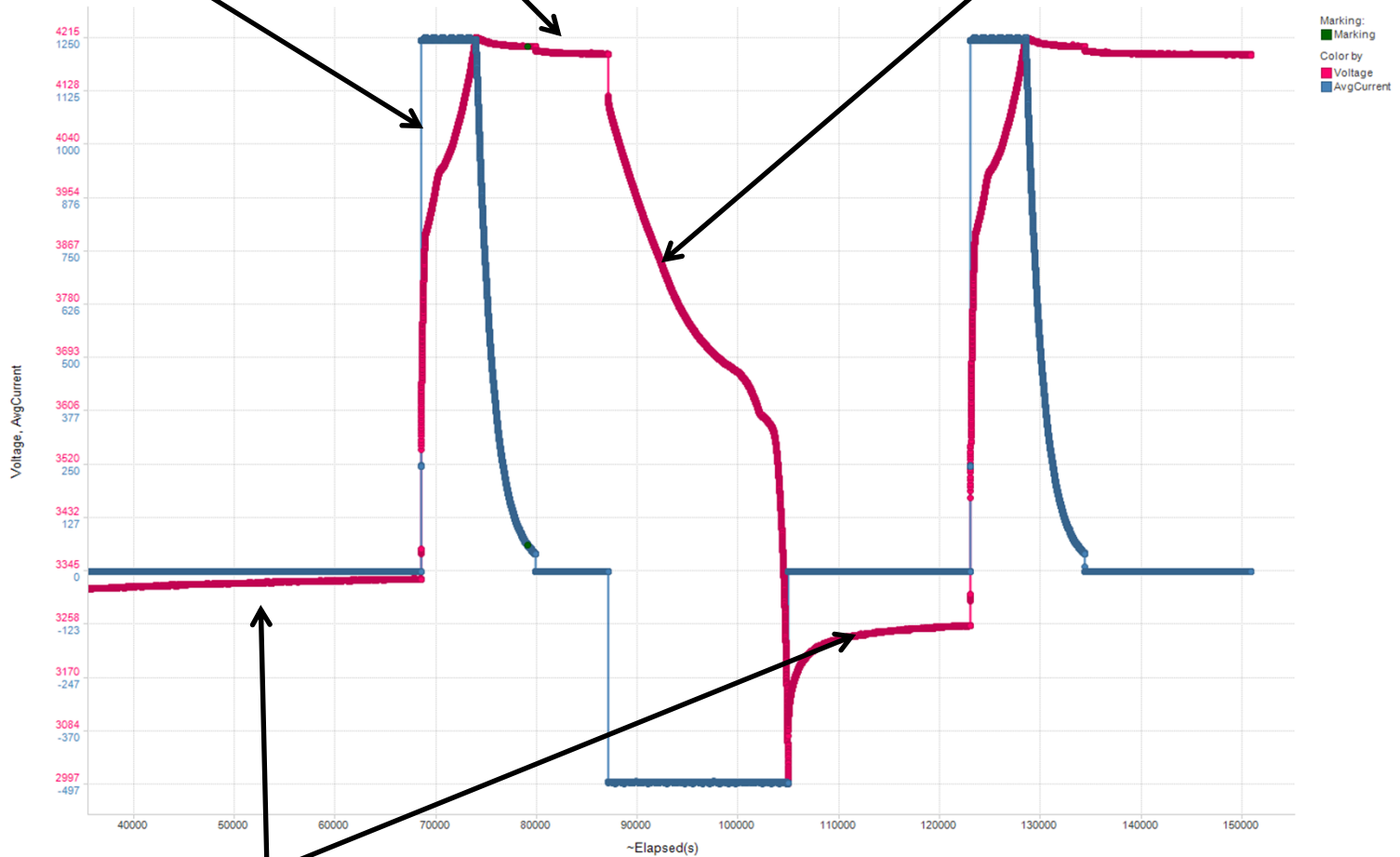# Learning Cycle Overview

Charge to full at C/2 rate

Relax for at least 2 hours
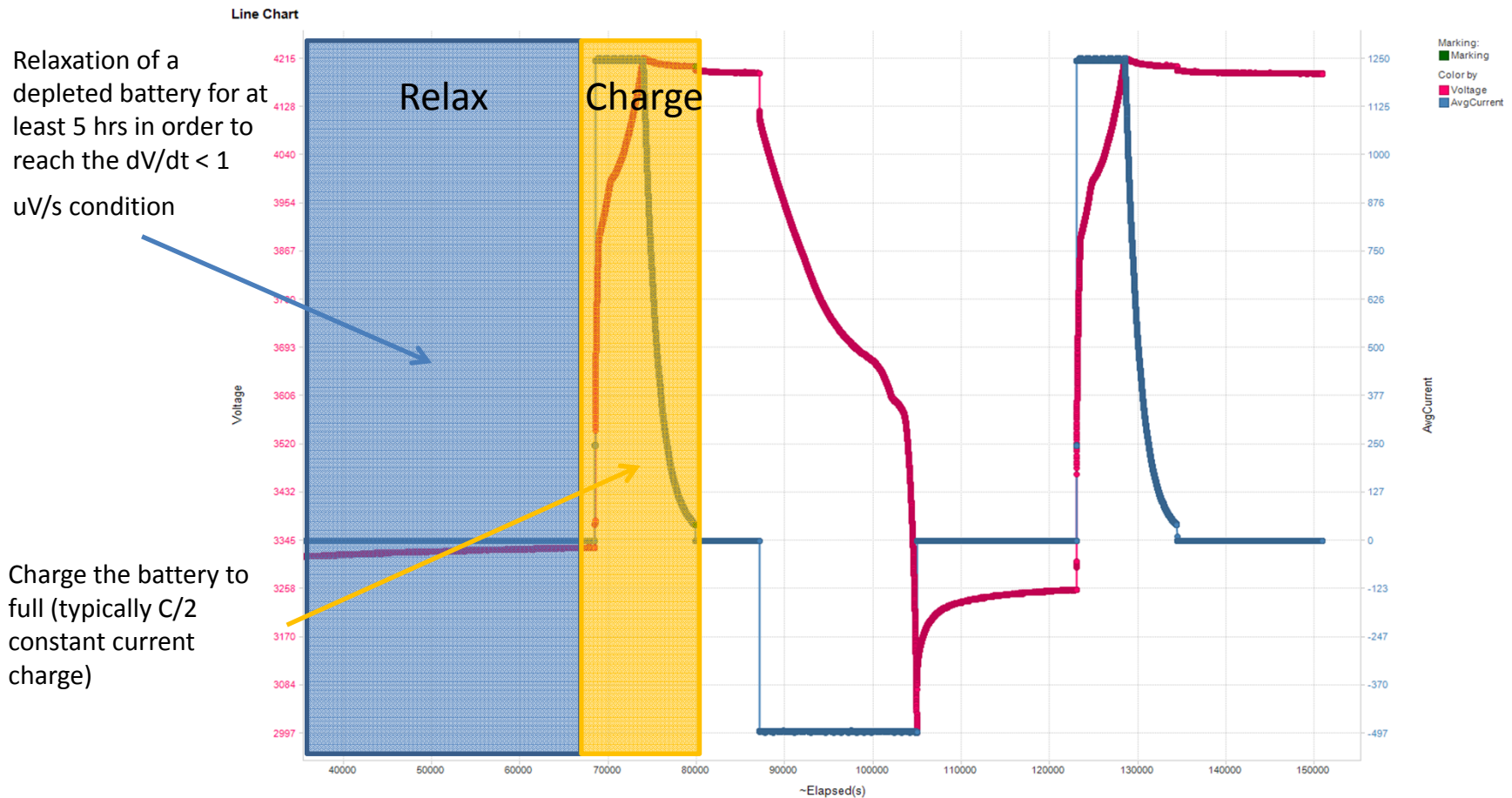
Discharge to full at C/5 – C/10 rate

Relax for at least 5 hours

Line Chart

Voltage, AvgCurrent

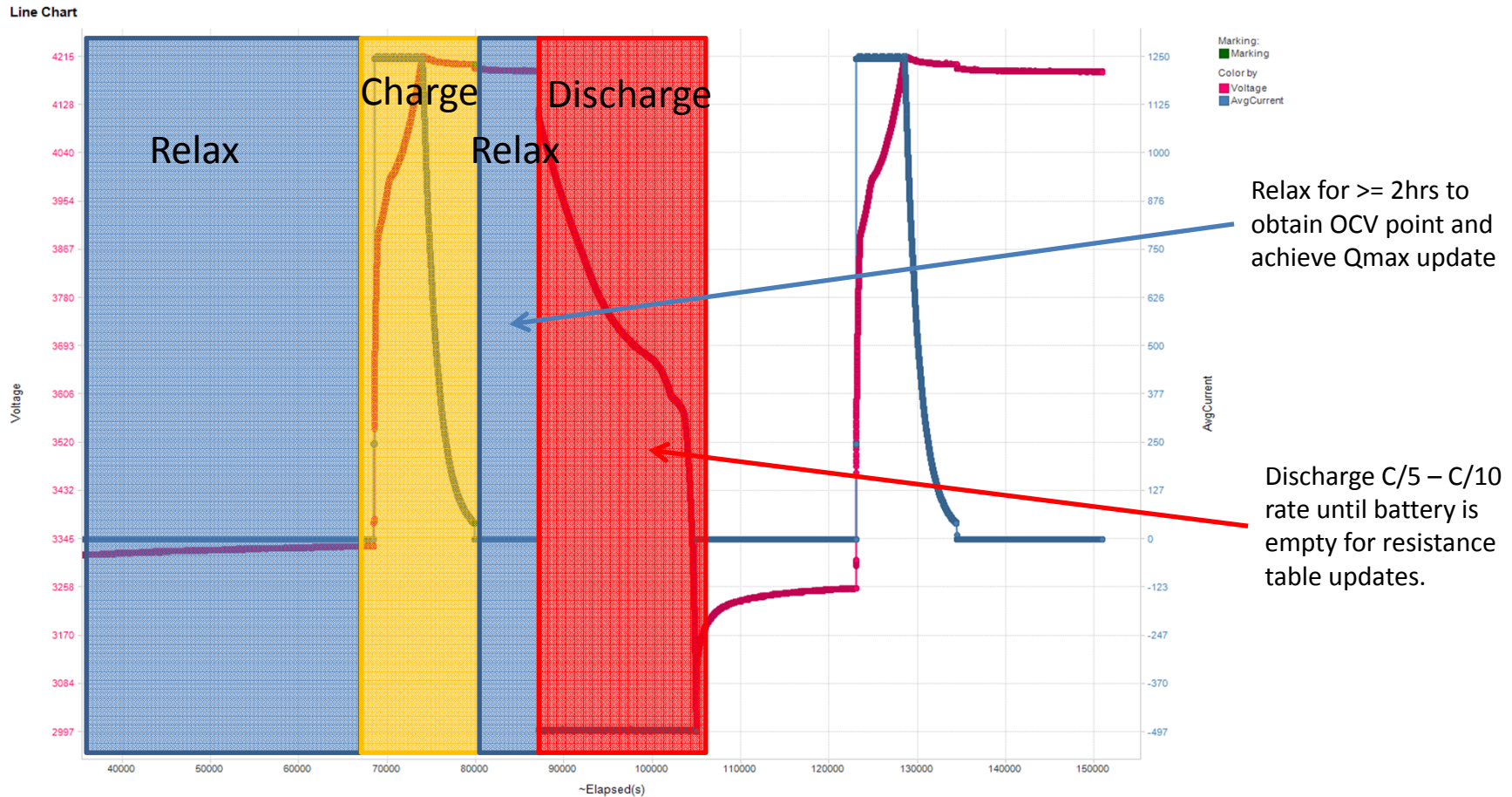~Elapsed(s)

Marking:
■ Marking

Color by
— Voltage
— AvgCurrent

Learning Cycle Break Down

Relaxation of a depleted battery for at least 5 hrs in order to reach the dV/dt < 1 uV/s condition

Relax

Charge

Charge the battery to full (typically C/2 constant current charge)

The Learning cycle should start with a depleted battery (typically **Voltage()** < 3200 mV). The learning cycle should also start out with the battery being in the relaxed state. The bq27425 will recognized a relaxed battery when dV/dt < 1 uV/s

After the dV/dt condition is reached, the bq27425 will take an open circuit voltage (OCV) reading and store the value for a future Qmax update. An indication of this would be the [RUP_DIS] bit in the Control Status register should be clear and the [VOK] bit in the Control Status register should clear. The battery can now be charged to full.

Learning Cycle Break Down

Relax

Charge

Relax

Discharge

Relax for >= 2hrs to obtain OCV point and achieve Qmax update

Discharge C/5 – C/10 rate until battery is empty for resistance table updates.
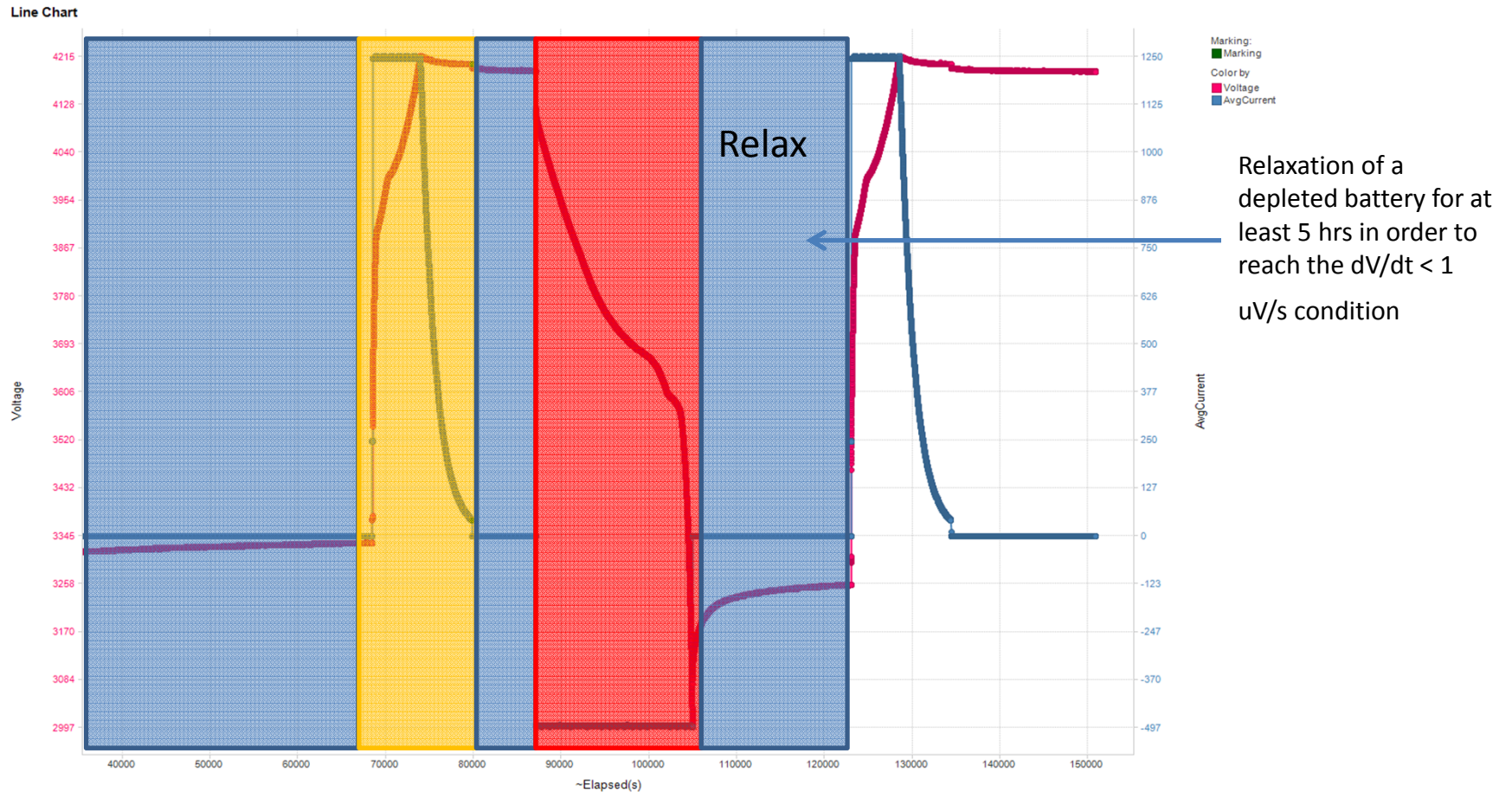
After the battery has charged to full. The [FC] bit in the Flags() register should set. The battery should now relax for at least 2 hours in order to meet the dV/dt < 1 uV/s condition for another OCV measurement.

Once the dV/dt < 1 uV/s condition has been meet the bq27425 will take anoter OCV measurement. At this point a Qmax update can be completed and the [QMAX_UP] bit in the ControlStatus() register will set.

After the Qmax update has occurred, the battery can be discharged to empty in order to allow for resistance table updates. The discharge charge should be between C/5 – C/10.

Learning Cycle Break Down

Line Chart

Relax

Relaxation of a depleted battery for at least 5 hrs in order to reach the dV/dt < 1

uV/s condition

During the discharge, the [RES_UP] bit in the ControlStatus() register should set. Upon exiting discharge mode the resistance table in RAM will update to the resistance table in NVM memory.

At the battery has been discharged to empty. The battery should be allowed to relax at least 5 hours in order to allow the bq27425 to obtain another OCV point. After the OCV point is taken another Qmax update will occur.

Learning Cycle
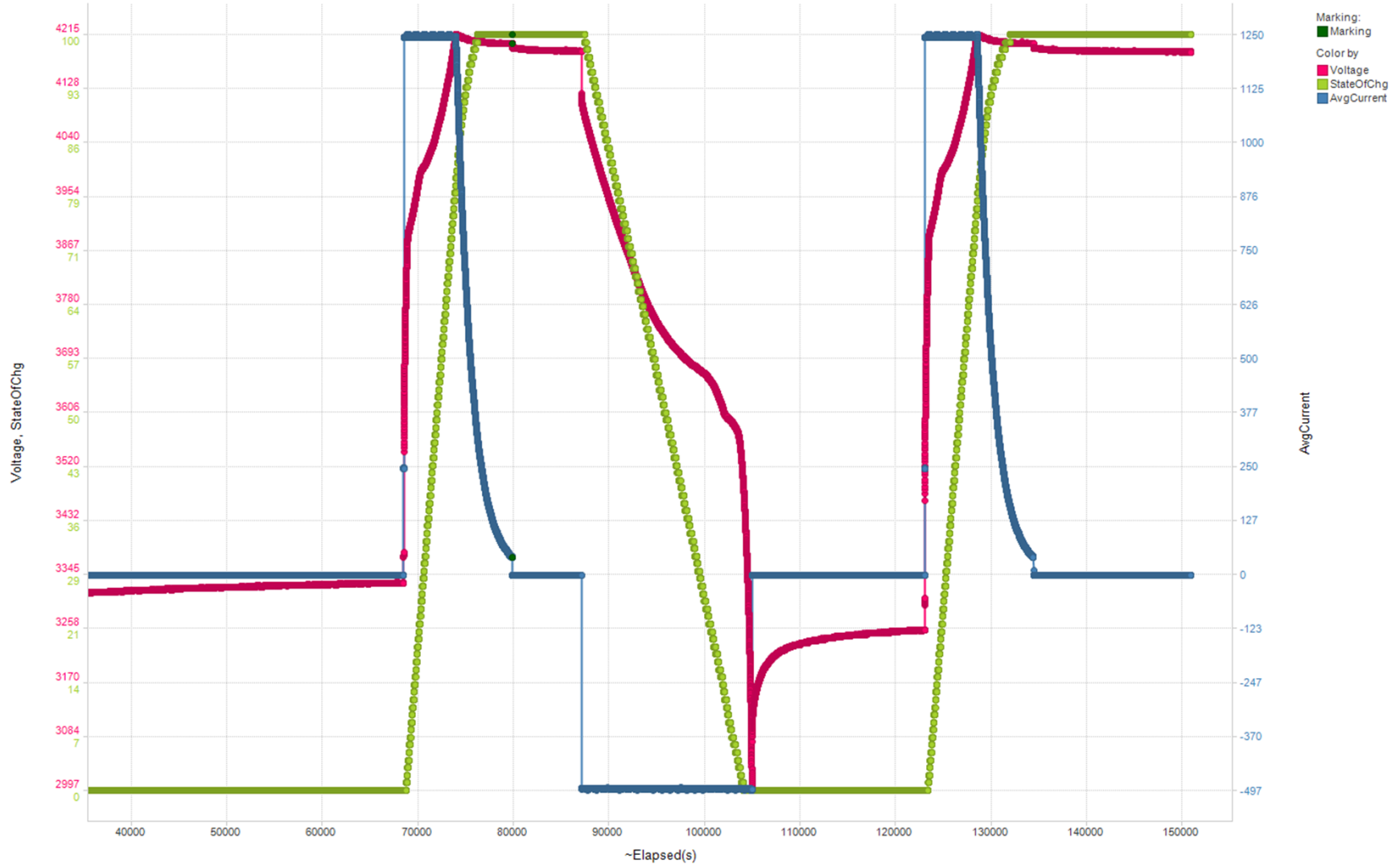
Notes about the bq27425

- The bq27425 is a ROM based gauge; therefore, some of the memory will reset to the default value upon a power on reset (POR) or a reset command from the host (0x0041).
  - Please refer to the SLUA652 "Configuring the bq27425G1-v2.02" application note (http://www.ti.com/litv/pdf/slua652) for more details.
- All of our gas gauges have current thresholds that allow the gauge to recognize if it is in charge mode, discharge mode or relaxation mode.
  - The current thresholds are not in the EEPROM (NVM) and are set to have the following values:
    - Charge Current threshold: C/13.3
    - Discharge Current threshold: C/16.7
    - Quit Current threshold (relaxation mode): C/25.0
  - Please refer to the SLUA652 "Configuring the bq27425G1-v2.02" application note (http://www.ti.com/litv/pdf/slua652) for more details.
  - Please refer to SLUA450 "Theory and Implementation of Impedance Track Battery Fuel-Gauging Algorithm in bq2750x Family" (http://www.ti.com/litv/pdf/slua450) for more details on Impedance Track.
- Due to the nature of the default chemistry the amount of error that can be expected will be tied very closely to how well the battery in the application matches the chemistry ID within the bq27425.
- It is recommended to base accuracy off of run time and how well the gauge reports 100% when fully charged and how well the gauge reports 0% SOC when terminate voltage has been reached.

Learning Cycle Accuracy

SW_bq27425G1_v202_learning_2500mAh_4200mV_20121128_sp.log
Discharge Cycle 1