Beam-gas background estimation for FTOF detector

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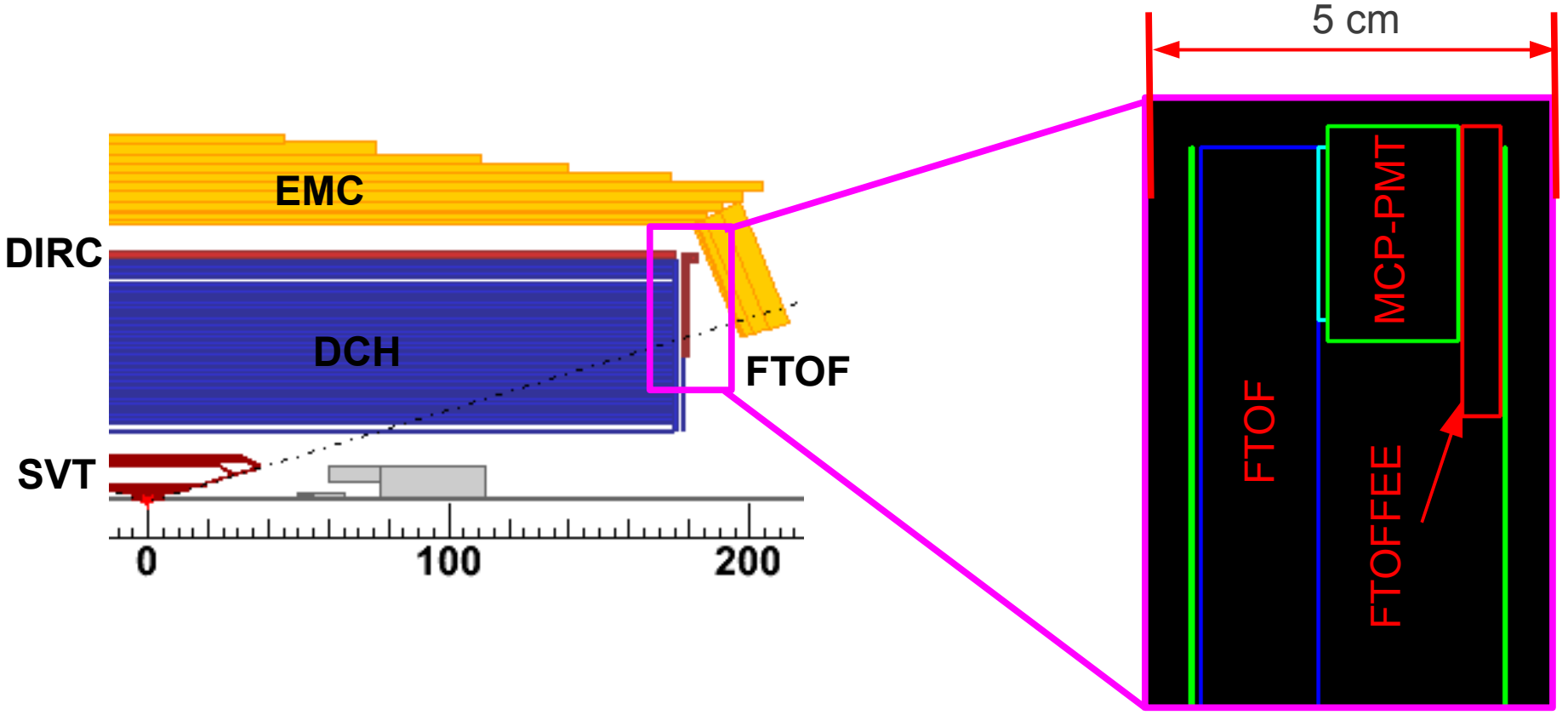
Outlook

- FTOF geometry reminder
- Gammas
- Neutrons
- Electrons
- Background Cherenkov photon rate and timing
- Absorbed dose
- Conclusions

LABORATOIRE DE L'ACCÉLÉRATEUR LINÉAIRE

SuperB

Geometry reminder



Total surface of the FTOF detector (quartz tiles) is = 1.71 x 10^4 cm^2

Mass of the FTOF is = 56.4 kg

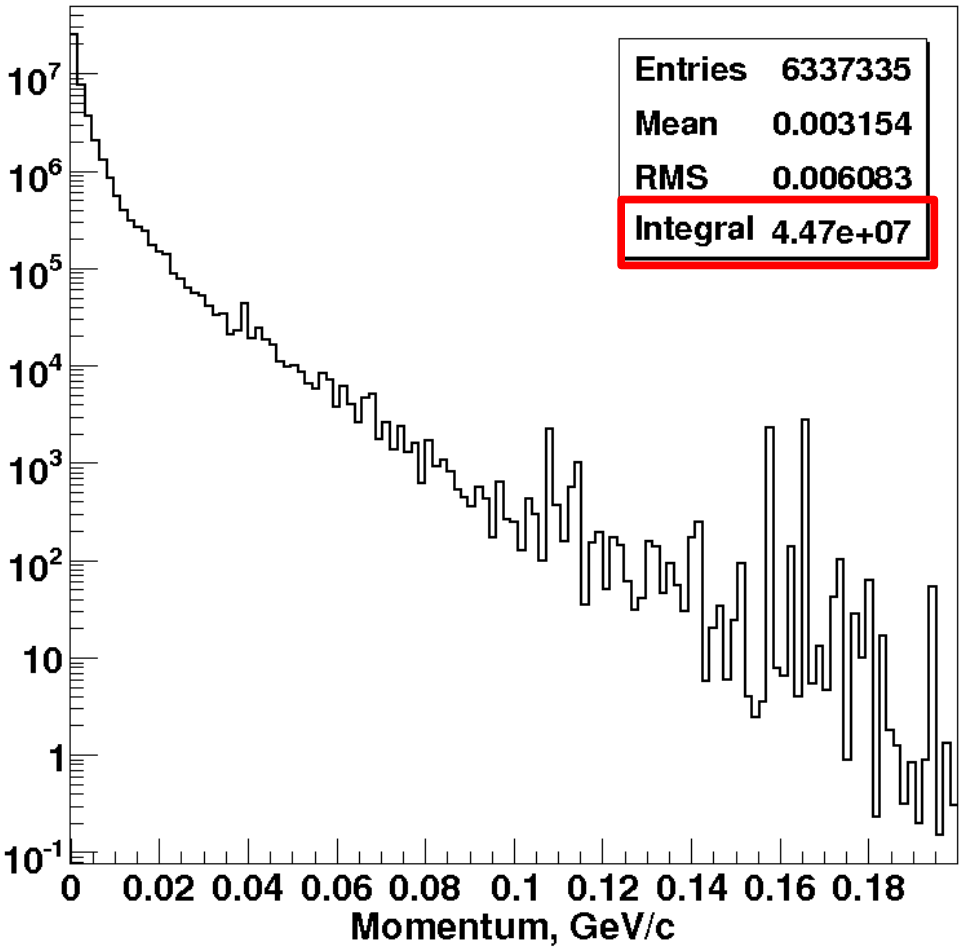
Total sensitive surface of the MCP-PMTs is = 813.12 cm^2

Total surface of the FTOFFEE is = 1.31 x 10^3 cm^2

Mass of the FTOFFEE is = 1.5 kg

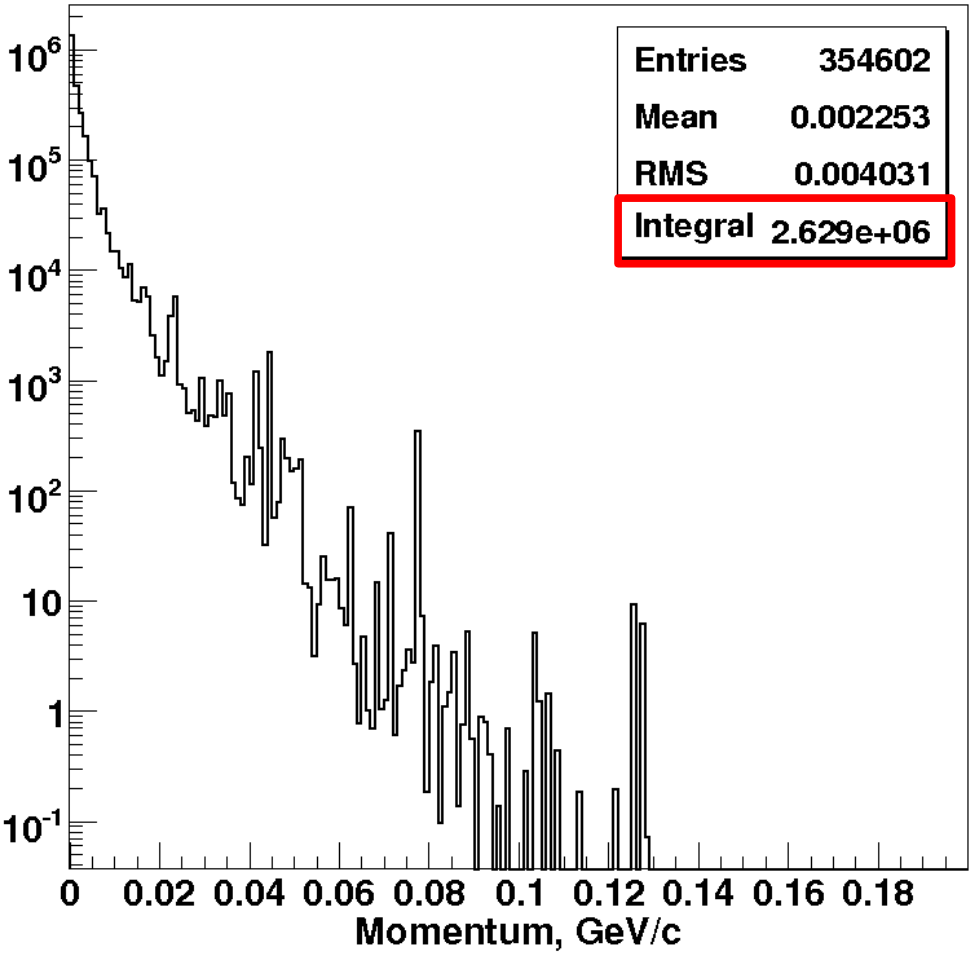
Gamma

FTOF:



~ 2.6 kHz/cm^2

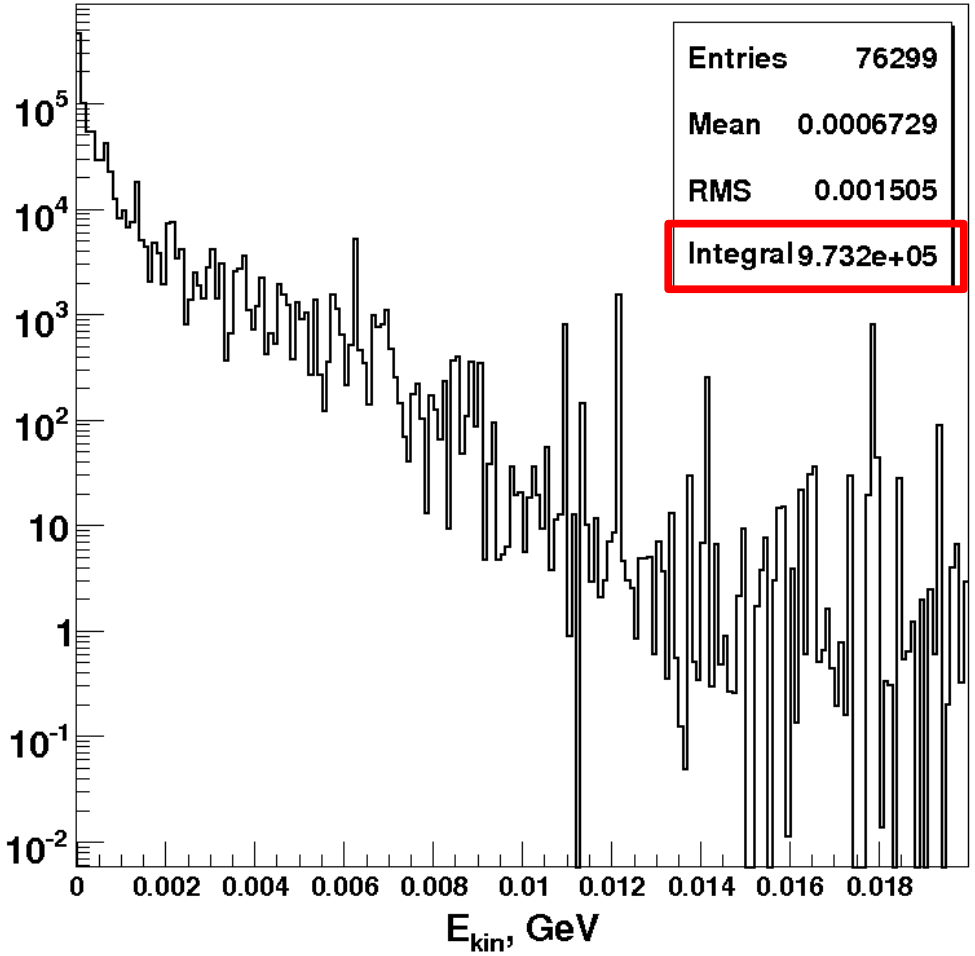
FTOFFEE:



~ 2.0 kHz/cm^2

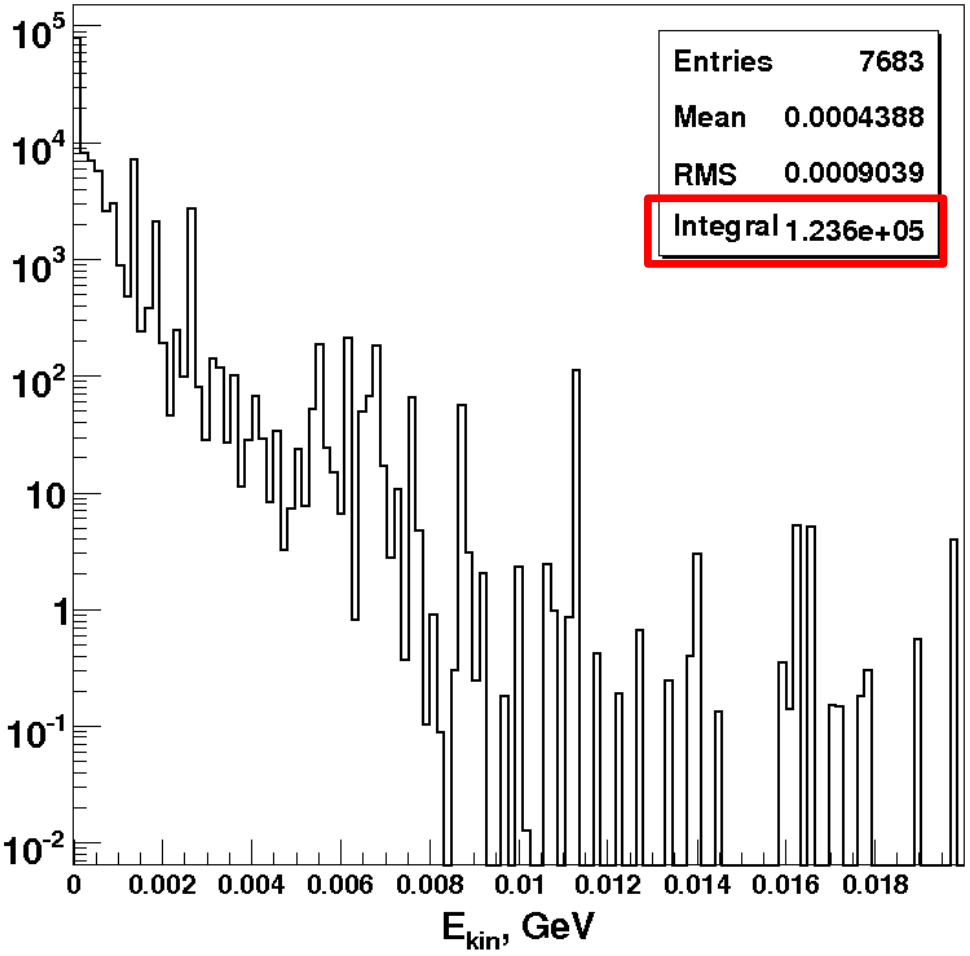
Neutrons

FTOF:



~ 57 Hz/cm^2

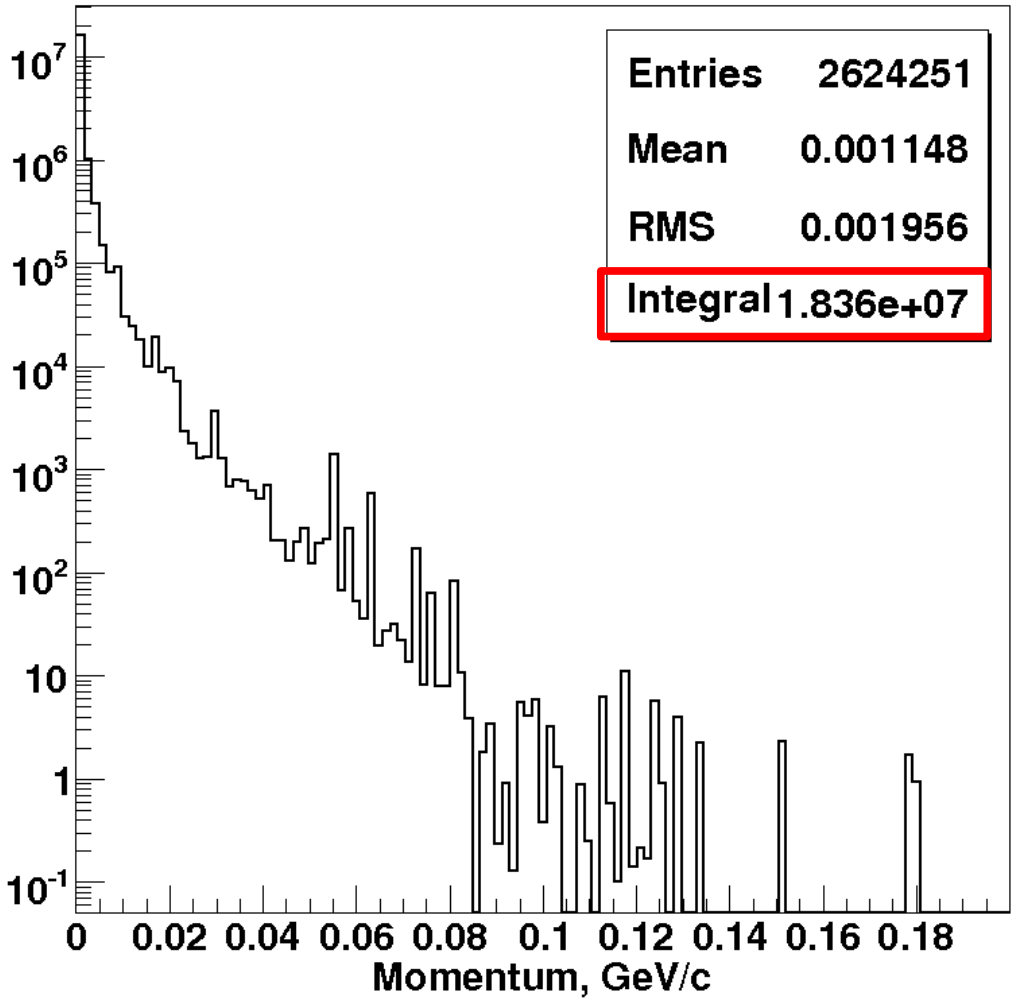
FTOFFEE:



~ 94 Hz/cm^2

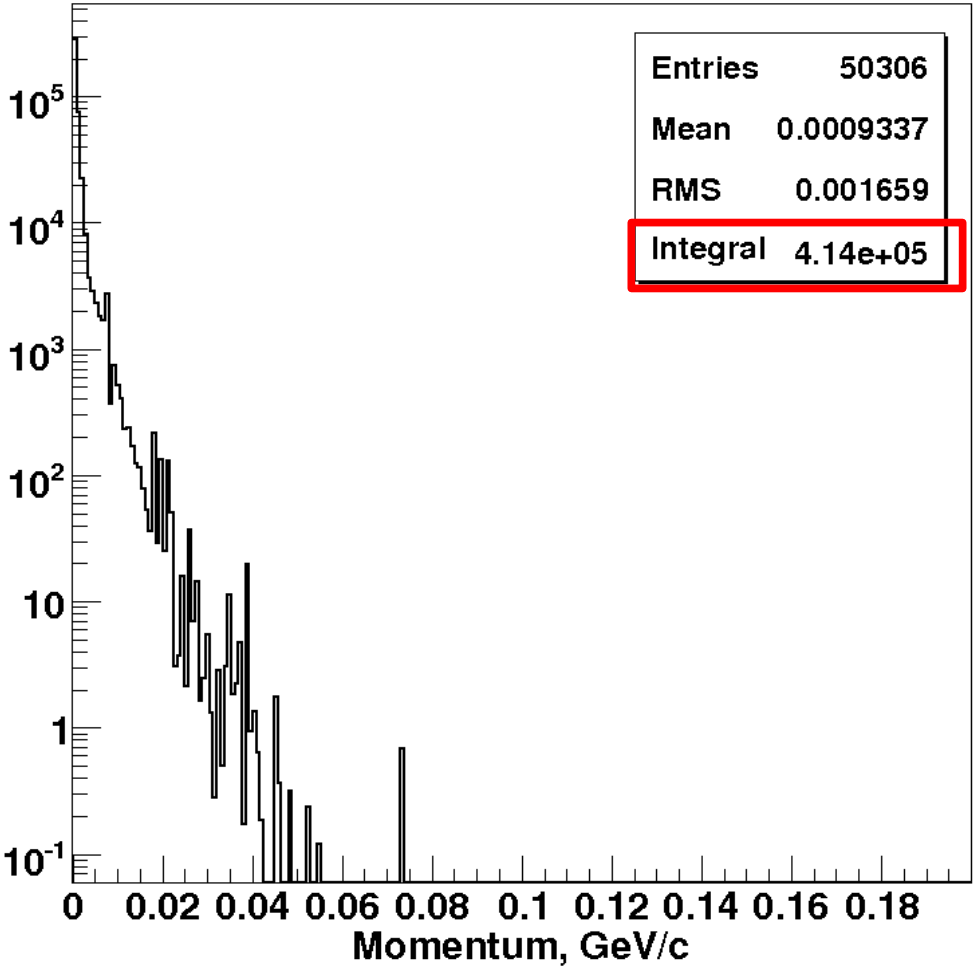
Electrons

FTOF:



~ 1.0 kHz/cm^2

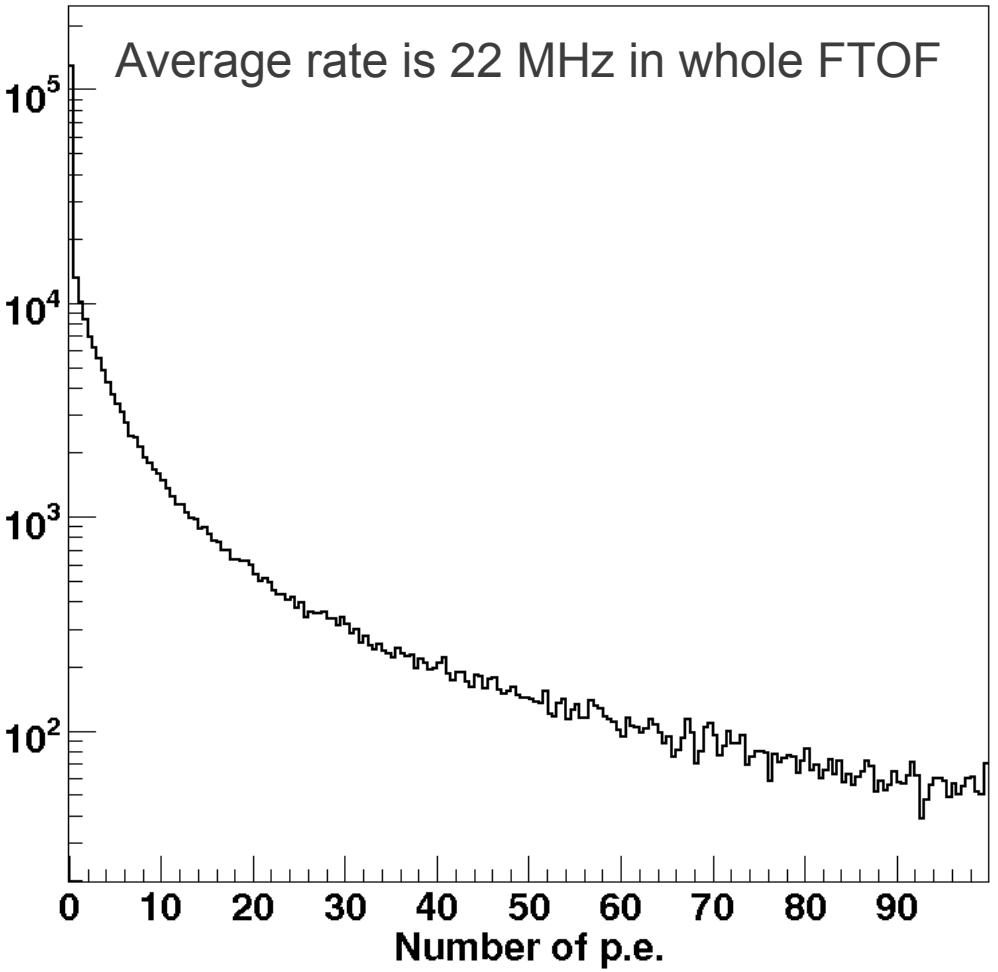
FTOFFEE:



~ 0.3 kHz/cm^2

Rate of the background photons

To calculate the background photon rate we use Jerry's method

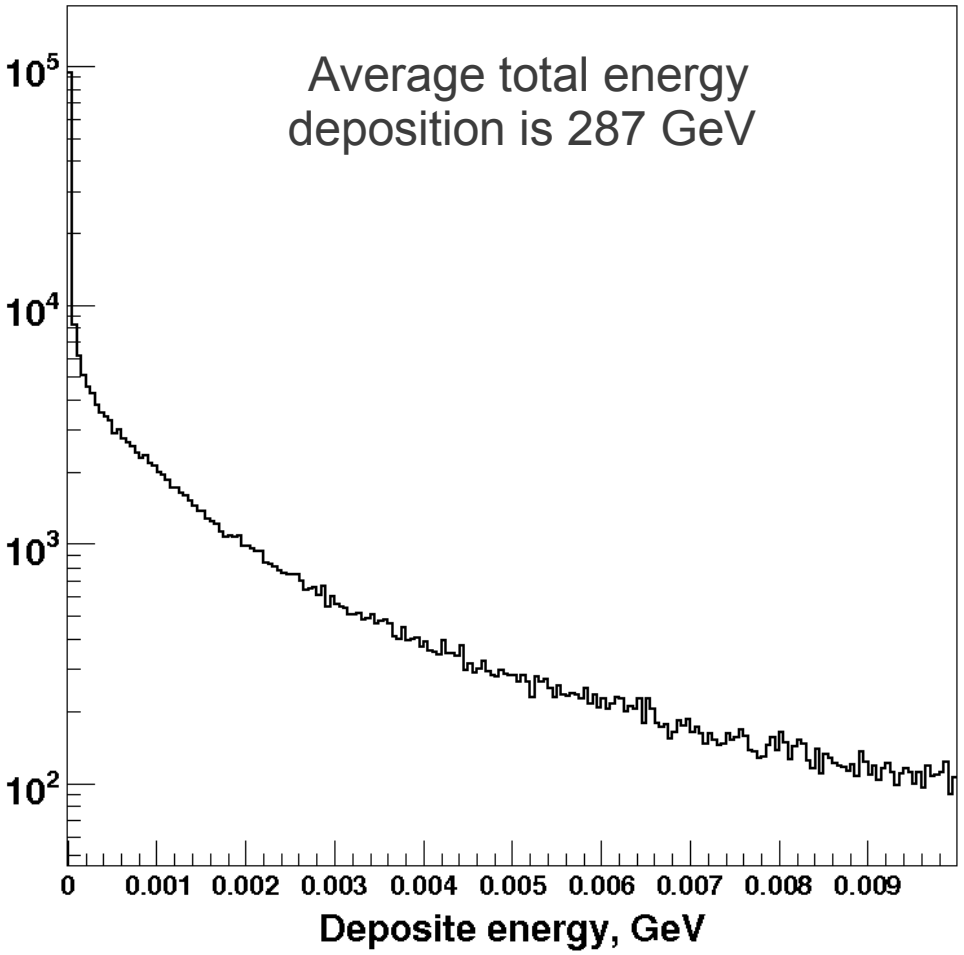


Rate: ~27.4 kHz/cm^2

NOTE: this rate shows how many photo electrons are produced per one cm^2 of the MCP-PMT sensitive area in one second.

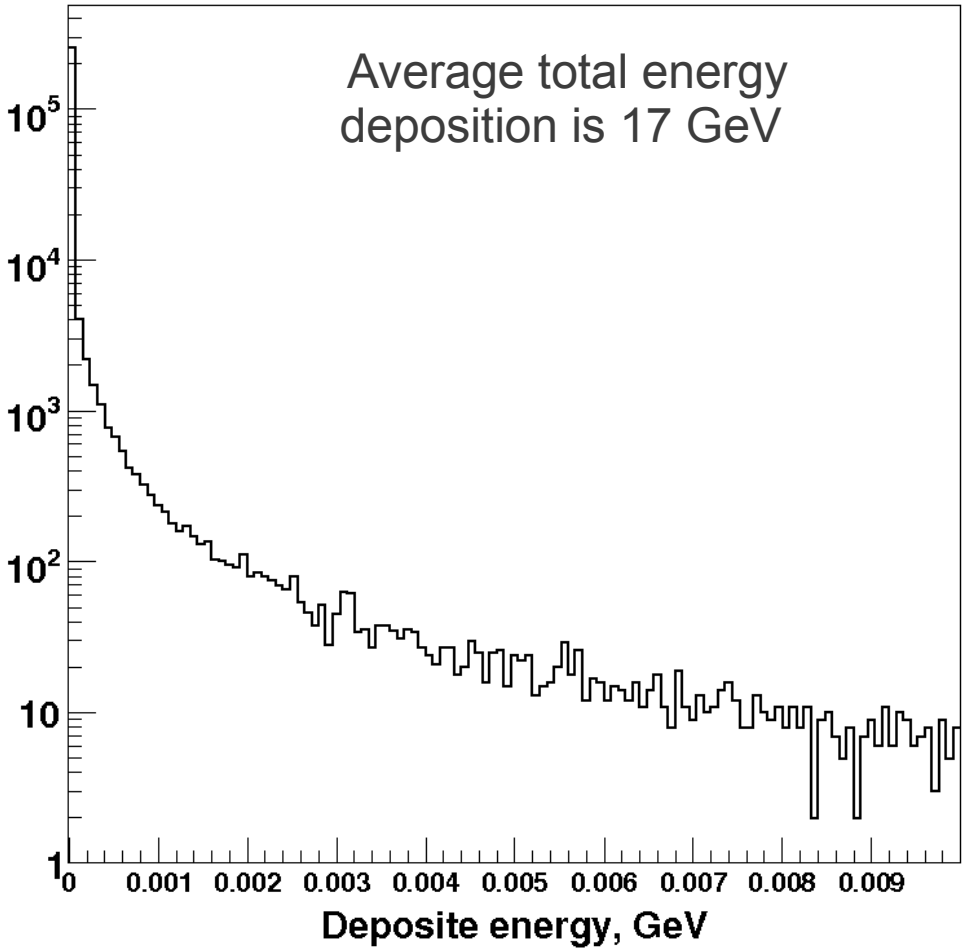
Absorbed dose

FTOF:



~ 16 Rad/year

FTOFFEE:



~ 34 Rad/year

Conclusions

	LER (Touschek):	Beam-gas:	Radiative Bhabha:
Gammas	~2.3 kHz/cm^2	~2.6 kHz/cm^2	~ 77 kHz/cm^2
Neutrons	~135 Hz/cm^2	~57 Hz/cm^2	~ 12 kHz/cm^2
Photo electrons	~2.2 kHz/cm^2	~22 kHz/cm^2	~ 460 kHz/cm^2
Doses	~0.7 Rad/year	~16 Rad/year	~1.4 kRad/year

Do not understand the difference in these numbers

Implementation of the Cherenkov physics for the FTOF detector

L. Burmistrov

3nd SuperB Collaboration Meeting @ INFN-LNF

Outlook

- Implementation of the Cherenkov physics into Brn
- Test
- Observed problems
- To do list

Implementation of the Cherenkov physics into Brn

→ Developed code for the FTOF detector is based on the FDIRC code

→ File list :

New files

./BrnPID/src/BrnFtofActions.cc
./BrnPID/include/BrnFtofActions.hh

./BrnPID/src/BrnFtofGHit.cc
./BrnPID/include/BrnFtofGHit.hh

./BrnPID/src/BrnFtofSD.cc
./BrnPID/include/BrnFtofSD.hh

./BrnPID/src/BrnRootFtofHit.cc
./BrnPID/include/BrnRootFtofHit.rdl

./BrnRunTime/OpticalPropertiesFTOF.mac

Surface and material properties of FTOF detector

Updated files

./BrnPID/include/Brn_PID_LinkDef.rdl

./BrnApp/src/Bruno.cc
./BrnApp/include/Bruno.hh

./BrnApp/src/BrnVolumeSensitivizer.cc
./BrnApp/include/BrnVolumeSensitivizer.hh

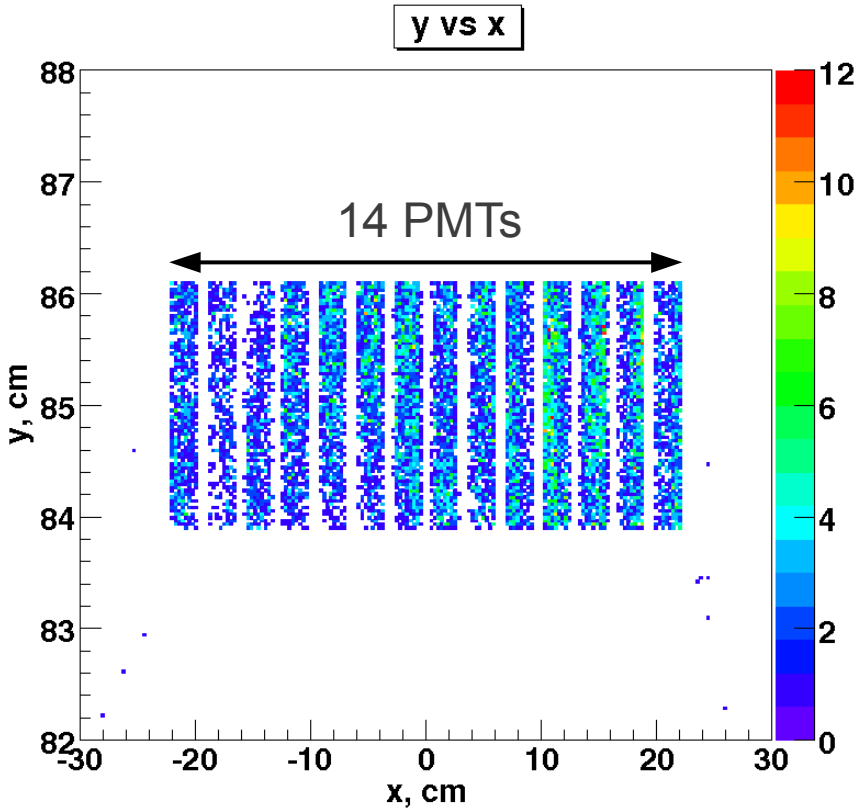
./BrnCore/src/RootEvt.cc
./BrnCore/include/RootEvt.hh

Test

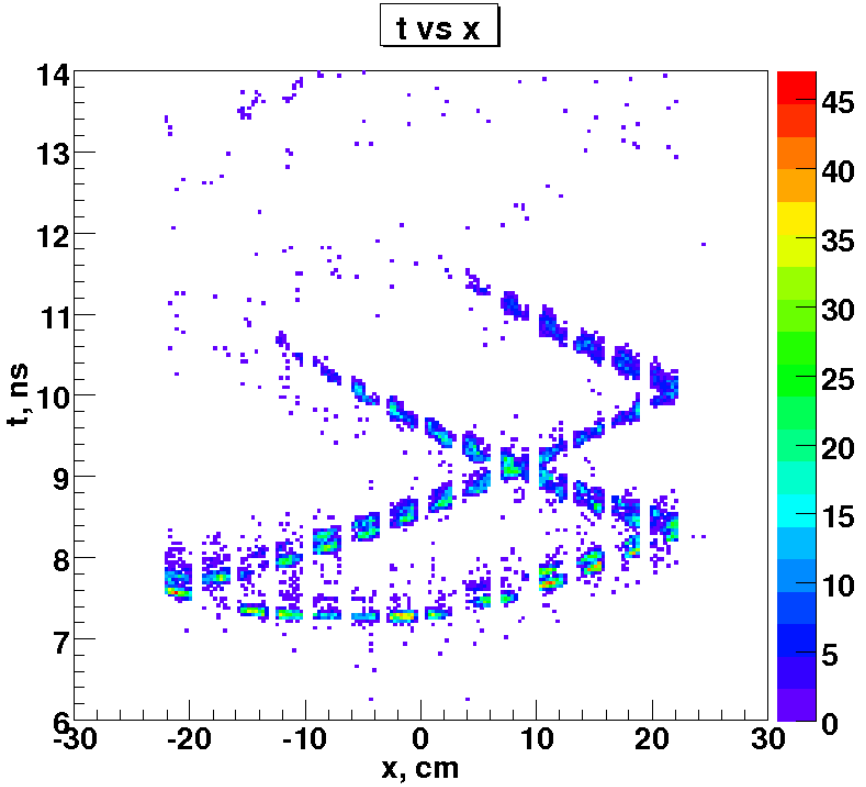
../bin/Linux26SL5_x86_64_gcc412/BrunoApp -G Geometry_CIPE_V00-00-02 -O OpticalPropertiesFTOF.mac -m singleparticle.mac

```
/generator/gun/particle 13
/generator/gun/energy 5 5
/generator/gun/position 0 0 0 0 0 0
#theta 20 deg FTOF
/generator/gun/direction 0 0.34202 0.939693
```

Detection of the Cerenkov photons



Time vs position distribution of the Cerenkov photons



400 events

Observed problems

→ The root branches for FDIRC and FTOF are duplicated

0 SVT hits
0 SVT FEE hits
0 DCH hits
0 DCH FEE hits
50 FDIRC hits
0 DIRC hits
0 DRC FEE hits
1627 SOB hits
50 FTOF hits
0 TOF FEE hits
0 EMC hits
0 EMC FEE hits
0 IFR hits
0 IFR FEE hits
0 RADMON hits
0 QD0 hits
>>> End of Event Number 1

0 SVT hits
0 SVT FEE hits
0 DCH hits
0 DCH FEE hits
39 FDIRC hits
0 DIRC hits
0 DRC FEE hits
1407 SOB hits
39 FTOF hits
0 TOF FEE hits
0 EMC hits
0 EMC FEE hits
0 IFR hits
0 IFR FEE hits
0 RADMON hits
0 QD0 hits
>>> End of Event Number 2

0 SVT hits
0 SVT FEE hits
0 DCH hits
0 DCH FEE hits
67 FDIRC hits
0 DIRC hits
0 DRC FEE hits
2911 SOB hits
67 FTOF hits
0 TOF FEE hits
0 EMC hits
0 EMC FEE hits
0 IFR hits
0 IFR FEE hits
0 RADMON hits
0 QD0 hits
>>> End of Event Number 3

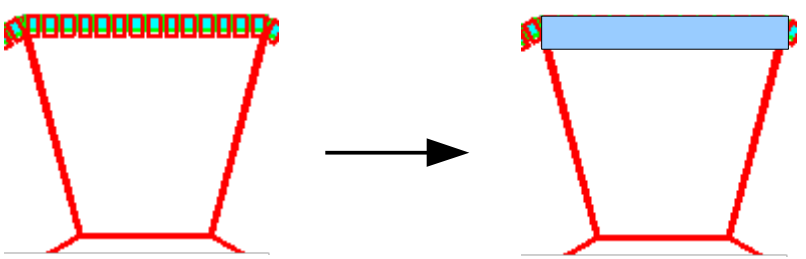
To do list

→ Remove the duplication problem

→ Implement the check of the material name for the FTOF detector

```
const G4StepPoint* aPoint = aStep->GetPreStepPoint();
aPoint->GetPhysicalVolume()->GetLogicalVolume()->GetMaterial()->GetName() == "fTOFrquaartz"
```

→ Update FTOF gdml file (make one sensitive volume per sector)



→ Create the kill photon class for the FTOF detector (similar to FDIRC)

→ Compare time distribution and number of detector p.e. with standalone simulation.

→ Commit the code