

Fundamentals Webinar Series

FUNDAMENTALS OF IMPEDANCE MEASUREMENTS

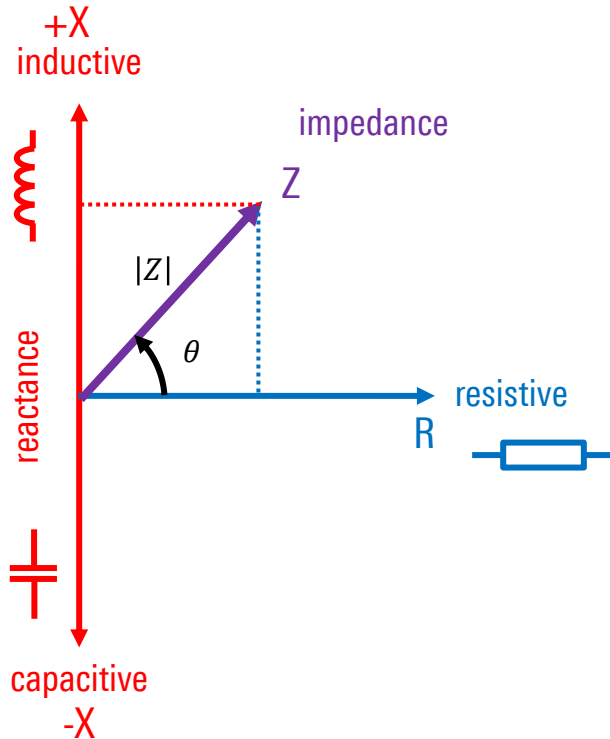
Elizabeth McKenna – Product Manager, Essentials Products
Shivam Arora – Product Manager, LCR Meters

ROHDE & SCHWARZ

Make ideas real



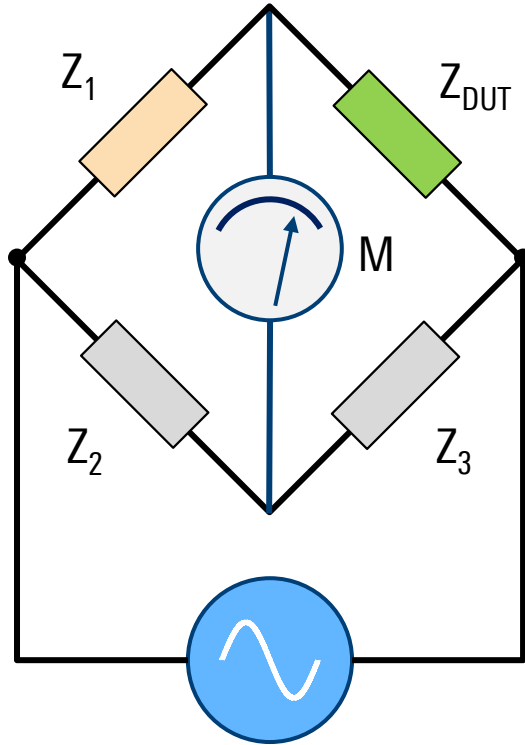
WHAT IS IMPEDANCE?



$$\text{Impedance Magnitude, } |Z| = \sqrt{R^2 + X^2}$$

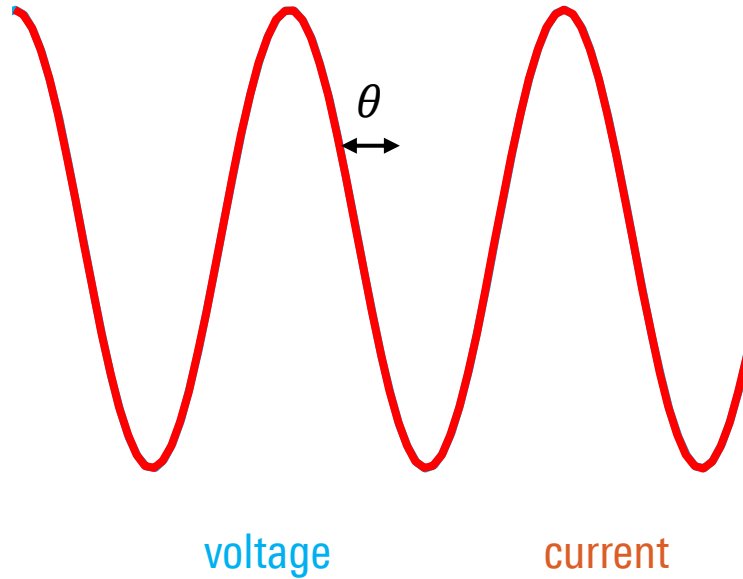
$$\text{Impedance Phase Angle, } \theta = \arctan \frac{X}{R}$$

TRADITIONAL LCR BRIDGE



$$Z_{DUT} = Z_1 \cdot \left(\frac{Z_3}{Z_2} \right)$$

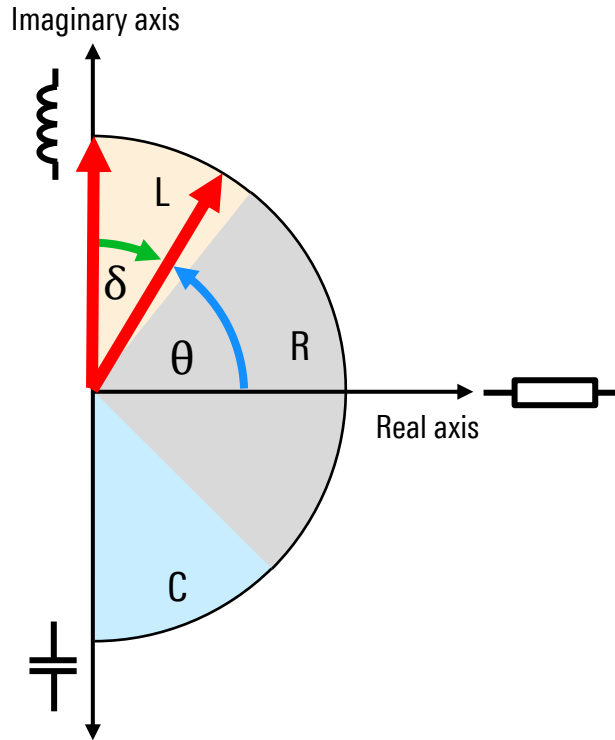
PHASE SHIFTS



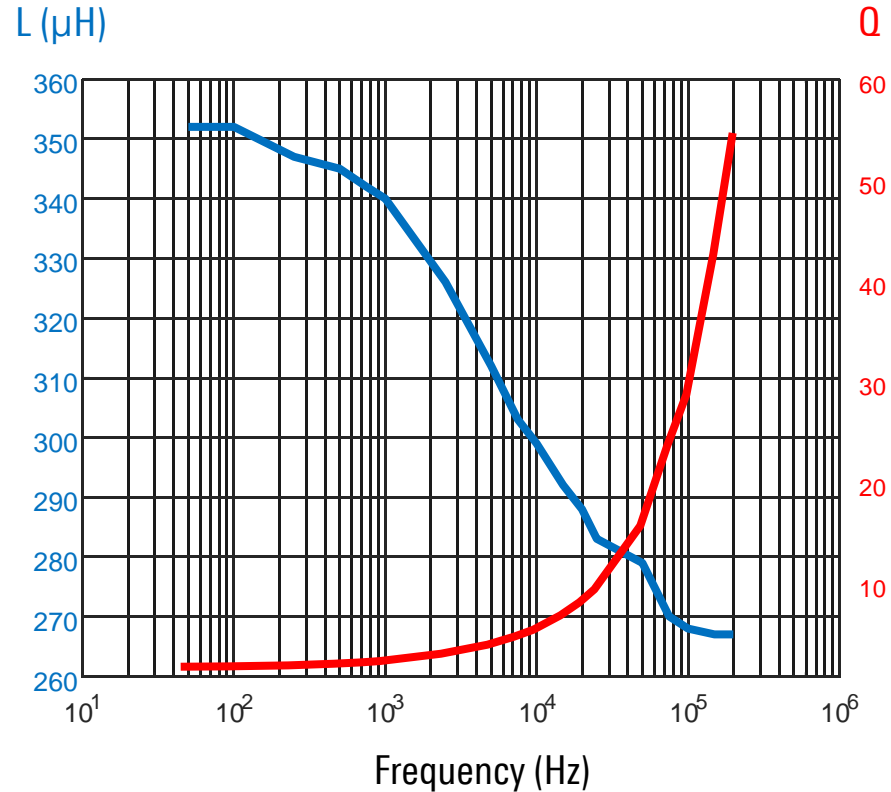
$\theta = \text{phase shift}$

PHASE ANGLE & LOSS ANGLE

L = Inductance
R = Resistance
C = Capacitance
 θ = Phase Angle
 $\delta = 90 - \theta$



MEASUREMENT FREQUENCY



LCR METERS AND IMPEDANCE ANALYZERS



LCX100 & LCX200: LCR Meters



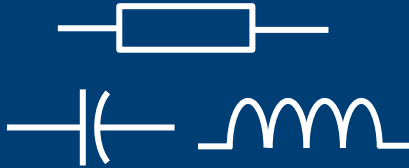
MFIA: Impedance Analyzer

GETTING STARTED WITH LCR METERS

Select / attach fixture



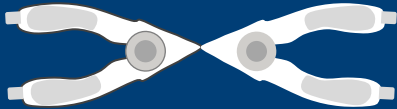
Select DUT type



Configure measurement parameters



Perform corrections



Choose measurements



Review results

Ls : 91.94 μ H
Q : 23.08

TEST FIXTURES



LCX-Z1: through hole

LCX-Z3: surface mount



LCX-Z2: Kelvin clips

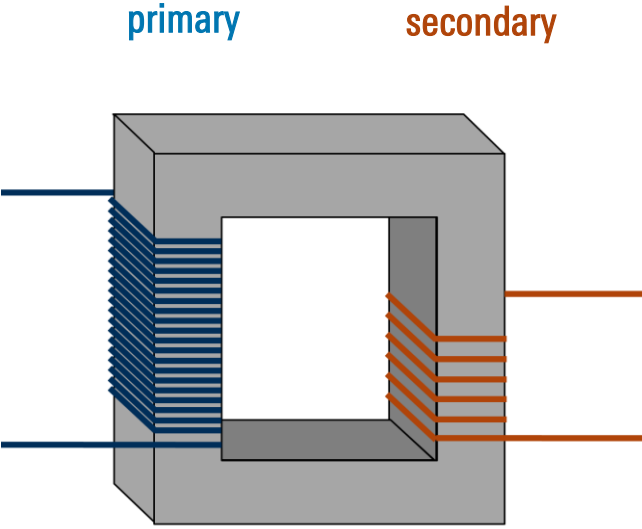
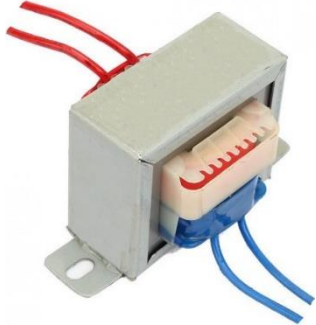


LCX-Z4: test tweezers

LCX-Z5: transformer test cables

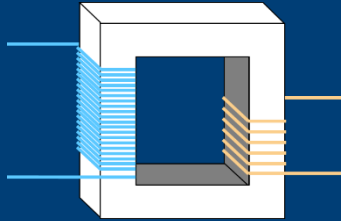


TRANSFORMERS

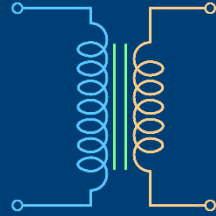


TRANSFORMER MEASUREMENTS

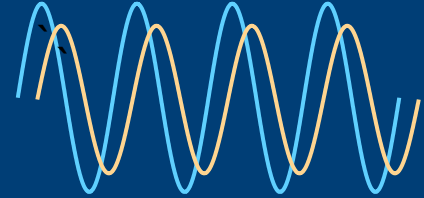
Turns ratio



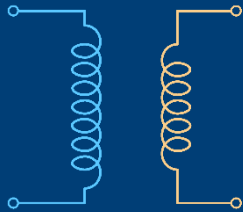
Mutual inductance



Phase angle



Primary and secondary inductance



Leakage inductance

