

TCT of irradiated LGADs Run7062 from CERN SSD

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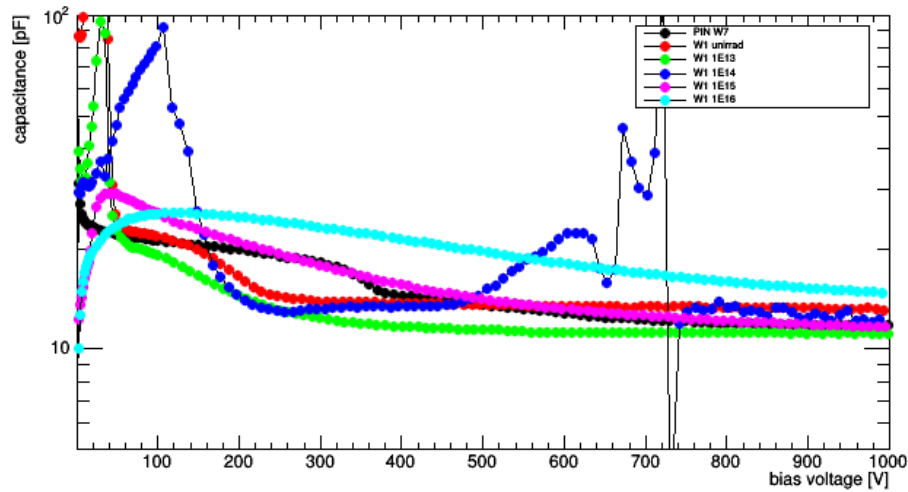
List of samples

- Neutron irradiated.
 - 1E13 – W1 J5
 - 1E14 – W1 H4
 - 1E15 – W1 H5
 - 1E16 – W1 H3
- Proton irradiated.
 - 9.87E11 – W1 A7
 - 1.36E13 – W1 B6
 - 1.04E14 – W1 B9
 - 9.16E14 – W1 C6
 - 2.30E16 – W1 D2
- Unirradiated
 - LGAD – W1 D8
 - PIN – W7 H9
- Earlier measurements:
 - W1 doping 1.6E13
 - Gain: 3.5 – 4.2 (1000V)
 - W3 doping 2.0E13
 - Gain: 10 – 16.7 (450V)
 - W5 doping 2.2E13
 - Not operational
 - W7 PIN

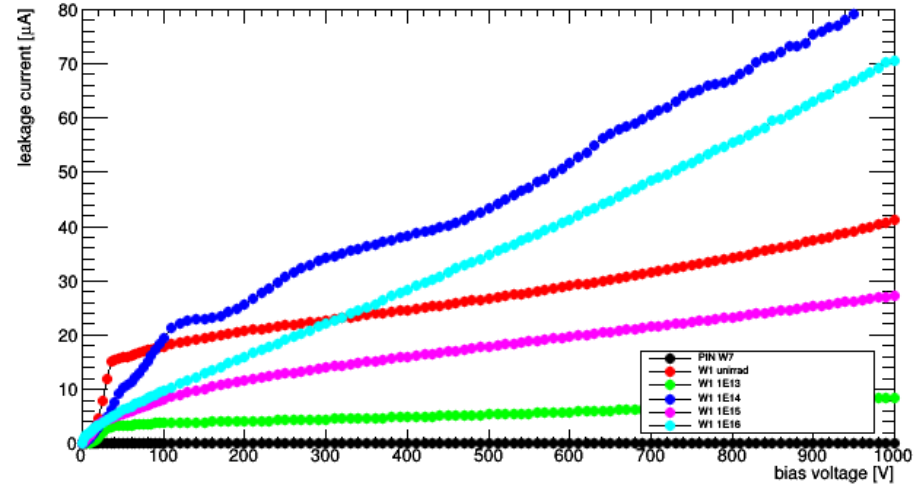
Neutron irradiation measurements

Neutron irradi. CVIV

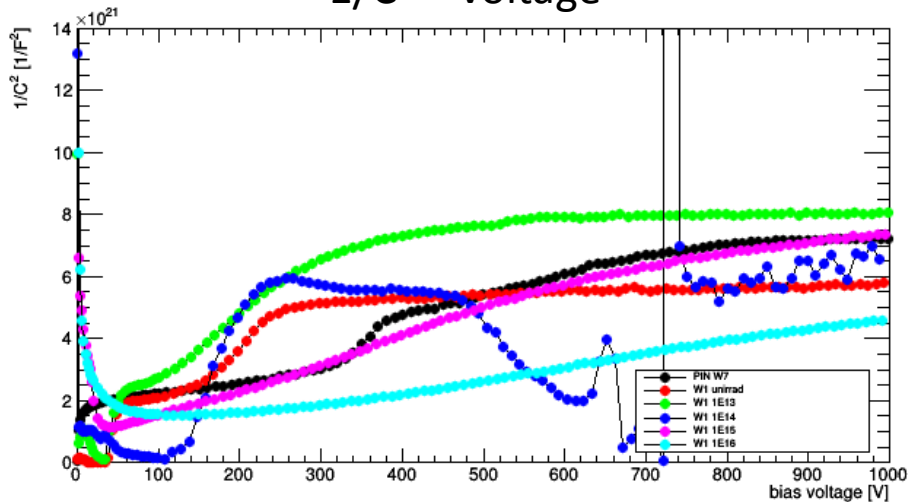
capacitance – voltage



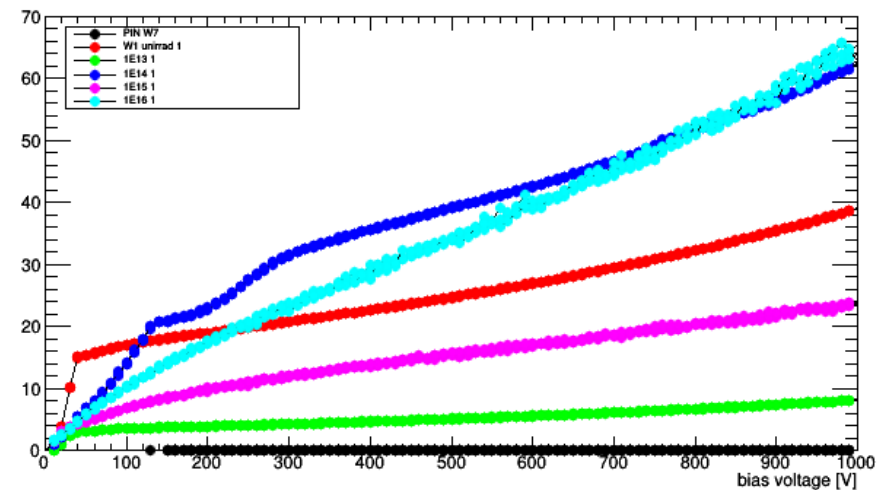
pad current– voltage



1/C² – voltage

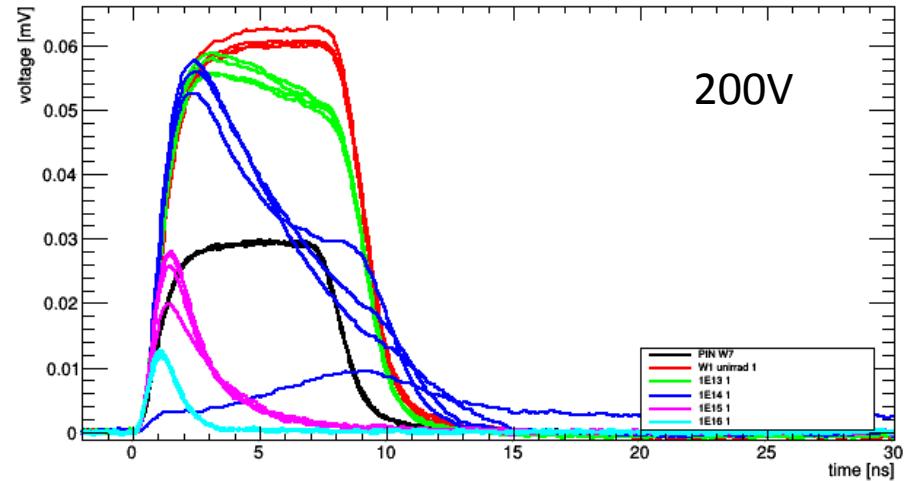
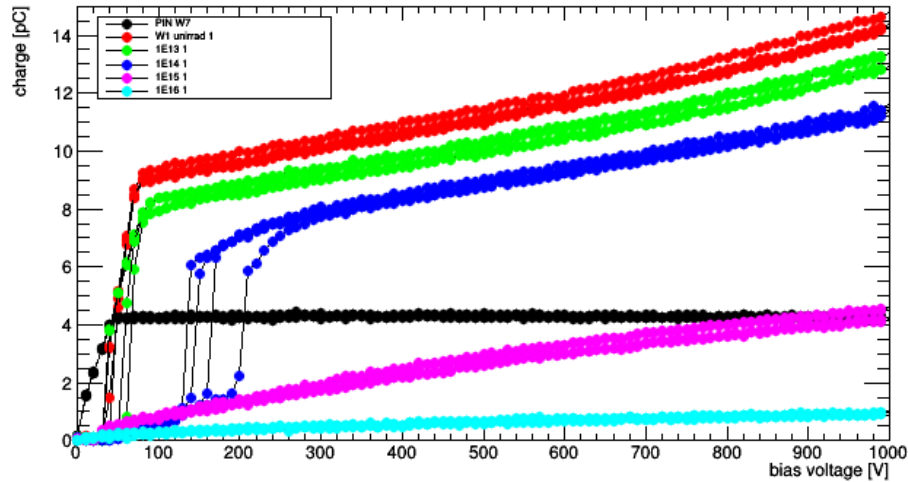


leakage current TCT – voltage

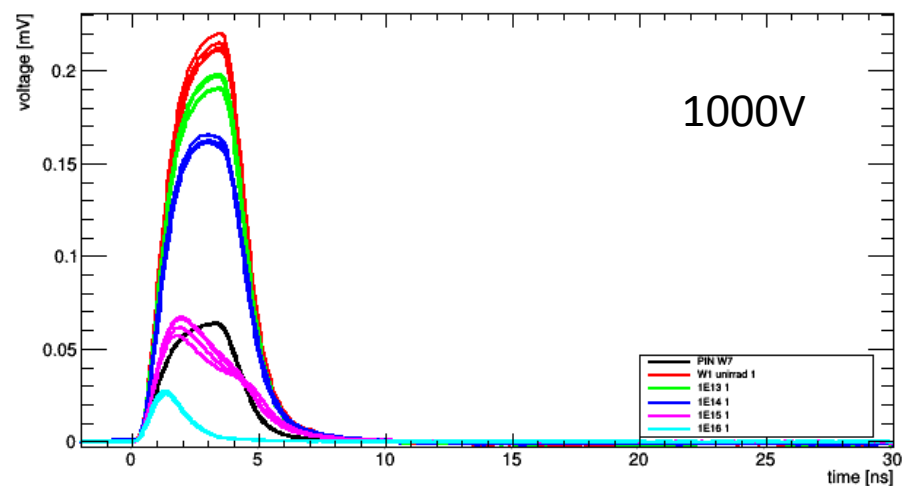
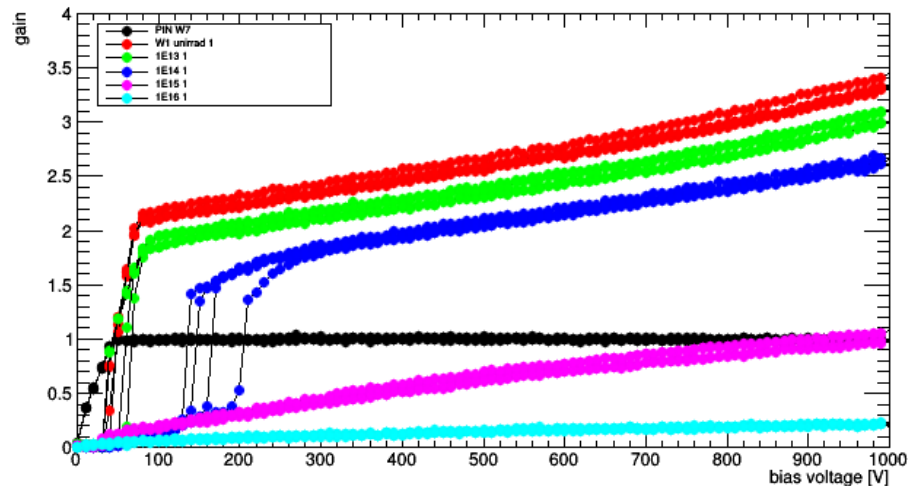


Neutron irradi. Red TCT front

charge – voltage

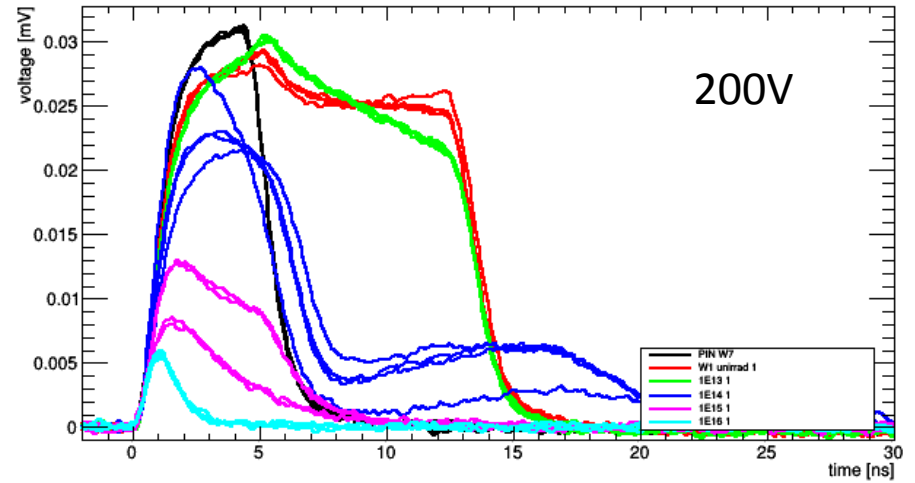
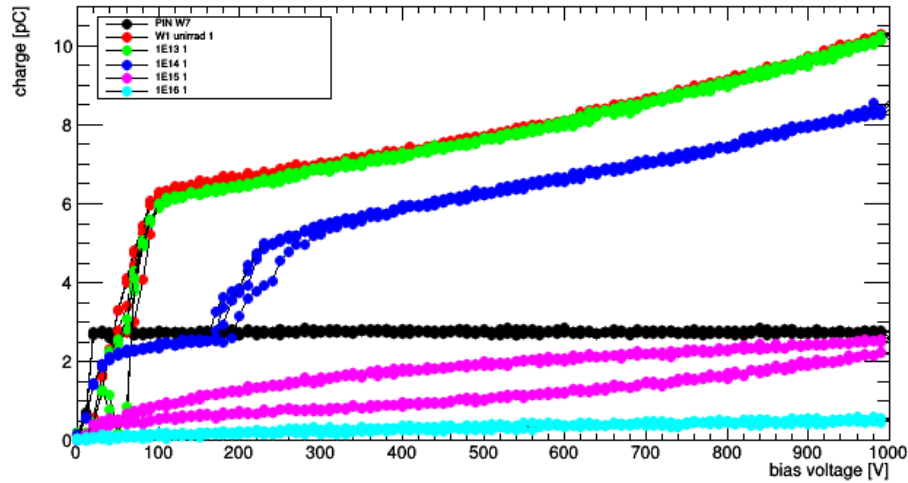


gain – voltage

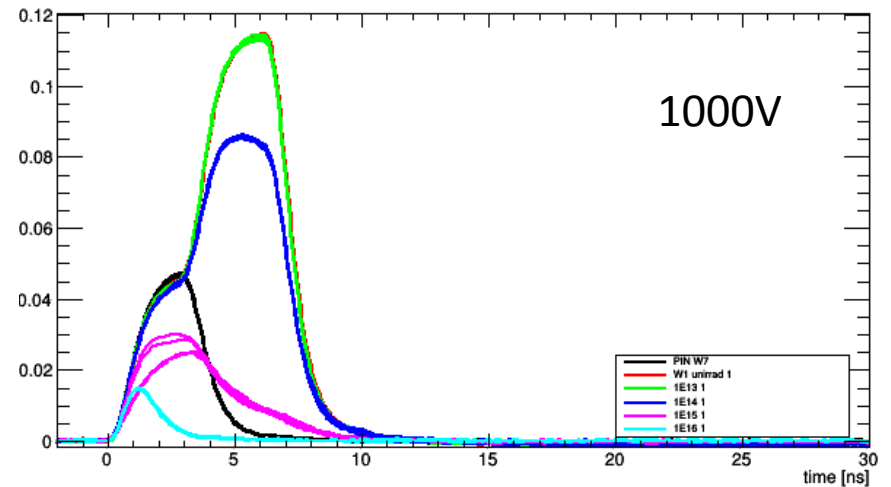
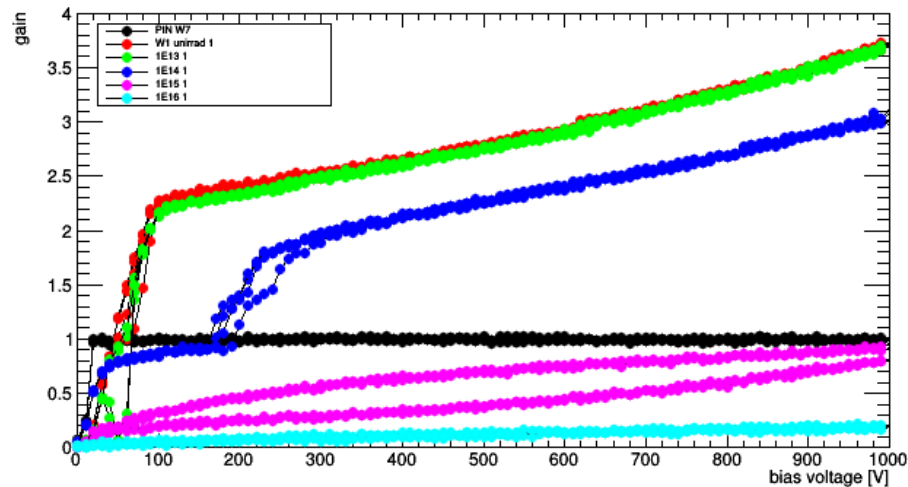


Neutron irradi. Red TCT back

charge – voltage



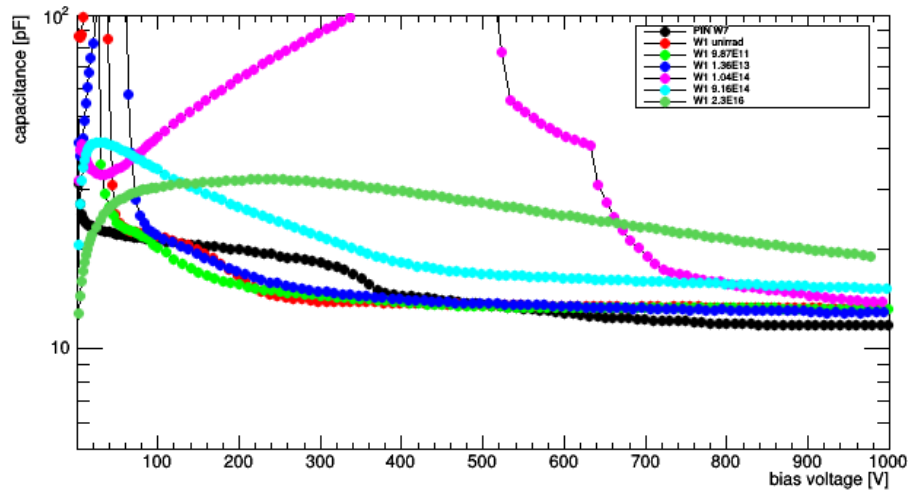
gain – voltage



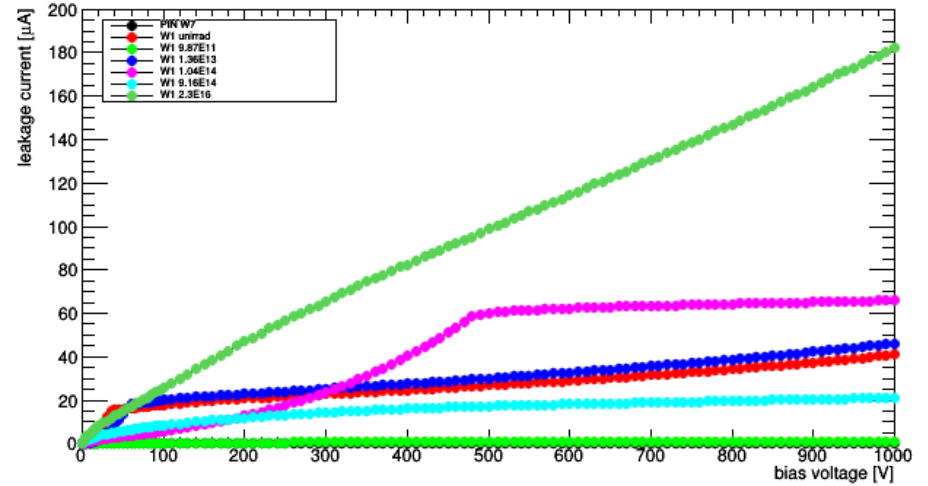
Proton irradiation measurements

Proton irradi. CVIV

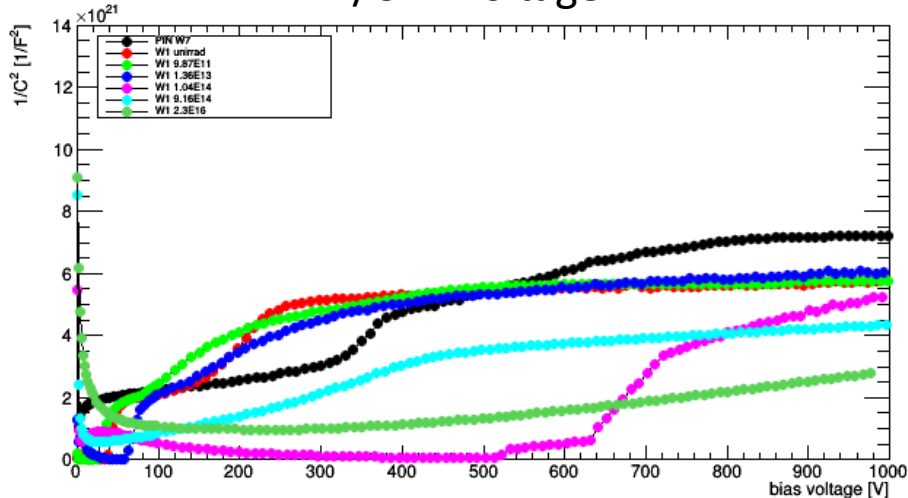
capacitance – voltage



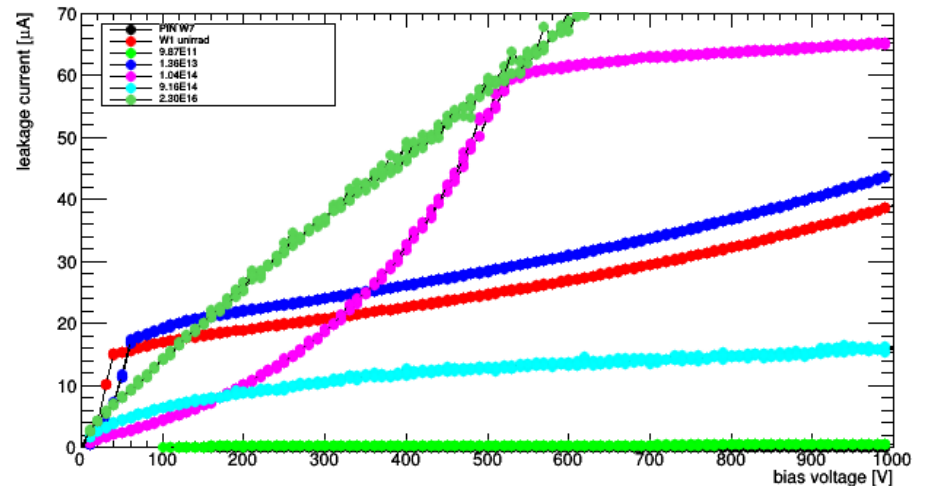
pad current – voltage



1/C² – voltage

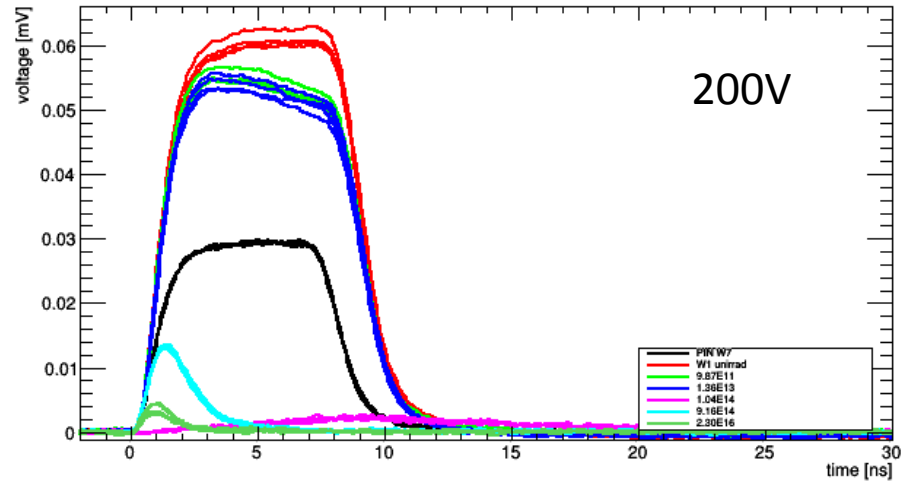
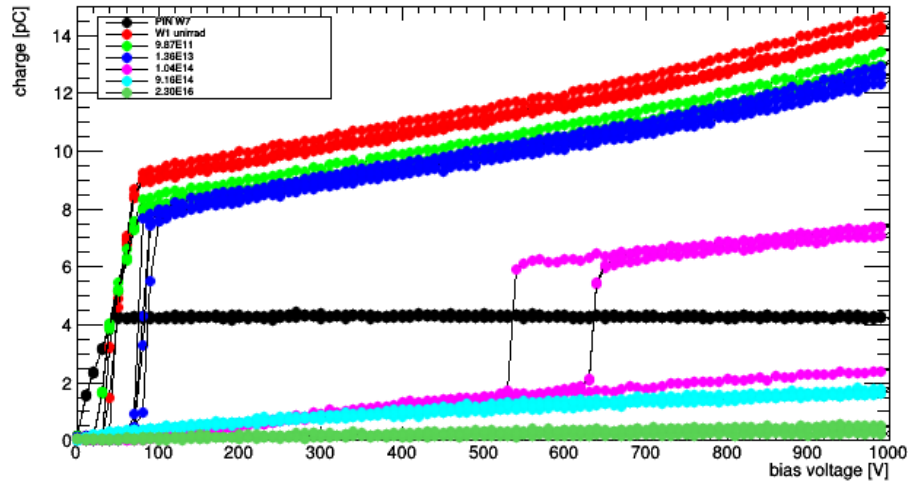


leakage current TCT – voltage

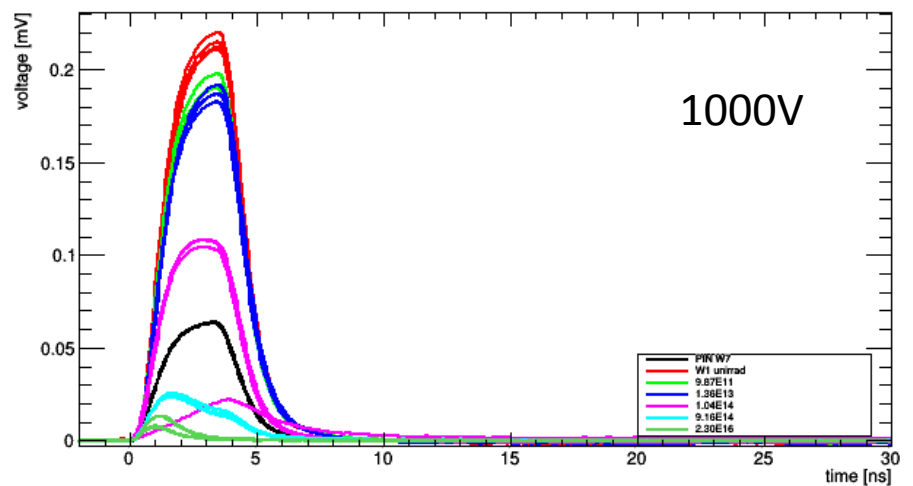
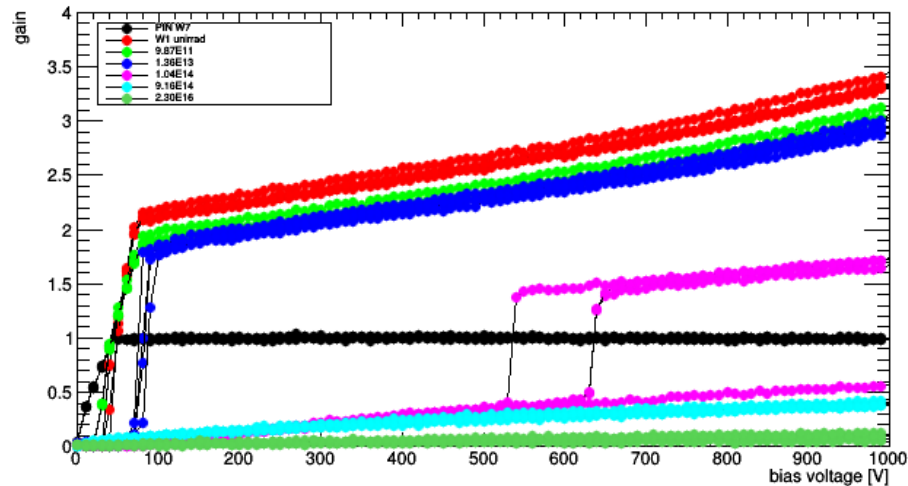


Proton irradi. Red TCT front

charge – voltage

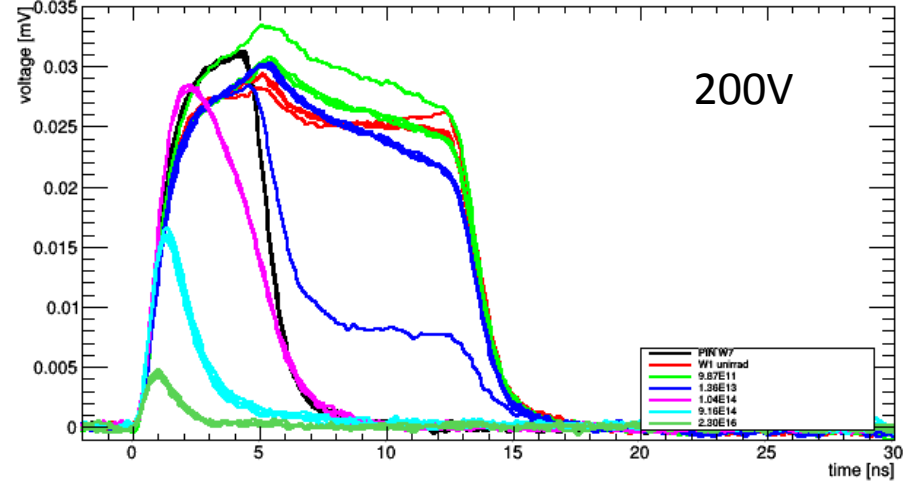
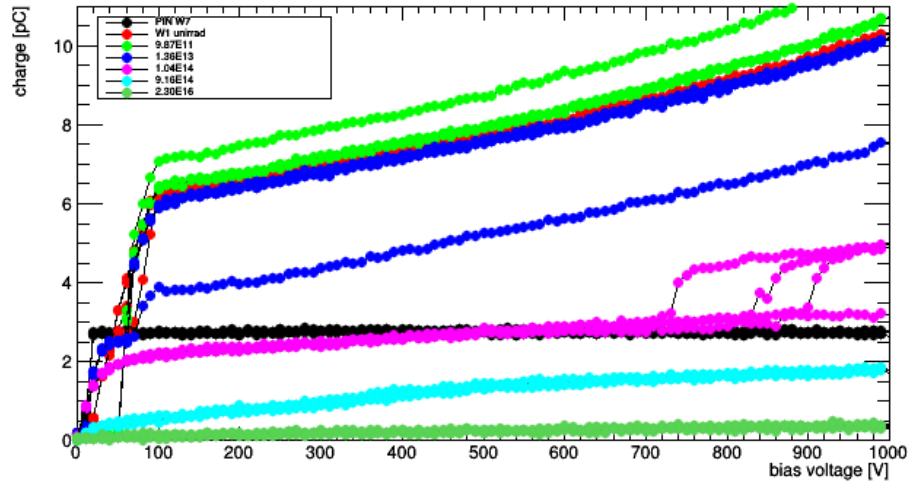


gain – voltage

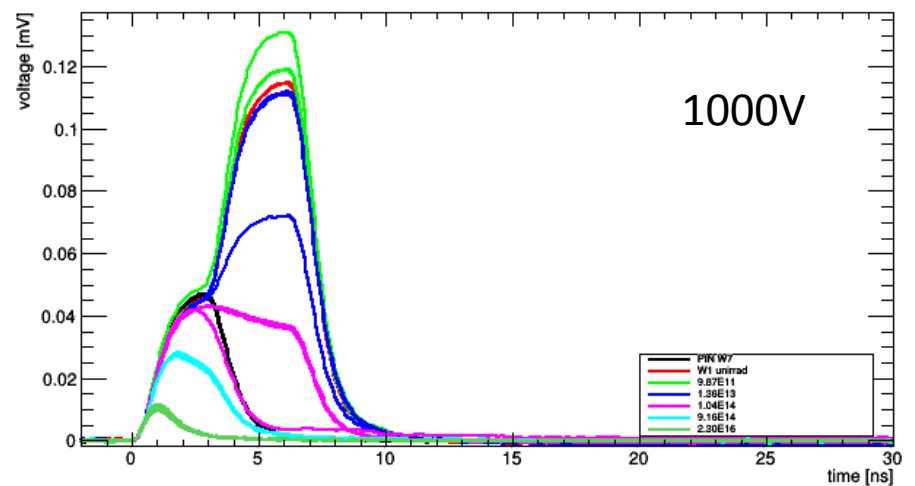
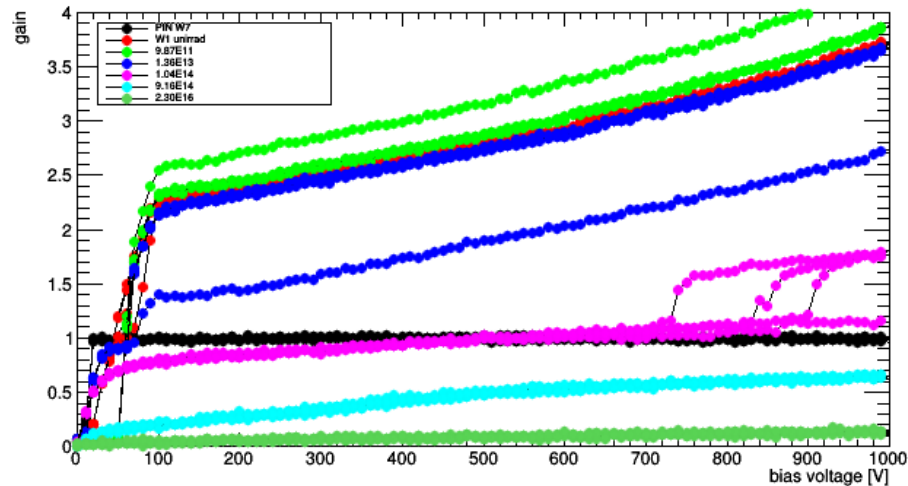


Proton irradi. Red TCT back

charge – voltage



gain – voltage



Individual measurements

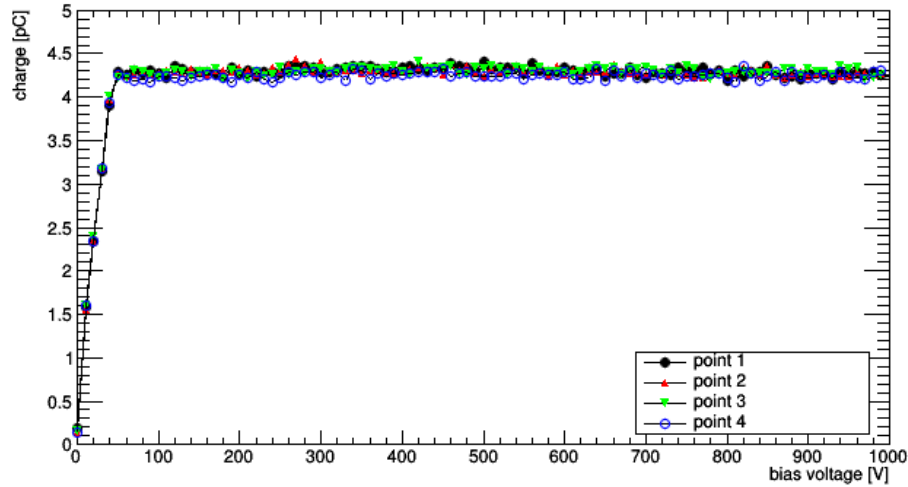
Three horizontal lines of varying shades of blue, stacked vertically, extending across the width of the slide.

Before irradiation W1 D8 and W7 H9

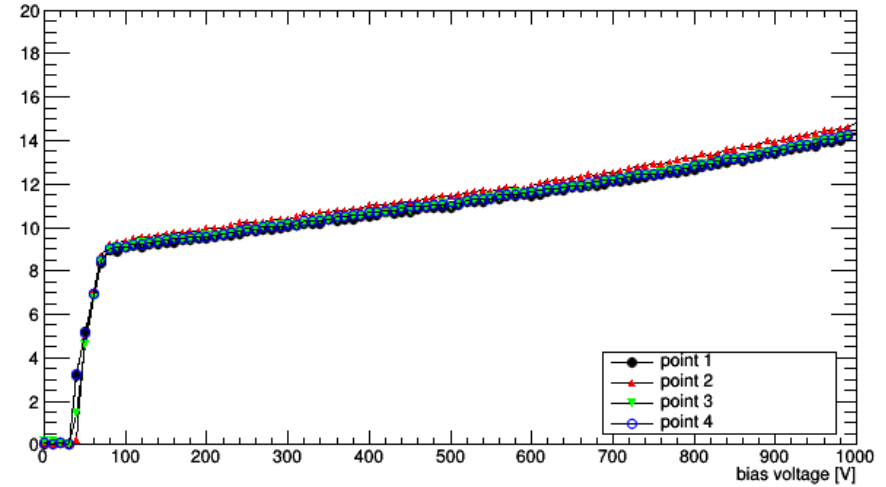


W7_H9 and W1_D8 red front

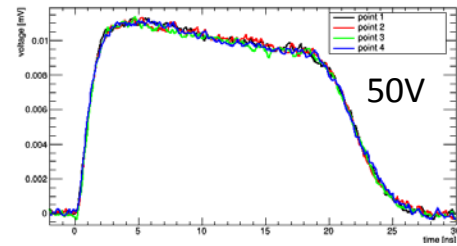
Red front: Run7062_W7_H9 Charge 25ns -- V



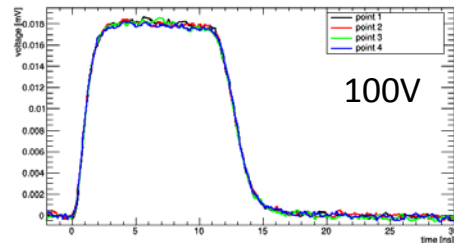
Red front: Run7062_W1_D8 Charge 25ns -- V



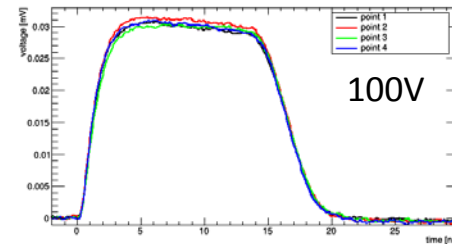
Red front: W7_H9 Signal -- V



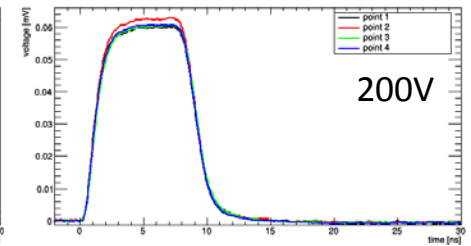
Red front: W7_H9 Signal -- V



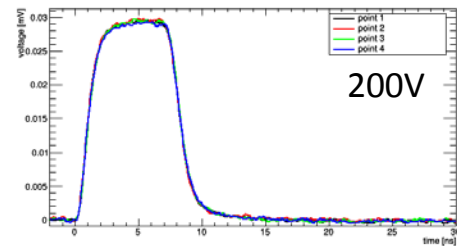
Red front: W1_D8 Signal -- V



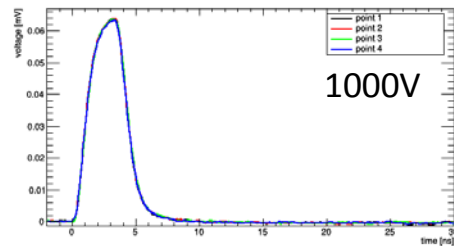
Red front: W1_D8 Signal -- V



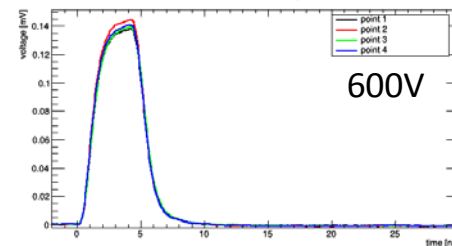
Red front: W7_H9 Signal -- V



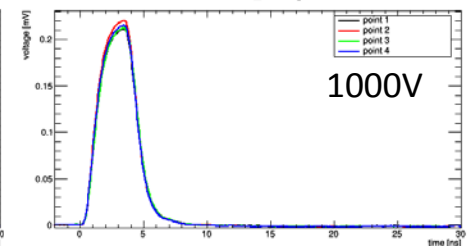
Red front: W7_H9 Signal -- V



Red front: W1_D8 Signal -- V

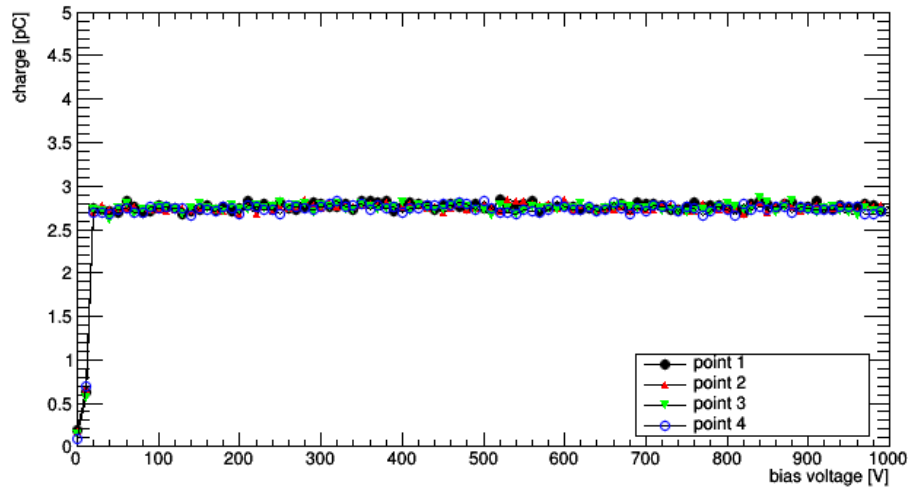


Red front: W1_D8 Signal -- V

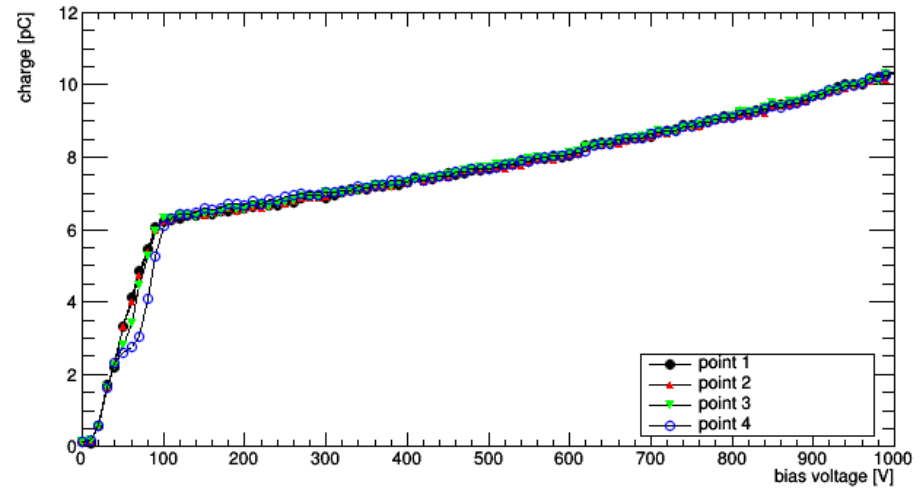


W7_H9 and W1_D8 red back

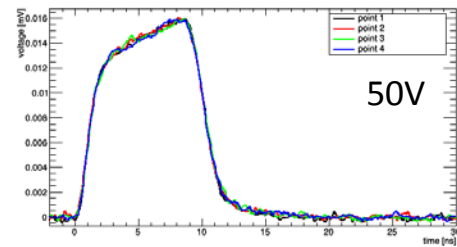
Red back: Run7062_W7_H9 Charge 25ns -- V



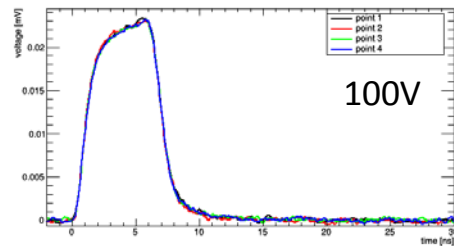
Red back: Run7062_W1_D8 Charge 25ns -- V



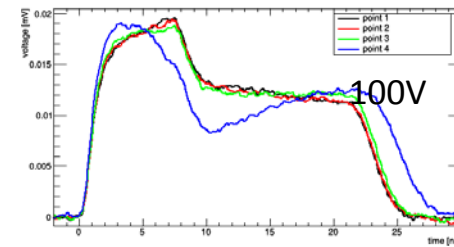
Red back: W7_H9 Signal -- V



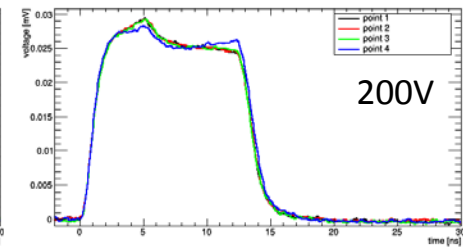
Red back: W7_H9 Signal -- V



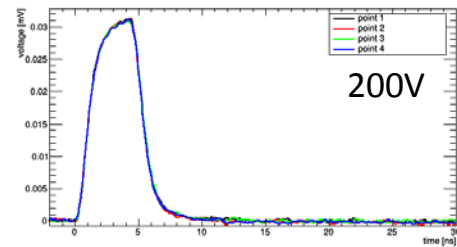
Red back: W1_D8 Signal -- V



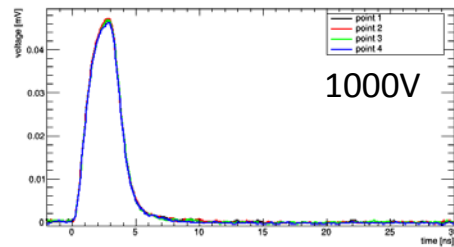
Red back: W1_D8 Signal -- V



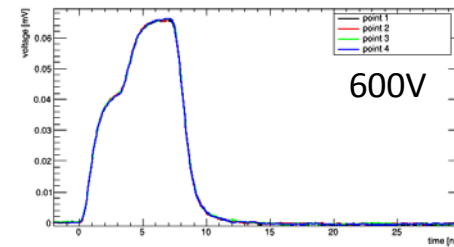
Red back: W7_H9 Signal -- V



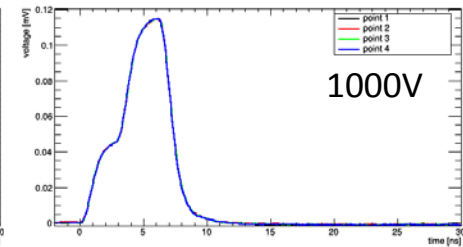
Red back: W7_H9 Signal -- V



Red back: W1_D8 Signal -- V



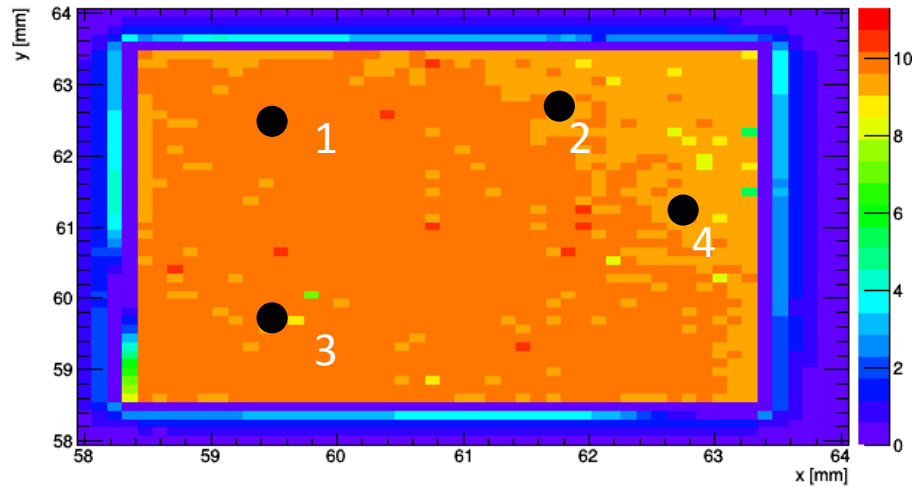
Red back: W1_D8 signal -- v



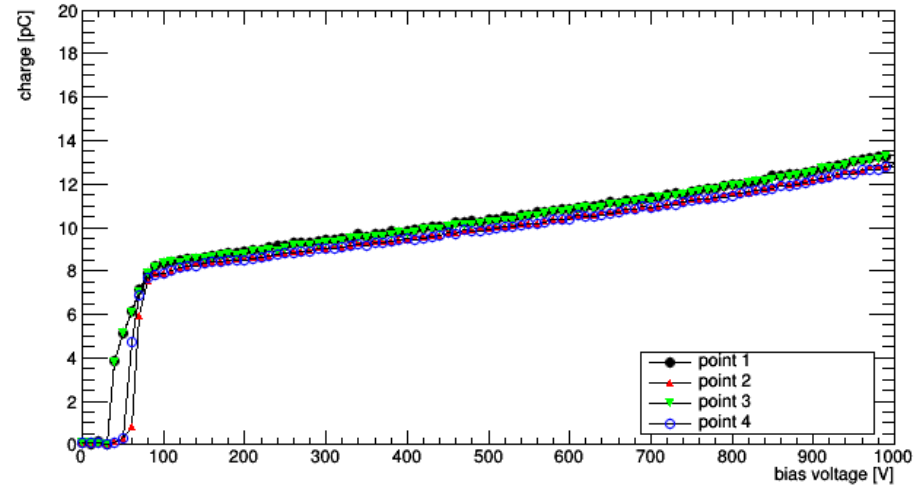
Neutron irradi. 1E13 W1 J5

Neutron irradi. 1E13 W1_J5 red front

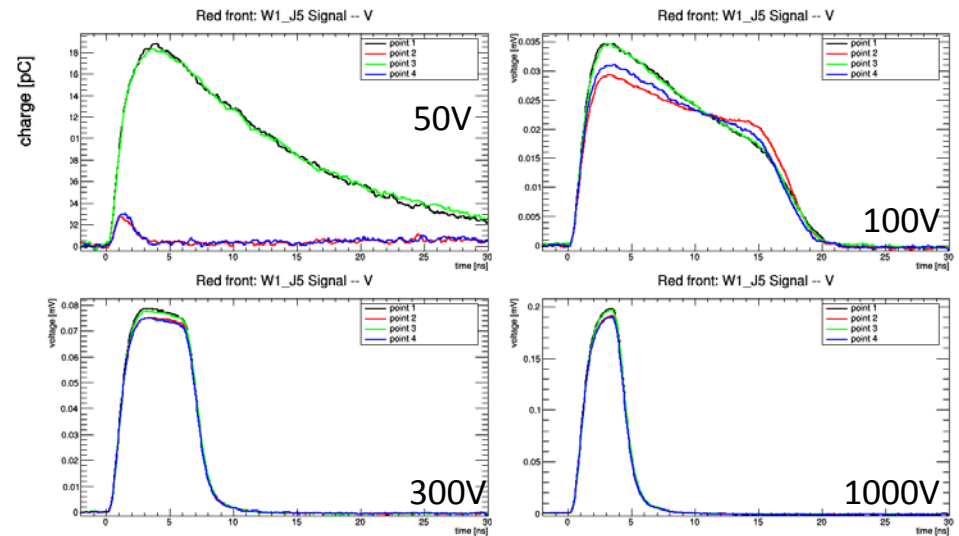
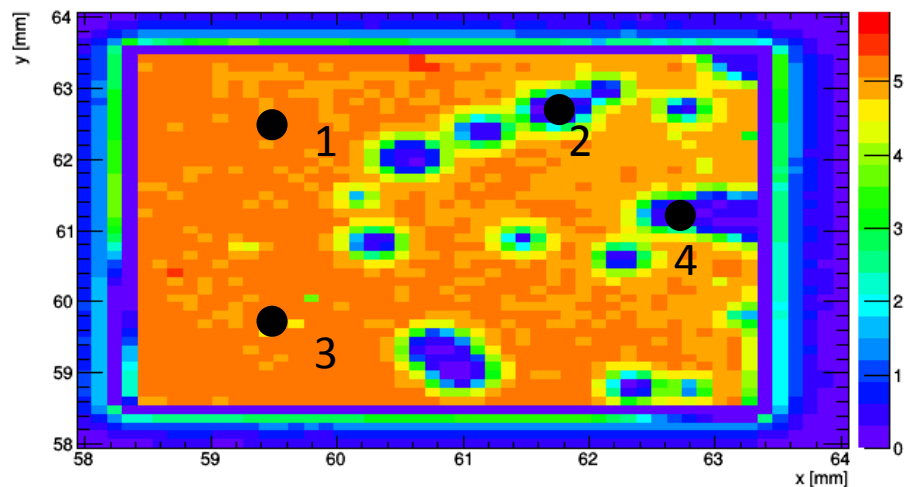
bias voltage: 400V



Red front: Run7062_W1_J5 Charge 25ns -- V

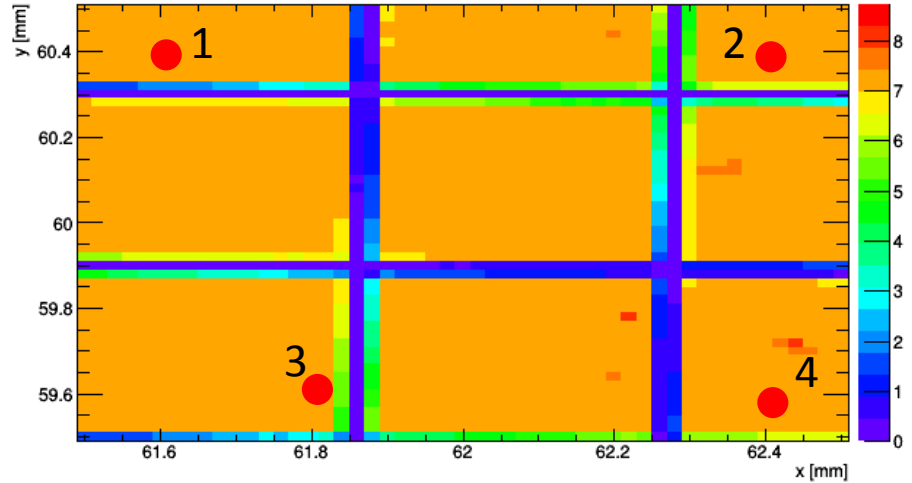


bias voltage: 50V

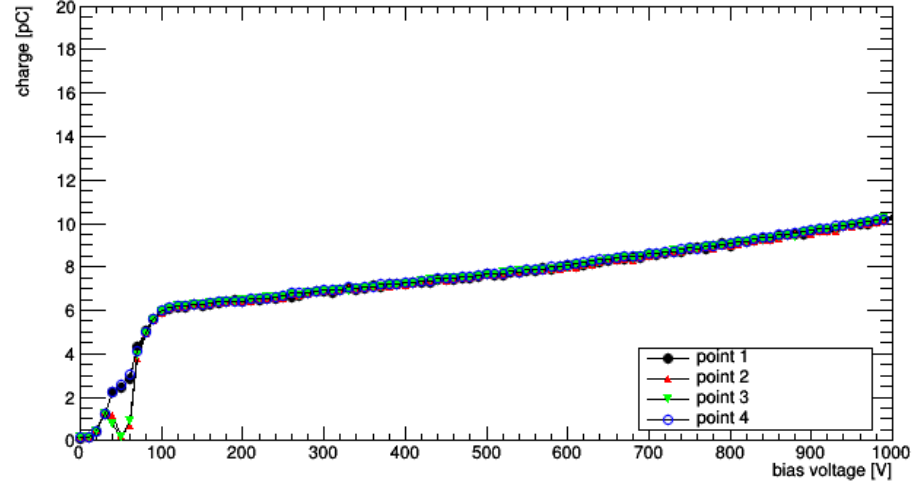


Neutron irradi. 1E13 W1_J5 red back

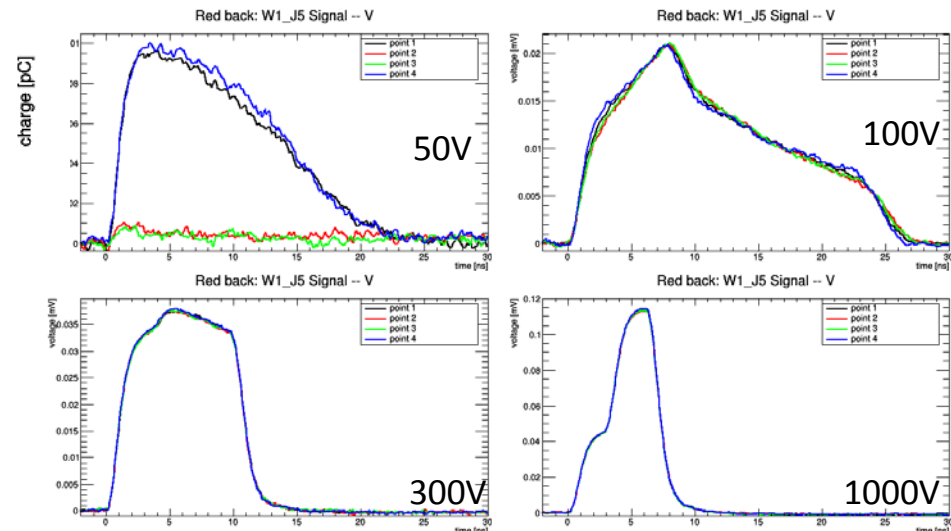
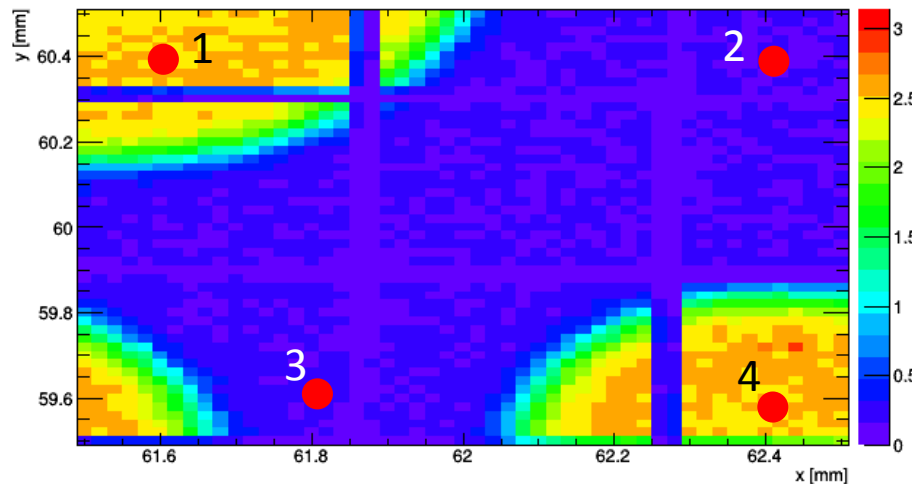
bias voltage: 400V



Red back: Run7062_W1_J5 Charge 25ns -- V



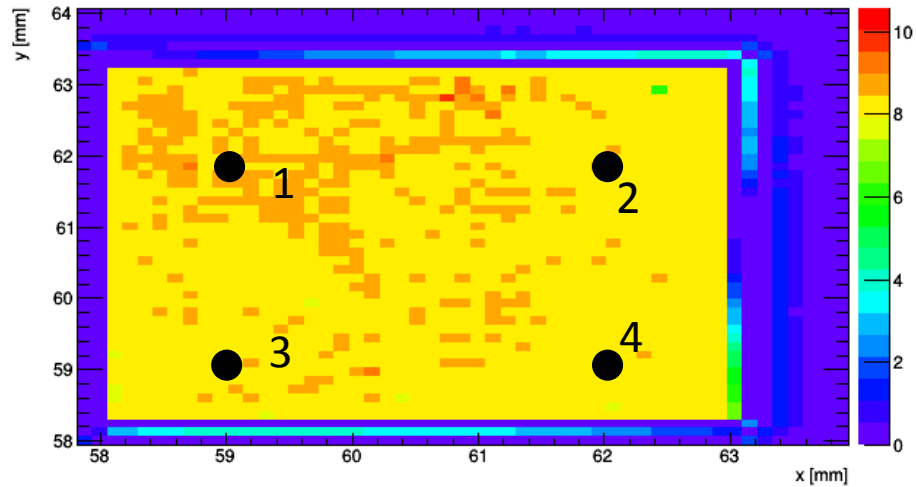
bias voltage: 50V



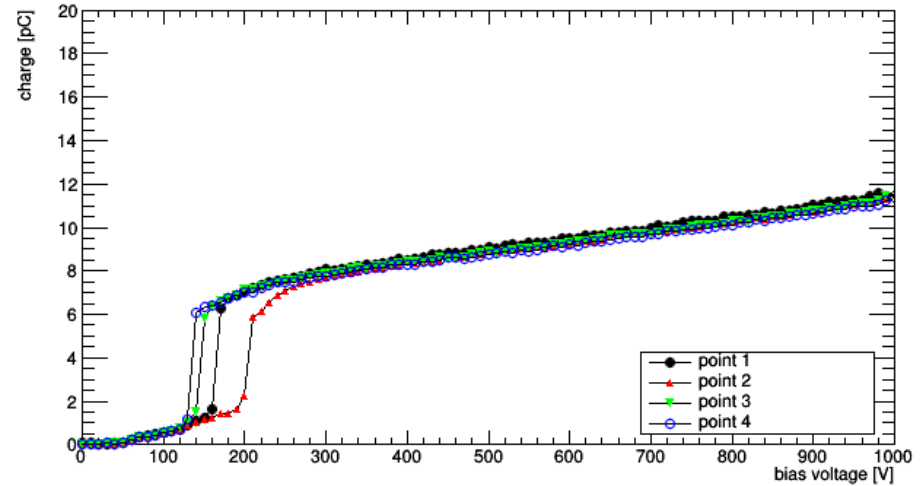
Neutron irradiation. $1E14$ W1 H4

Neutron irradi. 1E14 W1_H4 red front

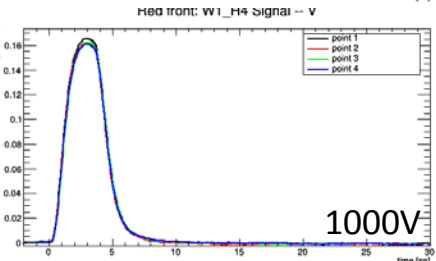
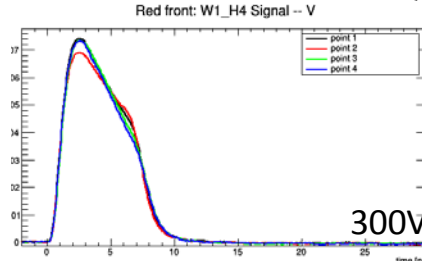
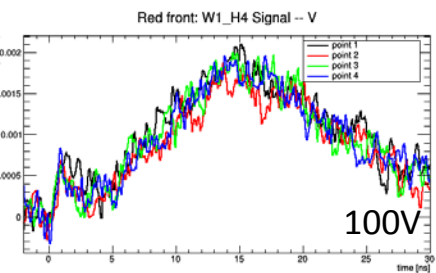
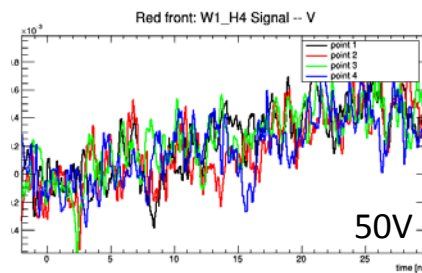
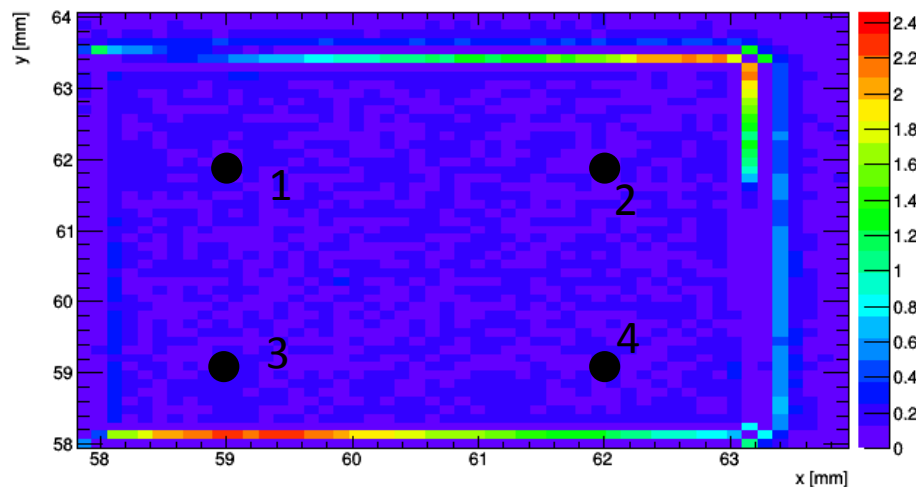
bias voltage: 400V



Red front: Run7062_W1_H4 Charge 25ns -- V

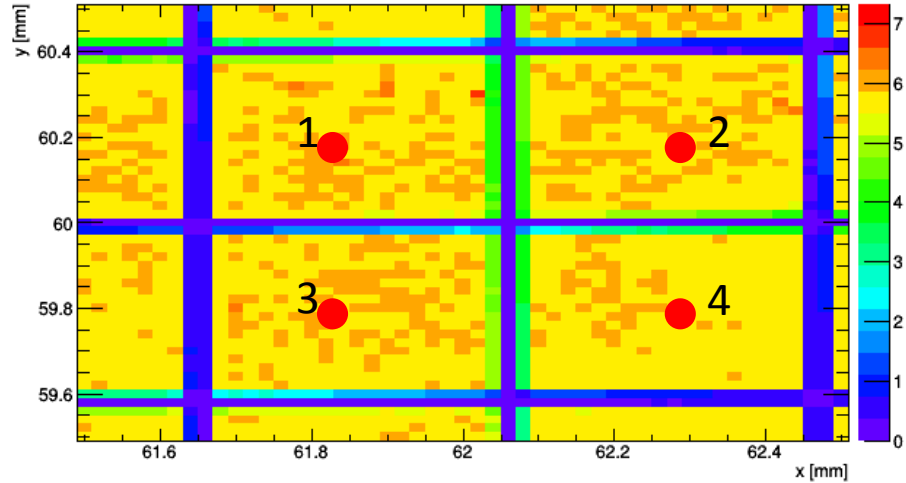


bias voltage: 50V

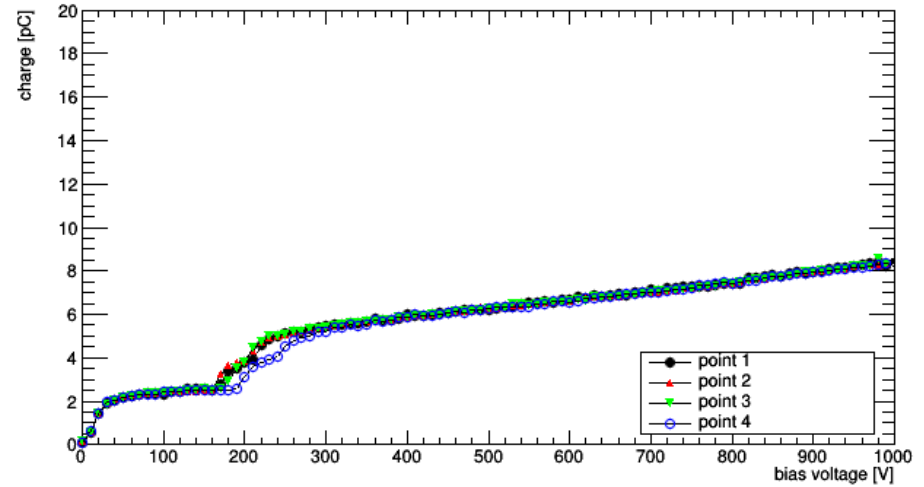


Neutron irradi. 1E14 W1_H4 red back

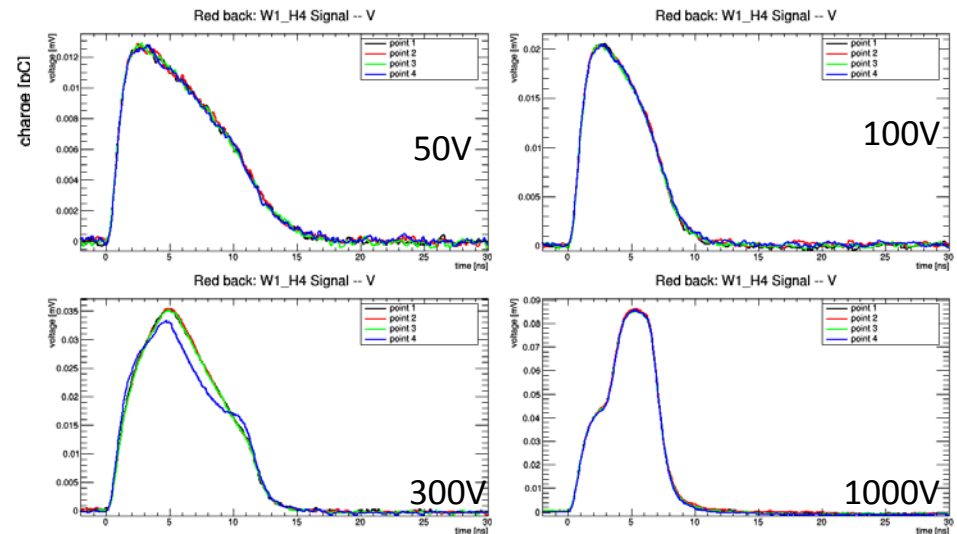
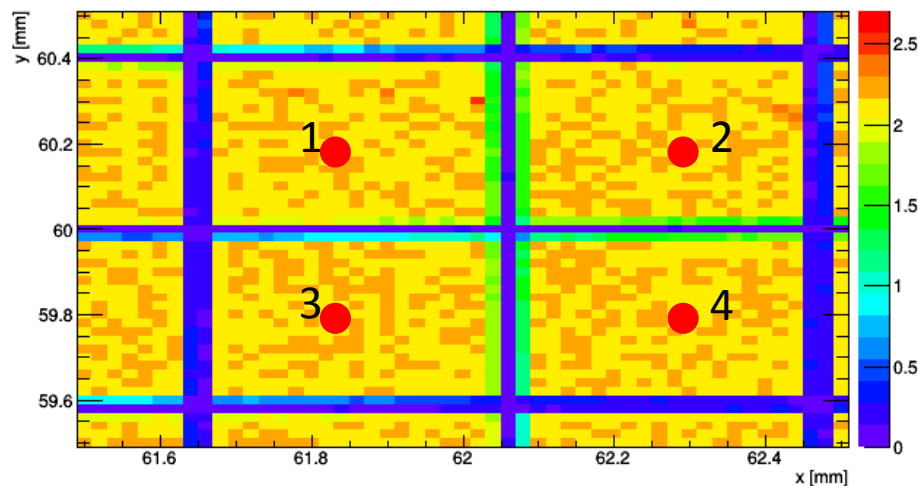
bias voltage: 400V



Red back: Run7062_W1_H4 Charge 25ns -- V



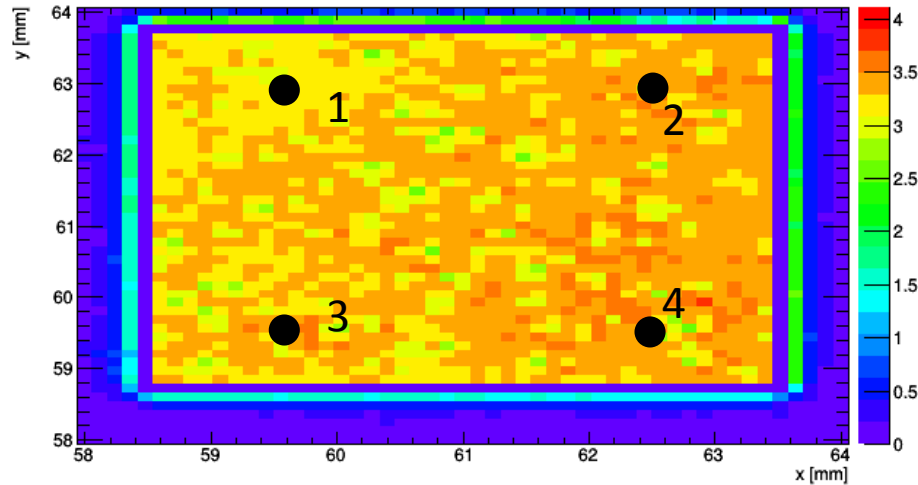
bias voltage: 50V



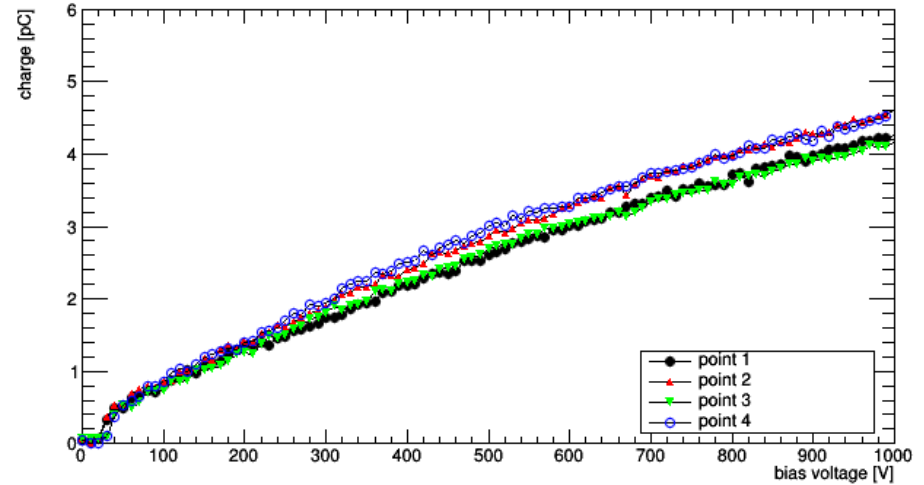
Neutron irradi. 1E15 W1 H5

Neutron irradi. 1E15 W1_H5 red front

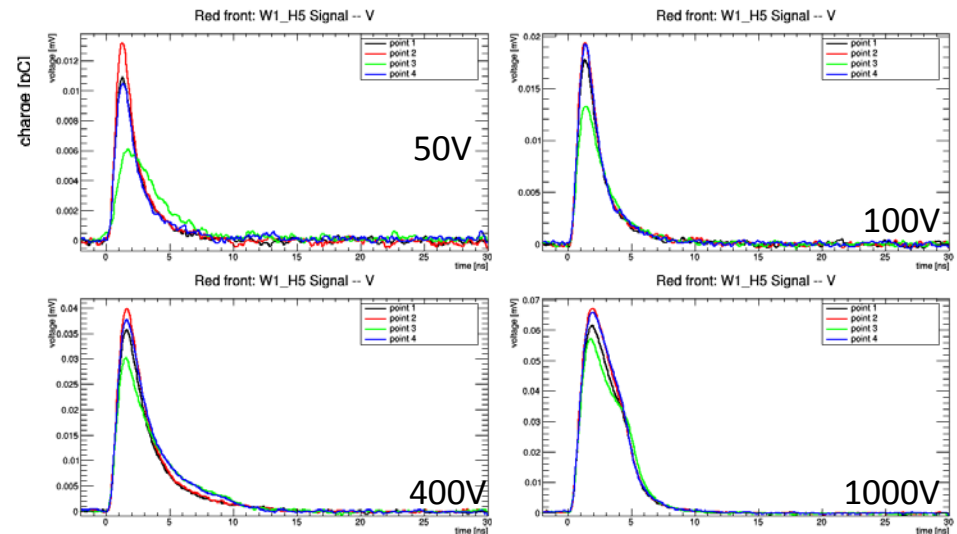
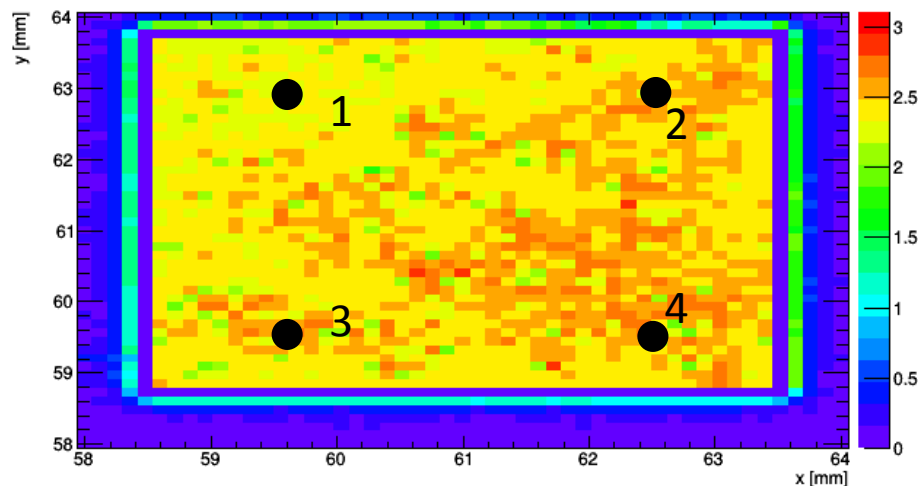
bias voltage: 600V



Red front: Run7062_W1_H5 Charge 25ns -- V

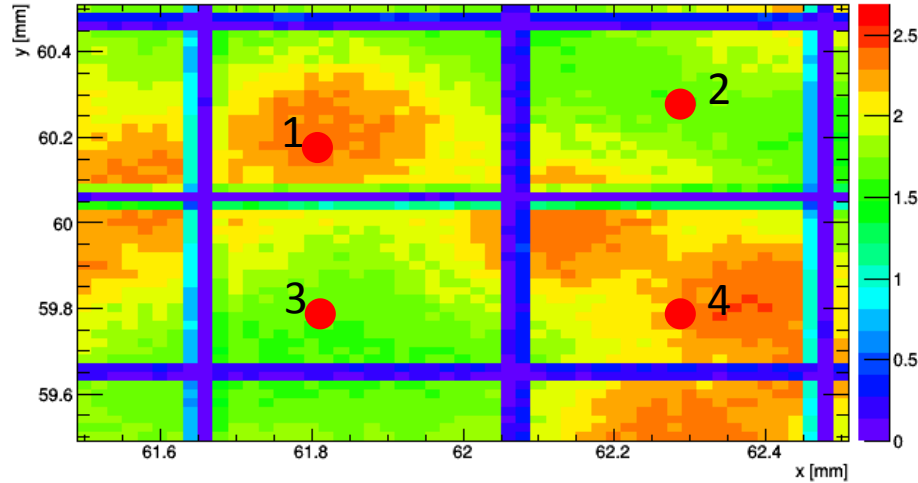


bias voltage: 400V

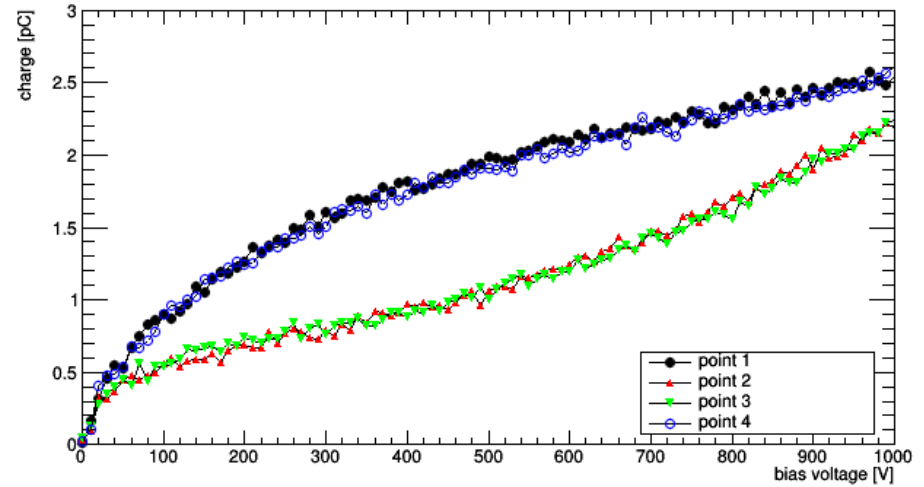


Neutron irradi. 1E15 W1_H5 red back

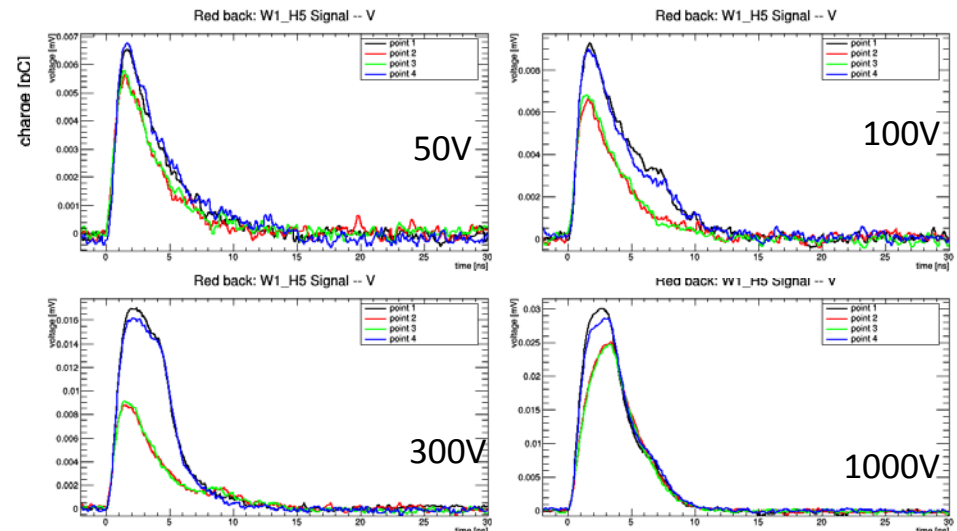
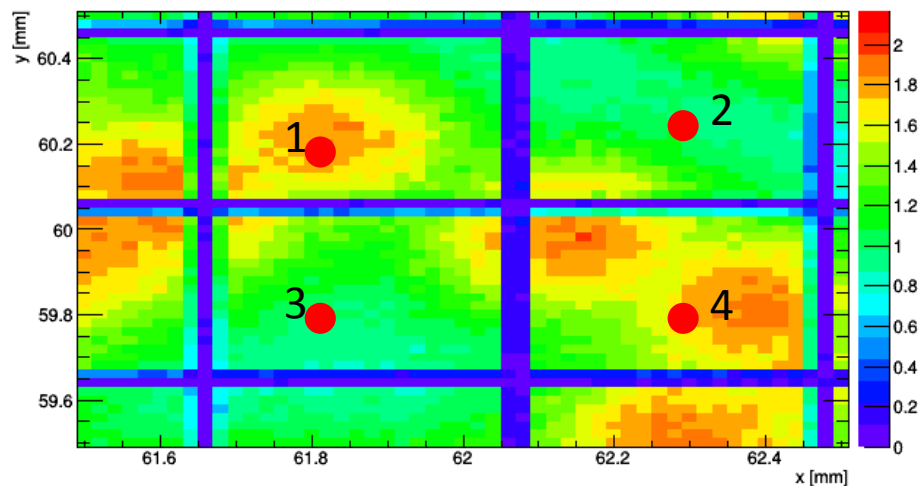
bias voltage: 800V



Red back: Run7062_W1_H5 Charge 25ns -- V



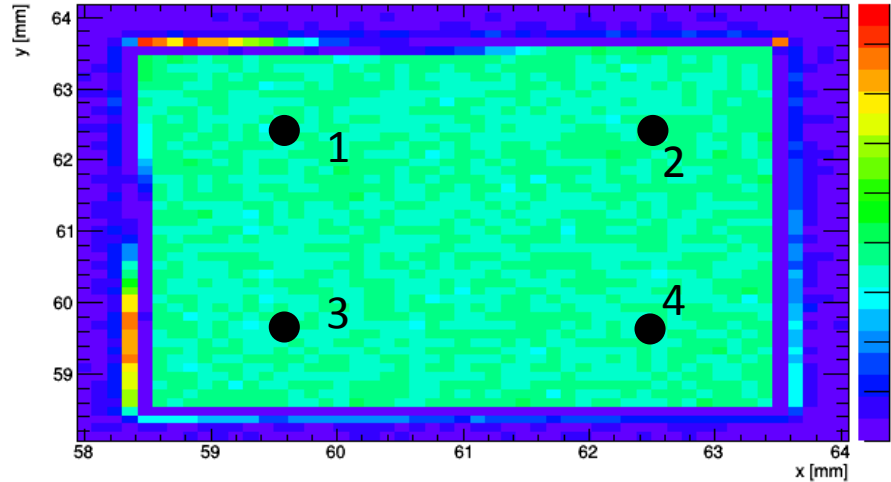
bias voltage: 400V



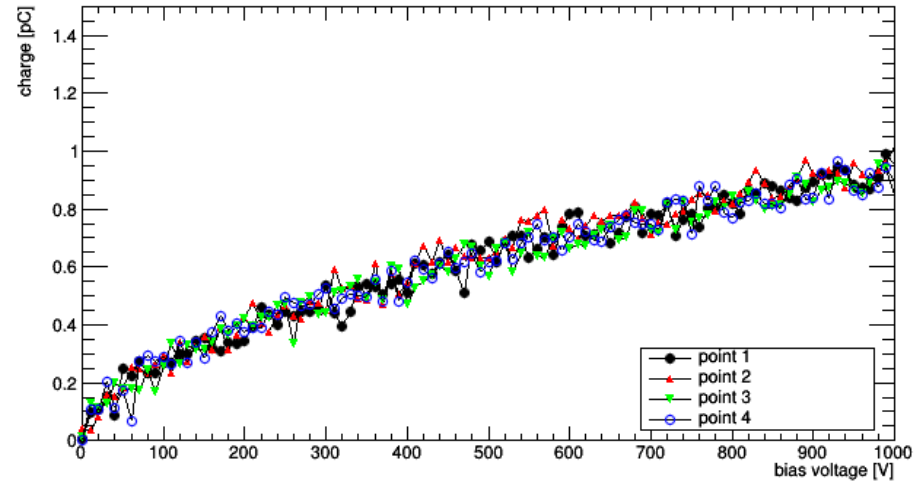
Neutron irradiation. $1E16$ W1 H3

Neutron irradi. 1E16 W1_H3 red front

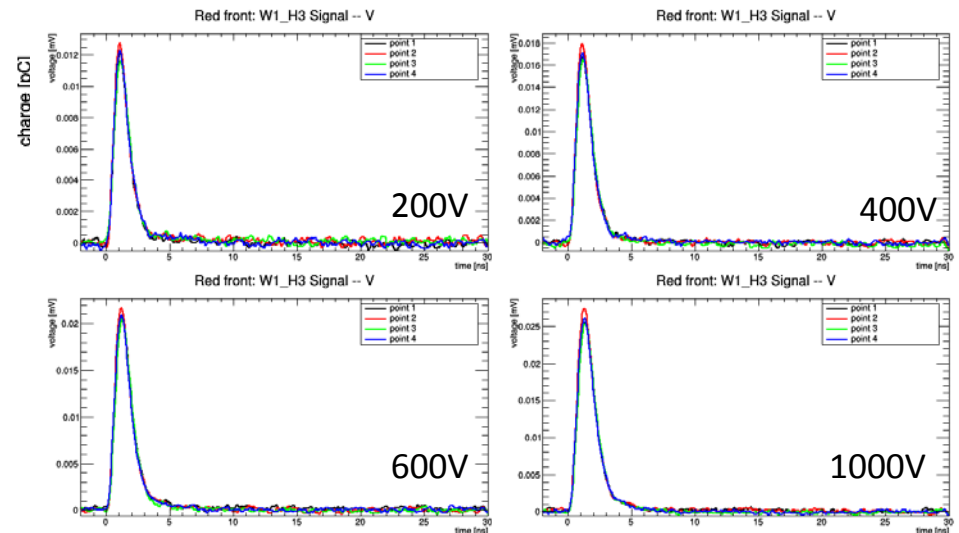
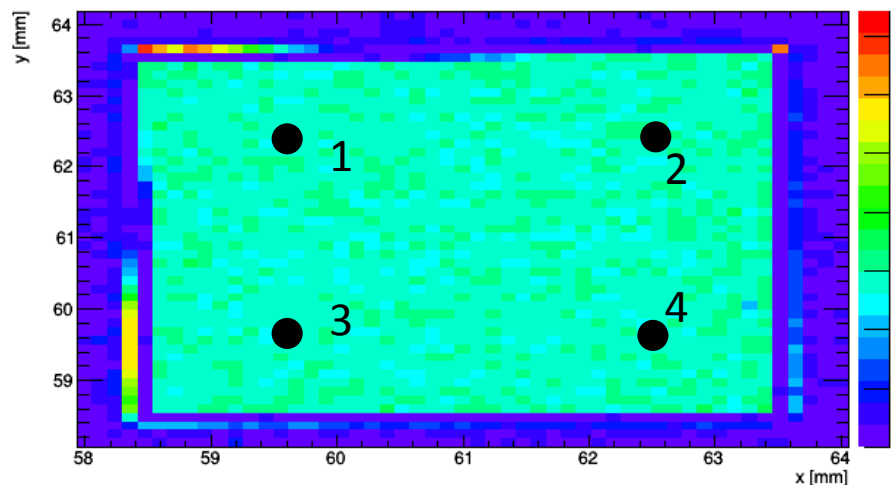
bias voltage: 600V



Red front: Run7062_W1_H3 Charge 25ns -- V

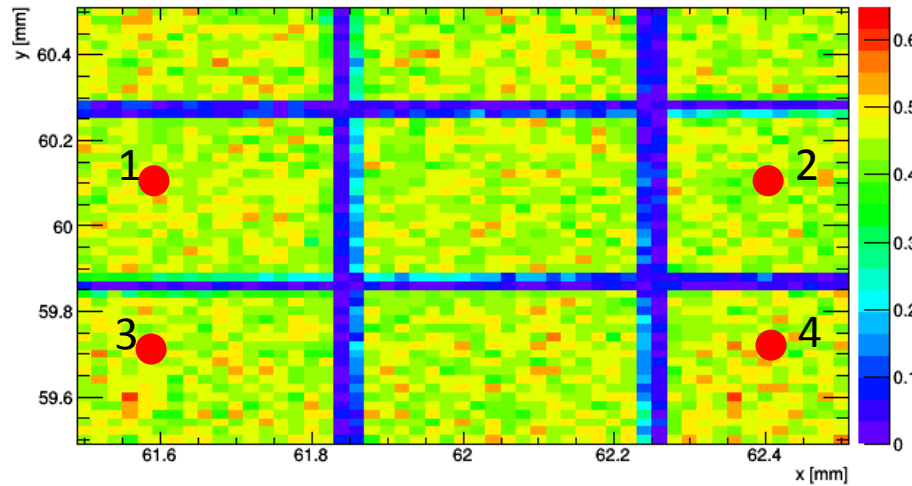


bias voltage: 400V

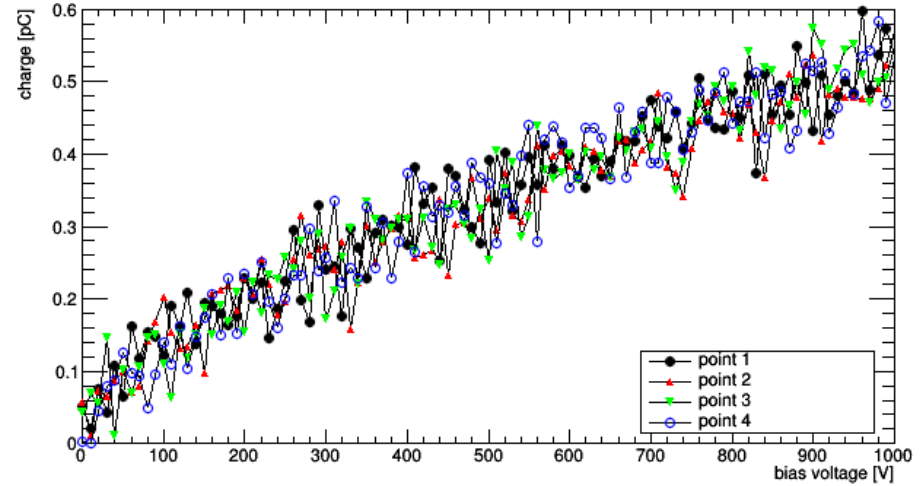


Neutron irradi. 1E16 W1_H3 red back

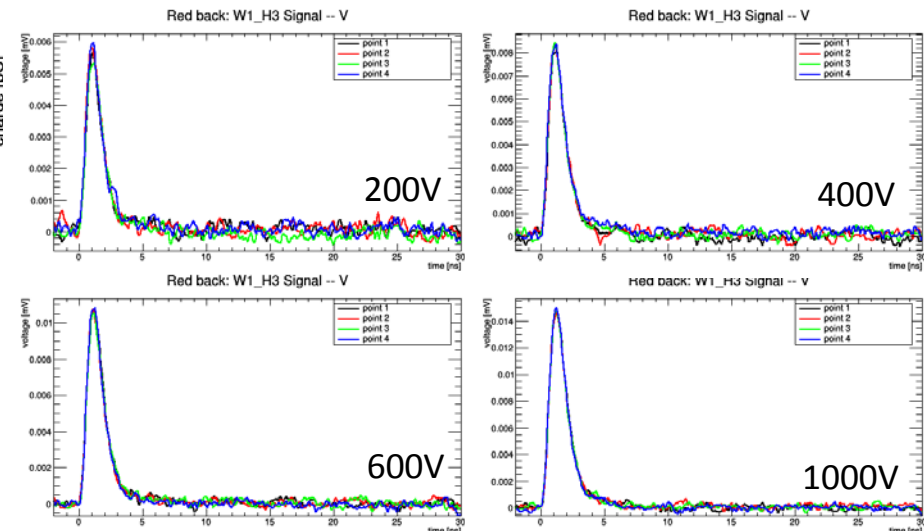
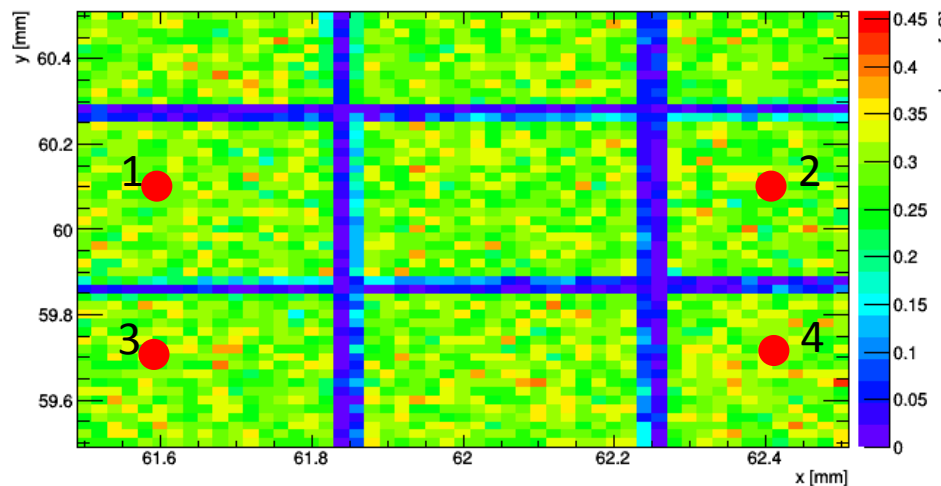
bias voltage: 800V



Red back: Run7062_W1_H3 Charge 25ns -- V



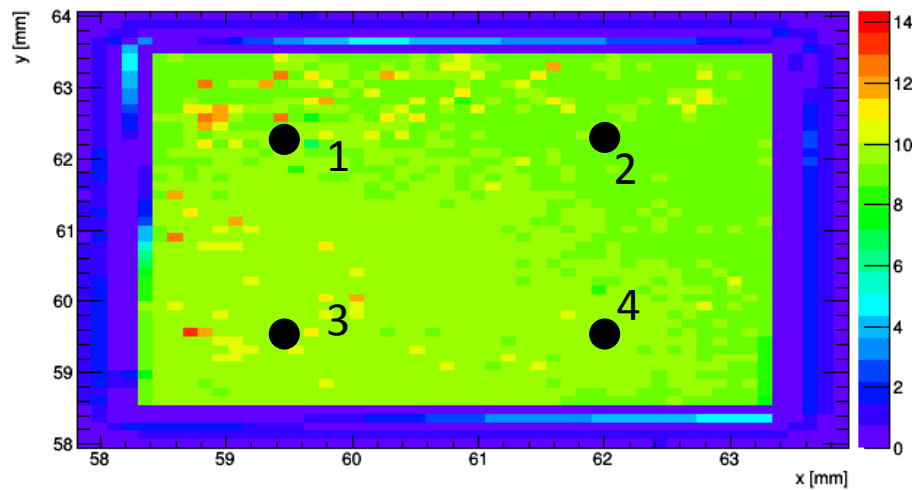
bias voltage: 400V



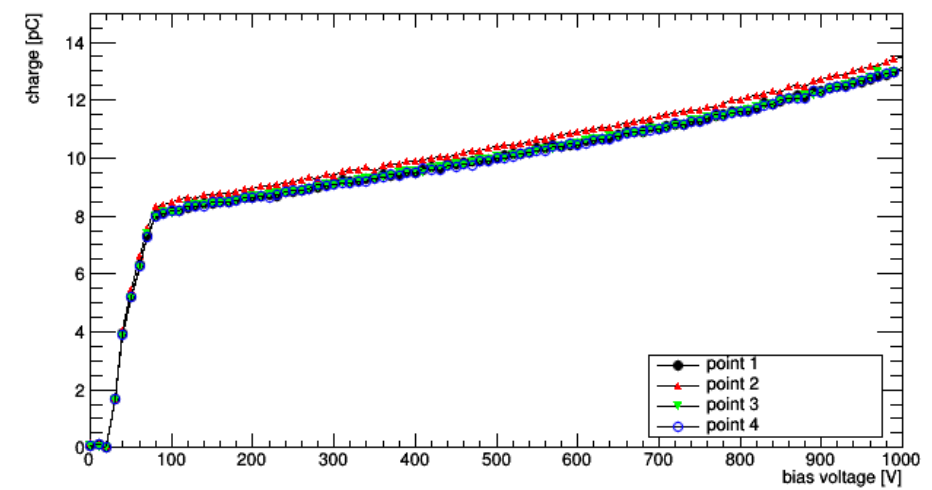
Proton irradi. 9.87E11 W1 A7

Proton irradi. 9.87E11 W1_A7 red front

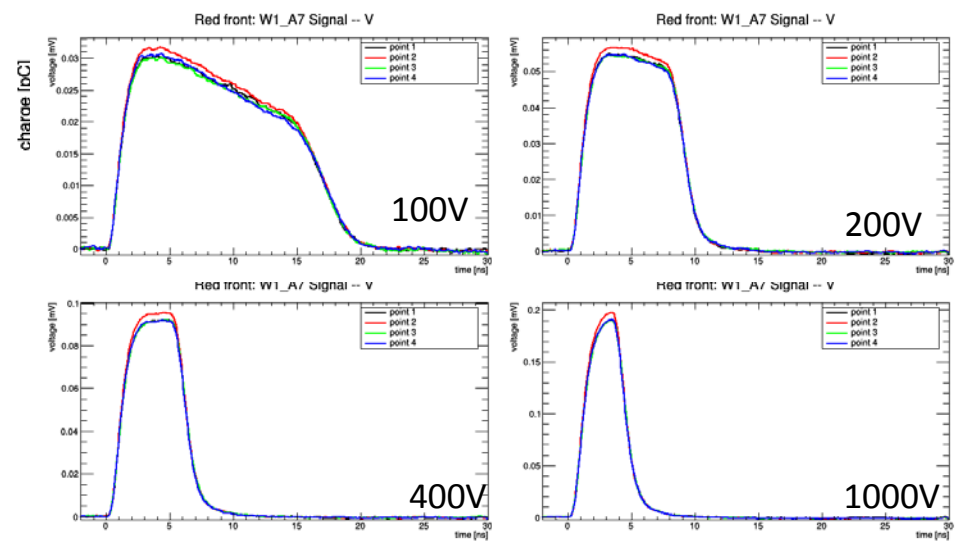
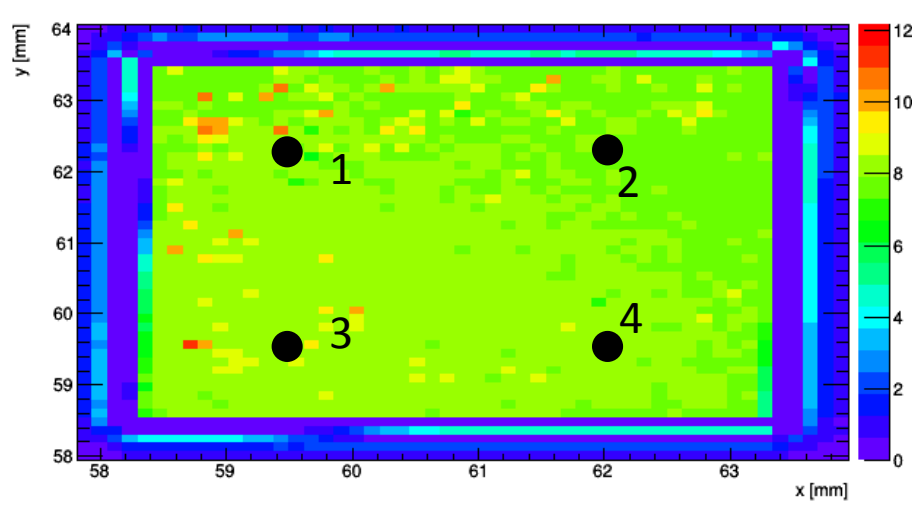
bias voltage: 400V



Red front: Run7062_W1_A7 Charge 25ns -- V

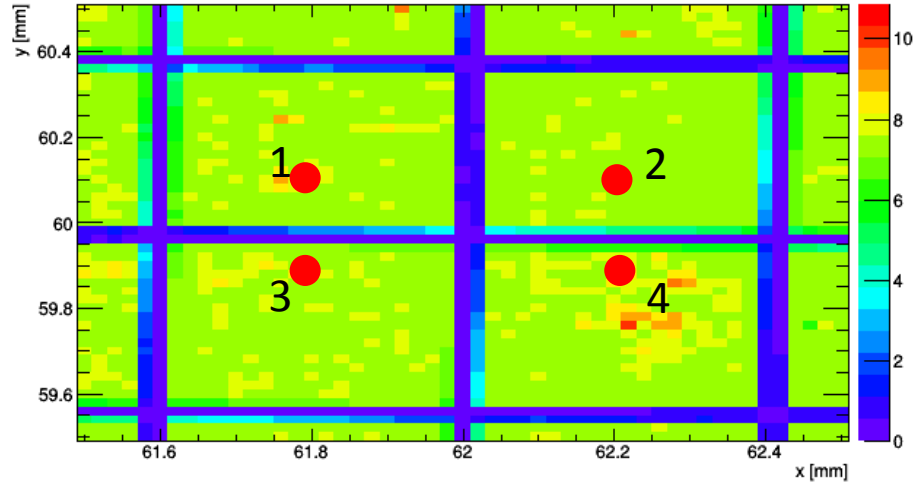


bias voltage: 100V

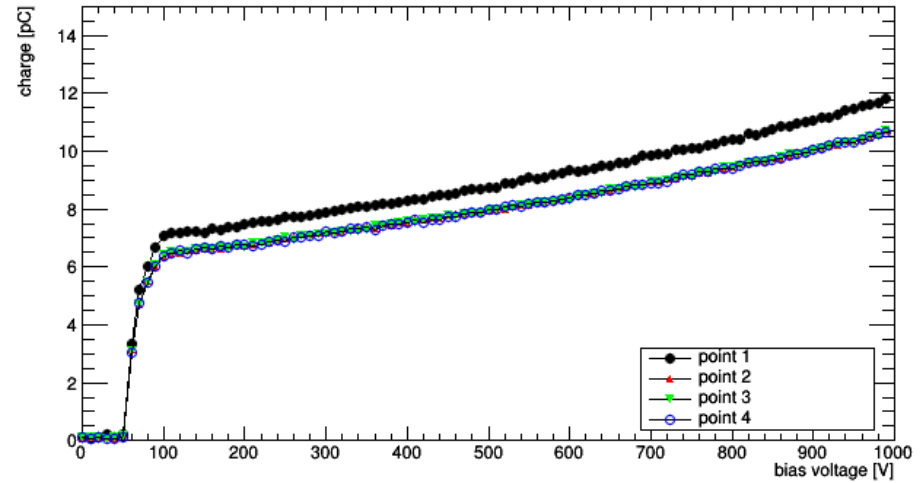


Proton irradi. 9.87E11 W1_A7 red back

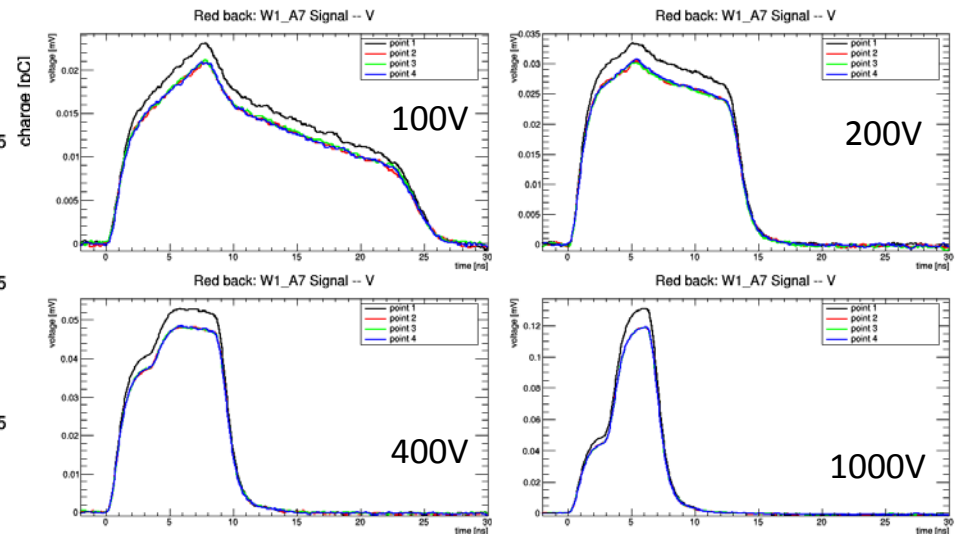
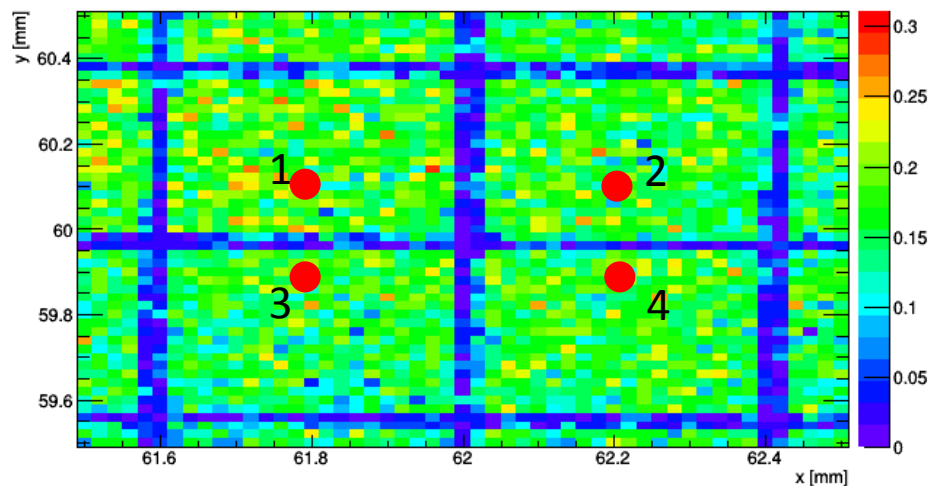
bias voltage: 800V



Red back: Run7062_W1_A7 Charge 25ns -- V



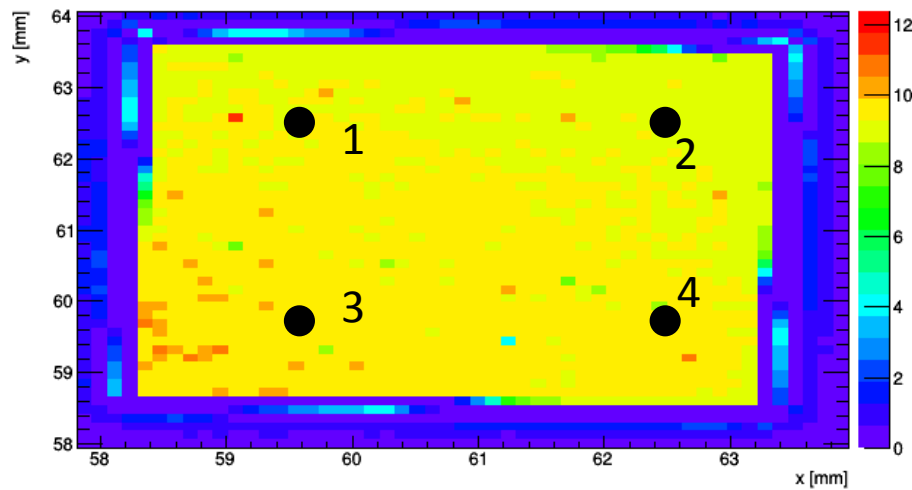
bias voltage: 400V



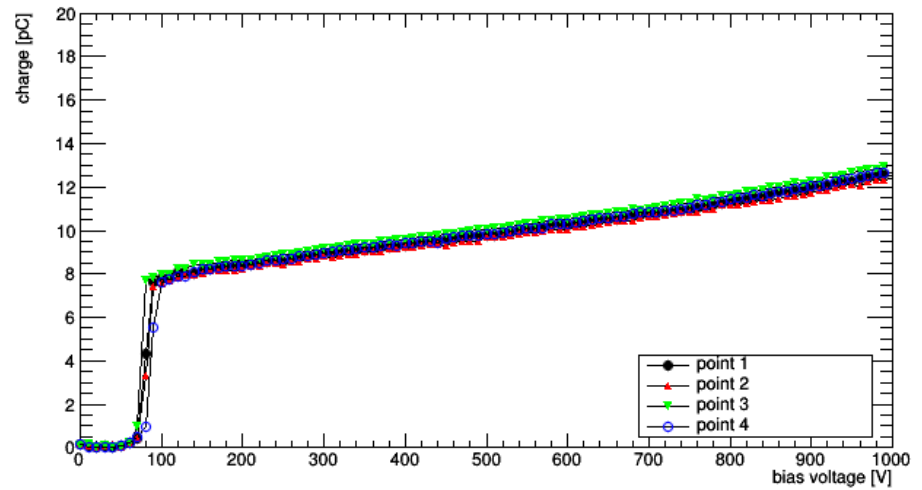
Proton irradi. $1.36E13$ W1 B6

Proton irradi. 1.36E13 W1_B6 red front

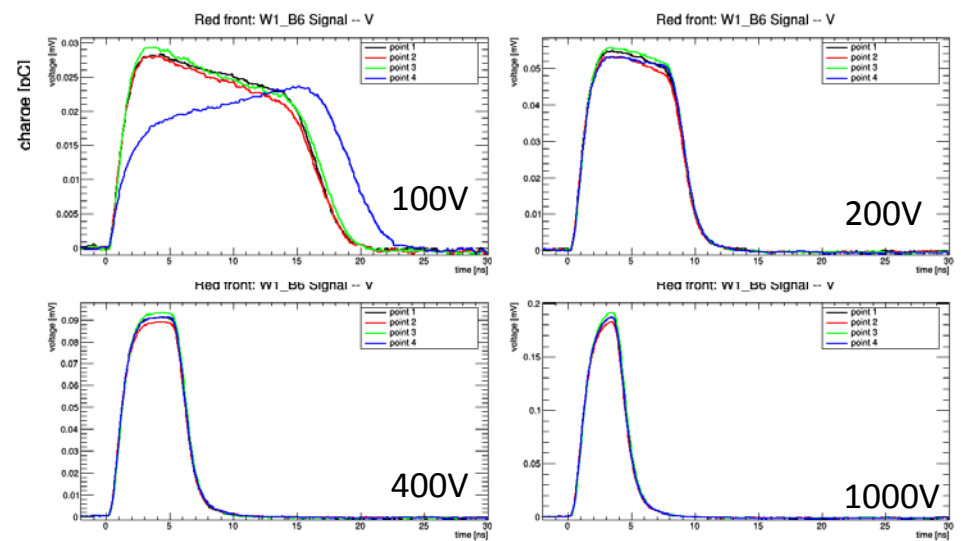
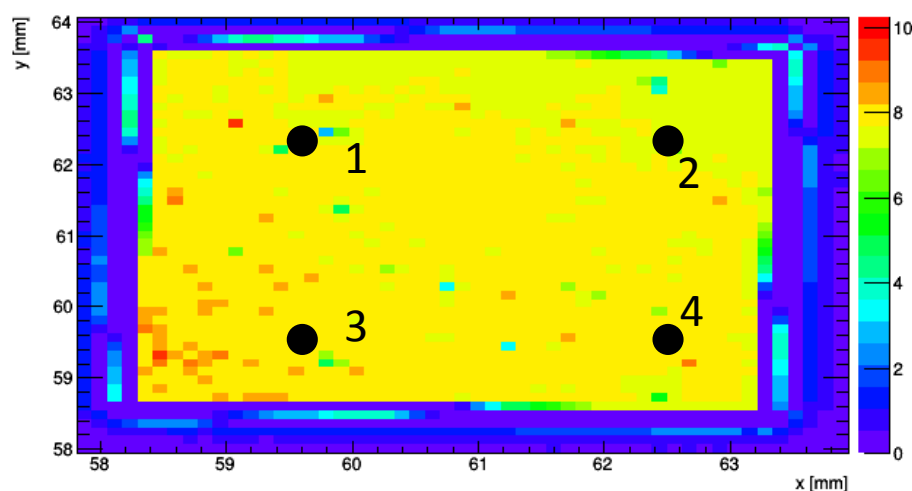
bias voltage: 400V



Red front: Run7062_W1_B6 Charge 25ns -- V

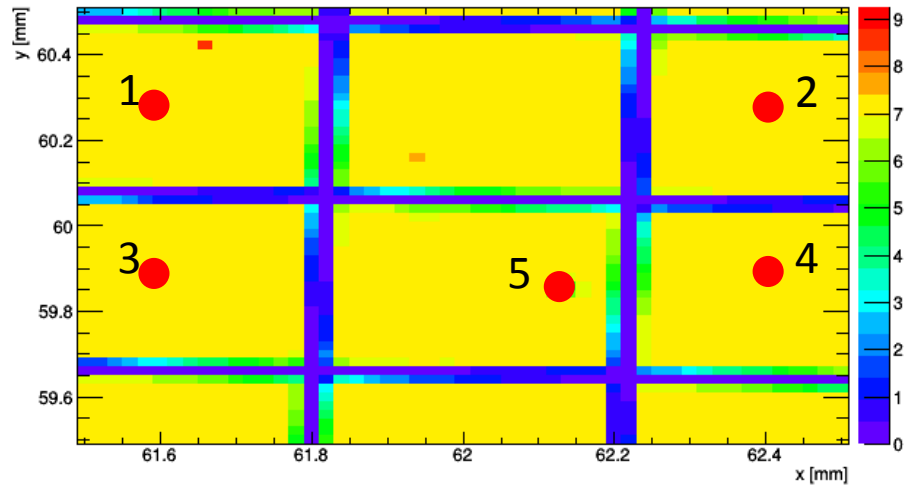


bias voltage: 100V

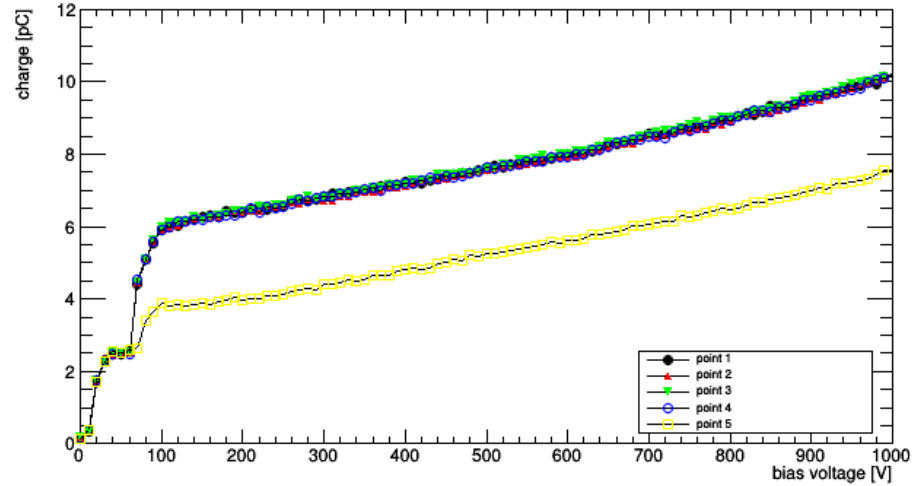


Proton irradi. 1.36E13 W1_B6 red back

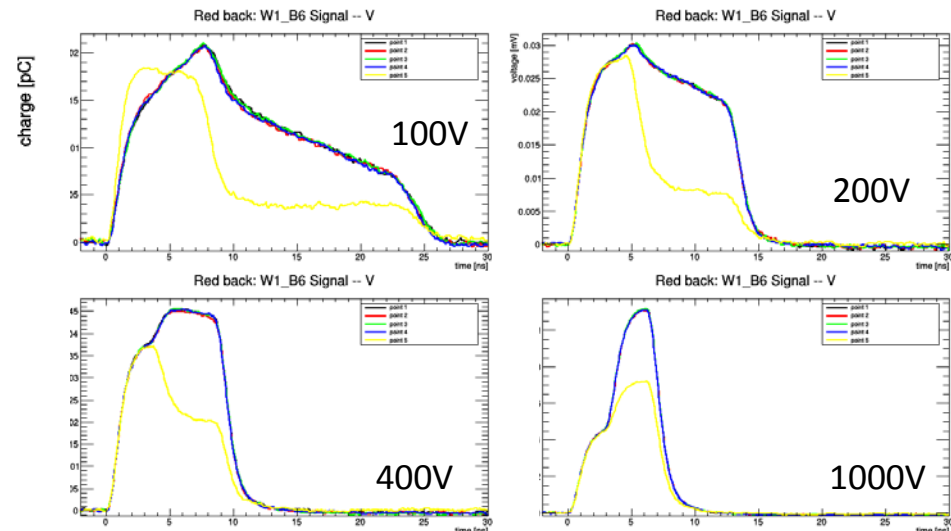
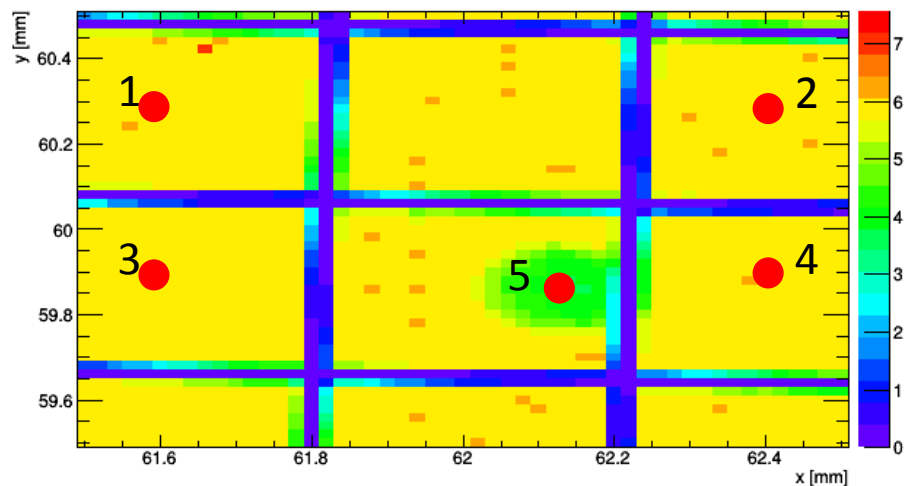
bias voltage: 400V



Red back: Run7062_W1_B6 Charge 25ns -- V



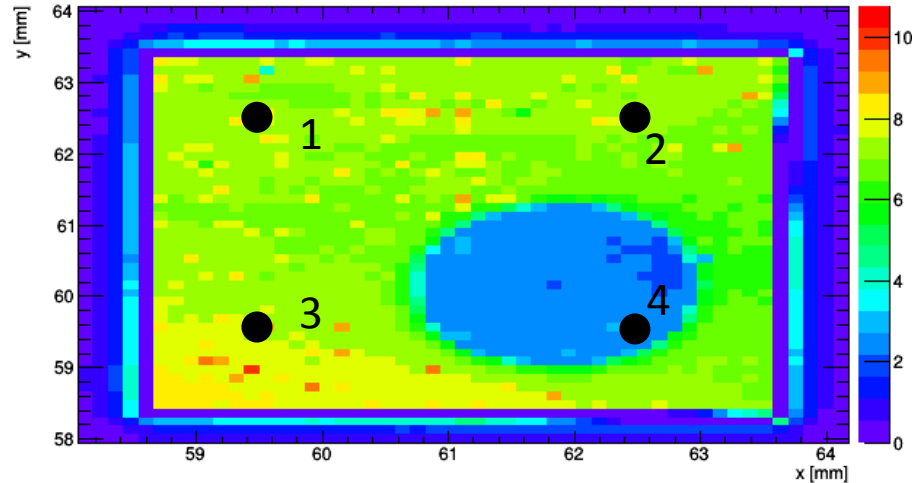
bias voltage: 100V



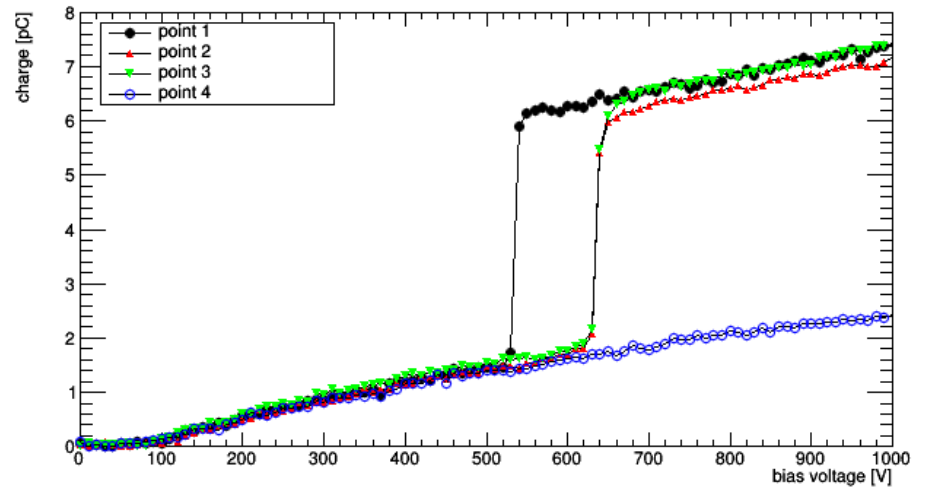
Proton irradi. $1.04E14$ W1 B9

Proton irradi. 1.04E14 W1_B9 red front

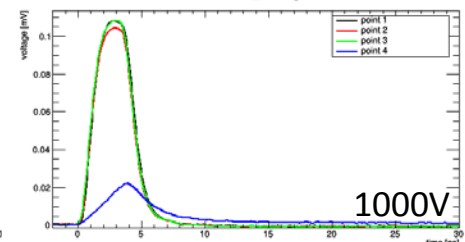
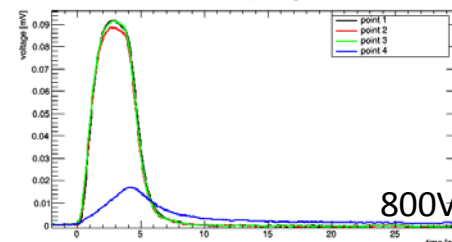
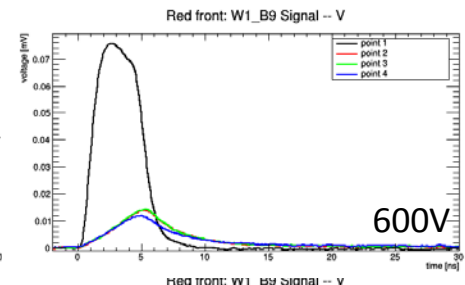
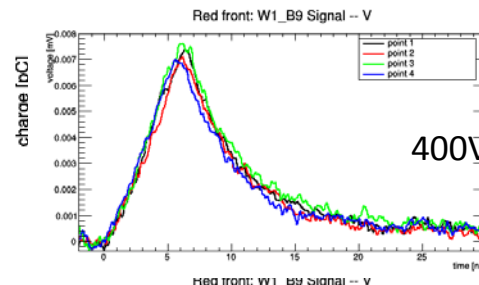
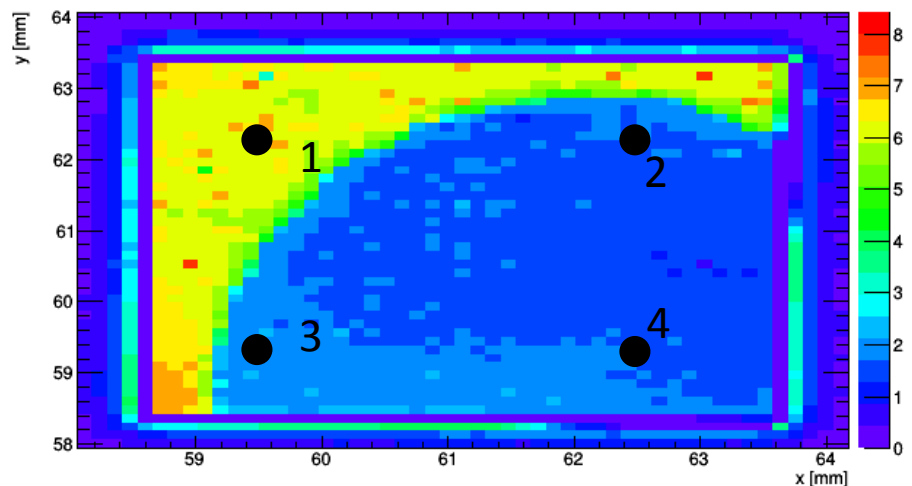
bias voltage: 1000V



Red front: Run7062_W1_B9 Charge 25ns -- V

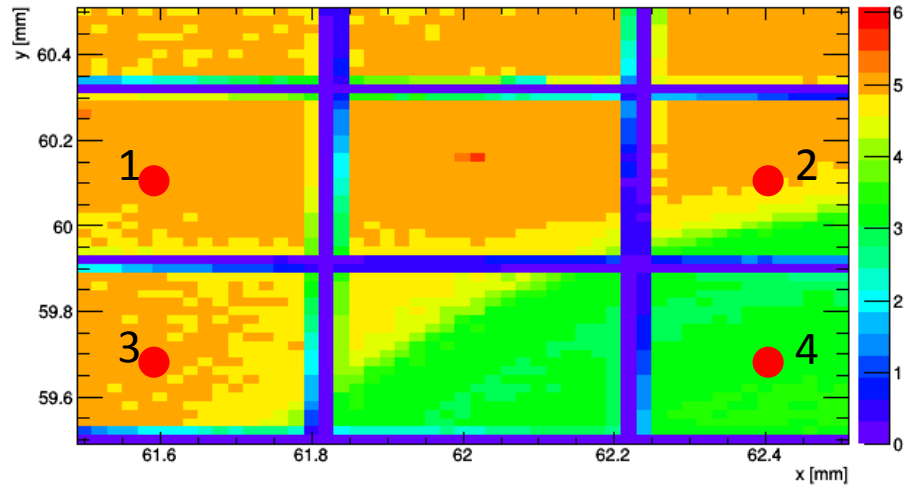


bias voltage: 600V

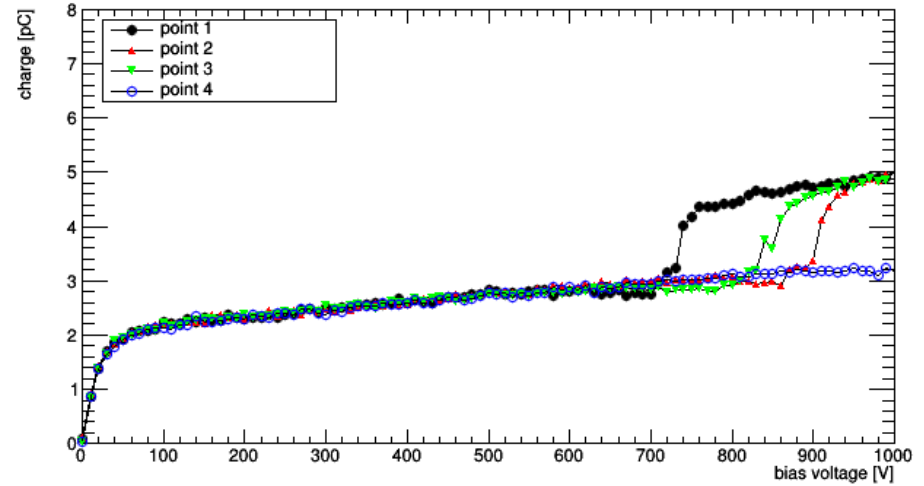


Proton irradi. 1.04E14 W1_B9 red back

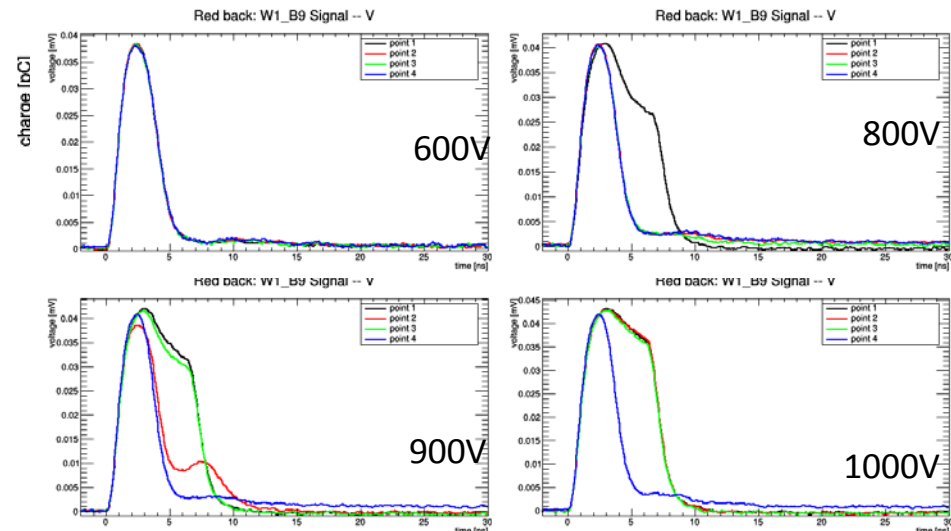
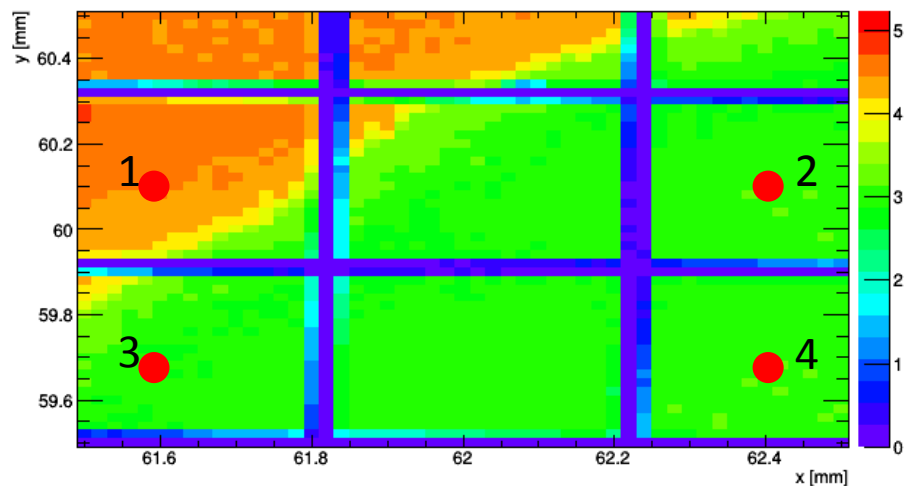
bias voltage: 1000V



Red back: Run7062_W1_B9 Charge 25ns -- V



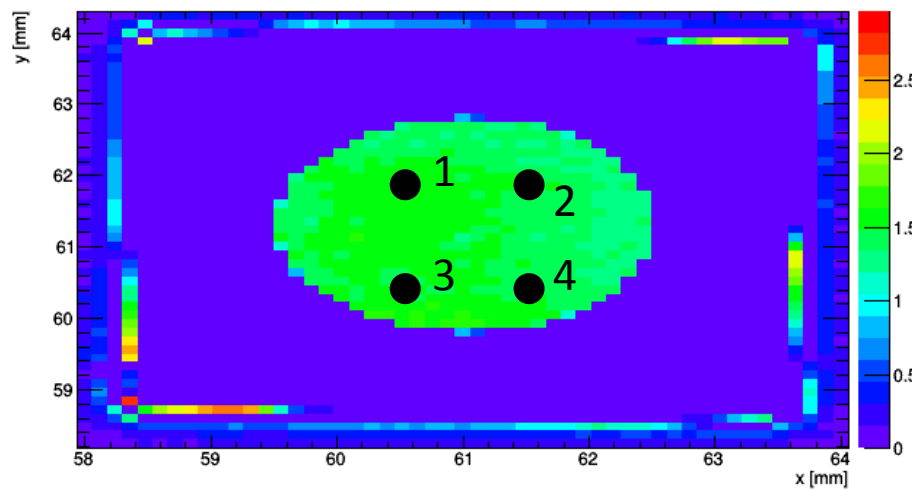
bias voltage: 800V



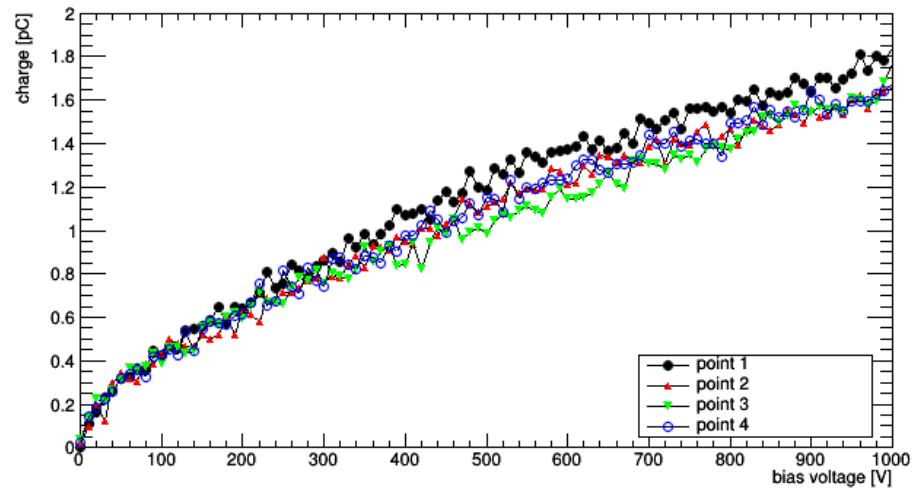
Proton irradi. $9.16E14$ W1 C6

Proton irradi. 9.16E14 W1_C6 red front

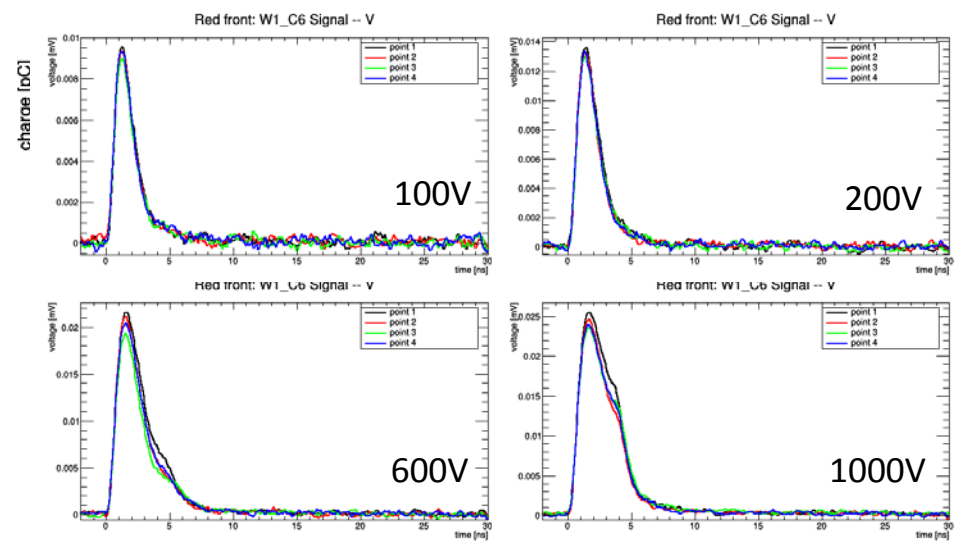
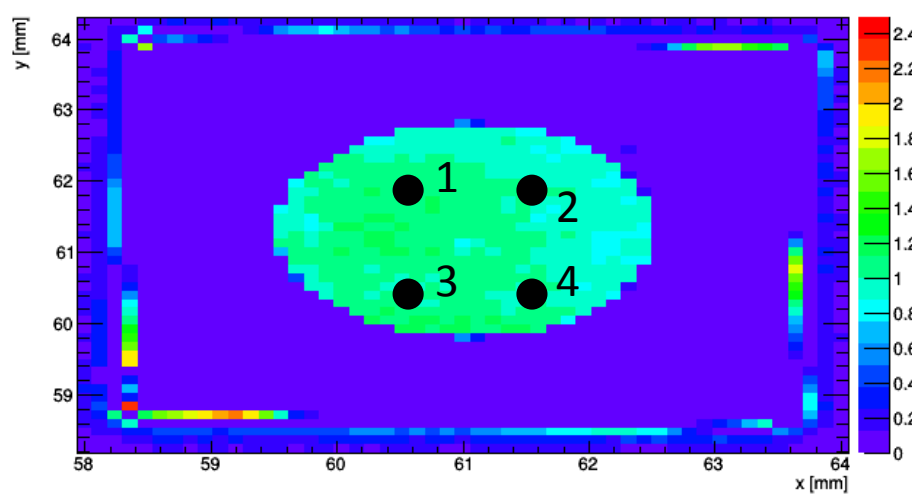
bias voltage: 800V



Red front: Run7062_W1_C6 Charge 25ns -- V

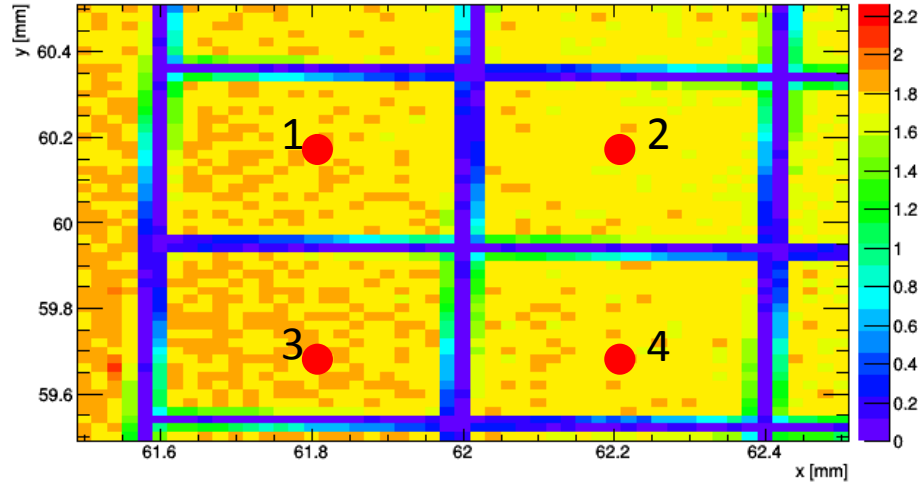


bias voltage: 400V

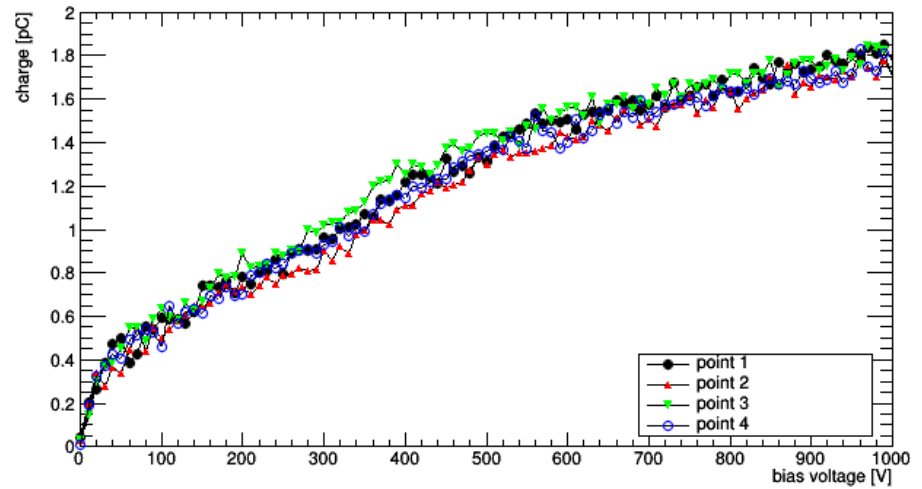


Proton irradi. 9.16E14 W1_C6 red back

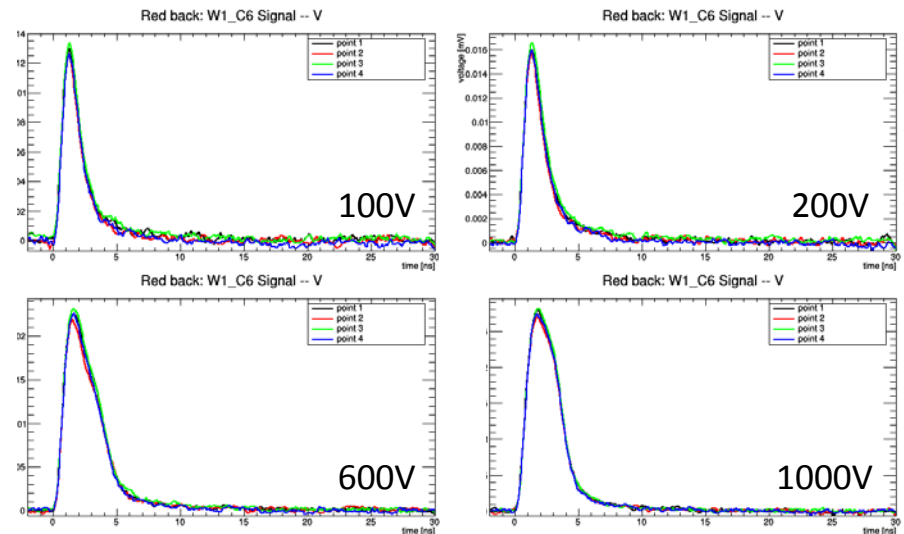
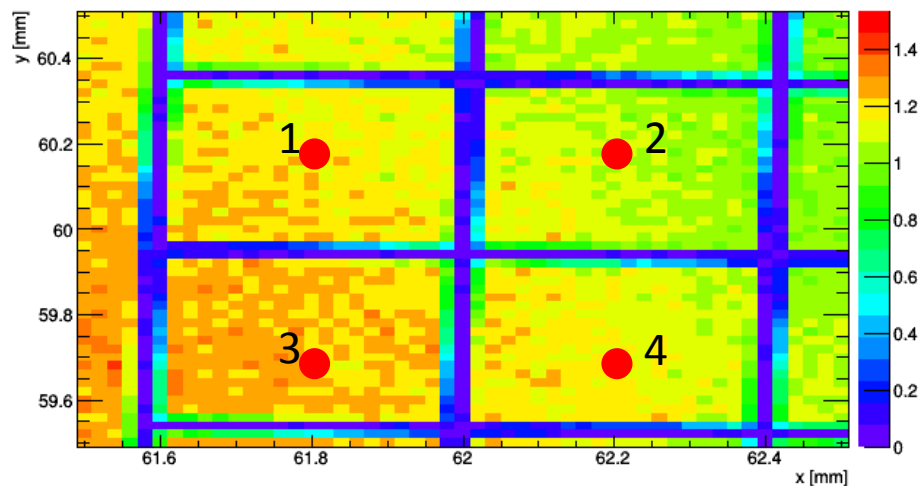
bias voltage: 1000V



Red back: Run7062_W1_C6 Charge 25ns -- V



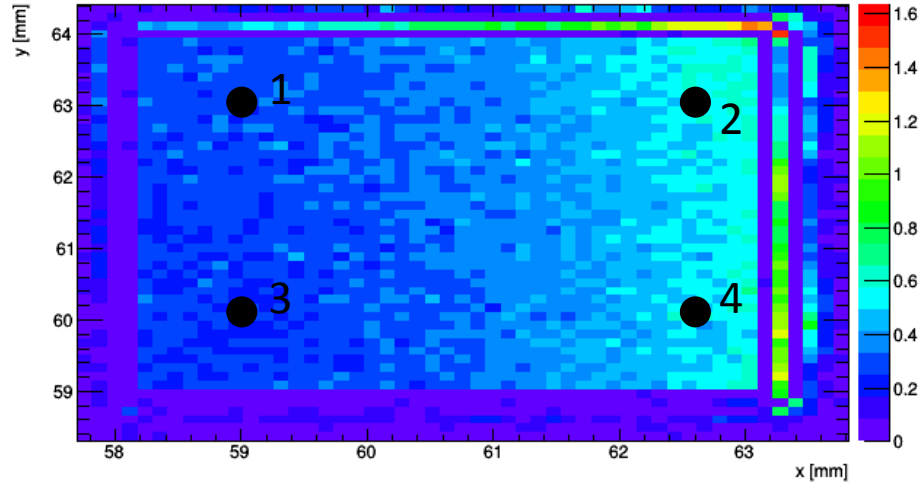
bias voltage: 400V



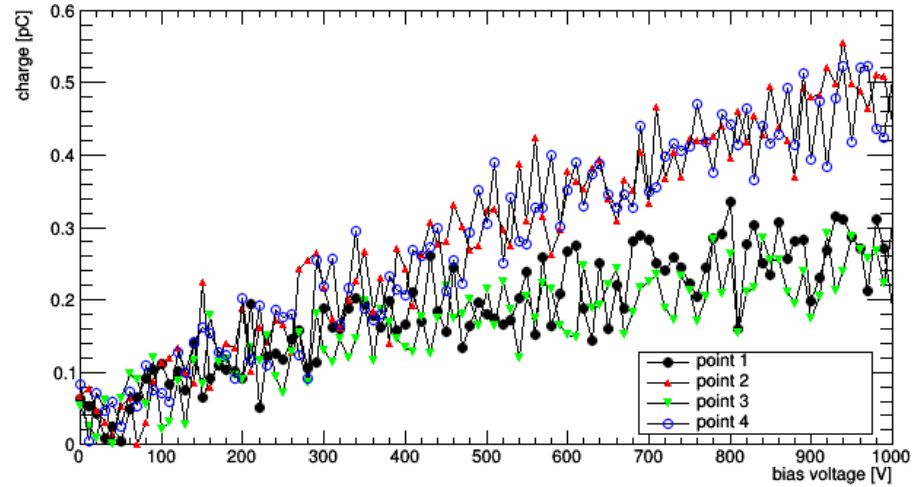
Proton irradi. $2.30E16$ W1 D2

Proton irradi. 2.30E16 W1_D2 red front

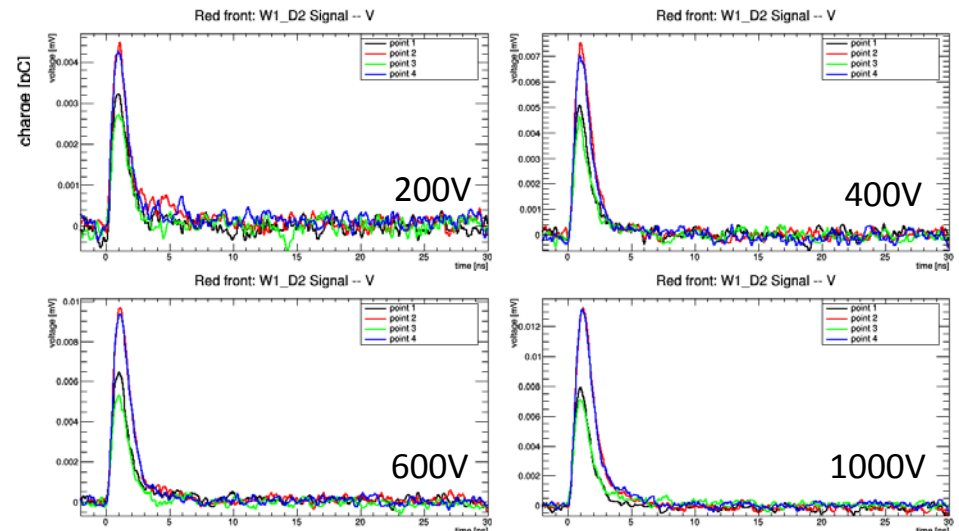
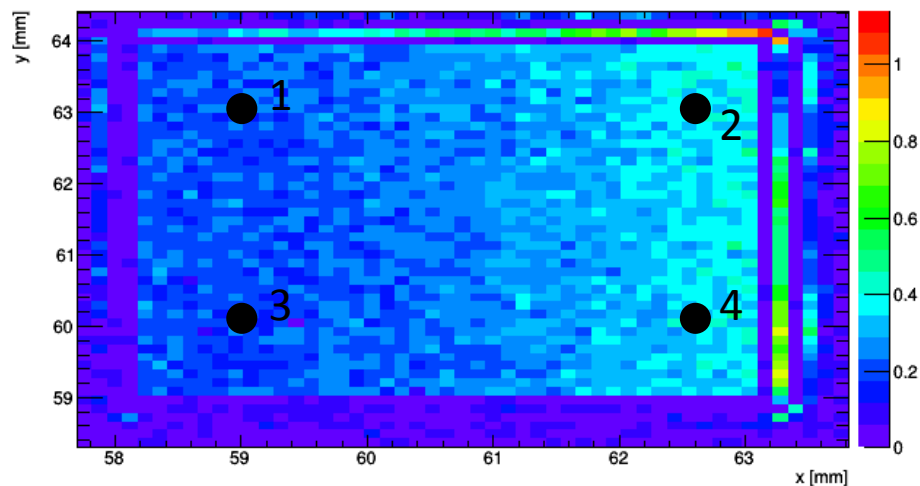
bias voltage: 1000V



Red front: Run7062_W1_D2 Charge 25ns -- V

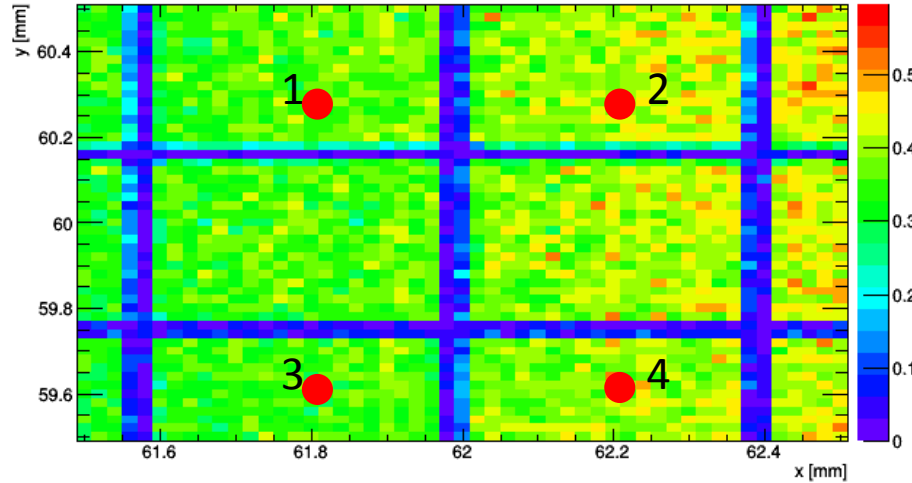


bias voltage: 600V

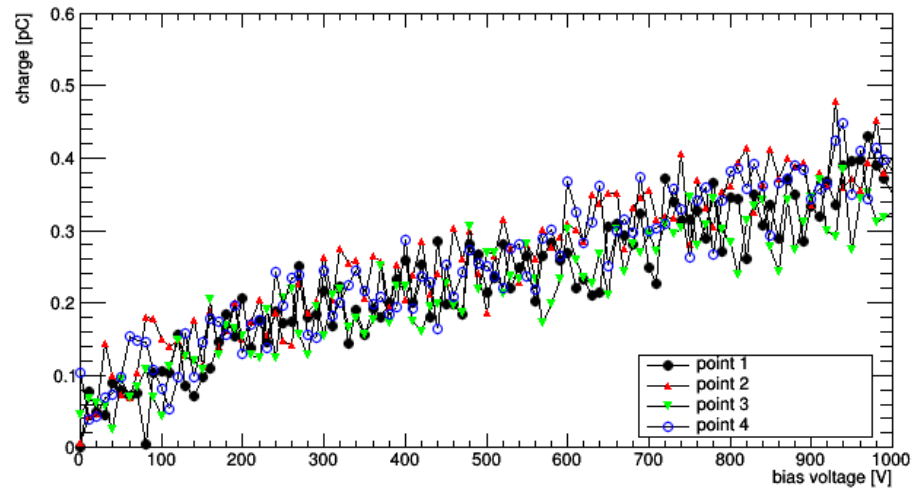


Proton irradi. 2.30E16 W1_D2 red back

bias voltage: 1000V



Red back: Run7062_W1_D2 Charge 25ns -- V



bias voltage: 600V

