AS AMENDED
1984

UNIVERSITY OF NEW SOUTH WALES

SCHOOL OF SURVEYING

29.005 Surveying V

FIELD EXERCISE: LONG-RANGE EDM

1. AIM

To demonstrate the possibilities, of field techniques and reduction procedures in MICROWAVE long-range EDM.

2. EQUIPMENT

Per Group:

1 x Clip Board
1 x 3m Pocket Tape

Supervisor:

2 x Tellurometer CA 1000 stations (1 x master, 1 x remote) each including cables, small 12V battery, headset, antenna, 5/8" adaptor, swivel base, WILD GDF 6 tribrach.
2 x 12V car Battery (spare)
1 x WILD Tripod GST 20
2 x 3m Pocket Tapes
1 x Psychrometers
1 x Containers with distilled water
2 x 10m lengths of string
2 x Knives
1 x Survey umbrella with steel base
2 x Thommen Barometers (large)
2 x SUUNTO magnetic compass
1 x Hammer
1 x WILD Trivet (for pillar centring)
2 x ROTRONIC Hygroscopes GT-L
1 x Survey umbrella witout steel base
1 x Additional WILD GDF6 tribrach
1 x Additional (HP) Swivel Base
1 x Key to Civil Engineering Roof

3. EXERCISE

The distance between pillar 20 (CE) and SSM 8296 (Dolls Point, Botany Bay), will be measured. The "remote" station will be operated by staff.

3.1 Set up instrument on pillar, level and measure height of instrument to top of pillar plate. Assume an additive constant of -23 mm (± 1 mm).

3.2 Set up umbrella and fix with string. Prepare psychrometer for measurement. The psychrometer must be in the shade. It should hang as high as possible, but reading should be easy, without touching. Wind up carefully, so that ventilator starts turning. Wet the wick of the wet bulb thermometer. From now on, wind up ev-ery time, when you hear a slowing down of the ventilator.

3.3 Set up barometer in the shade and on a horizontal surface.

3.4 Prepare field book for the reading of dry and wet temperatures as well as atmospheric pressure and time. Book make and serial numbers of barometer and psychrometer. Book calibration constant of barometer.

3.5 Start observing dry and wet bulb temperature and pressure; read and book observations every two minutes until the distance measurements of all groups are completed.

NOTE: Barometers and psychrometers are very fragile and expensive instruments. HANDLE THEM WITH CARE!

3.6 Measure the slope distance between pillar 20 (roof, Civil Engineering) and SSM 8296 (Dolls Point, Botany Bay) according to instructions. Pattern frequencies B, C, D, E and A have to be measured. In pattern A, measurements on all frequency control settings (1.5, 2.0, ..., 4.5) are required. Book time of all readings.

3.7 Obtain mean values of t, t', p over the measuring time interval from both stations and list on field form. Obtain height of instrument from 'Remote' station and also s/n of barometer.

4. REPORT

Group reports are required. Submission: Two weeks after field work.

4.1 Plot the five readings on pattern 'A' versus frequency (frequency control readings). Comment on the appearance of the curve.

4.2 Report any unusual characteristic of the test line and give an explanation for the phenomena observed.

4.3 Apply additive constant to the mean slope distance measured by your group.

Compute the first velocity correction for the two terminals according to

$$K' = \{325.0 - \frac{77.62}{(273.16 + t)}(p + \frac{4741}{(273.16 + t)} e)\} 10^{-6} d'$$

where K' = first velocity correction

p = pressure (mb)

t = temperature (dry) (°C)

e = partial water vapour pressure (mb)

(NOTE, that the above equation is an approximation of the Essen and Froome formula given in section 2.45, monograph no. 7 and that the approximation is better than 0.5 ppm). Check with attached nomogramme.

Compute 'e' according to equations (2.50a) and (2.51a), monograph no. 7. Mean the first velocity correction of the two terminals and apply it to the measured slope distance. (For Hygroscope, use Eq. 2.53!)

4.4 Reduce the distance further to zone 56/1 of the I.S.G., following the example of section 3.41, monograph no. 7. The following coordinates and elevations are given:

	E (I.S.G. 56/1)	N	(A.H.D.) H	
SSM 8296	313 633.949	1237 018.287	2.398 m	
P 20 (CE)	321 406.338	1245 420.797	86.593 m	top of pillar

4.5 Compute the plane distance from coordinates and discuss difference between measured and coordinate distance in the light of the accuracy of the instrument (st. dev. = ± (20 mm + 5 ppm)) and measuring conditions.

J. M. RUEGER,
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Attachment to Field Exercise
'Long Range EDM'

Refractive Index of Microwaves in Air

for the reduction of Tellurometer CA 1000 measurements