SEVEN Solutions
When every nanosecond counts

DUAL LLRF

2x { 16xADC ; 2xDAC ; 32xI/O }

The low level radio frequency

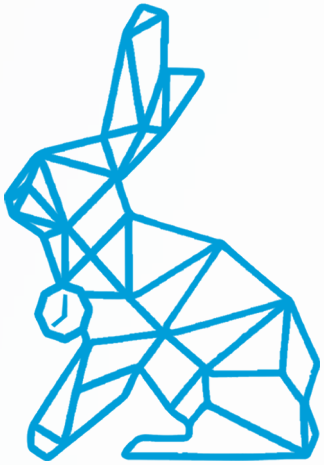
Dual LLRF

The CPIC LLRF is a fully digital RF to control two different cavities in the same Compact PCI-e Serial Rack. Each module is able to drive an RF cavity to a 175MHz with a stability of ±1% when using the feedback loop. The others ADCs are used to diagnostic the amplifier chain.

It has been designed within the IFMIF project to support RFQ, MEBT and SRF Linac cavities but can be extended to other cavities. It is controlled by an EPICS IOC in order to ease its integration in an EPICS control system. Finally, it is compatible with White Rabbit Protocol to retrieve time and the reference frequency using optical fiber network.

HIGHLIGHTS

- Amplitude and Phase Feedback loop
- Conditioning mode
- Beam Pulse mode
- Mechanical and Frequency Tuning
- Emergency stop based on digital I/O (<1µs)
- Post-mortem diagnostic (2GiB)
- White Rabbit Synchronization



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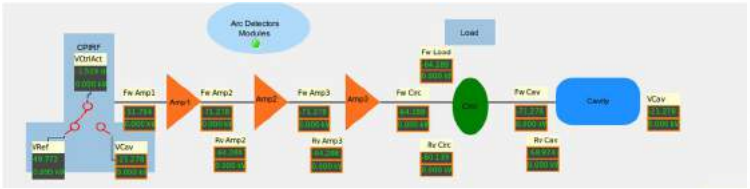
ISO 9001 QUALITY ASSURANCE

Technical Specification – DUAL LLRF

CPU	
Core	CPCI-S 3U; i5 1.5Ghz, 8GiB DDR3 2x USB, 2x RJ45 ETH 1Gbps 2x mini Display Port
OS	CentOS 6.4 (SSH, VNC)
EPICS	Base 3.14; IOC AsynDriver CSS/BOY 4.13 GUI
FPGA	
Type	Xilinx Virtex-6 (LX240T)
Memories	2GiB DDR (7m post-mortem)
Driver	PCi-e DMA (4Gbps)
Timing / Clocking (White Rabbit)	
I/O	4 SMA coaxial connectors (50Ω): ▪ 10 MHz reference clock input GPS/Cesium (CMOS,3vpp) ▪ 175MHz input (CMOS,3vpp) ▪ 10MHz output clock (3vpp) ▪ PPS Input/Output (CMOS,TTL,LVTTL / LVTTL)
SFP (WR)	1 x SFP 1.25Gbps, 1490/1310 nm, Single Fiber Bi-directional SFP.
Pulse Mode	2x SMA Direct input; (50Ω ,TTL) 2x SMA Opto-coupled input;
I/O Signals (Interlocks)	
DB-25 In	10x Dry Contact 4x Opto-coupled (<20 mA)
DB-25 Out	4x 5V level 1x DAC [0-5V] output 2x Slow Opto-coupled (70V,10mA) 2x Fast Opto-coupled (24V,10mA)
Certification	
Soldering	IPC- 610 Rev E Class 2
Others	ISO-9001, ISO-14001, CE, RoHS
Power Supply	
Input	100-240VAC, 50-60 Hz
Environmental Conditions	
Temp.	-10ºC ~ +50ºC
Humidity	0% ~ 90% RH
Physical Specification	
Dimension	19” rackeable 482,6x311.15x235 mm

RF Signals	
FrontEnd	Integrated 175MHz passband filters
DAC	2 channels SMA; 1.25 Gsps; 16bits Dynamic range: -60dBm to 14dBm
ADC	16 channels SMA; 125 Msps ; 14bits: ▪ 14 ch. -40dBm to 17dBm ▪ 2 ch. with 10dB amplifier
Attenuators	Controlled by software from 0dBm to 32dBm by 0.5dBm steps
Noises	Harmonics <-60dBc Spurious <-65dBc
Stability	▪ Max error RMS in standalone 0.9º phase & 0.0051% amplitude ▪ Feed-back stability injecting 250kW into cavity: <±0.5%
RF Splitter	
Properties	Only one for both cavities 1 input → 8 RF outputs ≈10dBm attenuation



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EPICS

ISO 14001 UCS

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