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### Deliverable 2.7 Technical Workshop 3

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Dissemination Level		
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PP	Restricted to other programme participants (including the Commission Services)	
RE	Restricted to a group specified by the consortium (including the Commission Services)	
CO	Confidential, only for members of the consortium (including the Commission Services)	

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# 1 Introduction

This Networking Activity – Technical dissemination - concentrates mainly on organization of a series of technical workshops. A special focus is on the technical achievements and progress of the JRAs in this project in order to disseminate these results within the community. The main objective is to exchange ideas and new directions, and to attract the interest of researchers and industrial engineers in related fields to collaborate in the development of Radio Astronomy as well as industry applications with the aim to transfer knowledge in both directions.

## 2 Technical Workshop 3

### 2.1 Scientific Summary

Despite the Corona virus crisis, a RadioNet Technical Dissemination Workshop on *Future trends in Radio Astronomy instrumentation* took place on 21-22 September 2020 as a virtual event. The workshop was organized by the Max Planck Institute for Radio Astronomy in Bonn (Germany):

<https://events.mpifr-bonn.mpg.de/indico/event/154/>

This meeting was the last in a series of technical workshops under the umbrella of RadioNet combining several aspects of engineering and operational issues at radio observatories all over Europe and beyond. It provided the unique opportunity to cross border the different communities to see what ‘the others’ are doing and planning and enhance communication between engineers, scientists and operators.

The Workshop continued a very successful series of engineering workshops and telescope operation - oriented meetings organized within the Sixth and Seventh Framework Programme. Engineers and scientists working at various observatories to get and keep their radio telescopes running presented their interesting projects in an oral presentation tailored to a virtual presentation. Due to purely virtual format of the workshop, there were no poster presentations.

#### SOME TOPICS OF THE WORKSHOP

- Luca Stringetti described the organization of the SKA and the role to handle projects towards a SKA prototype. Budget is 20MEUR per year, 1MEUR for each project.
- Christophe Rissacher presented the development plan and timeline to get NOEMA upgraded to 23 Antennas in two years. Many components are currently under development in the range from 70 to 400 GHz. A lot of effort is done to keep the two facilities up to date.
- Alber-Jan Boonstra outlined upgrade for LOFAR i.e. dual band observations and distributing clock signals for stations in the Netherlands. The latter strengthens science especial in the low band due to atmospheric disturbances at low frequencies. In the discussion the timing issue played an imported role. White Rabbit will be the solution.
- Walter Brisken resumed the next generation on VLBA Backends based on a new developed board replacing the RBDE. Taking the experience of this into account a better concept had been developed and deployment is planed until 2024.

- Grant Hampson showed how COTS components can help radio astronomy coming faster and cheaper to operation. With the example of SKA low he suggested a system with ePCI cards. In his second talk he demonstrated the corresponding receiver for SKA low designed with complex RFSoc (Radio Frequency System on Chip). A lot of effort had to be put into shielding and filtering of the receiver board.
- Paul Bowen demonstrated a VLBI system for a historic telescope composed completely from COTS components. GNU radio software was used to configure the SDR based formatter. Impressive results were demonstrated via real VLBI measurements.
- Alessandro Orfei showed details of a 19-beam receiver for the SRT. The design was driven also from sun observation requirements, which needs very high dynamic range. Additionally, he explained the RF infrastructure of the SRT and the problems that come with it. This is coming with a bunch of new high frequency and wideband receivers financed via national funding.
- Louise Mousset's talk focused on polarized bolometric measurement of CMB. Using an array of passive and switchable 'feed through' horns (receive horns at input and transmit horns towards the bolometer array) interferometry can be used for exact calibration.
- Sabrina Realini demonstrated a precise simulation of an existing telescope for q- and W-band multi pixel CMB observations.
- Pablo Torne demonstrated existing submm/mm-wave bolometer cameras for pulsar observations. In this band a new and very sensitive bunch of observations are possible to fill this wavelength gap up to high-energy observations.
- Alan Roy presented fundamental investigations for using solar thermal power plants for radio astronomy. These facilities are not in use by night and provide huge collecting areas that could be used for radio astronomy by night. This talk invoked great interest in the community and plenty of questions arose.
- The talk by Pietro Bolli pointed out some aspects of installing 3-frequency receivers in existing telescopes.
- Andrei Lobanov described what to do with such a receiver in VLBI. Frequency-phase transfer can improve VLBI resolution by lowering phase noise dramatically and should be performed wherever it's possible.
- Joseph Nsor showed the activities of his institute to get a decommissioned dish antenna converted into a working VLBI radio telescope.
- Olaf Wuknitz derived a method to resolve objects by lensing at massive objects. He suggested observing big areas of sky to find repeated FRBs for exact timing as well as distances. Therefore, big phased arrays would be appropriate. A new instrument tailored for that purpose would be better than existing systems.
- Harariharan Krishnan outlined a new low frequency real time imaging instrument that could meet the needs of the talk before.

## 2.2 Agenda

Monday afternoon, Sep 21 <sup>st</sup> , 2020	
12.00	Dial in (Registration)
12.30	Welcome and organization Dr. Reinhard Keller – MPIfR, Germany
12.40	Director's welcome address Prof. Dr. Anton Zensus – Director at MPIfR and RadioNet Coordinator
Session 1    Chair: Dr. Alessandro Navarrini	
13.00	SKA1 Observatory Development Plan Mr. Luca Stringhetti – SKA Organization, UK
13.25	IRAM telescope instrumentation overview and future plans Dr. Christophe Risacher, IRAM, France
13.50	LOFAR2.0: extending LOFAR observational capabilities for the coming decade Dr. Albert-Jan Boonstra, ASTRON, The Netherlands
14.15	The VLBA New Digital Architecture Dr. Walter Brisken – NRAO, USA
14.40	Online group photo
14.55	Coffee break
Session 2    Chair: Dr. Reinhard Keller	
15.10	The Effelsberg Direct Digitization Project Dr. Tobias Winchen, MPIfR, Germany
15.35	BRAND EVN Broadband Receiver - a technological challenge Dr. Gino Tuccari, MPIfR, Germany
16.00	Developing Digital Receiver for Radio Astronomy Receiver using RFSoc Dr. Chao Liu, Oxford University, UK
16.25	Smart Ambient-Temperature Very Low Noise LNAs for Radio Astronomy Arrays Prof. Sander Weinreb, Caltech, USA
16.50	Trivia event

Tuesday morning, Sep 22 <sup>nd</sup> , 2020	
Session 3      Chair: Dr. Alan Roy	
9.00	Accelerating astronomy using Atomic COTS Dr. Grant Hampson, CSIRO, Australia
9.25	Bluering Prototype System Results Dr. Grant Hampson, CSIRO, Australia
9.50	VLBI with a remote maser and a COTS formatter Dr. Paul Boven, JIVE, Netherlands
10.15	A Q-band 19 pixel multifeed receiver for the Sardinia radio telescope Dr. Alessandro Orfei, INAF-IRA, Italy
10.40	Coffee break
Session 4      Chair: Dr. Alessandro Orfei	
10.55	Latest calibration results from QUBIC: The Q&U Bolometric Interferometer for Cosmology Dr. Louise Mousset, Observatoire de Paris, France
11.20	Simulations of the Optical System of the LSPE-STRIP Instrument Ms. Sabrina Realini, University of Milano, Italy
11.45	Application of TES bolometers and KID cameras to pulsar observations Dr. Pablo Torne, IRAM, Granada, Spain
12.10	Solar power mirror arrays for radio astronomy - towards a test with the Juelich Solar Power Tower Dr. Alan Roy, MPIfR, Germany
12.35	Lunch break

Tuesday afternoon, Sep 22 <sup>nd</sup> , 2020	
<b>Session 5      Chair: Dr. Gino Tuccari</b>	
13.35	Managing hundreds of wideband receiving signals at the SRT Dr. Alessandro Orfei, INAF-IRA, Italy
14.00	A Compact Triple Band Receiver System working at K-, Q- and W-band for Medicina, Noto and Sardinia Radio Telescopes Dr. Pietro Bolli, INAF-OA Arcetri, Italy
14.25	Science applications of multiband receivers and frequency-phase transfer Dr. Andrei Lobanov, MPIfR, Germany
14.50	Coffee break
<b>Session 6      Chair: Dr. Pietro Bolli</b>	
15.05	Design and Implementation of Remote RFI Monitoring System Mr. Joseph A. K Nsor, Ghana Space Science & Tech. Institute, Ghana
15.30	Efficient wide-area sky monitoring Dr. Olaf Wucknitz – MPIfR, Germany
15.55	Development of an Optimized Real-Time Radio Transient Imager for LWA-SV Dr. Hariharan Krishnan, Arizona State University, USA
16.20	Earth-orbit aperture synthesis Dr. Alan Roy, MPIfR, Germany
16.45	Open discussion, workshop summary, and closure

## 2.3 Participants

Due to the Covid19 situation all over the world, the workshop was held as virtual event only. Therefore many participants registered for this workshop - from 29 countries have and many more than for any other workshop before in this NA.

The audience was enlarged for the first time through participants from Argentina, Columbia, Brazil, Ghana, Kenya and Ecuador. Furthermore, many young scientists as well as engineering stuff joined the workshop and had the opportunity not only to learn about future trends on instrumentation all over the world but also to get in contact with experienced senior scientists and engineers. The percentage of young women was relatively high for a technical oriented workshop.

Here a short statistic of participants per country:

<b>Country</b>	<b>Participants</b>	<b>Women</b>	<b>Women %</b>	
Argentina	4	1	25%	
Australia	12	1	8%	
Canada	1	0	0%	
Chile	5	0	0%	
China	3	0	0%	
Colombia	2	0	0%	
Ecuador	4	0	0%	
Finland	6	0	0%	
France	4	1	25%	
Germany	47	6	13%	
Ghana	5	0	0%	
Greece	1	1	100%	
Hungary	1	0	0%	
India	27	7	26%	
Ireland	1	0	0%	
Italy	20	5	25%	
Japan	2	0	0%	
Kenya	1	0	0%	
Korea	1	0	0%	
Mauritius	2	0	0%	
Mexico	1	0	0%	
Netherlands	14	2	14%	
Poland	1	0	0%	
Portugal	1	1	100%	
South Africa	2	0	0%	
Spain	17	2	12%	
Sweden	8	0	0%	
United Kingdom	24	4	17%	
United States	17	0	0	
	29	234	31	13%

A total of 234 participants have registered, due to the nature of the project the registrants couldn't sign the participants list:

Nr.	Name	Institution	Country
1.	A. Prasath	Madurai Kamaraj University	India
2.	ABANGA MORO	Bawah Ghana Radio Astronomy Observatory	Accra Ghana
3.	ABBAS Haider	Manav Rachna University	India
4.	ABDULLA Zubair	Jet Propulsion Lab	United States
5.	ABOELSOUD, Reem	Bonn University	Germany
6.	AGUDO Ivan	IAA-CSIC Granada	Spain
7.	AKUMU Paul	University of Mauritius	Mauritius
8.	ALBERDI Antxon	IAA-CSIC	Spain
9.	ALEF Walter	MPIfR	Germany
10.	AMBROSINI Roberto	INAF-IRA	Italy
11.	ANDREON Stefano	INAF-OABrera	Italy
12.	ANTON Sonia	Univ Aveiro /CIDMA /IT	Portugal
13.	ARAUJO FURLAN Susana Beatriz	Argentinian Institute of Radioastronomy	Argentina
14.	ARMIJOS Jairo	Astronomical Observatory of Quito	Ecuador
15.	ASABERE Bernard	Duah ASTRON	Netherlands
16.	ASKAR Hidir	UCI	United States
17.	BAARS, Jacob	MPIfR Rheinbach	Germany
18.	BACH Uwe	MPIfR	Germany
19.	BALDINI Veronica	INAF-IRA Tieste	Italy
20.	BANDARI HANUMANTH RAO	TATA INSTITUTE OF FUNDAMENTAL RESEARCH	India
21.	BARKER Steve	CSIRO	Australia
22.	BARVE Indrajit	IIA	India
23.	BAUTISTA DURÁN Marta	IGN	Spain
24.	B.Arul Pandian	Madurai Kamaraj University	India
25.	BEASLEY Tony	NRAO	USA
26.	BEHREND Jan	MPIfR	Germany
27.	BELLEVAL Christophe	Observatoire de Paris	France
28.	BEN SALEM Bilel	University of Bielefeld	Germany
29.	BENALCAZAR David	Escuela Politecnica Nacional	Ecuador
30.	BENTUM, Mark	ASTRON	Netherlands
31.	BESWICK Rob	JBCA/JBO	United Kingdom
32.	BHATTRAMAKKI Sahana	Raman research institute	India
33.	BLANCHARD Jay	NRAO	United States
34.	BOLIN Andrew	CSIRO	Australia
35.	BOLLI Pietro	INAF - Osservatorio Astrofisico di Arcetri	Italy
36.	BOONSTRA Albert-Jan	ASTRON	Netherlands

37. BOURKE Tyler SKA Organisation United Kingdom
38. BOVEN Paul JIVE Netherlands
39. BOWEN Mark CSIRO Australia
40. BRAY, Justin University of Manchester United Kingdom
41. BRISKEN Walter NRAO United States
42. BRYNDZA Przemyslaw MPIfR Germany
43. BUCH Kaushal Giant Metrewave Radio Telescope India
44. BUNTON John CSIRO Australia
45. CAIAZZO Marco SKA Organisation United Kingdom
46. CARLOS Valotto Instituto de Astronomia Teórica y Experimental Argentina
47. CASSARO Pietro INAF - Istituto di Radioastronomia Italy
48. CASSINO Augusto CONICET Argentina
49. CHATTERJEE Sougata GMRT-NCRA-TIFR India
50. CHAUDHARI Sandeep GMRT India
51. COLOMER Francisco JJIV-ERIC Netherlands
52. CONWAY John Onsala Space Observatory Sweden
53. CUTTAIA Francesco INAF-OAS Italy
54. C.Vinutha Raman Research Institute India
55. De VICENTE Pablo OAN Spain
56. DEMBSKA Marta DLR Institute of Data Science Germany
57. DESAI Nilesh M SAC India
58. DEV Ankur University Bonn Germany
59. DHENDE Abhijeet GMRT-NCRA India
60. DI VRUNO Federico SKAO United Kingdom
61. DIXIT Bela GMRT NCRA-TIFR India
62. DULAL Nipesh University Bonn Germany
63. DURAN Carlos ESO Chile
64. DZIB Sergio MPIfR Germany
65. FENECH Danielle University of Cambridge United Kingdom
66. FLORES Gary Escuela Politecnica Nacional Ecuador
67. FLYGARE Jonas Onsala Space Observatory Sweden
68. FORSON Albert Kuntu University of Mauritius Mauritius
69. FRANCESCHET Cristian Università degli Studi di Milano Italy
70. G A Shanmugha Sundaram Amrita University India
71. GALLIEGO Juan Daniel OAN Spain
72. GANCIO, Guillermo Instituto Argentino de Radioastronomia Argentina
73. GARCIA-MIRO Cristina JIV-ERIC Netherlands
74. GARCIA-PEREZ Oscar OAN Spain
75. GARCÍA CARREÑO Pablo OAN Spain
76. GARCIA MERIO Alberto University of Alcala Spain

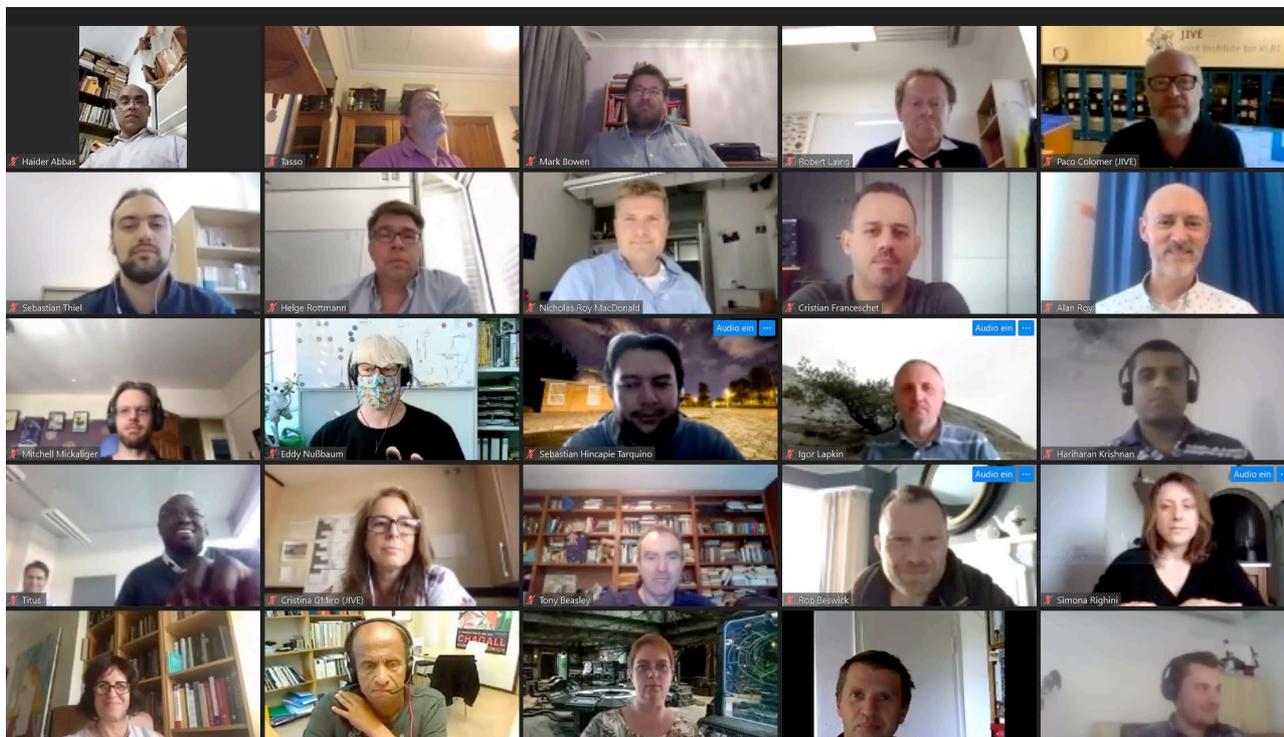
77. GARRINGTON Simon The University of Manchester United Kingdom
78. GIMÉNEZ DE CASTRO C. Guillermo UPM Brazil
79. GIZANI Nectaria Hellenic Open University Greece
80. GOLDEN, Aaron National University of Ireland Galway Ireland
81. GONZALES Javier OAN Spain
82. GRAINGE Keith University of Manchester United Kingdom
83. GREENHILL Lincoln Harvard University United States
84. GRUTZECK Gerrit MPIfR Germany
85. GUPTA Sweta GMRT-NCRA-TIFR India
86. GÓMEZ-MOLINA, Gabriel OAN Spain
87. HALAGALI Irappa GMRT-NCRA-TIFR India
88. HAMMARGREN Roger Onsala Space Observatory Sweden
89. HAMPSON Grant CSIRO Australia
90. HASE Hayo Bundesamt für Kartographie und Geodäsie - AGGO Germany
91. HAYMAN Douglas CSIRO Australia
92. HEITER Christopher MPIfR Germany
93. HELLDNER Leif Onsala Space Observatory Sweden
94. HINCAPIE TARQUINO Juan Sebastian Universidad Nacional de Colombia Colombia
95. HOCHGÜRTEL Stefan MPIfR Germany
96. HOVATTA Talvikki University of Turku Finland
97. INDERMUEHLE Balthasar CSIRO Australia
98. JANSSEN Michael Radboud University Netherlands
99. JOURJON Guillaume CSIRO Australia
100. JUNG Taehyun KASI Korea
101. JÜNEMANN Ferdinand MPIfR Germany
102. K S Srivani Raman Research Institute India
103. KALLUNKI Juha Aalto University Finland
104. KAUFFMANN Jens Haystack Observatory United States
105. KEANE Evan SKA United Kingdom
106. KEIMPEMA Aard JIV-ERIC Netherlands
107. KELLERMAN Fred self Webster United States
108. KELLERMANN Kenneth NRAO United States
109. KELLER Reinhard MPIfR Germany
110. KIDANE Zegeye Mekasha MPIfR Germany
111. KIRVES Petri Metsähovi Radio Observatory Finland
112. KLÖCKNER Hans-Rainer MPIfR Germany
113. KOBAYASHI Hideyuki National Astronomical Observatory of Japan Japan
114. KRAMER Joana MPIfR Germany
115. KRAUS Alex MPIfR Germany
116. KRISHNAN Hariharan Arizona State University United States

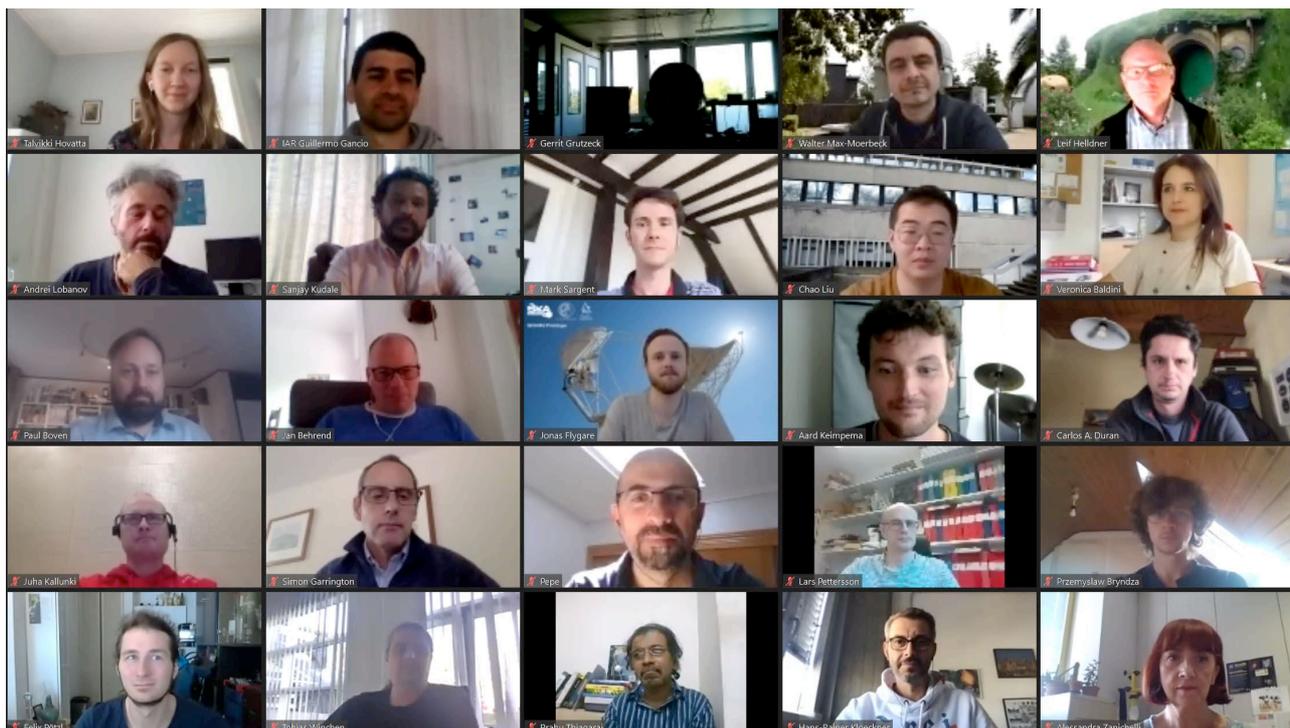
- 117.KUDALE Sanjay National Centre for Radio Astrophysics (GMRT-TIFR) India
- 118.KURTZ Stan Inst. of Radioastronomy Mexico
- 119.KYLENFALL Ulf Onsala Space Observatory Sweden
- 120.LABATE Maria Grazia SKAO United Kingdom
- 121.LAING Robert SKAO United Kingdom
- 122.LAPKIN Igor Chalmers University of Technology Sweden
- 123.LENZ Sonja MPIfR Germany
- 124.LINDQVIST Michael Onsala Space Observatory Sweden
- 125.LISAKOV Mikhail MPIfR Germany
- 126.LIU Chao Oxford University United Kingdom
- 127.LI Zhixuan Yunnan Observatories China
- 128.LLUMIQUINGA Henry Astronomical Observatory of Quito Ecuador
- 129.LOBANOV Andrei MPIfR Germany
- 130.LOPEZ-PEREZ Jose A. IGN - Yebes Observatory Spain
- 131.MAAT Peter ASTRON Netherlands
- 132.MACARIO Giulia INAF-Arcetri Italy
- 133.MACDONALD Nicholas Roy MPIfR Germany
- 134.MACK Karl-Heinz INAF Italy
- 135.MADIKA Eftychia MPIfR Germany
- 136.MARTIN Jean-Michel Observatoire de Paris France
- 137.MATTHEWS Lynn MIT Haystack Observatory United States
- 138.MAX-MOERBECK Walter U. de Chile Chile
- 139.MCKAY Derek University of Turku Finland
- 140.MCWHIRTER Russ MIT Haystack observatory United States
- 141.MEDINA Sac MPIfR Germany
- 142.MELIS Andrea INAF - Osservatorio Astronomico di Cagliari Italy
- 143.MENA Patricio NRAO / U. Chile Chile
- 144.MEY Philip SARA0 South Africa
- 145.MICKALIGER Mitchell The University of Manchester United Kingdom
- 146.MIGONI Carlo INAF - OAC Italy
- 147.MINGO Beatriz The Open University Milton United Kingdom
- 148.MINNICH Austin Caltech United States
- 149.MOLERA CALVES Guifre University of Tasmania Australia
- 150.MONARI Jader IRA INAF Italy
- 151.MONTOFRE Daniel Chalmers University of Technology Sweden
- 152.MOSQUERA Felipe FUDARTA Colombia
- 153.MOUSSET Louise APC France
- 154.MULEY Mekhala Giant NCRA-TIFR India
- 155.MUNDELL C University of Bath United Kingdom
- 156.MUTIE Isaac University of Manchester/Technical University of Kenya Kenya

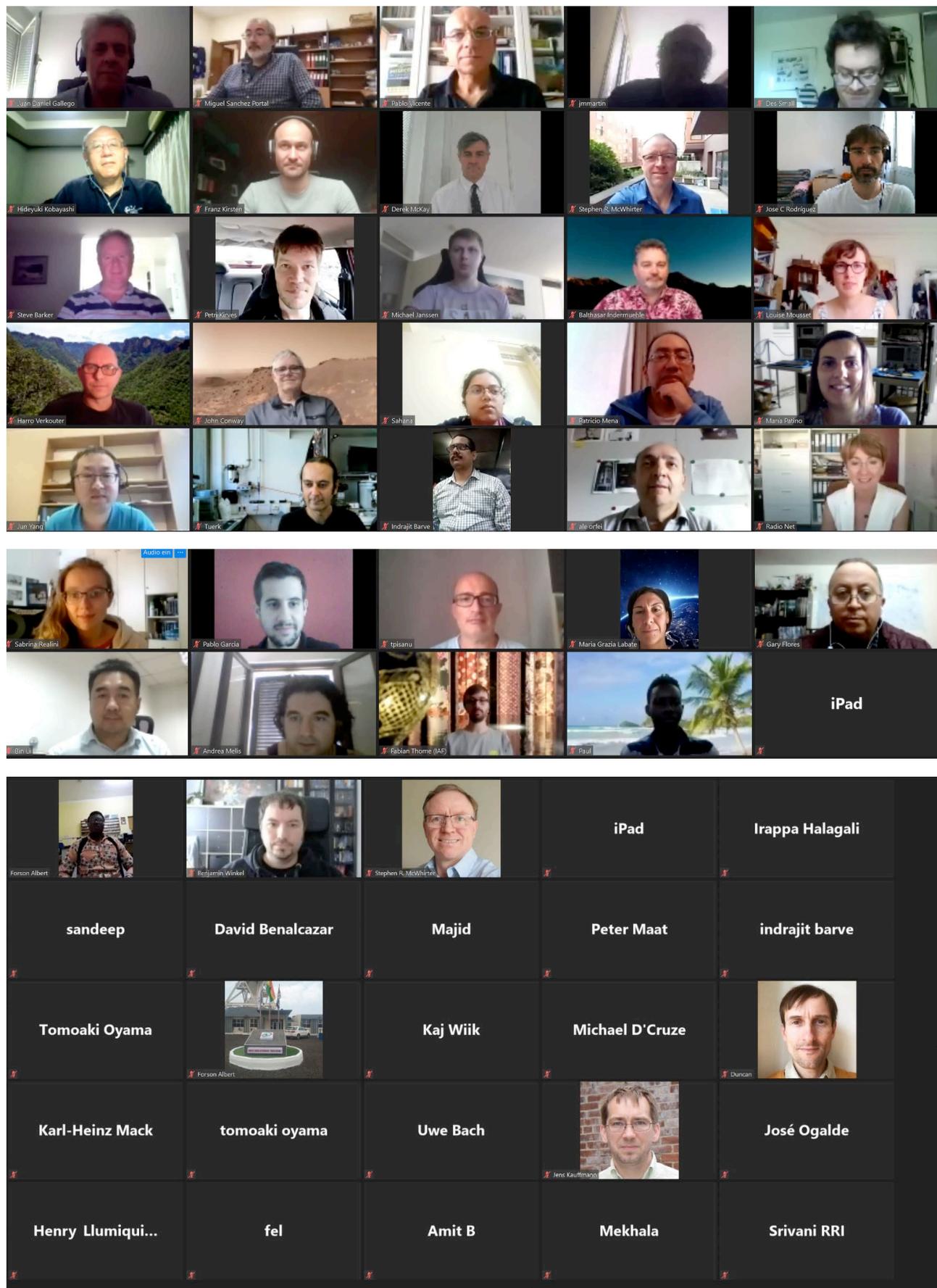
- 157.MYSERLIS Ioannis IRAM Spain
- 158.NALDI Giovanni INAF Italy
- 159.NAVARRINI Alessandro INAF Italy
- 160.NAVARRO Santiago IRAM Spain
- 161.NOROOZIARAB Majid MPIfR Germany
- 162.NSOR Joseph A.K. Ghana Space Science & Technology Institute Ghana
- 163.NUßBAUM Edmund MPIfR Germany
- 164.NYAKEE Christopher Ghana Space Science and Technology Institute Ghana
- 165.OGALDE José Joint ALMA Observatory Chile
- 166.ORFEI Alessandro INAF Italy
- 167.OYAMA Tomoaki National Astronomical Observatory of Japan Japan
- 168.OYEDOKUN Titus MPIfR Germany
- 169.PARIKH Gaurav Tata Institute of Fundamental Research India
- 170.PATINO ESTEBAN María Yebes Observatory Spain
- 171.PETTERSSON Lars Onsala Space Observatory Sweden
- 172.PISANU Tonino INAF Cagliari Italy
- 173.PLÖTZ Christian Bundesamt für Kartographie und Geodäsie Germany
- 174.POETZL, Felix Marc MPIfR Germany
- 175.POPPI Sergio INAF Italy
- 176.PROVEN-ADZRI Emmanuel Ghana Radio Astronomy Observatory Ghana
- 177.QUICK Jonathan HarTRAO South Africa
- 178.RAJAGOPALAN Ganesh MIT Haystack Observatory United States
- 179.RAMAKRISHNAN Venkatesh Universidad de Concepcion Chile
- 180.REALINI Sabrina Università degli Studi di Milano Italy
- 181.RIGHINI Simona INAF Italy
- 182.RISACHER christophe IRAM France
- 183.RODRIGUEZ Jose Carlos OAN Spain
- 184.ROS Eduardo MPIfR Germany
- 185.ROTTMANN Helge MPIfR Germany
- 186.ROTTMANN Izabela MPIfR Germany
- 187.ROY Alan MPIfR Germany
- 188.ROY JAYASHREE SKAO United Kingdom
- 189.SALAS Pedro Green Bank Observatory United States
- 190.SAMOKHINA, Marina MIPT Miranda Australia
- 191.SARGENT Mark U. of Sussex United Kingdom
- 192.SAVOLAINEN, Tuomas Aalto University Metsähovi Finland
- 193.SCHMITZ Margot MPIfR Germany
- 194.SCHMITZ Walter MPIfR Germany
- 195.SCHÄFER Frank MPIfR Germany
- 196.SCRAGG Thomas The University of Manchester United Kingdom

- 197.SERNA PUENTE José Manuel Yebes Observatory Spain
- 198.SETHI Sagar Jagiellonian University Poland
- 199.SHINDE Navnath GMRT- TIFR India
- 200.SINGH Shivangi Indian Institute of Technology India
- 201.S Keerthipriya Raman Research Institute India
- 202.SMALL Des JIV-ERIC Netherlands
- 203.SPENCER Ralph The University of Manchester United Kingdom
- 204.STRINGHETTI Luca SKAO United Kingdom
- 205.SUBRAMANIAM Sureshkumar NCRA-TIFR India
- 206.SUDA Harshavardhan Reddy NCRA-TIFR India
- 207.SZOMORU Arpad JIV-ERIC Netherlands
- 208.TAKYI Bright Ghana Space Science and Technology Institute Ghana
- 209.TERCERO Felix OAN Spain
- 210.THIAGARAJ Prabu Raman Research Institute India
- 211.THIEL Sebastian MPIfR Germany
- 212.THOME Fabian Fraunhofer IAF Germany
- 213.THONDIKULAM, VENKATASUBRAMANI LAKSHMANAN TIFR India
- 214.TORNE Pablo East Asian Observatory/IRAM United States
- 215.TROUP Euan CSIRO Australia
- 216.TZIOUMIS Tasso CSIRO Australia
- 217.TÜRK Sener MPIfR Germany
- 218.UNRUH Sandra University Bonn Germany
- 219.VAN BEMMEL Ilse JIV-ERIC Netherlands
- 220.VERKOUTER Harro JIV-ERIC Netherlands
- 221.VERTEGAAL Niels Eindhoven University of Technology Netherlands
- 222.WEINREB, Sander Caltech Pasadena United States
- 223.WIIK Kaj University of Turku Finland
- 224.WILKINSON Peter University of Manchester United Kingdom
- 225.WINCHEN Tobias MPIfR Germany
- 226.WINKEL Benjamin MPIfR Germany
- 227.WUCKNITZ Olaf MPIfR Germany
- 228.XU Yonghua Yunnan Observatories China
- 229.YANG Jun Onsala Space Observatory Sweden
- 230.YUXIANG Huang Yunnan Observatories China
- 231.ZANICHELLI Alessandra INAF - Istituto di Radioastronomia Italy
- 232.ZENSUS Anton MPIfR Germany
- 233.ZERAFA Duncan The University of Manchester United Kingdom
- 234.ÖLÇEK Deniz McGill University Canada

## 2.4 Workshop Photo







### 3 Summary and Impact

As the number of participants shows, this workshop was a great success. More participants than ever before in the long row of technical workshops since 2004 followed this workshop.

Surely one reason for that was the easy access due to the digital nature of the event with no need or cost for travelling and no workshop fee for participants. Although the number of registrations was 234 in total, the maximum number of participants online at the same time was 185. Considering that people registered from all over the world, from different time zones this number is quite impressive. We received very positive feedback from participants who immediately asked for documentation of the workshop.

We appreciate the impressive discipline of speakers for keeping their time limit and sending us their abstracts and presentations in time. We admire the respectfulness and professionalism of all participants in the use of the technical devices.

Instrumentation addressed in this workshop is directly connected to European infrastructure, especially the RadioNet infrastructures. Many talks reported about recent developments and future plans of our telescopes and the institutes that form the RadioNet consortium.

The impact on European infrastructures, especially the RadioNet infrastructures, can't be directly measured but is very valuable. The vivid exchange of information and the communication between staff – scientists and technicians - of different infrastructures keeps the whole community & infrastructures on the highest level of technology.

'Re-inventing the wheel' thus is minimized and communication between the technical groups, which is already at a high level, is fostered. In this last RadioNet technical workshop speakers from all over the world were invited to report from their plans and projects to keep Europe up to date, excellent and state of the art - and give input for future developments at the forefront of technology.

### 4 RadioNet contribution

A total of 208.73 EUR was used to buy advertisement material for the participants. Shipment was covered by MPIfR.

### 5 Publications

The presentations slides and recorded videos are accessible on the workshop's website:

<https://events.mpifr-bonn.mpg.de/indico/event/154/timetable/#20200921.detailed>

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