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Full Remote Alignment System for the High Luminosity LHC

The High Luminosity LHC (HL-LHC) is an upgrade of the LHC to achieve instantaneous luminosities, a factor five larger than the LHC nominal values and to increase the integrated luminosity by a factor of 10 beyond the LHC's design value. During the next shutdown for maintenance and upgrade, scheduled between 2026 and 2028, nearly 1.2 km of accelerator components will be replaced by new ones, relying on key innovative technologies. The Full Remote Alignment System (FRAS) is being developed to perform the remote alignment of these new HL-LHC components. FRAS will limit the doses taken by the surveyors in the tunnel, decrease the required strength of corrector magnets and push the accelerator performance. Innovative solutions for the remote adjustment and position determination of the components are being qualified, including the internal monitoring of the position of cold mass / crab cavities inside their cryostat. This paper will provide a status of the different systems under development and qualification, from the sensors and motor assemblies to the low level / high level acquisition and control/command systems and their corresponding software.

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