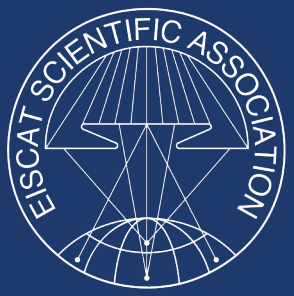

EISCAT Scientific Association

Data policy

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EISCAT Policy Document

Title: Data policy	Effective Date: 2016-05-16	Page 1 of #
Identifier: ESA_ADM_POL_	Author:	

Revision History		
Version No.	Effective Date	Description
	2016-05-16	

1. Introduction

The EISCAT Statutes include an appendix spelling out the EISCAT Data Policy. That policy indicates areas that require special attention to ensure that EISCAT systems adhere to the goals of the Association, but it does not prescribe detailed procedures for avoiding or handling potentially politically sensitive observations. This document describes the procedures implemented by EISCAT to adhere to the Data Policy.

The Data Policy originated largely from recommendations made by the EISCAT Council's Expert Group on Satellite and Space Debris Observations. The expert group was formed in response to concerns about the future capabilities of the EISCAT_3D radar and the potential for abuse of this new system, either accidentally or intentionally.

The EISCAT Data Policy indicates, in section 4. Transparency and Logging of EISCAT Operations:

1. EISCAT shall strive to have full transparency in its operations and with respect to the data generated. All observation campaigns shall be clearly documented and the campaign log shall be available for inspection in accordance with the EISCAT Agreement.
2. Generally, data segments containing radar echoes from resident space objects shall be filtered out at a low processing level. When such filtering is not adequate to reach the objectives of the approved observation campaign, special care must be taken to avoid a breach of the Objects and Means of the association as laid down in the EISCAT Agreement.
3. EISCAT raw data containing radar echoes from satellites shall not be distributed to other agencies.

The particular Objects and Means in question are as follows:

a) The aim of the Association is to provide access to radar, and other, high-latitude facilities of the highest technical standard for non-military scientific purposes.

e) The Association may contribute to the international task of tracking objects in space (natural or man-made). For this activity, an agreed list of objects shall be maintained and the Association shall only conduct tracking of objects from this list.

k) All use of observation time must be in line with the aims of the Association. Users shall not use the facilities for collecting data on military sensitive objects.

l) All data obtained shall become the property of the Association and shall be managed according to the EISCAT data policy.

2. Procedures

While no operational procedure can be 100% effective in avoiding the collection and dissemination of data containing classified or sensitive objects, especially not in an environment where state-of-the-art radar and signal processing techniques are being advanced, the following overlapping measures greatly reduce such risks. The expectation is that these procedures will minimize the risk without significantly impacting the scientific results from the measurements. The EISCAT Council's

Expert Group on Satellite and Space Debris Observations specifically noted, in their report from October 2015: “Although some high-precision measurements of satellite range and velocity can be made using the EISCAT radar, the capabilities of the present system in terms of orbit accuracy are such that tracking capabilities can be considered rudimentary compared to the open Space-Track catalogue. The statistical surveys that can be done with EISCAT are not restricted.” As a result, some of the Data Policy Procedures are not implemented on the legacy EISCAT systems (particularly those procedures requiring specialized technical solutions). Other procedures are, however, more generally applicable for all observations.

1) The first level of protection comes from the experiment request procedures. This is a web‐based process where experimenters are required to explain the purpose(s) of their measurement campaign(s) and the specific measurement techniques (e.g. pulse sequences, etc.) to be employed. This vetting of the experiment requests allows EISCAT to block users who unknowingly wish to attempt prohibited measurement campaigns. The vetting process will occur in two stages. In the first stage, experiments with no apparent conflicts with the aims of the Association can be simply approved. This includes operations for basic ionospheric measurements using standard pulse coding and processing schemes and measurement modes not amenable to characterizing classified or sensitive space objects. If there is any question about the acceptability of the goals of an experiment, the request will be passed on to the second stage.

   In the second stage, the experiment request will be evaluated by a group of radar experts, called the Experiment Review Panel, to determine whether the experiment goals/capabilities are at odds with EISCAT’s mandates. The panel will be chaired by the EISCAT Head of Operations and may include experts from outside the organization. This second stage evaluation may require additional information/clarification from the person(s) requesting the measurement(s). In the case of an experiment aimed at measuring the orbital parameters of one or multiple known satellites or other kinds of objects in space, the details of the target satellite(s) will be provided by the experimenter(s) and the satellite(s) will be compared to a list of approved objects (White List). For objects not on the White List at the time of the request, it is up to the requestor to justify an addition and demonstrate that the requested object is allowable. In any event, the Experiment Review Panel’s analysis must indicate that the experiment does not conflict with EISCAT’s mandate before said experiment can be performed.

   The White List will be openly available and initially based on the Open Space-Track Catalog (www.space-track.org). Any Associate or Affiliate can anonymously request to have an object removed from the White List. Non-manmade objects (e.g. near earth objects) can generally be added to the White List with minimal review. Ablating meteoroids are automatically on the White List and are identified primarily by their altitudes (below operational satellite altitudes).

2) The second level of protection comes from the automated removal of hard-target returns from the low level data stream. This protection level is specific to EISCAT_3D and it entails the

detection and removal of returns from the output data stream of each subarray of 91 antennas. The removal is only done for altitudes above 200 kilometers (thus leaving most meteor head echoes unaffected) and for Doppler velocities less than the escape velocity of 11.2 km/sec (thus ignoring objects that cannot be in Earth orbit). The algorithms employed are based on standard matched filter processing and the threshold is set to ensure a satisfactorily low false alarm rate while detecting the vast majority of actual targets. The specific objects of greatest interest for removal are, in any event, operational satellites and, as such, tend to have relatively large radar cross sections. Thus, if the algorithms fail to detect some objects, those objects will be primarily smaller pieces of space debris, etc. The algorithms will be periodically tested with objects of various cross sections from the White List and test reports will be available on line.

Some experiments will require that this automatic removal be disabled. In particular, it cannot be used for experiments that target objects on the White List or, for instance, searches for meteoroids prior to their interaction with the atmosphere or near earth objects (asteroids). When the automatic removal algorithm is disabled, the metadata for the radar returns will indicate this via dedicated tags. Reports will be sent to EISCAT Council periodically to specify which experiments and how much total time was used with the automatic removal disabled.

3) The third level of protection takes the form of full transparency of all EISCAT operations. No data will be collected without the details being added to an open and publicly accessible campaign log. This log will be automatically generated and updated during operations. Metadata, which describe operations as they occur (e.g. radar mode, antenna steering, etc.), are also openly available. Furthermore, all sites are available for inspection by the relevant agencies in the hosting countries. When practical, they will also be available for inspection by non-hosting countries, though this may be subject to local law (e.g. the need for travel visas, etc.). Inspections will have access to both the physical resources (after safety concerns have been taken into account) and the software source code and data.

   If any operations are discovered that violate the aims of the association, experiments can be immediately terminated by EISCAT and data can be made inaccessible.

4) The fourth level of protection comes from the fact that all data collected on EISCAT systems remain the property of the Association. Raw data shall not be disseminated to other agencies, either automatically or individually. Raw data can be accessed by the scientists who requested the experiments or, after the embargo period, by all Associates and Affiliates, but only processed results will be made openly available. Scientists may, at times, need to cache data from their experiments at their home facilities. These temporary caches are allowed if reasonable precautions are taken to ensure that the raw data are not disseminated further. Users must also ensure that their caches of EISCAT data are purged after use and that they, in any event, are not retained longer than two years unless explicitly permitted by EISCAT, in writing, and under extraordinary circumstances (e. g., to support PhD students during their university studies).