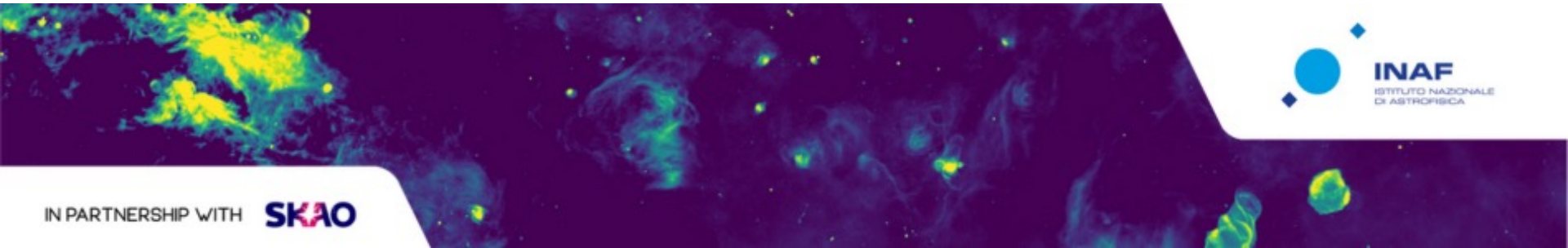
24 November 2025

The SKA Observatory

[from an Italian perspective]

Isabella Prandoni

Fifth National Workshop of the SKA Project

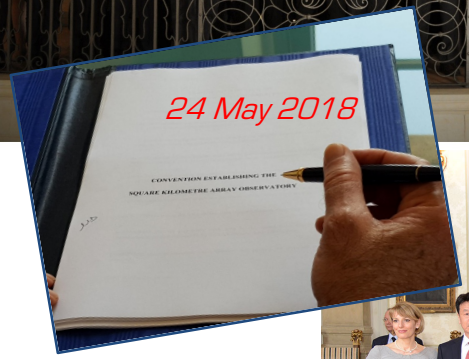


INAF participation to SKA

Courtesy J. Monari

The SKAO - Milestones

- **December 2011:** Establishment of SKA Organization (Italy founding member)
- **October 2015:** Negotiations start for establishment of an IGO (under Italy coordination)
- **24 May 2018:** Italy first country initialling the IGO convention
- **12 March 2019:** IGO signing ceremony – Rome
- **2019** - MAECI funds the SKA
- **5 February 2020:** Italy second country ratifying the IGO convention
- **15 January 2021:** SKA Observatory enters into force (Italy among 6 founding members)
- **01 July 2021**: SKAO Construction begins (Italy gets first contracts)



The SKAO: Italian Involvement

3 main lines of actions:

- **technology**: promote Italian design / maximise industrial return
- **science:** create the conditions for Italy-led SKA Surveys
- **data:** build the necessary expertise in data handling & analysis

SKA-IT: Design Leaderships

Pre-construction dates

2013
DESIGN CONSORTIA FORMED
Consortia commenced design of telescope elements.

2015–2016
ELEMENT PRELIMINARY DESIGN REVIEWS
Consortia presented detailed proposals for assessment by an expert panel from the SKA and external organisations.

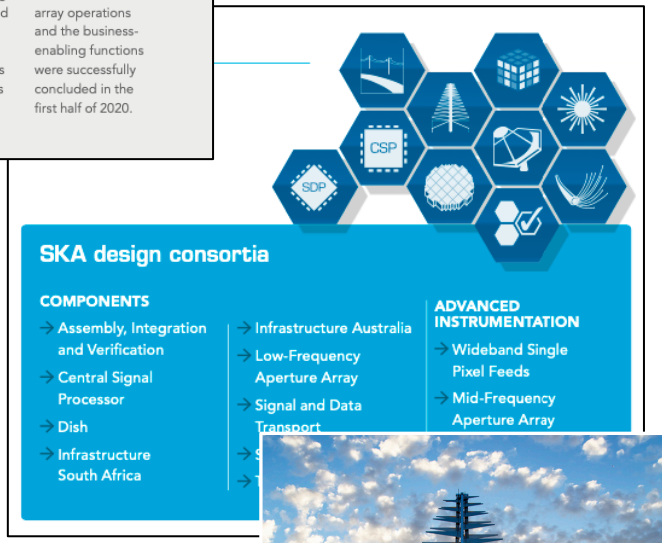
2016
SYSTEM PRELIMINARY DESIGN REVIEW
External experts assessed the SKA's system design, ensuring it was mature enough to enable the start of detailed design work.

2018–2019
ELEMENT CRITICAL DESIGN REVIEWS
The proposed design for each element was assessed against the project's tough engineering requirements.

DECEMBER 2019
SYSTEM CRITICAL DESIGN REVIEW
An independent panel of external reviewers endorsed the SKA's overall design, including how all parts of the SKA will work and interact with one another.

EARLY 2020
INDEPENDENT COST REVIEW
An independent review by consulting firm Arup concluded that the schedule and approach to construction follows logic and evidences good practice across both SKA-Low and SKA-Mid.

MID 2020
OPERATIONS REVIEWS
Independent reviews of both the array operations and the business-enabling functions were successfully concluded in the first half of 2020.

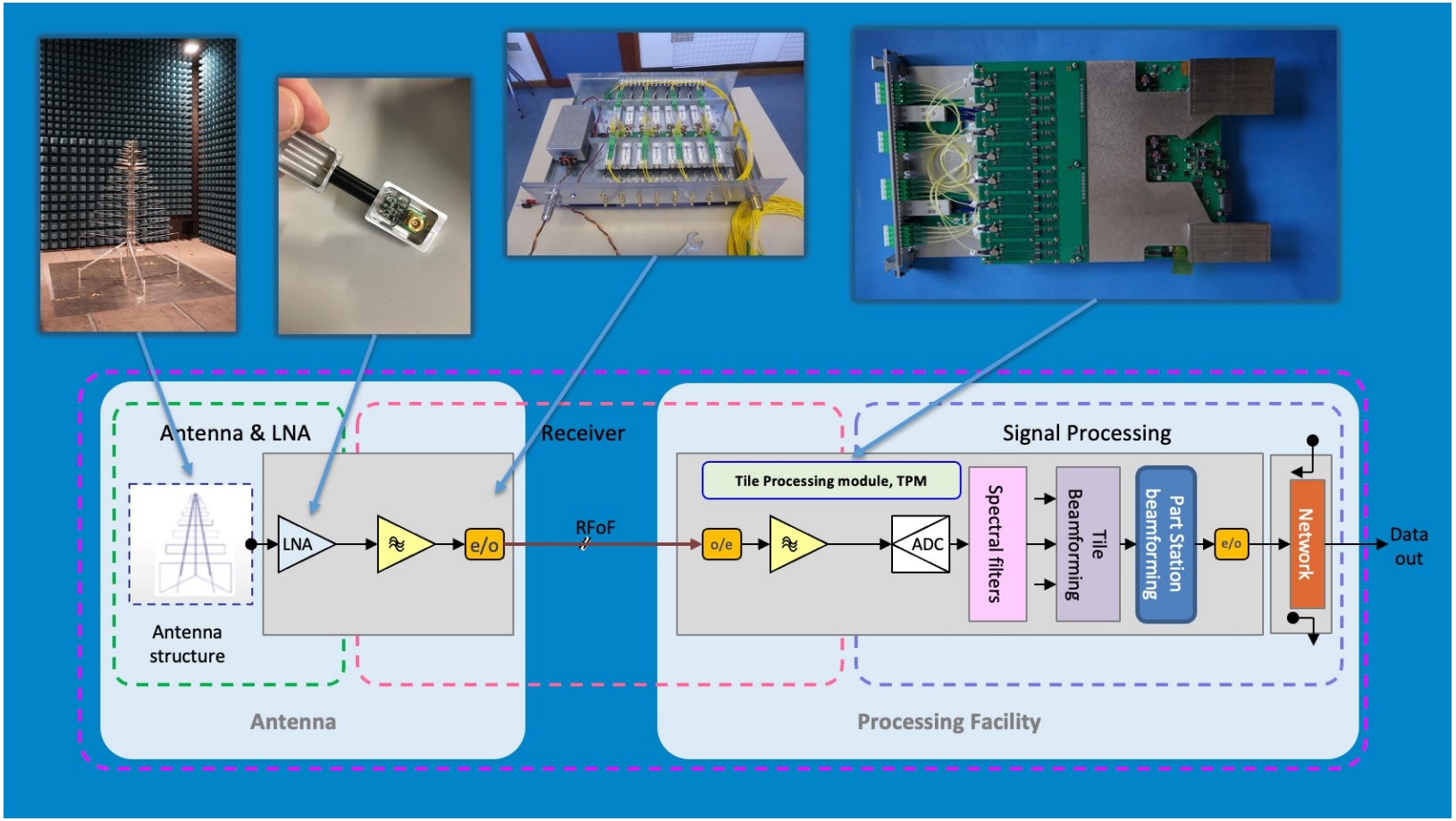


Italian technological leaderships established in pre-construction phase through EU-funded programmes (2005- 2012) and the Design Consortia (2013-2020)

- **Design of antennas, receivers & signal acquisition chain for SKA-Low**
- **Observatory Monitoring and Control (OMC) Software for SKA-Mid**
- **Development of software for pulsar search and timing**
- **Development of phased array feed (PAF) receivers**

SKA-LOW Prototype station
Antenna design SKALA 4.1AL

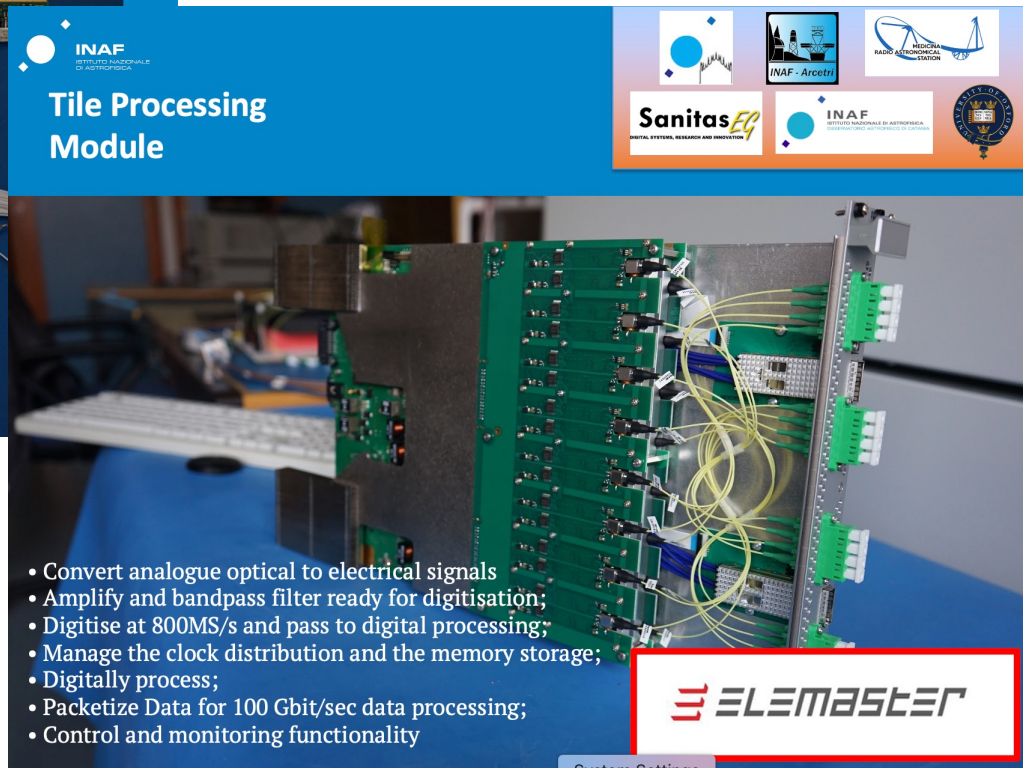
SKA-Low Receiver chain: Made in Italy



Courtesy J. Monari

SKA-Low: Signal processing subsystem (SPS) HW

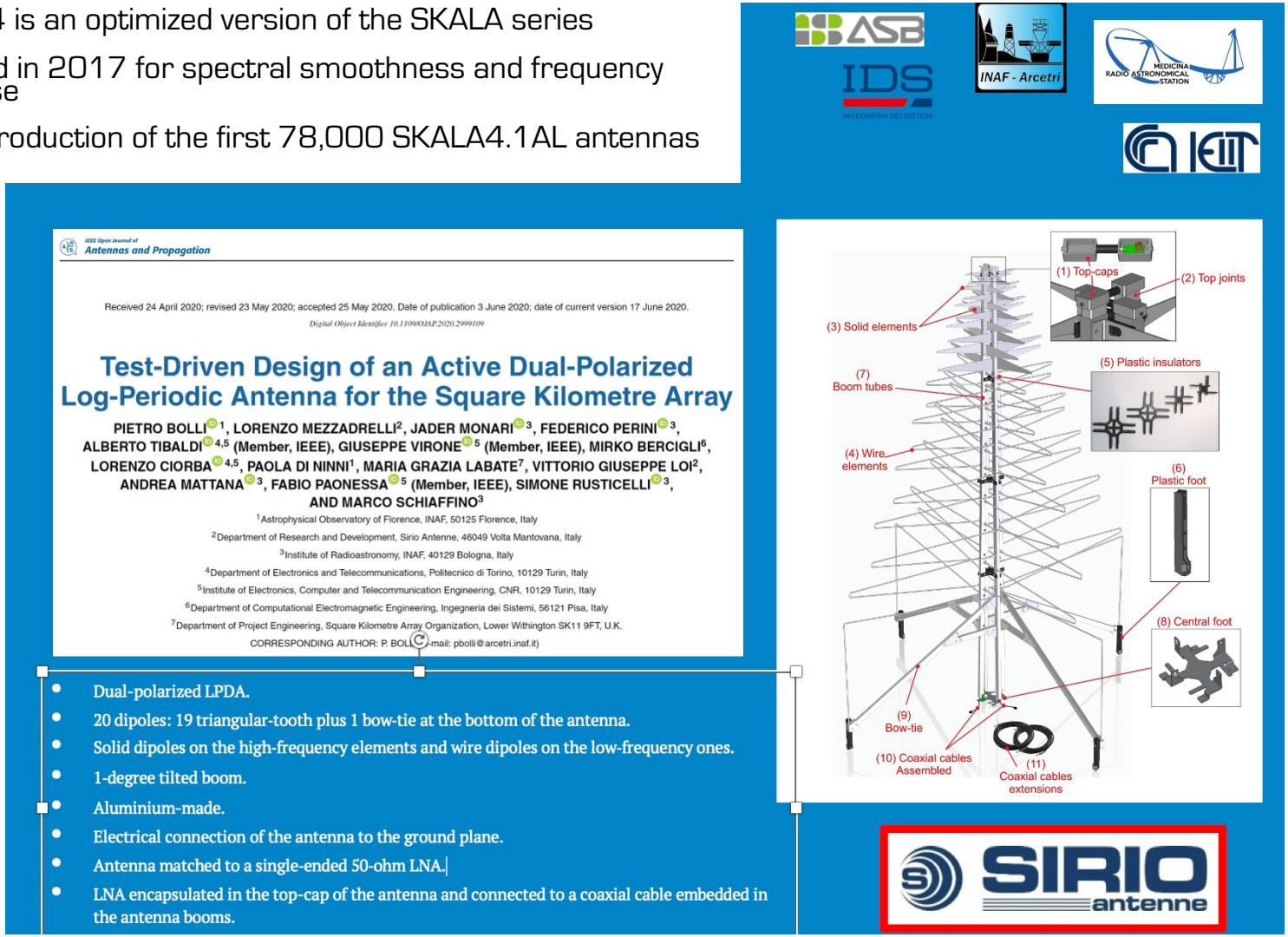
- digital processing system
- digitise, correlate and combine signals from SKA-Low antennas



Courtesy J. Monari

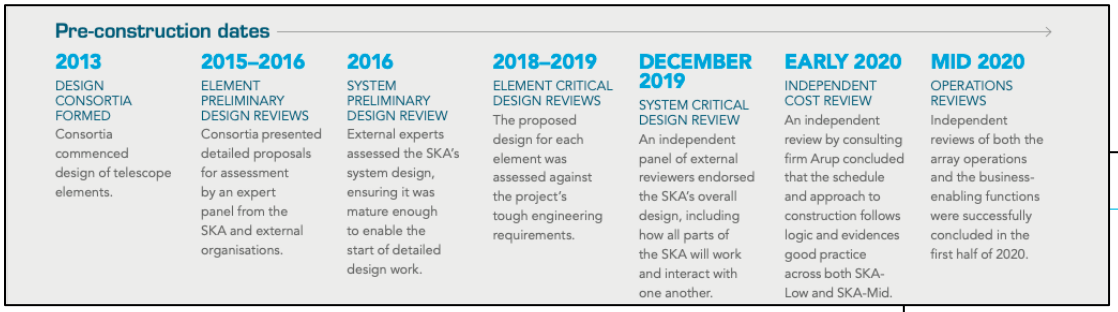
SKALA4.1AL Antenna

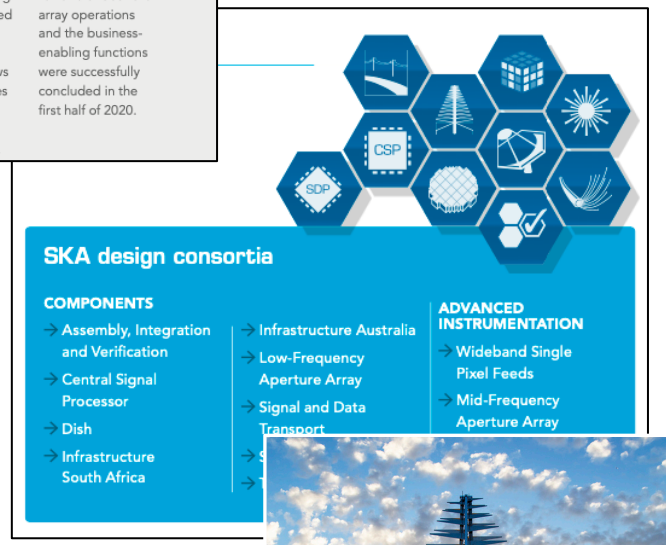
- SKALA4 is an optimized version of the SKALA series
- Selected in 2017 for spectral smoothness and frequency response
- SIRIO: production of the first 78,000 SKALA4.1AL antennas



Courtesy J. Monari

SKA-IT: SKAO Construction Contracts



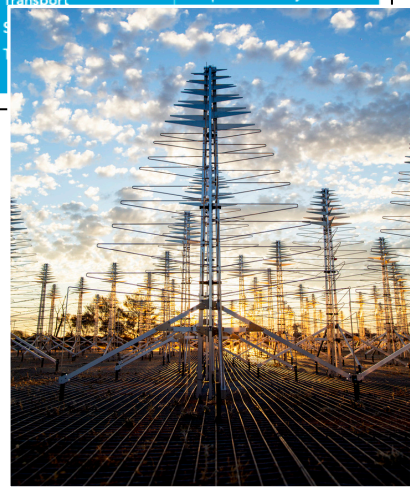


Italian technological leaderships established in pre-construction phase through EU-funded Design Consortia (2013-2020)

Industrial Return well above the guaranteed threshold of 42 MEu

1) **SIRIO Antenne: production of the first 78,000 SKALA4.1AL antennas**
2) **Elemaster Group: Signal Processing Sub-system (SPS) for SKA-Low**
3) **SAM: manufacturing feed indexers for first 64 SKA-Mid dishes**
4) **INAF: Observation Management and Control (OMC) SW**

SKA-Low station Management and Integration Contract (PSSC)



SKA-LOW Prototype station
Antenna design SKALA 4.1AL

OMC: Observatory Management & Control System

Meeting with M. Miccolis (SKAO) at INAF – Arcetri (Florence), May 11th 2022

Courtesy M. Dolci

SKA-IT: Preparing for SKA leaderships

Several initiatives to engage Italian Community and build a SKA-oriented leadership

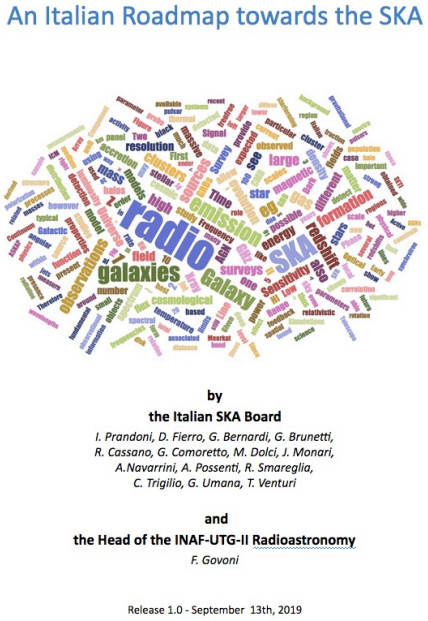
- **2018:** INAF joins the **International LOFAR Telescope**

See talks by
Gianfranco Brunetti
Francesco de Gasperin

- **2019:** INAF establishes an **Italian Roadmap towards the SKA**
  [weakness: no access to SKA-MID precursors]

- **2020:** INAF joins **MeerKAT+** (from 64 to 78 antennas, 2x max. baseline)
- **2023-2025:** PNRR (STILES): **Band 5b Receivers for MeerKAT**
  64 antennas (10 Meu)

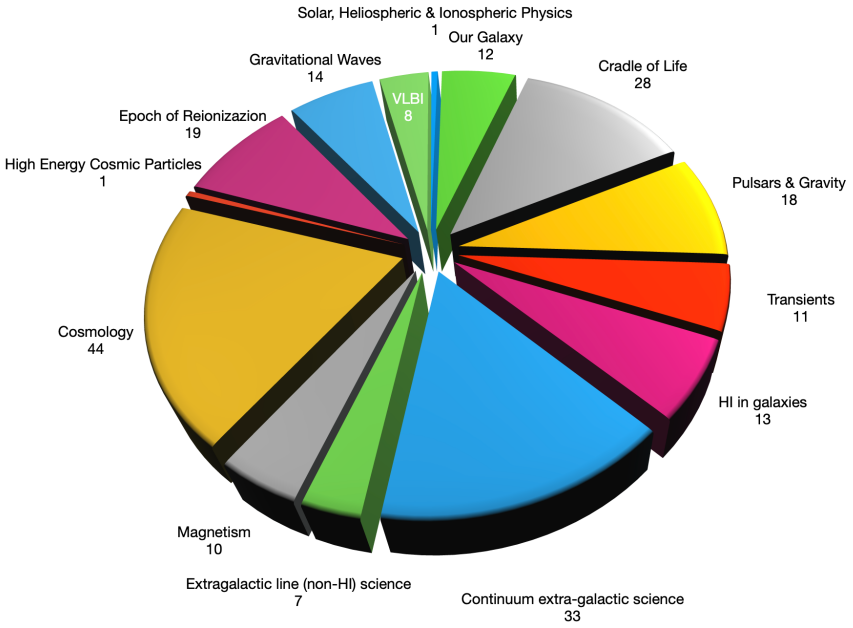
See talks by
Grazia Umana
Maria Grazia Labate
Tiziana Venturi

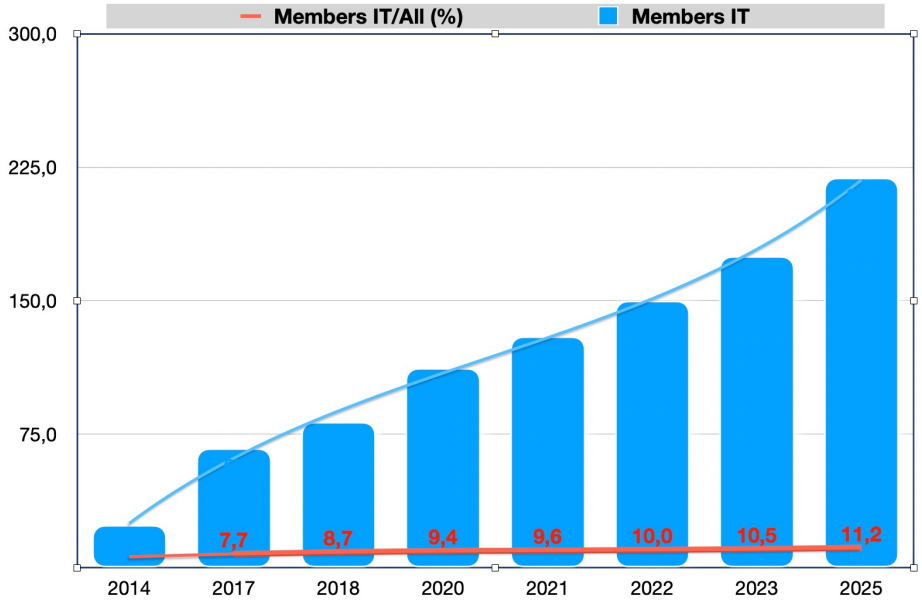


SKA-IT: Preparing for SKA leaderships

SKA Science Working Groups: 1950

- About 1950 members worldwide
- 14 SKA Science Working Groups
- **219 IT members** (11.2%) in all SWG





(Updated 2025)

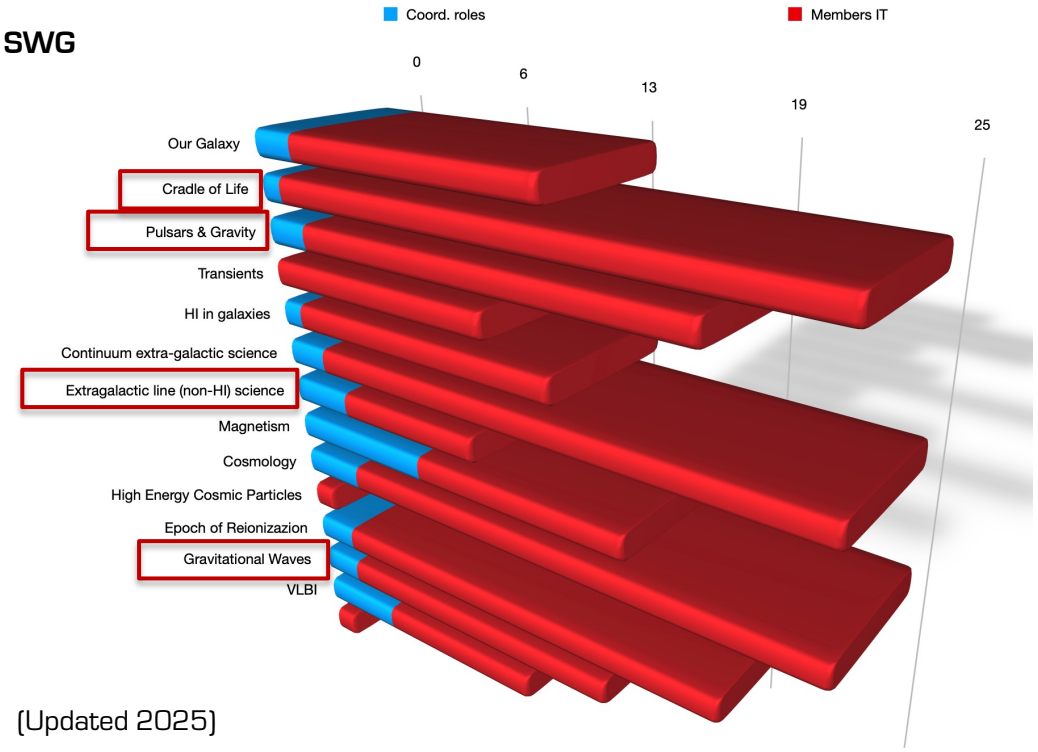
Rich and diverse ongoing scientific activities

SKA-IT: Preparing for SKA leaderships

Goal: maximal scientific return in the exploitation of SKA

- About 1950 members worldwide
- 14 SKA Science Working Groups
- **219 IT members** (11.2%) in all SWG
- **5 IT chairs (+5 ex-chairs)**
- **22 IT members with Coordination Roles in 11 SWG**

- ❑Pulsars & Gravity
- ❑HI in galaxies
- ❑Continuum extragalactic science
- ❑Extragalactic (non-HI) lines
- ❑Magnetism
- ❑Cosmology
- ❑Epoch of Reionization
- ❑Gravitational Waves
- ❑Our Galaxy
- ❑Cradle of Life



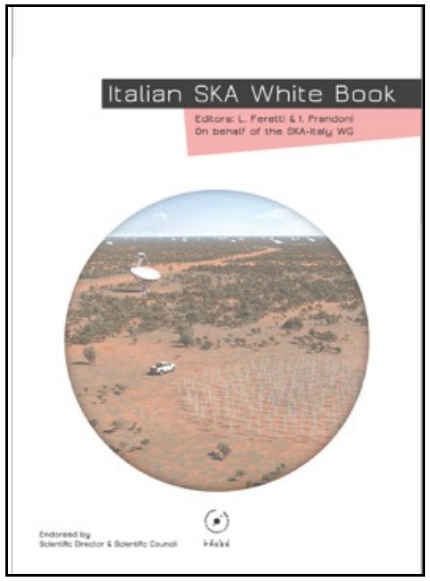
(Updated 2025)

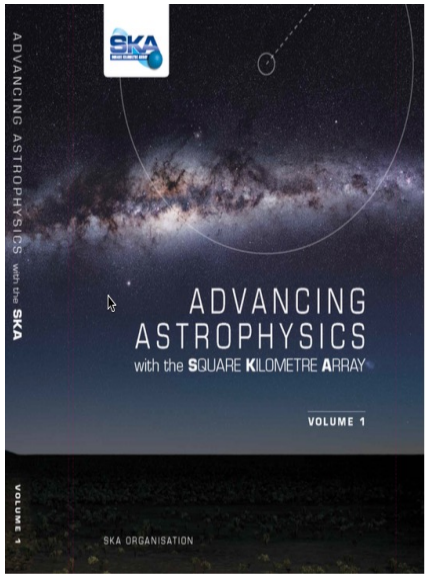
Rich and diverse ongoing scientific activities

SKA-IT: Preparing for SKA leaderships

Several initiatives to engage Italian Community and build a SKA-oriented leadership

- Italian SKA White Book (**2014**): >80 IT co-authors
- SKA Science Book **2015** - 135 chapters: **41% with IT co-authors** (56) – **15% with IT first authors** (20) (15%)





SKA-IT: Preparing for SKA leaderships

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- Italian SKA White Book (**2014**): >80 IT co-authors
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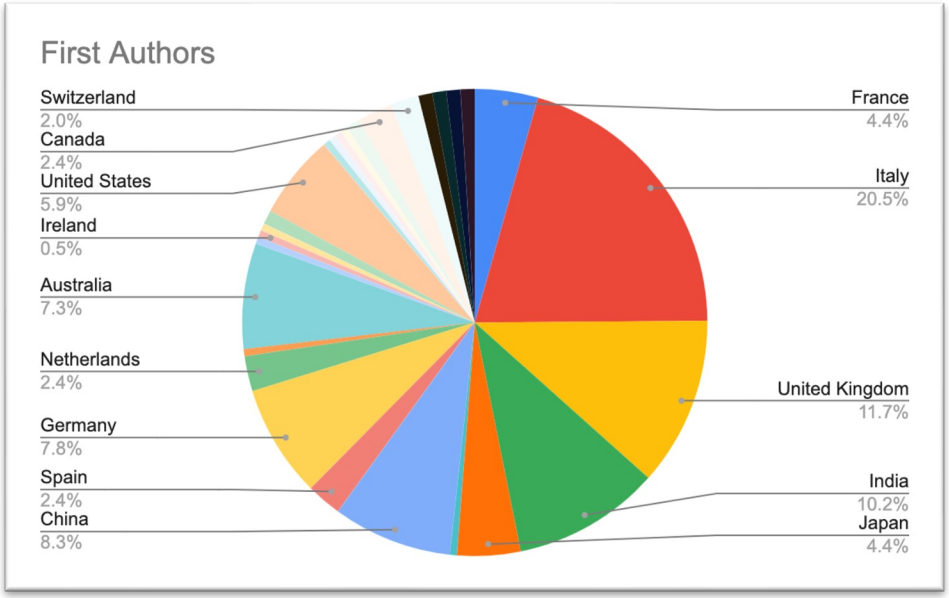
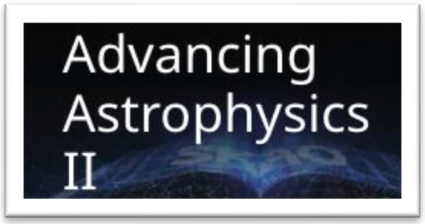
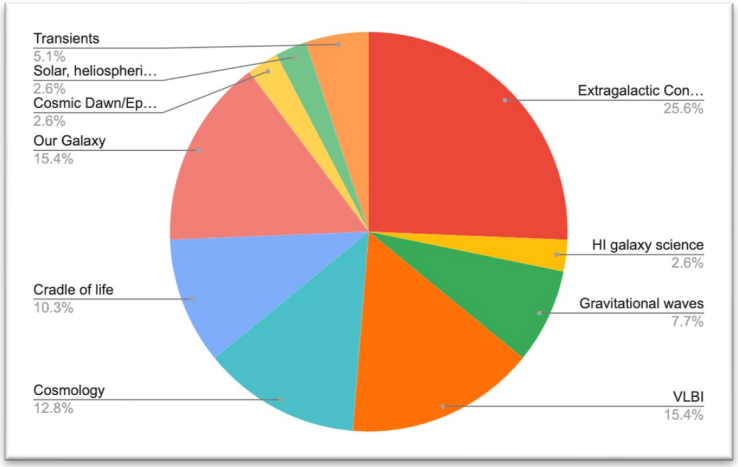
- SKA Science Book **2025 - 20% with IT first authors**



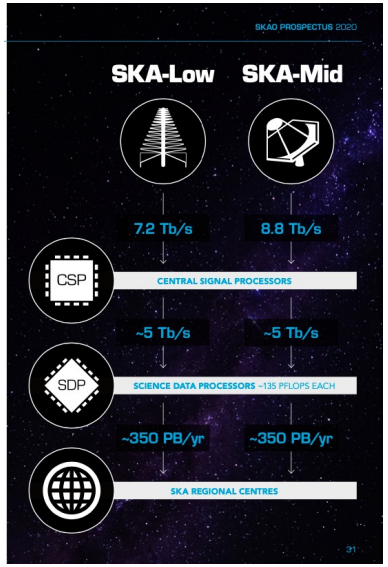




Courtesy A. Bonaldi

SKA-IT: Italian node of the SRC network

The **SKA Regional Center network (SRCnet)** will provide data access, data analysis, data archive, user support interfaces (proposal preparation, data management, etc.)



2021: Italy joins **SRC Network**

INAF strongly involved in the SRCnet international activities with a **total effort of ≈10 FTEs**

The Italian node (so far built on previous generation HW) passed the **validation test on October 2025**

The next future (and INAF investments)

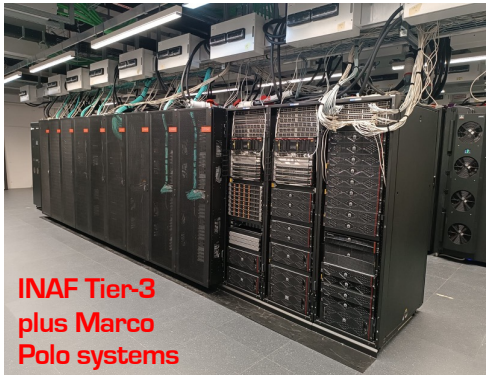
Joint building of the international and the national team

Italian Node Team

Person	LEVEL	Role
Taffoni	(Dev/DevOps)	Coordinator
Vitello	(Dev/DevOps)	Integrator
Tudisco	(Dev/DevOps)	Operator/Developer
Lacopo	(Dev/DevOps)	Developer
Maggio	(Service Ops / SRE)	Operator/Integrator
Gandolfi	(Service Ops / SRE)	Operator
Stagni	(Service Ops / SRE) + (Dev/DevOps)	Operator/Integrator
Galluzzi	SciDev	Support Scientist
Zanichelli	SciDev	Support Scientist
Knapic+IA2	(Dev/DevOps) +(Service Ops / SRE)	Operator/Developer
Sciacca	(Dev/DevOps)	Developer
Russo	(Dev/DevOps)	Developer
Bertocco	(Dev/DevOps)	Developer
Scavo	(Dev/DevOps)	Developer
Butora	(Dev/DevOps)	Developer
Molinaro	(Dev/DevOps)	Developer
Lorenzani	(Dev/DevOps)	Developer
Marotta	(Dev/DevOps)	Developer
Riggi	SciDev	Support Scientist
Massardi	SciDev	User interface

it SRC
SKAO Regional Centre Italy

The new Computing HW installed at the Bologna Technopolo



See talk by Andrea Possenti

SKA-IT: Summary & Next steps

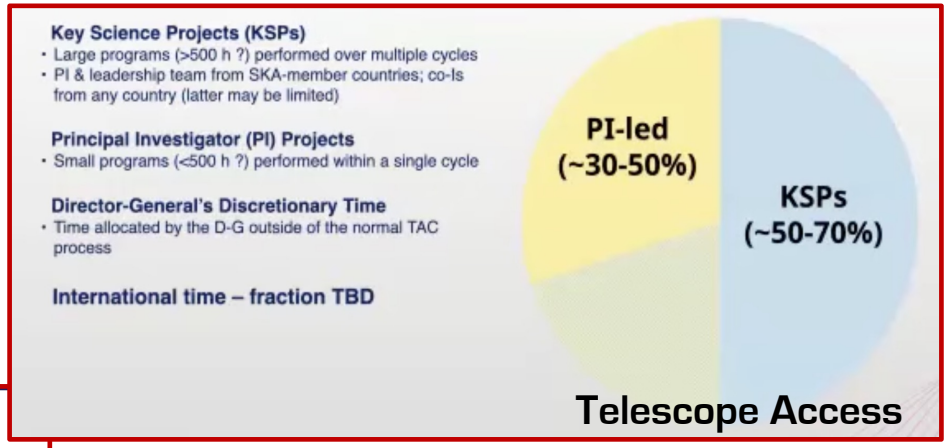
Strengths

- Recognized leaderships in SKA technology (SKA Tier 1 and Tier 2 contracts)
- Recognized leadership in SKA science (SWG chairs/coordination roles/Pishops Science Book chapters)
- PI-ships and leadership roles in both SKA MID and SKA LOW precursors
- Strong expertise in data analysis/observations (radio interferometry) & computational research

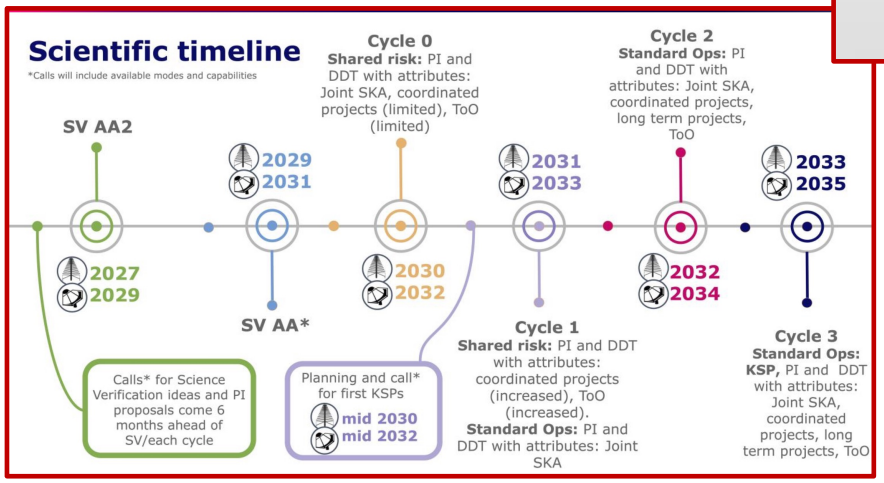
- ➢ Maintain / increase scientific visibility of IT community
- ➢ Foster engagement in early SKA observations
- ➢ Foster international PI/KSP leaderships
- ➢ Foster formation of national KSP teams (both science and data analysis)

- ➢ Foster IT involvement in Observatory Development Programme (>2030)

Credits: SKAO



Science driven, based on contribution level



Way forwards will be discussed on Friday...

Thanks!