The KM3NeT4RR project in Bologna: status and perspectives

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The KM3NeT4RR project lies within the KM3NeT experiment, a neutrino telescope located in the Mediterranean Sea and composed by two underwater large-scale detectors, ARCA and ORCA, mainly designed for studying cosmic neutrinos and neutrino properties respectively. The detectors consist in arrays of Digital Optical Modules, arranged in vertical lines, which detect Cherenkov light induced by relativistic charged particles produced by neutrino interactions.
Within this context, INFN-Bologna currently hosts a laboratory named "Bologna Common Infrastructure" (BCI) which is unique over the whole KM3NeT collaboration and puts in place all the data processing key-points due to a real implementation of the full experiment Data Acquisition chain inside a controlled environment.

For the KM3NeT4RR project, the BCI laboratory will be expanded in order to cope with the new detector design, necessary to expand the detectors to the foreseen cubic kilometer volume. The new test bench will feature all the hardware and software requirements to allow the validation of the time synchronisation strategy, which will change from the current custom and asymmetric network based on White Rabbit technology, to a standard White Rabbit use-case.

Alongside the BCI expansion and integrated with it, the KM3NeT4RR project also foresees the realisation of another unique test-bench called "Bologna Laboratory for User-ports" (BLU) which will mock the KM3NeT Calibration Units, dedicated calibration systems required to improve the detector acoustic positioning system of the optical modules and monitor the underwater environment. The "BLU" test-bench will allow the test of the monitoring instrumentation and the development of the required software to integrate them to the KM3NeT Data Acquisition system, as well as serve as research and development facility for multidisciplinary external contexts.