LCAL Simulation Status

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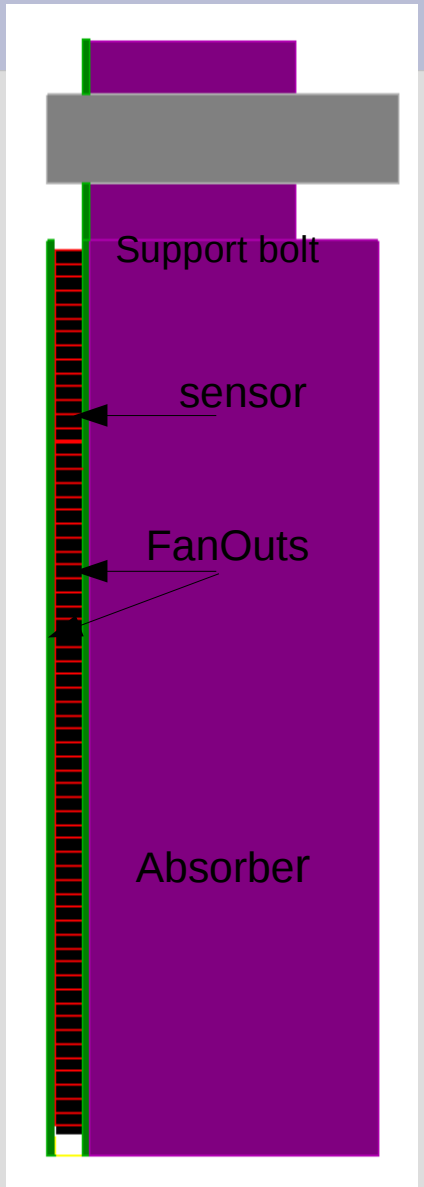
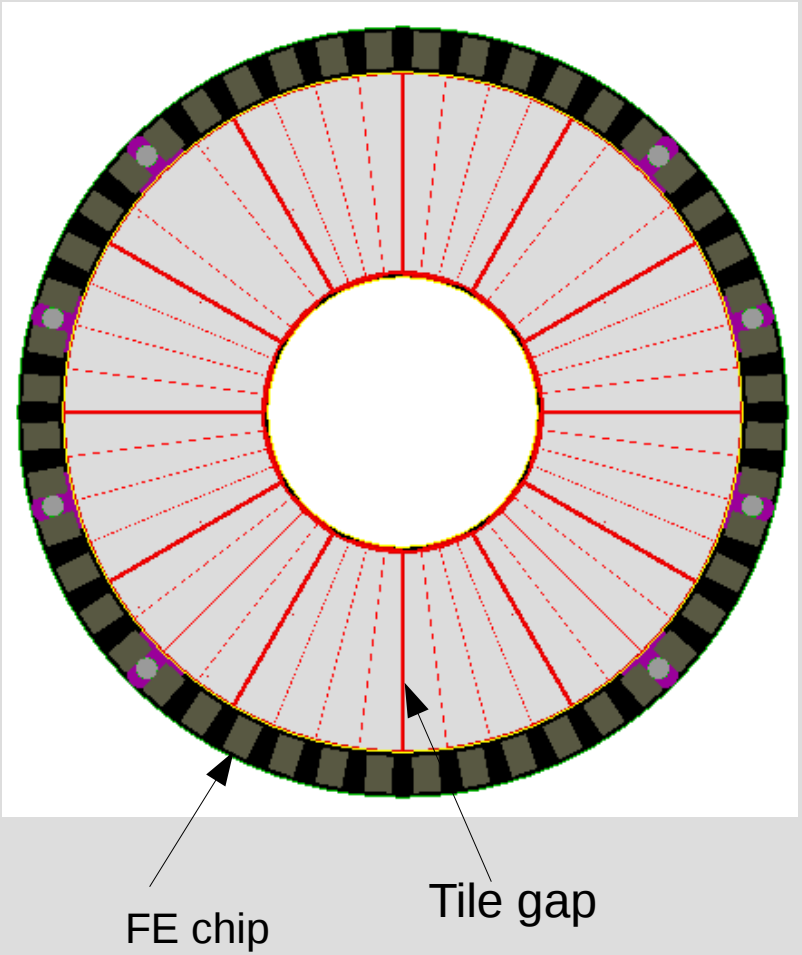
- New drivers SLcal03/LumiCalX01 features :
  - mechanical support structure
  - FE electronics
  - dead spaces between tiles
  - FE to sensor interconnection boards (PCB)
  - proper materials defined for PCB
- Simulations :
  - LCAL performance (energy resolution)
  - Impact SB2009
  - beam pipe shape

New LCAL driver

layer side cut



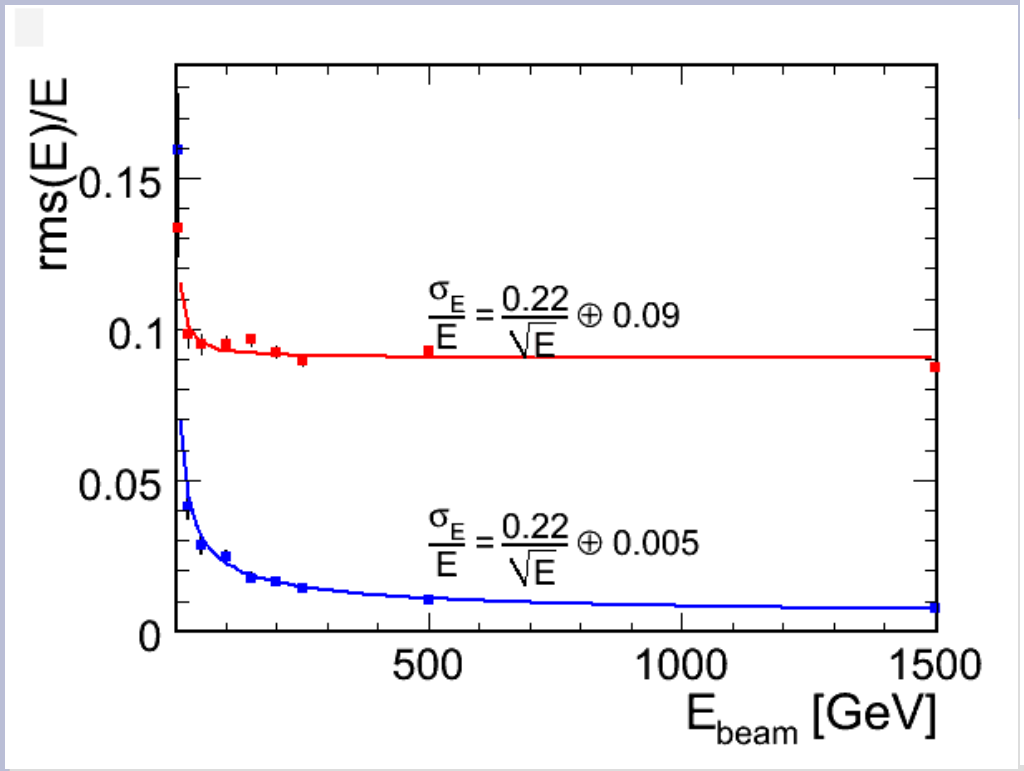
LCAL layer front view

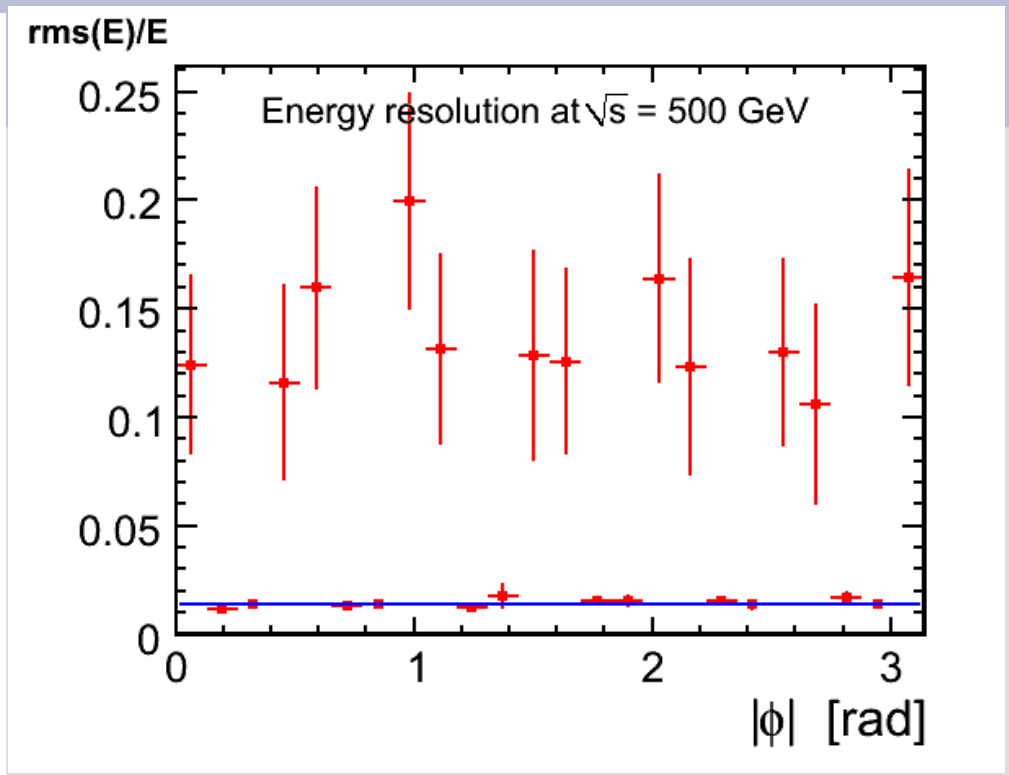


Prameter Name	Default Value	Units
Lcal_z_begin	2500.0	mm
Lcal_phi_offset	0.0	deg
Lcal_n_layers	30	
Lcal_n_tiles	12	
Lcal_nstrips_phi	48	
Lcal_nstrips_theta	64	
Lcal_extra_size	28.8	mm
Lcal_outer_radius	195.2	mm
Lcal_inner_radius	80.0	mm
Lcal_silicon_thickness	0.320	mm
Lcal_support_thickness	0.400	mm
Lcal_tungsten_thickness	3.500	mm
Lcal_layer_gap	0.200	mm
Lcal_tile_gap	1.200	mm
Lcal_sensor_phi_offset	3.750	deg

Note: Setting Lcal tile gap and extra size to 0.
reverts this model to old SLcal02

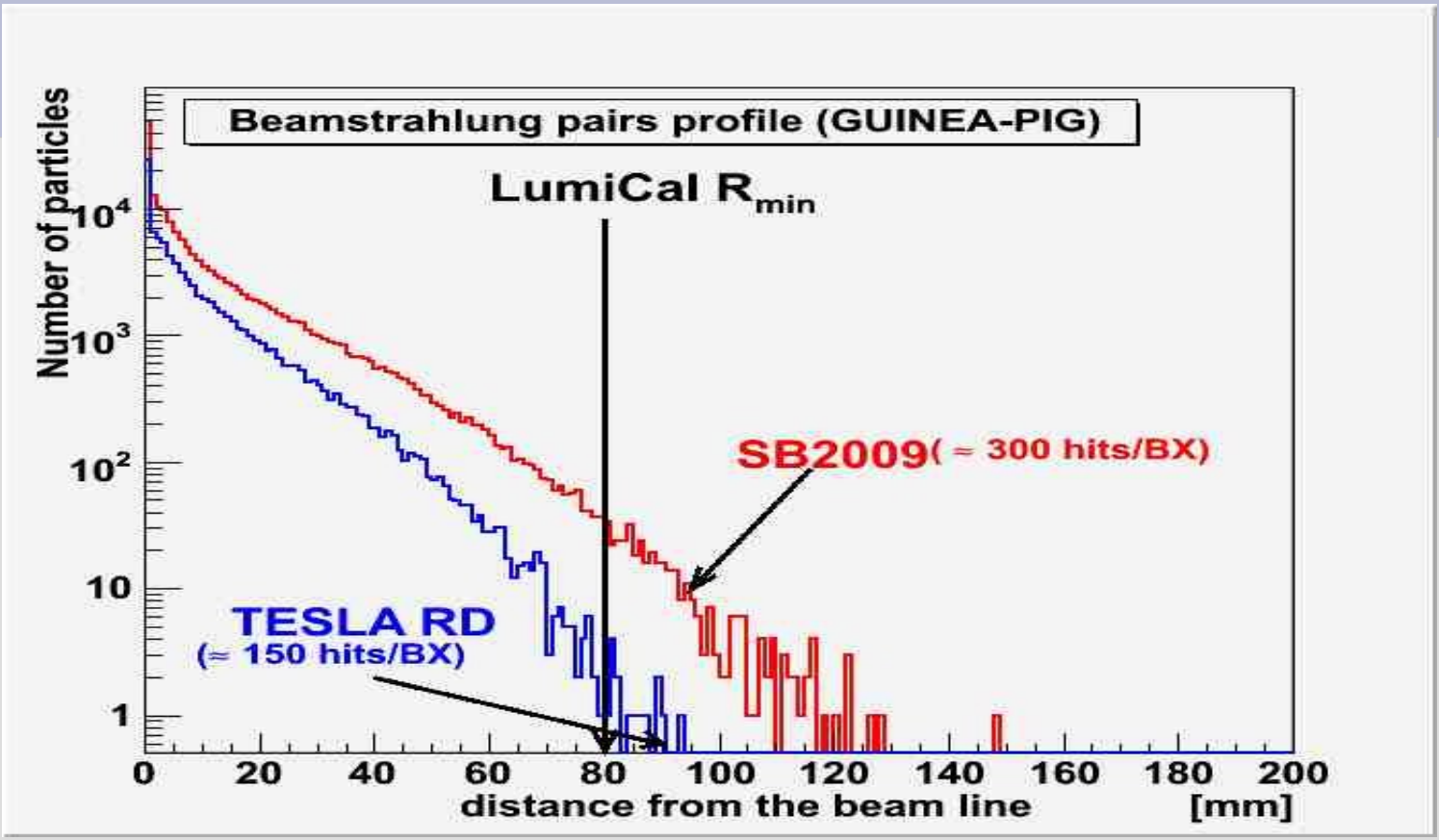
LCAL energy resolution issue (tile gaps)





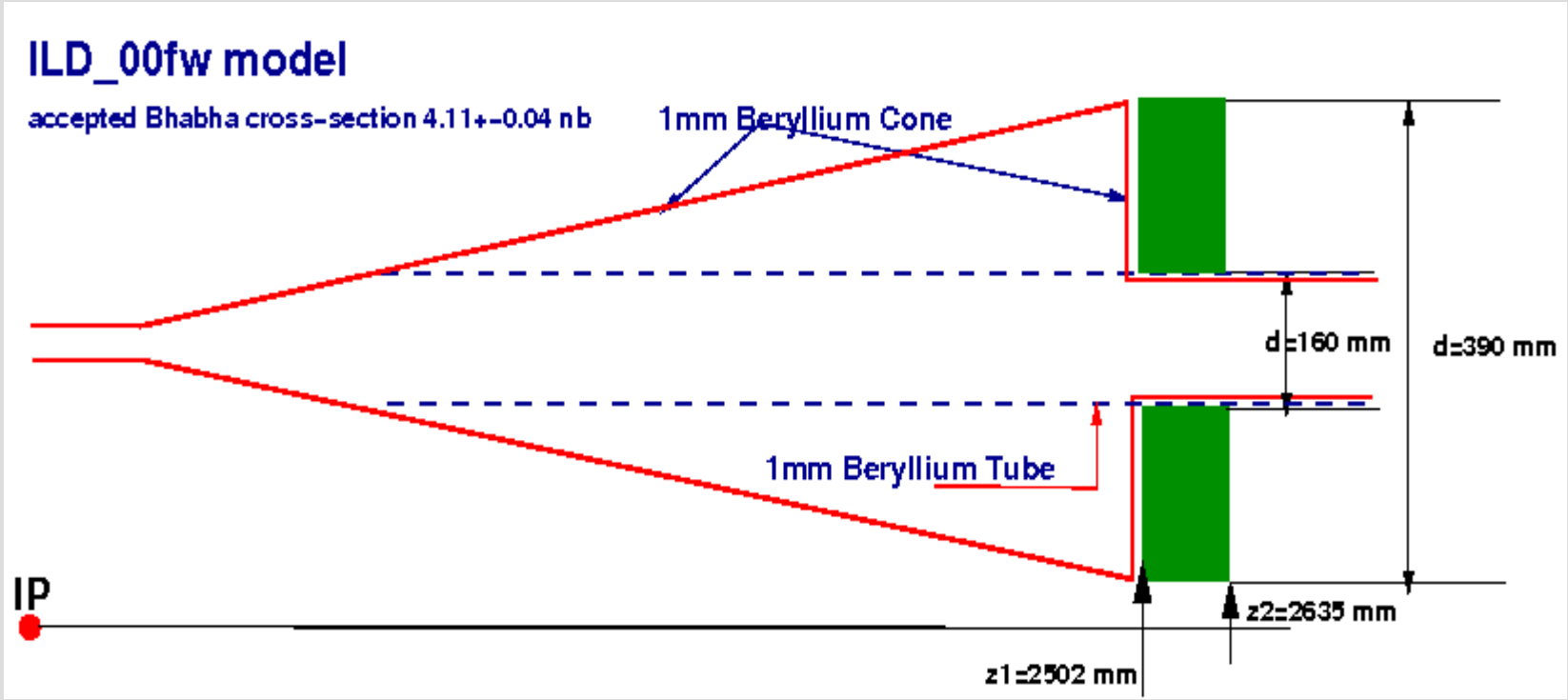
- Simulation done with Mokka, single electron scanning energy 10 – 1500 GeV:
  - dramatic impact of tile gaps on overall LCAL energy resolution
  - need to develop special method to maintain required resolution
  - more data

SB2009 impact



- Significant increase of the background level in LCAL (factor 2) :
  - increase of data volume from 4MB to 8MB per train
  - may introduce reconstruction bias (energy polar angle)
  - may force to increase LCAL inner radius (hermeticity)

Beam pipe shape in front of LCAL



Simulation based on 10^6 Bhabha events (LDC_03Rp model) indicate negligible 10^{-4} impact of beam pipe shape on luminosity measurement error.
Assuming inner radius of tube ~ 80 mm (to avoid secondaries from beamstrahlung and no straw materials in front of LCAL.

LumiCal Status/Plans

- Segmentation/granulation optimization done for old model with Mokka and stand alone Geant3 application
  Need to be redone for new geometry – new benchmarks for more realistic geometry
- Simulation of beam pipe shape, SB2009 done with Mokka
- Simulation of bhabha+beamstrahlung to estimate data volume, detector occupancy
- LumiCal new geometry model implemented, unstable need some more work (pad metalization, cables, cooling)
- Simulation for 1 TeV started and continuing
- Setup for test beam geometry (mid-term this year)
- Need to generate large ~10^6 sample of Bhabha events overlayed with beam background

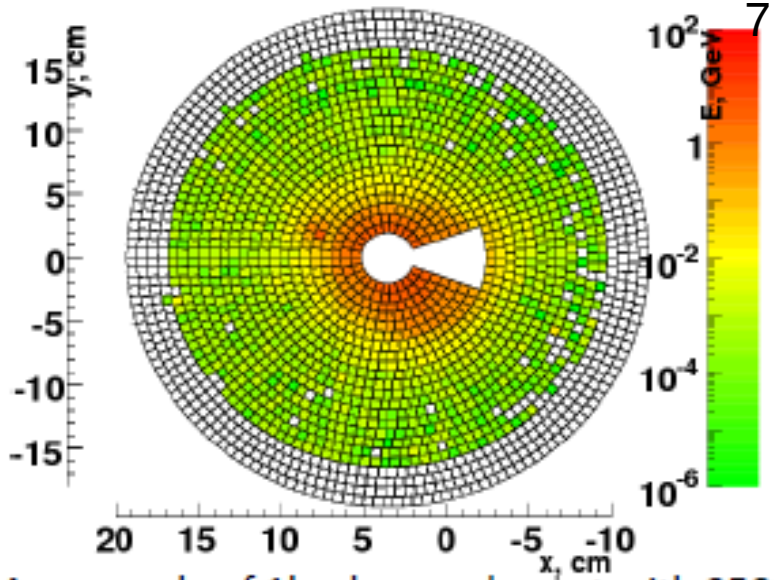
Beam Calorimeter

Main tasks:

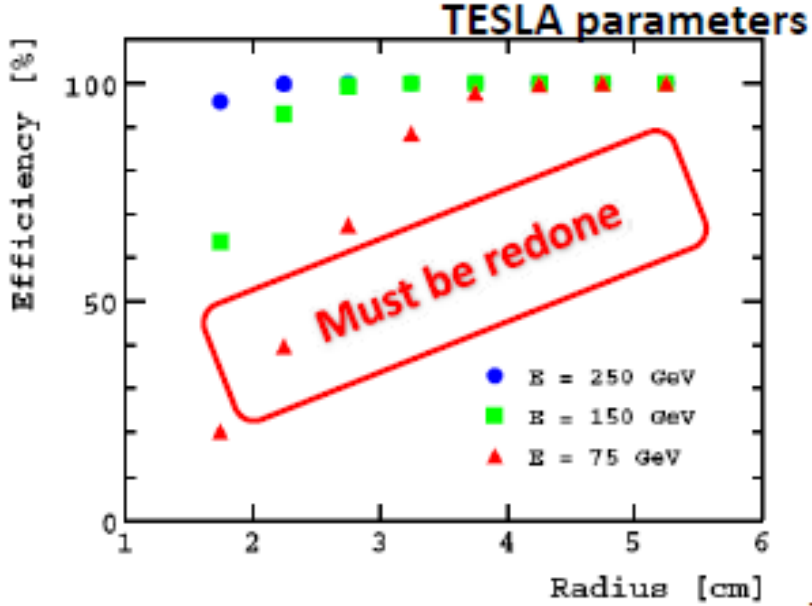
- Highly efficient detection single high energetic electrons (photons) at lowest angles
- Provide a signal for the use of luminosity optimization and beam diagnostics
- Minimize the amount of backscattered particles into the Inner Detector

Simulation tools:

- Guinea Pig (Nom. Par, SB-2009)
- BeCaS (a stand alone Geant4 BeamCal simulation programm)
- Mokka (ILCSoft)
- ROOT



An example of 1background event with 250GeV single high energetic electron



The efficiency to veto an electron of energy 75, 150, 250 GeV as a function of the radius in the BeamCal. (by V. Drugakov, 2006)

BeamCal status (BeCaS+Mokka):

- Optimization of BeamCal segmentation
- Studying beamstrahlung depositions with different beam parameters (Nom. Par., SB-2009)
- Rewriting and implementing of algorithm for single electron reconstruction
- Mokka: Already >1000BX on DESY-Grid
- Comparing Mokka results with BeCaS

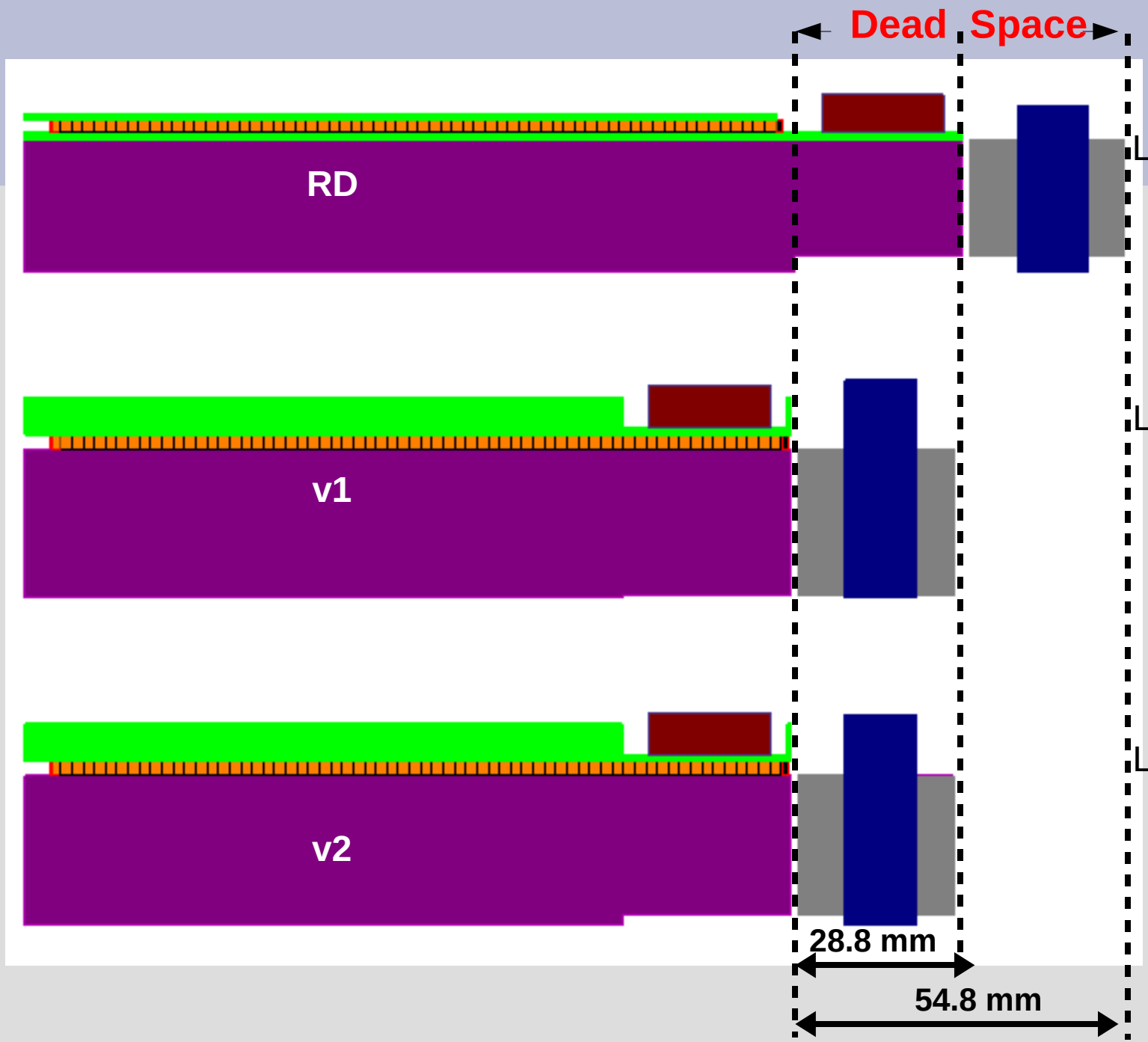
Spare slides

END

- new, closer to reality , implementation of LCAL is ready – will be committed to Mokka repository and available for testing soon

- new LCAL geometry setup with FE electronics moved into sensitive volume causes increase of Moliere radius and extra inhomogeneity structure in sensitive volume

ECAL – LCAL dead-gap issue

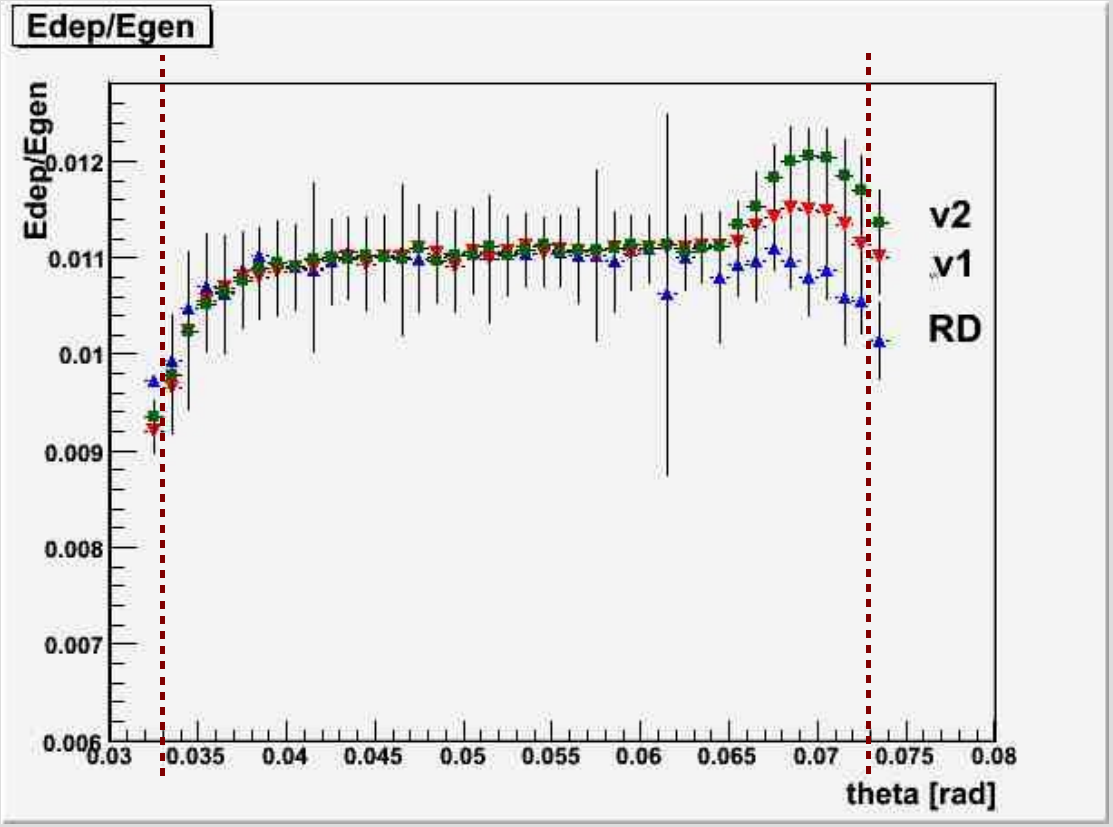


Layer Gap = 0.915 mm
R_M = 11.9

Layer Gap = 1.600 mm
R_M = 14.1 mm

Layer Gap = 1.420 mm
R_M = 13.6 mm

ECAL – LCAL dead-gap issue (cont.)



Reducing dead-gap may cause
- Increased Moliere radius
- Odd behavior of energy deposit as function of polar angle