

**Magnetic Field Test Report
for the
Applied Innovative Technologies, Inc.
NightStar
Magnetic Force Flashlight**

February 4, 2003

Prepared for:

Applied Innovative Technologies, Inc.
PO Box 754
Fort Lupton, CO 80621

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**Magnetic Field Test Report
for the
Applied Innovative Technologies, Inc.
NightStar
Magnetic Force Flashlight**

February 4, 2003

WLL Job # 7403 and 7404

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1 ADMINISTRATIVE

1.1 Customer

Applied Innovative Technologies, Inc.

PO Box 754

Fort Lupton, CO 80621

1.2 Test Specimen Identification

a. NightStar Magnetic Force Flashlight, Single Unit, with Priority Mail Carton. The Single Unit test specimen may be referred to as the Single Equipment Under Test (EUT) in this report.

b. NightStar Magnetic Force Flashlight, Case Lot (20 units), with shipping carton. The Case Lot test specimen may be referred to as the Case EUT in this report

1.3 Manufacturer

Applied Innovative Technologies, Inc.

PO Box 754

Fort Lupton, CO 80621

1.4 Requirements Summary

Evaluate the magnetic field strength of each EUT and compare to the requirements of United States Postal Service Publication 52, July 1999, section 349.24. The requirements provide for a magnetic field strength of less than 0.002 gauss at a distance of seven feet.

Provide field attenuation curve of each EUT magnetic field at one-foot increments from one foot to ten feet in three orthogonal planes.

1.5 References

- Washington Laboratories, Ltd. Quotation No. 60500-A
- Washington Laboratories, Ltd. Quality Assurance Manual
- Washington Laboratories, Ltd. Quality Assurance Program
- ISO 10012-1 Quality Assurance Requirements for Measuring Equipment, dated 1 May 1993

1.6 Test Equipment and Instrumentation

All instrumentation, measuring, and test equipment used in the performance of this test program were calibrated in accordance with ISO 10012-1. Standards used in performing all calibrations are traceable to the National Institute of Standards and Technology (NIST) by report number and date. When no national standards exist, the standards are traceable to international standards or the basis for calibration is otherwise documented. Table 1 lists the test equipment and calibration information for this test.

1.7 Test Dates

February 3, 2003

Table 1: Test Equipment List

Test Instrument	Asset #	Cal Due
Suunto KB-14/360 Compass	N/A	Cal-in-test
Elgar 5250SW Power Source	00313	5/10/03
WLL Field Coil	N/A	CNR
F.W. Bell 4048 Gauss Meter	00334	7/4/03

2 TEST PROCEDURE

An analog compass with 0.1-degree resolution was placed on a non-metallic cart in a coil oriented to produce a magnetic field at 90-degrees from the compass North-South axis. A direct current was supplied to the coil and the field strength, determined from the coil parameters and current using Equation 1 and Equation 2, was 0.6247 gauss. The established field from the coil provided a 68-degree angle change in the compass. Reducing this angular change (Equation 3) established a 0.2524 gauss North-South alignment field. This alignment field strength established the 0.2524 gauss reference field strength for the North-South axis in the test location with associated magnetic field influences.

Equation 1: Coil Field Calculation

$$H_{A/m} = \frac{NI}{2R}$$

where:

N = number of coil turns (120)

I = current in amps (0.58)

R = coil radius in meters (0.7)

Equation 2: A/m - Gauss Conversion

$$H_{gauss} = H_{A/m} * 79.58$$

Equation 3: Alignment Field Calculation

$$H_A = \frac{H_R}{\tan \theta}$$

where:

HA = North-South alignment field in gauss

HR = Coil reference field strength in gauss

θ = Compass angle in degrees

After establishing the North-South alignment field strength, the EUT was set on a non-metallic cart at one orthogonal plane and positioned at 90-degrees from the compass alignment. The compass angular deviation was measured at one-foot increments (1 – 10 feet) by repositioning the cart holding the EUT. The angular deviation measured at each test point was translated to the measured field strength from the EUT by rearranging Equation 3 to solve for the unknown field.

If the compass indicated saturation (90-degree deviation), the magnetic field was measured using the gauss meter. For low-level fields the gauss meter sensitivity was inadequate, prompting the use of the compass method. Readings greater than one gauss were made using the gauss meter.

The Single EUT was tested in three orthogonal planes as shown in Figure 1. The figure is a top view of the configurations. For the Case EUT, the same orientations were used with the flashlights (20 units) packaged for case shipment.

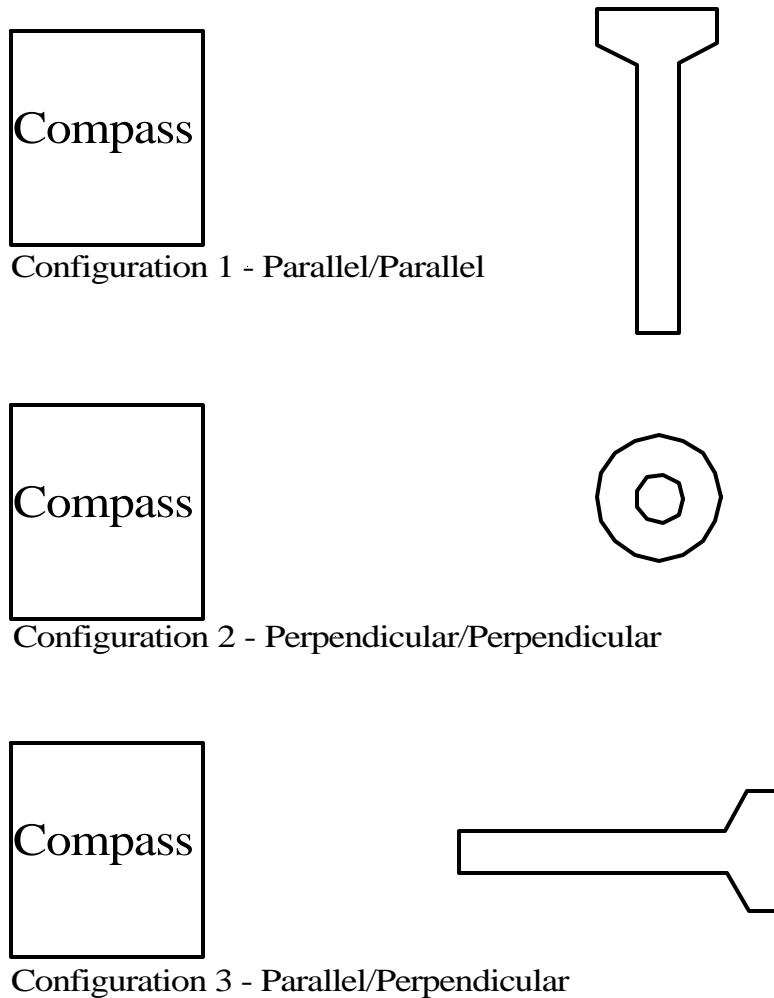


Figure 1: Test Orientations

3 TEST LIMIT

The test limits from United States Postal Service Publication 52, July 1999, section 349.24 requires the field strength to be less than 0.002 gauss at 7-feet.

4 TEST RESULTS

4.1 Single EUT

The Single EUT complies with the requirements for a field strength less than 0.002 gauss at 7-feet. The highest levels at the 7-foot point were measured with Single EUT oriented in configuration 3. Figure 2 through Figure 4 show plots of the test results from 1 to 10 feet. Because the measurements at 7-feet in configurations 1 and 2 were insufficient to cause a deflection on the compass the resulting field strength was zero. In configuration 3 the measurement at 7-feet was 0.0011 gauss. Figure 5 shows a plot of configuration 3 from 5 to 10 feet to provide increased resolution on the chart. Figure 6 shows a test configuration photograph.

4.2 Case EUT

The Case EUT (as originally packed) did not comply with the requirements for a field strength less than 0.002 gauss at 7-feet. The highest levels at the 7-foot point were measured with Case EUT oriented in configuration 3. Figure 7 through Figure 11 show plots of the test results including plots from 5 to 10 feet to increase the chart resolution.

Because the measurements at 7-feet for the case configurations exceeded the requirement, the flashlights were re-packed with the units inserted bulb-side up and bulb-side down in an alternating pattern (see Figure 17). The repack resulted in compliance with requirements as shown in Figure 12 through Figure 14. Several test location intervals of the repacked case configuration showed no measurable deflection of the compass, thus the resulting field strength was zero.

Figure 15 shows a test configuration photograph.

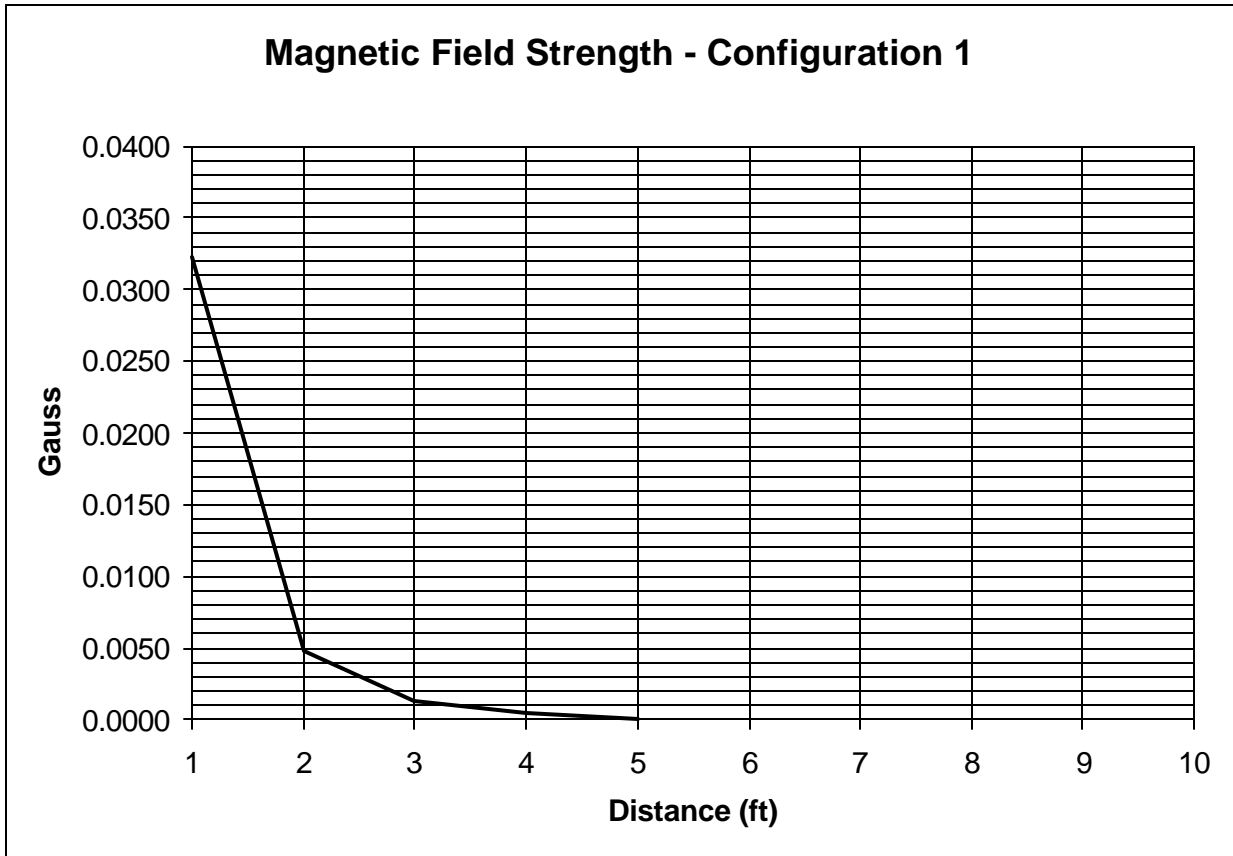


Figure 2: Test Data, Single EUT Configuration 1, 1 to 10 feet

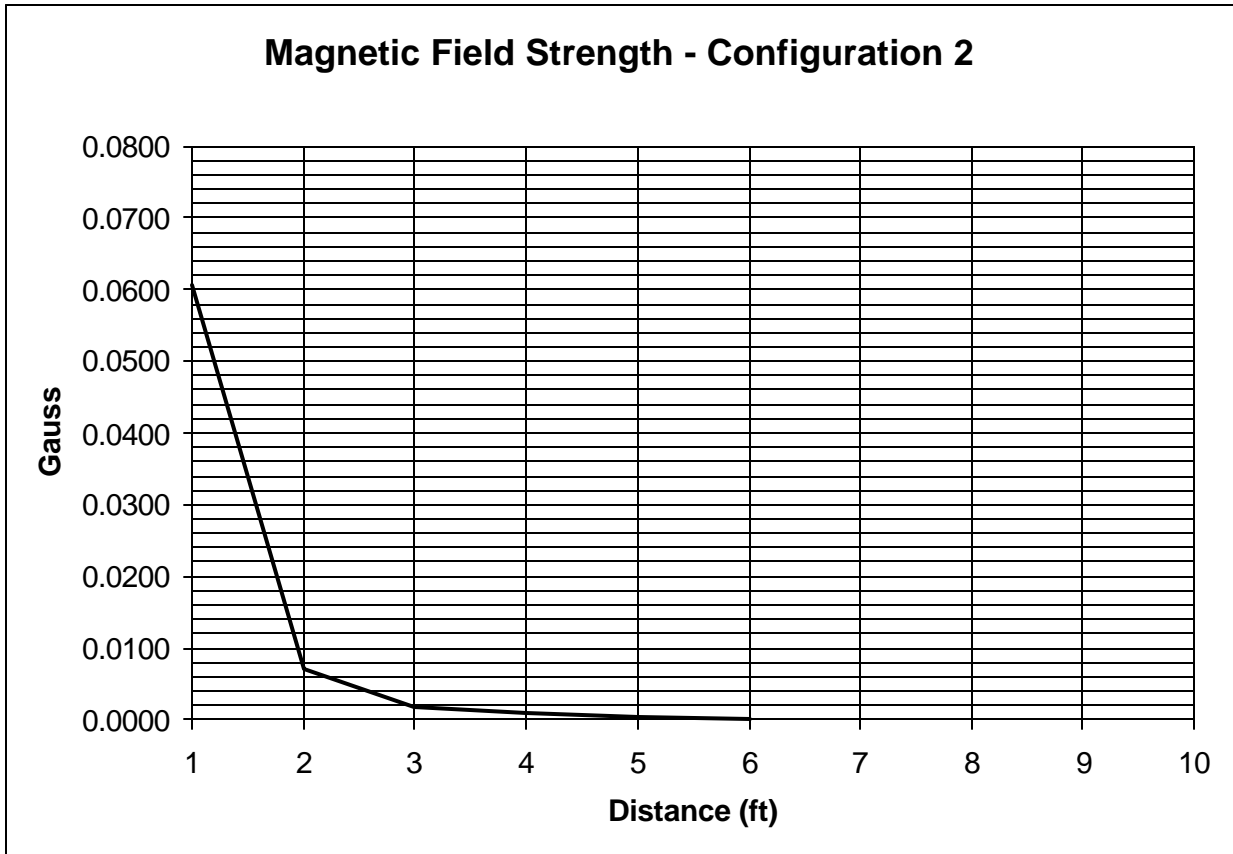


Figure 3: Test Data, Single EUT Configuration 2, 1 to 10 feet

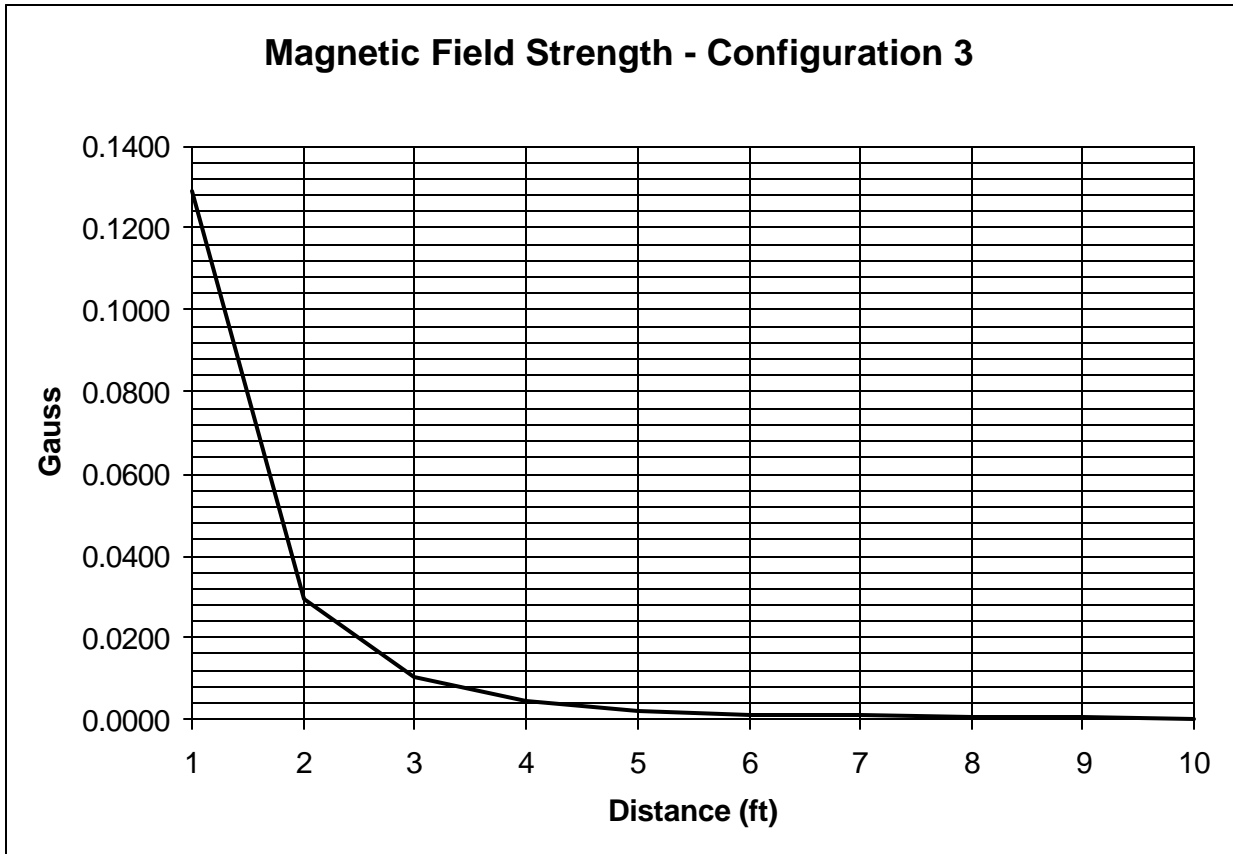


Figure 4: Test Data, Single EUT Configuration 3, 1 to 10 feet

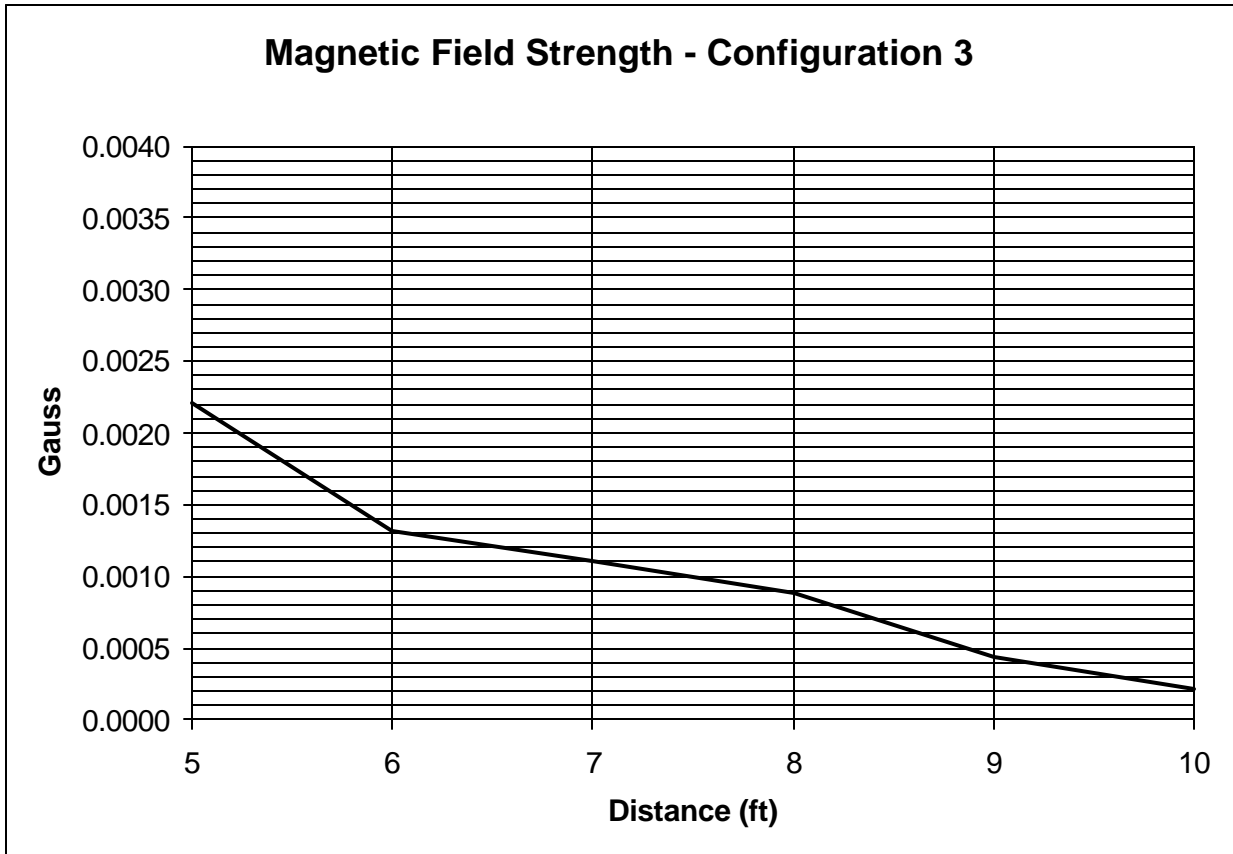


Figure 5: Test Data, Single EUT Configuration 3, 5 to 10 feet

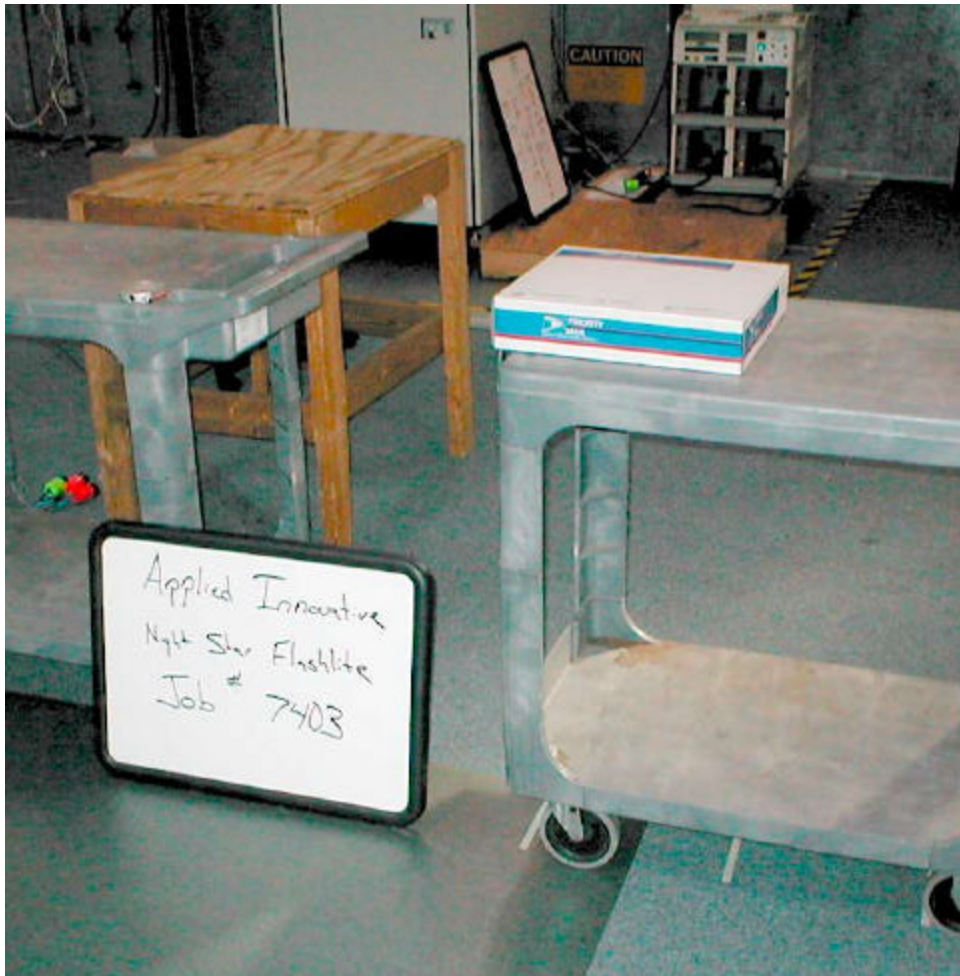


Figure 6: Test Configuration - Single EUT

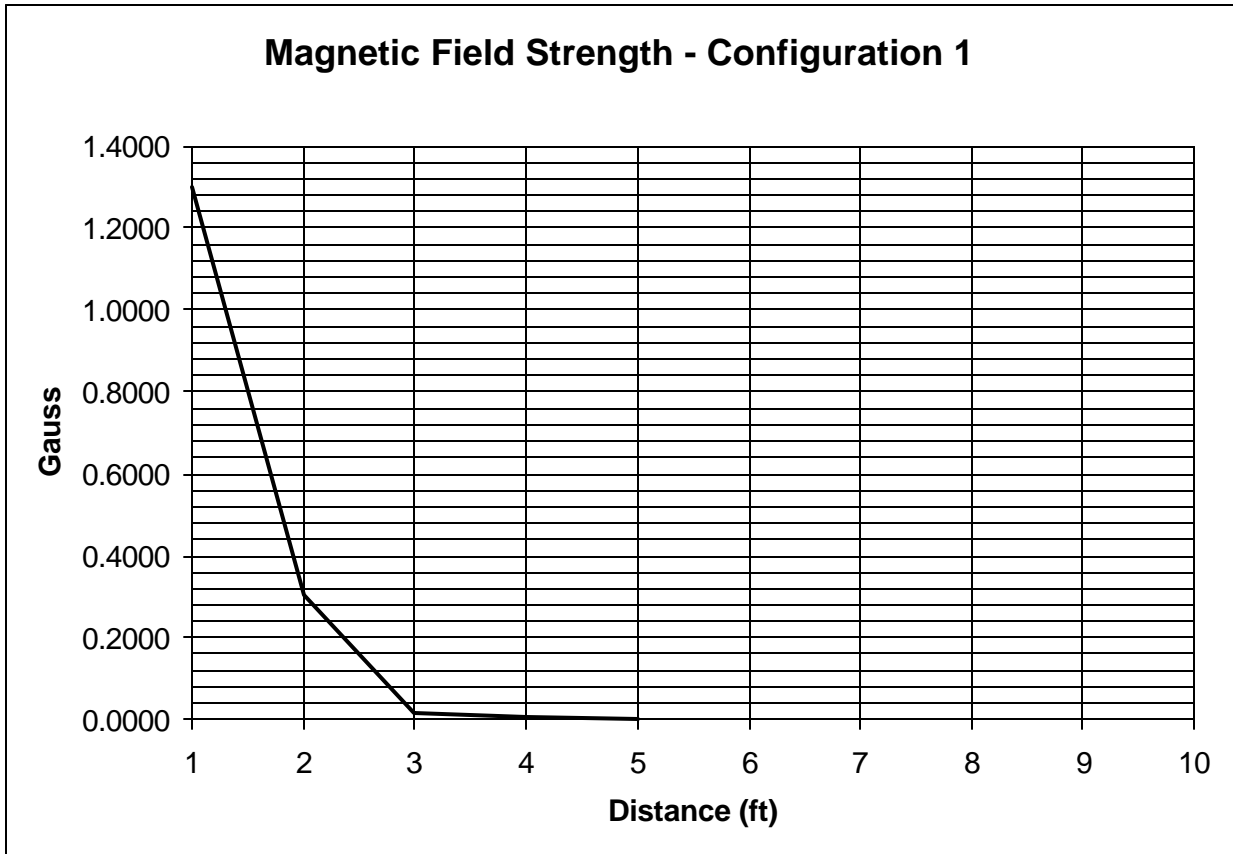


Figure 7: Test Data, Original Pack Case EUT Configuration 1, 1 to 10 feet

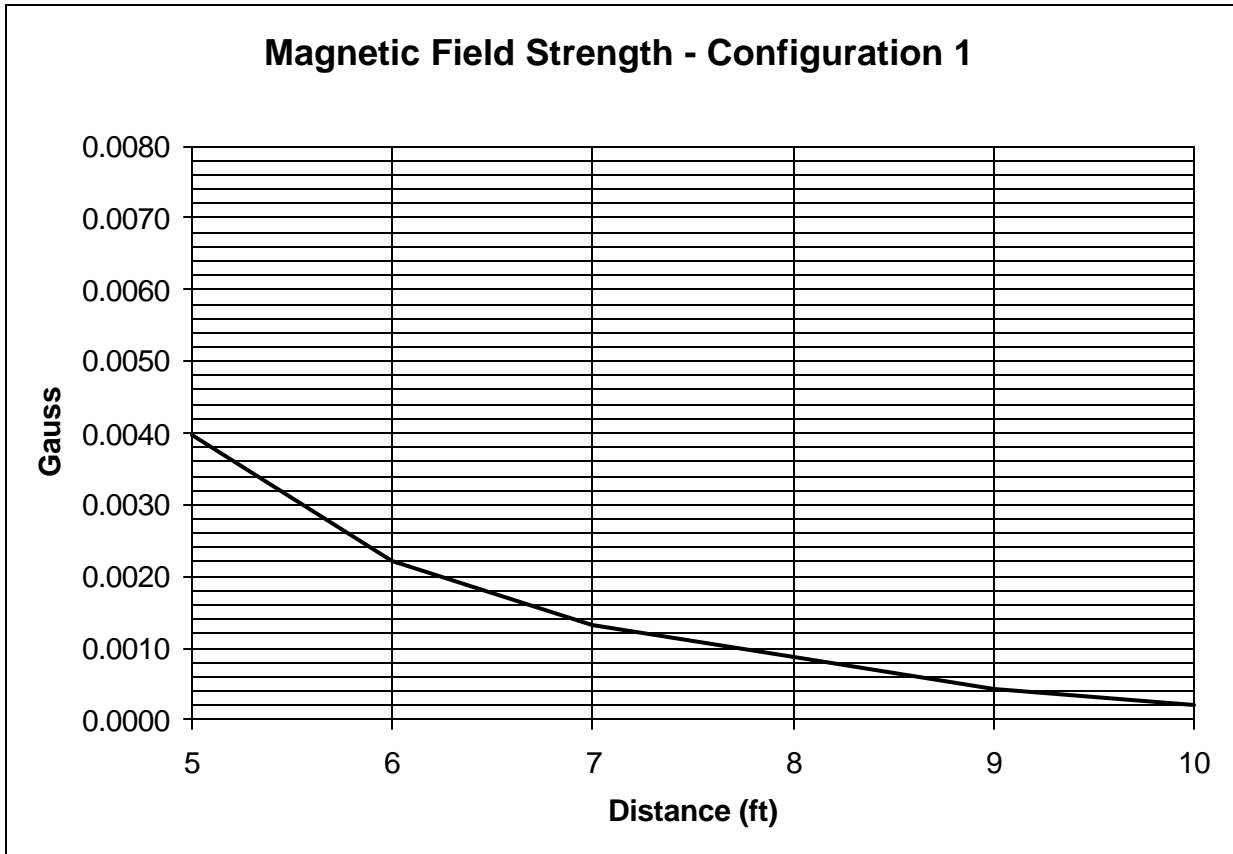


Figure 8: Test Data, Original Pack Case EUT Configuration 1, 5 to 10 feet

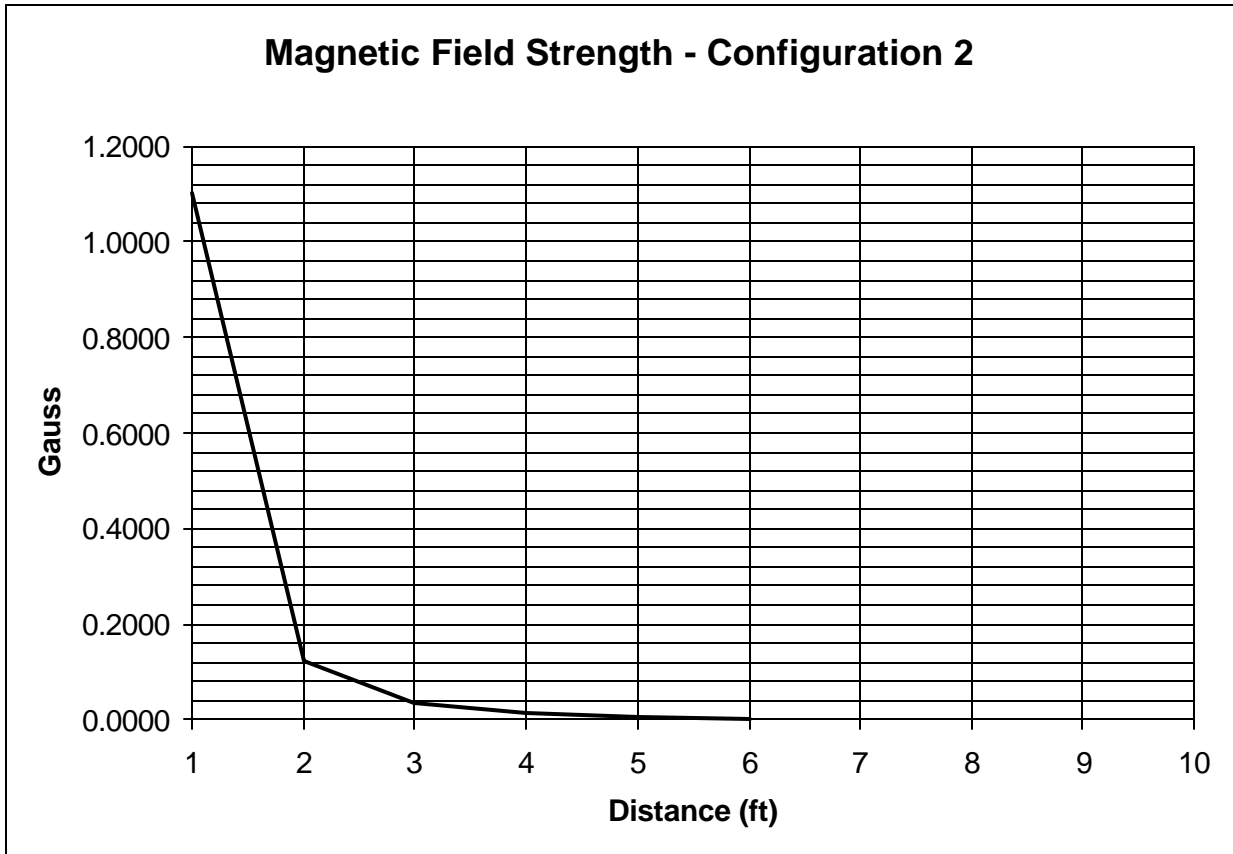


Figure 9: Test Data, Original Pack Case EUT Configuration 2, 1 to 10 feet

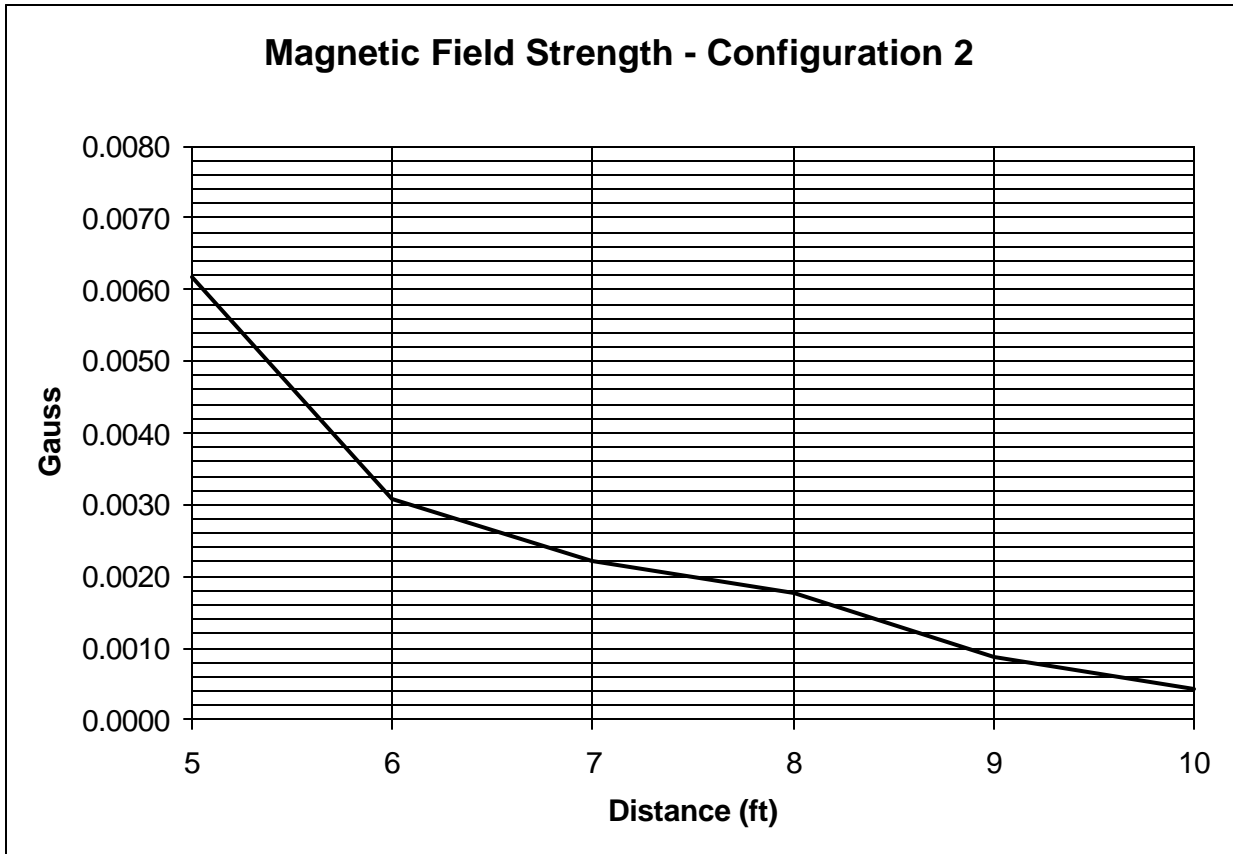


Figure 10: Test Data, Original Pack Case EUT Configuration 2, 5 to 10 feet

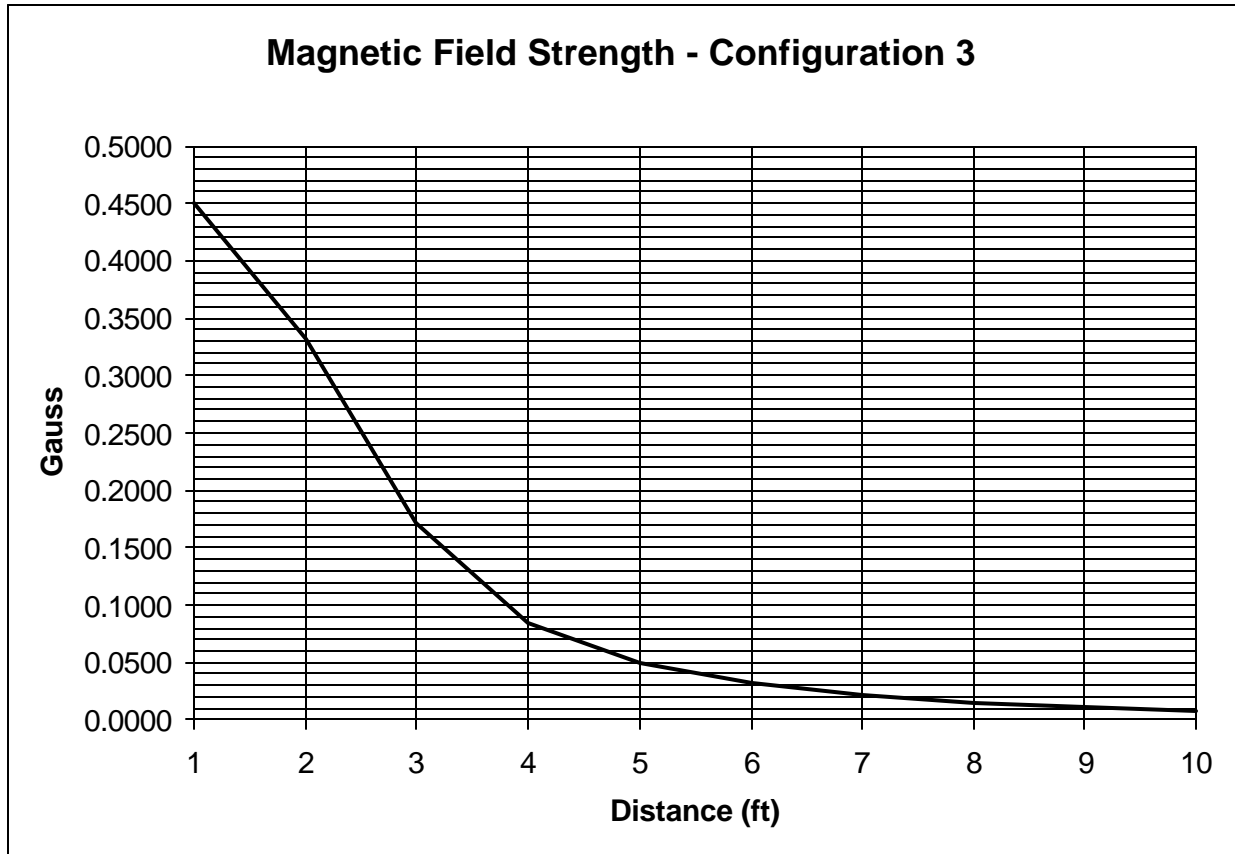


Figure 11: Test Data, Original Pack Case EUT Configuration 3, 1 to 10 feet

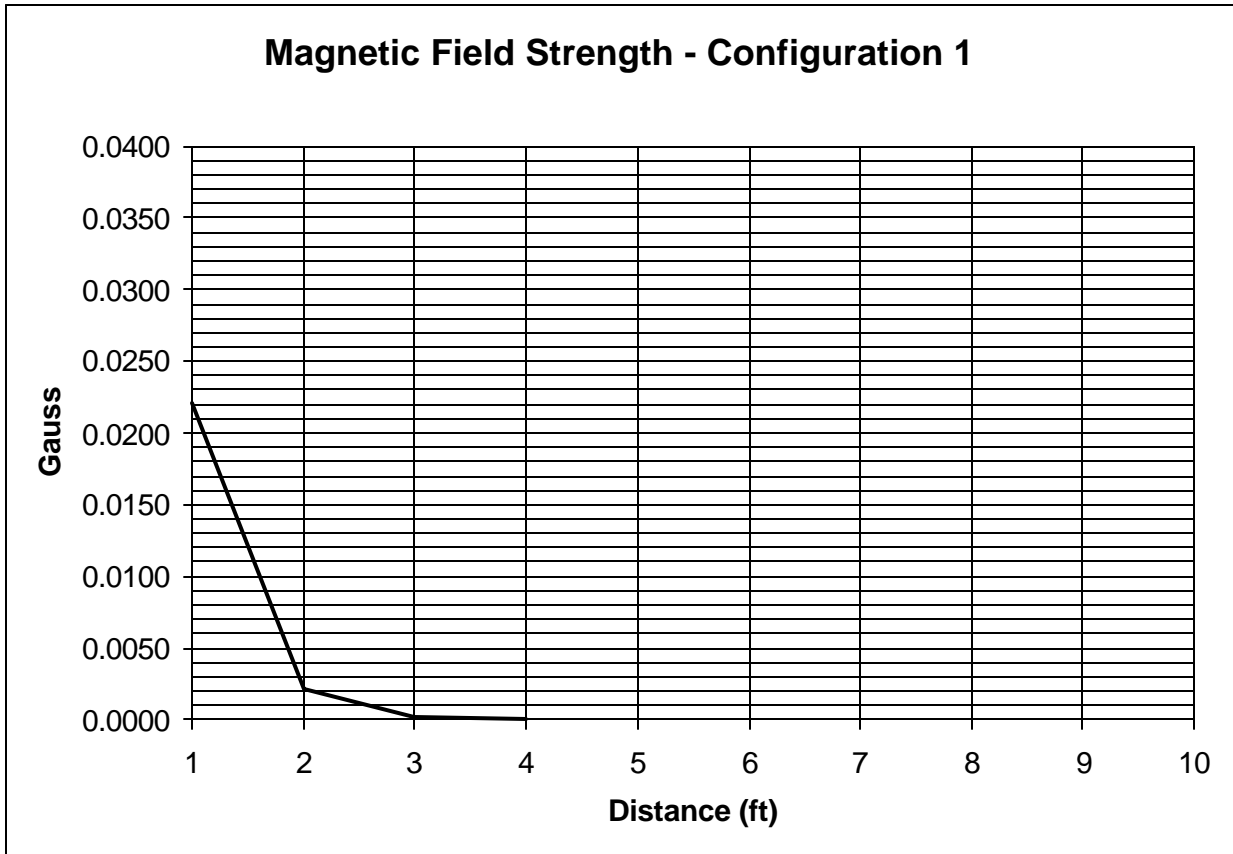


Figure 12: Test Data, Re-packed Case EUT Configuration 1, 1 to 10 feet

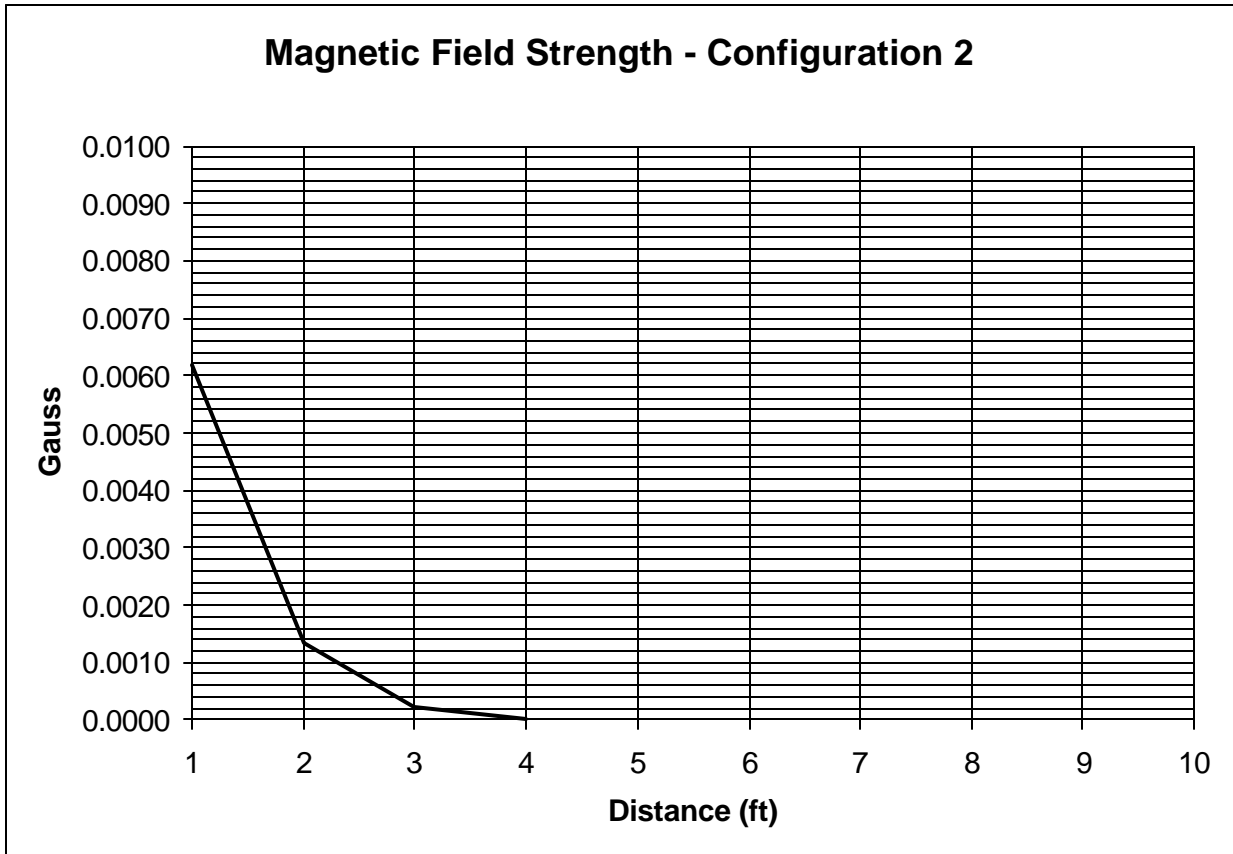


Figure 13: Test Data, Re-packed Case EUT Configuration 2, 1 to 10 feet

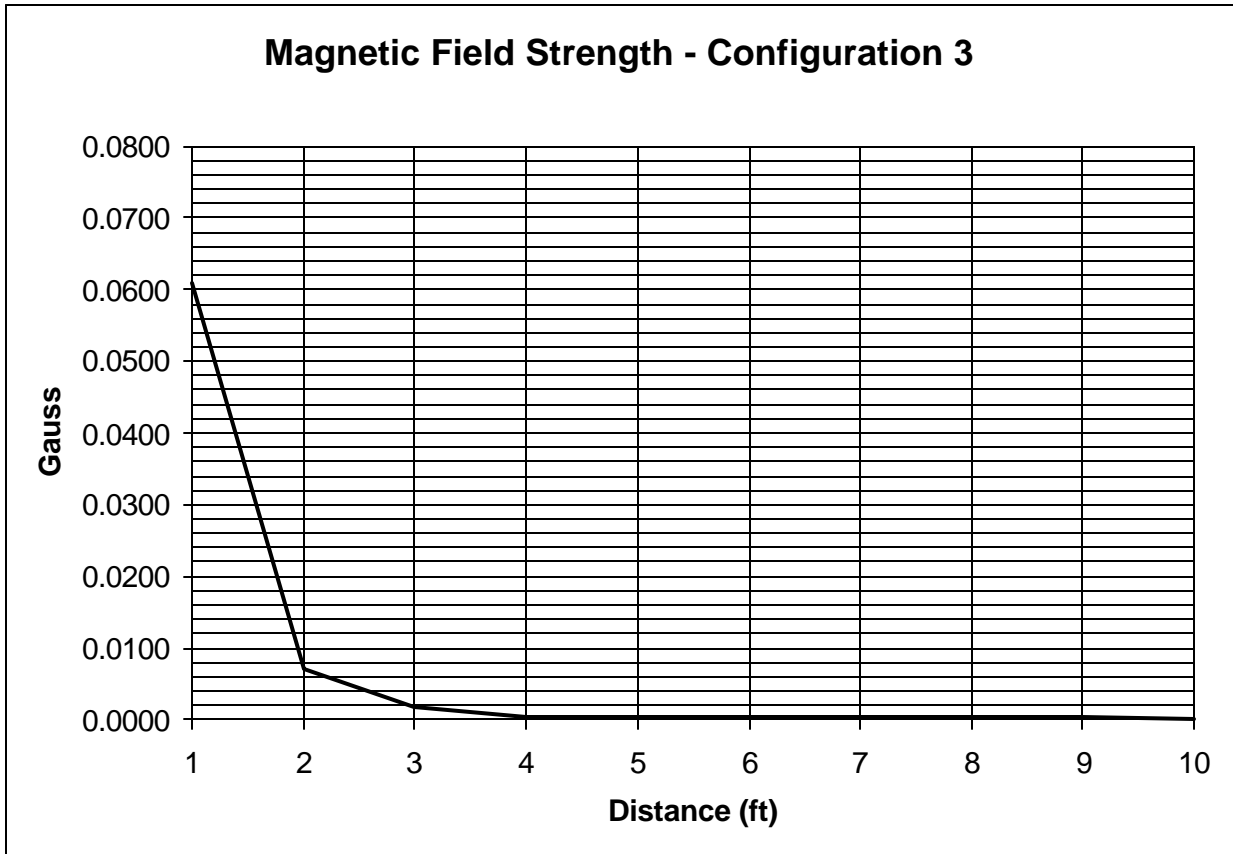


Figure 14: Test Data, Re-packed Case EUT Configuration 3, 1 to 10 feet



Figure 15: Test Configuration - Case EUT



Figure 16: Case As Originally Packed



Figure 17: Case Re-pack View