DISCOS

EVOLUTION IN THE DEVELOPMENT OF THE ITALIAN SINGLE-DISH CONTROL SYSTEM

Team

A. Orlati, M. Bartolini, S. Righini INAF-IRA
M. Buttu, A. Fara, C. Migoni, S. Poppi INAF-OAC

DISCOS [1] is a control system developed by the Italian National Institute for Astrophysics (INAF) and currently in use at three radio telescope facilities of Medicina, Noto and the Sardinia Radio Telescope (SRT) [2]. DISCOS development is based on the adoption of the ALMA Common Software (ACS) [3] framework. During the last two years, besides assisting the astronomical commissioning of the newly-built SRT and enabling its early science program, the control system has undergone some major upgrades. The long-awaited transition to a recent ACS version was performed, migrating the whole code base to 64 bit operative system and compilers, addressing the obsolescence problem that was causing a major technical debt to the project. This opportunity allowed us to perform some refactoring, in order to implement improved logging and resource management. During this transition the code management platform was migrated to a git-based versioning system and the continuous integration platform was modified to accommodate these changes. Further upgrades included the system completion at Noto and the expansion to handle new digital backends.

NEW FEATURES
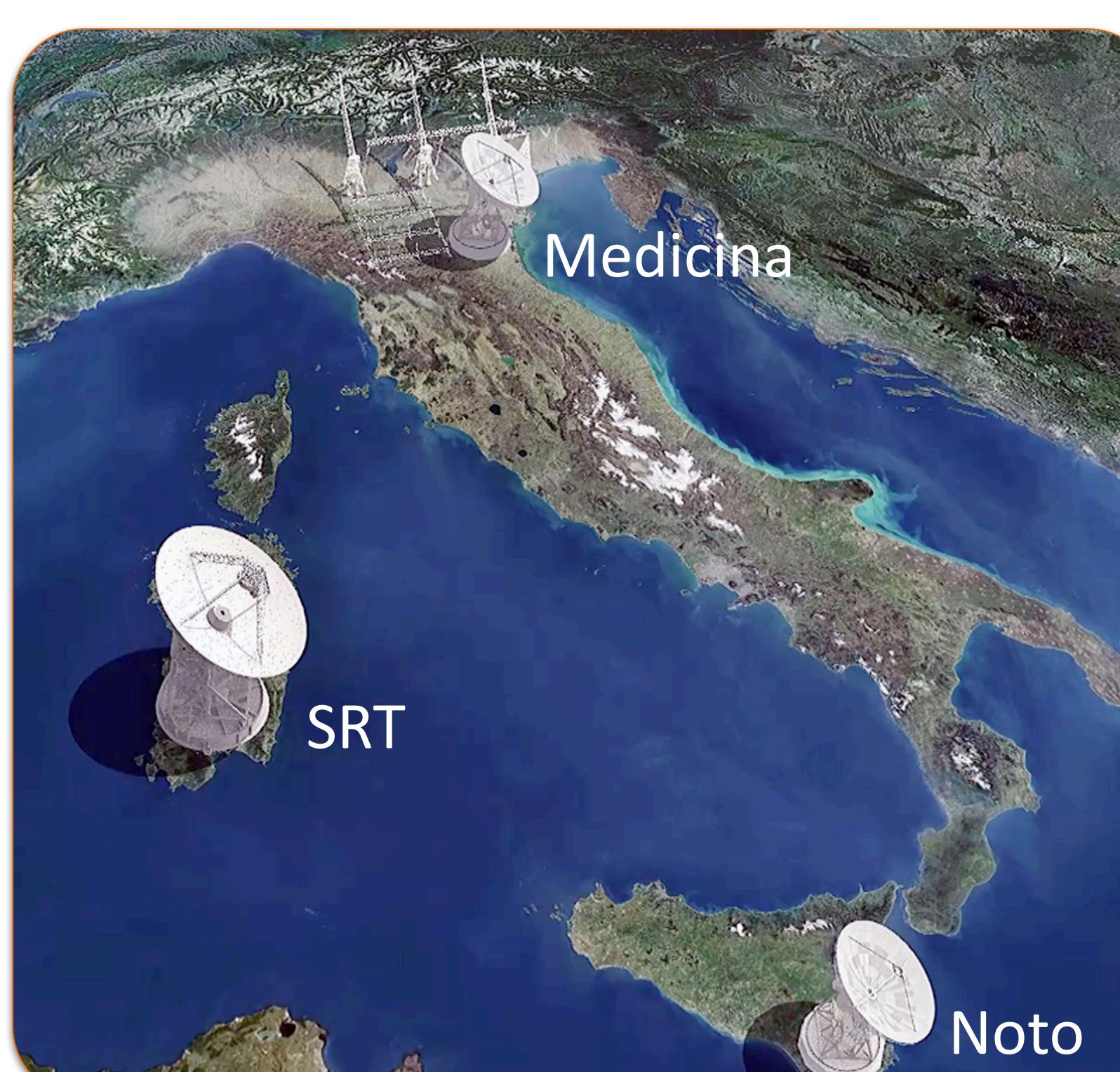
- **External Backends** can now be easily integrated into the control system, enabling custom observations via a simple TCP/IP-based protocol. A reference implementation is also provided.
- **Roach2-based spectrometer** were installed at SRT and Medicina sites for high-temporal-resolution spectroscopic observations.
- **Dewar positioner** is in charge of compensating the field rotation when dealing with multi-pixel receivers equipped with a de-rotation system.
- **Frequency Tracking** keeps a requested frequency in the center of the backend band. Both frontend and backend local oscillators could be tuned during this operation.
- **Github** organization containing repositories of the whole code base, support tools, and documentation. https://github.com/discos
- User manuals and developer documentation ported to **Restructured Text** format and continuously integrated with the code base. Available online at https://discos.readthedocs.io

MAJOR UPGRADES
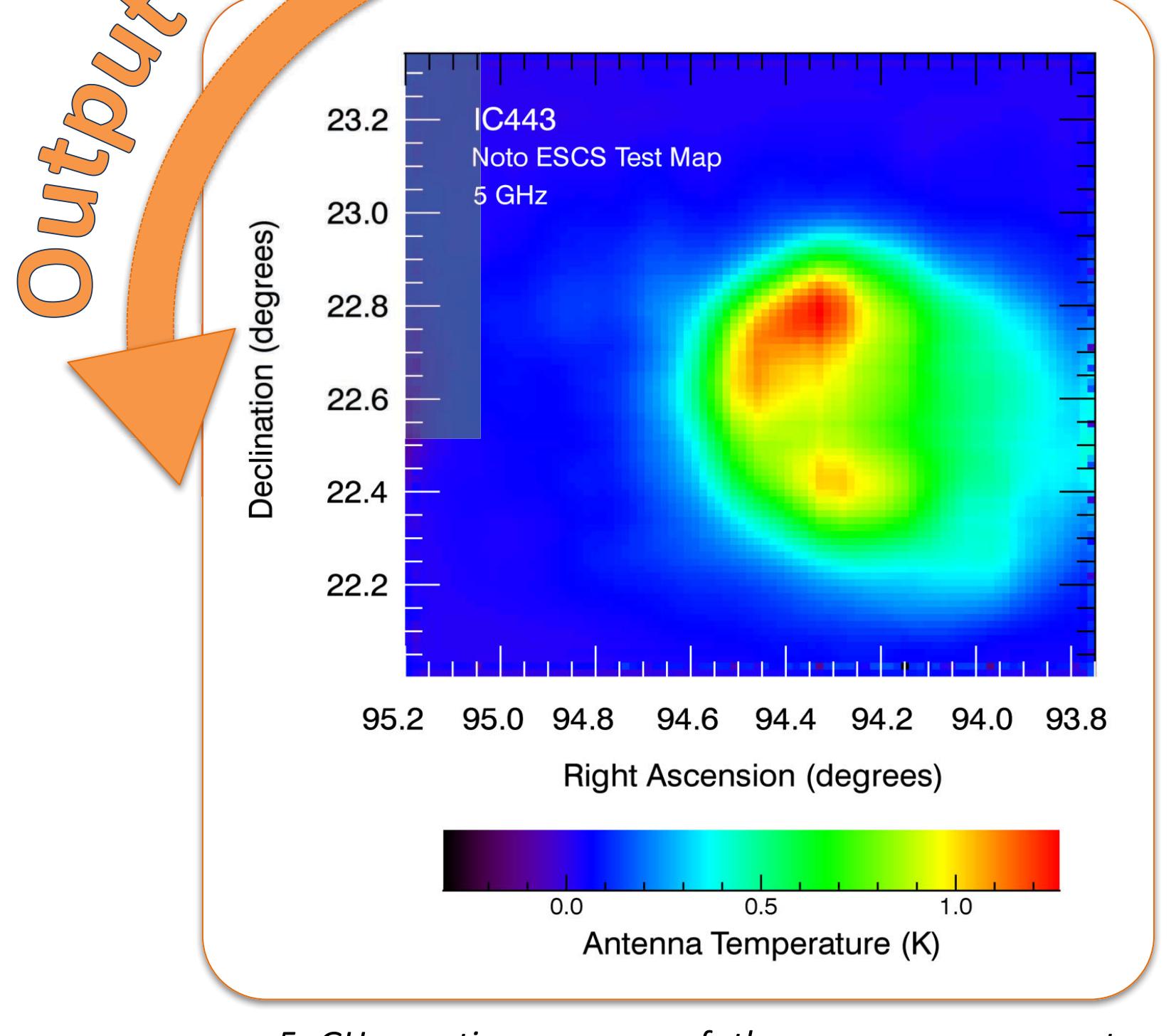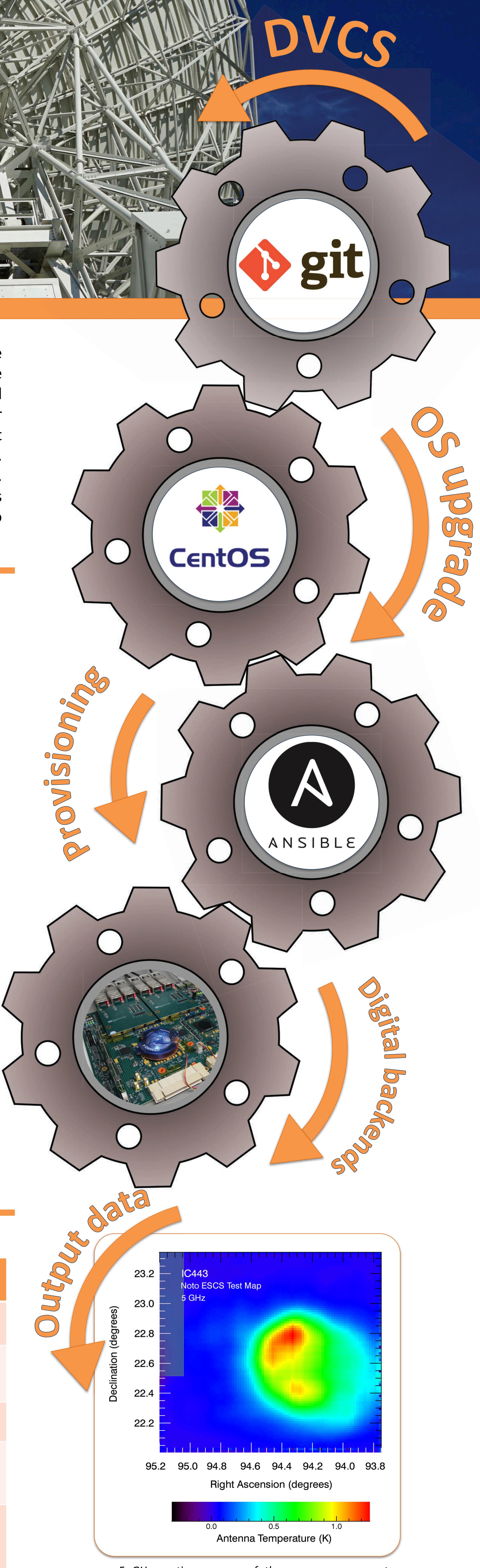
- Code base entirely migrated to a **git-based** distributed version control system, reducing the size of the repository from 3GB to 130MB and keeping all history, also migrating all issues and tags.
- Upgrade of the Operative System from 32 to **64 bit**. Being mostly C++ code this required a great effort.
- Migration of the whole code base to **ACS version 2016**
- Automated provisioning of development and production environments based on **Ansible** recipes and Vagrant+Virtualbox based virtualization.

[1] Orlati A. et al. Design Strategies in the Development of the Italian Single-dish Control System, ICALEPCS 2015
[2] Bolli P. et al. SRT: General Description, Technical Commissioning and First Light
[3] G. Chiozzi et al., "The ALMA Common Software: a developer-friendly CORBA-based framework", Proc. SPIE vol 6274, September 2004, p. 205 (2004)

Above: the team at work, installing DISCOS at Noto. Bottom left: the Italian radiotelescope sites. Table below: basic features of the three antennas. Right (top to bottom): schematization of the major project upgrades recently completed. The DISCOS project documentation can be found using the above QR code.

	SRT	**Medicina**	**Noto**
Main mirror	64 m	32 m	32 m
Antenna Control Unit	Beckhoff PLC Ethernet Vendor protocol	VxWorks-based PC Ethernet Vendor protocol	VxWorks-based PC Ethernet Vendor protocol
Active surface	Yes	No	Yes
Current receivers	P, L, C, K band	L, S, C, X, K band	P, L, S, C, X, K, Q band
Current back-ends	Total Power XARCOS Roach boards DFB	Total Power XARCOS (Roach boards)	Total Power

5 GHz continuum map of the supernova remnant 3C157/IC443, obtained with the Noto 32-m dish.