

Barry Controls Active Isolators
(STACIS)

Gabriela Gonzalez

LIGO-G950050

Barry Controls Active Isolators (STACIS)

G. González
May 26, 1995

- 3 feet x 3 DOF = 6 DOF isolation (!)

decoupled through passive isolation

- Bandwidth : ~1 to ~50 Hz

- Maximum gain :

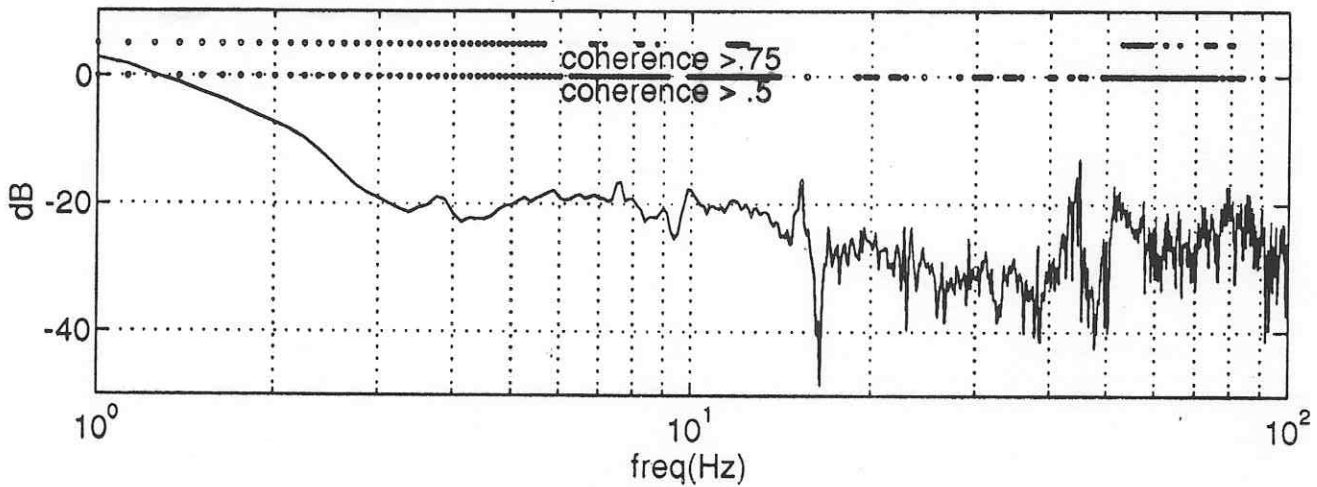
>>-30 dB @ ~30 Hz (horizontal)

>>-40 dB @ 10-20 Hz (vertical)

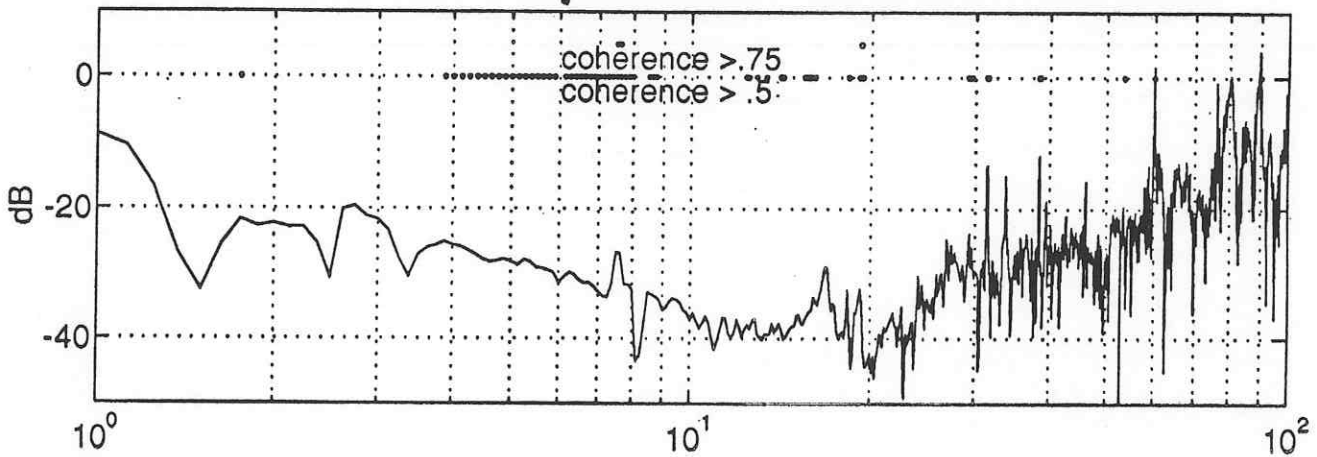
STACIS Transfer functions

›› Measured with seismic excitation

Barry Control Isolators: Horizontal transfer function (ground to bottom table)



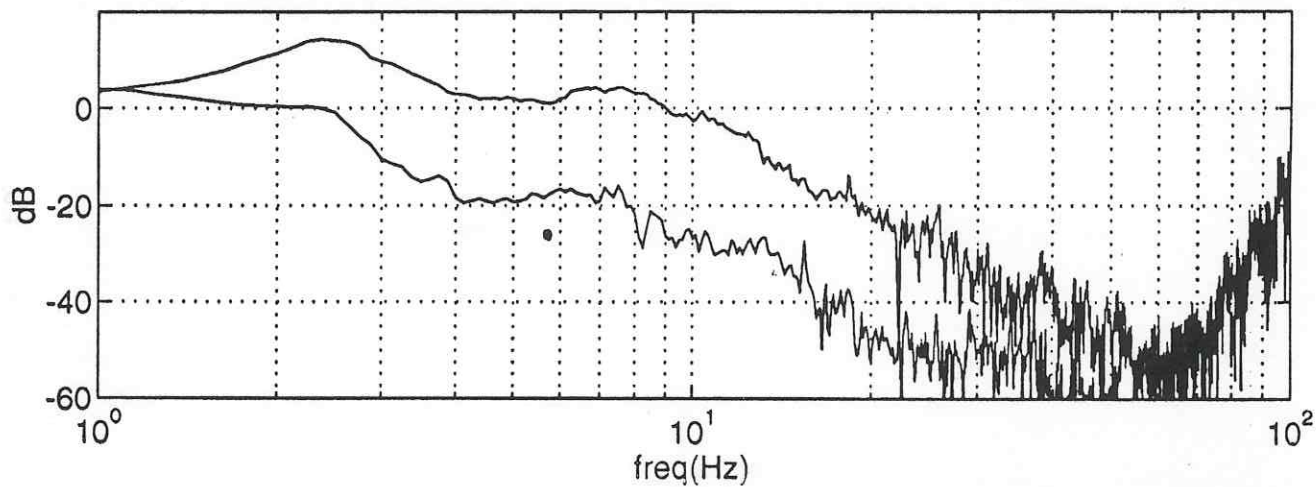
Barry Control Isolators: Vertical transfer function (ground to bottom table)



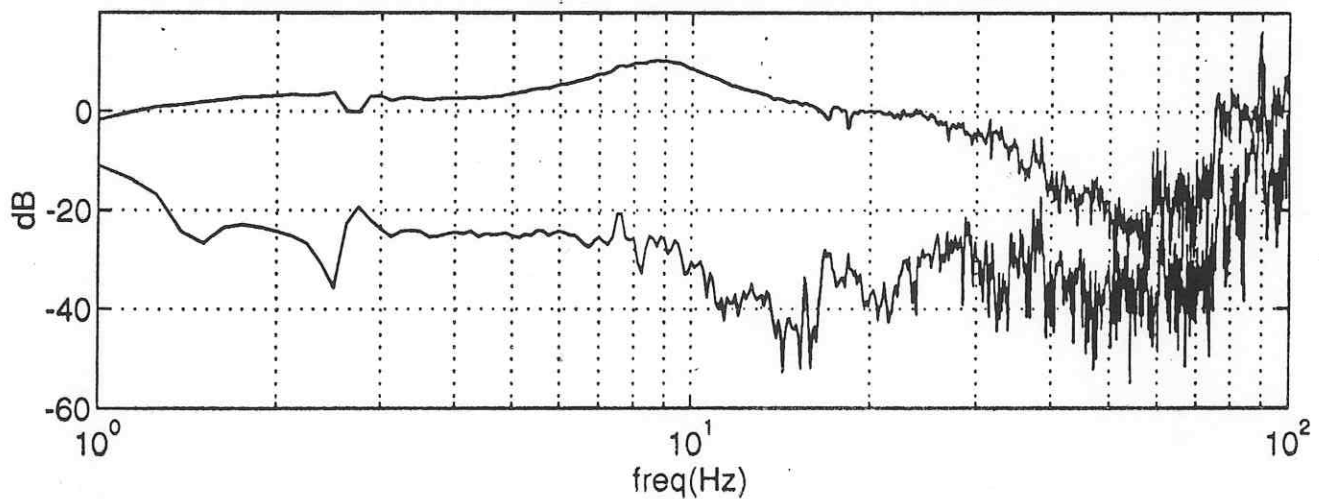
Stacis + stacks

» We reduce the effect of stacks' resonances and have unity gain at or below 2Hz (instead of 10-20 Hz)

Barry Control Isolators: Horizontal transfer functions ON/O FF (ground to top table)



Barry Control Isolators: Vertical transfer functions ON/OFF (ground to top table)

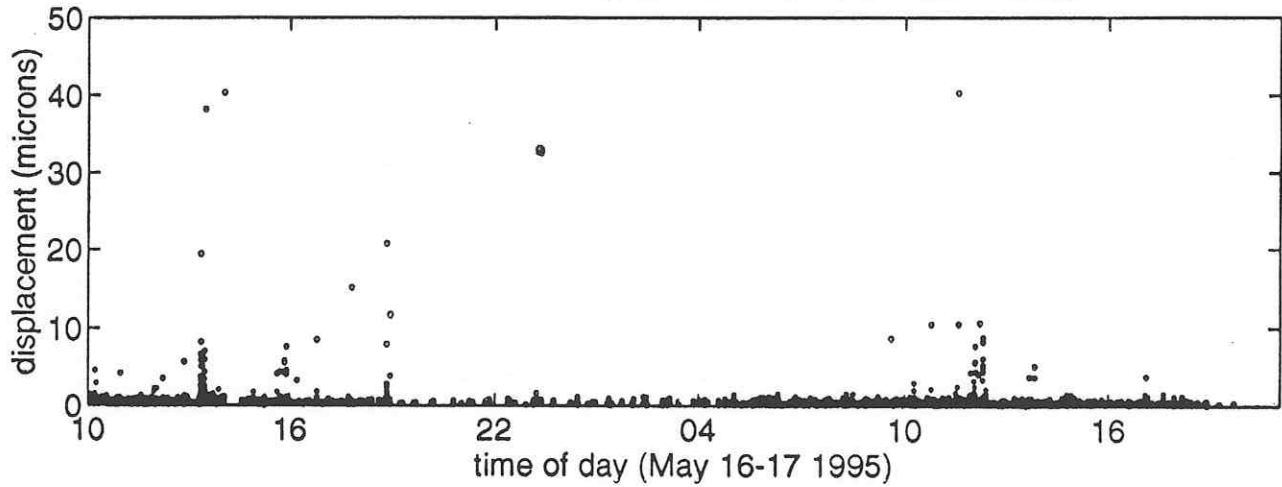


Non-stationary Noise

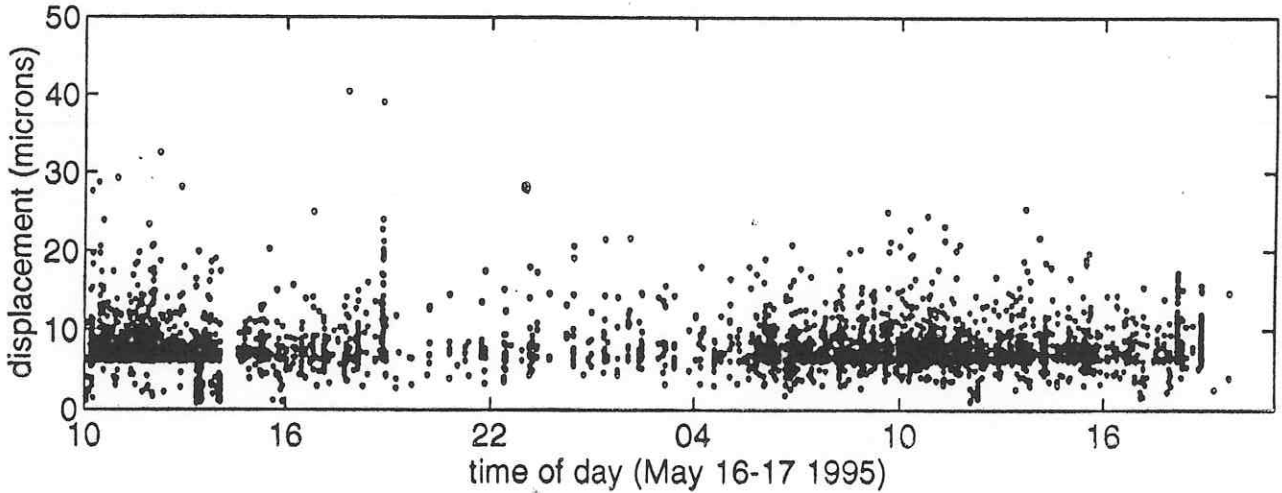
- Measure horizontal and vertical displacements above some threshold with geophones on the bottom table and on the ground, for 24 hrs (May 16-17).
 - ›› ~2000 events on ground > 10 microns
 - ›› <20 events on table > 10 microns : a factor of 100!
 - ›› Table/Ground: 2/16 horizontal and 4/94 vertical events >40 microns, around 12-1pm and 5-6pm.

Non-stationary noise: horizontal

HORIZONTAL DISPLACEMENT ON BOTTOM TABLE

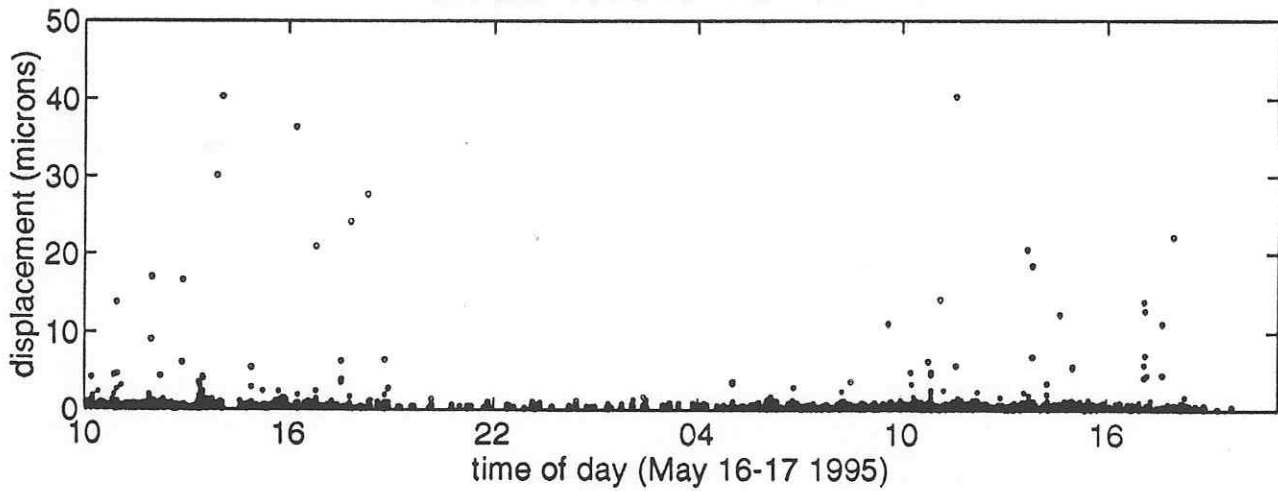


HORIZONTAL DISPLACEMENT ON GROUND

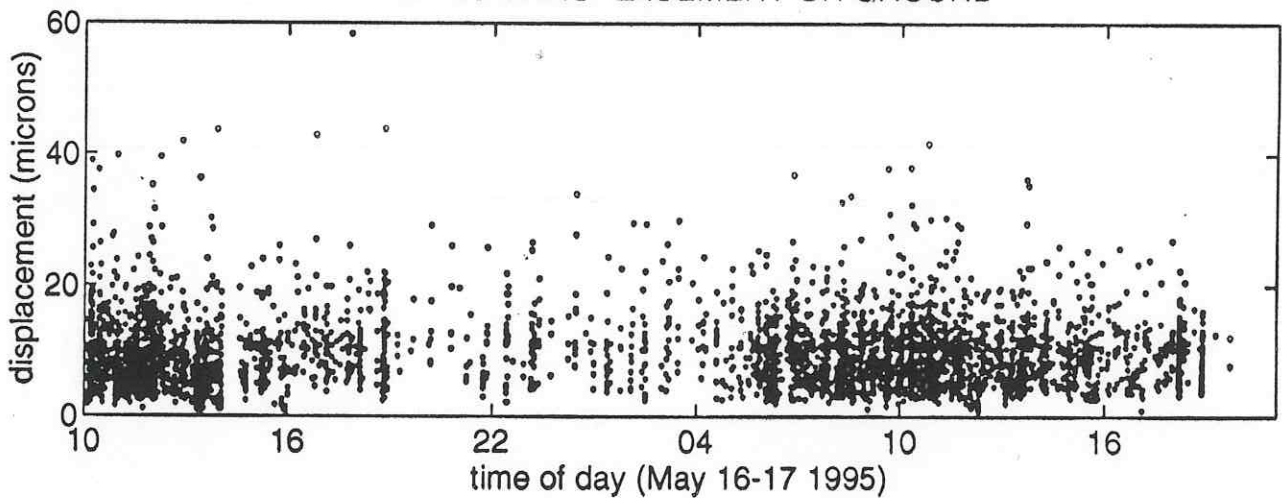


Non-stationary Noise: vertical

VERTICAL DISPLACEMENT ON BOTTOM TABLE

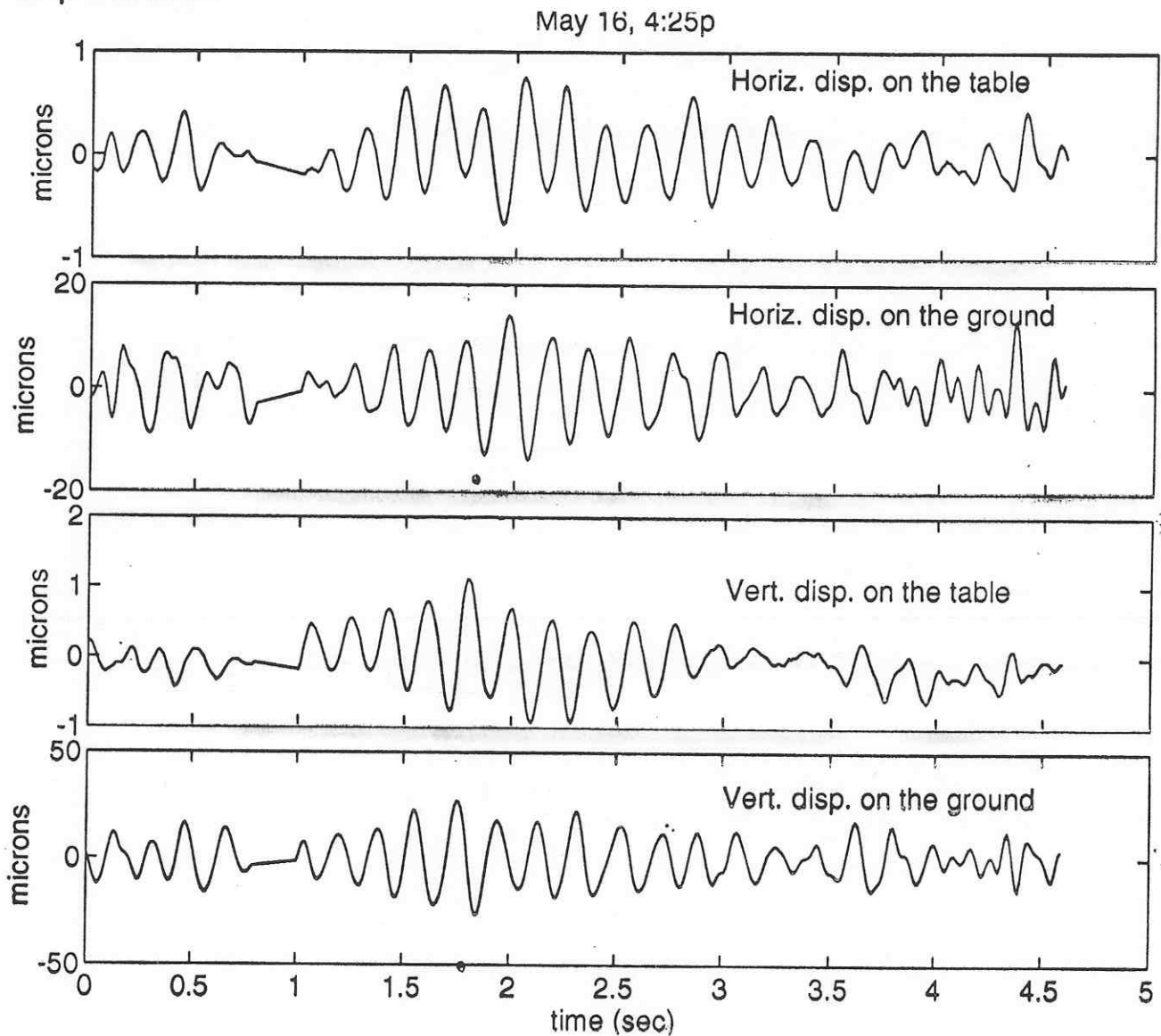


VERTICAL DISPLACEMENT ON GROUND



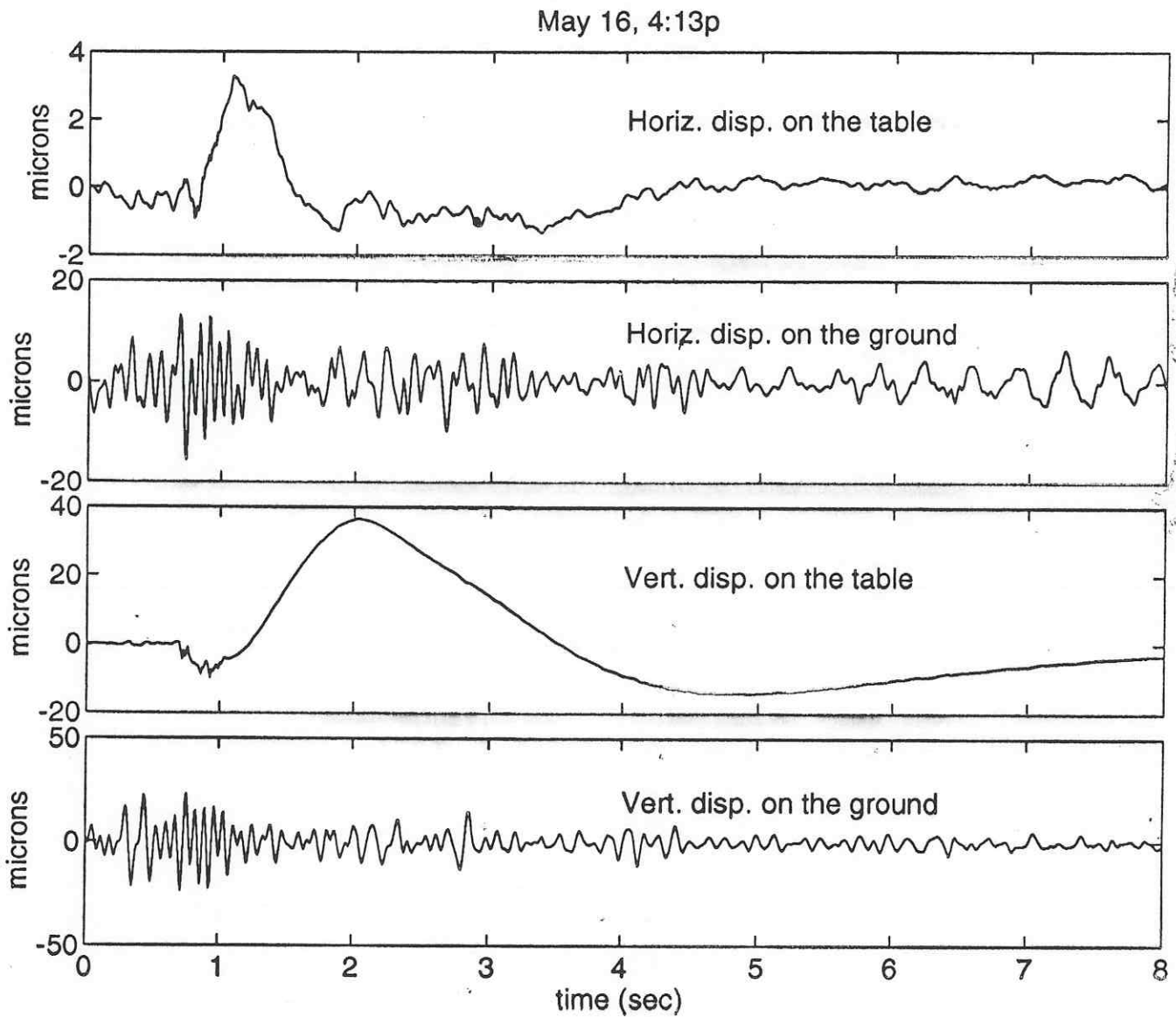
Non-stationary noise

>> Non saturating impulses (<40-50 microns) are nicely suppressed:



Non-stationary noise

>> Some ground excitations saturate STACIS in the vertical direction:



STACIS Isolators

- They give us :
 - ›› up to 30-40 dB more isolation between above 1 Hz, decreasing the stacks' resonances.
 - ›› a reduction factor of 100 in the number of impulsive events above 10 microns.
- BUT... the open loop transfer functions promised more in the horizontal.
 - ›› Possible reasons for mismatch are not understood:
 - Cross-couplings?
 - Flanking paths?
- We would also like this performance at lower frequencies:
 - ›› Not likely available from Barry Controls.
 - ›› Possible with lower frequency sensors.
 - ›› Needs understanding of less-than-perfect performance.