

# EM122 RX data rejected for outer sectors of swath 2

## Context

Julianna Diehl alerted MAC on 2021/10/26 to feedback from PI (below) about intermittent missing starboard coverage on an EM122 in the UNOLS fleet, appearing to occur only for the second swath in dual-swath mode:

*“The short of it is that on every other ping the starboard side crosstrack is short. It appears to end abruptly at the edge of a sector, about 3000 to 4000 meters or so out from nadir, depending on water depth. In this case the full swath length would be 7000-8000 m on either side, 14-16 km+ total. It is not especially obvious on the SIS display at survey speed of 6 kt or so, but is quite apparent at transit speed and in any crosstrack editor.*

*While at the study site, this behavior would toggle on and off for no obvious reason, sometimes within a single file. On the transit home I began processing some of their data in the last (new) area we visited that has no MBES coverage and I continued to experiment with SIS settings on the way back. If you turn dual swath off, you get a full swath every ping. We ran a BIST diagnostic and it was all OK. The system had been completely restarted a number of times during the trip, so that's not it, and it's not simply a SIS display thing.”*

## Symptoms

See examples of symptoms on the following pages.

## Solution

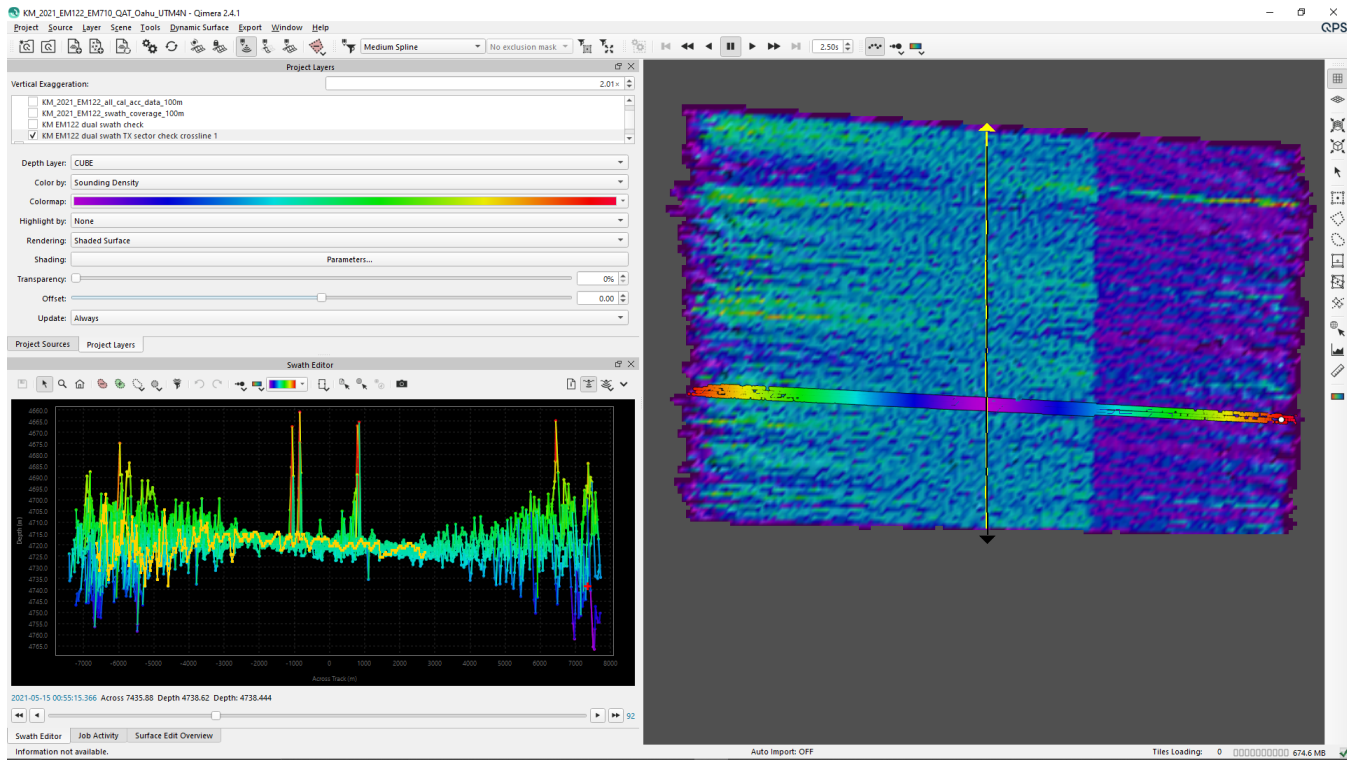
Diehl worked with Kongsberg technical support and replaced the EM122's two RX boards and BSP board with spares.

# Reduced sounding density (view in Qimera)

Looking through 2021 QAT data in June, this was evident at that time as well

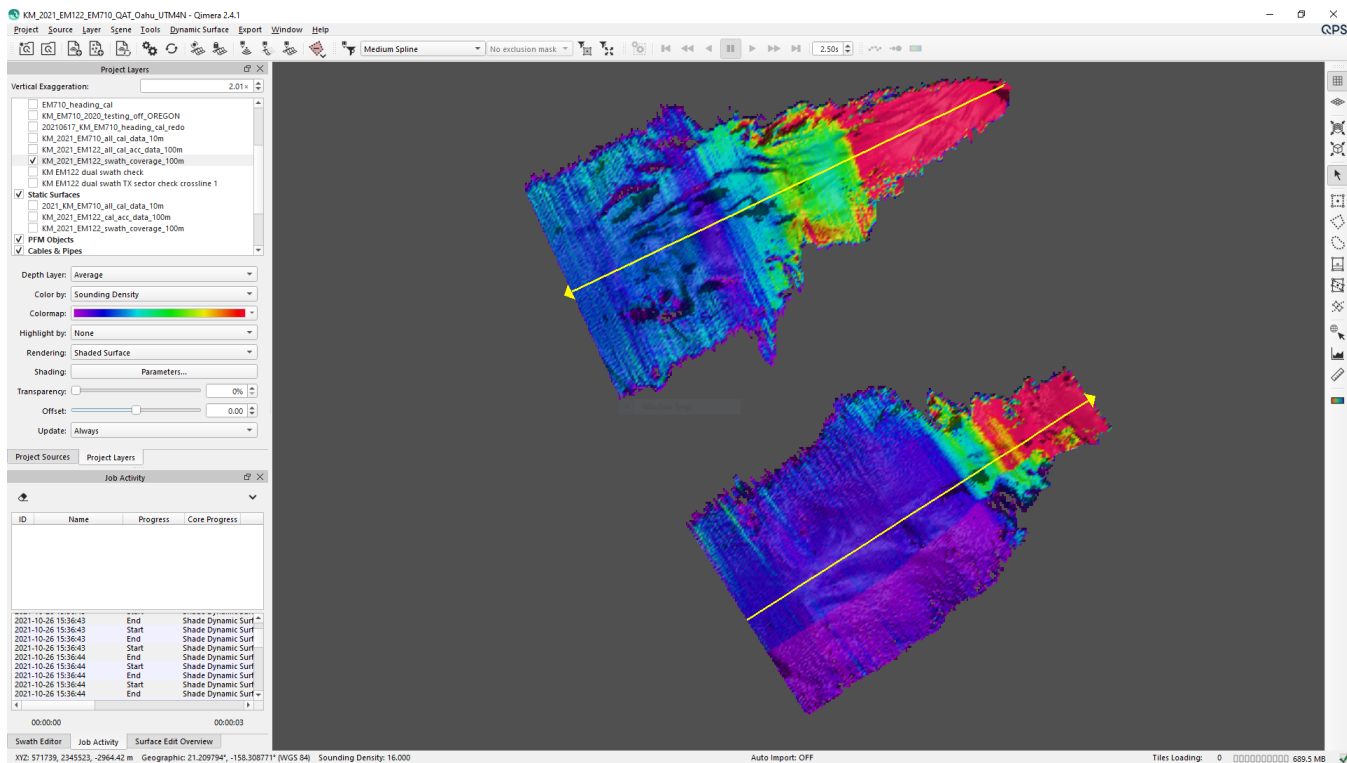
Lower left: coverage (yellow line in swath editor) is cut off on starboard side for every other swath

Right: sounding density for an accuracy crossline shows reduced density in dual-swath mode



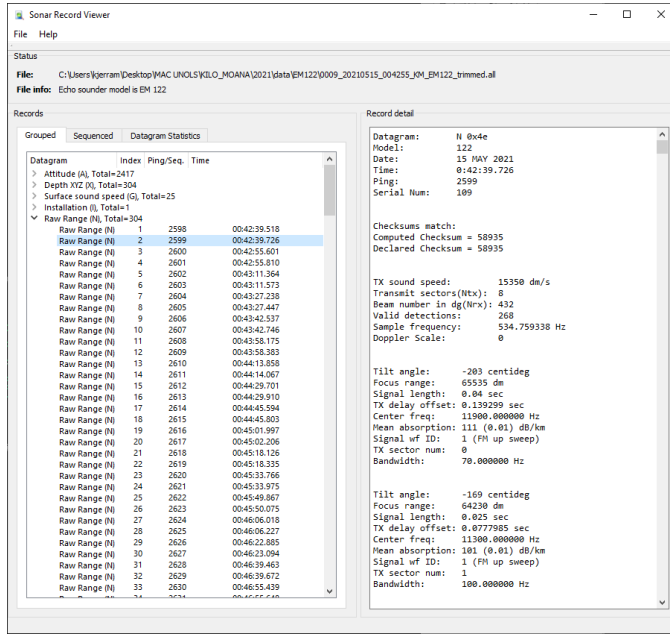
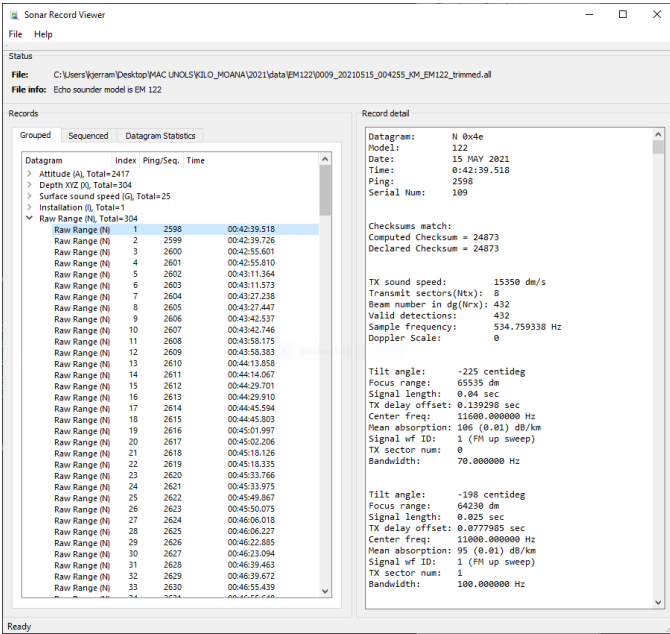
# Intermittent / unpredictable occurrence

This appears to have affected files after reaching deep water during the 2021 QAT; the outbound transit file (0001) shows consistent across-track density while moving from shallow to deep, but the inbound transit file (0012) shows the reduced density on the starboard side, with swath 2 failing to report any RX detections beyond ~20-30 deg (variable)



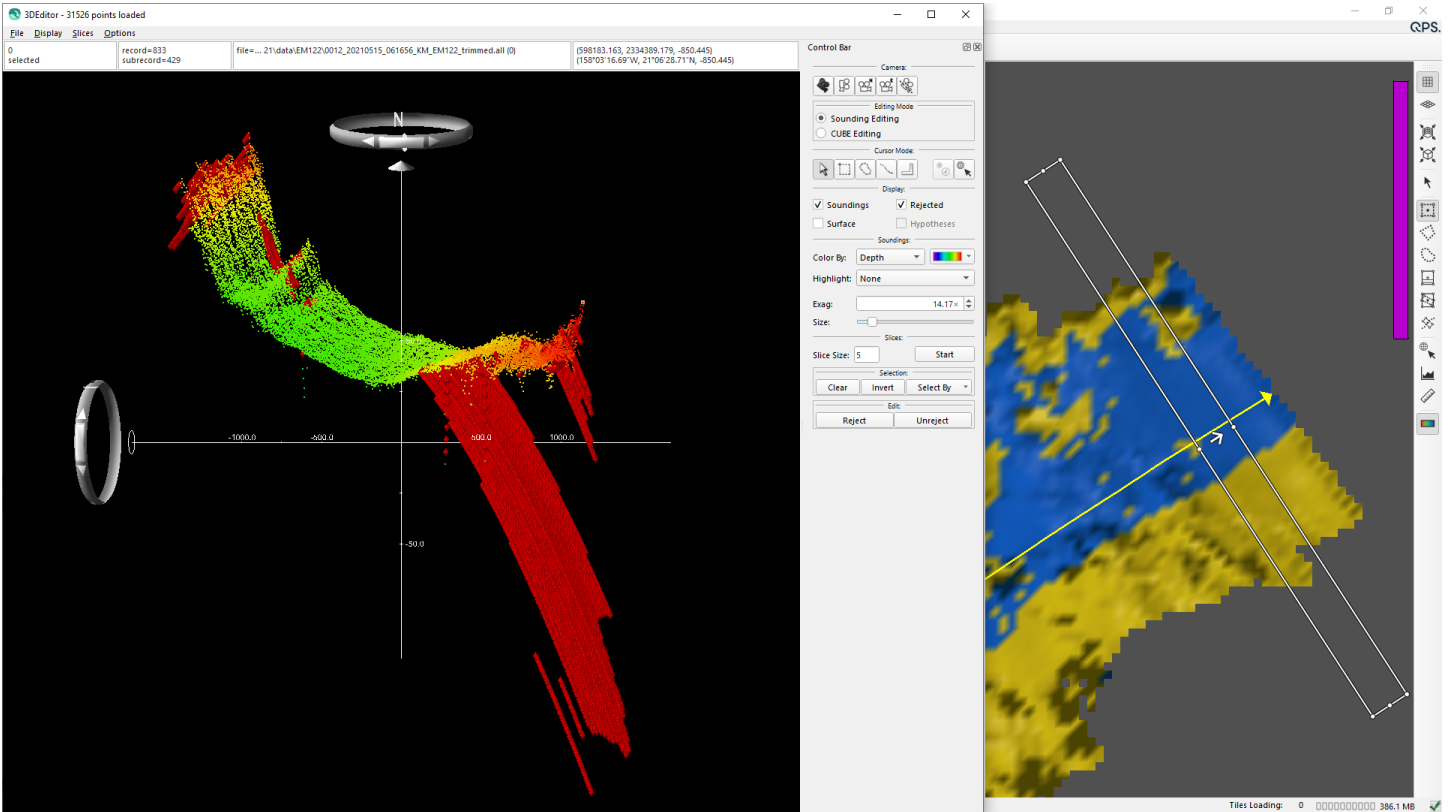
# Affects Swath 2

In file 0009 (a crossline example), Sonar Record Viewer shows 432 RX detections for swath 1 and 268 for swath 2 in a given dual-swath ping cycle



# Rejected / interpolated soundings with very low reflectivity

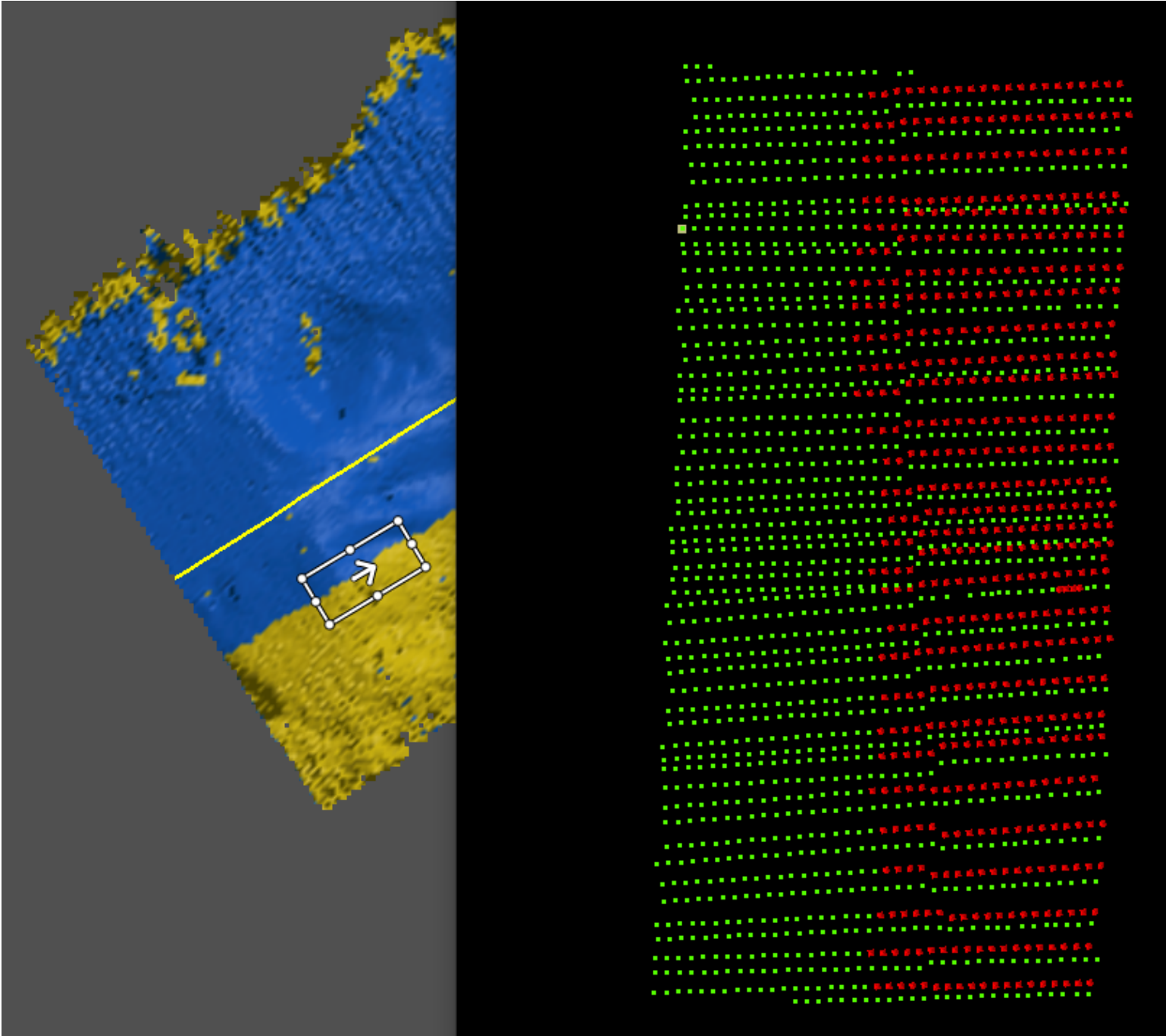
These show up as 'interpolated soundings' with very low reflectivity values (Sonar Record Viewer) and are assigned rejected flags, as shown in Qimera



Not associated directly with a TX Sector boundary

For swath 2, the rejected starboard RX beams do not appear to be associated with the TX sector boundary

This top-down view of valid (green) and rejected (red) soundings shows that the rejection starts inside a TX sector, based on the sector boundary (e.g., visible from yaw stabilization), in agreement with Sonar Record Viewer



For instance, in file 0009, swath 2, the transition from TX sector 4 to 5 happens at RX beam index 264

1. TX sector 5 is associated with valid RX beams out to index 294 (rejections start with RX index 295), meaning there are ~30 valid RX detections associated with TX sector 5
2. Rejected beams continue through 431, all with very low reflectivity ( $< -100$  dB)
3. Rejected beams are labeled “Interpolated detections” which may cause the curvature seen in Qimera

Status

**File:** C:\Users\kjerram\Desktop\MAC UNOLS\KILO\_MOANA\2021\data\EM122\0009\_20210515\_004255\_KM\_EM122\_trimmed.all  
**File info:** Echo sounder model is EM 122

Records

Grouped **Sequenced** Datagram Statistics

Datagram	Index	Ping/Seq.	Time
> Attitude (A), Total=2417			
> Depth XYZ (X), Total=304			
> Surface sound speed (G), Total=25			
> Installation (I), Total=1			
▼ Raw Range (N), Total=304			
Raw Range (N)	1	2598	00:42:39.518
Raw Range (N)	2	2599	00:42:39.726
Raw Range (N)	3	2600	00:42:55.601
Raw Range (N)	4	2601	00:42:55.810
Raw Range (N)	5	2602	00:43:11.364
Raw Range (N)	6	2603	00:43:11.573
Raw Range (N)	7	2604	00:43:27.238
Raw Range (N)	8	2605	00:43:27.447
Raw Range (N)	9	2606	00:43:42.537
Raw Range (N)	10	2607	00:43:42.746
Raw Range (N)	11	2608	00:43:58.175
Raw Range (N)	12	2609	00:43:58.383
Raw Range (N)	13	2610	00:44:13.858
Raw Range (N)	14	2611	00:44:14.067
Raw Range (N)	15	2612	00:44:29.701
Raw Range (N)	16	2613	00:44:29.910
Raw Range (N)	17	2614	00:44:45.594
Raw Range (N)	18	2615	00:44:45.803
Raw Range (N)	19	2616	00:45:01.997
Raw Range (N)	20	2617	00:45:02.206
Raw Range (N)	21	2618	00:45:18.126
Raw Range (N)	22	2619	00:45:18.335
Raw Range (N)	23	2620	00:45:33.766
Raw Range (N)	24	2621	00:45:33.975
Raw Range (N)	25	2622	00:45:49.867
Raw Range (N)	26	2623	00:45:50.075
Raw Range (N)	27	2624	00:46:06.018
Raw Range (N)	28	2625	00:46:06.227
Raw Range (N)	29	2626	00:46:22.885
Raw Range (N)	30	2627	00:46:23.094
Raw Range (N)	31	2628	00:46:39.463
Raw Range (N)	32	2629	00:46:39.672
Raw Range (N)	33	2630	00:46:55.439
Raw Range (N)	34	2631	00:46:55.648
Raw Range (N)	35	2632	00:47:11.108
Raw Range (N)	36	2633	00:47:11.316
Raw Range (N)	37	2634	00:47:27.509
Raw Range (N)	38	2635	00:47:27.718
Raw Range (N)	39	2636	00:47:43.635

Record detail

Beam index: 294  
 Pointing angle: -2760 centideg  
 TX sector num: 5  
 Detection info: 0x01

Valid Detection: Phase detect  
 Reflectivity correction: Not compensated

Det. Window: 168 samples  
 Quality factor: 2  
 Doppler Correction: 0  
 Two way travel time: 7.11191 sec  
 Reflectivity: -322 (0.1)dB  
 Real time clean info:0x00

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Beam index: 295  
 Pointing angle: -2795 centideg  
 TX sector num: 5  
 Detection info: 0x81

Invalid Detection: Interpolated detection  
 Reflectivity correction: Not compensated

Det. Window: 146 samples  
 Quality factor: 3  
 Doppler Correction: 0  
 Two way travel time: 7.13586 sec  
 Reflectivity: -1038 (0.1)dB  
 Real time clean info:0x00

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Beam index: 296  
 Pointing angle: -2829 centideg  
 TX sector num: 5  
 Detection info: 0x81

Invalid Detection: Interpolated detection  
 Reflectivity correction: Not compensated

Det. Window: 150 samples  
 Quality factor: 2  
 Doppler Correction: 0  
 Two way travel time: 7.16007 sec  
 Reflectivity: -1039 (0.1)dB  
 Real time clean info:0x00