# On Tevatron TevTuneTracker,

# Brief Status report on Uncoalesced Beams

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# Tevatron Tune Tracking

- Automatic fits of Spectrum Analyser data is hard, as it is just a mess of broad and signals.
- Goal : express “the art of picking the right line” into a reproducible algorithm that can be implemented on a modern computer, and can be run at ~ 1 Hz
- Status: Both for Coalesced beam and uncoalesced beam, it starts to work.
- Need to keep comissioning it ..
- Short term project: new Shottky will provide better information.
- Long term: Provide proof of principle that such difficult fits can be done .

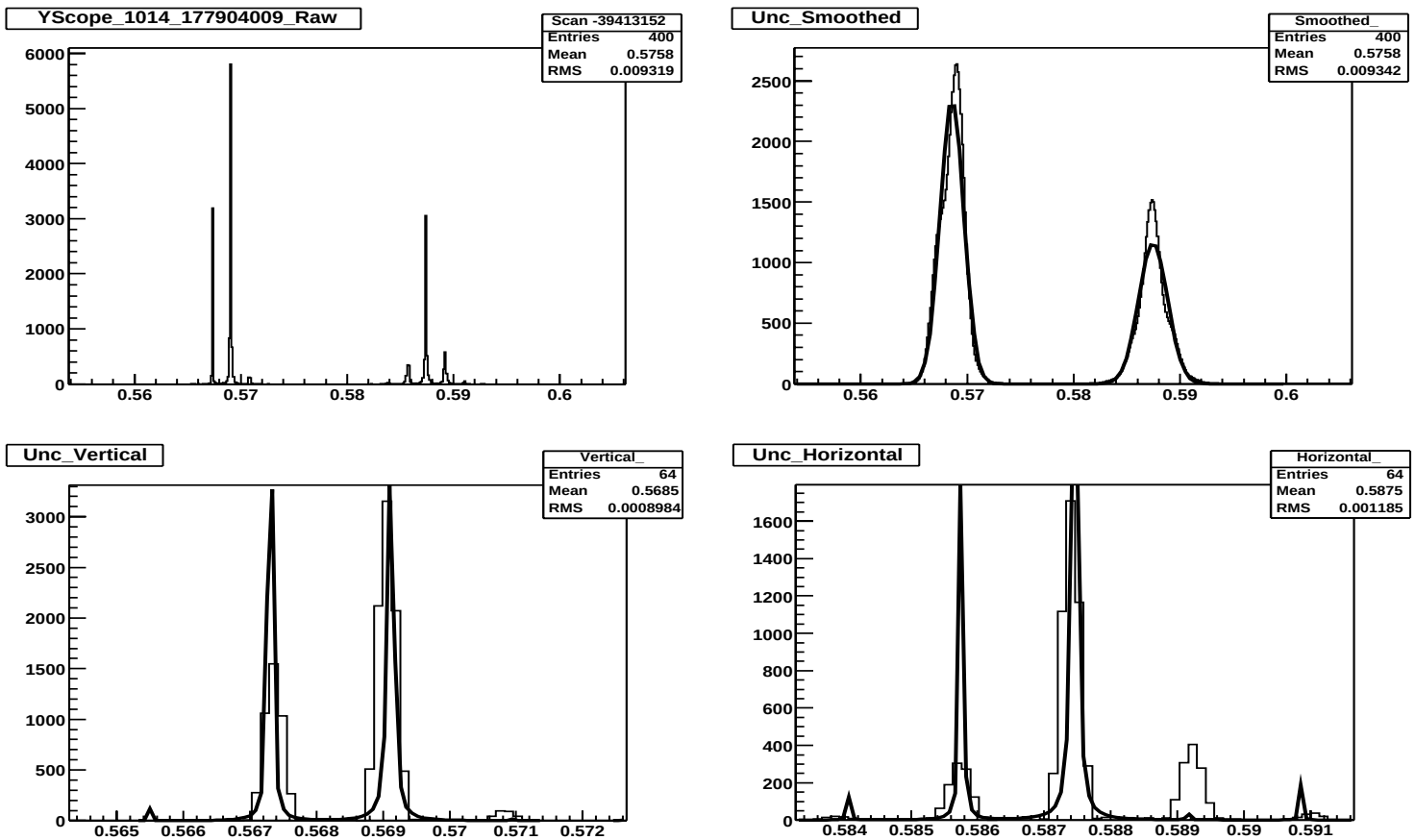
# Status, Hardware, Software..

- The vsamcr file have been analysed by John Marraffino, showing that some information could be gained.
- An HP3561A “box” has been connected to the existing proton shottky signal by Dean and Charlie Briegel
- Who has also written a nice ACNET Read Wave Form utility..
- Which, thanks to Ron Renchenmaker, Kevin Cahill, Jim Patrick, … , I am able to read on nova.
- And fit, using the infrastructure written by John M., based on the root package.
- And,. Thanks to a XML-RPC based library, I am writing the result of the fits to ACNET

# New ACNET Devices

- If the T:MAX111 and T:MAX110 are set “the right way for getting the V (vertical) signal, and if “things are running”..
- T:TUYXBR: The horizontal tune, either deduce from the narrow Synchro-betatron lines. Expected values: around 0.584, or conversely, the broad bump we got during normal store, at ~ 0.589
  - First element : the value :
  - 2nd : the error
- T:TUYYBR : Vertical tune, expected around 0.574 (nominal) to 0.580 Again, two elements, value and error..
- T:TUYuWD : the tune width. Either the Synchro-betatron splitting , or the width of the broad spectra. “u” stands for either Y or X, for the vertical and horizontal planes, respectively.
- More to come…

# Uncoalesced Beam, taken during Mike Martens Tev. Tune studies, Dec 11 2002. 16:36

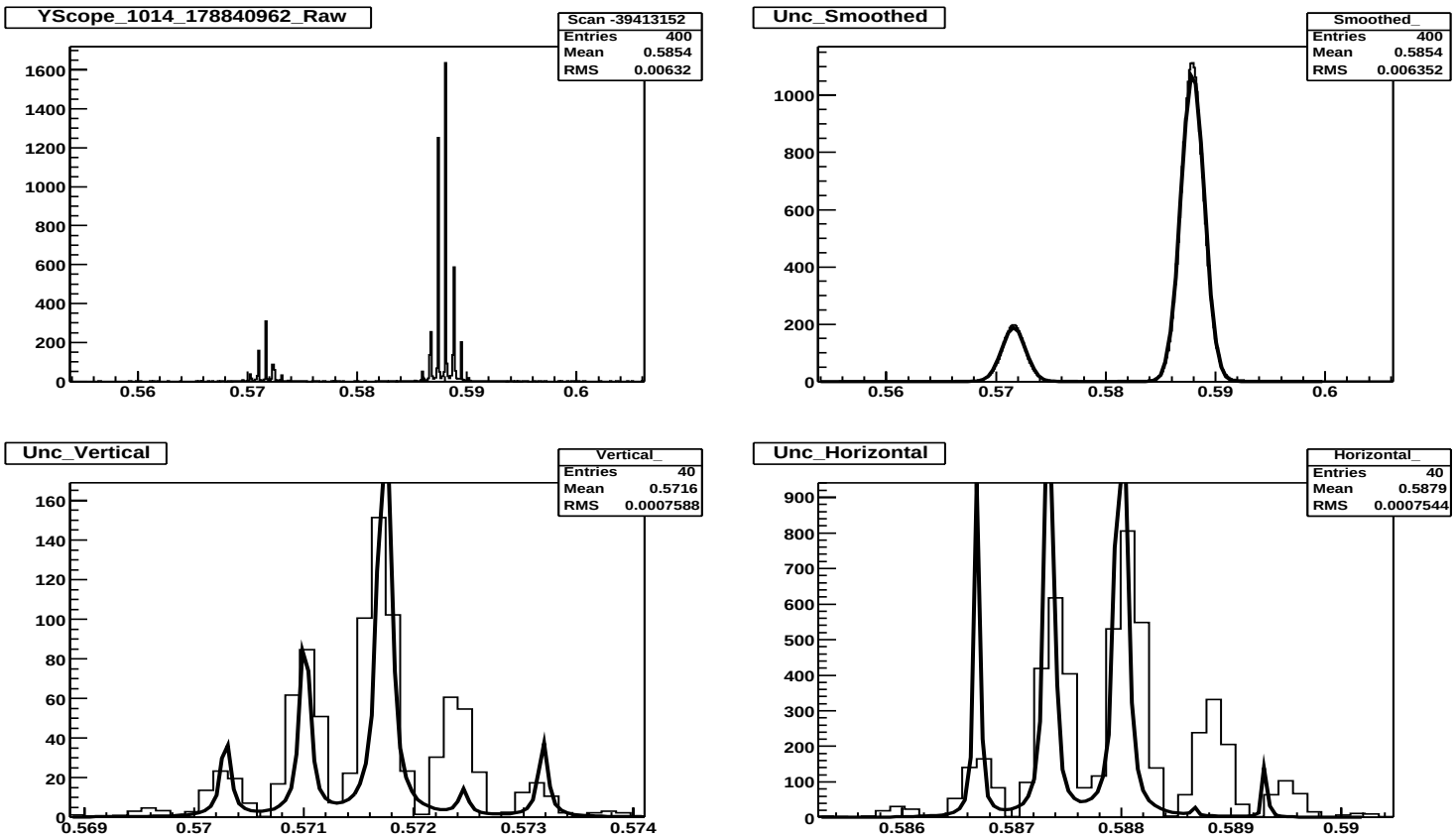



Tunes, V = 0.569115, H = 0.587459, Synch split, H = 0.001812, V = 0.00170, Predicted = 0.00168

# Algorithms..Uncoalesced..

- First, Histogram, on a linear Y scale.
- Scale such the noise level (~-90db) corresponds to ~0.5 counts per bin.
- Smear (or smooth), on a big scale (every bin content is spread, Gaussian wise, to neighboring bins, until we get a fit where the maximums of the 2 gaussian are within 25 % of the maximum of the histograms. (no chi-square cuts!)
- Fit Two gaussians. This determines the broad value of the Horizontal and Vertical tunes.
- Make two distinct new histograms, one for each region, using the original data.
- Smooth, Cern algorithm, two times.
- Fit with 5 Breit-Wigners, with a fixed width and fixed splitting.

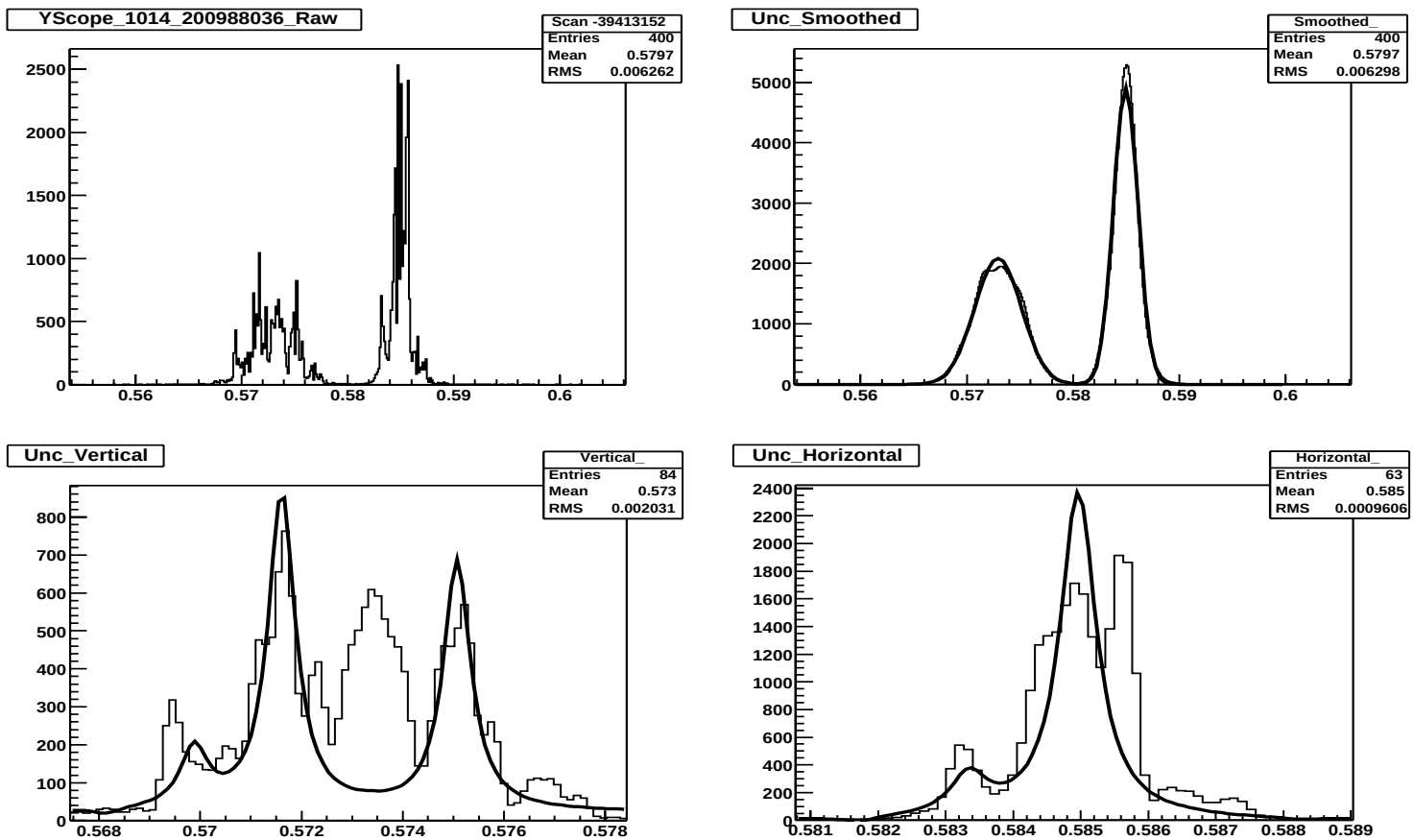
# This was at 150, at 980, same beam.. 16:55




Tunes, V = 0.571733, H = 0.587999, Synch split, H = 0.0007232, V = 0.000659, Predicted = 0.0065

# Back to 150, a bit later..

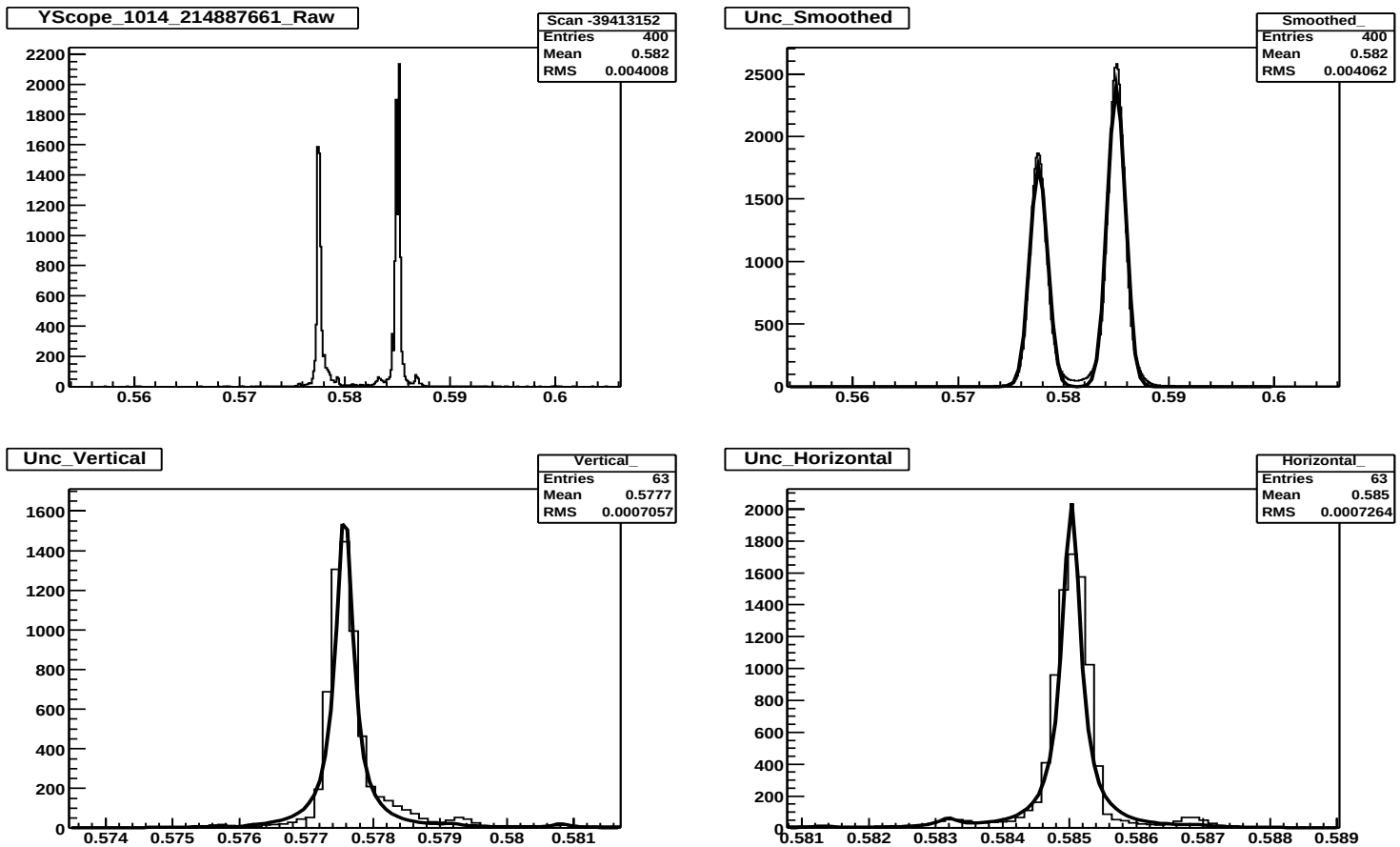
23:04




Despite missed bumps, Synch split, H = 0.0017312, V = 0.0016207, Predicted = 0.00166

# Owl shift…

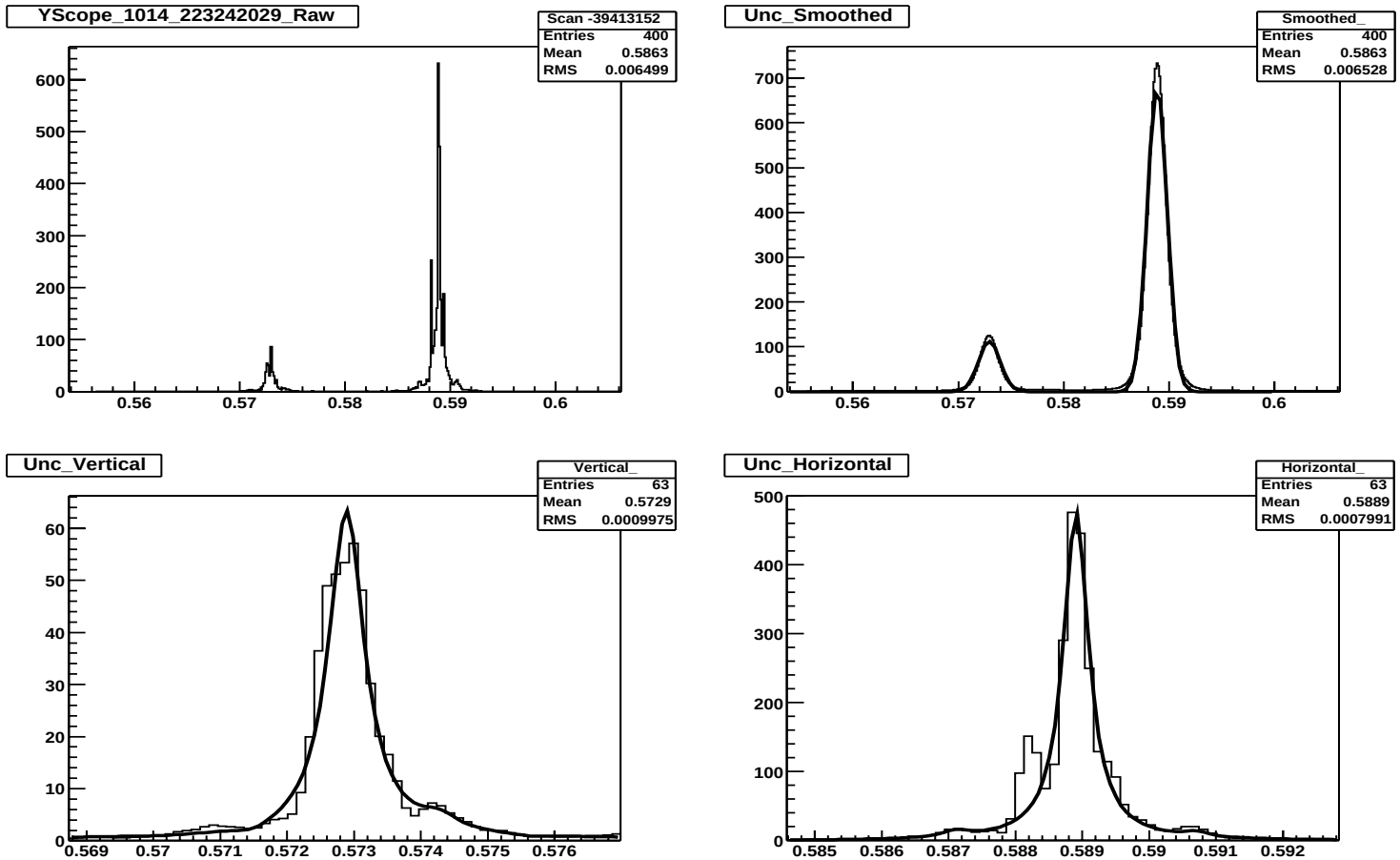
05:05



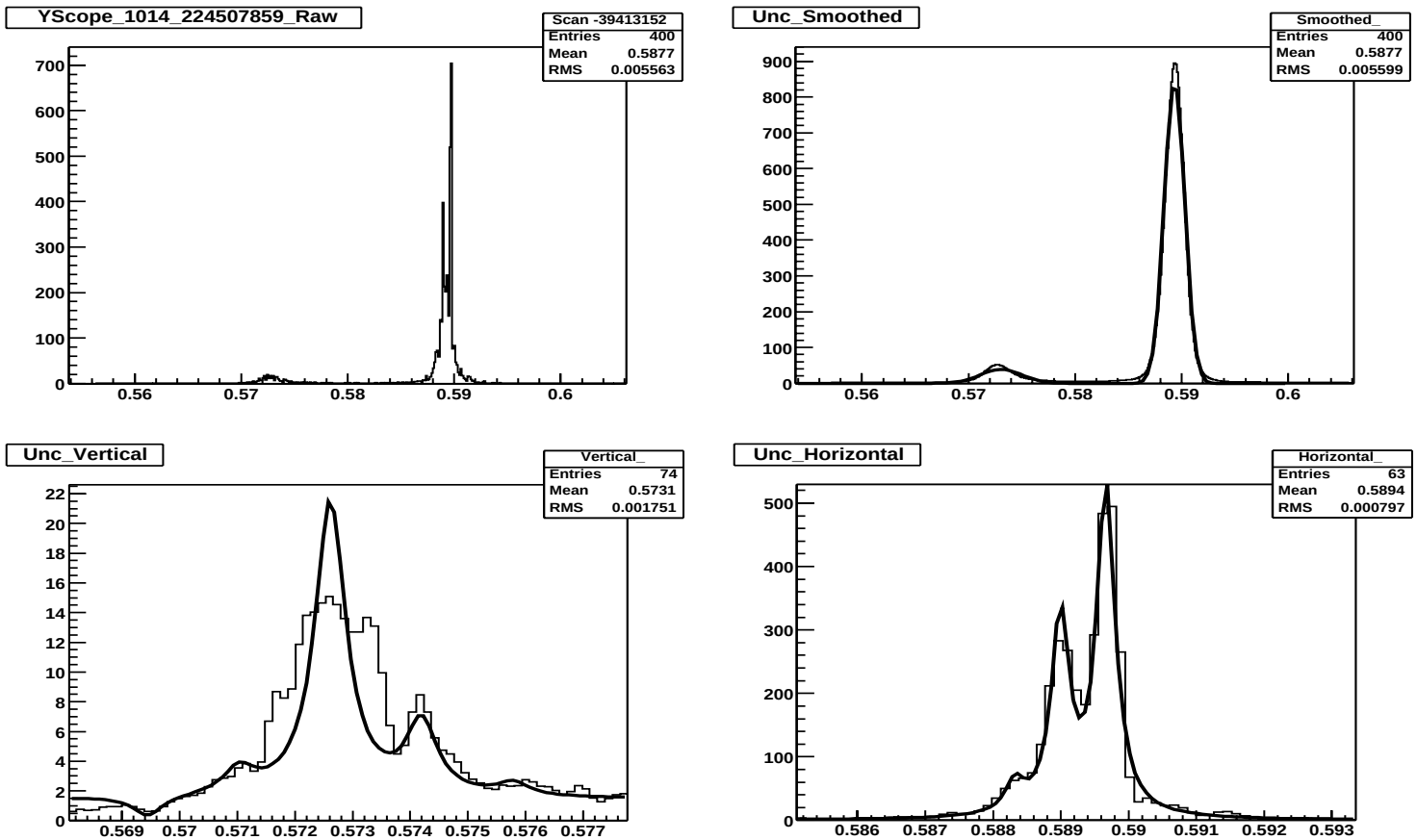

Despite weak bumps, Synch split, V = 0.001799, Predicted = 0.00165

05:36

# Owl shift…



# Owl shift…




Despite weak Vertical signal (no tickling, I presume) (10 db above noise),
we got a meaningful Verticla tune measurement, Sync-beta (0.00185)

# Conclusion..

- It is possible to express a measurement method into an algorithm that runs on a computer, as fast as one can read from a screen.
- However, these tunes number were not reported to ACNET last Wednesday, as I was tuning the algorithm..
- It could be.. Just a switch in the code…
- But I am stuck ! No more signal on “MY BOX”!!. The signal got away Wednesday or Thursday, for studies.. Can I have it back?