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1.1 Dissemination Level

| Dissemination Level | | |
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| 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) | |

1.2 Content

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2 Minutes from policy meetings

The minutes relate to the deliberations of the QueSERA Study Group (hereafter QSG). The QSG is charged with producing a white paper on the topic of the coordination and organisation of European Radio Astronomy. The terms of reference (ToR) of this activity were approved in June 2013. For more details on the ToR of the QSG, please consult RadioNet3 Deliverable D2.2. The QSG meetings are held in order to further the process of generating this white paper.

The QueSERA Study Group (QSG) has since met face-to-face on two occasions (14 October 2013 and 30 January 2014). This document aims to summarise the minutes of those meetings. In particular, (i) to outline some of the earlier background to this topic, (ii) to describe the progress of the QSG to date, (iii) and to present of a very preliminary range of possible options that might serve as a basis for the White paper discussions.

2.1 Introduction

The field of Radio Astronomy is a vibrant one, and changing rapidly. Many existing telescopes are undergoing significant upgrades, and new, large-scale facilities such as ALMA and the SKA are set to have a major impact in the field, especially so in Europe. European collaboration is stronger than ever, and this has been facilitated via various different entities in addition to RadioNet3 (e.g. the EVN, JIVE, IRAM, CRAF, ILT, ESKAC, etc.). With Horizon 2020 offering many new possibilities for radio astronomy and related fields, the number of relevant EC radio projects (already including RadioNet3, NEXPreS & GO-SKA) is set to increase substantially.

It is against this background, that the work programme of the QueSERA Study Group (QSG) was originally proposed and later verified via the adopted ToR (RadioNet3 deliverable D2.2). In brief, the main objective of the QSG is to generate a White Paper on the topic of the future coordination of radio astronomy in Europe, and to do this by also taking into account commentary from other relevant stakeholders (e.g. ASTRONET, SKAO, ESO, Funding Agencies etc). The paper will describe a range of options and discuss their various pros and cons. The aim is to also present a motivated recommendation to the Board if a consensus can be achieved within the QSG. Such a vision should ensure sustainable growth in the field for at least the next 10 years, with the aim of finding agreement within the full m/cm/mm/mm radio astronomy community. If a consensus is not possible (either within the QSG or at Board level) only a range of options will be presented. The deadline for the White paper (the main deliverable) is June 2015.

It should be noted that there is some overlap between the aims of the RadioNet3 QSG and other projects/committees - more specifically GO-SKA and the ASTRONET ETRC (European Radio Telescope Review Committee).

2.2 QSG Meetings

It was noted that all QSG meetings are open to all RadioNet3 Board members, in addition to members of the QSG itself. External stakeholders will also be invited once the deliberations of the QSG have matured to a more advanced state, and the initial findings shared with the Board. The chair has agreed to record summaries of the major discussions and note decisions/ action items, circulating these via paper deliverables.

2.2.1 Meeting 1 – details

The first meeting of the QueSERA Study Group was held on October 14, 2013 at Max-Planck-Society Office in Brussels (Rue Royale 225-227). The QueSERA task1 leader Michael Garrett (ASTRON) chaired the meeting. The following agenda was scheduled:

| | |
|-------|--|
| 11.30 | Welcome by M. Garrett |
| 11.40 | Review of Study Group ToR |
| 11.50 | Discussion of ETRC report and relevant recommendations for WP2.1 |
| 12.10 | Lunch |
| 12:45 | European Radio Astronomy in the next decade 2025 - facility perspective |
| 13:30 | Open discussion - How should we coordinate European Radio Astronomy in the coming decade? What are the options? What are the issues? |
| 14:15 | Coffee break |
| 15:15 | Open discussion - Continuation |
| 15:45 | Meeting summary, review of action items and way forwards |
| 17:00 | Closing |

The following participants attended the meeting:

| Name | Organization | Function |
|----------------------------|--------------|--|
| Jacqueline Casado Iglesias | MPIfR | <i>RadioNet3 Management- minutes</i> |
| Patrick Charlot | BORD | <i>RadioNet3 Board Vice Chair</i> |
| Michael Albert Garrett | ASTRON | <i>QueSERA Task 1 leader, QSG chair</i> |
| Simon Garrington | UMAN | <i>QSG member</i> |
| Franco Mantovani | MPIfR | <i>RadioNet3 Project Scientist, QSG member</i> |
| Adrian Russell | ESO | <i>QSG member</i> |
| Karl-Friedrich Schuster | IRAM | <i>QSG member</i> |
| Huib van Langevelde | JIVE | <i>QSG member</i> |
| Rene Vermeulen | ILT | <i>QSG member</i> |
| Anton Zensus | MPIfR | <i>RadioNet3 Coordinator, QSG member</i> |

2.2.2 Meeting 2 – details

The 2nd meeting of the QueSERA study group was organized on January 31, 2014 at the Max-Planck-Society Office in Brussels. Michael Garrett chaired the meeting following the agenda:

- Opening by M. Garrett
- Decision on how we record our meeting deliberations
- Taking note of the points made at the Mid-Term Review
- Reviewing the notes of the ASTRONET/RadioNet/Go-SKA deliberations on positioning of Europe in SKA
- Review and comments on contributions

- Contribution 1 (A. Zensus/ K. Schuster)
- Contribution 2 (H. van Langevelde, R. Vermeulen, S. Garrington)
- Contribution 3 (M. Garrett)
- Volunteers w.r.t. the presentation of our current activities to the RadioNet Board meeting in March

The following participants attended the meeting

| Name | Organization | Function |
|-------------------------|--------------|--|
| Michael Albert Garrett | ASTRON | <i>QueSERA Task 1 leader, QSG chair, minutes</i> |
| Simon Garrington | UMAN | <i>QSG member</i> |
| Franco Mantovani | MPIfR | <i>RadioNet3 Project Scientist, QSG member</i> |
| Adrian Russell | ESO | <i>QSG member</i> |
| Karl-Friedrich Schuster | IRAM | <i>QSG member</i> |
| Rene Vermeulen | ILT | <i>QSG member</i> |
| Tiziana Venturi | INAF | <i>Board member</i> |
| Anton Zensus | MPIfR | <i>RadioNet3 Coordinator, QSG member</i> |

2.3 Radio Astronomy Landscape

As a pre-requisite, the QSG has reviewed the current status of Radio Astronomy in Europe and how this was likely to develop over the coming decade. The field is currently dominated by national facilities and there is a strong ambition and mandate for these to continue as front-rank instruments for at least the next decade and in many cases beyond.

The national facilities often combine together to form internationally distributed (interferometer) networks e.g. the EVN, Global VLBI, mm-VLBI, EPTA etc. Significant growth was foreseen for VLBI in general and mm-VLBI, in particular - ALMA would soon also have a VLBI capability and the SKA1-mid would not expand beyond baseline lengths of a few hundred km at the very best. The suite of cm/mm facilities in Europe has recently received a boost with the commissioning of the SRT in Sardinia. At the other end of the radio domain, the International LOFAR Telescope (ILT) is seen as a major new European initiative that continues to expand, currently extending from the Netherlands into Germany, France, UK & Sweden. New LOFAR stations are under construction in Hamburg, and Poland is expected to place an order for 3 stations this year. Other countries (principally Ireland and Italy) may also join the next LOFAR procurement cycle, together with Poland. LOFAR's long-baseline capability will also greatly exceed that of SKA1-low. Significant upgrades to LOFAR can also be expected in the coming decade (e.g. Field-of-View and frequency range, and possible re-use of the infrastructure for higher frequency SKA AA prototypes).

Several international organisations are involved in operating radio astronomy facilities (ESO, JIVE, IRAM and the ILT). ESO is an international treaty organisation and JIVE is on its way to becoming an ERIC (European Research Infrastructure Consortium - a legal entity initiated and now recognised by the EC and its member states). The role of organisations like ESO and JIVE in the future development of European radio astronomy is difficult to assess without fully understanding their own ambitions. In both cases, the future strategy of engagement with other projects (e.g. the SKA) is still evolving.

NOEMA, the successor to the Plateau du Bure observatory, will be the most powerful mm radio telescope in the Northern Hemisphere - a demonstration of the scientific need to retain an all-sky capability with ALMA located in the Southern hemisphere. NOEMA was also seen as a platform on which new technologies could be more easily implemented and in which competitive advantage could be delivered to the European community. The QSG very much felt that NOEMA represented a good example of how cm-wavelength facilities in Europe might also develop in the era of the SKA. There are many lessons to be learned here, and to be applied to the era of the SKA construction phase and operations.

2.4 Forward Look

From the QSG discussions, it is perfectly clear that there is a strong ambition to maintain a major European radio telescope capability in the Northern hemisphere, through the ALMA and SKA eras. While some facilities may close, the vast majority are expected to continue to maintain their state-of-the-art capabilities. The QSG concluded that:

- i. it is essential to protect and further grow the vibrant European Radio Astronomy science community in the era of both ALMA & SKA,
- ii. it is essential that the impressive technical and engineering expertise in radio astronomy is retained,
- iii. there is broad interest in hosting SKA regional (data) centres in Europe covering a range of different support activities and interest, and that this is important in order to support the 2 previous statements,
- iv. national institutes have strong ambitions to maintain and upgrade current (complimentary) facilities well beyond the current decade,
- v. the NOEMA upgrade of PdBI is considered to be an excellent example of how European m/cm wavelength radio astronomy might also aggressively develop in the SKA era,
- vi. the EVN and JIVE represent a unique facility that has a strong and long-term scientific case, in addition to making a strategic link to the SKA (via the African VLBI Network, AERAP, and SKA1-mid),
- vii. as the E-ELT enters its full-blown construction phase, and as the ALMA construction and commissioning phase comes to an end, ESO's already significant role in European radio astronomy should become clearer.

2.5 ASTRONET ERTRC Report

A draft of the ERTRC (European Radio Telescope Review Committee)

http://ertrc.strw.leidenuniv.nl/index.php?option=com_content&view=article&id=109&Itemid=30

was considered as input. There are several draft recommendations that are highly relevant to the RadioNet3 project, and specifically recommendation 16:

"We recommend that an organisation for radio astronomy in Europe be set up by agreement among the funding agencies and other relevant governing bodies. Its founding documents should specify a clear mandate and scope of its activities, as well as the manner by which its budget is set. This will be mandatory for an effective European representation in the SKA."

2.6 ASTRONET/RadioNet3/Go-SKA deliberations on positioning of Europe in SKA

ASTRONET had taken the initiative to organise a Round Table meeting on November 14, 2014 between ASTRONET, RadioNet3 and Go-SKA in response to the ERTRC report. The meeting had drawn a sharp reaction from the SKA Organisation. Neither the QSG chair or RadioNet3 coordinator were able to attend the meeting. Nevertheless, the QSG discussed various points, and these are detailed in the notes of the meeting. There was concern within the QSG about some of the statements being made in the notes, in particular (reproduced below):

"It is clear from the discussion that:

- *The organisation of European Radio Astronomy requires careful planning and a step-by-step approach.*
- *The organisation of Radio Astronomy for SKA should not be addressed independent of other structures. It would be key that a European organisation does not only look after SKA, but also after the existing large facilities. In particular JIVE should be included, and possibly also the ILT and the EPTA. Small (national) facilities do not require coordination at the European level.*
- *A European organisation for Radio Astronomy should focus on facilities and technology development, not on science."*

The QSG felt it was premature to come to some of these conclusions, and that this should be explicitly recorded in this QSG report to the RadioNet3 Board. It is expected that another Round Table meeting would be organised in 2014.

2.7 Mid-Term Review of RadioNet3

The QSG addressed the relevant points of the RadioNet3 Mid Term Review (MTR) report one-by-one. The following conclusions were drawn:

- (i) it was felt that the notes of meetings should be made available only to the QSG and the RadioNet3 Board itself,
- (ii) interaction with the SKA Board will occur partly due to the overlap in the RadioNet3 and SKA Board membership, and via the exercise of consultation with external stakeholders (the latter also held for ASTRONET),
- (iii) the ERO light suggestion of the MTR was certainly an option, along with others,
- (iv) the QSG did indeed recognised the importance of the White Paper - the point about operational costs was well made and the white paper might need to be explicit on the various costs currently being made, and projected estimates for the SKA era. It was clear that the operational costs of the SKA require new funding sources to be identified, and
- (v) the advice to "tread carefully" in all areas was well made and also fully recognised by the QSG.

2.8 Options for European Radio Astronomy Coordination

By the end of the first QSG meeting, it was decided that one way of making progress was to generate some case studies that might form the basis of the options to be presented in the White Paper (see below).

At the second meeting, 2 options were prepared by subsets of the QSG, and circulated as working documents:

- 1) a light evolution of the current set-up with RadioNet as an overarching umbrella for European Radio Astronomy,
- 2) the establishment of a new (or the adoption of an existing) legal entity for European Radio Astronomy.

A third option proposed, since labelled the "RadioNet++ option", suggests a more aggressive evolution of RadioNet towards establishing itself as an independent legal entity.

2.9 Next steps

The QSG will meet again in 2014 to identify new options and to further develop those listed above. In addition, the QSG wishes to review how other fields have evolved in terms of centralised or distributed approaches. Indeed it was noted that even within our own field, lessons could be learned (ESO, ILT, JIVE, IRAM, EVN etc) - what has worked well and what has worked less well? Some examples of centralised (e.g. NRAO) and distributed (e.g. ESO) models were discussed.

The conclusion was that a fully centralised approach could endanger the goals of maintaining a broad and geographically distributed Radio Astronomy expertise, and that this danger should be tested against the various options.

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