Crystal Ball Prototype Data for P+Li7
(from CB Note 231 Figure 19)

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with calculated curve

$i1 := 0 .. 49$ $i2 := 25 .. 49$ $i3 := 50 .. 74$ $i4 := 75 .. 99$

$counts_{i1} :=$ $counts_{i2} :=$ $counts_{i3} :=$ $counts_{i4} :=$

$counts_{i1}$	$counts_{i2}$	$counts_{i3}$	$counts_{i4}$
0	13	43	29
0	14	44	21
0	19	53	9
0	28	42	9
2	28	36	9
1	18	35	1
1	28	58	1
2	24	68	2
2	27	84	1
6	41	74	1
4	32	96	0
7	38	121	2
6	29	140	0
3	38	134	0
10	48	153	1
11	61	151	1
5	55	158	0
12	51	143	2
3	58	123	0
8	40	95	1
9	53	102	0
10	54	76	0
13	50	48	0
9	50	45	0
15	56	31	0

$i := 0 .. 99$ $length(counts) = 100$

$E_i := .27 \cdot i$ $total := \sum_i counts_i$ $total = 3335$

$counts\_u_i := counts_i + \sqrt{counts_i}$ $counts\_d_i := counts_i - \sqrt{counts_i}$

$Eres_1 := 12.$ [MeV]

$\Gamma_1 := 5$ [MeV]

$\sigma CB_1 := .10 \cdot Eres_1$ [MeV]

$\sigma EM_1 := .50 \cdot Eres_1$ [MeV]

$efficCB_1 := 1.$

$efficEM_1 := .69$

$Eres_2 := 17.6$ [MeV]

$\Gamma_2 := .010$ [MeV]

$\sigma CB_2 := .074 \cdot Eres_2$ [MeV]

$\sigma EM_2 := .50 \cdot Eres_2$ [MeV]

$efficCB_2 := 1.$

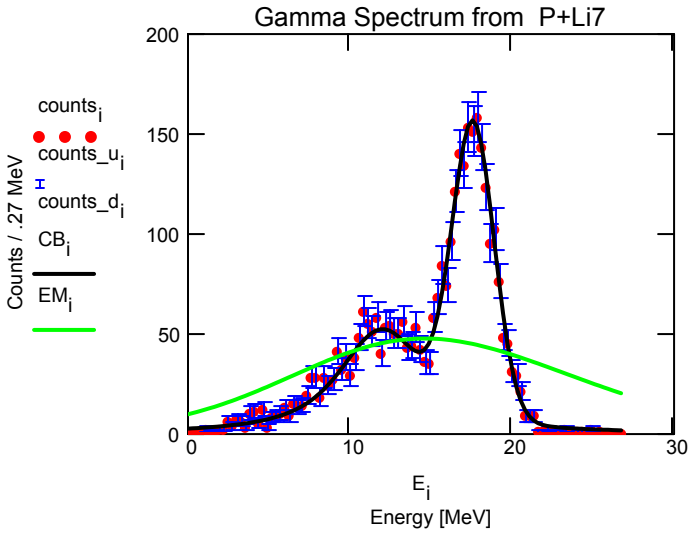
$efficEM_2 := 1$

Convolve the Lorentzian line width and the Gaussian detector resolution.

$$Dist(E, \sigma, Eres, \Gamma) := \int_{Eres - 20\cdot\Gamma}^{Eres + 20\cdot\Gamma} \left[\frac{1}{\sigma \cdot \sqrt{2\cdot\pi}} \cdot e^{\frac{-(E-\xi)^2}{2\cdot\sigma^2}} \right] \cdot \left[\frac{\frac{\Gamma}{2\cdot\pi}}{(\xi - Eres)^2 + \frac{\Gamma^2}{4}} \right] d\xi$$

$$CB_i := .27 \cdot \sum_{k=1}^{2} efficCB_k \cdot Dist\left(E_i, \sigma CB_k, Eres_k, \Gamma_k\right) \qquad sumCB := \sum_i CB_i \qquad CB_i := \frac{total}{sumCB} \cdot CB_i$$

$$EM_i := .27 \cdot \sum_{k=1}^{2} efficEM_k \cdot Dist\left(E_i, \sigma EM_k, Eres_k, \Gamma_k\right) \qquad sumEM := \sum_i EM_i \qquad EM_i := \frac{total}{sumEM} \cdot EM_i$$



For the Crystal Ball data, the first peak is a Lorentzian with its natural width broader than the detector resolution, while the second peak is a Lorentzian of Γ=10 KeV so we are seeing the Gaussian detector resolution. Equal flux for the two peaks seems to fit the Crystal Ball data. For the EM, the detector resolution will dominate the natural width of both peaks.