

Summary plenary session, Dec. 17th 2010

MDI Summary

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For the MDI Group

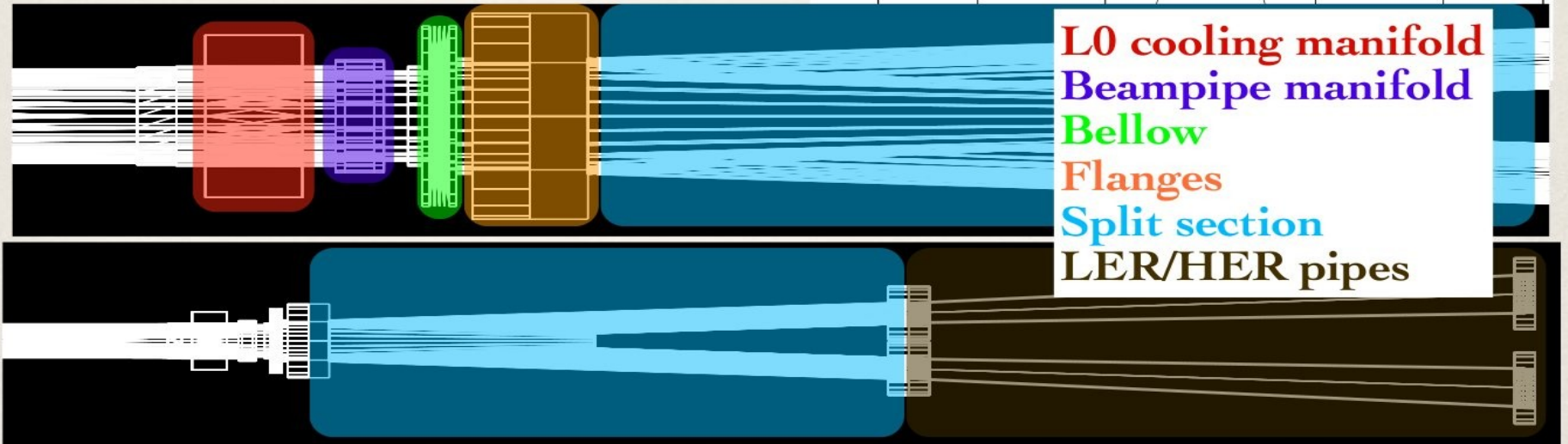
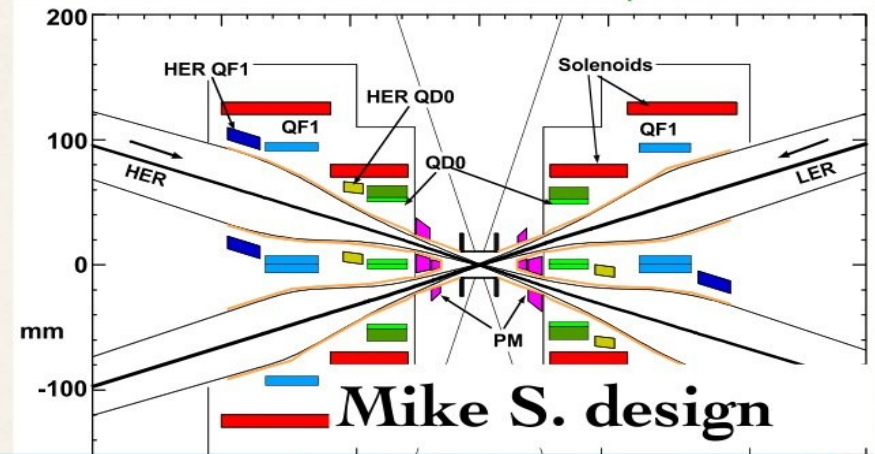
CALTECH SuperB Workshop

What is new?

- **Model updates:**
 - New Geometry around IP
 - Beam pipes extensions up to 10m
 - New final focus magnetic modeling (V12 SF10)
 - Geant4 migration from version 4.9.2 → 4.9.3
- **Test of the correctness of the model**
 - Final focus magnetic model validation
 - Beam pipe geometry validation
- **Full simulation new test production**
 - **SVT: occupancy**
 - 2Photon
 - Rad. Bhabha
 - **EMC: hits and energy deposits (Rad Bhabha)**
 - **IFR: Neutron Equivalent 1MeV energy (Rad Bhabha)**

New Geometry around IP R. Cenci

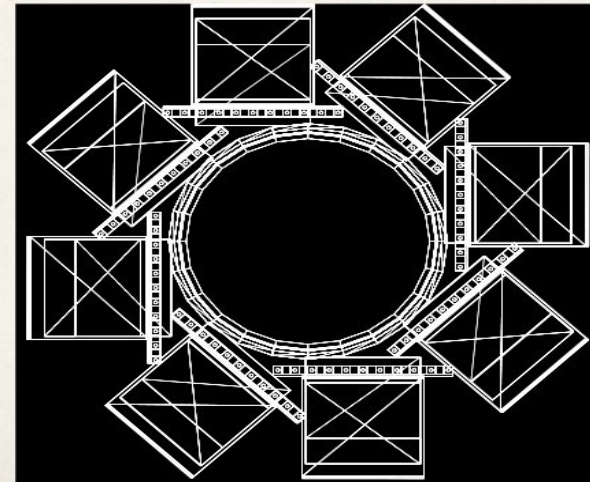
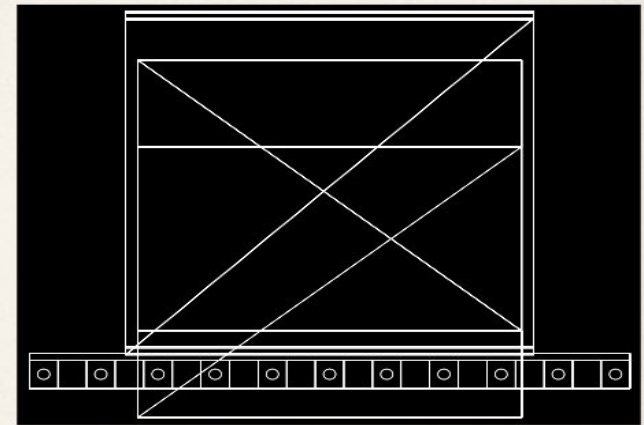
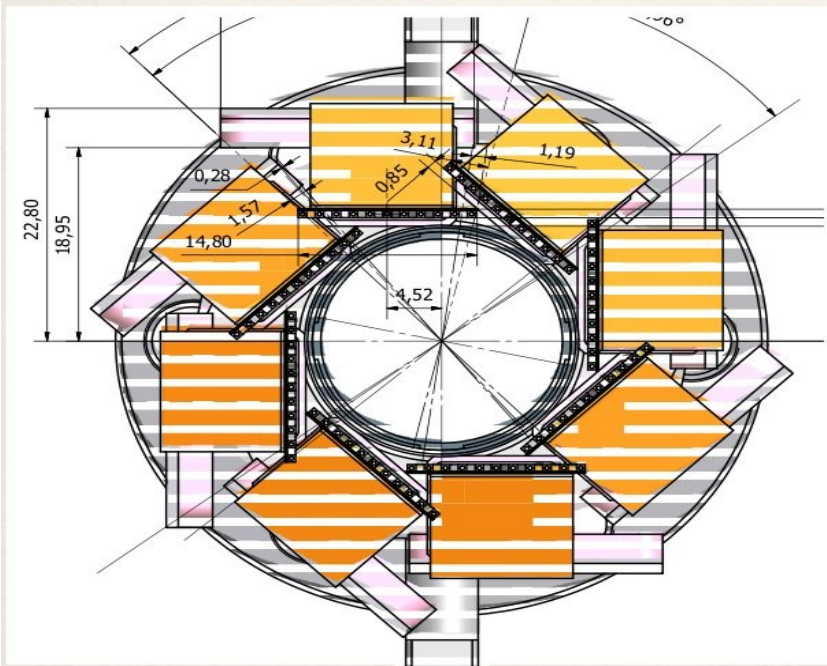
- Beryllium beam pipe with cooling and support structure
- Steel pipes with bellows and flanges up to $\pm 86\text{cm}$



- Pinwheeled L0 with cooling, HDIs and support
- Tungsten shield closest to the IP (beaks) has been removed to allocate cooling and support structure

- Pinwheeled L0
- Min radius 13 mm, max 18 mm

Filippo B. design

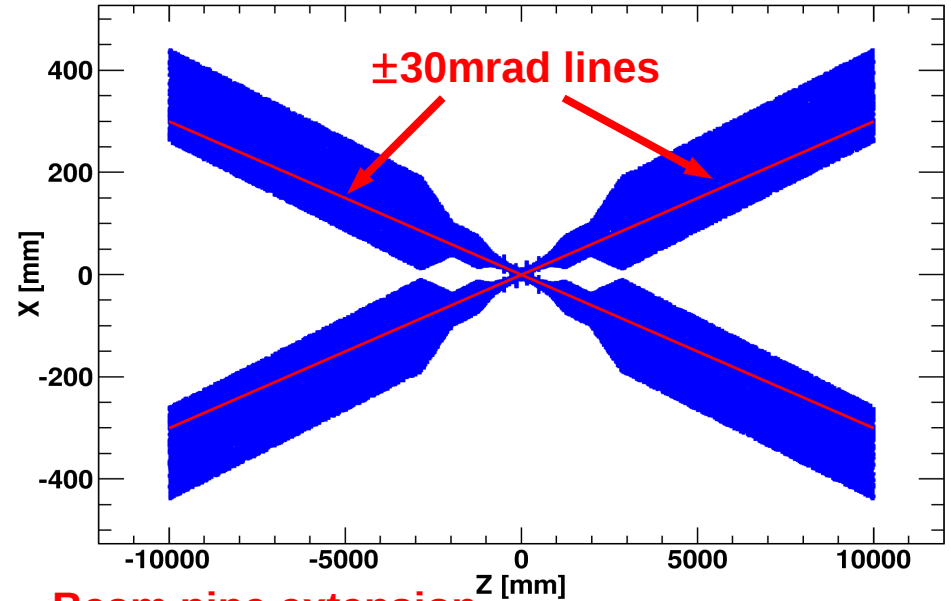


**Bruno
Implementation**

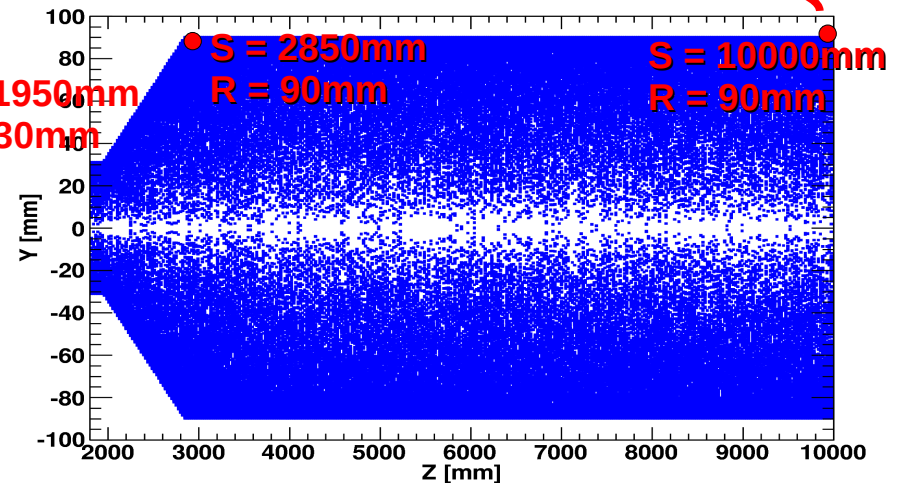
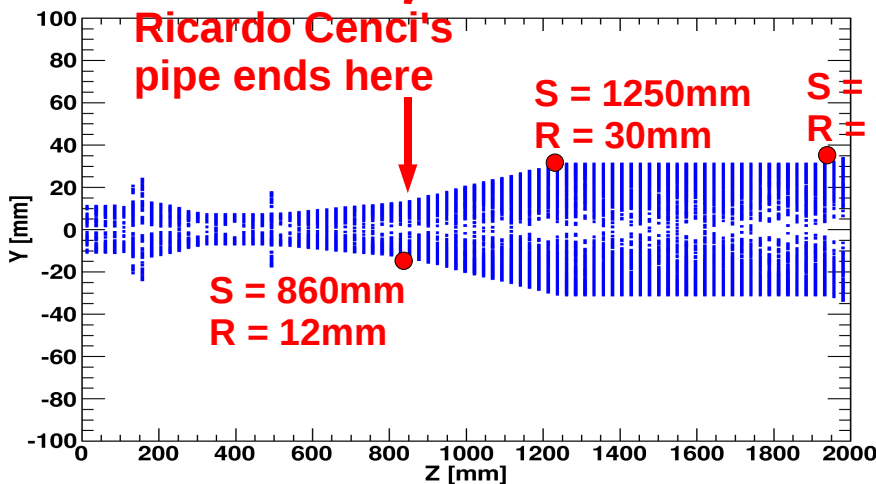
Beam Geometry Extension A. Pérez

- Validation tool: Helpful to sketch the geometry and to spot bugs
- Beam pipes tilt is higher (35mrad) than 30mrad
- Can check the beam pipes extension up to $\pm 10\text{m}$ from IP

Z vs X profile



Beam pipe extension

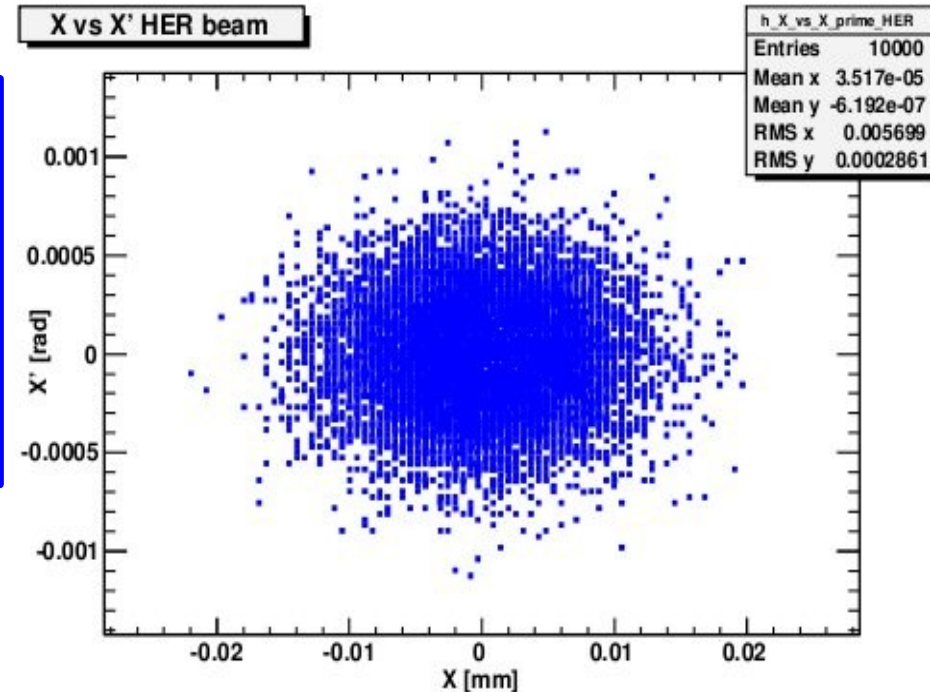


Final Focus Validation

A. Pérez

- Use final focus v12 sf10 layout
- Generate particles (10k) with the beam parameters (HER and LER) at the IP:
 - All particles are generated at $Z = 0$ and at the nominal beam energy

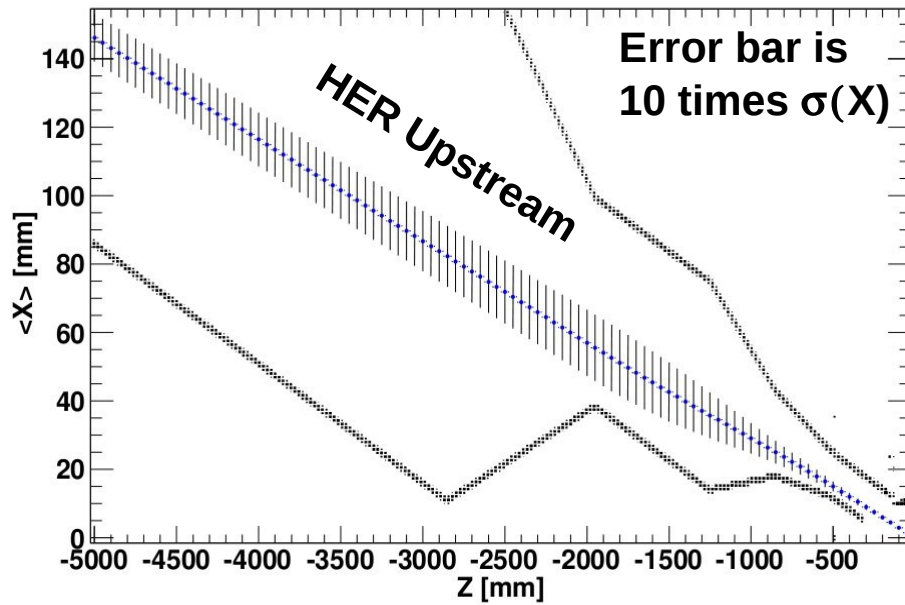
parameter	HER (e ⁺)	LER (e ⁻)
Energy	6.69 GeV	4.18 GeV
σ_x	7.3×10^{-3} mm	8.7×10^{-3} mm
β_x	26.0 mm	32.0 mm
σ_y	36.0×10^{-6} mm	35.0×10^{-6} mm
β_y	253.0×10^{-3} mm	205.0×10^{-3} mm
α_z	-30mrad	$\pi + 30$ mrad



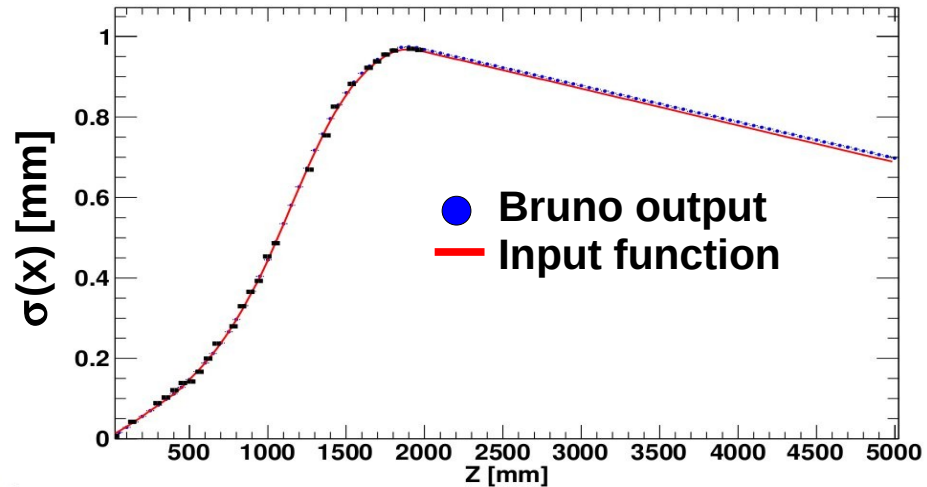
- Feed this particles into Bruno which transport them into the final focus field
- Builds special scoring geometry to study beam optics
- Goal: comparison with design values

Final Focus Modeling

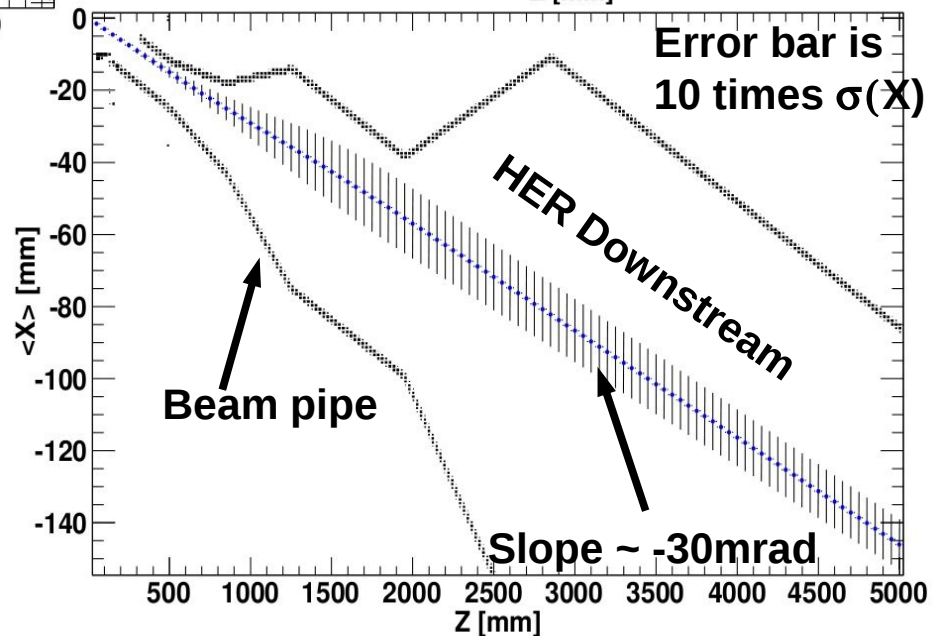
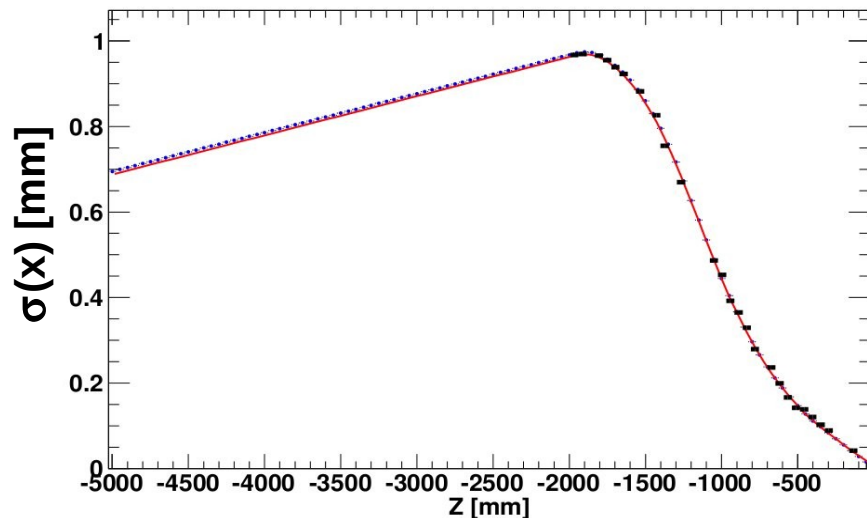
A. Pérez



Z vs $\sigma(\Delta X)$



Z vs $\sigma(\Delta X)$

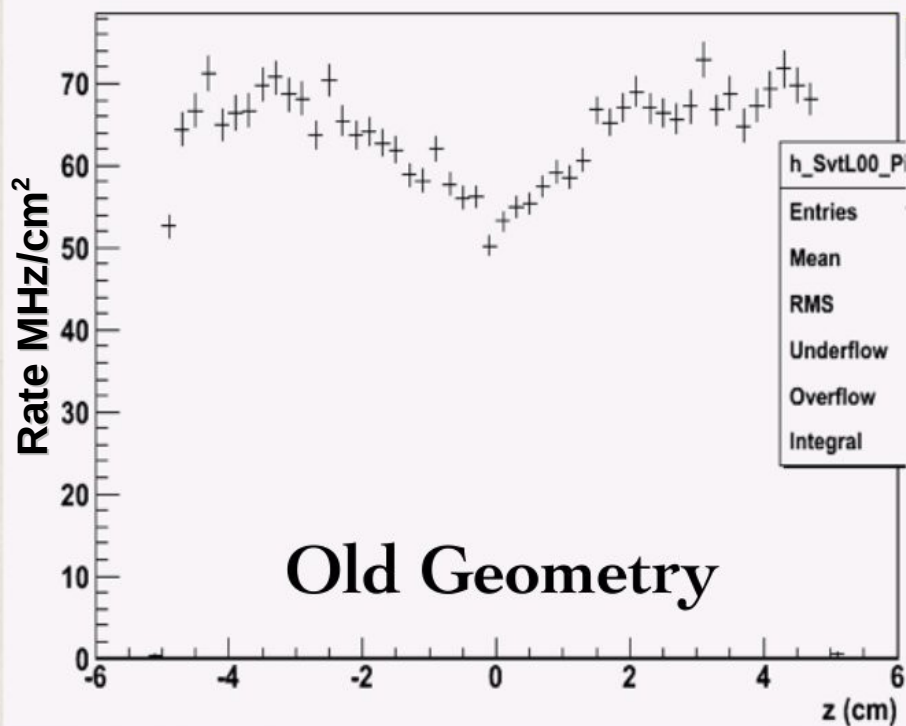


SVT: 2photon background R. Cenci

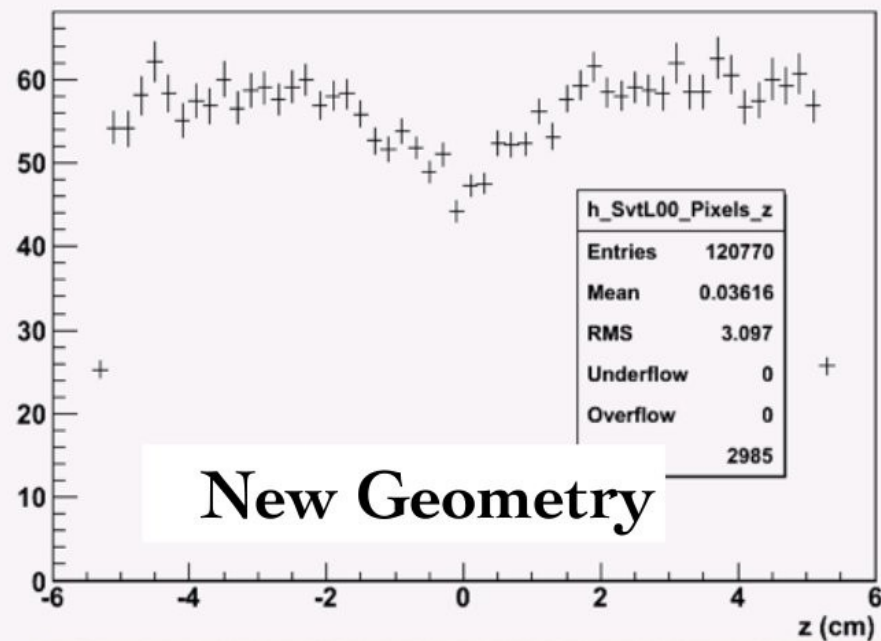
- Confirmed that lower cut on pT for 2photon has no effect on L0 rate
- Rate is slightly decreased but still higher than requested, 56 MHz/cm² (was 64)
- Shape is the same

- Sample equivalent to 260 μ s (~50k bunch crossings)
- New macro to produce those events, not yet embedded in Bruno (A. Pérez)

PixelsON distribution vs Z on Svt La



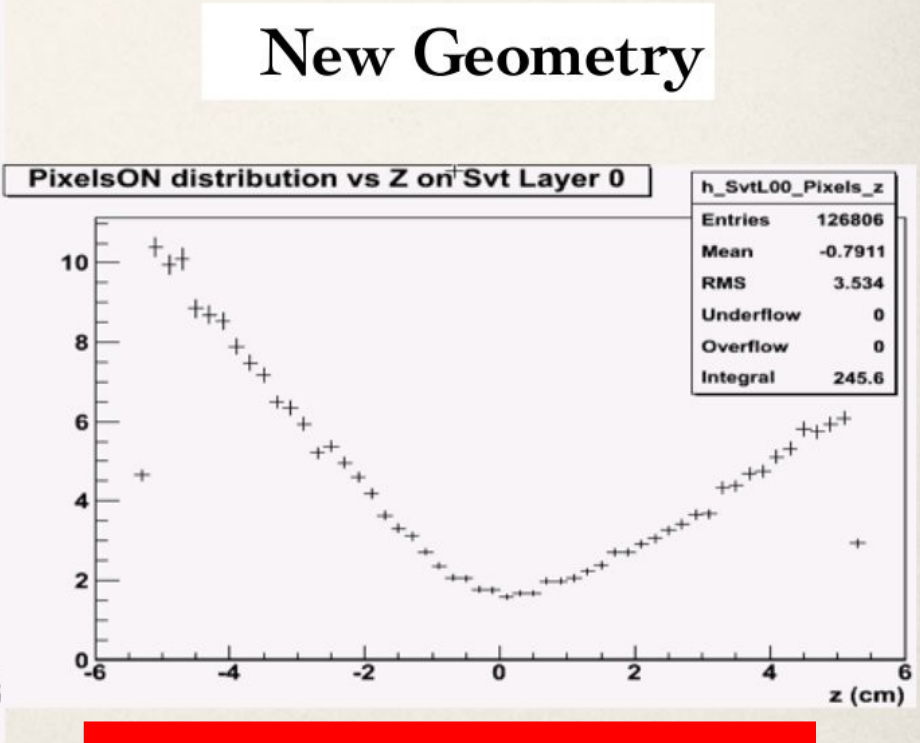
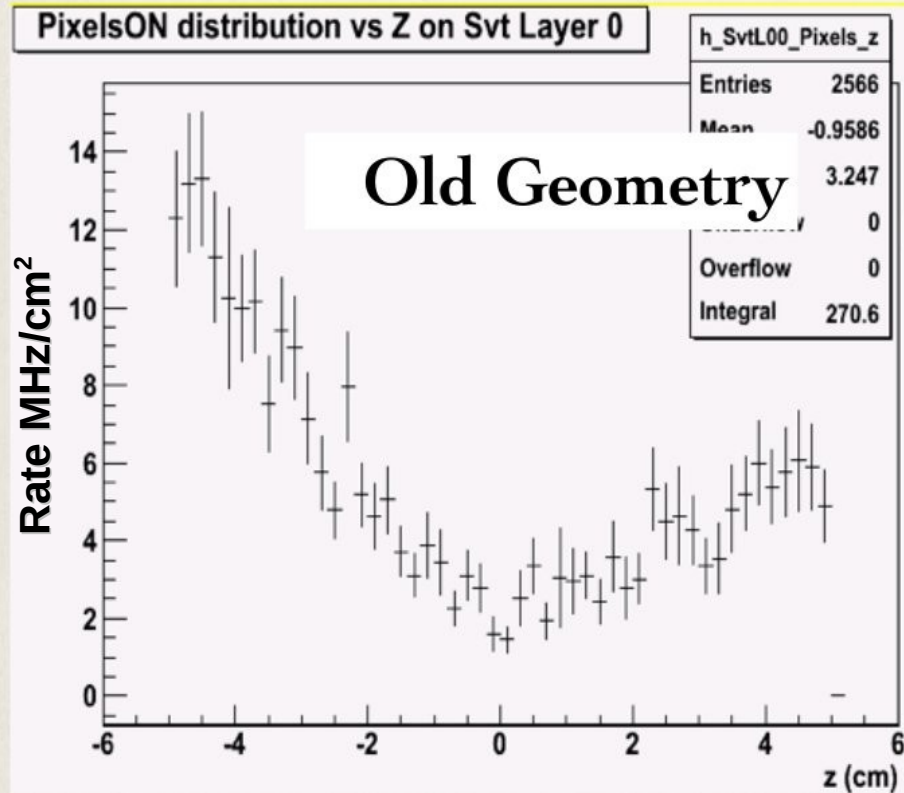
PixelsON distribution vs Z on Svt Layer 0



SVT: Radiative Bhabha background R. Cenci

- L0 rate decreased as well, 4.6 MHz/cm² (was 5.4)
- Shape again is the same

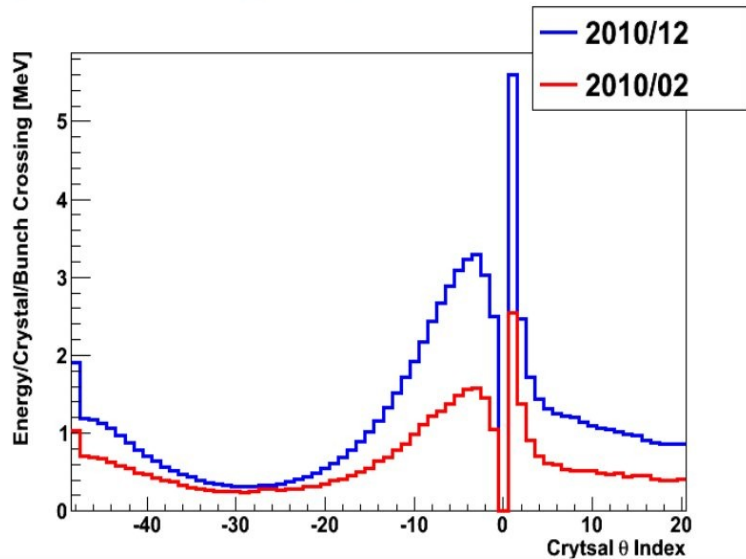
• Sample equivalent to 2.4ms (~1M bunch crossings)



Note: longitudinal B field off

EMC: Radiative Bhabha background S. Germani

Crystal energy deposit vs theta



■ Energy deposit per crystal per bunch crossing is higher in Winter production

■ EMC hits:

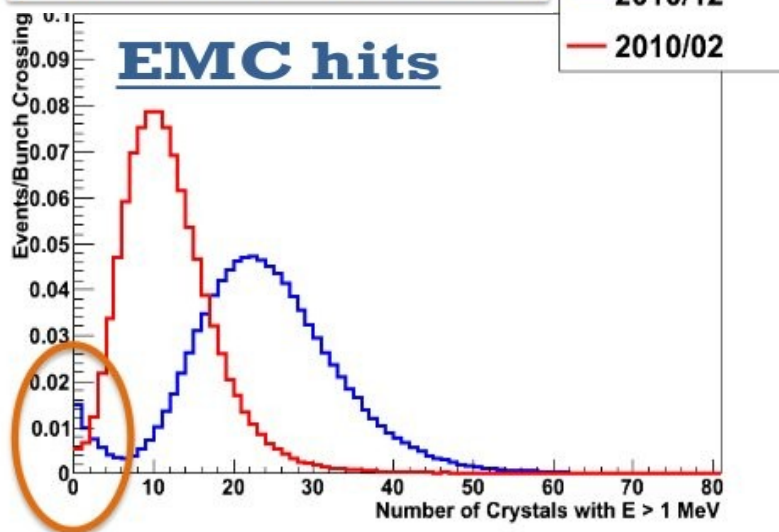
- Different behaviour at low multiplicity
- Winter production factor of ~2 higher multiplicity

■ Neutron flux: Winter production has

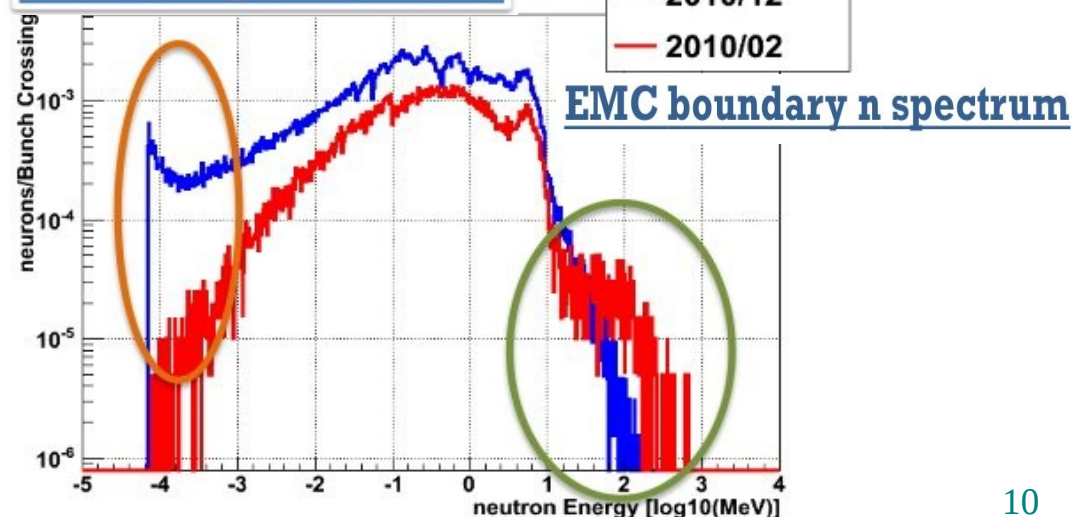
- much higher low energy neutrons flux
- Lower neutrons flux at high energy

■ A couple of features to be still understood

Crystals with $E > 1$ MeV / BC



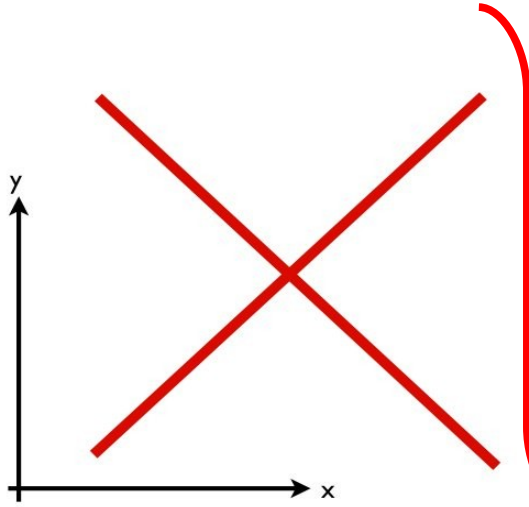
n entering EMC front



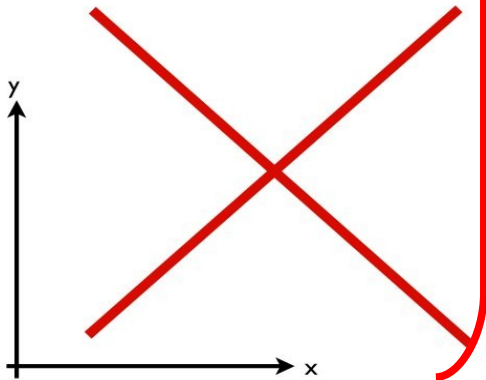
IFR: Radiative Bhabha background M. Munerato

February Production

BWDL7



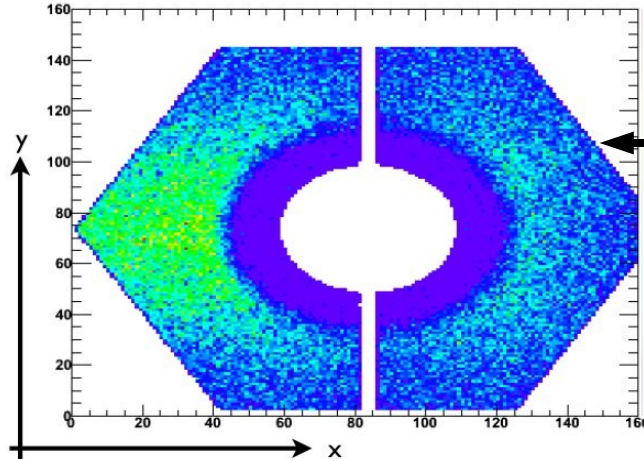
FWDL7



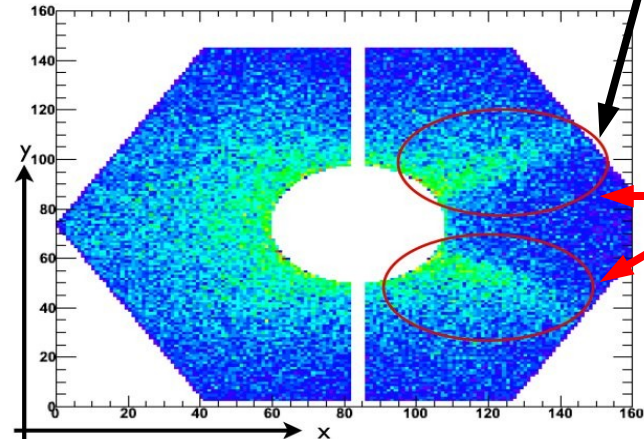
No Beam pipes up to 10m from IP

Winter Production

BWDL7



FWDL7



Neutron
Equivalent
1MeV
energy

**Feature of the
new final focus**

Future Plans

- **Some differences between Winter and February production. Changes**
 - New Geant4 version 4.9.2 → 4.9.3
 - New Final focus configuration
 - New pipes geometries (near IP and extension up to $\pm 10\text{m}$)
- **Some checks to understand the differences**
 - Run old geometry with new Geant4 version
 - Run new geometry with old Geant4 version

To be completed by end of January 2011
- **Detector groups will report on this test production findings** } **-2 weeks February 2011**
- **If we are lucky (reasonable discrepancies among Geant4 versions)**
 - Correct the little bug in pipes geometry
 - Instrument the boundary of Bwd-EMC
 - Optical model of PID
(Cerencov light production and propagation)

-2 or 3 weeks
- **Future production (with new configuration)**
 - 2photon background (500k bunch crossings)
 - Radiative Bhabha (1M bunch crossings)
 - Touschek and beam gas interaction (sample size to be decided)

-2 weeks

Summary

- **A more realistic modeling of IR geometry and beam pipes has been implemented**
- **New final focus layout is now implemented**
- **A validation machinery for the final focus magnetic layout and pipes geometries is now available**
- **Some differences between Winter and February production. Work in progress to understand them.**

Backup