

# Proposed guidelines for including colocated InSAR infrastructure in GNSS sitelogs

Lennard Huisman (NSGI - Kadaster) and Hans van der Marel (Delft University of Technology)

## Introduction

More and more InSAR **Corner Reflectors (CR)** and **Active Compact Transponders (ACTR)** are colocated with GNSS reference stations. At the EUREF 2023 symposium, an action was taken to provide EPN station managers with guidelines on how to include these colocations in sitelogs. Such guidelines are important to harmonize the information on GNSS and InSAR colocations. The colocation information on INSAR in the GNSS sitelog is meant to identify the colocated instrumentation and installation type for a certain period.

## Colocation section in GNSS sitelogs

Colocation information can be added to section 7 of the GNSS sitelogs. The structure of section 7 is as follows:

7.x	Instrumentation Type	: (GPS/GLONASS/DORIS/PRARE/SLR/VLBI/TIME/etc)
	Status	: (PERMANENT/MOBILE)
	Effective Dates	: (CCYY-MM-DD/CCYY-MM-DD)
	Notes	: (multiple lines)

The next sections will suggest how to fill these four subsections.

### Instrumentation type

The instrumentation type should describe the type of InSAR instrumentation (CR or ACTR). Next to that, the instrumentation can be set up to reflect signals in the **Ascending (A)** or **Descending (D)** track. If a pair of instruments is installed for both ascending and descending tracks, the instrumentation is **Coupled (C)**. In case the InSAR instrumentation is mechanically coupled and integrated with the GNSS monument and the GNSS station is continuously operating, the installation type is **Integrated (I)**. To describe the INSAR instrumentation type in the colocation section, we suggest the following convention:

INSAR <instrument type>/<installation type>.

This leaves us with the following table of possible instrumentation types:

InSAR instrument / installation type	Ascending (A)	Descending (D)	Coupled (C)	Integrated (I)
Corner reflector (CR)	INSAR CR/A	INSAR CR/D	INSAR CR/C	INSAR CR/I
Active compact transponder (ACTR)	INSAR ACTR/A	INSAR ACTR/D	INSAR ACTR/C	INSAR ACTR/I

### Status

If the installation is not permanent the status is mobile.

### Effective dates

InSAR instrumentation needs to be aligned relative to the satellite ground tracks. In some cases, instrumentation is installed but not aligned immediately. In this situation, it can happen that the instrument is already affecting the scatter in InSAR data but not usable. The effective dates are preferred to provide the period in which the instrument was orientated correctly.

### Notes

If a transponder and corner reflector information file or other information is available, the notes section can be used to provide a hyperlink to this logfile or add the information. An example is given on the right for IJMU00NLD.

## Surveyed local ties

If there is information on the relative position of the InSAR and GNSS instruments this information can be added to the existing section 5 on surveyed local ties.

## Next steps

We recommend to include these guidelines into the Guidelines for EPN Station & Operational Centres, for example in section 2.3 of those guidelines. The updated guidelines can than be shared with station operators with a recommendation to include information on InSAR and GNSS colocation in GNSS sitelogs. If this action is successful, it might be followed up by an action to harmonize information on other colocated sensors, such as gravimetry sensors, as well.

## Examples of instrumentation and installation types

Below some examples of instrumentation and installation types are shown for clarification.

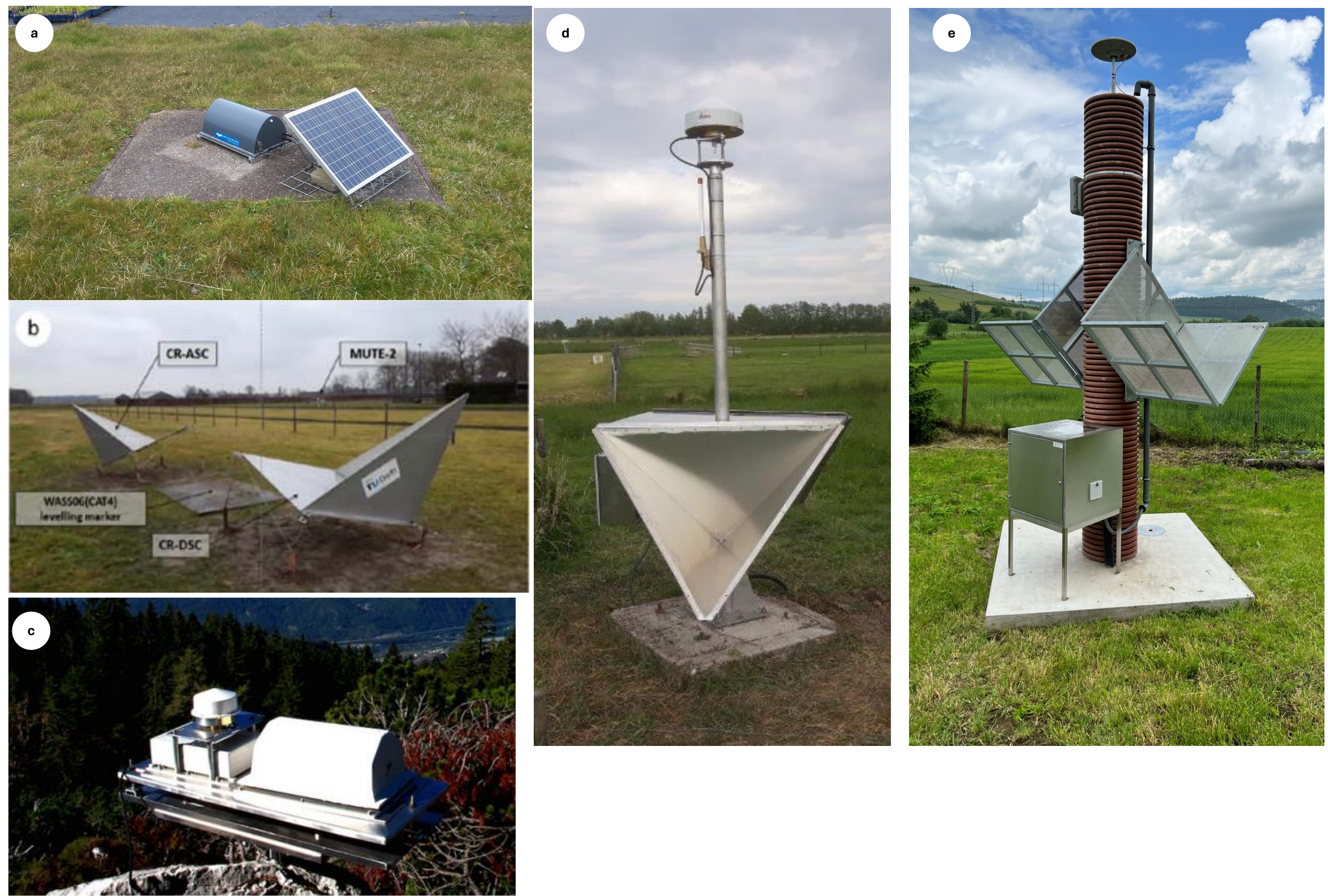


Figure: Different types of instruments:

- a) Coupled active transponder: ACTR/C,
- b) Two colocated, not coupled, corner reflectors: CR/A and CR/D,
- c) Active transponder integrated with GNSS: ACTR/I,
- d) Integrated Geodetic Reference Station (IGRS) CBW100NLD: CR/I,
- e) Integrated setup SPVL00SVK: CR/I

## Sitelog example IJMU00NLD

7.	Collocation Information
7.1	Instrumentation Type : TIDE-GAUGE STATION Status : PERMANENT Effective Dates : 1996-08-27/CCYY-MM-DD Notes : Tide gauge at Noordzee coast operated by RIKZ.
7.2	Instrumentation Type : UNDERGROUND LEVELING BENCHMARK Status : PERMANENT Effective Dates : 2004-12-30/CCYY-MM-DD Notes : Dutch height system NAP benchmark No. 024F0042
7.3	Instrumentation Type : INSAR ACTR/D Status : PERMANENT Effective Dates : 2012-05-14/2012-11-16 Notes : InSAR transponder No. CAT1, occupancy code 01A0 Systems: RS2
7.4	Instrumentation Type : INSAR ACTR/D Status : PERMANENT Effective Dates : 2012-11-16/2015-03-14 Notes : InSAR transponder No. CAT1, occupancy code 01B0 Systems: RS2 CAT moved to other side of mast
7.5	Instrumentation Type : INSAR ACTR/D Status : PERMANENT Effective Dates : 2015-03-14/2015-12-27 Notes : InSAR transponder No. CAT1, occupancy code 01B1 Systems: RS2, S1 Sentinel-1 (S1) observations added to program
7.6	Instrumentation Type : INSAR ACTR/C Status : PERMANENT Effective Dates : 2023-03-16/CCYY-MM-DD Notes : InSAR transponder No. E137, occupancy code 01C0 Systems: S1
7.x	Instrumentation Type : (GPS/GLONASS/DORIS/PRARE/SLR/VLBI/TIME/etc) Status : (PERMANENT/MOBILE) Effective Dates : (CCYY-MM-DD/CCYY-MM-DD) Notes : (multiple lines)

