

REVIEW ON THE ITALIAN RADIO TELESCOPE RECEIVERS

INTRODUCTION AND MOTIVATIONS

S. Tingay and P. Bolli

AGENDA

- Part I – Motivation of the review
 - Overall motivation for Section II
 - Desired outcomes
 - The future

- Part II - Details on the review
 - Composition and people involved
 - Process and timeline
 - (Preliminary) report
 - Program of the Workshop

Overall motivation for Section II

- In early 2016, I started to identify a number of issues within the INAF radio astronomy portfolio that required resolution;
- Significant gaps in common frequency coverage across the three telescopes;
- Science cases behind receiver development projects were not clear;
- Multiple development teams, with evidence that resources were not being utilised most efficiently;
- Some receiver developments had been underway for >10 years and were not finished;
- Budget situation for some receiver developments not well understood.
- The INAF receiver development program appeared to require more focus, more active management, and a more highly science-driven justification.
- My first action on this issue was to initiate and sponsor an INAF-wide review of receiver developments.

Desired outcomes

- Get a comprehensive sense of the progress of current receiver developments (budgets, staff involved, timescales, science cases etc etc);
- Give some level of priority to the current receiver developments;
- Understand how the INAF receivers/telescopes compare with comparable receivers/telescopes around the world (where do the INAF systems have advantages?);
- Learn some lessons from the last ten years of receiver development at INAF;
- Make some recommendations regarding how the receiver development program could be structured more efficiently in the future;
- Get a sense of where the community wants to go with the three telescopes over the next decade.

The future

- This workshop is an important point in the review, to have some discussion with the community regarding the draft report and to get an idea of what the community considers interesting for the future;
- Report will then be finalised. What next? From my point of view, what is needed:
- Development of a “five+ year plan” for receiver development at INAF, agreed by the major stakeholders (scientists, technologists, and observatories/institutes)
- Science-driven and serves the broad community;
- Project managed: Project Scientist, Project Engineer, Project Manager for each development
- A Project Plan for each project (science case, reviewed design process, accurate costs and schedule, staff dedicated to task, milestones etc).
- More science, more quickly -> make best use of advantages;
- More efficient delivery of receivers -> development plan can evolve over time;
- Prioritise resources to best science/engineering outcomes.

COMPOSITION



~70 PEOPLE INVOLVED

IRA: Simona Righini, Germano Bianchi, Andrea Orlati, Matteo Stagni, Claudio Bortolotti, Mauro Roma, Gaetano Nicotra, Sergio Mariotti, Jader Monari, Marco Poloni, Marco Morsiani, Jan Brand, Gino Tuccari, Marco Bondi, Marcello Giroletti, Karl-Heinz Mack, Monia Negusini, Isabella Prandoni, Tiziana Venturi, Franco Tinarelli

OACa: Sergio Poppi, Carlo Migoni, Andrea Melis, Alessandro Corongiu, Francesco Gaudiomonte, Giampaolo Serra, Franco Buffa, Ettore Carretti, Paola Castangia, Silvia Casu, Elise Egron, Federica Govoni, Matteo Murgia, Alberto Pellizzoni, Andrea Tarchi, Alessandro Navarrini, Adelaide Ladu, Silvia Leurini, Paolo Serra, Antonio Poddighe

OAA: Dario Panella, Renzo Nesti, Luca Moscadelli, Simone Bianchi, Viviana Casasola, Leslie Hunt, Fabrizio Massi, Luca Olmi

OACt: Corrado Trigilio, Francesco Schillirò

INAF HQ: Federico Gualano, Chiara Giorgieri

IASF: Fabrizio Villa

ASI: Giuseppe Valente, Maria Noemi Iacolina

Universities: Paolo de Bernardis, Paolo Tortora

Foreign people: Richard Prestage, Alex Kraus, Zhiqiang Shen, Pablo de Vicente, Jose A. Lopez-Perez, Carsten Kramer, Bong Won Sohn, Mareki Honma, Tetsuiro Minamidani, Michael Lindqvist, Tasso Tzioumis
Walter Alef

PROCESS

- AI#1 - National survey: PB, AZ, AO, TP
- AI#2 - International survey: PB, AO, MBu, MBe
- AI#3 - Ideas for future receivers: MBu, MBe, AZ, CS
- AI#4 - Survey on HR and instrumentation: AO, CC, TP, PB
- AI#5 - Status of the RT: GZ, PM, CC
- AI#6 - International projects: MBe, ST, AO + Navarrini
- AI#7 - Main characteristics of the RT: GZ, PM, CC
- AI#8 - Status of back-end: PB + BE team
- AI#9 - Considerations opacity and RFI: PB, AO + Buffa, RFI team
- AI#10 - List of papers: PB, AZ
- AI#11 - Northern Cross: PB + Bianchi
- AI#12 - Scientific cases for rx under-devel.: MBu, MBe, AZ, CS

TIMELINE

Year	2016																								2017																			
Month	June				July				August				Sept.				October				Nov.				Dec.				January				February				March							
Week	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4				
Kick-off meeting	█																																											
Prog. meeting							█					█				█					█								█				█											
National survey					█	█	█	█	█	█	█	█	█	█	█	█																												
Int. survey									█	█	█	█	█	█	█	█	█	█	█	█																								
Call for ideas																	█	█	█	█																								
Int. projects																					█	█	█	█	█	█	█	█																
Science analysis																									█	█	█	█	█	█	█	█												
Recomm andation																																	█	█	█	█								
Work shop																																												█

10° progress meeting (April) to discuss the Workshop outputs

REPORT

RECEIVERS FOR RADIO ASTRONOMY: CURRENT STATUS AND FUTURE DEVELOPMENTS AT THE ITALIAN RADIO TELESCOPES

P. Bolli, M. Beltrán, M. Burgay, C. Contavalle, P. Marongiu,
A. Orfei, T. Pisanu, C. Stanghellini, G. Zacchiroli, A. Zanichelli



Sponsored by S. Tingay

Section II of Science Directorate - INAF

Revision v5.3: March 8th, 2017

Initial part

Part I - Infrastructure

Main characteristics and status of the Italian RTs

Back-ends, opacity, RFI

INAF receiver groups

Northern Cross

SRT for space applicat.

Part II - Italian receivers and the International context

Receivers at the Italian radio telescopes

The International Context

International front-end projects

Part III - Scientific perspectives of the Italian Radio Telescope

Scientific cases for receivers u.d.

Ideas for future receivers

Part IV - Conclusion

Workshop

Appendices

Recommendations

REPORT: ERRORS / MISSING PARTS

List of figures

To be added at a later stage

RT	2017	2018	2019	2020	2021
IRA	Q Clow Ku S/X/L	Q Ku S/X/L W	Sim. freq. K/Q/W	Sim. freq. K/Q/W	Sim. freq. K/Q/W
OAC	S Q Clow	S	Multi-feed W C-band PAF	Multi-feed W C-band PAF	Multi-feed W C-band PAF
OAA	Clow Ku				
IASF	ALMA 2+3	ALMA 2+3			

Table 12.II – Workload distribution among the various INAF Structures for receiver development in the next 5 years (the W-band front-end for Noto is not shown). The colors indicate the radio telescopes for which the receiver is under development: SRT (black), MED (blue), NOTO (red).

Finally, in this Section we also provide a tentative budget estimate for receivers development in the next years taking into account what has been recommended in the previous Sections (Table 12.III). The given figures consider the cost of each specific project recommended either in the periods 2017-2018 or in 2019 and beyond. For receivers under development we give the residual cost still to be allocated for their completion.

	2017-2018	2019 and beyond
Q-band Mfeed 19	600,000	0
ALMA 2+3	80,000	0
S/X/L completion	80,000	0
Sim. Freq.	0	3,000,000 (with AS) 2,200,000 (w/o AS)
W-band Mfeed 19	0	1,700,000
PAF		2,700,000
TOTAL	860,000	7,400,000 (with AS) 6,600,000 (w/o AS)

Table 12.III – Budget estimate for the receivers proposed in the Recommendations.

Acknowledgements

This report was the results of contributions received from many people to whom we devote our thanks.

Chapter 2

Andrea Orlati (INAF-IRA), Sergio Poppi, Carlo Migoni, Andrea Melis and Alessandro Corongiu (INAF-OAC) for providing information about back-ends.

Matteo Stagni (INAF-IRA) for contribution on the DIFX software correlator.

Claudio Bortolotti, Mauro Roma (INAF-IRA), Francesco Gaudiomonte, Giampaolo Serra (INAF-OAC) and Gaetano Nicotra (INAF-IRA) for giving information about the RFI at each site.

Franco Buffa (INAF-OAC) for providing opacity data at SRT.

Chapter 3

Sergio Mariotti for information about the laboratory facility at INAF-IRA, Bologna and Medicina.

Dario Panella and Renzo Nesti for information about the laboratory facility at INAF-OAA, Firenze.

Jader Monari (INAF-IRA), SKA group leader at Medicina and Fabrizio Villa (INAF-IASF, Bologna), receiver group leader at IASF, for information about other groups inside INAF taking care of receivers development.

Chapter 4

Germano Bianchi (INAF-IRA) for the description of the status of Northern Cross.

Chapter 6

Marco Poloni and Marco Morsiani (INAF-IRA) for providing us the report about the status of the S/X/L-bands Noto receiver under evaluation.

Jan Brand (INAF-IRA) and Luca Moscadelli (INAF-OAA) for useful discussion on the scientific use of the Chigh-band receiver.

Ettore Carretti, Paola Castangia, Silvia Casu, Elise Egron, Federica Govoni, Matteo Murgia, Alberto Pellizzoni, Andrea Tarchi (INAF-OAC) contributing to the compilation of scientific keywords for SRT in Table 6.III.

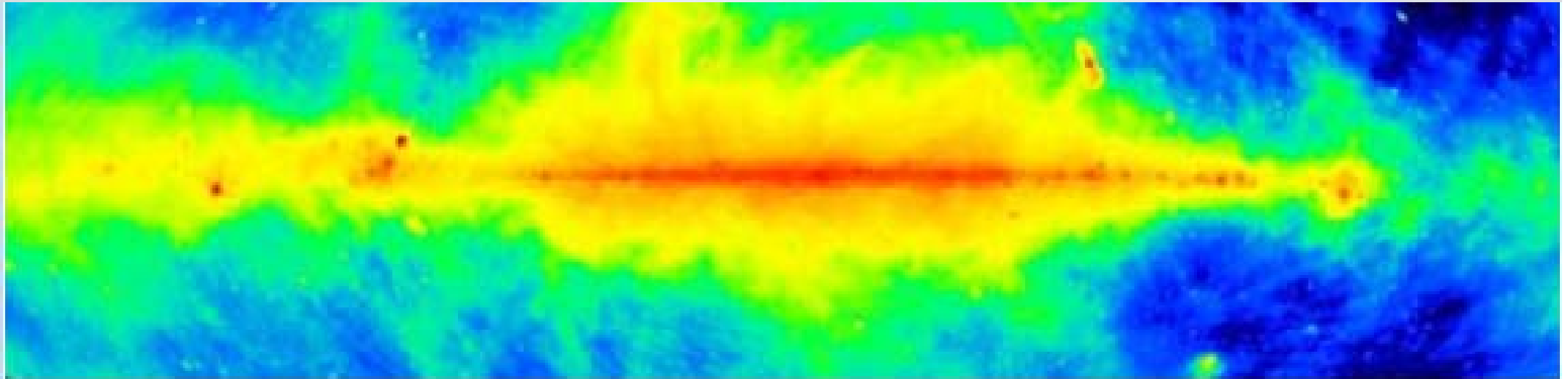
Chapter 7

The colleagues abroad providing lot of information about their telescopes and revising this chapter:

Richard Prestage, USA ; Alex Kraus, Germany; Zhiqiang Shen, China; Pablo de Vicente and Carsten Kramer, Spain; Bong Won Sohn, Korea; Mareki Honma and Tetsuro Minamidani, Japan; Michael Lindqvist, Sweden; Tasso Tzioumis, Australia.

.... and many many others!

WORKSHOP



RX2017

Receivers for Radio Astronomy:
current status and future developments at the Italian radio telescopes

Rome (Italy) - Tuesday, 21 March 2017

[Home](#)
[Rationale](#)
[Review document](#)
[Programme](#)
[Registration](#)
[Participant list](#)
[Venue and Logistics](#)

PROGRAM

- 10.00 – 10.20 Apertura lavori e motivazioni (Tingay)

Parte I: Il presente – Chairs: Beltran / Zanichelli

- 10.20 – 10.45 Infrastrutture (Zacchioli) → Ch. 1,2,3,4,5
- 10.45 – 11.10 Ricevitori presso i radio telescopi Italiani (Pisanu) → Ch. 6
- 11.10 – 11.35 Contesto internazionale (Orfei) → Ch. 7

Parte II: Il futuro – Chairs: Orfei / Pisanu

- 11.35 – 12.00 Progetti internazionali di ricevitori di interesse per le antenne Italiane (Beltran) → Ch. 8
- 12.00 – 12.25 Casi scientifici dei ricevitori in fase di sviluppo (Stanghellini) → Ch. 9
- 12.25 – 12.50 Idee per nuovi ricevitori (Zanichelli) → Ch. 10
- 12.50 – 13.15 Raccomandazioni del gruppo di lavoro (Bolli) → Ch. 12

13.15 – 14.15 Pausa pranzo

—————→ **Foto di gruppo!**

Parte III: Discussione generale – Chairs: Bolli / Burgay

- 14.15 – 14.35 Summary (Burgay)
- 14.35 – 16.00 Discussione generale

Each talk 20 mins + questions 5 mins

PARTICIPATION

