

TECHNICAL NOTE

Date: 12/18/91
By: Eric Schmitz
Subject: Analysis of Probe Effect in Magnet Ringing Waveform
To: Wayne Koska

This document provides experimental data and analysis which shows the conclusions stated in TS-SSC 91-248 to be inaccurate. Further experimentation and analysis were performed to examine the effects of using various oscilloscope probe connection schemes.

cc: R. Sims
L. Curry
R. Gaff
D. Kubik

Further Analysis of Probe effect on Magnet Ringing Waveform
Eric T. Schmitz
December 18, 1991

(Refer to technical note TS-SSC 91-248.)

The results described in technical note TS-SSC 91-248, "Analysis of Probe Effect in Magnet Ringing Waveform," have been contradicted by further experiment.

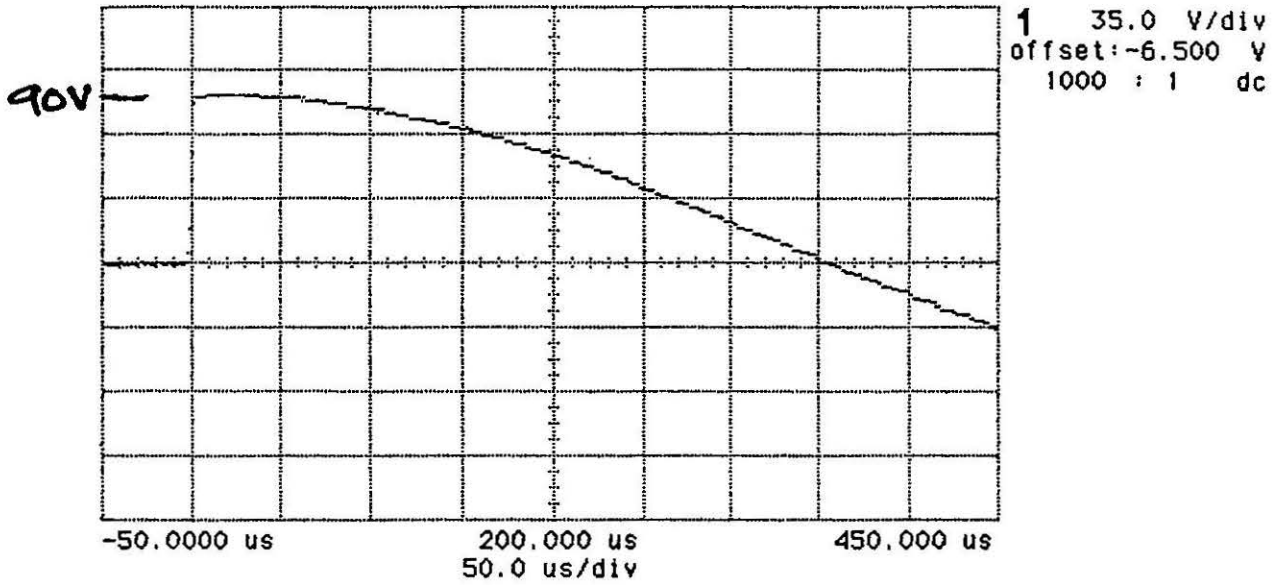
Figures 1 and 2 of this document show the ring waveform of a 1m outer coil using the HP probe #1 with the extra length of cable and without, respectively. Both graphs show a sharp initial rise of the waveform. Figures 3 and 4 show the waveform produced using the Tektronix probe #1 with the extra cable and without, respectively. It can be seen in both graphs that this probe produced a blunt initial rise whether or not the probe was connected via the extra cable.

In TS-SSC 91-248, it was assumed that the HP probes definitely did not pass through the extra length of cable in connection to the oscilloscope (paragraph 2). These latest results indicate that to have possibly been a false assumption. The cause of the blunt rise problem is very possibly that the Tektronix probe is not properly compensated.

There is, however, some noticeable difference between the waveforms that seems to depend on the inclusion of the extra cable. In the case of the HP probe, the "non-cable" waveform (Figure 2) had an initial amplitude of 105v, while the "cable" waveform (Figure 1) rose to only 90v (an attenuation of 14%). Likewise, for the Tektronix probe the "non-cable" waveform (Figure 4) the initial amplitude was 115v while the "cable" waveform (Figure 4) had an initial amplitude of 105v (an 87% attenuation). Use of the extra cable in the connection of the probe to the oscilloscope seems to cause some attenuation, but it is not clear how much of the cable's effect is resistive and how much is reactive.

From this analysis, it can be concluded only that the best setup to use is most likely the HP probe (compensated) connected directly to the front panel input of the oscilloscope, at least until the Tektronix probe can be properly and accurately calibrated.

hp stopped



1 30.00 V

Figure 1

HP #1 through cable

f_0 stopped

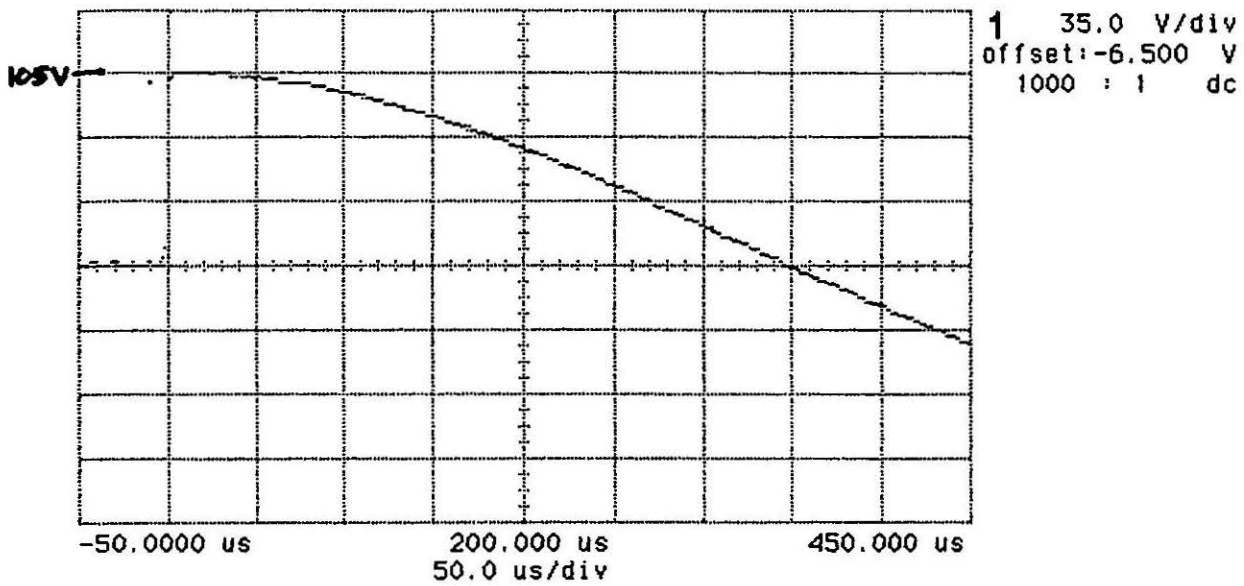


Figure 2

1 30.00 V

HP #1 direct

hp stopped

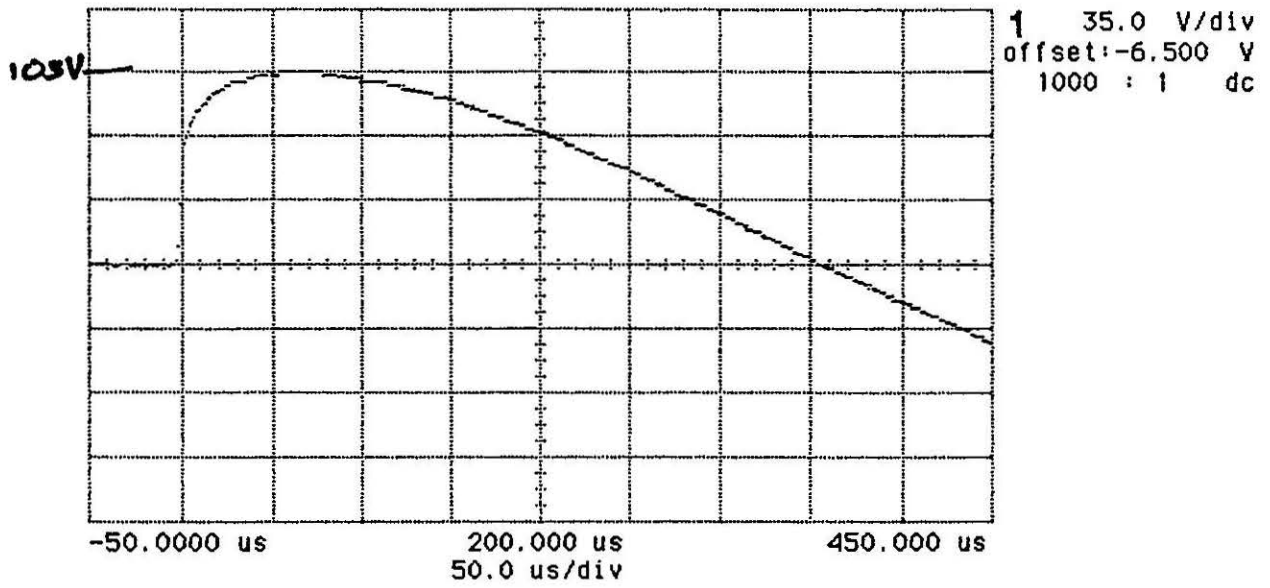


Figure 3

1 5 30.00 V

Tek #1 through cable

Ap printing

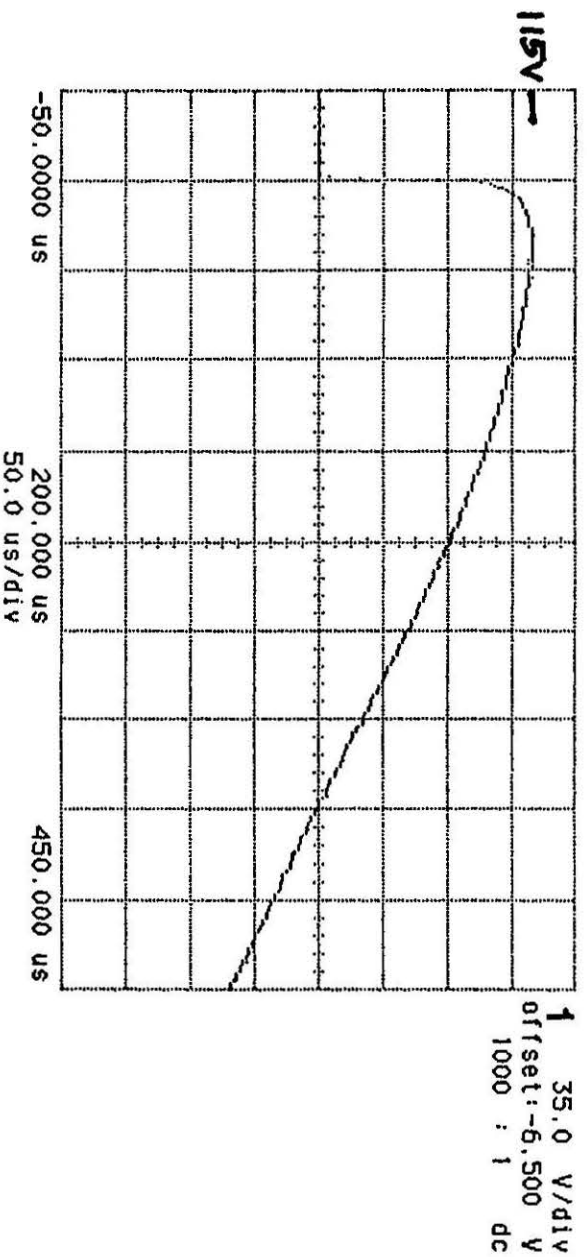


Figure 4

Tek #1 direct

1 F 30.00 V