

AHCAL Optimization Studies: First Results

Outline:

- > Roadmap
- > AHCAL Barrel Implementation
- > Jet Energy Resolution
- > Outlook

Dr. Eduard Avetisyan
AHCAL Optimization Studies
DESY, 9 December 2013

Variety of the Optimization Studies

- > Amount of layers (variable radius/thickness)
- > Ratio of radiator/scintillator thickness
- > Cell sizes (uniform) and
- > Cell sizes (variable)
- > ...



Current Implementation (Barrel only)

Using ILD_o1_v06 as basis, SHcalSc05 driver

> Control variables (also controllable via steering files):

```
G4double Hcal_stave_gaps;           /**<gap between HCAL staves*/
G4double Hcal_modules_gap;         /**<gap between HCAL modules*/
G4int     Hcal_nlayers;             /**<number of HCAL layers (default: 48)*/
G4int     Hcal_barrel_end_module_type; /**<type of the HCAL modules (default: 1)*/
G4double Hcal_fiber_gap;           /**<gap between HCAL fibers*/
G4double Hcal_chamber_tickness;    /**<thickness of the HCAL chambers*/
G4double Hcal_inner_radius;        /**<inner radius of the HCAL*/
```

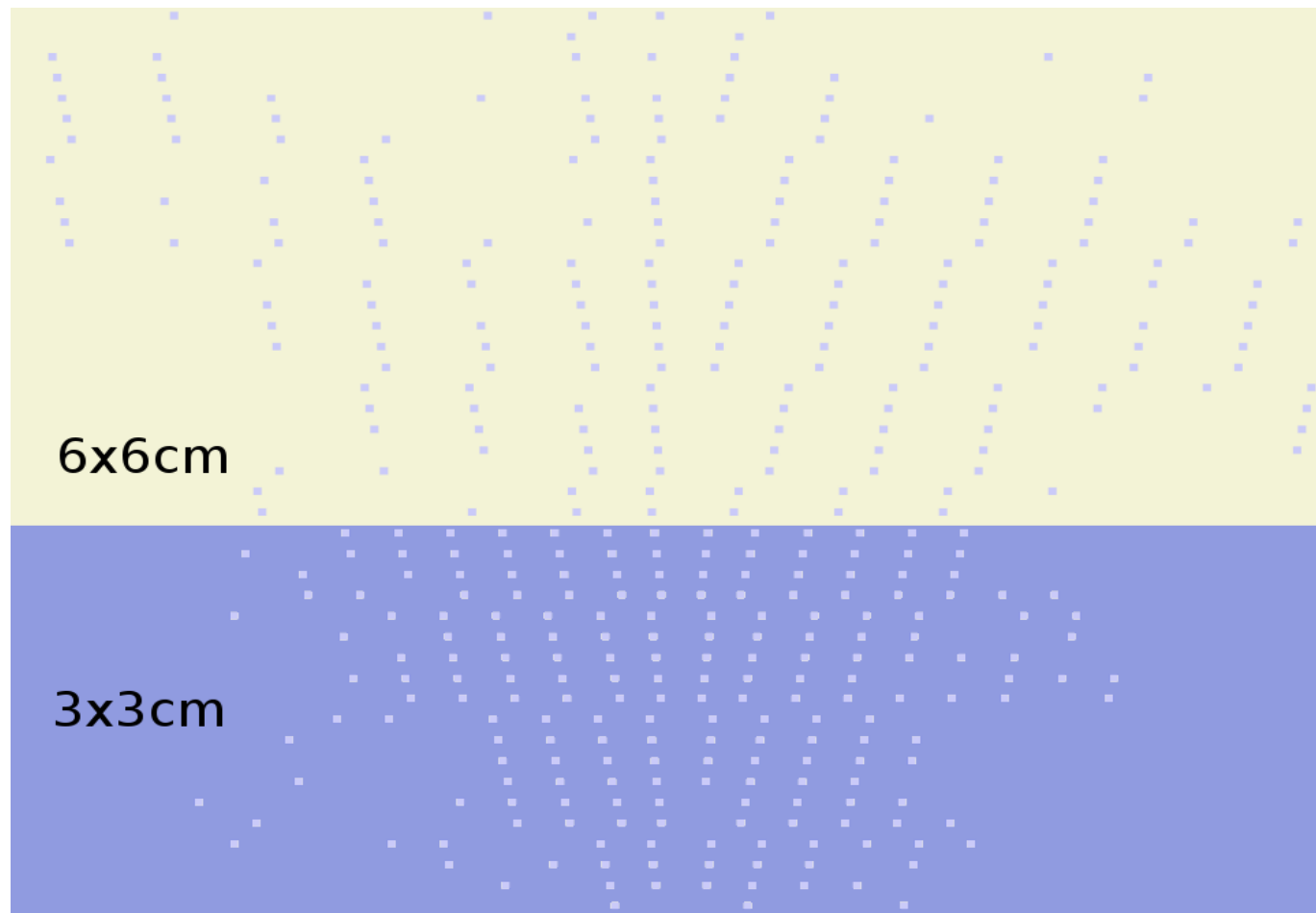
> New implementation:

```
G4int     Hcal_nlayers;             /**<number of HCAL layers (default: 48)*/
G4int     Hcal_nlayers_lowgran;    /**<after which HCAL layers the granularity gets scaled
(default: 48)*/
G4double Hcal_cell_size_lowgran;   /**<A scale parameter telling how much larger should the
cells become after layer=Hcal_cell_size_lowgran*/
G4int     Hcal_barrel_end_module_type; /**<type of the HCAL modules (default: 1)*/
```



Variable Granularity Implementation

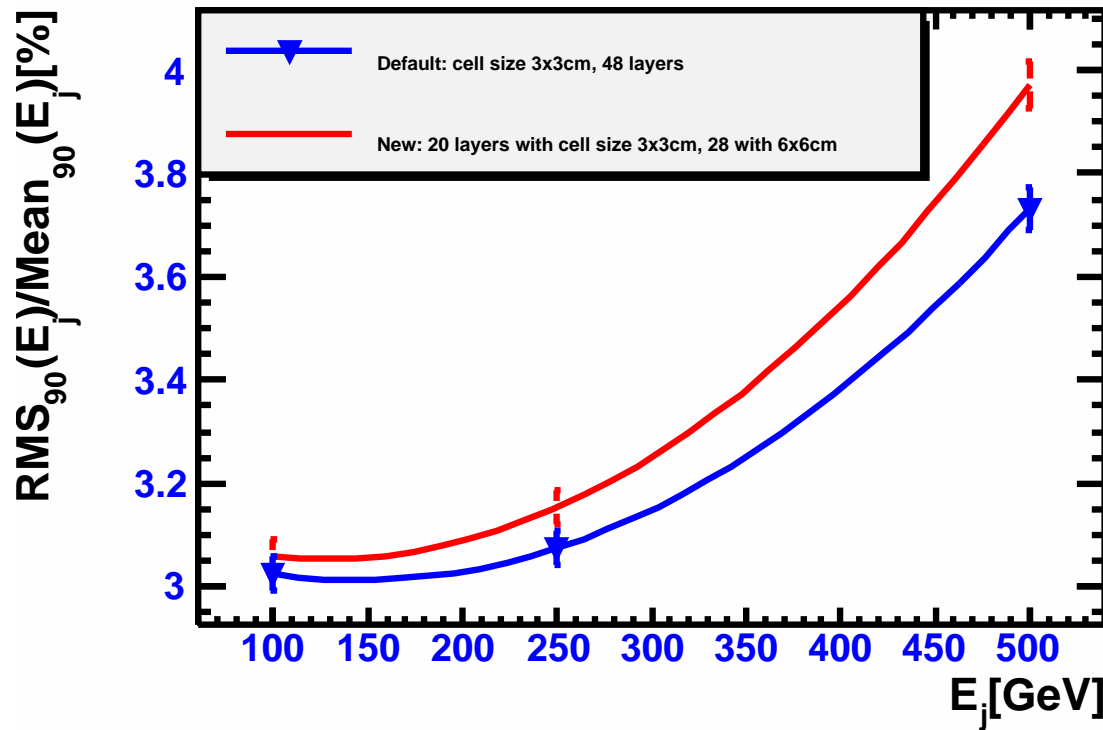
Using π^- gun with 20GeV



Jet Energy Resolution

Using Z' (200,500,1000GeV) generator files from Mark Thomson

And John Marshall's Pandora configuration for jet resolution analysis



Resolution drop by
max 0.5% for 500GeV jets



Next steps:

- > Implement the same for EndCap and Ring
- > Study resolution dependence on number of layers
- > Investigate the splitting of cells on layer boundaries
- > Redo the calibration for various high/low granularity options

Comparison for 1TeV CM Energy jets

