Advanced Compliance

6 Randolph Way
Hillsborough, NJ 08844
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Electromagnetic Emission Compliance Test Report

Equipment Under Test (EUT)	Dual Band Repeater IRD55FB-30-70
Applicant	Shyam Telecom Inc.
In Accordance With	FCC Part 22, Subpart H FCC Part 24, Subpart E
Test by	Advanced Compliance Laboratory, Inc. 6 Randolph Way Hillsborough, New Jersey 08844
Authorized by	Wei Li Lab Manager
Signature	
Date	June 15, 2005
AC Lab Report Number	0048-050615-01

NVLAP®
Lab Code:200101-0

The test result in this report is supported and covered by the NVLAP accreditation.

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Section 1. Summary of Test Results

Manufacturer:	Shyam Telecom Inc.
Model No.:	Dual Band Repeater IRD55FB-30-70
Sample No.:	D4RGCDE001

General: **All measurements are traceable to national standards**

These tests were conducted on a sample of the equipment for the purpose of demonstrating compliance with FCC Part 22, Subpart H& Part 24, Subpart E.

☐ New Submission ☒ Production Unit

☒ Class II Permissive Change ☐ Pre-Production Unit

THIS TEST REPORT RELATES ONLY TO THE ITEM(S) TESTED.

THE FOLLOWING DEVIATIONS FROM, ADDITIONS TO, OR EXCLUSIONS FROM THE TEST SPECIFICATIONS HAVE BEEN MADE.

"See Summary of Test Data"

NVLAP LAB CODE: 200101-0

Summary of Test Data

RF Power Output**	22.913(a) 24.232(a)	500W ERP 100W EIRP	Complies
Occupied Bandwidth (Voice & SAT)	2.1049(i)	Mask	N/A*
Occupies Bandwidth (Wideband Data)	2.1049(i)	Mask	N/A*
Occupied Bandwidth (Digital)**	2.1049(i)	Mask	Complies
Spurious Emissions at Antenna Terminals**	22.917 24.238	-13 dBm	Complies
Field Strength of Spurious Emissions**	22.917 24.238	-13 dBm E.I.R.P.	Complies
Frequency Stability**	22.355 24.235	1.5 ppm	Complies

* These items are NOT applied to the EUT.
** Tests related to EUT changes were conducted.

Comparing to its original model, there is no hardware changes in current product except the following adjustments on its Cellular Band Frequency Range by utilizing software method:

- **Cellular Band Uplink Frequency Range: Changing from 824-846.5MHz to 824-849MHz;**
- **Cellular Band Downlink frequency Range: Changing from 869-891.5MHz to 869-894MHz.**

The estimated uncertainty of the test result is given as following. The method of uncertainty calculation is provided in Advanced Compliance Lab. Doc. No. 0048-01-01.

	Prob. Dist.	Uncertainty(dB)	Uncertainty(dB)	Uncertainty(dB)
		30-1000MHz	1-6.5GHz	Conducted
Combined Std. Uncertainty u_c	norm.	±2.36	±2.99	±1.83

Wei Li
Lab Manager
Advanced Compliance Lab

Date: June 15, 2005

Advanced Compliance Laboratory, Inc. 6 Randolph Way, Hillsborough, NJ 08844, Tel: (908) 927 9288

Section 2. General Equipment Specification

Supply Voltage		90-240VAC 50/60Hz				
Frequency Range	Cellular	UL/824-849MHz; DL/869-894MHz				
	PCS	UL/1850-1910MHz; DL/1930-1990MHz				
	Modulation	CDMA (F9W) ☒	GSM (GXW) ☒	NADC (DXW) ☐	CDPD (F9W) ☐	AMPS (F8W, F1D) ☐
Output Impedance		50ohm				
Frequency Translation		F1-F1 ☒		F1-F2 ☐		N/A ☐
		Software ☐		Duplexer Change ☐		Full Band Coverage ☐

DC voltages and DC currents per 2.1033(c)(8)

The input supply to the transmitter was set at 5 Volts DC. The RF power output was measured with the indicated voltage and current applied into the final RF amplifying device(s).

800 MHz Cellular / 1900MHz PCS

RF Output, DC Current and RF Input Power are all average values.
Measured Maximum RF output: 27.72dBm (0.59W)
Measured DC voltage: 5.37V
Measured DC current: 3.38A.
Measured Minimum RF output: -61dBm
Measured DC voltage: 5.37V
Measured DC current: 3.29A

Tune-up procedure per 2.1033(c) (9)

There are no user accessible adjustments or tuning in this portable cellular transceiver. All necessary adjustments and tuning are performed during manufacture of the product. Any adjustments or tuning after service or repair are done as part of that process as special equipment is required to perform such adjustments.

Description of Operation

This device is a dual band repeater operating in both downlink and uplink spectrums of Cellular and PCS bands.

System Diagram

See Attachment.

Section 3. RF Output Power

Name of Test:	*RF Output Power*	Test Standard:	*22.913(a)* *24.232(a)*
Tested By:	WEI LI	Test Date:	06/08/2005-06/14/2005

Minimum Standard: Para. No. 22.913(a). The maximum effective radiated power (ERP) of base station transmitters and cellular repeaters must not exceed 500 Watts (57dBm).
Para. No. 24.232(a). The maximum peak output power of base transmitters should not exceed 100 Watts EIRP (50dBm).

Method of Measurement: *Detachable Antenna:*
The peak power at antenna terminals is measured using spectrum analyzer.

Integral Antenna:
If the antenna is not detachable from the circuit then the Peak Power Output is derived from the peak radiated field strength of the fundamental emission by using the plane wave relation

$$\frac{GP}{4\pi R^2} = \frac{E^2}{120\pi}$$

and proceeding as follows:

$$P = \frac{E^2 R^2}{30G} = \frac{E^2 3^2}{30G}$$

where,
P = the equivalent isotropic radiated power in watts
E = the maximum measured field strength in V/m
R = the measurement range (3 meters)
G = the numeric gain of the transmit antenna in relation to an isotropic radiator

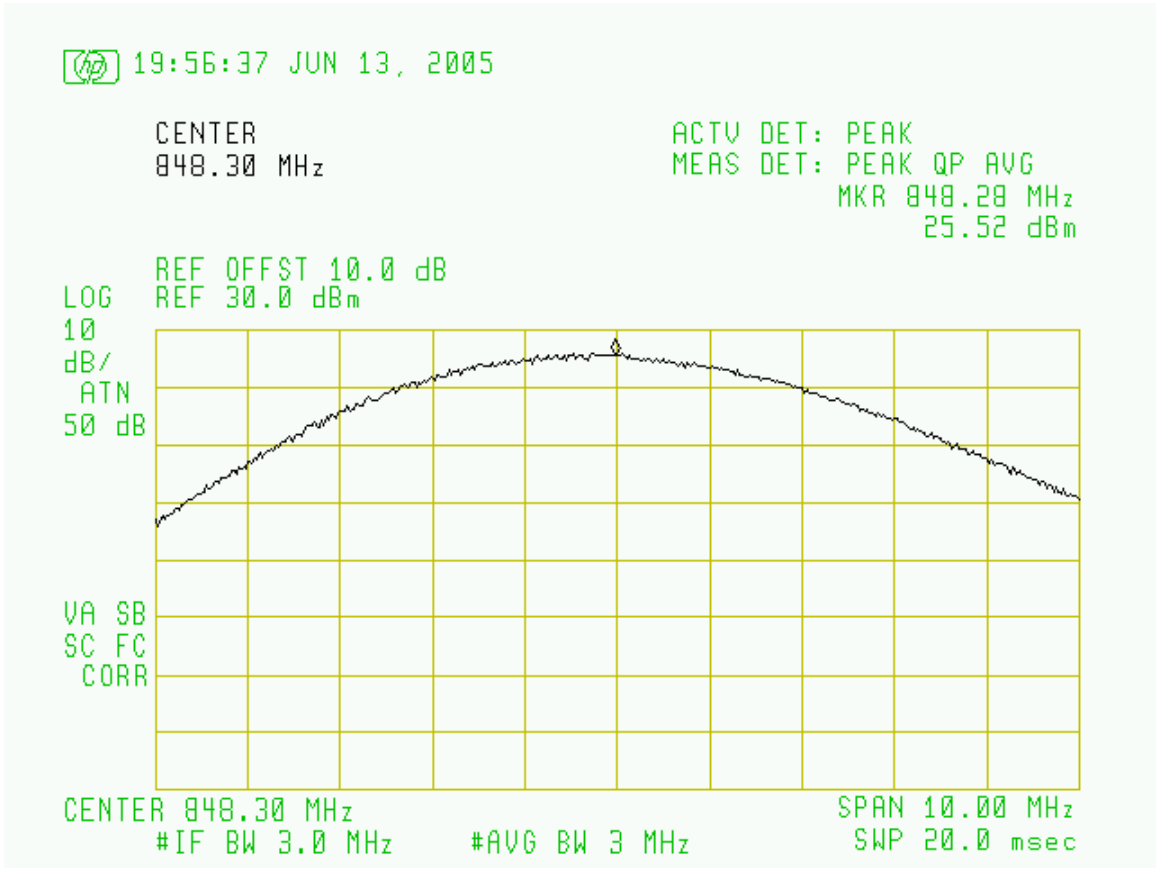
Test Result: **Complies**

Test Data:

Cellular Bands	Channel	Modulation	Power Output (dBm)	Limit (dBm)	Margin
Uplink	Hi	CDMA	25.52	57	-31.48
	Hi	GSM	17.12	57	-39.88
Downlink	Hi	CDMA	24.17	57	-32.83
	Hi	GSM	16.13	57	-40.87
Input Power (dBm)	-50 (Maximum gain)				
Ref Offset	Ref offset=Cable Factor +Attenuation=10/10.4dB				

Project Number:	0048-050615-01
EUT:	Shyam Dual Band Repeater IRD55FB-30-70
SN:	D4RGCDE001
Tested By:	Wei Li
Temperature:	70°F
Humidity:	30%

Section:	**RF Output Power: Cellular Bands**
Plot Name:	**Uplink, Hi-Channel CDMA Modulation**
Configuration:	Server Antenna Connector was connected to SG. Input: -50dBm



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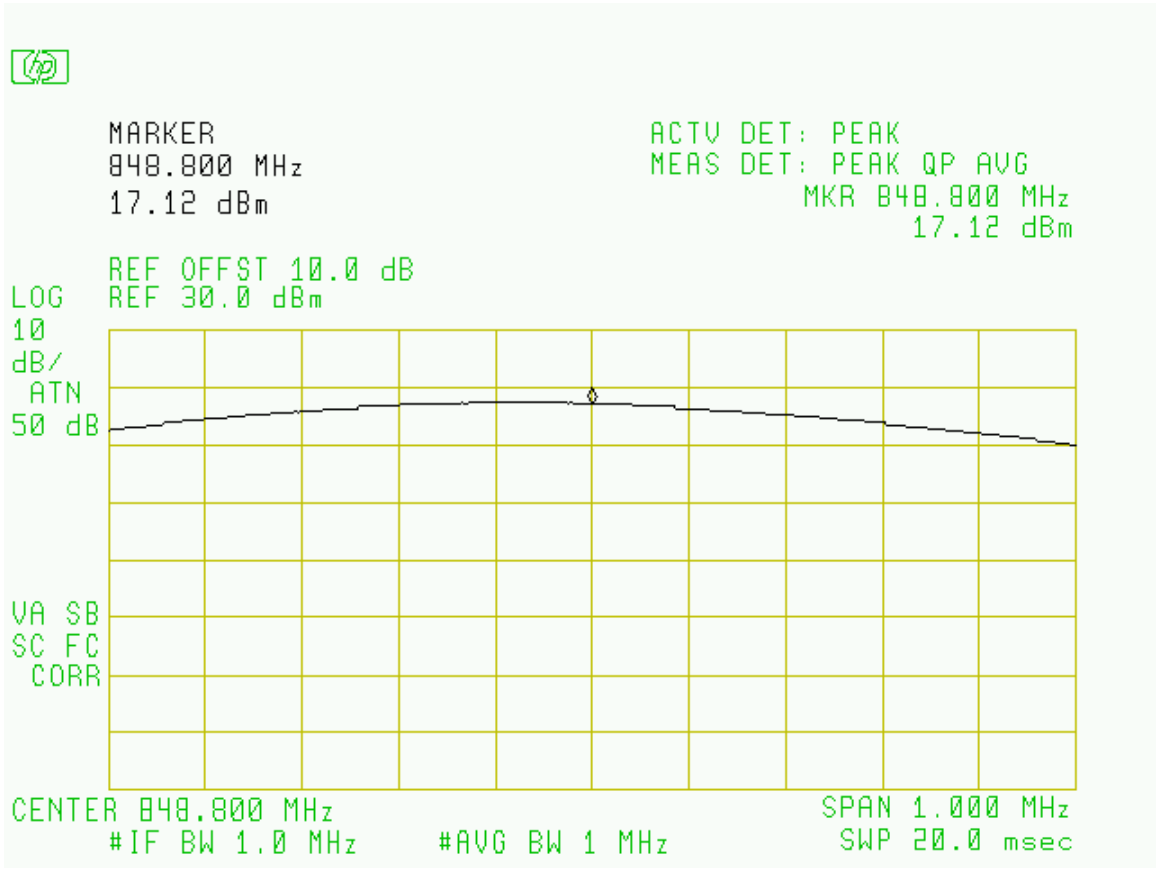
SN:	D4RGCDE001
Tested By:	Wei Li
Temperature:	70°F
Humidity:	30%

Section:	**RF Output Power: Cellular Bands**
Plot Name:	**Uplink, Hi-Channel GSM Modulation**
Configuration:	Server Antenna Connector was connected to SG. Input: -50dBm



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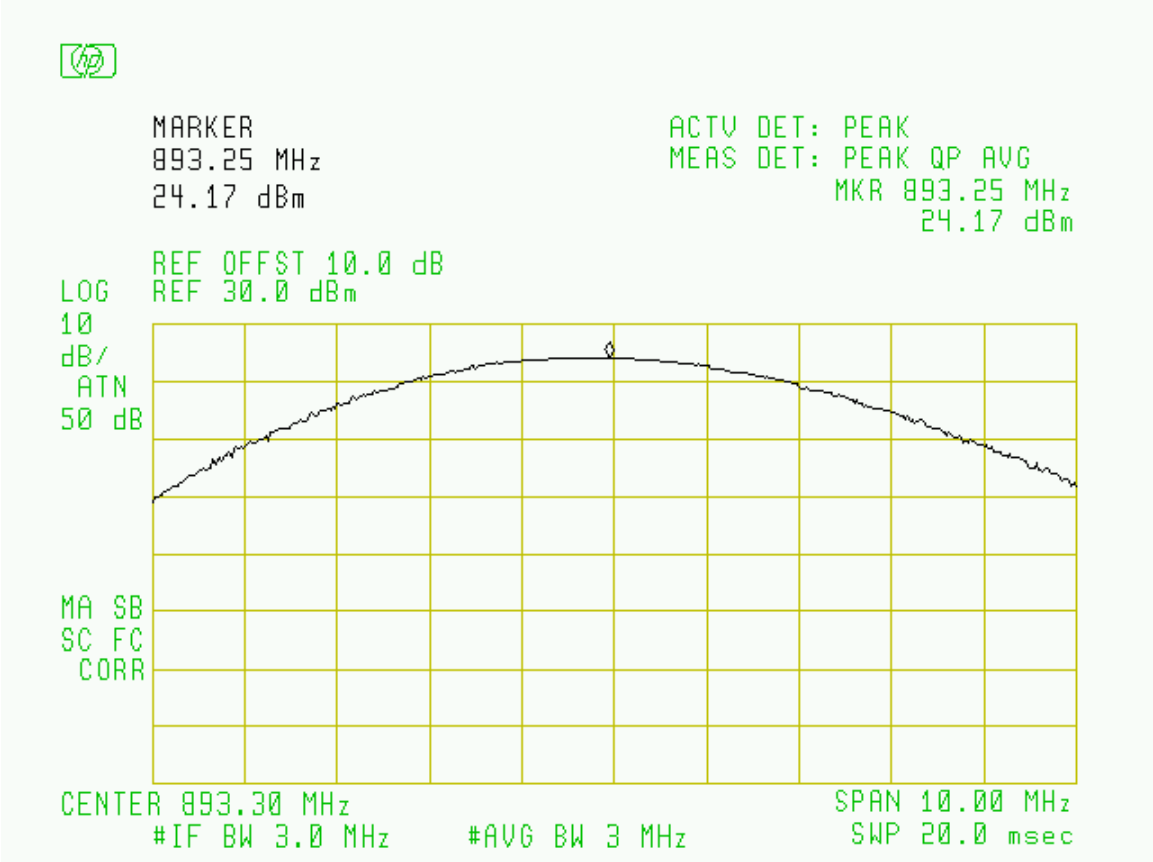
EUT:	Shyam Dual Band Repeater IRD55FB-30-70
SN:	D4RGCDE001
Tested By:	Wei Li
Temperature:	70°F
Humidity:	30%

Section:	**RF Output Power: Cellular Bands**
Plot Name:	**Downlink, Hi-Channel CDMA Modulation**
Configuration:	Donor Antenna Connector was connected to SG. Input: -50dBm



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EUT:	Shyam Dual Band Repeater IRD55FB-30-70
SN:	D4RGCDE001
Tested By:	Wei Li
Temperature:	70°F
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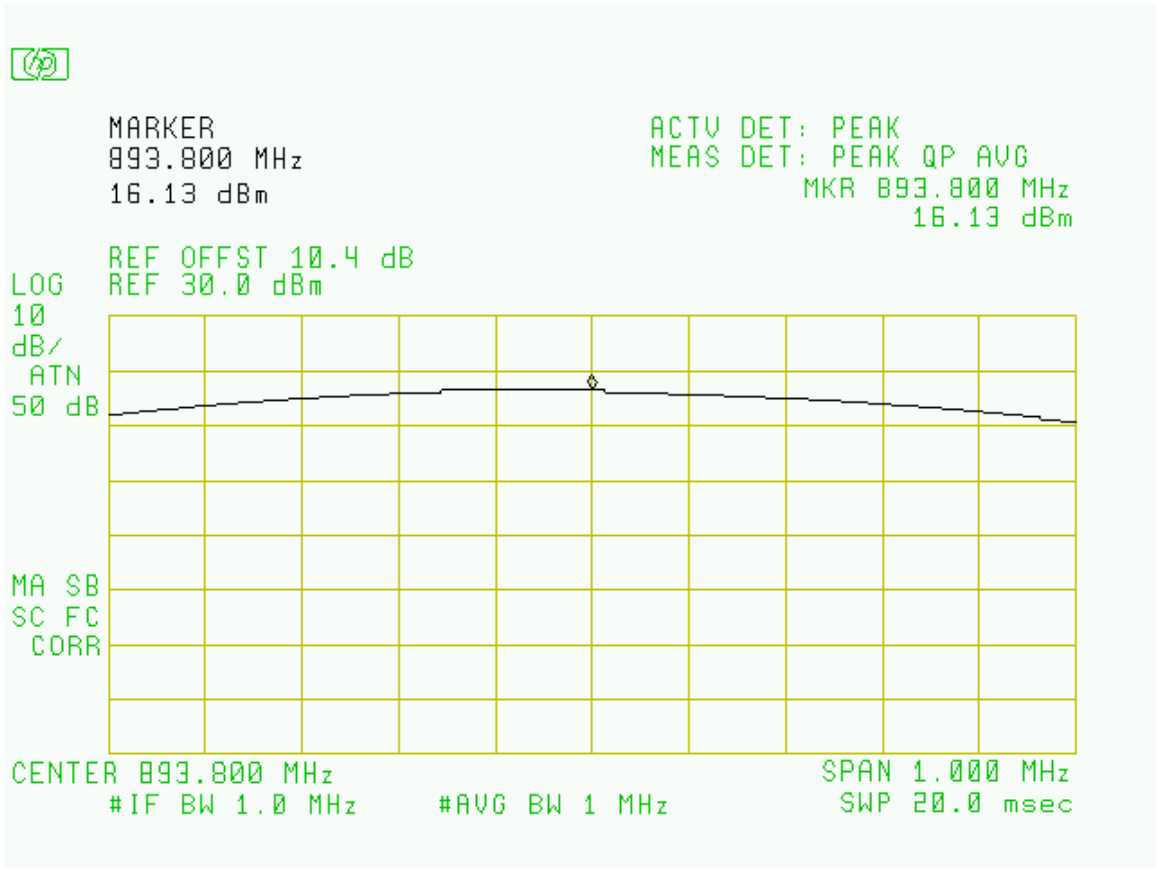
Section:	**RF Output Power: Cellular Bands**
Plot Name:	**Downlink, Hi-Channel GSM Modulation**
Configuration:	Donor Antenna Connector was connected to SG. Input: -50dBm



Section 4. Occupied Bandwidth

Name of Test:	*Occupied Bandwidth*	Test Standard:	*2.1049(i)*
Tested By:	WEI LI	Test Date:	06/08/2005-06/14/2005

Minimum Standard: Not defined by FCC. Input vs. Output.

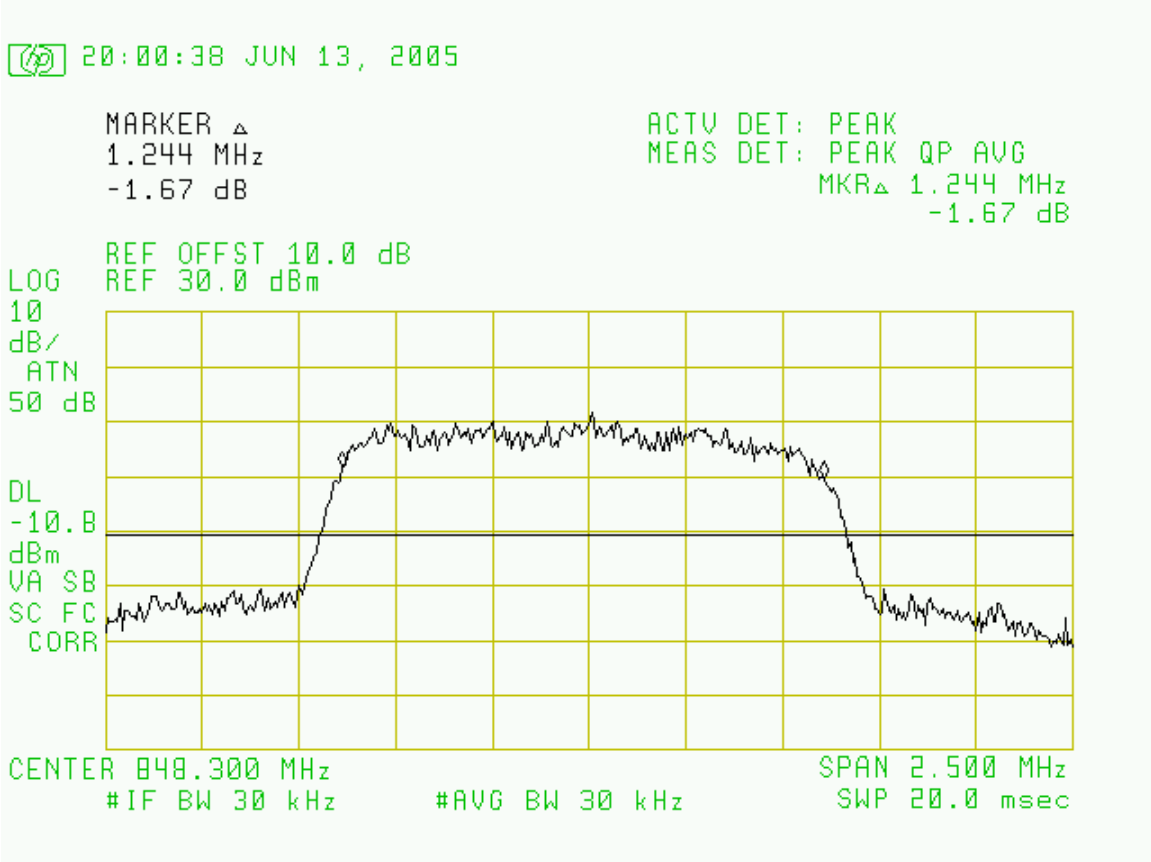
Method of Measurement: Spectrum Analyzer Settings:
RBW: CDMA (30 kHz), GSM (30 kHz), NADC (1 kHz) and CDPD (1 kHz)
VBW: ≥RBW
Span: As required
Sweep: Auto
Input Signal Characteristics:
RF level: Maximum recommended by manufacturer

Test Result: **Complies**

Test Data: Attached Plots

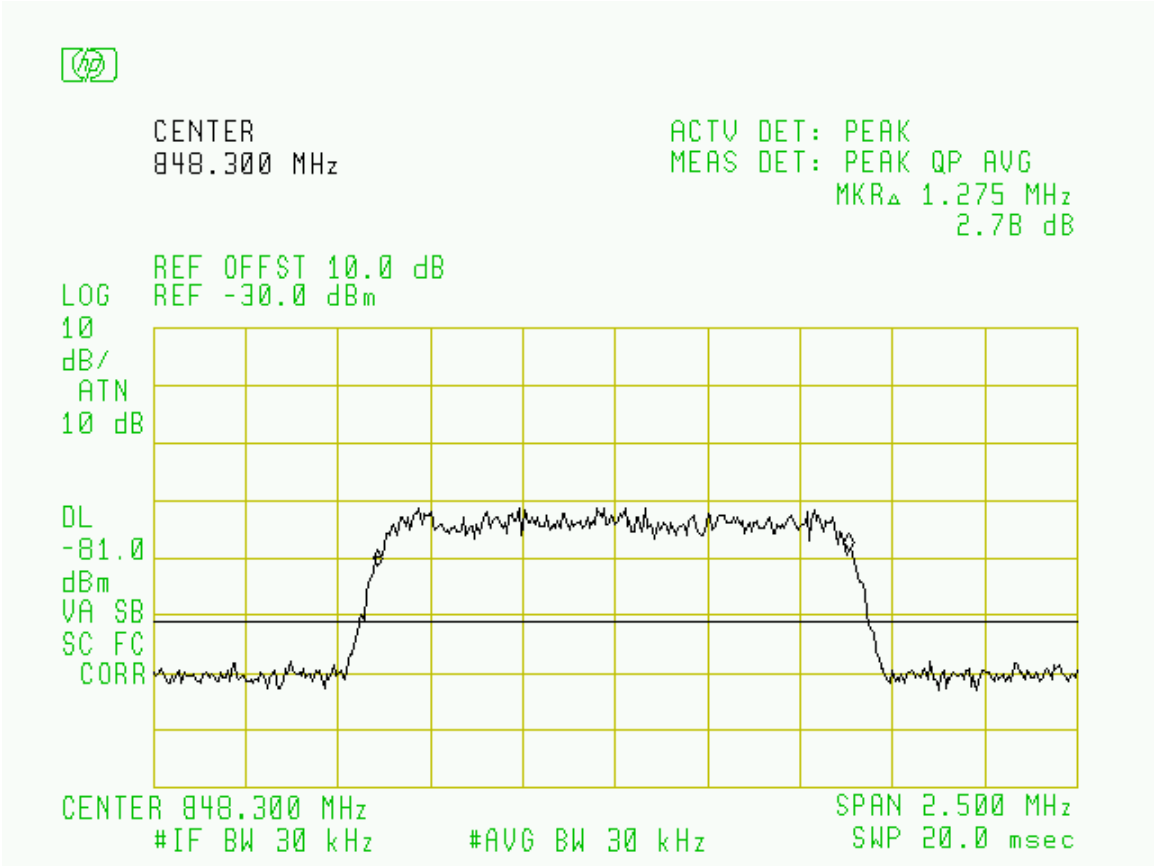
Project Number:	0048-050615-01
EUT:	Shyam Dual Band Repeater IRD55FB-30-70
SN:	D4RGCDE001
Tested By:	Wei Li
Temperature:	70°F
Humidity:	30%

Section:	**Occupied Bandwidth: Cellular Bands**
Plot Name:	**Uplink, Hi-Channel, CDMA Modulation**
Configuration:	SG Input: -55dBm, Output Port: EUT BTS



Project Number:	0048-050615-01
EUT:	Shyam Dual Band Repeater IRD55FB-30-70
SN:	D4RGCDE001
Tested By:	Wei Li
Temperature:	70°F
Humidity:	30%

Section:	**Occupied Bandwidth: Cellular Bands**
Plot Name:	**Uplink, Hi-Channel, CDMA Modulation**
Configuration:	SG Input: -55dBm, Output Port: SG



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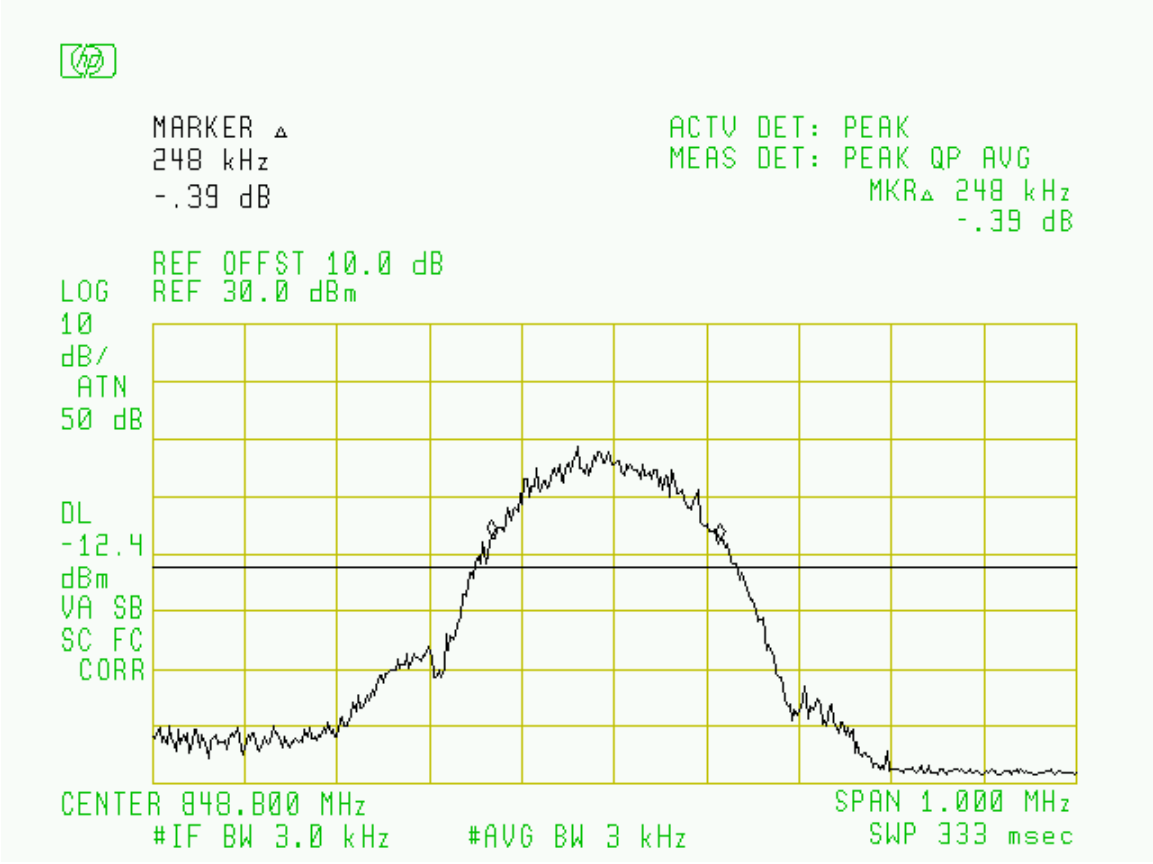
EUT:	Shyam Dual Band Repeater IRD55FB-30-70
SN:	D4RGCDE001
Tested By:	Wei Li
Temperature:	70˚F
Humidity:	30%

Section:	**Occupied Bandwidth: Cellular Bands**
Plot Name:	**Uplink, Hi-Channel, GSM Modulation**
Configuration:	SG Input: -55dBm, Output Port: EUT BTS



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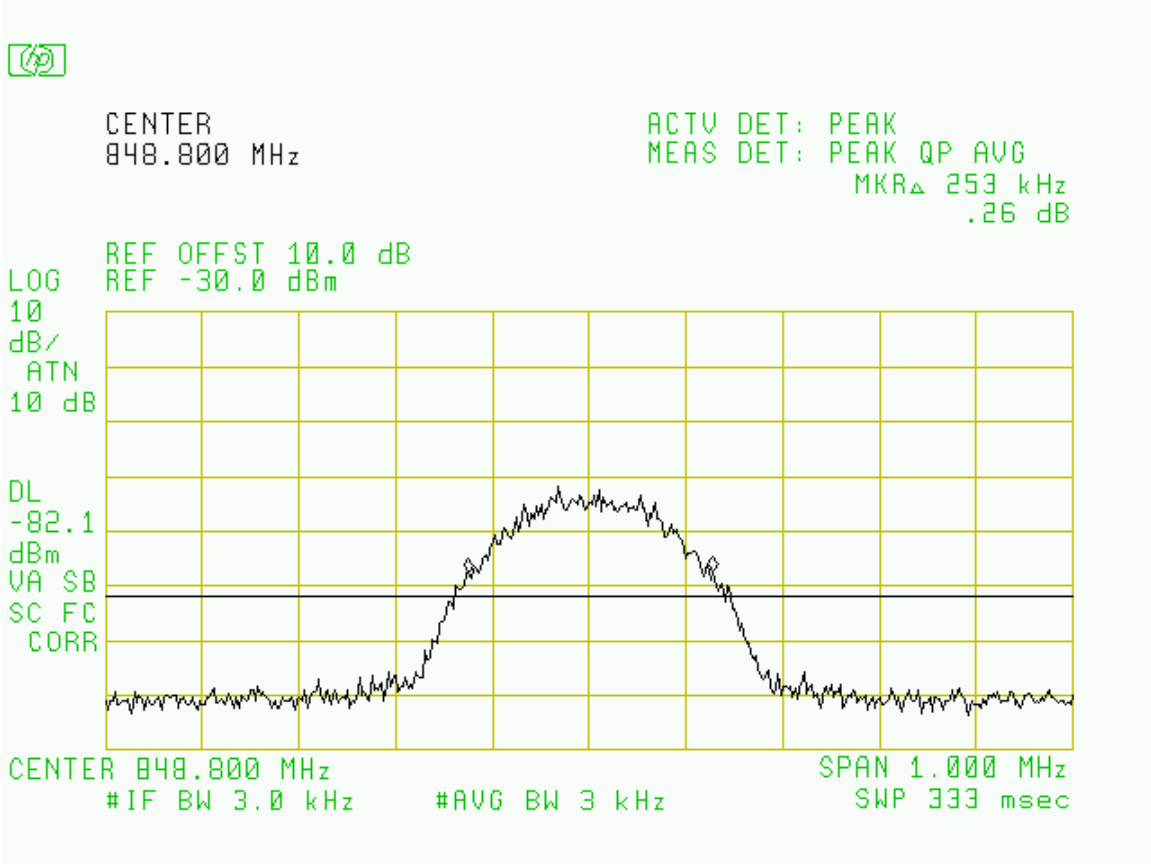
EUT:	Shyam Dual Band Repeater IRD55FB-30-70
SN:	D4RGCDE001
Tested By:	Wei Li
Temperature:	70°F
Humidity:	30%

Section:	**Occupied Bandwidth: Cellular Bands**
Plot Name:	**Uplink, Hi-Channel, GSM Modulation**
Configuration:	SG Input: -55dBm, Output Port: SG



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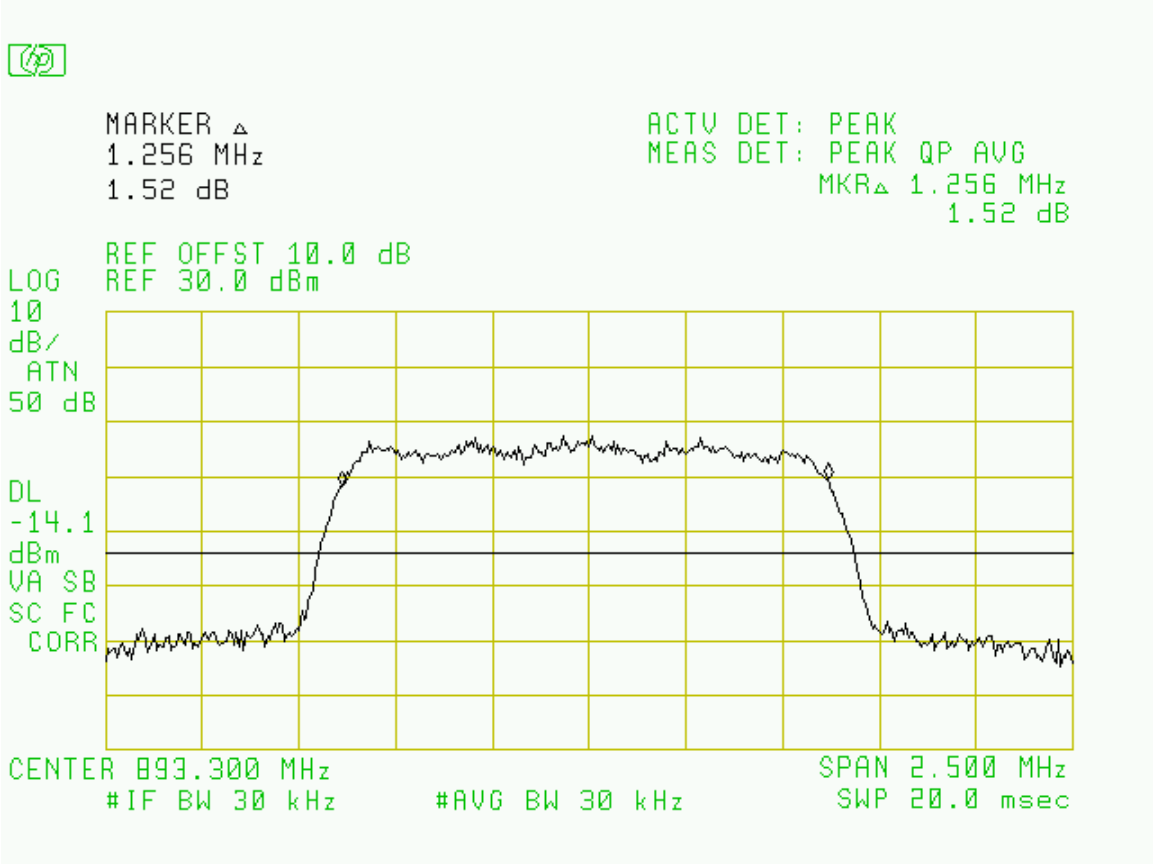
EUT:	Shyam Dual Band Repeater IRD55FB-30-70
SN:	D4RGCDE001
Tested By:	Wei Li
Temperature:	70°F
Humidity:	30%

Section:	**Occupied Bandwidth: Cellular Bands**
Plot Name:	**Downlink, Hi-Channel, CDMA Modulation**
Configuration:	SG Input: -55dBm, Output Port: EUT MOBILE



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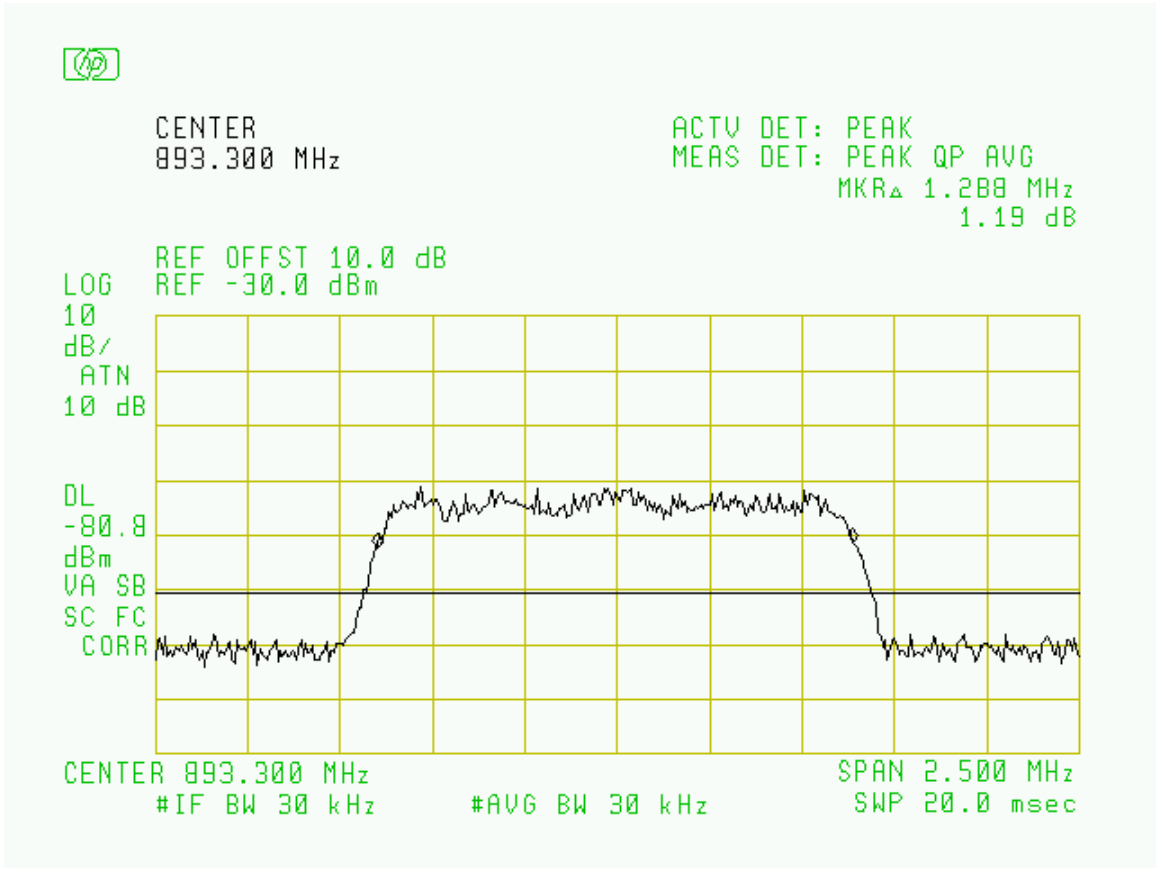
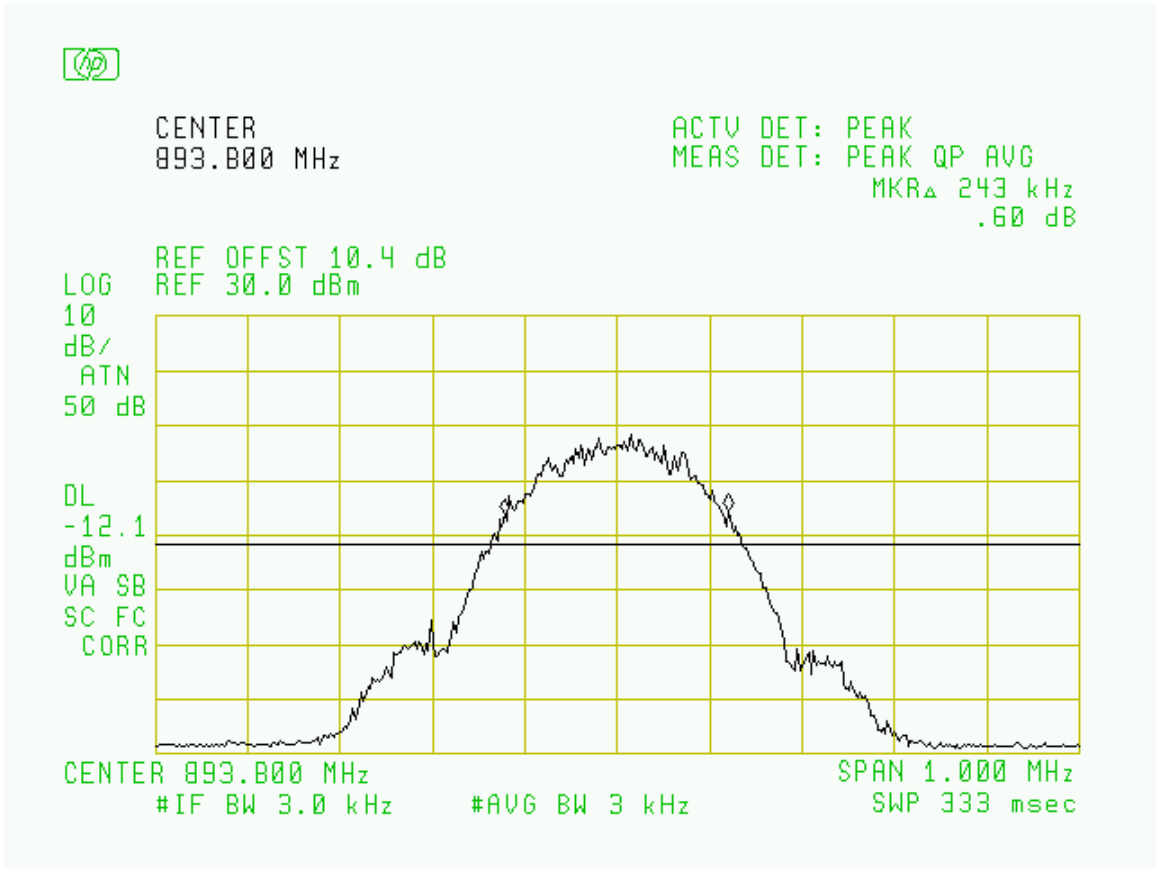
EUT:	Shyam Dual Band Repeater IRD55FB-30-70
SN:	D4RGCDE001
Tested By:	Wei Li
Temperature:	70°F
Humidity:	30%

Section:	**Occupied Bandwidth: Cellular Bands**
Plot Name:	**Downlink, Hi-Channel, CDMA Modulation**
Configuration:	SG Input: -55dBm, Output Port: SG



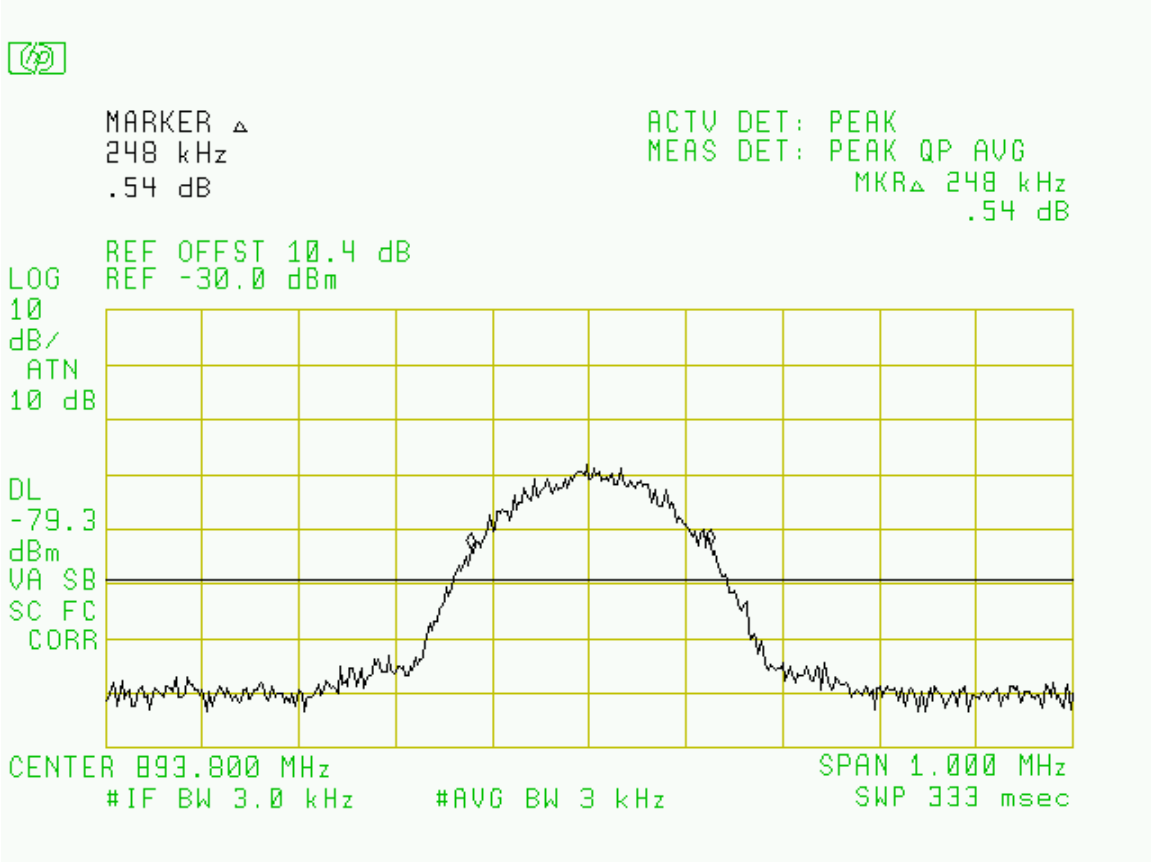
Project Number:	0048-050615-01
EUT:	Shyam Dual Band Repeater IRD55FB-30-70
SN:	D4RGCDE001
Tested By:	Wei Li
Temperature:	70°F
Humidity:	30%

Section:	**Occupied Bandwidth: Cellular Bands**
Plot Name:	**Downlink, Hi-Channel, GSM Modulation**
Configuration:	SG Input: -55dBm, Output Port: EUT MOBILE



Project Number:	0048-050615-01
EUT:	Shyam Dual Band Repeater IRD55FB-30-70
SN:	D4RGCDE001
Tested By:	Wei Li
Temperature:	70°F
Humidity:	30%

Section:	**Occupied Bandwidth: Cellular Bands**
Plot Name:	**Downlink, Hi-Channel, GSM Modulation**
Configuration:	SG Input: -55dBm, Output Port: SG



Section 5. Spurious Emissions at Antenna Terminals

Name of Test:	*Spurious Emissions at Antenna Terminals*	Test Standard:	*22.917 24.238(a)*
Tested By:	WEI LI EDWARD LEE	Test Date:	06/08/2005-06/14/2005

Minimum Standard: Para. No. 22.917(e). The mean power of emissions must be attenuated below the mean power of the unmodulated carrier on any frequency twice or more than twice the fundamental emission by at least 43 + 10 log P. This is equivalent to -13 dBm absolute power.
Para. No. 24.238(a). The magnitude of each spurious and harmonic emission that can be detected when the equipment is operated under conditions specified in the instrction manual and/or alignment procedure, shall not less than 43+10 log (mean output power in watts) dBc below the mean power output outside a licensee's frequency block (-13dBm).

Method of Measurement: Spectrum Analyzer Settings:
RBW: 100 kHz. As required for digital modulations.
RBW: 1MHz. When frequency is located above 1GHz.
VBW: ≥RBW
Start Frequency: 0 MHz
Stop Frequency: 13 GHz (Cellular), 22GHz (PCS)
Sweep: Auto

For Inter-modulation measurement: Two RF signals set as inputs. The frequencies of both RF signals shall be within the repeater's operating band. The spacing between both RF signals shall be the minimum possible spacing applied in a network. The level of both RF input signals shall be increased, until the maximum rated output power per channel, as declared by the manufacturer, is reached.

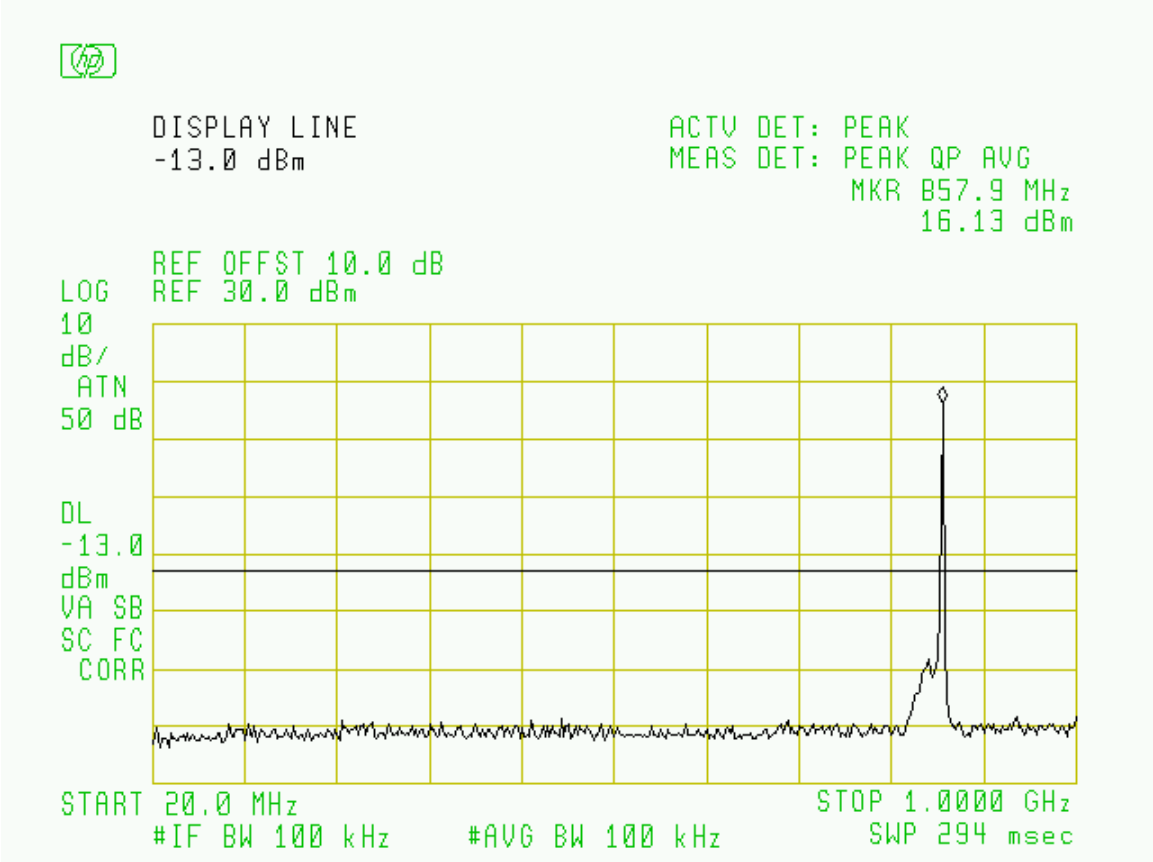
Frequencies: $f1=F_{(\text{Low CH/Mid CH/High CH})}$, $f2=f1\pm\Delta$
Spacing Δ=2.5MHz for CDMA and 600KHz for GSM
Each RF Input Level:
about -3dB comparing to the max. input level of single RF Input test

Test Result: **Complies**

Test Data: Attached Plots

Project Number:	0048-050615-01
EUT:	Shyam Dual Band Repeater IRD55FB-30-70
SN:	D4RGCDE001
Tested By:	Wei Li
Temperature:	70˚F
Humidity:	30%

Section:	**Spurious Emissions at Antenna Terminals: Cellular Bands / CDMA Modulation**
Plot Name:	**Uplink, Hi-Channel**
Configuration:	SG Input: -50dBm, Output Port: EUT BTS



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EUT:	Shyam Dual Band Repeater IRD55FB-30-70
SN:	D4RGCDE001
Tested By:	Wei Li
Temperature:	70˚F
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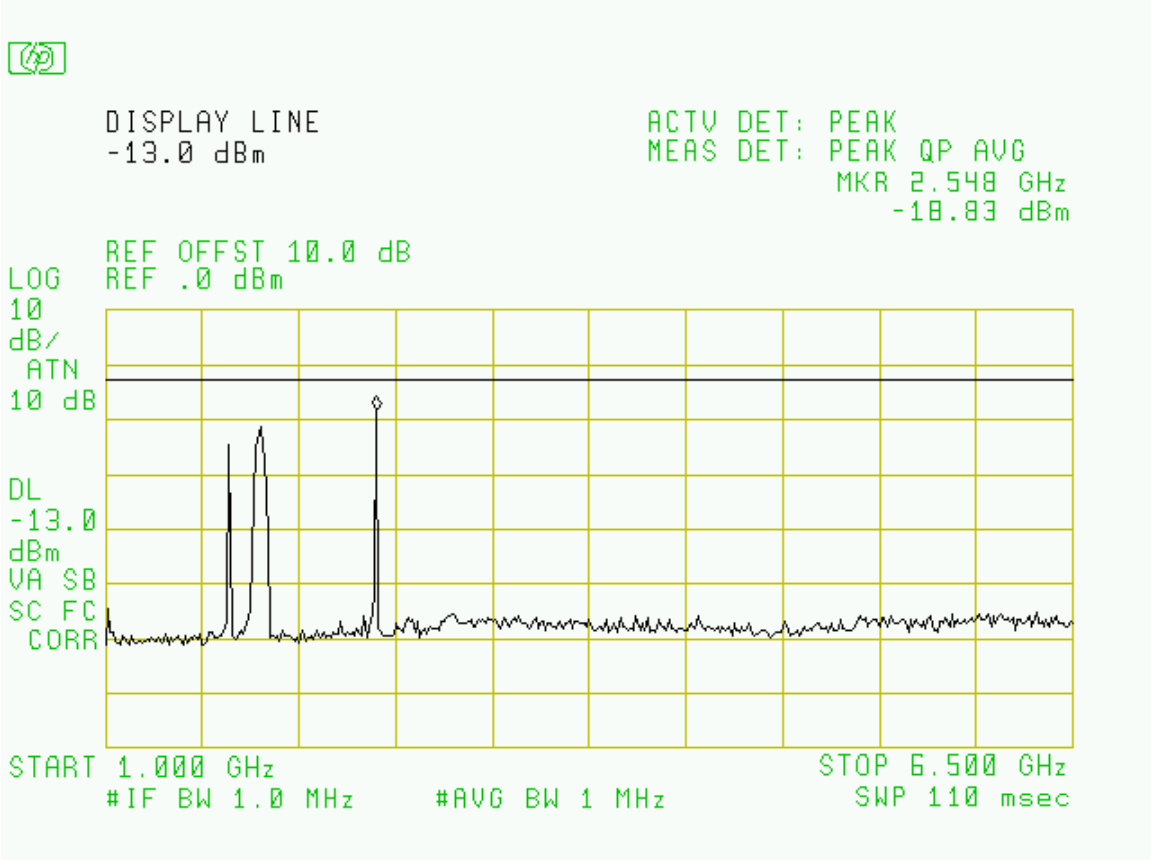
Plot Name:	**Uplink, Hi-Channel**
Configuration:	SG Input: -50dBm, Output Port: EUT BTS



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EUT:	Shyam Dual Band Repeater IRD55FB-30-70
SN:	D4RGCDE001
Tested By:	Wei Li
Temperature:	70°F
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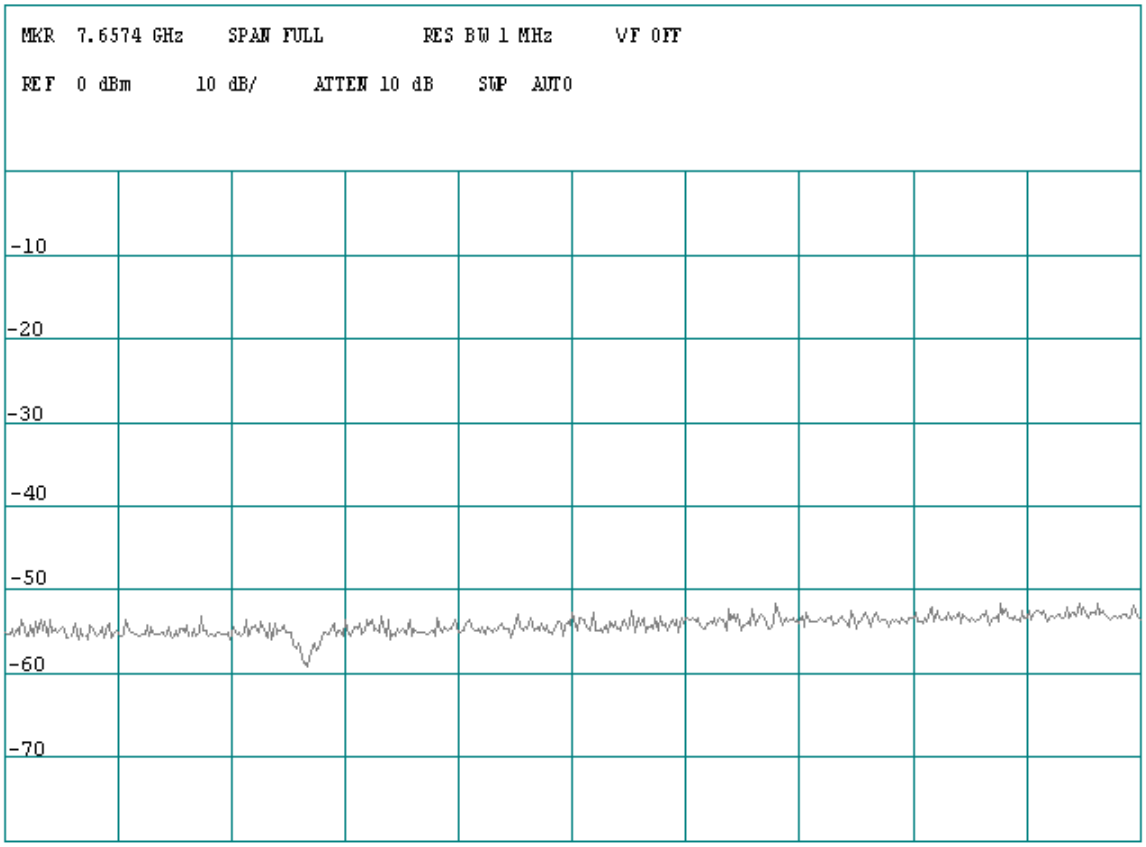
Section:	**Spurious Emissions at Antenna Terminals: Cellular Bands / CDMA Modulation**
Plot Name:	**Uplink, Hi-Channel**
Configuration:	SG Input: -50dBm, Output Port: EUT BTS



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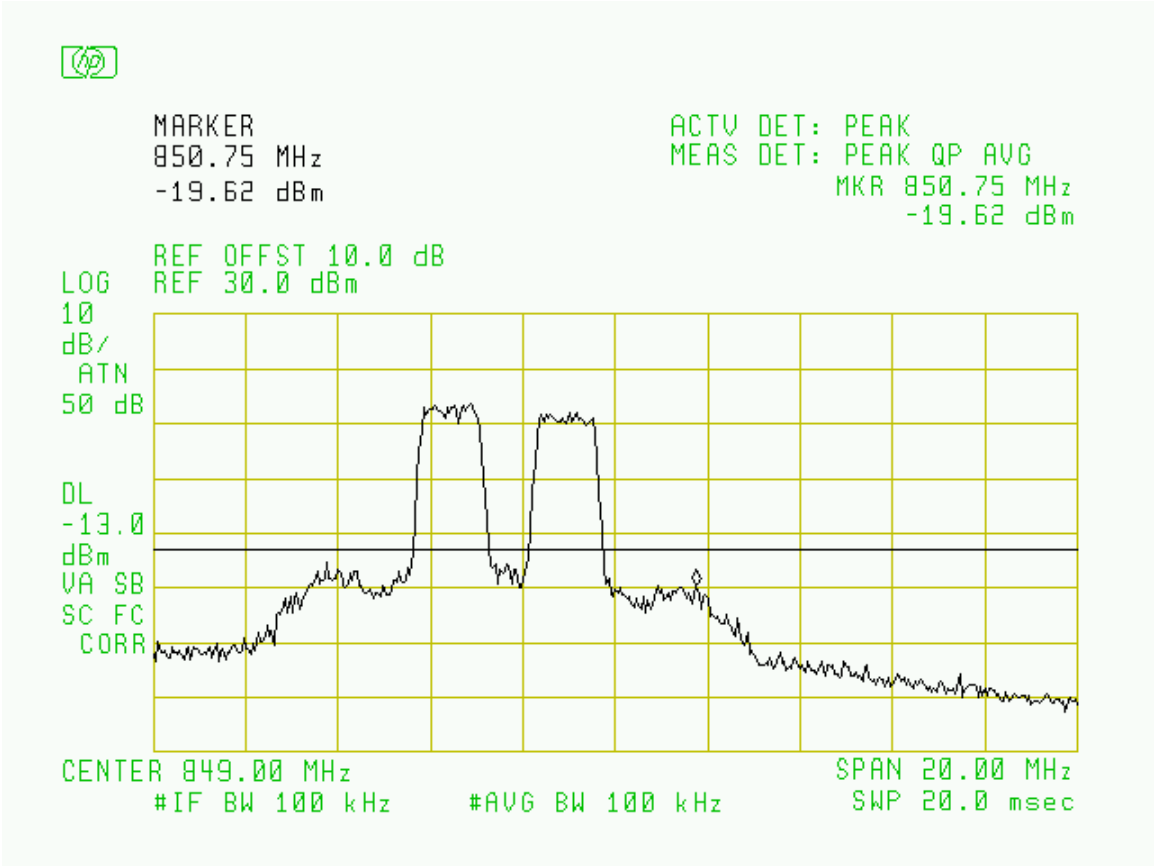
SN:	D4RGCDE001
Tested By:	Wei Li
Temperature:	70°F
Humidity:	30%

Section:	**Spurious Emissions at Antenna Terminals: Cellular Bands / CDMA Modulation**
Plot Name:	**UL, Hi-Chn, Intermodulation, Upper Bandedge**
Configuration:	SG Input: -50dBm, Output Port: EUT BTS



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Temperature:	70°F
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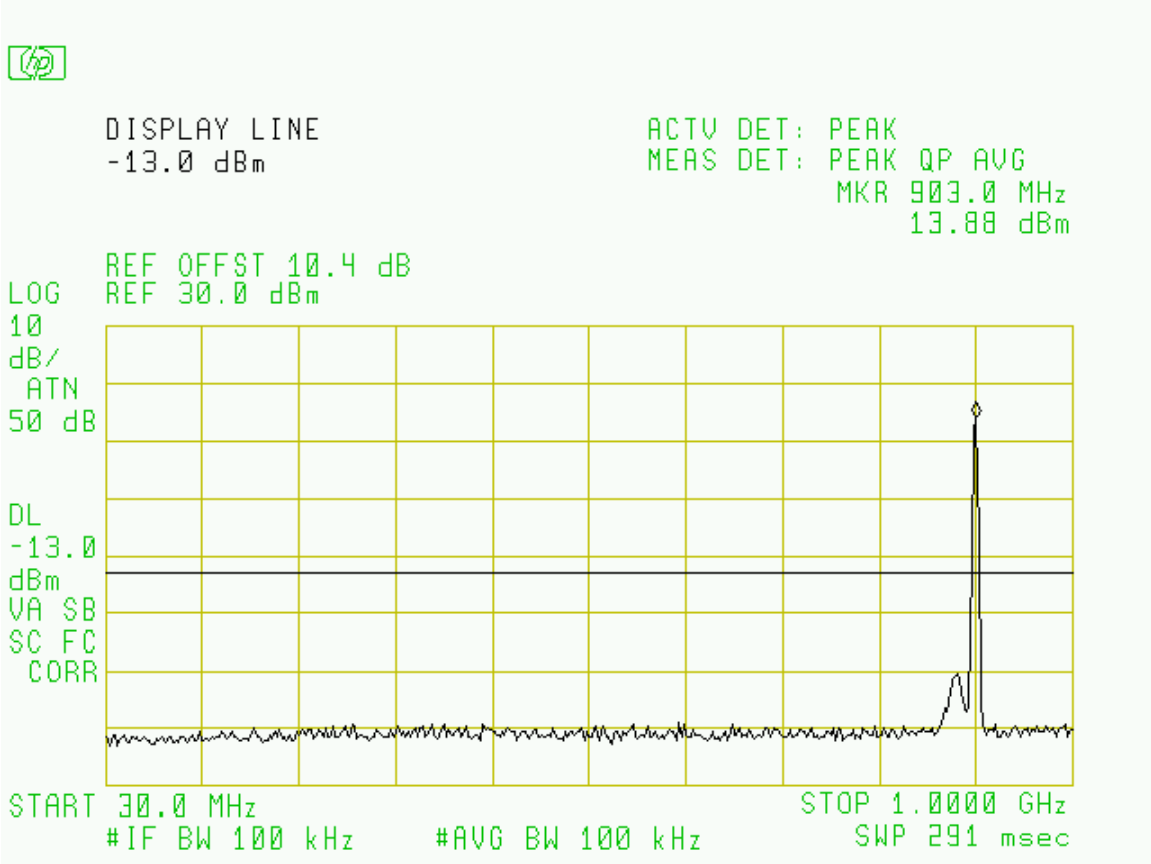
Section:	**Spurious Emissions at Antenna Terminals: Cellular Bands / CDMA Modulation**
Plot Name:	**Downlink, Hi-Channel**
Configuration:	SG Input: -50dBm, Output Port: EUT MOBILE



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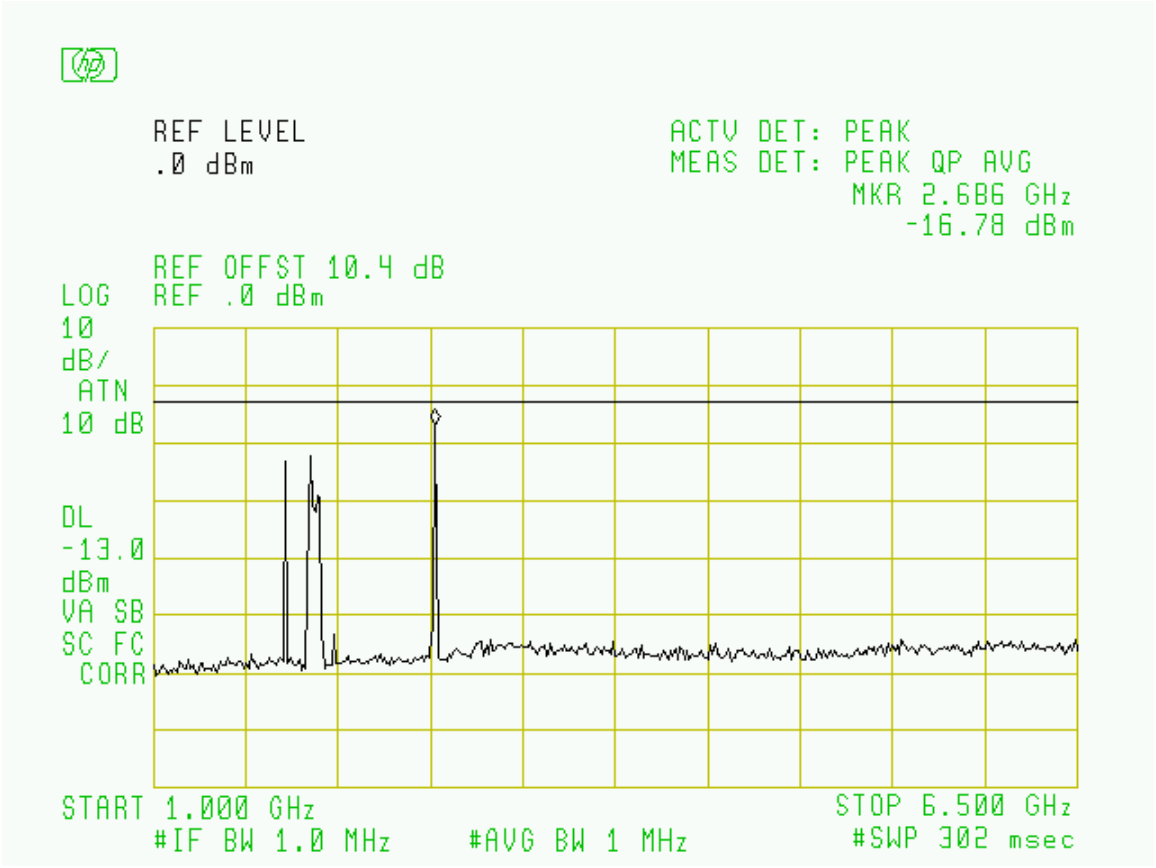
Configuration:	SG Input: -50dBm, Output Port: EUT MOBILE



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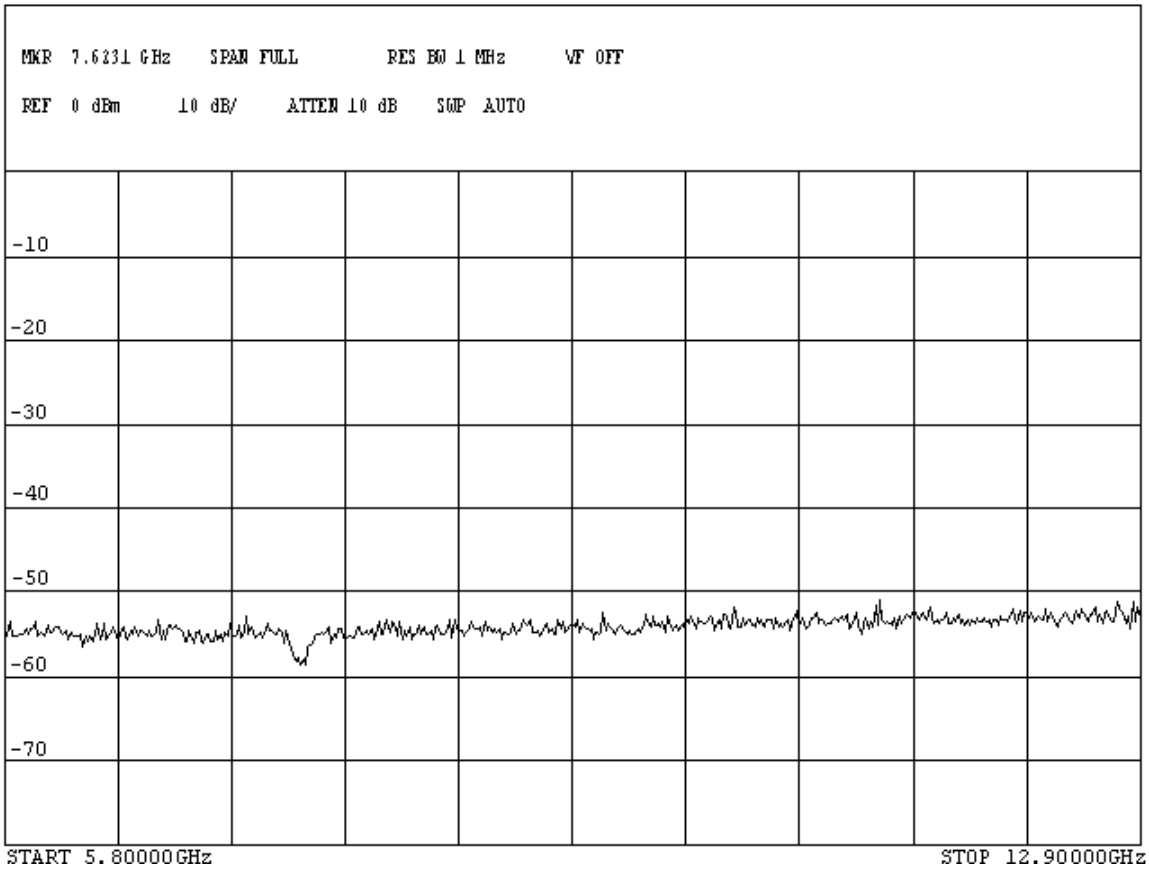
Section:	**Spurious Emissions at Antenna Terminals: Cellular Bands / CDMA Modulation**
Plot Name:	**Downlink, Hi-Channel**
Configuration:	SG Input: -50dBm, Output Port: EUT MOBILE



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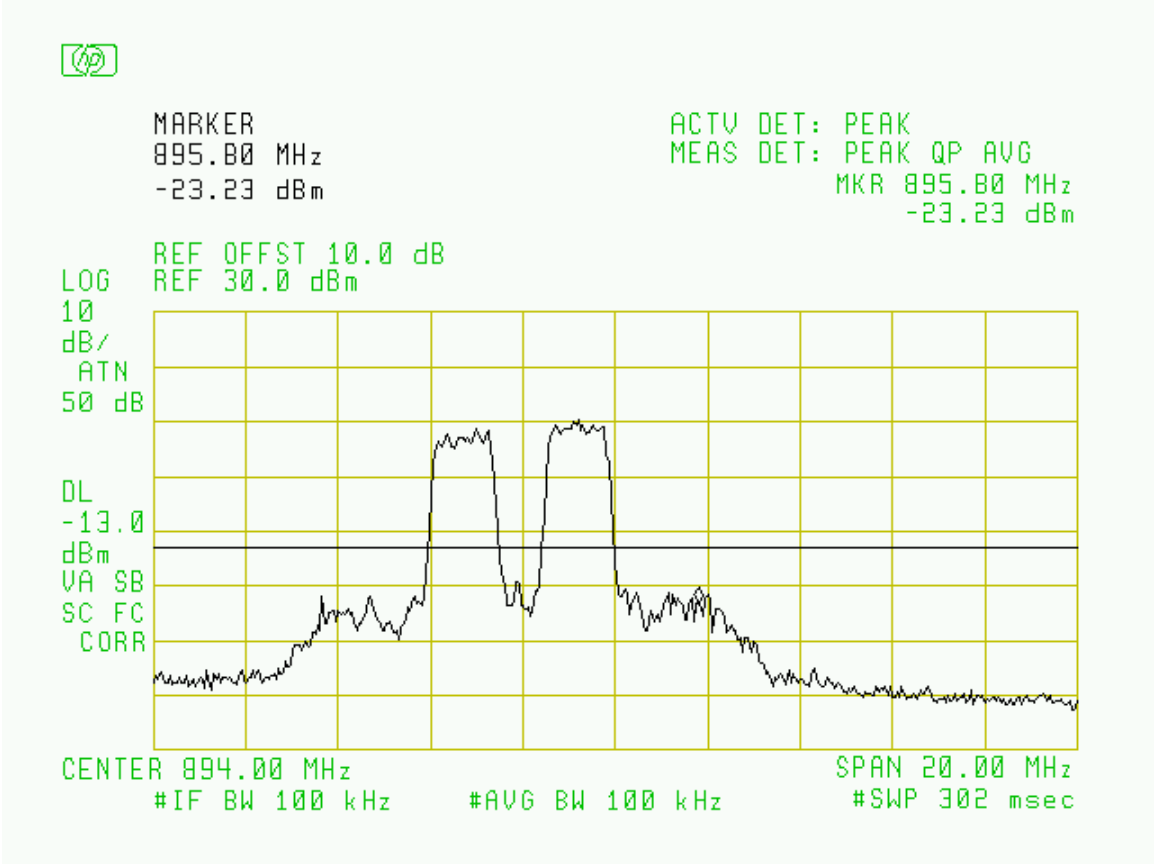
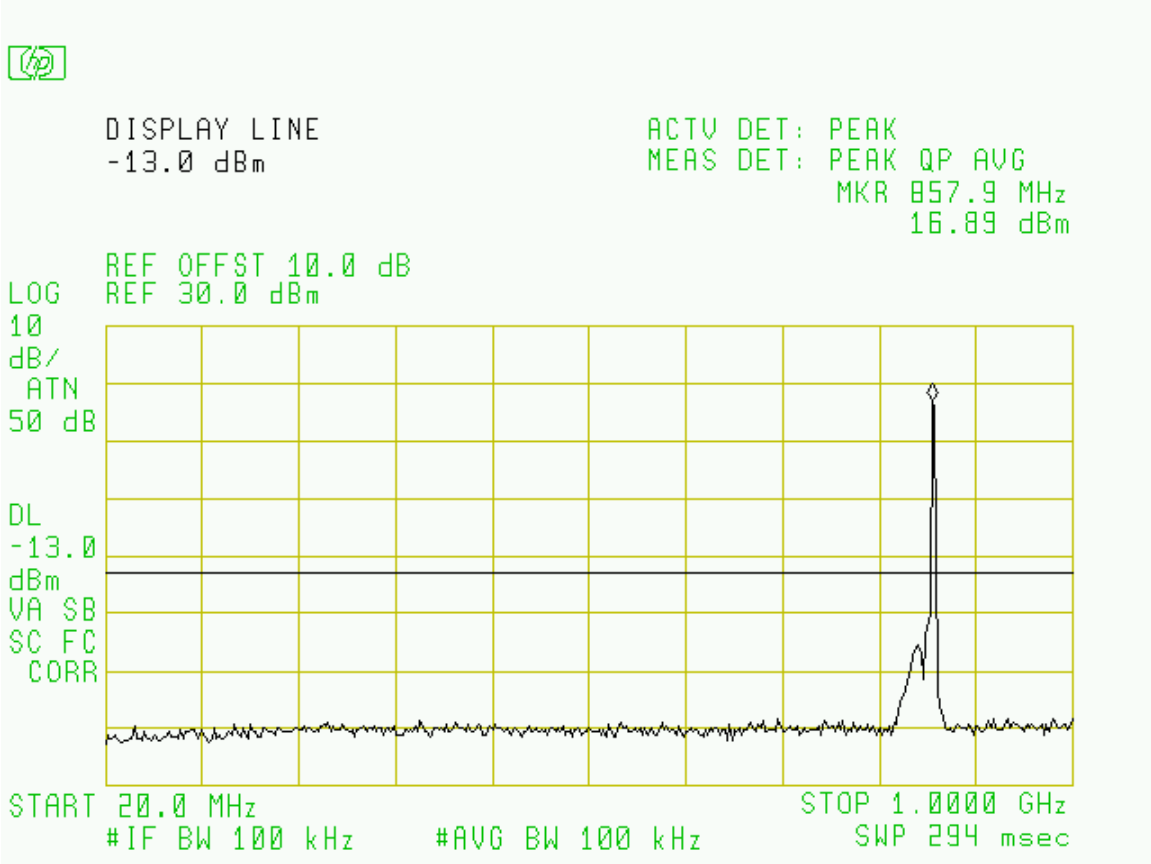
EUT:	Shyam Dual Band Repeater IRD55FB-30-70
SN:	D4RGCDE001
Tested By:	Wei Li
Temperature:	70°F
Humidity:	30%

Section:	**Spurious Emissions at Antenna Terminals: Cellular Bands / CDMA Modulation**
Plot Name:	**DL, Hi-Chn, Intermodulation, Upper Bandedge**
Configuration:	SG Input: -50dBm, Output Port: EUT MOBILE



Project Number:	0048-050615-01
EUT:	Shyam Dual Band Repeater IRD55FB-30-70
SN:	D4RGCDE001
Tested By:	Edward Lee
Temperature:	70˚F
Humidity:	30%

Section:	**Spurious Emissions at Antenna Terminals: Cellular Bands / GSM Modulation**
Plot Name:	**Uplink, Hi-Channel**
Configuration:	SG Input: -50dBm, Output Port: EUT BTS



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Temperature:	70˚F
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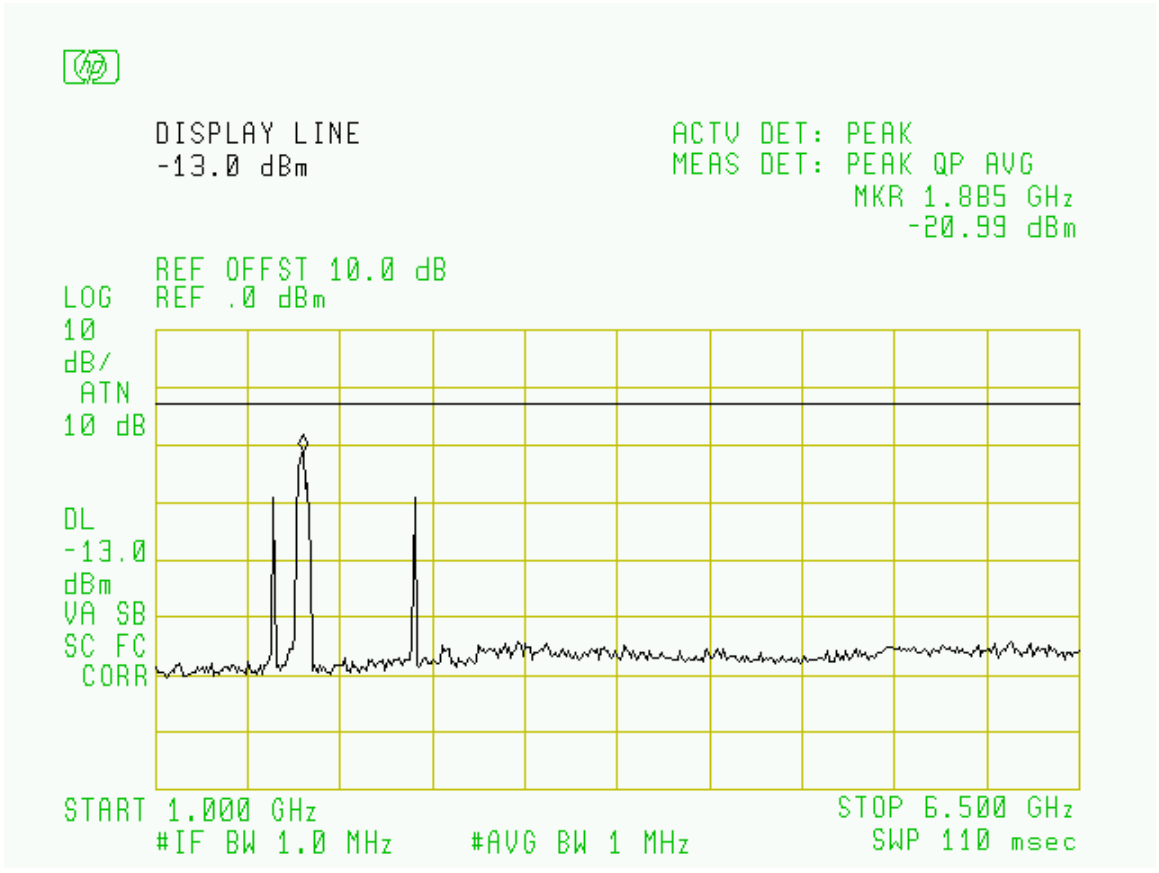
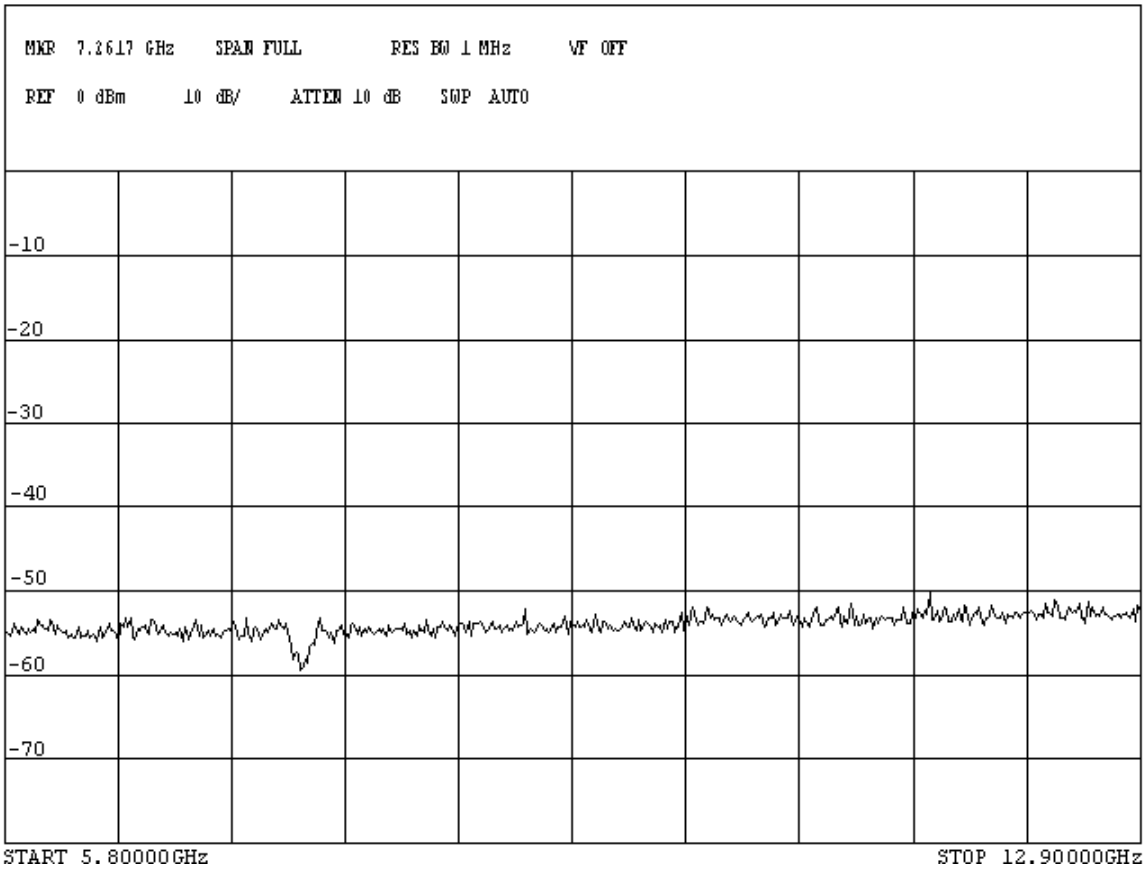
Plot Name:	**Uplink, Hi-Channel**
Configuration:	SG Input: -50dBm, Output Port: EUT BTS



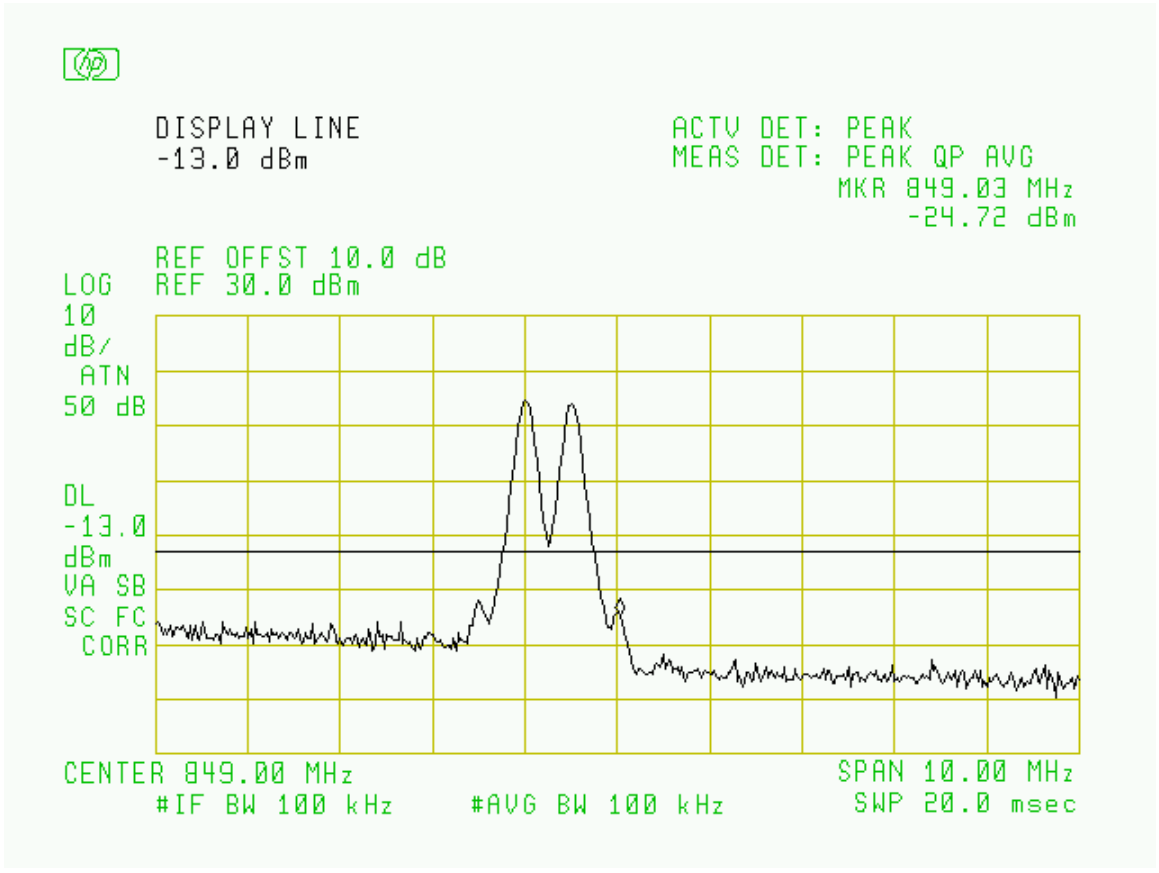
Project Number:	0048-050615-01
EUT:	Shyam Dual Band Repeater IRD55FB-30-70
SN:	D4RGCDE001
Tested By:	Edward Lee
Temperature:	70˚F
Humidity:	30%

Section:	**Spurious Emissions at Antenna Terminals: Cellular Bands / GSM Modulation**
Plot Name:	**Uplink, Hi-Channel**
Configuration:	SG Input: -50dBm, Output Port: EUT BTS



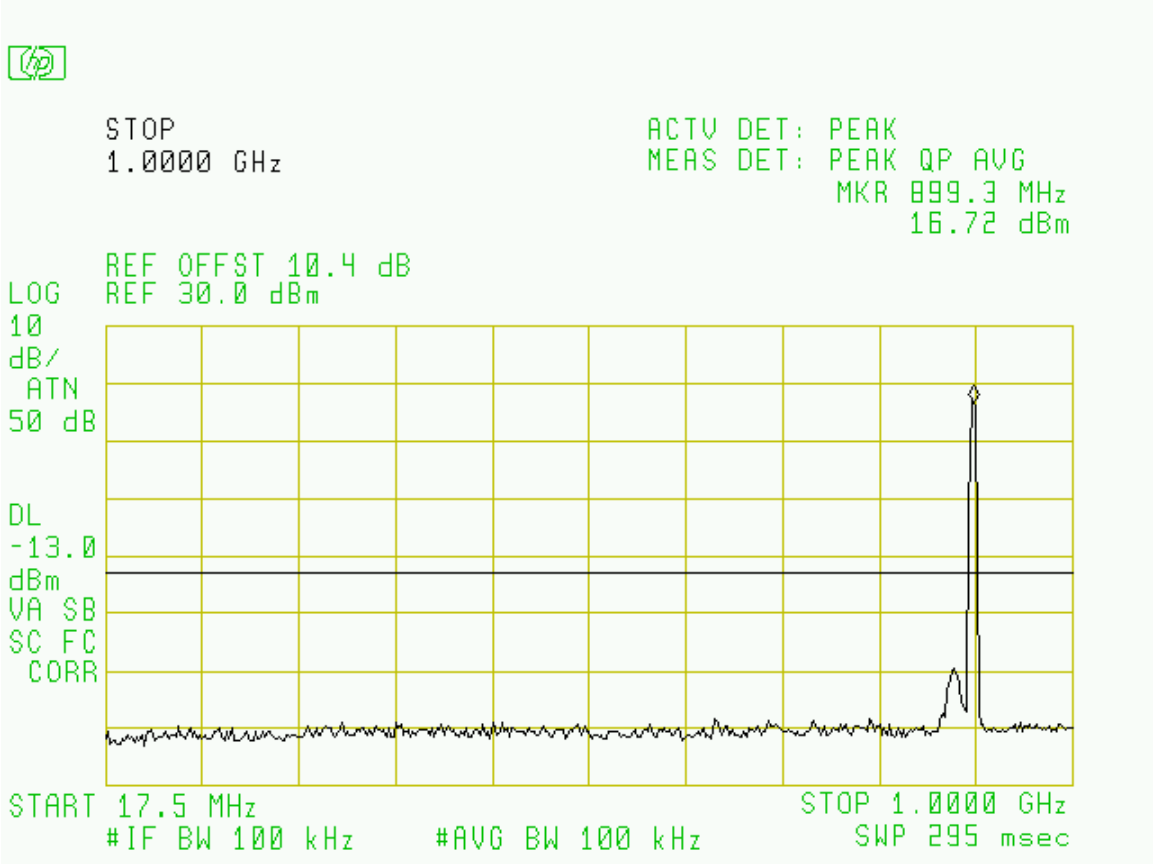
Project Number:	0048-050615-01
EUT:	Shyam Dual Band Repeater IRD55FB-30-70
SN:	D4RGCDE001
Tested By:	Edward Lee
Temperature:	70˚F
Humidity:	30%

Section:	**Spurious Emissions at Antenna Terminals: Cellular Bands / GSM Modulation**
Plot Name:	**UL, Hi-Chn, Upper Bandedge**
Configuration:	SG Input: -50dBm, Output Port: EUT BTS



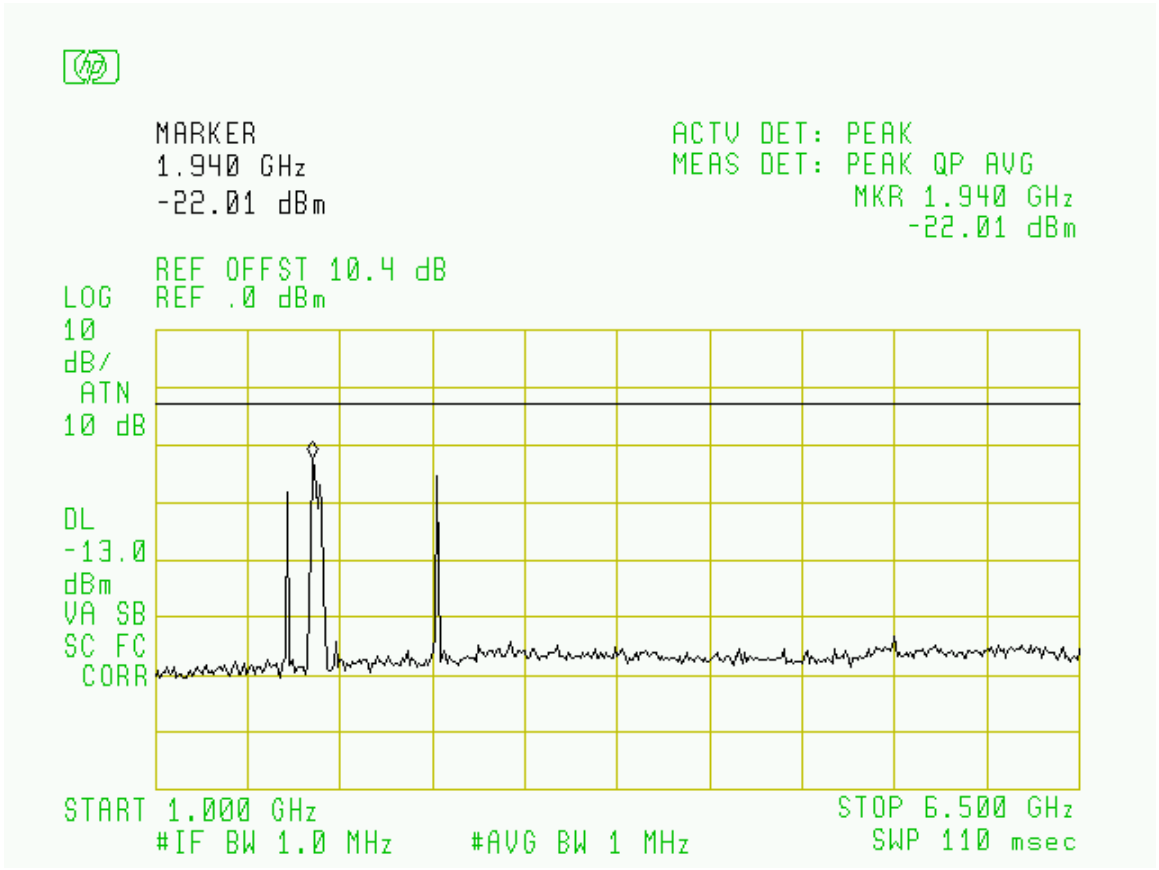
Project Number:	0048-050615-01
EUT:	Shyam Dual Band Repeater IRD55FB-30-70
SN:	D4RGCDE001
Tested By:	Edward Lee
Temperature:	70˚F
Humidity:	30%

Section:	**Spurious Emissions at Antenna Terminals: Cellular Bands / GSM Modulation**
Plot Name:	**Downlink, Hi-Channel**
Configuration:	SG Input: -50dBm, Output Port: EUT MOBILE



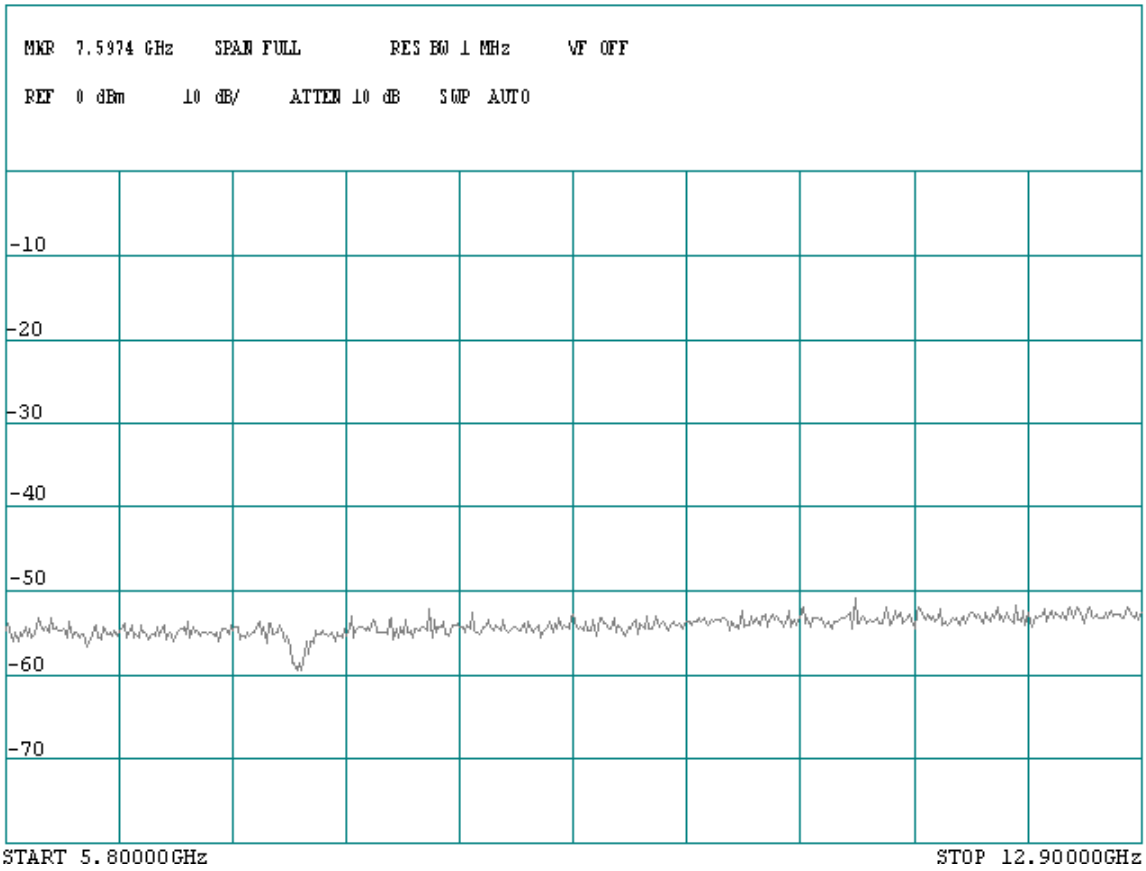
Project Number:	0048-050615-01
EUT:	Shyam Dual Band Repeater IRD55FB-30-70
SN:	D4RGCDE001
Tested By:	Edward Lee
Temperature:	70˚F
Humidity:	30%

Section:	**Spurious Emissions at Antenna Terminals: Cellular Bands / GSM Modulation**
Plot Name:	**Downlink, Hi-Channel**
Configuration:	SG Input: -50dBm, Output Port: EUT MOBILE



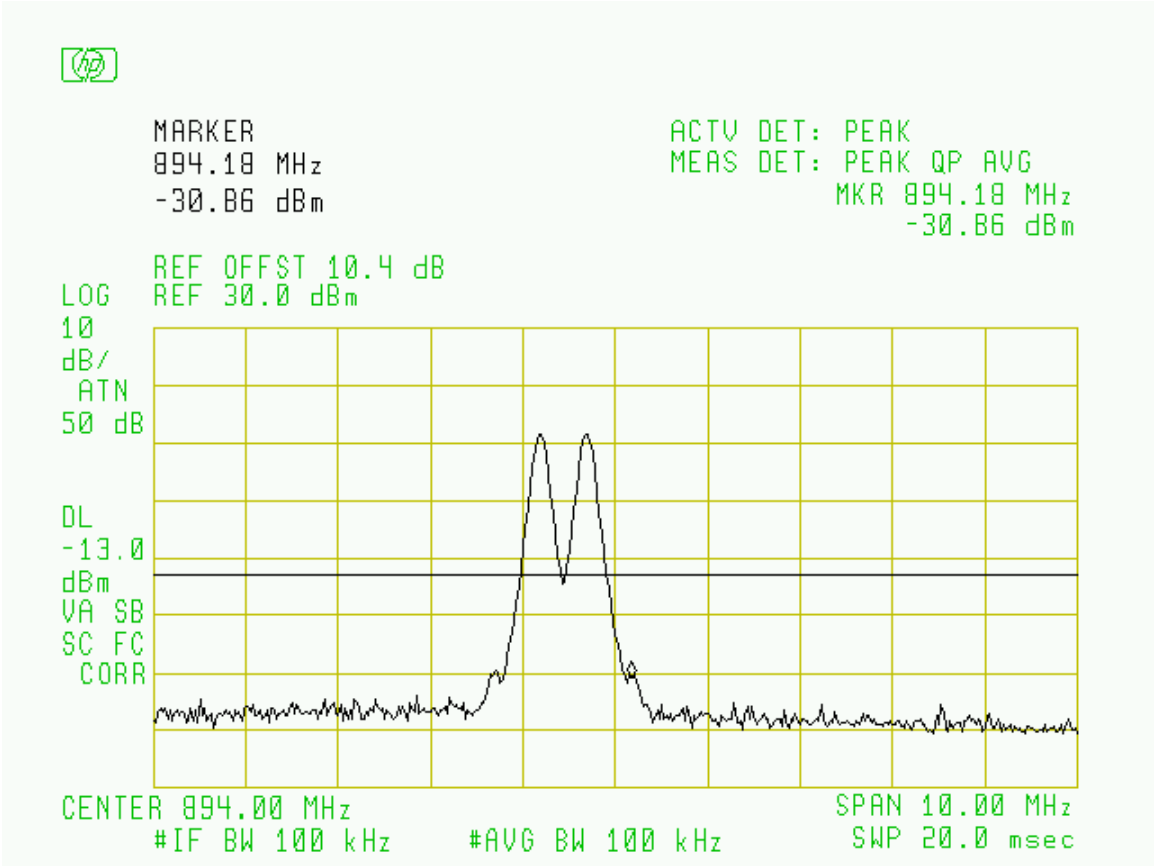
Project Number:	0048-050615-01
EUT:	Shyam Dual Band Repeater IRD55FB-30-70
SN:	D4RGCDE001
Tested By:	Edward Lee
Temperature:	70˚F
Humidity:	30%

Section:	**Spurious Emissions at Antenna Terminals: Cellular Bands / GSM Modulation**
Plot Name:	**Downlink, Hi-Channel**
Configuration:	SG Input: -50dBm, Output Port: EUT MOBILE



Project Number:	0048-050615-01
EUT:	Shyam Dual Band Repeater IRD55FB-30-70
SN:	D4RGCDE001
Tested By:	Edward Lee
Temperature:	70˚F
Humidity:	30%

Section:	**Spurious Emissions at Antenna Terminals: Cellular Bands / GSM Modulation**
Plot Name:	**Downlink, Hi-Chn, Upper Bandedge**
Configuration:	SG Input: -50dBm, Output Port: EUT MOBILE



Section 6. Field Strength of Spurious

Name of Test:	*Field Strength of Spurious*	Test Standard:	*22.917* *24.238*
Tested By:	EDWARD LEE	Test Date:	06/08/2005-06/14/2005

Minimum Standard: Para. No. 22.917(e). The mean power of emissions must be attenuated below the mean power of the unmodulated carrier on any frequency twice or more than twice the fundamental emission by at least 43 + 10 log P. This is equivalent to -13 dBm absolute power. Para. No. 24.238(a). The magnitude of each spurious and harmonic emission that can be detected when the equipment is operated under conditions specified in the instrction manual and/or alignment procedure, shall not less than 43+10 log (mean output power in watts) dBc below the mean power output outside a licensee's frequency block (-13dBm).

Method of Measurement: TIA/EIA-603-1992, Section 2.2.12
The antenna substitution method was used to determine the equivalent radiated power at spurious frequencies. The spurious emissions were measured at a distance of 3 meters. The EUT was then replaced with a reference substitution antenna with a known gain referenced to a dipole. This antenna was fed with a signal at the spurious frequency. The level of the signal was adjusted to repeat the previously measured level. The resulting ERP is the signal level fed to the reference antenna corrected for gain referenced to a dipole.

Test Result: **Complies**

Test Data: See Attached Table(s)

Configuration	Cellular
Band	Downlink
Channel	High

Freq. (MHz)	H,V	SA Reading (dBuV)	SG Reading (dBm)	CL (dB)	Gain (dBi)	ERP (dBm)	Limit (dBm)	Margin (dB)
1786.6	V	41.2	-75	1.2	7.3	-71.05	-13	-58.05
2679.9	V	40.5	-76	1.4	9.2	-70.35	-13	-57.35
3573.2	V	36.9*	-82	1.7	9.6	-76.25	-13	-63.25
4466.5	V	36.9*	-82	1.9	10.5	-75.55	-13	-62.55
5359.8	V	37.3*	-81	2.1	10.1	-75.15	-13	-62.15
6253.1	V	40.0*	-79	2.4	11.2	-72.35	-13	-59.35
7146.4	V	40.5*	-79	2.5	10.7	-72.95	-13	-59.95
8039.7	V	41.5*	-79	2.8	10.0	-73.95	-13	-60.95
8933.0	V	41.5*	-79	2.9	10.8	-73.25	-13	-60.25

NOTE:
*** Measured noise floor**
SA: Spectrum Analyzer
SG: Signal Generator
CL: SMA cable loss (6ft)

Worse case: Vertical
H=horizontal and V=vertical
ERP = SG reading - CL + Gain (dBi)-2.15
Margin = ERP - Limit

Configuration	Cellular
Band	Uplink
Channel	High

Freq. (MHz)	H,V	SA Reading (dBuV)	SG Reading (dBm)	CL (dB)	Gain (dBi)	ERP (dBm)	Limit (dBm)	Margin (dB)
1786.6	V	40.6	-79	1.2	7.1	-75.25	-13	-62.25
2679.9	V	41.0	-78	1.3	9.1	-72.35	-13	-59.35
3573.2	V	39.2*	-80	1.6	9.6	-74.15	-13	-61.15
4466.6	V	39.6*	-80	1.8	9.7	-74.25	-13	-61.25
5359.8	V	40.1*	-79	2.0	9.8	-73.35	-13	-60.35
6253.1	V	41.5*	-79	2.3	10.6	-72.85	-13	-59.85
7146.4	V	41.7*	-79	2.4	11.5	-72.05	-13	-59.05
8039.7	V	41.7*	-78	2.7	11.3	-71.55	-13	-58.55
8933.0	V	41.8*	-78	2.8	10.1	-72.85	-13	-59.85

NOTE:
*** Measured noise floor**
SA: Spectrum Analyzer
SG: Signal Generator
CL: SMA cable loss (6ft)

Worse case: Vertical
H=horizontal and V=vertical
ERP = SG reading - CL + Gain (dBi)-2.15
Margin = ERP - Limit

Section 7. Frequency Stability

Name of Test:	*Frequency Stability*	Test Standard:	*2.1055 22.355&24.235*
Tested By:	WEI LI	Test Date:	03/28-04/05/2005

Minimum Standard: Para. No. 22.355. The transmitter carrier frequency shall remain within the tolerances given in Table C-1.

TABLE C–1.—FREQUENCY TOLERANCE FOR TRANSMITTERS IN THE PUBLIC MOBILE SERVICES

Frequency range (MHz)	Base, fixed (ppm)	Mobile ≤3 watts (ppm)	Mobile <=3 watts (ppm)
25 to 50	20.0	20.0	50.0
50 to 450	5.0	5.0	50.0
450 to 512	2.5	5.0	5.0
821 to 896	1.5	2.5	2.5
928 to 929	5.0	n/a	n/a
929 to 960	1.5	n/a	n/a
2110 to 2220	10.0	n/a	n/a

Para No. 24.235. The frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block.

Method of Measurement: Frequency Stability With Voltage Variation:
The E.U.T. is placed in an environmental chamber and allowed to stabilize at +20 degrees Celsius for at least 15 minutes. Set SA resolution bandwidth low enough (30Hz) to obtain the desired frequency resolution. (Using frequency counter method: The frequency counter and signal generator are phase locked with the same 10 MHz reference frequency by connecting the 10 MHz ref. out of the counter to the 10MHz ref, in of the signal generator). With the voltage input to the E.U.T. set to 85% S.T.V., the frequency is measured in 30 second intervals for a period of 5 minutes. This procedure is repeated at 100% S.T.V. and 115% S.T.V.

Frequency Stability With Temperature Variation:
The input voltage to the E.U.T. is set to S.T.V. and the temperature of the environmental chamber is varied in 10 degree steps from -30 degrees C to +50 degrees C. The E.U.T. is allowed to stabilize at each temperature and the frequency is measured in 30 second intervals for a period of 5 minutes.

Test Result:	**Complies**

Test Data: See Attached Table(s)

Cellular Bands

Frequency Stability versus Environmental Temperature

Reference Frequency @ 115V & +20°C: Uplink: 834.398820 MHz, Downlink: 879.398756 MHz		
Temperature & Direction (°C)	Frequency (MHz)	Deviation (Hz)
-30 Up Link	-	
-30 Down Link	-	
-20 Up Link	-	
-20 Down Link	-*	
-10 Up Link	834.398746	-74
-10 Down Link	879.398669	-87
0 Up Link	834.398769	-51
0 Down Link	879.398701	-55
+10 Up Link	834.398794	-36
+10 Down Link	879.398727	-29
+20 Up Link	834.398820	0
+20 Down Link	879.398756	0
+30 Up Link	834.398836	+16
+30 Down Link	879.398775	+19
+40 Up Link	834.398850	+30
+40 Down Link	879.398789	+33
+50 Up Link	834.398868	+48
+50 Down Link	879.398822	+66

Frequency Stability versus AC Voltage (EUT +20°C operating frequency as reference)

Reference Frequency @ 115VAC & +20°C: Uplink: 834.398820 MHz, Downlink: 879.398756 MHz		
Voltage & Direction (VAC)	Frequency (MHz)	Deviation (Hz)
95Up Link	834.398797	-23
95Down Link	879.398732	-24
133Up Link	834.398801	-19
133Down Link	879.398740	-16

* EUT operation frequency range is -5°C ~55°C declared by manufacturer.

PCS Bands

Frequency Stability versus Environmental Temperature

Reference Frequency @ 115V & +20°C: Uplink: 1.859997381 GHz, Downlink: 1.939997128 GHz		
Temperature & Direction (°C)	Frequency (GHz)	Deviation (Hz)
-30 Up Link	-	
-30 Down Link	-	
-20 Up Link	-	
-20 Down Link	-*	
-10 Up Link	1.859997137	-245
-10 Down Link	1.939996900	-228
0 Up Link	1.859997177	-204
0 Down Link	1.939996937	-191
+10 Up Link	1.859997282	-99
+10 Down Link	1.939997045	-83
+20 Up Link	1.859997381	0
+20 Down Link	1.939997128	0
+30 Up Link	1.859997472	+91
+30 Down Link	1.939997193	+65
+40 Up Link	1.859997573	+192
+40 Down Link	1.939997295	+167
+50 Up Link	1.859997593	+212
+50 Down Link	1.939997358	+230

Frequency Stability versus AC Voltage (EUT +20°C operating frequency as reference)

Reference Frequency @ 115VAC & +20°C: Uplink: 1.859997381 GHz, Downlink: 1.939997128 GHz		
Voltage & Direction (VAC)	Frequency (GHz)	Deviation (Hz)
95Up Link	1.859997296	-85
95Down Link	1.939997146	+18
133Up Link	1.859997317	-64
133Down Link	1.939997154	+26

* EUT operation frequency range is -5°C ~55°C declared by manufacturer.

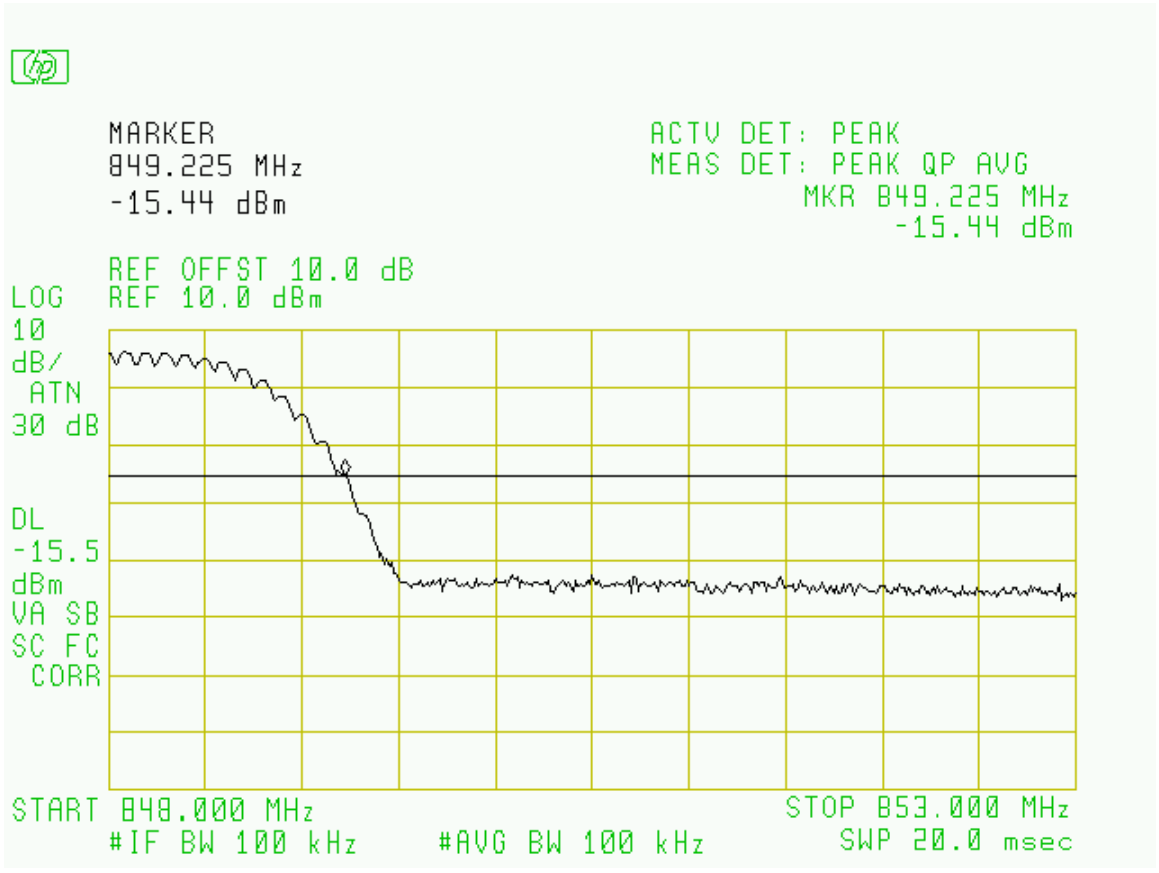
Section 8. Out of Band Rejection

Name of Test:	*Out of Band Rejection*	Test Standard:	
Tested By:	Edward Lee	Test Date:	06/08/2005-06/14/2005

Minimum Standard:	The passband gain shall not exceed the nominal gain by more than 1.0 dB. The 20 dB bandwidth shall not exceed the nominal bandwidth that is stated by the manufacturer. Outside of the 20 dB bandwidth, the gain shall not exceed the gain at the 20 dB point.
Method of Measurement:	Adjust the internal gain control of the equipment under test to the nominal gain for which equipment certification is sought. With the aid of a signal generator and spectrum analyzer, measure the 20 dB bandwidth of the amplifier (i.e. at the point where the gain has fallen by 20 dB). Measure the gain-versus-frequency response of the amplifier from the midband frequency f_0 of the passband up to at least $f_0 \pm 250\%$ of the 20 dB bandwidth.
Test Result:	**Complies**
Test Data:	See Attached Table(s)

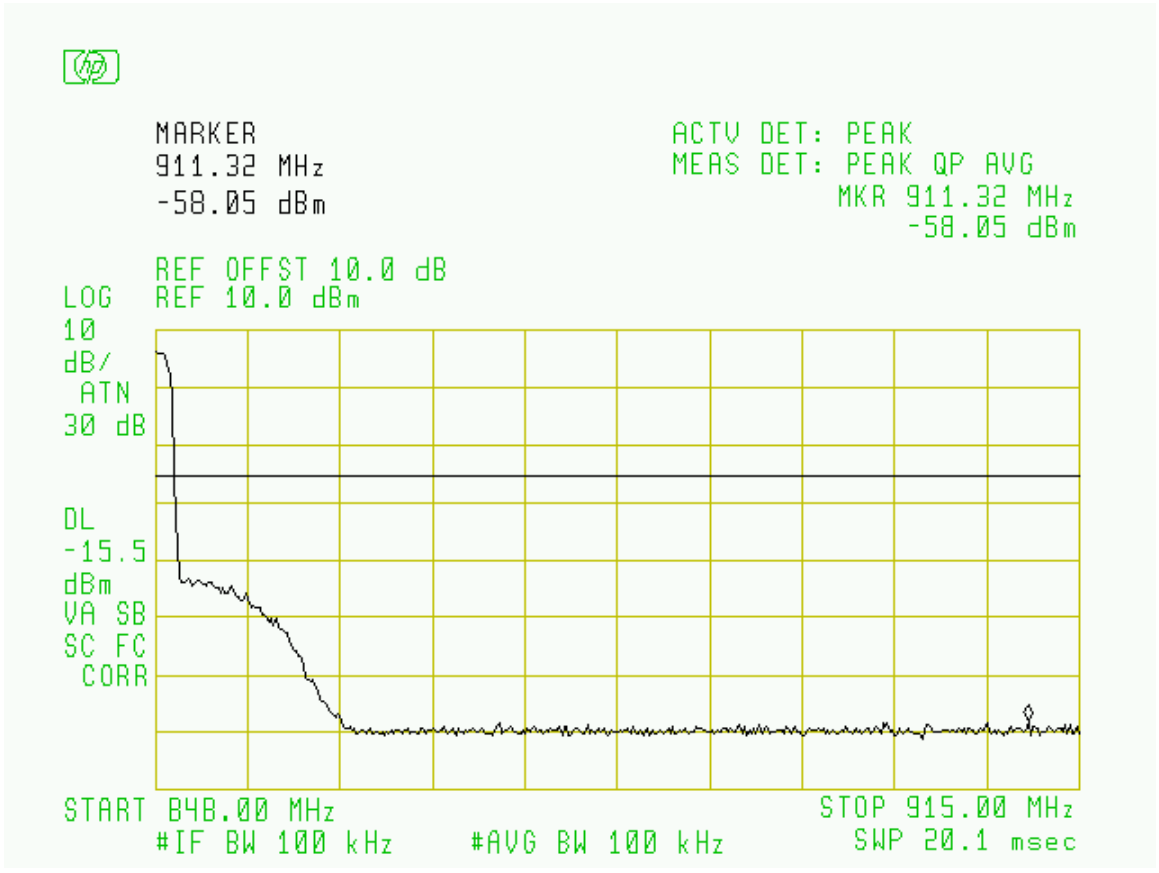
Project Number:	0048-050615-01
EUT:	Shyam Dual Band Repeater IRD55FB-30-70
SN:	D4RGCDE001
Test By:	Edward Lee
Temperature:	70˚F
Humidity:	30%

Section:	**Pass Band Gain & 20dB Bandwidth**
Plot Name:	**800 Cellular Uplink Upper Band-5MHz Span**
Configuration:	Server Antenna Connector was connected to SG. Input: -65dBm



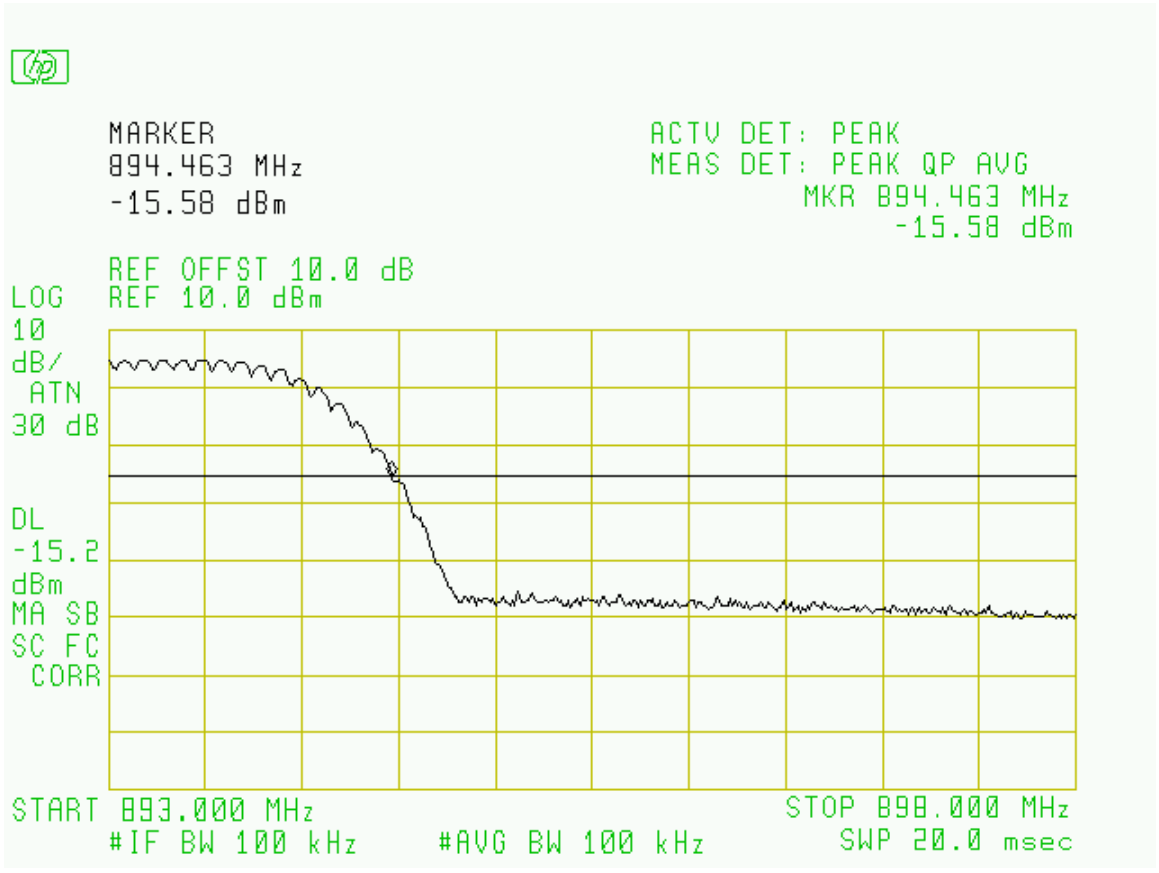
Project Number:	0048-050615-01
EUT:	Shyam Dual Band Repeater IRD55FB-30-70
SN:	D4RGCDE001
Test By:	Edward Lee
Temperature:	70˚F
Humidity:	30%

Section:	**Pass Band Gain & 20dB Bandwidth**
Plot Name:	**800 Cellular Uplink Upper Band-250% Span**
Configuration:	Server Antenna Connector was connected to SG. Input: -65dBm



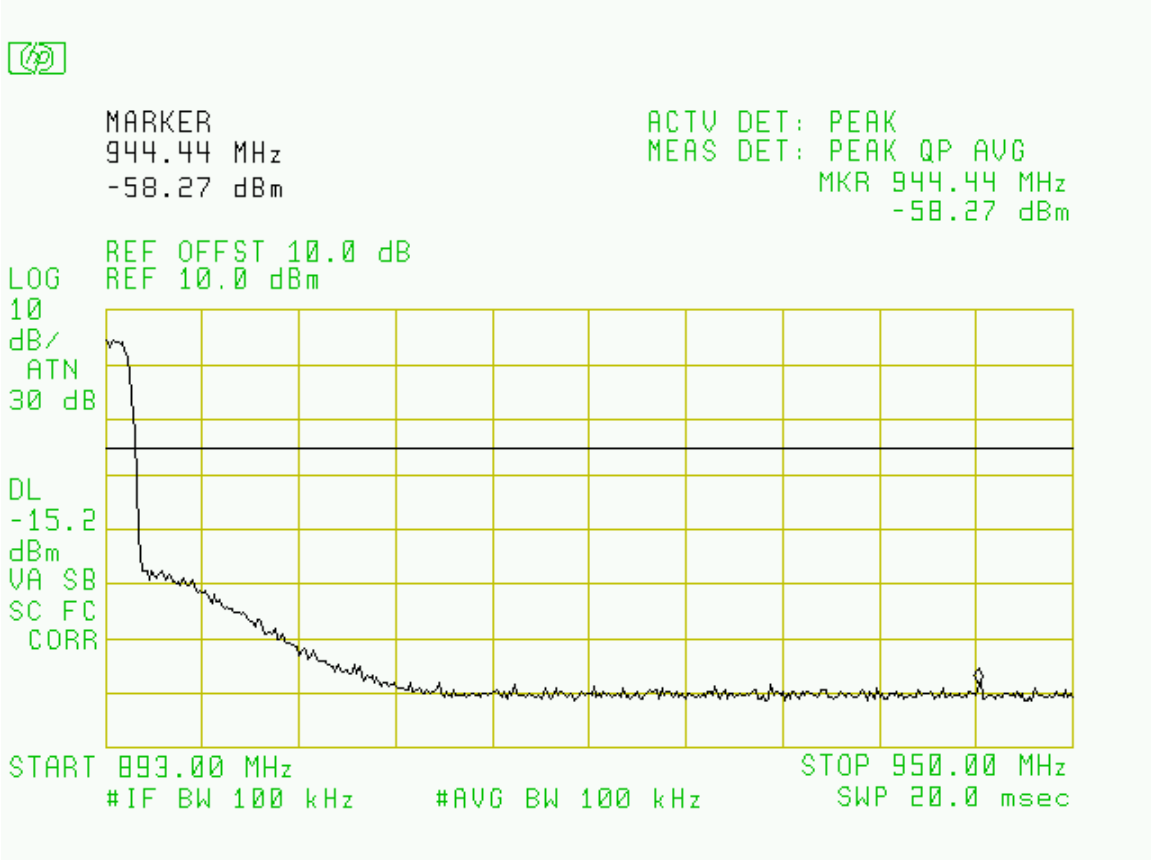
Project Number:	0048-050615-01
EUT:	Shyam Dual Band Repeater IRD55FB-30-70
SN:	D4RGCDE001
Test By:	Edward Lee
Temperature:	70˚F
Humidity:	30%

Section:	**Pass Band Gain & 20dB Bandwidth**
Plot Name:	**800 Cellular Downlink Upper Band-5MHz Span**
Configuration:	Server Antenna Connector was connected to SG. Input: -65dBm



Project Number:	0048-050615-01
EUT:	Shyam Dual Band Repeater IRD55FB-30-70
SN:	D4RGCDE001
Test By:	Edward Lee
Temperature:	70˚F
Humidity:	30%

Section:	**Pass Band Gain & 20dB Bandwidth**
Plot Name:	**800 Cellular Downlink Upper Band-250% Span**
Configuration:	Server Antenna Connector was connected to SG. Input: -65dBm



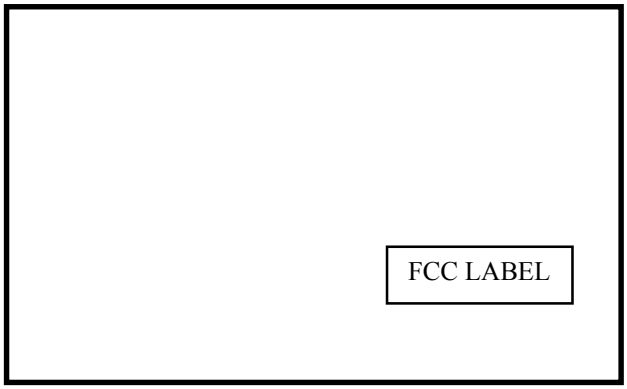
Section 9. Test Equipment List

Manufacture	Model	Serial No.	Description	Last Cal dd/mm/yy	Cal Due dd/mm/yy
HP	HP8546A	3448A00290	EMI Receiver	12/01/05	12/01/06
HP	E4432B	US38220355	250K-3GHz Signal Generator	17/09/03	17/09/05
EMCO	3104C	9307-4396	20-300MHz Biconical Antenna	12/02/05	12/02/06
EMCO	3146	9008-2860	200-1000MHz Log-Periodic Antenna	09/02/05	09/02/06
Fischer Custom	LISN-2	900-4-0008	Line Impedance Stabilization Networks	23/08/04	23/08/05
Fischer Custom	LISN-2	900-4-0009	Line Impedance Stabilization Networks	23/08/04	23/08/05
EMCO	6502	2665	10KHz-30MHz Active Loop Antenna	27/02/05	27/02/06
EMCO	3115	4945	Double Ridge Guide Horn Antenna	11/08/04	11/08/05
HP	8569B	2607A02802	1GHz-22GHz Spectrum Analyzer	10/02/05	10/02/06
Advantest	R3271	5003583	100Hz-26.5GHz Spectrum Analyzer	27/04/04	27/05/05
Delta Design	5900C	0-67-26	Temperature Chamber	24/03/05	24/03/06
HP	E8254A	US42110367	Signal Generator	23/03/05	23/03/06
Electro-Metrics	RGA-50	8-95	Double Ridge Guide Horn Antenna	10/02/05	10/02/06
EMCO	3116	4943	Double Ridge Guide Horn Antenna	11/01/05	11/01/06
Scientific-Atlanta	12A-18	441	Wave Guide Horn Antenna	04/08/04	04/08/05

Section 10. FCC ID Labeling

FCC ID: S3CIRD55FB-30-70
This device complies with Part 2, 15, 22 & 24 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 received, including interference that may cause undesired

FCC ID Label



Location of Label on Lower Side Wall

Section 11. Maximum Permissible Exposure

MPE estimate is given per 2.1091 of FCC Rules:

Calculation Equation:

$$d = 0.282 \times \frac{10^{\frac{P+G}{20}}}{\sqrt{S}}$$

Where, P=27.72 dBm, G=7 dBi (Server Antenna), G=12 dBi (Donor Antenna), and from §1.1310 Table 1 (B), S = 0.55 mW/cm^2

Plug all three items into the equation, and yields,

Power Density MPE Limit (mW/ cm^2)	Output Power (dBm)	Server Antenna Gain (dBi)	Donor Antenna Gain (dBi)	Server MPE Distance (cm)	Donor MPE Distance (cm)
0.55	27.72/26.07	7	12	20.70	36.82

NOTE:

For mobile or fixed location transmitters, the minimum separation distance is 20 cm, even if calculations indicate that the MPE distance would be less.

Section 12. Setup Photos

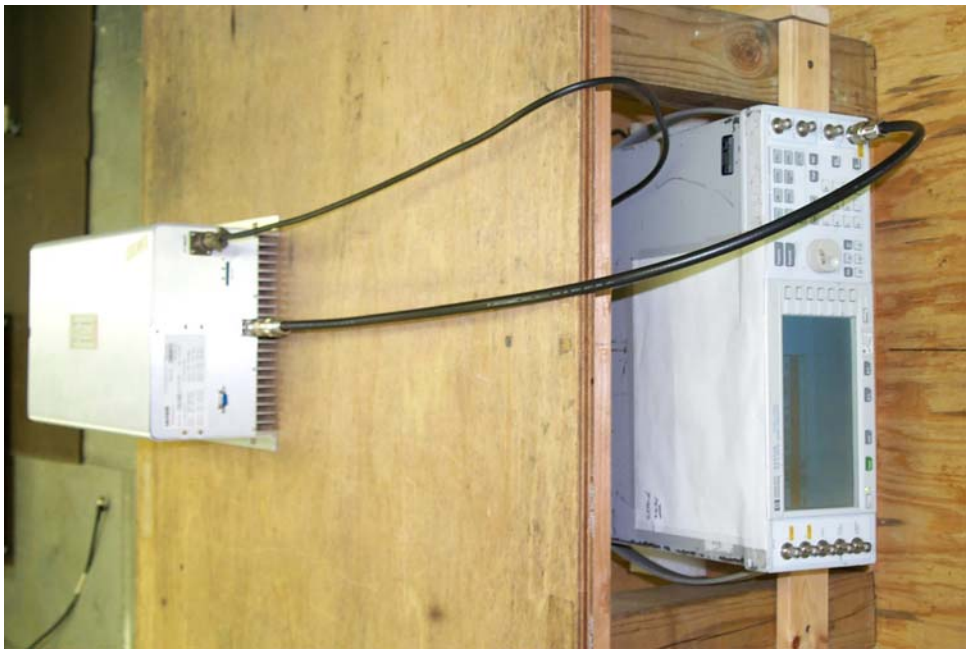
RF Output Power

Spurious Emissions at Antenna Terminal

Occupied Bandwidth

Field Strength of Spurious

Configuration I: Front View



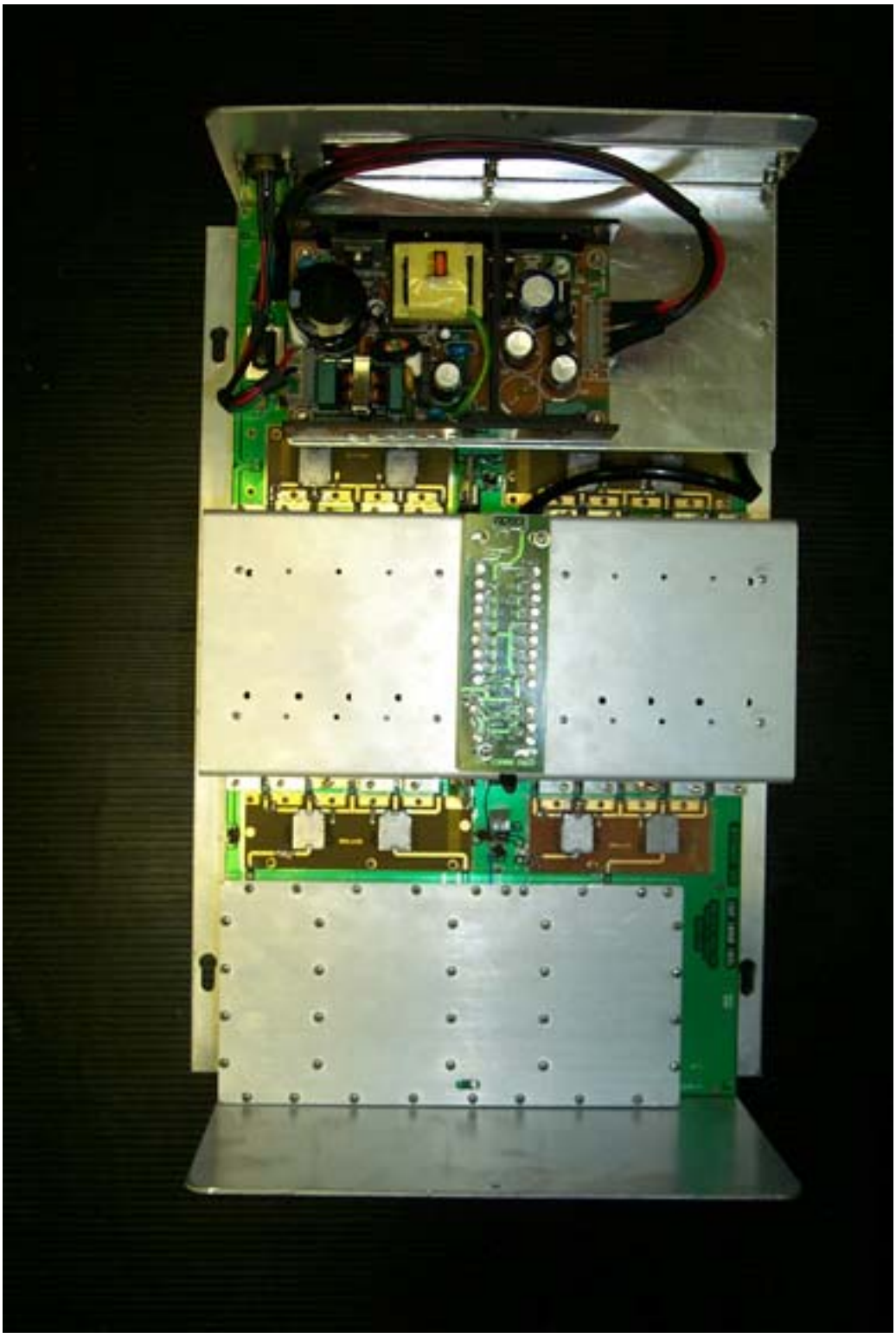
Configuration II: Rear View

Frequency Stability

Section 13. EUT Photos

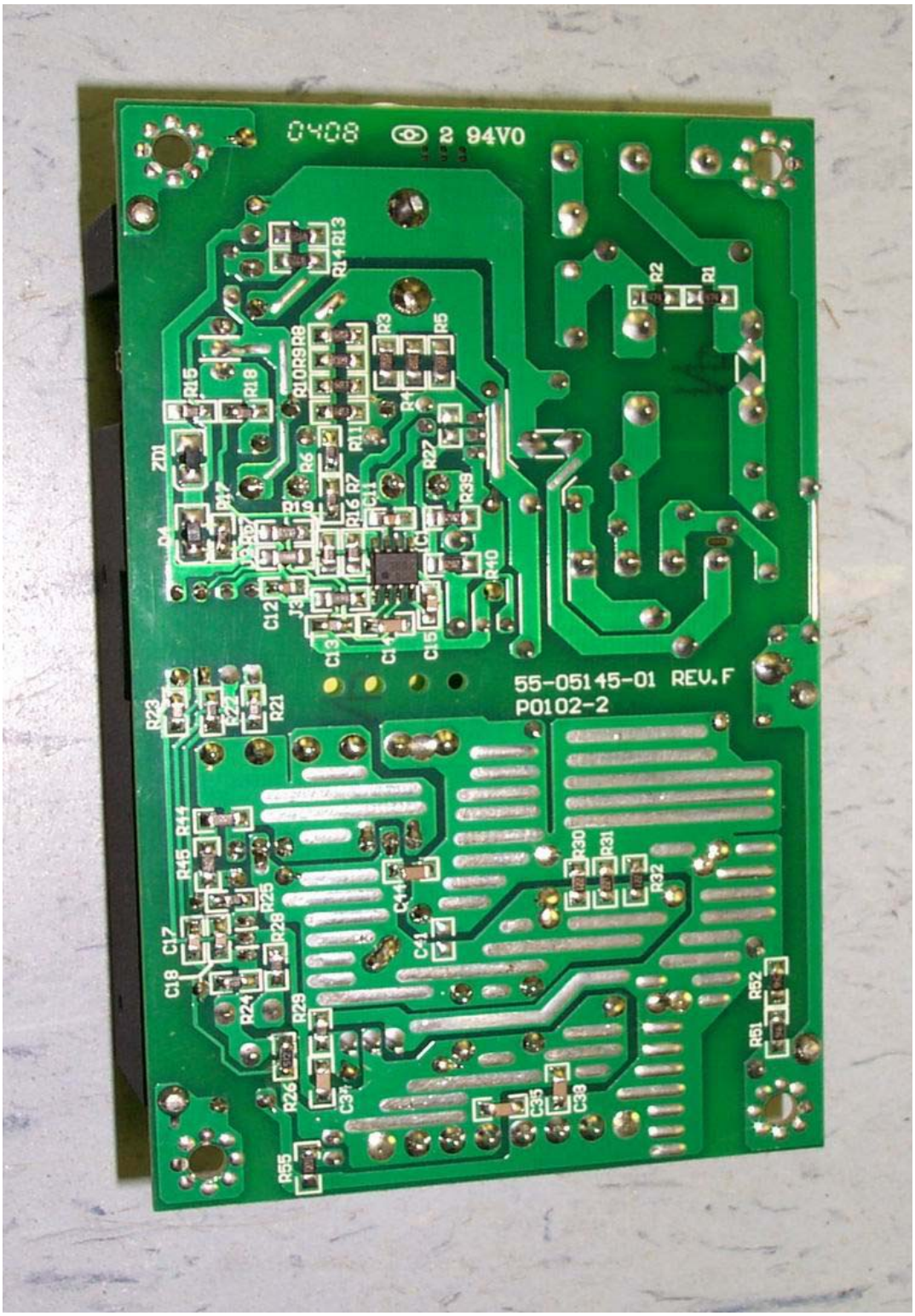
Front View

Bottom View



Inside View

Power Supply-1



Power Supply -2