



3301 E. Deseret Drive, St. George, UT 84790
www.wilsonelectronics.com • info@wilsonelectronics.com
phone 1-800-204-4104 • fax 1-435-656-2432

December 5, 2013
Subject: RF MPE EXPOSURE
Re: FCC ID: PWO460007

To Whom It May Concern:

The MPE calculations for model 460007 signal booster were done for each frequency band: 1700 MHz, 800 MHz, 700 MHz Band 13, 700 MHz Band 12, and 1900 MHz. For each band two calculations were done; these included the different possibilities of antennas that may be connected to this signal booster: fixed and mobile outside antennas. The order of the attached calculations is as follows:

1700 MHz band:

1. Fixed Outside Antenna: 314453-40075
2. Mobile Outside Antenna: 311114

800 MHz band:

3. Fixed Outside Antenna: 311124-400100
4. Mobile Outside Antenna: 311104

700 MHz band 13:

5. Fixed Outside Antenna: 314411-40075
6. Mobile Outside Antenna: 314203

700 MHz band 12:

7. Fixed Outside Antenna: 314411-40075
8. Mobile Outside Antenna: 301126

1900 MHz band:

9. Fixed Outside Antenna: 314473-0640
10. Mobile Outside Antenna: 311101

Radiation Safety

11. Calculated Combined Power Density

A booster's uplink power must not exceed 1 watt equivalent isotropic radiated power (EIRP) for each band of operation. Composite downlink power must not exceed 0.05 watt EIRP for each band of operation (20.21(e)(8)(i)(D)). The following formula was used to calculate the equivalent isotropic radiated power:

$$\text{EIRP} = \text{Power Out (Watts)} * \text{Duty Cycle Percent} * \text{Antenna Gain (non-log)} * \text{Coax loss (non-log)}$$

The power density (mW/cm²) is calculated using the following formula:

$$\text{Calculated Power Density} = 1000 * \text{EIRP (Watts)} / (4 * \pi * (\text{Distance from Antenna (cm)}^2))$$

Sincerely,

A handwritten signature in black ink, appearing to read "P. L. Cook".

Patrick L. Cook
Senior Research and Development Engineer



Minimum Safe Distance From Antennas

Based upon FCC OET Bulletin 65 and other FCC Sources

INPUT DATA

| | |
|-----------------------------|---------|
| Frequency MHz | 1710 |
| Pout Watts | 0.15849 |
| Duty Cycle Percent | 100.0% |
| Ant. Gain dBi | 8.20 |
| Coax Loss dB | 4.39 |
| Distance From Antenna In cm | 20.3 |

RESULTS OF CALCULATIONS

| | |
|------------------------------------------------|--------|
| Ant. Gain less Coax Loss dBi | 3.81 |
| Distance From Antenna In Inches | 8.00 |
| EIRP (Watts) | 0.3811 |
| FCC Power Density Limit (mw/cm ²) | 1.00 |
| Calculated Power Density (mw/cm ²) | 0.0735 |

REFERENCE DATA

| | |
|-----------------------------------------|-------|
| Pout dBm | 22.00 |
| Antenna Gain (non-log) | 6.61 |
| Coax loss (non-log) | 0.36 |
| General FCC Limit (mw/cm ²) | 1.00 |

Antenna # 314453-40075



Minimum Safe Distance From Antennas

Based upon FCC OET Bulletin 65 and other FCC Sources

INPUT DATA

| | |
|-----------------------------|---------|
| Frequency MHz | 1710 |
| Pout Watts | 0.15849 |
| Duty Cycle Percent | 100.0% |
| Ant. Gain dBi | 2.57 |
| Coax Loss dB | 0.00 |
| Distance From Antenna In cm | 20.3 |

RESULTS OF CALCULATIONS

| | |
|------------------------------------------------|--------|
| Ant. Gain less Coax Loss dBi | 2.57 |
| Distance From Antenna In Inches | 8.00 |
| EIRP (Watts) | 0.2864 |
| FCC Power Density Limit (mw/cm ²) | 1.00 |
| Calculated Power Density (mw/cm ²) | 0.0553 |

REFERENCE DATA

| | |
|-----------------------------------------|-------|
| Pout dBm | 22.00 |
| Antenna Gain (non-log) | 1.81 |
| Coax loss (non-log) | 1.00 |
| General FCC Limit (mw/cm ²) | 1.00 |

Antenna # 311114



Minimum Safe Distance From Antennas

Based upon FCC OET Bulletin 65 and other FCC Sources

INPUT DATA

| | |
|-----------------------------|---------|
| Frequency MHz | 824 |
| Pout Watts | 0.30903 |
| Duty Cycle Percent | 100.0% |
| Ant. Gain dBi | 9.60 |
| Coax Loss dB | 4.70 |
| Distance From Antenna In cm | 20.3 |

RESULTS OF CALCULATIONS

| | |
|------------------------------------------------|--------|
| Ant. Gain less Coax Loss dBi | 4.90 |
| Distance From Antenna In Inches | 8.00 |
| EIRP (Watts) | 0.9550 |
| FCC Power Density Limit (mw/cm ²) | 0.55 |
| Calculated Power Density (mw/cm ²) | 0.1842 |

REFERENCE DATA

| | |
|-----------------------------------------|--------|
| Pout dBm | 24.90 |
| Antenna Gain (non-log) | 9.12 |
| Coax loss (non-log) | 0.34 |
| General FCC Limit (mw/cm ²) | f/1500 |

Antenna # 311124-400100



Minimum Safe Distance From Antennas

Based upon FCC OET Bulletin 65 and other FCC Sources

INPUT DATA

| | |
|-----------------------------|---------|
| Frequency MHz | 824 |
| Pout Watts | 0.30903 |
| Duty Cycle Percent | 100.0% |
| Ant. Gain dBi | 2.48 |
| Coax Loss dB | 0.00 |
| Distance From Antenna In cm | 20.3 |

RESULTS OF CALCULATIONS

| | |
|------------------------------------------------|--------|
| Ant. Gain less Coax Loss dBi | 2.48 |
| Distance From Antenna In Inches | 8.00 |
| EIRP (Watts) | 0.5470 |
| FCC Power Density Limit (mw/cm ²) | 0.55 |
| Calculated Power Density (mw/cm ²) | 0.1055 |

REFERENCE DATA

| | |
|-----------------------------------------|--------|
| Pout dBm | 24.90 |
| Antenna Gain (non-log) | 1.77 |
| Coax loss (non-log) | 1.00 |
| General FCC Limit (mw/cm ²) | f/1500 |

Antenna # 311104



Minimum Safe Distance From Antennas

Based upon FCC OET Bulletin 65 and other FCC Sources

INPUT DATA

| | |
|-----------------------------|---------|
| Frequency MHz | 776 |
| Pout Watts | 0.20370 |
| Duty Cycle Percent | 100.0% |
| Ant. Gain dBi | 7.20 |
| Coax Loss dB | 3.00 |
| Distance From Antenna In cm | 20.3 |

RESULTS OF CALCULATIONS

| | |
|------------------------------------------------|--------|
| Ant. Gain less Coax Loss dBi | 4.20 |
| Distance From Antenna In Inches | 8.00 |
| EIRP (Watts) | 0.5358 |
| FCC Power Density Limit (mw/cm ²) | 0.52 |
| Calculated Power Density (mw/cm ²) | 0.1034 |

REFERENCE DATA

| | |
|-----------------------------------------|--------|
| Pout dBm | 23.09 |
| Antenna Gain (non-log) | 5.25 |
| Coax loss (non-log) | 0.50 |
| General FCC Limit (mw/cm ²) | f/1500 |

Antenna # 314411-40075



Minimum Safe Distance From Antennas

Based upon FCC OET Bulletin 65 and other FCC Sources

INPUT DATA

| | |
|-----------------------------|---------|
| Frequency MHz | 776 |
| Pout Watts | 0.20370 |
| Duty Cycle Percent | 100.0% |
| Ant. Gain dBi | 0.48 |
| Coax Loss dB | 0.00 |
| Distance From Antenna In cm | 20.3 |

RESULTS OF CALCULATIONS

| | |
|------------------------------------------------|--------|
| Ant. Gain less Coax Loss dBi | 0.48 |
| Distance From Antenna In Inches | 8.00 |
| EIRP (Watts) | 0.2275 |
| FCC Power Density Limit (mw/cm ²) | 0.52 |
| Calculated Power Density (mw/cm ²) | 0.0439 |

REFERENCE DATA

| | |
|-----------------------------------------|--------|
| Pout dBm | 23.09 |
| Antenna Gain (non-log) | 1.12 |
| Coax loss (non-log) | 1.00 |
| General FCC Limit (mw/cm ²) | f/1500 |

Antenna # 314203



Minimum Safe Distance From Antennas

Based upon FCC OET Bulletin 65 and other FCC Sources

INPUT DATA

| | |
|-----------------------------|---------|
| Frequency MHz | 698 |
| Pout Watts | 0.27227 |
| Duty Cycle Percent | 100.0% |
| Ant. Gain dBi | 7.30 |
| Coax Loss dB | 2.80 |
| Distance From Antenna In cm | 20.3 |

RESULTS OF CALCULATIONS

| | |
|------------------------------------------------|--------|
| Ant. Gain less Coax Loss dBi | 4.50 |
| Distance From Antenna In Inches | 8.00 |
| EIRP (Watts) | 0.7674 |
| FCC Power Density Limit (mw/cm ²) | 0.47 |
| Calculated Power Density (mw/cm ²) | 0.1480 |

REFERENCE DATA

| | |
|-----------------------------------------|--------|
| Pout dBm | 24.35 |
| Antenna Gain (non-log) | 5.37 |
| Coax loss (non-log) | 0.52 |
| General FCC Limit (mw/cm ²) | f/1500 |

Antenna # 314411-40075



Minimum Safe Distance From Antennas

Based upon FCC OET Bulletin 65 and other FCC Sources

INPUT DATA

| | |
|-----------------------------|---------|
| Frequency MHz | 698 |
| Pout Watts | 0.27227 |
| Duty Cycle Percent | 100.0% |
| Ant. Gain dBi | -0.36 |
| Coax Loss dB | 0.00 |
| Distance From Antenna In cm | 20.3 |

RESULTS OF CALCULATIONS

| | |
|------------------------------------------------|--------|
| Ant. Gain less Coax Loss dBi | -0.36 |
| Distance From Antenna In Inches | 8.00 |
| EIRP (Watts) | 0.2506 |
| FCC Power Density Limit (mw/cm ²) | 0.47 |
| Calculated Power Density (mw/cm ²) | 0.0483 |

REFERENCE DATA

| | |
|-----------------------------------------|--------|
| Pout dBm | 24.35 |
| Antenna Gain (non-log) | 0.92 |
| Coax loss (non-log) | 1.00 |
| General FCC Limit (mw/cm ²) | f/1500 |

Antenna # 301126



Minimum Safe Distance From Antennas

Based upon FCC OET Bulletin 65 and other FCC Sources

INPUT DATA

| | |
|-----------------------------|---------|
| Frequency MHz | 1850 |
| Pout Watts | 0.18578 |
| Duty Cycle Percent | 100.0% |
| Ant. Gain dBi | 10.00 |
| Coax Loss dB | 5.26 |
| Distance From Antenna In cm | 20.3 |

RESULTS OF CALCULATIONS

| | |
|------------------------------------------------|--------|
| Ant. Gain less Coax Loss dBi | 4.74 |
| Distance From Antenna In Inches | 8.00 |
| EIRP (Watts) | 0.5534 |
| FCC Power Density Limit (mw/cm ²) | 1.00 |
| Calculated Power Density (mw/cm ²) | 0.1068 |

REFERENCE DATA

| | |
|-----------------------------------------|-------|
| Pout dBm | 22.69 |
| Antenna Gain (non-log) | 10.00 |
| Coax loss (non-log) | 0.30 |
| General FCC Limit (mw/cm ²) | 1.00 |

Antenna # 314473-0640



Minimum Safe Distance From Antennas

Based upon FCC OET Bulletin 65 and other FCC Sources

INPUT DATA

| | |
|-----------------------------|---------|
| Frequency MHz | 1850 |
| Pout Watts | 0.18578 |
| Duty Cycle Percent | 100.0% |
| Ant. Gain dBi | 6.12 |
| Coax Loss dB | 0.00 |
| Distance From Antenna In cm | 20.3 |

RESULTS OF CALCULATIONS

| | |
|------------------------------------------------|--------|
| Ant. Gain less Coax Loss dBi | 6.12 |
| Distance From Antenna In Inches | 8.00 |
| EIRP (Watts) | 0.7603 |
| FCC Power Density Limit (mw/cm ²) | 1.00 |
| Calculated Power Density (mw/cm ²) | 0.1467 |

REFERENCE DATA

| | |
|-----------------------------------------|-------|
| Pout dBm | 22.69 |
| Antenna Gain (non-log) | 4.09 |
| Coax loss (non-log) | 1.00 |
| General FCC Limit (mw/cm ²) | 1.00 |

Antenna # 311101



Radiation Safety - Combined Radiation From Amplifier and Cell Phone

Calculated Power Density and Minimum Safe Distance For Cellular Phones (Uplink)

INPUT DATA

| | | | | | |
|-----------------------------|---------|---------|---------|---------|---------|
| Frequency MHz (Uplink) | 698 | 776 | 1710 | 824 | 1850 |
| Radiated Power (Watts) | 1.00000 | 1.00000 | 1.00000 | 1.00000 | 1.00000 |
| Duty Cycle Percent | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% |
| Distance From Antenna In cm | 20.3 | 20.3 | 20.3 | 20.3 | 20.3 |

RESULTS OF CALCULATIONS

| | | | | | |
|------------------------------------------------|--------|--------|--------|--------|--------|
| Distance From Antenna In Inches | 8.00 | 8.00 | 8.00 | 8.00 | 8.00 |
| EIRP (Watts) | 1.0000 | 1.0000 | 1.0000 | 1.0000 | 1.0000 |
| FCC Power Density Limit (mw/cm ²) | 0.47 | 0.52 | 1.00 | 0.55 | 1.00 |
| Calculated Power Density (mw/cm ²) | 0.19 | 0.19 | 0.19 | 0.19 | 0.19 |

Calculated Power Density and Minimum Safe Distance For Amplifier (Downlink)

| | | | | | |
|-----------------------------|----------|----------|----------|----------|----------|
| Frequency MHz | 729 | 746 | 2110 | 869 | 1930 |
| Pout Watts | 2.52E-06 | 1.67E-06 | 2.19E-06 | 1.87E-06 | 2.08E-06 |
| Duty Cycle Percent | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% |
| Ant. Gain dBi | -5.00 | -5.00 | 0.70 | 2.60 | 1.50 |
| Coax Loss dB | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Distance From Antenna In cm | 20.3 | 20.3 | 20.3 | 20.3 | 20.3 |

RESULTS OF CALCULATIONS

| | | | | | |
|------------------------------------------------|----------|----------|----------|----------|----------|
| Ant. Gain less Coax Loss dBi | -5.00 | -5.00 | 0.70 | 2.60 | 1.50 |
| Distance From Antenna In Inches | 8.00 | 8.00 | 8.00 | 8.00 | 8.00 |
| EIRP (Watts) | 7.96E-07 | 5.30E-07 | 2.57E-06 | 3.41E-06 | 2.94E-06 |
| FCC Power Density Limit (mw/cm ²) | 0.49 | 0.50 | 1.00 | 0.58 | 1.00 |
| Calculated Power Density (mw/cm ²) | 1.54E-07 | 1.02E-07 | 4.96E-07 | 6.58E-07 | 5.67E-07 |

Calculated Combined Power Density and For Amplifier and Phone at 20.31 cm (8.0 in.)

(Determined by Most limiting factors)

| | | | | | |
|----------------------------------------------------------------|------|------|------|------|------|
| FCC Power Density Limit (mw/cm ²) | 0.47 | 0.50 | 1.00 | 0.55 | 1.00 |
| Combined Power Density for Phone and Amp (mw/cm ²) | 0.19 | 0.19 | 0.19 | 0.19 | 0.19 |