

# PROJECT PERIODIC REPORT

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## Declaration by the scientific representative of the project Coordinator

I, as scientific representative of the Coordinator of this project and in line with the obligations as stated in Article II.2.3 of the Grant Agreement declare that:

- The attached periodic report represents an accurate description of the work carried out in this project for this reporting period;
- The project (tick as appropriate) <sup>1</sup>:
  - has fully achieved its objectives and technical goals for the period;
  - has achieved most of its objectives and technical goals for the period with relatively minor deviations.
  - has failed to achieve critical objectives and/or is not at all on schedule.
- The public website, if applicable
  - is up to date
  - is not up to date
- To my best knowledge, the financial statements which are being submitted as part of this report are in line with the actual work carried out and are consistent with the report on the resources used for the project (section 4) and if applicable with the certificate on financial statement.
- All beneficiaries, in particular non-profit public bodies, secondary and higher education establishments, research organisations and SMEs, have declared to have verified their legal status. Any changes have been reported under section 2.3 (Project Management) in accordance with Article II.3.f of the Grant Agreement.

Name of scientific representative of the Coordinator: .....

Date: ...../ ...../ .....

For most of the projects, the signature of this declaration could be done directly via the IT reporting tool through an adapted IT mechanism.

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# 1 Summary of the progress of the work

This report covers the first 18 months of the 4-year Preparatory Phase project for the EISCAT\_3D facility, Europe's next-generation radar for the study of the high-latitude atmosphere and geospace, located in northern Scandinavia.

## 1.1 Context and objectives

The high-latitude atmosphere and ionosphere are critically important for the study of Solar-Terrestrial relationships as well as the physical processes and the coupling of the different altitude regions in the Earth atmosphere. The Arctic areas of Northern Europe provide a unique opportunity to observe this region from the ground with instruments placed within a well-developed infrastructure of observational facilities and research institutions. EISCAT\_3D will be a world-leading international Research Infrastructure, using the incoherent scatter technique to study the atmosphere in the Scandinavian Arctic and to investigate how the Earth's atmosphere is coupled to space. EISCAT\_3D will provide an advanced tool for studying plasma physics phenomena in the atmosphere, a key atmospheric monitoring instrument for climate and space weather studies and an essential element in international global multi-instrument campaigns for studying the environment.

EISCAT\_3D will consist of several phased-array antenna sites for transmission of high-power radio waves and reception of faint signals back-scattered by charged particles in the atmosphere. Measuring and analysing the radio signal accurately probes the composition and physical parameters of the upper atmosphere. Each antenna array will consist of a large number of single antennas whose individual signals are digitally manipulated and combined to provide a cutting-edge atmospheric radar system. This will enable new types of volumetric imaging observations, multi-static observations, detailed studies on small scales, and quasi-continuous observations of the upper atmosphere. In order to reach the measurement objectives the radar will be distributed over several sites in Northern Scandinavia. The flexibility of the new instrument requires new measurement strategies and opens the radar observations to an expanding user community.

EISCAT\_3D will contribute to the growing field of research based on accumulating, handling and analysing large data volumes for Earth system studies. The fully working array will produce a data rate of several TB/s and the expected stored data volume in the initial phase of operation will be of the order of 1000 TB per year. Exploitation of its full potential requires collaboration with regional e-infrastructures and close connection to global e-infrastructures for the environment.

EISCAT Scientific Association is the Coordinator of the EISCAT\_3D Preparatory Phase project. EISCAT is currently funded and operated by research councils of Norway, Sweden, Finland, Japan, China and the United Kingdom and has its headquarters in Kiruna, Sweden. It runs a radar system on Svalbard and a system on the Northern Scandinavian mainland consisting of a main transmitting and receiving radar site in Tromsø, Norway, and receiving sites in Sodankylä, Finland, and Kiruna, Sweden. The latter mainland system, that has successfully been producing incoherent scatter data for more than 30 years, will be replaced by the new EISCAT\_3D system. The EISCAT host institutions actively participate in the project.

The current Preparatory Phase, that started in October 2010, aims to ensure that the project will reach a sufficient level of maturity so that the implementation of EISCAT\_3D can begin immediately after its conclusion in September 2014.

## **1.2 Work performed and main results**

The Preparatory Phase is concerned with forming a consortium, procuring the financing, selecting the sites, preparing for the data handling, considering the scientific requirements and planning construction and operation. For all these tasks researchers and other stakeholders are involved. The project actively involves the scientific user community and all relevant documents can be found on the project website ([www.eiscat3d.se](http://www.eiscat3d.se)), the major fraction being open to the public.

EISCAT Scientific Association will provide the basis for the future EISCAT\_3D consortium. The current EISCAT Associates have stated their support for the new EISCAT\_3D. A letter of intent in order to support the EISCAT\_3D project was fixed by the Council in October 2011, to be signed by the current EISCAT Associates and possibly also by potential new members of the association. EISCAT Council has formed a working group together with the project to negotiate a new consortium agreement for the EISCAT Association that should be more suitable for constructing and operating EISCAT\_3D and for attracting new members. Procedures will also be implemented within the research infrastructure to safeguard good scientific practice and to ensure the commitment to excellent research.

To procure the finances, major investments will be needed from several countries. The current estimate of costs for EISCAT\_3D that assumes a total budget of 120 M€ to be invested over 5 – 8 years, needs to be confirmed based on detailed planning and site selection. User groups in Norway, Sweden and Japan are currently planning to submit proposals during the coming year for investment into EISCAT\_3D. The Finnish user community plans submitting a proposal in the autumn of 2012 to include EISCAT\_3D in the national roadmap for research infrastructures. Funding situations in China and the United Kingdom are currently explored. Several other countries are either actively pursuing research based on EISCAT measurements or planning to do so in the near future. These are Belgium, Germany, Ireland, Italy, Poland, Russia and Ukraine. Some of these countries currently consider possible future participation in the EISCAT\_3D consortium. The outreach activities of the project, conference presentations by the project participants and the EISCAT\_3D project meetings are particularly important in this context.

The site selection makes progress, though the requirements for site location vary for the different measurement objectives and need to be balanced. The project has also realised that site selection would not only be based on scientific considerations. The site surveys, that are carried out by the project, investigate the radio environment as well as the local infrastructure conditions. These can not be made during the Arctic winter which constrains the schedule to the summer. Allocations for the frequency range of the EISCAT\_3D system were obtained in Norway, but not in Finland and Sweden. Progress in frequency allocation can be made as soon as the sites are selected and the first construction funding for the project is granted.

Planning for the data handling covers issues ranging from the direct connection of radar sites to the internet to the maintenance of the data and its placement within the framework of international geospace observatories and environmental research infrastructures. Some of the Work Packages related to data handling and data management have not formally started yet, since they for instance require knowledge of the detailed instrument performance and the radar sites. Nonetheless, some more general issues of data handling can be addressed by using the current EISCAT data and this approach is currently pursued. Preparatory work is also carried out in the frame of other projects. EISCAT, as Coordinator of the EISCAT\_3D Preparatory Phase, participates in consortia funded by the European Union through Framework Programme 7: ENVRI is related to the common needs of ESFRI projects in terms of data handling, storage and management. ESPAS will facilitate user access to space weather data from ground-based and satellite experiments. COOPEUS that is

currently under negotiation will facilitate collaboration with US environmental research institutions for common data policies and standards relevant to global research infrastructures in the environment field.

The scientific requirements have a major influence on the system design and for this a Science Case is continuously revised in collaboration with the present EISCAT user community and with prospective future users. Communication with the scientific user community is facilitated through outreach activities, conference presentations and a series of dedicated meetings organized by the project. The website for EISCAT\_3D has been online since March 2009 and is regularly maintained and updated. A user account system on the website was introduced at the beginning of the project and facilitates the close connection of the project to the community. The project sets a high priority on expanding the user base into the space weather and middle atmosphere communities, which have not been major users of EISCAT in the past. Nonetheless, discussions also showed that in order to prepare competitive proposals to the national funding bodies it is important to clearly state the primary objectives of the project and to emphasise the key scientific issues that focus on those measurement capabilities of EISCAT\_3D that are unique: the capability of continuous observations, of both small and large scale observations and the flexibility of changing the modes in order to directly respond to observed phenomena.

Planning the construction and operation of the new system requires a detailed instrument design. The design planning is based on a previous Design Study (funded within FP6) and on the long experience with the existing EISCAT radars. The project also aims to make use of innovative theoretical studies in signal processing, radar coding, data handling and data analysis. This recent progress is summarised in a handbook of measurement principles, whose initial version was prepared during the first months of the Preparatory Phase for consideration during the planning. The new instrument will carry out signal processing using Software-Defined Radio (SDR) receiver systems. The hardware needed for the field-testing of the planned signal processing development has been acquired. In order to produce designs of antennas, array layout, receiver front end and calibration systems suitable for manufacturing, antenna elements were identified and an antenna array layout was recommended. For designing and evaluating the EISCAT\_3D radar transmitter subsystem, a prototype 3-channel exciter has been successfully tested at the Jicamarca radar facility in Peru. In order to use the aperture synthesis imaging radar technique with the new instrument, simulations for optimal receiving outlier configuration were carried out and completed. A simple double triangular configuration was suggested as a result of this work. While work on specific technical tasks makes good progress, the results still need to be combined within an instrument design.

The project faces a wide range of expectations from researchers and other stakeholders. User expectations are in some cases contradictory, ranging from the desire to have a new system workable as quickly as possible to the desire to design the system in a sophisticated way based on the results of mathematically rigorous considerations. Combined with some gaps in the technical work that was proposed in the original project plan and with a deficiency in available engineering workforce at the project Coordinator, this has delayed the preparation of the instrument performance specification. This delay of a Deliverable in the project has an impact on some of the technical Work Packages and imposes uncertainties on budget and experiment description needed for the consortium negotiations. The project Coordinator approaches this problem with an additional recruitment planned for May 2012 and continued efforts to communicate with the user community. Further recruitments are envisioned for the autumn 2012. Other delays of Milestones and Deliverables have less impact on the work plan. Delayed starts of some of the Work Packages have also required minor changes in the project planning that will be compensated by an intensified

activity later in the project. The project benefits from its location within a network of well-developed observational facilities and research institutions that are very supportive of the project. At the same time they have different expectations that have to be met in a way so that all stakeholders are satisfied. To meet this challenge the project Coordinator benefits from exchange of experience, networking and training on managing international research infrastructures that is offered by projects within the Framework Programme 7. Swedish Research Council supports the development of the project with a 7 MSEK planning grant for 2012 and 2013 from its funding programme for research infrastructures. A major fraction of this funding is planned for negotiations and organisational preparation of the project.

### **1.3 Expected final results**

The goal of the Preparatory Phase is to bring the EISCAT Scientific Association in the position to begin implementing the new infrastructure in 2014. While not all of the Deliverables of the project have yet been delivered on time, the reasons for delays have been identified and measures have been taken to compensate for these delays so that there is confidence within the project that the EISCAT\_3D Preparatory Phase will end successfully. Regional and national enterprises from a wide range of industrial sectors are expected to participate in building the new system. The project expects that the EISCAT\_3D data will be managed in collaboration with the local e-infrastructure in the Nordic countries. The Research Infrastructure will be connected to universities and research institutions locally in Northern Scandinavia close to the sites, and globally through the members of the association and the international research community. EISCAT\_3D will also provide young researchers and engineers the opportunity to gain experience in the maintenance and handling of huge data volumes and will introduce young scientists to environmental research on internationally competitive level.

### **1.4 Project partners**

There are eight partners in the EISCAT\_3D Preparatory Phase:

- EISCAT Scientific Association (EISCAT, [www.eiscat.se](http://www.eiscat.se))
- University of Oulu (UOULU, [www.oulu.fi](http://www.oulu.fi))
- Luleå University of Technology (LTU, [www.ltu.se](http://www.ltu.se))
- Swedish Institute of Space Physics (IRF, [www.irf.se](http://www.irf.se))
- University of Tromsø (UiT, [www.uit.no](http://www.uit.no))
- Science & Technology Facilities Council (STFC, [www.stfc.ac.uk](http://www.stfc.ac.uk))
- Swedish Research Council (VR, [www.vr.se](http://www.vr.se))
- National Instruments Belgium NV (NI, [belgium.ni.com](http://belgium.ni.com), [belgique.ni.com](http://belgique.ni.com))

The host institutions for the present EISCAT systems are Sodankylä Geophysical Institute (independent department of University of Oulu), University of Tromsø and Swedish Institute of Space Physics.

## **2 Project objectives, work progress and achievements, project management**

EISCAT\_3D Preparatory Phase is a 4-year project that started on 1 October 2010. This report summarises the activities in the first 18 months of the project.

### ***2.1 Project objectives for the first reporting period***

The objective of the EISCAT\_3D Preparatory Phase is to carry out all of the activities required before the project can enter the Implementation Phase. The actions during the Preparatory Phase are aimed at organising the project legally and logistically, and facilitating the closure of any technical issues left open after the FP6 Design Study. The work plan of the Preparatory Phase lists the tasks that are needed to reach these objectives.

### ***2.2 Work progress and achievements during the period***

This section lists the progress of the EISCAT\_3D Preparatory Phase in the different Work Packages during the first 18 months of the project.

#### **2.2.1 Work Package 1: Project management and reporting**

A detailed account of the activities of the project management (Work Package 1) is presented in Section 2.3. In addition, this Work Package has been responsible for establishing the Technical Advisory Committee (TAC), a monitoring body for the technical execution of the EISCAT\_3D Preparatory Phase, and for the project meetings.

#### **2.2.2 Work Package 2: Legal and logistical issues**

This Work Package contains the support activities that are needed in order to clarify the site selection, to obtain frequency clearance and to identify infrastructural issues that need to be resolved before the construction and operation of EISCAT\_3D. This requires that the relevant frequency allocations are secured in the countries where EISCAT\_3D will be deployed (Task 2.1) and that the site selection is finalised (Task 2.2). In a further step in the project, the stakeholders need to be identified and the administrative issues of the utilisation of the sites need to be addressed (Task 2.3). The availability of access to relevant infrastructure (power, utilities, networking, transport) at the selected sites needs to be identified (Task 2.4) and the full cost of development of the sites needs to be quantified (Task 2.5).

The activities in this Work Package are coordinated by EISCAT Scientific Association.

#### ***Progress***

The activities in Work Package 2 started at the beginning of the project, and will continue until September 2013.

Task 2.1 (Frequency allocations): Frequency allocations for EISCAT\_3D have been obtained in Norway, but presently not in Finland and Sweden. However, it turned out that a change in the strategy for obtaining frequency allocations was needed compared to what was stated in the original

work plan. Since the negotiations involve simultaneous discussions with agencies from three countries, they need to be performed on a level which lies beyond the scope of the EISCAT\_3D Preparatory Phase and will thus take place outside the project. This also means that Deliverable 2.1 (Signed agreements on frequency allocations) will not be delivered, and Milestone 2.1 (Discussions on frequency allocations concluded and permissions obtained) will not be reached inside the EISCAT\_3D Preparatory Phase project, since the negotiations will take place elsewhere.

Task 2.2 (Finalising the site selection): Interactions with the Research Councils have revealed that the project should understand that decisions on site selection may not purely be based on scientific considerations. Thus the project has started preparing a short list of sites that are suitable both from a scientific and an infrastructural point of view, to present to the Research Councils as basis for negotiations. Such a list is currently under preparation at EISCAT and Tromsø University. Some survey activities have been made for all sites presently on that list. However, the site surveys can not be done in winter conditions and all required measurements on the sites were not finished before October 2011 have to be made during the summer of 2012 instead. This means that Deliverable 2.2 (Report listing the preferred sites) and Milestone 2.2 (New site surveys completed and selected sites identified) have to be shifted one year, so that all the needed measurements and surveying activities can be performed.

Tasks 2.3 (Discussions with site stakeholders), 2.4 (Access to infrastructure), 2.5 (Site development costs): Although detailed work on these tasks would be premature, some contacts with potential stakeholders are already established and a first evaluation of existing infrastructure at the sites that are under consideration has already been made with the present site survey data.

### ***Significant results***

From a scientific point of view, it is advisable that the core transmitting radar site would be located within roughly 100 km from a point at about 69° North and 20.5° East, which is close to the intersection of the Swedish, Norwegian and Finnish borders. This location is suitable for the study of atmospheric phenomena appearing east of the Scandinavian mountain range at low altitude, and also for high altitude observations together with supporting optical instruments requiring clear skies thanks to the favourable cloud cover statistics compared to more westerly locations. The site survey has considered sites within this area as well as several sites in other areas that could potentially serve as receiving sites for such a transmitter at this location.

### ***Deviations from the work plan***

Deliverable 2.1, that was due at the end of month 6 will not be delivered as part of the EISCAT\_3D Preparatory Phase project due to the change in the strategy for obtaining frequency allocations as discussed above. Similarly, Milestone 2.1 will also not be inside the project.

Deliverable 2.2 and Milestone 2.2 will be delayed one year, because the site survey activities can only be performed during the summer, and not all the needed measurements were made in the summer of 2011.

### ***Failures in reaching critical objectives***

The delays and changes in the work plan described above will not have a significant impact on the rest of the EISCAT\_3D Preparatory Phase.

### ***Use of resources***

The delay in the completion of the site survey activities means that some of the effort planned for this period will take place at a later point in the project.

### ***Corrective actions***

The frequency allocation discussions will take place outside the Preparatory Phase project, and will thus not be part of this Work Package. The site surveys will continue also in the summer of 2012.

## **2.2.3 Work Package 3: Science planning and user engagement**

The aim for Work Package 3 is to formulate the Science Case for EISCAT\_3D and to increase the user base of the future EISCAT\_3D facility beyond the existing EISCAT user community. A key part of this activity is to gather the requirements from the prospective users of the system, and the different types of new experiments that they would like to run. These requirements are then fed into the design and the implementation of the new infrastructure. Thus, this Work Package covers gathering these requirements, continuous updating of the Science Case and its tensioning against the capabilities of the new radar as they become progressively more well-defined.

The activities in Work Package 3 are coordinated by the University of Oulu through a Science Working Group with a rolling membership base.

### ***Progress***

Work Package 3 started at the beginning of the project, and the activities continue until 46 months into the project.

Task 3.1: (Form a Science Working Group and identify suitable contacts): The first task of this Work Package was to organise the work of the Science Working Group, consisting of a changing group of existing EISCAT users and scientists wishing to use EISCAT\_3D for new applications in fields neighbouring to the areas of the present system. In its first iteration, the Science Working Group was composed of seven scientists (including the WP3 leader and co-leader), with emphasis on atmospheric science applications of EISCAT\_3D. The Science Working Group had two meetings in the first half of 2011 where the science questions that could be addressed by EISCAT\_3D were discussed. One of the tasks the Science Working Group performed was to assemble a comprehensive list of contacts in prospective new EISCAT\_3D user communities. The second iteration of the Science Working Group also contains seven scientists, with emphasis on space weather and modelling issues, and their first meeting took place in January 2012.

Task 3.2 (Initial revisions of science plan and performance specification): The first version of the Science Case document has been prepared. Valuable input to the production of the Science Case came from the Science Working Group.

Task 3.3 (Regular reviews of the Science Case and feedback to software and hardware development): The Science Case is a living document that is evolving over time. A table of EISCAT\_3D radar performance requirements by science topics was compiled and is included as an appendix in the Science Case. This table is useful in the preparation of the Performance Specification Document in Work Package 6.

Task 3.4 (User engagement workshops): A workshop for members of the middle and lower atmosphere community was organised through Work Package 3 in May 2011, where the goals were to promote interaction with existing EISCAT users, to identify common science themes and to plan future research activities.

Task 3.5 (Final Science Case with user community requirements) will be performed at a later point in the project as an extension of Task 3.3.

In addition to these activities, EISCAT\_3D has been presented at several conferences and meetings as part of the user engagement activities.

### ***Significant results***

The initial version of the Science Case document has been prepared, and was delivered in June 2011.

The first user engagement workshop was held in Uppsala in May 2011, and a second workshop is planned for May 2012.

Two Science Working Groups have been formed, and they have been active in the science planning activities for the new system.

### ***Deviations from the work plan***

There are no significant deviations from the work plan.

### ***Failures in reaching critical objectives***

All critical objectives of this Work Package have been reached at this point of the project.

### ***Use of resources***

At this point in time, the spending is a little below the budgeted amount. UOULU has used person-months approximately as planned in this Work Package while STFC/RAL has used somewhat fewer person-months than planned at this stage due to other commitments such as activities in Work Package 1. These are minor deviations in the budget, and they can be corrected later in the project.

### ***Corrective actions***

No corrective actions are needed, and the work in Work Package 3 will continue as planned.

## **2.2.4 Work Package 4: Outreach activities**

The purpose of Work Package 4 is for the project to actively participate in outreach activities to provide information for the general public, opinion-formers, funding organisations, students and young people (the next generation of EISCAT users). This is done by making presentations at relevant meetings and conferences, by producing sets of outreach material intended for a variety of target audiences, and by maintaining an updated project web-site.

The outreach activities in this Work Package are coordinated by EISCAT Scientific Association.

## ***Progress***

The activities in Work Package 4 started at the beginning of the project, and will continue throughout its full duration.

Task 4.1 (Define and upgrade project web site): One of the tasks in Work Package 4 is to define and maintain the project website for EISCAT\_3D. This website ([www.eiscat3d.se](http://www.eiscat3d.se)) has been online since March 2009, and thus pre-dates the EISCAT\_3D Preparatory Phase project. However, at the beginning of the FP7 Preparatory Phase the website was updated, a user account system was introduced and it has been regularly maintained and updated since then.

Task 4.2 (Outreach plan): Early in the project, an outreach plan was produced, defining the various types of material needed to be produced in order to publicise the EISCAT\_3D project, the priority order in which this material should be produced and to identify the various different audiences which the project needs to address. This plan is updated when needed.

Task 4.3 (Contact list): In order to keep the participants in the project aware of funding opportunities, a list of contacts in the funding and policy organisations relevant to EISCAT\_3D was prepared as one of the tasks in Work Package 4. This list will be regularly maintained and updated so that it contains correct contact details.

Task 4.4 (Outreach materials) and Task 4.5 (Material for funding applications): An ongoing activity in this Work Package is to produce a selection of outreach material targeting different audiences, as defined in the outreach plan (Task 4.3). This material consists of hand-outs, brochures, press releases and similar items, and the intended target groups are scientists, policy makers, local communities, funding sources, media and school and university students. An initial library of material has been produced, where all these groups except the school and university students, have been addressed.

Task 4.6 (Presentations, project status and progress reporting): Another task in Work Package 4 is to report the progress of the project to the different stakeholders, including the European Commission, and this has been routinely done so far in the EISCAT\_3D Preparatory Phase project. Additionally, as part of the outreach activities in this Work Package, EISCAT\_3D has been presented at a large number of conferences and workshops.

## ***Significant results***

The EISCAT\_3D website was upgraded in December 2010 and has been continuously maintained and updated throughout the project.

A library of outreach material targeting most of the intended audience has been produced, and it is continuously updated.

## ***Deviations from the work plan***

There have been some delays in the production of outreach material. As a result, no material targeting university students and school children have yet been produced. The impact on other tasks in the project, however, is very limited.

## ***Failures in reaching critical objectives***

All critical objectives during the time period have been achieved.

### ***Use of resources***

Since not all of the tasks assigned during this periods have been done, the spending in this Work Package is below budget.

### ***Corrective actions***

In order to produce the educational material still missing from the library of outreach material, some relatively minor adjustments are needed in the outreach plan in order to schedule for this activity.

## **2.2.5 Work Package 5: Consortium building**

The objective of the Work Package 5 activities is to prepare for EISCAT\_3D in terms of identifying a supporting consortium of funding bodies, a funding scenario and an organisational structure that permits the implementation of the EISCAT\_3D system. The tasks in the Work Package are concerned with discussing the project with existing and potential future partners, clarifying the project costs, identifying funding opportunities, and completing the building of a consortium for funding the construction and operation of the EISCAT\_3D system.

The consortium building activities are coordinated by EISCAT Scientific Association.

### ***Progress***

Task 5.1 (Discussions with existing and potential future partners): Several discussions and meetings have taken place within the current member countries of the EISCAT Scientific Association, as well as with colleagues in Poland, Romania, Italy, Switzerland and Belgium. Close contacts exist already now between EISCAT and both Ukraine and Russia. An initial list has been prepared of potential EISCAT\_3D partner organisations (Deliverable 5.1) and it will serve as a basis for the consultations that will take place at a later stage of the EISCAT\_3D Preparatory Phase. This list mainly follows the bottom-up approach and can be used in combination with other contact lists prepared within the project. By participating in European and international projects EISCAT also reaches out for users within specific user communities, e.g. related to space weather and to environmental research.

Task 5.2 (Clarification of the project costs): A preliminary cost estimate of 120 M€ was made based on the results of the FP6 Design Study for a full-size core and four to six receiver sites, including ground support instruments and one movable site. The implementation of the full instrument will include a 4-year construction phase that should end with a system having incoherent scatter measurement capabilities already far beyond those of current systems. After the construction, a 4-year consolidation phase has been suggested in order to exploit the full 3D capabilities of the system by dedicated data processing. This cost estimate is going to be evaluated and substantiated in 2012 through input from the performance specification (Work Package 6) and site selection (Work Package 2) activities.

Task 5.3 (Identification of funding opportunities): EISCAT\_3D was brought up and discussed during a recent meeting of NOS-N (The Joint Committee of the Nordic Research Councils for Natural Sciences), a collaborating body for Nordic research councils that finance research in the natural sciences. There are expected calls for proposals for research infrastructure funding within the next two years in Sweden, Norway and Japan. EISCAT\_3D, together with the national user communities, will prepare submitting these proposals. The Norwegian participants have already

organised a first meeting in order to prepare for a proposal, and the Japanese user community has also begun the preparations.

**Task 5.4 (Completion of the consortium building):** A working group consisting of members of both the current EISCAT Council and of the EISCAT\_3D project is negotiating new statutes for the organisation. This is needed in order to prepare for the investments into EISCAT\_3D and to have an organisational structure that is suitable for the EISCAT\_3D project with a potential to attract new members. The working group aims to deliver a first draft of the new statutes for discussion at the EISCAT Council meeting in May 2012, with the prospect to deliver a proposal for the new statutes at the following EISCAT Council meeting (November 2012). Additionally, a letter of intent in order to support the EISCAT\_3D project was fixed by the Council in October 2011. This letter will be signed by the current EISCAT associates (China, Japan, Finland, Norway, Sweden and the UK) and possibly also by potential new associates.

### ***Significant results***

The upcoming deadlines for proposal submission in Japan, Norway and Sweden will require focusing activities primarily in these countries during the coming year. The Swedish Research Council has granted 7 MSEK funding for technical personnel, a facilitator and administrative support for preparatory work with EISCAT\_3D in the years 2012 and 2013 .

### ***Deviations from the work plan***

Deliverable 5.1 (Initial list of potential EISCAT\_3D partner organisations) was due at the end of month 6, but was delivered in month 14. The reason for this delayed was that the project manager could only start the work on month 11 of the project.

### ***Failures in reaching critical objectives***

All critical objectives in this Work Package has been reached at this point of the project.

### ***Use of resources***

The slow start of this Work Package has meant that the spending is below budget at the moment.

### ***Corrective actions***

There is no need for corrective actions at this point. The upcoming deadlines will require intensification of the activities during 2012 to compensate for the slow start of this Work Package.

## **2.2.6 Work Package 6: Performance specification**

The aim of Work Package 6 is to revisit the initial performance specification that was established at the beginning of the FP6-funded EISCAT\_3D Design Study, to incorporate a range of new measurement principles and to keep this performance specification under continuous review as the EISCAT\_3D Preparatory Phase progresses.

The activities in Work Package 6 are coordinated by EISCAT Scientific Association.

## **Progress**

Task 6.1 (Collate performance specification information from FP6 Design Study): In this task the performance specification from the FP6 Design study was revisited, taking findings and ideas which have emerged since the end of the Design Study into account, in order to generate an initial Performance Specification Document (Deliverable 6.1). Some findings were not evaluated properly at that time, so it was too early to modify the performance specification of the FP6 study. The description of this Deliverable requires that it should include an overview of the performance specification and the required reliability for all hardware elements. However, the project, advised by the chair of the Technical Advisory Committee, decided that this document should provide a structure listing all the items that need to be covered in the detailed Engineering Performance Specification Document, a document that needs to be established at the beginning of the EISCAT\_3D Construction Phase. Thus, during the Preparatory Phase, Deliverable 6.1 will serve as a guideline for the questions to be answered by work performed in the technical Work Packages.

Task 6.2 (Handbook of measurement principles): This task includes work to summarise and document innovative ideas in the theoretical studies of signal processing, coding, data handling and data analysis that have recently emerged, and to evaluate how these ideas can be applied with the new hardware. This is summarised in a handbook of measurement principles whose initial version forms Deliverable 6.2. The handbook describes and applies mathematical formalism and a set of statistical inversion theories to describe the principles of incoherent scatter measurements as well as the signal processing. Calculations have been carried out in order to find theoretically optimal solutions for the design of receiver-transmitter array configurations with the goal to provide the best possible performance for a given cost. The initial handbook also provides a numerical algorithm to estimate the measurement capabilities that can be achieved with a certain geometric configuration of transmitting and receiving sites. The handbook will be further expanded and iterated during the project.

Task 6.3 (Ongoing revision of performance specification): The third task of this Work Package is to update and maintain the Performance Specification Document to provide a basis from which to define the targets of the technical Work Packages. In order to do this, the results from Task 6.2 should specifically be incorporated, as well as the demands from the science community through the Science Case. An ongoing discussion in the project is how some of the results from Task 6.2 could be included in the performance specification while at the same time ensure that the instrument could realistically be ready for construction at the end of the Preparatory Phase. The ambition in the handbook is to utilise digital signal processing to a large extent with the ultimate goal of having a fully digital radar system (i.e. a software radar). Another suggestion in the handbook is to use a locally bi-static configuration at the central core site, that is a system where the radio transmission and reception are done with separate antenna arrays, which potentially could enhance the system performance. In theory, such a configuration bears some definite advantages in comparison to the conventional set-up of incoherent scatter radars, where the same antennas are used for transmission and reception. The options for such a locally bi-static solution have been discussed intensely and the project came to the solution that at the current point, the technical difficulties that would arise from such a set-up can not be fully estimated. As a result, the project currently follows a combined approach. The baseline core configuration will consist of a mono-static transmitting/receiving array that will make use of the design effort that is currently undertaken in Work Package 9 and will in addition comprise an array of antennas that are only designed for reception that will be used to investigate the performance of the locally bi-static configuration. Similarly the transition from a conventional radar system to a fully digital software radar is a critical step. It ultimately requires data handling and storage capabilities that are not available or not affordable at this point, but may

become so in the years to come. Also in this case the current design will be kept flexible in order to allow for a transition to a software radar system when it is fully available. These considerations will be summarised in the integrated performance specification document (Deliverable 6.3) that will be prepared before the summer of 2012.

### ***Significant results***

The initial Performance Specification Document has been produced, to be used as a guideline for which questions need to be answered by work performed in the technical Work Packages.

The first version of the handbook of measurement principles has been produced, and will provide input into the further development of the performance specification.

In order to facilitate the smooth progress of the other Work Packages a group of technical experts has suggested that the EISCAT\_3D Preparatory Phase project should continue based on the technical design of an initial performance specification which still permits modifications to take the results from the theoretical studies into account.

### ***Deviations from the work plan***

In contrast to the original work plan, Deliverable 6.1 does not include an initial performance specification, but rather the draft of the future Engineering Plan. This document thus defines which questions the technical Work Packages need to answer.

Deliverable 6.3 is presently delayed by 6 months, because the initial handbook of measurement principles (Deliverable 6.2) suggests two significant changes in the performance specification compared to the plans in the FP6 Design Study. Making such changes involves taking large risks and this has generated lively discussions within the project. Because other Work Packages rely on the performance specification, it was decided to formulate the performance specification so that the option for incorporating the ideas in the handbook is still open. These discussions, combined with a lack of engineering workforce able to work in the project from the Coordinator side, are the reasons for this delay.

### ***Failures in reaching critical objectives***

The Performance Specification Document is delayed, but the impact on the other Work Packages will be kept small if the work here progresses smoothly during the coming months. This would ensure that the technical Work Packages receive the performance specification that they need to continue their planned work.

### ***Use of resources***

This Work Package is approximately following the budget. In general, this Work Package suffers from a bad balance between the work tasks and the corresponding assigned work force. The project plan allocates 28 work months for summarising and documenting new measurement principles, but only 6 months for the actual work on the performance specification.

### ***Corrective actions***

EISCAT has hired a Technical Expert, beginning work on 1 May, 2012, who will be in charge of Work Package 6 and thus will coordinate the production of the performance specification.

## **2.2.7 Work Package 7: Digital signal processing**

In Work Package 7 the signal processing techniques using Software-Defined Radio (SDR) receiver systems are developed to be suitable for parallel processing of signals from a phased array radar, initially through laboratory set-ups of hardware and software and later followed by a field trial of the developed units.

The activities in this Work Package are coordinated by EISCAT Scientific Association.

### ***Progress***

The activities in Work Package 7 started at the beginning of the project, and will continue until spring 2014.

Task 7.1 (Sampler FPGA firmware development): The goal of this task is to obtain functional solutions for the needed implementation of the FPGA (Field Programmable Gate Array) sampling firmware, so that the sampler systems are capable of the required signal processing. Modifications of the USRP (Universal Software Radio Peripheral) firmware have been accomplished with Corgan LLC. In addition, parallel sampling has become possible thanks to development by Ettus Inc.

Task 7.2 (Acquiring sampling hardware for prototyping and testing): In order to be able to perform field-testing of the signal processing techniques using SDR receiver systems, hardware consisting of 38 dual-channel samplers and various kinds of front-ends have been acquired.

Task 7.3 (Integration of the optimised sampling hardware and analog hardware): This task is intended to integrate the sampling hardware developed in this Work Package with the analog front end hardware developed in Work Package 8.

Task 7.4 (Field-testing and demonstration): This task was planned to start before the summer of 2012. However, some early tests have already been performed. A dual-channel high dynamic receiver has been installed and tested at the EISCAT heating facility in Tromsø. Additionally, a 6-channel digital receiver has been installed at the EISCAT Svalbard Radar and has been used to perform some test measurements.

Task 7.5 (Clock synchronisation): The feasibility of using an off-the-shelf synchronisation system, such as the White Rabbit system, available from the EISCAT\_3D industrial partner National Instruments, is investigated. These activities are performed in parallel with Work Package 8.

### ***Significant results***

Most of the hardware that is needed for the field-testing has been acquired.

### ***Deviations from the work plan***

The acquirement of the field-testing hardware was delayed due to purchasing regulations at the University of Oulu. This process has delayed some of the planned activities in this Work Package, but there are no significant effects from this on the other Work Packages in the project.

### ***Failures in reaching critical objectives***

The critical objectives so far into this Work Package have been met.

### ***Use of resources***

In the original plan, the largest amount of work was planned to be performed by EISCAT. However, EISCAT has not been able to hire a person for this purpose and thus, the work load for Sodankylä Geophysical Observatory (SGO) has been increased to compensate for this. At the end of this period SGO is on its budget target but EISCAT has not used any of its allocated resources for work in this Work Package.

### ***Corrective actions***

Since there is no scope for EISCAT Scientific Association to hire a person for this Work Package, the project management has proposed to the General Assembly (GA) a project revision where the EISCAT tasks, and their associated budget allocation, should be transferred to SGO, who has staff available for these tasks.

## **2.2.8 Work Package 8: Antenna, front end and time synchronisation**

The aim of Work Package 8 is to produce designs of antennas, array layout, receiver front end and calibration system that are suitable for industrial consideration, and to identify the people who are capable of constructing these hardware elements.

The activities in this Work Package are coordinated by Luleå University of Technology.

### ***Progress***

The activities in Work Package 8 started at the beginning of the project, and will continue until month 42 into the project.

Task 8.1 (Antenna specification): One of the tasks of Work Package 8 is to specify the physical and electrical design of the individual antenna elements following the performance specification defined in Work Package 6. Eventually the antenna design will, through Work Package 14, be conducted in cooperation with an industrial manufacturer in order to ensure that it is mass-producible at reasonable cost. Following the initial performance specification inherited from the FP6 EISCAT\_3D Design Study, these activities have found the recommended antenna element for the array to be a folded dipole with a reflector element, although the design might change significantly based on future recommendations from antenna manufacturers. Also, the performance specification in Work Package 6 must be finalised before the antenna elements can be designed in detail and optimised for performance and production. Initial measurements have also been performed on the effects of snow accumulation on simple antenna structures.

Task 8.2 (Array configuration): Another task in this this Work Package is to identify possible configurations of the antenna array with respect to the hardware and electromagnetic properties. The initial studies have shown that a triangular grid is one promising antenna array layout. However, considerations will need to be taken on the requirements posed by other Work Packages in the EISCAT\_3D Preparatory Phase.

Task 8.3 (Electric and mechanical front end design): The task of designing the electric and mechanical front end to the updated system requirements, in terms of operating frequency, bandwidth, dynamic range, noise figure, calibration methods and return loss requirements, has had to be delayed due to the delay in the production of the Performance Specification Document. The work in this task has in the meantime commenced with the selection of components. An important step in this process is the characterisation of components in the relevant frequency range. For this purpose, a specialised test environment has been designed and is now being built.

Task 8.4 (Calibration): Investigation of timing and antenna calibrations is also an activity in Work Package 8. The work in this task has been performed in two areas. Firstly, in the Arctic environment, where the antenna arrays will be located, the phase of the far-field radiation pattern might change due to seasonal snow cover. One way to mitigate this effect is to install a system capable of measuring the position and time delay of a received signal through each of the individual antenna elements. Investigations have shown significant potential in this approach if sufficiently simple antennas are used. However, the amount of additional infrastructure required for this approach makes this a less desirable option. Thus, this is not at the present considered for the final array, although the option should be kept in mind for future upgrades of the system. For calibration purposes, the current plan is instead to rely on celestial radio sources and existing radar targets currently in orbit. Secondly, the relative phase of all receivers must be precisely known. For this purpose, a time distribution system, as the one built by National Instruments, is considered in the project. From the performance of the current version of this system, we estimate that the system can be operated using this system alone, but that augmenting it with an additional system may yield non-negligible performance improvements. The work in Task 8.4 has therefore proceeded with a thorough evaluation of the calibration system that was produced as a prototype for the FP6 EISCAT\_3D Design Study project. The evaluation shows that the performance that can be achieved with this system will fulfil the demands on calibration, including the signal path from the antenna through cabling and A/D converter. The final inclusion of this system in the finished EISCAT\_3D radar is however subject to the evaluation of achieved performance when using time distribution only.

### ***Significant results***

Based on the preliminary performance specifications, the recommended antenna elements are folded dipoles with reflectors.

No local measurement system should be built initially, but the option should be kept for the future.

The refined calibration system, as built in the EISCAT\_3D FP6 Design Study, does meet the requirements for EISCAT\_3D.

### ***Deviations from the work plan***

There are delays in some of the tasks in this Work Package, following from the delay in the production of the Performance Specification Document in Work Package 6. Without this specification, it is not possible to finalise the initial antenna elements and antenna array configuration, and it will thus potentially delay the production of the prototype antennas used for testing. Similarly, the electrical and mechanical front-end design is also dependent on the performance specification.

Another factor in the progress of Work Package 8 is that an LTU staff member originally working on the project has left LTU. His position has however at the writing of this report already been replaced with one senior professor working as expert guidance, and one engineer to do antenna design. With this set-up, a highly productive continuation of this Work Package is foreseen.

### ***Failures in reaching critical objectives***

The specification of the antenna elements and the antenna array configuration is not completed due to delays in the production of the Performance Specification Document in Work Package 6. The greatest impact of this delay will be in Work Package 14, where the mass production and reliability issues are addressed. With the changes in project staff as described above, there should be good possibilities to minimise these effects.

### ***Use of resources***

The Work Package is on budget target although the tasks have been carried out in a different order compared with the original plan.

The main cost in WP8 has been salaries. Some travelling to attend technical meetings, as well as meetings for the EISCAT\_3D Executive Board where LTU personnel are represented, have also been done. Material has been purchased to enable work on the time synchronisation system as well as on the characterisation of components, and computers have been purchased for staff use and for calculation purposes. Some measurement equipment and associated lab hardware have also been purchased.

### ***Corrective actions***

No corrective actions are proposed for Work Package 8.

## **2.2.9 Work Package 9: Transmitter development**

In Work Package 9 a couple of important parts of the EISCAT\_3D radar transmitter subsystem is designed and evaluated. These parts are the exciter, the beam-steering system and the Transmit/Receive (T/R) switch.

The activities in this Work Package are coordinated by the Swedish Institute of Space Physics.

### ***Progress***

The activities in Work Package 9 started at the beginning of the project, and will continue until month 30.

Task 9.1 (Design, mock-up and evaluation of exciter and pre-driver system): The progress of this task has been going according to the work plan. A fully digital exciter design based on an off-the-shelf digital up-converter chip has been developed and a prototype unit has been constructed. That unit could not be tested at the EISCAT facility in Tromsø as was originally planned, instead the testing took place at the incoherent radar facility in Jicamarca, Peru, in March 2012.

Task 9.2 (Mock-up and evaluation of the beam-steering system): The plan is that the prototyping and testing of the beam-forming of the transmitted beam will start after the summer of 2012.

Task 9.3 (Verification and evaluation of the T/R switch design): The verification and evaluation of the T/R switch design from FP6 Design Study is another activity of Work Package 9. This work has recently commenced and is progressing according to the work plan.

### ***Significant results***

The prototype 3-channel exciter has been successfully tested at the Jicamarca incoherent radar facility in Peru.

### ***Deviations from the work plan***

The testing of the exciter prototype had to be moved from the EISCAT transmitter site in Tromsø to the Jicamarca radar facility in Peru, due to technical concerns. This trip was not part of the original plan and has thus affected the budget of this Work Package. This can be adjusted during the next reporting period.

### ***Failures in reaching critical objectives***

All critical objectives in Work Package 9 at this time in the project have been achieved on time.

### ***Use of resources***

The Work Package is on its target budget, although the testing in Peru has had some effects on the distribution between salary and other costs in the Work Package.

### ***Corrective actions***

No corrective actions are needed in Work Package 9.

## **2.2.10 Work Package 10: Aperture synthesis imaging radar**

The activities in Work Package 10 are focused on determining the optimum number of outlying passive phased array antennas and their optimum localisation in order to fulfil the imaging spatial resolution criteria of the aperture synthesis imaging radar technique.

The activities in Work Package 10 are coordinated by University of Tromsø.

### ***Progress***

Work Package 10 was planned to start at the beginning of the project, and to continue for 24 months. The start was delayed three months, however, and the scheduling of the Work Package has had to be adjusted accordingly.

Task 10.1 (Simulation software): One of the activities in Work Package 10 is the development of software for the simulation of incoherent scatter signals, so that imaging algorithms can be tested using different configurations of the antenna arrays. This work has progressed according to the plan and the final version software is ready and available.

Task 10.2 (Evaluation of inversion algorithms): Another activity in this Work Package is the evaluation of the available image inversion algorithms, using simulated data prepared in Task 10.1. The final evaluation and ranking of the algorithms are in progress.

Task 10.3 (Outlying receiving site configuration): The configuration of the outlying receiving sites, optimised for aperture synthesis imaging purposes, is another task of this Work Package. It was concluded that a simple double triangle configuration of the outlying sites appears to be more favourable, often demonstrating higher resolution, than the other tested layouts.

Task 10.4 (Development of operational image inversion and visualisation software): One task of this Work Package is to develop operational software for multi-dimensional visualisation built on the prototype package from the EISCAT\_3D FP6 Design Study. It is based on the choice of the image inversion algorithm, and the main focus will be on high computational speed. This work is progressing according to the work plan, and will continue until the end of this Work Package.

Task 10.5 (Transmitting/receiving antenna beam matching): Another activity in Work Package 10 is beam matching of the transmitting and receiving phased array antennas. This is needed since the differences in the sizes of the phased arrays used to transmit and to receive may produce a mismatch of the antenna beam patterns, which can be improved by widening the transmitting antenna beam pattern. Here the feasibility of techniques to accomplish this widening, such as antenna beam coding, are evaluated. These activities are in progress, however, the final report will be delayed until August or September 2012 due to constrained availability of a consultant.

### ***Significant results***

Simulations for optimal outlying receiving site configurations are completed, suggesting a simple double triangular configuration.

The final version of the low-level software for simulation of incoherent scatter signals is ready, and can be used for further evaluation of image inversion algorithms and outlying receiver site configurations.

### ***Deviations from the work plan***

There have been some delays in Work Package 10. These delays are due to starting the Work Package three months later than planned because of a delay in the possible starting date for the person doing the work. No significant impact from these delays on other Work Packages are expected, and there is a plan to extend Work Package 10 three months to compensate for the delayed start.

### ***Failures in reaching critical objectives***

All expected critical objectives of Work Package 10 have been reached at this point in the project.

### ***Use of resources***

The use of resources is mostly according to the original plan, with the exception of the delay in starting the EISCAT\_3D Preparatory Phase work mentioned above. Some deviations are expected in the use of the travelling budget.

### ***Corrective actions***

No corrective actions are needed apart from the already mentioned shift of three months in the scheduling.

## **2.2.11 Work Package 11: Software theory and implementation**

The purpose of Work Package 11 is to develop the required software modules for the data processing and analysis tasks of the EISCAT\_3D radar system. This development of new data algorithms and software is needed because of the inherent complexity of a distributed phased-array incoherent radar system compared to earlier systems.

The activities in Work Package 11 are coordinated by Sodankylä Geophysical Observatory, which is part of University of Oulu.

### ***Progress***

The activities in Work Package 11 started at the beginning of the project, and will continue until the autumn of 2013.

Task 11.1 (Productification and parallelisation of FLIPS): One task of Work Package 11 is the parallelisation of the basic inverse problem solving tools for signal processing and data analysis to be used in the EISCAT\_3D radar system. Inversion techniques will be at the core of EISCAT\_3D computations in signal processing, beam-forming, interferometry and data analysis. Parallelisation of these tools are needed to make optimum use of multiple processors so that the computational time is minimised.

Task 11.2 (Development of signal processing and beam-forming software): Another task of this Work Package is the development of software for the signal processing and beam-forming systems. Initially the focus have been on the design and coding of the beam-forming software to be run in the high performance computing cluster. Specifically, it involves the implementation of the software architecture defined in the handbook on measurement principles (Work Package 6), comprising time-delay filtering, and summation calculations for beam-forming. The work has been carried out on the basis that the software should be applied to the software-defined radio hardware being evaluated in Work Package 7.

Task 11.3 (Development of new multi-purpose codes): Development of multi-purpose codes is needed in order to allow the EISCAT\_3D system to be used in an optimised fashion. This includes development of experiments enabling the new system to be used up to its theoretical limit.

Task 11.4 (Productification of the analysis software package): The development of data analysis software has recently begun. This task contains activities to make these tools applicable to multi-beam measurements and imaging applications, and to allow for some new experimental methods that the new system will enable.

Task 11.5 (Integration of hardware and software): The final task of Work Package 11 is the integration of EISCAT\_3D hardware and software. A consistent set of optimised hardware and software for beam-forming and signal processing will be identified, and its operation will be demonstrated as far as possible, using codes which deliver the best possible statistics within the constraints of the EISCAT\_3D system design. These activities are expected to start in the summer of 2013.

### ***Significant results***

The FLIPS (Fortran Linear Inverse Problem Solver) has been modified to utilise OpenCL and was able to achieve up to tenfold performance gain using NVIDIA's Tesla GPU Computing Processors.

LPI (data analysis) software has been modified so that a preliminary parallel version of the software as an R package is available. This still needs optimisation and implementation of some missing key features.

New radar codes (perfect pulse compression codes, optimised multi-phase codes and multi-phase alternating codes) will be tested using the Millstone Hill radar (in the beginning of April 2012). Some preliminary data have been recorded but are yet to be analysed.

### ***Deviations from the work plan***

There are no significant deviations from the work plan.

### ***Failures in reaching critical objectives***

All critical objectives in the work plan have been met at this point in the project.

### ***Use of resources***

The total costs in this Work Package is a bit below budget, which is partly due to a grant that Dr. Ilkka Virtanen got from the Finnish Academy of Science meaning that he does not need financing from this Work Package to cover for his salary. However, his grant covers only his salary, so he still needs some travel money from the Work Package. The budget also contains funding for the purchase of a parallel computer. However, instead a parallel computer purchased in February 2011 is going to be depreciated, partly retrospectively, over three years. The total amount used for salary costs is above budget. The difference is due to that the annual raise in salaries was larger than anticipated. The travel costs for this Work Package were above the budgeted amount during the period.

### ***Corrective actions***

Some of the money budgeted for salaries is needed to cover the travel costs. This will decrease the number of available person months, but should not be a serious problem because of the grant Dr. Virtanen received from the Finnish Academy of Science. The remaining budgeted funding will be sufficient to reach all the objectives of the Work Package.

## **2.2.12 Work Package 12: System control**

The aim of Work Package 12 is to determine the changes that need to be implemented in the existing EISCAT system control software (EROS) in order to be able to control a system on the scale envisaged for EISCAT\_3D, and to implement these changes.

The activities in Work Package 12 are coordinated by EISCAT Scientific Association.

### ***Progress***

The activities in Work Package 12 started in spring 2011 and are expected to continue until autumn 2013 following the work plan.

Task 12.1 (Generalisation of EROS for multiple nodes): The plan is to assess the possibility of running the existing EROS on multiple nodes by simulations and, if practical, implementation on multiple computers so that the distributed control can be demonstrated. For this purpose, some work has been done on interfacing EROS to the USRP-type (Universal Software Radio Peripheral) receivers that are used in software defined radio applications.

Task 12.2 (Extension of EROS to allow novel radar operations) will start at a later point in the project.

### ***Significant results***

There are as yet no significant results in this Work Package.

### ***Deviations from the work plan***

The work in this Work Package has started much slower than anticipated. This is partly due to the EISCAT staffing situation at Sodankylä, where these activities take place, which has changed more than what was expected when the EISCAT\_3D Preparatory Phase started. At the same time, unplanned work was needed on the old EISCAT UHF system, and this work had to be performed using time originally planned for EISCAT\_3D activities. The impact on other Work Packages from the slow start is minimal at the moment, but in order to provide the expected Deliverables the work speed has to increase in the coming year.

### ***Failures in reaching critical objectives***

At this time in the project there has not been any critical objectives in the work plan for this Work Package.

### ***Use of resources***

The main work in this Work Package has not really started yet. A representative of Work Package 12 has been attending project meetings, though, and some basic communication with other Work Packages has been performed. This means that this Work Package has only spent about 10% of its allocation for the period.

### ***Corrective actions***

No specific corrective actions are needed, except for an increase in the level of work activity.

## **2.2.13 Work Package 13: Data handling and distribution**

Work Package 13 is intended to determine how the EISCAT\_3D data system is implemented on the e-infrastructure which currently exists in northern Scandinavia (or is planned for the near future). This is achieved through engagement with the national providers of networking, storage and high

performance computing in order to ensure that the requirements of the project can be optimally satisfied.

The activities in this Work Package will be coordinated by the Swedish National Infrastructure for Computing, which is an entity within the Swedish Research Council.

### ***Progress***

The activities in Work Package 13 have not yet started. They are expected to begin after the summer of 2012.

The planned activities in this Work Package are: Determining how to address the networking requirements, using existing fibre networks as far as possible (Task 13.1), examination of any changes to the data-handling philosophy which might be required if the Software-Defined Radio philosophy is adopted for the signal processing and beam-forming (Task 13.2), interactions, and possible collaboration, with other ESFRI projects with respect to issues regarding data handling and distribution (Task 13.3), examination of the potential of existing resource providers to help address the storage and computing requirements for the EISCAT\_3D system (Task 13.4) and, finally, determining the optimum method for implementing the overall EISCAT\_3D data system concept, exploiting existing infrastructure as far as possible (Task 13.5).

### ***Significant results***

This Work Package has not yet started.

### ***Deviations from the work plan***

In the original plan, the activities in Work Package 13 were intended to start at the beginning of the project and continue at a relatively low intensity. These plans have subsequently been adjusted so that the activities will start at a later point in the project, but on a full time level. The impact on other Work Packages from this change is minimal, since the final Deliverables are still expected to be produced at the time defined in the original plan. However, the timing of the Milestones of this Work Package is affected by the change.

### ***Failures in reaching critical objectives***

This Work Package has not yet started.

### ***Use of resources***

None.

### ***Corrective actions***

As described above, Work Package 13 will start at a later time compared to the work plan, but it will proceed at higher intensity and thus the Deliverables are expected to be produced at the time defined in the work plan.

### **2.2.14 Work Package 14: Mass production and reliability**

Work Package 14 addresses the way in which the functional units of the EISCAT\_3D system can be specified for mass production at an affordable price. The activities include interaction with industrial partners capable of manufacturing the various sub-systems, since iteration of the design is expected to be necessary for the optimum mass-producible and reliable components.

These activities will be coordinated by EISCAT Scientific Association.

#### ***Progress***

The activities in Work Package 14 have not yet started. The plan is to start these activities in October 2012.

The activities that are planned to be performed in this Work Package are: Identification and specification of the components of the EISCAT\_3D radar system that could be mass-produced (Task 14.1), identification of companies capable of producing EISCAT\_3D system elements in the volumes required (Task 14.2), definition of procedures for system testing and quality assurance (Task 14.3), discussions with possible suppliers of mass-producible elements, and iteration of the design of those components (Task 14.4), building prototypes for testing and verification purposes (Task 14.5) and, finally, preparation of the formal Requests For Quotations (RFQs) that will be sent out to potential manufacturers at the beginning of the EISCAT\_3D Construction Phase (Task 14.6).

#### ***Significant results***

This Work Package has not yet started.

#### ***Deviations from the work plan***

None.

#### ***Failures in reaching critical objectives***

This Work Package has not yet started.

#### ***Use of resources***

None.

#### ***Corrective actions***

None.

### **2.3 Project management during the period**

The management and coordination activities in the EISCAT\_3D Preparatory Phase project during the first 18 months are summarised here.

### **2.3.1 Consortium management tasks and achievements**

The EISCAT management team, the project office, consists of H. Andersson, A. Tjulin and E. Turunen as the project Coordinator since the beginning of the project, and I. Mann who joined as a project manager in August 2011. The EISCAT team is complemented by I. McCrea at STFC. The overall governing body for the project is the General Assembly that meets at least once per year. The daily work within the project is overseen by the Executive Board that has weekly teleconferences and a physical meeting nominally every 3 months.

### **2.3.2 Problems and solutions**

As far as the technical design of the instrument is concerned, the original work plan of the project contains some gaps. This, combined with a deficiency of engineering workforce from the project Coordinator side and a set of delayed recruitments within the project, has compromised the progress of the performance specification and of some of the technical Work Packages. This has in turn had a negative impact on the cost estimate and on the consortium negotiations. The gaps in the work plan were noted during the first meeting of the Technical Advisory Committee and have later been discussed in detail during the first All-Hands Meeting in October 2011. In order to identify these gaps and to compensate for them, EISCAT has recruited a Technical Expert who will primarily take over the coordination of the missing system integration tasks as well as the tasks related to the instrument cost estimate and the manufacturing. The cost for this Technical Expert has to be covered by the project, hence a project revision is planned in order to make these funds available.

In general the project faces a number of different expectations. These are ranging from the expectations from the national research councils for a tangible instrument design and a solid cost estimate, the expectations from EISCAT users for a new functional system as soon as possible, to the expectations from radio scientists for an instrument design based on cutting edge radio science results obtained from mathematically rigorous considerations. In the first report from the Technical Advisory Committee, it was also noted that there is some competition between different groups on several issues (such as array layout, signal processing, etc.) and that this seem to stem from a strong desire from many involved parts to define what the finished EISCAT\_3D system should be, with strong disagreement with approaches from other parts. In the EISCAT\_3D Preparatory Phase this issue is addressed with a continuing effort of offering means for open communication within the user community. Outreach activities are particularly important for this. Moreover, the Technical Expert, who will start working on 1 May 2012 for EISCAT, will participate in the communication between the project and its users.

During its second meeting, the General Assembly complained about an information deficiency about the progress of the different Work Packages. In order to provide accurate information, the project office has now implemented a system that collects reports from the different Work Packages on a 3-monthly basis. The first of these reports was requested for the 6 month time period from July to December 2011, and it was found that these reports are a useful tool for the communication within the project.

### **2.3.3 Changes within the consortium**

When the project started, the Swedish National Infrastructure for Computing (SNIC), that is responsible for Work Package 13, was an entity under the Swedish Research Council (VR). Following rearrangements of the organisational structure of SNIC, it will be associated with

Uppsala University. This change will require some consideration in the recruitment process that is planned for the near future in Work Package 13, but has no impact on the actual work that will be carried out. The other effects, if any, that this reorganisation may have on the SNIC activities in the EISCAT\_3D Preparatory Phase are not yet clear.

### 2.3.4 Project meetings

A variety of meetings has been organised within the EISCAT\_3D Preparatory Phase during this reporting period.

There have been two project meetings where all project participants were invited

- EISCAT\_3D Preparatory Phase Kick Off meeting, 21 – 22 October 2010, Clarion Hotel Stockholm, Sweden.
- EISCAT\_3D “All-hands” meeting, 11 – 13 October 2011, Space Campus, Kiruna, Sweden.

The EISCAT\_3D General Assembly has had two meetings:

- First EISCAT\_3D General Assembly meeting, 6 October 2010, Radisson Blu Hotel Arlandia, Stockholm, Sweden.
- Second EISCAT\_3D General Assembly meeting, 24 October 2011, Stockholm Arlanda Business Centre, Sweden.

The EISCAT\_3D Executive Board has had weekly tele-conferences, and additionally six physical meetings with possibility for deeper discussions:

- First EISCAT\_3D Executive Board physical meeting, 21 October 2010, Clarion Hotel Stockholm, Sweden.
- Second EISCAT\_3D Executive Board physical meeting, 1 February 2011, Radisson Blu Arlandia Hotel, Stockholm, Sweden.
- Third EISCAT\_3D Executive Board physical meeting, 4 – 5 May 2011, Sigtuna Stadshotell, Sweden.
- Fourth EISCAT\_3D Executive Board physical meeting, 31 August – 1 September 2011, Sodankylä Geophysical Observatory, Finland.
- Fifth EISCAT\_3D Executive Board physical meeting, 17 – 18 November 2011, Luleå University of Technology, Sweden.
- Sixth EISCAT\_3D Executive Board physical meeting, 6 – 7 February 2012, Radisson Blu Arlandia Hotel, Stockholm, Sweden.

The Science Working Group, organised through Work Package 3, has had three meeting during the period:

- First EISCAT\_3D Science Working Group meeting, 14 January 2011, Finnish Meteorological Institute, Helsinki, Finland.
- Second EISCAT\_3D Science Working Group meeting, 18 May 2011, Ångström Laboratory, Uppsala, Sweden.

- Third EISCAT\_3D Science Working Group meeting, 12 – 13 January 2012, Istituto Nazionale di Geofisica e Vulcanologia (INGV), Rome, Italy.

The Technical Advisory Committee has had one meeting:

- First EISCAT\_3D TAC meeting, 15 September 2011, North Sweden European Office, Brussels, Belgium.

Some other meetings have also been organised with focus on EISCAT\_3D related topics:

- Third EISCAT\_3D Users Meeting, 18 – 20 May 2011, Ångström Laboratory, Uppsala, Sweden.
- Norwegian EISCAT community meeting, 29 February – 1 March 2012, Norwegian University of Science and Technology, Trondheim, Norway.

### **2.3.5 Project planning**

The project planning has gone through minor changes in order to take into account the delayed starts of some of the Work Packages. In practice, this means that there will be an intensification of the activities later in the project compared to the planned level. More information about the changes are found in the description of the individual Work Packages in Section 2.2.

### **2.3.6 Impact of deviations**

Some of the Milestones and Deliverables in the EISCAT\_3D Preparatory Phase are delayed. The impacts from most of these delays are minor. However, the delayed production of an initial performance specification has had an impact on the planning in some of the Work Packages where this input is needed.

### **2.3.7 Website**

The EISCAT\_3D website, [www.eiscat3d.se](http://www.eiscat3d.se), is managed by EISCAT Headquarters, and the content is hosted in Kiruna. The website has been on-line since March 2009, and it is prepared using the content management system Drupal which is an open source system written in PHP. By using a content management system, the maintenance of the website is significantly simplified compared to preparing the content from ground, although some of the flexibility is sometimes lost. Most of the website is accessible by everyone, but some of areas requires login for privacy reasons. Users may register with the Coordinator if they wish to gain access to the restricted areas of the website.

### **2.3.8 Co-ordination activities**

EISCAT as the Coordinator of the EISCAT\_3D preparatory phase also participates in two new consortia funded by the European Union through Framework Programme 7. The ENVRI project on “Common Operations of Environmental Research Infrastructures” has the central goal to implement harmonised solutions and draw up guidelines for the common needs of the environmental ESFRI projects (EMSO, EURO-ARGO, ICOS, Lifewatch, EISCAT\_3D, EPOS, and SIOS) on issues related to data handling, storage and management. The ESPAS project serves space weather and Sun-climate studies and has the primary goal to facilitate user access to heterogeneous data from multiple providers and multiple techniques from ground-based and satellite experiments. These two

projects started in October 2011. EISCAT Scientific Association has also joined the COOPEUS proposal to EU for collaboration between environmental research institutions regarding cooperation with USA on common data policies and standards relevant to global environmental research infrastructures. This project, currently under negotiation, starts nominally in October 2012.

### 3 Tables of Deliverables and Milestones

Table 1. Deliverables											
Del. no.	Deliverable name	Version	WP no.	Lead beneficiary	Nature	Dissemination level <sup>2</sup>	Delivery date from Annex I (proj month)	Actual / Forecast delivery date	Status No submitted / Submitted	Contractual Yes/No	Comments
2.1	Signed agreements on frequency allocations	1	2	EISCAT	Report	PU	6	<i>Not applicable</i>		Yes	Work plan changed, see Section 2.2.2
2.2	Report listing the preferred sites	1	2	EISCAT	Report	RE	12	<i>September 2012</i>		Yes	See Section 2.2.2
3.1	List of contact persons/ groups in prospective new EISCAT_3D user communities	1	3	STFC	List	RE	3	February 2011	Submitted	Yes	
3.2	Initial revision of the EISCAT_3D Science Case	1	3	STFC	Report	PU	9	July 2011	Submitted	Yes	
3.3	First Annual Report on WP3 activities	1	3	UOULU	Report	PU	12	September 2011	Submitted	Yes	
4.1	Define and upgrade project web site	1	4	EISCAT	Website	PU	3	February 2011	Submitted	Yes	

- 2 PU = Public  
 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).

Table 1. Deliverables											
Del. no.	Deliverable name	Version	WP no.	Lead beneficiary	Nature	Dissemination level	Delivery date from Annex I (proj month)	Actual / Forecast delivery date	Status No submitted / Submitted	Contractual Yes/No	Comments
4.2	Outreach plan	1	4	EISCAT	Report	PU	3	March 2011	Submitted	Yes	
4.3	Contact list	1	4	EISCAT	List	RE	4	August 2011	Submitted	Yes	
4.4	Outreach materials	1	4	EISCAT	Library	PU	12	June 2012		Yes	Library partially completed
4.5	Material for funding applications	1	4	EISCAT	Library	PU	18	June 2012		Yes	
5.1	Initial list of potential EISCAT_3D partner organisations	1	5	EISCAT	Report	RE	6	December 2011	Submitted	Yes	
5.2	First annual report on consortium building activities	1	5	EISCAT	Report	RE	12	December 2011	Submitted	Yes	
6.1	Initial Performance Specification Document	1	6	STFC	Report	PU	6	August 2011	Submitted	Yes	
6.2	Initial version of the handbook of measurement principles	1	6	UOULU	Report	PU	6	October 2011	Submitted	Yes	

**Table 1. Deliverables**

Del. no.	Deliverable name	Version	WP no.	Lead beneficiary	Nature	Dissemination level	Delivery date from Annex I (proj month)	Actual / Forecast delivery date	Status No submitted / Submitted	Contractual Yes/No	Comments
6.3	First version of an integrated Performance Specification	1	6	STFC	Report	PU	12	June 2012		Yes	See Section 2.2.6
7.1	Report on proposed implementation of digital signal processing	1	7	EISCAT	Report	PU	12	May 2012		Yes	Will be prepared by UOULU
9.1	Report on the design of the digital exciter	1	9	IRF	Report	PU	15	January 2012	Submitted	Yes	
10.1	Report on the study of outlying receiving site configurations	1	10	UiT	Report	PU	9	September 2011	Submitted	Yes	
10.2	Report on the results of the transmitting / receiving antenna beam matching.	1	10	UiT	Report	PU	18	June 2012		Yes	Work Package shifted 3 months

**Table 2. Milestones**

Milestone no.	Milestone name	Work package no	Lead beneficiary	Delivery date from Annex I	Achieved Yes/No	Actual / Forecast Achievement date	Comments
1.1	Kick-off meeting	1	EISCAT	October 2010	Yes	October 2010	
1.2	Technical Advisory Committee (TAC) formed	1	EISCAT	December 2010	Yes	February 2011	
1.3	"All-Hands" meeting held	1	EISCAT	October 2011	Yes	October 2011	
2.1	Discussions on frequency allocations concluded and permissions obtained	2	EISCAT	March 2011	No	<i>Not applicable</i>	Work plan changed, see Section 2.2.2
2.2	New site surveys completed and selected sites identified	2	EISCAT	September 2011	No	<i>September 2012</i>	See Section 2.2.2
3.1	Science Working Group established (initial version - rolling membership)	3	STFC	November 2010	Yes	November 2010	
3.2	Workshop to publicise the potential of EISCAT_3D to the middle and lower atmosphere community	3	UOULU	May 2011	Yes	May 2011	
4.1	New project web site launched	4	EISCAT	December 2010	Yes	December 2010	
4.2	Initial library of outreach materials ready	4	EISCAT	September 2011	No	<i>June 2012</i>	Library partially completed
4.3	Initial library of funding application materials ready	4	EISCAT	March 2012	No	<i>June 2012</i>	

**Table 2. Milestones**

Milestone no.	Milestone name	Work package no	Lead beneficiary	Delivery date from Annex I	Achieved Yes/No	Actual / Forecast Achievement date	Comments
5.1	First list of potential partner organisations available	5	EISCAT	March 2011	Yes	November 2011	
5.2	First update of project costs and initial review of funding possibilities available	5	EISCAT	September 2011	Yes	December 2011	
6.1	Initial version of the Performance Specification Document ready	6	STFC	March 2011	Yes	July 2011	
6.2	Initial version of the handbook of measurement principles ready	6	UOULU	March 2011	Yes	September 2011	
6.3	Integrated Performance Specification ready	6	STFC	September 2011	No	<i>June 2012</i>	See Section 2.2.6
7.1	Hardware acquired for field-testing	7	UOULU	September 2011	Yes	January 2012	
7.2	Completion of preliminary plans for the sampling hardware	7	UOULU	December 2011	No	<i>June 2012</i>	Late hardware acquisition
7.3	Hardware ready for field-testing	7	UOULU	March 2012	No	<i>July 2012</i>	Late hardware acquisition
8.1	Initial design of the individual antenna elements completed	8	LTU	September 2011	Yes	December 2011	
8.2	Initial specification of the antenna elements and antenna array configuration completed	8	LTU	March 2012	No	<i>June 2012</i>	

**Table 2. Milestones**

Milestone no.	Milestone name	Work package no	Lead beneficiary	Delivery date from Annex I	Achieved Yes/No	Actual / Forecast Achievement date	Comments
9.1	First exciter prototype in operation	9	IRF	July 2011	Yes	May 2011	
9.2	Revision of the exciter design finalised	9	IRF	October 2011	Yes	September 2011	
10.1	First version of the low-level simulation software available	10	UiT	November 2010	Yes	February 2011	
10.2	Preliminary evaluation of the different image inversion algorithms ready	10	UiT	January 2011	Yes	February 2011	
10.3	Preliminary simulations for optimal outlying receiving site configurations completed	10	UiT	March 2011	Yes	April 2011	
10.4	Simulations for optimal outlying receiving site configurations completed	10	UiT	June 2011	Yes	August 2011	
10.5	Final version of the low-level simulation software ready	10	UiT	September 2011	Yes	January 2012	
10.6	Different image inversion algorithms evaluated and ranked	10	UiT	December 2011	No	<i>May 2012</i>	Work Package shifted 3 months
11.1	Initial versions of signal processing and beam-forming	11	UOULU	March 2012	No	<i>June 2012</i>	

**Table 2. Milestones**

Milestone no.	Milestone name	Work package no	Lead beneficiary	Delivery date from Annex I	Achieved Yes/No	Actual / Forecast Achievement date	Comments
13.1	Report on the networking requirements and provision aspects to the identified sites task completed	13	VR	December 2011	No	<i>September 2012</i>	Work Package starts later than in the original plan

## 4 Use of the resources

Personnel costs, subcontracting and any major costs incurred by each beneficiary:

<b>Table 3.1 Personnel, subcontracting and other major cost items for Beneficiary 1 (EISCAT Scientific Association) for the period</b>			
Work Package	Item description	Amount in € with 2 decimals	Explanations
	Components, hardware, etc	0,00	
1, 2, 3, 4, 5, 6, 12	Personnel costs	199 905,67	<i>Persons working in the project: Mr. Andersson, Mr. Vanhainen, Mr. Markkanen, Dr. Westman, Dr. Häggström, Mr. Bergqvist, Dr. Tjulin, Dr. Mann. Totally 23,7 person-months. Major WP's: 1, 5 and 4</i>
	Subcontracting	0,00	
1, 2, 3, 4, 5, 12	Travel and meeting costs	95 770,70	<i>Project travels. Conference costs and covered travel expenses for invited external experts. Major WP's: 5, 1 and 3</i>
1, 2, 4	Remaining direct costs	6 264,37	<i>Minor items. Major WP: 4 (PR/Outreach costs)</i>
Indirect costs		60 388,14	<i>20% flat rate</i>
<b>TOTAL COSTS</b>		<b>362 328,88</b>	

<b>Table 3.2 Personnel, subcontracting and other major cost items for Beneficiary 2 (OULUN YLIOPISTO) for the period</b>			
Work Package	Item description	Amount in € with 2 decimals	Explanations
7	Components, hardware, etc	10 980,16	<i>Depreciation of USRP Xilinx Spartan ( 3815,87 euro), Lapstore Dual Server (634,66 euro), MacBook air 13,3" Thunderbolt 27"(2784,14 euro), USRP N210P (1896,66 euro), electronics, cables etc. (1848,86 euro)</i>
1, 3, 6, 7, 11	Personnel costs	383 516,18	<i>Salaries of: Anita Aikio (7,4 Person months/WP 3), Vierinen Juha-Pekka ( 6 PM/ WP 7), Peltoniemi Markus (2,9 PM/ WP 7), Lehtinen Markku (0,5 PM/WP 1 , 10,9 PM/WP 6, 2,3 PM/WP 11), Orispää Risto ( 1 PM/WP 6, 12,9 PM/ WP 11), Virtanen Ilkka (7,3 PM/WP 11)</i>
7	Subcontracting	22 564,10	<i>Dual-DDC and GPIO Streaming implementaion, Corgan Enterprises LLC</i>
1, 3, 7, 11	Travel and meeting costs	42 886,81	<i>Travel costs to: 6.10.2010 Arlanda, Sweden, EISCAT_3D general assembly, Aikio, 602,16 euro; 21.10.2010 Stockholm, Sweden, EISCAT_3D kick-off meeting, Aikio, 393,32 euro; 22.11.2010, Stockholm, Sweden, EISCAT_3D kick-off meeting, Aikio 476,65 euro; 7.12.2010 Luleå, Sweden, EISCAT_3D Project meeting, Orispää, Lehtinen 118,42 euro; 12.1.-14.1.2011 Helsinki, Finland, EISCAT_3D SWG meeting, Aikio, Pellinen-Wanneberg, Cliverd, McCrea, Oksavik, Rapp, 3293,9 euro; 31.1.-2.2.2011 Arlanda, Sweden, Executive board meeting, Ulich, 170 euro; 28.2-4.3.2011 Luosto, Finland, Inverse problems winter seminar, Orispää, Lehtinen 170 euro; 16.3.-18.3.2011 Sodankylä, Finland, project meeting, Aikio, Virtanen, Orispää, 959,32 euro; 3.5.-4.5.2011 Sigtuna Sweden, Executive board meeting, Ulich, 429,68 euro; 17.5.-20.5.2011 Uppsala Sweden, EISCAT_3D SWG meeting, Aikio, Virtanen, Orispää, Lehtinen, Sofieva, Belova, Clicerd, Engler, Kero, 5688 euro; 4.6.-13.6.2011 Kiiruna Sweden, Installation of sampler at the Kiruna's and Svalbard's radars for field test, Vierinen, 1461,79 euro; 25.7.-29.7.2011 Kilpisjärvi, Finland, Field Test, Virtanen 319,90 euro; 1.8.-5.8.2011 Kilpisjärvi, Finland, Field Test, Orispää 308,07 euro; 3.9.-10.9.2011 Qingdao China, EISCAT 15th workshop, Aikio, Vierinen, Virtanen, Ulich, 9328,90 euro; 16.9.-26.9.2011 Grönlanti ISR Workshop, Aikio 352 euro; 27.9.-28.9.2011 Kilpisjärvi, Finland, Field Test, Vierinen 401,04 euro; 7.10.-16.10.2011 Kiiruna Sweden, FP 7 All-hands meeting, Aikio, Lehtinen, Peltoniemi, Vierinen, Orispää, Corgan 9023 euros; 24.10.-28.10.2011 Amsterdam, Holland, Discussions about LOFAR technology regarding field tests, Lehtinen, Aikio 2300,32 euro; 10.11.-11.11.2011 Kilpisjärvi, Finland, Field Test, Peltoniemi 68 euro; 18.11.2011 Luleå Sweden, Executive board meeting, Ulich 280,68 euro; 29.11.-2.12.2011 Kilpisjärvi, Finland, Field Test, Peltoniemi 118 euro; 5.12.-9.12.2011 Tromsa, Norway, Field test API measurement, Peltoniemi 424,50 euro; 12.12.-16.12.2011 Helsinki, Finland, Inverse days, Orispää, Peltoniemi 709,66 euro; 11.1.-14.1.2012 Rome, Italy, Aikio, Lamy, Pitout, Vierinen, Stanislawski, 2318,63 euro; 6.2.-8.2.2012 Arlanda, Sweden, Ulich, 1305,51 euro; 11.2.-14.2.2012 Helsinki, Finland, Project meeting, Lehtinen 266,64 euro; 4.3.-14.3.2012 Helsinki, Finland and Stockholm, Sweden, EISCAT_3D meeting, Aikio, Lehtinen 519,54 euro.</i>
	Remaining direct costs	0,00	
Indirect costs		262 429,89	<i>Overheads</i>
TOTAL COSTS		722 377,14	

**Table 3.3 Personnel, subcontracting and other major cost items for Beneficiary 3 (LULEA TEKNISKA UNIVERSITET) for the period**

Work Package	Item description	Amount in € with 2 decimals	Explanations
8	Components, hardware, etc	20 201,47	<i>Material has been purchased to perform work on time synchronization system as well as on characterization of components. Computers have been purchased for staff use as well as for calculation purposes. Some measurement equipment and associated lab hardware have been purchased.</i>
1, 8	Personnel costs	155 870,96	<i>Persons working in the project: Jonny Johansson, Mikael Larssmark, Johan Borg, Tore Lindgren. Totally 18,55 person-months. Major WP: 8</i>
	Subcontracting	0,00	
1, 8	Travel and meeting costs	9 584,34	<i>Project travels. Conference costs. Major WP: 1</i>
	Remaining direct costs	0,00	
Indirect costs		111 394,06	
TOTAL COSTS		297 050,83	

**Table 3.4 Personnel, subcontracting and other major cost items for Beneficiary 4 (INSTITUTET FOR RYMDFYSIK) for the period**

Work Package	Item description	Amount in € with 2 decimals	Explanations
9	Components, hardware, etc	9 616,89	<i>Laptop (accounting practice: laptops are not taken as investments), electronic components</i>
1, 9	Personnel costs	169 550,37	<i>Total working month 23,6422. Working month WP9-23,4027 Personell: Gudmund Wannberg, Ingemar Wolf, Walter Puccio and Yvonne Freiner. Working month WP1-0,2395 Personell: Gudmund Wannberg, Lars Eliasson and Asta Pellinen-Wannberg</i>
	Subcontracting	0,00	
9	Travel and meeting costs	15 739,77	<i>Kick-Off and General Assembly. Presentation of WP9 at KVA, SNRV och URSI. Project meetings and work. Testings of the transmitter in Ramfjordmoen, Norway and Lima, Peru</i>
	Remaining direct costs	0,00	
Indirect costs		116 944,22	<i>60% flate rate</i>
TOTAL COSTS		311 851,26	

<b>Table 3.5 Personnel, subcontracting and other major cost items for Beneficiary 5 (UNIVERSITETET I TROMSOE) for the period</b>			
Work Package	Item description	Amount in € with 2 decimals	Explanations
	Components, hardware, etc	0,00	
2, 5, 10	Personnel costs	167 667,22	<i>Persons working in the project: Dr. Johnsen, Dr. Lunde, Dr. Belyey. Totally 25,5 person-months. Major WP: 10</i>
	Subcontracting	0,00	
1, 2, 5, 10	Travel and meeting costs	12 639,23	<i>Project travels. Conference costs. Major WP: 1</i>
	Remaining direct costs	0,00	
Indirect costs		108 183,87	
<b>TOTAL COSTS</b>		<b>288 490,32</b>	

<b>Table 3.6 Personnel, subcontracting and other major cost items for Beneficiary 6 (SCIENCE AND TECHNOLOGY FACILITIES COUNCIL) for the period</b>			
Work Package	Item description	Amount in € with 2 decimals	Explanations
	Components, hardware, etc	0,00	
1, 3	Personnel costs	58 315,30	<i>Person working in the project: Dr. McCrea. Totally 1 198.20 hours.</i>
	Subcontracting	0,00	
1, 3	Travel and meeting costs	16 160,99	<i>Project management meetings and project travel.</i>
	Remaining direct costs	0,00	
Indirect costs		61 231,06	<i>Actual indirect costs</i>
<b>TOTAL COSTS</b>		<b>135 707,35</b>	

**Table 3.7 Personnel, subcontracting and other major cost items for Beneficiary 7 (VETENSKAPSRADET - SWEDISH RESEARCH COUNCIL) for the period**

Work Package	Item description	Amount in € with 2 decimals	Explanations
	Components, hardware, etc	0,00	
5	Personnel costs	15 291,30	<i>Persons working in the project: Tomas Andersson. Totally 2,20 person-months.</i>
	Subcontracting	0,00	
5	Travel and meeting costs	2 951,42	<i>Meeting in Copenhagen regarding preparatory phase. Costs for travel for invited expert. Travel cost to Svalbard.</i>
	Remaining direct costs	0,00	
Indirect costs		10 945,63	
TOTAL COSTS		29 188,35	

**Table 3.8 Personnel, subcontracting and other major cost items for Beneficiary 8 (NATIONAL INSTRUMENTS BELGIUM NV) for the period**

Work Package	Item description	Amount in € with 2 decimals	Explanations
7	Components, hardware, etc	127 035,00	<i>National Instruments Product: FPGA Boards*6, Power Cords*6, myDAQ University Kit (HW Only*12), NI ELVIS II*6)</i>
1, 7	Personnel costs	11 200,00	<i>Two persons working on project- Project Manager 0.6 months (0,2 months WP1) and Systems Engineer Sweden 0.275 months</i>
	Subcontracting	0,00	
1, 7	Travel and meeting costs	3 981,51	<i>Project travels for two staff involved- all actual cost incurred</i>
	Remaining direct costs	0,00	
Indirect costs		28 443,30	
TOTAL COSTS		170 659,81	

## 5 Financial statements: forms C and summary financial report

### 5.1 Financial statement: EISCAT

#### FP7 - Grant Agreement - Annex VI - Combination of CP & CSA

Form C - Financial Statement (to be filled in by each beneficiary)			
Project nr	261967	Funding scheme	Combination of CP & CSA
Project Acronym	EISCAT_3D_2		
Period from	01/10/2010	Is this an adjustment to a previous statement?	No
To	31/03/2012		
Legal Name	EISCAT SCIENTIFIC ASSOCIATION	Participant Identity Code	99097722
Organisation short Name	EISCAT	Beneficiary nr	1
Funding %for RTD activities (A)	75,00%	If flat rate for indirect costs specify %	20,00%

#### 1. Declaration of eligible costs/lump sum/flat rate/scale of unit (in €)

	Type of Activity					TOTAL (A+B+C+D+E)
	RTD (A)	Coordination (B)	Support (C)	Management (D)	Other (E)	
Personnel costs	0,00	66 414,21	71 465,76	62 025,70	0,00	199 905,67
Subcontracting	0,00	0,00	0,00	0,00	0,00	0,00
Other direct costs	0,00	54 786,96	22 350,66	24 897,45	0,00	102 035,07
Indirect costs *	0,00	24 240,23	18 763,28	17 384,63	0,00	60 388,14
Access costs	0,00	0,00	0,00	0,00	0,00	0,00
Lump sum/flat rate/scale of unit declared	0,00	0,00	0,00	0,00	0,00	0,00
<b>Total</b>	0,00	145 441,40	112 579,70	104 307,78	0,00	362 328,88
Maximum EC contribution	0,00	129 685,25	100 383,57	104 307,78	0,00	334 376,60
Requested EC contribution						334 376,60

\* Indirect costs relating to:

- "Coordination" and "Support" activities are reimbursed up to a maximum of 7% of the direct eligible costs relating to these activities excluding the direct eligible costs for subcontracting and the costs of resources made available by third parties which are not used on the premises of the beneficiary.

#### 2. Declaration of receipts

Did you receive any financial transfers or contributions in kind, free of charge from third parties or did the project generate any income which could be considered a receipt according to Art.II.17 of the grant agreement ?

No

If yes, please mention the amount (in €)

#### 3. Declaration of interest yielded by the pre-financing (to be completed only by the coordinator)

Did the pre-financing you received generate any interest according to Art. II.19 ?

Yes

If yes, please mention the amount (in €)

519,20

#### 4. Certificate on the methodology

Do you declare average personnel costs according to Art. II. 14.1?

No

Is there a certificate on the methodology provided by an independent auditor and accepted by the Commission according to Art.II.4.4?

No

Name of the auditor

Cost of the certificate (in €), if

#### 5. Certificate on the financial statements

Is there a certificate on the financial statements provided by an independent auditor attached to this financial statement according to Art.II.4.4. ?

No

Name of the auditor

Cost of the certificate (in €)

#### 6. Beneficiary's declaration on its honour

We declare on our honour that:

- the costs declared above are directly related to the resources used to attain the objectives of the project and fall within the definition of eligible costs specified in Articles II.14 and II.15 of the grant agreement, and, if relevant, Annex III and article 7 (special clauses) of the grant agreement;
- the receipts declared above are the only financial transfers or contributions in kind, free of charge, from third parties and the only income generated by the project which could be considered as receipts according to Art.II.17 of the grant agreement;
- the interest declared above is the only interest yielded by the pre-financing which falls within the definition of Art.II.19 of the grant agreement;
- there is full supporting documentation to justify the information hereby declared. It will be made available at the request of the European Union and in the event of an audit by the European Union and/or by the Court of Auditors and/or their authorised representatives.

Beneficiary's Stamp	Name of the Person(s) Authorised to sign this Financial Statement
	Dr. Esa Turunen, Mr. Henrik Andersson
	Date & signature
	07/05/2012

## 5.2 Financial statement: UOULU

### FP7 - Grant Agreement - Annex VI - Combination of CP & CSA

Form C - Financial Statement (to be filled in by each beneficiary)			
Project nr	261967	Funding scheme	Combination of CP & CSA
Project Acronym	EISCAT_3D_2		
Period from	01/10/2010	Is this an adjustment to a previous statement ?	No
To	31/03/2012		
Legal Name	OULUN YLIOPISTO	Participant Identity Code	999844670
Organisation short Name	UOULU	Beneficiary nr	2
Funding % for RTD activities (A)	75,00%	If flat rate for indirect costs specify %	60,00%

#### 1. Declaration of eligible costs/lump sum/flat rate/scale of unit (in €)

	Type of Activity					TOTAL (A+B+C+D+E)
	RTD (A)	Coordination (B)	Support (C)	Management (D)	Other (E)	
Personnel costs	43 989,90	54 049,82	280 214,17	5 262,29	0,00	383 516,18
Subcontracting	22 564,10	0,00	0,00	0,00	0,00	22 564,10
Other direct costs	21 761,59	15 634,03	8 904,16	7 567,19	0,00	53 866,97
Indirect costs *	39 450,89	41 810,31	173 471,00	7 697,69	0,00	262 429,89
Access costs	0,00	0,00	0,00	0,00	0,00	0,00
Lump sum/flat rate/scale of unit declared	0,00	0,00	0,00	0,00	0,00	0,00
<b>Total</b>	<b>127 766,48</b>	<b>111 494,16</b>	<b>462 589,33</b>	<b>20 527,17</b>	<b>0,00</b>	<b>722 377,14</b>
<b>Maximum EC contribution</b>	<b>95 824,86</b>	<b>74 561,72</b>	<b>309 356,61</b>	<b>20 527,17</b>	<b>0,00</b>	<b>500 270,36</b>
<b>Requested EC contribution</b>						<b>500 270,36</b>

\* Indirect costs relating to:

- "Coordination" and "Support" activities are reimbursed up to a maximum of 7% of the direct eligible costs relating to these activities excluding the direct eligible costs for subcontracting and the costs of resources made available by third parties which are not used on the premises of the beneficiary.

#### 2. Declaration of receipts

Did you receive any financial transfers or contributions in kind, free of charge from third parties or did the project generate any income which could be considered a receipt according to Art.II.17 of the grant agreement ?  
If yes, please mention the amount (in €)

No

#### 3. Declaration of interest yielded by the pre-financing (to be completed only by the coordinator)

Did the pre-financing you received generate any interest according to Art. II.19 ?  
If yes, please mention the amount (in €)

No

#### 4. Certificate on the methodology

Do you declare average personnel costs according to Art. II. 14.1?

No

Is there a certificate on the methodology provided by an independent auditor and accepted by the Commission according to Art.II.4.4?

No

Name of the auditor

Cost of the certificate (in €), if

#### 5. Certificate on the financial statements

Is there a certificate on the financial statements provided by an independent auditor attached to this financial statement according to Art.II.4.4. ?

Yes

Name of the auditor

PricewaterhouseCoopers Oy

Cost of the certificate (in €)

1 120,00

#### 6. Beneficiary's declaration on its honour

We declare on our honour that:

- the costs declared above are directly related to the resources used to attain the objectives of the project and fall within the definition of eligible costs specified in Articles II.14 and II.15 of the grant agreement, and, if relevant, Annex III and article 7 (special clauses) of the grant agreement;
- the receipts declared above are the only financial transfers or contributions in kind, free of charge, from third parties and the only income generated by the project which could be considered as receipts according to Art.II.17 of the grant agreement;
- the interest declared above is the only interest yielded by the pre-financing which falls within the definition of Art.II.19 of the grant agreement;
- there is full supporting documentation to justify the information hereby declared. It will be made available at the request of the European Union and in the event of an audit by the European Union and/or by the Court of Auditors and/or their authorised representatives.

Beneficiary's Stamp	Name of the Person(s) Authorised to sign this Financial Statement
	Mr. Arto Eljander and Prof. Markku Lehtinen
	Date & signature
	14/05/2012

## 5.3 Financial statement: LTU

### FP7 - Grant Agreement - Annex VI - Combination of CP & CSA

Form C - Financial Statement (to be filled in by each beneficiary)			
Project nr	261967	Funding scheme	Combination of CP & CSA
Project Acronym	EISCAT_3D_2		
Period from	01/10/2010	Is this an adjustment to a previous statement ?	No
To	31/03/2012		
Legal Name	LULEÅ TEKNISKA UNIVERSITET	Participant Identity Code	999876874
Organisation short Name	LTU	Beneficiary nr	3
Funding % for RTD activities (A)	75,00%	If flat rate for indirect costs specify %	60,00%

#### 1. Declaration of eligible costs/lump sum/flat rate/scale of unit (in €)

	Type of Activity					TOTAL (A+B+C+D+E)
	RTD (A)	Coordination (B)	Support (C)	Management (D)	Other (E)	
Personnel costs	153 310,77	0,00	0,00	2 560,19	0,00	155 870,96
Subcontracting	0,00	0,00	0,00	0,00	0,00	0,00
Other direct costs	25 755,58	0,00	0,00	4 030,23	0,00	29 785,81
Indirect costs *	107 439,81	0,00	0,00	3 954,25	0,00	111 394,06
Access costs	0,00	0,00	0,00	0,00	0,00	0,00
Lump sum/flat rate/scale of unit declared	0,00	0,00	0,00	0,00	0,00	0,00
<b>Total</b>	<b>286 506,16</b>	<b>0,00</b>	<b>0,00</b>	<b>10 544,67</b>	<b>0,00</b>	<b>297 050,83</b>
<b>Maximum EC contribution</b>	<b>214 879,62</b>	<b>0,00</b>	<b>0,00</b>	<b>10 544,67</b>	<b>0,00</b>	<b>225 424,29</b>
<b>Requested EC contribution</b>						<b>225 424,29</b>

\* Indirect costs relating to:

- "Coordination" and "Support" activities are reimbursed up to a maximum of 7% of the direct eligible costs relating to these activities excluding the direct eligible costs for subcontracting and the costs of resources made available by third parties which are not used on the premises of the beneficiary.

#### 2. Declaration of receipts

Did you receive any financial transfers or contributions in kind, free of charge from third parties or did the project generate any income which could be considered a receipt according to Art.II.17 of the grant agreement ?  
If yes, please mention the amount (in €)

No

#### 3. Declaration of interest yielded by the pre-financing (to be completed only by the coordinator)

Did the pre-financing you received generate any interest according to Art. II.19 ?  
If yes, please mention the amount (in €)

No

#### 4. Certificate on the methodology

Do you declare average personnel costs according to Art. II. 14.1?

No

Is there a certificate on the methodology provided by an independent auditor and accepted by the Commission according to Art.II.4.4?

No

Name of the auditor

Cost of the certificate (in €), if

#### 5. Certificate on the financial statements

Is there a certificate on the financial statements provided by an independent auditor attached to this financial statement according to Art.II.4.4. ?

No

Name of the auditor

Cost of the certificate (in €)

#### 6. Beneficiary's declaration on its honour

We declare on our honour that:

- the costs declared above are directly related to the resources used to attain the objectives of the project and fall within the definition of eligible costs specified in Articles II.14 and II.15 of the grant agreement, and, if relevant, Annex III and article 7 (special clauses) of the grant agreement;
- the receipts declared above are the only financial transfers or contributions in kind, free of charge, from third parties and the only income generated by the project which could be considered as receipts according to Art.II.17 of the grant agreement;
- the interest declared above is the only interest yielded by the pre-financing which falls within the definition of Art.II.19 of the grant agreement;
- there is full supporting documentation to justify the information hereby declared. It will be made available at the request of the European Union and in the event of an audit by the European Union and/or by the Court of Auditors and/or their authorised representatives.

Beneficiary's Stamp	Name of the Person(s) Authorised to sign this Financial Statement
	Markus Vuopio
	Date & signature
	26/04/2012

## 5.4 Financial statement: IRF

### FP7 - Grant Agreement - Annex VI - Combination of CP & CSA

Form C - Financial Statement (to be filled in by each beneficiary)			
Project nr	261967	Funding scheme	Combination of CP & CSA
Project Acronym	EISCAT_3D_2		
Period from	01/10/2010	Is this an adjustment to a previous statement ?	No
To	31/03/2012		
Legal Name	INSTITUTET FOR RYMDFYSIK	Participant Identity Code	998137955
Organisation short Name	IRF	Beneficiary nr	4
Funding % for RTD activities (A)	75,00%	If flat rate for indirect costs specify %	60,00%

#### 1. Declaration of eligible costs/lump sum/flat rate/scale of unit (in €)

	Type of Activity					TOTAL (A+B+C+D+E)
	RTD (A)	Coordination (B)	Support (C)	Management (D)	Other (E)	
Personnel costs	167 356,67	0,00	0,00	2 193,70	0,00	169 550,37
Subcontracting	0,00	0,00	0,00	0,00	0,00	0,00
Other direct costs	25 356,67	0,00	0,00	0,00	0,00	25 356,67
Indirect costs *	115 628,00	0,00	0,00	1 316,22	0,00	116 944,22
Access costs	0,00	0,00	0,00	0,00	0,00	0,00
Lump sum/flat rate/scale of unit declared	0,00	0,00	0,00	0,00	0,00	0,00
<b>Total</b>	<b>308 341,34</b>	<b>0,00</b>	<b>0,00</b>	<b>3 509,92</b>	<b>0,00</b>	<b>311 851,26</b>
<b>Maximum EC contribution</b>	<b>231 256,01</b>	<b>0,00</b>	<b>0,00</b>	<b>3 509,92</b>	<b>0,00</b>	<b>234 765,93</b>
<b>Requested EC contribution</b>						<b>234 765,93</b>

\* Indirect costs relating to:

- "Coordination" and "Support" activities are reimbursed up to a maximum of 7% of the direct eligible costs relating to these activities excluding the direct eligible costs for subcontracting and the costs of resources made available by third parties which are not used on the premises of the beneficiary.

#### 2. Declaration of receipts

Did you receive any financial transfers or contributions in kind, free of charge from third parties or did the project generate any income which could be considered a receipt according to Art.II.17 of the grant agreement ?  
If yes, please mention the amount (in €)

No

#### 3. Declaration of interest yielded by the pre-financing (to be completed only by the coordinator)

Did the pre-financing you received generate any interest according to Art. II.19 ?  
If yes, please mention the amount (in €)

No

#### 4. Certificate on the methodology

Do you declare average personnel costs according to Art. II. 14.1?

No

Is there a certificate on the methodology provided by an independent auditor and accepted by the Commission according to Art.II.4.4?

No

Name of the auditor

Cost of the certificate (in €), if

#### 5. Certificate on the financial statements

Is there a certificate on the financial statements provided by an independent auditor attached to this financial statement according to Art.II.4.4. ?

No

Name of the auditor

Cost of the certificate (in €)

#### 6. Beneficiary's declaration on its honour

We declare on our honour that:

- the costs declared above are directly related to the resources used to attain the objectives of the project and fall within the definition of eligible costs specified in Articles II.14 and II.15 of the grant agreement, and, if relevant, Annex III and article 7 (special clauses) of the grant agreement;
- the receipts declared above are the only financial transfers or contributions in kind, free of charge, from third parties and the only income generated by the project which could be considered as receipts according to Art.II.17 of the grant agreement;
- the interest declared above is the only interest yielded by the pre-financing which falls within the definition of Art.II.19 of the grant agreement;
- there is full supporting documentation to justify the information hereby declared. It will be made available at the request of the European Union and in the event of an audit by the European Union and/or by the Court of Auditors and/or their authorised representatives.

Beneficiary's Stamp	Name of the Person(s) Authorised to sign this Financial Statement
	Lars Eliasson
	Date & signature
	04/05/2012

## 5.5 Financial statement: UiT

### FP7 - Grant Agreement - Annex VI - Combination of CP & CSA

Form C - Financial Statement (to be filled in by each beneficiary)			
Project nr	261967	Funding scheme	Combination of CP & CSA
Project Acronym	EISCAT_3D_2		
Period from	01/10/2010	Is this an adjustment to a previous statement ?	No
To	31/03/2012		
Legal Name	UNIVERSITETET I TROMSOE	Participant Identity Code	999874643
Organisation short Name	UIT	Beneficiary nr	5
Funding % for RTD activities (A)	75,00%	If flat rate for indirect costs specify %	60,00%

#### 1. Declaration of eligible costs/lump sum/flat rate/scale of unit (in €)

	Type of Activity					TOTAL (A+B+C+D+E)
	RTD (A)	Coordination (B)	Support (C)	Management (D)	Other (E)	
Personnel costs	0,00	26 909,43	140 757,79	0,00	0,00	167 667,22
Subcontracting	0,00	0,00	0,00	0,00	0,00	0,00
Other direct costs	0,00	0,00	4 176,04	8 463,19	0,00	12 639,23
Indirect costs *	0,00	16 145,66	86 960,30	5 077,91	0,00	108 183,87
Access costs	0,00	0,00	0,00	0,00	0,00	0,00
Lump sum/flat rate/scale of unit declared	0,00	0,00	0,00	0,00	0,00	0,00
<b>Total</b>	0,00	43 055,09	231 894,13	13 541,10	0,00	288 490,32
<b>Maximum EC contribution</b>	0,00	28 793,09	155 079,20	13 541,10	0,00	197 413,39
<b>Requested EC contribution</b>						197 413,39

\* Indirect costs relating to:

- "Coordination" and "Support" activities are reimbursed up to a maximum of 7% of the direct eligible costs relating to these activities excluding the direct eligible costs for subcontracting and the costs of resources made available by third parties which are not used on the premises of the beneficiary.

#### 2. Declaration of receipts

Did you receive any financial transfers or contributions in kind, free of charge from third parties or did the project generate any income which could be considered a receipt according to Art.II.17 of the grant agreement ?

If yes, please mention the amount (in €)

No

#### 3. Declaration of interest yielded by the pre-financing (to be completed only by the coordinator)

Did the pre-financing you received generate any interest according to Art. II.19 ?

If yes, please mention the amount (in €)

No

#### 4. Certificate on the methodology

Do you declare average personnel costs according to Art. II. 14.1?

Is there a certificate on the methodology provided by an independent auditor and accepted by the Commission according to Art.II.4.4?

No

No

Name of the auditor

Cost of the certificate (in €), if

#### 5. Certificate on the financial statements

Is there a certificate on the financial statements provided by an independent auditor attached to this financial statement according to Art.II.4.4. ?

No

Name of the auditor

Cost of the certificate (in €)

#### 6. Beneficiary's declaration on its honour

We declare on our honour that:

- the costs declared above are directly related to the resources used to attain the objectives of the project and fall within the definition of eligible costs specified in Articles II.14 and II.15 of the grant agreement, and, if relevant, Annex III and article 7 (special clauses) of the grant agreement;
- the receipts declared above are the only financial transfers or contributions in kind, free of charge, from third parties and the only income generated by the project which could be considered as receipts according to Art.II.17 of the grant agreement;
- the interest declared above is the only interest yielded by the pre-financing which falls within the definition of Art.II.19 of the grant agreement;
- there is full supporting documentation to justify the information hereby declared. It will be made available at the request of the European Union and in the event of an audit by the European Union and/or by the Court of Auditors and/or their authorised representatives.

Beneficiary's Stamp	Name of the Person(s) Authorised to sign this Financial Statement
	John Arne Opheim
	Date & signature
	26/04/2012

## 5.6 Financial statement: STFC

### FP7 - Grant Agreement - Annex VI - Combination of CP & CSA

Form C - Financial Statement (to be filled in by each beneficiary)			
Project nr	261967	Funding scheme	Combination of CP & CSA
Project Acronym	EISCAT_3D_2		
Period from	01/10/2010	Is this an adjustment to a previous statement ?	No
To	31/03/2012		
Legal Name	SCIENCE AND TECHNOLOGY FACILITIES COUNCIL	Participant Identity Code	999980179
Organisation short Name	STFC	Beneficiary nr	6
Funding % for RTD activities (A)	75,00%	If flat rate for indirect costs specify %	105,00%

#### 1. Declaration of eligible costs/lump sum/flat rate/scale of unit (in €)

	Type of Activity					TOTAL (A+B+C+D+E)
	RTD (A)	Coordination (B)	Support (C)	Management (D)	Other (E)	
Personnel costs	0,00	26 667,78	0,00	31 647,52	0,00	58 315,30
Subcontracting	0,00	0,00	0,00	0,00	0,00	0,00
Other direct costs	0,00	8 622,65	0,00	7 538,34	0,00	16 160,99
Indirect costs *	0,00	28 001,17	0,00	33 229,89	0,00	61 231,06
Access costs	0,00	0,00	0,00	0,00	0,00	0,00
Lump sum/flat rate/scale of unit declared	0,00	0,00	0,00	0,00	0,00	0,00
<b>Total</b>	0,00	63 291,60	0,00	72 415,75	0,00	135 707,35
<b>Maximum EC contribution</b>	0,00	37 760,76	0,00	72 415,75	0,00	110 176,51
<b>Requested EC contribution</b>						110 176,51

\* Indirect costs relating to:

- "Coordination" and "Support" activities are reimbursed up to a maximum of 7% of the direct eligible costs relating to these activities excluding the direct eligible costs for subcontracting and the costs of resources made available by third parties which are not used on the premises of the beneficiary.

#### 2. Declaration of receipts

Did you receive any financial transfers or contributions in kind, free of charge from third parties or did the project generate any income which could be considered a receipt according to Art.II.17 of the grant agreement ?  
If yes, please mention the amount (in €)

No

#### 3. Declaration of interest yielded by the pre-financing (to be completed only by the coordinator )

Did the pre-financing you received generate any interest according to Art. II.19 ?  
If yes, please mention the amount (in €)

No

#### 4. Certificate on the methodology

Do you declare average personnel costs according to Art. II. 14.1?

No

Is there a certificate on the methodology provided by an independent auditor and accepted by the Commission according to Art.II.4.4?

No

Name of the auditor

Cost of the certificate (in €), if

#### 5. Certificate on the financial statements

Is there a certificate on the financial statements provided by an independent auditor attached to this financial statement according to Art.II.4.4. ?

No

Name of the auditor

Cost of the certificate (in €)

#### 6. Beneficiary's declaration on its honour

We declare on our honour that:

- the costs declared above are directly related to the resources used to attain the objectives of the project and fall within the definition of eligible costs specified in Articles II.14 and II.15 of the grant agreement, and, if relevant, Annex III and article 7 (special clauses) of the grant agreement;
- the receipts declared above are the only financial transfers or contributions in kind, free of charge, from third parties and the only income generated by the project which could be considered as receipts according to Art.II.17 of the grant agreement;
- the interest declared above is the only interest yielded by the pre-financing which falls within the definition of Art.II.19 of the grant agreement;
- there is full supporting documentation to justify the information hereby declared. It will be made available at the request of the European Union and in the event of an audit by the European Union and/or by the Court of Auditors and/or their authorised representatives.

Beneficiary's Stamp	Name of the Person(s) Authorised to sign this Financial Statement
	JOE MOXON
	Date & signature
	02/05/2012

## 5.7 Financial statement: VR

### FP7 - Grant Agreement - Annex VI - Combination of CP & CSA

Form C - Financial Statement (to be filled in by each beneficiary)			
Project nr	261967	Funding scheme	Combination of CP & CSA
Project Acronym	EISCAT_3D_2		
Period from	01/10/2010	Is this an adjustment to a previous statement ?	No
To	31/03/2012		
Legal Name	VETENSKAPSRADET - SWEDISH RESEARCH COUNCIL	Participant Identity Code	999586165
Organisation short Name	VR	Beneficiary nr	7
Funding % for RTD activities (A)	75,00%	If flat rate for indirect costs specify %	60,00%

#### 1. Declaration of eligible costs/lump sum/flat rate/scale of unit (in €)

	Type of Activity					TOTAL (A+B+C+D+E)
	RTD (A)	Coordination (B)	Support (C)	Management (D)	Other (E)	
Personnel costs	0,00	15 291,30	0,00	0,00	0,00	15 291,30
Subcontracting	0,00	0,00	0,00	0,00	0,00	0,00
Other direct costs	0,00	2 951,42	0,00	0,00	0,00	2 951,42
Indirect costs *	0,00	10 945,63	0,00	0,00	0,00	10 945,63
Access costs	0,00	0,00	0,00	0,00	0,00	0,00
Lump sum/flat rate/scale of unit declared	0,00	0,00	0,00	0,00	0,00	0,00
<b>Total</b>	0,00	29 188,35	0,00	0,00	0,00	29 188,35
<b>Maximum EC contribution</b>	0,00	19 519,71	0,00	0,00	0,00	19 519,71
<b>Requested EC contribution</b>						19 519,71

\* Indirect costs relating to:

- "Coordination" and "Support" activities are reimbursed up to a maximum of 7% of the direct eligible costs relating to these activities excluding the direct eligible costs for subcontracting and the costs of resources made available by third parties which are not used on the premises of the beneficiary.

#### 2. Declaration of receipts

Did you receive any financial transfers or contributions in kind, free of charge from third parties or did the project generate any income which could be considered a receipt according to Art.II.17 of the grant agreement ?

No

If yes, please mention the amount (in €)

#### 3. Declaration of interest yielded by the pre-financing (to be completed only by the coordinator)

Did the pre-financing you received generate any interest according to Art. II.19 ?

No

If yes, please mention the amount (in €)

#### 4. Certificate on the methodology

Do you declare average personnel costs according to Art. II. 14.1?

No

Is there a certificate on the methodology provided by an independent auditor and accepted by the Commission according to Art.II.4.4?

No

Name of the auditor

Cost of the certificate (in €), if

#### 5. Certificate on the financial statements

Is there a certificate on the financial statements provided by an independent auditor attached to this financial statement according to Art.II.4.4. ?

No

Name of the auditor

Cost of the certificate (in €)

#### 6. Beneficiary's declaration on its honour

We declare on our honour that:

- the costs declared above are directly related to the resources used to attain the objectives of the project and fall within the definition of eligible costs specified in Articles II.14 and II.15 of the grant agreement, and, if relevant, Annex III and article 7 (special clauses) of the grant agreement;
- the receipts declared above are the only financial transfers or contributions in kind, free of charge, from third parties and the only income generated by the project which could be considered as receipts according to Art.II.17 of the grant agreement;
- the interest declared above is the only interest yielded by the pre-financing which falls within the definition of Art.II.19 of the grant agreement;
- there is full supporting documentation to justify the information hereby declared. It will be made available at the request of the European Union and in the event of an audit by the European Union and/or by the Court of Auditors and/or their authorised representatives.

Beneficiary's Stamp	Name of the Person(s) Authorised to sign this Financial Statement
	Tomas Andersson
	Date & signature
	10/05/2012

## 5.8 Financial statement: NI

### FP7 - Grant Agreement - Annex VI - Combination of CP & CSA

Form C - Financial Statement (to be filled in by each beneficiary)			
Project nr	261967	Funding scheme	Combination of CP & CSA
Project Acronym	EISCAT_3D_2		
Period from	01/10/2010	Is this an adjustment to a previous statement ?	No
To	31/03/2012		
Legal Name	NATIONAL INSTRUMENTS BELGIUM NV	Participant Identity Code	991286069
Organisation short Name	NI	Beneficiary nr	8
Funding % for RTD activities (A)	50,00%	If flat rate for indirect costs specify %	20,00%

#### 1. Declaration of eligible costs/lump sum/flat rate/scale of unit (in €)

	Type of Activity					TOTAL (A+B+C+D+E)
	RTD (A)	Coordination (B)	Support (C)	Management (D)	Other (E)	
Personnel costs	8 640,00	0,00	0,00	2 560,00	0,00	11 200,00
Subcontracting	0,00	0,00	0,00	0,00	0,00	0,00
Other direct costs	127 707,56	0,00	0,00	3 308,95	0,00	131 016,51
Indirect costs *	27 269,51	0,00	0,00	1 173,79	0,00	28 443,30
Access costs	0,00	0,00	0,00	0,00	0,00	0,00
Lump sum/flat rate/scale of unit declared	0,00	0,00	0,00	0,00	0,00	0,00
<b>Total</b>	<b>163 617,07</b>	<b>0,00</b>	<b>0,00</b>	<b>7 042,74</b>	<b>0,00</b>	<b>170 659,81</b>
<b>Maximum EC contribution</b>	<b>81 808,54</b>	<b>0,00</b>	<b>0,00</b>	<b>7 042,74</b>	<b>0,00</b>	<b>88 851,28</b>
<b>Requested EC contribution</b>						<b>88 851,28</b>

\* Indirect costs relating to:

- "Coordination" and "Support" activities are reimbursed up to a maximum of 7% of the direct eligible costs relating to these activities excluding the direct eligible costs for subcontracting and the costs of resources made available by third parties which are not used on the premises of the beneficiary.

#### 2. Declaration of receipts

Did you receive any financial transfers or contributions in kind, free of charge from third parties or did the project generate any income which could be considered a receipt according to Art.II.17 of the grant agreement ?

No

If yes, please mention the amount (in €)

#### 3. Declaration of interest yielded by the pre-financing (to be completed only by the coordinator)

Did the pre-financing you received generate any interest according to Art. II.19 ?

No

If yes, please mention the amount (in €)

#### 4. Certificate on the methodology

Do you declare average personnel costs according to Art. II. 14.1?

No

Is there a certificate on the methodology provided by an independent auditor and accepted by the Commission according to Art.II.4.4?

No

Name of the auditor

Cost of the certificate (in €), if

#### 5. Certificate on the financial statements

Is there a certificate on the financial statements provided by an independent auditor attached to this financial statement according to Art.II.4.4. ?

No

Name of the auditor

Cost of the certificate (in €)

#### 6. Beneficiary's declaration on its honour

We declare on our honour that:

- the costs declared above are directly related to the resources used to attain the objectives of the project and fall within the definition of eligible costs specified in Articles II.14 and II.15 of the grant agreement, and, if relevant, Annex III and article 7 (special clauses) of the grant agreement;
- the receipts declared above are the only financial transfers or contributions in kind, free of charge, from third parties and the only income generated by the project which could be considered as receipts according to Art.II.17 of the grant agreement;
- the interest declared above is the only interest yielded by the pre-financing which falls within the definition of Art.II.19 of the grant agreement;
- there is full supporting documentation to justify the information hereby declared. It will be made available at the request of the European Union and in the event of an audit by the European Union and/or by the Court of Auditors and/or their authorised representatives.

Beneficiary's Stamp	Name of the Person(s) Authorised to sign this Financial Statement
	Mr. Rudy Van-Gompel
	Date & signature
	08/05/2012

## 5.9 Summary financial report

### FP7 - Grant Agreement - Annex VI - Combination of CP & CSA

Summary Financial Report - Combination of CP & CSA																			
Project acronym		EISCAT_3D_2		Project nr.		261967		Reporting period from		01/10/2010		to		31/03/2012		Page		1/1	
Funding scheme				CP-CSA				Type of activity								Total (A)+(B)+(C)+(D)+(E)			
Beneficiary nr.	If 3rd Party, linked to beneficiary	Adjustment (Yes/No)	Organization Short Name	RTD (A)		Coordination (B)		Support (C)		Management (D)		Other (E)		Total	Max EU Contribution	Receipts	Interest		
				Total	Max EU Contribution	Total	Max EU Contribution	Total	Max EU Contribution	Total	Max EU Contribution	Total	Max EU Contribution						
1		No	EISCAT	0.00	0.00	145,441.40	129,685.25	112,579.70	100,383.57	104,307.78	104,307.78	0.00	0.00	362,328.88	334,376.60	0.00	519.20		
2		No	UOULU	127,766.48	95,824.86	111,494.16	74,561.72	462,589.33	309,356.61	20,527.17	20,527.17	0.00	0.00	722,377.14	500,270.36	0.00	0.00		
3		No	LTU	286,506.16	214,879.62	0.00	0.00	0.00	0.00	10,544.67	10,544.67	0.00	0.00	297,050.83	225,424.29	0.00	0.00		
4		No	IRF	308,341.34	231,256.01	0.00	0.00	0.00	0.00	3,509.92	3,509.92	0.00	0.00	311,851.26	234,765.93	0.00	0.00		
5		No	UiT	0.00	0.00	43,055.09	28,793.09	231,894.13	155,079.20	13,541.10	13,541.10	0.00	0.00	288,490.32	197,413.39	0.00	0.00		
6		No	STFC	0.00	0.00	63,291.60	37,760.76	0.00	0.00	72,415.75	72,415.75	0.00	0.00	135,707.35	110,176.51	0.00	0.00		
7		No	VR	0.00	0.00	29,188.35	19,519.71	0.00	0.00	0.00	0.00	0.00	0.00	29,188.35	19,519.71	0.00	0.00		
8		No	NI	163,617.07	81,808.54	0.00	0.00	0.00	0.00	7,042.74	7,042.74	0.00	0.00	170,659.81	88,851.28	0.00	0.00		
TOTAL				886,231.05	623,769.03	392,470.60	290,320.53	807,063.16	564,819.38	231,889.13	231,889.13	0.00	0.00	2,317,653.94	1,710,798.07	0.00	519.20		
Requested EU contribution for the reporting period (in €)														1,710,798.07					

## **6 Certificates**

### ***6.1 Certificate on the financial statements: UOULU***

(Attached)