

Calculating Averages and Standard Deviations for the Neutral Particle Spectrometer Control and Monitor Software

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This note presents details of the part of the LabVIEW code written to control and monitor the Neutral Particle Spectrometer (NPS) that calculates temperature, relative humidity, and dew point averages and standard deviations.

LabVIEW code was written to control and monitor the front and back crystal zones, the electronics zone, the detector frame, the Hall, and chillers [1]. Figure 1 is a flowchart of the code to calculate averages and standard deviations.

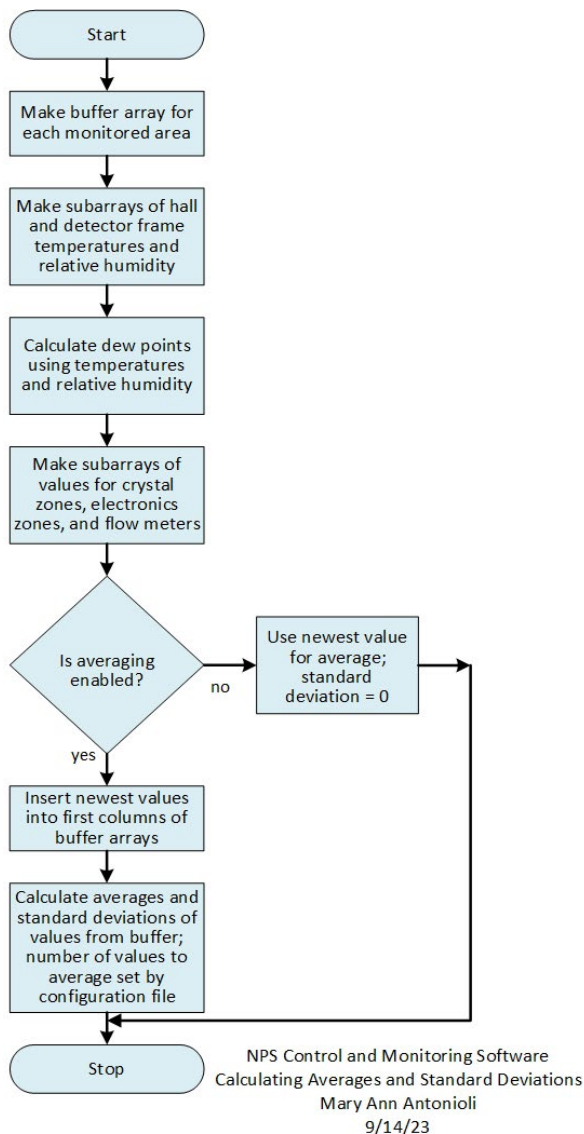


FIG. 1. Flowchart of the code to calculate averages and standard deviations.

The code begins with the creation of buffer arrays for each monitored area to store the values read from the Keysight measurement unit.

Four subarrays are made from the read values for temperatures and relative humidity for the Hall and detector frame. The values are used to calculate the dew point for each area, using

$$Dp = 243.12 * H / (17.62 - H)$$

where $H = (\log_{10}(RH) - 2) / 0.4343 + (17.62 * T) / (243.12 + T)$ and T is temperature and RH is relative humidity.

Subarrays are made from the read values for the crystal zones, electronics zones, and chiller flow meters. If averaging is not enabled, the last read value for temperatures and relative humidity, and the calculated dew points, are used for the average; standard deviation is 0.

If averaging is enabled, the newest read values are inserted into the first column of each buffer array. Using the number of values to average set by the configuration file, averages and standard deviations are calculated, and when a new value is read, the oldest values are removed from the buffer (moving average). The scan rate to read values is set to 1 s.

To conclude, a section of the LabVIEW code that controls and monitors the NPS calculates averages and standard deviations of read temperatures and relative humidities, and calculated dew points; this part of the code has been tested.

[1] [M.A. Antonioli, et al., Overview of Control and Monitoring Software for the Neutral Particle Spectrometer, DSG Note 2023-36, 2023.](#)