

EMC Background Studies

Computing + FullSim + Background Session
SuperB Collaboration Meeting
La Biodola
3/6/2012

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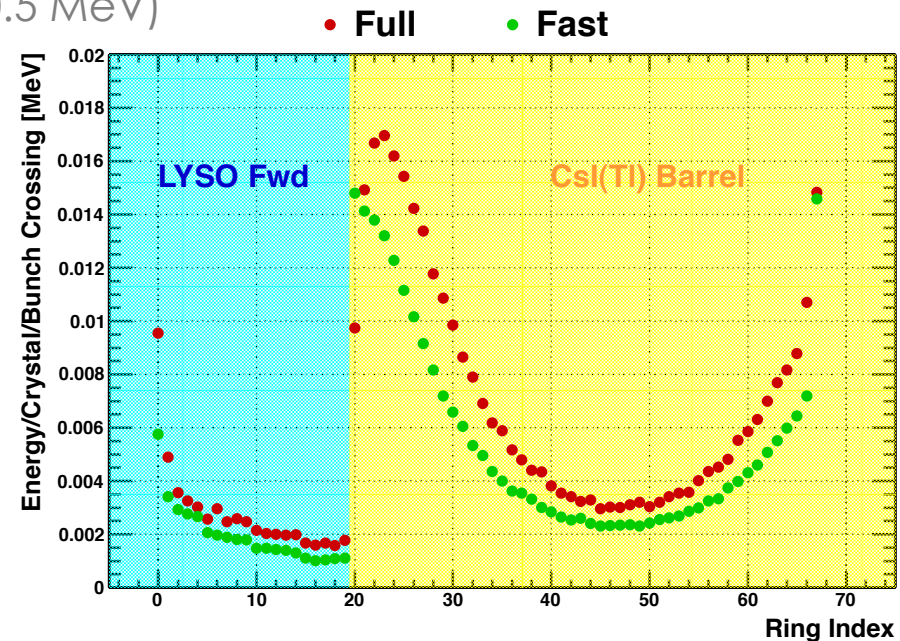
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Outline

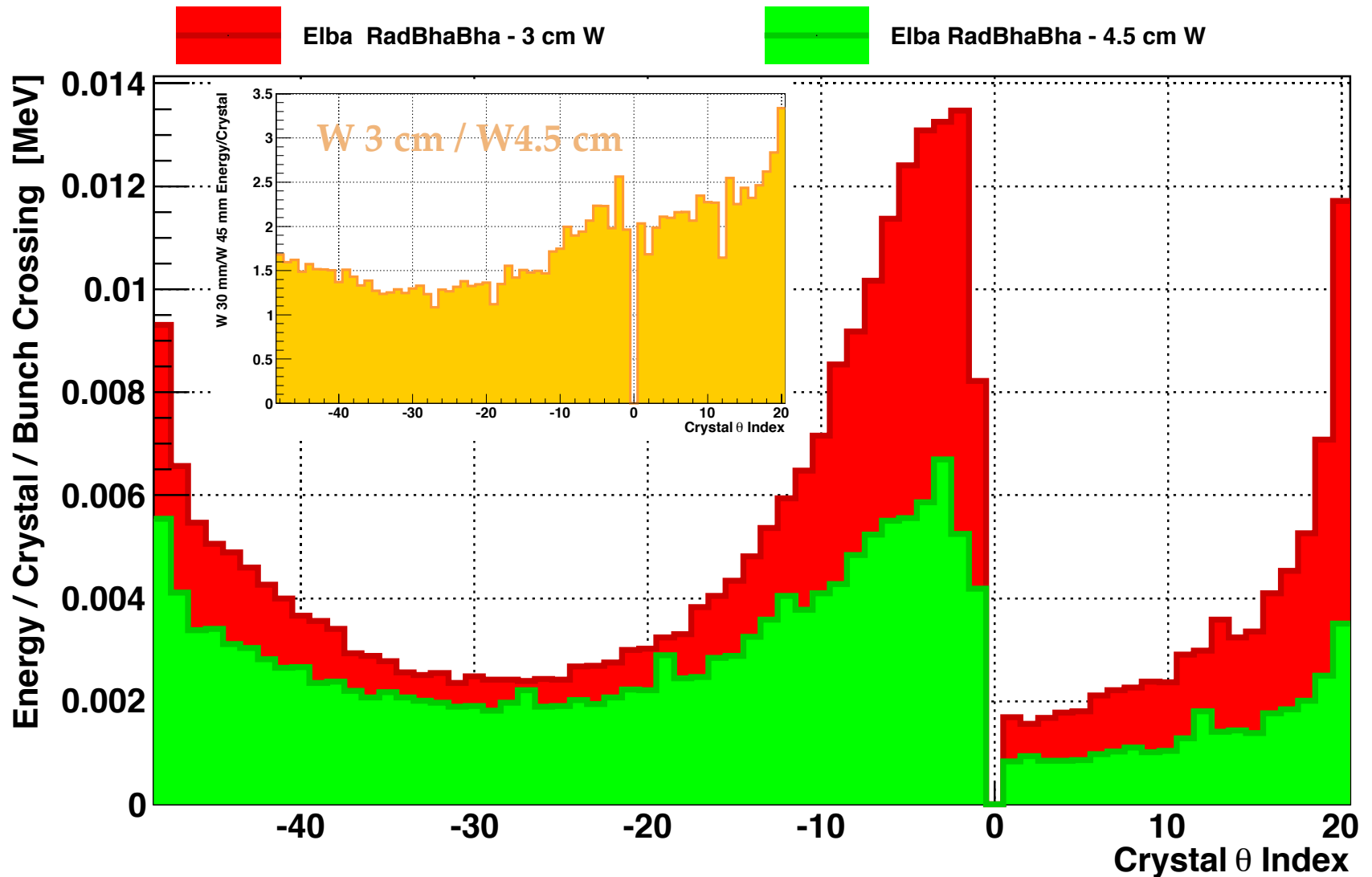
- Compare 3 and 4.5 cm shield with RadBhaBha
- Compare December 2011 (Frascati) and June 2011 (Elba) productions
- Barrel Resolution effects
 - Shield Thickness
 - Background Types

Summary of Past Results

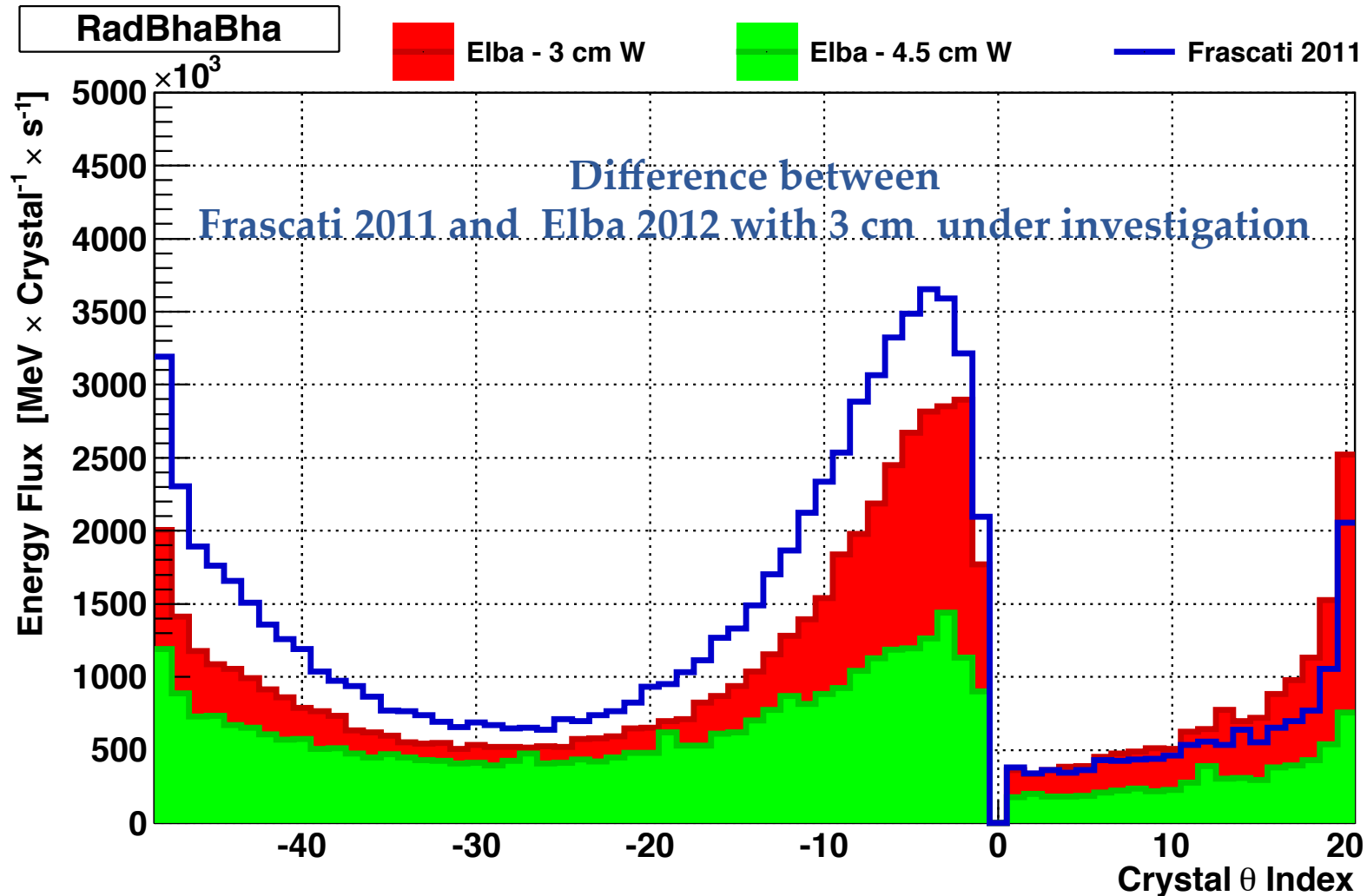
- Barrel
 - Energy resolution with NO Background similar to the BaBar one (2008)
 - Large Background impact on resolution with 140 μ s CSP + 500 ns Shaper
 - Large energy resolution dependence on the θ angle
 - Significant performance improvement with 100 ns CSP + 500 ns Shaper (same noise level)
 - Small average effect on energy resolution adding Touschek background (Expect larger effects in Fwd and Bkd regions)
 - Noise scan recommends RMS < 1 MeV (0.5 MeV)
- Fwd Endcap
 - Similar performance for all simulated options with NO Background
 - LYSO OK even with x5 Background safety factor
- Full-Fast comparison
 - Improved agreement for Energy/Crystal from RadBhaBha



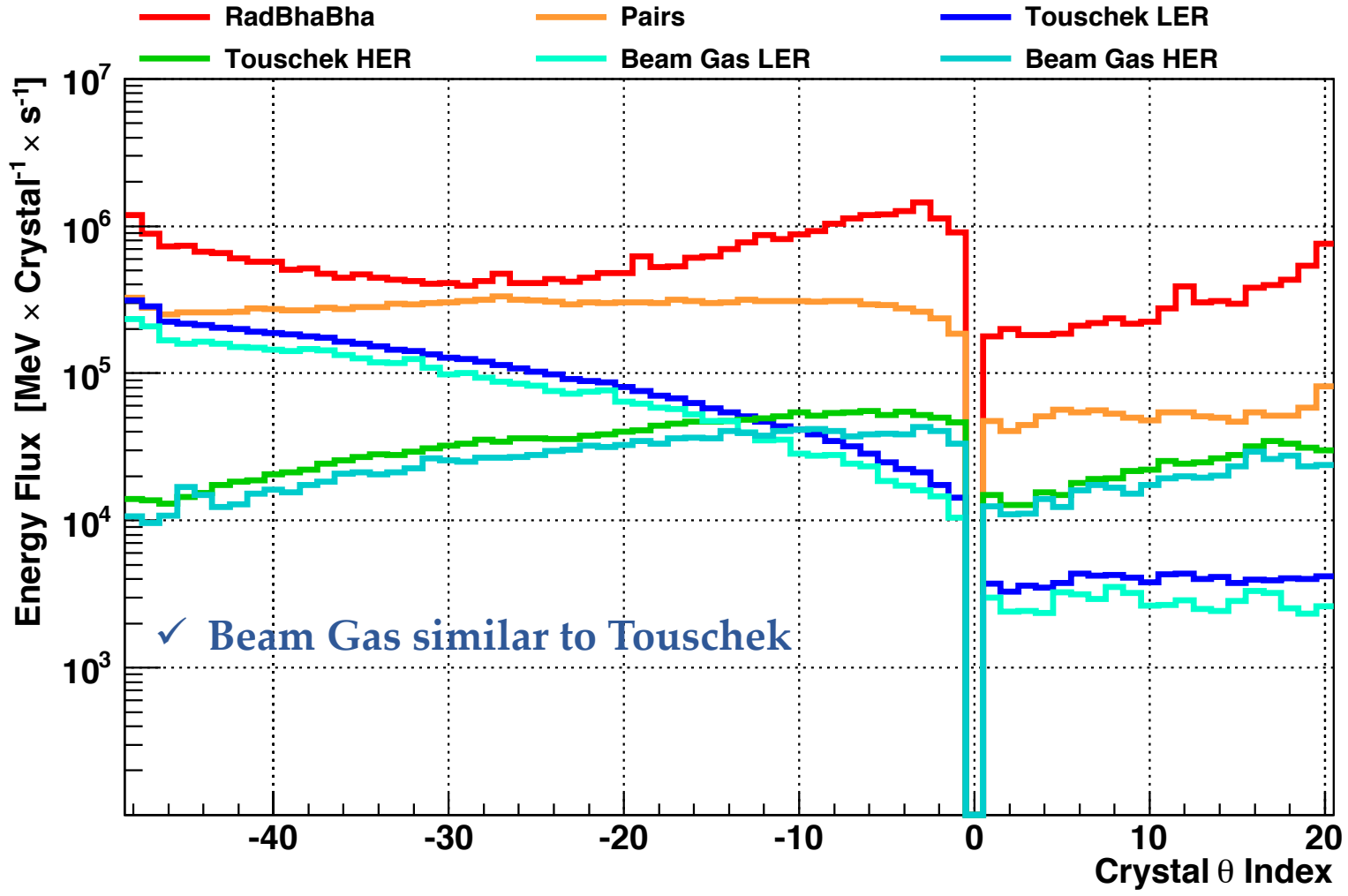
Compare Shields



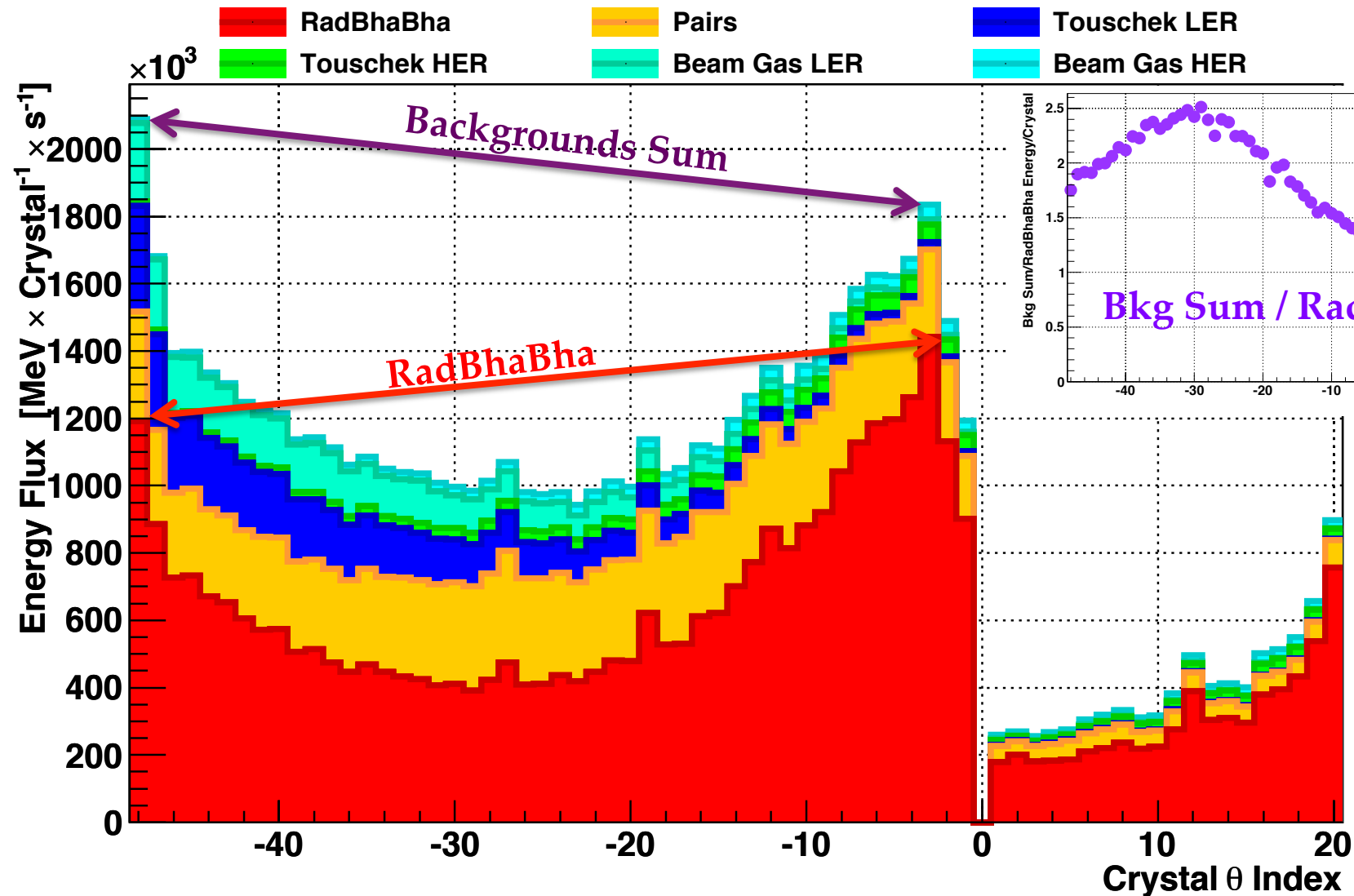
Compare RadBhaBha Prods



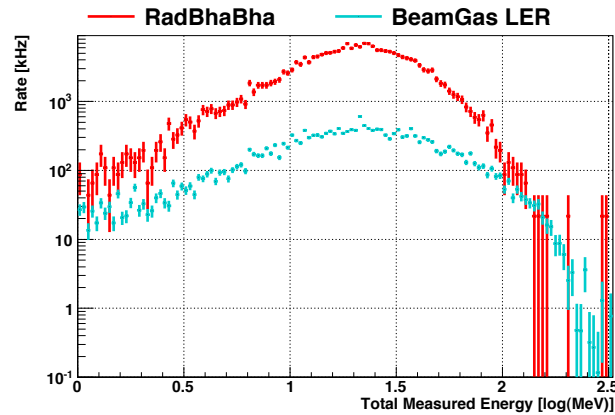
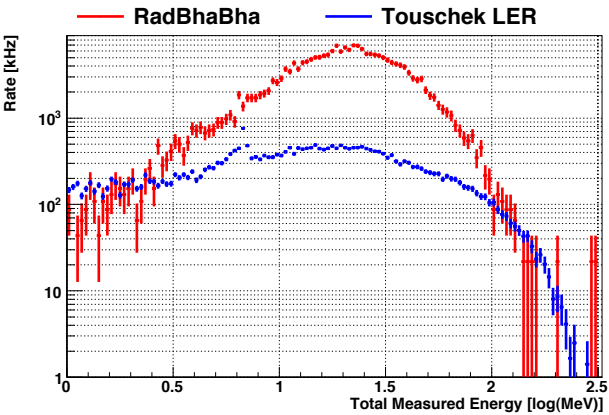
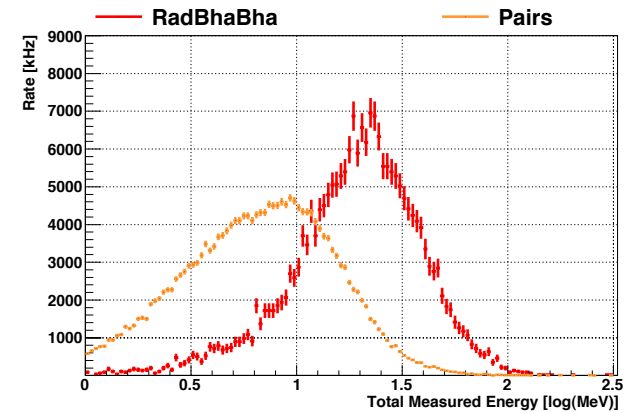
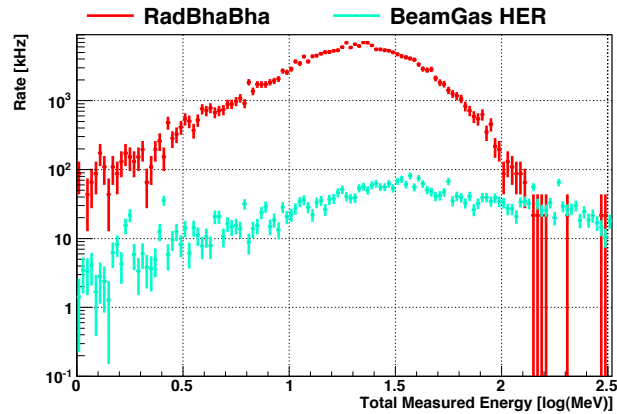
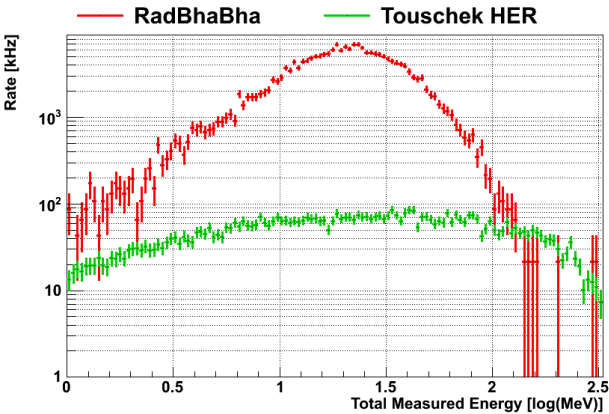
Compare Backgrounds-45mm W



Sum of Bkgs - 45 mm W



Total EMC Energy

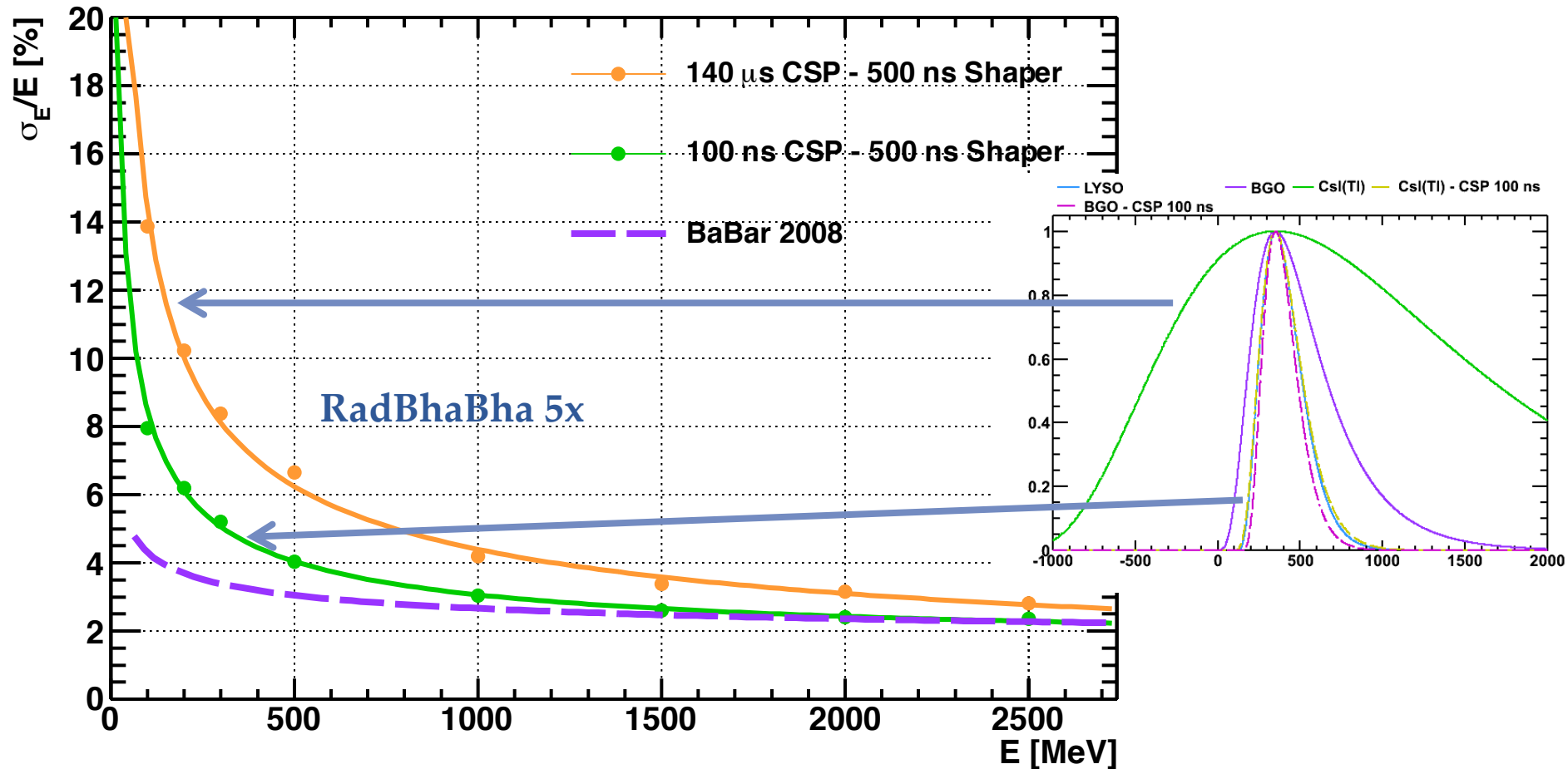


Touschek and Beam Gas give significant high energy contribution in the EMC total Energy

Barrel Performance Simulation

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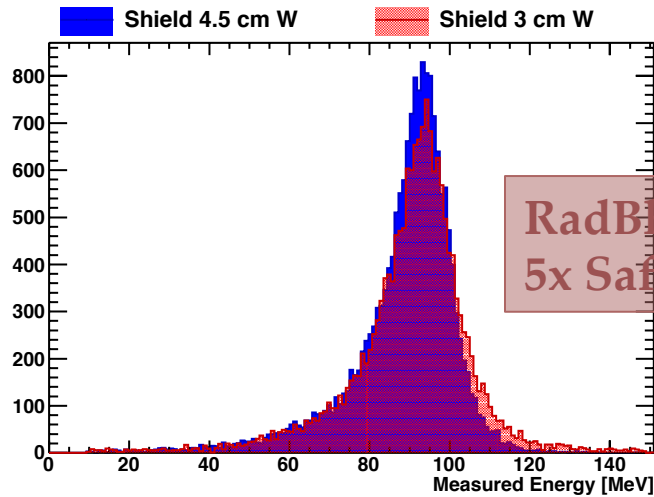
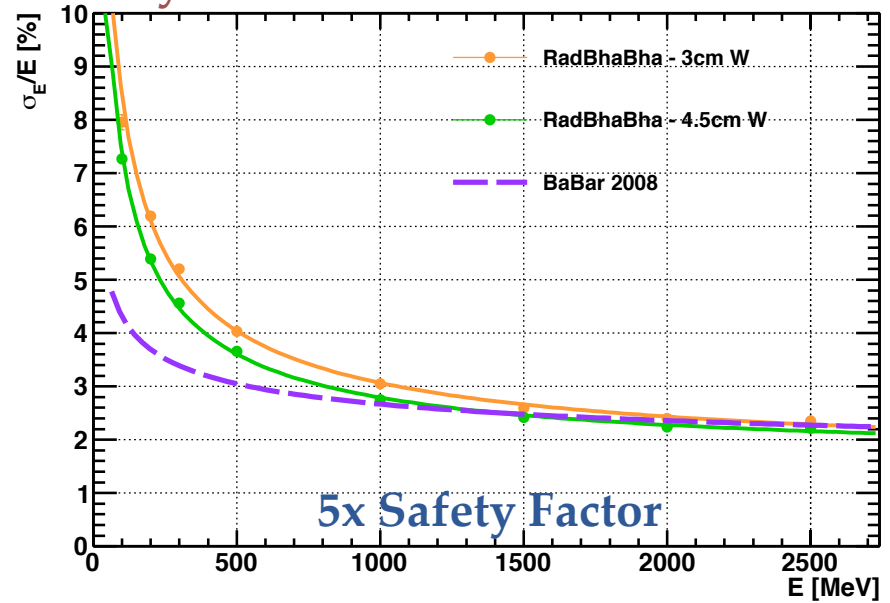
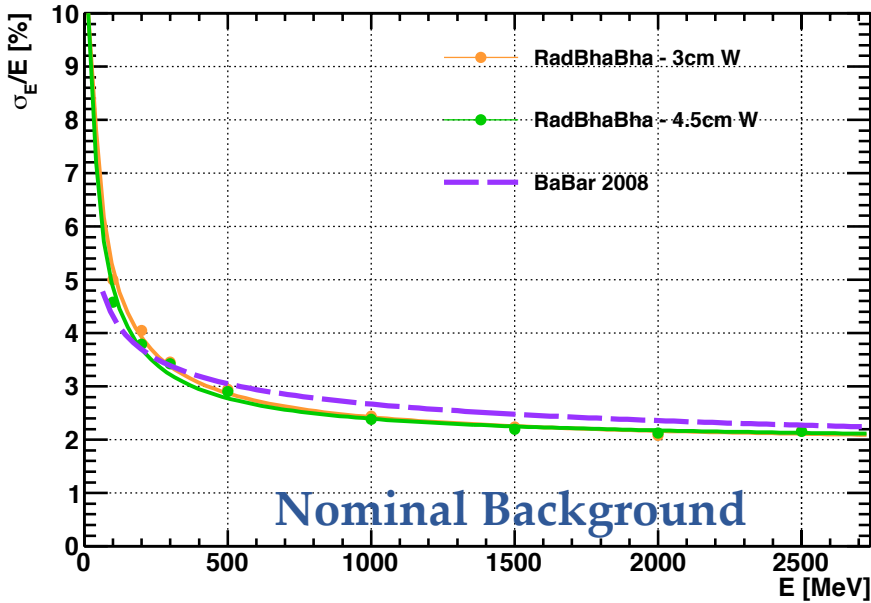
Comapre CSP - 3cm W



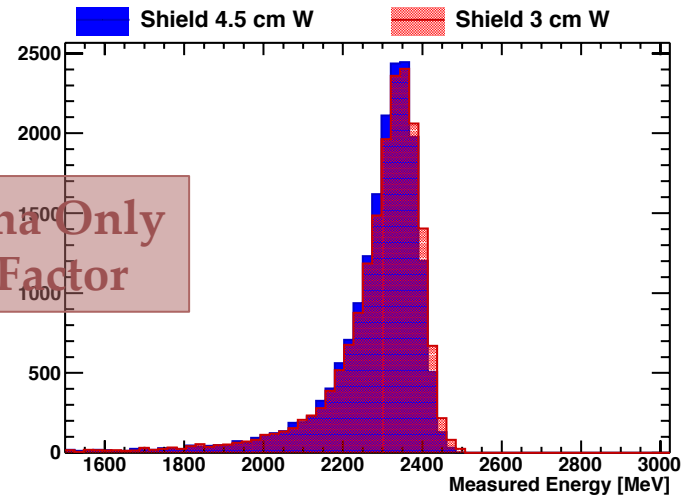
From now on the 100 ns CSP 500 ns Shaper configuration will be used as the default one

Barrel Resolution vs Shield

RadBhaBha Only

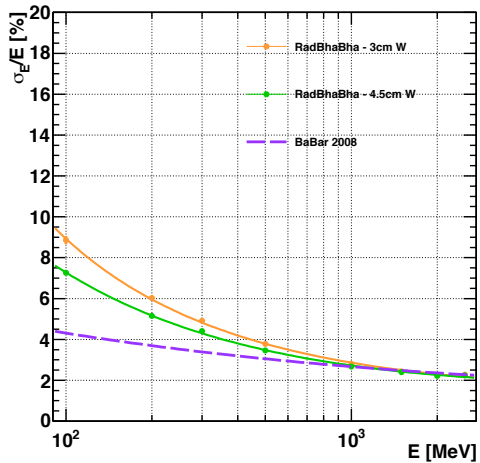


RadBhaBha Only
5x Safety Factor

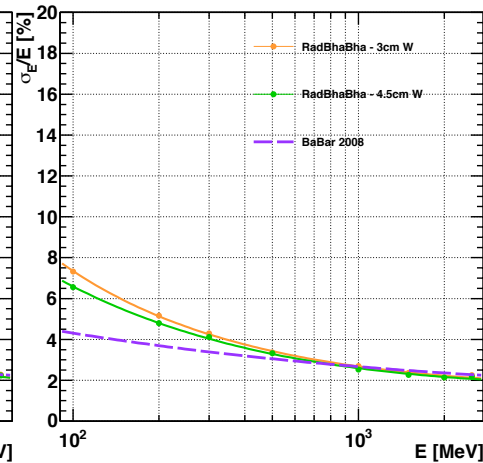


Shield Effect vs Theta (x5)

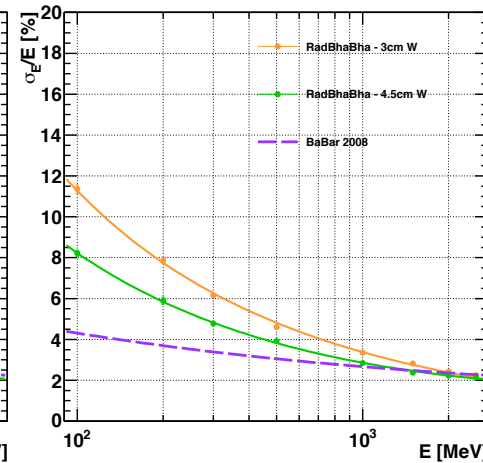
Theta 100-140



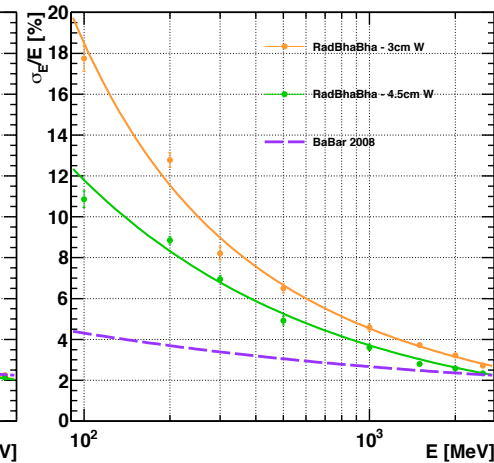
Theta 60-100



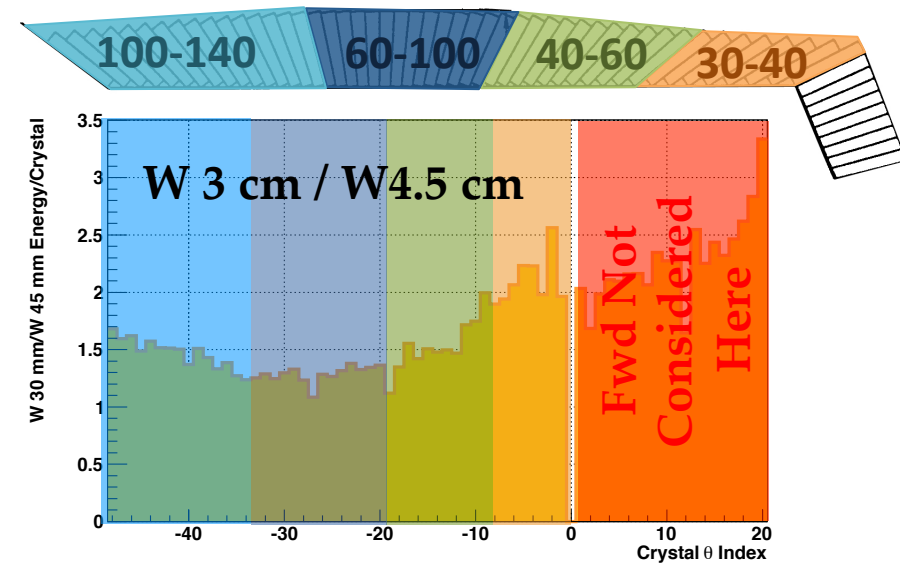
Theta 40-60



Theta 30-40

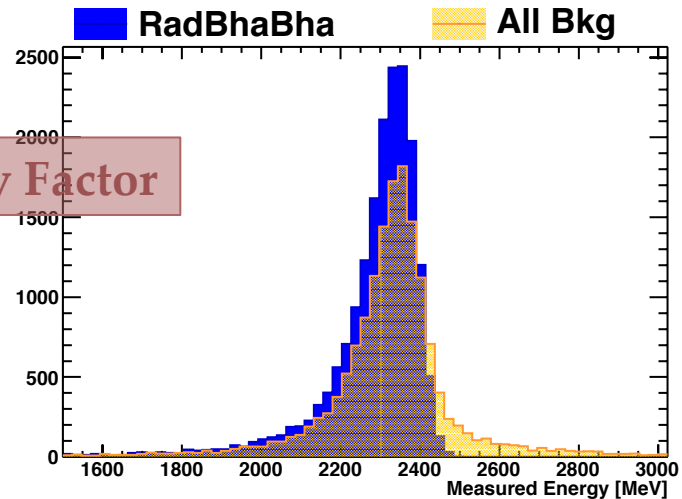
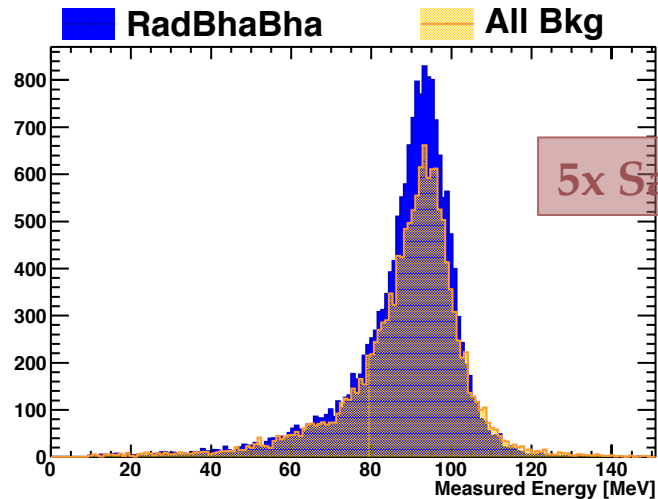
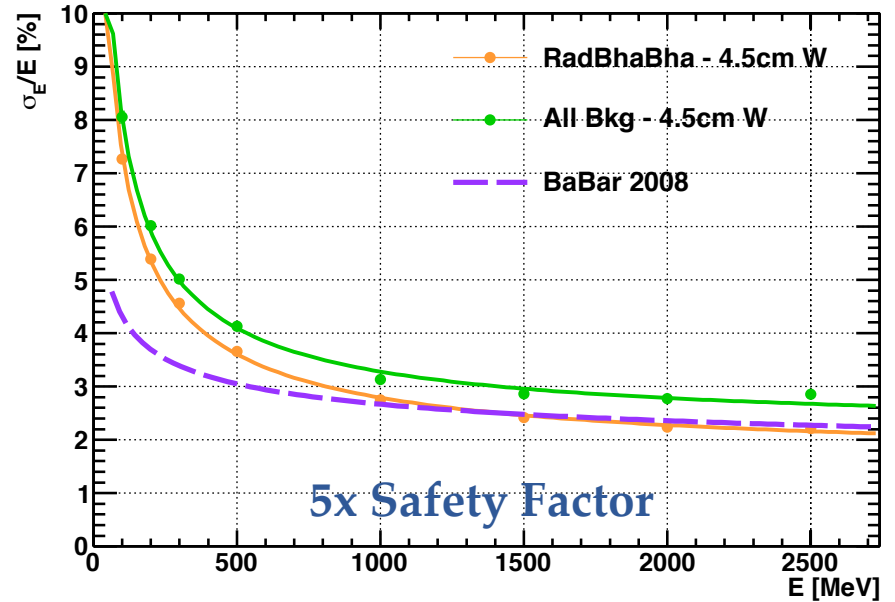
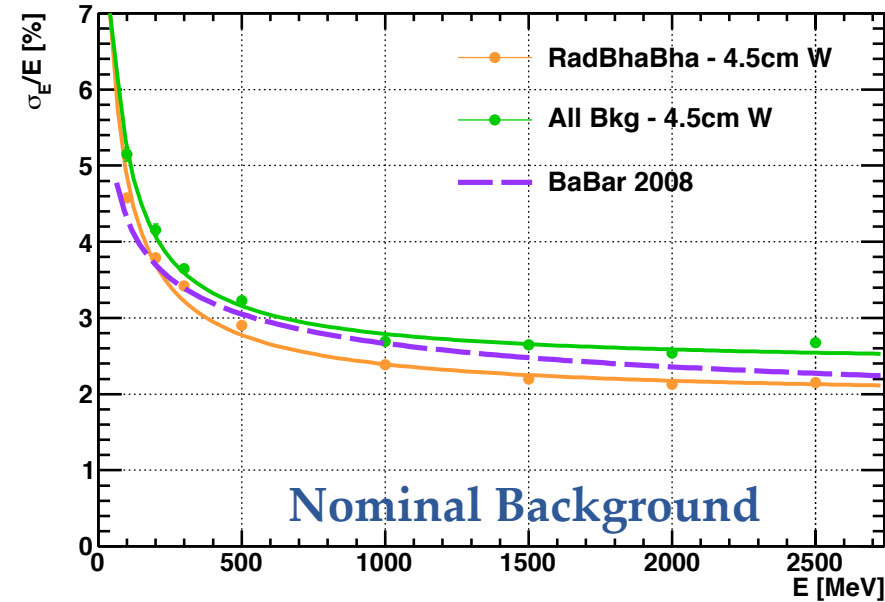


- ✓ Large performance improvement in fwd region
- ✓ Small effect in central barrel region
- ✓ More uniform Barrel performance across θ angles



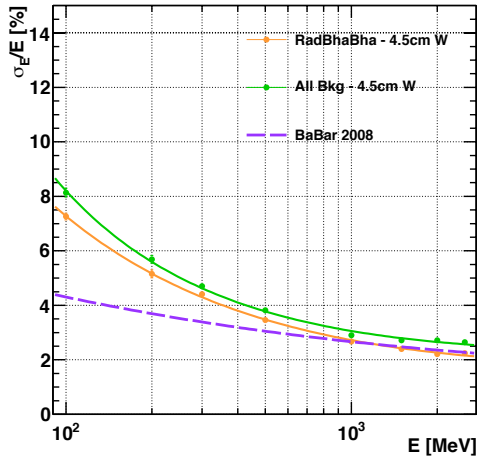
Barrel vs Bkg

RadBhaBha + Pairs + Touschek + Beam Gas

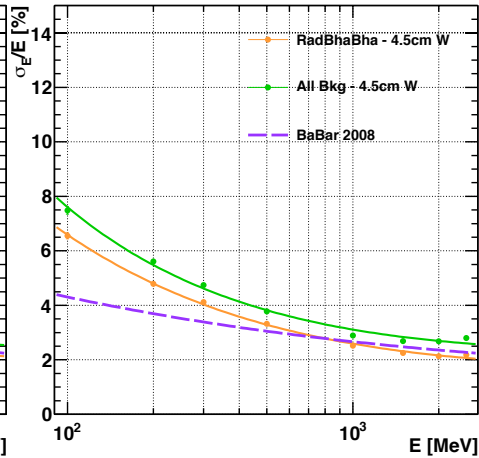


Bkg Effect vs Theta (x5)

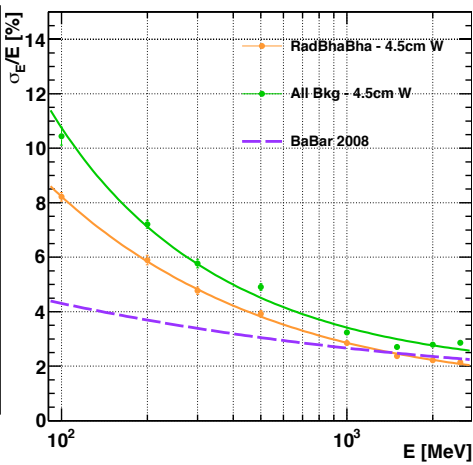
Theta 100-140



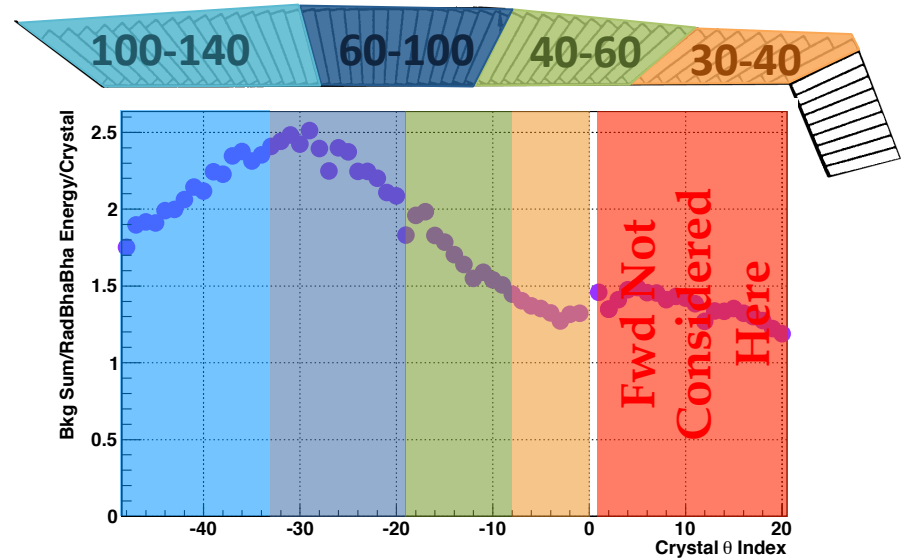
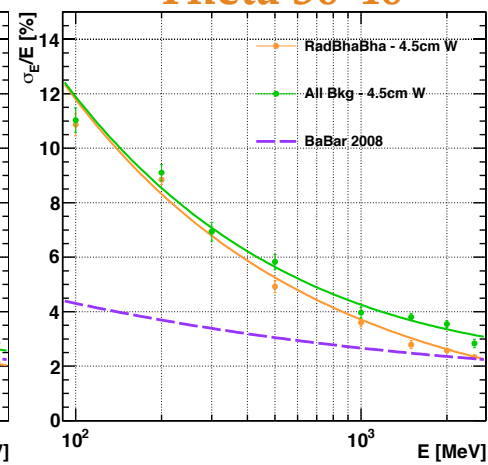
Theta 60-100



Theta 40-60



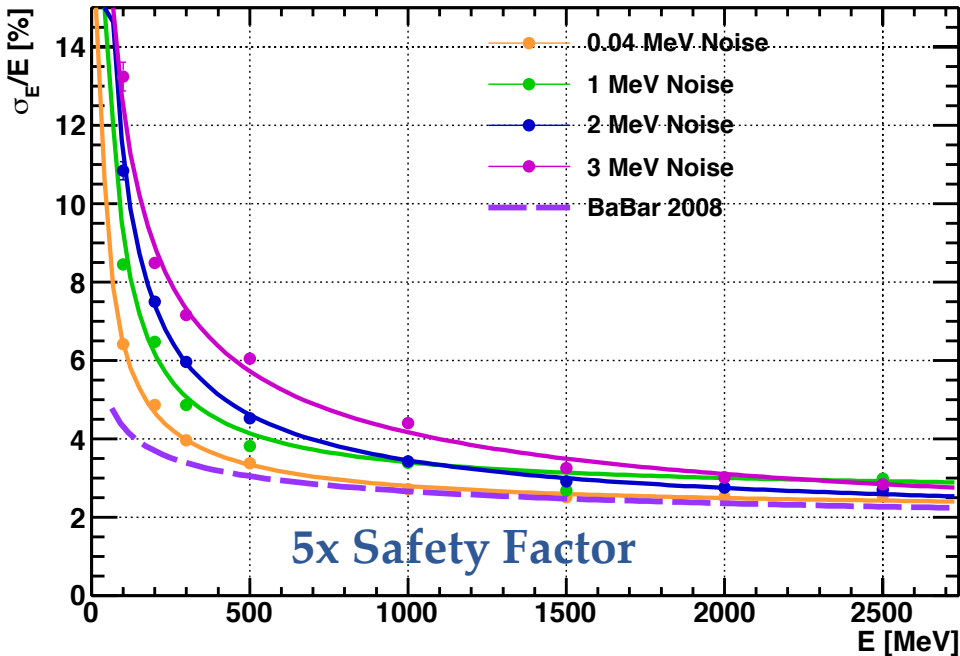
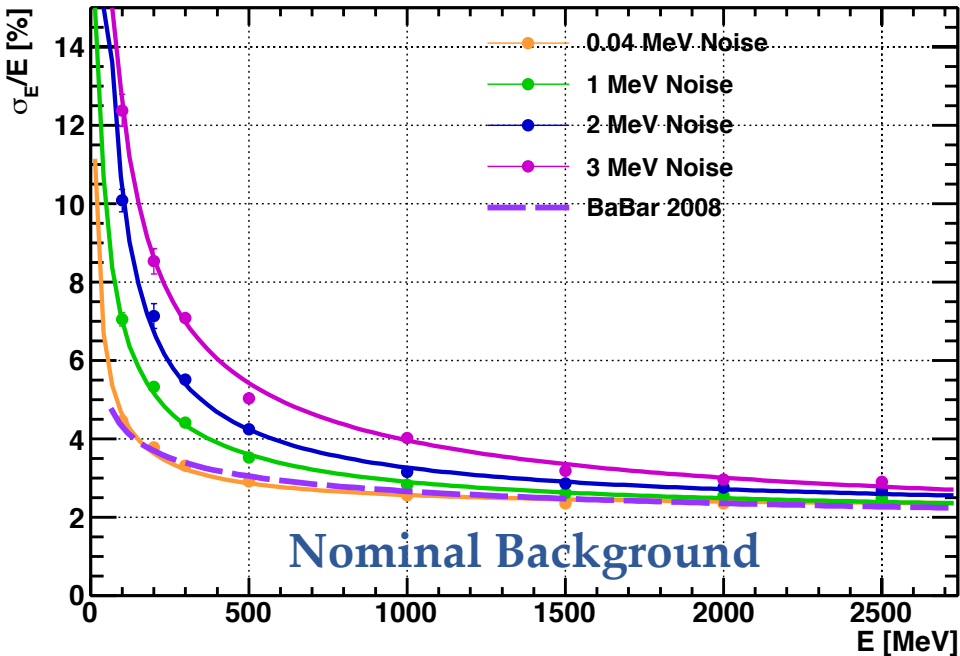
Theta 30-40



Backup

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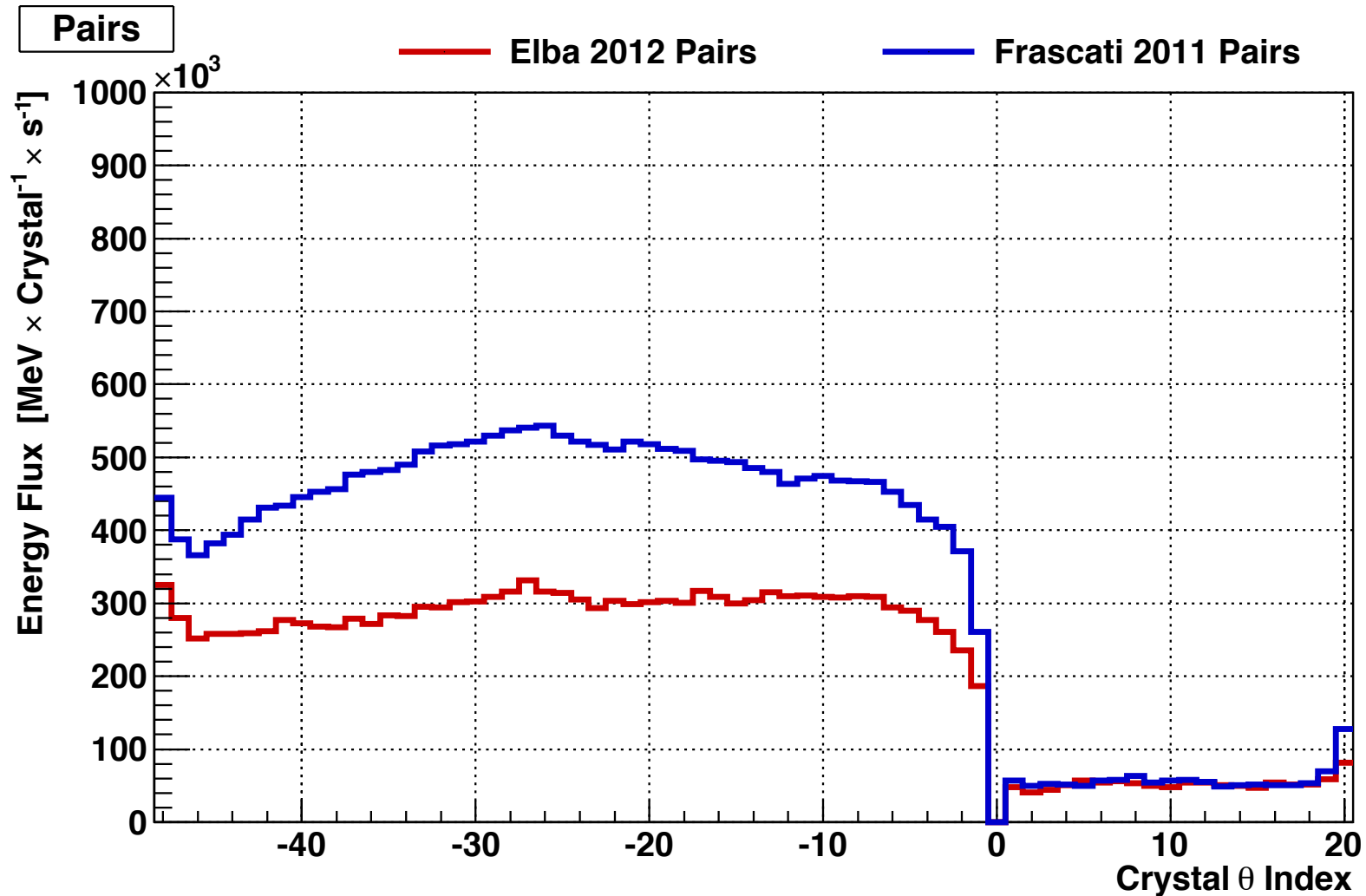
Pure CsI Fwd Endcap



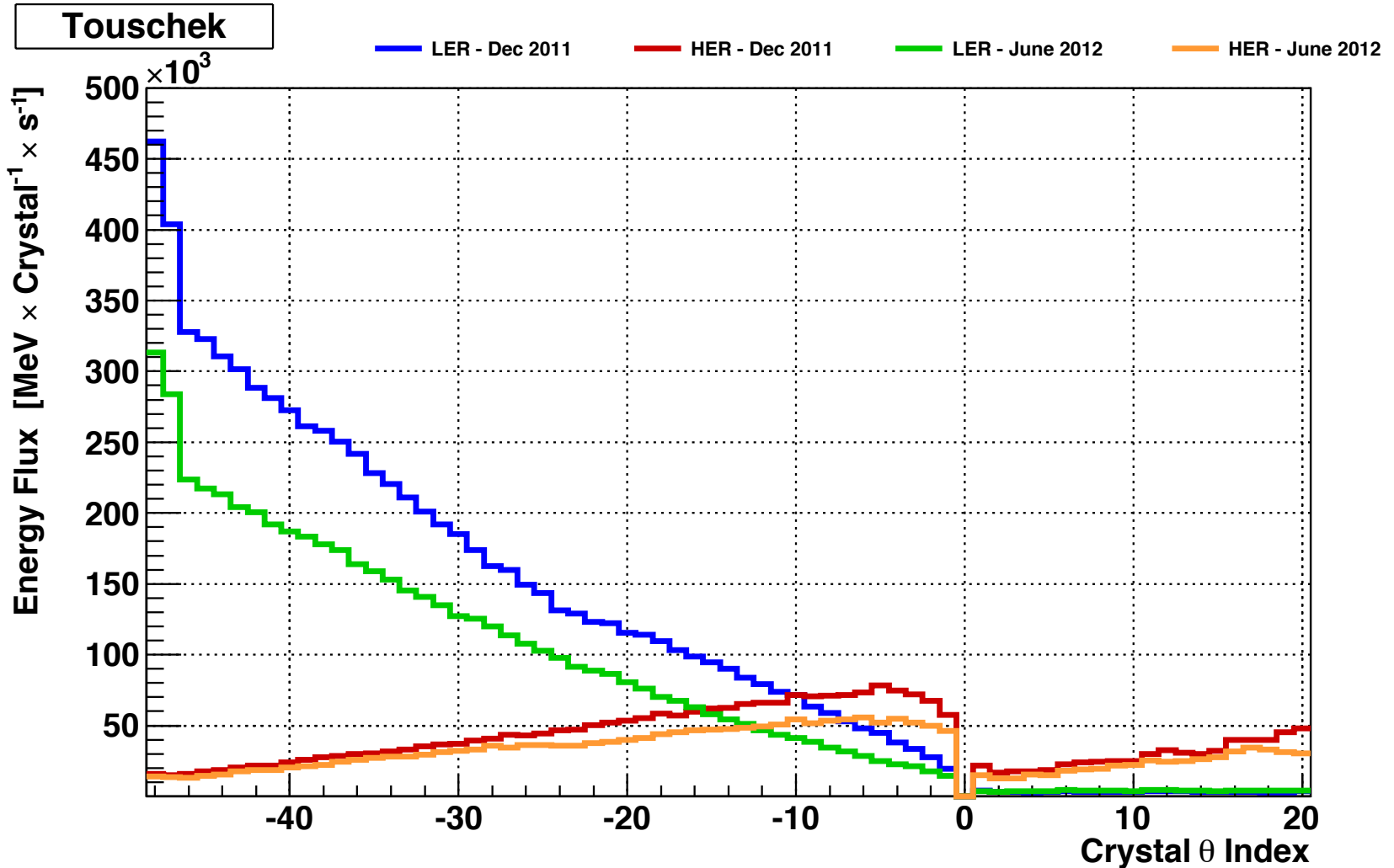
RadBhaBha with 4.5 cm W Shield

- ✓ With negligible Noise effect good resolution even with x5 Background
- ✓ Large noise impact on resolution for RMS ≥ 1 MeV

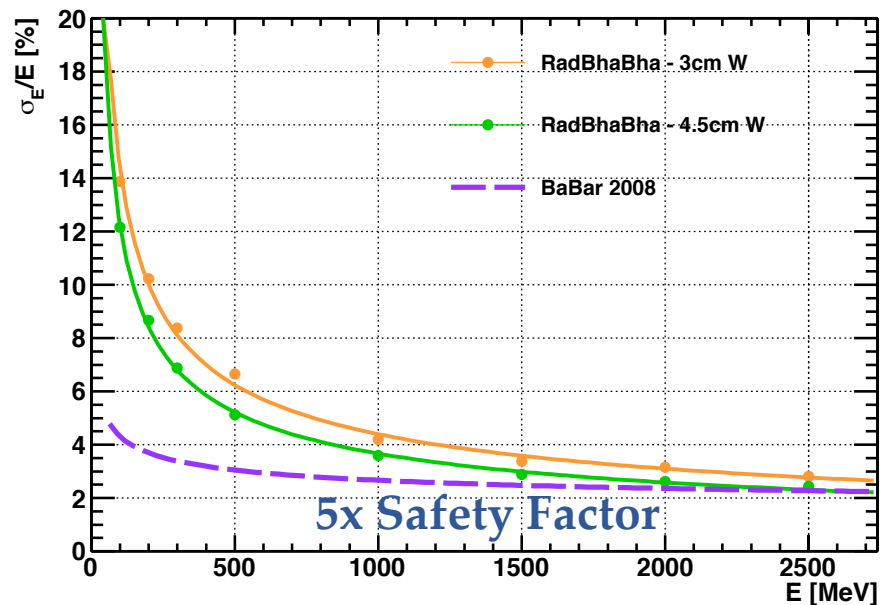
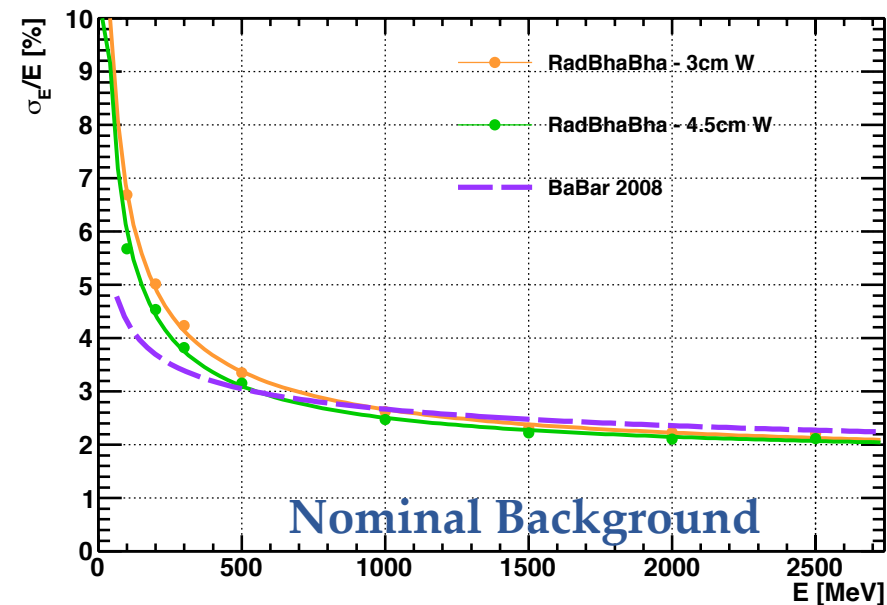
Compare Pairs Productions



Compare Touschek Prods



CSP 140 μs Barrel vs Shield



Elba June 2012 RadBhaBha production

CSP 140 μ s Barrel vs Bkg

Elba June 2012 RadBhaBha + Pairs + Touschek + Beam Gas production

