

SKA-related Activities in Italy

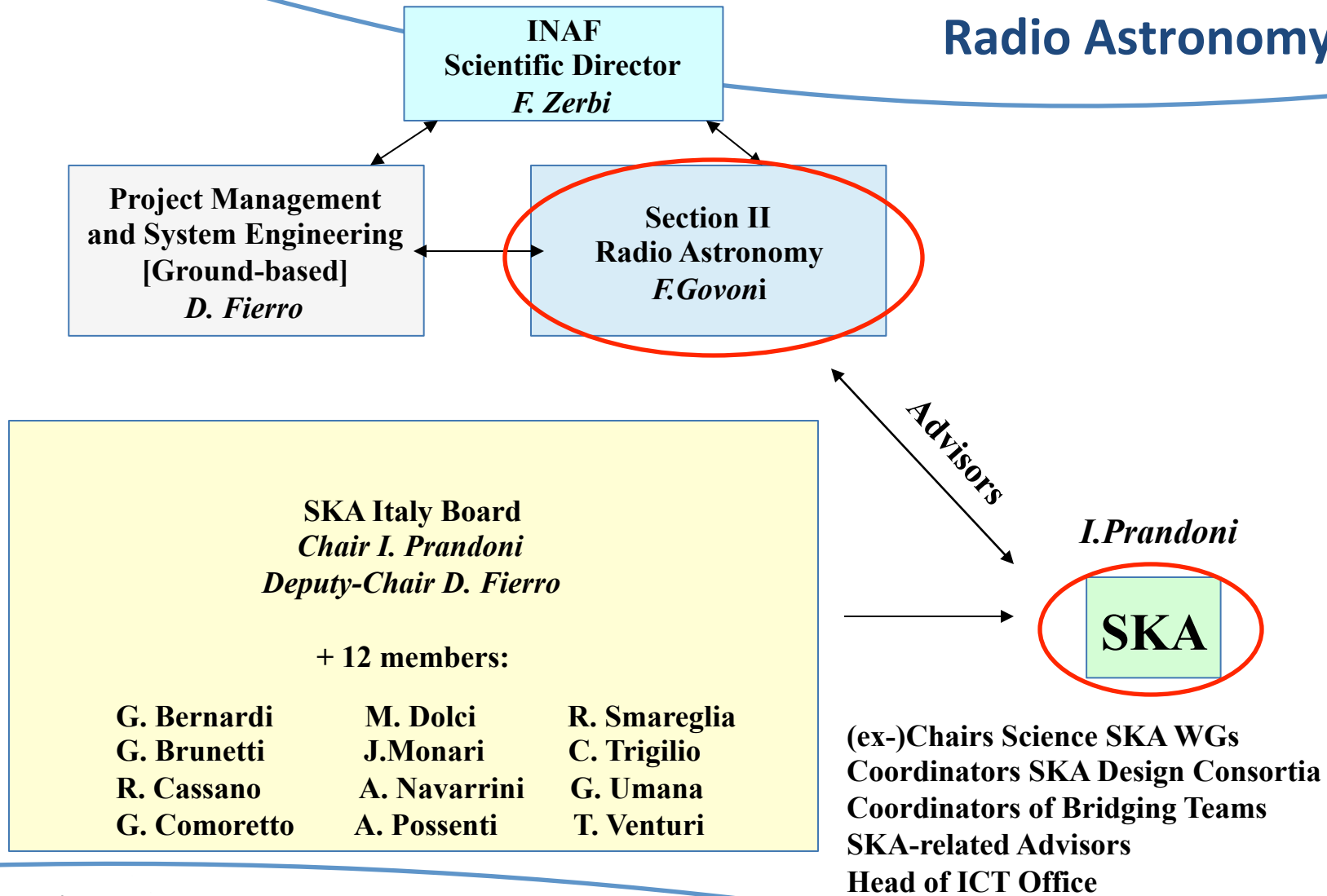
Isabella Prandoni

INAF-IRA

[chair SKA-Italy Board]



INAF Section II Radio Astronomy



Role of the SKA Italy Board

◆ Advise INAF/Section-II on SKA-related matters

- establish an Italian view to be played in the International SKA context
- propose actions to maximize return of Italy investment in technology, science, industry

◆ SKA Roadmap Document now being drafted

I. SKA in Italy (science, techno, computing)

II. SWOT analysis

- identify opportunities/critical areas/strengths/..

III. Propose coordinated actions for the next-future in view of construction and KSP

- establish ways to enlarge participation and return (e.g. data challenges)
- establish ways to strengthen existing (scientific/technical) expertise
- evaluate how best exploiting synergies with other INAF-led facilities
- ...

2nd National SKA Workshop

- ◆ **Roadmap Part I: Opportunity to get a comprehensive update of SKA Project and SKA-related activities in Italy:**

- ◆ technology
- ◆ science
- ◆ synergies(*)

General: the SKA Project

SKA-related Technology and HPC activities

Science with SKA Precursors & Pathfinders

Synergies between SKA and other facilities

(*) Synergy Session organized in collaboration with Heads of INAF High-Energy and Optical/IR Astronomy Divisions (M. Cappi and A. Fontana)

- ◆ **Roadmap Parts II & III: Opportunity to get inputs/comments/suggestions from community**

- ◆ Discussion Session dedicated to the Italian Roadmap to the SKA

1st National SKA Workshop

- **Nov. 2011: Italy one of the founding members of the SKA Organization**

- Dec. 2011: Kick-off meeting: INAF, Rome
- June 2012: 1st National SKA Meeting: MIUR, Rome
 - ❖ >100 participants
 - ❖ First discussion of an Italian Roadmap to the SKA



La via italiana allo SKA

MIUR
Roma, 19-20 Giugno 2012

◆ INAF
ISTITUTO NAZIONALE
DI ASTROFISICA
◆ NATIONAL INSTITUTE
FOR ASTROPHYSICS

II National SKA Workshop – December 3-5, 2018 – I. Prandoni



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- **Italian White Book [Feretti, Prandoni et al. 2014]**

- ❖ Editorial Board (16 scientists)
- ❖ >80 co-authors
- ❖ delivered July 2013
- ❖ printed in 2014

- **2015-2017: Ad hoc SKA/CTA funding from MIUR: 10 MEu/yr**



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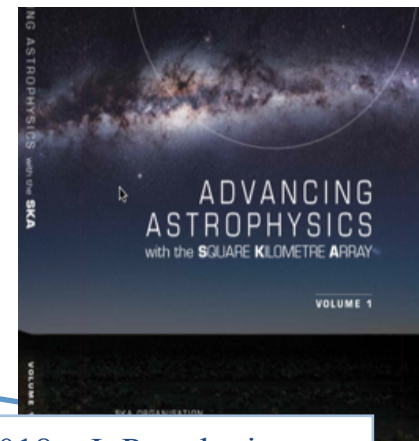
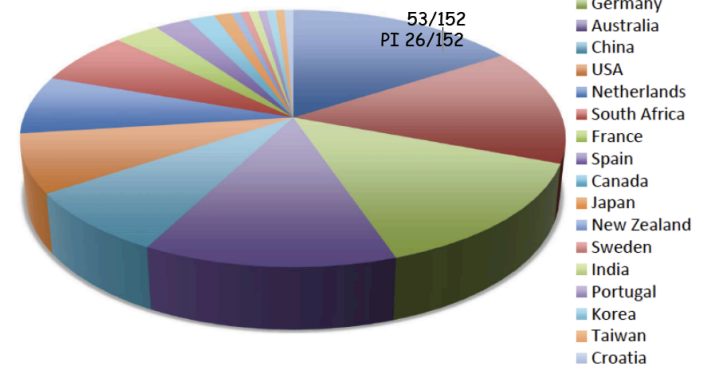
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- **2014: International SKA Conference at Giardini Naxos**

- **SKA Science Book [Braun et al. 2015]**

- ❖ 26/152 Italian PIs (~15%)
- ❖ 52/152 Italian co-authors

Chapter Proposals by Lead Author Affiliation



International SKA Working & Focus Groups - Italian participation updated to Nov 2018

#	SKA Working/Focus Group	Members	IT Members	chairs/core
1	Solar, Heliospheric & Ionospheric Physics	78	1 (1.3%)	
2	Our galaxy	60	8 (13.3%)	chair
3	Cradle of Life	60	6 (10%)	
4	Pulsars & Gravity	80	4 (5%) [1 non-INAF]	1 ex-chair/1 tier-1 member
5	Transients	69	5 (7.2%) [1 non INAF]	
6	HI in galaxies	69	3 (4.3%)	
7	Continuum extra-galactic science (AGN/galaxies, galaxy clusters)	113	13 (11.5%) [4 non INAF]	2 ex-chairs/2 core members
8	Extragalactic line (non-HI) science	40	1 (2.5%)	
9	Magnetism	76	11 (14.5%) [4 non INAF]	1 ex-chair/4 core members
10	Cosmology	130	16 (12.3%) [10 non INAF]	1 core member
11	Epoch of Reionization	72	8 (11.1%) [4 non INAF]	chair
12	VLBI (Focus)	72	6 (8.3%) [1 non INAF]	4 core members
13	High-energy cosmic particles (Focus)	25	-	
All	November 2018	944	82 (8.7%)	
All	November 2017	871	67 (7.7%)	



- **2015-2017: Ad hoc SKA/CTA funding from MIUR: 10 MEu/yr**
- **2016: Ad hoc call SKA/CTA Science Projects**
 - 3 MEu distributed → 7 projects funded for 2-years (2017-2018)
 - 4 SKA-related + 1 SKA/CTA → ~ 2 MEu
 - ① C. Codella: *GENeral CoNditions in Early planetary Systems for the rISe of life with SKA (GENESIS-SKA)*
 - ② M. Giroletti: *Towards the SKA and CTA era: discovery, localisation, and physics of transient sources*
 - ③ L. Hunt: *Empowering SKA as a Probe of galaxy Evolution with HI (ESKAPE-HI)*
 - ④ A. Possenti: *Opening a new era in pulsars and compact objects science with MeerKAT (IPESKA)*
 - ⑤ I. Prandoni: *FORmation and Evolution of Cosmic STructures (FORECaST) with Future Radio Surveys*
 - **16 INAF structures involved**
 - **new externally-funded SKA-related projects (ERC, etc.)**

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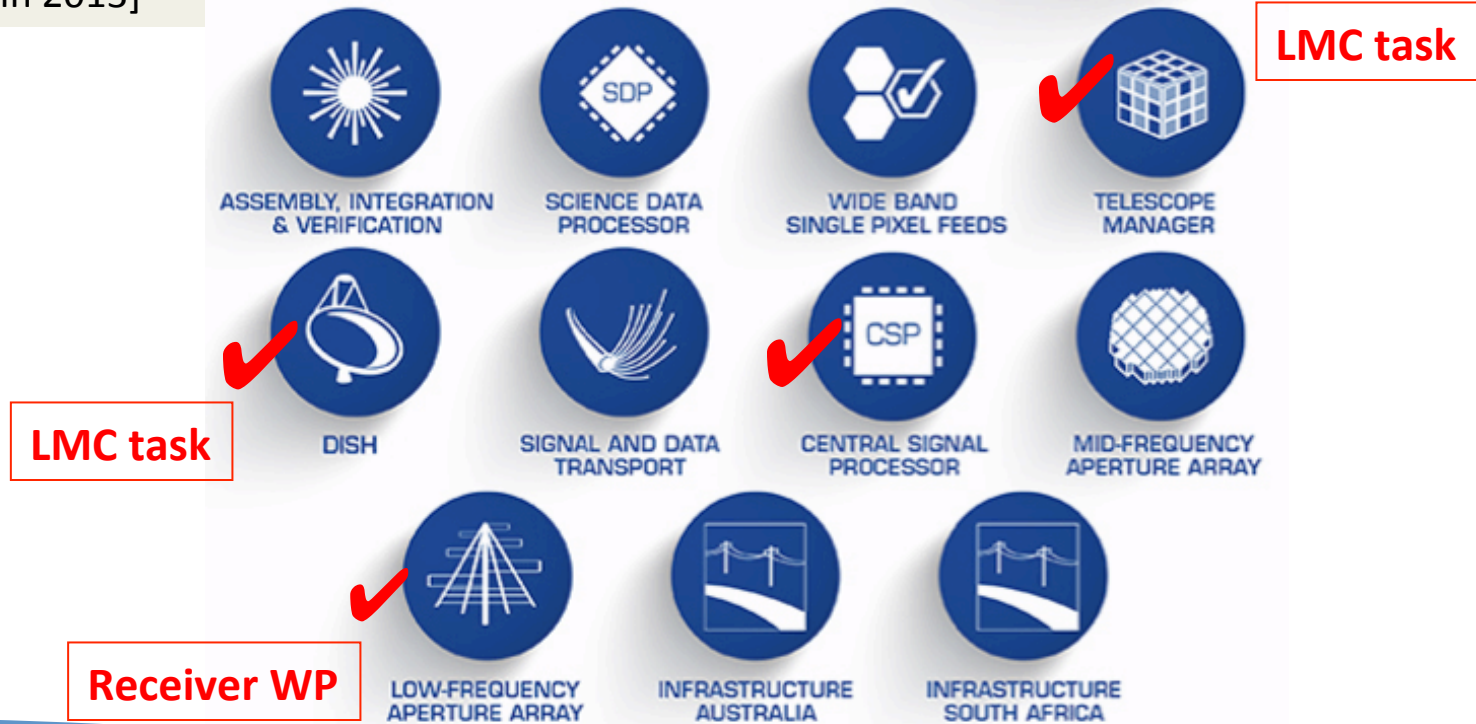
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Time to update Italian White Book!

- 2015-2017: Ad hoc SKA/CTA funding from MIUR: 10 MEu/yr
 - Funding of Italian Participation to SKA Design Consortia [established in 2013]



Involved INAF Structures:

INAF HQ (Rome)

Radioastronomy Institute [LFAA]

Catania Observatory [DISH]

Trieste Observatory [TM]

Arcetri Observatory [CSP]

IASF-Milano

Teramo Observatory

Consortia: 2013-2018/19

Bridging phase: from 2018 to SKA1 Construction proposal



Techno

SKA Advanced Instrumentation Programme – Phased Array Feeds

Partners: INAF, UMAN, ASTRON, Chalmers Univ., Malta Univ.

From PHAROS to PHAROS2 (C-band)

INAF: Digital Backends & “Warm Section”

INAF Leader: A. Navarrini (Cagliari Obs.)

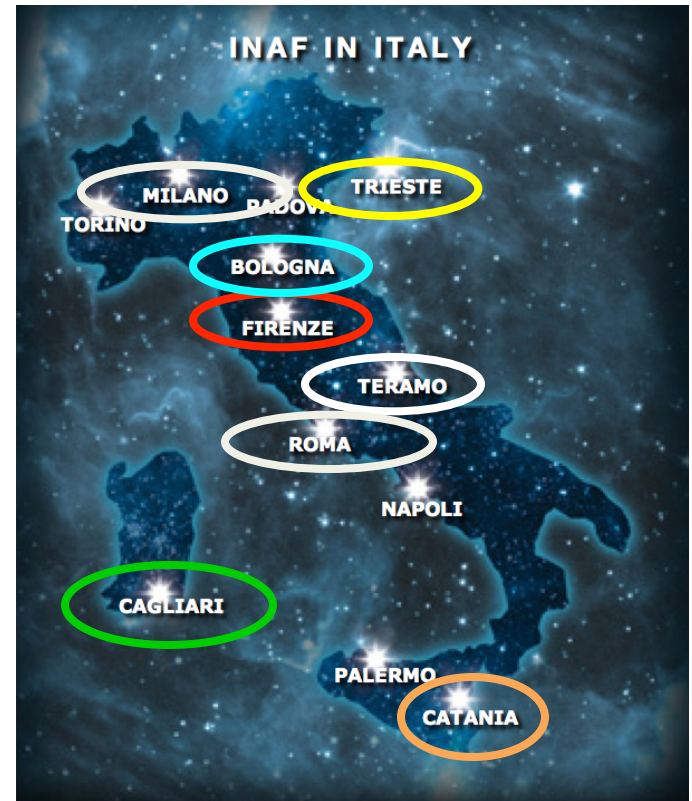
Cagliari Obs

IRA

Arcetri Obs

Catania Obs

MoU signed 2018



Participation of Italian industrial partners to SKA Consortia

- **Central Data Processing** – Leonardo Finmeccanica (Airbone & Space Systems, Land and Naval defence, Electronics, Security and Information Systems)
- **Telescope Management & Local monitoring control** – Elettra
- **Low Frequency Aperture Arrays** (long standing tradition in INAF, with inhouse and more industrial partners, such as **Sirio**, Leonardo-Finmeccanica, Lightech, Sanitas, Campera, Optel)
- **SKA-DISH** – Società Aeronautica Mediterranea (**SAM**) & EIE (involved in the construction of ALMA, ASTRI, E-ELT)

Italian industry strong in several other areas:

- ✓ **forefront:** e.g. precision mechanics and state-of-the-art electronics
- ✓ **traditional:** e.g. infrastructure [i.e. Astaldi-Cimolai & EIE involved in dome & main structure of E-ELT]

Data

SKA Data Regional Centers – AENEAS



Advanced European Network of E-infrastructures
for Astronomy with the SKA AENEAS - 731016



Advanced European Network of E-infrastructures
for Astronomy with the SKA

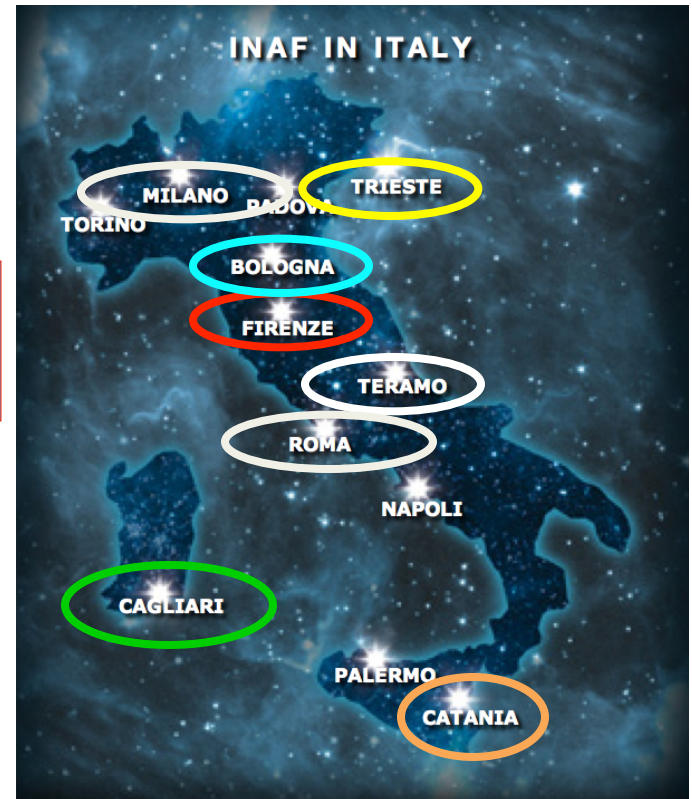
*Design and specification of a distributed, European SKA
Regional Centre to support the pan-European astronomical
community in achieving the scientific goals of the SKA*

*EC Horizon 2020 (€3 million)
13 countries, 28 partners, SKAO, host countries,
e-infrastructures (EGI, GÉANT, RDA), NREN's
Three year project (2017-2019)*

- WP1: Project Management
- WP2: Governance Structure and Business Models
- WP3: Computing and Processing Requirements
- WP4: Data Transport and Optimal European Storage Topologies
- WP5: Data Access and Knowledge Creation
- WP6: User Services



Lead WP5: M. Massardi (IRA) - (ARC experience)
WP5: interface between a distributed ESDC and a
distributed body of end users



IRA, Obs. Trieste, Obs Catania

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Actions towards Precursors

International LOFAR Telescope (ILT)

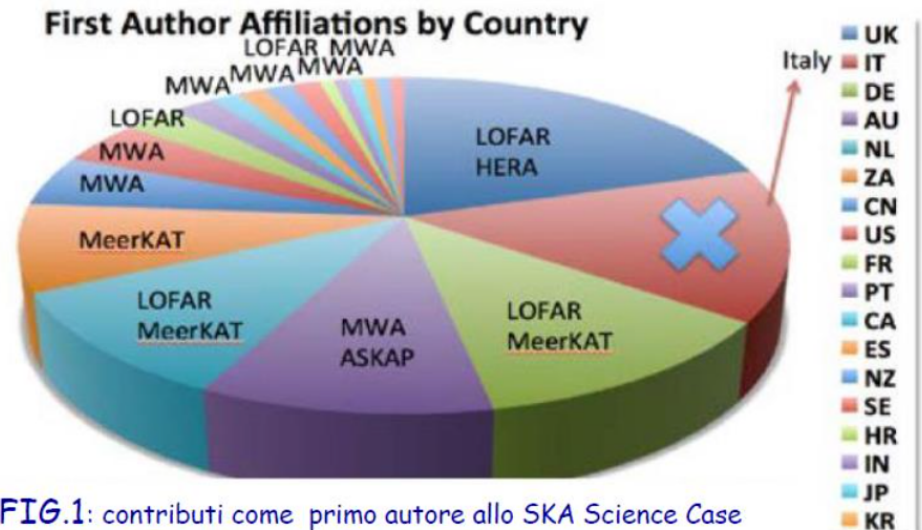
Action coordinated by Radioastronomy Division (F. Govoni & G. Brunetti)

- ◆ Agreement to join through:
 - 1) yearly share + technological involvement of INAF in LOFAR 2.0 development;
 - 2) LOFAR 2.0 station (from 2021)

~2.5 MEu/5 years

Signed April 16, 2018

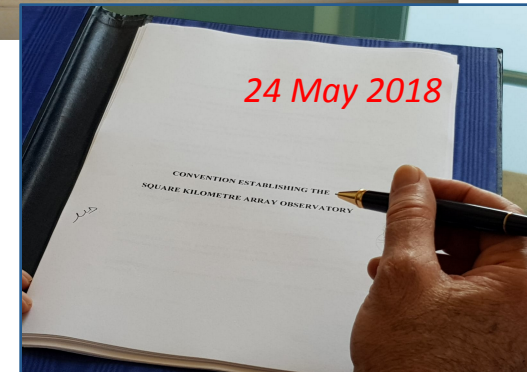
LOFAR → *Science ready* Instrument



SKA in Italy: latest milestones

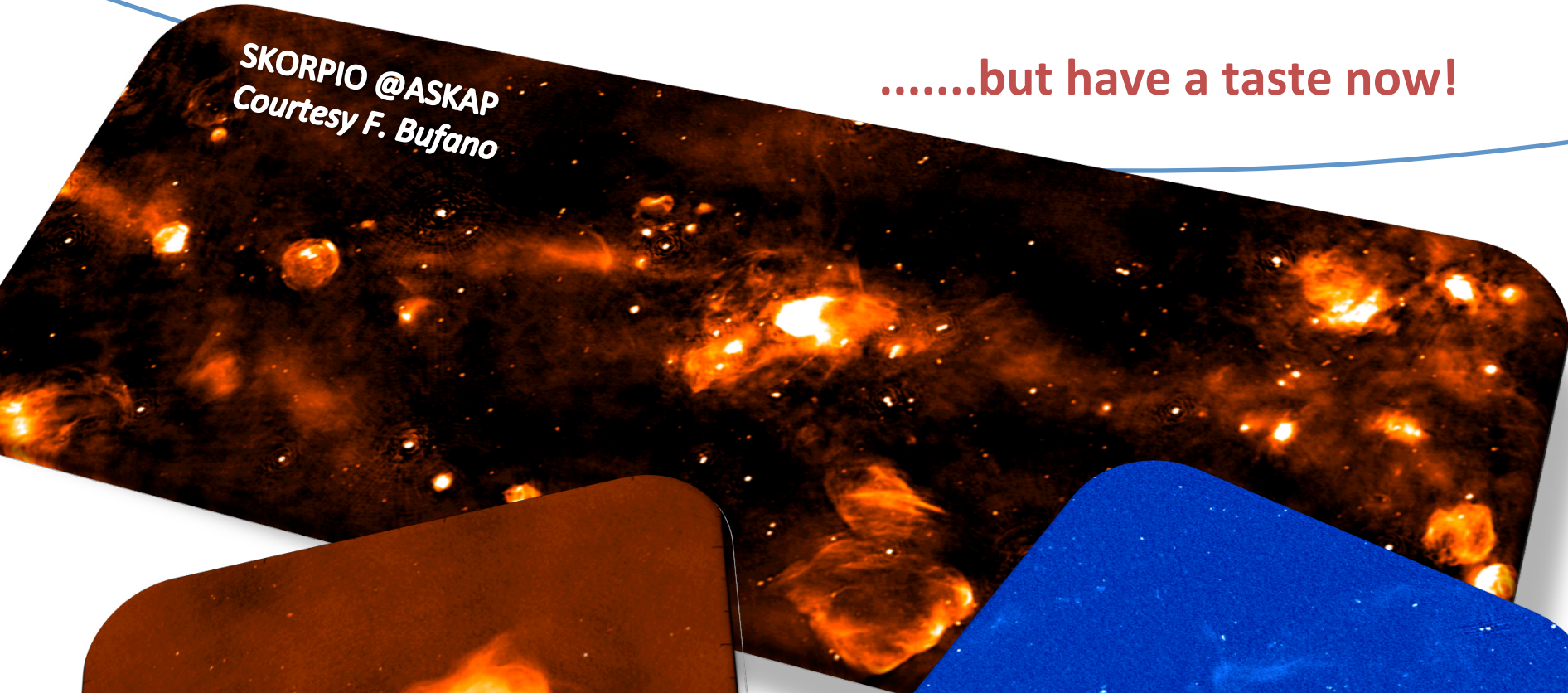
- 2016: negotiations for establishment of an IGO (under the coordination of Italy)
- 2018: Italy first country initialling the IGO convention
- 2018: funding for SKA & CTA announced:
 - 185 MEu/11 years (*TBC*)

.....Exciting times to come!

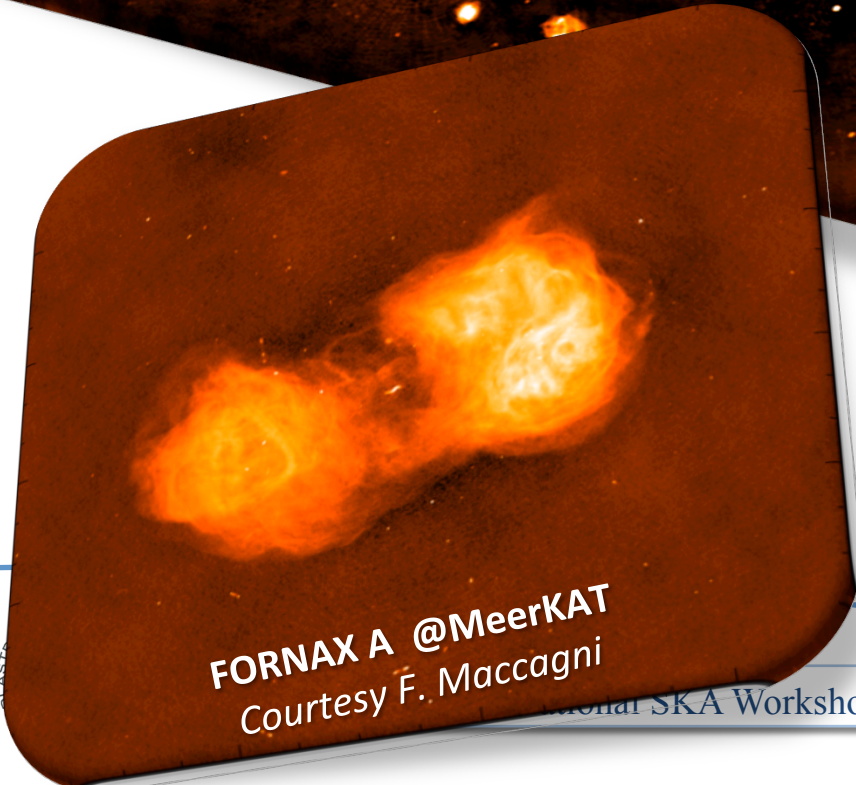


.....but have a taste now!

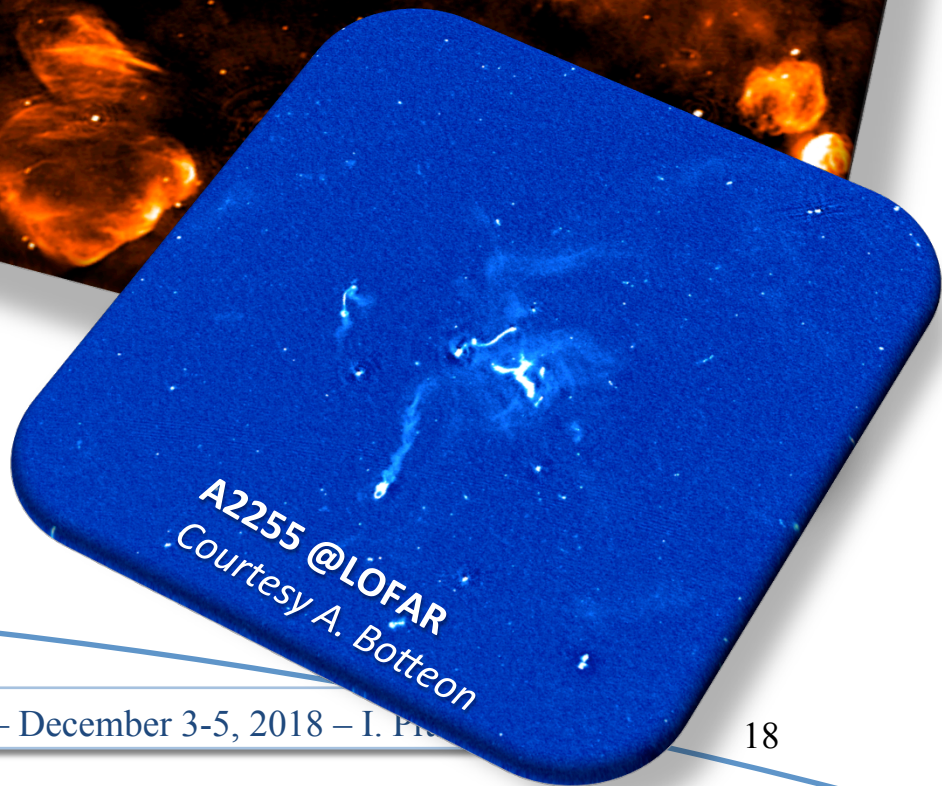
SKORPIO @ASKAP
Courtesy F. Bufano



FORNAX A @MeerKAT
Courtesy F. Maccagni



A2255 @LOFAR
Courtesy A. Botteon



.....but have a taste now!

SKORPIO @ASKAP
Courtesy F. Bufano

SKORPIO ASKAP GLIMPSE HI-GAL
Courtesy G. Umata

FORNAX A @MeerKAT
Courtesy F. Maccagni

255 @LOFAR
Courtesy A. Botteon