

7 October 2021

Customer Assistance

50 Hz and 60 Hz Noise Mitigation Procedures

Discussion

Low polarization ($\mu\text{C}/\text{cm}^2$) signal response from the Precision tester – especially when measuring very small samples – is often subject to environmental noise in the form of 50 Hz or 60 Hz noise, depending on the native power distribution. This noise can be identified by plotting the data as a function of time (ms). 50 Hz noise will appear as a periodic signal with a 20.0 ms period. 60 Hz noise will have a period of slightly less than 17.0 ms.

For measurements taken from Hysteresis-based (PE/PV) Tasks, the data may be plotted as a function of time by selecting "Polarization ($\mu\text{C}/\text{cm}^2$) Vs Time (ms)" in the Plot Filter control of the Plot Setup tab, either under QuikLook or when recalling the Task from the DataSet Archive.

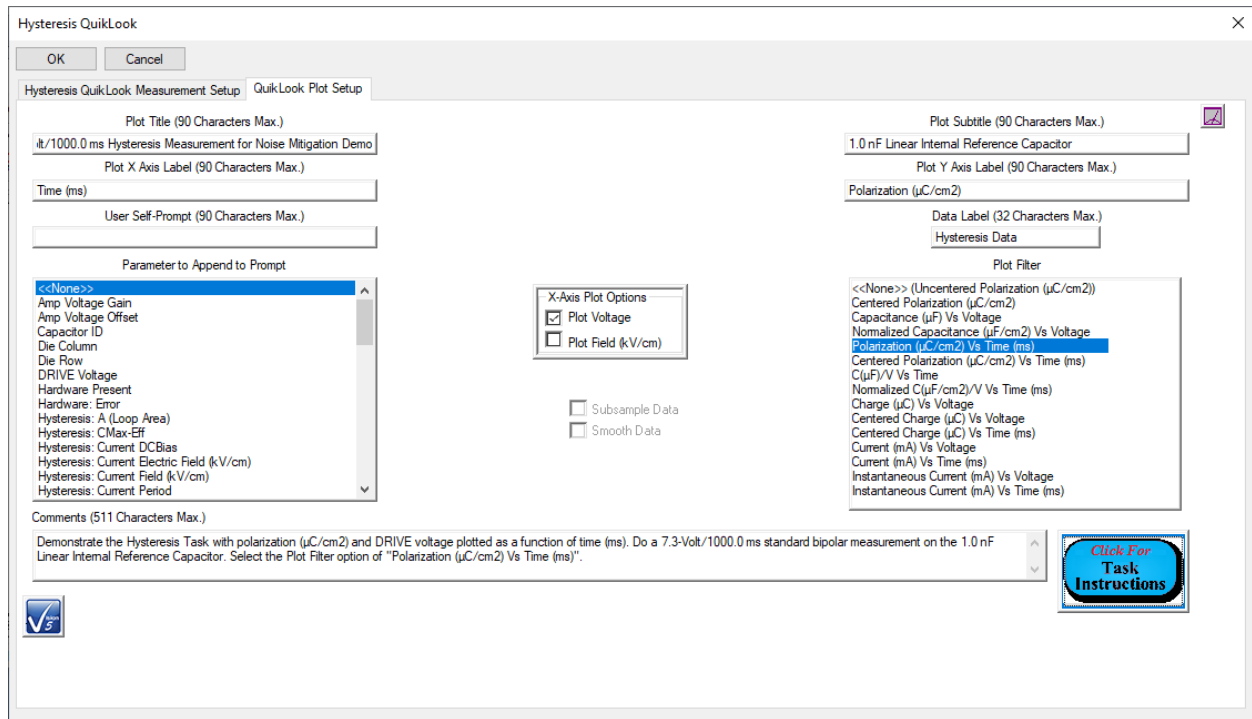


Figure 1 – Hysteresis Task Configured to Plot Polarization ($\mu\text{C}/\text{cm}^2$) Vs Time (ms).

The plot will show both polarization ($\mu\text{C}/\text{cm}^2$) and DRIVE voltage or electric field (kV/cm) plotted as a function of the measurement period (ms).

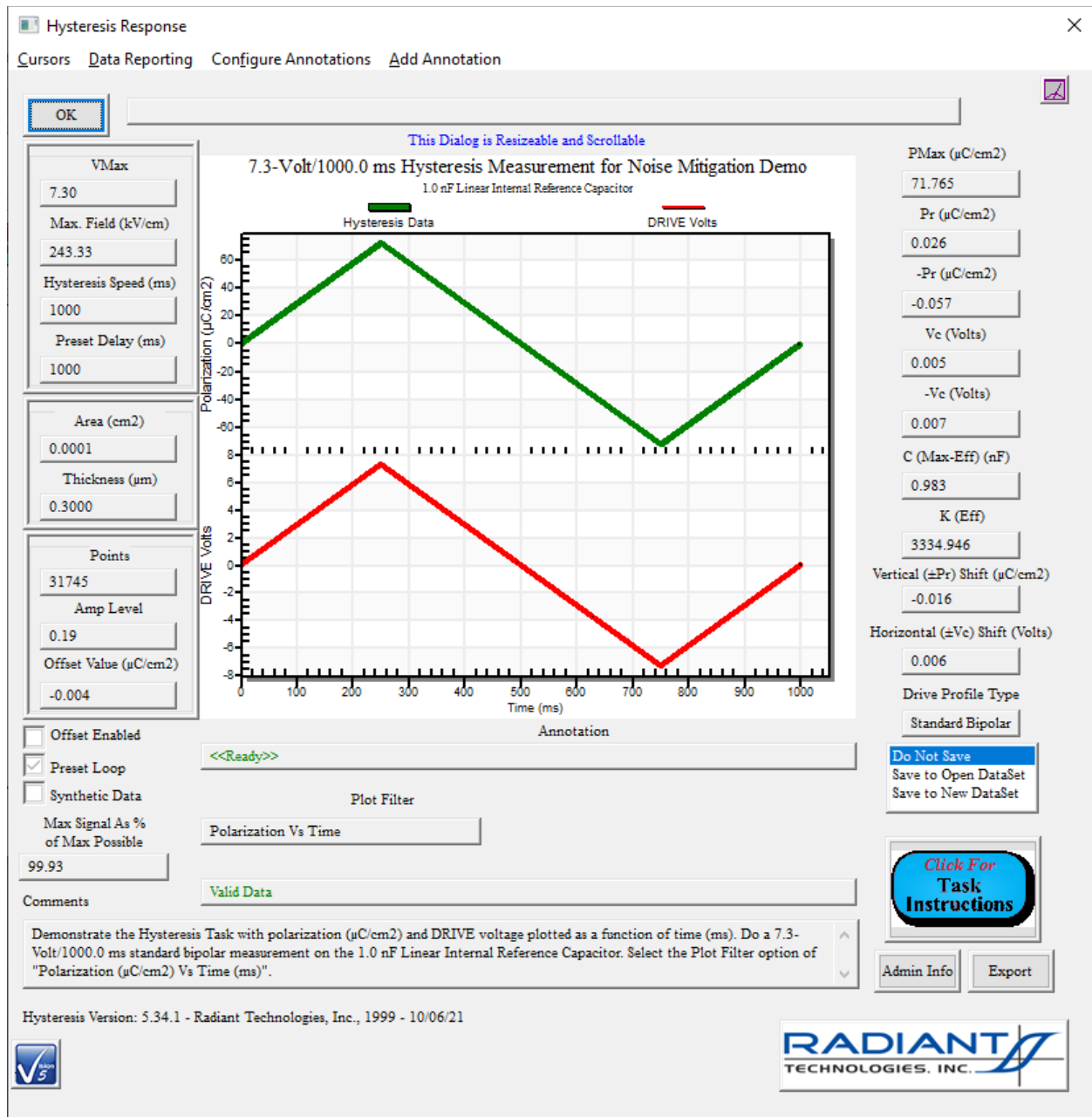


Figure 1 – Hysteresis Polarization ($\mu\text{C}/\text{cm}^2$) Vs Time (ms) Data.

Note that the effects of environmental noise will depend strongly on the measurement period (ms) of the Task. High-speed measurements may not show detectable interference from external noise.

The section below describes steps that can be taken to mitigate the introduction

Environmental Noise Mitigation

The following steps can help to reduce 50/60 Hz environmental noise: Make your DRIVE and RETURN signal cables as short as possible.

- Keep your DRIVE and RETURN signal cables as far as possible from the AC power cables connected to the equipment. In particular be sure that DRIVE and RETURN cables do not cross over power cables.
- Use only coaxial (BNC) DRIVE and RETURN cables. For example, the minigrabbers [short red and black cables with clips] that we provide with the system have BNC connectors, but do not provide coaxial shielding.
- Make sure that the tester is firmly grounded at the green rear-panel banana plug to any other equipment in the experiment (High-Voltage Interface, Amplifier, Current Source, etc.).
- Make sure that the tester is firmly grounded to any metal components in the experiment (tables, probe stations, shelving, equipment racks, etc.).
- Turn off as much other equipment in the lab as possible, especially equipment with rotating motors - fans, etc.
- Turn off the overhead fluorescent lamps if possible.
- Above all, ensure that the ground connector of the AC power cables is connected to a solid earth ground. This is not an issue in the US.
- In extreme cases, enclosing the experiment in a copper shield box should eliminate external noise.

Please try as many of these steps as is practical.

Good luck in your research.

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