Cavity BCM Digital Receivers Bench Test

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Virginia Tech
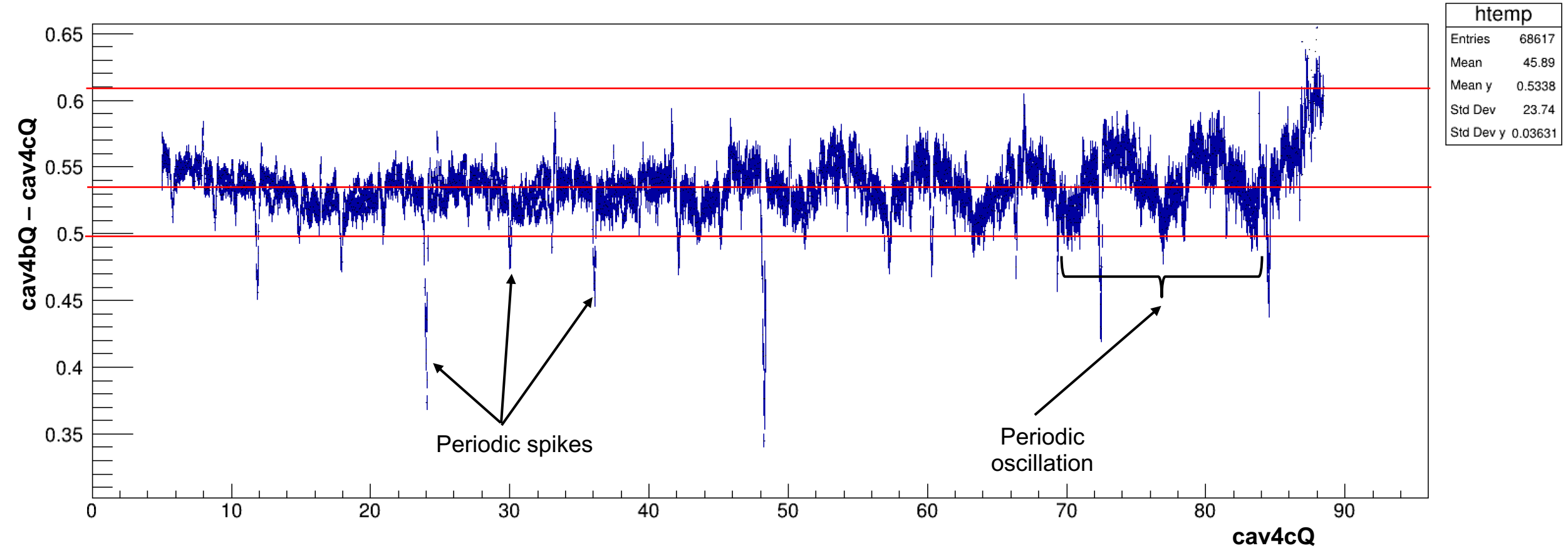
Blacksburg, Virginia, USA

How was the bench test performed?

- Bench test was performed on the three digital BCM receivers
- RF source was connected to the three digital receivers with the following settings
  - Frequency: 1497 MHz
  - RF Level: -20 dB
  - AM1 Depth: 91 % ON
  - Modulation wave: Sawtooth with 0.01 Hz frequency
- This generates triangular wave patterns with equivalent current range nearly 5 µA to 100 µA
- Took a couple of parity run with this settings and the analysis is presented in the following slides
- In the following slides, the three digital receivers are labeled as cav4bQ, cav4cQ, and cav4dQ
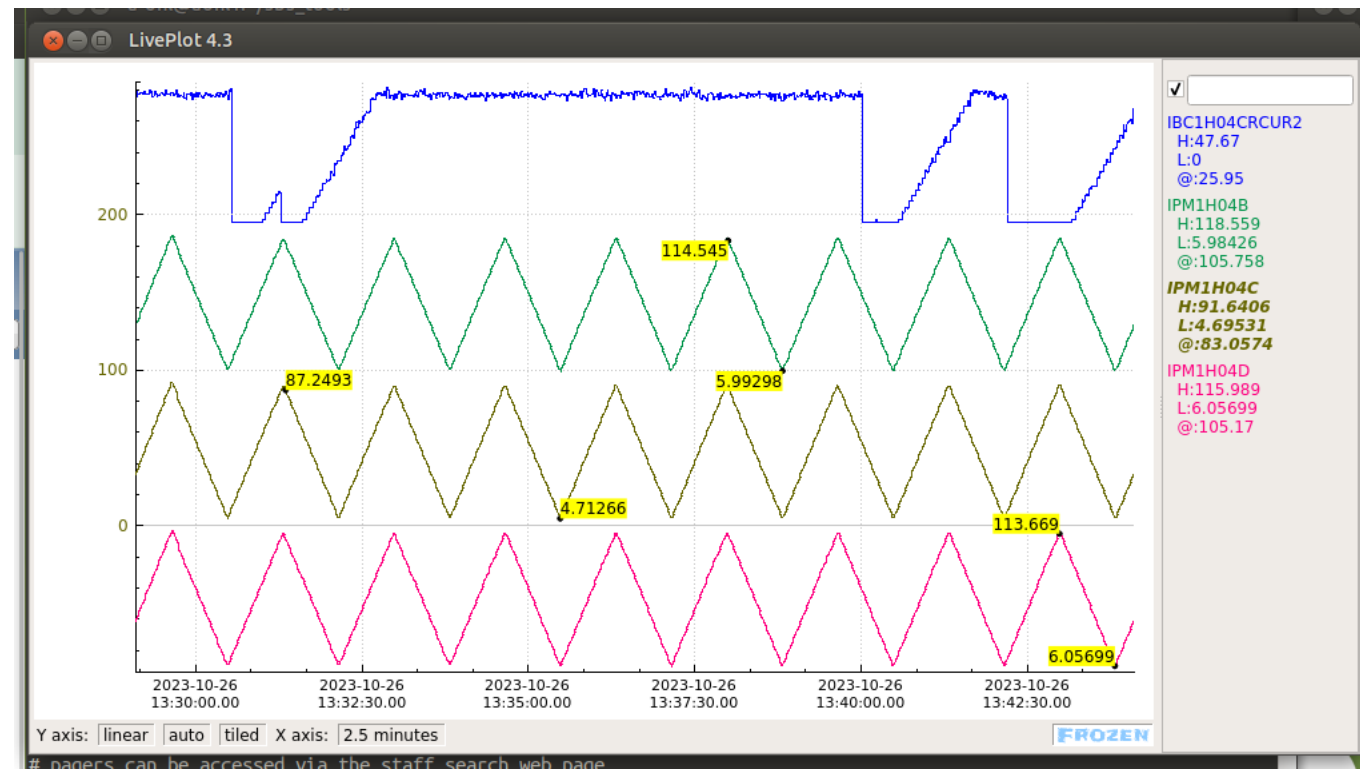
Double difference profile plot between cav4bQ and cav4cQ

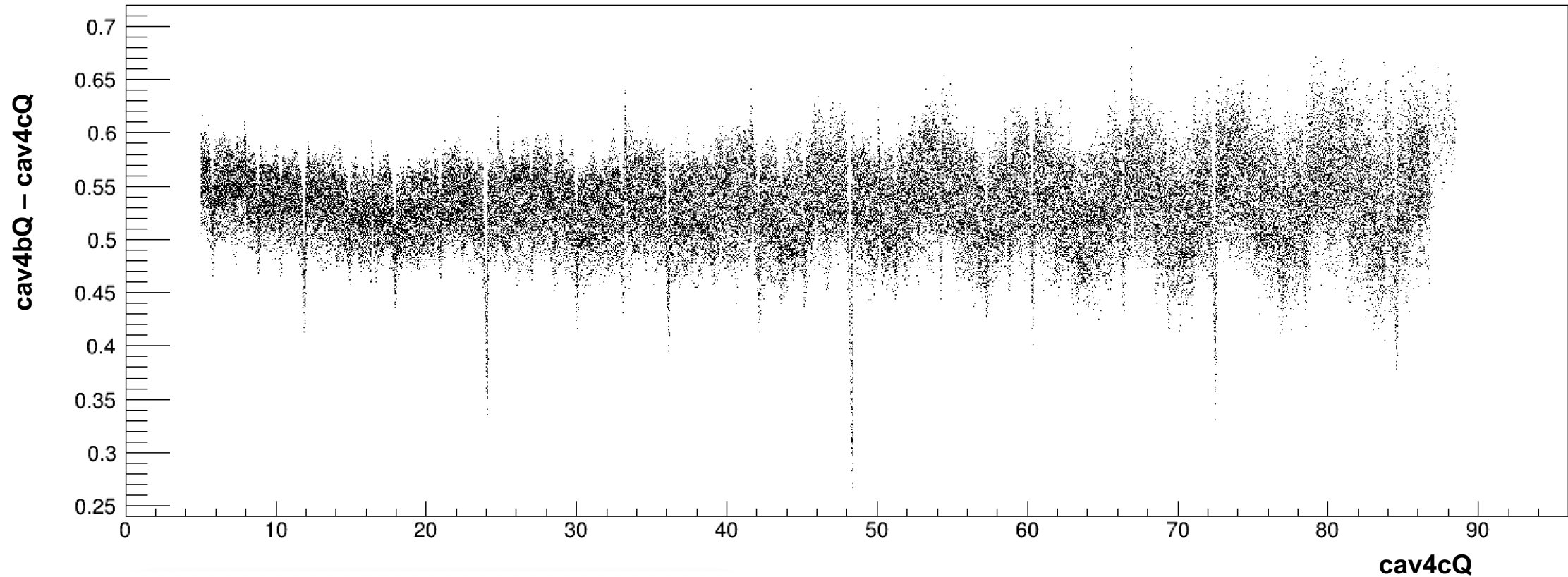cav4bQ/1.265-cav4cQ/0.9:cav4cQ {CodaEventNumber>36.28e3&&cav4cQ>5}

htemp	
Entries	68617
Mean	45.89
Mean y	0.5338
Std Dev	23.74
Std Dev y	0.03631

Periodic spikes

Periodic oscillation

Two important features are observed:
1. Periodic spikes
2. Periodic oscillation, whose amplitude increases as a function of current
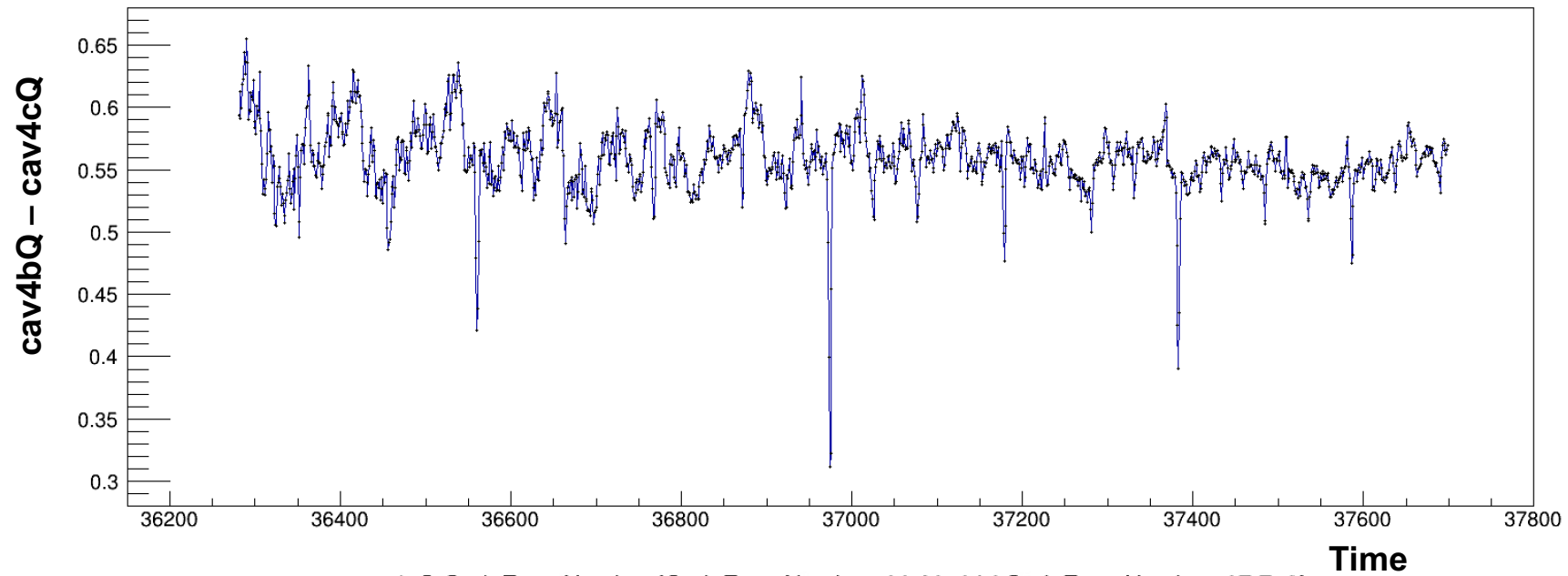3. ~0.1% differential nonlinearity

Double difference profile plot between cav4bQ and cav4cQ

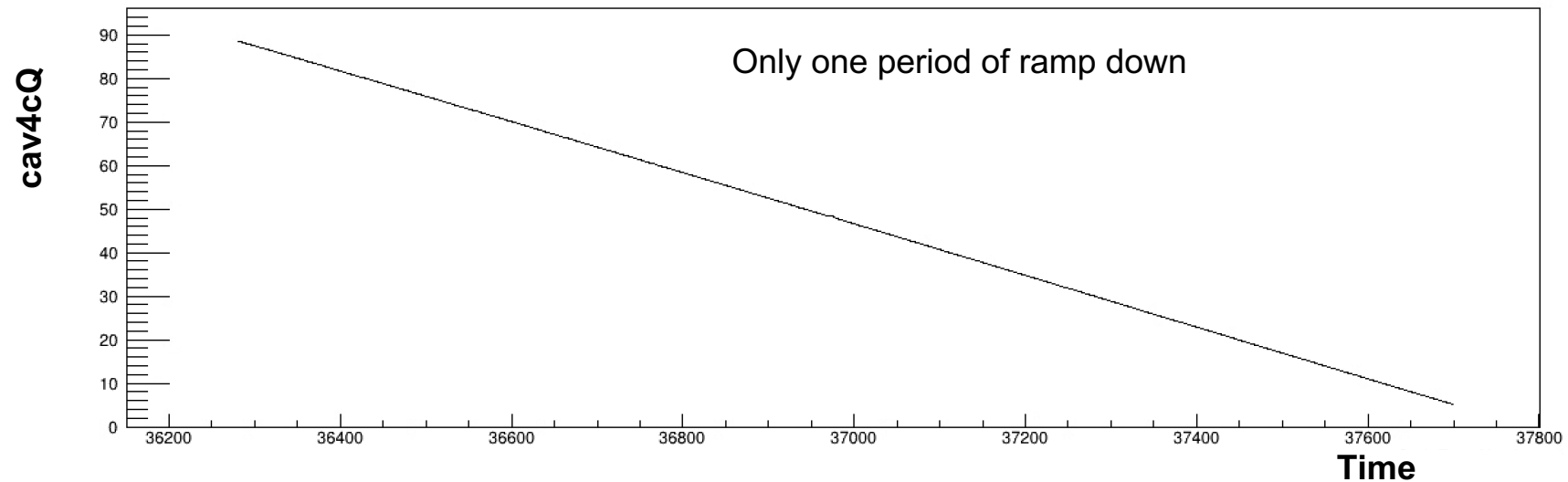cav4bQ/1.265-cav4cQ/0.9:cav4cQ {CodaEventNumber>36.28e3&&cav4cQ>5}

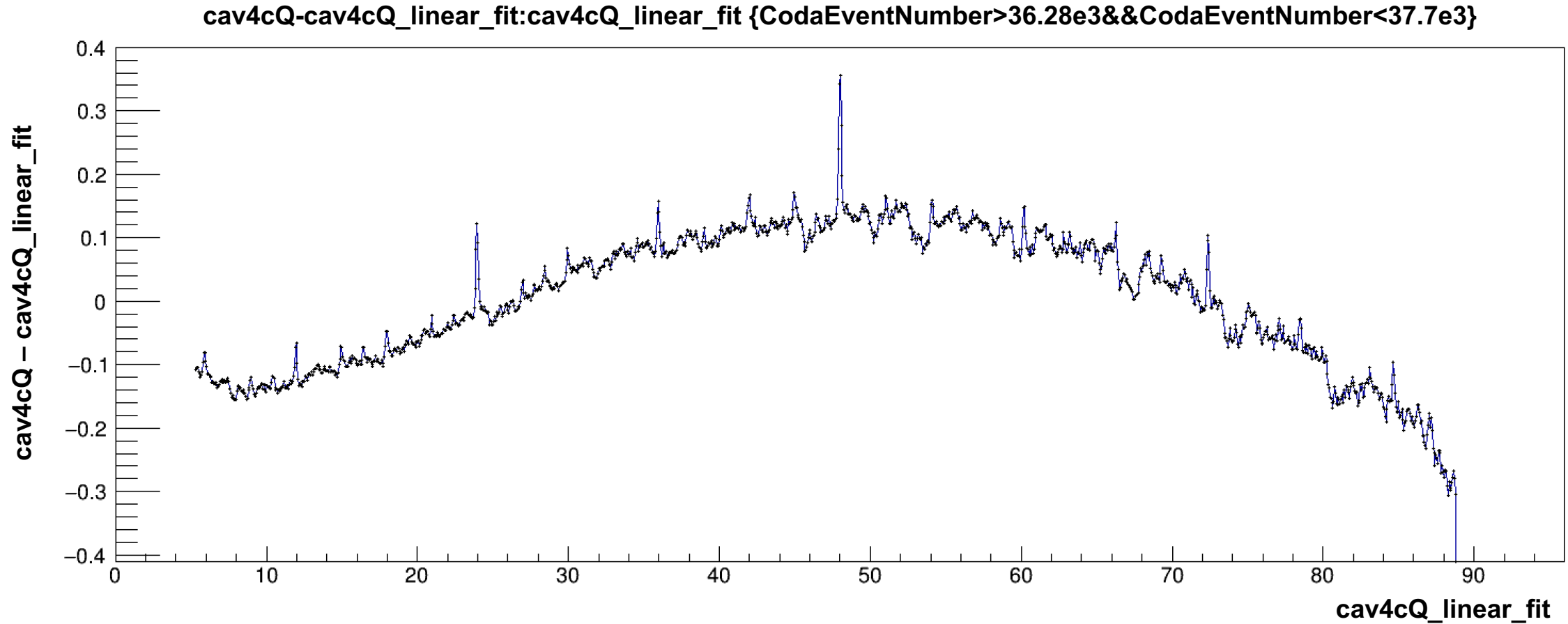# Double difference between cav4bQ and cav4cQ over time

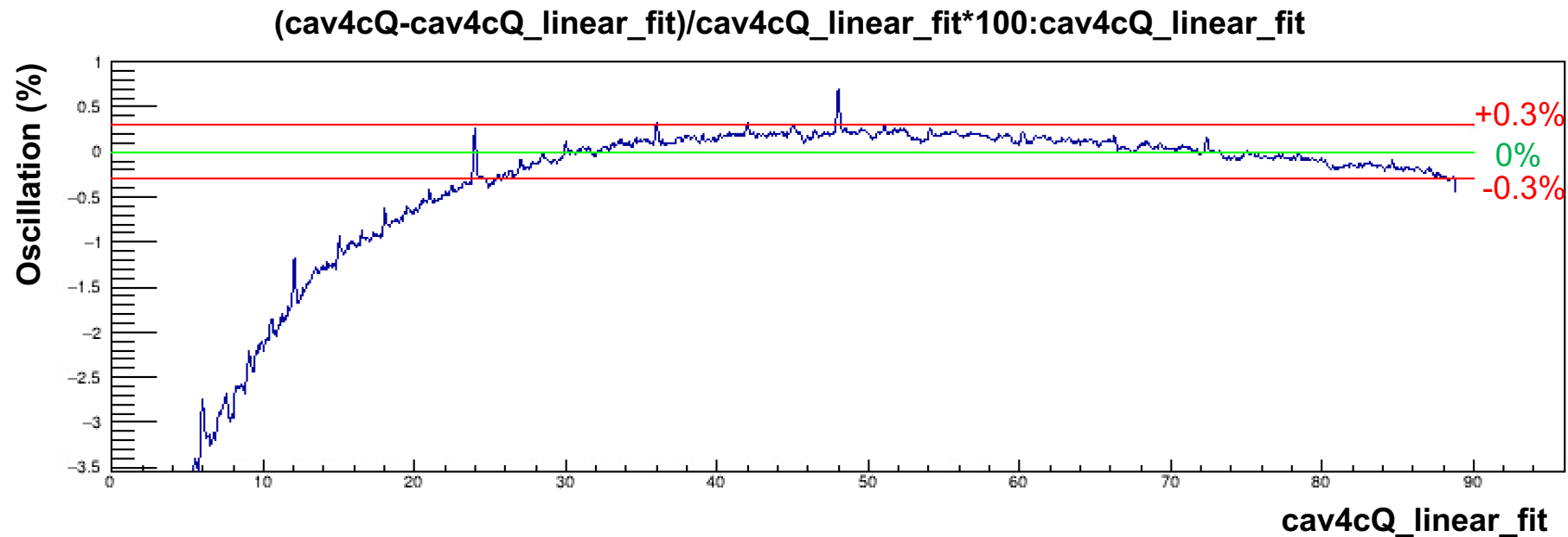cav4bQ/1.265-cav4cQ/0.9:CodaEventNumber {CodaEventNumber>36.28e3&&CodaEventNumber<37.7e3}
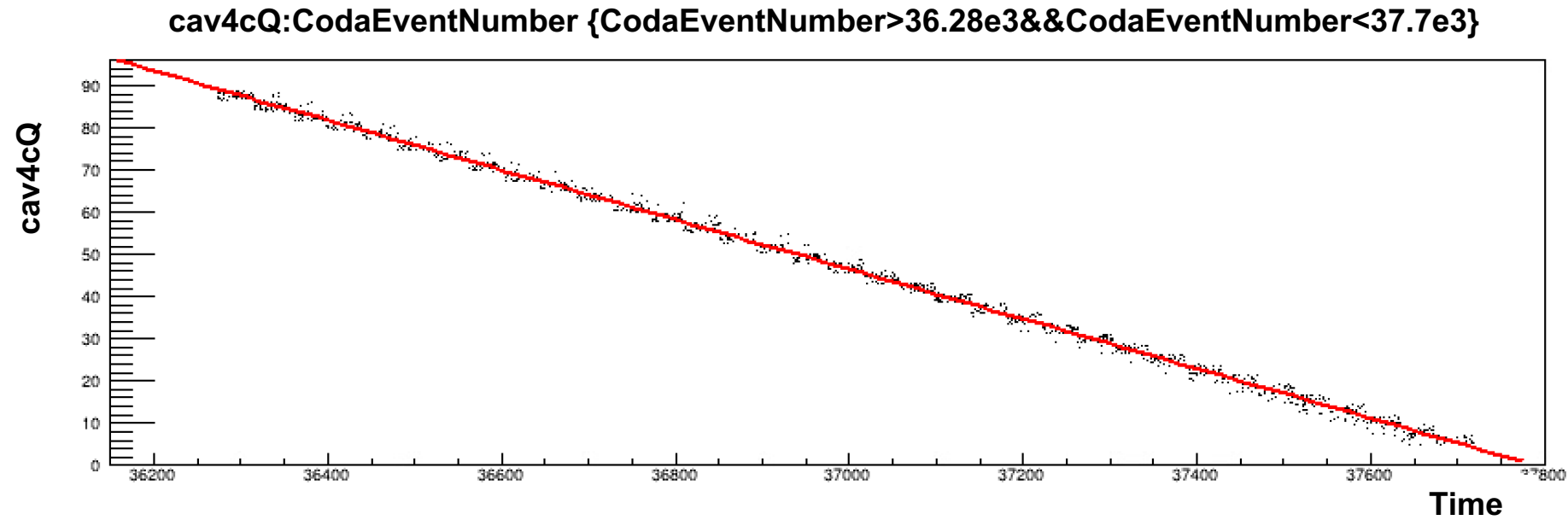
cav4cQ:CodaEventNumber {CodaEventNumber>36.28e3&&CodaEventNumber<37.7e3}

Only one period of ramp down

Residual plot for cav4cQ

cav4cQ-cav4cQ_linear_fit:cav4cQ_linear_fit {CodaEventNumber>36.28e3&&CodaEventNumber<37.7e3}

cav4cQ sees up to 0.3 % level of amplitude oscillation for 25 µA – 90 µA

cav4cQ:CodaEventNumber {CodaEventNumber>36.28e3&&CodaEventNumber<37.7e3}

(cav4cQ-cav4cQ_linear_fit)/cav4cQ_linear_fit*100:cav4cQ_linear_fit

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Double difference profile plot between cav4dQ and cav4cQ

cav4dQ/1.096-cav4cQ/0.9:cav4cQ {CodaEventNumber>36.28e3&&cav4cQ>5}

htemp	
Entries	68617
Mean	45.89
Mean y	0.7381
Std Dev	23.74
Std Dev y	0.04307
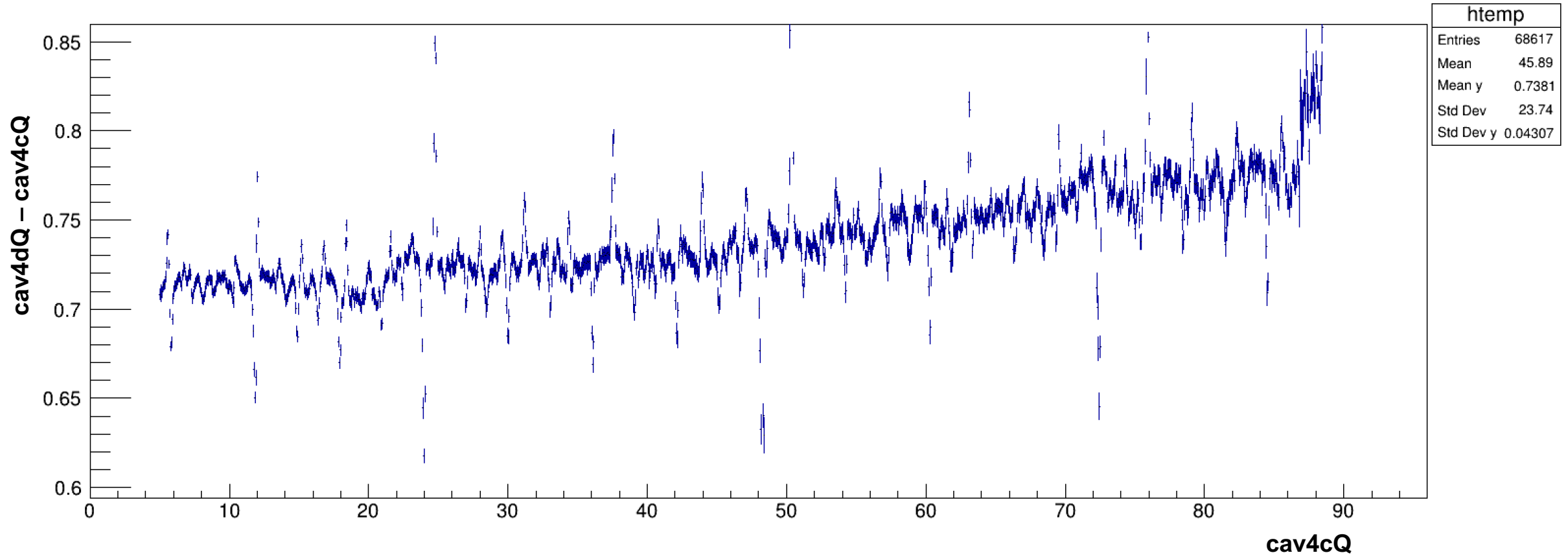
Double difference scatter plot between cav4dQ and cav4cQ

cav4dQ/1.096-cav4cQ/0.9:cav4cQ {CodaEventNumber>36.28e3&&cav4cQ>5}
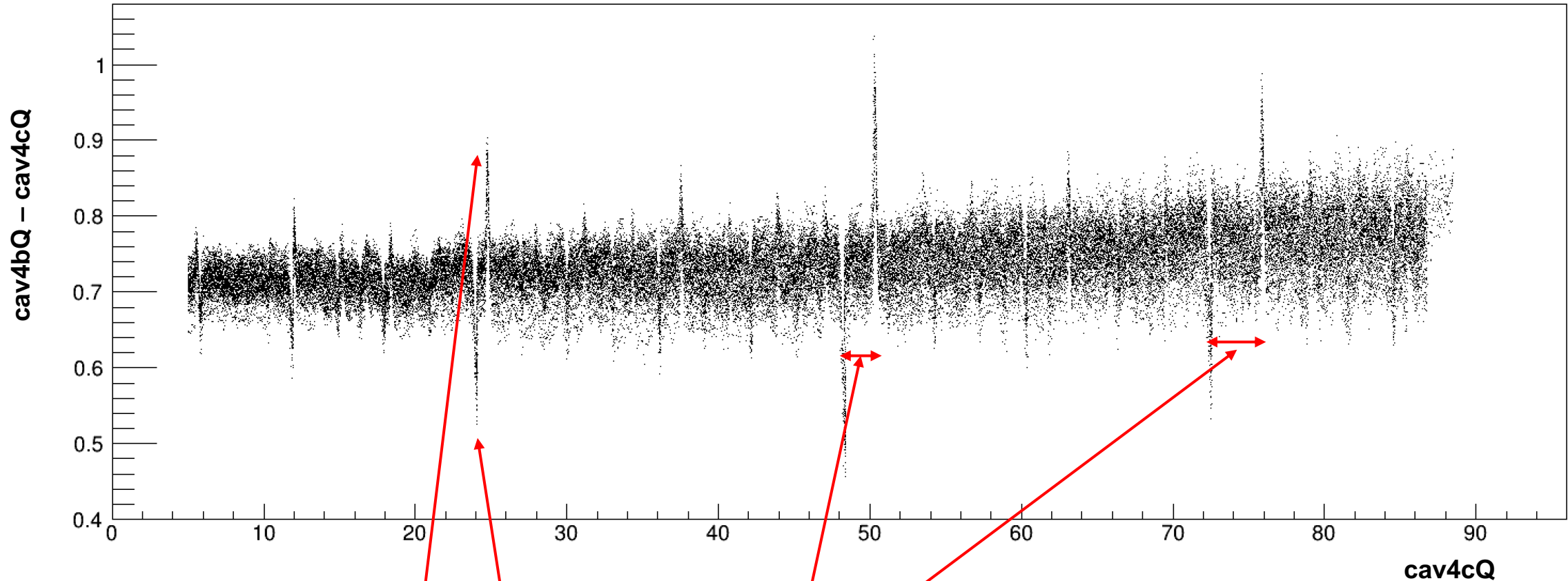
- Periodic spikes up and down; possibly the two receivers spike at different times
- The gap between the up and down spikes gets larger as the current increase
- A larger spike appears after a few smaller spikes (periodically)

Thank You

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