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## Challenges of K-modulation measurements in the LHC Run 3

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The future upgrade to the High-Luminosity Large Hadron Collider (HL-LHC) will impose tight tolerances on IP optics measurements. k-modulation is currently the preferred method in the LHC for IP optics measurements and will play a critical role in the HL-LHC. As such, Run 3 of the LHC provides an ideal test-bench for addressing challenges in k-modulation. In the first commissioning year of Run 3, this method was used to measure and validate optics with beta ranging from 30cm to 24m. However unsatisfactory reproducibility was observed for low beta measurements. This paper presents the k-modulation results for the start of Run 3 with in depth analyses and it highlights the sensitivity of this method in view of the challenging HL-LHC runs.

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### Footnotes

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