# RF Exposure evaluation

Applicant Data: SIEMENS AG
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Germany

Product Data: Industrial WLAN Access Point / Client
MSAX65-W1-M12-E2
Siemens

WLAN 2,4 GHz and 5 GHz

mobile 20cm

General Population/Uncontrolled

FCC ID: LYHMSAX65V1

| Standards |
|---|
| KDB 447498 v06 |
| ---------- |
| FCC CFR 47, Part 2.1091: Radiofrequency radiation exposure evaluation: mobile devices. |
| FCC CFR 47, Part 2.1307: Actions that may have a significant environmental effect, for which Environmental Assessments (EAs) must be prepared. |
| FCC CFR 47, Part 2.1310: Radiofrequency radiation exposure limits. |

# RF Exposure evaluation

## Maximum Permissible Exposure

As specified in Chapter e(1) of 47 CFR Part 1.1310 – Limits for Maximum Permissible Exposure (MPE)

Table (i) - Limits for Occupational/ Controlled Exposure

| Frequency range (MHz) | Power density (mW/cm²) |
|---|---|
| 300 – 1500 | f/300 |
| 1500 - 100000 | 5.0 |

Table (ii) – Limits for General Population/ Uncontrolled Exposure

| Frequency range (MHz) | Power density (mW/cm²) |
|---|---|
| 300 – 1500 | f/1500 |
| 1500 - 100000 | 1.0 |

# RF Exposure evaluation

## Calculations

$S = P * G / ( 4 * \pi * R^2 )$

$R = \sqrt{} ( P * G / S_{lim} * 4 * \pi )$

$G = S_{lim} * 4 * \pi * R^2 / P$

Where:

S = power density (mW/cm²)
P = power input to the antenna (mW)
G = power gain of the antenna (mW)
R = distance to the centre of radiation of the antenna (cm)
$S_{lim}$ = FCC / IC Limit (mW/cm²)

## Simultaneous Transmission Considerations

The calculation below is used to consider situations in which simultaneous exposure to fields of different frequencies occur. The calculation is performed by the sum of each relative exposure for each equipment according to the following criteria.

$$\sum_{1}^{N} \frac{S_{eqn}}{S_{Limn}} = \frac{S_{eq1}}{S_{Lim1}} + \frac{S_{eq2}}{S_{Lim2}} + \ldots + \frac{S_{eqN}}{S_{LimN}} \leq 1$$

Where:

$S_{eq}$ = S = power density (mW/cm²)
$S_{lim}$ = FCC / IC Limit (mW/cm²)

# RF Exposure evaluation

## Assessment

| | | | G | | P | S | Slim | Seq / Slim |
|---|---|---|---|---|---|---|---|---|
| Operational Mode | Frequency Band (MHz) | Antenna Gain (dBi) | Antenna Gain -numeric- (mW) | Output Power (dBm) | Output Power (mW) | Power Density value (mW/cm²) | FCC Limit (mW/cm²) | Relative Power Density value |
| WLAN 2.4 GHz | 2412 - 2462 | 9,0 | 7,94 | 19,4 | 87,10 | 0,1376 | 1,0000 | 0,1376 |
| WLAN 2.4 GHz | 2412 - 2462 | 14,0 | 25,12 | 14,4 | 27,54 | 0,1376 | 1,0000 | 0,1376 |
| WLAN 5 GHz | 5180-5240 | 8,0 | 6,31 | 22,9 | 194,98 | 0,2448 | 1,0000 | 0,2448 |
| WLAN 5 GHz | 5260-5320 | 8,0 | 6,31 | 20,7 | 117,49 | 0,1475 | 1,0000 | 0,1475 |
| WLAN 5 GHz | 5500-5720 | 8,0 | 6,31 | 21,6 | 144,54 | 0,1814 | 1,0000 | 0,1814 |
| WLAN 5 GHz | 5745-5825 | 8,0 | 6,31 | 24,8 | 302,00 | 0,3791 | 1,0000 | 0,3791 |
| WLAN 5 GHz | 5180-5240 | 9,0 | 7,94 | 20,2 | 104,71 | 0,1655 | 1,0000 | 0,1655 |
| WLAN 5 GHz | 5260-5320 | 9,0 | 7,94 | 19,8 | 95,50 | 0,1509 | 1,0000 | 0,1509 |
| WLAN 5 GHz | 5500-5720 | 9,0 | 7,94 | 19,9 | 97,72 | 0,1544 | 1,0000 | 0,1544 |
| WLAN 5 GHz | 5745-5825 | 9,0 | 7,94 | 20,8 | 120,23 | 0,1900 | 1,0000 | 0,1900 |
| WLAN 5 GHz | 5180-5240 | 14,2 | 26,30 | 14,7 | 29,51 | 0,1544 | 1,0000 | 0,1544 |
| WLAN 5 GHz | 5260-5320 | 14,2 | 26,30 | 14,9 | 30,90 | 0,1617 | 1,0000 | 0,1617 |
| WLAN 5 GHz | 5500-5720 | 14,2 | 26,30 | 14,6 | 28,84 | 0,1509 | 1,0000 | 0,1509 |
| WLAN 5 GHz | 5745-5825 | 14,2 | 26,30 | 21,3 | 134,90 | 0,7059 | 1,0000 | 0,7059 |

Note1: only worst-case values per frequency band are listed in the table above.
Note2: max output power values per frequency band has been marked yellow.

Simultaneous Transmission:

| | WLAN 2,4 GHz | WLAN 5 GHz |
|---|---|---|
| ($S_{eq}$ / $S_{lim}$ ) | 0,1376 | 0,7059 |
| Sum | 0,8435 | |
| Limit | 1 | |
| Conclusion | passed | |

Note: max. values marked green in the assessment table.

Report Reference:

- MDE_Siem_1911_FCC_01_rev01 from 7layers GmbH, Germany issued on 2022-02-23
- MDE_Siem_1911_FCC_02_rev01 from 7layers GmbH, Germany issued on 2022-02-23
- MDE_Siem_1911_FCC_05_rev01 from 7layers GmbH, Germany issued on 2024-02-06

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