

# DMT Monitor of Channel Excursions

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Describe briefly what a control chart is. Mention origins in quality control. What does it mean to be “in control.” To be in control means that the data is behaving as it is expected to. A control chart may find possible uses in LIGO as a quantitative and qualitative tool to look for unexpected fluctuations in statistical values.

3 min

## Control Charts.

- A versatile tool for providing qualitative and quantitative measurements of the quality of data.

## How to Make and Use Control Charts.

- Plot statistical values over time.
- Decide upon appropriate control limits and plot them as horizontal lines.
- Record the excursions beyond control limits and make judgements about whether the data is “in control.”

Simplest example of a control chart. Only an example of how one might be used. After going through steps give example of graphical and textual output on E5.

6 min

# Example: Mean Control Chart.

Data is out of control if...

- Any points exceed 3-sigma.
- Two consecutive points are beyond 2-sigma.
- Four consecutive points are beyond sigma.
- Look for trends or accumulation.
- Data is not in control again until three consecutive points are below 1-sigma.

Show examples of how other types of examples are used in MonControl. The Chi-Squared control chart can indicate how far away from gaussianity the data is. A jump in the value of the Chi-Square could certainly indicate something.

## Other types of control charts.

- Standard Deviation.
- Chi-Squared.
- Skew/Kurtosis.

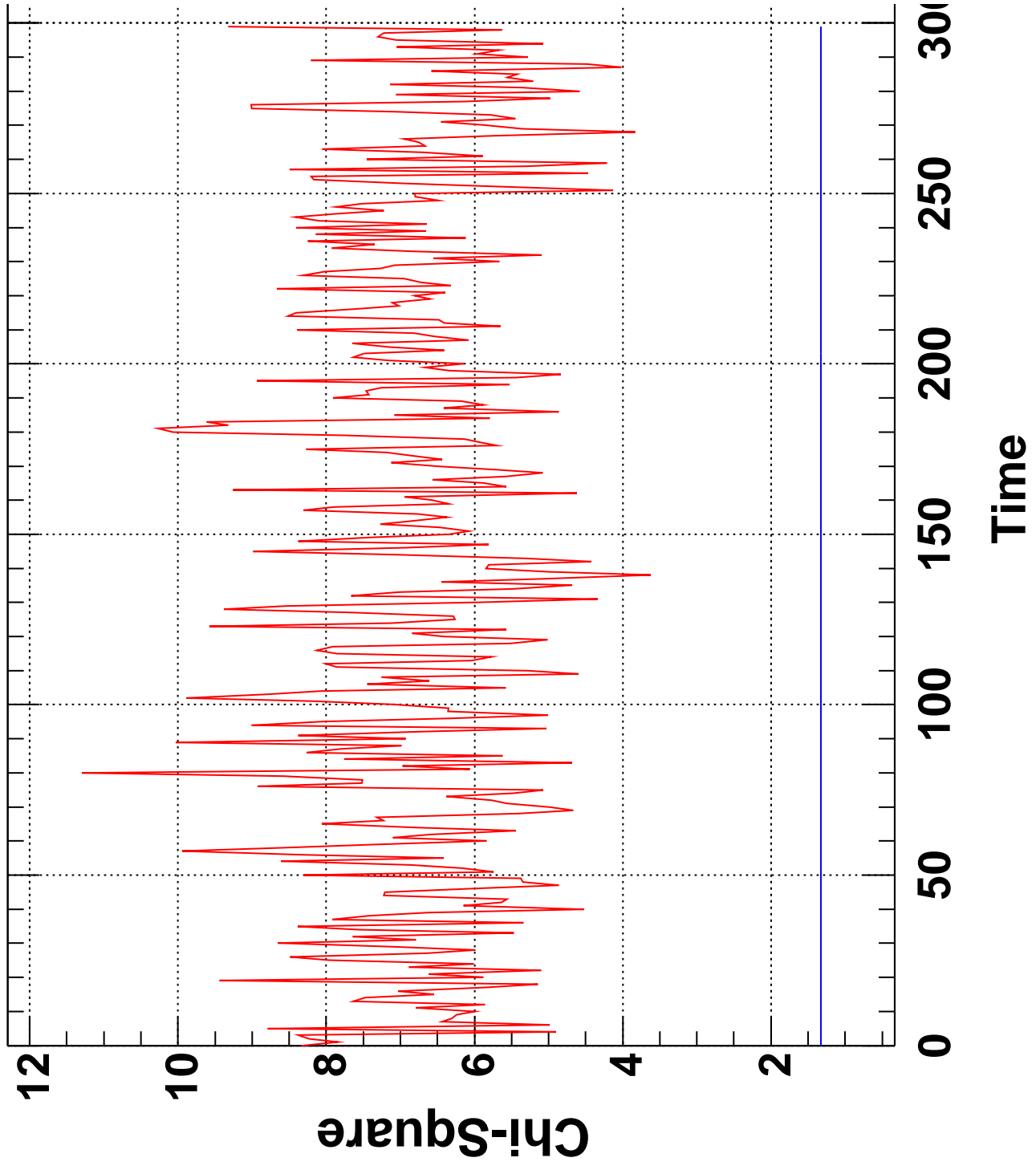


Next things are: Make more versatile and user-friendly. Make html page.

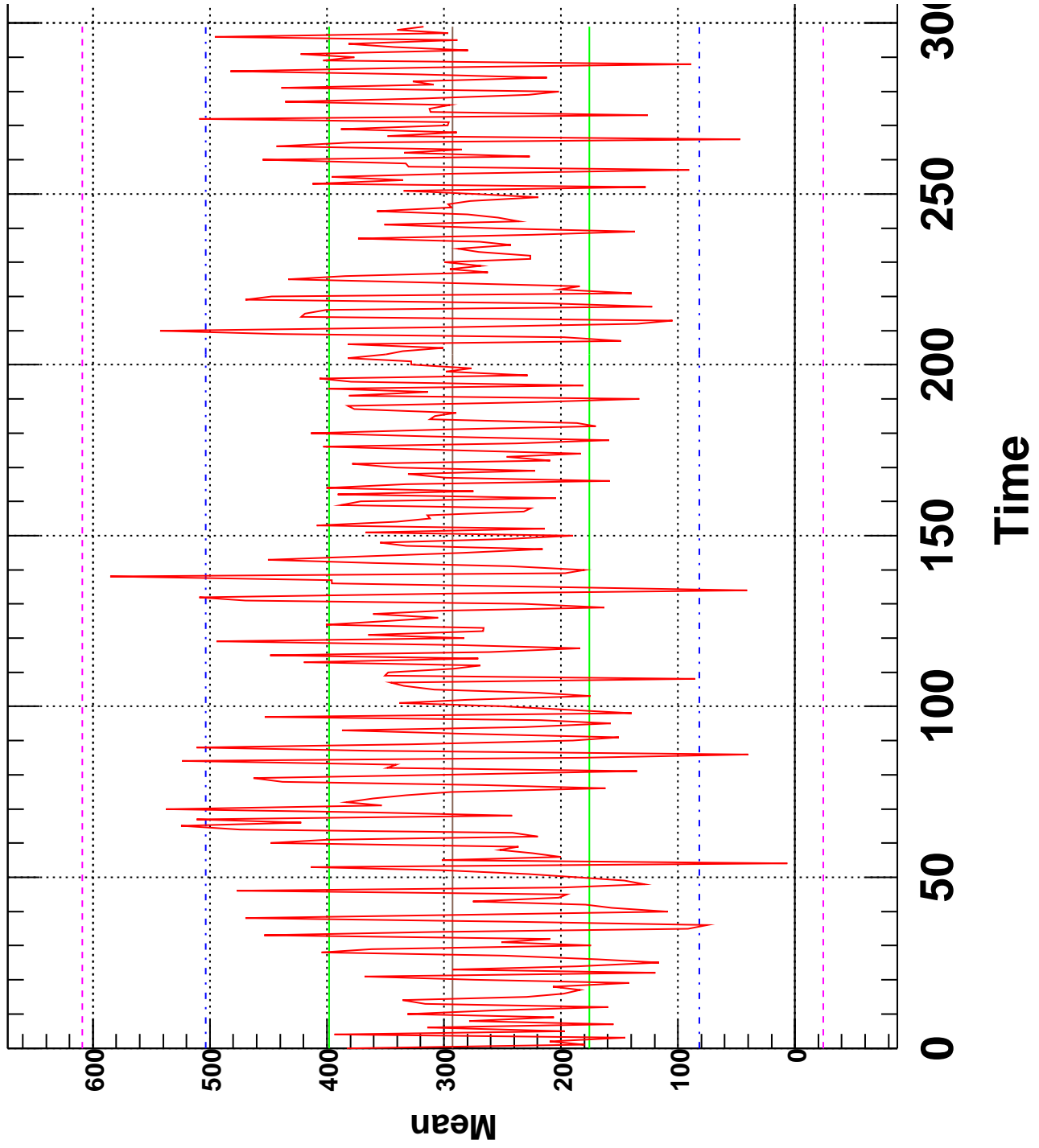
Taylor contains good discussions about control charts in general and how to use them. Natrella contains useful tables with values for making control charts.

## Sources.

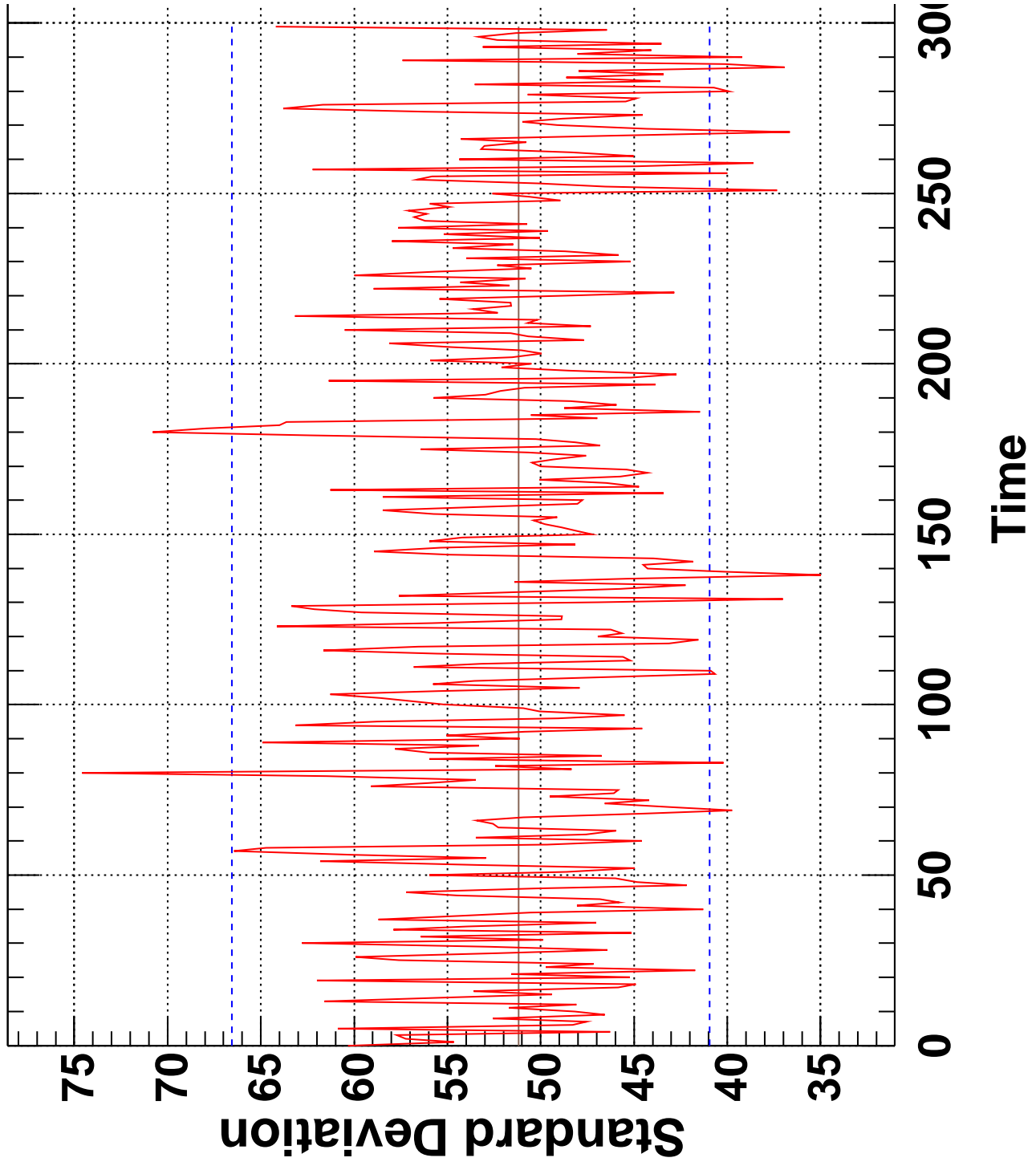
- Taylor, J.K., *Quality Assurance of Chemical Measurements*. (Chelsea, MI: Lewis Publishers, Inc., 1987).
- Natrella, M.G., "Experimental Statistics," *NBS Handbook 91*, (Gaithersburg, MD: National Institute of Standards and Technology 1963, p 18-1-18-4).



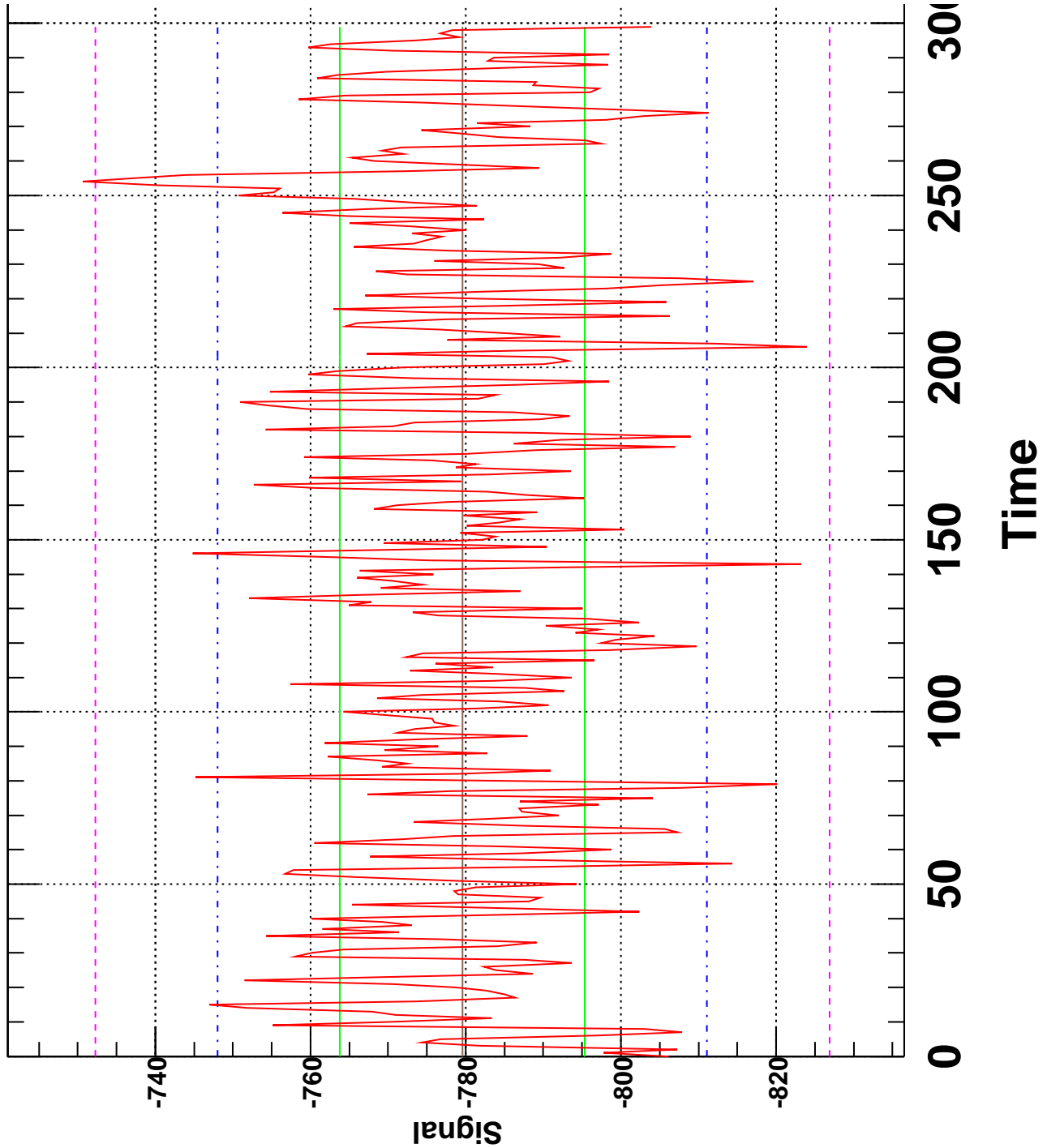
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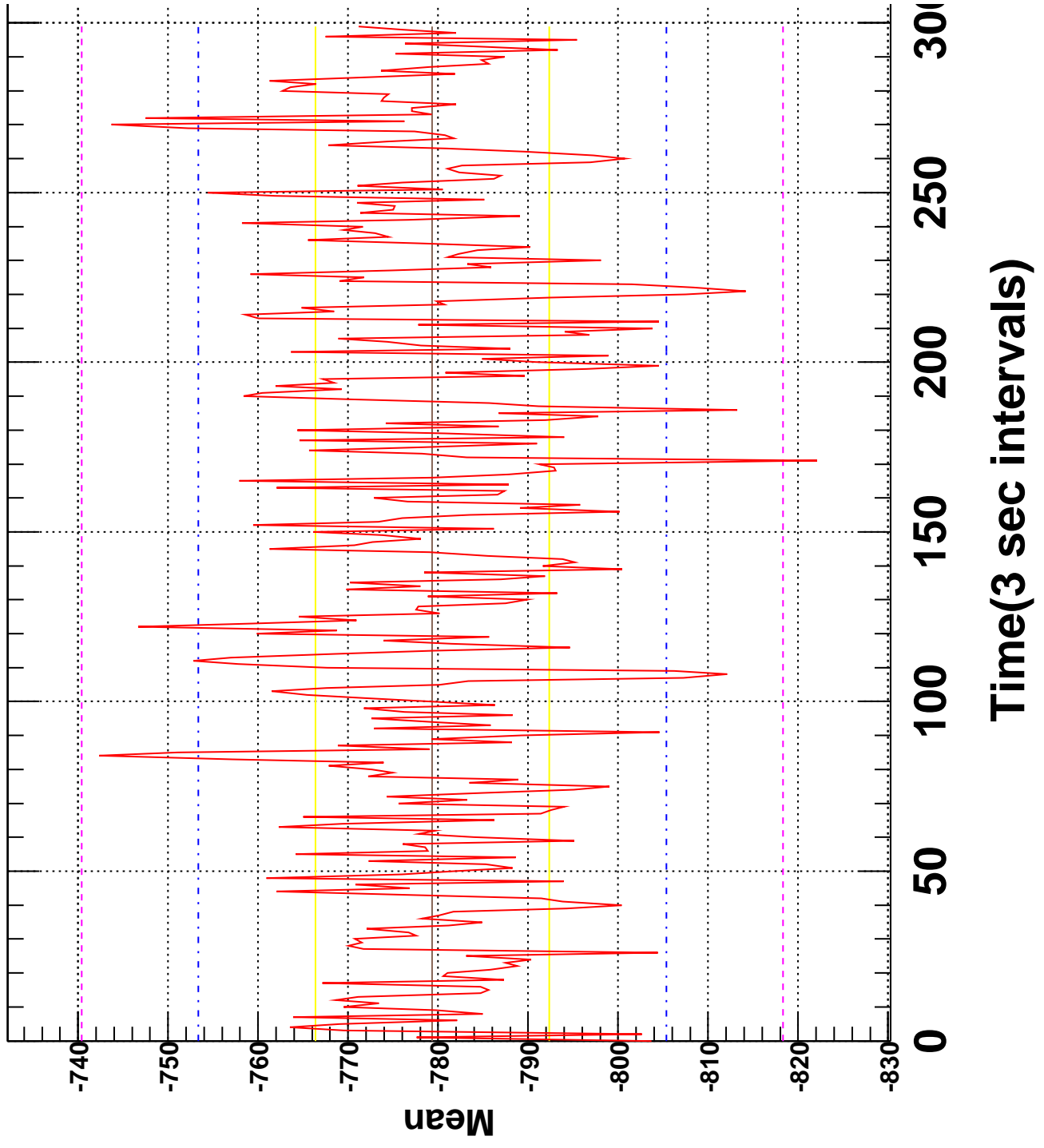
**T0=05/08/2001 22:45:45**



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**T0=05/08/2001 22:45:45**



**T0=05/08/2001 22:45:45**

=====**Control Monitor**=====

Stride Number: 3

Time: 681086758:000000000

Current Mean: -807.242

Standard Deviation: 57.2461

Skew: -0.160641

kurtosis: -0.449859

Total Mean: -801.928

Total Standard Deviation: 57.711

Total Skew: -0.151876

Total Kurtosis: -0.296171

+++++

Mean In control.

Mean Below Preset Minimum.

Standard Deviation in control.

$\chi^2/\text{dof}$ : 8.23276

=====**END**=====

Total number of warnings: 3

Mean exceeded upper control limit 0 times.

Mean below control limit 1 times.



=====END=====

=====Control Monitor=====

Stride Number: 11

Time: 681086758:000000000

Current Mean: -770.102

Standard Deviation: 48.1732

Skew: -0.0379462

kurtosis: -0.315573

Total Mean: -790.702

Total Standard Deviation: 56.0909

Total Skew: -0.0303375

Total Kurtosis: -0.27

+++++

Mean In control.

Mean Below Preset Minimum.

Standard Deviation in control.

chi<sup>2</sup>/dof: 5.99808

=====END=====