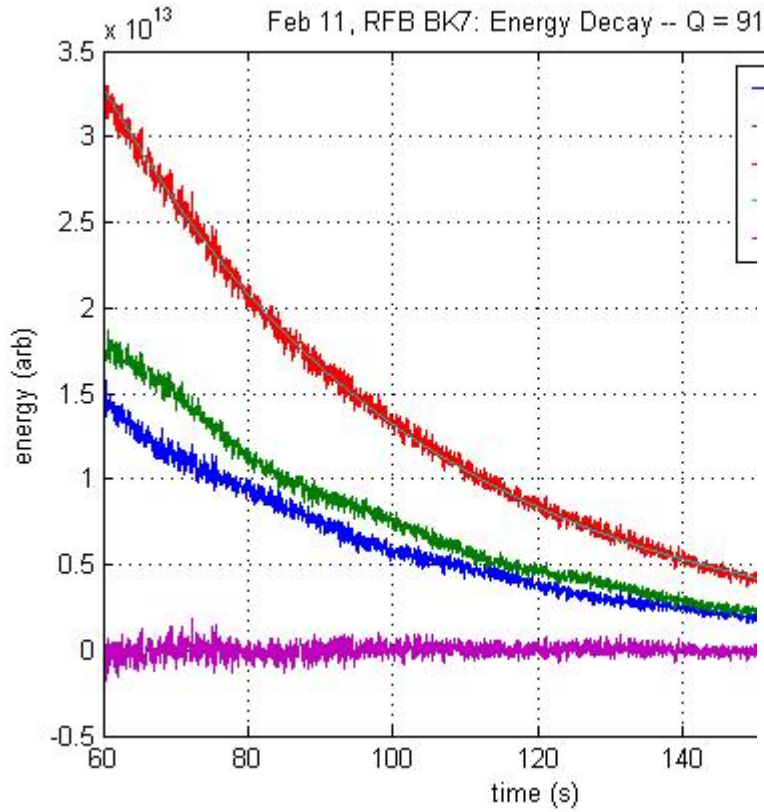
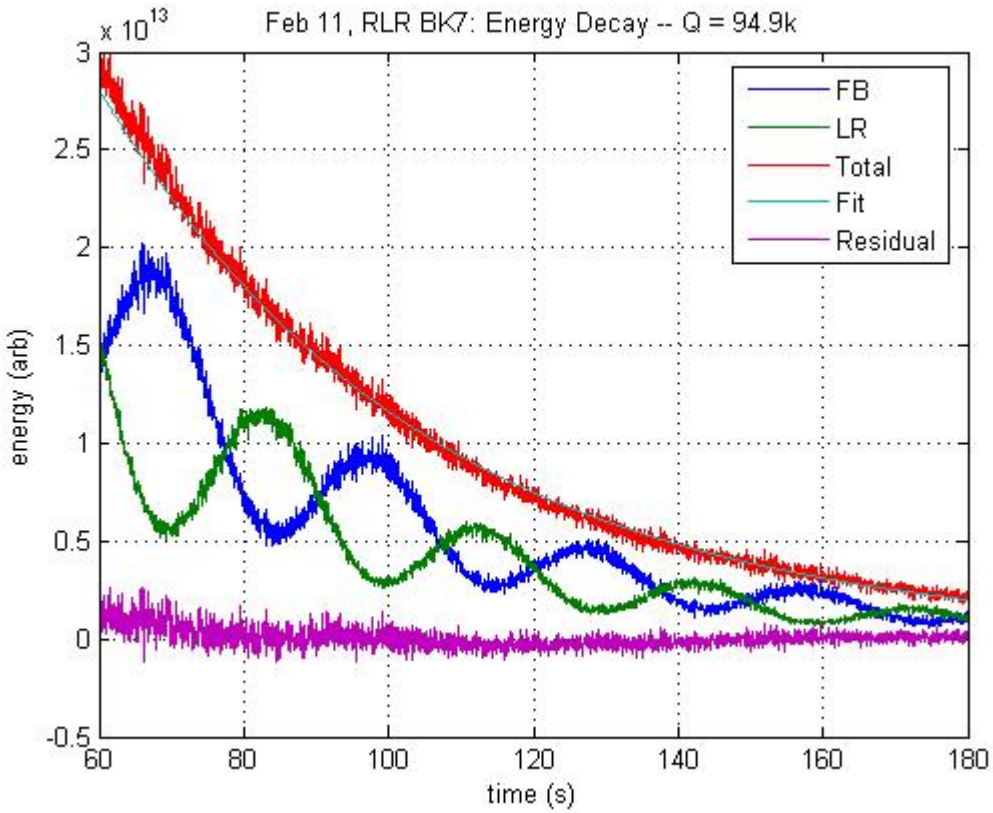
# Recent Ring-Down Measurements at MIT

# BK7 Prism

# BK7 Prism Ring-Down

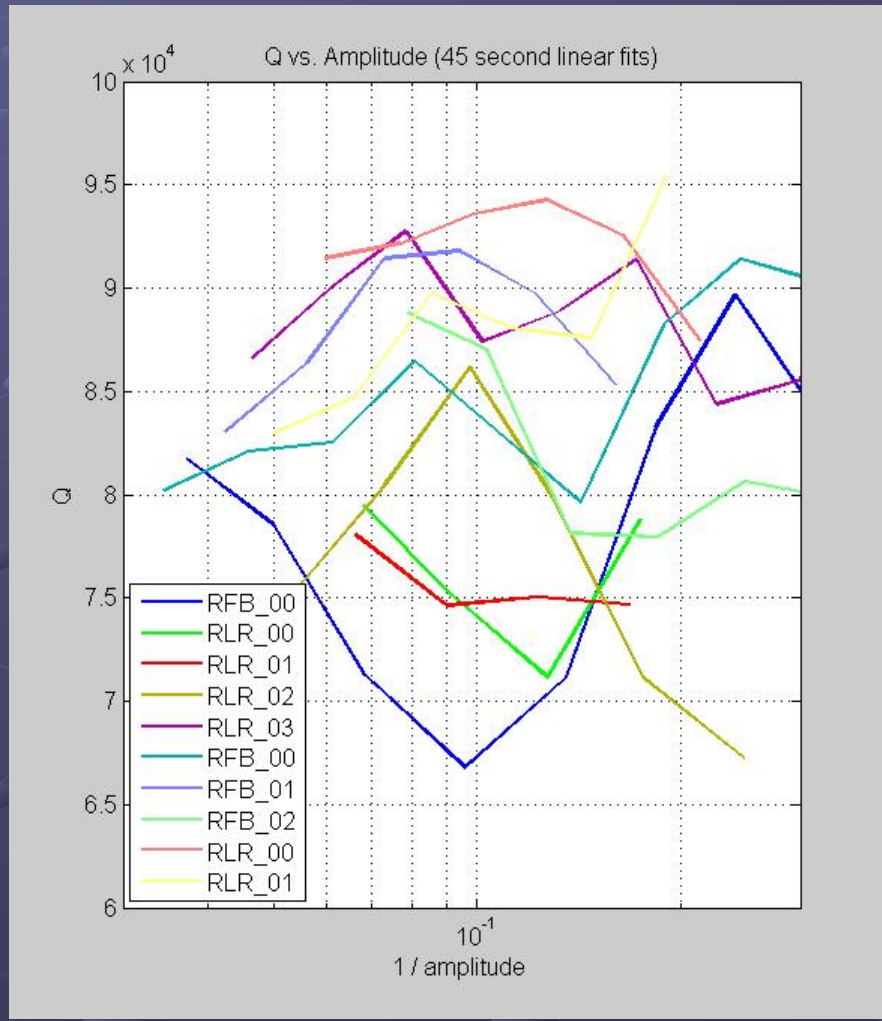
- Strong Beating => need both polarizations



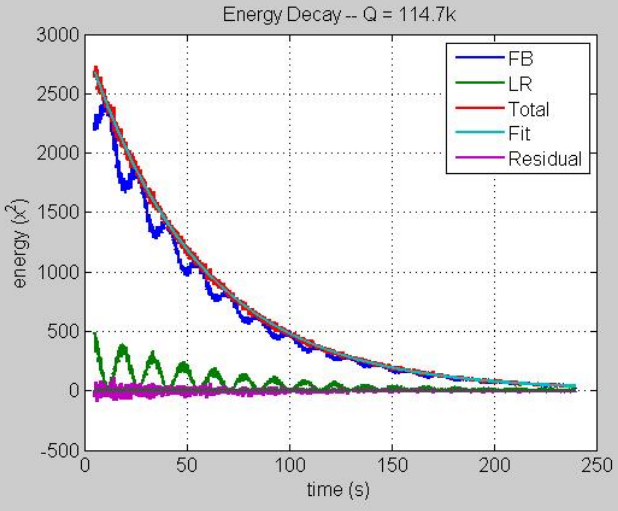
# BK7 Prism Ring-Downs

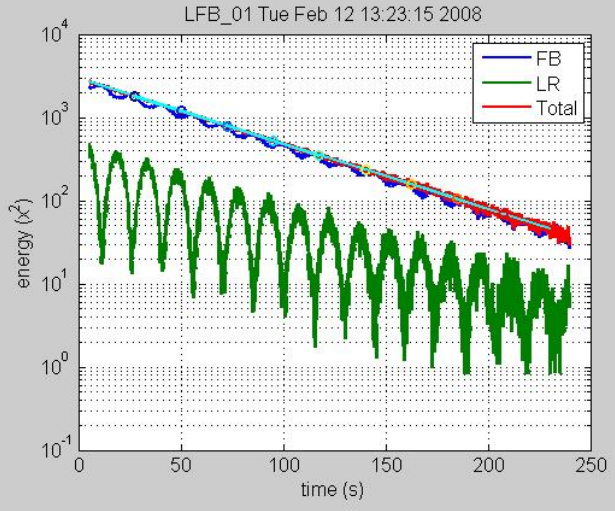
- Variable
- Difficult to excite only one polarization
- Q = 85k +/- 15k

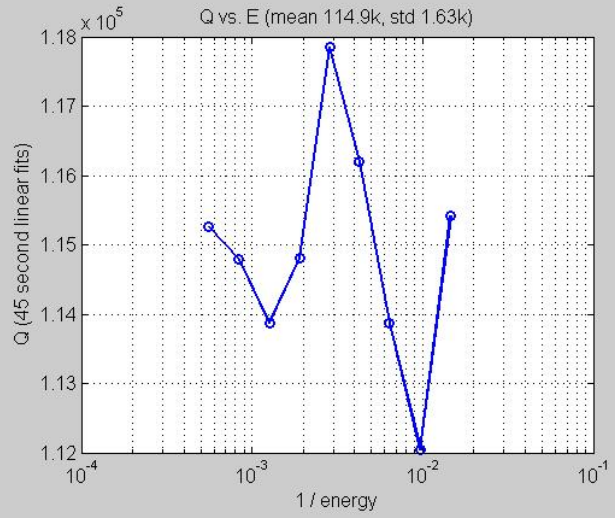


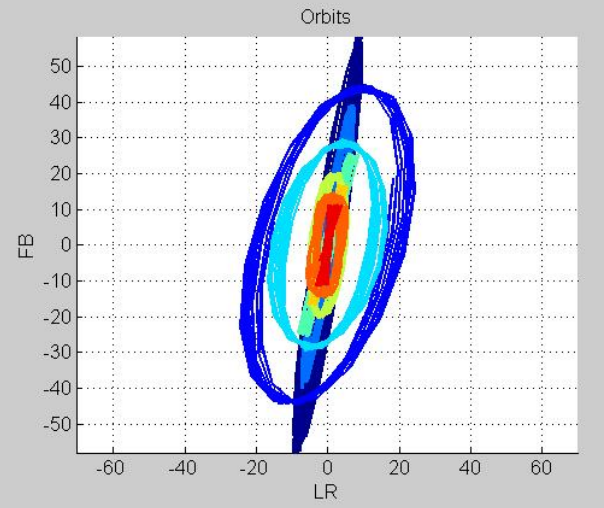
# Hardened Clamp

# Clamp Ring-Down



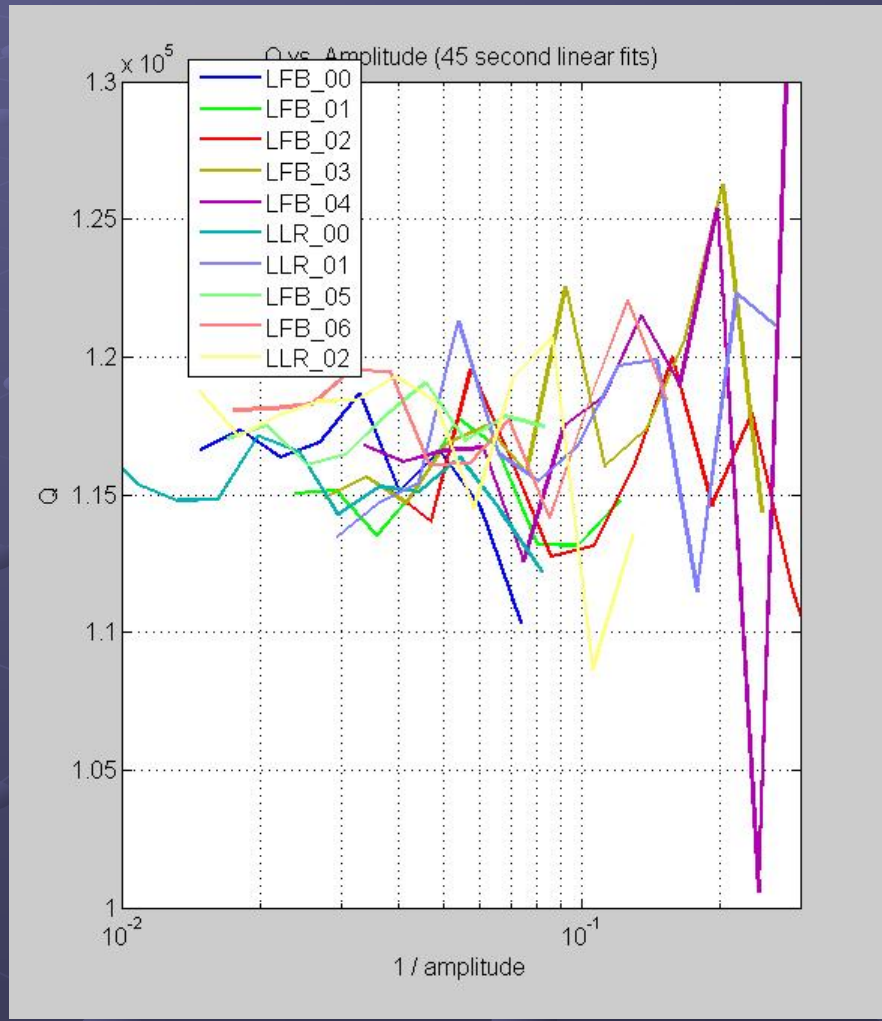



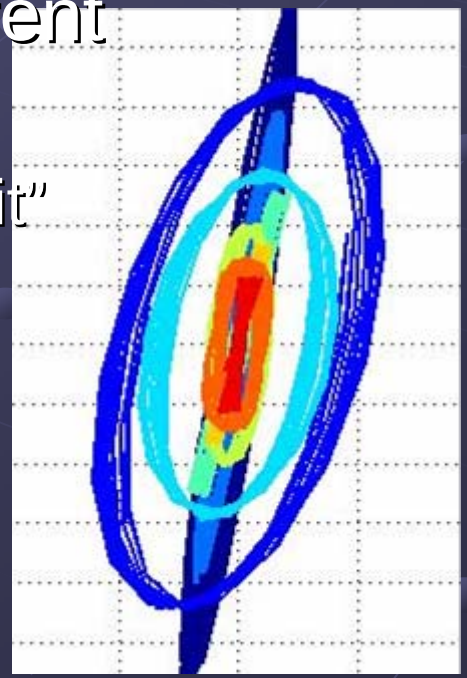
# Clamp Ring-Downs

- Less Variable
- Amplitude Independent
- Q = 118k +/- 5k



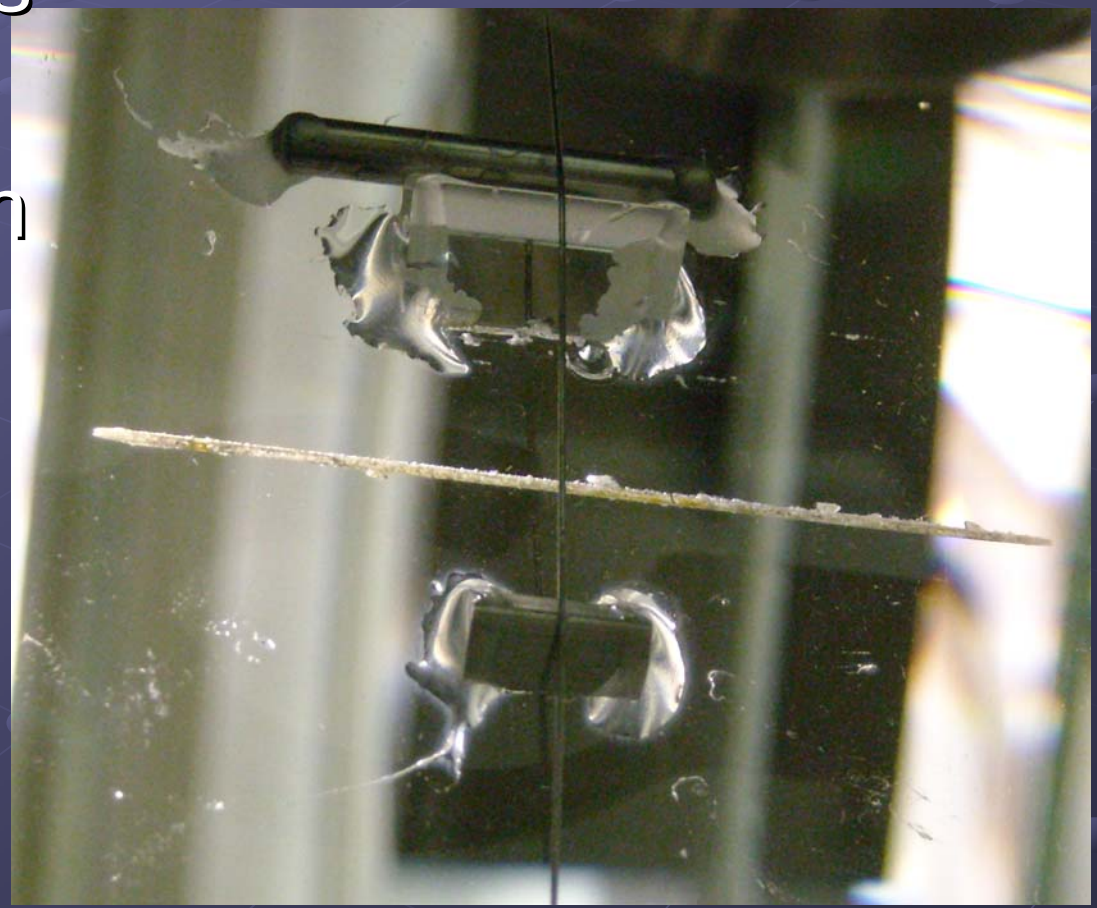
# Things Learned: Polarization Dynamics

- Energy is exchanged between polarizations
  - Excitation dependent beating
  - Measure both polarizations to avoid problems
- Different polarizations may have different loss, but not along normal-mode lines
  - Probably causes observed “preferred orbit”
  - Confuses the notion of the Q of each polarization



# Things Learned: Q Variability

- A clamp gives consistent results
- A pair of prisms works better than a single one



# Things Learned: Unexplained Loss Still Large

- Loss angle in the clamp is about 7e-4 above the thermo-elastic limit
  - Based on measurements at 330 and 660Hz
- Not due to clamp motion relative to the mirror (i.e., glue working)

# What next?

- Look for a eLIGO compatible solution
  - Determine if clamp is ok
  - Try other prisms
    - Currently measuring sapphire-aluminum pair
- Try to relate to currently installed stand-offs
  - Measure LIGO1 stand-off in this rig
  - Reconcile this with in-situ measurements