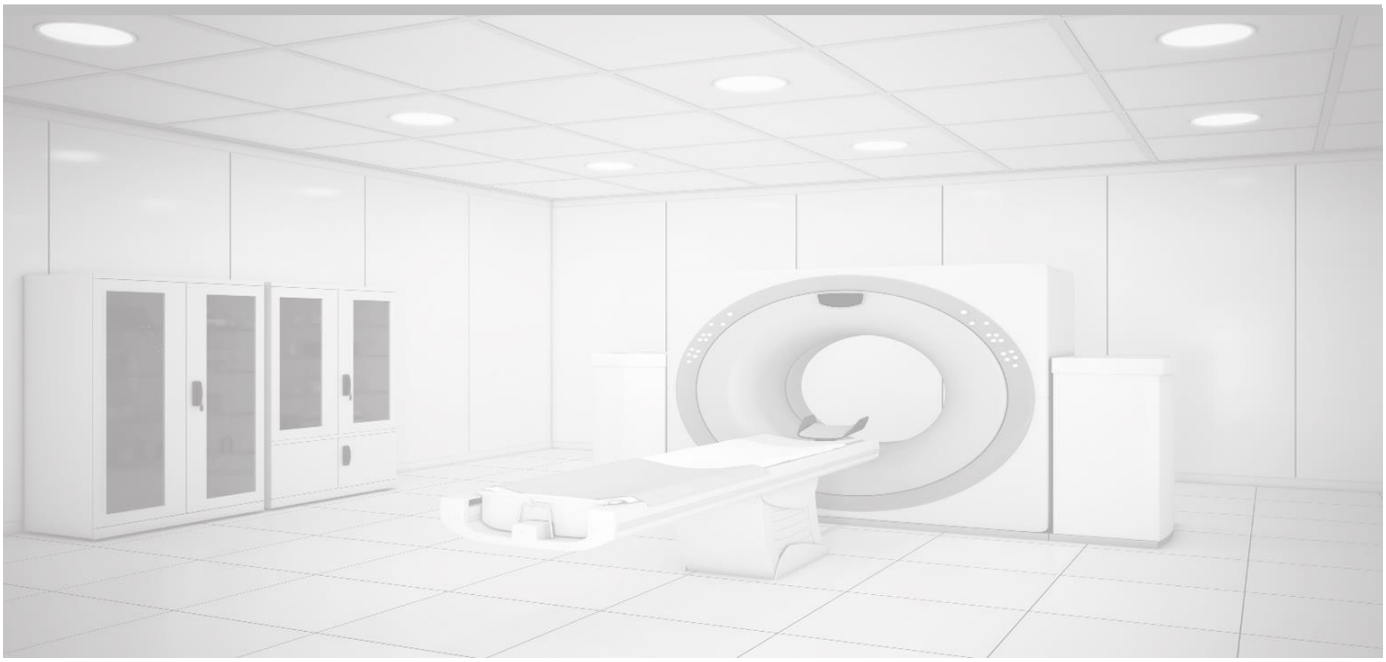
MRI SYSTEMS APPLICATION NOTE



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Preface

This Application Note details the guidelines for applying VESDA systems for smoke and gas leak detection in MRI environments

Related Products

All VESDA detectors.

Contents

1 Background

Magnetic Resonance Imaging (MRI) is a scanning procedure that uses strong magnets and radio-frequency (RF) pulses to create images of the internal structure of the human body.

The typical MRI system is accommodated across three adjoining rooms:

1. MRI scanner room. This room houses the MR scanner/magnet. The room is shielded against the transmission of magnetic forces, RF, noise and vibrations.
2. Equipment room. This room contains the control cabinets for the operation of the MR scanner/magnet.
3. Control room. This room contains operating and communication devices.

A fire within or near a MRI system will present a serious threat to life safety, high value equipment and facility, creating particular challenges for evacuation and fire response. Leakage of cryogenic gas (e.g. spill or leak of Helium liquid) in the MRI scanner room will displace oxygen leading to risk of asphyxiation.

As MR scanners are finding wide use in hospitals and other health care facilities, a reliable and early warning fire and gas detection system incorporated in the overall MRI fire safety program becomes of paramount importance for protection against fire and gas threats.

2 Why Use VESDA Smoke / Gas Detection

The benefits of deploying VESDA systems (smoke and gas) in MRI environments are as follows:

- VESDA systems incorporating smoke and gas detection detect fires at their incipient stage allowing for quick MRI system shutdown before fire escalates to a point where quench is initiated as well as monitoring of reduced oxygen levels caused by cryogenic gas leaks.
- Active and multiple hole sampling ensures consistent and predictable detection performance.
- Flexible and remote sampling permits placement of sampling holes within the MRI scanner room with the detectors mounted externally, which ensures:
  - Detectors operation does not impact MRI operation and affect the quality of diagnostic information
  - Reliable detectors operation since they are protected from magnetic forces and RF
  - Safe and easy detectors maintenance carried out without disruption and interference to MRI operation
- Where a dry pipe or pre-action type fire suppression system forms part of the overall fire protection solution, the VESDA system can be designed and interfaced for automatic suppression release.

3 VESDA Design Principles

- Do Not install VESDA detectors inside the MRI scanner room. Detectors should be installed in the Equipment or Control room with pipe network branched to adjoining rooms.
- Levels of protection:
  - Fire Detection:
    - Open area: ceiling / air return vent
    - Localised: Inside MR scanner and cabinets for protection equipment against overheating, electrical arching, etc.
  - Gas Detection:
    - MRI scanner room ceiling (VESDA Sensepoint XCL – Large Bore gas detector).
- Consideration should be given to returning the detector exhausted air to the MRI scanner room to minimise airflow faults due to potential pressure differentials caused by:
  - Continuous discharge of small amounts of cryogen in the MRI scanner room causing an increase in room pressure (i.e. liquid helium conversion to gas undergoes 1:760 expansion).
  - MRI scanner room “operating” at higher ambient pressure to prevent dust infiltration.

Note!

The impedance of the exhaust pipe on the VESDA system must be modelled in ASPIRE.

- VESDA pipe must be of non-ferromagnetic material i.e. polymeric, copper

- All pipe penetrations to the MRI scanner room must pass through appropriate penetration panel (i.e. wave guide).

Note!

- For VESDA Sensepoint XCL installation refer to manual (Doc No. 35563). For setting VESDA Sensepoint XCL alarm levels in the presence of Helium gas, consult application note (Doc No. 35745).
- Consult with MRI system designers to ensure design and installation of the VESDA system does not compromise the integrity of the MRI scanner room shielding.

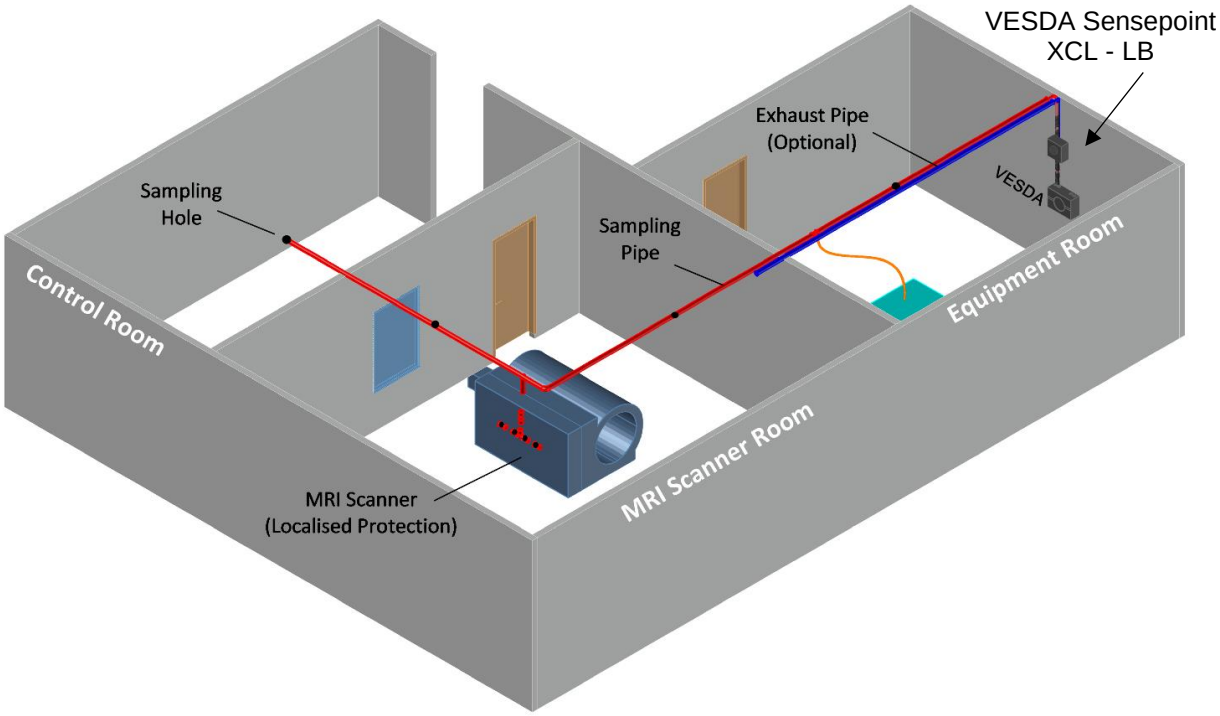

Figure 1: VESDA Protection in Typical MRI Environment

Further Support

Contact an Xtralis office or distributor for further information.

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