EMPOWER RF SYSTEMS, INC.

# ACCEPTANCE TEST REPORT

**SKU 2200**

**ELECTRICAL SPECIFICATIONS** @ 230VAC Single-phase, 25°C ambient, 200W System, MGC mode unless specified otherwise

| Parameter | Specifications | | | | | | Frequency (MHz) & Test Results | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Symbol | Min | Typ | Max | Unit | Notes | 2500 | 2850 | 3200 | 3550 | 3900 | 4250 | 4600 | 4950 | 5300 | 5650 | 6000 | Pass/Fail |
| Operating Frequency Range | BW | 2500 | | 6000 | MHz | Plot 1 (pg4) | x | x | x | x | x | x | x | x | x | x | x | Pass |
| Input Frequency Hopping<br>f1 to f2 >100µS,minimum dwell =20µS | $F_{1-2}$ | 100 | | | µSec | Record (see pg6) | x | x | x | x | x | x | x | x | x | x | x | Pass |
| Output Power CW @ 200W (into 2:1 VSWR) | $P_{out}$ | 53 | | | dBm | Record | 53 | 53 | 53 | 53 | 53 | 53 | 53 | 53 | 53 | 53 | 53 | Pass |
| Power Reporting Accuracy | $P_{FWD}$ | | | ±1.5 | dB | Record (see pg3) | x | x | x | x | x | x | x | x | x | x | x | Pass |
| | $P_{REV}$ | | | ±1.5 | dB | | x | x | x | x | x | x | x | x | x | x | x | Pass |
| Sample Port @ $P_{OUT}$ = 53 dBm | $P_{sample}$ | -2 | | 2 | dBm | Record | 0.09 | -0.1 | -0.15 | -0.42 | -0.44 | -0.65 | -0.75 | -0.87 | -0.7 | -0.8 | -0.9 | Pass |
| Input Power for rated $P_{OUT}$ = 200W<br>(CW-MGC MODE minimum VVA attenuation) | $P_{IN}$ | -10 | | 2 | dBm | Record | -6.23 | -5.2 | -2.4 | -2.6 | -8 | -6.6 | -6.3 | -4.7 | -2.9 | -6.1 | -0.7 | Pass |
| Small Signal Gain Flatness, $P_{IN}$ = -30dBm | ΔG | | | ±2.5 | dB | Plot 1 (pg4) | x | x | x | x | x | x | x | x | x | x | x | Pass |
| Leveled ALC Flatness @ 53dBm | ΔALC | | | ±1.5 | dB | Plot 2 (pg4) | x | x | x | x | x | x | x | x | x | x | x | Pass |
| Gain Adjustment Range | VVA | 20 | | | dB | Plot 3 (pg4) | x | x | x | x | x | x | x | x | x | x | x | Pass |
| Wide Band Noise Level, beyond 3MHz from carrier, including phase noise | $No_{WIDE}$ | | | -50 | dBm/kHz | Record (DVT ONLY) | -87.5 | -86.7 | -86.8 | -88.5 | -87.38 | -88 | -89.1 | -91.1 | -90.3 | -93.1 | -95.5 | Pass |
| RF Noise in transmission mode<br>@ 53dB Gain, @ 5MHz from carrier, inc phase noise | No | | | -75 | dBm/Hz | Record (DVT ONLY) | -121.5 | -120.5 | -121.3 | -122.5 | -121.3 | -121.7 | -122.5 | -125.4 | -124.2 | -126.6 | -128.5 | Pass |
| Input Return Loss | $S_{11}$ | | | -10 | dB | Plot 4 (pg4) | x | x | x | x | x | x | x | x | x | x | x | Pass |
| Inter-modulation (2nd Order)<br>2-Tones @ 47dBm/Tone | $IMD_{2nd}$ Δ =10kHz | | | -20 | dBc | Record | -21.5 | -23 | -51 | -84 | -100 | -83 | -87 | -85 | -89 | -81 | -90 | Pass |
| | $IMD_{2nd}$ Δ=1MHz | | | -20 | dBc | Record | -21.5 | -23.5 | -51 | -83 | -95 | -83 | -87 | -85 | -89 | -80 | -90 | Pass |
| Inter-modulation (3rd Order)<br>2-Tones @ 47dBm/Tone | $IMD_{3rd}$ Δ =10kHz | | | -23 | dBc | Record | -25.2 | -25 | -26 | -23 | -24 | -27 | -27 | -26 | -24 | -26 | -36 | Pass |
| | $IMD_{3rd}$ Δ=1MHz | | | -23 | dBc | Record | -29 | -27 | -25 | -28 | -29 | -31 | -30 | -30 | -29 | -31 | -24 | Pass |
| Out-of-Band IMD Distortion Level<br>2-Tones @ 47dBm/Tone, Δ =1MHz | >6500MHz | | | -50 | dBc | Record | x | x | x | x | x | x | x | x | x | x | -62 | Pass |
| In-Band Harmonics @ $P_{out}$ = 200W CW | $2^{nd}$ | | -15 | -12 | dBc | Record | -22 | -25 | -55 | -88 | -86 | -86 | -87 | -88 | -87 | -73 | -88 | Pass |
| | $3^{rd}$ | | -19 | -13 | dBc | | -75 | -73 | -74 | -91 | -84 | -71 | -83 | -78 | -72 | -88 | -68 | Pass |
| Out-of-Band Harmonic Distortion Level<br>@ Pout = 200W | >6500MHz | | | -50 | dBc | Record | -74 | -80 | -90 | -91 | -90 | -71 | -85 | -70 | -71 | -83 | -68 | Pass |
| Spurious Signals | Spur | | -70 | -60 | dBc | Record | -75 | x | x | x | x | -74 | x | x | x | x | -73 | Pass |
| AM Modulation 85% depth FC = 4000MHz<br>@ 56W average (~200W peak) | 3kHz | | | -20 | dBc | Record | -22 | | | | | | | | | | | Pass |
| Switching Time, 1KHz TTL, PIN = 0dBm | $T_{ON\ 90\%}$ | | | 10 | µSec | Plot 5 (pg5) | 1.7 | | | | | | | | | | | Pass |
| | $T_{OFF\ 10\%}$ | | | 10 | | Plot 6 (pg5) | 1.7 | | | | | | | | | | | Pass |
| Operating Voltage (Single phase 50/60Hz) | $V_{AC}$ | 207 | 230 | 253 | Volt | Verify | √ | | | | | | | | | | | Pass |
| Power Consumption @ Cold Standby | $I_{SD}$ | | | 550 | VA | Record | 410 | | | | | | | | | | | Pass |
| Power Consumption @ Hot Standby | $I_{SB}$ | | | 800 | VA | Record | 612 | | | | | | | | | | | Pass |
| Power Consumption @ $P_{OUT}$ = 200W | $P_D$ | | | 1800 | VA | Record | 1223 | 1221 | 1431 | 1406 | 1252 | 1350 | 1454 | 1649 | 1822 | 1601 | 2046 | Fail |
| Power Factor @ $P_{OUT}$ = 200W | PF | 0.8 | | | | Record | 0.970 | 0.971 | 0.970 | 0.970 | 0.975 | 0.975 | 0.980 | 0.980 | 0.980 | 0.970 | 0.970 | Pass |
| AC Power THD (voltage / current) | THD | | | 5 | % | Record | 1.1 | 1.1 | 1.1 | 1.1 | 1.1 | 1.1 | 1.1 | 1.1 | 1.3 | 1.3 | 1.2 | Pass |
| NTE Test, Limiter = 53.5dBm (AGC mode) | $P_{OOD}$ | | | 53.5 | dBm | Record $P_{OUT}$ | 53.5 | x | x | x | x | 53.5 | x | x | x | x | 53.5 | Pass |
| Input Overdrive –Shut down | $P_{IOD}$ | | | 8 | dBm | Verify | √ | | | | | | | | | | | Pass |
| Thermal Overload @ device flange –Shut down | $T_{SD}$ | | | 80 | °C | Verified | √ | | | | | | | | | | | - |
| Reflected Power Reduction Point<br>(Approx. 3.5:1 VSWR trip point; max reduction -6dB) | VSWR | | | >3:1 | VSWR | Verify | √ | | | | | | | | | | | Pass |

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# ACCEPTANCE TEST REPORT

**SKU 2200**

**Power Reporting Accuracy**

| Forward Power, 50 Ohm Load (ALC MODE) | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Frequency (MHz)** | **Measuremnt Method** | **PIN =0dBm** | **PIN =0dBm** | **PIN =0dBm** | **PIN =0dBm** | **Limits** | **Pass/Fail** |
| **2500** | External Test Equipment | 52.8 | 49.7 | 46.8 | 45.2 | **±1.5 dB** | **Pass** |
| | Ethernet Reporting | 53 | 50.4 | 47.3 | 45.3 | | |
| | Pass/Fail | P | P | P | P | | |
| **4250** | External Test Equipment | 53.1 | 49.8 | 46.9 | 44.9 | **±1.5 dB** | **Pass** |
| | Pass/Fail | P | P | P | P | | |
| **6000** | External Test Equipment | 52.8 | 50 | 46.8 | 45 | **±1.5 dB** | **Pass** |
| | Pass/Fail | P | P | P | P | | |

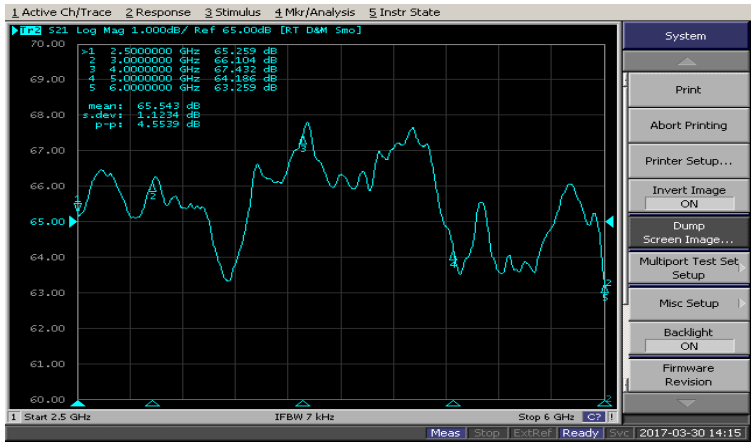
| Reverse Power, Open Load (AGC MODE) | | | | | |
|---|---|---|---|---|---|
| **Frequency (MHz)** | **Measuremnt Method** | **PIN =-10dBm** | **PIN =-8dBm** | **PIN =-7dBm** | **PIN =-6dBm** |
| **2500** | External Test Equipment FWD PWR | **42** | **43** | **43.9** | **44.9** |
| | Ethernet Reporting FWD PWR | **42.6** | **43.6** | **44.3** | **45.3** |
| | Ethernet Reporting REV PWR | **40** | **41.3** | **42.2** | **43.2** |
| **4250** | External Test Equipment FWD PWR | **43.3** | **44** | **46.1** | **47.4** |
| | Ethernet Reporting FWD PWR | **43** | **45.3** | **46.3** | **47.9** |
| | Ethernet Reporting REV PWR | **41** | **43.3** | **43** | **45** |
| **6000** | External Test Equipment FWD PWR | **40.3** | **42.1** | **43.2** | **44.5** |
| | Ethernet Reporting FWD PWR | **42.7** | **44.5** | **45.6** | **47.2** |
| | Ethernet Reporting REV PWR | **41** | **40** | **43** | **44** |

**PERFORMANCE PLOTS**

**Plot 1 - Small Signal Gain**

Top Curve: Small Signal Gain @ $P_{IN}$ = -30dBm

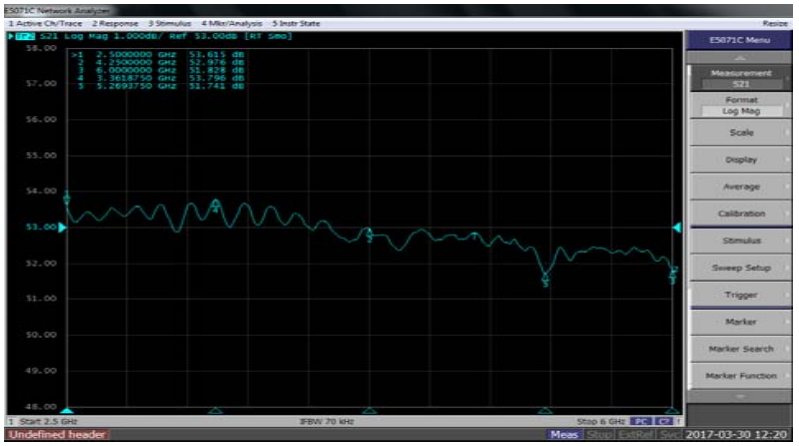
Reference: 65dB, 1dB/div.




**Plot 2 - Leveled ALC Flatness - 200W**

Top Curve: Power Gain @ Constant PIN = 0dBm

Reference: 53dB, 1dB/Div.

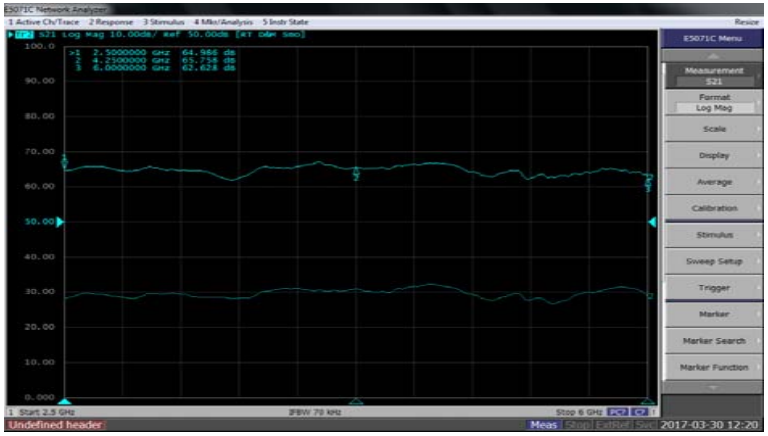



**Plot 3 -Gain Adjustment Range**

Top Curve: Max Signal Gain @ PIN = -30dBm

Reference Level: 50dB, 10dB/div.

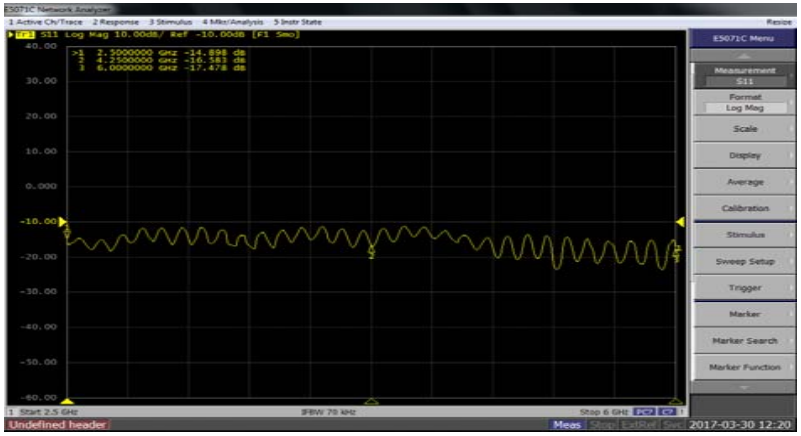
Bottom Curve: Minumum Signal Gain @ PIN = -30dBm




**Plot 4- Small Signal Return Loss**

Top Curve: Input Return loss

Reference: -10dB, 10dB/div.



**PERFORMANCE PLOTS**

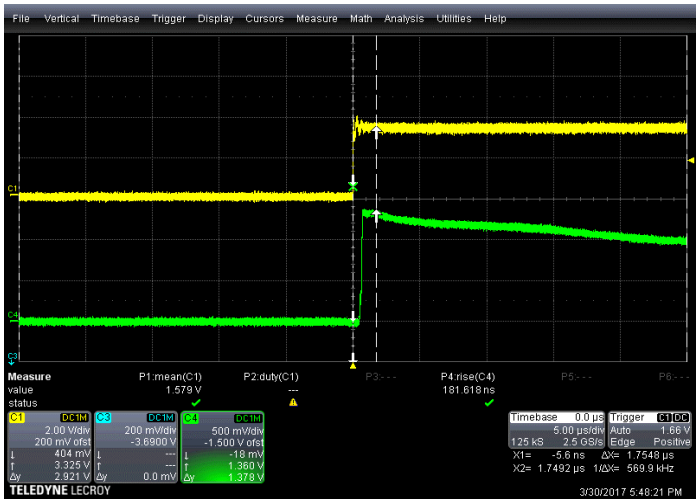
**Plot 5 - Switching Time (on)**

Top Curve: Control Signal

Reference: Yellow trace

Bottom Curve: Detected Output RF Response

Reference: Blue trace




**Plot 6 - Switching Time (off)**

Top Curve: Control Signal

Reference: Yellow trace

Bottom Curve: Detected Output RF Response

Reference: Blue trace