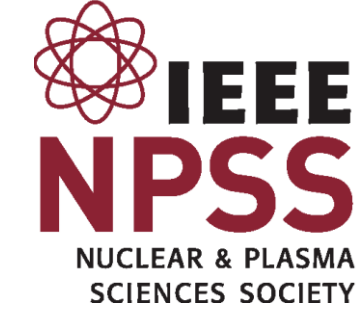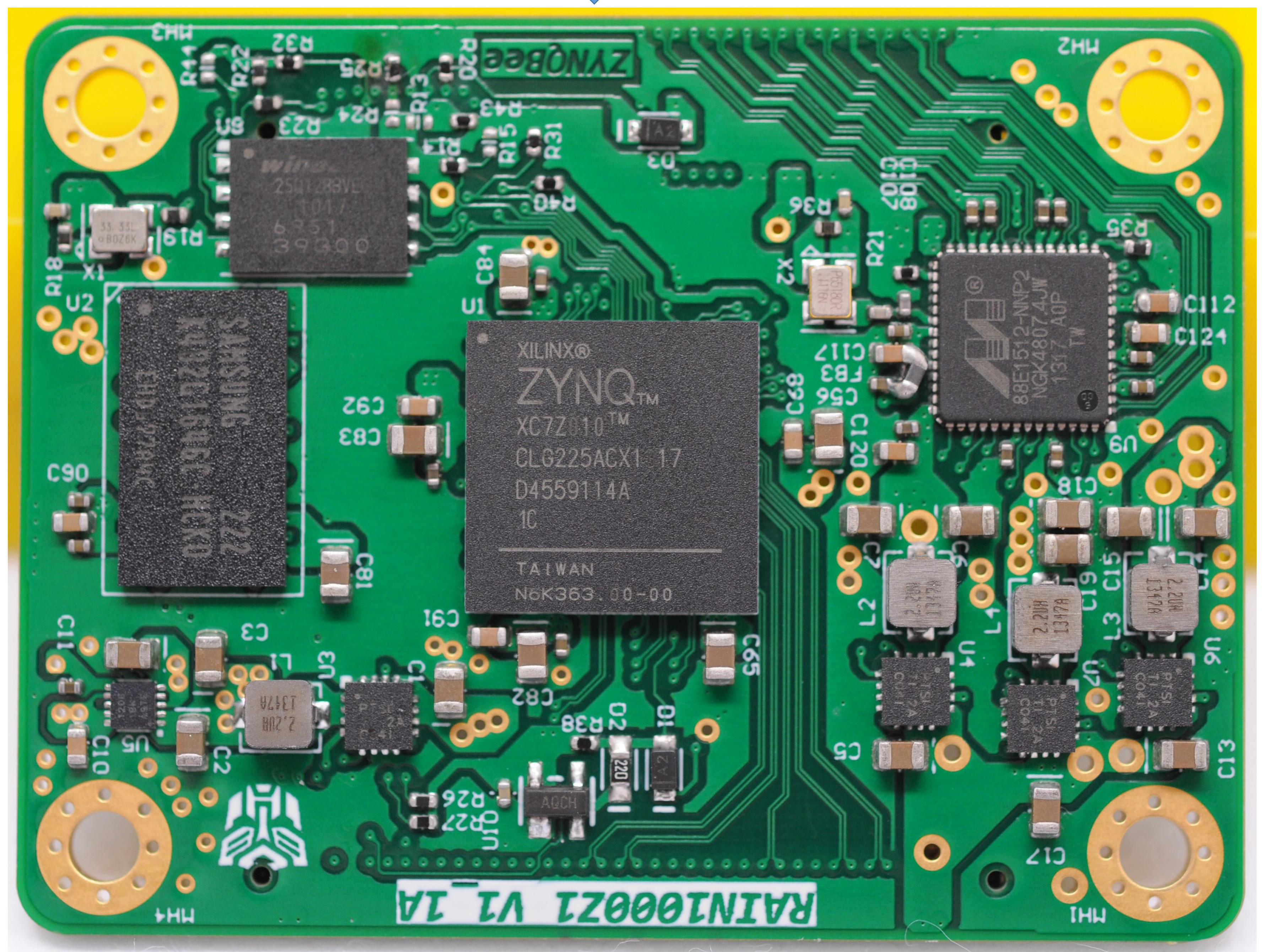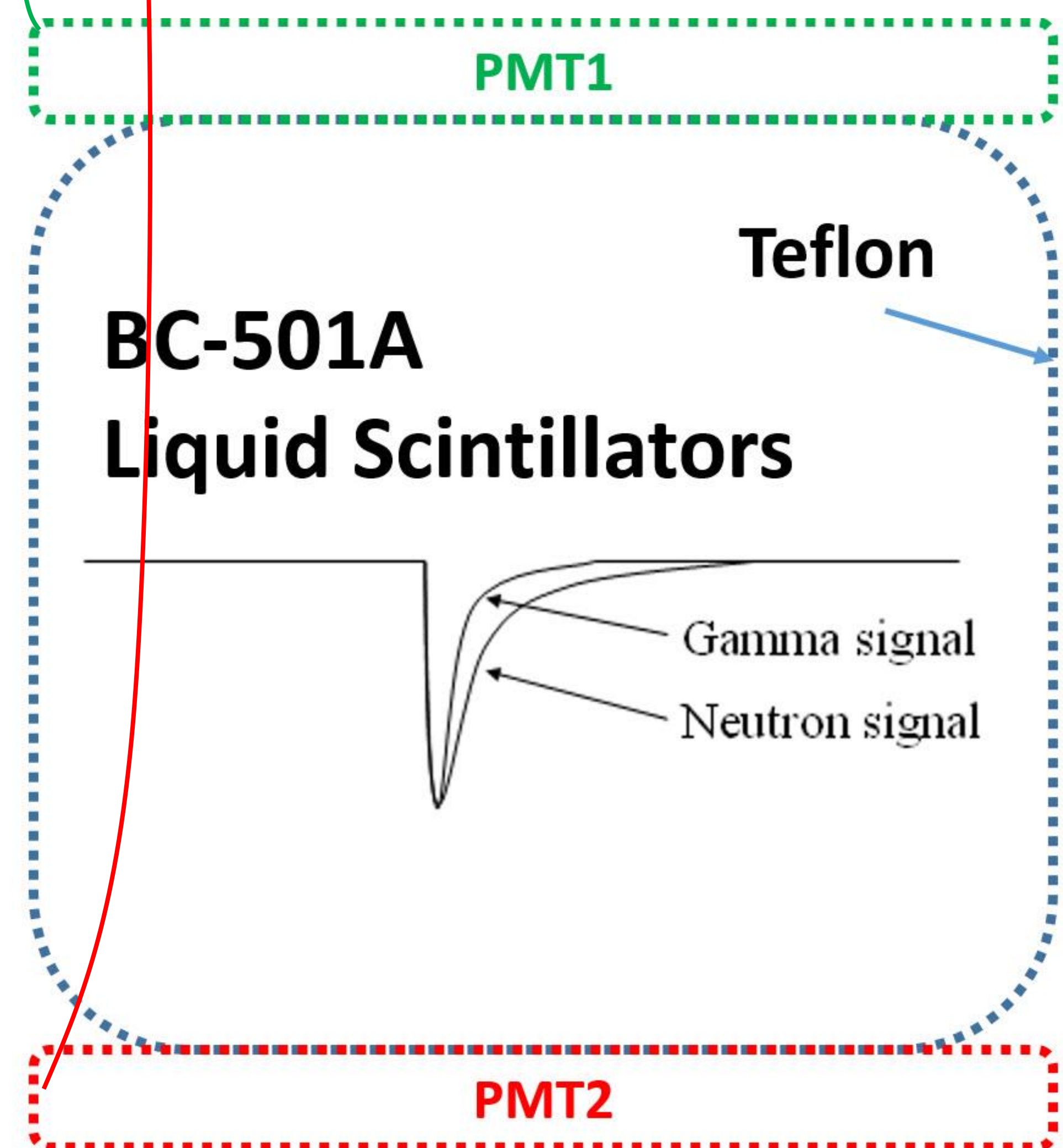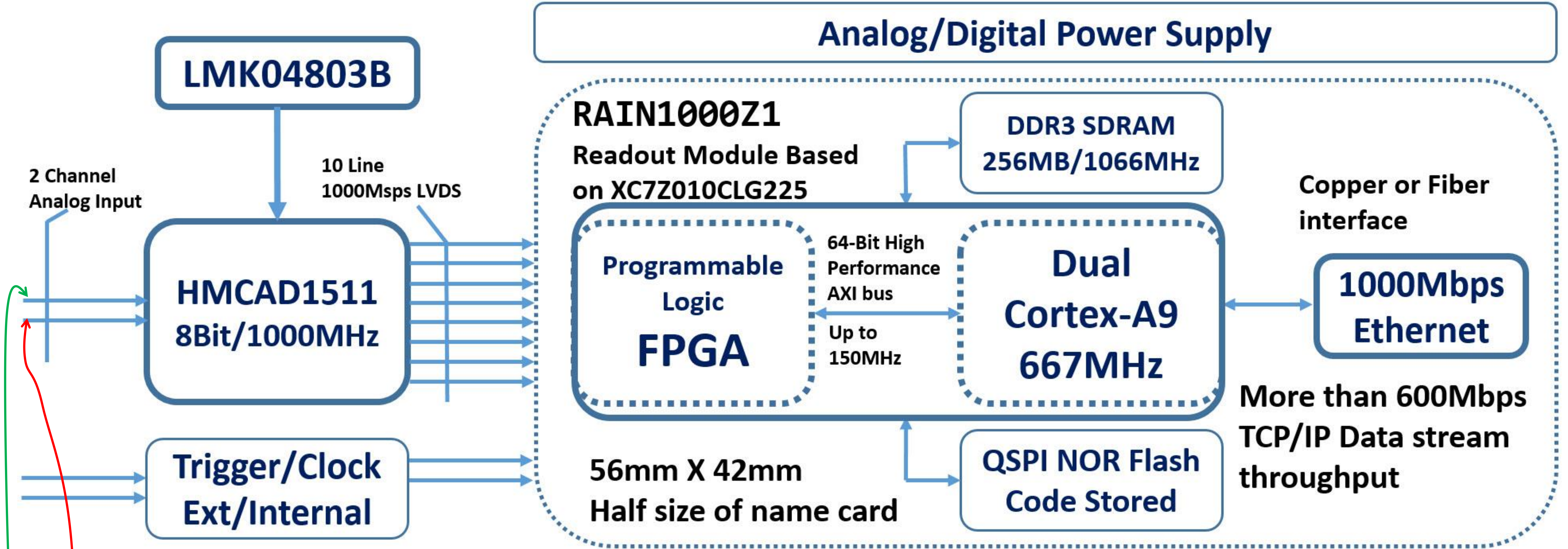# Readout System with 2-Channel 8-Bit 1GHz FADC Based on RAIN1000Z1 ZYNQ Module for Crystal Detector

RT2016 Padova, Italy

In SuperK @ 2006

Analog/Digital Power Supply

LMK04803B

2 Channel Analog Input

10 Line 1000Msps LVDS

HMCAD1511 8Bit/1000MHz

Trigger/Clock Ext/Internal

RAIN1000Z1 Readout Module Based on XC7Z010CLG225

Programmable Logic FPGA

64-Bit High Performance AXI bus — Up to 150MHz

Dual Cortex-A9 667MHz

DDR3 SDRAM 256MB/1066MHz

Copper or Fiber interface

1000Mbps Ethernet

More than 600Mbps TCP/IP Data stream throughput

56mm X 42mm Half size of name card

QSPI NOR Flash Code Stored

PMT1

BC-501A Liquid Scintillators

Teflon

- Gamma signal
- Neutron signal

PMT2

- RAIN1000Z1 is a high performance readout module we developed last two years. It is based on the ZYNQ architecture SOC chip from Xilinx and ZYNQ is the new architecture of FPGA with dual high performance ARM Cortex-A9 processors and high-capacity programmable logic.

- For the liquid scintillator crystal detectors, such as BC-501A, we used for neutron background measurement in the CJPL (China JingPing Underground Lab) experiment hall, we developed a 2-channels 8-Bit 1GHz FADC readout system with RAIN1000Z1 module.

- With the two PMTs in the dual end of detector, the analog signal is send to FADC and the digital results is triggered and anticoincidence in the FPGA logic, the final data is send to computer by gigabits Ethernet with ARM processor running Embedded Linux.

- With the benefit of high bandwidth and high performance inter connected HP bus between ARM processor (PS) and FPGA logic (PL), the FADC's data gathered by FPGA logic is buffered and transferred to the ARM processor's DDR3 SDRAM running at 1066MHz with CDMA function without many CPU time. The readout interface's data throughput can reach more than 600Mbps with gigabits Ethernet.

NEUTRON region

GAMMA region
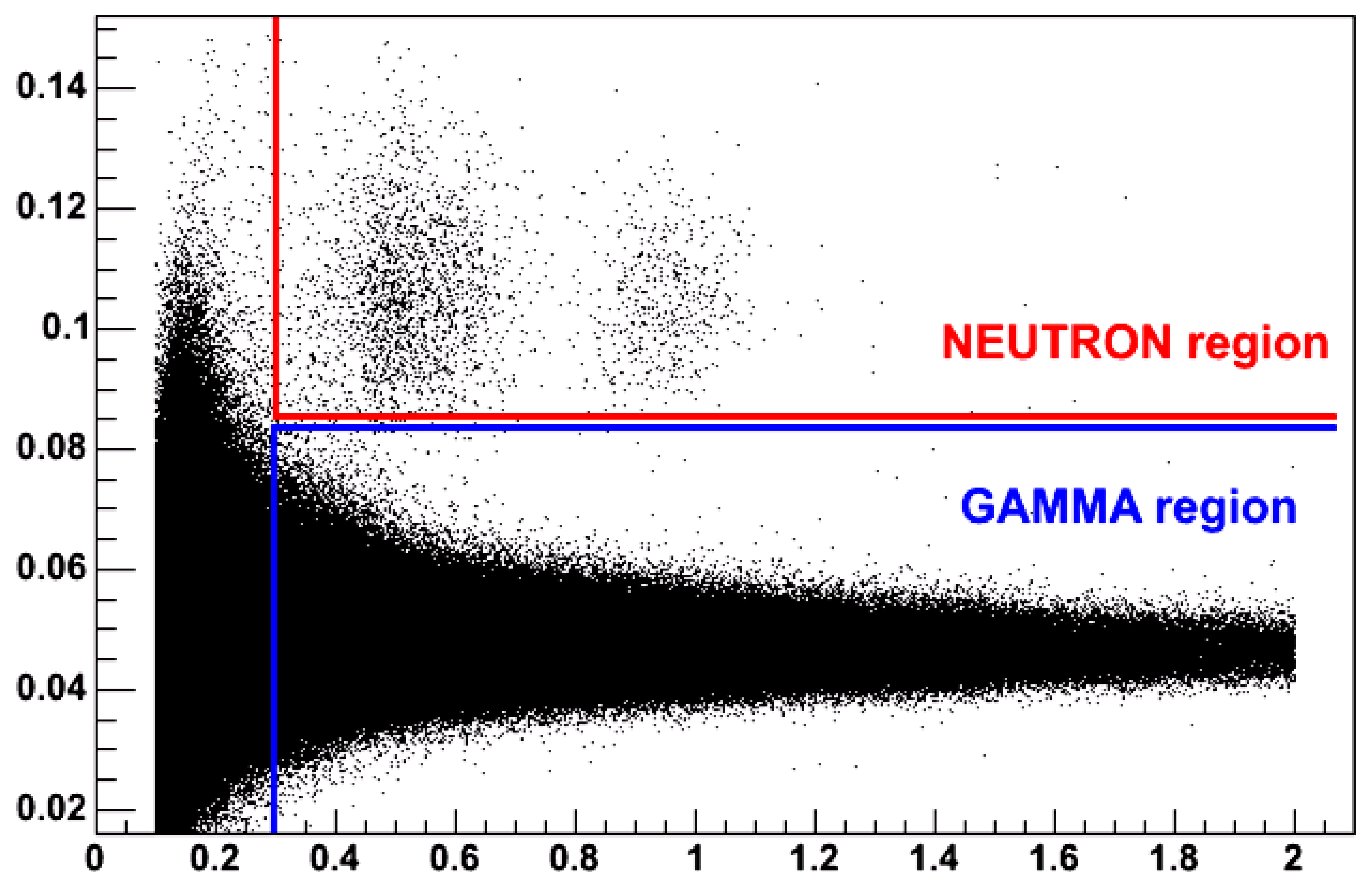
X is energy of particles and Y is the ratio of signal tail integral VS signal integral
Threshold is 300kev

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CJPL 中国锦屏地下实验室 China Jinping Underground Laboratory