

Upgrades to the Spallation Neutron Source Timing System utilizing MicroTCA

MicroTCA Workshop

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What will be covered today

- MicroTCA future at SNS
- SNS Timing System Overview
- MicroTCA based Timing at SNS

MicroTCA future at SNS

- VME to MicroTCA upgrades are part of the Integrated Controls Section modernization strategy at SNS
- Extensive in-house hardware & firmware expertise
- Improving the reliability through extensive component health monitoring (IPMI)



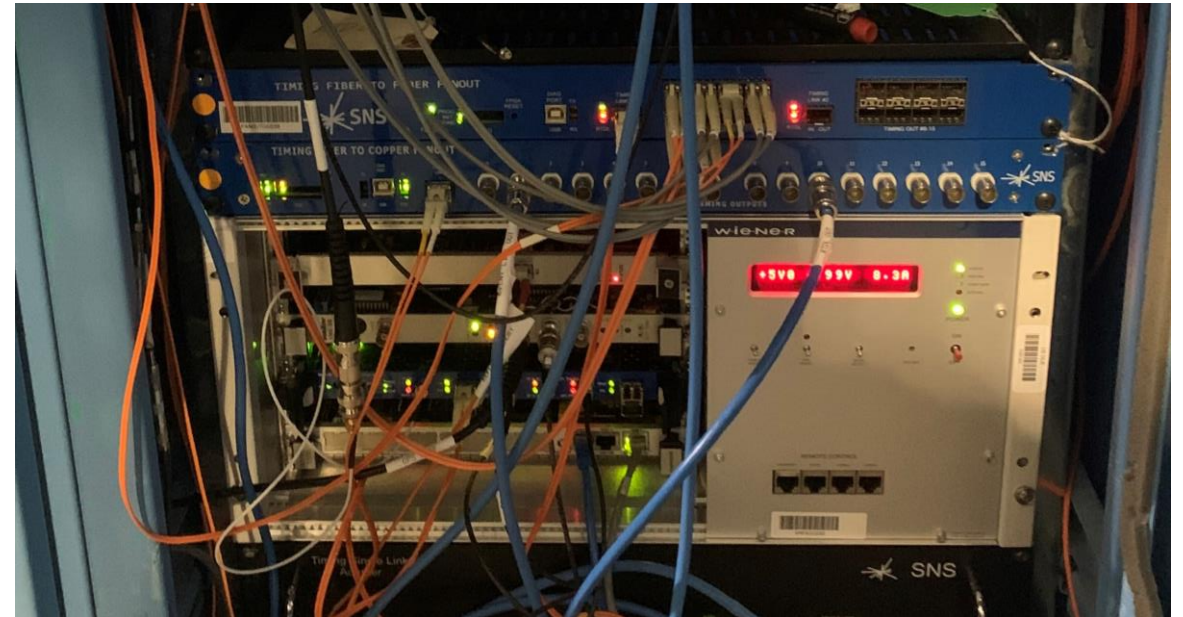
Photo: farmpd.com



Vadatech VT814

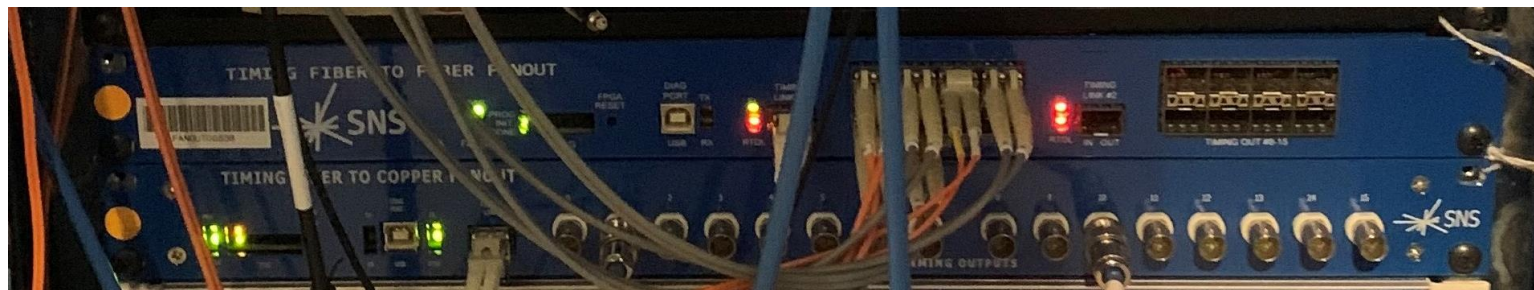
Timing Hardware Overview

- Timing Master
- Timing Distribution
 - Total of 238 fanouts installed in the SNS Accelerator and First Target Station(FTS)
- Timing Receivers
 - 9 different models used at SNS
 - VME(3), PCI, PXI, cRIO, DAS Custom, MPS Chassis, FMC
 - Over 500 Receivers installed in the Accelerator and FTS



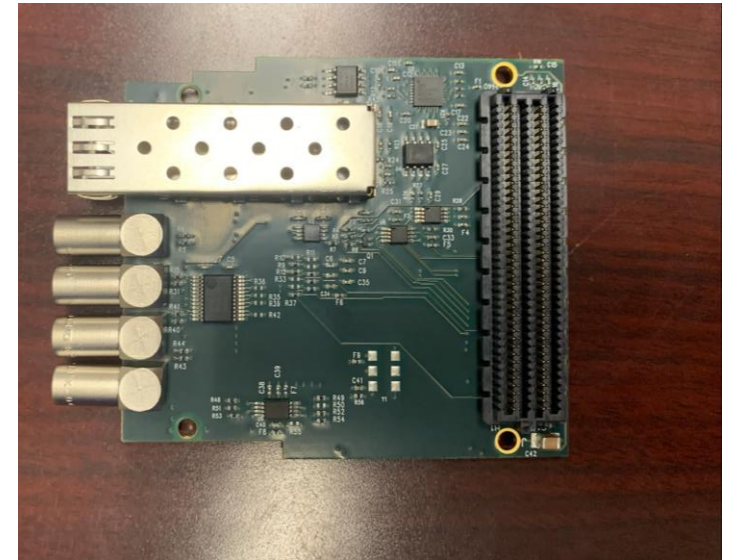
SNS Timing Master

SNS Timing Fanouts



FMC Timing Receivers

- For use with FPGA Carriers
 - Custom
 - MicroTCA
- Two flavors
 - 4 output LEMO
 - 4 output SSMC with a Machine Protection System(MPS) output

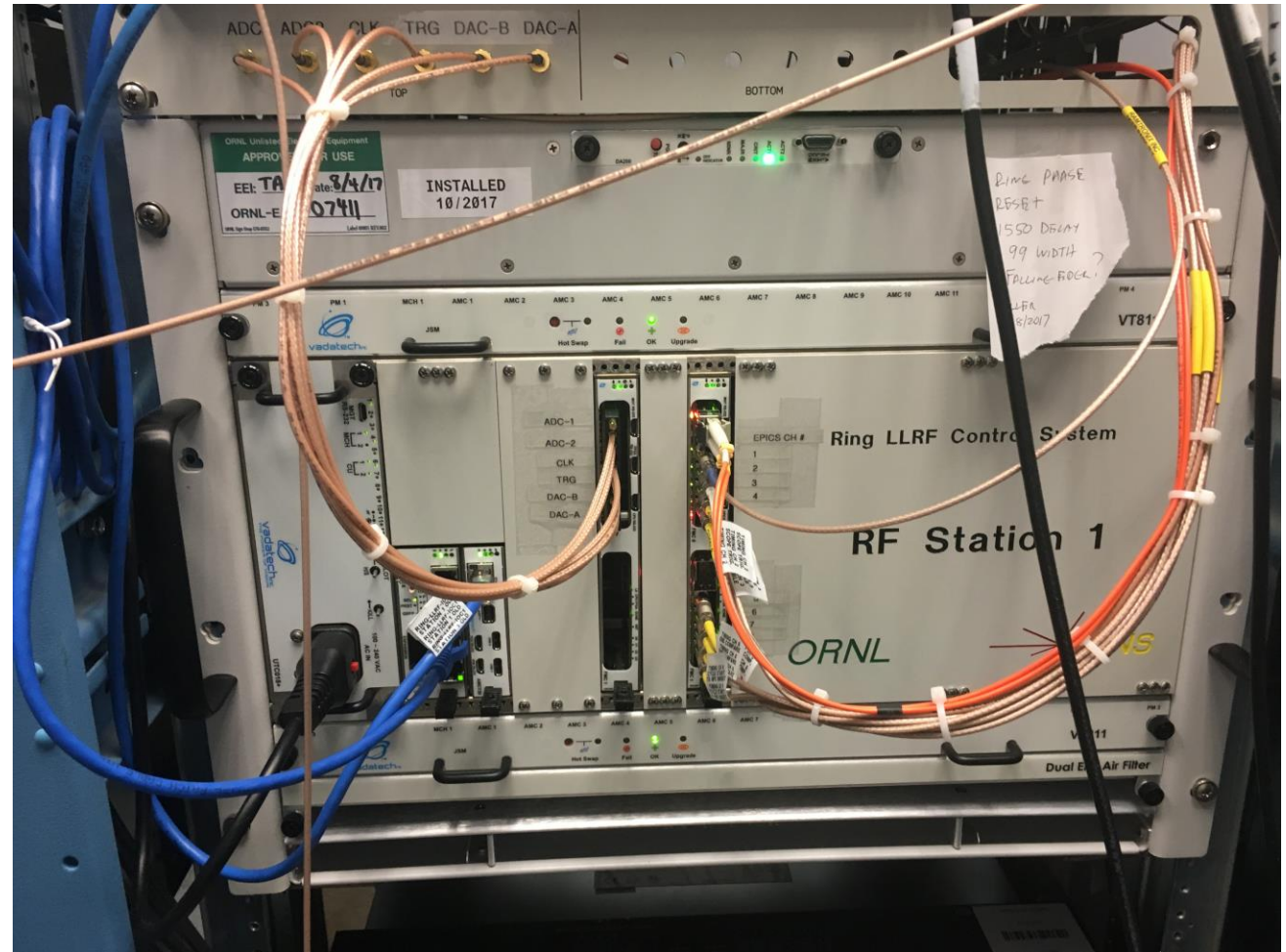


MicroTCA based Timing Applications at SNS

- Ring Low Level RF(LLRF)
- Machine Protection System(MPS)
- Magnet Power Supplies(PS) - Injection Kickers
 - Waveform Monitor
 - Waveform Generator

Ring Low Level RF

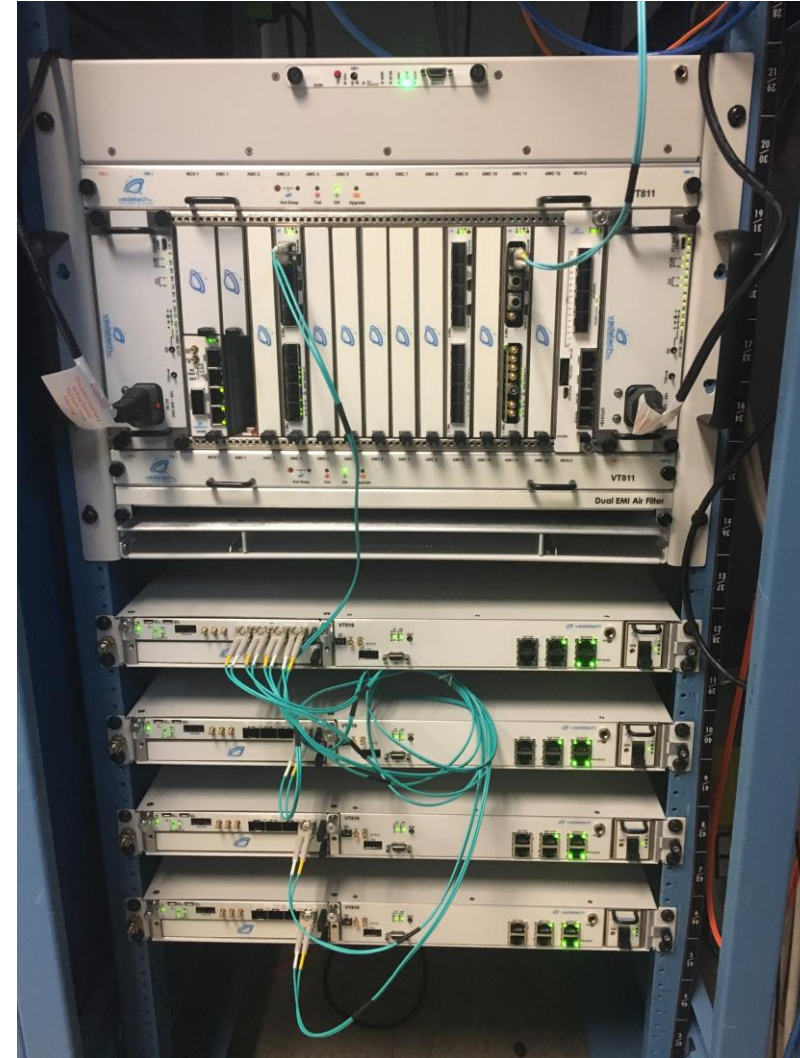
- Upgrade from VME in 2016
- First MicroTCA production deployment at SNS
- Total of 4 LLRF systems in use
- Timing Receiver FMC with LEMO connectors
- Hardware
 - Vadatech VT811 Chassis
 - Vadatech UTC002 MCH
 - Vadatech AMC502 carrier cards
 - Vadatech AMC726 Processor



Ring LLRF Station 1

Upgraded Machine Protection System

- MPS Trigger Control
 - Provides gates to the Ion Source and RFQ
- Second MicroTCA production deployment
- Replaced a “black box” Trigger Control Chassis
- Hardware
 - Vadatech VT811 Chassis
 - Vadatech UTC002 MCH
 - Vadatech UTC006 Crossbar/MCH
 - Vadatech AMC502 carrier cards
 - Vadatech AMC726 Processor



SNS MPS Master and Trigger Control

Magnet Power Supplies – Injection Kicker Waveform Monitor

- Third production deployment at SNS
- Replaced a set of Lecroy Scopes
 - Lecroy Scope model was obsolete
- Hardware
 - Vadatech VT811 Chassis
 - Vadatech UTC002 MCH
 - Vadatech AMC502 carrier cards
 - Vadatech AMC726 Processor



Injection Kicker Waveform Monitor

Magnet Power Supplies – Injection Kicker Waveform Generator

- Set to be put into production in January 2022
- Replaced Yokogawa function generator
 - Yokogawa module was obsolete
- Hardware
 - Vadatech VT811 Chassis
 - Vadatech UTC002 MCH
 - Vadatech AMC502 carrier cards
 - Vadatech AMC726 Processor



Closing

- MicroTCA will be used for future upgrades at SNS
 - Averaging 1 deployment a year
 - Leveraging MicroTCA
- Planned Future Upgrade
 - Magnet Power Supply Extraction Kicker Waveform Monitor
 - Linac LLRF
 - Machine Protection System
 - Beam Power Limiting System(BPLS)
- Extensive Deployment already in production

Questions?