PNOTS

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ISSUE	*DATE*	*Change Notice*	*AFFECTED PARAGRAPH.*	*CHANGE DESCRIPTION*
1	11/05/2020	Characterization Plan	-	Initial Issue
2	01/07/2020	Initial Report	7, 8, 9	Added ST Report, WS Report and Working Progress
3	24/07/2020	Final Report	5, 7, 8, 9	Timeline updated Added Product Summary Tables Updated ST Characterization Updated WS Characterization Changed Section 9 Work in Progress by Next Steps

3.1	01/10/2020	Updated Final Report	8, 8.1.1, 8.1.2	Updated WS Az & Range Resolution

TABLE OF CONTENTS

1. INTRODUCTION

1.1 OBJECT

This plan describes activities, timeline and data takes required to provide product verification and characterization of PAZ products related to Staring Spotlight and Wide ScanSAR Modes.

1.2 SCOPE

Activities described by this document will be carried out by INTA CALVAL Centre after the instrument configuration update to ST and WS imaging modes and before the *Ground Segment modifications for DAS and New Modes* become operational.

This plan assures that following calibration and verification topics are covered:

- Geometric Calibration: pixel localization of new modes.
- Impulse Response Function: 2-D resolution, ISLR, PSLR
- Radiometric calibration: radiometric resolution, absolute and relative radiometric accuracy, NESZ.
- WideBeams Patterns Characterization

2. REFERENCE DOCUMENTS

	Document	*Reference*	*Date*
RD-1	COMMISSIONING PHASE REPORT. PRODUCT DEFINITION	PAZ / INT / CALVAL / RPT / 002	09/01/2019

3. OVERVIEW

This document contains:

- Test Plan: describing calibration activities to be carried out.
- Data Take Plan: describing data takes required.

4. TEST PLAN

4.1 ASSUMPTIONS

The configuration update has been performed at 2020-04-28T06:28:00. Since that, some acquisitions have been already planned in order to acquire useful data as soon as possible, so for the purposes of this document, the Characterization Phase has been considered to start at 2020-05-04.

4.2 RESTRICTIONS

This characterization plan is designed to be carried out before the Ground Segment modification becomes operational, so planning, commanding and processing tasks that should be supported by the system shall be performed at CALVAL Centre requiring manual interaction by CALVAL engineers.

This approximation allows to start the characterization before Ground Segment modification acceptation but restricts the analysis to a reduced data take acquisition plan.

Moreover, the sensibility restriction for SCIE orbits and High resolution images over most of INTA calibration field reduces the opportunities of quality data takes and available test data set, especially for Staring Spotlight Mode.

CALVAL Centre reserves the option to extend the characterization campaign once the Ground Segment is operational, especially in radiometric and antenna model analysis.

4.3 ACTIVITIES

4.3.1 Geometric Calibration

Description: Verification of Pixel Location Accuracy of new modes in complex images estimating location error of pixels versus actual Corner Reflectors GPS location.

Test Data Set: WS and ST data takes over INTA calibration field.

Expected Outputs: Pixel Location Accuracy, Internal Delay, Azimuth Shift.

Remarks: As it has been proved in PAZ Calibration Campaigns, pixel location accuracy is consistent along the different imaging and polarization modes, being restricted mostly by the quality of the orbit determination and the pixel size, so no great deviations are expected with respect to nominal modes. Because of that, a first estimation with reasonable confidence can be provided at the end of second orbit cycle.

4.3.2 Antenna Model Verification

Description: Derivation of Gamma Profiles from rainforest images and verification versus reference antenna pattern.

Test Data Set: WS data takes over rainforest.

Expected Outputs: WS Antenna Elevation Pattern shape error.

Remarks: Antenna Model verification will be performed over WS datatakes since ST elevation beams used have been already validated during nominal modes C.P.

4.3.3 Radiometric Calibration

Description: Estimation of Absolute Calibration Factor for ST and WS imaging modes, measuring RCS shown at images versus ideal Corner Reflector RCS by leg size and their historic series.

Test Data Set: WS and ST data takes over INTA Corner Reflectors.

Expected Outputs: Absolute Calibration Factor, Radiometric Accuracy.

Remarks: Radiometric Calibration is affected by a number of error sources, including Antenna Model, Corner Reflector degradation and weather conditions, so the greater the number of measurements, the better the confidence in the calibration. As many as possible acquisitions will be required for this task. Characterization will be provided at the end of the analysis phase requiring the largest number of samples.

4.3.4 Impulse Response Function

Description: Analysis of focusing performance via IRF analysis.

Test Data Set: ST & WS images from INTA calibration field.

Expected Outputs: Resolution, PSLR, ISLR.

Remarks: As it has been proved in PAZ Calibration Campaigns, IRF parameters are consistent along the different beams, geometry and polarization, allowing a smaller sample of measurements to get the characterization.

4.3.5 NESZ Verification

Description: Analysis of background noise in WS images to assess performances of WideBeams.

Test Data Set: WS images in HV polarization over areas with no backscatter expected as in Pacific Doldrums.

Expected Outputs: NESZ for all Wide Beams.

4.3.6 Coverage

Description: Analysis of actual coverage for new modes and verification against definition in swath preview table.

Test Data Set: all images acquired during Characterization Phase.

Expected Outputs: Swath Coverage.

Remarks: Analysis will be initially performed over a reduced subset of beams within full performance angle rate and completed when Ground Segment modification becomes operational.

4.3.7 Radiometric Resolution

Description: Relationship between mean intensity and variance of homogeneous distributed targets provides an overall metric of radiometric quality of images, including noise contributions as speckle, NESZ, ISLR and ambiguities noise.

Test Data Set: distributed targets defined over WS and ST images, preferring those whose stability has been already proven during C.P.

Expected Outputs: Radiometric Resolution.

5. TIMELINE

This plan was designed to get a characterization of the new modes before Ground Segment is upgraded for new modes operation.

- Start: 02/05/2020
- End: 18/07/2020
- Duration: 4 Orbit Cycle
- Pixel Location Accuracy, IRF, preliminary coverage: End of Cyle 2 + 1 week
- Radiometric Analysis, Antenna Model Verification, NESZ, Radiometric Resolution: End of Cycle 4+1week

An intermediate report was delivered with first conclusions on resolution, coverage, IRF and geometric performances.

This final report, summarizes the activities and conclusions obtained at the end of the 4-cycle period initially planned. As it will be stated in Section 9, next steps, reference antenna patterns verification will require at least 4 more cycles.

6. DATA TAKE PLAN

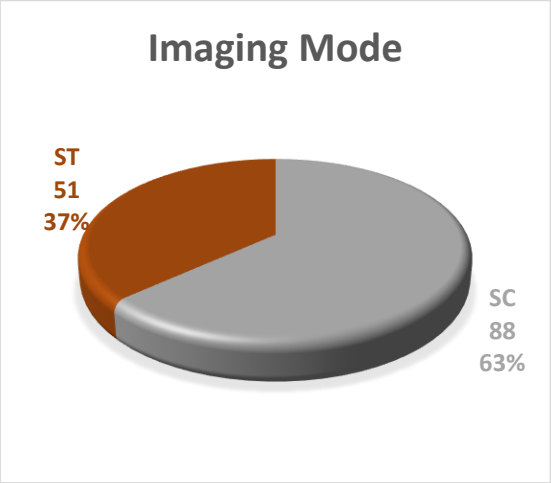
Data take plan has been designed to perform a minimum of 139 acquisitions in a four-cycles plan, starting from 2020-05-02 and ending on 2020-07-18.

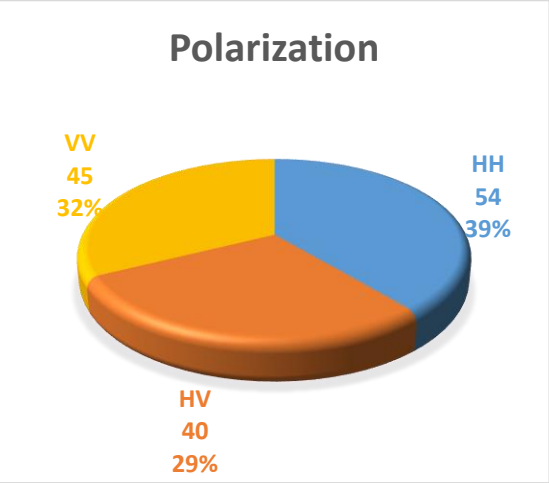
125 additional data takes for radiometric resolution analysis over 160 distributed targets have been included with respect to the original plan showed in Annex A.

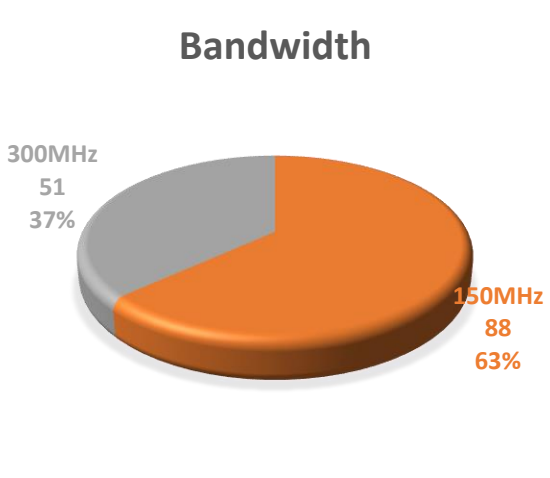
Acquisition plan is distributed as follows. (Note that an extension of these acquisitions may be considered once the Ground Segment modification becomes operational).

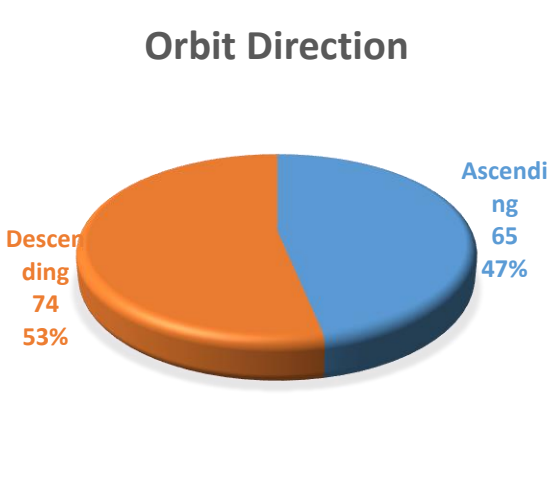
BeamID		
Value	**Count**	**%**
spot_012	5	3,597122302
spot_019	5	3,597122302
spot_028	4	2,877697842
spot_033	4	2,877697842
spot_049	4	2,877697842
spot_056	8	5,755395683
spot_057	4	2,877697842
spot_061	4	2,877697842
spot_094	5	3,597122302
spot_096	4	2,877697842
spot_098	4	2,877697842
wide_001	32	23,02158273
wide_002	8	5,755395683

wide_003	16	11,51079137
wide_004	8	5,755395683
wide_005	24	17,26618705
	139	









Staring Spotlight Beams have been selected to cover spotlight modes full performance angle rate in order to maintain certain degree of analysis consistency, although no performances have been set for these new modes.

BeamID	MinIncidenceAngle	MaxIncidenceAngle
'spot_012'	20,7967300000000	22,6806100000000
'spot_019'	24,4791700000000	26,2740300000000
'spot_028'	28,9499600000000	30,6239300000000

'spot_033'	31,3002400000000	32,9059100000000
'spot_049'	38,1768900000000	39,5689200000000
'spot_056'	40,8859700000000	42,1900400000000
'spot_057'	41,2587600000000	42,5506200000000
'spot_061'	42,7153500000000	43,9593900000000
'spot_094'	52,8483200000000	53,7616300000000
'spot_096'	53,3679300000000	54,2648000000000
'spot_098'	53,8781700000000	54,7589600000000

The Data Take Plan considered (without datatakes for distributed target analysis) is provided in Annex A.

7. STARING SPOTLIGHT PRODUCTS (ST)

Imaging Mode	ST				
Product Type	Detected				Complex
Geometric Projection	(MGD, GEC, EEC)				SSC
Polarization Mode	S				
Resolution Mode	SE		RE		
Polarization Mode	HH, VV				
Characterization Range	20º-55º				
Range Scene Size (Km)	9… 4.6				
Azimuth Scene Size (Km)	2.7… 3.6				
NESZ (dB)	<-19				
PSLR (dB)	-25				
ISLR (dB)	-14.74				
Incidence Angle (deg)	20	45	20	45	
Slant Range Resolution (m)	-	-	-	-	0.59
Ground Range Resolution (m)	1.78	0.96	1.78	0.97	-
Azimuth Resolution (m)	0.7	0.38	1.42	0.97	0.22
Range Pixel Spacing (m)	0.38	0.20	0.74	0.54	0.45
Azimuth Pixel Spacing (m)	0.38	0.20	0.74	0.54	0.17
Effective Number of Looks	3.3	2	6.6	5	
Pixel Localization Accuracy (m)					0.20

Figure 1. Chino Airport. CA. USA

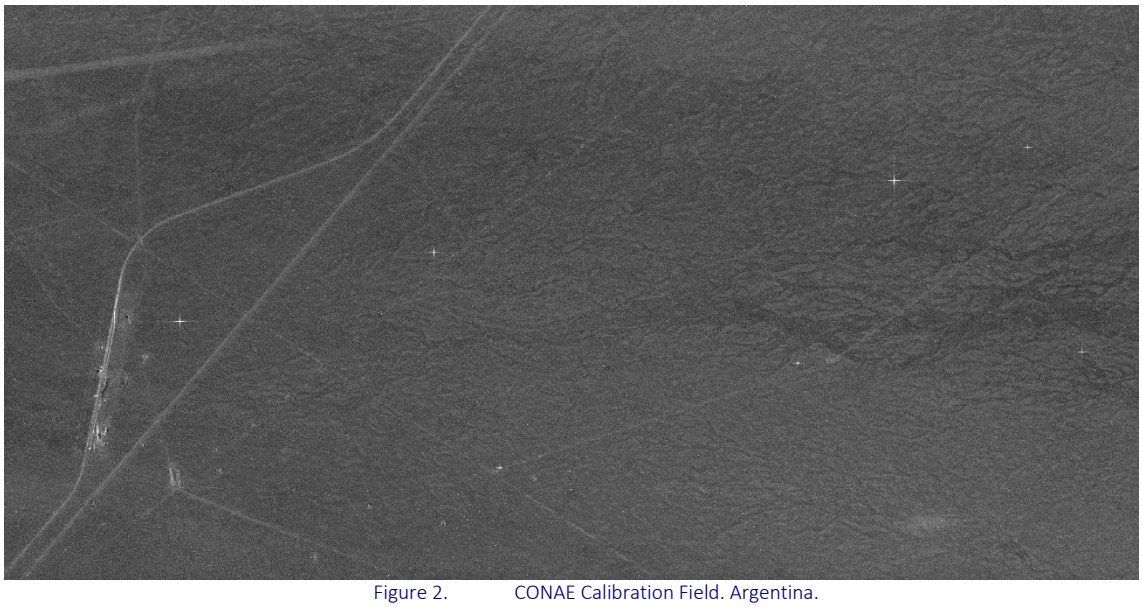


Figure 2. CONAE Calibration Field. Argentina.

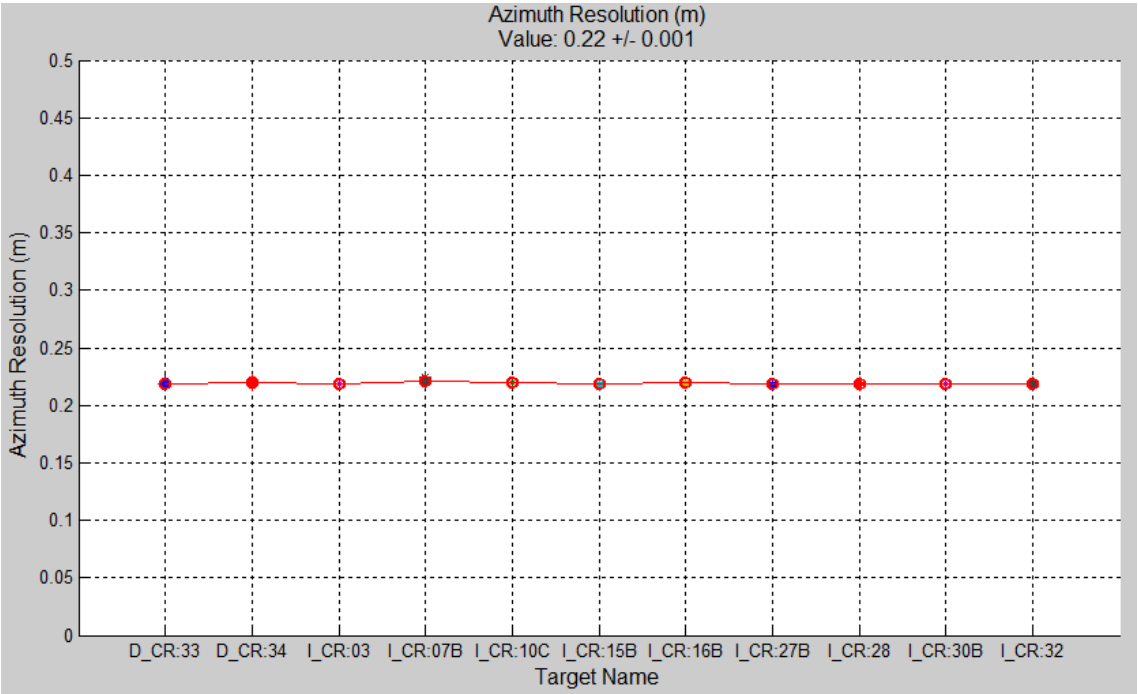
Figure 3. Pinal Aripark. AZ. USA

7.1 CHARACTERIZATION

After radiometric analysis, corner reflector responses on ST images were found to be saturated because of the long integration time of this imaging mode, so IRF measurements (resolution, ISLR and PSLR) and radiometric measurements have been recalculated since initial report using a processor gain attenuation.

So, we suggest making a recommendation to the users to use at least 10dB attenuation in processing gain when urban or high dynamic range images are intended to be acquired.

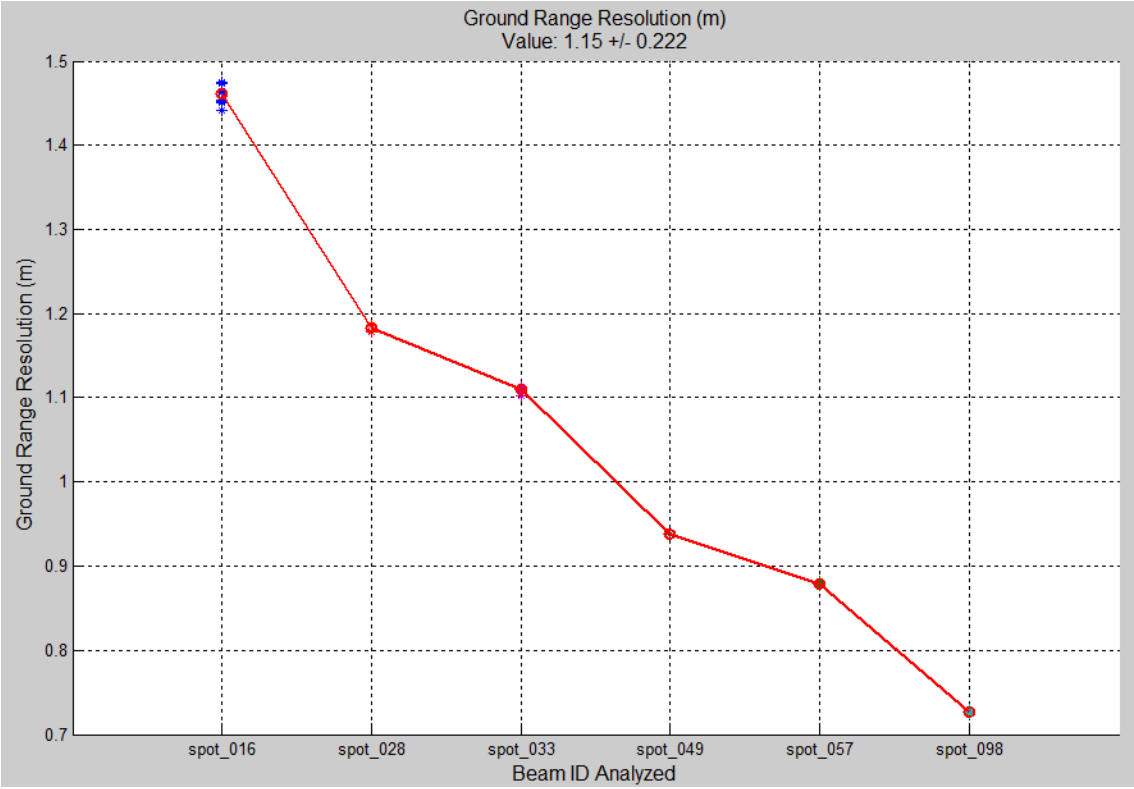
7.1.1 Azimuth Resolution

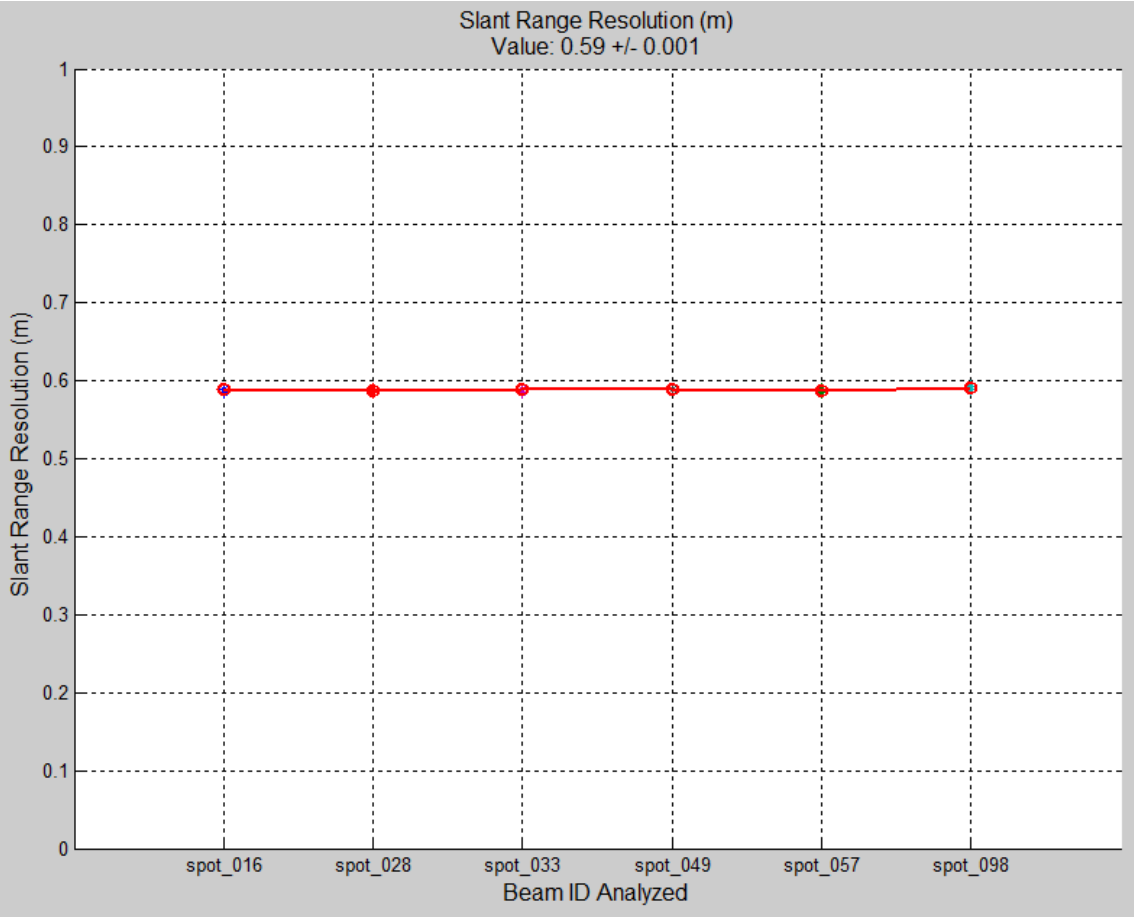


Statistics

Mean	0,22
StdDev	0,001

7.1.2 Range Resolution

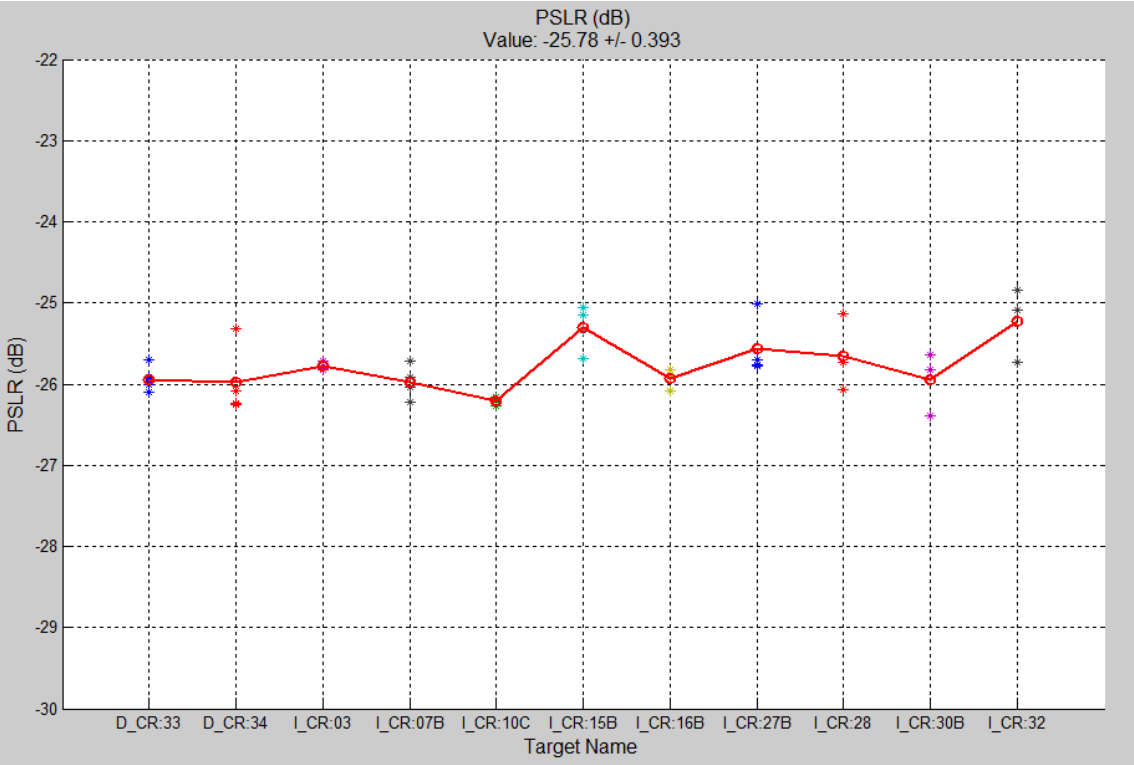




Statistics	*Slant Range*	*Ground Range*
Mean	0,59	1,15
StdDev	0,001	0,22

7.1.3 PSLR

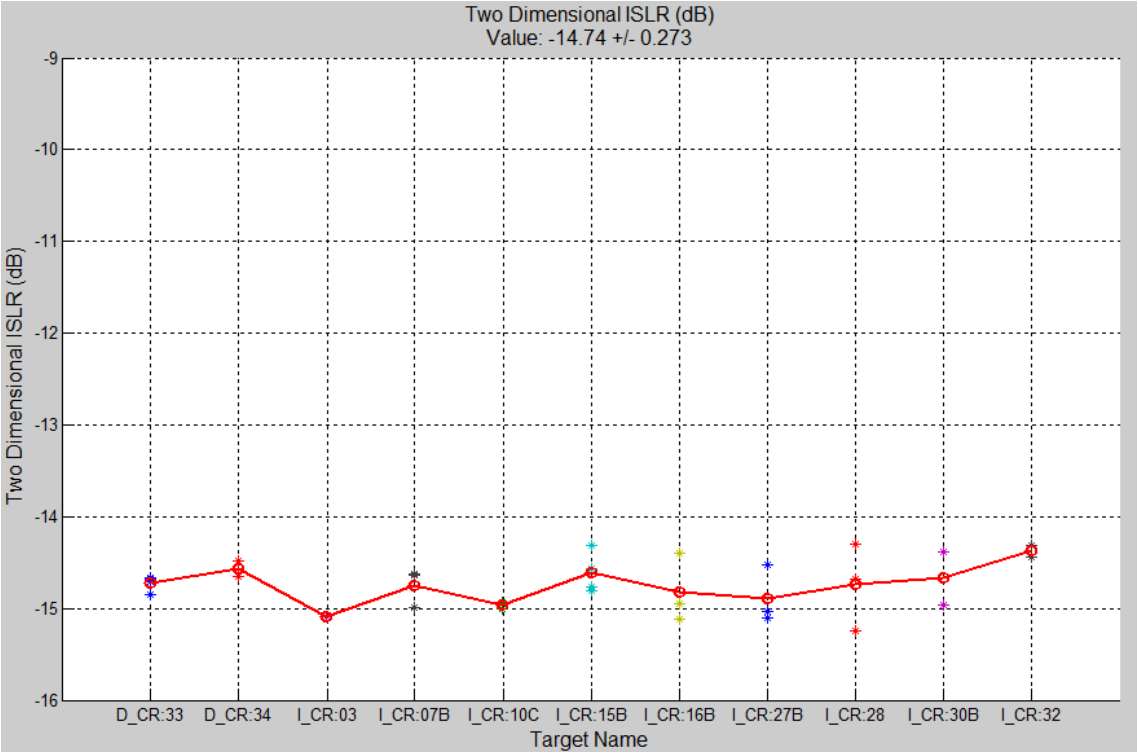
As it was noted in initial report, best cases there were considered more representative of the system performances. The degradation observed in initial report was addressed to clutter level with respect to signal level. As CR IRF were found to be saturated this ratio was actually degraded, so after the correction, this levels makes more sense and match the best cases reported initially.



Statistics

Mean	-25,78
StdDev	0.39

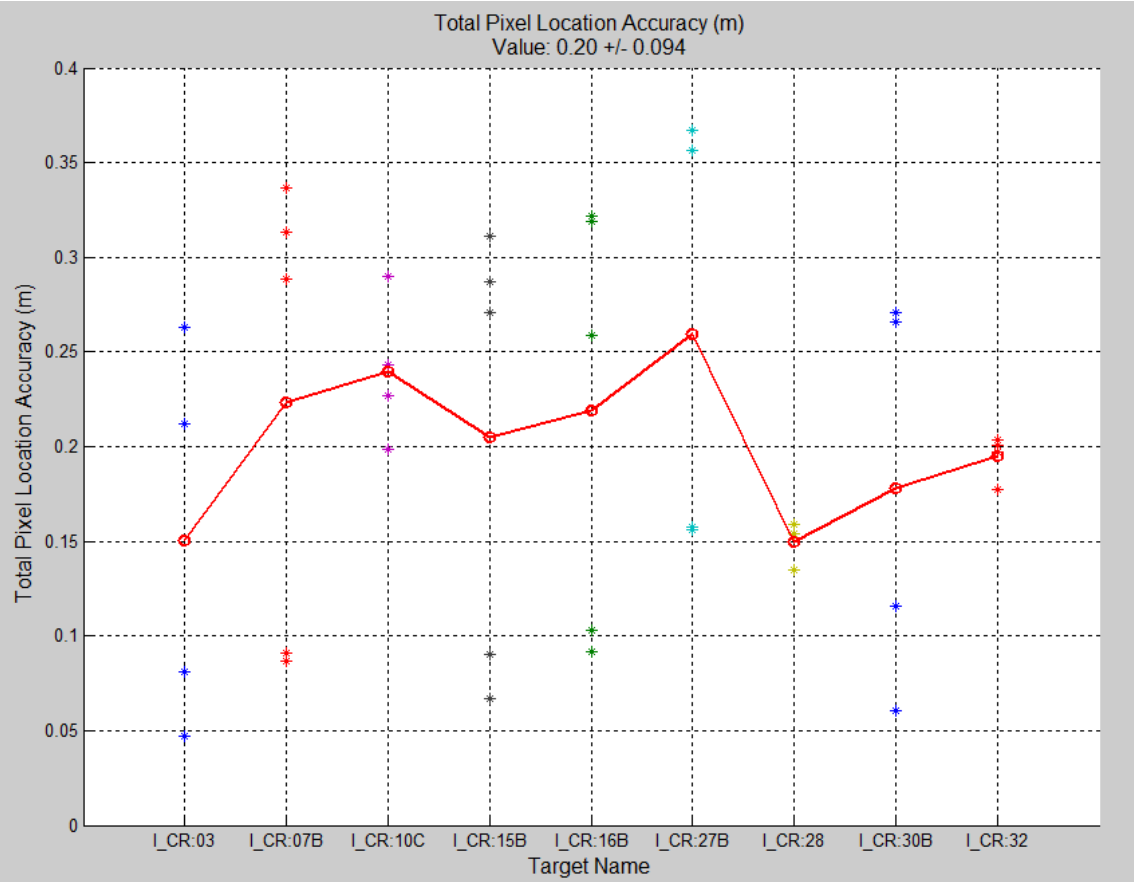
7.1.4 ISLR



Statistics

Mean	-14,74
StdDev	0.27

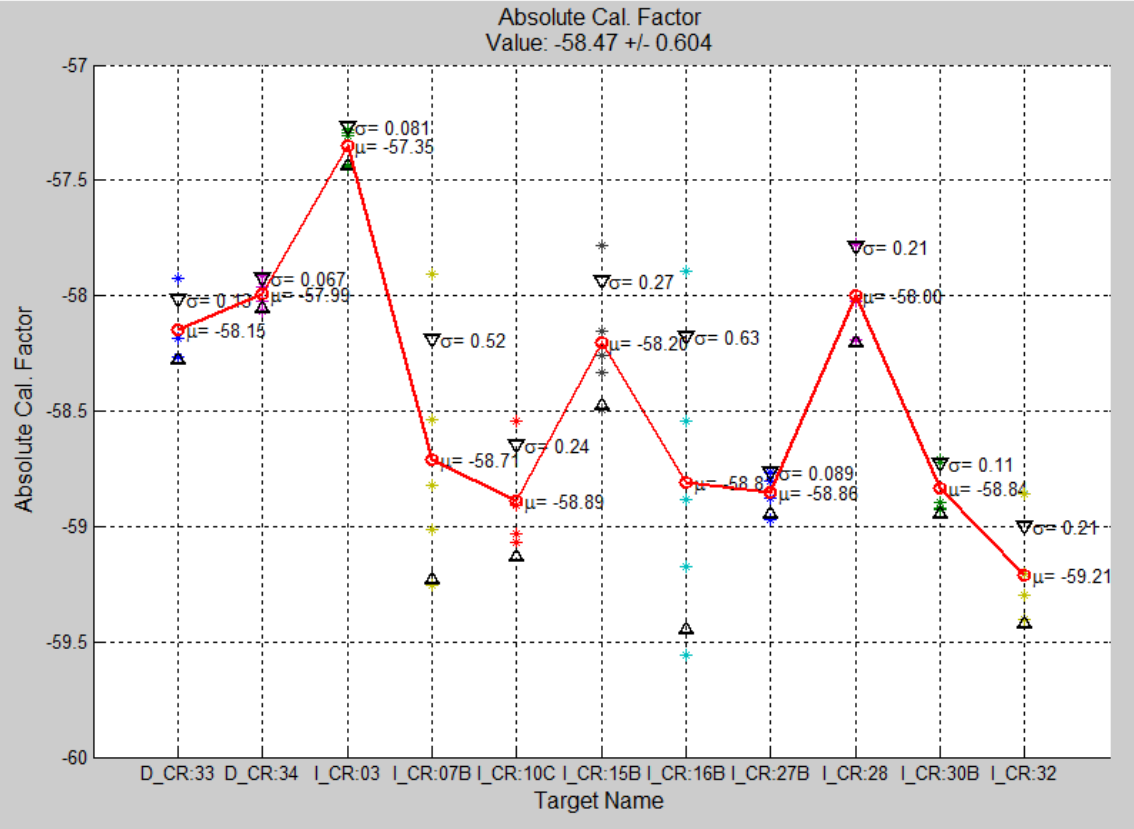
7.1.5 Pixel Localization Accuracy



Statistics

Mean	0,20
StdDev	0,09

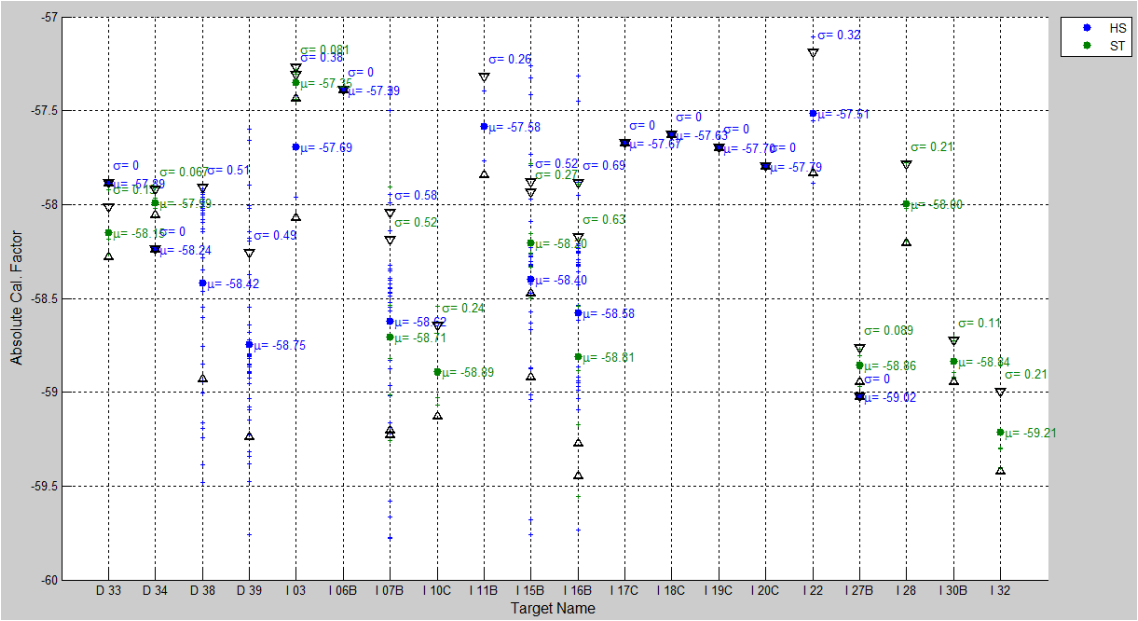
7.1.6 Radiometric Analysis



Statistics

Mean	-58.47
StdDev	0.60

A cross-check with HS mode has been made using long-term PAZ HS data acquisitions over reflectors. Results show that ST mode is radiometrically equivalent to HS:



StartTime: 2018-09-09
StopTime: 2020-07-15

'Target Name'	'HS'	'ST'	Delta
'DLR_CR:33/1.5'	-57,888742	-58,1485172	0,2597752
'DLR_CR:34/1.5'	-58,241091	-57,990439	-0,250652
'INTA_CR:03/1.0'	-57,690709	-57,352411	-0,338298
'INTA_CR:07B/1.5'	-58,62410037	-58,707926	0,08382563
'INTA_CR:15B/1.5'	-58,3990439	-58,2049368	-0,1941071
'INTA_CR:16B/1.5'	-58,57917213	-58,8100244	0,23085227
'INTA_CR:27B/1.5'	-59,022817	-58,85510175	-0,16771525

7.1.7 NESZ Analysis

Main contributors for NESZ Analysis are signal bandwidth and reference antenna patterns. Since there are no changes on those parameters with respect to HS mode, just a verification on the annotated noise has been performed for ST mode.

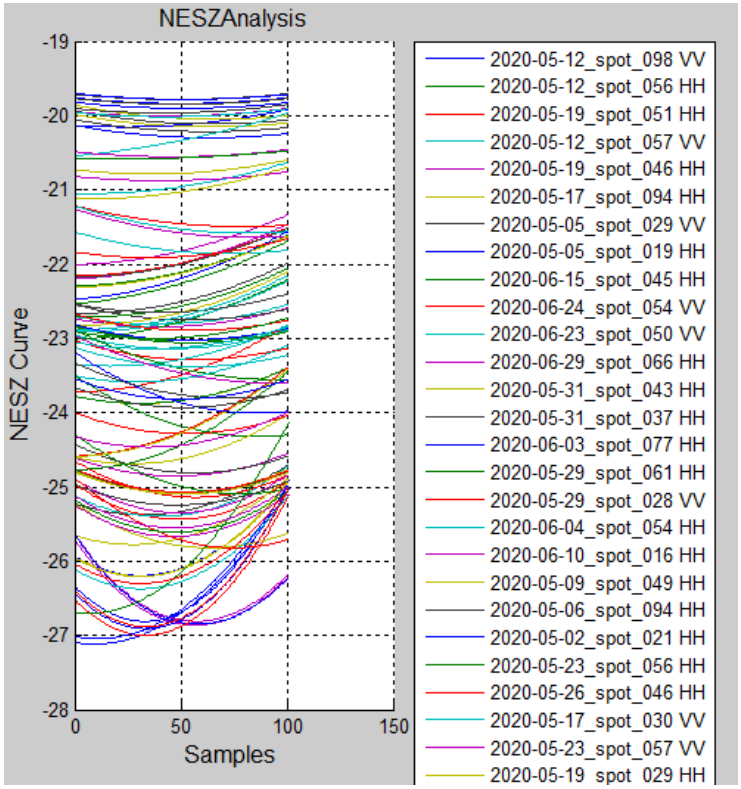
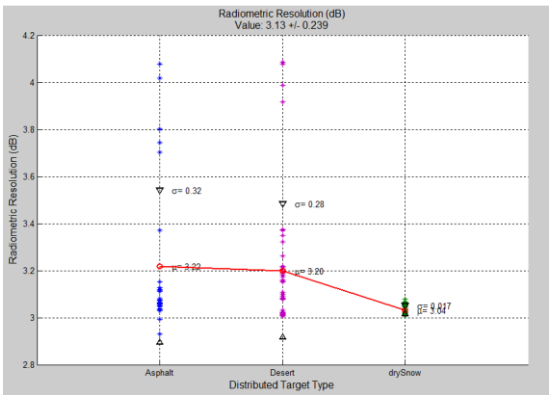
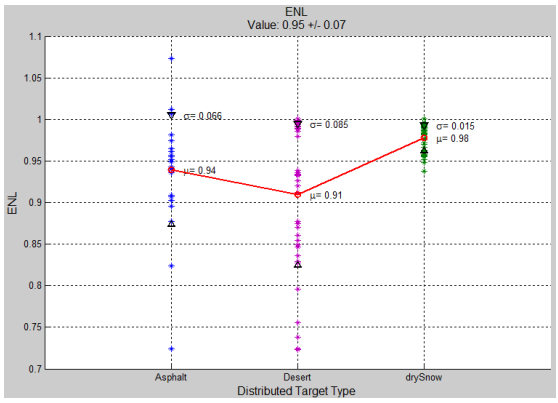


Figure 4. Annotated noise for ST acquisitions

7.1.8 Radiometric Resolution

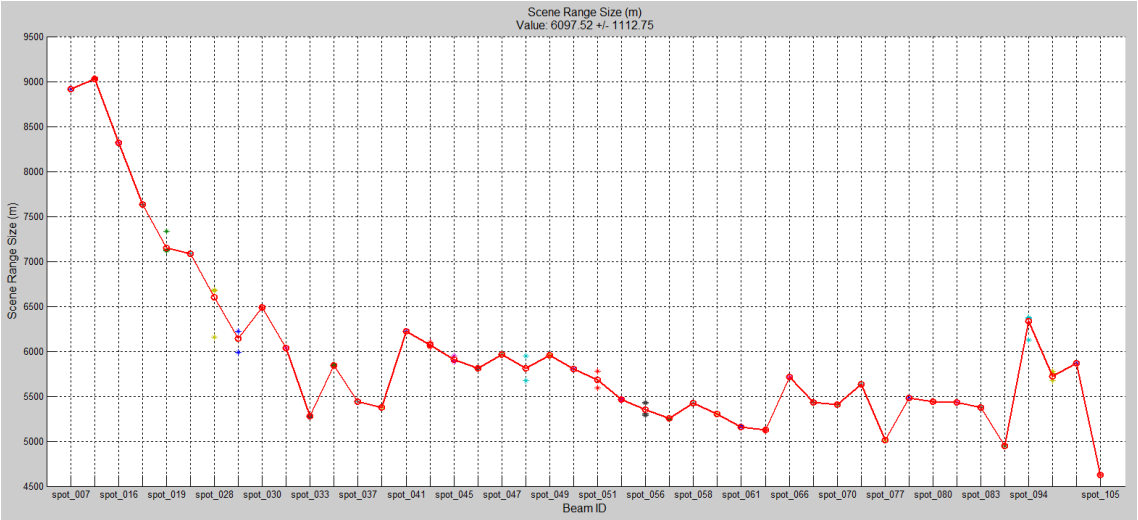
7.1.8.1 SSC

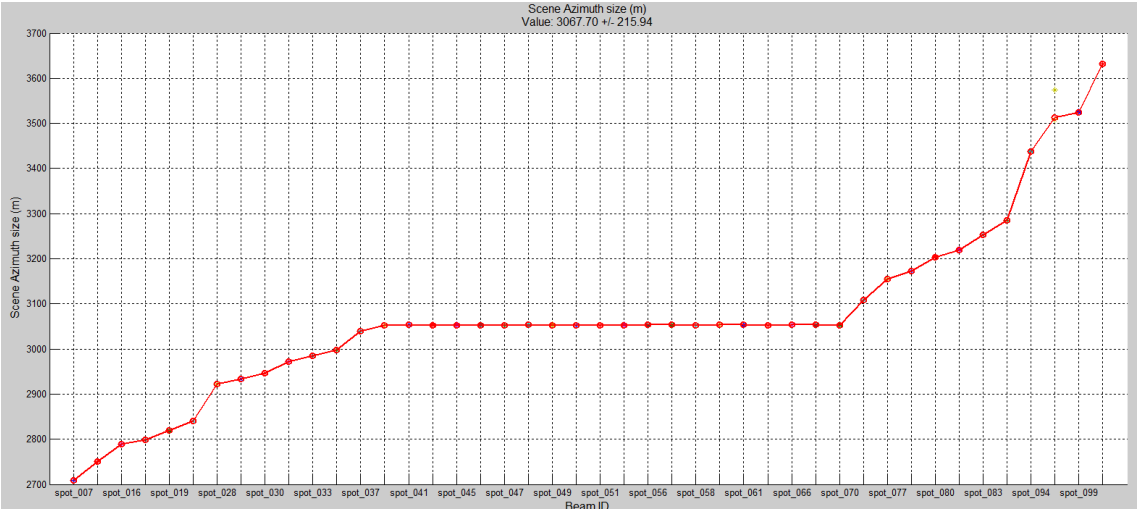




Statistics	Radiometric Resolution	Equivalent Number of Looks
Mean	3.13	0.95
StdDev	0.239	0.07

7.1.9 Scene Size

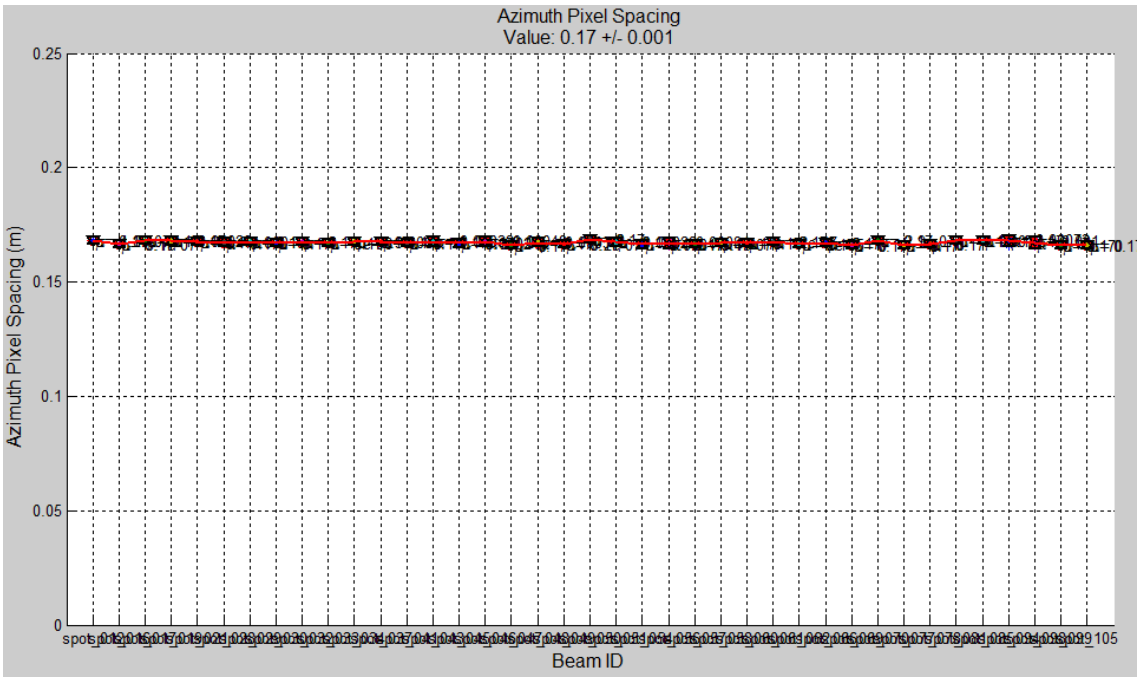


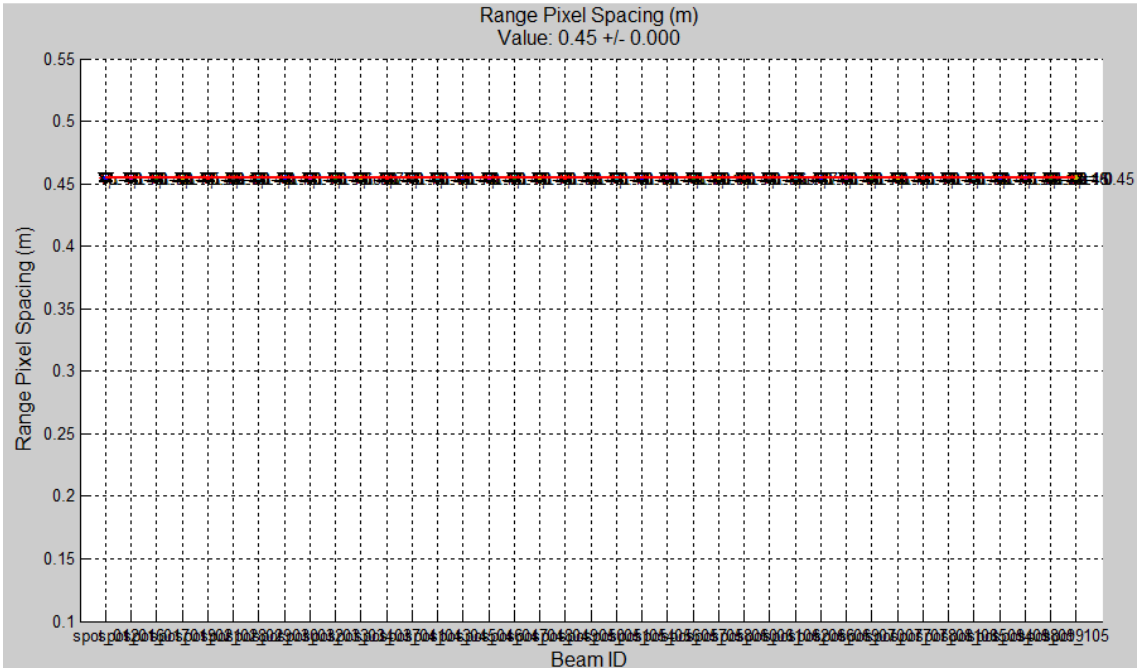


Statistics	Range (20°-55°)	Azimuth (20°-55°)
Scene Size (Km)	9 – 4.6	2.7-3.6

7.1.10 Pixel Spacing

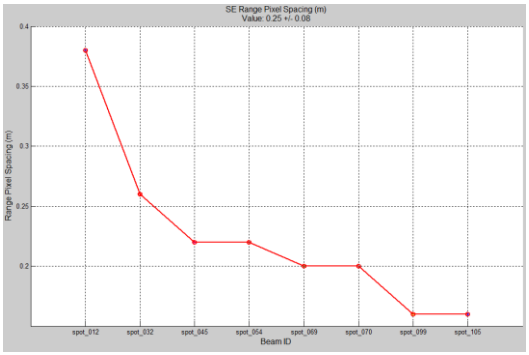
7.1.10.1 Complex Products

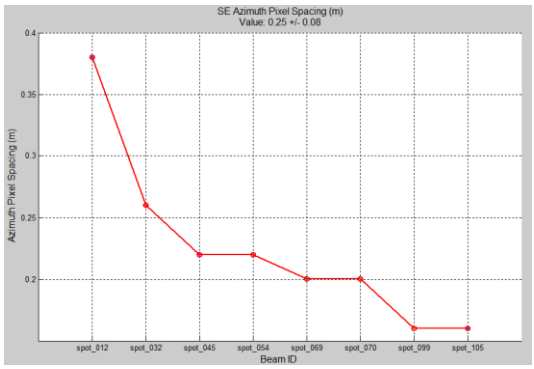


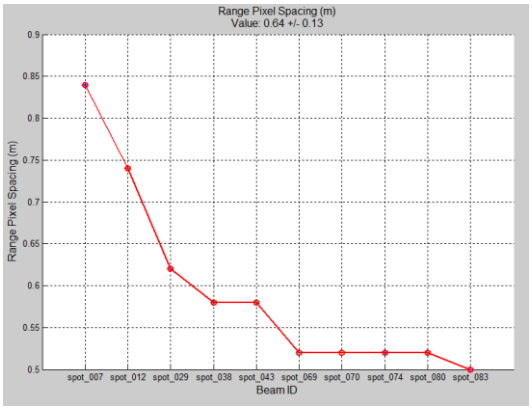


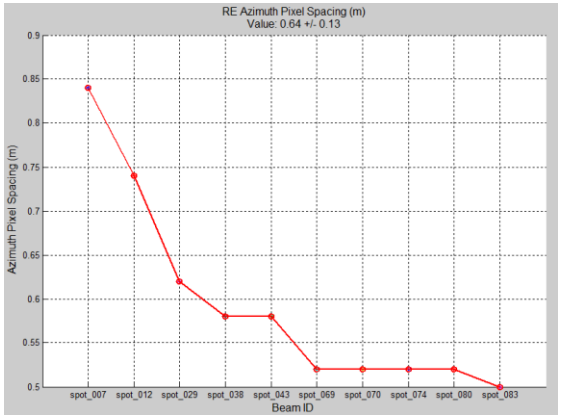
Statistics	Range	Azimuth
Mean	0.45	0.17
StdDev	0	0.001

7.1.10.2 Detected Products









	SE (20-55)		RE (20-55)	
Statistics	*20*	*55*	*Range*	*Azimuth*
Range	0.38	0.16	0.84	0.5
Azimuth	0.38	0.16	0.84	0.5

8. WIDE SCANSAR PRODUCTS (WS)

Imaging Mode	SC		
Product Type	Detected		Complex
Geometric Projection	(MGD, GEC, EEC)		SSC
Polarization Mode	S		
Resolution Mode	RE		
Polarization Mode	HH, VV, HV, VH		
Characterization Range	20-45		
Range Scene Size (Km)	273-196		
Azimuth Scene Size (Km)	208		
NESZ (dB)	<-24		
PSLR (dB)	-18		
ISLR (dB)	-15		
Incidence Angle (deg)	20	45	
Slant Range Resolution (m)	- -	- -	1.75-3.18
Ground Range Resolution (m)	35	35	-
Azimuth Resolution (m)	39	39	38.27
Range Pixel Spacing (m)	15	15	1.36
Azimuth Pixel Spacing (m)	15	15	14.21
Effective Number of Looks	7.27	8.46	
Pixel Localization Accuracy (m)			0.97

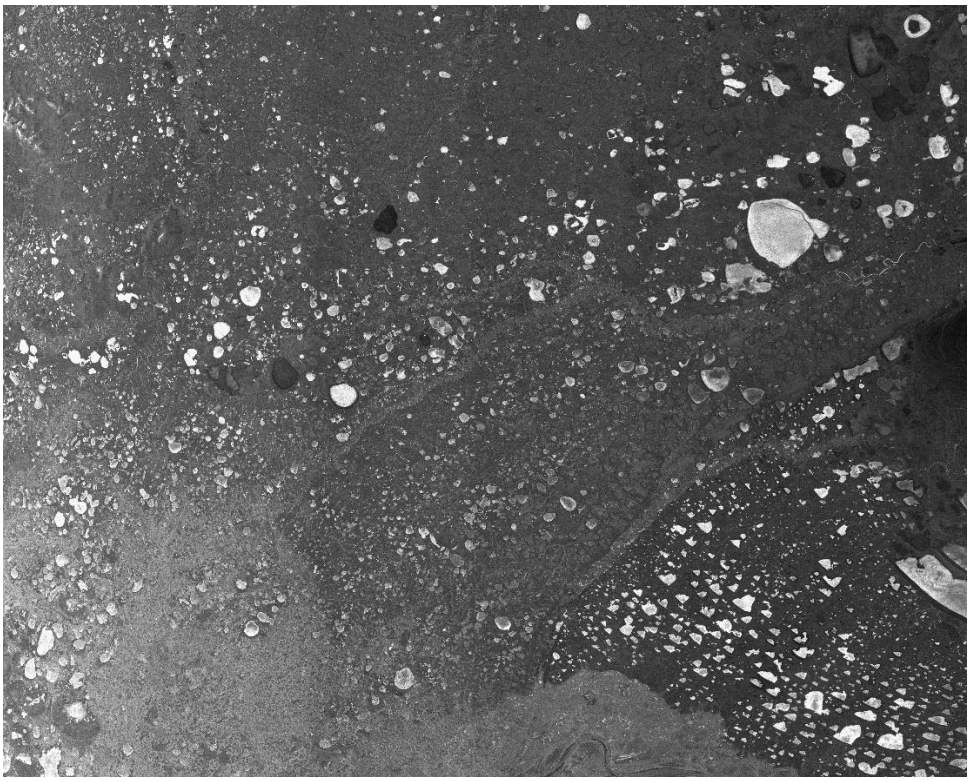
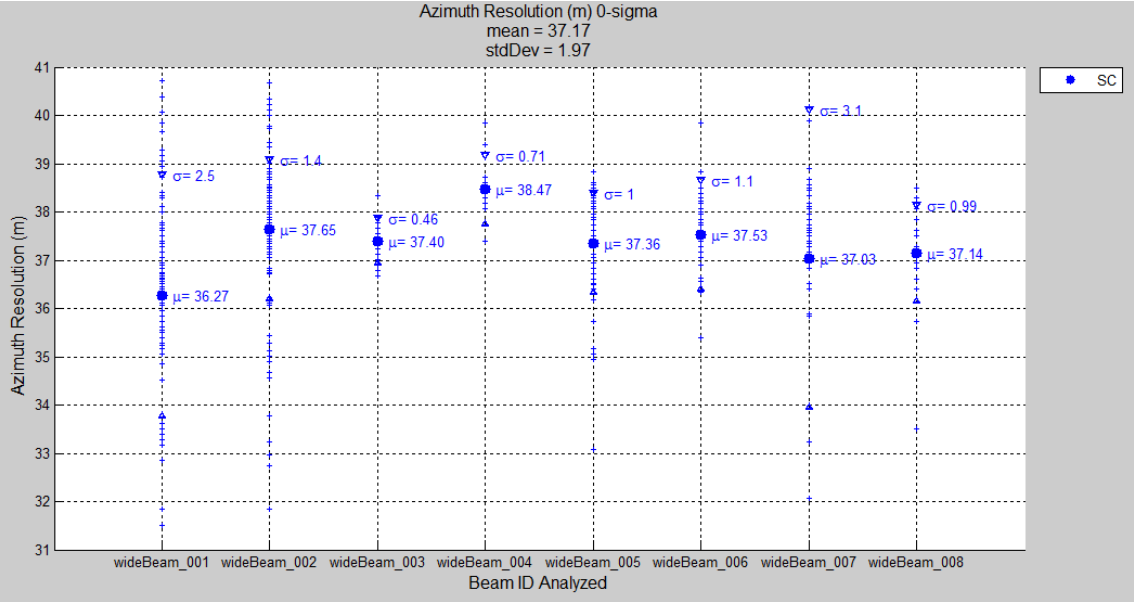


Figure 5. Kolyma Gulf.

8.1 CHARACTERIZATION

8.1.1 Azimuth Resolution

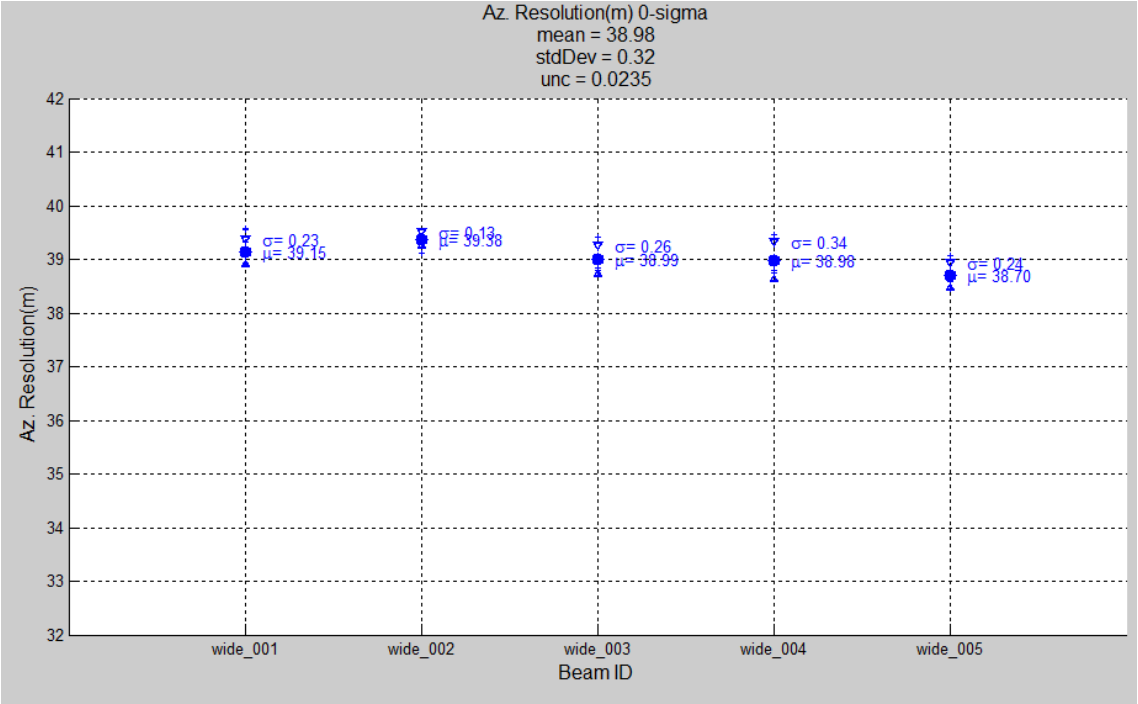
8.1.1.1 Complex Products



Statistics

Mean	37.17
StdDev	1.91

8.1.1.2 Detected Products

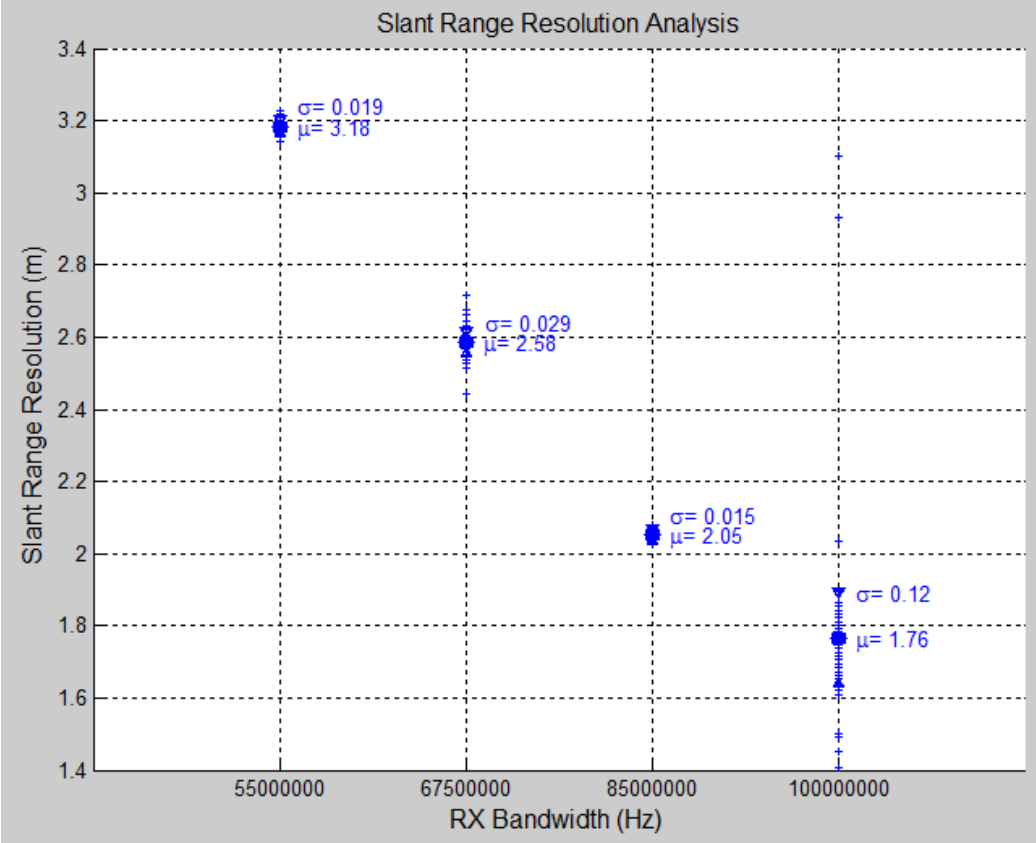


Statistics

Mean	38.98
StdDev	0.32

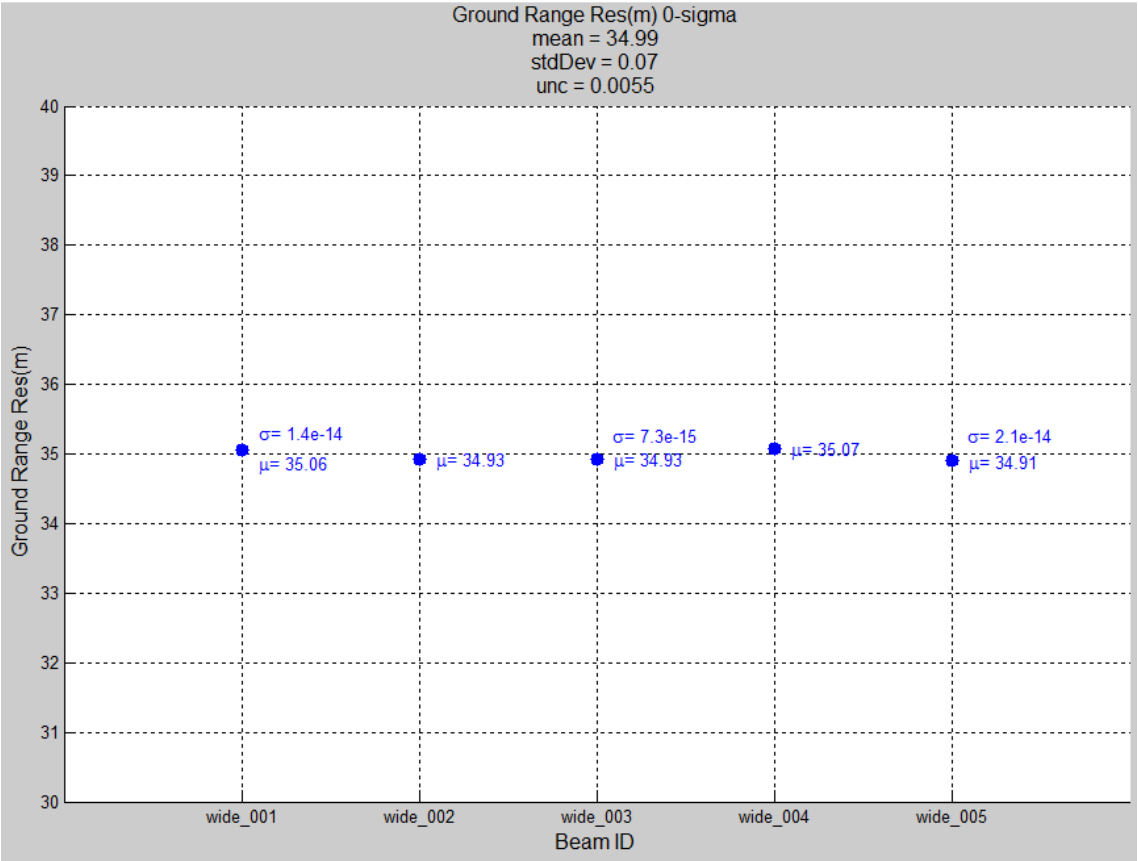
8.1.2 Range Resolution

8.1.2.1 Slant Range Resolution



Statistics	wideBeam 008-010	wideBeam 004-007	wideBeam 003	wideBeam 001-002
Mean	3.18	2.58	2.05	1.76
StdDev	0.02	0.03	0.01	0.12

8.1.2.2 Ground Range Resolution



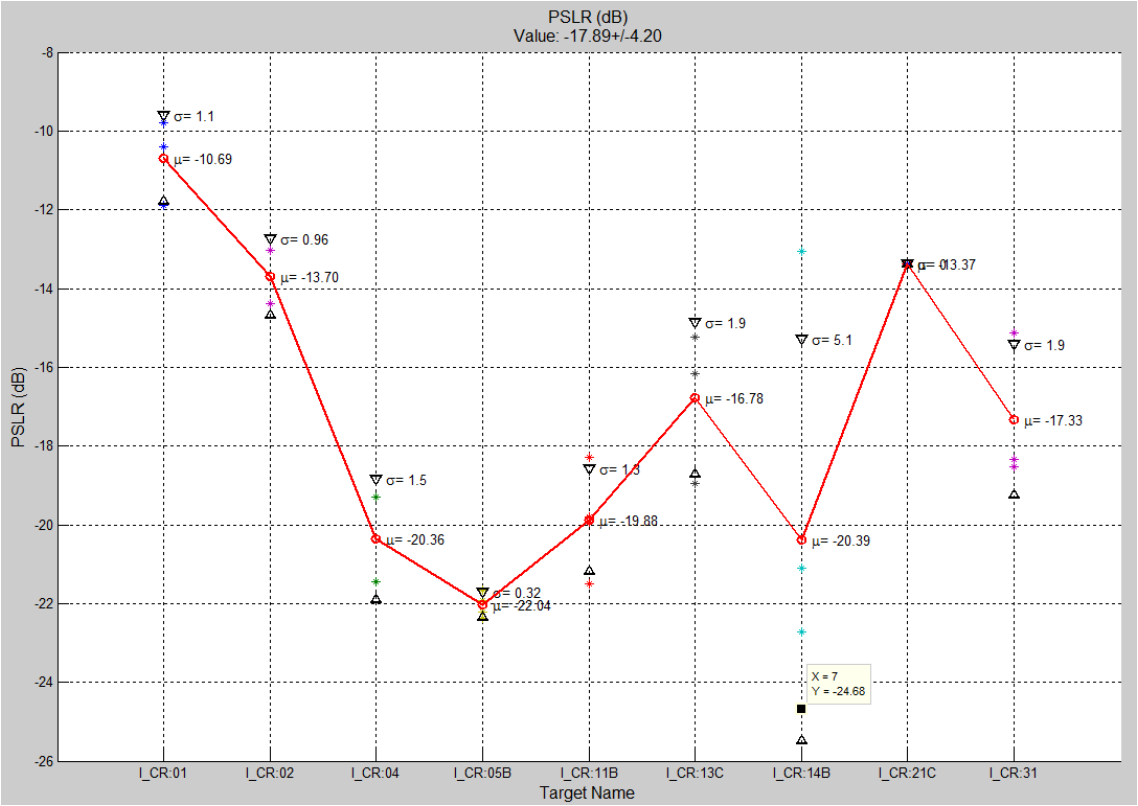
Statistics

Mean	34.99
StdDev	0.07

8.1.3 PSLR

Note that PSLR and IRLR measures at image level using corner reflectors may be strongly affected by clutter level. Although the analysis method takes this clutter into account, individual spurious elements within the scene may degrade the results obtained.

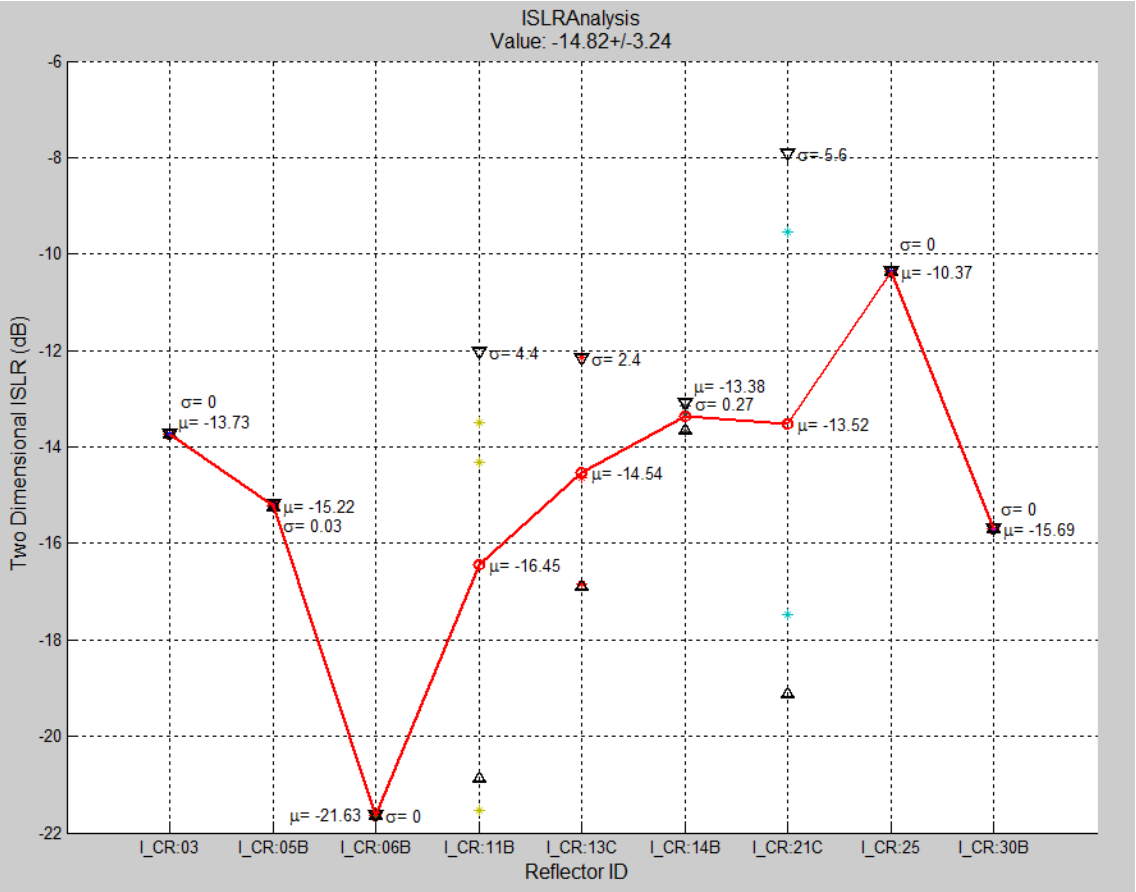
In order to keep coherence, we provide here the results as they have been measured, noticing that best cases here may be more representative of the system performances.



Statistics

Best	-24.68
Mean	-17.89
StdDev	4.20

8.1.4 ISLR



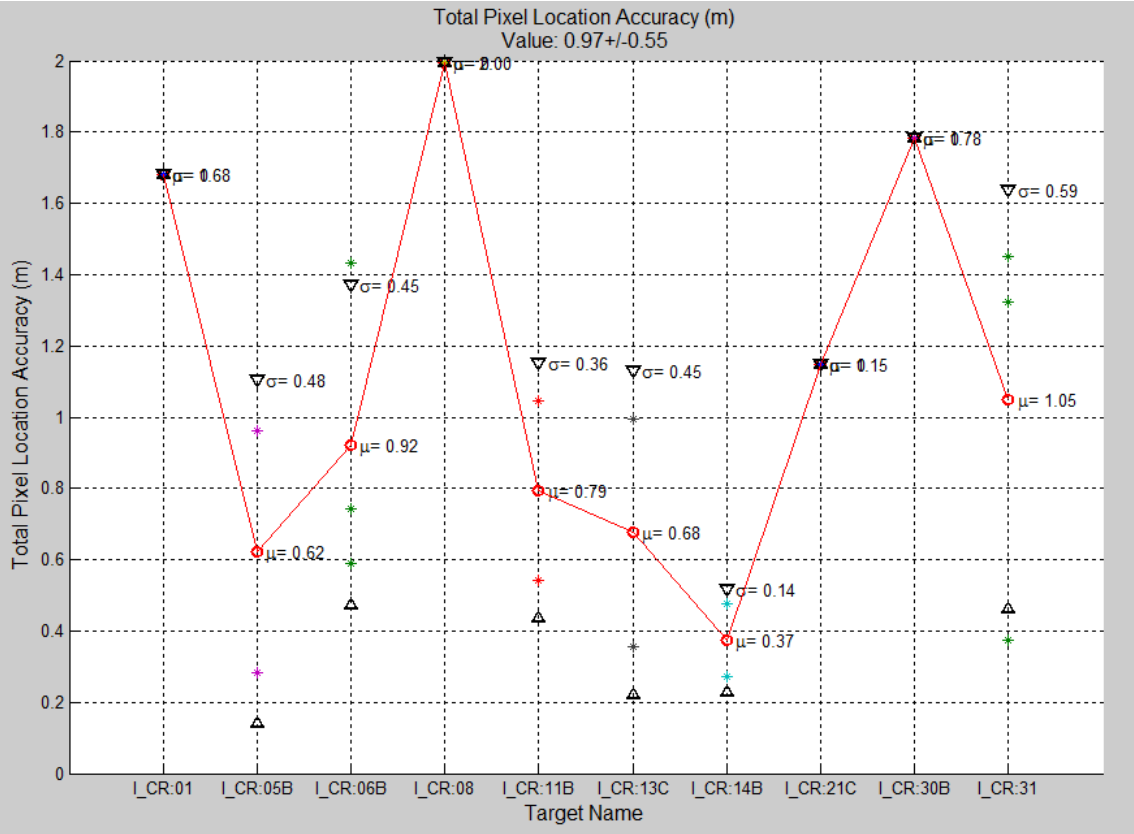
Statistics

Best	-21.63
Mean	-14.82
StdDev	3.24

8.1.5 Pixel Localization Accuracy

Note that standard deviation observed for each reflector is larger than expected. This may be caused during analysis computation by noise perturbations in the analysis window within the reflectors neighborhood, so actual performances may be better than shown.

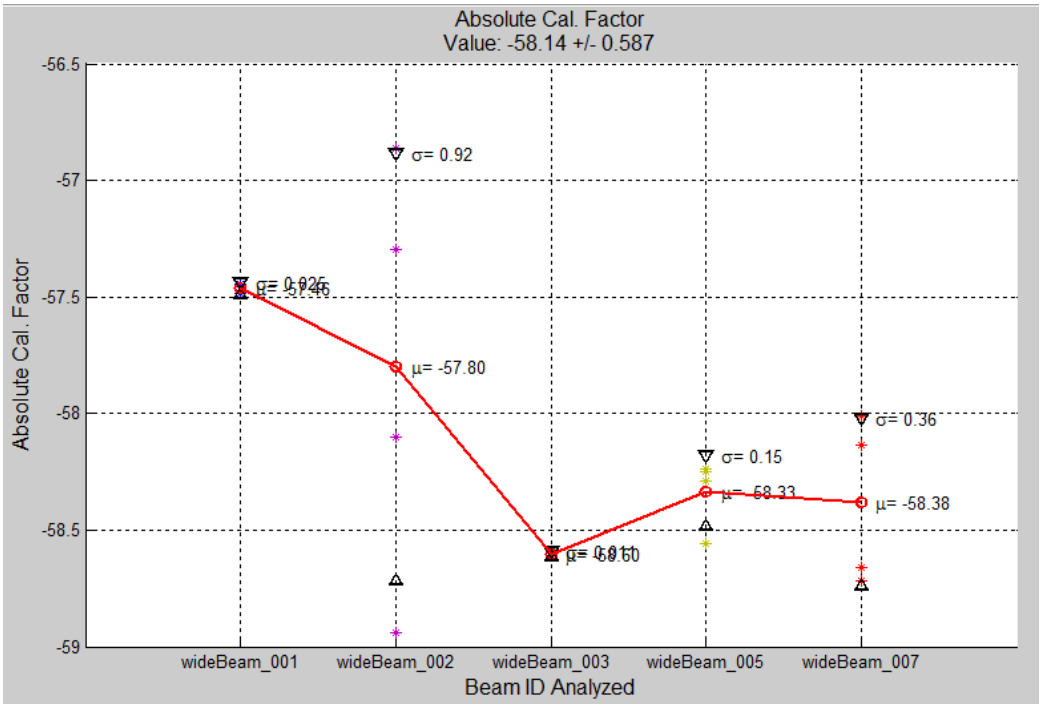
Still under investigation.

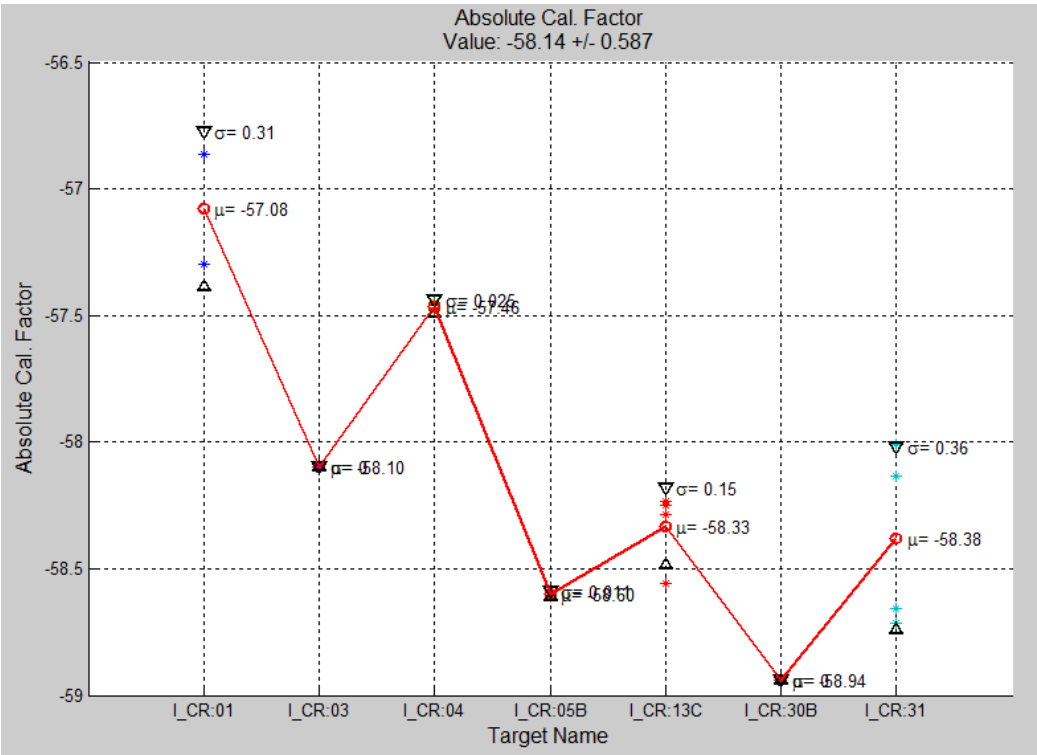


Statistics

Mean	0.97
StdDev	0.55

8.1.6 Radiometric Analysis



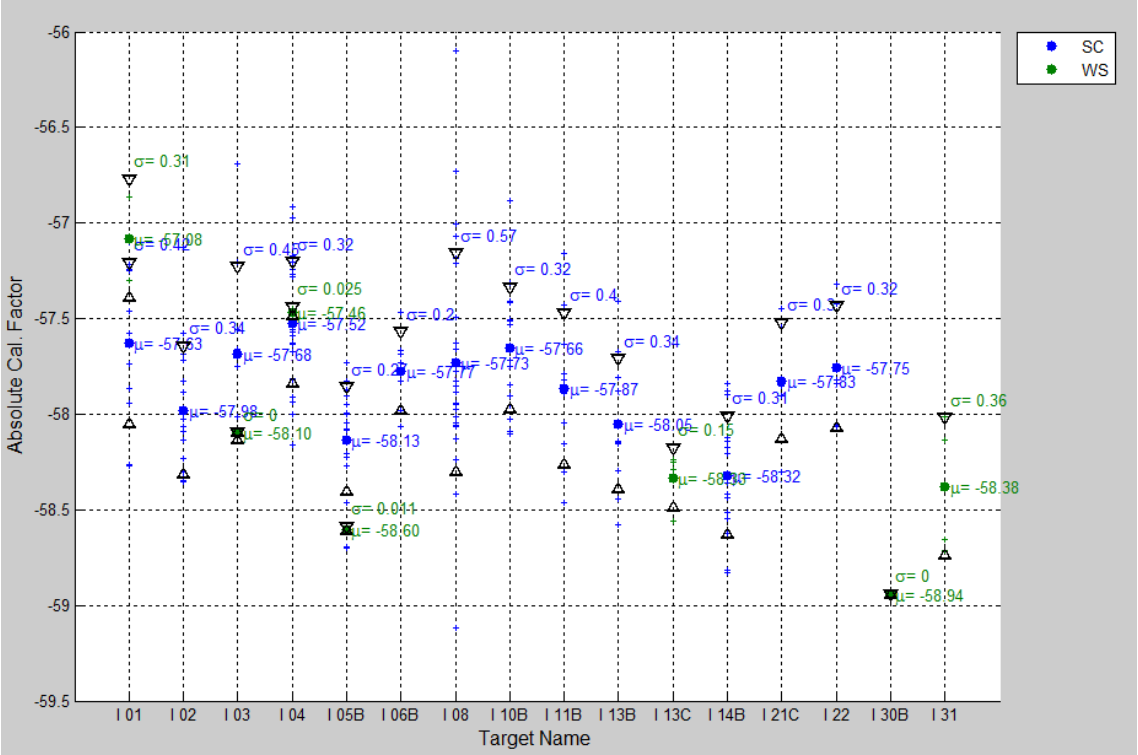


Statistics

Mean	-58.14

StdDev	0.587

Similar to ST mode, a comparison with performances on SC mode has been made:



Radiometric Accuracy for CRs available on both modes is within mode standard deviation:

'Target Name'	'SC'	'WS'	Delta
'INTA_CR:01/1.0'	-57,6299158181818	-57,0800160000000	-0,549899818
'INTA_CR:02/1.0'	-57,9824109375000	[]	
'INTA_CR:03/1.0'	-57,6846168000000	-58,0999080000000	0,4152912
'INTA_CR:04/1.5'	-57,5239350000000	-57,4645030000000	-0,059432
'INTA_CR:05B/1.5'	-58,1344796111111	-58,6012995000000	0,466819889
'INTA_CR:06B/1.5'	-57,7745815714286	[]	
'INTA_CR:08/1.0'	-57,7316890357143	[]	
'INTA_CR:10B/1.5'	-57,6559314117647	[]	
'INTA_CR:11B/1.5'	-57,8680375000000	[]	
'INTA_CR:13B/1.5'	-58,0547130909091	[]	
'INTA_CR:13C/1.5'	[]	-58,3331347500000	
'INTA_CR:14B/1.5'	-58,3201999375000		
'INTA_CR:21C/1.0'	-57,8258376666667	[]	
'INTA_CR:22/1.0'	-57,7537640000000	[]	

'INTA_CR:30B/1.5'	[]	-58,9422180000000	
'INTA_CR:31/1.0'	[]	-58,3803910000000	

8.1.7 NESZ

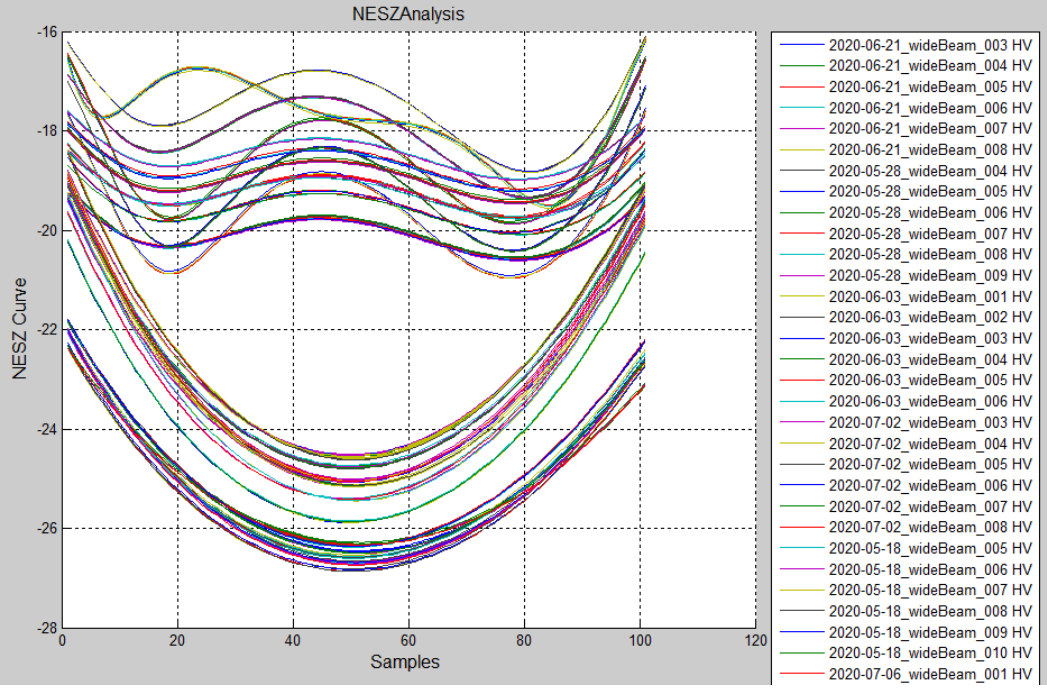


Figure 6. Annotated noise for Wide Beams

It must be noted that RE products include a noise compensation in order to deal with low backscatter areas, especially for SC products. This compensation subtracts NESZ Curves shown above from RE images so residual NESZ is expected to be lower than those annotated curves, as can be shown from actual measurements over Pacific Doldrums:

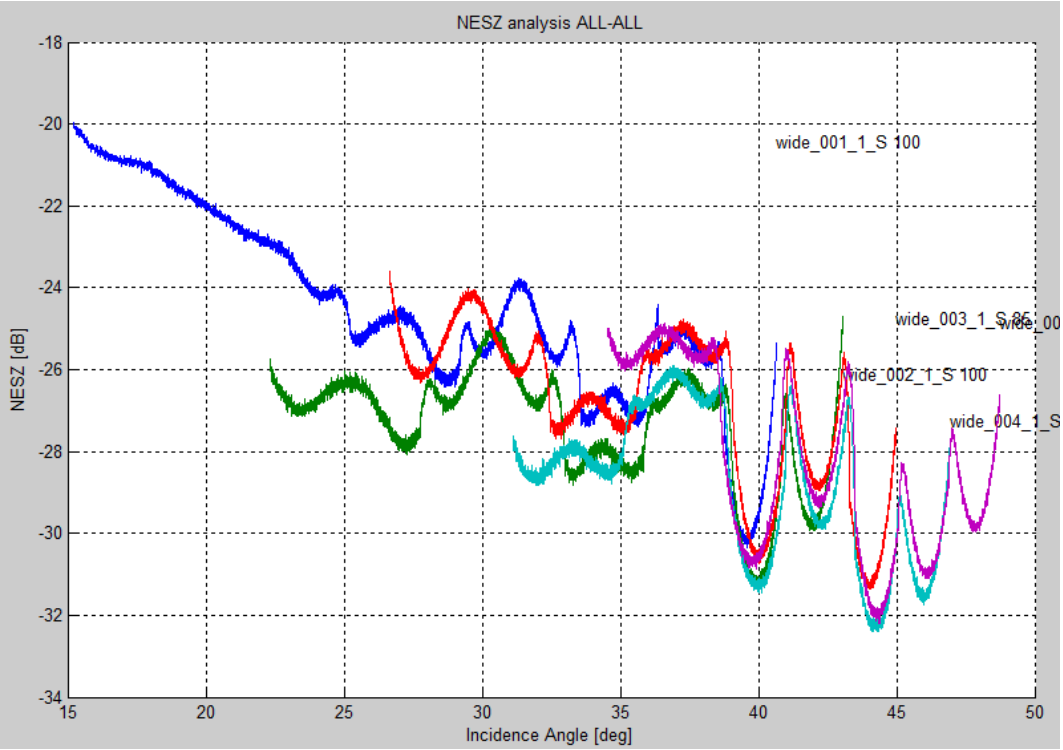
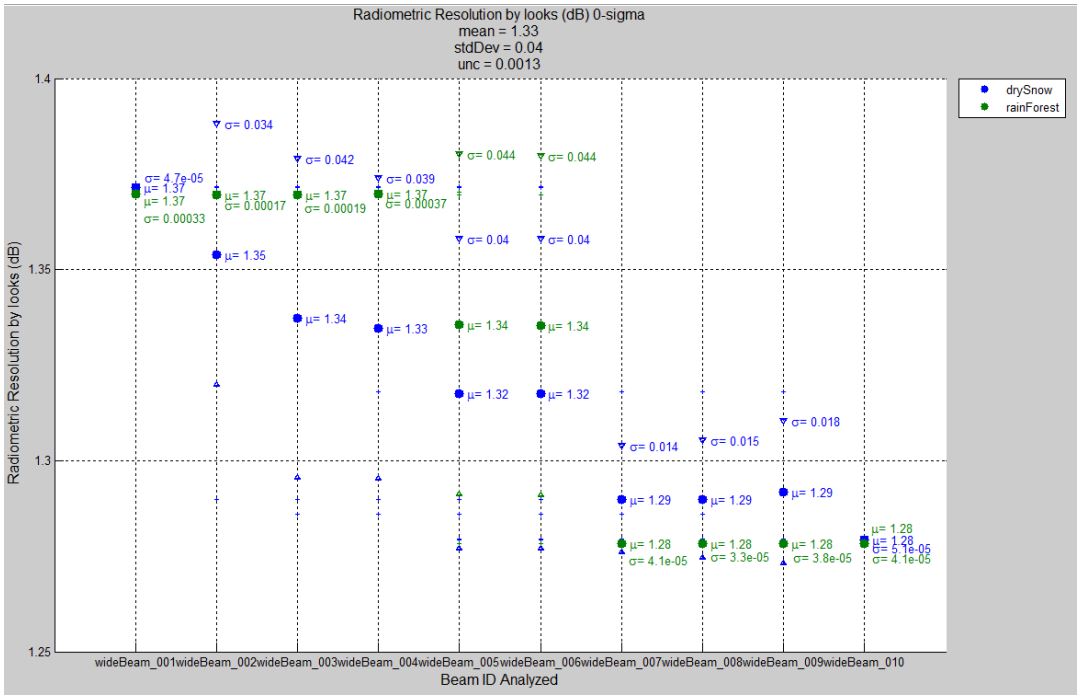
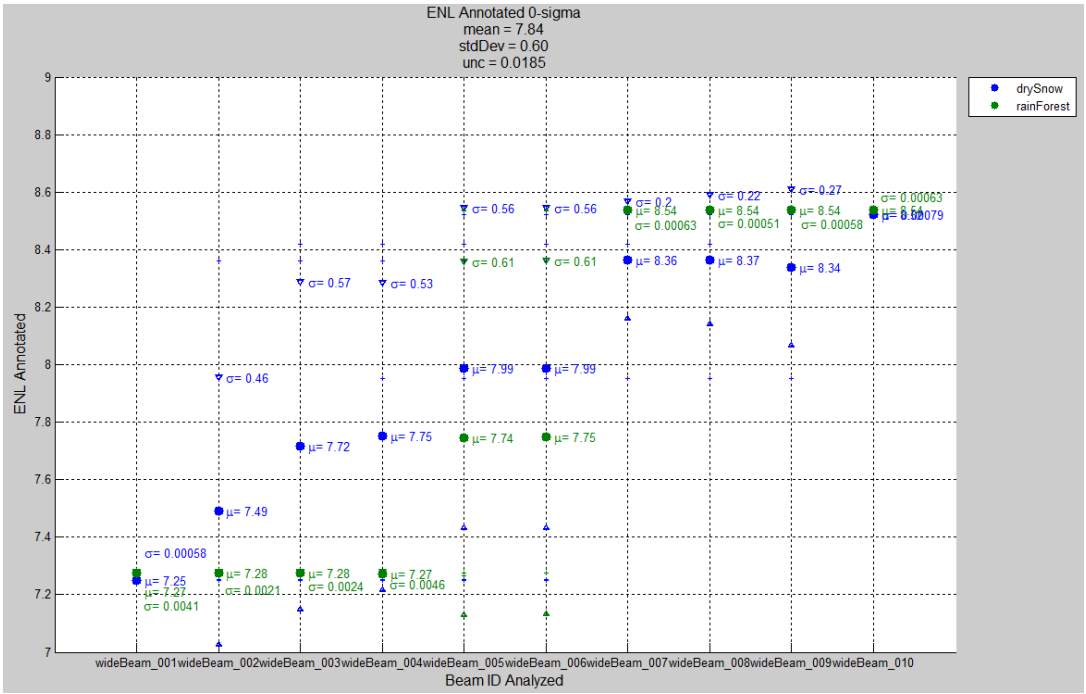


Figure 7. NESZ Measurements for Wide Beams over Doldrums

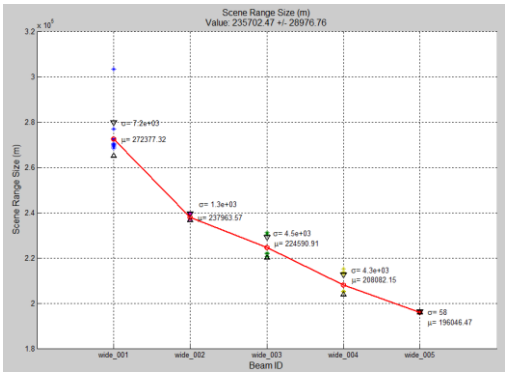
8.1.8 Radiometric Resolution & Equivalent Number of Looks

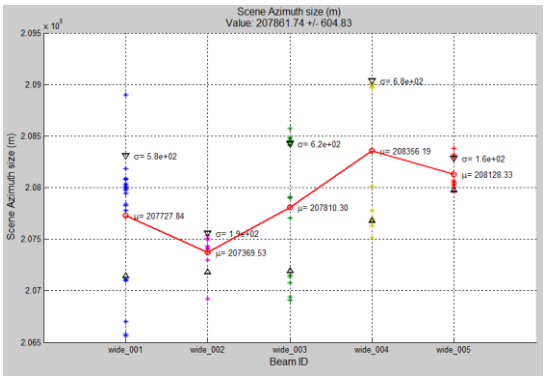




Statistics	Radiometric Resolution	Equivalent Number of Looks
Mean (wideBeam 001-010)	1.37-1.28	7.25-8.54
StdDev	0.04	0.60

8.1.9 Scene Size

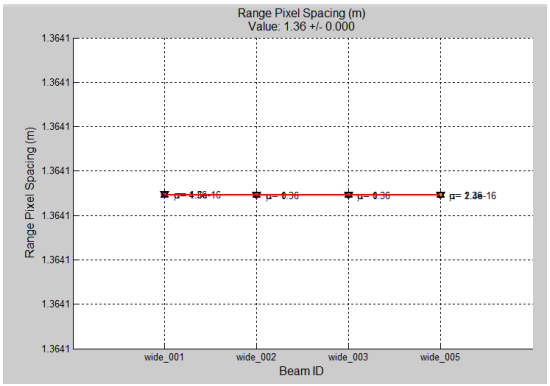


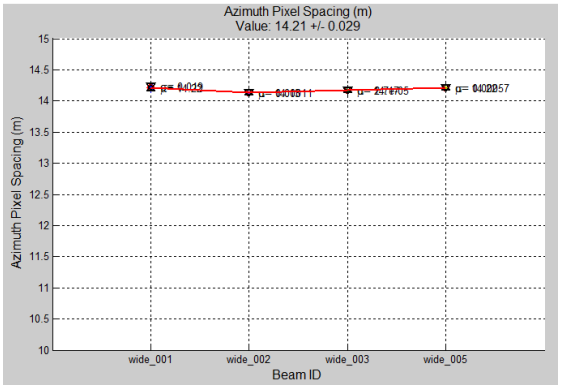


Statistics	Range	Azimuth
Mean Scene Size (Km)	273-196	208

8.1.10 Pixel Spacing

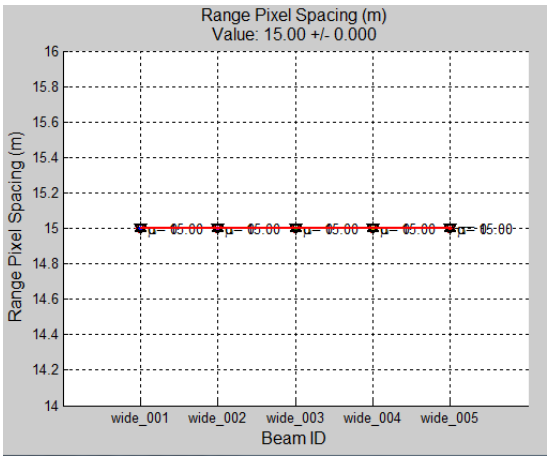
8.1.10.1 Complex Products

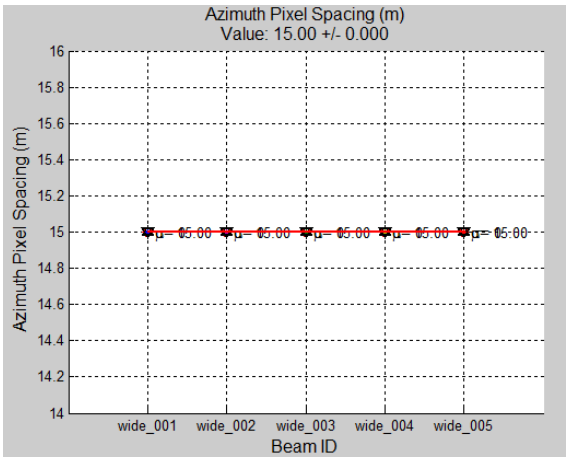




Statistics	Range	Azimuth
Pixel Spacing SSC (m)	1.36	14.21

8.1.10.2 Detected Products (RE)





Statistics	Range	Azimuth
Pixel Spacing RE (m)	15	15

9. NEXT STEPS

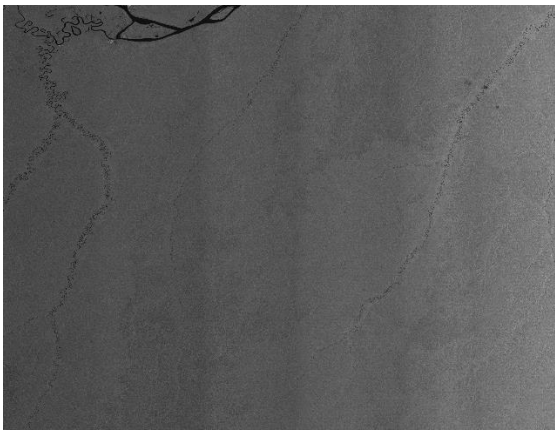
9.1 REFERENCE ANTENNA PATTERN VALIDATION

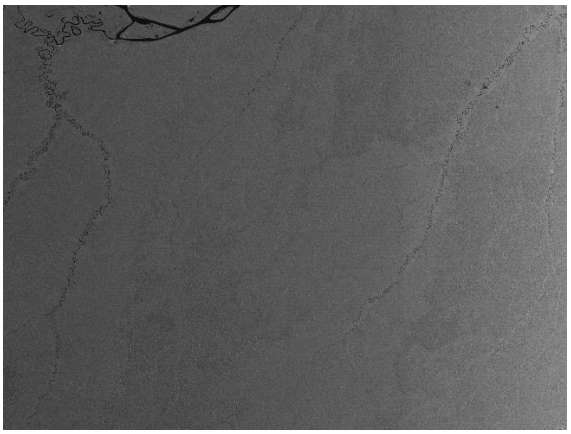
First results on pattern validation did not comply with error margins used during nominal modes commissioning phase.

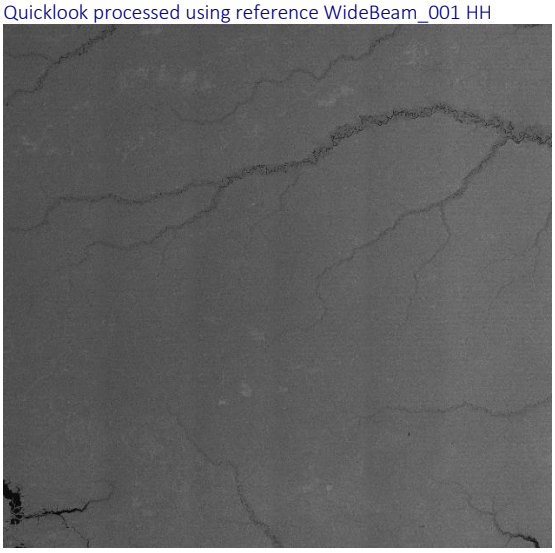
Differences in shape between actual and reference patterns lead to different correction accuracy during processing and may produce radiometric discontinuity along different subswaths, mostly noticeable in homogeneous target areas such as ocean and rainforest.

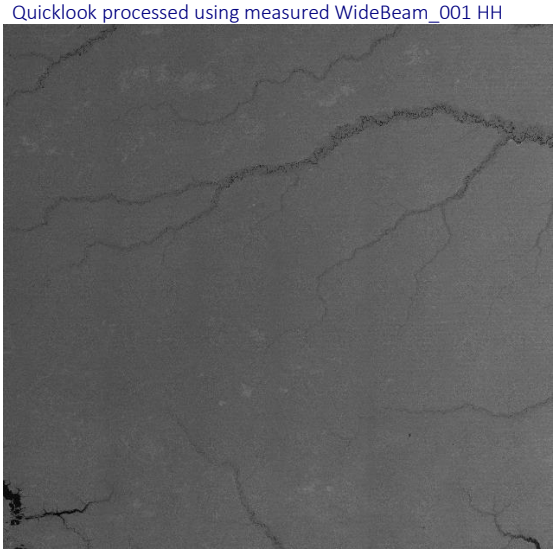
Correction measures taken during CP to adapt sub-arrays characterization to fit reference patterns cannot be applied now without affecting nominal modes, so the strategy chosen is based on measuring all wide beams for all polarizations and use them for processing.

This approach is requiring more acquisitions over rainforest than initially planned but results are promising. First overview comparisons using this correction are shown below.


Quicklook processed using reference WideBeam_001 HH


Quicklook processed using measured WideBeam_001 HH


Quicklook processed using reference WideBeam_005 VV

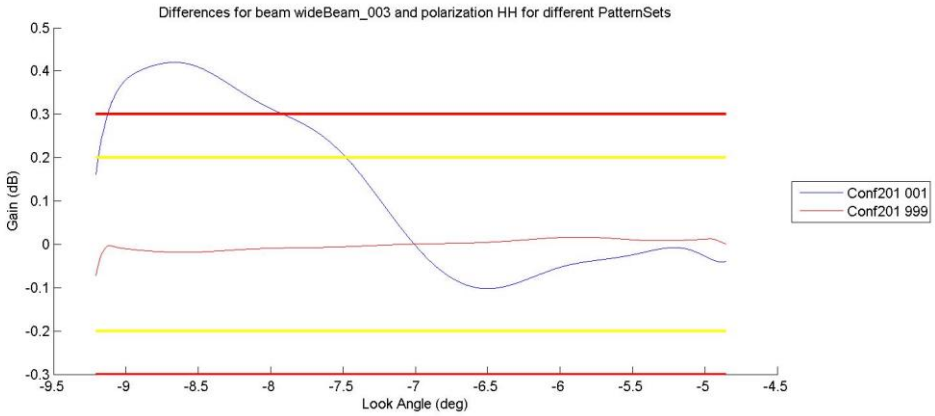

Quicklook processed using measured WideBeam_005 VV

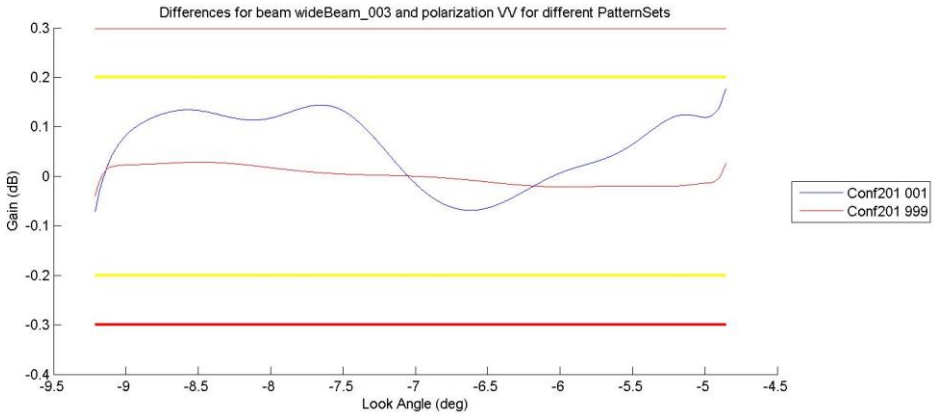
A complete set of reference antenna patterns 201_999 has been generated from statistics of measurements and, then, shape errors show great improvement with respect to 201.001 version, as expected.

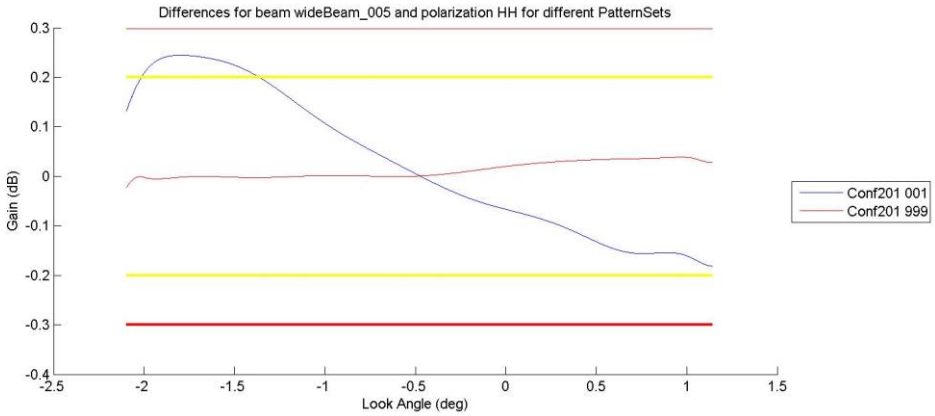
CONFIGURATION 201_001				201_999	
		SHAPE DIFF			
Beam	Pol	Mean	Max	Mean	Max
wideBeam_001	HH	0,03116084	0,16452556	-0,00780913	0,02278955
wideBeam_001	VV	0,02801461	0,30045068	0,00917811	0,05047179
wideBeam_002	HH	0,281343	0,51902892	-0,01267815	0,04494614
wideBeam_002	VV	0,21449516	0,41861622	0,00388112	0,02536195
wideBeam_003	HH	0,12225318	0,42007187	-0,00022605	0,01846014
wideBeam_003	VV	0,06233055	0,14393638	0,00050645	0,02851949

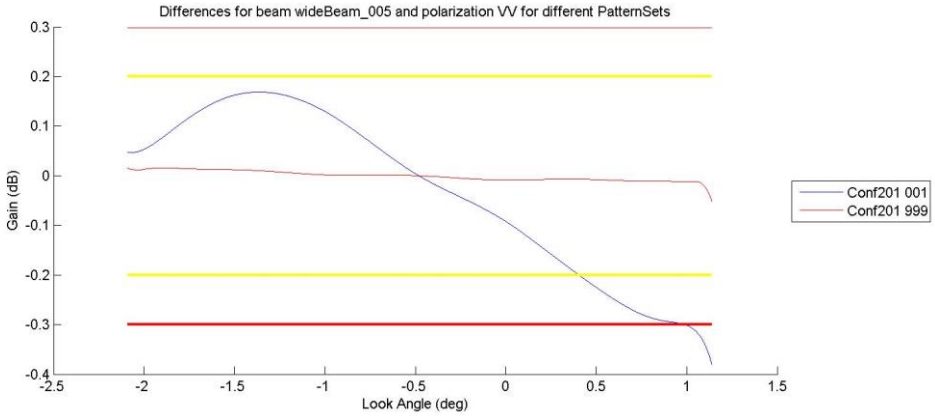
wideBeam_004	HH	0,06646562	0,44621009	0,00391064	0,02469567
wideBeam_004	VV	-0,00332273	0,39253312	0,00092829	0,02017301
wideBeam_005	HH	0,02681758	0,24455788	0,01209356	0,03852539
wideBeam_005	VV	-0,02780001	0,31823446	-0,00029511	0,01557581
wideBeam_006	HH	0,0253554	0,11642011	-4,674E-05	0,00881032
wideBeam_006	VV	0,04432236	0,18959031	-0,0008959	0,00393864
wideBeam_007	HH	-0,01772941	0,2135733	0,00124276	0,01510508
wideBeam_007	VV	0,04546738	0,26906418	0,00395767	0,0210392
wideBeam_008	HH	-0,00629977	0,21488254	0,00598466	0,01999882
wideBeam_008	VV	-0,0039722	0,19425019	-0,00591984	0,02591578
wideBeam_009	HH	-0,04341513	0,24824565	0,01584341	0,04884543
wideBeam_009	VV	0,02710423	0,27711192	-0,00044638	0,02403316
wideBeam_010	HH	0,00578134	0,114966	0,01961174	0,04894038
wideBeam_010	VV	0,0324632	0,11721628	-0,00360028	0,00957525

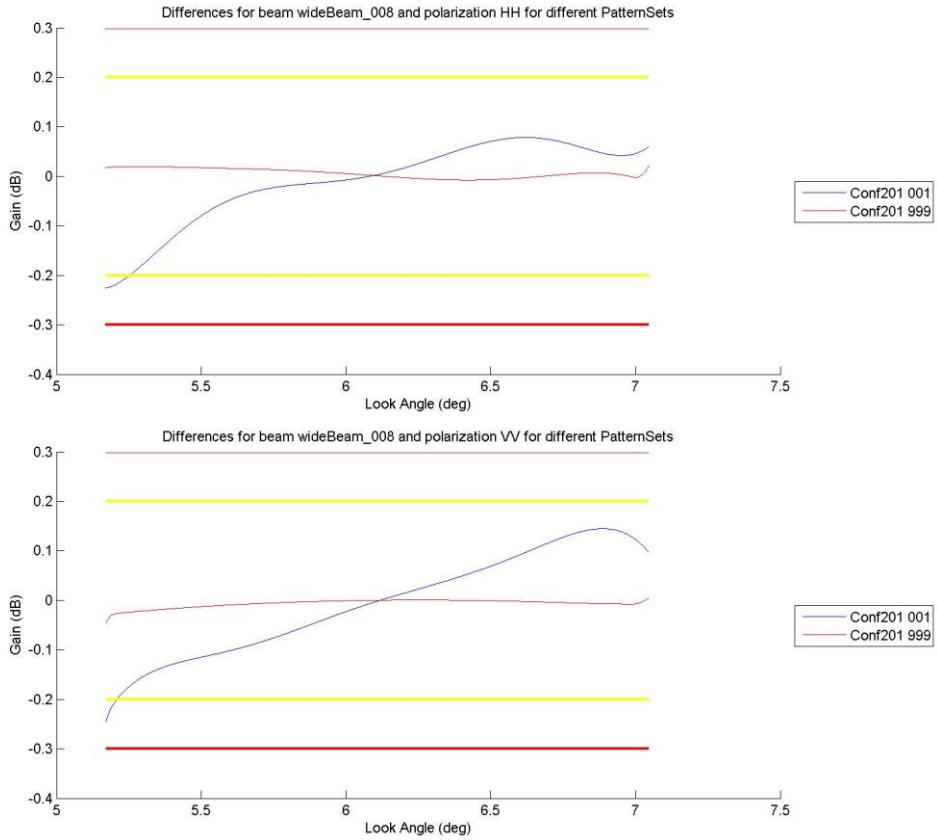
Some examples of this correction are shown:




Differences for beam wideBeam_003 and polarization VV for different PatternSets
Gain (dB)
Look Angle (deg)
Conf201 001
Conf201 999


Differences for beam wideBeam_005 and polarization HH for different PatternSets
Gain (dB)
Look Angle (deg)
Conf201 001
Conf201 999


Differences for beam wideBeam_005 and polarization VV for different PatternSets
Gain (dB)
Look Angle (deg)
Conf201 001
Conf201 999



It should be noted that new patterns fits better because they have been generated from and measured over the same areas. For a reliable region-free characterization a new set of acquisitions is being defined in order to include new data takes over different distributed target areas.

10. ANNEX A: DT PLAN

Mode	Pol. Mode	Target Type	BW	Channel	Illuminated zone	Beam	UTC (Center Coordinate)
ST	S	CR	300	VV	Australia	spot_012	2020-05-02T08:19:59.987000Z
ST	S	CR	300	HH	Argentina	spot_019	2020-05-05T10:06:59.906667Z
ST	S	CR	300	HH	Argentina	spot_094	2020-05-06T09:49:59.319333Z
ST	S	CR	300	HH	Argentina	spot_019	2020-05-16T10:06:59.906667Z
ST	S	CR	300	HH	Argentina	spot_094	2020-05-17T09:49:59.319333Z

ST	S	CR	300	VV	Australia	spot_061	2020-05-18T08:28:24.763333Z
ST	S	CR	300	HH	Neustrelitz	spot_028	2020-05-18T16:44:00.505500Z
ST	S	CR	300	VV	AlbaceteEast-Tiesas	spot_033	2020-05-19T17:57:47.797167Z
ST	S	CR	300	HH	Neustrelitz	spot_049	2020-05-20T05:24:56.069000Z
ST	S	CR	300	HH	Argentina	spot_056	2020-05-22T09:58:29.331167Z
ST	S	CR	300	VV	AlbaceteEast-Mahora	spot_057	2020-05-23T06:11:49.329667Z

ST	S	CR	300	VV	Australia	spot_098	2020-05-23T08:36:46.899833Z
ST	S	CR	300	HH	Neustrelitz	spot_056	2020-05-23T16:52:34.156500Z
ST	S	CR	300	VV	Australia	spot_012	2020-05-24T08:19:59.987000Z
ST	S	CR	300	VV	AlbaceteEast	spot_096	2020-05-18T06:03:20.666000Z
ST	S	CR	300	VV	Argentina	spot_019	2020-05-27T10:06:59.906667Z
ST	S	CR	300	VV	Argentina	spot_094	2020-05-28T09:49:59.319333Z
ST	S	CR	300	HH	Australia	spot_061	2020-05-29T08:28:24.763333Z

ST	S	CR	300	VV	Neustrelitz	spot_028	2020-05-29T16:44:00.505500Z
ST	S	CR	300	VV	AlbaceteEast-Tiesas	spot_033	2020-05-30T17:57:47.797167Z
ST	S	CR	300	VV	Neustrelitz	spot_049	2020-05-31T05:24:56.069000Z
ST	S	CR	300	VV	Argentina	spot_056	2020-06-02T09:58:29.331167Z
ST	S	CR	300	VV	AlbaceteEast-Mahora	spot_057	2020-06-03T06:11:49.329667Z
ST	S	CR	300	HH	Australia	spot_098	2020-06-03T08:36:46.899833Z

ST	S	CR	300	VV	Neustrelitz	spot_056	2020-06-03T16:52:34.156500Z
ST	S	CR	300	HH	Australia	spot_012	2020-06-04T08:19:59.987000Z
ST	S	CR	300	VV	AlbaceteEast	spot_096	2020-05-29T06:03:20.666000Z
ST	S	CR	300	HH	Argentina	spot_019	2020-06-07T10:06:59.906667Z
ST	S	CR	300	HH	Argentina	spot_094	2020-06-08T09:49:59.319333Z
ST	S	CR	300	VV	Australia	spot_061	2020-06-09T08:28:24.763333Z
ST	S	CR	300	HH	Neustrelitz	spot_028	2020-06-09T16:44:00.505500Z

ST	S	CR	300	HH	AlbaceteEast-Tiesas	spot_033	2020-06-10T17:57:47.797167Z
ST	S	CR	300	HH	Neustrelitz	spot_049	2020-06-11T05:24:56.069000Z
ST	S	CR	300	HH	Argentina	spot_056	2020-06-13T09:58:29.331167Z
ST	S	CR	300	HH	AlbaceteEast-Mahora	spot_057	2020-06-14T06:11:49.329667Z
ST	S	CR	300	VV	Australia	spot_098	2020-06-14T08:36:46.899833Z
ST	S	CR	300	HH	Neustrelitz	spot_056	2020-06-14T16:52:34.156500Z

ST	S	CR	300	VV	Australia	spot_012	2020-06-15T08:19:59.987000Z
ST	S	CR	300	HH	AlbaceteEast	spot_096	2020-06-09T06:03:20.666000Z
ST	S	CR	300	VV	Argentina	spot_019	2020-06-18T10:06:59.906667Z
ST	S	CR	300	VV	Argentina	spot_094	2020-06-19T09:49:59.319333Z
ST	S	CR	300	HH	Australia	spot_061	2020-06-20T08:28:24.763333Z
ST	S	CR	300	VV	Neustrelitz	spot_028	2020-06-20T16:44:00.505500Z
ST	S	CR	300	HH	AlbaceteEast-Tiesas	spot_033	2020-06-21T17:57:47.797167Z

ST	S	CR	300	VV	Neustrelitz	spot_049	2020-06-22T05:24:56.069000Z
ST	S	CR	300	VV	Argentina	spot_056	2020-06-24T09:58:29.331167Z
ST	S	CR	300	HH	AlbaceteEast-Mahora	spot_057	2020-06-25T06:11:49.329667Z
ST	S	CR	300	HH	Australia	spot_098	2020-06-25T08:36:46.899833Z
ST	S	CR	300	VV	Neustrelitz	spot_056	2020-06-25T16:52:34.156500Z
ST	S	CR	300	HH	Australia	spot_012	2020-06-26T08:19:59.987000Z
ST	S	CR	300	HH	AlbaceteEast	spot_096	2020-06-20T06:03:20.666000Z

SC	S		150	VV	AmazonRainForest_Brazil_2	wideBeam_005,wideBeam_006,wideBeam_007,wideBeam_008,wideBeam_009,wideBeam_010	2020-05-14T10:33:52.859000Z
SC	S		150	HV	Pacific Doldrums_4	wideBeam_004,wideBeam_005,wideBeam_006,wideBeam_007,wideBeam_008,wideBeam_009	2020-05-17T12:50:26.368333Z
SC	S		150	HH	AmazonRainForest_Brazil_2	wideBeam_005,wideBeam_006,wideBeam_007,wideBeam_008,wideBeam_009,wideBeam_010	2020-05-17T23:04:50.001000Z
SC	S		150	HV	Pacific Doldrums_5	wideBeam_005,wideBeam_006,wideBeam_007,wideBeam_008,wideBeam_009,wideBeam_010	2020-05-18T02:16:00.363667Z
SC	S		150	VV	AmazonRainForest_Brazil_2	wideBeam_001,wideBeam_002,wideBeam_003,wideBeam_004,wideBeam_005,wideBeam_006	2020-05-18T22:47:53.156500Z

SC	S		150	HV	Pacific Doldrums_3	wideBeam_003,wideBeam_004,wideBeam_005,wideBeam_006,wideBeam_007,wideBeam_008	2020-05-19T13:50:41.537500Z
SC	S		150	HV	Pacific Doldrums_2	wideBeam_002,wideBeam_003,wideBeam_004,wideBeam_005,wideBeam_006,wideBeam_007	2020-05-20T03:16:04.453000Z
SC	S		150	HH	AmazonRainForest_Brazil_2	wideBeam_001,wideBeam_002,wideBeam_003,wideBeam_004,wideBeam_005,wideBeam_006	2020-05-20T10:24:58.294833Z
SC	S	CR	150	HH	Madrid_D	wideBeam_001,wideBeam_002,wideBeam_003,wideBeam_004,wideBeam_005,wideBeam_006	2020-05-22T06:28:40.314333Z
SC	S		150	HV	Pacific Doldrums_1	wideBeam_001,wideBeam_002,wideBeam_003,wideBeam_004,wideBeam_005,wideBeam_006	2020-05-23T14:16:22.791500Z

SC	S	CR	150	HH	Madrid_A	wideBeam_003,wideBeam_004,wideBeam_005,wideBeam_006,wideBeam_007,wideBeam_008	2020-05-24T18:06:45.710333Z
SC	S		150	VV	AmazonRainForest_Brazil_2	wideBeam_005,wideBeam_006,wideBeam_007,wideBeam_008,wideBeam_009,wideBeam_010	2020-05-25T10:33:52.859000Z
SC	S		150	HV	Pacific Doldrums_4	wideBeam_004,wideBeam_005,wideBeam_006,wideBeam_007,wideBeam_008,wideBeam_009	2020-05-28T12:50:26.368333Z
SC	S		150	HH	AmazonRainForest_Brazil_2	wideBeam_005,wideBeam_006,wideBeam_007,wideBeam_008,wideBeam_009,wideBeam_010	2020-05-28T23:04:50.001000Z
SC	S		150	HV	Pacific Doldrums_5	wideBeam_005,wideBeam_006,wideBeam_007,wideBeam_008,wideBeam_009,wideBeam_010	2020-05-29T02:16:00.363667Z

SC	S		150	VV	AmazonRainForest_Brazil_2	wideBeam_001,wideBeam_002,wideBeam_003,wideBeam_004,wideBeam_005,wideBeam_006	2020-05-29T22:47:53.156500Z
SC	S		150	HV	Pacific Doldrums_3	wideBeam_003,wideBeam_004,wideBeam_005,wideBeam_006,wideBeam_007,wideBeam_008	2020-05-30T13:50:41.537500Z
SC	S		150	HV	Pacific Doldrums_2	wideBeam_002,wideBeam_003,wideBeam_004,wideBeam_005,wideBeam_006,wideBeam_007	2020-05-31T03:16:04.453000Z
SC	S		150	HH	AmazonRainForest_Brazil_2	wideBeam_001,wideBeam_002,wideBeam_003,wideBeam_004,wideBeam_005,wideBeam_006	2020-05-31T10:24:58.294833Z
SC	S	CR	150	HH	Madrid_D	wideBeam_001,wideBeam_002,wideBeam_003,wideBeam_004,wideBeam_005,wideBeam_006	2020-06-02T06:28:40.314333Z

SC	S		150	HV	Pacific Doldrums_1	wideBeam_001,wideBeam_002,wideBeam_003,wideBeam_004,wideBeam_005,wideBeam_006	2020-06-03T14:16:22.791500Z
SC	S	CR	150	HH	Madrid_A	wideBeam_003,wideBeam_004,wideBeam_005,wideBeam_006,wideBeam_007,wideBeam_008	2020-06-04T18:06:45.710333Z
SC	S		150	VV	AmazonRainForest_Brazil_2	wideBeam_005,wideBeam_006,wideBeam_007,wideBeam_008,wideBeam_009,wideBeam_010	2020-06-05T10:33:52.859000Z
SC	S		150	HV	Pacific Doldrums_4	wideBeam_004,wideBeam_005,wideBeam_006,wideBeam_007,wideBeam_008,wideBeam_009	2020-06-08T12:50:26.368333Z
SC	S		150	HH	AmazonRainForest_Brazil_2	wideBeam_005,wideBeam_006,wideBeam_007,wideBeam_008,wideBeam_009,wideBeam_010	2020-06-08T23:04:50.001000Z

SC	S		150	HV	Pacific Doldrums_5	wideBeam_005,wideBeam_006,wideBeam_007,wideBeam_008,wideBeam_009,wideBeam_010	2020-06-09T02:16:00.363667Z
SC	S		150	VV	AmazonRainForest_Brazil_2	wideBeam_001,wideBeam_002,wideBeam_003,wideBeam_004,wideBeam_005,wideBeam_006	2020-06-09T22:47:53.156500Z
SC	S		150	HV	Pacific Doldrums_3	wideBeam_003,wideBeam_004,wideBeam_005,wideBeam_006,wideBeam_007,wideBeam_008	2020-06-10T13:50:41.537500Z
SC	S		150	HV	Pacific Doldrums_2	wideBeam_002,wideBeam_003,wideBeam_004,wideBeam_005,wideBeam_006,wideBeam_007	2020-06-11T03:16:04.453000Z
SC	S		150	HH	AmazonRainForest_Brazil_2	wideBeam_001,wideBeam_002,wideBeam_003,wideBeam_004,wideBeam_005,wideBeam_006	2020-06-11T10:24:58.294833Z

SC	S	CR	150	HH	Madrid_D	wideBeam_001,wideBeam_002,wideBeam_003,wideBeam_004,wideBeam_005,wideBeam_006	2020-06-13T06:28:40.314333Z
SC	S		150	HV	Pacific Doldrums_1	wideBeam_001,wideBeam_002,wideBeam_003,wideBeam_004,wideBeam_005,wideBeam_006	2020-06-14T14:16:22.791500Z
SC	S	CR	150	HH	Madrid_A	wideBeam_003,wideBeam_004,wideBeam_005,wideBeam_006,wideBeam_007,wideBeam_008	2020-06-15T18:06:45.710333Z
SC	S		150	VV	AmazonRainForest_Brazil_2	wideBeam_005,wideBeam_006,wideBeam_007,wideBeam_008,wideBeam_009,wideBeam_010	2020-06-16T10:33:52.859000Z

SC	S		150	HV	Pacific Doldrums_4	wideBeam_004,wideBeam_005,wideBeam_006,wideBeam_007,wideBeam_008,wideBeam_009	2020-06-19T12:50:26.368333Z
SC	S		150	HH	AmazonRainForest_Brazil_2	wideBeam_005,wideBeam_006,wideBeam_007,wideBeam_008,wideBeam_009,wideBeam_010	2020-06-19T23:04:50.001000Z
SC	S		150	HV	Pacific Doldrums_5	wideBeam_005,wideBeam_006,wideBeam_007,wideBeam_008,wideBeam_009,wideBeam_010	2020-06-20T02:16:00.363667Z
SC	S		150	VV	AmazonRainForest_Brazil_2	wideBeam_001,wideBeam_002,wideBeam_003,wideBeam_004,wideBeam_005,wideBeam_006	2020-06-20T22:47:53.156500Z
SC	S		150	HV	Pacific Doldrums_3	wideBeam_003,wideBeam_004,wideBeam_005,wideBeam_006,wideBeam_007,wideBeam_008	2020-06-21T13:50:41.537500Z

SC	S		150	HV	Pacific Doldrums_2	wideBeam_002,wideBeam_003,wideBeam_004,wideBeam_005,wideBeam_006,wideBeam_007	2020-06-22T03:16:04.453000Z
SC	S		150	HH	AmazonRainForest_Brazil_2	wideBeam_001,wideBeam_002,wideBeam_003,wideBeam_004,wideBeam_005,wideBeam_006	2020-06-22T10:24:58.294833Z
SC	S	CR	150	HH	Madrid_D	wideBeam_001,wideBeam_002,wideBeam_003,wideBeam_004,wideBeam_005,wideBeam_006	2020-06-24T06:28:40.314333Z
SC	S		150	HV	Pacific Doldrums_1	wideBeam_001,wideBeam_002,wideBeam_003,wideBeam_004,wideBeam_005,wideBeam_006	2020-06-25T14:16:22.791500Z

SC	S	CR	150	HH	Madrid_A	wideBeam_003,wideBeam_004,wideBeam_005,wideBeam_006,wideBeam_007,wideBeam_008	2020-06-26T18:06:45.710333Z
SC	S		150	VV	AmazonRainForest_Brazil_2	wideBeam_005,wideBeam_006,wideBeam_007,wideBeam_008,wideBeam_009,wideBeam_010	2020-05-16T09:58:19.411333Z
SC	S		150	HV	Pacific Doldrums_4	wideBeam_004,wideBeam_005,wideBeam_006,wideBeam_007,wideBeam_008,wideBeam_009	2020-05-17T12:50:26.368333Z
SC	S		150	HH	AmazonRainForest_Brazil_2	wideBeam_005,wideBeam_006,wideBeam_007,wideBeam_008,wideBeam_009,wideBeam_010	2020-05-19T22:31:23.053000Z
SC	S		150	HV	Pacific Doldrums_5	wideBeam_005,wideBeam_006,wideBeam_007,wideBeam_008,wideBeam_009,wideBeam_010	2020-05-18T02:16:00.363667Z

SC	S		150	VV	AmazonRainForest_Brazil_2	wideBeam_001,wideBeam_002,wideBeam_003,wideBeam_004,wideBeam_005,wideBeam_006	2020-05-18T22:47:53.156500Z
SC	S		150	HV	Pacific Doldrums_3	wideBeam_003,wideBeam_004,wideBeam_005,wideBeam_006,wideBeam_007,wideBeam_008	2020-05-19T13:50:41.537500Z
SC	S		150	HV	Pacific Doldrums_2	wideBeam_002,wideBeam_003,wideBeam_004,wideBeam_005,wideBeam_006,wideBeam_007	2020-05-20T03:16:04.453000Z
SC	S		150	HH	AmazonRainForest_Brazil_2	wideBeam_001,wideBeam_002,wideBeam_003,wideBeam_004,wideBeam_005,wideBeam_006	2020-05-20T10:24:58.294833Z
SC	S	CR	150	HH	Madrid_D	wideBeam_001,wideBeam_002,wideBeam_003,wideBeam_004,wideBeam_005,wideBeam_006	2020-05-22T06:28:40.314333Z

SC	S		150	HV	Pacific Doldrums_1	wideBeam_001,wideBeam_002,wideBeam_003,wideBeam_004,wideBeam_005,wideBeam_006	2020-05-23T14:16:22.791500Z
SC	S	CR	150	HH	Madrid_A	wideBeam_003,wideBeam_004,wideBeam_005,wideBeam_006,wideBeam_007,wideBeam_008	2020-05-24T18:06:45.710333Z
SC	S		150	HV	Pacific Doldrums_4	wideBeam_004,wideBeam_005,wideBeam_006,wideBeam_007,wideBeam_008,wideBeam_009	2020-05-28T12:50:26.368333Z
SC	S		150	HV	Pacific Doldrums_5	wideBeam_005,wideBeam_006,wideBeam_007,wideBeam_008,wideBeam_009,wideBeam_010	2020-05-29T02:16:00.363667Z
SC	S		150	VV	AmazonRainForest_Brazil_2	wideBeam_001,wideBeam_002,wideBeam_003,wideBeam_004,wideBeam_005,wideBeam_006	2020-05-29T22:47:53.156500Z

SC	S		150	HV	Pacific Doldrums_3	wideBeam_003,wideBeam_004,wideBeam_005,wideBeam_006,wideBeam_007,wideBeam_008	2020-05-30T13:50:41.537500Z
SC	S		150	HV	Pacific Doldrums_2	wideBeam_002,wideBeam_003,wideBeam_004,wideBeam_005,wideBeam_006,wideBeam_007	2020-05-31T03:16:04.453000Z
SC	S		150	HH	AmazonRainForest_Brazil_2	wideBeam_001,wideBeam_002,wideBeam_003,wideBeam_004,wideBeam_005,wideBeam_006	2020-05-31T10:24:58.294833Z
SC	S	CR	150	HH	Madrid_D	wideBeam_001,wideBeam_002,wideBeam_003,wideBeam_004,wideBeam_005,wideBeam_006	2020-06-02T06:28:40.314333Z
SC	S		150	HV	Pacific Doldrums_1	wideBeam_001,wideBeam_002,wideBeam_003,wideBeam_004,wideBeam_005,wideBeam_006	2020-06-03T14:16:22.791500Z

SC	S	CR	150	HH	Madrid_A	wideBeam_003,wideBeam_004,wideBeam_005,wideBeam_006,wideBeam_007,wideBeam_008	2020-06-04T18:06:45.710333Z
SC	S		150	HV	Pacific Doldrums_4	wideBeam_004,wideBeam_005,wideBeam_006,wideBeam_007,wideBeam_008,wideBeam_009	2020-06-08T12:50:26.368333Z
SC	S		150	VV	AmazonRainForest_Brazil_2	wideBeam_005,wideBeam_006,wideBeam_007,wideBeam_008,wideBeam_009,wideBeam_010	2020-05-27T09:58:19.411333Z
SC	S		150	HH	AmazonRainForest_Brazil_2	wideBeam_005,wideBeam_006,wideBeam_007,wideBeam_008,wideBeam_009,wideBeam_010	2020-06-10T22:31:23.053000Z
SC	S		150	HH	AmazonRainForest_Brazil_2	wideBeam_005,wideBeam_006,wideBeam_007,wideBeam_008,wideBeam_009,wideBeam_010	2020-05-30T22:31:23.053000Z

SC	S		150	VV	AmazonRainForest_Brazil_2	wideBeam_005,wideBeam_006,wideBeam_007,wideBeam_008,wideBeam_009,wideBeam_010	2020-06-07T09:58:19.411333Z
SC	S		150	HV	Pacific Doldrums_5	wideBeam_005,wideBeam_006,wideBeam_007,wideBeam_008,wideBeam_009,wideBeam_010	2020-06-09T02:16:00.363667Z
SC	S		150	VV	AmazonRainForest_Brazil_2	wideBeam_001,wideBeam_002,wideBeam_003,wideBeam_004,wideBeam_005,wideBeam_006	2020-06-09T22:47:53.156500Z
SC	S		150	HV	Pacific Doldrums_3	wideBeam_003,wideBeam_004,wideBeam_005,wideBeam_006,wideBeam_007,wideBeam_008	2020-06-10T13:50:41.537500Z
SC	S		150	HV	Pacific Doldrums_2	wideBeam_002,wideBeam_003,wideBeam_004,wideBeam_005,wideBeam_006,wideBeam_007	2020-06-11T03:16:04.453000Z
SC	S		150	HH	AmazonRainForest_Brazil_2	wideBeam_001,wideBeam_002,wideBeam_003,wideBeam_004,wideBeam_005,wideBeam_006	2020-06-11T10:24:58.294833Z

SC	S		150	HV	Pacific Doldrums_1	wideBeam_001,wideBeam_002,wideBeam_003,wideBeam_004,wideBeam_005,wideBeam_006	2020-06-14T14:16:22.791500Z
SC	S		150	VV	AmazonRainForest_Brazil_2	wideBeam_005,wideBeam_006,wideBeam_007,wideBeam_008,wideBeam_009,wideBeam_010	2020-06-18T09:58:19.411333Z
SC	S		150	HV	Pacific Doldrums_4	wideBeam_004,wideBeam_005,wideBeam_006,wideBeam_007,wideBeam_008,wideBeam_009	2020-06-19T12:50:26.368333Z
SC	S		150	HH	AmazonRainForest_Brazil_2	wideBeam_005,wideBeam_006,wideBeam_007,wideBeam_008,wideBeam_009,wideBeam_010	2020-06-21T22:31:23.053000Z
SC	S		150	HV	Pacific Doldrums_5	wideBeam_005,wideBeam_006,wideBeam_007,wideBeam_008,wideBeam_009,wideBeam_010	2020-06-20T02:16:00.363667Z

SC	S		150	VV	AmazonRainForest_Brazil_2	wideBeam_001,wideBeam_002,wideBeam_003,wideBeam_004,wideBeam_005,wideBeam_006	2020-06-20T22:47:53.156500Z
SC	S		150	HV	Pacific Doldrums_3	wideBeam_003,wideBeam_004,wideBeam_005,wideBeam_006,wideBeam_007,wideBeam_008	2020-06-21T13:50:41.537500Z
SC	S		150	HV	Pacific Doldrums_2	wideBeam_002,wideBeam_003,wideBeam_004,wideBeam_005,wideBeam_006,wideBeam_007	2020-06-22T03:16:04.453000Z
SC	S		150	HH	AmazonRainForest_Brazil_2	wideBeam_001,wideBeam_002,wideBeam_003,wideBeam_004,wideBeam_005,wideBeam_006	2020-06-22T10:24:58.294833Z
SC	S		150	HV	Pacific Doldrums_1	wideBeam_001,wideBeam_002,wideBeam_003,wideBeam_004,wideBeam_005,wideBeam_006	2020-06-25T14:16:22.791500Z

SC	S	CR	150	VV	Madrid_D	wideBeam_001,wideBeam_002,wideBeam_003,wideBeam_004,wideBeam_005,wideBeam_006	2020-06-24T06:28:40.314333Z
SC	S	CR	150	VV	Madrid_A	wideBeam_003,wideBeam_004,wideBeam_005,wideBeam_006,wideBeam_007,wideBeam_008	2020-06-26T18:06:45.710333Z
SC	S	CR	150	VV	Madrid_A	wideBeam_003,wideBeam_004,wideBeam_005,wideBeam_006,wideBeam_007,wideBeam_008	2020-06-15T18:06:45.710333Z

SC	S	CR	150	VV	Madrid_D	wideBeam_001,wideBeam_002,wideBeam_003,wideBeam_004,wideBeam_005,wideBeam_006	2020-06-13T06:28:40.314333Z