



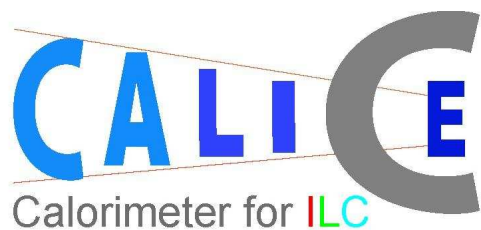
Old DHCAL
New model
Conclusion



A new Digital Hadron Calorimeter in MOKKA

Gabriel MUSA, Emmanuel LATOUR

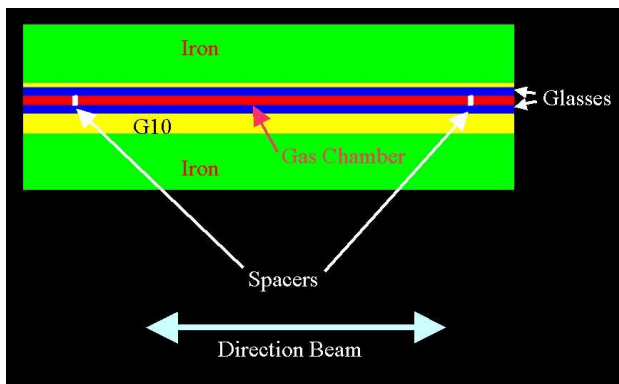
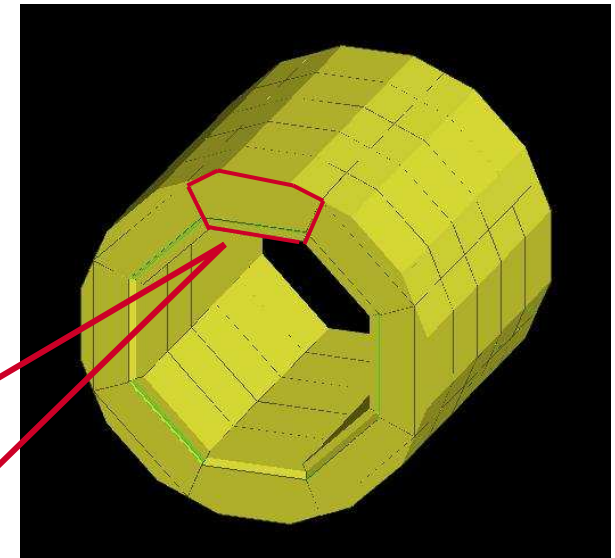
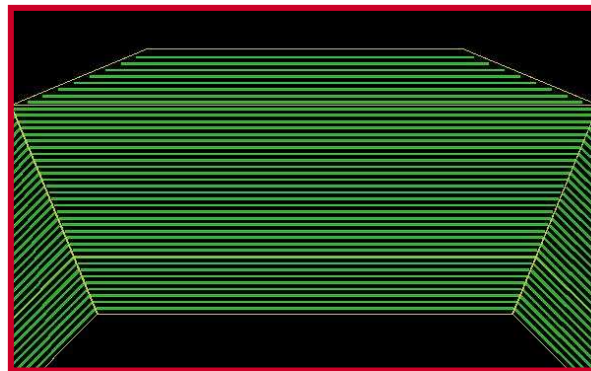
Paulo MORA DE FREITAS



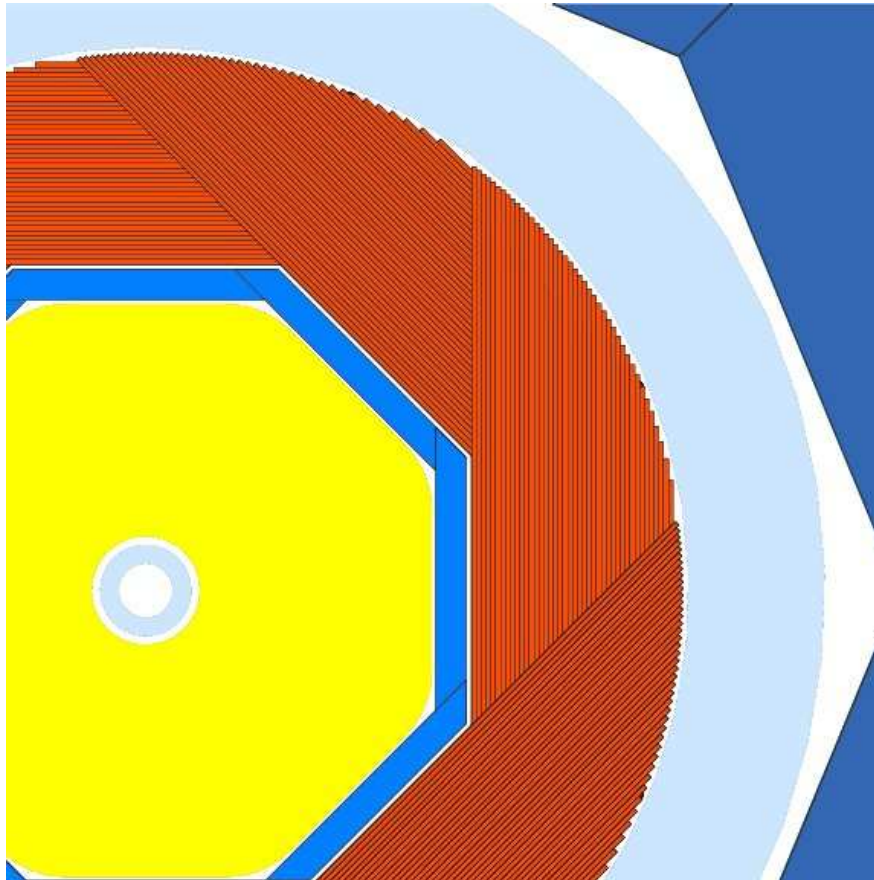
Detector optimization meeting, March 12th 2008

Previous HCAL in MOKKA

- Tesla TDR, in models03
 - Driver= hcal03
 - Absorber=Fe
- Used both for AHCAL and DHCAL



RPC:
gas=TFE+isobutane+N
1×1 cm cells



Barrel

- Geometry proposed by Henri Videau
- 5 modules, 8 staves, 40 layers (2cm steel+6mm RPC)
- Convenient:
 - **No crack**
 - **Solves gas/electrical supply issues**
- Needs studies on mechanical structure

End caps

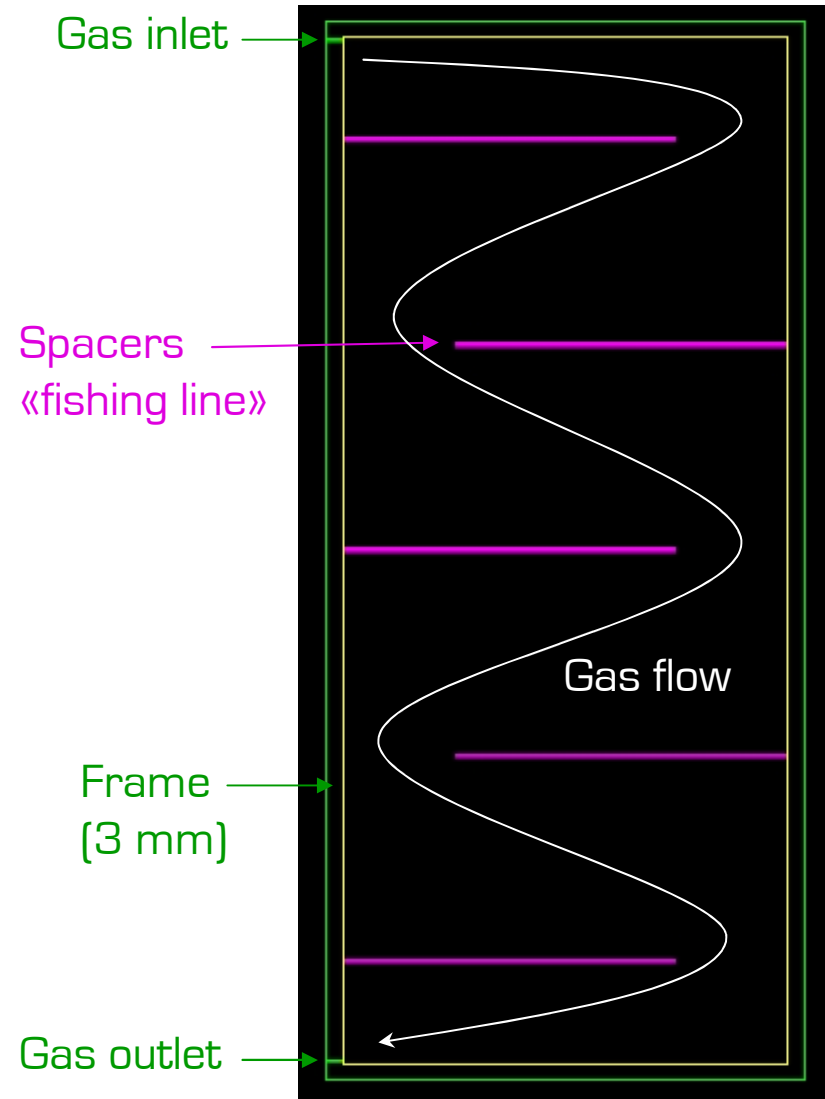
- No new proposal
- kept Tesla TDR

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Geometry
RPC
Materials
Implementation

Overall design

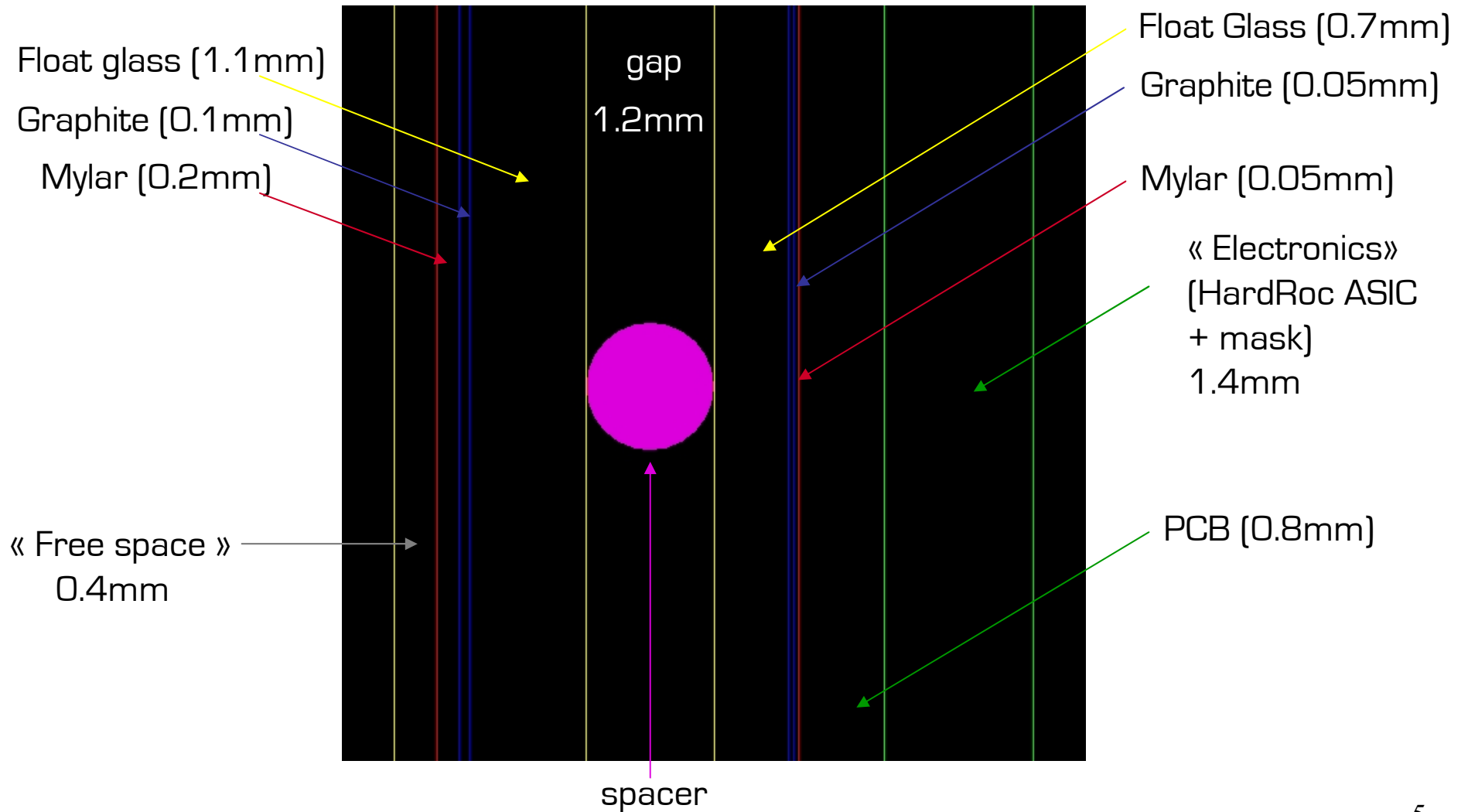
- Inspired by current R&D developments on large dimensions RPC
- Structure more detailed compared to previous MOKKA's RPC
- 40 different sizes (length)
- 6mm of material budget



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Cross section



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Materials used

- Absorber = stainless steel
- New RPC materials required appended to **materials02** DB

Component	Material	Name of material in DB
PCB+Electronics	G-10/FR4 epoxy	g10
mylar	mylar	mylar
graphite	graphite	graphite
glass	quartz+soda+MgO+CaO	FloatGlass
gas	Mixture: TFE(93%)+SF ₆ (2%)+isobutane (5%)	RPCGAS2
spacers	nylon	nylon
frame, gas inlets	PEEK-GF30 (PolyEtherEtherKetone+30% glass fiber	PEEK
free space	air	air

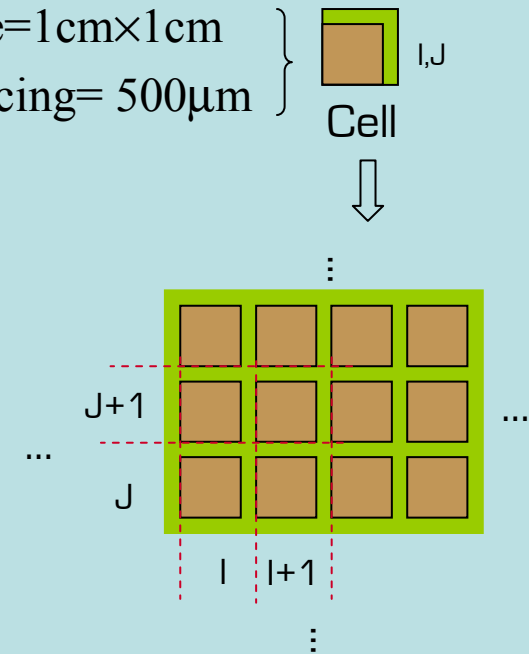
- Available in source/Geometry/LDC

New superdriver : **SHcal04**

- **Barrel**
 - Boolean solid: Tube-Octagon,
 - Filled with steel
- **Modules:** *SHcal04::BarrelVirtualModules*
 - Builds 1 **layer** (for one stave)
 - Fills layer with RPC
 - Builds **staves** by rotating layer
 - Builds modules applying z-offset
 - Loops on 40 layers
- **RPC:** *SHcal04::BuildRPC2Box(...)*

New sensitive detector: **SDHcalSD01**

- Sensitive volume=gas gap (without spacer)
- Pad size=1cm×1cm
- Pad spacing= 500μm



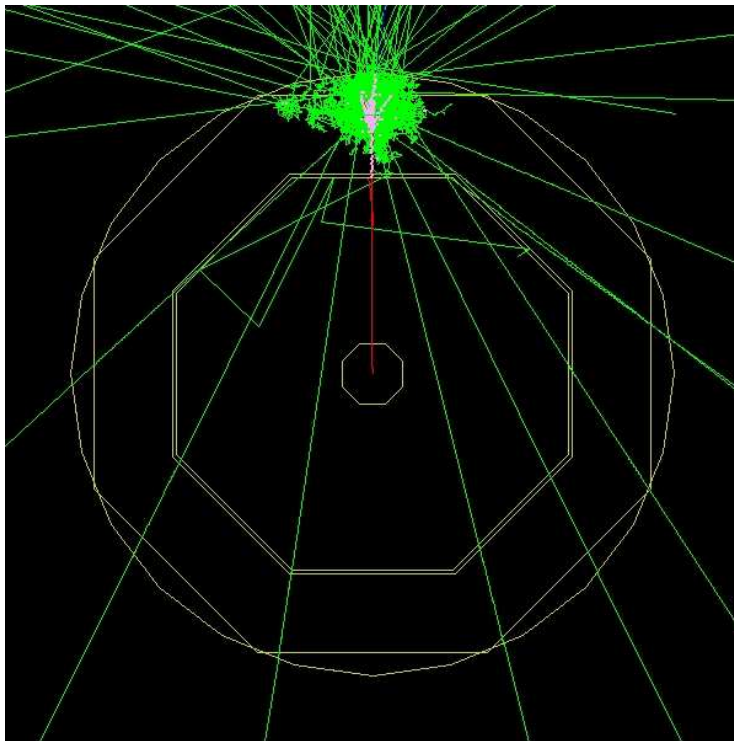
- Geometry debugged, cell ID recovery tested with alternative method

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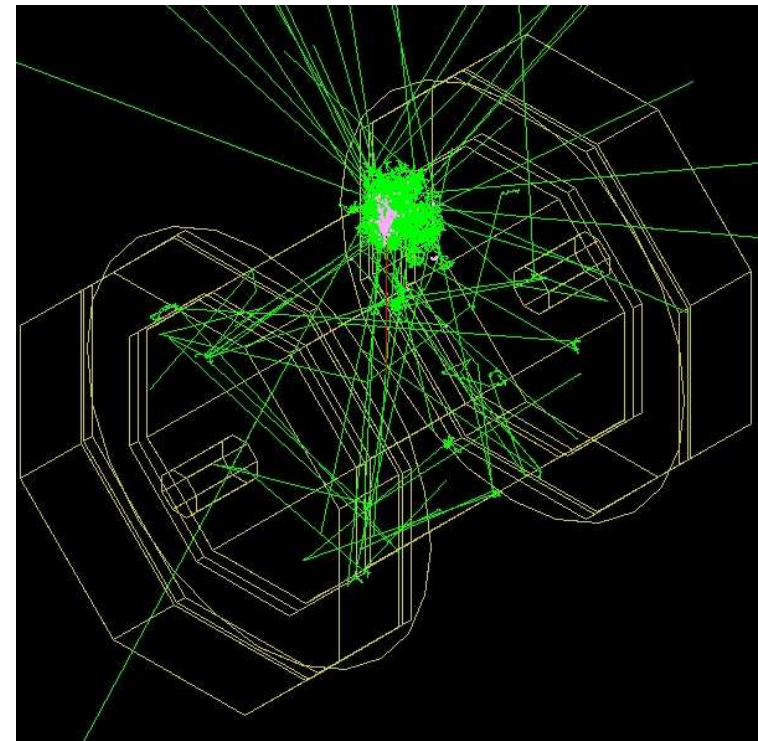
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Example of full DHCAL

Event with a 20 GeV π



Normal to z-axis



Normal to $(1,1,1)$ axis

- New DHCAL model implemented in MOKKA
 - Barrel « à la Videau »
 - End caps unchanged
- Code committed in CVS and DB updated
- Remaining points
 - Need to convert geometry to xml with Mokka GEAR
 - Adjust RPC size to have an integer number of pads
 - Remove hits that fall between two pads
 - Shift central spacer to avoid crack for central module
- Documentation being written