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HL-LHC BPM electronics development as a case study for direct digitization and integrated processing techniques in accelerator instrumentation

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The technological evolution of analog-to-digital and digital-to-analog converters increases the amount of data that can be processed in the digital domain. Therefore, direct digitization enables many advanced signal processing techniques and is attracting more and more attention in the field of accelerator instrumentation. The future HL-LHC Beam Position Monitor (BPM) data acquisition system to be installed near the ATLAS and CMS experiments is a clear example of an application with demanding signal processing requirements that could greatly benefit from this trend. The investigated architecture is based on an RF System-on-Chip from Xilinx, which allows fast RF conversion and high-performance digital processing to be integrated in a single chip for multiple channels. This paper compares the estimated performance and cost of such an integrated solution with an architecture based on discrete components.

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Footnotes

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Yes

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