STEREO
IMPACT

FM1 SWEA Magnetics Test Report

IMPACT-SWEA-FM1-Magnetics-Report.doc
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Document Revision Record

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A	2005-Mar-24	Preliminary Draft	-

Distribution List

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1. Overview

1.1. *Introduction*

The Solar Wind Electron Analyzer and Supra-Thermal Electron Detector (Downstream) (SWEA/STE-D) is the part of the STEREO IMPACT instrument suite. It resides at the end of the IMPACT boom, ~1m from the MAG sensor.

This document describes the results of the magnetics testing performed on the FM1 SWEA unit. This testing was performed at U.C. Berkeley. .

1.2. *Applicable Documents*

The following documents are closely interrelated with this specification. All documents can be found on the Berkeley STEREO/IMPACT FTP site unless otherwise indicated:

http://sprg.ssl.berkeley.edu/impact/dwc/

1. APL Document APL 7381-9003 Rev A – STEREO Environment Definition, Observatory and Instrument (on APL web site)

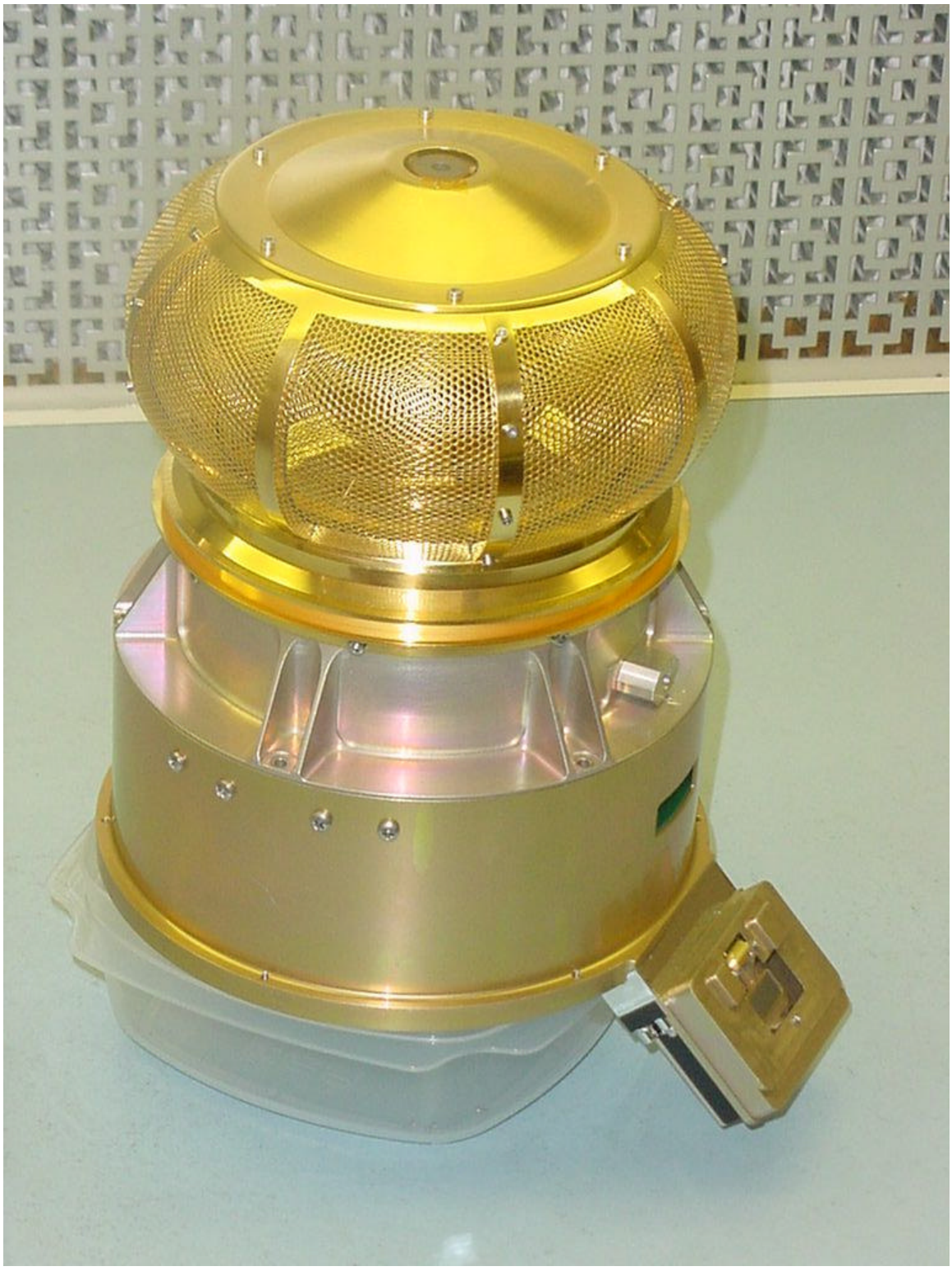


Fig 1. FM1 SWEA/STE-D

2. Test Setup

The SWEA/STE-D was tested on the THEMIS magnetic test facility consisting of a test stand capable of rotating the instrument a fixed distance from a Meda FVM-400 tri-axial magnetometer sensor. The test stand is non-magnetic, which was demonstrated by spinning the stand with no instrument attached (~2nT response at 30cm).

The facility background included occasional drifts of up to tens of nT. This background was avoided by spinning the instrument several times at ~0.5Hz, so that the peak to peak field measurement stood out clearly from the background.

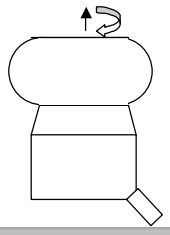
Measurements were taken at both 30cm and 60cm. The rule of thumb is to measure at least 3x the long dimension of the unit under test. The 30cm measurement was a consistency check.

Field Samples were taken at 5Hz and recorded on a PC.

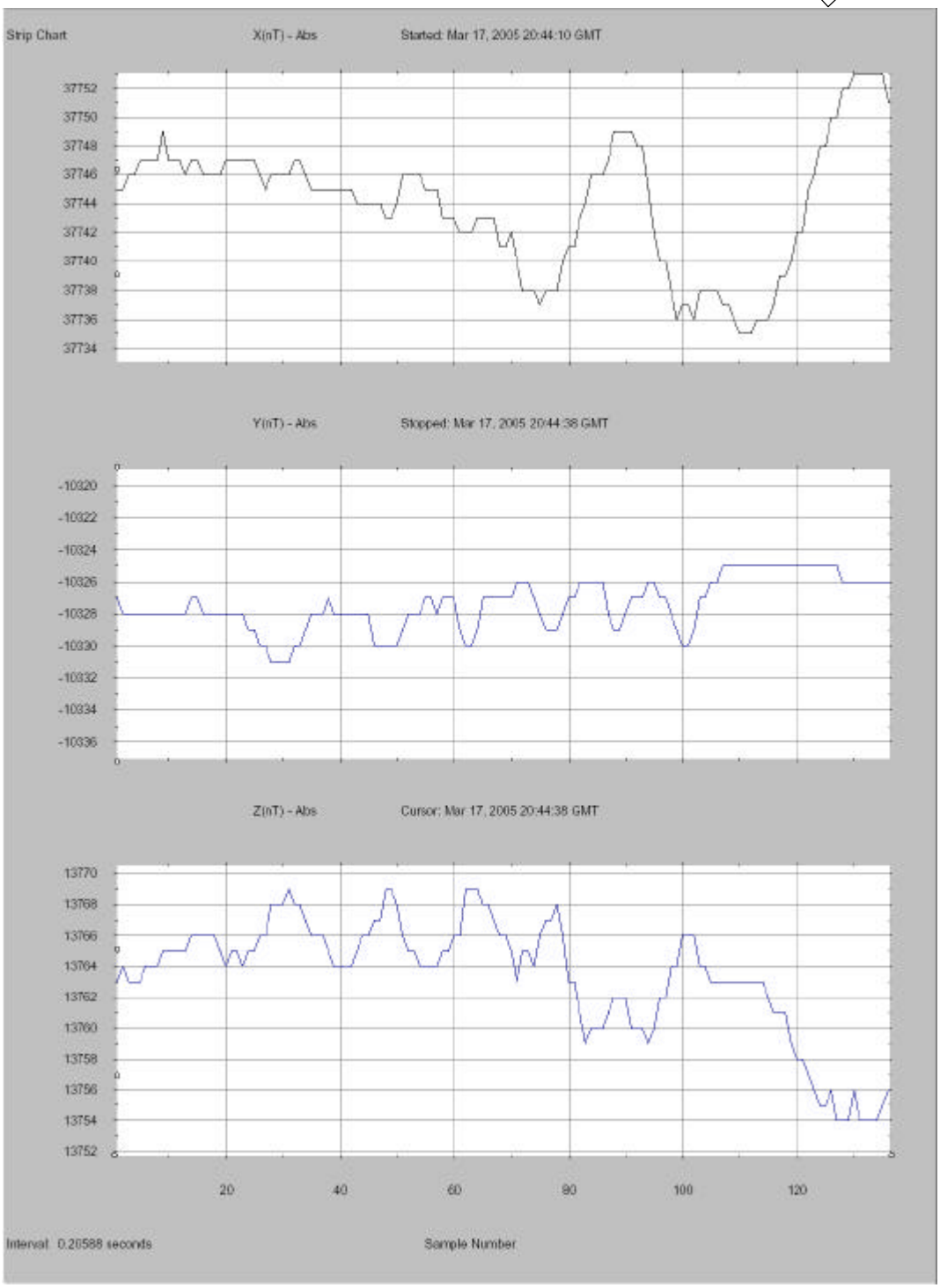
The instrument was bagged in lumalloy to avoid contamination, and the connector savers were not removed.

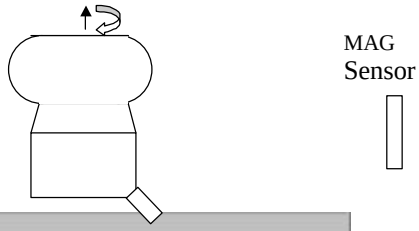
After the first axis measurements the unit was degaussed and measured again.

3. Test Data

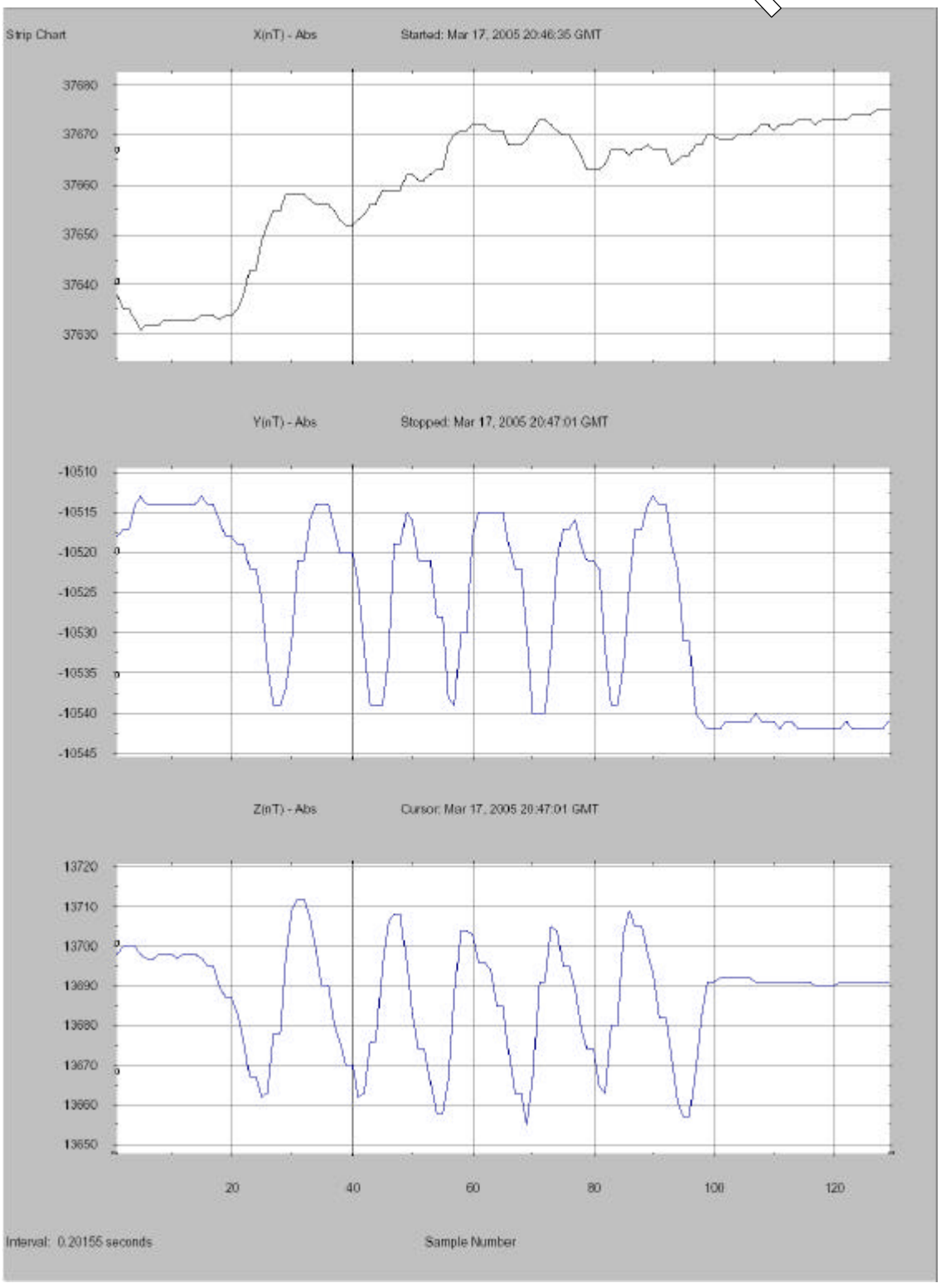


3.1. *Axis 1, 60cm*

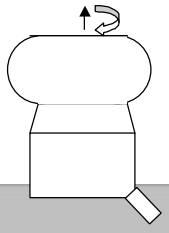


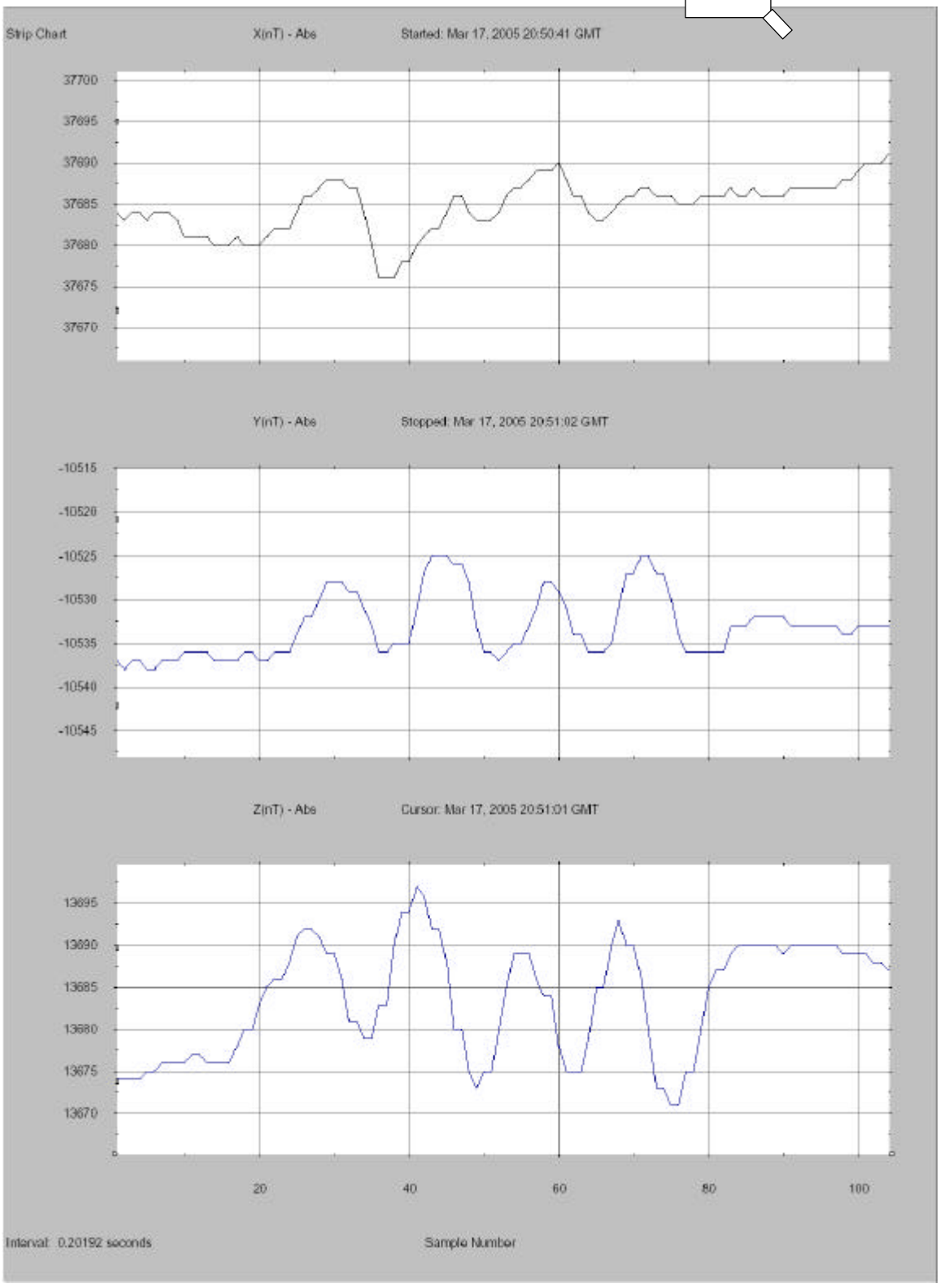


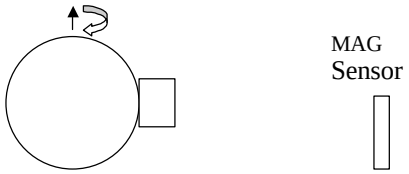
3.2. ***Axis 1, 30cm***



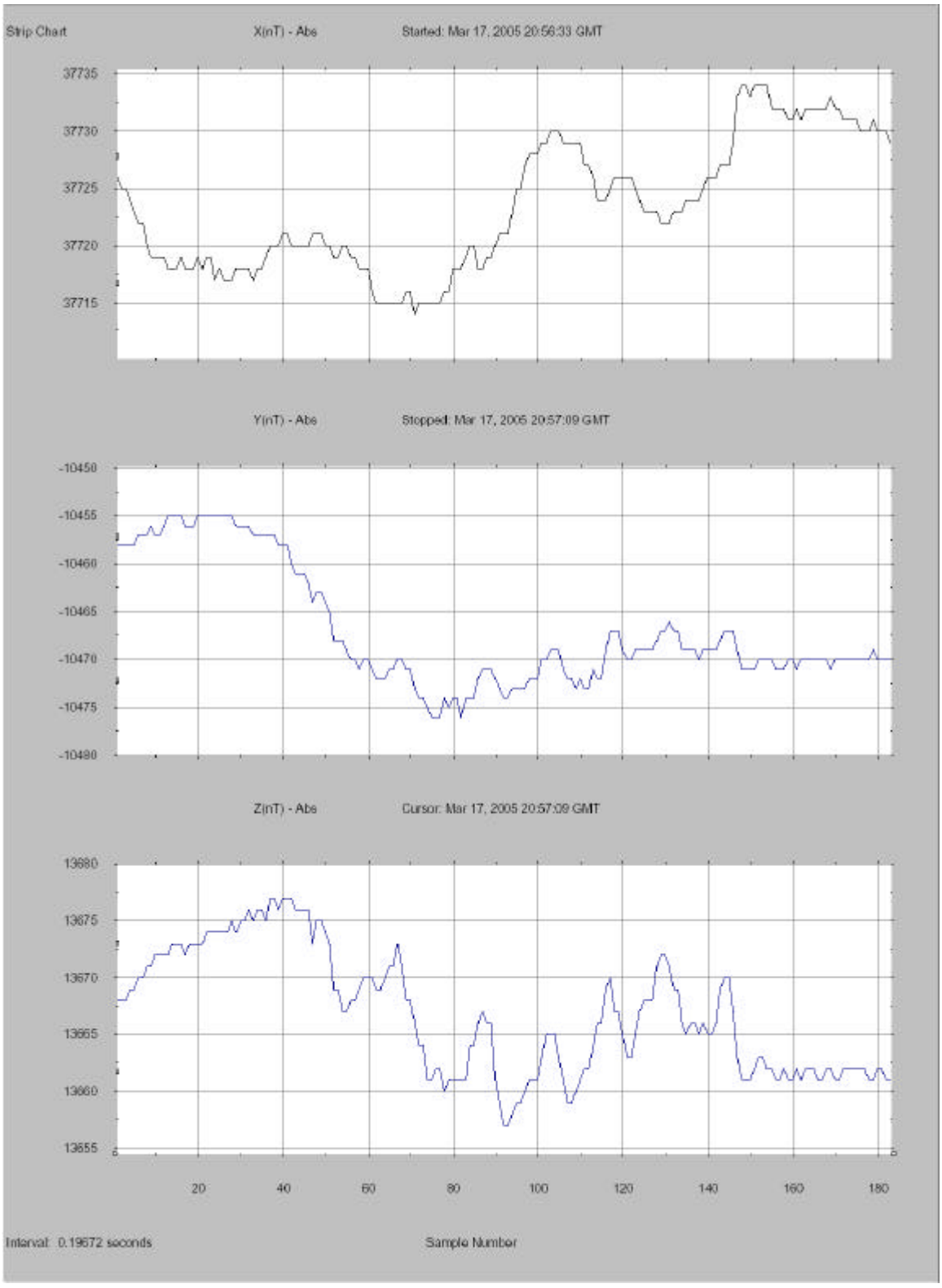
3.3. ***Axis 1, 30cm, post-degauss***

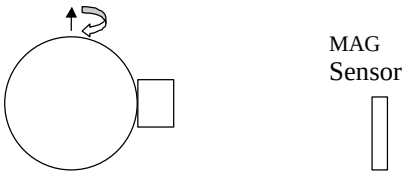




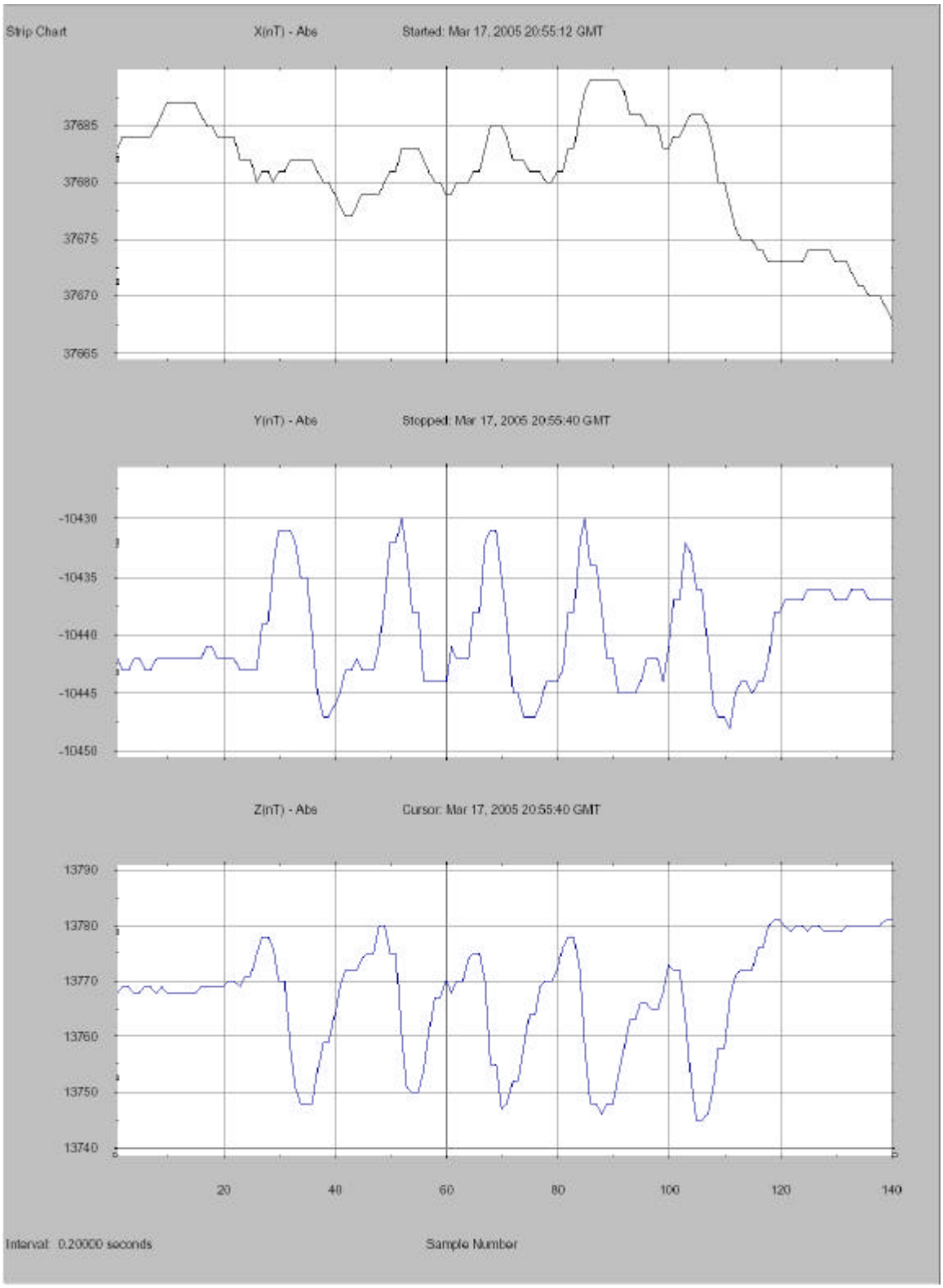


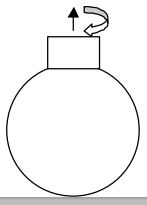
3.4. ***Axis 2 60cm***



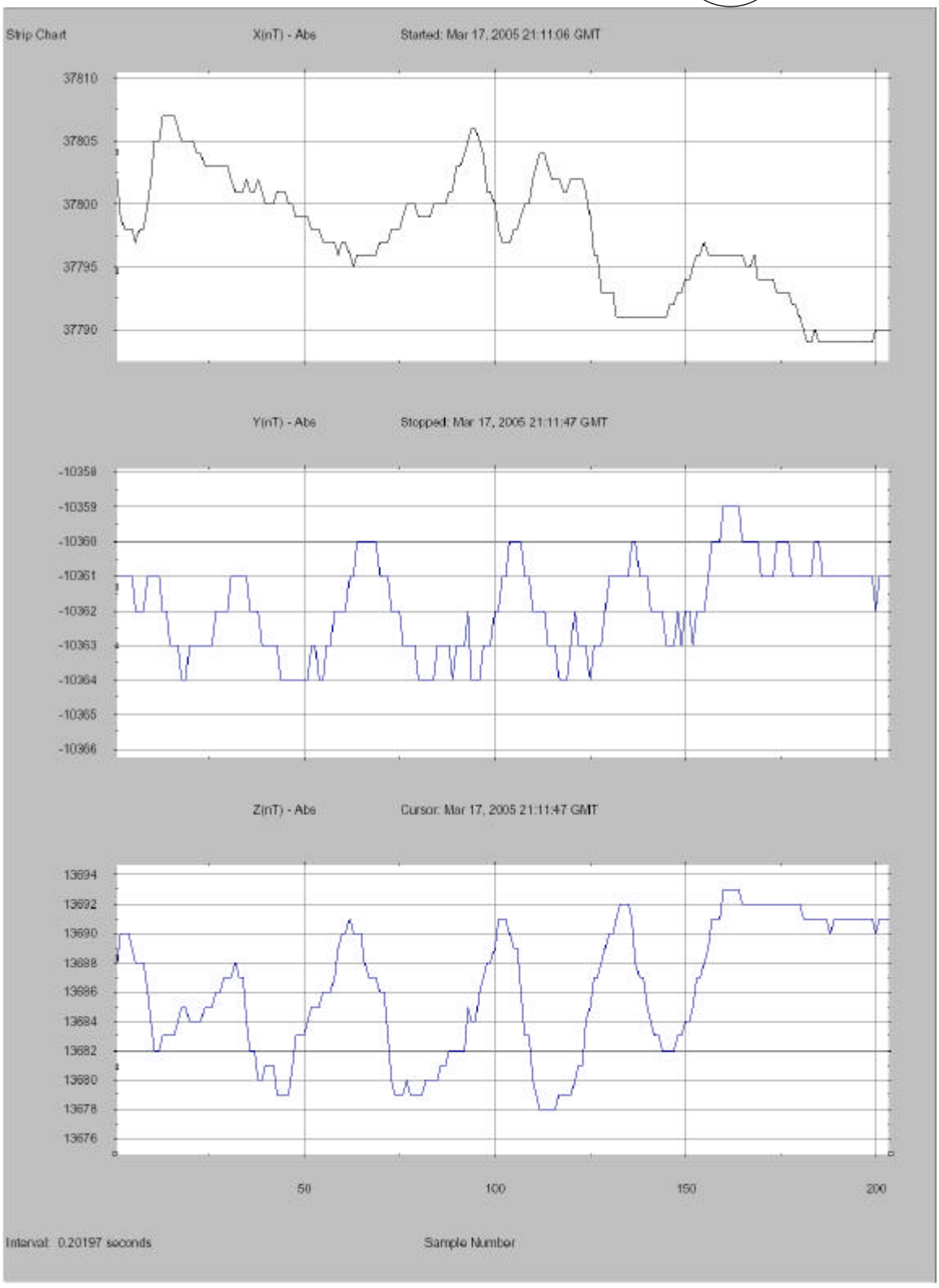


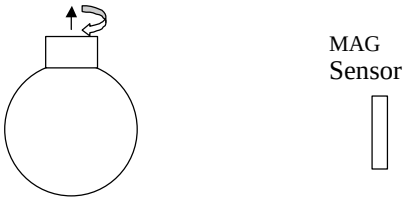
3.5. ***Axis 2, 30cm***



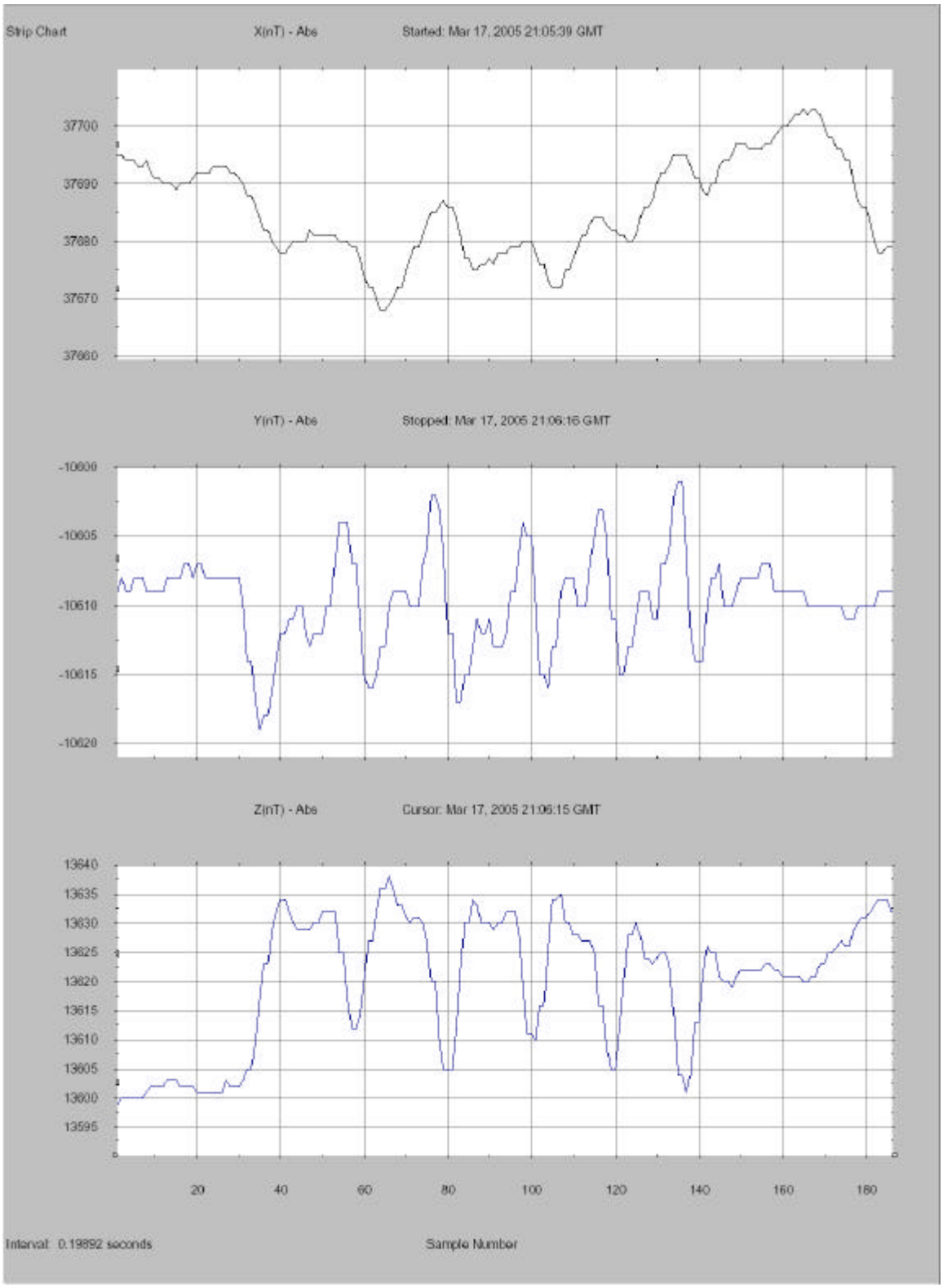


3.6. ***Axis 3, 60cm***



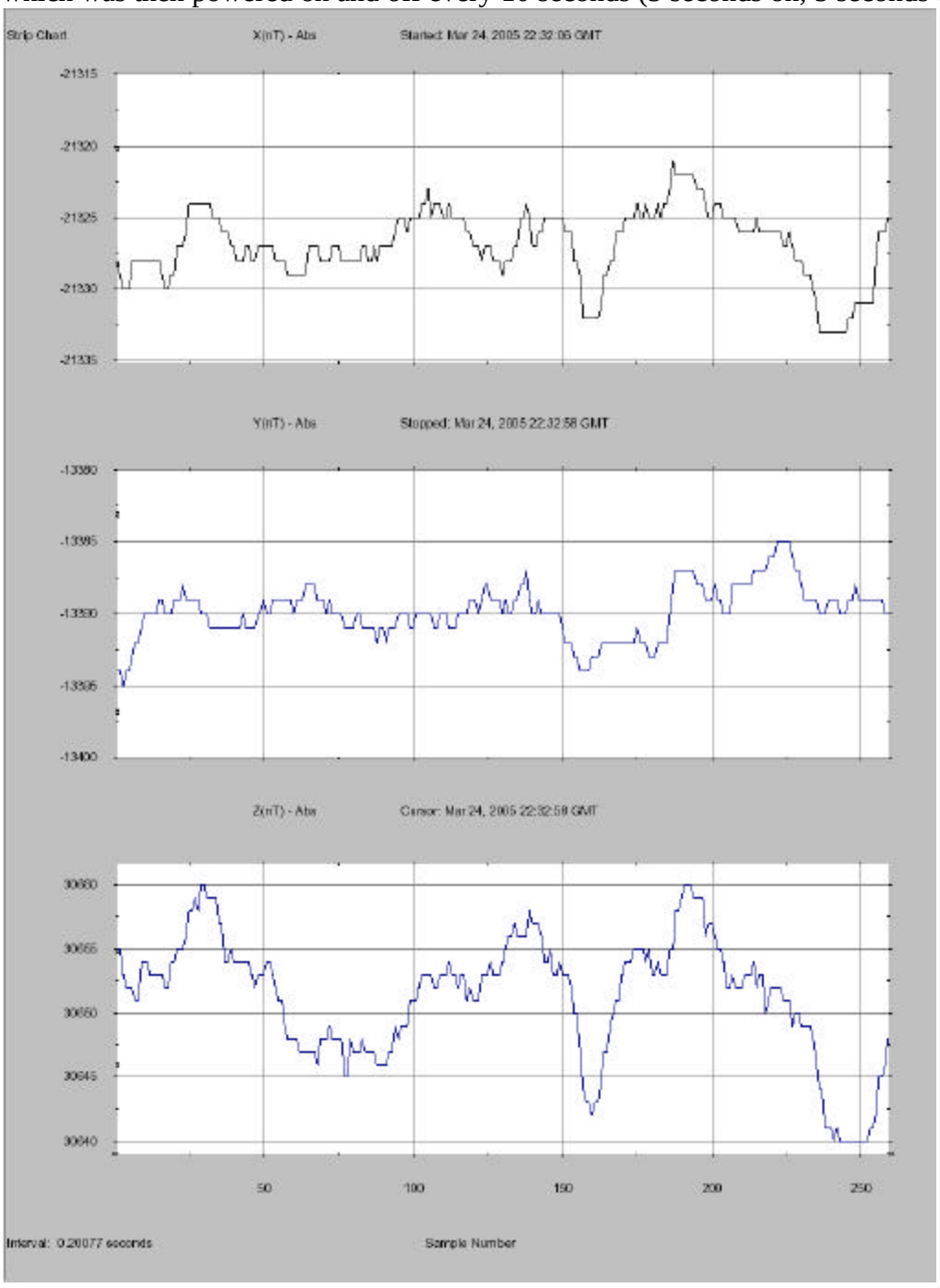


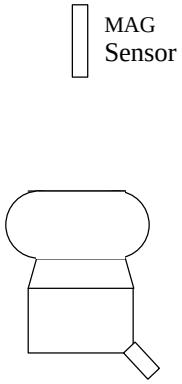
3.7. ***Axis 3, 30cm***



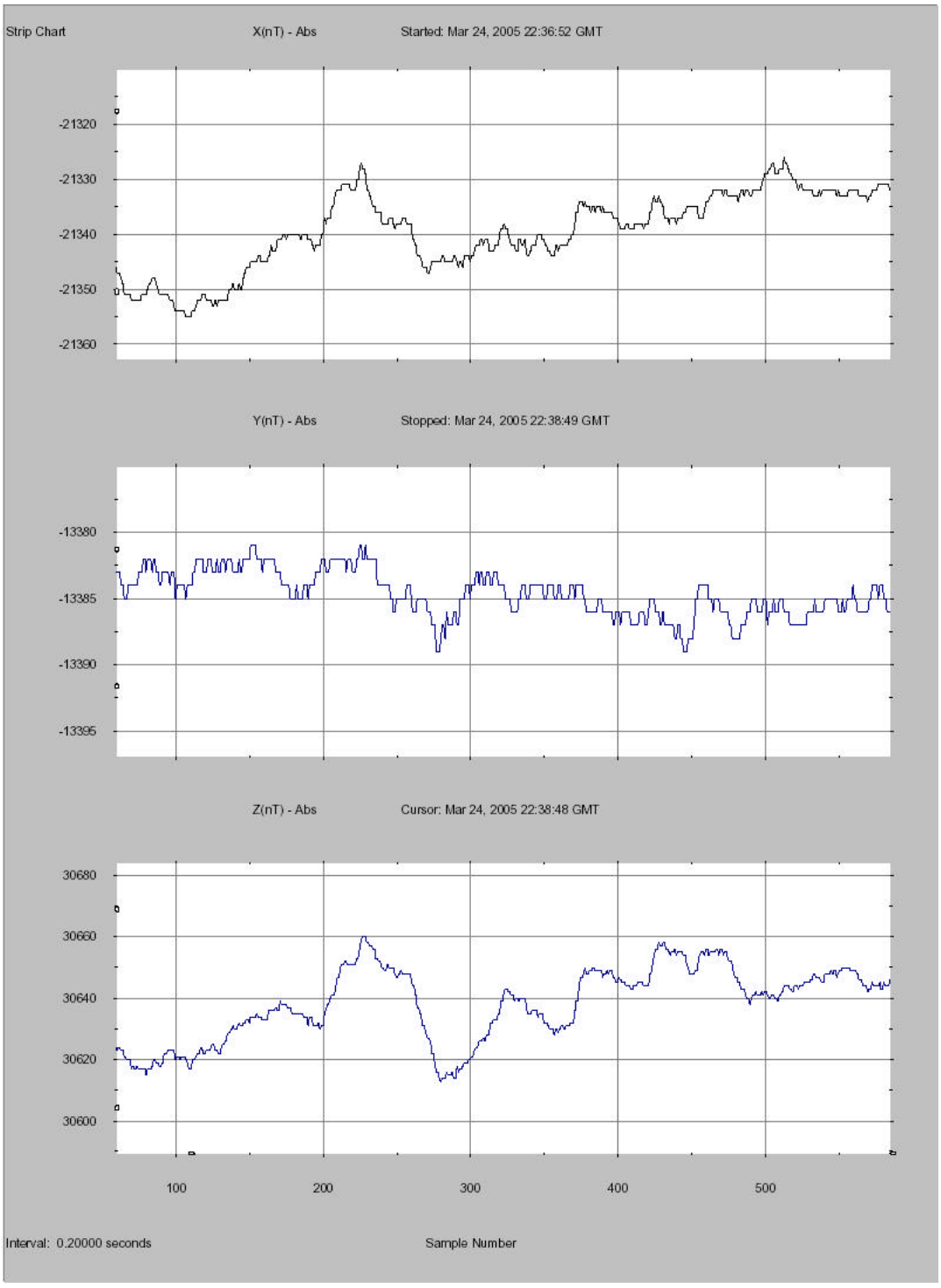
3.8. *Dynamic Data*

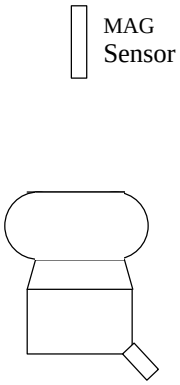
In addition to static measurements a test was run to look for low frequency AC fields from the instrument when powered. The sensor was placed ~30cm from the instrument, which was then powered on and off every 10 seconds (5 seconds on, 5 seconds off).





Another dynamic test was made with the operational heater cycling on and off with a 20 second period, 50% duty cycle.





4. Analysis

The static data at 60cm shows maximum peak-to-peak variations of ~10nT at the spin period (Axis 3, Z; the Z magnetometer axis is along the vector from SWEA to the sensor). That corresponds to a magnetic moment of 2-5nT-m^3, and a field at the Magnetometer sensor, ~1m away, of ~1nT. The spacecraft-level goal is 1nT DC, so we are a significant factor for the MAG, but not terrible. The reduction by degaussing of a factor of 3 is actually of some concern because this indicates the variability of the field with time as the unit perms up.

The dynamic data shows no correlation to the switching frequency, indicating a dynamic field less than 2nT, corresponding to an AC field at the MAG sensor of less than 0.08nT, close to the spacecraft goal for dynamic fields of 0.05nT AC.

The MAG PI has declared this a typical and acceptable level.