RPC UPSCOPE

TEMPERATURE MONITORING SYSTEM BASED ON FBG TECHNIQUE

CABLING LAYOUT AND SENSOR DESIGN

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Temperature sensor: optical sensor based on FBG technique

1 sensor per chamber; 72 sensors per RPC Wheel

Cabling will follow existing cable routing



Sensor monitoring system

Modular design based on TreeLike-Array of n.18 sensors (to fit 1/4 RPC Wheel) Design constrains: balancing cost and performance

TreeLike-Array: 1 TRUNK and 9 BRANCHES







TreeLike-Array of n.18 sensors

BRANCH: n. 2 sensors connected in series

TRUNK: L=200m (long length allows positioning far-end in USC) ϕ <20mm (small diameter allow cabling in cable chains)

BRANCH: 5m<L<15m;



Temperature Sensor – OPTION 'A': Custom Temperature sensor

Bare FBG housed in thermally insulated box with sensing finger FBG sensor feels finger temperature



Temperature Sensor – OPTION 'A': Custom Temperature sensor

Sensing finger is tailored to pass through existing window on RPC honeycomb skin and reach Strip copper layer

Strip copper layer (between Upper and Lower gas gaps) pointed out as best location for sensing RPC temperature



<u>Temperature Sensor – OPTION 'A': customization of commercially</u> <u>available sensor</u>

Sensor pigtail is prepared for in-line fusion splicing and protected against small-radius bending Sensor housing is provided of sensing finger





<u>Temperature Sensor – OPTION 'A': customization of commercially</u> <u>available sensor</u>

Sensor is placed in existing window on RPC honeycomb skin. Sensing finger is tailored to pass through existing window on RPC honeycomb skin and reach Strip copper layer

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Constrains addressing the proposed cabling design

Array of 72 sensors:

Tree-like Array cabling:

limited availability of optical channels of Control Unit

array constructed at Optical Box allows
by-pass of faulty sensors
following of existing cable routing on RPC wheel

Optical Box in USC:

unrestricted access to allow reconfiguration of array



Branch with n.2 FBGs:

limit raising of optical loss due to long optical path ('back and forth' path from/to Optical Box and Sensors)
just one good sensor is lost if by-pass of branch with faulty sensor is required

<u>4 x Tree-like Array per RPC Wheel:</u>
 Distribution of Trunk cables in
 FAR and NEAR cabling chains (already fully packed)
 Optical box

Optical Loss budget







TreeLike-Array of n.18 sensors

