

An Arria10 SOM based FPGA Controller for LLRF Applications

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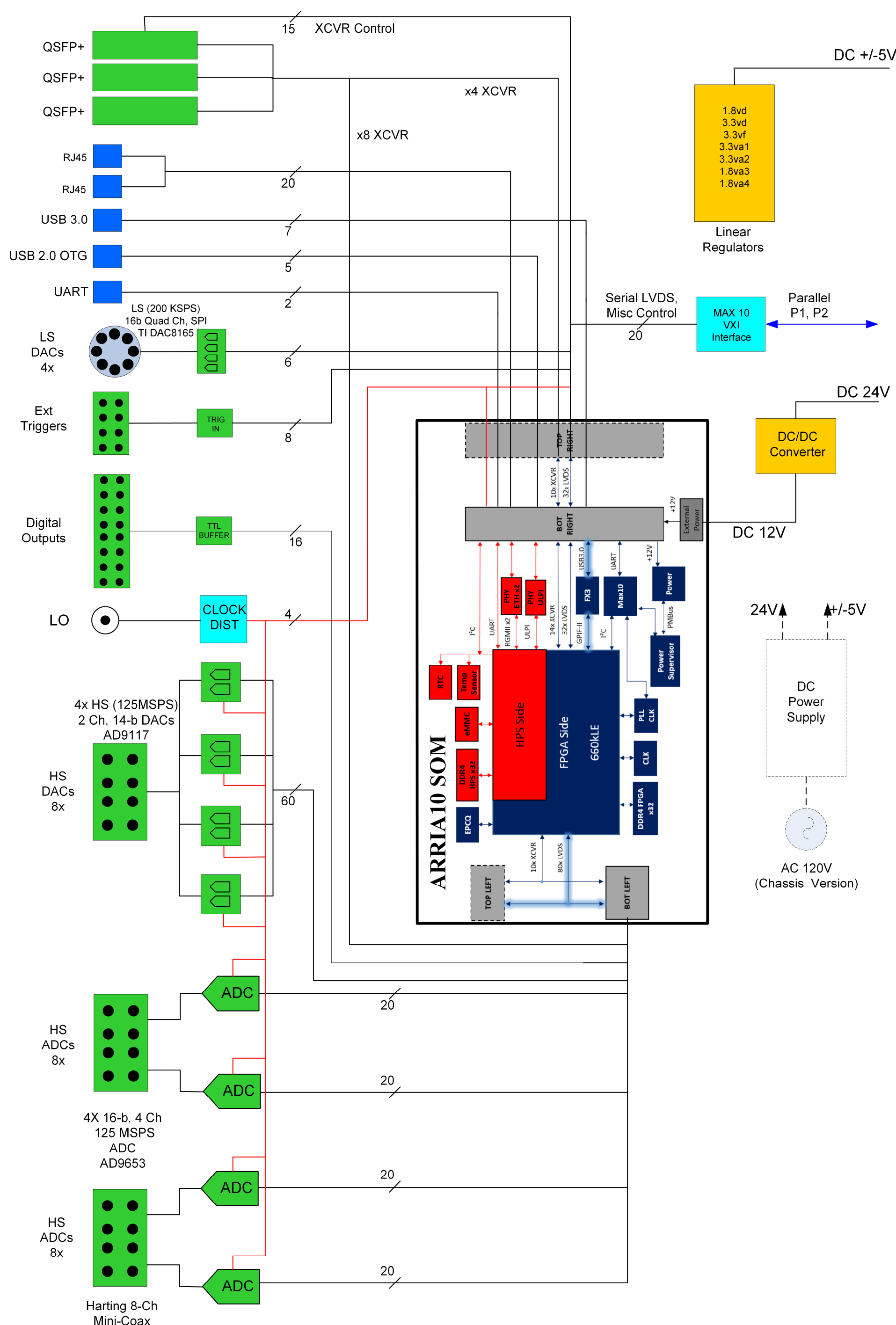
S2-32

Introduction

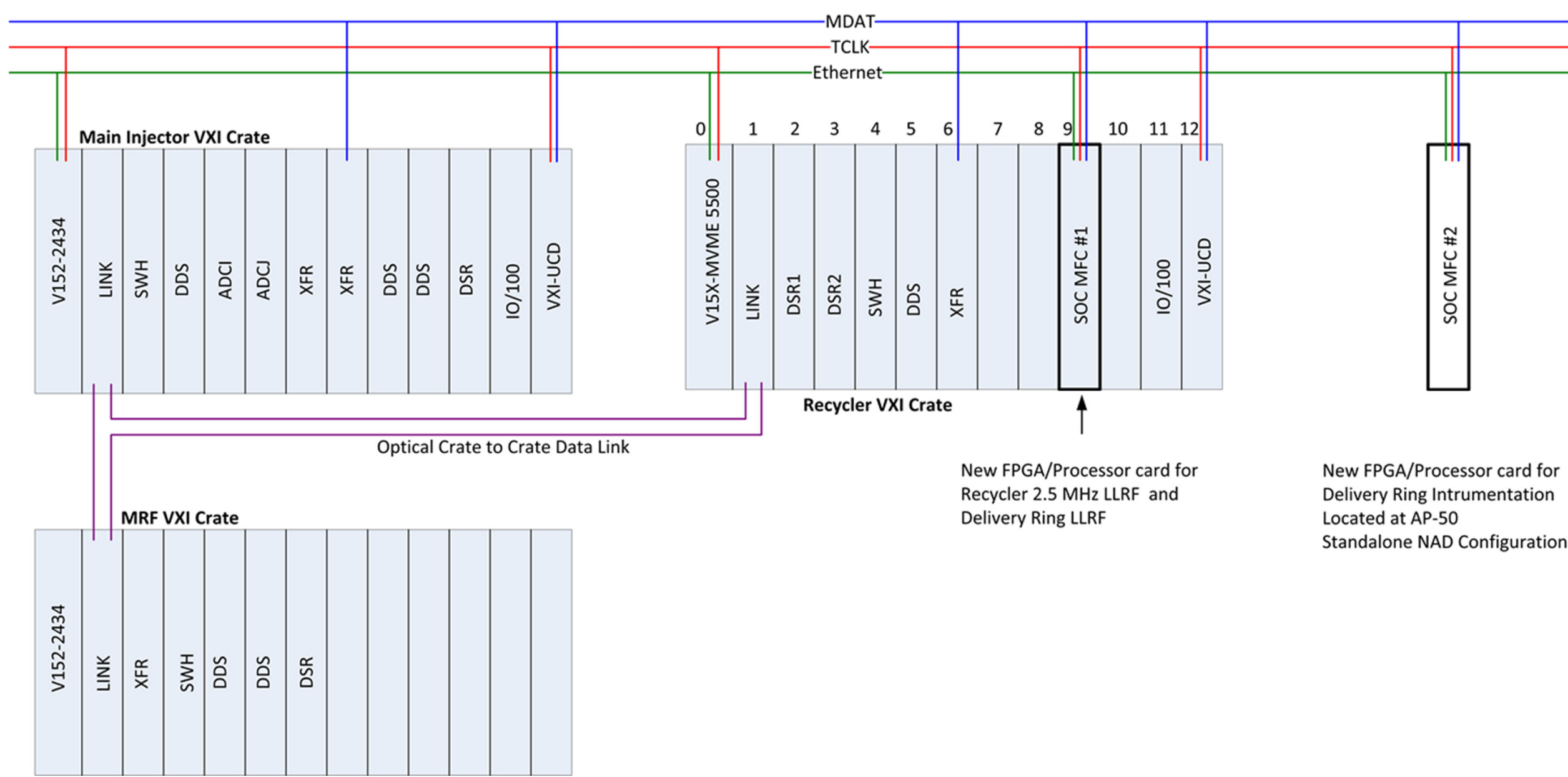
SOM(System On a Module) based FPGA boards allow the simplification of the LLRF hardware design to SOM carrier cards with primarily analog components and connectors. The SOM module contains a large SoC FPGA with a dual core ARM microprocessor and other digital components such as DDR4 SDRAM, flash memory, power management and clock generators. The Fermilab LLRF controller board is a network attached device (NAD) targeted for use in a variety of LLRF applications in new and upgrade projects.

| Device Feature | Specifications | Number of Channels |
|-------------------------------|-------------------|--------------------|
| High Speed ADC | 16-bit, 125 MSPS | 16 |
| High Speed DAC | 14-bit, 125 MSPS | 8 |
| Low speed DAC | 16-bit, 200 kSPS | 4 |
| FPGA | ARRIA10 | 660k LE |
| Processor | Dual Core ARM | 1.6 GHz |
| DDR4 (Processor) | 32-bit, 2400 MT/s | 4 GB |
| DDR4 (FPGA) | 32-bit, 2400 MT/s | 4 GB |
| Software/Configuration | eMMC/EPCQ | 32 GB/512MB |
| 18x19 multipliers | Fixed Point | 3,376 |
| Variable-precision DSP blocks | SP Floating Point | 1,688 |
| Digital Inputs (Triggers) | TTL, 50 Ω | 8 |
| Digital Outputs | TTL, 50 Ω | 16 |
| Gbit Ethernet | RJ45 | 2 |
| High Speed Xcvrs | QSFP, 4x10 Gbps | 3 |
| USB | 2.0, 3.0 | 1x, 1x |

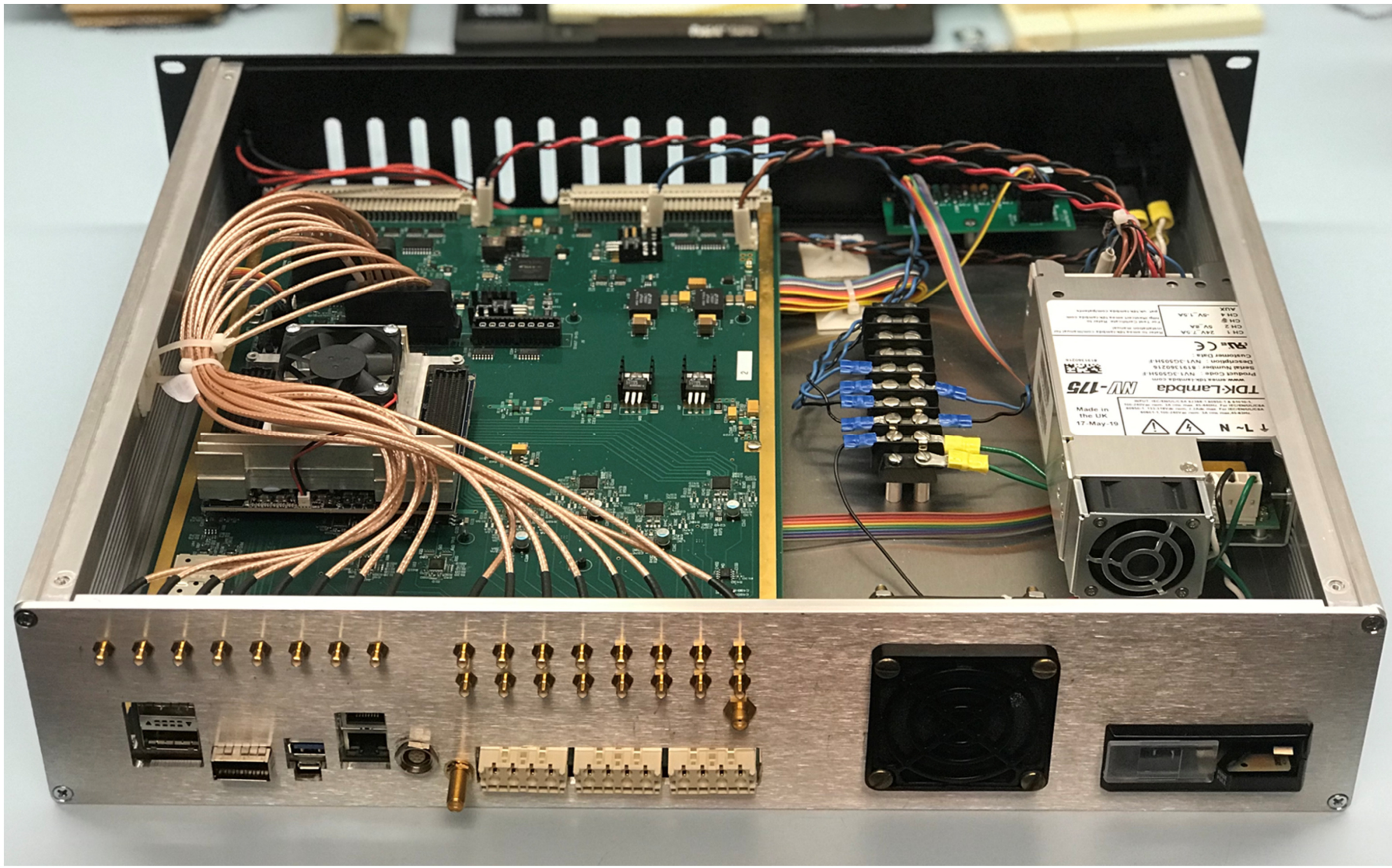
Board Overview



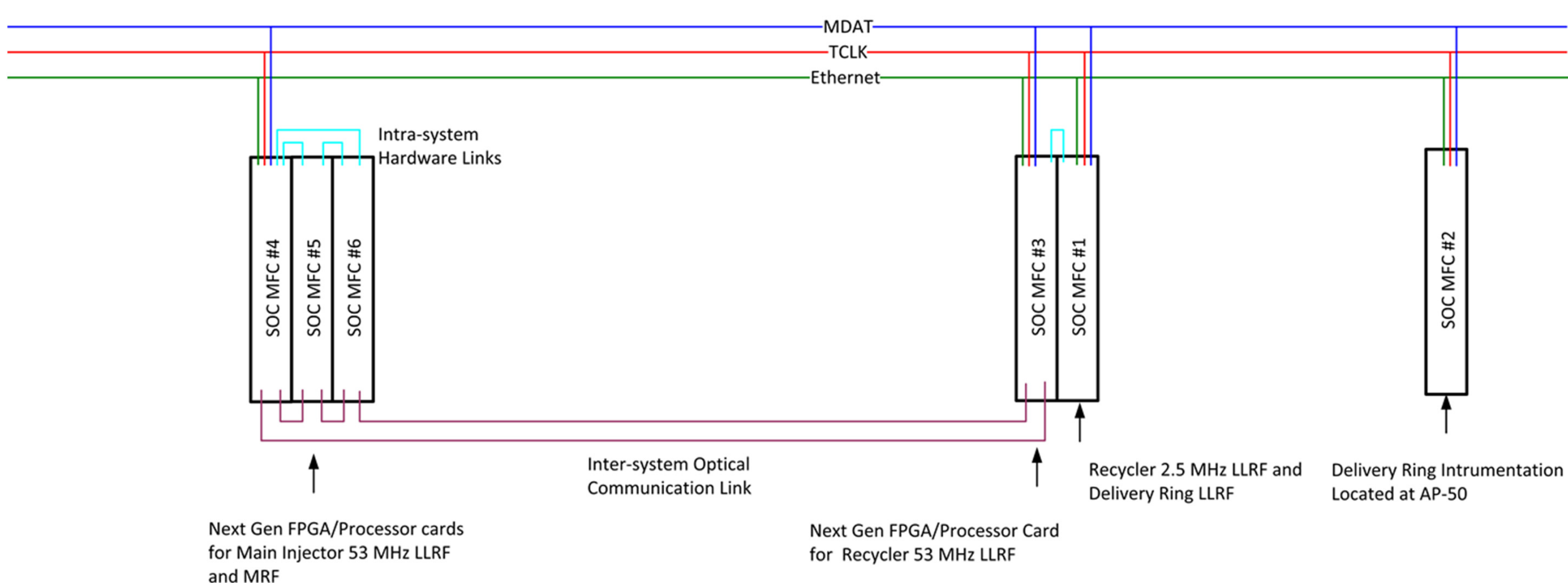
LLRF System Configuration for Mu2e Stage I



Chassis Prototype

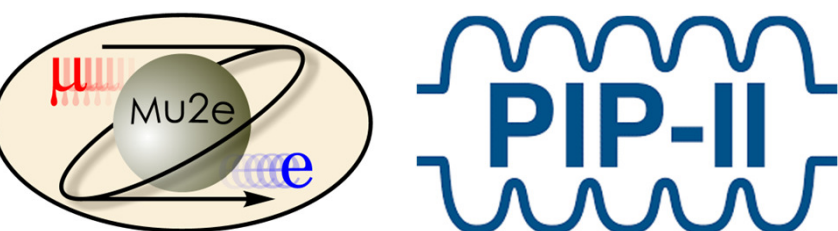


LLRF System Upgrade for PIP-II/Mu2e Stage II



Summary

- A general purpose network attached digitizer board with a large FPGA and multiple high speed fiber/ethernet connections has been developed targeted at new projects such as Mu2e and PIP-II as well as an upgrade path for older LLRF systems.
- A prototype is being tested and a production board will be released by the end of the year.



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