Storm6: A Unified Platform for Real-Time TD and FFC NMR Acquisition and Analysis

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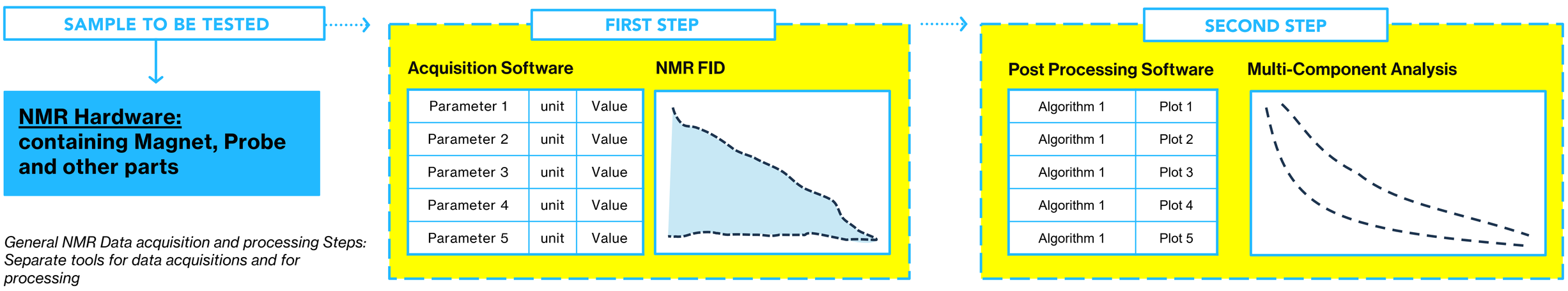
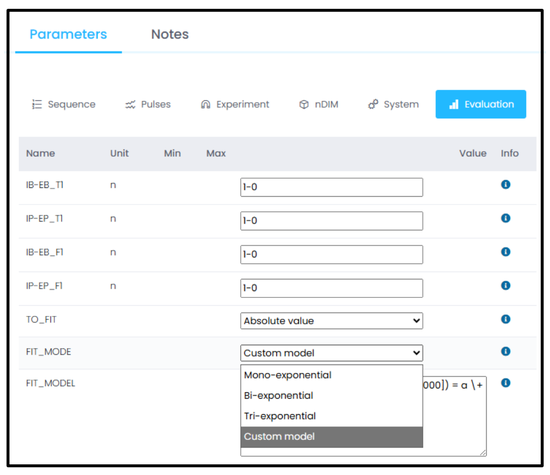
Introduction

Nuclear Magnetic Resonance (NMR) has long been a fundamental tool for probing molecular structure and dynamics for decades; however, the separate steps between data acquisition and analysis remain a persistent challenge, especially for samples with multi-exponential relaxation behavior. Generally, NMR software packages are designed with the assumption that acquisition happens at the instrument level using the manufacturer's acquisition software, while for advanced analysis separate software packages are used [1][2]. These separate processes not only slow down the workflow but can also delay timely experimental decisions, particularly when real-time analysis is needed to assess sample complexity or adjust protocols swiftly.

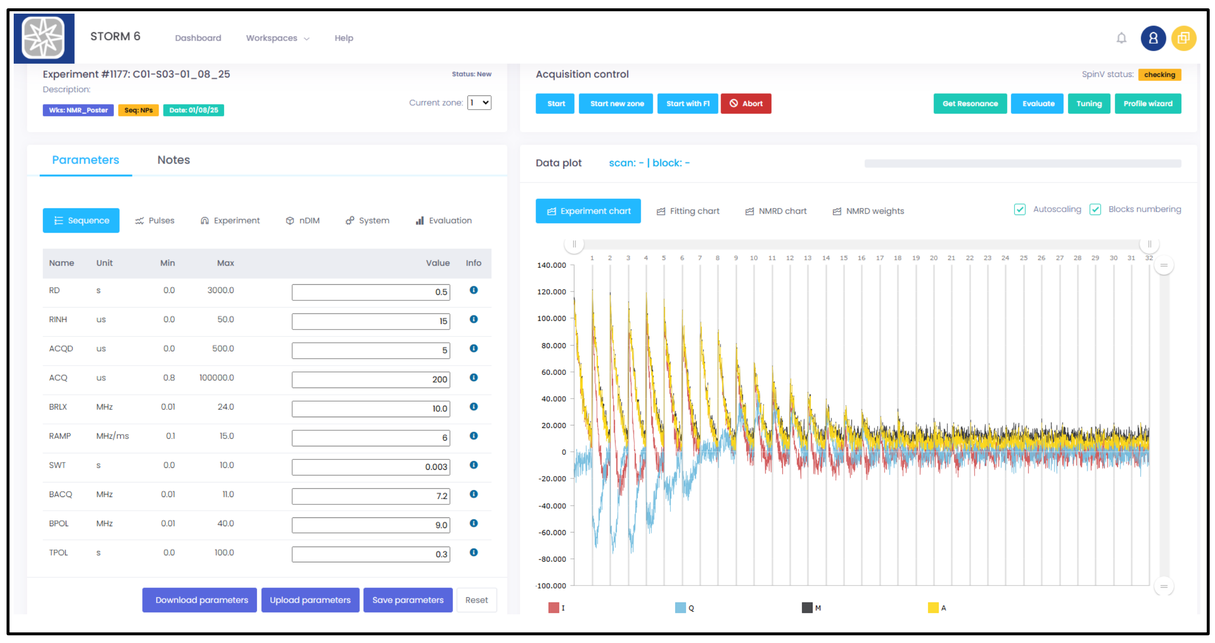


General NMR Data acquisition and processing Steps: Separate tools for data acquisitions and for processing

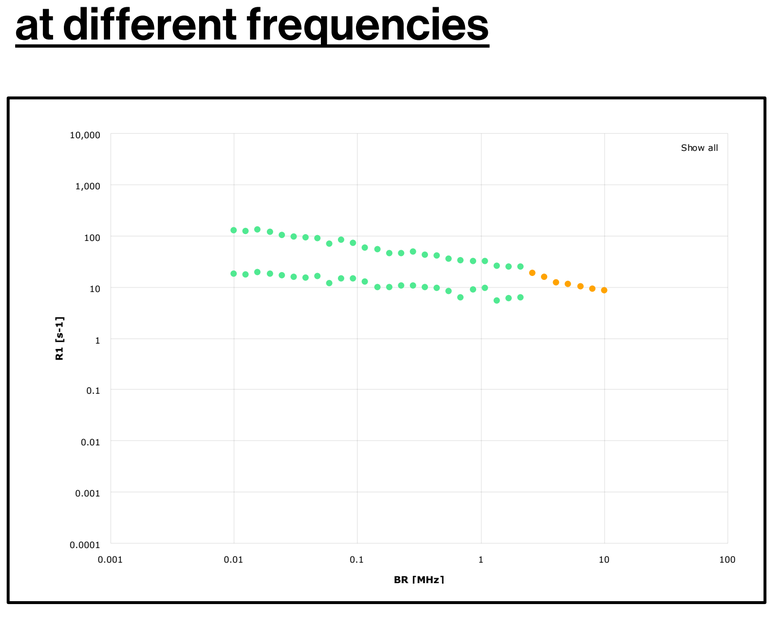
Storm6, developed by Stelar for Time Domain (TD) and Fast Field Cycling (FFC) NMR systems, aims to address this longstanding limitation. Contrary to conventional platforms, Storm6 brings together experiment control, flexible parameter management, and most importantly, real-time data analysis within a single, intuitive interface. Byincorporating the **OneFitEngine**, the core fitting engine of Fitteia [3], Storm6 provides its users with a platform to observe the evolution of relaxation components and their weight distributions as the magnetic field varies. This real-time behavior allows researchers to examine sample complexity, spot variations quickly, and decide whether to continue, adjust, or stop an experiment without leaving the acquisition environment.



Users can set the experiment parameters in the parameters list for acquisition and can also select the model to fit the acquired data.
Data can be fitted using mono-exponential, bi-exponential, tri-exponential, or any custom model, based on the guidelines of OneFitEngine



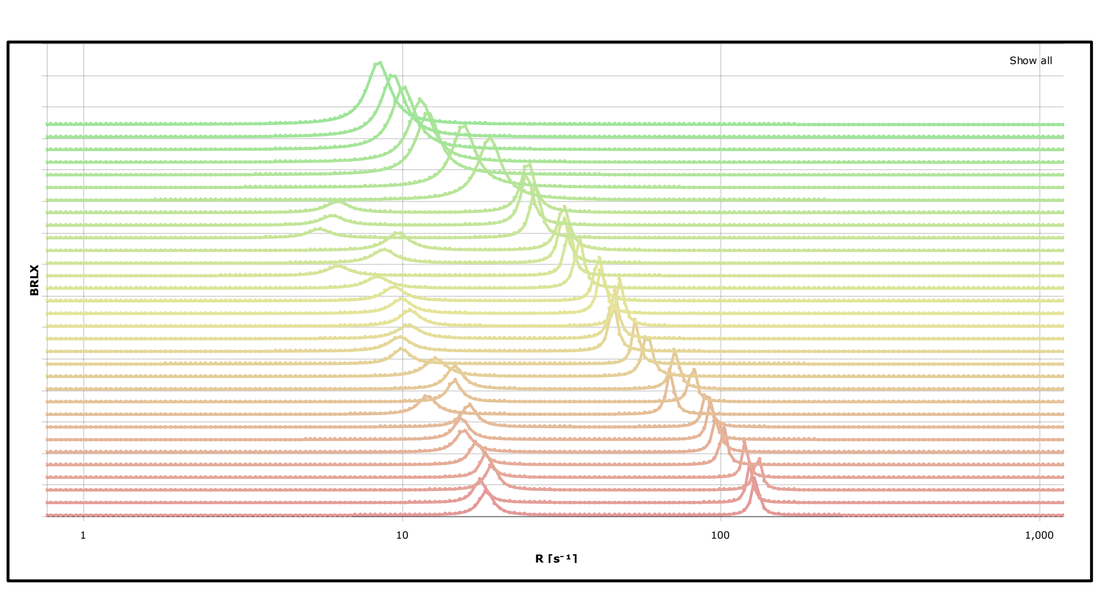
NMRD profile showing relaxation rates of measured samples at different frequencies



In the NMRD profile, the red points from 10 MHz to 3.2 MHz represent data from mono-exponential fitting, while the points from 3.2 MHz to 0.01 MHz show bi-exponential fitting for the same sample (cheese).

The adjacent graph illustrates how the weight and distribution of components vary with frequency. These detailed real-time results provide critical insights into the sample, enabling faster analysis and informed decision-making.

Associated NMRD component weight distribution for the measured sample



Conclusions

Closing the gap between acquisition and analysis, Storm6 modernizes the experimental process and helps users extract significant insights from their data in real time. This integrated approach ensures NMR workflows are more efficient and reproducible, allowing faster, more informed scientific discovery.

References
[1] Claridge, T. (2009). Software Review of MNova: NMR Data Processing, Analysis, and Structure Elucidation
[2] NMR Software | Processing, Prediction, and Assignment
[3] Pedro J Sebastião 2014 *Eur. J. Phys.* **35** 015017