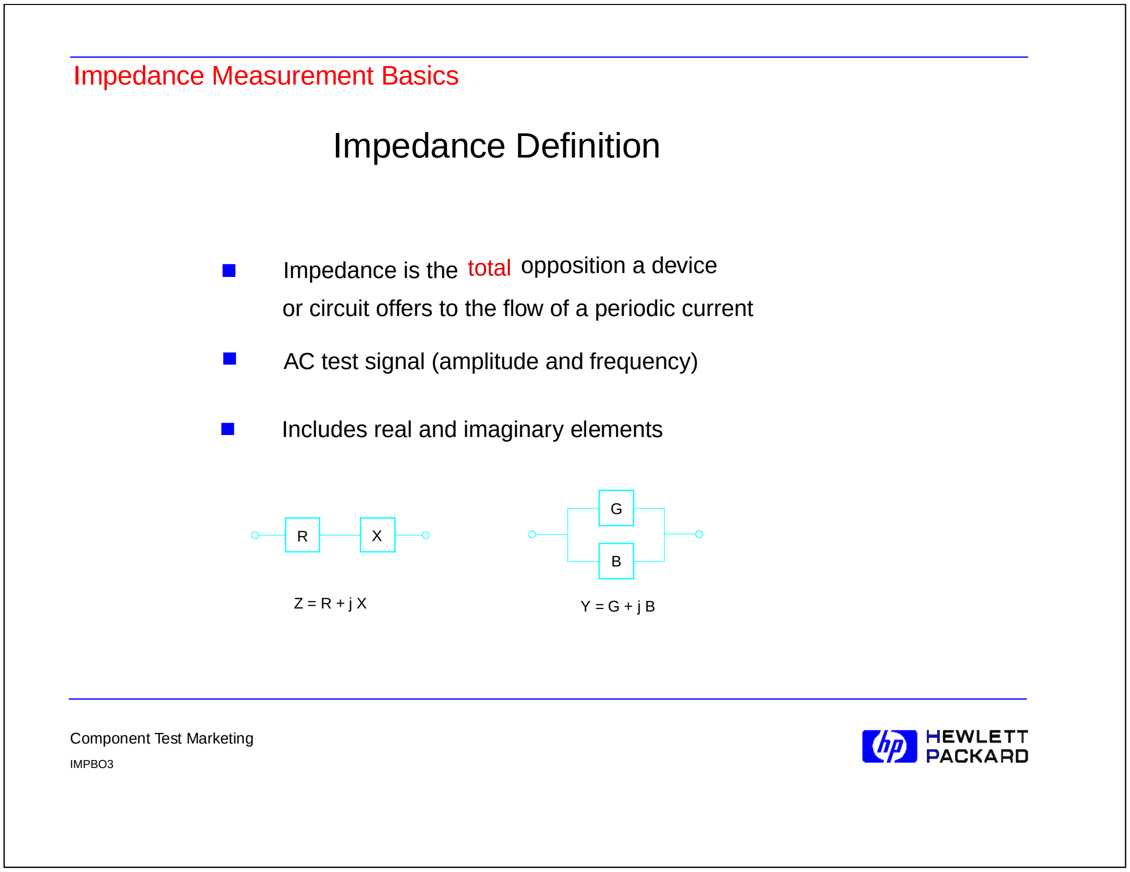
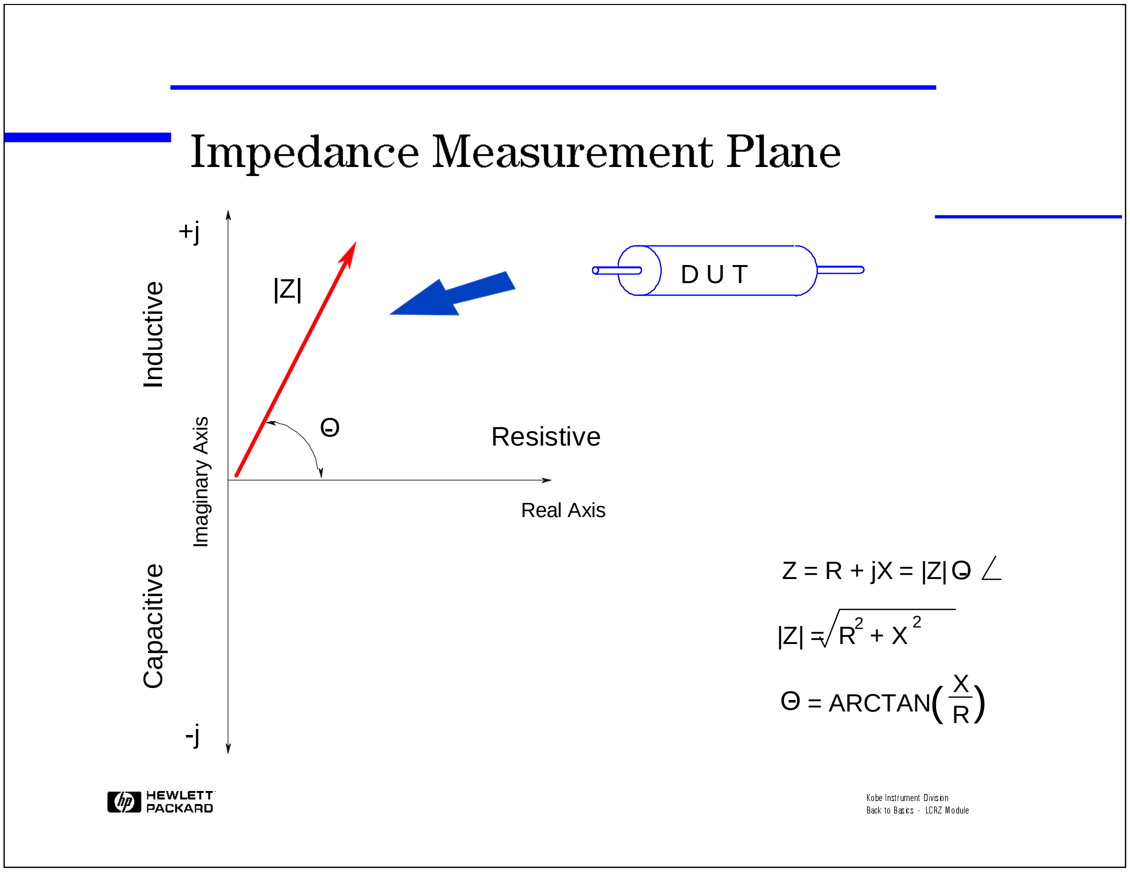
Slide #2



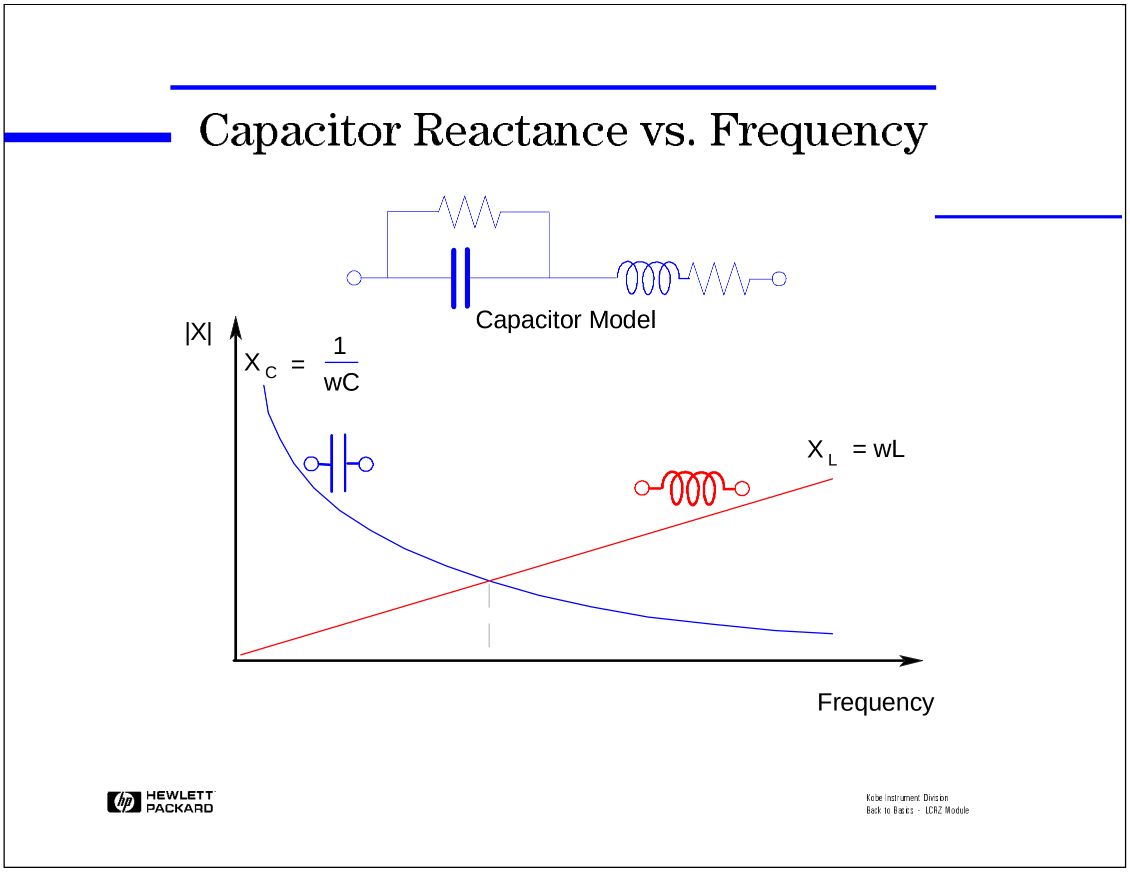
This is the definition of impedance. PERIODIC, in this case means an AC test signal as opposed to a static or DC test signal. So, amplitude and frequency should be considered. TOTAL includes both real and imaginary components. This obviously applies to simple components as well as to complex DUT, cables, amplifiers, etc. By definition, impedance is for the series model: Z=R+jX, where the real part R is the resistance and the imaginary part X the reactance. Similarly, admittance is for the parallel model: Y=G+jB, where G is the conductance and B the susceptance.

Slide #3



The impedance measurement plane can be visualized with the real element, or resistance, on the x-axis and the imaginary element, or reactance, on the y-axis. Ideal components would lie on an axis. Capacitors are typically found in the lower quadrant, while inductors are in the upper quadrant. The more ideal an inductor or a capacitor, the less resistive it will be, therefore the angle will be close to +90 degrees or -90 degrees.

Slide #12

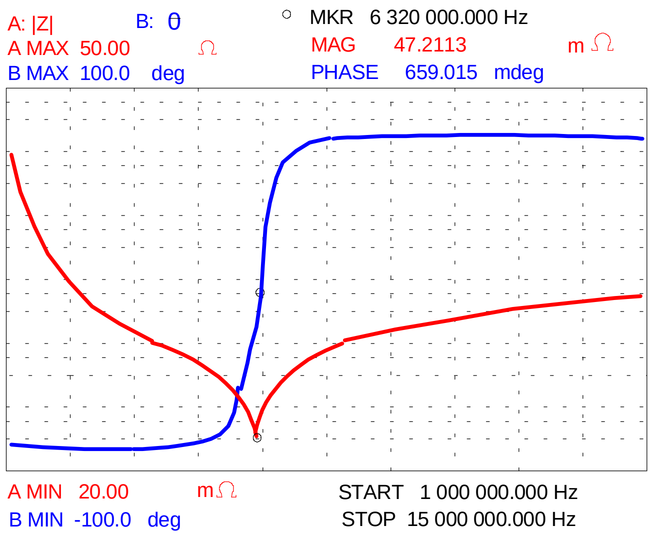


Frequency is the most significant dependency factor. The reactance of an ideal capacitor would vary like the Xc curve. We can oversimplify this real world capacitor model by neglecting the resistors and essentially take into account the series lead reactance Xl.

As a consequence, this capacitor looks like a capacitor in the lower frequency region. The point where the capacitive and inductive reactance are equal is the resonant frequency and the component behaves like a resistor. At higher frequencies, this capacitor behaves like an inductor!

Slide #13

Example Capacitor Resonance Impedance vs. Frequency



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This display shows Z and theta of a capacitor between 1 MHz and 15 MHz. Before resonance, the phase is around -90 degrees and the component effectively looks like a capacitor. The impedance decreases with the frequency until the resonance point, due to the inductive elements of the component. Note that at resonance, the phase is 0 degrees - purely resistive. After resonance the phase angle changes to +90 degrees so the inductive elements dominate. Remember, when you buy a capacitor, you get 3 components!