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Contribution of HEP Electronics Techniques to the Medical Imaging Field

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The purpose of this study is to show how innovative concepts of compact, pipelined, deadtimeless and "Time Of Flight" capable electronics similar to those developed for High Energy Physics experiments (LHC and post LHC) could be fairly and easily transferred to the medical imaging field through clinical Positron Emission Tomography scanners.

The two overriding weaknesses of PET camera readout electronics, namely timing resolution and dead-time, were investigated analytically and by Monte-Carlo simulation. Results show that there is rather space available for count rate enhancement, especially through a huge decrease of the timing resolution well below the nanosecond. An optimized solution using basic building blocks of HEP for a generic read out electronic chain is proposed and discussed.

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