



SPEAR3 RF EPICS Interface

- Background
- Hardware and Software
 - DM Displays
 - Other Tools



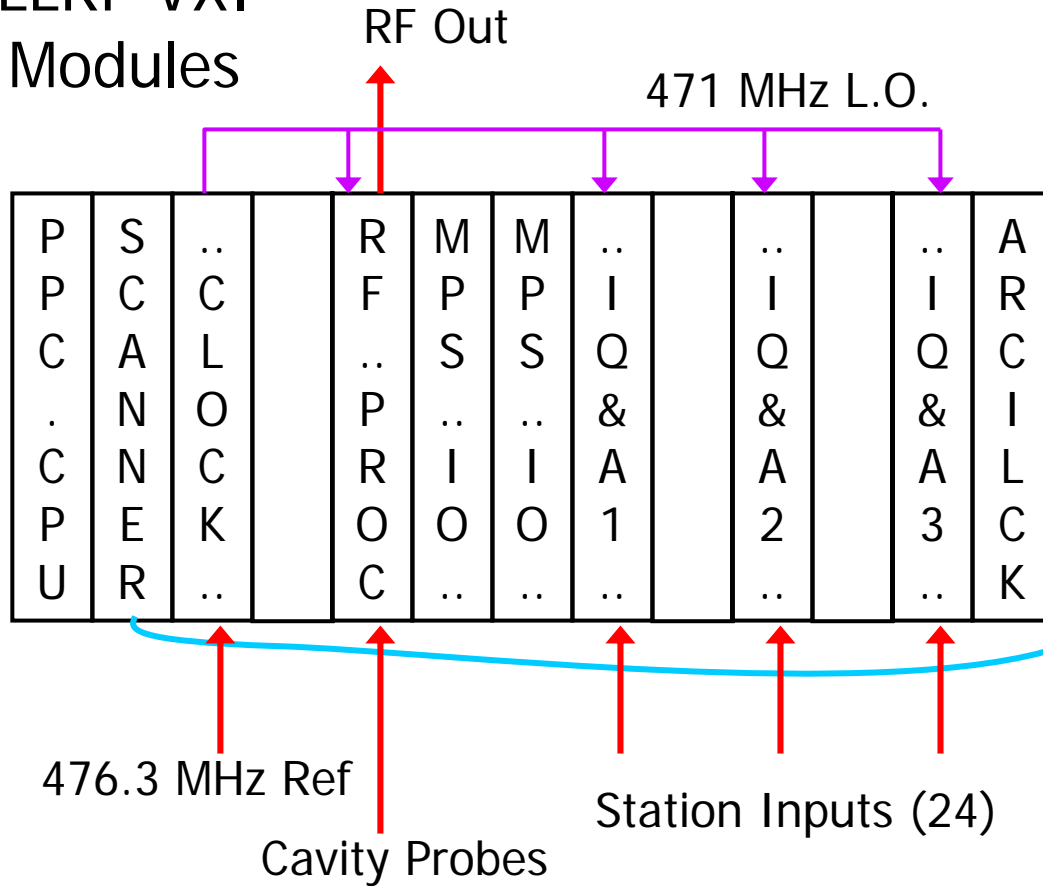
Background

- SW and HW same as PEP-II with “minor” exceptions
- Shared maintenance by PEP-II and SPEAR projects
- Notable differences from rest of SPEAR:

	SPEAR	RF
Display Tool	EDM	DM
Matlab	PC	Solaris
Real Time OS	RTEMS	VxWorks
Crate	VME	VXI
PPC	Synergy	KineticSystems
EPICS Version	3.14	3.13

Hardware Diagram

LLRF VXI
Modules



AB

RF MPS

1771 PLC, DCM,
I/O Modules

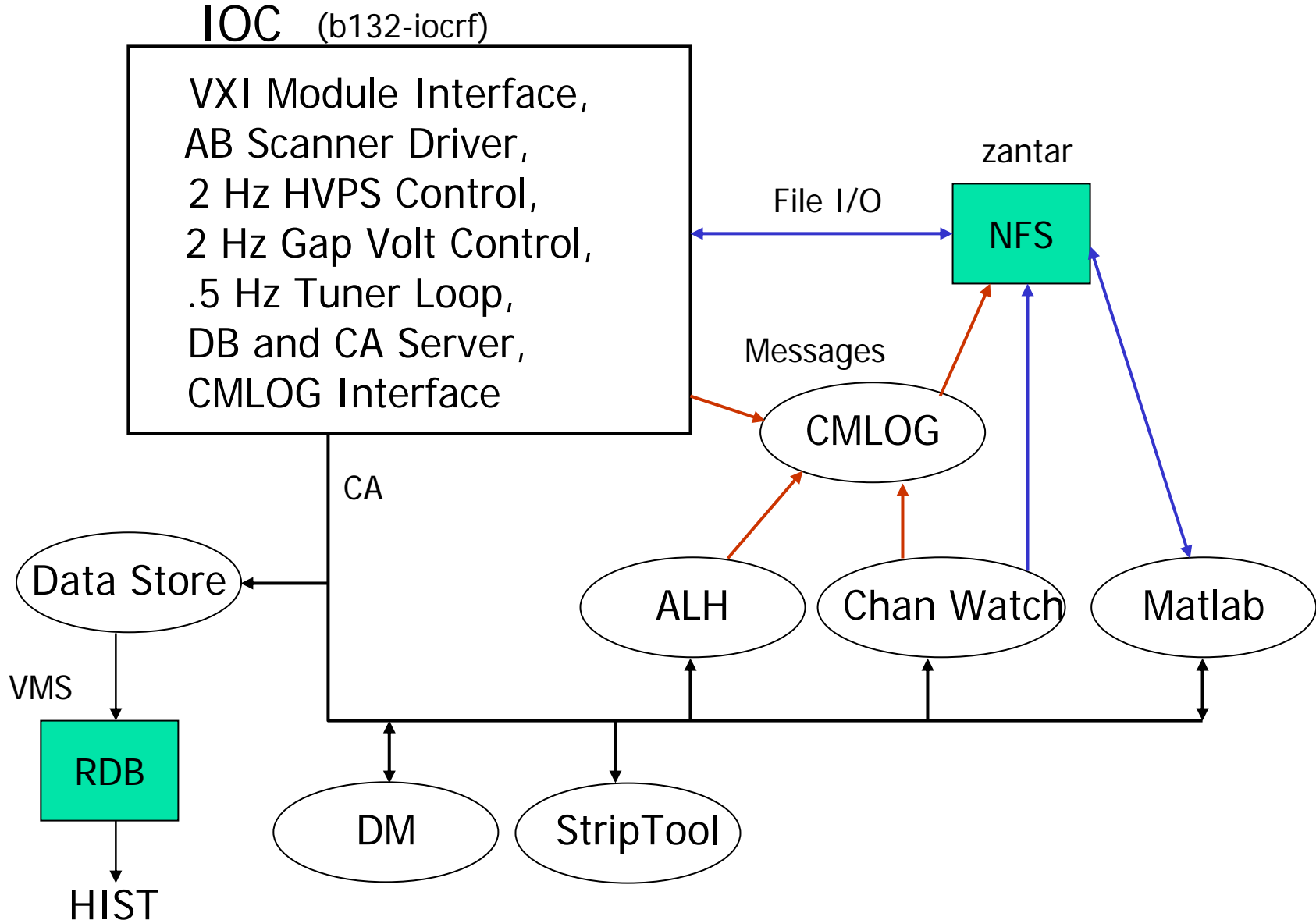
Tuner Control

1746 Stepper
Motor Cards

HVPS (B118)

1746 PLC, DCM,
I/O Modules

Software Diagram



Main Station Display

**HER RF 8-5
Station**

Beam Current (mA)
 Beam Abort

<input type="button" value="Klystron"/>	<input type="button" value="Circulator"/>	<input type="button" value="HVPS"/>	<input type="button" value="Waveguide"/>	<input type="button" value="Cavities"/>
<input type="button" value="Vacuum"/>	<input type="button" value="Flow"/>	<input type="button" value="Temps"/>	<input type="button" value="Phase/Pwrs"/>	<input type="button" value="Arc Intlks"/>
<input type="button" value="System"/>	<input type="button" value="Tuners"/>	<input type="button" value="Feedback"/>	<input type="button" value="Modu Diags"/>	

MATLAB Apps

In ON_CW. Direct/Comb loops on.

State Control:

Auto Reset Tries Left
 Max Cav Vacuum (Torr)
 Max Cav Gap Volt (kV)
 Max Klys Fwd Pwr (kW)
 HVPS Loop

Stn Online/Offline

Contactor

Stn Gap Volt (kV)
 Stn Phase (Deg)
 Swept Sine
 Beam Tickle

Clear filament faults before closing contactor.
 Drive Pwr Setpoint (W)
 High Pwr Drive Pwr (W)
 Saturatd Drive Pwr (W)

Klystron

Filament Voltage (V)
 Filament Current (Amp)
 Fila Status/Timer(Sec)
 Drive Power (W)
 Vacuum Level (Torr)
 Forward Power (kW)
 Reflected Power (kW)

HVPS Voltage Control (kV)

Max Voltage (kV)

HVPS Voltage (kV)
 HVPS Current (Amp)
 HVPS Power (kW)
 Collectr Power (kW)

<input type="button" value="Cavity A"/>	<input type="button" value="Cavity B"/>	<input type="button" value="Cavity C"/>	<input type="button" value="Cavity D"/>
<input type="text" value="DB"/> <input type="text" value="8.9e-10"/>	<input type="text" value="DB"/> <input type="text" value="7.8e-10"/>	<input type="text" value="DB"/> <input type="text" value="7.6e-10"/>	<input type="text" value="DB"/> <input type="text" value="7.2e-10"/>
<input type="text" value="DB"/> <input type="text" value="66"/>	<input type="text" value="DB"/> <input type="text" value="64"/>	<input type="text" value="DB"/> <input type="text" value="68"/>	<input type="text" value="DB"/> <input type="text" value="78"/>
<input type="text" value="DB"/> <input type="text" value="22"/>	<input type="text" value="DB"/> <input type="text" value="23"/>	<input type="text" value="DB"/> <input type="text" value="23"/>	<input type="text" value="DB"/> <input type="text" value="27"/>

Stn Gap Volt (kV)
 Cavity A Volt (kV)
 Cavity B Volt (kV)
 Cavity C Volt (kV)
 Cavity D Volt (kV)

Tuner Posn (mm)

A
 B
 C
 D

Feedback Display

HER RF 8-5
Feedback

Print Exit
Go To Help

Station Direct Lp Ripple Lp Drive Pwr Gap Volt Modu Diags

In ON_CW. Direct/Comb loops on.

Station State DB ON_CW

	Direct Loop	Comb Loop	Tuner Loop	Load Angle Offset		
Loop Control	<input checked="" type="checkbox"/> ON	<input checked="" type="checkbox"/> ON	<input checked="" type="checkbox"/> ON	<input checked="" type="checkbox"/> ON	<input checked="" type="checkbox"/> Tuners	
Loop Gain (dB)	14.8948	17.0000	HVPS Loop <input type="checkbox"/> OFF <input checked="" type="checkbox"/> PROC <input type="checkbox"/> ON		HVPS Loop Status <input checked="" type="checkbox"/> DB GOOD	
Gain Offset (dB)	0.0000	0.0000	TUNE - DAC Control - ON CW <input checked="" type="checkbox"/> ON <input checked="" type="checkbox"/> ON		DAC Control Status <input checked="" type="checkbox"/> DB GOOD	
Conv Factor	154.2517	151.5077	Direct Feedback Loop Options			
DAC Counts	<input checked="" type="checkbox"/> DB 857	<input checked="" type="checkbox"/> DB 1073	Freq Offs Tracking <input checked="" type="checkbox"/> ON	Integral Compensation <input checked="" type="checkbox"/> ON	Lead Compensation <input checked="" type="checkbox"/> ON	
Loop Phase (Deg)	3.1	1.7	Ripple Loop <input checked="" type="checkbox"/> ON <input checked="" type="checkbox"/> ON		Woofer State Kick Taxi Link OK Single TAXI sync <input type="button" value="Send"/>	
Phase Offset (Deg)	<input checked="" type="checkbox"/> DB -1.2	<input checked="" type="checkbox"/> DB 0.0	Gap FF Loop <input checked="" type="checkbox"/> ON	LFB Woofer <input type="checkbox"/> OFF		
Total Phase (Deg)	<input checked="" type="checkbox"/> DB 1.9	<input checked="" type="checkbox"/> DB 1.7	Station Phase (Deg)			
For Ramping ON: Gain Delta (dB)	0.2	5.0	Offset	5.51	Ramp Delta	0.1
Init Gain Offset (dB)	-10	-20	Base	70.10	Monitor Delta	0.1
Stn Gap Voltage (kV)	<input checked="" type="checkbox"/> DB 2301	<input checked="" type="checkbox"/> Stn Volt Plot	Total	<input checked="" type="checkbox"/> DB 74.4	Carv Freq Offset	<input checked="" type="checkbox"/> DB -1.2
Gap Volt Setpoint (kV)	2300	<input checked="" type="checkbox"/> HVPS Volt Plot	MATLAB Applications			
HVPS Voltage (kV)	<input checked="" type="checkbox"/> DB 67.81	<input checked="" type="checkbox"/> Klys Pwr Plot	<input checked="" type="checkbox"/> Meas Rippl <input checked="" type="checkbox"/> MeasDirCls			
Klys Out Fwd Pwr (kW)	<input checked="" type="checkbox"/> DB 265	<input checked="" type="checkbox"/> Drive Pwr Plot	<input checked="" type="checkbox"/> Plot Total <input checked="" type="checkbox"/> MeasBmPhs			
Drive Power (W)	<input checked="" type="checkbox"/> DB 12.0	Klys Gain (dB)	<input checked="" type="checkbox"/> DB 43.4			
Drive Pwr Setpoint (W)	12.0	Gain Setpoint (dB)	<input checked="" type="checkbox"/> DB 43.5500			
High Pwr Drive Pwr (W)	19.0	<input checked="" type="checkbox"/> MoreMATLAB				
Saturatd Drive Pwr (W)	44.0					

RF Processing Module Display

PEP-II LLRF HR85 -
RF Processing Module

Print

Exit

Help

MRST **Software Reset** STAT **NO ALARM** SEVR **NO ALARM**

Status message **Success**

MID	0x4f00	SERN	0x8003	VSCL	0xfffe
MTYP	0x7103	VERN	0x1114	A240	0x9200
				VATT	0x4
MSTT	0xc80c	ISTT	0x4007	RSTT	0x401
MCTL	0x8800	ICTL	0x3a57	RCTL	0x3e47

A16

IMSK 197 **Interrupt Acknowledgement**

No 476 MHz	Clock Error	Rip Lp Ser Lnk Err	Software
ADC Oflw	Inv State Mach Op	Invalid Op	

DAC Set Points

Ripple Loop Parameters

	DSP File	Load	Status
DSPE	/dsp/rippleRfp	Rea	DSTT NO ALARM
DDSF	/dat/ripple.dat		SDST NO ALARM
RMSZ	256 Signal I RAM	Get	Status
SIRF	/dat/DIRECT_I_CLOSED	Get	SIST NO ALARM
	Signal Q RAM	Get	Status
SQRF	/dat/DIRECT_Q_CLOSED	Get	SQST NO ALARM
	Cavity I RAM	Get	Status
CIRF	/dat/CAVITY_I	Get	CIST NO ALARM
	Cavity Q RAM	Get	Status
CQRF	/dat/CAVITY_Q	Get	CQST NO ALARM
	DAC I RAM	Load	Status
DIRF	/tbl/NOISE_I_BI_SMALL	Load	DIST NO ALARM
	DAC Q RAM	Load	Status
DQRF	/tbl/NOISE_Q_BI_SMALL	Load	DQST NO ALARM

Module Status

RF On

RF Happy

476 MHz RF reference present

80 MHz backplane clock present

40 MHz backplane clock present

10 MHz backplane clock present

Ripple backplane clock present

State machine okay

Feedback Signal I ADC in range

Feedback Signal Q ADC in range

Cavity I ADC in range

Cavity Q ADC in range

Ripple serial link okay

DSP booted

DSP memory free

Note: When ripple backplane clock is missing, turn station OFF and software reset the RFP and all IQA modules.

Data Taking Mode **Single Shot** Continuous Mode **Stop**

State **Reset** **Load** **Rea**

Feedback Signal **Total** Cavity Selector **4** Dacs Control **On** **Noise 1**

Lead Comp **On** Integral Comp **On** Analog Ripple Loop **Not Active**

Direct Loop

On

Comb Loop

On

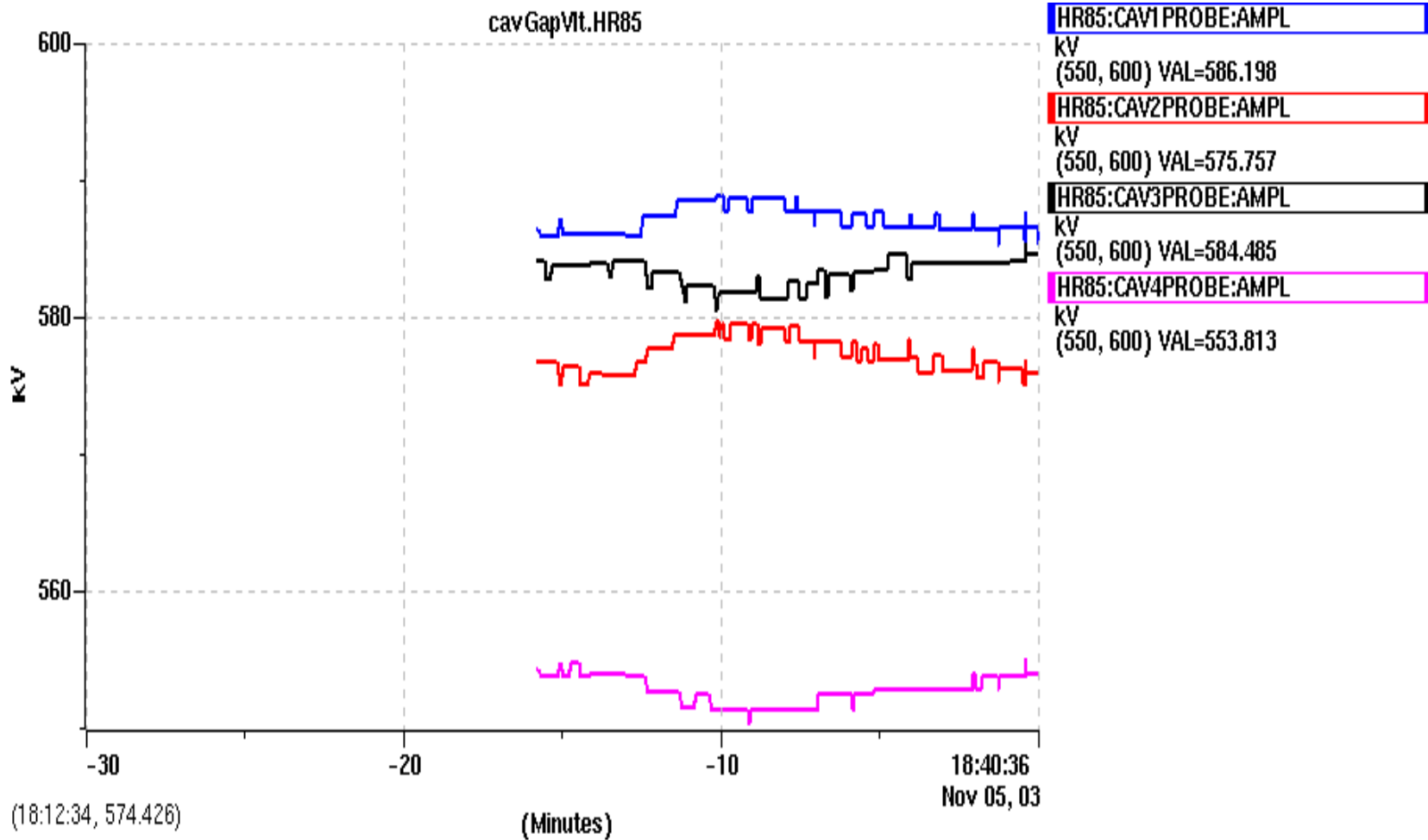
DSP Ripple Loop

with RF ON

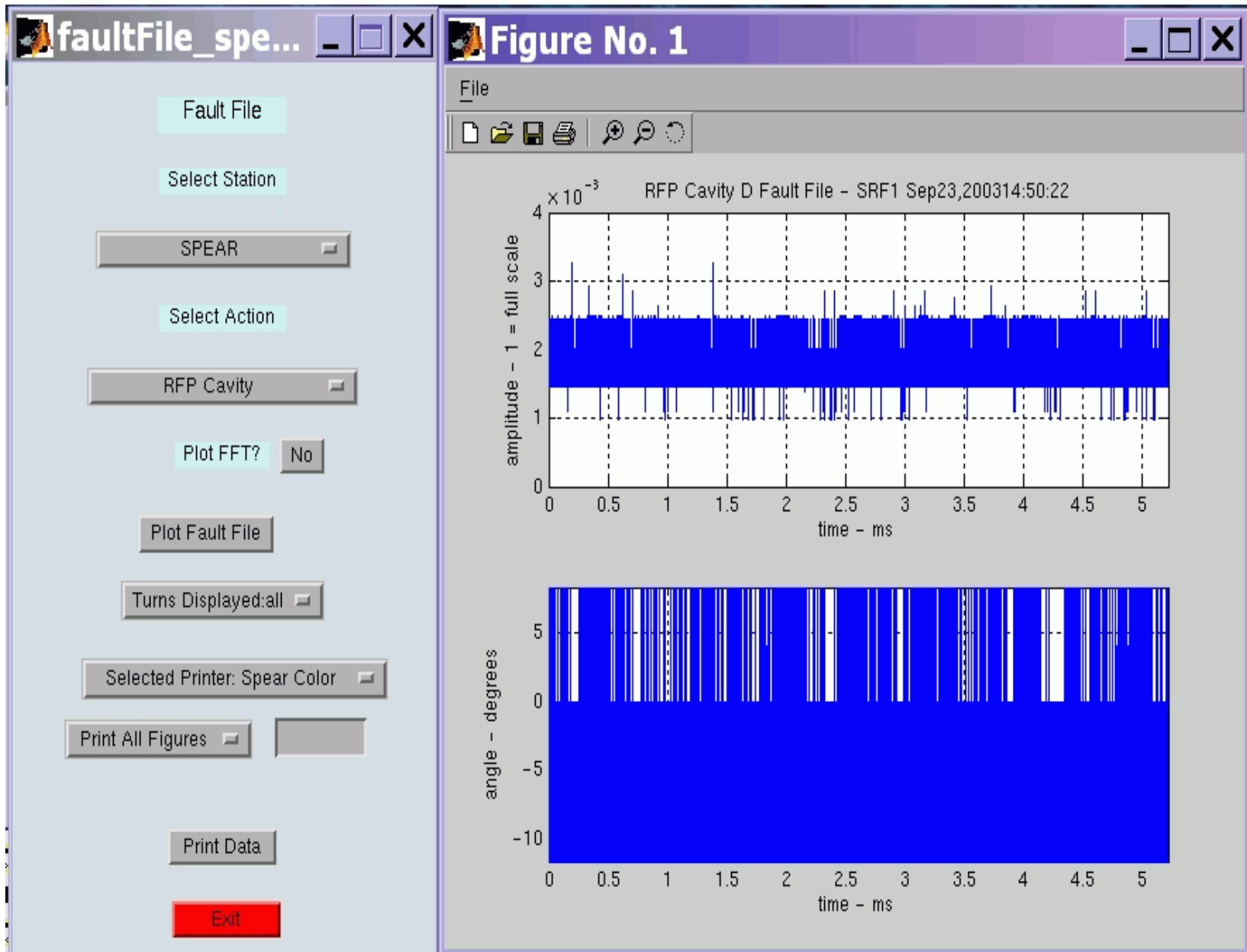
On

RF Status **On** Fault **Reset** Mode **Operate** RF **On**

StripTool Display



Matlab GUI



CMLOG Browser

<u>F</u> ile	<u>O</u> ptions	<u>P</u> references				<u>H</u> elp
<i>Sys</i>	<i>Host</i>	<i>Time</i>	<i>Status</i>	<i>Sevr</i>	<i>Message</i>	
Channel Watcher	b132-iocrf	Wed Nov 5 17:37:47 2003	NO_ALARM	NO_ALARM	SRF1:STN:VOLT:CTRL changed from 2200 to 3300	
Channel Watcher	b132-iocrf	Wed Nov 5 17:38:37 2003	NO_ALARM	NO_ALARM	SRF1:STN:VOLT:CTRL changed from 3300 to 440	
Channel Watcher	b132-iocrf	Wed Nov 5 17:38:41 2003	NO_ALARM	NO_ALARM	SRF1:STN:VOLT:CTRL changed from 440 to 3500	
Channel Watcher	b132-iocrf	Wed Nov 5 17:43:16 2003	STATE	MAJOR	SRF1:HVPS:LOOP:CTRL changed from ON to OFF	
cmlogServer	prymatt	Wed Nov 5 18:31:13 2003	N/A	N/A	Received browser connection from host prymatt.slac.stanford.edu at port 21	
cmlogServer	prymatt	Wed Nov 5 18:31:13 2003	N/A	N/A	Received user saa launched browser from prymatt.slac.stanford.edu with pro	

Wed Nov 5 18:35:28 2003 From Tue Nov 4 18:31:20 2003 To Wed Nov 5 18:31:20 2003

Select time interval to query the server

From		To	
Year	2003	Year	2003
Month	November	Month	November
Day	4	Day	5
Hour	18	Hour	18
Minute	31	Minute	31
Second	20	Second	20

Server searching message

 Get all messages
200

Number of messages to search

Ok

Reset

Cancel

Alarm Browser

File Action View Setup Help

- V **SPR** ▶ <-DA-L> (0,243,2,0,12)
 - V **SPR_RF** ▶ G <-DA-L> (0,243,2,0,12)
 - V **ARC** G <--A--> (0,14,0,0,0)
 - V **CAVA** G <--A--> (0,32,0,0,0)
 - V **CAVB** G <--A--> (0,32,0,0,0)
 - V **CAVC** G <--A--> (0,32,0,0,0)
 - V **CAVD** G <--A--> (0,32,0,0,0)
 - V **CIRC** G <--A--> (0,10,0,0,0)
 - V **DIAG** G <-DA-L> (0,3,2,0,5)
 - V **HVPS** G <-DA-L> (0,24,0,0,5)
 - V **KLYS** G <--A--> (0,32,0,0,0)
 - V **SYS** G <-DA-L> (0,5,0,0,2)
 - V **WG01** G <--A--> (0,9,0,0,0)
 - V **WG02** G <--A-L> (0,9,0,0,0)
 - V **WG03** G <--A-L> (0,9,0,0,0)
 - V **SRF1:CAV1 FRWD:POWER:FRST** <--A--> <LINK,INVALID>
 - V **SRF1:CAV1 REFL:POWER:FRST** <--A--> <LINK,INVALID>
 - V **SRF1:CAV1 PROBE:AMPL:FRST** <--A--> <LINK,INVALID>
 - V **SRF1:CAV1 WATR:TEMP:FRST** <--A--> <UDF,INVALID>
 - V **SRF1:CAV1 WATRRTN:TEMP:FRST** <--A--> <UDF,INVALID>
 - V **SRF1:CAV1 WATR:FLOW:FRST** <--A--> <UDF,INVALID>
 - V **SRF1:CAV1 WNDW:TEMPULIM:FRST** <--A--> <UDF,INVALID>
 - V **SRF1:CAV1 WGFERR:TEMP:FRST** <--A--> <UDF,INVALID>
 - V **SRF1:CAV1 TUNRBL:TEMP:FRST** <--A--> <UDF,INVALID>
 - V **SRF1:CAV1 TUNRMV:TEMP:FRST** <--A--> <UDF,INVALID>
 - V **SRF1:CAV1 TUNRFX:TEMP:FRST** <--A--> <UDF,INVALID>
 - V **SRF1:CAV1 HOM1:TEMP:FRST** <--A--> <UDF,INVALID>
 - V **SRF1:CAV1 HOM2:TEMP:FRST** <--A--> <UDF,INVALID>
 - V **SRF1:CAV1 HOM3:TEMP:FRST** <--A--> <UDF,INVALID>
 - V **SRF1:CAV1 BD01:TEMP:FRST** <--A--> <UDF,INVALID>
 - V **SRF1:CAV1 BD02:TEMP:FRST** <--A--> <UDF,INVALID>
 - V **SRF1:CAV1 BD03:TEMP:FRST** <--A--> <UDF,INVALID>
 - V **SRF1:CAV1 BD04:TEMP:FRST** <--A--> <UDF,INVALID>

Execution Status: Local Passive

Mask <CDATL>: <Cancel,Disable,noAck,noackT,noLog>

Group Alarm Counts: <ERROR,INVALID,MAJOR,MINOR,NOALARM>

Channel Alarm Data: <Status,Severity>,<Unack Severity>

Filename: /afs/slac/g/spear/epics/app/rf/ref/app/ah/config/SRF_ahConfig

SilenceOneHour

SilenceCurrent

Silence Forever: Off

Beep Severity: MINOR