

KTL Ottawa

Safety - EMI - Telecom - ISO Guide 25

**CLASS II PERMISSIVE CHANGE
ENGINEERING TEST REPORT**

**ON:
THE ALLEN TELECOM GROUP, SYSTEMS DIVISION
"ACTIVELITE SIGNAL DISTRIBUTION SYSTEM"**

FCC ID: LB45855

**IN ACCORDANCE WITH:
FCC PART 22, SUBPART H
CELLULAR BAND REPEATERS**

PROJECT NO.: 8R00777

TESTED FOR:

ALLEN TELECOM GROUP, SYSTEMS DIVISION
30500 BRUCE INDUSTRIAL PARKWAY
CLEVELAND, OHIO
44139-3996

TESTED BY:

KTL OTTAWA INC.
3325 RIVER ROAD, R.R. 5
OTTAWA, ONTARIO K1V 1H2



NVLAP LAB CODE: 100351-0

AUGUST 1998

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This report applies only to the items tested.

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EQUIPMENT: ActiveLite Signal Distribution System
FCC ID: LB45855

Section 1. Summary of Test Results

Manufacturer: Allen Telecom Group

Model No.: ATSA100 ATSA110 302314-001

Serial No.: 9802005 None None

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.

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: 100351-0

TESTED BY: _____ DATE: _____
Kevin Carr, Technologist

TECHNICAL REVIEW: _____ DATE: _____
Tom Tidwell, Senior Technologist

APPROVED BY: _____ DATE: _____
W. Waterhouse, RF Engineering Lab Manager

EQUIPMENT: ActiveLite Signal Distribution System
FCC ID: LB45855

Summary Of Test Data

NAME OF TEST	PARA. NO.	SPEC.	MEAS.	RESULT
RF Power Output	22.913(a)	500W ERP	Plot	Complies
Occupied Bandwidth (Voice & SAT)	22.917(c)	Mask C	N/A	N/A
Occupies Bandwidth (Wideband Data)	22.917(d)	Mask D	N/A	N/A
Occupied Bandwidth (ST)	22.917(d)	Mask D	N/A	N/A
Occupied Bandwidth (Digital)	None	Input vs. Output	Plot	Complies
Spurious Emissions at Antenna Terminals	22.917	-13 dBm	Plot	Complies
Field Strength of Spurious Emissions	22.917	-13 dBm E.I.R.P.	N/A	N/A
Frequency Stability	22.355	1.5 ppm	N/A	N/A

Footnotes For N/A's: There is no hardware modification for this permissive change.

Test Conditions: Temperature: 23 °C
 Humidity: 50 %

EQUIPMENT: ActiveLite Signal Distribution System
FCC ID: LB45855

Section 2. General Equipment Specification

Supply Voltage Input:	120 VAC, 60 Hz				
Frequency Range:	Downlink:	869 to 894 MHz			
Frequency Range:	Uplink:	Not tested. The uplink path is hardwired to the base station.			
20 dB Bandwidth:	Not Applicable				
Type of Modulation and Designator:	CDMA (F9W)	GSM (GXW)	TDMA (DXW)	CDPD (F9W)	AMPS (F8W, F1D)
	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
					Already Approved
AGC Threshold:	Not Applicable				
Output Impedance:	50 ohm				
Gain:	-9.5 dBm				
Max Input Power:	+22.7 dBm at the splitter input.				
RF Output (Rated):	Single:	13.2 dBm			
	Composite:	10.2 dBm / 2 channel			
Frequency Translation:		F1-F1	F1-F2	N/A	
		<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Band Selection:		Software	Duplexer Change	Fullband Coverage	
		<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	

EQUIPMENT: ActiveLite Signal Distribution System
FCC ID: LB45855

Description of Modifications For Class II Permissive Change

The addition of TDMA & CDMA modulations. There were no hardware change to this equipment. The original testing and grant did not consider these digital modulations.

EQUIPMENT: ActiveLite Signal Distribution System
FCC ID: LB45855

Modifications Made During Testing

NOT APPLICABLE

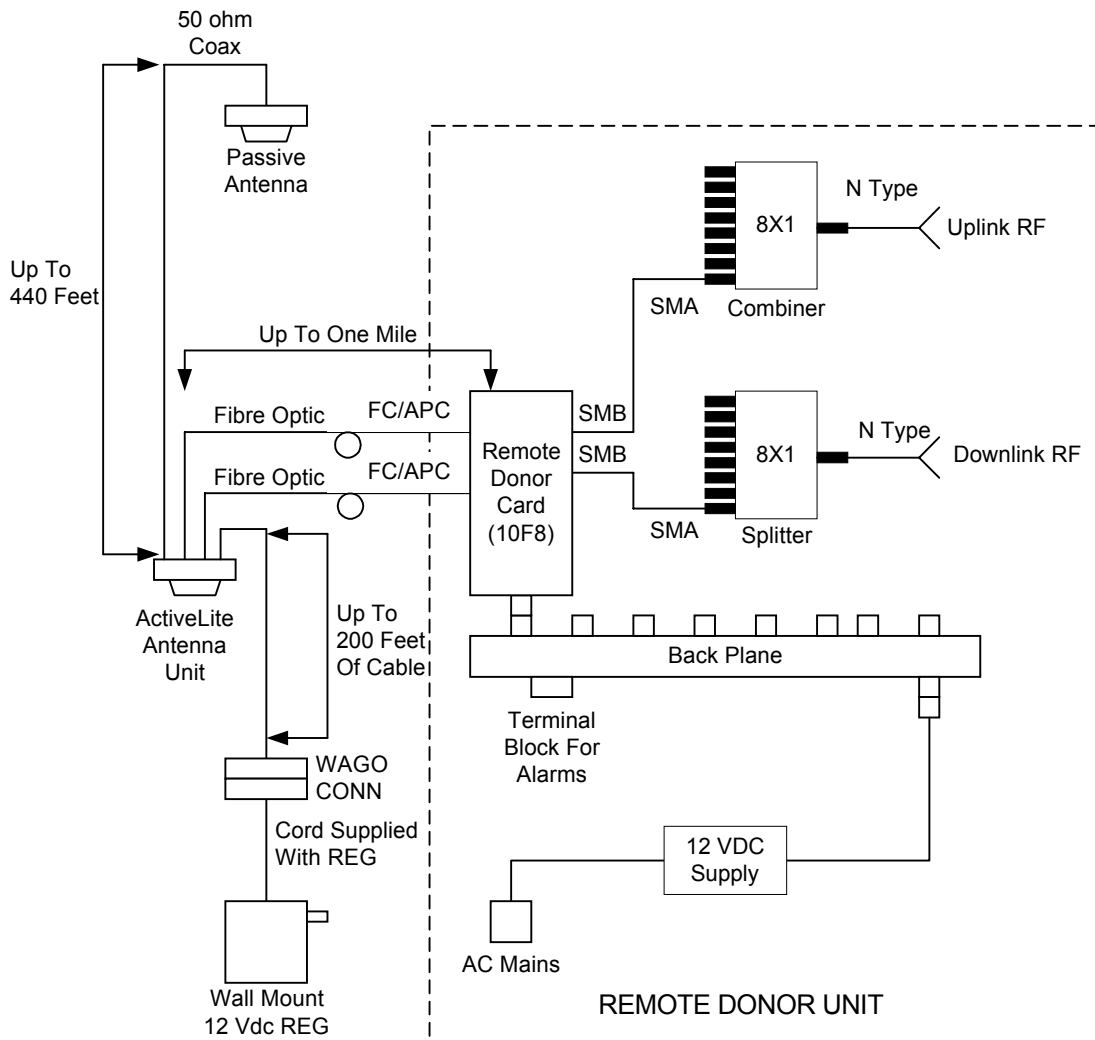
EQUIPMENT: ActiveLite Signal Distribution System
 FCC ID: LB45855

Theory of Operation

The ActiveLite Signal Distribution System is a fibre optic RF distribution system that provides distribution of radio signals inside structures where the use of coaxial cables is impractical. The RF signals are brought into the remote donor unit which then converts the RF energy into light energy.

Each antenna unit in the system is a self-contained module that converts the transmitted modulated light into an RF signal and a received RF signal into modulated light. The antenna unit transmits these light signals to and from the remote donor unit using a fibre optic cable with two fibres. One fibre is for the RF signal uplink and the other is for the RF downlink.

System Diagram



EQUIPMENT: ActiveLite Signal Distribution System
FCC ID: LB45855

Section 3. RF Power Output

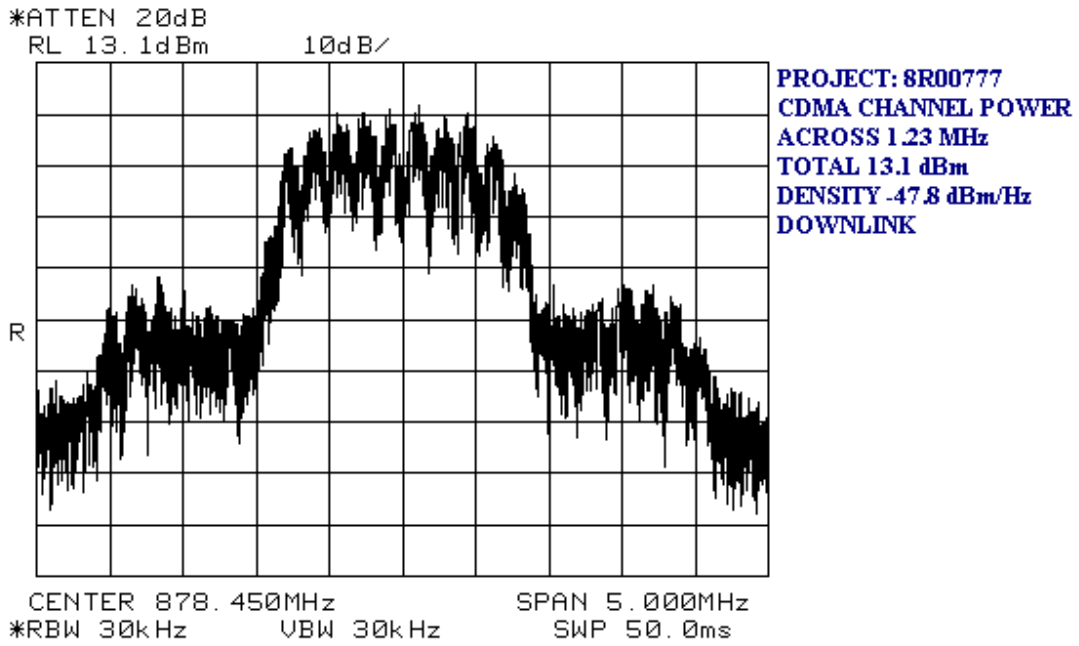
NAME OF TEST: RF Power Output	PARA. NO.: 2.985
TESTED BY: Kevin Carr	DATE: August 6, 1998

Test Results: Complies.

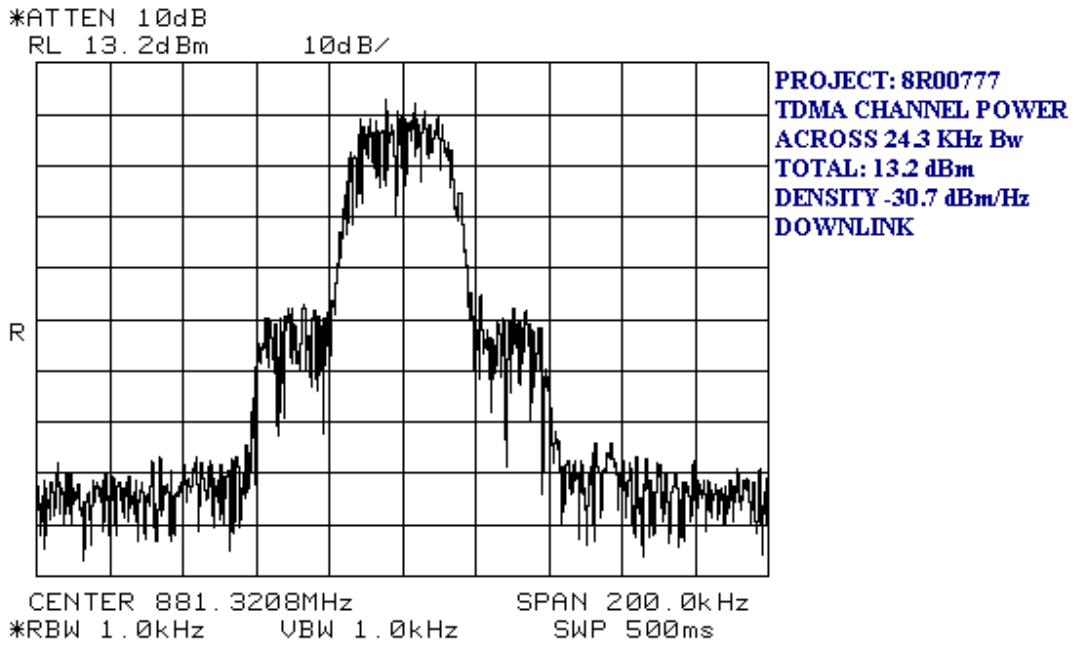
Measurement Data:

	Modulation Type	Per Channel Power Output (dBm)	Composite Power Output (dBm)
Downlink	CDMA	10.1	13.1
Downlink	TDMA	10.2	13.2

EQUIPMENT: ActiveLite Signal Distribution System
FCC ID: LB45855



EQUIPMENT: ActiveLite Signal Distribution System
FCC ID: LB45855



EQUIPMENT: ActiveLite Signal Distribution System
FCC ID: LB45855

Section 4. Occupied Bandwidth

NAME OF TEST: Occupied Bandwidth (Voice + SAT)	PARA. NO.: 2.917(c)
TESTED BY:	DATE:

Test Results: Complies/Does Not Comply.

Test Data: See attached graph(s).

NOT APPLICABLE

EQUIPMENT: ActiveLite Signal Distribution System
FCC ID: LB45855

NAME OF TEST: Occupied Bandwidth (WB Data)	PARA. NO.: 2.917 (d)
TESTED BY:	DATE:

Test Results: Complies/Does Not Comply.

Test Data: See attached graph(s).

NOT APPLICABLE

EQUIPMENT: ActiveLite Signal Distribution System
FCC ID: LB45855

NAME OF TEST: Occupied Bandwidth (ST)	PARA. NO.: 2.917(d)
TESTED BY:	DATE:

Test Results: Complies/Does Not Comply.

Test Data: See attached graph(s).

NOT APPLICABLE

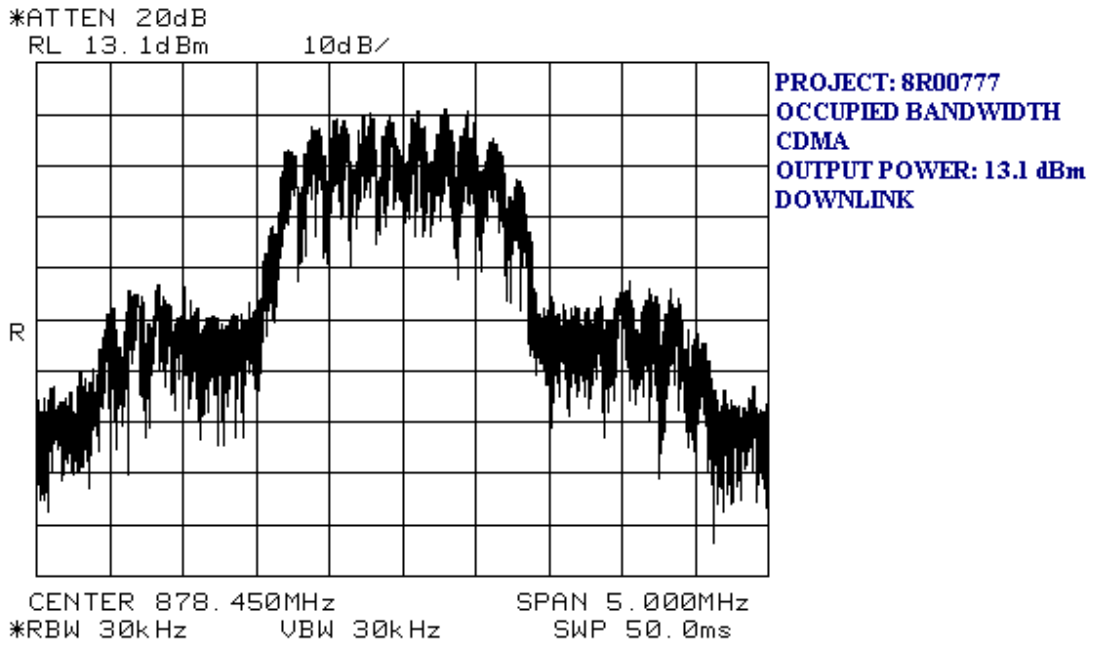
EQUIPMENT: ActiveLite Signal Distribution System
FCC ID: LB45855

NAME OF TEST: Occupied Bandwidth (Digital Mod.)	PARA. NO.: 2.917(e)
TESTED BY: Kevin Carr	DATE: August 6, 1998

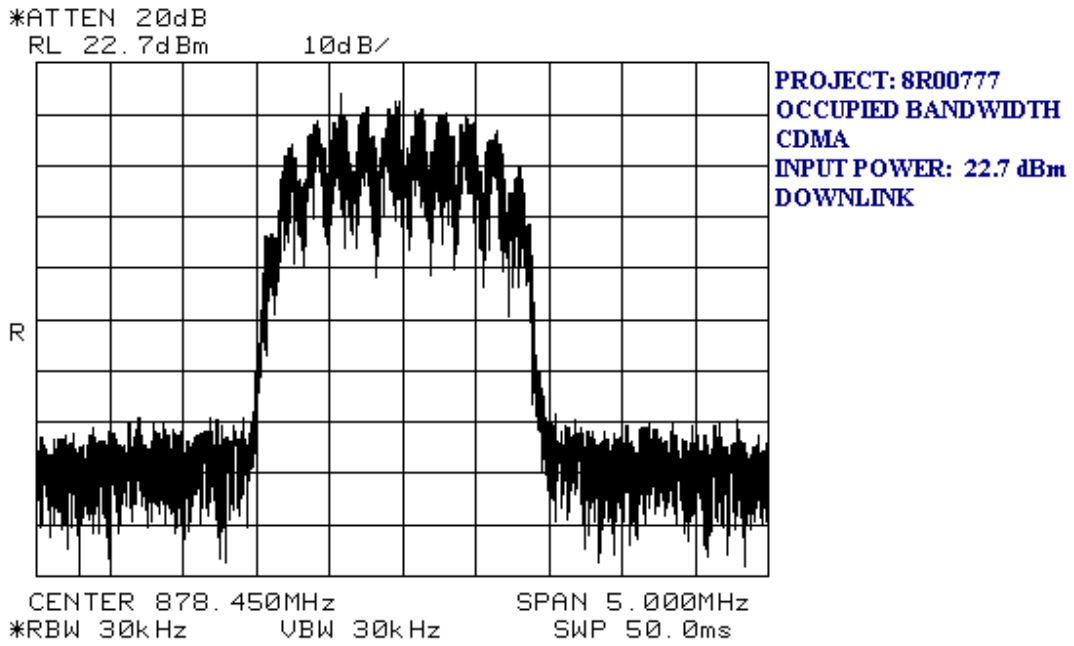
Test Results: Complies.

Test Data: See attached graph(s).

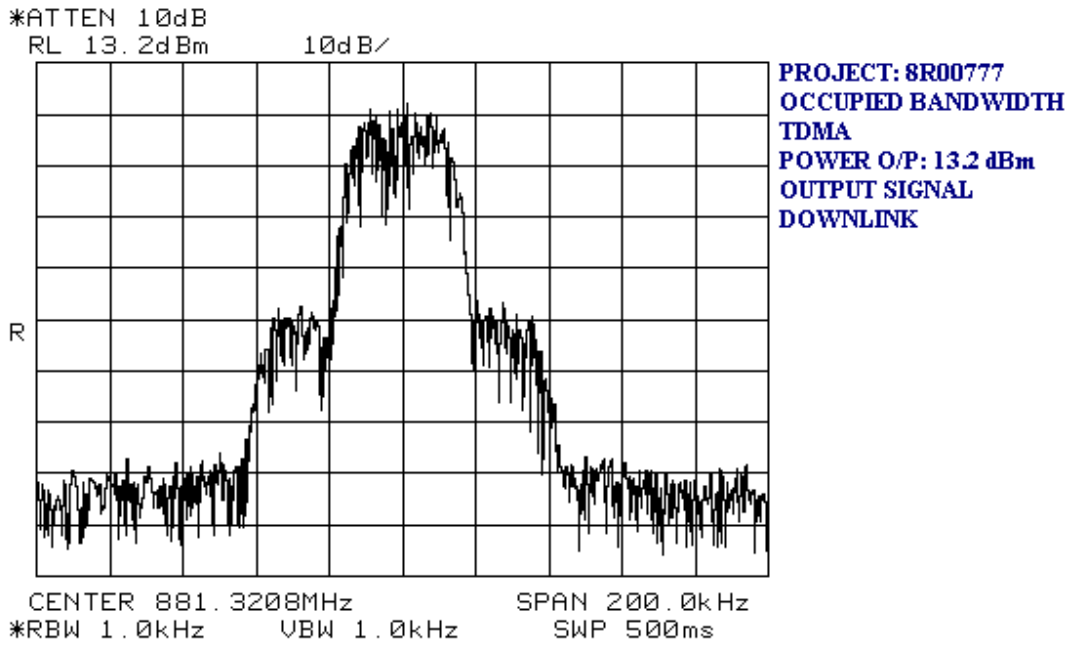
EQUIPMENT: ActiveLite Signal Distribution System
FCC ID: LB45855



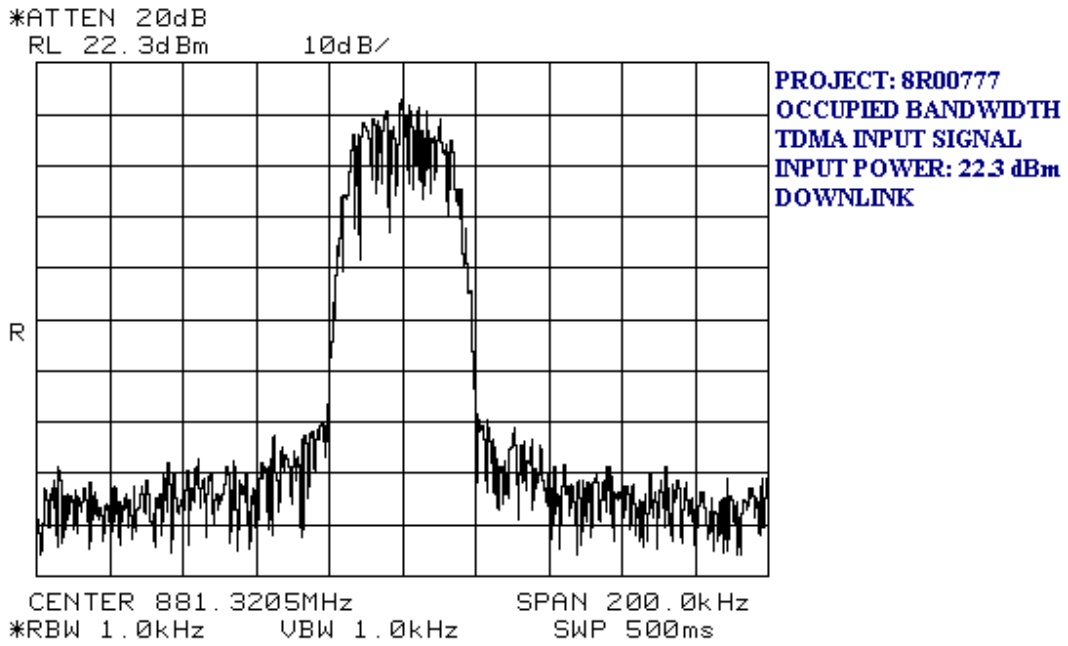
EQUIPMENT: ActiveLite Signal Distribution System
FCC ID: LB45855



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FCC ID: LB45855



EQUIPMENT: ActiveLite Signal Distribution System
FCC ID: LB45855

Section 5. Spurious Emissions at Antenna Terminals

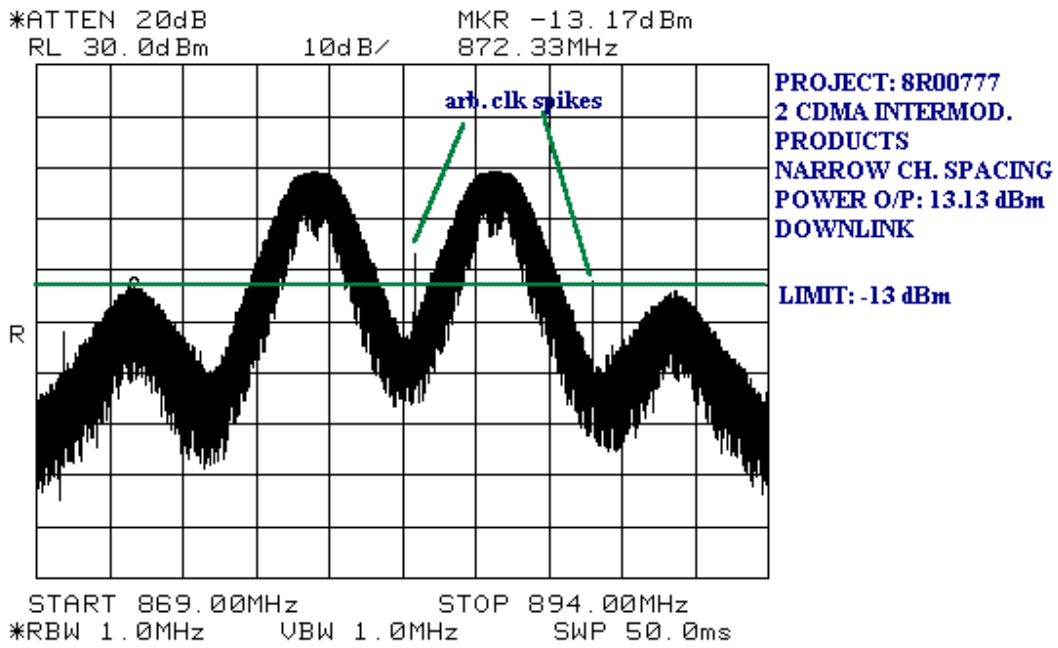
NAME OF TEST: Spurious Emissions @ Antenna Terminals	PARA. NO.: 2.917(e)
TESTED BY: Kevin Carr	DATE: August 6, 1998

Test Results: Complies.

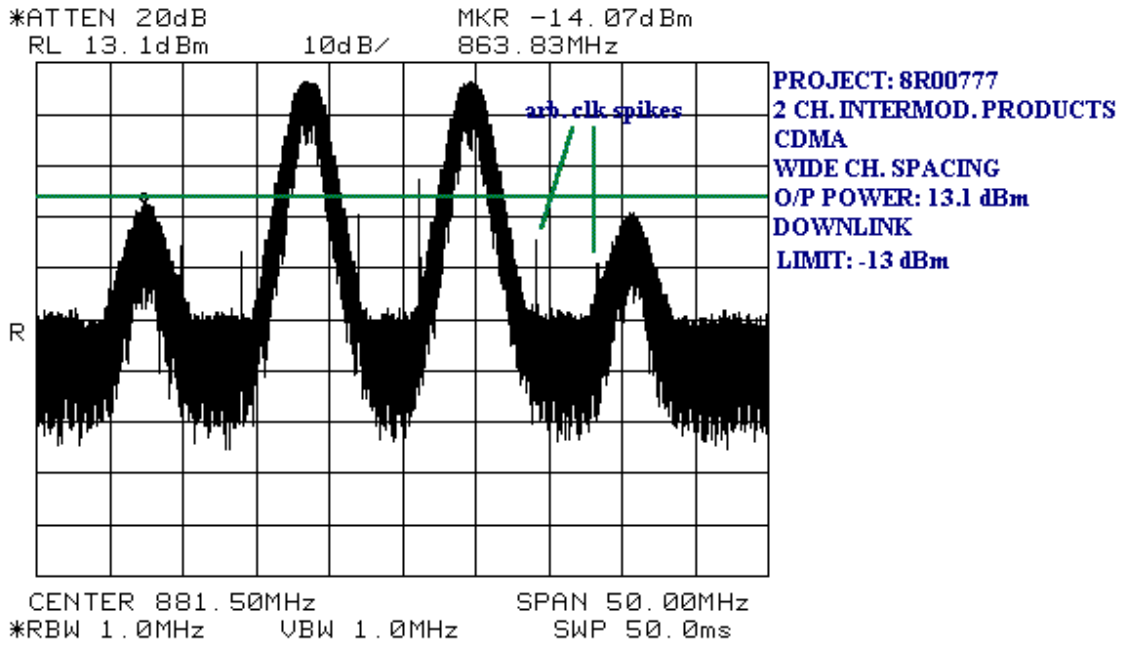
Test Data:

NAME OF TEST	WORST-CASE SPURIOUS LEVEL(dBm)
0 to 10 GHz spurious (Downlink)	-30.9
3 - signal intermodulation (Downlink)	-13.0
Lower band edge spurious (Downlink)	-14.07
Upper band edge spurious (Downlink)	-14.73

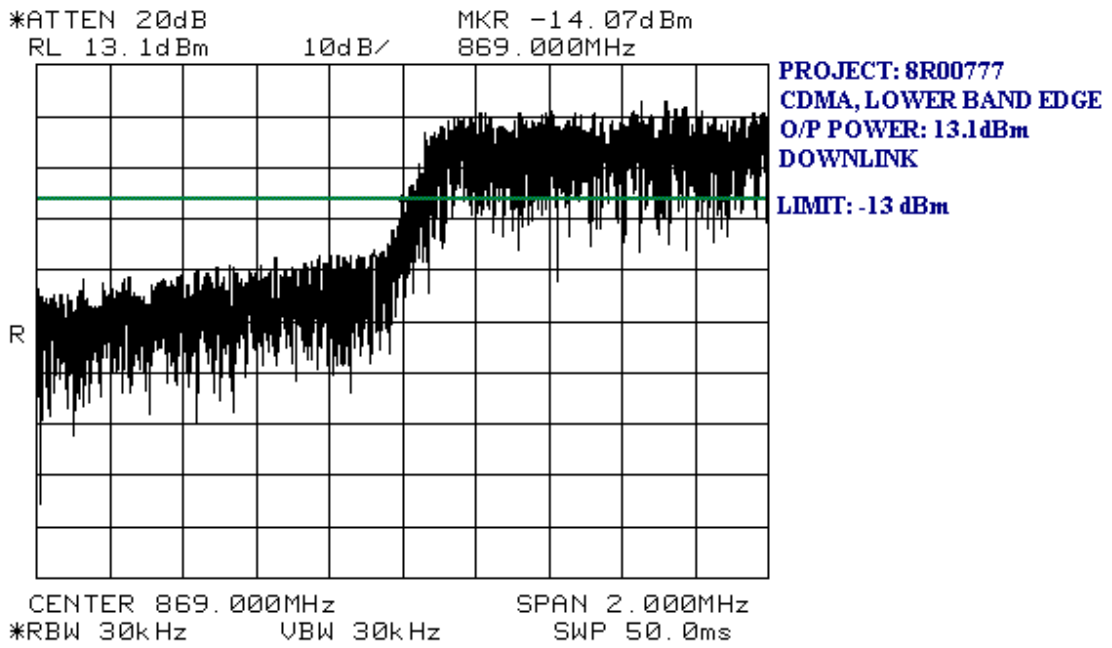
EQUIPMENT: ActiveLite Signal Distribution System
FCC ID: LB45855



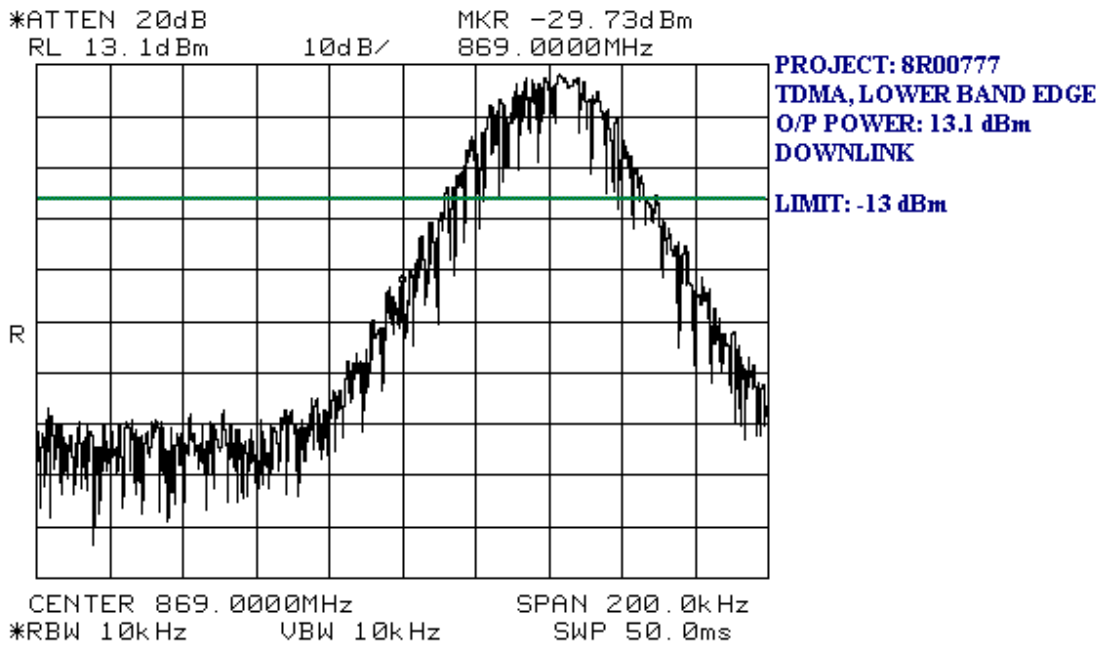
EQUIPMENT: ActiveLite Signal Distribution System
FCC ID: LB45855



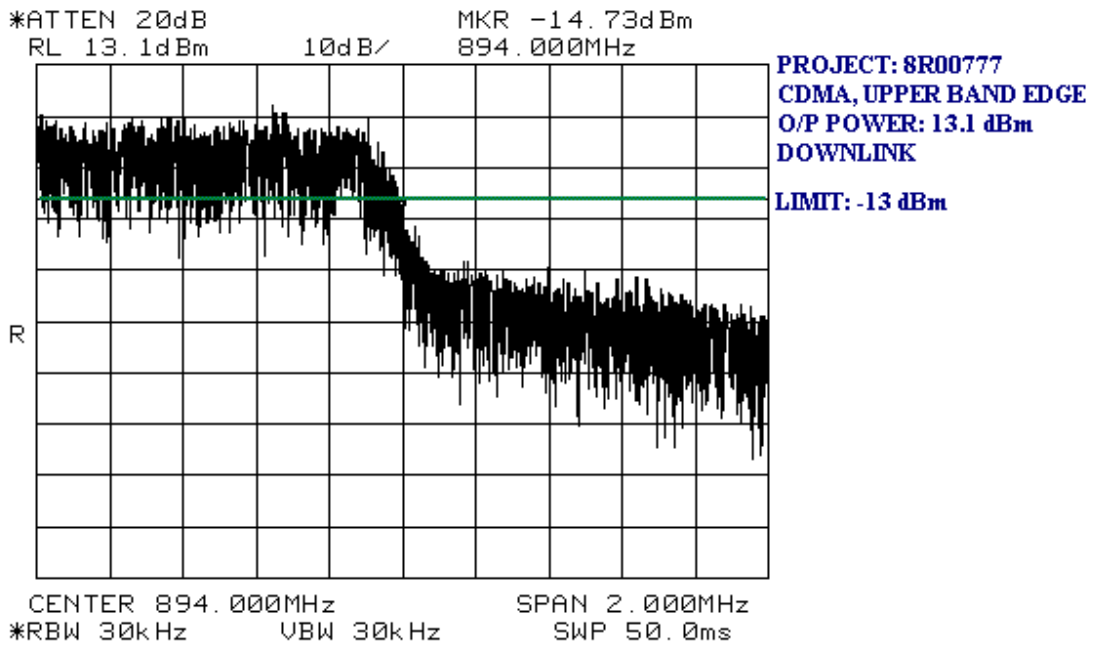
EQUIPMENT: ActiveLite Signal Distribution System
FCC ID: LB45855



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FCC ID: LB45855



EQUIPMENT: ActiveLite Signal Distribution System
FCC ID: LB45855



EQUIPMENT: ActiveLite Signal Distribution System
FCC ID: LB45855

Section 6. Field Strength of Spurious

NAME OF TEST: Field Strength of Spurious Emissions	PARA. NO.: 2.917(e)
TESTED BY:	DATE:

Test Results: Complies/Does Not Comply.
The maximum field strength is ____ dB μ V/m @ 3m.

Test Data:

NOT APPLICABLE

EQUIPMENT: ActiveLite Signal Distribution System
FCC ID: LB45855

Photographs of Test Setup

FRONT VIEW

NOT APPLICABLE

REAR VIEW

EQUIPMENT: ActiveLite Signal Distribution System
FCC ID: LB45855

Section 7. Frequency Stability

NAME OF TEST: Frequency Stability	PARA. NO.: 22.355
TESTED BY:	DATE:

Test Results: Complies/Does Not Comply.

Measurement Data: Standard Test Frequency: _____ MHz
Standard Test Voltage: _____ Vdc

NOT APPLICABLE

EQUIPMENT: ActiveLite Signal Distribution System
FCC ID: LB45855

Section 8. Test Equipment List

CAL CYCLE	EQUIPMENT	MANUFACTURER	MODEL	SERIAL	LAST CAL.	NEXT CAL.	
1 Year	Spectrum Analyzer	Hewlett Packard	8565E	FA000981	May 20/98	May 20/99	
1 Year	Attenuator	Narda	765-20	9510	July 24/98	July 24/99	
1 Year	RF Millivoltmeter	Rohde & Schwarz	URV5	FA000420	July 23/98	July 23/99	
1 Year	Insertion Unit	Rohde & Schwarz	URV5-Z4	FA000905	July 23/98	July 23/99	
	50 Ω Termination	Wiltron	26N50	605248	N/A	N/A	
1 Year	50 ohm Combiner Pad	Mini Circuits	ZA3PD-2	9746	Dec. 12/97	Dec. 12/98	
1 Year	Signal Generator	Rohde & Schwarz	SM1Q03	1084-8004-03	July 23/98	July 23/99	
1 Year	Arbitrary Waveform Gen.	Sony/Tektronix	AWG2021	J310495	NCR	NCR	
3 Year	RF Generator	Rohde & Schwarz	SME3	DE14439	June 29/96	June 29/99	

NA: Not Applicable
 NCR: No Cal Required

EQUIPMENT: ActiveLite Signal Distribution System
FCC ID: LB45855

ANNEX A
TEST METHODOLOGIES

EQUIPMENT: ActiveLite Signal Distribution System
FCC ID: LB45855

NAME OF TEST: RF Power Output	PARA. NO.: 2.985
--------------------------------------	-------------------------

Test Conditions: Standard Temperature & Humidity
Standard Test Voltage

Minimum Standard: Para. No. 22.913(a). The maximum effective radiated power (ERP) of base transmitters and cellular repeaters must not exceed 500 watts.

Method Of Measurement:

Detachable Antenna:

The peak power at antenna terminals is measured using an in-line peak power meter. Power output is measured with the maximum rated input level.

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 $GP/4\pi R^2 = E^2/120\pi$ 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

EQUIPMENT: ActiveLite Signal Distribution System
FCC ID: LB45855

NAME OF TEST: Occupied Bandwidth (Voice & SAT)	PARA. NO.: 2.989
---	-------------------------

Test Conditions: Standard Temperature & Humidity
Standard Test Voltage

Minimum Standard: 22.917(c) The mean power of any emission removed from the carrier frequency by a displacement frequency (f_d in kHz) must be attenuated below the mean power of the unmodulated carrier (P) as follows:

(i) On any frequency removed from the carrier frequency by more than 12 kHz but not more than 20 kHz:

at least $117 \log (f_d/12)$

(ii) On any frequency removed from the carrier frequency by more than 20 kHz, up to the first multiple of the carrier frequency:

at least $100 \log (f_d/11)$ dB or $43 + 10 \log (P)$ dB, whichever is the lesser attenuation.

Method Of Measurement:

Spectrum Analyzer Settings:

RBW: 300 Hz
VBW: \geq RBW
Span: 100 kHz
Sweep: Auto
Mask: CELLF3E

Input Signal Characteristics (F3E/F3D):

RF level: Maximum recommended by manufacturer
AF1 frequency: 6 kHz
AF1 level: sufficient to produce 2 kHz deviation
AF2 frequency: 2.5 kHz
AF2 level: sufficient to produce 12 kHz deviation.

EQUIPMENT: ActiveLite Signal Distribution System
FCC ID: LB45855

NAME OF TEST: Occupied Bandwidth (WB Data)	PARA. NO.: 2.989
---	-------------------------

Test Conditions: Standard Temperature & Humidity
Standard Test Voltage

Minimum Standard: 22.917(c) The mean power of any emission removed from the carrier frequency by a displacement frequency (f_d in kHz) must be attenuated below the mean power of the unmodulated carrier (P) as follows:

(1) On any frequency removed from the carrier frequency by more than 20 kHz but not more than 45 kHz:

at least 26 dB

(2) On any frequency removed from the carrier frequency by more than 45 kHz but not more than 90 kHz:

at least 45 dB

(3) On any frequency removed from the carrier frequency by more than 90 kHz, up to the first multiple of the carrier frequency:

at least 60 dB or $43 + 10 \log (P)$ dB, whichever is the lesser attenuation.

Method Of Measurement:

Spectrum Analyzer Settings:

RBW: 300 Hz

VBW: \geq RBW

Span: 200 kHz

Sweep: Auto

Mask: CELLF1D

Input Signal Characteristics:

RF level: Maximum recommended by manufacturer

AF1 frequency: 10 kHz, random bit sequence

AF1 level: sufficient to produce 8 kHz deviation

EQUIPMENT: ActiveLite Signal Distribution System
FCC ID: LB45855

NAME OF TEST: Occupied Bandwidth (ST)	PARA. NO.: 2.989
--	-------------------------

Test Conditions: Standard Temperature & Humidity
Standard Test Voltage

Minimum Standard: 22.917(c) The mean power of any emission removed from the carrier frequency by a displacement frequency (f_d in kHz) must be attenuated below the mean power of the unmodulated carrier (P) as follows:

(1) On any frequency removed from the carrier frequency by more than 20 kHz but not more than 45 kHz:

at least 26 dB

(2) On any frequency removed from the carrier frequency by more than 45 kHz but not more than 90 kHz:

at least 45 dB

(3) On any frequency removed from the carrier frequency by more than 90 kHz, up to the first multiple of the carrier frequency:

at least 60 dB or $43 + 10 \log (P)$ dB, whichever is the lesser attenuation.

Method Of Measurement:

Spectrum Analyzer Settings:

RBW: 300 Hz

VBW: \geq RBW

Span: 200 kHz

Sweep: Auto

Mask: CELLF1D

Input Signal Characteristics:

RF level: Maximum recommended by manufacturer

AF1 frequency: 10 kHz tone

AF1 level: sufficient to produce 8 kHz deviation

EQUIPMENT: ActiveLite Signal Distribution System
FCC ID: LB45855

NAME OF TEST: Occupied Bandwidth (Digital Modulation) PARA. NO.: 2.989
--

Test Conditions: Standard Temperature & Humidity
 Standard Test Voltage

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: \geq RBW

Span: As required

Sweep: Auto

Mask:

Input Signal Characteristics:

RF level: Maximum recommended by manufacturer

EQUIPMENT: ActiveLite Signal Distribution System
FCC ID: LB45855

NAME OF TEST: Spurious Emission at Antenna Terminals	PARA. NO.: 2.991
---	-------------------------

Test Conditions: Standard Temperature & Humidity
Standard Test Voltage

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.

Method Of Measurement:

Spectrum Analyzer Settings:

RBW: 30 kHz (AMPS). As required for digital modulations.

VBW: \geq RBW

Start Frequency: 0 MHz

Stop Frequency: 10 GHz

Sweep: Auto

EQUIPMENT: ActiveLite Signal Distribution System
FCC ID: LB45855

NAME OF TEST: Field Strength of Spurious Radiation	PARA. NO.: 2.993
---	-------------------------

Test Conditions: Outdoor Range
 Standard Test Voltage

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.

Calculation Of Field Strength Limit:

An example of attenuation requirement of $43 + 10 \log P$ is equivalent to -13 dBm (5×10^{-5} Watts) at the antenna terminal. We determine the field strength limit by using the plane wave relation.

$$GP/4\pi R^2 = E^2/120\pi$$

For emissions ≤ 1 GHz:

$G = 1.64$ (Dipole Gain)
 $P = 10^{-5}$ Watts (Maximum spurious output power)
 $R = 3m$ (Measurement Distance)

$$E = \frac{\sqrt{30GP}}{R}$$

$$E = \frac{\sqrt{30 \times 1.64 \times 5 \times 10^{-5}}}{3} = 0.016533 \text{ V / m} = 84.4 \text{ dB}\mu\text{V / m}$$

For emissions > 1 GHz:

$G = 1$ (Isotropic Gain)
 $P = 1 \times 10^{-5}$ Watts (Maximum spurious output power)
 $R = 3m$ (Measurement Distance)

$$E = 84.4 - 20 \log \sqrt{1.64} = 82.3 \text{ dB}\mu\text{V / m@3m}$$

The spectrum is searched to 10 GHz.

EQUIPMENT: ActiveLite Signal Distribution System
FCC ID: LB45855

NAME OF TEST: Frequency Stability	PARA. NO.: 2.995
--	-------------------------

Test Conditions: As per measurement data.

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

Freq. Range (MHz)	Base, fixed	Mobile > 3 W	Mobile ≤ 3 W
821 to 896	1.5	2.5	2.5

Table C-1

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. 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 10 MHz 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.

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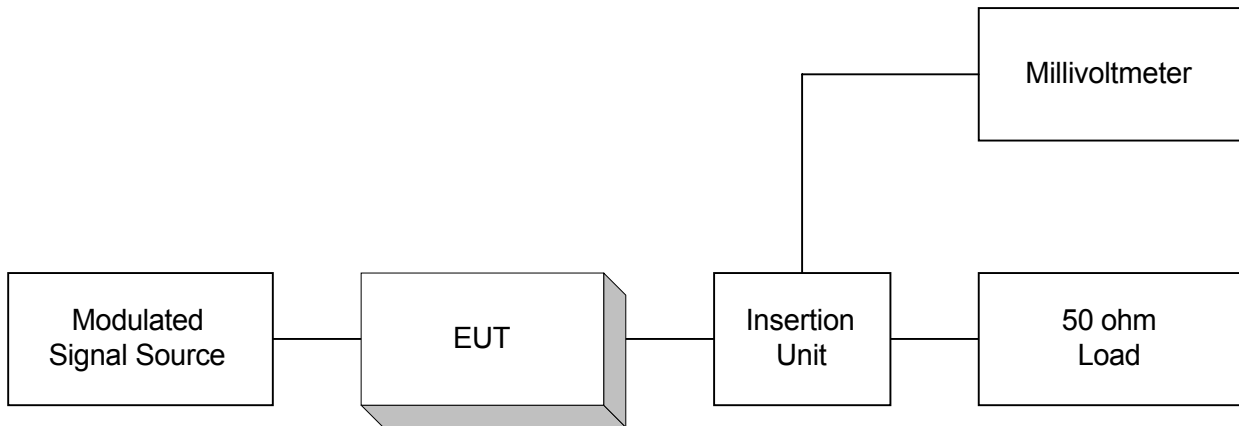
FCC PART 22, SUBPART H
CELLULAR BAND REPEATERS
PROJECT NO.: 8R00777
ANNEX B

EQUIPMENT: ActiveLite Signal Distribution System
FCC ID: LB45855

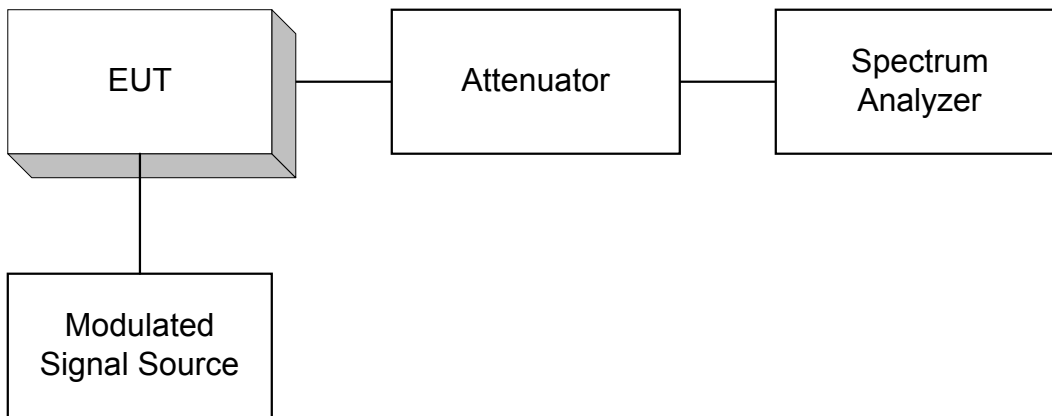
ANNEX B
TEST DIAGRAMS

EQUIPMENT: ActiveLite Signal Distribution System
FCC ID: LB45855

Para. No. 2.985 - R.F. Power Output

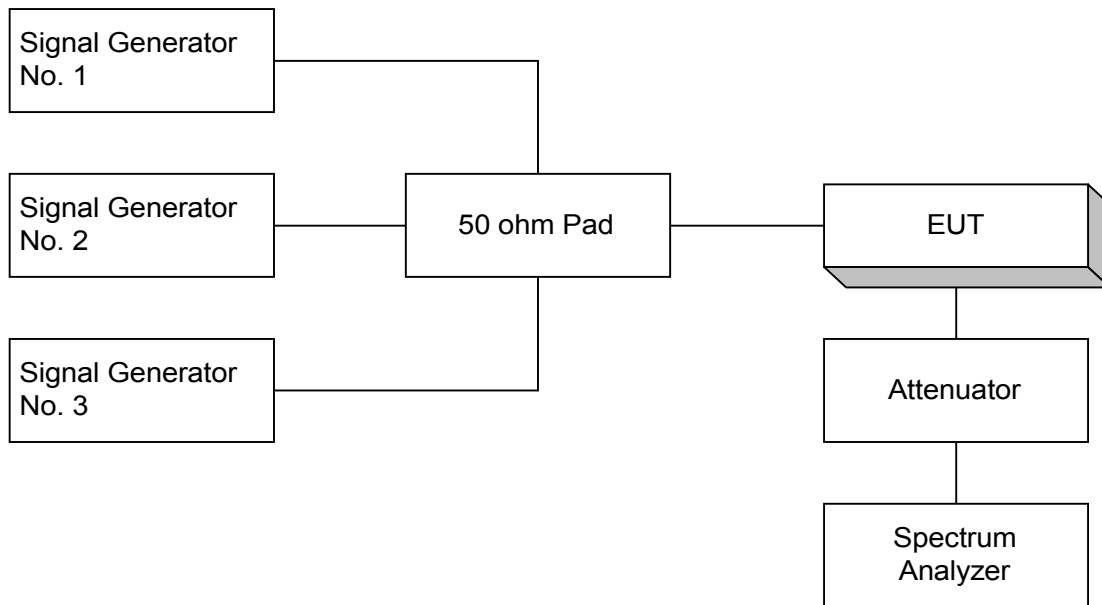
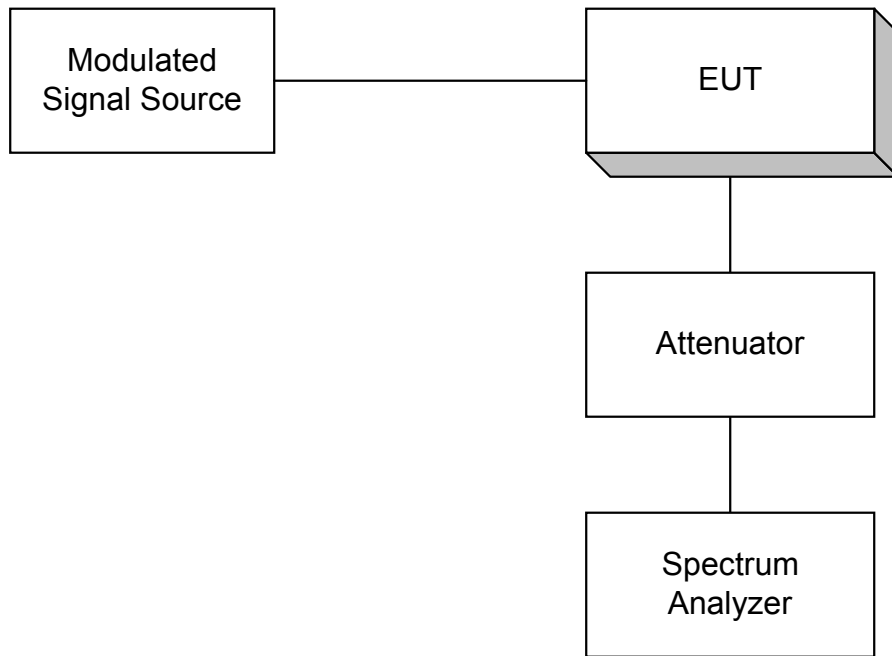


Para. No. 2.989 - Occupied Bandwidth



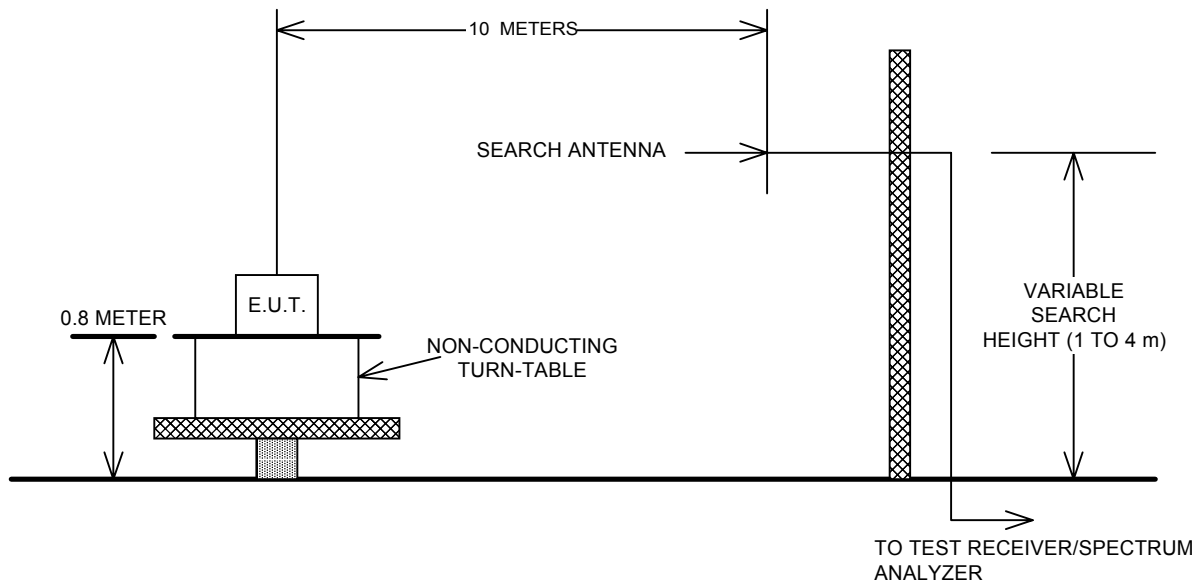
EQUIPMENT: ActiveLite Signal Distribution System
FCC ID: LB45855

Para. No. 2.991 Spurious Emissions at Antenna Terminals



EQUIPMENT: ActiveLite Signal Distribution System
FCC ID: LB45855

Para. No. 2.993 - Field Strength of Spurious Radiation



Para. No. 2.995 - Frequency Stability

