# FCC PART 90

# TEST AND MEASUREMENT REPORT

For

## SYM Technology, Inc.

234 E. Colorado Blvd., STE 410
Pasadena, CA 91101

## FCC ID: W74-V308919

| **Report Type:** | **Product Type:** |
|---|---|
| Original Report | Bi-Directional Amplifier |

| | |
|---|---|
| **Test Engineer:** | Jeffrey Wu |
| **Report Number:** | R12043014-90 |
| **Report Date:** | 2012-06-19 |
| **Reviewed By:** | Victor Zhang<br>EMC/RF Lead |

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Fax: (408) 732 9164

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## DOCUMENT REVISION HISTORY

| Revision Number | Report Number | Description of Revision | Date of Revision |
|---|---|---|---|
| 0 | R12043014-90 | Original Report | 2012-08-07 |

# 1 GENERAL INFORMATION

## 1.1 Product Description for Equipment under Test (EUT)

This test and measurement report was prepared on behalf of *SYM Technology, Inc.* and their product *FCC ID: W74-V308919*, model: *Vision30, o*r the "EUT" as referred to in this report. The EUT is a bi- directional amplifier with removable service cards operating in the PCS and SMR bands. The frequency bands are: 806-824/ 896-901/ 1850-1915 MHz for uplink and 851-869/ 935-940/ 1930-1995 MHz for downlink. Modulation types are iDEN, CDMA and LTE.

## 1.2 Mechanical Description

The EUT Approximate measurement is: 48 cm (L) x 29 cm (W) x 50 cm (H). Weight: 40823g.

*The test data gathered are from typical production sample, serial number: R12043014 assigned by Manufacture.*

## 1.3 Objective

This type approval report is prepared on behalf of *SYM Technology, Inc.* in accordance with Part 90 of the Federal Communication Commissions rules.

The objective is to determine compliance with FCC rules for RF output power, modulation characteristic, occupied bandwidth, spurious emissions at antenna terminal, field strength of spurious radiation, frequency stability, Emission Mask, and conducted and radiated margin.

## 1.4 Related Submittal(s)/Grant(s)

No Related Submittals

## 1.5 Test Methodology

All tests and measurements indicated in this document were performed in accordance with the Code of Federal Regulations Title 47 Part 2, Sub-part J as well as the following parts:

Part 90 Private Land Mobile Radio Services

Applicable Standards: TIA/EIA-603-C

All radiated and conducted emissions measurement was performed at Bay Area Compliance Laboratory, Corp. The radiated testing was performed at an antenna-to-EUT distance of 3 meters.

## 1.6 Measurement Uncertainty

All measurements involve certain levels of uncertainties, especially in the field of EMC. The factors contributing to uncertainties are spectrum analyzer, cable loss, antenna factor calibration, antenna directivity, antenna factor variation with height, antenna phase center variation, antenna factor frequency interpolation, measurement distance variation, site imperfections, mismatch (average), and system repeatability.

Based on NIS 81, The Treatment of Uncertainty in EMC Measurements, the values ranging from +2.0 dB for Conducted Emissions tests and +4.0 dB for Radiated Emissions tests are the most accurate estimates pertaining to uncertainty of EMC measurements at BACL Corp.

Detailed instrumentation measurement uncertainties can be found in BACL Corp. report QAP-018.

## 1.7 Test Facility

The test site used by BACL Corp. to collect radiated and conducted emissions measurement data is located at its facility in Sunnyvale, California, USA.

The test site at BACL Corp. has been fully described in reports submitted to the Federal Communication Commission (FCC) and Voluntary Control Council for Interference (VCCI). The details of these reports have been found to be in compliance with the requirements of Section 2.948 of the FCC Rules on February 11 and December 10, 1997, and Article 8 of the VCCI regulations on December 25, 1997. The test site also complies with the test methods and procedures set forth in CISPR 22:2008 §10.4 for measurements below 1 GHz and §10.6 for measurements above 1 GHz as well as ANSI C63.4-2003, ANSI C63.4-2009, TIA/EIA-603 & CISPR 24:2010.

The Federal Communications Commission and Voluntary Control Council for Interference have the reports on file and they are listed under FCC registration number: 90464 and VCCI Registration No.: A-0027. The test site has been approved by the FCC and VCCI for public use and is listed in the FCC Public Access Link (PAL) database.

Additionally, BACL Corp. is an American Association for laboratory Accreditation (A2LA) accredited laboratory (Lab Code 3297-02). The current scope of accreditations can be found at http://www.a2la.org/scopepdf/3297-02.pdf?CFID=1132286&CFTOKEN=e42a3240dac3f6ba-6DE17DCB-1851-9E57-477422F667031258&jsessionid=8430d44f1f47cf2996124343c704b367816b

# 2 SYSTEM TEST CONFIGURATION

## 2.1 Justification

The EUT was configured for testing according to TIA/EIA-603-C.

The final qualification test was performed with the EUT operating at normal mode.

## 2.2 EUT Exercise Software

The software used was web based GUI via Lan Port(Http://192.168.2.1) provided by Sym Technology and was verified by BACL (name of tester) to comply with the standard requirements being tested against.

## 2.3 Equipment Modifications

No modifications were made to the EUT.

## 2.4 Local Support Equipment and Software List and Details

| Manufacturer | Description | Model | Serial Number |
|---|---|---|---|
| Dell | Laptop | Latitude D600 | - |

## 2.5 EUT Host Internal Configuration

| Manufacturer | Description | Model | Serial Number |
|---|---|---|---|
| SYM Technology | Vision Rectifier (Power Supply) | VS-RET | - |
| SYM Technology | Vision Network Controller | VS-CTR | - |
| SYM Technology | Vision Main Frame Enclosure | VS-MF | - |
| SYM Technology | Vision 800/900MHz Digital Unit | V89DTU | - |
| SYM Technology | Vision 800/900MHz RF Unit | V89RFM | - |
| SYM Technology | Vision 800/900MHz 30dBm HPA | V3089HPA | - |

## 2.6 Interface Ports and Cables

| Cable Description | Length (m) | To | From |
|---|---|---|---|
| RF cable | <1 | Signal Generator | Input/ EUT |
| RF cable | <1 | Output/ EUT | Spectrum Analyzer |

# 3 SUMMARY OF TEST RESULTS

| FCC Rules | Description of Tests | Results |
|---|---|---|
| §2.1046, §90.635 | RF Output Power | Compliant |
| §2.1047 | Modulation Characteristics | N/A[1] |
| §2.1049 | Occupied Bandwidth | Compliant |
| §2.1051, §90.691 | Emission Mask | Compliant |
| § 2.1051,§ 90.669 | Spurious Emissions at Antenna Terminals | Compliant |
| §2.1053, §90.669 | Field Strength of Spurious Radiation | Compliant |
| §2.1055 | Frequency Stability | N/A[1] |
| §2.1091 | RF Exposure | Compliant |

Note[1]: Not applicable, the EUT is an amplifier; there is no oscillator circuit in the EUT, and there are no modulation characteristics.

# 4 FCC §2.1046 & §90.635 – RF OUTPUT POWER

## 4.1 Applicable Standard

According to FCC §2.1046, and §90.635, (a) The effective radiated power and antenna height for base stations may not exceed 1 kilowatt (30 dBw) and 304 m. (1,000 ft.) above average terrain (AAT), respectively, or the equivalent thereof as determined from the Table. These are maximum values, and applicants will be required to justify power levels and antenna heights requested, (b) The maximum output power of the transmitter for mobile stations is 100 watts (20 dBw).

## 4.2 Test Procedure

*Conducted:*

The RF output of the transmitter was connected to the signal generator and the spectrum analyzer through sufficient attenuation.

## 4.3 Test Equipment List and Details

| Manufacturers | Descriptions | Models | Serial Numbers | Calibration Dates |
|---|---|---|---|---|
| Agilent | Spectrum Analyzer | E4440A | MY44303352 | 2012-05-10 |
| Agilent | Signal Generator | E4438C | MY45091309 | 2012-05-03 |

***Statement of Traceability:*** **BACL Corp.** attests that all calibrations have been performed according to A2LA requirements, traceable to the NIST.

## 4.4 Test Environmental Conditions

| | |
|---|---|
| **Temperature:** | 21°C |
| **Relative Humidity:** | 49 % |
| **ATM Pressure:** | 101.2 kPa |

*The testing was performed by Jeffrey Wu on 2012-05-22 in RF Site.*

## 4.5 Test Results

Please refer to the following tables.

| Mode | | Channel | Frequency (MHz) | Input Power (dBm) | Output Power (dBm) |
|---|---|---|---|---|---|
| iDEN | 806-824 Uplink | Low | 806.1 | -59 | 30.3 |
| | | Middle | 815 | -59 | 30.26 |
| | | High | 823.9 | -58 | 30.26 |
| | 851-869 Downlink | Low | 851.1 | -58 | 30.63 |
| | | Middle | 860 | -60 | 30.48 |
| | | High | 868.9 | -59 | 29.87 |
| | 896-901 Uplink | Low | 896.1 | -59 | 30.69 |
| | | Middle | 898.5 | -59 | 30.08 |
| | | High | 900.9 | -59 | 30.69 |
| | 935-940 Downlink | Low | 935.1 | -59 | 30.01 |
| | | Middle | 937.5 | -59 | 30.67 |
| | | High | 939.9 | -59 | 30.76 |

# 5 FCC §2.1049 – OCCUPIED BANDWIDTH

## 5.1 Applicable Standard

Requirements: FCC §2.1049.

## 5.2 Test Procedure

The RF output of the transmitter was connected to the simulator and the spectrum analyzer through sufficient attenuation.

According to the FCC 2-11-04/EAB/RF, Input and output signals were compared to verify that there was no any degradation to the signal due to amplification and conversion from the repeater using an RBW of 300 Hz or 1% of the emission bandwidth. Then the 26 dB & 99% bandwidth was recorded.

## 5.3 Test Equipment List and Details

| Manufacturers | Descriptions | Models | Serial Numbers | Calibration Dates |
|---|---|---|---|---|
| Agilent | Spectrum Analyzer | E4440A | MY44303352 | 2012-05-10 |
| Agilent | Signal Generator | E4438C | MY45091309 | 2012-05-03 |

***Statement of Traceability:*** **BACL Corp.** attests that all calibrations have been performed according to A2LA requirements, traceable to the NIST.

## 5.4 Test Environmental Conditions

| | |
|---|---|
| **Temperature:** | 22 °C |
| **Relative Humidity:** | 51 % |
| **ATM Pressure:** | 101.3kPa |

*The testing was performed by Jeffrey Wu on 2012-05-23 in RF Site.*

## 5.5 Test Results

Please refer to the following tables.

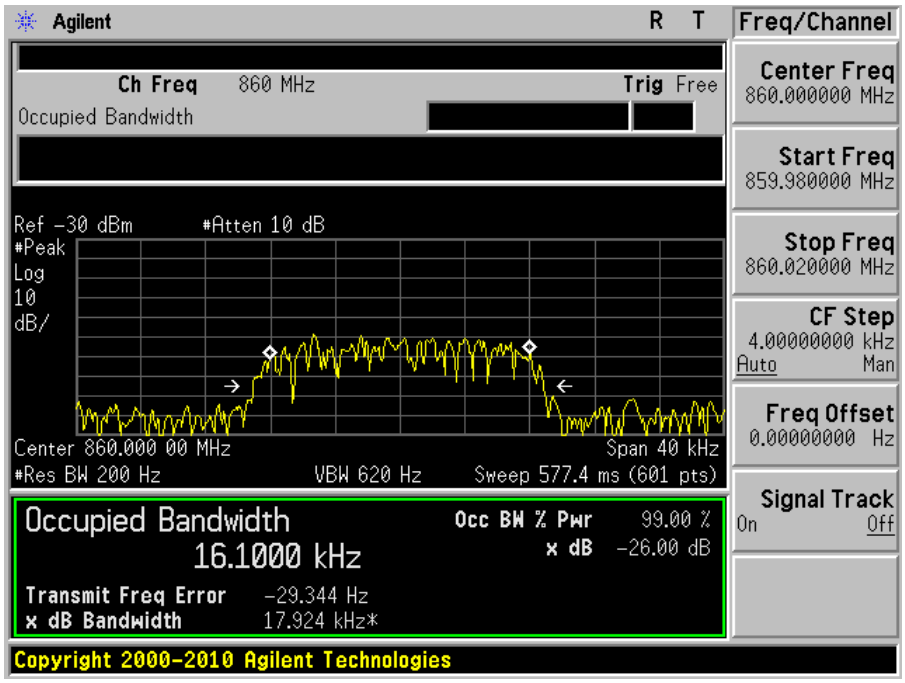
| Mode | | Channel | Frequency (MHz) | Emission Bandwidth Input (kHz) | Emission Bandwidth Output (kHz) |
|---|---|---|---|---|---|
| iDEN | 806-824 Uplink | Middle | 815 | 16.5697 | 16.1536 |
| | 851-869 Downlink | Middle | 860 | 16.1000 | 15.9209 |
| | 896-901 Uplink | Middle | 898.5 | 16.1944 | 16.4289 |
| | 935-940 Downlink | Middle | 937.5 | 15.7968 | 15.7124 |

Please refer to the following plots:

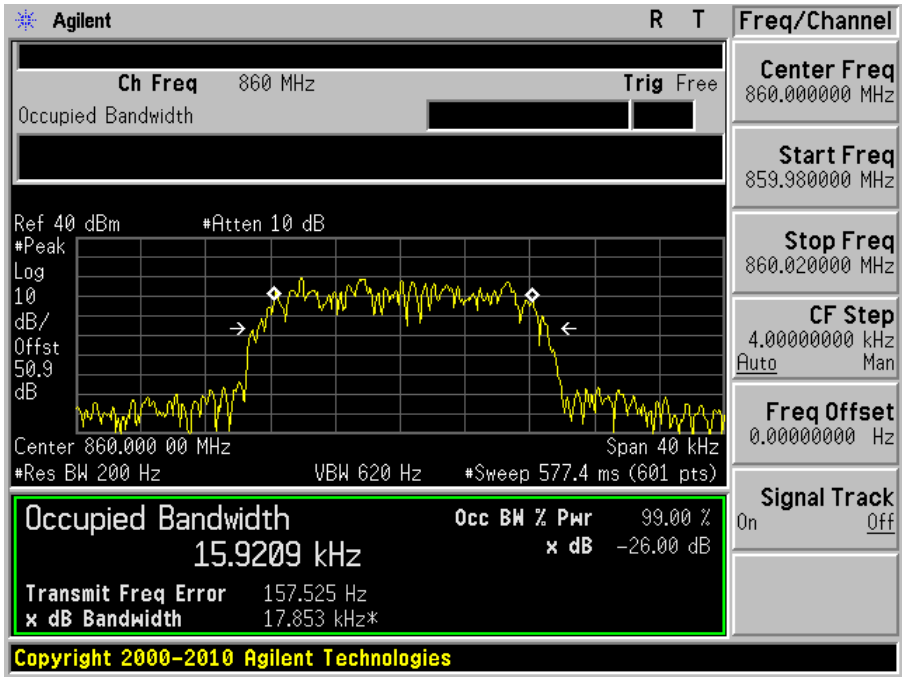
**851-869 MHz Downlink**

**Middle Channel**

Input



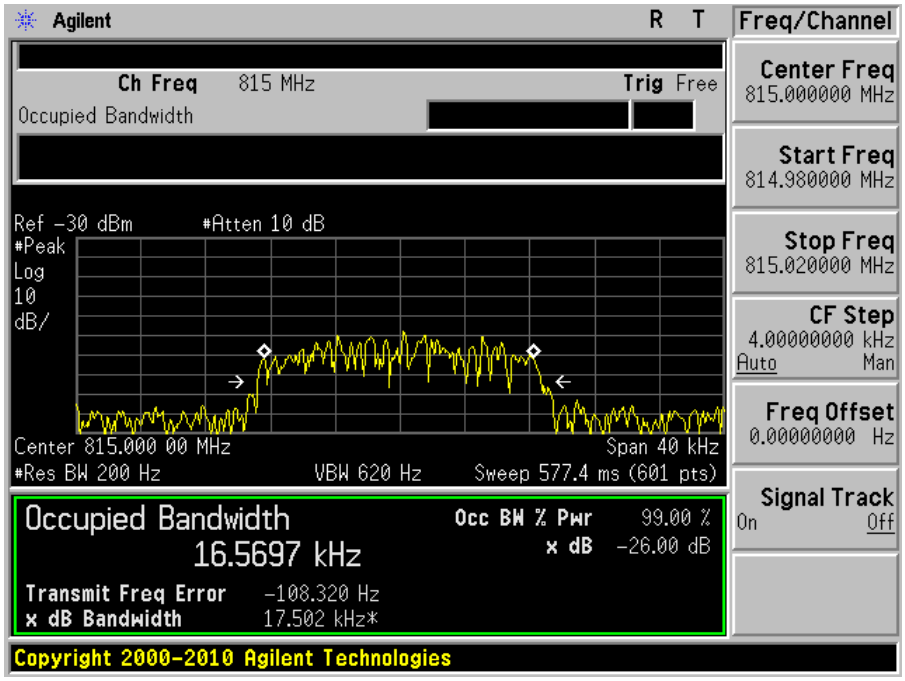

Output



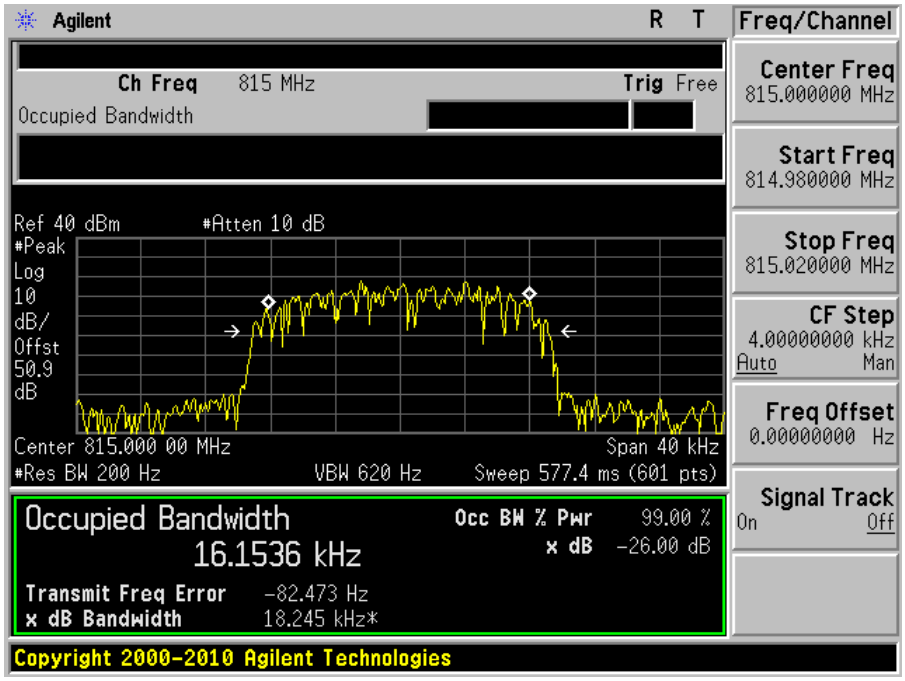
**806-824 MHz Uplink**

**Middle Channel**

Input



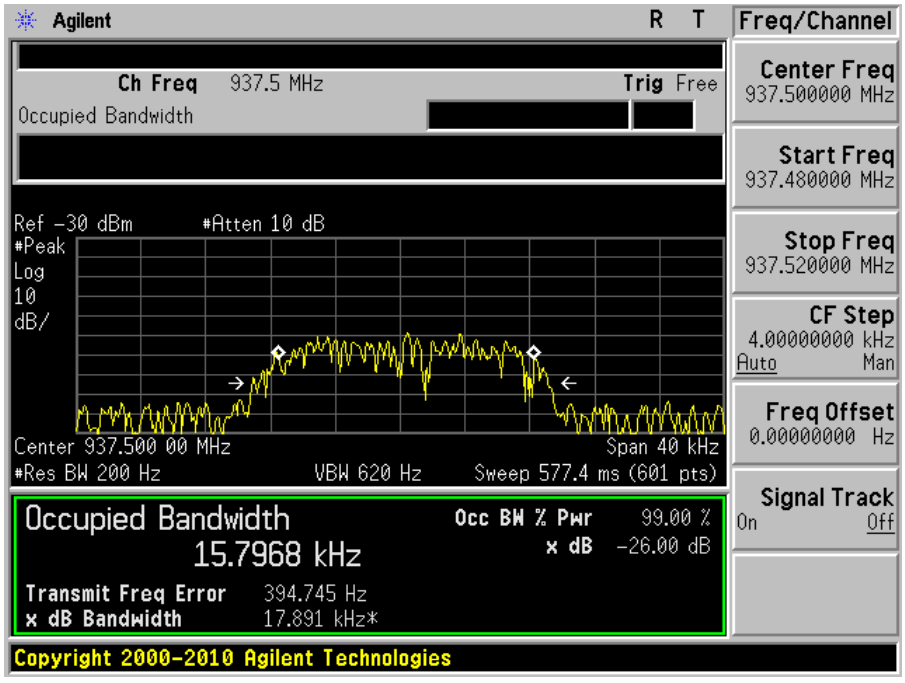

Output



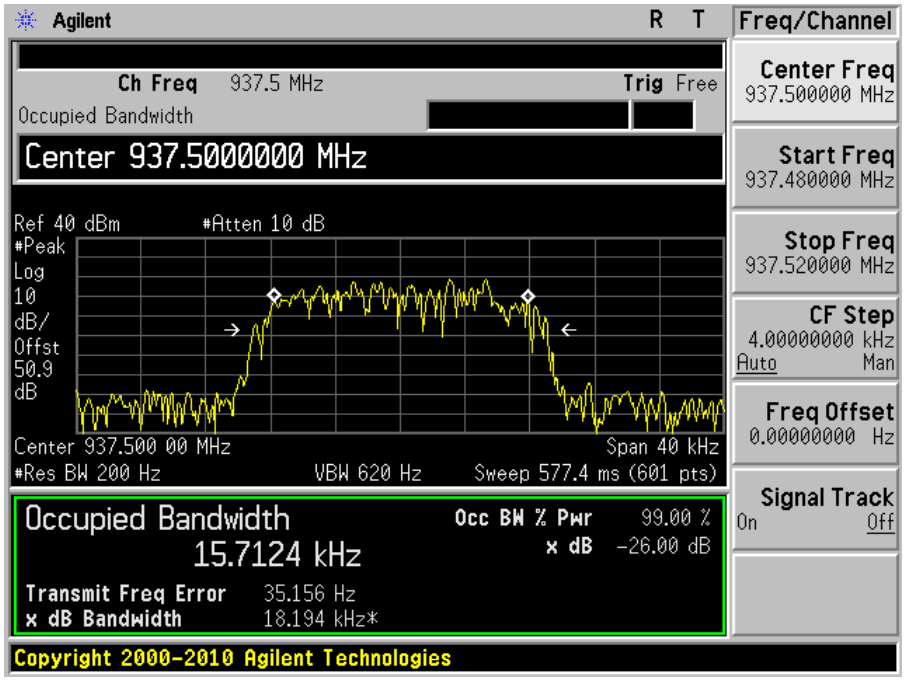
**935-940 MHz Downlink**

**Middle Channel**

Input



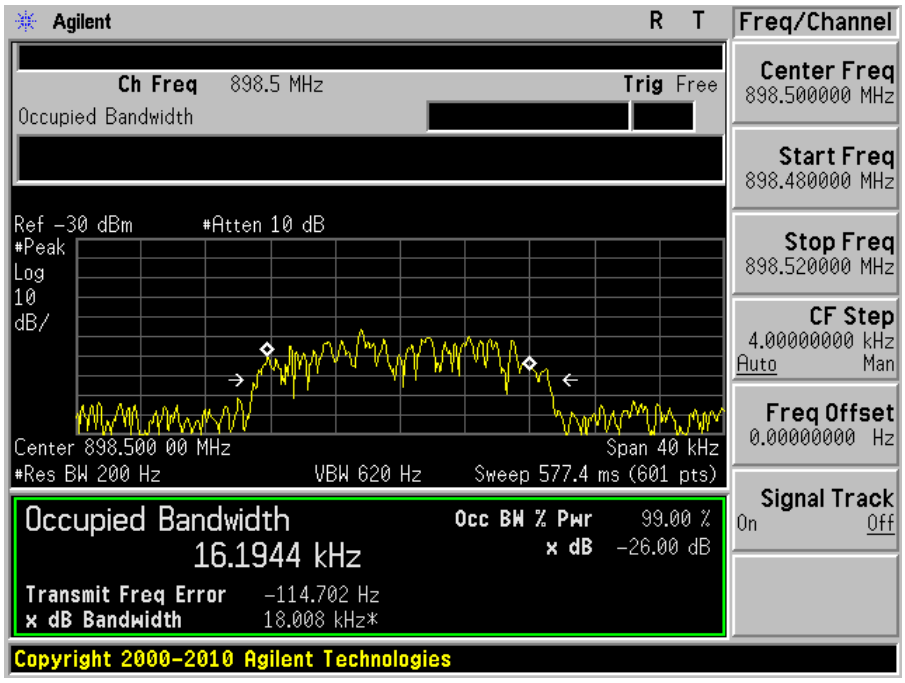

Output



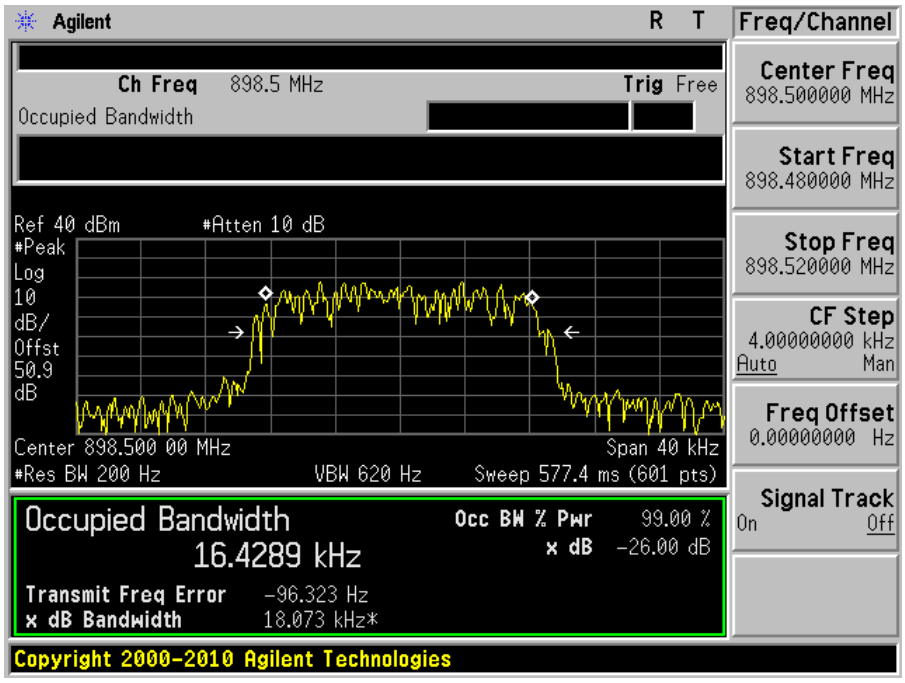
**896-901 MHz Uplink**

**Middle Channel**

Input




Output



# 6 FCC §2.1051 & §90.691 – EMISSION MASK

## 6.1 Applicable Standard

According to FCC §90.691: (a) Out-of-band emission requirement shall apply only to the “outer” channels included in an EA license and to spectrum adjacent to interior channels used by incumbent licensees. The emission limits are as follows:

(1) For any frequency removed from the EA licensee's frequency block by up to and including 37.5 kHz, the power of any emission shall be attenuated below the transmitter power (P) in watts by at least 116 Log10(f/6.1) decibels or 50 + 10 Log10(P) decibels or 80 decibels, whichever is the lesser attenuation, where f is the frequency removed from the center of the outer channel in the block in kilohertz and where f is greater than 12.5 kHz.

(2) For any frequency removed from the EA licensee's frequency block greater than 37.5 kHz, the power of any emission shall be attenuated below the transmitter power (P) in watts by at least 43 + 10Log10(P) decibels or 80 decibels, whichever is the lesser attenuation, where f is the frequency removed from the center of the outer channel in the block in kilohertz and where f is greater than 37.5 kHz.

## 6.2 Test Procedure

The RF output of the transmitter was connected to the simulator and the spectrum analyzer through sufficient attenuation.

## 6.3 Test Equipment List and Details

| Manufacturers | Descriptions | Models | Serial Numbers | Calibration Dates |
|---|---|---|---|---|
| Agilent | Spectrum Analyzer | E4440A | MY44303352 | 2012-05-10 |
| Agilent | Signal Generator | E4438C | MY45091309 | 2012-05-03 |

***Statement of Traceability:*** **BACL Corp.** attests that all calibrations have been performed according to A2LA requirements, traceable to the NIST.

## 6.4 Test Environmental Conditions

| | |
|---|---|
| **Temperature:** | 21°C |
| **Relative Humidity:** | 49 % |
| **ATM Pressure:** | 101.3kPa |

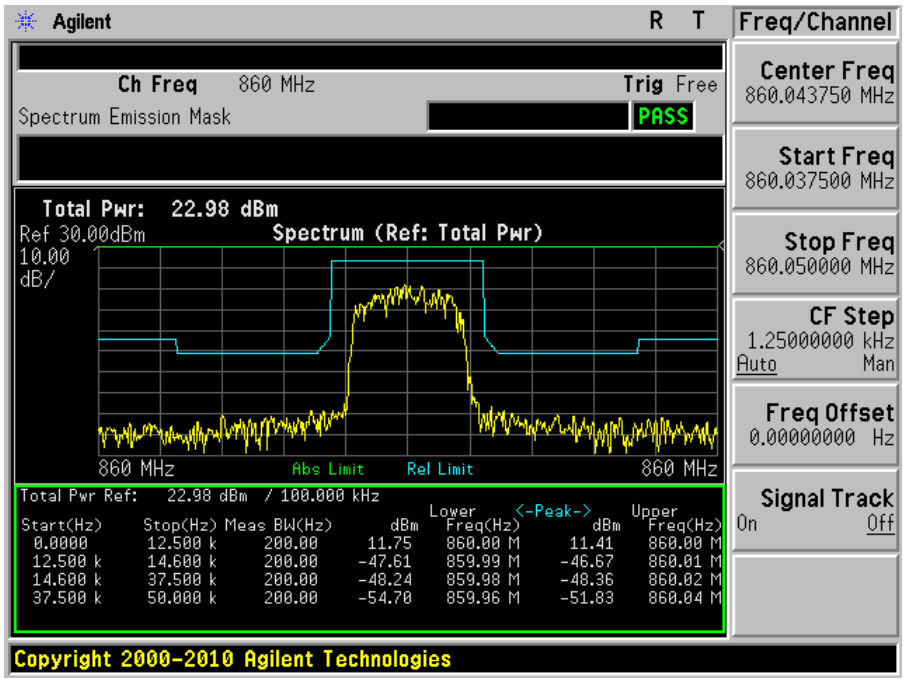
*The testing was performed by Jeffrey Wu on 2012-05-24 in RF Site.*

## 6.5 Test Results

Please refer to the following plots.

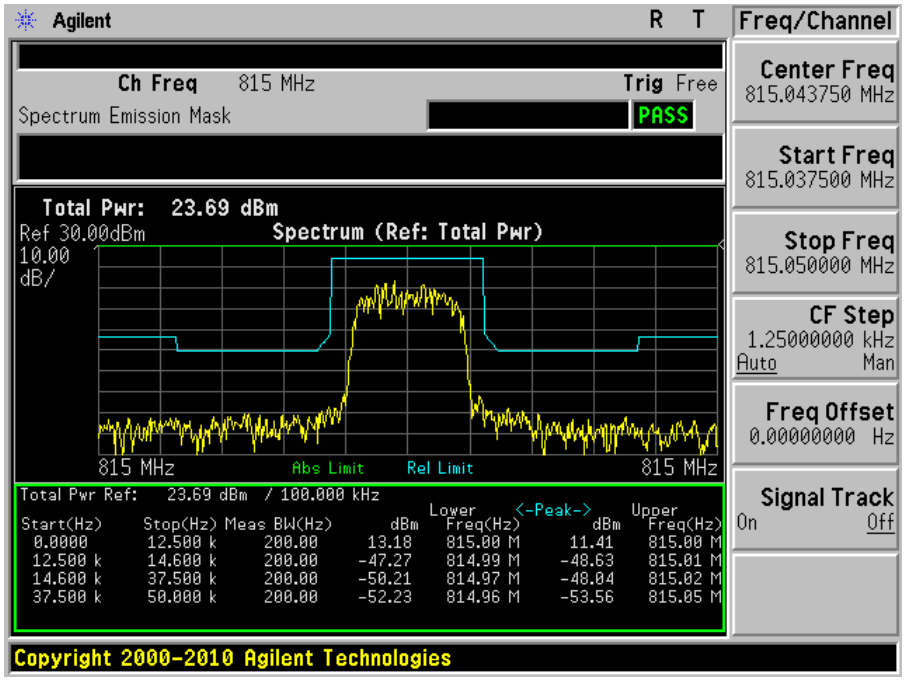
**851-869 MHz Downlink**

**Middle Channel**



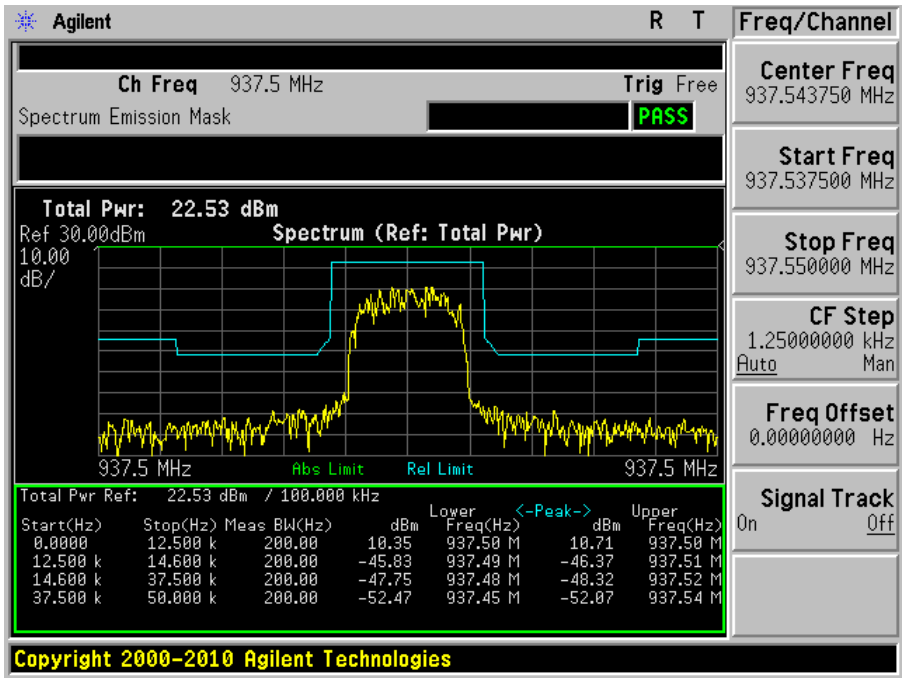

**806-824 MHz Uplink**

**Middle Channel**



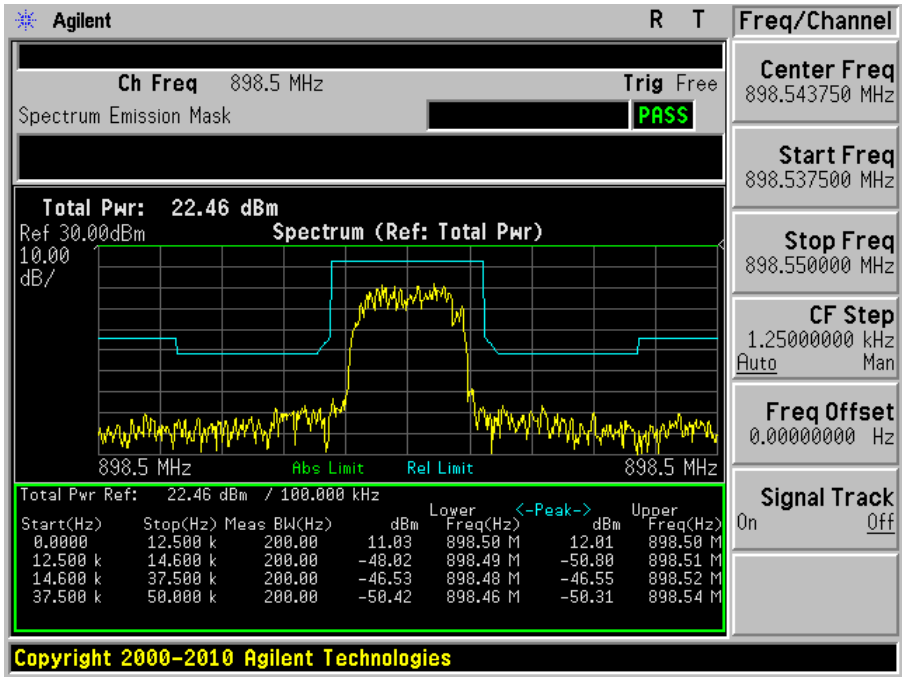
**935-940 MHz Downlink**

**Middle Channel**




**896-901 MHz Uplink**

**Middle Channel**



# 7 FCC §2.1051 & §90.669 - SPURIOUS EMISSIONS AT ANTENNA TERMINALS

## 7.1 Applicable Standard

Requirements: FCC §2.1051 & §90.669.

The spectrum was to be investigated to the tenth harmonics of the highest fundamental frequency as specified in §2.1057.

## 7.2 Test Procedure

The RF output of the transceiver was connected to a spectrum analyzer and simulator through appropriate attenuation. The resolution bandwidth of the spectrum analyzer was set at 100 kHz. Sufficient scans were taken to show any out of band emissions up to $10^{th}$ harmonic.

## 7.3 Test Equipment List and Details

| Manufacturers | Descriptions | Models | Serial Numbers | Calibration Dates |
|---|---|---|---|---|
| Agilent | Spectrum Analyzer | E4440A | MY44303352 | 2012-05-10 |
| Agilent | Signal Generator | E4438C | MY45091309 | 2012-05-03 |
| Rohde & Schwarz | Signal Generator | SMIQ03 | 849192/0085 / DE23746 | 2011-04-23[1] |

*Note 1: Two year calibration cycle.*

***Statement of Traceability:*** **BACL Corp.** attests that all calibrations have been performed according to A2LA requirements, traceable to the NIST.

## 7.4 Test Environmental Conditions

| | |
|---|---|
| **Temperature:** | 21 °C |
| **Relative Humidity:** | 49 % |
| **ATM Pressure:** | 101.3kPa |

*The testing was performed by Jeffrey Wu on 2012-05-24 in RF Site.*

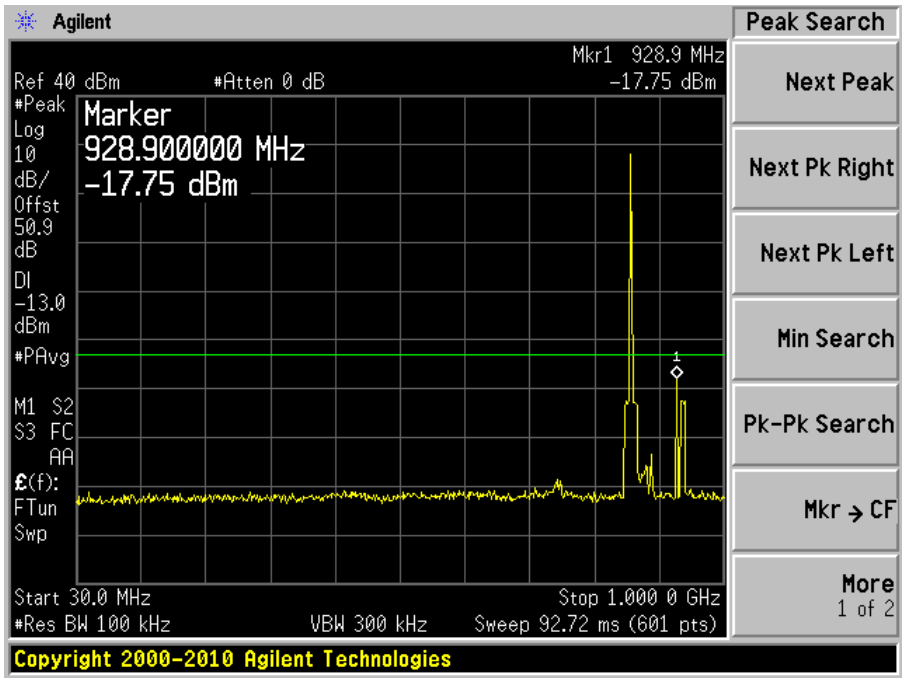
## 7.5 Test Results

Please refer to the following plots.

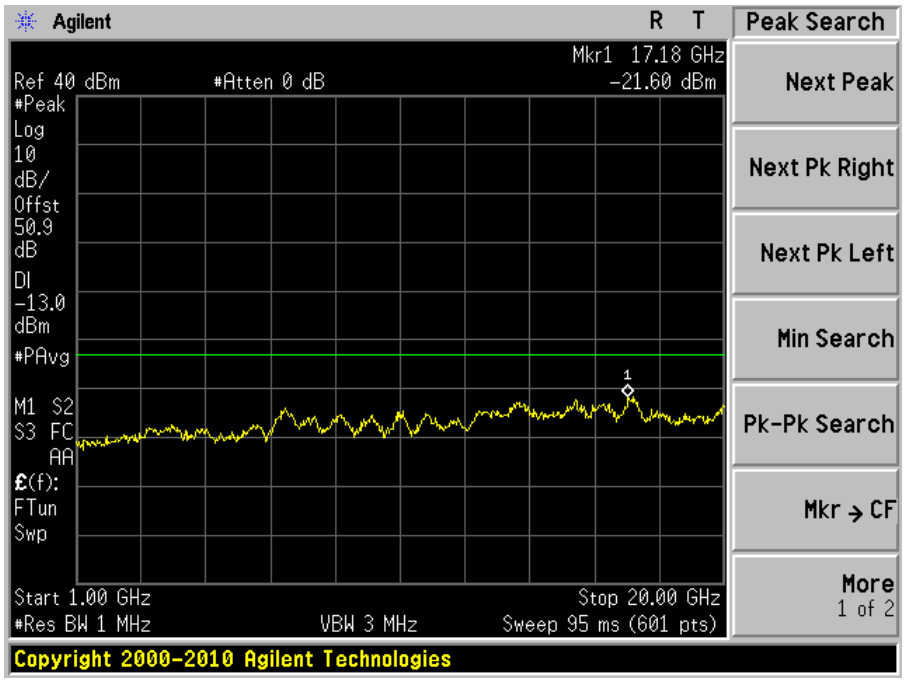
**851-869 MHz Downlink**

**Middle Channel**

30MHz to 1GHz



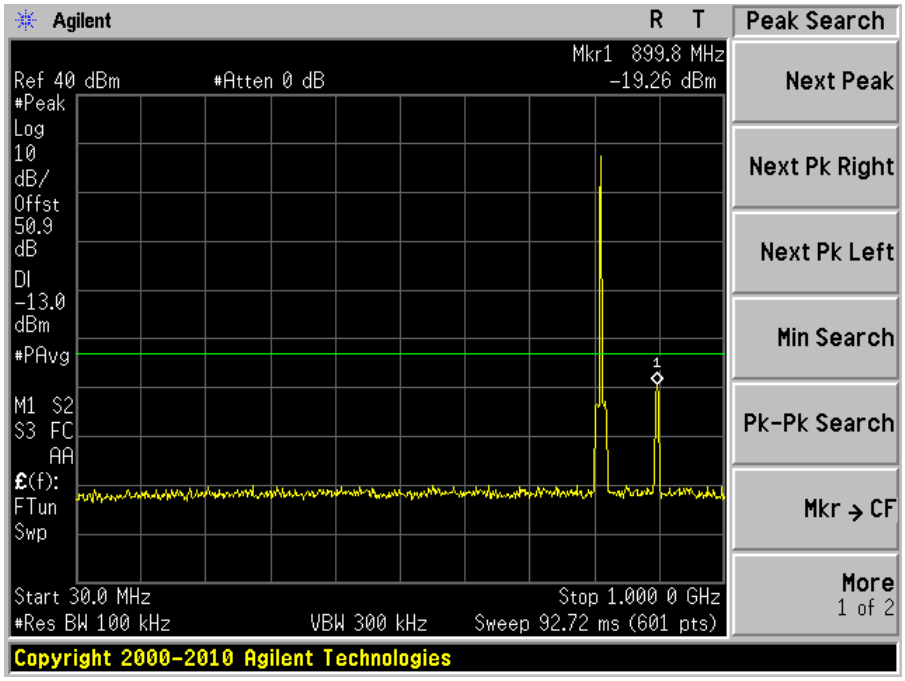

1GHz to 20GHz



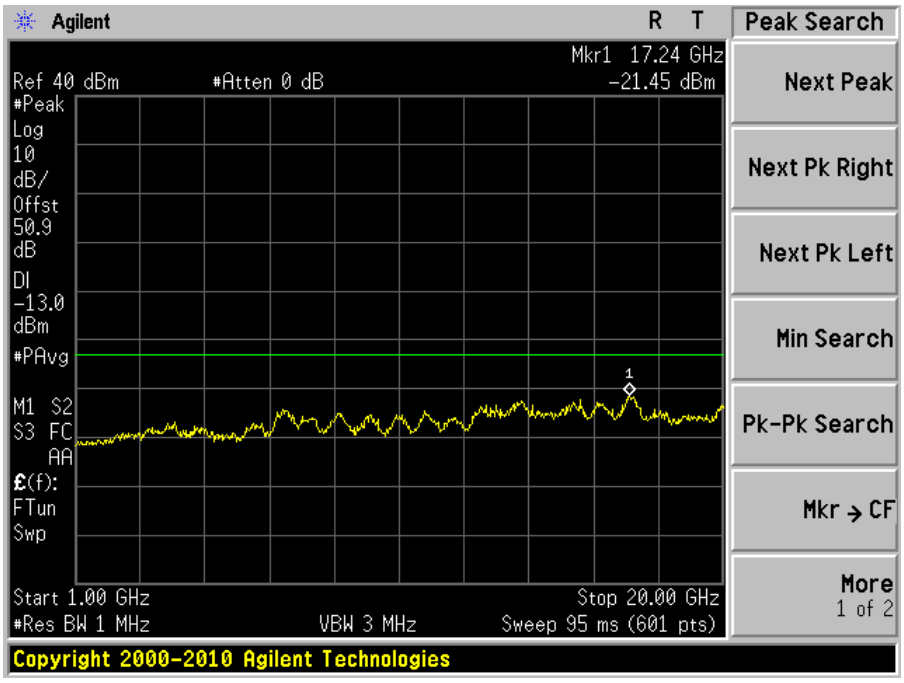
**806-824 MHz Uplink**

**Middle Channel**

30MHz to 1GHz



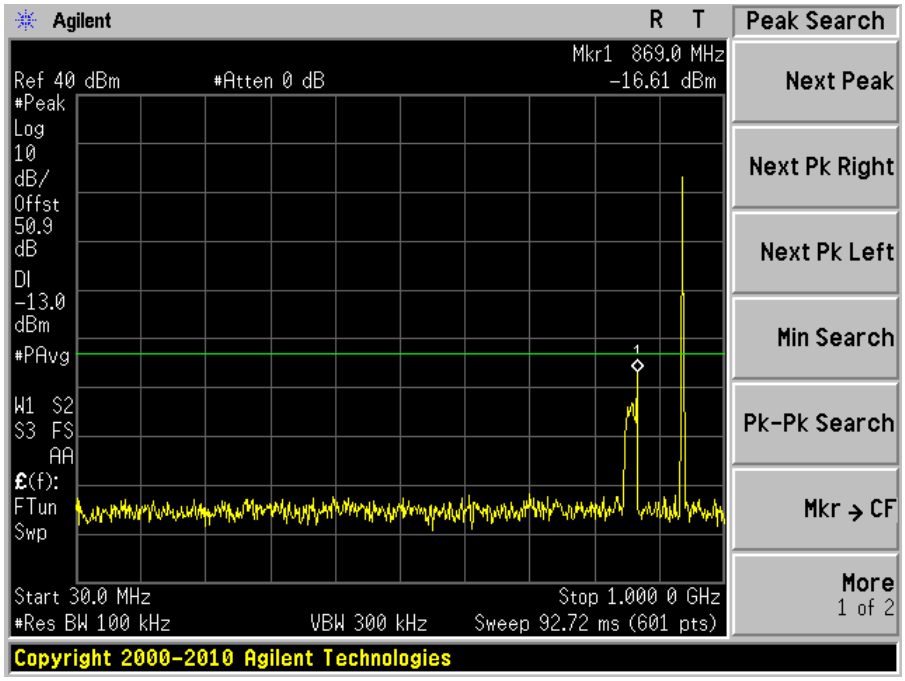

1GHz to 20GHz



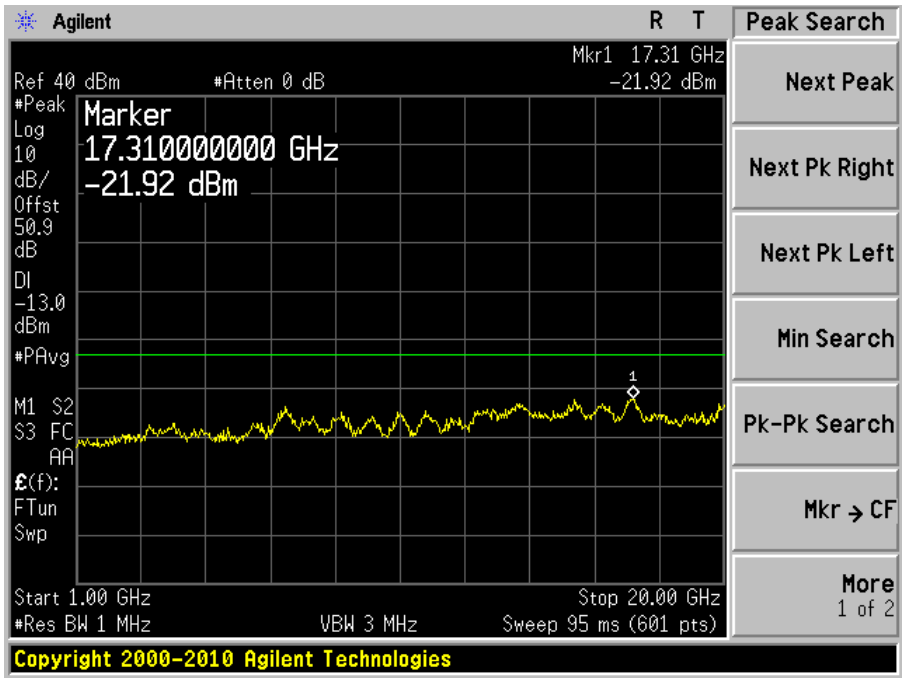
**935-940 MHz Downlink**

**Middle Channel**

30MHz to 1GHz



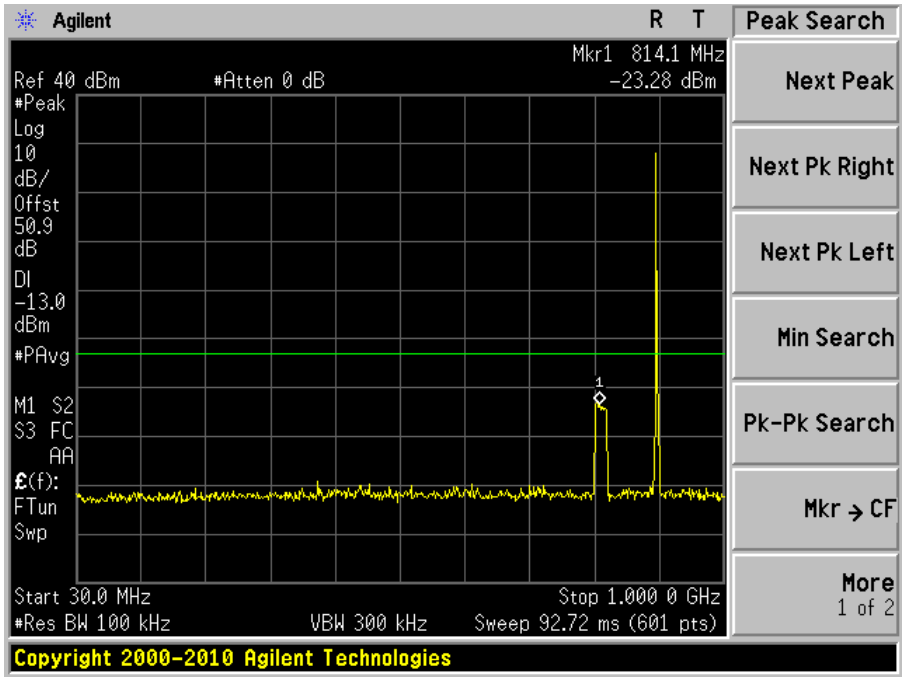

1GHz to 20GHz



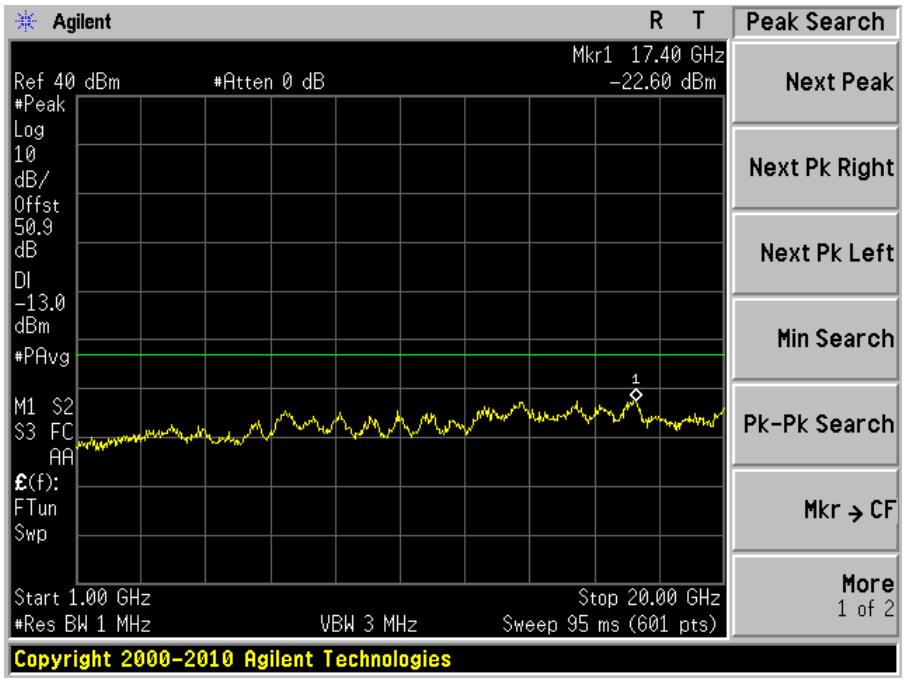
**896-901 MHz Uplink**

**Middle Channel**

30MHz to 1GHz




1GHz to 20GHz

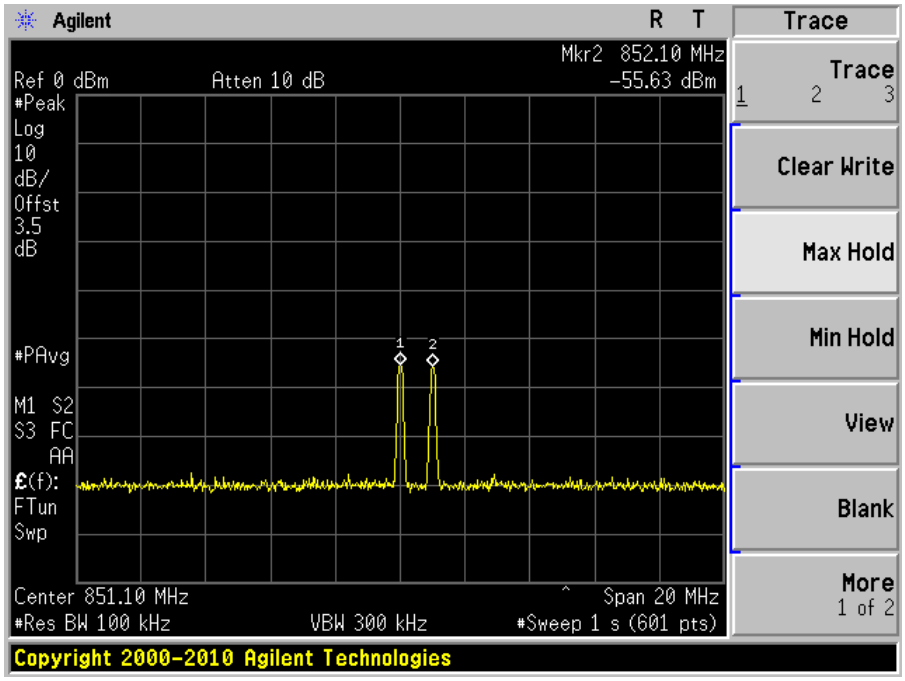


## Inter-modulation

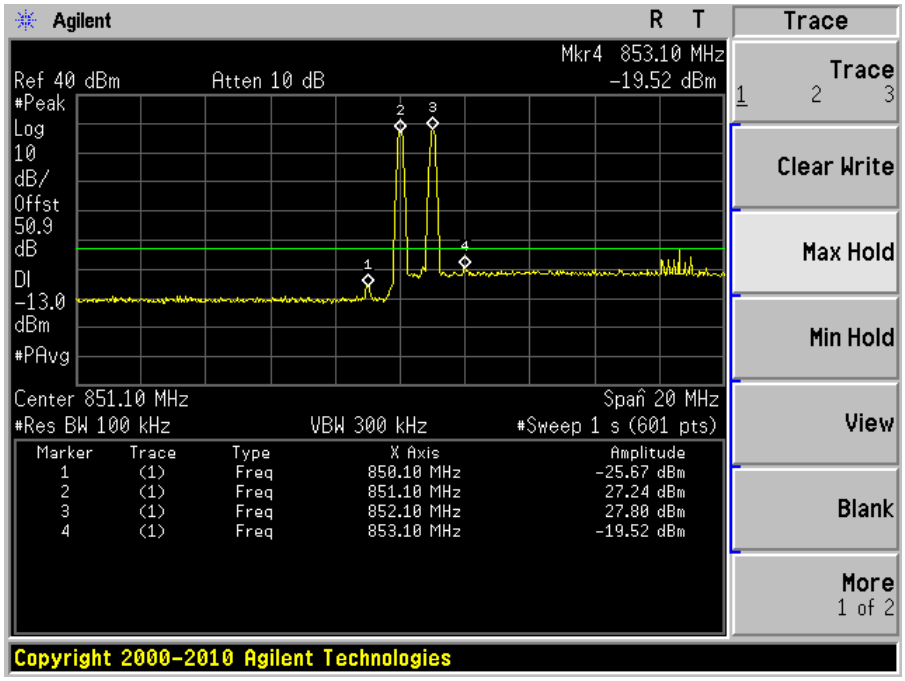
**851-869 MHz Downlink**

**Low Channel**

Input

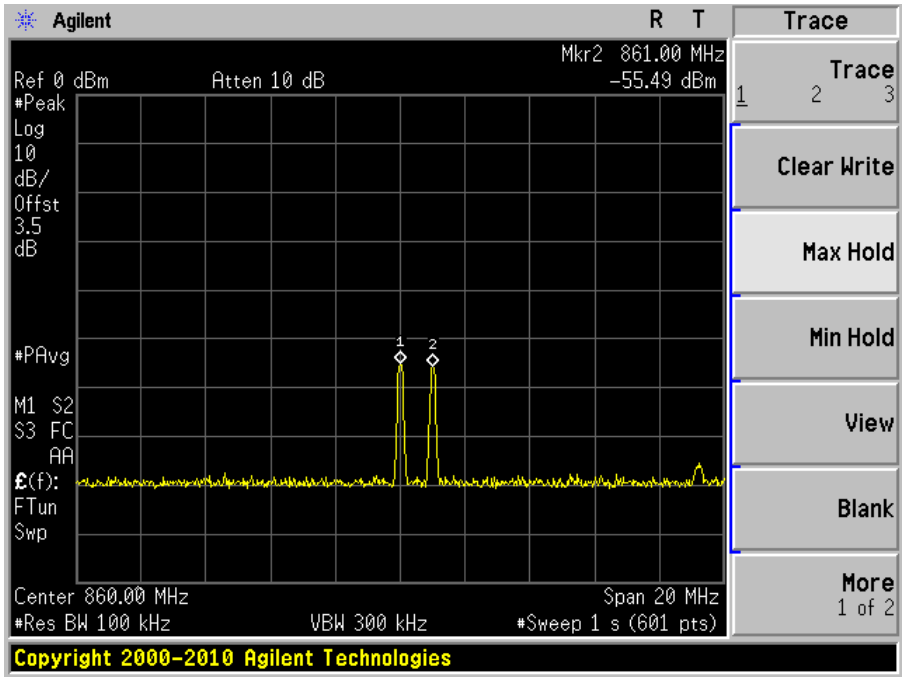



Output

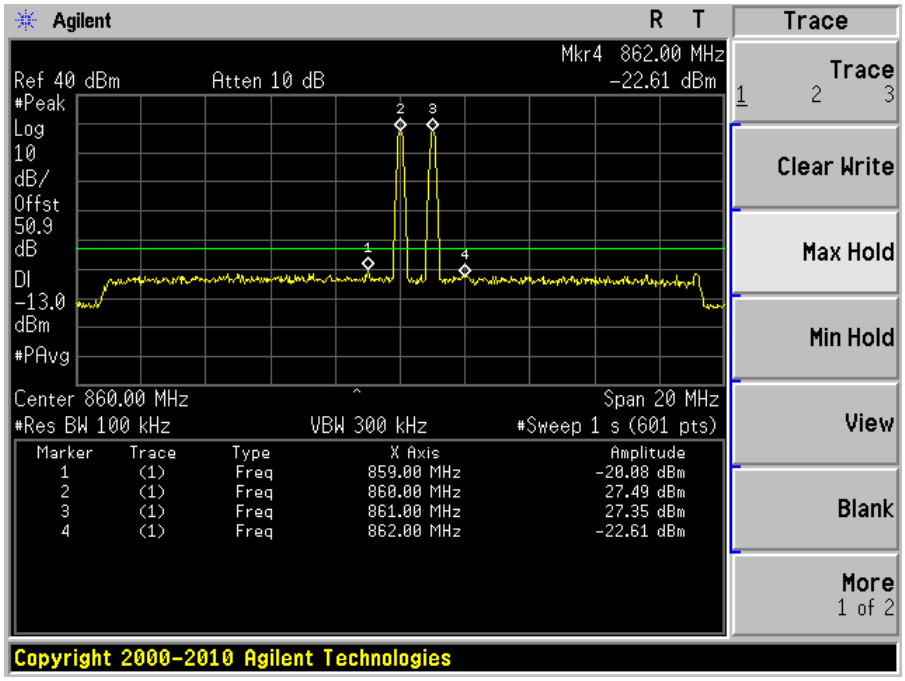


**Middle Channel**

Input

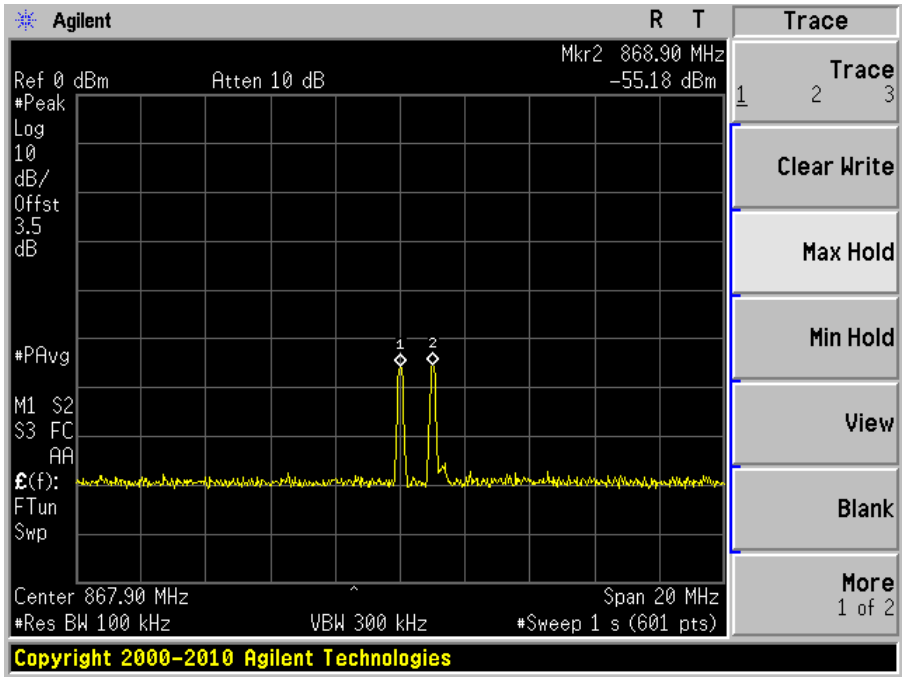



Output

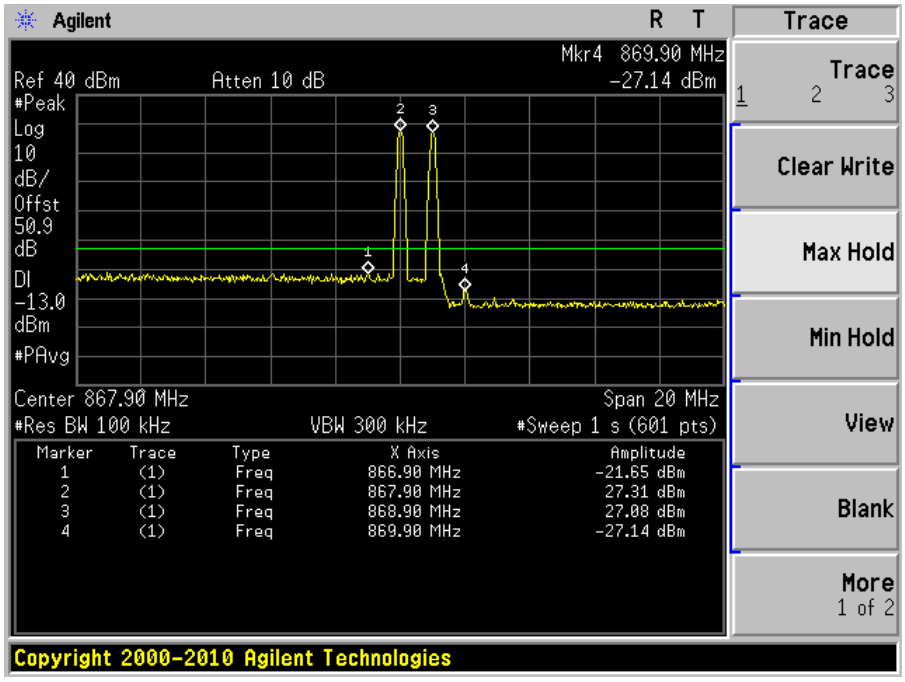


**High Channel**

Input



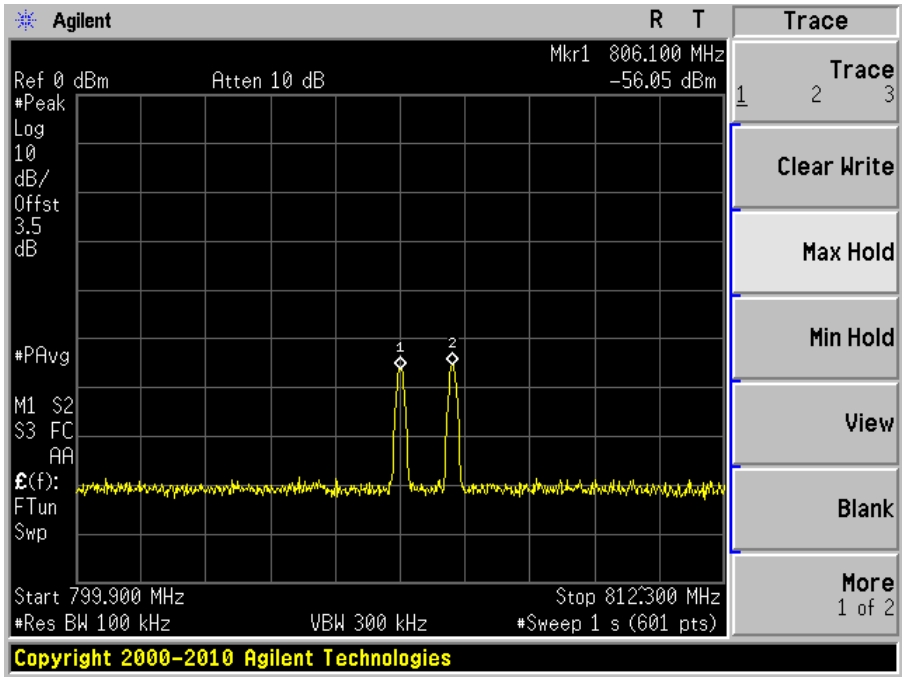

Output



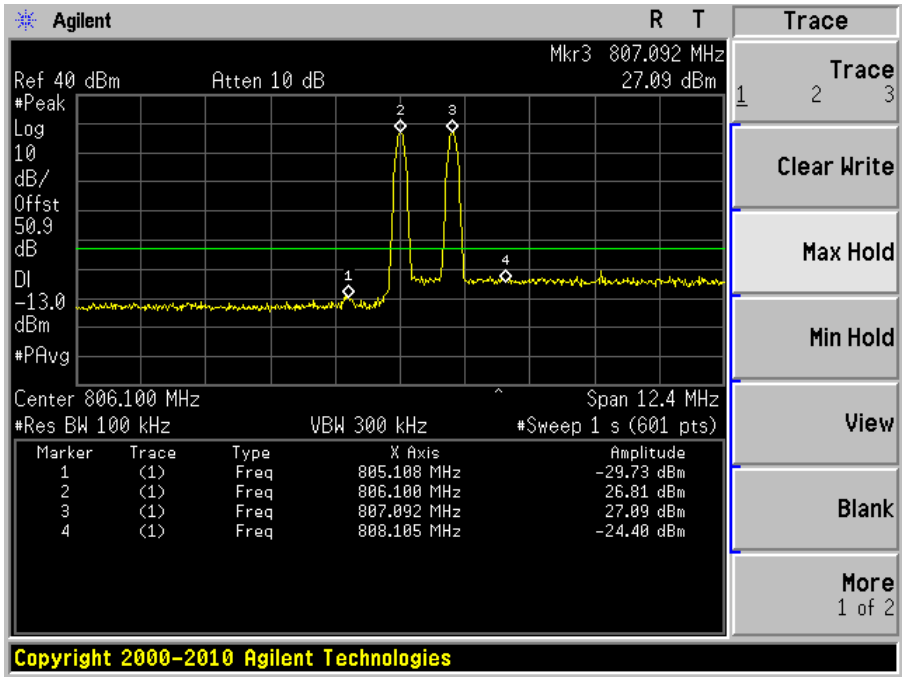
**806-824 MHz Uplink**

**Low Channel**

Input

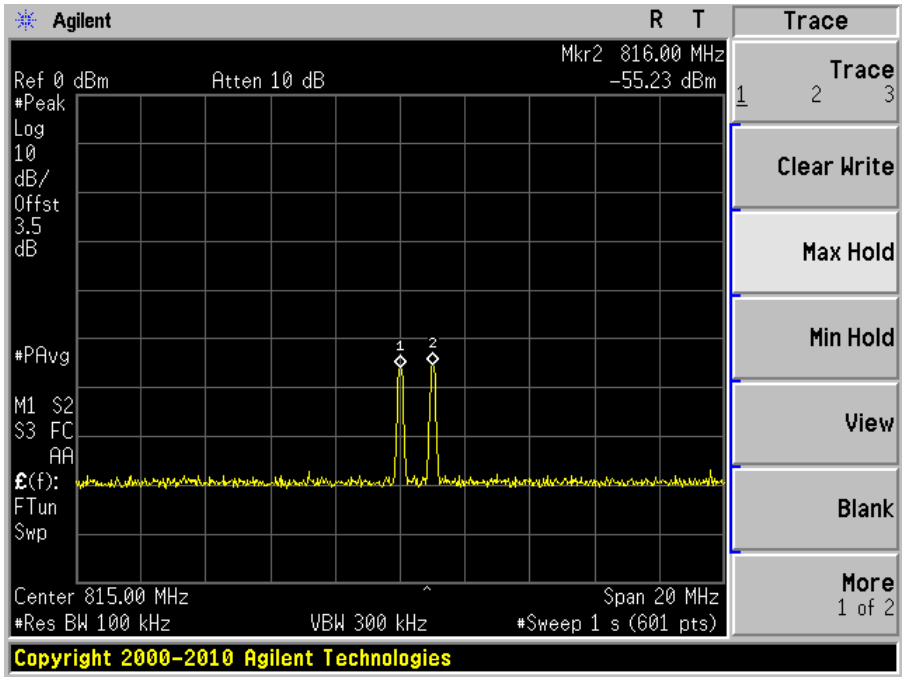


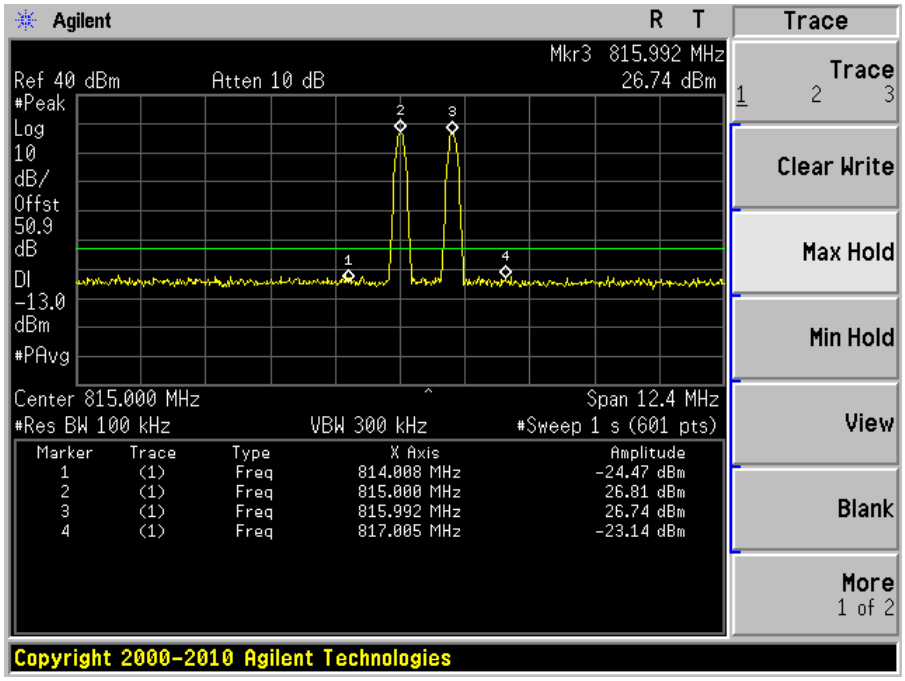

Output



**Middle Channel**

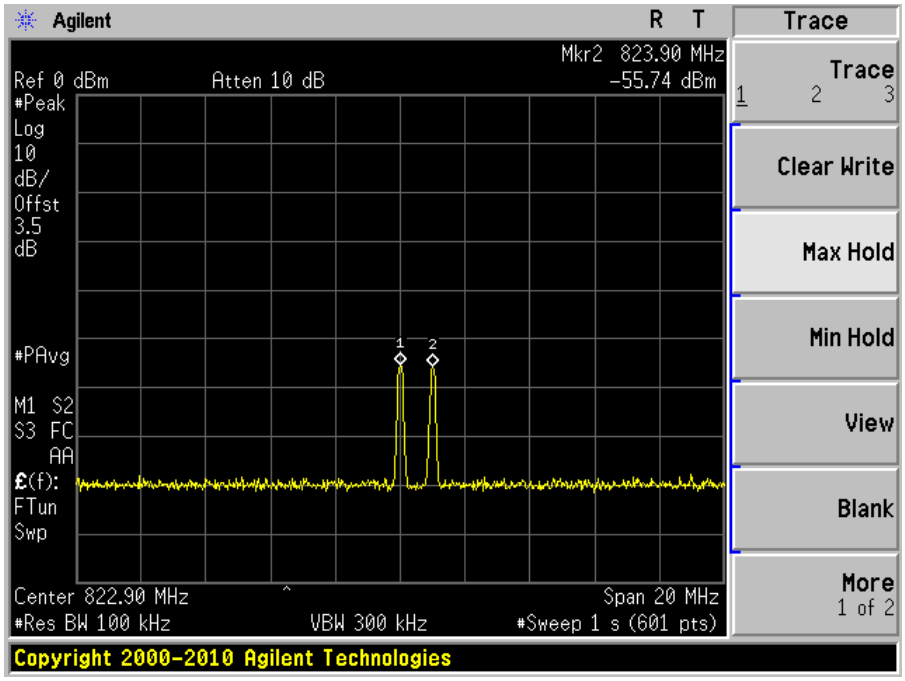
Input



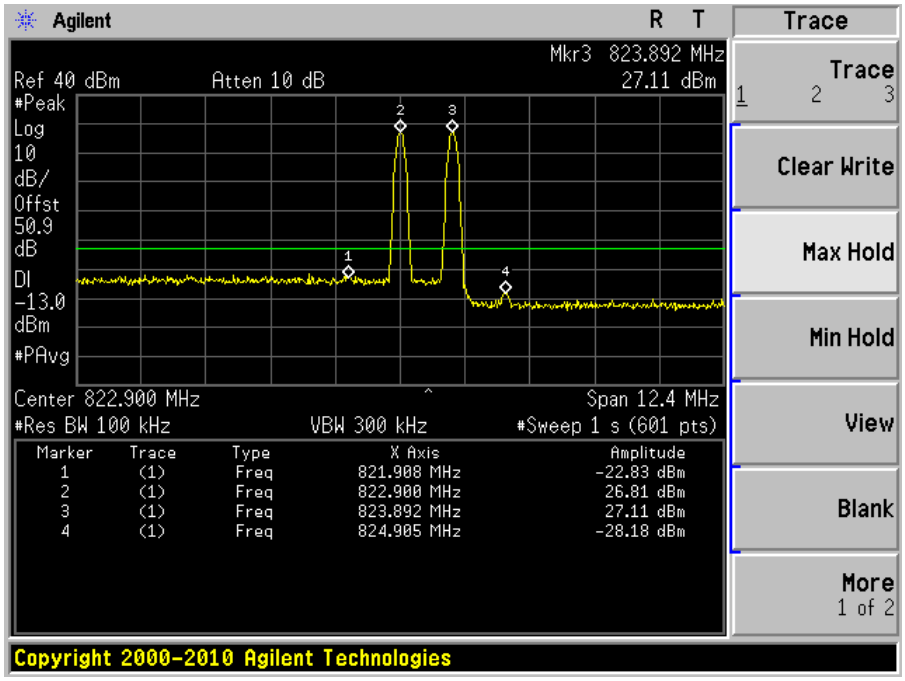



**High Channel**

Input



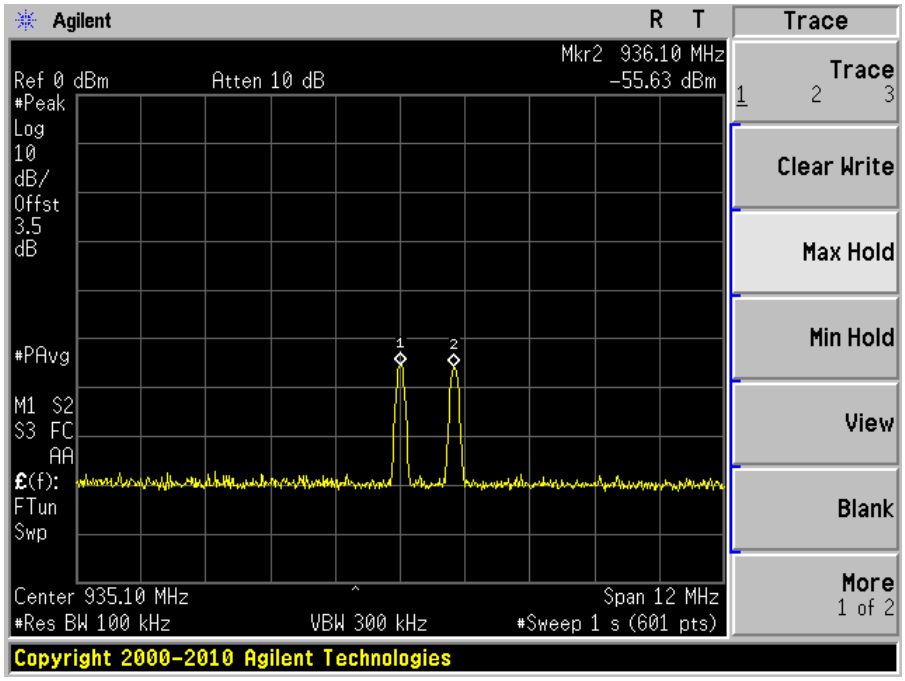

Output



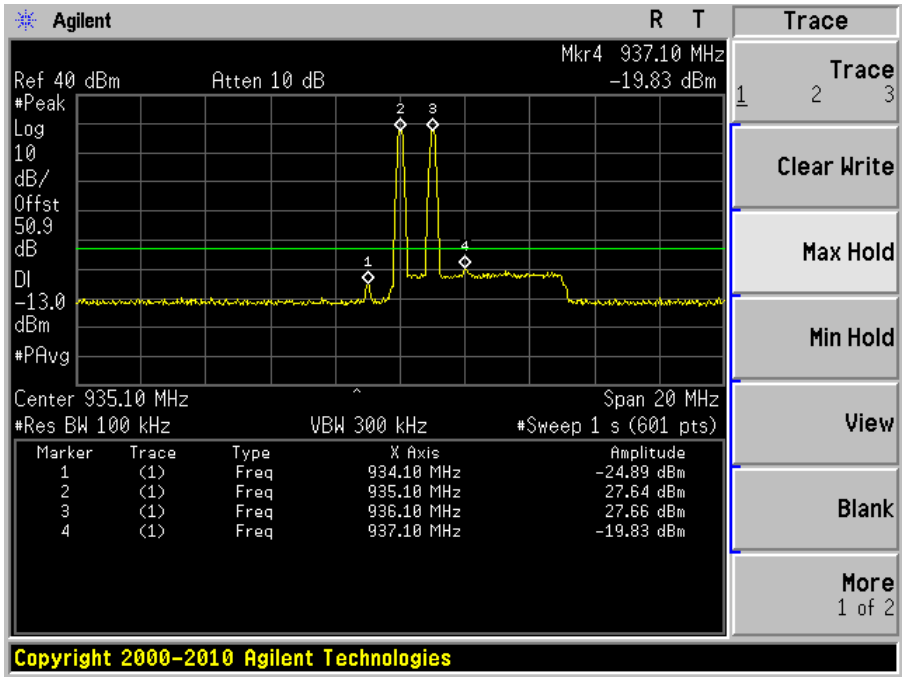
**935-940 MHz Downlink**

**Low Channel**

Input

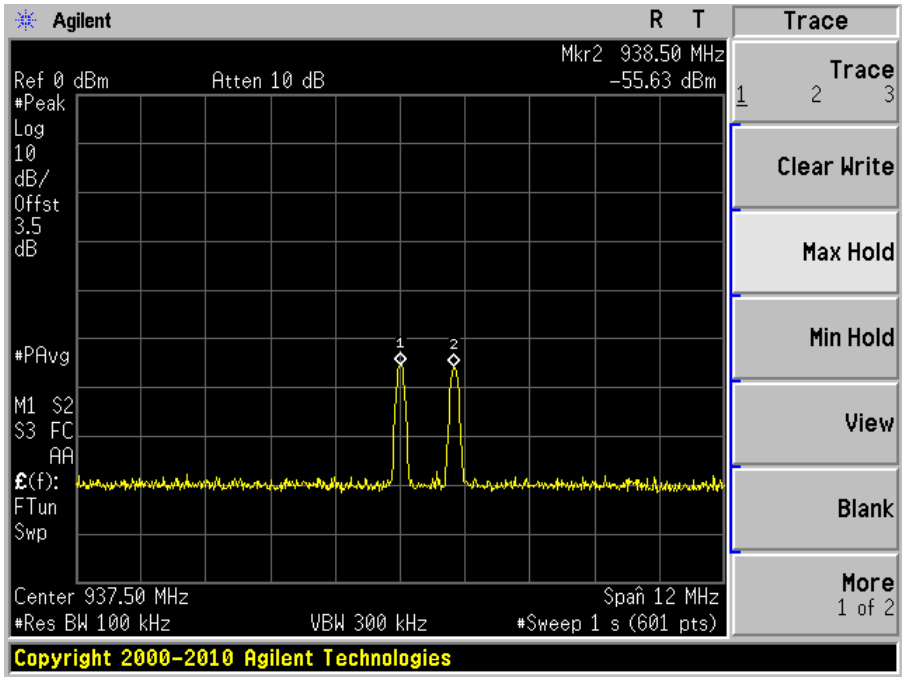



Output

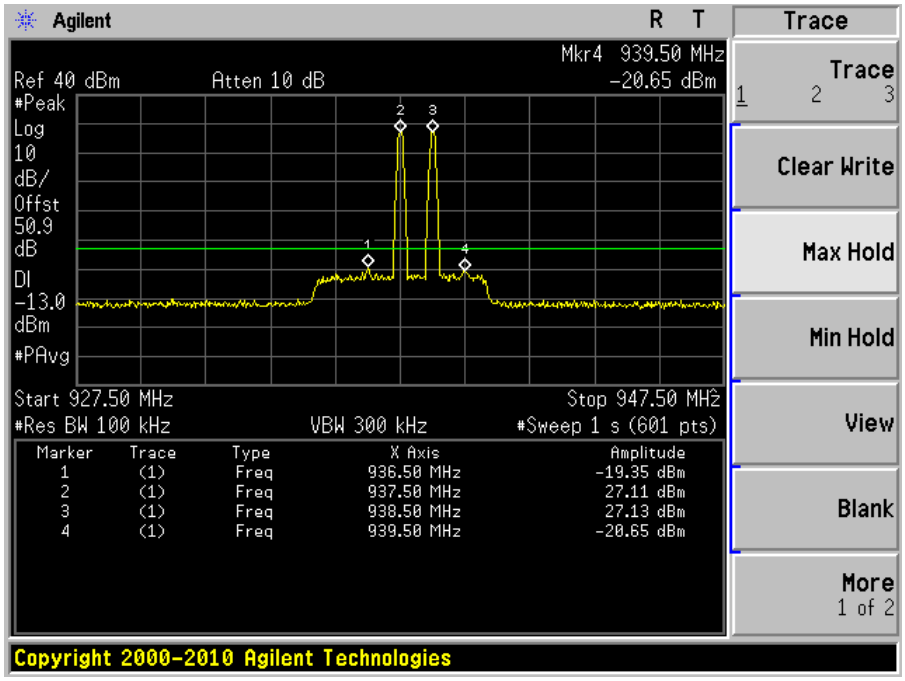


**Middle Channel**

Input

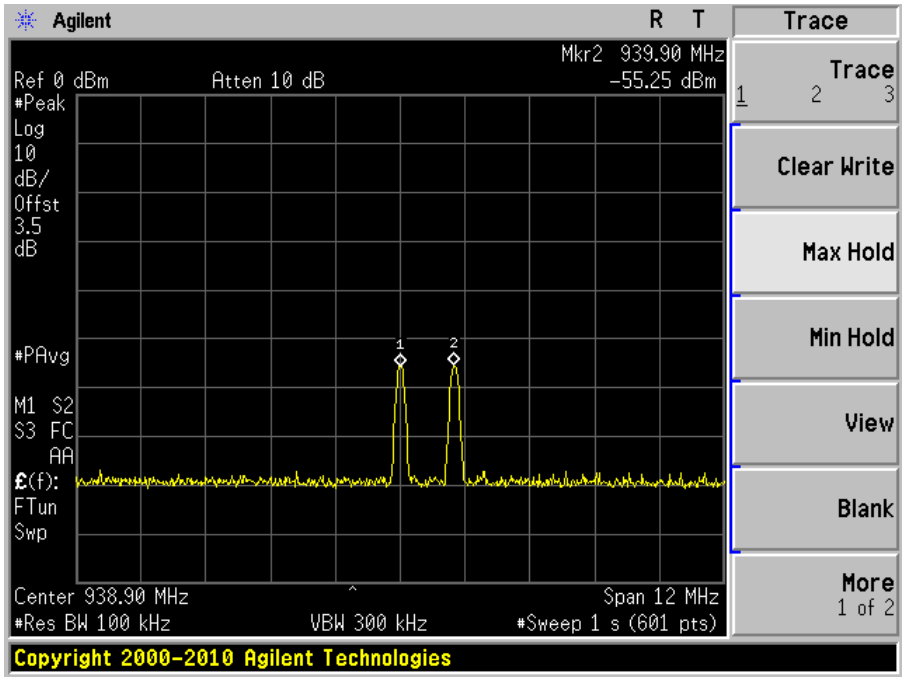



Output

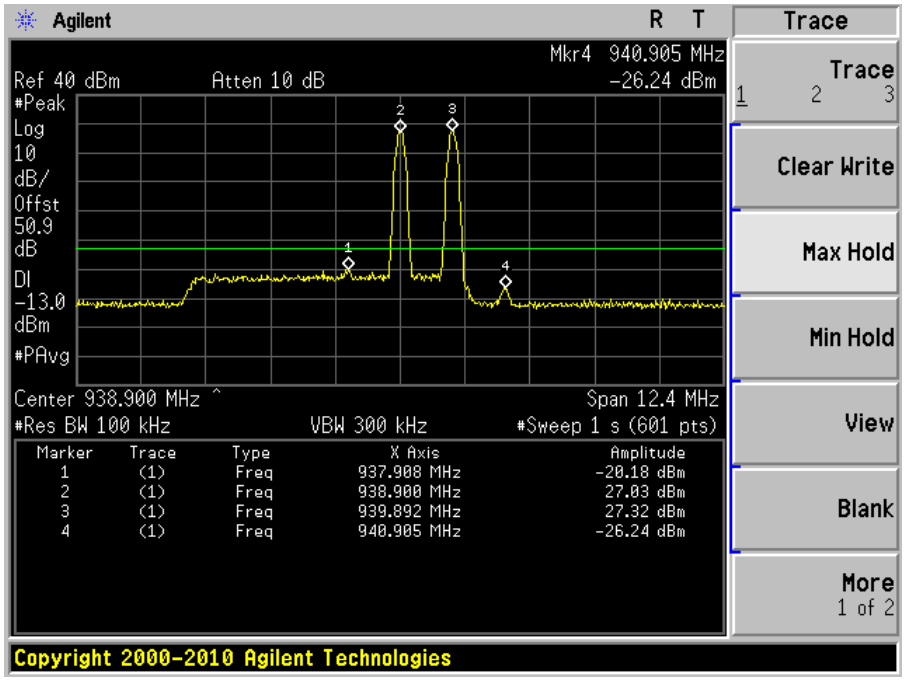


**High Channel**

Input



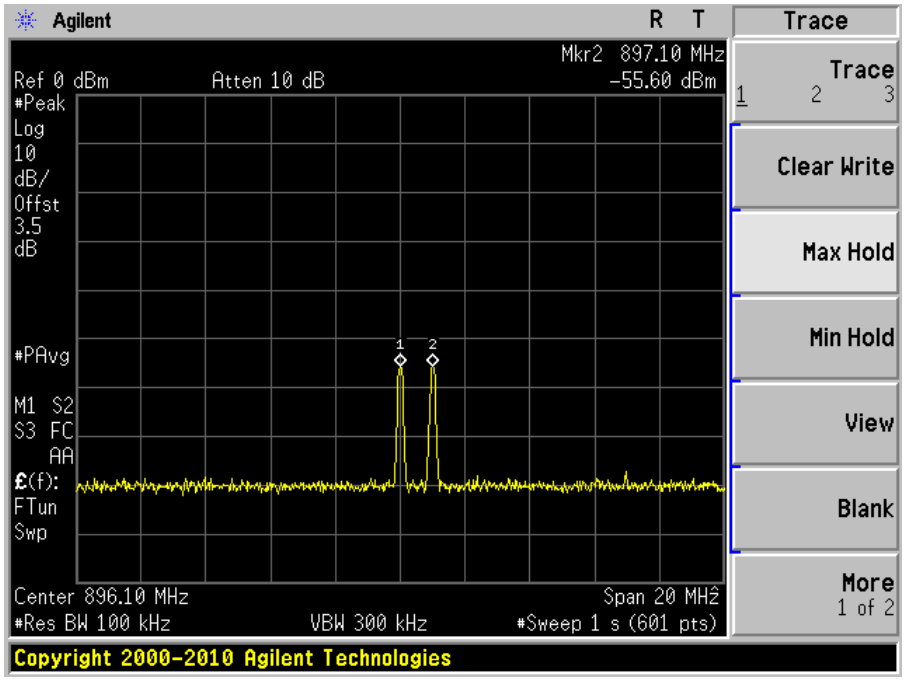

Output



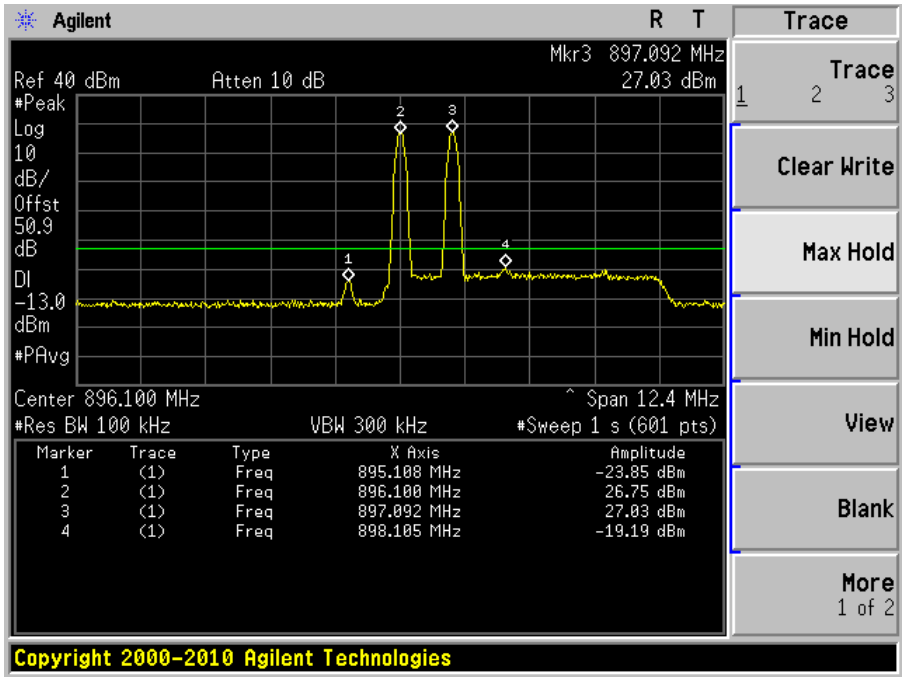
**896-901 MHz Uplink**

**Low Channel**

Input

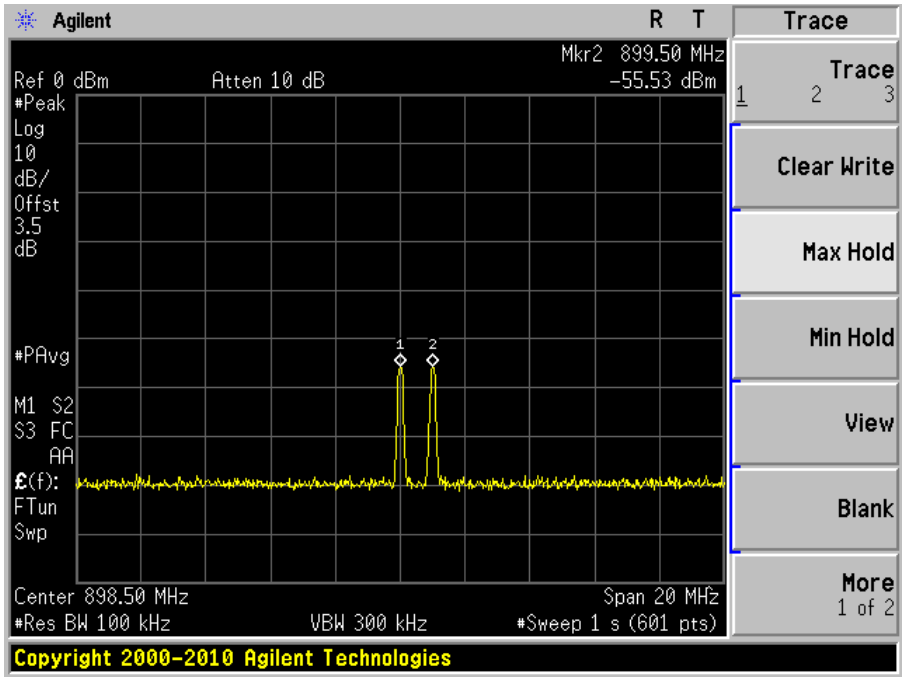



Output

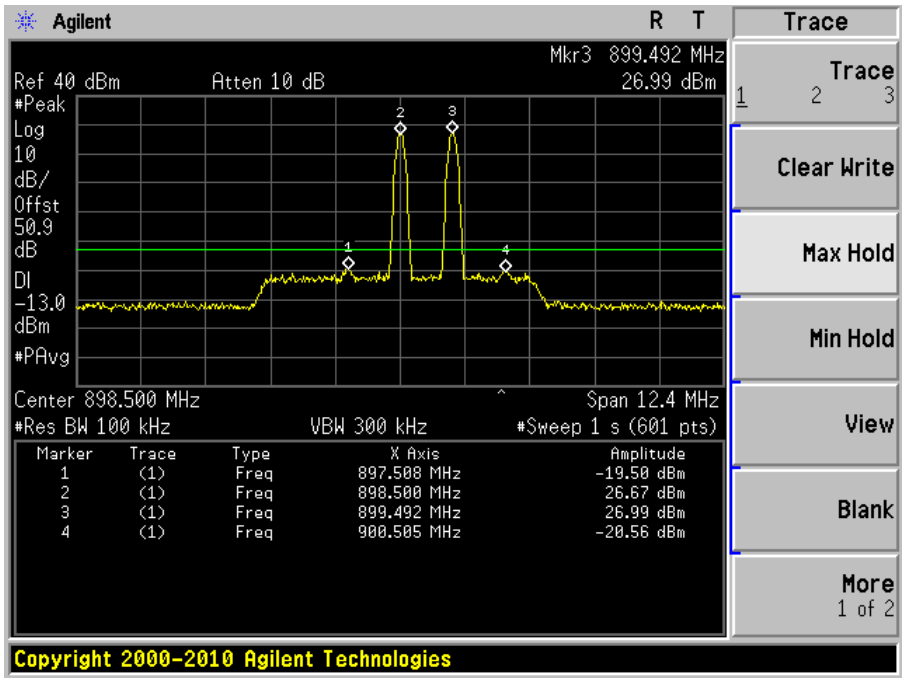


**Middle Channel**

Input

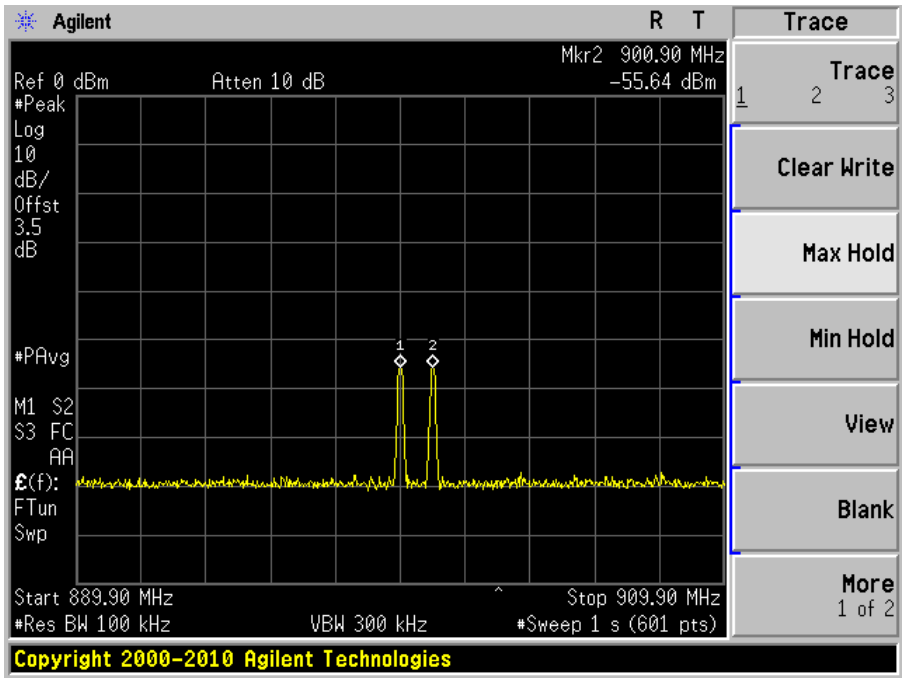



Output

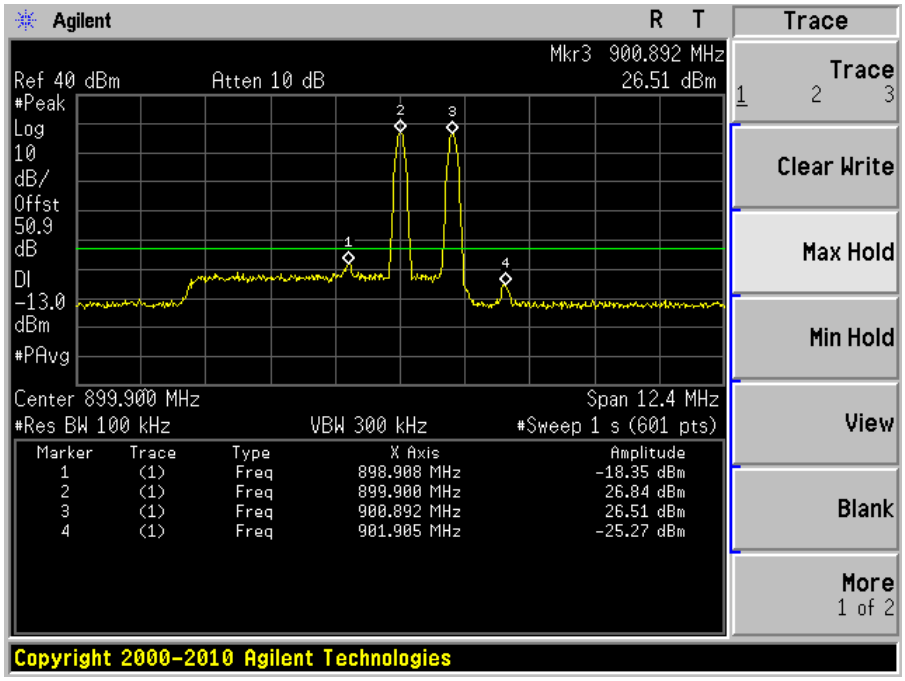


**High Channel**

Input




Output



# 8 FCC §2.1053 & §90.669 - SPURIOUS RADIATED EMISSIONS

## 8.1 Applicable Standard

Requirements: FCC §2.1053 & §90.669.

## 8.2 Test Procedure

The transmitter was placed on a turntable, and it was transmitting into a non-radiating load which was also placed on the turntable.

The measurement antenna was placed at a distance of 3 meters from the EUT. During the tests, the antenna height and polarization as well as EUT azimuth were varied in order to identify the maximum level of emissions from the EUT. The test was performed by placing the EUT on 3-orthogonal axis.

The frequency range up to tenth harmonic of the fundamental frequency was investigated.

Remove the EUT and replace it with substitution antenna. A signal generator was connected to the substitution antenna by a non-radiating cable. The absolute levels of the spurious emissions were measured by the substitution.

Spurious emissions in dB = 10 log (TX Power in Watts/0.001) – the absolute level
Spurious attenuation limit in dB = 43 + 10 Log10 (power out in Watts)

## 8.3 Test Equipment List and Details

| Manufacturers | Descriptions | Models | Serial Numbers | Calibration Dates |
|---|---|---|---|---|
| Agilent | Spectrum Analyzer | E4440A | MY44303352 | 2012-05-10 |
| Sunol Science Corp | System Controller | SC99V | 011003-1 | N/R |
| Sunol Science Corp | Combination Antenna | JB3 | A020106-2 | 2011-08-10 |
| Hewlett Packard | Pre amplifier | 8447D | 2944A06639 | 2011-06-09 |
| EMCO | Horn antenna | 3115 | 9511-4627 | 2011-10-03 |
| Mini-Circuits | Pre Amplifier | ZVA-183-S | 570400946 | 2012-05-09 |
| Eaton | Horn Antenna | 96001 | Mar-07 | 2011-10-03 |
| Rohde & Schwarz | Signal Generator | SMIQ03 | 849192/0085 / DE23746 | 2011-04-23[1] |

*Note 1: Two year calibration cycle.*

***Statement of Traceability:*** **BACL Corp.** attests that all calibrations have been performed according to A2LA requirements, traceable to the NIST.

## 8.4 Test Environmental Conditions

| | |
|---|---|
| **Temperature:** | 21 °C |
| **Relative Humidity:** | 49 % |
| **ATM Pressure:** | 101-102kPa |

*The testing was performed by Jeffrey Wu on 2012-05-25 in 5 Meter Chamber 2.*

## 8.5 Test Results

**851-869 MHz Downlink-** Worst Channel

| Indicated | | Turntable Azimuth (degree) | Test Antenna | | Substituted | | | | | Limit (dBm) | Margin (dB) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Frequency (MHz) | S.A. Amp. (dBuV) | | Height (m) | Polarity (H/V) | Frequency (MHz) | Level (dBm) | Ant. Cord. (dB) | Cable Loss (dB) | Absolute Level (dBm) | | |
| 1200 | 60.19 | 335 | 100 | H | 1200 | -50.32 | 6.53 | 1.34 | -45.13 | -13 | -32.13 |
| 1200 | 54.03 | 225 | 167 | V | 1200 | -56.48 | 6.92 | 1.34 | -50.9 | -13 | -37.9 |
| 4000 | 52.41 | 332 | 117 | H | 2460 | -47.1 | 10.26 | 2 | -38.84 | -13 | -25.84 |
| 4000 | 52.11 | 312 | 107 | V | 2460 | -47.4 | 10.27 | 2 | -39.13 | -13 | -26.13 |

*Note: All other emissions are on/under noise floor level.*

**806-824 MHz Uplink-** Worst Channel

| Indicated | | Turntable Azimuth (degree) | Test Antenna | | Substituted | | | | | Limit (dBm) | Margin (dB) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Frequency (MHz) | S.A. Amp. (dBuV) | | Height (m) | Polarity (H/V) | Frequency (MHz) | Level (dBm) | Ant. Cord. (dB) | Cable Loss (dB) | Absolute Level (dBm) | | |
| 1200 | 60.17 | 337 | 106 | H | 1200 | -50.34 | 6.53 | 1.34 | -45.15 | -13 | -32.15 |
| 1200 | 55.64 | 167 | 124 | V | 1200 | -54.87 | 6.92 | 1.34 | -49.29 | -13 | -36.29 |
| 4000 | 54.27 | 30 | 142 | H | 2460 | -45.24 | 10.26 | 2 | -36.98 | -13 | -23.98 |
| 4000 | 52.05 | 66 | 125 | V | 2460 | -47.46 | 10.27 | 2 | -39.19 | -13 | -26.19 |

*Note: All other emissions are on/under noise floor level.*

**935-940 MHz Downlink-** Worst Channel

| Indicated | | Turntable Azimuth (degree) | Test Antenna | | Substituted | | | | | Limit (dBm) | Margin (dB) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Frequency (MHz) | S.A. Amp. (dBuV) | | Height (m) | Polarity (H/V) | Frequency (MHz) | Level (dBm) | Ant. Cord. (dB) | Cable Loss (dB) | Absolute Level (dBm) | | |
| 1200 | 60.27 | 335 | 103 | H | 1200 | -50.24 | 6.53 | 1.34 | -45.05 | -13 | -32.05 |
| 1200 | 54.13 | 224 | 232 | V | 1200 | -56.38 | 6.92 | 1.34 | -50.8 | -13 | -37.8 |
| 4000 | 52.86 | 331 | 116 | H | 4000 | -46.65 | 10.26 | 2 | -38.39 | -13 | -25.39 |
| 4000 | 52.04 | 312 | 173 | V | 4000 | -47.47 | 10.27 | 2 | -39.2 | -13 | -26.2 |

*Note: All other emissions are on/under noise floor level.*

**896-901 MHz Uplink-** Worst Channel

| Indicated | | Turntable Azimuth (degree) | Test Antenna | | Substituted | | | | | Limit (dBm) | Margin (dB) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Frequency (MHz) | S.A. Amp. (dBuV) | | Height (m) | Polarity (H/V) | Frequency (MHz) | Level (dBm) | Ant. Cord. (dB) | Cable Loss (dB) | Absolute Level (dBm) | | |
| 1200 | 60.14 | 322 | 107 | H | 1200 | -50.37 | 6.53 | 1.34 | -45.18 | -13 | -32.18 |
| 1200 | 55.15 | 176 | 120 | V | 1200 | -55.36 | 6.92 | 1.34 | -49.78 | -13 | -36.78 |
| 4000 | 54.05 | 30 | 140 | H | 4000 | -45.46 | 10.26 | 2 | -37.2 | -13 | -24.2 |
| 4000 | 51.79 | 67 | 127 | V | 4000 | -47.72 | 10.27 | 2 | -39.45 | -13 | -26.45 |

*Note: All other emissions are on/under noise floor level.*

# 9 FCC §1.1310 & §2.1091 - RF EXPOSURE

## 9.1 Applicable Standard

According to §1.1310 and §2.1091 RF exposure is calculated.

Limits for Controlled Exposure

| Frequency Range (MHz) | Electric Field Strength (V/m) | Magnetic Field Strength (A/m) | Power Density ($mW/cm^2$) | Averaging Time (minutes) |
|---|---|---|---|---|
| **(A) Limits for Occupational/Controlled Exposure** | | | | |
| 0.3-1.34 | 614 | 1.63 | *(100) | 6 |
| 1.34-30 | 1842/f | 4.89/f | *($900/f^2$) | 6 |
| 30-300 | 61.4 | 0.163 | 1.0 | 6 |
| 300-1500 | / | / | f/300 | 6 |
| 1500-100,000 | / | / | 5 | 6 |

f = frequency in MHz
* = Plane-wave equivalent power density

## 9.2 MPE Prediction

Predication of MPE limit at a given distance, equation from OET Bulletin 65, Edition 97-01

$$S = PG/4\pi R^2$$

Where: S = power density
P = power input to antenna
G = power gain of the antenna in the direction of interest relative to an isotropic radiator
R = distance to the center of radiation of the antenna

## 9.3 Test Results

800 MHz Band UL:

| | |
|---|---|
| Maximum peak output power at antenna input terminal (dBm): | 30.26 |
| Maximum peak output power at antenna input terminal (mW): | 1061.7 |
| Prediction distance (cm): | 23 |
| Prediction frequency (MHz): | 823.9 |
| Antenna Gain, typical (dBi): | 12 |
| Maximum Antenna Gain (numeric): | 15.85 |
| Power density at predication frequency and distance ($mW/cm^2$): | 2.531 |
| MPE limit for uncontrolled exposure at predication frequency ($mW/cm^2$): | 2.746 |

800 MHz Band DL:

| | |
|---|---|
| Maximum peak output power at antenna input terminal (dBm): | 30.63 |
| Maximum peak output power at antenna input terminal (mW): | 1156.1 |
| Prediction distance (cm): | 23 |
| Prediction frequency (MHz): | 851.1 |
| Antenna Gain, typical (dBi): | 12 |
| Maximum Antenna Gain (numeric): | 15.85 |
| Power density at predication frequency and distance ($mW/cm^2$): | 2.757 |
| MPE limit for uncontrolled exposure at predication frequency ($mW/cm^2$): | 2.837 |

900 MHz Band UL:

| | |
|---|---|
| Maximum peak output power at antenna input terminal (dBm): | 30.69 |
| Maximum peak output power at antenna input terminal (mW): | 1172.2 |
| Prediction distance (cm): | 23 |
| Prediction frequency (MHz): | 896.1 |
| Antenna Gain, typical (dBi): | 12 |
| Maximum Antenna Gain (numeric): | 15.85 |
| Power density at predication frequency and distance ($mW/cm^2$): | 2.795 |
| MPE limit for uncontrolled exposure at predication frequency ($mW/cm^2$): | 2.987 |

900 MHz Band DL:

| | |
|---|---|
| Maximum peak output power at antenna input terminal (dBm): | 30.76 |
| Maximum peak output power at antenna input terminal (mW): | 1191.2 |
| Prediction distance (cm): | 23 |
| Prediction frequency (MHz): | 939.9 |
| Antenna Gain, typical (dBi): | 12 |
| Maximum Antenna Gain (numeric): | 15.85 |
| Power density at predication frequency and distance ($mW/cm^2$): | 2.840 |
| MPE limit for uncontrolled exposure at predication frequency ($mW/cm^2$): | 3.133 |

**Result:**

The highest power density level at 23 cm is below the MPE controlled limit.

# 10 EXHIBIT A - FCC ID LABELING AND WARNING STATEMENT

## 10.1 FCC ID Label Requirement

FCC § 2.925 Identification of equipment

(a) Each equipment covered in an application for equipment authorization shall bear a nameplate or label listing the following:

(1) FCC Identifier consisting of the two elements in the exact order specified in §2.926. The FCC Identifier shall be preceded by the term *FCC ID* in capital letters on a single line, and shall be of a type size large enough to be legible without the aid of magnification.

*Example:* FCC ID XXX123. XXX—Grantee Code 123—Equipment Product Code

**FCC ID: XXX-XXXXXX**

## 10.2 FCC ID Label Content

**Model: Vision30** sym

For In-Building Application
FCC ID: W74-V308919
Contains FCC ID: RUJ-LR802UKN2

This device complies with part 15 of the FCC Rules.
Operation is subject to the following two conditions:
(1) This device may not cause harmful interference, and (2) this device must accept any interference that may cause undesired operation.

UL LISTED
I.T.E XXXX

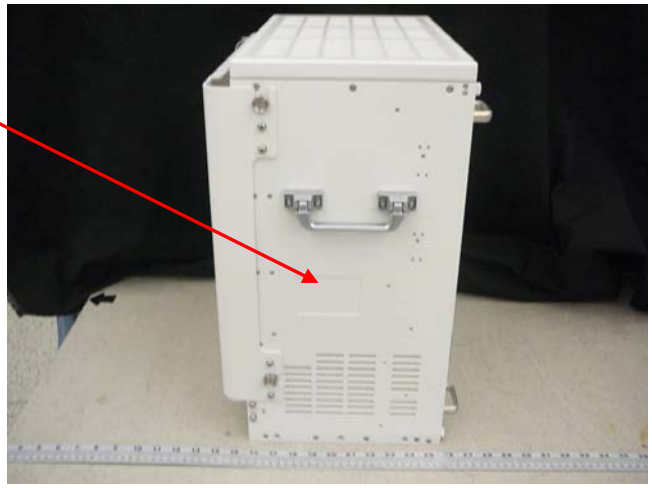
Power Rating
AC INPUT: 110-125V~, 50/60Hz 4.5A

RoHS COMPLIANT

MADE IN KOREA

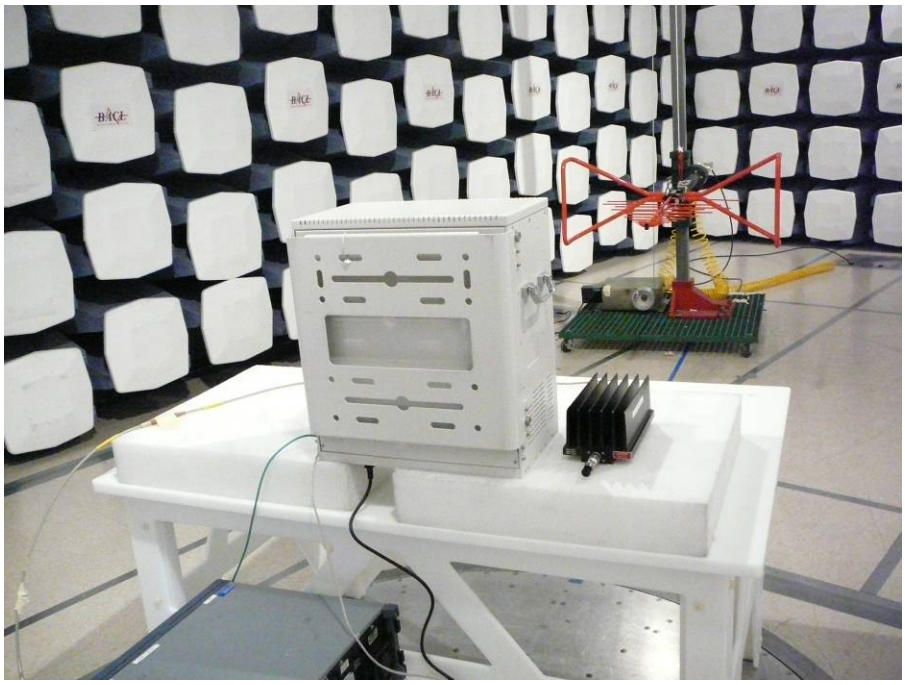
## 10.3 FCC ID Label

Label here

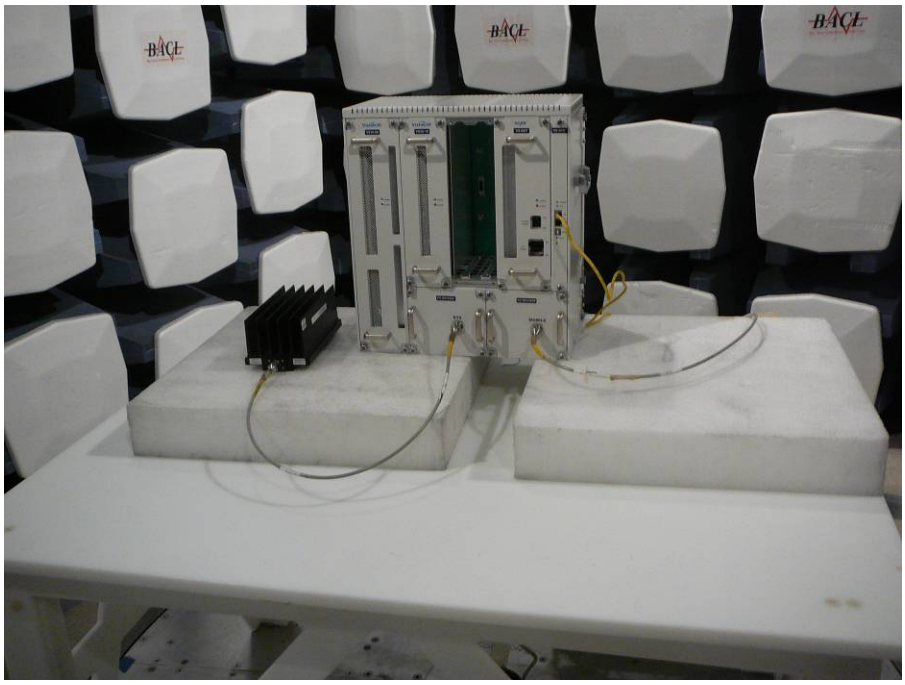


# 11 EXHIBIT B - TEST SETUP PHOTOGRAPHS

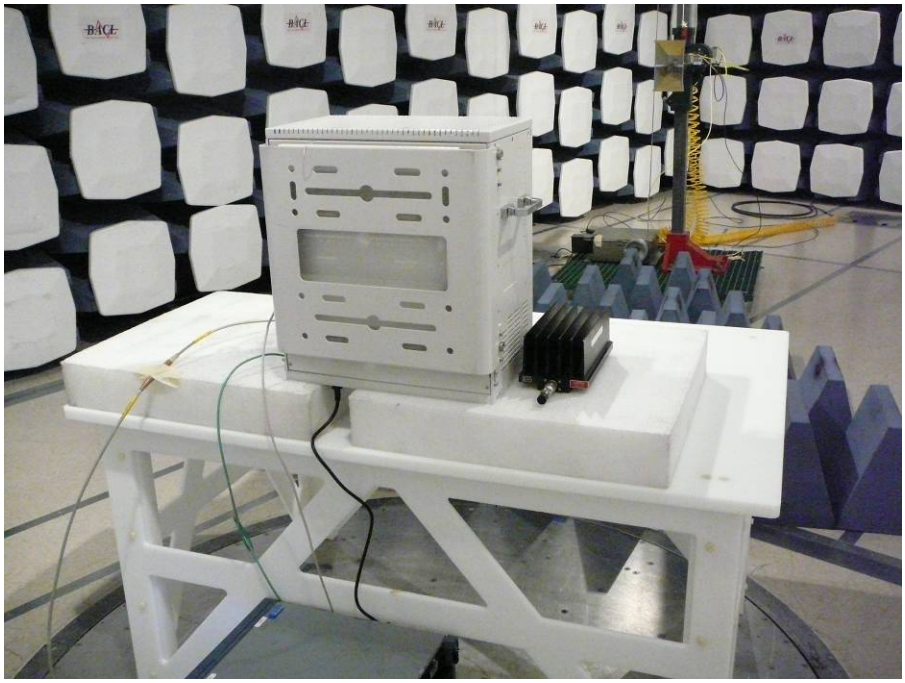
## 11.1 Radiated Emissions – Rear View (Below 1 GHz)



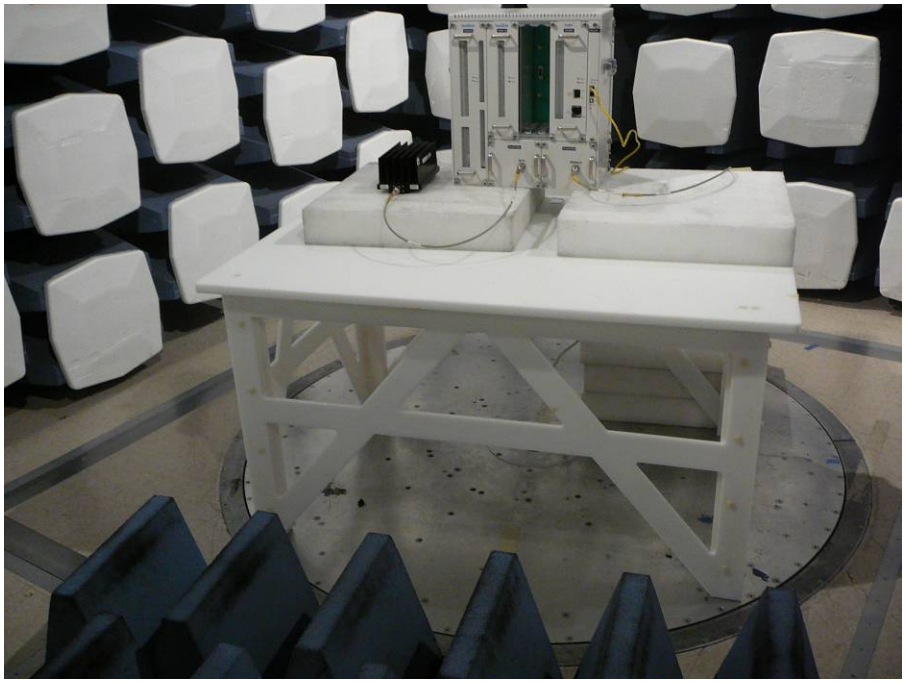
## 11.2 Radiated Emissions - Front View (Below 1 GHz)



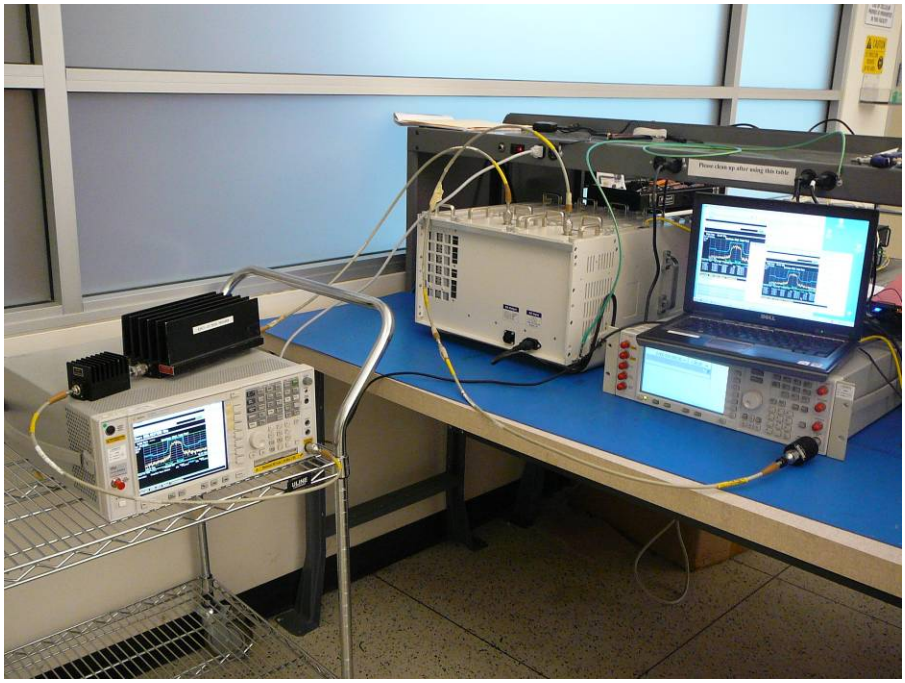
## 11.3 Radiated Emissions - Rear View (Above 1 GHz)



## 11.4 Radiated Emissions - Front View (Above 1 GHz)



## 11.5 Bench Setup View

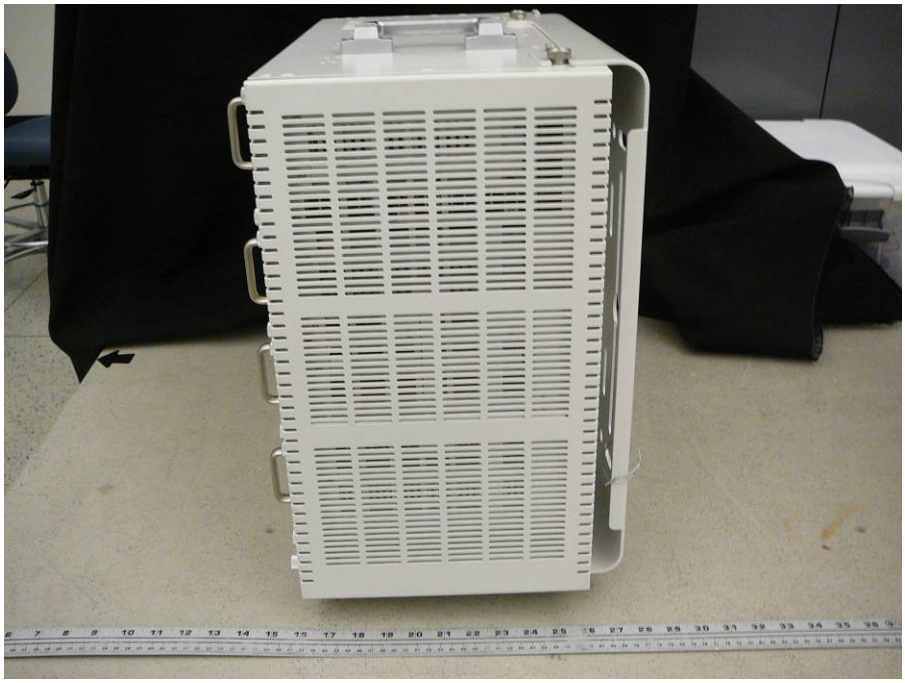


# 12 EXHIBIT C - EUT PHOTOGRAPHS

## 12.1 EUT-Main Frame Enclosure Front View

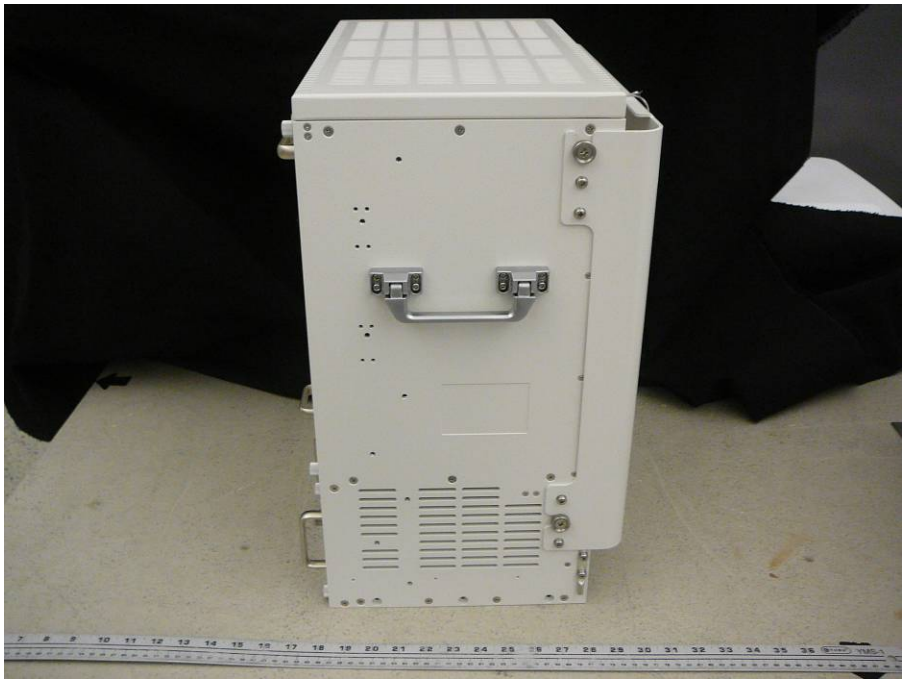

## 12.2 EUT-Main Frame Enclosure Rear View

## 12.3 EUT-Main Frame Enclosure Top View



## 12.4 EUT-Main Frame Enclosure Bottom View

## 12.5 EUT-Main Frame Enclosure Left Side View



## 12.6 EUT-Main Frame Enclosure Right Side View

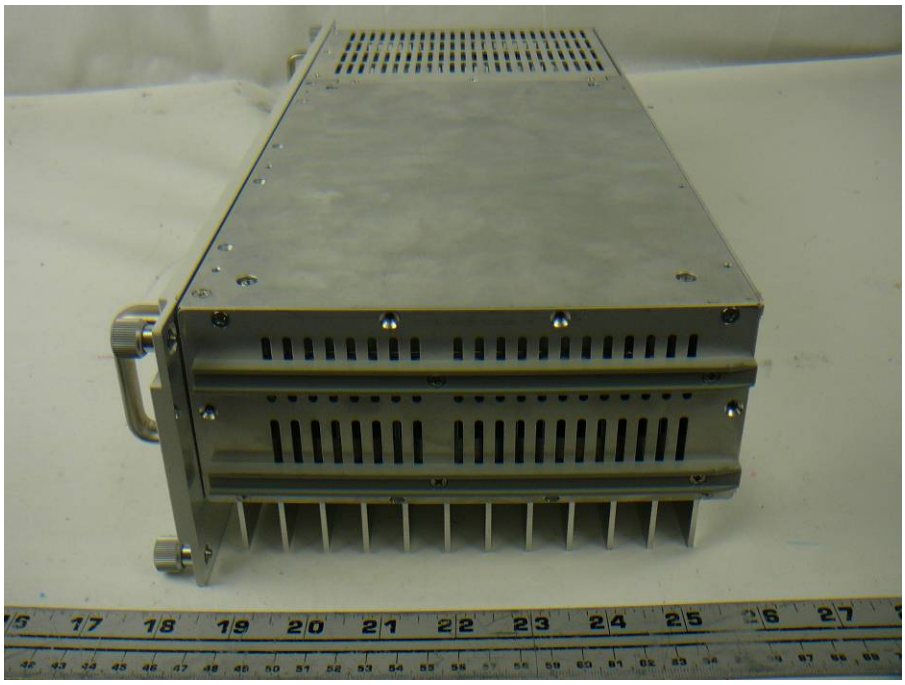
## 12.7 EUT-Main Frame Enclosure Open View 1

## 12.8 EUT-Main Frame Enclosure Open View 2

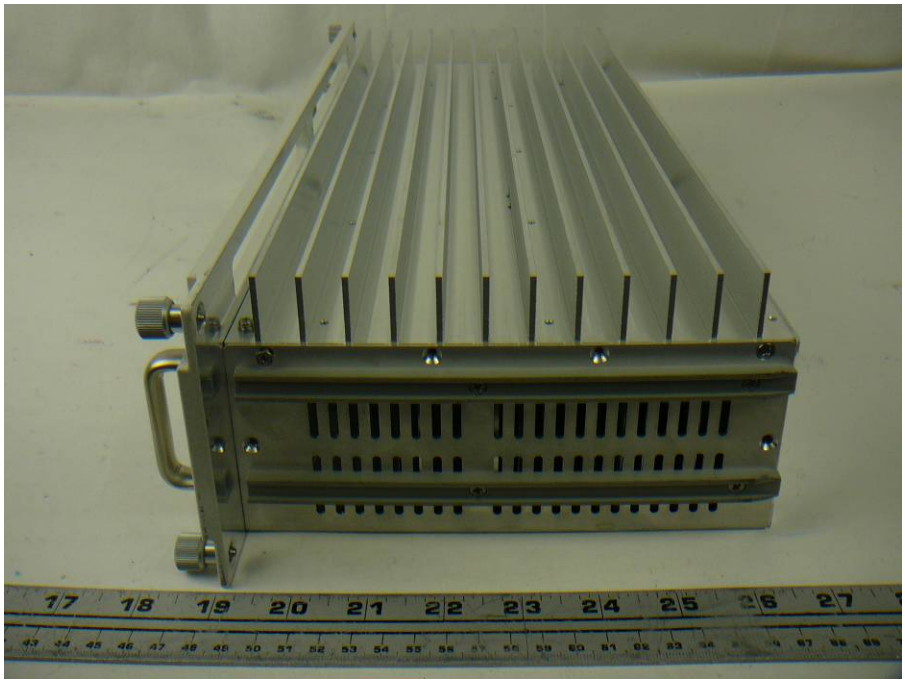
## 12.9 Vision30 800/900MHz Service Card Front View


## 12.10 Vision30 800/900MHz Service Card Rear View

## 12.11 Vision30 800/900MHz Service Card Top View



## 12.12 Vision30 800/900MHz Service Card Bottom View



## 12.13 Vision30 Filter and Combiner BTS Front View


## 12.14 Vision30 Filter and Combiner BTS Rear View

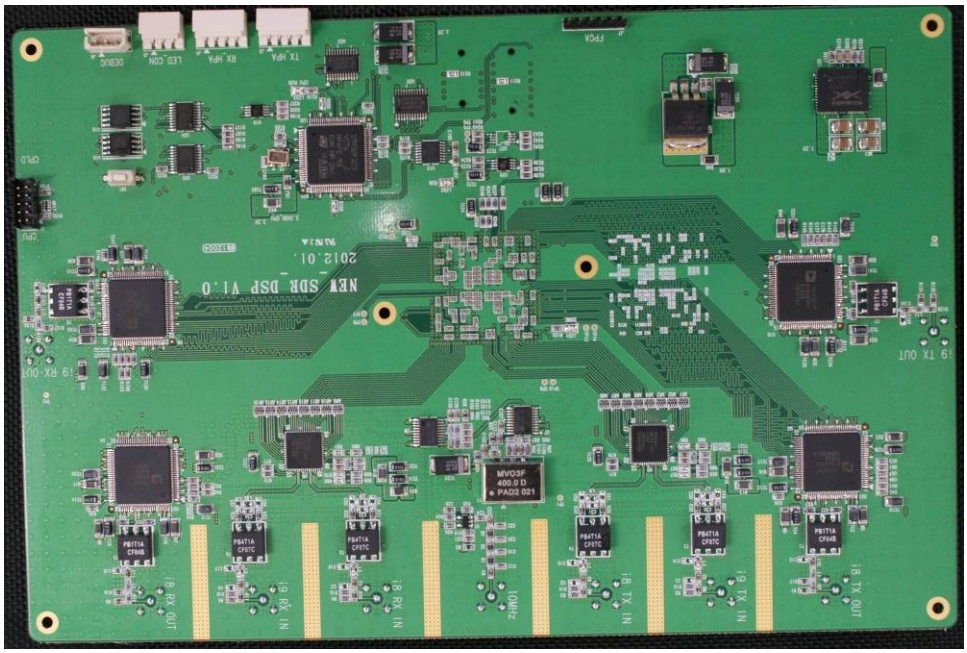
## 12.15 Vision30 Filter and Combiner Mobile Front View


## 12.16 Vision30 Filter and Combiner Mobile Rear View

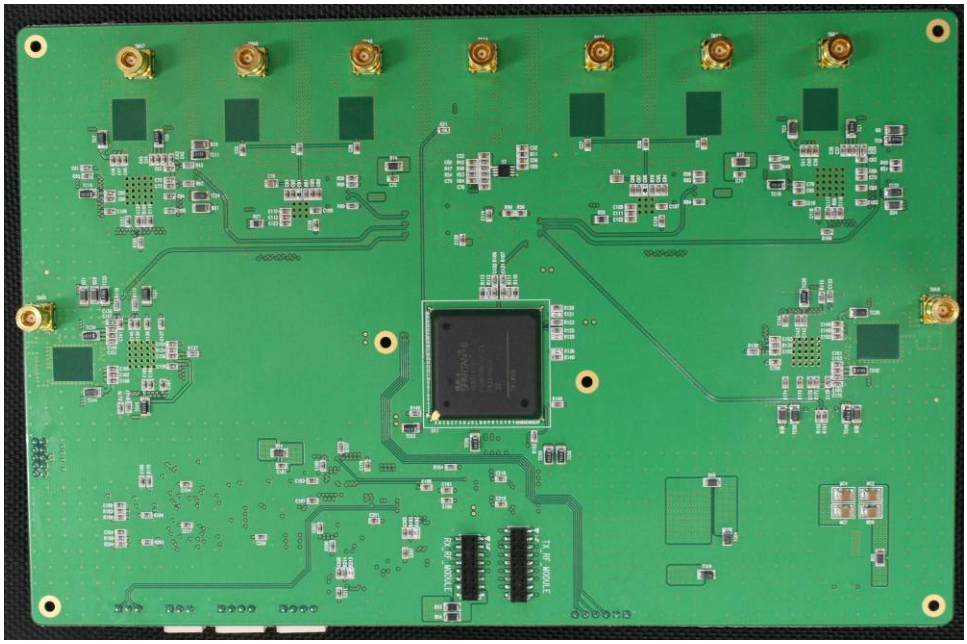
## 12.17 Vision30 Rectifier (Power Supply) Front View


## 12.18 Vision30 Network Controller Front View

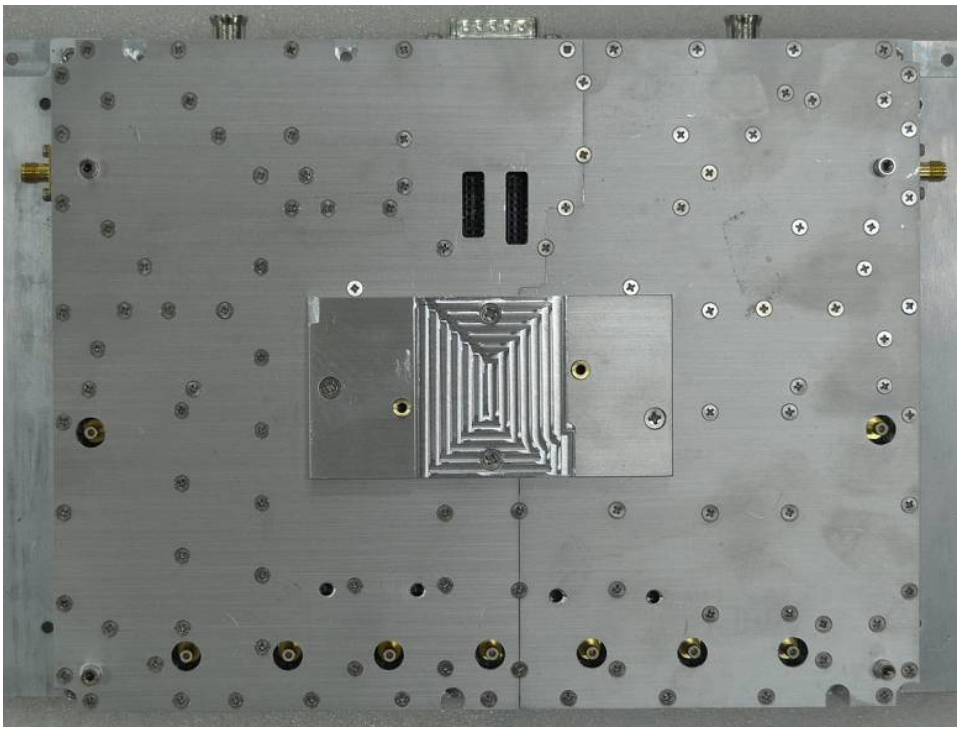
## 12.19 Vision30 800/900MHz Service Card Digital Unit PCB Top View



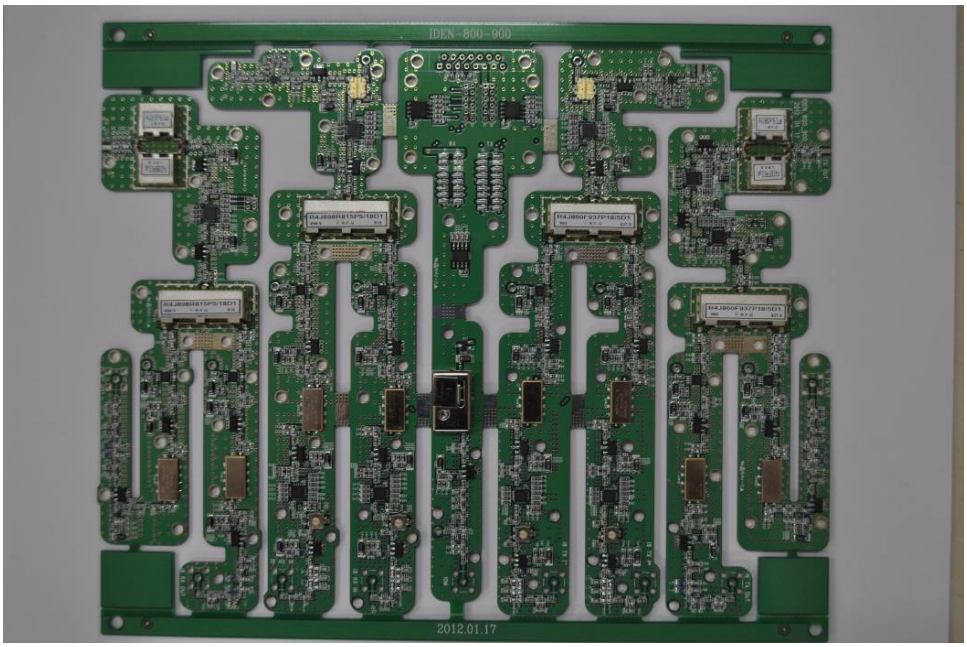
## 12.20 Vision30 800/900MHz Service Card Digital Unit PCB Bottom View



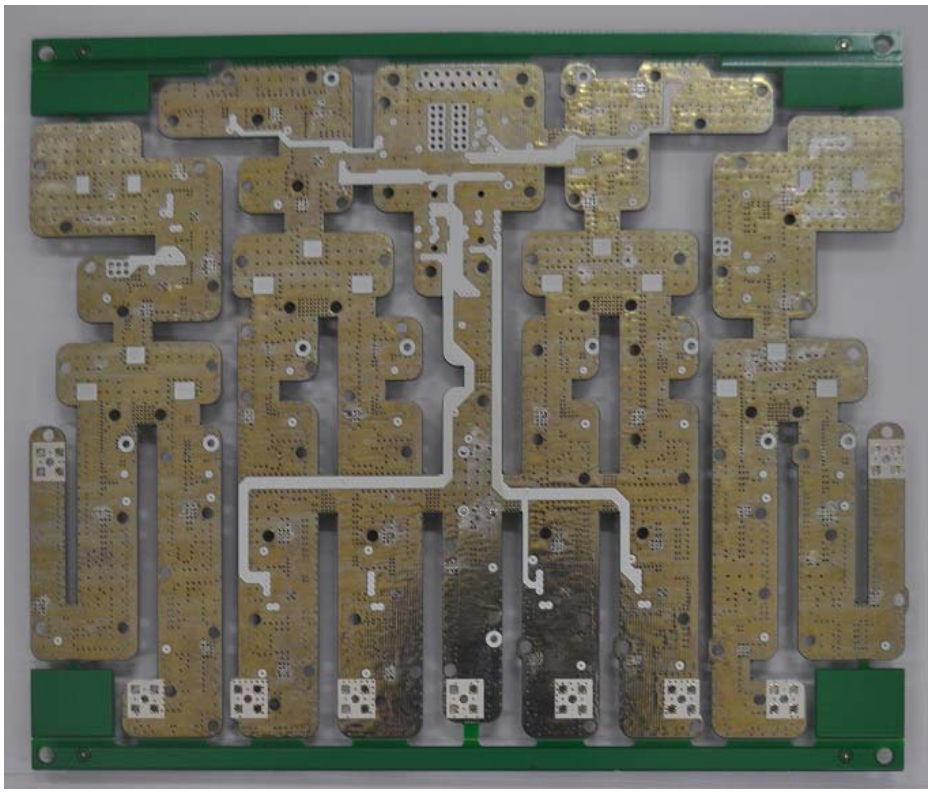
## 12.21 Vision30 800/900MHz Service Card RF Unit Shielded View



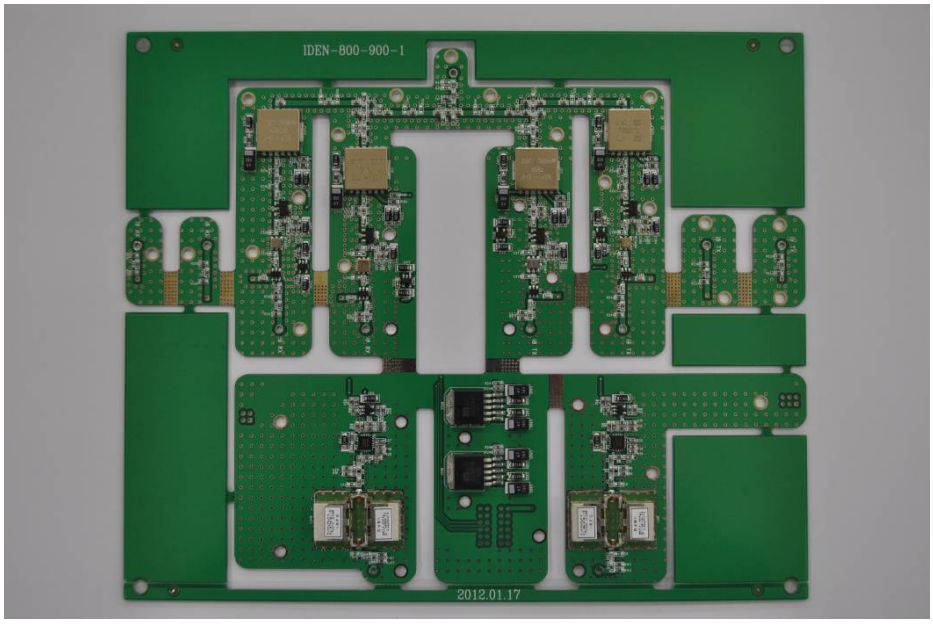
## 12.22 Vision30 800/900MHz Service Card RF Unit PCB 1 Top View



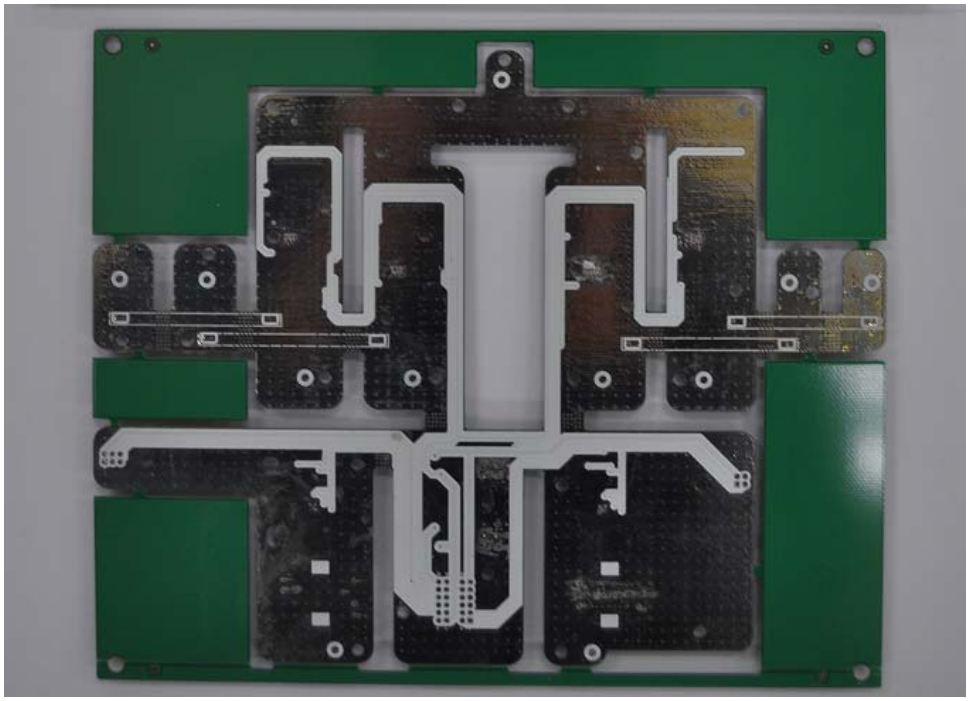
## 12.23 Vision30 800/900MHz Service Card RF Unit PCB 1 Bottom View



## 12.24 Vision30 800/900MHz Service Card RF Unit PCB 2 Top View

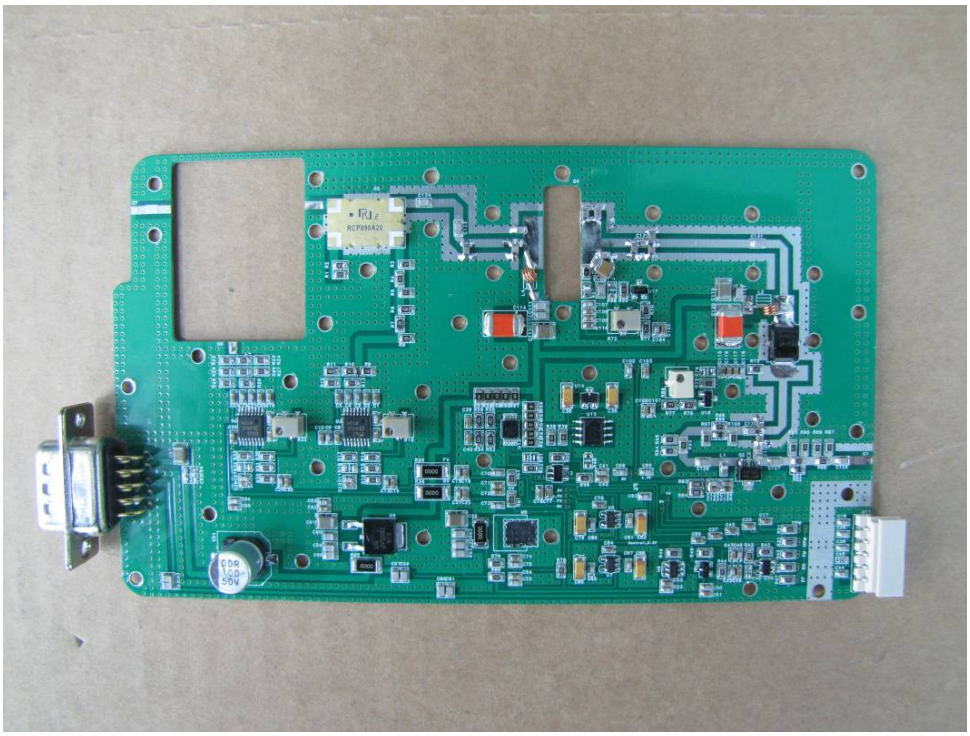


## 12.25 Vision30 800/900MHz Service Card RF Unit PCB 2 Bottom View

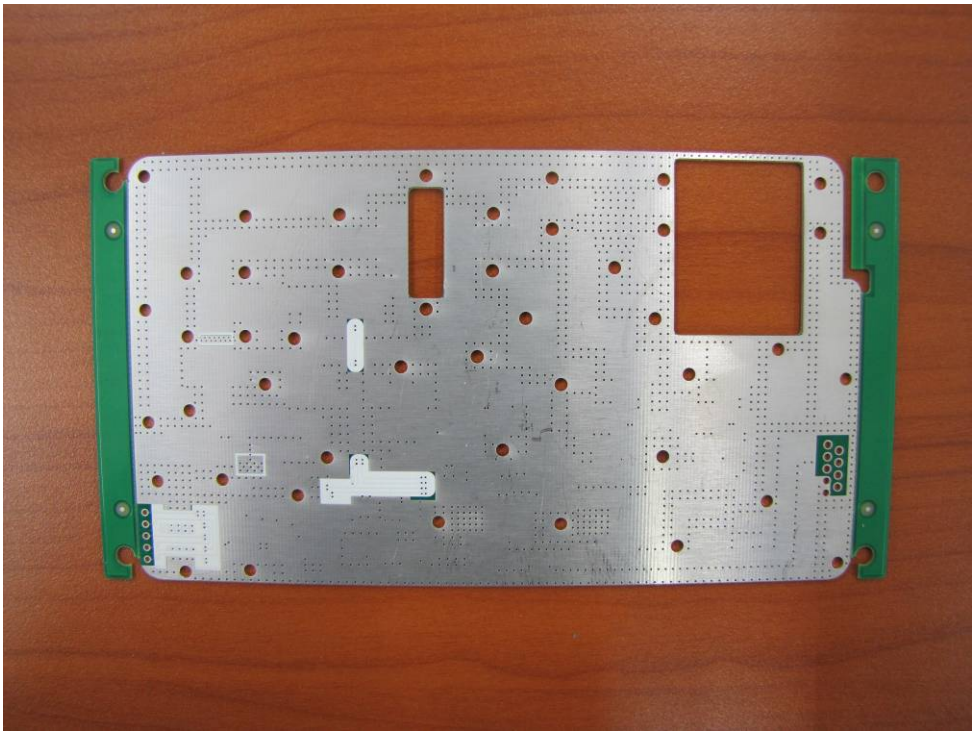


## 12.26 Vision30 800/900MHz Service Card HPA Shielded View

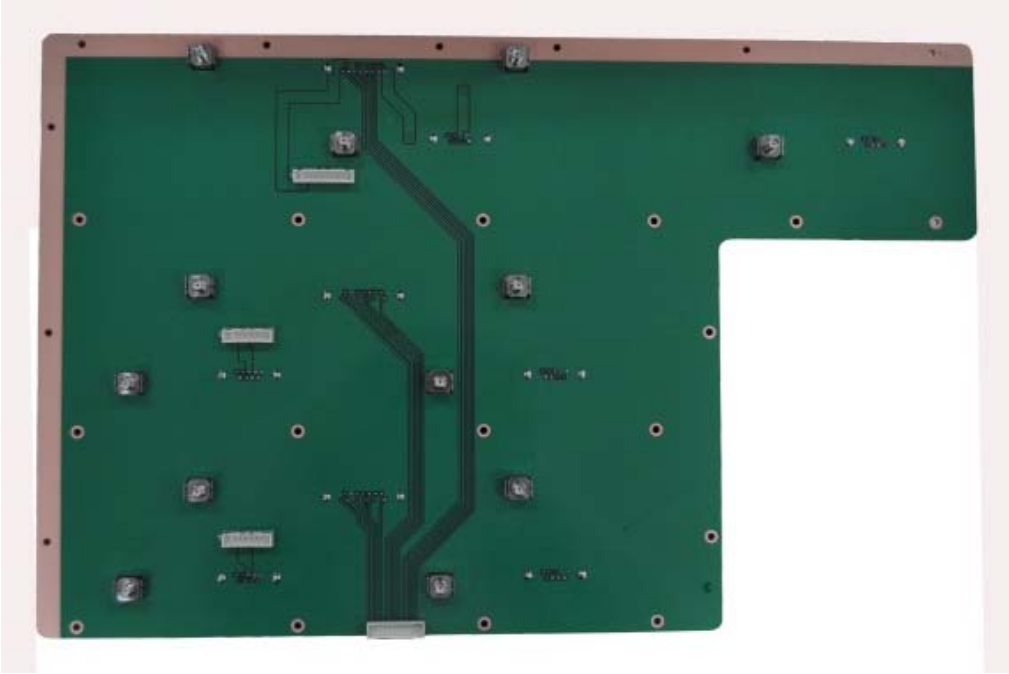
## 12.27 Vision30 800/900MHz Service Card HPA PCB Top View



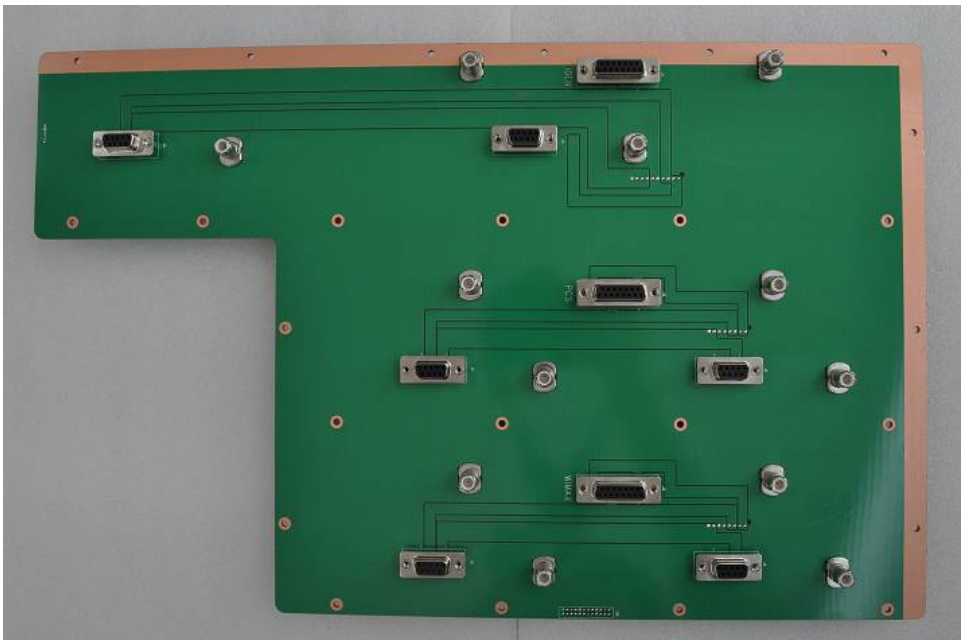
## 12.28 Vision30 800/900MHz Service Card HPA PCB Bottom View



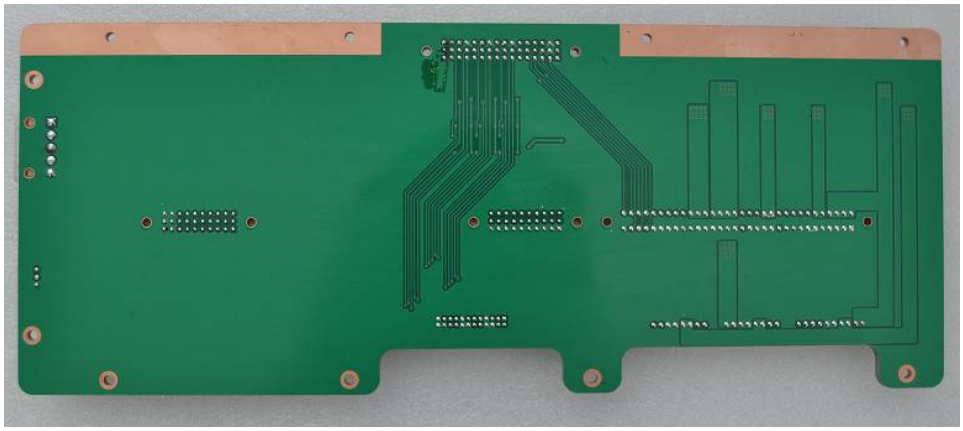
## 12.29 Main Frame PCB 1 Top View



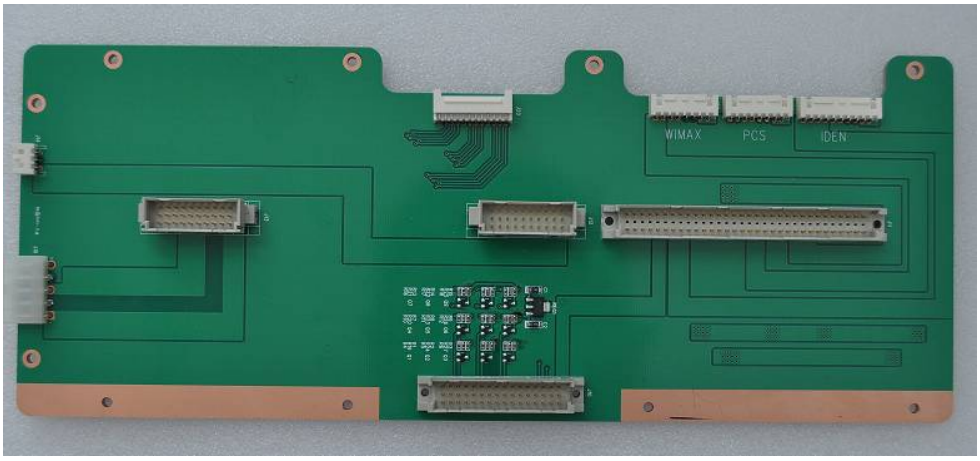
## 12.30 Main Frame PCB 1 Bottom View



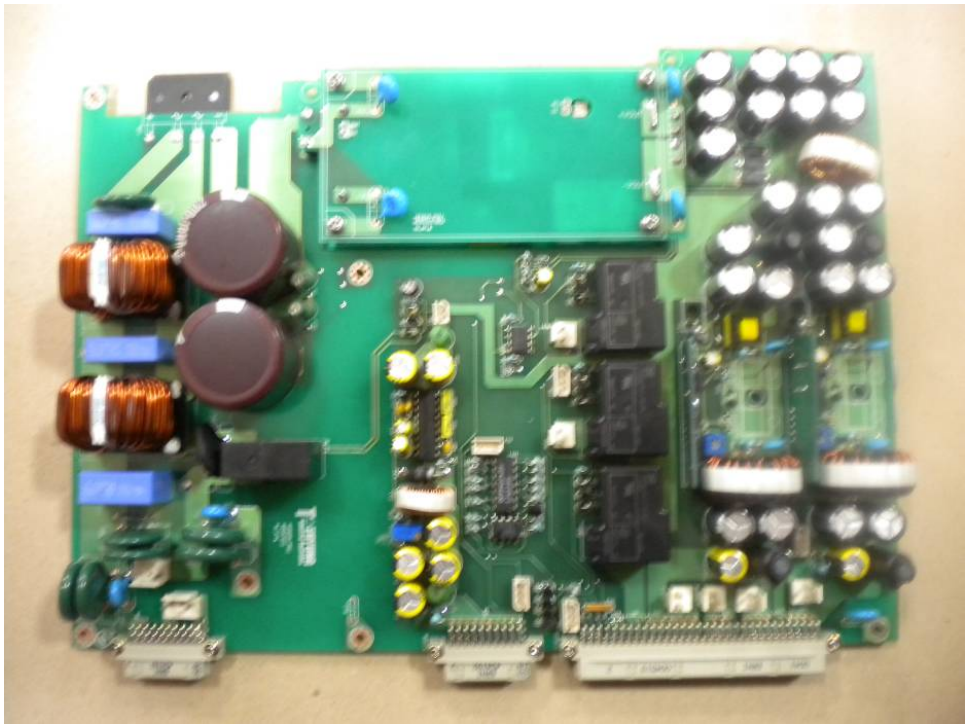
## 12.31 Main Frame PCB 2 Top View



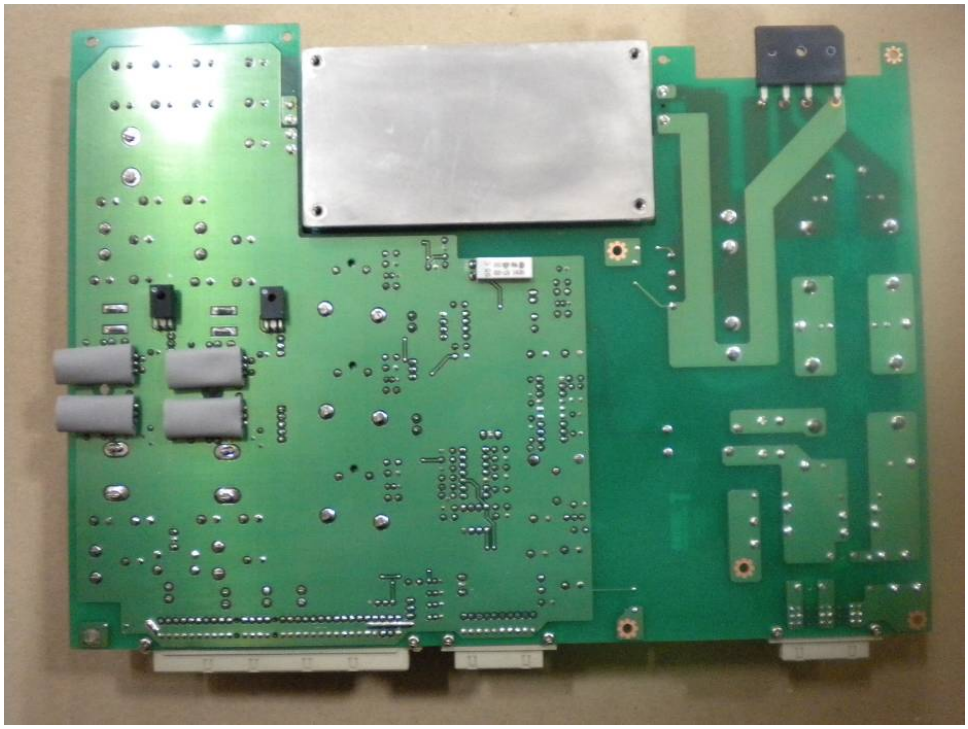
## 12.32 Main Frame PCB 2 Bottom View



## 12.33 Vision30 Rectifier PCB Top View

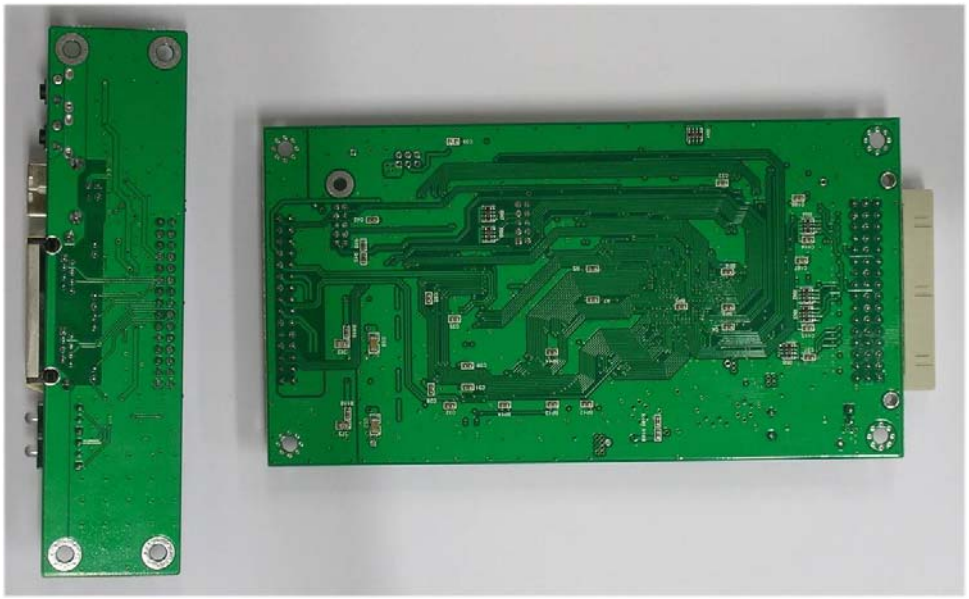


## 12.34 Vision30 Rectifier PCB Bottom View



## 12.35 Vision30 Network Controller PCB Top View


## 12.36 Vision30 Network Controller PCB Bottom View



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