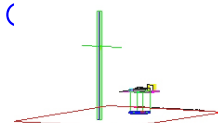


PCTEST Engineering Laboratory, Inc

6660-B Dobbin Road • Columbia, MD 21045 • U.S.A.

TEL (410) 290-6652 • FAX (410) 290-6654

<http://www.pctestlab.com>



CERTIFICATE OF COMPLIANCE

Siemens Transportation Systems
50, rue Barbes
92542 Montrouge Cedex, France
Attention: Mr. Regis Lardennois

Dates of Tests: Sept 25 - Oct 1, 2002
Test Report S/N: 15.220925561.QSC
Test Site: PCTEST Lab, Columbia MD

FCC ID

QSCCARBORNE

APPLICANT

Siemens Transportation Systems

FCC Rule Part(s): § 15.247; ANSI C-63.4 (1992)
Classification: Spread Spectrum Transceiver (DSS)
Max Output Power: 35.7 dBm EIRP
Method/System: Direct Sequence System (DSS)
Equipment Type: Transportation Control System
Frequency Range: 2408 - 2474 MHz
Model No(s) .: Carborne Unit

This equipment has been shown to be capable of compliance with the applicable technical standards as indicated in the measurement report and was tested in accordance with the measurement procedures specified in ANSI C-63-4 as modified via email correspondence from the FCC Lab.

I attest to the accuracy of data. All measurements reported herein were performed by me or were made under my supervision and are correct to the best of my knowledge and belief. I assume full responsibility for the completeness of these measurements and vouch for the qualifications of all persons taking them.

PCTEST certifies that no party to this application has been denied the FCC benefits pursuant to Section 5301 of the Anti-Drug Abuse Act of 1988, 21 U.S.C. 862.


Randy Ortanez
President

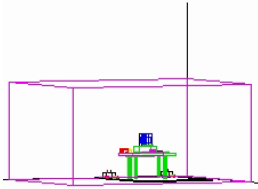
PCTEST™ PT. 15.247 REPORT		EVALUATION REPORT			Reviewed By: Quality Manager
					
Test Report S/N: 15.220401140.A3L	Test Dates: APRIL 8-9, 2002	EUT Type: Laptop w/ Wireless LAN	FCC ID: A3LSP10WL	Page 1 of 18	

TABLE OF CONTENTS

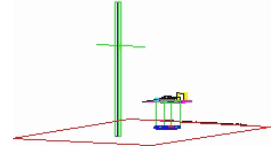
SCOPE		3
INTRODUCTION (SITE DESCRIPTION)		4
PRODUCT INFORMATION		5
DESCRIPTION OF TESTS		
A. CONDUCTED EMISSIONS		6
B. RADIATED EMISSIONS		8
C. RESTRICTED BANDS		10
D. ANTENNA REQUIREMENT		12
E. DIRECT SEQUENCE BANDWIDTH		13
F. MAXIMUM PEAK POWER OUTPUT		14
G. POWER DENSITY		17
EIRP MEASUREMENTS (SPURIOUS)		18
RESTRICTED BAND RADIATED MEASUREMENTS		20
LIST OF TEST EQUIPMENT		22
CONCLUSION		23

PCTEST™ PT. 15.247 REPORT	EVALUATION REPORT  			Reviewed By: Quality Manager
Test Report S/N:15.220401140.A3L	Test Dates: APRIL 8-9, 2002	EUT Type: LAPTOP W/ WIRELESS LAN	FCC ID: A3LSP10WL	Page 2 of 19

MEASUREMENT REPORT



Scope - Measurement and determination of electromagnetic emissions (EME) of radio frequency devices including intentional and/or unintentional radiators for compliance with the technical rules and regulations of the Federal Communications Commission.



§2983(a) General Information

Applicant Name:	Siemens Transportation Systems
Address:	50, rue Barbes 92542 Montrouge Cedex, France
Attention:	Mr. Regis Lardennois

- FCC ID: **QSCCarborne**
- Class: Spread Spectrum Transceiver (DSS)
- Type: Transportation Control System
- Freq. Range: 2408 - 2474 MHz
- Method/System: Direct Sequence System (DSS)
- Model No(s): **Carborne**
- Max. RF Output Power: 35.7 dBm EIRP
- Rule Part(s): § 15.247
- Dates of Tests: Sept 25 - Oct 1, 2002
- Place of Tests: PCTEST Lab, Columbia, MD U.S.A.
- Test Report S/N: 220925561.QSC

PCTEST™ PT. 15.247 REPORT	EVALUATION REPORT  			Reviewed By: Quality Manager
Test Report S/N:15.220401140.A3L	Test Dates: APRIL 8-9, 2002	EUT Type: LAPTOP W/ WIRELESS LAN	FCC ID: A3LSP10WL	Page 3 of 19

INTRODUCTION

The measurement procedure described in American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9kHz to 40GHz (ANSI C63.4-1992) and FCC Public Notice dated July 12, 1995 entitled "Guidance on Measurement for Direct Sequence Spread Spectrum Systems" were used in the measurement of **Siemens Transportation Control System**.

These measurement tests were conducted at **PCTEST Engineering Laboratory, Inc.** facility in New Concept Business Park, Guilford Industrial Park, Columbia, Maryland. The site address is 6660-B Dobbin Road, Columbia, MD 21045. The test site is one of the highest points in the Columbia area with an elevation of 390 feet above mean sea level. The site coordinates are 39° 11'15" N latitude and 76° 49'38" W longitude. The facility is 1.5 miles North of the FCC laboratory, and the ambient signal and ambient signal strength are approximately equal to those of the FCC laboratory. There are no FM or TV transmitters within 15 miles of the site. The detailed description of the measurement facility was found to be in compliance with the requirements of § 2.948 according to ANSI C63.4 on October 19, 1992.

PCTEST Location

The map at right shows the location of the PCTEST Lab, its proximity to the FCC Lab, the Columbia vicinity area, the Baltimore-Washington International (BWI) airport, and the city of Baltimore, D.C. area. (see Figure1).

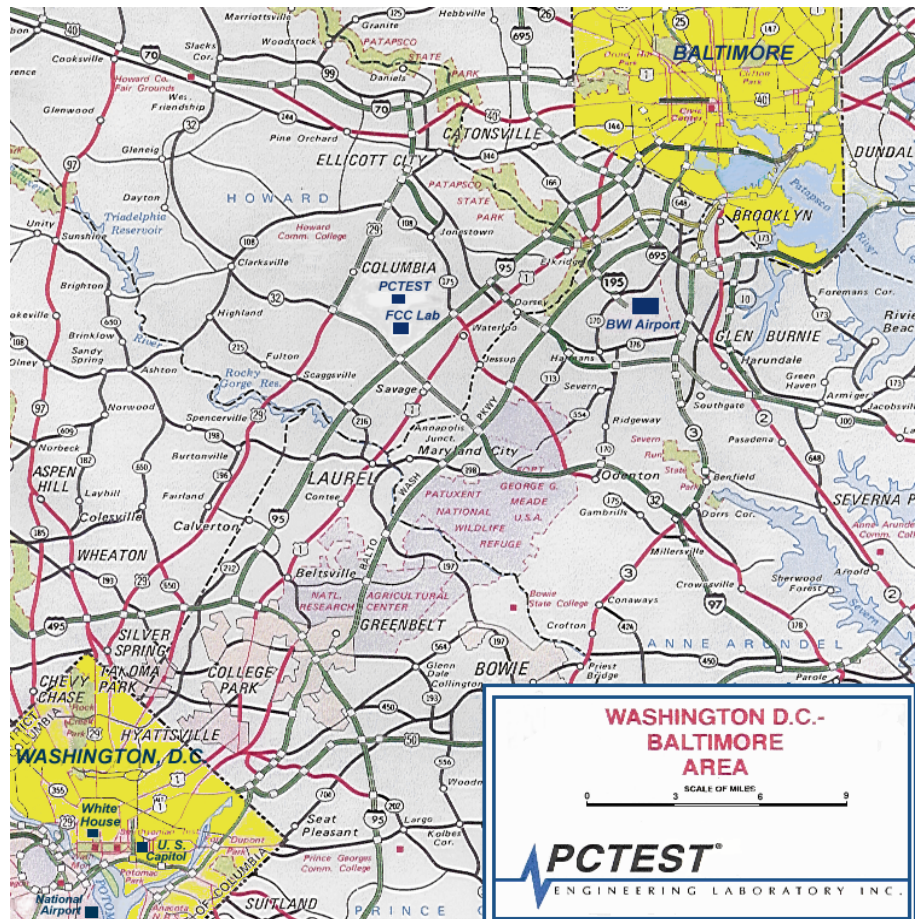


Figure 1. Map of the Greater Baltimore and Metropolitan Washington, D.C. area.

PCTEST™ PT. 15.247 REPORT	EVALUATION REPORT 			Reviewed By: Quality Manager
Test Report S/N:15.220401140.A3L	Test Dates: APRIL 8-9, 2002	EUT Type: LAPTOP W/ WIRELESS LAN	FCC ID: A3LSP10WL	Page 4 of 19

PRODUCT INFORMATION

Equipment Description:

The Equipment under test (EUT) is a Siemens Transportation Control Systems **subway car control transceiver** using spread spectrum direct sequence and time division duplex techniques.

Frequency Range: 2408 - 2474 MHz
 Channels: 9
 Antenna: Various, Max Gain is 14 dBi patch
 Spread Spectrum Method: Direct Sequence
 Max RF Output Power: 35.7 dBm EIRP
 Port/Connector(s) : RS232

PCTEST™ PT. 15.247 REPORT	EVALUATION REPORT  			Reviewed By: Quality Manager
Test Report S/N:15.220401140.A3L	Test Dates: APRIL 8-9, 2002	EUT Type: LAPTOP W/ WIRELESS LAN	FCC ID: A3LSP10WL	Page 5 of 19

Description of Tests

Conducted Emissions

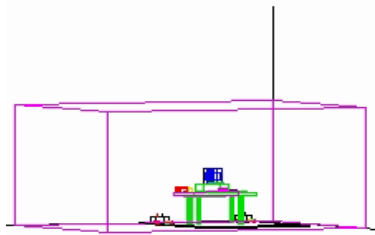


Figure 4. Shielded Enclosure Line-Conducted Test Facility

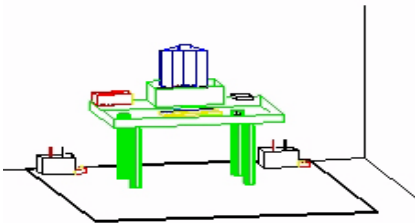


Figure 2. Line Conducted Emission Test Set-Up

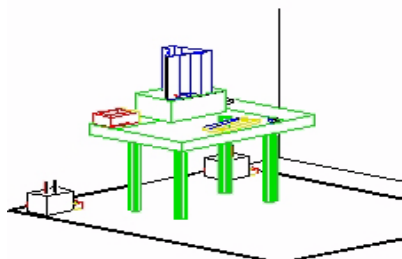


Figure 3. Wooden Table & Bonded LISNs

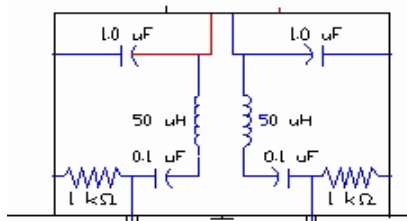


Figure 5. LISN Schematic Diagram

The line-conducted facility is located inside a 16'x20'x10' shielded enclosure. It is manufactured by Ray Proof Series 81 (see Figure 2). The shielding effectiveness of the shielded room is in accordance with MIL-Std-285 or NSA 65-6. A 1m. x 1.5m. wooden table 80cm. high is placed 40cm. away from the vertical wall and 1.5m away from the side wall of the shielded room (see Figure 3). Solar Electronics and EMCO Model 3725/2 (10kHz-30MHz) 50 Ω /50 μ H Line-Impedance Stabilization Networks (LISNs) are bonded to the shielded room (see Figure 4). The EUT is powered from the Solar LISN and the support equipment is powered from the EMCO LISN. Power to the LISNs are filtered by a high-current high-insertion loss Ray Proof power line filters (100dB 14kHz-10GHz). The purpose of the filter is to attenuate ambient signal interference and this filter is also bonded to the shielded enclosure. All electrical cables are shielded by braided tinned copper zipper tubing with inner diameter of 1/2". If the EUT is a DC-powered device, power will be derived from the source power supply it normally will be powered from and this supply lines will be connected to the Solar LISN. LISN schematic diagram is shown in Figure 5. All interconnecting cables more than 1 meter were shortened by non-inductive bundling (serpentine fashion) to a 1-meter length. Sufficient time for the EUT, support equipment, and test equipment was allowed in order for them to warm up to their normal operating condition. The RF output of the LISN was connected to the spectrum analyzer to determine the frequency producing the maximum EME from the EUT. The spectrum was scanned from 450kHz to 30MHz with 20 msec. sweep time. The frequency producing the maximum level was reexamined using EMI/Field Intensity Meter and Quasi-Peak adapter. The detector function was set to CISPR quasi-peak mode. The bandwidth of the

Diagram		EVALUATION REPORT			Reviewed By: Quality Manager
PCTEST™ PT. 15.247 REPORT		 			
Test Report S/N:15.220401140.A3L	Test Dates: APRIL 8-9, 2002	EUT Type: LAPTOP W/ WIRELESS LAN	FCC ID: A3LSP10WL	Page 6 of 19	

receiver was set to 10 kHz. The EUT, support equipment, and interconnecting cables were arranged and manipulated to maximize each EME emission. Each emission was maximized by: switching power lines; varying the mode of operation or resolution; clock or data exchange speed; scrolling H pattern to the EUT and/or support equipment, and powering the monitor from the floor mounted outlet box and the computer aux AC outlet, if applicable; whichever determined the worst-case emission. Photographs of the worst-case emission can be seen in Appendix C. Each EME reported was calibrated using the HP8640B signal generator.

PCTEST™ PT. 15.247 REPORT	EVALUATION REPORT			Reviewed By: Quality Manager
				
Test Report S/N:15 220401140 A3L	Test Dates: APRIL 8-9 2002	EUT Type: LAPTOP W/ WIRELESS LAN	FCC ID: A3LSP10WL	Page 7 of 19

Description of Tests (Continued)

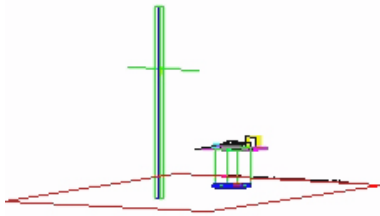


Figure 6. 3-Meter Test Site

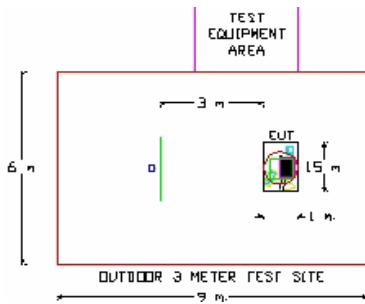


Figure 7. Dimensions of Outdoor Test Site

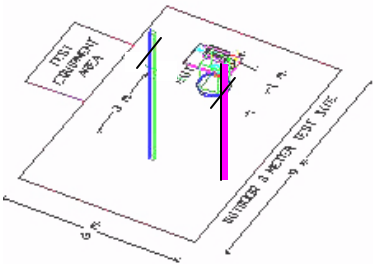


Figure 8. Turntable and mast poles for substituting for EUT

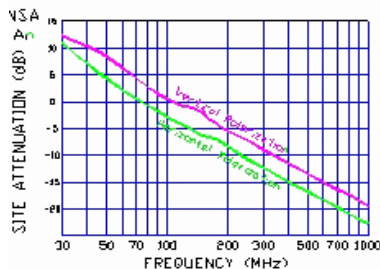


Figure 9. Normalized Site Attenuation Curves (H&V)

Radiated Emissions

Preliminary measurements were made indoors at 1 meter using broadband antennas, broadband amplifier, and spectrum analyzer to determine the frequency producing the maximum EME. Appropriate precaution was taken to ensure that all EME from the EUT were maximized and investigated. The system configuration, clock speed, mode of operation or video resolution, turntable azimuth with respect to the antenna were noted for each frequency found. The spectrum was scanned from 30 to 200 MHz using biconical antenna and from 200 to 1000 MHz using log-spiral antenna. Above 1 GHz, linearly polarized double ridge horn antennas were used.

Final measurements were made outdoors at 3-meter test range using substitution techniques per FCC email correspondence (see Figure 6). The test equipment was placed on a wooden and plastic bench situated on a 1.5 x 2 meter area adjacent to the measurement area (see Figure 7) with the antenna mounted on a mast that simulated actual installation conditions (See photos). Sufficient time for the EUT, support equipment, and test equipment was allowed in order for them to warm up to their normal operating condition. Each frequency found during pre-scan measurements was re-examined and investigated using EMI/Field Intensity Meter and Quasi-Peak Adapter or power meter. The detector function was set to CISPR quasi-peak mode and the bandwidth of the receiver was set to 100kHz or 1 MHz depending on the frequency or type of signal for reference readings on the EMI meter. Peak power was measured with a power meter.

The EMI measurement system was tuned to the frequencies found during preliminary radiated measurements. The EUT was configured as per the attached configuration drawing(s), and support equipment and interconnecting cables were re-configured to the set-up producing the maximum emission for the frequency. The EUT, support equipment, and interconnecting cables were re-arranged and manipulated to maximize each EME emission. The reference reading

PCTEST™ PT. 15.247 REPORT		EVALUATION REPORT		Reviewed By: Quality Manager
				
Test Report S/N:15.220401140.A3L	Test Dates: APRIL 8-9, 2002	EUT Type: LAPTOP W/ WIRELESS LAN	FCC ID: A3LSP10WL	Page 8 of 19

antenna height was varied 1 to 4 meters and stopped at the azimuth or height producing the maximum emission. Each emission was maximized. Photographs of the worst-case emission can be seen in Appendix C. Each EME reported was calibrated using an HP synthesized signal generator for the frequency of measurement. The Theoretical Normalized Site Attenuation Curves for both horizontal and vertical polarization are shown in Figure 9.

PCTEST™ PT. 15.247 REPORT	EVALUATION REPORT			Reviewed By: Quality Manager
				
Test Report S/N:15 220401140 A3L	Test Dates: APRIL 8-9 2002	EUT Type: LAPTOP W/ WIRELESS LAN	FCC ID: A3LSP10WL	Page 9 of 19

§ 15.205 Restricted Bands

Special attention is made for the EUT's harmonic and spurious radiated emission in the restricted bands of operation. The EUT was tested from 9kHz and up to the tenth harmonic of the fundamental frequency of the transmitter using CISPR quasi peak detector below 1GHz. Above 1 GHz, average measurements was used using RBW 1 MHz - VBW 10Hz and linearly polarized horn antennas.

In addition, peak measurements were taken to ensure that the peak levels are not more than 20dB above the average limit. All out of band emissions, other than those created by the spreading sequence, data sequence, and the carrier modulation must not exceed the limits show in Table 1 per 15.209.

Frequency (MHz)	F/S (UV/m)	Meas. Dist. (Meters)
0.009- 0.490	2400/F (kHz)	300
0.490- 1.705	24000/F (kHz)	30
1.705- 30.00	30	30
30.0-88.0	100	3
88.0- 216.0	150	3
216.0- 960.0	200	3
Above 960	500	3

Table 1. Radiated Emission Limits Per 15.209

Test Equipment

HP 8566B	Spectrum Analyzer 100Hz-22GHz
HP83017A	Microwave Analyzer 40dB Gain (0.5 - 26.5 GHz)
HP 3784A	Digital Transmission Analyzer
EMCO 3115	Horn Antenna (1 - 18GHz)
HP 8495A	20dB Attenuator (DC-40GHz) 0-70dB

PCTEST™ PT. 15.247 REPORT	EVALUATION REPORT			Reviewed By: Quality Manager
				
Test Report S/N:15 220401140 A3L	Test Dates: APRIL 8-9 2002	EUT Type: LAPTOP W/ WIRELESS LAN	FCC ID: A3LSP10WL	Page 10 of 19

HP 8493B 10dB Attenuator
Hewlett Packard Power Meter
MicroCoax Cables Low Loss Microwave Cables (1-26.5 GHz)
CDI Dipoles Dipole Antennas (30 - 1000 MHz)

PCTEST™ PT. 15.247 REPORT	EVALUATION REPORT  			Reviewed By: Quality Manager
Test Report S/N:15.220401140.A3L	Test Dates: APRIL 8-9, 2002	EUT Type: LAPTOP W/ WIRELESS LAN	FCC ID: A3LSP10WL	Page 11 of 19

§ 15.203 Antenna Requirement

An intentional radiator antenna shall be designed to ensure that no antenna other than that furnished by the applicant can be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with this requirement unless the equipment must be professionally installed. This system must be professionally installed by trained individuals. Please see the file attachment "Installation Instructions".

The Siemens Carborne unit complies with the requirement of §15.203.

CONCLUSION

The equipment must be professionally installed. The unit meets the Antenna Requirements of §15.203.

PCTEST™ PT. 15.247 REPORT	EVALUATION REPORT			Reviewed By: Quality Manager
				
Test Report S/N:15 220401140 A3L	Test Dates: APRIL 8-9 2002	EUT Type: LAPTOP W/ WIRELESS LAN	FCC ID: A3LSP10WL	Page 12 of 19

§15.247(a) (2) – Direct Sequence Bandwidth

Res. Bandwidth = 100 kHz (10dB/div)
 Vid. BW = 100 kHz
 Span = 30 MHz
 Ref. Level 23.6 dBm
 Sweep 4 ms
 (see attached bandwidth plots)

FREQ (MHz)	6dB Bandwidth (MHz)
2408	4.13
2441	4.13
2474	4.13

Table 2. 6dB Bandwidth measurements

Minimum Standard – The transmitter shall have a minimum 6dB bandwidth of 500kHz (0.5 MHz) using a 100 kHz RBW.

REMARKS:

PASS

PCTEST™ PT. 15.247 REPORT	EVALUATION REPORT			Reviewed By: Quality Manager
				
Test Report S/N:15.220401140.A3L	Test Dates: APRIL 8-9, 2002	EUT Type: LAPTOP W/ WIRELESS LAN	FCC ID: A3LSP10WL	Page 13 of 19

§15.247(b) & (d) Maximum Peak Output Power and Power Spectral Density

Minimum Standard - The maximum peak output power of the transmitter shall not exceed 1 watt. For this transmitter, there is one configuration with two antennas that are connected. Only one antenna will be active at any time. When the 14 dBi patch antenna is used, the RF power output of the Tx is reduced automatically through software control. In the path for the 9 dBi antenna there is a permanently mounted 2 dB attenuator. In order to show compliance with the peak power output limit, the FCC has directed that power measurement for this application must be measured as EIRP and that the input power to the antenna, measured at the antenna input, must not exceed 1 watt as specified in Section 15.247. Radiated EIRP power and power spectral density measurements were taken at 3 meters using a substitution technique as required by the FCC for EIRP. Conducted measurements were made using a power meter for peak power and spectrum analyzer for power spectral density measurements. The FCC correspondence requiring the above measurement process has been submitted as an attachment to this application.

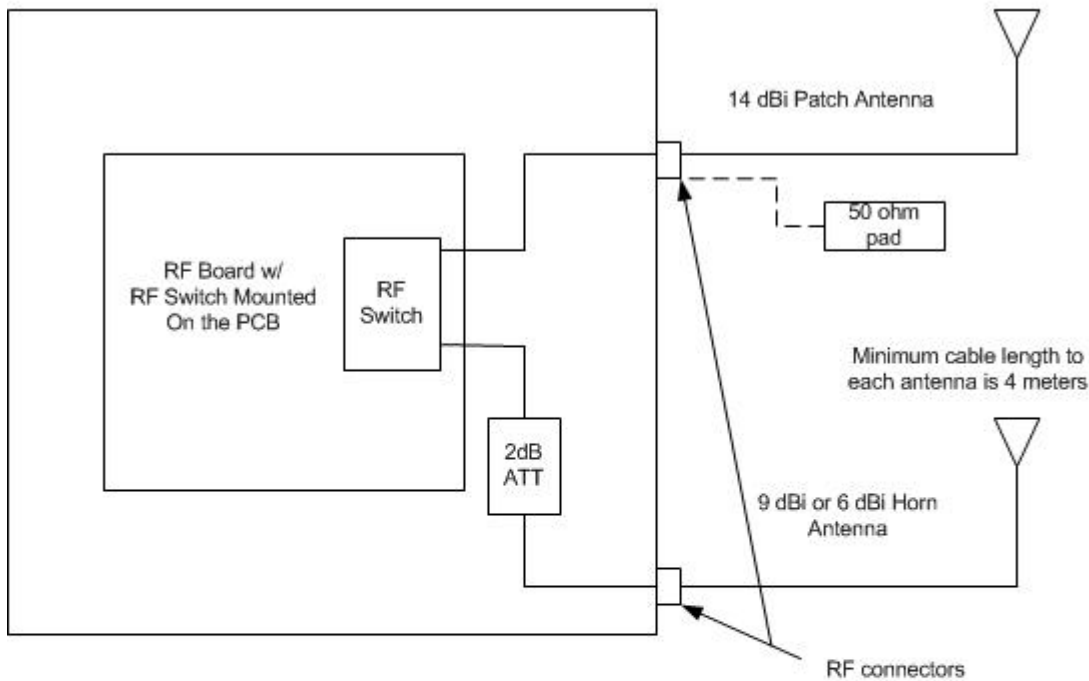
Following is the configuration diagram for the carborne transmitter. If for any reason one antenna is removed, the unused RF port feeding that antenna will be terminated with a 50 ohm pad. Removal of an antenna will result in slightly lower values of EIRP. This will always be the case due to the maximizing process during testing whereby the antennas were manipulated and oriented, within the constraints of the permitted mounting variations, during testing to produce worst case results.

Antennas that will be used for the carborne configuration are:

Gain dBi	Type	Manufacturer	Model
14	Patch	Radiall/Larsen	PA 4 14 2400
9	Horn	Astron	P-2409
6	Horn	Astron	P-2406

PCTEST™ PT. 15.247 REPORT	EVALUATION REPORT			Reviewed By: Quality Manager
				
Test Report S/N:15.220401140.A3L	Test Dates: APRIL 8-9, 2002	EUT Type: LAPTOP W/ WIRELESS LAN	FCC ID: A3LSP10WL	Page 14 of 19

CARBORNE TRANSMITTER ENCLOSURE



Each Carborne transmitter installed will conform to the above specification. Nominal max RF output power from the TX board is 27.8 dBm. Software control is used to reduce the power output of the RF board by 4 dB when the 14 dBi antenna is selected. Only one antenna will be active at any given time. A 2 dB pad is installed permanently in the path to the 9 dBi or 6 dBi antenna to insure compliance and coupled with cable losses, RF switch loss, and internal cabling, provides for a margin of compliance of about 1 dB at the antenna input to the 9 dBi gain antenna. Compliance with power levels is based on input power to each antenna as stipulated in the FCC interpretation that is submitted as part of this filing. Some cars may not be equipped with a 14 dBi patch antenna. The port normally feeding the 14 dBi antenna will be terminated in 50 ohms for these installations.

The above equipment is used only in a transportation vehicle. In this case, the digital electronics associated with the operation of the device is exempt from compliance with the technical requirements as a digital device pursuant to Section 15.103(a).

PCTEST™ PT. 15.247 REPORT		EVALUATION REPORT		Reviewed By: Quality Manager
 		 		
Test Report S/N:15.220401140.A3L	Test Dates: APRIL 8-9, 2002	EUT Type: LAPTOP W/ WIRELESS LAN	FCC ID: A3LSP10WL	Page 15 of 19

Table 3. Output Power Measurements

Frequency MHz	Antenna Gain dBi	Number of Antennas	Conducted Power to Antenna dBm	Attenuation Added dB	Power Reduced from nominal y/n	Measured EIRP dBm	System Type	Power Spec Den dBm
2408	14	1	21.6	0	4dB, software	35.09	Carborne	3.4
2441	14	1	21.6	0	4dB, software	35.17	Carborne	3.6
2474	14	1	21.6	0	4dB, software	35.37	Carborne	2.9
2408	9	1	23.6	2	y	32.6	Carborne	6.4
2441	9	1	23.6	2	y	32.7	Carborne	7.7
2474	9	1	23.6	2	y	32.6	Carborne	6.4
2408	6	1	23.6	2	y	29.7	Carborne	6.4
2441	6	1	23.6	2	y	29.8	Carborne	7.7
2474	6	1	23.6	2	y	29.7	Carborne	6.4

Minimum Standard - The transmitter peak output power delivered to the antenna input shall not exceed 1 watt. Max EIRP shall not exceed 36 dBm.

REMARKS :

PASS

PCTEST™ PT. 15.247 REPORT		EVALUATION REPORT		Reviewed By: Quality Manager
 		 		
Test Report S/N:15.220401140.A3L	Test Dates: APRIL 8-9, 2002	EUT Type: LAPTOP W/ WIRELESS LAN	FCC ID: A3LSP10WL	Page 16 of 19

Power Density

Minimum Standard - The transmitted power density averaged over any 1 second interval shall not be greater than 8dBm in any 3kHz bandwidth within these bands. Measurements were made on a spectrum analyzer using the following settings.

Res. Bandwidth =	3 kHz (10dB/div)
Vid. BW =	3 kHz
Span =	30 MHz
Ref. Level	23.6 dBm
Sweep	1000 sec

dBm $\Rightarrow$ Limit < 8dBm

See Data in Above Table and PSD Plots

Minimum Standard - The transmitter power density averaged over a 1 second interval shall not be greater than 8dBm in any 3 kHz BW within these bands based on measurements at the input to the radiating antenna under investigation.

REMARKS:

PASS

PCTEST™ PT. 15.247 REPORT	EVALUATION REPORT  			Reviewed By: Quality Manager
Test Report S/N:15.220401140.A3L	Test Dates: APRIL 8-9, 2002	EUT Type: LAPTOP W/ WIRELESS LAN	FCC ID: A3LSP10WL	Page 17 of 19

§15.247 (d) SPURIOUS EMISSIONS MEASUREMENTS

A. Transmitter Portion

Operating Frequencies: 2408 MHz, 2441 MHz, and 2474 MHz

Distance of Measurements: 3 meters or 30 meters using substitution technique

As requested by the FCC, this data is presented as dB below the carrier measurements in lieu of radiated measurements for non restricted band frequencies and in dBuV/m for restricted bands. The data table below specifies the antenna to which it applies. Only two antennas will be connected at one time, either 14 and 9 dBi or the 6 dBi antenna may be substituted for the 9 dBi antenna in some cases. Any unused RF ports were terminated in 50 ohms as will occur in actual installations.

14 dBi Antenna

Fund				Fund				Fund			
Spurious Emissions				Spurious Emissions				Spurious Emissions			
Freq. MHz	Freq MHz	dBc	dBuV/m @3m	Freq MHz	Freq MHz	dBc	dBuV/m @3m	Freq MHz	Freq MHz	dBc	dBuV/m @3m
2408	4816	-98.09	30.3	2441	4882	-95.6	32.2	2474	4948	-92.4	32.5
2408	7224	-118.37	10.3	2441	7323	-115.9	12	2474	7422	-113.5	11.5
2408	9632	-120.77		2441	9764	-118		2474	9896	-115.5	

Table 5

9 dBi Antenna

Fund				Fund				Fund			
Spurious Emissions				Spurious Emissions				Spurious Emissions			
Freq MHz	Freq MHz	dBc	dBuV/m @3m	Freq MHz	Freq MHz	dBc	dBuV/m @3m	Freq MHz	Freq MHz	dBc	dBuV/m @3m
2408	4816	97.5	28.3	2441	4882	97.6	30.2	2474	4948	96.8	31
2408	7224	117.6	8.3	2441	7323	117.9	10	2474	7422	117.7	10.2
2408	9632	117.6		2441	9764	119.5		2474	9896	119.1	

Table 6

PCTEST™ PT. 15.247 REPORT		EVALUATION REPORT		Reviewed By: Quality Manager	
					
Test Report S/N:15.220401140.A3L	Test Dates: APRIL 8-9, 2002	EUT Type: LAPTOP W/ WIRELESS LAN	FCC ID: A3LSP10WL	Page 18 of 19	

6dBi Antenna											
Fund	Spurious Emissions			Fund				Fund	Spurious Emissions		
	Freq MHz	dBc	dBuV/m @3m		Freq MHz	dBc	dBuV/m @3m		Freq MHz	dBc	dBuV/m @3m
2408	4816	98.9	26	2441	4882	99.7	25.2	2474	4948	98.8	26.1
2408	7224	118.1	6.9	2441	7323	118.1	6.9	2474	7422	117.8	7.2
2408	9632	118.9		2441	9764	118.7		2474	9896	119	

Table 7

NOTES:

1. All harmonics/spurs are at least 20 dB below the highest emission in the authorized band using RBW = 100kHz
2. The peak emissions above 1 GHz are not more than 20 dB above the average limit.
3. The reference measurement antenna is manipulated through typical positions, polarity and length during the tests to maximize the reference level reading.
4. The EUT is supplied with nominal AC voltage or/and a new/fully recharged battery.
5. The spectrum is measured from 9kHz to the 10th harmonic and the worst-case emissions are reported.
6. System noise floor < -95 dBm.

PCTEST™ PT. 15.247 REPORT	EVALUATION REPORT			Reviewed By: Quality Manager
				
Test Report S/N:15 220401140 A3L	Test Dates: APRIL 8-9 2002	EUT Type: LAPTOP W/ WIRELESS LAN	FCC ID: A3LSP10WL	Page 19 of 19

RADIATED Measurements (Restricted Band)

Transmitter Portion

Operating Frequency: 2474 MHz

Distance of Measurements: 3 meters

FREQ MHz	LEVEL dBm	AFCL dB	POL	dBuV/M	F/S uV/m@3m	WATTS	dBm	dBc/ mar
2483. 8	-98.2	33	V	41.8	123.027	4.54E-09	-53.429	12.2
22484	-97.5	33	V	42.5	133.352	5.33E-09	-52.729	11.5
2484. 4	-96	33.1	V	44.1	160.325	7.71E-09	-51.129	11.5
2486	-93.6	33.1	V	46.5	211.349	1.34E-08	-48.729	7.5
2493	-99	33.2	V	41.2	114.815	3.95E-09	-54.029	12.8

Table 8

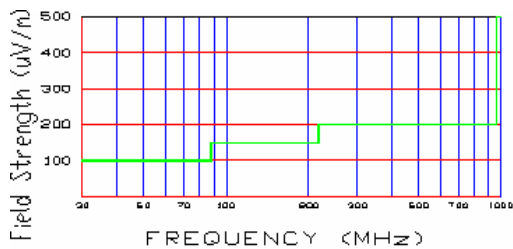


Figure 12. Restricted band harmonics and spurious limits.

Above 1 GHz limit is 500 uV/m
(54dBu/m)

NOTES:

1. All harmonics in the restricted bands specified in §15.205 are below the limit shown in table 2. (note: * Restricted Band) (Also see tables 5, 6, and 7)
2. All harmonics/spurs are at least 20 dB below the highest emission in the authorized band using RBW = 100kHz (See table 4)
3. Average Measurements > 1GHz using RBW = 1 MHz VBW = 10 Hz.
4. The peak emissions above 1 GHz are not more than 20 dB above the average limit.

PCTEST™ PT. 15.247 REPORT		EVALUATION REPORT		Reviewed By: Quality Manager
 		 		Page 20 of 19
Test Report S/N:15.220401140.A3L	Test Dates: APRIL 8-9, 2002	EUT Type: LAPTOP W/ WIRELESS LAN	FCC ID: A3LSP10WL	

5. The antenna is manipulated through typical positions, polarity and length during the tests to maximize EIRP and radiated measurements.
6. The EUT is supplied with nominal AC voltage or/and a new/fully recharged battery.
7. The spectrum was measured from 9kHz the 10th harmonic and the worst-case emissions are reported.
8. < - 120 dBm are below the analyzer floor level.

PCTEST™ PT. 15.247 REPORT	EVALUATION REPORT  			Reviewed By: Quality Manager
Test Report S/N:15.220401140.A3L	Test Dates: APRIL 8-9, 2002	EUT Type: LAPTOP W/ WIRELESS LAN	FCC ID: A3LSP10WL	Page 21 of 19

TEST EQUIPMENT

Type	Model	Cal. Due Date	S/N
Microwave Spectrum Analyzer	HP 8566B (100Hz-22GHz)	12/05/02	3638A08713
Microwave Spectrum Analyzer	HP 8566B (100Hz-22GHz)	04/17/03	2542A11898
Spectrum Analyzer/Tracking Gen.	HP 8591A (9kHz-1.8GHz)		06/02/03
3144A02458			
Spectrum Analyzer	HP 8591A (9kHz-1.8GHz)	10/15/02	3108A02053
Spectrum Analyzer	HP 8594A (9kHz-2.9GHz)	11/02/02	
3051A00187			
Signal Generator	HP 8640B (500Hz-1GHz)	06/02/03	
2232A19558			
Signal Generator	HP 8640B (500Hz-1GHz)	06/02/03	1851A09816
Signal Generator	Rohde & Schwarz (0.1-1000MHz)	09/11/02	894215/012
Ailtech/Eaton Receiver	NM 37/57A-SL (30-1000MHz)	04/12/03	0792-03271
Ailtech/Eaton Receiver	NM 37/57A (30-1000MHz)	03/11/03	0805-03334
Ailtech/Eaton Receiver	NM 17/27A (0.1-32MHz)	09/17/02	0608-03241
Quasi-Peak Adapter	HP 85650A	08/09/02	2043A00301
Ailtech/Eaton Adapter	CCA-7 CISPR/ANSI QP Adapter	03/11/03	0194-04082
RG58 Coax Test Cable	No. 167		n/a
Harmonic/Flicker Test System	HP 6841A (IEC 555-2/3)		3531A00115
Broadband Amplifier (2)	HP 8447D		1145A00470,
1937A03348			
Broadband Amplifier	HP 8447F		2443A03784
Transient Limiter	HP 11947A (9kHz-200MHz)		
2820A00300			
Horn Antenna	EMCO Model 3115 (1-18GHz)		9704-5182
Horn Antenna	EMCO Model 3115 (1-18GHz)		9205-3874
Horn Antenna	EMCO Model 3116 (18-40GHz)		9203-2178
Biconical Antenna (4)	Eaton 94455/Eaton 94455-1/Singer 94455-1/Compliance Design 1295, 1332,		
0355			
Log-Spiral Antenna (3)	Ailtech/Eaton 93490-1	0608,	1103,
1104			
Roberts Dipoles	Compliance Design (1 set) A100		5118
Ailtech Dipoles	DM-105A (1 set)		
33448-111			
EMCO LISN (2)	3816/2		1077,
1079			
EMCO LISN	3725/2		2009
Microwave Preamplifier 40dB Gain	HP 83017A (0.5-26.5GHz)		
3123A00181			
Microwave Cables	MicroCoax (1.0-26.5GHz)		
Ailtech/Eaton Receiver	NM37/57A-SL		0792-03271
Spectrum Analyzer	HP 8591A		3034A01395
Modulation Analyzer	HP 8901A		2432A03467
NTSC Pattern Generator	Leader 408		
0377433			
Noise Figure Meter	HP 8970B		3106A02189
Noise Figure Meter	Ailtech 7510		TE31700
Noise Generator	Ailtech 7010		1473

PCTEST™ PT. 15.247 REPORT		EVALUATION REPORT		Reviewed By: Quality Manager
 				
Test Report S/N:15.220401140.A3L	Test Dates: APRIL 8-9, 2002	EUT Type: LAPTOP W/ WIRELESS LAN	FCC ID: A3LSP10WL	Page 22 of 19

Microwave Survey Meter	Holaday Model 1501 (2.450GHz)	80931
Digital Thermometer	Extech Instruments 421305	426966
Attenuator	HP 8495A (0-70dB) DC-4GHz	
Bi-Directional Coax Coupler	Narda 3020A (50-1000MHz)	
Shielded Screen Room	RF Lindgren Model 26-2/2-0	6710 (PCT270)
Shielded Semi-Anechoic Chamber (PCT278)	Ray Proof Model S81	R2437
Environmental Chamber PCT285	Associated Systems Model 1025 (Temperature/Humidity)	

* Calibration traceable to the National Institute of Standards and Technology (NIST).

Conclusion

The data collected shows that the **Siemens Transportation Systems Transportation Control System** complies with Part 15C of the FCC Rules.

PCTEST™ PT. 15.247 REPORT	EVALUATION REPORT  			Reviewed By: Quality Manager
Test Report S/N:15.220401140.A3L	Test Dates: APRIL 8-9, 2002	EUT Type: LAPTOP W/ WIRELESS LAN	FCC ID: A3LSP10WL	Page 23 of 19