



Call for Proposals to use POLARIS Magnetotelluric Equipment

1. Introduction

POLARIS is a Canadian university-government-industry geophysical consortium focused on investigation of the structure and dynamics of the Earth's lithosphere, earthquake ground motion, and geomagnetic hazards. Funding for POLARIS has been obtained from the Canada Foundation for Innovation (CFI), the Ontario Innovation Trust (OIT), the British Columbia Knowledge Development Fund (BCKDF), Natural Resources Canada (NRCan) and from a variety of other sources including the private sector. Partial operational support for POLARIS has been provided by NSERC through its Major Facilities Access program.

The POLARIS steering committee envisions that after 2005 the POLARIS audio-frequency and broadband magnetotelluric (MT) instruments and roving long-period MT instruments will become available for other scientific investigations. Ten observatory MT instruments are expected to become available after 2008 and will ideally be deployed as part of a POLARIS broadband satellite-telemetered station. These systems are unusually flexible, in that they provide real-time data access without the need for an Internet connection, have complete autonomous solar power systems and have proven reliability under temperate and subarctic conditions.

Researchers from CFI-eligible institutions are invited to submit applications to use the POLARIS equipment under the terms set forth below. Other researchers, including researchers from outside Canada, are also invited to apply in collaboration with co-investigator(s) from a CFI-eligible institution. There are two types of application:

- 1. Formal applications.** These are applications, submitted with a lead time of at least four months, in which the MT equipment is requested for a period of more than two months and/or the user requires a guarantee that the equipment will be available over a specified time period.
- 2. Casual applications.** These are applications submitted with a shorter lead time in which the equipment is to be used for less than two months and the user is able to accept whatever instrumentation is available.

2. Description of POLARIS MT

POLARIS is a Canadian university-government-industry geophysical consortium focused on investigation of the structure and dynamics of the Earth's lithosphere and the prediction of earthquake ground motion. The original POLARIS concept is based on combined seismological and MT studies of the Earth using remote observatories transmitting data over a VSAT satellite network and using Libra seismograph systems manufactured by Nanometrics Inc. of Ottawa, Ontario. An extension of this concept is currently being developed to upgrade some of the observatories with geodetic sensors measuring crustal deformation using the Global Positioning System (GPS).

Electromagnetic studies form an integral part of the POLARIS project. MT equipment has been acquired to develop an infrastructure for soundings over depths ranging from the uppermost crust to depths of several hundreds kilometres into the asthenosphere. In order to provide the capability of carrying out electromagnetic soundings at different target depths, the POLARIS MT equipment includes:

- (a)** audio-frequency (10^4 to 10 Hz) MT (AMT) systems for imaging the upper crust;
- (b)** broadband (10^2 to 10^{-3} Hz) MT (BBMT) systems for imaging the middle and lower crust;
- (c)** long-period (1 to $<10^{-4}$ Hz) MT (LMT) systems with specialized ring-core fluxgate magnetometers required for imaging at mantle depths and for geomagnetic hazard studies. The POLARIS AMT-BBMT equipment consists of six MTU-5A systems that have been procured from Phoenix Geophysics and the LMT equipment of twenty ring-core NIMS systems from Narod Geophysics. The LMT instruments are divided into one group of ten instruments that are optimally configured for roving long-period MT deployments and a group of ten instruments that is optimally configured for ultra-long period observatory deployments at POLARIS satellite-telemetered stations. Figures 1-3 show the POLARIS BBMT and LMT equipment and an example of a POLARIS seismograph station incorporating MT recordings.

The POLARIS infrastructure is managed by a steering committee composed of Canadian scientists and engineers who are actively involved in POLARIS research. Contact information for the steering committee can be found at the POLARIS website (www.polarisnet.ca).



Figure 1. Phoenix MTU-A equipment.



Figure 2. Narod NIMS MT equipment.



Figure 3. Observatory MT deployment at seismograph station.

3. Deployment and rental of POLARIS MT equipment

At the discretion of the steering committee the POLARIS AMT, BBMT, and roving LMT instruments will become available for rental/redeployment commencing 1 October 2005. Users wishing to make observatory MT recordings prior to 2008 should contact POLARIS for more information. **Highest priority for the use of the equipment is assigned to scientific-based deployments forming part of the ongoing POLARIS project or forming part of projects partnering with POLARIS.**

The purpose of scientific-based deployments is to support world-class geophysical research studies beyond the scope and/or locations of the initial POLARIS deployments. The use of POLARIS equipment in this context requires the project to involve a principal investigator from a CFI-eligible institution and the data acquired using the equipment are subject to the POLARIS policies of open data access. Please consult

<http://www.polarisnet.ca/outreach/agu-00-poster/polposter.html> for background on the original scope of the POLARIS program. Proposals to extend the studies at existing POLARIS arrays will also be considered and will be subject to the same evaluation criteria as proposals to redeploy.

For projects in which the investigators are unable to accommodate the POLARIS open data policy, in which the investigators wish to bypass a detailed evaluation of project objectives (e.g. of specific site locations), and/or in which there is not a principal investigator from a CFI-eligible institution, the POLARIS MT instruments may be made available for commercial rental at specified rates. Lower priority is assigned to such rentals.

In order to maximize the use of the POLARIS MT equipment there are two types of applications. Applications for both scientific and commercial rentals should follow one of the two sets of procedures.

3.1. Formal applications. These are applications, submitted with a lead time of at least six months, in which the equipment is requested for a period of more than two months and/or in which the user requires a guarantee that the equipment will be available over a specified time period.

There will be two cycles of applications per year with submission dates as shown in Table 1. Canadian and/or international researchers who wish to apply are required to submit a research proposal (less than 5 pages in length) and curricula vitae of project investigators. The proposal should succinctly outline: 1) the type and number of instruments requested; 2) the proposed location and time-frame for their use; 3) the composition of the research team; 4) the scientific rationale for the MT equipment use; and, 5) the funding source to cover the costs associated with the project. Letters supporting the application may be included with proposals. Proposals in digital format (PDF format) should be emailed to: POLARIS Program Manager, Dr. Isa Asudeh, at iasudeh@nrcan.gc.ca.

Table 1. Dates for Formal Applications for use of POLARIS MT Equipment

	Summer Deployments	Fall to Spring Deployments
Period of Equipment Use	May 1-September 30	October 1-April 30
Deadline for Application	October 1	May 1
Response from POLARIS	December 1	July 1

3.2. Casual applications. These are applications submitted with a shorter lead time in which the equipment is to be used for less than two months and the user is willing to accept whatever instrumentation is available. There is no deadline for these applications but wherever possible the applicant should provide six weeks lead time for evaluation of their request. Canadian and/or international researchers who wish to apply are required to submit a letter of intent (two-pages maximum) to use the POLARIS equipment. The letter of intent should succinctly outline: 1) the type and number and of instruments requested; 2) the proposed location and time-frame for their use; 3) the composition of the research team; 4) the scientific rationale for the MT equipment use; and, 5) the proposed funding source to cover the costs associated with the project. Letters of intent in digital format (PDF format) should be emailed to: POLARIS Program Manager, Dr. Isa Asudeh, at iasudeh@nrcan.gc.ca.

4. Terms of reference

4.1 Evaluation of proposals: Proposals will be vetted by the POLARIS steering committee or an evaluation committee, struck for this purpose by the steering committee. The evaluation committee will be composed of POLARIS researchers and other researchers who are not in conflict of interest on the proposals submitted. Proposals will be evaluated on the basis of scientific merit and feasibility. The POLARIS steering committee reserves the right to obtain the opinions of external expert referees concerning the scientific merit and feasibility of proposals. Preference will be given to studies that further the POLARIS mission of lithospheric analysis and research investigating seismicity, seismic hazards, and geomagnetic hazards.

4.2 Equipment priority: In the case of proposals deemed to be of equal merit based on the evaluation criteria stated above, first priority will be given to members of the POLARIS consortium; second priority will be given

to other Canadian researchers; non-Canadian Principal Investigators (PI's) are invited to apply, but must have a Canadian co-applicant from a CFI-eligible institution.

4.3 Fees: The POLARIS Steering Committee reserves the right to establish and modify the rental fee structure. For each rental there is an initial one-time per-instrument fee to cover the cost of administration, instrument preparation and calibration, and packing prior to the rental. The fees must be paid in full prior to the availability of the equipment. The fees are payable to an account at Carleton University and administered there on behalf of the POLARIS Steering Committee.

The present fee structure is listed in Table 2.

Table 2. Current POLARIS MT Equipment Rental Costs

Item	CFI-eligible Project	Commercial Project
Instrument preparation and administration (one-time)	\$100/instrument	\$200/instrument
AMT/BBMT Equipment		
Phoenix MTU, three coils, and MTU accessories	\$600/month	\$2000/week
Additional AMT or MT coil	\$70/month	\$240/week
Phoenix MT processing software	Included in instrument rental cost	Unavailable
Air loop	\$70/month	\$150/week
Phoenix Battery and carrying case	\$50/month	\$65/week
Phoenix Battery Charger	\$20/month	\$30/week
LMT Equipment		
NAROD Geophysics NIMS instrument and accessories.	\$200/month	\$650/week
General Equipment		
Electrodes (set of 6)	\$220/month	n/a
Wires (per 300 m)	\$100/month	n/a

4.4 Basic equipment: Users expected to provide their own field computers and instrument deployment tools. Users of the equipment are expected to provide their own flash cards. Due to licence agreements Phoenix MT processing software can be supplied to only scientific project rentals that are closely associated with the POLARIS project. Details on the accessories needed for MT deployments can be obtained from the POLARIS Program manager, Dr Isa Asudeh.

4.5 Shipping costs: Investigators using the POLARIS MT equipment are responsible for the full cost of shipping (including insurance). Applicants may wish to consult the POLARIS program manager to assist in developing a realistic budget for shipping the equipment.

4.6 Letter of notification: The POLARIS steering committee will provide successful applicants with a letter of notification that may be useful for securing funds from external agencies.

4.7 PI responsibility for the equipment: The PI is responsible for safeguarding the POLARIS field equipment from loss or damage. The PI's responsibility begins when the equipment leaves the POLARIS instrument facility, and ends upon return of the equipment.

4.8. Inter-institutional agreements: With the exception of PI's from the institutions that own the equipment, the PI's institution will need to enter into an inter-institutional agreement with the POLARIS Consortium.

4.9 Data access: Data from all POLARIS deployments will be made available to any researcher through the POLARIS data archiving facilities.

4.10 **Deployment duration:** The normal maximum duration of rentals is one year, but may be extended at the discretion of the POLARIS steering committee.

4.11 **Acknowledgement:** Published works and reports based on results obtained using POLARIS MT equipment should include an appropriate acknowledgement to the POLARIS facility.

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