The Status of Various SNS Diagnostic Devices

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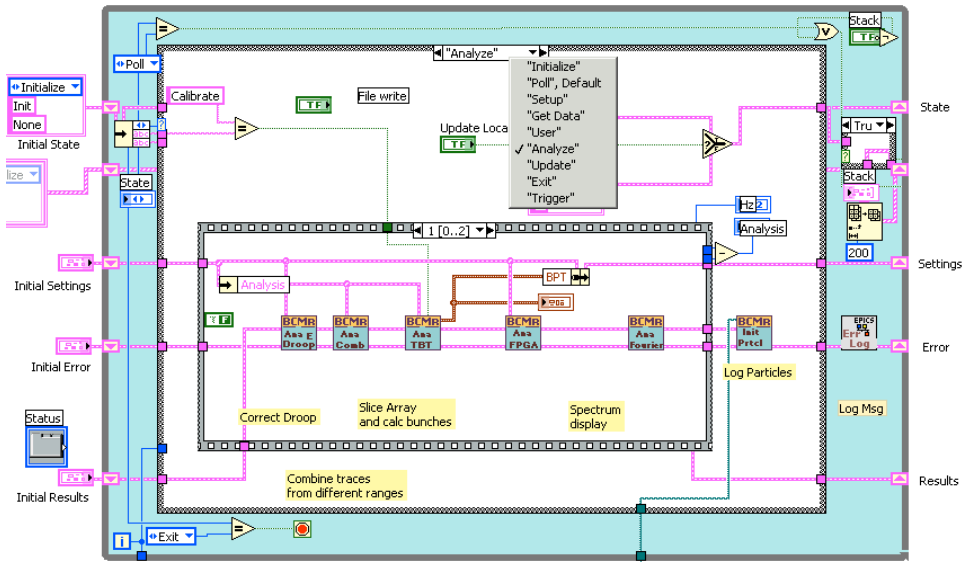
Diagnostics Systems

Diagnostics Systems	Type	IOCs
Beam Position Monitor	PC	162
Beam Loss Monitor	VME	16
Beam Loss Data Concentrator	PC	3
Fast Beam Loss Monitor	PC	12
Neutron Detector	PC	7
Beam Current Monitor	PC	22
Beam Charge Integrator	VME	2
Wire Scanner	PC	42
Laserwire	PC	31
Faraday Cup	PC	3
Beam Stop	PC	1
Timing System	PC	13
Chumps	VME	1
Harp	PC	1
Beam Shape Monitor	PC	2
Video Foil Monitor	PC	1
Spark Detector	PC	4
MEBT Video	PC	1
Residual Gas Monitor	PC	1
Emittance Scanner	PC	2
Data Collection and Publishing	PC	4
Support: Configuration File Management	PC	-

There are ~300 IOCs:

- VME with VxWorks
- PC with LabVIEW/XP



State machine template

Configuration File Management System

What is a configuration file?
- holds calibration values
- data-acquisition settings
- analysis setup
- names

Why have configuration file management?
- makes your management less jumpy
- makes your job easier

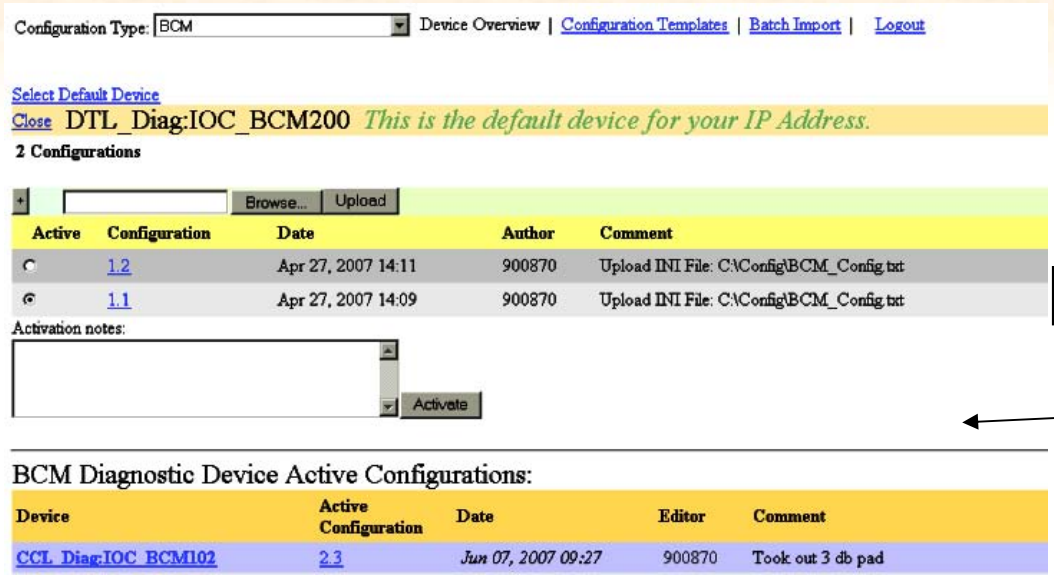
Management is more than backup
- version control
- authorization
- copy to and from storage

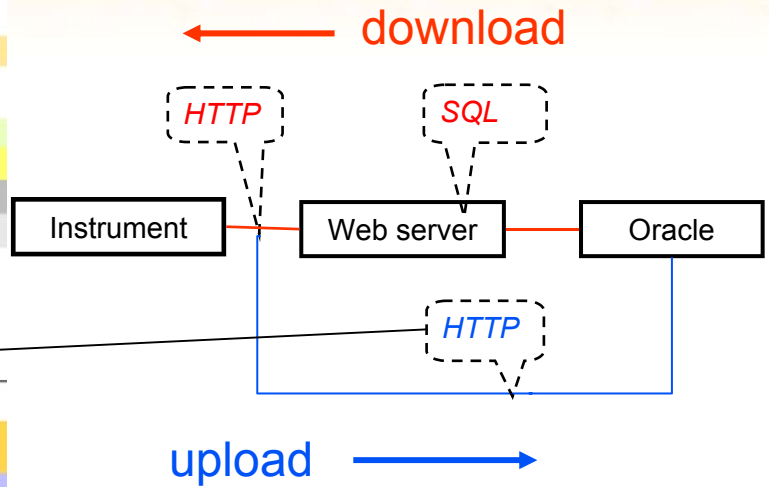
```
[Comments]
Purpose         = "Initial values for the BPM program"
Version         = 1.2.0 11/15/04"
Detector        = "SCL_Diag:BPM04"
Serial          = "10"

[SM]
Client          = "EPICS"
Version         = "3.14b2"
Security        = "Diagnostics.acf"
Sys_Sub         = "SCL_Diag"
IOC             = "IOC_BPM04"
A               = "BPM04"
B               = "None1"
C               = "None2"
TaskList        = "C:\\Vis\\TIME\\TIME_Task.vi"
PVList          = "C:\\Vis\\TIME\\TIME_Init_GetPVs.vi"

[BPM]
X0              = 0.045448
x1              = 18.235
x2              = 0
XY2             = 0
Y0              = -0.068517
Y1              = 18.248
Y2              = 0
.................
```

Configuration File Management System





Initially:

- Use web browser from instrument or office to edit configuration files
- Use web server to query database: VxWorks and LabVIEW clients

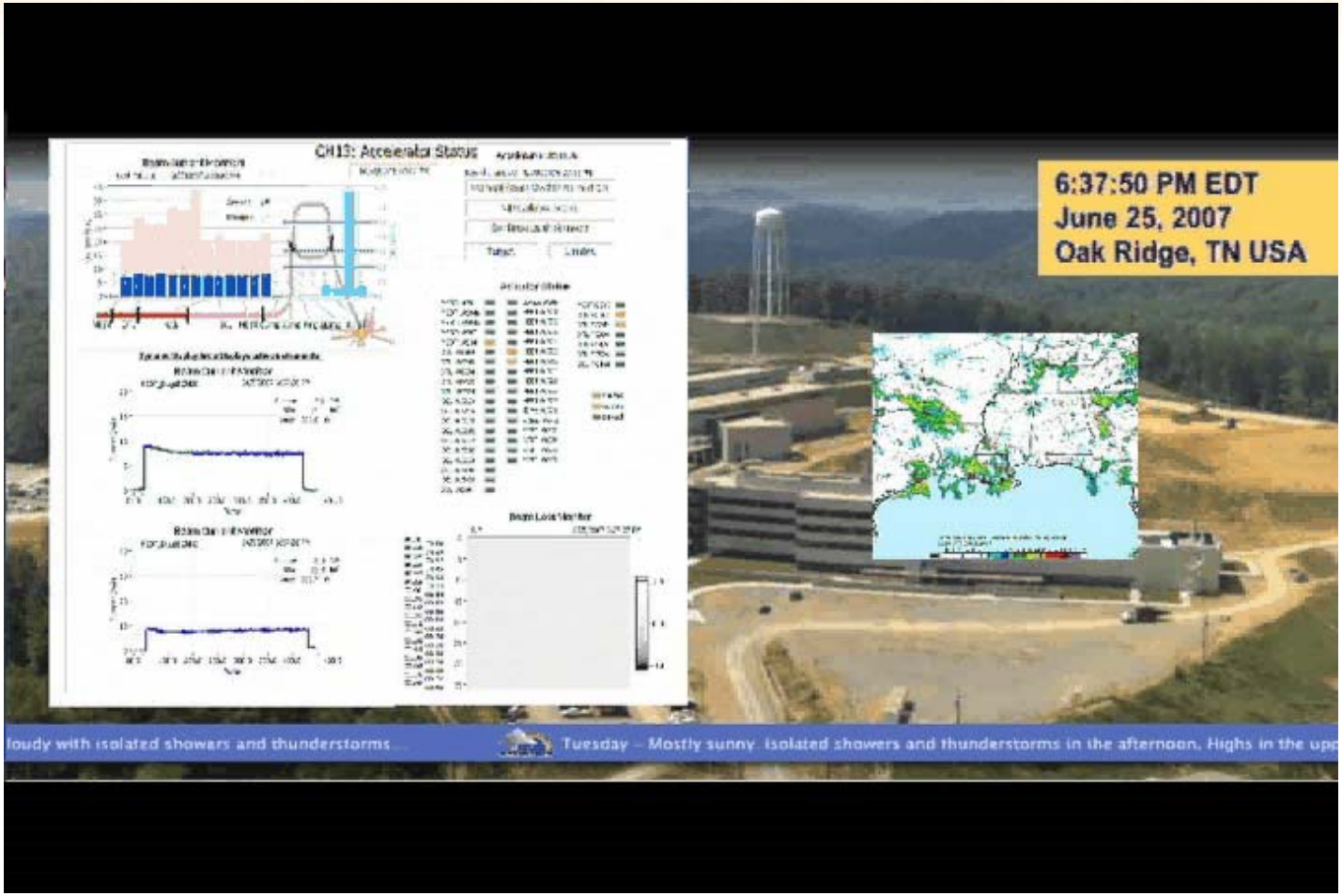
But: Nice for management, more work than using scripts to copy files

Added:

- Upload file or group of files and have database routines parse all fields
- Match IP address of browser client with specific instrument

---> Better for users too. Goals reached --> freeze development

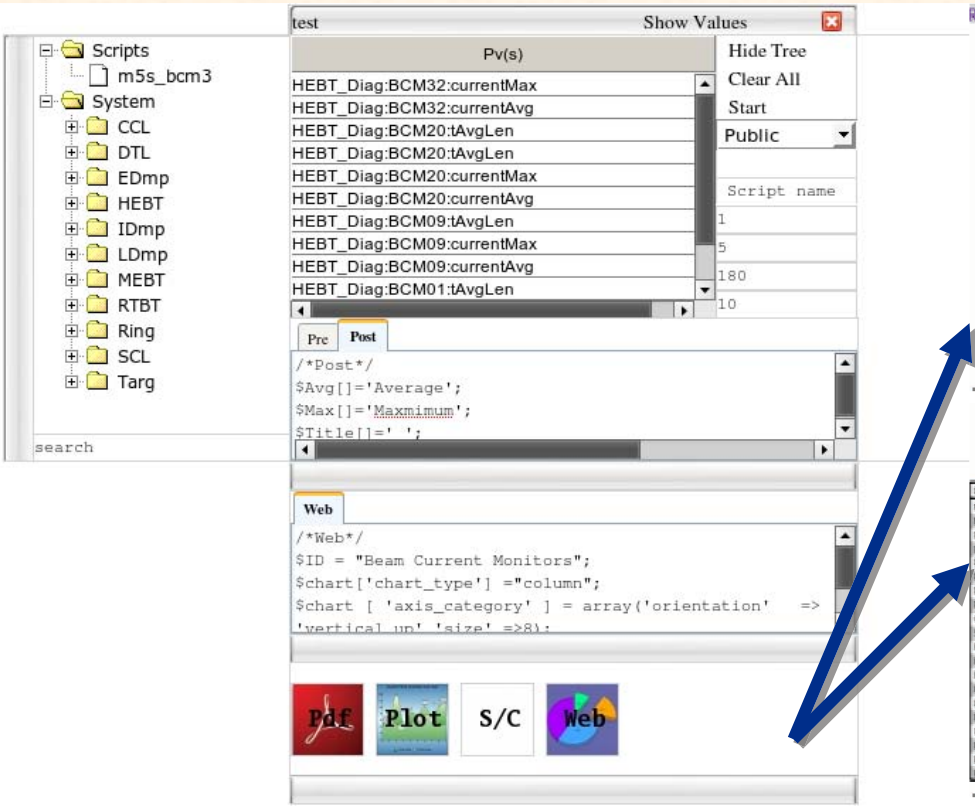
Data Collection and Publishing

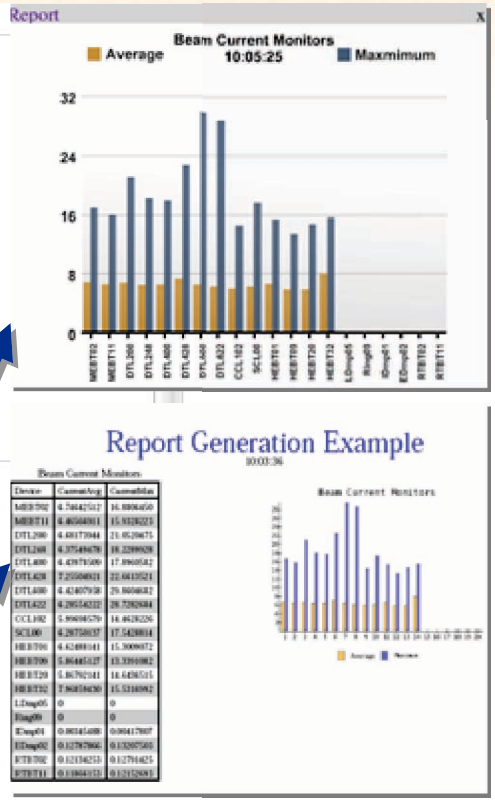


The goal is to summarize accelerator related data for use in the control room, office and home.

- kiosk displays
- web pages
- consoles

Data Collection and Publishing





- mySQL
- PHP
- JavaScript
- Flash

Provide a user-interface to:

- selects what data to acquire
- how to process the data
- how to publish the data

Next phase, move to Oracle:

- re-use available Physics code
- cluster maintenance done by IT

Beam Current Monitors

Software changes to simplify software as we move from commissioning to production -> flexible/additional features versus simple/easy to maintain:

a) Rely on improved timing system to align with mini-pulses

b) Exact same software for each BCM type (linac <-> ring/rtbt)

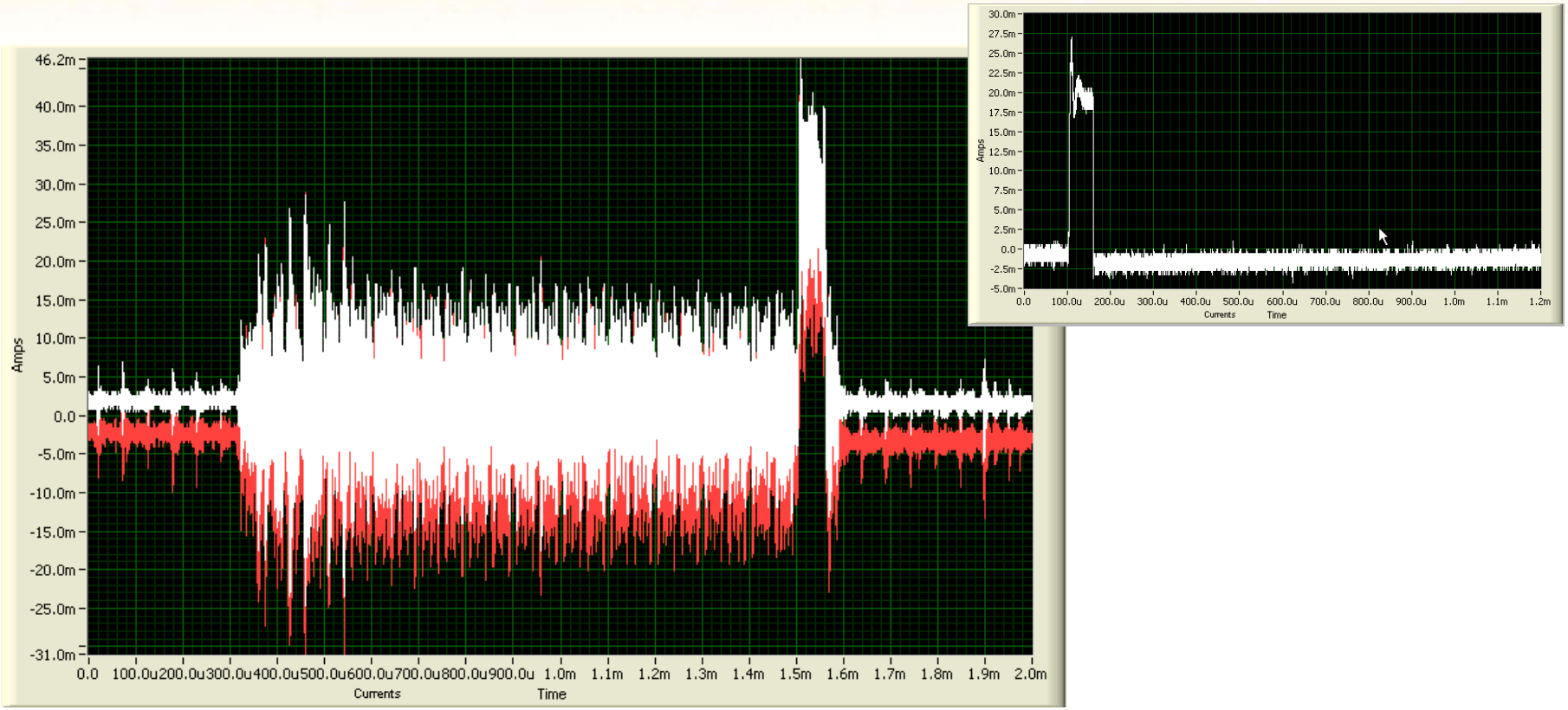
---> **Easier maintenance, move to freezing systems**

---> Plan to use Group Controller for performance analysis

Any problems? Maybe just a bit noisy:

- Unfortunate grounding scheme of toroids in DTL cavities
- Lots of excellent noise sources: switching power supplies, Source RF

Beam Current Monitors

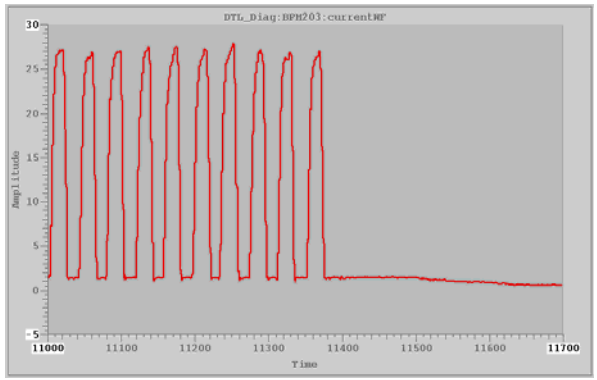


DTL BCM200 signal. The insert shows a much cleaner signal from CCL BCM102.

Beam Current Monitors

Noise investigation is a work in progress:

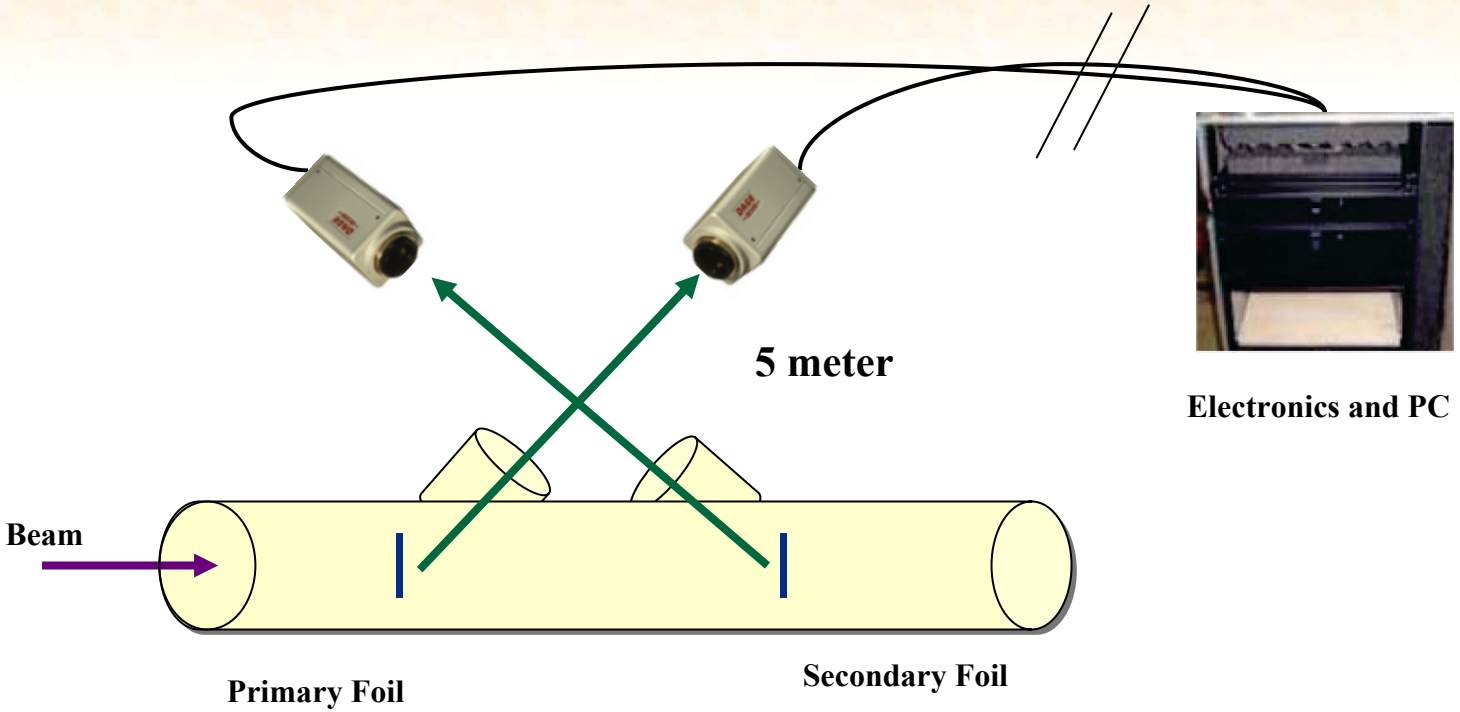
- Amplifier in tunnel doesn't help
- Choke doesn't help



Alternatives:

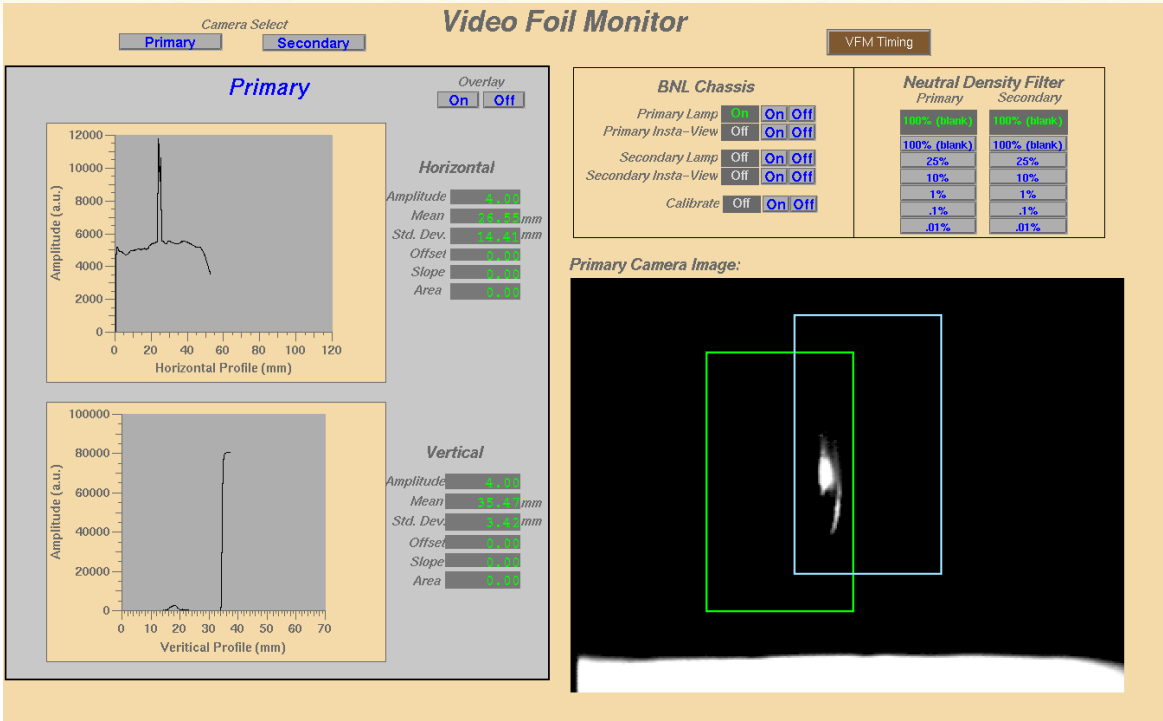
- Use BPMs for current waveform (narrow band)
- Signal processing cleans up waveform but distorts
- Replace toroids (long, long term).

Video Foil Monitor



- LabVIEW-based data-acquisition and analysis on rack-mounted PC, designed and delivered by BNL, software finalized by SNS
- Required to position the foil during start of run

Video Foil Monitor

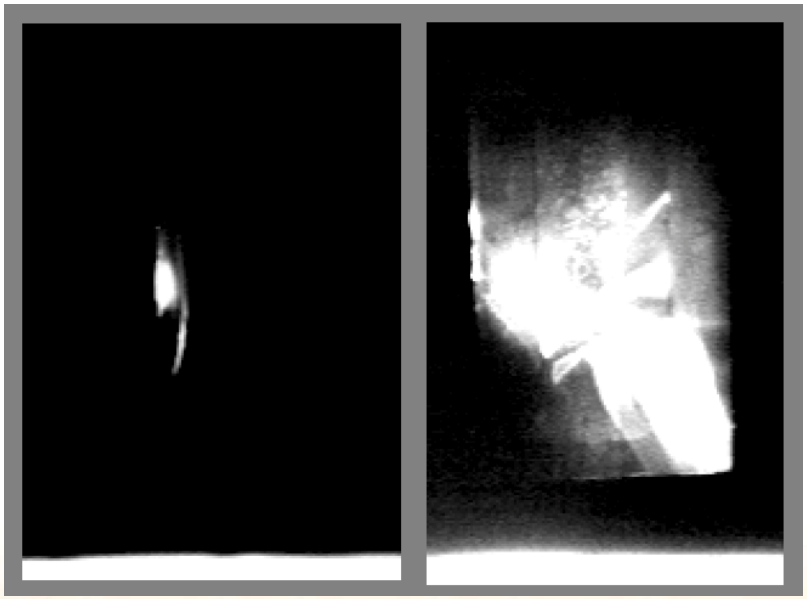


Problem: Where is the Foil?

Image had deteriorated so much that only a small part of the foil (diamond) was to be seen

Video Foil Monitor

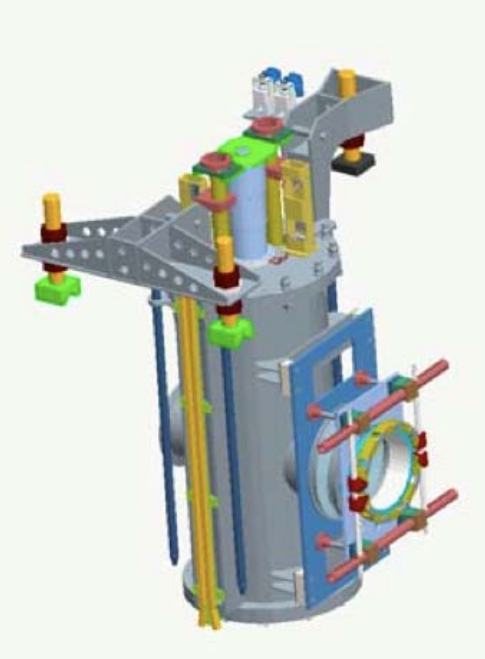
- **Is it the software?** Revert code and see if it makes a difference -> No
- **Is it the lamp?** Check light source alignment and power: realigned and more light
- **Is it the foil?** Sometimes image ok other times bad. Check foil reflection: up to 90% of light reflects like a mirror -> curves in foil and position/angle of foil matter
- **Is it the electronics?** Check electronics: BNL document (Dave Gassner) on adjusting video gain! -> big improvement



Harp

Designed as a retractable fork with 32 wires each for the horizontal, vertical, and diagonal plane

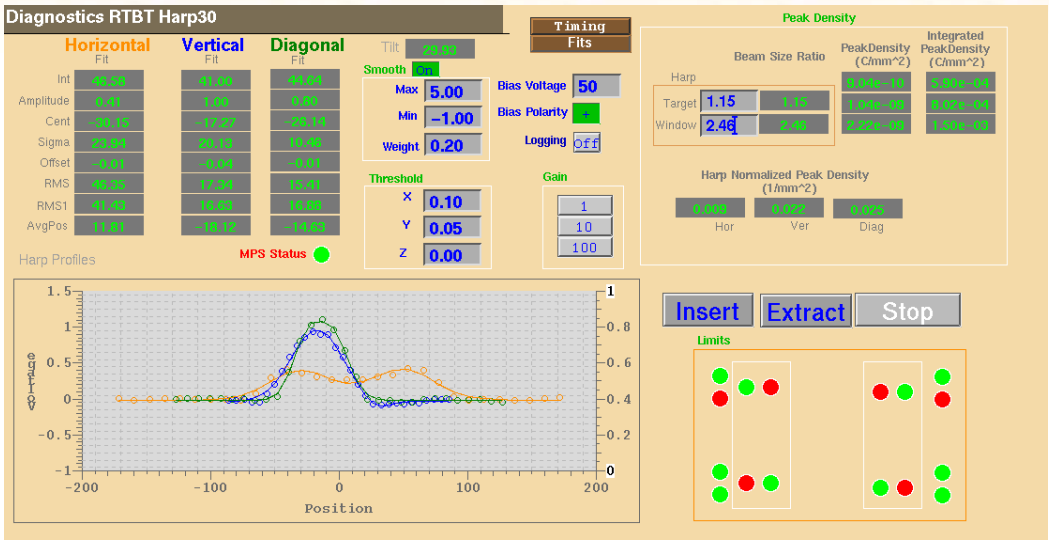
- Last transverse profile instrument before target
- LabVIEW-based system with CompactRIO with FPGA for insertion control

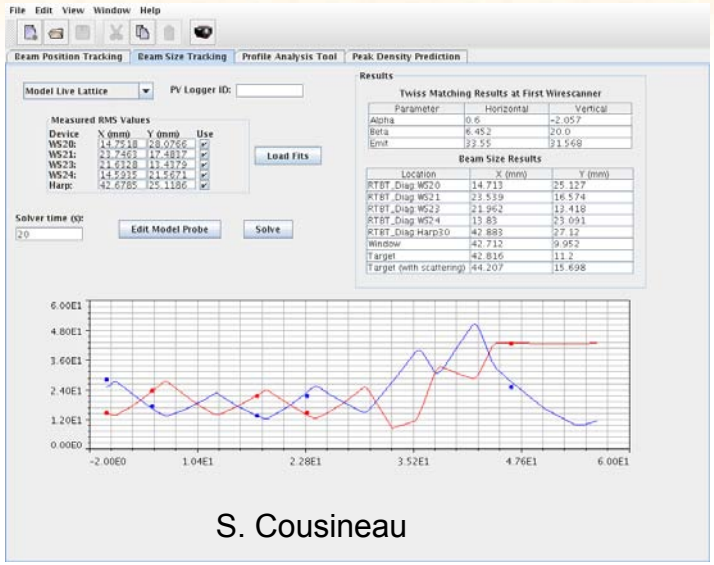


Calculations and experience showed that harp can be left inserted even at full power but with limited life-time. Longevity of bellows questionable.

-> Leave harp inserted, move on to commissioning other systems. Revisit later.

Harp





S. Cousineau

Now the harp profiles are always available during beam -> use the harp to predict peak intensities on target and window during runs to calculate longevities.

- Peak density code in harp program to be able to continuously calculate and log
- RTBT Wizard program (Physics app) to calculate projection factors

Summary

- Focus on using Oracle relational database
- Finalizing of software with focus on production runs
- Getting to know the instruments