



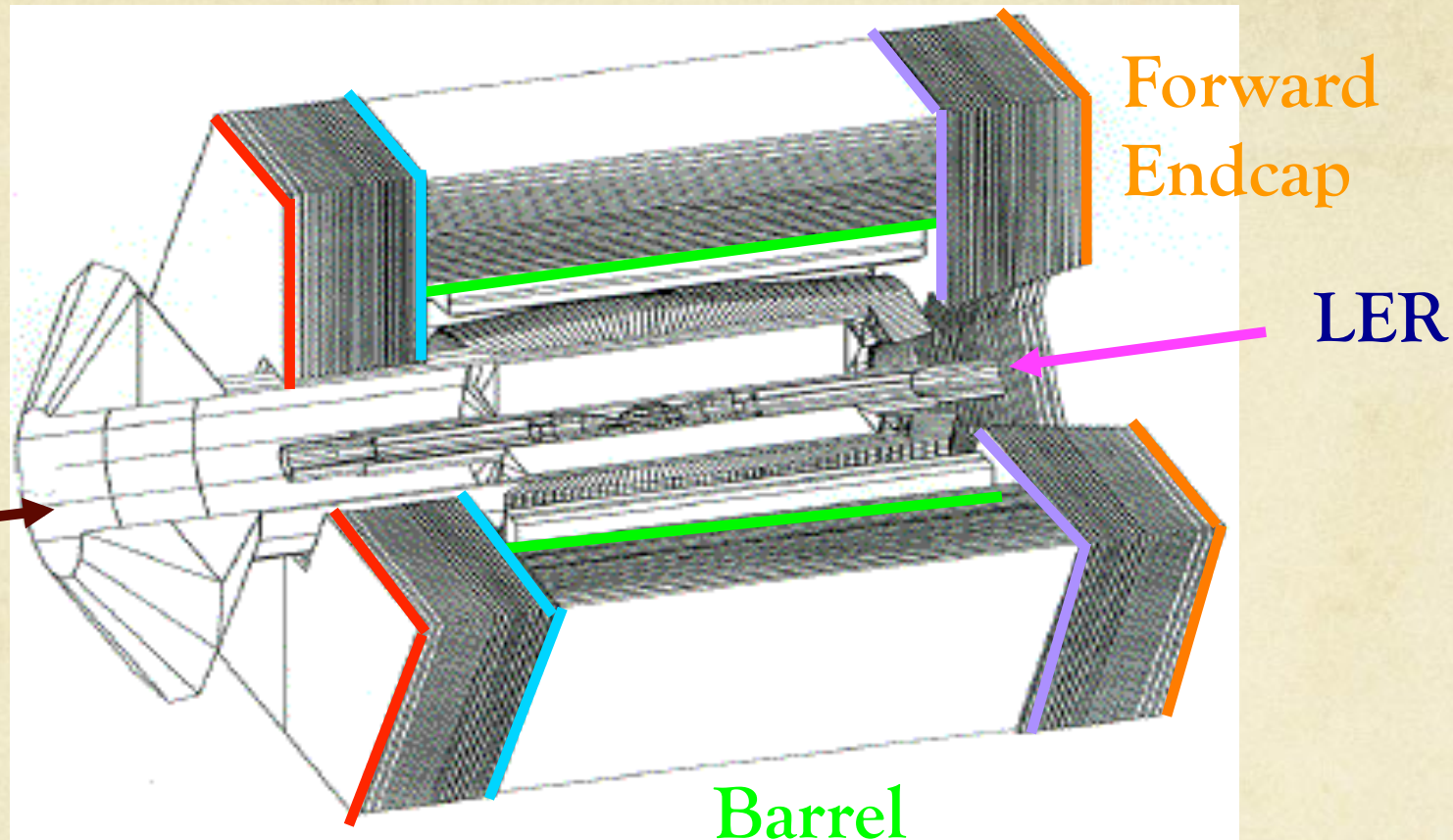
# IFR Background Report

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# Hot regions



**Barrel:** innermost layers, mostly neutrons

**FWD encaps** (hottest region) : inner layers and outer layers (BEAM halo), electron and photons

**BWD encaps:** inner layers and small radii

# What's new from the Frascati CM Meeting



*Frascati March 2012*

- ✓ Beam Composition for the IFR background
- ✓ Radiative Bhabha Background Studies (neutrons, photons and electron)
- ✓ Touschek background (neutrons, photons and electron)
- ✓ Pair background (neutrons, photons and electron)
- ✓ Background Studies and Absorbed dose on our FEEs

- ✓ Tungsten shield changed from 3 cm to 4.5 cm
- ✓ Added a Boron Loaded Polyethylene Shield between Magnet and IFR (5 cm)
- ✓ Added a Boron Loaded Polyethylene Shield (10 cm) in FWD and BWD endcap + iron structure (10cm)

*New*

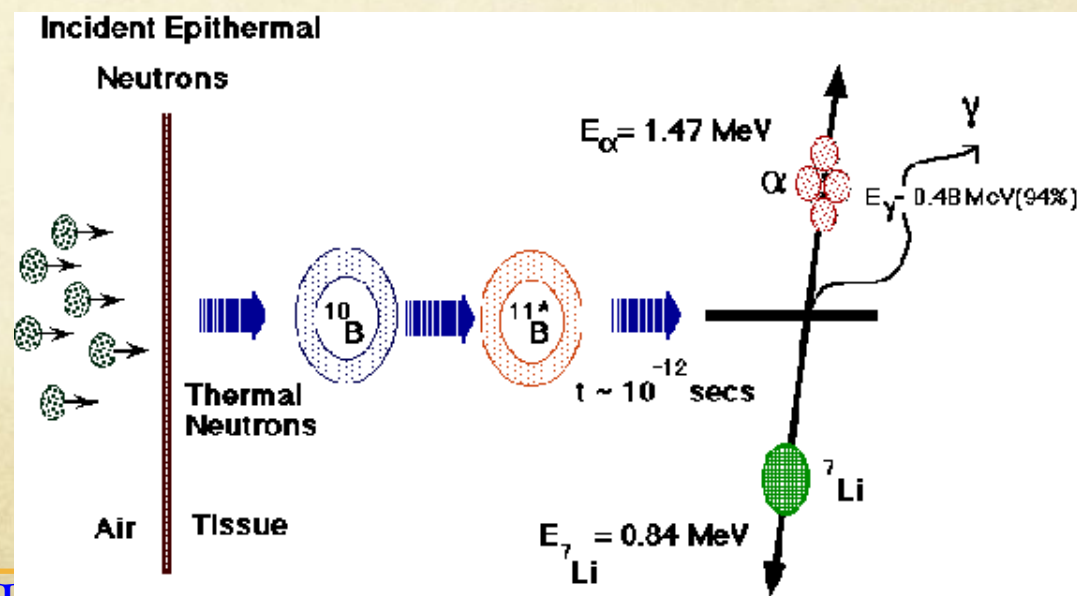
# Some “Shielding Physics”

We added a Polyethylene (C<sub>2</sub>H<sub>4</sub>)<sub>n</sub>H<sub>2</sub>.)Boron Loaded (5%) shield for the following reasons

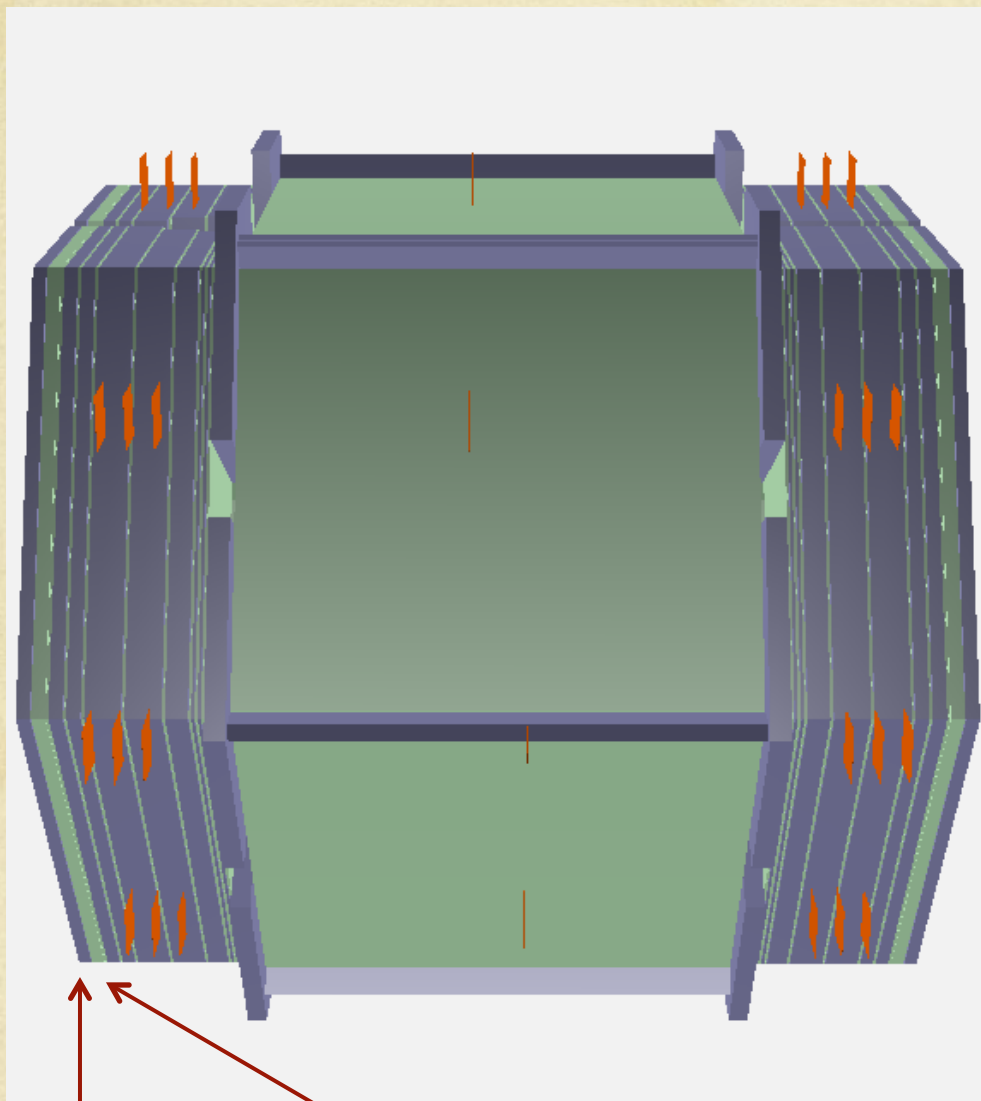
PE has a high hydrogen density which slows neutron particles down so they can be absorbed.

Hydrogen slow down neutron since when a fast neutron collides with a light nucleus, it loses a large fraction of its energy

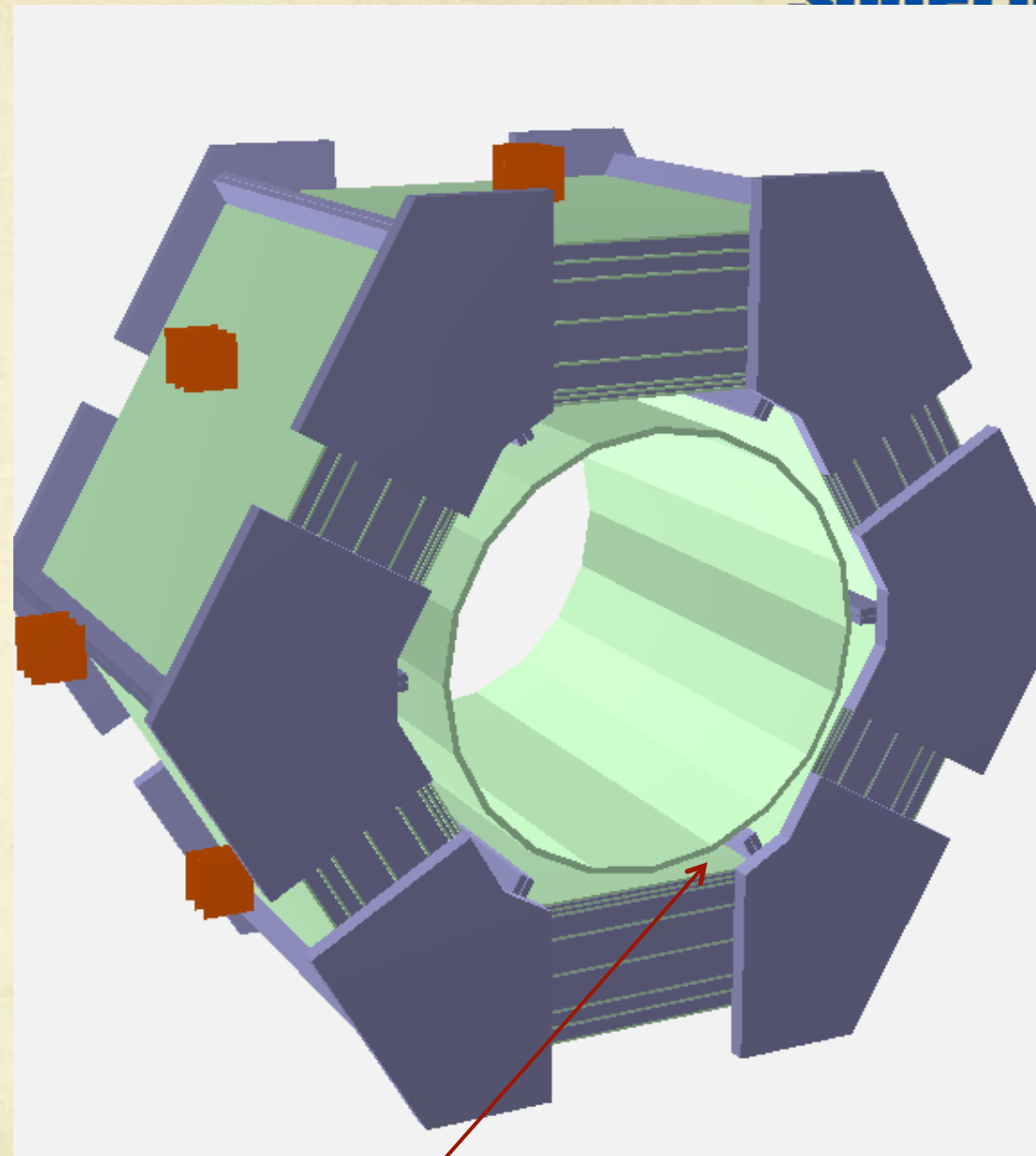
The Boron we used is <sup>10</sup>B since this has a very high cross section for capture of thermal neutron



# Our Shield Configuration



10 cm of Iron+10 cm PE



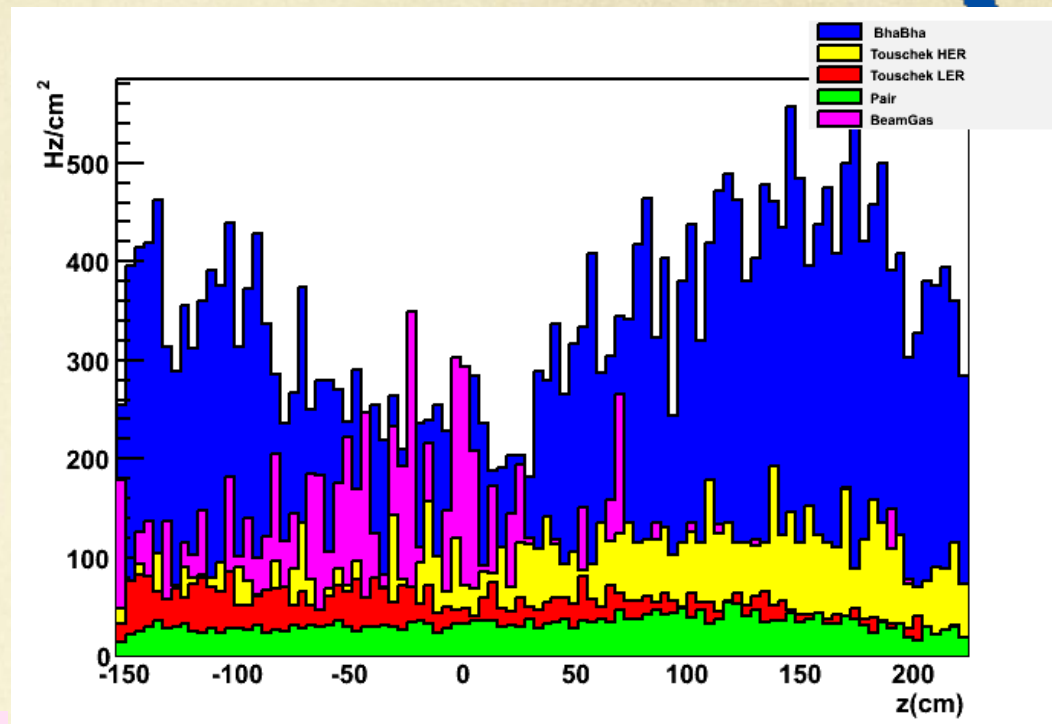
5 cm PE

# Neutron Rates (for different background sources)

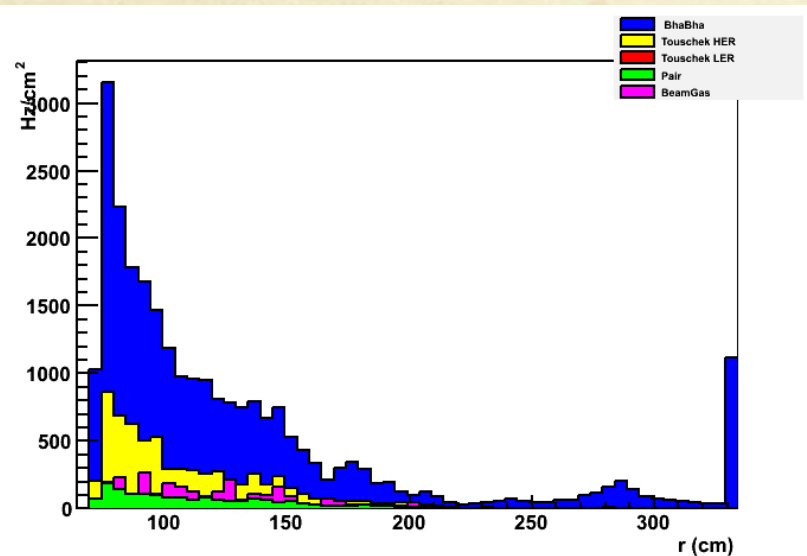


## Rate vs Z-coordinate for Barrel

Rate of  $450\text{Hz}/\text{cm}^2$  -  $\rightarrow$  about  $3 \times 10^9$  neutrons/ $\text{cm}^2$  for a year



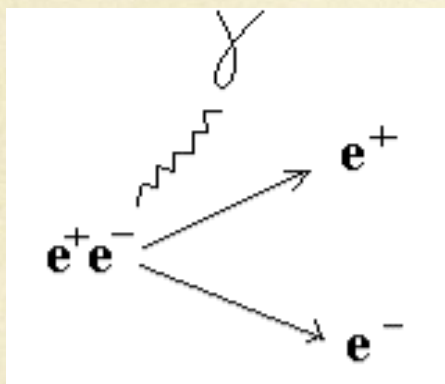
## Rate vs radius for FWD Endcap



All the rate are normalized to 1MeV energy

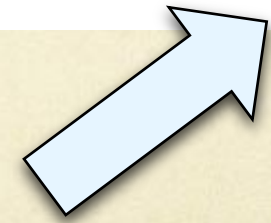
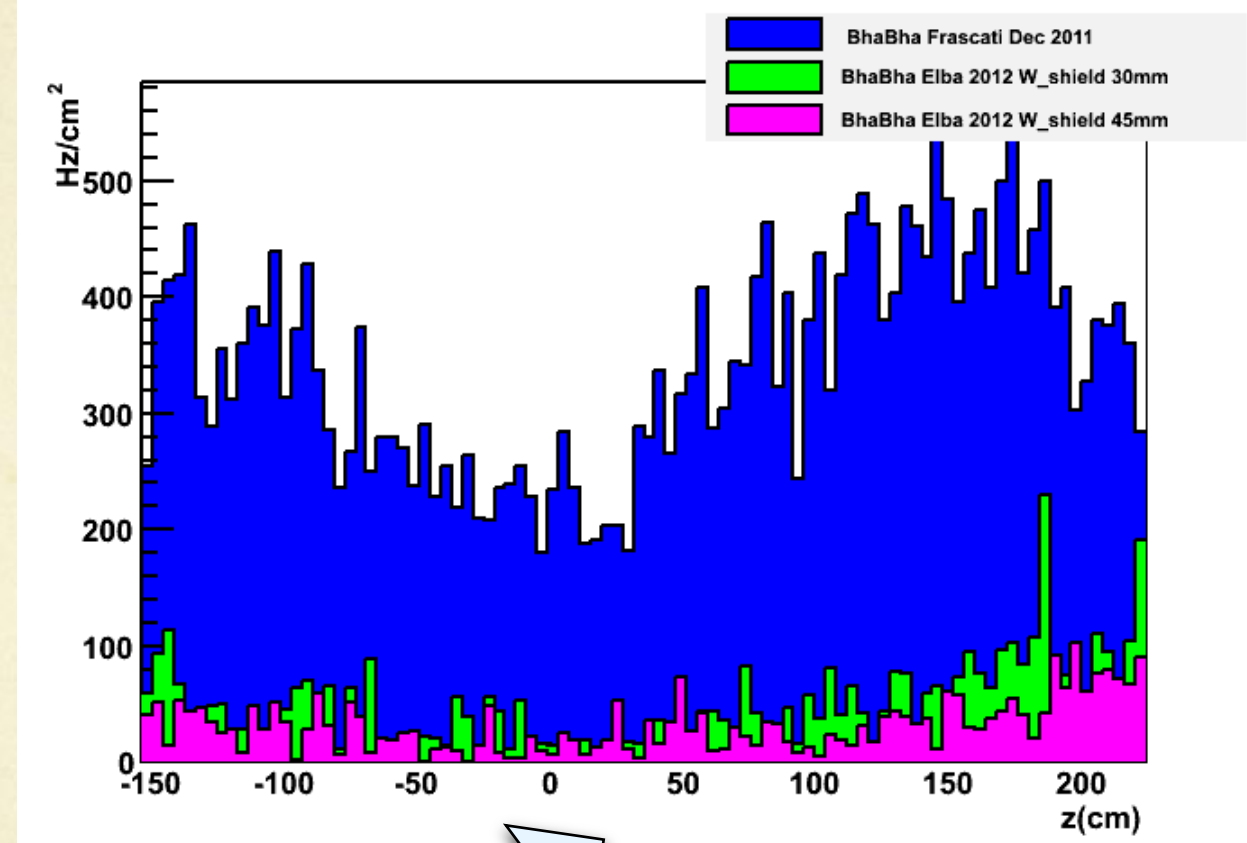
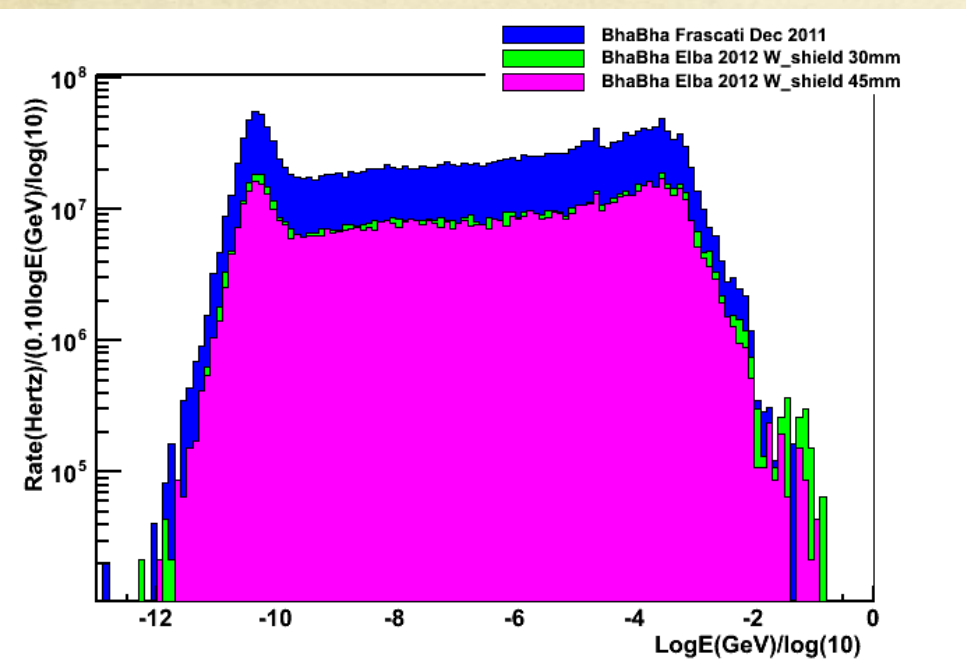
The main contribution to the background are Radiative BhaBha

# Effect of the Shielding on Radiative Bhabha Background



## Energy Distribution

## Rate L0 vs Z-coordinate Barrel



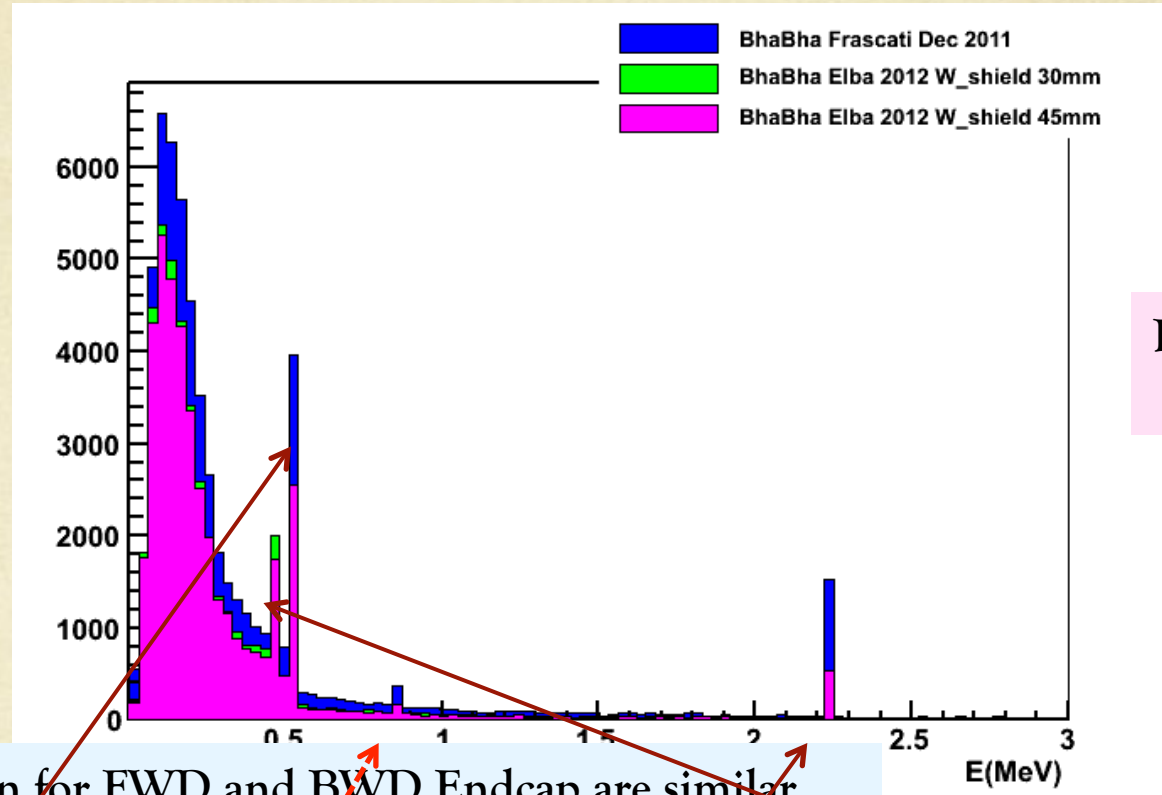
Significant reduction of the neutron rate on Barrel L0 from 450 Hz/cm<sup>2</sup> to ~ 50 Hz/cm<sup>2</sup> : 1 order of magnitude less



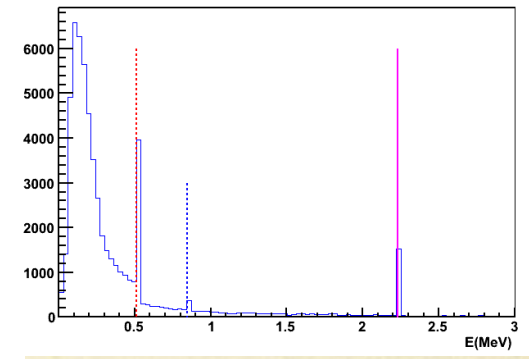
# Photons Distributions(1)



## Barrel: Photon Energy Distribution (Layers from 0 to 7)



Photon Energy Distribution  
Frascati 2011



The Energy distribution for FWD and BWD Endcap are similar

Photons of energy  $\sim 0.512$  MeV are from annihilation radiation

Photons of energy  $\sim 0.847$  MeV are due from neutron inelastic scattering on  $Fe^{56}$

Photons of energy  $\sim 2.223$  MeV are from neutron capture on Hydrogen

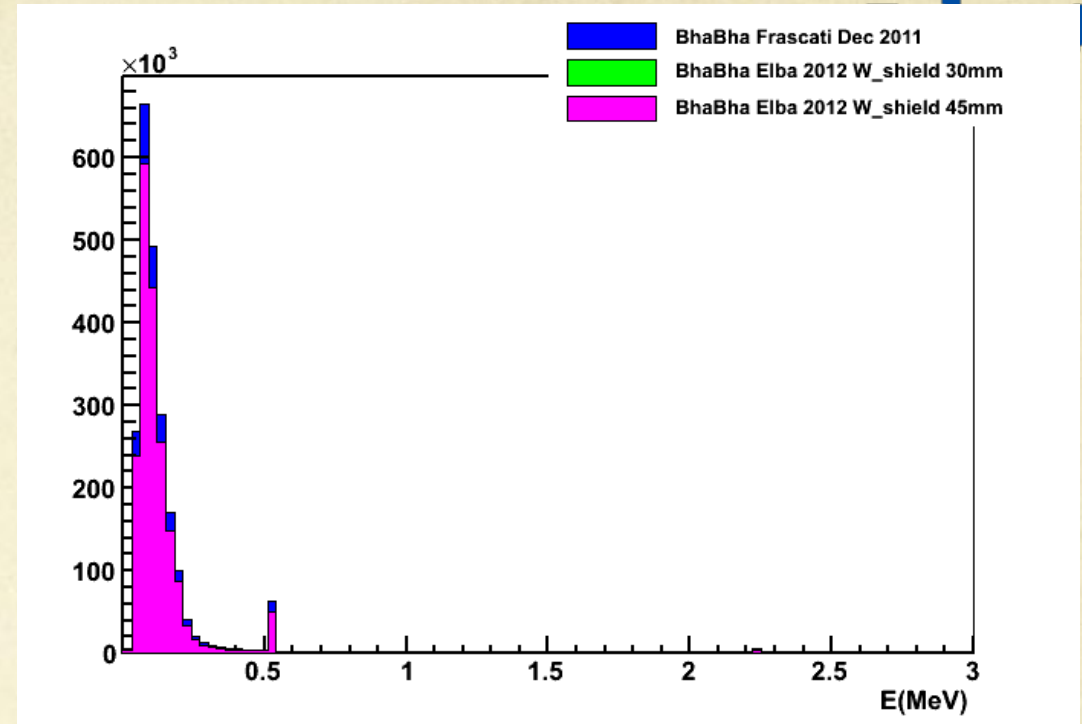
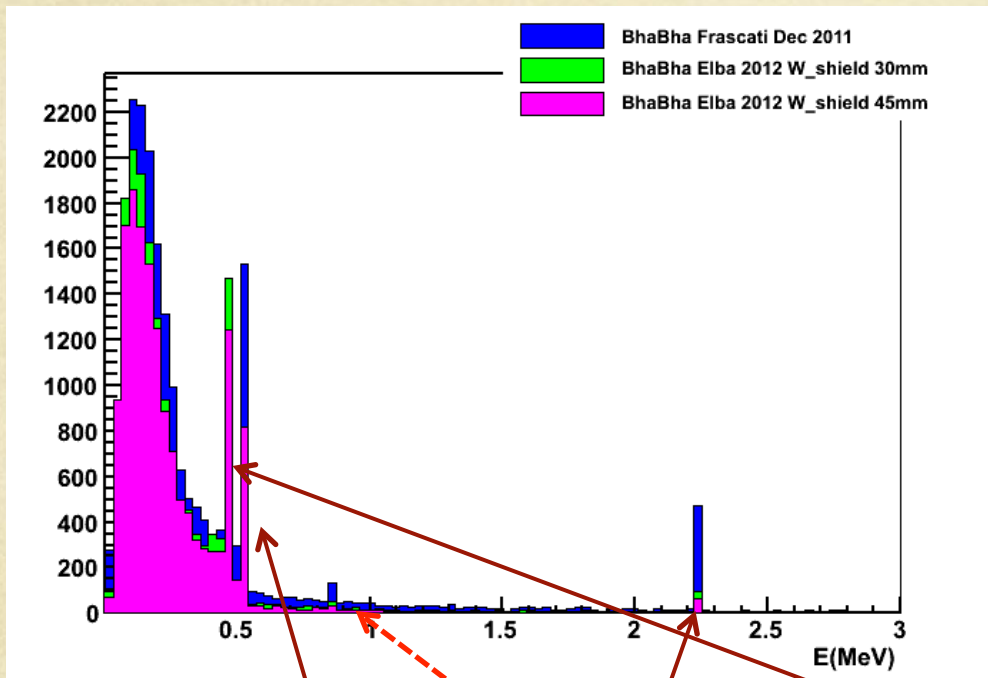
**NEW:** Photons of energy  $\sim 0.48$  MeV are from neutron capture on  $B^{10}$

# Photons Distributions(2)



Barrel: Photon Energy Distribution L0

Barrel: Photon Energy Distribution L7



The Energy distribution for FWD and BWD Endcap are similar

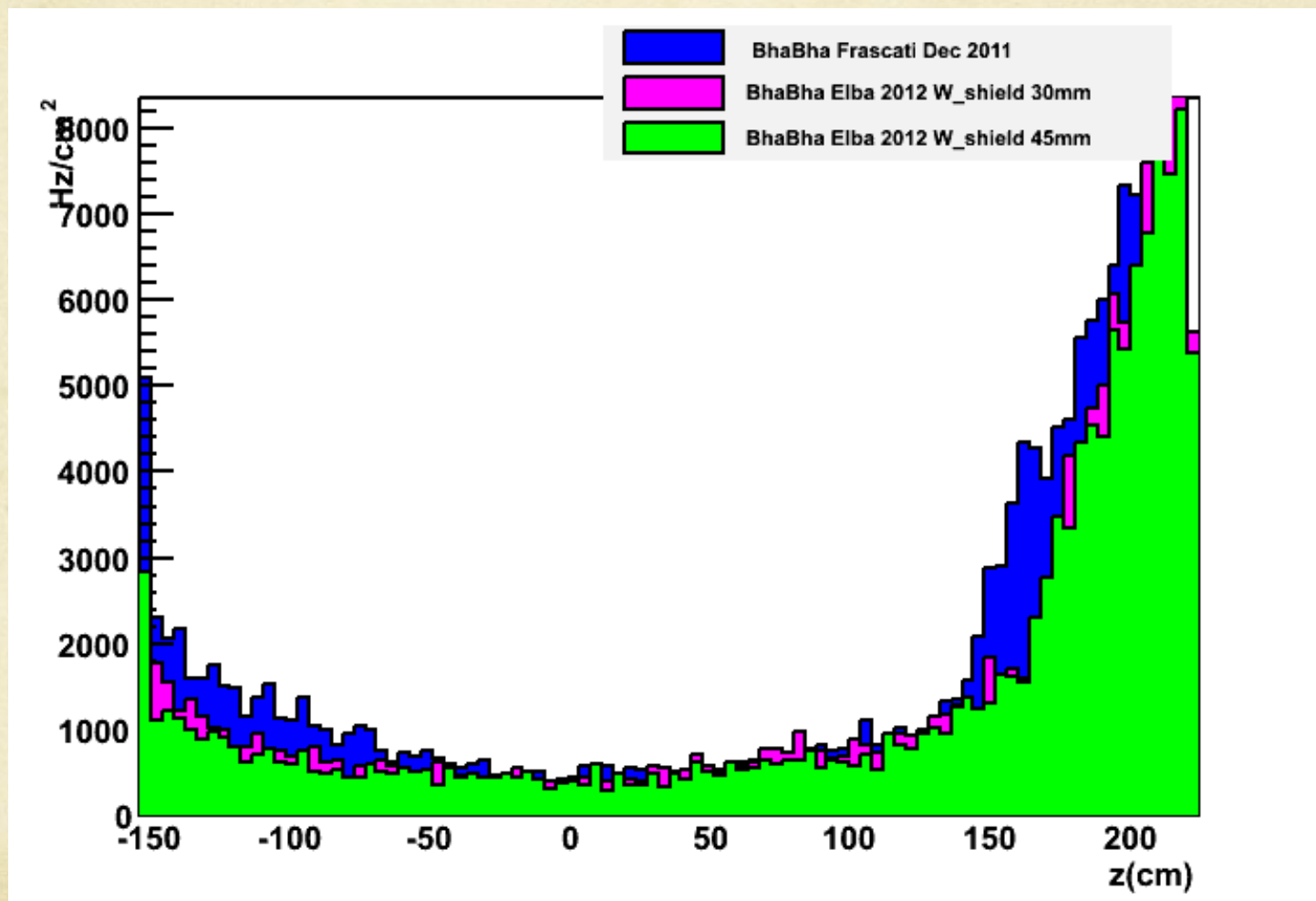
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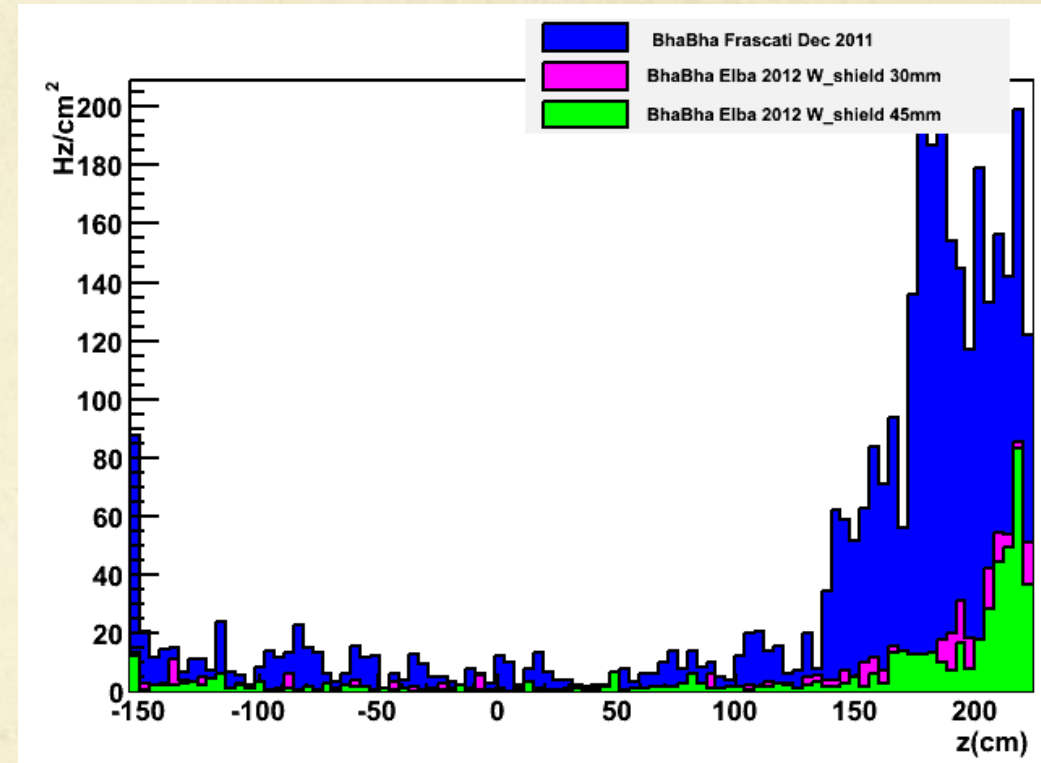
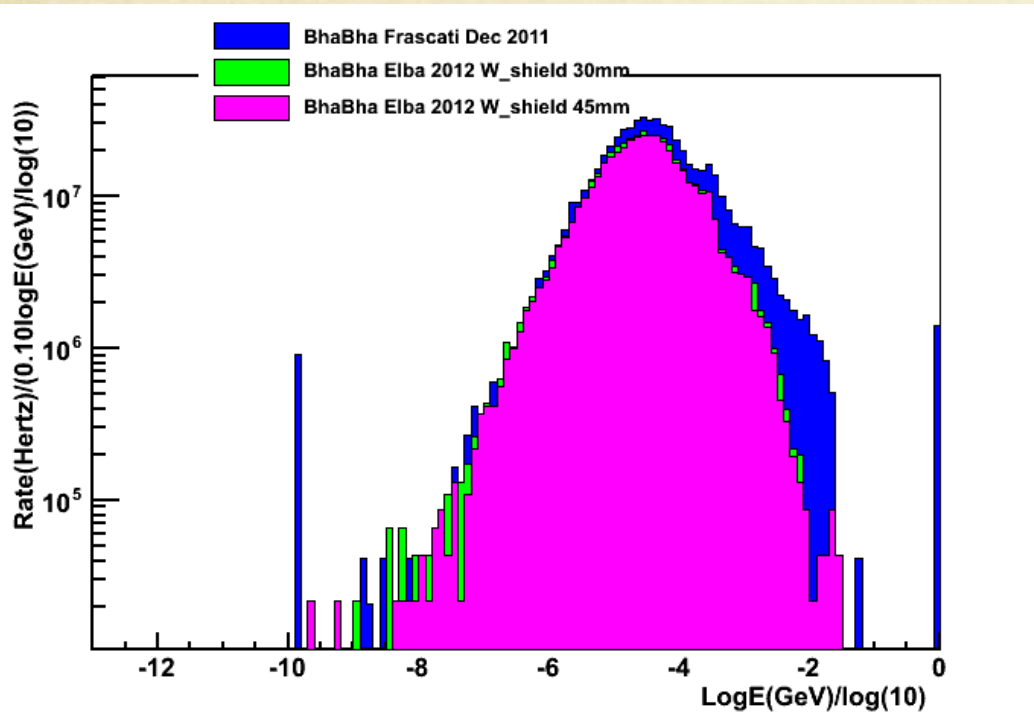
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## Rate L0 vs Z-coordinate for Barrel



## Barrel: Electron Energy Distribution

## Rate L0vs Z-coordinate for Barrel



The Energy distribution for FWD and BWD Endcap are similar

Significant reduction of the electron rate on Barrel L0



- ✓ Radiative BhaBha background, have been studied after the addition of the shielding. The results seem promising
- ✓ Other background sources after the shielding effects will be studied in the next days
- ✓ IFR TDR background on writing

# BACK-UP SLIDES