



RadioNet support for Short Term Missions Application form

STM INFORMATION	
APPLICANT 'S NAME	Joni Tammi
AFFILIATION	Aalto University Metsähovi Radio Observatory
HOST INSTITUTE	Onsala Space Observatory, Director John Conway, email john.conway@chalmers.se , tel. +46 31 772 55 03
DATE OF THE STM	April 27 – April 28 2017
TOTAL COST OF STM	3650 eur
OTHER SOURCES OF FUNDING	Metsähovi Radio Observatory has prioritised this visit over several other visits in 2017. In case no or limited STM support, we shall cover the remaining costs ourselves and limit other travels in 2017.
Request <i>(max. 2,5 pages)</i>	
Topic	<p>Technical visit from the Metsähovi Radio Observatory (MRO) to Onsala Space Observatory (OSO) in order to discuss common technical challenges we share, to compare how we have approached those matters, and to learn from each others how have/could overcome them in order to secure the operations. Our common concerns -- not shared with most of the RadioNet/EVN observatories -- are related to working with radomes, Nordic weather conditions, automatizing 15-25-metre scale radio telescope operations, etc.</p> <p>Within the RN4 this visit strengthens collaboration of, and technical perspective in, the Nordic observatories, as well as supports the technical expertise of both observatories, leading to increased resilience in face of technical problems and challenges affecting our participation in RN4 & EVN activities.</p>
Proposed work	<p>The two-day visit consists of visits to the observatory facilities, particularly from the technical and operational point of view. The focus is on radio telescopes, receivers, VLBI equipment, RFI equipment, atomic clocks, etc. In addition to the site visits, there will be presentations by both the OSO and MRO staff, and discussions on various relevant topics including and not limited to:</p> <ul style="list-style-type: none"> • VLBI arrangements at OSO and MRO; in particular, improving system (signal chain) reliability/quality check before the session in practice. Securing VLBI operation in general, especially automation and remotisation of various stages of session preparations, running the sessions, quality control, and testing. • Working with Nordic weather conditions; removal and minimising the effect of snow, rain, humidity, ice • Time and frequency: H-maser stability and operational issues. Also, transmission of standards over kilometre-distances – experiences and lessons learnt. • Receivers: millimetre receivers, 4-12 GHz broad-band upgrades, sensitivity requirements, etc. • RFI monitoring and experiment related issues. <p>Small radio telescopes and interferometers in education: the next generations of radio astronomers and engineers.</p>
Cross-disciplinary	OSO and MRO have a long history in collaboration that even since MRO's first VLBI experiments in the 1980s. This visit strengthens Nordic collaboration in radio astronomy, especially on the infrastructure level, at a time when MRO is

	<p>struggling in the local university reforms and greatly benefits from any help in regards to efforts that enable improved efficiency, reliability and continuation of the operations.</p> <p>After recent layoffs (and facing potential reductions of effective work hours in the future) at MRO we are in a situation where our technical staff is having severe challenges in taking care of the radio telescopes and the related infrastructure, as well as running highly specialised observations, such as the VLBI sessions. We are looking for ways to improve efficiency, automate parts of the work and various processes, and in general look for more autonomous and automated operations.</p> <p>Furthermore, at MRO we are looking at replacing our protective radome in the near future. Since the previous replacement was in 1991, and due to the aforementioned reductions in staff, most of the MRO's current technical team have not participated in the replacement process. Many OSO engineers, on the other hand, have clearly in their memory their 20-metre radio telescope radome replacement in 2014, and transferring their practical knowledge and lessons learnt to MRO, is likely to be very beneficial in reducing the downtime and the risk for the MRO 14-metre telescope.</p>
Impact	<p>In addition to strengthening the Nordic VLBI and radio astronomical collaboration, transfer of technical knowledge and know-how, and improving mutual understanding of many of our shared challenges, we expect the obtained and shared knowledge to materialise as concrete improvements in our service to the RadioNet project and to the global VLBI community.</p> <p>In particular, new advances in observational automation or VLBI session operations would alleviate many threats especially MRO's VLBI participation has been facing. Furthermore, potential novel solutions to common technical problems, as well as new developments, are likely to be applicable to other radio telescopes and observatories as well.</p>
Curriculum Vitae	<p>The visit consist of six persons from MRO:</p> <ul style="list-style-type: none"> • Dr Joni Tammi (Staff Scientist); astronomer and the director of the observatory since 2014. In addition to the management of the infrastructure, his responsibilities include teaching and cooperation with the various user groups and stakeholders. • Dr Juha Kallunki (Laboratory Engineer); head of the technical team. He manages the technical operations of the infrastructure, and his role is to coordinate the daily maintenance and development work and all other technical operations. He is also the MRO's representative in working groups dealing with technical questions (e.g. EVN TOG and CRAF). • Mr Ari Mujunen (Laboratory Engineer) is an expert in the technical side of VLBI (both equipment and technologies), and the research-IT coordinator of the observatory. He has also played a central role in VLBI technology development (FlexBuff in particular). • Mr Petri Kirves (Operations Engineer) is specialized in receiver technology. He provides the upkeep and development of the receivers for the radio telescopes, and he is also in charge of MRO's RFI monitoring. • Mr Juha Aatrokoski (IT Engineer) develops and manages the observing system and the research IT infrastructure. • Mr Erkki Oinaskallio (Laboratory Technician) takes care of upkeep of the premises as well as the hardware side of the various measurement system, including the telescope mechanics and the H-masers. <p>Selected publications relevant to the work:</p> <ul style="list-style-type: none"> • Mujunen A., Aatrokoski J., Tornikoski M. & Tammi J. 2016, "GPS Time Disruptions on 26-Jan-2016", Aalto University publication series SCIENCE + TECHNOLOGY, 2/2016, ISBN 978-952-60-6703-2 • Uunila, Minttu; Kallunki, Juha; Molera & Calvés, Guifré 2015, "Using software spectrometer to ensure VLBI signal chain reliability", proceedings of "12th European VLBI Network Symposium and Users Meeting", 7-10 October 2014, Cagliari, Italy



ONSA LA RYMDOBSERVATORIUM

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ONSA LA SPACE OBSERVATORY

CHALMERS UNIVERSITY OF TECHNOLOGY

Onsala, 14th February 2017

Dear Dr Tammi,

It is my pleasure to invite you and the technical team of the Metsähovi Radio Observatory (MRO) to visit the Onsala Space Observatory (OSO).

As previously discussed, the ideal time for the visit would be April 27--28 2017. The two days should leave enough time for you to meet our engineering group, to get to know the 20- and 25-metre radio telescopes, and to discuss the various technical topics and concerns shared by both the OSO and the MRO, to benefit both parties.

Yours sincerely,

Prof John Conway
Director
Onsala Space Observatory