LDC and the 14 mrad Crossing Angle

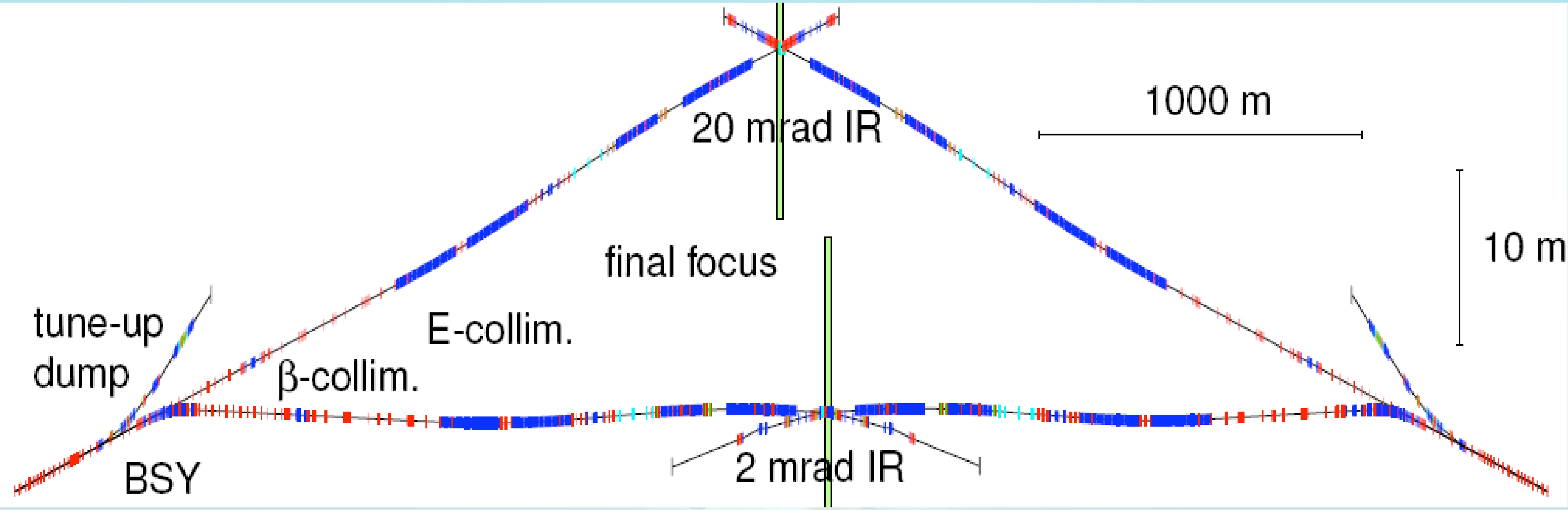
Karsten Buesser

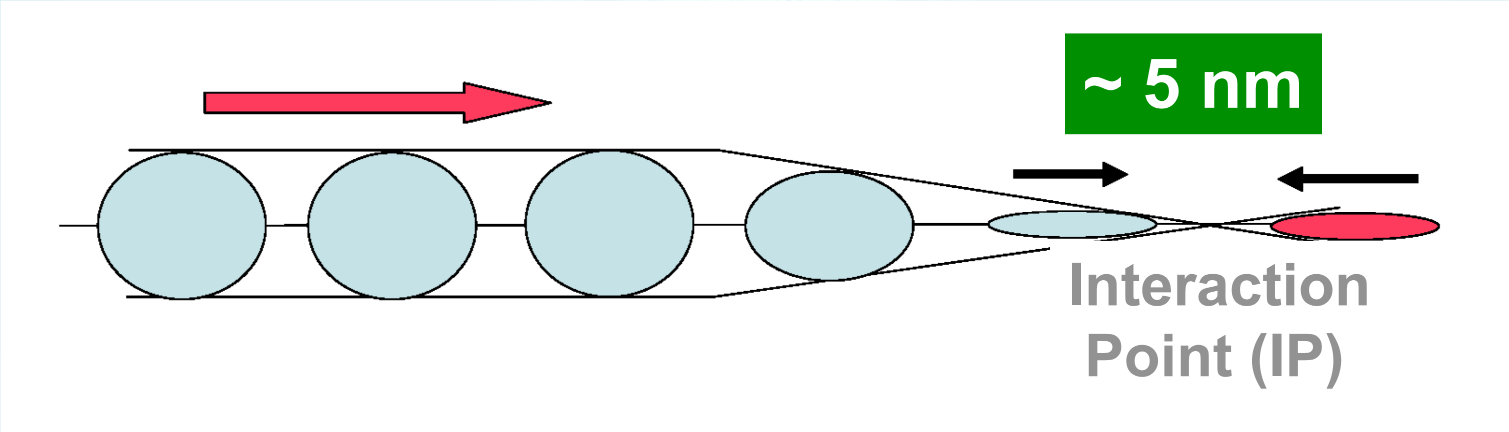
LDC Meeting

Valencia

11. November 2006

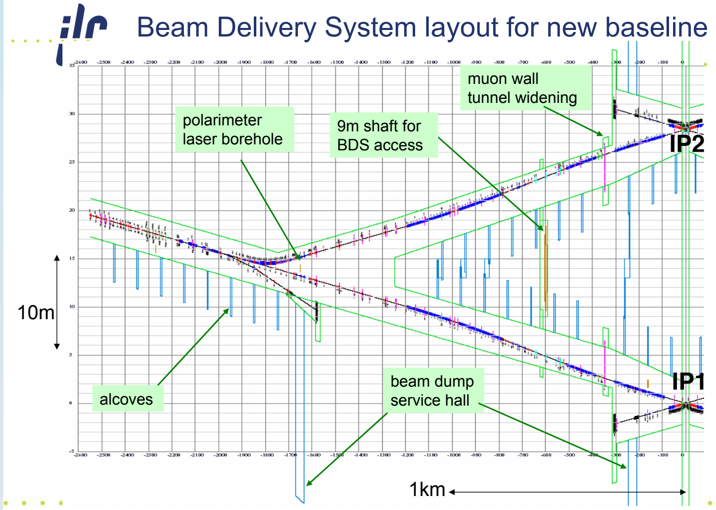
Beam Delivery System

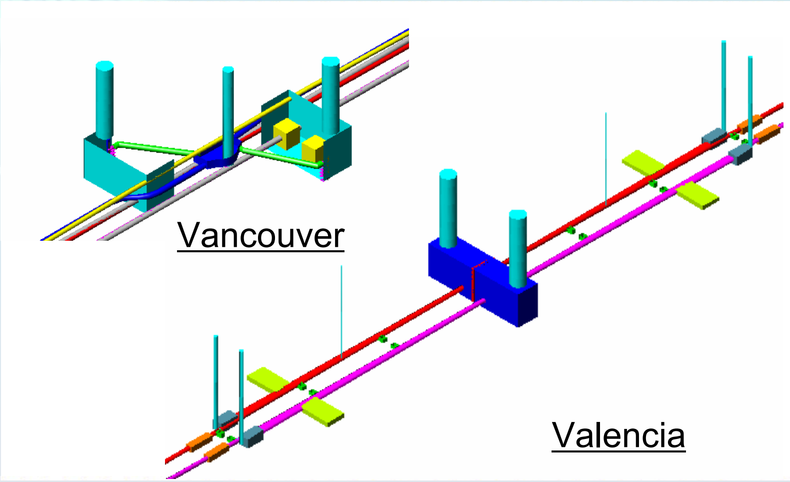




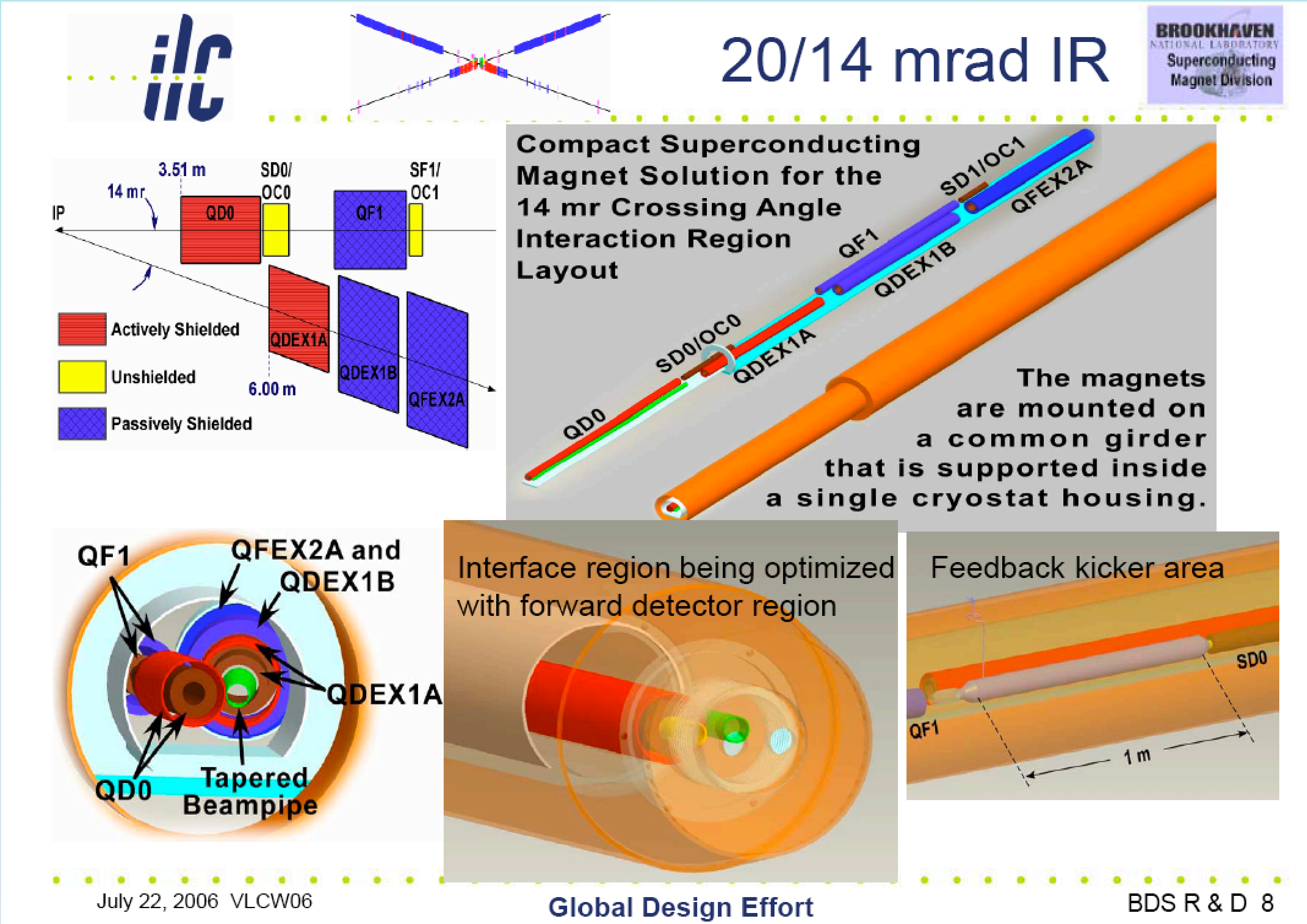
BDS Change Request: Crossing Angle

- Beam Delivery System change request
  - Submitted on July 29th to the CCB
  - Approved by GDE EC on September 21st.
- Changing the baseline from 2/20 mrad crossing angles to a symmetric configuration of 14/14 mrad
- Both detectors will be placed at the same longitudinal position (z=0) in one detector hall
- Reason: substantial cost savings

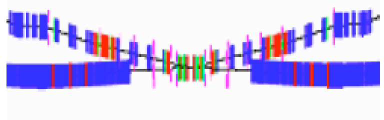




14/20 mrad Technology

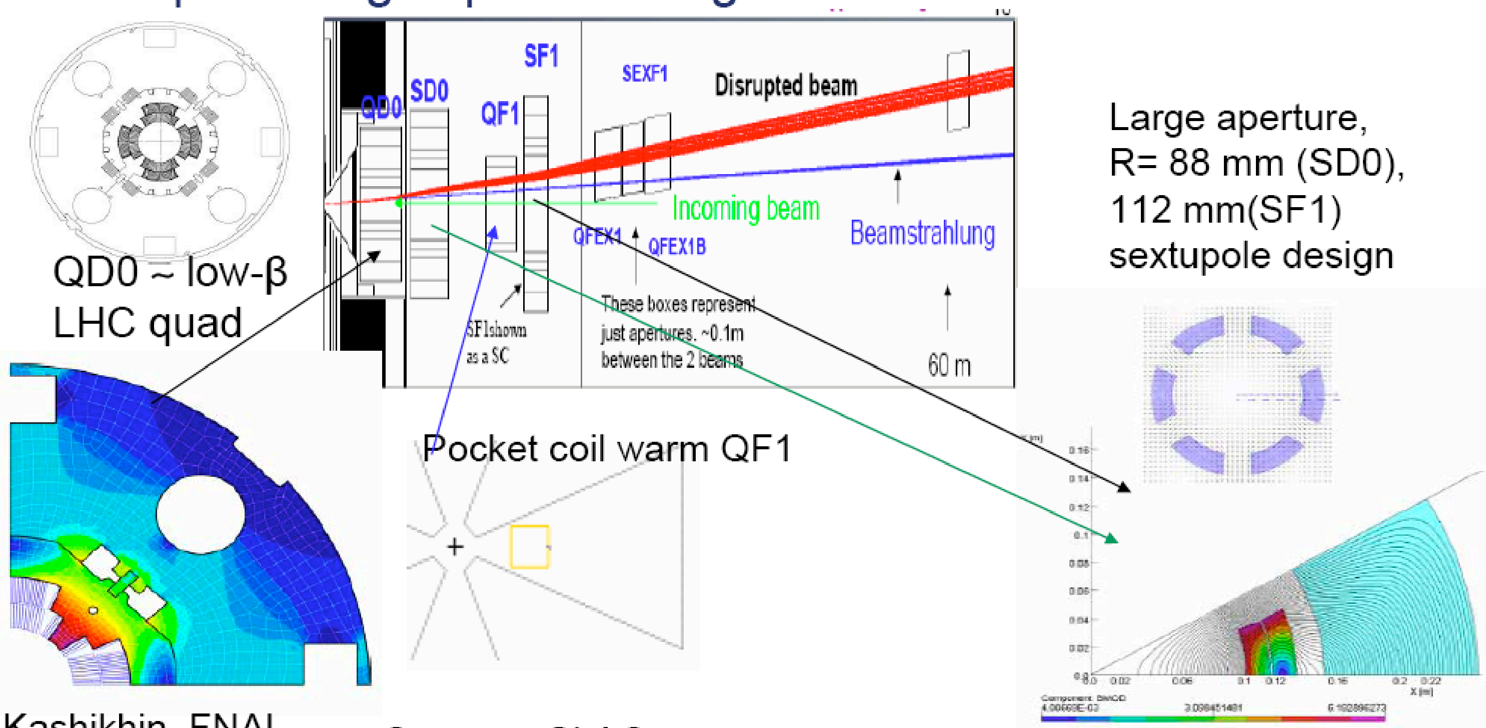


2 mrad Technology



2 mrad IR

- To extract the disrupted spent beam+ beamstrahlung requires large aperture magnets



QD0 ~ low-β LHC quad

Large aperture, R= 88 mm (SD0), 112 mm(SF1) sextupole design

Pocket coil warm QF1

Kashikhin, FNAL

Spencer, SLAC

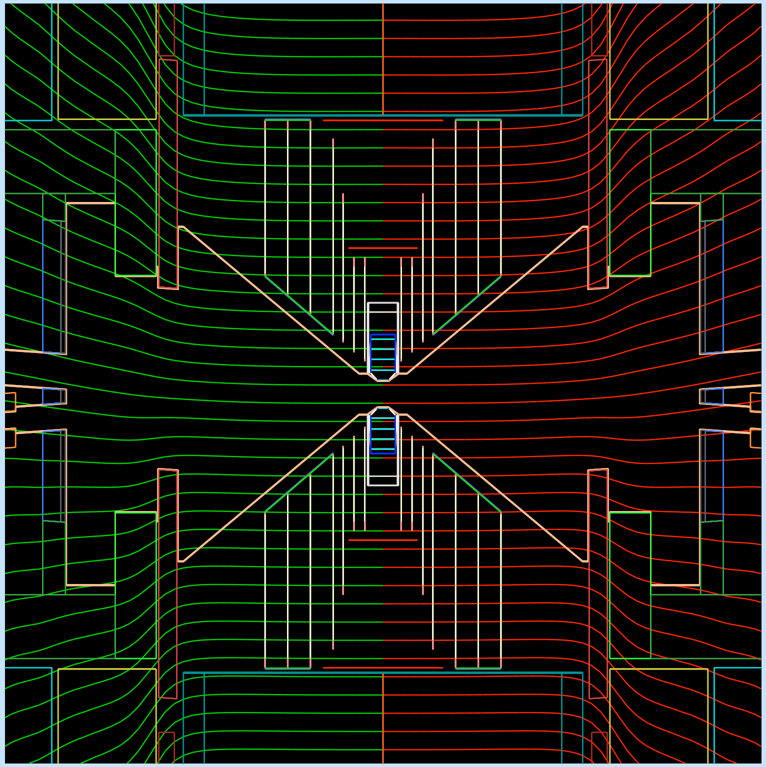
Kashikhin, FNAL

July 22, 2006 VLCW06

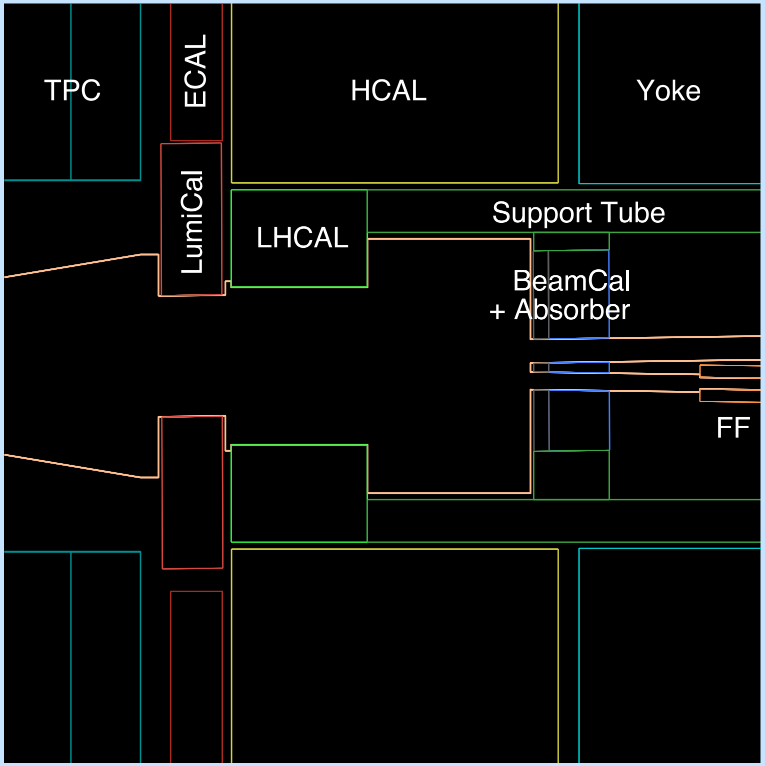
Global Design Effort

BDS R & D 9

LDC 14 mrad Forward Region



14 mrad crossing angle with anti-DID field (1:10)



Forward region design (compressed view 1:2)

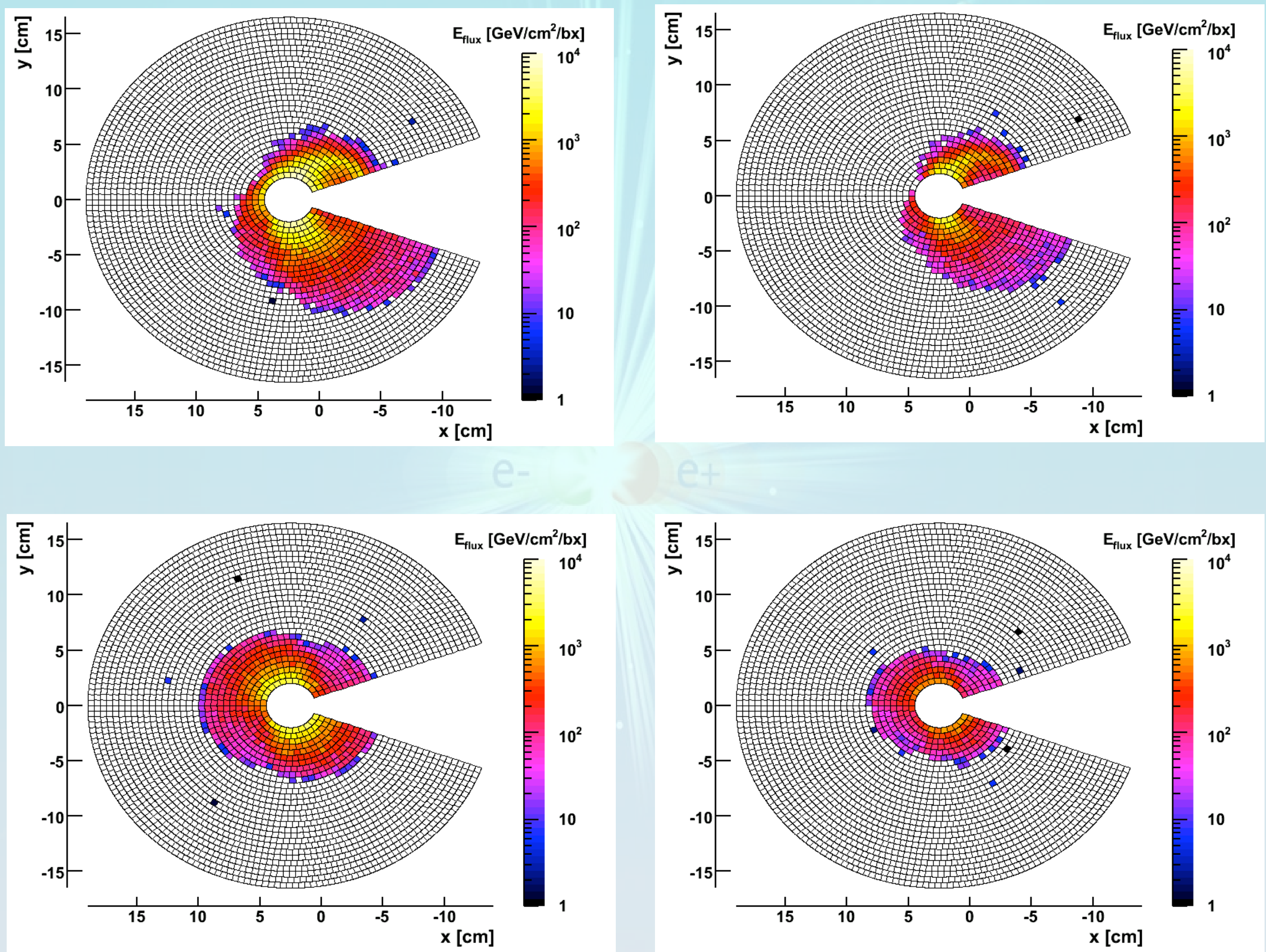
A. Vogel

Beamstrahlung Pairs on the BeamCal

LowP | Nominal

DID

Anti DID

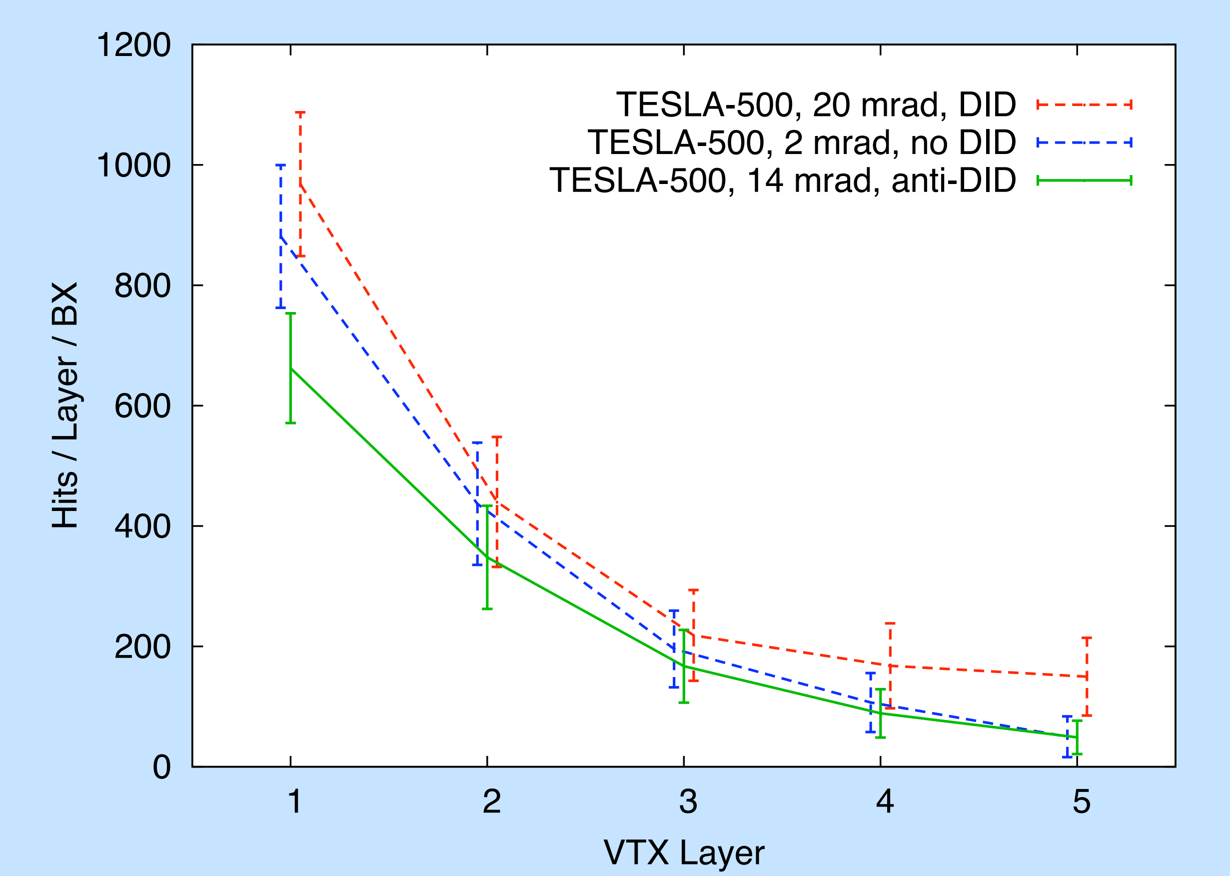


C. Grah

Larger blind area compared to 20 mrad (30° => 40°)

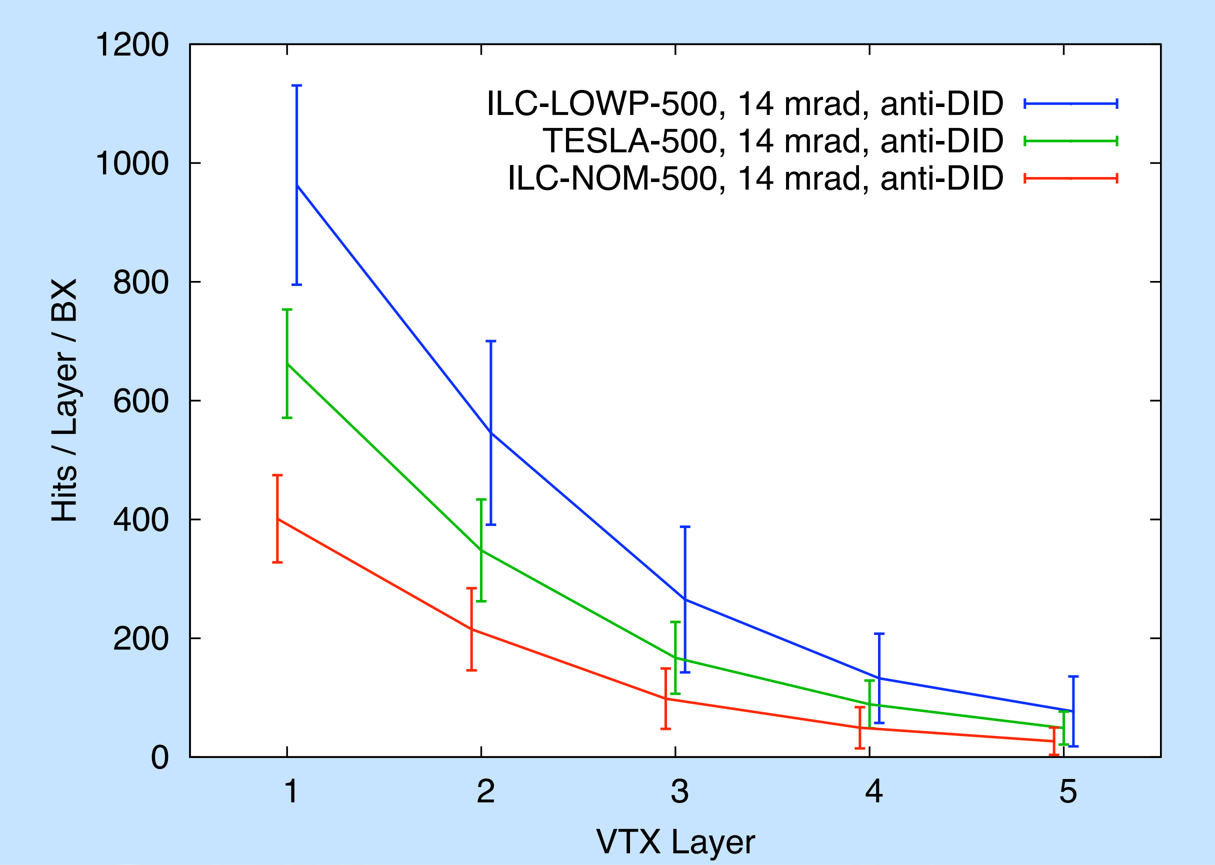
VTX Hits

Pair background simulated with GUINEA-PIG and MOKKA



A. Vogel

VTX Hits



A. Vogel

Neutrons in the VTX

Neutrons passing any VTX layer (with double counting)

- 1.7 ± 2.9 per BX for ILC-NOM-500
- 8.6 ± 10.4 per BX for ILC-LOWP-500

Normalisation per unit area (total surface is $2.8 \cdot 10^3\,\mathrm{cm}^2$)

Normalisation per nominal run time with $\int \mathcal{L}\,dt = 500\,\mathrm{fb}^{-1}$

- $3.9 \cdot 10^{11}$ BX in total for ILC-NOM-500
- $2.0 \cdot 10^{11}$ BX in total for ILC-LOWP-500

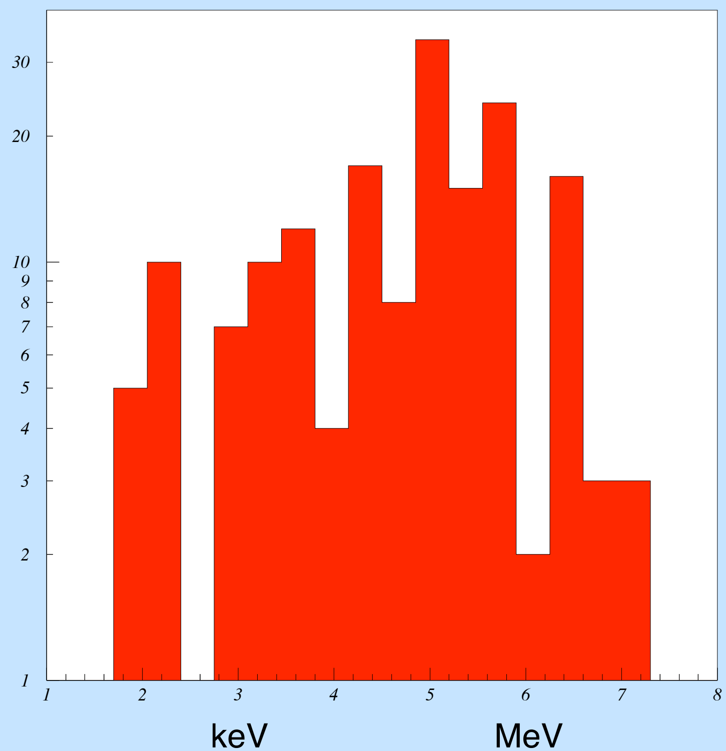
Neutron fluence (no NIEL scaling applied yet)

- $(2.3 \pm 4.0) \cdot 10^8$ neutrons / cm^2 for ILC-NOM-500
- $(6.1 \pm 7.4) \cdot 10^8$ neutrons / cm^2 for ILC-LOWP-500

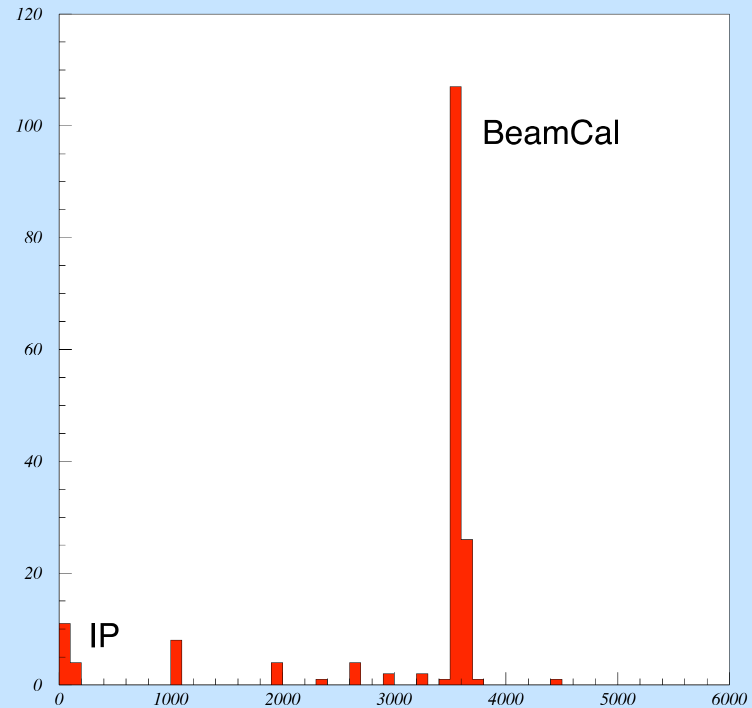
A. Vogel

Neutrons in the VTX

Statistics for neutrons are rather low . . .



Energy spectrum



Origins of particles

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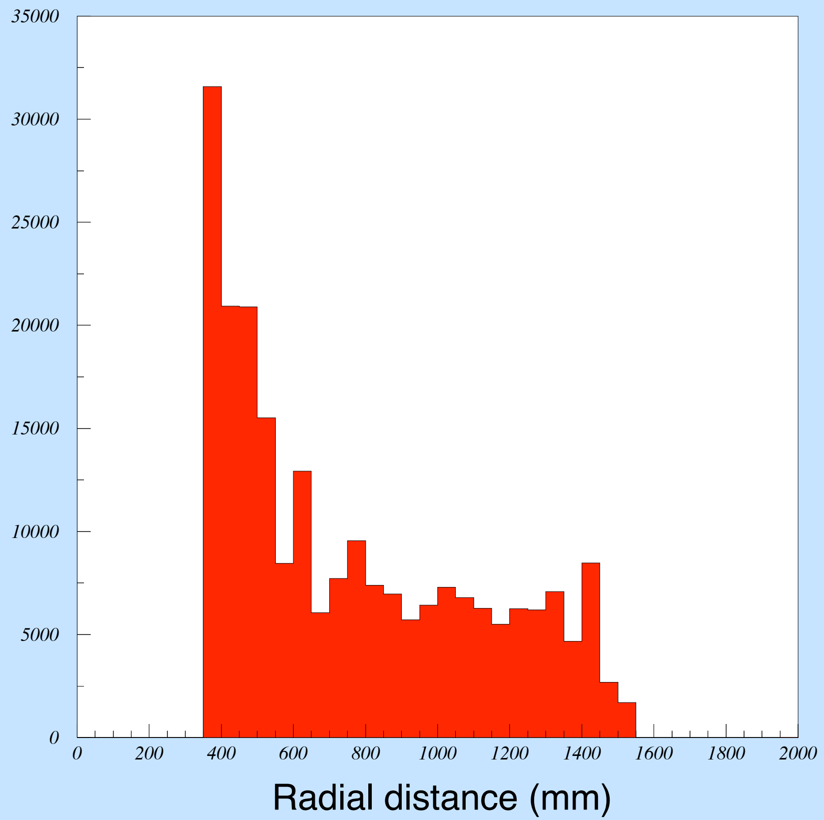
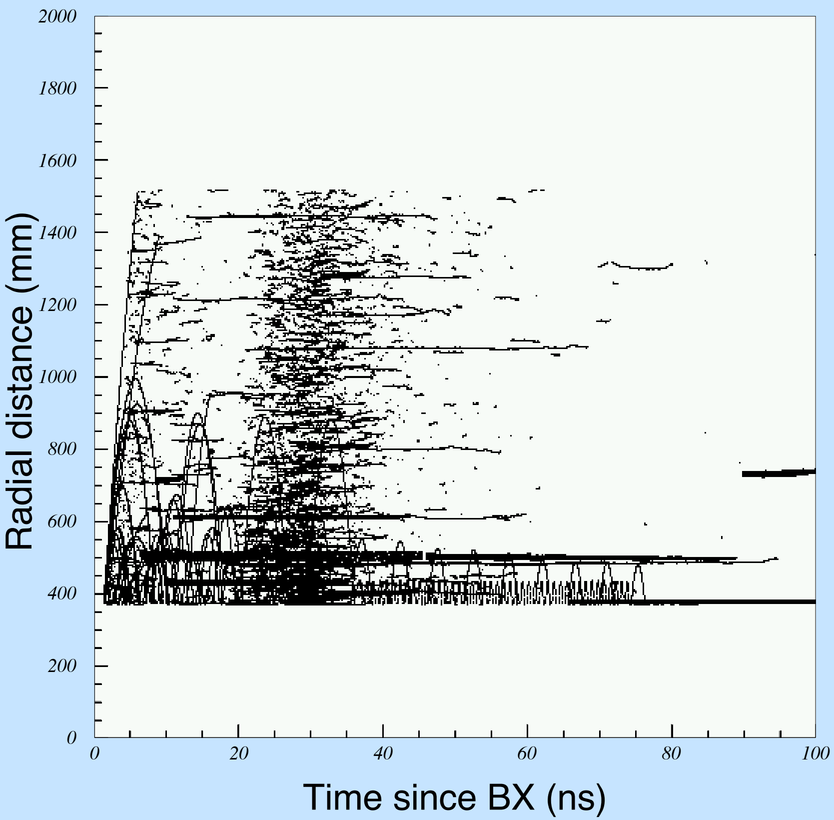
TPC Hits

Mokka hits in the TPC (overlay of 100 BX)



Radial distribution



Time structure

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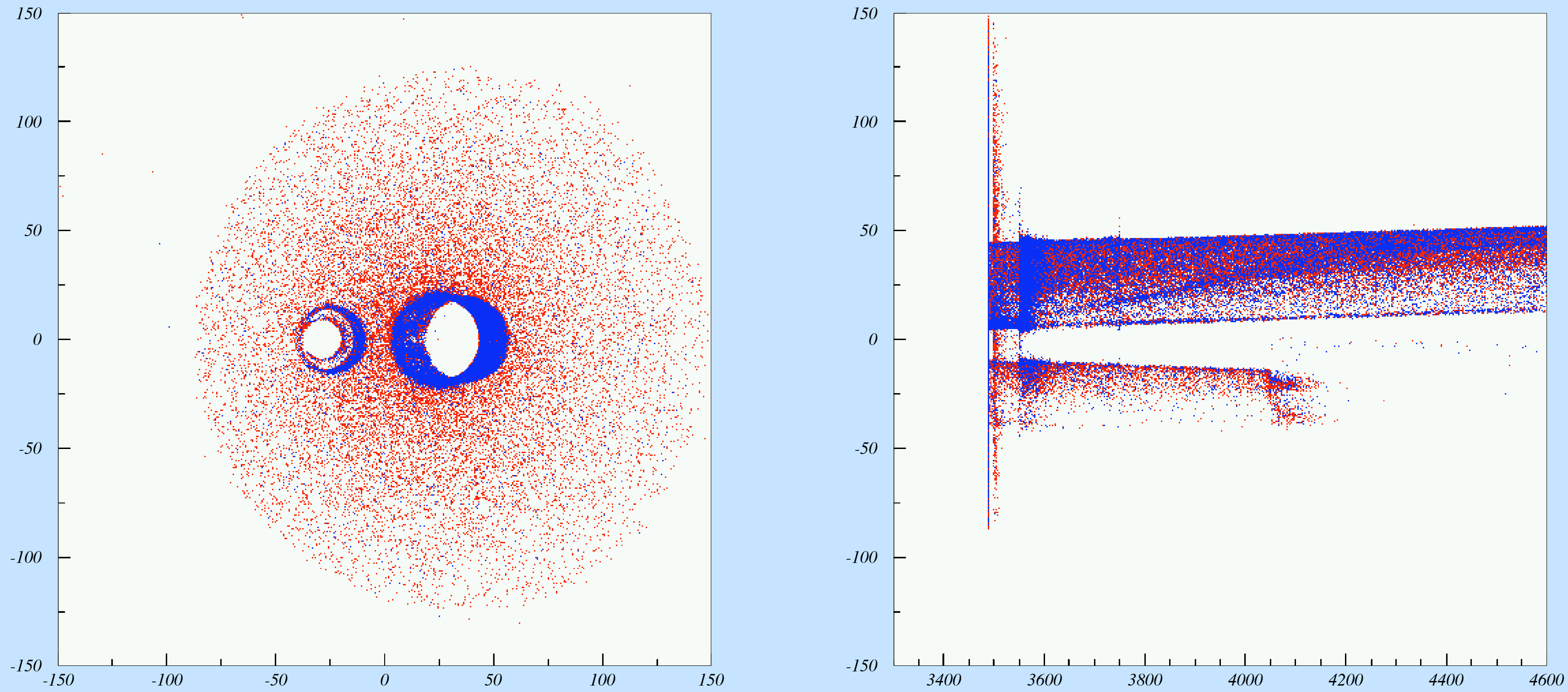
Backscattering Sources



Origins of backscattered electrons and positrons which enter the inner parts of the detector

A. Vogel

Summary

- 14 mrad crossing angle is the ILC baseline now
- LDC forward region has been adopted to that by modifying the existing 20 mrad design
  - thanks to Adrian Vogel and Ringo Schmidt
- First background studies have been performed
  - No surprises
- Optimisations yet to be done