

AbstractID: 8811 Title: Facing a horrifying reality: An anatomy of MR magnet explosion

Purpose:

To investigate several recent sentinel events that led to catastrophic MR magnet failures, including magnet explosions.

Method and Materials:

An analysis of root cause for a catastrophic magnet failure has been performed, using available manufacturer's documentation. Practical on-site conditions have been verified by conducting several walk-through inspections. Further information was gathered during on-site visits to two MR magnet factories in the US.

Results:

During past few years, there has been anecdotal evidence of increased frequency of incidental magnet quenches at customer installations throughout the US. Most of them were "white" (i.e. non-destructive) quenches that occurred during magnet handling at installation or routine servicing (e.g. ramping up). These types of events have been known for a long time and are not subject of this presentation. However, spontaneous quenches have been recorded as well, especially for high field (3T) units. In most cases, the root cause of these events could not be immediately determined. This is a cause for concern, since a few of these events (author has documented knowledge of three that occurred in the Southeast US within the last year) represented a catastrophic magnet failure that can be described in simple words as magnet explosion.

The root cause analysis, performed using available data, could not unequivocally determine the reason for the explosions. However, a failure of the magnet's cryogenic venting system has been identified as a strong, plausible candidate for the explanation of observed events.

Conclusion:

MR magnet explosions, long considered a myth, have become a reality. Since the most likely failure scenario is linked to failures of the magnet's cryoventing system, the medical physics professionals supporting MRI installations are urged to become familiar with the operational characteristics of magnet cryosystems, learn about proper site planning design, and develop methods of competent monitoring of cryoventing systems performance.