# MPE/RF EXPOSURE EVALUATION

**FCC CFR 47 Part 1.1310**

**Report No.: SAFR01-U6A Rev A FCC MPE**

Company: Safran Passenger Innovations

Evaluation of: Rave Access Point

# MPE/RF EXPOSURE EVALUATION

FROM

Evaluation of: Safran Passenger Innovations Rave Access Point

To: FCC CFR 47 Part 1.1310

Report Serial No.: SAFR01-U6A Rev A FCC MPE

This report supersedes: NONE

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**Calculations for RF Exposure Evaluation**

Power Density = Pd ($W/m^2$) = EIRP/($4*\pi*d^2$)
EIRP = P * G
P = Peak output power (W)
G = Antenna numeric gain (numeric)
d = Separation distance (m)
Numeric Gain = 10 ^ (G (dBi)/10)

Because the EUT belongs to the General Population/Uncontrolled Exposure the limit of power density is 1.0 $mW/cm^2$

The Safran Passenger Innovations Rave AP contains the following pre certified radios modules that were assessed assuming simultaneous transmission. These calculations represent worst case in terms of the RF exposure levels. There are two TK4WLE200NX radio modules installed in the Rave AP meaning that there can be a total of up to 5 radios operating simultaneously.

| Ref | FCC ID | Radio Type | MPE Report Issued by | Report Number | Date |
|---|---|---|---|---|---|
| (1) | TK4WLE200NX | WiFi | MRT Technology (Suzhou) Co., Ltd | 1608RSU02004 V01 | 09-07-2016 |
| (2) | TK4WLE1216V520 | WiFi | Bureau Veritas (H.K.) Ltd | SA190807D08A | Nov 18 2019 |
| (3) | SQGBT800 | BT | International Certification Corp. | FA490301 Rev 01 | Sept 19 2014 |

| Freq. Band (MHz) | Ant Gain (dBi) | Numeric Gain (numeric) | Peak Output Power (dBm) | Peak Output Power (mW) | Calculated Power Density ($mW/cm^2$) @ 20cm | Power Density Limit ($mW/cm^2$) | Min Calculated safe distance for Limit (cm) |
|---|---|---|---|---|---|---|---|
| 2400.0 - 2483.5 (802.15.4 (CabinLink)) | 5.50 | 3.55 | 6.42 | 4.39 | 0.003 | 1.00 | 1.11 |
| 2412 ~ 2462 (DTS) (1) | 5.50 | 3.55 | 24.78 | 300.61 | 0.212 | 1.00 | 9.21 |
| 5745 – 5825 (1) | 6.80 | 4.79 | 22.48 | 177.01 | 0.169 | 1.00 | 8.21 |
| 5150- 5825 (2) | 7.00 | 5.01 | 25.68 | 369.83 | 0.369 | 1.00 | 12.15 |
| 2400.0 - 2483.5 (BT) (3) | 5.50 | 3.55 | 7.91 | 6.18 | 0.004 | 1.00 | 1.32 |

**Simultaneous Operation BLE + 802.15.4 (CabinLink) + 3 Wi-Fi radios Assessment**

Assessment of worst case exposure conditions with the 5 radios transmitting simultaneously.

| Freq. Band (MHz) | Ant Gain (dBi) | Numeric Gain (numeric) | Peak Output Power (dBm) | Peak Output Power (mW) | Power Density Limit ($mW/cm^2$) $E_{ref}$ | Power Density ($mW/cm^2$) | $E_i/E_{ref}$ |
|---|---|---|---|---|---|---|---|
| 2400.0 - 2483.5 (802.15.4 (CabinLink)) | 5.50 | 3.55 | 6.42 | 4.39 | 1.00 | 0.003 | 0.003 |
| 2412 ~ 2462 (DTS) (1) | 5.50 | 3.55 | 24.78 | 300.61 | 1.00 | 0.212 | 0.212 |
| 5745 – 5825 (1) | 6.80 | 4.79 | 22.48 | 177.01 | 1.00 | 0.169 | 0.169 |
| 5150- 5825 (2) | 7.00 | 5.01 | 25.68 | 369.83 | 1.00 | 0.369 | 0.369 |
| 2400.0 - 2483.5 (BT) (3) | 5.50 | 3.55 | 7.91 | 6.18 | 1.00 | 0.004 | 0.004 |
| | | | | | | **Summation of Ratio:** | **0.757** |

The Total Evaluation was calculated using the formula:

$$\sum_{i=1}^{n} Ei/_{Eref} \leq 1$$

Where
Ei: calculated E-field Strength for transmitter
Eref: E-field strength related limit

**Minimum Safe Distance = 0.20 m**
Note: for mobile or fixed location transmitters the minimum separation distance is 0.20m, even if calculations indicate the MPE distance to be less.

**Specification - RF Exposure Evaluation Limits**

The Limit is defined in Table 1 of FCC §1.1310.

**Specification - Maximum Permissible Exposure Limits**

TABLE 1—LIMITS FOR MAXIMUM PERMISSIBLE EXPOSURE (MPE)

| Frequency range (MHz) | Electric field strength (V/m) | Magnetic field strength (A/m) | Power density ($mW/cm^2$) | Averaging time (minutes) |
|---|---|---|---|---|
| **(A) Limits for Occupational/Controlled Exposure** | | | | |
| 0.3-3.0 | 614 | 1.63 | *100 | 6 |
| 3.0-30 | 1842/f | 4.89/f | $*900/f^2$ | 6 |
| 30-300 | 61.4 | 0.163 | 1.0 | 6 |
| 300-1,500 | -- | -- | f/300 | 6 |
| 1,500-100,000 | -- | -- | 5 | 6 |
| **(B) Limits for General Population/Uncontrolled Exposure** | | | | |
| 0.3-1.34 | 614 | 1.63 | *100 | 30 |
| 1.34-30 | 824/f | 2.19/f | $*180/f^2$ | 30 |
| 30-300 | 27.5 | 0.073 | 0.2 | 30 |
| 300-1,500 | -- | -- | f/1500 | 30 |
| 1,500-100,000 | -- | -- | 1.0 | 30 |

f = frequency in MHz * = Plane-wave equivalent power density


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