

## **Antenna Test Report**

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BLE Antenna

Revision 1.2

## Table of Contents

|                                 |   |
|---------------------------------|---|
| 1 Report Summary .....          | 3 |
| 2 Antenna Description .....     | 3 |
| 3 Test Setup and Procedure..... | 3 |
| 4 Antenna Patterns .....        | 4 |

## 1 Report Summary

The Rocky Mountain ATV BLE antenna has antenna gain characteristics shown in Table 1.

**Table 1: Antenna gain summary**

| Measurement                  | Gain (dBi) |
|------------------------------|------------|
| Peak Gain (2402-2480 MHz)    | +1.18      |
| Average Gain (2402-2480 MHz) | -2.95      |

## 2 Antenna Description

The antenna manufacturer is Rocky Mountain ATV.

Address: Rocky Mountain ATV  
1551 American Way  
Payson, Utah 84651, United States

The embedded monopole antenna is a flexible circuit connected to the main PCB, adhered to a plastic riser.

**Figure 1: BLE Antenna**

Frequency range of interest is 2402 MHz to 2480 MHz.

## 3 Test Setup and Procedure

Testing was performed on 27FEB2025 at Antenna Test Lab (ATL) in Raleigh, NC, USA. The test data is available as 2025-02-27 Device-Solutions Bluetooth Antennas.zip

For passive gain measurements, a coaxial cable is attached to the PCB at the single ended antenna driving point.

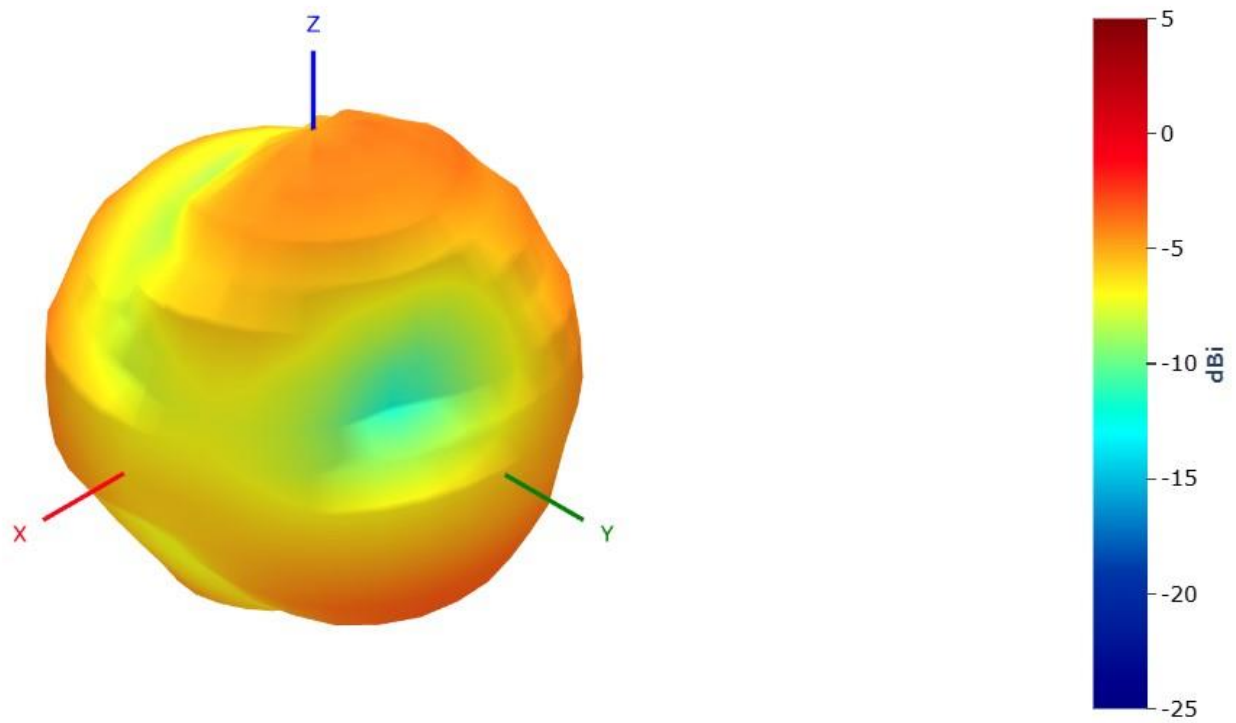
**Figure 2: Test setup**

The test procedure follows the IEEE Std 149-2021, IEEE Recommended Practice for Antenna Measurements, more commonly called “Substitution Method Testing.” The substitution method uses a lab reference antenna with known characteristics to make a reference measurement. After normalizing the chamber measurement system, the antenna under test (AUT) is substituted for the reference antenna. Finally, the reference antenna’s known gain at all positioner angles is added to the result to obtain the AUT’s gain in dBi. The reference antenna measurement in the ATL chamber is available as 2025-04-03 Reference Horn Sweep for Device Solutions 2300-2550MHz.zip

## **4 Antenna Patterns**

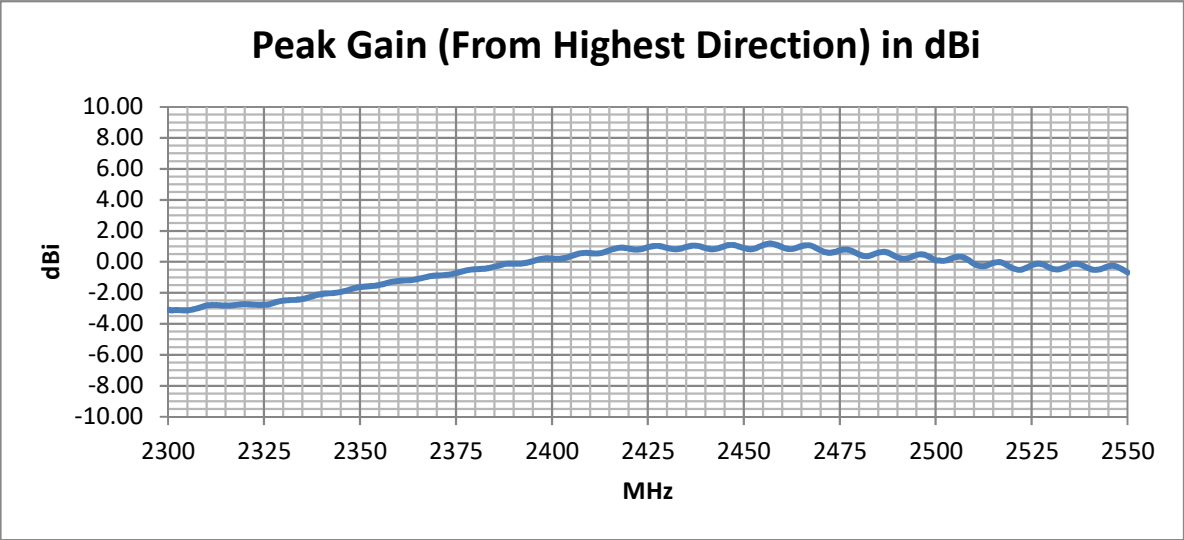
3D rotatable patterns and result tabulations are available in the accompanying data package.

2025-02-27 Device Solutions Bluetooth Antennas.zip

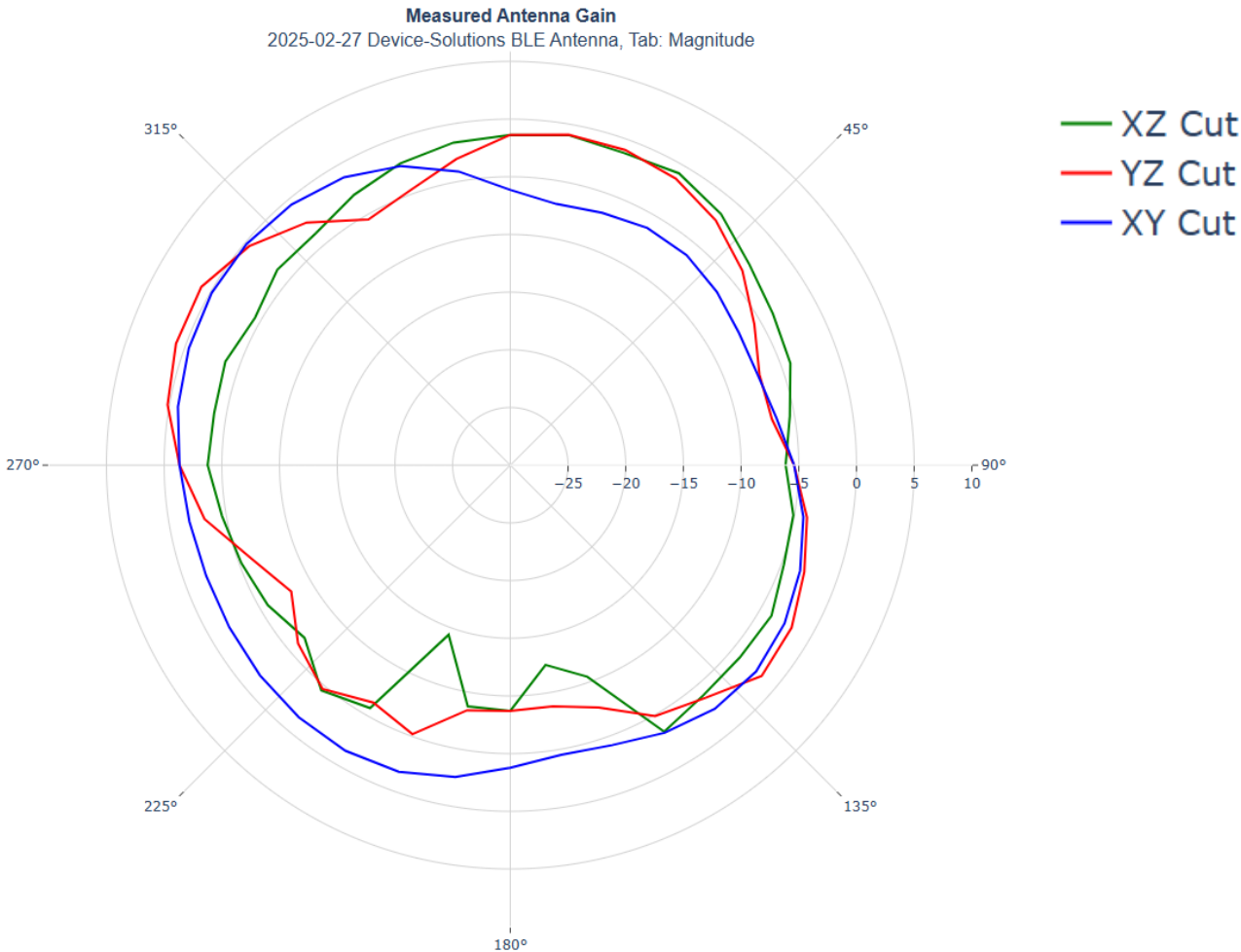
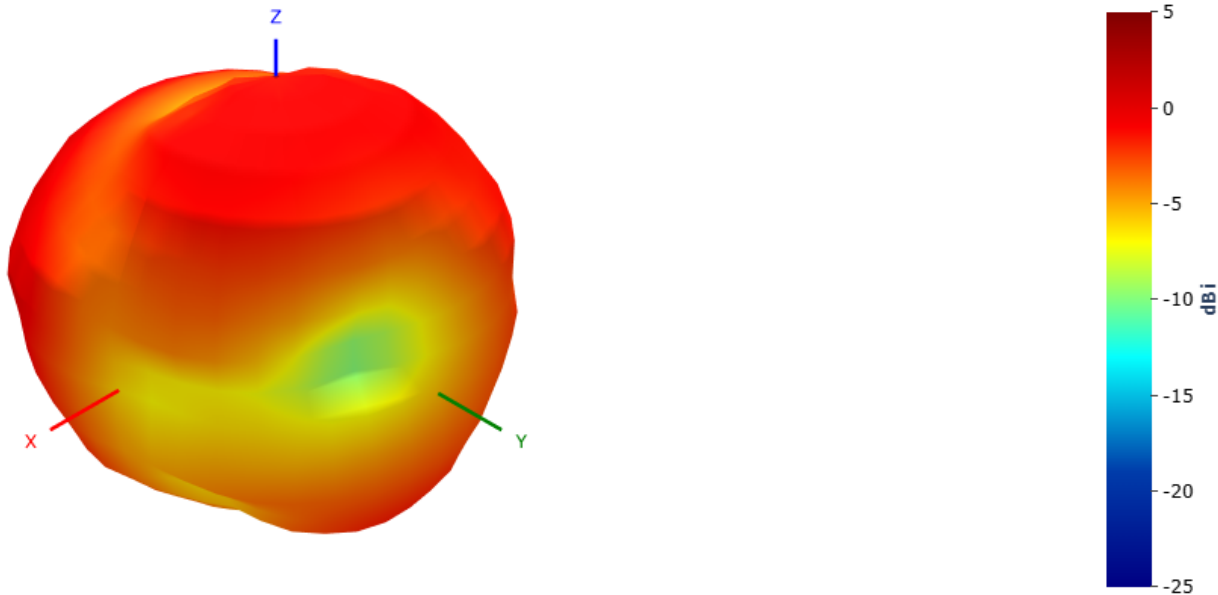


**Figure 3: BLE Antenna pattern**

| Frequency (MHz) | Peak Gain (From Highest Direction) in dBi |
|-----------------|-------------------------------------------|
| 2300            | -3.09                                     |
| 2301            | -3.13                                     |
| 2302            | -3.11                                     |
| 2303            | -3.12                                     |
| 2304            | -3.13                                     |
| 2305            | -3.13                                     |
| 2306            | -3.10                                     |
| 2307            | -3.04                                     |
| 2308            | -2.97                                     |
| 2309            | -2.89                                     |
| 2310            | -2.82                                     |
| 2311            | -2.79                                     |
| 2312            | -2.79                                     |
| 2313            | -2.79                                     |
| 2314            | -2.82                                     |
| 2315            | -2.83                                     |
| 2316            | -2.82                                     |
| 2317            | -2.80                                     |
| 2318            | -2.77                                     |
| 2319            | -2.74                                     |
| 2320            | -2.72                                     |
| 2321            | -2.74                                     |
| 2322            | -2.76                                     |
| 2323            | -2.77                                     |
| 2324            | -2.78                                     |
| 2325            | -2.77                                     |
| 2326            | -2.76                                     |
| 2327            | -2.69                                     |
| 2328            | -2.61                                     |
| 2329            | -2.55                                     |
| 2330            | -2.50                                     |
| 2331            | -2.48                                     |
| 2332            | -2.46                                     |
| 2333            | -2.46                                     |
| 2334            | -2.43                                     |
| 2335            | -2.40                                     |
| 2336            | -2.34                                     |
| 2337            | -2.27                                     |
| 2338            | -2.19                                     |
| 2339            | -2.12                                     |
| 2340            | -2.08                                     |
| 2341            | -2.04                                     |
| 2342            | -2.03                                     |
| 2343            | -2.02                                     |
| 2344            | -1.99                                     |
| 2345            | -1.95                                     |
| 2346            | -1.89                                     |
| 2347            | -1.81                                     |
| 2348            | -1.74                                     |
| 2349            | -1.67                                     |
| 2350            | -1.63                                     |
| 2351            | -1.60                                     |
| 2352            | -1.58                                     |
| 2353            | -1.56                                     |
| 2354            | -1.54                                     |
| 2355            | -1.49                                     |
| 2356            | -1.44                                     |
| 2357            | -1.37                                     |
| 2358            | -1.31                                     |
| 2359            | -1.26                                     |
| 2360            | -1.23                                     |
| 2361            | -1.21                                     |
| 2362            | -1.20                                     |
| 2363            | -1.19                                     |
| 2364            | -1.16                                     |
| 2365            | -1.11                                     |
| 2366            | -1.05                                     |
| 2367            | -1.00                                     |
| 2368            | -0.94                                     |
| 2369            | -0.90                                     |



Measured Antenna Gain  
2025-02-27 Device-Solutions BLE Antenna, Tab: Magnitude

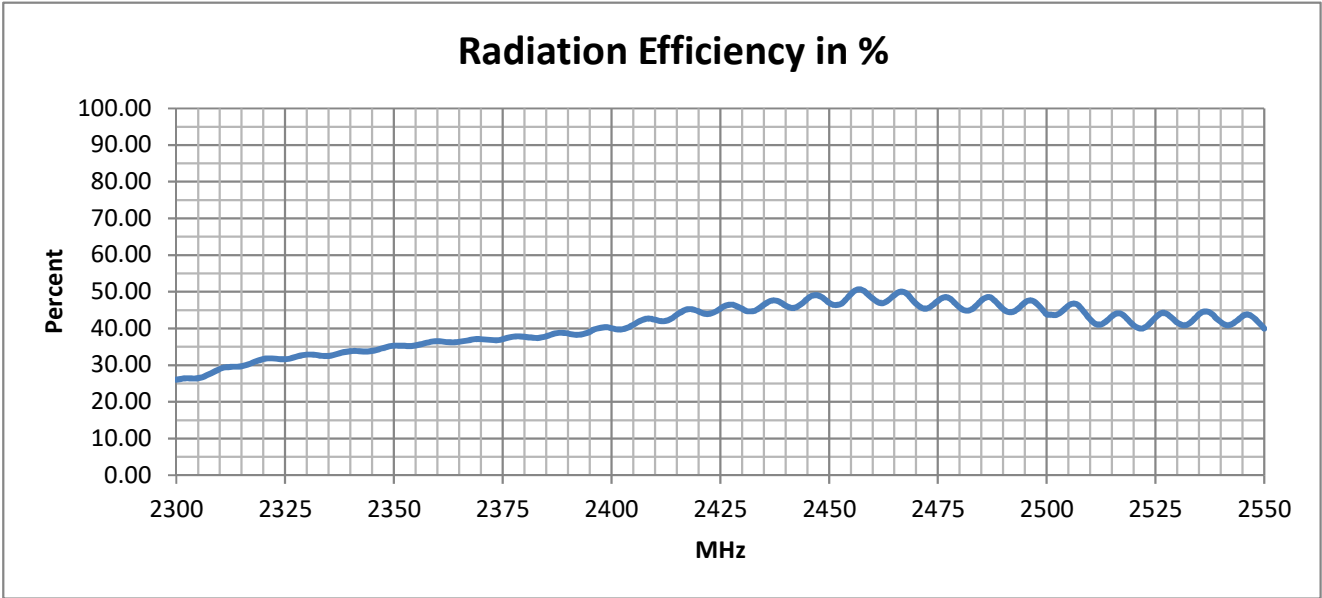
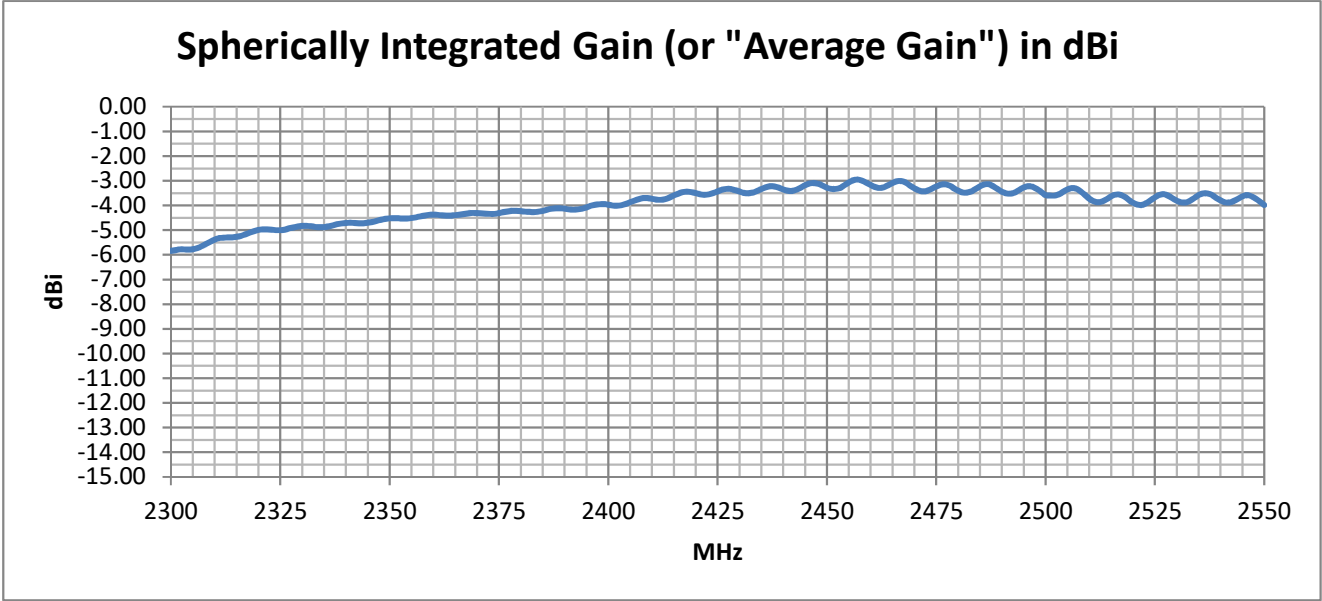


| Frequency<br>(MHz) | Peak Gain<br>(From Highest<br>Direction) in<br>dBi |
|--------------------|----------------------------------------------------|
| 2370               | -0.88                                              |
| 2371               | -0.87                                              |
| 2372               | -0.85                                              |
| 2373               | -0.83                                              |
| 2374               | -0.79                                              |
| 2375               | -0.73                                              |
| 2376               | -0.66                                              |
| 2377               | -0.60                                              |
| 2378               | -0.54                                              |
| 2379               | -0.50                                              |
| 2380               | -0.48                                              |
| 2381               | -0.47                                              |
| 2382               | -0.45                                              |
| 2383               | -0.43                                              |
| 2384               | -0.38                                              |
| 2385               | -0.32                                              |
| 2386               | -0.25                                              |
| 2387               | -0.18                                              |
| 2388               | -0.13                                              |
| 2389               | -0.11                                              |
| 2390               | -0.12                                              |
| 2391               | -0.11                                              |
| 2392               | -0.11                                              |
| 2393               | -0.08                                              |
| 2394               | -0.02                                              |
| 2395               | 0.04                                               |
| 2396               | 0.12                                               |
| 2397               | 0.18                                               |
| 2398               | 0.22                                               |
| 2399               | 0.24                                               |
| 2400               | 0.21                                               |
| 2401               | 0.20                                               |
| 2402               | 0.20                                               |
| 2403               | 0.23                                               |
| 2404               | 0.28                                               |
| 2405               | 0.37                                               |
| 2406               | 0.45                                               |
| 2407               | 0.53                                               |
| 2408               | 0.57                                               |
| 2409               | 0.58                                               |
| 2410               | 0.56                                               |
| 2411               | 0.54                                               |
| 2412               | 0.54                                               |
| 2413               | 0.58                                               |
| 2414               | 0.65                                               |
| 2415               | 0.74                                               |
| 2416               | 0.83                                               |
| 2417               | 0.89                                               |
| 2418               | 0.92                                               |
| 2419               | 0.90                                               |
| 2420               | 0.86                                               |
| 2421               | 0.81                                               |
| 2422               | 0.79                                               |
| 2423               | 0.81                                               |
| 2424               | 0.87                                               |
| 2425               | 0.94                                               |
| 2426               | 1.00                                               |
| 2427               | 1.03                                               |
| 2428               | 1.02                                               |
| 2429               | 0.97                                               |
| 2430               | 0.90                                               |
| 2431               | 0.84                                               |
| 2432               | 0.81                                               |
| 2433               | 0.83                                               |
| 2434               | 0.89                                               |
| 2435               | 0.96                                               |
| 2436               | 1.02                                               |
| 2437               | 1.05                                               |
| 2438               | 1.03                                               |
| 2439               | 0.97                                               |

| Frequency<br>(MHz) | Peak Gain<br>(From Highest<br>Direction) in<br>dBi |
|--------------------|----------------------------------------------------|
| 2440               | 0.89                                               |
| 2441               | 0.83                                               |
| 2442               | 0.82                                               |
| 2443               | 0.85                                               |
| 2444               | 0.93                                               |
| 2445               | 1.01                                               |
| 2446               | 1.08                                               |
| 2447               | 1.09                                               |
| 2448               | 1.05                                               |
| 2449               | 0.97                                               |
| 2450               | 0.89                                               |
| 2451               | 0.83                                               |
| 2452               | 0.82                                               |
| 2453               | 0.86                                               |
| 2454               | 0.97                                               |
| 2455               | 1.08                                               |
| 2456               | 1.15                                               |
| 2457               | 1.18                                               |
| 2458               | 1.14                                               |
| 2459               | 1.05                                               |
| 2460               | 0.95                                               |
| 2461               | 0.86                                               |
| 2462               | 0.82                                               |
| 2463               | 0.84                                               |
| 2464               | 0.92                                               |
| 2465               | 1.01                                               |
| 2466               | 1.06                                               |
| 2467               | 1.07                                               |
| 2468               | 1.00                                               |
| 2469               | 0.87                                               |
| 2470               | 0.74                                               |
| 2471               | 0.64                                               |
| 2472               | 0.59                                               |
| 2473               | 0.60                                               |
| 2474               | 0.66                                               |
| 2475               | 0.74                                               |
| 2476               | 0.79                                               |
| 2477               | 0.79                                               |
| 2478               | 0.72                                               |
| 2479               | 0.60                                               |
| 2480               | 0.48                                               |
| 2481               | 0.39                                               |
| 2482               | 0.36                                               |
| 2483               | 0.41                                               |
| 2484               | 0.50                                               |
| 2485               | 0.59                                               |
| 2486               | 0.64                                               |
| 2487               | 0.64                                               |
| 2488               | 0.54                                               |
| 2489               | 0.42                                               |
| 2490               | 0.30                                               |
| 2491               | 0.22                                               |
| 2492               | 0.20                                               |
| 2493               | 0.25                                               |
| 2494               | 0.35                                               |
| 2495               | 0.44                                               |
| 2496               | 0.48                                               |
| 2497               | 0.46                                               |
| 2498               | 0.36                                               |
| 2499               | 0.23                                               |
| 2500               | 0.09                                               |
| 2501               | 0.09                                               |
| 2502               | 0.06                                               |
| 2503               | 0.11                                               |
| 2504               | 0.21                                               |
| 2505               | 0.30                                               |
| 2506               | 0.33                                               |
| 2507               | 0.31                                               |
| 2508               | 0.19                                               |
| 2509               | 0.04                                               |

| Frequency<br>(MHz) | Peak Gain<br>(From Highest<br>Direction) in<br>dBi |
|--------------------|----------------------------------------------------|
| 2510               | -0.13                                              |
| 2511               | -0.24                                              |
| 2512               | -0.28                                              |
| 2513               | -0.26                                              |
| 2514               | -0.17                                              |
| 2515               | -0.07                                              |
| 2516               | -0.02                                              |
| 2517               | -0.03                                              |
| 2518               | -0.13                                              |
| 2519               | -0.27                                              |
| 2520               | -0.40                                              |
| 2521               | -0.49                                              |
| 2522               | -0.52                                              |
| 2523               | -0.45                                              |
| 2524               | -0.34                                              |
| 2525               | -0.22                                              |
| 2526               | -0.14                                              |
| 2527               | -0.12                                              |
| 2528               | -0.17                                              |
| 2529               | -0.29                                              |
| 2530               | -0.41                                              |
| 2531               | -0.48                                              |
| 2532               | -0.49                                              |
| 2533               | -0.42                                              |
| 2534               | -0.32                                              |
| 2535               | -0.20                                              |
| 2536               | -0.13                                              |
| 2537               | -0.13                                              |
| 2538               | -0.20                                              |
| 2539               | -0.32                                              |
| 2540               | -0.43                                              |
| 2541               | -0.51                                              |
| 2542               | -0.51                                              |
| 2543               | -0.47                                              |
| 2544               | -0.38                                              |
| 2545               | -0.29                                              |
| 2546               | -0.25                                              |
| 2547               | -0.30                                              |
| 2548               | -0.40                                              |
| 2549               | -0.54                                              |
| 2550               | -0.69                                              |

| Frequency (MHz) | Integrated Spherical Total Isotropic Gain (dBi) | Estimated Radiation Efficiency (%) |
|-----------------|-------------------------------------------------|------------------------------------|
| 2300            | -5.84                                           | 26.06                              |
| 2301            | -5.81                                           | 26.24                              |
| 2302            | -5.78                                           | 26.42                              |
| 2303            | -5.78                                           | 26.42                              |
| 2304            | -5.79                                           | 26.36                              |
| 2305            | -5.77                                           | 26.49                              |
| 2306            | -5.73                                           | 26.73                              |
| 2307            | -5.65                                           | 27.23                              |
| 2308            | -5.56                                           | 27.80                              |
| 2309            | -5.47                                           | 28.38                              |
| 2310            | -5.38                                           | 28.97                              |
| 2311            | -5.32                                           | 29.38                              |
| 2312            | -5.31                                           | 29.44                              |
| 2313            | -5.29                                           | 29.58                              |
| 2314            | -5.29                                           | 29.58                              |
| 2315            | -5.27                                           | 29.72                              |
| 2316            | -5.23                                           | 29.99                              |
| 2317            | -5.17                                           | 30.41                              |
| 2318            | -5.10                                           | 30.90                              |
| 2319            | -5.04                                           | 31.33                              |
| 2320            | -4.99                                           | 31.70                              |
| 2321            | -4.97                                           | 31.84                              |
| 2322            | -4.97                                           | 31.84                              |
| 2323            | -4.98                                           | 31.77                              |
| 2324            | -5.00                                           | 31.62                              |
| 2325            | -5.00                                           | 31.62                              |
| 2326            | -4.98                                           | 31.77                              |
| 2327            | -4.93                                           | 32.14                              |
| 2328            | -4.89                                           | 32.43                              |
| 2329            | -4.85                                           | 32.73                              |
| 2330            | -4.83                                           | 32.89                              |
| 2331            | -4.83                                           | 32.89                              |
| 2332            | -4.84                                           | 32.81                              |
| 2333            | -4.87                                           | 32.58                              |
| 2334            | -4.88                                           | 32.51                              |
| 2335            | -4.88                                           | 32.51                              |
| 2336            | -4.85                                           | 32.73                              |
| 2337            | -4.81                                           | 33.04                              |
| 2338            | -4.76                                           | 33.42                              |
| 2339            | -4.73                                           | 33.65                              |
| 2340            | -4.71                                           | 33.81                              |
| 2341            | -4.70                                           | 33.88                              |
| 2342            | -4.71                                           | 33.81                              |
| 2343            | -4.72                                           | 33.73                              |
| 2344            | -4.72                                           | 33.73                              |
| 2345            | -4.70                                           | 33.88                              |
| 2346            | -4.67                                           | 34.12                              |
| 2347            | -4.62                                           | 34.51                              |
| 2348            | -4.58                                           | 34.83                              |
| 2349            | -4.54                                           | 35.16                              |
| 2350            | -4.52                                           | 35.32                              |
| 2351            | -4.52                                           | 35.32                              |
| 2352            | -4.52                                           | 35.32                              |
| 2353            | -4.53                                           | 35.24                              |
| 2354            | -4.53                                           | 35.24                              |
| 2355            | -4.51                                           | 35.40                              |
| 2356            | -4.48                                           | 35.65                              |
| 2357            | -4.44                                           | 35.97                              |
| 2358            | -4.41                                           | 36.22                              |
| 2359            | -4.38                                           | 36.48                              |
| 2360            | -4.37                                           | 36.56                              |
| 2361            | -4.38                                           | 36.48                              |
| 2362            | -4.40                                           | 36.31                              |
| 2363            | -4.41                                           | 36.22                              |
| 2364            | -4.41                                           | 36.22                              |
| 2365            | -4.39                                           | 36.39                              |
| 2366            | -4.37                                           | 36.56                              |
| 2367            | -4.35                                           | 36.73                              |
| 2368            | -4.32                                           | 36.98                              |
| 2369            | -4.30                                           | 37.15                              |





| Frequency<br>(MHz) | Integrated<br>Spherical Total<br>Isotropic Gain<br>(dBi) | Estimated<br>Radiation<br>Efficiency (%) |
|--------------------|----------------------------------------------------------|------------------------------------------|
| 2370               | -4.31                                                    | 37.07                                    |
| 2371               | -4.32                                                    | 36.98                                    |
| 2372               | -4.33                                                    | 36.90                                    |
| 2373               | -4.34                                                    | 36.81                                    |
| 2374               | -4.34                                                    | 36.81                                    |
| 2375               | -4.31                                                    | 37.07                                    |
| 2376               | -4.27                                                    | 37.41                                    |
| 2377               | -4.24                                                    | 37.67                                    |
| 2378               | -4.22                                                    | 37.84                                    |
| 2379               | -4.22                                                    | 37.84                                    |
| 2380               | -4.23                                                    | 37.76                                    |
| 2381               | -4.25                                                    | 37.58                                    |
| 2382               | -4.26                                                    | 37.50                                    |
| 2383               | -4.27                                                    | 37.41                                    |
| 2384               | -4.25                                                    | 37.58                                    |
| 2385               | -4.22                                                    | 37.84                                    |
| 2386               | -4.17                                                    | 38.28                                    |
| 2387               | -4.13                                                    | 38.64                                    |
| 2388               | -4.11                                                    | 38.82                                    |
| 2389               | -4.11                                                    | 38.82                                    |
| 2390               | -4.13                                                    | 38.64                                    |
| 2391               | -4.16                                                    | 38.37                                    |
| 2392               | -4.17                                                    | 38.28                                    |
| 2393               | -4.16                                                    | 38.37                                    |
| 2394               | -4.13                                                    | 38.64                                    |
| 2395               | -4.08                                                    | 39.08                                    |
| 2396               | -4.01                                                    | 39.72                                    |
| 2397               | -3.97                                                    | 40.09                                    |
| 2398               | -3.95                                                    | 40.27                                    |
| 2399               | -3.94                                                    | 40.36                                    |
| 2400               | -3.97                                                    | 40.09                                    |
| 2401               | -4.00                                                    | 39.81                                    |
| 2402               | -4.01                                                    | 39.72                                    |
| 2403               | -3.99                                                    | 39.90                                    |
| 2404               | -3.94                                                    | 40.36                                    |
| 2405               | -3.87                                                    | 41.02                                    |
| 2406               | -3.80                                                    | 41.69                                    |
| 2407               | -3.74                                                    | 42.27                                    |
| 2408               | -3.70                                                    | 42.66                                    |
| 2409               | -3.70                                                    | 42.66                                    |
| 2410               | -3.73                                                    | 42.36                                    |
| 2411               | -3.76                                                    | 42.07                                    |
| 2412               | -3.77                                                    | 41.98                                    |
| 2413               | -3.74                                                    | 42.27                                    |
| 2414               | -3.68                                                    | 42.85                                    |
| 2415               | -3.59                                                    | 43.75                                    |
| 2416               | -3.52                                                    | 44.46                                    |
| 2417               | -3.46                                                    | 45.08                                    |
| 2418               | -3.44                                                    | 45.29                                    |
| 2419               | -3.46                                                    | 45.08                                    |
| 2420               | -3.50                                                    | 44.67                                    |
| 2421               | -3.55                                                    | 44.16                                    |
| 2422               | -3.57                                                    | 43.95                                    |
| 2423               | -3.55                                                    | 44.16                                    |
| 2424               | -3.50                                                    | 44.67                                    |
| 2425               | -3.43                                                    | 45.39                                    |
| 2426               | -3.36                                                    | 46.13                                    |
| 2427               | -3.33                                                    | 46.45                                    |
| 2428               | -3.33                                                    | 46.45                                    |
| 2429               | -3.38                                                    | 45.92                                    |
| 2430               | -3.43                                                    | 45.39                                    |
| 2431               | -3.49                                                    | 44.77                                    |
| 2432               | -3.50                                                    | 44.67                                    |
| 2433               | -3.48                                                    | 44.87                                    |
| 2434               | -3.41                                                    | 45.60                                    |
| 2435               | -3.33                                                    | 46.45                                    |
| 2436               | -3.26                                                    | 47.21                                    |
| 2437               | -3.22                                                    | 47.64                                    |
| 2438               | -3.23                                                    | 47.53                                    |
| 2439               | -3.28                                                    | 46.99                                    |

| Frequency<br>(MHz) | Integrated<br>Spherical Total<br>Isotropic Gain<br>(dBi) | Estimated<br>Radiation<br>Efficiency (%) |
|--------------------|----------------------------------------------------------|------------------------------------------|
| 2440               | -3.35                                                    | 46.24                                    |
| 2441               | -3.40                                                    | 45.71                                    |
| 2442               | -3.41                                                    | 45.60                                    |
| 2443               | -3.36                                                    | 46.13                                    |
| 2444               | -3.28                                                    | 46.99                                    |
| 2445               | -3.18                                                    | 48.08                                    |
| 2446               | -3.11                                                    | 48.87                                    |
| 2447               | -3.09                                                    | 49.09                                    |
| 2448               | -3.12                                                    | 48.75                                    |
| 2449               | -3.19                                                    | 47.97                                    |
| 2450               | -3.28                                                    | 46.99                                    |
| 2451               | -3.33                                                    | 46.45                                    |
| 2452               | -3.33                                                    | 46.45                                    |
| 2453               | -3.29                                                    | 46.88                                    |
| 2454               | -3.18                                                    | 48.08                                    |
| 2455               | -3.07                                                    | 49.32                                    |
| 2456               | -2.98                                                    | 50.35                                    |
| 2457               | -2.95                                                    | 50.70                                    |
| 2458               | -2.99                                                    | 50.23                                    |
| 2459               | -3.08                                                    | 49.20                                    |
| 2460               | -3.17                                                    | 48.19                                    |
| 2461               | -3.25                                                    | 47.32                                    |
| 2462               | -3.29                                                    | 46.88                                    |
| 2463               | -3.26                                                    | 47.21                                    |
| 2464               | -3.18                                                    | 48.08                                    |
| 2465               | -3.09                                                    | 49.09                                    |
| 2466               | -3.02                                                    | 49.89                                    |
| 2467               | -3.01                                                    | 50.00                                    |
| 2468               | -3.07                                                    | 49.32                                    |
| 2469               | -3.19                                                    | 47.97                                    |
| 2470               | -3.30                                                    | 46.77                                    |
| 2471               | -3.39                                                    | 45.81                                    |
| 2472               | -3.43                                                    | 45.39                                    |
| 2473               | -3.40                                                    | 45.71                                    |
| 2474               | -3.32                                                    | 46.56                                    |
| 2475               | -3.23                                                    | 47.53                                    |
| 2476               | -3.16                                                    | 48.31                                    |
| 2477               | -3.14                                                    | 48.53                                    |
| 2478               | -3.19                                                    | 47.97                                    |
| 2479               | -3.30                                                    | 46.77                                    |
| 2480               | -3.40                                                    | 45.71                                    |
| 2481               | -3.47                                                    | 44.98                                    |
| 2482               | -3.48                                                    | 44.87                                    |
| 2483               | -3.43                                                    | 45.39                                    |
| 2484               | -3.33                                                    | 46.45                                    |
| 2485               | -3.22                                                    | 47.64                                    |
| 2486               | -3.15                                                    | 48.42                                    |
| 2487               | -3.14                                                    | 48.53                                    |
| 2488               | -3.22                                                    | 47.64                                    |
| 2489               | -3.33                                                    | 46.45                                    |
| 2490               | -3.44                                                    | 45.29                                    |
| 2491               | -3.51                                                    | 44.57                                    |
| 2492               | -3.52                                                    | 44.46                                    |
| 2493               | -3.47                                                    | 44.98                                    |
| 2494               | -3.37                                                    | 46.03                                    |
| 2495               | -3.27                                                    | 47.10                                    |
| 2496               | -3.22                                                    | 47.64                                    |
| 2497               | -3.24                                                    | 47.42                                    |
| 2498               | -3.33                                                    | 46.45                                    |
| 2499               | -3.45                                                    | 45.19                                    |
| 2500               | -3.58                                                    | 43.85                                    |
| 2501               | -3.59                                                    | 43.75                                    |
| 2502               | -3.60                                                    | 43.65                                    |
| 2503               | -3.55                                                    | 44.16                                    |
| 2504               | -3.45                                                    | 45.19                                    |
| 2505               | -3.35                                                    | 46.24                                    |
| 2506               | -3.30                                                    | 46.77                                    |
| 2507               | -3.32                                                    | 46.56                                    |
| 2508               | -3.43                                                    | 45.39                                    |
| 2509               | -3.57                                                    | 43.95                                    |

| Frequency<br>(MHz) | Integrated<br>Spherical Total<br>Isotropic Gain<br>(dBi) | Estimated<br>Radiation<br>Efficiency (%) |
|--------------------|----------------------------------------------------------|------------------------------------------|
| 2510               | -3.72                                                    | 42.46                                    |
| 2511               | -3.83                                                    | 41.40                                    |
| 2512               | -3.87                                                    | 41.02                                    |
| 2513               | -3.83                                                    | 41.40                                    |
| 2514               | -3.74                                                    | 42.27                                    |
| 2515               | -3.63                                                    | 43.35                                    |
| 2516               | -3.56                                                    | 44.06                                    |
| 2517               | -3.56                                                    | 44.06                                    |
| 2518               | -3.64                                                    | 43.25                                    |
| 2519               | -3.77                                                    | 41.98                                    |
| 2520               | -3.89                                                    | 40.83                                    |
| 2521               | -3.96                                                    | 40.18                                    |
| 2522               | -3.98                                                    | 39.99                                    |
| 2523               | -3.91                                                    | 40.64                                    |
| 2524               | -3.79                                                    | 41.78                                    |
| 2525               | -3.67                                                    | 42.95                                    |
| 2526               | -3.57                                                    | 43.95                                    |
| 2527               | -3.54                                                    | 44.26                                    |
| 2528               | -3.60                                                    | 43.65                                    |
| 2529               | -3.70                                                    | 42.66                                    |
| 2530               | -3.81                                                    | 41.59                                    |
| 2531               | -3.87                                                    | 41.02                                    |
| 2532               | -3.88                                                    | 40.93                                    |
| 2533               | -3.81                                                    | 41.59                                    |
| 2534               | -3.70                                                    | 42.66                                    |
| 2535               | -3.58                                                    | 43.85                                    |
| 2536               | -3.51                                                    | 44.57                                    |
| 2537               | -3.51                                                    | 44.57                                    |
| 2538               | -3.57                                                    | 43.95                                    |
| 2539               | -3.69                                                    | 42.76                                    |
| 2540               | -3.79                                                    | 41.78                                    |
| 2541               | -3.87                                                    | 41.02                                    |
| 2542               | -3.88                                                    | 40.93                                    |
| 2543               | -3.82                                                    | 41.50                                    |
| 2544               | -3.73                                                    | 42.36                                    |
| 2545               | -3.63                                                    | 43.35                                    |
| 2546               | -3.58                                                    | 43.85                                    |
| 2547               | -3.62                                                    | 43.45                                    |
| 2548               | -3.72                                                    | 42.46                                    |
| 2549               | -3.84                                                    | 41.30                                    |
| 2550               | -3.98                                                    | 39.99                                    |