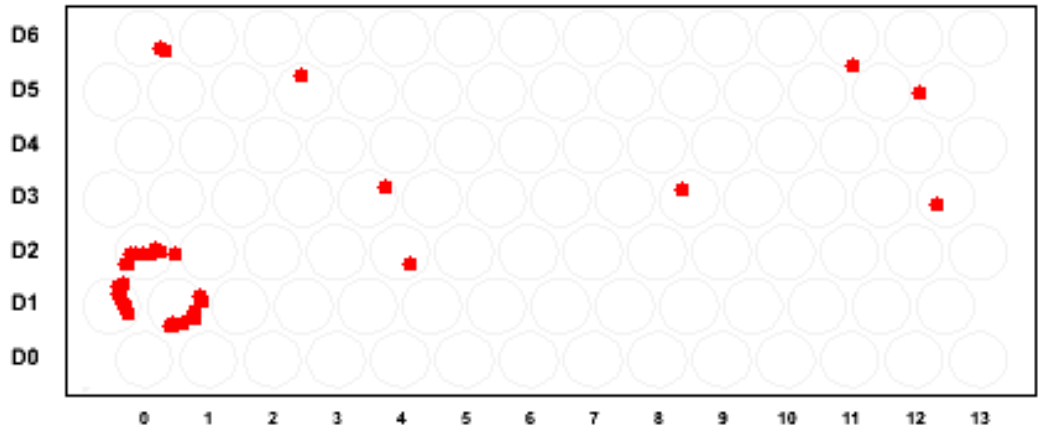
First Cerenkov rings produced by cosmic particles in the RICH of LHCb

The LHCb Collaboration has observed first rings produced by Cherenkov light emitted by cosmic particles in the radiators of RICH1.



LHCb identifies charged particles over the momentum range 1-150 GeV/c by two Ring Imaging Cherenkov (RICH1 and RICH2) detectors. In order to observe these rings, two scintillation counters have been installed one up and one downstream, of the RICH1 detector. These allow a selection of nearly horizontal particles, muons from cascades produced from cosmic ray interactions in the upper part of earth atmosphere.

RICH detectors work by measuring the emission of Cherenkov radiation. This phenomenon, often compared to the sonic boom produced by an aircraft breaking the sound barrier, occurs when a charged particle passes through a certain medium with a speed higher than the speed of light in this medium. As it travels through the medium, the particle emits light (photons) along a cone, the opening angle of which depends on the particle speed. The cone is measured as a ring in the detector and together with a momentum measurement in the magnetic field, allows indentifying the nature of the particle traversing.

(Read more http://lhcb-public.web.cern.ch/lhcb-public/en/Detector/RICH-en.html)

There are two transparent media (radiators) in the RICH1 detector, with different indices of refraction, therefore two rings are observed. The smaller radius corresponds to the C_4F_{10} (gas) and the bigger one to the aerogel radiator (solid). The radii of both rings and the number of detected photons (points in the Figure) correspond roughly to the values predicted for a particle moving with a speed close to the speed of light in vacuum, which is higher than the speed of light in the two RICH1 radiators.

The LHCb RICH detectors have previously recorded the splash of particles produced by the proton beam in the LHC during the first day beam on September 10th, 2008, demonstrating that all the photodetectors are operational. But this is the first time that the RICH sees a particle as it will see them in the experiment i.e. detecting the ring produced by the particle passing in the volume of the radiators projecting the Cerenkov light onto the optics in the right direction.