FLASH Operations
and the TINE Archiving Tools

Mark Lomperski, DESY-MIN

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Pre-Introduction

- The Trigger for this seminar came following the Long Bunch Train Workshop Feb 2010
- From the Operations Working Group (The message I got…)
  - The Operations Plan for their study-period was to
    - get stable operation with long bunch trains
    - run with long bunch trains, collecting lots of data with the DAQ under different conditions
    - study machine performance
  - It took too much time to achieve long-bunch trains!
  - Some of the Difficulties which costed time:
    - Reproducibility (Reload same file, but don't get the "same machine")
    - Losses: Tuning, Minimizing
    - Exception Handling (Interlocks, Detection, understanding, fixing)
- These are "normal" operations issues, but the 9mA Run is a case of "Extreme Operations"
  - Push the machine to "operation limits" (therefore have more frequent "problems")
  - Need to find and fix problems fast, since there is only a limited number of shifts

- These issues are strongly connected to Archiving Tools (data collection + storage, GUIs)
  - Reproducibility: Saving and Comparing machine states, Documenting machine states
  - Losses: (LOTS of data, LOTS of knobs, Tuning: trends, reproducibility)
  - Exceptions (Understanding "Anomalous Events")

- I presented "The TINE Archiving Tools for Operations Analysis" at the Workshop.
  Here I would like to focus on the above issues (which are important for "normal" FLASH operations, not just for the 9mA Run!!)

The Agenda

- **Introduction: A Bit of Background Info**

  There are various Archive Tools available in the Control Room, they have different designs, with associated "VorTeile" and "NachTeile" (efficient for X, inefficient for Y)".

  - General Design Considerations for Archiving for Operations
  - DOOCS Archiving Tools available for Operations
  - Design Decisions made for the TINE Archiving Tools

- **Archiving In Action: "In-Use" Case**

  - Operations Issues from 9 mA Run

  - Usage of TINE Tools to help operation analysis

  - GUIs-GUIs-GUIs-GUIs!!!!

    - Focus on the FUNCTIONALITY!!!!!!

      Archiving Data Structures, APIs, etc are strongly reflected in:

      - How do you "formulate" your question?   (Clicking somewhere…)
      - How do you search (browse) through the data?
      - Analysis? Correlation with other data?

Interactive Data Browsing for the Analysis of Operations

- The Users: The Operators, "Sub-System Responsibles"
- Operations-Questions are "simple"
    - The Usual Suspects (Orbit, Losses, RF)
    - How have things changed? When, Why? (If nothing has changed, they're relaxing, sipping coffee)
- Response-Time is important
    - Questions-to / Answers-from the Archive are like a dialogue
- Need "complete" data (as are available "live")
    - Complete orbits, RF-pulse forms ("Time-Domain Data"), Energy, etc.
- But don't need all information from all pulses
    - For "technical" questions (e.g. for an RF trip) – need specific pulses
    - For "general" questions need "representative" pulses
- Need access to data from now, a moment ago, an hour ago, a day…
    - e.g. setting up the linac after a shutdown (one day, 5 months..)

- Functional Components of a Complete Archiving System
    - Collection and Storage of Data
    - Methods for Retrieval (by clients) [APIs: select a time/pulse, select a time-interval]
    - **GUIs for Display + Analysis**: data browsing, integration, "simple" analysis
        - Users formulate their questions, retrieve their data, try to find answers

DOOCS Data Storage Tools for Operations

- **The DAQ System (The new kid on the block)**
  - Design: Save EVERYTHING (think like an experimenter) (9 mA Run: 10 TB in one week!)
  - + : Complete data sets
  - - : Can only keep data for a limited time (~1 Month)
  - - : "Interactive Browsing" time consuming (@10 Hz 1 million pulses/day!)
- **Local Histories**
  - Design: Filter data using tolerances, store data locally at the Server
  - + : Easy integration into Operations-GUIs
  - + : Quick response
  - - : "Simple" tolerance limitations (e.g. if the noise is larger without beam…)
  - - : Save only "primitive" data (e.g. floats) but not arrays (orbits, T.D. data)
- **Persistence in Time Domain Plots**
- **Save & Restore**
  - Saving Set-Points
- **The Logbook**
  - Documentation of the Machine

Design of the TINE Archive Tools

- Designed for Operations: the main users are in the control room
  - Development started for the HERA-p Quench Protection in 1992
  - Has been in continuous use and development, for all accelerators in the control room
- Data Collection and Storage:
  - Data collected by TINE Subscriptions
    - any server with TINE (thread) can "deliver" data to be archived (flexible, dynamic configuration)
  - Fast Response Time for Retrieval: Data stored on disk
  - Disk space is "limited" and plan to keep "forever" so must limit the data to be stored!
    - "Logic" to decide when data is "interesting" [or when to throw data away]
      - Filtering: Tolerance, Machine State (e.g. "only with beam"), Triggers
      - Refined by "Learning by Doing" (gather experience answering operations-type questions)
      - **Set of "overlapping tools" with different "logic" strategies** (Central-, Local Histories, Event-)
- Data Retrieval:
  - Data Server: Request data using standard TINE calls
    - Use APIs to supply property names, time or time intervals
    - Many platform and programming languages: Java, Matlab, LabView ;   on linux, windows, etc.
  - Easy to integrate both live and archive data into browsers and displays
- Data Display for Archiving isn't just "Passive Displaying"
  - "General Purpose Tools" are provided for immediate data browsing
  - Using APIs data can be integrated into special viewers for complex data
  - **A set of viewers are needed** for Users to ask/answer questions quickly
    - A GUI for Orbit Analysis is not optimal to study losses
    - Goal: It should be easy to formulate complex questions

The Message from Part 1:

(Paraphrased from a classic text of British Philosophy. **Sing Along!**)

You can't **always keep** what you want.

But if you try sometime, you just might find,

you can **keep** what you **need**.

What **data** do you **need** to answer Operations Questions?

(Not "9 mA Questions" but "9 mA Operations Questions")

The Goal for Part 2:

- Show examples of the TINE archiving tools with different "filtering strategies"
 - Exceptions
  - Reproducibility
  - Losses

Exceptions ("Exceptions to the Rule")

- The "Rule" for the Linac: Each pulse should be the "identical" to the previous pulse.
- For Operations and for the Technical Subsystems, the "most interesting" pulses are those where something has "changed"
- "Changes" include
  - New Set-Points
  - "Jumps"
  - "Jittering"
  - The "change" may (or may not be) large enough to trip an interlock
    - Anomalous RF Events
- The **cause** of a change detected in diagnostics (jump in orbit or in a measured phase) may not be immediately clear
  - Operators: Quick access to the synchronized data facilitates detective work
    - If browsing takes too long, one doesn't take the time
    - If only a subset of the data are viewed, one may come to the wrong conclusion (give up too early)
    - "Filtering" can help "cut to the chase"

Catching Exceptions on the Consoles: **Persistence**

17.06.2008 17:37 Ayvazyan /tmp/kly_4chain_1213717062.jpg

Again, short jump in amplitude & phase at ACC2/3, which is visible on kly
See also next two pictures.
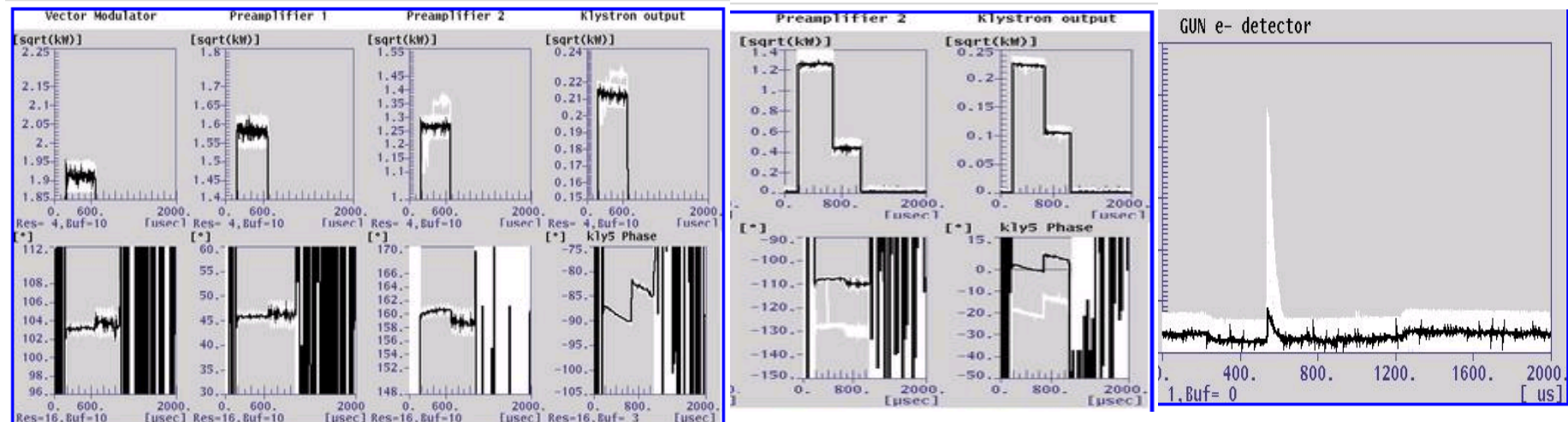
14.03.2008 11:04 Gerth /tmp/rpc_spectrum_neg_12054
Gun/ACC1 gradient/phase jumps visible in SR Monitor BC2
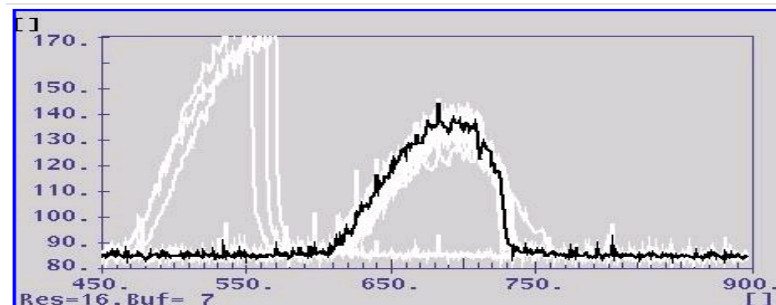
A very useful feature to realize that something has happened, sometime.

But the client needs to be running,
it needs to be collecting all pulses,
and you cannot use/integrate this data to correlate with other information, to study the problem.

Interlock Information: The Coupler of Acc1.

The symptoms: vacuum bursts (valves closing), quenches …
For the Detective Work in the BKR: No T.D. plots, just Interlock Information

"Vacuum Events" "Coupler Events" "Quench Events"

These are the just the effects (Which subsystem cried "uncle").

But what is / are the **cause(s)** of these "events"?

Looking at the Time-Domain pulses before the "trip" would be useful!

During the 9 mA run – these "events" occurred more and more often…

10.09.2009 01:46 Carwardine — ACC1 Cavity 8 probe amplitude

Shown are two plots: the pulse before the trip and the pulse of the trip. The gradient is higher for the pulse that trips.

Data extracted from DAQ at timestamp 10-Sept-2009 00:48:02
Matlab data file is here:
/daq_data/ilc/LINAC/matlab/DOI/DOI_data/DOI_ttflinac_00027.mat

Probe Amplitude — ACC1 Cavity 8 probe amplitude

Pulse prior to trip

Pulse which trips (why is amplitude higher?)
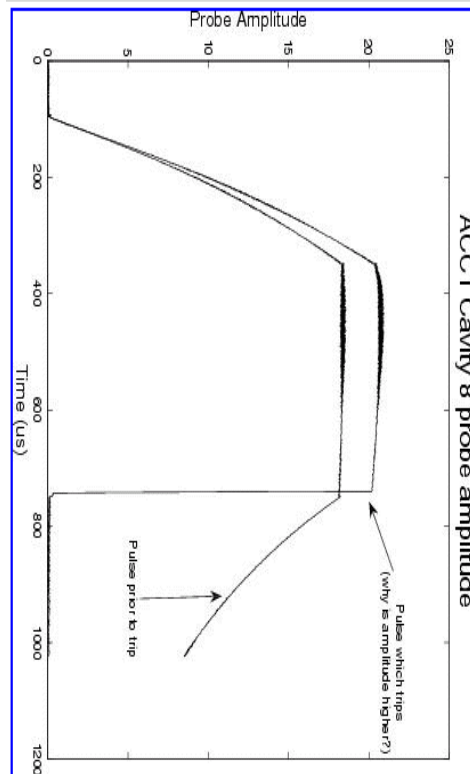
The gradient (of all cavities!) changes dramatically from one pulse to the next!

With only the interlock information (i.e. without seeing the T.D. data of the last pulses) one was just looking at one of the symptoms – and the wrong "cause" (Schuldige) was "identified".

For the Operations Crew:
How to be "better detectives" next time?

"Learning by Doing"

"Fool me once, shame on you.
 Fool me twice shame on me."   The TINE Archive can help.

He who seeks shall find…

maybe more than he was expecting. Dedicated to T.Grevsmuehl

- Torsten asked for help archiving the pulses from interlock events. He was familiar with TINE Archiving from mhf-p (proton) days.
- The strategy to "find" and archive these pulses:
  - The data are sent (TINE Scheduling) to a middle layer at the machine repetition rate
  - This server compares pulses and looks for changes which are "out of tolerance"
  - If changes are detected:
    - Generate an "Event" (A "HV Event", or just changes in the RF channels?)
      - Keep "pre" and "post" triggers (the previous 2 and next 5 pulses)
      - Include all relevant ADC channels, the GEN.EVENT number for "Timing".
    - These data are saved in the **Event Archiver**
  - else
    - log (every ~20 minutes) pulses for documentation in the **Event Archiver**
- Started with Test-Modulator at end of 2008, moved to the FLASH rf-stations in 2009. This data transfer (from the ADCSCOPE Servers) ran the rest of the year without problems.

- Event Viewing:
  - The list of events and associated data can be collected with RPC Calls
  - Test GUI in VB-6. "Event Display" will be added to the Java Trace-Plot Viewer soon!
    - Think Functionality!

Event Archive Viewing for the FLASH High Level RF
First Example of a "HV Event": Ramping Down Acc1
A sequence of 8 HV pulses

HV ADC: KLY2.ADC/KLY2.1/CH04.TD

1. Select a System
2. Select a Device
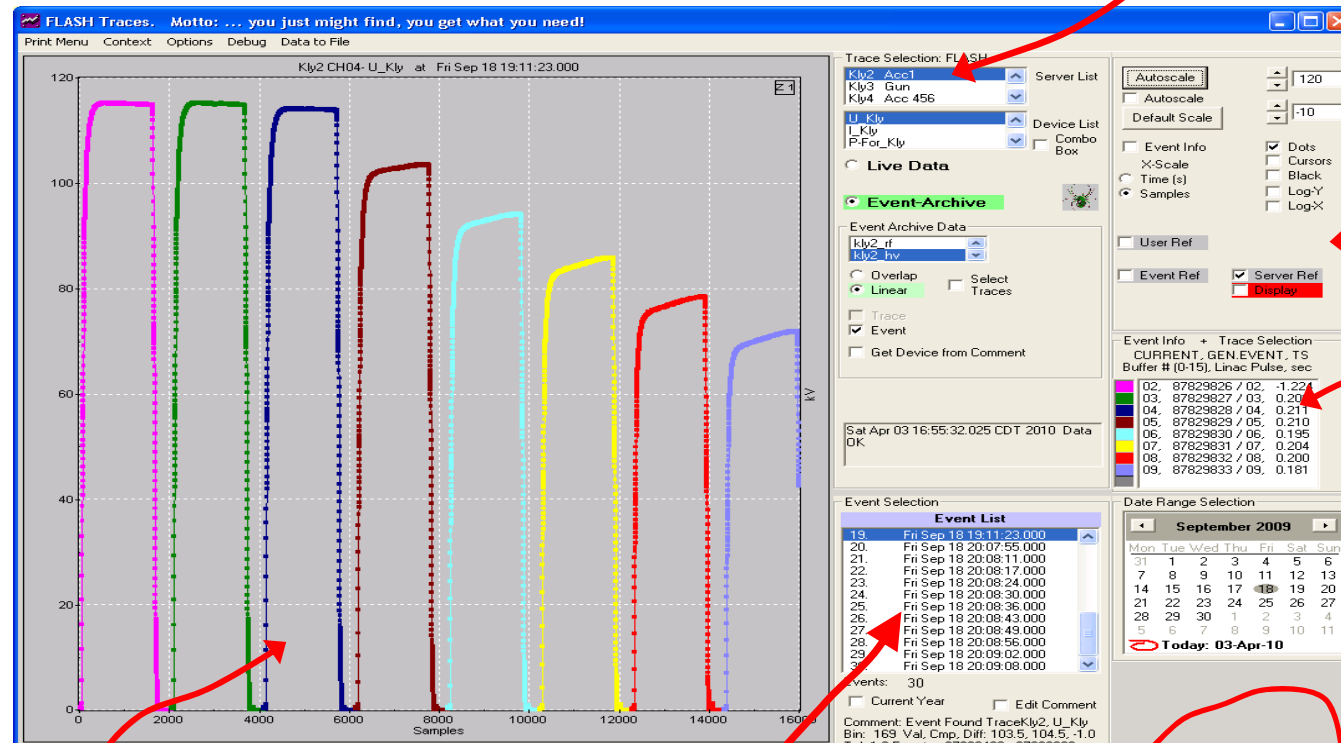
Graphics Options
e.g. scaling

Timing Info:
e.g. GEN.EVENT

comment (event information) generated by middle layer

The First Pulse Out of Tolerance

3. Select an Event from Event List

Re-draw the 8 Pulses "Overlaid"
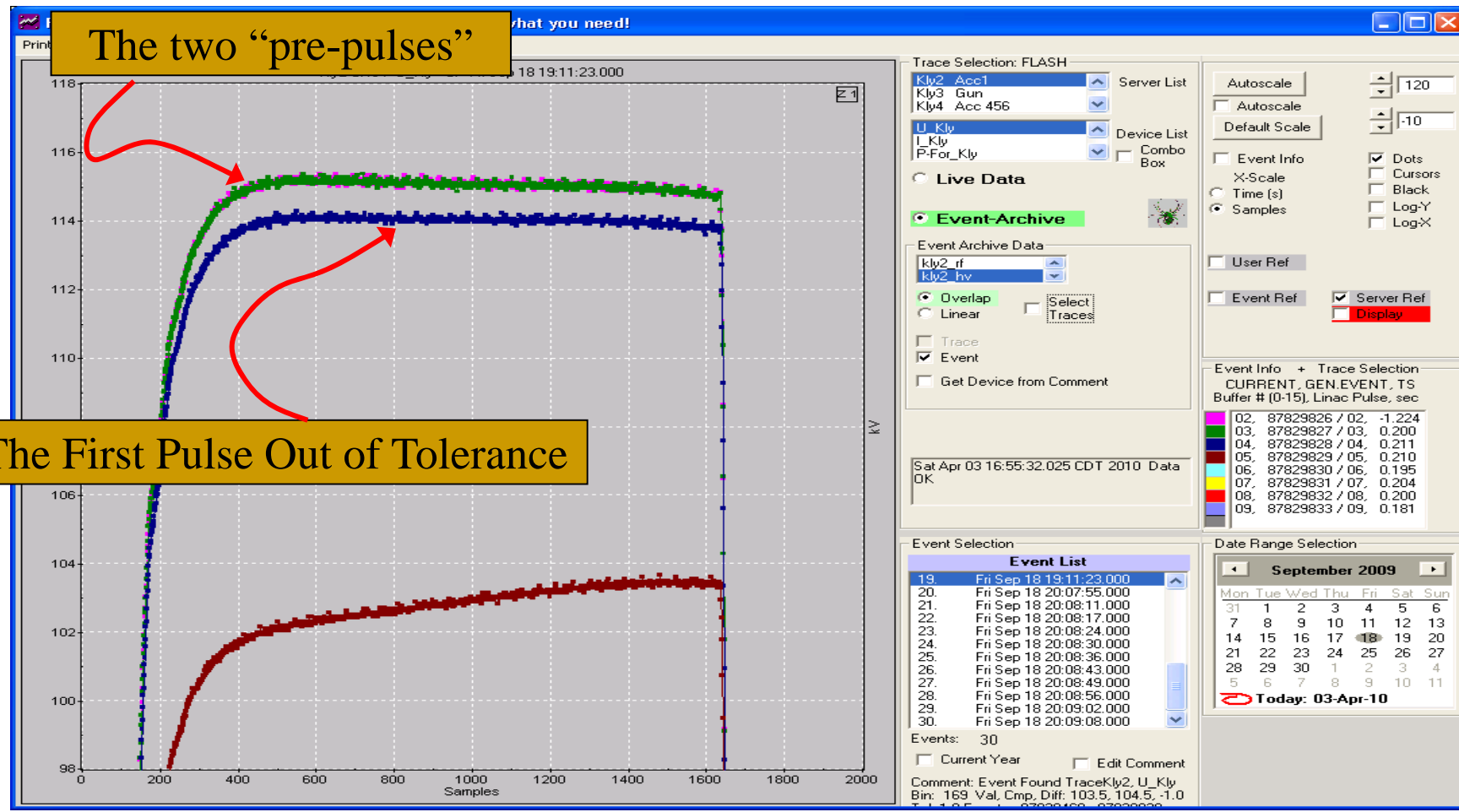
Another High-Voltage Event (i.e. Kly I or V out of tolerance)
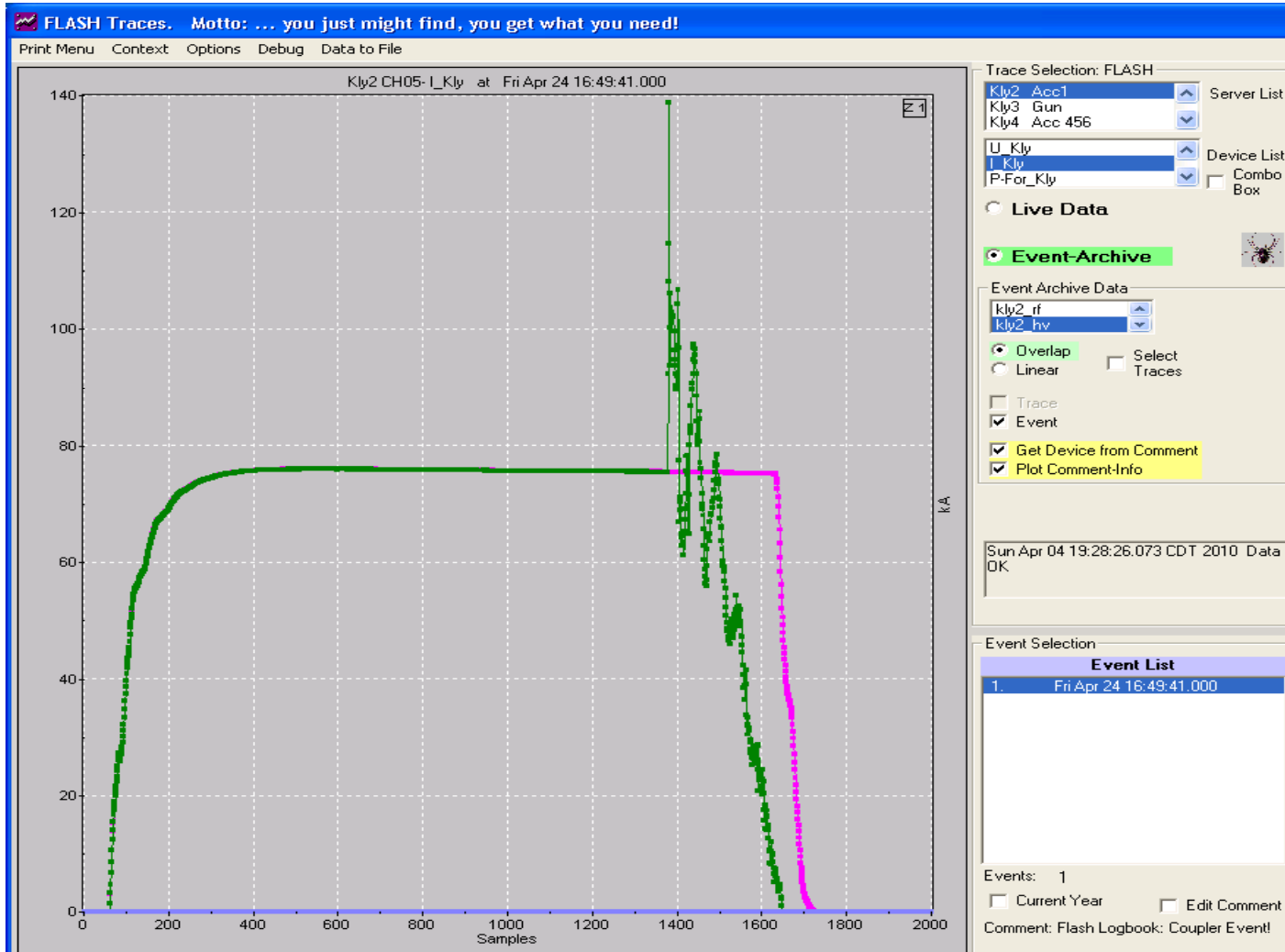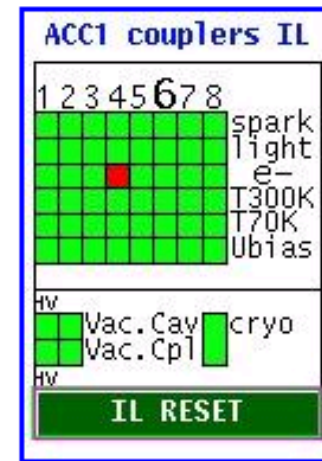
The Logbook Entry for this Event: Coupler Interlock!

A Single Pulse with "Exceptional" Klystron Current (The modulator continued pulsing!)
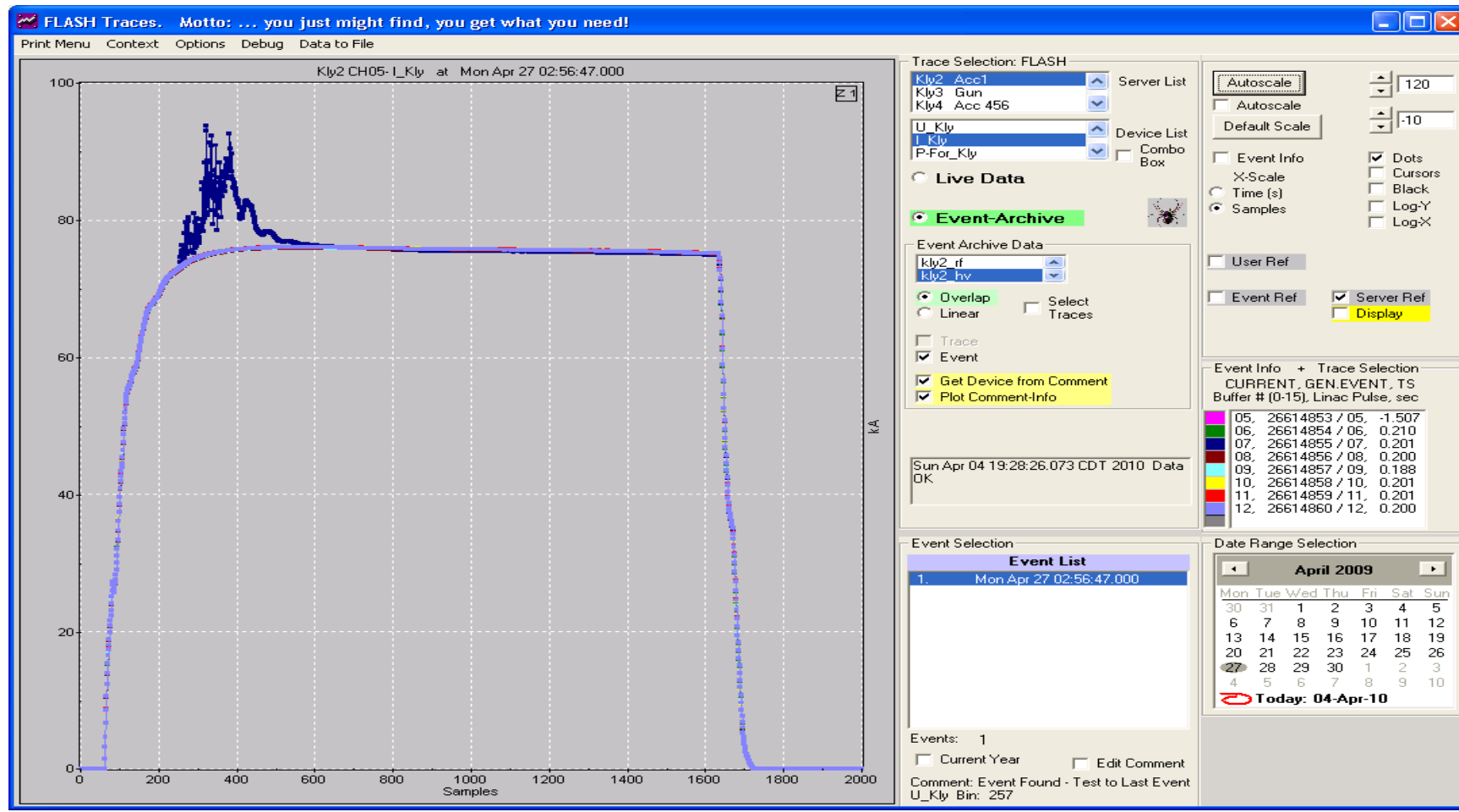
Another "Exceptional" Pulse

(The modulator continued pulsing!)
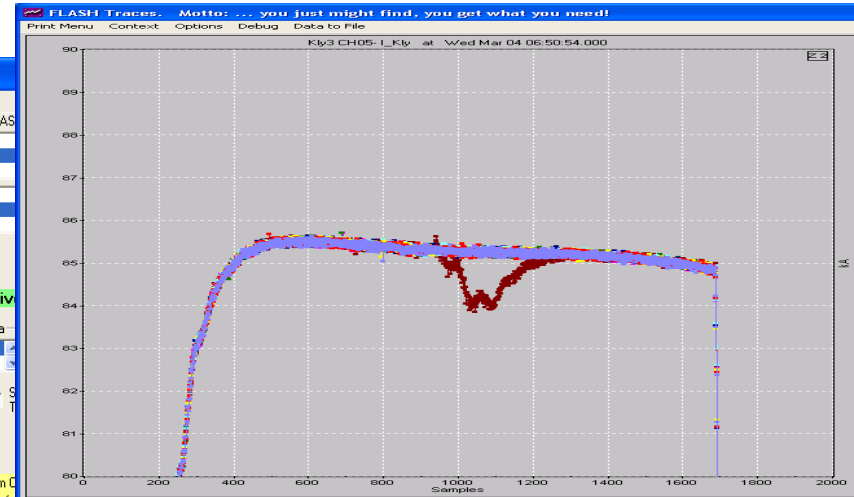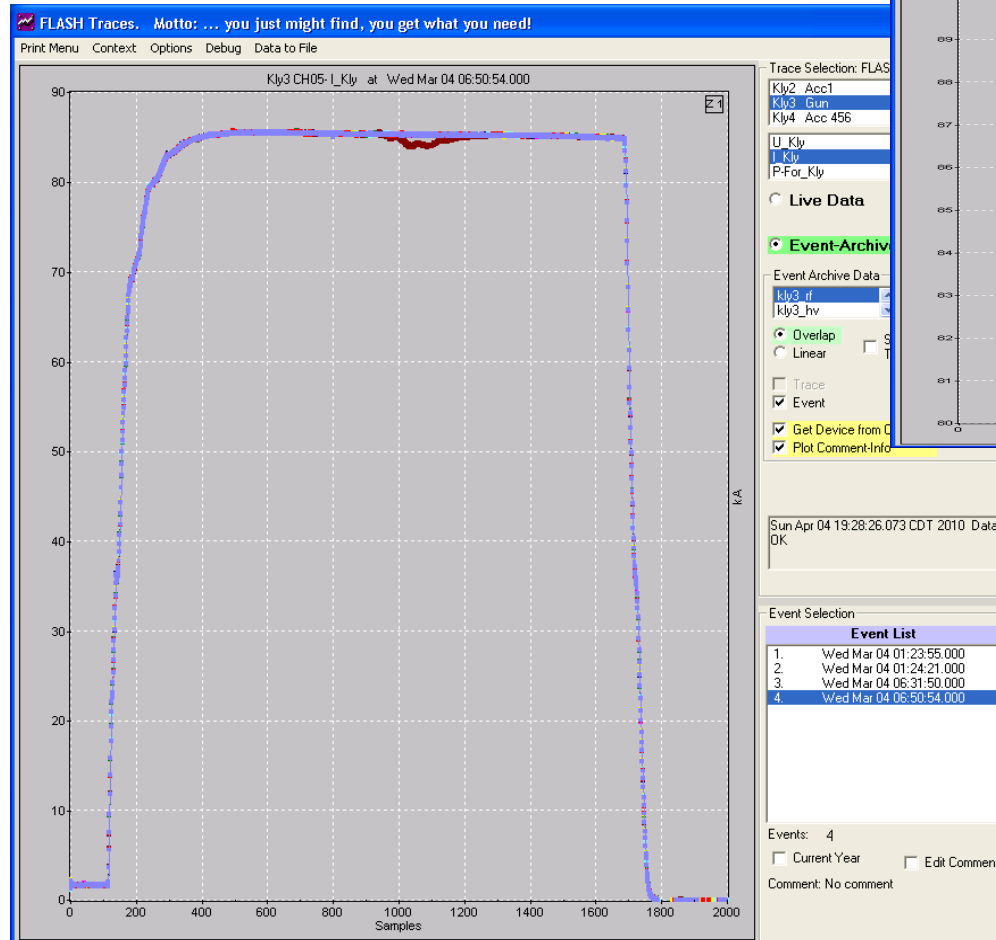
These are examples of events Torsten was "looking for"….

(And the data are all still there for viewing….)

What else was found?

Valeri and Ruediger's Coupler Interlock

(remember the one with the note about the possible repeat-offender (three times at ~22:54) ?

Plotted: Klystron-2 Forward Power   Last Year: KLY2.ADC, KLY2.1, CH00.TD
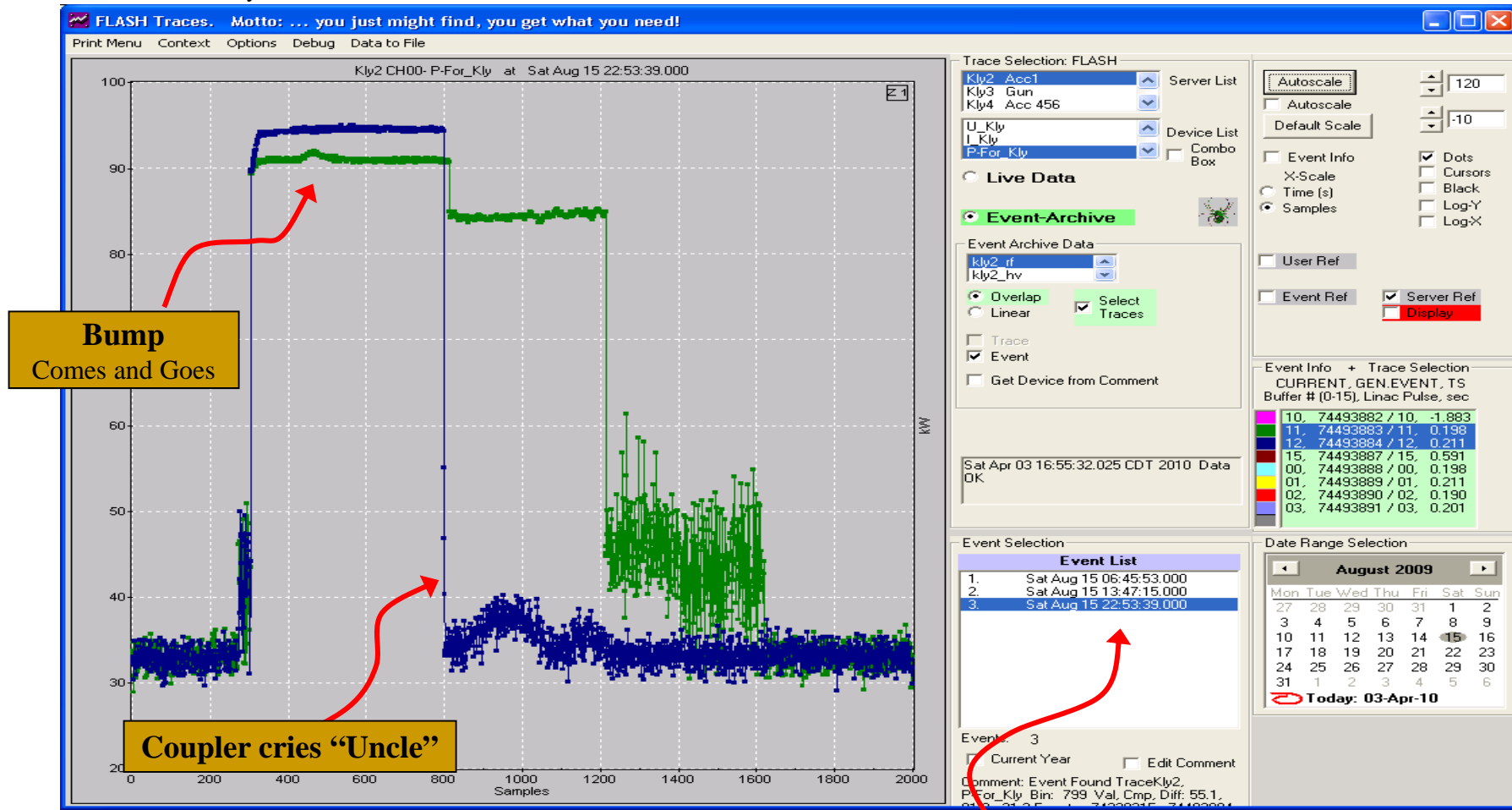
The 13:47 Event (also a coupler event)

This is the Klystron Forward Power.
The Pre-amp Output has the same "features" so the "cause of the exception" is "upstream" → LLRF?.
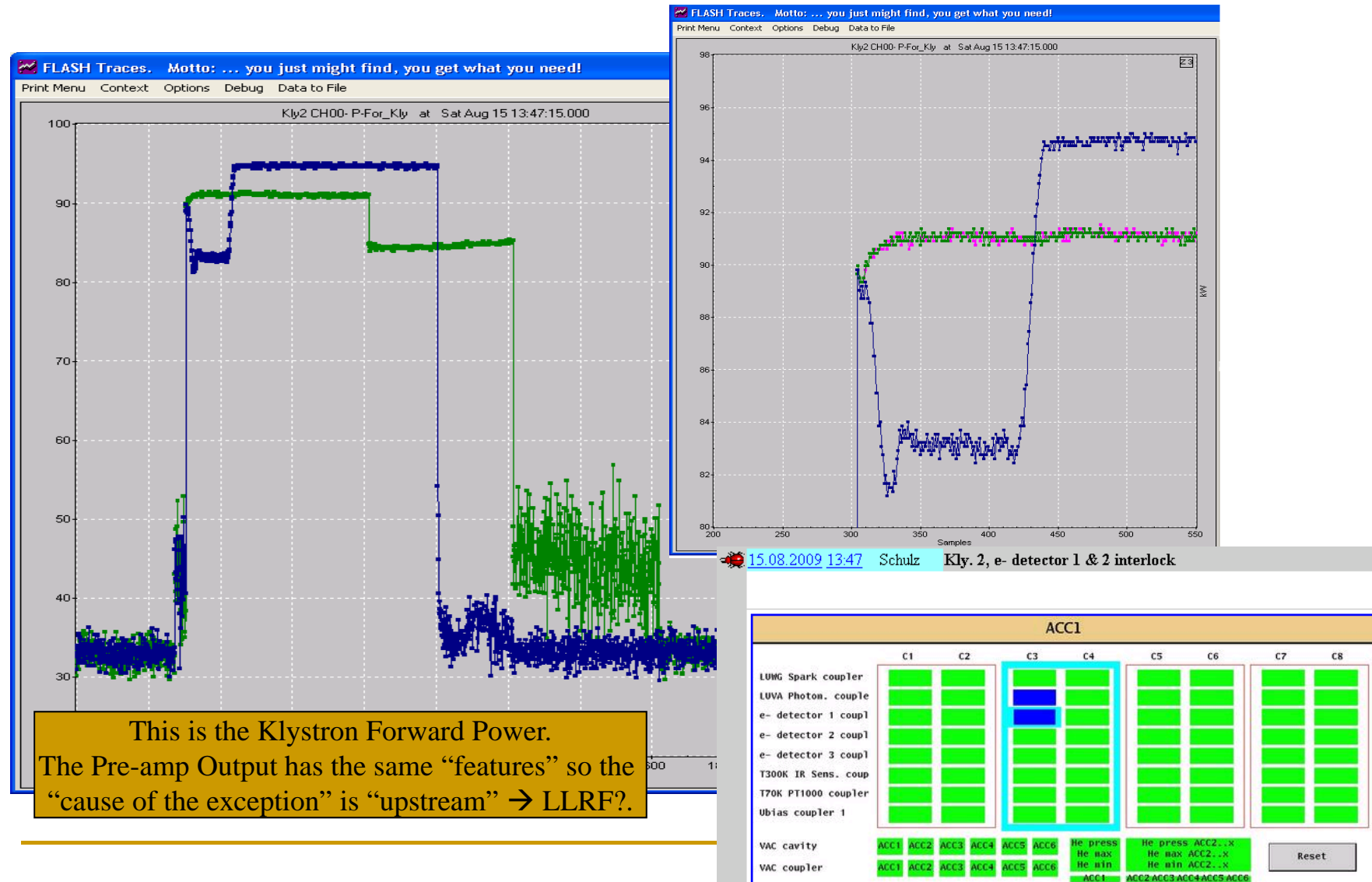
The first RF Event of the day, at 06:46

(No logbook entry – occurred during the shift change!)
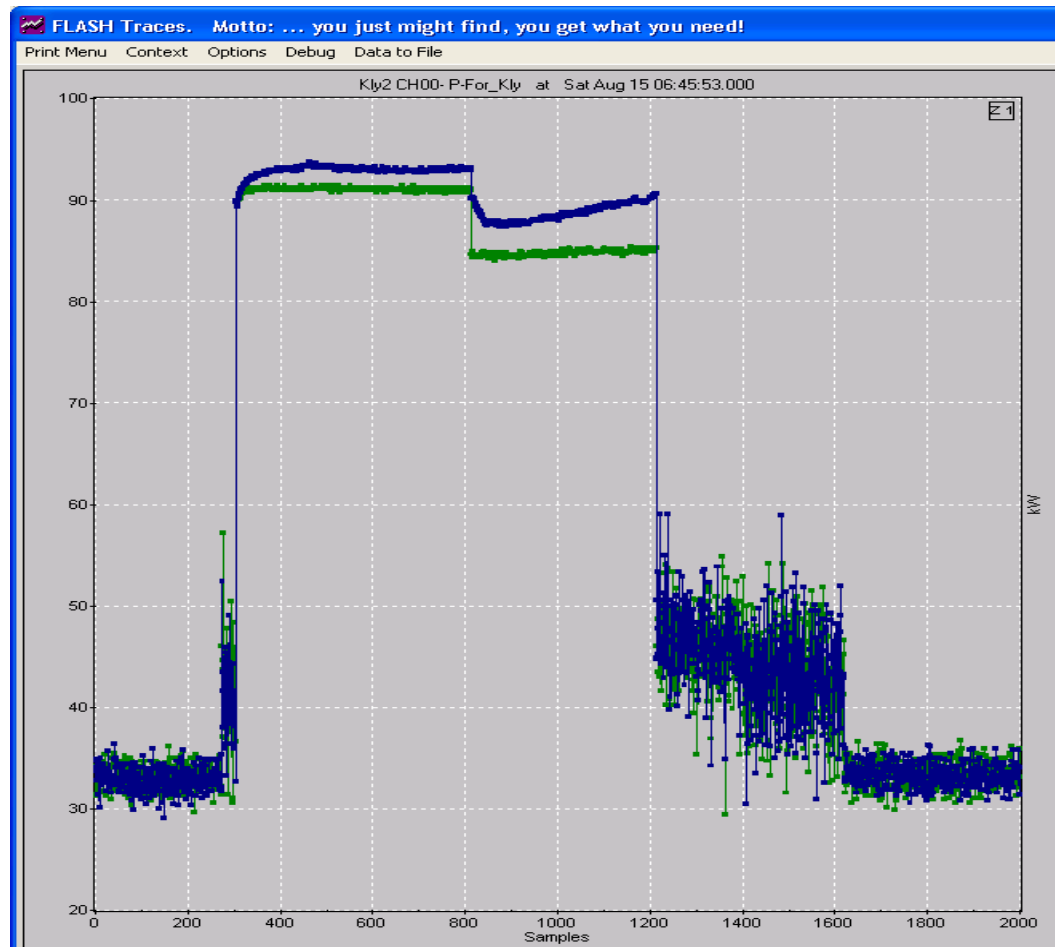
The Events which have been "caught" are...

Not just Acc-1 Interlocks…

Not just Anomalous LLRF…

Not just the last pulse before the trip is "needed" to understand the domino-chain of events…

Interlocks: Late Shift   17-Sept.2009

Goal	* 9 mA studies
Achievements	* Magaged to get 480 bunches back (for longer trains we get losses in BC3 and 6DUMP)
Difficulties	* 1 cryo interlock, fast reset possible
	* 1 ACC456 interlock, fast reset possible

18:30   Cryo Interlock, affecting Acc-23 -456   19:27   Acc456 ("Forward Power Limit")

17.09.2009 18:29 ttflinac   We had 1 cryo interlock which affected operation at ACC23456

17.09.2009 19:27 ttflinac   /tmp/kly_intlck4_1253208430.jpg
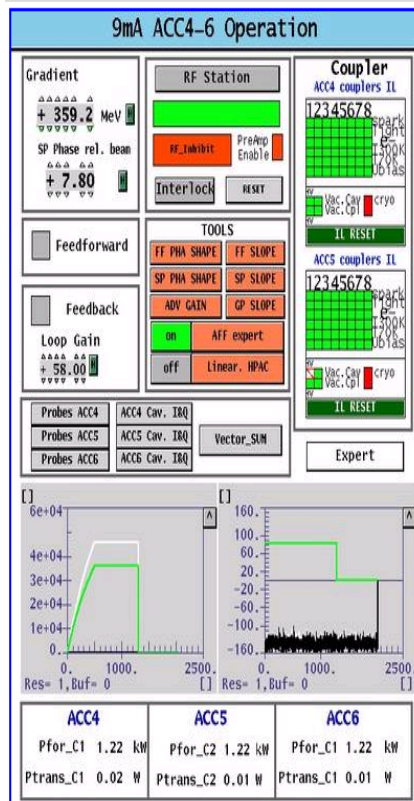
No indication from the logbook that the causes are, in any way, "connected" …
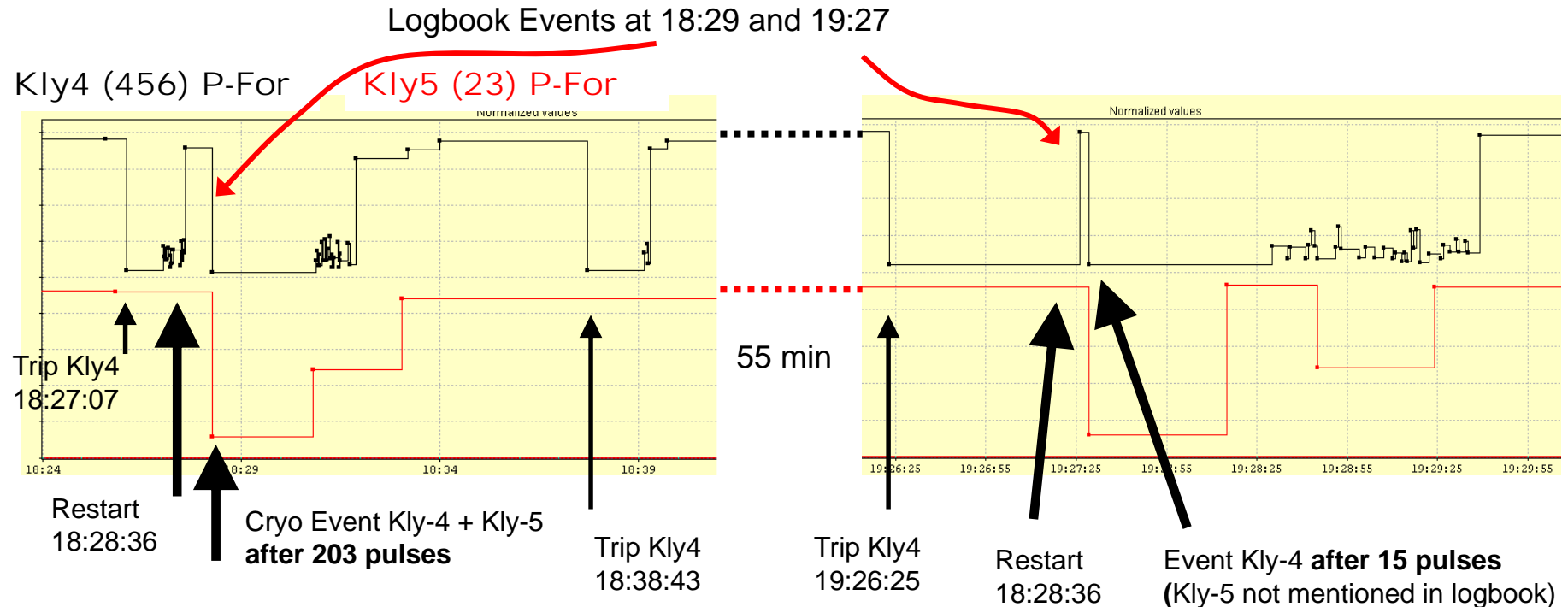
Activities of Kly-4 + -5 on 17 Sept 2009

Kly4: RF Tripped 5 times in 1 hour!
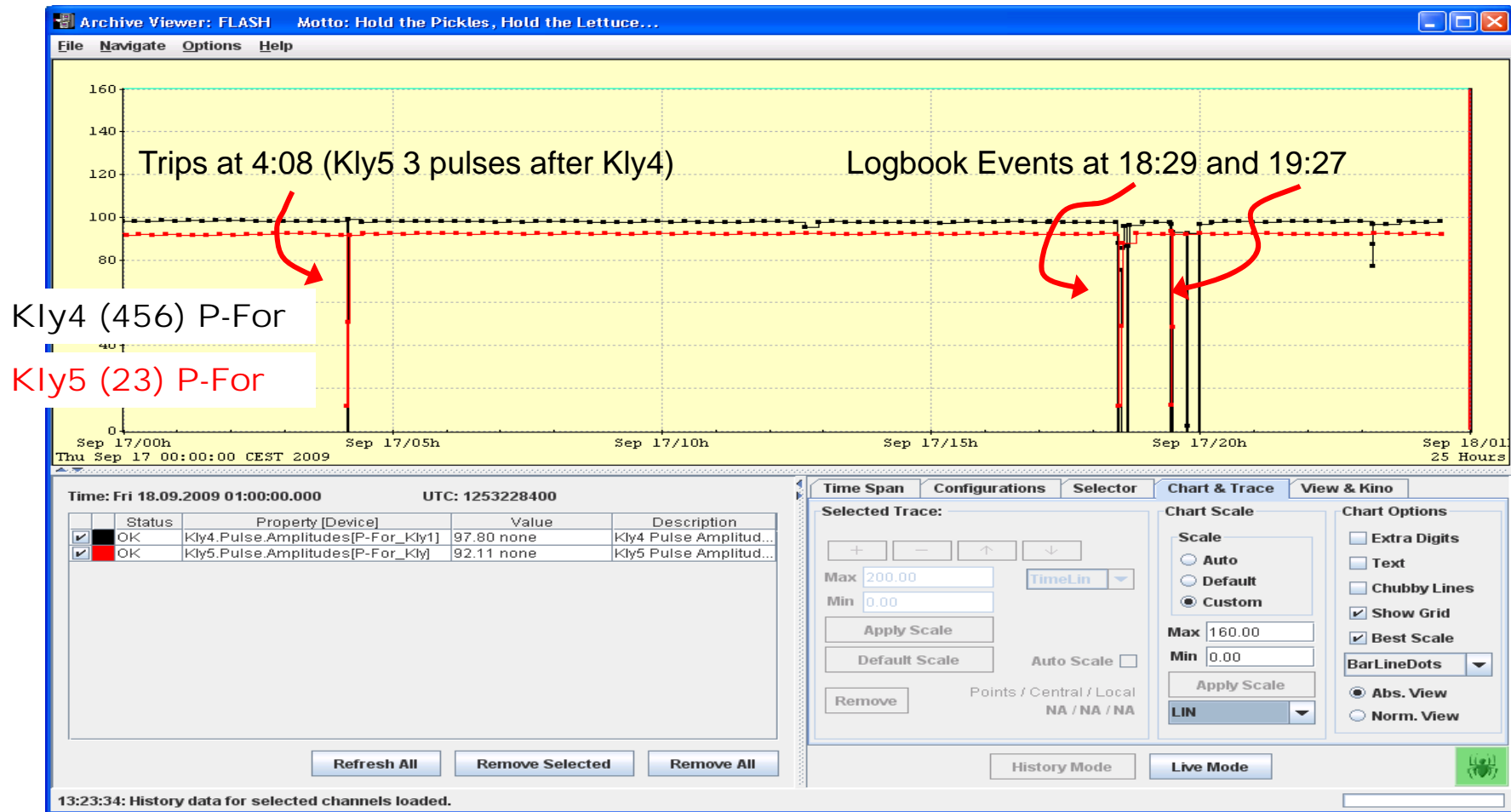
"Synchronous Trips" of Kly-4 and -5

## Zoom into these "Events" (Times and pulse-counts from event archive)

Logbook Events at 18:29 and 19:27

Kly4 (456) P-For **Kly5 (23) P-For**

Trip Kly4
18:27:07

Restart
18:28:36

Cryo Event Kly-4 + Kly-5
after 203 pulses

Trip Kly4
18:38:43

Trip Kly4
19:26:25

Restart
18:28:36

Event Kly-4 **after 15 pulses**
(Kly-5 not mentioned in logbook)

55 min

"Synchronous" trips of -4 and -5 (one with Cryo!) shortly after Kly-4 is re-started?

Problems with the "re-start"? First look at the "healthy" re-start after trip at 18:38.

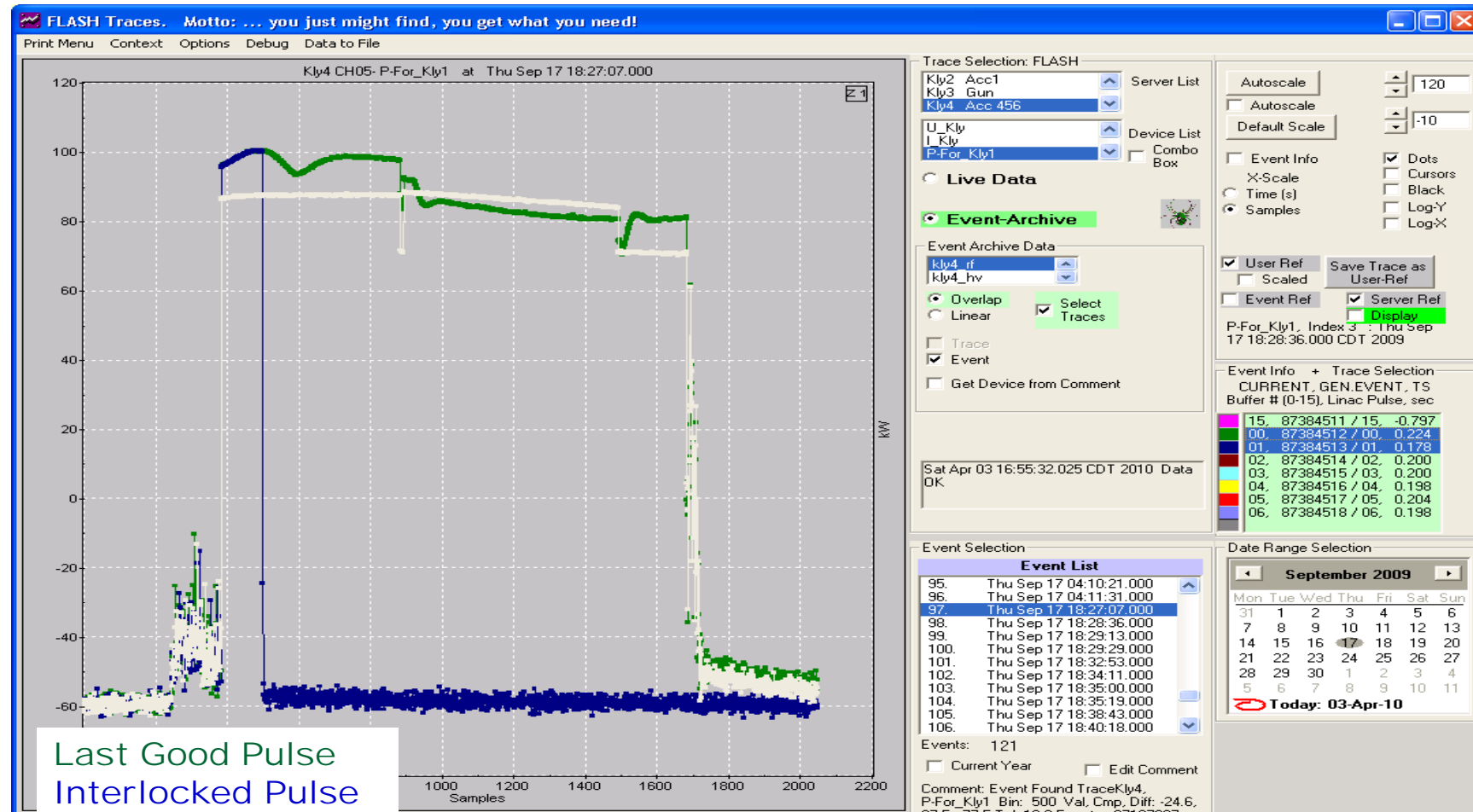# The Trip at 18:38 and the 1ˢᵗ Pulse after Re-Start

Stable running after this restart
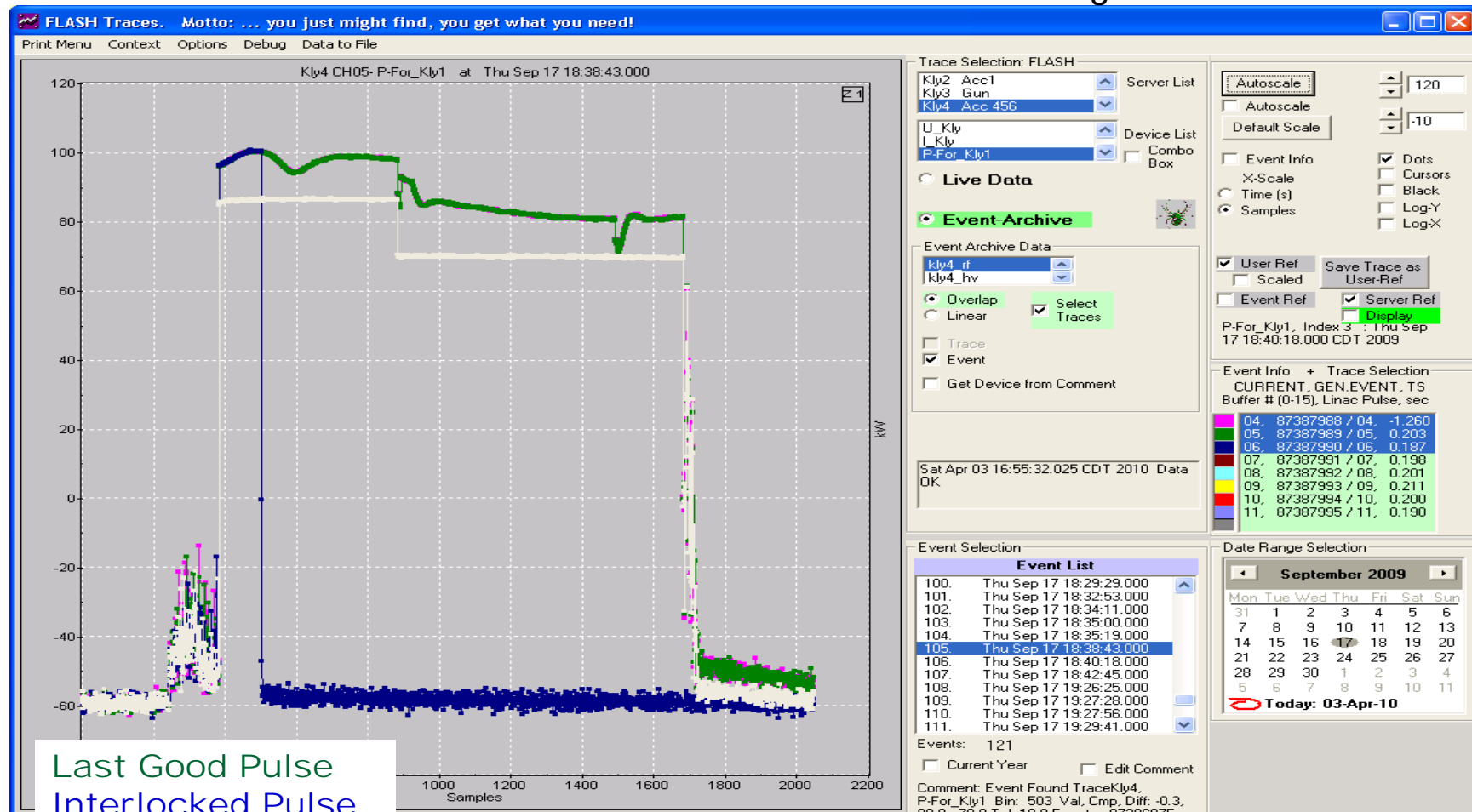
Last Good Pulse
Interlocked Pulse

First Pulse after Switching On: Note the Fill-Time and the Beam-Time

The Trip at 18:27 and the 1ˢᵗ Pulse after Re-Start

Cryo, "Power Limit" after this restart

Last Good Pulse
Interlocked Pulse

First Pulse after Switching On: Note the STRANGE Fill- and Beam- Times!!!

Ramping The Power Up to the Cryo-Event
The 1st Pulse after Re-Start, and last before cryo-trip
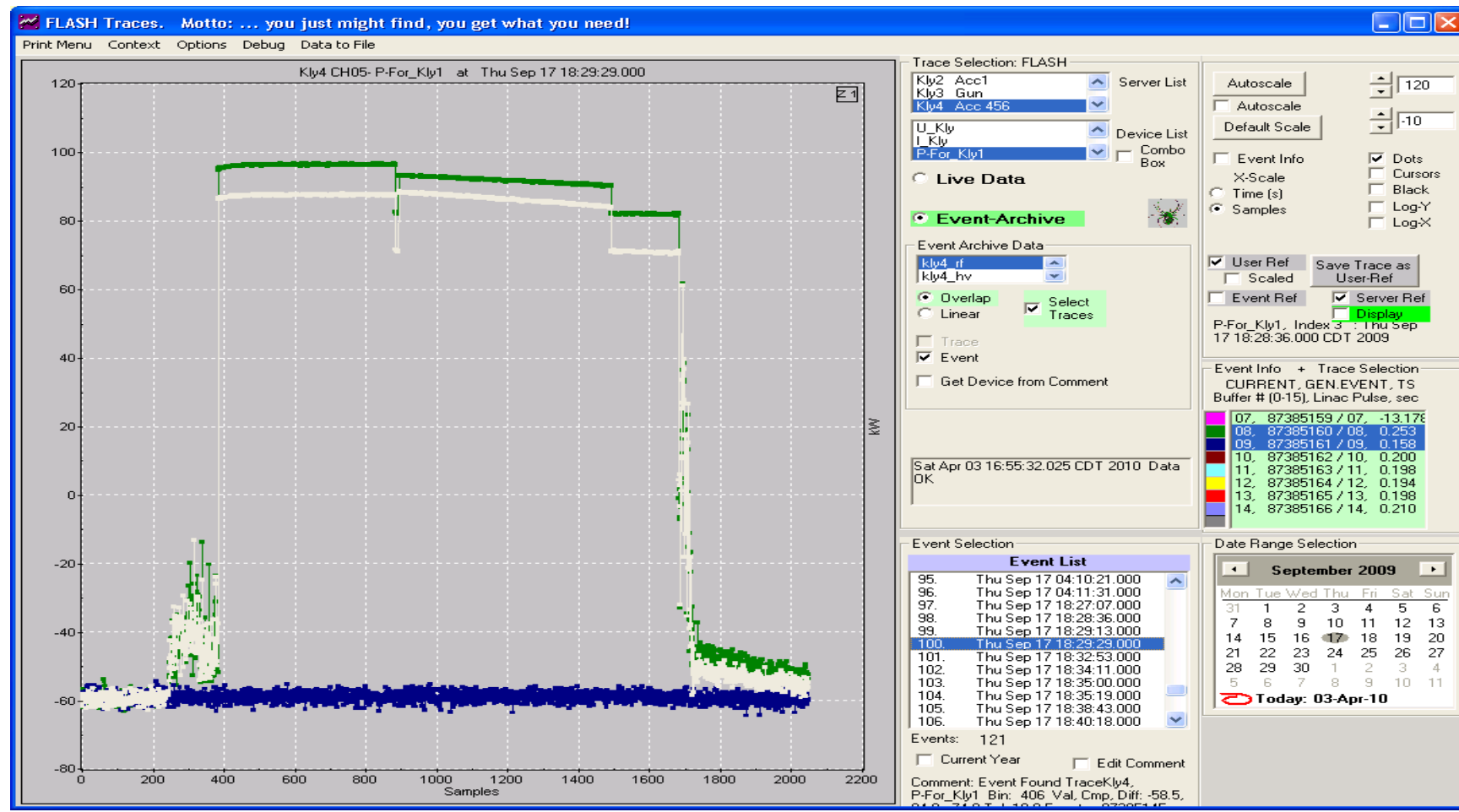
"Normal" and "Quenching" Pulses
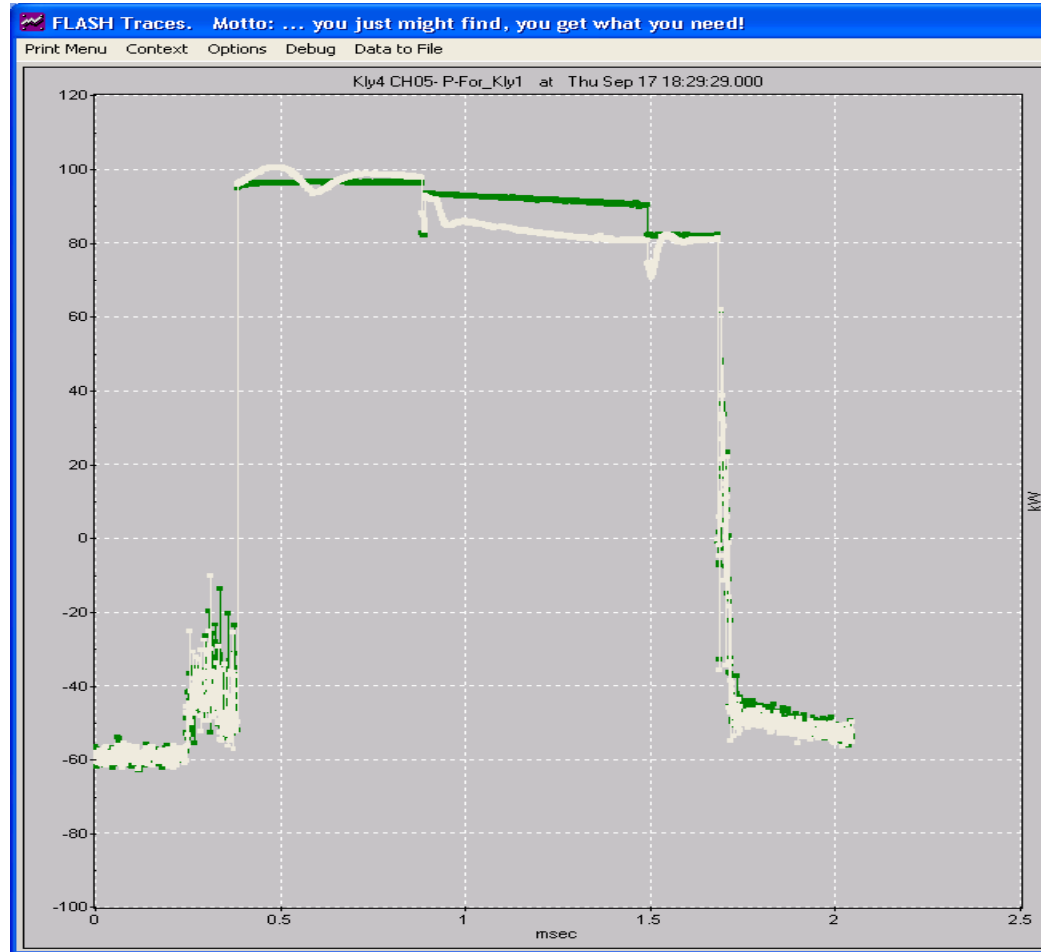
With access to the TD data :
The **first pulses** of Kly-4 after the interlocks at 18:29 and 19:27 were "exceptional" (and identical).

At 18:29, 203 High-Power pulses were produced until the Cryo-Event (tripping Kly-4 and -5).

At 19:27 only 15 High Power pulses were produced until the Kly-4 "Power Limit" Interlock stopped the fun early…
(tripping Kly-4 and -5).

(Cause? Beam loading-feed-forward-adaptive-compensation pulse full on with no beam?)

Exceptions: Closing Comments

- Time for the Demo of "The Best Trips of Acc-1 in August"?

- Examples of "Exception Analysis" from the FLASH High Power RF
- For use in operations, these data are available "immediately" on the consoles
  - Collected and archived and available from the Event Archive Server within seconds
  - Just Request the List-of-Events with your GUI, and get the data
- Data can be browsed and viewed quickly
  - Hey, System-Responsibles!!!
  - Take a look before going to the 8:30 meeting?
- Find an Exceptional Pulse? Or sequence of pulses? And you want to know more?
  - How was the orbit? Transmission? The Losses?
  - **The GEN.EVENT Numbers are stored in the Event!!!!**
    Get the other data from the DAQ!
  - These tools are Complimentary! The "event detection and filtering" helps to "browse" the DAQ data!

For the Operations Crew:
How to be "better" next time?

"Learning by Doing"

"Fool me once, shame on you.
Fool me twice shame on me."

Reproducibility

The Goal: Restore the Set-Points and you restore the Machine!!!!

Consider components for isolated technical subsystems   (Divide and Conquer)

Magnet Subsystem: Reproduce the magnetic fields   Diag: Orbits   **A Solved Problem?**

RF: Reproduce cavity fields and phases   Cav Grad+Phases   **Still in its Infancy?**

Working with Machine States

- Save Complete (Subsystem) State
    - Set-Points (e.g. power supply Set-Points == "Soll Wert-en")
    - Component Status (e.g. magnet cycle-status; "Ist Wert-en")
    - **All Relevant Diagnostics to "document" the state (e.g. the orbit)**
- Restore Set-Points
    - Including Special Procedure (e.g. power supply cycling)
- Compare Two States
    - Check if Set Points have been reached according to "procedures"
    - **Compare Diagnostics (e.g. difference orbits)**

- Basic Requirements for Handling "State Data" (Sounds like the TINE Event Archiver!)
    - Storage of data for a complete State as a "Unit"
    - Methods (APIs) to Browse / Select / Retrieve any / all data for a State
    - Integrate State Data into GUIs to Display / Compare States, with Live Data
- Important Method to Document the Machine!

Storage of "State Diagnostics"

- **Current Tool: The Logbook!**
  - Use Cases:
    - Shift Change
    - End-of-Run
  - Only of Limited Usefulness
    - Screen-Shots – difficult to compare quantatively two states – since you cannot "integrate" the stored data into the control system, into your GUI
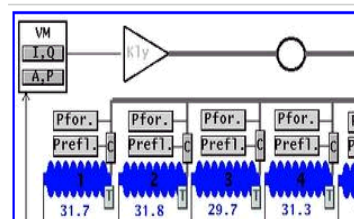
Docu: End-of-Run   and   Beginning-of-Shift

28 Screen Shots for the RF   16 screen shots

These data could all be collected in an Event, and retrieved, displayed, compared, … !!!

Saving and Comparing "State-Diagnostics"

- Diagnostics Data are varied: Orbits, T.D. Properties, Images….
  - Suitable Data Storage Tool: The TINE Event Archiver
    - The file system sends a trigger that a new file is being stored –
      The Event-Archive collects and stores all required data (not a specific pulse)
      - **This functionality has already been added to current Save&Restore!**
    - GUIs can retrieve event lists, retrieve the data from selected events ("files")

- Displaying and Comparing Diagnostics Data
  - Easy to integrate Event and Live data (similar APIs)
  - Need "subsystem-oriented" tools (an all-purpose tool is hard to imagine)
    - Orbits best compared with an Orbit-Tool: Difference Orbits, Optics calculations
    - Losses with a Loss-Monitor Tool: Bunch and DC Currents, different loss systems
    - The varied LLRF Signals best organized with a LLRF Tool

- How to "quantify" the reproducibility of an RF Station (in 28 Screen Shots)?
  - What "SetPoints" are needed (LLRF correction tables, … logbook plots last night?) ?
  - What "Diagnostics" (Probe Signals, Cavity Voltages and Phases, …)
  - Save everything! (a few states a day does not require significant disk space!)

Usage of State Data: Reference Traces

- To Evaluate the "Health" of devices, a Trace (waveform) read-back can be VERY informative
  - Live Pulse = Reference? No Problem
     else
  - What is "different"? Could it be a Timing Problem? Amplitude?

  "Golden Orbits" for all devices!

- Defining "Reference Traces"
  - For some devices, the "Reference" is the last saved file
  - For others, and expert may need to "declare" waveforms to be the "References"
- Integrating into GUIs: "Reference Traces"
  - These stored waveforms can be displayed as "References" – to be compared with the "Live" Data

Reference Traces integrated into GUIs

Evaluate the Health of a SubSystem at a Glance: A Standard Tool, in use for L2 Modulators for years…

L2 Septum Amplitude OK, Timing Shifted
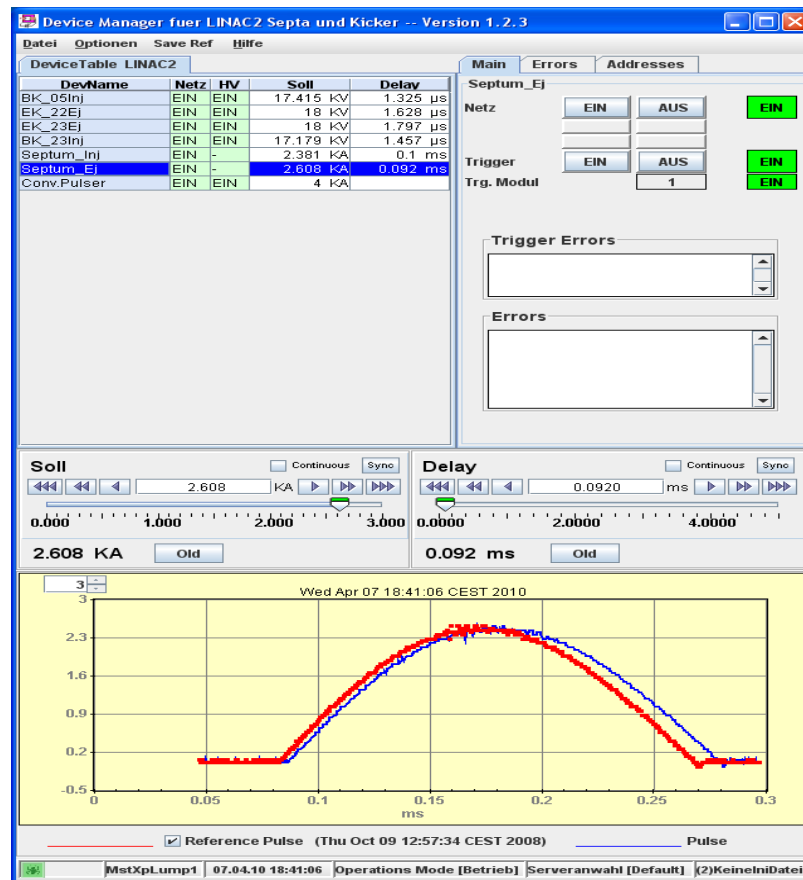
L2 RF Pulse Shape OK, Amplitude Lower
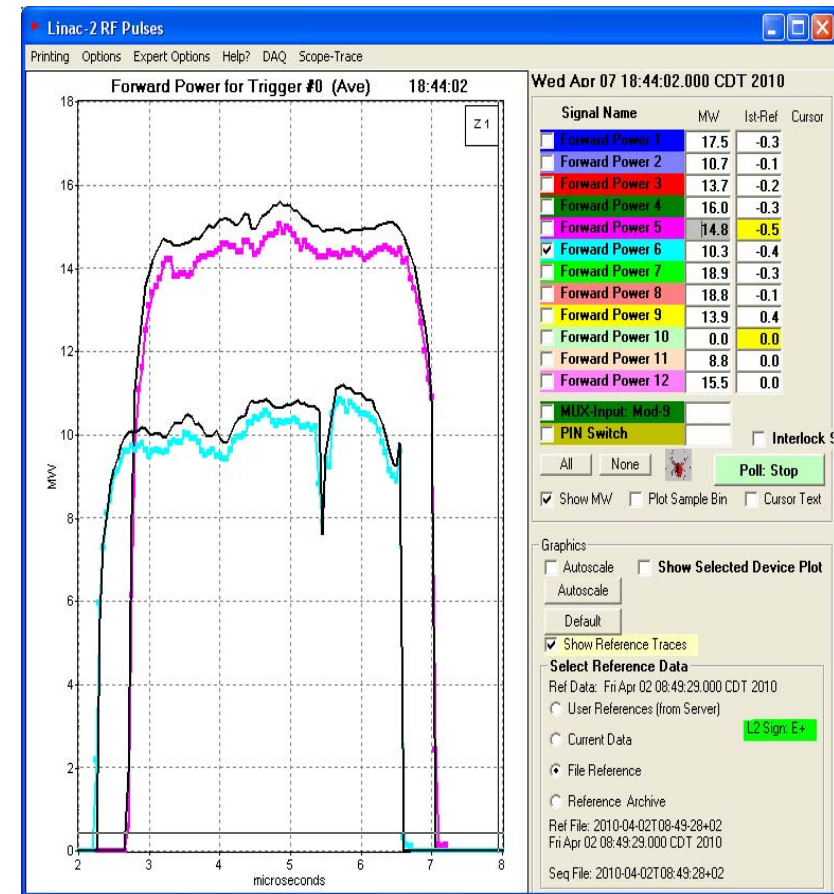
Reference Traces for Operations: A Scenario

Linac-2 is acting a little strange.
Check the Live Data against the
Reference Traces.

RF Modulator 9   Hmmm…
It isn't the Amplitude…
and it isn't the Timing…
Not one of the "standard" knobs.

Better call an expert.
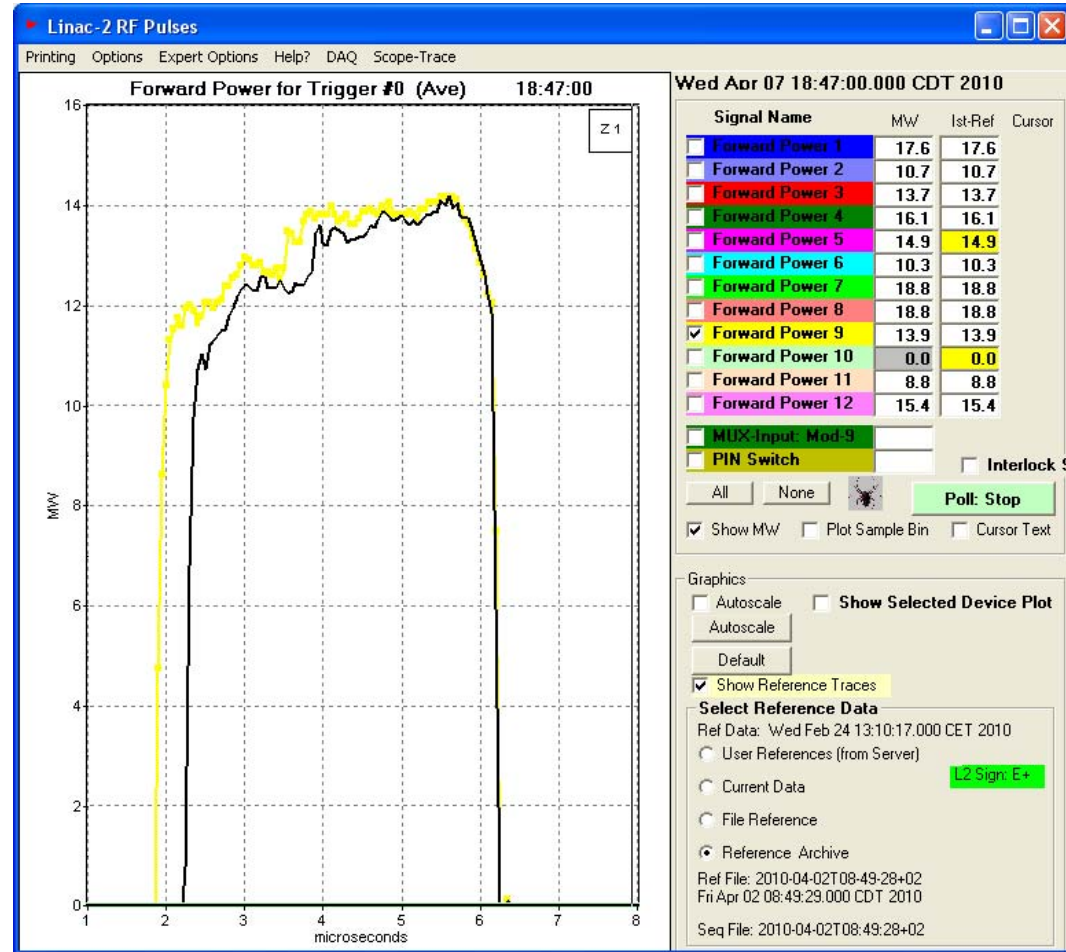
Part 3: Reproducibility: Closing Comments

- Varied "Diagnostics Data" are needed to "document" the "State" of a Subsystem (e.g. orbits for the magnets, cavity probe voltages and phases for the RF).
- The TINE Event archiver is suitable for the task of collecting, saving, and providing the data.

- For the display and comparision of "complex" State Data "SubSystem" specific tools are needed (e.g. Orbit Tools).

- Integrating "Reference" Curves (like "Golden Orbits" for the BPMs) into GUIs for the Technical Systems can speed up the "evaluation" of the health of a subsystem.

Looking for Answers
Monitoring / Browsing Complex Data

- Browsing "Time Ranges" to find interesting "Periods"

  - Study Loss-Development

  - Study Orbit changes, Drifts

  - Correlate data from different subsystems (orbit, energy, SASE, …)

  - …

- What sorts of questions do you have?

BLMs: Documentation in Logbook – How to analyze for Operations?

13.08.2009 08:46 ttflinac /home/ttflinac/ddd/util/BIS-BLM-protection disabled

BIS-BLM-protection disabled for 30 minutes by operators

26.07.2009 20:20 ttflinac /tmp/blm_overview_COL_1248632401.jpg
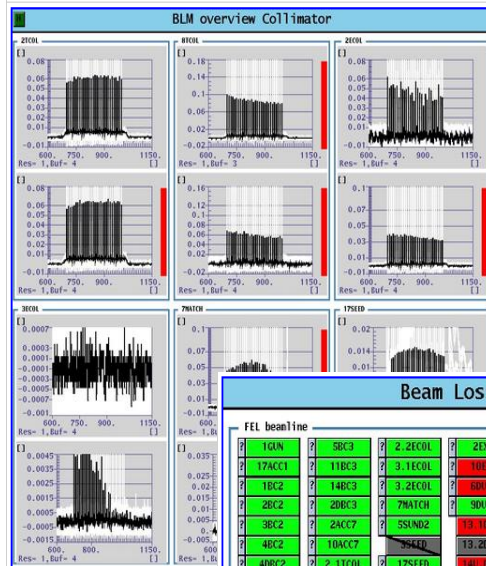
18.09.2009 21:14 ttflinac /tmp/blm_overview_Exp_DUMP_1253301284.jpg
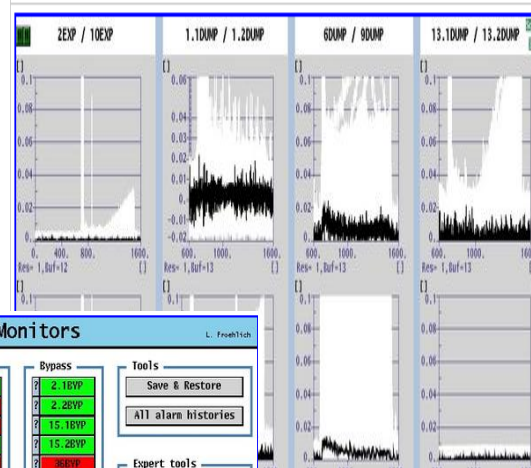
Losses versus Time?
How to evaluate trends?
How to correlate with
other parameters?

Beam-Losses, DC Losses…

The full TD data is useful,
but for data versus time?

SASE Tuning: Drifts, jumps:

How to correlate changes to "Beam Parameters" (e.g. Orbit, Energy) and then to "Technical Parameters"? (e.g. Phase of an RF Cavity)
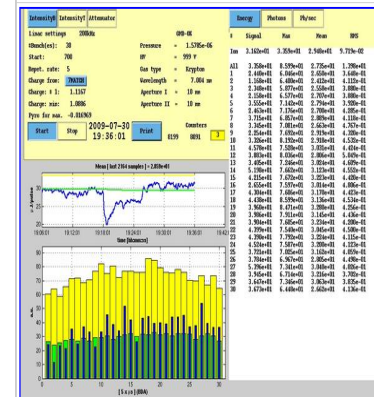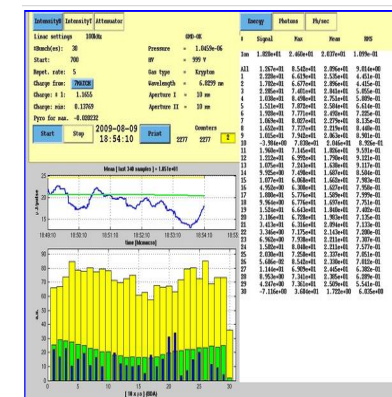
Make it as easy as possible to correlate SASE (a number) versus orbit changes, RF parameters…
… (The Usual Suspects)

Drifts/Jumps in RF Parameters
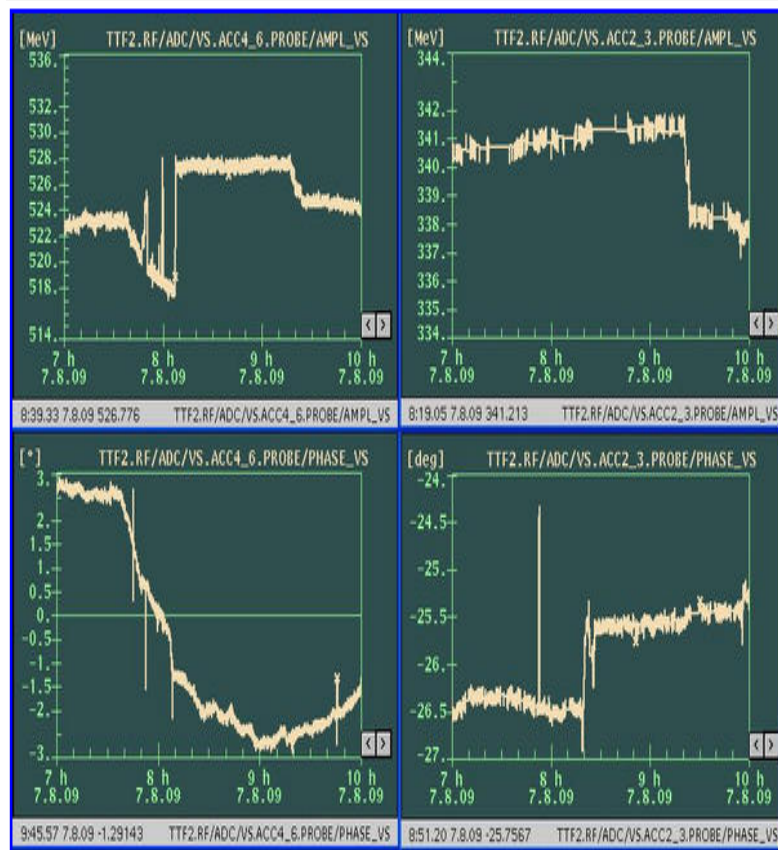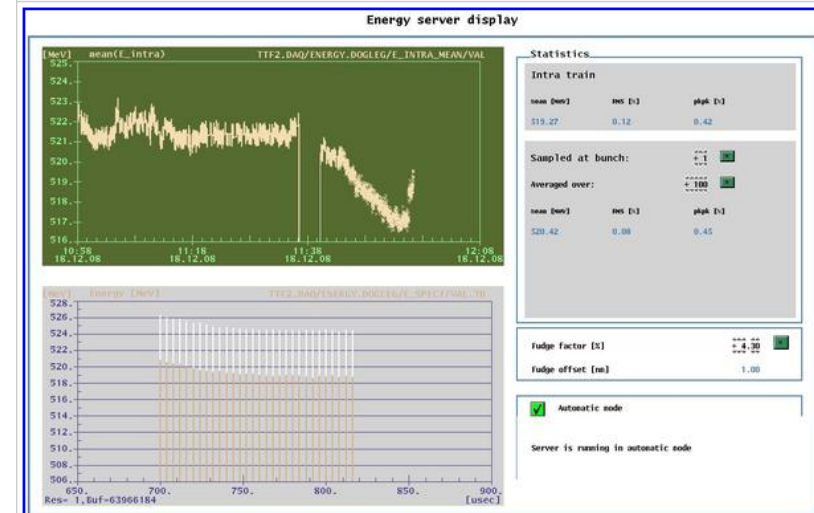
The drifts are in single values –
Can you understand what is happening
by looking at the TD Data from the LLRF?

How to correlate with the vast amount
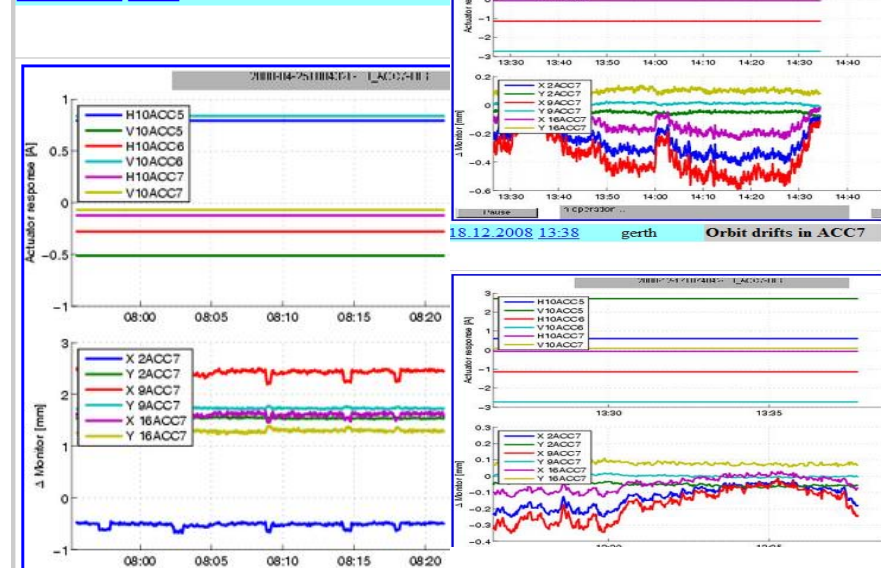of data from the LLRF?

Jumps in the orbit, correlated with energy…

Positions versus Time is useful to correlate with other parameters.

To find the causes of orbit changes **difference orbits** are VERY Useful!

For Orbit Gurus Off-Line: Click at one time – get the orbit – click at another time – get the second – calculate difference

Where in the linac does the change start? What is the most effective corrector?

General Storage of Archive Data for FLASH

Some General Considerations:

- Efficient Use of Storage Space: Can data be "re-packaged" and "reduced" to be able to save more often, without too much "loss" of information?
    - BLMs: For each BLM, calculate the total loss in a pulse (81 floats versus 81*2k floats per pulse)
    - BPMs: Save the orbit from the FIRST BUNCH more often than the whole train. (HERA-e: 287 Monitors)
- Utilizing and Combining Data stored as "Events" with data stored "Continuously"
    - BLMs: Trend-Charts of Loss-Sums, with TD data of loss signals
    - BPMs: "Default" properties with "few" bunches, "Events" with complete TD
- Saving "raw" data so the clients can decide how to "analyze"
    - Radiation Monitors (Neutron Counters, Pandoras)
        - Save Integrals. Clients need to do the differences

- Examples of Systems/GUIs where "Archive" Data is "Fully Integrated" with "Live Data"
    - BLMs, BCMs
    - BPMs
    - Vibration Measurements
    - Neutron Counters
    - Pandora Radiation Monitors
- Think Functionality!!!!!
    - Meant to be EXAMPLES of how, for subsystems with complex data, GUIs can be written which allow easy access and integration and simple analysis of archive data
    - Add the Archive APIs to YOUR Favorite GUI!!!!
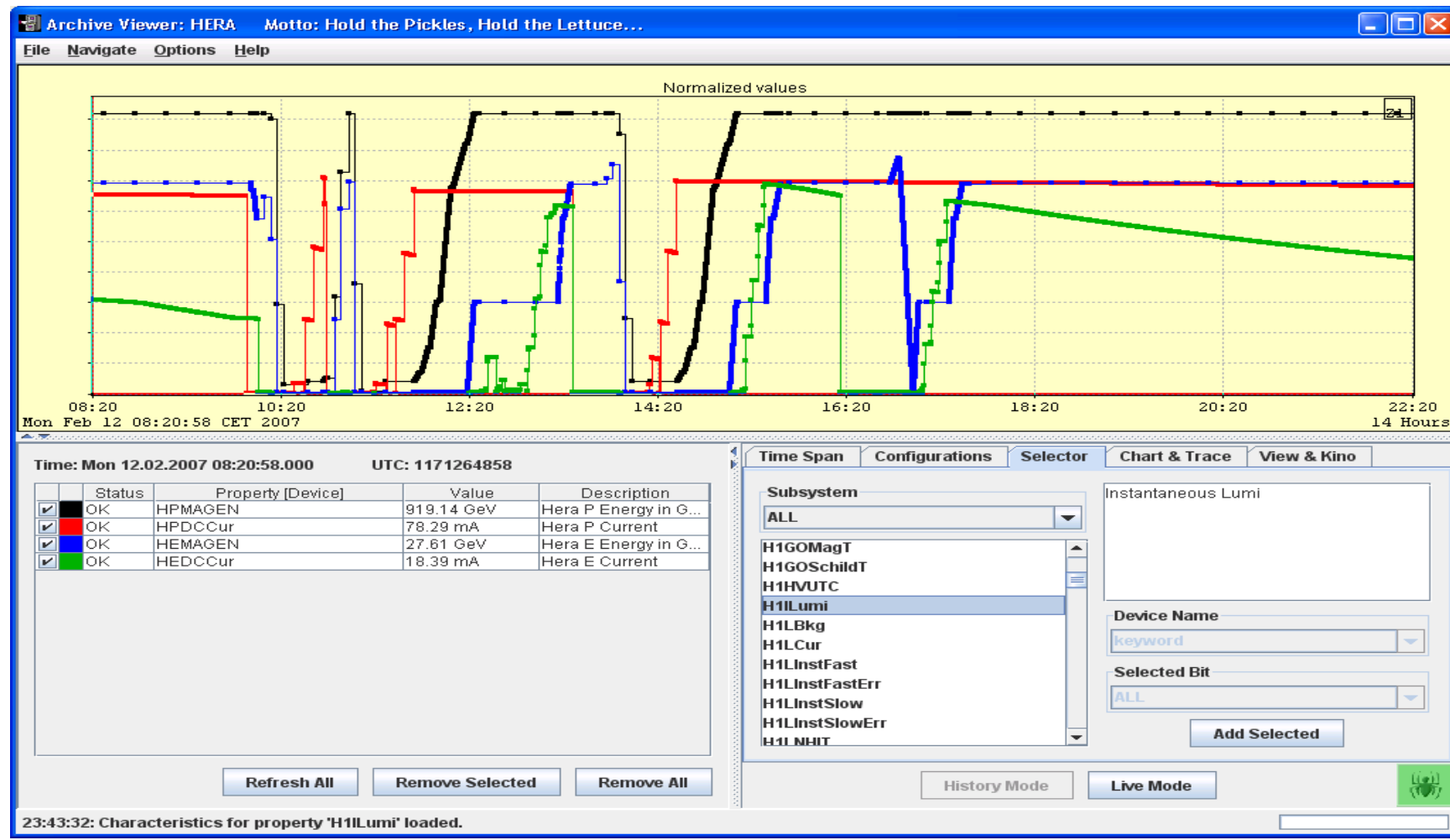- (Just screen shots – I will show a movie in a moment)

HERA Operations: At a Glance, In an Instant

Beam energies and currents from the Central Archiver, re-scaled to "fit" in one plot
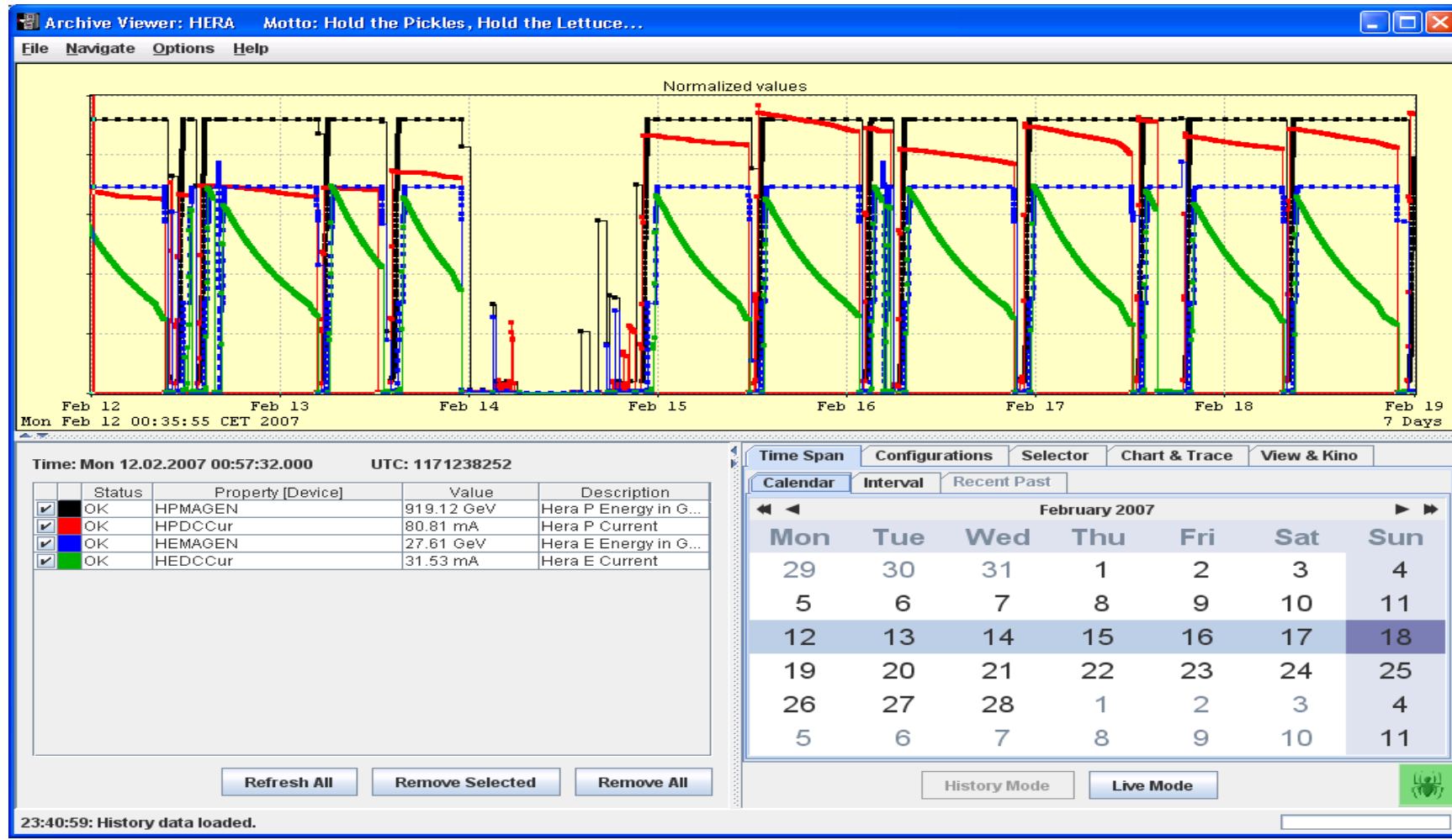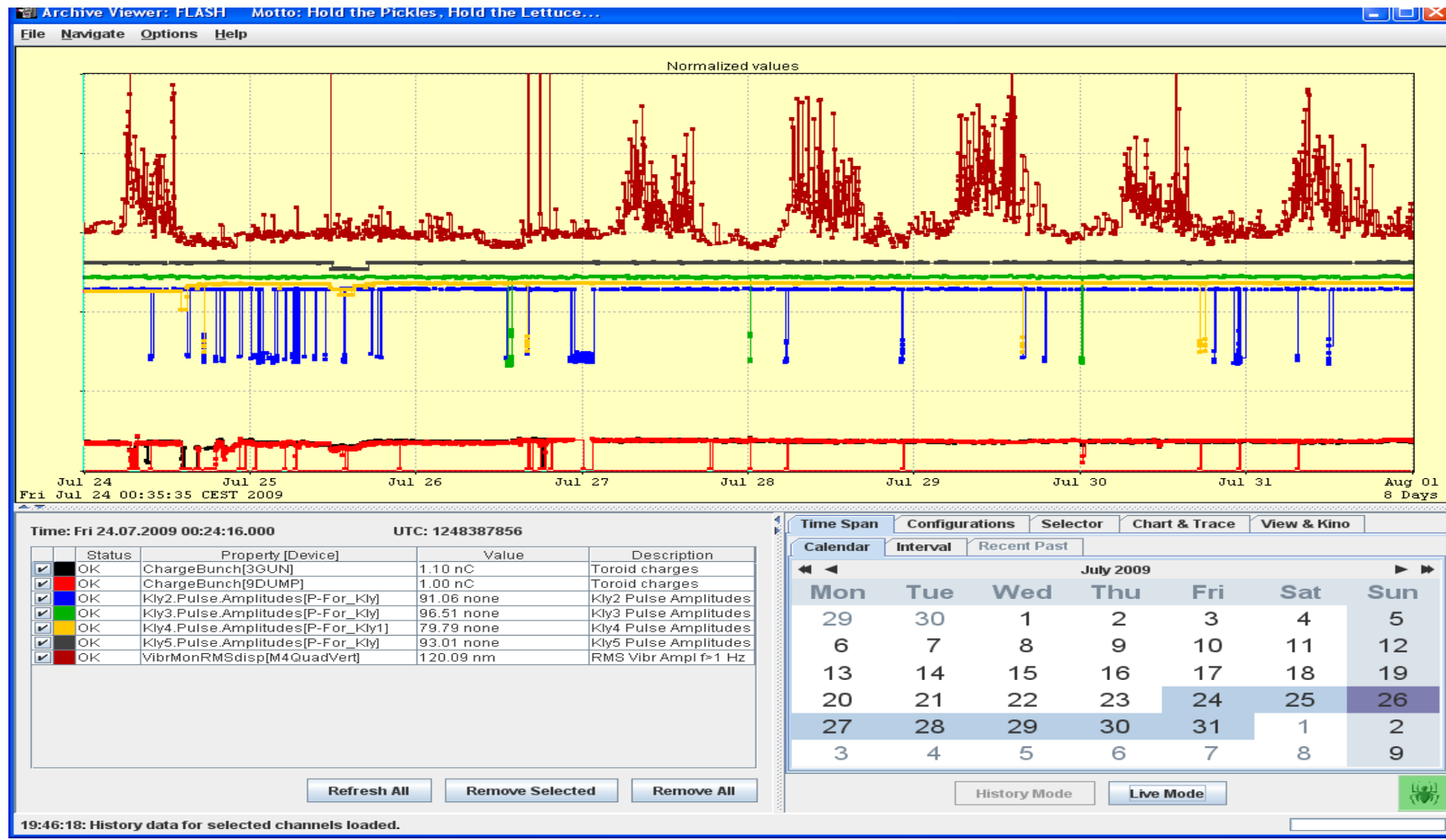
Zoom into an Interesting Time Interval…

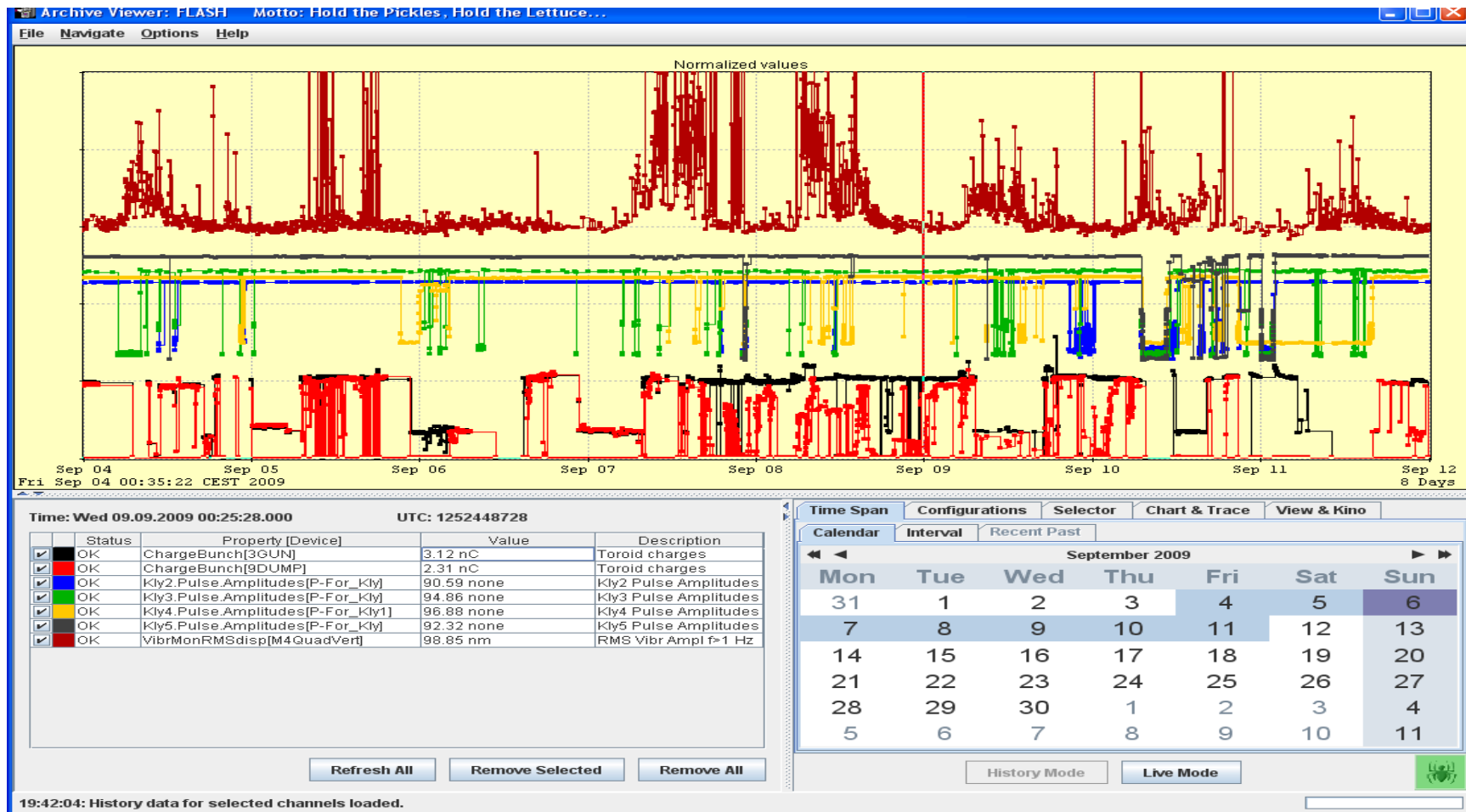select and add additional parameters from the list of archived properties

FLASH RF Operations Overview: A Quiet Week

(hmmmm…. just some problems with ACC-1 on Saturday…)

FLASH RF Operations Overview: 9 mA Run

From here, you can continue your search for an event, a specific time interval….

Monitoring the BLM Subsystem.

- Lars Froehlich asked for a simple archiving of the BLMs to help during commissioning (Sept 2006).
  - Middle Layer collects the data from all BLMs
  - TD Data stored in the Event Archive – all BLMs together.
  - Data collection is triggered "regularly" – every 10 minutes.
    - Started on a Trigger from BLM-Alarms, but not completed
  - For use in "long term" monitoring, HV tuning, etc.

- Values for use in a "Trend-Chart: Sum the Loss-Signals for each BLM over the TD pulse
  - It is additionally useful to separate the total loss signal into "Beam" and "DC" components.
  - The Middle Layer calculates the quantities and they are archived "Continuously"

- Simple GUIs to display the BLM Event-Data (TD) and Losses-versus-Time
  - Helps Operations detect / understand trends, correlations
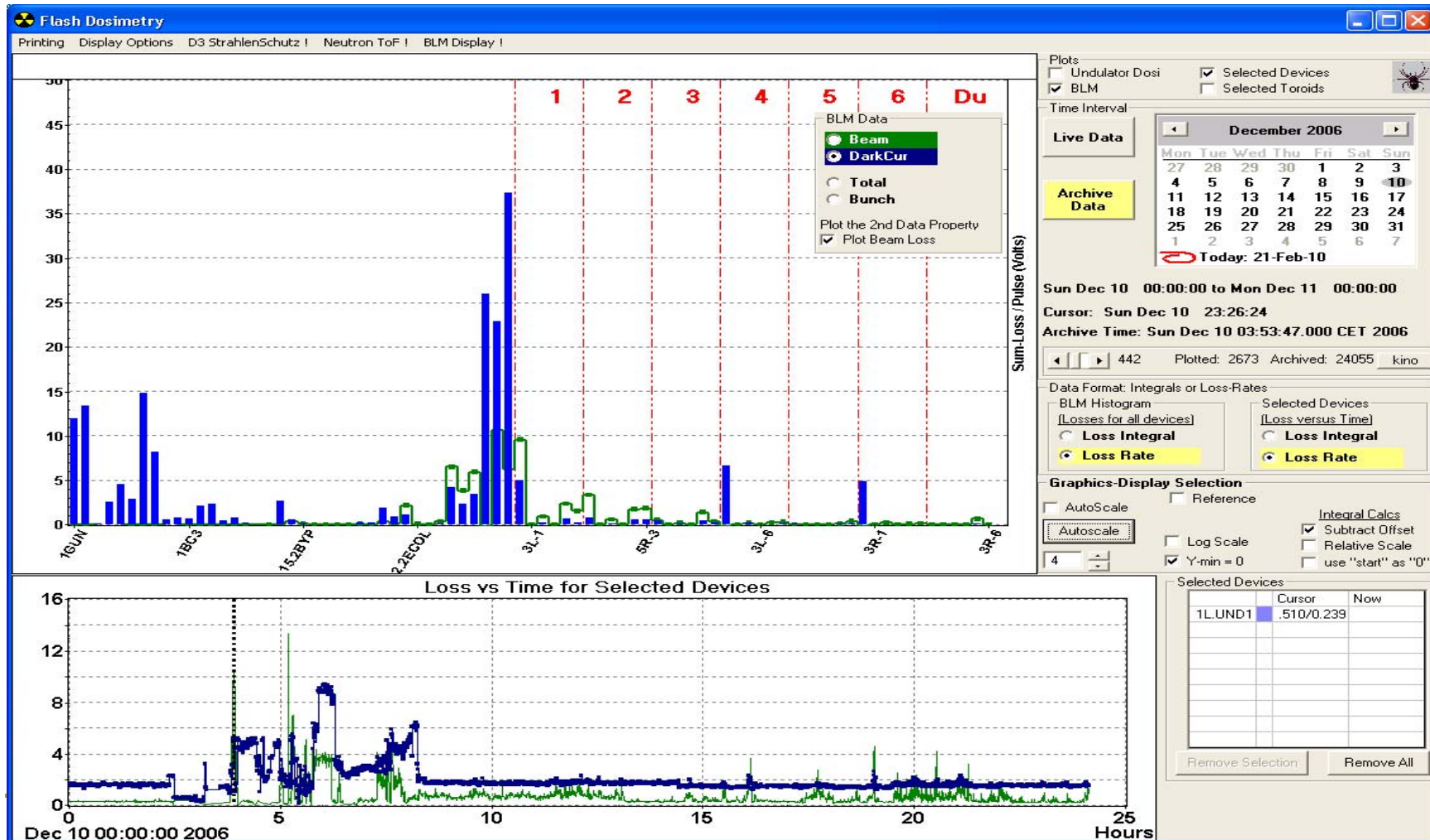
BLM (Specific) GUI: Event Archive Data

A simple GUI to show the "event" list, the TD Data for selected monitors, toroid 3GUN.
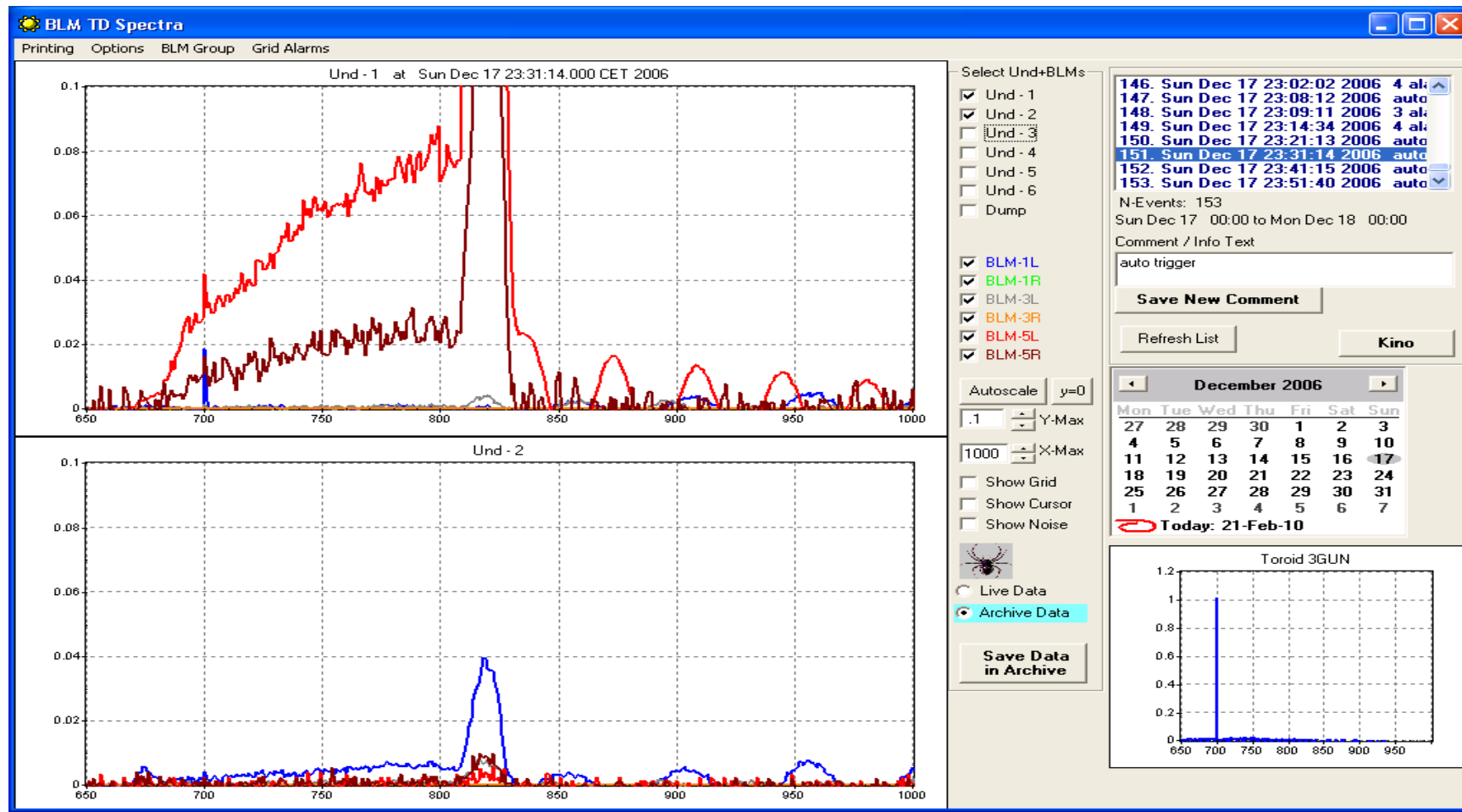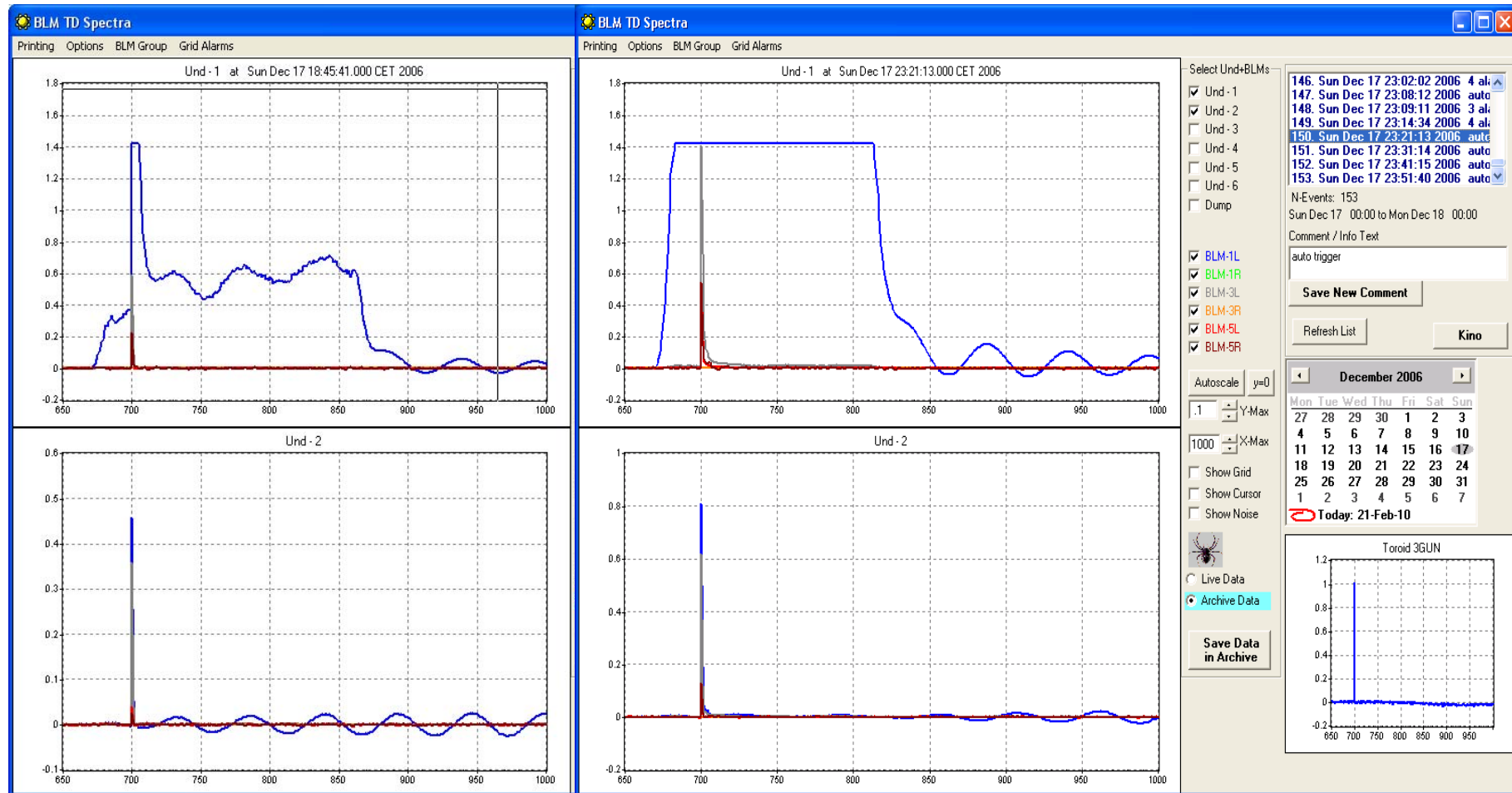
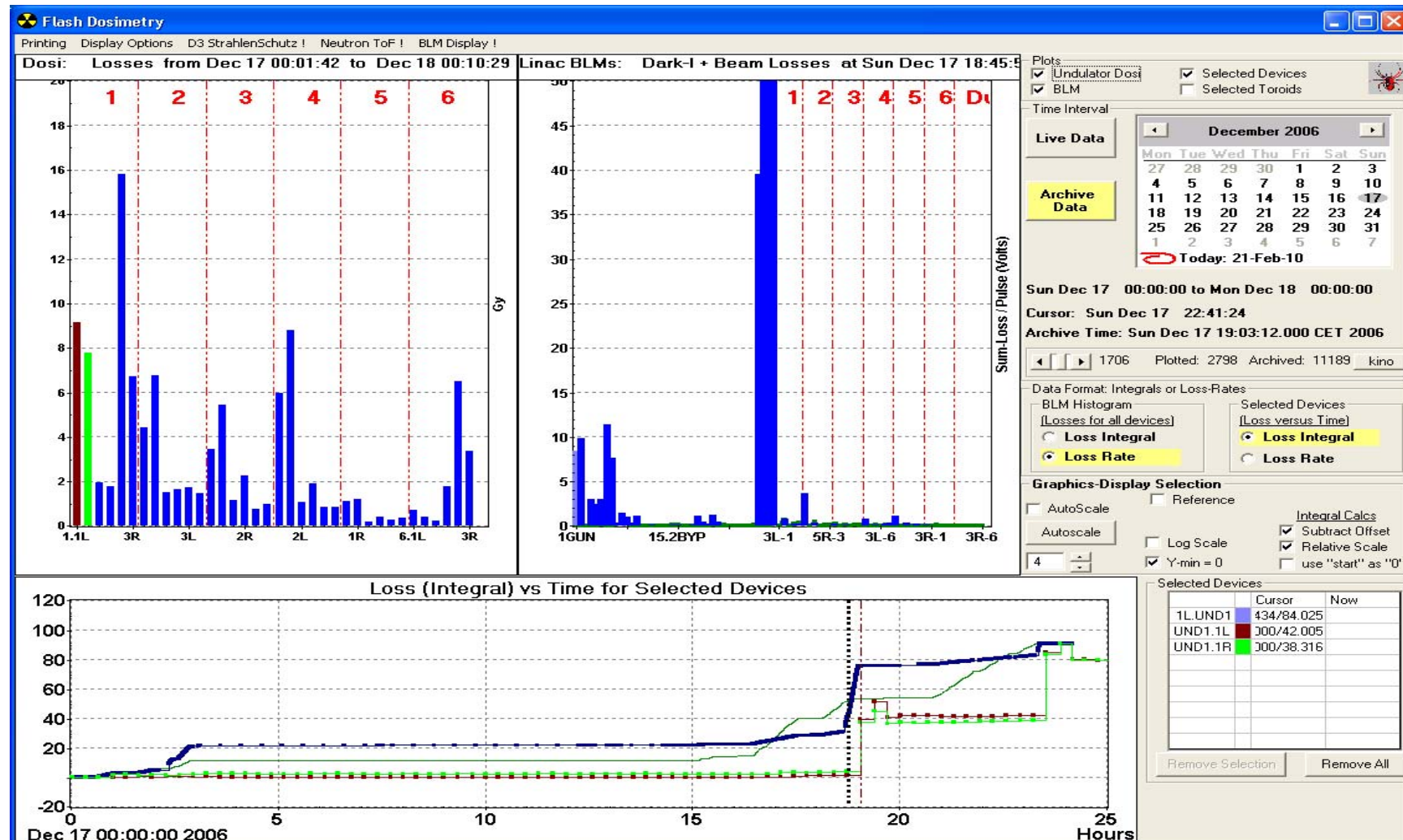# BLM GUI: Displaying + Correlating Loss-Sums.

(1) "Fast" BLMs (L.Froehlich): **"Beam"** and **"DC"** Loss components
(2) "Fast" BLMs (L.Froehlich) / "Fibers" (M.Koerfer) / Dosimeters (Th.Vielitz)

High DC Losses in Und-1 BLM-1L
at 18:45 and 23:21 on 16.Dec.2006

Correlate the high DC-Lossed from the Fast-BLMs with Fiber-Dosimeter readings

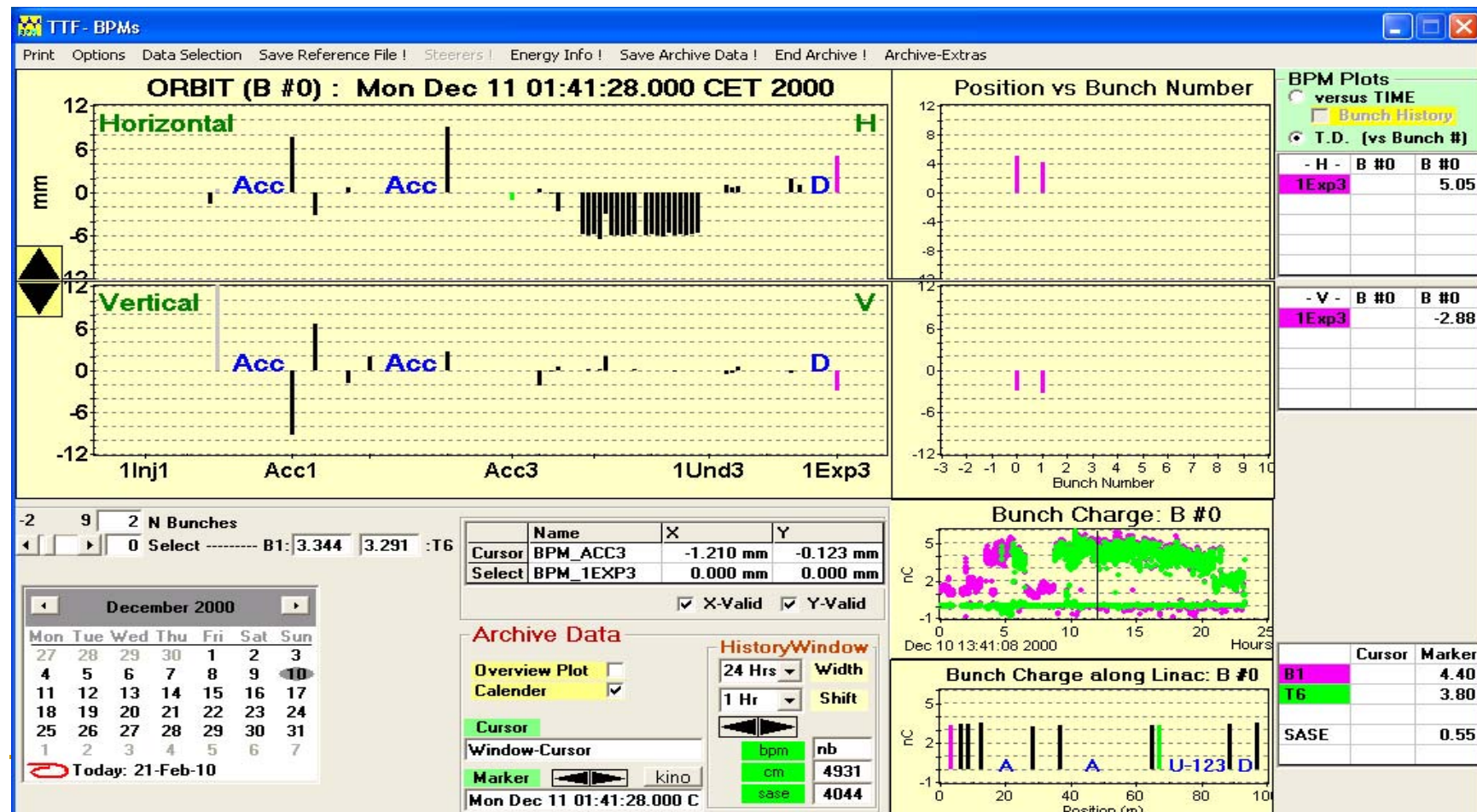# An Orbit Display with Archive Data (TTF1 Data)

(Written to help understand wire-scanner data)

For a "complete" picture of an orbit, need to show:

The Orbit + Transmission for one (selected) bunch at a selected time

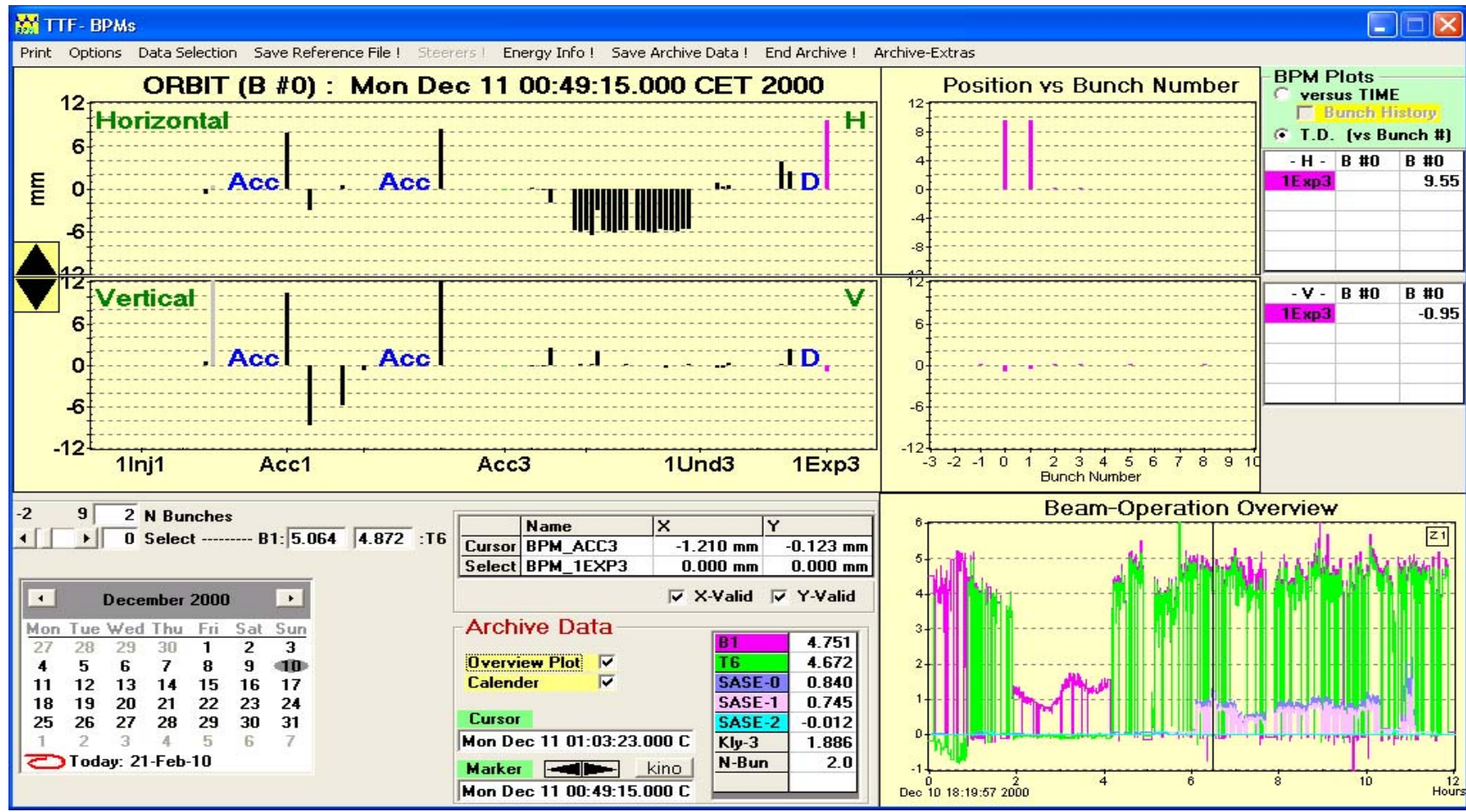The TD (orbit versus Bunch Number) or Histories of Selected Bunch, for Selected Monitors

Click to select a time, get the orbit and the transmission.

Find an Orbit: History Plot of SASE, Transmission, etc.

The "Operation Overview" includes the SASE versus time.
Use this plot to locate an interesting time interval, and to select an orbit.

Retrieve Archived Orbits for Analysis: An Example GUI

The histories include the SASE versus time and selected BPMs.

Select an orbit, save to a ref buffer, select 2nd orbit, calculate the difference… your analysis.

<u>**Think Archive Functionality!!!!**</u> (e.g. click! get the orbit at a selected time)

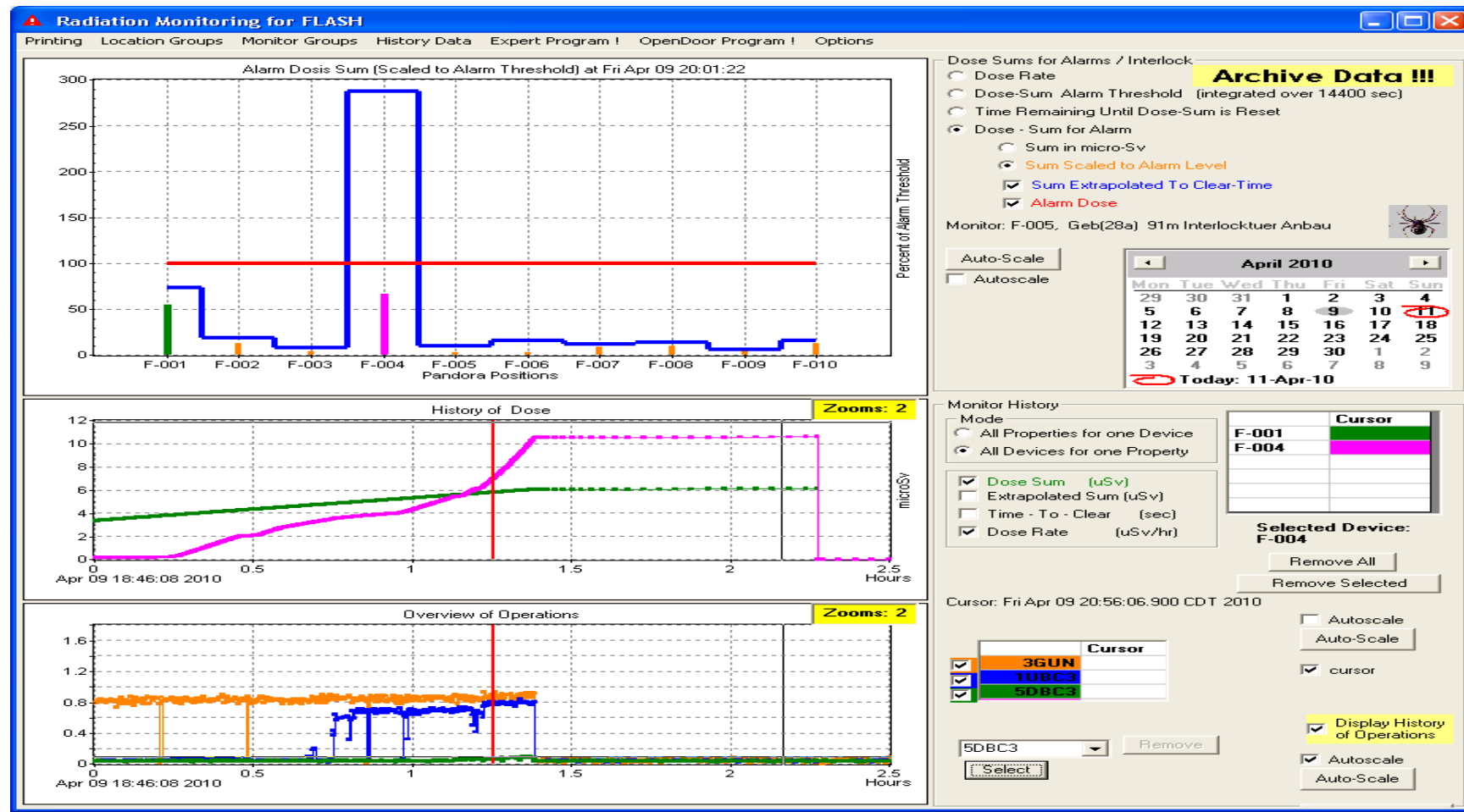**Integrate the Archive-APIs into your Java Optics GUI!**

Study Archived-Orbits with your Optics Tools!!
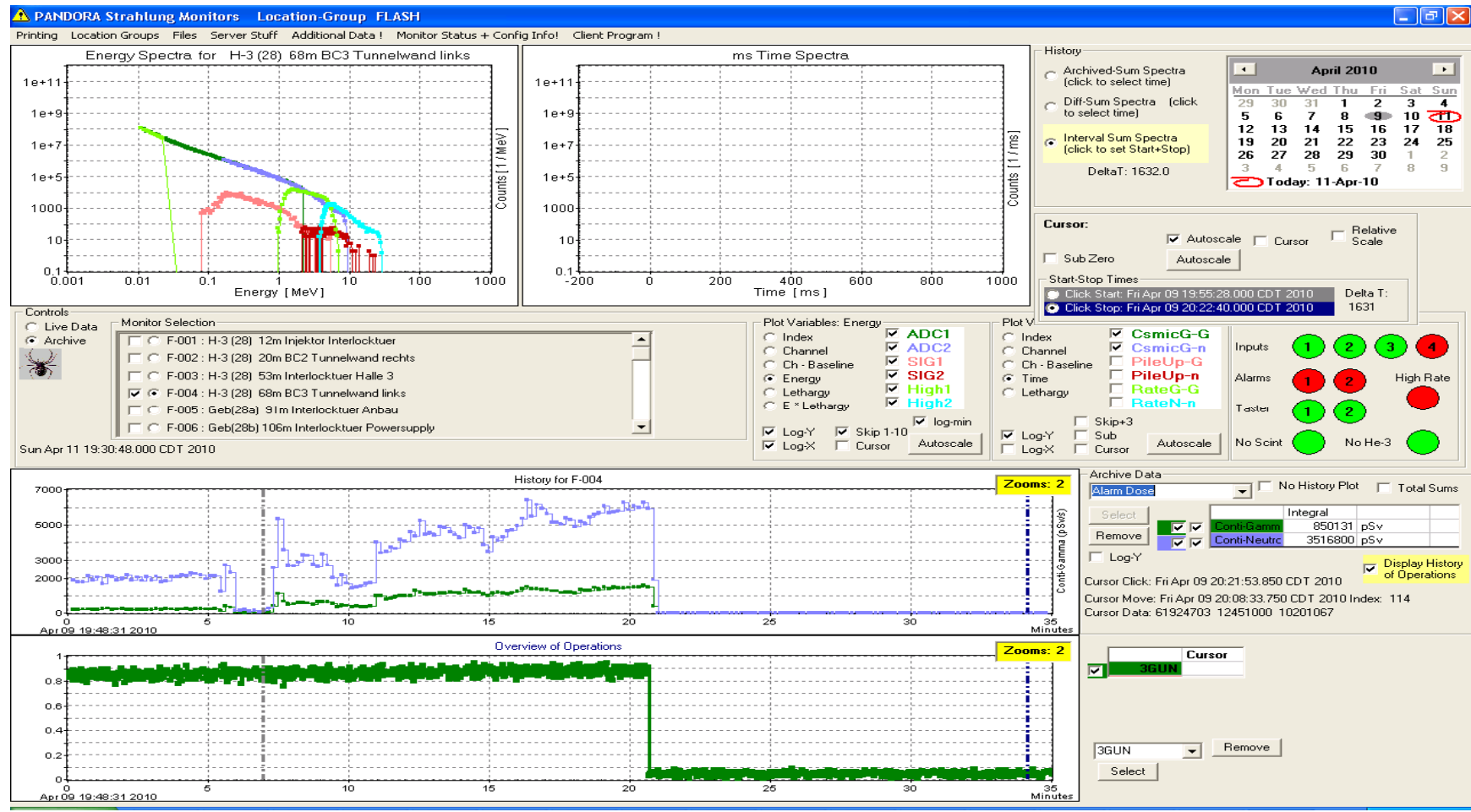
Debug your Optics Tools with Archived Orbits!!
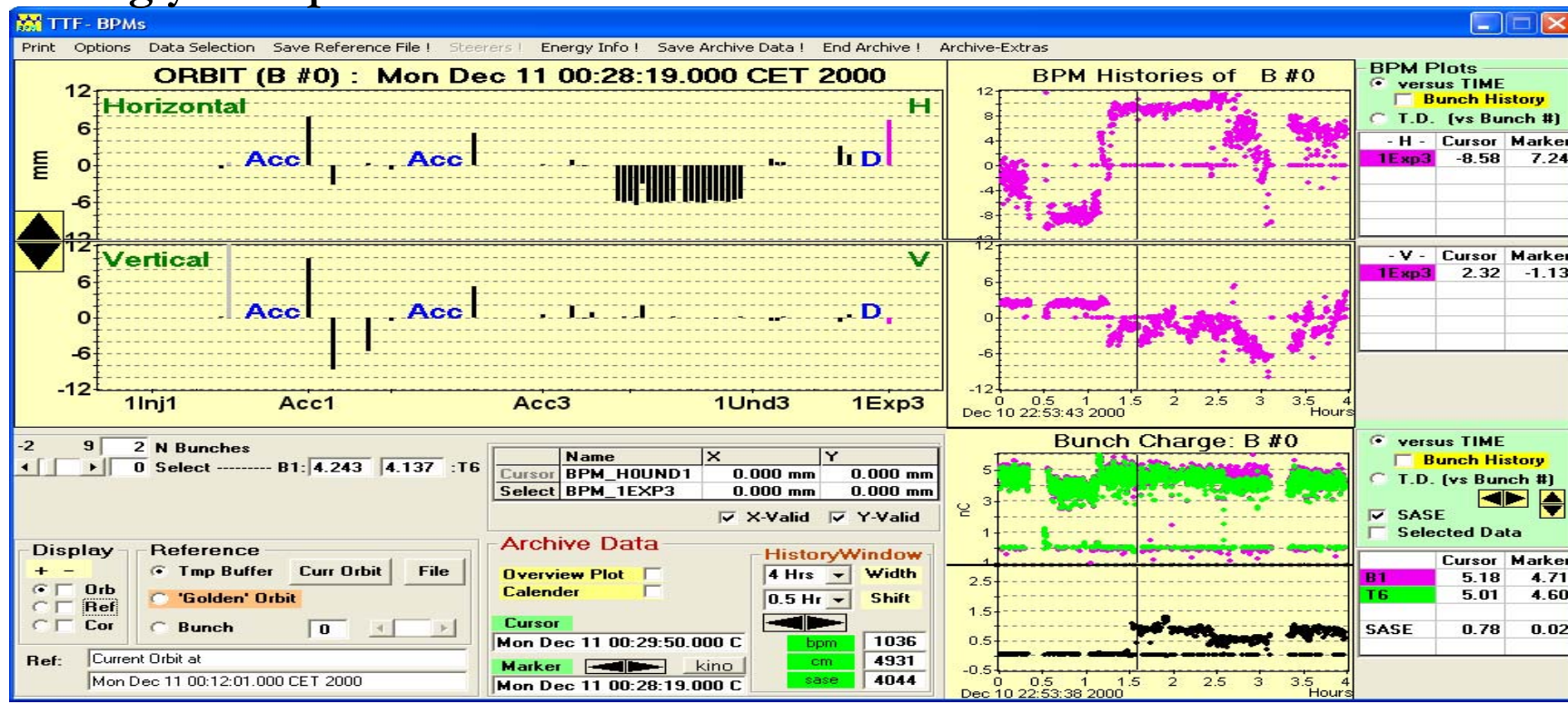
Time for the Movie?

Pandora - Operations

Pandora – Expert Version

Summary

- The TINE Archiving Tools have been part of Operations Analysis in the BKR since ~1992.

- They are in use for all accelerators at DESY,
  at FLASH only for specific subsystems.

- After the 9 mA Run, discussions about improving the operation-efficiency of FLASH.

  - Reproducibility, Loss Analysis, Exception Analysis

- The TINE Archiving Tools could be use to help, and complement the use of the DOOCS archiving tools i.e. the DAQ and Local Histories.

- I tried to show examples of how "Archiving" can be "Integrated" into GUIs to help study operations, "on-line"

- Operations-Enthusiasts and Subsystem-Responsibles: just ask!