

# The Status of Various SNS Diagnostic Devices

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SNS

Oak Ridge, TN  
U.S.A.

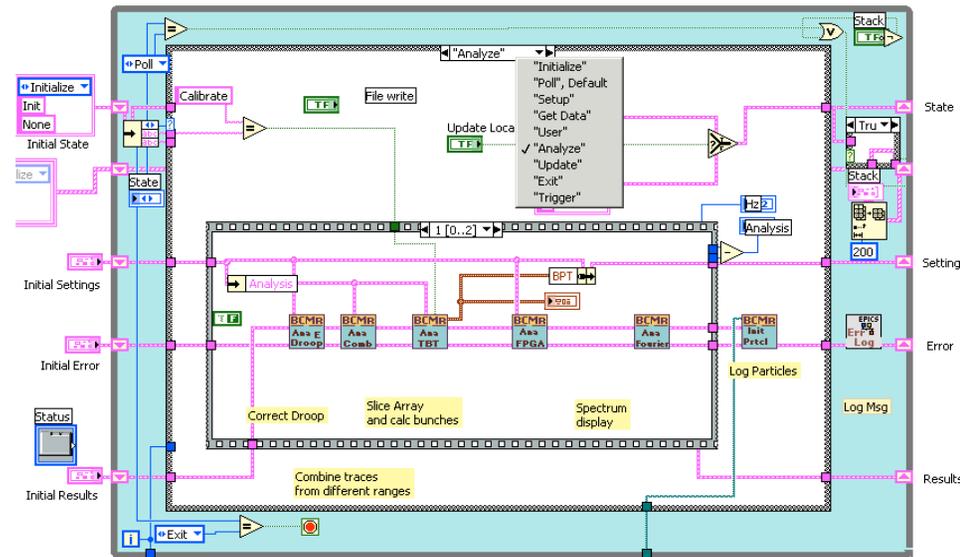


# Diagnostics Systems

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"
PVLlist     = "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

Configuration Type:  Device Overview | [Configuration Templates](#) | [Batch Import](#) | [Logout](#)

[Select Default Device](#)  
[Close](#) DTL\_Diag:IOC\_BCM200 *This is the default device for your IP Address.*

2 Configurations

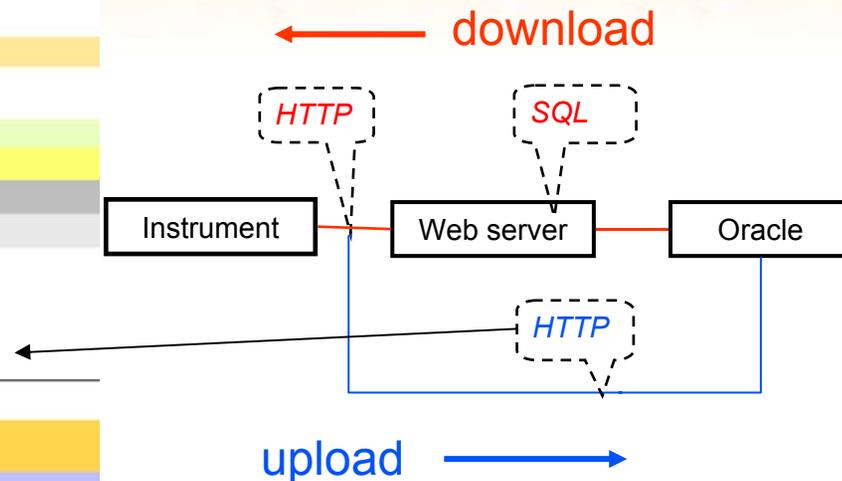
Active	Configuration	Date	Author	Comment
<input type="radio"/>	<a href="#">1.2</a>	Apr 27, 2007 14:11	900870	Upload INI File: CAConfig\BCM_Config.txt
<input type="radio"/>	<a href="#">1.1</a>	Apr 27, 2007 14:09	900870	Upload INI File: CAConfig\BCM_Config.txt

Activation notes:

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BCM Diagnostic Device Active Configurations:

Device	Active Configuration	Date	Editor	Comment
<a href="#">CCL Diag:IOC BCM102</a>	<a href="#">2.3</a>	Jun 07, 2007 09:27	900870	Took out 3 db pad



## 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**



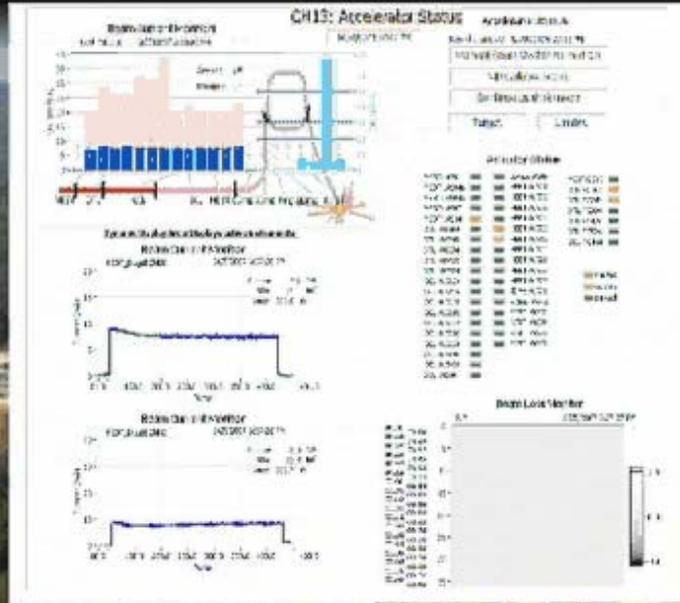
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# Data Collection and Publishing

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

- kiosk displays
- web pages
- consoles



6:37:50 PM EDT  
June 25, 2007  
Oak Ridge, TN USA



loudly with isolated showers and thunderstorms

Tuesday - Mostly sunny. Isolated showers and thunderstorms in the afternoon. Highs in the upper

# Data Collection and Publishing

DiagNo	CurrentAvg	CurrentMax
MEBT02	4.7642712	14.8094630
MEBT11	4.8648911	15.9332623
DTL200	4.4817394	15.8529675
DTL210	4.3754476	14.2289328
DTL400	4.4797500	17.8905542
DTL420	7.2056831	22.6433521
DTL430	4.4240738	29.8606882
DTL432	4.2854322	28.7592984
CCL180	5.9949379	14.4623226
SCL40	4.2873825	17.5426884
HEBT01	4.4248911	15.3669372
HEBT06	5.3644522	15.7391882
HEBT20	5.8679241	14.4426515
HEBT32	7.9693830	15.5318982
LDmp05	0	0
Ring00	0	0
EDmp01	0.9814149	0.9841797
EDmp02	0.1279746	0.1305980
EDmp03	0.1234253	0.1271435
EDmp11	0.1044173	0.1122643

- 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



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# 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:**

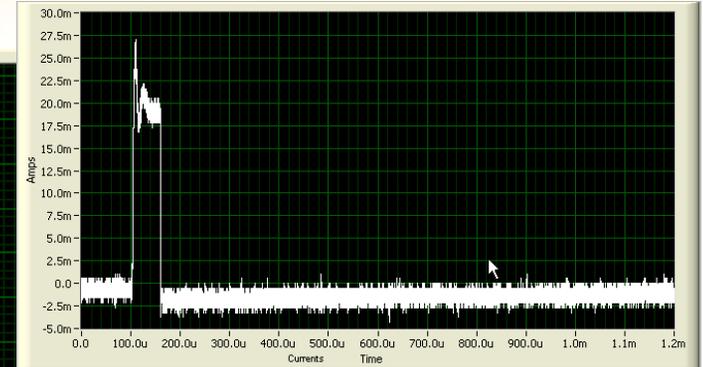
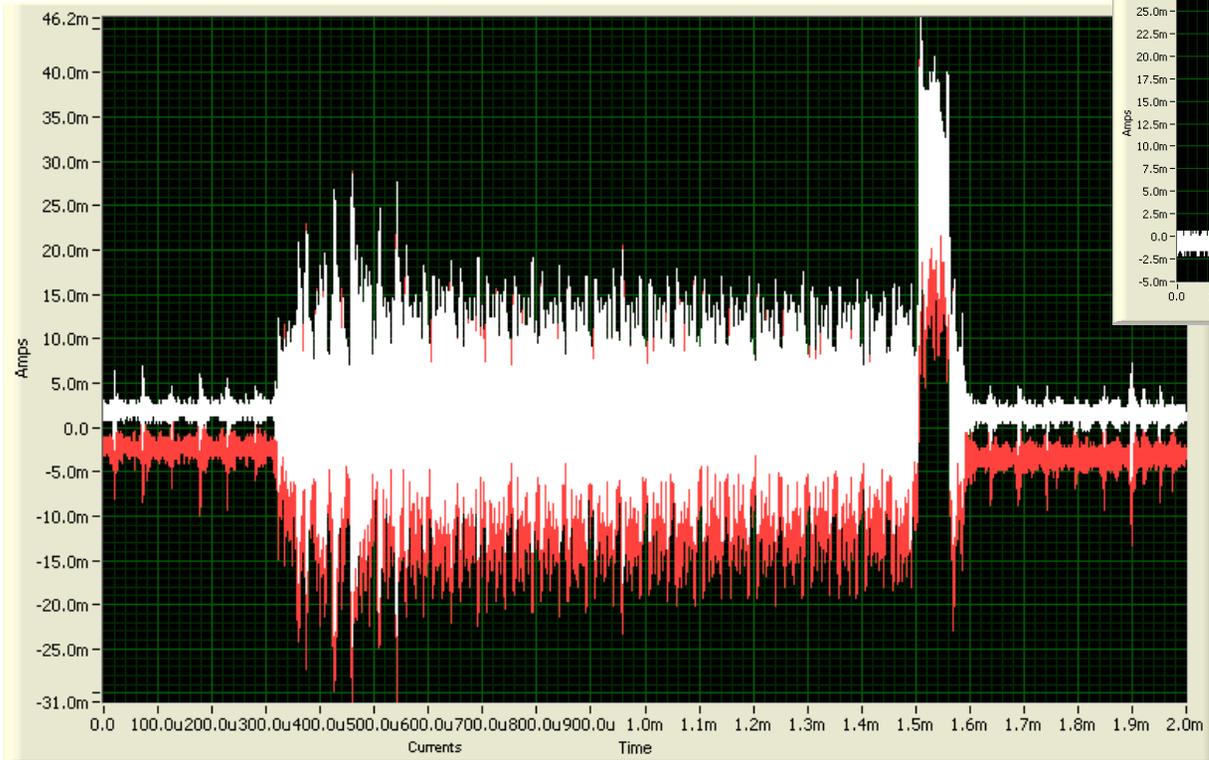
- Unfortunate grounding scheme of toroids in DTL cavities
- Lots of excellent noise sources: switching power supplies, Source RF



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# Beam Current Monitors



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

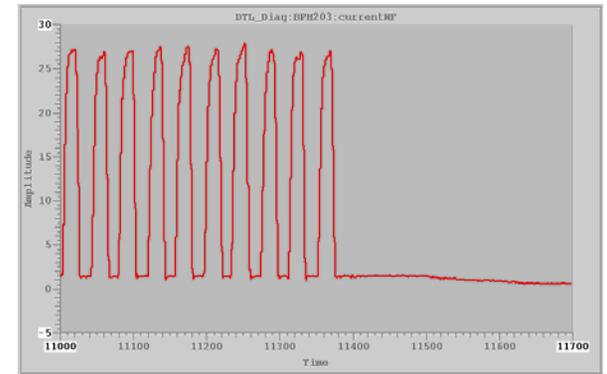
# Beam Current Monitors

Noise investigation is a work in progress:

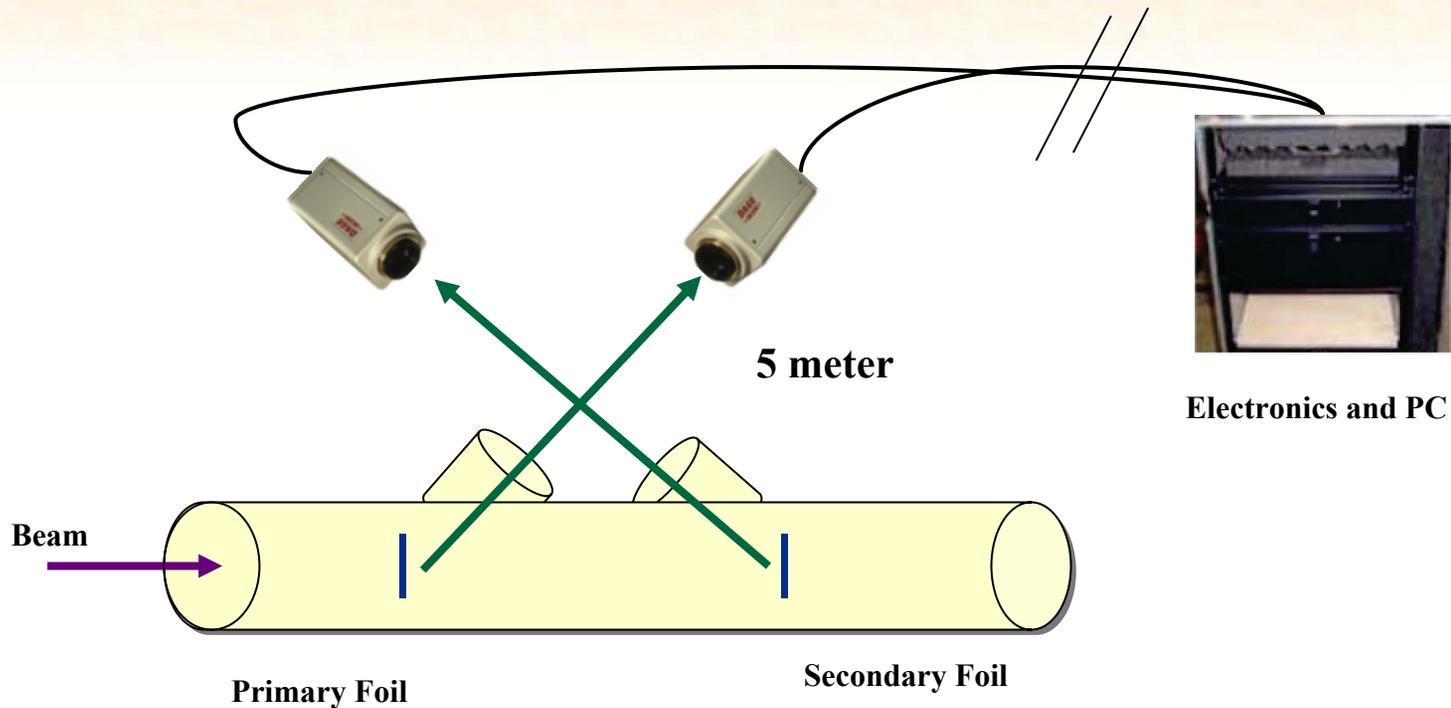
- Amplifier in tunnel doesn't help
- Choke doesn't help

Alternatives:

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

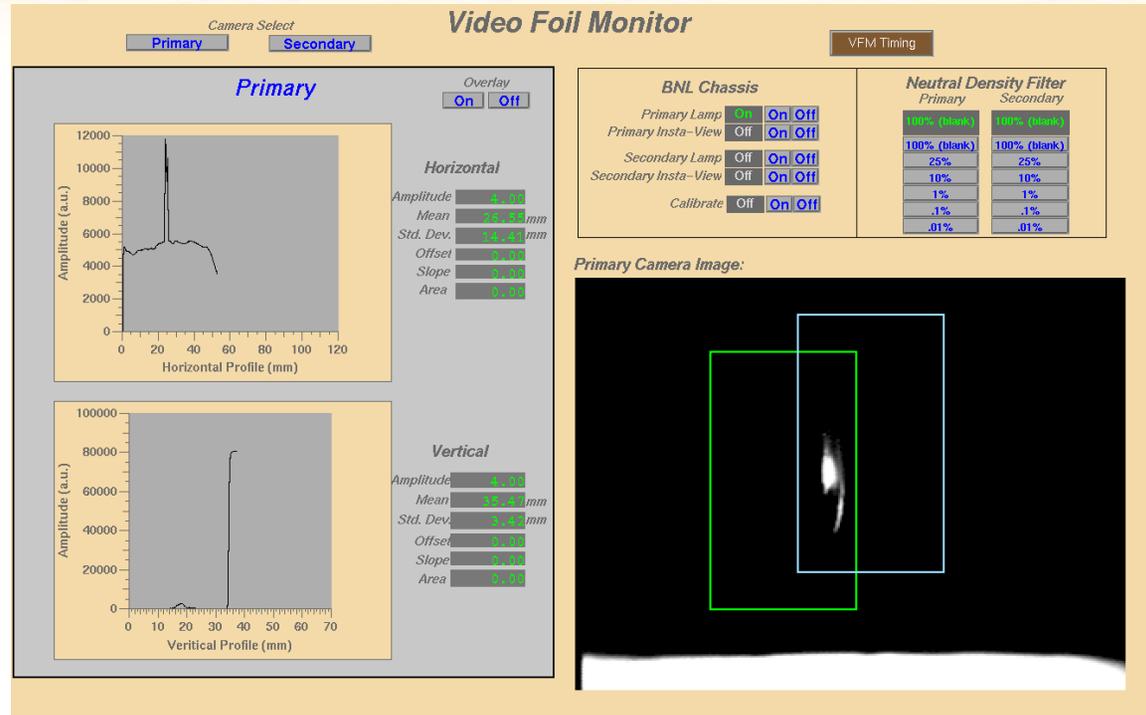


# Video Foil Monitor



- 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

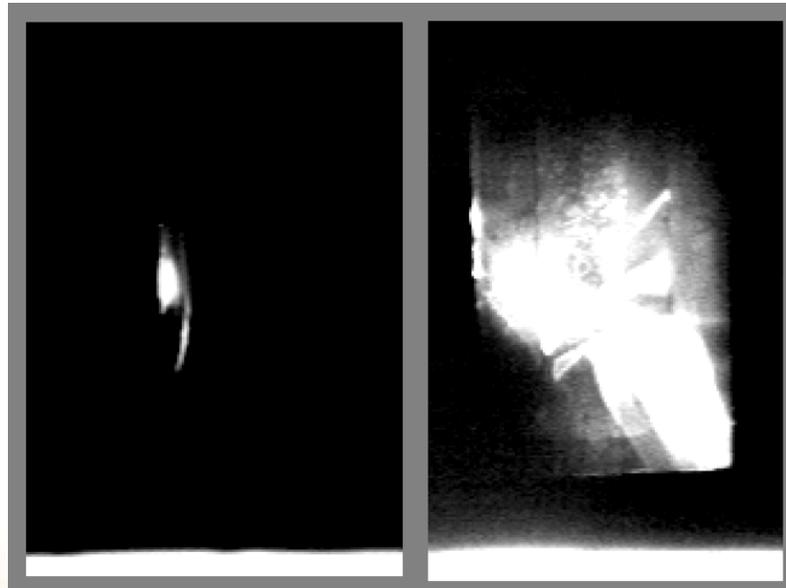


## Problem: Where is the Foil?

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

# Video Foil Monitor

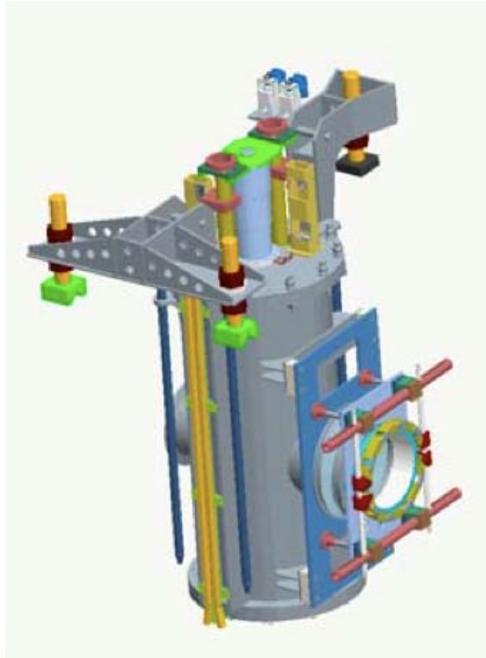
- **Is it the software?** Revert code and see if it makes a difference -> No
- **Is it the lamp?** Check light source alignment and power: realigned and more light
- **Is it the foil?** Sometimes image ok other times bad. Check foil reflection: up to 90% of light reflects like a mirror -> curves in foil 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**

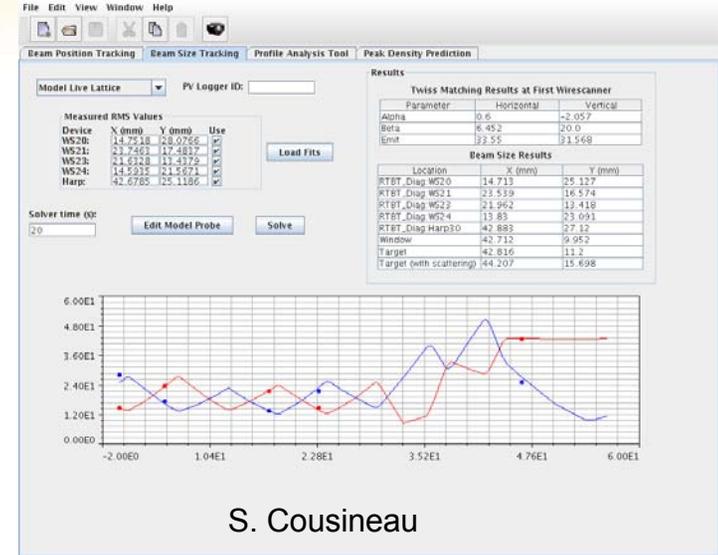
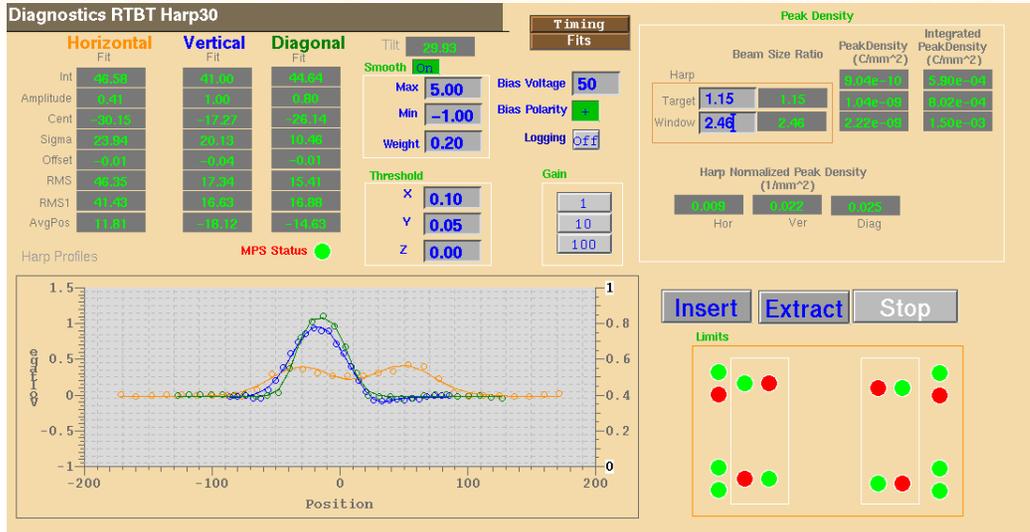
- Last transverse profile instrument before target
- LabVIEW-based system with CompactRIO with FPGA for insertion control



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



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



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