ekahau
WIRELESS DESIGN

ecse
RECERTIFICATION

# Multiple Choice Exam Objectives

The following chart provides a breakdown of the questions within each knowledge domain

| Knowledge Domain | Percentage |
|---|---|
| Ekahau Tools & Methodology | 3 |
| Standards & Regulations | 3 |
| RF Fundamentals | 8 |
| Modulations & Spectrum | 3 |
| Wi-Fi Channels & Power Levels | 5 |
| 802.11 Fundamentals | 3 |
| Association & Re-association Process | 5 |
| Contention | 9 |
| Wi-Fi Security | 3 |
| Wi-Fi Predictive Design | 30 |
| Wi-Fi Validation Surveys | 25 |
| Ekahau Reporting | 3 |

## Ekahau Tools & Methodology - 3%

- Identify and use Ekahau Tools
  - + Ekahau AI Pro
  - + Ekahau Connect Suite
  - + Ekahau Sidekick
- Explain 3 Steps to Great Wi-Fi
  - + Step 1: Design
  - + Step 2: Validate
  - + Step 3: Health Checks

## Standards & Regulations - 3%

- Explain the role of industry organizations
  - + IEEE
  - + Wi-Fi Alliance
  - + Regulatory Domains & Bodies
- Explain IEEE 802.11-2020 PHYs
  - + 802.11 Prime
  - + 802.11a
  - + 802.11b
  - + 802.11g
  - + 802.11n
  - + 802.11ac
  - + 802.11ax

## RF Fundamentals - 8%

- Explain RF fundamentals
  - + Sine waves
  - + Wavelength & frequency
  - + Amplitude
  - + Phase
  - + Noise & SNR
  - + Inverse Square Law (ISL)
  - + Free Space Path Loss (FSPL)
- Understand how to measure wall attenuation
- Understand units used in Wi-Fi and dB math
  - + dB vs mW
  - + Rules of 3s and 10s

## Modulations & Spectrum - 3%

- Understand modulation types
  - + Baseband
  - + Frequency
  - + Amplitude
  - + Phase
- Understand modulation constellations
  - + BPSK
  - + QPSK
  - + 16-QAM through 1024-QAM
- Understand Air Time
- Understand spread spectrum
  - + DSSS
  - + OFDM
  - + OFDMA
  - + Spectral masks

## Wi-Fi Channels & Power Levels - 5%

- Explain Multiple Input Multiple Output (MIMO) operations
  - + Spatial Multiplexing
  - + TxBF
  - + MRC

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# ECSE Recertification Multiple Choice Exam Objectives

- Explain Modulation and Coding Schemes (MCS) table
  - Channels aggregation
- Understand 2.4 GHz channels allocation
  - Channels allocation
- Understand 5 GHz channels allocation
  - Channels allocation
  - DFS
- Understand 6 GHz channels allocation
  - Channels allocation
  - Devices Classification
  - AFC
  - PSD
- Explain channel planning across all 3 bands

## 802.11 Fundamentals - 3%

- Explain OSI Model and understand how it applies to Wi-Fi
- Explain structure of 802.11 Header
- Explain types of 802.11 MAC Frames and understand their role
  - Management frames
  - Control frames
  - Data frames

## Association & Re-association Process - 5%

- Explain association process
  - Green Diamond
  - Association process
  - SSID vs BSSID
- Explain re-association process and improvements
  - Re-association process
  - 802.11r
  - 802.11k
  - 802.11v
- Explain AP discovery options on 2.4 and 5 GHz bands
  - Passive
  - Active
- Explain AP discovery options on 6 GHz band
  - Out-of-band
  - In-band

## Contention - 9%

- Explain channel contention
  - Channel co-location & reuse
  - Radio Tx power impact on channel contention
  - Distributed Coordination Function (DCF) aka “The Game”
  - Design for Least Capable Most Important (LCMI) device
- Explain interference impact on channel contention
  - Cross-Channel Interference (CCI) / channel contention
  - Adjacent-Channel Interference (ACI)
  - Primary / secondary channels and pri / sec Overlapping Basic Service Set (OBSS)
  - non-Wi-Fi interference
  - Noise
  - Attenuation
  - Reflection
  - Multipath
  - Refraction
  - Scattering
  - Diffraction
- Explain network load impact on contention
  - Calculate capacity requirements realistically

## Wi-Fi Security - 3%

- Explain Wi-Fi security options and identify which ones should not be used in enterprise Wi-Fi
  - Open
  - WEP
  - WPA
  - WPA2
  - WPA3

## Wi-Fi Predictive Design - 30%

- Understand steps required to prepare the project for Wi-Fi design using Ekahau AI Pro
  - Set regulatory domain
  - Import floor plans
  - Scale
  - Draw and manipulate walls and attenuation areas
  - Create building
  - Align floors
  - Specify inclusion and exclusion areas
  - Use areas nesting
  - Use holes in the floors
- Understand design visualizations
  - Primary coverage
  - Secondary coverage
  - Coverage Planning
  - SNR
  - Noise
  - Channel interference
  - Network health
  - Network issues
  - Channel width

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# ECSE Recertification Multiple Choice Exam Objectives

- Data rate
- Throughput
- BLE

- Understand antenna fundamentals
  - Gain
  - Beamwidth
  - Polarization
  - Frequency response
  - Coverage pattern
  - Reading antenna data sheets / charts
- Use Ekahau AI Pro for manual predictive design
  - Choosing relevant AP and antenna type
  - Using omnidirectional and directional antennas
  - Setting antennas height, direction and tilt
  - Setting radio Tx power
- Use Ekahau AI Pro Auto-Planner for automatic predictive design
  - AI Auto-Planner
  - Channel Planner
- Understand how to capture business and technical requirements and translate them into RF requirements to design or survey against
  - Business requirements
  - Technical requirements
  - RF requirements

## Wi-Fi Validation Surveys - 25%

- Explain when and how to use different types of surveys
  - Wi-Fi Design Survey
  - Pre-Deployment Survey (AP on a Stick)
  - Post-Deployment Survey
  - Periodic Health Survey
  - TShooting / Assessment Survey
- Explain when and how to use different types of survey data collection with both Ekahau AI Pro and Ekahau Survey
  - Stop and go
  - Continuous
  - Autopilot
  - GPS
- Understand the difference between active and passive surveys
  - Passive site survey
  - Active site survey
- Explain how to perform super-accurate Wi-Fi site surveys
  - Ekahau 6 Tips for Super-Accurate Wi-Fi Site Surveys
- Explain what Ekahau Insights is and how to use it
  - What is Ekahau Insights
  - Who is it good for
  - How to use Ekahau Insights
- Use advanced Ekahau AI Pro features
  - Auto Wall Calibration
  - Network Simulator
- Demonstrate ability to analyze survey and live 802.11 data
  - Analyzing survey data with Ekahau AI Pro
  - Analyzing survey data with Ekahau Survey
  - Analyzing live RF conditions with Ekahau AI Pro and the Sidekick (protocol)
  - Analyzing live RF conditions with Ekahau Analyzer and the Sidekick (protocol)
- Demonstrate ability to use analyze spectrum data
  - Types of RF interferers
  - Live RF conditions with Ekahau AI Pro and the Sidekick (spectrum)
  - Live RF conditions with Ekahau Analyzer and the Sidekick (spectrum)
  - Channel utilization reported by spectrum analyzer
  - Channel utilization reported by a Wi-Fi network card
  - Density vs Waterfall views
- Understand how to use Sidekick to capture 802.11 frames
  - Using Ekahau Capture

## Ekahau Reporting - 3%

- Demonstrate ability to use reporting tools
  - Ekahau AI Pro One-Click reporting tool
  - Exporting visualizations as images
  - Ekahau Insights

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