PACO

MIL-STD-461G

Specified for Surgical Suite Lighting

SANTE - SERIES

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Overview of Surgical Suite Lighting

Deciding on surgical lighting presents a challenge for hospitals, particularly in the operating room (OR), which is filled with many sensitive medical devices. In addition to visible light, lights generate electromagnetic radiation that can interfere with other medical devices, such as defibrillators, ECG monitors, and infusion pumps. In the early 2000s, researchers showed that electromagnetic interference (EMI) affected the operation of medical devices. Since then, much more research has been conducted, which has revealed that EMI can associated with malfunctions in medical implants, such as pacemakers. In extreme cases, EMI from LEDs has been associated with the disconnection of a medical telemetry system and noise artifacts in patient monitors. Thus, when selecting a light source, it is necessary to choose one that limits EMI under a certain threshold so it does not affect a procedure's outcome by interfering with sensitive medical equipment, thus ensuring a patient's safety.

Electromagnetic Interference with Medical Devices

As medical equipment in the OR becomes increasingly sophisticated, the number of devices susceptible to EMI increases. In fact, most modern electronic devices generate EMI, which often escapes from these devices and can potentially interfere with other devices. This includes the surgical lights positioned above the surgeon in the OR, which generate EMI in the form of radiated emissions and conducted emissions.

These two types of emissions differ in the way they propagate away from their source and affect other devices. Once generated by the OR light, radiated emissions travel through the air until they reach another object, typically a medical device. If an interfering signal reaches a medical device, the device can pick up the signal, much like a radio. This can lead to an erroneous readout on displays or even a device malfunction. The other type of EMI, conducted emissions, are generated when a current exits via the light's AC power cable and flows back into the mains. This can affect the power quality and may interrupt a medical device's correct functioning.

The effects of interference can be mitigated by keeping devices a certain distance away from the source of EMI, but lighting is generally placed in a fixed position to optimize a surgeon's performance (as noted by the above discussion). Similarly, medical devices, such as EKG monitors must be connected to a patient, and the display must be close enough for the surgical staff to see. Therefore, it's typically not possible to significantly alter the positions of the lighting or medical equipment without sacrificing the visibility of one or more components in an OR.

Testing for EMI: MIL-STD-461G

Lighting generally emits both types of EMI and that OR lights are designed to minimize the amount of EMI that is emitted from them below that certain threshold. **MIL-STD-461G** is a military standard that provides testing specifications and limits for EMI-generating equipment so that these devices do not interfere with each other during their operation. Although this is a military specification, many civilian organizations have also found it useful for testing the EMI of their equipment to reduce interference between devices.

This standard specifies that equipment should not produce conducted or radiated EMI above a certain limit. A device must pass tests for both radiated and conducted emissions—a failure in either means that the device does not meet the standard. The relevant limits in **MIL-STD-461G** are CE102 for conducted emissions, which measures power leads from a fixture from 10 kHz to 10 MHz, and RE102, which measures radiated emissions from 10 kHz to 18 GHz. The tests are performed in an anechoic testing chamber to prevent outside EMI from influencing the results, and the results of the tests are compared against a specific maximum limit for each individual frequency.

All measured noise levels must remain below the limit in order for a device to pass the test.

At PA-CO Lighting, our LED surgical luminary suite, PRCLS, is compliant with **MIL-STD-461G**. It uses an acrylic lens with an RF grid filter to reduce EMI emissions.

As shown below, the EMI generated by our LEDs (blue line) is below both limits specified by Mil-Std-461G (green line). Thus, our design ensures that our surgical suite luminaries do not generate enough electromagnetic interference to affect sensitive medical equipment in the OR, such as ECG monitors and infusion pumps.

PRCL

Spec Sheets & IES Files:

PRCL

PRCLS

Spec Sheets & IES Files:

PRCLS

MDS4

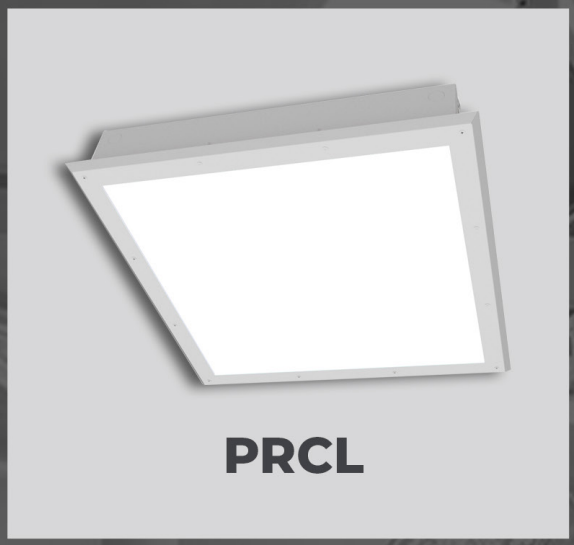
Spec Sheets & IES Files:

MDS4

MDS6

Spec Sheets & IES Files:

MDS6



PRCL

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