MAROC3 is a 64-channel chip designed to readout negative fast input current pulses such as those provided by Multi Anode Photo Multipliers. Each channel provides a 100% trigger rate for signal greater than 1/3 photoelectron (50fC) and a charge measurement up to 30 photoelectrons (~ 5 pC) with a linearity of 2%. The gain of each channel can be tuned between 0 and 4 thanks to an 8 bit variable gain preamplifier allowing to compensate the non-uniformity between detector channels. A slow shaper combined with two Sample and Hold capacitors allows storing the charge up to 5 pC as well as the baseline. In parallel, 64 trigger outputs are obtained thanks to two possible trigger paths: one made of a bipolar or unipolar fast (15 ns) shaper followed by one discriminator for the photon counting and one made with a bipolar fast shaper (with a lower gain) followed by a discriminator to deliver triggers for larger input charges (> 1 pe). The discriminator thresholds are set by two internal 10-bit DACs. A digital charge output is provided by an integrated 8, 10 or 12 bit Wilkinson ADC.

<table>
<thead>
<tr>
<th>Detector Read-Out</th>
<th>MAPMT, SiPM</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of Channels</td>
<td>64</td>
</tr>
<tr>
<td>Signal Polarity</td>
<td>Negative</td>
</tr>
<tr>
<td>Sensitivity</td>
<td>Trigger on 1/3 photo-electron with a $10^5$ PM gain or 50 fC</td>
</tr>
<tr>
<td>Timing Resolution</td>
<td>60ps RMS on single photo-electron, threshold 1/3 of photo-electron</td>
</tr>
<tr>
<td>Dynamic Range</td>
<td>5 pC ($10^6$ PM gain), Integral Non Linearity: 2% up to 5 pC</td>
</tr>
<tr>
<td>Packaging &amp; Dimension</td>
<td>PQFP240, TFBGA353</td>
</tr>
<tr>
<td>Power Consumption</td>
<td>3.5 mW /ch, power supply= 3.5V</td>
</tr>
<tr>
<td>Inputs</td>
<td>64 current inputs</td>
</tr>
<tr>
<td>Outputs</td>
<td>64 trigger outputs</td>
</tr>
<tr>
<td></td>
<td>Wired OR of the 64 triggers for each of the 2 discriminators</td>
</tr>
<tr>
<td></td>
<td>1 multiplexed analog charge output that can be daisy chained</td>
</tr>
<tr>
<td></td>
<td>1 digital charge measurement (8, 10 or 12 bits)</td>
</tr>
<tr>
<td>Internal Programmable Features</td>
<td>gain adjustment between 0 and 2 over 8 bits for each input preamp, trigger threshold adjustment (10bits), analog and digital charge measurement, 64 trigger outputs, 64 trigger masks</td>
</tr>
</tbody>
</table>

They are using Maroc 3A

CERN (ATLAS luminometer)
Jefferson lab (CLASS12)
Industrial applications under NDA

More about Maroc 3A

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