

RadioNet support for training events Application form

| EVENT INFORMATION | |
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| TITLE | Next Generation Galactic Fidelity - Galaxy Analysis with MeerKAT and other Decimeter Radio Interferometers (A RATT training camp) |
| PLACE | Tbd., one of many high class budget venues in the South African Cape Region |
| ORGANISER'S INSTITUTE NAME | <p><i>Please insert the name of the organisation and the details on the contact person</i></p> <p>South African Radio Astronomy Observatory (SARAO) and Rhodes University</p> <p>Contact: Dr. Gyula I. G. Józsa</p> <p>SKA South Africa</p> <p>The Park</p> <p>Park Road</p> <p>Pinelands</p> <p>7405</p> <p>South Africa</p> <p>Email: jozsa@ska.ac.za</p> <p>Phone: +27 (0)21 506 7340 Fax: +27 (0)21 506 7375</p> |
| DATE | January 2019 |
| NO. OF PARTICIPANTS | ~60, 30 students to be supported, 12 Lecturers to be supported |
| TOTAL EVENT COST | € 61 000.- |
| OTHER SOURCES OF FUNDING | <p><i>Please specify the other sources of funding and their level</i></p> <p>There are currently no other sources of funding. Once approved we will approach SARAO HCD for further funding.</p> |

REQUEST *(max. 2 pages)*

With MeerKAT, ASKAP, and APERTIF becoming operational we have arrived in the era of the next generation decimeter-wavelength radio telescopes. We stand at the threshold of utilizing these telescopes to examine major questions in galaxy evolution and dynamics, one of the main fields in which they - and finally the SKA - are expected to produce transformational science. However, the complexity of this task, in particular the challenging data sizes involved, necessitates a critical stage of preparedness for all scientists, who want to become involved in the analysis of radio data from these facilities.

It is therefore essential that we train young scientists with the skills to tackle the advanced challenges this new breed of radio telescope are presenting.

Our motivation for this proposal is driven by:

1. How can we provide young scientists with the skills necessary for them to become radio astronomers and to understand the specifics of radio data?
2. Given the large data volume, how do we automate data reduction and handle it?
3. With the large number of objects observed, how do we automate and accelerate analyses making use of modern statistical and machine learning techniques?

4. What are the old and new questions in galaxy evolution and dynamics which we can address so much better now or even for the first time?

We therefore propose to host a school on the analysis of radio data in the context of galaxy evolution and dynamics. We aim to host tutorials and projects, combined with specialized lectures, on how to exploit this flood of data and produce science-specific products. The NG Galaxy Fidelity workshop will extend the scope of the former (highly successful) 3GC events organised by RATT¹, which concentrated on maximising the reliability of intermediate data products, images and data cubes.

The layout of the proposed NG Galactic Fidelity workshop is:

- The workshop is conducted over two weeks. This ensures plenty of interaction between students and researchers, and helps embed the acquired skills through repetition, reiteration and discussion.
- The first week involves a crash-course in the theoretical and practical aspects of calibration and imaging, with a strong emphasis on hands-on tutorials and examples, making use of our own MeerKAT pipeline MeerKATHI. The aim is to give the attendees the skills to handle and understand the most important ingredients in modern 3GC data reduction pipelines: flagging, cross- and self-calibration, modern techniques to tackle direction dependent effects using the single modules of the MeerKATHI pipeline (commonly used software packages).
- The second week builds on the imaging from the first week. We will extend our focus on advanced tools and topics to analyse the reduced and ancillary data. The previous step produces continuum images and line cubes. These products will be input to source finding algorithms to extract astronomical source properties and identifying unusual sources through automated classification (machine learning). We will introduce the concepts to study the detailed distribution and kinematics of the atomic gas. We will touch upon machine learning techniques to automatically classify radio objects, discuss statistical interpretation of galaxy data and cross-correlation with ancillary data and scientific applications. (e.g., source finding, automated source classification, parametrisation) with lectures and tutorials.

The workshop will be open to a limited number of interested members of the community (postdocs and faculty), but will chiefly be aimed at MSc and PhD students with the view to developing skills and techniques applicable to calibrating and reducing MeerKAT or any radio interferometric data. In addition, we will focus on developing expertise and familiarity with the current generation of software tools used in the context of galaxy studies, in particular employing the HI line. The talks/lectures, tutorials, discussions and group projects provide an excellent opportunity for young (and expert) astronomers to learn the advanced skills in the calibration, imaging and analysis of radio data.

We have ample experience in the organisation of hands-on schools, as demonstrated in the past 3GC workshops. This encompasses normal conference logistics, technical setup of a venue to accommodate the required computing power, as well as selecting a set of international, motivated, world class lecturers (being ourselves specialists in the field).

¹ The latest workshop was held in Port Alfred in 2015: <http://www.acgc.uct.ac.za/3gc4hifidelity/>

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| <p>SOC: Dr Gyula I. G. Józsa (contact) Prof Oleg M. Smirnov Dr Sandeep Sirothia Dr Sphehile Makhathini Dr Arun Anyian Dr Kshitij Thorat - SARAO/RATT</p> | <p>Layout: 60-70 attendees 30 MSc/PhD (supported by providing accommodation, sustenance except dinner, excursion, workshop dinner) 18 Postdoc and senior (not supported) 12 Lecturers (supported by providing accommodation, sustenance except dinner, excursion, workshop dinner, flights if necessary)</p> |
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We have not decided on a specific conference venue yet and are currently investigating the possibilities. There are many high-quality lower-budget venues available. For this proposal we are extrapolating from our experience with other schools organised by us.

| Requested contribution | <i>Please specify the level of the requested RadioNet support [EURO]</i> € 45 000.- | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
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| Use of the RadioNet contribution | <p><i>Please specify the use of the RadioNet contribution, e.g. approximately how many people will be supported, is this students, tutors, etc.? Which other costs exist? What is the overall budget for the event? How will this event contribute to RadioNet goals?²</i></p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: center;">Item</th> <th style="text-align: center;">Number</th> <th style="text-align: center;">Cost</th> <th style="text-align: center;">Comments</th> </tr> </thead> <tbody> <tr> <td>Accommodation</td> <td>30 for 12 nights</td> <td>R 220,000</td> <td>Students</td> </tr> <tr> <td>Accommodation</td> <td>12 for 12 nights</td> <td>R 120,000</td> <td>Lecturers/SOC</td> </tr> <tr> <td>Flights</td> <td>6</td> <td>R 120,000</td> <td>Lecturers</td> </tr> <tr> <td>Food (not dinner)</td> <td>42</td> <td>R 150,000</td> <td>Students/Lecturers/SOC</td> </tr> <tr> <td>Workshop Dinner</td> <td>42</td> <td>R 15,000</td> <td>Students/Lecturers/SOC</td> </tr> <tr> <td>Excursion</td> <td>42</td> <td>R 15,000</td> <td>Students/Lecturers/SOC</td> </tr> <tr> <td>Car Hire</td> <td></td> <td>R 20,000</td> <td>Shuttles and Logistical Support</td> </tr> <tr> <td>Conference Room</td> <td></td> <td>R 20,000</td> <td></td> </tr> <tr> <td>Total Requested Budget</td> <td></td> <td>R 680,000</td> <td>approximately € 45,000.- for an exchange rate of R 15/€</td> </tr> </tbody> </table> <p>Not covered are the flights of 6 lecturers (R 120,000), the 10 SOC/LOC (R 50,000), and the cost of conference assistance (R 70,000) which we will ideally be able to pay. The total projected budget is R 920,000,- or € 61,000.-</p> | | | Item | Number | Cost | Comments | Accommodation | 30 for 12 nights | R 220,000 | Students | Accommodation | 12 for 12 nights | R 120,000 | Lecturers/SOC | Flights | 6 | R 120,000 | Lecturers | Food (not dinner) | 42 | R 150,000 | Students/Lecturers/SOC | Workshop Dinner | 42 | R 15,000 | Students/Lecturers/SOC | Excursion | 42 | R 15,000 | Students/Lecturers/SOC | Car Hire | | R 20,000 | Shuttles and Logistical Support | Conference Room | | R 20,000 | | Total Requested Budget | | R 680,000 | approximately € 45,000.- for an exchange rate of R 15/€ |
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| Impact of training | <p><i>Please outline the anticipated impact of the event e.g. on knowledge transfer to the next generation of scientists and engineers.</i></p> <p>Target audience is advanced students up to professionals. The workshop intends to give attendees i) an introduction into interferometric imaging with</p> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

² For more information about the RadioNet training programme please contact Dr. Anita Richards (a.m.s.richards@manchester.ac.uk).

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| | <p>MeerKAT and similar telescopes that enables them to understand the specifics of modern data reduction pipelines, in particular MeerKAT pipelines, ii) a deeper understanding of science analysis techniques used on radio data and the ability to combine radio data with ancillary data.</p> |
| Accessibility | <p><i>Please specify the selection criteria for attendees</i></p> <p>We aim at an audience of 30 advanced Masters and PhD students, and 18 postdoc and early-career students, 12 lecturers. For non-lecturers/SOC/LOC we will request a brief motivation for attendance and a reference statement from a supervisor for students to select participants if necessary. Primary selection criterion will be how well the need for the training is justified (preferring excellent attendees who intend to use radio data in galaxy analyses). We will balance this to some extent to accommodate students with socially disadvantaged background, but not blindly. Here - if there is a gap - the main criterion is also the potential of excellence as opposed to the proof. For this we will look at the reference statements.</p> <p>Lecturers (if not from the SOC) are selected solely on the basis of demonstrated world class excellence in analysis techniques and science and proven teaching ability.</p> |
| Ethics | <p><i>Please explain how you will encourage ethical issues such as gender, ethnic diversity, reaching new communities, as relevant.</i></p> <p>By choosing South Africa as the locus we are enabling South African students to attend the school much easier. As commonly known, South Africa has a very diverse set of ethnic groups with different social background, much of which is historically induced, and it is surrounded by rather poor countries. Students from all these environments are put into the advantage of proximity to the conference venue. In the past we have managed to create an atmosphere of cultural curiosity and respect between all groups in our audiences, with science as the easy ice breaker (it is actually not very hard) and we are looking forward to witness the same dynamics to evolve in this school. Likewise, we aim at a diverse lectureship and audience in terms of gender balance. We will make clear to everyone that we expect mutual respect of each other and will get down hard on any trespasses against that policy.</p> |