Construction and testing of an RPC in Puebla

RPC 2018 - THE XIV WORKSHOP ON RESISTIVE PLATE CHAMBERS AND RELATED DETECTORS

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Construction

• RPC size -> 30 x 30 cm
• Glass -> 2 mm (Saint-Gobain)
• Gas Gap -> 2 x 1mm
• Acrilic gas box -> 35 x 35 cm
• ReadOut Pads -> 4 and 9
• Grafitte and acrilic paint for electrodes
• Paint resistivity -> ~5MΩ/□
• Gas -> Argon, Freon
RPC box
Paint
Assembling
Final assembling for test
Gas
HV

Setup for efficiency

Plastic Scintillator

RPC

Plastic Scintillator
Electronics

- **CSA**
- **GSA**
- **Amp**
- **ADC 10 bits**

Data: 100100101011
Response of the FEE
Data processing

• FPGA

• Cyclone 5, 5CEFA2F23C8N
Data processing Diagram

- Ring buffer
- Pulse finder
- Data Format.
- Event Memory
- Control
- Test Signal
Sistema de adquisición

R.B. (DPM)

P.F.: Trigger

D. F

M.E.B (FIFO)

C.D: Clock Distribution
## Data Format

<table>
<thead>
<tr>
<th>Valid Event</th>
<th>Empty Event</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Channel Address</strong></td>
<td><strong>Channel Address</strong></td>
</tr>
<tr>
<td>(101, 111, ...)</td>
<td>(101, 111, ...)</td>
</tr>
<tr>
<td>DW1</td>
<td>DW1</td>
</tr>
<tr>
<td>TSH (255)</td>
<td>TSH (255)</td>
</tr>
<tr>
<td>DW2</td>
<td>DW2</td>
</tr>
<tr>
<td>TSM (255)</td>
<td>TSM (255)</td>
</tr>
<tr>
<td>DW3</td>
<td>DW3</td>
</tr>
<tr>
<td>TSL (255)</td>
<td>TSL (255)</td>
</tr>
<tr>
<td>DW4</td>
<td>DW4</td>
</tr>
<tr>
<td>Event Number</td>
<td>Event Number</td>
</tr>
<tr>
<td>DW5</td>
<td>DW5</td>
</tr>
<tr>
<td>Event Data</td>
<td>Number words</td>
</tr>
<tr>
<td>DW6</td>
<td>(6)</td>
</tr>
<tr>
<td>Number of data word</td>
<td>DW6</td>
</tr>
<tr>
<td>(6)</td>
<td>(6)</td>
</tr>
</tbody>
</table>

- **Channel Address** (0x101, 0x111, 0x121, ...)
- **Time Stamp**
- **Event Number**
- **Event Data**
- **Total Number of Words**

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![Graph](image.png)
Auto-test Signal

Signal stored in the FPGA to verify the processing path.

100000 Eventos
Results

ARGON

RPC 2 gaps Resistivity

\[ y = 3846.9x + 9586 \]

\[ R^2 = 0.8258 \]

FRON

Efficiency

5.6 \times 10^{12} \Omega/cm^2
CH3
# Ev. =10770
Rate = 4.48Hz

CH6
# Ev. =12493
Rate = 3.47Hz

CH9
# Ev. =23672
Rate = 4.6Hz

CH2
# Ev. =5438
Rate = 2.58Hz

CH5
# Ev. =1831
Rate = 0.5Hz

CH8
# Ev. =6722
Rate = 1.87Hz

CH1
# Ev. =8902
Rate = 4.23Hz

CH4
# Ev. =5663
Rate = 2.35Hz

CH7
# Ev. =17740
Rate = 4.92Hz
All RPC pads

RPC Events: 93227
Rate: 34.5Hz
Summary on RPC construction

• 30 x 30 cm RPC Fully constructed and under test with cosmics

• Electronics is working for 8 channels

• The quality of the materials are ok.

• New electronics using Kintex 7 Ultra scale

• HVPS is under development
Thank You