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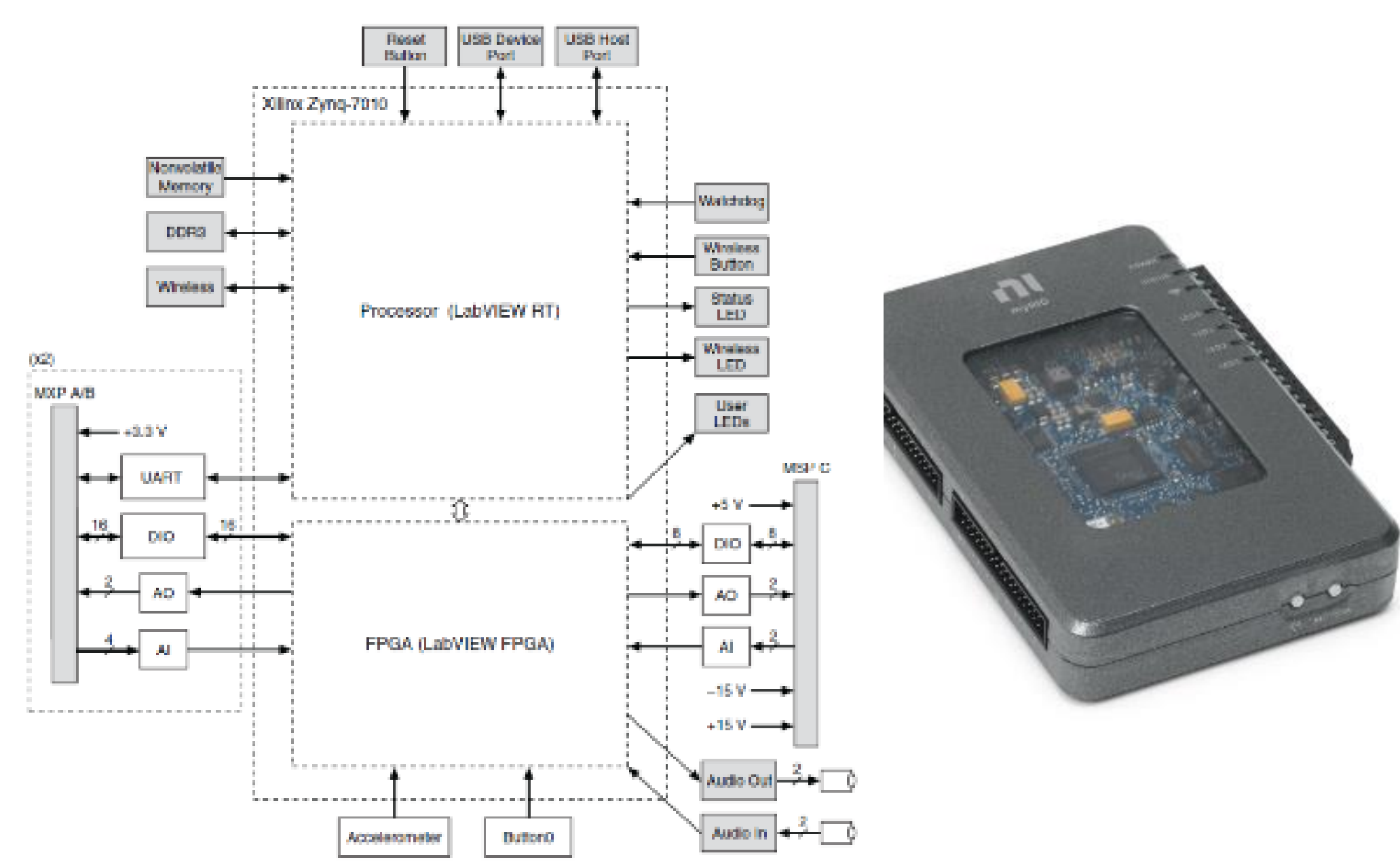
Introduction

This work presents advancements in a coincidence electronics and a Pulse Height Analyzer (PHA) utilizing commercial FPGA-based (Field-Programmable Gate Array) hardware for radiation scintillation detectors.

- The FPGA-based coincidence electronics performance is assessed through an experimental setup for the gamma-gamma angular distribution of a Na-22 radioisotope source.

- The FPGA-based PHA undergoes testing with a NaI(Tl) detector, with a subsequent comparison of energy resolution against a commercial EASY-MCA 2K from AMETEK Inc.

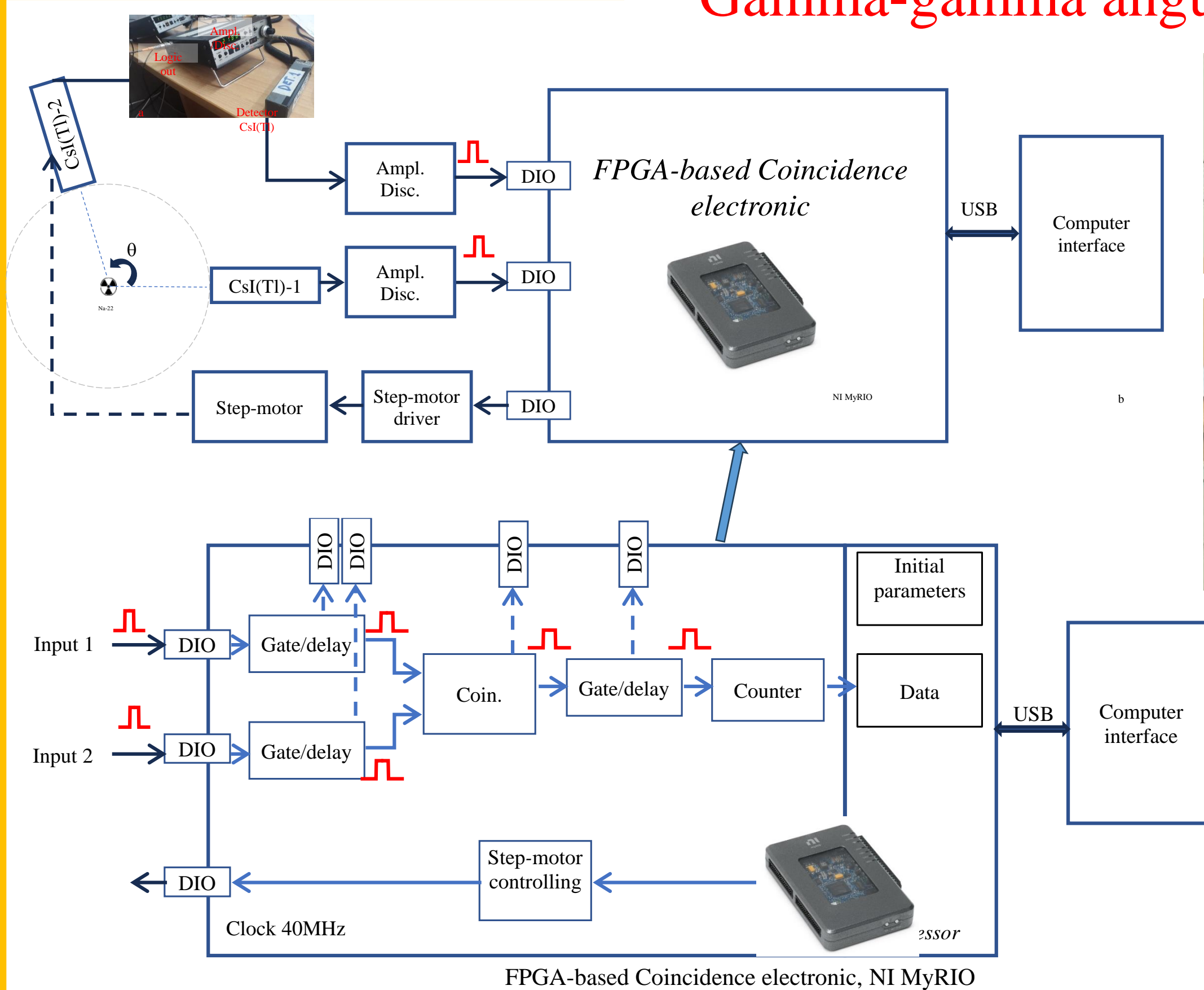
Hardware of the NI MyRIO [1]



NI MyRIO [1]:

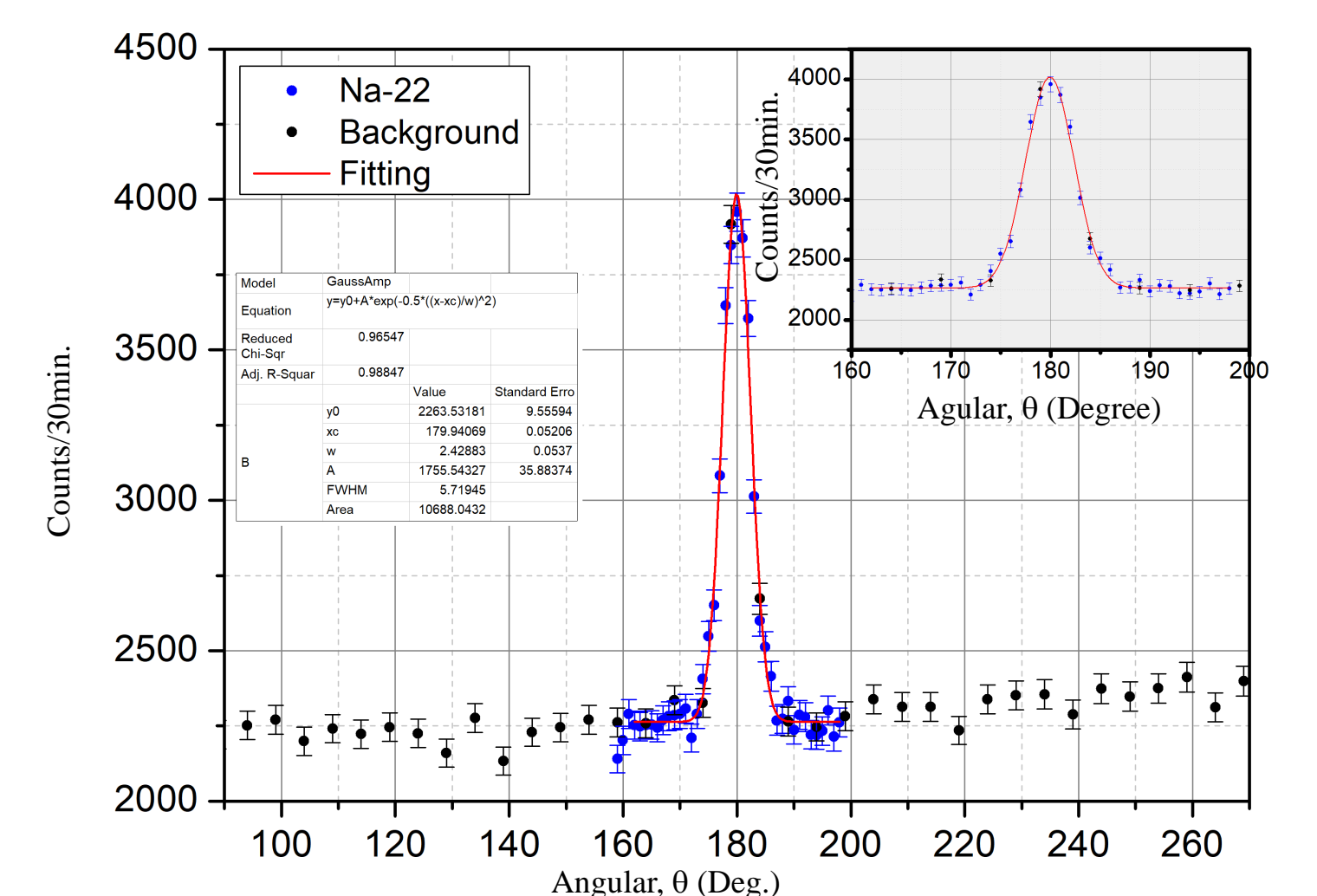
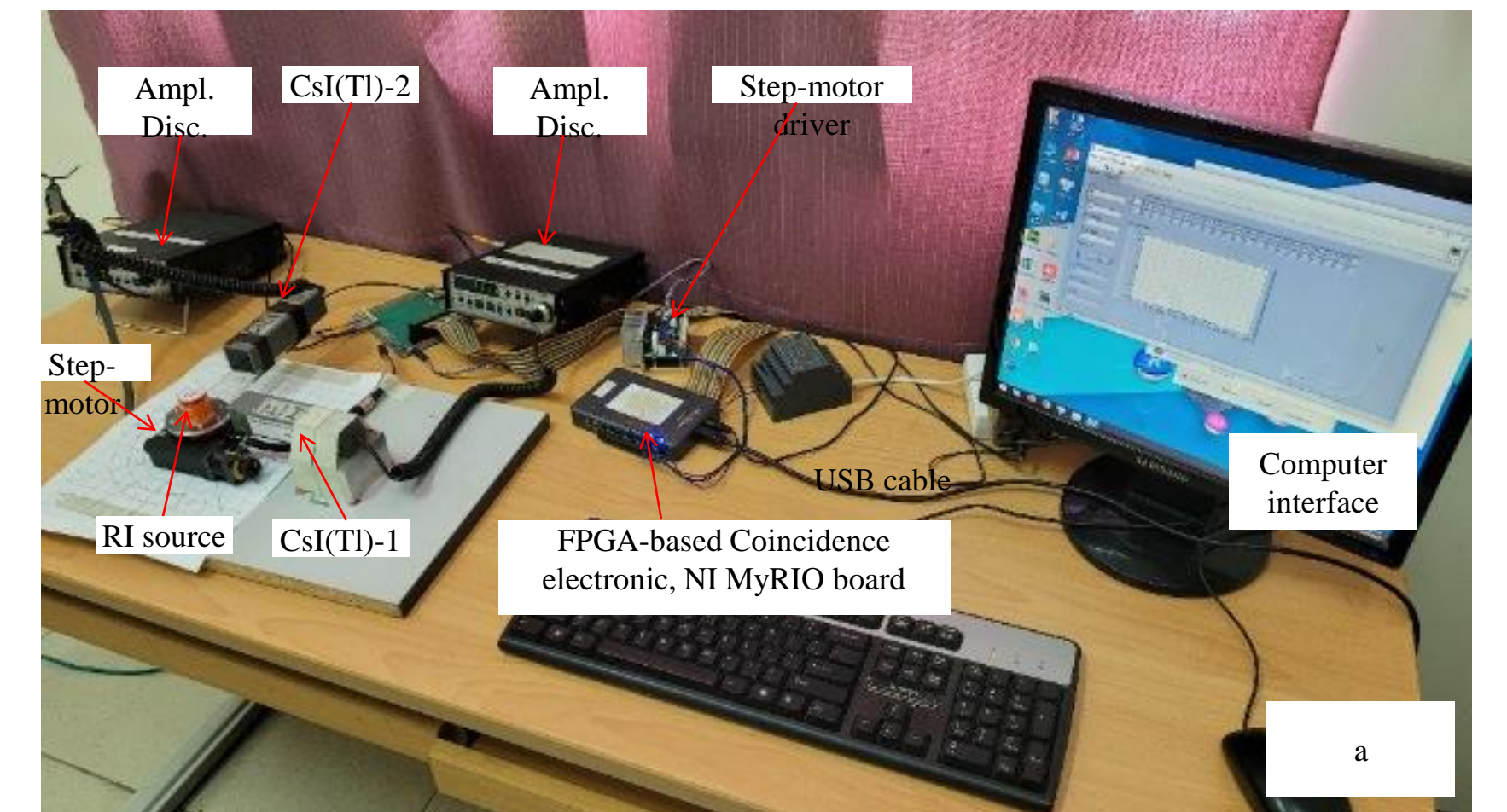
- Field-Programmable Gate Array (FPGA), ARM Cortex-A9 processor,
- Analog input (AI), digital input and output (DIO),
- USB/wireless connectivity with a host computer.
- LabVIEW codes, developed on the LabVIEW™ platform [2].

Gamma-gamma angular distribution system

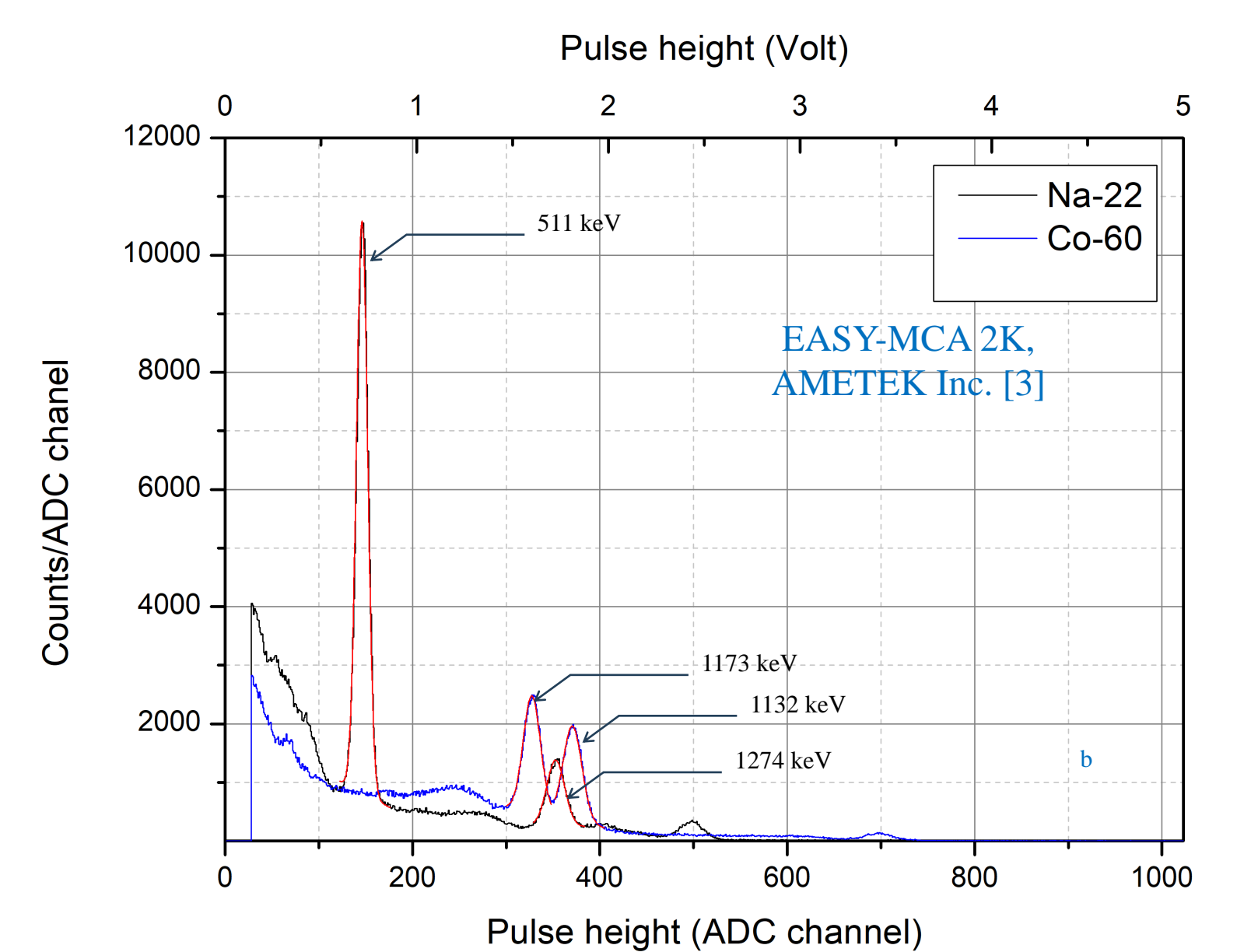
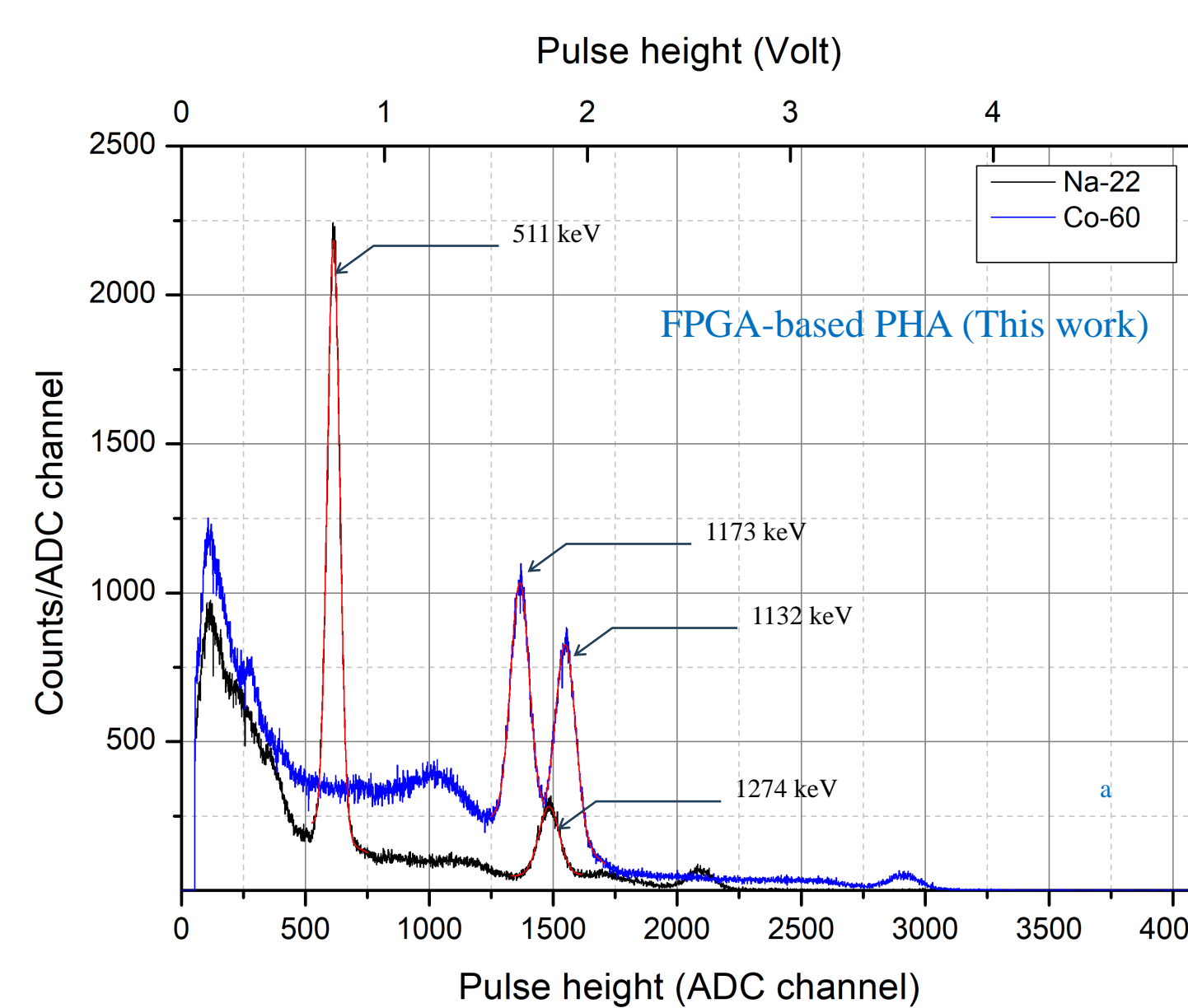
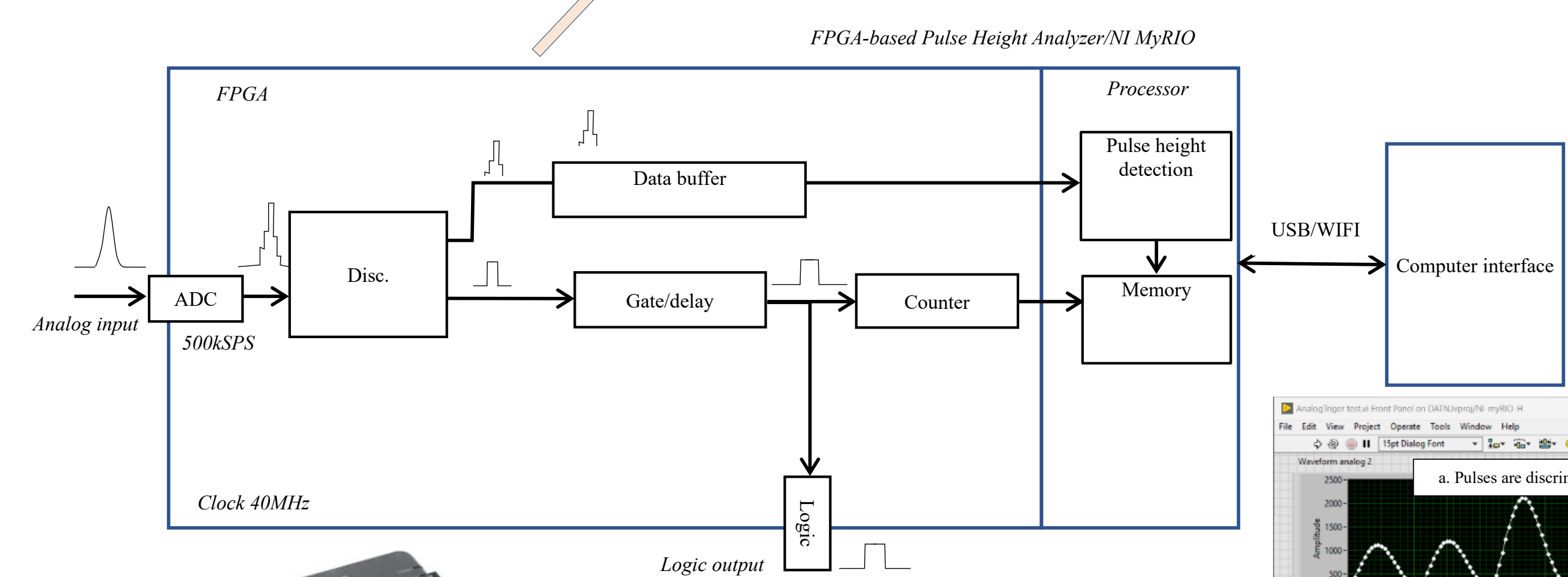
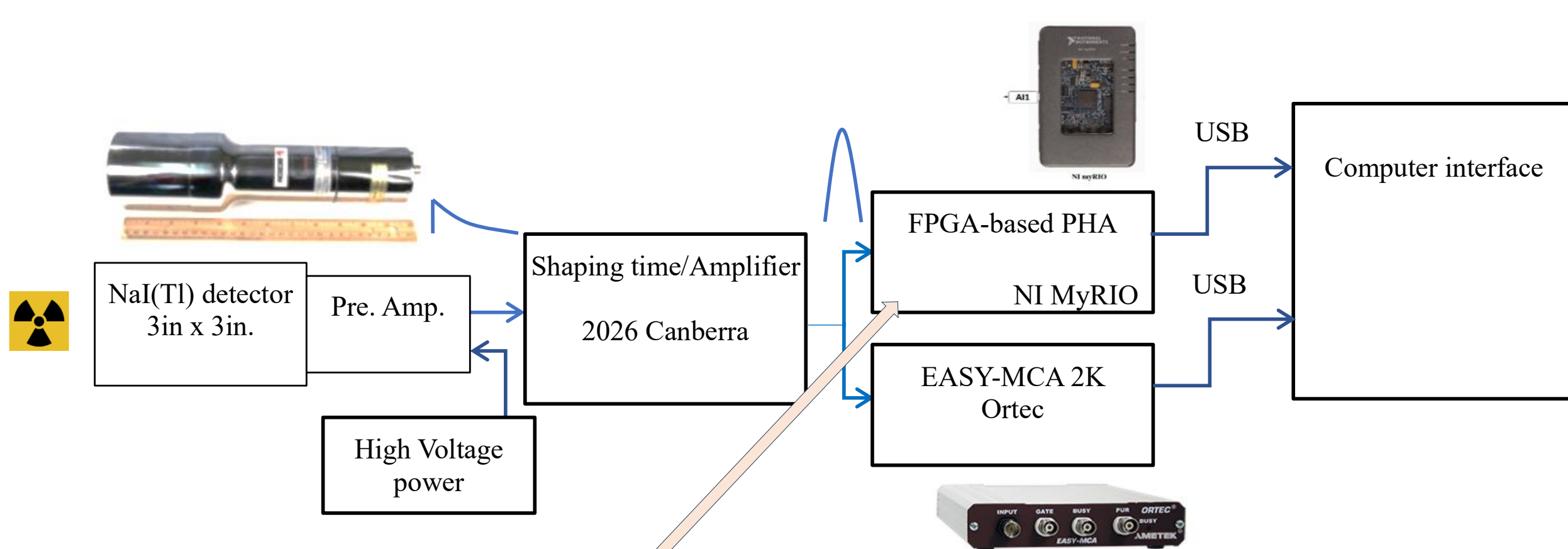


Initial parameters:

- (1) Positions of CsI(Tl)-1 relative to CsI(Tl)-2, including start and finish rotation angles;
- (2) Step rotation angle; and
- (3) Duration per step rotation angle.



FPGA-BASED PULSE HEIGHT ANALAYER



RI sources	Energy (keV)	Energy resolution (%)	
		FPGA-based PHA (This work)	EASY-MCA 2K, AMETEK Inc. [3]
Na-22	511	10.4 ± 0.1	10.4 ± 0.1
	1274	7.0 ± 0.1	6.8 ± 0.1
Co-60	1173	6.9 ± 0.1	7.1 ± 0.1
	1332	6.6 ± 0.1	6.7 ± 0.1

Conclusions

- The system's automation potential, incorporating angular rotation via a step motor, coincidence counting, and spectrum saving, is demonstrated.
- FPGA-based PHA for NaI(Tl) detector exhibits commendable performance in comparison to the commercial EASY-MCA 2K from AMETEK Inc.

References

- [1] NI MyRIO-1900, National Instruments Corp., [Online] <https://www.ni.com/>
- [2] NI LabVIEW software, National Instruments Corp., [Online] <http://www.ni.com/labview/>
- [3] EASY-MCA 2K, AMETEK Inc., [Online] <https://www.ortec-online.com/>

Acknowledge

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