*PNI Application Brief:*

# Solving High Latitude Compassing Calibration

Geomagnetic motion tracking and pointing products
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Any compass incorporated into a host system requires calibration so the compass properly compensates for ferrous and magnetic components of the system. If this is not done correctly, heading readings can be very inaccurate. Recently PNI assisted a customer operating in northern Scandinavia where the high latitude corresponds to the magnetic field having a large dip angle, or inclination.

Magnetic calibration entails taking calibration sample points at various relative headings and attitudes. PNI's standard calibration pattern involves taking 12 sample points. Conceptually the x, y, and z magnetic field readings for the sample points are plotted, and by extrapolation a "calibration sphere" can be constructed. Figure 1 shows such a sphere when working at the magnetic equator, with a dip angle of 0°. As can be seen, the 12 points are well distributed, and this helps ensure the calibration sphere can be modeled accurately. Using PNI's standard calibration routine and working at typical latitudes, 0.3° rms heading accuracy can be achieved with PNI's TCM compasses.

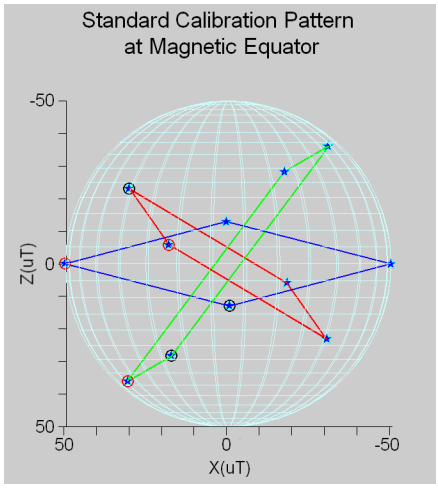


*Figure 1: Calibration Coverage at Equator with Standard Calibration Pattern*

Figure 2 shows the resulting sample points for PNI's standard calibration pattern when working in northern Scandinavia, where the dip angle was 76°. Due to the high dip angle the sample points are concentrated in one area, and it is difficult to accurately extrapolate the calibration sphere. The result is a less accurate heading reading.

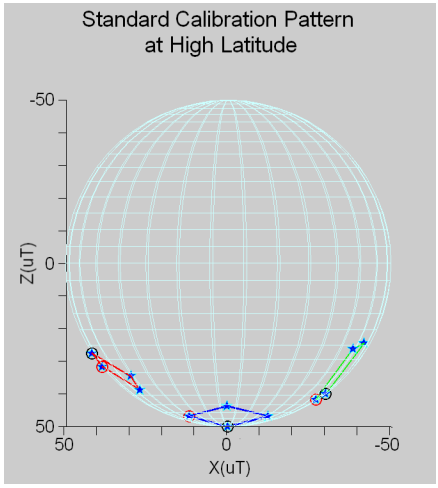


*Figure 2: Calibration Coverage at High Latitude with Standard Calibration Pattern*

The essential problem is to improve sample point coverage for generating the calibration sphere. PNI subsequently performed MatLab modeling and devised a number of improved calibration patterns. After evaluating the options and the customer's constraints, PNI

recommended increasing the roll during calibration, and following a different sequence. As can be seen in Figure 3, the effect is much better coverage.

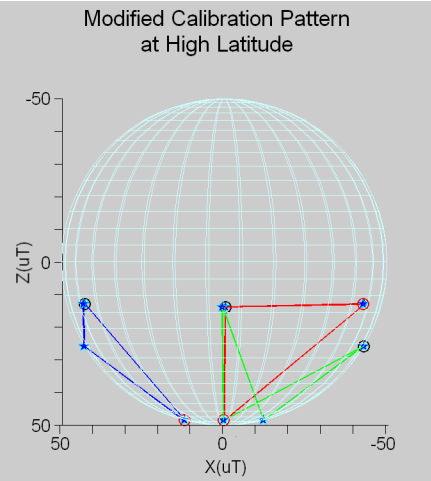


*Figure 3: Calibration Coverage at High Latitude with Modified Calibration Pattern*

The ultimate result of using the high-roll calibration pattern at high latitude was the ability to retain a heading accuracy of ~0.3° rms, thus meeting the customer's expectations and requirements.