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RF MPE EXPOSURE

August 14, 2020
FCC ID: PWO460062

The MPE calculations for **EUT model 460062** signal booster were done for frequency bands:

- 700 MHz (Band 12)
- 700 MHz (Band 13)
- 800 MHz (Band 5)
- 1900 MHz (Band 2)
- 1700/2100 MHz (Band 4)

Antennas recommended for the EUT:

Port	Frequency Range (MHz)	Antenna Product Number	Coax Product Number	Maximum Antenna Gain (dBi)	Minimum Coax Loss (dB)	Gain - Coax Loss (unitless)
Donor	698-716	314475	952375	7.5	2.6	3.1
Donor	777-787	314475	952375	7.5	2.6	3.1
Donor	824-849	314475	952375	7.3	2.8	2.8
Donor	1710-1785	314475	952375	8.8	4.3	2.8
Donor	1850-1915	314475	952375	8.8	4.6	2.6
Server	728-746	311155	951150	5.2	2.1	2.0
Server	746-756	311155	951150	5.2	2.1	2.0
Server	869-894	311155	951150	4.4	2.2	1.7
Server	1930-1995	311155	952360	10.6	3.9	4.7
Server	2110-2155	311155	952360	8.2	4.3	2.5

*Maximum antenna gain and minimum cable losses were selected to compute “worst case” limit and are indicated in the antenna kitting specification for model 460062

EUT Operating Limits

Limits for Uncontrolled Exposure
47 CFR 1.1310 Table 1(B)

Frequency Range (MHz)	Limit (mw/cm^2)
0.3-1.234	100
1.24-30	180/f^2
30-300	0.2
300-1500	f/1500
1500-100,000	1

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EUT Operating Limits Evaluation

Port	Frequency Range (MHz)	EUT Maximum Output power dBm (mw)	Power density limit (mw/cm^2)	Power density evaluation (mw/cm^2)	Minimum safe distance (cm)
Donor	698-716	23.03 (200.91)	0.47	0.124	20
Donor	777-787	20.5 (112.20)	0.52	0.069	20
Donor	824-849	24.3 (270.40)	0.55	0.152	20
Donor	1710-1785	22.2 (167.11)	1	0.094	20
Donor	1850-1915	24.6 (288.40)	1	0.151	20
Server	728-746	11.7 (14.62)	0.49	0.006	20
Server	746-756	10.6 (11.48)	0.50	0.005	20
Server	869-894	11.5 (14.06)	0.58	0.005	20
Server	1930-1995	9.9 (9.84)	1	0.009	20
Server	2110-2155	11.8 (14.96)	1	0.007	20

*The lowest frequency in each band was used to compute the "worst case" limit.

NOTE: Simultaneous transmission does not apply to consumer boosters as the output power is capped at 30 dBm EIRP regardless of how many signals are present.

EUT Power Density Evaluation

Calculated power density - Uplink:

Band 12 (698-716 MHz)
Power density is calculated using maximum uplink transmitted power of 200.91 mw and unitless antenna gain less coax loss of 3.1

$$S = \frac{P_t G}{4\pi r^2} = \frac{(200.91)(3.1)}{4\pi 20^2} = 0.124\ (mw/cm^2)$$

$S = Power\ Density\ (mw/cm^2)$
$P_t = Transmitter\ Power\ (mw)$
$G = Antenna\ Gain\ (nonlog) * Coax\ Loss\ (nonlog) * duty\ cycle\ (\%)$
$r = Distance\ to\ center\ of\ radiation\ of\ antenna\ (cm)$

At the minimum safe distance of 20 cm, the power density of the EUT is $0.124\ (mw/cm^2)$, which is less than the operational limit of 0.47 (mw/cm^2). Therefore, no minimum safe distance calculation is required.

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Band 13 (777-787 MHz)
Power density is calculated using maximum uplink transmitted power of 112.2 mw and unitless antenna gain less coax loss of 3.1

$$S = \frac{P_t G}{4\pi r^2} = \frac{(112.2)(3.1)}{4\pi 20^2} = 0.069\ (mw/cm^2)$$

$S = Power\ Density\ (mw/cm^2)$
$P_t = Transmitter\ Power\ (mw)$
$G = Antenna\ Gain\ (nonlog) * Coax\ Loss\ (nonlog) * duty\ cycle\ (\%)$
$r = Distance\ to\ center\ of\ radiation\ of\ antenna\ (cm)$

At the minimum safe distance of 20 cm, the power density of the EUT is $0.069\ (mw/cm^2)$, which is less than the operational limit of 0.52 (mw/cm^2). Therefore, no minimum safe distance calculation is required.

Band 5 (824-849 MHz)
Power density is calculated using maximum uplink transmitted power of 270.4 mw and unitless antenna gain less coax loss of 2.8

$$S = \frac{P_t G}{4\pi r^2} = \frac{(270.4)(2.8)}{4\pi 20^2} = 0.152\ (mw/cm^2)$$

$S = Power\ Density\ (mw/cm^2)$
$P_t = Transmitter\ Power\ (mw)$
$G = Antenna\ Gain\ (nonlog) * Coax\ Loss\ (nonlog) * duty\ cycle\ (\%)$
$r = Distance\ to\ center\ of\ radiation\ of\ antenna\ (cm)$

At the minimum safe distance of 20 cm, the power density of the EUT is $0.152\ (mw/cm^2)$, which is less than the operational limit of 0.55 (mw/cm^2). Therefore, no minimum safe distance calculation is required.

Band 4 (1710-1785 MHz)
Power density is calculated using maximum uplink transmitted power of 167.11 mw and unitless antenna gain less coax loss of 2.8

$$S = \frac{P_t G}{4\pi r^2} = \frac{(167.11)(2.8)}{4\pi 20^2} = 0.094\ (mw/cm^2)$$

$S = Power\ Density\ (mw/cm^2)$

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$P_t = Transmitter\ Power\ (mw)$
$G = Antenna\ Gain\ (nonlog) * Coax\ Loss\ (nonlog) * duty\ cycle\ (\%)$
$r = Distance\ to\ center\ of\ radiation\ of\ antenna\ (cm)$

At the minimum safe distance of 20 cm, the power density of the EUT is $0.094\ (mw/cm^2)$, which is less than the operational limit of 1 (mw/cm^2). Therefore, no minimum safe distance calculation is required.

Band 2 (1850-1915 MHz)
Power density is calculated using maximum uplink transmitted power of 288.4 mw and unitless antenna gain less coax loss of 2.6

$$S = \frac{P_t G}{4\pi r^2} = \frac{(288.4)(2.6)}{4\pi 20^2} = 0.151\ (mw/cm^2)$$

$S = Power\ Density\ (mw/cm^2)$
$P_t = Transmitter\ Power\ (mw)$
$G = Antenna\ Gain\ (nonlog) * Coax\ Loss\ (nonlog) * duty\ cycle\ (\%)$
$r = Distance\ to\ center\ of\ radiation\ of\ antenna\ (cm)$

At the minimum safe distance of 20 cm, the power density of the EUT is $0.151\ (mw/cm^2)$, which is less than the operational limit of 1 (mw/cm^2). Therefore, no minimum safe distance calculation is required.

Calculated power density - Downlink:

Band 12 (728-746 MHz)
Power density is calculated using maximum downlink transmitted power of 14.62 mw and unitless antenna gain less coax loss of 2.0

$$S = \frac{P_t G}{4\pi r^2} = \frac{(14.62)(2.0)}{4\pi 20^2} = 0.006\ (mw/cm^2)$$

$S = Power\ Density\ (mw/cm^2)$
$P_t = Transmitter\ Power\ (mw)$
$G = Antenna\ Gain\ (nonlog) * Coax\ Loss\ (nonlog) * duty\ cycle\ (\%)$
$r = Distance\ to\ center\ of\ radiation\ of\ antenna\ (cm)$

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At the minimum safe distance of 20 cm, the power density of the EUT is 0.006 (mw/cm^2), which is less than the operational limit of 0.49 (mw/cm^2). Therefore, no minimum safe distance calculation is required.

Band 13 (746-756 MHz)
Power density is calculated using maximum downlink transmitted power of 11.48 mw and unitless antenna gain less coax loss of 2.0

$$S = \frac{P_t G}{4\pi r^2} = \frac{(11.48)(2.0)}{4\pi 20^2} = 0.005\ (mw/cm^2)$$

$S = Power\ Density\ (mw/cm^2)$
$P_t = Transmitter\ Power\ (mw)$
$G = Antenna\ Gain\ (nonlog) * Coax\ Loss\ (nonlog) * duty\ cycle\ (\%)$
$r = Distance\ to\ center\ of\ radiation\ of\ antenna\ (cm)$

At the minimum safe distance of 20 cm, the power density of the EUT is 0.005 (mw/cm^2), which is less than the operational limit of 0.50 (mw/cm^2). Therefore, no minimum safe distance calculation is required.

Band 5 (869-894 MHz)
Power density is calculated using maximum downlink transmitted power of 14.06 mw and unitless antenna gain less coax loss of 1.7

$$S = \frac{P_t G}{4\pi r^2} = \frac{(14.06)(1.7)}{4\pi 20^2} = 0.005\ (mw/cm^2)$$

$S = Power\ Density\ (mw/cm^2)$
$P_t = Transmitter\ Power\ (mw)$
$G = Antenna\ Gain\ (nonlog) * Coax\ Loss\ (nonlog) * duty\ cycle\ (\%)$
$r = Distance\ to\ center\ of\ radiation\ of\ antenna\ (cm)$

At the minimum safe distance of 20 cm, the power density of the EUT is 0.005 (mw/cm^2), which is less than the operational limit of 0.58 (mw/cm^2). Therefore, no minimum safe distance calculation is required.

Band 4 (2110-2155 MHz)
Power density is calculated using maximum downlink transmitted power of 14.96 mw and unitless antenna gain less coax loss of 2.5

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$$S = \frac{P_t G}{4\pi r^2} = \frac{(14.96)(2.5)}{4\pi 20^2} = 0.007\ (mw/cm^2)$$

$S = Power\ Density\ (mw/cm^2)$
$P_t = Transmitter\ Power\ (mw)$
$G = Antenna\ Gain\ (nonlog) * Coax\ Loss\ (nonlog) * duty\ cycle\ (\%)$
$r = Distance\ to\ center\ of\ radiation\ of\ antenna\ (cm)$

At the minimum safe distance of 20 cm, the power density of the EUT is $0.007\ (mw/cm^2)$, which is less than the operational limit of 1 (mw/cm^2). Therefore, no minimum safe distance calculation is required.

Band 2 (1930-1995 MHz)
Power density is calculated using maximum downlink transmitted power of 9.84 mw and unitless antenna gain less coax loss of 4.7

$$S = \frac{P_t G}{4\pi r^2} = \frac{(9.84)(4.7)}{4\pi 20^2} = 0.009\ (mw/cm^2)$$

$S = Power\ Density\ (mw/cm^2)$
$P_t = Transmitter\ Power\ (mw)$
$G = Antenna\ Gain\ (nonlog) * Coax\ Loss\ (nonlog) * duty\ cycle\ (\%)$
$r = Distance\ to\ center\ of\ radiation\ of\ antenna\ (cm)$

At the minimum safe distance of 20 cm, the power density of the EUT is $0.009\ (mw/cm^2)$, which is less than the operational limit of 1 (mw/cm^2). Therefore, no minimum safe distance calculation is required.

END OF REPORT