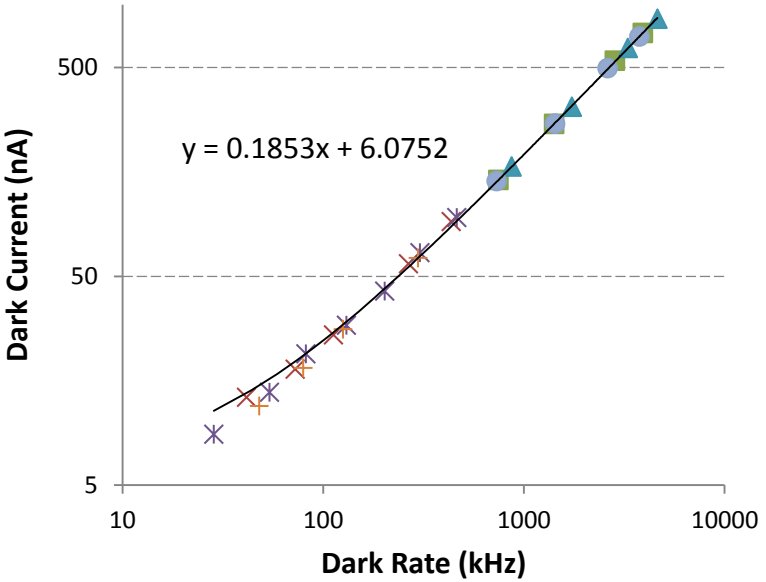
Gain vs. Dark Current/Dark Rate

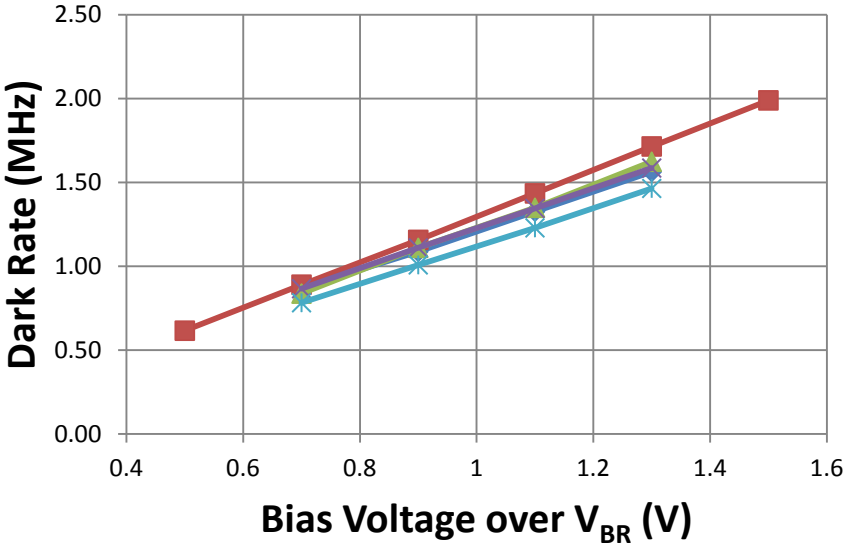
Yi Qiang 2012/1/19

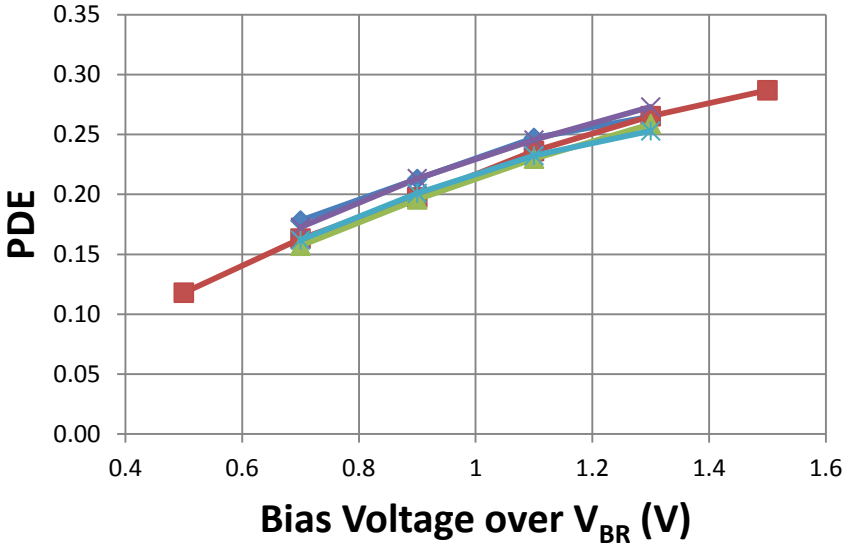
- **1 mm^2 50 um SiPM (S10362-11-050C)**
  - FADC 250: 12-bit covers 0-0.5 V, 50 Ω, 4 ns, ×66 pre-amplifier:
    - 1 channel = 0.5V*4ns/4096/66/50Ω = 1.48×10^{-16} C = 925 e
  - Average gain: 909 channels -> **0.84×10^6**
  - Gain from current/rate fit: **1.16×10^6**
  - Difference: 38%, could be explained by cross-talk and after pulsing

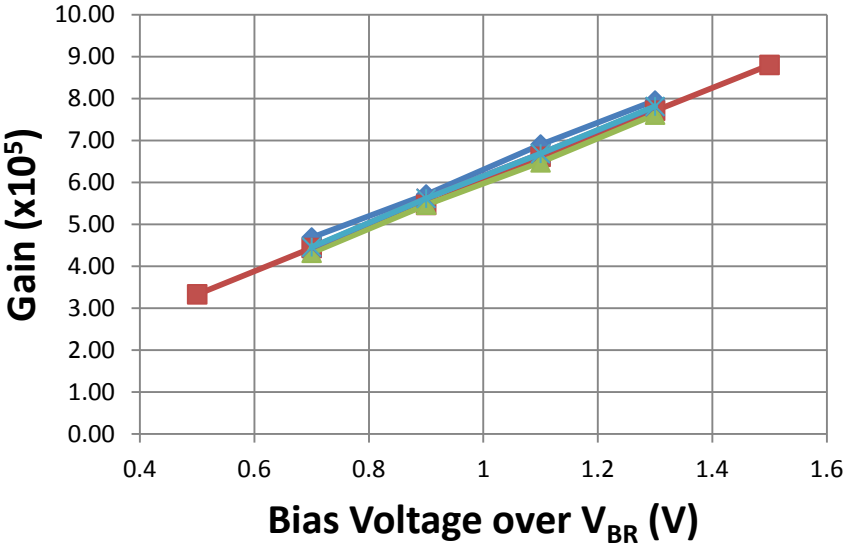


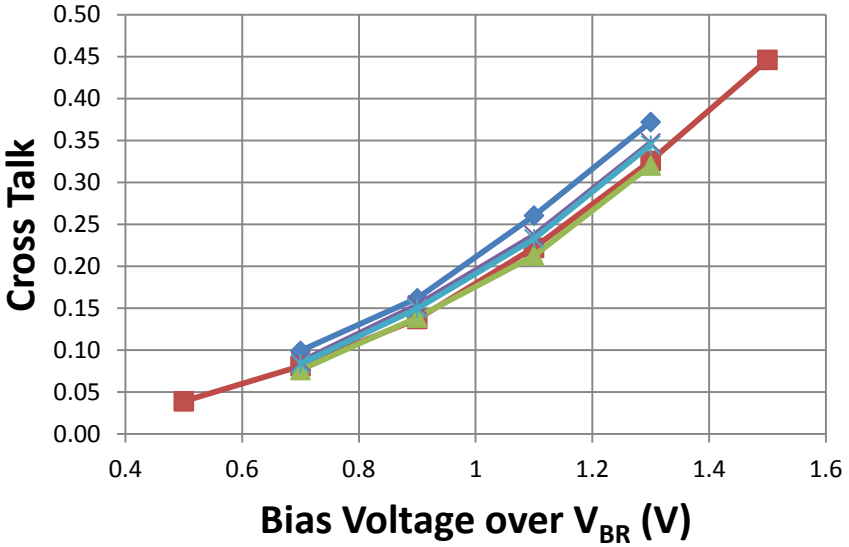
- **First Article Units**
  - QDC V792: 100 pC/Channel
  - ×66 pre-amplifier
  - Average gain from 3 samples: **0.56×10^6**
  - Dark current/Dark rate = 1.84 uA/15.1 MHz: **0.76×10^6**
  - Difference: 36%, similar to 1 mm^2 case, but much smaller deviation is expected due to smaller cross-talk and after-pulsing with lower bias.

Voltage Dependence



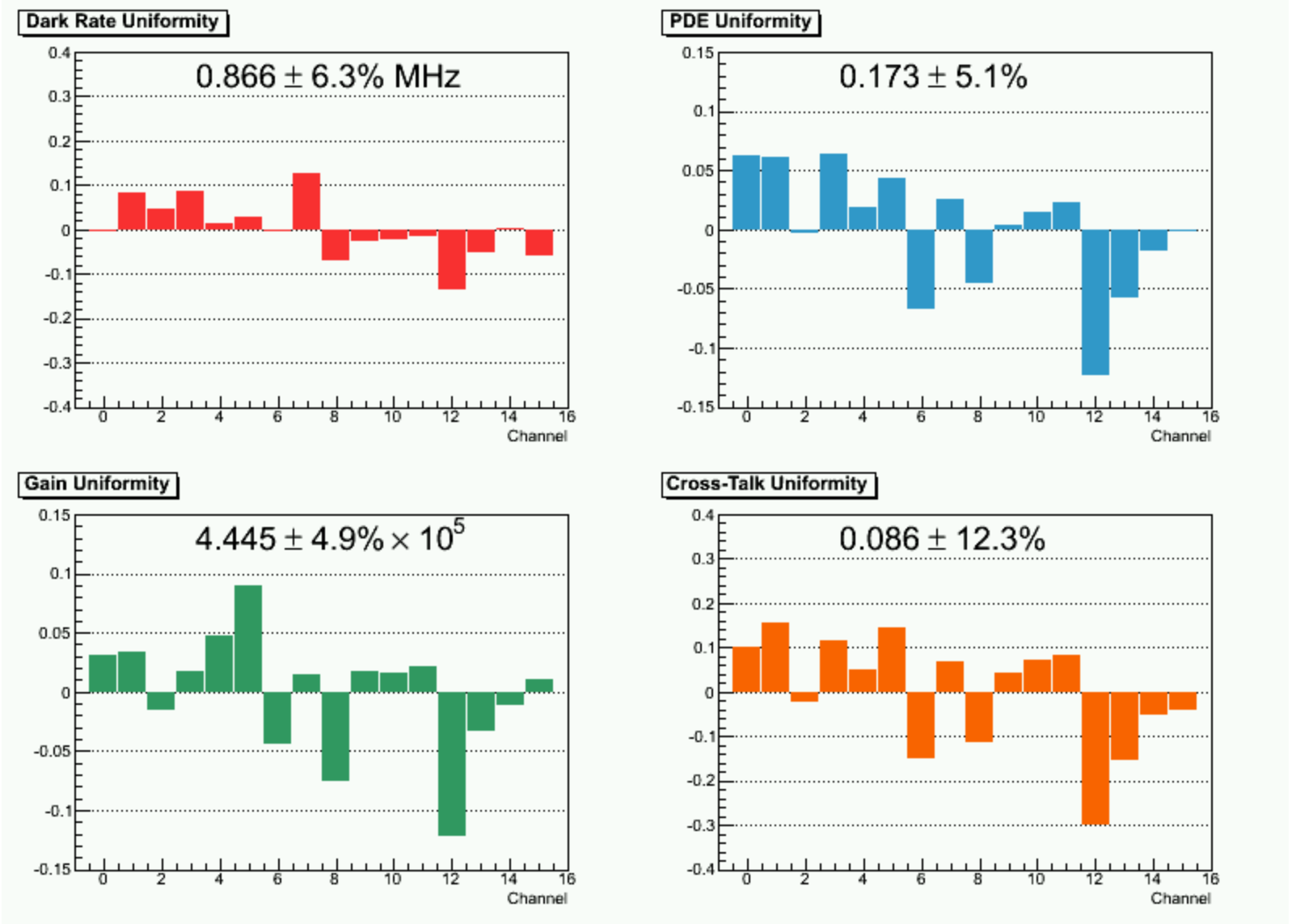




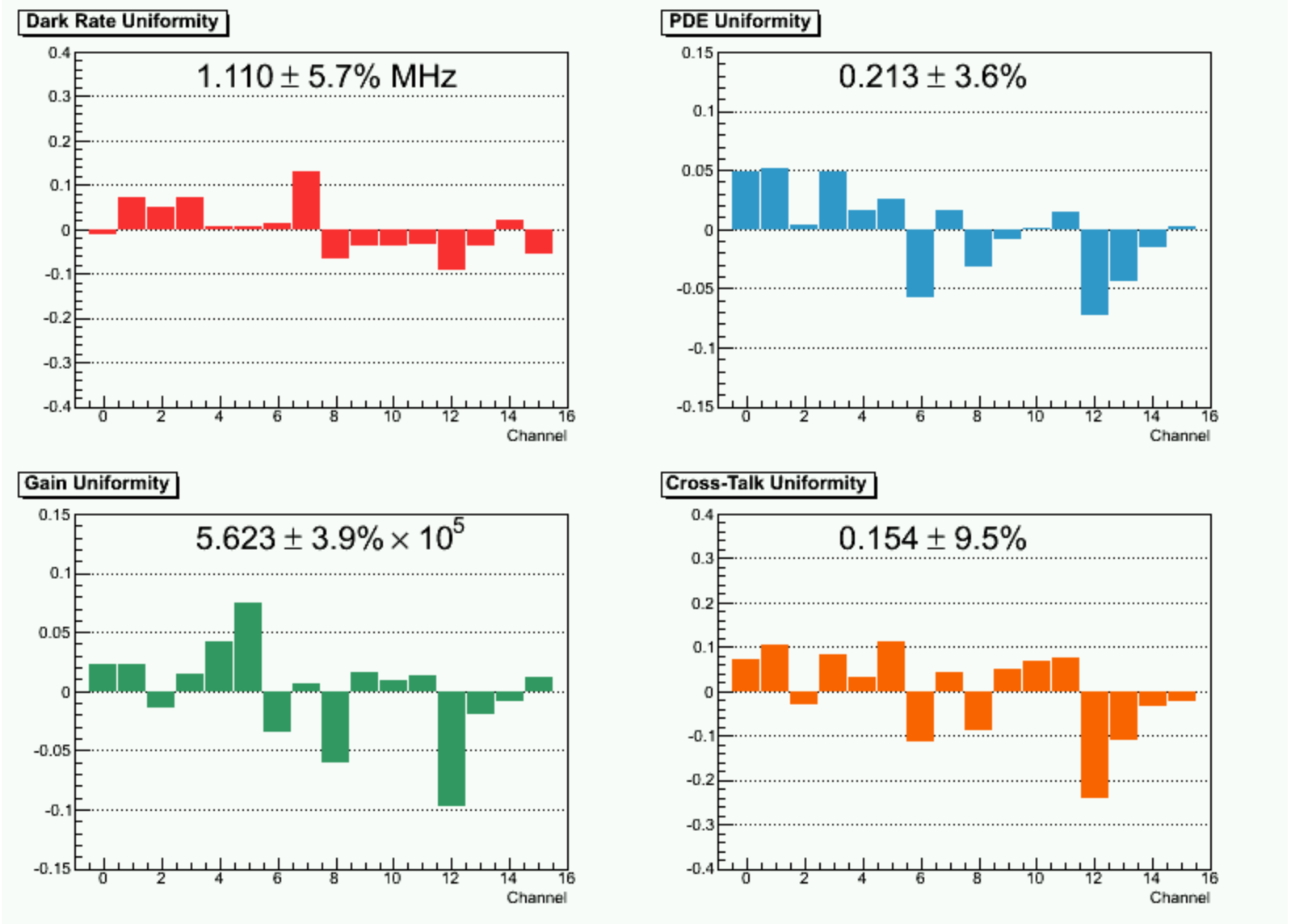


SiPM #3,#51,#60,#73,#90

Uniformity @ 0.7 V (SiPM#73)



Uniformity @ 0.9 V (SiPM#73)



Uniformity @ 1.3 V (SiPM#73)