

## How long does it take to run an EIS experiment ?

“It depends” is the answer you would get from us. Four factors affect the length of an EIS experiment:

1. Frequency range (Initial Freq. and Final Freq.)
2. Points/decade, which is the density of data in the impedance spectrum
3. External noise and sample instability, which force additional Lissajous curve measurements per impedance point
4. Sampling mode, which affects the min/max number of Lissajous curves required per impedance point

Frequency range and points/decade are as expected. A larger value in either of these settings increases the duration of an EIS experiment. External noise and sample instability cause the running script to measure additional Lissajous curves beyond the minimum requirement.

In this email, we focus on the fourth item, the sampling mode. In the EIS script window shown below, it is a setting with three options: 1) “fast”, 2) “normal”, and 3) “low noise”. The sampling mode affects the minimum number of Lissajous curves required before accepting an impedance measurement. More curves are averaged in low noise mode to improve the accuracy of the measurement at the cost of speed. Fast mode has a lower accuracy but is a good option if the sample impedance is low and well defined. Normal mode is the default setting and is what we routinely use.



To illustrate the impact of the sampling mode, we plot the total number of points measured over the elapsed time for a potentiostatic EIS experiment using each of the three modes. At a 1MHz to 1mHz frequency range and 10 points/decade, the total number of points is 90. It is easy to see that the last two decades (points 70 to 90) account for most of the elapsed time. These points correspond to the 100 mHz to 1 mHz frequency range. Unless it is needed, save yourself time by setting your Final freq. parameter to 100 mHz or higher.

Finally, don't forget about the limits of your instrument. The above discussion is only relevant when measuring impedance within the limits of your accuracy contour plot (ACP). [See our application note on ACPs for details.](#)

