

29 January 2009  
10:00 am Harbor View Conference Room

**MBARI Project 900907 Meeting**  
**High Resolution Near-Surface Seismic Refraction Tomography**

Attending: David Caress, Rich Henthorn, Mark Chaffey, Paul McGill

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**Last week**

- Ordered amplifier electronics
- Ordered receivers – delivery mid-April

**Timing is the critical design issue**

- Want to achieve timing accuracy of data to 0.25 millisecond
  - 3 parts per billion accuracy
- Logging source timing
  - Can use computer in amplifier to log source times, using time keys from surface.
  - Other option is to have the primary clock on the surface.
  - We will likely try to use the clock in the amplifier hardware.
- Syncing receiver timing
  - Time stored to microsecond resolution
  - Use IR interface?
  - Receiver clock is good 2.5 parts per million over full temperature range.
  - Temperature compensated crystal in tag – we might work with Bill to embed active temperature compensation of crystal frequency – can get curves from cold room experiments
  - Basic concept
    - Set receiver time on deck
    - Read receiver time over IR port on deck
    - Read receiver time over IR port at deployment
    - Read receiver time over IR port at recovery
    - Read receiver time over IR port on deck

**Need to move towards PDR**

- Block diagram of architecture
- How do we couple the software and hardware so that we can have deterministic timing?
- Timing error budget
- We will set date next week
- We should involve Bill Burgess in the review

## Functional Requirements from Previous Meeting

### Overall System

- Acoustic system combining on-bottom sources and receivers capable of propagating sound through the seafloor to lateral ranges of more than 100 meters.
- Data must allow reliable identification of refracted arrivals allowing resolution of subsurface sound speed structure.
- Depth rating 3000 m (300 m in first year).

### Acoustic Source

- Integrated with ROV Ventana
  - Exportable for use on ROV ROPOS and ROV Jason
- Depth rating of 3000 meters required
  - 6000 m desirable for possible future use with different receivers
- User-defined, repeatable, calibrated source wavelet.
  - Source can be changed interactively during experiments
- Source timing and navigation recorded
- Maximum pulse length at least 100 millisecond
- Minimum pulse spacing 1 second

### Acoustic Receivers

- Deployable from ROV
- Depth rating 3000 m
- Record full bandwidth of source wavelets
- Record continuously for at least 10 hours (24 hours desired).
- System time can be synched with source system
- System time can be measured relative to source system

### Combination of Source and Receivers

- Travel time accuracy should be accurate to uncertainty of arrival picks in time series.
  - Travel times are the difference between the source time and the arrival time in the processed receiver data.
  - Klauder wavelet analysis of 1-6 kHz sweep has 0.5 msec width
    - The finest useful travel time accuracy is +/- 0.25 msec
  - A 2000 m/s sound speed in sediment translates to 2 m per msec
  - 3 kHz wavelength => 0.33 msec period