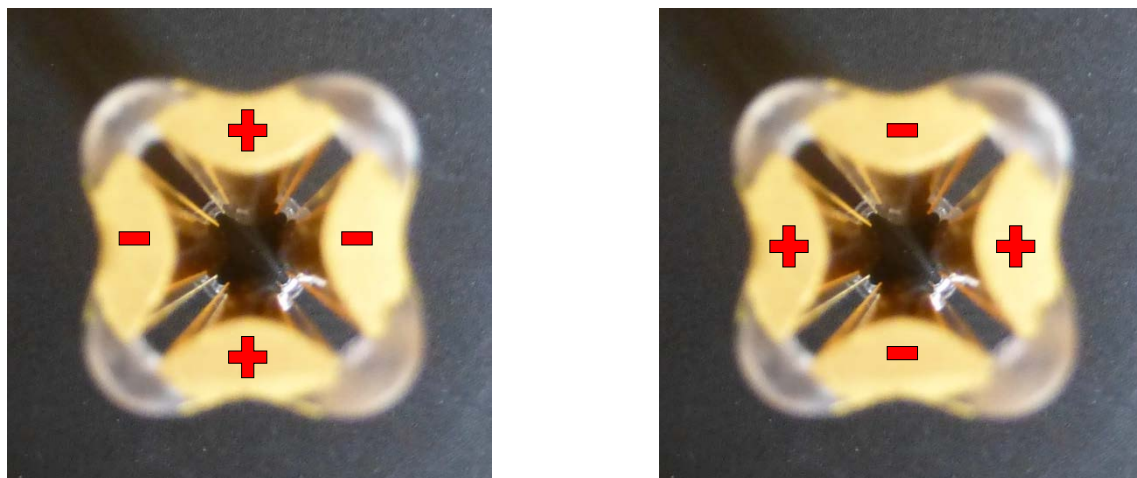


## DC Polarity – what it means, how to check it

The Agilent GCMS quadrupole is a fused-silica (quartz) tube coated with a thin layer of gold. The four hyperbolic surfaces create the complex electric fields necessary for mass selection. Segments 180 degrees apart are electrically connected. Segments 90 degrees apart are electrically isolated from each other. Radio frequencies of adjoining segments are 180 degrees out of phase with each other. One connected pair has a positive DC voltage added to the RF voltage, the other connected pair has a negative DC voltage added to the RF voltage. The pair with a positive bias is the high pass filter that filters out all masses lower than the selected  $m/z$ . The pair with a negative bias is the low pass filter that filters out all masses higher than the selected  $m/z$ . (from the Agilent 5977 Series MSD System Concepts Guide)

The quadrupole's ion transmission efficiency, the number of ions that it passes from the source to the detector, is affected by the selection of the connected pair that is positive and the connected pair that is negative. This is due to inconsistencies of the segments themselves. When Agilent GCMS systems used metal quads, the choice of polarity was very important due to irregularities in the manufacturing process. The molded quartz quads do not exhibit the same amount of differences between the choices.

The software DC polarity selection switches the pairing of the segments.

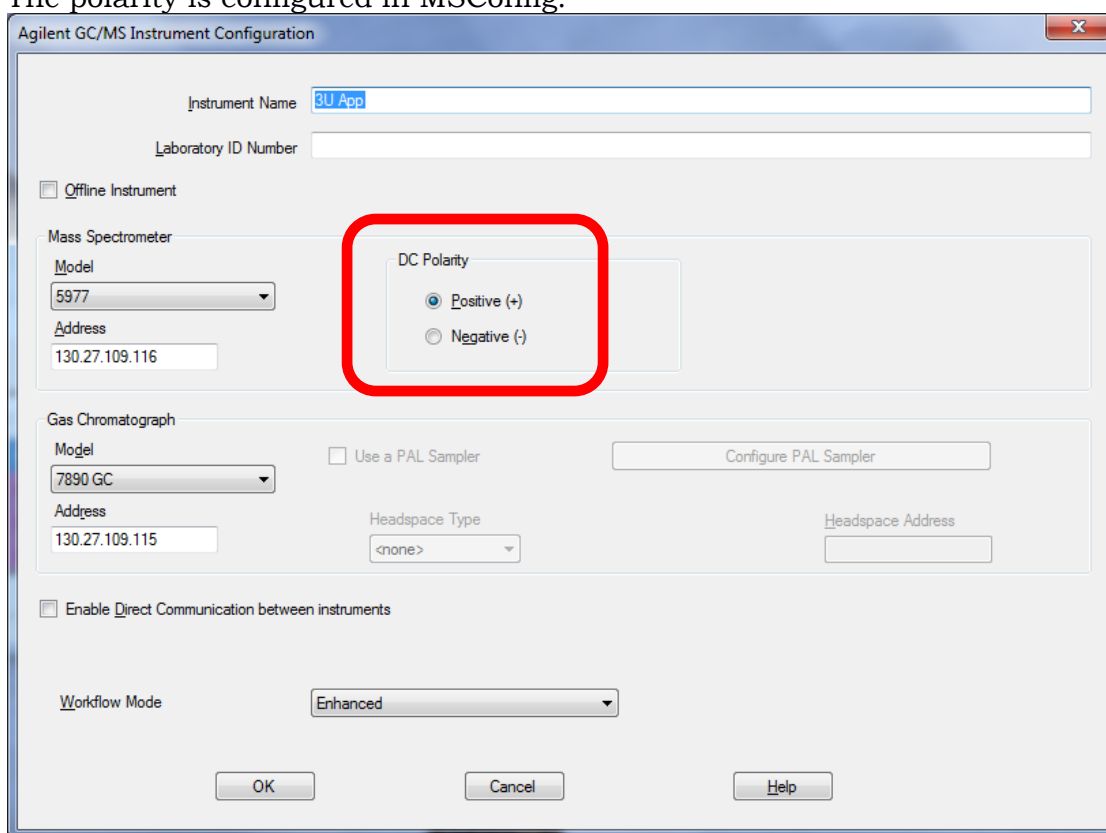


The MSD has been tested in the factory with both DC Polarities. The recommended DC Polarity was the polarity that yielded optimum results from a test suite. It is listed on the final test sheet accompanying your MSD and also on a label on the RFPA fan cover. The recommended DC Polarity should be used as the initial starting point for

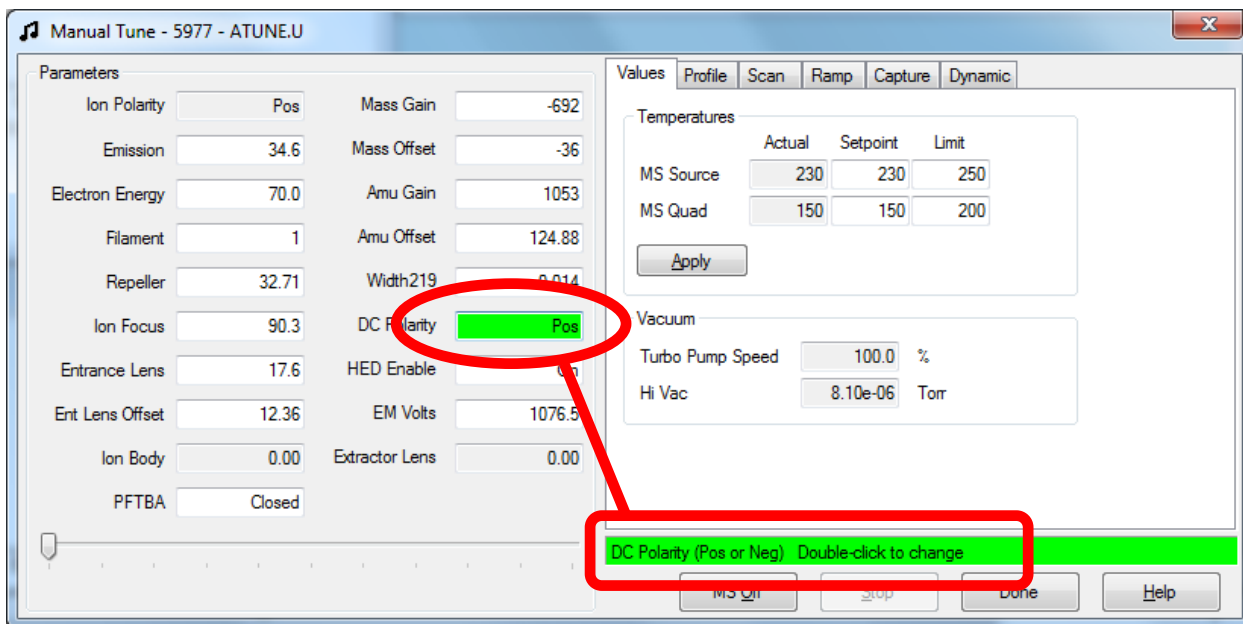
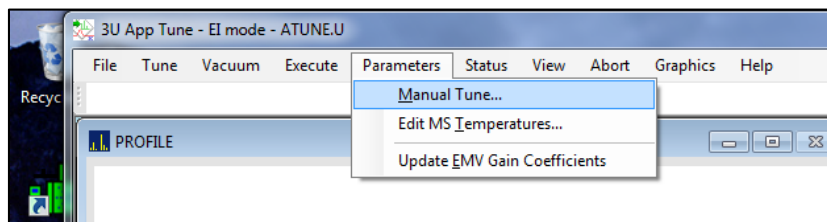
configuring the instrument. The instrument may not be as sensitive as it could be if the appropriate DC polarity is selected.



The polarity is configured in MSConfig:



You can also change it for testing in Manual Tune:



### **How to check it:**

Tune in both polarities on both filaments (to eliminate possible filament effects)

Change the polarity in Manual Tune as shown above and save the tunes as something like atune\_F1\_pos.u, atune\_F1\_neg.u, atune\_F2\_pos.u, and atune\_F2\_neg.u. Run tune evaluation for all four tunes and compare the results.

- Abundance
  - Is the abundance significantly better (lower EMV) in one polarity compared to the other? This ion transmission efficiency difference is the primary reason to switch.
- Peak Shape --poor ion peak shape in one polarity vs the other.
  - Asymmetry, splitting, or tilting
- Precursors - from the Tune Evaluation
  - 69 precursor should be  $\leq 3\%$
  - 219 precursor should be  $\leq 6\%$
  - 502 precursor should be  $\leq 12\%$

- Isotope Ratios – from the Tune Evaluation
  - Ratio of 70:69 = 0.5 to 1.6%
  - Ratio of 220:219 = 3.2 to 5.4%
  - Ratio of 503:502 = 7.9 to 12.3%
  - Ratios too high or too low may point at an ion transmission problem

These type of problems can also be caused by a dirty source, poor vacuum, no PFTBA in the vial, poor quad contacts, broken or shorting quad contact bridges, rarely a dirty quad, rarely the side board or other electronics.

How many samples have been run on this system? If the system has run an extreme number of dirty samples, the front of the quad may be contaminated enough to affect the ion transmission efficiency. If this is the case, please call Agilent and create a service request.

How old is the EMV – a consumable part? Replacing a used EMV is not covered by the hardware maintenance contract. It may be time to replace it before continuing.

The short version – try both polarities and save as the default in MSConfig the one that exhibits the lowest tune EMV and best tune ion peak shapes. This maximizes the ion transmission efficiency which is one piece of the path to maximizing total GCMS system sensitivity.