Beauty 2005

Status of the LHCb RICH detector and the HPD

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The LHCb detector

Designed to study CP violation and rare decays of B-hadrons at LHC

17-100 GeV/c RICH1: 2-60 GeV/c





RICH2:

RICH 1







RICH 1 Mirrors

3mm thick Be base + 0.3mm glass surface layer coated with Al.

Radius curvature: 2700mm







Beampipe hole

а.

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Aerogel I

linked network of SiO2 particles density = 0.15 g/cm³ hygroscopic





Transparent over a wide range: optical properties dominated by Rayleigh scattering: Transmittance T, clarity factor C, surface scattering factor A, thickness t, wavelength λ

$$T = Ae^{\left(-\frac{C\dagger}{\lambda^4}\right)}$$



Produced by the Boreskov Institute for Catalysis in Novosibirsk

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Aerogel II



World-record 50 mm thickness and 200 mm transverse size

> n = 1.030 ± 0.001 C=0.006 µm⁴/cm tested against: radiation OK C4F10 OK?

Pre-production OK -4 liters inside specs



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Testbeam I



Mirror curvature R= 949 mm

Beam: PS-T9 10 GeV/c $\pi^{-}(\pi^{+}, p)$

Aerogel: 4 tiles $10 \times 10 \times 4.4 \text{ cm}^3$ n=1.028 C=0.0052 $\mu \text{m}^4/\text{cm}$



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Testbeam II

Photon yield studies:

Single photon resolution (mrad):

Nγ	HPDO	HPD1	HPD2
Data	1.19	1.00	0.86
MC	1.22	1.09	1.21

Scaling with acceptance to 2π :

Data	11.7	9.3	9.1
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σ_{Θ}	HPDO	HPD1	HPD2
Data	3.2	3.2	3.5
MC	2.4	2.4	2.4

Becomes 2.7 mrad scaled to RICH1 optics



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Testbeam III



10 GeV/c π^+ , p





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RICH2 - software version





HPD plane: 9 columns, 16 tubes each

~100 m³

n = 1.0005





RICH 2 - hardware version

Superstructure



Magnetic shield maximum measured field at the HPD focal plane 6 G



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Alignment I



Spherical Mirrors Alignment

All mirrors from one side



Alignment and stability set a 50 µrad contribution to the overall uncertainty in the single photon Cherenkov angle reconstruction



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The Hybrid Photon Detector









System Test I





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Magnetic distortions...









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...and corrections

Calibration and distortion monitoring system in both RICHes to allow corrections



Conclusions

- The RICH project is healthy and advanced
- Construction is under way almost over for RICH2
- The photon detector is understood in both detection issues and data-flow
- Eager for first collisions in 2007



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