16th March 2021

Validation of the FE electronics for the instrumented baffle and calibration of the photo sensors. v1.0

This document intends to describe the work that is needed to fully characterize the performance of the FE electronics for the instrumented baffle and the calibration of the photo sensors. We count with preliminary boards (based on FR4 PCBS and instrumented with v2 photo sensors) to be used for exercising the procedure. A priori, there is no need to run the tests with these boards in the clean room and can be performed in the lab since v2 are only used for testing. One of the boards is equipped with 38 photo sensors and 8 temperature sensors. We will run both ½ baffles and readout the whole system using the three readout modes (serial, bluetooth, wireless).

Outside clean room and inside the dark box (no environmental light)

1. **Characterization of the dark current for the FE electronics+sensors. (perform 4 x 3 measurements)**

    a. Monitor the voltage and current in the board
    b. Monitor for each sensor the signals
    c. Monitoring of the temperatures of the boards
    d. Monitor the temperature of the black box
    e. Monitor humidity in black box
    f. Use different readout modes:
    serial readout (4 measurements)
    bluetooth (4 measurements)
    wireless (4 measurements)

Make sure you take enough statistics in each case

Analyse the data for sensor response vs time, temperature, humidity, readout mode

2. **Laser tests including X-Y table (repeat procedure 4 x 3 times)**
    CAUTION: Operate the 1064nm laser with the box closed always

    Start with serial readout mode and then move to bluetooth and wireless

    a. Take a measurement with no laser power and determine pedestals /dark currents in the sensors
        i. Run one measurement as in 1
    b. Inspect with visible laser the correct positioning of the laser on sensors
        i. Program will automatically move the laser fiber thru sensors
        ii. When all is well aligned and positioned switch to 1064 nm laser **(do not open the box when laser is on)**
    c. Illuminate using the 1064 nm laser the sensors one by one.
        i. This requires the X-Y table with predefined positions pointing to the center of the sensors (see above)
    d. Consider different laser output power (as displayed in the laser)(from 0 mW to 40 mW in steps of 0.5 mW) take enough statistics in each position (scan the 38 sensors with a fixed laser power before modifying it)
        i. Sensors are going to saturate above about 20 mW

e. Monitor the voltage and current in the board
f. Monitoring of the temperatures of the board
g. Monitor the temperature of the black box
h. Monitor humidity in black box
i. Display sensor response vs laser power in each case

Analyse the data taken for sensor response vs laser vs time, vs temperature vs humidity vs readout mode

3. **Stress tests vs time (x 3)**
   (run the system continuously for about 12, 24, 48, 72, 96 hours)
   a. This will require DAQ to run automatically taking data periodically
   b. Analyze the data taken for sensor response / temperature in board
   c. Use different readout modes

4. **Heat up the box from room temperature to about 35 C**
   a. Repeat 1
   b. Repeat 2

Please preserve the data you take and present results in the Virgo+Hardware meetings.