Sine Wave	**Bit Rate and Baud Rate**	**Shannon-Hartley Theorem**
Formula $y(t) = A\sin(2\pi ft + \phi)$ $T = \frac{1}{f}$ $f = \frac{1}{T}$ $\Delta\phi = 2\pi f\Delta t$ $V_{\text{rms}} = \frac{V_m}{\sqrt{2}}$ **Description** General Form Period Frequency Phase Shift RMS Voltage	**Formula** $R = B\log_2(M)$ $\text{Baud} = \frac{\text{Bit Rate}}{\log_2(\text{Number of Levels})}$ **Description** Bit Rate Baud Rate	**Formula** $C = B\log_2(1 + \text{SNR}_{\text{linear}})$ $\text{SNR}_{\text{linear}} = 10^{\frac{\text{SNR}_{\text{dB}}}{10}}$ **Description** Channel Capacity SNR (linear)
Power and Loss	**Antenna**	**Signal Types**
Formula $L = a \times d$ $P_{\text{received}} = P_{\text{transmitted}} - L_{\text{total}}$ $P_{\text{W}} = 10^{\frac{P_{\text{dBm}}}{10}} \times 10^{-3}$ **Description** Power Loss Received Power dBm to Watts	**Formula** $A_{\text{eff}} = \frac{\lambda^2 G_{\text{lin}}}{4\pi}$ $G_{\text{lin}} = 10^{\frac{G_{\text{dBi}}}{10}}$ **Description** Effective Area Gain (linear)	**Type** Analog Signal Digital Signal **Description** Continuous signal that varies over time (e.g., sine wave, voice signal) Discrete signal with distinct levels (e.g., binary data)
Modulation Schemes	**Line Coding Schemes**	**Constellation Diagrams**
Scheme ASK (Amplitude Shift Keying) FSK (Frequency Shift Keying) PSK (Phase Shift Keying) QAM (Quadrature Amplitude Modulation) **Description** Varies amplitude Varies frequency Varies phase Combines amplitude and phase variations	**Scheme** NRZ-L (Non-Return to Zero-Level) Manchester AMI (Alternate Mark Inversion) **Description** Binary 1 is high, 0 is low Binary 1 is low-to-high transition, 0 is high-to-low transition Binary 1 alternates polarity, 0 is zero voltage	**Scheme** QPSK 8-QAM **Points** Four points at 0°, 90°, 180°, 270° Eight points with different amplitudes and phases
Frequency Spectrum		
Signal Sine Wave Square Wave NRZ Data Stream	**Spectrum** Single frequency component Fundamental frequency and odd harmonics DC component and harmonics of the bit rate	

Conversion Table

Unit	Conversion	Unit	Conversion	Unit	Conversion	Unit	Conversion
1 MHz	1×10^6 Hz	1 kHz	1×10^3 Hz	1 mW	1×10^{-3} W	1 μW	1×10^{-6} W
1 Gbps	1×10^9 bps	1 Mbps	1×10^6 bps	1 kbps	1×10^3 bps	1 Baud	1 symbol per second