

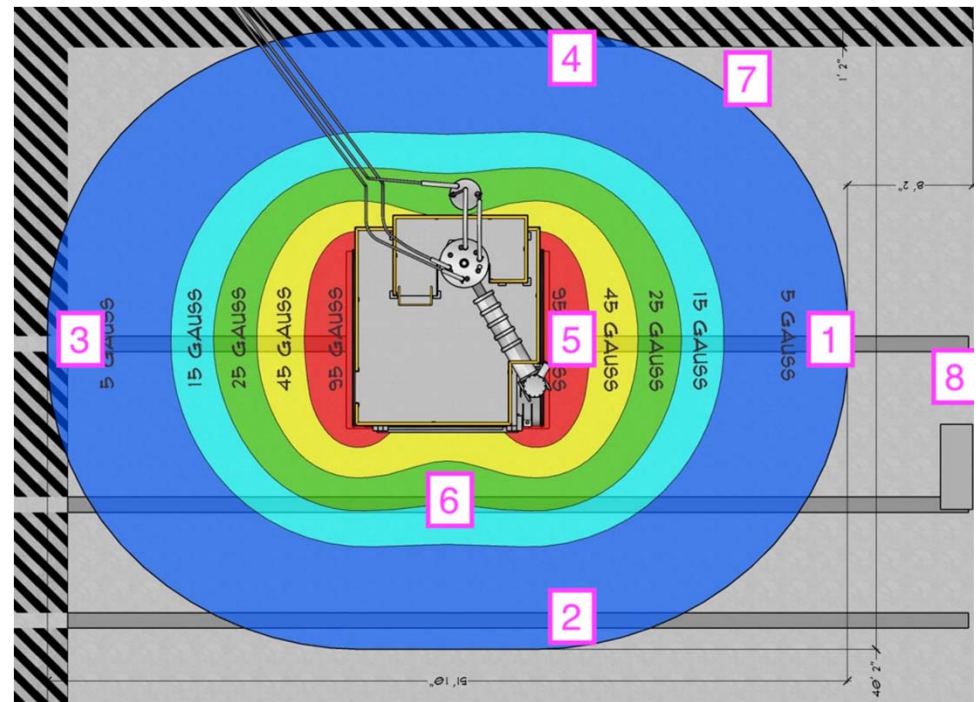
Analysis of the CLEO Field Mapping Units' Data

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Refer to DSG Note 2023-07 for details on the hardware/software setup of the field mapping units, with the only change being while the initial plans were for the current only to be ramped to 100 A the actual test went to 120 A. See figure 1 for approximate unit placement. Of note; units 1, 2, 3, 5, and 6 were all placed on top of the steel cable access covers which remained in place during the test. Units 7 and 8 were placed approximately level with the bore of the magnet (2 m above ground level) while all others were at ground level. The field lines in figure 1 are at the bore height of the magnet, not necessarily what each unit would expect to measure.

In analyzing the data the first step was to rotate all the units to have a common coordinate system as they were not placed with the same orientation, some due to being mounted on a vertical surface others such that the display would be mounted in a direction that was easy to read. After all the data had a common coordinate system it was trimmed to only contain the time around when the current was applied to the magnet as it was constantly recording and the additional data would increase processing and analysis time. This resulted in approximately 2.5 hours' worth of data recorded at 1 Hz. Once the data had been trimmed the first minute was averaged to calculate a baseline and this was subtracted from each subsequent measurement as an offset, figure 2 shows the individual X, Y, Z components of each of the units.

- **8 field mapping units were deployed for 120 A low power CLEO magnet test**
- **Data was collected and analyzed**
- **Stray fields within simulated results less than Earth's magnetic field**
 - Should pose no adverse effects

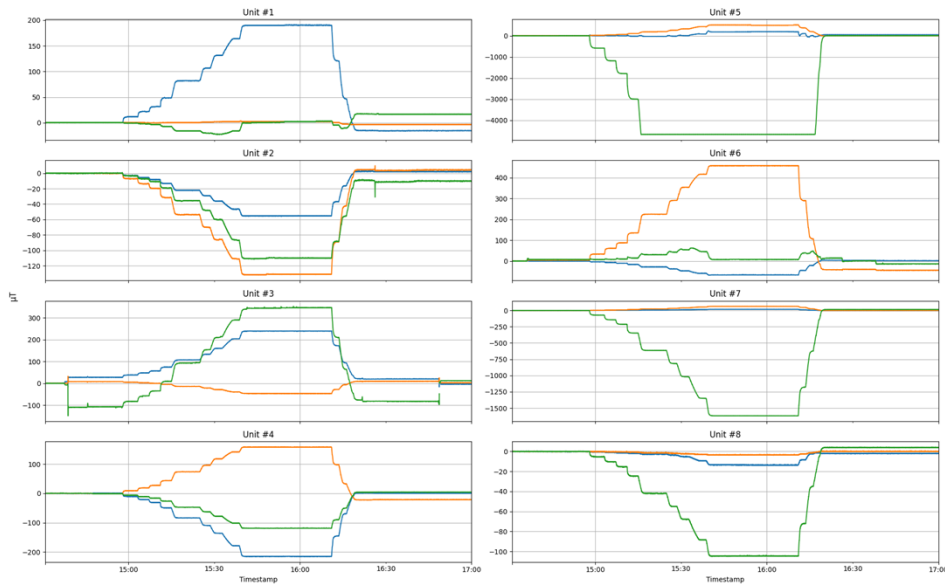


Mapping Unit locations

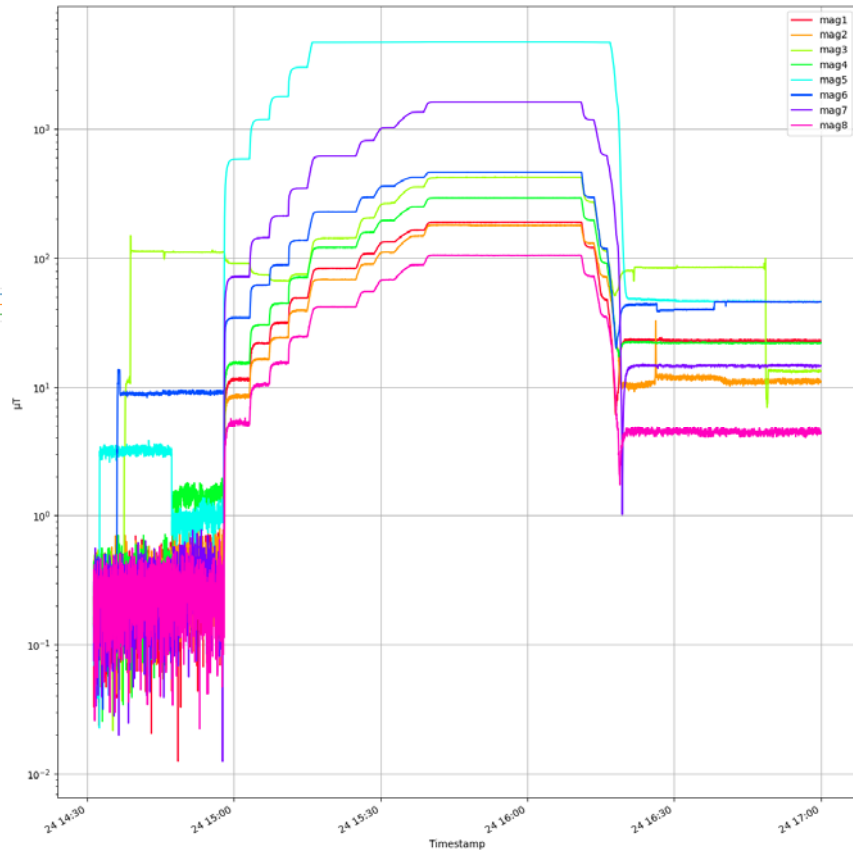
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The components were then combined into the field magnitude via the Pythagorean theorem, see figure 3 for the resulting field magnitude from each unit and table 1 lists some overall statistics (rounded to 1 decimal place). The start and end average fields are calculated from the first or last 60 seconds of data respectively.

From the data acquired by the field mapping units it was shown that any stray field remaining after the powering of the solenoid is at the level of the Earth's magnetic field (25 – 65 μT).



Mapping Unit X, Y, Z Component Data



Mapping Unit Field Magnitude Data