Gas sTOF, or gastof

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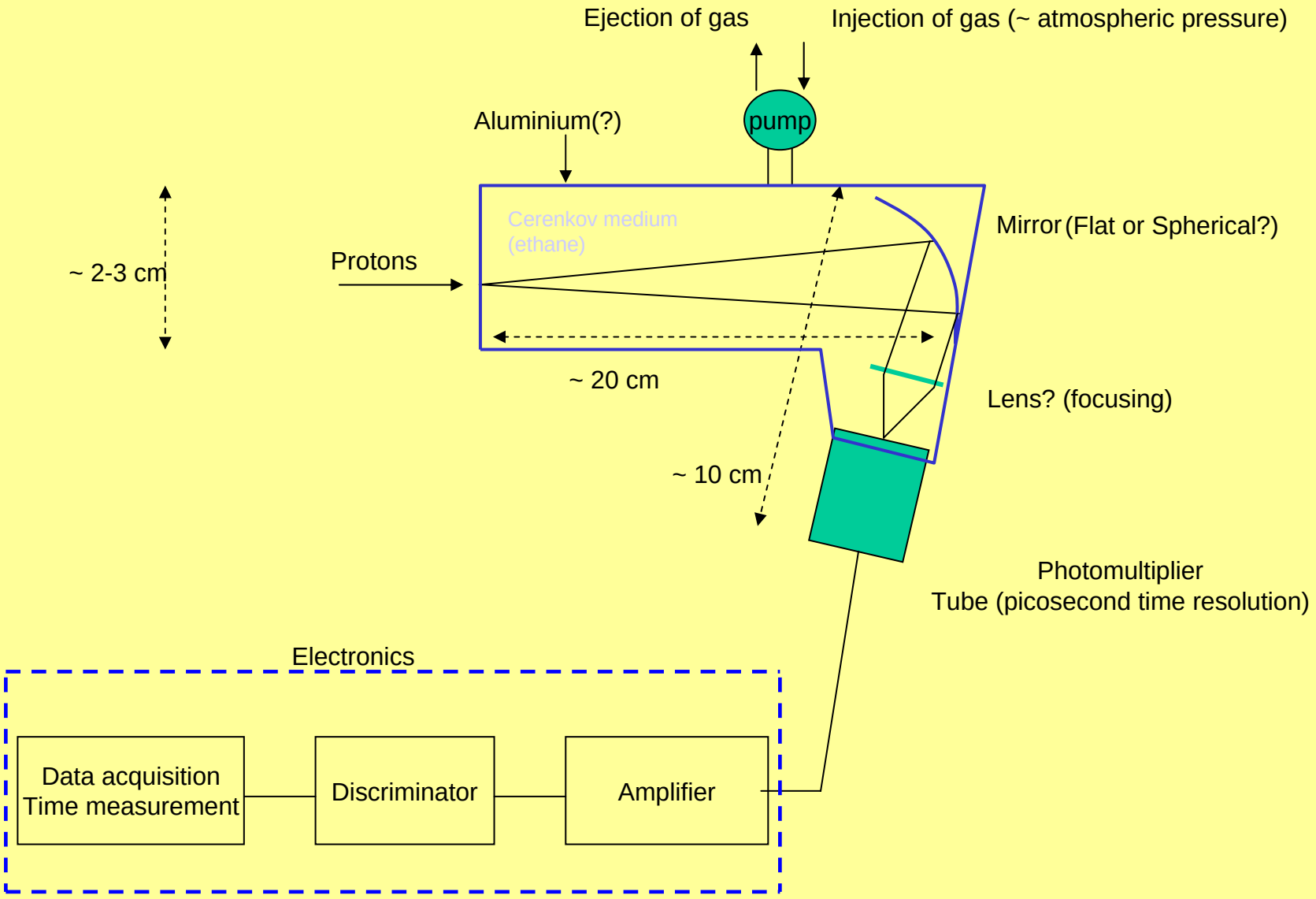
UCLouvain

- Status:
  - simulations
  - tests
  - prototypes
- Next steps and plans

gastof


Ejection of gas
Injection of gas (~ atmospheric pressure)
pump
Aluminium(?)
~ 2-3 cm
Protons
Cerenkov medium
(ethane)
Mirror (Flat or Spherical?)
~ 20 cm
Lens? (focusing)
~ 10 cm
Photomultiplier
Tube (picosecond time resolution)
Electronics
Data acquisition
Time measurement
Discriminator
Amplifier

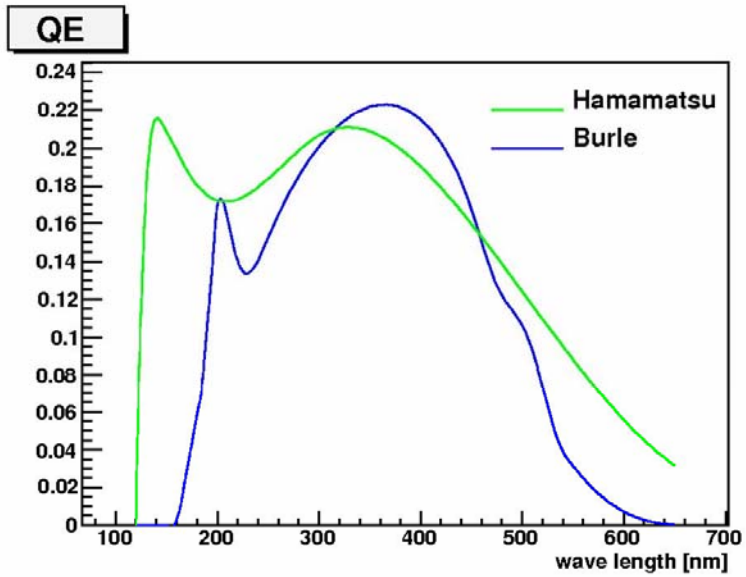
Status

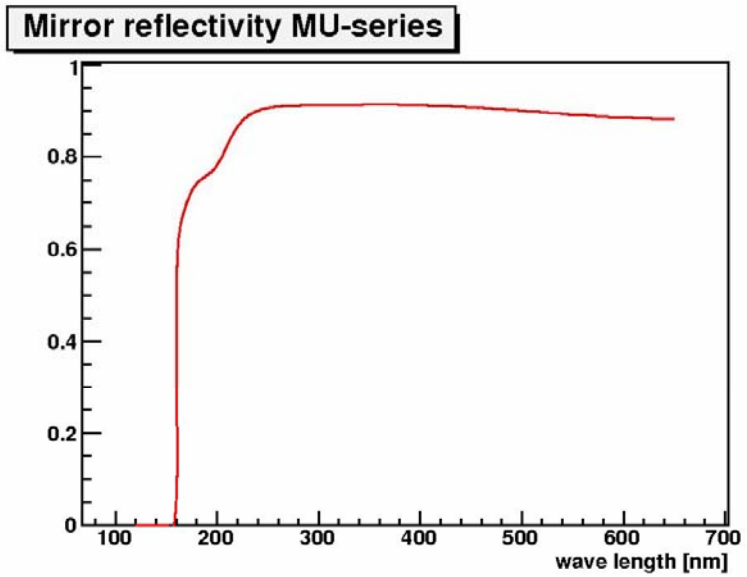
- **Tomek Pierzchała and Pierre Rodeghiero-made MC simulation of Cerenkov detector (ray tracing) - Gastof is really fast though provides small number of photons**

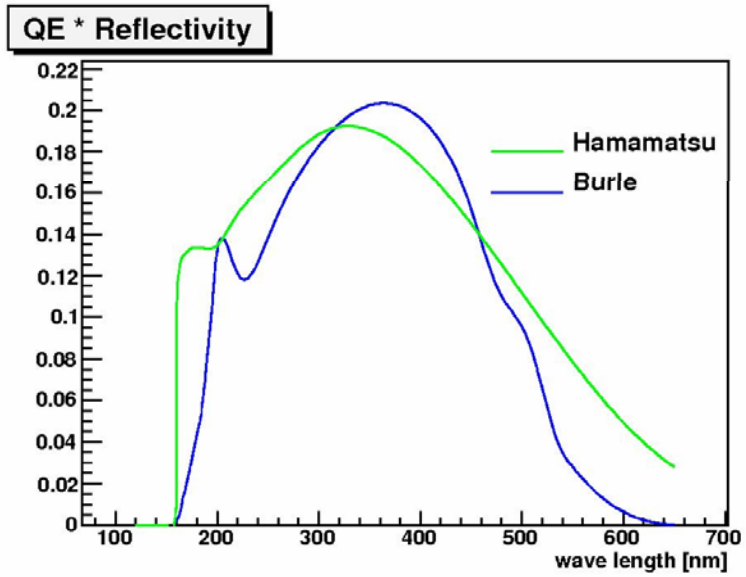
- **We have all electronics needed for tests, including two PMTs from Burle; have received UV mirror and C_4F_{10} gas (from DESY!)**

- **We aim at preparing prototype (or two?) for beam tests in summer (first prototype ready now for cosmics)**

Simulations with Burle

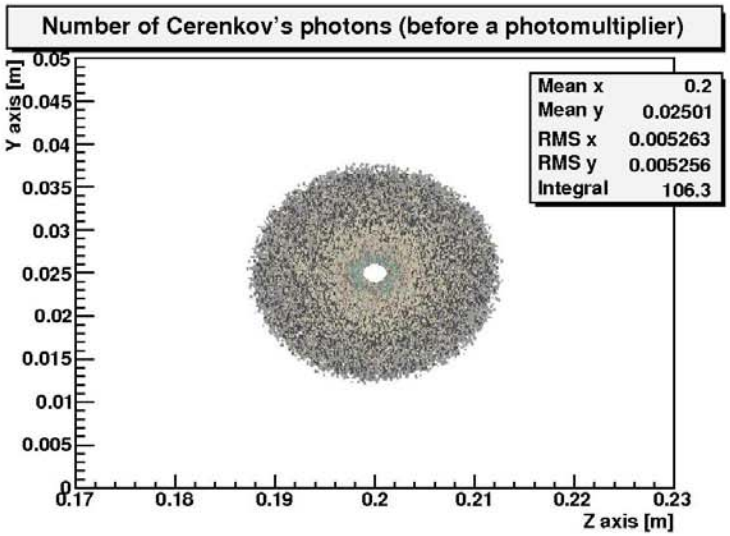


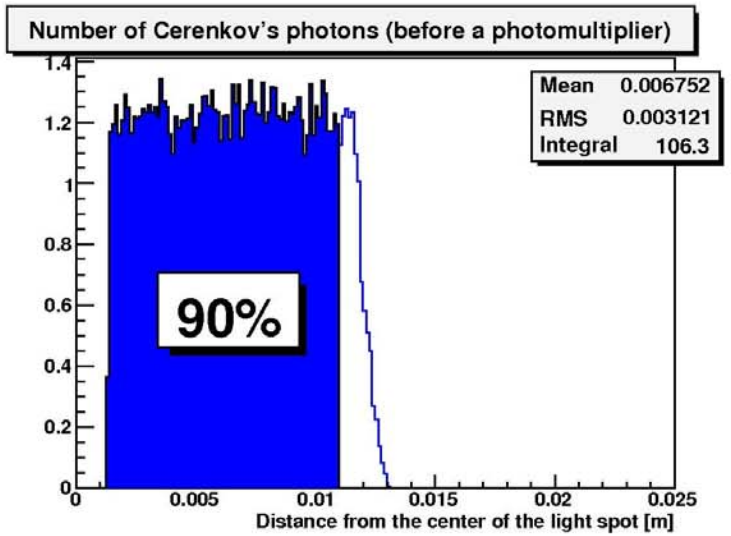


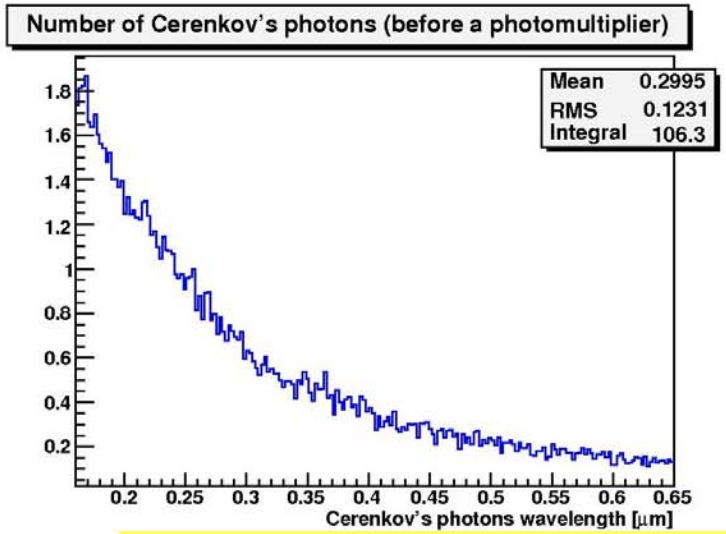


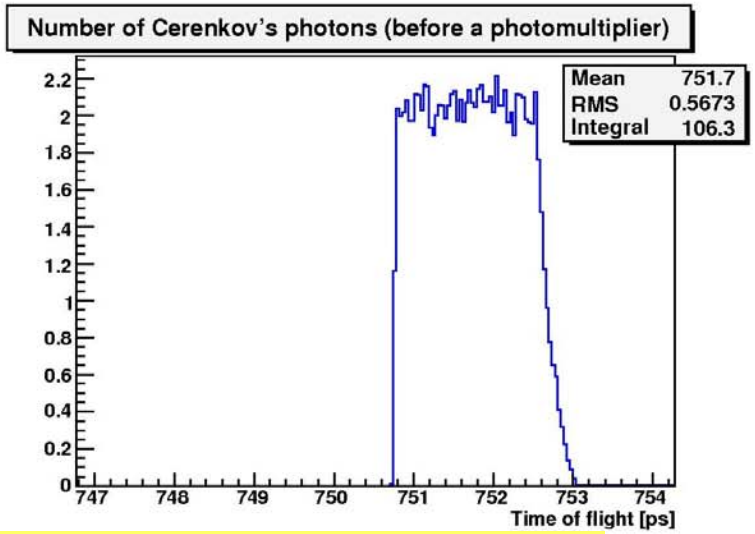
Still room for improvement:
- QE: ultra UV extension (Hamamatsu)
- Mirror: special MgF coating

Simulations with Burle (raytracing)



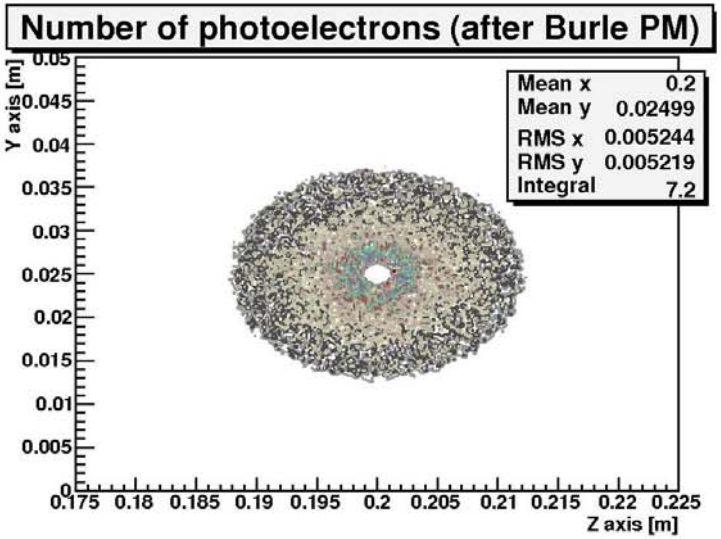


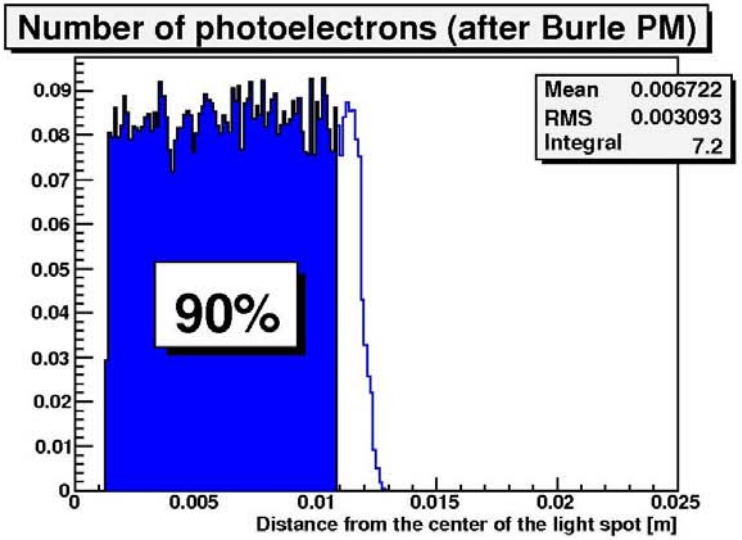


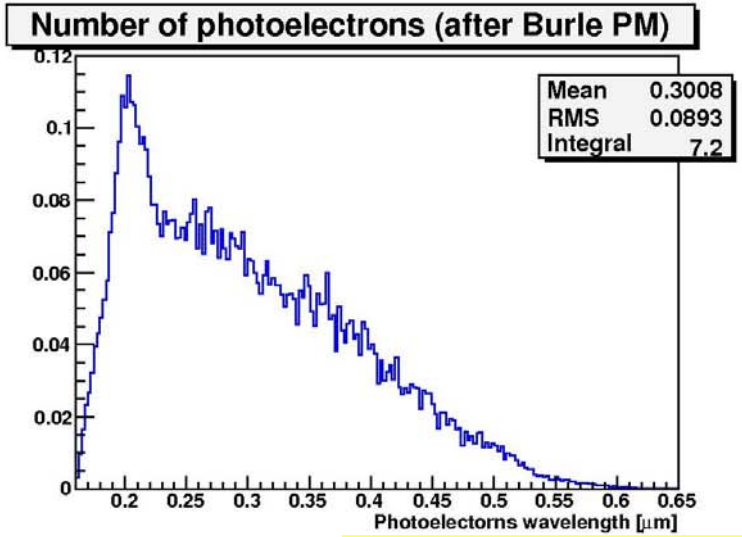


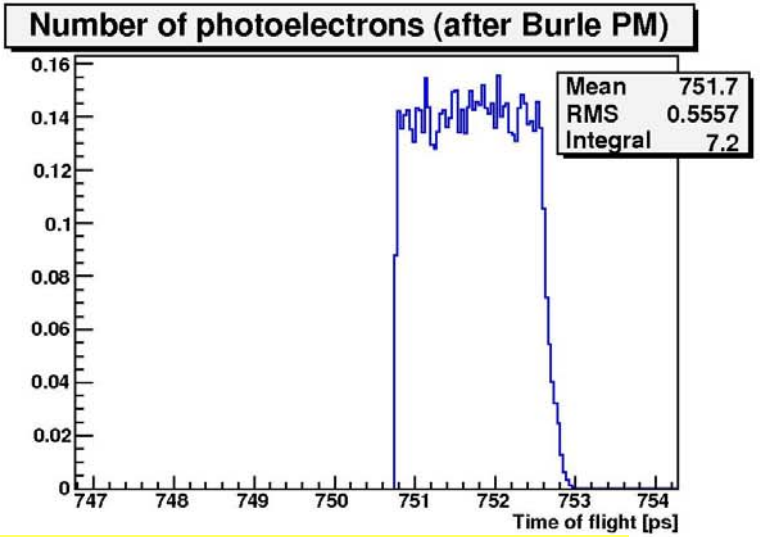
20cm of C_4F_{10} + Flat mirror + central proton

Simulations with Burle (raytracing)



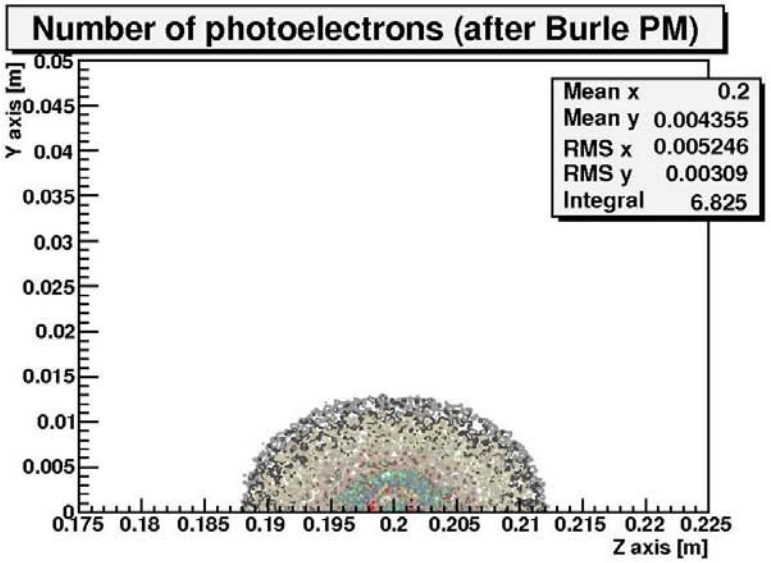


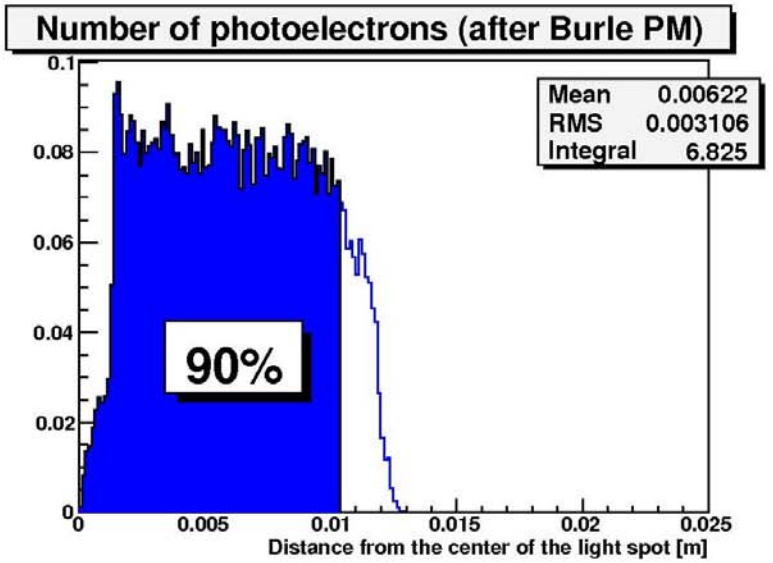


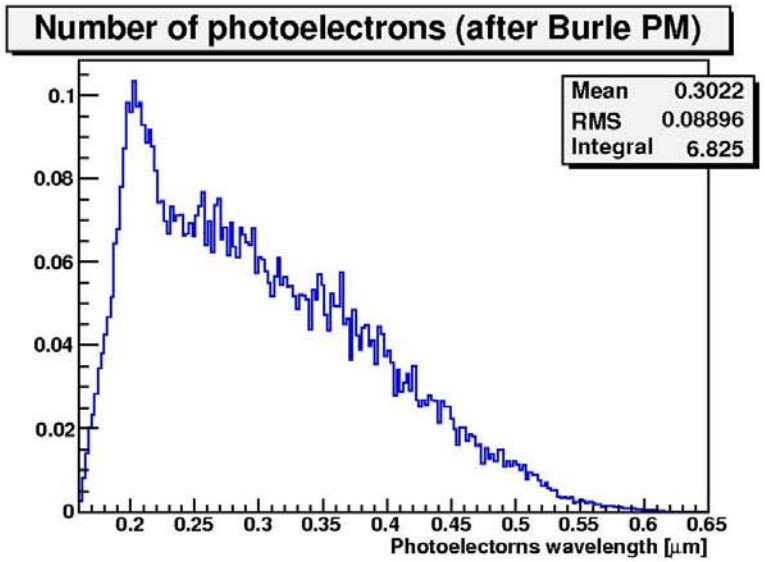


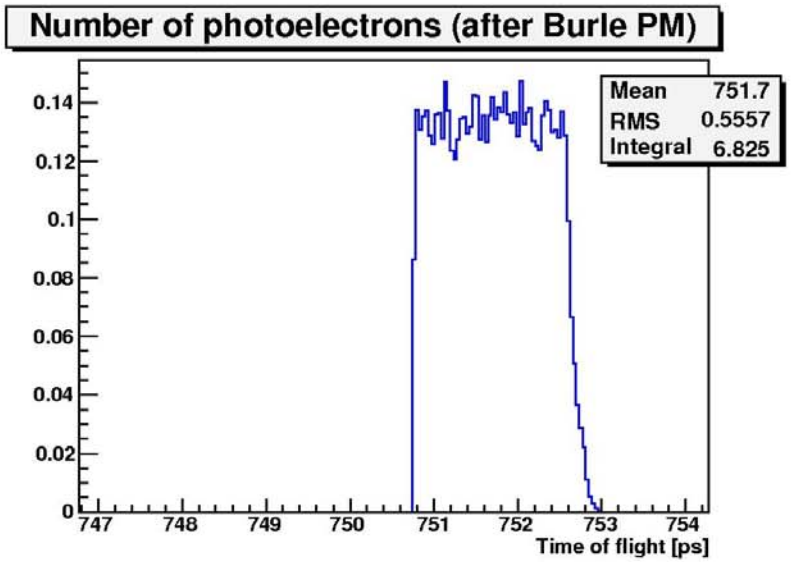
C_4F_{10} + Flat mirror + central protons

Simulations with Burle (raytracing)



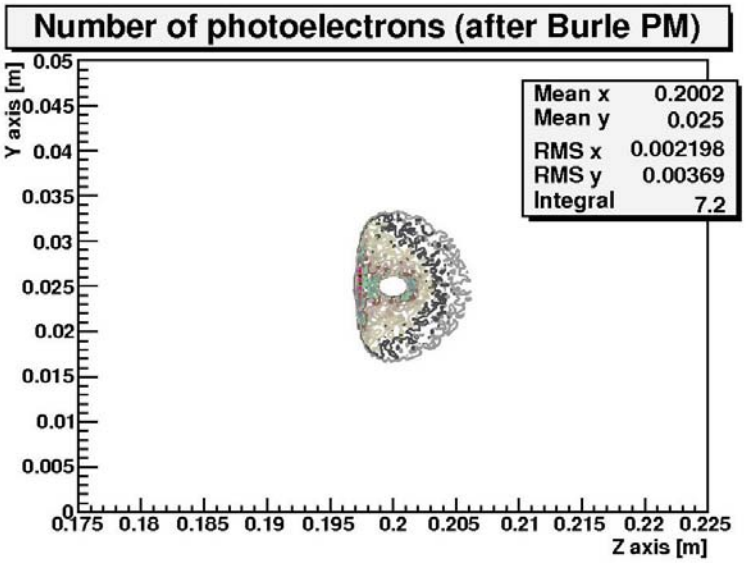


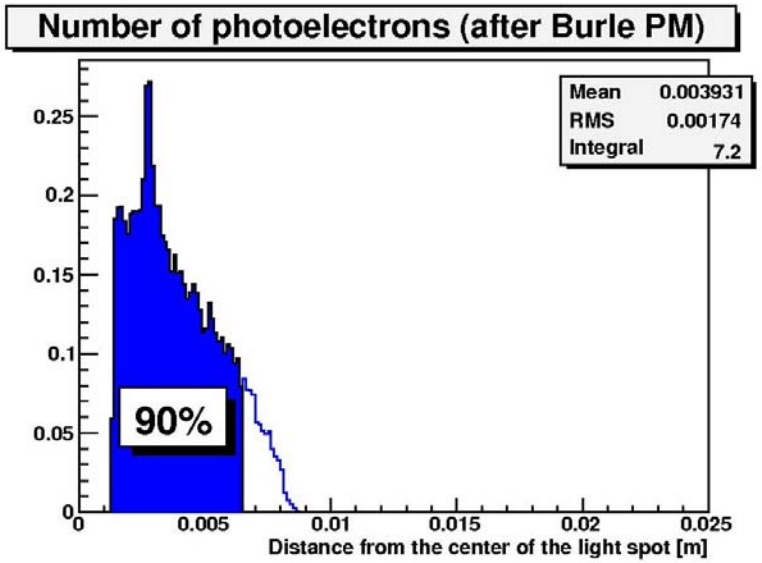


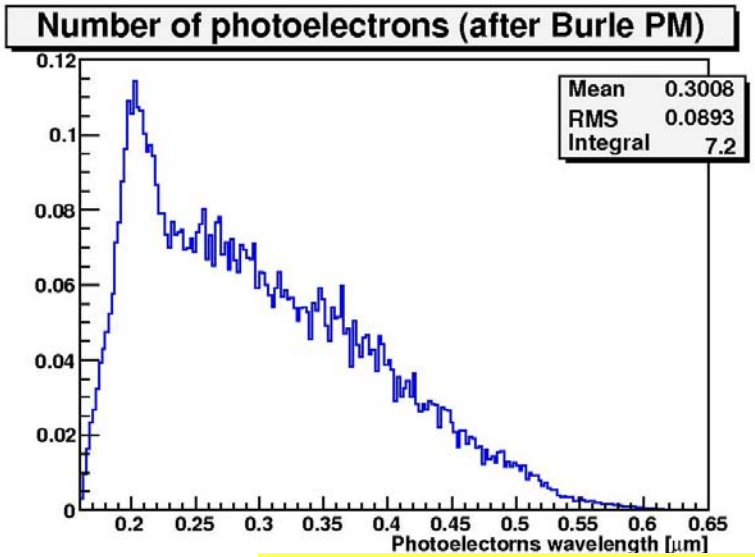


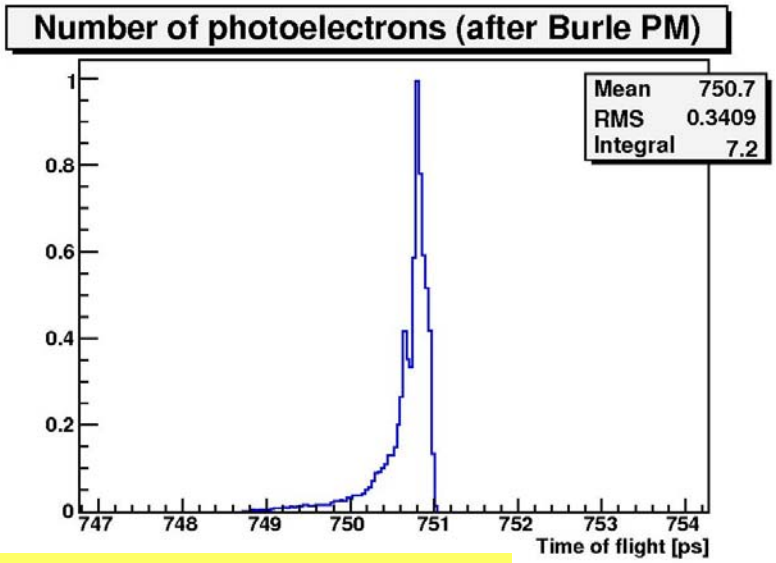
C_4F_{10} + Flat mirror + p 1mm from wall

Simulations with Burle (raytracing)



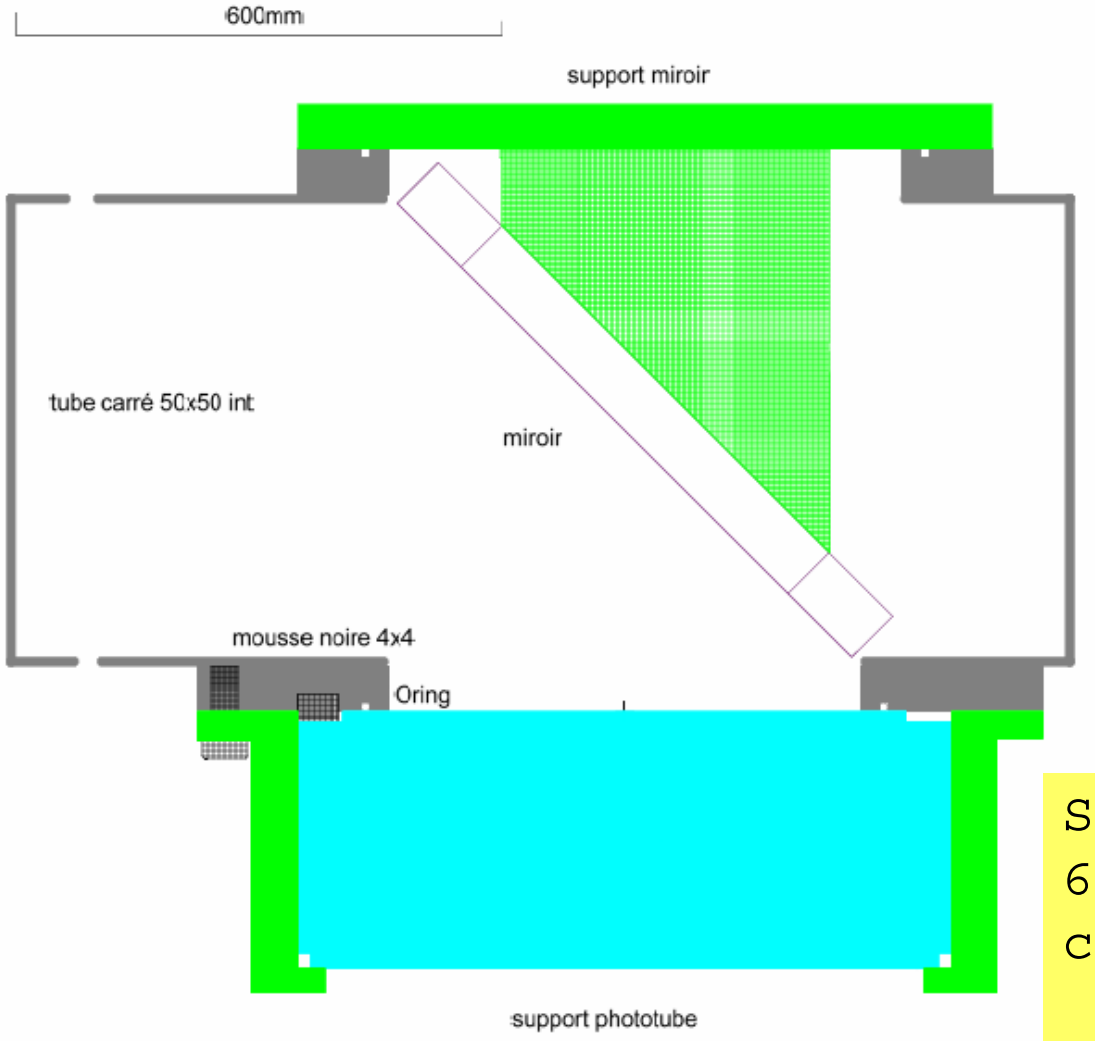






C_4F_{10} + spherical mirror + central p

Prototyping gastof



Start with air Cerenkov 60cm long and put to cosmic rays

Continue with 20-30cm long prototype using C_4F_{10} gas

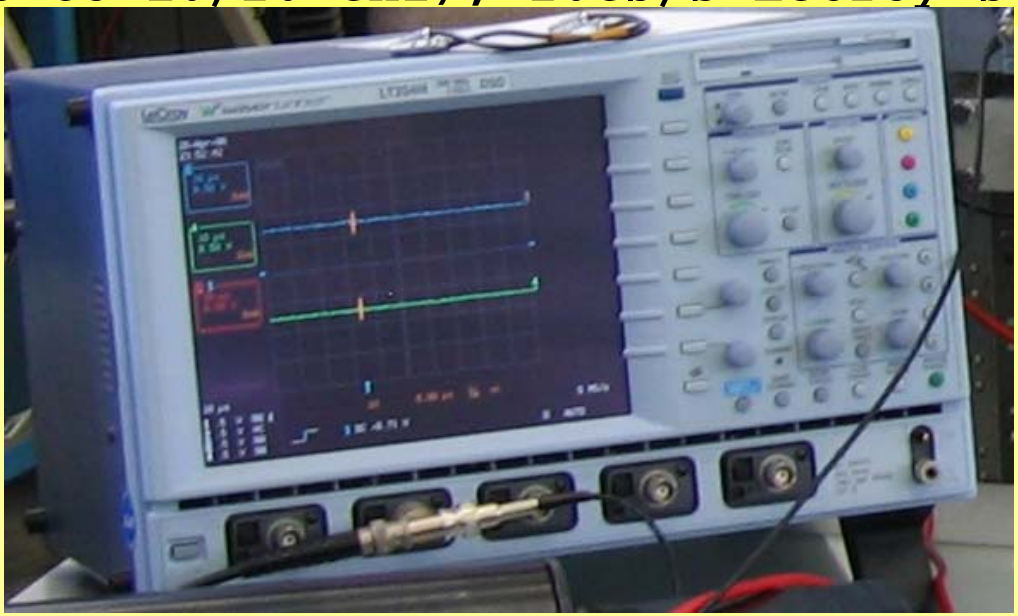
gastof **electronics for beam tests**

- **Will use two (fastest) preamplifiers from Hamamatsu; work on own design of fast amplifiers based on Philips chips**

- **Discriminators: Off-shell**

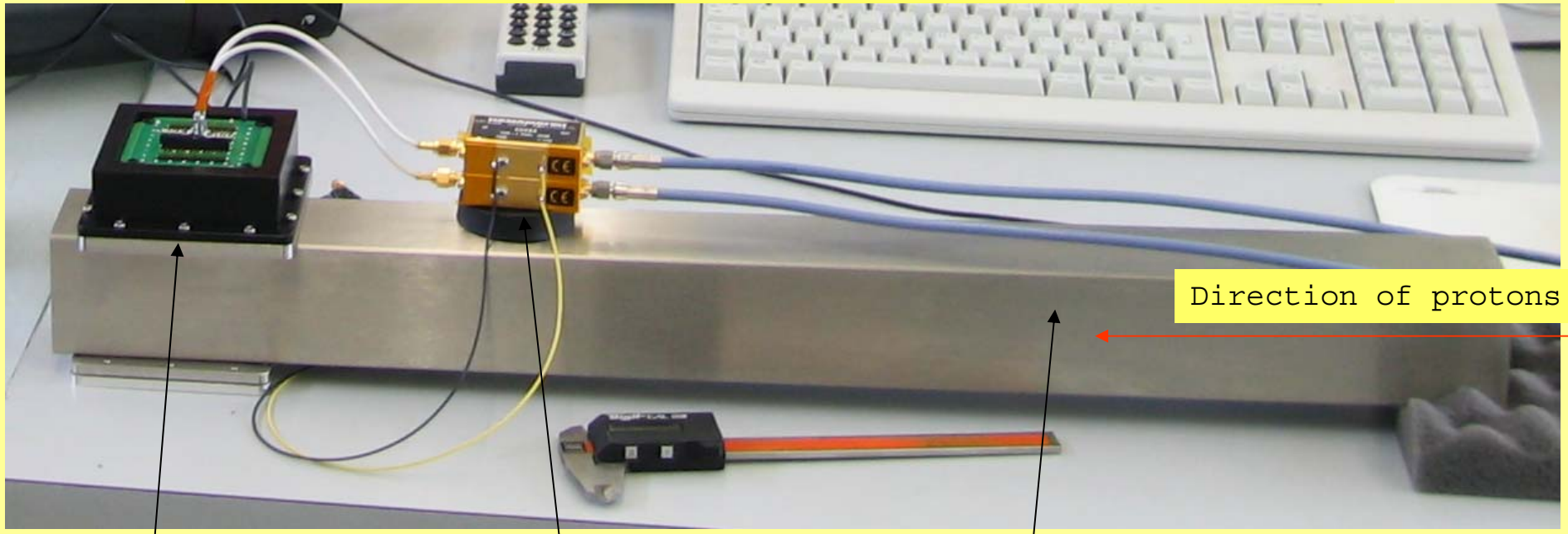
- **Will test use of CERN TDC (VME) for DAQ – with ~20 ps resolution**

- **Have at disposal 3GHz (CERN provides access to 10/20 GHz), 20GS/s LeCroy scope:**



gastof **prototyping**

- **Mechanics for air Cerenkov is (now) finished:**



Burle MCP-PMT
(mirror inside)

Amplis

SS tube
(can be over/under pressure)

Once it is assembled and tested will build shorter version for C_4F_{10}

Highlights and Further Plans:

- Gastof **requires maximal (UV) photon detection efficiency – will continue improving mirror and photocathode – contacting Hamamatsu**

- **To go beyond 10 ps resolution one needs even faster MCP-PMTs and electronics (note:** Gastof **needs only few channels)**

- **At LHC very high event rates are expected – high anode currents are needed (and count rates > 10 MHz)**

The TCSPC Power Package SPC-134

Four Channel Time-Correlated Single Photon Counting Module

- Four Completely Parallel TCSPC Channels
- Ultra-High Data Throughput
- Overall Count Rate 32 MHz
- Channel Count Rate 8 MHz (Dead Time 125ns)
- Dual Memory Architecture: Readout during Measurement
- Reversed Start/Stop: Repetition Rates up to 200 MHz
- Electrical Time Resolution down to 8 ps FWHM / 5 ps rms
- Channel Resolution down to 813 fs
- Up to 4096 Time Channels / Curve
- Measurement Times down to 0.1 ms
- Software Versions for Windows 95 / 98 / NT
- Direct Interfacing to most Detector Types
- Single Decay Curve Mode
- Oscilloscope Mode
- Seqential Recording Mode
- Spectrum Scan Mode with 8 Independent Time Windows
- Continuous Flow Mode for Single Molecule Detection
- FIFO / Time Tag Mode for Single Molecule Detection