

# Geant4 Simulation for Background Studies

Eugenio for the superb Geant 4 simulation group.

# Mission of the group

- Assess and reduce the impact of backgrounds on
  - the operability,
  - the performances,
  - the life-span of the detector  
for different options and combinations of
- the machine
- the interaction region
- the detector

# Background team turn-over

	he/she was	Now she/he is
Group coordinator	Giovanni Calderini	Eugenio + Marica
SVT	Giovanni Calederini, E.P. G.M.	Giovanni Marchiori E. P.
DCH	Aaron Roodman	Matteo Rama
EMC	Steve Playfer	Claudia Cecchi Stefano Germani
IFR	Gianluca Cavoto	Gianluigi Cibinetto Marcello Rotondo Mauro Munerato
SuperB/Touschek	Manuela Boscolo	Manuela Boscolo

Lot of “know how” migrated to other experiments...

# February goals we met

- ☑ Simulation code able to read a GDML description of the SuperDet. GDMLs written for:
  - ☑ the CDR cylindrical detector used for Bkg Studies
  - ☑ a 0.0 version of the TDR SuperDet
    - ☑ Full simulation of backgrounds events on the 0.0 SuperDet (very small samples... just an appetizer)
- ☑ SuperB Geant4 simulation code put on a “Collaboration Wide” repository. Geant4 & GDML libraries easily available as RPM packages ([Roberto Stroili](#))
- ☑ Wiki page for the documentation ( [Alberto Gianoli](#) )
- ☑ Documentation (E.P., Mauro Munerato)
- ☑ Pairs production (Diag36) to Geant4 interface

# February goals we did not met

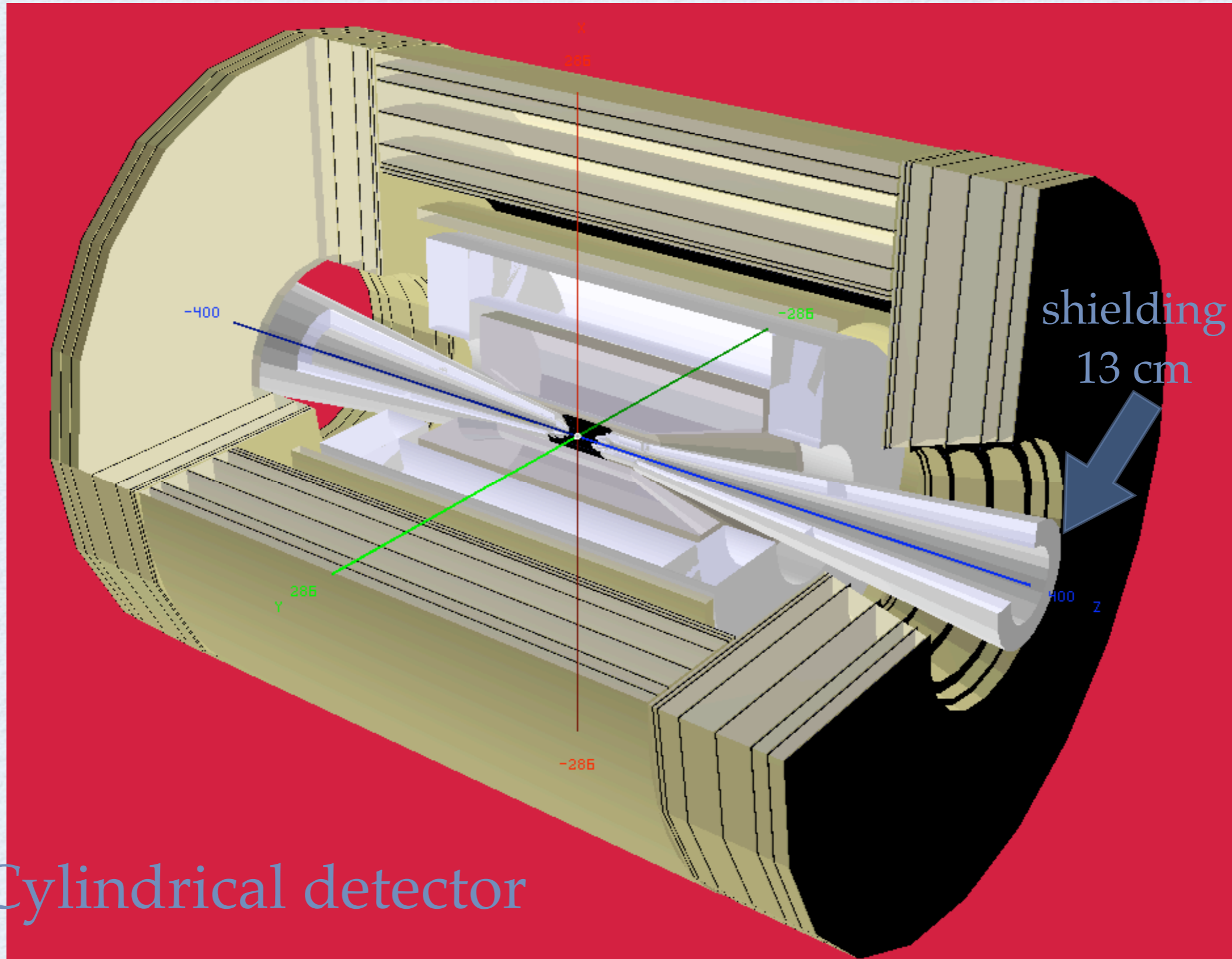
- ❑ SVT layer0 readout electronics dose evaluation
- ❑ Detailed documentation and how-tos
- ❑ Detailed comparison of the C++ CDR cylindrical detector simulation against the GDML one:
  - ❑ Geometrical comparison of the GDML detector with the C++ looks fine

# What the group showed before this Meeting

	Radiative Bhabha	Pairs production	Touschek	Single beam (non Toushek)
SVT	Done	“Done” without Geant4 simulation*	“Done” with limited statistic LER only, beam line unrealistic*	To do
DCH	Done	To do	To do	To do
EMC	Done	To do	To do	To do
IFR	Done	To do	To do	To do

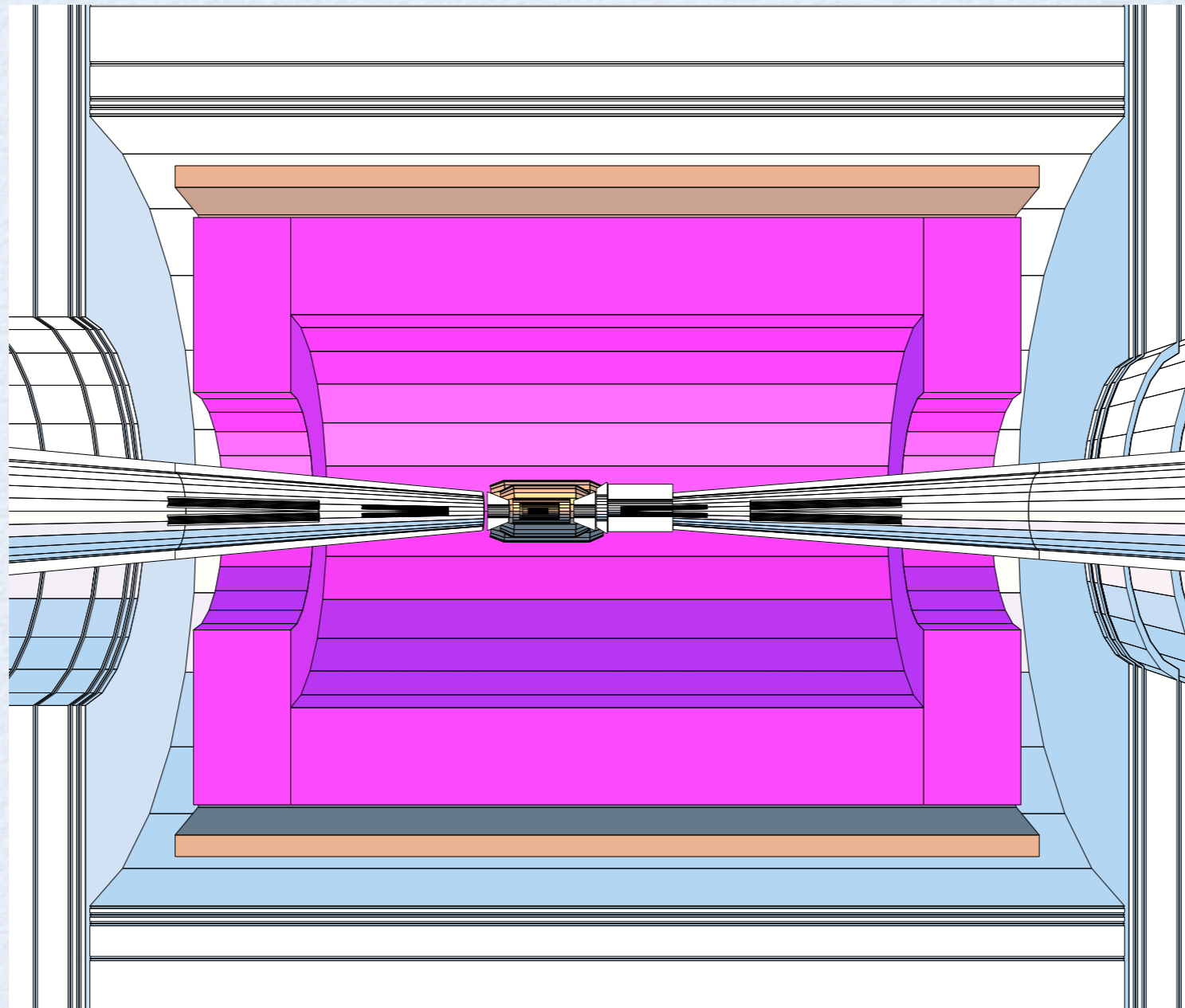
\*See Giovanni Marchiori SVT talk

# CDR starting point



Cylindrical detector

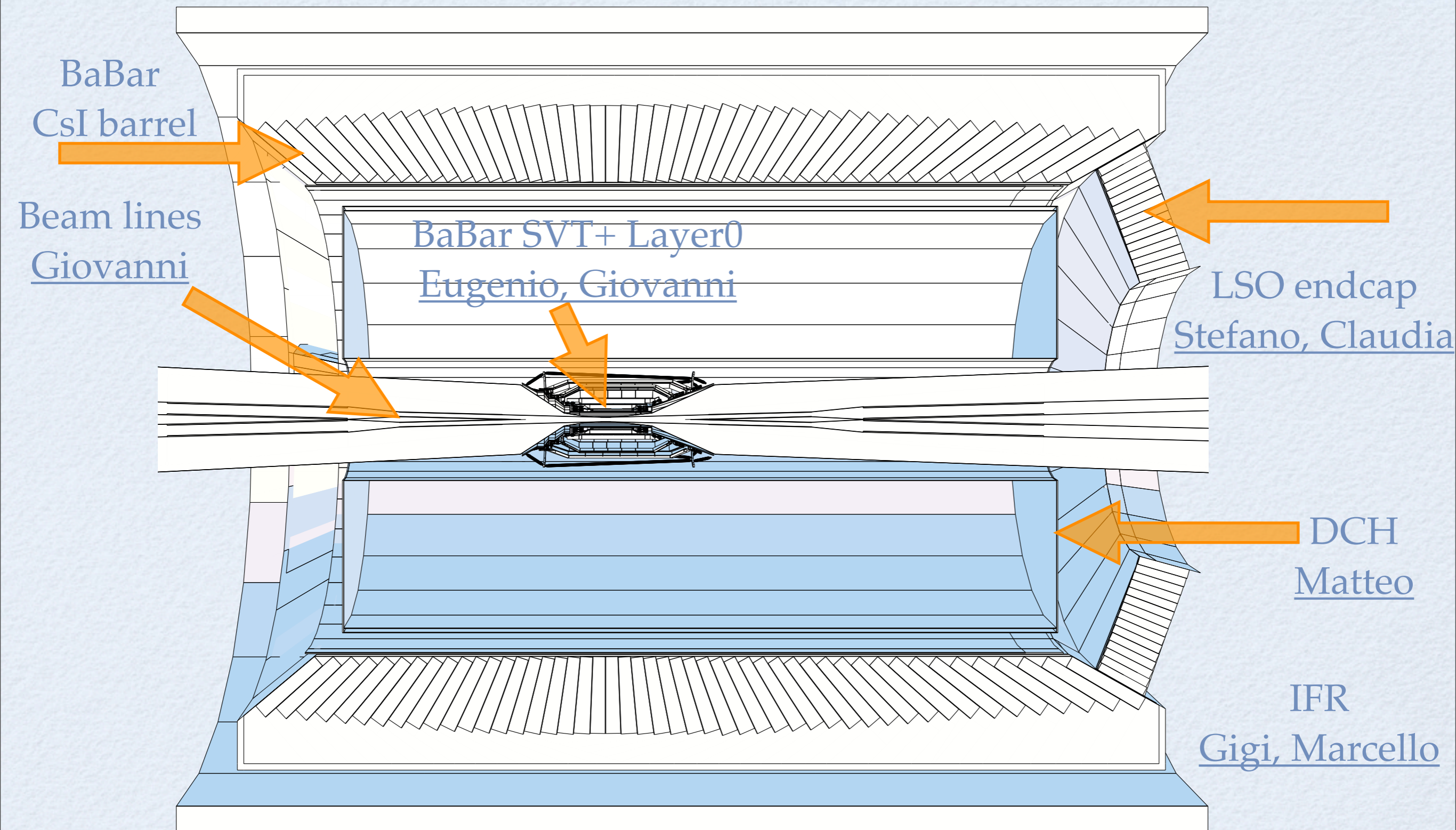
# CDR detector (coded in GDML)



- Cylindrical detector automatically translated from C++ to GDML by the simulation code then read back from GDML
- Same exercise done with Geant4 BaBar model

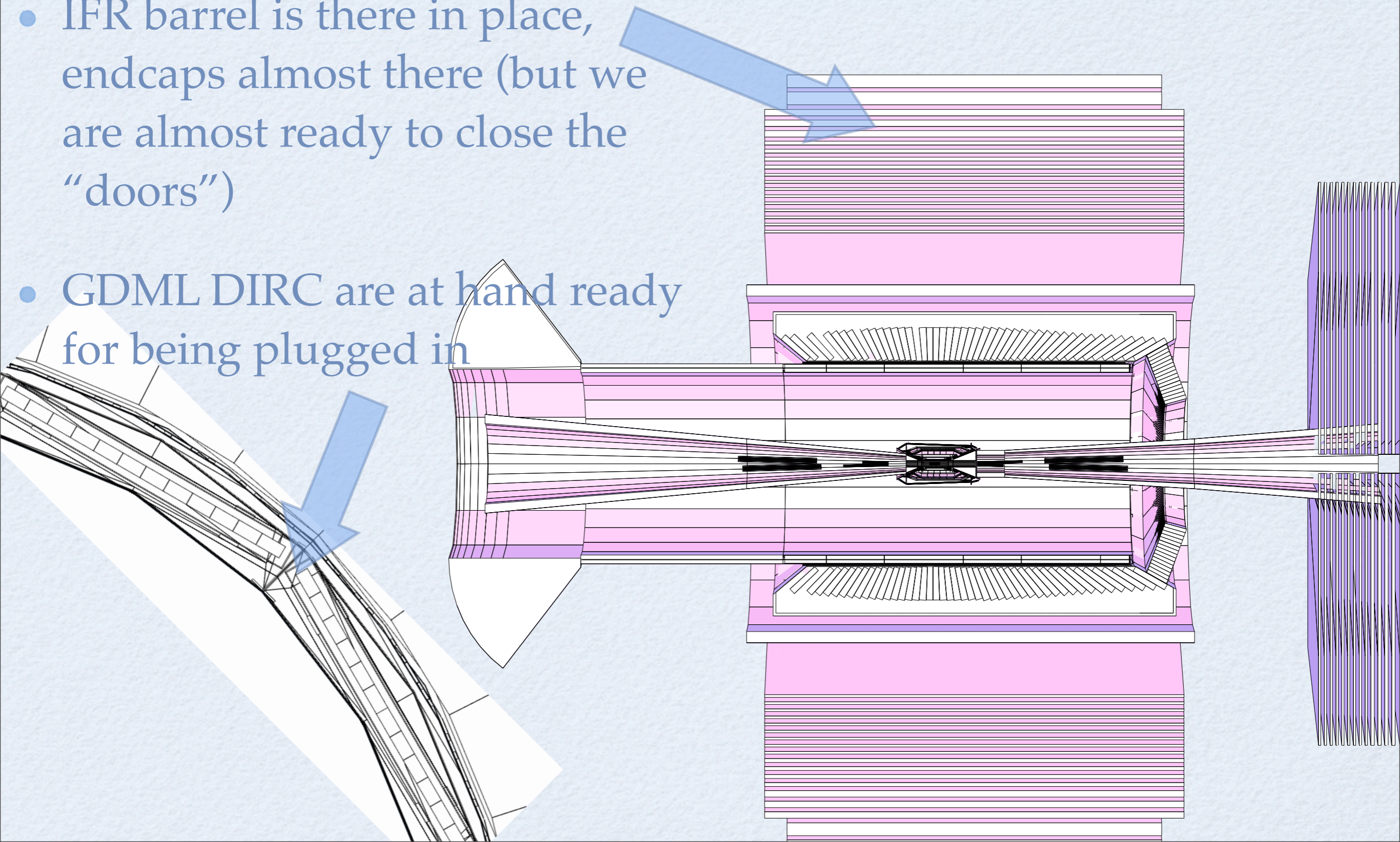


# TDR SuperDet release 0.0



# IFR & DIRC

- IFR barrel is there in place, endcaps almost there (but we are almost ready to close the “doors”)
- GDML DIRC are at hand ready for being plugged in



# Geant4 simulated sample

- (Last minute) Production of small background samples
  - Touschek HER+LER (thanks to Manuela Boscolo) ( $\sim 1000$  macro particles)
  - Radiative Bhabhas (10 bunch crossing. CPU time: 1 min/crossing)
  - Pairs production (700 events)

# To Do list (urgent)

- **Enlarge the group:** we are eagerly looking for
  - experienced Geant4 developers willing to help us
  - C++ newbies willing to learn Geant4  
(and the Physics that the geant simulates)
  - detectors/backgrounds experts willing to give us wise advices
  - detectors/backgrounds experts wannabes that desires to learn from

# To Do list (will be urgent in couple months)

- Produce bigger samples: backgrounds and single particles event to validate the simulation
  - CPU / disk-space requirements
  - book-keeping
  - job submission management
  - **If you want to help us you are welcome!**

# Next steps (goals for the next meeting)

- Analyse in details the Radiative Bhabha, pairs production and Touschek background samples (SVT, DCH, EMC, IFR)
- Write the documentation
- Have a first look at single beams (non Touschek) backgrounds

# Conclusions

- The background team activities revived
- Lot of work done by dedicated, and over-committed, people
- We have a very detailed description of the detector to begin to play with
- Join us! To teach/learn.