

AGILE Mini-Calorimeter test @ DAΦNE Nov. 2005 preliminary results

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AGILE MiniCalorimeter (MCAL)



30 CsI(Tl) scintillator 375×23× 15 mm

2 custom PIN PD for each bar (Si active area 256 mm², 130 pF, I_s 1.5 nA @ 20 °C)

Weighting the signals A end B from the two PD of one bar the energy and position can be evaluated

$$x \propto \ln (A/B) \quad E \propto \text{sqrt}(A*B)$$

MCAL operative modes

- 1) **GRID:** MCAL is 'slave' of the Tracker. On Data Handling command all the PD signals are analysed and sent to DH.
The FEE can handle an event rate up to 1300 Hz.

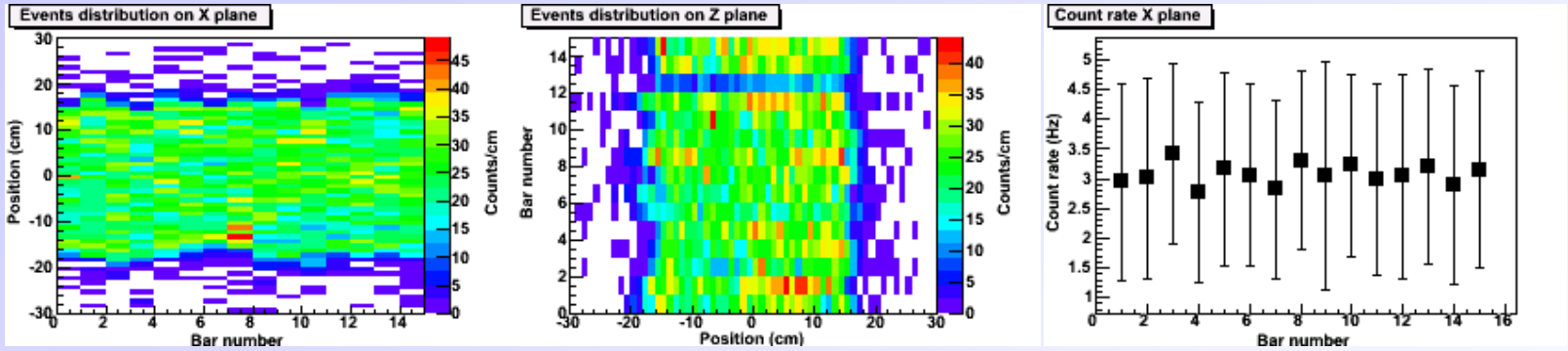
- 2) **BURST:** MCAL independently detects events above 300 keV.
This data are processed in the Data Handling for transient event search.
The FEE can handle an event rate up to 500 kHz.

- 0) **HK:** using Burst data MCAL continuously generate the spectrum, in broad channels, of collected events in the two planes. Spectra refresh period is 1 sec.

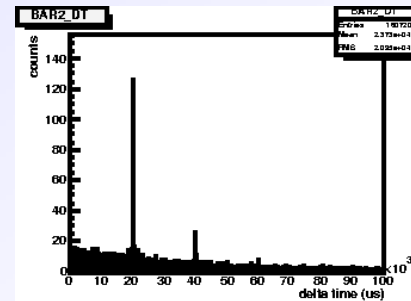
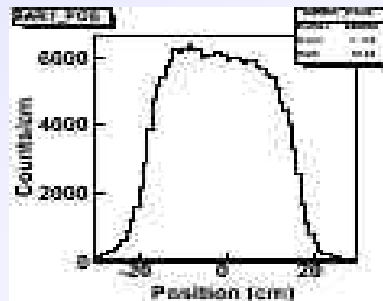
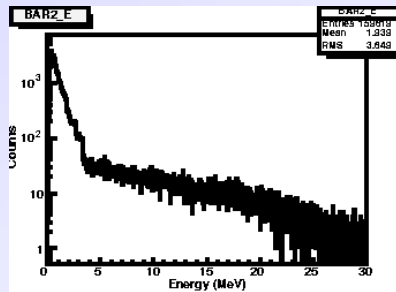
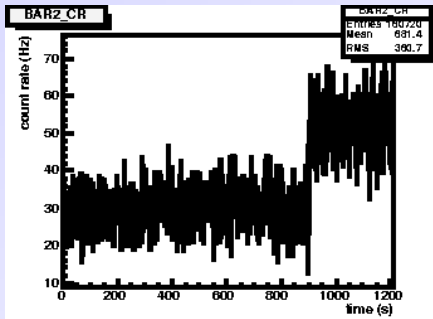
Energy resolution FWHM	~ 10 % @ 1 MeV ~0.7% @ 100 MeV
Position resolution (1σ)	~20 mm @ 1 MeV ~2 mm @ 100 MeV
Time resolution (Burst)	~2 μ s
Energy Range	GRID: 1 – 500 MeV BURST: 0.3 – 100 MeV
Event time of analysis	GRID: ~60 μ s BURST: ~10 μ s/bar

Use of data in Burst mode run id 2143

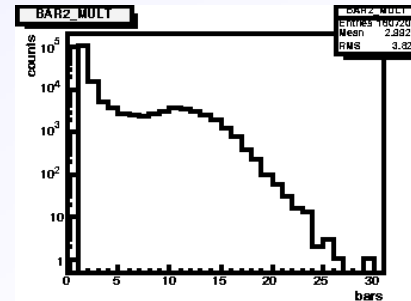
From MCAL Burst data counts maps, ratemeter spectra etc. can be derived



As well as for each individual bar

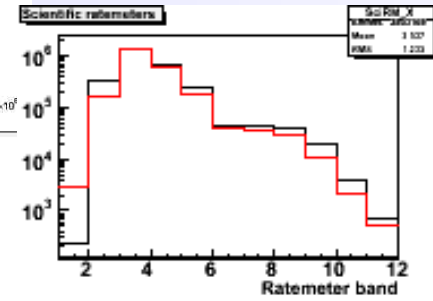
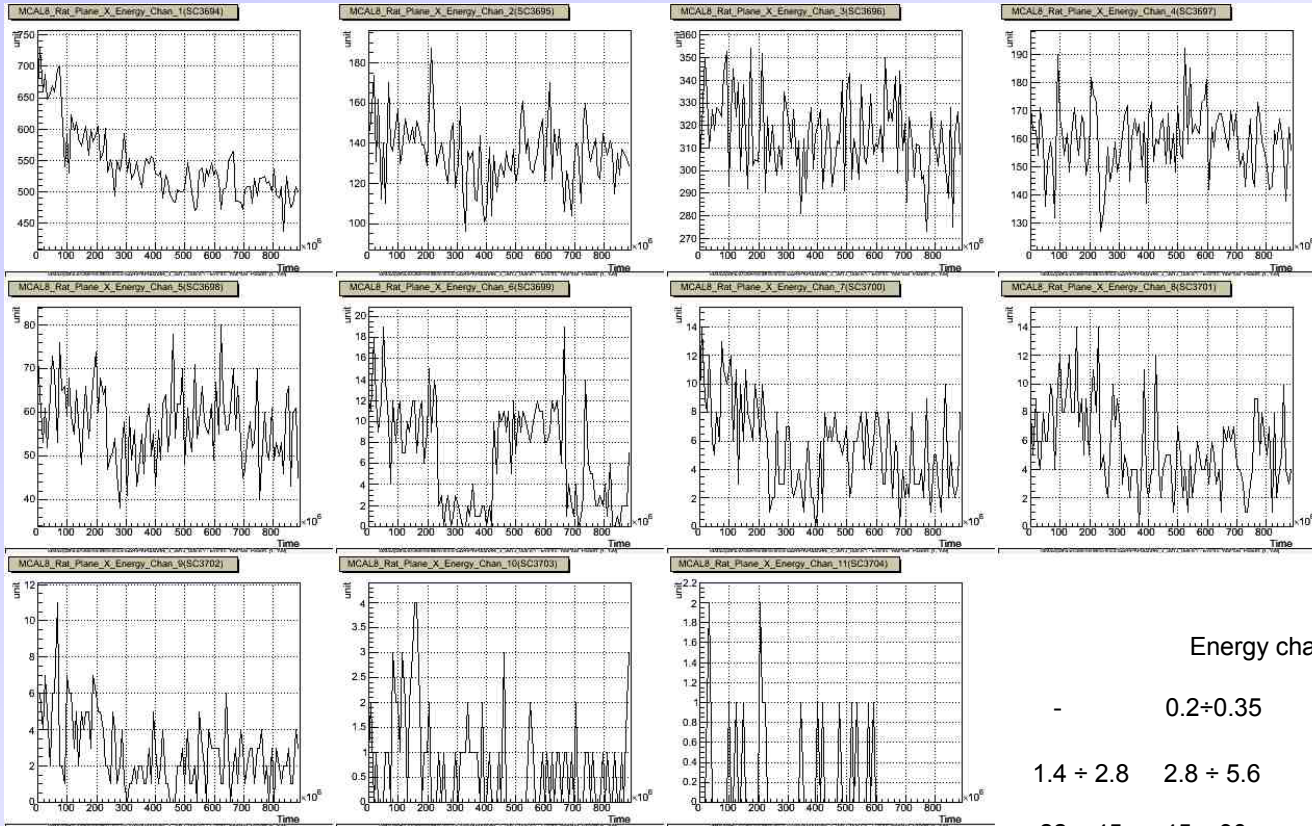


Δt distribution between events



Events multiplicity distribution (# of coincident bar for one hit)

Data in House-Keeping (HK) mode



Energy channels (MeV)

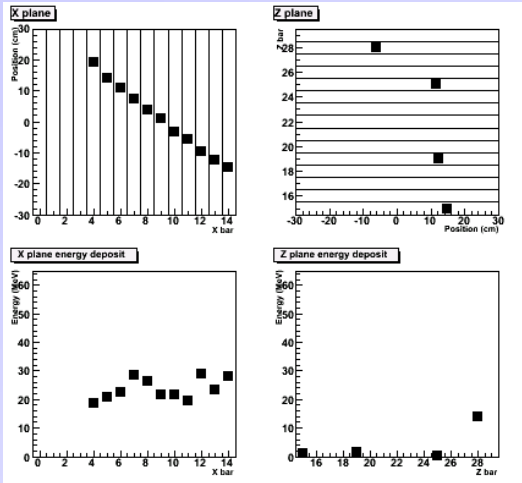
-	0.2÷0.35	0.35÷0.7	0.7÷1.4
1.4 ÷ 2.8	2.8 ÷ 5.6	5.6 ÷ 11	11 ÷ 22
22 ÷ 45	45 ÷ 90	> 90	

Run id 2143

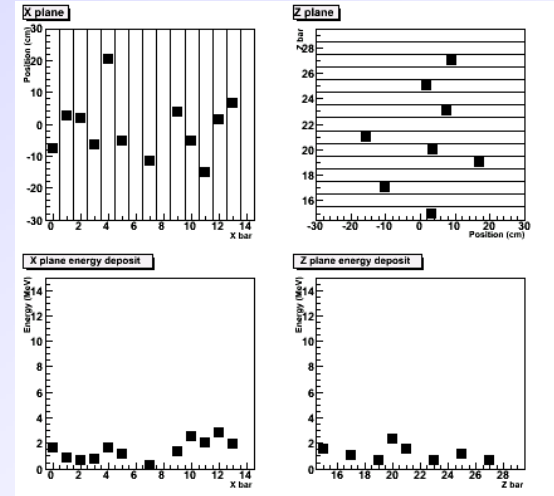
E beam

639 MeV

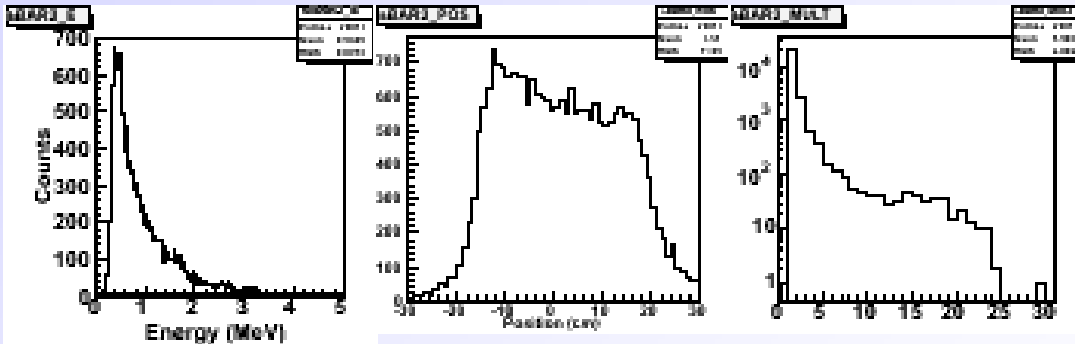
AGILE out of the beam



Bar 2 plane X 800 < t



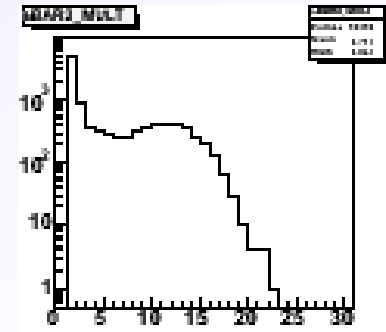
Bar 2 plane X first 1000 < t < 1200



Energy

Position

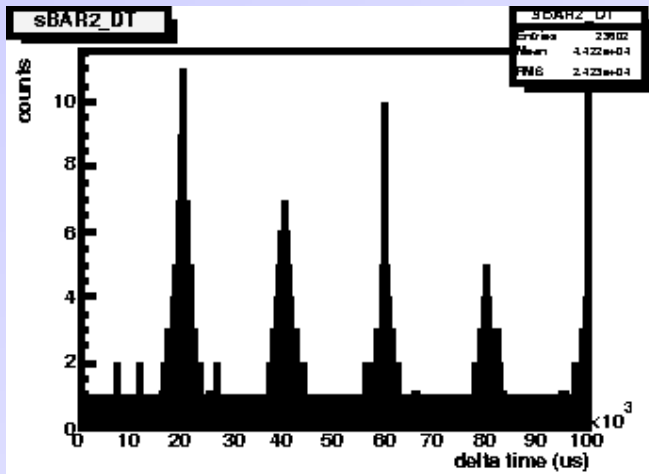
Mux



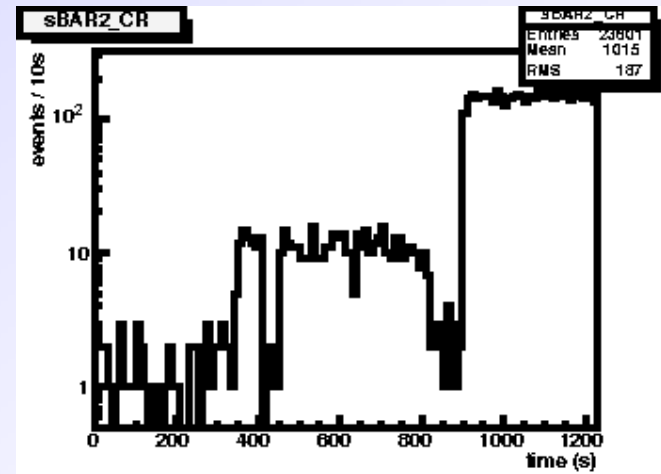
Run id 2143

E beam 639 MeV AGILE out of the beam

Selection of events with $MUX > 8$
Details of bar 2 plane X



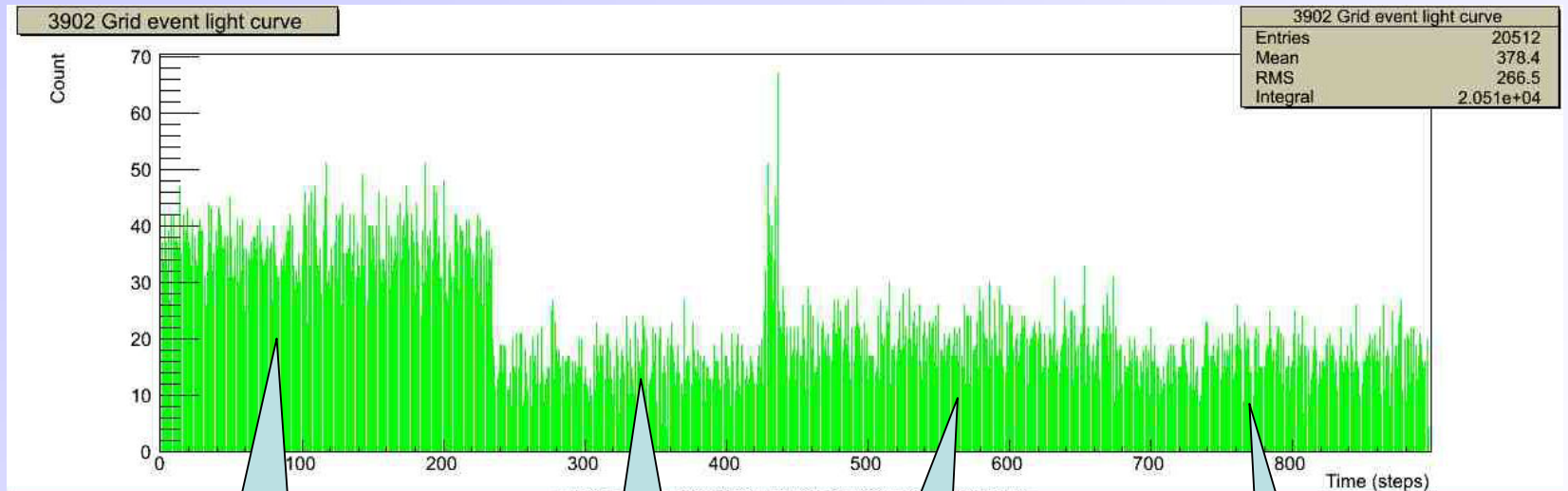
Δt distribution between events



Rate meter, with bkg, pre- beam and beam

Run id 2244

E beam 450 MeV beam on AGILE at (13, 523), $\theta = 30^\circ$ $\varphi = 135^\circ$
Test on AGILE bkg GRID mode 39.02 and MCAL HK



Beam ON
e- @ BTF

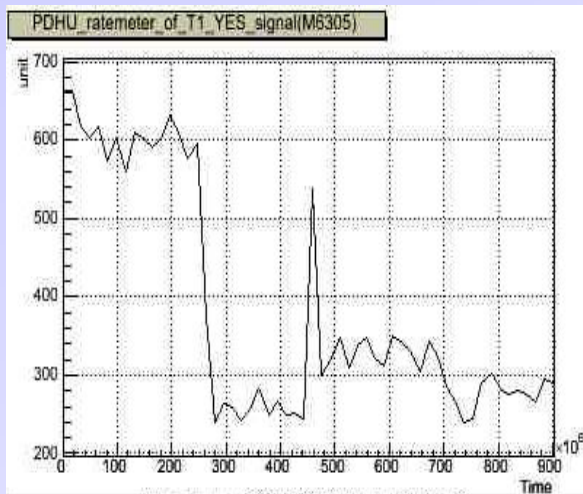
LINAC ON
Gun OFF

LINAC ON
Gun ON
Target-1 OFF

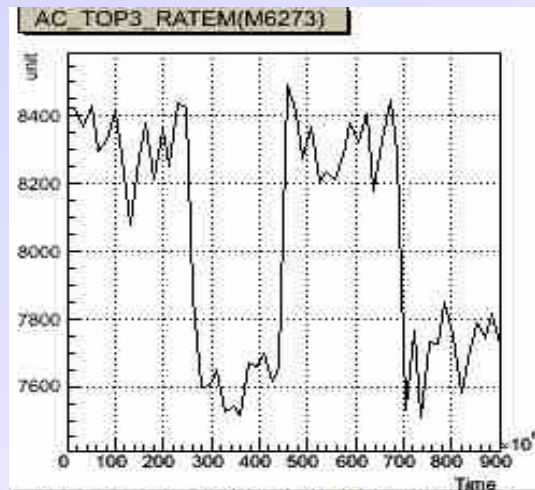
Beam OFF

Run id 2244

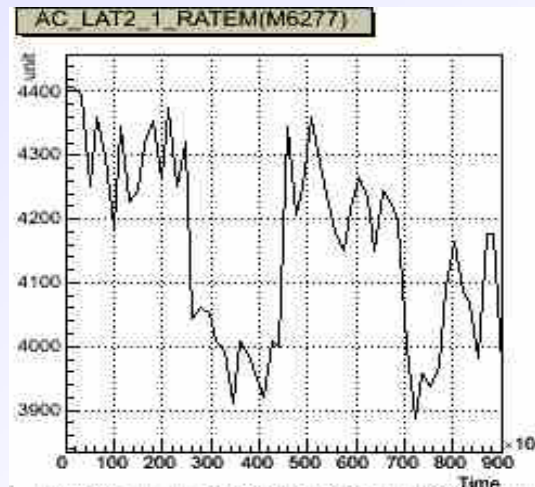
E beam 450 MeV



Ratemeter of triggered events on AGILE Tracker



Ratemeter of triggered events on two AC panel (one top, one lateral)

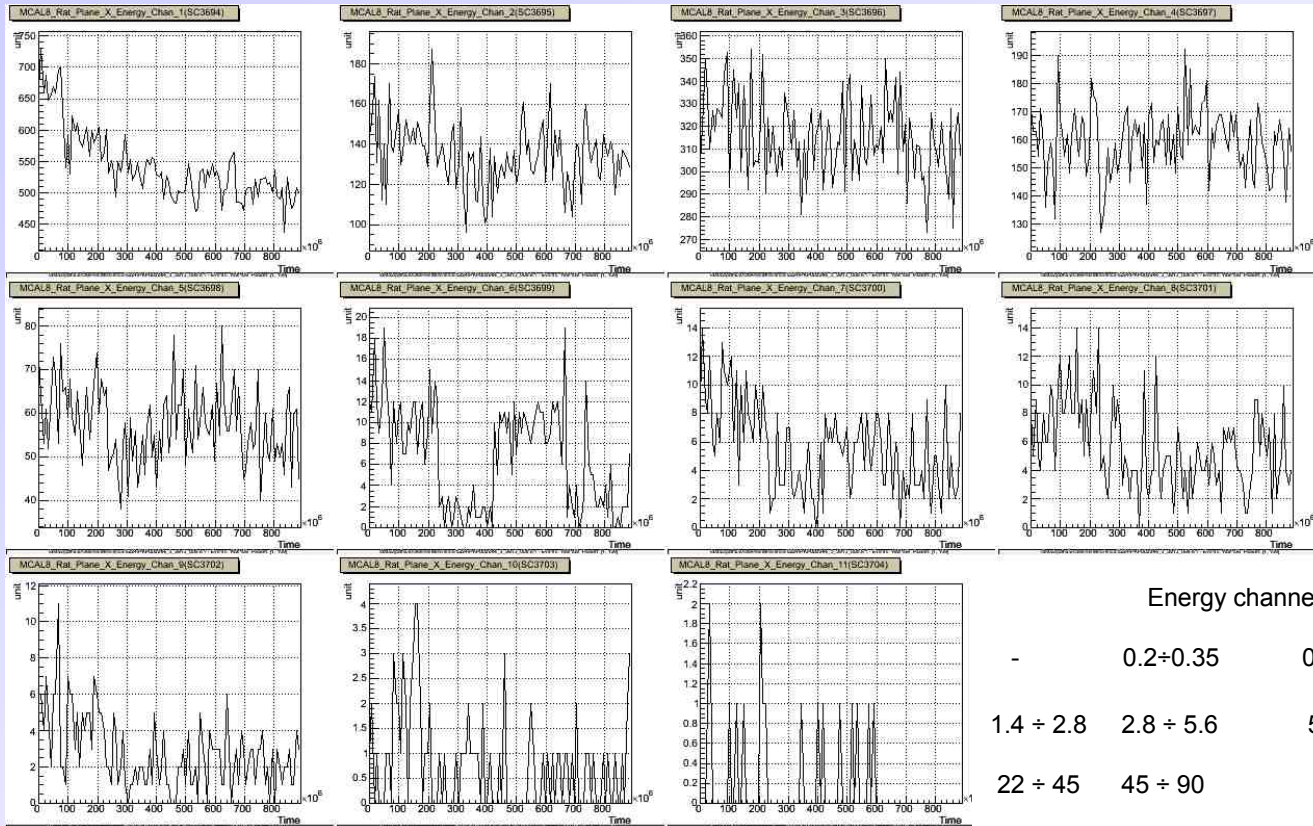


All the other panels exhibits the same behaviour

AC thr about 70 keV

Run id 2244

E beam 450 MeV

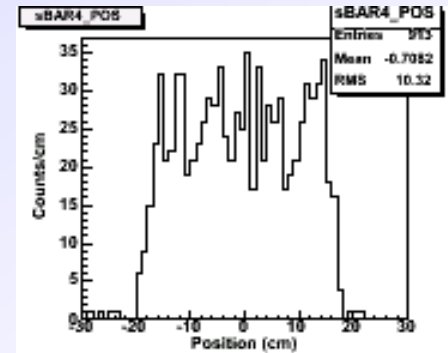
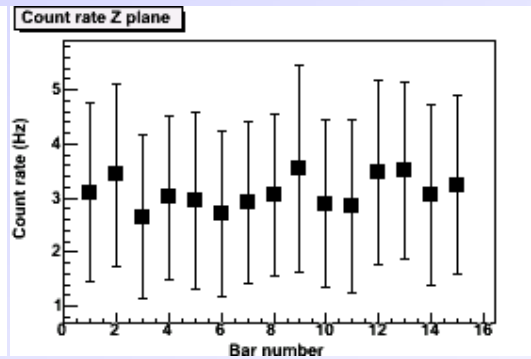
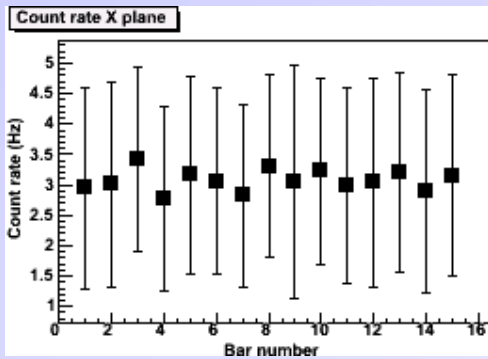


HK data of MCAL

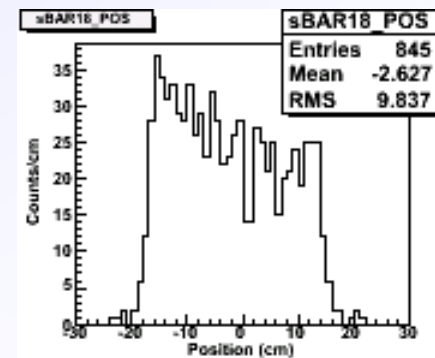
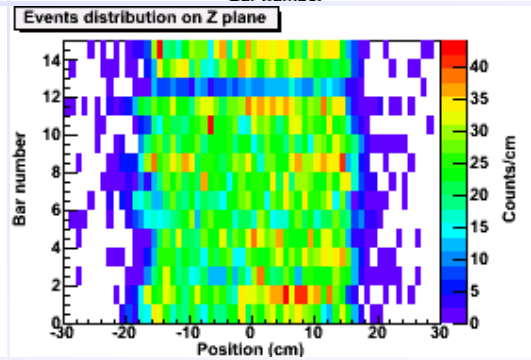
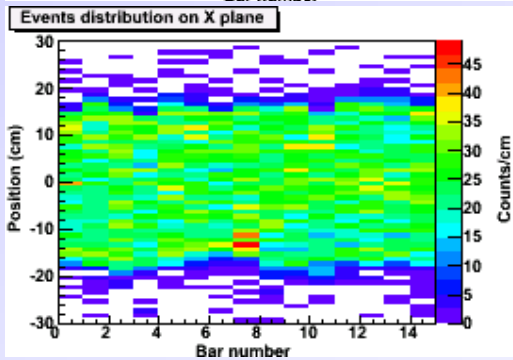
Run id 2245

E beam 450 MeV beam on AGILE at (13, 523.01), $\theta = 30^\circ$ $\varphi = 135^\circ$ MCAL Burst mode (30.09)

Time < 300 sec, beam OFF Events with $E > 2$ MeV



Bar 4
plane x

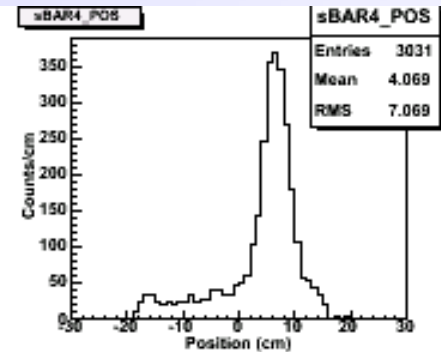
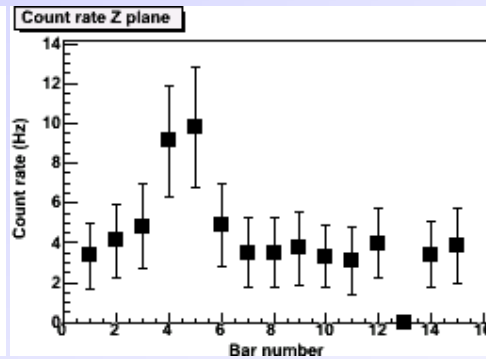
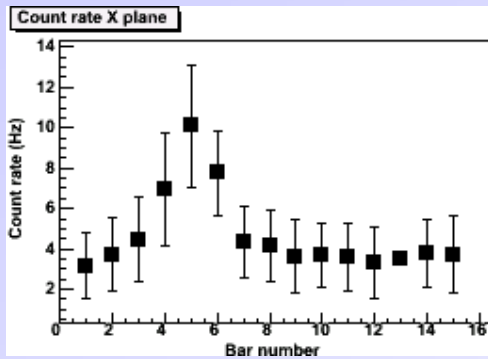


Bar 2
plane z

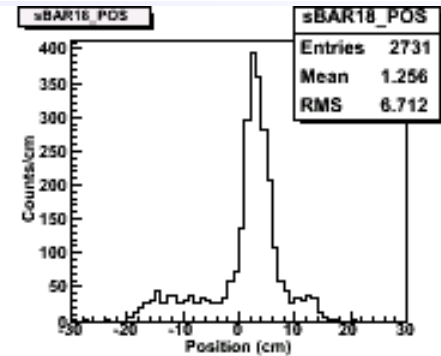
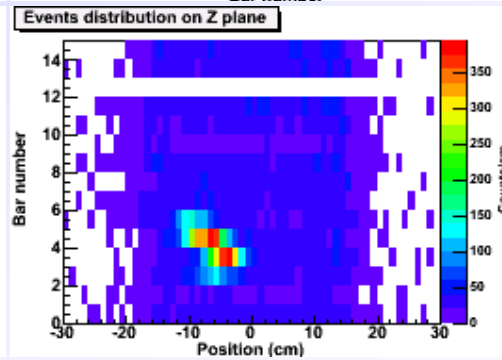
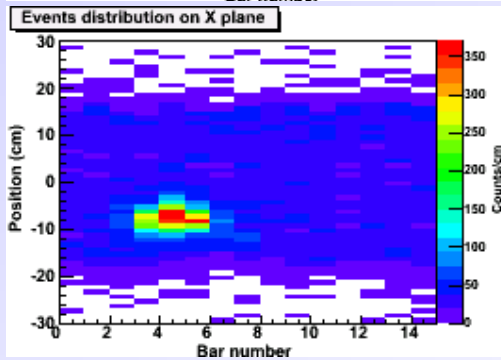
Run id 2245

E beam 450 MeV beam on AGILE at (13, 523.01), $\theta = 30^\circ$ $\varphi = 135^\circ$ MCAL Burst mode (30.09)

300 < Time < 600 sec, beam ON Events with E > 2 MeV



Bar 4
plane x



Bar 2
plane z

Run id 2245

E beam 450 MeV beam on AGILE at (13, 523.01), $\theta = 30^\circ$ $\varphi=135^\circ$ MCAL Burst mode (30.09)

Low Energy ($E < 2$ MeV) background evaluation during the beam

Beam spot area confined in bars X4,X5,X6 positions $z=4\div 10$ cm and in bars Z3,Z4,Z5 positions $x = 4 \div 10$ cm, total area 45 cm^2 (~3% area MCAL).

Considered all events on MCAL plane coincident with at least an hit with $E > 0.5$ MeV on beam spot area

Total counts ($E > 0.5$ MeV) on beam spot area ~ 11000 ($\equiv 43$ ct/sec)

MCAL bkg ($E > 0.5$ MeV) ~ 800 ct/sec

Total counts ($E > 0.5$ MeV) on beam spot area **due to the spill ~ 20 ct/sec**

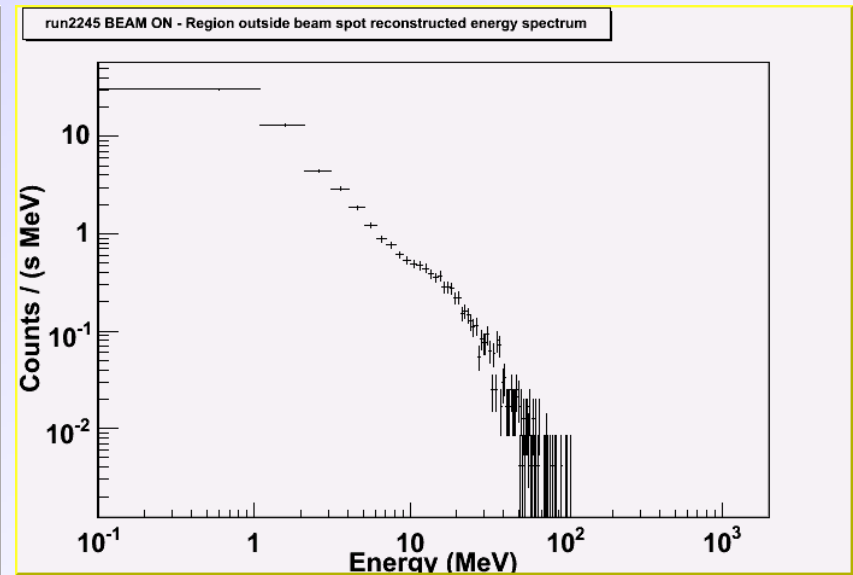
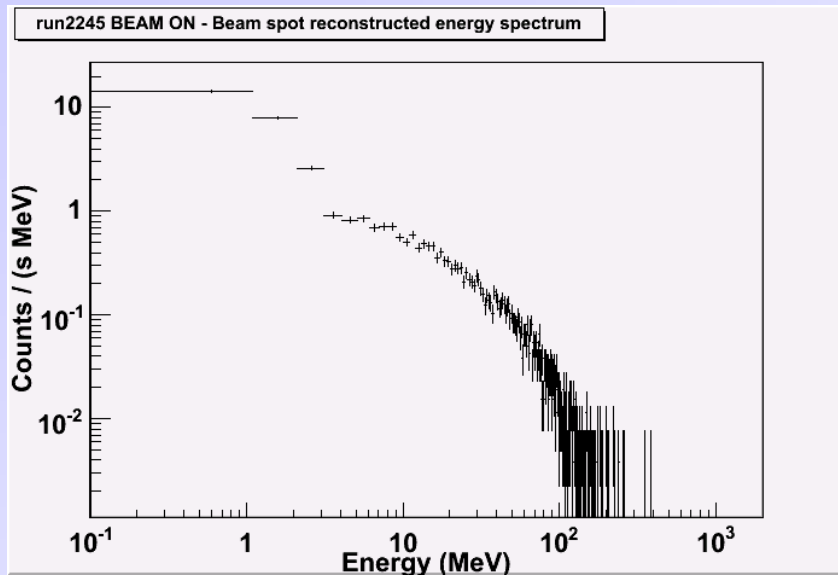
Total counts ($E > 0.5$ MeV) on MCAL coincident with spot ~ 15000 ($\equiv 63$ ct/sec) (and probably due to the spill) distributed as:

.5 < E (MeV) < 1	31 ct/sec
1 < E (MeV) < 1.5	9 ct/sec
1.5 < E (MeV) < 2	4 ct/sec

Run id 2245

E beam 450 MeV beam on AGILE at (13, 523.01), $\theta = 30^\circ$ $\varphi=135^\circ$ MCAL Burst mode (30.09)

Low Energy ($E < 2$ MeV) background evaluation during the beam



In the range $0.5 < E < 2$ MeV the bkg rate due to the spill is about 0.03 ph/sec cm^2

That, considering the MCAL effective area in that range result in about 0.2 ph/ sec cm^2
(Considering an isotropic distribution)

Run id 2245

E beam 450 MeV beam on AGILE at (13, 523.01), $\theta = 30^\circ$ $\varphi = 135^\circ$ MCAL Burst mode (30.09)

