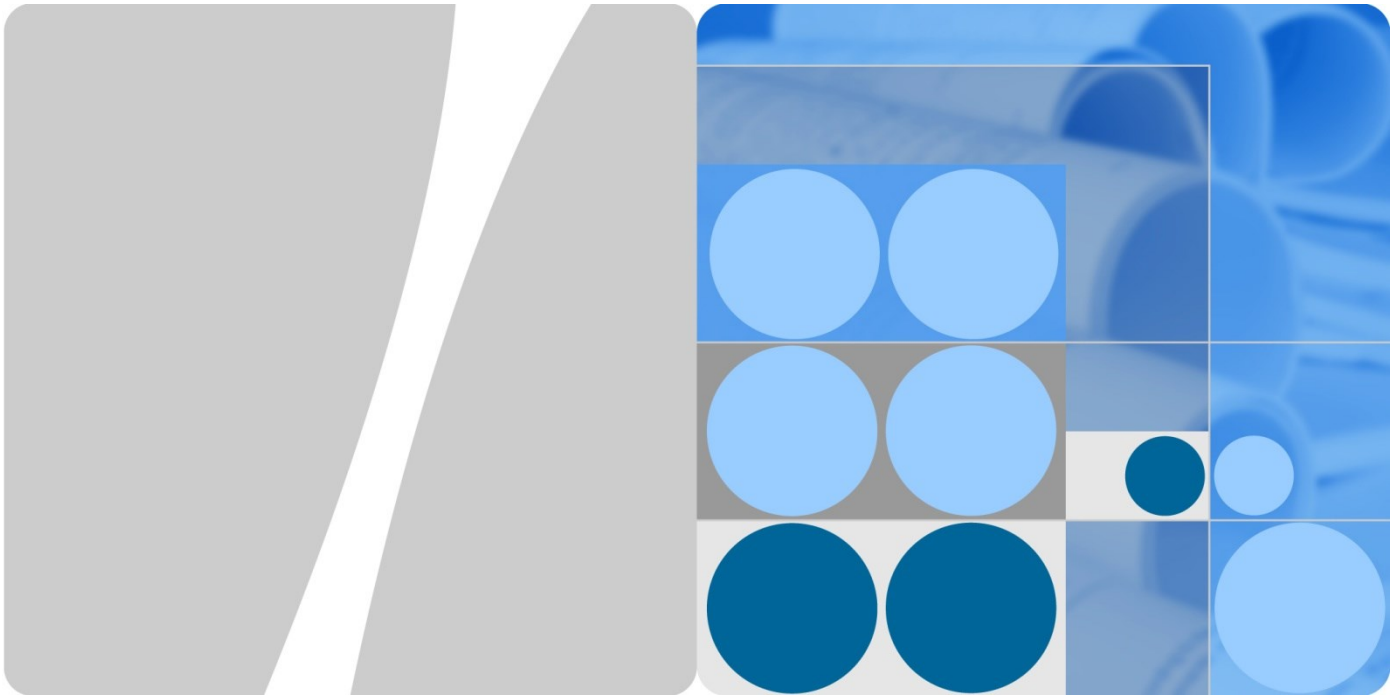

UNIVPM - Ampliamento WIFI - MonteDago WLAN Planning Report

Elettrica srl

HUAWEI

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1 WLAN Network Design Rules

Design Guidelines

When designing WLAN network, first ensure normal signal exchange between APs and wireless network adapters, and effective access by users. Planning of wireless network coverage needs to take the following factors into consideration: effective coverage of the AP signals, location of AP antennas, and AP configuration. When choosing the location for AP placement, follow these guidelines:

1. If only one AP needs to be installed in a hall, install it in the center of the hall ceiling. If two APs are required, install them on the two diagonal corners of the ceiling.

2. Make sure WLAN signals go through minimum walls and ceilings. WLAN signals will be significantly weakened when penetrating walls and ceilings. Therefore, place APs and computer in proper positions to ensure that WLAN signals go through the shortest path when penetrating a wall or ceiling. This minimizes the signal loss.

3. Make sure a straight connection between an AP and its coverage area. Choose a proper position for AP placement to ensure that WLAN signals travel vertically through the wall or ceiling.

4. AP antennas are adjustable. Place an AP in a proper position to ensure that the main beam directly face the target area, realizing the best coverage.

5. Install APs away from electronic devices such as microwave ovens, wireless cameras, and cordless phones.

Network Designing Parameters

Penetration Loss

Regardless of indoor AP or outdoor AP, the signal coverage shows a significant attenuation due to the structural characteristics of a building, resulting in a coverage hole.2.4GHz microwave penetration loss for a variety of materials measured experience:

8mm Board: 1~1.8dB
38mm Board: 1.5~3dB
40mm Wooden doors: 2~3dB
12mm Glass: 2~3dB
250mm Concrete wall: 20~30dB
Brick wall: 10~15dB
Floor to block: 20~30dB
Elevator to block: 20~40dB

Indoor path loss

Indoor environment the path loss formula:

$$L = 20 * \lg(f) + 10 * D * \lg(d) + p - 24$$

Parameter description: L: Path loss (dB); f: working frequency (MHz); D: Attenuation factor; d: transmission distance (m); P: penetration factor coefficient.

In a semi-open indoor environment, the transmission model in the same floor is simplified as:

2.4 GHz band: (D = 2.5, p = 6)

$$L = 20 * \lg(f) + 10 * D * \lg(d) + p - 24 = 50 + 25 * \lg(d)$$

5.8 GHz band: (D = 3, p = 6)

$$L = 20 * \lg(f) + 10 * D * \lg(d) + p - 24 = 57 + 30 * \lg(d)$$

Therefore, indoor semi-open environment, the value of path loss with distance in the following table:

Distance:	1m	2m	5m	10m	15m	20m	40m	80m	100m
2.4G :	50dB	57.5dB	67.5dB	75dB	79.4dB	82.5dB	90.1dB	97.6dB	100dB
5.8G :	57dB	66dB	78dB	87dB	92.3dB	96dB	105.1dB	114.1dB	117dB

Outdoor path loss

Outdoor environment the path loss formula:

$$L = 42.6 + 26 * \lg(d) + 20 * \lg(f)$$

Parameter description: L: Path loss (dB); f: working frequency (MHz); d: transmission distance (Km).

Therefore, outdoor open environment, the value of path loss with distance in the following table:

Distance:	50m	100m	200m	300m	500m	800m	1000m
2.4G :	76.4dB	84.2dB	92dB	96.6dB	102.4dB	107.7dB	110.2dB
5.8G :	84dB	91.9dB	99.7dB	104.2dB	110dB	115.4dB	117.9dB

Link Budget

Indoor environment, the link budget equation:

$$\mathrm{RSSI(dBm)} = \mathrm{P} + \mathrm{Tx} + \mathrm{Rx} - \mathrm{L} - \mathrm{S}$$

Parameter description: RSSI: Field strength (dBm); p: Transmit power (dBm); Tx: Transmitting antenna gain(dB); Rx: Receive antenna gain(dB); L: Path loss(dB); S: Penetration loss(dB).

The link budget is only a theoretical reference. In actual network construction, proper adjustments can be made according to the type of the building, the wireless condition on spot and the simulating testing results.

2 Material List

Part Number	Material Name	Material Model	Material Quantity	Remarks
	AP	AirEngine5761-11	92	

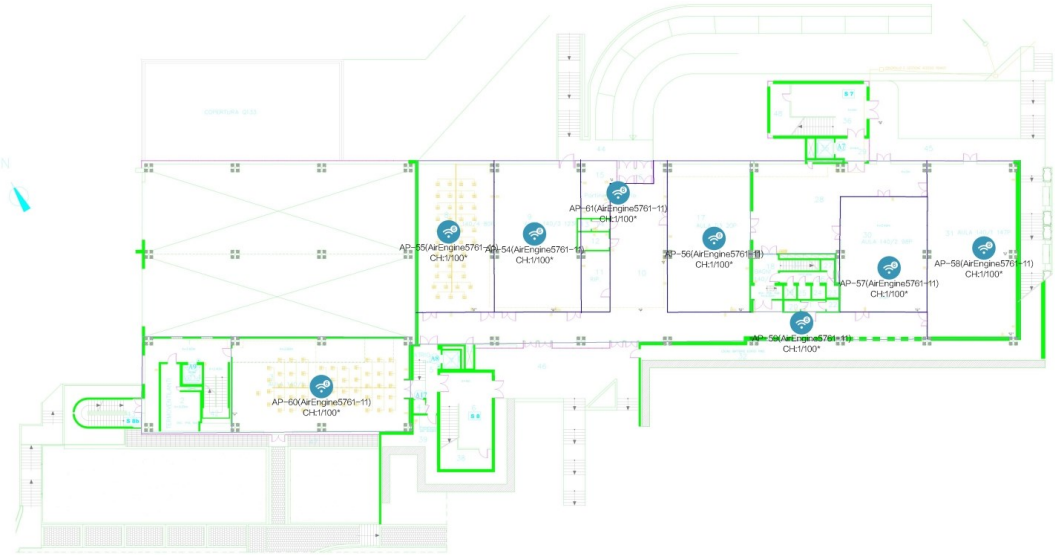
Note: Before deployment, carry out site surveys and adjust the solution based on the survey result.

3 Engineering Design Chart

3.1 MonteDago

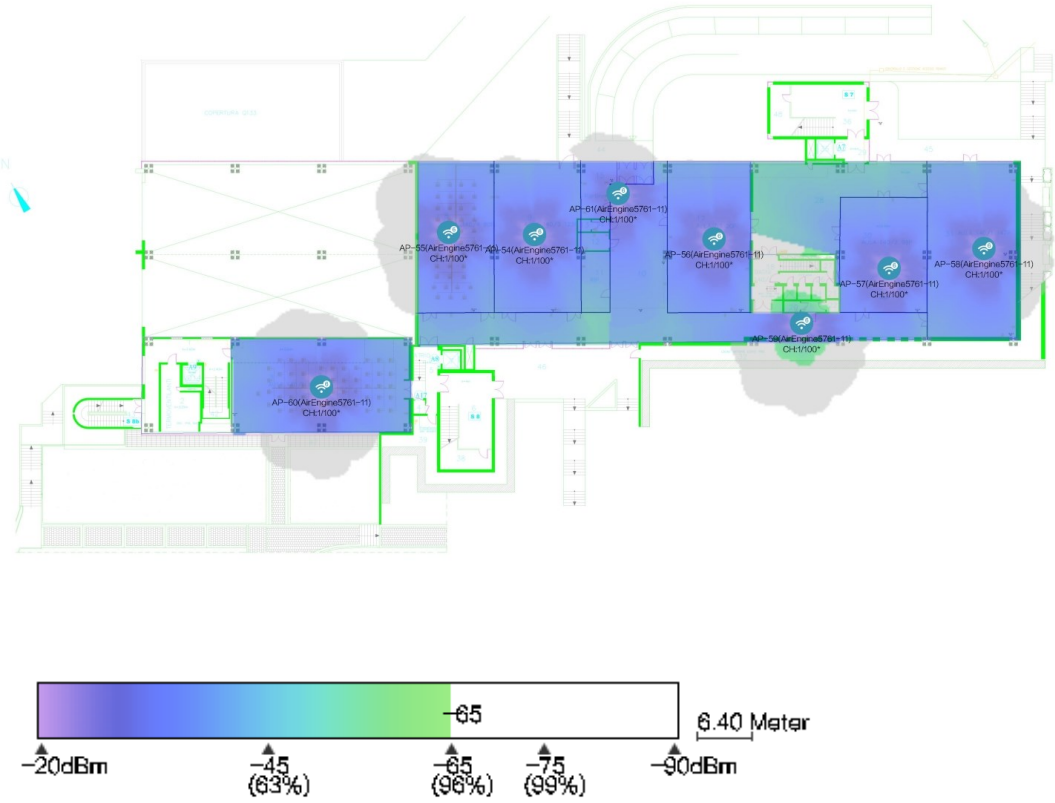
1layer Q.ta 140

System Plan Diagram



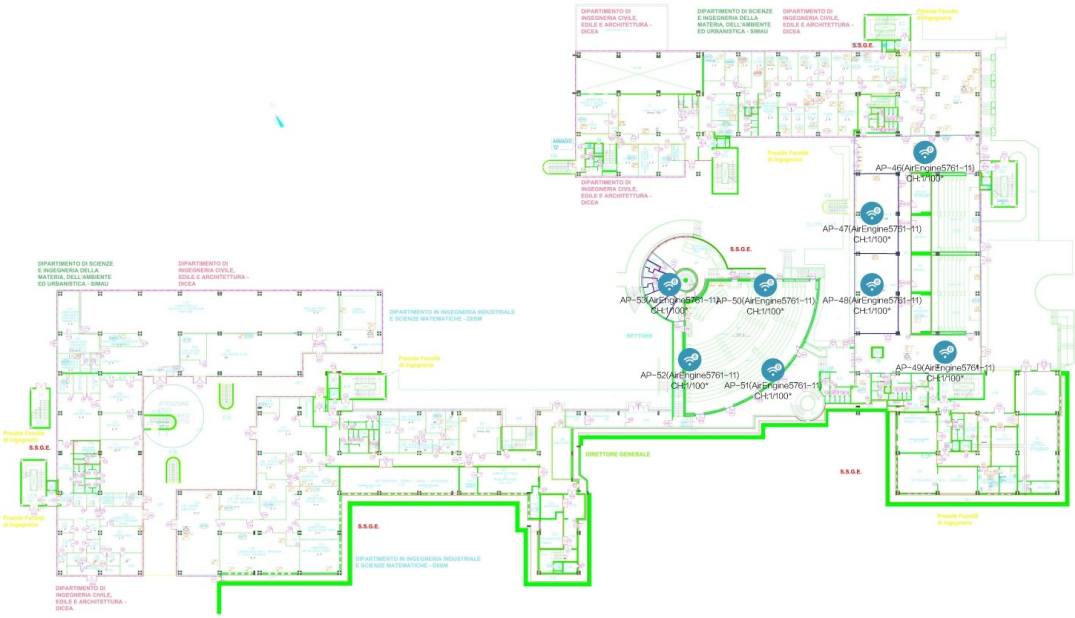
2.4G&5G Simulation Diagram

1) RSSI Simulation Diagram



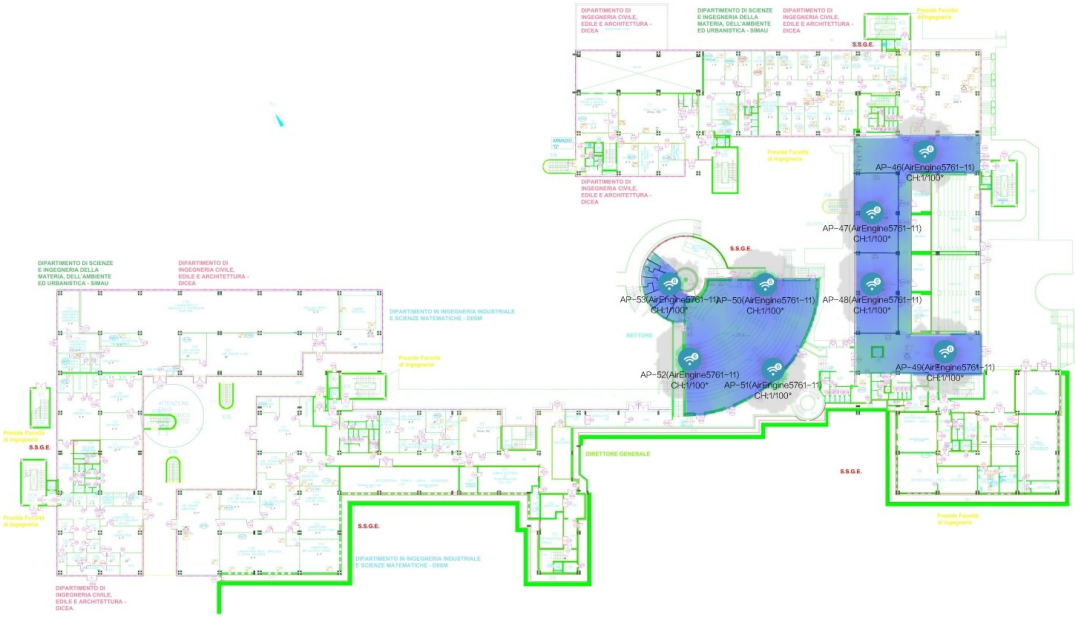
2layer　Q.ta 145

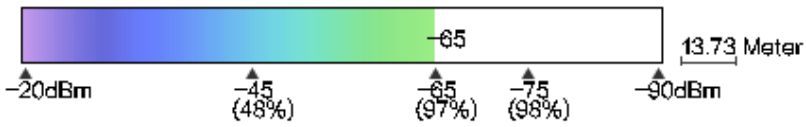
System Plan Diagram



2.4G&5G Simulation Diagram

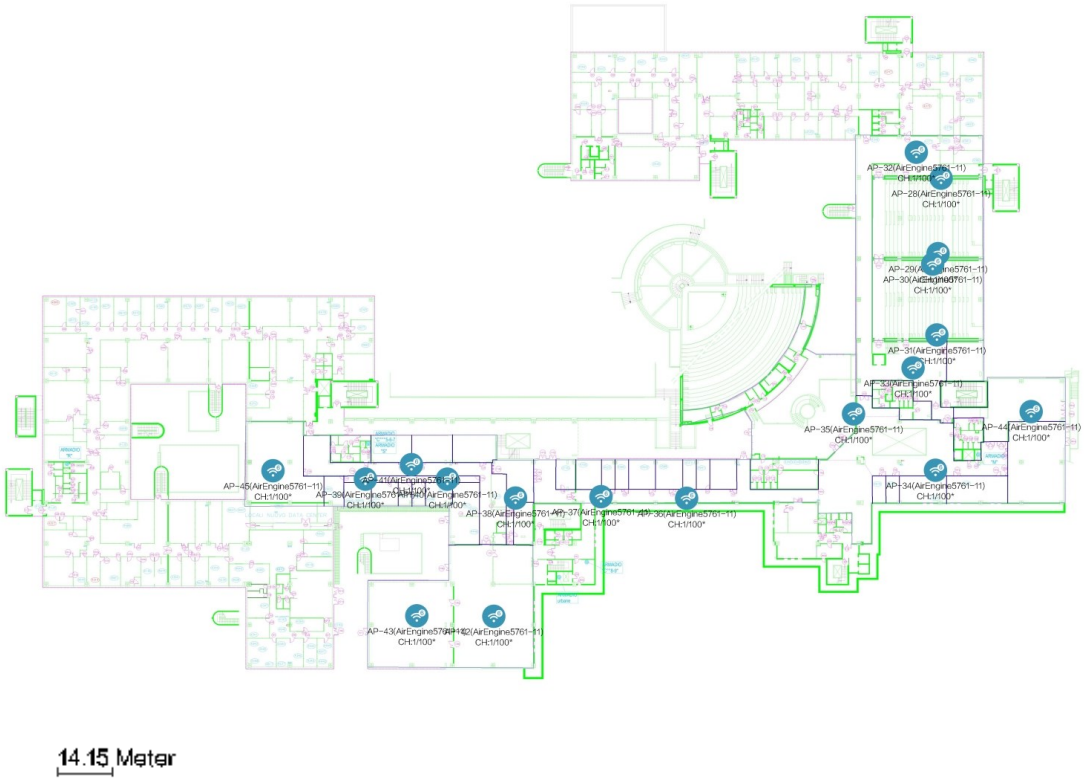
1) RSSI Simulation Diagram





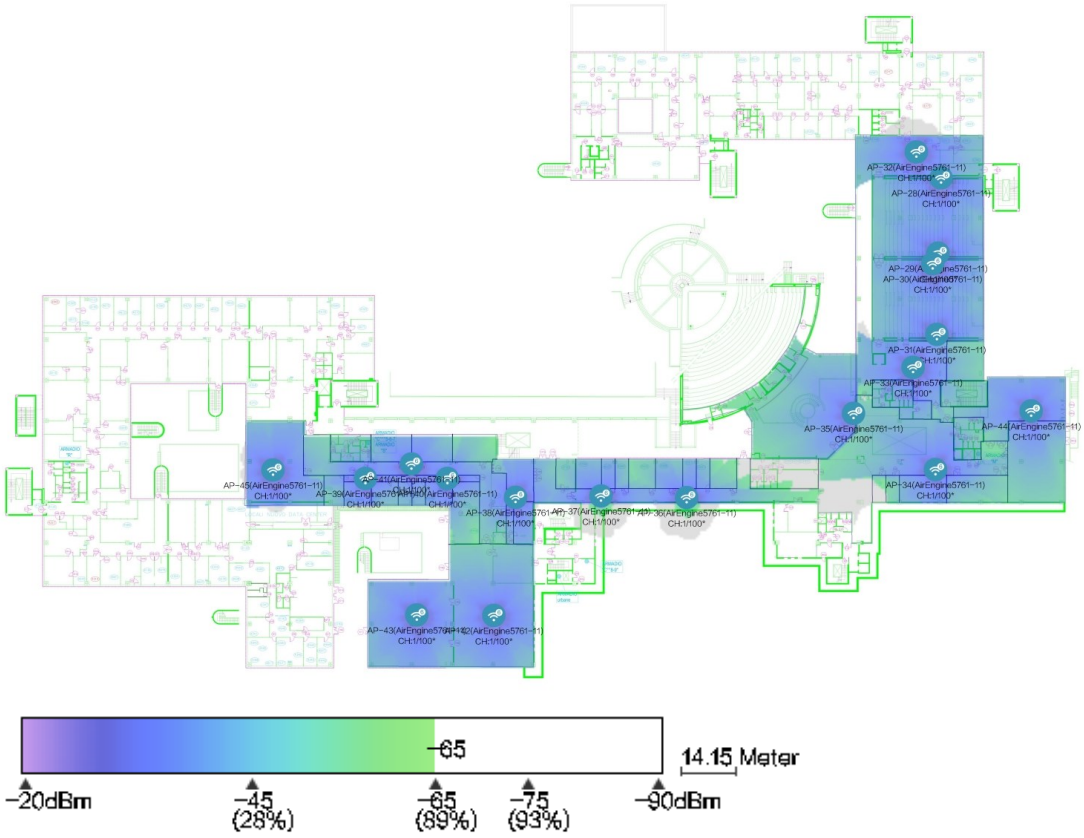
3layer Q.ta 150

System Plan Diagram



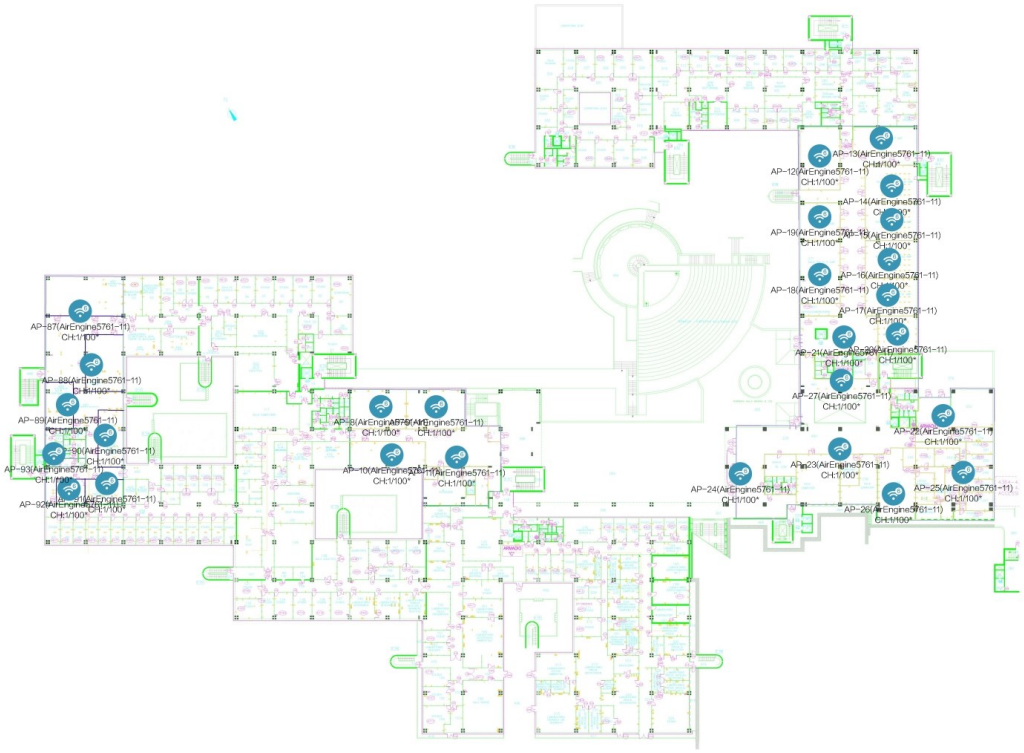
2.4G&5G Simulation Diagram

1) RSSI Simulation Diagram



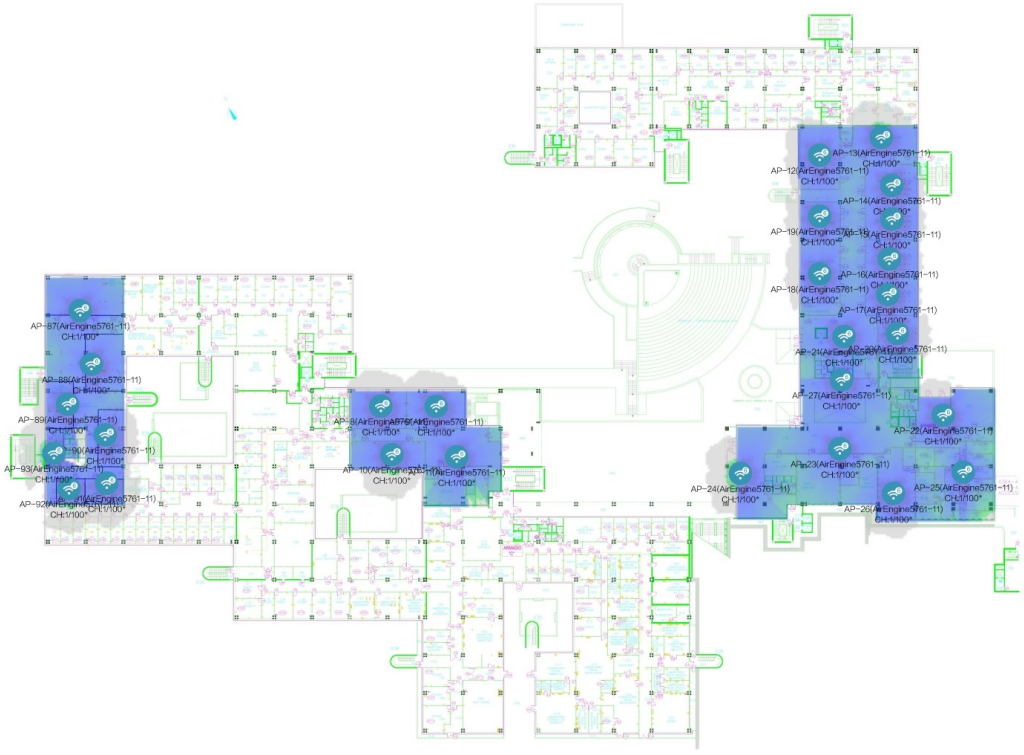
4layer　Q.ta 155

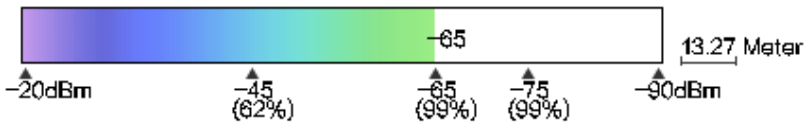
System Plan Diagram



2.4G&5G Simulation Diagram

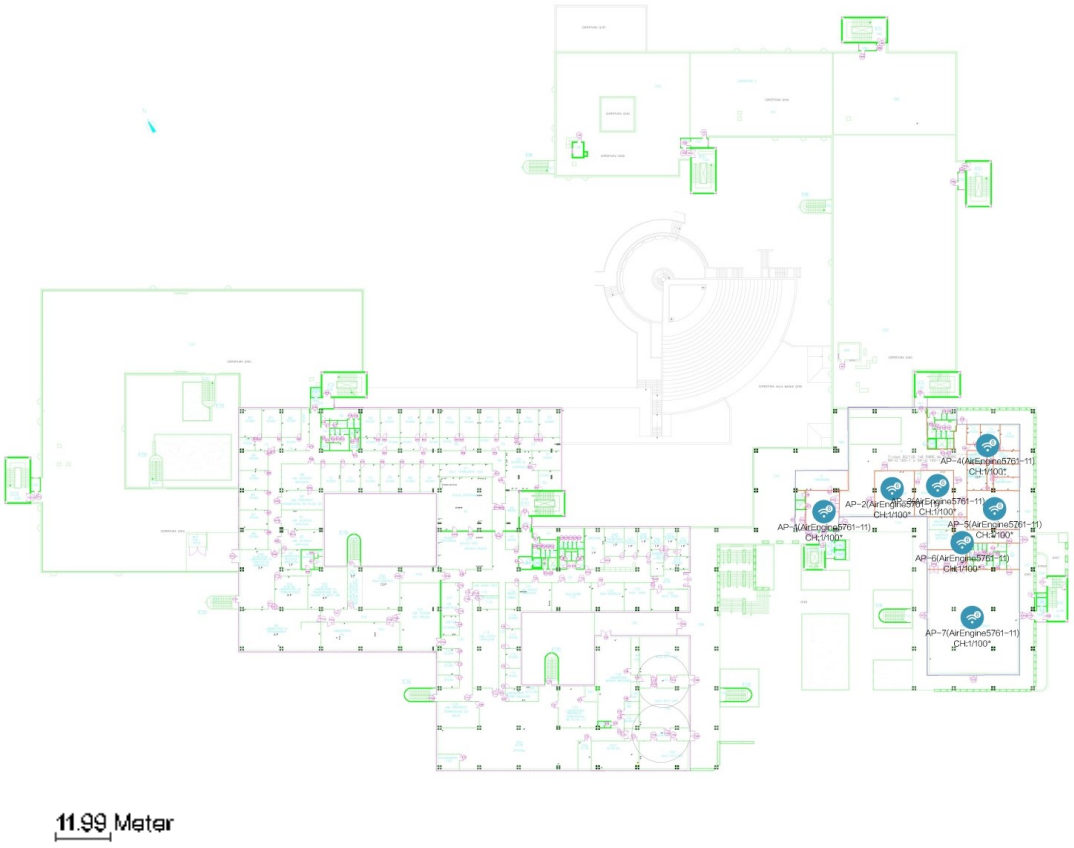
1) RSSI Simulation Diagram





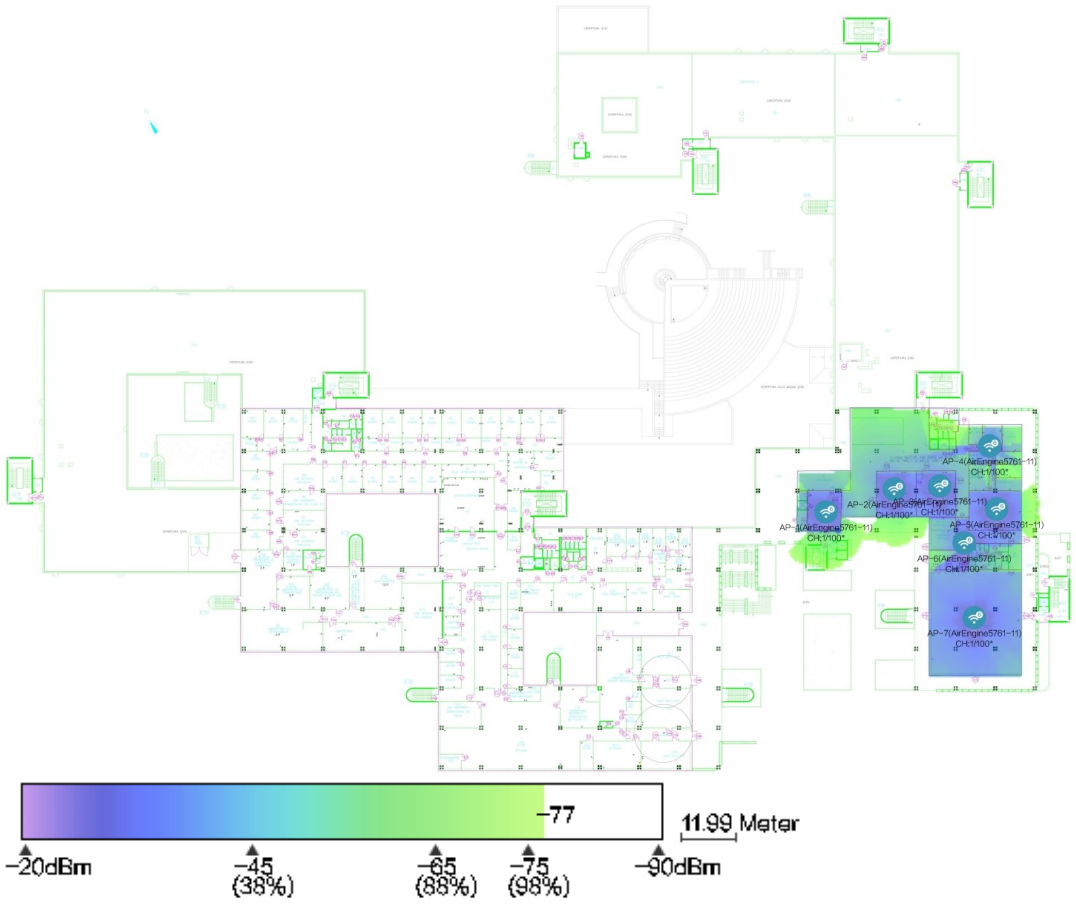
5layer Q.ta 160

System Plan Diagram



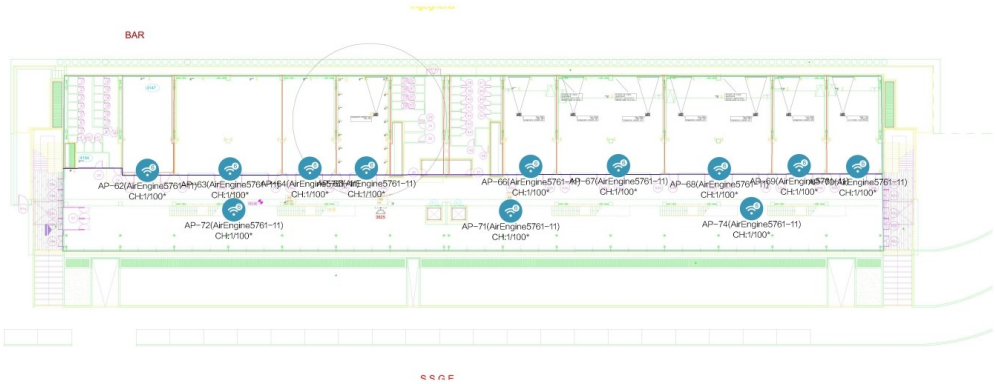
2.4G&5G Simulation Diagram

1) RSSI Simulation Diagram



6layer AUSUD-PT

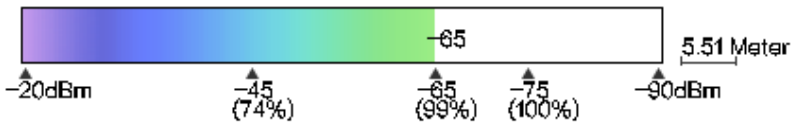
System Plan Diagram



5.51 Meter

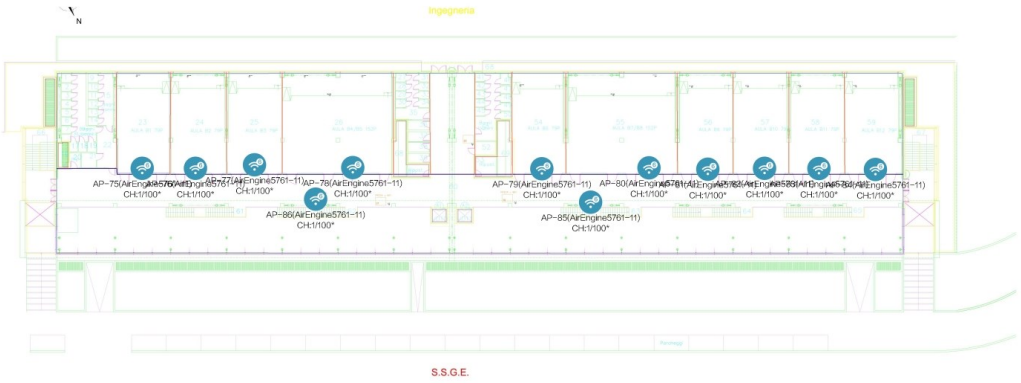
2.4G&5G Simulation Diagram

1) RSSI Simulation Diagram



7layer AUSUD-P01

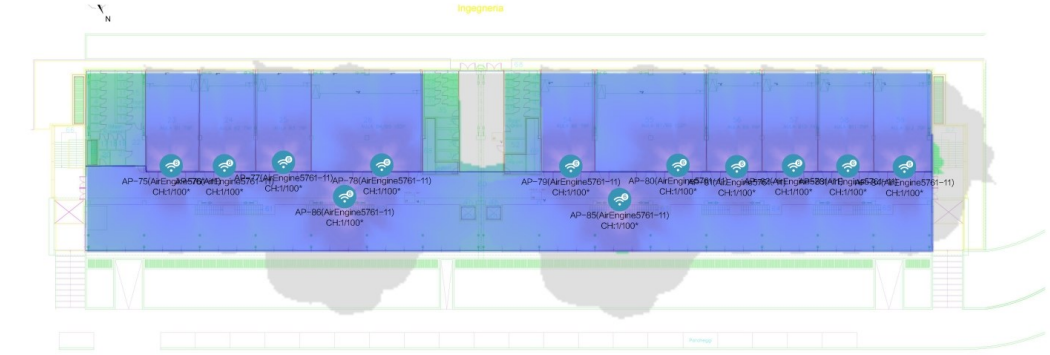
System Plan Diagram

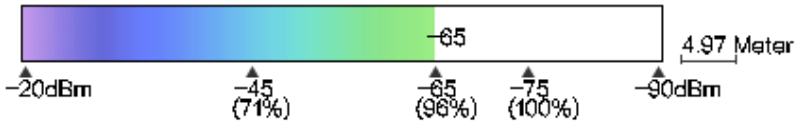


4.97 Meter

2.4G&5G Simulation Diagram

1) RSSI Simulation Diagram


N
Ingegneria
AP-75(AirEngine5761-11)
CH:1/100*
AP-76(AirEngine5761-11)
CH:1/100*
AP-77(AirEngine5761-11)
CH:1/100*
AP-78(AirEngine5761-11)
CH:1/100*
AP-79(AirEngine5761-11)
CH:1/100*
AP-80(AirEngine5761-11)
CH:1/100*
AP-85(AirEngine5761-11)
CH:1/100*
S.S.G.E.


-65
4.97 Meter
-20dBm
-45
(71%)
-65
(98%)
-75
(100%)
-90dBm

4 Product Introduction

4.1 AirEngine5761-11

parameter	AirEngine5761-11
Dimensions (Diameter x Height)	Φ220 x 50 mm
Power Input	DC: 12 V ±10%
PoE power supply: In compliance with 802.3at/af.Note: When 802.3af power is supplied	the USB port is disabled.
Maximum Power Consumption	15.3W (excluding USB)
Maximum Number of Users	≤ 1024
Operating Temperature	–10°C to +50°C
Antenna Type	Built-in Smart Antennas
MIMO:Spatial Streams	2.4 GHz: 2x2:2 5 GHz: 2×2:2
Radio Protocols	802.11a/b/g/n/ac/ac wave2/ax
Maximum Rate	1.775 Gbit/s