Contribution ID: **411** Type: **Poster**

Marx Generator Solid-State Pulse Modulator Application to Kicker Systems of the Future Circular Collider

Wednesday 13 April 2016 17:30 (2 hours)

The Future Circular Collider (FCC) will require extremely reliable kicker systems to ensure safe injection and extraction of beam. Most existing kicker systems at CERN rely on long-established technologies which include thyratron switches and pulse-forming networks/lines (PFN/PFL). However thyratrons are susceptible to untriggered (erratic) turn-on which negatively impacts system reliability. In addition long-term commercial availability of thyratrons is a real concern. In mitigation an alternative fast-switch technology, based on high power semiconductor devices, such as the Marx generator is being actively pursued. A Marx generator topology would also potentially resolve problems which are associated with the pulse forming: PFNs are complex devices built of many discrete components, difficult to adjust for optimisation of pulse-shapes, and PFLs rely on difficult-to-source cable for the highest voltage (~80 kV) kicker systems. This contribution discusses the application of solid-state Marx generators to the injection and extraction kicker systems of FCC.

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Session Classification: Poster session

Track Classification: Accelerators