

How Does the MedLux® XLS Recessed Lighting System Operate on AC Current without affecting the MRI Operation?

We are asked quite often how it is possible to operate our MedLux® lighting products in the MRI environment on AC line current. Some magnet vendors expressly recommend against the use of anything but DC to power lighting fixture inside the shield room. The problems with AC powered light sources relate to the generation of EMI (Electro-Magnetic Interference) and the generation of artifacts due to ‘motor’ effects from filaments subjected to strong static magnetic fields.

LED fixtures do not have any moving parts, so motor effects do not occur. EMI can be an issue since LEDs need constant current to operate properly, so a device called a driver is required. However, if designed properly, the LED driver can be made virtually noise-free in the frequency range that affects the MR displays.

The critical range of frequencies for interference in an MRI is between 25MHz and 1GHz (42.58MHz x T). Our XLS lights have been tested within this range, both by use of a spectrum analyzer and by being subjected to GE’s “Coherent Noise Test”. All testing was conducted with lights at full brightness as well as dimmed to various lower brightness settings. The spectrum sweep results are less than 20dB above 1uV (i.e. < 3.2uV maximum) and the GE tests have passed for every size magnet they make (0.6T to 19T). Similar tests have passed successfully on Hitachi, Philips, Siemens and Toshiba MR equipment. The reason we can’t tell you if this level of performance meets a specific requirement (a “standard maximum level”) is because the major MR manufacturers are not willing to share the exact limits with anyone. Since there is no written standard to test against, we cannot provide any third party certification of these results. However, to date, we have not had a single case where our XLS lights or GPI fixtures caused any interference whatsoever.

Another reason that DC is generally specified for MR applications is the need for dimming. To dim a DC system, you simply lower the voltage to the level desired. For AC powered fixtures, this is not so easily accomplished. By virtue of a patented technique (US 7,629,570 and US 8,025,424 B2), MedLux® LED fixtures can be dimmed very successfully without generating any EMI, even when the dimmer control itself is installed within the shield room! For a more detailed discussion of the operation of our MedLux® dimming system, please reference our paper: “MedLux® Dimmer White Paper”.