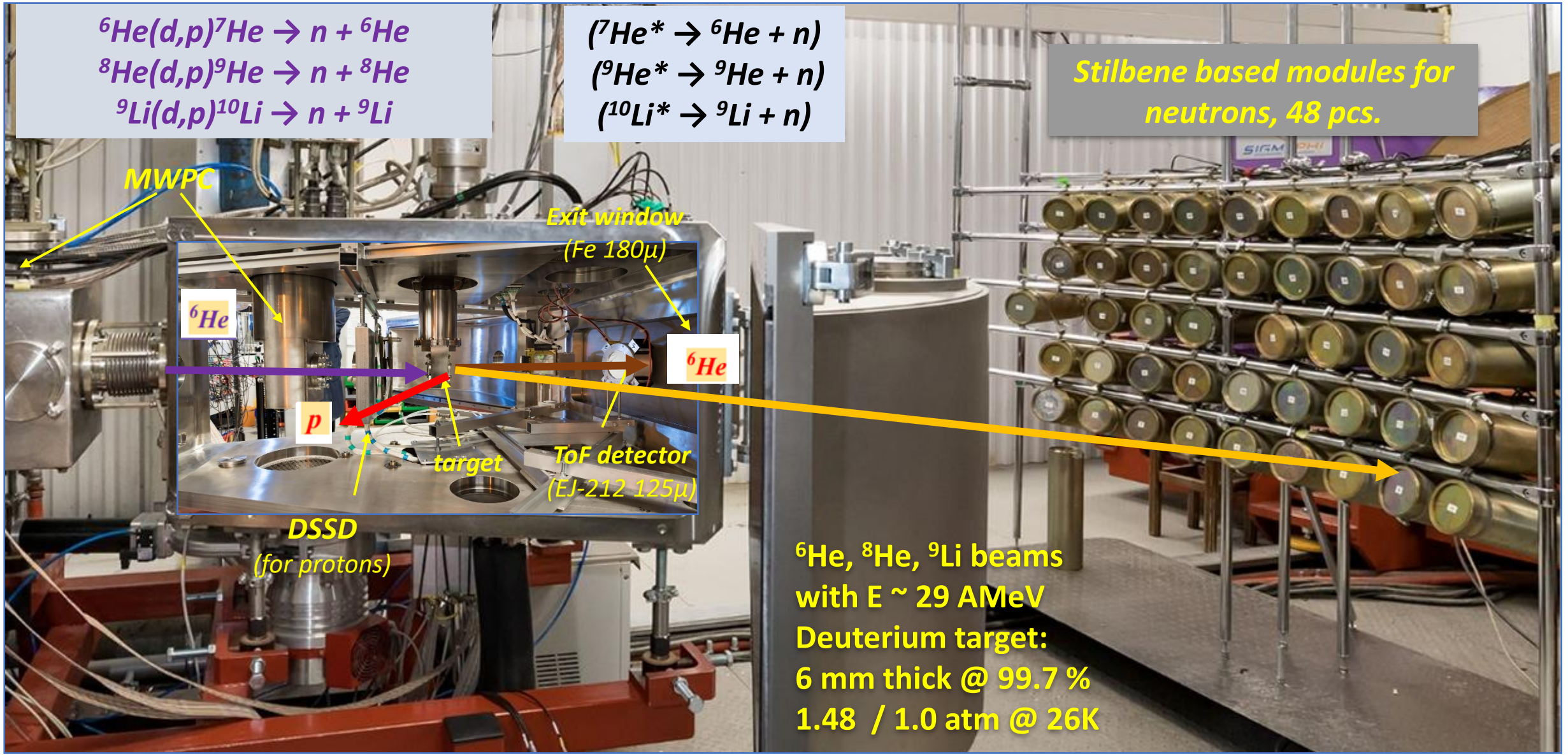


(a) Stilbene

(b) Stilbene Couped to PMT

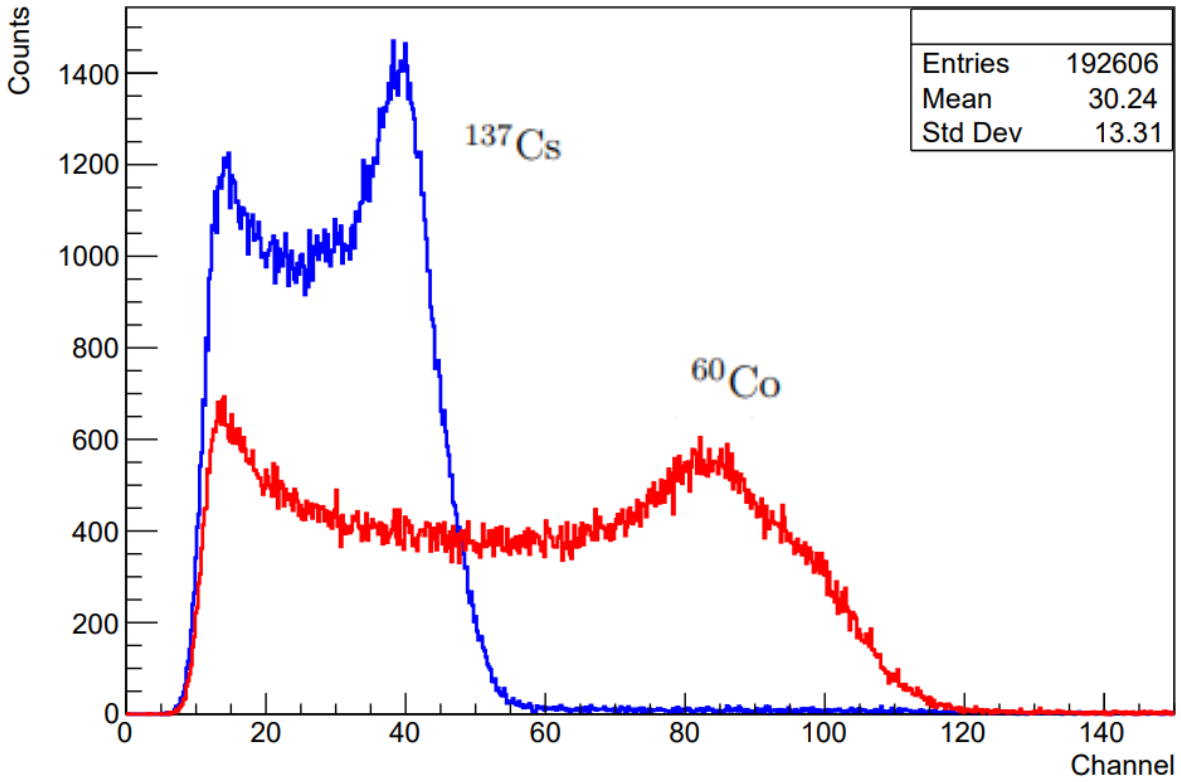
(c) Stilbene Array

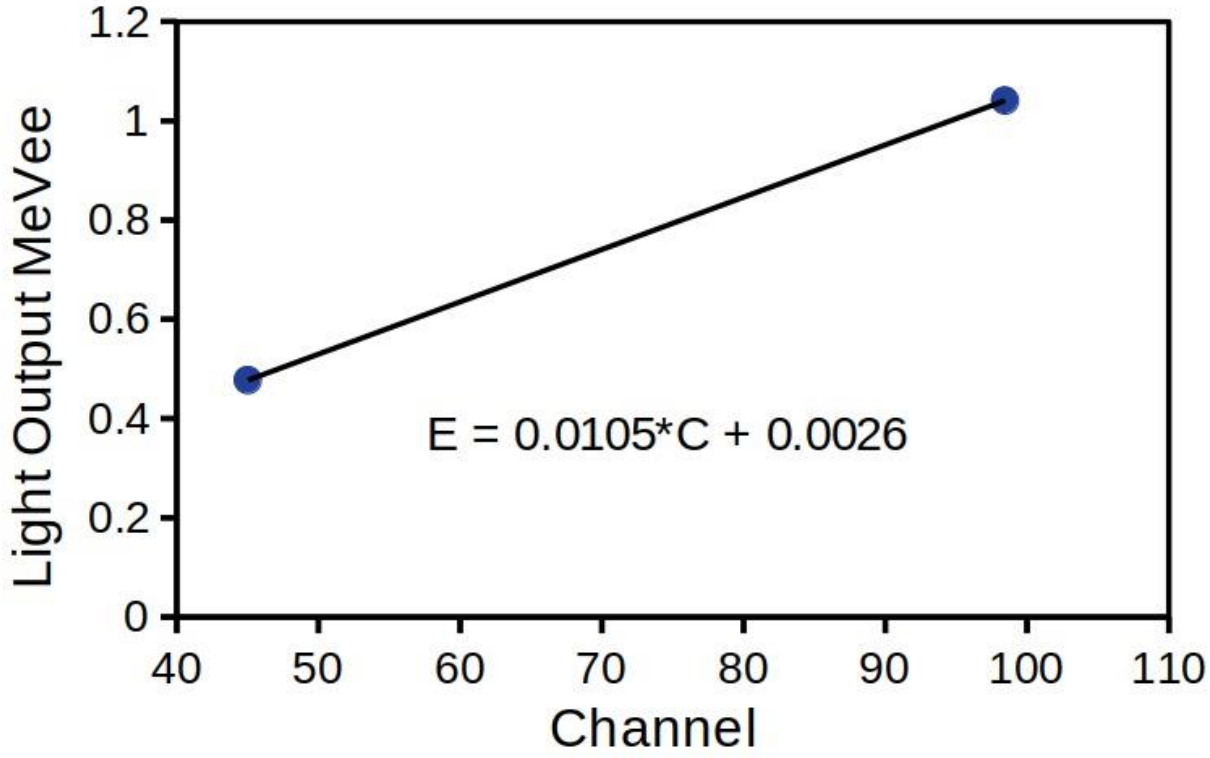
EXAMPLE OF NEUTRON DETECTION @ ACCULINNA-2



ENERGY CALIBRATION
COMPTON EDGE TECHNIQUE

Uncalibrated Spectrum

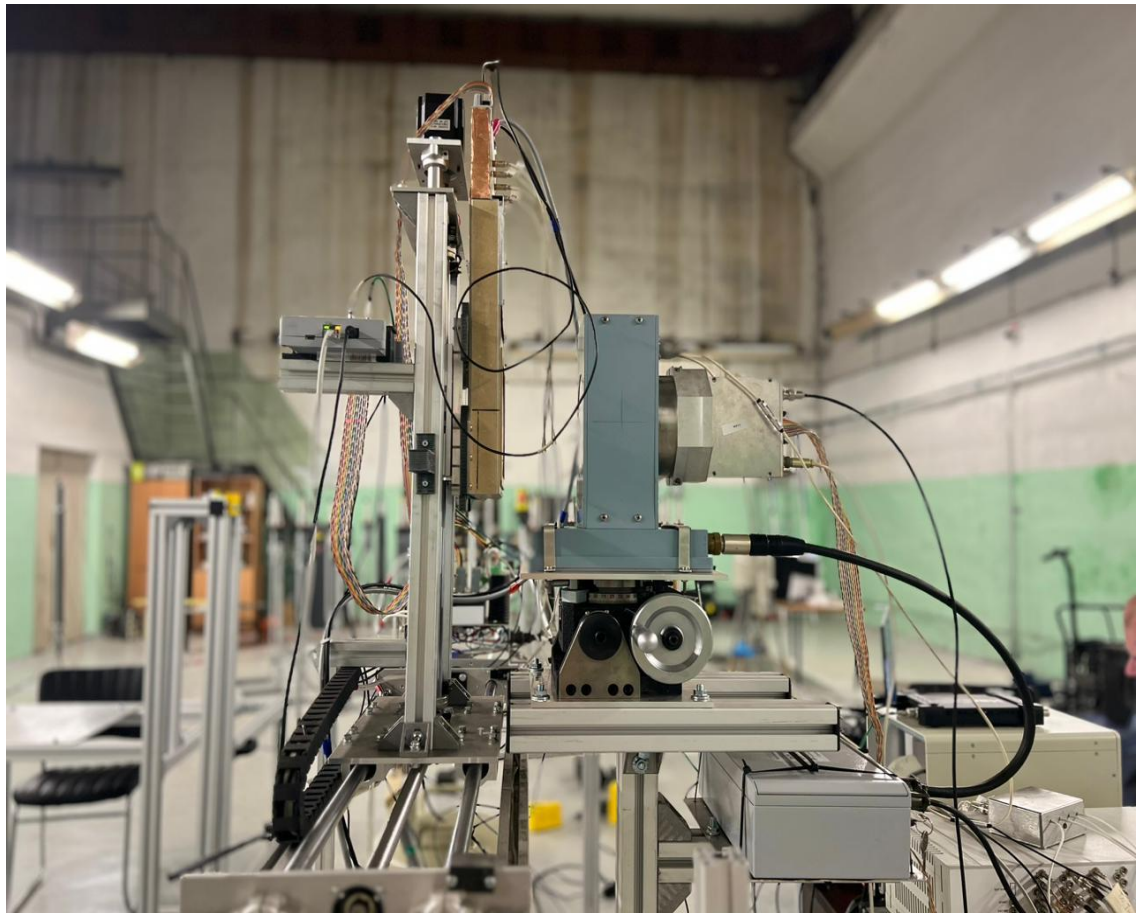




$$Nc = Np + 1.2\sigma$$

Nc : Channel number of the Compton edge.
Np: Channel number of the edge peak
σ: is a standard deviation of the edge peak.

NEUTRON GENERATOR
@ FRANK LABORATORY OF NEUTRON PHYSICS

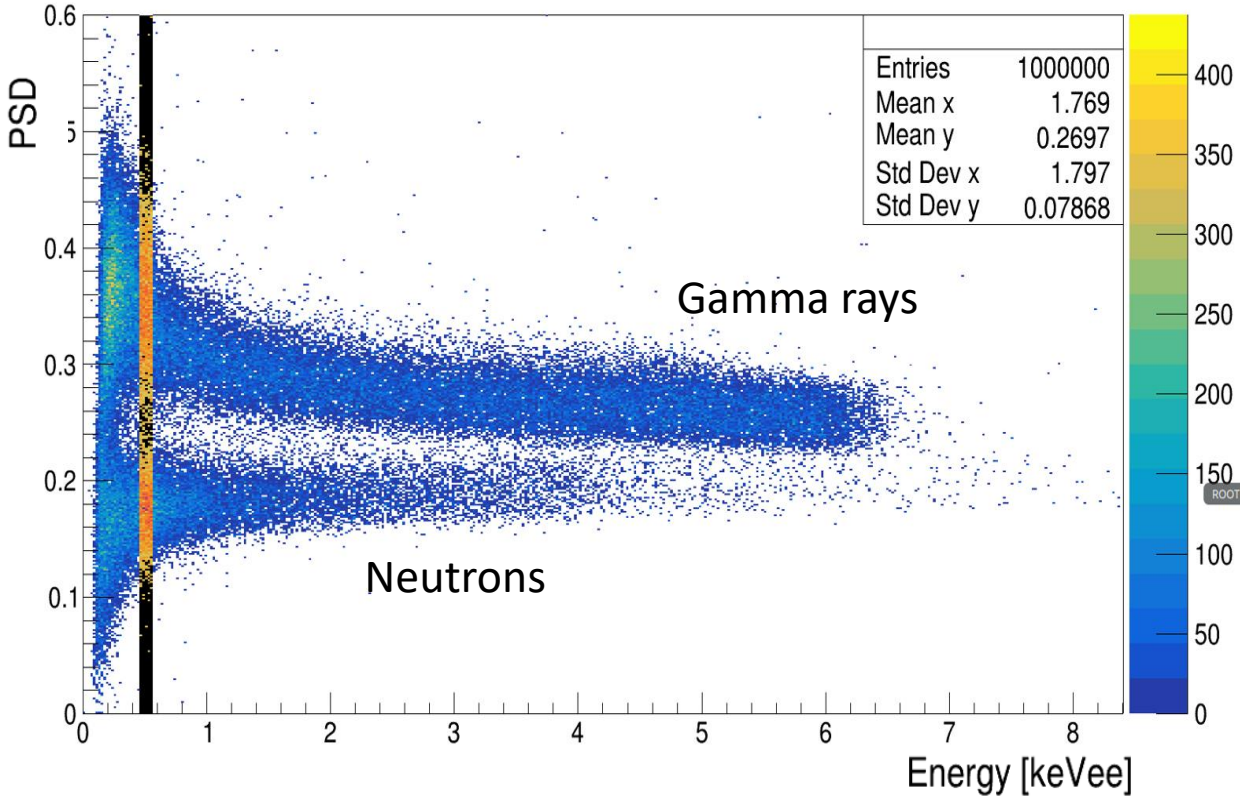


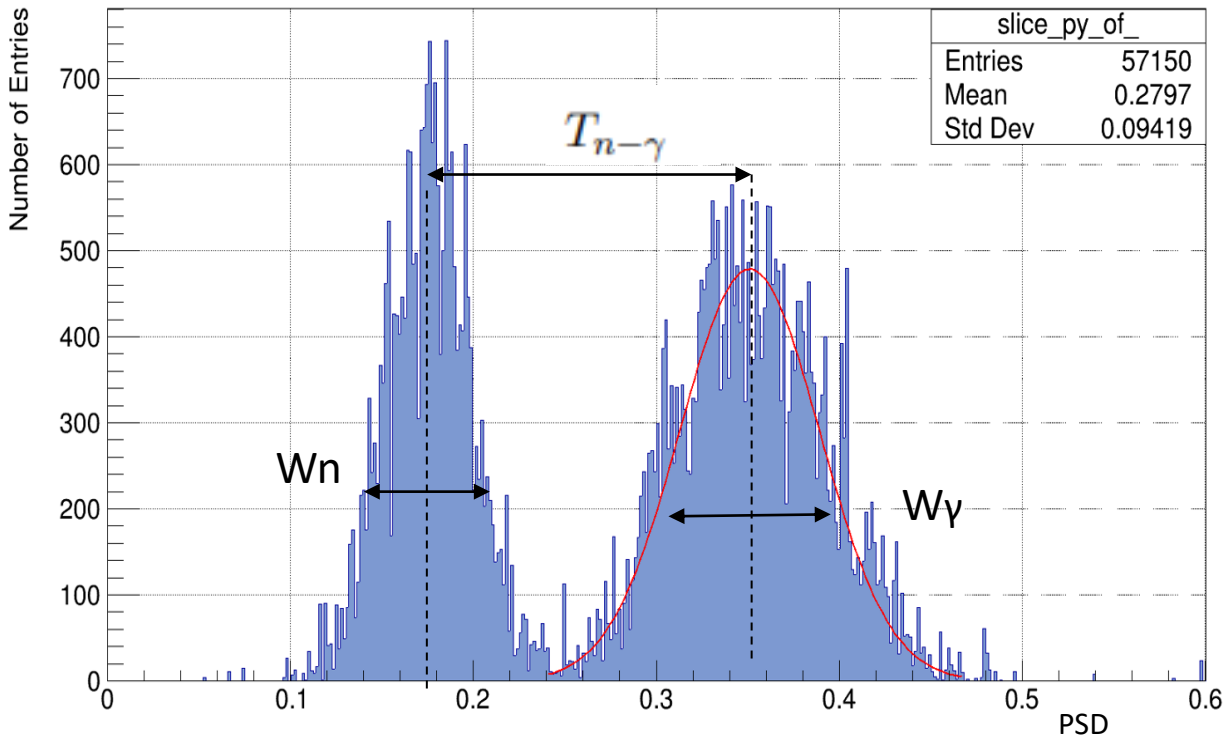
A clean monoenergetic of 14.1 MeV neutrons beam using TANGRA-setup consists of a portable neutron generator (ING-27 generator) at the Frank Laboratory of Neutron Physics (FLNP) in Dubna

PULSE SHAPE DISCRIMINATION

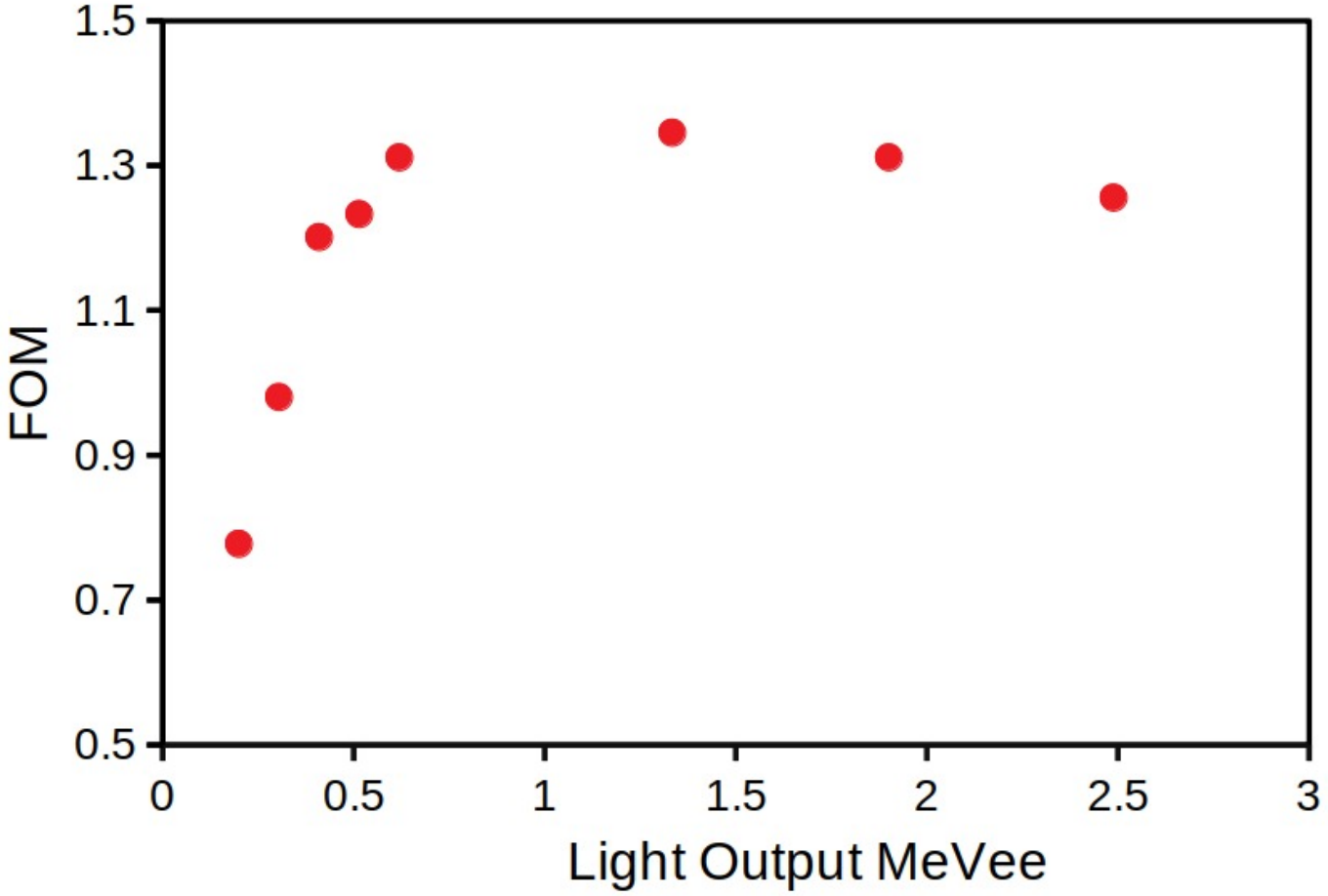
FOM – Figure of Merit

$$FOM = \frac{T_{n-\gamma}}{W_n - W_\gamma}$$





INVESTIGATION OF FOM
@ DIFFERENT LIGHT OUTPUT



- The higher the energy, the better FOM.
- Once the energy is larger than 1.5 MeVee the FOM saturates.
- At 50 keVee (above threshold), neutron-gamma are well-separated

MeVee: Mega electron volts electron-equivalent

Thank you for attention