

# MAXIMUM PERMISSIBLE EXPOSURE

## Standard Applicable

### Standalone SAR test exclusion considerations

Unless specifically required by the *published RF exposure KDB procedures*, standalone 1-g head or body and 10-g extremity SAR evaluation for general population exposure conditions, by measurement or numerical simulation, is not required when the corresponding *SAR Test Exclusion Threshold* condition, listed below, is satisfied. These test exclusion conditions are based on source-based time-averaged maximum conducted output power of the RF channel requiring evaluation, adjusted for tune-up tolerance, and the minimum *test separation distance* required for the exposure conditions.<sup>22</sup> The minimum *test separation distance* is determined by the smallest distance from the antenna and radiating structures or outer surface of the device, according to the host form factor, exposure conditions and platform requirements, to any part of the body or extremity of a user or bystander (see 5) of section 4.1). To qualify for SAR test exclusion, the *test separation distances* applied must be fully explained and justified by the operating configurations and exposure conditions of the transmitter and applicable host platform

<sup>20</sup> Cellphones (handsets) are not normally designed to be used or operated in extremity only exposure conditions. The maximum output power levels of cellphones, in conjunction with the required SAR test results, generally do not require extremity SAR testing to show compliance.

<sup>21</sup> Maximum conducted and radiated power should both be taken into consideration to establish the worst case aggregate maximum output power.

<sup>22</sup> Test exclusion is applied to the required test channels on a channel by channel basis.

requirements, typically in the SAR measurement or SAR analysis report, according to the required *published RF exposure KDB procedures*. When no other RF exposure testing or reporting is required, a statement of justification and compliance must be included in the equipment approval, in lieu of the SAR report, to qualify for the SAR test exclusion. When required, the device specific conditions described in the other *published RF exposure KDB procedures* must be satisfied before applying these SAR test exclusion provisions; for example, handheld PTT two-way radios, handsets, laptops & tablets etc.<sup>23</sup>

- 1) The 1-g and 10-g SAR test exclusion thresholds for 100 MHz to 6 GHz at *test separation distances*  $\leq 50$  mm are determined by:

$$[(\text{max. power of channel, including tune-up tolerance, mW}) / (\text{min. test separation distance, mm})] \cdot [\sqrt{f_{(\text{GHz})}}] \leq 3.0 \text{ for 1-g SAR and } \leq 7.5 \text{ for 10-g extremity SAR,}^{24} \text{ where}$$

- $f_{(\text{GHz})}$  is the RF channel transmit frequency in GHz
- Power and distance are rounded to the nearest mW and mm before calculation<sup>25</sup>
- The result is rounded to one decimal place for comparison
- 3.0 and 7.5 are referred to as the numeric thresholds in the step 2 below

The test exclusions are applicable only when the minimum *test separation distance* is  $\leq 50$  mm and for transmission frequencies between 100 MHz and 6 GHz. When the minimum *test separation distance* is  $< 5$  mm, a distance of 5 mm according to 5) in section 4.1 is applied to determine SAR test exclusion.

- 2) At 100 MHz to 6 GHz and for *test separation distances*  $> 50$  mm, the SAR test exclusion threshold is determined according to the following, and as illustrated in Appendix B:<sup>26</sup>
  - a) [Power allowed at numeric threshold for 50 mm in step 1) + (test separation distance - 50 mm)  $\cdot$  ( $f_{(\text{MHz})}/150$ )] mW, at 100 MHz to 1500 MHz
  - b) [Power allowed at numeric threshold for 50 mm in step 1) + (test separation distance - 50 mm)  $\cdot$  10] mW at  $> 1500$  MHz and  $\leq 6$  GHz
- 3) At frequencies below 100 MHz, the following may be considered for SAR test exclusion, and as illustrated in Appendix C:<sup>27</sup>
  - a) The power threshold at the corresponding test separation distance at 100 MHz in step 2) is multiplied by  $[1 + \log(100/f_{(\text{MHz})})]$  for *test separation distances*  $> 50$  mm and  $< 200$  mm
  - b) The power threshold determined by the equation in a) for 50 mm and 100 MHz is multiplied by  $\frac{1}{2}$  for *test separation distances*  $\leq 50$  mm
  - c) SAR measurement procedures are not established below 100 MHz. When SAR test exclusion cannot be applied, a KDB inquiry is required to determine SAR evaluation requirements for any test results to be acceptable.

## Calculations

The 1-g and 10-g SAR test exclusion threshold for 100MHz to 6 GHz at test separation distance  $\leq 50$  mm:  $(P_{out} / \text{min test separation distance mm}) \times \sqrt{f}$

Where

**f** is the RF channel transmit frequency in GHz power density in  $\text{mW}/\text{cm}^2$

**P<sub>out</sub>** = output power to antenna in mW

Power and distance are rounded to the nearest mW and mm before calculation.

The result is rounded to one decimal place for comparison

3.0 and 7.5 are referred to as the numeric thresholds in the step 2 below

The limit of calculation results  $\leq 3.0$  for 1-g SAR and  $\leq 7.5$  for 10-g extremity SAR.

## Result (Worse case mode)

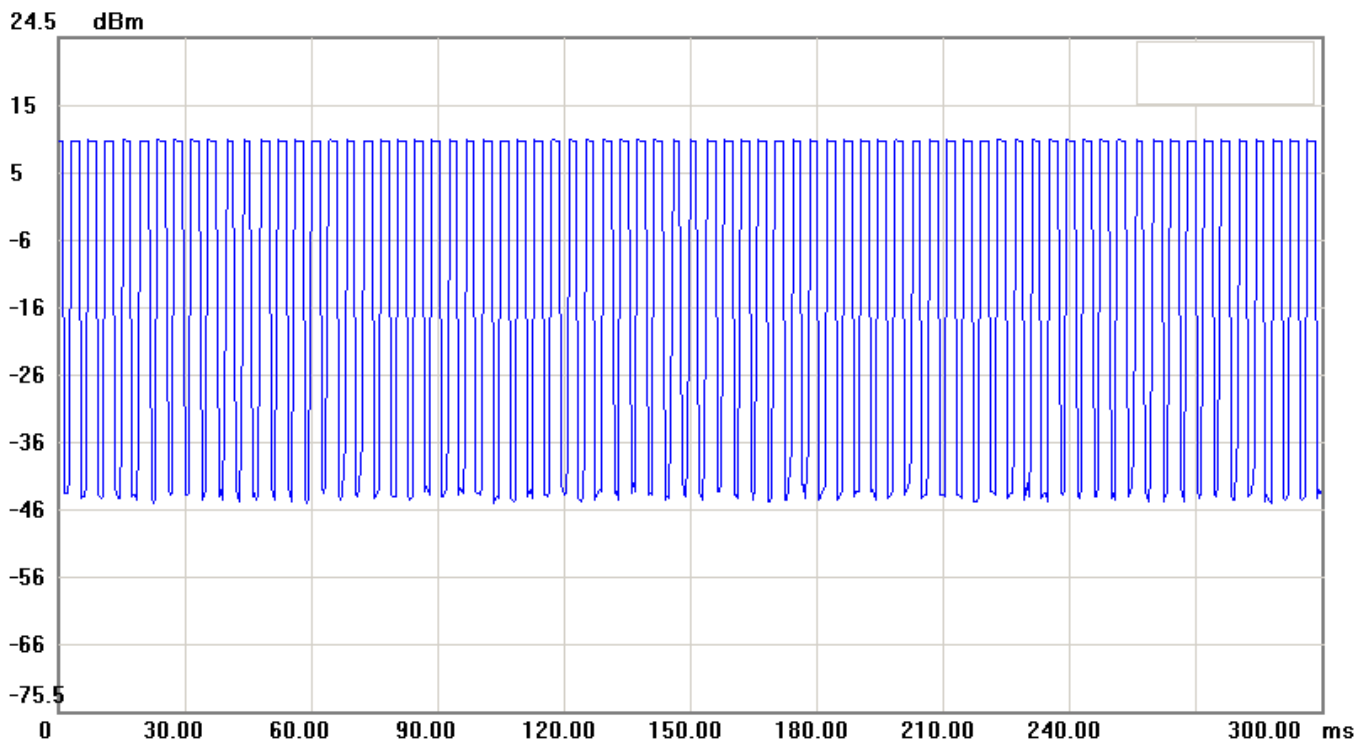
Radio Technology	Operation Frequency (GHz)	min. test separation distance (mm)	Maximum Average Output Power (mW)	Limit (1-g SAR)	Limit (10-g extremity SAR)	Calculation results
DTS	2.5	5	8	3	7.5	2.53

The calculation results is  $2.53 < 3.0$  for 1-g SAR and  $< 7.5$  10-g SAR so standalone 1-g head or body and 10-g extremity SAR evaluation for general population exposure condition, by measurement or numerical simulation, is not required.

**Duty Factor(reference only)**

$$\begin{aligned}
 &\text{Duty} && \text{Calculation} \\
 & && \\
 &\text{Duty} &= & 10\log \frac{2 \text{ (ms)} \times 1.00}{4.1 \text{ (ms)}} \\
 & &= & -3.1175 \text{ dB}
 \end{aligned}$$

File: DMW-881      Data: #9      Date: 2013/12/18      Temperature: 26 °C  
 Time: PM 05:32:26      Humidity: 60 %



Condition:

RF Conducted

EUT:

Sweep Time: 300ms    Att.: 30dB

Model:

RBW: 1000 KHz      VBW: 1000 KHz

Test Mode:

Note:

File: DMW-881

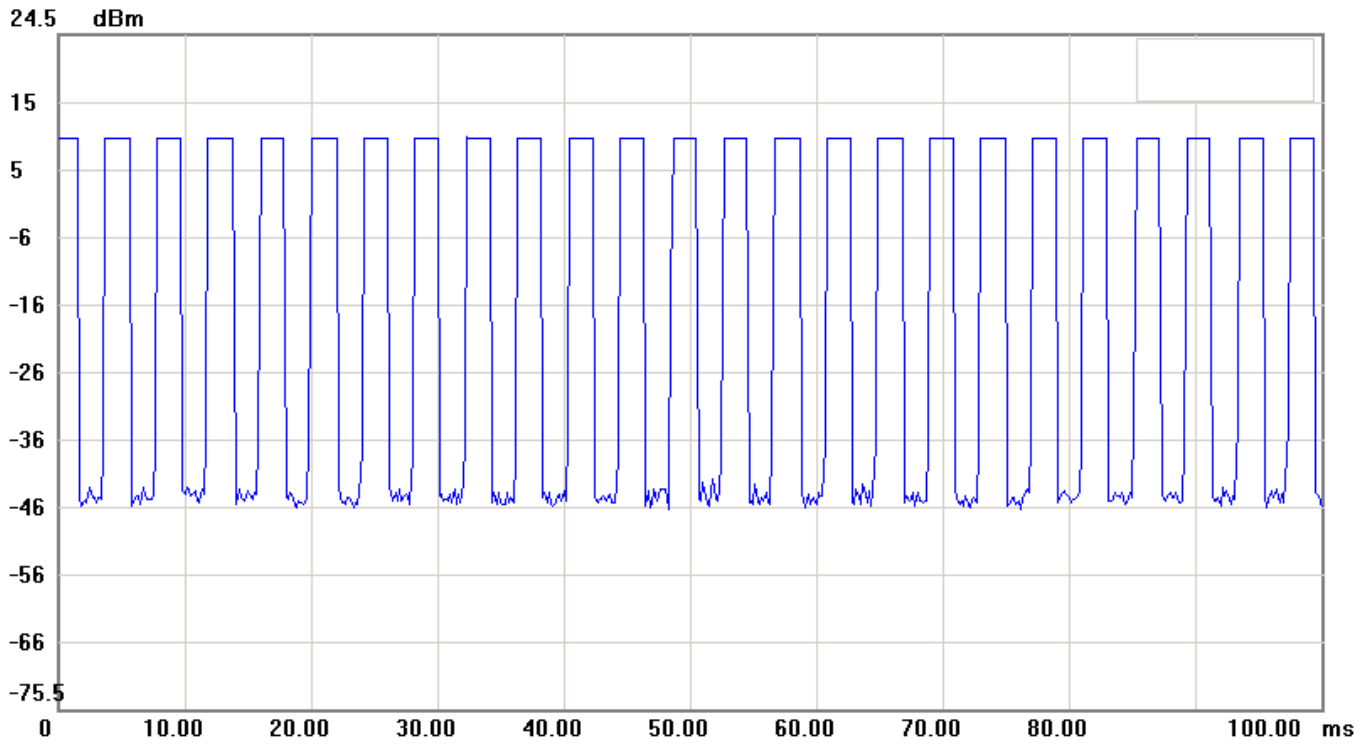
Data: #6

Date: 2013/12/18

Temperature: 26 °C

Time: PM 05:27:46

Humidity: 60 %



Condition:

RF Conducted

EUT:

Sweep Time: 100ms Att.: 30dB

Model:

RBW: 1000 KHz VBW: 1000 KHz

Test Mode:

Note:

File: DMW-881      Data: #8      Date: 2013/12/18      Temperature: 26 °C  
 Time: PM 05:29:02      Humidity: 60 %



Condition:

RF Conducted

EUT:

Sweep Time: 15ms    Att.: 30dB

Model:

RBW: 1000 KHz      VBW: 1000 KHz

Test Mode:

Note:

No.	Sweep time(ms)	Level(dBm)
1	3.9250	-47.06
2	5.9250	-46.47
3	8.0250	-45.69

No.		$\Delta$ Time(ms)	$\Delta$ Level(dB)
1	mk3-mk1	4.1	1.37
2	mk2-mk1	2	0.59