

# FERMILAB VTS STATUS

Presented by Yuriy Pischalnikov

- Starting from March, 2012 Yuriy Pischalnikov took responsibility as VTS Test Area Leader at T&I Department (Joe Ozelis moved to MSU to work for FRIB Project);
- Yuriy will work as a liaison to coordinate technical issues related to VTS commissioning/operations/etc. between FNAL and Indian collaborators

- Status of VTS facility at FNAL
  - VTS1 fully operational facility/ R&D and production testing
- Modification & additions to VTS1 based on several years of operations
  - Modification of safety barrier around VTS pits
  - Radiation shielding modifications (internal/external);
  - New SRF Cavity Staging area;
  - New electronics- required to test variety of SRF cavities (1,3GHz; 325MHz; 650MHz; 3,9GHz);
- VTS2&3 Status
  - Status of cryo-system;
  - Status of DAQ/electronics system;
  - Preliminary schedule for commissioning;

- Active R&D program at VTS1
  - Single cell 1.3GHz cavities-
    - R&D for high Q
    - R&D related to development of cavities processing
  - 9 cell 1.3GHz “production” testing
  - 325MHz “single spoke” SSR1 cavities testing
  - 650MHz single cell cavities testing
  
  - Development of new cavities diagnostics instrumentation
    - T-map system as a unique instrument (welcome addition to Fast thermometry and Second sound systems)

# T&I Department VCTF at IB1



# Removing Internal Radiation Shielding

- Goal is to boost efficiency of VTS tests –
  - Decrease consumptions of LHe  $\sim 400\text{L}$  to cool-down internal shielding
  - Decrease time required to warmup VTS after SRF cavity test

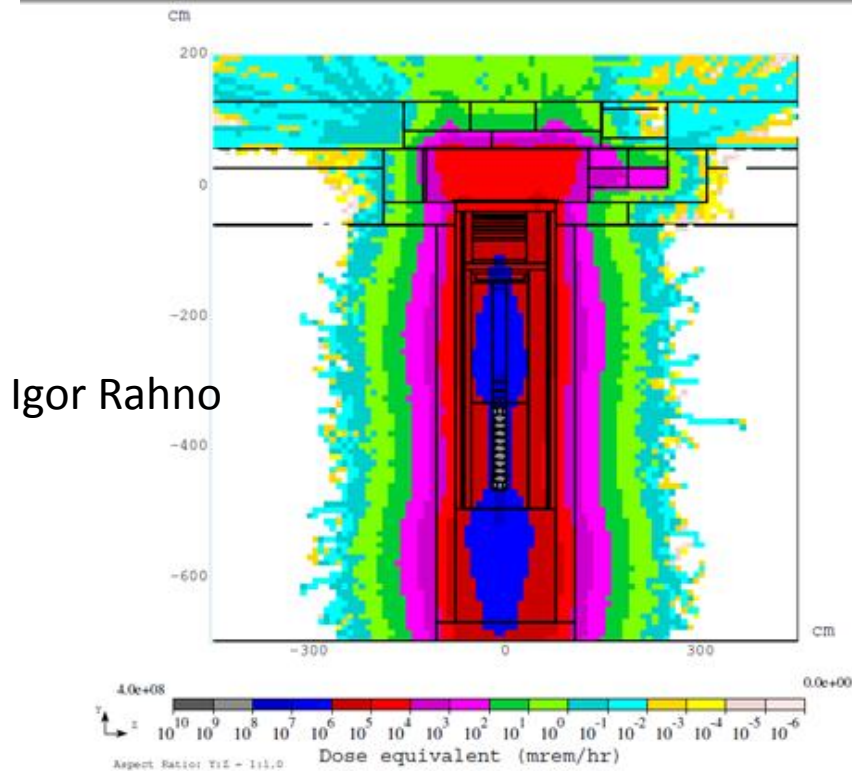


Figure 3: The calculated dose distribution around the VTS2/3 facility with the modified radiation shielding and with the lower RF cavity tested.



# Modification of existing shielding



Additional steel

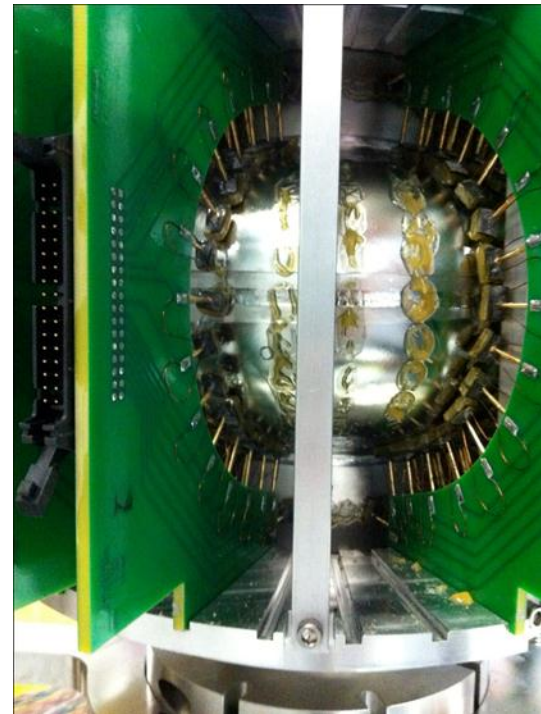
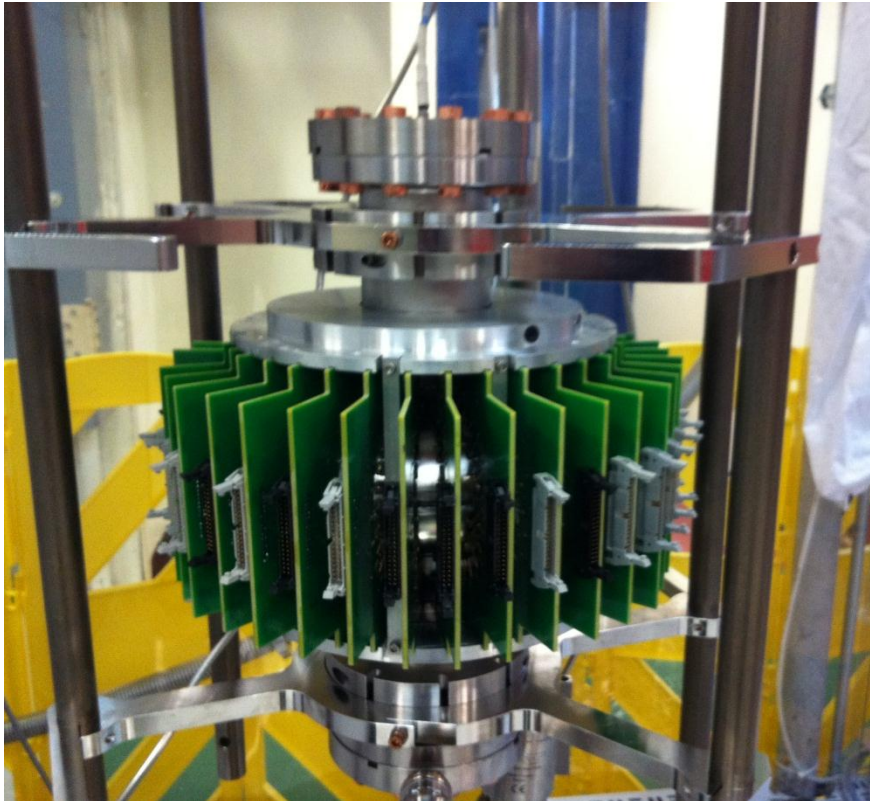


Next step is safety  
paperwork and adding  
steel walls around VTS1 pit

# New SRF cavities diagnostics instrumentation at VTS

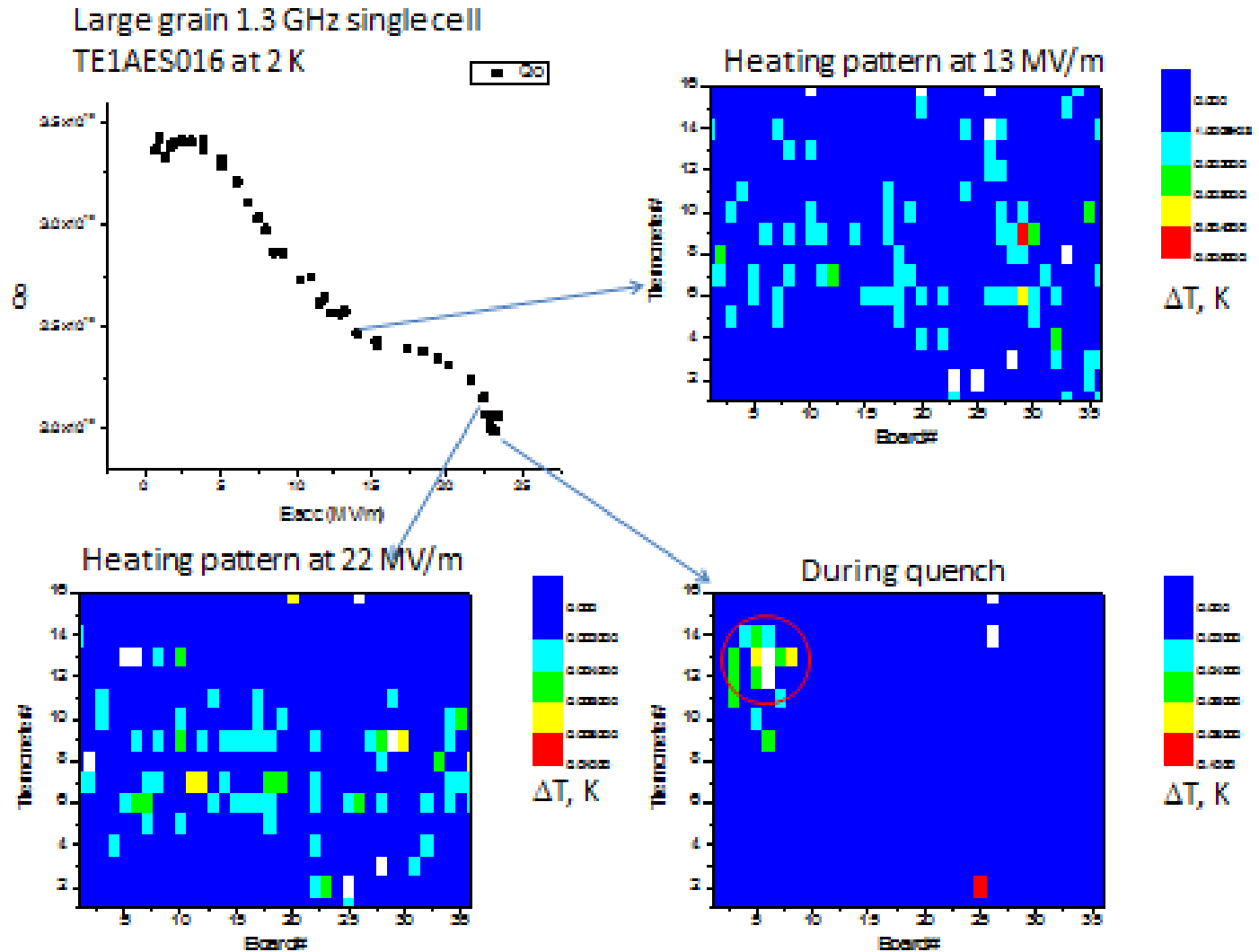
## T-Map System

~600 temperature sensors diagnostics instrumentation for 1.3GHz single cell cavity



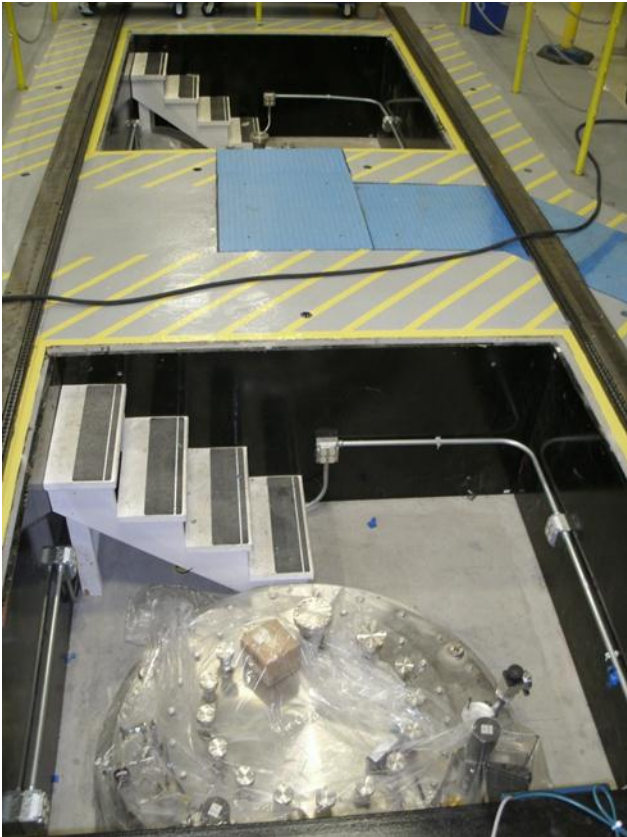


# T-Map System Performance courtesy of Alex Romanenko



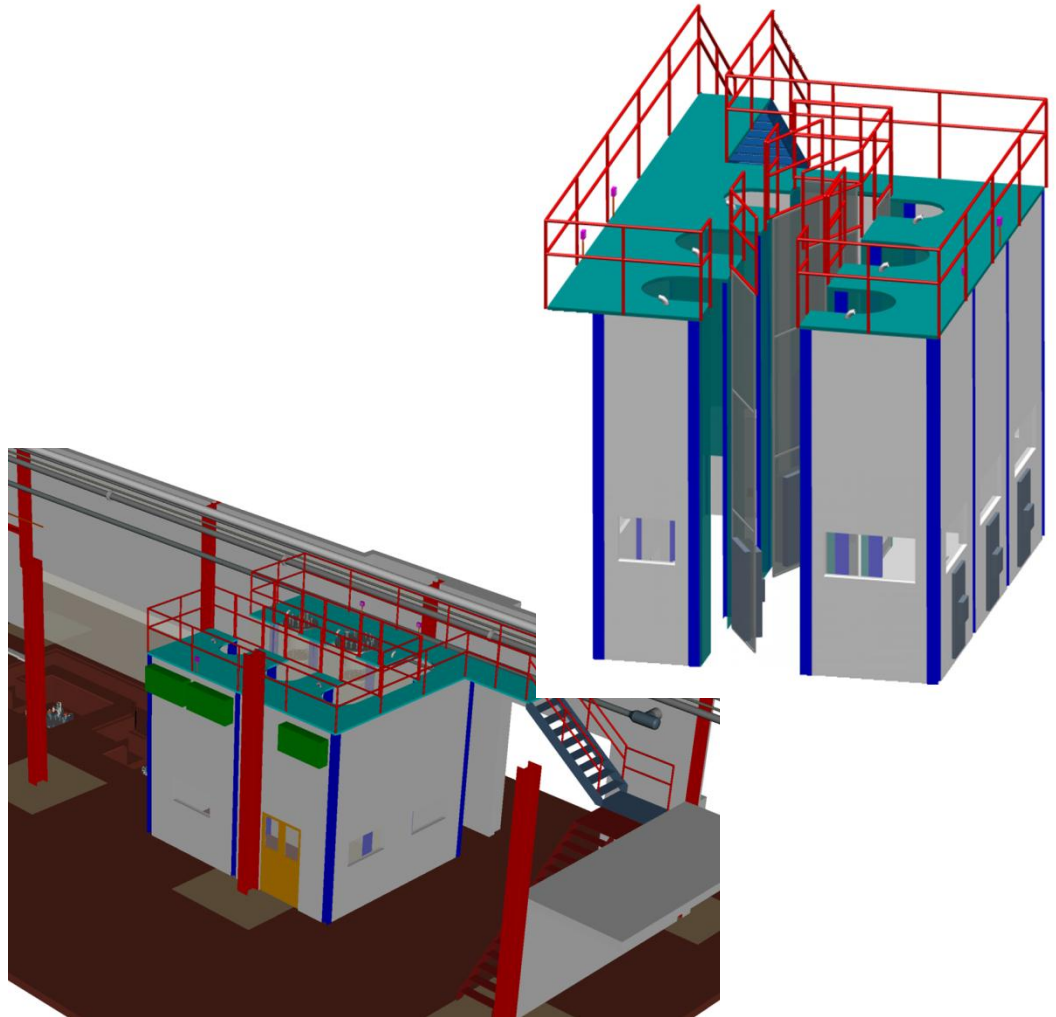
# VTS2&3

- VTS2&3 Project was delayed – shortage of available resources and several New projects at IB1 (T&I Department)
- Cryogenics piping of VTS2&3 is completed on ~80% . Work is in progress..

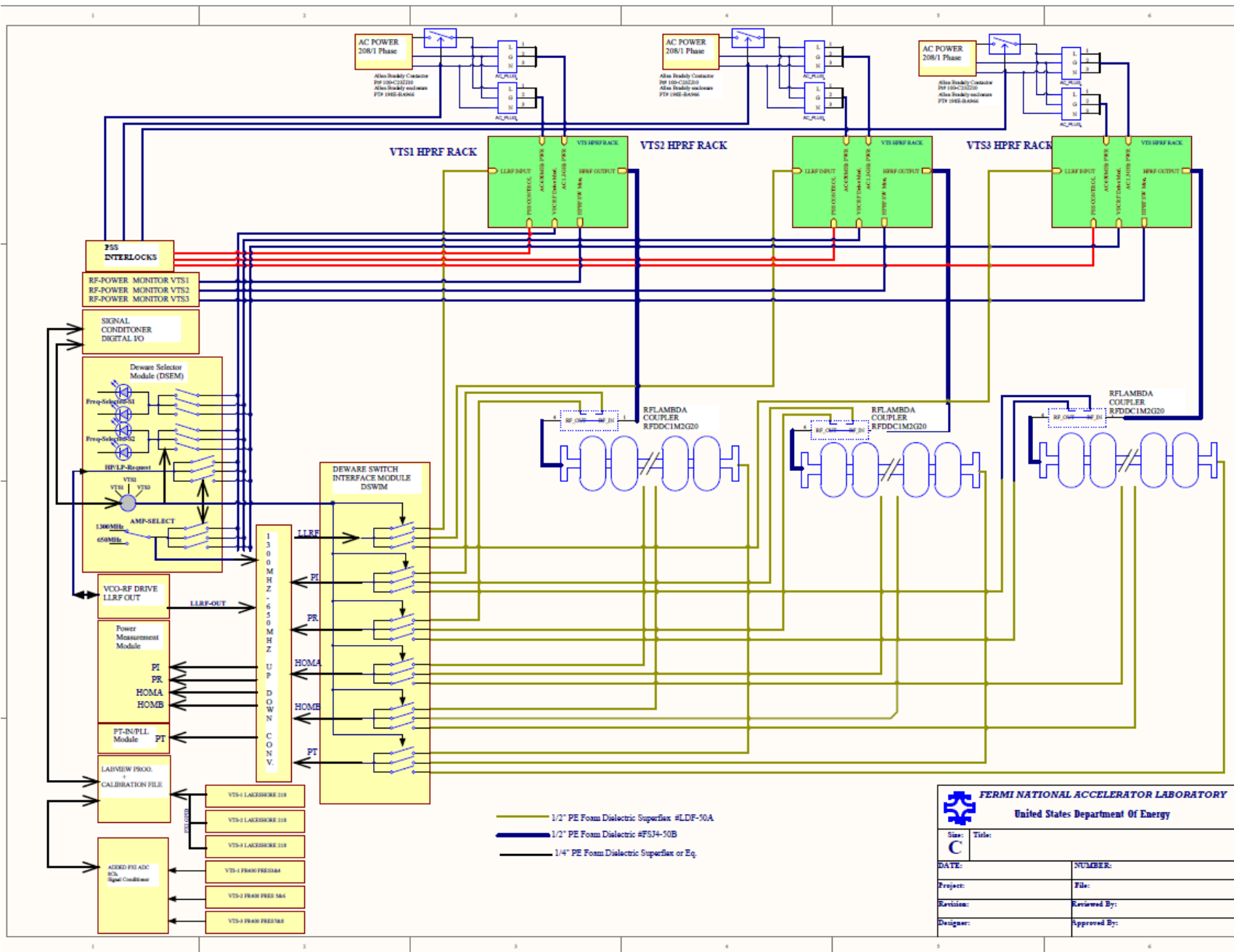


## New Staging Area for VTS Facility

Contract to build NSA awarded. Construction will take place during January, 2013 (during maintenance of IB1 cryo-plant)



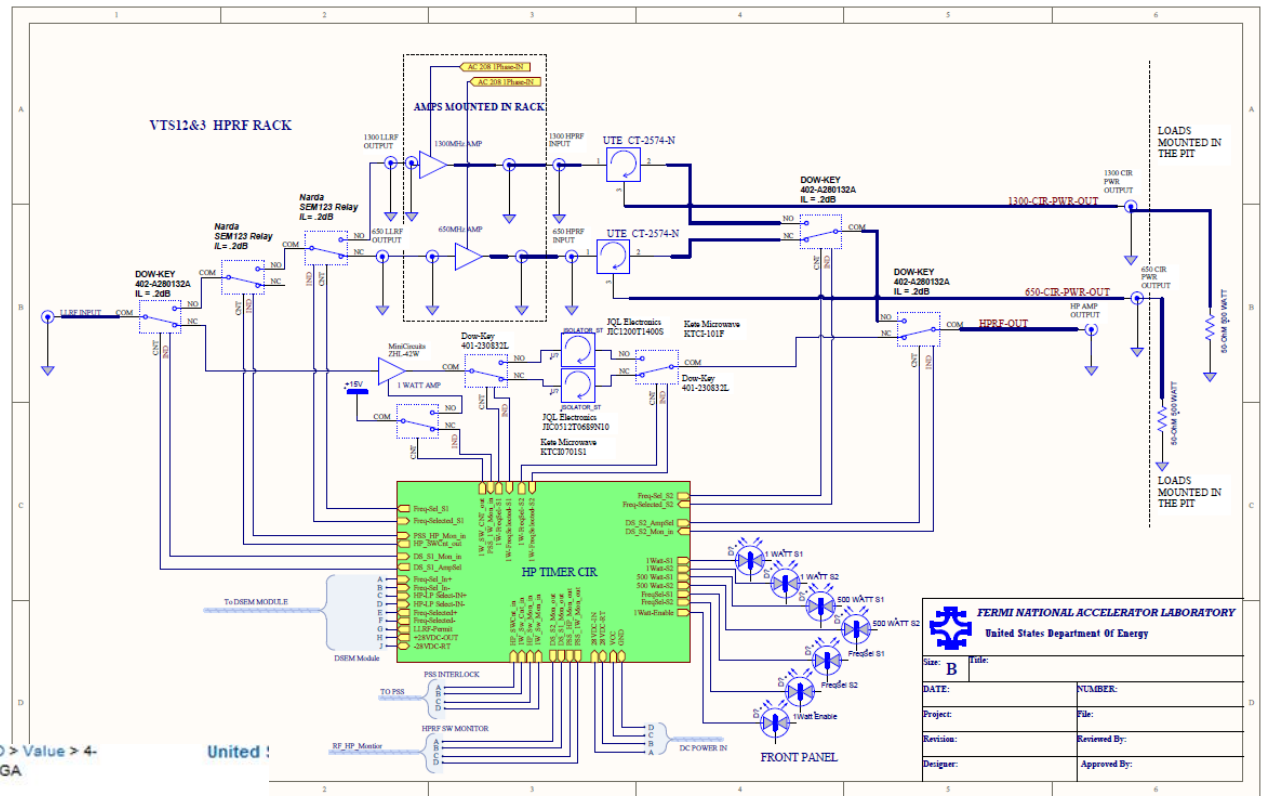
# VTS1-2-3 LLRF & HP RF /Interlocks Block Diagram





VTS1-2-3 will rely more on robust industrial solutions /minimize custom (in-house made) electronics.

Example: NI cRIO with Digital I/O modules will replace in-house made electronics to manage safety interlocks for HP RF system.



NI Home > Products & Services > CompactRIO > Real-Time CompactRIO > Value > 4-slot Chassis with Integrated 400 MHz Real-Time Controller and LX25 FPGA

## NI cRIO-9075

### Integrated 400 MHz Real-Time Controller and LX25 FPGA

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- Rugged, embedded control and monitoring system with -20 to 55 °C operating temperature range
- 400 MHz industrial real-time processor for control, data logging, and analysis
- 4-slot LX25 FPGA chassis for custom I/O timing, control, and processing
- 10/100BASE-T Ethernet port, RS232 serial port for connection to peripherals
- Single 9 to 30 VDC power supply input
- Small footprint suited for OEM applications with

NI Home > Products & Services > C Series Hardware > Digital and Counter I/O > Bidirectional, 5V/TTL, 100 ns, 8-Ch

## NI 9401

### 8 Ch, 5 V/TTL High-Speed Bidirectional Digital I/O Module

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- 8-channel, 100 ns ultrahigh-speed digital I/O
- 5 V/TTL, sinking/sourcing digital I/O
- Bidirectional, configurable by nibble (4 bits)
- Industry-standard 25-pin D-Sub connector
- Hot-swappable operation
- -40 to 70 °C operating range

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Size: <b>B</b>	Title:
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# Capabilities to test different types of cavities at VTS (1,3GHz;325MHz;650MHz;3,9GHz)

Example: NI PXI-2546 “RF switches” modules will be deployed to manage “quick” configuration of VTS for different type of cavities.

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NI Home > Products & Services > Modular Instruments > RF and Wireless Test > Switches > 50  $\Omega$  RF Switches > 2.7 GHz Dual 4x1 Mux (PXI) United !

## NI PXI-2546

### 2.7 GHz 50 $\Omega$ Dual 4x1 Mux (Insertion Loss <1.35 dB)

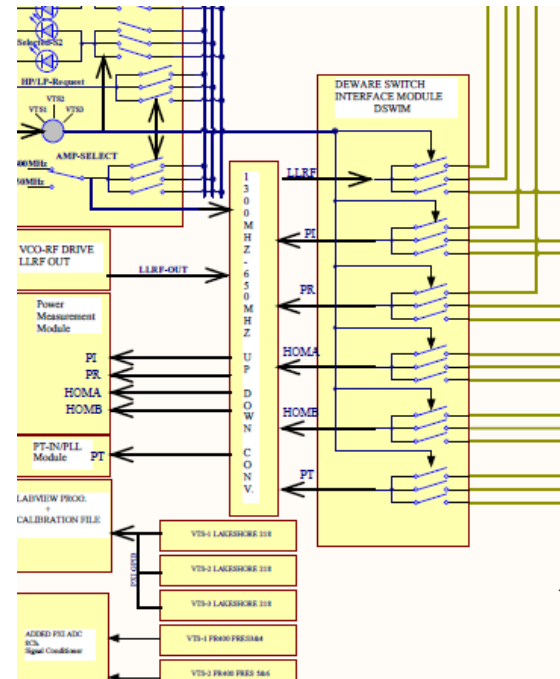
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- 50  $\Omega$  characteristic impedance
- 2.7 GHz bandwidth
- Insertion loss at 2.7 GHz <1.35 dB (typical <1.05 dB)
- VSWR at 2.7 GHz <1.7 (typical <1.5)
- Onboard relay counting
- Use NI Switch Executive for calibrating losses on each channel of the PXI-2546

- >> Compare to similar products
- >> Configure Complete PXI System
- Data Sheet



# Summary

- **VTS1 is playing a key role for strong SRF Cavities R&D program at FNAL**
- **Development/construction of VTS2&3 is on progress (we are short in manpower)**
- **According to existing plan commissioning VTS2&3 at the end of 2013.**