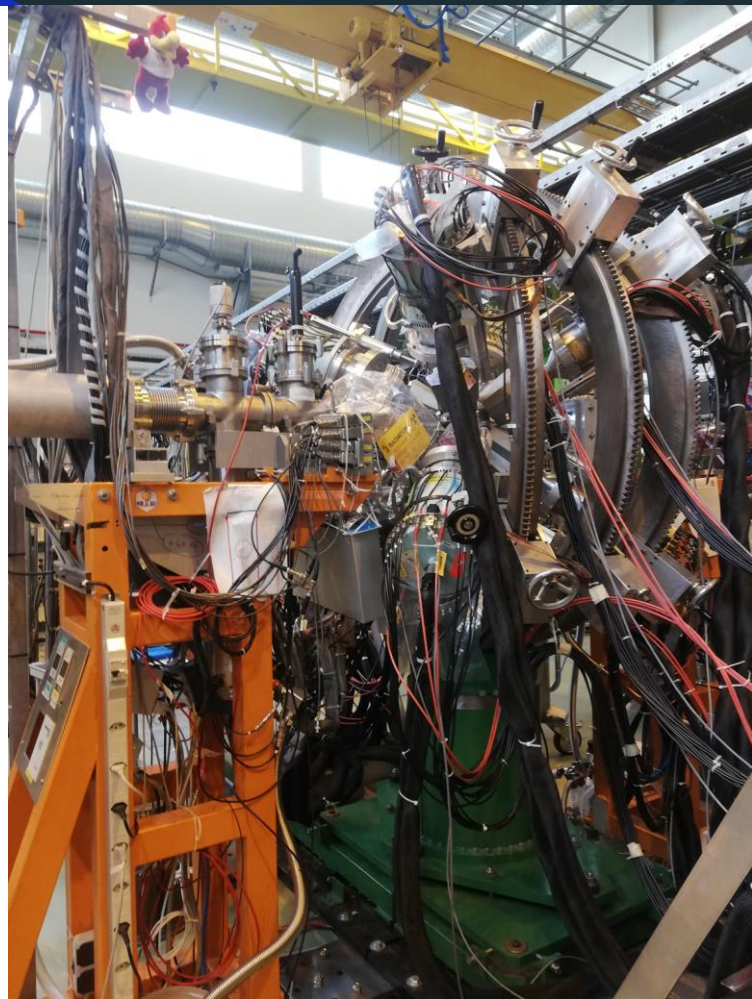
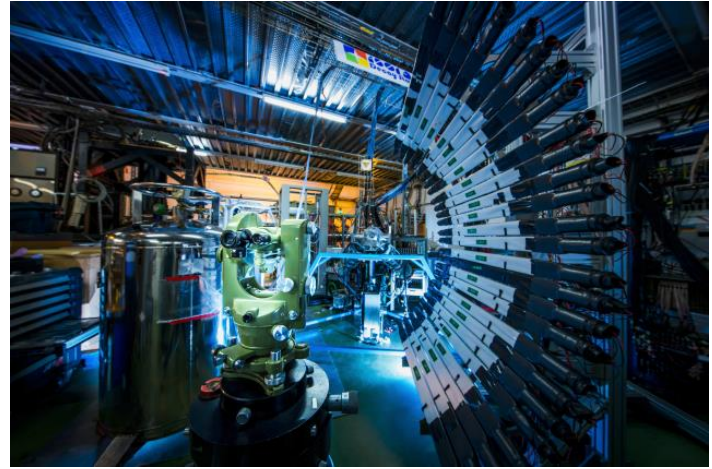


Miniball



ISOLDE



About Miniball!



Squad



Training and preparation?



MINIBALL Experiment

SAFETY NOTICE MINIBALL

OXYGEN DEFICIENCY

Be **AWARE** of cryogen leak
Don't stand in discharge points

HAZARDS

- low temperature
- overhead loads
- Electricity
- overpressure relief
- asphyxiation

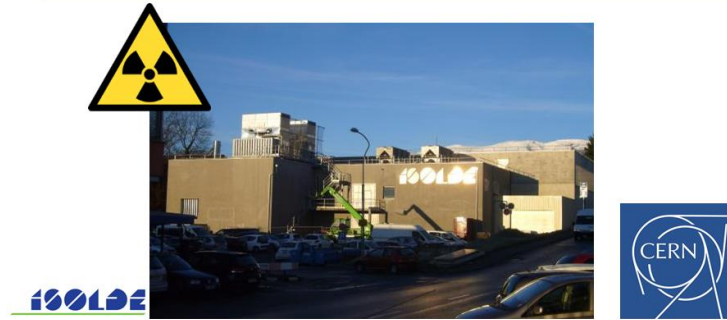
PERSONAL PROTECTIVE EQUIPMENT

CRYOGENIC ACTIVITIES
It is mandatory to wear cryogenic protective gloves, safety goggles and leather shoes with overlapping trousers when you perform cryogenic activities in the **MINIBALL**.

In case of Emergency: Call 74444

Emergency 74444

Radiation Protection Awareness - ISOLDE Fundamentals



SIR - Safety Information Registration

Main Menu > Electrical Safety - Awareness > Electrical Safety - Awareness (Module 1)

INFO **SPEAKER TEXT**

Search...

1. Electrical Safety - Awareness
2. Disclaimer
3. Objectives of the course
4. Instructions
5. List of Chapters
6. The electrical circuit
7. Sockets
8. Electrical equipment at CERN
9. Failures
10. Electrical shocks
11. Direct contact
12. Indirect contact
13. Electrical shocks: physiological effects
14. Burns
15. Appropriate behaviour

Electrical Safety - Awareness Instructions

Please turn on the sound

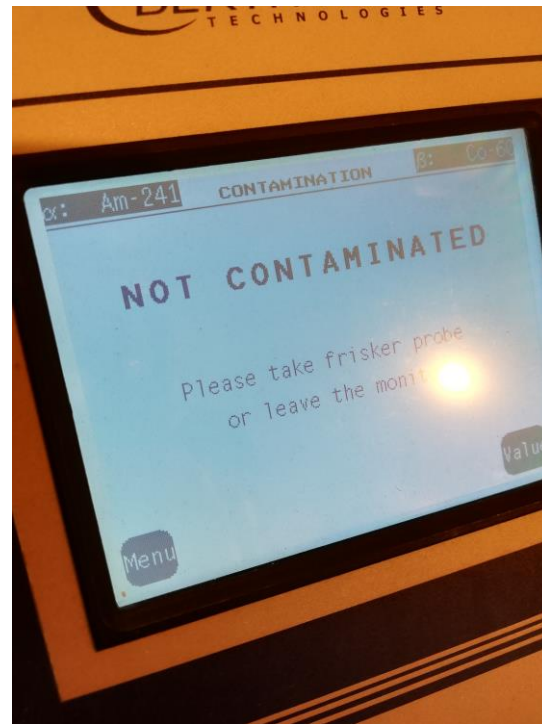
SIR - Safety Information Registration

Main Menu > Radiation Protection - Supervised Area > 1- Supervised Radiation areas - Introduction - Page 1/9

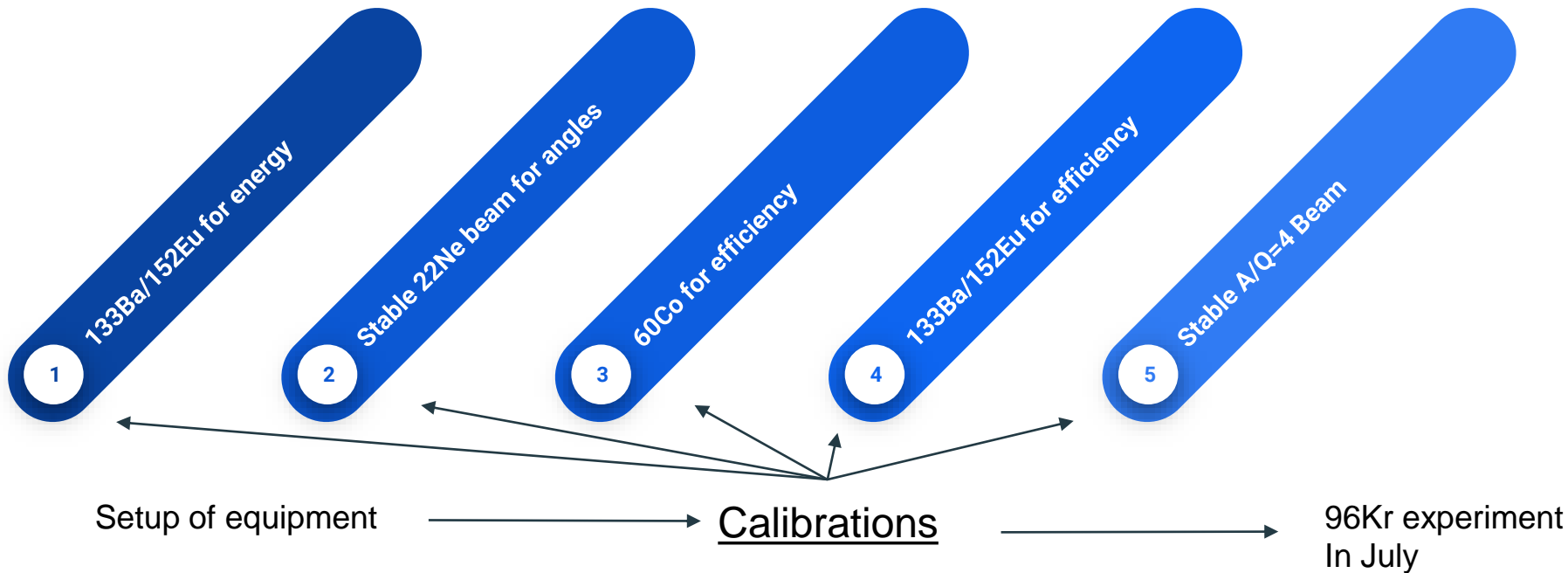
RP COURSE / SUPERVISED RADIATION AREAS - INTRODUCTION



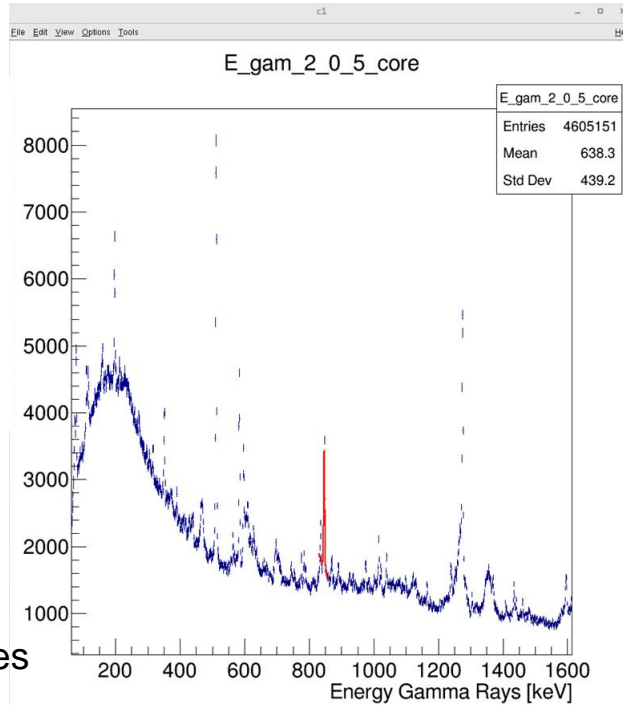
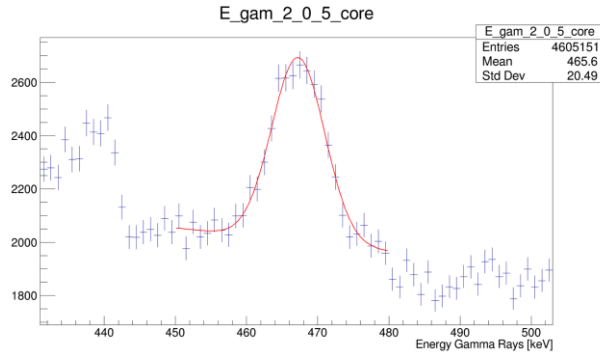
You are going to follow the training module:
« Introduction to radiological risks in CERN Supervised Radiation Areas »
Passing the test that follows is necessary to work in a Supervised Radiation Area.



Tasks and work!



Doppler analysis

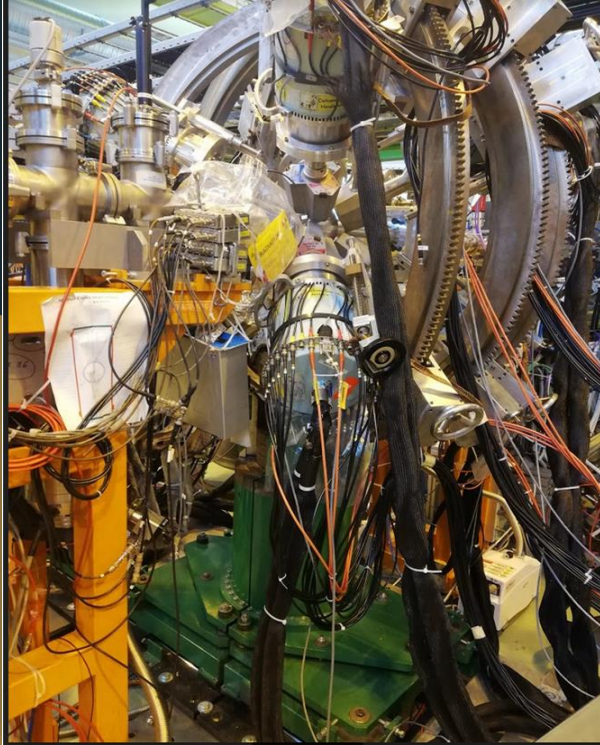


```

minibal@mbanana-pc/~ne_data
File Edit View Search Terminal Help
E_gamma_2_0_5_core
4 Content 6.77059e+03 8.51689e+02 1.11202e+00 -2.19099e-07
5 Mean 4.28059e+02 2.13934e-01 -5.00822e-04 4.88059e-04
Chi Square: 15.539960
FWHM: 8.307317 +- 0.741396
root [14] E_gamma_0_0_1_core->Draw()
Info in -<Canvas: MakeDefCanvas: created default TCanvas with name c1
root [15] FitSinglePeak(E_gamma_0_0_1_core, 198, 205)
FCN=8.52433 FROM MIGRAD STATUS=CONVERGED 494 CALLS 495 TOTAL
EDM=7.27255e-09 STRATEGY= 1 ERROR MATRIX ACCURATE
EXT PARAMETER VALUE ERROR STEP FIRST
NO. NAME SIZE DERIVATIVE
1 BgConstant 6.52770e+03 7.13015e+02 2.38580e-02 2.83772e-06
2 BgSlope -1.53920e+01 3.60275e+00 1.20702e-04 5.32661e-04
3 Sigma 1.13115e+00 4.72532e-02 5.47161e-05 -1.81333e-04
4 Content 5.15466e+03 2.07525e+02 2.12224e-01 4.31078e-07
5 Mean 1.97218e+02 4.20519e-02 9.40410e-05 -1.05275e-03
Chi Square: 8.524327
FWHM: 2.663662 +- 0.111273
root [16] FitSinglePeak(E_gamma_0_0_1_core, 300, 350)
FCN=117.789 FROM MIGRAD STATUS=CONVERGED 698 CALLS 699 TOTAL
EDM=1.0857e-08 STRATEGY= 1 ERROR MATRIX ACCURATE
EXT PARAMETER VALUE ERROR STEP FIRST
NO. NAME SIZE DERIVATIVE
1 BgConstant 3.44250e+03 1.67492e+02 3.78887e-02 -1.83109e-05
2 BgSlope -3.11208e+00 5.10157e-01 1.16331e-04 -6.94290e-03
3 Sigma 5.00402e+00 4.78899e-01 1.38959e-03 -1.13669e-04
4 Content 5.66045e+03 4.86089e+02 1.18662e+00 -3.89932e-07
5 Mean 3.22923e+02 3.06684e-01 1.44289e-03 1.42799e-04
Chi Square: 117.788954
FWHM: 11.783562 +- 1.127720
root [17] FitSinglePeak(E_gamma_0_0_1_core, 830, 860)
FCN=284.277 FROM MIGRAD STATUS=CONVERGED 585 CALLS 586 TOTAL
EDM=1.27256e-06 STRATEGY= 1 ERROR MATRIX ACCURATE
EXT PARAMETER VALUE ERROR STEP FIRST
NO. NAME SIZE DERIVATIVE
1 BgConstant 7.33939e+03 5.87127e+02 5.11885e-02 7.25852e-05
2 BgSlope -7.42444e+00 6.94684e-01 6.05438e-05 6.14373e-02
3 Sigma 1.73227e+00 6.54755e-02 4.24640e-04 -2.08684e-02
4 Content 5.02343e+03 1.39136e+02 8.64036e-01 6.09096e-06
5 Mean 8.46537e+02 6.20518e-02 4.84284e-04 -2.16196e-02
Chi Square: 284.276739
FWHM: 4.079190 +- 0.154183
root [18] E_gamma_2_0_5_core->Draw()
root [19] FitSinglePeak(E_gamma_2_0_5_core, 830, 860)
FCN=355.973 FROM MIGRAD STATUS=CONVERGED 605 CALLS 606 TOTAL
EDM=5.29381e-08 STRATEGY= 1 ERROR MATRIX ACCURATE
EXT PARAMETER VALUE ERROR STEP FIRST
NO. NAME SIZE DERIVATIVE
1 BgConstant 1.21755e+04 7.40632e+02 7.25227e-02 1.42796e-05
2 BgSlope -1.23921e+01 8.76422e-01 8.57780e-05 1.21938e-02
3 Sigma 1.60940e+00 4.51020e-02 3.27075e-04 5.21635e-03
4 Content 7.07832e+03 1.73526e+02 1.22085e+00 -1.62424e-06
5 Mean 8.46891e+02 4.09171e-02 4.03829e-04 -3.88924e-04
Chi Square: 355.972916
FWHM: 3.789847 +- 0.106207
root [20]
    
```

1. Draw graph of interest
2. Locate Doppler Shift
3. Fit peak(s)
4. Take note of important values
5. 8-3-6 = 144 graphs!

Angle analysis



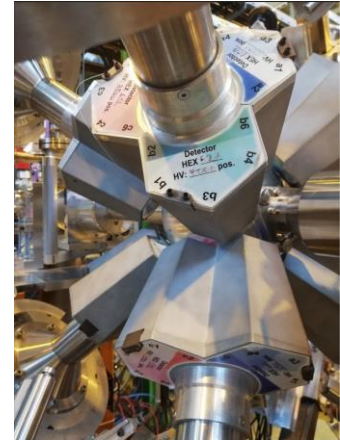
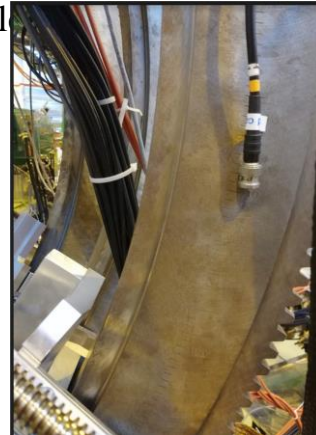
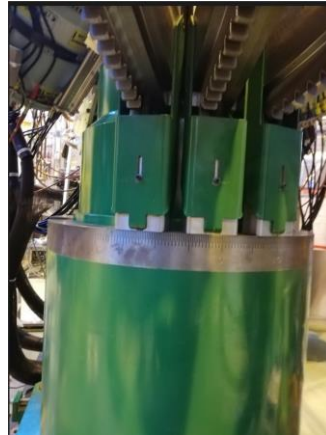
E_{Lab} by

$$E_{DC} = \gamma E_{Lab} [1 - \beta \cos(\theta_\gamma)], \quad (4)$$

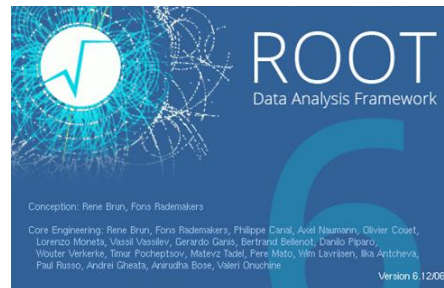
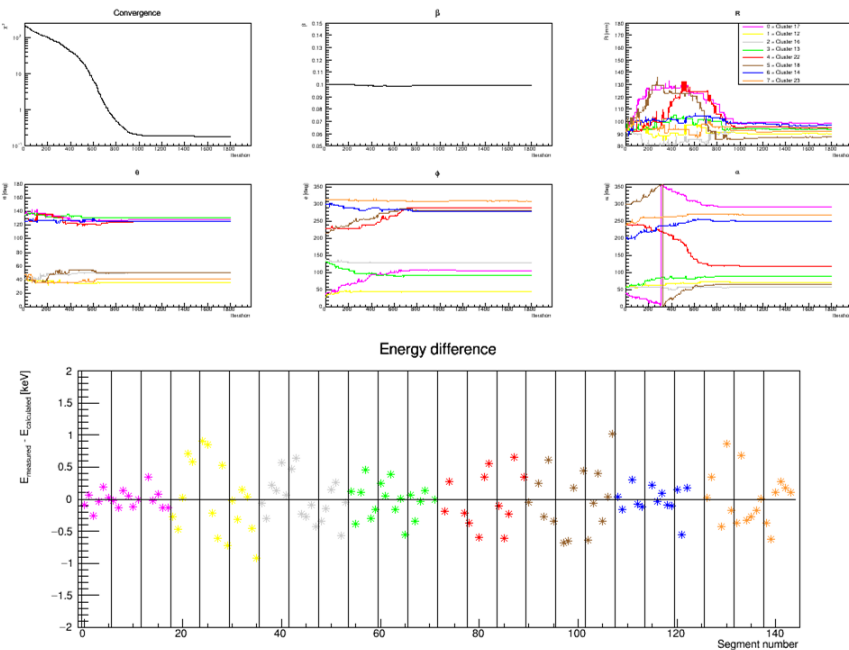
where $\gamma = 1/\sqrt{1-\beta^2}$, $\beta = v/c$ and θ_γ is related to the angles of the γ -ray ($\theta_\gamma, \phi_\gamma$) and of the particle emitting the γ -ray (θ_p, ϕ_p) by

$$\cos(\theta_\gamma) = \sin(\theta_p) \sin(\theta_\gamma) \cos(\phi_p - \phi_\gamma) + \cos(\theta_p) \cos(\theta_\gamma). \quad (5)$$

⊙ angle



Angle manipulation

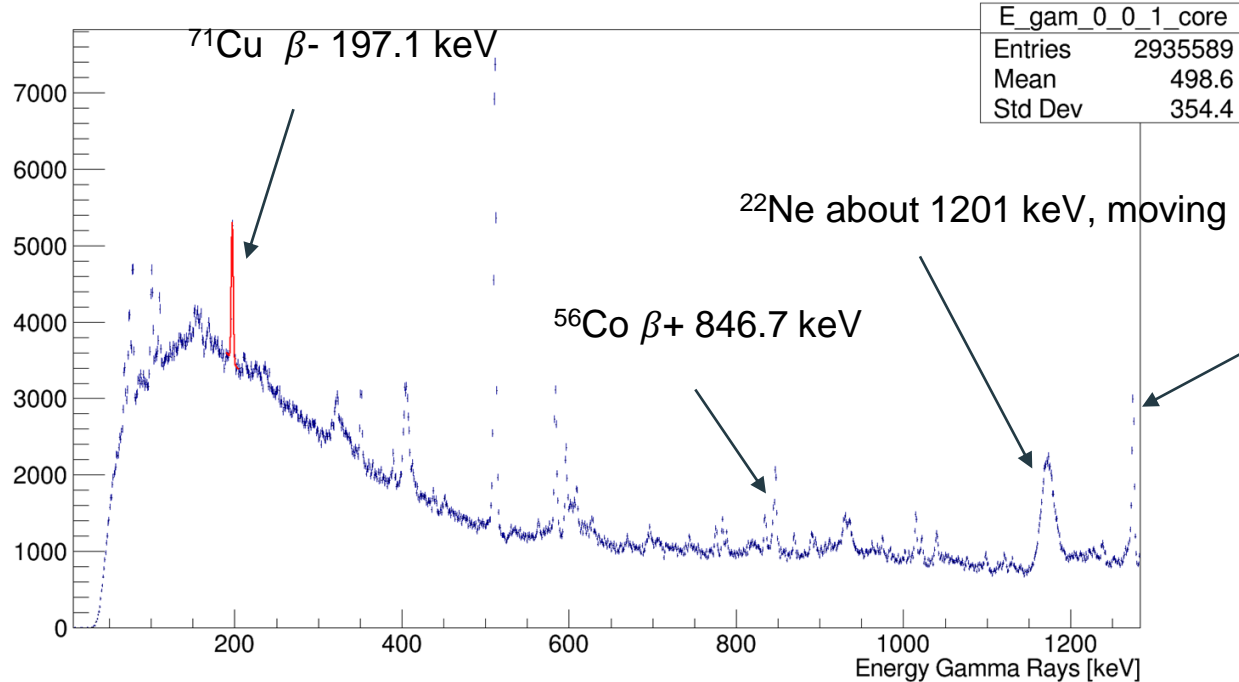


```

minibal@mbanapc:~/ne_data/angles/GeneticPositionClusters
File Edit View Search Terminal Help
theta[5] = 50.34 phi[5] = 282.84 alpha[5] = 67.56 r[5] = 87.18
theta[6] = 125.36 phi[6] = 279.89 alpha[6] = 251.50 r[6] = 97.83
theta[7] = 40.89 phi[7] = 310.29 alpha[7] = 270.35 r[7] = 92.14
Chisqr = 0.185918 Beta = 0.09941 E = 101.26 MeV Iteration 1600
theta[0] = 127.70 phi[0] = 106.98 alpha[0] = 292.01 r[0] = 98.35
theta[1] = 35.79 phi[1] = 45.14 alpha[1] = 72.80 r[1] = 90.56
theta[2] = 50.19 phi[2] = 128.91 alpha[2] = 58.61 r[2] = 93.89
theta[3] = 130.83 phi[3] = 93.69 alpha[3] = 89.90 r[3] = 93.69
theta[4] = 124.93 phi[4] = 291.07 alpha[4] = 120.25 r[4] = 94.82
theta[5] = 50.34 phi[5] = 282.84 alpha[5] = 67.69 r[5] = 87.18
theta[6] = 125.36 phi[6] = 279.73 alpha[6] = 251.49 r[6] = 96.65
theta[7] = 40.89 phi[7] = 310.29 alpha[7] = 270.35 r[7] = 92.14
Chisqr = 0.185307 Beta = 0.09941 E = 101.26 MeV Iteration 1800
theta[0] = 127.76 phi[0] = 107.18 alpha[0] = 292.22 r[0] = 98.51
theta[1] = 35.79 phi[1] = 45.18 alpha[1] = 72.80 r[1] = 90.07
theta[2] = 50.19 phi[2] = 128.91 alpha[2] = 58.32 r[2] = 93.26
theta[3] = 130.83 phi[3] = 93.69 alpha[3] = 89.90 r[3] = 93.49
theta[4] = 124.93 phi[4] = 290.93 alpha[4] = 120.33 r[4] = 94.91
theta[5] = 50.34 phi[5] = 283.16 alpha[5] = 67.43 r[5] = 87.26
theta[6] = 125.36 phi[6] = 279.73 alpha[6] = 251.57 r[6] = 96.85
theta[7] = 40.89 phi[7] = 310.24 alpha[7] = 270.34 r[7] = 92.09
Chisqr = 0.185054 Beta = 0.09940 E = 101.24 MeV Iteration 2000
theta[0] = 127.76 phi[0] = 107.25 alpha[0] = 292.22 r[0] = 98.35
theta[1] = 35.79 phi[1] = 45.14 alpha[1] = 72.80 r[1] = 90.44
theta[2] = 50.19 phi[2] = 128.91 alpha[2] = 58.45 r[2] = 93.61
theta[3] = 130.85 phi[3] = 92.62 alpha[3] = 89.14 r[3] = 92.94
theta[4] = 124.93 phi[4] = 290.89 alpha[4] = 120.25 r[4] = 94.93
theta[5] = 50.34 phi[5] = 282.95 alpha[5] = 67.69 r[5] = 87.18
theta[6] = 125.36 phi[6] = 279.53 alpha[6] = 251.49 r[6] = 96.75
theta[7] = 40.89 phi[7] = 310.25 alpha[7] = 270.35 r[7] = 92.14
  
```

Background radiation detection!

E_gam_0_0_1_core

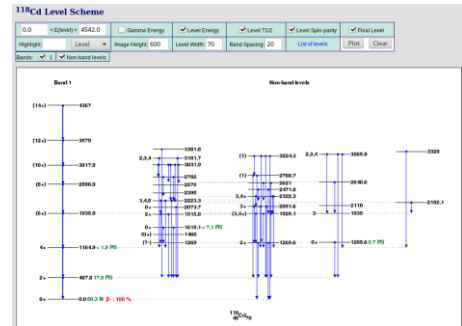


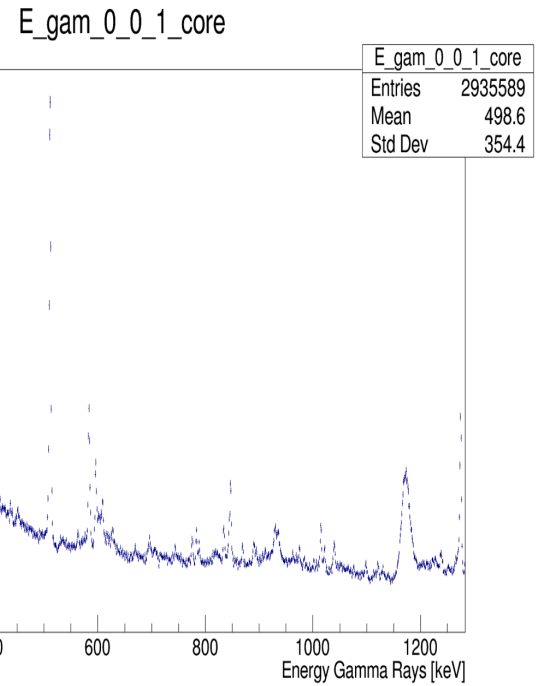
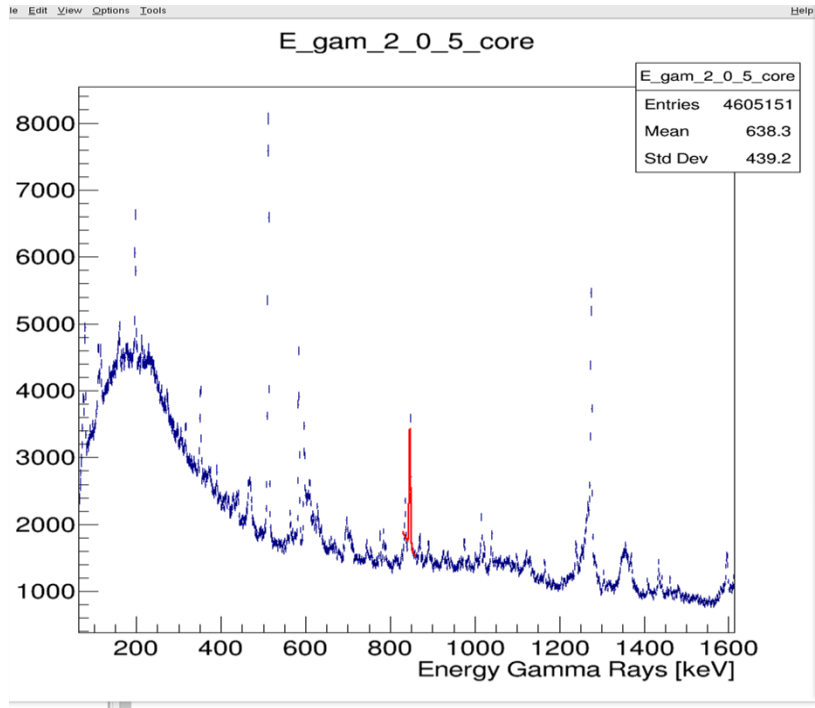
WWW Table of Radioactive Isotopes

22Ne		
Atomic Mass	21.9913851	
Decay Mode	β^-	
Half-life (T _{1/2})	3.75(1) min	
Parent Isotope	22Na	
Energy (keV)	1274.5	
Intensity (%)	100	
Decay Branching Ratio	100	
References	NB 2003, NUBASE2003	
Decay properties:		
Mode	Branching Ratio (keV)	References
β^-	100%	1274.5(20)
Data sets:		
Mode	Decay scheme	Display data
Table	Summary	Summary
ENSDF data	ENSDF	ENSDF
IAEA applications	IAEA	IAEA

Summary from WWW Table of Radioactive Isotopes

Energy (keV)	Intensity (%)	Decay mode
1274.5(20)	100	β^-





Experience

```
minibal@mbanapc:~/ne_data/angles/GeneticPositionClusters
File Edit View Search Terminal Help
theta[5] = 50.34 phi[5] = 282.84 alpha[5] = 67.56 r[5] = 87.18
theta[6] = 125.36 phi[6] = 279.89 alpha[6] = 251.50 r[6] = 97.83
theta[7] = 40.89 phi[7] = 310.29 alpha[7] = 270.35 r[7] = 92.14
Chisqr = 0.185918 Beta = 0.09941 E = 101.26 MeV Iteration 1600
theta[0] = 127.70 phi[0] = 106.98 alpha[0] = 292.01 r[0] = 98.35
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theta[2] = 50.19 phi[2] = 128.91 alpha[2] = 58.61 r[2] = 93.89
theta[3] = 130.83 phi[3] = 93.69 alpha[3] = 89.90 r[3] = 93.69
theta[4] = 124.93 phi[4] = 291.07 alpha[4] = 120.25 r[4] = 94.82
theta[5] = 50.34 phi[5] = 282.84 alpha[5] = 67.69 r[5] = 87.18
theta[6] = 125.36 phi[6] = 279.73 alpha[6] = 251.49 r[6] = 96.65
theta[7] = 40.89 phi[7] = 310.29 alpha[7] = 270.35 r[7] = 92.14
Chisqr = 0.185307 Beta = 0.09941 E = 101.26 MeV Iteration 1800
theta[0] = 127.76 phi[0] = 107.18 alpha[0] = 292.22 r[0] = 98.51
theta[1] = 35.79 phi[1] = 45.18 alpha[1] = 72.80 r[1] = 90.07
theta[2] = 50.19 phi[2] = 128.91 alpha[2] = 58.32 r[2] = 93.26
theta[3] = 130.83 phi[3] = 93.69 alpha[3] = 89.90 r[3] = 93.49
theta[4] = 124.93 phi[4] = 290.93 alpha[4] = 120.33 r[4] = 94.91
theta[5] = 50.34 phi[5] = 283.16 alpha[5] = 67.43 r[5] = 87.26
theta[6] = 125.36 phi[6] = 279.73 alpha[6] = 251.57 r[6] = 96.85
theta[7] = 40.89 phi[7] = 310.24 alpha[7] = 270.34 r[7] = 92.09
Chisqr = 0.185054 Beta = 0.09940 E = 101.24 MeV Iteration 2000
theta[0] = 127.76 phi[0] = 107.25 alpha[0] = 292.22 r[0] = 98.35
theta[1] = 35.79 phi[1] = 45.14 alpha[1] = 72.80 r[1] = 90.44
theta[2] = 50.19 phi[2] = 128.91 alpha[2] = 58.45 r[2] = 93.61
theta[3] = 130.85 phi[3] = 92.62 alpha[3] = 89.14 r[3] = 92.94
theta[4] = 124.93 phi[4] = 290.89 alpha[4] = 120.25 r[4] = 94.93
theta[5] = 50.34 phi[5] = 282.95 alpha[5] = 67.69 r[5] = 87.18
theta[6] = 125.36 phi[6] = 279.53 alpha[6] = 251.49 r[6] = 96.75
theta[7] = 40.89 phi[7] = 310.25 alpha[7] = 270.35 r[7] = 92.14
100% PL0000 34005-CONVERGED 400 CALCS 401 TOTAL
```



Thank you!

