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Modular Experiment Control System packages for the CBM experiment

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The Compressed Baryonic Matter (CBM) experiment at FAIR will explore the QCD phase diagram at high net-baryon densities through heavy-ion collisions, using the beams provided by the SIS100 synchrotron in the energy range of 4.5-11 AGeV/c (fully stripped gold ions). This physics program strongly relies on rare probes with complex signatures, for which high interaction rates and a strong selection are needed to achieve the necessary statistics.

These requirements led to the technical decision for a self-triggered and free-streaming data acquisition, followed by an online full reconstruction and selection chain. Such a system can operate reliably and efficiently only with a performant Experiment Control System (ECS) to ensure the synchronization and data quality of all sub-systems.

After looking at existing solutions, the development of a Python based solution focused only on the Experiment Control and on the upper layer of Detector Controls (state and configuration propagation) was instead chosen for CBM. To allow maximal quality checks of the core functions, it will be divided in three levels, from an experiment independent modular core to various user interfaces.

This contribution presents the design choices for this ECS, the technical core package, the CBM ECS core package and the demonstrator GUI packages based on it, as well as the checks and tests done with them.

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