

# Silicon Task Force Update

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Johns Hopkins University

# Who's Involved?

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- FCC
  - Vince Pavlocek and Jennifer Olszewski
- CDF
  - Gino Bolla, Chris Hill, Steve Nahn, Stefano Moccia, Joel Goldstein
  - Stan Forrester, Azizur Rahaman, Reid Mumford

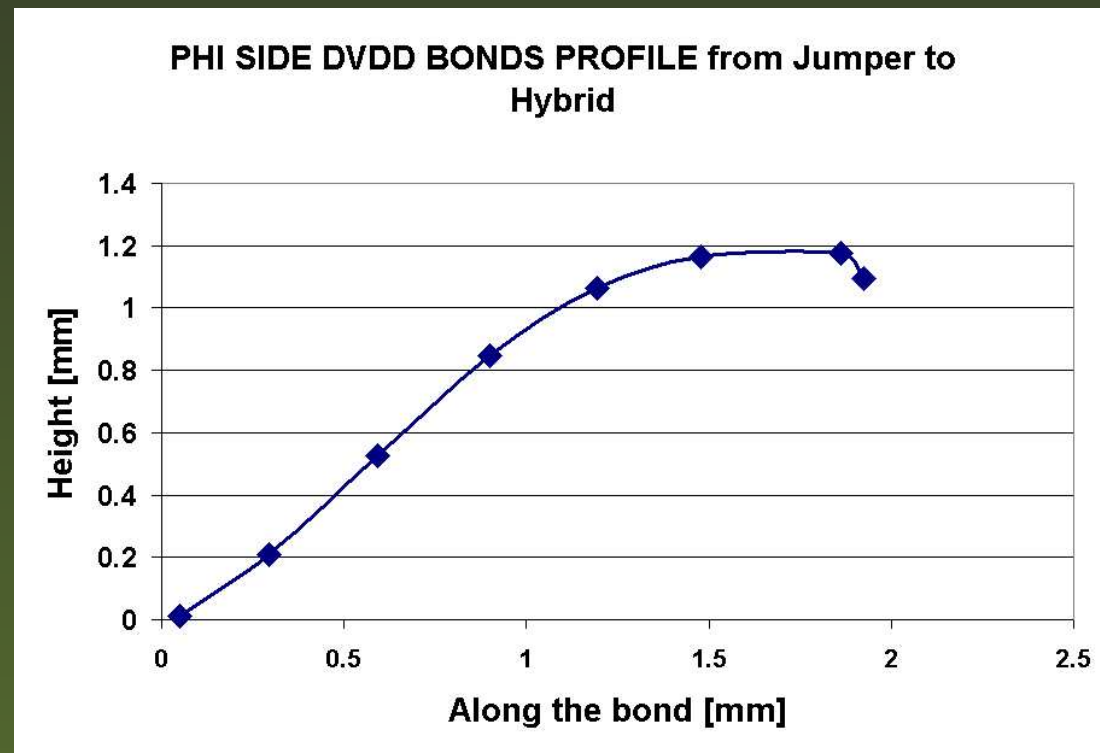
# Test Description

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- Jumpers are driven with a current (pulse, sine, arbitrary)
- In 1.3T Technical Division Calibration Magnet
- Jumpers are viewed with a microscope and CCD video camera
- Video caliper used to measure oscillation amplitudes

# Bonds

- *test* bonds: simple loops w/ both feet on same elevation spanning 2mm
- *realistic* bonds

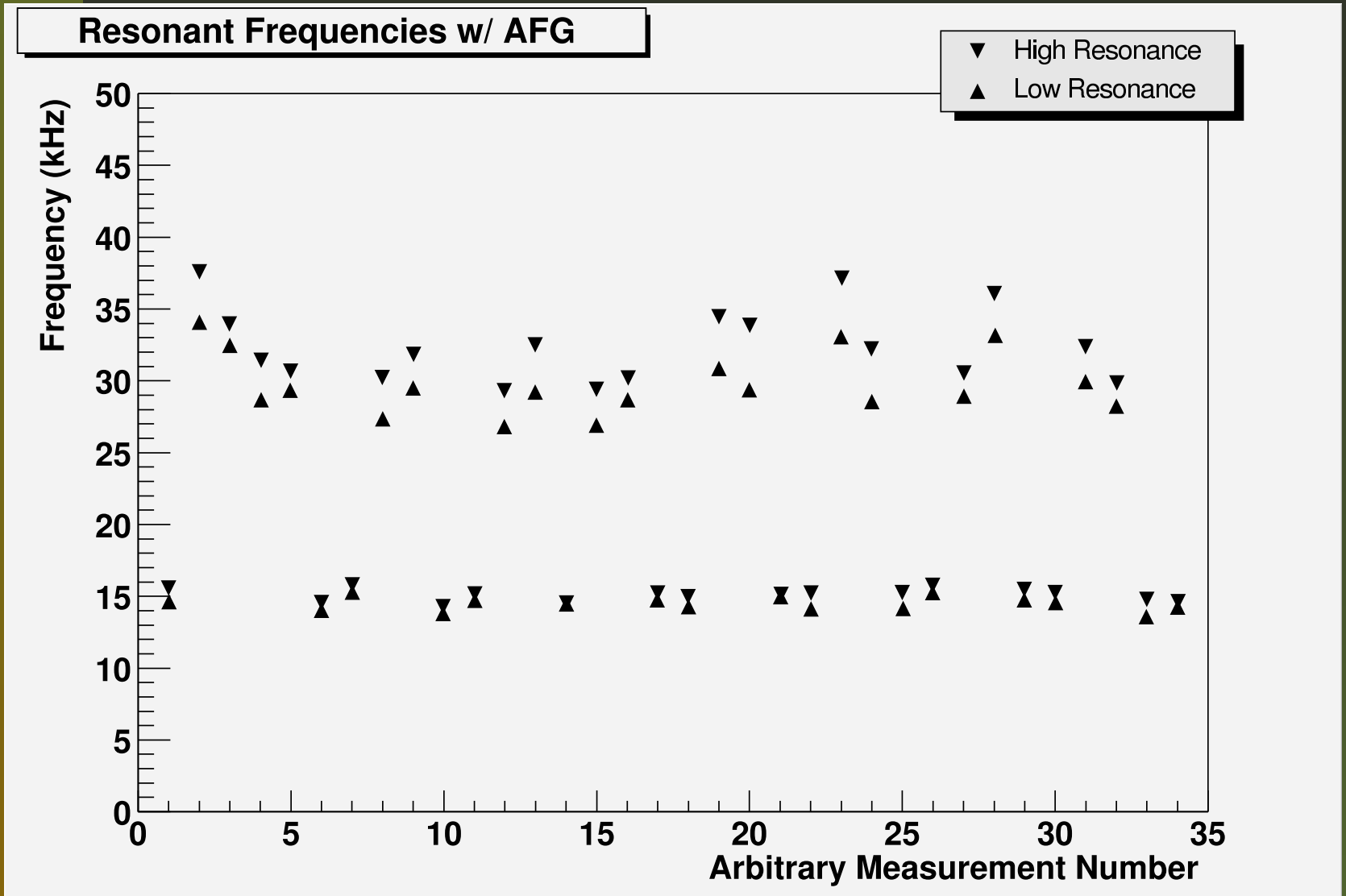


# Background

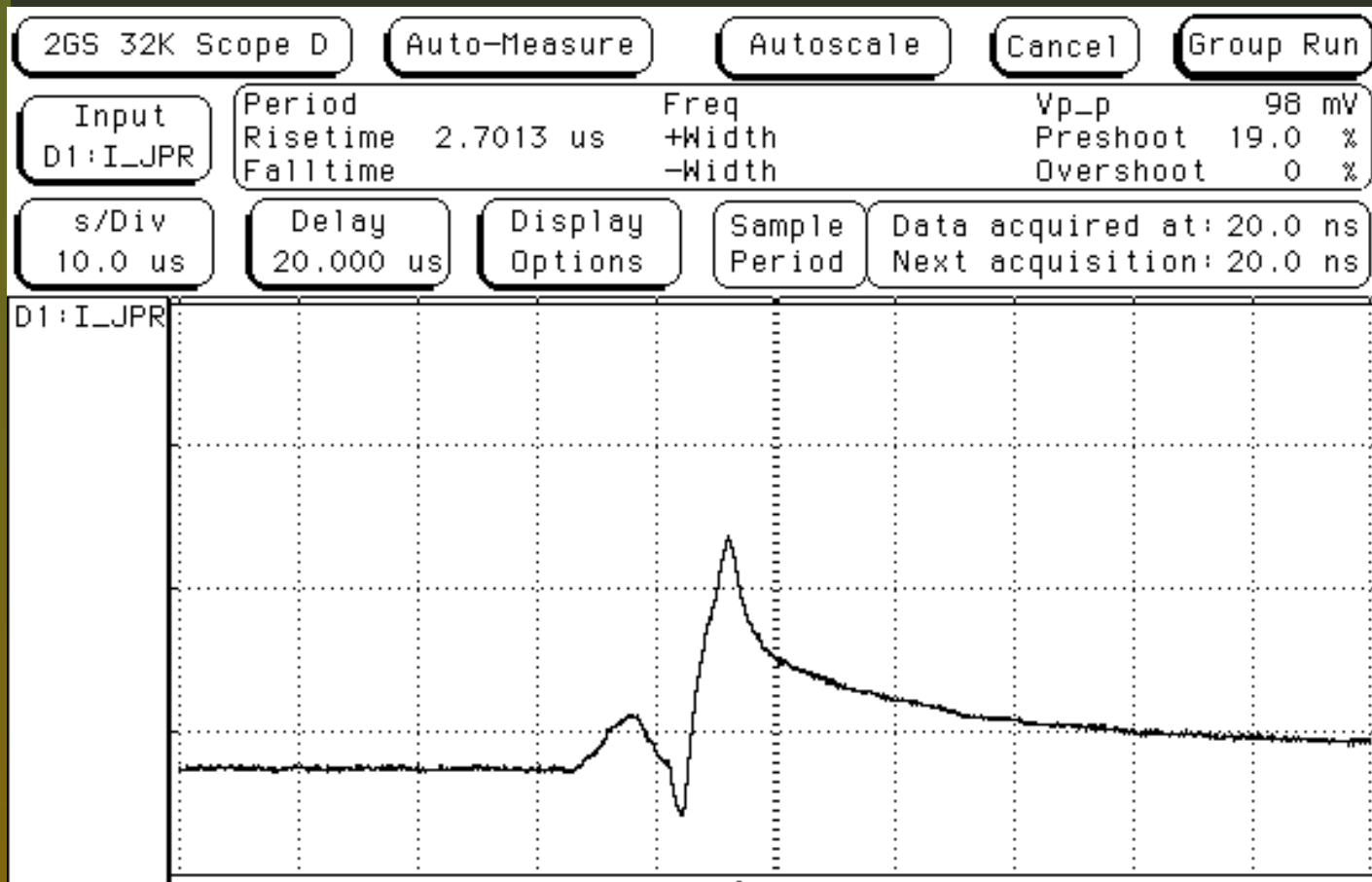
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- Vibrations appear in two directions
  - Lateral Vibration (side to side)
  - Bending Vibration (in the plane of the jumper)
- All samples have resonances
- Test samples
  - 24 *test* Jumpers tested with 40mA sine-wave
  - 8 *realistic* Jumpers tested with 80mA simulated digitize/readout-wave
  - 33 *realistic* Jumpers tested with 80mA pulse

# Resonant Frequencies w/ Sine Wave

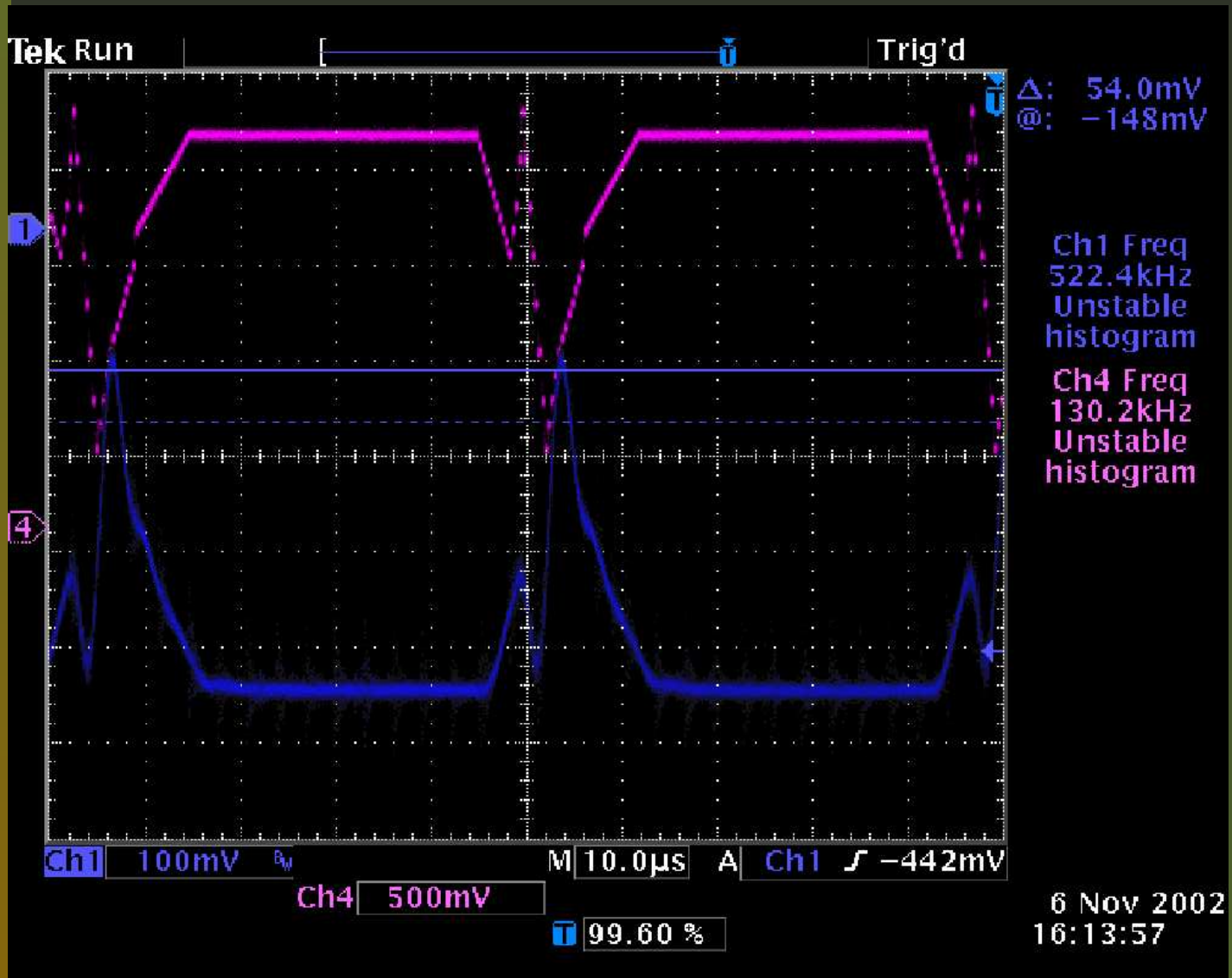


# Digitize/Readout Current Profile



- Current for single chip

# More Realistic Waveform



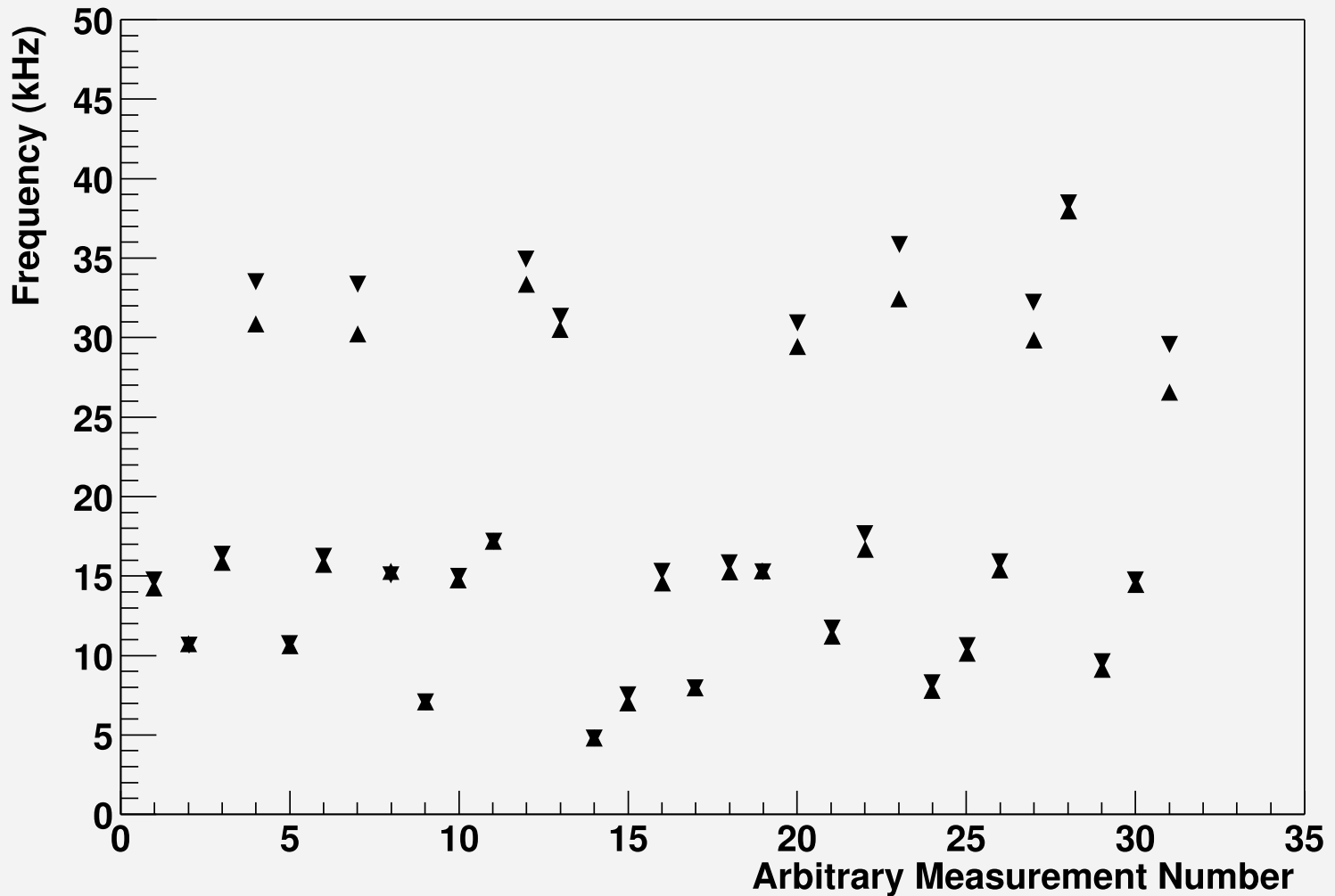
# AFG Resonance Tests

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- Wave form is produced by LeCroy AFG.
- We scan from 0-50kHz in steps of  $\sim 50\text{Hz}$ .
- It takes  $\sim 3.0-3.5$  hrs to test 2 bonds.
- 8 bonds were tested.

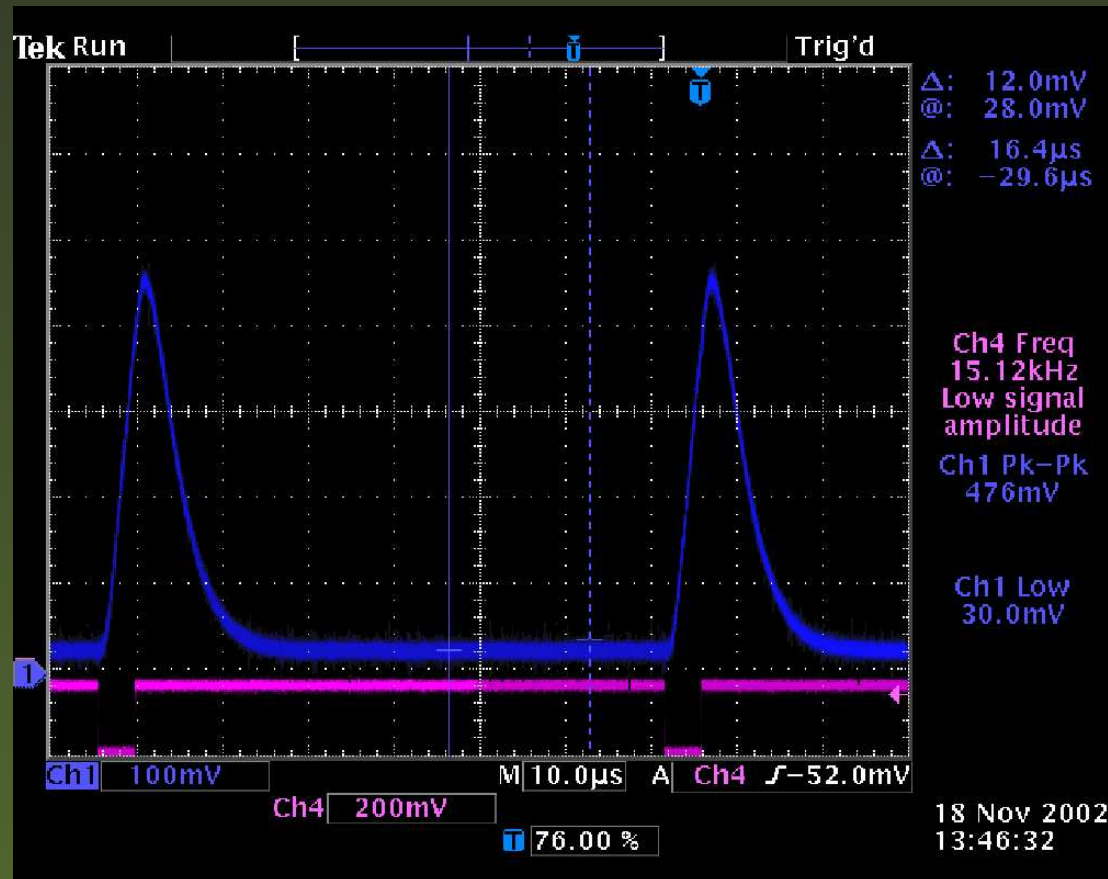
# New Resonance Behavior

Resonant Frequencies w/ AFG

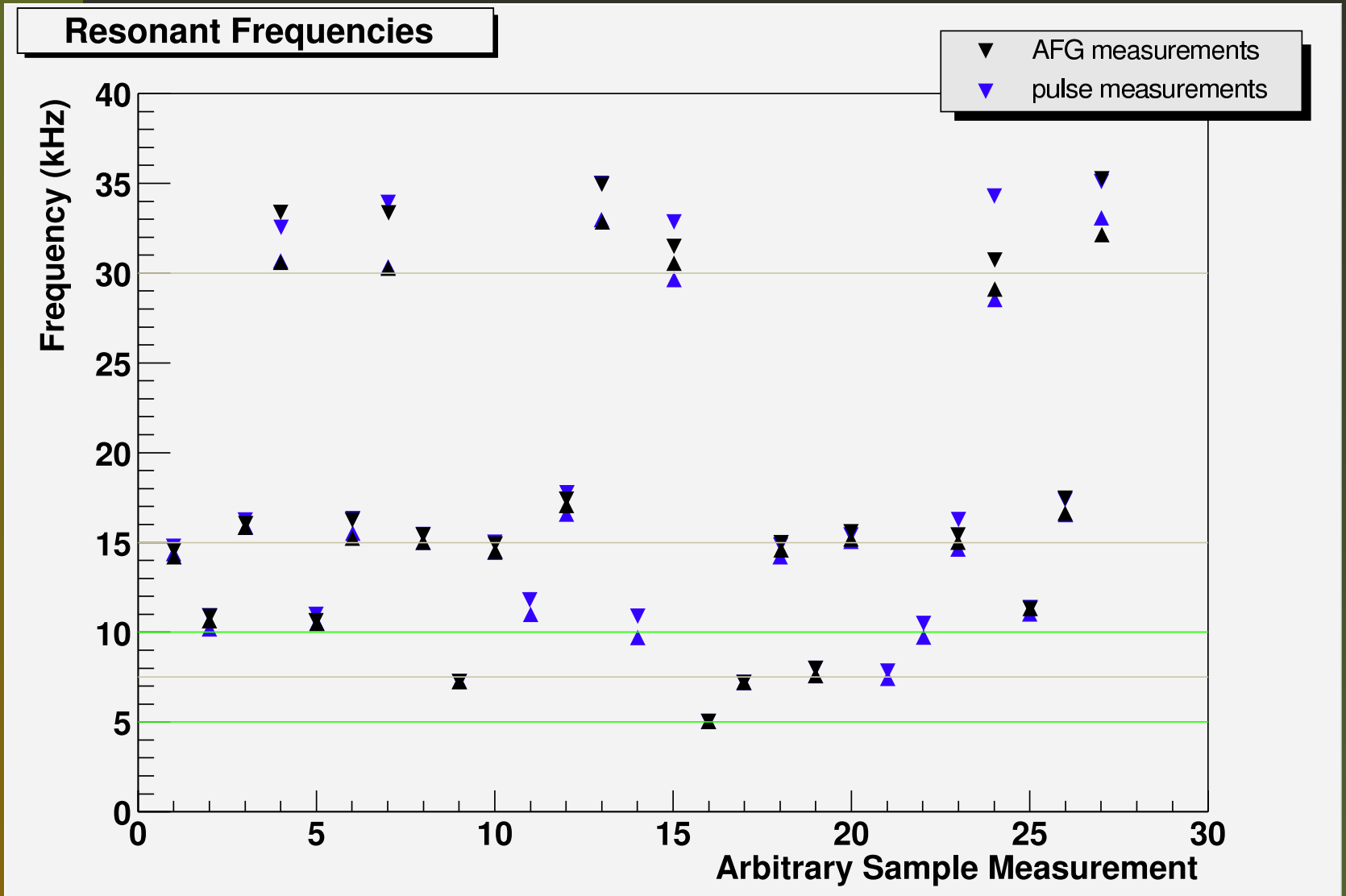


# Pulse vs. AFG

- The AFG tests take too long.
- replicate the results w/ analog pulse generator

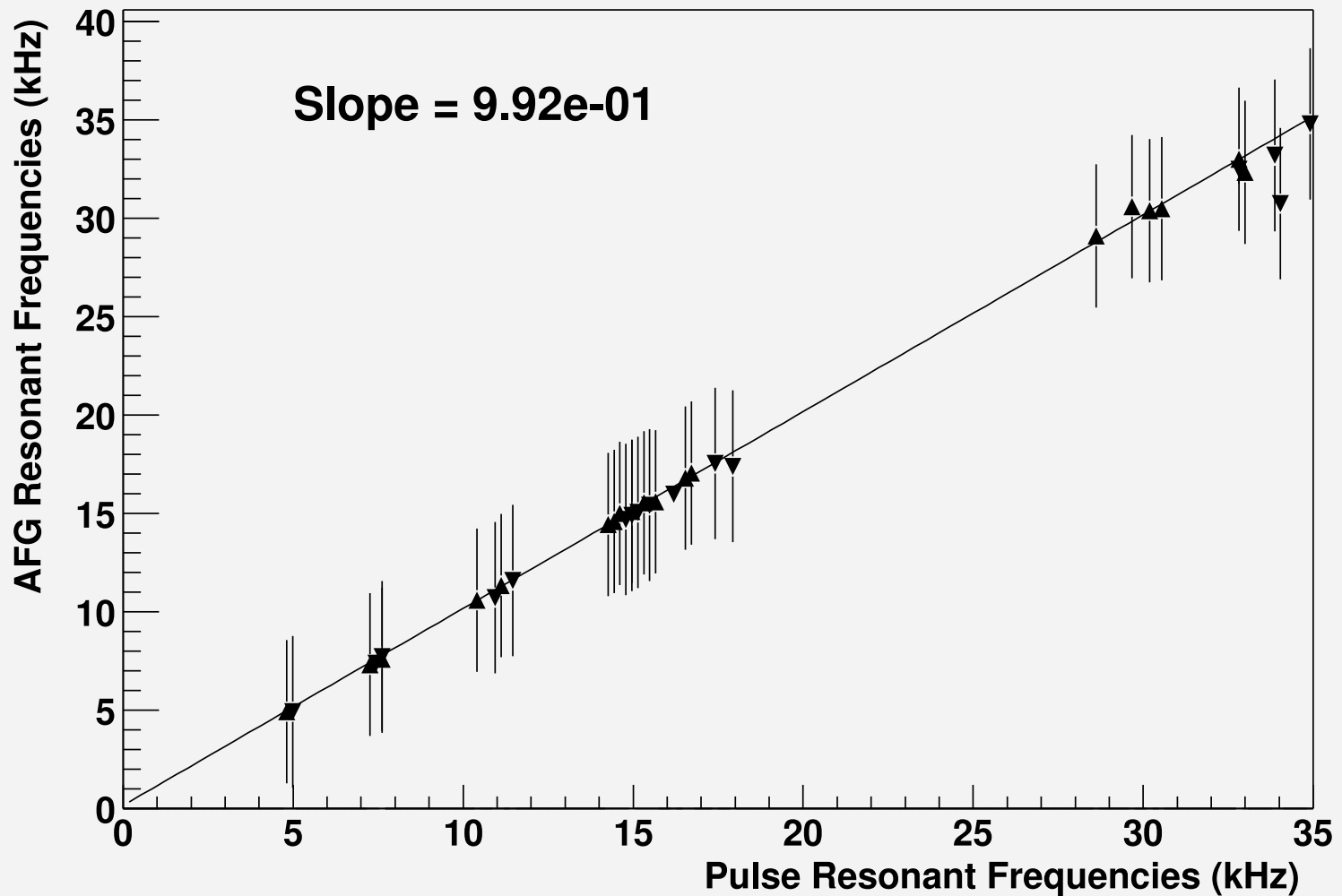


# Pulse vs. AFG response

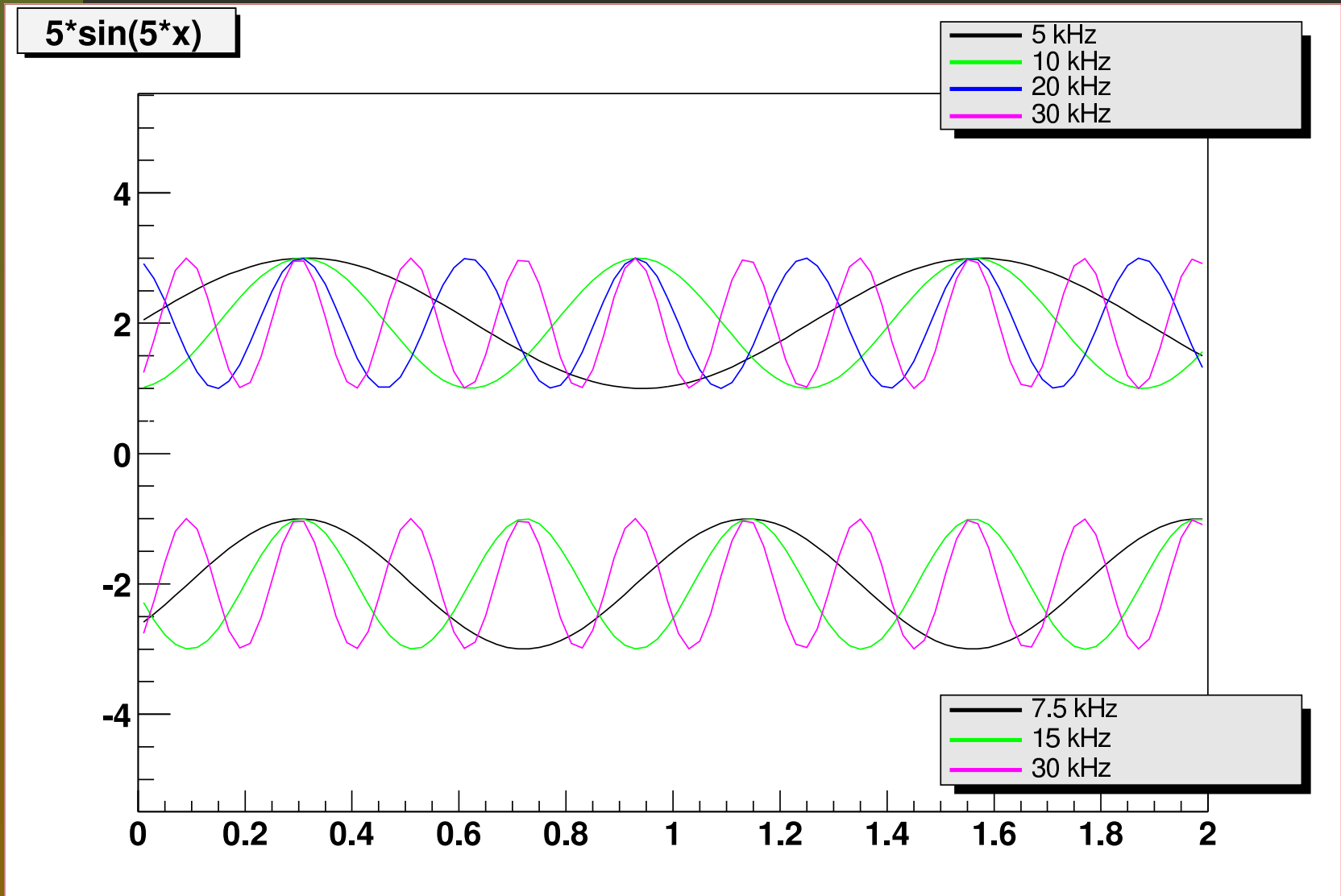


# Pulse vs. AFG response

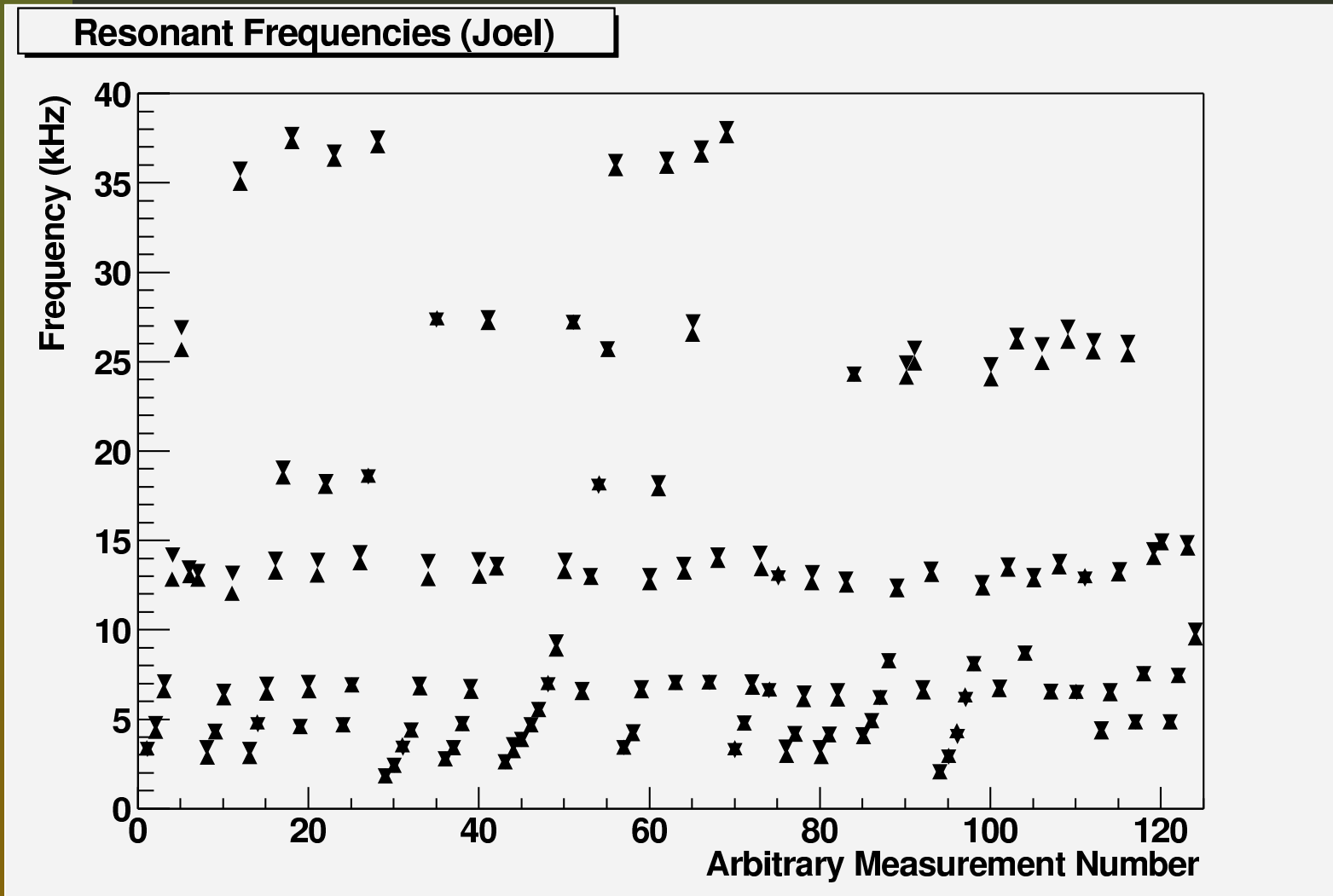
pulse vs afg frequencies



# Resonance Explanation

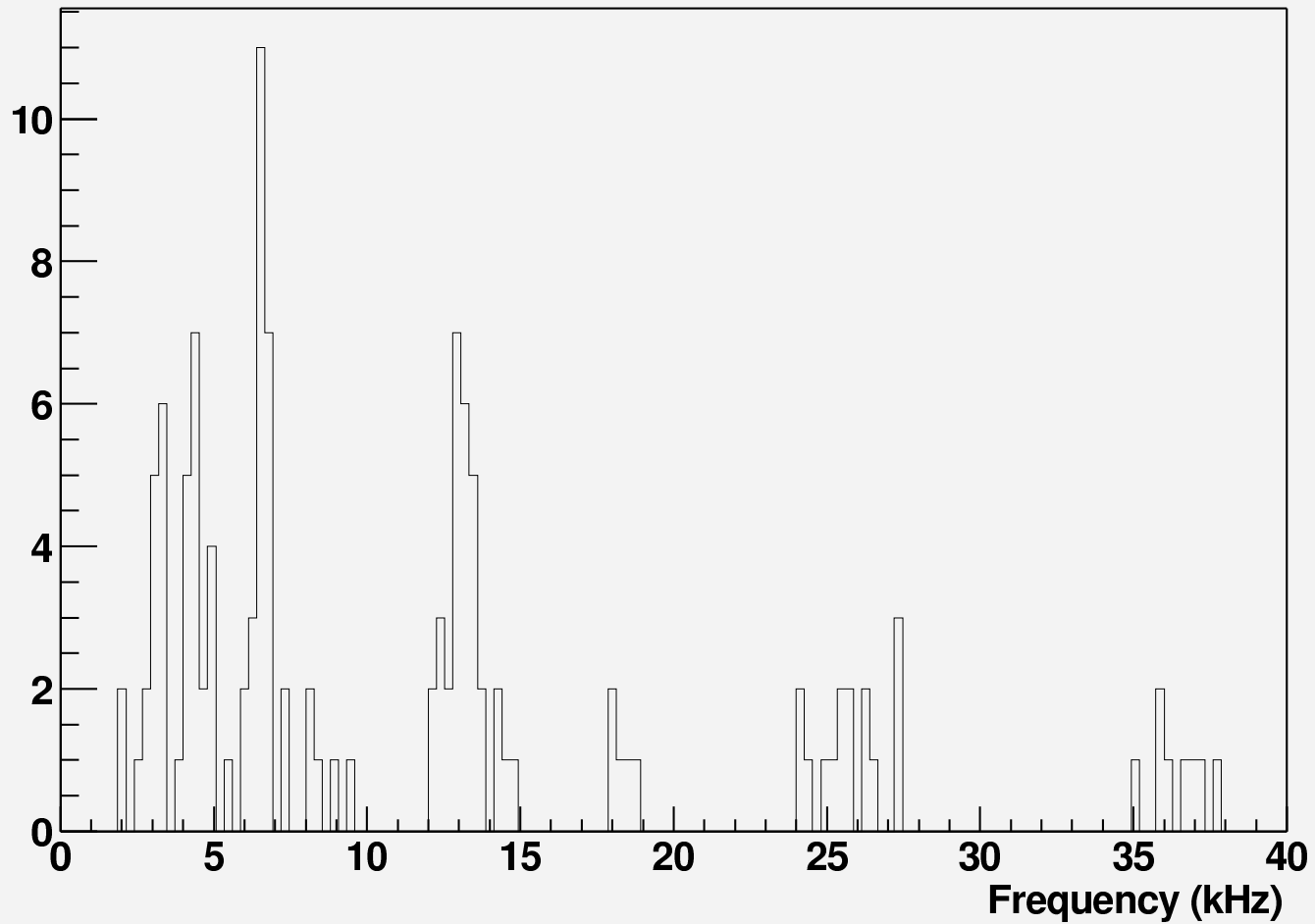


# Joel Bonds



# Families of Resonances

## Low Resonances

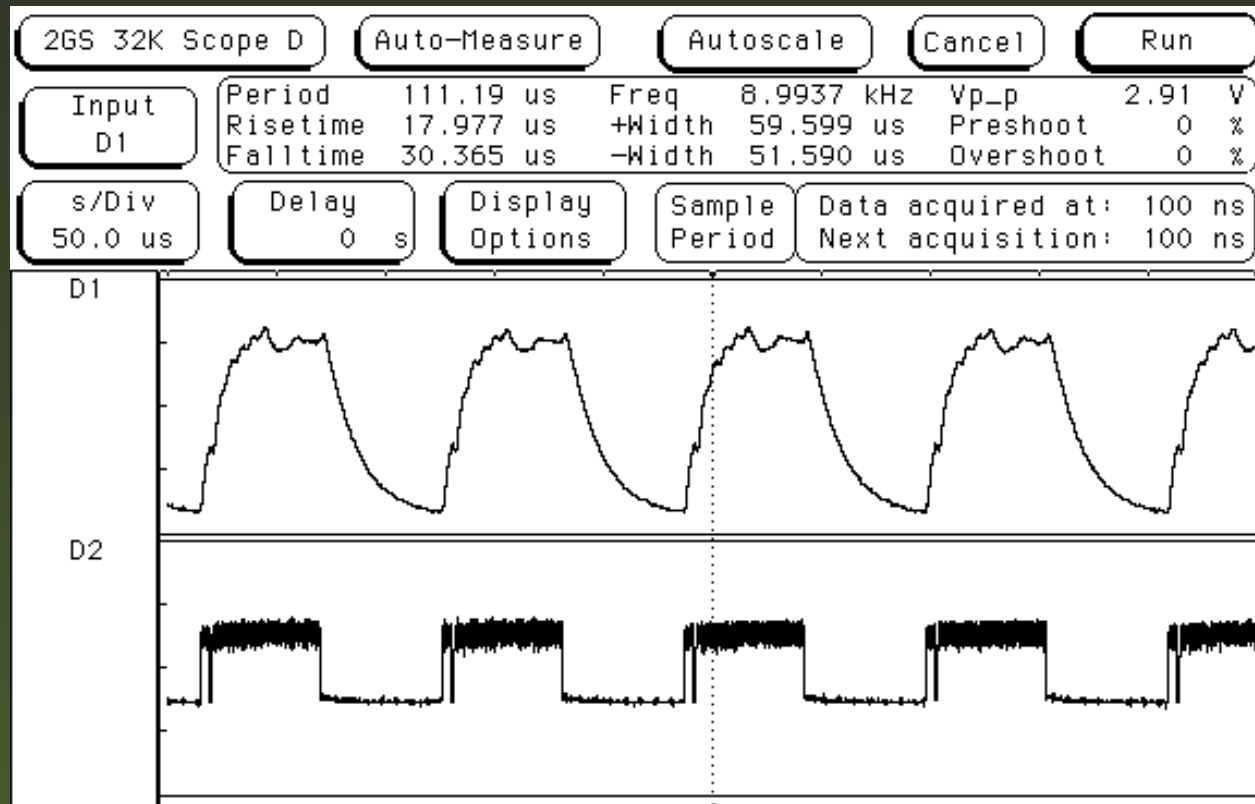


# Time to Get “Real”

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- Move SI Task Force T-stand to B0
- Put 5 layers of SI in 1.4T TOF Magnet
- Only 4 layers are operational. (L4 has some problem.)
- Run `svxdaq` to try to produce a failure.
  - Use FFO fifo command writer to produce specific frequency.
  - Use R-driver of 7 (we want large current swings).
  - Read-All mode.
- “Blind” test. Only feedback is a failed ladder!!

# Current Monitoring



- top waveform is current from a layer.
- bottom is BEClk from FTM spy board.

# TOF Mode of Operation.

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- Frequencies should be roughly the same as those measured for “Joel’s” bonds.
- First scans were done with 500Hz step size for 1 hr per step.
- Scanned from 15kHz to 11kHz. No failures.
- Revised scan operating procedure:
  - 200 Hz step size
  - 10 min per step
  - Scan from 14kHz down to 6.4kHz.

# Jumper Failure

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- Jumper failure at 9.0kHz (Wed 11 Dec 2k2).
- Symptoms are exactly as described by Gino in Jun21 Si e-log.
- This means that we have between 2 and 5 bonds broken.
- The magnet box will be opened later for autopsy.
- For the time being, we continue to try to break bonds

# Continuing Work at TD

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- Jennifer Olszewski, Azizur Rahaman, and Vince Pavlocek are continuing studies at Tech. Division.
- Measuring how long it takes to break a bond at resonance.
- So far the results have shown that it is difficult to break a bond at resonance.
- However, a small change in driving frequency can cause a failure.
- These studies are on-going.

# Future of Si TF?

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- Continue to try to break all bonds in TOF.
- Repair bonds and restart test.
- Implement resonant countermeasures
  - Lower R-Driver
  - More randomized readout to avoid hard driving freqs.
- move on to understand DOIM failures...