

October 8, 2001

Federal Communications Commission
Authorization and Evaluation Division
7435 Oakland Mills Road
Columbia, MD 21046

Attention: Applications Examiner

Applicant: LG Electronics Inc.
533, Hogue-dong, Dongan-gu, Anyang-shi, Kyongki-do
431-749, Korea

Equipment: STAREX-IS Indoor BTS System.

FCC ID: BEJ3G1XINBTS

Specification: for a 47 CFR 24 Licensed Certification

Dear Examiner:

The following application for Grant of Equipment Authorization is presented on behalf of LG Electronics Inc. for the Licensed Certification of their Model: STAREX-IS Indoor ITS System.

Enclosed, please find a complete data and documentation package demonstrating that this device complies with the technical requirements of 47 CFR 24, for a Base Station (ITS) Transceiver System.

If you have any questions, please contact the undersigned, who is authorized to act as Agent.

Sincerely,

A handwritten signature in blue ink, appearing to read "Chris Harvey".

Chris Harvey, Director
EMC Laboratory
MET Laboratories, Inc.

MET Laboratories, Inc. *Safety Certification - EMI - Telecom Environmental Simulation*

914 WEST PATAPSCO AVENUE ! BALTIMORE, MARYLAND 21230-3432 ! PHONE (410) 354-3300 ! FAX (410) 354-3313

ENGINEERING TEST REPORT

in support of the
Application for Grant of Equipment Authorization

EQUIPMENT: STAREX-IS Indoor ITS System.

FCC ID: BEJ3G1XINBTS

Specification: 47 CFR 24

On Behalf of the Applicant: LG Electronics Inc.
533, Hogye-dong, Dongan-gu, Anyang-shi, Kyongki-do
431-749, Korea

Manufacturer: LG Electronics Inc.
533, Hogye-dong, Dongan-gu, Anyang-shi, Kyongki-do
431-749, Korea

Manufacturer's Representative Mr. Jong-Kuk Kim

Test Date(s): 8-12 October, 2001

ENGINEERING STATEMENT

I ATTEST: the measurements shown in this report were made in accordance with the procedures indicated, and that the emissions from this equipment were found to be within the limits applicable. I assume full responsibility for the accuracy and completeness of these measurements. On the basis of the measurements made, the equipment tested is capable of operation in accordance with the requirements of Part 24 of the FCC Rules under normal use and maintenance.



Liming Xu
EMC Engineer, MET Laboratories

Summary of Test Results

These tests were conducted on a sample of the equipment for the purpose of demonstrating compliance with Part 24, of 47 CFR. All tests were conducted using measurement procedure ANSI C63.4-1992.

Type of Submission/Rule Part:	Original Filing/Part 24
EUT:	Starex-IS Indoor ITS System.
FCC ID:	BEJ3G1XINBTS
Type of Emissions:	1M3F9W (CDMA)
RF Power output:	CDMA: 16.0 Watts at all channels
Frequency Range (MHz):	1850-1910 receive and 1930-1990 Transmit (1931.25-1988.75)
Frequency Stability:	+/- 20 Hz

Summary of Test Data

Name of Test	FCC Rule Part/Section	Results
Radiated Spurious Emissions	2.1053; 24.238(a)	Complies
Occupied Bandwidth	2.1049	Complies
RF Power Output	2.1046; 24.232(a),(c)	Complies
Spurious Emissions at Antenna Terminals	2.1051; 24.238(a)	Complies
Spurious Emissions at Antenna Terminals Frequency Block Edges	2.1051; 24.238(b)	Complies
Frequency Stability over temperature variations	2.1055(a)(1)	Complies
Frequency Stability over supply Voltage variations	2.1055(d)(1)	Complies
Modulation Characteristics	2.1047(a)	Complies

1.0 INTRODUCTION:

The following data is presented on behalf of the Applicant, LG Electronics Inc. as verification of the compliance of the Starex-IS Indoor ITS System. to the requirements of 47 CFR 24.

2.0 TEST SITE:

All testing was conducted at MET Laboratories, Inc., 914 West Patapsco Avenue, Baltimore, Maryland 21230-3493. Radiated emissions measurements were performed on a three-meter Semi-Anechoic chamber. A complete site description is on file with the FCC Laboratory Division as 31040/SIT/MET.

3.0 TEST EQUIPMENT USED:

Manufacturer	Equipment	Calibration Due Date @ time of testing	Cal. Interval
Hewlett Packard	8563A Spectrum Analyzer	6/14/012	annual
EMCO	Biconical Antenna 3104	3/21/02	annual
EMCO	EMCO Log Periodic Antenna	11/01/01	annual
EMCO	Double Ridge Guided Horn	2/27/02	annual
Hewlett Packard	8594EM Analyzer	11/18/01	annual
Solar	LISN	7/27/02	annual

4.0 EQUIPMENT UNDER TEST CONFIGURATION:

The Base Station (ITS) was configured with DC power supply modules and an external PC to program the EUT to output a CDMA Modulation type PCS RF signal. The EUT with host external computer was configured for maximum signal gain and bandwidth. The EUT was operated in a manner representative of the typical usage of the equipment. During all testing, system components were manipulated within the confines of typical usage to maximize each emission.

5.0 TEST TYPE(S):

- 5.1 Radiated Emissions: 47 CFR2.1053, , 24.238(a)
- 5.2 Occupied Bandwidth: 47 CFR2.1049
- 5.3 RF Power Output: 47 CFR 2.1046, 24.232(a), (c)
- 5.4 Spurious Emission at Antenna Terminals: 47 CFR 2.1051, 24.238(a)
- 5.5 Spurious Emission at Antenna Terminals at Frequency Block edges +/- 1 MHz, 47 CFR 2.1051, 24.238(b)
- 5.6 Frequency Stability over temperature variations: 47 CFR 2.1055(a)(1)
- 5.7 Frequency Stability over variations in supply voltage: 47 CFR 2.1055(d)(1)
- 5.8 Modulation Characteristics: 47 CFR 2.1047(a)

6.0 TEST RESULTS**6.1 TEST TYPE:** Radiated Emissions**6.1.1 TECHNICAL SPECIFICATION:** 2.1053; 24.238(a)**6.1.2 TEST DATE(S):** 12 October, 2001**6.1.3 MEASUREMENT PROCEDURES:**

As required by §2.1053, *field strength of spurious radiation measurements* were made in accordance with the general procedures of ANSI C63.4-1992 "Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz". Preliminary radiated emission measurements were performed inside a shielded chamber with digital signal on and terminated. The frequency list from the preliminary measurements was used as a guide for making final measurements on a 3 meter Anechoic chamber. The unit was scanned over the frequency range of the lowest system oscillator value to 20 GHz. The Radiated Spurious Emissions *Limit* is obtained by the following:

Based on an output power (as measured at the output of the Amplifier) of 16 watts:

$$P_o = 16 \text{ W}$$

the radiated power level of all spurious emissions must be attenuated by at least $43 + 10\log(P_o)$ below P_o , yielding:

$$P_o - [43 + 10\log(P_o)] \leq -13 \text{ dBm}$$

All of the measurable radiated emissions are related to the digital device portion of the EUT, and thus are compared to the 47CFR 15 Class A field strength limit. Mathematical calculations indicate that these field strengths yield radiated power levels greater than 30 dB below the -13 dBm limit for spurious emissions from the transmitter portion of the EUT calculated above. There were no observable radiated emissions from the transmitter portion of the EUT.

The Spurious Radiated Emissions were measured from 1GHz to 20GHz for the Indoor ITS System. There were no detectable spurious emissions in that frequency range.

Photograph of Test Configuration

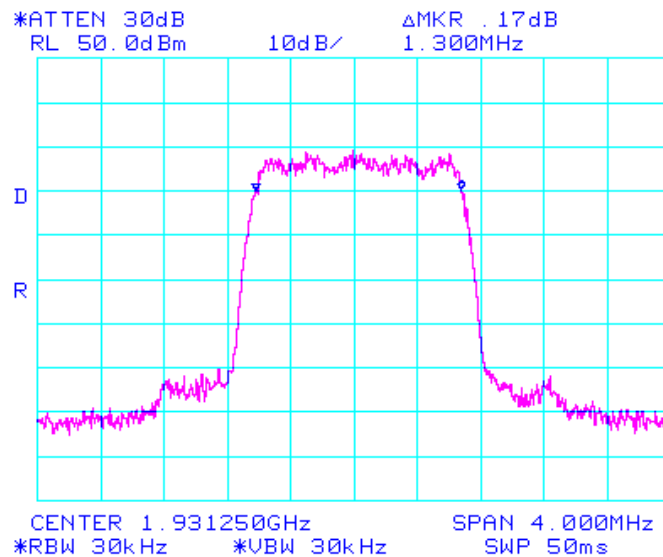


6.2 TEST TYPE: Occupied Bandwidth**6.2.1 TECHNICAL SPECIFICATION:** 47CFR2.1049**6.2.2 TEST DATE(S):** 10 October, 2001**6.2.3 MEASUREMENT PROCEDURES:**

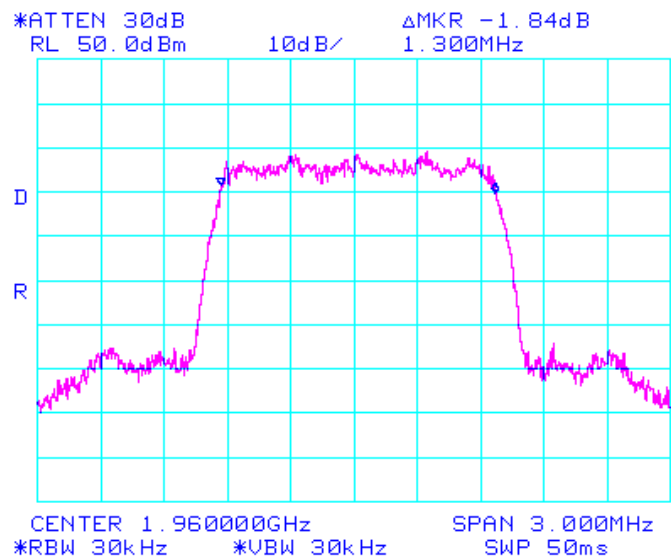
As required by §2.1049 of CFR 47, *occupied bandwidth measurements* were made on the Base Transceiver Station (ITS). The EUT was configured to transmit a CDMA modulated carrier signal. Using a bandwidth of 30KHz, we determined the occupied bandwidth of the emission at the center of the selectable channel range.

6.2.4 RESULTS:

Equipment complies with Section 2.1049. Plots of the occupied bandwidth, as measured at the RF output port follows:

Emission Bandwidth Met11406

Emission Bandwidth Met11406



6.3 TEST TYPE: RF Power Output

6.3.1 TECHNICAL SPECIFICATION: 47CFR2.1046 and 24.232(a), (c)

6.3.2 TEST DATE(S): 10 October, 2001

6.3.3 MEASUREMENT PROCEDURES:

As required by §2.1046 of CFR 47, *RF power output measurements* were made at the RF output terminals using an attenuator and spectrum analyzer. This test was performed with carrier modulated by a CDMA modulation signal.

Plots of the RF output Power level of the Digitally modulated carrier, as measured at the RF output are included on the following page .

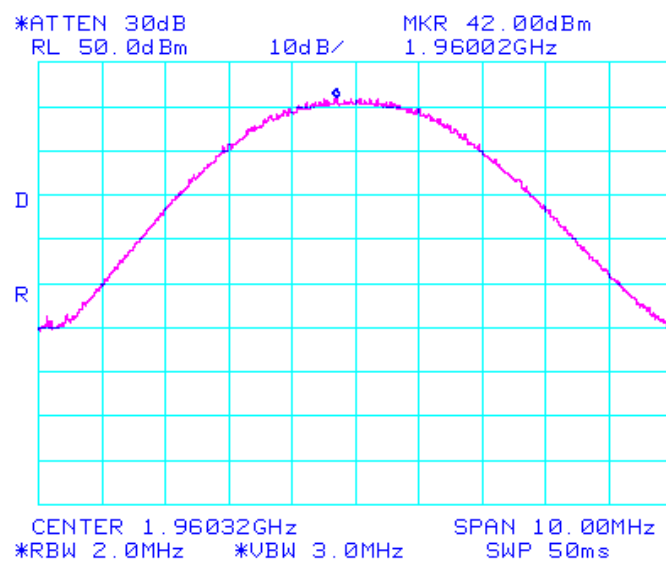
6.3.4 RESULTS:

Equipment complies with 47CFR 2.1046 and 24.232(a). The Base T Station (ITS) does not exceed 100 W (or 50 dBm) at the carrier frequency.

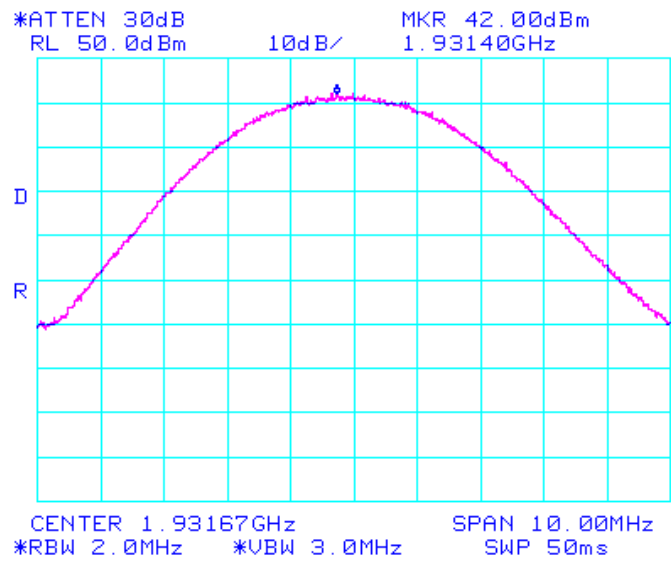
The following pages show measurements of RF Power output which is summarized below:

CDMA: 16 Watts at all frequency channels

RF output power Met11406



RF output power Met 11406



6.4 TEST TYPE: Spurious Emissions at Antenna Terminals

6.4.1 TECHNICAL SPECIFICATION: 2.1051; 24.238(a)

6.4.2 TEST DATE(S): 10 October, 1999

6.4.3 MEASUREMENT PROCEDURES:

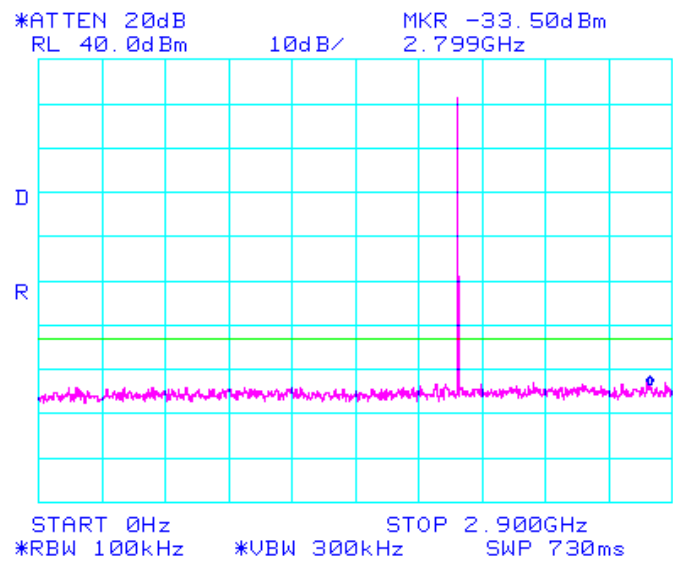
As required by §2.1051 of CFR 47, *spurious emissions at antenna terminal measurements* were made at the RF output terminals using a 50 S attenuator and spectrum analyzer set for a 100 kHz bandwidth. This test was performed with Digitally modulated carrier signals. The EUT was adjusted for continuous transmit on frequencies in Downlink band. The frequency spectrum was investigated from 9.0 KHz to 20.0 GHz. For measuring emissions above 2 GHz, a high-pass filter was used to eliminate the fundamental transmit frequency to prevent possible saturation effects on the front end of the spectrum analyzer.

6.4.4 RESULTS:

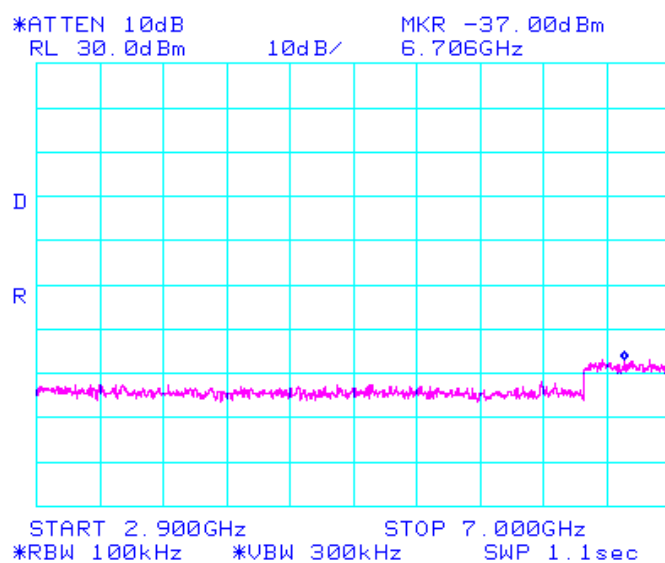
The following plots are included to illustrate compliance with the requirements of 47 CFR Part 24.238(a):

Equipment complies with Section 2.1051 and 24.238(a)

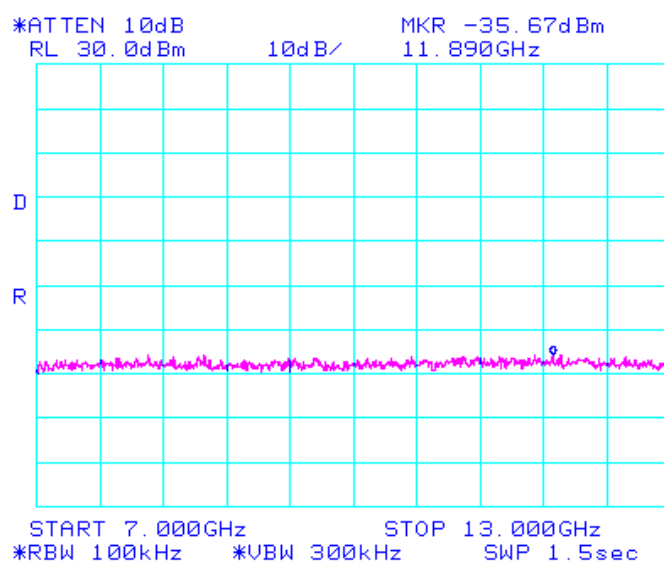
Conducted spur emissions at antenna port Met11406



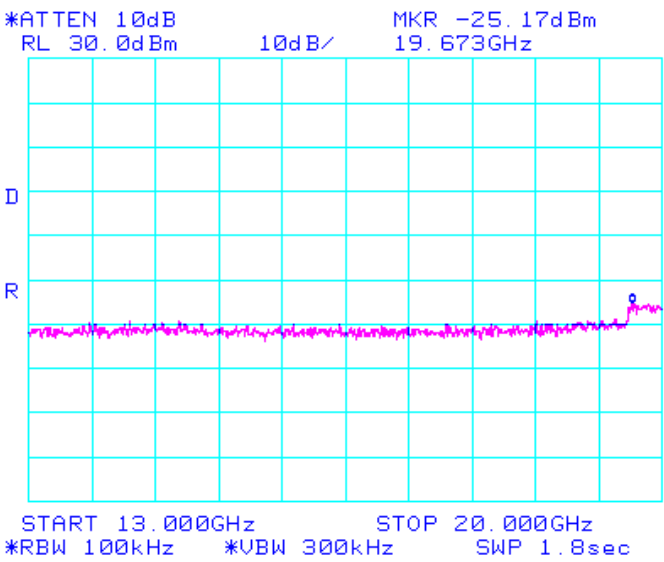
Conducted spur emissions at antenna port Met11406



Conducted spur emissions at antenna port Met11406



Conducted spur emissions at antenna port Met11406



6.5 TEST TYPE: Spurious Emissions at Antenna Terminals at Block Edges +/- 1 MHz

6.5.1 TECHNICAL SPECIFICATION: 2.1051; 24.238(b)

6.5.2 TEST DATE(S): 10 October, 2001

6.5.3 MEASUREMENT PROCEDURES:

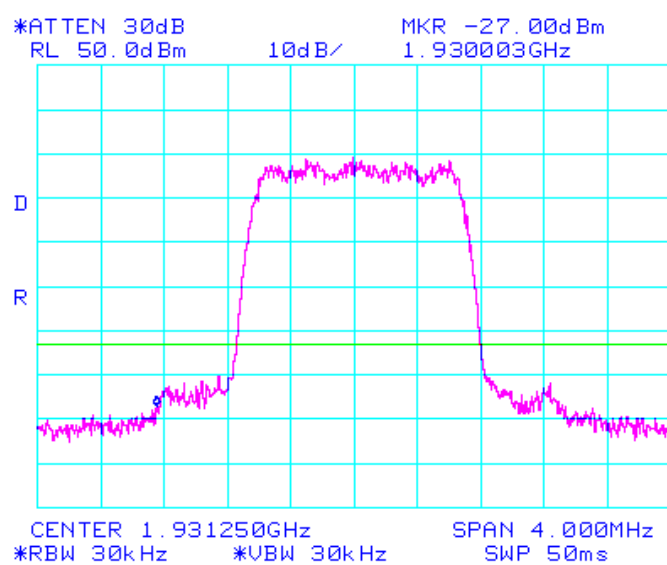
As recommended in FCC Part 24, 1% of the 26dB bandwidth was chosen to measure the peak of any emission inside the 1.0 MHz frequency band adjacent to each frequency block edge. All other frequencies were measured using a 30 KHz RBW. The unit was exercised using signal types required by §2.1049.

6.5.4 RESULTS:

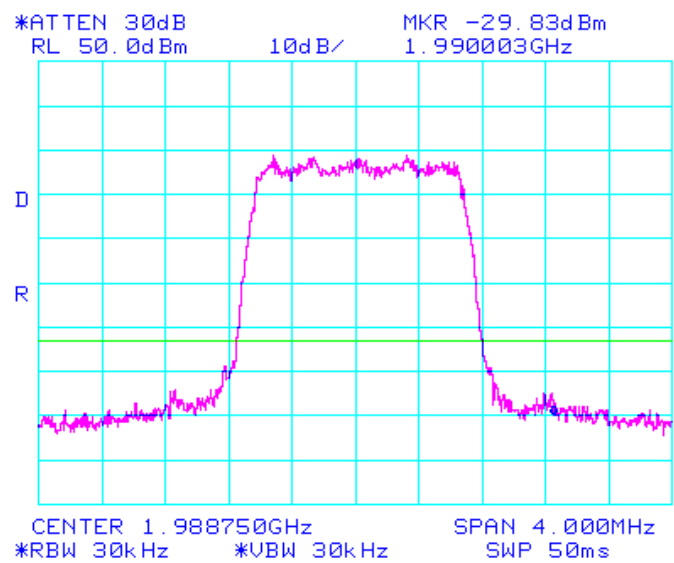
Modulation products outside of this band are attenuated at least $43 + 10 \log(P)$ below the level of the modulated carrier. A Plot of the spurious emissions at +/- 1 MHz around the transmit frequency, as measured at the antenna port, appears on the following page.

Plots of the spurious emissions as measured at the extremes of each frequency block appear on the following pages.

Spur emissions at Low side of Block A Met 11406



Spur emissions at High side of Block C Met11406



6.6 TEST TYPE: Frequency Stability over Temperature Variations**6.6.1 TECHNICAL SPECIFICATION:** 2.1055(a)(1)**6.6.2 TEST DATE(S):** 12 October, 2001**6.6.3 MEASUREMENT PROCEDURES:**

As required by §2.1055(a)(1) of CFR 47, *frequency tolerance measurements* were made over the temperature range of -30EC to +50EC. The frequency measurements were made using direct input to a spectrum analyzer. Climatic control was accomplished using an environmental simulation chamber. The temperature was first lowered to -30EC and then raised hourly in 10E increments. The unit remained in the chamber during temperature transitions and during the measurement process.

6.6.4 RESULTS:

Frequency tolerance of carrier signal: +/- 0.005% for a temperature variation from - 30EC to + 50EC at normal supply voltage.

CARRIER FREQUENCY DEVIATIONS DUE TO TEMPERATURE INSTABILITY

Temperature (EC)	Carrier Frequency (CH 661) (GHz)	Frequency Deviation (Hz)	Deviation Limit (Hz)
-30	N/A		
-20	N/A		
-10	N/A		
0	1.959999910	5	± 98
+10	1.959999908	3	± 98
+20	1.959999905	0	± 98
+30	1.959999902	-3	± 98
+40	1.959999902	-3	± 98
+50	1.959999905	-0	± 98

Per Specification : This Indoor ITS operation temperature is from 0 to 50 Degree C.

The unit meets the requirements of 2.1055 (a)(1)

6.7 TEST TYPE: Frequency Stability over Voltage Variations**6.7.1 TECHNICAL SPECIFICATION:** 2.1055(d)(1)**6.7.2 TEST DATE(S):** 12 October, 2001**6.7.3 MEASUREMENT PROCEDURES:**

As required by §2.1055(d)(1) of CFR 47, *frequency tolerance measurements* were made over changes in the supply voltage to the EUT from 85% to 115% of the nominal supply voltage using a variac to vary the DC supply. The frequency measurements were made using direct input to a spectrum analyzer.

6.7.4 RESULTS:

Frequency tolerance of carrier signal: $\pm 0.005\%$ for a variation in primary voltage from 85% to 115% of the **rated supply**.

Percentage of Rated Supply	DC Voltage 24V	Carrier Frequency (GHz)	Deviation (Hz)	Deviation Limit (Hz)
85 %	20.4	1.960000009	-7	± 98
100 %	24	1.960000016	0	± 98
115 %	27.6	1.960000014	2	± 98

The unit meets the requirements of 2.1055 (d)(1)

6.8 TEST TYPE: Modulation Characteristics

6.8.1 TECHNICAL SPECIFICATION: 2.1047(a)

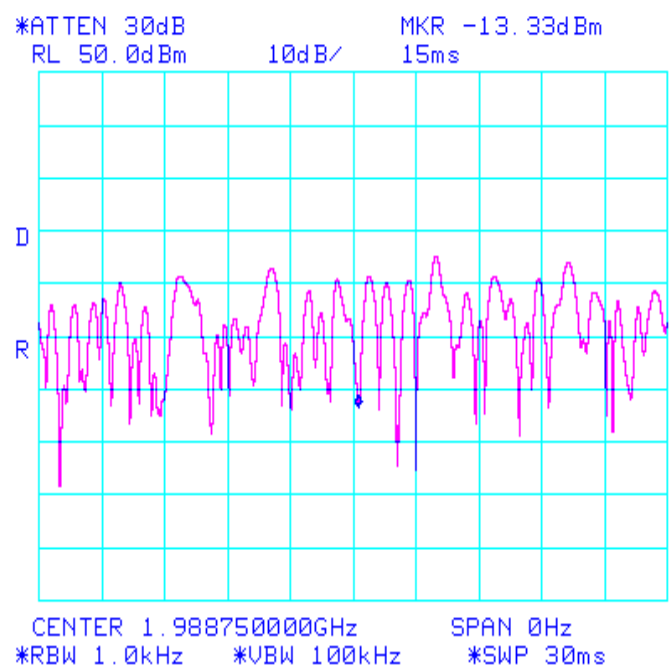
6.8.2 TEST DATE(S): 12 October, 2001

6.8.3 MEASUREMENTS REQUIRED:

The Starex-IS Indoor ITS uses CDMA modulation. The voice information is digitized and coded into a bit stream.

The following plots give a detailed explanation of the modulation scheme used in the ITS of the PCS system.

Modulation Characteristics Met11406



Modulation Characteristics Met11406

