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Paper number 93

**Implementation of Sweep Frequency Response
Analysis (SFRA) for Condition Assessment of Power
and Distribution Transformers**

Mahmut Erkut Cebeci
EPRA, Turkey

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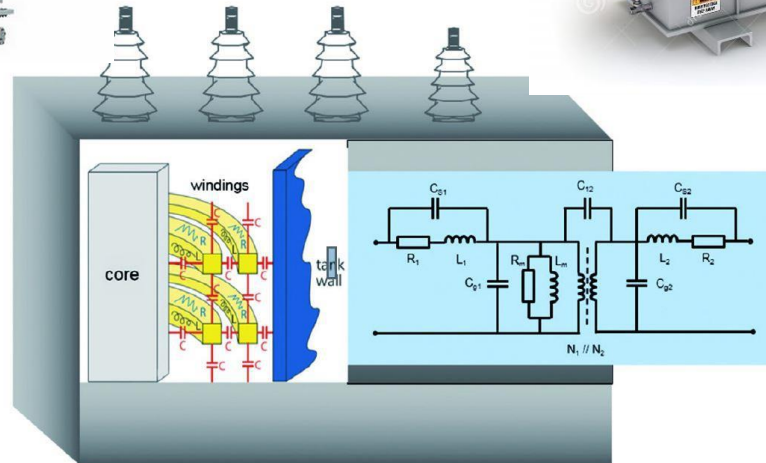
- Transformers in electrical network
- Common transformer failures
- Sweep Frequency Response Analysis (SFRA)
- SFRA technique and methods
 - Connection of the SFRA device
 - Reference fingerprint
 - SFRA measurement type
 - Comparative tests
- Assessment of the SFRA test results

Transformers in electrical networks

- Power Transformer

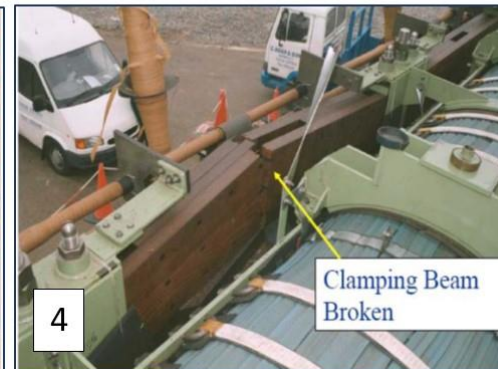


- Distribution Transformer

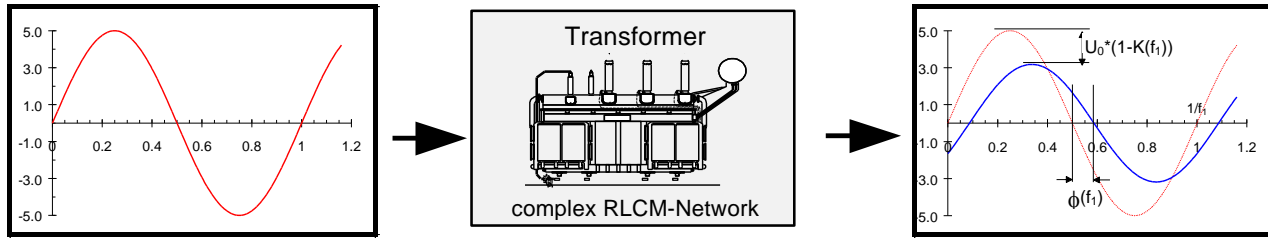


Transformer common failures

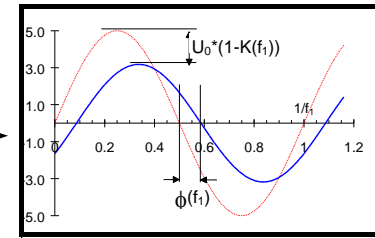
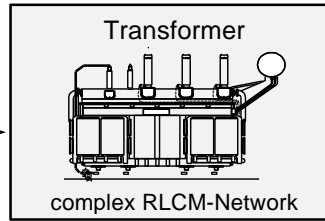
- Transformer winding deformation
- Inter turn short circuit
- Broken conductor in winding
- Broken clamping elements



Sweep Frequency Response Analysis (SFRA)



sine generator
(variable frequency)

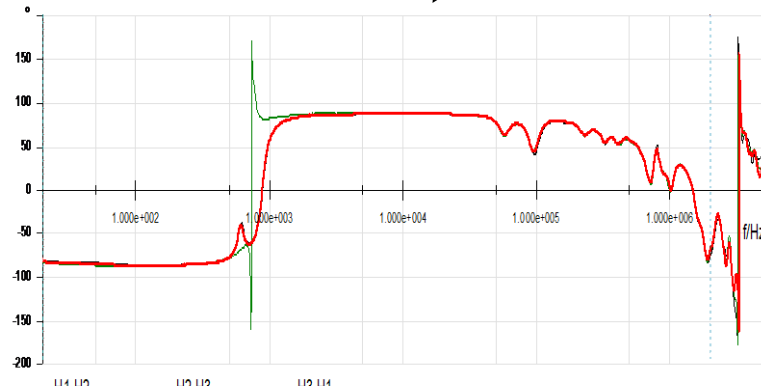
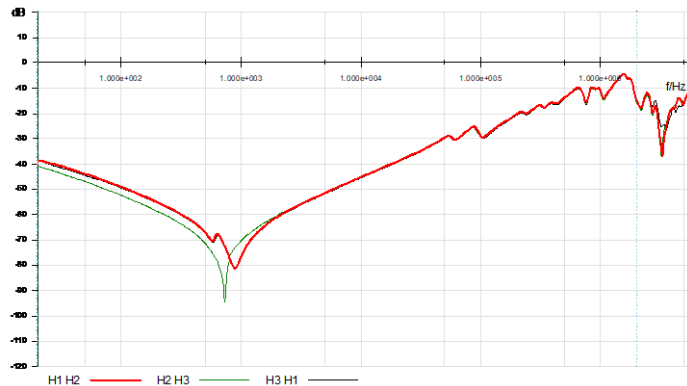


$K(f_1)$

$\phi(f_1)$

Magnitude

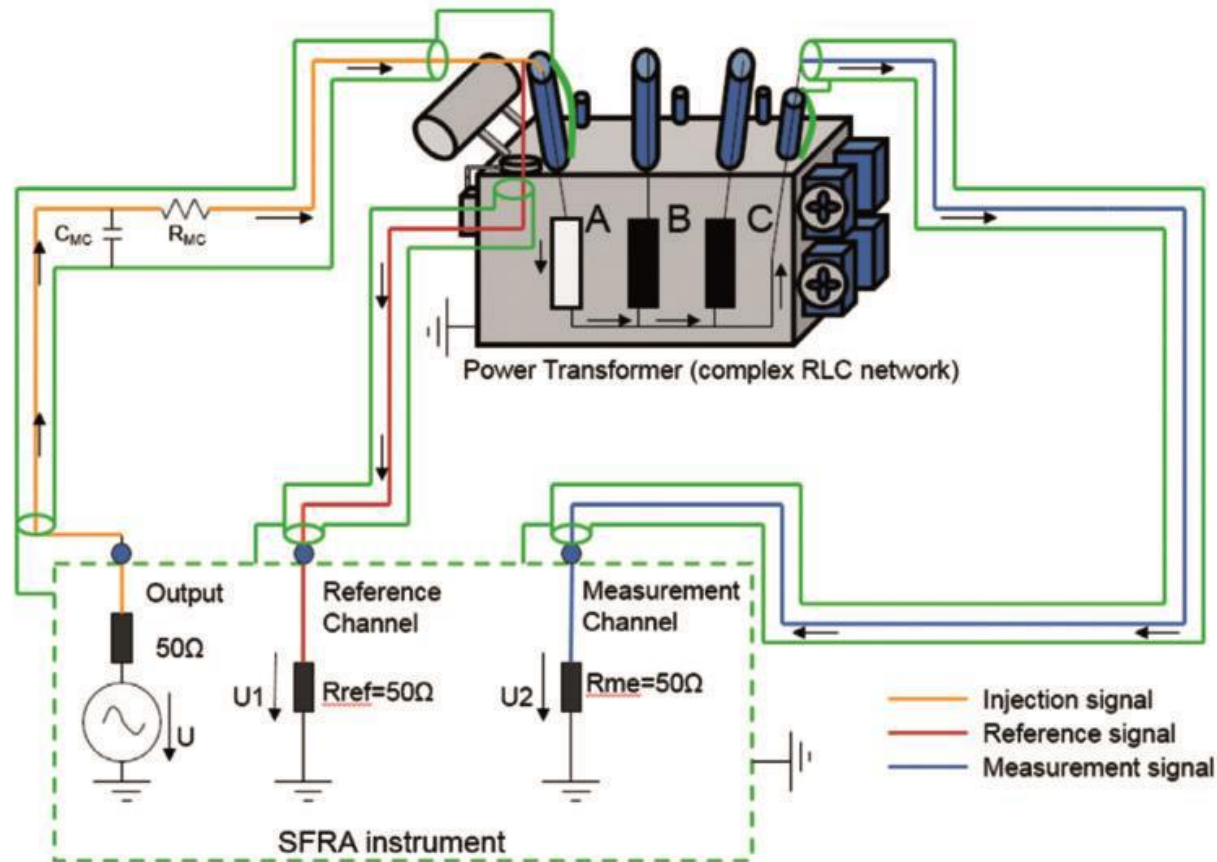
Phase



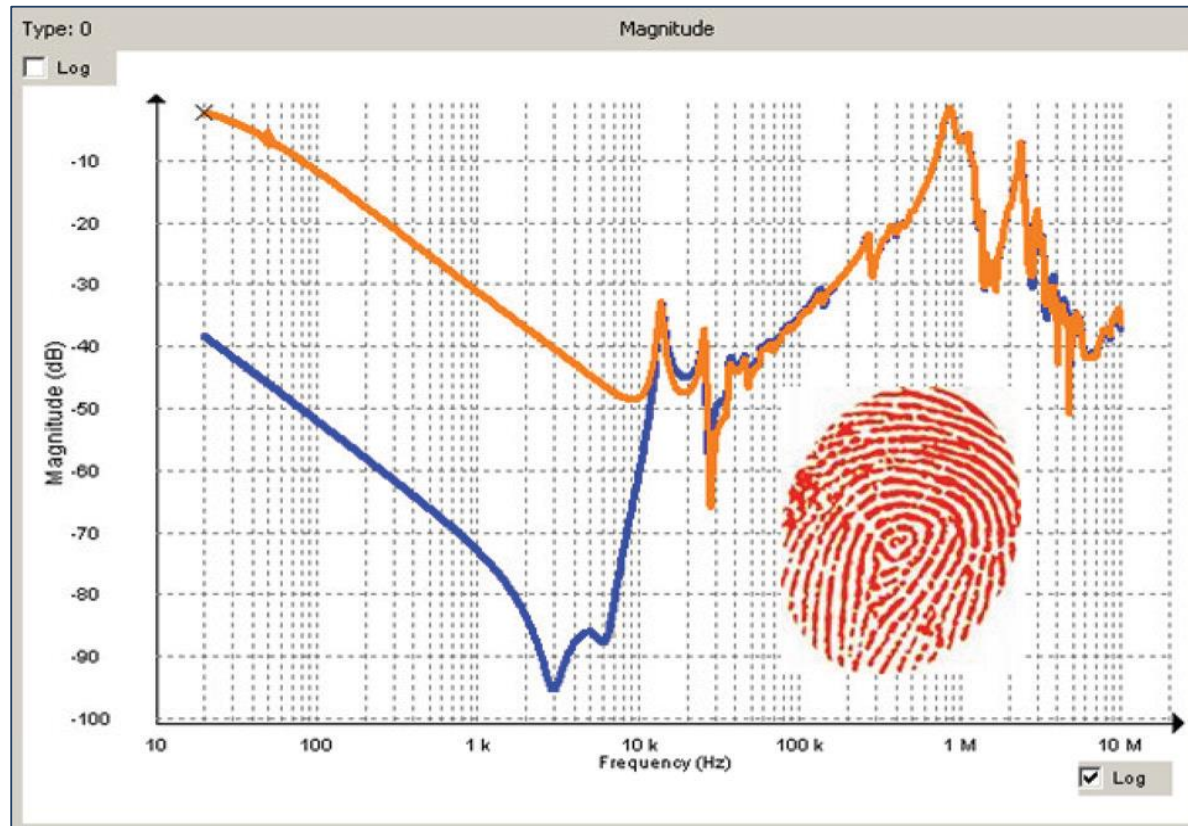
$$H(dB) = 20 \log_{10} \left(\frac{V_{out}}{V_{in}} \right)$$

SFRA technique and methods

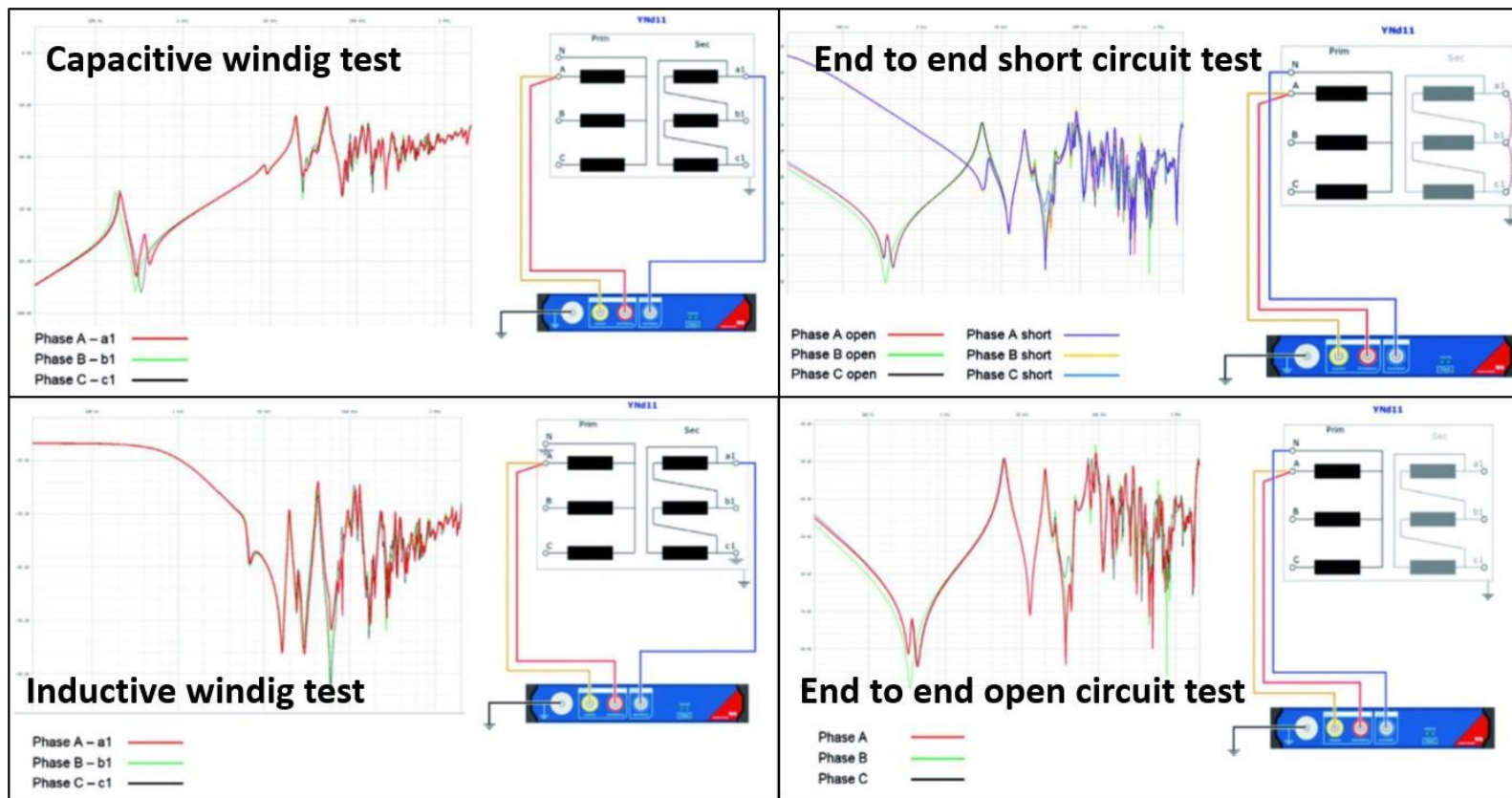
- Connection of the SFRA device



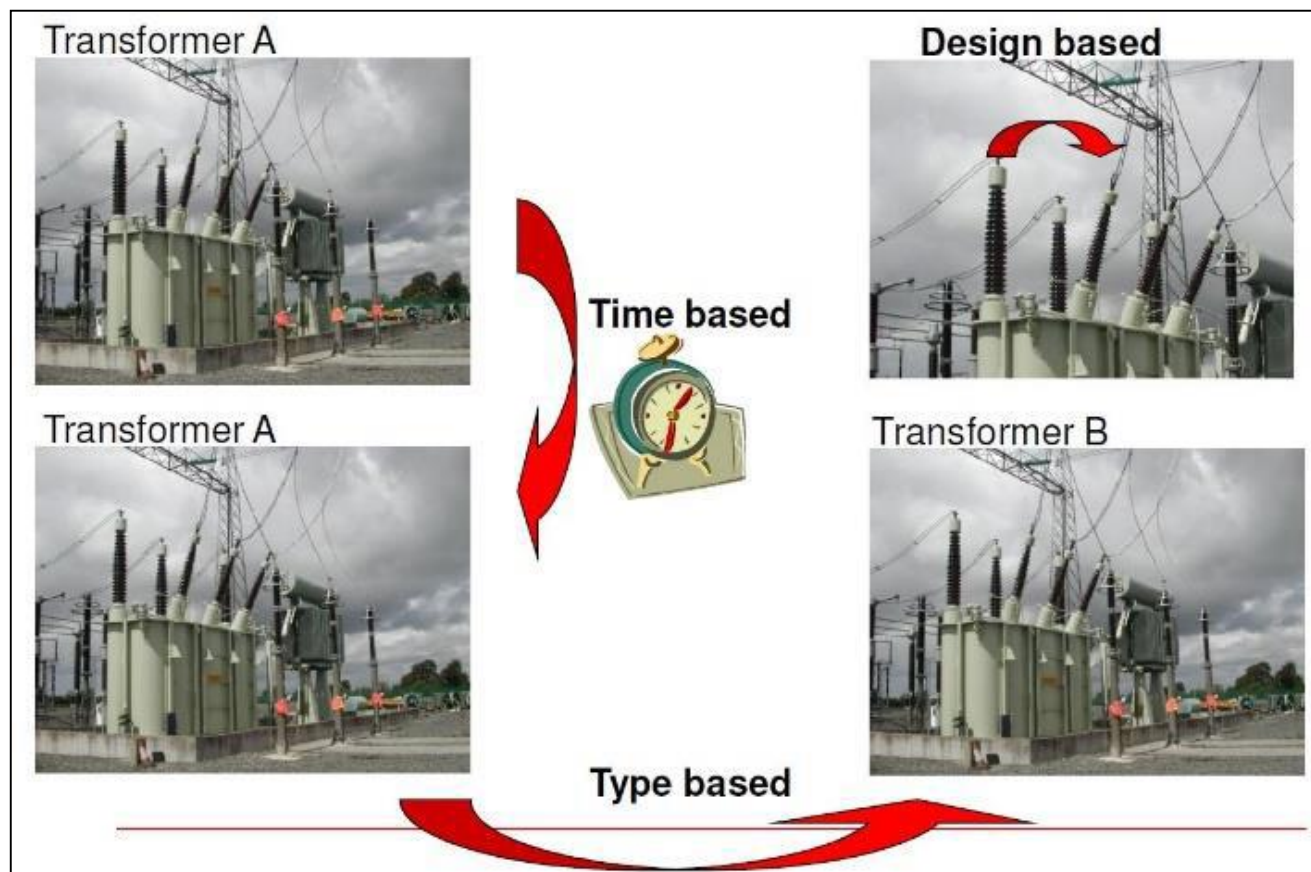
- Reference fingerprint



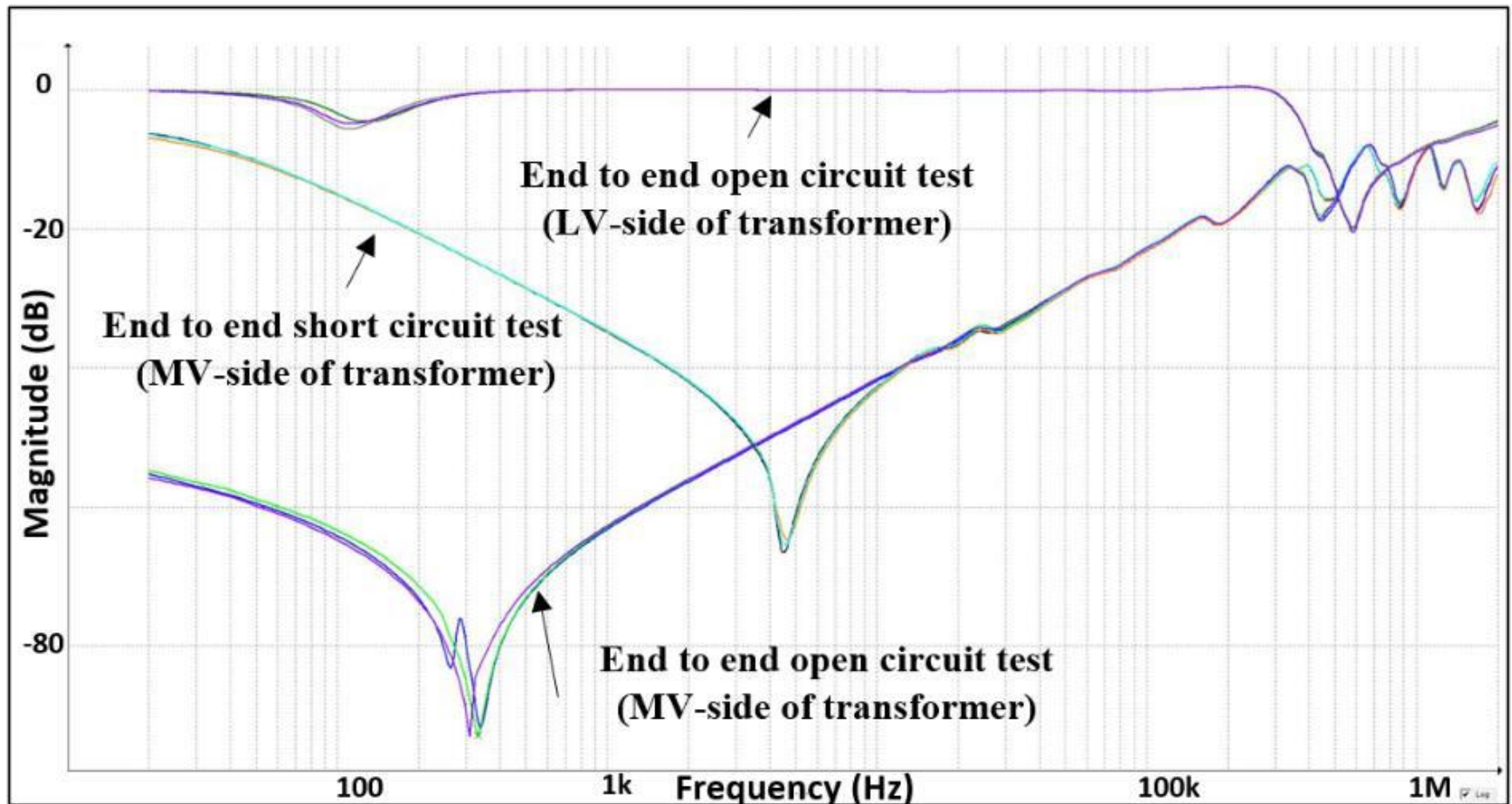
- SFRA measurement types

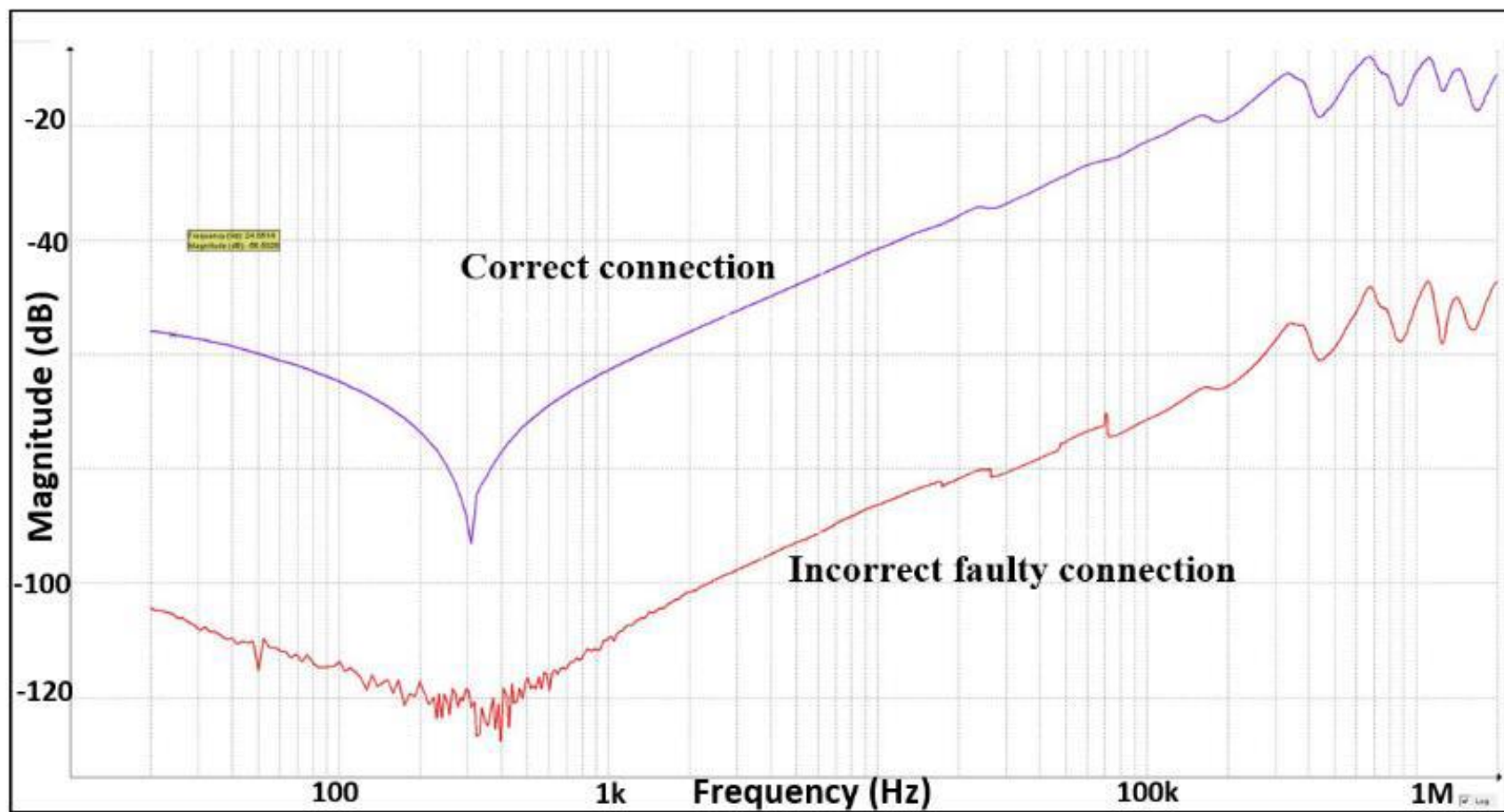


- Comparative tests

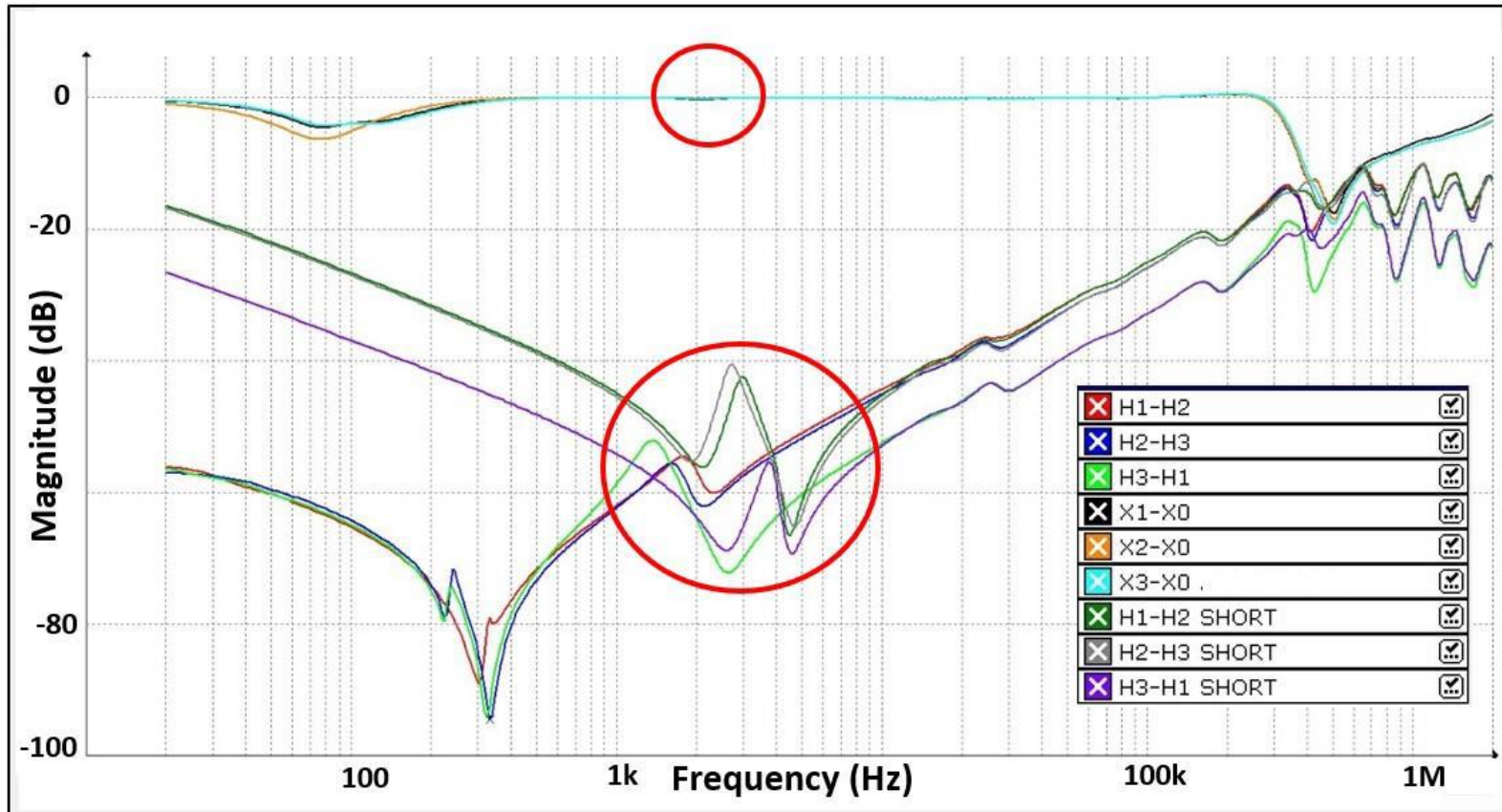


Assessment of the SFRA test results

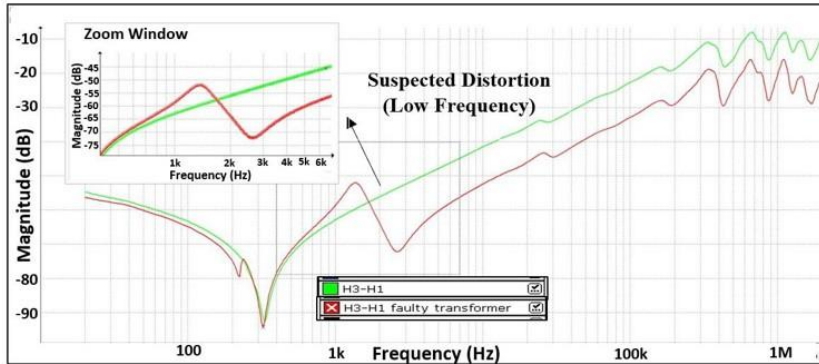




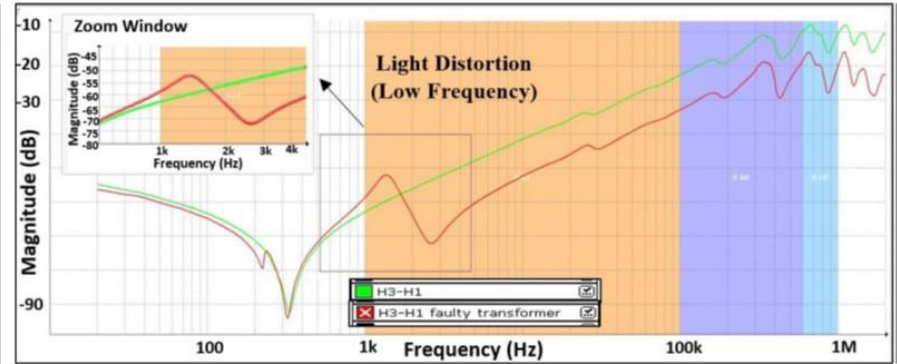
- Short and Open circuit tests in SFRA faulty transformer



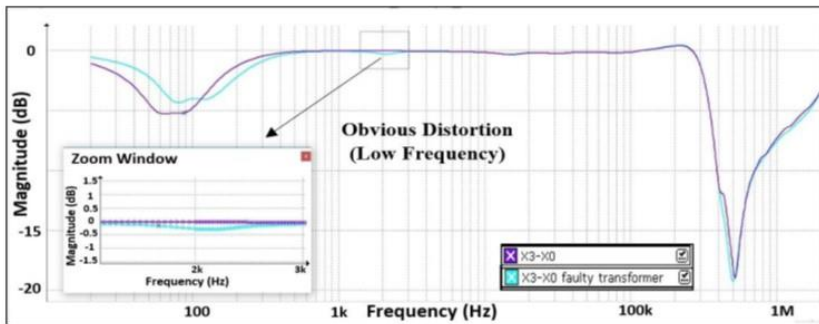
- Comparison of MV "C" phases with correlation Analysis



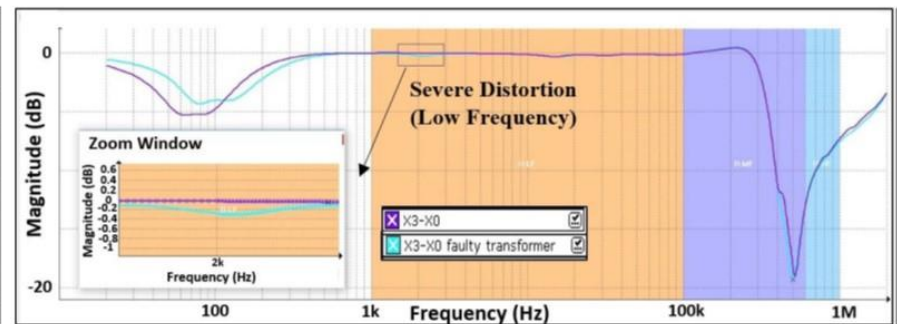
- Comparison of MV "C" phases with DL/T 911 analyzer



- Comparison of MV "c" phases with correlation Analysis



- Comparison of MV "c" phases with DL/T 911 analyzer



Thank you!

