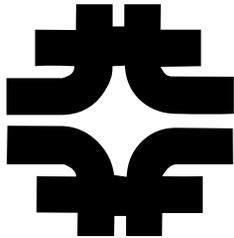


On Tevatron Tune Fitter & New Chromaticity Panel, Status Reports and Plans



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Outline

- Failures/outage of the tune fitter during May – June
- Study on July 3 on automated Conventional measurements.
- Plan for the new Chromaticity Panel

Tune broke down Late May – mid June!

– Two separate incidents:

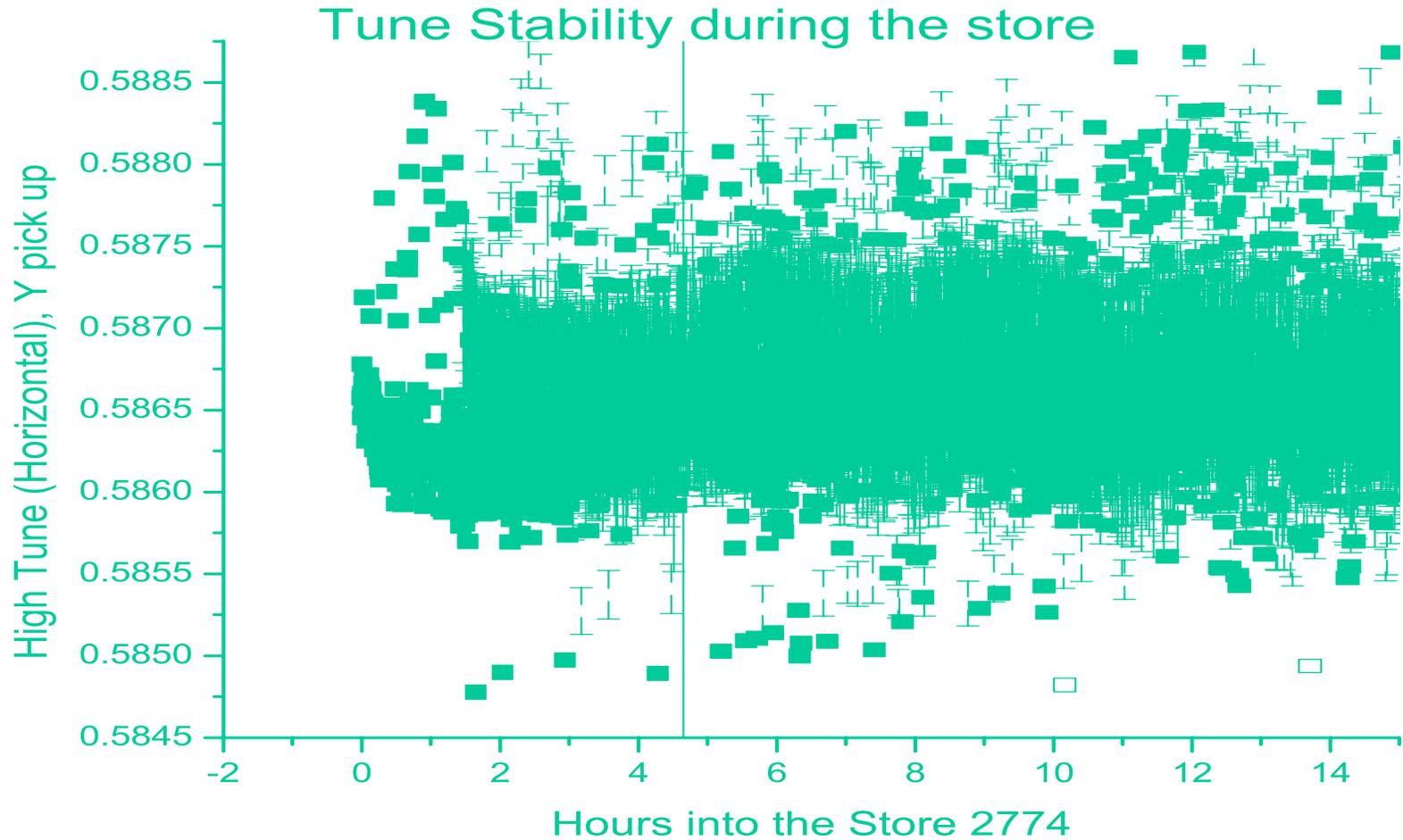
- The OAC engine reporting results via XMLRPC interface got buggy.. Fixed after a week! (I was painting my house..)
- Both HP3561a occasionally loose their “state, due to either: Power down the device, or failure of the MCR01 VxWork node reading the device via GPIB interface, followed by “hand-buggering”..

– Remediation:

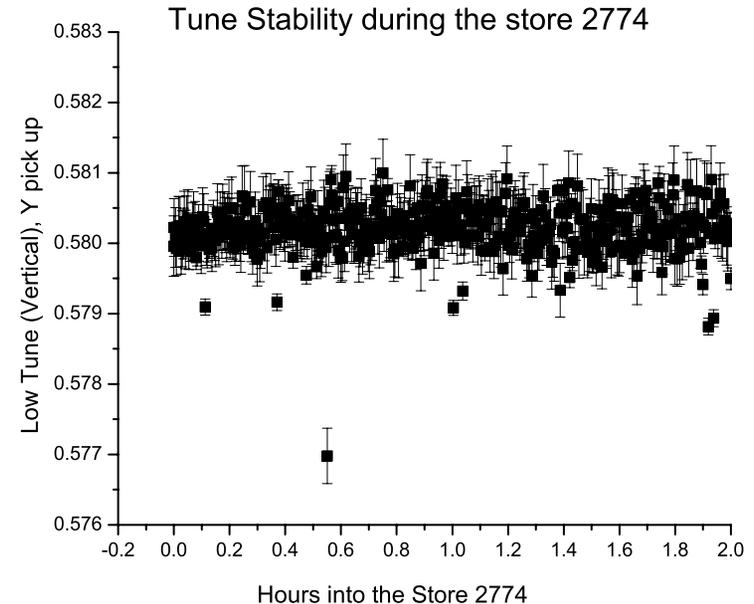
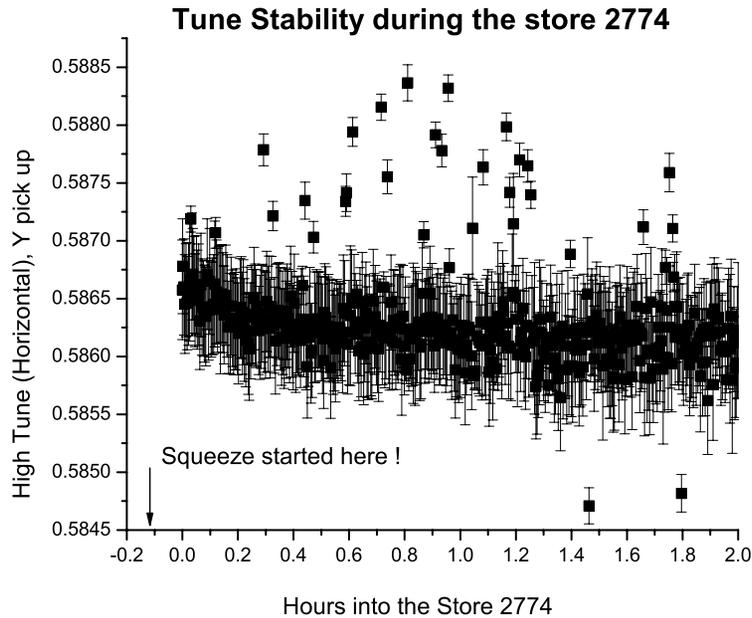
- Reduce software error rate (hard), better testing...
- Download the state from VxWork periodically.. Hard, Charlie tried and failed. **Buy new device, with ethernet connection!!**

Anyway, it is back...

July 11 2003



Tunes during the first two hours of store 2774



- The origin of tune shift during the first ~hour of the stores is a bit mysterious.. Does not fit with beam lifetime to be explained by beam-beam effect.. Hysteris? Low beta Quad stabilizing?

Tune Fitter Speed Performance: no improvement!

- Yet..! This is just a \$\$ issue. We still could go to $\sim 1\text{Hz}$ (almost Nyquist limit, if we want to get $\sim 10^{-4}$ precision). Acquire:
- Better Spectrum Analyzer with faster (ethernet based) readout.
- More CPU. Since the arbitration between the X and Y channel is difficult anyway, implementing parallel computing is trivial. (a few lines of code change in the OAC responsible for generating the input files for the tune fitter.
- However, for Coalesced beams, with the current algorithm, it would require ~ 10 CPU at 1 GHz to read 1 Hz.
- *But, the most promising application seems to be for accurate tune/chromaticity and coupling measurement with uncoalesced beams.. Only ~ 2 to 4 such CPU would be needed to reach close to 1 Hz.*

Documentation: <http://www-bd.fnal.gov/tevtune/>

- T:TUuvBR[0:1]

The tune and error values, where :

u stands for either X (Y) to refer to the signal from X (Y) pickup, respectively

v stands for either X or Y to refer to the X or Y tunes.

The array length is two, as we store the values itself (array index 0) and the error (array index 1) This error is set to a 1/4 of the synchro-betatron line split if we have a successful Lorentzian fit and the 1/4 of the Gaussian sigma obtained from the smoothed out spectra.

If the 5 Breit-Wigner fit over the discrete Synchro-betatron lines failed, then this is the width (sigma) of the broad, smoothed out bump that determine the effective tune. If this high precision fit succeeded, this is fitted value for the synchrotron line split. For such good fits, it is most of the time in close agreement with the predicted synchrotron tune split, or a multiple of it. The value for the smoothed bumps is much bigger and indicate a poor fit.

T:TUuvWD

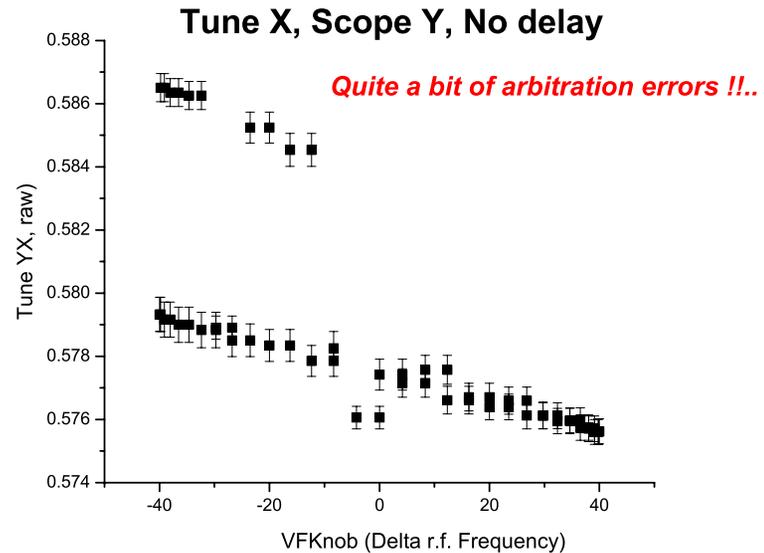
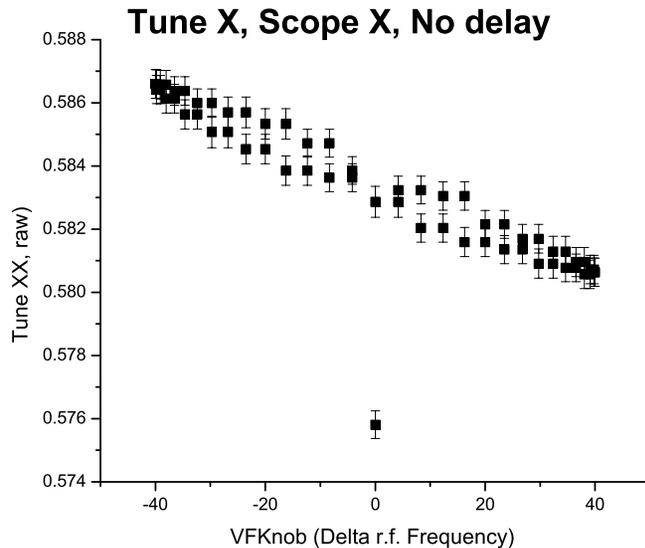
Onto the new Automated Chromaticity Measurement

- *Goal: accuracy, repeatability...*
- *With more CPU power, faster than operation.*
- *A 10 min. preliminary study was conducted on July 3 2003:*
 - *(To exercise the new Java Application “Studies”)*
 - *To gather the type of data this new application would fit.*
- *We simply ramp the frequency vernier (T:VFKNOB) and record the tunes*
- *Result: after a bit of fussing around to remember how to use “Accelerator Studies”, no problem to take the data.*

Comments on “Accelerator Studies”

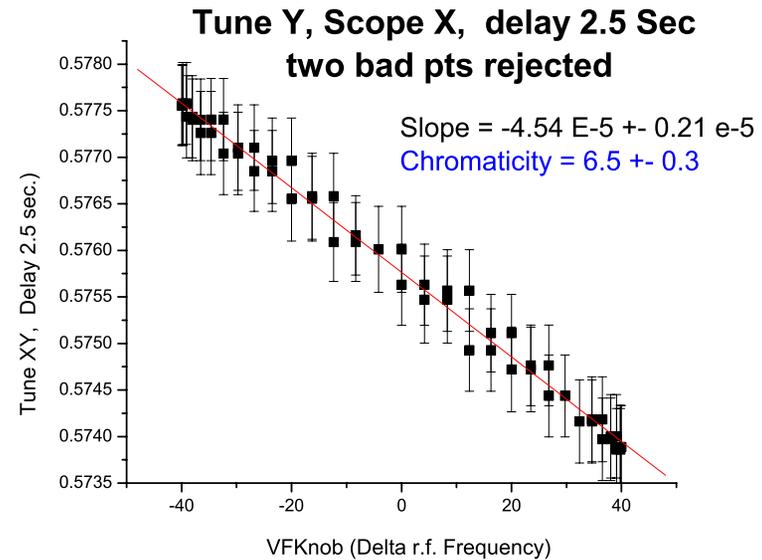
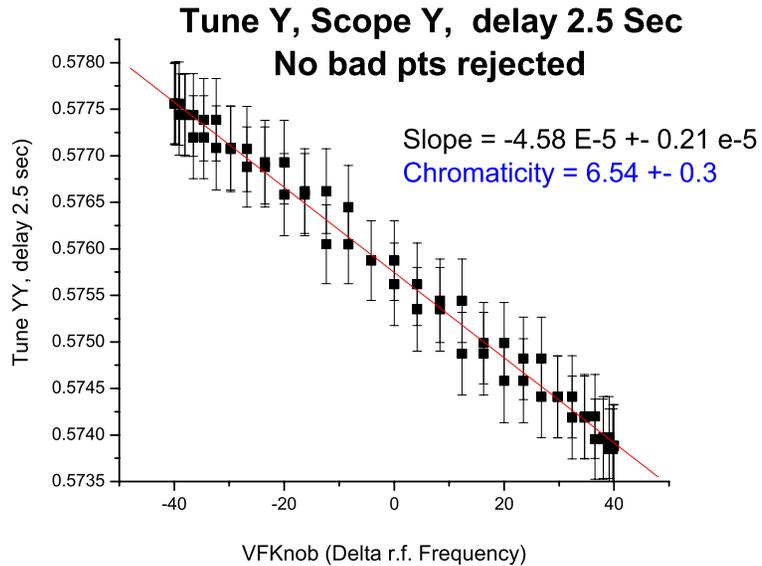
- *One of us should work in close collaboration with Luciano P. to integrate and enhance ! This could increase our productivity during studies..*
- *Todo list: **Integration!!!***
 - *Use it more, as it is.. (After a rebuild with the new version of the Framework.. Minor detail...)*
 - *Most important is a known, default directory where the xml files for Studies resides, so that we can re-use them, and/or use them for templates for new studies. Also, have a default directory is a shared place, so that we can access the data for offline analysis, as a group, not as individuals.*
 - *Suggested minor upgrade:*
 - *automatic restoration of all actuators to their “found” value upon termination of a study.*
 - *If multiple output files are used, create a directory each time we have a study, in the specified directory. To be implemented in coordination with the “shared” repository idea...*

Results on Chromaticity, 1



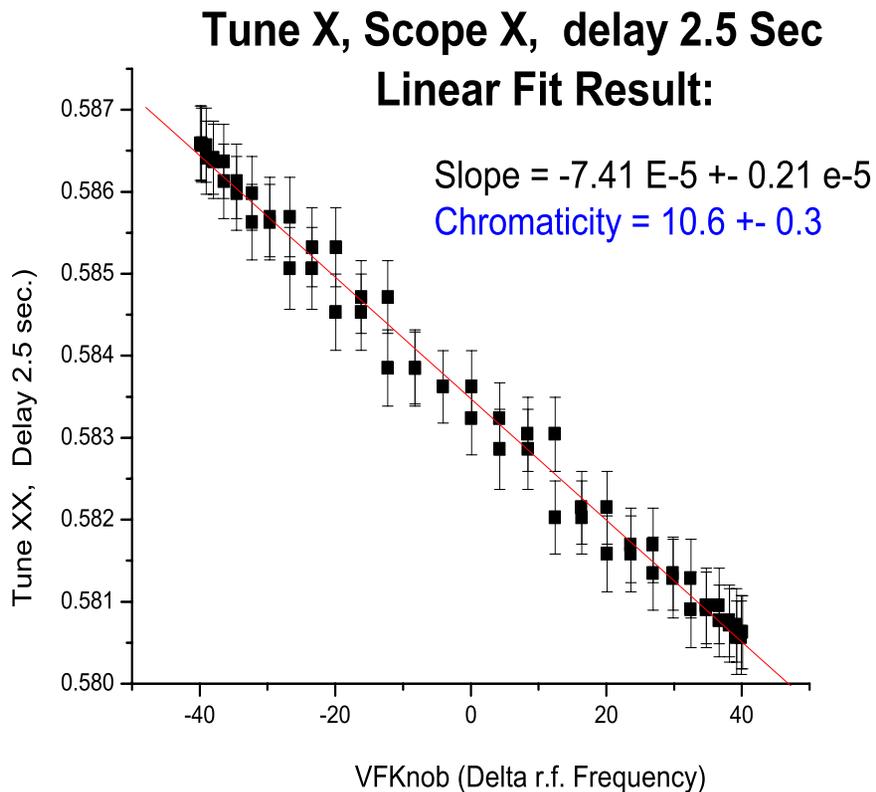
- “No delay” means that it is assumed that a setting has immediate effect on the tune. In reality, we have to shift the actuator settings with respect to the measurements to take into account the response time of the tune meter..
- Arbitration mistakes.. Since then, this option has been turned off.

Results on Chromaticity, Vertical.



- X and Y pick-up agree.
- After rejecting badly arbitrated fits, a real attempt can be made at estimating errors.

Results on Chromaticity, Horizontal



- No non-linearity observed over a range of ± 40 Hz..
Disappointing!
- But if there are, we have a chance to investigate it systematically...

Status of this new TevChromaticity application.

- Worth writing, I think.. Two goals:
 - Familiarizing myself with Daq stuff, “old” and “new”
 - We will be able to measure Chrom more systematically, and accurately.
- Designed...
- In the “new” Java framework, detailed design done, DaQ prelim. Code written.
- Next week, write the GUI part.
- Assemble ~ a few days.. Should be ready for testing before the shutdown.
- In the “Old” (Vax-C), it might take a bit longer!...