



Backup LLRF System for the SNS RFQ



System Overview

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Outline



- Background (Alex)
- Scope of this work and Specification (Alex)
- System description (Larry)
- Chassis description (Marco)
- Digital board and Simulations (Larry)
- Systems Performance (Larry and Alex)
- Schedule (Alex)
- Organizational Issues and interfaces (Alex)



Background



- LBNL built and commissioned **5 LLRF systems** at 402.5 MHz for the Front End
 - 1 (spare) used in commissioning for the RFQ
 - Spare unit, customized for RF system not delivered to SNS
 - Does not include protection functions
 - Not suitable as-built for long-term operations
 - 4 for MEBT rebunchers
 - Fully operational
 - Delivered to SNS
 - Hybrid digital/analog design
 - Need Integration with the existing klystron system

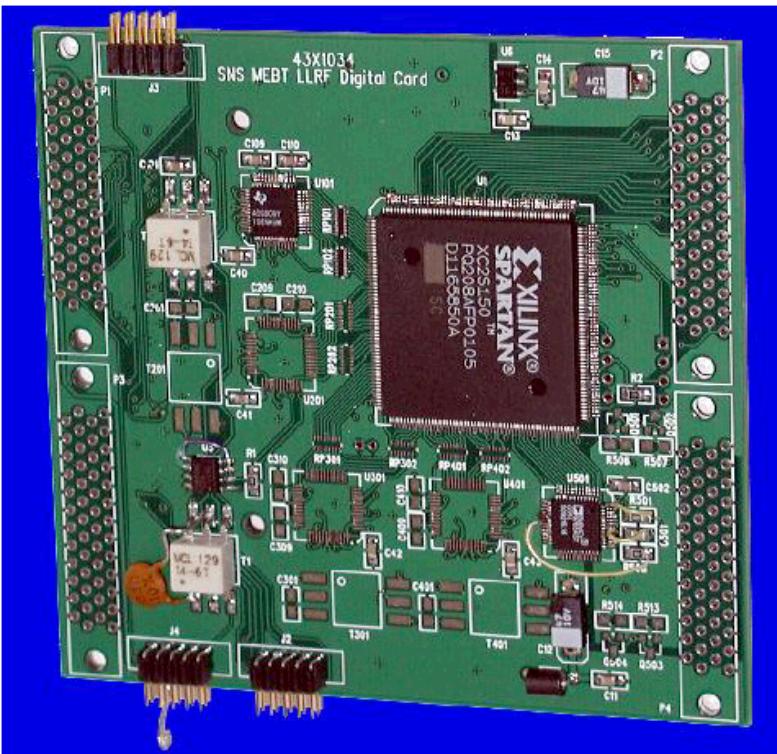


Scope of this work and Specification

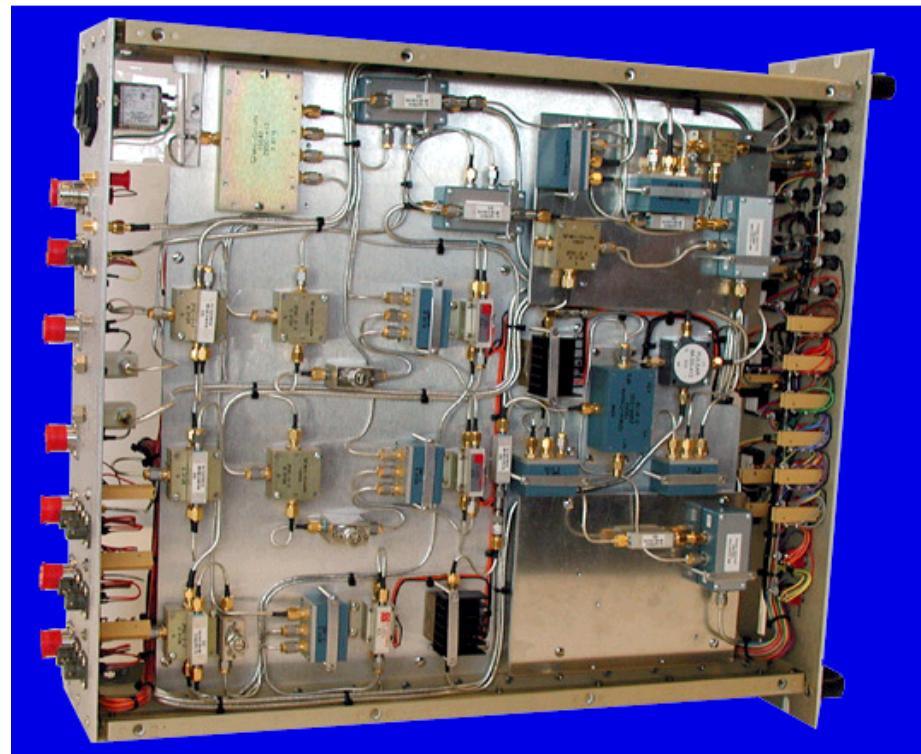


- Provide SNS a valid backup solution for the FES commissioning in November and December
- Needs to be cost effective and low risk
- Rapid Implementation leveraging the experience of the commissioning in Berkeley
- Evolution of the initial system that addresses some issues
- Scalable - easily replicable
- Fully compatible with LANL hardware so that it can be phased out at any moment
- Possibly integrate as much possible of the final SNS hardware/software/infrastructure
- Built for 1%, 1 degree accuracy

MEBT LLRF Hardware



Digital Board



RF Chassis



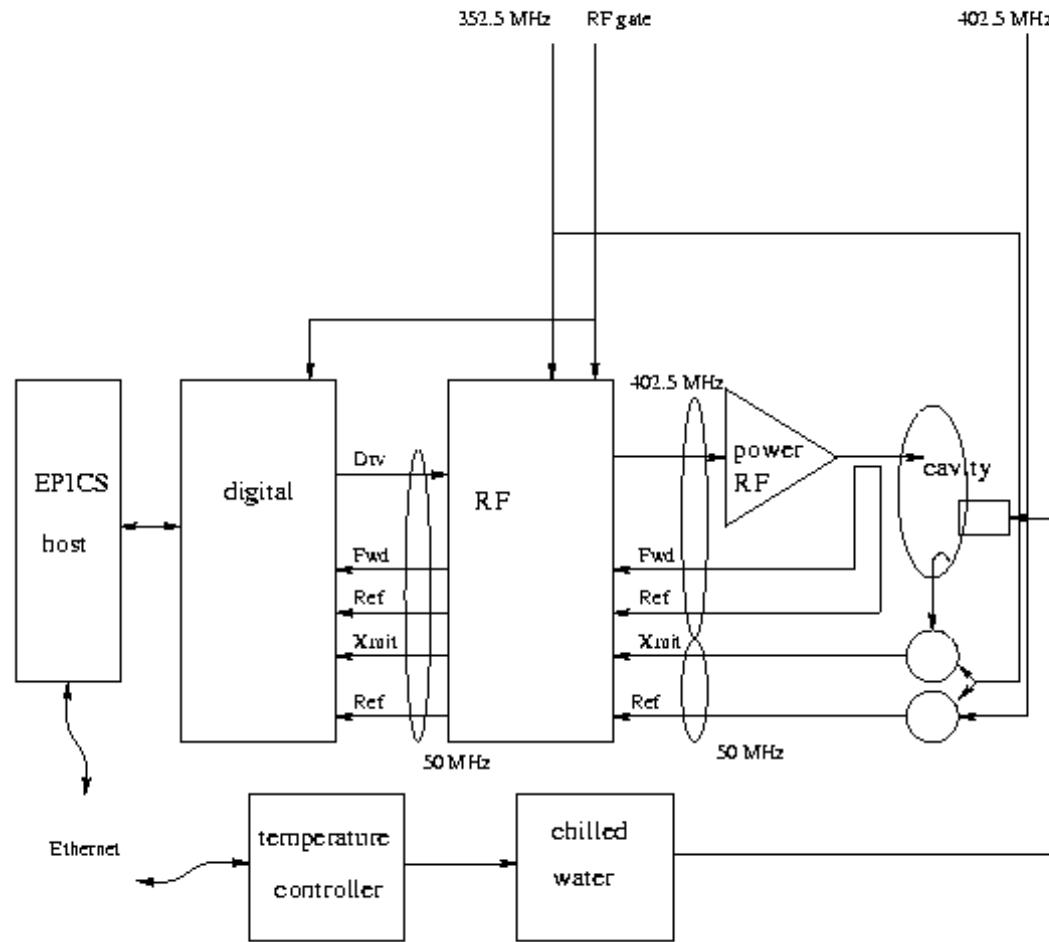
Technical Details

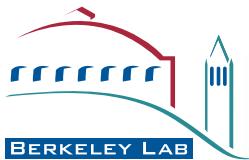


- **Design modifications** as compared to MEBT LLRF systems
 - On-board VCXO
 - Phase locked to externally provided 50 MHz reference
 - On-board synthesis of the 50 MHz output signal
 - Removal of the manual controls and readouts in the front panel
 - Rearrangement of connectors
 - Simpler chassis assembly and improved signal integrity
 - Small amount of housekeeping and system health-checking
- **New simulations needed** to accommodate specific features of new Power-RF system
- **No Event-Link and RTDL receivers included**
 - Can be added later
- **Outboard memory can be added later**
 - To process more detailed waveforms

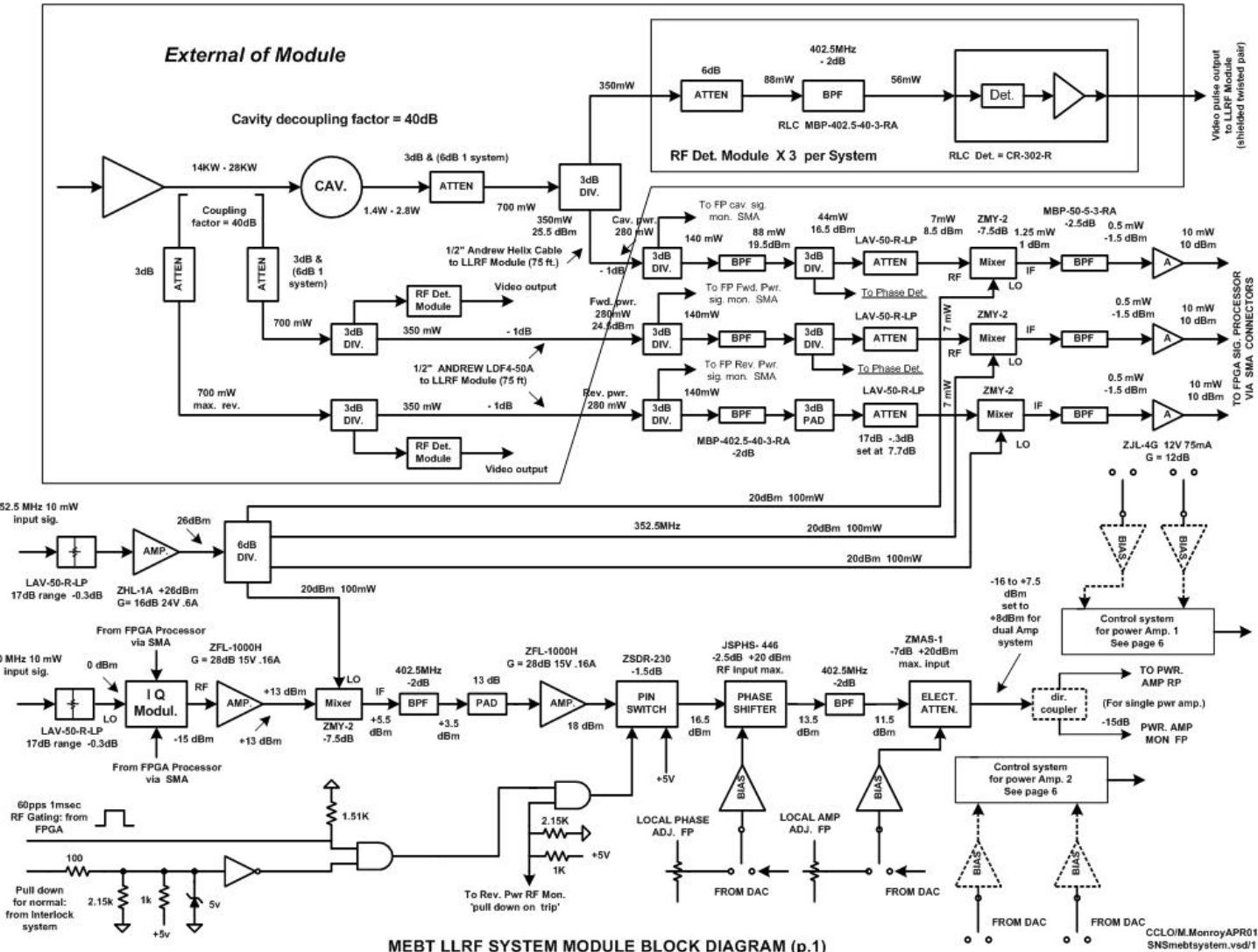


RFQ LLRF System Overview





MEBT LLRF Diagram





Commissioning Experience with FES



- Supported the FES commissioning in April/May
- Performance measurements
 - Observed about +/- 3 deg ph noise in MEBT and +/- 5 in RFQ
 - Most ph noise from “Roscoe” RF distribution system
 - Klystron at LBNL noisy and not regulated
 - Things improved when line sync'd
- Improvements being addressed here