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Technical Report No. 07-112-x

Addendum to the Technical Report No. 07-112, EMI Evaluation of the XG Technology, XG-VOIP-BTS to FCC Part 15, Class A Conducted and Radiated Emission Requirements, and Section 15.247, "Operation within the band of 902 – 928 MHz."

Performed: 04 December 2007

Customer: XG Technology, Inc.
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1. INTRODUCTION

This document is an addendum to Technical Report No. 07-112 which documents the FCC compliance results for the XG Technology, Inc.'s XG-VOIP-BTS with software revision FVXGBTS101107-A. The unit was evaluated for compliance to the FCC CFR-47, Part 15, Class A requirements as well as Section 15.247. This document reports the results for the calculated peak power and the power spectral density (PSD) as required per FCC CFR-47, Part 15, Section 15.247 following the measurement procedures described in the FCC document "*Measurement of Digital Transmission Systems Operating under Section 15.247, March 2005*," and Agilent Technologies "*Application Note 150-2*." The results apply only to the specific items of equipment, configurations and procedures supplied to the Florida Atlantic University EMI R&D Laboratory as reported in this document.

2. OBJECTIVE

This evaluation was performed to verify conformance of the XG Technology, XG-VOIP-BTS module to the U.S. Federal Communications Commission (FCC), Code of Federal Regulations (CFR), Title 47 - Telecommunication, FCC Part 15 Subpart C- Intentional Radiators, Section 15.247, "Operation within the bands 902-928 MHz" for conducted peak power and PSD measurements.

3. CONCLUSION

The XG Technology, XG-VOIP-BTS unit met the FCC, Part 15 Subpart C- Intentional Radiators, Section 15.247, "Operation within the band of 902-928 MHz", as described in the Technical Report No. 07-112 and this addendum.

4. TEST PROCEDURES AND RESULTS

4.1 TEST PROCEDURES

The measurement techniques identified in the measurement procedure of ANSI C63.4-2003 *"American National Standard of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz"*, as well as the FCC document "*Measurement of Digital Transmission Systems Operating under Section 15.247* (March 2005)," were followed as close as practical during this evaluation. Note also that measurement methods defined by Agilent Technologies "*Application Note 150-2*" were also observed. Complete details and specific procedures used are discussed in the respective test result sections.

4.2 PULSE WIDTH AND REPETION FREQUENCY

From Figure 1 provided by XG Technology, Inc., the pulse characteristics of the XG-VOIP-BTS are determined as follows:

- Pulse width τ_{eff} = 100 ns
- Pulse repetition frequency, PRF = 1.66 MHz.

The pulse desensitization factor α_L can be computed as per Agilent Technologies "*Application Note 150-2*", (page 8):

$$\begin{aligned}\alpha_L &= 20\log_{10}\left(\tau_{eff}\times PRF\right) \quad (1)\\ &= 20\log_{10}\left(100\times10^{-9}\times1.66\times10^{6}\right)\\ &= 20\log_{10}\left(0.166\right)\\ &= -15.598\,dB \approx -15.6\,dB\end{aligned}$$

Figure 1: XG-VOIP-BTS pulse repetition frequency

Note that the measurement data shown in Figure 16 of Technical Report 07-112, Section 4.3.2.2 (page 24) refers to the packet transmission rate.

4.3 MAXIMUM OUTPUT POWER

This section describes a corrective measurement data to Section 4.3.2.2 (page 24) of technical report 07-112. The maximum output power of the XG Technology XG-VOIP-BTS unit was measured using the HP 8566B spectrum analyzer (SA) on the peak detector mode, while the "bypass" instrument function of the HP 85650A Quasi-Peak Adapter was activated. The coaxial output port for the XG-VOIP-BTS antenna was connected to SA in series with a HP 8495B variable attenuator set to 40 dB. Since the 11 MHz 6-dB bandwidth of the signal exceeds SA IF bandwidth limit, the peak power was determined using the pulse desensitization technique defined in the Agilent Technologies "*Application Note 150-2*".

The spectrum analyzer was centered to the peak of the fundamental frequency (916.02 MHz). Figure 2 presents the measurement data with resolution bandwidth (B) and the frequency span set to 100 kHz and 40 MHz, respectively. In Figure 3, the frequency span was reduced to 0 Hz and the video trigger of SA was activated. Note that for both measurements, the resolution bandwidth met the Agilent Technologies "*Application Note 150-2*" (Equation 3) requirements for pulse desensitization using line spectra measurements: B = 100 kHz < 0.1 PRF.

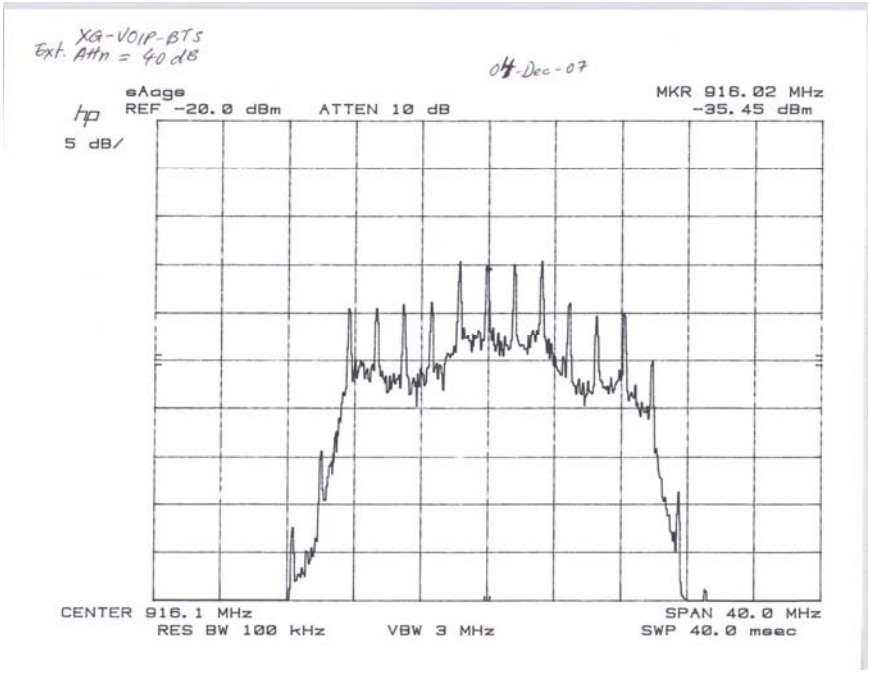

Figure 2: XG-VOIP-BTS SA Display for Peak Power Measurement

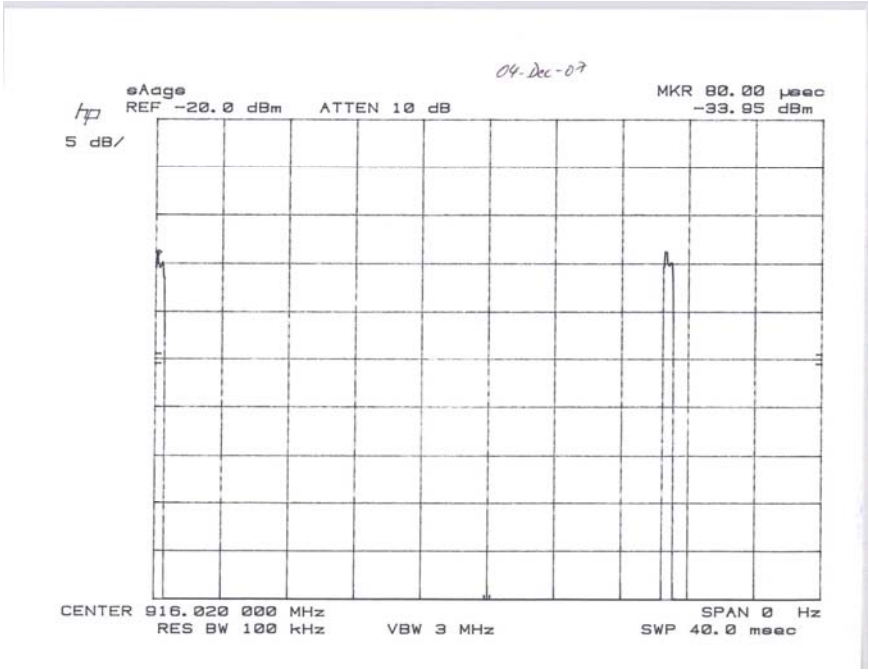

Figure 3: Peak Power Measurement with 0 Hz Span
(Packet Transmission Rate of 30.35 ms)

SA Reading (dBm)	External Attenuation (dB)	Cable Loss (dB)	α_L (dB)	Corrected Power (dBm)*	Corrected Power (mW)
-33.95	40	0.61	-15.60	22.26	168.10

Table 1: Peak Power Measurement

where the corrected power is given by the relation:

* Corrected Power (dBm) = SA Reading (dBm) + External Attenuation (dB) + Cable Loss (dB) - α_L (dB)

Note that the value from Figure 3 was used for the computation.

It can be seen from the data above that the calculated maximum peak output power is 22.26 dBm, corresponding to 168.1 milliwatts, which is lower than the 1 watt limit. Hence, the device meets the maximum output power requirements as per Section 15.247.

4.3.2.1 POWER SPECTRAL DENSITY

The power spectral density of the XG Technology, XG-VOIP-BTS, was measured using the HP 8566B spectrum analyzer on the peak detector mode while the "bypass" instrument function of the HP 85650A Quasi-Peak Adapter was activated. The coaxial feed for the XG-VOIP-BTS antenna was connected to SA in series with an HP 8495B variable attenuator set to 40 dB. The spectrum analyzer was set from 915.87 MHz to 917.87 MHz. The resolution bandwidth was reduced to 3 kHz. The sweep time was increased to 666 seconds to meet the specification of PSD Option 1 of the FCC guideline for "*Measurement of Digital Transmission Systems Operating under Section 15.247*", i.e., Sweep time = span / 3 kHz.

The measurement results are presented in Figure 4. Note that the PSD corresponds to display line value of -37.8 dBm and that the PRF of 1.66 MHz is provided by the marker Δ value.

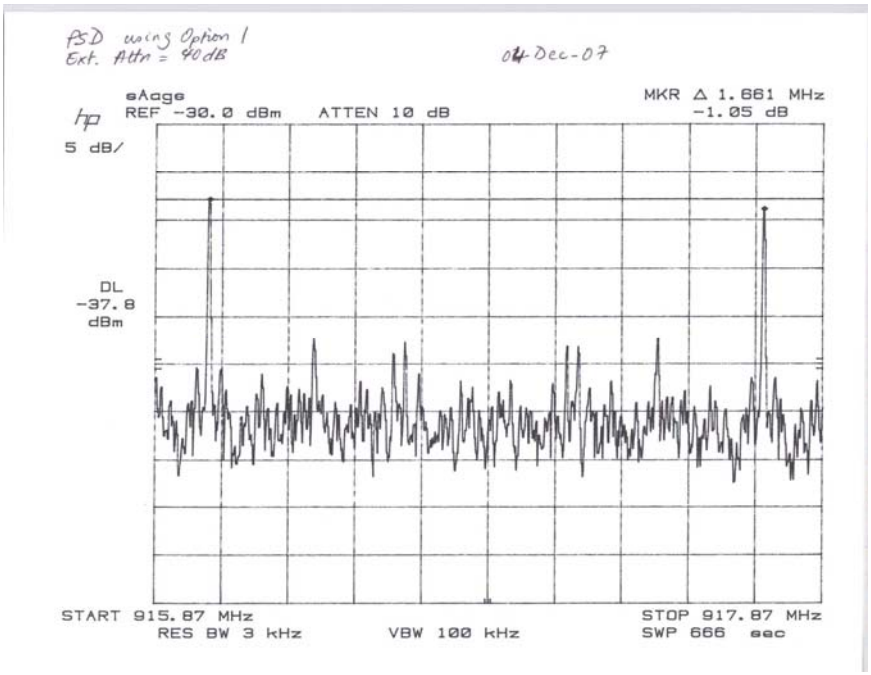

Figure 4: Power Spectral Density Measurement

The corrected value of the PSD is provided in Table 2.

SA Reading (dBm)	External Attenuation (dB)	Cable Loss (dB)	Corrected PSD* (dBm)	FCC Limit (dBm)	Margin to Limit (dB)
-37.8	40	0.61	2.81	8	5.19

Table 2: PSD Peak Measurements

* Corrected PSD (dBm) = SA Reading (dBm) + External Attenuation (dB) + Cable Loss (dB)

It can be seen from Figure 4 and Table 2 that the power spectral density did not exceed the 8 dBm limit. Hence the unit meets the power spectral density requirements as per Section 15.247.

MAJOR TEST EQUIPMENT

FAU EMI R&D LABORATORY TEST EQUIPMENT						
Equipment Type	**Manufacturer**	**Description**	**Model**	**Serial No.**	**Calibration Date**	**Calibration Interval (Years)**
Spectrum Analyzer	Hewlett Packard	RF Section	8566B	2403A06381	Aug-22-06	2
Spectrum Analyzer	Hewlett Packard	Display	85662A	2407A06381	Aug-22-06	2
Spectrum Analyzer	Hewlett Packard	Quasi Peak Adapter	85650A	2430A00559	Aug-22-06	2
RF Preselector	Hewlett Packard	Preselector	85685A	2510A00151	Feb-8-06	2
LISN	EMCO	LISN	3825/2R	1095	March-10-06	2
Antenna	EMCO	Biconical	3108	2147	Feb-24-06	2
Antenna	EMCO	Log Periodic	3146	1385	Feb-24-06	2
Amplifier	Hewlett Packard	Amplifier	8447D	2443A03952	Dec-01-06	2
Amplifier	Hewlett Packard	Microwave Amplifier	83017A	3123A00324	Nov-27-06	2
Power Meter Sensor	Rohde & Schwarz	Thermal Power Sensor	NRP-Z55	10028	July-18-07	2

TEST FACILITY

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A2LA Certification No. 2129.01
FCC Registration: 90599
Industry of Canada: IC46405-4076

Description	The 3m semi-anechoic chamber and Power Line Conducted Spurious Voltage test setup are constructed and calibrated to meet the FCC requirements of Section 2.948, as well as Industry Canada RSS 212 Issue 1.
Site Filing	A site description is on file with the Federal Communications Commission, 7435 Oakland Mills Road, Columbia, MD 21046, and with the Industry Canada, Certification and Engineering Bureau, 3701 Carling Ave., Building 94, P.O. Box 11490, Station "H", Ottawa Ontario, K2H 8S2.
Instrument	All measuring equipment is in accord with ANSI C63.4 and CISPR 22 requirements.

End of Report