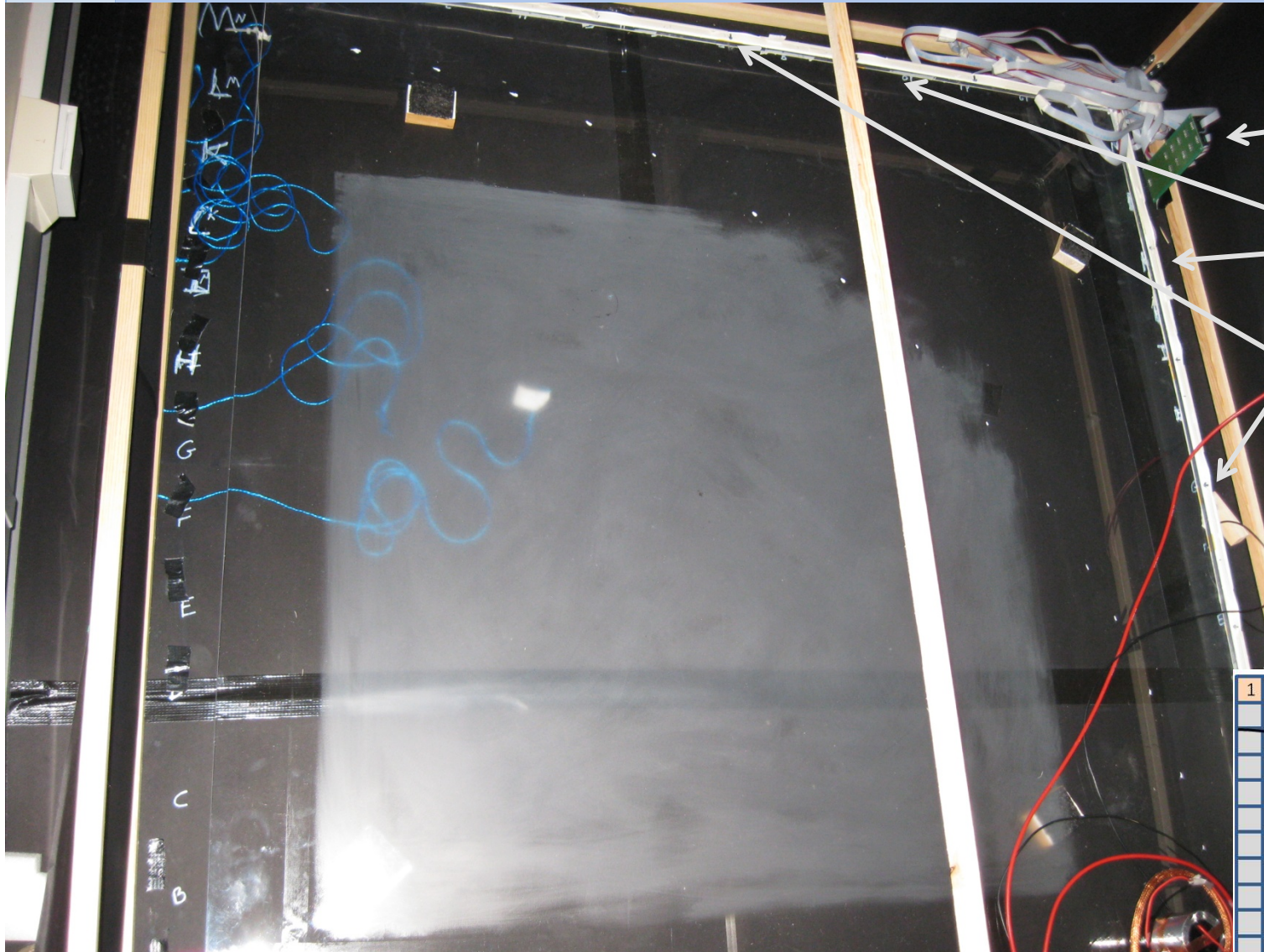# FCAL monitor/calibration
29 January 2013 update

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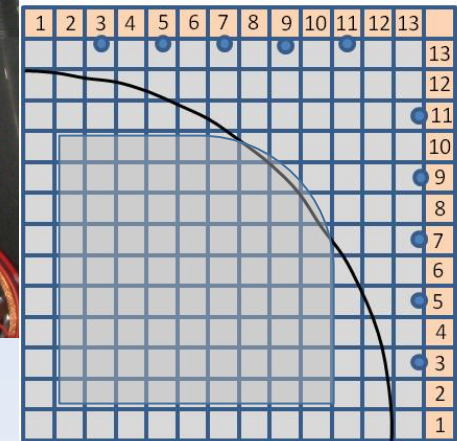# Plexiglas board divided in 13x13 cells (10cm×10cm each)
"Blasted" area shown (sanded with emery paper #800)

Fcal controller and power distribution boards
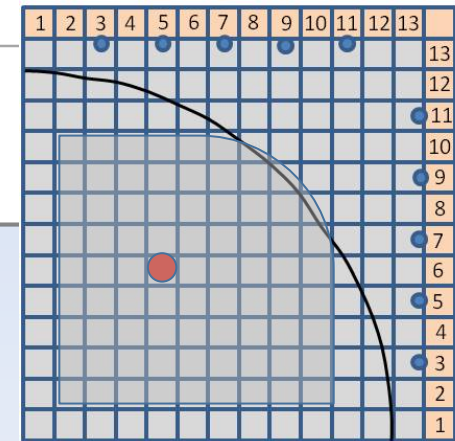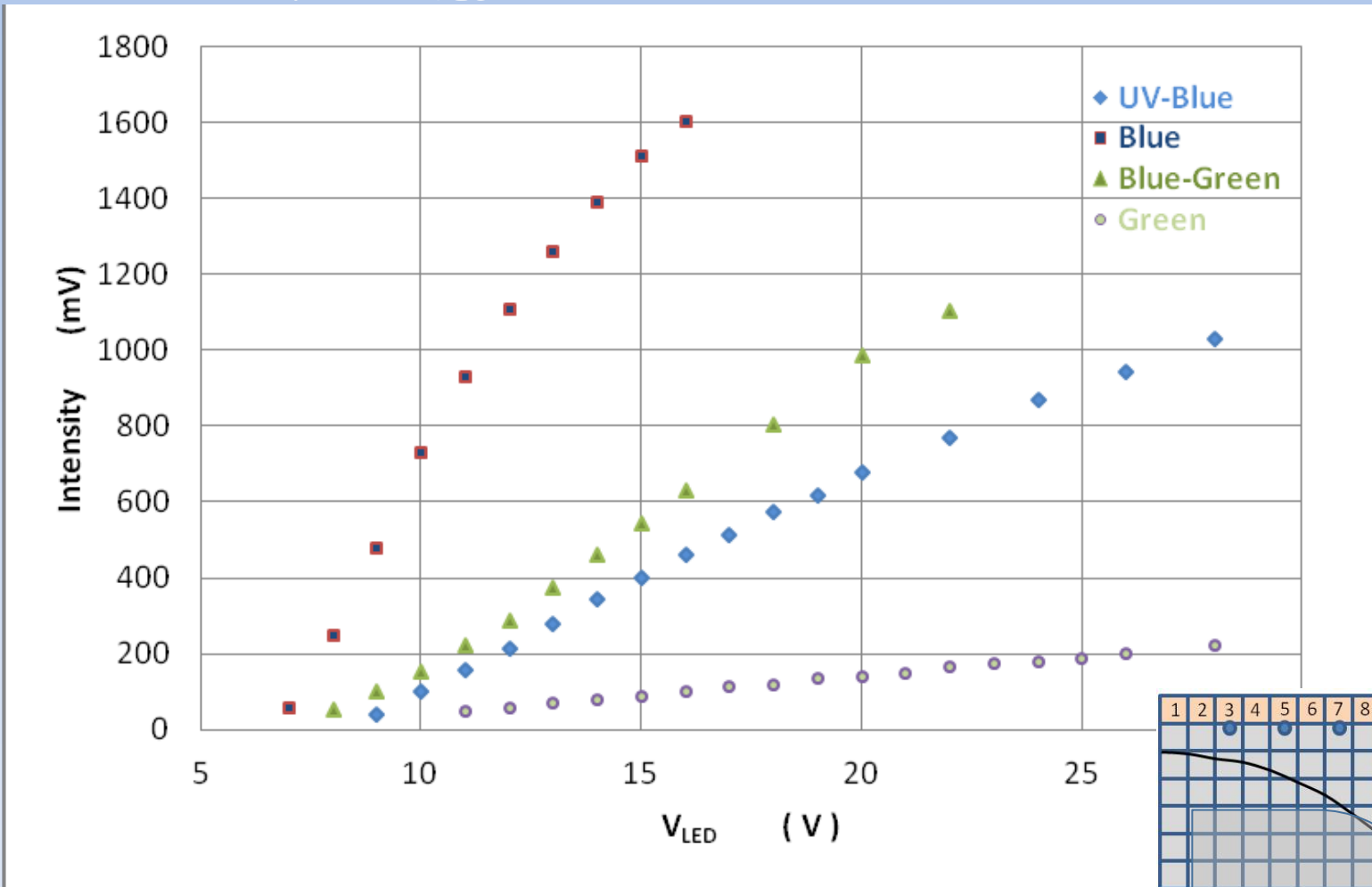
LEDs holders
(5 groups of 4 LEDs in each holder)

LED position
(shown with blue arrow)

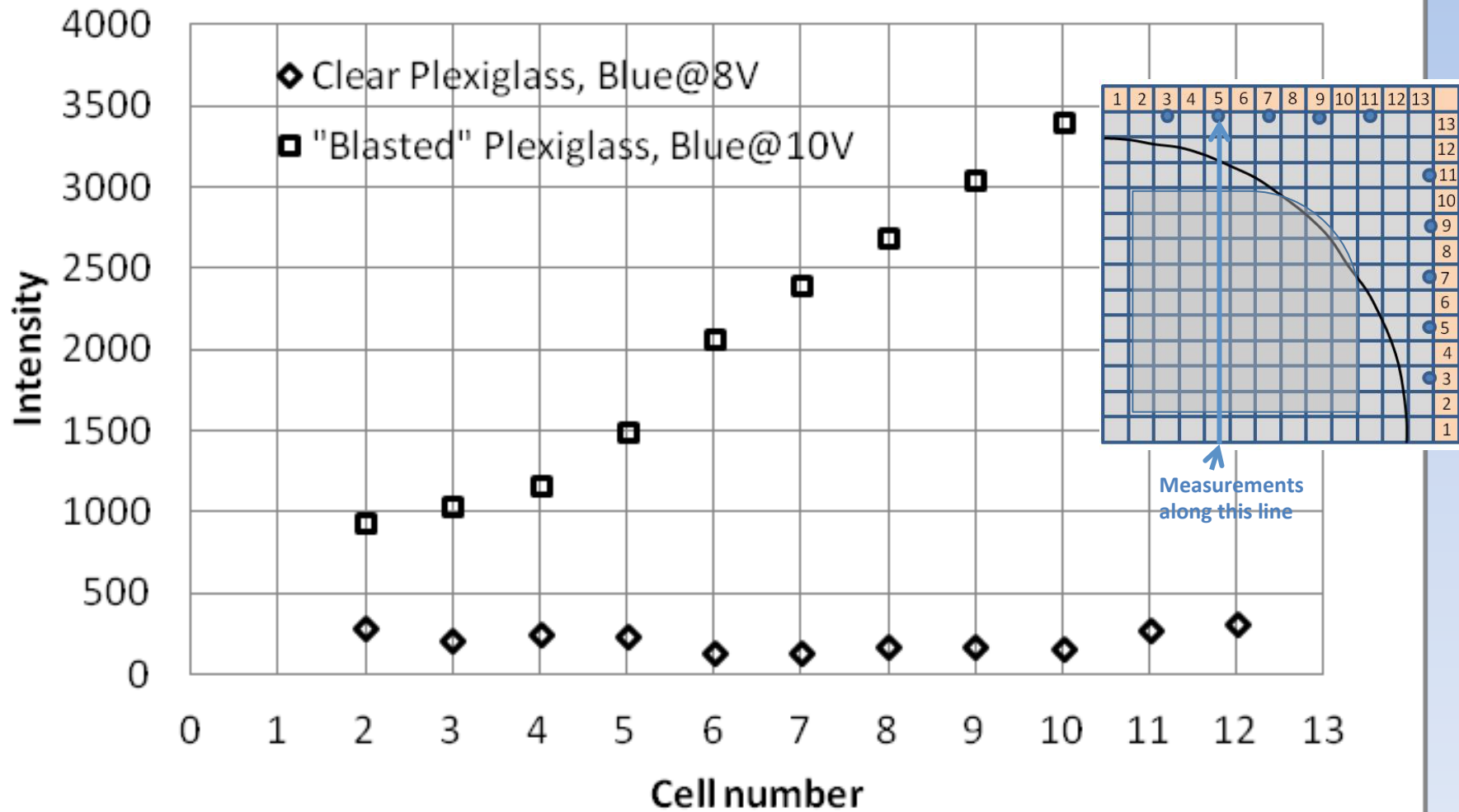Dots represents the limit of the area occupied with FCAL PMTs

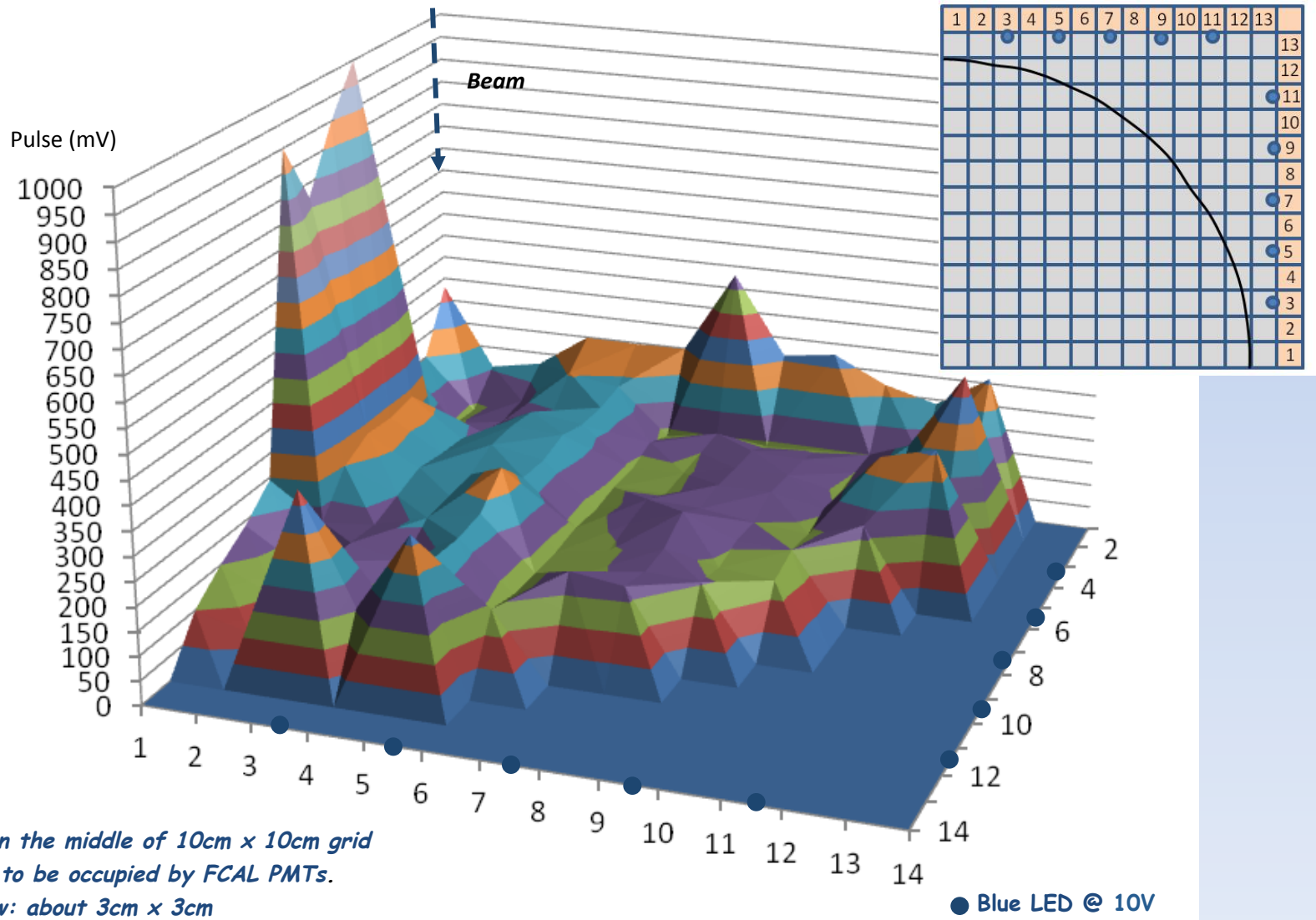# Intensity vs V_{LED}

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

Pulse (mV)

Beam

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

● Blue LED @ 10V

Short PMT@1340V

Number 1 to 14 indicates beginning of row or column

Intensity distribution on a 13x13 cells "Blasted" Plexiglas

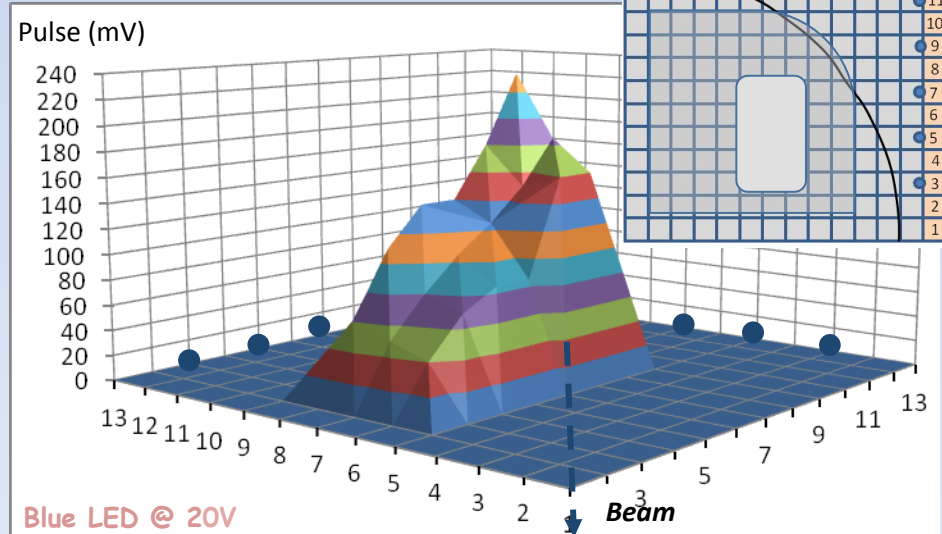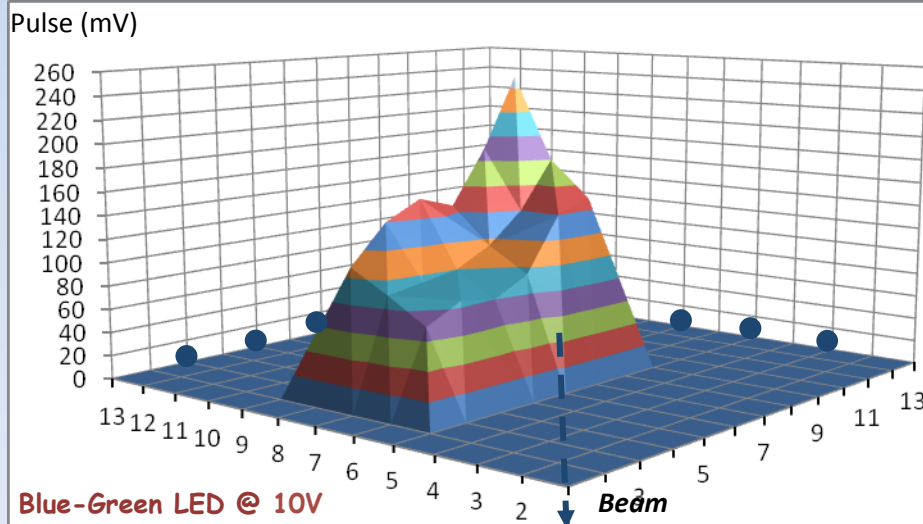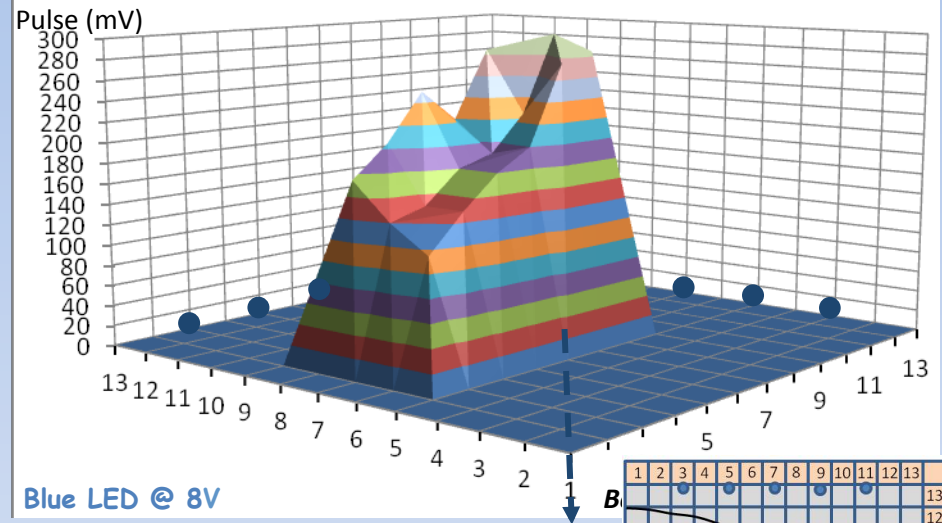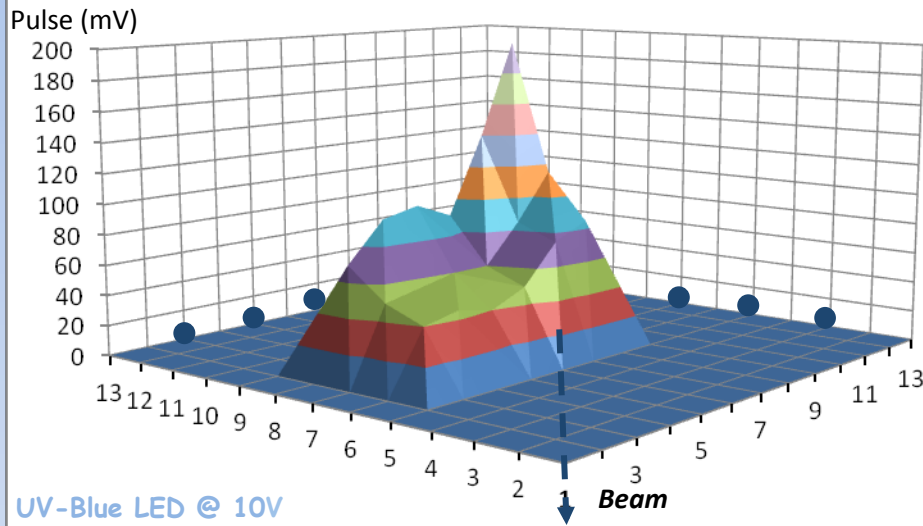UV-Blue LED @ 10V

Blue LED @ 8V
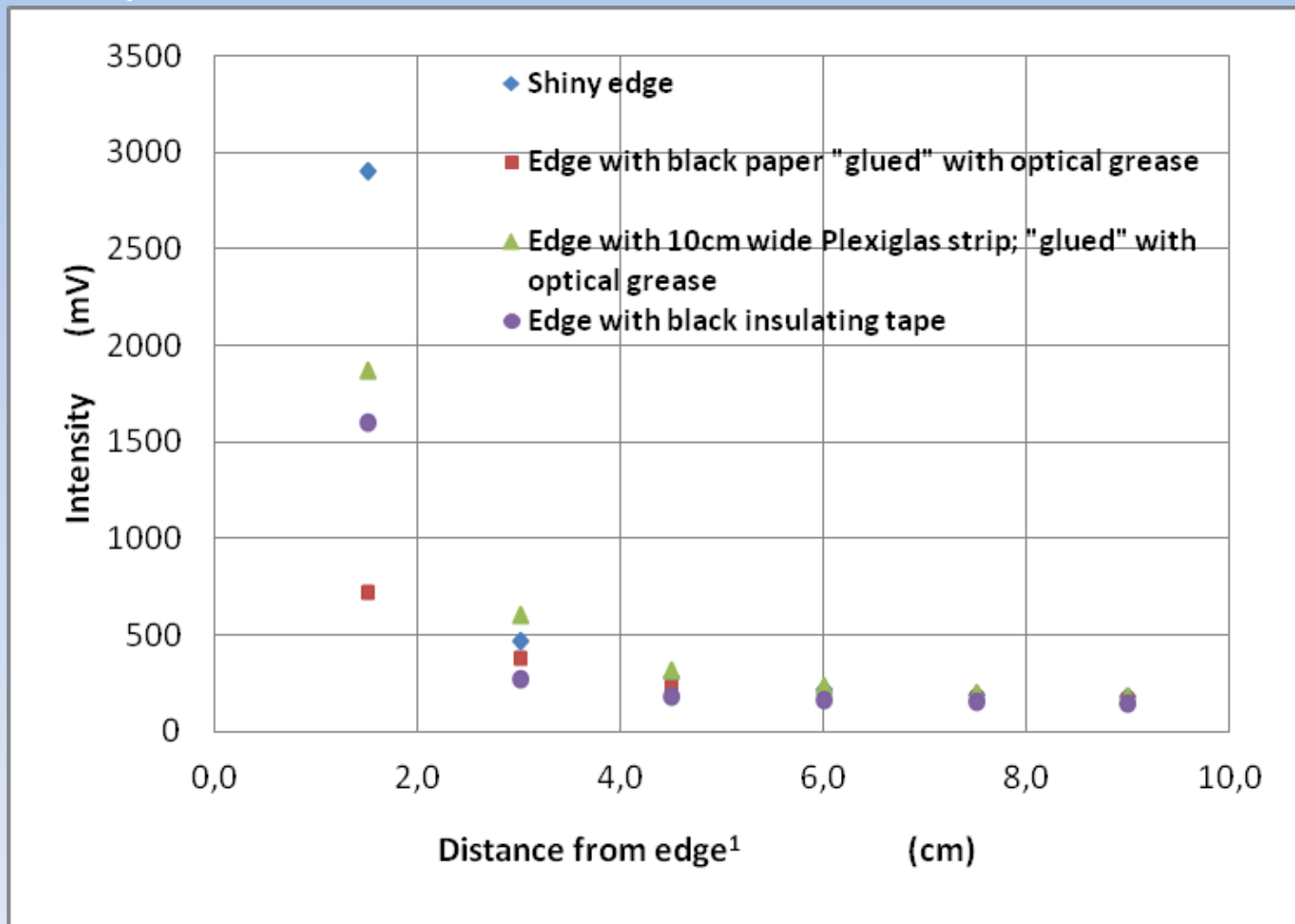
Blue-Green LED @ 10V

Blue LED @ 20V

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

Array PMT@1670V

Number 1 to 13 indicates row or column number

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
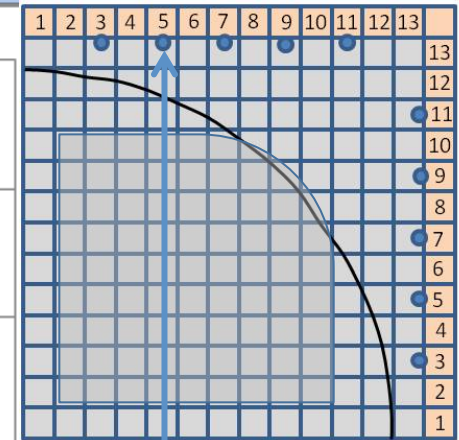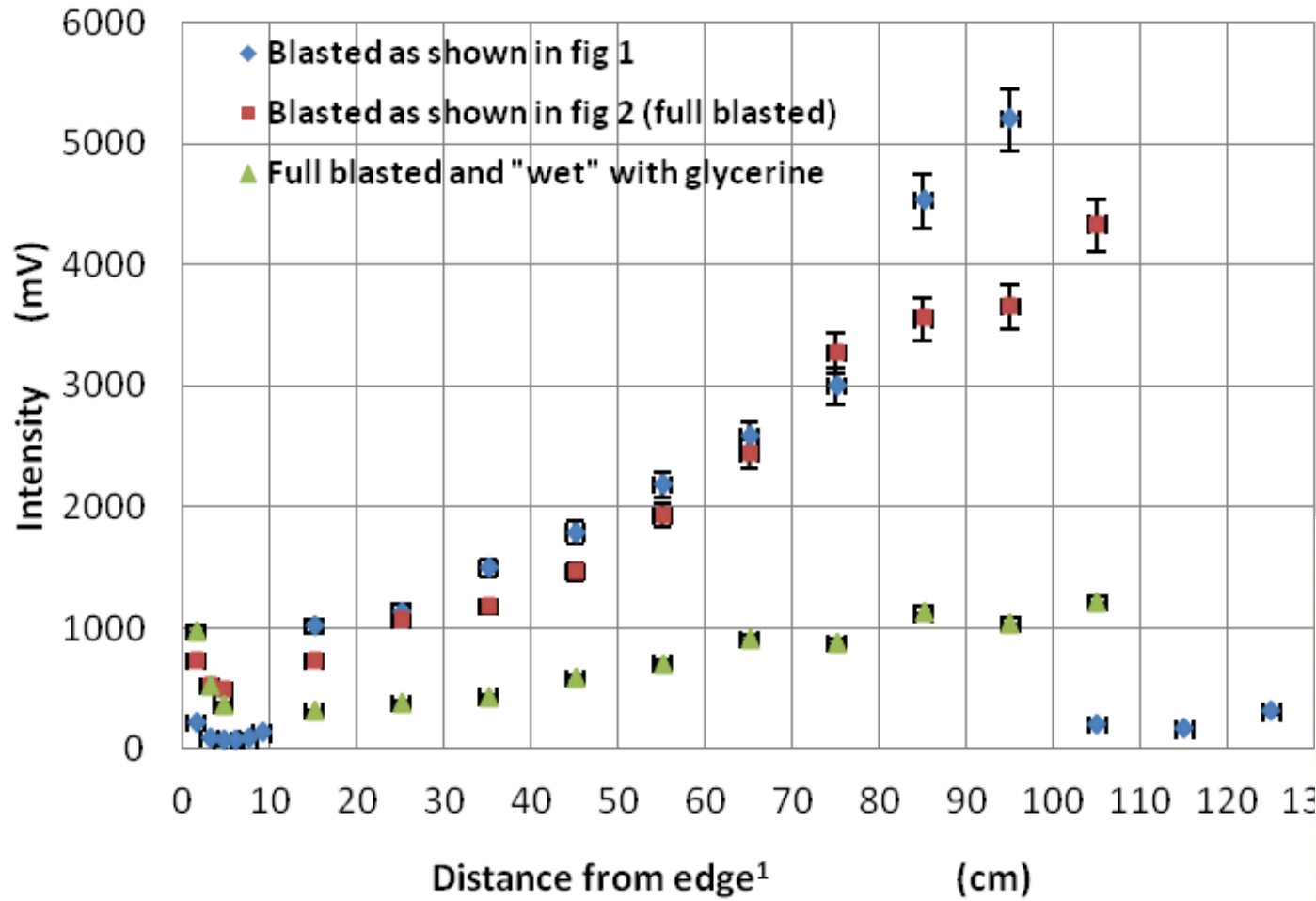
Intensity along full column 5 (two series of measurements)

Short PMT@1340V
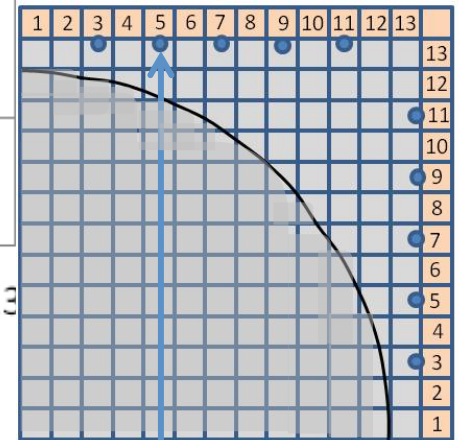[1]Distance of the PMT window central line from the Plexiglas edge
Blue LED@8V
Intensity in mV

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