

SC/EATS 3660 3.0 and SC/ENG 3160 3.0 Advanced Field Surveys – Summer 2006

Date: 19 August 2006

Due: 02 September 2006

Objectives: This is a 15 days camp comprising field and laboratory work. It involves organizational, planning, scheduling and logistical aspects of high precision field operations related to engineering physics, establishment and observation of control networks for engineering structures.

Task: Perform precise control surveys to determine the form and spatial position of the Algonquin VLBI Antenna

A project that is involved in IERS activities is chosen as the task for this year's Advanced Field Surveys. The Students will perform the precise observation to determine the form and the spatial position of the Algonquin VLBI antenna at Algonquin Observatory. This requires precise control surveys. Students start from Design, pre-analysis, field Observation, data processing to the final report. The Leica Total Stations TC1800/T3 with the distance accuracy of 1mm + 1ppm, and the angular accuracy of 1 seconds will be used here. The expected accuracy of the results is millimeters. In order to complete this survey successfully, students will apply their knowledge to the practical applications that would go through all of the working procedures professionally.

This consists of the following procedures:

1. Planning

Network Design/Antenna survey design

2. Total Station/Theodolite/EDM Tests

EDM:

Zero error (different tests with different prisms)

Scale Error (optional)

Cyclic Error

Theodolite:

Optical Plummet check

Line-of-sight error (Horizontal collimation error)

Tilting (horizontal) axis error (Only TPS1100/1000)

Compensator index error/Level Bubble check

Vertical Index error

Error caused by refocusing a group of the targets with different LOS lengths (optional)

The procedure to apply the correction caused by vertical axis error (optional)

3. The Network Setup and Observation

Set up a mini control network using the existing pillars around the antenna; perform the observation and network adjustment. This is the basis of the antenna observation.

Three full sets observation is required with total station. The distance measurements should be corrected to the real atmospheric conditions. All of the stations will be occupied by the GPS receivers twice in a static mode.

4. Antenna Observation

Set up the observation targets using Leica sticker signs. The targets should regularly be distributed on the antenna inner surface so that its form and spatial position can be estimated as good as possible.

Three full sets observation is required. The distance measurements should be corrected to the real atmospheric conditions.

5. Data pre-analysis

The field measurements should be preanalysed daily after dinner as that the necessary repeating observations can be done next day to ensure that good results can be reached.

6. Data processing/Adjustment

All of the surveyed data will be processed using GeoLab in the second week. This project may need some extended adjustment model. Students may implement

7. Final report

The fieldwork, the results of data processing and the analysis should be summarized in a final report for the IERS working group.

The Instruments:

Two sets of Leica Total Stations

Two prisms

The Sticker targets

Additional necessary utilities

GPS receivers