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Evaluation of the first version of the new RFPI system dedicated to PIP-II project accelerator

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The Low-Level Radio Frequency (LLRF) control system is one of the most critical superconducting linac infrastructures responsible for the parameters of the beam acceleration. The LLRF system mainly focuses on the electromagnetic field parameters inside the cavity. While it incorporates fast feedback algorithms to optimize energy transfer to the passing particle beam it does not follow other cryomodule or cavity parameter changes. The Radio Frequency Protection Interlock (RFPI) system closely monitors various factors (like cryomodule vacuum, beamline vacuum, field emission probe current level, temperature, RF signal leakage, etc). Its simple but reliable logic has to provide an instant decision about the LLRF system or high-power amplifier output signal blocking in case of safety region excitation.

This contribution presents a new version of the RFPI system which logic is implemented in the FPGA chip. The initial work on the prototype of the new system design resulted in the PoC (Proof of Concept) device. The PoC offers the possibility of various protection logic configurations, input signals parameters evaluation, and modularity aspects verification. The structure and test results from the device evaluation are summarized and discussed in this contribution.

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Footnotes

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