Answers for Session Session 2b - Modulation/Coding, EVM, Multipath, MIMO

1. How do the transmitter and receiver get locked in phase in wifi?

The transmitter and receiver in Wi-Fi get locked in phase using a process called Phase-locked loop (PLL) synchronization.

A PLL is a circuit that uses a feedback loop to keep the frequency and phase of its output signal synchronized with the frequency and phase of an input signal.

The PLL adjusts its output frequency and phase until they are aligned with the input signal. Once the transmitter and receiver are locked in phase, they can communicate with each other without any errors. The transmitter will transmit data on its carrier frequency, and the receiver will receive the data and demodulate it using its own carrier frequency. The demodulated data will be an exact copy of the data that was transmitted, even if the two devices are moving or experiencing interference.

2. What is the coding rate ?

A coding rate of 5/2 typically means that, for every 5 bits of data input, 2 bits are added for error correction or redundancy in the encoded signal. This higher coding rate is often used in advanced error-correcting codes
A higher coding rate means that a larger portion of the output signal is used to represent the original data, resulting in a more efficient and robust communication system.
In contrast, a lower coding rate means that a larger portion of the output signal is used for error correction or redundancy, which can help in dealing with noisy or unreliable communication channels but may reduce the overall data transmission rate

3. Are these required SNRs fixed ? How do wireless devices compute SNR, is it dynamic?

The required SNRs for different modulation techniques are not fixed. They can vary depending on the channel conditions, the required data rate, and the desired performance.

For example, a higher SNR will be required for a higher data rate or for a more reliable connection. However, if the channel conditions are good, then a lower SNR may be acceptable

Wireless devices typically compute SNR by measuring the signal strength and the noise level. The signal strength is measured using the RSSI (received signal strength indication). The noise level is measured using the CNR (carrier-to-noise ratio). The SNR is then calculated using the following equation:

SNR = RSSI - CNR

4. Does sensitivity indicate how far the receiver can receive the signal?

No, sensitivity does not indicate how far the receiver can receive the signal. The sensitivity of a receiver is the minimum signal strength that the receiver can detect and demodulate correctly. The range of a receiver is the maximum distance at which the receiver can detect and demodulate a signal correctly.

5. What is the difference between a radio chain and a radio? In a dual band radio wireless AP, are there multiple chains in each radio?

One set of transmitter and receiver components is called a radio chain.

A radio in the context of wireless communication refers to a specific frequency band or channel on which data is transmitted and received. A radio chain, on the other hand, represents an individual transmit or receive path within a radio. In a dual-band radio wireless Access Point (AP), there are typically multiple chains within each radio. These chains are separate transmit and receive paths that allow the AP to utilize multiple antennas for improved signal quality and performance on both the 2.4 GHz and 5 GHz frequency bands.

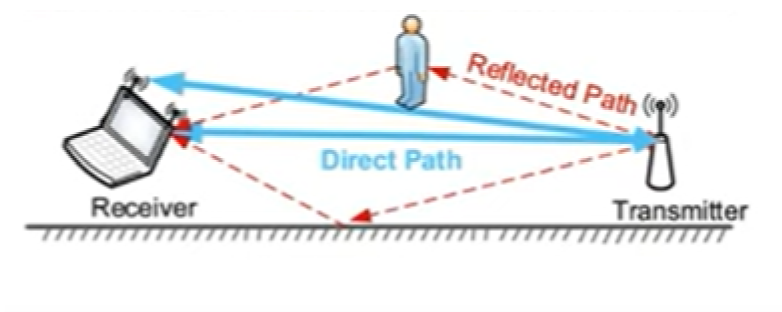
6. How to find the range of MIMO AP.

Perform a site survey. If you need a more accurate estimate of the range of your MIMO AP, you can perform a site survey. This involves using a Wi-Fi analyzer to measure the signal strength from your AP at different locations in your environment. This will give you a detailed map of the coverage area of your AP.

MIMO APs typically have a longer range than non-MIMO APs. This is because MIMO APs can use multiple antennas to transmit and receive data, which can improve the signal strength and range.

7. Does multipath communication make multiple RSSI values ??

In a multipath communication environment, multiple radio signals can take different paths to reach the receiver. This results in varying signal strengths and delays, leading to the reception of multiple signal components. Each of these signal components will have its own Received Signal Strength Indicator (RSSI) value.



This phenomenon is known as multipath propagation, and it can result in fading and signal degradation if not properly managed.

Maximum Ratio Combining (MRC): MRC is a diversity technique that combines multiple received signals with different phase shifts and amplitudes to maximize the signal-to-noise ratio at the receiver.

8. You get a Pattern that is not symmetric in four Quadrants, There will be 8 points in each quadrant. Tha can not be arranged as a quadrant.

In the constellation diagram, the goal of arranging these points is to optimize the trade-off between signal-to-noise ratio (SNR) and the achievable data rate.

In digital communication, a constellation diagram is a graphical representation of the signal points in a modulation scheme. Each point in the constellation represents a unique symbol that encodes binary information. The amplitude and phase of each point in the constellation are carefully chosen to maximize the SNR, which is essential for reliable data transmission.

We will not be getting a non symmetric pattern.