ABC-CAFE Irradiation with neutrons

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- Hybrid with 6 ABC-CAFE chip pairs was irradiated in the reactor in Ljubljana

- Our standard setup was used:

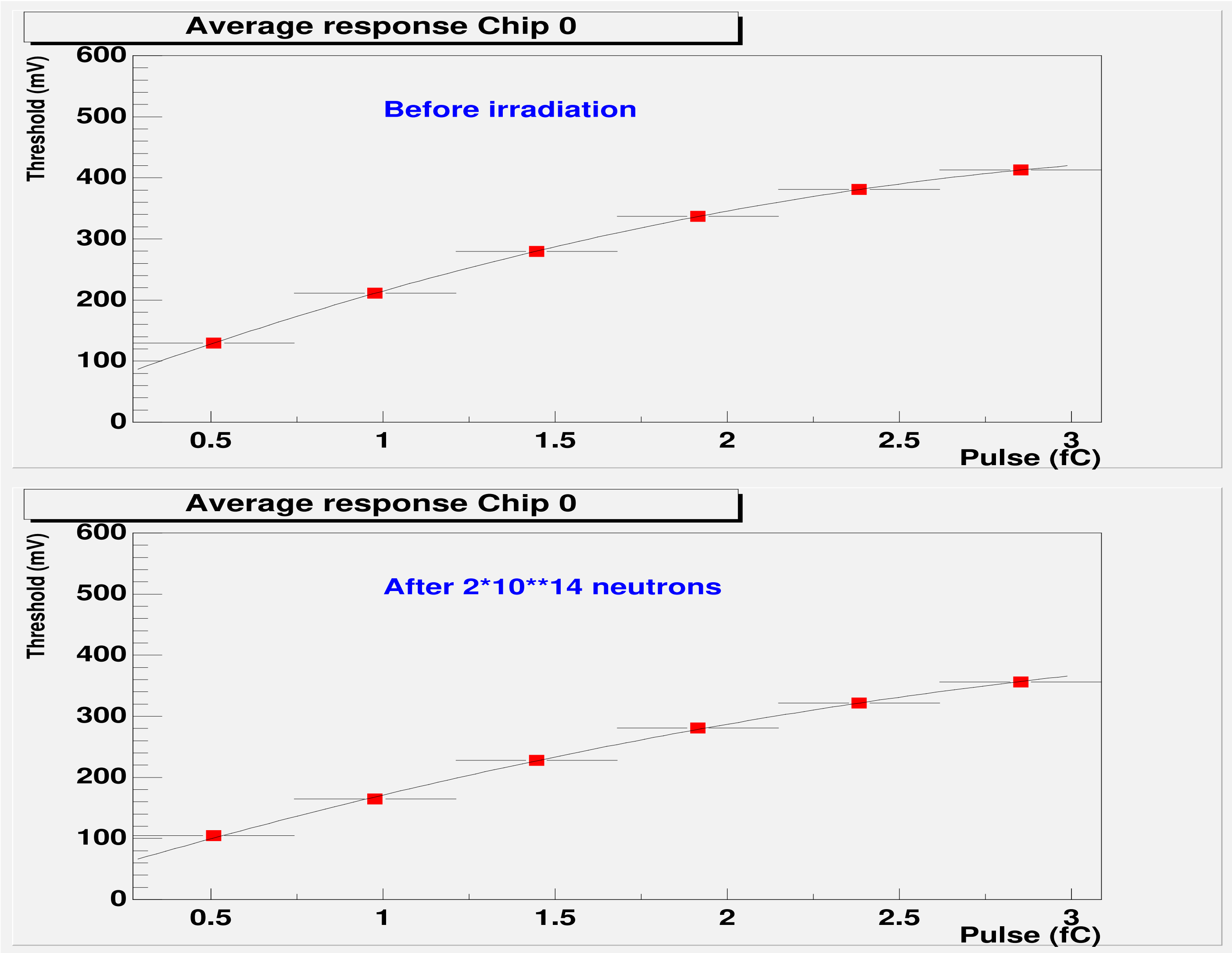
  MXI, SEQSI , DRAFT, LVDS repeater,
  long cables (5m)

- during irradiation:
  - clock at 40MHz
  - pulse and readout the chips

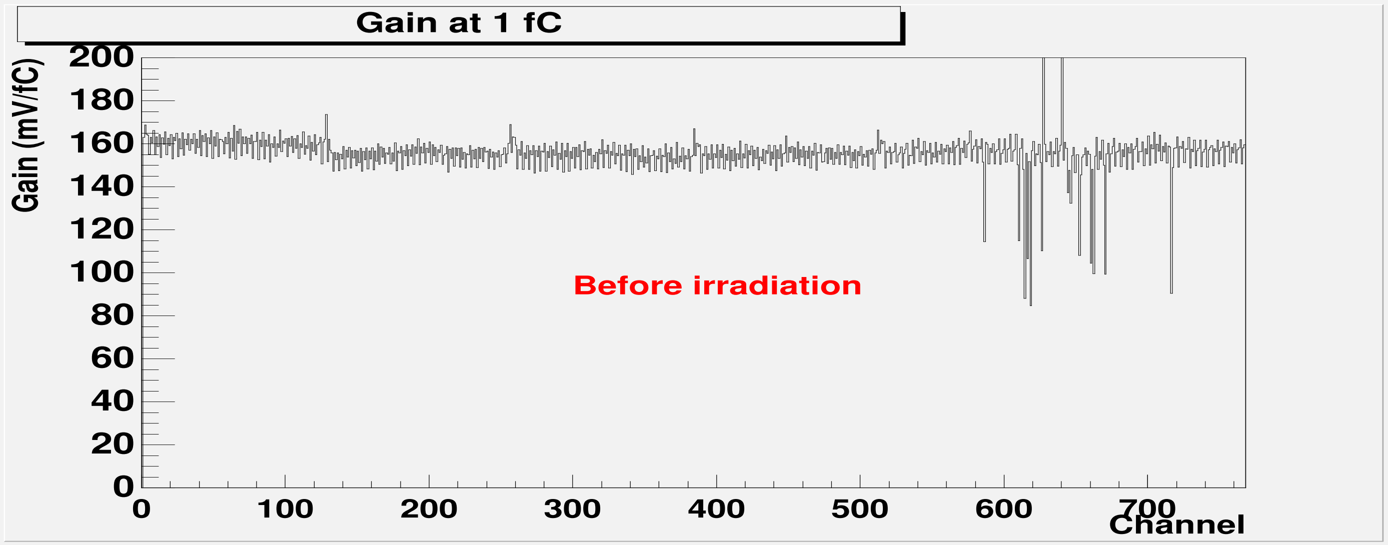
- chip performance was tested after fluences of:
  - 0 n/cm^2
  - 5×10^{13} n/cm^2
  - 1×10^{14} n/cm^2
  - 1.5×10^{14} n/cm^2
  - 2×10^{14} n/cm^2

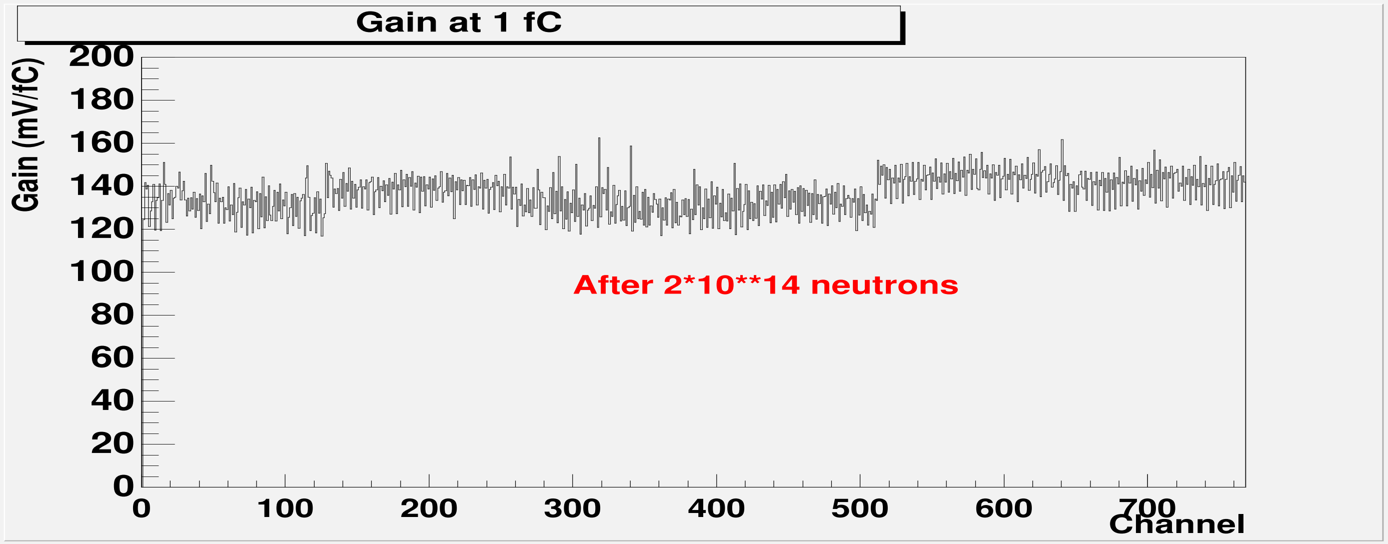
- at each point do threshold scans:
  - edge detect, edge (01X) data compression
  - 6 pulses from 0.5 to 3 fC
  - measure gain, and noise at 3 preamplifier bias currents

- Average response for chip 0 at ViSet (preamp) current DAC = 6

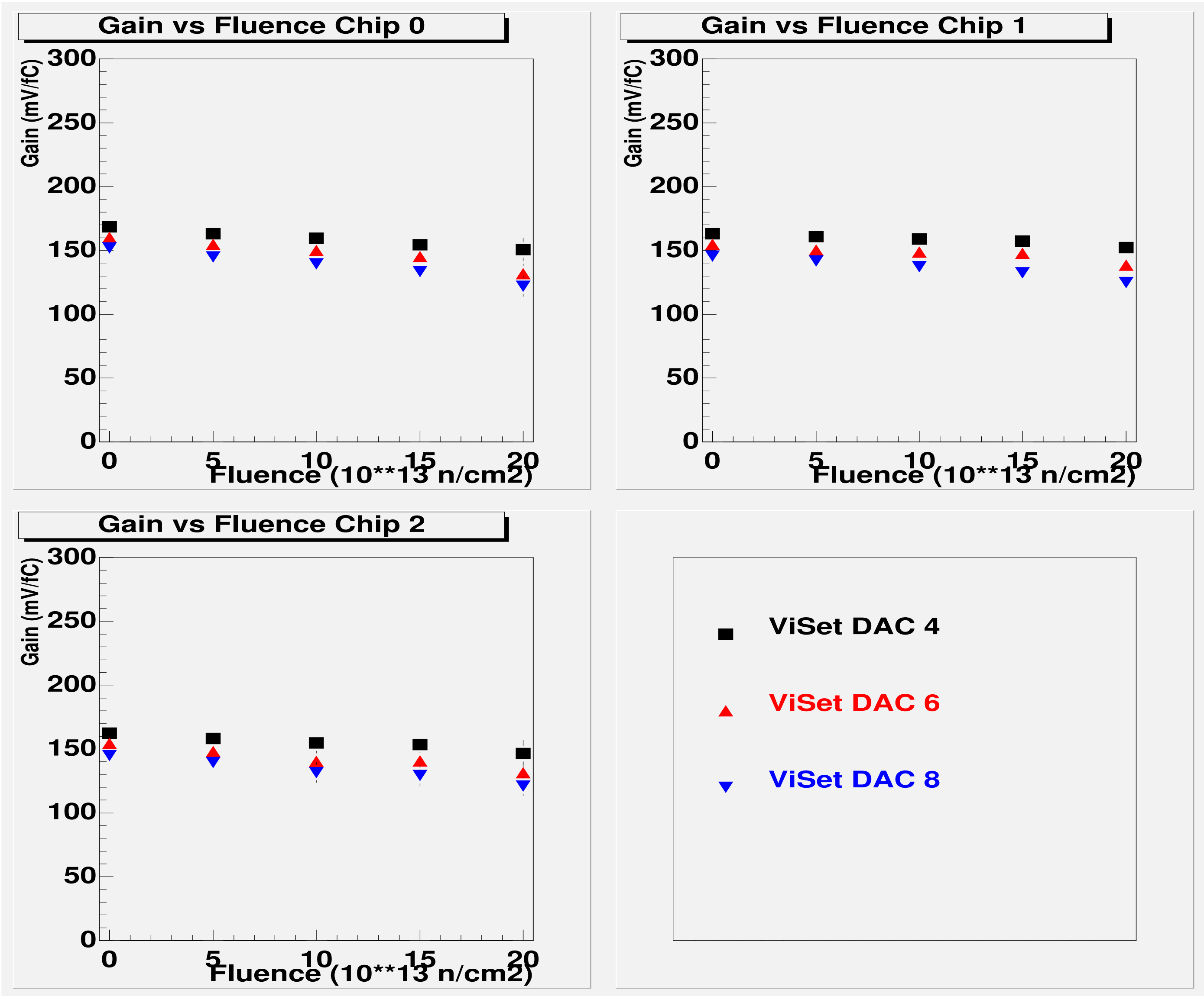


• Gain vs channel number before and after irradiation ViSet DAC = 6

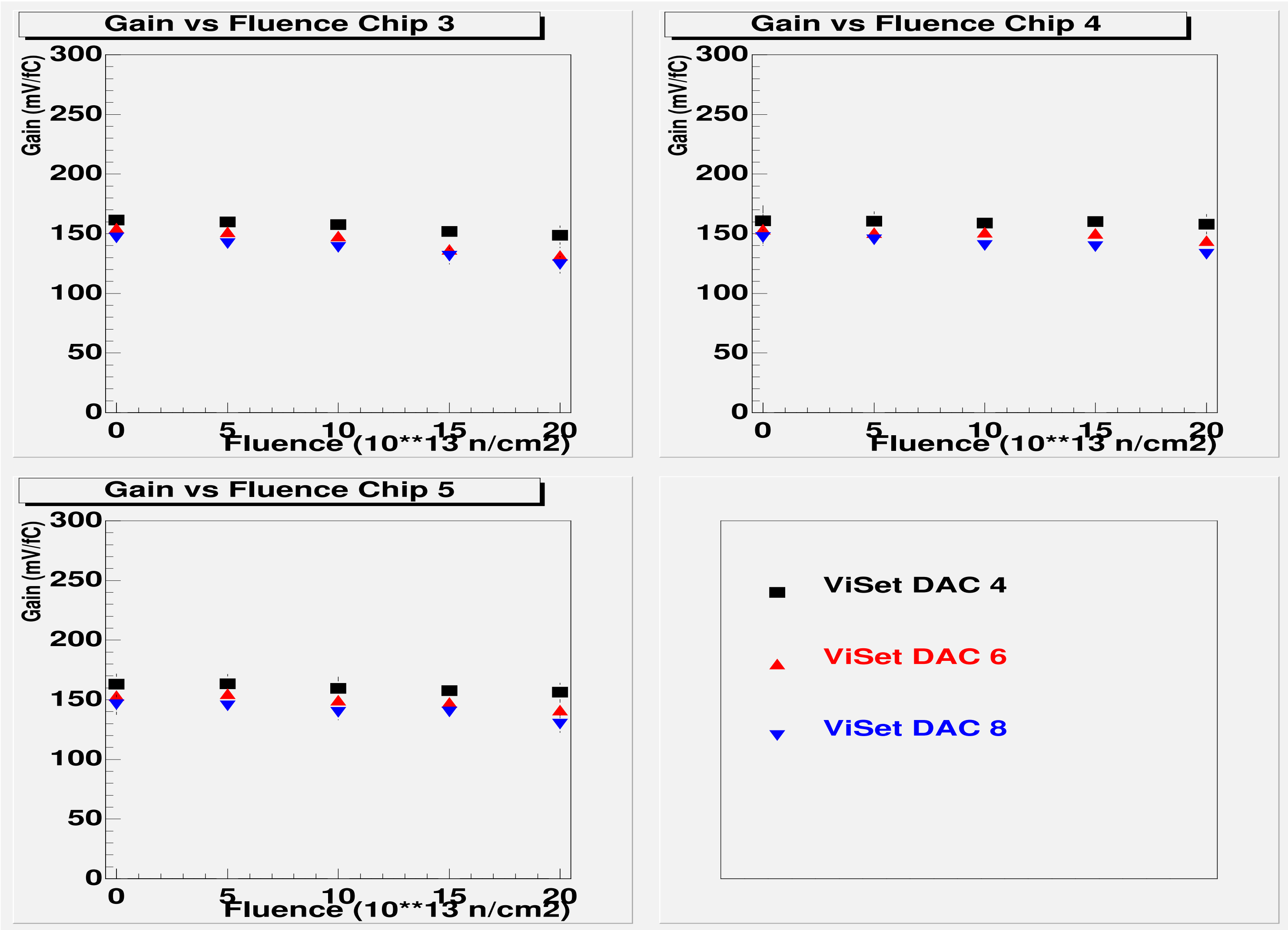




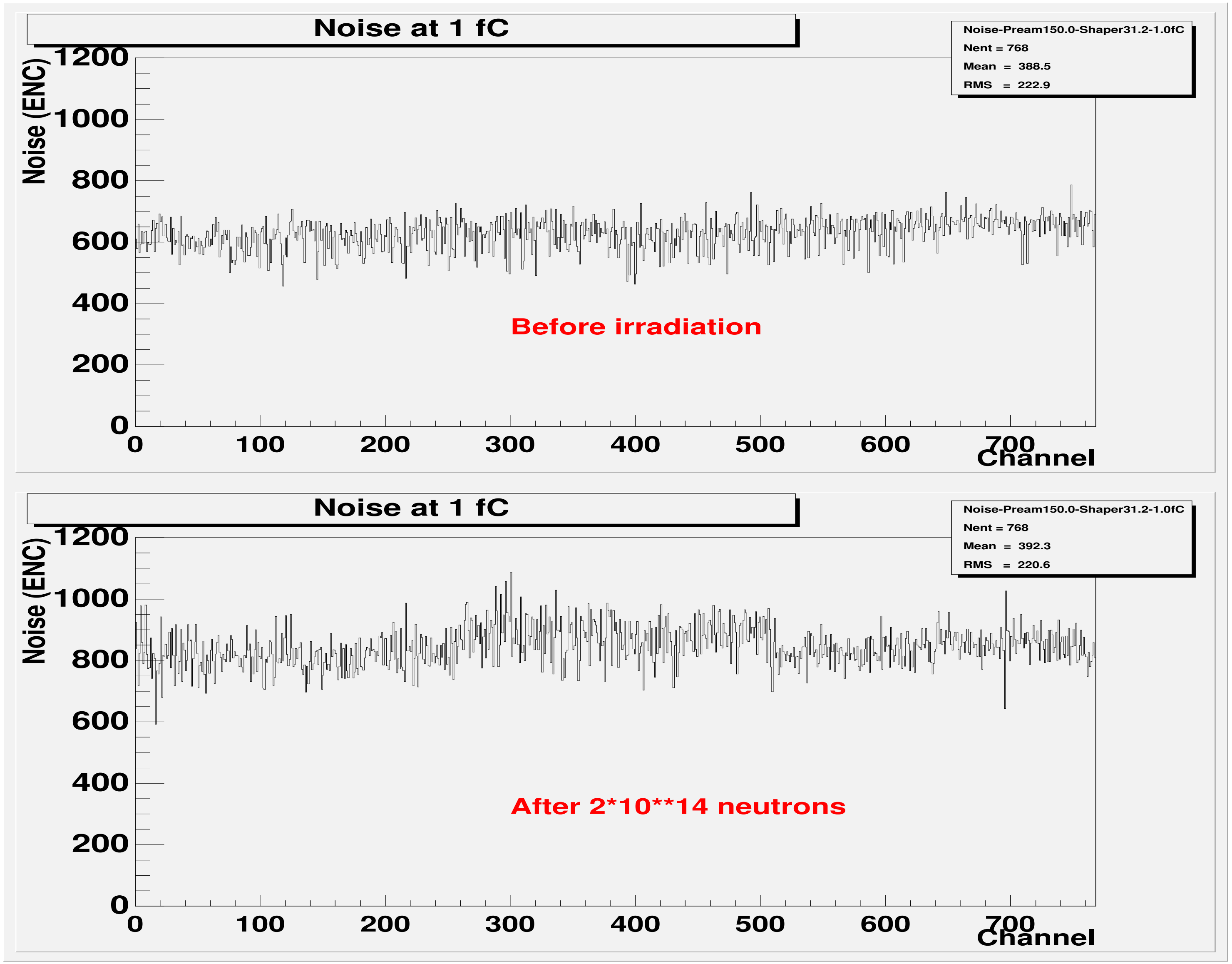
• Gain as a function of fluence chips 0 - 2



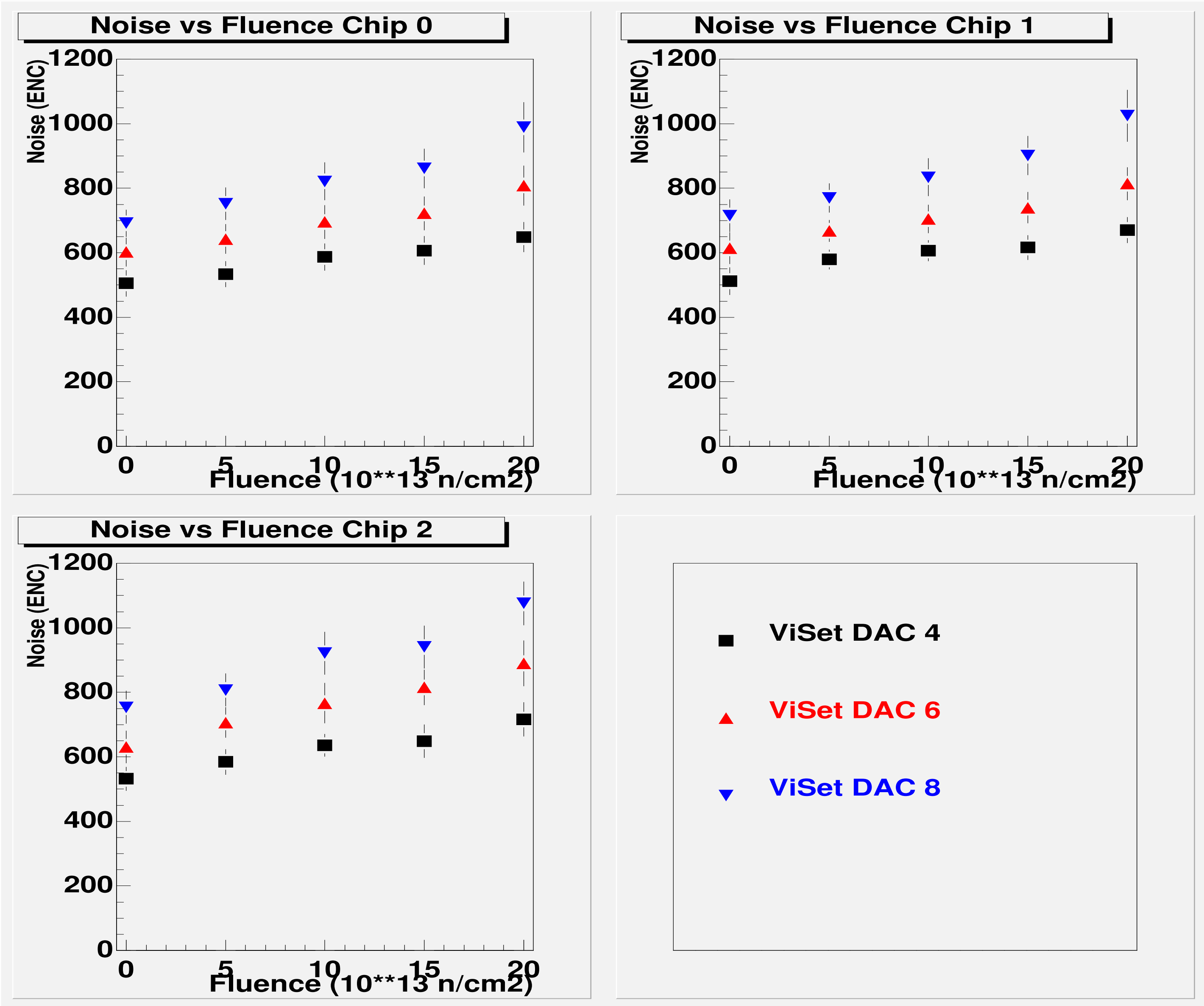
• Gain as a function of fluence chips 3 - 5



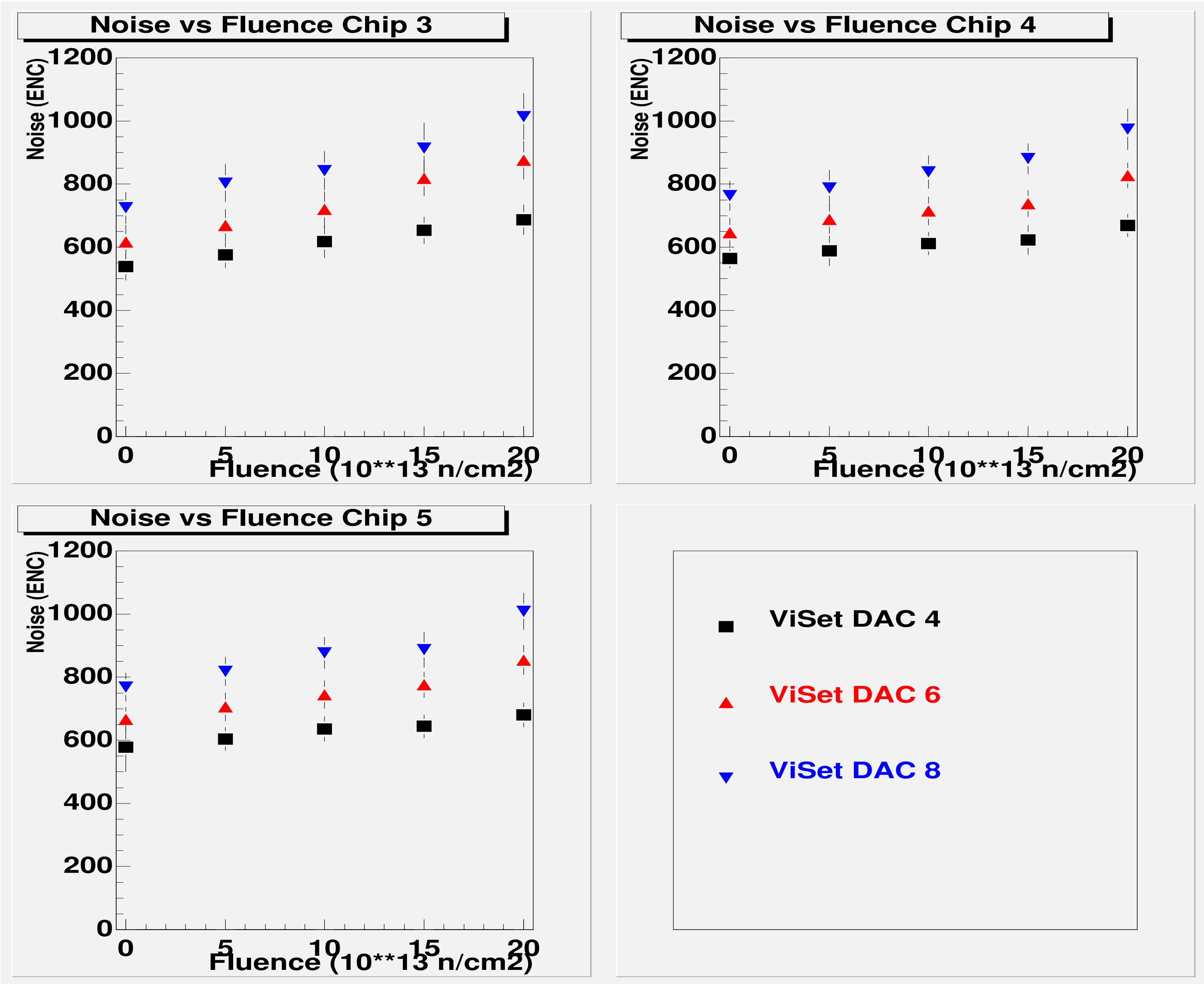
- Noise at 1 fC vs channel number ViSet DAC = 6



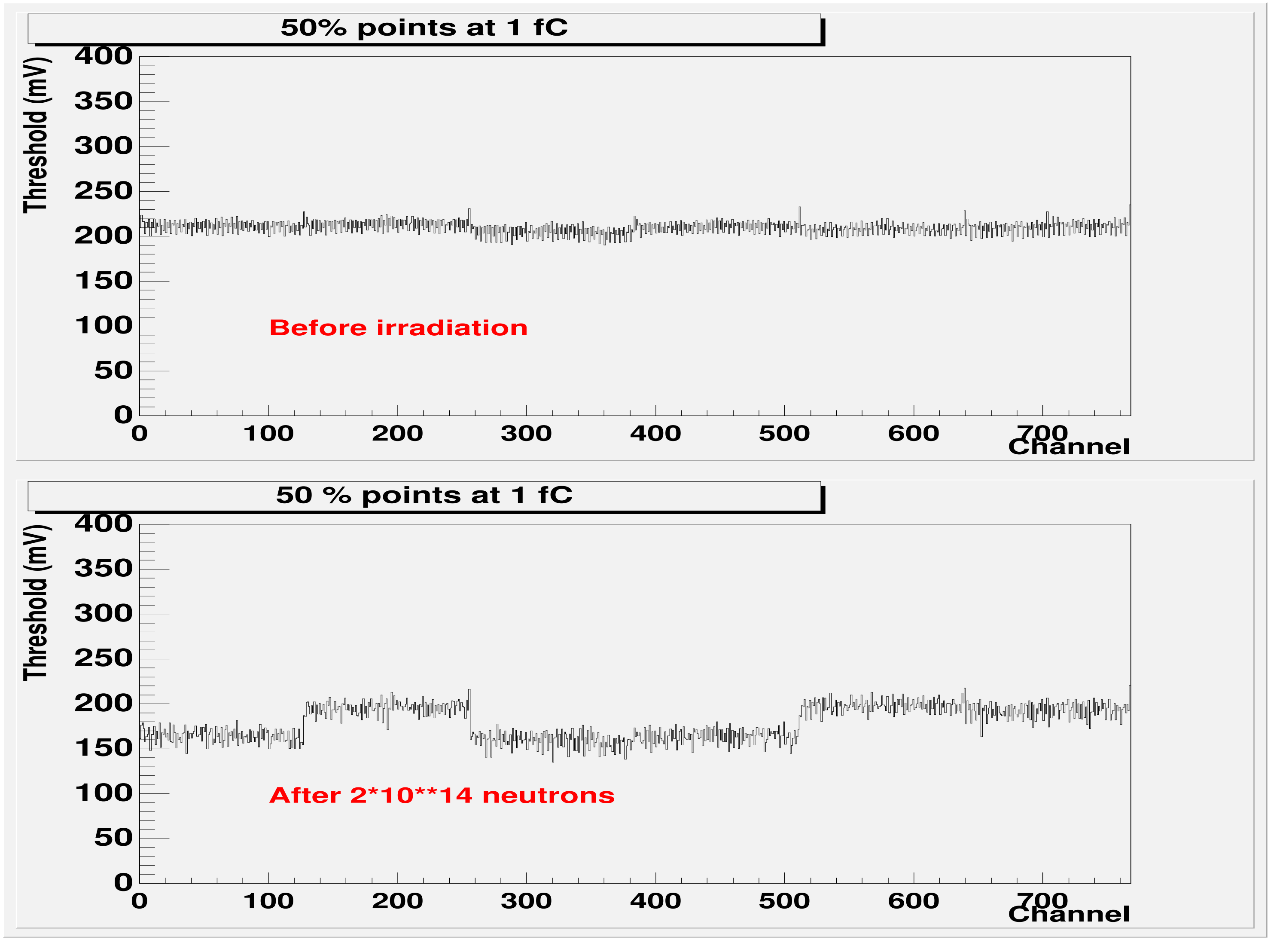
• Noise at 1 fC as a function of fluence chips 0-2



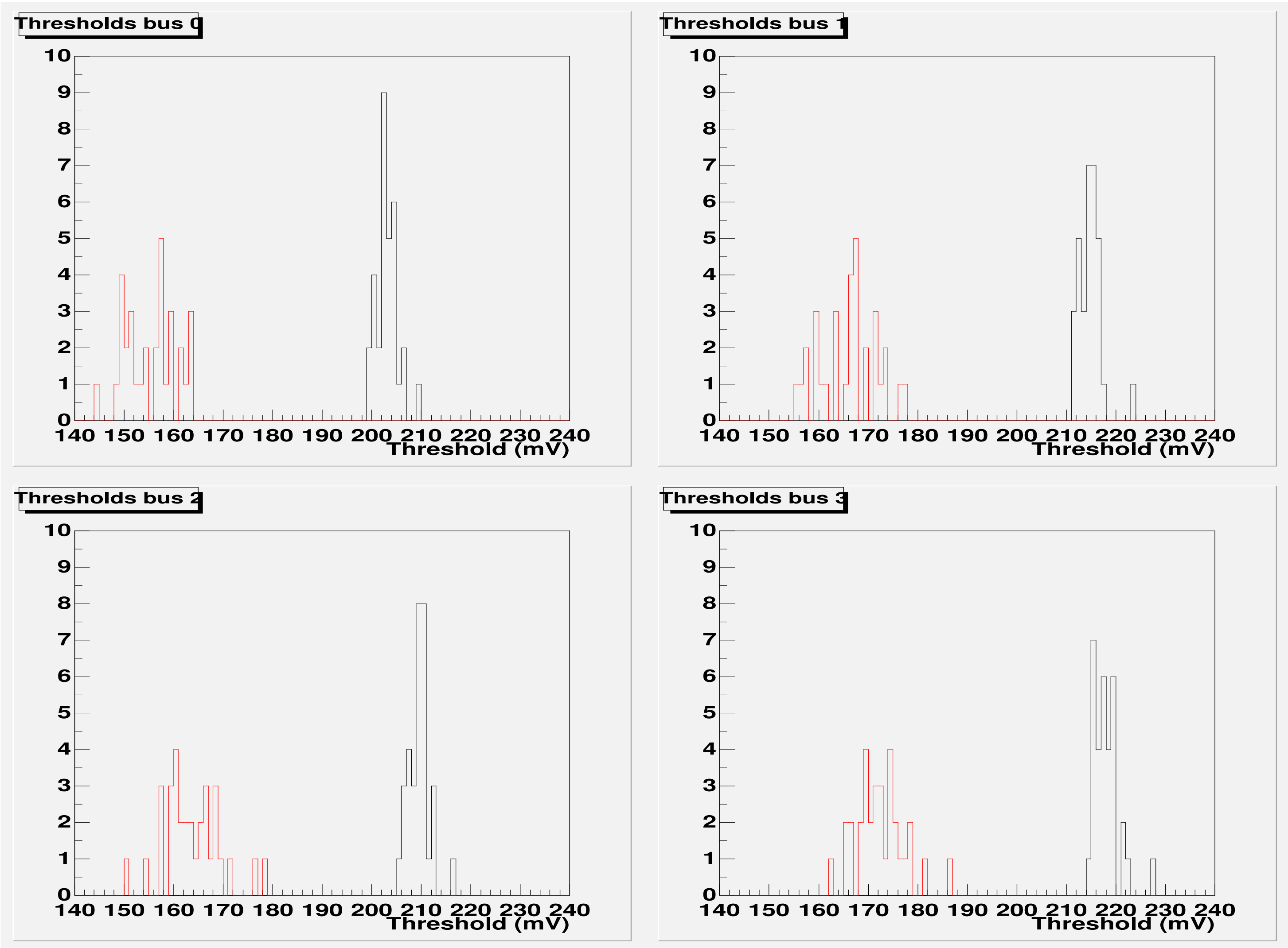
• Noise at 1 fC as a function of fluence chips 3-5



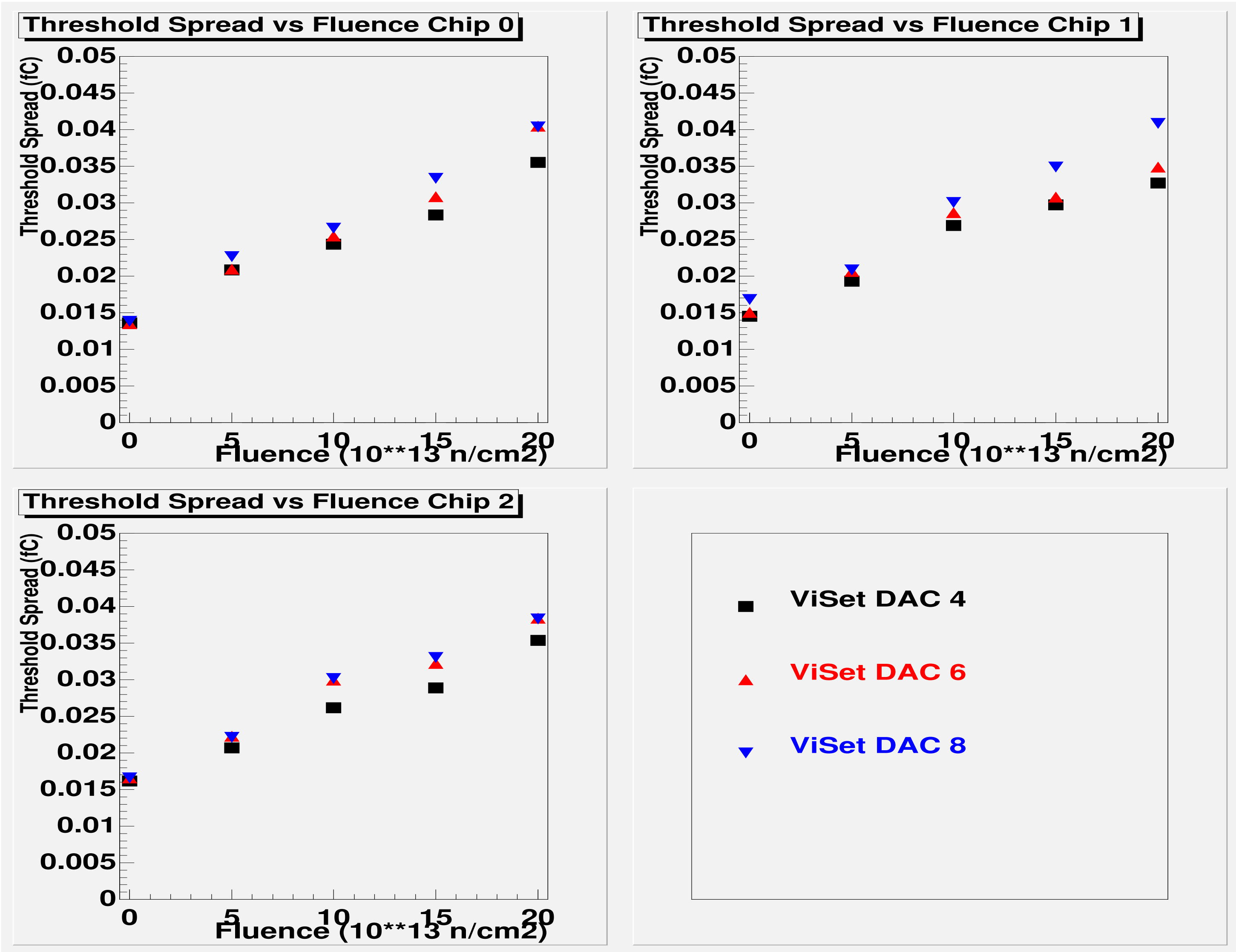
• Thresholds (50% point) at 1fC before and after irradiation
ViSet DAC = 6



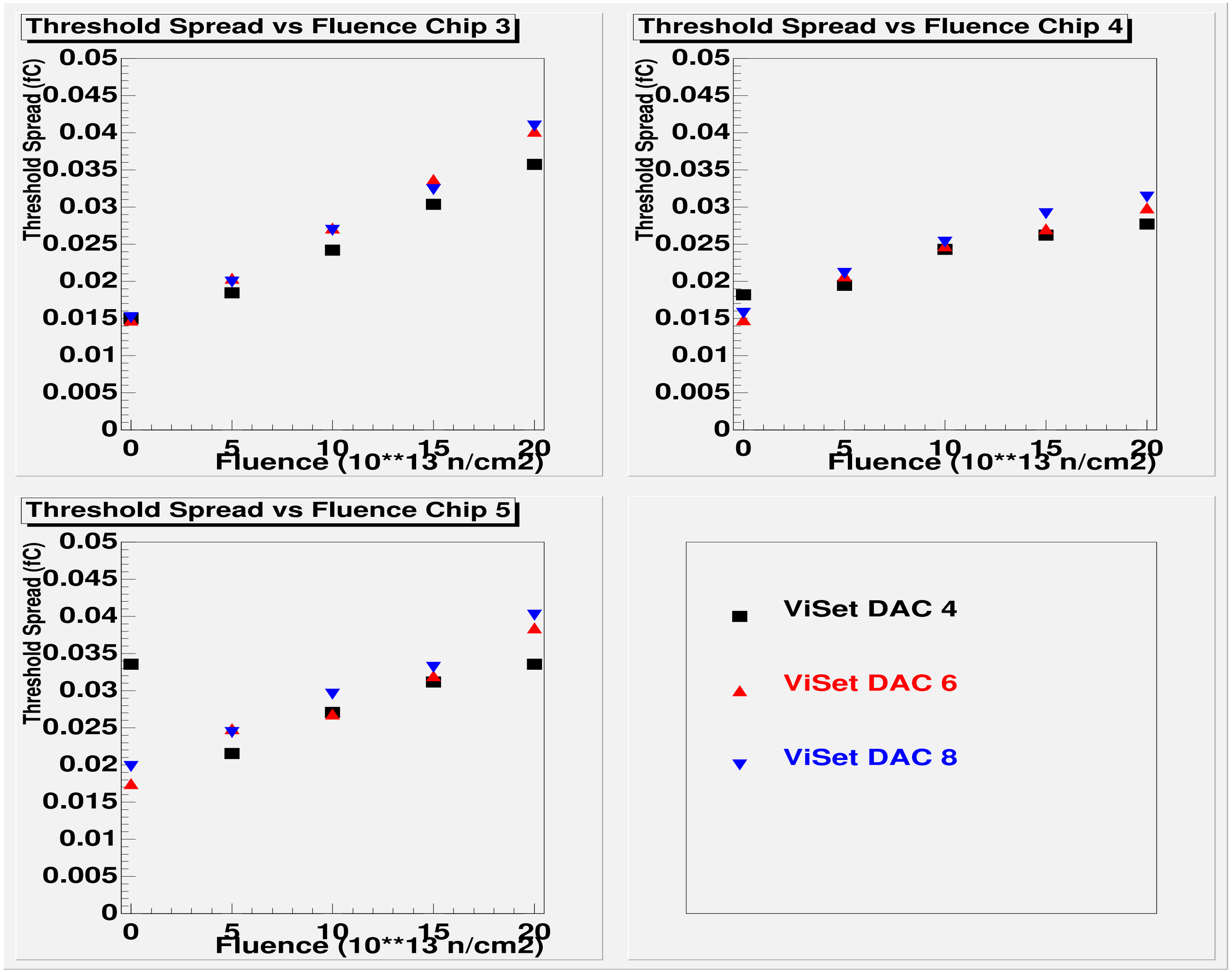
- Distribution of 50% points for chip 0 at 1 fC before and after irradiation
  ViSet DAC = 6



• 50% points spread (RMS) at 1fC vs fluence chips 0-2



• 50% points spread (RMS) at 1fC vs fluence chips 3-5



Conclusions:

- chips work after irradiation with $2x10^{14}$ n/cm^2
- gain dropped by ~ 10%
- noise increase depends on preamplifier current:
  - from 500 to 600 electrons at ViSet DAC = 4
  - from 700 to 1000 electrons at ViSet DAC = 8
- threshold spread at 1fC increased from ~0.015 fC to ~0.035 fC