

UNIFYING DATA DIVERSITY AND CONVERSION TO COMMON ENGINEERING ANALYSIS TOOLS

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INTRODUCTION

The large variety of systems for the measurements of insulation, conductivity, RRR, quench performance, etc. installed at CERN's superconducting magnet test facility generates a diversity of data formats. This mixture causes problems when the measurements need to be correlated. Each measurement application has a dedicated data analysis tool used to validate its results, but there are no generic bridge between the applications that facilitates cross analysis of mixed data and data types.

Since the LHC start-up, the superconducting magnet test facility hosts new R&D measurements on a multitude of superconducting components. These results are analysed by international collaborators, which triggered a greater need to access the raw data from many typical engineering and analysis tools, such as MATLAB®, Mathcad®, DIAdem™, Excel™... This paper describes the technical solutions developed for the data formats unification and reviews the present status.

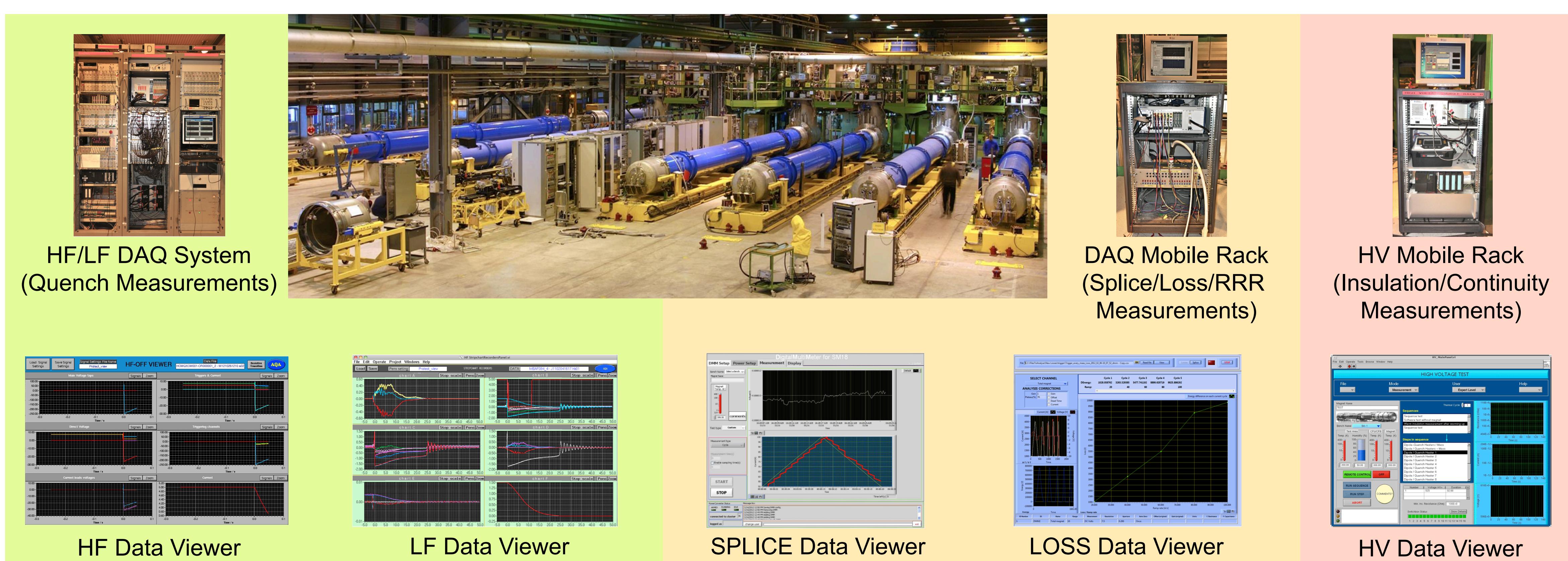
THE SUPERCONDUCTING MAGNET TEST FACILITY (SM18) DURING THE LHC MAGNETS SERIES MEASUREMENTS

Before their installation in the tunnel, the 1706 LHC superconducting magnets have been tested at CERN.

- 1232 Dipoles
- 474 Quadrupoles
- 108h in average per magnet

The testing conditions were the same than during the LHC operation.

- Magnet current up to 13kA
- Cooled down to 1.9K

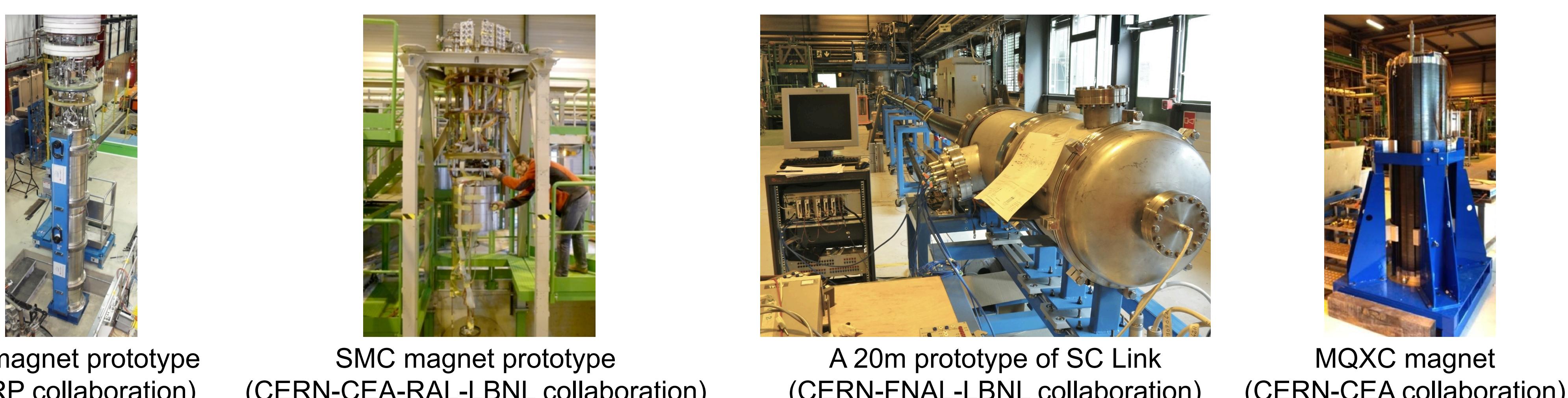


DIVERSITY AT THE SUPERCONDUCTING MAGNET TEST FACILITY SINCE THE LHC START-UP

After the LHC start-up, the SM18 was converted into a Transnational Access Test Facility. This is a unique test platform for the superconductivity community.

Several R&D projects are now tested here (i.e. for the High-Luminosity upgrade of the LHC), under international collaborations.

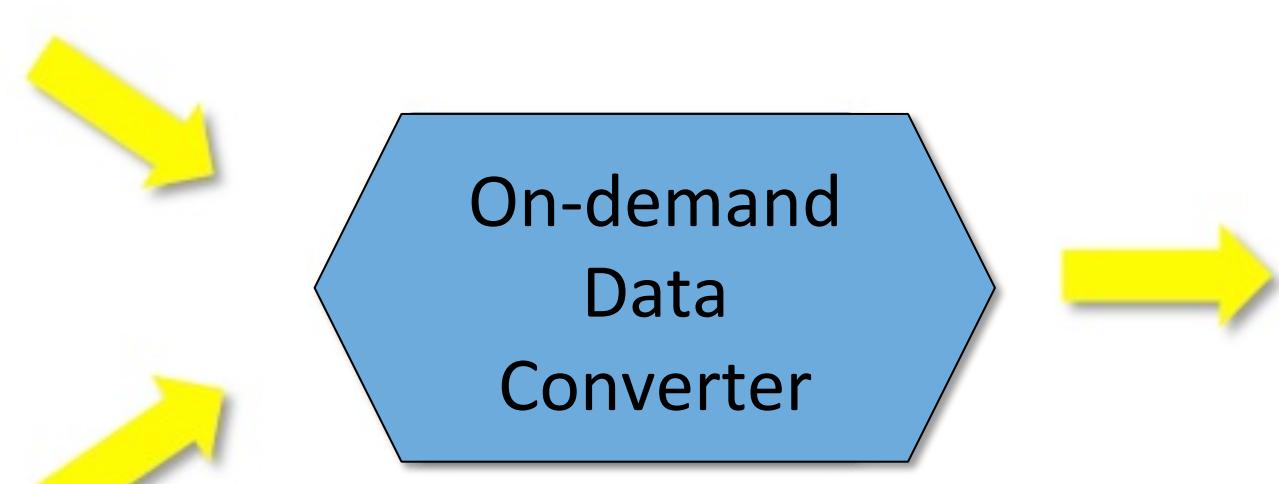
This created a need for a more flexible data access solution. Also, new or extended analysis features are missing, furthermore some correlating data capabilities from all the equipment sources.



DATA UNIFICATION AND CONVERSION TO COMMON ENGINEERING ANALYSIS TOOLS

The proposed solution consist in converting the legacy data into a common data format, giving the possibility to use several mathematical and analysis tools from the market.

Application	Data Format	Legacy Data Analysis
HF-DAQ	Binary	Dedicated tool
LF-DAQ	Binary	Dedicated tool
HV	Text	Included in App.
LOSS	Text	Dedicated tool/Excel
ACT	Text	Included in App.
RRR	Text	Dedicated tool/Excel
SPLICE	Text	Dedicated tool/Excel



MATLAB®

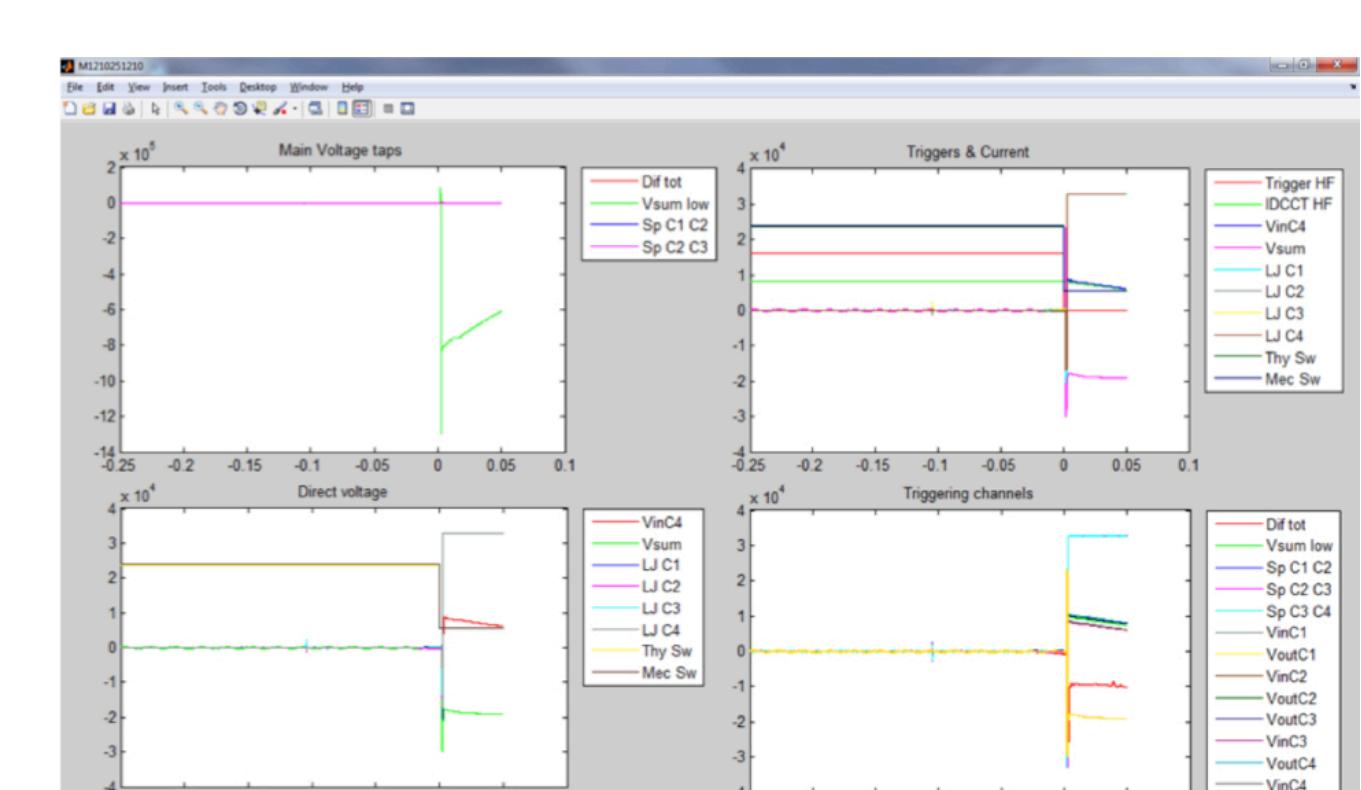
Microsoft Office Excel

Mathcad®

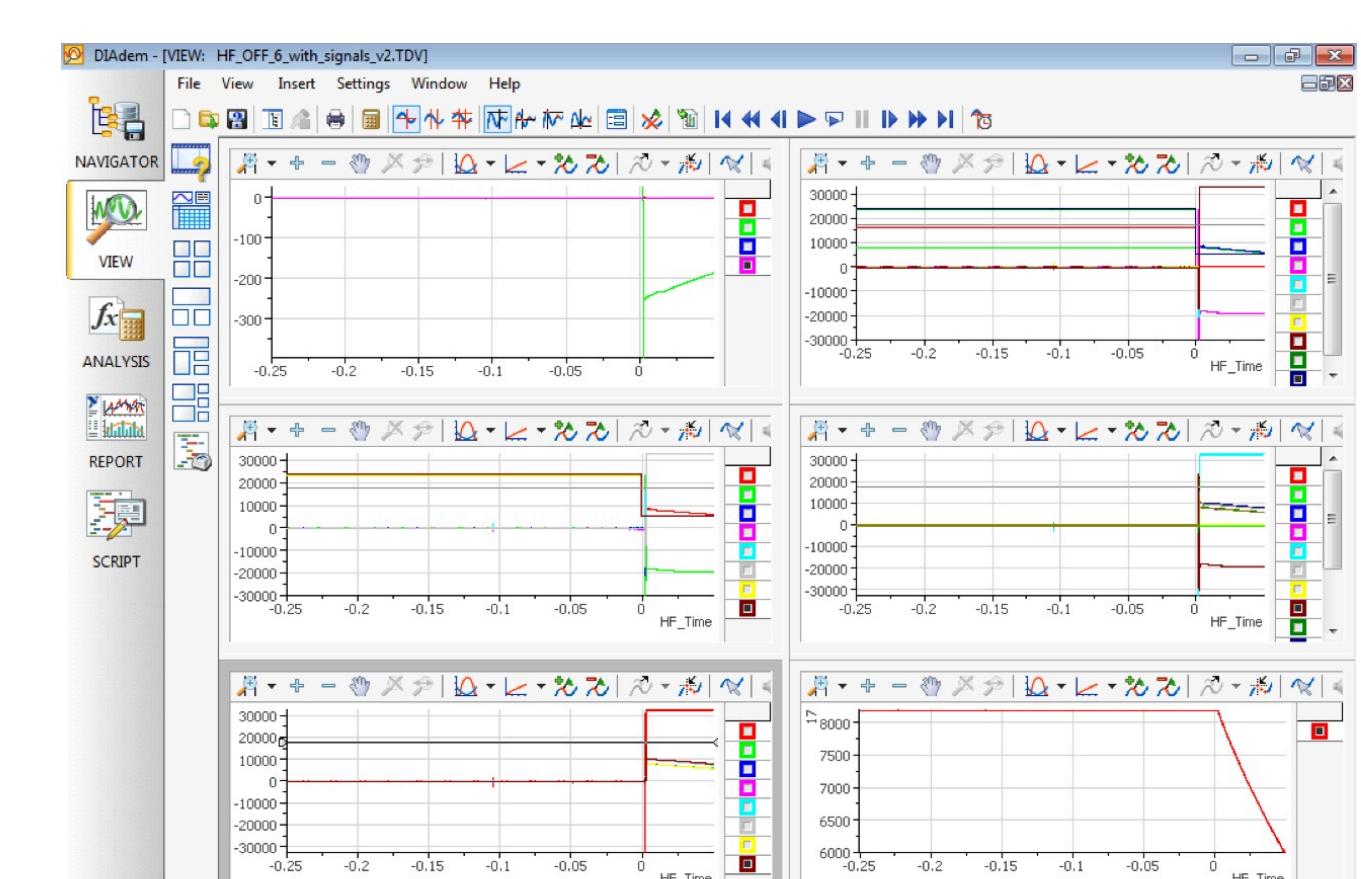
DIAdem™

Wolfram Mathematica®

Maple™



HF/LF DAQ Data on MATLAB®



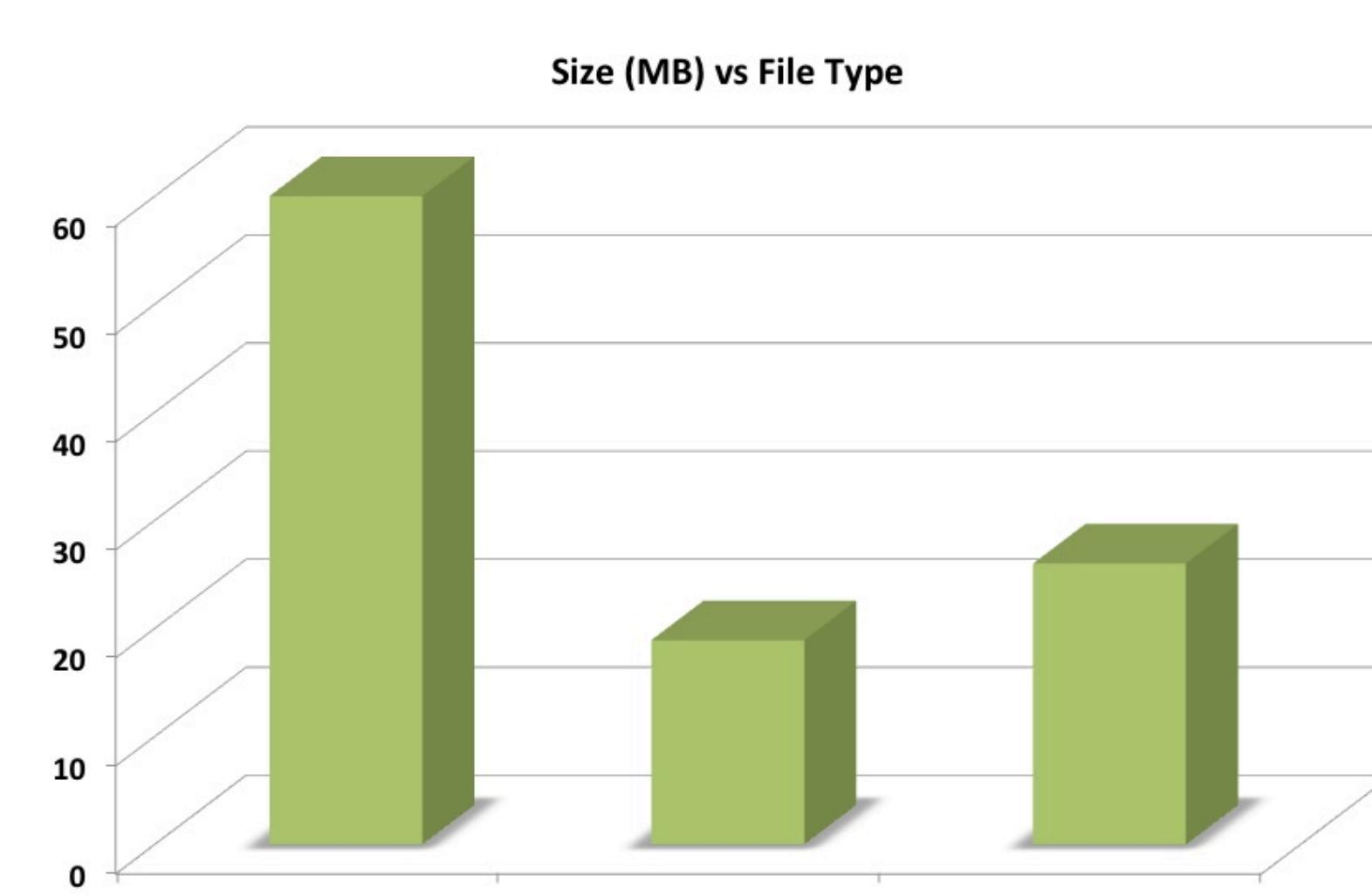
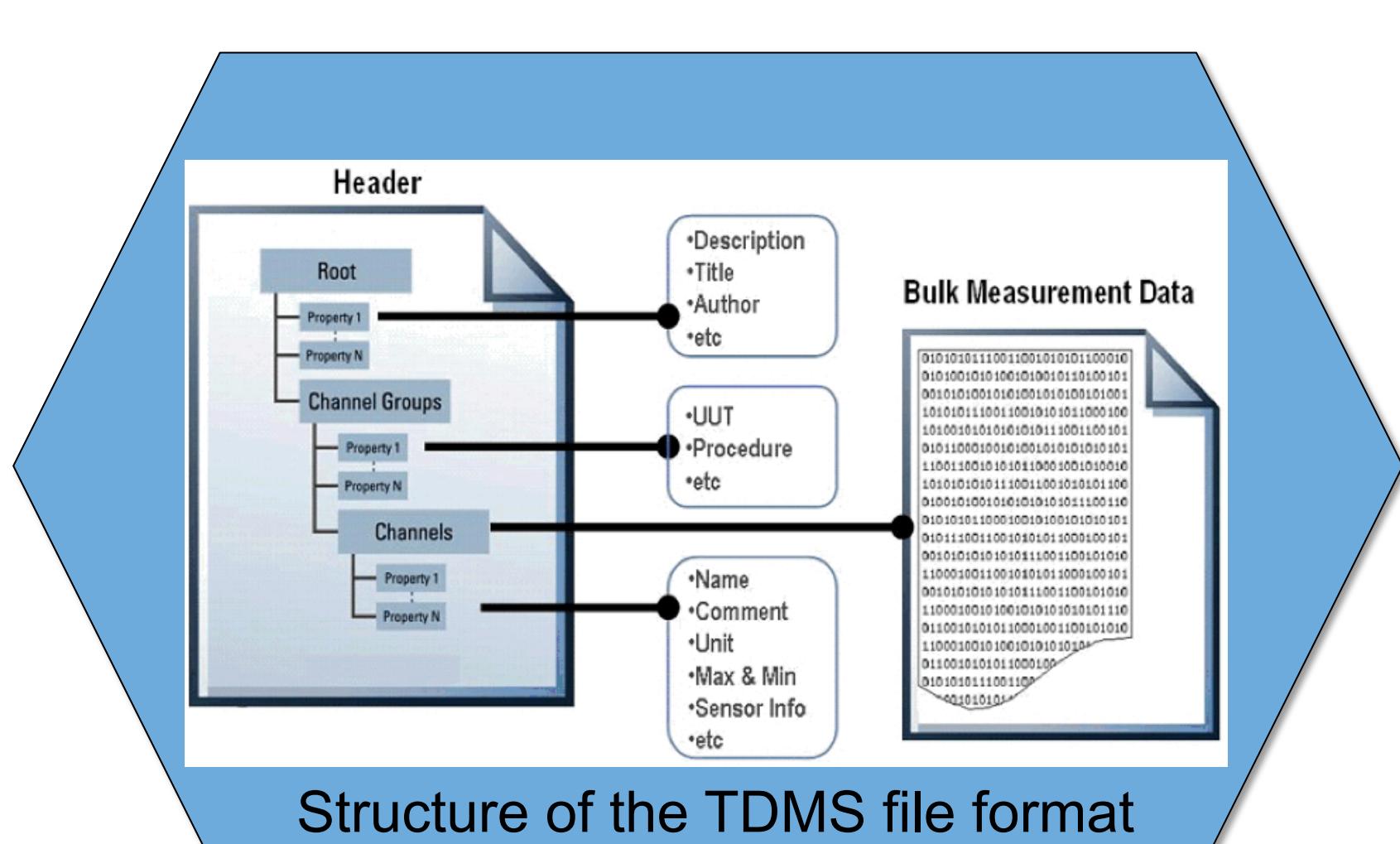
HF/LF DAQ Data on DIAdem™



HF/LF DAQ Data on Mathcad™

After a survey of the wide range of existing file formats, we selected the TDMS, as it can be handled by DIAdem™, MATLAB® and Excel™.

The data converter can also generate CSV formatted file, so that measurements can be analysed with Mathcad®, Maple™, Mathematica® ...



CONCLUSION

With the data converter, the users can now access to the SM18 measurements with their usual engineering tools and can apply their own analysis and algorithms.