



Power Handling Capacity of the 100 Series Probes

Introduction

EMC probes like the Beehive Electronics 100 series probes (figure 1) can be used in two ways. They can be used as receiving antennas, to measure an electromagnetic field. Alternatively, when driven by a signal generator, they can be used as transmitters. When used this way, they can be used to test the susceptibility of circuits to electromagnetic fields.



Figure 1

Probe Current Handling Capacity

The power handling capacity of the probes is limited by the current-handling capacity of its traces and components. At low frequencies, this is determined by the probe's DC resistance. As frequency increases, dielectric losses and conductor skin depth reduce the current handling capacity of the probes. The maximum current for the probes is shown in figure 2.

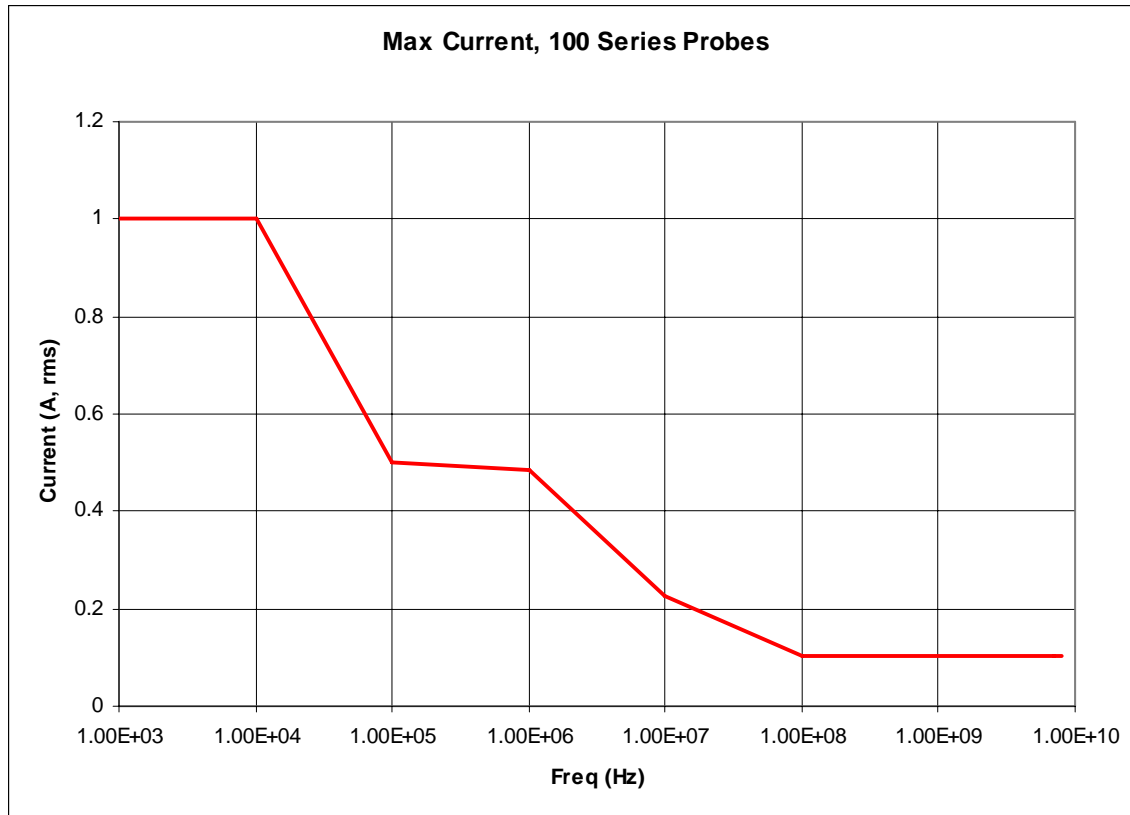


Figure 2

Probe Power Handling Capacity

The impedance of the 100 series probes is a complex function of frequency. The magnetic field probes, models 100 A, B, and C, approximate a short at DC. The 100D electric field probe is an open circuit at DC. As the frequency increases, the impedance of the probes varies in a complex fashion. This varying impedance is taken into account in determining the sensitivity of the probes; and does not cause any problems in normal operation. For determining the maximum power handling capacity of the probe, however, the impedance is important.

For the purposes of this application note, we calculate the power handling in the most conservative way: by assuming that the probe is a short to ground. A 50 ohm source will deliver the most current when it is loaded by a short circuit. The graph in figure 3 shows the power setting of a 50 ohm signal generator that will deliver the current shown in figure 2 above.

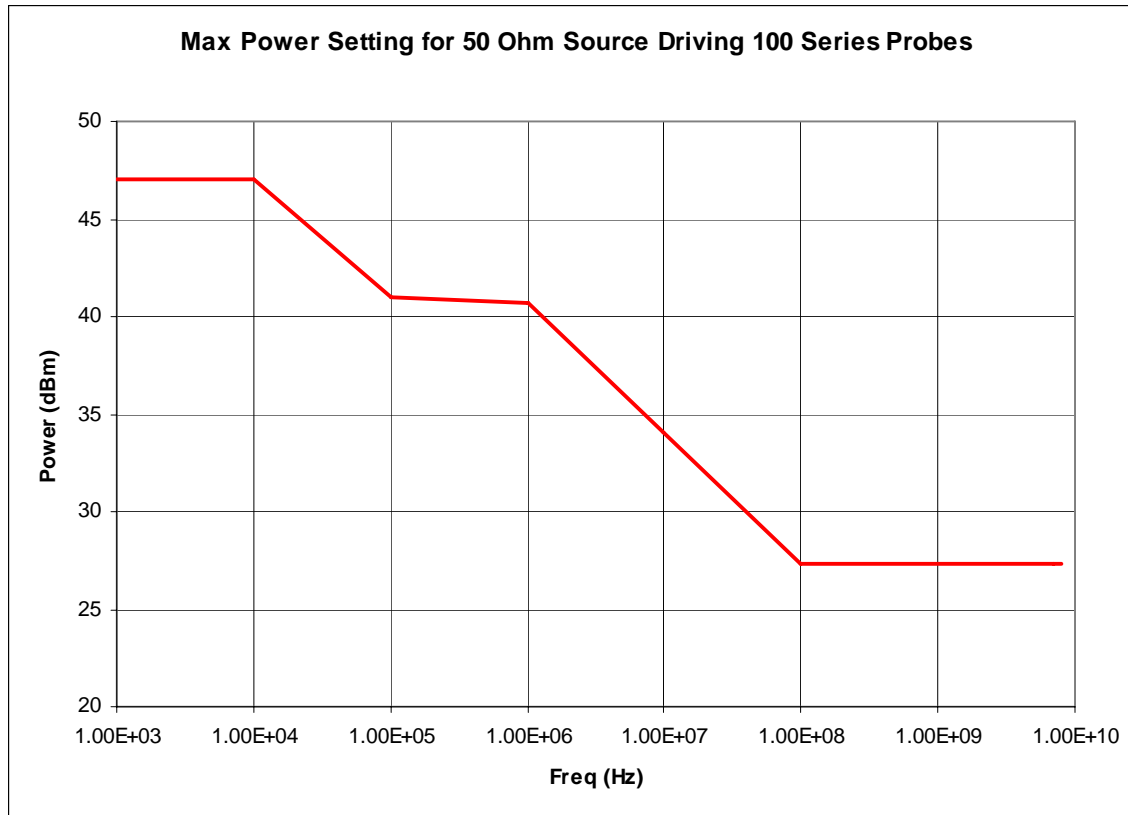


Figure 3

If a specific application requires more than the power shown in figure 3, a more accurate calculation can be done by measuring the complex impedance of the probe at the frequency of interest. With the current rating of the probe from figure 2 and the measured impedance, it is possible to calculate the power setting of a signal generator that will deliver that current into the probe's measured impedance.

These ratings were determined by analyzing the case where the probe is used as a transmitter, i.e. when it is driven by a signal generator through the connector. They also apply when it is used as a receiver as well, i.e. when the probe is connected to a spectrum analyzer.

Low Frequency Considerations for the 100D E-Field Probe

At low frequencies, the impedance of the 100D E field probe is very high. As a result, if the currents in figure 2 were applied to the probe, very high voltages would result. For this reason, it is necessary to specify a maximum voltage rating for the 100D as well. This is determined by the voltage rating of the SMB connector, and is 335V rms.

Summary

The graphs above show the current- and power-handling capacity of the 100 series EMC probes. For more information, please contact Beehive Electronics at (707) 824-9206 or sales@beehive-electronics.com