

Lawrence Berkeley National Laboratory

Recent Work

Title

RIPPLE MEASUREMENTS IN APOLLO - 8 x 16 x 36 ""HIGH POWERED-H MAGNET"", ABC NUMBER 67922

Permalink

<https://escholarship.org/uc/item/3md2m819>

Author

Nelson, Donald H.

Publication Date

1982

LBID-521
c.1



Lawrence Berkeley Laboratory

UNIVERSITY OF CALIFORNIA

Engineering & Technical
Services Division

RECEIVED
LAWRENCE
BERKELEY LABORATORY

MAY 24 1982

LIBRARY AND
DOCUMENTS SECTION

For Reference

Not to be taken from this room



LBID-521
c.1

DISCLAIMER

This document was prepared as an account of work sponsored by the United States Government. While this document is believed to contain correct information, neither the United States Government nor any agency thereof, nor the Regents of the University of California, nor any of their employees, makes any warranty, express or implied, or assumes any legal responsibility for the accuracy, completeness, or usefulness of any information, apparatus, product, or process disclosed, or represents that its use would not infringe privately owned rights. Reference herein to any specific commercial product, process, or service by its trade name, trademark, manufacturer, or otherwise, does not necessarily constitute or imply its endorsement, recommendation, or favoring by the United States Government or any agency thereof, or the Regents of the University of California. The views and opinions of authors expressed herein do not necessarily state or reflect those of the United States Government or any agency thereof or the Regents of the University of California.

ENGINEERING NOTE

LBID-521

FILE NO.

MT 309

PAGE

1 of 4

SUBJECT

Ripple Measurements in Apollo - 8 x 16 x 36
"High Powered-H Magnet", AEC Number 67922

NAME

Donald H. Nelson

DATE

January 8, 1982

INTRODUCTION

Dr. Michael Raybourn, Biology and Medicine Division, requested assistance from Magnetic Measurements Engineering in measuring the magnitude of the magnetic field ripple in Apollo, a 16 x 36 "HPH" magnet he is using for biological studies. The purpose of this report is to document these tests.

COORDINATE SYSTEM

The coordinate system of the measurements is based on the location at which biological tissue is tested for its dependence on magnetic induction. The origin was located by an electrode mounted in the magnet, and the cartesian coordinate system used is shown in Figure 1.

TESTS

Originally, we planned to measure field ripple at the origin and on the 6-faces of a 2 cm cube enclosing the origin. At each location, we planned to measure the magnitude of the A/C component of B_x , B_y and B_z . Because the magnitudes of the A/C component of $B_x(0, 0, 0)$, $B_y(0, 0, 0)$ and $B_z(0, 0, 0)$ were so low, we only made measurements at the origin.

Inspection of the preliminary data suggested that 1) there was no significant ripple in $B_z(0, 0, 0)$, and 2) the magnitude of ripple in $B_z(0, 0, 0)$ as measured in 1977 was apparently much higher than the ripple of $B_z(0, 0, 0)$ measured in December, 1981. Our inability to reproduce earlier data shifted our concentration to validating our results.

ENGINEERING NOTE

LBID-521

FILE NO.

MT 309

PAGE

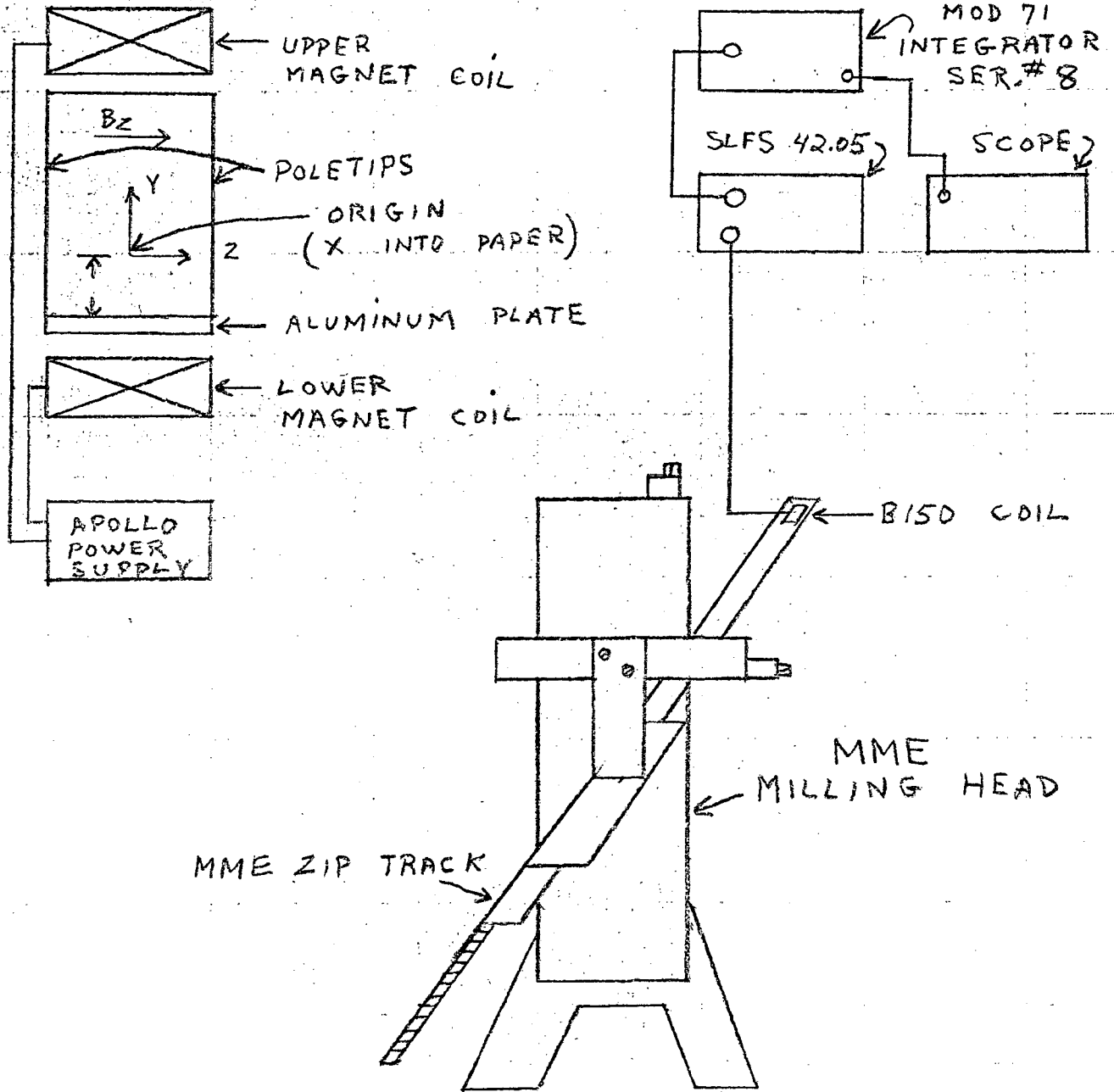
2 of 4

SUBJECT

Ripple Measurements in Apollo - 8 x 16 x 36
 "High Powered-H Magnet", AEC Number 67922

NAME Donald H. Nelson

DATE January 8, 1982



DESCRIPTION

EQUIPMENT

COIL
 INTEGRATOR
 FLUX STANDARD
 SCOPE

MME B-150
 MME Mod 71 S/N 8
 SLFS 42
 TEKTRONIX MOD 5103N
 Amp 5A22N

$nA = 0.537 [cm^2]$
 $R = 46.4 [R\Omega]$
 $C = 0.1 [MF]$
 $\phi = 0.055 [Wb]$
 508767
 508721

FIGURE 1 Coordinate System and Test Equipment

ENGINEERING NOTE

LBID-521

FILE NO.

MT 309

PAGE

3 of 4

SUBJECT

Ripple Measurements in Apollo - 8 x 16 x 36
 "High Powered-H Magnet", AEC Number 67922

NAME

Donald H. Nelson

DATE

January 8, 1982

RESULTS

The results of our December, 1981 measurements are summarized in Table II along with conflicting results from 1977 measurements. We conclude that the amplitude of the ripple in $B(0, 0, 0)$ is $\sim 0.01\%$ of the D/C component of $B_z(0, 0, 0)$. When the power supply is unfiltered and is $\sim 0.001\%$ (10 ppm) of the D/C component when the filter is connected.

In addition to the measurements summarized in Table II, we observed the ripple at lower magnet current with and without the filter and concluded that it is consistently less than 0.01% of the dc field over the field range of interest.

DISTRIBUTION

C.G. Dols
 M.I. Green
 E.C. Hartwig/L.J. Wagner/W.H. Deuser
 M.S. Raybourn
 T.S. Tenforde
 Magnetic Measurements Engineering (4)

This work was supported by the U.S. Dept. of Energy under Contract DE-AC03-76SF00098.

LBID-521

FILE NO.
MT 309

PAGE
4 of 4

SUBJECT

Ripple Measurements in Apol10 - 8 x 16 x 36
 "High Powered-H Magnet", AEC Number 67922

NAME
Donald H. Nelson

DATE
January 8, 1982

Status of Magnet Power Supply Filter	Component Measured	December 1981 Data		December 1977
		Magnitude of 60 Hz Ripple (Teslas)	Magnitude of 360 Hz Ripple (Teslas)	Magnitude of 360 Hz Ripple (Teslas)
Unfiltered	B _x	4.0 x 10 ⁻⁵	2.0 x 10 ⁻⁵	—
Unfiltered	B _y	1.5 x 10 ⁻⁵	1.5 x 10 ⁻⁵	—
Unfiltered	B _z	1.0 x 10 ⁻⁵	1.0 x 10 ⁻⁵	80 x 10 ⁻⁵
Filtered	B _z	10 ⁻⁶	10 ⁻⁶	8 x 10 ⁻⁵

Approximate (+50%) Pk/PK Amplitudes of A/C Component of Magnetic Induction for DC Current ~150 A
 DC Field B_z = 0.3 Tesla

TABLE II Summary of Ripple Measurements

This report was done with support from the Department of Energy. Any conclusions or opinions expressed in this report represent solely those of the author(s) and not necessarily those of The Regents of the University of California, the Lawrence Berkeley Laboratory or the Department of Energy.

Reference to a company or product name does not imply approval or recommendation of the product by the University of California or the U.S. Department of Energy to the exclusion of others that may be suitable.

TECHNICAL INFORMATION DEPARTMENT
LAWRENCE BERKELEY LABORATORY
UNIVERSITY OF CALIFORNIA
BERKELEY, CALIFORNIA 94720