# Upstream Veto and Timing Veto Detectors: on the way for the CDR.

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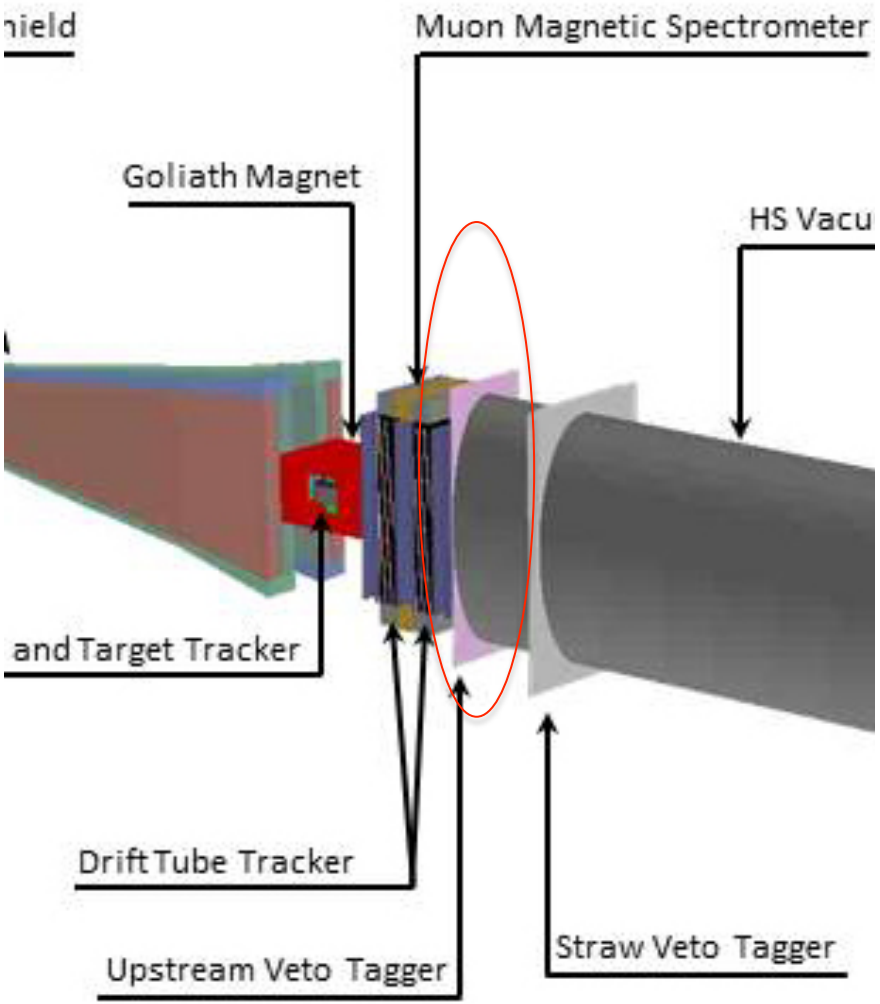
SHiP collaboration meeting, February 11th 2016

SHiP
Search for Hidden Particles

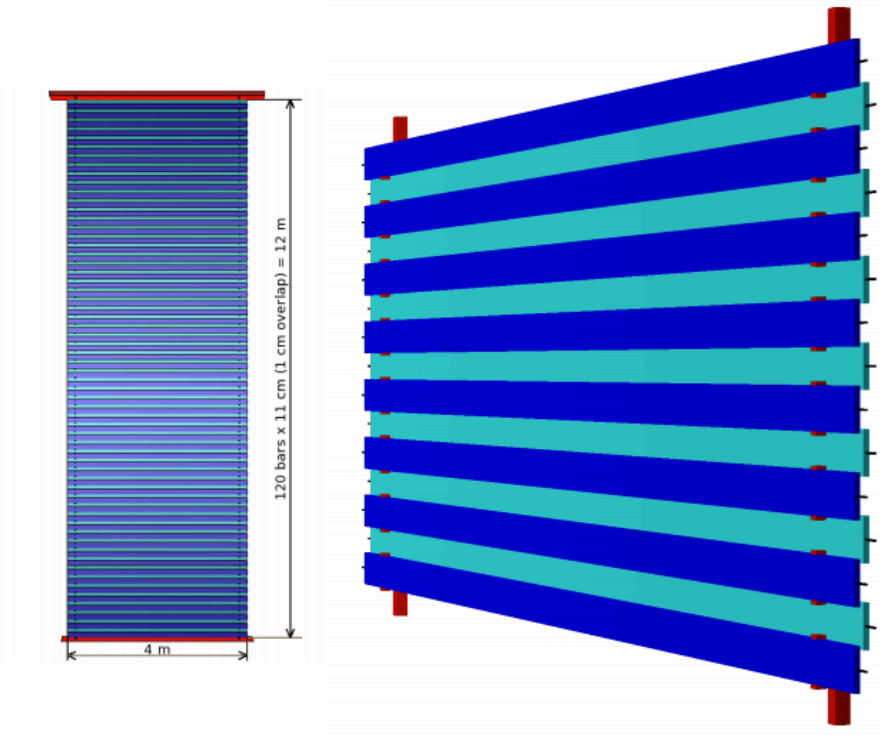
# Upstream Veto




***Main characteristics:***

- **Goal**: detect charged particles entering the decay volume

# Upstream Veto




***Main characteristics:***

- **Goal**: detect charged particles entering the decay volume
- **Technologies**:
  - Plastic scintillating bars with wavelength-shifting fiber 400x12x1 cm, 120 bars to cover an area of 4x12m2
  - Readout: SiPM with CITIROC or DRS4 front-end electronics
- **Properties**:
  - 99.9% efficiency (needed negligible noise level, time resolution of 1ns sufficient, if signal rate of 100kHz)
- **Cost**: 0.1 MCHF

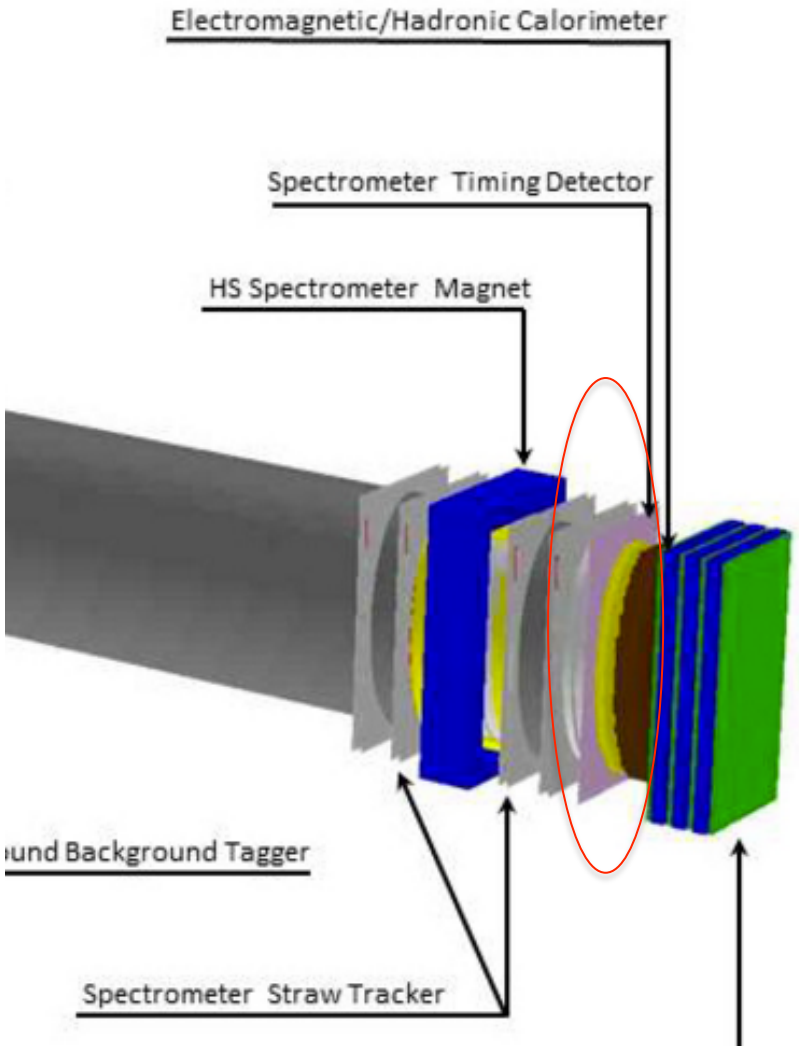
# Effects of the SHiP optimization

- To be understood if it is really needed
  - Presence or not of the OPERA system in front of the decay volume
  - Type of the decay volume
- Smaller dimensions of the decay volume: positive effect on the performance and the cost (already negligible on the other hand)
- Level of redundancy of the veto systems
- The technology chosen doesn't require too much R&D:
  - Most crucial element is the dimension of the bars

# Conclusions

- No R&D or test in lab/beam expected for this year
- Keeping an eye on simulation and background studies while the rest of the experiment is being optimized.

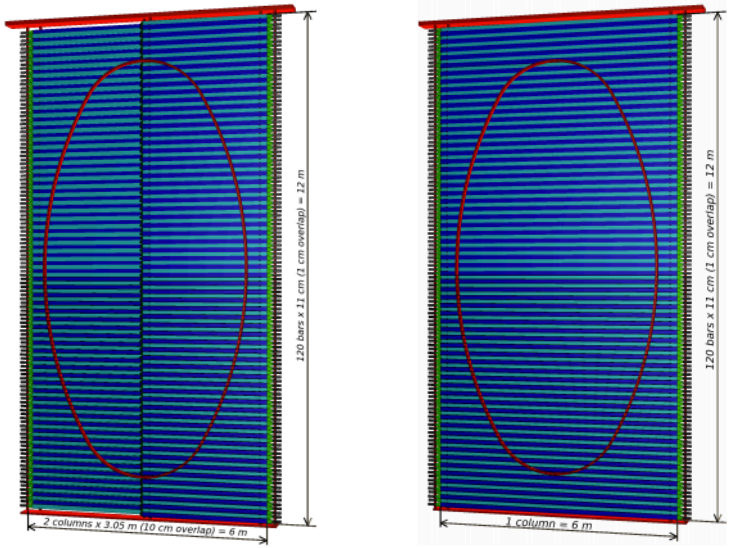
# Timing detector




*Main characteristics:*

- Goal: discriminating against random crossing background
- Technologies:
  - Plastic scintillating bars (either PMT or SiPM readout)
  - MRPC
- Properties:
  - Excellent time resolution (order of 50 to 100 ps)
- Cost: 0.5 MCHF

# Timing detector




*Main characteristics:*

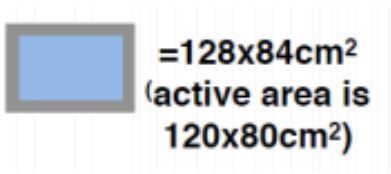
Plastic scintillators

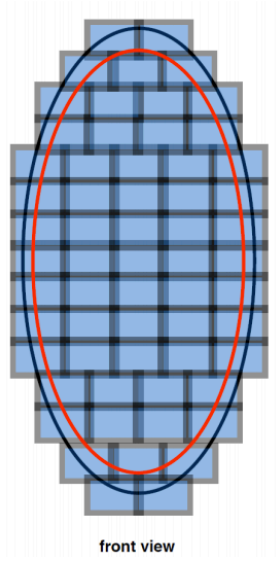
- 2 columns of 305x11x2 cm3 bars
  - Readout with PMTs
  - Readout with SiPMs
- 1 bar of 6m (technically challenging)
- 5 columns readout with SiMPs

*Main characteristics:*

MRPC

- Combination of Alice-TOF and EEE detectors:
  - An OR-red double stack configuration with 120 cm long strips.



# Effects of the SHiP optimization

- Partially dependent on the global experiment optimization
  - From a better understanding of the background rate, more precise estimate of the required time resolution needed
  - PID and pre-shower option
  - Type of surrounding veto tagger (segmentation, …)
- Needed to choose the:
  - Technology/readout
  - Front-end electronics

# 2016: plastic option

- Testing the time resolution for 3m and 1.2m long bars of different plastic types using cosmic muons and test beams.
- R&D study with large-area SiPM arrays.
- Comparison of the performance achievable with DRS4 chip and SAMPIC technologies.
- Improvements in the simulation .

- Geneva CERN lab already set up and Alex and Etam have started to test the first bars with the PMTs (see Alex's talk)
- In preparation a lab in Zurich (Chris just come on board)

# Conclusions

- Partially dependent on the global experiment optimization
- R&D to work in the line of deciding which design/ technology
  - Already started (plastic option). See Alex talk.
  - In contact with the French groups to investigate the possibility to use the SAMPIC (first test probably in few weeks)
  - No work started yet for the MRPC
- We will need some simulation work to implement more details (like granularity, for example) of the detector in FairShip