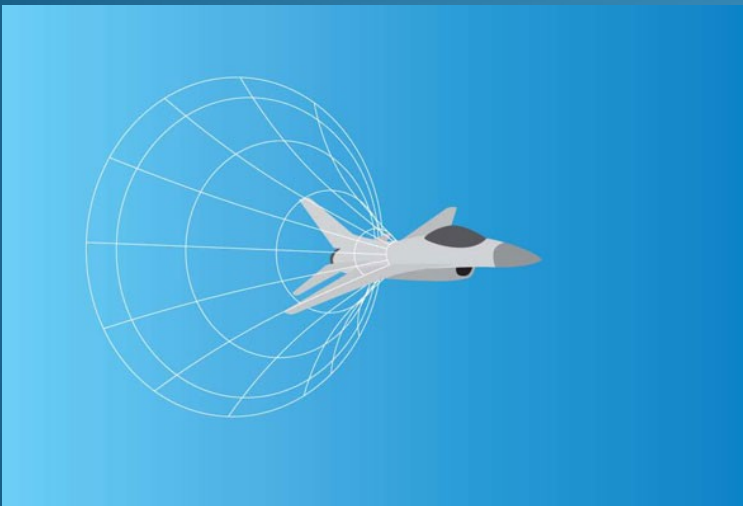# Čerenkov Timing Simulations in Geant4
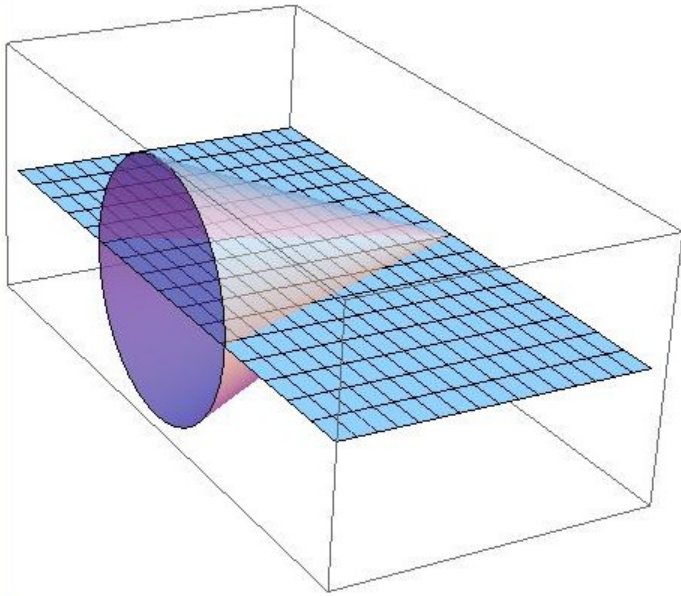

Symmetry Magazine Aug 09

Chris Nicholson

Supervisor: Mike Albrow
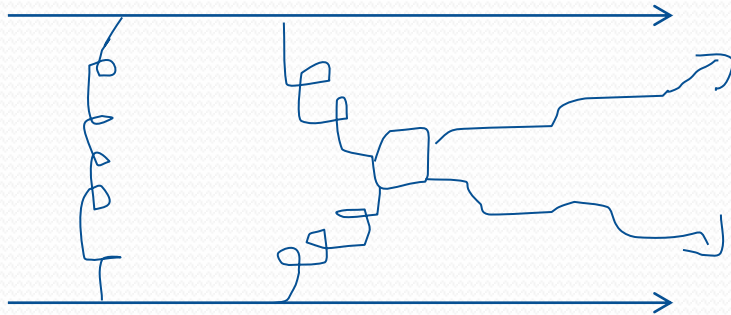
Background

Čerenkov radiation produced by 'faster than light particles' in a medium : ultra-relativistic protons in quartz.

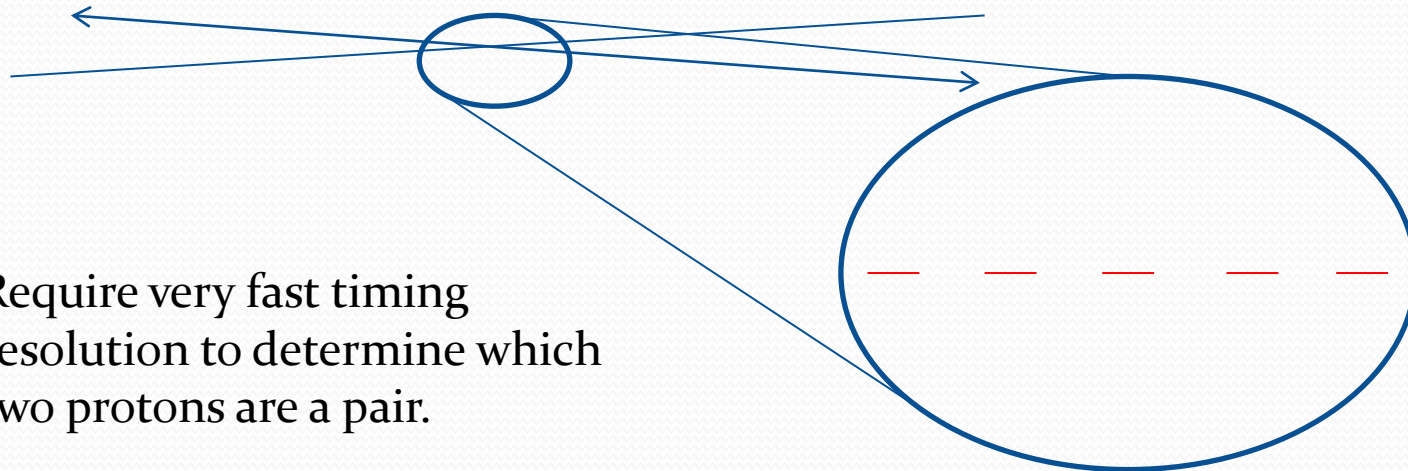

http://sadjadi.org/Cerenkov/boom.jpg

Background II
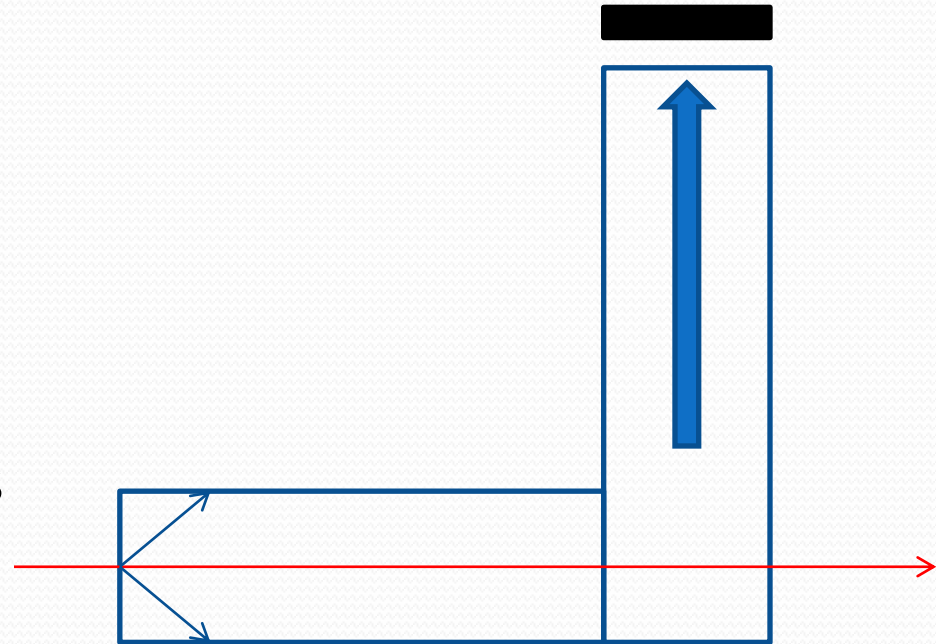
Exclusive two photon production.

Possibility of Higgs from top quark loop.

Require very fast timing resolution to determine which two protons are a pair.

Method

- Geant4 Simulations & Root analysis
- Compare with results from test beam measurements
- Look at:
  - Dispersion
  - Absorbtion
  - SiPM efficiency
  - Materials
  - Test beam measurements

To Investigate

- How much light reaches detector? More than quartic?
- Various effects: dispersion vs. path length; angle of incidence changes for square geometry.
- Can blue catch up with red?
- Different materials
- Red light filter
- Aiming for ps resolution
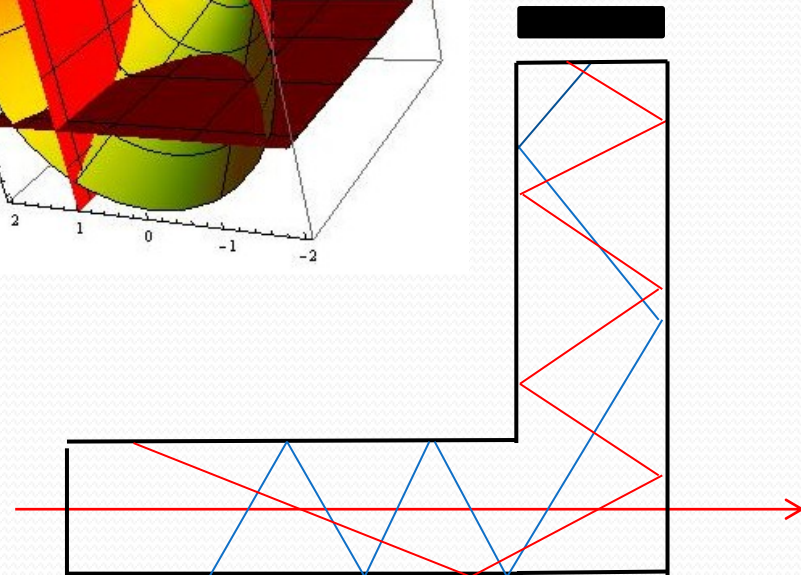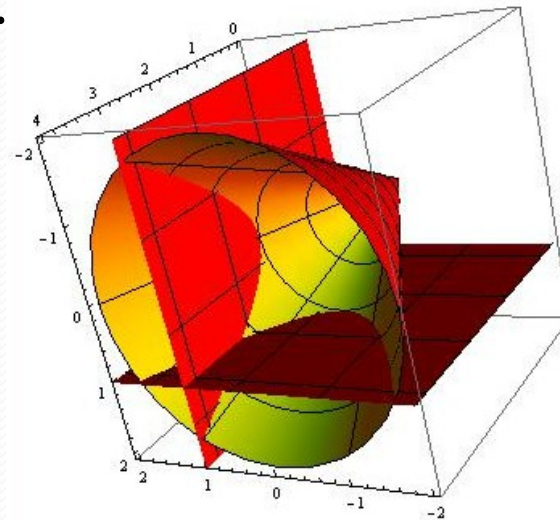
Schedule

- **Familiarise with Geant4 & Root code from Moriah's project (last summer)**

- **Tutorials to improve knowledge**

- Change geometry to L-bar and run simulation and analysis

- Analysis of test beam data

- Compare to test beam results