1 TEST REPORT

1.1 System test configuration

1.1.1 Justification

The system was configured for testing in a typical fashion (as a customer would normally use it). A typical smart card was presented to the GemEasyLink 680SP contactless reader, which was itself connected to a personal computer. It has been tested with a Hewlett Packard Vectra 515series D4136A Personal computer. Each ports of the Personal Computer were loaded with a typical peripheral device.

1.1.2 EUT Exercise software

The EUT exercise program (68X80.exe running under DOS) used during radiated and conducted testing was designed to exercise the GemEasyLink 680SP contactless reader in a manner similar to a typical use (reading the contactless smart card in loop)

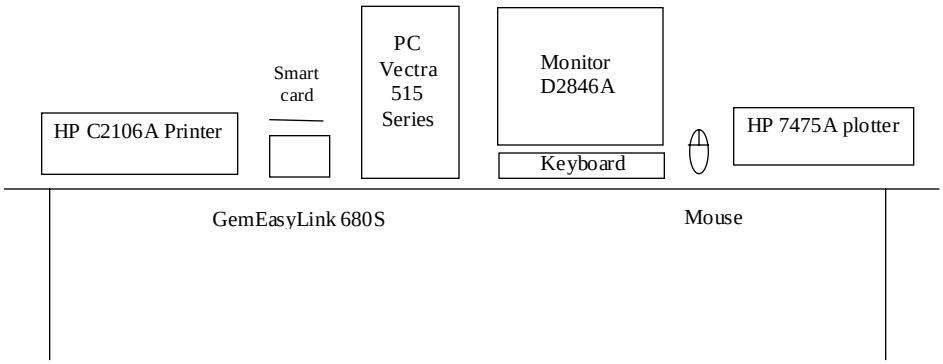
1.1.3 Special accessories

The cable used to connect the GemEasyLink 680SP contactless reader, to RS232 ports of the Personal Computer is shielded and attached to the product. It is connected to Com 1.
The smart card used with the GemEasyLink 680SP contactless reader, is a Contactless Smart Card Proxibus CMP 201, manufactured by GEMPLUS. The Power supply block used to power the GemAirLinkMicro-P contactless reader, is a COMATEL ref 49199 mod: AL.0030090.1S block when used with 230V/50Hz, and a HITRON mod: HER-57-312 block when used with 120V/60Hz.
As shown in Figure#1, all interfaces cables used for compliance testing are shielded as normally supplied. All these cables are normally recommended to be used with the Personal Computer.

1.1.4 Equipment modifications

In order to comply FCC Part 15, Subpart C, a common mode ferrite has been set on serial cable, at 3cm of the connector, PC side (consequently, installation guide has been modified). The unit tested was representative to a production unit.

1.1.5 Configuration of tested system



1.2 Conducted emission data

1.2.1 Test procedure

The product has been tested according to ANSI C63.4-1992 and FCC PART15, Subpart C, Section 15.207.

The product has been tested with 120V / 60Hz power line voltage and compared to the FCC PART15, Subpart C, Section 15.207 limits. Measurement bandwidth was 9KHz from 450 KHz to 30 MHz.

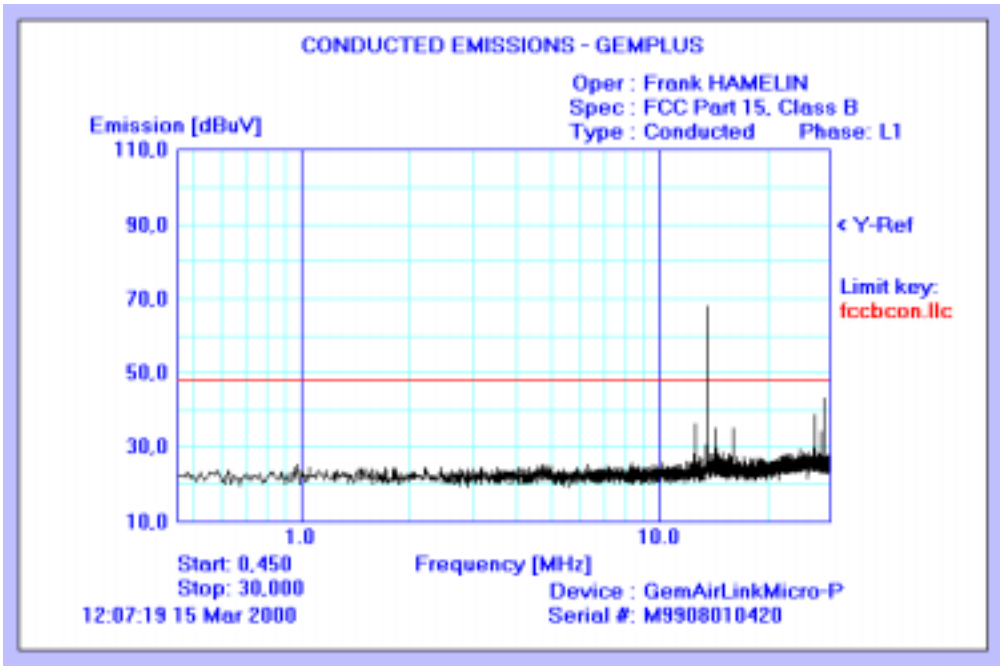
Measurement was initially made with an HP-8591EM Spectrum Analyzer in peak mode. This was followed by a Quasi-Peak, i.e. CISPR measurement with the Rohde & Schwarz ESH3 receiver for any strong signal. An Average measure has also been performed on peak exceeding the limit of 250µV.
The Peak data are shown on the following plots. Quasi-Peak and Average measurements are detailed in a table with frequencies and levels measured.

Interconnecting cables and equipment's were moved to position that maximized emission. A summary of the worst case emissions found in all test configurations and modes is shown on the following page.

The13.56 MHz frequency, which is the fundamental frequency, exceeds the level when tested in normal configuration. In order to show that the product's electronic isn't the cause, we had performed an other test, with the product wrapped up in a conductive aluminium foil (the antenna of the product is integrated in the board, and cannot be replaced by a dummy load). In this configuration, results are FCC compliant; Graphs are shown hereafter.

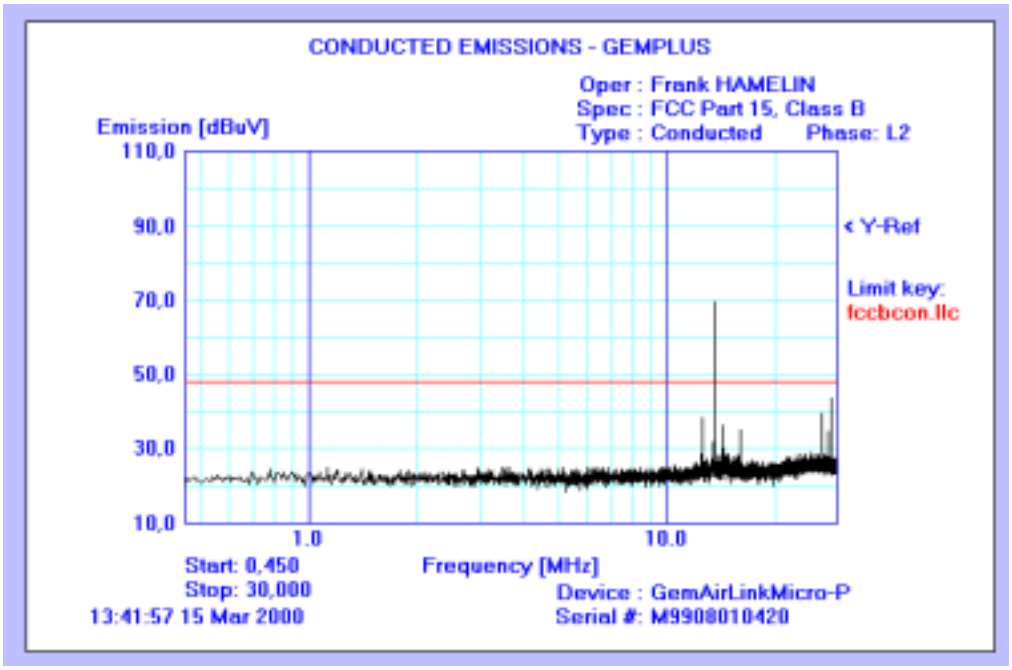
Test equipment :
HP 8591EM Spectrum Analyzer
Rhode & Schwarz ESH3 Receiver
EMCO 3810/2SH LISN N°1
TELEMETER NNB-2/16L LISN N°2

1.2.2 Neutral conducted emission data on GemEasyLink 680SP contactless reader



Num.	Freq. [MHz]	Peak [dBµV]	Q-Peak [dBµV]	QP limit [dBµV]	***QP delta [dBµV]***	Average [dBµV]
1	12,53	38,01	36,72	48,00	**-11,28**	
2	13,57	69,71	69,53	48,00	**21,53**	68,15
3	14,33	37,27	35,51	48,00	**-12,49**	
4	16,01	34,25	33,09	48,00	**-14,91**	
5	27,12	38,39	37,73	48,00	**-10,27**	
6	28,20	33,44	32,32	48,00	**-15,68**	
7	28,65	43,34	42,83	48,00	**-5,17**	

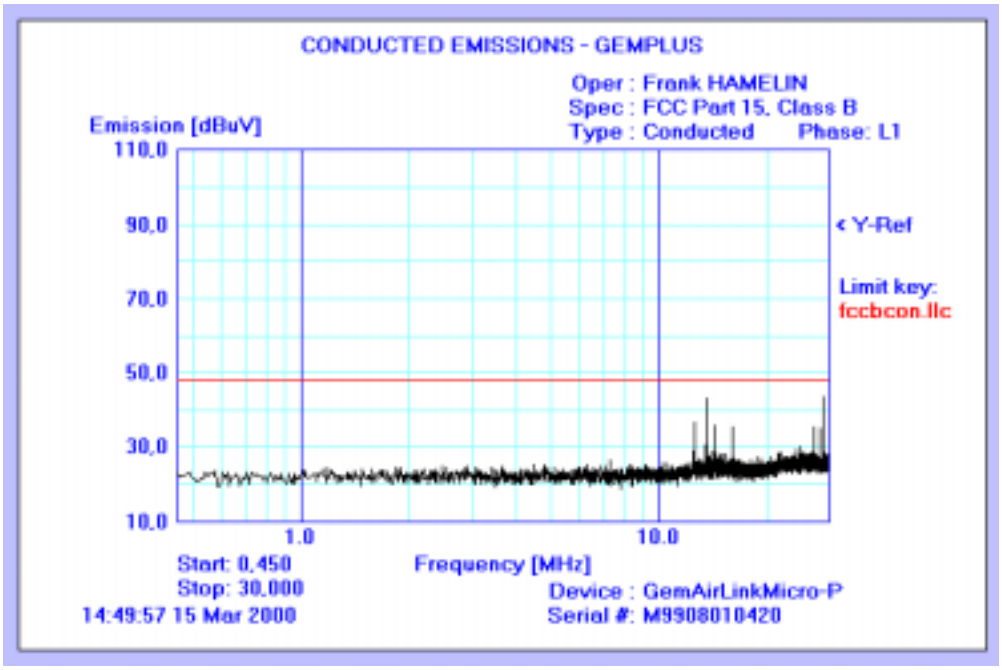
1.2.3 Line conducted emission data on GemEasyLink 680SP contactless reader



Num.	Freq. [MHz]	Peak [dBµV]	Q-Peak [dBµV]	QP limit [dBµV]	***QP delta [dBµV]***	Average [dBµV]
1	12,53	39,86	38,18	48,00	-9,82	
2	13,57	69,86	69,66	48,00	21,66	68,41
3	14,33	38,11	35,70	48,00	-12,3	
4	16,00	36,16	34,00	48,00	-14	
5	27,12	40,38	38,85	48,00	-9,15	
6	28,21	35,95	34,17	48,00	-13,83	
7	28,65	44,51	43,54	48,00	-4,46	

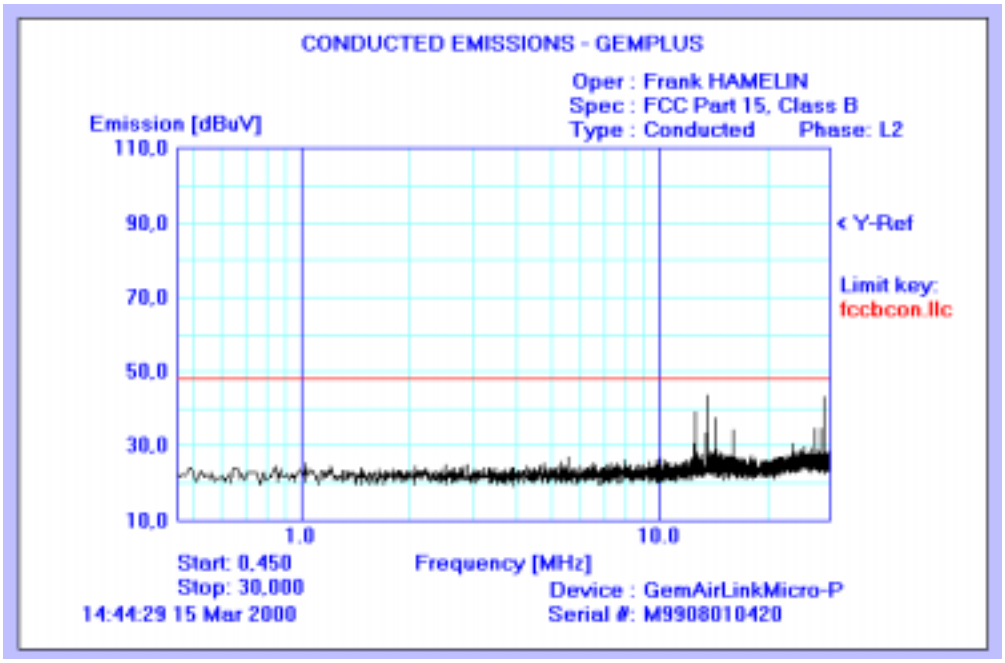
1.2.4 Neutral conducted emission data on GemEasyLink 680SP contactless reader

The product is wrapped up in a conductive aluminium foil



1.2.5 Line conducted emission data on GemEasyLink 680SP contactless reader

The product is wrapped up in a conductive aluminium foil



1.3 RADIATED EMISSION DATA

1.3.1 Test Procedure (15.225)

The product has been tested according to ANSI C63.4-1992 and FCC PART15, Subpart C, Section 15.225.

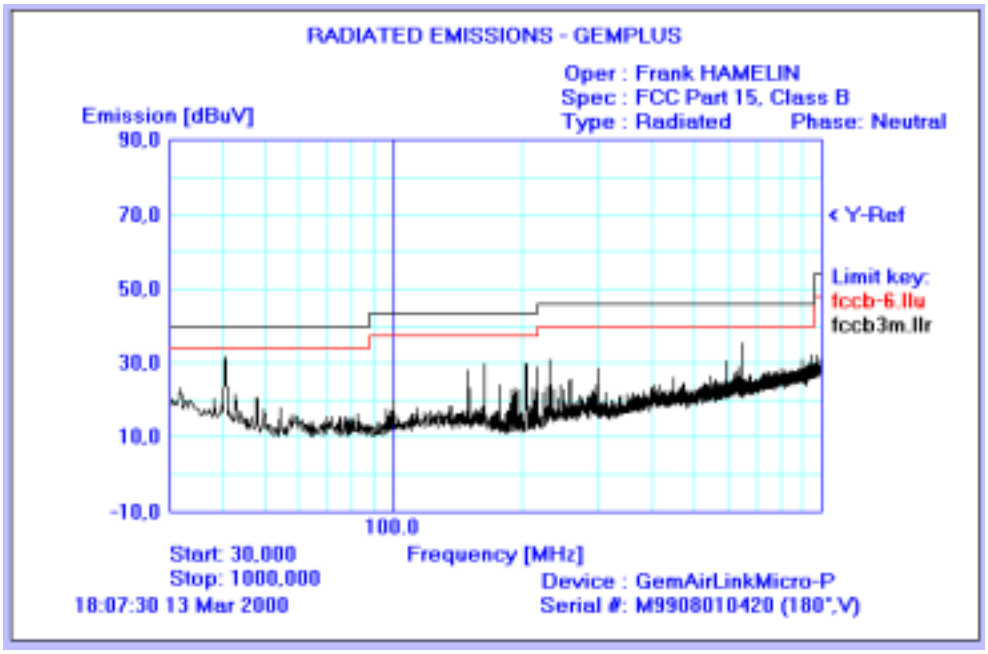
The product has been tested with 230V / 50Hz power line voltage, at a distance of 3 meters from the antenna and compared to the FCC PART15, Subpart C, Section 15.225 limits. Measurement bandwidth was 120 KHz from 30 MHz to 1 GHz, and 9KHz below 30 MHz. Requirements of 15.209 e) have been observed.
Above 30MHz, antenna height search was performed from 1m to 4m for both horizontal and vertical polarization. Continuous linear turntable azimuth search was performed with 360 degrees range.
Below 30MHz, a rod antenna has been used, according provisions of ANSI C63.4 (measurements distance is 10 meters and then extrapolated to 30 meters).
Interconnecting cables and equipment's were moved to position that maximized emission. A summary of the worst case emissions found in all test configurations and modes is shown on the following page.

Test Equipment: HP-8574A E.M.I Receiver
HP-8568B Analyzer + HP-85650 Quasi-Peak adapter + HP-85685A RF Preselector.
EMCO 3104C Biconical Antenna & EMCO 3146 Log Periodic Antenna
EMCO-1050, 6 meters height antenna mast & EMCO-1060, 3 meters diameter Turntable.
HP-8591EM Spectrum analyser
CHASE CBL6111A Antenna, 30-1000MHz
ElectroMetrics Model RVR-30M, Passive Rod Antenna

1.3.2 Radiated emission data

Final result 30-1000 MHz

Graph example - 30-1000MHz



Frequency (MHz)	QPeak Lmt (dBµV/m)	QPeak (dBµV/m)	QPeak-Lmt (dB)	Angle (deg)	Pol	Hgt (cm)	Tot Corr (dB)
40.67	40.0	39.1	-0.9	90	V	242	11.0
48.02	40.0	31.4	-8.6	57	V	319	11.8
149.20	43.5	38.1	-5.4	248	H	134	15.6
162.74	43.5	30.2	-13.3	45	H	121	17.8
203.45	43.5	39.8	-3.7	57	H	104	13.7
216.99	47.0	26.3	-20.8	264	V	274	14.1
230.53	47.0	34.8	-12.2	274	V	103	14.5
547.83	47.0	37.3	-9.7	3	H	187	22.8

647.48	47.0	43.8	-3.2	306	H	168	24.9

1.3.3 Radiated emission data

Final result below 30 MHz

Frequency (MHz)	QPeak Lmt (dBµV/m)	QPeak (dBµV/m)	QPeak-Lmt (dB)	Angle (deg)	Pol	Hgt (cm)	Tot Corr (dB)
13.56	40.0	39.1	-0.9	90	V	242	11.0
27.12	40.0	31.4	-8.6	57	V	319	11.8
28.638	43.5	38.1	-5.4	248	H	134	15.6

1.3.4 Field Strength Calculation

The field strength is calculated by adding the Antenna Factor and Cable Factor, and subtracting the Amplifier Gain (if any) from the measured reading. The basic equation with a sample calculation is as follow :

FS = RA + AF + CF – AG

Where FS = Field Strength
RA = Receiver Amplitude
AF = Antenna Factor
CF = Cable Factor
AG = Amplifier Gain

Assume a receiver reading of 52.5dBµV is obtained. The antenna factor of 7.4 and a cable factor of 1.1 is added. The amplifier gain of 29dB is subtracted, giving a field strength of 32 dBµV/m.

FS = 52.5 + 7.4 + 1.1 – 29 = 32 dBµV/m

The 32 dBµV/m value can be mathematically converted to its corresponding level in µV/m.

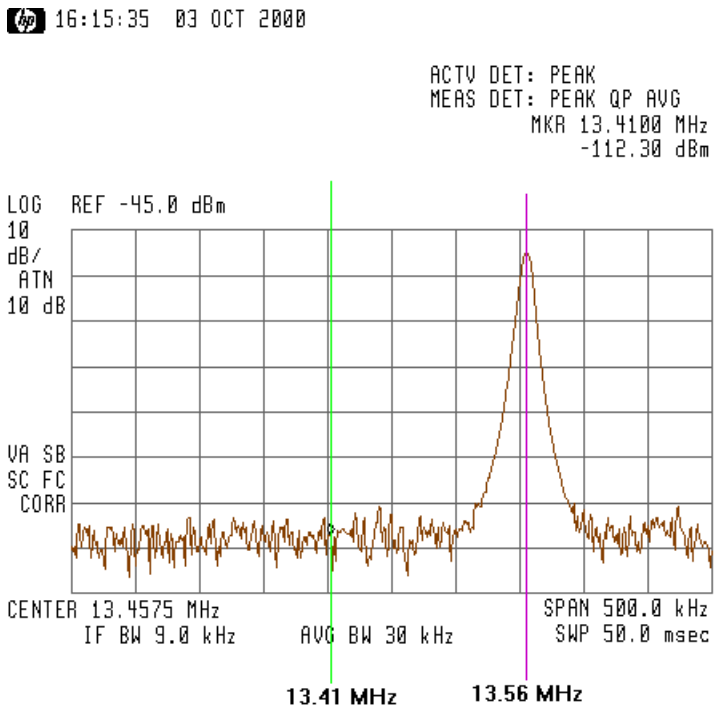
Level in µV/m = Common Antilogarithm [(32dBµV/m)/20] = 39.8 µV/m.

1.4 Fundamental field strength (15.225.a)

Fundamental frequency	Measured level	Limit level (at 30m)
15.56 MHz	**84µV/m**	10000µV/m

1.5 Occupied bandwidth

Here is a plot of the occupied bandwidth, which show that , 13.36MHz - 13.41MHz restricted band is free of spurious emission.



1.6 Fundamental frequency tolerance (15.225.c)

The frequency tolerance of the carrier signal shall be maintained within +/-0.01% of the operating frequency.

1.6.1 Voltage fluctuation

Power supply has been set at 85% and 115% of nominal voltage, at 20°C.
Frequency of carrier: 13.56 MHz
Upper limit: 13.561356 MHz
Lower limit: 13.558644 MHz

Voltage	98V/60Hz	115V/60Hz	132V/60Hz
Frequency (MHz)	13.560109	13.560125	13.560132
Result	Pass	-	Pass

1.6.2 temperature

Teperature has been set at –20°C and +50°C at nominal voltage (115V/60Hz).
Frequency of carrier: 13.56 MHz
Upper limit: 13.561356 MHz
Lower limit: 13.558644 MHz

Voltage	-20°C	20°C	+50°C

Frequency (MHz)	13.560517	13.560112	13.559508
Result	Pass	-	Pass