The RICH detector of the NA62 experiment at CERN

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### THE NA62 DETECTORS

- **CEDAR**: differential Cherenkov counter to tag the K⁺ in the beam (50MHz)
- **GIGATRACKER**: Beam spectrometer consisting of 3 Si microstrip stations upstream the decay region (800 MHz) for K⁺ tracking
- **STRAN** - magnet spectrometer consisting of 4 chambers of straw tubes to measure direction and momentum of charged decay products (~10 MHz)
- **RICH**: Ring Image Cherenkov, providing muon/pion separation, measuring track time at for 15 GeV < p < 35 GeV
- **LKR**: The high-performance electromagnetic calorimeter built for the NA48 experiment acting as photon veto in the forward region
- **MUD**: hadron calorimeter and muon detector

### The Mirrors

- Hexagonal Mirrors
- 17 focal length
- 1 mm diameter
- 2.5 cm thick glass
- Aluminum deposit with MgF₂ coat
- MARCON company
- Photo actuators for alignment

### The light collection

Winston Cones covered with Mylar
- 22 mm high
- 18 mm wide (max)
- 7.5 mm wide (min)
1 mm thick quartz window

### The Photomultipliers

- Hamamatsu R7400 U03
- Metal package tube
- 8 mm active dd
- 2.5 cm thick glass
- Aluminum deposit with MgF₂ coat
- MARCON company
- Photo actuators for alignment

### Electronics and DAQ

Integrated Data Acquisition and Trigger with time resolution ~100 ps

- PM Hit Maps
- Test Beam Results: N_{hit} = 17, \Delta t_{event} = 78 ps, \Delta \theta = 56 \mu rad (biased by PM geometry) (NIM A 593 (2008), 314)

- 200 GeV/c negative hadron beam from CERN SPS (mainly K⁺)
- Mirror by MARCON:
  - 1 mm thick quartz window
  - 2.5 cm thick glass
  - 96 PMTHamamatsu R7400
- Neon gas at atmospheric pressure

### RICH detector

- Vessel: 17 m long, 3 mm dd
- Mirror Mosaic (17 m Focal Length)

### Simulation

\[ m_{rec}^2 = p^2 \left( \theta_{max}^2 - \theta_c^2 \right) \]

- \( \Delta \theta = 63 \times 10^{-4} \) [Neon]
- \( \nu = \left( \max \right) \times f \times 19 \) cm

### RICH-100 prototype: the 2007 Test Beam

- 200 GeV/c negative hadron beam from CERN SPS (mainly K⁺)
- Mirror by MARCON:
  - 1 mm thick quartz window
  - 2.5 cm thick glass
  - 96 PMTHamamatsu R7400
- Neon gas at atmospheric pressure

### RICH-400 prototype: the 2009 Test Beam

Going on (may-june 2009) at CERN: soon results
- PM endcap changed
- 414 PM (20% of total)
- New TDC (TELL1)
- Validate \(\pi-\mu\) separation in 15<p<35 GeV/c
- Improve PM cooling

### Electronics board

- 128 TDC channels, 100 ps resolution
- HPTDC, CERN control FPGA and static memory on-board
- 10 layers PCB: (16xVOS connectors, individual shielding)
- FullMotherboard (612 channels) with PC on-board and 4 x 1 Gbit links
- NINO ASIC as fast Time Over Threshold discriminator
- HPTDC with 100 ps LSB
- NINO ASIC as fast Time over Threshold discriminator
- PreAMP, NEON

- PM board: PM holder, PM Endcap and cooling system

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