

EMC Background Studies

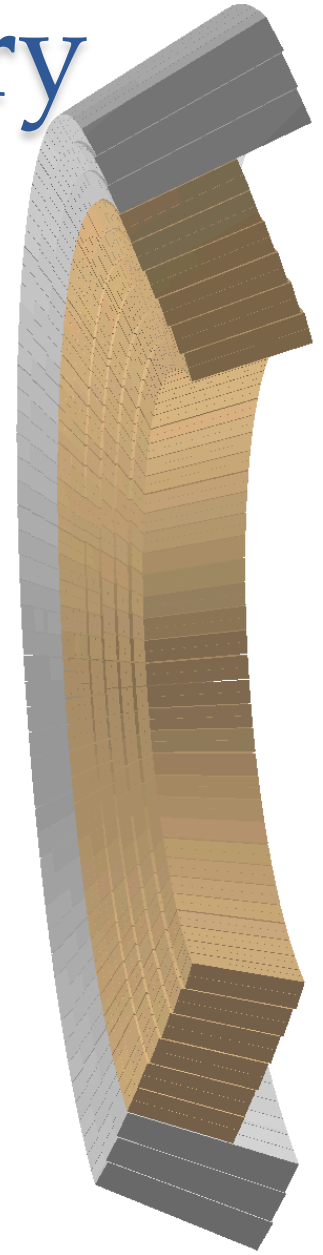
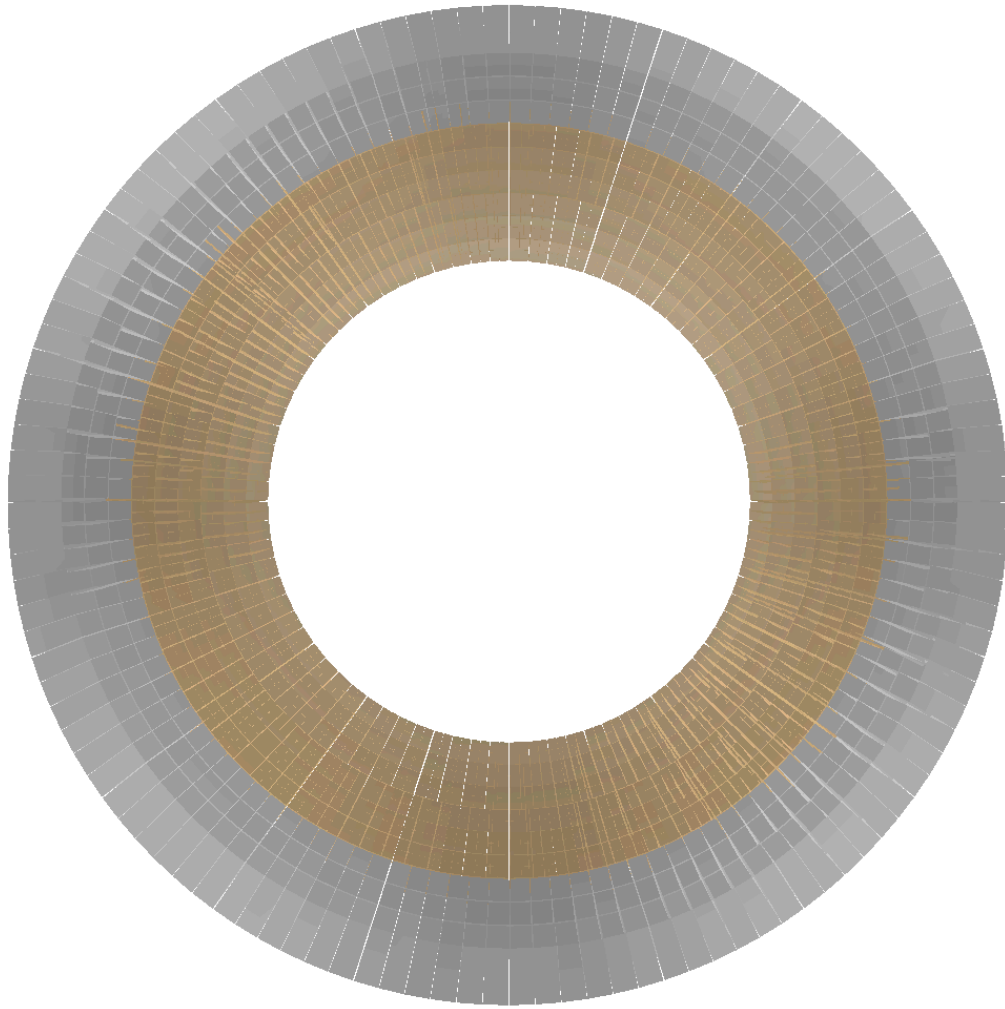
20/09/2012

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Outline

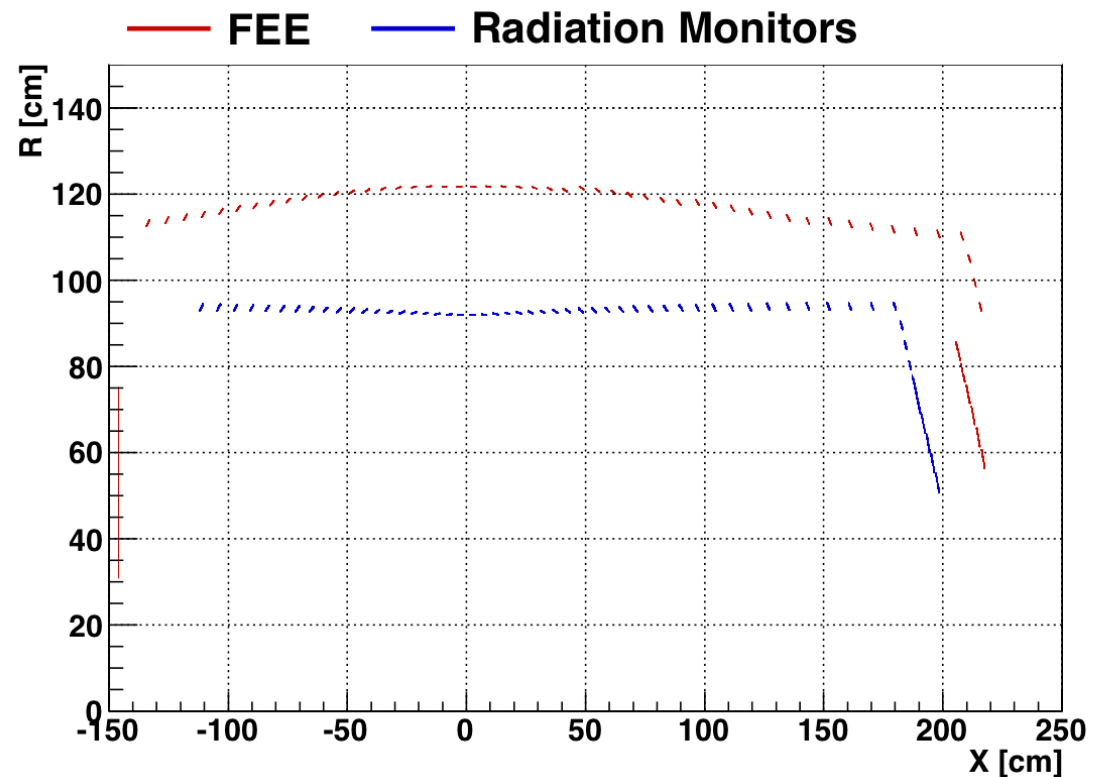
- Geometry and Simulation evolutions
- New Background production and Radiation Dose
- Hybrid endcap performance

Hybrid Fwd Geometry



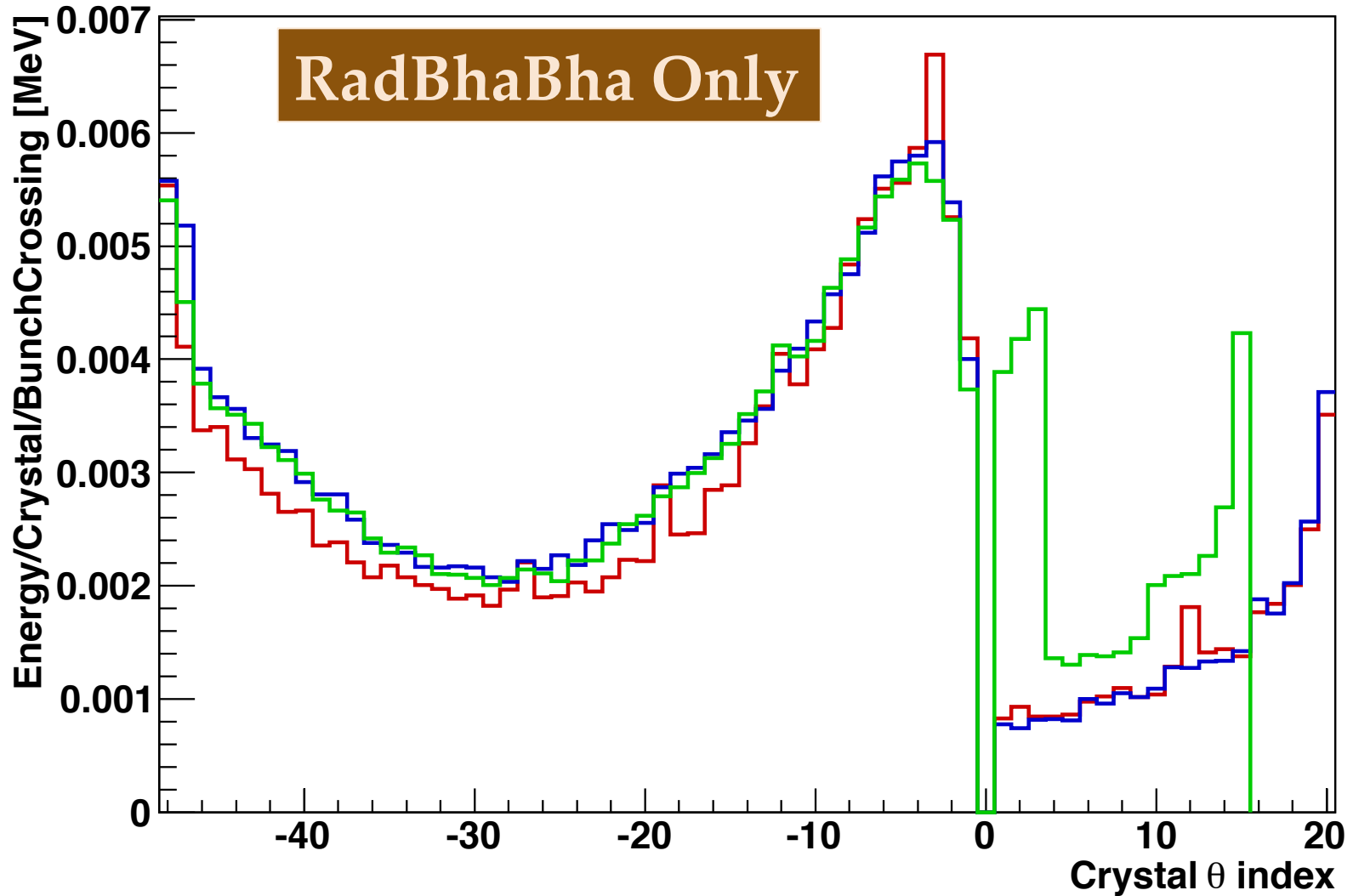
Additional Volumes

- FEE Silicon on crystals back
 - It has been there for more than one year
- Radiation Monitor Silicon on crystals front
 - Added just for last production



Quick look at the new Prod

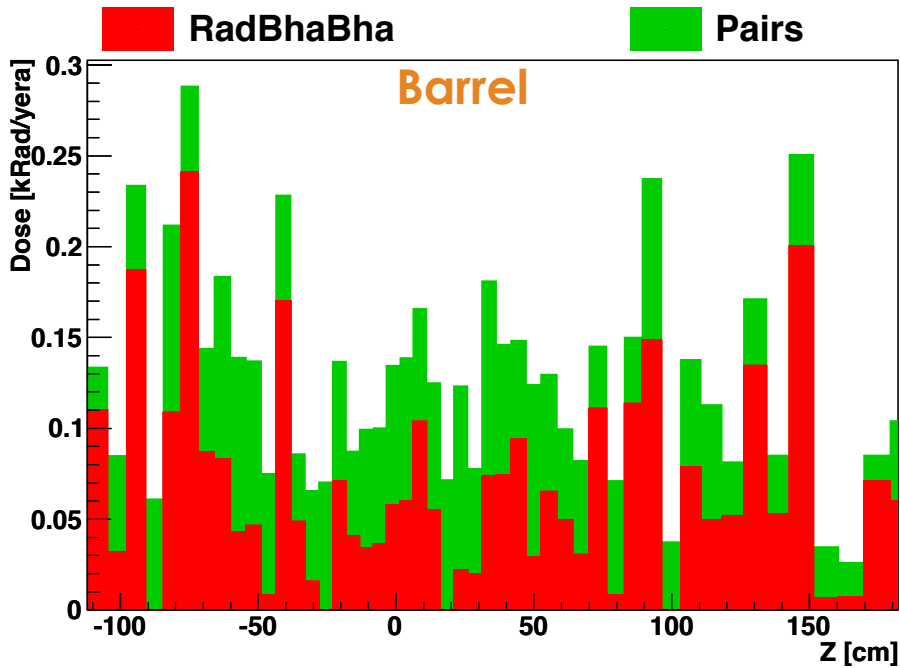
— Elba 2012 — Pisa 2012 — Pisa 2012 - Hybrid Fwd



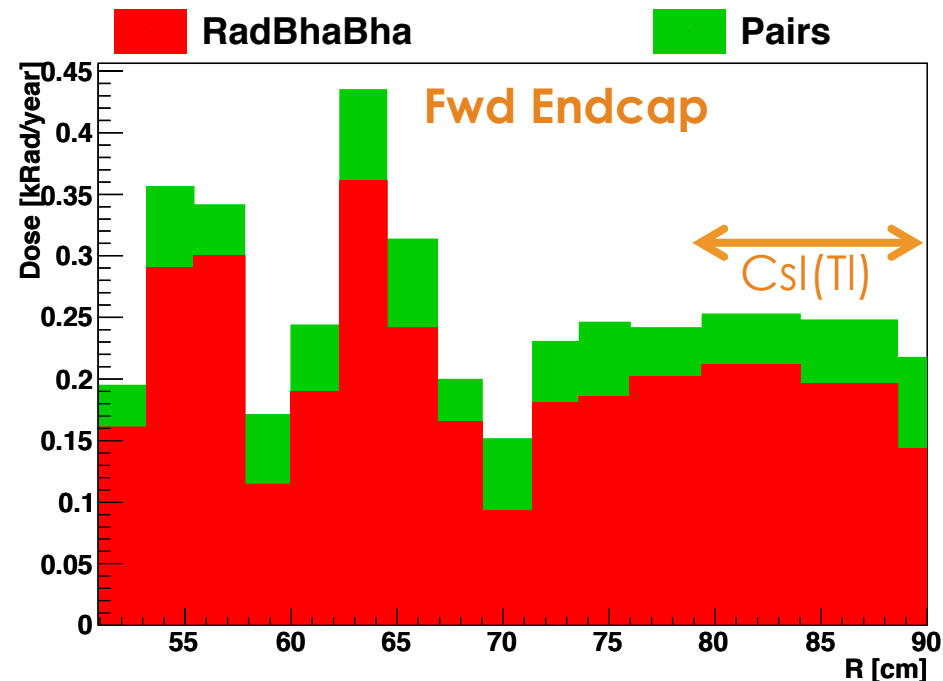
Other backgrounds

- The last production (Pisa) also includes
 - Pairs
 - Touschek
 - Beam Gas
 - Synchrotron
- Synchrotron background has NO hits in the EMC
- Other backgrounds still to be analyzed in details

Radiation Dose



- Use Radiation Monitors volumes to emulate radiation measurements from BaBar RadFETs
- Evaluate Dose/year vs Position



CsI crystal region for hybrid endcap has ~ 0.25 kRad/year

BaBar Calorimeter Slides ...

Degradation of Calorimeter Performance at High Luminosities

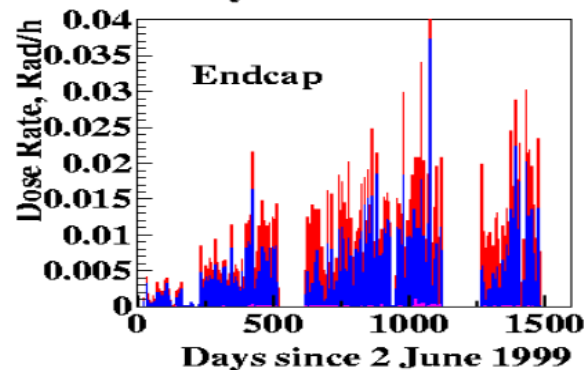
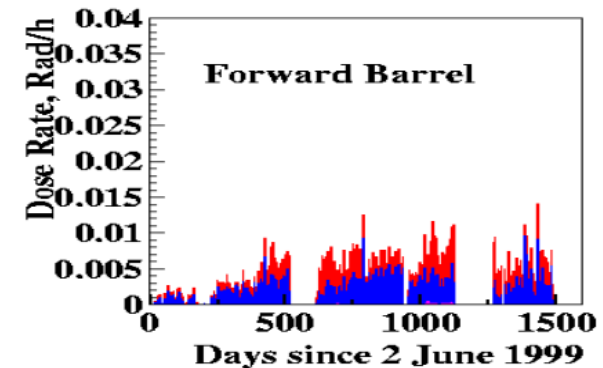
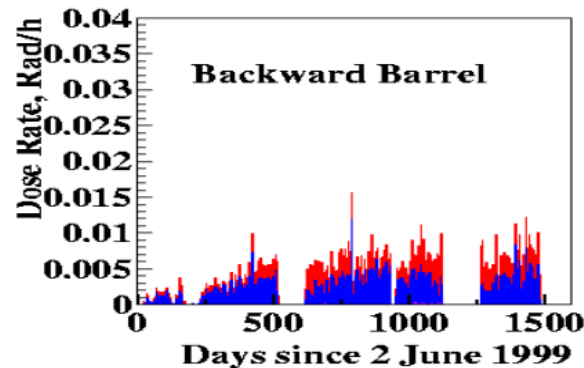
Martin Kocian

SLAC

Honolulu, 21 January 2004



Dose Accumulation



Inject/tune
Stable beams
Injection Holding

T. Hryn'ova

Present dose rate is about 0.01 rad/h (from leakage currents)

⇒ At 10^{36} the dose should be about 1 rad/h

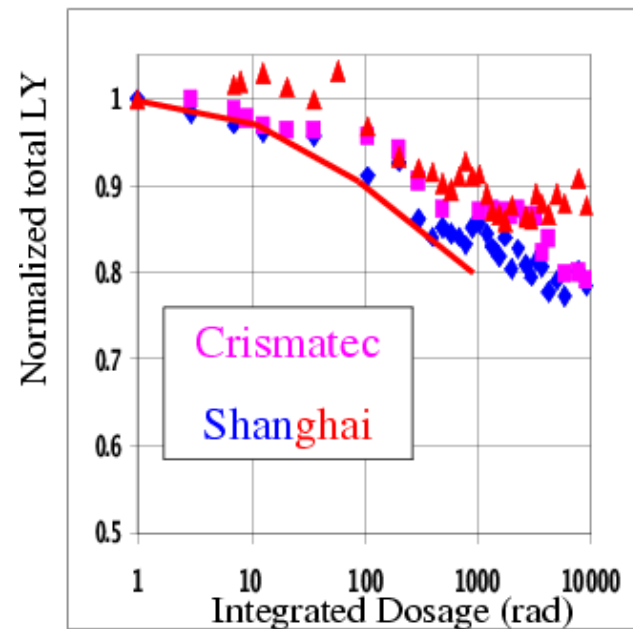
...BaBar Calorimeter Slides

Crystal Irradiation Experiment

Crystal irradiation experiment by Tetiana Hryn'ova et al.

- Irradiated 16 CsI(Tl) crystals at 1-2 rad/h with ^{60}Co
- Integrated dose of 10,000 rad
- Measured total lightyield and uniformity
- Plot on the right shows lightyield vs dose for 3 crystals
- The red line indicates the original Babar specification
- The irradiation test is in good agreement with Babar data

Typical Crystal Scanner crystals



Dose Extrapolation

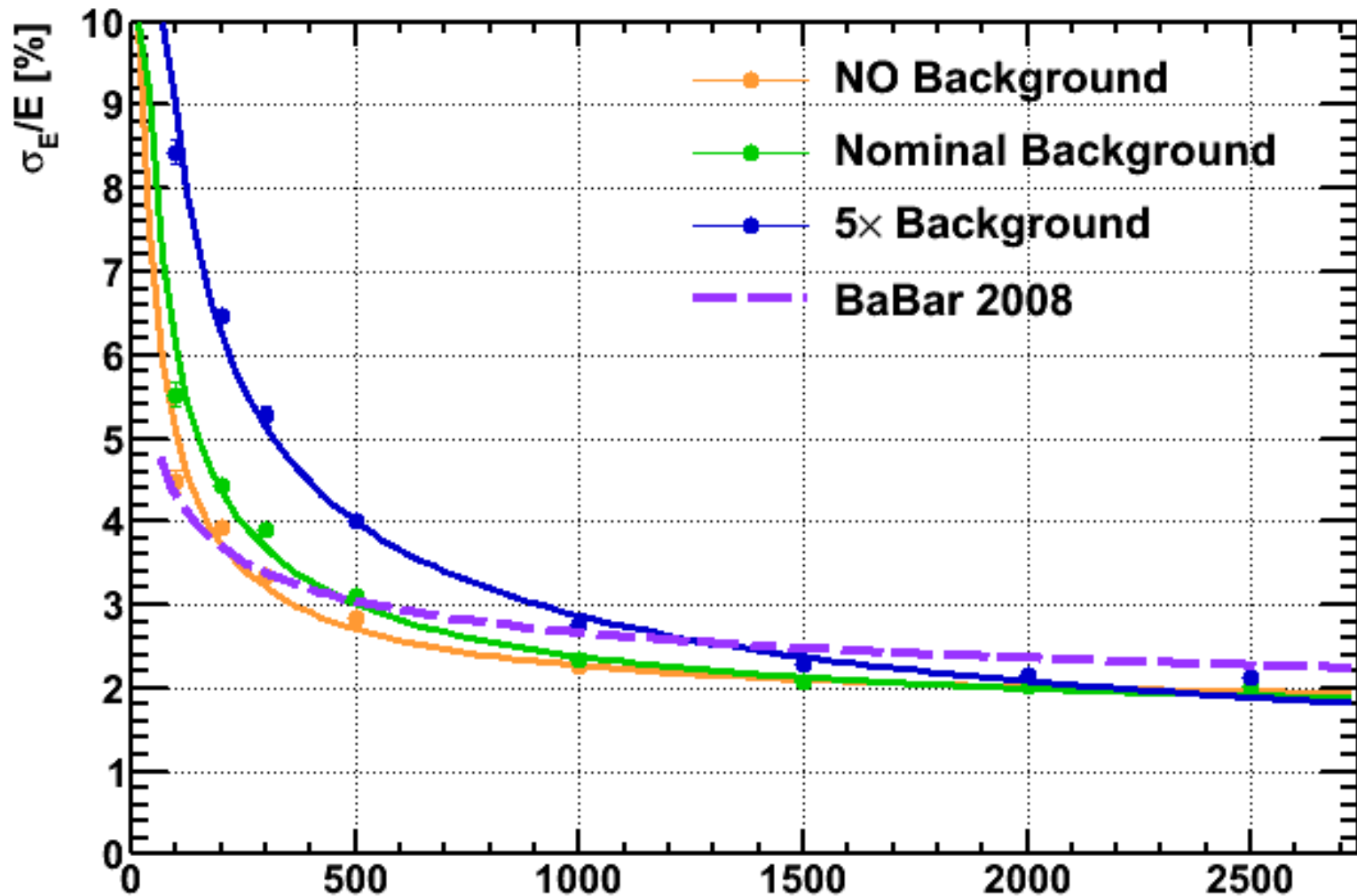
- BaBar
 - 1 Rad/h @ 10^{36} → 2.78 kRad/year
 - Radiation test reached 10 kRad → 75 % LY
- SuperB (Pairs+RadBhaBha)
 - Backward Barrel ~ 0.135 kRad/year
 - Central Barrel ~ 0.123 kRad/year
 - Forward Barrel ~ 0.116 kRad/year
 - Csl Endcap Part ~ 0.239 kRad/year

 - Used in extrapolation 0.25 kRad/year
 - 10 year running dose < BaBar radiation test (10 kRad)

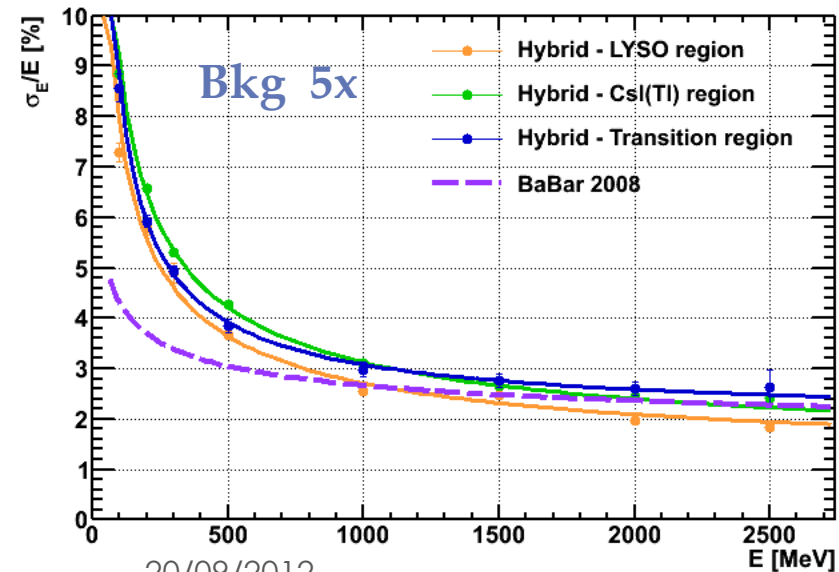
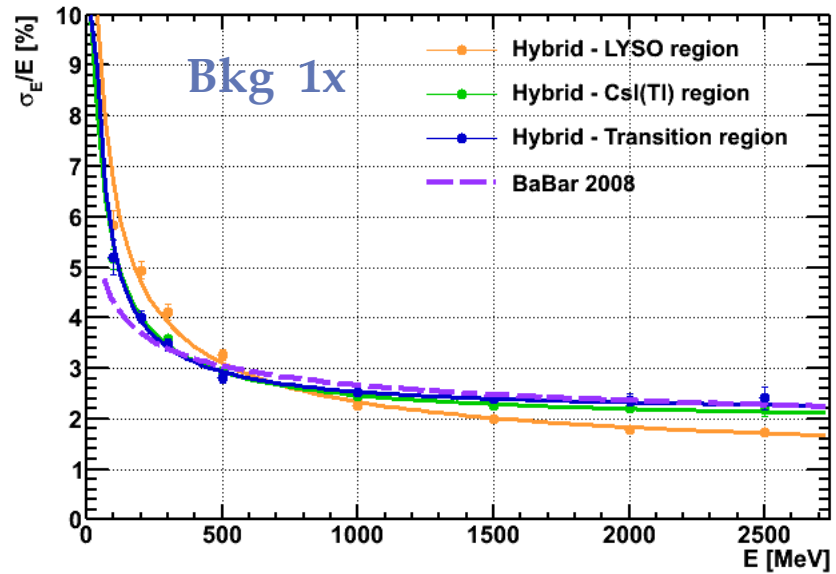
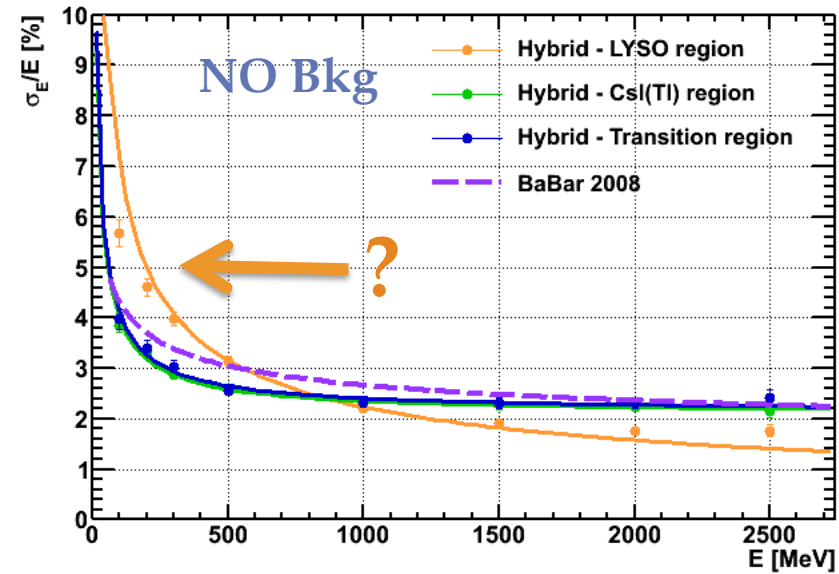
Dose Conclusions

- SuperB seems to have 1/10 of Dose vs Integrated Luminosity wrt BaBar
- BaBar radiation test
 - 10 kRad > 10 SuperB years
 - -25% LY at 10 kRad
- BaBar data extrapolation
 - Not very solid
 - Worts loss for First Endcap ring : -60% LY @ 75 ab⁻¹
- Need to include Touscheck and Beam Gas in dose evaluation
 - Expected to be marginal

Hybrid Fwd – Resolution

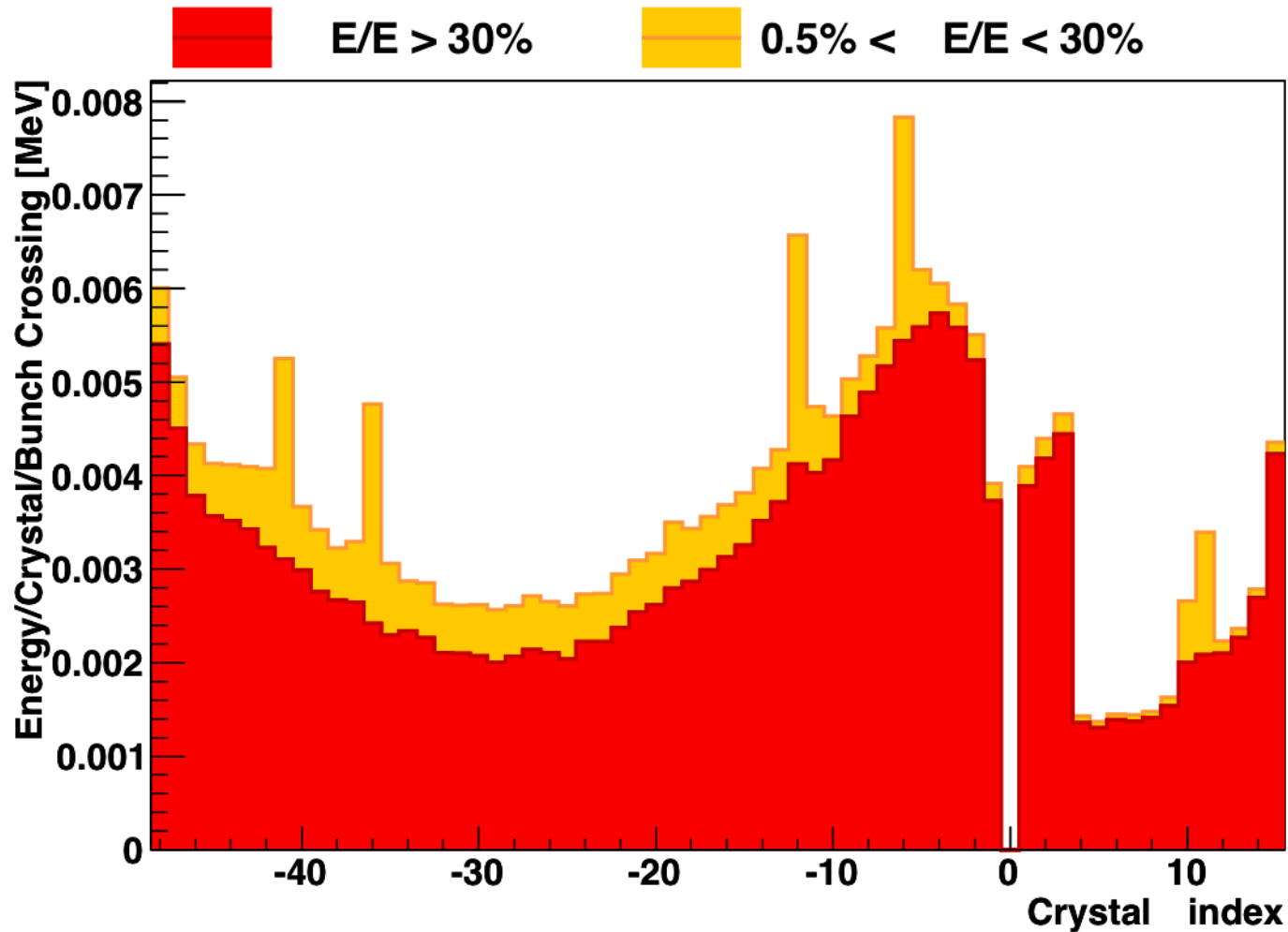


Hybrid Fwd – $\sigma_E(E)$ vs Region

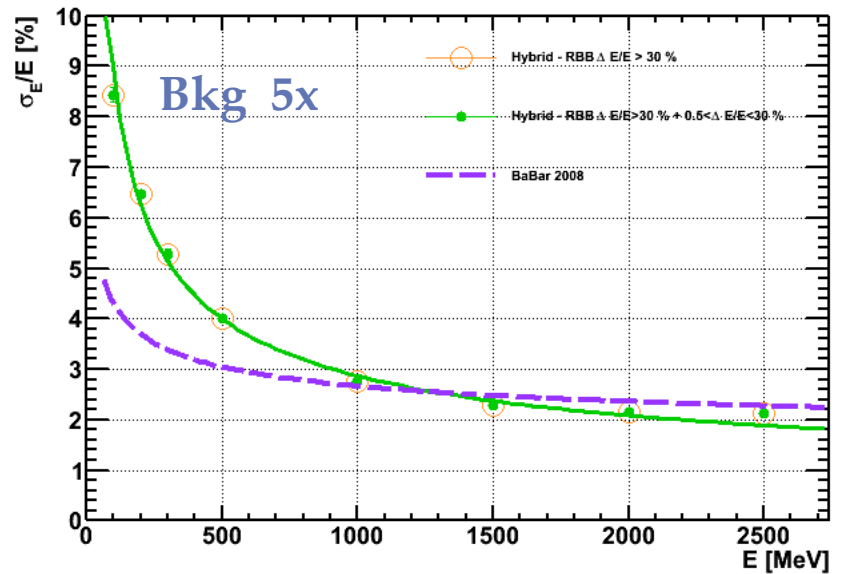
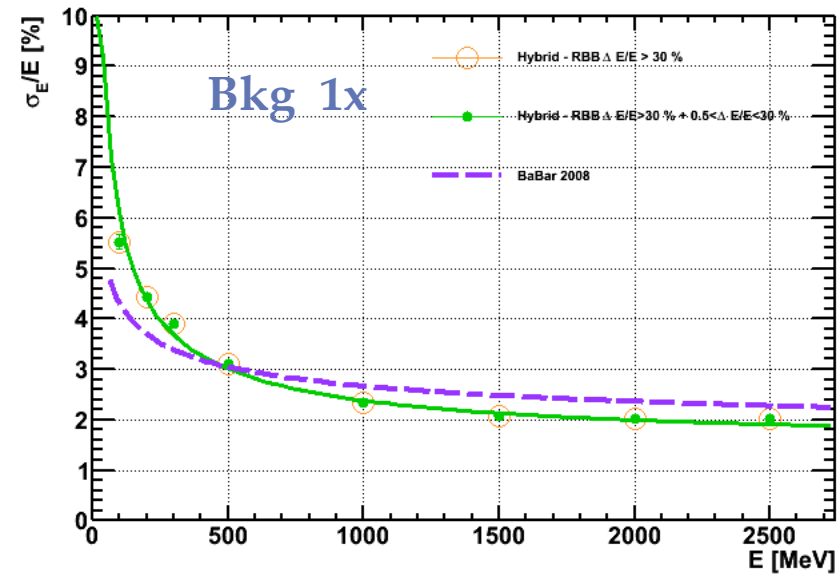


- LYSO region
 - shows strange resolution at low E
 - still almost insensitive to background
- CsI(Tl) region
 - Resolution flat at high E (leakage?)
- Transition
 - Performance similar to CsI(Tl)

Background details ...



Background details ...



Conclusions

- NewBackground Production consistent with previous one
 - RadBhaBha with $0.5 < \Delta E/E < 30\%$ add small contribution
 - Synchrotron background has NI effect on EMC
- Radiation dose seems not to be too worrisome
- Hybrid endcap
 - LYSO region intrinsic performance to be understood
 - The transition seems not to have a large effect on the intrinsic resolution
 - Still sensitive to background levels