British Geological Survey
NATURAL ENVIRONMENT RESEARCH COUNCIL

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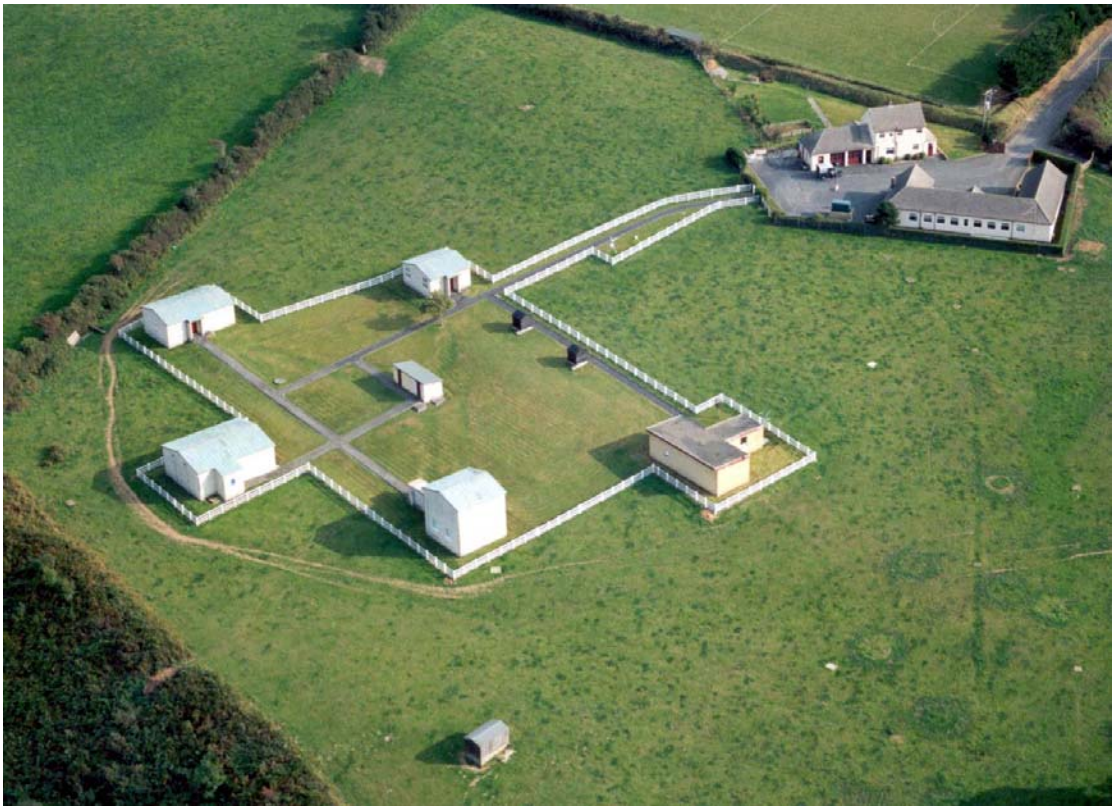
Hartland Magnetic Observatory
Low-field Calibration Facility



Hartland Magnetic Observatory is located close to the North Devon village of Hartland. The observatory is operated by the British Geological Survey, part of the Natural Environment Research Council, for the purpose of continuous geophysical monitoring.

Test 1 Calibration Hut

When the observatory was built in 1956, it was equipped with a pair of symmetrical calibration coils in a dedicated non-magnetic building, Test Hut 1. These coils were wound on square formers (approximately 2m x 2m across) mounted parallel to each other and oriented to produce a bias field in the vertical (Z) direction. The original purpose of the coils was to calibrate BMZ magnetometers by simulating a range of amplitudes of the vertical component of the geomagnetic field.

In 1983, as part of the test programme for the magnetometer experiment on board the United Kingdom Satellite (UKS) of the Active

Magnetospheric Particle Tracer Explorer (AMPTE) programme, engineers from Rutherford Appleton Laboratory modified the Z-coils to create a low-field facility (LFF). Four sets of parallel coils were added to generate bias fields in the horizontal plane as well as vertically. Two coil sets were aligned approximately North-South (N-S Main coils and N-S Calibration coils) and two East-West (E-W Main coils and E-W Calibration coils). Since the UKS magnetometer was designed to measure low magnetic fields in the solar wind (up to a few nT), the Z, N-S Main and E-W main coils were used to cancel out the natural magnetic field in the centre of the coil system, while the N-S Calibration and E-W calibration coils were used to generate calibrating fields.

Low Field Calibration Coils

Test Hut 1 provides an indoor, temperature regulated test environment with mains electricity points. Coil currents are manually controlled using Time 9818 current sources. Variations in the ambient field are monitored on-site in real-time, allowing bias adjustments to be made to maintain low-field. Since 1983, the coils have been used to calibrate compasses and magnetometers for the oil and avionics industries.

Approximate Coil Specifications

	North-South Coils (X-coils)		East-West Coils (Y-Coils)		Vertical Coils (Z-Coils)
	Main Coils	**Cal Coils**	**Main Coils**	**Cal Coils**	**Main Coils**
Orientation	-0° 32' 57" wrt True North		89° 30' 04" wrt True North		90° 02' 20" wrt horizontal (N-S)
	-0° 00' 29" wrt horizontal		0° 01' 11" wrt horizontal		90° 03' 24" wrt horizontal (E-W)
Outside width of former	2.05 m		2.10 m		1.91 m
Inside width of former	1.93 m		2.05 m		1.74 m
Separation of formers	1.08 m		1.18 m		1.00 m
No. of turns	55	54.5*	3	1	55
Resistance	2.33 Ω (5.90 Ω at plug)	2.30 Ω (5.70 Ω at plug)	0.18 Ω (1.45 Ω at plug)	0.09 Ω (1.33 Ω at plug)	2.67 Ω (6.29 Ω at plug)
Coil constants	45.153 nT/mA	44.628 nT/mA	2.270 nT/mA	0.7610 nT/mA	48.825 nT/mA

* This value is derived from experiment and suggests an extra turn on one of the coils

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