Trigger preliminary studies

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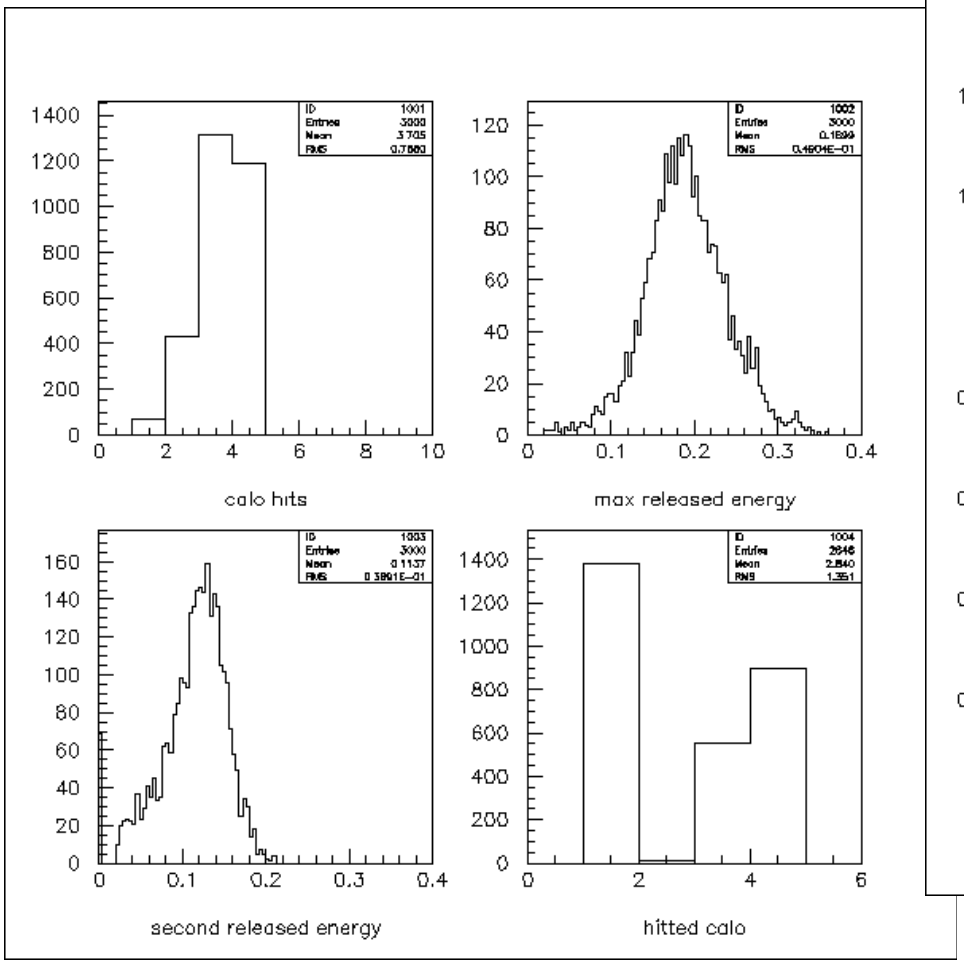
Trigger

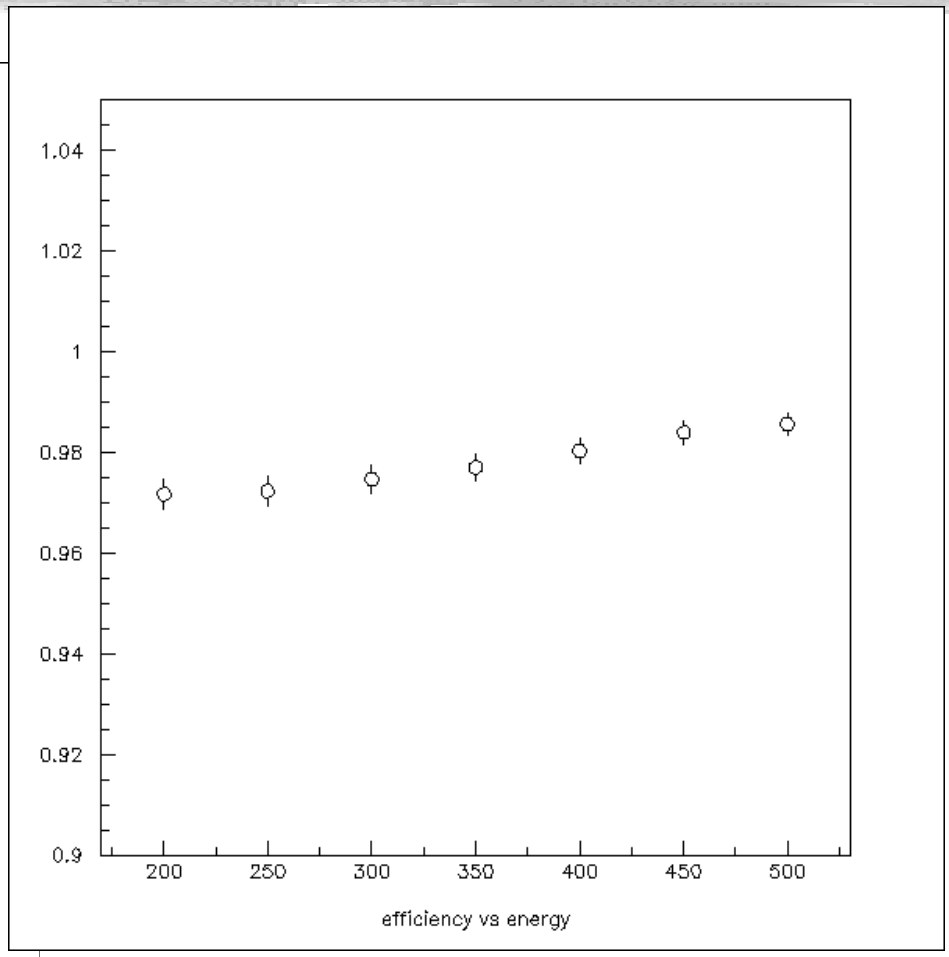
- First study for hadronic cross section
- First level trigger requirements:
  - Very high efficiency for all channels
  - Trigger on all "luminosity bhabhas"
- Based on energy release in the e.m.c.
- "Minimum bias" trigger
  - at least 2 releases over a threshold (2 MeV)

Multihadronic events

- Procedure:
  - Event generation for each channel
  - Follow the particle up to the e.m.c.
  - Study the energy release
    - accurate montecarlo with lead-fibers-glue
    - experimental data from KLOE
    - different thickness
    - impact angle considered
    - low energy signals weighted

Example: $k^+k^-\pi^+\pi^-$





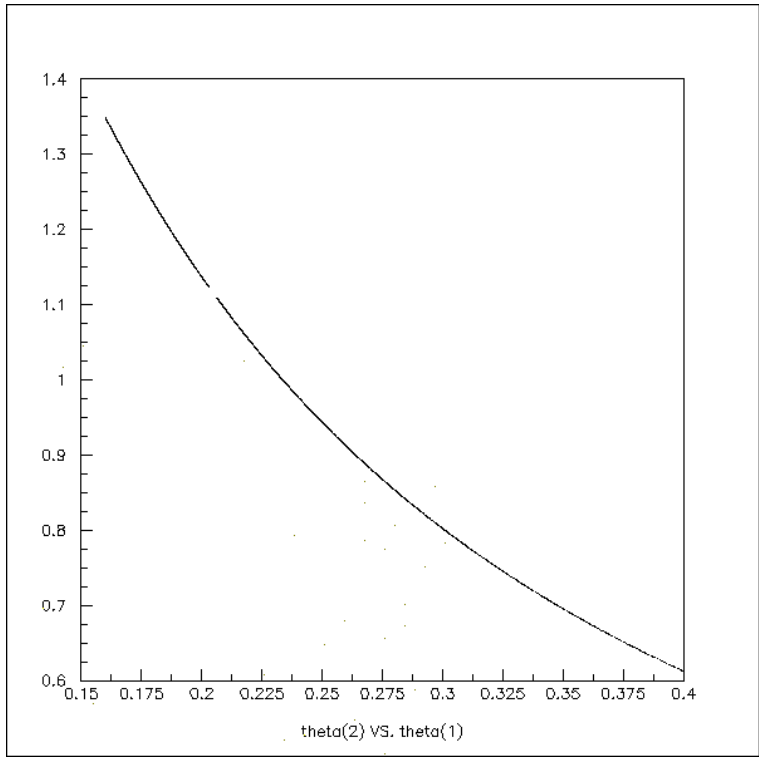
Minimum bias efficiency

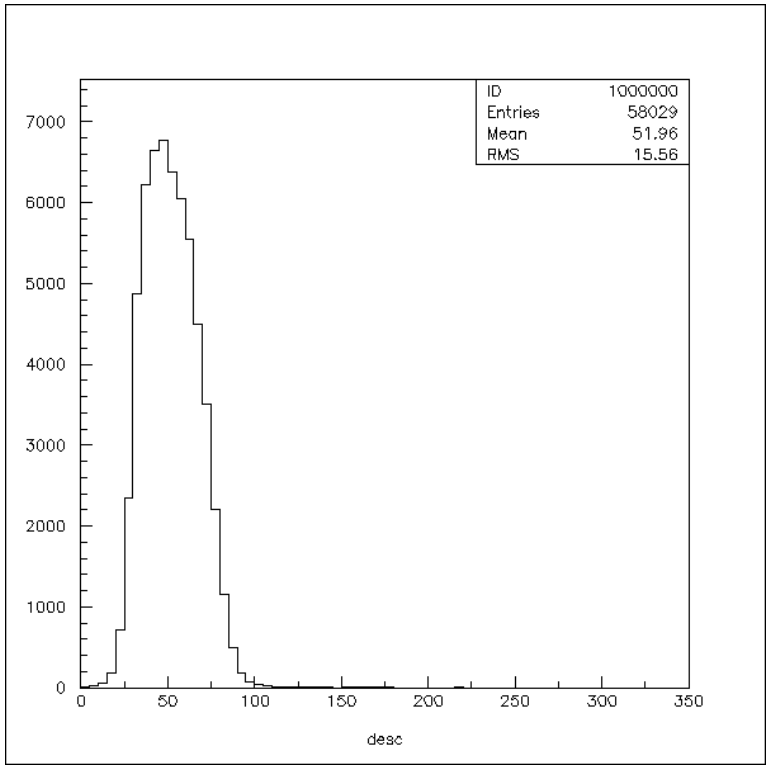
Reaction	Low energy	c.m. energy	Efficiency		Reaction	Low energy	c.m. energy	Efficiency
$\pi+\pi-2\pi0$	200	1580	.999		$2\pi+2\pi-2\pi0$	200	1580	1
	250	1766	1			250	1766	1
	300	1935	1			300	1935	1
	350	2090	1			350	2090	1
	400	2234	1			400	2234	1
	450	2370	1			450	2370	1
	500	2498	.999			500	2498	1
$2\pi+2\pi-$	200	1580	.991		k+k-$\pi+\pi-$	200	1580	.972
	250	1766	.997			250	1766	.972
	300	1935	.995			300	1935	.975
	350	2090	.995			350	2090	.977
	400	2234	.997			400	2234	.980
	450	2370	.996			450	2370	.984
	500	2498	.997			500	2498	.986
$\pi+\pi-4\pi0$	200	1580	1					
	250	1766	1					
	300	1935	1		**global**	**200**	**1580**	**.994**
	350	2090	1			**350**	**2090**	**.995**
	400	2234	1					
	450	2370	1					
	500	2498	1					

Bhabha events

- Trigger efficiency on "luminosity Bhabhas" (0.3 rad < θ < 0.4 rad)
- θ_{min} = 0.16 rad
- e^+e^- correlation
- spectrum of released energy
- full efficiency (> 99.99 %)

Bhabha


1.4
1.3
1.2
1.1
1
0.9
0.8
0.7
0.6
0.15 0.175 0.2 0.225 0.25 0.275 0.3 0.325 0.35 0.375 0.4
theta(2) VS. theta(1)


ID 1000000
Entries 58029
Mean 51.96
RMS 15.56
7000
6000
5000
4000
3000
2000
1000
0
0 50 100 150 200 250 300 350
desc

Cosmic background reduction

- Rate can be reduced:
  - rejecting only 2 deposits in barrel or pole
- Cannot affect Bhabha efficiency
- Expected reduction factor > 3

Trigger efficiency

Reaction	Low energy	c.m. energy	Efficiency		Reaction	Low energy	c.m. energy	Efficiency
$\pi+\pi-2\pi0$	200	1580	.999		$2\pi+2\pi-2\pi0$	200	1580	1
	250	1766	1			250	1766	1
	300	1935	.999			300	1935	1
	350	2090	1			350	2090	1
	400	2234	1			400	2234	1
	450	2370	.999			450	2370	1
	500	2498	.999			500	2498	1
$2\pi+2\pi-$	200	1580	.991		k+k-$\pi+\pi-$	200	1580	.971
	250	1766	.996			250	1766	.972
	300	1935	.994			300	1935	.971
	350	2090	.994			350	2090	.975
	400	2234	.996			400	2234	.978
	450	2370	.994			450	2370	.982
	500	2498	.997			500	2498	.985
$\pi+\pi-4\pi0$	200	1580	1					
	250	1766	1					
	300	1935	1		**global**	**200**	**1580**	**.994**
	350	2090	1			**350**	**2090**	**.995**
	400	2234	1					
	450	2370	1					
	500	2498	1					

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Trigger rate

- Minimum bias
  - hadrons + muons ~1 Hz
  - Bhabha ($\theta > 0.16$) ~20 Hz
  - cosmic ~500 - 600 Hz
  - machine background ?
- Cosmic veto on
  - hadrons + muons ~1 Hz
  - Bhabha ($\theta > 0.16$) ~20 Hz
  - cosmic < 150 - 200 Hz
  - machine background ?

Some considerations

- Rates and data flow not challenging for DAQ
- Online filters (luminosity offline -> online)
- Cosmic background downscale
- Take into account machine background
- New studies varying thresholds
- DAQ aspects

Conclusion

- A simple trigger
- It is very efficient for all the events
- It can reasonably reduce cosmic background