



Date: 16<sup>th</sup> November 2001

Mr. Joe Dichoso  
Authorization & Evaluation Division  
Federal Communications Commission Laboratory  
7435 Oakland Mills Road  
Columbia, MD 21046

Re: Form 731 Confirmation Number: EA21096 with FCC ID: AZ489FT5815.

Dear Mr. Dichoso;

Motorola Inc., 8000 West Sunrise Boulevard, Fort Lauderdale, Florida 33322, herein submits its response to the October 30, 2001 request for information in Correspondence Number 21096.

- 1) The body worn phantom is made out of 1" thick natural High Density Polyethylene. The dimensions of the holder and the opening are shown below. The measured dielectric constant is less than 2.3 and the loss tangent is less than 0.0046 all the way up to 2.184GHz.

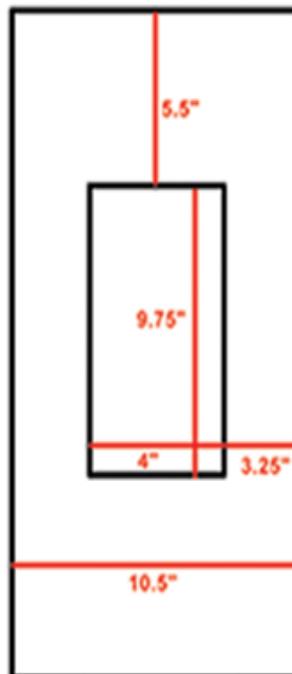


Figure 1. Dimensions of the Body-Worn Phantom Support

- 2) The body-worn positioner is the same positioner used for the head adjacent measurements. The average measured dielectric constant is 3.29 and average measured loss tangent is 0.053 across the 800 MHz band.
  
- 3) An incorrect antenna description was inserted in the SAR report. The correct antenna description is the retractable half-wave antenna given in the operational description. The corrected description for the SAR report is shown below.

|                      |               |      |
|----------------------|---------------|------|
| <b>Type</b>          | Retractable   |      |
| <b>Location</b>      | Right Side    |      |
| <b>Dimensions</b>    | Length        | 85mm |
|                      | Width at Base | 5mm  |
| <b>Configuration</b> | Half-Wave     |      |

- 4) The SAR test measurement in the original filing was for the cheek/touch position only. The 15° tilt SAR measurement results are shown in the tables below. These measurements were taken within 24 hours of the previously reported phone mode head adjacent measurements.

A full data set output of the test condition with the highest SAR values, per transmitting band, is attached at the end of this report. The test conditions included are indicated as bold numbers in the following tables. All other test conditions measured lower SAR values than those included.

| Description       | <i>f</i><br>(MHz) | Conducted Output Power (dBm) | Left Head - 15° tilt Position |            |                   |              | Right Head - 15° tilt Position |            |                   |            |
|-------------------|-------------------|------------------------------|-------------------------------|------------|-------------------|--------------|--------------------------------|------------|-------------------|------------|
|                   |                   |                              | Antenna Extended              |            | Antenna Retracted |              | Antenna Extended               |            | Antenna Retracted |            |
|                   |                   |                              | SAR, 1g (W/kg)                | Drift (dB) | SAR, 1g (W/kg)    | Drift (dB)   | SAR, 1g (W/kg)                 | Drift (dB) | SAR, 1g (W/kg)    | Drift (dB) |
| 800MHz Phone Mode | <b>806.0125</b>   | 28.3dBm                      |                               |            |                   |              |                                |            |                   |            |
|                   | <b>813.5125</b>   | 28.4dBm                      | 0.638                         | -0.28      | <b>0.715</b>      | <b>-0.40</b> | 0.515                          | -0.18      | 0.541             | -0.33      |
|                   | <b>824.9875</b>   | 28.3dBm                      |                               |            |                   |              |                                |            |                   |            |

**Table 1: SAR measurement results for the portable radio FCC ID AZ489FT5815 with Battery SNN5716A attached, at highest possible output power. Measured against the head.**

| Description       | $f$<br>(MHz) | Conducted Output Power (dBm) | Left Head - 15° tilt Position |            |                   |            | Right Head - 15° tilt Position |            |                   |            |
|-------------------|--------------|------------------------------|-------------------------------|------------|-------------------|------------|--------------------------------|------------|-------------------|------------|
|                   |              |                              | Antenna Extended              |            | Antenna Retracted |            | Antenna Extended               |            | Antenna Retracted |            |
|                   |              |                              | SAR, 1g (W/kg)                | Drift (dB) | SAR, 1g (W/kg)    | Drift (dB) | SAR, 1g (W/kg)                 | Drift (dB) | SAR, 1g (W/kg)    | Drift (dB) |
| 900MHz Phone Mode | 896.01875    | 28.3dBm                      |                               |            |                   |            |                                |            |                   |            |
|                   | 898.49375    | 28.3dBm                      | 0.471                         | -0.32      | 0.518             | -0.28      | 0.316                          | -0.33      | 0.459             | -0.22      |
|                   | 901.9875     | 28.3dBm                      |                               |            |                   |            |                                |            |                   |            |

Table 2: SAR measurement results for the portable radio FCC ID AZ489FT5815 with Battery SNN5716A attached, at highest possible output power. Measured against the head.

- 5) In the body-worn configuration, the headset and not the data cable was used for all configurations because it can be seen in the original SAR report in tables 10 & 11 that this causes the maximum measured SAR. The use of the data cable actually lowers SAR. The data cable was utilized only for the peak SAR configuration in order to show how use of this accessory impacts measured SAR.
- 6) It is believed that the RF current distribution is different for the body worn configuration vs. the head adjacent testing. This may cause the antenna retracted SAR to be lower than expected. Another unit (serial number 919ABL5CYC) was tested for head adjacent SAR at the same time to see if it was repeatable from unit to unit. It was determined that this effect is repeatable and can be seen from the SAR measurement results shown in the table below.

| Description | $f$<br>(MHz) | Conducted Output Power (dBm) | Left Head        |            |                   |            | Right Head       |            |                   |            |
|-------------|--------------|------------------------------|------------------|------------|-------------------|------------|------------------|------------|-------------------|------------|
|             |              |                              | Antenna Extended |            | Antenna Retracted |            | Antenna Extended |            | Antenna Retracted |            |
|             |              |                              | SAR, 1g (W/kg)   | Drift (dB) | SAR, 1g (W/kg)    | Drift (dB) | SAR, 1g (W/kg)   | Drift (dB) | SAR, 1g (W/kg)    | Drift (dB) |
| 900MHz PSTN | 896.01875MHz | 28.3dBm                      |                  |            | 1.1               | -0.15      |                  |            | 1.03              | -0.31      |
|             | 898.49375MHz | 28.3dBm                      | 0.271            | -0.06      | 1.1               | -0.2       | 0.288            | -0.16      | 1.03              | -0.17      |
|             | 901.9875MHz  | 28.3dBm                      |                  |            | 1.07              | -0.17      |                  |            | 0.948             | -0.19      |

Table 3: SAR measurement results for the portable radio FCC ID AZ489FT5815 with Battery SNN5716A attached, at highest possible output power. Measured against the head.

- 8) We are obtaining the needed equipment to monitor and report temperature of the tissue simulant before and after each SAR tests, and not just during the validation tests. We do currently monitor and record the room ambient temperature to verify that it does not drift by more than  $\pm 2.0^{\circ}\text{C}$  from the temperature measured in the morning.

- 9) ERP data was inadvertently omitted in the original submission and is attached as new Exhibit 6.7. The graph therein shows that the spatial peak value obtained while the transmitter was mounted on a platform during rotation in an anechoic chamber, using the substitution method described in Exhibit 7.2(b), occurred at the rotational angle of 126 degrees when measured in the 800 MHz band. In the 900 MHz band the spatial peak value was observed at an angle of 176 degrees. In Exhibit 12.1.C we have used the term “maximum ERP” to refer to this spatial peak value measured for a continuous wave signal corresponding to 100% duty cycle.
- 10) a) 700 milliwatts is stated in Exhibits 12.1.A and new Exhibit 6.7 as the maximum output power rating, based on the requirement of 2.1046(a) and the definition of output power given in 47 CFR 90.7, as power delivered to a 50 ohm impedance (which is the load the antenna system is designed to provide). It is the maximum average power measured during the interval of a TDM transmission pulse, so we adopted the term pulse average power for this rating. Note that this mean power type of rating is unaffected by the various TDM duty cycles employed so it also is equal to the mean power that would be measured with an RMS power meter if the radio were to transmit continuously (i.e. –100% duty cycle), a condition that does not occur during normal operation but was used to measure ERP.  
b) As stated in preceding item 9 the value stated in Exhibit 12.1.C of 589 milliwatts was the maximum ERP (pulse average) that was measured.  
c) The value of 28.5 dBm refers to the 700 milliwatt maximum output power (pulse average) rating stated in Exhibit 12.1.A. It is a rounded-up value since the decibel equivalent of 700 milliwatts more precisely is 28.451dBm.  
d) The mean output power of 582 milliwatts stated in exhibit 6.1 for the 800 MHz band, and 602 milliwatts for the 900 MHz band, was the (pulse average) data observed during that particular output power measurement, not a rated value like that listed in Exhibit 12.1.A.
- 11) Attached is a revised version of Exhibit 5 to enhance readability.

Contact me at (954) 723-5793 if you require any additional information.

Regards,  
*/s/ Mike Ramnath*  
FCC Liaison  
Email: [mike.ramnath@motorola.com](mailto:mike.ramnath@motorola.com)

Attachments:  
Exhibit 5 (Corrected)  
Exhibit 6.7 (New)  
DASY™ Output plots for 15° Tilt SAR measurements

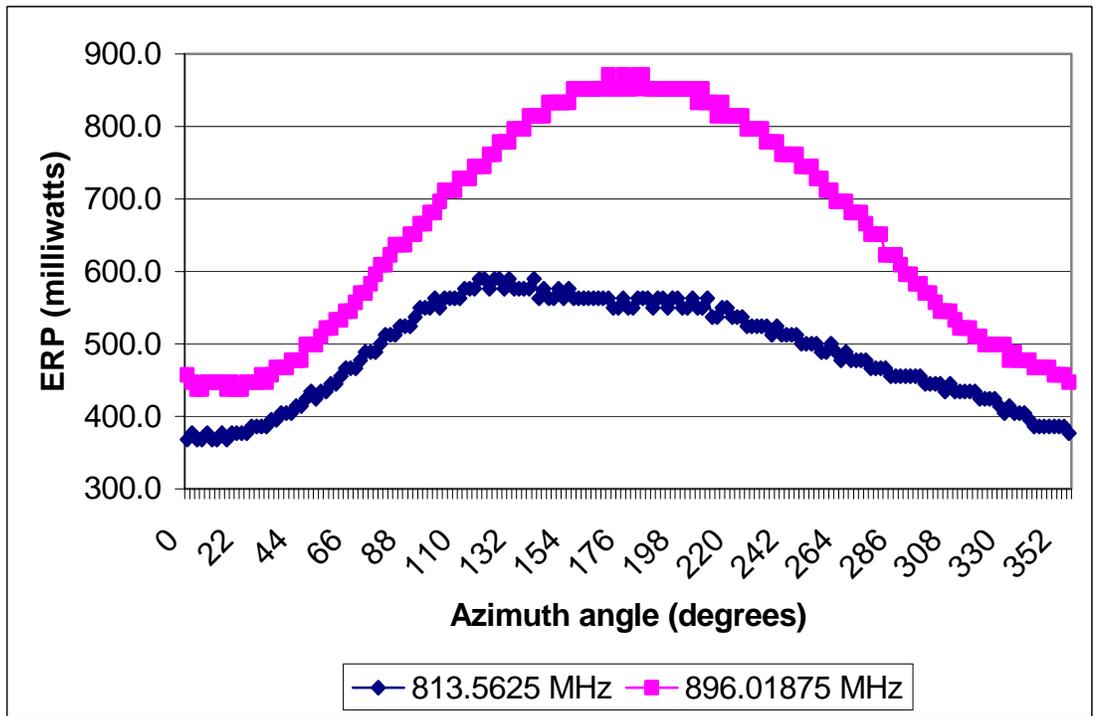
## 6.7 Effective Radiated Power (ERP)

As described in more detail in Exhibit 7.1.b. the radiated power received at a spectrum analyzer was measured from a radio specimen with integral antenna at 2 degree increments as the specimen was rotated. The radio output power was tuned to transmit as close as possible to the maximum output power (700mW average power). These recorded power readings are uncalibrated ERP measurements. To convert these readings to ERP values, a reference reading was obtained from a calibrated (to an ideal dipole) antenna to which was applied the same power level as the measured output power of the radio specimen. The reading at the spectrum analyzer from this calibrated reference antenna served to calibrate the spectrum analyzer readings for ERP measurements.

- a. For operation in the 800 MHz band a maximum ERP of 589 milliwatts was observed at 813.5625MHz and a rotation angle of 126 degrees. The maximum ERP measured in the 900 MHz band was 871.0 milliwatts at 896.01875MHz and a rotation angle of 176 degrees. This is evident in the following data table and the plot made from the data in that table.

By taking the ratio of the radio specimen measurements to the output power, the antenna gain was determined that is listed in Exhibit 12.1.b.

Figure 6-31: Maximum ERP vs. Azimuth



| <b>Radio @ 813.5625MHz</b> |                                 |                   |              |
|----------------------------|---------------------------------|-------------------|--------------|
| Conducted Power            |                                 | <b>711 mW:</b>    |              |
| Azimuth Angle (degrees)    | Spectrum Analyzer Reading (dBm) | Measured ERP (mW) | 813.5625 MHz |
| 0                          | -16.7                           | 379.1             | 368.1        |
| 2                          | -16.6                           | 387.9             | 376.9        |
| 4                          | -16.7                           | 379.1             | 368.1        |
| 6                          | -16.7                           | 379.1             | 368.1        |
| 8                          | -16.6                           | 387.9             | 376.9        |
| 10                         | -16.7                           | 379.1             | 368.1        |
| 12                         | -16.7                           | 379.1             | 368.1        |
| 14                         | -16.6                           | 387.9             | 376.9        |
| 16                         | -16.7                           | 379.1             | 368.1        |
| 18                         | -16.6                           | 387.9             | 376.9        |
| 20                         | -16.6                           | 387.9             | 376.9        |
| 22                         | -16.6                           | 387.9             | 376.9        |
| 24                         | -16.6                           | 387.9             | 376.9        |
| 26                         | -16.5                           | 396.9             | 385.9        |
| 28                         | -16.5                           | 396.9             | 385.9        |
| 30                         | -16.5                           | 396.9             | 385.9        |
| 32                         | -16.5                           | 396.9             | 385.9        |

| <b>Radio @ 896.01875 MHz</b>    |                   |                |
|---------------------------------|-------------------|----------------|
|                                 |                   | <b>679 mW:</b> |
| Spectrum Analyzer Reading (dBm) | Measured ERP (mW) | 896.01875 MHz  |
| -16.5                           | 435.9             | 456.9          |
| -16.6                           | 426.0             | 447.0          |
| -16.7                           | 416.3             | 437.3          |
| -16.7                           | 416.3             | 437.3          |
| -16.6                           | 426.0             | 447.0          |
| -16.6                           | 426.0             | 447.0          |
| -16.6                           | 426.0             | 447.0          |
| -16.6                           | 426.0             | 447.0          |
| -16.7                           | 416.3             | 437.3          |
| -16.6                           | 426.0             | 447.0          |
| -16.6                           | 426.0             | 447.0          |
| -16.7                           | 416.3             | 437.3          |
| -16.7                           | 416.3             | 437.3          |
| -16.6                           | 426.0             | 447.0          |
| -16.6                           | 426.0             | 447.0          |
| -16.5                           | 435.9             | 456.9          |
| -16.6                           | 426.0             | 447.0          |

|     |       |       |       |
|-----|-------|-------|-------|
| 34  | -16.4 | 406.2 | 395.2 |
| 36  | -16.4 | 406.2 | 395.2 |
| 38  | -16.3 | 415.6 | 404.6 |
| 40  | -16.3 | 415.6 | 404.6 |
| 42  | -16.3 | 415.6 | 404.6 |
| 44  | -16.2 | 425.3 | 414.3 |
| 46  | -16.2 | 425.3 | 414.3 |
| 48  | -16.1 | 435.2 | 424.2 |
| 50  | -16   | 445.3 | 434.3 |
| 52  | -16.1 | 435.2 | 424.2 |
| 54  | -16   | 445.3 | 434.3 |
| 56  | -16   | 445.3 | 434.3 |
| 58  | -15.9 | 455.7 | 444.7 |
| 60  | -15.9 | 455.7 | 444.7 |
| 62  | -15.8 | 466.3 | 455.3 |
| 64  | -15.7 | 477.2 | 466.2 |
| 66  | -15.7 | 477.2 | 466.2 |
| 68  | -15.7 | 477.2 | 466.2 |
| 70  | -15.6 | 488.3 | 477.3 |
| 72  | -15.5 | 499.7 | 488.7 |
| 74  | -15.5 | 499.7 | 488.7 |
| 76  | -15.5 | 499.7 | 488.7 |
| 78  | -15.4 | 511.3 | 500.3 |
| 80  | -15.3 | 523.2 | 512.2 |
| 82  | -15.3 | 523.2 | 512.2 |
| 84  | -15.3 | 523.2 | 512.2 |
| 86  | -15.2 | 535.4 | 524.4 |
| 88  | -15.2 | 535.4 | 524.4 |
| 90  | -15.2 | 535.4 | 524.4 |
| 92  | -15.1 | 547.9 | 536.9 |
| 94  | -15   | 560.7 | 549.7 |
| 96  | -15   | 560.7 | 549.7 |
| 98  | -15   | 560.7 | 549.7 |
| 100 | -14.9 | 573.7 | 562.7 |
| 102 | -15   | 560.7 | 549.7 |
| 104 | -14.9 | 573.7 | 562.7 |
| 106 | -14.9 | 573.7 | 562.7 |
| 108 | -14.9 | 573.7 | 562.7 |
| 110 | -14.9 | 573.7 | 562.7 |
| 112 | -14.8 | 587.1 | 576.1 |
| 114 | -14.8 | 587.1 | 576.1 |
| 116 | -14.8 | 587.1 | 576.1 |
| 118 | -14.7 | 600.8 | 589.8 |
| 120 | -14.7 | 600.8 | 589.8 |
| 122 | -14.8 | 587.1 | 576.1 |
| 124 | -14.7 | 600.8 | 589.8 |
| 126 | -14.7 | 600.8 | 589.8 |
| 128 | -14.8 | 587.1 | 576.1 |
| 130 | -14.7 | 600.8 | 589.8 |
| 132 | -14.8 | 587.1 | 576.1 |
| 134 | -14.8 | 587.1 | 576.1 |
| 136 | -14.8 | 587.1 | 576.1 |

|       |       |       |
|-------|-------|-------|
| -16.5 | 435.9 | 456.9 |
| -16.4 | 446.1 | 467.1 |
| -16.4 | 446.1 | 467.1 |
| -16.4 | 446.1 | 467.1 |
| -16.3 | 456.5 | 477.5 |
| -16.3 | 456.5 | 477.5 |
| -16.3 | 456.5 | 477.5 |
| -16.1 | 478.0 | 499.0 |
| -16.1 | 478.0 | 499.0 |
| -16.1 | 478.0 | 499.0 |
| -16   | 489.1 | 510.1 |
| -15.9 | 500.5 | 521.5 |
| -15.9 | 500.5 | 521.5 |
| -15.8 | 512.2 | 533.2 |
| -15.8 | 512.2 | 533.2 |
| -15.7 | 524.1 | 545.1 |
| -15.7 | 524.1 | 545.1 |
| -15.6 | 536.3 | 557.3 |
| -15.5 | 548.8 | 569.8 |
| -15.5 | 548.8 | 569.8 |
| -15.4 | 561.6 | 582.6 |
| -15.3 | 574.7 | 595.7 |
| -15.2 | 588.1 | 609.1 |
| -15.2 | 588.1 | 609.1 |
| -15.1 | 601.8 | 622.8 |
| -15   | 615.8 | 636.8 |
| -15   | 615.8 | 636.8 |
| -15   | 615.8 | 636.8 |
| -14.9 | 630.1 | 651.1 |
| -14.9 | 630.1 | 651.1 |
| -14.8 | 644.8 | 665.8 |
| -14.8 | 644.8 | 665.8 |
| -14.7 | 659.8 | 680.8 |
| -14.7 | 659.8 | 680.8 |
| -14.6 | 675.2 | 696.2 |
| -14.5 | 690.9 | 711.9 |
| -14.5 | 690.9 | 711.9 |
| -14.5 | 690.9 | 711.9 |
| -14.4 | 707.0 | 728.0 |
| -14.4 | 707.0 | 728.0 |
| -14.4 | 707.0 | 728.0 |
| -14.3 | 723.5 | 744.5 |
| -14.3 | 723.5 | 744.5 |
| -14.3 | 723.5 | 744.5 |
| -14.2 | 740.3 | 761.3 |
| -14.2 | 740.3 | 761.3 |
| -14.1 | 757.6 | 778.6 |
| -14.1 | 757.6 | 778.6 |
| -14.1 | 757.6 | 778.6 |
| -14   | 775.2 | 796.2 |
| -14   | 775.2 | 796.2 |
| -14   | 775.2 | 796.2 |



|     |       |       |       |
|-----|-------|-------|-------|
| 242 | -15.3 | 523.2 | 512.2 |
| 244 | -15.3 | 523.2 | 512.2 |
| 246 | -15.3 | 523.2 | 512.2 |
| 248 | -15.4 | 511.3 | 500.3 |
| 250 | -15.4 | 511.3 | 500.3 |
| 252 | -15.4 | 511.3 | 500.3 |
| 254 | -15.4 | 511.3 | 500.3 |
| 256 | -15.5 | 499.7 | 488.7 |
| 258 | -15.5 | 499.7 | 488.7 |
| 260 | -15.4 | 511.3 | 500.3 |
| 262 | -15.5 | 499.7 | 488.7 |
| 264 | -15.6 | 488.3 | 477.3 |
| 266 | -15.5 | 499.7 | 488.7 |
| 268 | -15.6 | 488.3 | 477.3 |
| 270 | -15.6 | 488.3 | 477.3 |
| 272 | -15.6 | 488.3 | 477.3 |
| 274 | -15.6 | 488.3 | 477.3 |
| 276 | -15.7 | 477.2 | 466.2 |
| 278 | -15.7 | 477.2 | 466.2 |
| 280 | -15.7 | 477.2 | 466.2 |
| 282 | -15.7 | 477.2 | 466.2 |
| 284 | -15.8 | 466.3 | 455.3 |
| 286 | -15.8 | 466.3 | 455.3 |
| 288 | -15.8 | 466.3 | 455.3 |
| 290 | -15.8 | 466.3 | 455.3 |
| 292 | -15.8 | 466.3 | 455.3 |
| 294 | -15.8 | 466.3 | 455.3 |
| 296 | -15.8 | 466.3 | 455.3 |
| 298 | -15.9 | 455.7 | 444.7 |
| 300 | -15.9 | 455.7 | 444.7 |
| 302 | -15.9 | 455.7 | 444.7 |
| 304 | -15.9 | 455.7 | 444.7 |
| 306 | -16   | 445.3 | 434.3 |
| 308 | -15.9 | 455.7 | 444.7 |
| 310 | -16   | 445.3 | 434.3 |
| 312 | -16   | 445.3 | 434.3 |
| 314 | -16   | 445.3 | 434.3 |
| 316 | -16   | 445.3 | 434.3 |
| 318 | -16   | 445.3 | 434.3 |
| 320 | -16.1 | 435.2 | 424.2 |
| 322 | -16.1 | 435.2 | 424.2 |
| 324 | -16.1 | 435.2 | 424.2 |
| 326 | -16.1 | 435.2 | 424.2 |
| 328 | -16.2 | 425.3 | 414.3 |
| 330 | -16.3 | 415.6 | 404.6 |
| 332 | -16.2 | 425.3 | 414.3 |
| 334 | -16.3 | 415.6 | 404.6 |
| 336 | -16.3 | 415.6 | 404.6 |
| 338 | -16.3 | 415.6 | 404.6 |
| 340 | -16.4 | 406.2 | 395.2 |
| 342 | -16.5 | 396.9 | 385.9 |
| 344 | -16.5 | 396.9 | 385.9 |

|       |       |       |
|-------|-------|-------|
| -14.2 | 740.3 | 761.3 |
| -14.2 | 740.3 | 761.3 |
| -14.2 | 740.3 | 761.3 |
| -14.3 | 723.5 | 744.5 |
| -14.3 | 723.5 | 744.5 |
| -14.3 | 723.5 | 744.5 |
| -14.3 | 723.5 | 744.5 |
| -14.4 | 707.0 | 728.0 |
| -14.4 | 707.0 | 728.0 |
| -14.5 | 690.9 | 711.9 |
| -14.5 | 690.9 | 711.9 |
| -14.6 | 675.2 | 696.2 |
| -14.6 | 675.2 | 696.2 |
| -14.6 | 675.2 | 696.2 |
| -14.7 | 659.8 | 680.8 |
| -14.7 | 659.8 | 680.8 |
| -14.7 | 659.8 | 680.8 |
| -14.8 | 644.8 | 665.8 |
| -14.9 | 630.1 | 651.1 |
| -14.9 | 630.1 | 651.1 |
| -14.9 | 630.1 | 651.1 |
| -15.1 | 601.8 | 622.8 |
| -15.1 | 601.8 | 622.8 |
| -15.1 | 601.8 | 622.8 |
| -15.2 | 588.1 | 609.1 |
| -15.3 | 574.7 | 595.7 |
| -15.3 | 574.7 | 595.7 |
| -15.4 | 561.6 | 582.6 |
| -15.4 | 561.6 | 582.6 |
| -15.5 | 548.8 | 569.8 |
| -15.5 | 548.8 | 569.8 |
| -15.6 | 536.3 | 557.3 |
| -15.7 | 524.1 | 545.1 |
| -15.7 | 524.1 | 545.1 |
| -15.7 | 524.1 | 545.1 |
| -15.8 | 512.2 | 533.2 |
| -15.9 | 500.5 | 521.5 |
| -15.9 | 500.5 | 521.5 |
| -15.9 | 500.5 | 521.5 |
| -16   | 489.1 | 510.1 |
| -16   | 489.1 | 510.1 |
| -16.1 | 478.0 | 499.0 |
| -16.1 | 478.0 | 499.0 |
| -16.1 | 478.0 | 499.0 |
| -16.1 | 478.0 | 499.0 |
| -16.1 | 478.0 | 499.0 |
| -16.1 | 478.0 | 499.0 |
| -16.3 | 456.5 | 477.5 |
| -16.2 | 467.1 | 488.1 |
| -16.3 | 456.5 | 477.5 |
| -16.3 | 456.5 | 477.5 |
| -16.3 | 456.5 | 477.5 |
| -16.3 | 456.5 | 477.5 |
| -16.4 | 446.1 | 467.1 |
| -16.4 | 446.1 | 467.1 |

|     |       |       |       |
|-----|-------|-------|-------|
| 346 | -16.5 | 396.9 | 385.9 |
| 348 | -16.5 | 396.9 | 385.9 |
| 350 | -16.5 | 396.9 | 385.9 |
| 352 | -16.5 | 396.9 | 385.9 |
| 354 | -16.5 | 396.9 | 385.9 |
| 356 | -16.6 | 387.9 | 376.9 |

Peak Reading (mW)

589.8

|       |       |       |
|-------|-------|-------|
| -16.4 | 446.1 | 467.1 |
| -16.4 | 446.1 | 467.1 |
| -16.5 | 435.9 | 456.9 |
| -16.5 | 435.9 | 456.9 |
| -16.5 | 435.9 | 456.9 |
| -16.6 | 426.0 | 447.0 |

871.0