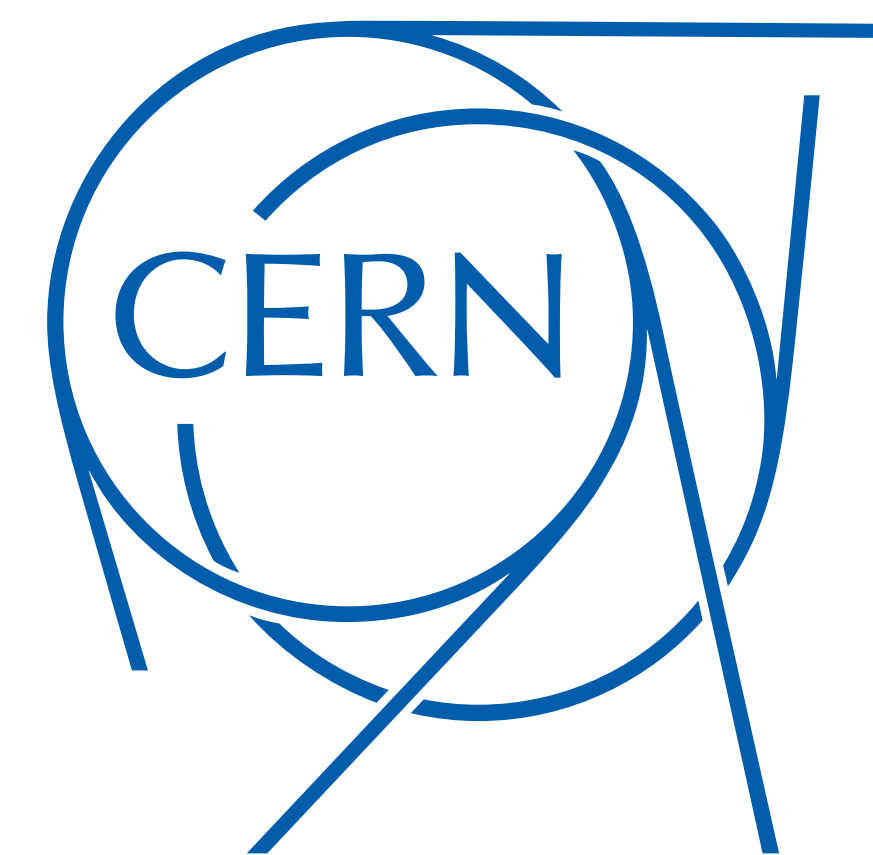


# New Quench Detection System to Enhance Protection of the Individually Powered Magnets in the Large Hadron Collider



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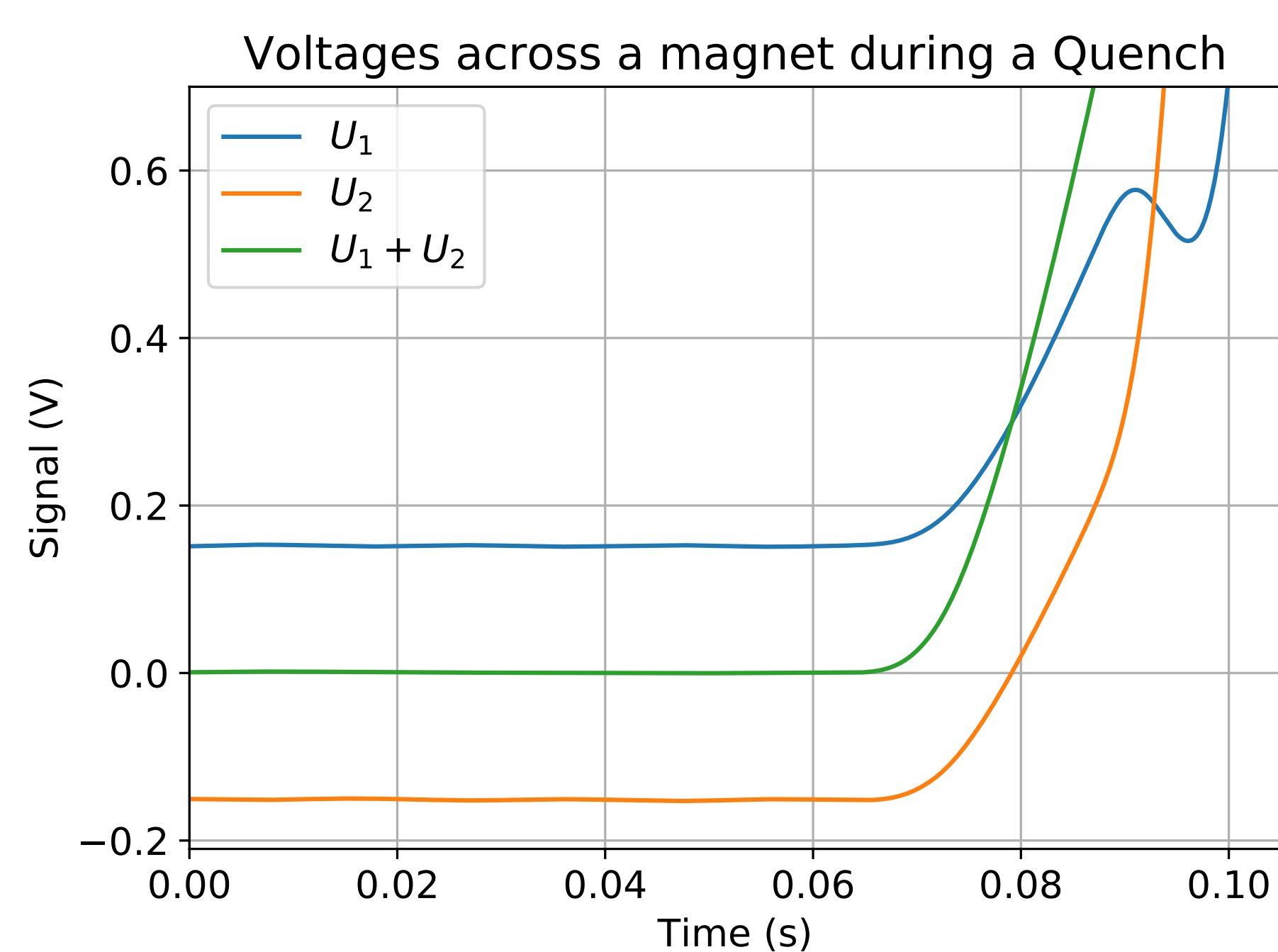
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## 1. Introduction

To further improve the existing Quench Detection System (QDS) of individually powered magnets installed in the Large Hadron Collider (LHC), a new radiation tolerant electronic board was developed. The board provides three galvanic isolated signal acquisition channels able to acquire with different and configurable signal resolution and acquisition rate the analog signals of different properties.

## 2. Quench

- LHC magnets are made out of superconducting material to reach high magnetic fields
- During operation, they might change their state and become resistive, which is called a quench

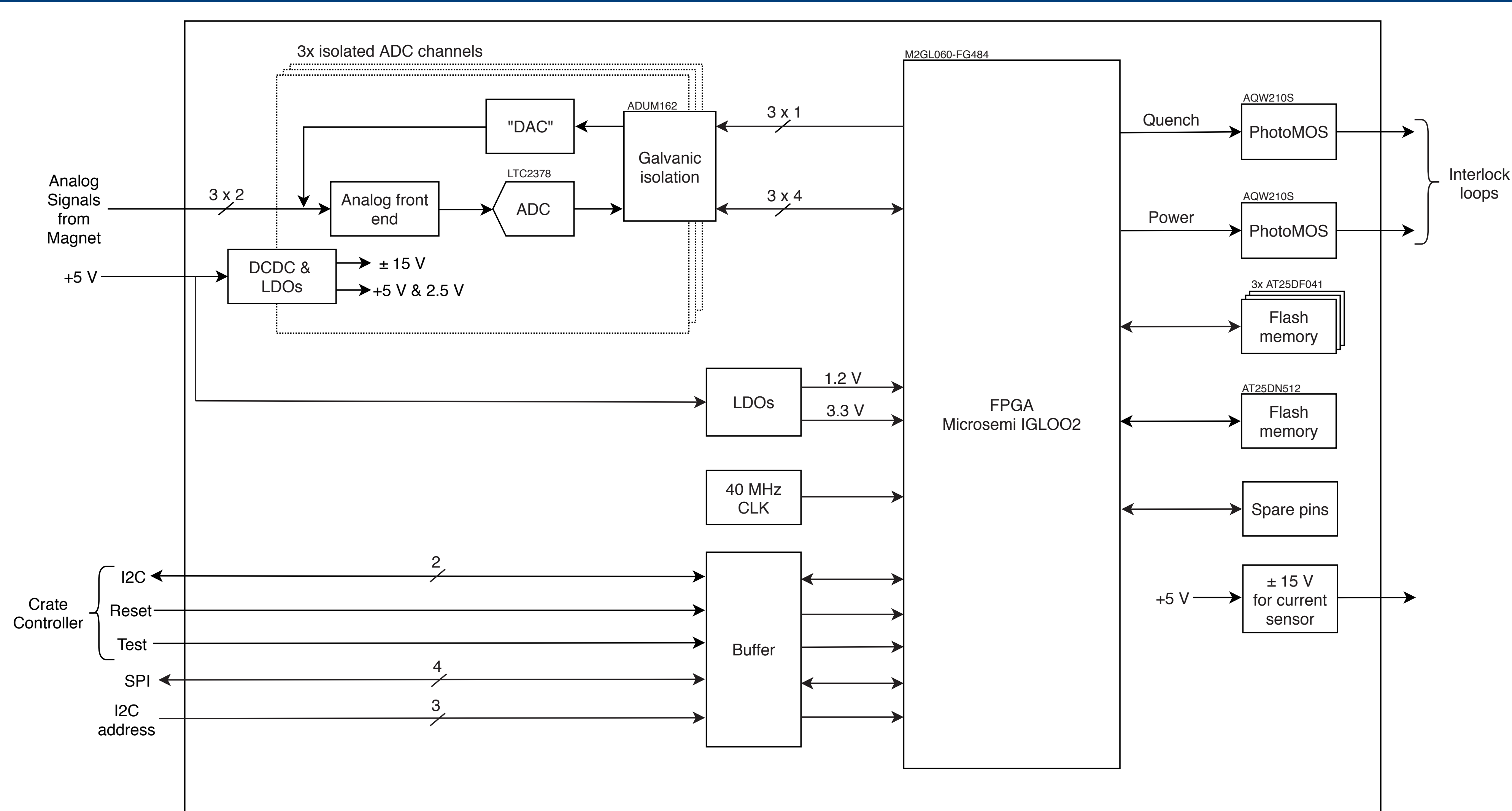


- Due to large amount of stored energy a quench has to be detected by a highly reliable Quench Detection System (QDS)
- QDS then triggers appropriate protection actions for the magnet circuits and the removal of the particle beams

## 3. The New System

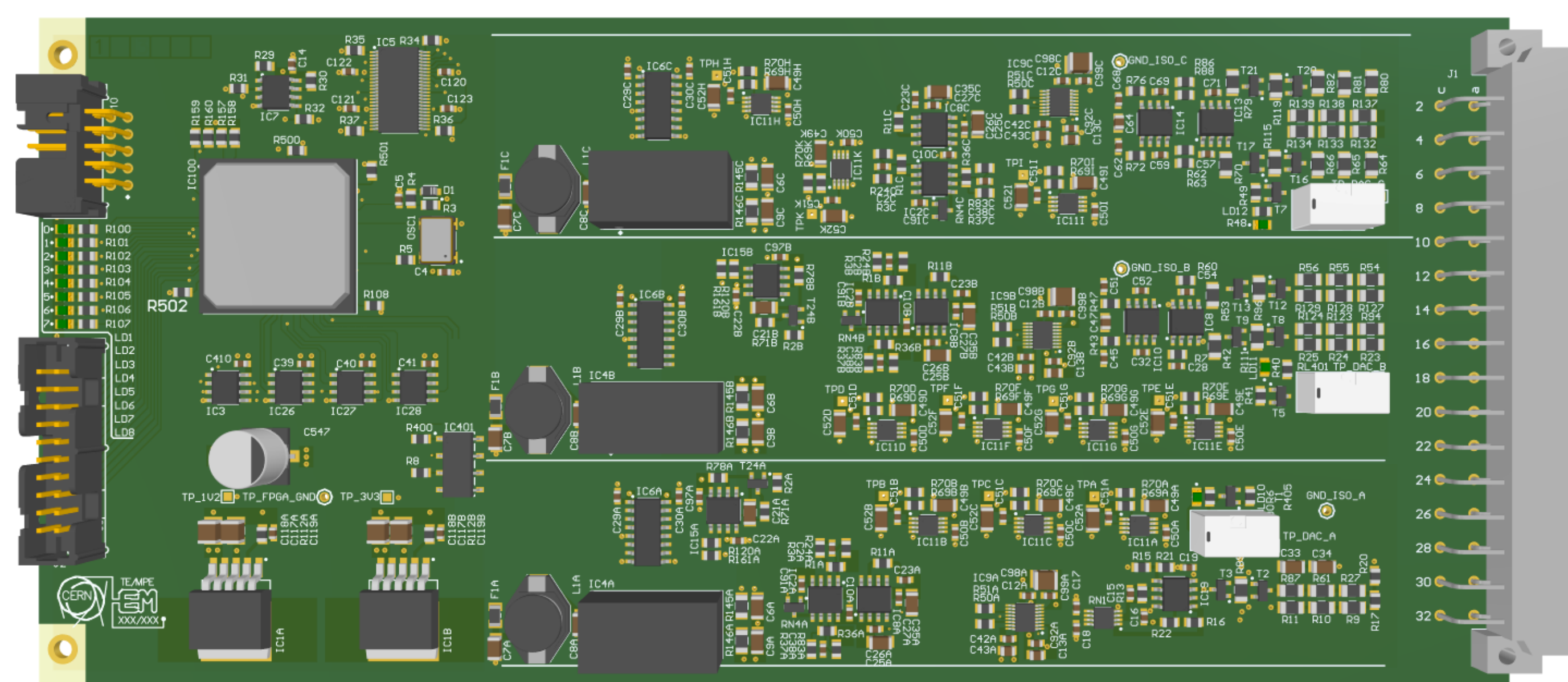
- Depending on magnet type, different protection schemes are applied
- The newly developed system can cover several magnet types with one board, where each magnet can be defined via firmware

## 4. Block Diagram of the New System



## 5. Implementation

- New board will be used to protect three different circuits in LHC
- Further improvement of the existing Quench Protection Systems
- A new current sensor can be used for specific LHC magnets
- All components were qualified in radiation (up to 10 Gy/y) to withstand LHCs radiation environment over their entire lifetime



## 6. Conclusion

A new quench detection system was developed to further improve and upgrade three existing systems in LHC. The board itself is designed and will be produced soon.