FCAL monitor/calibration
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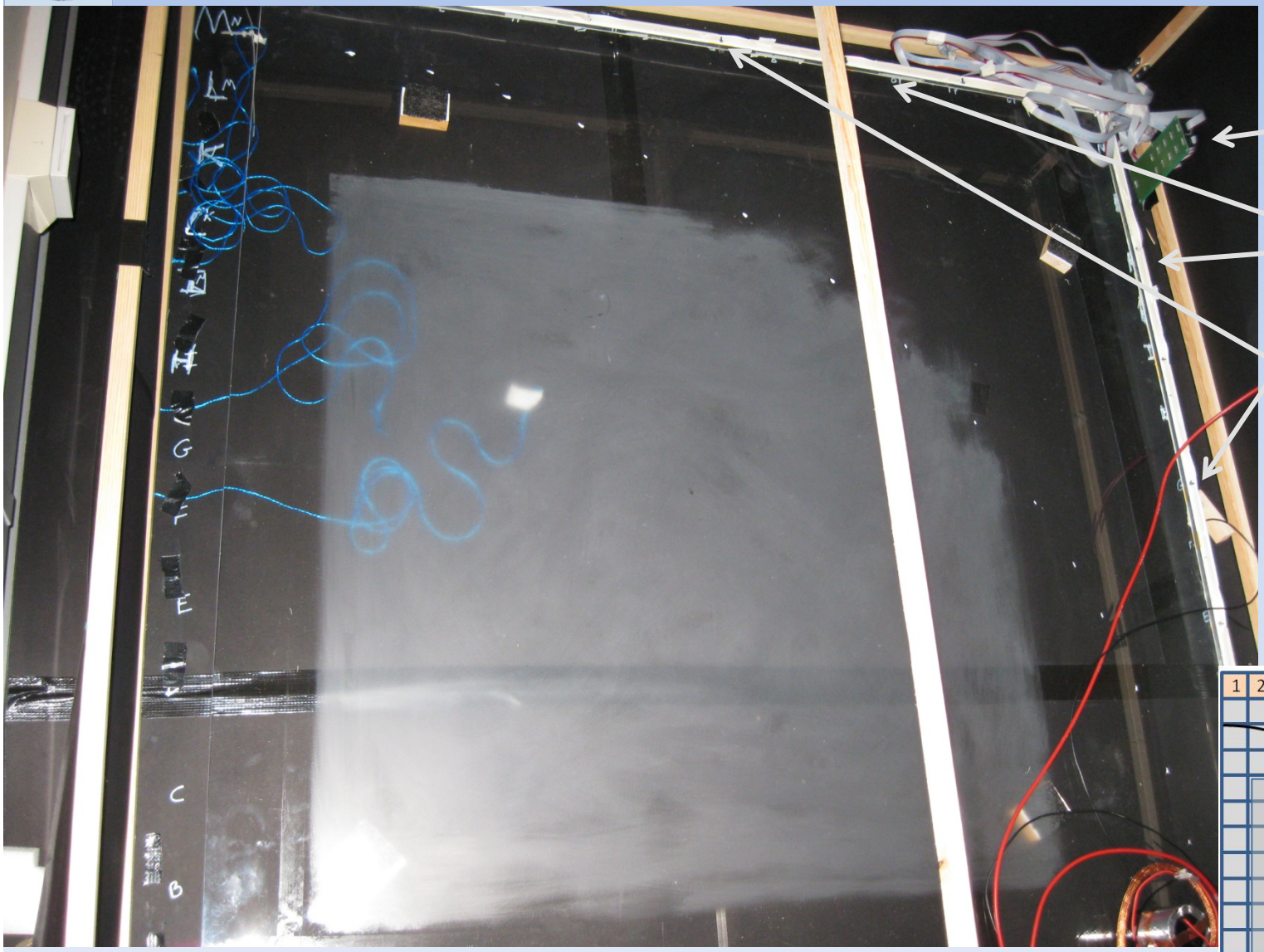
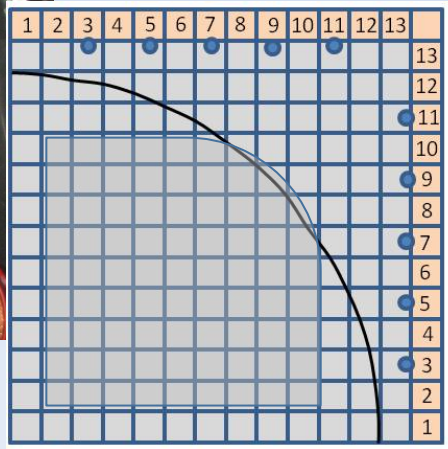
Plexiglas board divided in 13x13 cells (10cmx10cm eac
"Blasted" area shown (sanded with emery paper #800)



Fcal controller and power distribution boards

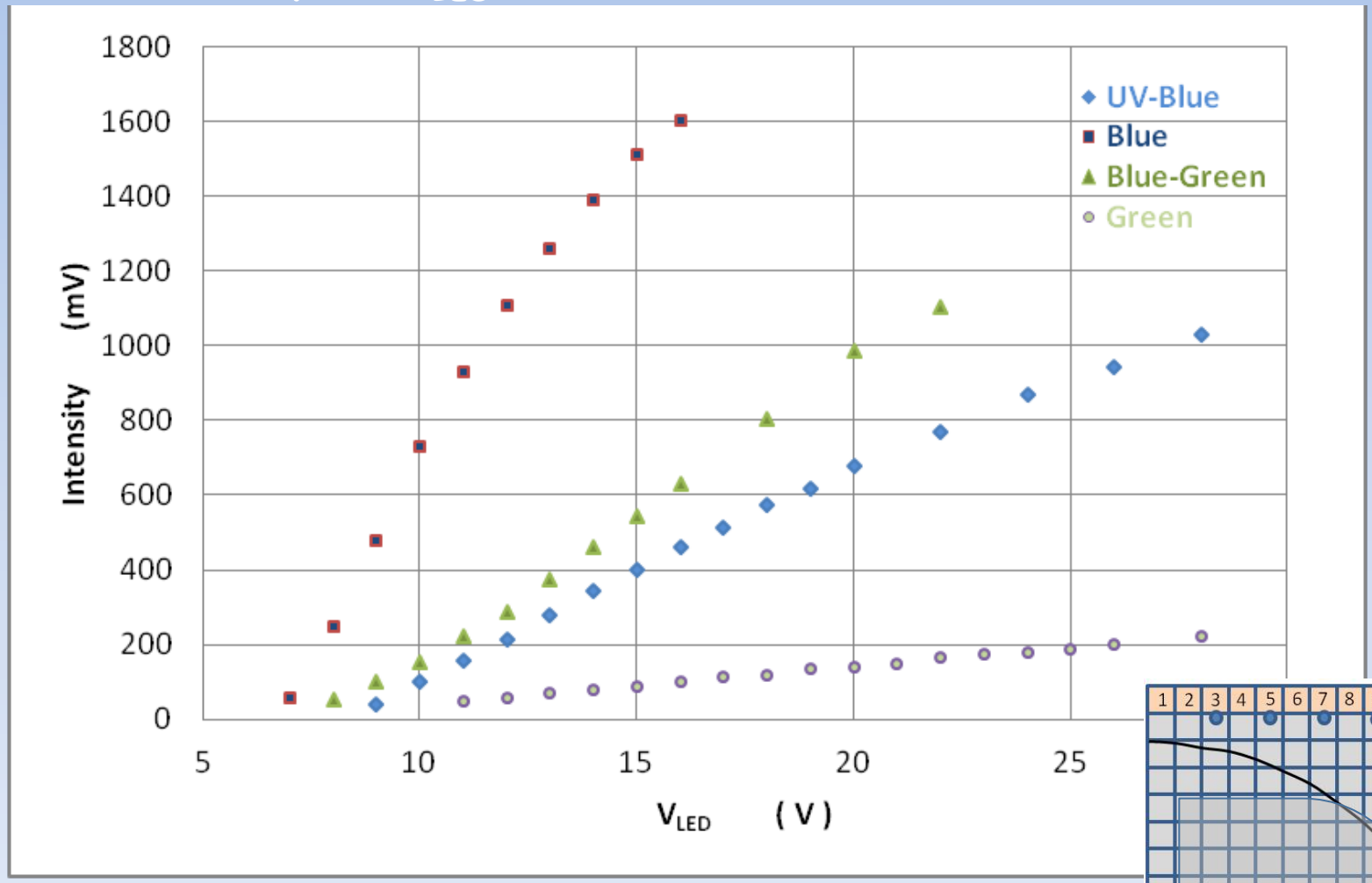
LEDs holders (5 groups of 4 LEDs in each holder)

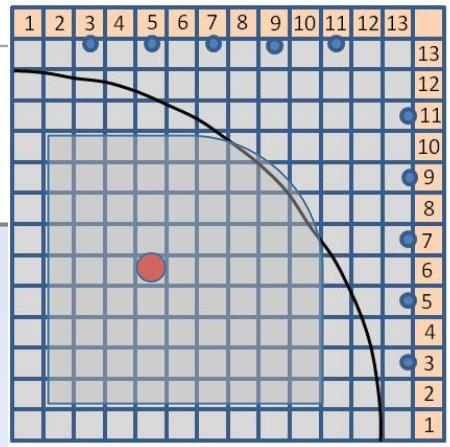
LED position (shown with blue arrow)



Dots represents the limit of the area occupied with FCAL PMTs

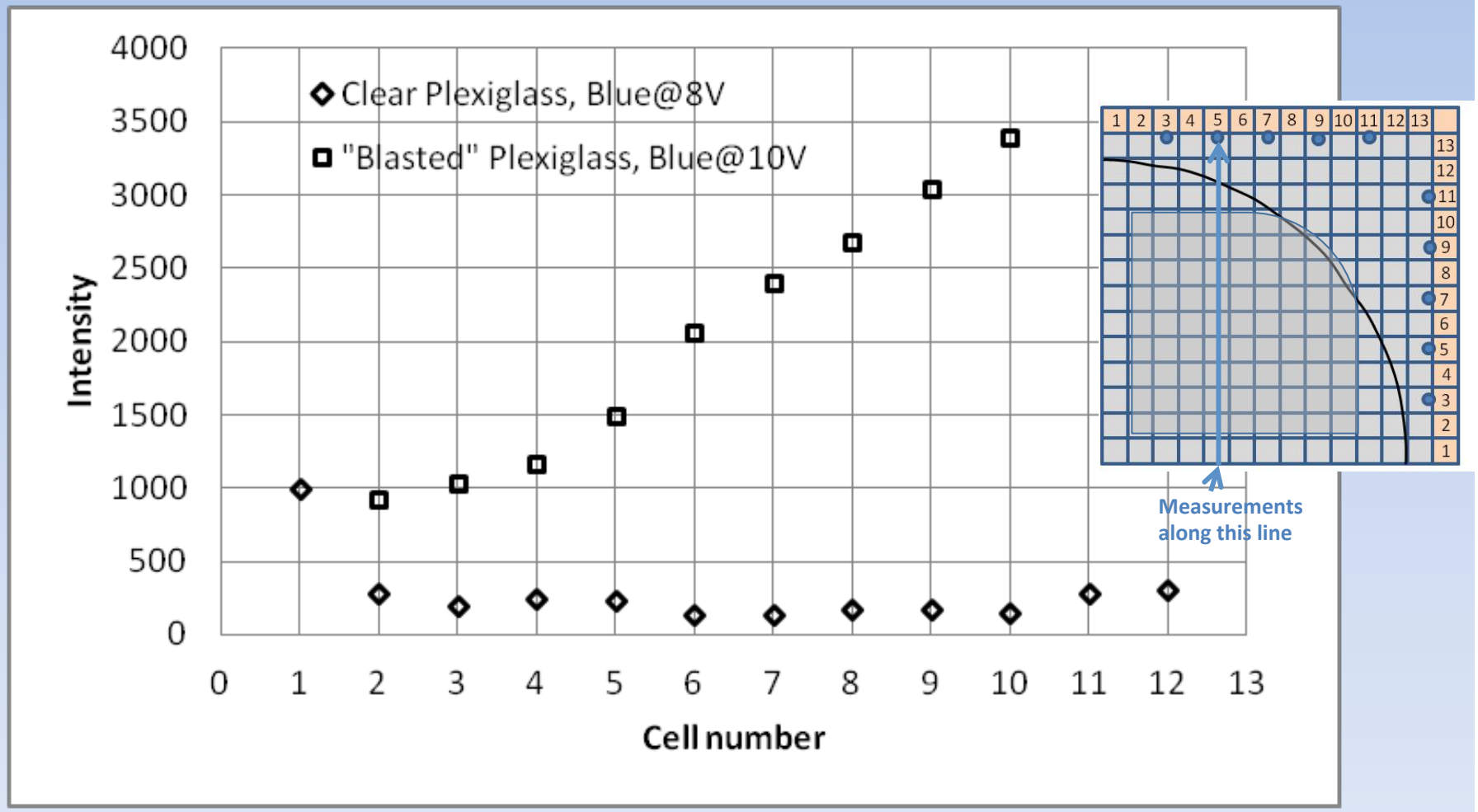
Intensity vs V_{LED}





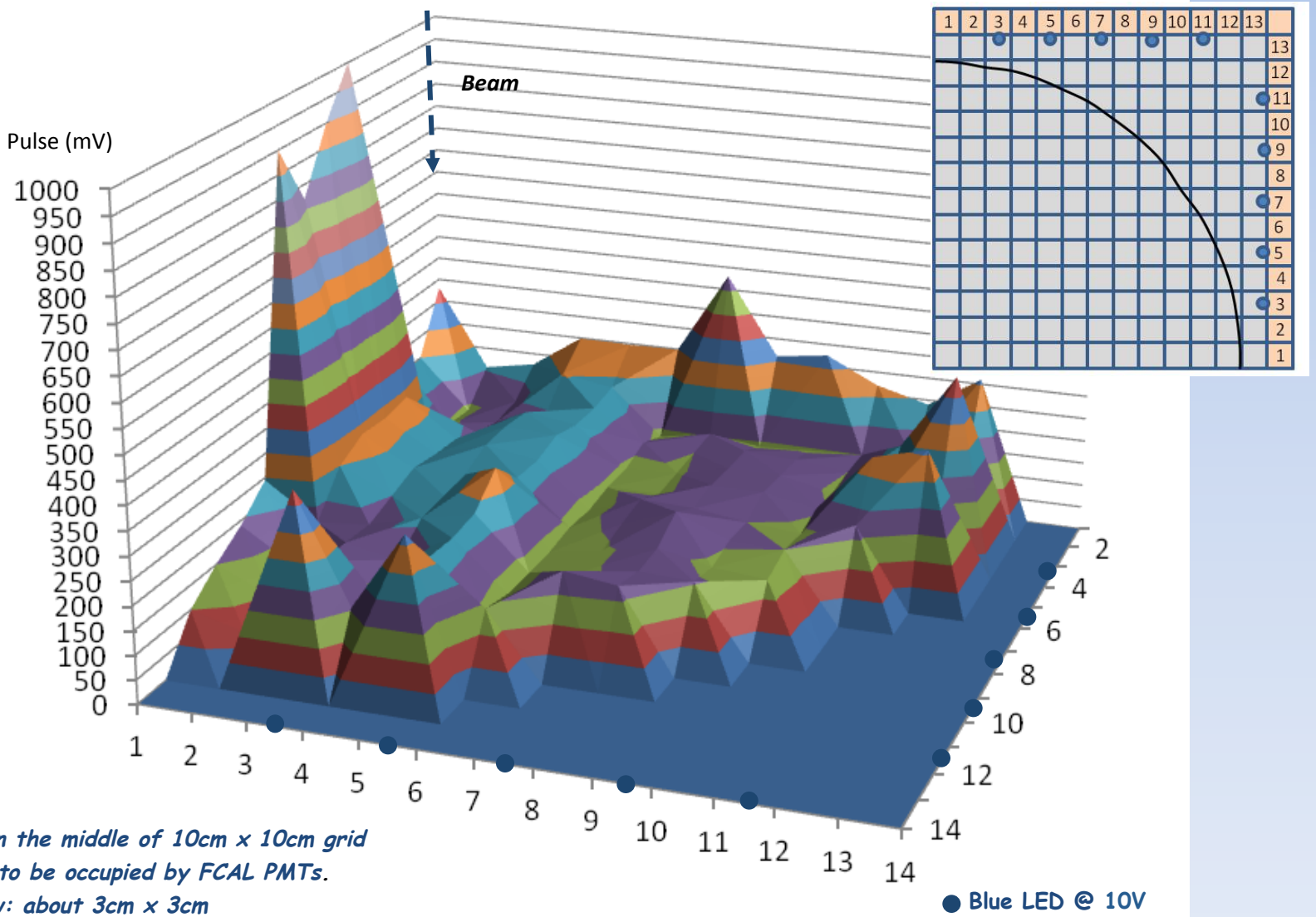
Array PMT@1670V
Intensity in mV

Intensity along column 5



Short PMT@1340V
Blue LED
Intensity in mV

Intensity distribution on a 13x13 cells
Clear Plexiglas

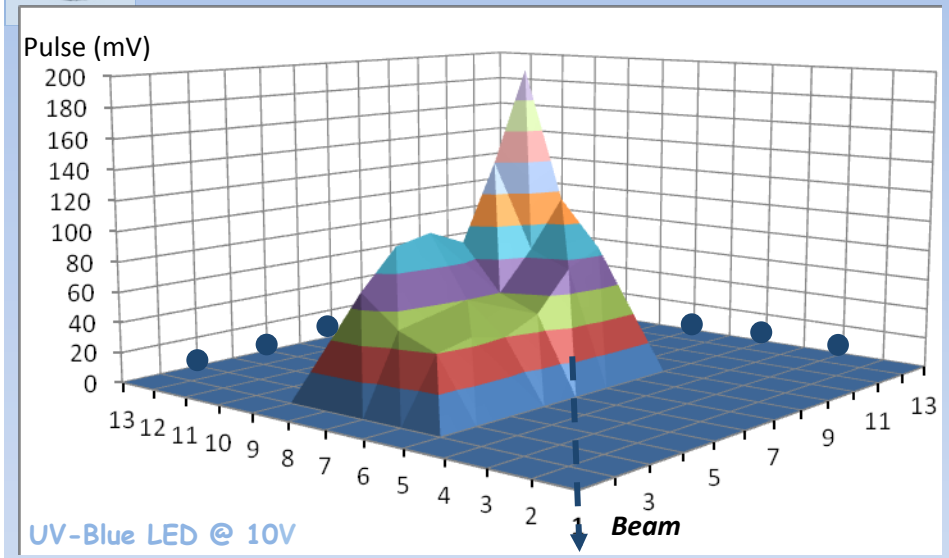


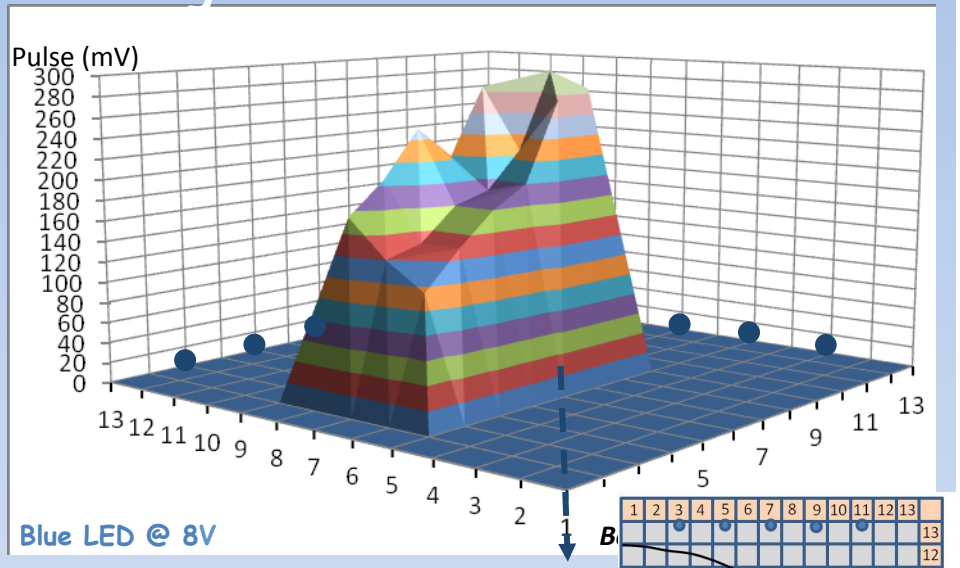
Measurements taken in the middle of 10cm x 10cm grid at positions expected to be occupied by FCAL PMTs.
Measuring PMT window: about 3cm x 3cm

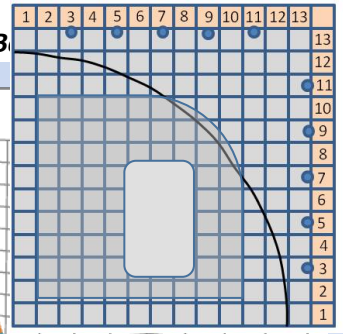
Short PMT@1340V

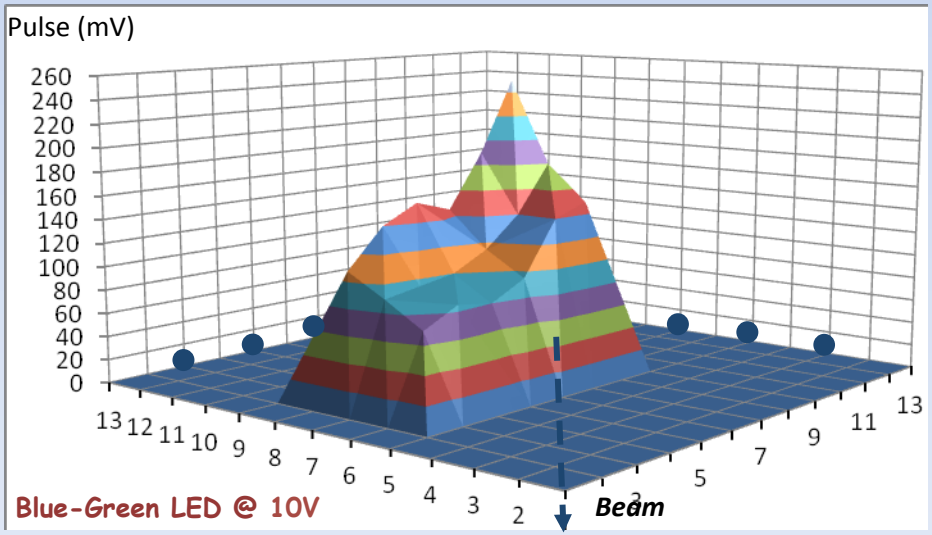
Number 1 to 14 indicates beginning of row or column

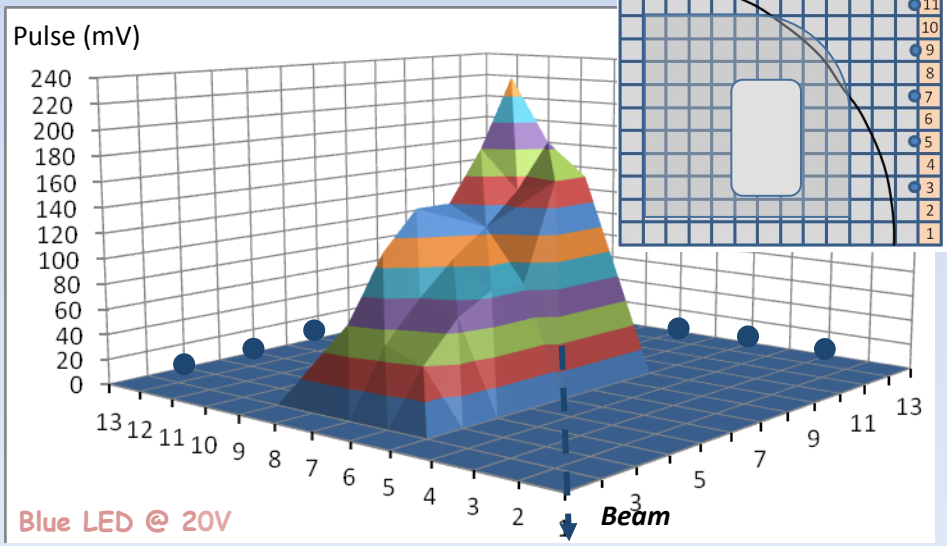
Intensity distribution on a 13x13 cells "Blasted" Plexiglas









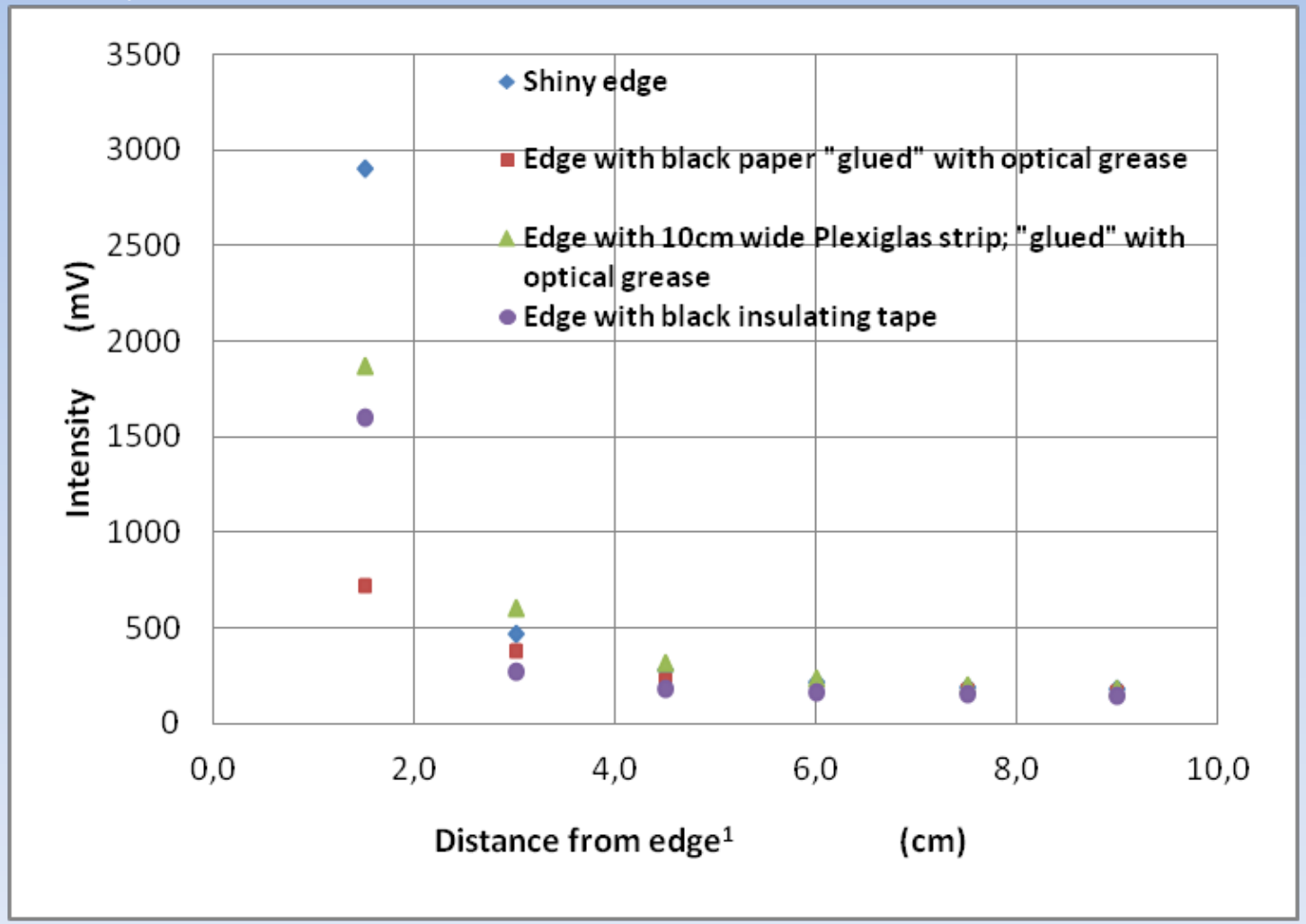


Measurements taken in the middle of 10cm x 10cm grid at position expected to be occupied by FCAL PMTs.

Number 1 to 13 indicates row or column number

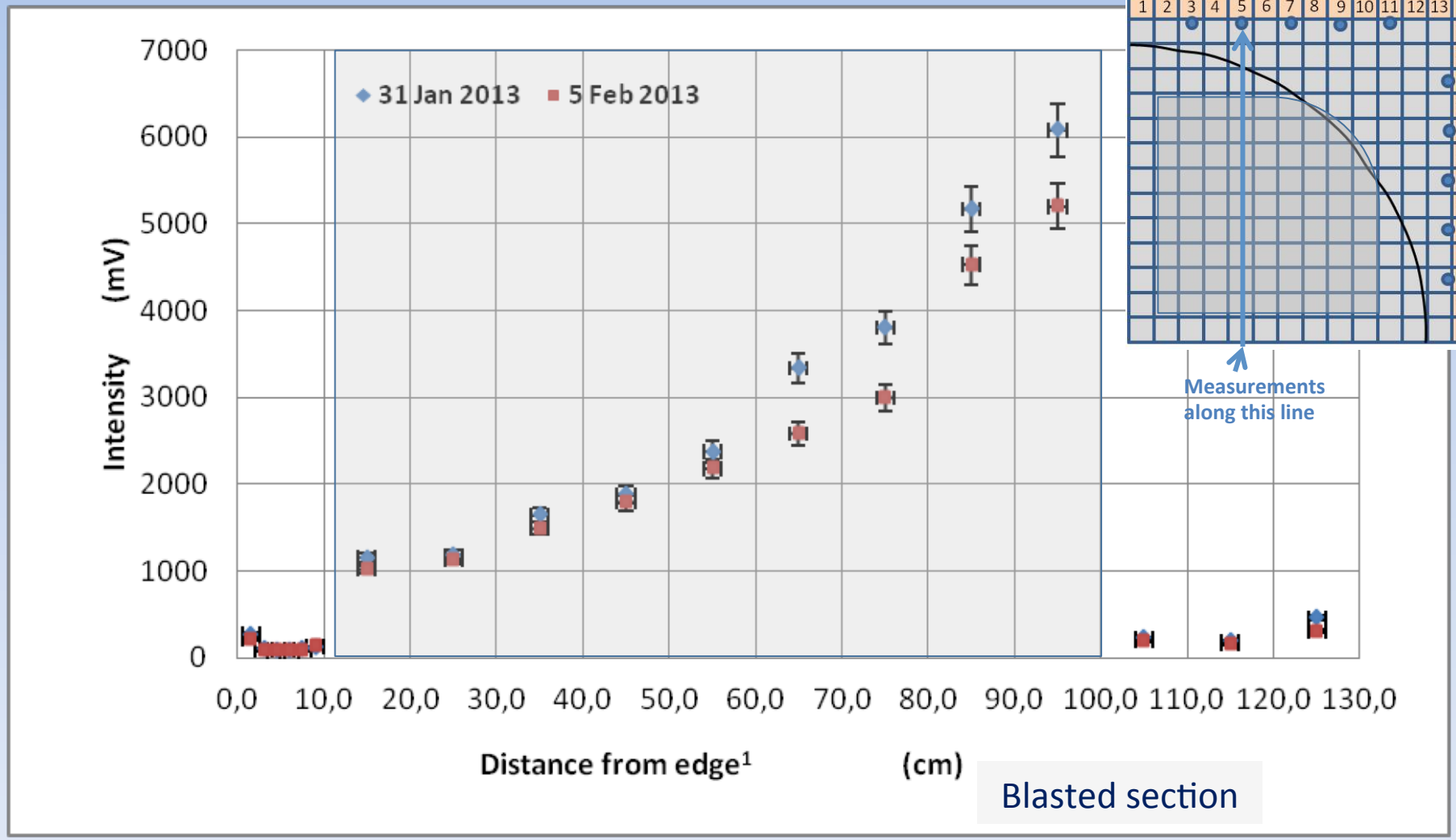
Array PMT@1670V

Reflectance test



Short PMT@1340V (30mm x 30mm window)
[1]Distance of the PMT window central line from the Plexiglas edge
Blue LED, Intensity in mV

Intensity along full column 5 (two series of measurements)



Short PMT@1340V

[1]Distance of the PMT window central line from the Plexiglas edge

Blue LED@8V

Intensity in mV

Remarks

- As expected, after test measurements, light escape from the Plexiglas board side increase if Plexiglas is "blasted"
- As expected, "available" light decrease fast inside the "blasted" Plexiglas board; a lot escapes on the side
- The apparent light intensity between the "blasted"/unblasted is between 50 to 4, depending and decreasing with the distance from the LED
- Uniformity of the light detected is better on the unblasted plexiglas
- Repositioning the PMT on the "same" spot induce an error of about ± 15%
- Due to reflections, higher signal is expected on the very end, relative to the end, of the Plexiglas edge opposite the LEDs

Conclusions

- The Plexiglas board surface should be "blasted" to increase the light collected from its side
- A uniform "blast" is not recommended unless it is very lightly applied
- Alternately,
  - ✓Small plastic lenses (ϕ 2 or 3 mm) could be glued in front of each array PMT
  - ✓ Small glue drops applied on the Plexiglas surface in front on each PMT
  - ✓A series of marks could be applied on the board such as crossing lines or dots, easily applied with a CNC machine:
    - •Marginally dense in order to have marks in front of each PMT
    - •Variable dense depending on the distance from the LEDs
- To decrease high signal near the Plexiglas Edges, we could "glue" on the Plexiglas board edges black paper with glue or optical grease