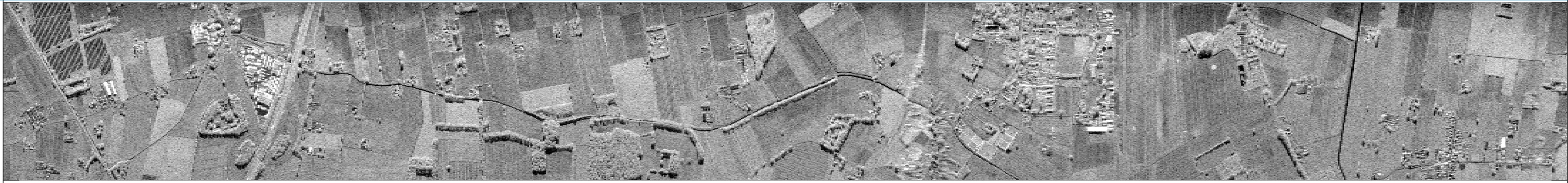

Ka-band InSAR Airborne demonstrator

Final Review

Kick-off meeting

ESA-ESTEC, 11 July 2022

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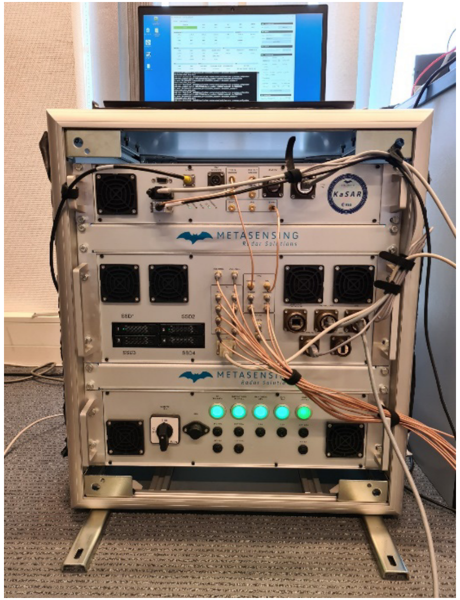
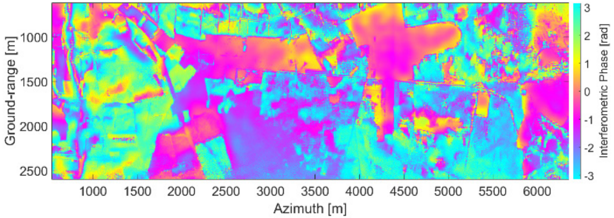
Outline

- Meeting Introduction
- Project Overview
- The KaSAR instrument
- The Aircraft carrier and pod
- The KaSAR processor
- Functional verification campaign
- Requirements review
- Lessons learned and way forward
- Conclusion





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The KaSAR Project

Task 1 – Requirements Review and Consolidation

- Critically review and consolidate/complement requirements

→ Requirements Review (RR)

Task 2 – Preliminary Instrument Design and Performance

- Identify suitable carrier aircraft(s) and define interfaces
- Define instrument architecture including options
- Define preliminary instrument design
- Develop performance model and derive preliminary instrument performance
- Define processor architecture and algorithms for XTI and ATI image processing.
- Elaborate preliminary on-ground and in-flight verification plan

→ Preliminary Design Review (PDR)

Task 3 – Detailed Instrument Design

- Elaborate detailed instrument design and interface design
- Define procurement approach
- Create on-ground instrument test plan and procedures
- Create verification test campaign plan and procedures
- Elaborate detailed processor design.
- Update performance model and predicted performance

→ Critical Design Review (CDR)

Task 4 – Instrument Manufacture, Integration and Tests

- Instrument manufacturing, assembly, integration and test
- Interface manufacturing and assembly
- Preparation of the in-flight verification campaign
- Processor implementation
- End-to-end test on ground outside aircraft

→ Instrument and Processor (on-ground) Test Review Board (TRB)

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DOCUMENT

Appendix 1 to ESA ITT AO/1-8362/15/NL/FE

Statement of Work

Development of a Ka-band InSAR Airborne Instrument Demonstrator

Task 5 – Verification Flight Campaign and System Verification

- Airworthiness certification
- Instrument integration/accommodation on an aircraft
- Verification Flight Campaign
- System Performance Verification
- Final evaluation of design and test activity and recommendations

→ Final Review (FR)

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The KaSAR Project - SOW

Goal: Development of a compact, transportable, single-pass, Ka-band InSAR Airborne Instrument Demonstrator (KaSAR).

The KaSAR system is composed of:

- Airborne segment: KaSAR Instrument with control software
- Ground segment: End-to-End Processor from raw data to interferograms

Main development topics of the project:

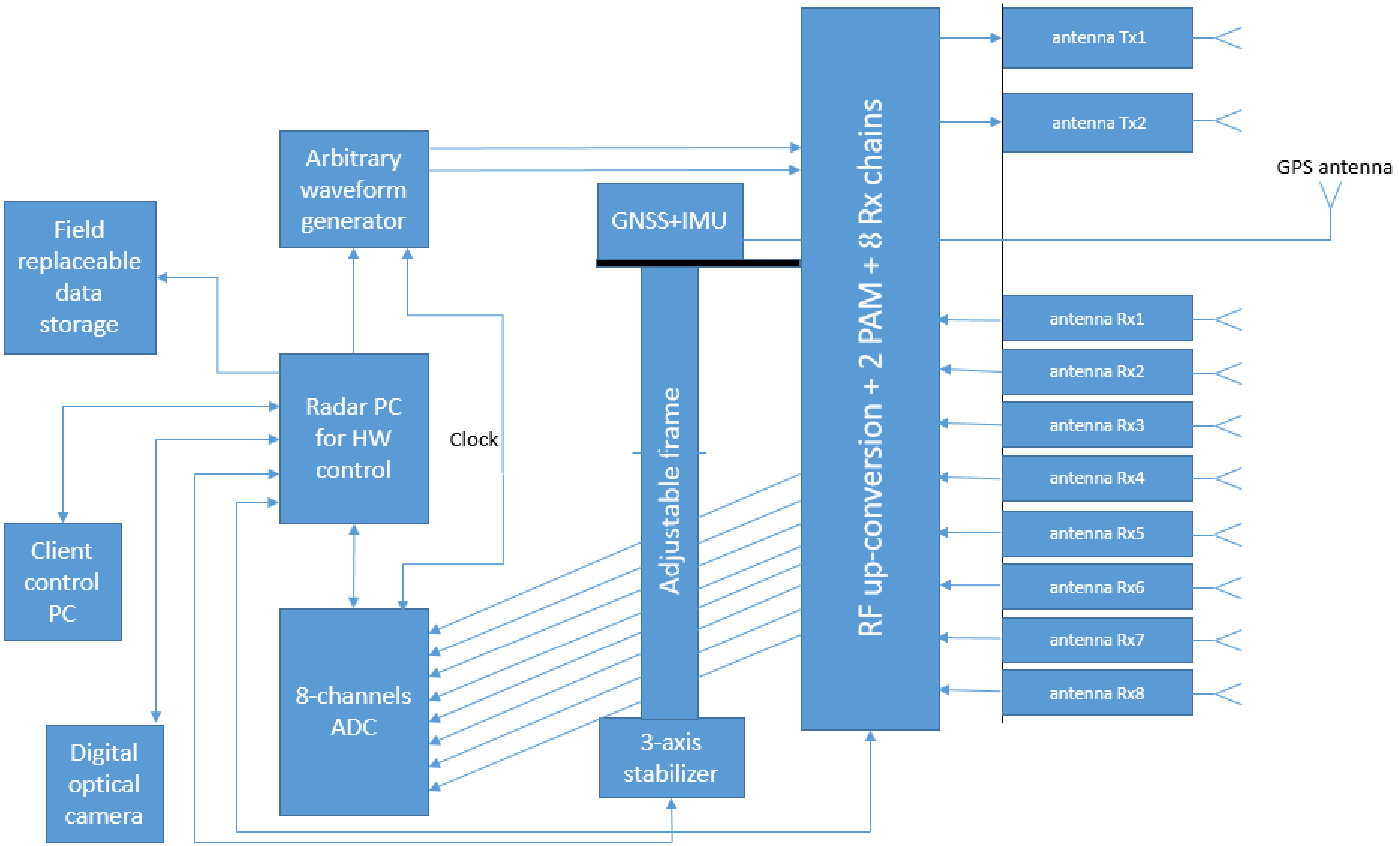
1- Instrument
2- Processor
3- System verification
4- Airworthiness certification

The KaSAR Project - Now

KaSAR is:

- multi-channel (8x) airborne SAR system at Ka-band
- Single-pass Along- and Cross-Track Interferometric SAR
- with Polarimetric SAR capability
- with adjustable and multiple baselines
- Includes the End-to-End Processor from Raw data to Interferograms
- Verified on ground and in-flight
- With airworthiness certification
- Can be used for further airborne SAR data collection experiments

The KaSAR airborne segment



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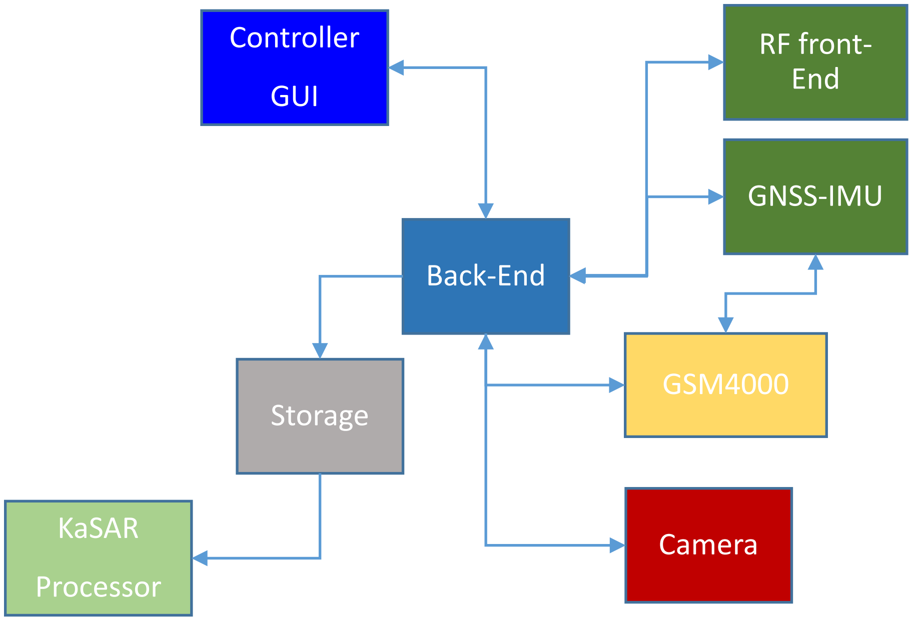
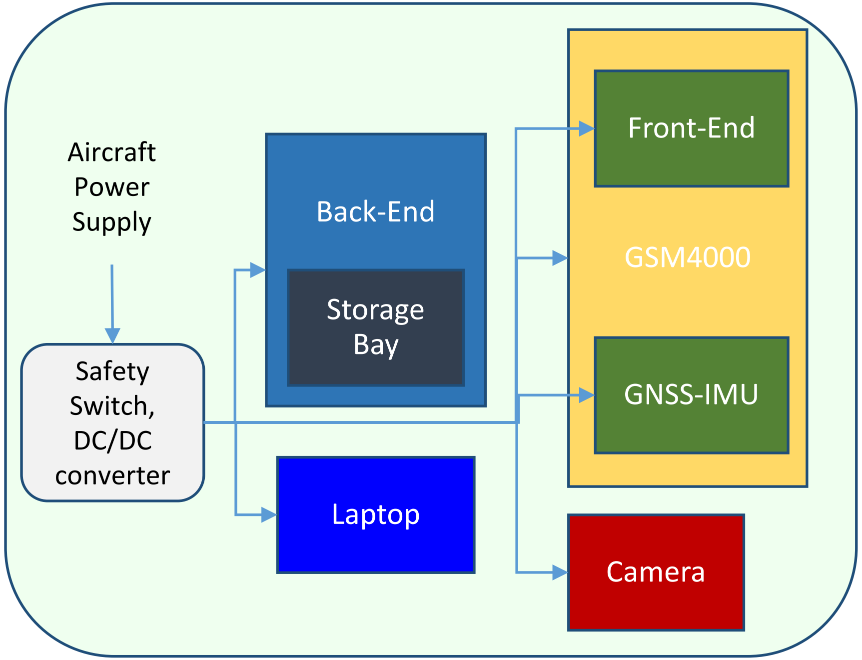
The KaSAR System



Logical block diagram of the instrument



Mechanical block diagram of the instrument

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The KaSAR Instrument

Property	Value
Operating frequency	35.75 GHz
Modulation	FMCW
Bandwidth	500 MHz (adjustable)
Transmit power	10W
Number Tx channels	2 (toggled)
Number Rx channels	8 (simultaneous)
Data storage	8 TB
Antenna size (az x el)	0.1m x 0.05m
Antenna gain	22.3 dBi
Beamwidth (az x el)	4.5° x 35°
Cross-polar	< -27dB
Sidelobe level	< -15dB
Polarization	Dual linear (H & V)

Property	Value
Height of operation	500m < h < 3000m
Incidence angles	20° - 50°
Operational modes	Single-pol V, Single-pol H, full-pol V&H, ping-pong, dual-view L/R
Adjustable Baselines (RX antenna distance)	0.1m < ATB < 0.5m 0.1m < XTB < 0.4m
NESZ	<-20dB
Swath width	> 1km (resolution dependent)
Ground resolution	< 1m x 1m (SLC)
Inter-channel phase accuracy	< 1° RMS (after I-CAL and E-CAL corrections)
Vertical accuracy (from the data)	~10cm flat areas (high coherence) ~50cm forested areas
Spaceborne reference scenario	400-800 km orbit height, 7 km/s speed, 16 km swath (NESZ< -16dB)

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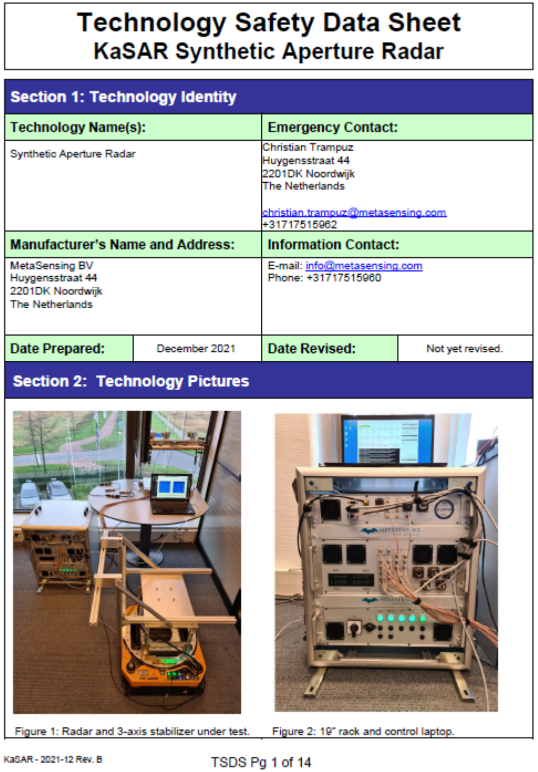
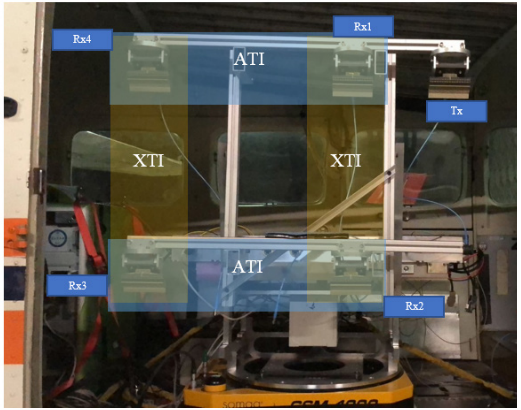
The KaSAR Instrument

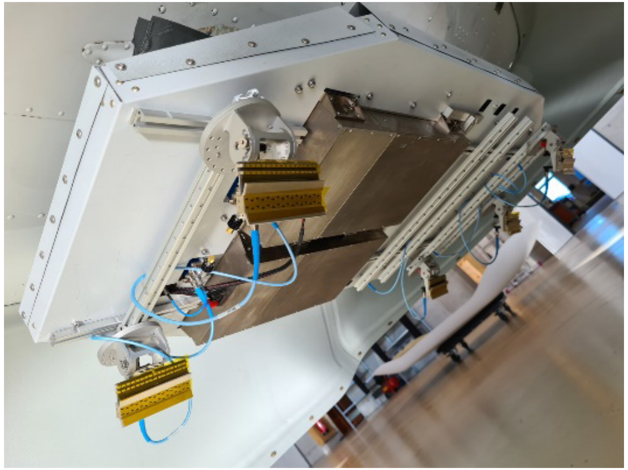


Technology Safety Data Sheet KaSAR Synthetic Aperture Radar			
Section 1: Technology Identity			
Technology Name(s):		**Emergency Contact:**	
Synthetic Aperture Radar		Christian Trampuz Huygensstraat 44 2201DK Noordwijk The Netherlands christian.trampuz@metasensing.com +31717515962	
Manufacturer's Name and Address:		**Information Contact:**	
MetaSensing BV Huygensstraat 44 2201DK Noordwijk The Netherlands		E-mail: info@metasensing.com Phone: +31717515960	
Date Prepared:	December 2021	**Date Revised:**	Not yet revised.
Section 2: Technology Pictures			

Figure 1: Radar and 3-axis stabilizer under test. Figure 2: 19" rack and control laptop.

KaSAR - 2021-12 Rev. B TSDS Pg 1 of 14





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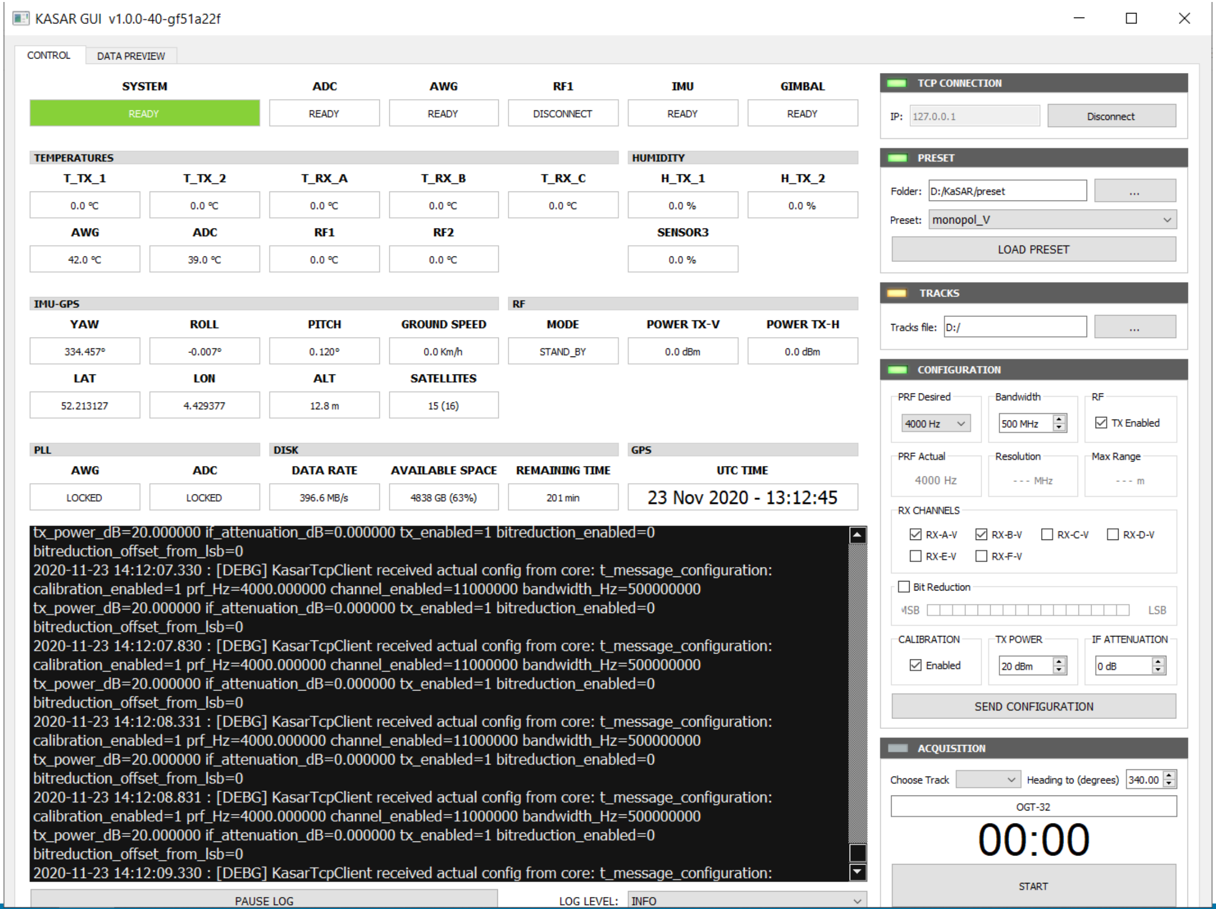
Command & Control Software



Configuration and operation GUI

with Pilot Assistant

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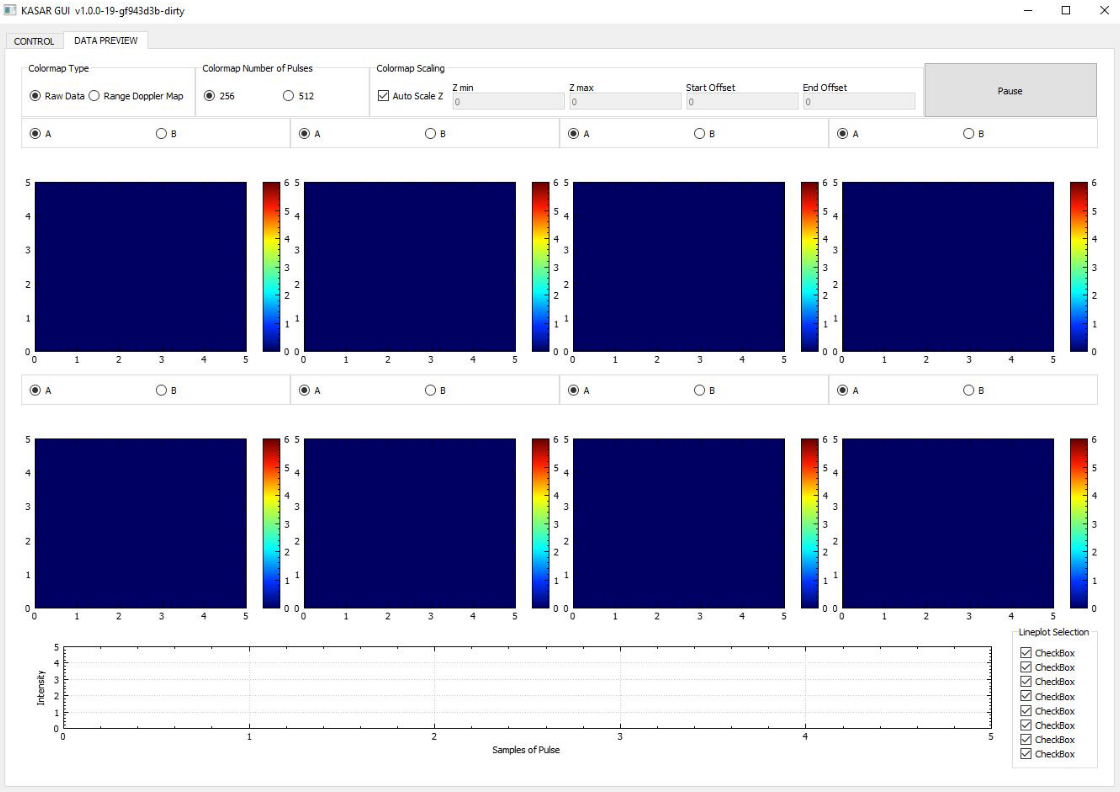
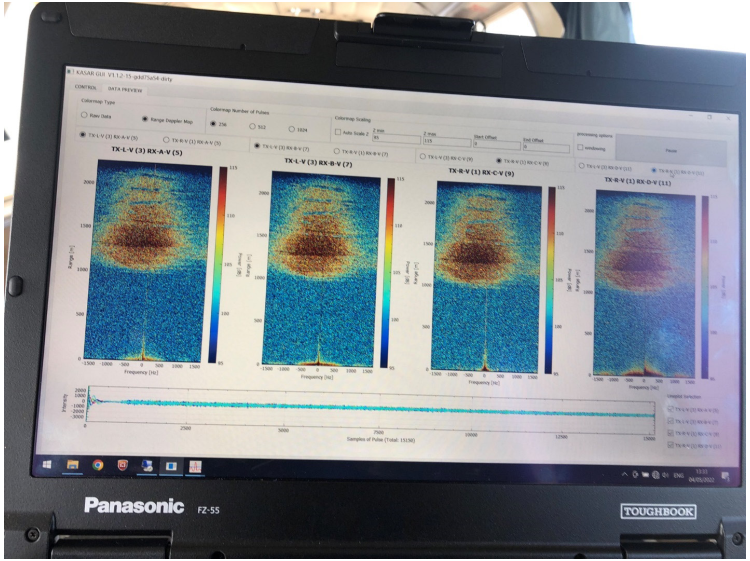
Command & Control Software

In-flight acquired data monitoring





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The aircraft carrier with pod

AIRBORNE TECHNOLOGIES

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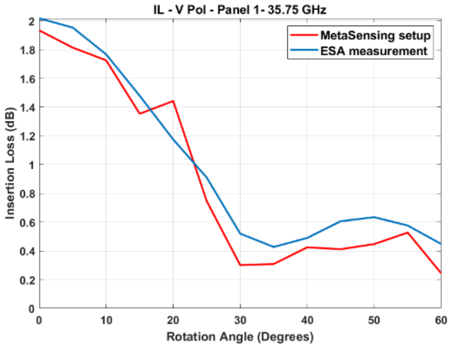
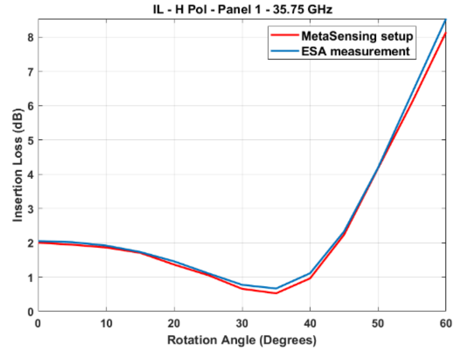
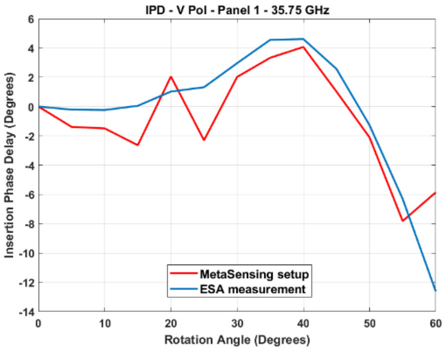
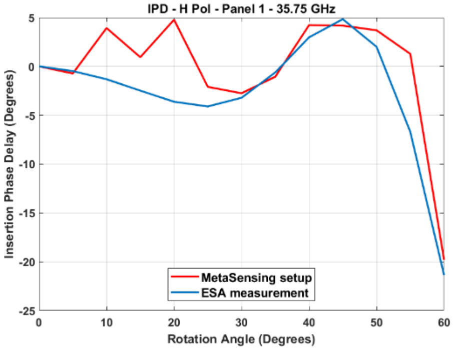
The pod

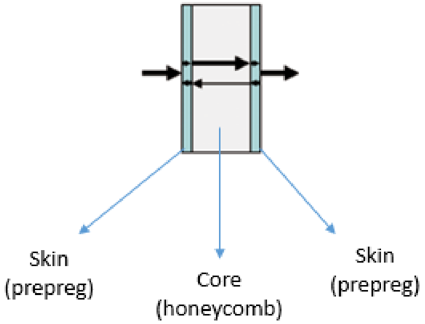




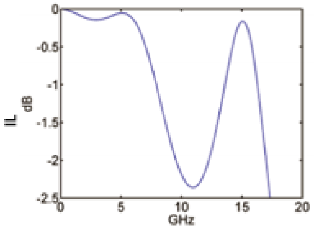




Radome structure A-sandwich

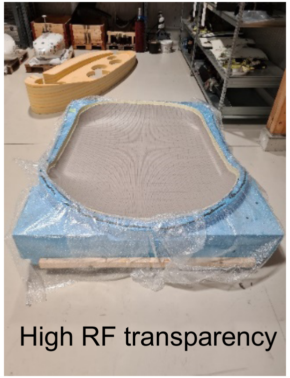


Typical performance



Reflections of an A-sandwich radome are plotted versus frequency. The foam core is designed to be 0.25 wavelengths at 5 GHz, which provides maximum performance at <7 GHz (and 15 GHz where the phase shift is an odd multiple of 180°).

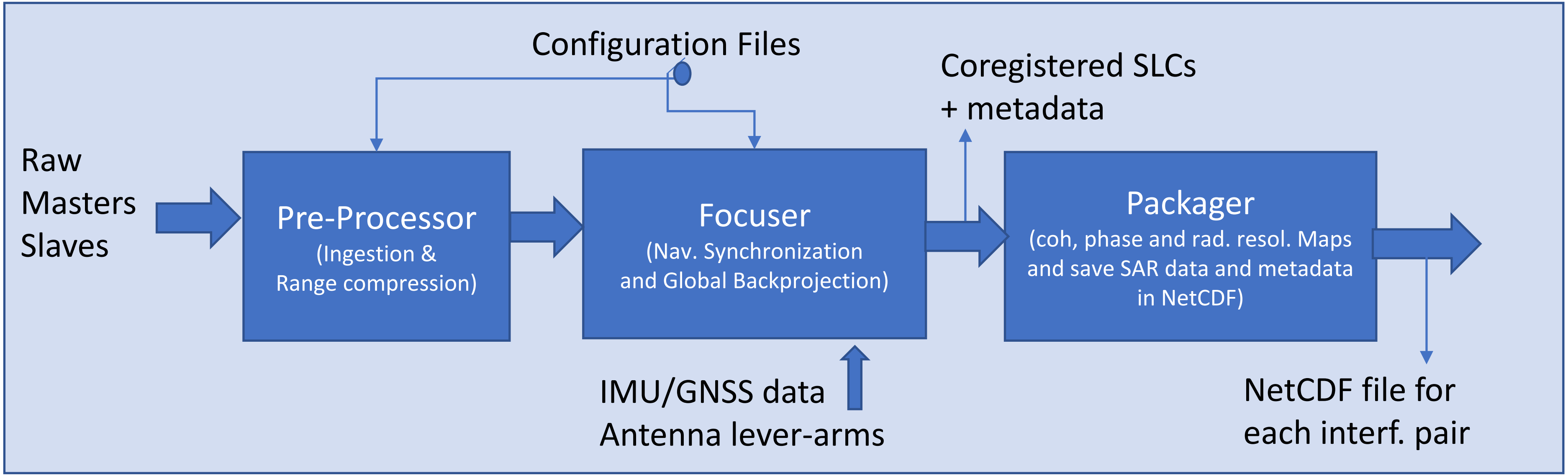
Scaled to Ku-band (13.5 GHz) and Ka-band (35.75 GHz)



The KaSAR Processor

The KaSAR Processor

From Raw data to SAR Interferograms



The KaSAR Processor

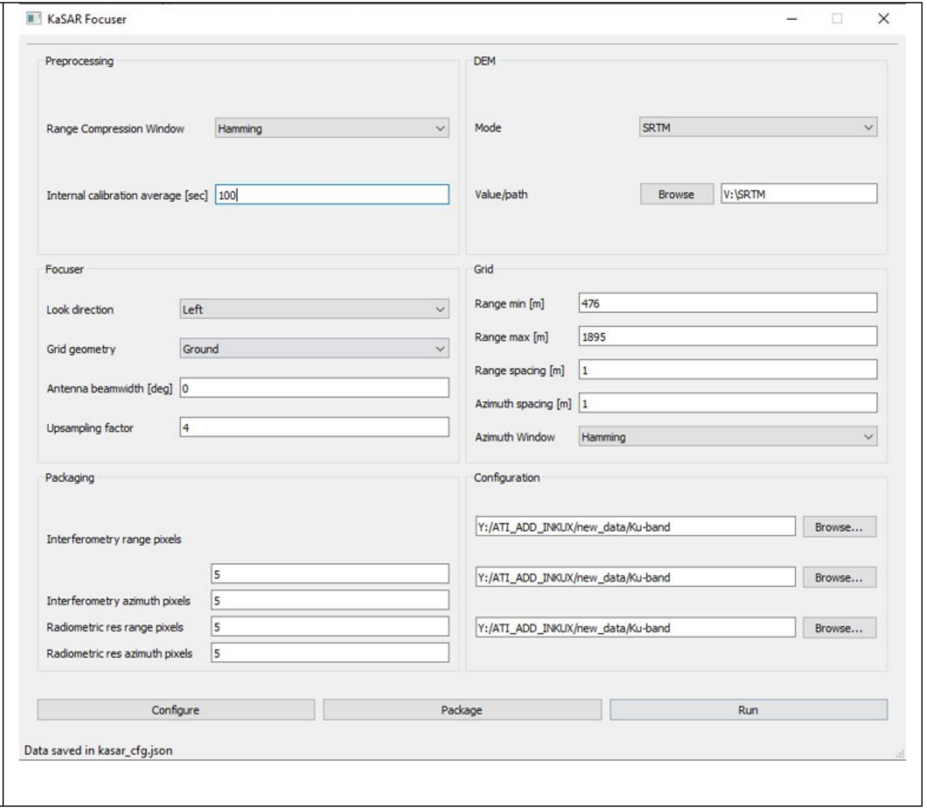
Configuration file


filled_kasar_cfg.json - Notepad

File Edit Format View Help

```
{
    "description": "Input configuration file",
    "version": "1.0.0",
    "datatake_path": "Y:/ATI_ADD_INKUX/new_data/Ku-band",
    "sensors_log_path": "Y:/ATI_ADD_INKUX/new_data/Ku-band",
    "output_path": "Y:/ATI_ADD_INKUX/new_data/Ku-band",
    "preprocess": {
        "rc_window": "HAMMING",
        "ical_averaging_sec": 100.0
    },
    "focuser": {
        "look_direction": "left",
        "grid_geometry": "ground",
        "antenna_beamwidth_deg": 0.0,
        "upsampling_factor": 4.0,
        "grid": {
            "range_min_m": 476.0,
            "range_max_m": 1895.0,
            "range_spacing_m": 1.0,
            "azimuth_spacing_m": 1.0
        },
        "az_window": "HAMMING",
        "dem": {
            "mode": "srtm",
            "path": "V:\\SRTM"
        }
    },
    "packaging": {
        "interferometry": {
            "looks": {
                "range_pixels": 5,
                "azimuth_pixels": 5
            }
        },
        "radiometric_res": {
            "looks": {
                "range_pixels": 5,
                "azimuth_pixels": 5
            }
        }
    }
}
```

GUI



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The KaSAR Processor

The processing of the Functional campaign data this presentation has been done interfacing with the Configuration text file and Running one single call:

kasar_processor ('C:\kasar_processor\gui\kasar_cfg0.json', 'focuser')


```
{
    "description": "Input configuration file",
    "version": "1.0.0",
    "datatake_path": "V:\\KASARFUNCCAMP_PROJECT\\20220504T134817",
    "post_processed_nav": "V:\\KASARFUNCCAMP_PROJECT\\postprocnav\\flight2\\flight2.txt",
    "output_path": "V:\\KASARFUNCCAMP_PROJECT\\",
    "preprocess": {
        "rc_window": "HAMMING",
        "ical_averaging_sec": 1.0
    },
    "focuser": {
        "look_direction": "left",
        "grid_geometry": "ground",
        "antenna_beamwidth_deg": 0.41,
        "upsampling_factor": 4.0,
        "grid": {
            "range_min_m": 500.0,
            "range_max_m": 2500.0,
            "range_spacing_m": 1.0,
            "azimuth_spacing_m": 1.0
        },
        "az_window": "HAMMING",
        "dem": {
            "mode": "mean",
            "value": 0.0
        }
    },
    "packaging": {
        "interferometry": {
            "looks": {
                "range_pixels": 0,
                "azimuth_pixels": 0
            }
        },
        "radiometric_res": {
            "looks": {
                "range_pixels": 1,
                "azimuth_pixels": 1
            }
        }
    }
}
```


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The KaSAR Processor

The Processor allows interfacing to every module independently.

The processor works running 3 independent procedures:

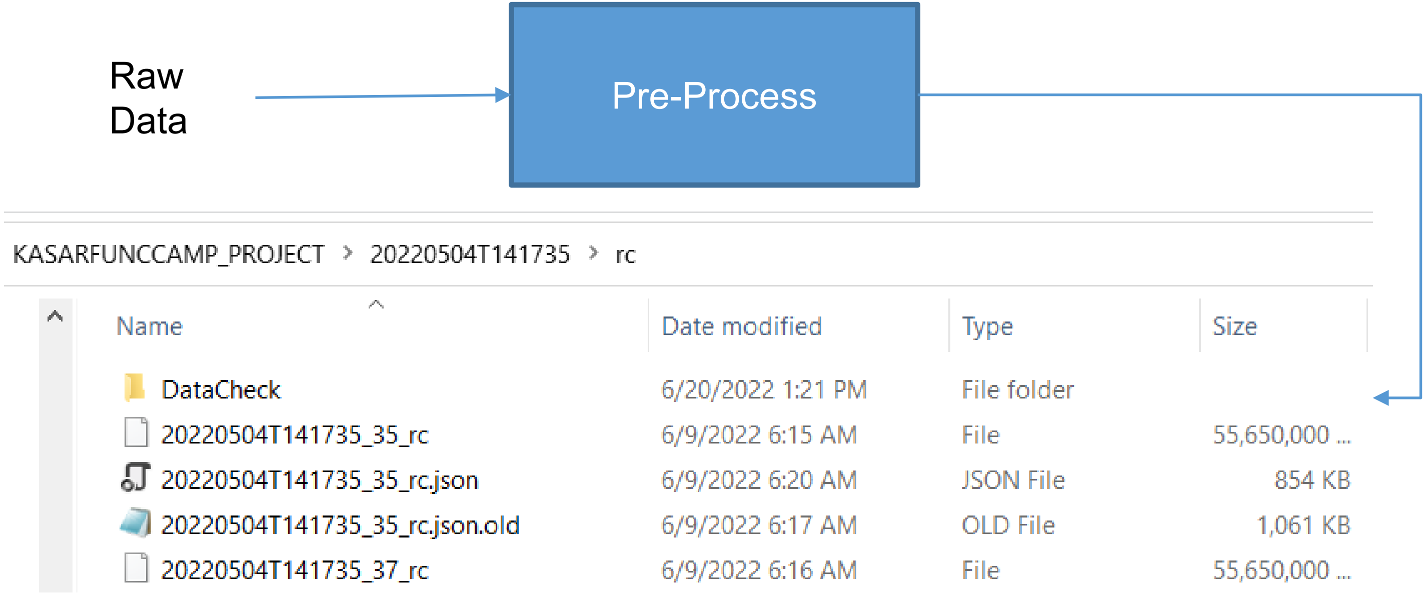
1. kasar_preprocessor.m (1 call in Matlab)
2. Pre_nav, nav, az_comp (procedure made of 3 calls..3 c++ executables)
3. MAIN_KaSAR_packager.m (1 call in Matlab)

The Pre-Processor

The Pre-Processor does the data transcription and range compression

1. Set the schema of the KASAR pre-processor

input_schema_fname = '/home/metasensing/repos/kasar_processor\gui\schemas\v4.schema.json';



Name	Date modified	Type	Size
DataCheck	6/20/2022 1:21 PM	File folder	
20220504T141735_35_rc	6/9/2022 6:15 AM	File	55,650,000 ...
20220504T141735_35_rc.json	6/9/2022 6:20 AM	JSON File	854 KB
20220504T141735_35_rc.json.old	6/9/2022 6:17 AM	OLD File	1,061 KB
20220504T141735_37_rc	6/9/2022 6:16 AM	File	55,650,000 ...

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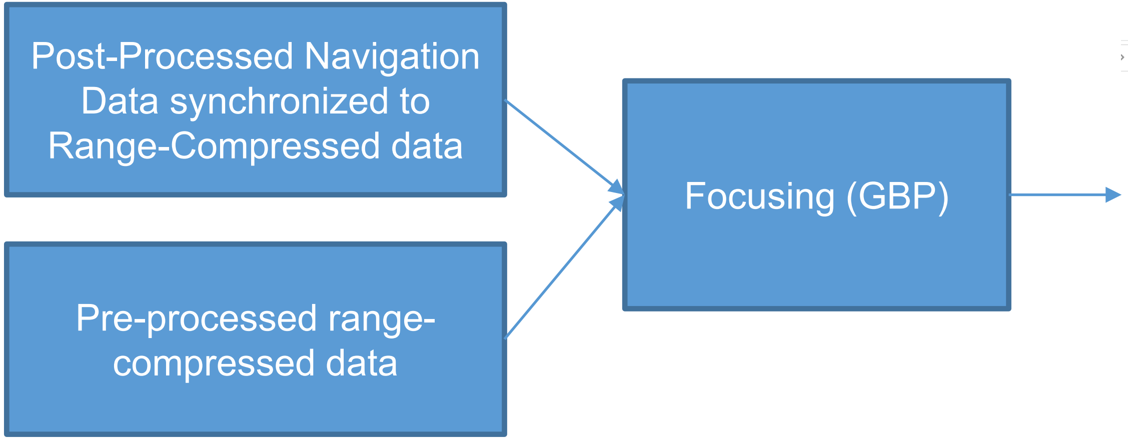
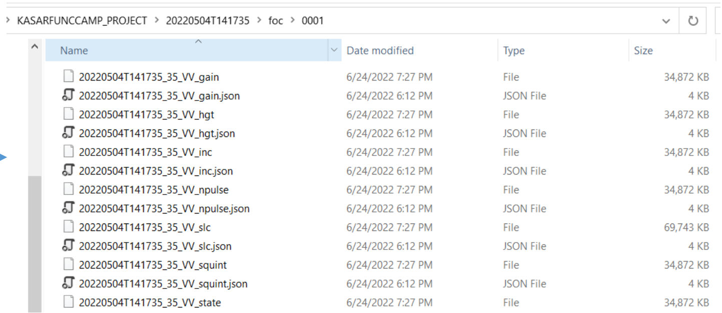
The Focuser

1) The Focuser begins by ingesting the post-processed navigation data and interpolating them into the time grid of the raw data, so the navigation and range compressed data are synchronized.

2) The actual focusing starts afterwards by running the code that implements the GBP algorithm



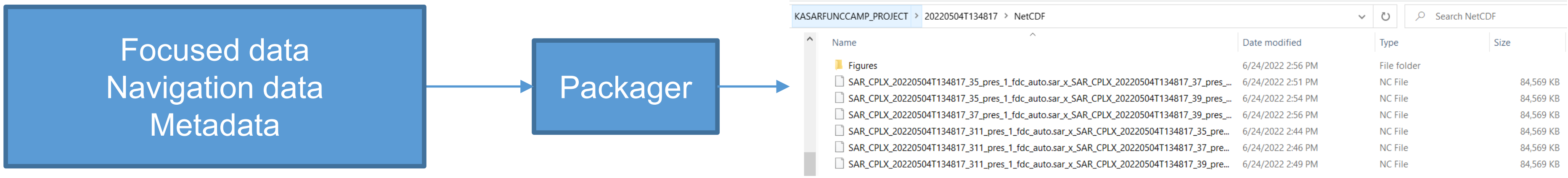


KASARFUNCCAMP_PROJECT › 20220504T141735 › foc › 0001

Name	Date modified	Type	Size
20220504T141735_35_VV_gain	6/24/2022 7:27 PM	File	34,872 KB
20220504T141735_35_VV_gain.json	6/24/2022 6:12 PM	JSON File	4 KB
20220504T141735_35_VV_hgt	6/24/2022 7:27 PM	File	34,872 KB
20220504T141735_35_VV_hgt.json	6/24/2022 6:12 PM	JSON File	4 KB
20220504T141735_35_VV_inc	6/24/2022 7:27 PM	File	34,872 KB
20220504T141735_35_VV_inc.json	6/24/2022 6:12 PM	JSON File	4 KB
20220504T141735_35_VV_npulse	6/24/2022 7:27 PM	File	34,872 KB
20220504T141735_35_VV_npulse.json	6/24/2022 6:12 PM	JSON File	4 KB
20220504T141735_35_VV_slc	6/24/2022 7:27 PM	File	69,743 KB
20220504T141735_35_VV_slc.json	6/24/2022 6:12 PM	JSON File	4 KB
20220504T141735_35_VV_squint	6/24/2022 7:27 PM	File	34,872 KB
20220504T141735_35_VV_squint.json	6/24/2022 6:12 PM	JSON File	4 KB
20220504T141735_35_VV_state	6/24/2022 7:27 PM	File	34,872 KB

The Packager

- The Packager outputs the interferometric SAR data and corresponding metadata in one single Netcdf file.
- The Netcdf are saved in pairs of interferometric data (master and slave)
- All available combination of channels are outputted.
- Additionally, visualization of intensity , radiometric resolution and interferometric phase and coherence are made available in .jpeg format and .fig



The KaSAR Processor Outputs:

Data from the Functional Campaign showing the system performance

Verification Functional Campaign Description

KaSAR Processor Outputs

Functional Campaign flown on:
- 02 May 2022
- 04 May 2022

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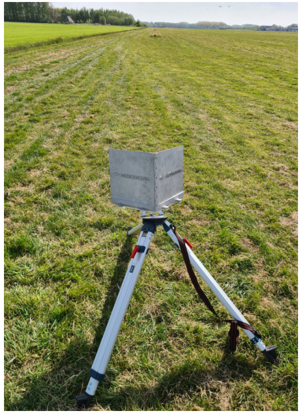
KaSAR Processor Outputs

The functional campaign has Ground Control Points used to quantitatively verify the performance of the processor in terms of resolution, radiometric and phase accuracy.



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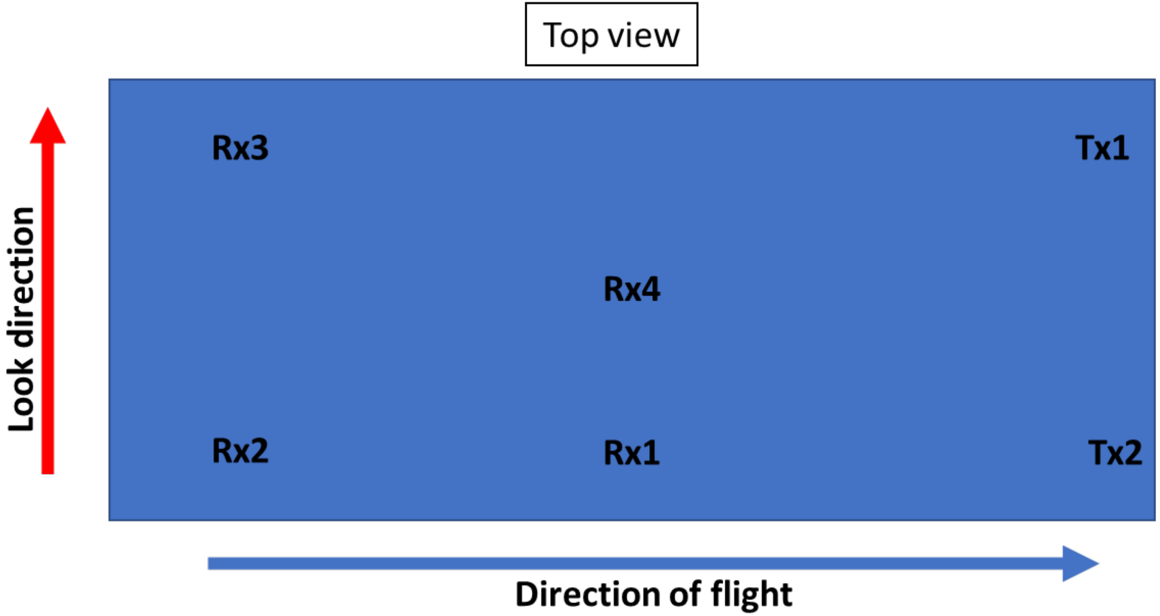
KaSAR Functional Campaign

Functional Campaign: Position of the antennas



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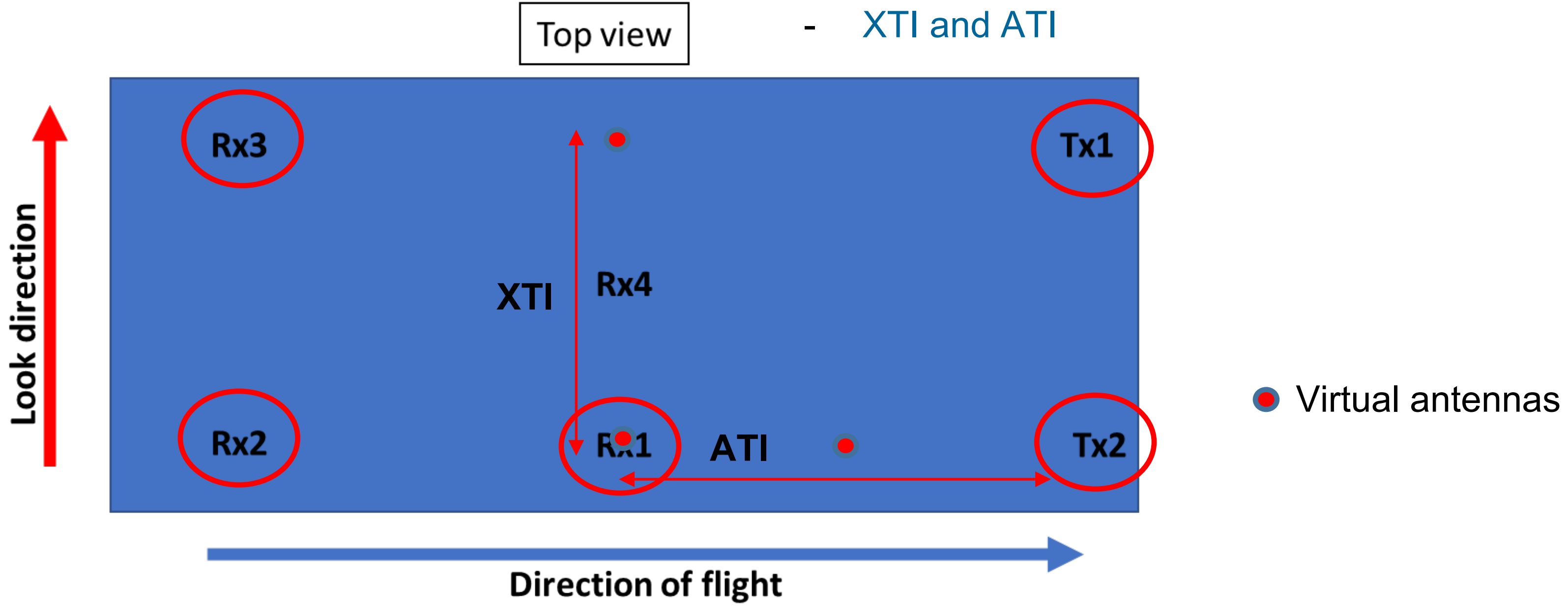
Functional Campaign: Position of the antennas and modes:

- Single-Pol V or H
- Ping–Pong V or H (Tx1 and Tx2 toggling)
- Full-Pol mode
- XTI and ATI



KaSAR functional campaign

- Number of acquisitions: 40

2 May 2022:

Single-Pol-V: 3

Single-Pol-H: 3

4 May 2022:

Single-Pol-H: 7

Ping-pong H: 6

Single-Pol-V: 4

Ping-pong V: 4

Full-Pol: 13

Example of log file

Acquisition name	Operational mode	BW [MHz]	PRF [kHz]	Num channels	Gimbal	Description
Flight 1 (02 may)						V-pol antennas connected
20220502T155925	Single-Pol V	500	4.0	4	Compensation on	Test acquisition
20220502T160050	Single-Pol V	500	4.0	4	Compensation on	Test acquisition
20220502T160132	Single-Pol V	500	4.0	4	Compensation on	Test acquisition
Flight 2 (02 may)						H-pol antennas connected
20220502T181930	Single-Pol H	500	4.0	4	Compensation on	Test acquisition
20220502T182031	Single-Pol H	500	4.0	4	Compensation on	Test acquisition

KaSAR Processor Outputs

With the functional campaign data, we aim to fully test the KASAR Processor in all operation modes (V, H, full-pol, ATI, XTI) and demonstrate that the functionalities are implemented.

Therefore, the following tracks has been selected:

20220502T172210 (Single-Pol H)

20220504T134817 (ping-pong V)

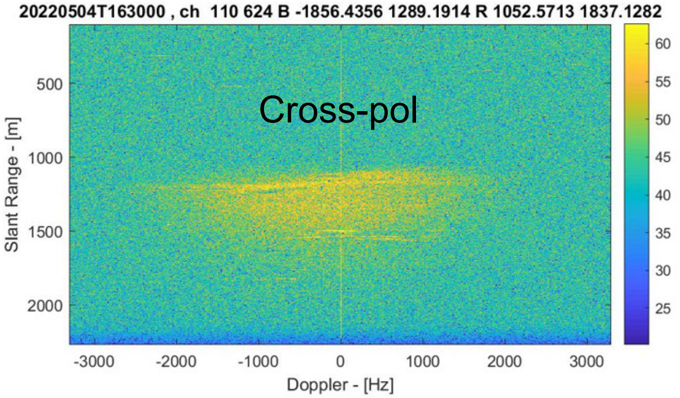
20220504T141735 (Single-Pol V)

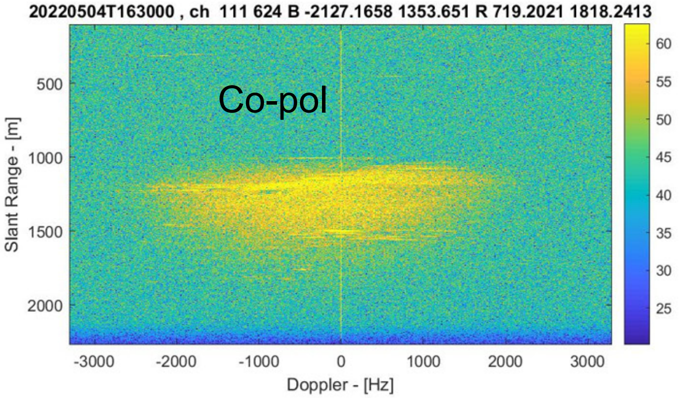
20220504T163000 (full-pol)

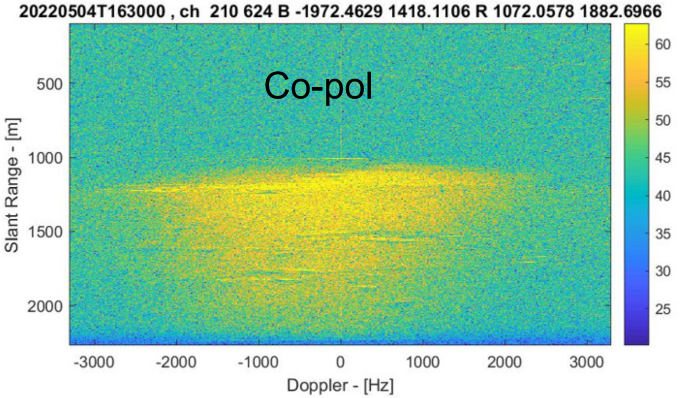
- Note that the name of the processed data might differ from raw data because the name of the processed file comes form the gps time, which is in fact the time of start of the acquisition.

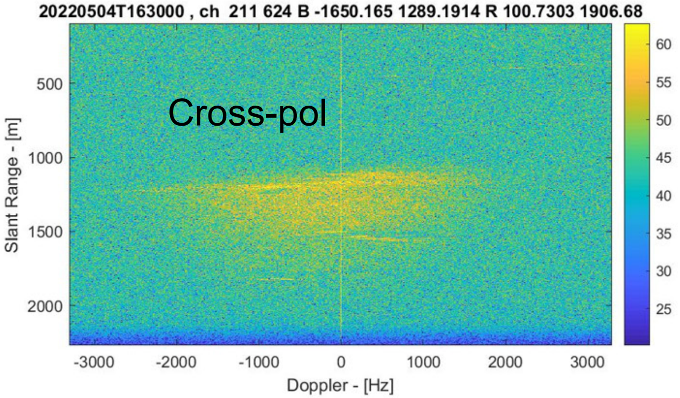
KaSAR Processor Outputs

Before Proceeding – Check Raw data









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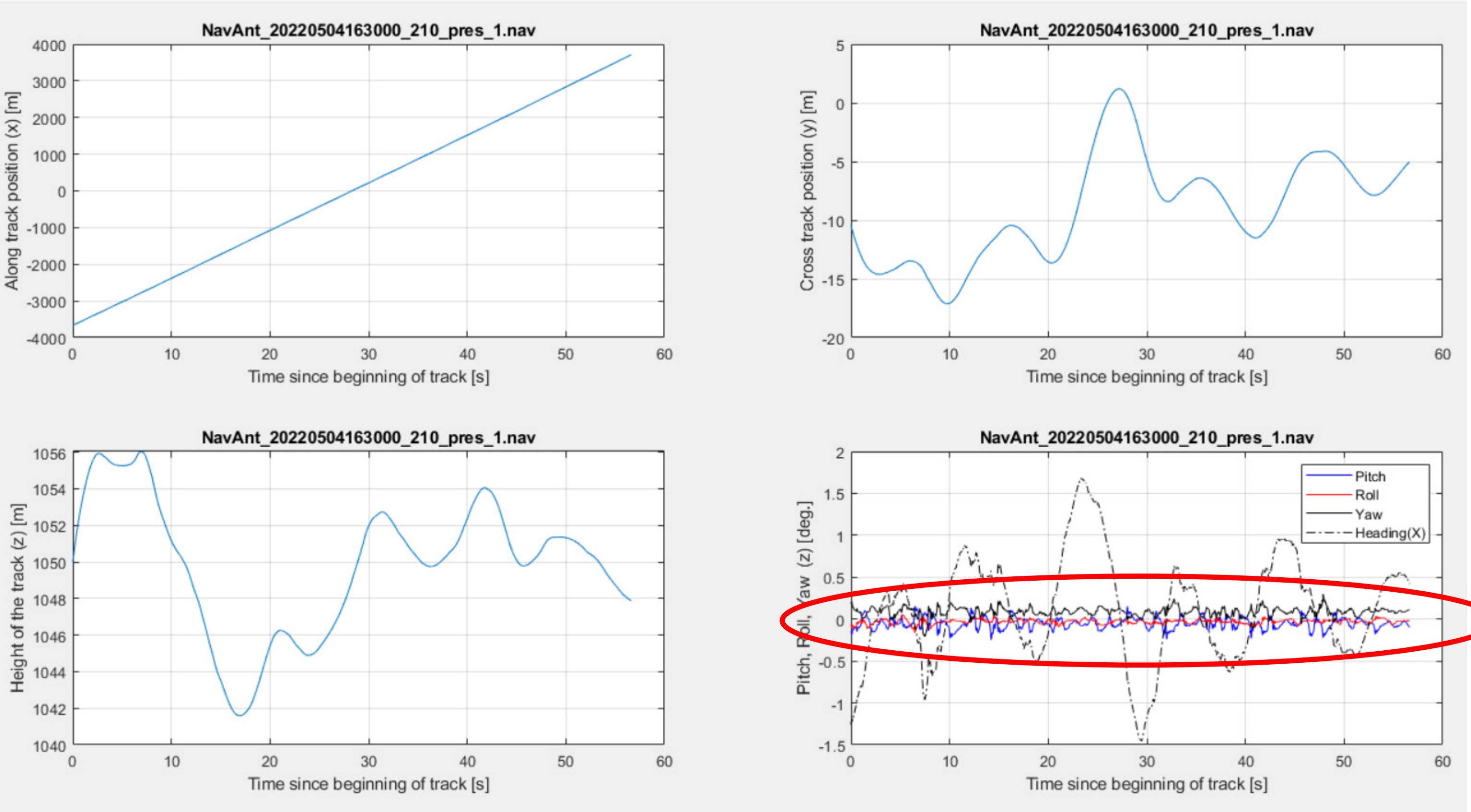
KaSAR Processor Outputs

Before Proceeding – Check Nav



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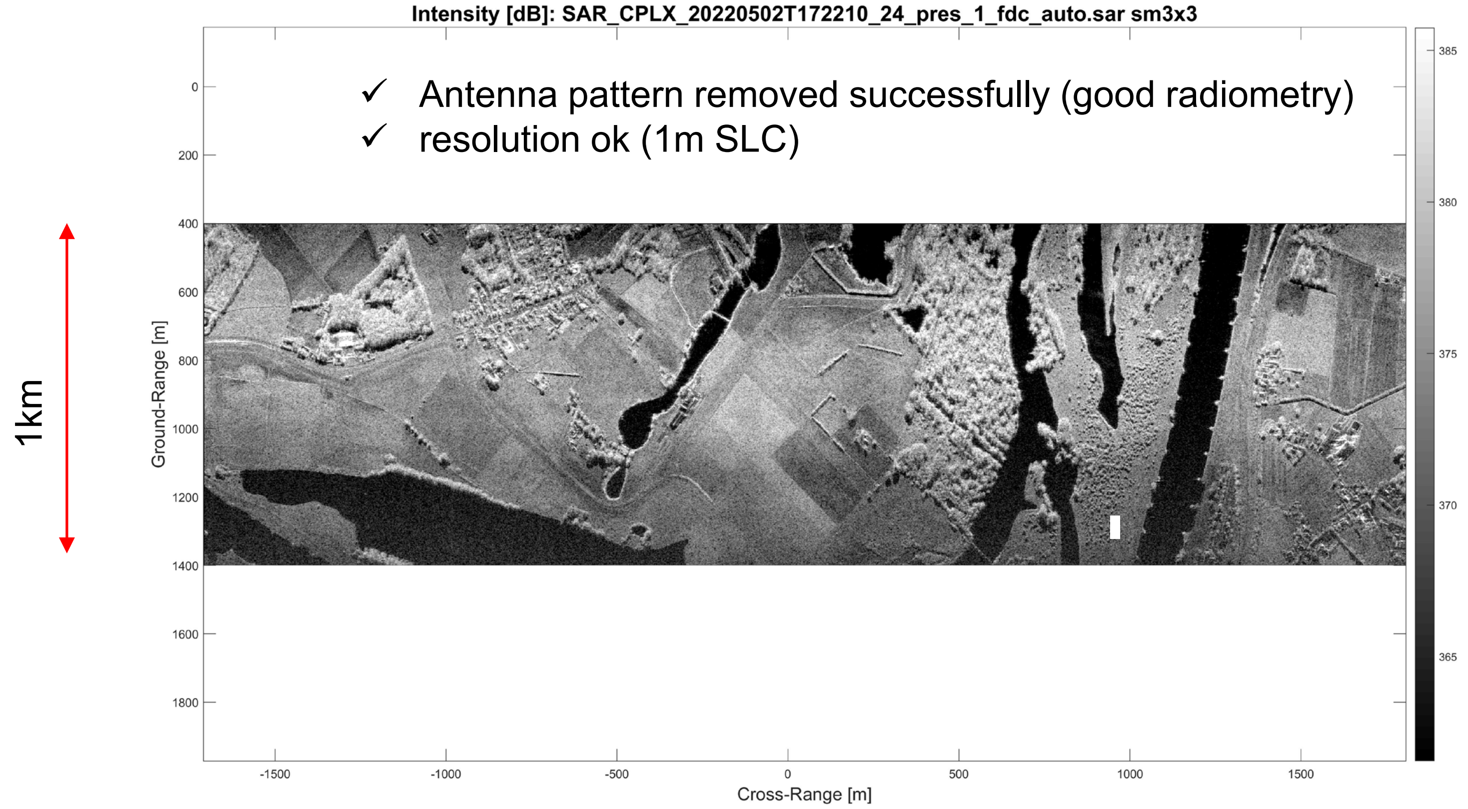
KaSAR Processor Output & Analysis

Radiometry

KaSAR Processor Outputs

Single-Pol (HH)



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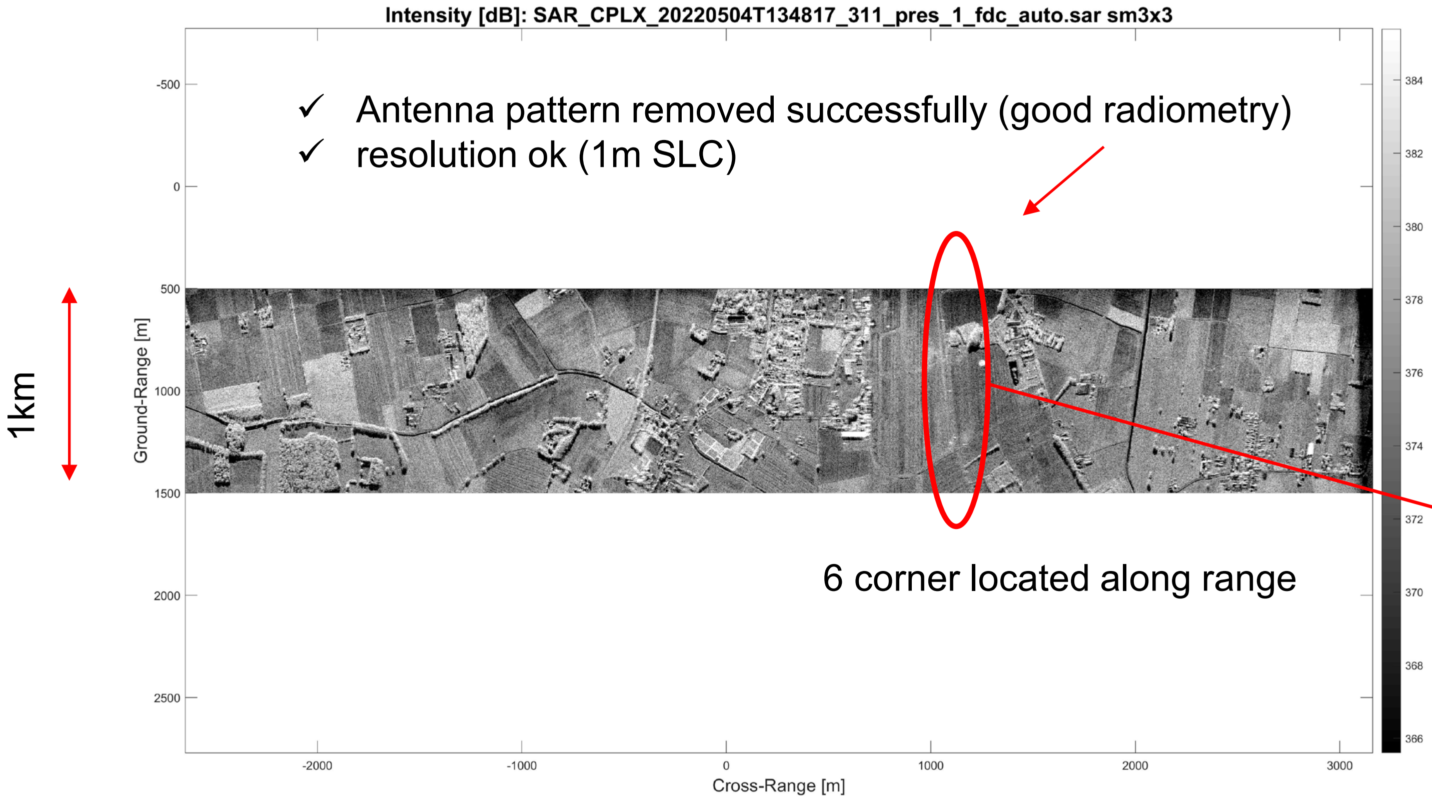
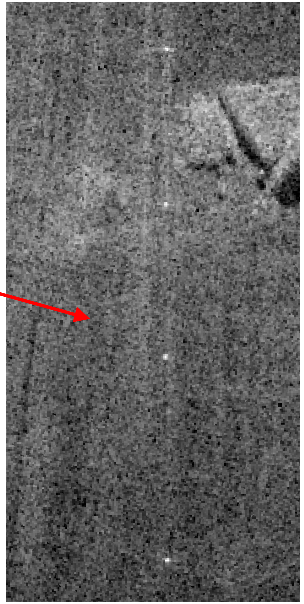
KaSAR Processor Outputs

Ping-Pong (VV)

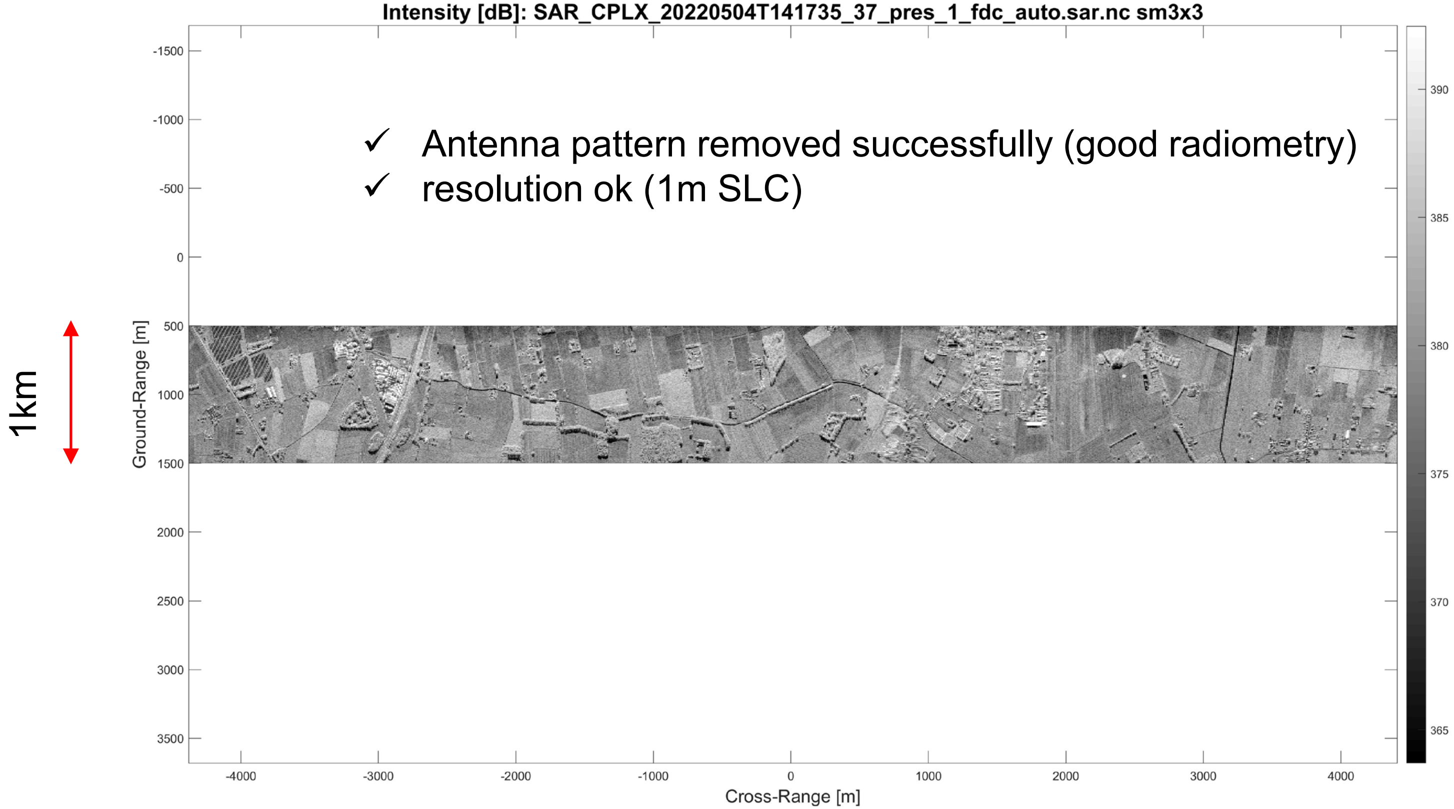




METASENSING Radar Solutions

KaSAR Processor Outputs

Single-Pol (VV)



- ✓ Antenna pattern removed successfully (good radiometry)
- ✓ resolution ok (1m SLC)

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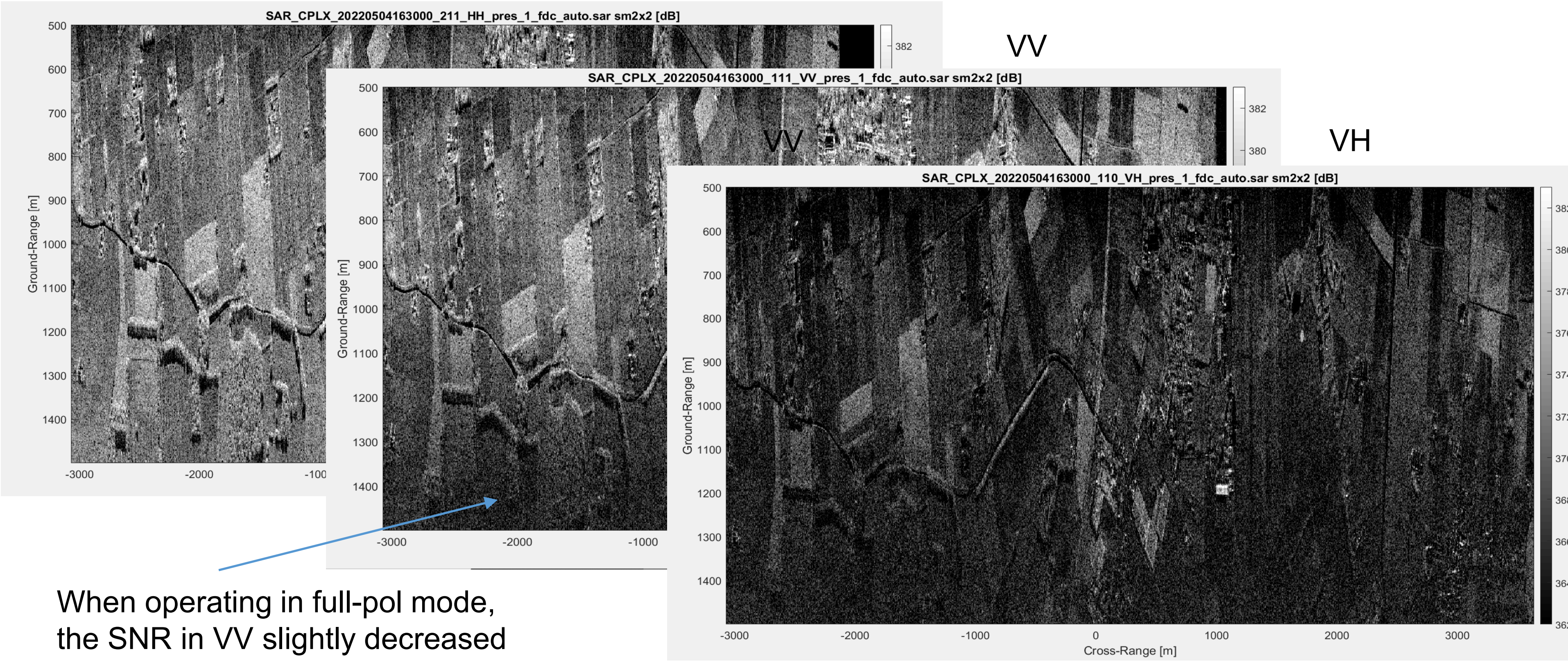
KaSAR Processor Outputs

Full-Pol

HH



When operating in full-pol mode, the SNR in VV slightly decreased

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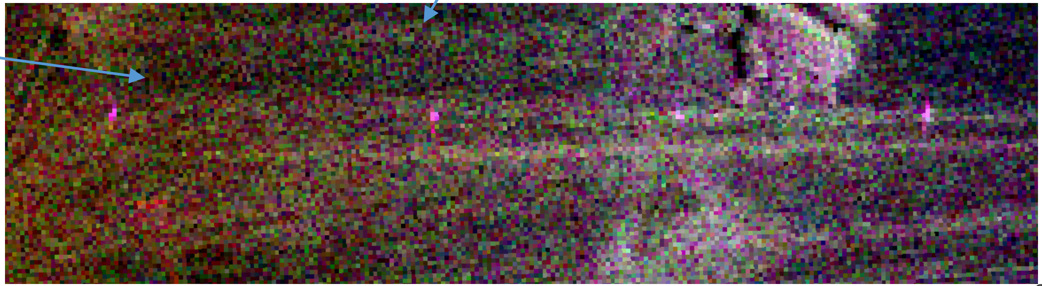
KaSAR Processor Outputs

Full-Pol

RGB Composite (Red= HH, VV=Blue, HV=Green)
(3x3 m reso, 1km swath)
(20220504T163000 (channels 210 (HH), 111(VV), 110(VH))

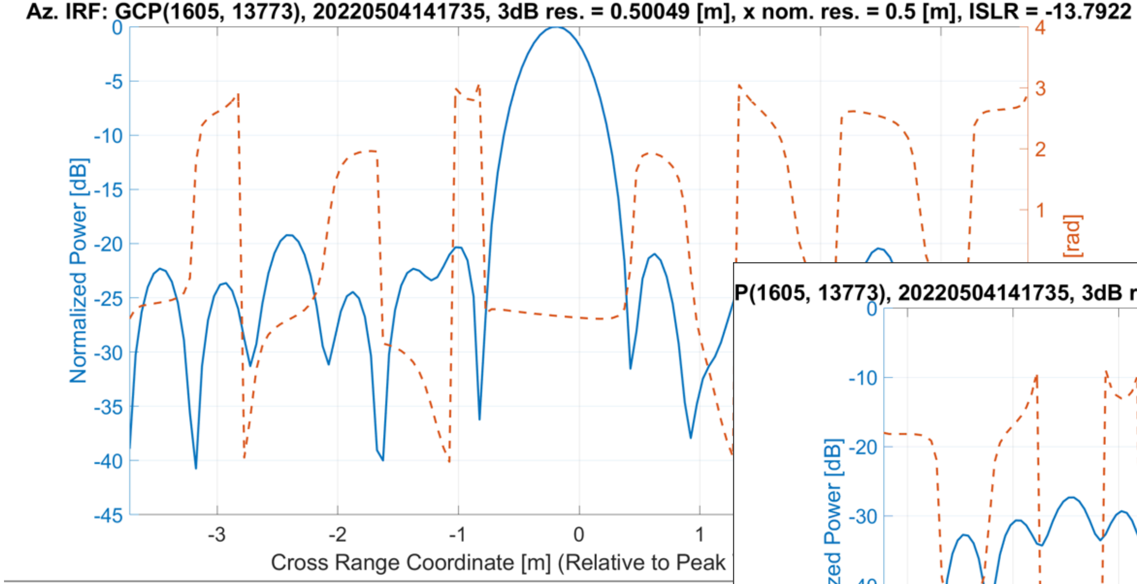
Corner Response only in HH and VV
(Red + Blue = Purple)

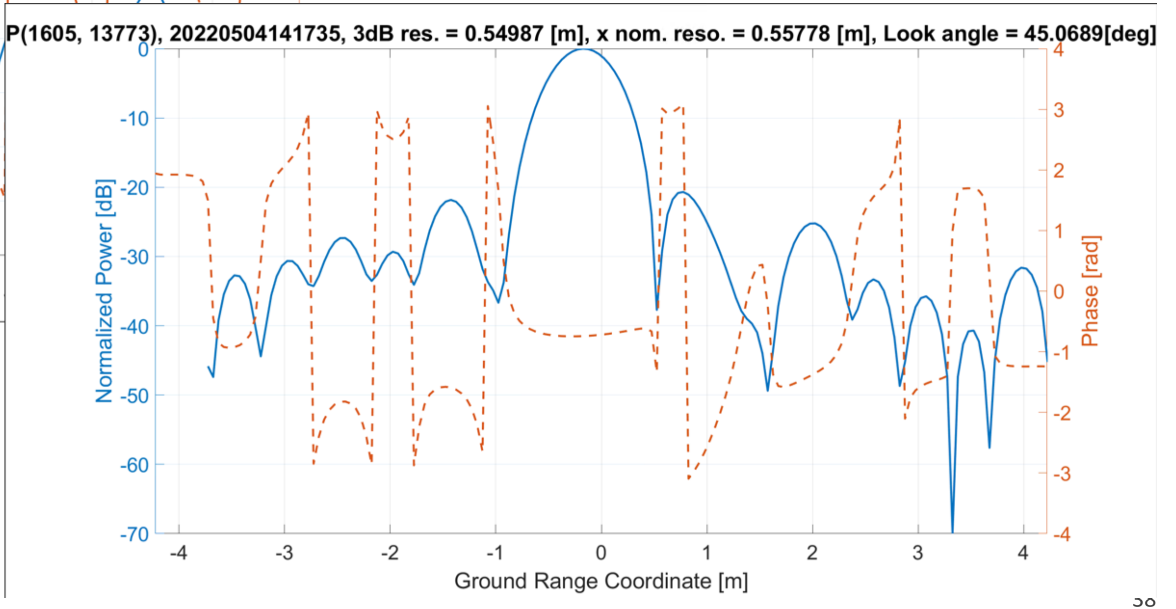
25 dB between Co-pol /Cross-pol ratio



Corner Reflector IRF

Reso < 1m in both directions

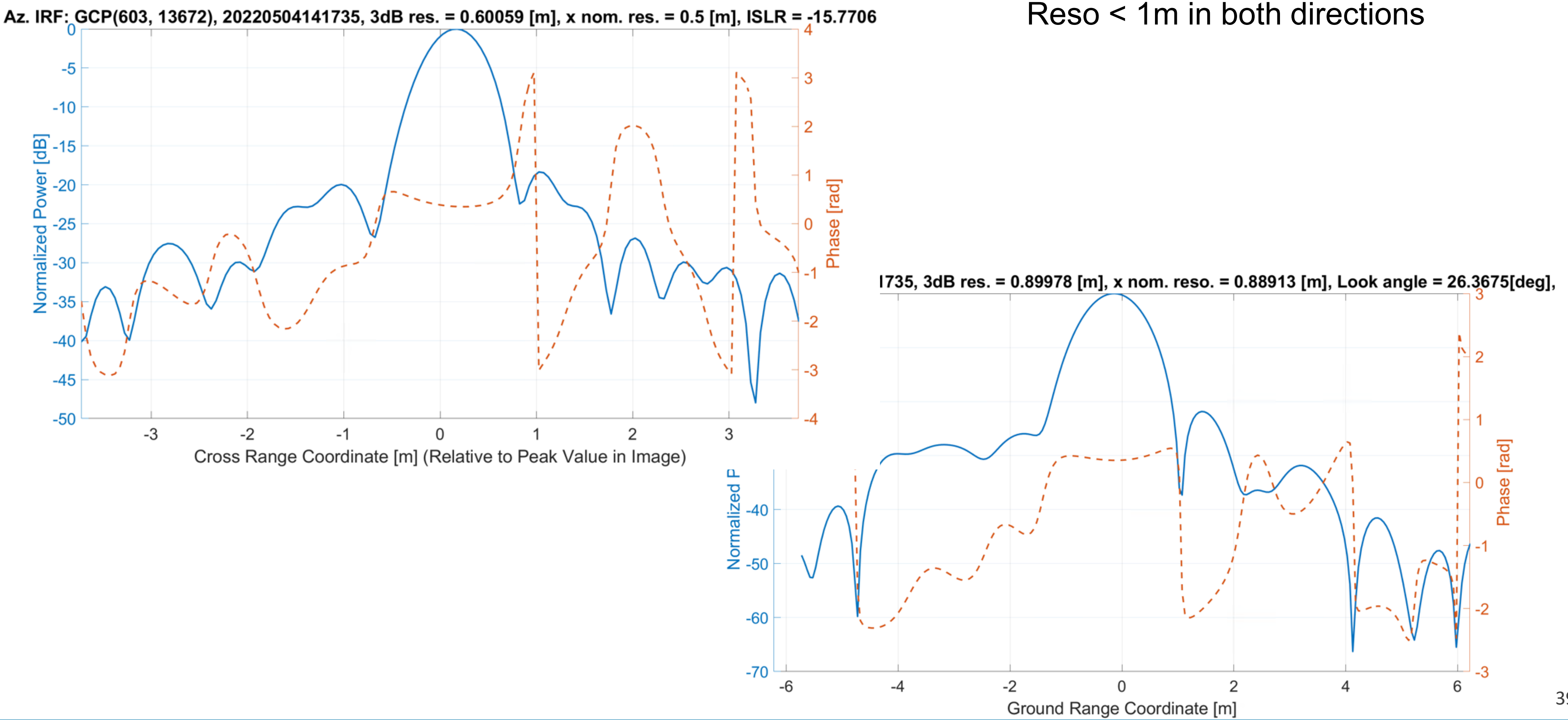




KaSAR Output Analysis

Corner Reflector IRF

Reso < 1m in both directions



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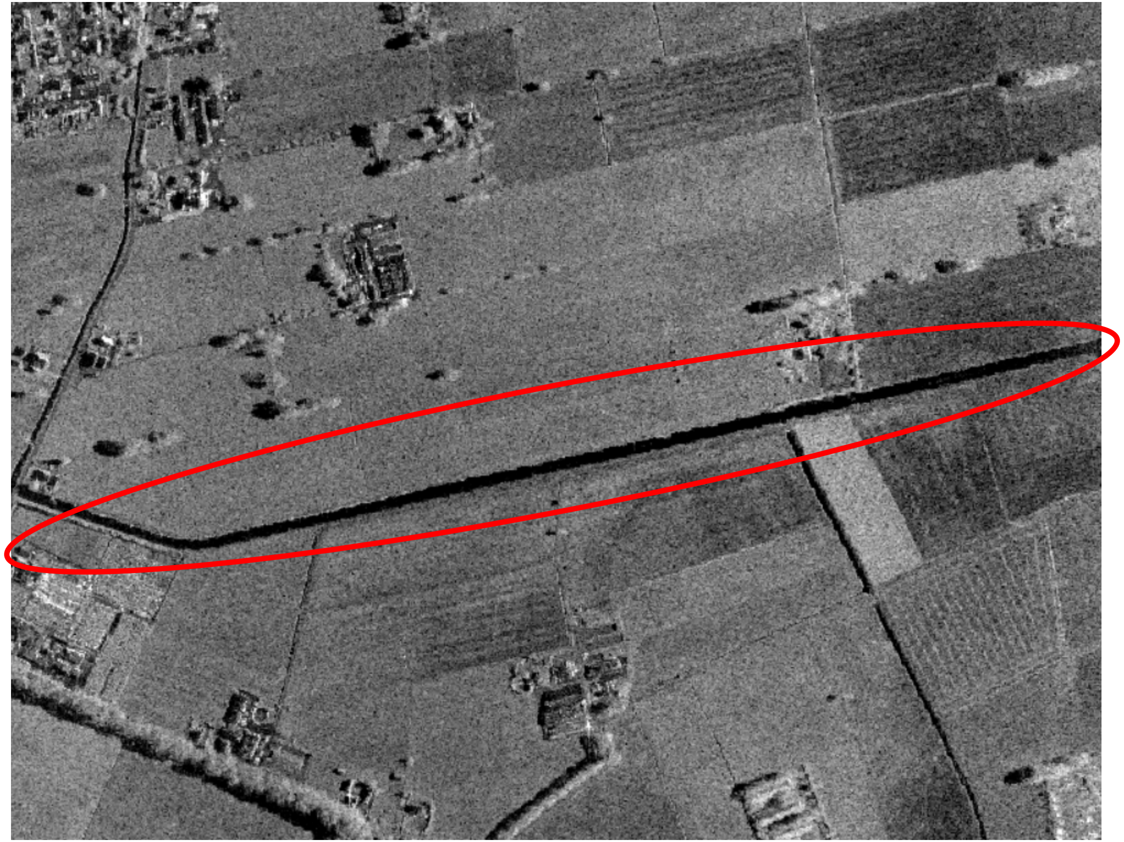
KaSAR Output Analysis

NESZ

NESZ < -20 dB

(approx. - 25 dB)

Based on low
Backscatter areas
In the sigma-0
Calibrated image



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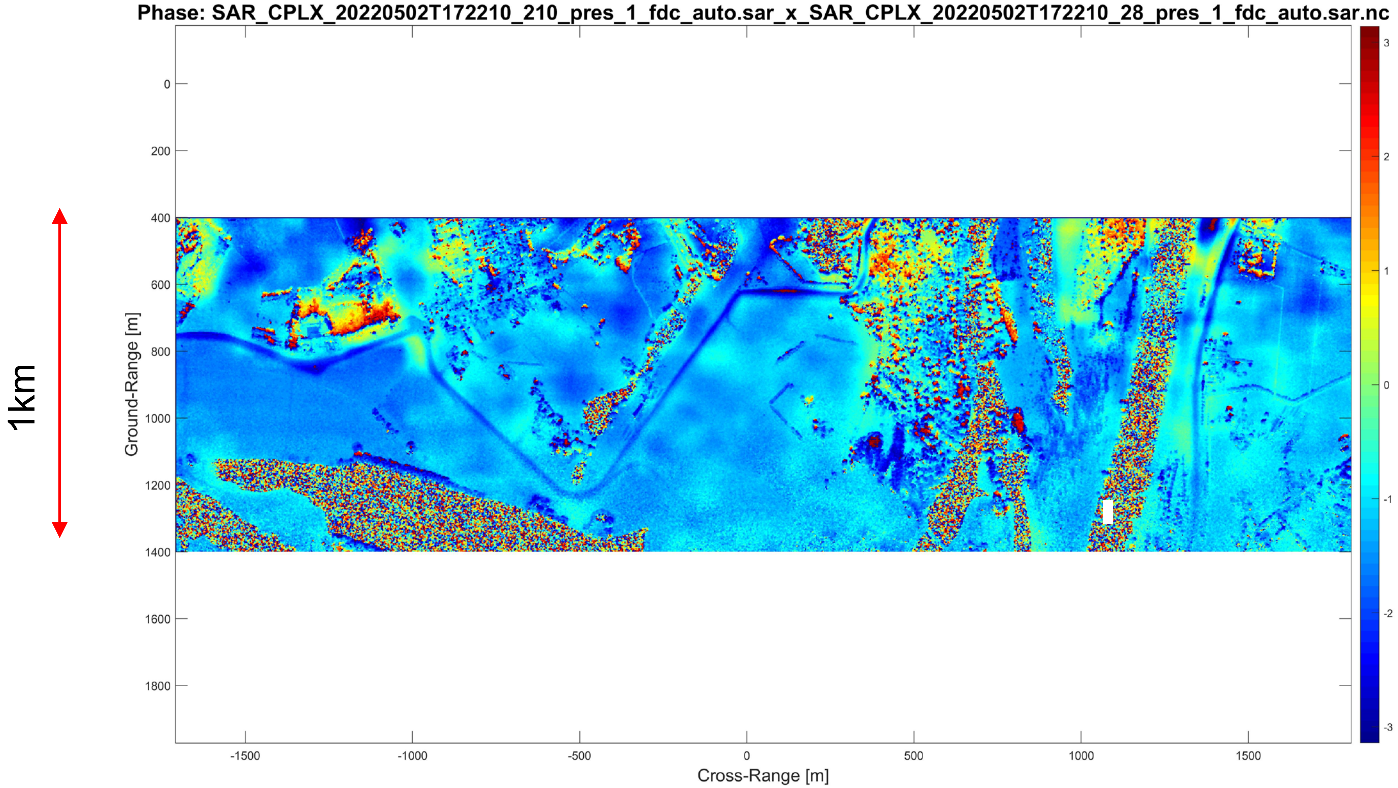
KaSAR Processor Output & Analysis

XTI

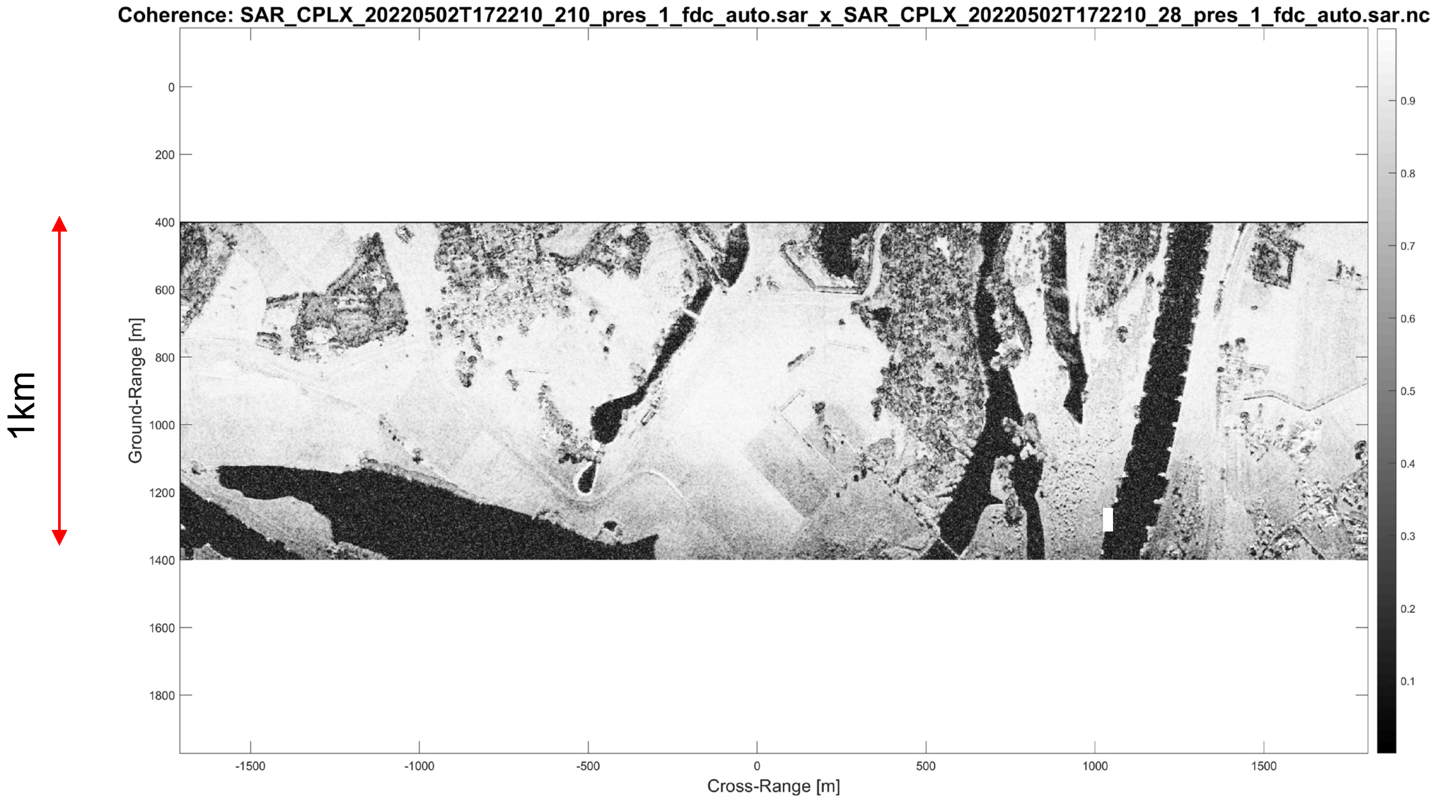
KaSAR Processor Outputs

XTI Single-Pol (HH)



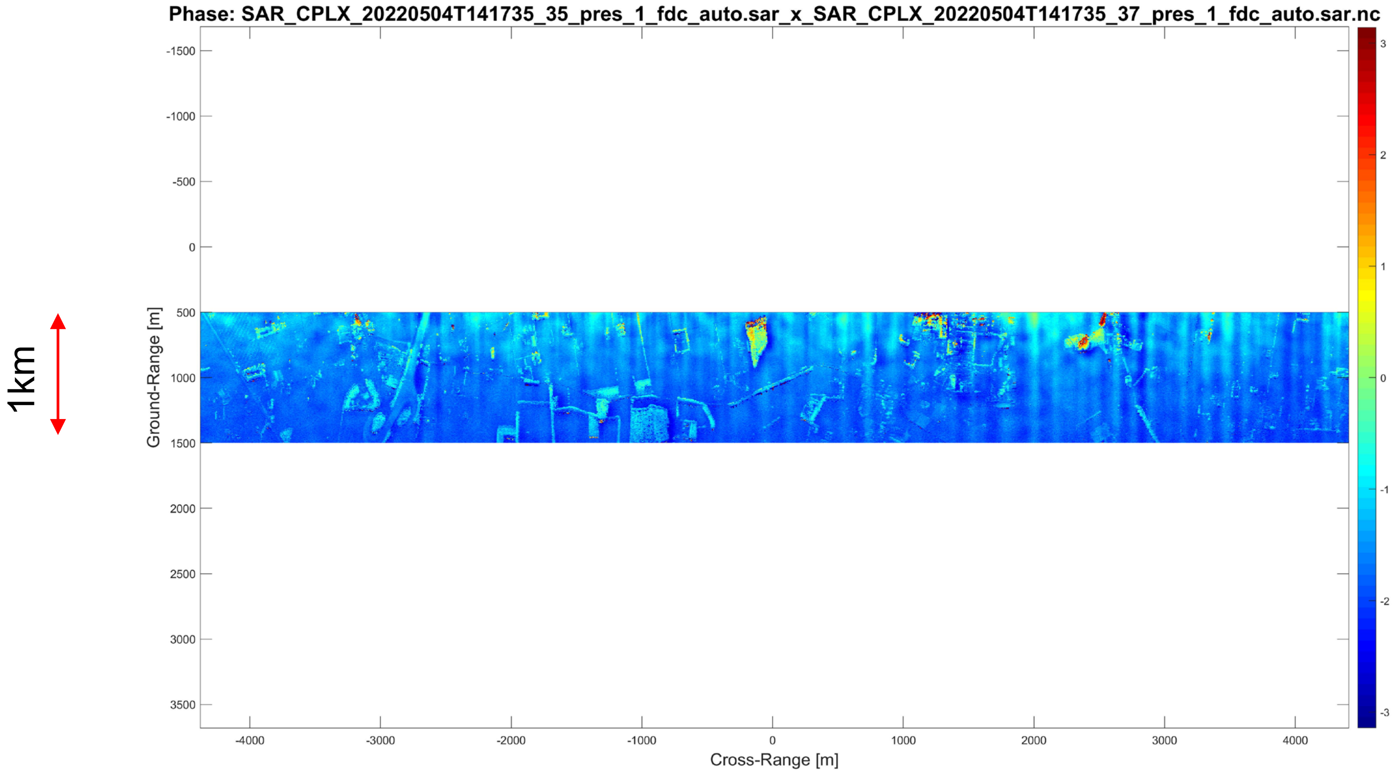
KaSAR Processor Outputs

XTI Single-Pol (HH)



KaSAR Processor Outputs

XTI Single-Pol (VV)



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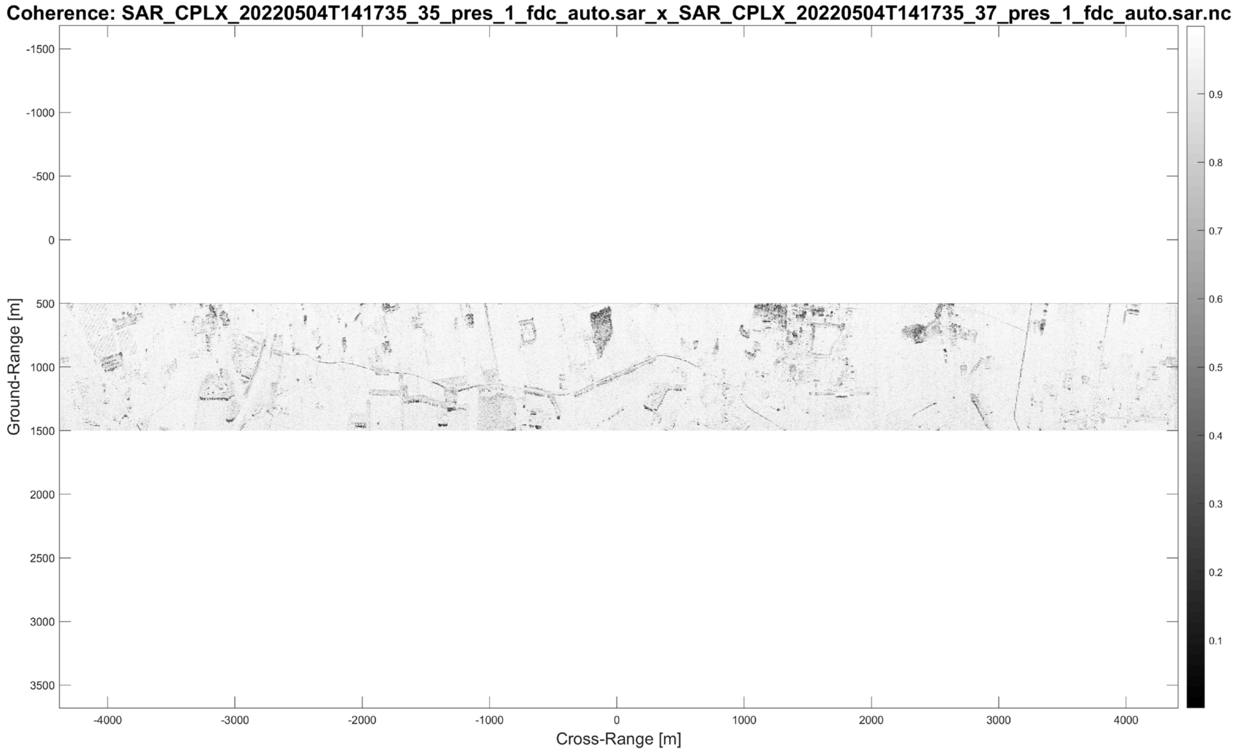
KaSAR Processor Outputs

XTI Single-Pol (VV)

1km



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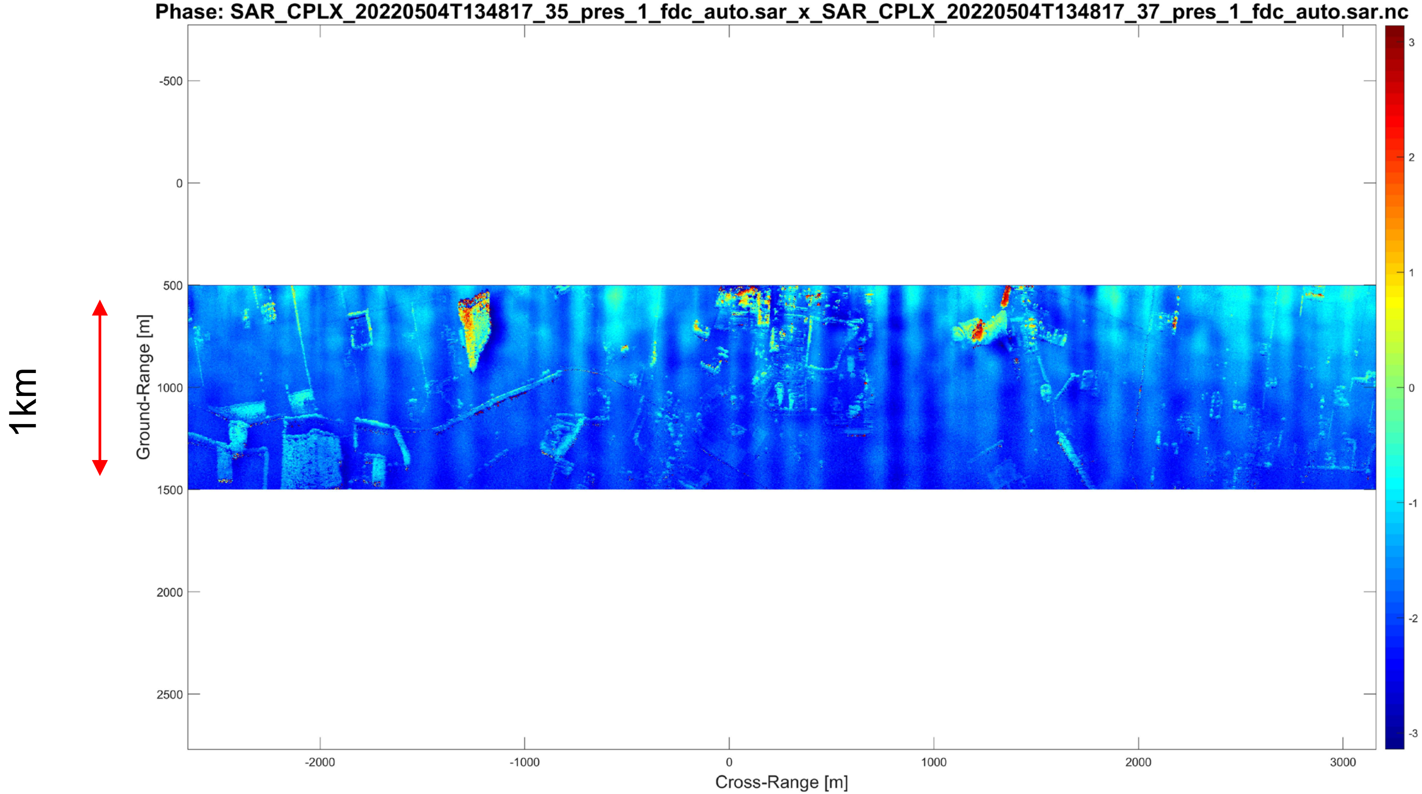
KaSAR Processor Outputs

XTI Ping-Pong (VV)



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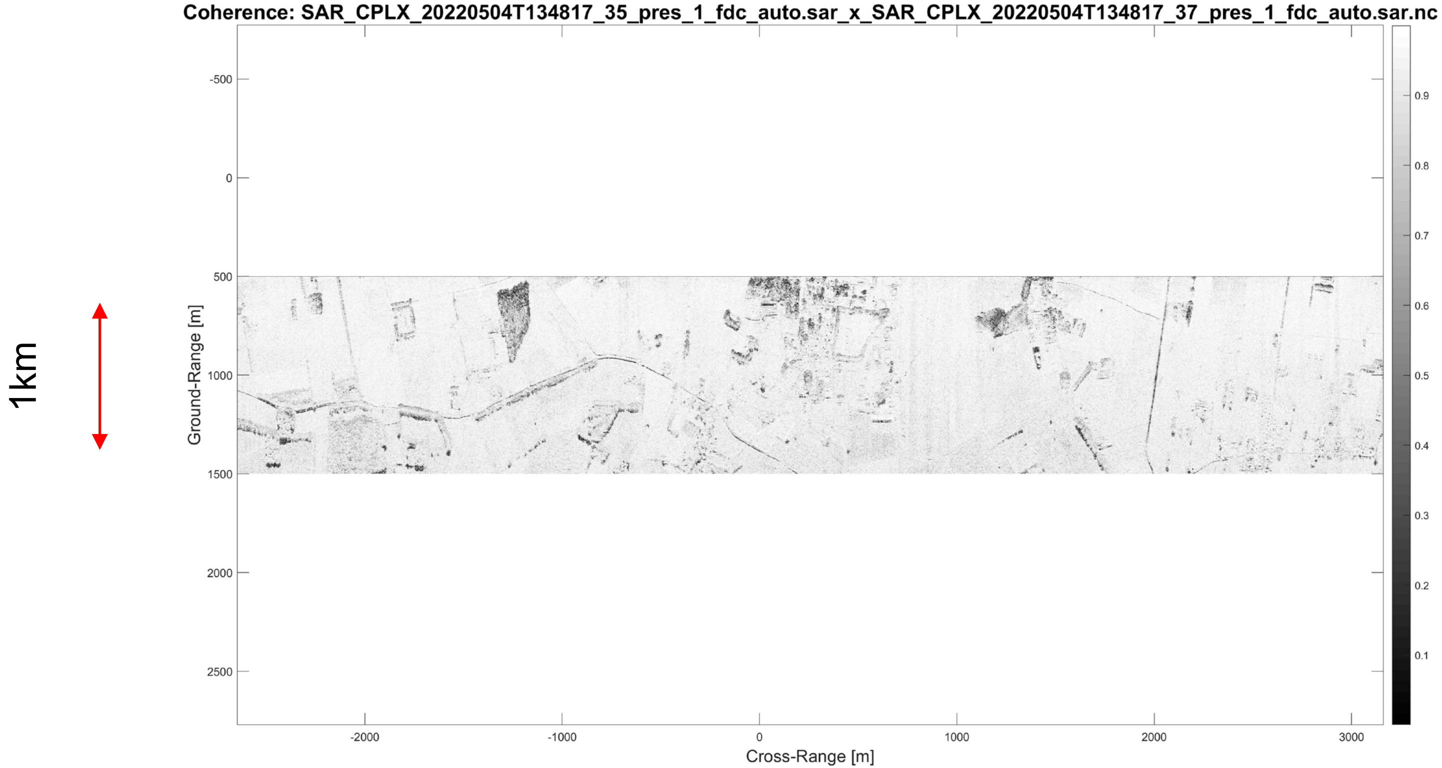
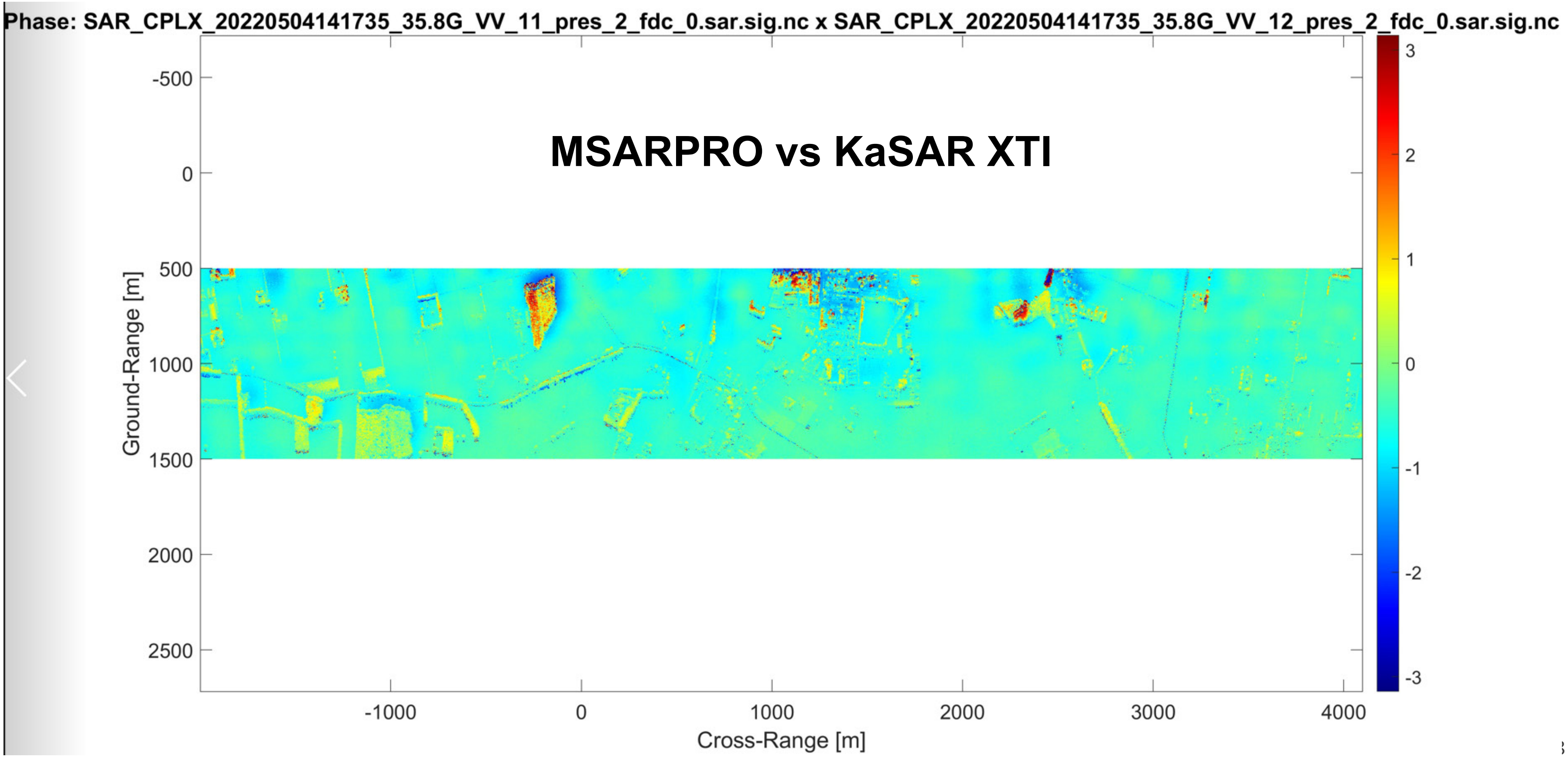
KaSAR Processor Outputs

XTI Ping-Pong (VV)

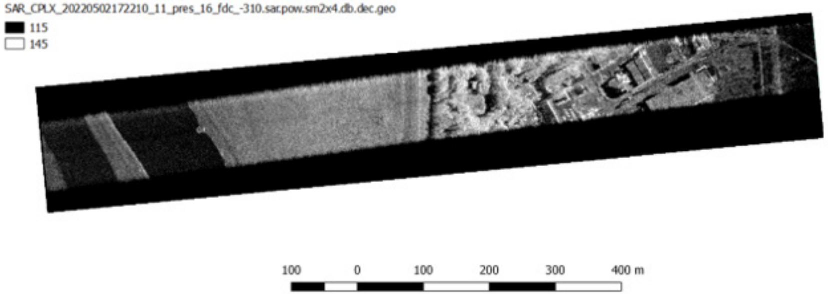


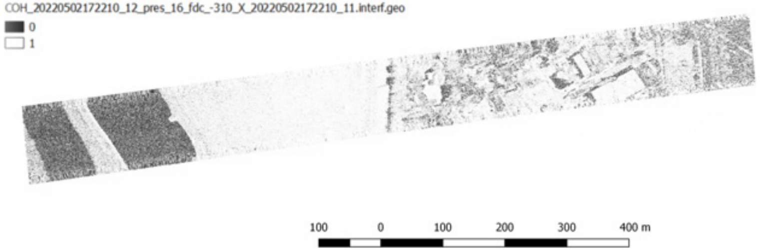
METASENSING Radar Solutions

KaSAR Output Analysis

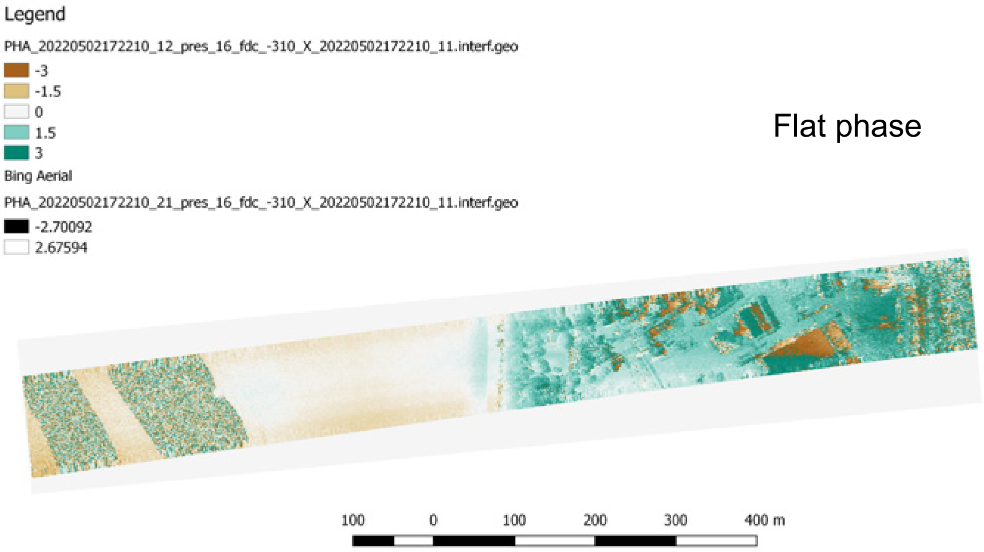


KaSAR Output Analysis





Very high coherence (~1)



Flat phase

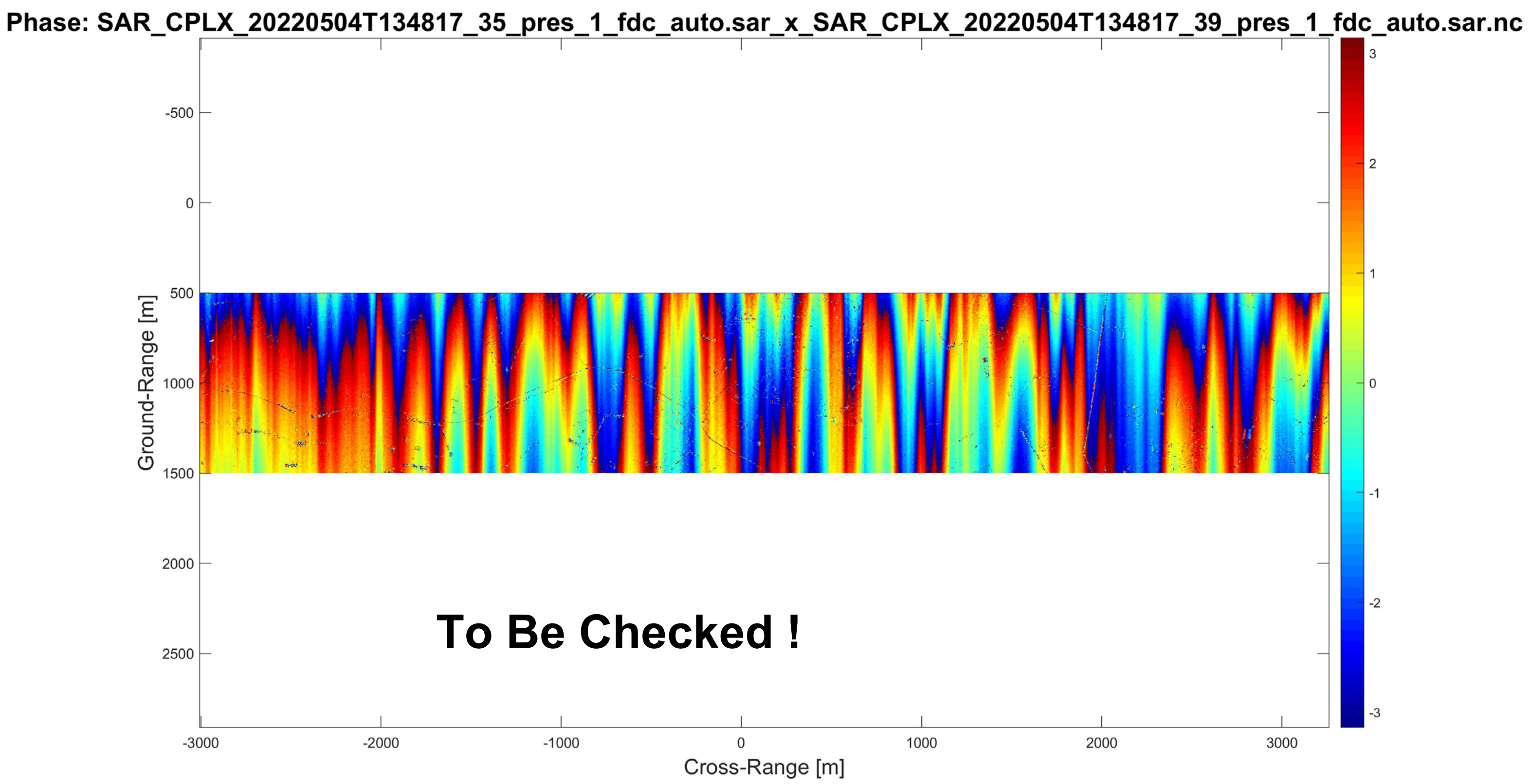
METASENSING
Radar Solutions

KaSAR Processor Output & Analysis

ATI

KaSAR Output Analysis

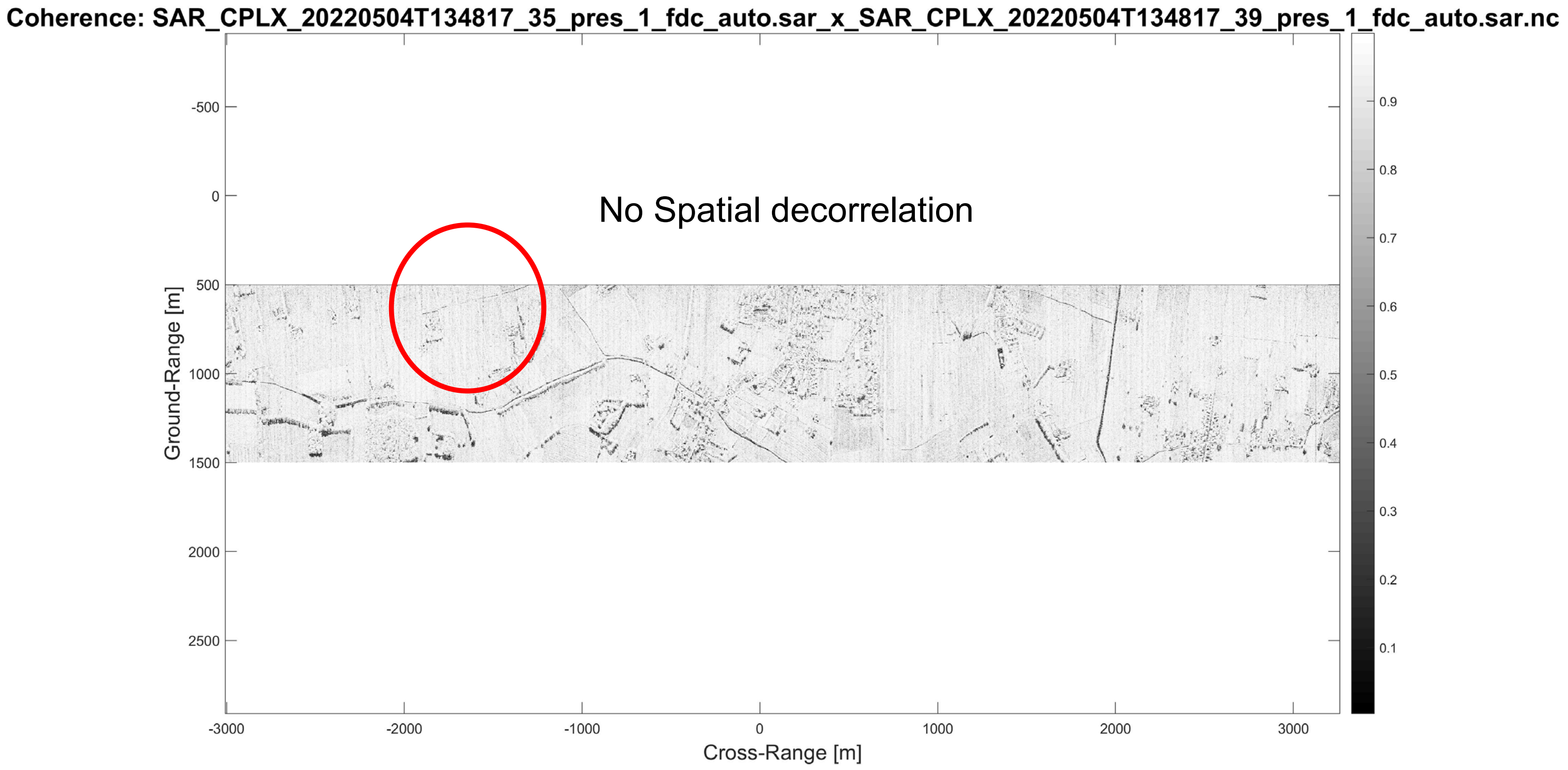
ATI Single-Pol (VV)



To Be Checked !

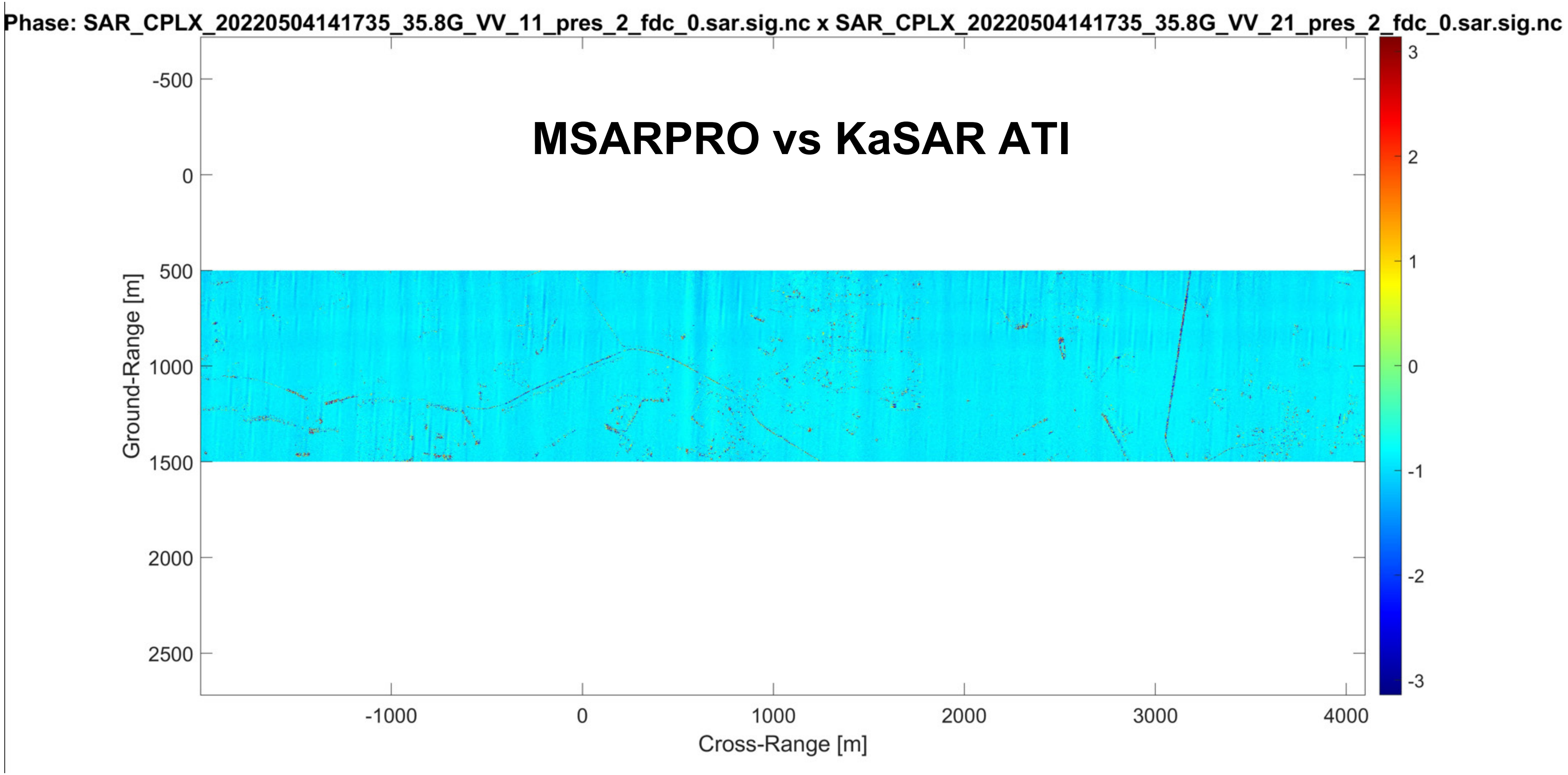
KaSAR Output Analysis

ATI Single-Pol (VV)



METASENSING
Radar Solutions

KaSAR Output Analysis



METASENSING
Radar Solutions

Requirements review - General

ITEM ID in SOW	TEST ID In D11	PURPOSE	YES/NO	MILESTONE
GEN-010	T01-GEN-POS	The airborne demonstrator shall be representative of the spaceborne reference scenario.	YES	TRB-1/TRB-2
GEN-020	T02-GEN-POS	The minimum covered incidence angle range shall be 20-50 deg.	YES	FR
GEN-030	T03-GEN-POS	The minimum swath width shall be 1 km in stripmap mode.	YES	FR
GEN-040	T04-GEN-LAB	A least 1 suitable aircraft to carry the instrument shall be identified.	YES	TRB-2
GEN-050	T05-GEN-AIR	The instrument shall allow fast and simple (de-) installation on the aircraft.	YES	FR
GEN-060	T06-GEN-AIR	The Instrument shall be designed with suitable well documented control interfaces	YES	FR
GEN-070	T07-GEN-POS	The Instrument shall be suitable for usage in polar and tropical climate areas.	YES	FR
GEN-080	T08-GEN-LAB	The instrument shall be built in a way to allow for easy accommodation and/or implementation of additional components/functionality.	YES	TRB-2
GEN-090	T09-GEN-POS	The instrument shall allow to emulate the performance of XTI spaceborne case	YES	FR

Requirements review - Instrument

ITEM ID in SOW	TEST ID	PURPOSE	YES/NO	Verification
INS-010	T010-INS-LAB	The instrument center frequency shall be Ka-band at 35.75 GHz.	Yes	TRB-1 / TRB-2
INS-020	T020-INS-POS	The instrument shall be designed to allow SLC 1m x 1m (el. x az.) on ground resolution.	Yes	FR
INS-025	T020-INS-LAB	The instrument shall be designed to allow SLC 1m x 1m (el. x az.) on ground resolution (bandwidth, antenna size).	Yes	TRB-1/TRB-2
INS-030	T030-INS-POS	The instrument shall be designed for NESZ of less than -20dB for VV/HH polarization in clear sky conditions.	Yes	FR
INS-040	T040-INS-POS	The instrument shall be designed for a DTAR of less than -25dB for VV/HH polarization in clear sky conditions.	Yes	FR
INS-045	T045-INS-POS	The instrument shall be designed for a radiometric error (*) of 0.5 dB (1-sigma) and 1 dB (3-sigma). Degradations up to 0.8 dB (1-sigma) and 1.3 dB (3-sigma) will be accepted.	Yes	FR
INS-050	T050-INS-LAB	The instrument shall be designed for a cross polar isolation of -25dB	Yes	TRB-1
INS-055	T055-INS-INF	The instrument shall be designed for a cross polar isolation of -25dB	Yes	FR
INS-060	T060-INS-LAB	The instrument shall have 4 Rx channels	Yes	TRB-1
INS-070	T070-INS-LAB	The instrument shall be extended to have a total of 8 Rx channels	Yes	TRB-1
INS-080	T080-INS-LAB	The antenna system shall support simultaneous H and V	Yes	TRB-1
INS-090	T090-INS-LAB	The instrument shall be easily extendable to HH, HV, and VV, VH operation	Yes	TRB-1
INS-100	T100-INS-LAB	Observation concept: Single-Pass Interferometric SAR	Yes	PDR/CDR
INS-110	T110-INS-LAB	XTI: multiple baselines in cross-track	Yes	TRB-2

Requirements review - Instrument

ITEM ID in SOW	TEST ID	PURPOSE	YES/NO	Verification
INS-120	T120-INS-LAB	ATI: multiple baselines in along-track	Yes	TRB-2
INS-130	T130-INS-LAB	Hybrid configuration between XTI and ATI	Yes	TRB-2
INS-140	T140-INS-LAB	Extended functionality: +/- 45 deg squint, enhanced polarimetry	Yes	TRB-2
INS-150	T150-INS-INF	Attitude and position knowledge and control	Yes	FR
INS-155	T155-INS-LAB	Attitude and position knowledge and control verification on ground	Yes	TRB-2
INS-160	T160-INS-POS	Suitable internal and external calibration (inter-channel phase accuracy of 1 deg RMS)	Yes	FR
INS-165	T165-INS-LAB	Suitable internal calibration (inter-channel phase accuracy of 1 deg RMS)	Yes	TRB-2
INS-166	T166-INS-LAB	Suitable temperature and humidity monitoring instruments shall be installed in the pod near the antennas	Yes	TRB-2
INS-170	T170-INS-LAB	On-board data storage for at least 2 hours	Yes	TRB-1 / TRB-2
INS-180	T180-INS-POS	Ancillary data (navigation, calibration data) should be available and recorded	Yes	FR
INS-185	T185-INS-LAB	Ancillary data (navigation, calibration data, temperature and humidity) should be available, recorded and meaningful	Yes	TRB-2
INS-190	T190-INS-INF	In-flight operation monitoring	Yes	FR
INS-195	T195-INS-LAB	Real-time monitoring of correct instrument functioning	Yes	TRB-2
INS-200	T200-INS-INF	Optical Swath monitoring	Yes	FR
INS-210	T210-INS-POS	Adjustable signal bandwidth for low resolution modes	Yes	FR
INS-215	T215-INS-LAB	Adjustable signal bandwidth for low resolution modes	Yes	TRB-1
INS-220	T220-INS-LAB	The fully integrated instrument operates correctly and generates the expected outputs on the ground (radar and ancillary data)	Yes	TRB-2

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Requirements review - Processor

ITEM ID in SOW	TEST ID	PURPOSE	YES/NO	MILESTONE
PRO-010	T010-PRO-LAB	The processor shall be developed for interferometric phase maps representation and independent of the carrier platform	Yes	TRB-2
PRO-020	T020-PRO-LAB	As input, the processor shall accept the raw data in the format as acquired by the instrument and without the need for any pre-processing Output in netCDF of map of radiometric resolution, interferometric coherence maps, multi-looked interferometric phase maps	Yes	TRB-2
PRO-030	T030-PRO-POS	Non-free licenses shall not be used, unless necessary for improving the performances of the processor	Yes	TRB-2
PRO-040	T040-PRO-POS	The processor shall have a simple Graphical User Interface	Yes	TRB-2
PRO-050	T050-PRO-POS	It shall be possible to set all simulator parameters by means of a user-friendly configuration file.	Yes	TRB-2
PRO-060	T060-PRO-POS	A set of graphic routines supporting all the operations required for displaying and printing the graphical outputs shall be provided.	Yes	TRB-2
PRO-070	T070-PRO-POS	The source code of the processor shall be provided	Yes	TRB-2
PRO-080	T080-PRO-POS	The source code of the tool shall be written in such a manner that it may be understood, modified and debugged by typical end users	Yes	TRB-2
PRO-090	T090-PRO-POS	The source code shall be written in an appropriate way to allow future modifications.	Yes	TRB-2
PRO-100	T100-PRO-POS	The processor shall be easily extendable	Yes	TRB-2
PRO-110	T110-PRO-POS	The processor shall be designed platform independent	Yes	TRB-2

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Lessons Learned & way forward

- Complex development project of a state-of-the-art radar system
- Multipath and coupling within the pod
- Handling of multiple channels simultaneously generating large amount of data to record on disk
- Airworthiness certification for the radar and the pod
- Project management to correctly handle all the complex development
- Importance of sub-contractor management

- The KaSAR system is ready to be operated for dedicated airborne SAR data collection campaigns for different studies.

Conclusions

- The objective and all the tasks within the project have been reached and performed.
- The KaSAR system (instrument + processor) has been developed, operated and evaluated
- KaSAR is a multi-channel, airborne, polarimetric, single-pass Along- and Cross-Track Interferometric SAR (InSAR) at Ka-band, with adjustable and multiple baselines.
- The instrument is supported by the End-to-End SAR processor.
- The sensor is hosted on MetaSensing’s PA31 aircraft.
- A dedicated pod has been designed, fabricated, integrated on the aircraft, certified and validated in flight in terms of RF performance.
- The functional verification campaign has been flown on 2nd and 4th May 2022 and data have been processed and analyzed.
- Successful results have been obtained showing that the instrument and the processor can be used operationally for further Ka-band data collection campaign experiments.

Conclusions

- Updates and some improvements can be introduced in the processing software.
- The first release of the KaSAR processor is operational and its functionality has been tested with the functional campaign data.
- The outputs of the KaSAR processor shows that all modes of operations of KaSAR instrument can be ingested and processed.
- Further refinement in the accuracy and quality of the KaSAR processor output data will be tackled having the MetaSAR-Pro as source of comparison and analyzing a greater volume of data.
- All data acquired and here presented are delivered as raw data, together with the delivered processor and configuration files, so that all results presented and obtained are reproducible.

Thank you!