

RF Shielding Applications

Overview

Electromagnetic shielding is the process of limiting the flow of electromagnetic fields between two locations by separating them with a barrier made of a conductive material. Typically, it is applied to covers or printed shells, separating electrical devices from the 'outside world' and to cables, separating wires from the environment through which the cable runs. Electromagnetic shielding used to block radio frequency electromagnetic radiation is known as RF shielding.

The shielding can reduce the coupling of radio waves, electromagnetic fields and electrostatic fields, though not static or low-frequency magnetic fields. The amount of reduction depends very much upon the coating material used on the PolyJet™ printed model, its thickness, the size of the shielded volume and the frequency of the fields of interest. The size, shape and orientation of apertures in a shield in relation to an incident electromagnetic field are also factors.

One example is a shielded mobile phone that has electromagnetic shielding in the form of electronics in an inner conductor. The shielding impedes the escape and addition of signals from and to the core conductor.

Several factors serve to limit the shielding capability of real RF shields. One is that, due to the electrical resistance of the conductor, the excited field does not completely cancel the incident field. Also, most conductors exhibit a ferromagnetic response to low-frequency magnetic fields so that such fields are not fully attenuated by the conductor. Any holes in the shield force currents to flow around them so that fields passing through the holes do not excite opposing electromagnetic fields. These effects reduce the field-reflecting capability of the shield.

RF Shielding Applications

RF shielding can vary greatly according to the specific printed part (RF radiation, location, what needs to be shielded, etc.). RF shielding can be as simple as a coated layer on a single side of the part or multiple layers of shielding on part of or the entire printed model. Therefore, it is essential to understand and define how much RF shielding one will need as early as possible in the planning process. In fact, it should be one of the very first steps taken after selecting which RF shielding part is required.

RF shielding blocks radio wave signals from entering or exiting a printed model. RF shielding must be a complete, 6-sided box in order to work. One must also take into consideration the fact that radio frequencies function

Skill Level Time Cost



Picture 1. The aerosol RF shielding coating



Picture 2. Applying coating onto PolyJet™ part



Picture 3. Homogeneous coating onto printed model

over a very broad spectrum. A selected model functions in a very specific frequency, thus the RF shielding should be designed to be applicable to the frequency of interest.

The Process

A workable solution for RF shielding coating can be achieved by using the conductive coating 3800 Series (3801 aerosol spray 365 ml, from www.hollandsheilding.com) to apply a nickel/acrylic coating. It is also available in aerosol forms for prototypes and small runs. The aerosol is compatible with most plastics and metal substrates and meets the requirements of BS EN 100015-1 (Basic Specification: Protection of electrostatic sensitive devices).

This single component nickel/acrylic conductive coating provides cost effective RF shielding on plastic housing used in the electronics and computer industries and combines RF shielding properties with a convenient method of application for prototype, design and touch-up work. It is specially formulated to provide a homogeneous finish. With a surface resistivity of 0.9 Ohm/Sq, this coating spray provides the following shielding performances:

Frequency (MHz)	Coating (dB)
30	36
100	38
200	44
500	54
700	54
900	50



Picture 4. PolyJet™ part prior to coating



Picture 5. Convenient method of application for PolyJet™ parts



Picture 6. Ready model with RF shielding coating

Disclaimer

Objet Geometries Ltd. is not responsible for misuse of our products or their use in conjunction with unsafe or improperly maintained equipment or for uses other than intended as specified in this application note.

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