



# SweGRIDS

## FDS measurement of oil using combined AC and DC voltage

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# Background

Frequency domain spectroscopy measurement is a non-invasive condition assessment method used on power components.

✓ Design

✓ Localize the fault

✓ Estimate the service life



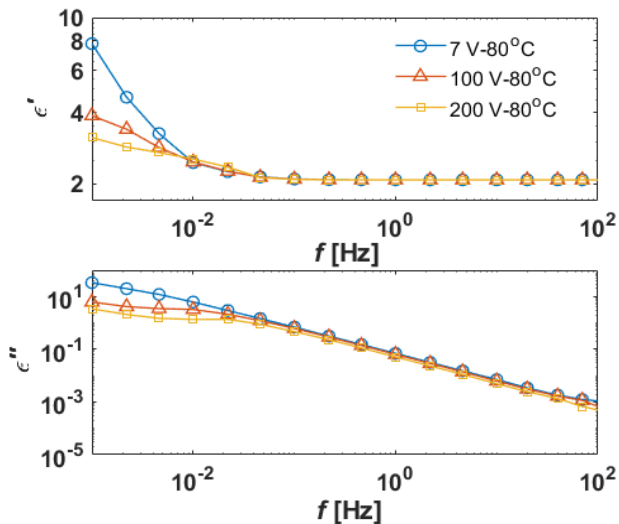
[Turbosquid.com](https://www.turbosquid.com)



[kbvresearch.com](https://www.kbvresearch.com)

# Voltage-dependent properties in the FDS measurement of oil

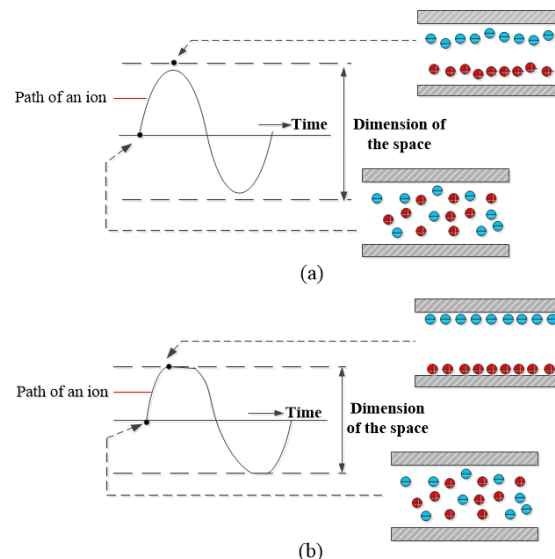
Complex permittivity of oil measured under AC voltage



Deviation from linearity at **low frequencies**, with the imaginary permittivities **decreasing with increasing voltage**

Voltage-dependent phenomenon (Garton effect)

- mobile charges blocked at the boundary
- depleted from the bulk of the liquid

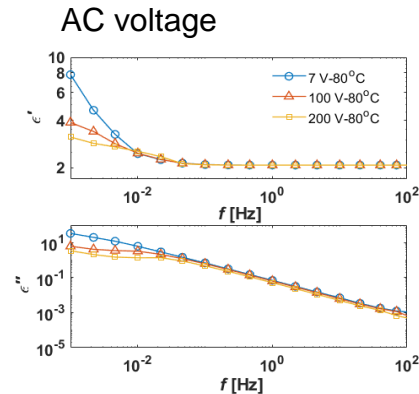
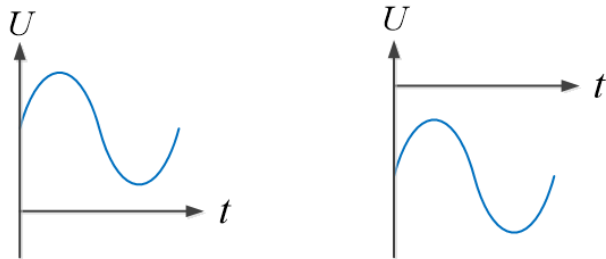


Bring **difficulties** for analysing the measurement results and comparing results measured under different situations

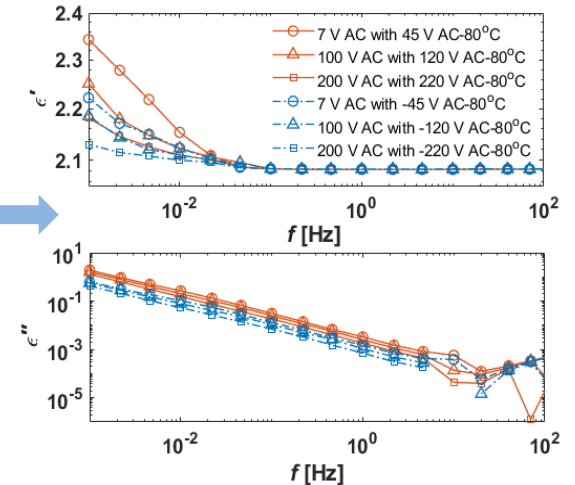
# Measurement using combined AC and DC voltage

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Combined AC and DC voltage



Combined AC and DC voltage



AC voltage with **DC bias** can **limit** the motions of ions to the **boundaries** of the oil gap, and thus **remove** the contribution due to the **voltage-dependent** movement of ions

The **voltage-dependent** phenomena occurring at low frequencies owing to charge movements has been significantly **reduced**

**Conclusion:** Using the **DC bias** in the FDS measurements of oil can significantly **decrease** the **voltage dependence** of the results caused by **ion movements**