R/V Kilo Moana Multibeam Echosounder System Review

Multibeam Advisory Committee
Quality Assurance Team

March 29th, 2012 with amendments May 2nd, 2012

Report prepared by:

Jonathan Beaudoin
Center for Coastal and Ocean Mapping/Joint Hydrographic Center
University of New Hampshire
Durham, NH

Paul Johnson
Center for Coastal and Ocean Mapping/Joint Hydrographic Center
University of New Hampshire
Durham, NH

This work was funded by the National Science Foundation through grant 147606.
# Table of Contents

Introduction ...................................................................................................................... 3  
System Geometry ............................................................................................................. 3  
  Blom survey, 2005 ........................................................................................................... 4  
  Applanix site visit, 2006 ............................................................................................... 4  
  Summary of Current System Geometry ........................................................................ 5  
Operator Manuals and Training Material ....................................................................... 6  
Deployment of MAC Software Tools, Utilities and Documentation .............................. 7  
  Installation .................................................................................................................... 7  
  SVP Editor ................................................................................................................... 7  
  BIST Logger .................................................................................................................. 9  
  Data Backup Scripts ..................................................................................................... 9  
System Performance ....................................................................................................... 10  
  Geometric Calibration .................................................................................................. 10  
  Coverage ..................................................................................................................... 10  
  EM122 Noise Levels .................................................................................................... 12  
  Comparison with US Coast Guard Cutter Healy .......................................................... 21  
Summary ......................................................................................................................... 23  
Recommendations ........................................................................................................... 24  
Appendix A – EM122 Troubleshooting Log .................................................................... 27  
Appendix B – Email transcript regarding EM122 concerns ........................................... 30
Introduction

The R/V Kilo Moana transited from Portland, OR to Honolulu, HI from March 13th to 22nd after a session in dry dock during which the receiver array for the vessel’s EM122 multibeam was replaced and a new EM710 multibeam was installed. Multibeam Advisory Committee (MAC) members Jonathan Beaudoin and Paul Johnson were onboard for the transit as part of their NSF funded project to assist the UNOLS community in improving the quality of multibeam echosounder data that is collected by vessels in the US Academic Fleet. Jonathan and Paul head up the Quality Assurance Team (QAT) of the MAC, whose goal is to visit vessels and assess their mapping systems as a whole. This includes reviewing items such as sensor configurations, availability and quality of documentation, current survey and data management practices, etc. The aim of this type of review is to identify areas where improvements can be made and to also document existing good practices already in place and to make them available to the entire community.

Due to constraints on ship scheduling, the full Sea Acceptance Trial (SAT) for the systems has been delayed until later in the 2012 field season. In addition to the review activities discussed above, a cursory examination of the data quality from both systems was made during the transit and will also be reported on in this document. This additional review is not meant to replace an in depth examination that can be conducted by the MAC’s Sea Acceptance Team (SAT), led by John Hughes Clarke.

System Geometry

In this report, we use the term system geometry to mean the positional and angular offsets of the various components of the multibeam mapping system. These parameters are critical to being able to collect soundings in an unbiased and repeatable manner.

The coordinate system used in this report is consistent with the system used by Kongsberg Maritime and Applanix where:
- The positive x-axis points towards the bow
- The positive y-axis points to starboard
- The positive z-axis points downward
- A positive roll rotation bring the port side up and the starboard side down
- A positive pitch rotation brings the bow up and stern down
- A positive heading rotation swings the bow to starboard
Existing reports, ship drawings and records of survey configuration changes were reviewed with the aim of independently coming to a set of linear and angular offsets for the ship mapping system components. The following documents were provided for review:

- **2005 Blom survey report**: the baseline ship survey that establishes the ship coordinate system and the position/orientation of the EM1002, EM120 and POSMV IMU and GPS antenna. Positions of other acoustic sensors were reported but are not subject to this review.
- **2006 Applanix site visit report**: review of POSMV configuration
- **2008 Applanix site visit report**: review of POSMV configuration
- **2012 IMTEC survey visit report**: ship survey conducted during the 2012 dry dock period in Newport, OR. Established position of the new EM710 transducer and the new EM122 receiver array. This survey was conducted by surveying the existing position of the EM122 transmit array and re-establishing the Blom coordinate system; the new measurements are thus relative and carry forward and compound upon any uncertainties from the 2005 Blom survey.

The following issues and points of interest were found during review of the above documentation.

**Blom survey, 2005**

The 25-foot draft markings were surveyed and the deviations of the markings from the true 25-foot draft were reported in mm (all deviations were acceptable). What is not obvious from this report or others that follow is how the waterline z-offset is calculated. Having examined the draft markings on the bow during the visit, the 25-foot mark is taken to be the nominal water line of the vessel (red paint below the mark and white paint above). Converting to meters gives a water line offset of 7.62 m from the keel, which becomes -7.62 m in the axis convention used by Kongsberg Maritime. Referencing this to the granite block gives the water line z offset that should be used in the EM122 and EM710 configuration:

\[
WLZ = -7.62 - (-0.8) = -6.82 \text{ m}
\]

**Applanix site visit, 2006**

1. The IMU frame w.r.t Ref frame incorrectly reports the pitch as -0.310 when it should be 0.310. The screen shots of the POSMV configuration included in the Applanix report indicate the correct value, however.
2. The Ref to primary GPS lever arm was incorrectly calculated as it used the Blom report Z values without first referencing these to the granite block. A coordinate shift of the GPS antenna z-offsets of 0.2159 was pointed out and corrected for in
the 2006 report. The Blom coordinates reported the position of the
geospatially highest point on the antennae; however, the phase center should
instead be reported. The positive z-offset reduced the primary antenna z-offset
to -27.9531.
3. The GAMS antenna separation value is entered as 3.948 m however, the Blom
report coordinates suggest it should be 3.955 m. The value of 3.948 m was
derived during a GAMS calibration and should NOT be corrected to match the
Blom report value. We simply note the 7mm discrepancy for the sake of future
reviews of the ship’s coordinate system documentation.

An additional z-offset was introduced to the POSMV GPS antennae during the 2012
dry dock period in that the threaded bolts upon which they were mounted were
changed for shorter bolts. This dropped their position by 0.109 m, bringing their
current z-offsets to -27.844 (primary) and -27.839 (secondary).

**Summary of Current System Geometry**

Table 1 lists a summary of the linear and angular offsets of the survey suite systems
onboard the *R/V Kilo Moana*. The above findings were reviewed and checked against
an independent verification done by Ferguson with general agreement within
rounding error. To the best of our knowledge, these offsets represent the survey
configuration as of March, 2012 based solely on the trail of documentation and
verbal reports of changes in offsets since the original Blom survey of 2005. If
undocumented changes have been made, then these values will be in error.

Current system settings were then checked against those listed in Table 1 and the
following corrections were made to the system configuration files:
1. The POS/MV primary GPS antenna height was set to -28.06 m. This was changed
to -27.8441 m, correcting a 0.2159 m error.
2. The EM710 receiver pitch offset was entered as -0.01°. The IMTEC survey
indicates that it should be 0.007°. After rounding the second value to 0.01°
resolution, this is likely due to a misinterpretation of the IMTEC survey results.

<table>
<thead>
<tr>
<th></th>
<th>X (m)</th>
<th>Y (m)</th>
<th>Z (m)</th>
<th>Roll (deg)</th>
<th>Pitch (deg)</th>
<th>Heading (deg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Granite Block (RP)</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Center of Rotation</td>
<td>-9.44</td>
<td>8.522</td>
<td>-6.82</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>POS/MV IMU</td>
<td>1.059</td>
<td>-1.218</td>
<td>-0.431</td>
<td>0.00</td>
<td>0.31</td>
<td>-0.46</td>
</tr>
<tr>
<td></td>
<td>POS/MV Primary GPS</td>
<td>POS/MV Secondary GPS</td>
<td>EM122 TX</td>
<td>EM122 RX</td>
<td>EM710 TX</td>
<td>EM710 RX</td>
</tr>
<tr>
<td>----------------</td>
<td>--------------------</td>
<td>----------------------</td>
<td>-------------</td>
<td>-------------</td>
<td>-------------</td>
<td>-------------</td>
</tr>
<tr>
<td></td>
<td>6.437</td>
<td>6.536</td>
<td>-27.844</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>6.468</td>
<td>10.491</td>
<td>-27.839</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>EM122 TX</td>
<td>-3.270</td>
<td>-0.053</td>
<td>0.803</td>
<td>-0.064</td>
<td>0.024</td>
<td>0.026</td>
</tr>
<tr>
<td>EM122 RX</td>
<td>1.155</td>
<td>-1.224</td>
<td>0.805</td>
<td>-0.075</td>
<td>-0.035</td>
<td>0.017</td>
</tr>
<tr>
<td>EM710 TX</td>
<td>11.844</td>
<td>-1.120</td>
<td>0.553</td>
<td>-0.233</td>
<td>-0.190</td>
<td>180.016*</td>
</tr>
<tr>
<td>EM710 RX</td>
<td>10.825</td>
<td>-1.227</td>
<td>0.556</td>
<td>-0.265</td>
<td>0.007</td>
<td>180.101*</td>
</tr>
</tbody>
</table>

* Note that the heading offsets for the EM710 transmitter and receiver have had 180° added since both of them are installed in the opposite sense of their usual configuration. The values in the table have been adjusted for this to allow for direct entry into the SIS configuration for the EM710.

**Operator Manuals and Training Material**

The usual suite of operator manuals for the EM120/EM122 and EM710 were readily available on board in hardcopy format. Softcopy were also available on both multibeam workstations. These manuals are lengthy and many multibeam operators resort to “cookbook” style manuals for their technicians. Much of this style of documentation onboard was maintained in a wiki format on the ship’s network, however, much of it was outdated and pertained to the original EM1002/EM120 installation in which an older acquisition system was used (the Unix based Merlin acquisition system).

A set of documentation was generated to provide direction to technicians on how to:

1. Document and back up their current system configuration and preferred survey settings.
2. Un-install SIS to return the system to a base pre-install state (i.e. the SIS database is removed).
3. Re-install SIS and re-establish the preferred system configurations from (1).

These were installed on the Desktop of each machine, along with configuration files generated from (1) above such that the system can be easily restored to a safe configuration after each cruise, if the need arises.
Deployment of MAC Software Tools, Utilities and Documentation

Installation

All MAC tools, utilities, cookbooks, system settings, etc are installed in C:\installs\ of both multibeam workstations. In that base directory, the user will find:

• MAC Cookbooks
  o SIS Configuration Backup
  o SIS Software Uninstallation
  o SIS Software Installation
  o SVP Editor and BIST Logger quick start guide
• MAC Data
  o World Ocean Atlas 2009, used with SVP Editor
• MAC Extras
  o Additional third party software tools
• MAC Python Install
  o Installation files and instructions for setting up the python work environment required for MAC Software Tools
• MAC System Configuration
  o Documentation of vessel configuration for Kilo Moana as of 20120321 for
    ▪ EM122
    ▪ EM710
    ▪ POSMV
• MAC Tools
  o SVP Editor
  o BIST Logger (in utils directory)

SVP Editor

A set of sound velocity profile (SVP) processing tools was installed on both multibeam workstations. This software, called SVP Editor, is developed and maintained by the MAC and has the aim of streamlining and standardizing current practices regarding the acquisition, processing and application of SVPs to multibeam data.

Discussion with technicians on board shed light on current SVP acquisition practices:

• Expendable Bathythermographs (XBTs) provide the majority of sound velocity profiles for multibeam SVP corrections
• Expendable Velocimeters (XSVs) are available but are rarely used for SVP corrections
• Conductivity-Temperature-Depth (CTD) profilers are available but are rarely used for SVP corrections
• XBT casts are done once per day during transit
• XBT casts are done as required during dedicated mapping cruises with protocol often dictated by the Chief Scientist (e.g. launch XBT if the surface sound speed deviates by more then 2 m/s from the last XBT cast)

The current XBT workflow steps are:
1. Launch the probe.
2. Manually enter position and surface salinity into metadata, including an adjustment of the surface salinity measurement such that the salinity and temperature values provide a sound speed that is equal to what is being reported by the surface SV probes in the sonar room.
3. Data are then copied via serial line transfer to a backup server in the XBT lab, where it is automatically and immediately distributed to another data server in the survey lab.
4. A set of command line programs are then run on a computer in the survey lab to (a) convert the raw XBT data (.EDF format) into a format ingestible by the multibeam acquisition system, this includes downsampling the profile, and (b) transmit the downsampled and converted cast to the multibeam acquisition system. If both multibeam systems are running, then step (b) is repeated for the second sounder.
5. Kongsberg Maritime’s SVP editor software (not to be confused with the MAC’s SVP Editor software) is run on the multibeam acquisition work stations to vertically extend the cast to 12,000 m, as required by SIS and is then uploaded into SIS for application in real-time ray tracing. This is repeated for the second multibeam system if both are running.

The MAC SVP Editor seeks to streamline much of the above and to provide additional functionality to improve the downsampling and extension algorithms to improve the accuracy of the refraction correction to the multibeam soundings. The following workflow was demonstrated during the cruise and is proposed as an alternate to the above:

1. Launch the probe.
2. Manually enter position and surface salinity into metadata (retire the practice of adjusting the surface salinity as this is no longer necessary).
3. Data are then copied via serial line transfer to a backup server in the XBT lab, where it is automatically and immediately distributed to another data server in the survey lab. This practice, though not necessary for the MAC software, should be maintained as it provides a tested and robust backup and logging solution to archiving the raw XBT data.
4. The data are exported and copied to a shared network drive that is visible to the multibeam acquisition machines.
5. The MAC SVP editor software is used to process the cast by loading the data from the shared network drive mentioned in (4). Automated processing involves loading salinity from the World Ocean Atlas, extending the profile from the World Ocean Atlas, and inserting the surface sound velocity measurement in the upper portion of the profile. The cast is then delivered to SIS for immediate application and without further intervention on SIS. This is repeated for the second multibeam system if both are running.

As part of the software installation, a cookbook style start-up guide was provided that documented the new workflow in more detail, including detail on the processing procedures within the MAC SVP Editor.

An additional feature of the MAC SVP Editor is the ability to set it up in “server” mode. In this particular mode of operation, the software monitors position broadcasts from SIS and constructs synthetic sound velocity profiles based on the World Ocean Atlas and then delivers them to SIS for immediate application. This mode of operation was used during the transit from Portland, OR to Honolulu, HI with no discernable refraction artifacts in the real-time graphical display in SIS. It is suggested that this particular mode of operation be used in lieu of the daily XBT casts while in transit, unless in areas of high spatio-temporal oceanographic variability, e.g. the Gulf Stream. Future work will focus on providing guidance to operators as to when/where the server mode can be used in lieu of in situ measurements.

**BIST Logger**

A python script was developed during the transit to automatically log the multibeam Built-In Self Test (BIST) output with additional metadata derived from network broadcasted position, heading and engine RPMs. The intent of this script is to increase the utility of BIST output files by including many of the variables often required during noise testing (these are usually documented in the file name of the BIST files). The software, called BIST Logger, was installed on both multibeam workstations. Documentation for this software was provided in the start-up guide, along with documentation for the SVP Editor.

**Data Backup Scripts**

Upon request, two scripts were written to insure a safe and easy backup of EM710 and EM122 raw multibeam data. When the script is activated it will prompt the user to supply the current cruise name and the desired interval to copy the data. The script will then sync the acquisition machine’s raw directory, SVP directory, and BIST directory to an archive drive and a NAS for safe storage. The script resides on the Macintosh computer, Kai, which is also used as the aggregation point for post
cruise data releases to the visiting science parties as well as the national repositories.

During implementation of the script, discussions were held with the Kilo Moana’s Ocean Technology Group (OTG) about changing some aspects of their logging configurations of their acquisition machines. The file naming convention was modified from logging Line-YearMonthDay_Hour_Minute_Second_KiloMoana.all to Line-YearMonthDay_Hour_Minute_Second_KMxxx.all where the xxx is replaced with either 122 or 710 depending upon the system logging the data. This will clear any future problems with end-users that were unable to easily determine which multibeam system collected the data, for those cases where the raw data has been separated from its metadata. We also changed the SVP logging directory from the Kilo Moana’s default location of E:\SVP to E:\sisdata\common\svp as this location is the default path for SIS, meaning that in the event of a reinstall of SIS the transfer script will continue to function without modification.

System Performance

As mentioned in the introduction, a full SAT has yet to be conducted for either system. Nonetheless, some comments can be made on the data quality and overall performance for both systems. Time limitations precluded full patch test calibrations or rigorous testing and these comments are based on observation of the data acquired during transit alone.

Geometric Calibration

Though a small amount of time was found to perform a subset of the patch test calibration lines for the EM710 at the end of the transit, the water depths and seafloor geometry were not conducive to the effort. Nonetheless, the data that were acquired indicate that the roll and pitch offsets are very small, likely less than 1/10th of a degree. The data did not support analysis for the yaw offset.

Coverage

Coverage testing was done while steaming down the continental slope off of the mouth of the Columbia River. Both the EM710 and EM122 were permitted to run in automatic mode such that the sounders would choose the most appropriate depth mode for the seafloor being mapped. Referring to Fig. 1, the EM710 maintained the full swath width of coverage until it became attenuation limited at a depth of ~400 m. From this depth on, it was able to maintain a 2 km swath width down to a depth of ~1,500 m with full signal extinction seen at 2,000m. This is consistent with the results of extinction testing performed for other EM710 by John Hughes Clarke of
the MAC SAT team. The coverage performance achieved in this test will vary, of course, with seafloor backscattering strength.

The EM122 coverage was disappointing and hovered between 1-1.5x water depth and dropped to as low as 0.75x water depth at full ocean depth. After email communication with the manufacturer, it was suggested to run the system with a degraded 4° receiver beamwidth. This mode of operation uses a subset of the elements in the receive array and presumably a subset of the cables and boards and is helpful to trouble shoot problematic pathways in the signal processing chain between the transducers and the acquisition system. Coverage did improve to ~2x water depth, however, it was still suboptimal. Under direction from the manufacturer, various other configurations were attempted throughout the cruise, none of which improved the situation in both 1°x2° and 1°x4° modes:

- Megger on RX10 cable
- Swapping DP16 pre-amp boards 3 and 4
- Swapping RX32 receiver boards 1 and 2
- Swapping receiver transducer cables 1-4 with cables 5-8 (transducers 5-8 are on RX1-RX4 and transducers 1-4 are on RX5-RX8)

Figure 1. Achievable swath width coverage.
EM122 Noise Levels

BIST tests were run after each of the various configuration changes without any significant BIST failures besides a reported nonunique firmware identification with transposed RX32 boards. RX noise spectrums are plotted below in figures 2-7. Note that these data were all acquired at full ship speed while underway (~11kts, 120rpm). From these figures, it is clear that the noise levels observed on the second RX32 board are routinely higher than those on RX32 board 1, even when the RX32 boards are swapped (figures 6 and 7). The noise spectrum on RX32 board 2 is also characterized by three peaks centered on 10.75 kHz, 11.5 kHz and 12.25 kHz with each peak being anywhere from 3-7 dB higher than the noise level in the neighboring frequency bands. These peaks are not apparent on RX32 board 1 in any of the tests.

Figure 2. Board 1 noise spectrum after RXIO megger, 9 consecutive runs.
Figure 3. Board 2 noise spectrum after RXIO megger, 9 consecutive runs.

Figure 4. Board 1 noise spectrum after swapping DP16 boards 3 and 4, single run of BIST.
Figure 5. Board 2 noise spectrum after swapping DP16 boards 3 and 4, single run of BIST.
RX Board 1, after RX32 boards swapped

![Graph showing noise spectrum for RX Board 1 after swapping RX32 boards](image1)

Figure 6. Board 1 noise spectrum after swapping position of RX32 boards, 9 consecutive runs.

RX Board 2, after RX32 boards swapped

![Graph showing noise spectrum for RX Board 2 after swapping RX32 boards](image2)

Figure 7. Board 2 noise spectrum after swapping position of RX32 boards, 9 consecutive runs.
A short noise test was conducted following a brief stop of the Kilo Moana to allow for deck and crane operation testing. Receiver noise spectrums were repeatedly measured while the vessel increased RPM from 40 to 120 in steps of 20 RPM. The newly developed BIST Logger program was used to greatly facilitate the testing process, allowing the operator to launch the RX noise spectrum test repeatedly without having to stop for annotation of ship speed, engine RPM, location of the test, or having to type a file name to save to since these data were logged directly into the BIST Logger output file along with the BIST test output. This allowed for a set of 294 receiver noise spectrum tests to be conducted over a 38 minute period during which the engine RPM was steadily incremented.

Results are plotted in figures 8-10. As expected, noise levels are at their highest at 120 RPM (~11kts). Noise levels increased slowly between RPMs of 40 to 100 and made the most dramatic increase going from 100 RPM to 120 RPM. The spectral maximum noise level for each run of the test is also plotted in the figure (green); these are primarily associated with RX32 board 2. Note also that RX32 board 2 is systematically noisier than board 1 by ~3 dB. The full set of spectral noise measurements are presented in image format in figures 9 and 10. It is interesting to note that the noise peaks seen in figures 2-7 are also evident in Figure 10 but they only appear at 120 RPM. This suggests, under the current system configuration, that 100 RPM (10 kts) may prove to be the optimal survey speed.

![Figure 8. Noise levels versus engine RPM.](image)
Whereas noise level testing is certainly beneficial to understanding the performance of the echosounding systems, it does not directly indicate the coverage that is achievable under various operating conditions. If noise is a limiting factor in obtaining coverage then it appears that operating at 100 RPM (10kts) might be a reasonable compromise between ship speed and coverage. It may prove beneficial to do echosounding tests at different speeds to determine how much coverage is gained by operating at 100 RPM as to allow for more informed decision making that...
cannot be made based on noise level measurements alone. In its current configuration, the system was seen to track up to 3x water depth when running at 80 RPM in 1°x4° mode.

The BIST results also allow for investigation of the noise levels across the receiver array. Figures 11-14 show BIST measurements of receiver channel noise levels that were collected for the troubleshooting tests discussed above; these are from a single run of the RX noise level test, i.e. they are not the average of several tests as is usually done.

![Noise Levels, ADCPs secured](image)

Figure 11. Receiver element noise levels across receive array, ADCPs secured, 11 knots. As expected, noise levels increase toward the ends of the array (element 0 and element 63) due to increased flow noise. Also of note are the two bad channels (52 and 61) and several noisy channels (40, 41, 44-47), all on the starboard side of the array. There are also noisier channels on the port half of the array (20, 21, 23,24), however, it is not as pronounced as the starboard channels.
Figure 12. Receiver noise levels across the receive array after checking the RXIO cables. Note that noise levels are consistent with those of Fig. 11, as expected, and the features pointed out in Fig. 11 persist: two defective channels and several noisy channels.
Figure 13. Receiver noise levels across the receive array after swapping DP16 boards 3 and 4 in the pre-amp cabinet. Note that the two defective channels move to different channel numbers (36 and 45), this implies that DP16 board 4 is the source of the two defective channels. The noisy channels on the starboard side persist though are partially mitigated by the defective channels from DP16 board 4.
Figure 14. Receiver noise levels across the receive array after swapping RX32 boards in the TRU cabinet with DP16 boards 3 and 4 still swapped from their original configuration. The two defective channels are stationary (36 and 45) and the noisy starboard channels persist, suggesting that the RX32 boards are not the source of the noise.

Comparison with US Coast Guard Cutter Healy

Previous BIST results, obtained during trials onboard the US Coast Guard Cutter Healy during its 2010 EM122 SAT, are plotted for comparison in figures 15 and 16. It is clear from Figure 16 that the Kilo Moana did not always have this noise peak at 120 RPM. With the exception with the increased noise level at 120 RPM, the noise versus RPM measurements shown in figure 8 are consistent with those in figure 16 with noise levels in the 50-55 dB range.
Figure 15. Spectral noise levels for Healy and Kilo Moana, 2010. This figure was drawn from a different report and the measurements from the Langseth should be disregarded as they are not relevant to this work and they were collected in an uncontrolled setting.

Figure 16. Broadband noise levels vs. engine RPM for Healy and Kilo Moana, 2010.
Referring to Figure 15, the 2010 measurements for the Healy and the Kilo Moana indicate that the Healy is acoustically much noisier than the Kilo Moana. Kilo Moana’s current noise measurements, with the exception of the 120 RPM peak, are consistent with the 2010 spectral noise measurements. The water column data can be used to further compare the two systems, as in figures 17 and 18.

**Figure 17.** Kilo Moana 2012 water column imagery, Deep mode, 1°x2° configuration. Green crosses indicate the bottom tracked solutions. The coverage depicted in this image is typical of the coverage achieved throughout the transit, less than 1x water depth (refer to Figure 1). Note the pronounced inter-sector sidelobe interference near the seafloor, particularly on the starboard side. Also note the difference in nature of the noise in the water column prior to the first bottom return between this system and the Healy’s EM122.

**Figure 18.** Healy 2010 water column imagery, Deep mode, 1°x2° configuration. Green crosses indicate the bottom tracked solutions. Note the increased coverage obtained by the Healy despite having acoustic noise levels 10-15 dB higher than the Kilo Moana (see Figure 15).

**Summary**

The point of the QAT visit was to help the host institution in developing protocols and practices that are conducive to the acquisition of high quality multibeam data.
Even with a finely tuned and calibrated survey system, it is still possible to collect poor quality data through poor choice of operational system parameters, etc. Software tools to aid in this regard were deployed and documentation was prepared that can help return the system to a healthy configuration such that the institution can recover from a sub-optimal system configuration. Current awareness of the importance of maintaining a “chain of custody” on the survey system geometry is high. It is recommended that procedures and training be given to all technical staff to maintain awareness of the fact that changes to the system geometry must be adequately documented.

It is recommended that the technicians familiarize themselves with the software and documentation provided during the cruise. Revisions, corrections, criticisms and suggestions are welcome and will improve future efforts to help other vessels in this regard.

Though the EM710 has yet to undergo a sea acceptance trial, preliminary data indicate that it is functioning as expected without any issues or problems being immediately apparent in data from the system.

The larger issue that dominated most of the cruise was that the EM122 system was clearly underperforming. Examining the water column data, it is clear that noise is a limiting factor in the ability of the system to track beyond 1x water depth. Based on the noise level measurements made during the transit, however, it is not likely to be due to high acoustic noise levels. The nature of the observed noise is markedly different from that of the Healy and points to perhaps problems inherent to the EM122 system itself and not the ship. This conclusion is further supported by the fact that increased coverage was obtained when operating in 1°x4° mode where parts of the signal processing chain are removed.

**Recommendations**

It is recommended that in depth troubleshooting of the EM122 system be undertaken with the manufacturer with at sea testing (not dockside). This is best done with personnel on board who are able to process, evaluate and interpret water column imagery in order to assess whether or not troubleshooting procedures are effectively reducing the noise in the data. Personnel from the other MAC teams, namely John Hughes Clarke of the Sea Acceptance Team and Tim Gates of the Acoustic Noise Team, should be contacted as soon as possible in order to schedule a ship visit where both can attend.

To facilitate further and continued assistance from the MAC, it is requested that Jonathan Beaudoin and Paul Johnson be kept up to date on progress made towards resolving the EM122 issues.
Until the problem is diagnosed and corrected, the following two recommendations are made:

1) Continually collect water column data in support of further analysis. Examining the seabed imagery or bathymetry alone will not effectively give an indication that the noise problem is solved. It was observed during the transit from Portland to Honolulu that the noise problems that are immediately obvious in the water column only manifest themselves as reduced coverage in bathymetry and seabed imagery data. It should be noted that the EM122 SIS software will default to a state of not recording water column data if the system is restarted. Water column logging is enabled through the “Logging” checkbox in the “Show/Hide” menu of the water column display in SIS, see Figure 19. This practice can be retired once the issues have been resolved.

2) Operate the EM122 in a 1°x4° mode to maximize the potential use of the data for science users requiring bathymetric or imagery data. This can be done by running the TRUSetup.jar program (see Figure 16):

C:\Program Files\Kongsberg Maritime\SIS\PU\EM122\PUCD\TRUSetup.jar

Referring to Fig. 20, the software will scan for the EM122 TRU unit and populate the “Echosounder” dropdown menu with the IP address of the TRU. At this point, select 4 from the RX dropdown menu and click “Set”. Once the dialog box becomes responsive again (a few seconds at most), click “Exit” and then cycle the power on the EM122 TRU. Note that the system will still report itself as 1°x2° if viewed in the
Installation Parameters dialog in SIS (one can configure the system to run in $1^\circ \times 4^\circ$ via two methods, review the notes and email exchange in Appendix A and B for further explanation). Once the issues are resolved, revert the system back to $1^\circ \times 2^\circ$ using the same procedure outlined above and cycling the power to the EM122 TRU.

Figure 20. Configuring the EM122 to run in $1^\circ \times 4^\circ$ mode.
Appendix A – EM122 Troubleshooting Log

This is a log maintained by J. Beaudoin that was used to keep track of the system configuration changes and observed changes in performance during the EM122 troubleshooting sessions that occurred during the transit from Portland, OR to Honolulu, HI. Refer to Appendix B for an email transcript that details the communications between the ship and the manufacturer.

20120316, following instructions from Mark Rice's email of 3/16/12, 07:31AM

1. Closed SIS

2. Ran C:\Program Files\Kongsberg Maritime\SIS\PU\EM122\PUCD\TRUSetup.jar and changed the receive opening angle to 4 degrees. This program edits the system.ini file on the TRU.

3. Started SIS, looked in installation parameters and saw that system was reporting as 1x2 degree system.

4. telnet to TRU, saw that there is a system.ini file, retrieved it via ftp, examining the file saw that the TRU is configured to be 1x4 degrees. Not sure if the system reports itself correctly in SIS so decided to close SIS and cycle the power to the EM122 TRU.

5. Energize TRU, restart SIS. Noticed that "SH Status" warning indicator is RED. Still self reporting 1x2, looked at directions again. Saw that we should have adjusted system to 1x4 in SIS in the installation parameters first. Did this, cycling power an TRU and restarting SIS.

6. Re-energized TRU and restarted SIS, self-reports as 1x4 in the installation parameters dialog, SH status lamp still red.

7. Pinging and logging data, despite SH status red lamp. Subjective evaluation from real-time display points to an improvement in coverage (2x water depth easily, but still gaps in bottom tracking near sector boundaries). Logging to file 0056_20120316_170053_KM.all at roughly 1700 UTC. Stopped logging at ~1800 UTC.

8. Switched SIS installation parameters back to 1x2, switching TRU back as well via the TRUSetup.jar program to 1x2. Cycled power on TRU and restarted SIS. The SH status lamp is now green. Logging at ~1809 UTC to line 0057_20120316_180924_KM.all. Performance degradation noticed immediately. Setting of 1x4 degrees yielded at least 2x water depth, returning to 1x2 degrees sees the coverage drop to ~0.75x water depth.
9. Changing RX beamwidth to 4 degrees using SIS Installation Parameters dialog. Restarting SIS and TRU. Logging at 1826 UTC into line 0058_20120316_182616_KM.all. SIS reports 1x4 configuration in the Installation Parameters dialog but the system.ini file on the TRU reports 1x2. Real-time subjective evaluation points to an improvement over the poor performance witnessed in 1x2 mode with performance improvement equivalent to case where SIS and the TRU were both configured to 1x4. Water column displays seem to be still dominated by noise and sidelobe interference, especially when compared to data in equivalent water depths with the Healy’s EM122 (collected during their SAT in 2010 during a transit from Honolulu to Dutch Harbor, AK). Done logging at 1953 UTC. Stopped pinging and switched SIS Installation parameters back to 1x2 degrees, started pinging again to have immediate comparison to 1x4 degree configuration (through SIS only). Logging to line 0060_20120316_195433_KM.all at 1954 UTC. Done logging 2034 UTC. Powering down to begin pre-amp DP16 board swaps.

10. Powered back up after swapping DP16 boards 3 and 4. The bad staves moved with the board and are sitting between the 1/2 and 3/4 section in the stave display (from left to right) whereas they sat between 3/4 and 4/4 marks on the display previously. Collecting a small dataset, system is back to default 1x2 degree setting, logging to line 0061_20120316_210702_KM.all at ~2107 UTC. Stopped logging at 2117 UTC. Running BIST.

11. Did change to 1x4 system on TRU, pinging and logging at 2140 UTC into file 0062_20120316_214108_KM.all (SH status lamp is red again). Coverage is improved, noticed that staves 1-32 appear in the stave display and all are fine (staves 33-64 aren't used? presumably bypassing preamp boards 3 and 4 under this configuration as only the first 4 hydrophones are used). Water column is still dominated by sidelobe returns with data gaps and mistracking near sector boundaries. Stop logging at 2244 UTC. Switched back to 1x2 degree.

12. Swapped the two RX32 boards. Energized TRU, started SIS and pinging. Still have reduced swath width. Ran BIST, RX32 test fails on "Unique Firmware" portion of the test. Ran 10 RX spectrum tests and plotted results, noise spikes stay with slot 2 (which now holds the RX32 board from slot 1 after the swap). Switching back to 1x4 to collect more data while underway until further instructions from Kongsberg. Logging into line 0064_20120316_234236_KM.all.

13. Switching to 1x4 in SIS installation datagrams. Logging into line 0065_20120317_005116_KM.all. Note new day in UTC time stamps (now 20120317). So far, we've swapped the DP16 boards and the RX32 boards. Line 0064 is on TRU forced 1x4, line 0065 is on SIS forced 1x4 mode.

14. Back to 1x4 via TRU. Logging into line 0067_20120317_020239_KM.all.

15. Logged overnight. On line 0083, changed absorption coefficient in the Runtime Parameters to be CTD instead of Salinity (35) at ~1814 UTC, 20120317.
16. 2012-03-18, 0328 UTC: Stopped logging to attempt datagram distribution correction as per Mark Rice’s suggestions in email of 2012-03-16.

17. 2012-03-20 19:27 UTC: Swapped receive transducer cables 1-4 with 5-8. So transducers 5-8 are on RX1-RX4 and xducers 1-4 are on RX5-RX8. Powered up again at 1931 UTC, logging data into line file 0161_20120320_193430_KM.all at 1935 UTC. Stave display now shows noisy staves 10, 13, 14 and 16. Prior stave displays showed data dropouts (low signal for entire time series), now the bad staves show signal that’s higher than the neighboring staves.

18. 20120320 - 2158 UTC, engine room dropped third generator a few tens of minutes ago and noticed in line 0165_20120320_214417_KM.all that coverage increased to nearly 3x water depth and that the stave display cleaned up, port/stbd RPM was down to ~80 vs. the usual 120. AT ~2158, third generator back online and RPMs back up to 120, noise came back in stave display and coverage reduced to just under 2x water depth.

19. 20120321 - 2200 UTC. Returned system to initial configuration:
- unswapped RX1-4 and RX5-8 cables.
- unswapped DP16 boards 3 and 4
- unswapped the two RX32 boards
- returned the TRU setup for a 1degx2deg system.

Energizing TRU.
Appendix B – Email transcript regarding EM122 concerns

Mark -
We just finished the first step of testing. We removed hydrophone cables 1-4 and replaced them with 5-8 and ran the system in 1x4 transceiver mode. We didn't see any significant improvement in the data quality and the 2 bad staves appeared questionable in that mode, although not completely dead. On ftp.soest.hawaii.edu in pjohnson/km120-EM122/1x4_SwappedCables_1-4_to_5-8 directory are a small .all and .wcd file as well as screen capture of the scope display.

When we have data from the next test I'll send it over. - Paul

On 3/20/12 9:31 AM, Mark Rice wrote:
Hello Paul,

Thanks for the information.

It looks like the first 4 hydrophone are ok as far as we can tell. We would like you to try a few things for us. Can you remove hydrophone cables 1 - 4 and replace them with 5 - 8 in order then run in 1 X 4 transceiver mode? We would like to see if 5 - 8 behave the same as 1 - 4. If that does not look any better swap 5 - 8 so RX 1 would have cable 8 and RX2 would have cable 7 and so on.

On the datagram distribution, you might have a corrupt DB in SIS that is not allowing you to delete entries. Rebuild the DB, reinstall SIS making sure to say yes to delete DB and saving PU and user parameters. I would also make sure you have screen grabs the important parameters.

Best Regards,

Mark E. Rice
Export/QA / IT
Kongsberg Underwater Technology Inc.
19210 33rd Ave West Suite "A"
Lynnwood, WA. 98036
PH 425-712-1107
FX 425-712-1197

This e-mail message (including attachments, if any) is confidential and may be privileged. Any unauthorized distribution or disclosure is prohibited. Disclosure to anyone other than the intended recipient does not constitute waiver of privilege. If you have received this e-mail in error, please notify us and delete it and any attachments from your computer system and records.

Paul Johnson ---03/18/2012 03:42:49 AM---Mark - We tried the datagram distribution method you mentioned and we think it

From: Paul Johnson <pjohnson@ccom.unh.edu>
To: Mark Rice <mark.rice@kongsberg.com>,
Cc: Jonathan Beaudoin <jbeaudoin@com.unh.edu>, jbe@omg.unh.ca, Joyce Miller <joycemil@hawaii.edu>, "J. Scott Ferguson" <jscottf@hawaii.edu>, Ned Eilasen <ned.eilasen@kongsberg.com>, uhor@soest.hawaii.edu, Vic Polidoro <vicpolidoro@gmail.com>
Date: 03/18/2012 03:42 AM
Subject: Re: EM122 concerns
Mark -
We tried the datagram distribution method you mentioned and we think it might work. The problem is we can’t unsubscribe to the datagrams that were subscribed to using the Tools->Custom->Datagram distribution window. When we click on one of the subscribed datagrams in that windows and click on the unsubscribe button it does not remove the subscription. - Paul

On 3/17/12 12:46 PM, Mark Rice wrote:

Hello Paul,

Well it looks like we figured out one of our problems. We will get a preamp board out to you ether from Lynnwood or Horten first thing Monday morning.

I understand you are having internet issues, but is it possible to get a small raw.all data set while in 1 X 4 modes? Also a set of scope display grabs?

Just a sanity check, can you verify that the hydrophone cables are S/N 101 - 108 with 101 plugged in to RX 1 on the underside of the preamp going in sequence to S/N 108 on RX8

When you swapped RX boards and you had one fail, did you switch it back and it worked or did you have to use your spare?

Have you sorted out the datagram distribution?

Thanks for the plots.

Best Regards,

Mark E. Rice
Export/QA / IT
Kongsberg Underwater Technology Inc.
19210 33rd Ave West Suite “A”
Lynnwood, WA. 98036
PH 425-712-1107
FX 425-712-1197

This e-mail message (including attachments, if any) is confidential and may be privileged. Any unauthorized distribution or disclosure is prohibited. Disclosure to anyone other than the intended recipient does not constitute waiver of privilege. If you have received this e-mail in error, please notify us and delete it and any attachments from your computer system and records.

Paul Johnson ---03/16/2012 09:44:57 PM---This afternoon we ran the Kilo Moana’s EM122 in its normal base configuration as a 1x2 degree multi

From: Paul Johnson <pjohnson@ccom.unh.edu>
To: “J. Scott Ferguson” <jscottf@hawaii.edu>,
Cc: Ned Eliasen <ned.eliasen@kongsberg.com>, Mark Rice <mark.rice@kongsberg.com>, Vic Polidoro
This afternoon we ran the Kilo Moana’s EM122 in its normal base configuration as a 1x2 degree multibeam, in a 1x4 mode set by SIS, and in a 1x4 mode set by configuring the TRU. The quality of the bathymetry and imagery in both 1x4 mode were significantly better than operating the system in its base 1x2 mode (we will send out some plots of the data in a short while). Attached to this email is a plot of the swath widths as shown by plotting the outermost valid beam, as identified by the system, for the port and starboard sides. Each run of the system in its various modes are color coded and the green lines on the plot indicate the swath width as a function of depth (1 x water depth, etc..). The data shows that the base configuration of 1x2 (purple points on the plot) collects data which for the most part are less than 1x water depth while both 1x4 configurations collect data between 1.5x and 2.8x water depth.

- Paul

On 3/16/12 3:51 PM, J. Scott Ferguson wrote:
> Ned,
> We have the following EM122 spares onboard:
> >
> > RIO RX #308301 SN: 671259
> > RX32 #309057 SN: 423437
> > TX36 LC #307677 ver. B SN: 397796
> > TX36 LC #307677 ver. B SN: 397462
> > PSU 170V #302992 SN: 0844001016
> > PSU 170V #302992 SN: 1008001008
> > PSU CPCI #382-099656 SN: 00047451/00021/109
> > PSU 12V #302991 SN: 1008001021
> > PSU 6V #382-098939 SN: 1007001004
> >
> > As far as I am aware upon arriving in Honolulu we will immediately begin our operational cruises, which may not allow time for further testing of the EM122. However, Sandy may have more updated information on our schedule or may have had discussions with the scientists to allow for continued debugging. We do have an 11-day
> transit from Honolulu to Pohnpei that begins on 3/29. That may allow
> for further underway testing if required.
> 
> According to the current schedule the next time for unrestricted
> multibeam sea trials and acceptance is 5/18 to 5/21 in Honolulu.
> 
> Within the next hour or so Paul will be providing an update on our
> test results. Unfortunately we are having poor communications due to
> congestion on the HiSeasNet.
> 
> Thanks,
> 
> On 3/16/12, Paul Johnson<pjohnson@ccom.unh.edu> wrote:
> 
> -------- Original Message --------
> Subject: Re: EM122 concerns
> Date: Fri, 16 Mar 2012 13:47:02 -0800
> From: Ned Eliasen<ned.eliasen@kongsberg.com>
> To: pjohnson@ccom.unh.edu
> CC: Sandy Shor<shor@soest.hawaii.edu>
> 
> Paul,
> What is your spare situation on this board?
> What is the schedule when you get to Honolulu, are you stopping?
> If we need to send equipment to you will you be able to get it in Honolulu?
> 
> R/Ned
> 
> Inactive hide details for Paul Johnson -- 03/16/2012 02:32:28
> PM--We swapped the 3 and 4 DP16 PCB boards and the bad channels Paul
> Johnson
> -- 03/16/2012 02:32:28 PM--We swapped the 3 and 4 DP16 PCB
> boards and
> the bad channels moved with the boards. - Paul
> 
> From: Paul Johnson<pjohnson@ccom.unh.edu>
> To: Mark Rice<mark.rice@kongsberg.com>,
> Cc: Jonathan Beaudoin<jbeaudoin@ccom.unh.edu>, jhc@omg.unb.ca,
> Joyce
> Miller<joycemil@hawaii.edu>, jscottf@hawaii.edu, KM
> Hydrographic
> Support<km.hydrographic.support@kongsberg.com>, KM Support
> Lynnwood
> Mail-In<km.support.lynnwood@kongsberg.com>, Ned Eliasen
> <ned.eliasen@kongsberg.com>, "Alexander (Sandy) Shor"
> <shor@soest.hawaii.edu>, Brian Taylor<taylorb@hawaii.edu>
> Date: 03/16/2012 02:32 PM
Subject: Re: EM122 concerns

We swapped the 3 and 4 DP16 PCB boards and the bad channels moved with the boards. - Paul

On 3/16/12 9:52 AM, Mark Rice wrote:

Hello Paul,

You check the message service to determine the red light issue.

Best Regards,

Mark E. Rice
Export/QA / IT
Kongsberg Underwater Technology Inc.
19210 33rd Ave West Suite "A"
Lynnwood, WA. 98036
PH 425-712-1107
FX 425-712-1197

This e-mail message (including attachments, if any) is confidential and may be privileged. Any unauthorized distribution or disclosure is prohibited. Disclosure to anyone other than the intended recipient does not constitute waiver of privilege. If you have received this e-mail in error, please notify us and delete it and any attachments from your computer system and records.

AM---Hi Mark - We went down the quickest of the paths you mention

AM---Hi Mark - We went down the quickest of the paths you mentioned to start with, and

From: Paul Johnson <pjohnson@ccom.unh.edu>
To: Mark Rice <mark.rice@kongsberg.com>
Cc: Jonathan Beaudoin <jbeaudoin@ccom.unh.edu>, jhc@omg.unb.ca, Joyce Miller <joycemil@hawaii.edu>, _jscottf@hawaii.edu_
Hi Mark -

We went down the quickest of the paths you mentioned to start with, and that was changing the system from a 1x2 to a 1x4 system. Everything went smoothly, however, when we connected with the TRU through SIS we now have a red light on SH Status, is that normal for the steps we did? We can still collect data, which we are doing now and will send off soon. - Paul

On 3/16/12 7:31 AM, Mark Rice wrote:

Hello Paul,

One thing I don't think we tried and might be the cause of the two bad staves is the internal pre amp wiring or the DP16 board itself. You have 4 DP16 PCB's in the pre amp, they are located from left to right, the far left one is number 1. The last four are blank plates. Can you swap DP16 number 3 and 4 in the pre amp? Then check the stave display to see if the bad channels moved.

I would like you to change your system to a 1 X 4 deg system in SIS. This will let us use just the 4 middle hydrophones. See if that make any difference. Now we will change the system.ini file to a 1 X 4 deg system. Under /program files/kongsberg
trusetup.jar  Use this program to edit the system.ini file to read 1 X 4.
Doing this will let us use only the first 4 hydrophones. Check to see if this make a difference. If not return both setting back to a 1 X 2.
With regards to the data distribution, it looks like there is a limit on how many outputs you can have so we will skin this fish a different way. You currently use a different data distribution to output center beam depth, I would like to try using this program to distribute the datagrams. In SIS installation menu under user defined datagrams select the datagrams you want out putted. You will notice a port number on the same page, this is the number you will use on the new datagram distribution program usually (16103). Create a new entry for each different IP and port address you are using. Follow the format from the center beam depth entry.
You can swap receiver cards or put in your spare.

Best Regards,

Mark E. Rice
Export/QA / IT
Kongsberg Underwater Technology Inc.
19210 33rd Ave West Suite "A"
Lynnwood, WA.  98036
PH 425-712-1107
FX 425-712-1197

This e-mail message (including attachments, if any) is confidential and may be privileged. Any distribution or disclosure is prohibited. Disclosure to anyone other than the intended recipient does not constitute waiver of privilege. If you have received this e-mail in error, please notify us and delete it and any attachments from your computer system and records.

PM---All - The cable that had been identified as
All -

The cable that had been identified as being potentially suspect by Mark was rung out, and it checked out fine. After reconnecting it back to the PU the 2 dead staves remained. We are wondering how the 2 dead staves relate to the RX32 boards.

We had earlier identified that RX32 board 2 showed spikes at certain frequency from the data pulled out of the BIST.

Jonathan and I ran a series of BIST tests last night with the ADCP on and off (this was to explore potential acoustic noise sources on the ship). RX board 2 consistently showed frequency dependent spikes in it (irregardless of the status of the ADCP).
We are wondering if it would be worth either swapping the 2 RX board to see if the problem moves with the board, or else replace one of them with our 1 spare. The data and plots for the BISTs can be found on the ftp site in the NoiseAnalysis folder. - Paul

On 3/15/12 1:37 PM, Mark Rice wrote:

Thanks Paul,

We are reviewing the data.

Best Regards,

Mark E. Rice
Export/QA / IT
Kongsberg Underwater Technology Inc.
19210 33rd Ave West Suite "A"
Lynnwood, WA. 98036
PH 425-712-1107
FX 425-712-1197

This e-mail message (including attachments, if any) is confidential and may be privileged. Any unauthorized distribution or disclosure is prohibited. Disclosure to anyone other than the intended recipient does not constitute waiver of privilege. If you have received this e-mail in error, please notify us and delete it and any attachments from your computer system and records.

03/15/2012 01:31:05 PM---Sorry been trying to get some screen shots off the ship, but Paul Johnson ---03/15/2012 01:31:05 PM---Sorry been trying to get some screen shots off the ship, but the internet has been really really slow
Date: 03/15/2012 01:31 PM
Subject: Re: EM122 concerns

---

Sorry been trying to get some screen shots off
the ship, but
the internet has been really really slow. Just
verified and
it is set to 1 x 2 deg. We captured screen shots
for one
beam trace for every sector. These shots are now
available
on the ftp site in 150deg_sector . - Paul

On 3/15/12 10:49 AM, Mark Rice wrote:

Hello Paul,

Can we get a couple more scope displays with
increasing
beam numbers. Beam 1 was two far out and did
not get
beam formed in the image sent. We would also
like to
see both sides of the swath.

Can you verify the the system is still set to
1 X 2 deg?

Thanks.

Best Regards,

Mark E. Rice
Export/QA / IT
Paul Johnson ---03/15/2012 10:30:56 AM---

just replaced the scope display figures in the ftp directory

with a new shot of the whole interf

From: Paul Johnson <pjohnson@ccom.unh.edu>
To: Mark Rice <mark.rice@kongsberg.com>,
K M Hydrographic Support
jscottf@hawaii.edu <mailto:jscottf@hawaii.edu>, KM
<mailto:km.hydrographic.support@kongsberg.com>, Jonathan
Beaudoin <mailto:jbeaudoin@ccom.unh.edu>, Joyce Miller
N ed Eliasen <mailto:ned.eliasen@kongsberg.com>,
"Alexander (Sandy) Sh or" <mailto:shor@soest.hawaii.edu>,
Brian Taylor
<mailto:taylorb@hawaii.edu>, KM
Support Lynnwood Mail-In
<mailto:km.support.lynnwood@kongsberg.com>
Date: 03/15/2012 10:30 AM
Subject: Re: EM122 concerns

--------------------------------------------------------------
----------

You just replaced the scope display figures in the ftp directory with a new shot of the whole interf.
We just replaced the scope display figures in the ftp directory with a new shot of the whole the scope display and water column display (EM122_031512_Beam1_75degrees.PNG). For this manually defined the swath to be 75 degrees.

- Paul

On 3/15/12 8:04 AM, Mark Rice wrote:

Hello Scott,

Thanks for the feedback.

Norway and Lynnwood are looking into the and so far we don’t see the smoking gun.

currently working to verify the
correct on the RX array. I have no

it’s wrong, but need to cover all the

Can you send a screen grab on the stave display?

Looking at the spectral noise graph
downward spikes are our bad RX channels.

had a chance to look at the faulty cable?

We would also like several screen grabs
display, selecting beam numbers on the

the port and starboard swath.

Best Regards,

Mark E. Rice
Export/QA / IT
Kongsberg Underwater Technology Inc.
19210 33rd Ave West Suite "A"
Lynnwood, WA. 98036
PH 425-712-1107
FX 425-712-1197

This e-mail message (including any) is confidential and may be
privileged. Any unauthorized distribution or
disclosure is prohibited. Disclosure to anyone
other than the intended recipient does not
constitute waiver of privilege. If you have received this
e-mail in error, please notify us and delete it
and any attachments from your computer system
and records.

04:22:18
PM—Mark, We are preparing a bundle of data that
summarizes what we have seen since
From: "J. Scott Ferguson"

To: Mark Rice
Cc: KM Hydrographic Support

Jonathan Beaudoin
Joyce Miller
Ned Eliasen
Paul Johnson
"Alexander (Sandy) Shor"
Brian Taylor

KM Support Lynnwood Mail-In

Date: 03/14/2012 04:22 PM
Subject: Re: EM122 concerns

--------------------------------------------------------------
----------
Mark,

We are preparing a bundle of data that summarizes what we have seen since leaving the river and will provide a link to those data once complete. We cannot stop the ship at this point due to schedule and heavy seas but may be able to do so closer to Hawaii. The datagram subscription problem is apparently new and we have not figured out a workaround. Can you please query Norway about that as well? I also have no history of the SV problem on the 1002. We have a workaround but report our findings.

We were running both the 38 kHz and 300 kHz ADCPs and could see what we believe to be the 38 kHz transmissions in the 710. Until we got into deep water (1000m) the ACDP interference showed up primarily in the watercolumn with little bathymetric expression. As we got deeper obvious bathymetric artifacts. We ran these sonars in an effort to characterize interference problems during the run downslope in Oregon. We will not run them as we reach shallow water in Hawaii. We did not see any sign of interference in the 122 data including the water column.

thanks,
Scott

On Wed, Mar 14, 2012 at 12:51 PM, Mark Rice wrote:

As you mention in 7 to 20 meters of
water your
from the
the look of
RX noise
data set
settings? Are you
including the 710)
to see how
the 122.
subscription
issue only
on the EM1002?
>
>
>
>
>
>
>
>
>
>
>
>
>
>
>
>
>
>
>
>
>
>
>
>
>
>
>
>
>
>
>
>
>
>
>
>
>
>
>
>
>
>
>
>
>
>
>
>
>
>
>
>
>
>
>
>
>
>
>
>
>
>
>
>
>
>
>
>
>
>
>
>
>
>
>
>
>
>
>
>
>
>
>
>
>
>
>
>
>
>
>
>
>
>
>
>
>
>
>
>
>
>
>
>
>
>
>
>
>
>
>
>
>
>
>
>
>
>
>
>
>
>
>
>
>
>
>
>
>
>
>
>
>
>
>
>
>
>
>
>
>
>
>
>
>
>
>
>
>
>
>
>
>
>
>

not going to get good reliable data
EM122, but I'm a little puzzled by
the data in deeper water. The BIST
test is not to high. A small RAW.all
might help us pin the issue down.
What are your current filter
running any other sonars (not
Can you stop the ship for a moment
that might effect the data?
Perhaps Norway can shed some light on
I have not run across the datagram
problems and SV issues. Is the SV
happening on the 710? Did you see it

Best Regards,

Mark E. Rice
Export/QA / IT
Kongsberg Underwater Technology
Inc.
19210 33rd Ave West Suite "A"
Lynnwood, WA. 98036
PH _425-712-1107_<tel:425-712-
FX _425-712-1197_<tel:425-712-

This e-mail message (including
if any) is confidential and may
privileged. Any unauthorized
disclosure is prohibited.
anyone other than the intended
does not constitute waiver of
you have received this e-mail in
please notify us and delete it
Ned and Mark,

We crossed the Columbia River bar at about 1900 today and are now headed downslope. The EM710 is working quite well (see attached screen grab, EM710_20120314) but we are having problems with the EM122. We've had a number of problems getting the sonar to operate in shallow water (7 to 20 m) and restarted both the TRU...
and the SIS software several times. Still we weren't too concerned until the ship headed downslope.

Now that we're in deeper water (250 to 1000 m so far) the EM122 data is significantly noisier than the EM710 with a correspondingly reduced swath width. Compare the "EM122_noise" screen grab taken include a BIST with one of screen water (the 710 is but is EM122 barely 1x water EM710 swath recommendations on how to and datagrams on

Anytime we the error "No persisted for system this error? noticed

software several times. Still we weren't too concerned until the ship headed downslope.

Now that we're in deeper water (250 to 1000 m so far) the EM122 data is significantly noisier than the EM710 with a correspondingly reduced swath width. Compare the "EM122_noise" screen grab taken include a BIST with one of screen water (the 710 is but is EM122 barely 1x water EM710 swath recommendations on how to and datagrams on

Anytime we the error "No persisted for system this error? noticed

WE also have some ancillary problems and observations as follows:

1. We are unable to subscribe to the EM122 (see EM122-Datagram-subscription-error). subscribe to a new datagram we get echosounder selected". This has at least a day and across several restarts. Do you know how to resolve

2. When starting up the EM710 SIS, we
that the "SV Used" field was 1500 m/s, sensor and profile values were obviously different. We launched the Runtime Parameters dialog to investigate if the sound speed source for beam to Runtime Parameters dialog, the error dialog acknowledged "SV Used" by clicking the "Okay" button, the value returned to a reasonable value. In a few other instances, it did not return to a reasonable value and we had to toggle the sound speed source from "sensor" to "manual" and back to "sensor" to get the "SV used" field back to something reasonable. Thus, we have a work around but we wanted to let you know of the problem.

Thanks very much,
Scott

--

J. Scott Ferguson
Director of Marine Technical Services
School of Ocean and Earth Sciences
University of Hawaii Marine Center

jscottf@hawaii.edu  (808) 349-2750
(tel:+18088323081)
(cellular, voice or text)
jscottf@hawaii.edu  (808) 832-3081
(tel:+18088323081) (office)

[attachment "BIST_13Mar2012_EM122.txt" deleted]