

P37: Coincidence detection in PET

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Introduction: A complex task for PET cameras is the design of a coincidence detection system that allows for a very tight time window. This brings us necessarily to discussing the concept of coincidence in PET (including the concepts of single, prompt and multiple events in a PET chamber), the different options for coincidence sorting and the concept of Field of View (FOV). We present results from a coincidence system we implemented in a Xilinx Virtex-5 FPGA with coincidence time windows of the order of a few hundred picoseconds and capable of FOV selection and multiple coincidence rejection implemented in real-time.

Objectives: Implement a coincidence detection system that allows for a very tight coincidence time window (in the order of a few hundred of picosecond) and capable of FOV selection and multiple coincidences rejection.

Materials and Methods: A custom board, containing a Xilinx Virtex-5 FPGA, was used to implement the coincidence system.

Results and Discussion: A coincidence system capable of multiple coincidences rejection and FOV selection was developed and tested in a small RPC-PET camera. Coincidence windows of 212 ps, 578 ps, 956 ps and 1534 ps can be used.

Conclusion: A coincidence system can be effectively implemented in a FPGA, with very tight coincidence windows, with the corresponding benefits in reducing the number of random coincidences, and hence the overall noise on the acquired image. Multiple coincidences rejection and the chamber FOV can be programmed.

References

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