
POWER MANAGEMENT

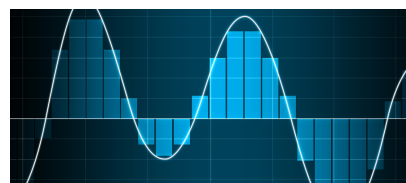
How Does Radiated EMI Impact Medical Devices?

Standards have been created for electromagnetic interference to meet the electromagnetic-compatibility requirements of implanted and wearable medical devices.

Steve Taranovich

Related To: [Electronic Design](#)

Analog Design in a Digital World



An August 22nd Electronic Design-hosted
webinar

REGISTER NOW

Members can download this article in PDF format.

What you'll learn:

- How does EMI differ from RMI?
- What types of EMI and EMC affect medical devices?
- Shielding options.
- Dealing with computed-tomography interference.

The medical circumstance for many people requires that they have an implanted pacemaker/defibrillator or an implanted insulin pump. These kinds of critical equipment must not be disrupted by the operation of other electronics such as cell phones, etc.

What's the Difference Between EMI and RFI?

The terms radio-frequency interference (RFI) and electromagnetic interference (EMI) often may be used interchangeably since radio waves are simply a subset of the electromagnetic spectrum. However, there's actually a difference in practice.

EMI is usually characterized as any frequency of electrical noise; RFI is a specific subset of electrical noise within the EMI spectrum. RFI is classified as a disturbance that may affect an electrical circuit due to either electromagnetic conduction or electromagnetic radiation emitted from some external source.

SPONSORED



SPONSORED CONTENT

DC/DC Buck Controllers: Achieve High Reliability in Demanding Applications

DC/DC step-down (buck) controllers with external FETs provide a power supply for even the most challenging require...



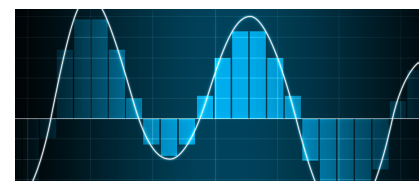
SPONSORED CONTENT

Achieving Low EMI with DC/DC Switching Regulators

As electronic systems become increasingly dense and integrated, electromagnetic interference (EMI) is becoming an increa...

IEC 60601-1-2 is the primary standard for EMI and electromagnetic compatibility for electronic medical equipment and systems. This standard is created to meet performance expectations for medical electronic equipment that

Analog Design in a Digital World



An August 22nd Electronic Design-hosted webinar

REGISTER NOW

performance expectations for medical electronic equipment that is in the presence of an electromagnetic interference.

Medical Device Examples

There are so many types of medical devices that can be worn or implanted. Some of the main examples include:

- Clothing
- Watch
- Ring
- Shoes
- Belt
- Glasses
- Armband

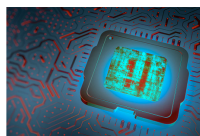
EMI/EMC Effects on Implanted or Wearable Electronics

Electromagnetic waves, which are emitted via communication devices (cell phones, etc.) or from an electrostatic discharge (ESD), will cause power disturbances that create a surge in conductive current as well as a localized radiated transient field.

EMI may occur when these three factors are present: a source of EMI, a coupling path, and a receptor. The coupling path from the source to the receptor can be a magnetic field, electric current, or even an electromagnetic field.

For instance, lightning is an EMI source that occurs in nature. Other sources of EMI might be radios, wireless networks, computers, cellphones or even any electrical signals. Keep in mind that any signals less than 50 kHz will typically not be a concern (*see figure*).

SPONSORED



SPONSORED CONTENT

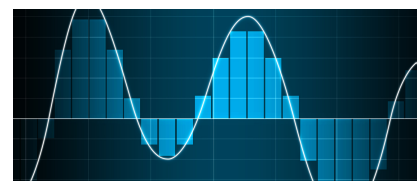
Increasing capacity of semiconductor burn-in

Burn-in thermal chambers have become increasingly more complex and require semiconductor ICs that achieve the highest l...



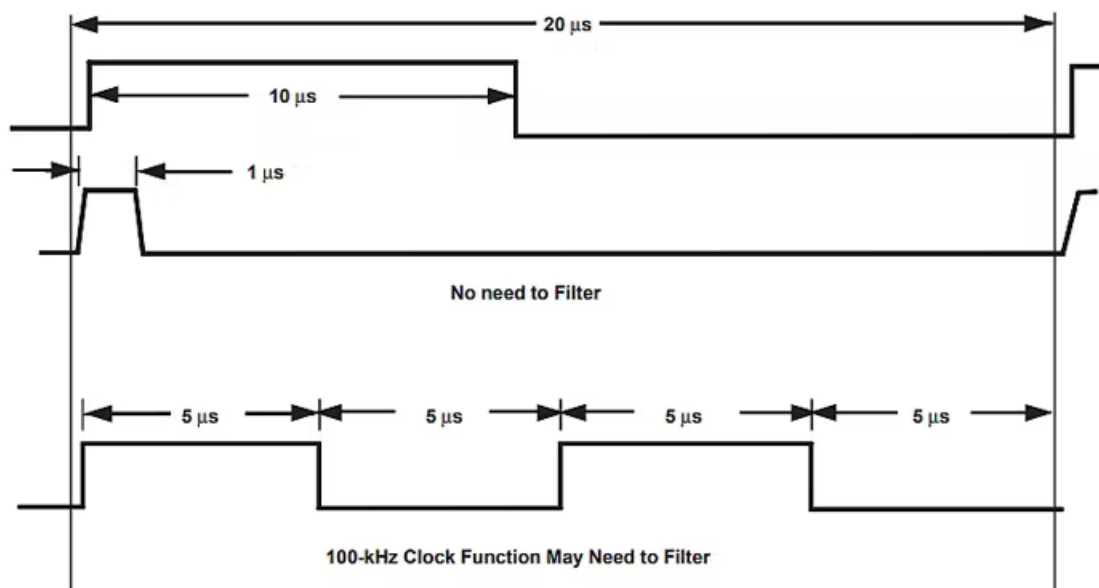
SPONSORED CONTENT

Analog Design in a Digital World



An August 22nd Electronic Design-hosted webinar

[REGISTER NOW](#)



Signals below 50 kHz do not raise any concerns with EMI.

Shielding Against EMI

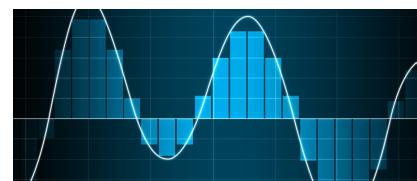
Modern EMI shielding is more challenging than it has ever been before. The use and production of new medical devices, along with the construction of digital circuits that are smaller yet faster for these newer models, make them susceptible to electromagnetic fields and the inevitable interference.

Gold is one of the best coatings that can be employed as an effective barrier to EMI. It does not cause a reaction when it comes into contact with the human body, making it an ideal coating for medical devices such as pacemakers. Occasionally, platinum is used instead of gold on pacemakers. Platinum will help resist corrosion, but cost is a major factor. Gold is already-expensive gold.

Multi-Cavity EMI Shielding

Designers of medical devices always need to consider EMI shielding. EMI shielding equipment failure and stay compliant with federal regulations. EMI shielding will help solve various problems associated with shielding.

Analog Design in a Digital World



An August 22nd Electronic Design-hosted webinar

REGISTER NOW

compared to perforated, soldered metal can shields.

Another option is a polymer-based, non-ferromagnetic shield, as it will not disturb MRI imaging.

EMI/EMC Filters

Employing an EMI filter may help with conducted emissions as well as meet immunity and fast transient requirements of radiated emissions. A power line or mains EMI filter can be installed at the power entry point of equipment to prevent electromagnetic noise from exiting or entering the medical implant/device.

Computed-Tomography (CT) Interference with Medical Devices

The Federal Drug Administration (FDA) has been notified of a small number of reports of adverse events that may be associated with CT imaging of implantable and wearable electronic devices (such as insulin pumps, cardiac implantable electronic devices, and neurostimulators).

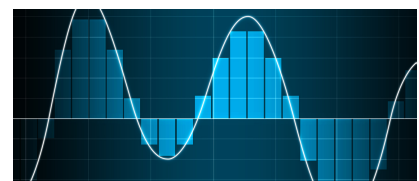
A CT scanner will directly irradiate the circuitry of certain devices (when the device is visible in the resulting CT image) and may cause sufficient electronic interference to affect device function and operation. Although there's a low probability of causing clinical harm, it's still possible.

Interference can be avoided when the medical device isn't within the field of view of the CT scanner. CT is the preferred tomographic imaging technology for certain implantable and wearable medical devices. CT is safer for patients with devices compared to MRI imaging (MRI) safety status, too.

Summary

The rise of advanced wireless technologies creates an almost sa

Analog Design in a Digital World



An August 22nd Electronic Design-hosted
webinar

[REGISTER NOW](#)

[EMI's Potentially Dangerous Impact on Pacemakers](#)

[How Does EMI Affect the Human Body and Brain? | Electronic Design](#)

[Interference between CT and Electronic Medical Devices | FDA](#)

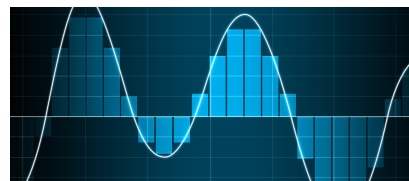
[EMI/EMC Standards for Medical Devices - VSE](#)

[5G Networks: Effects On Radiated Emissions And EMI Shielding \(com-power.com\)](#)

[The Importance of EMI Shielding in Medical Devices - SAT Plating](#)

[FDA/CDRH Recommendations for EMC/EMI in Healthcare Facilities | FDA](#)

Analog Design in a Digital World



**An August 22nd Electronic Design-hosted
webinar**

REGISTER NOW