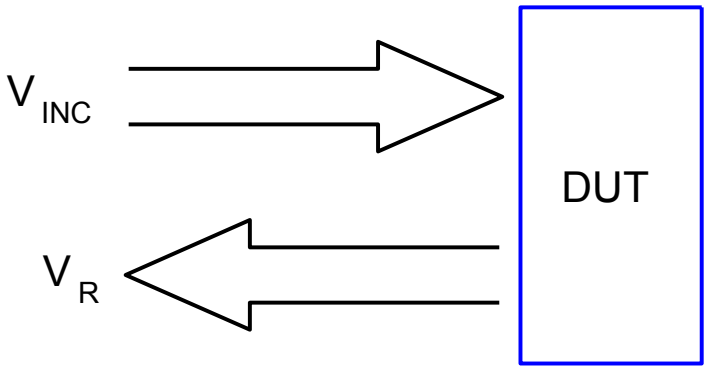
RF POWER MEASUREMENT

Advantages and Disadvantages

- High frequency, 1MHz < f < 1.8GHz
- Most accurate method at > 100 MHz
- Grounded device measurement

Network Analysis (Reflection) Technique

Theory of Operation



$$\Gamma = \frac{V_R}{V_{INC}} = \frac{Z_L - Z_O}{Z_L + Z_O}$$

Summary

Which compensation technique should you select?

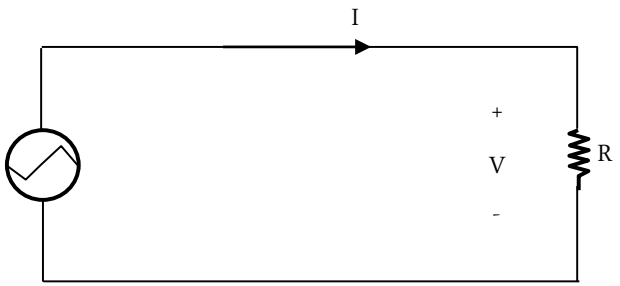
- Selection Guideline -

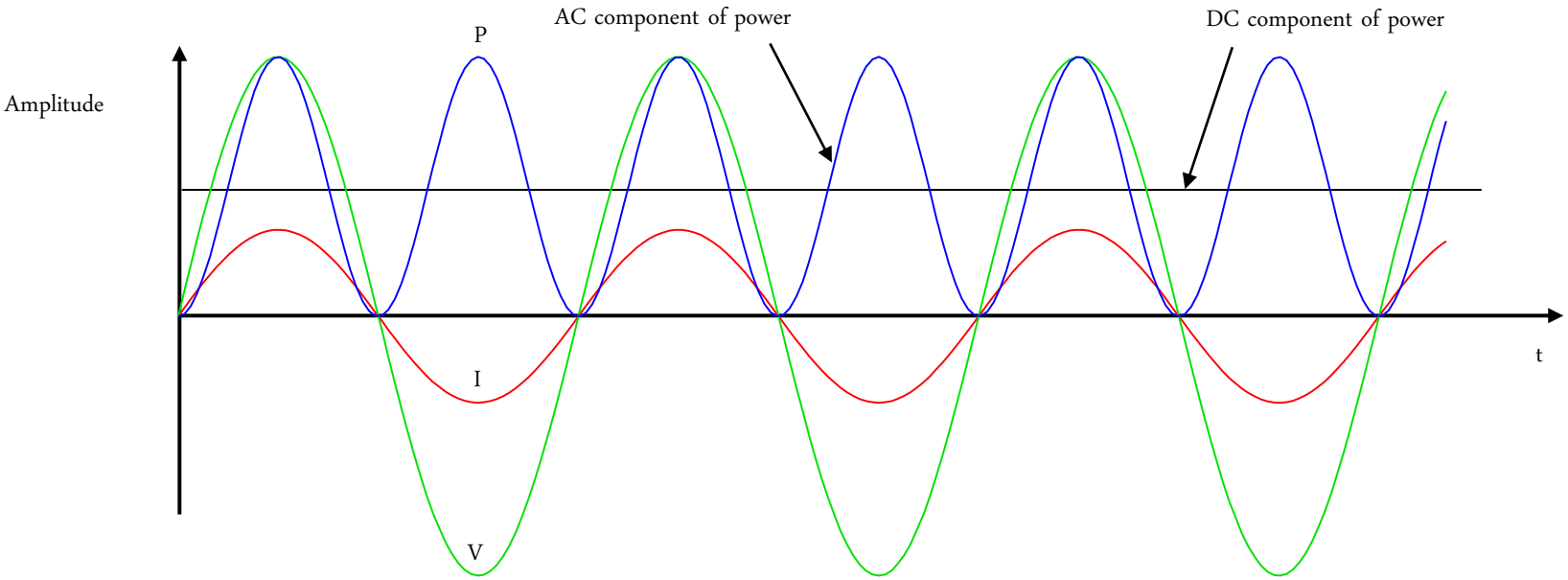
Instruments	Fixture Connection		Residual Compensation
	Primary Fixture	Secondary Fixture	
Z Analyzer LCR Meter (4284A, 4285A etc.)	Direct Test Fixture		OPEN/SHORT only
	Specified HP Cable	Direct Test Fixture	Cable correction + OPEN/SHORT
		Complicated Fixture Scanner, etc.	Cable correction + OPEN/SHORT/LOAD
	Non-specified HP cable Non-HP cable	Direct Test Fixture Other Fixtures	OPEN/SHORT/LOAD
	Self-made Test Fixture		OPEN/SHORT or OPEN/SHORT/LOAD

Units and Definitions

- Unit of power is the watt (W): 1W = 1 joule/sec
- The watt is a basic unit: 1 volt is defined as 1 W/ampere
- Relative power measurements are expressed in dB: P(dB) = 10 log(P/Pref)
- Absolute power measurements are expressed in dBm: P(dBm) = 10 log(P/1 mW)

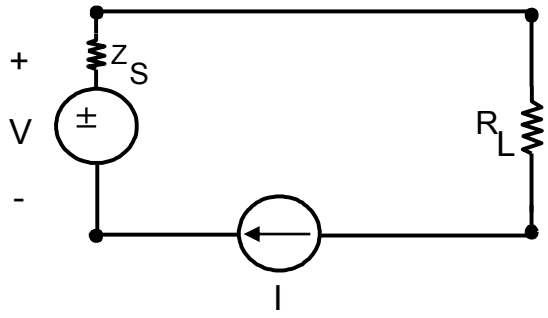
Power: P = (I)(V)

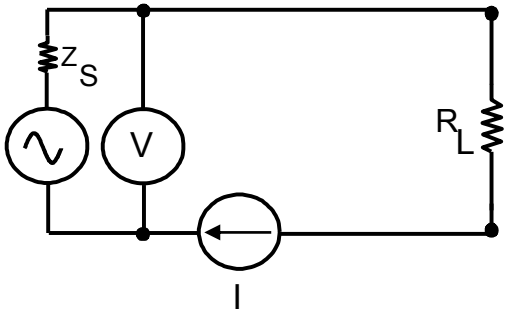

I
+
V
-
R

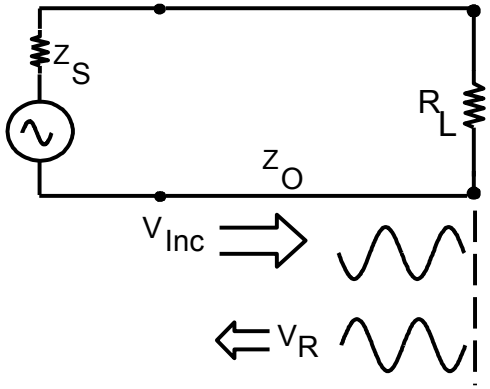

Amplitude
P
AC component of power
DC component of power
I
V
t

Power Measurements at Different Frequencies

- DC
- Low Frequency
- High Frequency

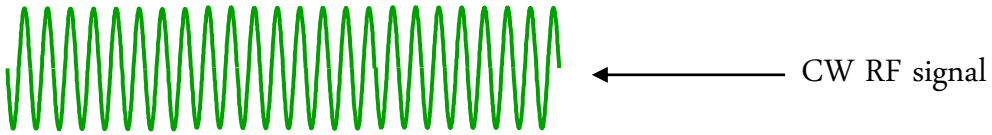






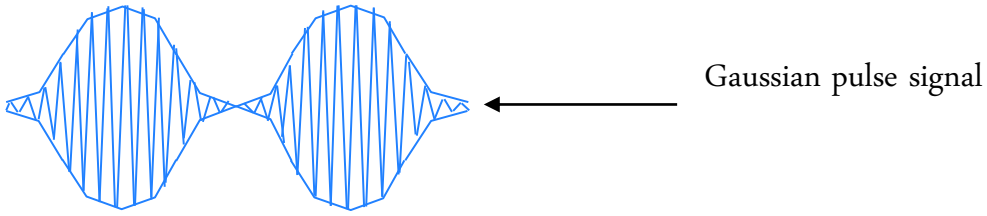
Types of Power Measurements

- Average Power

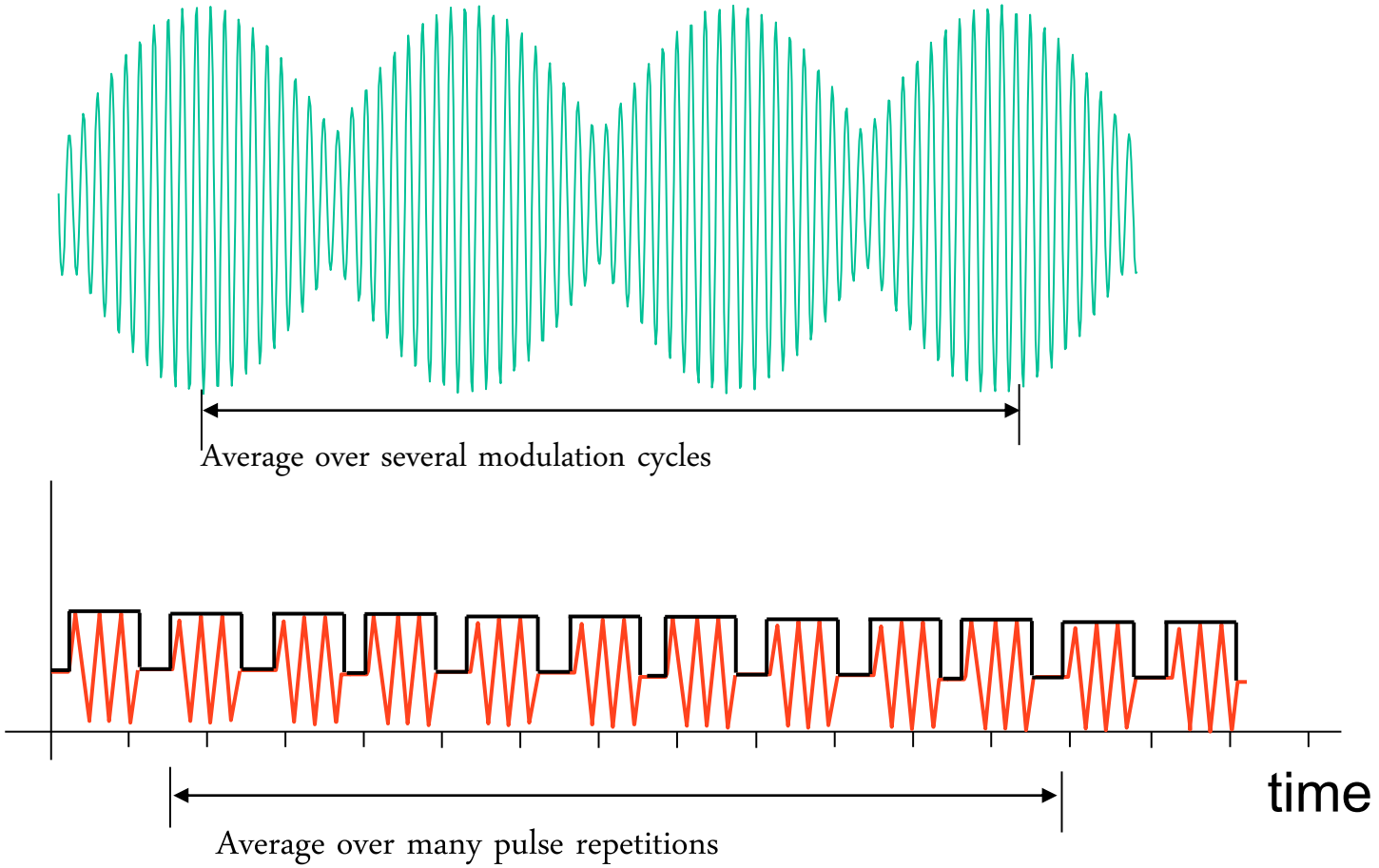


- Pulse Power

- Peak Envelope Power



Average Power



Measurement Types Summary

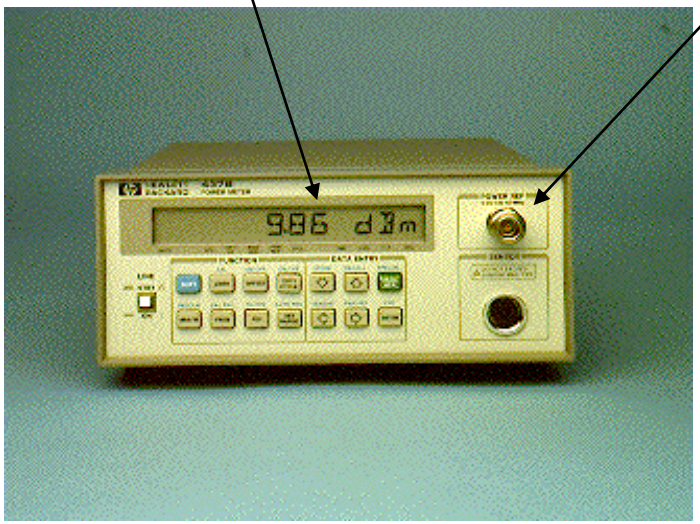
- For a CW signal, average, pulse, and peak envelope power give the same results
- Average power is more frequently measured because of easy-to-use measurement equipment and highly accurate and traceable specifications
- Pulse and peak envelope power can often be calculated from average power

Power Meter Errors

Zero Carryover

Power reference error

+/- 1 count



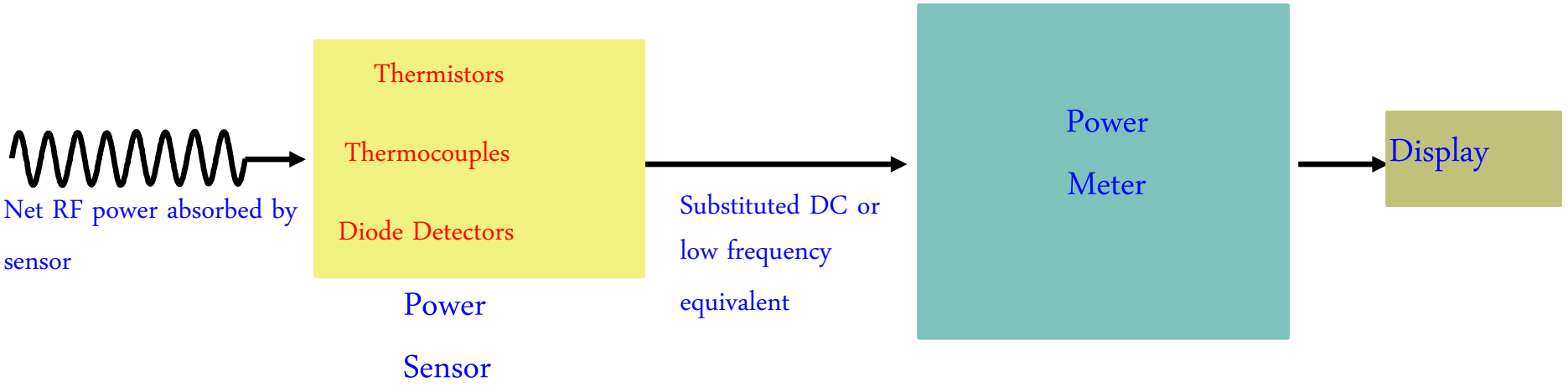
Drift

Zero Set

Noise

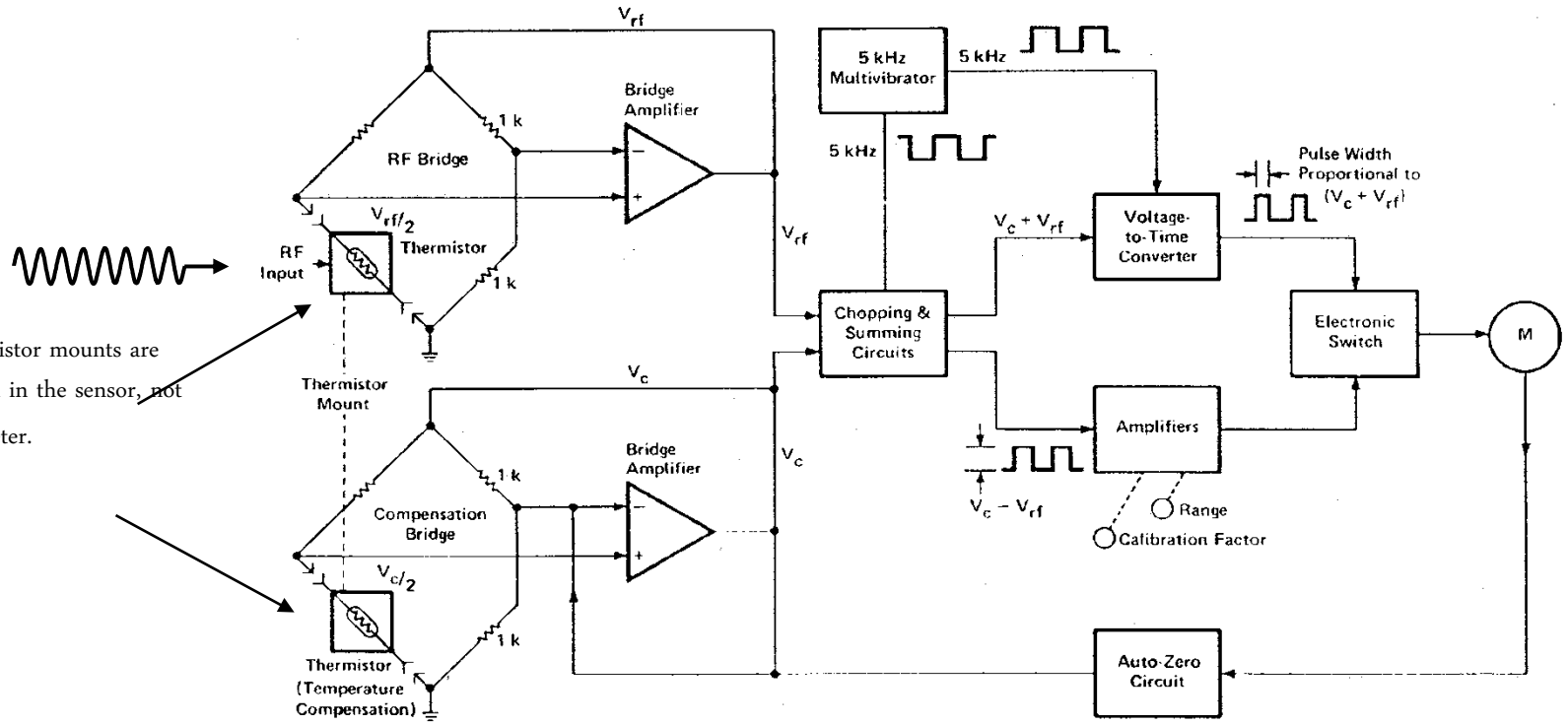
Instrumentation error

Methods of Sensing Power



Power Meters for Thermistor Mounts

- HP 432A Power Meter



Thermistor mounts are located in the sensor, not the meter.

The Basic Power Meter