# SAR & RF Exposure Exemption Technical Brief

## Application Information

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|---|---|
| **APPLICANT** | Alula |
| **DATE** | 12/24/2018 |
| **PROD DESC** | Wireless Door/Window Sensor |
| **PMN** | RE107 Door/Window Sensor |
| **HVIN** | RE107 |
| **FVIN** | 75-0082-01, 75-0086-01 |
| **IC** | 8310A-RE107 |

## SAR Evaluation Exemption (RSS-102, Section 2.5.1)

From RSS-102, Section 2.5.1 Exemption Limits for Routine Evaluation – SAR Evaluation

> *"SAR evaluation is required if the separation distance between the user and/or bystander and the antenna and/or radiating element of the device is less than or equal to 20 cm, except when the device operates at or below the applicable output power level (adjusted for tune-up tolerance) for the specified separation distance defined in Table 1."*

This device is meant to be mounted to the wall or ceiling of a residence. As such, it will always be at least 20cm from the user, and is thus exempt from SAR evaluation.

## RF Exposure Exemption (RSS-102, Section 2.5.2)

Field strength measurements were taken at 3 meters. Because of the low duty cycle of this device, the 20dB duty cycle correction is allowed. Using the standard conversion from field strength, EIRP is calculated as follows:

**EIRP (dBm)** = (E – 20) + 20log(3) – 104.8

From RSS-102, Section 2.5.2 Exemption Limits for Routine Evaluation – RF Exposure Evaluation

> *"RF exposure evaluation is required if the separation distance between the user and/or bystander and the device's radiating element is greater than 20 cm, except when the device operates as follows:*
>
> - *At or above 300 MHz and below 6 GHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than 1.31 x $10^{-2}$ $f^{0.6834}$ W (adjusted for tune-up tolerance), where f is in MHz."*

Thus, the EIRP limit for exemption from RF exposure evaluation is calculated as follows:

**EIRP Limit (dBm)** = $10\log(1.31 \times 10^{-2} f^{0.6834}) + 30$

The table that follows will show that the device is exempt from RF exposure evaluation.

| Frequency (MHz) | Peak Level (dBuV/m) | EIRP (dBm) | EIRP Limit (dBm) | Margin (dB) | Test Result |
|---|---|---|---|---|---|
| 319.5 | 89.8 | -25.5 | 28.3 | -53.7 | PASS |
| 639.0 | 62.3 | -53.0 | 30.3 | -83.3 | PASS |
| 958.5 | 39.4 | -75.9 | 31.5 | -107.4 | PASS |
| 1278.0 | 55.2 | -60.1 | 32.4 | -92.5 | PASS |
| 1597.5 | 49.6 | -65.7 | 33.1 | -98.7 | PASS |
| 1917.0 | 48.5 | -66.8 | 33.6 | -100.4 | PASS |
| 2236.5 | 63.7 | -51.6 | 34.1 | -85.6 | PASS |
| 2556.0 | 46.3 | -69.0 | 34.5 | -103.4 | PASS |
| 2875.5 | 53.4 | -61.9 | 34.8 | -96.7 | PASS |
| 3195.0 | 53.5 | -61.8 | 35.1 | -96.9 | PASS |

## RF Exposure Limits (FCC 1.1310)

From FCC **§1.1310,** the allowable field strength exposure limits for 300-1500 MHz is calculated as follows:

**Power Density Limit:** $\frac{f}{1500}$ ($mW/cm^2$) where f = frequency in MHz

For frequencies above 1500 MHz, the limit is $1 mW/cm^2$.

**Power Density Limit (dBmW/m²):** $\frac{dBmW}{m^2} = 10\log_{10}(\frac{f}{1500} * 10000)$

*where f remains 1500 above frequencies of 1500 MHz

**Peak Level to Power Conversion:** $\frac{dBmW}{m^2} = \frac{dBuV}{m} - 115.8$

| Frequency (MHz) | Peak Level (dBuV/m) | Peak Level (dBmW/m^2) | Power Limit (dBmW/m^2) | Margin (dB) | Test Result |
|---|---|---|---|---|---|
| 319.5 | 89.8 | -26.0 | 33.3 | -59.3 | PASS |
| 639.0 | 62.3 | -53.5 | 36.3 | -89.8 | PASS |
| 958.5 | 39.4 | -76.4 | 38.1 | -114.5 | PASS |
| 1278.0 | 55.2 | -60.6 | 39.3 | -99.9 | PASS |
| 1597.5 | 49.6 | -66.2 | 40.0 | -106.2 | PASS |
| 1917.0 | 48.5 | -67.3 | 40.0 | -107.3 | PASS |
| 2236.5 | 63.7 | -52.1 | 40.0 | -92.1 | PASS |
| 2556.0 | 46.3 | -69.5 | 40.0 | -109.5 | PASS |
| 2875.5 | 53.4 | -62.4 | 40.0 | -102.4 | PASS |
| 3195.0 | 53.5 | -62.3 | 40.0 | -102.3 | PASS |

Sincerely,

Paul Saldin
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Alula