

Actions items and feedback from BEDs PDR

06/20/2012

Attendees: Larry Bird, Dale Graves, Roberto Gwiazda, Andy Hamilton, Denis Klimov, Brian Kieft, Mike McCann, Rob McEwen, Ed Mellinger, Alana Sherman, Bill Ussler

1. Is the Electrochem lithium battery stack capable of sustaining the pulse discharge voltage range estimate? Estimated voltage <2 v/cell [Ed]
 - a. A similar battery problem exists for the LRAUV [Denis]
 - b. Supercaps should be considered [Alana/Ed]
2. [Denis]: We specified 2 strings of 7 cells. The number of batteries in series selected to satisfy operating voltage range of the modem in both DC and pulse mode. So good point on discharge range and we better to be sure not to over discharge a pack even in pulse mode. We can use 8 to keep from triggering the low battery/low power level of the modem.

Results: If hardware is required, design re-use could be possible if we consider the supercaps used in the LRAUV variable buoyancy valve control board. Denis will investigate the Electrochem cells to see if further action is required.

3. Pressure transducer [Andy] – what is its accuracy? Can the depth in the sediment be determined using it? He pointed out that this is an absolute reference measurement independent of the other sensors. Careful calibration is needed.
 - a. Dead weight tester is the only way to accurately calibrate a pressure sensor [Bill]
 - b. Jim Schofield has a DWT in his work area that Bill has used in the past for pressure transducer calibrations [Bill]
 - c. Tidal signal is between 0.5 and 1 m [Bill]

Results: The value of absolute measurements is realized and calibration of the sensor will take place using the dead weight rig to maximize accuracy. At this time, the only way to determine height of sediment above the instrument via the pressure sensor would be to use high resolution bathymetry data from after a specific event to subtract depth of seafloor from actual depth. Tidal considerations also apply.

4. RTC discussion
 - a. 2ppm/year translates to 60 sec/year using a Maxim chip [Bob]
 - b. Cs clock is more power hungry, but could be adapted at a power cost [Bob]
 - c. Various strategies were discussed concerning how to discipline a clock [Andy et al]

Results: Bob is investigating alternatives to our Dallas/Maxim chip outside of the cesium clock solution. There are alternative options, however power, packaging, and availability is being considered. Further consideration of thermal transients on launch might be considered. Ice chest???

5. Schedule and Cost
 - a. When will these estimates be available? [Alana and Andy]

Results: Following PDR, the team will meet to examine procurement, critical path, and schedule. The WBS and schedule will be updated with the results.

6. Validation
 - a. A STED will be available to validate the occurrence (or lack of) of an event.

Results: The team would appreciate the use of the STED.

7. Additional Improvements

- a. Apart from the future improvements listed in the PDR package, Andy suggested a scheme in which multiple deployed BEDs could range to each other at a regular interval

Results: Following PDR, the team will meet to examine procurement, critical path, and schedule. The WBS and schedule will be updated with the results.

Q&A

Q. Roberto: can the unit be shut down for a season?

A. Bill: events are not seasonal, so it should be run continuously.

Q. Andy: is the motion detection threshold adjustable?

A. Bob, Bill: yes motion thresholds need to be adjustable up, if there are too many small debris flow events, or down if no events are recorded over a predetermined period of time (or if an event was known to occur).

Q. Alana: could an event be missed?

A. Denis: contextual data (periodic 1/ hour) is to be implemented to record change in orientation independently of event recording to detect sub-threshold motion.

Q. Andy: that sounds good. So can you change the rate of this data acquisition?

A. Denis: well the rate is selected not to generate too much data since this process runs continuously, so 1/hour is selected

Q. Andy: You mentioned “sensor fusion” on board. What about additional sensors outside chip?

A. Brian: no magnetometer for now, but it would be good to have it (later) A. Denis: rotation around vertical axis can be detected without drift; and to resolve heading we need magnetometer. There is Pressure Sensor with no drift (absolute depth), but the tidal shift needs to be subtracted.

A. Bob: magnetometer is harder to implement since vendor is very proprietary about some parts of the code but gyro code is open source

Q. Ed: How many units can be built and deployed? Perhaps so they can be made with different densities, and stop at different depth? Dozens? Hundreds?

A. Brian: well not so many, more like handfuls, first a prototype. If we have many, may have to use an AUV to collect data from them since it would take too much time.

A. Bill: then we would need to have individual ID of some sort, but homers have IDs.

A. Alana: modems have individual IDs too.

Q. Can density be adjustable?

A. Bill: yes, and the units with higher density would sink deeper; depth in sediment is limited by communication

Q. multiple, on housing material

A. Dale: steel is heavy, has predictable corrosion, but then there are lithium batteries so corrosion is not desirable (sanctuary). Basically looking for composite carbon fiber for housing (stiffness, cost), and Ti end caps for corrosion resistance (burial in sediments condition)

Q. Bill: can water absorption by composite be a problem? Perhaps density change?

A. Dale: for composite, not a problem, such a small amount (percents?) A. Ed: you are not looking for neutral buoyancy, so small density changes are ok.

Q. Larry: what kind of foam is used for density calculation? 500m? 1000m?

A. Dale: 1000m foam was used for calculation. There is also plastic skin around foam, encapsulating foam completely.

Q. Roberto: how long is foam is going to last?

A. Dale: the plastic skin is pretty good, even if foam is cracked, it is going to be contained inside the outer skin.

Q. Do you envision it to move with sediments?

A. Bill: unit is supposed to move with sediments, it should be totally symmetrical, center of gravity in the center.

Q. Andy: But if it is round, is it going to rotate ok? The sphere is smooth, and rotation in this case seems to be the important information.

A. Bill, Brian: we did some modeling of different shapes, like a log, sphere, etc. If the sphere proves too slippery, we can add appendages sticking out into sediments mass or vary the shape.

Q. Denis. And so can be shape of the pressure wave measurements (phase shift, delay), in addition with accurate time measurements, can it be used for something, like sediments depth?

A. Bill: that is good question. Depending on the material, it may be possible.

Q. Andy: can you adjust the clock when deployed in the field?

A. Bob: no we would detect the offsets from accurate (GPS) clock and adjust on shore.

A. Denis: time is protected system parameter and cannot be changed by acoustic link.

A. Andy: sure, but you can report it and read offsets from a ship about every month or so.

Comments on Future Improvements:

Andy: drop weight idea is good.

Alana: yes it is good. Getting this thing from out of there!

Q. Rob: can it be used with a leash or the float?

A. Brian: It is not desirable, interferes with motion.

Q. Roberto: how deep is to be buried? Couple meters? (seems kind of hard at that size of 15")

A. Bill: unit deployed on a surface, or very shallow burial

Q. Larry: how do you grab a smooth sphere?

A. Brian: a monkey fist.

Q. How do you imagine downloading the data from the small boat? File incomplete, start over slow?

This can take a long time.

A. Brian: yes boat time is big limitation in this program. An AUV of opportunity (LRAUV, waveglider, etc) is a way to collect data without a human

A. Denis: we considered data decimation and also realize the file compression is essentially the same thing. It has advantage of getting more data, but also has a risk of having the corrupt file as result of partial data loss. Uncompressed data, even incomplete still can be plotted.