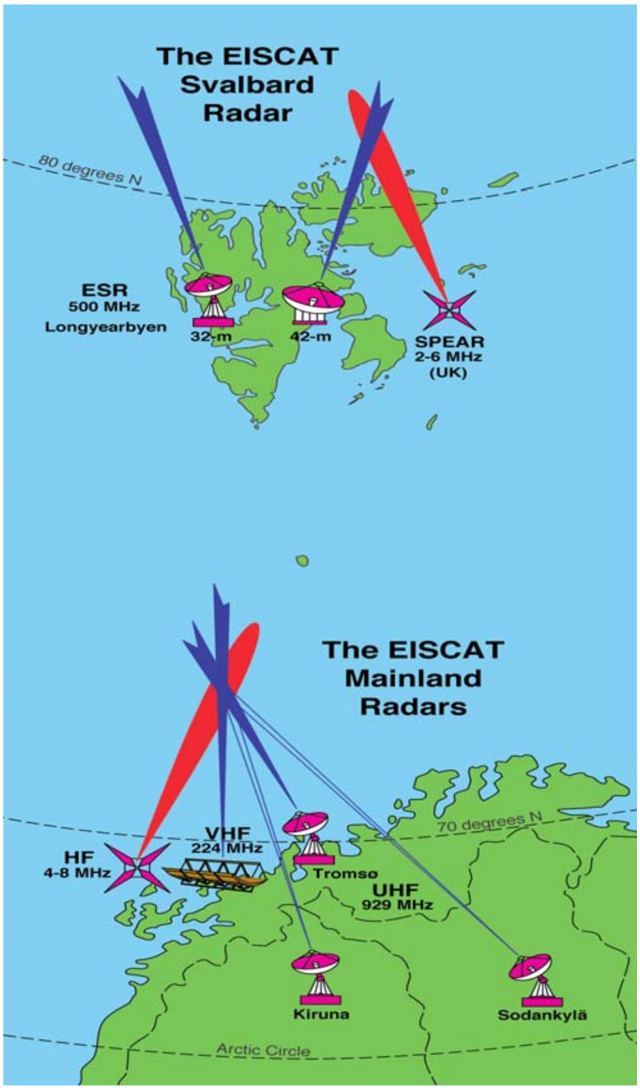
EISCAT

EUROPEAN INCOHERENT SCATTER
SCIENTIFIC ASSOCIATION

ANNUAL REPORT 2005



EISCAT Radar Systems

Location	Tromsø		Kiruna	Sodankylä	Longyearbyen	
Geographic Coordinates	69°35´N 19°14´E		67°52´N 20°26´E	67°22´N 26°38´E	78°09´N 16°02´E	
Geomagnetic Inclination	77°30´N		76°48´N	76°43´N	82°06´N	
Invariant Latitude	66°12´N		64°27´N	63°34´N	75°18´N	
Band	VHF	UHF	UHF	UHF	UHF	
Frequency (MHz)	224	931	931	931	500	
Maximum bandwidth (MHz)	3	8	8	8	10	
Transmitter	2 klystrons	2 klystrons	-	-	16 klystrons	
Channels	8	8	8	8	6	
Peak power (MW)	2x1.5	2x1.3	-	-	1.0	
Average power (MW)	2x0.19	2x0.16	-	-	0.25	
Pulse duration (ms)	0.001-2.0	0.001-2.0	-	-	<.001-2.0	
Phase coding	binary	binary	binary	binary	binary	
Minimum interpulse (ms)	1.0	1.0	-	-	0.1	
Receiver	analog	analog	analog	analog	anal.-digital	
System temperature (K)	250-350	90-110	30-35	30-35	55-65	
Digital processing	14 bit ADC, 32 bit complex, autocorrelation functions, parallel channels				12 bit ADC, lag profiles 32 bit complex	
					Antenna 1	**Antenna 2**
Antenna	parabolic cylinder 120m x 40m Steerable	parabolic dish 32m Steerable	parabolic dish 32m Steerable	parabolic dish 32m Steerable	parabolic dish 32m Steerable	parabolic dish 42m Fixed
Feed system	line feed 128 crossed dipoles	Cassegrain	Cassegrain	Cassegrain	Cassegrain	Cassegrain
Gain (dBi)	46	48	48	48	42.5	45
Polarization	circular	circular	any	any	circular	circular

EISCAT Heating Facility in Tromsø

Frequency range: 4-8 MHz, Maximum transmitter power: 12 x 0.1 MW, Antennas: two arrays (4-8 MHz): 24 dBi, one array (5.4-8 MHz): 30 dBi. Additionally, a Dynasonde is operated at the Heating facility.

EISCAT Scientific Association
2005

EISCAT, the European Incoherent Scatter Scientific Association, is established to conduct research on the lower, middle and upper atmosphere and ionosphere using the incoherent scatter radar technique. This technique is the most powerful ground-based tool for these research applications. EISCAT is also being used as a coherent scatter radar for studying instabilities in the ionosphere, as well as for investigating the structure and dynamics of the middle atmosphere and as a diagnostic instrument in ionospheric modification experiments with the Heating facility.

There are ten incoherent scatter radars in the world, and EISCAT operates three of the highest-standard facilities. The experimental sites of EISCAT are located in the Scandinavian sector, north of the Arctic Circle. They consist of two independent radar systems on the mainland, together with a further radar constructed on the island of Spitzbergen in the Svalbard archipelago - the EISCAT Svalbard Radar - Scandinavia (see schematic and operating parameters on the inside of the front cover).

The EISCAT UHF radar operates in the 931 MHz band with a peak transmitter power of more than 2.0 MW and 32 m, fully steerable parabolic dish antennas. The transmitter and one receiver are in Tromsø (Norway). Receiving sites are also located near Kiruna (Sweden) and Sodankylä (Finland), allowing continuous tri-static measurements to be made.

The monostatic VHF radar in Tromsø operates in the 224 MHz band with a peak transmitter power of 2 x 1.5 MW and a 120 m x 40 m parabolic cylinder antenna, which is subdivided into four sectors. It can be steered mechanically in the meridional plane from vertical to 60^o north of the zenith; limited east-west steering is also possible using alternative phasing cables.

The EISCAT Svalbard radar (ESR), located near Longyearbyen, operates in the 500 MHz band with a peak transmitter power of 1.0 MW, a fully steerable parabolic dish antenna of 32 m diameter, and a fixed field aligned antenna of 42 m diameter. The high latitude location of this facility is particularly aimed at studies of the cusp and polar cap region.

The basic data measured with the incoherent scatter radar technique are profiles of electron density, electron and ion temperature, and ion velocity. Subsequent processing allows a wealth of further parameters, describing the ionosphere and neutral atmosphere, to be derived. A selection of well-designed radar pulse schemes are available to adapt the data-taking routines to many particular phenomena, occurring at altitudes between about 50 km and more than 2000 km. Depending on geophysical conditions, a best time resolution of less than one second and an altitude resolution of a few hundred meters can be achieved.

Operations of 3-4000 hours each year are distributed equally between Common Programmes (CP) and Special Programmes (SP). At present, six well-defined Common Programmes are run regularly, for between one and three days, typically about once per month, to provide a data base for long term synoptic studies. A large number of Special Programmes, defined individually by Associate scientists, are run to support national and international studies of both specific and global geophysical phenomena.

The Annual Reports present a summary of EISCAT's operations, developments, publications, budget, and Council and committee structure for each year. Further details of the EISCAT system and operation can be found in various EISCAT reports, including illustrated brochures, which can be obtained from EISCAT Headquarters in Kiruna, Sweden.

The investments and operational costs of EISCAT are shared between:

Suomen Akatemia, Finland
Centre National de la Recherche Scientifique, France
Max-Planck-Gesellschaft, Federal Republic of Germany
National Institute of Polar Research, Japan
Norges forskningsråd, Norway
Vetenskapsrådet, Sweden
Particle Physics and Astronomy Research Council, United Kingdom

EISCAT Scientific Association 2005

Contents

Introduction

In contrast to earlier Annual Reports prepared by the EISCAT Scientific Association, this year's Report concentrates exclusively on the activities, administration, and financial operations of the Association itself. The activities of the user community cover such a wide area, and are conducted across so many fields and within the research organisational structures of so many different countries and administrations that the inclusion of a comprehensive survey of the scientific work of the community is no longer practical, nor perhaps relevant, within this publication. The scientific programme is covered in a number of other documents prepared in connection with the renewal of the EISCAT Agreement and the establishment of several new lines of activity within the Association and is not repeated here, with the exception of the inclusion of the list of refereed publications achieved by the user community during the reporting period.

Further Information

General information, operations, real time and archival data:
www.eiscat.se
EISCAT_3D project:
eiscat3d.eiscat.se or www.eiscat.se/groups/EISCAT_3D_info

Cover illustrations

In the presence of Mr Qin-jian Lou, Vice Minister of the Ministry of Information Industry of the Peoples Republic of China, Professor Qingsheng Dong, General Director, China Research Institute of Radio Wave Propagation (CRIRP), places the last signature on the new EISCAT Agreement. The ceremony took place during the 65th meeting of the EISCAT Council, held in the coastal city of Qingdao (main picture) 18-19 Octber 2006.
Left to right (back row): Mr. Zhang WenSen (Director, Economics Cooperation Section, International Cooperation Department, China Electronics Technology Group Corporation), Professor Asgeir Brekke (Council Chairman, University of Tromsø), Mr Qin-jian Lou, Mr. Han Jun (Deputy Director General, Department of Science & Technology, Ministry of Information Industry), Professor Tony van Eyken (EISCAT Director), Mr. Yuan Pu (Deputy Director. CRIRP), Mr. Ma Tiehan (Director, Foreign Affairs Department, CRIRP), Dr Asta Pellinen (Swedish Institute of Space Physics), Professor Torre Vorren (University of Tromsø), Professor Jürgen Röttger (Max-Planck Society), and Professor Zuo Xiao (Beijing University). Front row: Professor Qingsheng Dong, and Ms Miranda Wu (CRIRP).

Council Chairman's Introduction

2005 was one of the most difficult years in the history of the EISCAT Scientific Association. At the extraordinary Council meeting in Oslo in March 2005 the French and German delegations declared that they would not be able to sign the new Agreement which should take effect from January 1st 2007. This was the first time ever in the history of the Association that a member country had wanted to withdraw. As France and Germany represented about 50% of the annual contribution to the budget of the EISCAT organisation, and since the UK delegation also announced a reduction in their contribution, it was clear that the organisation was meeting the most serious moment of its history. Without increased contributions from the countries continuing as full members, or the addition of new members to the organisation, EISCAT would have to close down and instead of focusing on the future of the organisation, was forced to discuss the possibility of reducing the staff and dismantling the installations. This was an especially difficult situation to be in when we were, at the same time, looking for new partners in EISCAT.

Fortunately the question of dismantling the radar systems in the case of closing down was settled by an offer from the Scandinavian member countries to carry such potential costs without any further commitment from the other countries. The Scandinavian countries also offered to double their annual contributions from the present level after January 1st 2007; Finland would in fact increase its contribution by almost a factor of 2.5 from the present.

Discussions with Chinese authorities and scientists concerning possible Chinese membership in EISCAT had taken place rather regularly since 1998 and by 2005 it had become clear that China was willing to sign a new Agreement from the end of 2006 and indeed to contribute financially to the organisation already from January 1st 2006. Since 2003, discussions had also taken place, between the EISCAT organisation and The Academy of Sciences of the Ukraine, concerning possible membership of the Ukraine in the EISCAT organisation. In the fall of 2005 a Declaration of Intent was signed between the Academy and EISCAT stating that the Ukraine would become an EISCAT member from 2008.

At the EISCAT Headquarters, the director and his staff had worked hard on a new development plan for EISCAT and also obtained a grant from EU to carry through a feasibility study for a new phased array radar system, EISCAT_3D. This all helped to ease some of the financial stress on the organisation while giving the EISCAT engineers and scientists interesting and important challenges to focus on. The end of the year, when the ceremony of signature for the new EISCAT Agreement was arranged in Qingdao, China, brought a promising conclusion to the most difficult year in the history of EISCAT and also encouraged both the EISCAT staff and the Association's scientists to continue to engage themselves in the future of the organisation.

From a scientific point of view, the efforts made by the director and his staff to run the EISCAT radars in continuous operations exceeding 30 days, is a remarkable achievement and has certainly brought EISCAT to the forefront of a new area in radar management. It is also very satisfying to notice that the number of scientific papers based on EISCAT experiments is now increasing again after some years of decline. The EU funded TransNational Access programme represents a positive support to EISCAT as it gives users from non-associate countries a chance to become acquainted with the EISCAT system for scientific use. The EISCAT Summer School, and the accompanying EISCAT Workshop, that was so well organised in Kiruna brought together young scientists from many countries, clearly showing that EISCAT has a bright future.

To live with an organisation that has been to such a critical phase as EISCAT has in the last years as the financial situation has weakened has put a heavy burden on the director in trying to keep the spirit up for himself and for his staff. For the staff, particularly, it has been extremely hard to live with such an uncertain future. I will therefore take this opportunity to thank the staff for all their efforts and hard work to keep the EISCAT systems working and in good shape. On behalf of the EISCAT organisation I would also like to express my sympathy for the difficulties you have gone through in this troubled time and thank you for your devotion and enthusiasm in working for an inspiring future for EISCAT.

Asgeir Brekke
Chair
Longyearbyen, September 2006

Director's Summary

2005 was a momentous year for the EISCAT Scientific Association. The new EISCAT Agreement was signed, allowing the Association to emerge from a rather unsettled period which has characterised the last several years. Included in the signatories of the new Agreement is the China Research Institute of Radio Wave Propagation, marking the entry of the Peoples Republic of China into the Association, though sadly during this year the French community also announced their intention to resign from the Association at the end of 2006. This year, the Association also embarked on a four-year study, with European Union support, to design a replacement for the mainland radar systems which have served the community so well for more than twenty years.

The Association's facilities have maintained a high level of availability throughout the year, covering the requests of the user community for special programme operations as well as taking part in the International Union of Radio Scientists (URSI) Incoherent Scatter Working Group (ISWG) programme of co-ordinated world-wide operations and continuing the Association's own common programme.

The Association's facilities are technically in reasonable shape, the system utilisation is high, and the operations are within budget.

Efforts to finalise the new EISCAT Agreement have formed a major part of the Association's work during the year. The Council Chairman and the Director travelled to China and Japan in February 2005 to negotiate details of the future involvement of both nations. Very constructive discussions with both communities resulted in the signing of a new Memoranda of Understanding in both Beijing and Tokyo.

The Director and Council Chairman with Mr Jainhua Cao and Professor Jian Wu at the Ministry of Information Industry in Beijing on 21 February 2005

During a meeting at the Ministry of Information Industry of the Peoples Republic of China in Beijing, Mr Jainhua Cao, Head of Section, Department of Science and Technology, said that the Ministry attached great importance to establishing a joint agreement between representatives of China and the EISCAT Scientific Association. The Council Chairman, Professor Brekke, welcomed Chinese scientists to the Association noting that the involvement of many young Chinese researchers in EISCAT would be very beneficial to both parties.

Following the conclusion of the visit to China, the EISCAT delegation visited Tokyo for meetings with Japanese scientists and government officials. The Japanese community has played a substantial role in EISCAT activities since joining the Association in 1996. During the meetings in Tokyo, the National Institute for Polar Research and the Solar-Terrestrial Environment Laboratory (University of Nagoya) signed a further Memorandum of Understanding confirming their strong, and continuing, commitment to EISCAT and establishing that both organisations would be signatories of the new EISCAT Agreement.

The Council Chairman with Mr Qin-jian LOU, Vice Minister of the Ministry of Information Industry of the Peoples Republic of China, during the latter's visit to the EISCAT Council meeting held at the Sea View Garden Hotel in Qingdao (photo CRIRP)

Doubts over the future funding of the Association had delayed the approval of the 2005 budget and an extraordinary meeting of the EISCAT Council was convened in Oslo at the beginning of March to resolve the outstanding issues. During the meeting the French Associate announced that it would be withdrawing from the Association at the end of the present Agreement; this is the first time that an Associate has withdrawn, and is particularly sad since France was a founding member of the Association, French scientists were strongly involved in the specification and design of the facilities, and the French community have been very active and innovative members of the incoherent scatter community for nearly forty years. Subsequently the Council both approved the 2005 budget, allowing a resumption of normal operations (see below), and approved the draft of the new Agreement to be finalised during the year.

The Director and Council Chairman, together with Academicians A. G. Naumovets, L. M. Lytvynenko, and V. M. Loktev, during the signing ceremony at the Academy of Sciences in Kiev

A small working group immediately started preparing the final text of the Agreement, which was approved at the June meeting of the EISCAT Council, held in Stockholm, Sweden, and circulated for signature later in the summer. The final signature was added to the document during the autumn EISCAT Council meeting, held in Qingdao, China, on 18-19 October (see cover), bringing to an end the uncertainties over the continuation of the Association.

Later in the year, the Council Chairman and the Director visited the Ukraine to discuss how Ukrainian scientists could also join the Association in the future. After discussions at the Institute of Radio Astronomy in Kharkiv, the group moved to Kiev where a Declaration of Intent was signed with Academician A. G. Naumovets, Vice-President of the National Academy of Sciences of the Ukraine, and Academician L. M. Lytvynenko, Director of the Institute of Radio Astronomy, under which the Institute of Radio Astronomy, on behalf the Ukraine, will join EISCAT in 2008.

Further efforts to expand the Association included discussions with representatives of the Russian Academy of Science who visited the EISCAT radar site at Ramfjordmoen in August.

Every two years, a major scientific workshop is hosted by one of the member countries of the Association. In 2005, the workshop was held in Kiruna, Sweden and was accompanied by a two-week radar school organised by scientists from the Swedish Institute of Space Physics, Kiruna. The school and workshop took place in August and September and were attended by scientists and students from all the EISCAT nations, as well as from the USA, Canada, China, and elsewhere (see photo on page 45). The scientific proceedings will again be published as a special issue of Annales Geophysicae while all the tutorial materials prepared for the school were distributed electronically to attendees. The next workshop, to be organised by the Finnish EISCAT community, will be held in August 2007, in the Åland Islands, in the Gulf of Bothnia between Finland and Sweden, and will again include a specialised radar school.

Dr Mike Rietveld, EISCAT Heating Senior Scientist, with Professor Nikolay P Laverov, Vice President, Russian Academy of Sciences, and Professor Pavlenko, Head of Arctic Projects, Russian Academy of Sciences, in the Heating transmitter hall, Ramfjordmoen

The EICAT systems delivered a total of 3612 hours of operations during 2005, compared with a budgeted target of 4200 hours. The delay in adopting the 2005 budget resulted in a substantial loss of operations during the first quarter and caused the important winter dark season to be covered at levels far below those planned. Operations between January 1 and March 31 were restricted to include only those which could be accomplished at minimum cost. With the co-operation of the user community, a significant program of SP operations was possible, but no Common Programmes were conducted. Regular operations restarted at the ESR on 1 March, following Council approval of the 2005 budget, and at the mainland radars on 1 April.

However, the operating time was recovered later in the year and, except for the Heating facility, the mainland systems operated more than budgeted. The major shortfall was associated with the Svalbard operations; the available Special Programme time was increased substantially in the 2005 budget compared with previous years, but the user community was not able to react rapidly enough to utilize all the new time during the first year.

Data wall at the Svalbard radar showing the September 2005 long run at the ESR and UHF tri-static radars. The Sondrestrom and Millstone Hill radars were also operating throughout, with Jicamarca, MU, and Arecibo all participating for shorter intervals.

Within the operating totals, the Common Programmes amounted to 60% of the operations while the remaining 40% were Special Programme experiments conducted by scientists from the countries of the Association.

The Common Programme included a very long (30+ days) run in September as part of the co-ordinated World-day programme organised by the International Union of Radio Scientists; this single run more than doubled the normal annual co-ordinated programme and was the first time that the World's radars attempted such a long co-ordinated period of observations. Both the EISCAT Svalbard Radar and the tri-static EISCAT UHF system took part; the UHF operation was the longest scheduled program ever attempted by that system.

Extended operations are increasingly important to support modelling and forecasting efforts related to Space Weather and its effects on our society's technologically based systems.

In January 2005, EISCAT made a proposal to the international coordination administration of the 2007-8 International Polar Year (IPY), on behalf of the URSI ISWG, covering extended operations of the World's ten incoherent scatter radar sites, and particularly the high latitude radars in Scandinavia, Greenland, New England, and northern Canada (under construction) to ensure that these facilities operate during as much of the IPY as possible. Since that proposal was accepted, and incorporated into a larger cluster with ICESTAR[1] and the IHY[2], the development of the infrastructure and procedures to support long operations at EISCAT has become very important.

Incoherent scatter radars provide uniquely detailed data on the atmosphere and ionosphere between altitudes of about 80 and 1500km. Incoherent scatter radars measure profiles of the density, temperature, and velocity of the ionosphere directly, and an extensive range of parameters describing both the ionised and neutral components of the atmosphere, as well remote sensing of the terrestrial magnetosphere, can be further derived. While these instruments are the most powerful ground-based facilities available for this purpose, they have traditionally only been operated for relatively restricted intervals.

Some radars will be able to run essentially continuously but EISCAT plans to ensure the availability of incoherent scatter radar data from at least one of the high-latitude radar sites throughout the entire IPY interval. The result will be the most extensive, and most detailed, dataset describing the polar atmosphere ever collected and it will be invaluable for the purposes of monitoring, modelling, and basic scientific research.

The EISCAT Svalbard Radar operated during 2005 with great reliability. The mainland radar systems also operated reliably until an engineering problem caused both the UHF and the VHF radar systems to be partially unavailable during the early part of the autumn; thereafter both systems again operated reliably.

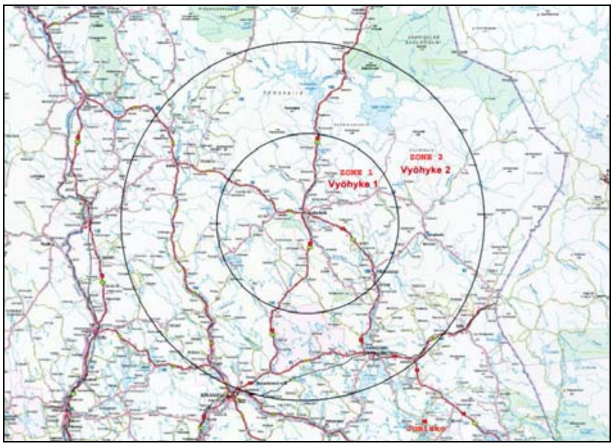
Severe in-band interference appeared on the UHF receivers in Sodankylä in early February. Prompt investigation by the EISCAT site staff revealed that several new GSM base stations in the neighbourhood had been erroneously programmed to transmit inside the 929.0–930.5 MHz spectrum segment reserved, under a gentlemen's agreement with the Finnish GSM operators, for EISCAT use. The staff quickly contacted the local operator, Finnet, who immediately moved the frequencies of these base stations well away from the protected band, restoring normal radar performance at F-region altitudes in the general direction of Tromsø.

Under the agreement, frequencies in the range 927.5-932.0 MHz are not to be used within zone 1 (radius 50 km from Sodankylä), while frequencies in the range 929.0-930.5 MHz are not to be used within zone 2 (radius 100 km). However, following this incident, a thorough investigation of the general RFI situation at Sodankylä showed that, even with these voluntary restrictions, as many as four simultaneous, extremely strong GSM carriers are picked up by the antenna at low elevations (below approximately 10^{o}) in the 90–270^{o} azimuth sector. These signals were identified as originating from the GSM base station complex in central Sodankylä and are reflected off antenna towers etc. before entering the UHF antenna. All carriers are at frequencies above 940 MHz (i.e. well outside the EISCAT UHF band), but so strong that they drive the

[1] Interhemispheric Conjugacy Effects in Solar-Terrestrial and Aeronomy Research, Scientific Committee on Antarctic Research, Standing Scientific Group on Physical Sciences, Scientific Research Programme 2005-2009.

[2] International Heliospheric Year

first low-noise preamplifier stage (which is a wide-band design) into hard limiting, causing the noise floor to increase by as much as 10 dB.



Protection zones 1 and 2 around the Sodankylä receivers

Mitigation measures implemented at Sodankylä over the last few years have retained the ability of the receiving system to perform adequately for incoherent scatter observations, but the same measures have seriously eroded the sensitivity of the system for interplanetary scintillation (IPS) work and meaningful IPS operation at 930 MHz in Sodankylä must be regarded as practically impossible and future IPS observations will have to concentrate on using the 1.4 GHz receiving capability.

The determination of accurate calibration constants for incoherent scatter radars has always been a problematic issue with most radars specifying the errors in their absolute parameter determination, particularly of plasma densities, at no better than 10%. Routine plasma line calibration data are now included with the archived and distributed analysed data from the EISCAT Svalbard Radar. Inclusion of a similar calibration, derived from the EISCAT dynasonde, for the mainland UHF and VHF radars means that the analysed electron density data distributed by the Association now carries a routine, accurate, absolute calibration for the first time.

A persistent feature of the operation of the EISCAT Svalbard Radar has been the accumulation of snow on the reflecting surface of the 42m antenna during the long winter season. The effects of the snow loading on the electrical properties of the antenna have been difficult to quantify until the introduction of routine plasma line calibration into the common programme operations during 2005 allowed the system constants of both antennas to be determined easily for the first time.

The ready availability of accurate calibration information immediately revealed the extent of the effect of the snow on the 42m antenna surface and showed that ion line derived electron densities could be in error by as much as a factor of four or five during periods of substantial snow accumulation.

The Svalbard radar staff therefore set out to remove all the snow from the antenna surface, a process which involved manually removing approximately 42 tons of snow. The entire site staff was required to complete this process, and even visitors were pressed into service to help, and the task took more than a week to complete. Snow must be repeatedly moved down the inner surface of the dish until it can finally be expelled through removable gratings located at the centre of the reflector around the vertex cabin.

French PhD student, Cyril Simon, is pressed into service clearing snow in the EISCAT Svalbard Radar 42m antenna – a process which finally cleared 42 tons of snow and ice from the reflecting surface.

A programme of regular snow removal was subsequently adopted. This has maintained the snow accumulation at manageable levels, but necessarily placed a substantial physical burden on staff members.

Also at the Svalbard Radar, the success of initial efforts to observe NEIALs[3] using interferometry techniques with the two antennas aligned along the local magnetic field, led to the construction and installation of an additional, dedicated antenna and receiver system in the spring of 2005. The initial antenna and (EISCAT constructed) receiver system of this Tromsø University project utilises an array of sixteen yagi antennas mounted on a secure frame located to the south of the

[3] Naturally Enhanced Ion Acoustic Lines

existing antennas; further such arrays are planned for later installation.

EISCAT staff members Halvor Horn, Anja Strømme, and Martin Langteigen with the snow finally removed.

Dr Tom Grydeland, University of Tromsø, with the first interferometer array at the ESR

Extensive problems in the transmitter power supply systems at Tromsø were encountered during summer maintenance. The systems are protected by spark-gap crowbar systems which have always been prone to false firings, often interrupting the smooth operation of both the UHF and VHF transmitters. Following work to reduce false crowbars firings on for the VHF radar in Tromsø it was found that many of the VHF rectifier diodes had been destroyed, along with many of the capacitor bank bleed resistors. Additional efforts to improve the UHF crowbar performance lead to the destruction of both pulse transformers, used to step up the voltage applied to achieve ionisation of the air within the spark gap.

While a spare pulse transformer shipped to Tromsø from the Sondrestrom Radar in Greenland was in transit, both failed units were rewound by a local engineering firm and all the destroyed diodes and resistors were replaced allowing the UHF radar to participate in the extended September operation with only a short delay.

Deeper investigation revealed several underlying problems of which the most serious involved the control circuitry in the protection systems associated with the high voltage switch gear systems. These units had been in place since the original installation and had become so worn out that both sets had had to be replaced with modern equivalents (original sets are no longer manufactured or available) earlier in the year. The original documentation and description of the operation of these units proved to have been inadequate and the complete functionality had therefore not been implemented in the replacement system.

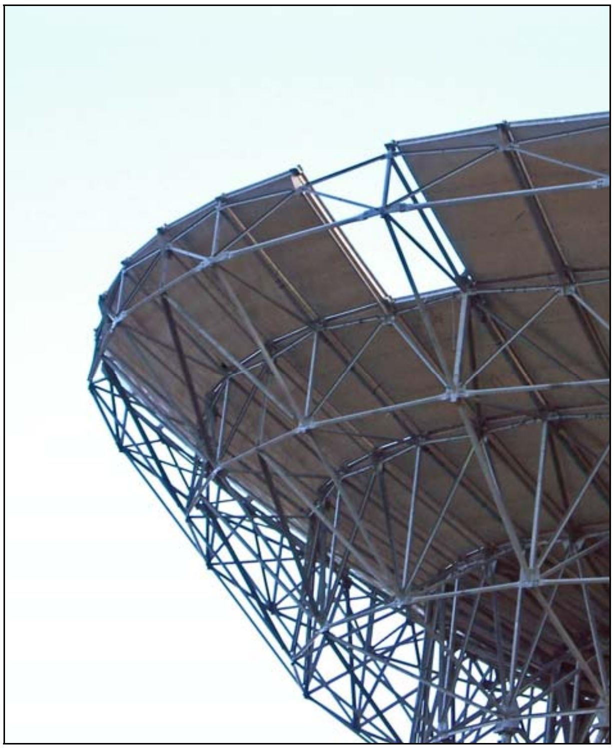
The whole crowbar circuitry and firing logic was carefully reviewed, the identified missing functionality implemented into the replacement switch gear systems, the spark-gap geometries investigated and corrected, and the functionality of the whole system carefully tested and validated to ensure that such a chain of events cannot happen again. Additionally, the procedures for implementing and testing changes in critical system components were reviewed and additional checks introduced to further safeguard the overall radar capability.

Exceptional gusty winds in September damaged the main reflector surface of the 32m UHF antenna in Tromsø but the displaced panel was readily repaired and replaced with the aid of a trailer-mounted mobile lift platform.

In spite of this outcrop of problems in Tromsø, the site staff was able to stabilise the situation and both incoherent scatter radars continue to operate effectively and with high-availability to support both the Common and Special Programme requirements of the Association.

Single-klystron operation is routinely available at ~1.5 MW on the VHF radar and the new HV switchgear has significantly reduced the number of false trips during system start-up. The failed klystron has been evaluated at the workshops of Communications and Power Industries (CPI), in Palo Alto, and, based on the resulting report and recommendations; it was finally decided to order the completion of the repair work. The tube is scheduled to be returned from the factory in early summer 2006.

Ramfjordmoen transmitter capacitor banks (left) and crowbar assemblies (round structures, right hand side)



Gust damage on the 32m UHF antenna at Tromsø

Continuing work to tune and improve the UHF waveguide at Tromsø has allowed the transmitter power to be steadily increased and fairly routine operation at between 1.9 and 2.1 MW is now possible. This is the highest power level ever achieved reliably by the EISCAT UHF system and very close to the design goal, for the UHF transmitter upgrade, of 2.4 MW. In addition, the long awaited second receiver channels are being installed at Kiruna and Sodankylä allowing the implementation of an improved software polariser algorithm at both sites.

Meanwhile, the ionospheric modification facility continues to operate effectively and work started during the year to upgrade and extend the transmitter exciter and control system. The whole exciter part of the Heater will be relocated to the transmitter hall with a battery of fourteen DDS units installed in a RF-shielded VME crate and remotely operated via an optical fiber link from the existing control room.

Rebuilt and reinstalled Heating transmitter tube

The upgrade will simplify the practical operation of the system, bring the control mechanisms in line with those of the other EISCAT radar systems and substantially improve the flexibility of the whole system enabling new and novel experiment modes to be introduced. In preparation for tests in magnetospheric radar mode, the smaller of the high-frequency arrays has been re-configured for receive-only use.

Two worn out power tubes were shipped to a US tube rebuilder. The first has been rebuilt as a pilot study, returned to EISCAT, and installed in one of the transmitters. Initial results are very encouraging and the second tube will probably also be rebuilt by the same company. New Heating transmitter tubes are no longer available and a reliable mechanism for rebuilding the existing stock as they wear out is essential for the long term continued operation of the facility.

EISCAT data archiving, data analysis, and data distribution continues to develop towards the goals of 100% online raw data in the archive, 100% of analysed data available through the web-based Madrigal archive, and 100% on-time data analysis for all new measurements.

The data archive at Kiruna has been extended during the year with a second 2x6 Tbit RAID and the backup/safety RAID has been moved to the warm area in the antenna basement. Two independent UPS units provide operating power for the primary and backup RAIDs, thus ensuring a measure of redundancy even in case of a massive mains power failure.

The slowest of the inter-site data links has been upgraded to 100 Mbits/s with the installation, by the University of Tromsø, of a fiber connection linking the Ramfjordmoen facilities to the main University campus.

Dr Gudmund Wannberg, the technical leader of the EISCAT_3D Design Study and Deputy Director of the Association, and the Council Chairman gave a press conference at EISCAT's Ramfjordmoen site following the start of the design study.

In a major change of direction for the Association, a contract, under the European Union's Sixth Framework Programme initiative - Structuring the European Research Area – Design Studies, was successfully established at the beginning of the year. The project, named EISCAT_3D, is a four-year design study to develop a replacement for the two mainland incoherent scatter radars. The project formally started on 1 May 2005 with EISCAT acting both as the Coordinator and a substantial partner in the project where about 45% of the total estimated work effort is within EISCAT. Other partners are the University of Tromsø, Luleå University of Technology and the Council for the Central Laboratory of Research Council – Rutherford Appleton Laboratory.

A further contract, within the European Union Sixth Framework Programme initiative - Structuring the European Research Area – TransNational Access, was also negotiated. European Union funding under this contract will allow scientists in countries currently not associated with EISCAT to use the mainland infrastructure. Users will be supported for travel, instruction, and time on the systems through the Sixth Framework. The contract will start on 1 January 2006 and it is envisaged that the first user will be allocated time on the systems in autumn 2006.

The contract with the European Space Agency concerning the project "Small-Sized Space Debris Data Collection with EISCAT Radar Facilities" was successfully completed during the year and the contract work ended as planned by the end of December. It was mutually agreed not to activate the optional 2006 phase at this time since EISCAT wished to redeploy effort to the EISCAT_3D design study and the ESA Space Debris budgets for 2006 were under substantial pressure.

EISCAT measurements of space debris have been very effective using both the UHF and ESR systems. Coherent integration over 0.2s gives a 50% probability of detection for objects at 1000 km having effective diameters greater than 2.5 cm, using the Tromsø UHF radar, and about 2.9 cm, in the case of the EISCAT Svalbard Radar.

Space debris work with EISCAT will continue at a low level as an in-house activity and the main programme may be reactivated in the future.

The EISCAT facilities continue to attract substantial numbers of visitors, mainly as part of organised tours and fact-finding studies, but also through *ad hoc* visits by tourists and interested members of the public. Of a total of about 1400 visit days, rather more than half were radar users with most of those visits being to the main radar site at Ramfjordmoen near Tromsø. Of non-user visits, the EISCAT site in Sodankylä was the most popular, followed by the much less accessible Svalbard Radar site outside Longyearbyen, the receiver site at Kiruna, and Ramfjordmoen. On Svalbard, a trial arrangement to offer tours to the radar through the program of one of the Longyearbyen-based tour companies was surprisingly popular with local tourists. In spite of high demand, such visits proved operationally difficult since the Svalbard Radar site staff is small and heavily committed to the maintenance and operation of the radar facility.

Scientists using the data and facilities of the Association published sixty-four papers, theses, and books in the refereed literature in 2005, continuing an upward trend in the number of publications completed in recent years.

The staff complement has been largely stable, and staff reductions commenced in 2003 were completed during the year. EISCAT's first ever research PostDoc, Dr Anja Strømme, funded through a US NSF (National

Science Foundation) award to SRI (Stanford Research Institute) International, has been located on Svalbard. One new engineer, Martin Langteigen, joined the team on Svalbard in April while two engineers resigned towards the end of the year: Halvor Horn, from Svalbard and Frei Rønningsbakk, from the Ramfjordmoen site. One of these positions will not be filled. in preparation for the transition to a reduced post-2007 staff complement level.

The new shift-working agreement negotiated between the staff at Ramfjordmoen and the University of Tromsø appears to be considerably more expensive and less flexible than that which it replaced.

During the year EISCAT staff participated in many international scientific meetings, in ELKOM-05, the Professional Electronics Exhibition held at the Helsinki Fair Centre, and in the production of a television documentary about auroral research called 'Riddle of the Polar Sky'. Staff members have also served on a number of external committees including the European Science Foundation's Committee for Radio astronomy Frequencies (CRAF), and the Technical Advisory Committee for the new US Advanced Modular Incoherent Scatter Radar (AMISR).

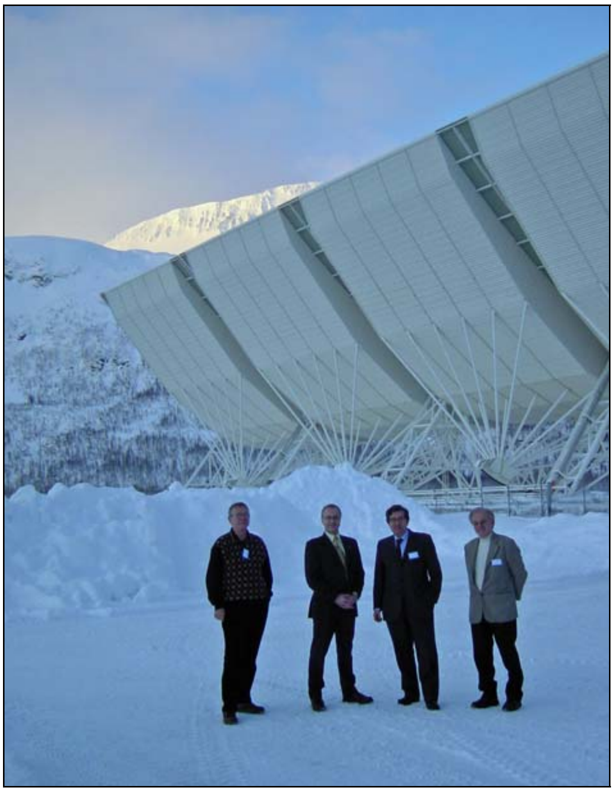
Staff on Svalbard were involved in preparatory work for a large, new Norwegian Optical Observatory, announced in May by the Norwegian Ministry of Education and Science, which is to be constructed close to the radar site at Breinosa. Construction of the facility will be carried out by the Norwegian Directorate of Public Construction and Property and will be finished in time for the auroral season 2006/2007, and the IPY. UNIS will oversee the daily operations but the EISCAT Scientific Association looks forward to greatly expanded cooperation with the optical facilities as a result of the establishment of the new observatory in such close proximity to the radar.

The new observatory joins not only the EISCAT Svalbard Radar on Breinosa, but also the SPEAR (Space Plasma Exploration by Active Radar) system, owned and operated by the UK's University of Leicester, and its associated ionosonde, as well as the slightly further removed SOUSY (University of Tromsø) MST and meteor scatter (National Institute of Polar Research, Japan) radars located in the valley at the foot of the mountain. Future EISCAT plans include the provision of a local dynasonde to augment these facilities.

The 2005 operations were below target and this resulted in lower expenditure than budgeted. The budget for the year was balanced by transferring the surplus, relative to the budget, of 1778 kSEK to the restructuring reserve established to cover transition costs associated with the implementation of the structures and working practices required under the new Agreement.

The proposed 2006 budget was approved by the Council in the autumn, together with the outline budgets for 2007 and beyond. The funding level for 2007 and beyond will be reduced compared to recent years and some reorganisation will be necessary during 2006 to adapt the Association to the new Agreement. Coupled with the planned cost reductions to be implemented, the long-term budget plan is sound and funds from EISCAT's restructuring reserve will be used to ease the transition into the post-2006 regime.

While the total post-2006 numerical funding contributions from the Associates will be reduced (even with substantial increases in the contributions of Finland, Norway, and Sweden, and the addition of China as a new Associate), an equally serious budget impact results from the complete lack of indexation of contributions over the last ten years. If the Association is to remain viable in the long term, this lack of adequate indexing to offset the inevitable effects of inflation must be addressed.



The EU Minister of Research (second from right) with the Council Chairman and Director at Ramfjordmoen

China will already contribute to the Association in 2006 and negotiations with several potential new Associates, as well as efforts to attract new European Associates, will continue.

During the coming year, EISCAT will continue to support the wide range of existing and new programmes proposed by the various Associates' scientific communities, including the hosting of user-supplied equipment. In addition to continuing to support the Associates' scientific communities, supporting users related to the TransNational Access programme, and participating in the World-days' schedule, much effort will be invested in the ongoing EISCAT_3D Design Study.

Operational targets in 2006 will be largely similar to those of 2005, but the 2007 targets will be substantially reduced to accommodate the revised budget levels – though planning is in hand to conduct quasi-continuous operation of the EISCAT Svalbard Radar during the International Polar Year (which begins 1 March 2007) provided adequate additional funding can be procured. The Science Advisory Committee has begun to consider the best way to absorb the operational restrictions at the mainland radars and, while currently preferring the UHF rather than the VHF radar, nevertheless supports the completion of the klystron repair and continued operation of the VHF system. The VHF system is also planned to be used as an illuminator in the EISCAT_3D design study test system development.

Studietur Nord 2006 at the Svalbard Radar

In the longer term, additional resources related to both new Associates and individual contracts, such as those with the EU, will allow the operational hours to be increased. The TransNational Access programme will continue until 2009. The Ukraine will join the Association in 2008, while 2009 will see the completion of the new EISCAT_3D design and the potential start of the construction phase leading to the initial availability of the new facility as early as 2012.

Future work to secure the availability of the UHF frequency will be necessary if the system is to continue to be viable after 2006. Other outstanding issues to be addressed include the potential need to mothball one of the mainland radars for budgetary reasons, the need to maintain an adequate staffing level while retaining the necessary skill-set to maintain the Association's complex radar facilities, the need to revitalise and expand the user community, as well as future funding and budget development, particularly with regard to capital funding for the EISCAT_3D construction phase (efforts to get EISCAT into the ESFRI roadmap for future European research infrastructure have met with limited success so far).

Members of the Chinese Arctic and Antarctic Administration, together with the Council Chairman inside the ESR 42m antenna, including Mr Wei Wenliang, Deputy Director, Mr Chen Danhong, Chief of the Cooperation Division, Mr Liu Chi, Chief Europe Division, Department of International Cooperation , MOST, and Professor He Jianfeng.

Planning objectives are based on maintaining and developing the EISCAT Svalbard Radar, restoring, and maintaining, the full VHF radar capability, updating the Heater, and extending the passive UHF capabilities as hardware is released by the introduction of the new EISCAT_3D VHF system.

In the software and support area, EISCAT plans to develop operational methods to support continuous and unattended operation, improve data analysis, storage, and retrieval capabilities, and develop improved data assimilation and distribution models. EISCAT will also encourage other instrument teams to deploy related diagnostics at or near the radar sites, partly through its support of value added data services to enhance the Association's role in co-coordinating high latitude studies.

EISCAT intends to continue to provide the highest class facilities to support World class research, delivering timely, fully processed, calibrated and validated data addressing detailed plasma physics and the traditional user community. This will include near continuous operation and targeted upgrades to provide proper support for event driven research, Space Weather and environment applications, and global models. EISCAT's University connections will underpin an aggressive graduate and post-graduate training programme

A group from the China Electronics Technology Group Corporation (CETC) with Professor Jain Wu (far right) , Director, National Key Laboratory of Electromagnetic Environment (LEME), CRIRP, inside the EISCAT Svalbard Radar 42m antenna

With the signature of China at the last Council meeting of 2005, the new Agreement is complete and the immediate future of the Association is no longer in doubt. EISCAT now moves to a situation in which it is assured of five-year funding, rolling forward by a year at a time each year. In this situation, there will always be five years' notice of impending funding problems. While the new agreement is much simpler, and removes the "crunch points" associated with the expiry of the previous agreements, this should not be a cause for complacency, and the executives and the user community will have to work continuously to justify regular funding.

Under the new Agreement, it will be necessary for EISCAT to change in a number of ways if it is to continue to meet the needs of the user community. There is now a strong need to engage with the funding agencies and with the wider public, to explain the excitement, relevance, and cost-effectiveness both of EISCAT and EISCAT-related science. This exercise needs to involve the whole EISCAT community, and requires a unified and co-ordinated plan, which provides a well-argued case for the scientific goals of EISCAT and the strategy for achieving them. In the past, EISCAT's scientific programme has effectively been formed by simply integrating the individual objectives of the users, often without reference to the national strategies of the Associates, where they exist, without an over-arching plan. However, while the existing EISCAT Agreement almost mandated this approach, such a strategy can no longer guarantee EISCAT funding. A clear science strategy is needed, with backing from a well-organised, vocal and better integrated user community. This will also accurately inform decisions on future facilities, and in planning future operations and defining this plan must be a major objective of the EISCAT community over the coming months.

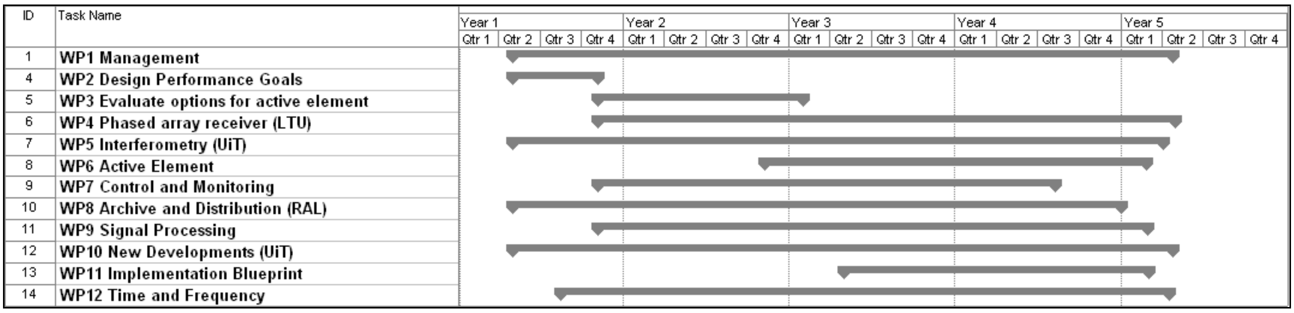
2005 has been a momentous year for the EISCAT Scientific Association and has, in many ways, marked the initial stages of the transition of the Association from a passive provider of facilities into a proactive scientific force. This process will take a number of years to complete, but the Association is now firmly established on a path which will lead to a secure financial foundation and a platform for the future development of scientific programmes of the highest calibre.

I would like to take this opportunity to thank all the members of EISCAT's staff, the Council Chairman, the members of the EISCAT Council and the other EISCAT committees, and the many people both within and outside the present EISCAT community who have contributed to the effort, now thankfully successful, to reach a new EISCAT Agreement. The new Agreement, which will come into force on 1 January 2007, can carry the Association safely into the future.

My additional thanks are due to the EISCAT staff for their continued dedication and efficiency in operating the facilities and delivering first class data to the user community, even while the basis of their continued employment was being placed in such doubt by the funding decisions enacted by the same community.

Tony van Eyken
Director
Kiruna, August 2006

EISCAT_3D Design Study



4-year, EISCAT_3D Overall Project Management Plan as proposed to, and funded by, the European Union (Year1=2005)

The radars of the European Incoherent Scatter Scientific Association (EISCAT) are the World's leading ground based instruments providing high quality radar observations of the auroral and polar ionosphere and atmosphere. Current and future ionospheric and plasma physics research, geophysical environmental monitoring, modelling, and forecasting (e.g. for space weather, ionospheric corrections, and climate change) are driving requirements for both quasi-continuous observations and substantially improved spatial and temporal resolution.

EISCAT_3D is a four-year design study to investigate the technical feasibility, costs, and potential European manufacturers of a new, next generation VHF incoherent scatter radar with distributed power amplifiers and an upgraded antenna array for both transmission and reception, together with at least two further, remote reception facilities, using phased arrays with multiple distributed receivers and capable of advanced in-beam interferometry. The design study also encompasses essential developments in advanced signal processing, data collection, distribution, and analysis.

The facility envisaged in this design study will surpass all other facilities, both existing and under construction, and will provide European researchers with access to the World's most advanced and capable facility. It will require the development of new radar and signal processing technology, together with crucial developments in polarisation control, built-in interferometric capabilities, the provision of remote receiving installations with electronic beam forming, signal processing, and automated data analysis. In order to allow the construction of the large phased array systems required, the design study also envisages seminal developments in the design and production of VLSI technology components.

The design study also includes communication, data distribution, and data archiving systems which leverage the available skills and existing network and Grid structures. These developments will allow European, and other, users to access data from the new systems irrespective of their location within the community.

The project formally started on 1 May 2005 with EISCAT acting both as the Coordinator and a substantial partner in the project where about 45% of the total estimated work effort is within EISCAT. Other partners are the University of Tromsø, Luleå University of Technology and the Council for the Central Laboratory of Research Council – Rutherford Appleton Laboratory.

During the first eight-months of the project, the partners have achieved the milestones and generated the deliverables required by the contract with the European Union with very little modification to the original plan.

In June 2005, a questionnaire was sent to individuals identified as past, present or presumptive future scientific users of a possible EISCAT_3D radar to obtain their views on the performance required of the new system. A well-attended half-day session, dedicated to introducing the EISCAT_3D project to the scientific community and evaluating the system requirements, was conducted in connection with the EISCAT Workshop held in Kiruna, Sweden in August.

Subsequently the Design Specification Document, version 1.1, was issued on 7 November 2005, though the frequency management authorities of Sweden, Finland and Norway had already been informed about the probable spectrum requirements in April.

Extensive simulation of the receiving array has been performed and it has been shown that the required post-digitisation beam steering can be achieved, even for very large arrays. Reconstruction of short baud-length pulses has also been demonstrated and upper limits on timing jitter and aperture stability have been set.

Work has commenced on the receiver front-end design as well as on the time synchronization issue, system-level designs for the digital beam-formers, the signal processing hardware, and the data storage system.

A survey of existing and emerging industry-standard ultra-fast serial communications protocols has been undertaken and several potentially suitable protocols identified for intra-array communication.

Spectacular solar effects at the EISCAT Svalbard Radar on 4 April 2005

In December 2005, the EISCAT Scientific Association moved into two offices in the new Svalbard Science Park (to be formally opened in 2006) just around the corner from the UNIS Geophysics wing (above)

EISCAT Operations 2005

The EISCAT radars operate in two basic modes, using approximately half the available observing time for each. In the Special Programme mode, users conduct individual experiments dedicated to specific experiments and objectives. The resulting data are reserved for the exclusive use of the experimenters for one year from the date of collection. Special programmes often make use of the well developed pulse schemes and observing modes of the Common Programme. EISCAT Common Programmes are conducted for the benefit of the entire user community and the resulting data are immediately available to all. The common Programme modes are developed and maintained by EISCAT staff, and the overall programme is monitored by the Scientific Advisory Committee. Common Programme operations are often conducted as part of the coordinated World Day programme organised by the International Union of Radio Scientists (URSI) Incoherent Scatter Working Group (ISWG).

Common Programme One, CP-1, uses a fixed transmitting antenna, pointing along the geomagnetic field direction. The three-dimensional velocity and anisotropy in other parameters are measured by means of the receiving stations at Kiruna and Sodankylä (see map, inside front cover). CP-1 is capable of providing results with very good time resolution and is suitable for the study of substorm phenomena, particularly auroral processes where conditions might change rapidly. The basic time resolution is 5 sec. Continuous electric field measurements are derived from the tri-static F-region data. On longer time scales, CP-1 measurements support studies of diurnal changes, such as atmospheric tides, as well as seasonal and solar-cycle variations. The observation scheme uses alternating codes for spectral measurements.

Common Programme Two, CP-2, is designed to make measurements from a small, rapid transmitter antenna scan. One aim is to identify wave-like phenomena with length and time scales comparable with, or larger than, the scan (a few tens of km and about ten minutes). The present version consists of a four-position scan which is completed in six minutes. The first three positions form a triangle with vertical, south, and south-east positions, while the fourth is aligned with the geomagnetic field. The remote site antennas provide three-dimensional velocity measurements in the F-region. The pulse scheme is identical with that of CP-1.

Common Programme Three, CP-3, covers a 10^o latitudinal range in the F-region with a 17-position scan up to 74^oN in a 30 minute cycle. The observations are made in a plane defined by the magnetic meridian through Tromsø, with the remote site antennas making continuous measurements at 275 km altitude. The coding scheme uses alternating codes. The principle aim of CP-3 is the mapping of ionospheric and electrodynamic parameters over a broad latitude range.

Common Programmes One, Two, and Three are run on the UHF radar. Three further programmes are designed for use with the VHF system. The UHF and VHF radars are often operated simultaneously during the CP experiments. Such observations offer comprehensive data sets for atmospheric, ionospheric, and magnetospheric studies.

Common Programme Four, CP-4, covers geographic latitudes up to almost 80^oN (77^oN invariant latitude) using a low elevation, split-beam configuration. CP-4 is particularly suitable for studies of high latitude plasma convection and polar cap phenomena. CP-4 was unavailable during 2005 because the repair of one of the two klystrons permits the use of only a single beam.

Common Programme Six, CP-6, is designed for low altitude studies, providing spectral measurements at mesospheric heights. Velocity and electron density are derived from the measurements and the spectra contain information on the aeronomy of the mesosphere. Vertical antenna pointing is normally used.

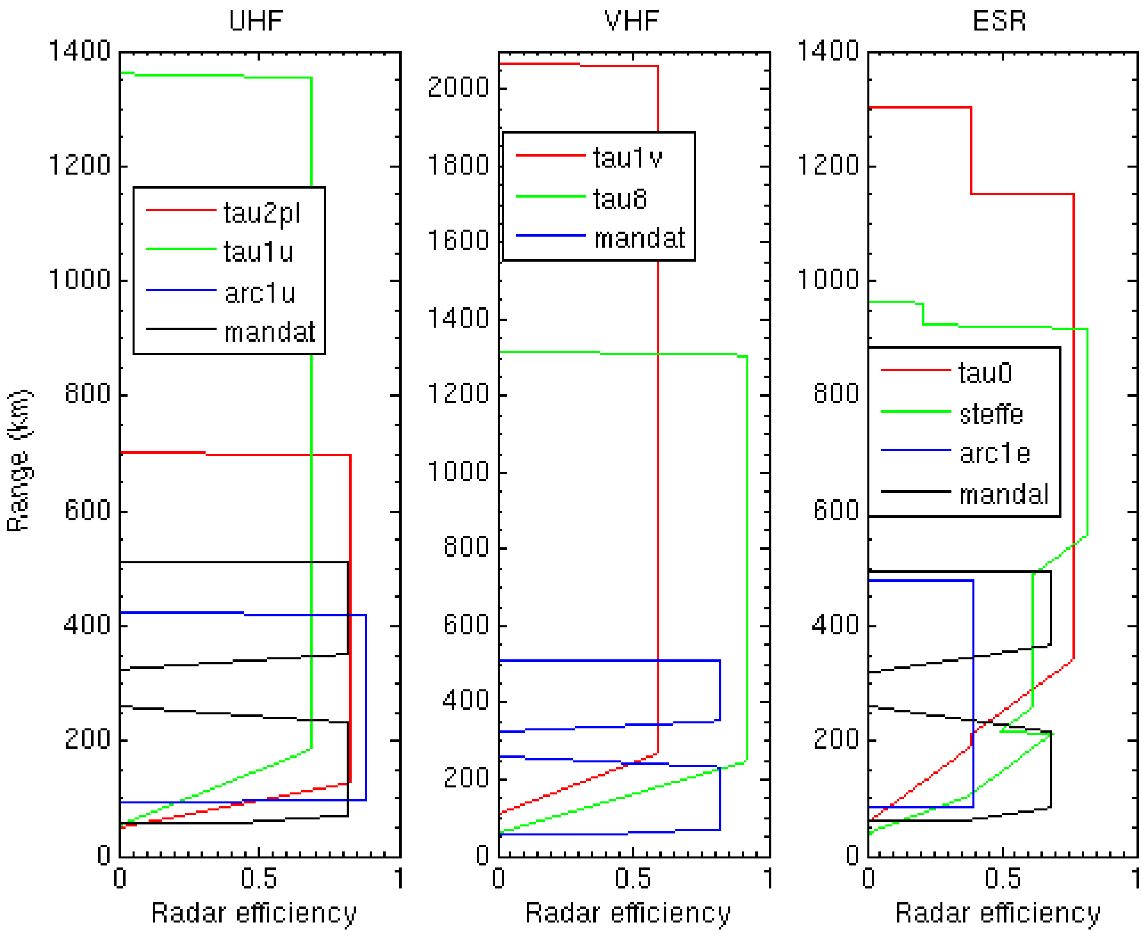
Common Programme Seven, CP-7, probes high altitudes and is particularly aimed at polar wind studies. The present version uses both of the VHF klystrons and is designed to cover altitudes up to 2500 km vertically above Ramfjordmoen. CP-7 was not used during 2005 because the repair of one of the two klystrons restricts the available output power.

Equivalent Common Programme modes are available for the EISCAT Svalbard Radar. CP-1L is directed along the geomagnetic field (81.6º inclination). CP-2L uses a four position scan with spacing matching CP-2. CP-3L is a 15 position elevation scan with southerly beam swinging positions overlapping those of CP-3. CP4-L combines observations in the F-region viewing area of the two beams of CP-4 with field-aligned and vertical measurements. Alternating code pulse schemes have been used extensively for each mode to cover ranges of approximately 80 to 1200 km with integral clutter removal below 150 km.

The table and diagram on the next page summarise the presently available modulation schemes on the three incoherent scatter radars. Subsequent tables show the accounted hours on the various facilities for each month and for each Common Programme mode (CP) or Associate (SP), an overview of EISCAT Common Programme experiments in 2005 (WD indicates a co-ordinated 'World Day' incoherent scatter experiment, * indicates multiple radar operation for some or all of the interval), and a summary of the actual operations compared with the targets for the year.

Experiment Name	Radar	Range Resolution	Time Resolution	Range Coverage	Application
tau0	ESR	3 – 9 km	3.2, 6.4 s	90-1200 km	Low elevation and long range experiment (CP 3,4,7)
tau1	VHF UHF	4 - 11 km 2 – 9 km	5 s	60-2000 km 60-1300 km	Low elevation experiment (CP 3)
tau2pl	UHF	2 – 5 km	5 s	90-750 km	High elevation E and F region, plasma lines (CP 1,2)
tau8	VHF	2 – 12 km	5 s	60-1300 km	Low elevation and long range experiment, plasma lines (CP 4,7)
arc1	UHF ESR	1 km	0.44 s 0.4 s	96-400 km 85-480 km	High time resolution for auroral studies
arc_dlayer	VHF	0.3 km	5 s	60-120 km	High spectral resolution for D-region
manda	VHF ESR	0.5 km 0.8 km	6 s 6 s	60-500 km	High spectral resolution for D-region (CP 6)
hilde	ESR	3 – 14 km	5.1 s	40-1300 km	Dual antenna experiment
steffe	ESR	2 – 16 km	6.4 s	40-1000 km	High elevation E and F region, plasma lines (CP 1,2)

Table of standard pulse schemes available for the various radar systems, and applications in the Common Programmes



Range extent for the CP experiments used at different radars. The "radar efficiency" is a measure of how much of the power of the radar is used at different ranges, 1 being that the maximum RF duty cycle is used. There are other parameters as well which are important for an experiment, such as range, time and spectral resolution.

2005 CP UHF & VHF

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total	%
CP1		5.5	20.5	40				69	16		73.5	0.5	225	21
CP2					2.5				523				525.5	49
CP3				54	6.5						75.5		136	13
CP4				7		53.5							60.6	6
AA	12	9.5	18	25	12	15	*6*			16.5	9	8	131	131
Total	12	15	38.5	126	23	68.5	6	69	539	16.5	158	8.5	**1080**	100 %

2005 SP UHF & VHF

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total	%
3rdP										17			17	2
EI							10.5						10.5	1
FI						8			5.5	41.5			55	8
FR	9.5						36						45.5	6
GE	7	1		14			26.5			90.5			139	19
NI										39	15.5		54.5	8
NO	6		31				26.5			11.5	2.5		77.5	11
SW	30.5		5.5		1	28.5	21		25		2.5		114	16
UK		24		24.5	21	24.5	62			46.5			202.5	28
Total	53	25	36.5	38.5	22	61	182.5	0	30.5	246	20.5	0	**715.5**	100 %

2005 CP ESR

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total	%
CP1L		1	85	46	7			5.5		6	10		160.5	12
CP1L						101			667				768	57
CP3L				52.5							78		130.5	10
CP6L			1	8.5		53				1.5	78	2.5	144.5	11
AA	5.5	9.5	29	24	11	15		6		20	11.5	12	143.5	11
Total	5.5	10.5	115	131	18	169	0	11.5	667	27.5	177.5	14.5	**1348**	100 %

2005 SP ESR

2001	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total	%
3rdP														
EI				1						1			2	1
FI									5.5	9			14.5	4
FR	9.5						33						42.5	11
GE														
NI	6	1.5								8	6	38	59.5	16
NO	6	1.5	2.5	15					12.5			6	43.5	12
SW											20	18	38	10
UK	31	8.5	8	30.5	5	24	26.5					44.5	178	47
Total	52.5	11.5	10.5	46.5	5	24	59.5	0	18	18	26	106.5	**378**	100 %

ESR Common Programmes during 2005

05-03-29 06UT 04-02 16UT CP1L WD*
05-04-19 08UT 04-21 13UT CP3L *
05-06-08 08UT 06-10 13UT CP6L *
05-06-13 08UT 06-17 14UT CP2L WD*
05-09-01 08UT 09-30 14UT CP2L WD*
05-11-08 07UT 11-11 14UT CP3L WD*
05-11-17 07UT 11-20 15UT CP6L WD*

VHF Common Programmes during 2005

05-06-08 08UT 06-10 13UT CP6 *

UHF Common Programmes during 2005

05-03-29 07UT 03-29 13UT CP1 WD*
05-03-30 07UT 03-30 13UT CP1 WD*
05-03-31 07UT 03-31 13UT CP1 WD*
05-03-31 22UT 04-02 16UT CP1 WD*
05-04-19 08UT 04-21 13UT CP3 *
05-06-13 08UT 06-17 14UT CP2 WD*
05-08-10 17UT 08-13 14UT CP1 WD
05-09-06 18UT 09-30 14UT CP2 WD*
05-11-08 07UT 11-11 14UT CP3 WD*
05-11-17 07UT 11-20 15UT CP6 WD*

Overall Total Operating Hours 2005

Targets	CP	SP
ESR	1000	1500
Heating		200
M'land	750	750

Radar	Total Hours	
UHF	1296	
VHF	377	
Heating	141	
ESR	1720	
Passive	79	UHF + ESR

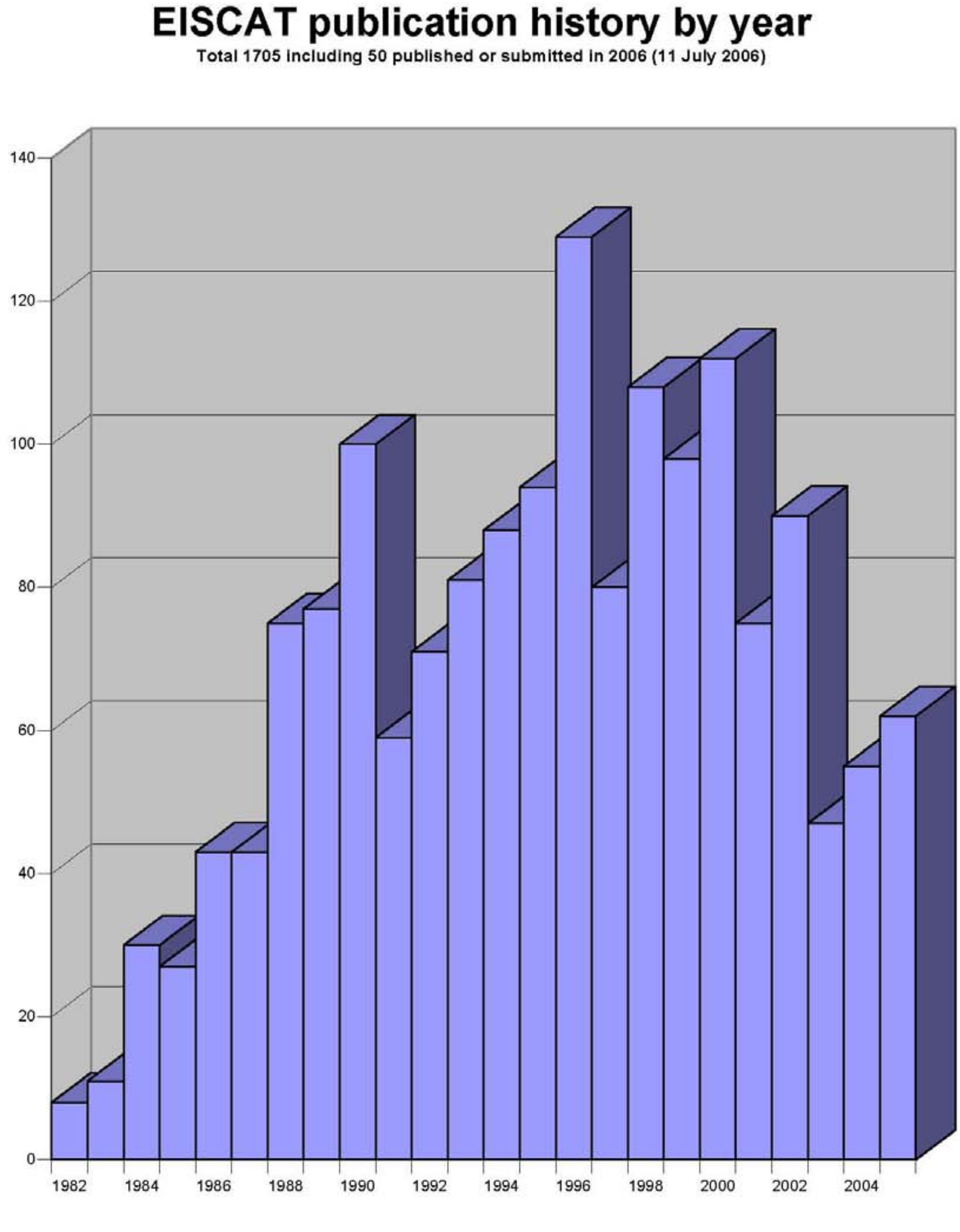
Charged Hours

Instrument	Total Hrs	CP actual	CP Planned	% of Plan	SP actual	SP Planned	% of Plan
M'land	1813	948.5	750	**126%**	847	950	**89%**
ESR	1720	1204	1000	**120%**	522	1500	**35%**

Associate Shares

Associate	M'land Hrs	M'land %	ESR Hrs	ESR %	Overall %	Nominal %
3rd Party	17	2%	0	0%		
EISCAT	10.5	1%	2	0%		
Finland	63	7%	23	4%	6%	6%
France	73	9%	73	14%	11%	21%
Germany	165	19%	29	6%	14%	20%
Japan	65	8%	71	14%	10%	8%
Norway	92	11%	59	11%	11%	11%
Sweden	128	15%	54	10%	14%	11%
UK	233	28%	211	40%	33%	23%
Totals	**846.5**	**100%**	**522**	**100%**	**100%**	**100%**

Scaling the Kiruna UHF antenna during the EISCAT Radar School and Workshop 2005


EISCAT publication history by year
Total 1705 including 50 published or submitted in 2006 (11 July 2006)
140
120
100
80
60
40
20
0
1982
1984
1986
1988
1990
1992
1994
1996
1998
2000
2002
2004

Publications 2005

Amm, O., E.F. Donovan, H. Frey, M. Lester, R. Nakamura, J.A. Wild, A. Aikio, M. Dunlop, K. Kauristie, A. Marchaudon, I.W. McCrea, H.J. Opgenoorth, and A. Strømme: Coordinated studies of the geospace environment using Cluster, satellite and ground-based data: an interim review. Ann. Geophys., 23, 6, pp 2129-2170, 2005

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2005 Meetings: Council and Committees

EISCAT Council

Council63b[4]: March 1, Voksenaasen Hotel, Oslo, Norway
Council64: June 8-9, Scandic Hotel Hasselbacken, Stockholm, Sweden
Council65: October 18-19, Sea View Garden Hotel, Qingdao, China

EISCAT Scientific Advisory Committee

SAC68: April 14-15. University of Versailles, Versailles, France
SAC69: August 28, Vinterpalatset Hotel, Kiruna, Sweden

EISCAT Administration and Finance Committee

AFC64: May 4, Copenhagen Admiral Hotel, Copenhagen, Denmark
AFC65: September 20, Medical Research Council, London, UK

2005 Meetings: EISCAT_3D Design Study

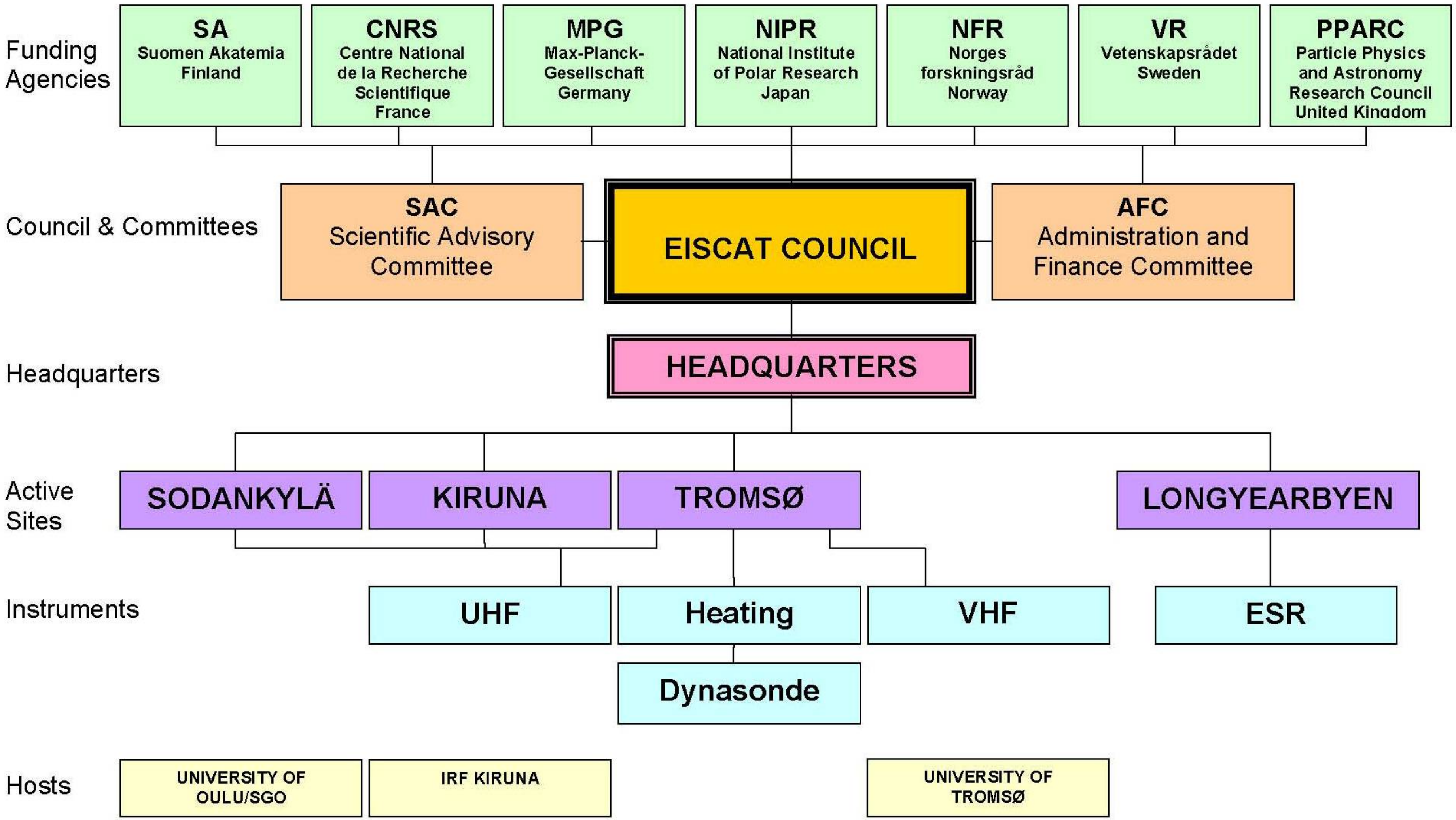
General Assembly

3DGA1: May 10, Luleå University of Technology, Luleå, Sweden

Steering Committee

3DSC1: May 20, Video conference
3DSC1: September 13-14, 'All hands meeting', Luleå University of Technology, Luleå, Sweden

[4] Extraordinary Council meeting



Staff at the active sites are, in general, employed through contracts with the listed host institutions.

EISCAT Scientific Association

December 2005

	Finland	France	Germany	Japan	Norway	Sweden	United Kingdom
Council	Dr. K. Kauristie Prof. T. Nygrén	Dr. D. Alcaydé Dr. W. Kofman Dr. A-M. Lagrange	Prof. J. Röttger Mr. M. Truchseß	Prof. T. Aso Prof. R. Fujii Prof. S. Fukao	Prof. A. Brekke* Prof. O. H. Ellestad Mr. A. Engebretsen	Dr. F. Karlsson Dr. A. Pellinen-Wannberg	Mr. C. G. Brooks Prof. M. Lockwood
Administrative and Finance Committee	Dr. K. Sulonen	Dr. P.-L. Blelly	Mr. M. Schleier	Mr. M. Nagata	Dr. B. Jacobsen	Dr. T. Andersson*	Mrs. S. Horne
Scientific Advisory Committee	Dr. A. Aikio*	Dr. F. Forme	Dr. M. Förster	Prof. T. Ogawa	Prof. C. La Hoz	Dr. S. Buchert	Dr. I. McCrea

* = Chairperson

EISCAT Executives

Director: Prof. A. P. van Eyken
Deputy Director Technical: Dr. U. G. Wannberg
Head of Administration: Mr. H. Andersson

EISCAT Site Leaders

EISCAT Svalbard Radar: Mr. H. Boholm
Kiruna: Mr. L.-G. Vanhainen
Sodankylä: Mr. M. J. Postila
Tromsö Radar: Mr. R. Jacobsen
Tromsö Heating: Dr. M. Rietveld

Non-Associates members of the Scientific Advisory Committee were Prof. E. Donovan (Canada) and Dr. J. Kelly (USA).

Appendix

Legal Report submitted in Sweden 2006

EISCAT Scientific Association
Registered as a Swedish non-profit organisation
Organisation number: 897300-2549

Annual report for the financial year 2005-01-01 – 2005-12-31

The EISCAT Council and the Director for the Association herewith submits the annual report for 2005.

ADMINISTRATION REPORT

Ownership, organisation and objective

The EISCAT Scientific Association was established in 1975 through an agreement between the Centre National de la Recherche Scientifique (France), the Max Planck Gesellschaft (Germany), Vetenskapsrådet (Sweden), Norges forskningsråd (Norway), the Particle Physics and Astronomy Research Council (United Kingdom) and Suomen Akatemia (Finland). In 1996, the National Institute of Polar Research (Japan) joined the Association. These organisations are called EISCAT Associates. The Association has its formal seat in Kiruna, Sweden, and is registered as a non-profit organisation.

The aim of the Association is to make significant progress in the understanding of physical processes in the high latitude atmosphere by means of experimental programmes generally conducted using the incoherent scatter radar technique, which may be carried out as part of wider international projects. For this purpose, the Association has developed, constructed, and now operates, a number of radar facilities at high latitudes. At present, these comprise a system of stations at Tromsø (Norway), Kiruna (Sweden), Sodankylä (Finland), and Longyearbyen (Svalbard).

The Association is fully funded by the Associates. Depending on the available funding, scientific priorities and operational targets are adjusted on an annual basis.

The Association is governed by the EISCAT Agreement, Statutes, Financial Rules, and the Rules for the Management of Scientific Programmes.

The EISCAT Council is charged with the overall administration and supervision of the Association's activities. The Council consists of a Delegation of each Associate with a maximum of three members from each Associate. The Council appoints a Director, who is responsible for the daily management and operation of the facilities of the Association, for signing negotiable instruments, cheques and contracts entered into in the Association's name, and executing the Council's decisions, subject to such rules as may be laid down by the Council. The Council, in consultation with the Director, also selects the senior management team.

Two committees support the EISCAT Council, one handles scientific issues, and the other covers administrative and financial matters.

The current Director is Professor Anthony P. van Eyken. His employment contract with the Council will run until December 31, 2008.

Operation and scientific development

The EISCAT Svalbard Radar operated this year with great reliability. The mainland radar systems also operated reliably until an engineering problem caused both the UHF and the VHF radar systems to be partially unavailable during the early part of the autumn; thereafter both systems have been operating reliably. The handling of the broken VHF klystron continued during the year; after some further deliberation, it was finally decided to complete the repair and the tube is scheduled to be returned from the factory in early summer 2006. The total repair cost will be around 1 200 kSEK, whereof 789 kSEK has already been paid. 282 kSEK of the total payment was made this year.

The various radars operated for a total of 3 612 hours (4 667 hours in 2004), compared with a budgeted target of 4 200 hours. A delay in adopting the 2005 budget resulted in a substantial loss of operations during the first quarter. This caused the important winter dark season not being covered at planned levels but nevertheless, the mainland systems operated more than budgeted with only Heating being below target. The major shortfall was associated with the Svalbard operations where Special Programme hours were substantially lower than target.

Common Programmes amounted to 60% (58%) of the operations while the remaining 40% (42%) were Special Programme experiments conducted by scientists from the countries of the Association. The Common Programme included a very long (30+ days) run in September as part of the co-ordinated World-day programme organised by the International Union of Radio Scientists; this single run more than doubled the normal annual co-ordinated programme and was the first time that the World's radars attempted such a long co-ordinated period of observations. Both the EISCAT Svalbard Radar and the tri-static EISCAT UHF system took part; the UHF operation was the longest scheduled program ever attempted by that system. Extended operations are increasingly important to support modelling and forecasting efforts related to Space Weather and its effects on technologically based systems.

A contract, under the European Union's Sixth Framework Programme initiative - Structuring the European Research Area – Design Studies, was successfully established in the beginning of the year. The project, named EISCAT_3D, is a four-year design study to develop a replacement for the two mainland incoherent scatter radars. The project started 2005-05-01. EISCAT acts as the Coordinator and is also a substantial partner in the project where about 45% of the total estimated work effort is within EISCAT. Other partners are the University of Tromsø, Luleå University of Technology and the Council for the Central Laboratory of Research Council – Rutherford Appleton Laboratory.

A further contract with the European Union has recently been negotiated. This contract is also within the Sixth Framework Programme initiative - Structuring the European Research Area – Transnational Access. This contract will allow scientists in countries currently not associated with EISCAT to use the mainland infrastructure. Users will be supported for travel, instruction, and time on the systems through the Sixth Framework. The contract will start 2006-01-01 and it is envisaged that the first user will be allocated time on the systems in autumn 2006.

The contract with the European Space Agency concerning the project "Small-Sized Space Debris Data Collection with EISCAT Radar Facilities" ran during the year. The contract work ended as planned by the end of December. The draft final report was delivered in February 2006. It was mutually agreed not to activate the optional 2006 phase at this time.

Future operation and scientific development

During the coming year, EISCAT will continue to support the wide range of existing and new programmes proposed by the various Associates' scientific communities, including the hosting of user-supplied equipment.

In addition to continuing to support the Associates' scientific communities, supporting users related to the Transnational Access programme, and participating in the World-days' schedule, much effort will be put into the ongoing Design Study. Both the Transnational Access programme and the Design Study will continue into 2009.

Work on the long term future of the Association led to the signing of a new Agreement, which will come into force 2007-01-01, in autumn 2005. The funding level for 2007 and onwards will be lower than today. Work in 2006 will concentrate on adapting the Association to the new Agreement. This will involve both a reduction in complement levels and a re-negotiation of the host contracts. The estimated operating hours for 2007 will be of the order of 2 300 hours but planning is in hand to conduct quasi-continuous operation of the EISCAT Svalbard Radar during the International Polar Year (which begins 2007-03-01) provided adequate additional funding can be procured.

Negotiations with several potential new Associates will continue.

Additional resources related to both new Associates and individual contracts, such as those with the EU, will allow the operational hours to be increased.

The work of the Council and its committees
The Council held two ordinary meetings and one extraordinary during 2005 under the leadership of the Chairman, Professor Asgeir Brekke. The extraordinary meeting handled primarily new Agreement details. The supporting committees, the Administrative and Finance Committee and the Scientific Advisory Committee both held two meetings each.

The work relating to expand the number of Associates continued. Chinese representatives signed the new EISCAT Agreement, together with the existing continuing Associates, and will join the Association from 2007-01-01; Chinese scientists are already using the systems for initial studies. In November, a Declaration of Intent between EISCAT and the National Academy of Sciences of the Ukraine was signed; the Academy plans to join the Association in 2008.

Budget development during the year
The 2005 operations were a bit below target and this resulted in lower expenditure than budgeted for. The staffing was stable throughout the year. Towards the end of the year, two engineers resigned. These positions will not be filled since the transition to a reduced post-2007 staff complement level has started.

The long-term budget plan
The 2006 budget was set in the autumn. The 2007 budgeting work started already in connection with the new Agreement detailing. The overall funding for 2007 and for the following four years was finalised earlier in the year. Coupled with the planned cost reductions to be implemented, the long-term budget plan is sound. Funds from EISCAT's restructuring reserve will be used to ease the transition into the 2007 budget and beyond.

The result for 2005 and the surplus handling
The year was balanced by transferring the surplus, relative to the budget, of 1 778 kSEK to the restructuring reserve.

PROFIT AND LOSS ACCOUNTS

in thousands of Swedish Crowns

	Note 1	***2005***	***2004***
Associate contributions	Note 2	29 489	29 489
Other operating income		1 446	1 258
		30 935	30 746
Operation costs		-4 791	-5 065
Administration costs		-5 056	-4 401
Personnel costs	Note 3	-18 301	-16 961
Depreciation of fixed assets		-18 689	-21 718
		-46 838	-48 145
Operating profit/loss		*-15 903*	*-17 399*
Interest income		288	274
Other financial income and cost		199	57
Own reserves and funds	Note 4	-1 495	-1 377
		-1 008	-1 046
Profit/loss after financial items		*-16 911*	*-18 445*
Appropriations	Note 5	-1 778	-3 273
Transfer from funds invested	Note 6	18 689	21 718
		16 911	18 445
Net profit/loss for the year		*0*	*0*

BALANCE SHEET

in thousands of Swedish Crowns

		2005	2004
ASSETS			
Fixed assets			
Tangible fixed assets	Note 7		
Buildings		7 829	11 004
Radar systems		22 296	35 840
Equipment and tools		2 390	3 636
		32 514	50 481
Current assets			
Receivables		326	468
Prepayments and accrued income	Note 8	511	221
Cash at bank and in hand	Note 9	25 238	18 035
		26 074	18 724
Total assets		*58 589*	*69 204*
CAPITAL AND LIABILITIES			
Capital			
Funds invested	Note 10	31 851	49 795
Funds held on reserve	Note 11	14 887	12 360
		46 738	62 154
Long term liabilities			
Long term liabilities	Note 12	632	605
Current liabilities			
Liabilities, trade	Note 13	9 388	5 193
Provisions	Note 14	673	720
Other liabilities		1 158	532
		11 219	6 445
Total capital and liabilities		*58 589*	*69 204*
Pledged assets		*632*	*605*
Contingent liabilities		*none*	*none*

STATEMENT OF CASH FLOWS

in thousands of Swedish Crowns

	2005	*2004*
<u>Operating activities</u>		
Operating result before financial items	-15 903	-17 399
Transfer from funds invested	18 689	21 718
Interest received	288	274
Currency exchange rate changes	199	-35
Extra ordinary income and cost	0	92
Increase/decrease of receivables	142	-69
Increase/decrease of prepayments and accrued income	-290	351
Increase/decrease of creditors and liabilities	4 801	662
Cash flow from operations	*7 927*	*5 594*
<u>Investment activities</u>		
Investments in tangible assets	-724	-1 432
Cash flow from investment activities	*-724*	*-1 432*
Cash flow for the year	*7 203*	*4 162*
Liquid assets at the beginning of the year	*18 035*	*13 873*
Liquid assets at the end of the year	*25 238*	*18 035*

Note 1 *Accounting principles*
The accounting and valuation principles applied are consistent with the provisions of the Swedish Annual Accounts Act and generally accepted accounting principles (bokföringsnämnden allmänna råd och vägledningar).

All amounts are in thousands of Swedish kronor (SEK) unless otherwise stated.

Receivables
Receivables are stated at the amounts estimated to be received, based on individual assessment.

Receivables and payables in foreign currencies
Receivables and payables in foreign currencies are valued at the closing day rate. Where hedging measures have been used, such as forwarding contracts, the agreed exchange rate is applied. Gains and losses relating to operations are accounted for under other financial income and cost.

Bank accounts in foreign currencies
Bank balances in foreign currencies are valued at the closing day rate.

Fixed assets
Tangible fixed assets are stated at their original acquisition values after deduction of depreciation according to plan. Assets are depreciated systematically over their estimated useful lives.

The following periods of depreciation are applied: Buildings 10 - 50 years, Radar systems 3 - 20 years and Equipment and tools 3 - 5 years.

Note 2 *Associate contributions*
The Associates contributed to the operation during the year according to a fixed percentage.

		2005
CNRS (France)	23.25%	6 856
MPG (Germany)	23.25%	6 856
NIPR (Japan)	7.00%	2 064
PPARC (United Kingdom)	23.25%	6 856
RCN (Norway)	9.30%	2 742
SA (Finland)	4.65%	1 371
SRC (Sweden)	9.30%	2 742
	100.00%	29 489

Accumulated contributions status as of 2005-12-31

	1976 - 2005
CNRS (France)	183 218
MPG (Germany)	176 548
NIPR (Japan), 1996 -	60 498
PPARC (United Kingdom)	195 158
RCN (Norway)	114 603
SA (Finland)	46 878
VR (Sweden)	88 859
	865 763

Note 3 *Personnel costs and average number of employees*
The Association employs directly the Headquarters staff, currently seven positions, including the Directors. The Headquarters is located in Kiruna, Sweden. The personnel working at the Kiruna (Sweden), Sodankylä (Finland), Svalbard and Tromsö (Norway) sites are not employed by the Association. Instead, the personnel are provided via site contracts by the Swedish Institute of Space Physics (Kiruna site staff), Oulu University (Sodankylä staff) and Tromsö University (Tromsö and Svalbard staff). The Association refunds all expenses related to the provided staff, as well as an additional overhead.

Personnel costs in total	***2005***	***2004***
Salaries and emoluments paid to the Directors	2 117	1 880
Other personnel, employed and provided via site contracts	11 098	10 335
Social security contributions amounted to	4 648	4 108
of which for pension costs	2 603	2 175

Of the pension costs, 926 kSEK (792 kSEK) relates to the Directors. The Directors and all other directly employed staff are included in ITP like occupational pension plans. For the personnel provided via site contracts, the pension plans are handled by their respective employer.

The members of the board (EISCAT Council) and members of committees do not receive remunerations from the Association. Travel expenses in connection with Council and committee meetings are paid by the different Associates and is then usually reimbursed from the Association, excluding the Japanese Associate who pays the travel cost for their own members.

Salaries and emoluments and average number of staff per country

Finland		
Salaries and emoluments	1 562	1 463
Average number of staff - men and women	4 + 0	4 + 0
Norway (including Svalbard)		
Salaries and emoluments	7 902	7 255
Average number of staff - men and women	12 + 3	12 + 2
Sweden		
Salaries and emoluments	3 751	3 497
Average number of staff - men and women	7 + 1	7 + 2

Members of the board and Directors at year-end - men and women

Board members (EISCAT Council)	14 + 3	14 + 3
Directors	2 + 0	2 + 0

Note 4 *Own reserves and funds*
Transactions involving own reserves and funds.

Capital Operating reserve		
Budgeted transfer to the reserve	-534	-1 571
Transfer from the reserve	746	1 432
Investments made	-746	-1 432
Equipment repair fund		
Transfer from the fund for the VHF klystron repair	283	66
Spare parts reserve		
Budgeted transfer to the reserve	-29	-35
Transfer from the reserve	68	19
Budgeted use of our own funds/reserves		
Surplus fund transfer	504	144
ESR klystron purchase re-allocation		
Via the surplus fund for use in 2006	-1 277	0

	2005	2004
Design study allocation		
For later financing in the four-year project	-511	0
Sum own reserves and funds	*-1 495*	*-1 377*

Note 5 *Appropriations*
The outcome for this year became a surplus relative to the budget amounting to 1 778 kSEK. The amount has been transferred to the restructuring reserve. The 2004 outcome resulted in a surplus (3 273 kSEK) and it was transferred to the same reserve.

Note 6 *Transfer from funds invested*
The depreciation cost is covered by funds from Capital - funds invested.

Note 7 *Tangible fixed assets*
Changes in tangible fixed assets during 2005.

Buildings		
Opening acquisition value	42 204	42 086
Acquisitions during the year	0	118
Closing acquisition value	42 204	42 204
Opening accumulated depreciation	-31 199	-27 925
Depreciations during the year	-3 175	-3 275
Closing accumulated depreciation	-34 375	-31 199
Closing residual value	7 829	11 004
Radar systems		
Opening acquisition value	243 624	243 624
Acquisitions during the year	0	0
Closing acquisition value	243 624	243 624
Opening accumulated depreciation	-207 784	-191 925
Depreciations during the year	-13 544	-15 859
Closing accumulated depreciation	-221 328	-207 784
Closing residual value	22 296	35 840
Equipment and tools		
Opening acquisition value	30 872	29 931
Acquisitions during the year	724	1 314
Disposals during the year	-105	-373
Closing acquisition value	31 491	30 872
Opening accumulated depreciation	-27 235	-25 024
Depreciations during the year	-1 970	-2 585
Disposals during the year	104	373
Closing accumulated depreciation	-29 101	-27 235
Closing residual value	2 390	3 636
Sum tangible fixed assets	*32 514*	*50 481*

	2005	2004

Note 8 *Prepayments and accrued income*
The main buildings and systems insurance for 2006 was paid in December.

	2005	2004
Prepaid rents	76	77
Prepaid insurances	401	94
Other items	34	50
	511	221

Note 9 *Bank balances status*

	2005	2004
Nordea	25 237	18 033
Cash in hand	1	2
	25 238	18 035

Note 10 *Funds invested status*

	2005	2004
Buildings	7 166	10 319
Radar Systems	22 296	35 840
Equipment and Tools	2 390	3 636
	31 851	49 795

Note 11 *Funds held on reserve*
283 kSEK was drawn from the equipment repair fund for the VHF klystron repair. 1 277 kSEK was put in the surplus fund for purchase of additional klystrons to the Svalbard system (budgeted for 2005 but postponed into 2006). 511 kSEK was allocated in the new External Project Reserve for later financing in the four-year EISCAT_3D design study project. The surplus for this year was transferred to the restructuring reserve.

	2005	2004
Capital operating reserve	1 629	1 841
Equipment repair fund	1 190	1 473
External projects reserve	511	0
Restructuring reserve	9 632	7 854
Spare parts reserve	421	460
Surplus fund	1 505	732
	14 887	12 360

Note 12 *Long term liabilities*
Refers to the Husbanken Norway loan concerning the owned flat on Svalbard. The loan is in NOK. The loan was amortized (22 kSEK) during the year.

Note 13 *Liabilities, trade*
The design study is partially financed by the European Commission. The Commission pre-financed 80% of the first 18 months of the project that started 2005-05-01. 39% of that pre-financing was distributed to the Consortium partners (including EISCAT - totally 657 kSEK in other operating income).

	2005	2004
Liabilities EU, pre-financing	3 737	0
Other liabilities, trade	5 651	5 193
	9 388	5 193

Note 14 *Provisions*

	2005	2004
Associate travel	539	273
Staff travel	134	85
Restructuring costs	0	363
	673	720

Longyearbyen, 2006-06-01

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Prof. Ole Henrik Ellestad

Prof. Shoichiro Fukao

Dr. Finn Karlsson

Dr. Wlodek Kofman

Prof. Mike Lockwood

Dr. Asta Pellinen-Wannberg

Mr. Michael Truchseß

Prof. Anthony P. van Eyken
Director

Dr. Sølvi Anderssen

Prof. Asgeir Brekke

Prof. Ryoichi Fujii

Mrs. Sue Horne

Dr. Kirsti Kauristie

Dr. Ann-Marie Lagrange

Prof. Tuomo Nygrén

Dr. Jürgen Röttger

Our audit report was issued on 2006-09-29

Mrs. Annika Wedin
Authorised Public Accountant

Mr. Robert Barnden
Authorised Public Accountant

Öhrlings
PRICEWATERHOUSECOOPERS

Audit report

To the council of EISCAT Scientific Association

Corporate identity number 897300-2549

We have audited the annual accounts, the accounting records and the administration of the council and the director of EISCAT Scientific Association for the year 2005. These accounts and the administration of the association and the application of the Annual Accounts Act when preparing the annual accounts are the responsibility of the council and the director. Our responsibility is to express an opinion on the annual accounts and the administration based on our audit.

We conducted our audit in accordance with generally accepted auditing standards in Sweden. Those standards require that we plan and perform the audit to obtain reasonable assurance that the annual accounts are free of material misstatement. An audit includes examining, on a test basis, evidence supporting the amounts and disclosures in the accounts. An audit also includes assessing the accounting principles used and their application by the council and the director and significant estimates made by the council and the director when preparing the annual accounts as well as evaluating the overall presentation of information in the annual accounts. As a basis for our opinion concerning discharge from liability, we examined significant decisions, actions taken and circumstances of the association in order to be able to determine the liability, if any, to the council or the director. We also examined whether any council member or the director has, in any other way, acted in contravention of the Annual Accounts Act or the statutes. We believe that our audit provides a reasonable basis for our opinion set out below.

The annual accounts have been prepared in accordance with the Annual Accounts Act and give a true and fair view of the association's financial position and results of operations in accordance with generally accepted accounting principles in Sweden. The statutory administration report is consistent with the other parts of the annual accounts.

The council and the director have not acted in contravention of the statutes.

Stockholm 2006-09-29

Robert Barnden
Authorized Public Accountant

Annika Wedin
Authorized Public Accountant

Participants at the EISCAT workshop and radar school held in Kiruna, Sweden, August 15 to September 2, 2005. Phoyo: Torbjörn Lövgren

Report 2005 of the EISCAT Scientific Association

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NIPR
National Institute of Polar Research
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RCN
Research Council of Norway
(Norges forskningsråd)
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VR
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