Preparation of mimosa22 test at IPHC

- Quick description of the Mi22 chip (signals I/O)
- System architecture (GC)
- Test bench
  - Hardware: (WD, MS)
  - Software slow-control, JTAG (KKJ)
  - Software DAQ (GC)
  - Upgrade software analysis (MG)
- Status

**Input**

**Input clock**: 100 MHz clock provided in LVDS by the digital auxiliary board.

**Slow control JTAG**: for parameterization of bias, signal selection, pattern value & discriminator selection

**Synchronization of the chip is done by two signals**: START & SPEAK

**Voltage and bias reference**: (Some of these voltages can also be fix by JTAG)

**Output**

**Data output**

- **Mimosa 22 digital output => DAQ**: The 128 columns are multiplexed to 16 digital output. With programmable pattern header
- **Mimosa 22 analog output => DAQ**: There are 8 analog parallel output

**Marker of Mimosa 22**: Each Matrices analog and digital have their own markers to pilot the DAQ.

<table>
<thead>
<tr>
<th>Digital</th>
<th>Analog</th>
</tr>
</thead>
<tbody>
<tr>
<td>• CLK_D (input Clock/2)</td>
<td>• CLK_A (input clock/16)</td>
</tr>
<tr>
<td>• MK_SYNC_D Signal of synchronization</td>
<td>• MK_SYNC_A Signal of synchronization</td>
</tr>
<tr>
<td>• MK_TEST_D Marker for debugging</td>
<td>• MK_TEST_A Marker for debugging</td>
</tr>
</tbody>
</table>

**DAC output (Bias test points)**

**Temperature sensor**: Two diodes are implement to measure the temperature at the top and the bottom of the chip
17 different types of pixels

Matrice of 576 lines by 136 columns

Temperature sensor

DAC Bias outputs

Clock LVDS CMOS

Signal Sync & JTAG

Markers

Discri Threshold

Voltage reference

8 Analog outputs

4608 pixels

16 Digital outputs

73728 pixels
Hardware from DAQ side:

- A digital interface card
  - It is a digital extension of acquisition imager board. It provide LVDS / CMOS conversion of the digital outputs of the matrices to be acquire by the cmos Imager_board input. It manage the distribution of the clock, synchro and markers signals between card
Sync signal

Digital Data 15-12
Digital Data 11-8
Digital Data 7-4
Digital Data 3-0

To USB extension board

Marker Digital
Marker Analog

Analog Output

Digital Auxiliary board

Analog Auxiliary board

Proximity board

Area of active matrixe
2.53*10.59 mm
HARDWARE chip side

Three board are needed to test the chip:

- The proximity board where the chip is bound. It includes the minimum front-end electronic, just the signal amplification for critical signals.

- The Analog auxiliary board: To buffer the 8 analog signals of Mi22 in differential to be transmitted in long distance (40 m). We will use two AUX_V4 to do the acquisition of the 8 channels.

- The Digital auxiliary board: It generates the 100 MHz clock of Mi22. Buffering the digital signals from DAQ to Mi22 (and the JTAG) and from Mi22 to DAQ in LVDS to be transmitted in long distance (40 m). It provides also power supply of the chip and proxi_board.
JTAG interface

-Multiple Mi22 control with independent JTAG values for each chip
Device parameters/registers

To modify Bias register values for MIMOSA22 device

To modify Readout Mode register values for MIMOSA22 device

To modify Discriminator Control register values for MIMOSA22 device

To modify Column Control register values for MIMOSA22 device

To modify Line Pattern register values for MIMOSA22 device
Adaptation of the software to manage N acquisition cards with different format of data.

Here:
Two analog and one digital card with different frequency and different number of pixels.
Root monitoring under windows on the acquisition PC

For the 8 analog columns

Raw Data

Read  Calib

For the digital part

Discriminator

CDS

Hits
upgrade data analysis software:

- For the laboratory tests, we will adapt the mimosa_analysis labview program to be able to analyze the 8 analog outputs of the chip and characterize the different sub matrices
Status

- PCB and component are ready (assembling soon)
- Chip bounding (in nexts weeks)
- Bench validation
- Chip testing (starting in Mars)

Validation of the acquisition system by emulating the mi22 chip output signal with a pattern generator

February