



Standalone SAR test exclusion considerations

March 25, 2019

- Device category = ☐ Portable device ☒ Mobile device
- Transmitting mode = ☒ Single Transmitting ☐ Simultaneous Transmitting
- Max. transmitting frequency = 1909.3 MHz
- Min. test separation distance = 200 mm
- Max. Antenna Gain = 3.32 dBi
- Max. power with turn-up tolerance = 24.00 dBm = 251.2 mW (Typical Power = Max. 24.00 dBm)

Note. LTE Cat.M1 Band 2

KDB 447498 D01 clause 4.3.1 Step 2-2) SAR test exclusion thresholds for 1500MHz to 6GHz at test separation distances > 50 mm

[Threshold at 50 mm + (test separation distance - 50 mm) X 10] mW

= [1.74 + (200mm - 50mm X 10)] = 1501.7

Note. The calculation result was rounded to one decimal place for comparison.

→ SAR evaluation for general population exposure conditions by measurement or numerical simulation is not required.

Maximum Permissible Exposure(MPE) evaluation for mobile device

$$S = P G / (4 R^2 \pi) , \text{ mW/cm}^2$$

S = Maximum power density

G = Numeric power gain of the antenna

P = Maximum power with turn-up tolerance

R = Distance from transmitting antenna

$$= 0.107337 \text{ mW/cm}^2$$

Conclusion: The exposure condition of this device is compliant with FCC rules.

The limit for maximum permissible exposure = 1.000000 mW/cm²



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- Device category = ☐ Portable device ☒ Mobile device
- Transmitting mode = ☒ Single Transmitting ☐ Simultaneous Transmitting
- Max. transmitting frequency = 1754.3 MHz
- Min. test separation distance = 200 mm
- Max. Antenna Gain = 3.83 dBi
- Max. power with turn-up tolerance = 23.00 dBm = 199.6 mW (Typical Power = Max. 23.00 dBm)

Note. LTE Cat.M1 Band 4

KDB 447498 D01 clause 4.3.1 Step 2-2) SAR test exclusion thresholds for 1500MHz to 6GHz at test separation distances > 50 mm

[Threshold at 50 mm + (test separation distance - 50 mm) X 10] mW

= [1.32 + (200mm - 50mm X 10)] = 1501.3

Note. The calculation result was rounded to one decimal place for comparison.

→ SAR evaluation for general population exposure conditions by measurement or numerical simulation is not required.

Maximum Permissible Exposure(MPE) evaluation for mobile device

$$S = P G / (4 R^2 \pi) , \text{ mW/cm}^2$$

$$= 0.095916 \text{ mW/cm}^2$$

S = Maximum power density

P = Maximum power with turn-up tolerance

G = Numeric power gain of the antenna

R = Distance from transmitting antenna

Conclusion: The exposure condition of this device is compliant with FCC rules.

The limit for maximum permissible exposure = 1.000000 mW/cm²



Standalone SAR test exclusion considerations

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- Device category = ☐ Portable device ☒ Mobile device
- Transmitting mode = ☒ Single Transmitting ☐ Simultaneous Transmitting
- Max. transmitting frequency = 715.3 MHz
- Min. test separation distance = 200 mm
- Max. Antenna Gain = -1.16 dBi
- Max. power with turn-up tolerance = 24.00 dBm = 251.2 mW (Typical Power = Max. 24.00 dBm)

Note. LTE Cat.M1 Band 12

KDB 447498 D01 clause 4.3.1 Step 2-1) SAR test exclusion thresholds for 100MHz to 1500MHz at test separation distances > 50 mm

[Threshold at 50 mm + (test separation distance - 50 mm) X (f(MHz) / 150)] mW

= [1.06 + (200mm - 50mm) X (715.3MHz / 150)] = 716.4

Note. The calculation result was rounded to one decimal place for comparison.

→ SAR evaluation for general population exposure conditions by measurement or numerical simulation is not required.

Maximum Permissible Exposure(MPE) evaluation for mobile device

$$S = P G / (4 R^2 \pi) , \text{ mW/cm}^2$$

$$= 0.038260 \text{ mW/cm}^2$$

S = Maximum power density

P = Maximum power with turn-up tolerance

G = Numeric power gain of the antenna

R = Distance from transmitting antenna

Conclusion: The exposure condition of this device is compliant with FCC rules.

The limit for maximum permissible exposure = 0.476866 mW/cm² (f/1500)



Standalone SAR test exclusion considerations

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- Device category = ☐ Portable device ☒ Mobile device
- Transmitting mode = ☒ Single Transmitting ☐ Simultaneous Transmitting
- Max. transmitting frequency = 784.5 MHz
- Min. test separation distance = 200 mm
- Max. Antenna Gain = 0.84 dBi
- Max. power with turn-up tolerance = 24.00 dBm = 251.2 mW (Typical Power = Max. 24.00 dBm)

Note. LTE Cat.M1 Band 13

KDB 447498 D01 clause 4.3.1 Step b-1) SAR test exclusion thresholds for 100MHz to 1500MHz at test separation distances > 50 mm

[Threshold at 50 mm + (test separation distance - 50 mm) X (f(MHz) / 150)] mW

= [1.11 + (200mm - 50mm) X (784.5MHz / 150)] = 785.6

Note. The calculation result was rounded to one decimal place for comparison.

→ SAR evaluation for general population exposure conditions by measurement or numerical simulation is not required.

Maximum Permissible Exposure(MPE) evaluation for mobile device

$$S = P G / (4 R^2 \pi) , \text{ mW/cm}^2$$

$$= 0.060639 \text{ mW/cm}^2$$

S = Maximum power density

P = Maximum power with turn-up tolerance

G = Numeric power gain of the antenna

R = Distance from transmitting antenna

Conclusion: The exposure condition of this device is compliant with FCC rules.

The limit for maximum permissible exposure = 0.523000 mW/cm² (f/1500)



Standalone SAR test exclusion considerations

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- Device category = ☐ Portable device ☒ Mobile device
- Transmitting mode = ☒ Single Transmitting ☐ Simultaneous Transmitting
- Max. transmitting frequency = 2480 MHz
- Min. test separation distance = 200 mm
- Max. Antenna Gain = 1.99 dBi
- Max. power with turn-up tolerance = 6.00 dBm = 4.0 mW (Typical Power = Max. 6.00 dBm)

Note. BLE

KDB 447498 D01 clause 4.3.1 Step 2-2) SAR test exclusion thresholds for 1500MHz to 6GHz at test separation distances > 50 mm

[Threshold at 50 mm + (test separation distance - 50 mm) X 10] mW

= [0.03 + (200mm - 50mm X 10)] = 1500

Note. The calculation result was rounded to one decimal place for comparison.

→ SAR evaluation for general population exposure conditions by measurement or numerical simulation is not required.

Maximum Permissible Exposure(MPE) evaluation for mobile device

$$S = P G / (4 R^2 \pi) , \text{ mW/cm}^2$$

$$= 0.001258 \text{ mW/cm}^2$$

S = Maximum power density

P = Maximum power with turn-up tolerance

G = Numeric power gain of the antenna

R = Distance from transmitting antenna

Conclusion: The exposure condition of this device is compliant with FCC rules.

The limit for maximum permissible exposure = 1.000000 mW/cm²



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Modules	Maximum power density, S (mW/cm ²)	MPE Limit (mW/cm ²)	MPE Ratio
WWAN Module / LTE Cat.M1 Band 2	0.107337	0.564400	0.1902
WWAN Module / LTE Cat.M1 Band 4	0.095916	1.000000	0.0959
WWAN Module / LTE Cat.M1 Band 12	0.038260	0.565866	0.0676
WWAN Module / LTE Cat.M1 Band 13	0.060639	1.000000	0.0606
BLE (2.4G)	0.001258	1.000000	0.0013
Maximum MPE ratio: (0.1902 + 0.0013)			0.1915 < 1