LINAC GIRDER R&D
C. Boffo (FNAL) - F. Le Pimpec (SLAC)
Linac Girder R&D
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Measurements @ SLAC 06/23

SLD PIT

1.8 m long structure
Al strongback
concrete block
Gravity water feed system
Sensors:

Geospace Geophones HS1
PCB Piezo accelerometers
Streckeisen STS-2
Sensors on concrete block:
2 SLAC Piezo
2 SLAC seismometers
2 FNAL Geophones

Conclusion:
Sensors are crosschecked but FNAL DAQ need to be analyzed. Necessary to use Amplifier on Geophones.
Improvements to our system:

- Built 4 amplifier with gain 150 - (problem with gain/ frequency ratio at working frequency it matches with gain = 10).
- Assembled Al strongback with supports for movers
- Assembled Stainless steel strongback with 2 dummy FXBs
- Assembled Al strongback with 2 dummy FXBs
- Rewrote the DAQ code in Labview 7 (last version)

- Solved problem on our DAQ: noise from the laptop power supply to the ADC PCMCI A...perform measurements with battery only
Crosschecked DAQs in T157 Eugueni office after improvements.
MP8 used both DAQ in parallel:
- We did find a STS-2 very precise seismometers (J. Volk) and decided to try to use it
- Background
- Magnet Table
Not reliable on quiet environment
Vibration setup, Al Girder/Strongback Clamped on Magnet Table

FXB002
SLAC Piezo
FXB001
Magnet Table
Movers
Strongback
FNAL STS-2
FNAL Geophone

WATER:
LCW $T_{in}$ 30.5 °C
Ambient $T$ ~18.3 °C
Flow in Structure 0.41 l/s (6.5 Gpm)
2 FXB structures on movers
Connect the instrumentation to the DAQ code in Labview (additional DAQ card) in order to monitor: Pressure, Temperature and Flow of the LCW, and Ambient Temperature
Increase in displacement for FXB (x10), Girder (x8), Magnet table (x4) at 10Hz

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MP8 used both DAQ in parallel:
- The tunnel is very resonant
- The magnet table is easily excited by people talking
- Data still demonstrate a quiet enough environment

STS-2 have a good signal without amplification but need lower sampling rate. 4000 Hz, Wd Sz 2, 12 s

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17-18 July @ FNAL

FXB002
SLAC Piezo
FXB001

Water IN

Al

SS

FNAL STS-2

Strongback

FNAL Geophone

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Vibration in MP8, 0.41 l/s Water in FXB01 or FXB02 structures on Al Girder, Wd Sz 2

**SLAC**

Displacement: m

Freq : Hz

**SS**

Displacement: m

Freq : Hz

Vibration in MP8, 0.41 l/s Water in FXB01 or FXB02 structures on SS Girder, Wd Sz 2

**FNAL**

Displacement: m

Freq : Hz

Vibration in MP8, 0.41 l/s Water in FXB01 or FXB02 structures on Al Girder, Wd Sz 2

**Water**

Displacement: m

Freq : Hz
Stainless Steel strongback

FNAL DAQ FXB on SS girder, Frequency of 10 Hz

SLAC - FXB on SS girder, Frequency of 10 Hz

FNAL DAQ FXB on SS girder, Frequency of 50 Hz

SLAC - FXB on SS girder, Frequency of 50 Hz
Vacuum 07/28 @ FNAL

FNAL geoph & piezo
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SLAC piezo
Vibration in MP8, 4.1 l/s water, vac solid - no vac dashed, no pumps, Al Strbk

Displacement, m

Freq : Hz

[Graph showing vibration displacement vs frequency with different lines for Piezo FXB01, FNAL Geoph Girder g=10, FNAL Geoph Floor g=10, and FNAL STS2 floor]
NEXT STEP

• Build more reliable amplifiers (1 week D. Connolly)
• Cross check with Shiltsev precise seismometers Aug. 4th (C.B.)
• Test with permanent quad (1 weeks J. Volk)
• Design of strongback for 3 structures (E. Borissov)
• Instrument strongback w/ movers using LVDTs (C. B. – E. Borissov)
• Write code in Labview for movers (C. B.)
• New water system (B. Smith)
• Hydrostatic Level System arrives in 1 week
• ANSYS model to improve and cross check with measurements (C.B.)