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KONGSBERG

Service Report

CUSTOMER: WHOI	**VESSEL/FACTORY/SITE:** Neil Armstrong	**DATE:** February, 3rd – 18th 2016
LOCATION: Charleston, SC	**ENGINEER:** Tony Dahlheim	**SERIAL/FILE No:**
WORKORDER / PO: SO00058S-INSTALL, HAT & SAT	**ACCOUNT/PROJECT No:**	**CONTRACT No:**

EQUIPMENT DELIVERED/INSTALLED/REPLACED.

These PCB'S are sent back to KUTI

QTY	Part Desc.	Part No.	Serial No.	Comments.
1	EM122BSP RIO	316694C	721567	Faulty no trig out
1	DP16 Preamp	308085 B	720901	Five channels faulty
1	DP16 Preamp	308085 B	7209092	One channel faulty

These PCB's were replaced and installed

QTY	Part Desc.	Part No.	Serial No.	Comments.
1	EM122BSP RIO	316694C	730478	Replaced/Installed
1	DP16 Preamp	308085 D	725906	Replaced/Installed
1	DP16 Preamp	308085 D	725911	Replaced/Installed

1. Main Purpose of Visit.

Finish Installation of EM710, EM122, EK80, and HiPAP gantry. Perform HAT and SAT on EM710, EM122, and EK80. Have HiPAP gantry installation CAT performed.

2. Technical Report.

February 3rd – 9th.

- Set limit switches on Gate valve on HiPAP Gantry. Tested system and found system is working as expected. The remote control box for gantry system for hoist control is working. The only part malfunctioning is the LED on the control box at bridge for hoist in the up position. Customer signed off on CAT on HiPAP gantry system with gate valve.

- Wired SSVS pump system to SSVS junction box. Found that pump has locked up. Took pump apart and found impeller has been bent. Adjusted impeller back into place and hooked pump back up to piping and SSVS junction box. Tested system locally and all operations including flow are working at this time.

  Tested SSVS system from computer lab using the SSVS control box and confirmed the operation and flow are working at this time.

  Setup surface sound speed probe and confirmed it is setup correctly and data is being inputted into the EM710 and EM122 systems.

- Installed current versions of software on the EM122, EM710, and EK80. Both EM122 and EM710 are running SIS version 3.4.1 and EK80 running 1.8.2. EK80 software updated after HAT to 1.8.3.

- Setup the K-Sync for the EM122, EM710, and EK80. Found that EM710 and EK80 working with K-Sync. During troubleshooting with the EM122 found that the BSP RIO not working trig out function faulty. Also during this time found that two DP16 cards on the preamp have faulty channels, one with five faulty channels and the other has one faulty channel. Replaced all of these cards with shipment from KUTI. Tested system again with K-Sync and all systems are working. Both preamp DP16 boards were replaced on the EM122 preamp. EM122 operating as expected.

- Performed HAT on each system EM122, EM710, EK80, and HiPAP Gantry CAT. All documents have been signed, accepted and taken by Aaron Berry KUTI PM back to office for our records.

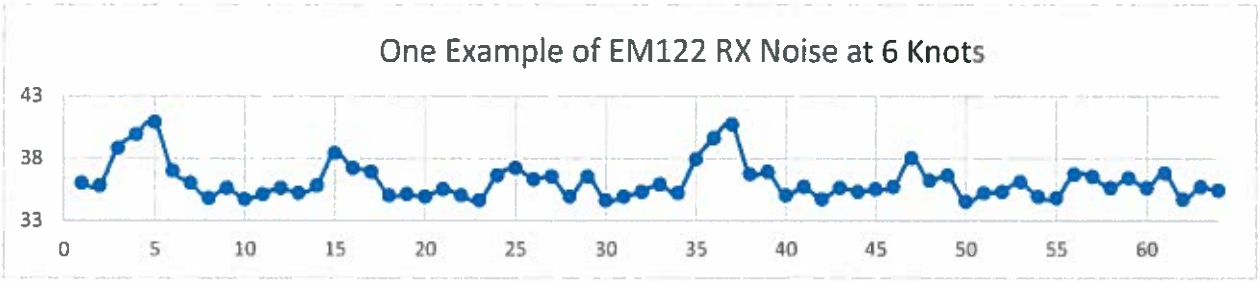
February 10th 2016.

- Heading out to sea testing systems as we head to patch test area. Found that CNAV system is the primary input into EM122, EM710, and EK80. It was discussed to change this by inputting the CNAV into the POS/MV and have the POS/MV output to position, attitude, 1PPS, att velocity to the EM122 and EM710.

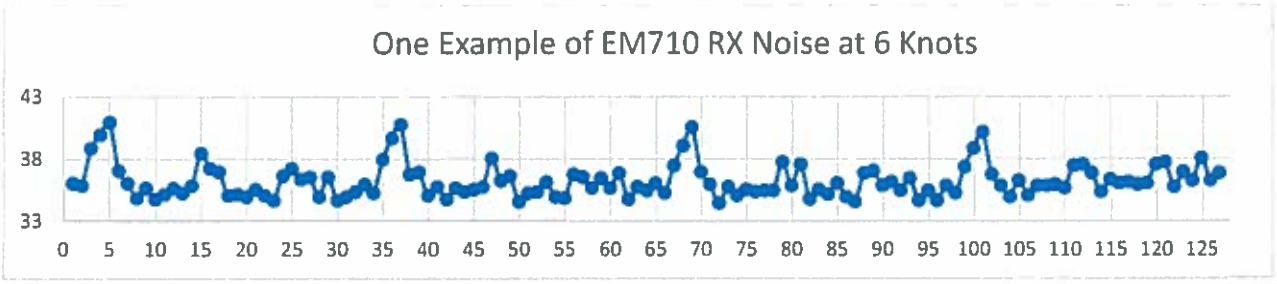
  This change was done and now the EM systems are receiving this information from the POS/MV. No offsets have to be entered into SIS for the CNAV antenna location. The POS/MV will handle all lever arm locations for the antennas and IMU to the reference block. SIS will handle all transducer offsets referenced to the reference block.

February 11th – 12th 2016.

- Noise tests performed in approximately 2000 meters of water starting at 2 knots increase by two knots until full speed at 12 knots. Results recorded on EM122 and EM710 computers also recorded in SAT documents for the EM122 and EM710.

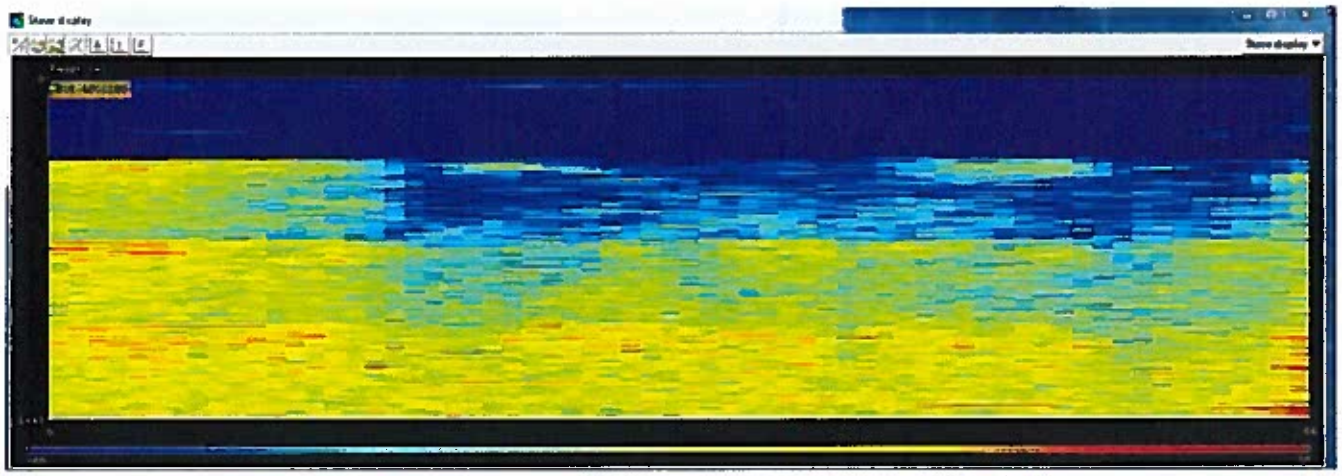


(X = dB, Y = stave number)



(X = dB, Y = stave number)

- At high sea states and heading dependent, the EM122 and the EM710 will have aeration over the EM122 and EM710 TX and RX array as seen below in the stave display of the EM122.

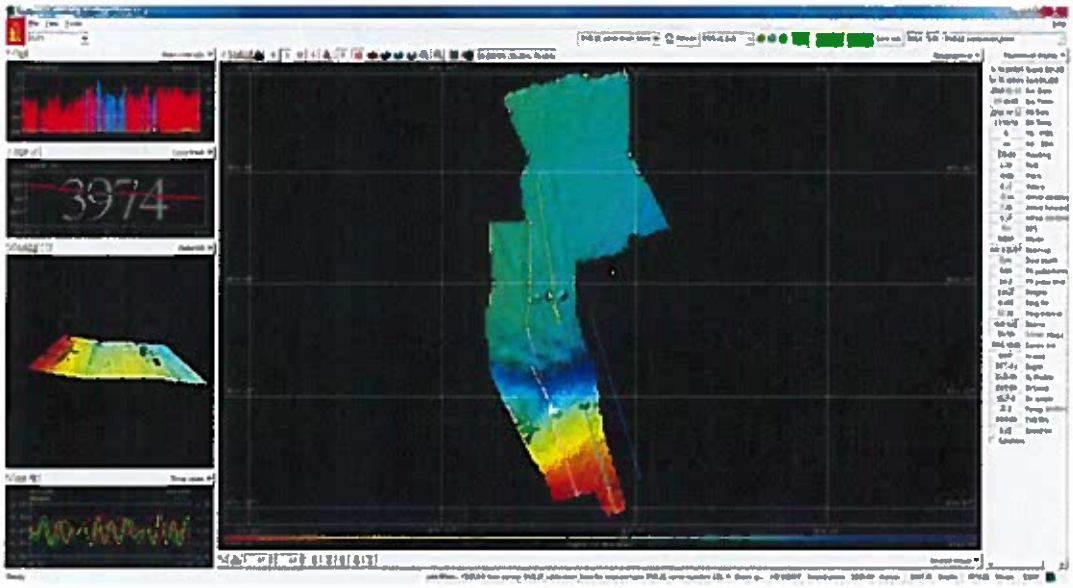


(Stave display showing aeration over EM122 RX array)

- Calibration lines run for the EM122 for latency, pitch, roll, and heading. Table below are the angular offsets found after calibration of the EM122 system and offset numbers entered into SIS under Installation -> Sensor Setup -> Angular Offsets -> Attitude 1, COM2/UDP5. Latency was found to be zero.

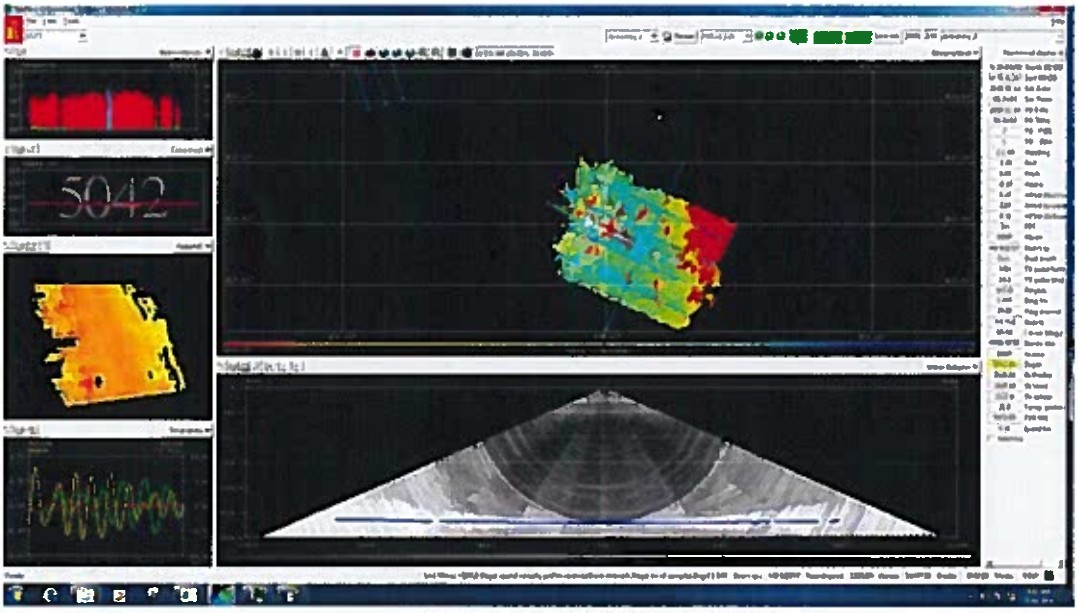
EM122 Angular Offsets

Roll	Pitch	Heading
0.01	-0.05	-1.2



(EM122 Calibration area)

- Accuracy Survey run for the EM122 with data being collected for further evaluation of the EM122 Multibeam system. Due to 7ft – 14ft seas again, data being collected by the EM122 is only good in one direction, following seas. Against the seas, the aeration over the arrays is so severe that the EM122 cannot track bottom.



(EM122 Accuracy Area)

- Due to weather forecast with seas increasing to 7-14ft and the allotted time for testing the other systems aboard the vessel, the EK80 calibration SAT will be deferred to another date. The beginning of April 2016 when the vessel will be at the WHOI dock or the earliest convenient date to complete the EK80 SAT is requested by Kongsberg.

February 13th 2016.

- Finished EM122 accuracy survey with all lines collecting data in one direction. Also not able to make cross line over accuracy lines due to bad data being collected by the EM122 in that direction. An additional line was run in the middle of the accuracy lines for the analysis of accuracy area that will be performed by Paul Johnson from CCOM UNH.

- As of right now the EM710, EM122, EK80, ADCP 150, ADCP 38, and Knudsen are connected to the K-Sync. Below I have **examples** on how to connect the ADCP's and Knudsen. ***Please refer to manuals from manufactures before connecting to K-Sync. Also, consult third party manufactures for details on synchronizing their systems.*** After testing the K-Sync system, only one system not sending out a trig out reply is the ADCP 38. Customer needs to follow up on wiring through ship to K-Sync and confirm the trig out on ADCP 38 deck box is working.

Sync OS 38			
Cable	K-Sync pin block 5	K-sync option	Software settings
Center OUT	1 (trig out)	TTL, 4,7 kOhm, pull down	O 03, Active high
Screen OUT	2 (gnd		
Center IN	4 (trig in)	TTL, 4,7 kOhm, pull down	I 10, Active high
Screen IN	5 (gnd)		
			Rising Edge

Sync OS 150			
Cable	K-Sync pin block 5	K-sync option	Software settings
Center OUT	1 (trig out)	TTL, 4,7 kOhm, pull down	O 04, Active high
Screen OUT	2 (gnd		
Center IN	4 (trig in)	TTL, 4,7 kOhm, pull down	I 13, Active high
Screen IN	5 (gnd)		
			Rising Edge

Sync Knudsen			
Cable	K-Sync pin block 5	K-sync option	Software settings
Center OUT	1 (trig out)	TTL, 10 kOhm, pull down	O 05, Active high
Screen OUT	2 (gnd		
Center IN	4 (trig in)	TTL, 10 kOhm, pull down	I 16, Active High
Screen IN	5 (gnd)		
			Rising edge

February 14th - 15th 2016

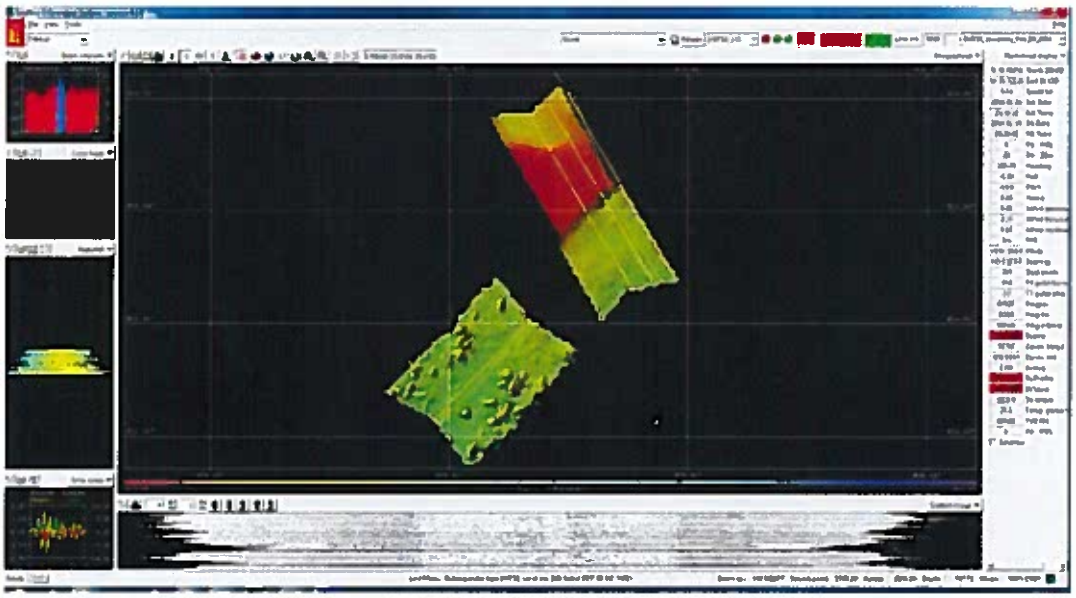
- Gate valve opened and gantry pole lowered by bridge. Sonardyne testing completed and transponder release and brought aboard vessel. Gantry pole raised and gate valve closed.

- Transit to EM710 calibration area. On the way filled out noise and sea conditions performance assessments in the SAT documents for EM710 and EM122.

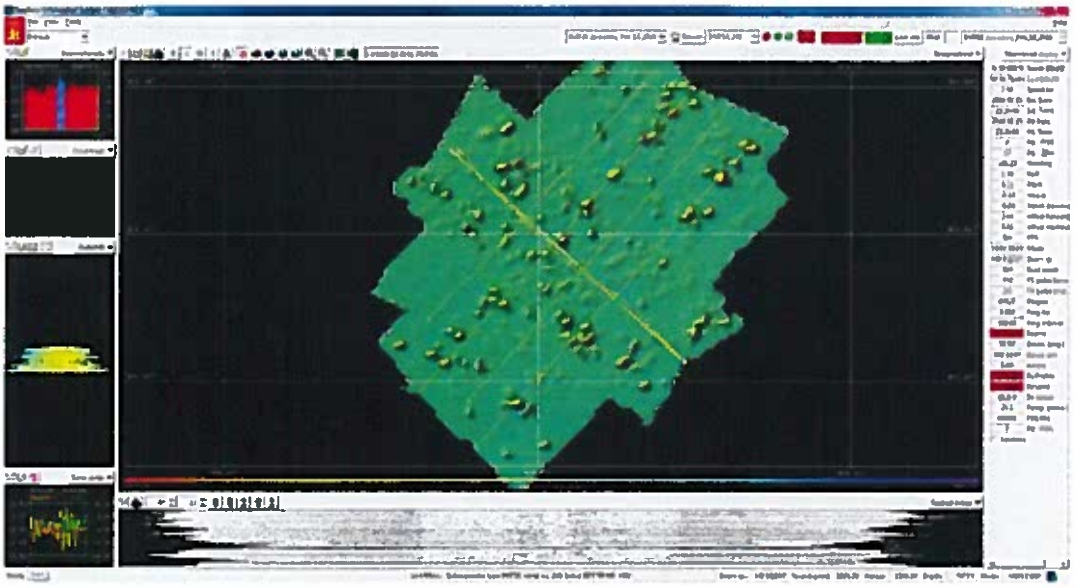
- Executed calibration lines for the EM710 at calibration site for roll, pitch, heading, and latency. Once finished with calibration site entered the offset numbers into SIS under Installation -> Sensor Setup -> Angular Offsets -> Attitude 1, COM2/UDP5. Latency was found to be zero. Performed the accuracy survey for the EM710. Below are the findings for angular offsets for the EM710 calibration. Additional screen shots of EM710 calibration site and accuracy survey site below.

EM710 Angular Offsets

Roll	Pitch	Heading
0.03	0.05	-1.2



(EM710 Calibration Site)



(EM710 Accuracy Site)

February 16 2016.

- ADCP testing throughout the day and additional testing of the EM122, EM710, and K-Sync.
- Finishing report on WHOI Neil Armstrong.
- SAT for EM122 and EM710 signed by customer.

February 17th 2016.

- Return to port in Charleston, SC.

February 18th 2016.

- Travel from Charleston, SC to Seattle, WA.

3. Software Details.

SOFTWARE	VERSIONS
EM122	3.4.1
EM710	3.4.1
EK80	1.8.3

4. Concerns/Remarks.

Remarks:

- Due to weather conditions and high seas, the EK80 calibration will have to be done at later date. Leaving calibration kit for the EK80 aboard the Neil Armstrong for future calibration.
- Within SIS, request datagrams from EM and MDM 400 not working correctly sending out datagrams. Sent email to Norway about this issue and still waiting for response and fix.
- Due to the poor weather conditions, calibrating the EM122 and EM710 was successful. Kongsberg is confident that the angular offset numbers entered into SIS for each system are correct. Accuracy surveys for the EM122 and EM710 are within limits of each system taken into account the weather conditions of high seas and planning of accuracy survey lines. These surveys will be evaluated by CCOM UNH for the Neil Armstrong.

5. Time Sheet.

DAY	PLACE: PORT-ONSHORE, OFFSHORE, TRAVEL	ACTIVITIES	HOURS
02/03/2016	Travel	Seattle, WA to Charleston, SC	8
02/04/2016	Port-Onshore	Continued installation on Neil Armstrong	10
02/05/2016	Port-Onshore	Continued installation on Neil Armstrong	10
02/06/2016	Port-Onshore	Continued installation on Neil Armstrong	10
02/07/2016	Port-Onshore	Continued installation on Neil Armstrong	10
02/08/2016	Port-Onshore	Continued installation on Neil Armstrong	10
02/09/2016	Port-Onshore	HAT and CAT documents completed	10
02/10/2016	Offshore	SAT, EM122 and EM710	12
02/11/2016	Offshore	SAT, EM122 and EM710	12
02/12/2016	Offshore	SAT, EM122 and EM710	12
02/13/2016	Offshore	SAT, EM122 and EM710	12
02/14/2016	Offshore	SAT, EM122 and EM710	12
02/15/2016	Offshore	SAT, EM122 and EM710	12
02/16/2016	Offshore	SAT, EM122 and EM710	12
02/17/2016	Offshore	SAT, EM122 and EM710	12
02/18/2016	Travel	Charleston, SC to Seattle, WA	8

6. Signatures.

DATE:	*KM Representitive signature:*	*Work Accepted on behalf of Customer signature:*
16 Feb 2016	Tony Dahlheim	
	Printed:Tony Dahlheim	*Printed:* Amy Simoneau