



H2020 Grant Agreement No. 730562 – RadioNet

<u>PROJECT TITLE:</u>	Advanced Radio Astronomy in Europe
<u>STARTING DATE</u>	01/01/2017
<u>DURATION:</u>	48 months
<u>CALL IDENTIFIER:</u>	H2020-INFRAIA-2016-1
<u>TOPIC:</u>	INFRAIA-01-2016-2017 Integrating Activities for Advanced Communities



Deliverable 3.1

Specialised training event 1

Due date of deliverable:	2018-04-30
Actual submission date:	2018-03-09
Leading Partner:	The University of Manchester (UMAN)

Document information

Document name:	Specialised training event 1 - ERIS
Type	Report
WP	WP3 – Training
Version date:	2018-03-09
Authors (Institutes)	Anita Richards (UMAN) John McKean (ASTRON)

Dissemination Level

Dissemination Level		
PU	Public	X
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)	

Index

1	Introduction	3
2	ERIS 2017	3
2.1	ERIS 2017 content	4
2.2	ERIS 2017 attendance	5
3	Impact	7
4	RadioNet financial support	8
5	Acronyms	8

1 Introduction

The training activity of RadioNet is devoted to equipping radio astronomers and engineers with the skills, which are essential to take full advantage of the present and future radio astronomical infrastructures by offering a focussed set of schools and forums.

The European Radio Interferometry School (ERIS) is a bi-annual graduate level school that forms a fundamental part of the training and development of early-career radio astronomers (and those coming to radio from other research areas), primarily from Europe, but also from RadioNet partner countries throughout the world. Beside the facilities themselves, the human capital of European radio astronomy is also a crucial factor of its success. Training in such skills as observation, data analysis and software is needed to fully exploit the potential of RadioNet facilities. These skills are transferable to any career involving processing of large data volumes, imaging, and technical problem solving, and although most attendees stay in an astronomy-related occupation, medical science, teaching and earth-sensing for monitoring of food security trends are among the other areas which have benefited from radio astronomy training.

Previous ERIS (with attendance in some cases exceeding 100) have been extremely successful in delivering the training needed to prepare participants to write their own proposals, reduce interferometry data and interpret their results. In alternate years, general and mm-wave focussed events are held, and have been since near the start of RadioNet cooperation back to 2004.

2 ERIS 2017

ERIS 2017 was organised jointly between the Netherlands Institute for Radio Astronomy (ASTRON) and the Joint Institute for VLBI ERIC (JIV-ERIC) in Dwingeloo from October 16–20, 2017.

In the Scientific Organising Committee were J. P. McKean (Co-Chair; ASTRON/RUG), H. J. van Langevelde (Co-Chair; JIV-ERIC), A. D. Biggs (ESO), R. Campbell (JIV-ERIC), M. Giroletti (INAF), M. Iacobelli (ASTRON), K. Johnston (Leeds U.), R. Laing (ESO), Z. Paragi (JIV-ERIC), V. Piétu (IRAM), A. Richards (UMAN) and W. Vlemmings (OSO).

The school included both, lectures and practical tutorials given by invited specialists in interferometry with expertise and experience in using the main European radio astronomy facilities, which include the Atacama Large Millimetre/Sub-millimetre Array (ALMA), the e-Multi-Element Remotely Linked Interferometry Network (e-MERLIN), the European VLBI Network (EVN), the Low Frequency Array (LOFAR) and the Northern Extended Millimetre Array (NOEMA).

The teaching materials, including the lecture notes, tutorial guides and datasets used for the school are archived on the school website, www.astron.nl/eris2017/

which provides an additional route for the transfer of knowledge to students that were unable to attend the school and will form the basis for the material used at future ERIS.



Figure 1 - Conference photograph of the participants of ERIS 2017 at the WSRT.

2.1 ERIS 2017 content

ERIS was carried out over one week, and contained a science programme of 45 minutes lectures (including 5 minutes for questions), and 1 to 2.5 hour plenary tutorials and a day of in depth tutorials on ALMA, LOFAR and VLBI. There were 16 lecturers / tutorial leads, of which 5 were female.

The topics covered by the lectures/tutorials included,

- calibration and imaging of continuum, spectral line, and polarization data;
- low frequency (LOFAR domain), cm-wave (e-MERLIN domain), high frequency (ALMA/NOEMA domain), and VLBI interferometry;
- extracting the information from astronomical data and interpreting the results; and
- choosing the most suitable array and observing plan for your project.

Other activities included

- a visit to the Westerbork Synthesis Radio Telescope site including explanations of the main components of the array and technology developments at the site.
- An evening lecture on “Imaging Black Holes” by Prof H. Falcke (RU, Netherlands)

The science programme was:

Monday, 16 October 2017

08:30	Registration	
08:50	Opening/Welcome	John McKean (SOC/LOC), Directors
09:00	L1: Introduction to Radio Astronomy	John McKean (ASTRON)
09:45	L2: Introduction to Interferometry	Anna Scaife (UMAN)
10:30	Tea/coffee	
11:00	L3: Fundamentals of Interferometry	Robert Laing (SKA)
11:45	T1: Fun with Interferometers (S)	Robert Laing (SKA)
12:30	Lunch	
13:30	L4: Modern Interferometers	Joe Callingham (ASTRON)
14:15	L5: Data formats and editing	Andre Offringa (ASTRON)
15:00	T2: Data loading, inspection and flagging	Andy Biggs (ESO)
16:45	T3: Introduction to Writing a proposal	Robert Laing (SKA)
17:00	Leave for tour of WSRT	
18:30	BBQ@WSRT	

Tuesday, 17 October 2017

08:50	LOC announcements	
09:00	L6: Introduction to Millimetre Interferometry	Vincent Pietu (IRAM)
09:45	L7: Introduction to Calibration	John McKean (ASTRON)
10:30	Tea/coffee	
11:00	T4: Calibration (Part 1)	Anita Richards (UMAN)
12:30	Lunch	
13:30	T4: Calibration (Part 2)	Anita Richards (UMAN)
14:30	L8: Introduction to Imaging	Anna Scaife (UMAN)
15:15	Tea/coffee	
15:45	T5: Imaging	Joe Callingham (ASTRON)
17:15	L9: Introduction to Low Frequency Interferometry	Vanessa Moss (ASTRON)
18:00	Close	
21:00	Evening lecture	Heino Falcke (RU)
22:00	End of Day	

Wednesday, 18 October 2017

08:50	LOC announcements	
09:00	L10: Advanced Imaging	Andre Offringa (ASTRON)
09:45	L11: Spectral Line Interferometry	Katharine Johnston (Leeds U.)

10:30	Tea/Coffee	
11:00	T6: Error recognition and Image Analysis	Anita Richards (UMAN)
12:30	Lunch	
13:30	T7: Self-calibration	John McKean (ASTRON)
15:30	Tea/coffee	
16:00	L12: Very Long Baseline Interferometry	Bob Campbell (JIV-ERIC)
16:45	T8: Very Long Baseline Interferometry	Minnie Mao (UMAN)
18:15	Close	

Thursday, 19 October 2017

08:50	LOC announcements	
09:00	L13: Polarisation	Ivan Marti-Vidal (OSO)
09:45	L14: Pipelines	Benito Marcote/Andy Biggs (JIV-ERIC, ESO)
10:30	Tea/Coffee	
11:00	Advanced Tutorials	
	T9A Metre/Wide-field (LOFAR)	Marco Iacobelli (ASTRON)
	T9B Centimetre/Polarisation	Ivan Marti-Vidal (OSO)
	T9C Centimetre/e-VLBI	Minnie Mao (UMAN)
	T9D Millimetre/Spectral line (ALMA/NOEMA)	Katharine Johnstone (Leeds U.)
12:30	Lunch	
13:30	Advanced Tutorials (Cont.)	
15:30	Tea/Coffee	
16:00	Advanced Tutorials (Cont.)	
17:00	L15: Proposals and scheduling	Marcello Giroletti (INAF)
17:45	T10: Writing a proposal	
18:30	Close	
19:30	Conference Dinner	
21:00	(Interferometry) Pub Quiz	

Friday, 20 October 2017

08:50	LOC announcements	
09:00	L16: Archives and legacy data	Marcello Giroletti (INAF)
09:45	T10: Writing a proposal	
10:30	Tea/Coffee	
11:00	T10: Proposal presentations	
12:30	Lunch	
13:30	T10: Proposal presentations	
15:00	Concluding remarks / Feedback	John McKean (SOC/LOC), Directors
15:30	End of School	

2.2 ERIS 2017 attendance

ERIS was open to all regardless of their ethnicity, gender and academic position. However, there was an effort to actively encourage the attendance of those students from developing countries, by advertising the school as widely as possible. Also, all attendees had to agree to the Dwingeloo Code of Conduct during registration, which ensured a harassment-free school experience for everyone, regardless of gender, sexual orientation, disability, physical appearance, race, age, political opinion or religion.

73 participants from 21 countries attended the school (see Figure 1). The vast majority of the participants was at graduate level (Masters/PhD) with a few staff members and a few at bachelor level. 35 women attended, giving a gender ratio between male and female of 1:0.92, which is excellent. It is hoped that the future ERIS can maintain this gender parity, and that a similar balance can be achieved at the lecturer / tutorial lead level (1:0.45).

In addition to the participants, there were 16 invited lecturers / tutorial leads and 4 LOC members dealing with the daily organisation of the meeting.



Figure 2 - Map of the world showing the locations of the participants of ERS 2017.

1	Aghababaei, Atefeh	Physikalisches Institut Universität zu Köln	Germany
2	Algera, Hiddo	Leiden University	Netherlands
3	Amarantidis, Stergios	Institute of Astrophysics and Space Sciences	Portugal
4	Asabre Frimpong, Naomi	University of Manchester	United Kingdom
5	Berlicki, Arkadiusz	Astronomical Institute, Czech Academy of Sciences	Czech Republic
6	Bilimogga, Pooja	Kapteyn Astronomical Institute	Netherlands
7	Blecher, Tariq	SKA SA	South Africa
8	Bright, Joe	University of Oxford	United Kingdom
9	Cau, Massimo	Unibo/IRA-INAF Italy	Italy
10	Chen, Sina	University of Padova	Italy
11	Chen, Weiwei	Max Planck Institute for Radio Astronomy	Germany
12	Chen, Wen	Yunnan observatories	China
13	Climent Oliver, Juan Bautista	Universidad de Valencia	Spain
14	Congiu, Enrico	Dipartimento di Fisica e Astronomia "G. Galilei", SKAO	Italy
15	Cremonini, Andrea	Jagiellonian University	United Kingdom
16	Curylo, Malgorzata	Kapteyn Astronomical Institute (University of Gron)	Poland
17	Deb, Tirna	Max-Planck-Institut für Astrophysik	Netherlands
18	Di Mascolo, Luca	University of Bristol	Germany
19	Duffy, Ryan	Dublin Institute of Advanced Studies	United Kingdom
20	Feeney-Johansson, Anton	Joint ALMA Observatory	Ireland
21	Fernandez, Jose	Radboud University Nijmegen	Chile
22	Fraga-Encinas, Raquel	Observatoire de Genève	Netherlands
23	Fudamoto, Yoshinobu	Instituto de Astrofísica de Andalucía (IAA-CSIC)	Switzerland
24	Gallego-Calvene, Aurelia Teresa	European Southern Observatory	Spain
25	Garcia Dabo, Cesar Enrique	University of Oxford	Germany
26	Hale, Catherine	Kapteyn Institute/University of Cape Town	United Kingdom
27	Healy, Julia	University of Manchester	Netherlands
28	Hesterly, Katie	University of Bonn	United Kingdom
29	Hoang, Thanh Dat	Instituto de Astrofísica de Canarias	Germany
30	Jimenez, Camilo	Kapteyn Institute/ASTRON	Spain
31	Jurlin, Nika	JIVE/University of Zagreb	Netherlands
32	Klindžić, Dora	European Southern Observatory	Netherlands
33	Kolwa, Sthabile	University of Edinburgh	Germany
34	Kondapally, Rohit	Argelander-Instituts für Astronomie	United Kingdom
35	Lau, Chun Wai	Shanghai Astronomical Observatory	Germany
36	Li, Ting	TU Dortmund	China
37	Linhoff, Lena		Germany

38	Liu, Wenjuan	Astronomical Institute, Czech Academy of Sciences	Czech Republic
39	Mahatma, Vijay	University of Hertfordshire	United Kingdom
40	Mandlik, Ayushi	Argelander-Institut für Astronomie	Germany
41	Mantri, Aakash	Argelander-Institut für Astronomie	Germany
42	Mingo, Beatriz	Open University	United Kingdom
43	Modak, Ziad	Argelander-Institut für Astronomie	Germany
44	Montesino Pouzols, Federico	European Southern Observatory	Germany
45	Mooney, Sean	University College Dublin	Ireland
46	Munjal, Sonia	Argelander-Institut für Astronomie (AlfA)	Germany
47	Muratova, Nataliia	Astronomical Institute, Czech Academy of Sciences	Czech Republic
48	Murthy, Suma	Kapteyn Astronomical Institute	Netherlands
49	Mutie, Isaac	Technical University of Kenya	Kenya
50	Ngo, Thanh Liem	I. Physikalisches Institut - University of Cologne	Germany
51	Nguyen, Anh	Bonn-Cologne Graduate School of Astrophysics	Germany
52	Olech, Mateusz	Nicolaus Copernicus University, Centre for Astrono	Poland
53	Parker, Raeesa	University of Central Lancashire	United Kingdom
54	Perger, Krisztina	Eötvös Loránd University	Hungary
55	Peters, Josephine	University of Oxford	United Kingdom
56	Piotrowska, Julia	Jagiellonian University	Poland
57	Rolfe, Samantha	University of Hertfordshire	United Kingdom
58	Romano, Domenico	UNSW	Australia
59	Roskowinski, Carole	Torun Centre for Astronomy	Poland
60	Sabzali, Vajihah	Ipm(Research Institute for Fundamental Science)	Iran, Islamic Republic Of
61	Sadaghiani, Mahya	University of Cologne	Germany
62	Sanchez, Maria	Nacional de Técnica Aeroespacial	Spain
63	Santamaría Miranda, Alejandro	ESO Chile/Universidad de Valparaíso	Chile
64	Sarniak, Rafal	Centre for Astronomy at Nicolaus Copernicus Univer	Poland
65	Schaap, Jorrit	Astron	Netherlands
66	Schmidt, Kevin	Technische Universität Dortmund	Germany
67	Stacey, Hannah	RuG / ASTRON	Netherlands
68	Sweijen, Frits	Leiden University	Netherlands
69	Terni de Gregory, Beatrice	IRA-INAF Bologna	Italy
70	van der Vlugt, Dieuwertje	Leiden University	Netherlands
71	Webster, Brendan	The Open University	United Kingdom
72	Wolowska, Aleksandra	Nicolaus Copernicus University	Poland
73	Zhang, Maolin	Leiden University	Netherlands

3 Impact

Over the period of a week, ERIS provided the participants with theoretical understanding of complex concepts of interferometry, gave hands-on experience on using standard analysis software (casa, aips), developed critical thinking in the preparation and execution of interferometry observations, and facilitated the networking of early stage researchers. In addition, the school gave opportunity to experienced researchers (postdocs) to develop their teaching skills through the delivery of lectures and tutorials. As part of the review of the school, the students completed a short questionnaire (~30% response), in which 100% of the respondents considered the school to be “useful”. Additional comments and suggestions (mainly about the limited time allotted for tutorials) from the participants will be incorporated into future ERIS.

The RadioNet contribution was vital in keeping the costs low enough to enable radio astronomers from all over Europe to attend, especially from institutes without long tradition and depth of expertise in this field, as well as providing expert lecturers and enough tutors to ensure that the hands-on sessions went smoothly and participants could focus on radio astronomical problem solving.

All lectures and tutorials are available on-line: <http://www.astron.nl/eris2017/> and a general 'ERIS Organisers' Guide' is being prepared by the organisers of this and previous ERIS.

4 RadioNet financial support

The RadioNet contribution was used to cover the costs associated with logistics and with the running of the school (15k Euros); up to an additional (5k Euros) were used to cover the costs of the invited lecturers and tutors. ASTRON/JIV-ERIC contributed similar amounts, and the participants paid a modest registration fee.

5 Acronyms

ALMA	Atacama Large Millimetre/sub-millimetre Array
ASTRON	the Netherlands Institute for Radio Astronomy
e-MERLIN	UK radio interferometry array
ERIC	European Research Infrastructure Consortium
ERIS	European Radio Interferometry School
JIV-ERIC	Joint Institute for VLBI in Europe
LOFAR	Low Frequency Array
NOEMA	NOrthern Extended Millimetre Array
VLBI	Very Long Baseline Interferometry

Copyright

© Copyright 2018 RadioNet

This document has been produced within the scope of the RadioNet Project.

The utilization and release of this document is subject to the conditions of the contract within the Horizon2020 programme, contract no. 730562