

Justification

The individuals and/or the organization requesting the test provided the modes, configurations and settings available to evaluate. While scanning the radiated emissions, all of the EUT parameters listed below were investigated. This includes, but may not be limited to, antennas, tuned transmit frequency ranges, operating modes, and data rates.

Channels in Specified Band Investigated:

Low
Mid
High

Operating Modes Investigated:

No Hop

Data Rates Investigated:

Maximum

Output Power Setting(s) Investigated:

Maximum

Power Input Settings Investigated:

12 VDC.

Software\Firmware Applied During Test

Operating system	Unknown	Version	Unknown
Exercise software	VACM Utility Software	Version	3.0.8

Description

The system was tested using special firmware developed to test all functions of the device during the test. The firmware put the radio into a no-hop mode with a modulated carrier. Transmit channels were selectable between the lowest, a middle, and the highest channels in the operating band.

EUT and Peripherals in Test Setup Boundary

Description	Manufacturer	Model/Part Number	Serial Number
SCP Network Analysis Tool	Ford	N/A	015674
Bluetooth Hands Free Unit	Visteon	VMVL2.1a	MV42001173
Bluetooth Hands Free Unit	Visteon	VMVL2.1a	MV42001005
Control Box w/harness	Nissan	MVL 2005	N/A
10Amp/13.8VDC Power Supply	RadioShack TM	CAT. No. 22-506	806977
DC Power Supply	Hewlett Packard	6574A	US36340150

Cables					
Cable Type	Shield	Length (m)	Ferrite	Connection 1	Connection 2
DC Leads	No	3.2	No	SCP Network Analysis Tool	DC Power Supply
DC Leads	No	0.6	No	Control Box w/harness	10Amp/13.8VDC Power Supply
AC Power	No	1.8	No	10Amp/13.8VDC Power Supply	AC Mains
AC Power	No	2.0	No	DC Power Supply	AC Mains
Serial	No	1.4	No	SCP Network Analysis Tool	Control Box w/harness
DC Leads	No	3.6	No	Control Box w/harness	Bluetooth Hands Free Unit
Control	No	3.6	No	Control Box w/harness	Bluetooth Hands Free Unit
SMA	No	1.2	No	Spectrum Analyzer	RF adapter cable
RF adapter cable	No	0.2	No	SMA cable	Bluetooth Hands Free Unit
PA = Cable is permanently attached to the device. Shielding and/or presence of ferrite may be unknown.					

Measurement Equipment					
Description	Manufacturer	Model	Identifier	Last Cal	Interval
Spectrum Analyzer	Hewlett Packard	8593E	AAP	12/07/2004	13 mo
Spectrum Analyzer	Hewlett Packard	8593E	AAA	12/06/2004	13 mo

Test Description

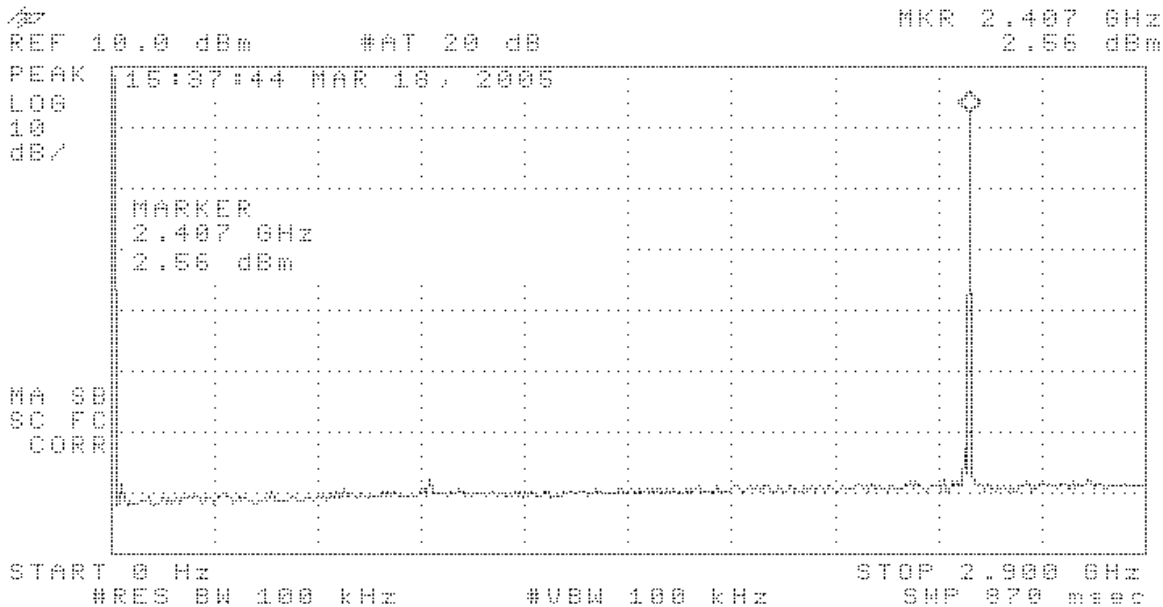
Requirement: Per 47 CFR 15.247(d), in any 100 kHz bandwidth outside the authorized band, the maximum level of radio frequency power must be at least 20dB down from the highest emission level within the authorized band. The measurement is made with the spectrum analyzer's resolution bandwidth set to 100 kHz, and the video bandwidth set to greater than or equal to the resolution bandwidth.

Configuration: The spurious RF conducted emissions were measured with the EUT set to low, medium, and high transmit frequencies. The measurements were made using a direct connection between the RF output of the EUT and the spectrum analyzer. The EUT was transmitting at its maximum data rate in a no hop mode. For each transmit frequency, the spectrum was scanned throughout the specified frequency.

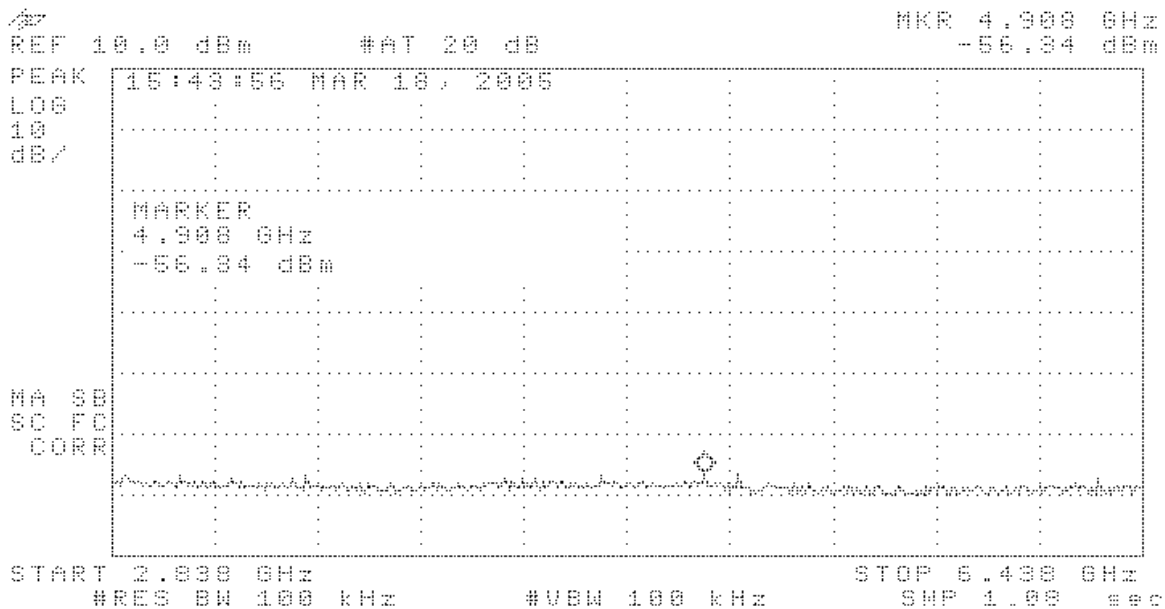
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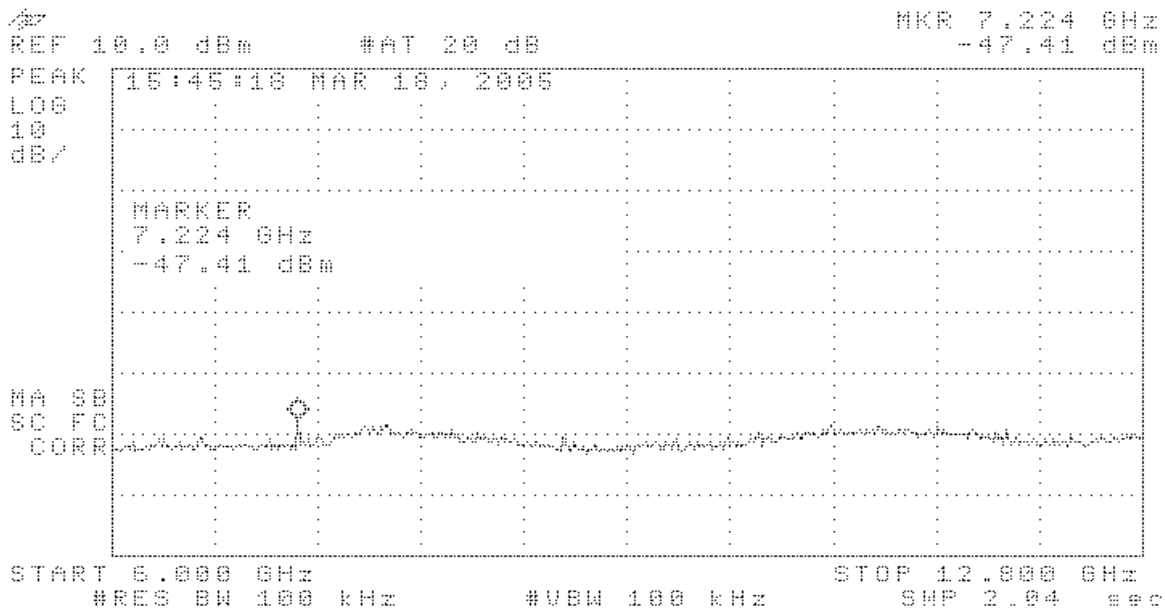
NORTHWEST EMC		EMISSIONS DATA SHEET		Rev BETA 01/30/01	
EUT: VMVL2.1a		Work Order: 7LAY0030			
Serial Number: MV42001173		Date: 03/18/05			
Customer: Visteon		Temperature: 70 °F			
Attendees: None		Tested by: Jonathan Peng		Humidity: 51% RH	
Customer Ref. No.: N/A		Power: 12VDC		Job Site: OC11	
TEST SPECIFICATIONS					
Specification: 47 CFR 15.247(d)		Year: 2004		Method: DA 00-705, ANSI C63.4	
				Year: 2003	
SAMPLE CALCULATIONS					
COMMENTS					
EUT OPERATING MODES					
Modulated at maximum data rate					
DEVIATIONS FROM TEST STANDARD					
None					
REQUIREMENTS					
Maximum level of any spurious emission outside of the authorized band is 20 dB down from the fundamental					
RESULTS					
Pass					
SIGNATURE					
Tested By:					
DESCRIPTION OF TEST					
Antenna Conducted Spurious Emissions - Low Channel 0MHz-2.9GHz					



NORTHWEST EMC		EMISSIONS DATA SHEET		Rev BETA 01/30/01	
EUT: VMVL2.1a			Work Order: 7LAY0030		
Serial Number: MV42001173			Date: 03/18/05		
Customer: Visteon			Temperature: 70 °F		
Attendees: None		Tested by: Jonathan Peng		Humidity: 51% RH	
Customer Ref. No.: N/A		Power: 12VDC		Job Site: OC11	
TEST SPECIFICATIONS					
Specification: 47 CFR 15.247(d)		Year: 2004		Method: DA 00-705, ANSI C63.4	
				Year: 2003	
SAMPLE CALCULATIONS					
COMMENTS					
EUT OPERATING MODES					
Modulated at maximum data rate					
DEVIATIONS FROM TEST STANDARD					
None					
REQUIREMENTS					
Maximum level of any spurious emission outside of the authorized band is 20 dB down from the fundamental					
RESULTS					
Pass					
SIGNATURE					
Tested By:					
DESCRIPTION OF TEST					
Antenna Conducted Spurious Emissions - Low Channel 2.9GHz-6.0GHz					



NORTHWEST EMC		EMISSIONS DATA SHEET		Rev BETA 01/30/01	
EUT: VMVL2.1a			Work Order: 7LAY0030		
Serial Number: MV42001173			Date: 03/18/05		
Customer: Visteon			Temperature: 70 °F		
Attendees: None		Tested by: Jonathan Peng		Humidity: 51% RH	
Customer Ref. No.: N/A		Power: 12VDC		Job Site: OC11	
TEST SPECIFICATIONS					
Specification: 47 CFR 15.247(d)		Year: 2004		Method: DA 00-705, ANSI C63.4	
				Year: 2003	
SAMPLE CALCULATIONS					
COMMENTS					
EUT OPERATING MODES					
Modulated at maximum data rate					
DEVIATIONS FROM TEST STANDARD					
None					
REQUIREMENTS					
Maximum level of any spurious emission outside of the authorized band is 20 dB down from the fundamental					
RESULTS					
Pass					
SIGNATURE					
Tested By: 					
DESCRIPTION OF TEST					
Antenna Conducted Spurious Emissions - Low Channel 6GHz-12.8GHz					



Rev BETA
01/30/01

EUT:	VMVL2.1a	Work Order:	7LAY0030
Serial Number:	MV42001173	Date:	03/18/05
Customer:	Visteon	Temperature:	70 °F
Attendees:	None	Tested by:	Jonathan Peng
Customer Ref. No.:	N/A	Power:	12VDC
		Humidity:	51% RH
		Job Site:	OC11

TEST SPECIFICATIONS

Specification:	47 CFR 15.247(d)	Year:	2004	Method:	DA 00-705, ANSI C63.4	Year:	2003
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SAMPLE CALCULATIONS

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COMMENTS

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EUT OPERATING MODES

Modulated at maximum data rate

DEVIATIONS FROM TEST STANDARD

None

REQUIREMENTS

Maximum level of any spurious emission outside of the authorized band is 20 dB down from the fundamental

RESULTS

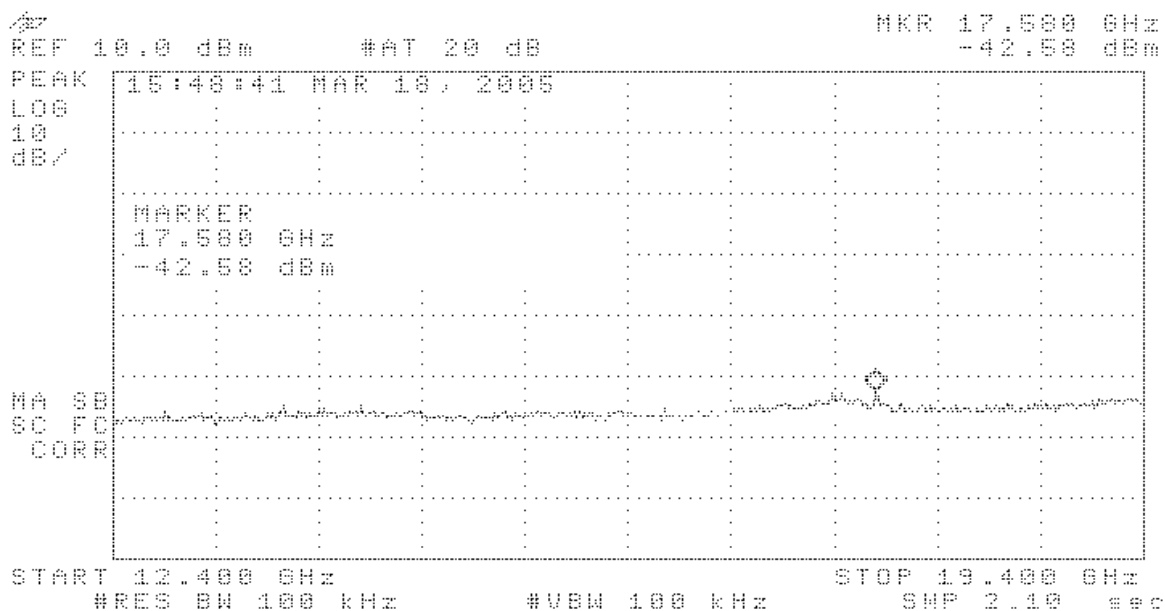
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SIGNATURE

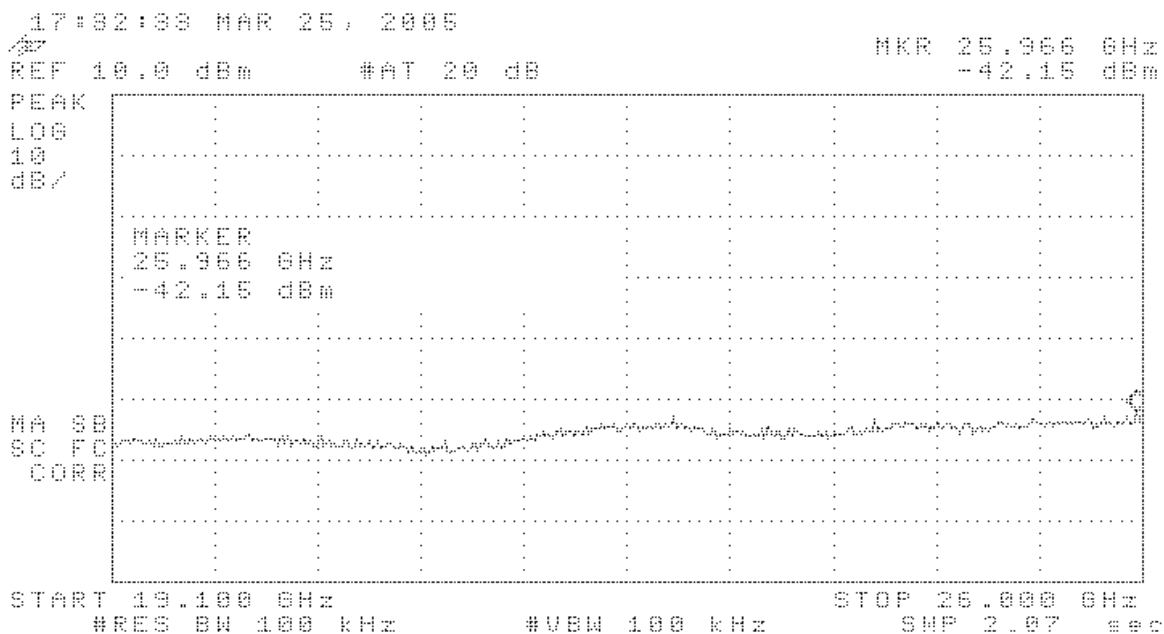
Tested By: 

DESCRIPTION OF TEST

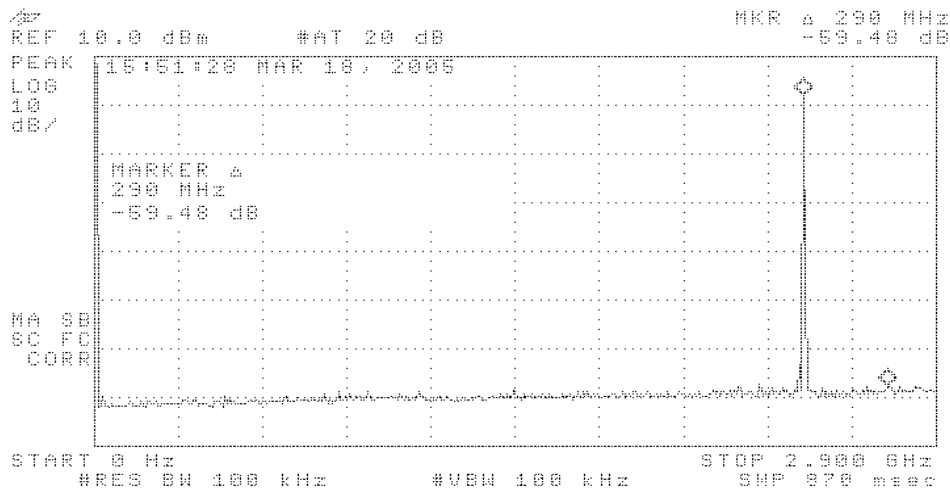
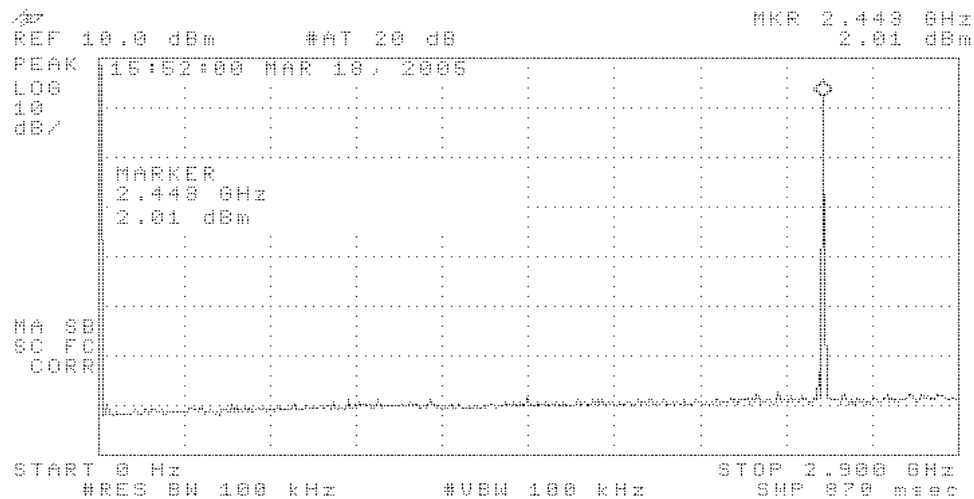
Antenna Conducted Spurious Emissions - Low Channel 12.4GHz - 19.4GHz



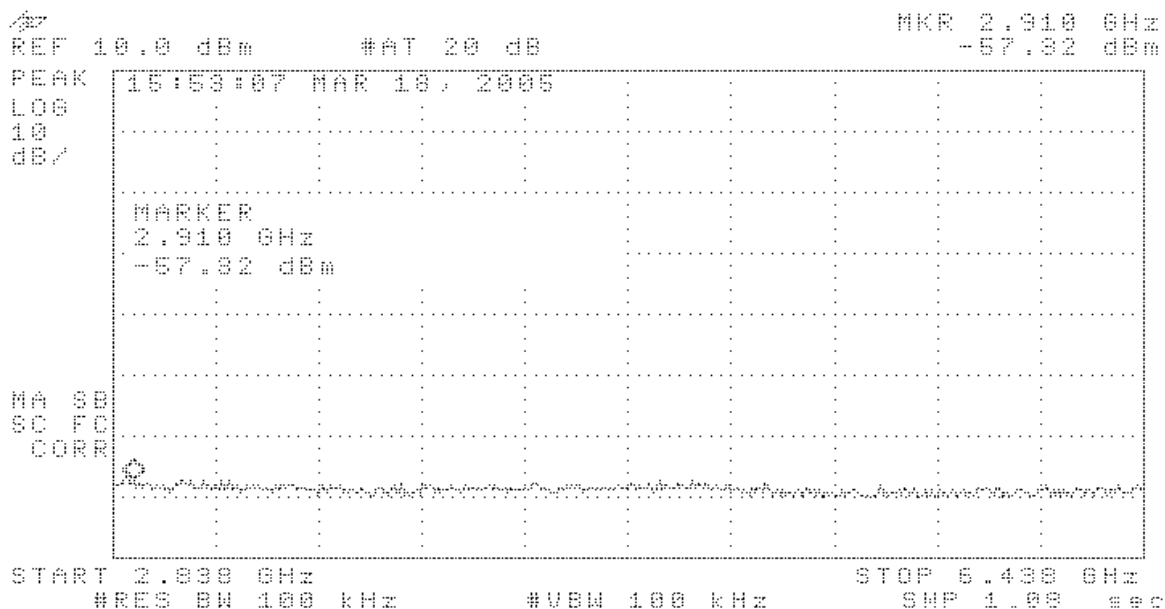
NORTHWEST EMC		EMISSIONS DATA SHEET		Rev BETA 01/30/01	
EUT: VMVL2.1a			Work Order: 7LAY0030		
Serial Number: MV42001173			Date: 03/25/05		
Customer: Visteon			Temperature: 70 °F		
Attendees: None		Tested by: Jonathan Peng		Humidity: 44% RH	
Customer Ref. No.: N/A		Power: 12VDC		Job Site: OC11	
TEST SPECIFICATIONS					
Specification: 47 CFR 15.247(d)		Year: 2004		Method: DA 00-705, ANSI C63.4	
				Year: 2003	
SAMPLE CALCULATIONS					
COMMENTS					
None					
EUT OPERATING MODES					
Modulated at maximum data rate					
DEVIATIONS FROM TEST STANDARD					
None					
REQUIREMENTS					
Maximum level of any spurious emission outside of the authorized band is 20 dB down from the fundamental					
RESULTS					
Pass					
SIGNATURE					
Tested By: 					
DESCRIPTION OF TEST					
Antenna Conducted Spurious Emissions - Low Channel 19.1GHz - 26GHz					



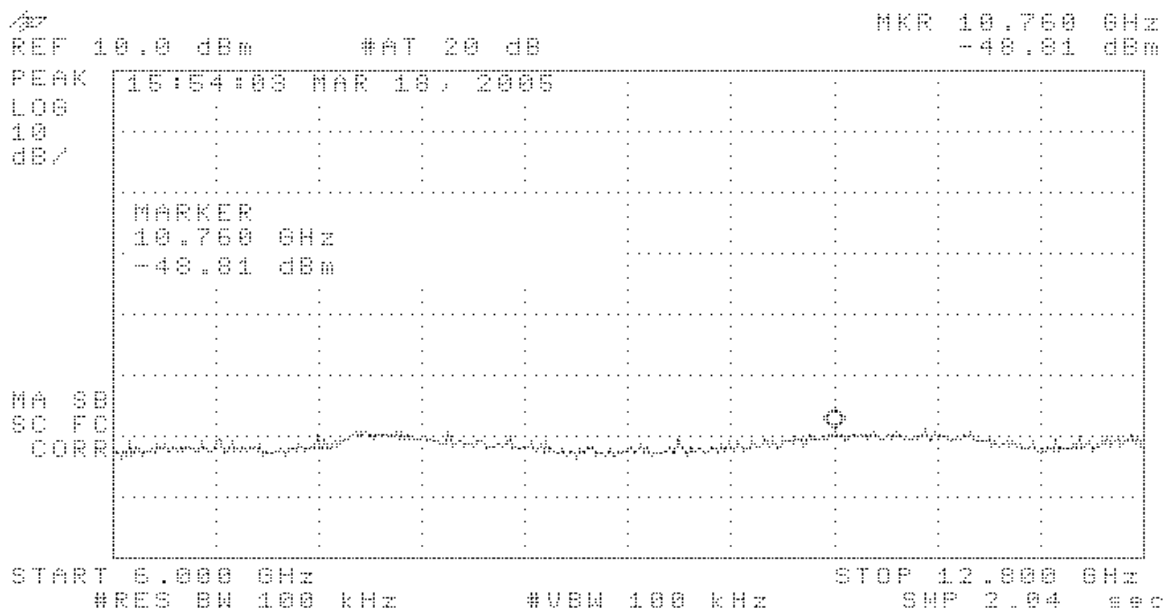
NORTHWEST EMC		EMISSIONS DATA SHEET		Rev BETA 03/30/01	
EUT: VMVL2.1a		Work Order: 7LAY0030			
Serial Number: MV42001173		Date: 03/18/05			
Customer: Visteon		Temperature: 70 °F			
Attendees: None		Tested by: Jonathan Peng		Humidity: 51% RH	
Customer Ref. No.: N/A		Power: 12VDC		Job Site: OC11	
TEST SPECIFICATIONS					
Specification: 47 CFR 15.247(d)		Year: 2004		Method: DA 00-705, ANSI C63.4	
				Year: 2003	
SAMPLE CALCULATIONS					
COMMENTS					
None					
EUT OPERATING MODES					
Modulated at maximum data rate					
DEVIATIONS FROM TEST STANDARD					
None					
REQUIREMENTS					
Maximum level of any spurious emission outside of the authorized band is 20 dB down from the fundamental					
RESULTS					
Pass					
SIGNATURE					
 Tested By: _____					
DESCRIPTION OF TEST					
Antenna Conducted Spurious Emissions - Mid Channel 0MHz-2.9GHz					



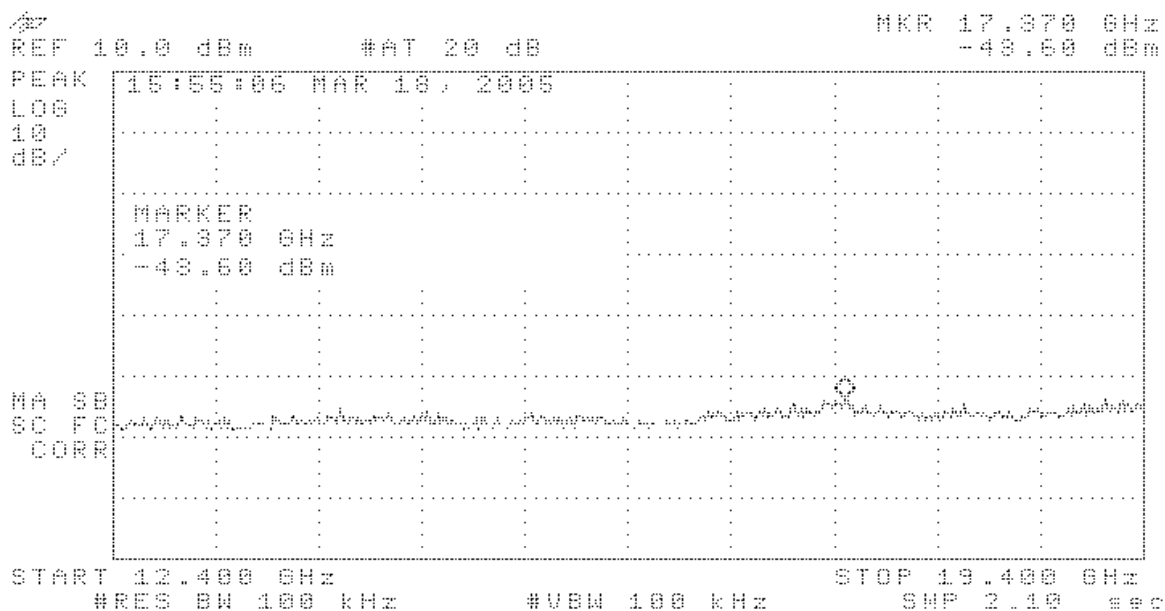
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EUT: VMVL2.1a			Work Order: 7LAY0030		
Serial Number: MV42001173			Date: 03/18/05		
Customer: Visteon			Temperature: 70 °F		
Attendees: None		Tested by: Jonathan Peng		Humidity: 51% RH	
Customer Ref. No.: N/A		Power: 12VDC		Job Site: OC11	
TEST SPECIFICATIONS					
Specification: 47 CFR 15.247(d)		Year: 2004		Method: DA 00-705, ANSI C63.4	
				Year: 2003	
SAMPLE CALCULATIONS					
COMMENTS					
None					
EUT OPERATING MODES					
Modulated at maximum data rate					
DEVIATIONS FROM TEST STANDARD					
None					
REQUIREMENTS					
Maximum level of any spurious emission outside of the authorized band is 20 dB down from the fundamental					
RESULTS					
Pass					
SIGNATURE					
Tested By: 					
DESCRIPTION OF TEST					
Antenna Conducted Spurious Emissions - Mid Channel 2.9GHz-6GHz					



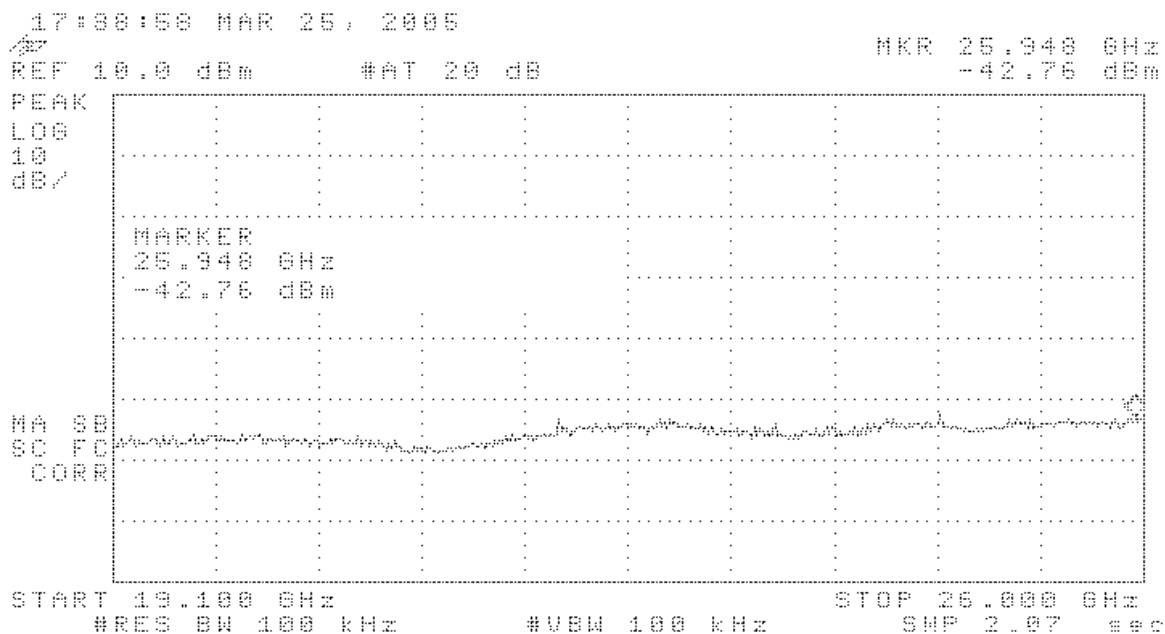
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EUT: VMVL2.1a			Work Order: 7LAY0030		
Serial Number: MV42001173			Date: 03/18/05		
Customer: Visteon			Temperature: 70 °F		
Attendees: None		Tested by: Jonathan Peng		Humidity: 51% RH	
Customer Ref. No.: N/A		Power: 12VDC		Job Site: OC11	
TEST SPECIFICATIONS					
Specification: 47 CFR 15.247(d)		Year: 2004		Method: DA 00-705, ANSI C63.4	
				Year: 2003	
SAMPLE CALCULATIONS					
COMMENTS					
None					
EUT OPERATING MODES					
Modulated at maximum data rate					
DEVIATIONS FROM TEST STANDARD					
None					
REQUIREMENTS					
Maximum level of any spurious emission outside of the authorized band is 20 dB down from the fundamental					
RESULTS					
Pass					
SIGNATURE					
 Tested By: _____					
DESCRIPTION OF TEST					
Antenna Conducted Spurious Emissions - Mid Channel 6GHz-12.8GHz					



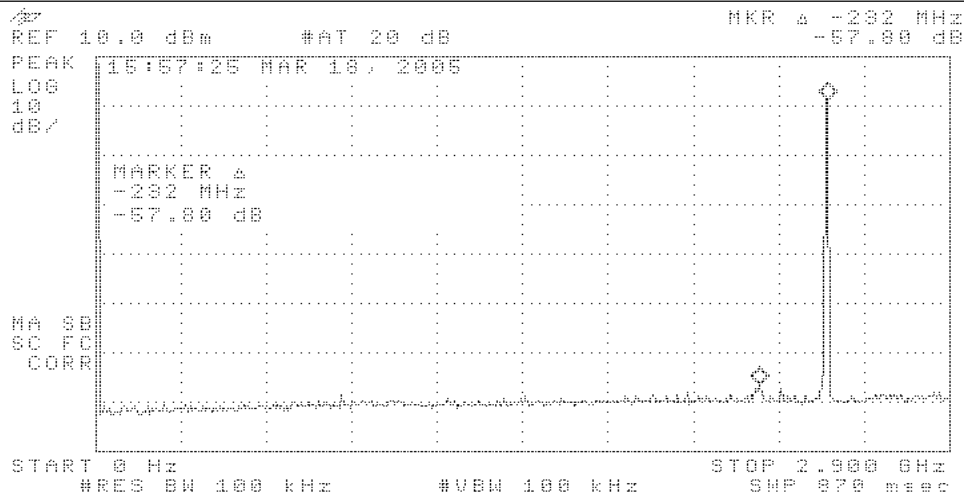
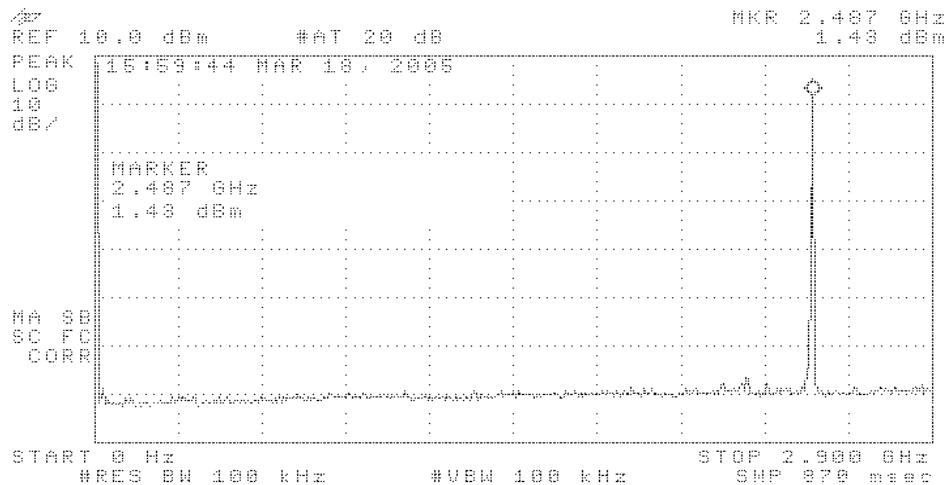
NORTHWEST EMC		EMISSIONS DATA SHEET		Rev BETA 01/30/01	
EUT: VMVL2.1a		Work Order: 7LAY0030			
Serial Number: MV42001173		Date: 03/18/05			
Customer: Visteon		Temperature: 70 °F			
Attendees: None		Tested by: Jonathan Peng		Humidity: 51% RH	
Customer Ref. No.: N/A		Power: 12VDC		Job Site: OC11	
TEST SPECIFICATIONS					
Specification: 47 CFR 15.247(d)		Year: 2004		Method: DA 00-705, ANSI C63.4	
				Year: 2003	
SAMPLE CALCULATIONS					
COMMENTS					
None					
EUT OPERATING MODES					
Modulated at maximum data rate					
DEVIATIONS FROM TEST STANDARD					
None					
REQUIREMENTS					
Maximum level of any spurious emission outside of the authorized band is 20 dB down from the fundamental					
RESULTS					
Pass					
SIGNATURE					
 Tested By: _____					
DESCRIPTION OF TEST					
Antenna Conducted Spurious Emissions - Mid Channel 12.4GHz-19.4GHz					



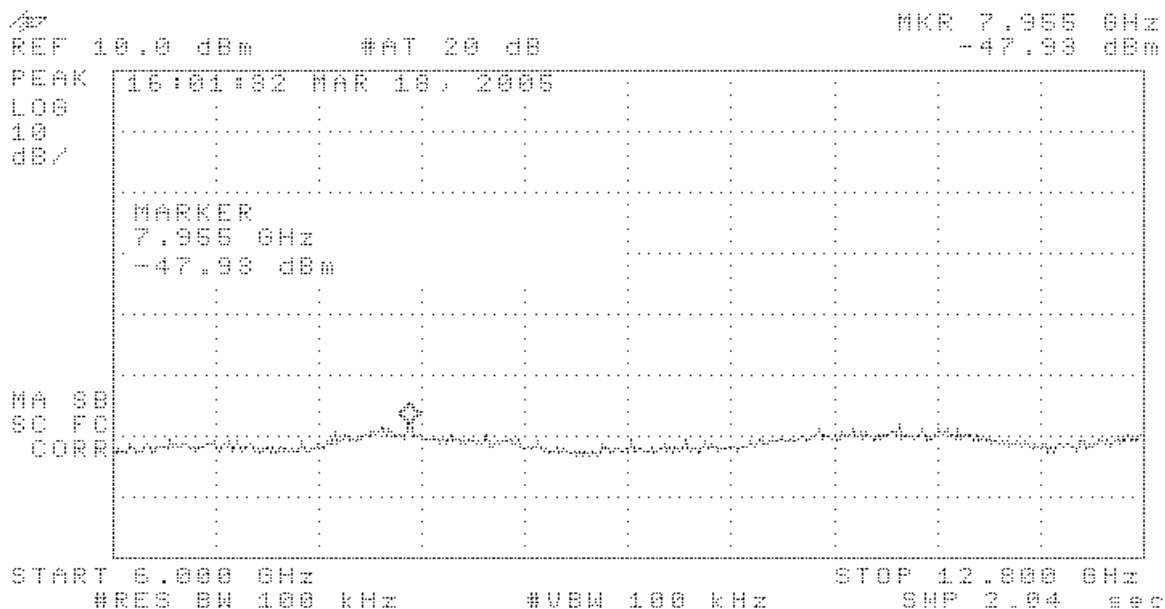
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EUT: VMVL2.1a			Work Order: 7LAY0030		
Serial Number: MV42001173			Date: 03/25/05		
Customer: Visteon			Temperature: 70 °F		
Attendees: None		Tested by: Jonathan Peng		Humidity: 44% RH	
Customer Ref. No.: N/A		Power: 12VDC		Job Site: OC11	
TEST SPECIFICATIONS					
Specification: 47 CFR 15.247(d)		Year: 2004		Method: DA 00-705, ANSI C63.4	
				Year: 2003	
SAMPLE CALCULATIONS					
COMMENTS					
None					
EUT OPERATING MODES					
Modulated at maximum data rate					
DEVIATIONS FROM TEST STANDARD					
None					
REQUIREMENTS					
Maximum level of any spurious emission outside of the authorized band is 20 dB down from the fundamental					
RESULTS					
Pass					
SIGNATURE					
Tested By:					
DESCRIPTION OF TEST					
Antenna Conducted Spurious Emissions - Mid Channel 19.1GHz-26GHz					



NORTHWEST EMC		EMISSIONS DATA SHEET		Rev BETA 03/30/01
EUT: VMVL2.1a			Work Order: 7LAY0030	
Serial Number: MV42001173			Date: 03/18/05	
Customer: Visteon			Temperature: 70 °F	
Attendees: None	Tested by: Jonathan Peng	Humidity: 51% RH		
Customer Ref. No.: N/A	Power: 12VDC	Job Site: OC11		
TEST SPECIFICATIONS				
Specification: 47 CFR 15.247(d)	Year: 2004	Method: DA 00-705, ANSI C63.4	Year: 2003	
SAMPLE CALCULATIONS				
COMMENTS				
None				
EUT OPERATING MODES				
Modulated at maximum data rate				
DEVIATIONS FROM TEST STANDARD				
None				
REQUIREMENTS				
Maximum level of any spurious emission outside of the authorized band is 20 dB down from the fundamental				
RESULTS				
Pass				
SIGNATURE				
 Tested By: _____				
DESCRIPTION OF TEST				
Antenna Conducted Spurious Emissions - High Channel 0MHz-2.9GHz				



NORTHWEST EMC		EMISSIONS DATA SHEET		Rev BETA 01/30/01	
EUT: VMVL2.1a			Work Order: 7LAY0030		
Serial Number: MV42001173			Date: 03/18/05		
Customer: Visteon			Temperature: 70 °F		
Attendees: None		Tested by: Jonathan Peng		Humidity: 51% RH	
Customer Ref. No.: N/A		Power: 12VDC		Job Site: OC11	
TEST SPECIFICATIONS					
Specification: 47 CFR 15.247(d)		Year: 2004		Method: DA 00-705, ANSI C63.4	
				Year: 2003	
SAMPLE CALCULATIONS					
COMMENTS					
None					
EUT OPERATING MODES					
Modulated at maximum data rate					
DEVIATIONS FROM TEST STANDARD					
None					
REQUIREMENTS					
Maximum level of any spurious emission outside of the authorized band is 20 dB down from the fundamental					
RESULTS					
Pass					
SIGNATURE					
 Tested By: _____					
DESCRIPTION OF TEST					
Antenna Conducted Spurious Emissions - High Channel 6GHz-12.8GHz					



EUT:	VMVL2.1a	Work Order:	7LAY0030
Serial Number:	MV42001173	Date:	03/18/05
Customer:	Visteon	Temperature:	70 °F
Attendees:	None	Tested by:	Jonathan Peng
Customer Ref. No.:	N/A	Power:	12VDC
		Humidity:	51% RH
		Job Site:	OC11

TEST SPECIFICATIONS

Specification:	47 CFR 15.247(d)	Year:	2004	Method:	DA 00-705, ANSI C63.4	Year:	2003
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SAMPLE CALCULATIONS

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COMMENTS

COMMENTS	
None	

EUT OPERATING MODES

List of Erasing Modes	
Modulated at maximum data rate	

DEVIATIONS FROM TEST STANDARDS

DEVIATIONS FROM TEST STANDARD
None

REQUIREMENTS

Maximum level of any spurious emission outside of the authorized band is 20 dB down from the fundamental

RESULTS

RESULTS

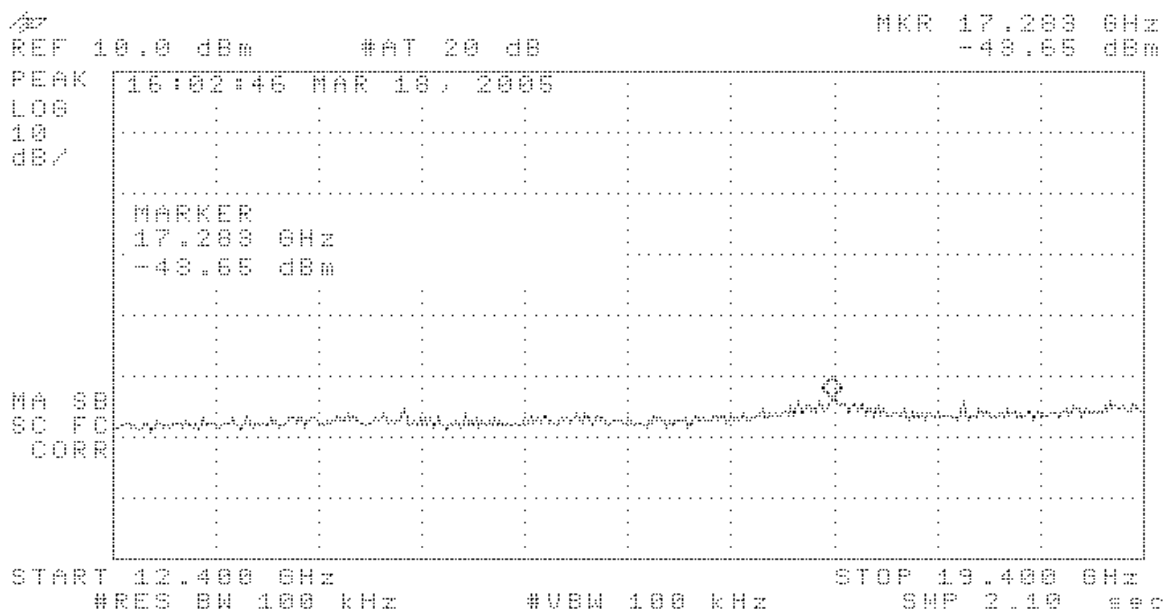
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SIGNATURE _____

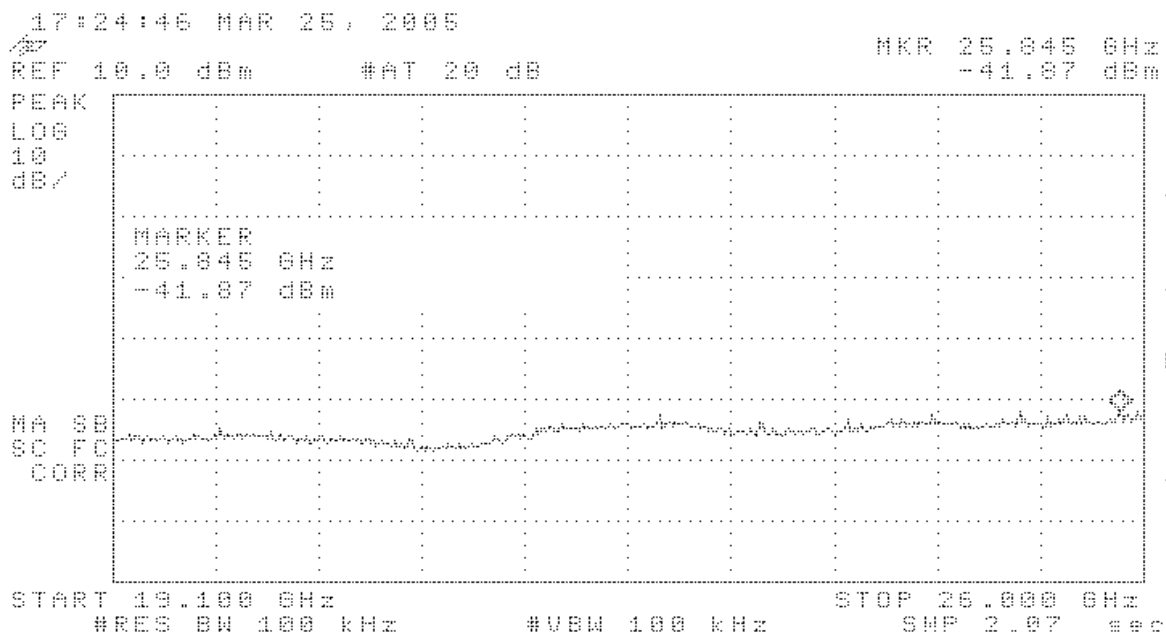
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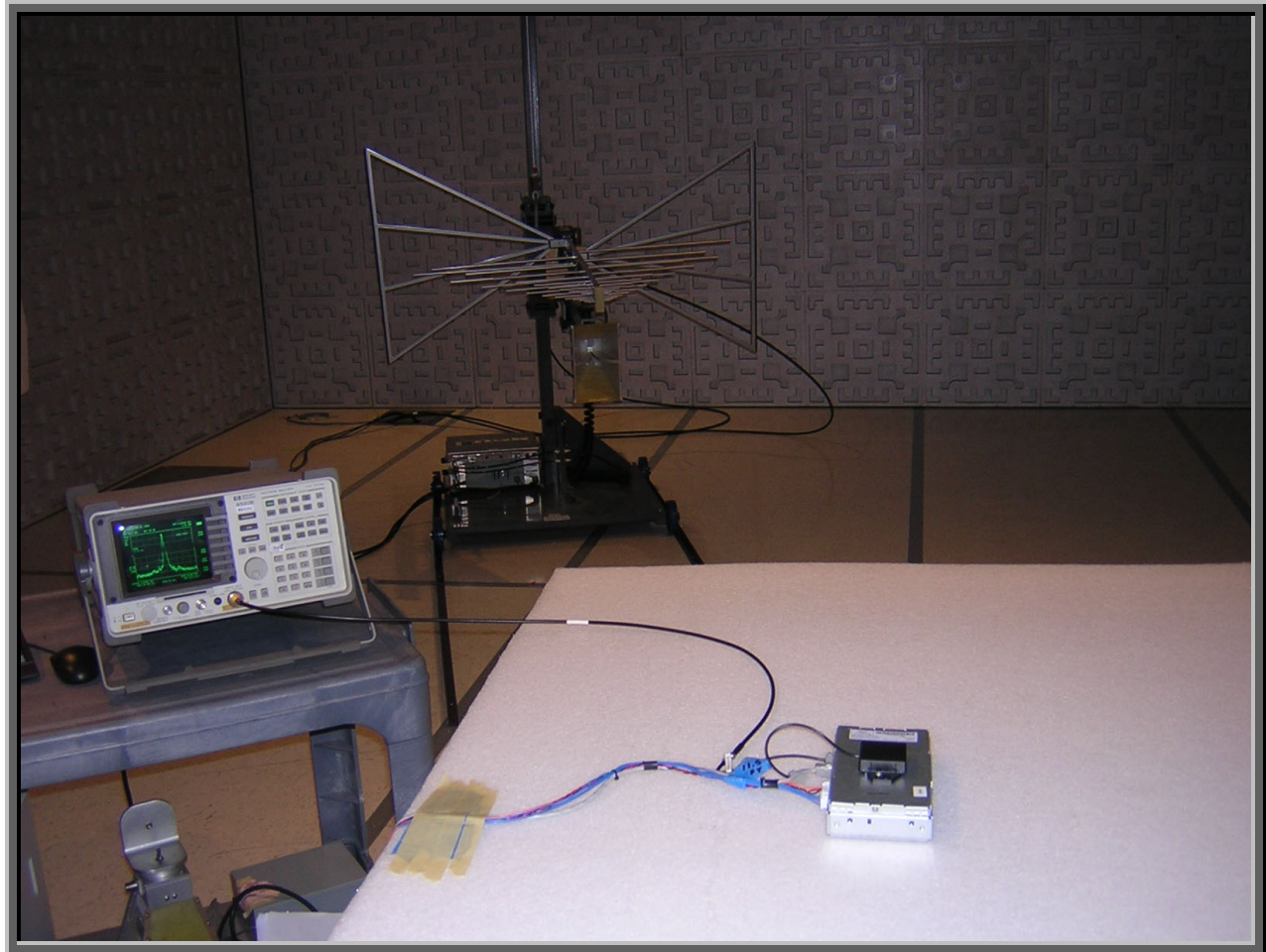
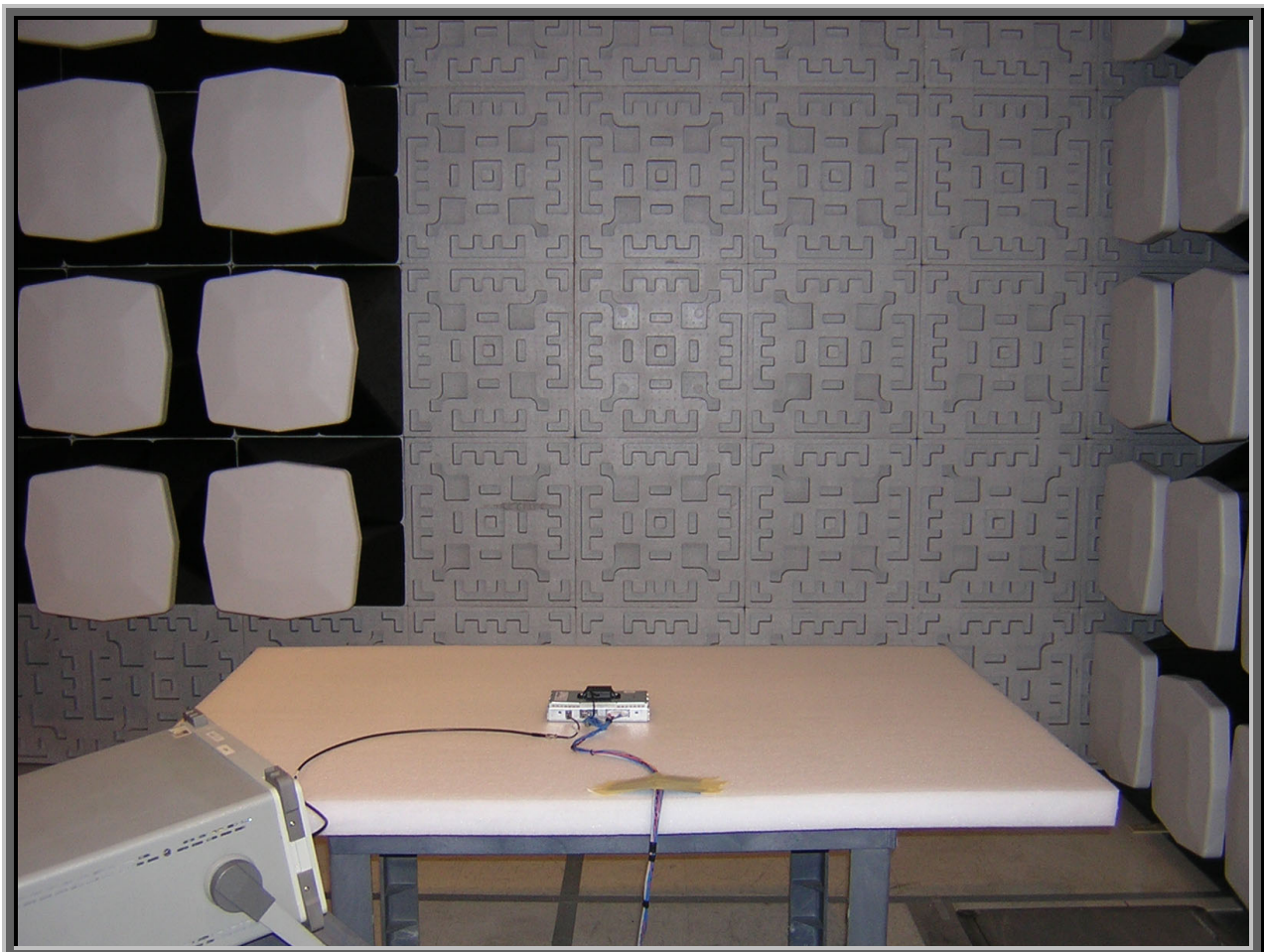
DESCRIPTION OF TEST

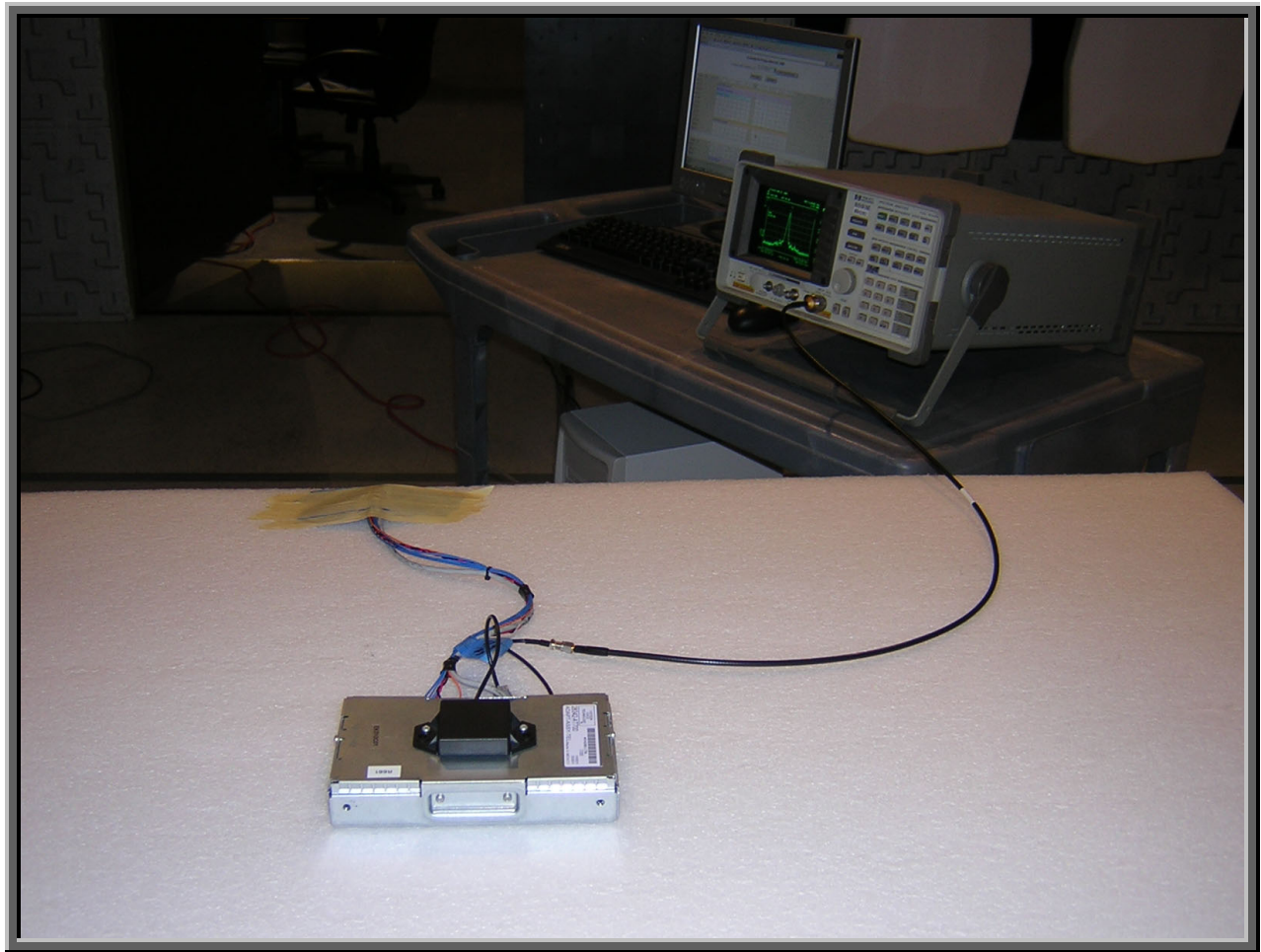
Antenna Conducted Spurious Emissions - High Channel 12.4GHz-19.4GHz



NORTHWEST EMC		EMISSIONS DATA SHEET		Rev BETA 01/30/01	
EUT: VMVL2.1a			Work Order: 7LAY0030		
Serial Number: MV42001173			Date: 03/25/05		
Customer: Visteon			Temperature: 70 °F		
Attendees: None		Tested by: Jonathan Peng		Humidity: 44% RH	
Customer Ref. No.: N/A		Power: 12VDC		Job Site: OC11	
TEST SPECIFICATIONS					
Specification: 47 CFR 15.247(d)		Year: 2004		Method: DA 00-705, ANSI C63.4	
				Year: 2003	
SAMPLE CALCULATIONS					
COMMENTS					
None					
EUT OPERATING MODES					
Modulated at maximum data rate					
DEVIATIONS FROM TEST STANDARD					
None					
REQUIREMENTS					
Maximum level of any spurious emission outside of the authorized band is 20 dB down from the fundamental					
RESULTS					
Pass					
SIGNATURE					
Tested By:					
DESCRIPTION OF TEST					
Antenna Conducted Spurious Emissions - High Channel 19.1GHz-26GHz					







Justification

The individuals and/or the organization requesting the test provided the modes, configurations and settings available to evaluate. While scanning the radiated emissions, all of the EUT parameters listed below were investigated. This includes, but may not be limited to, antennas, tuned transmit frequency ranges, operating modes, and data rates.

Channels in Specified Band Investigated:

Low Channel
Mid Channel
High Channel

Operating Modes Investigated:

No Hop

Data Rates Investigated:

Maximum Data Rate

Power Input Settings Investigated:

12 VDC

Frequency Range Investigated

Start Frequency	30 MHz	Stop Frequency	26 GHz
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Software\Firmware Applied During Test

Exercise software	VACM Utility Software	Version	3.0.8
Description			
The system was tested using special firmware developed to test all functions of the device during the test. The firmware put the radio into a no-hop mode with a modulated carrier. Transmit channels were selectable between the lowest, a middle, and the highest channels in the operating band.			

EUT and Peripherals in Test Setup Boundary

Description	Manufacturer	Model/Part Number	Serial Number
SCP Network Analysis Tool	Ford	N/A	015674
Bluetooth Hands Free Unit	Visteon	VMVL2.1a	MV42001173
Bluetooth Hands Free Unit	Visteon	VMVL2.1a	MV42001005
Control Box w/harness	Nissan	MVL 2005	N/A
10Amp/13.8VDC Power Supply	RadioShack TM	CAT. No. 22-506	806977

Remote Equipment Outside of Test Setup Boundary

Description	Manufacturer	Model/Part Number	Serial Number
DC Power Supply	Hewlett Packard	6574A	US36340150
Equipment isolated from the EUT so as not to contribute to the measurement result is considered to be outside the test setup boundary.			

Cables

Cable Type	Shield	Length (m)	Ferrite	Connection 1	Connection 2
DC Leads	No	3.2	No	SCP Network Analysis Tool	DC Power Supply
DC Leads	No	0.6	No	Control Box w/harness	10Amp/13.8VDC Power Supply
AC Power	No	1.8	No	10Amp/13.8VDC Power Supply	AC Mains
AC Power	No	2.0	No	DC Power Supply	AC Mains
Serial	No	1.4	No	SCP Network Analysis Tool	Control Box w/harness
DC Leads	No	3.6	No	Control Box w/harness	Bluetooth Hands Free Unit
Control	No	3.6	No	Control Box w/harness	Bluetooth Hands Free Unit
PA = Cable is permanently attached to the device. Shielding and/or presence of ferrite may be unknown.					

Measurement Equipment

Description	Manufacturer	Model	Identifier	Last Cal	Interval
Spectrum Analyzer	Hewlett Packard	8593E	AAP	12/07/2004	13 mo
Receiver	Schaffner	SCR 3101	ARC	04/28/2003	24 mo
Pre-Amplifier	Miteq	AM-1616-1000	AOM	10/20/2004	13 mo
Antenna, Biconilog	EMCO	3142	AXJ	09/08/2003	24 mo
Antenna, Horn	EMCO	3115	AHB	08/27/2003	24 mo
Pre-Amplifier 0.5-18 GHz	Miteq	AMF-4D-005180-24-10P	APP	05/07/2004	13 mo
Antenna, Horn	EMCO	3160-07	AHP	NCR	NA
Pre-Amplifier	Miteq	AMF-6F-08001200-30-10P	AOK	12/26/2004	13 mo
Antenna, Horn	EMCO	3160-08	AHO	NCR	NA
Pre-Amplifier	Miteq	AMF-6F-12001800-30-10P	AOJ	12/26/2004	13 mo
Antenna, Horn	EMCO	3160-09	AHN	NCR	NA
Pre-Amplifier	Miteq	AMF-6F-18002650-25-10P	AOI	02/15/2005	13 mo
High Pass Filter	Micro-Tronics	HPM50111	HFM	04/20/2005	13 mo

Test Description

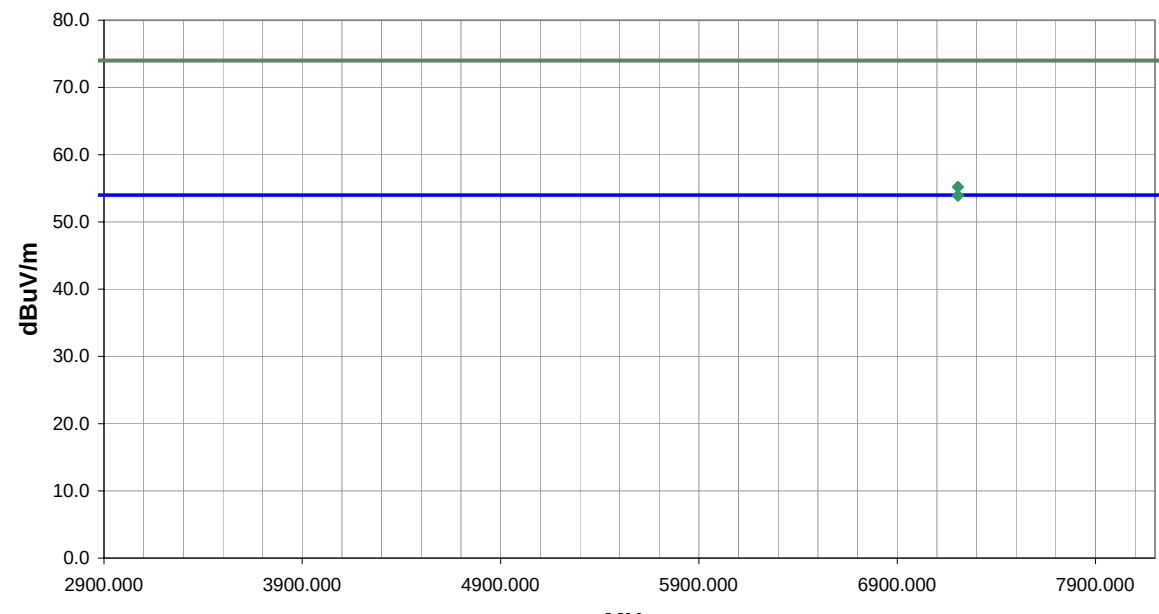
Requirement: The field strength of any spurious emissions or modulation products that fall in a restricted band, as defined in 47 CFR 15.205, is measured. The peak level must comply with the limits specified in 47 CFR 15.35(b). The average level (taken with a 10Hz VBW) must comply with the limits specified in 15.209.

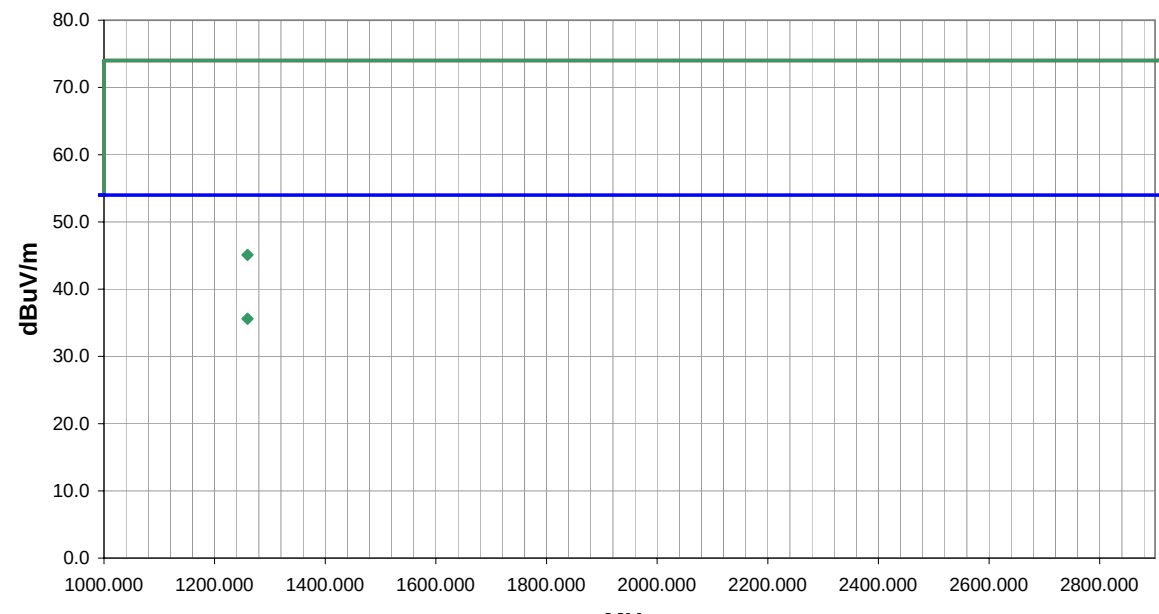
Configuration: The highest gain of each type of antenna to be used with the EUT was tested. The EUT was configured for low, mid, and high band transmit frequencies. For each configuration, the spectrum was scanned throughout the specified range. In addition, measurements were made in the restricted bands to verify compliance. While scanning, emissions from the EUT were maximized by rotating the EUT on a turntable, adjusting the position of the EUT and the EUT antenna in three orthogonal axis, and adjusting measurement antenna height and polarization, and manipulating the EUT antenna in 3 orthogonal planes (per ANSI C63.4:1992). A preamp and high pass filter were used for this test in order to provide sufficient measurement sensitivity.

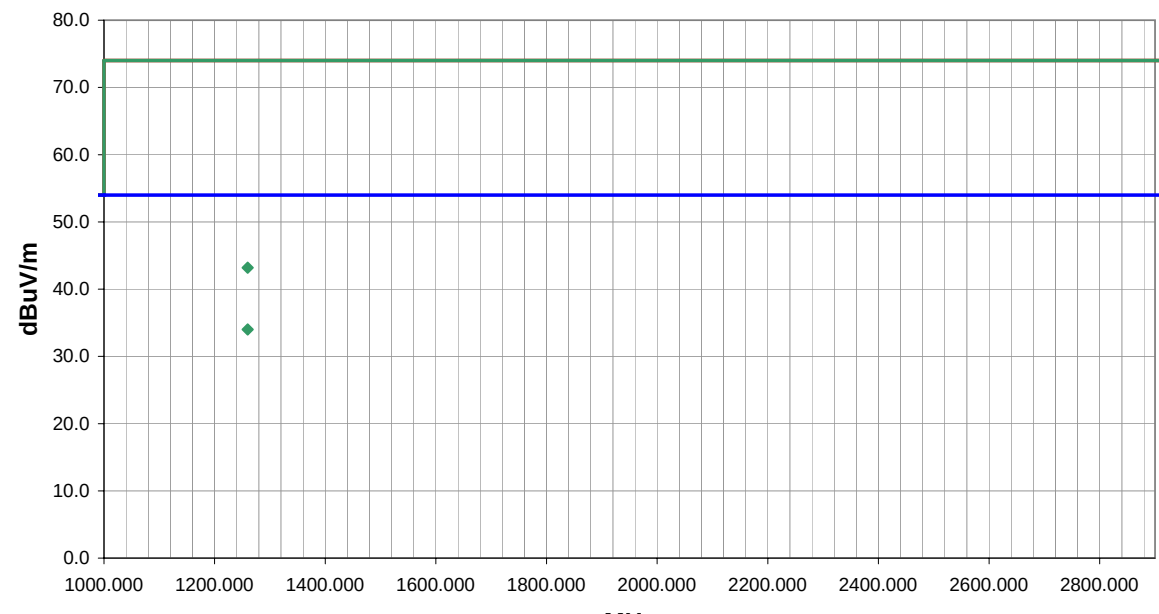
Bandwidths Used for Measurements			
Frequency Range (MHz)	Peak Data (kHz)	Quasi-Peak Data (kHz)	Average Data (kHz)
0.01 – 0.15	1.0	0.2	0.2
0.15 – 30.0	10.0	9.0	9.0
30.0 – 1000	100.0	120.0	120.0
Above 1000	1000.0	N/A	1000.0
<i>Measurements were made using the bandwidths and detectors specified. No video filter was used.</i>			

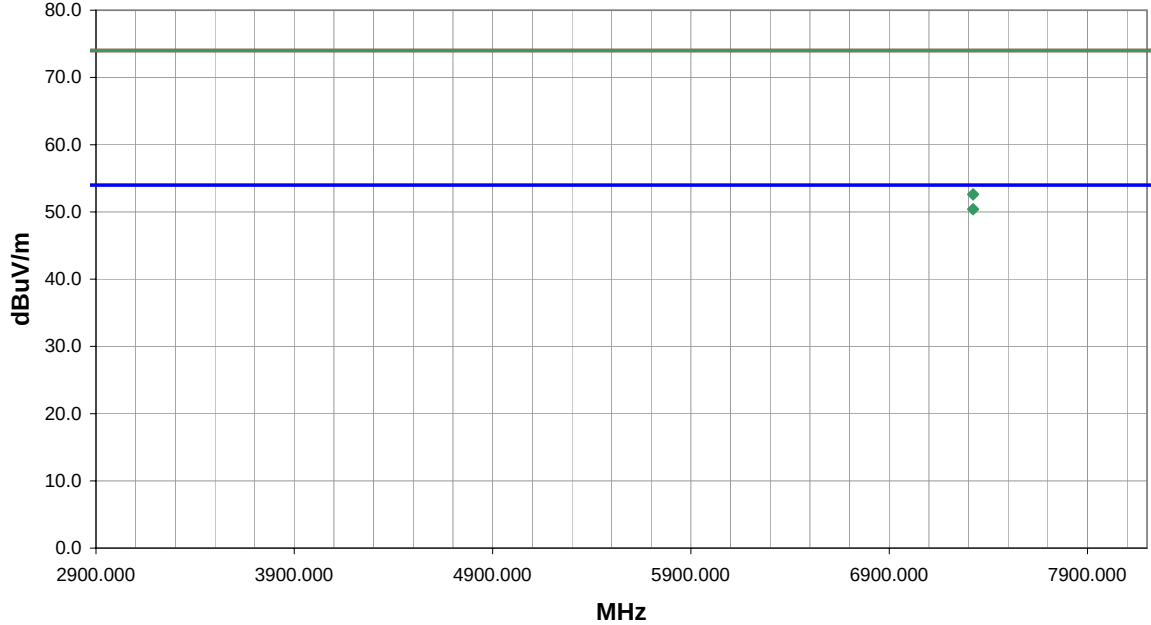
Completed by:

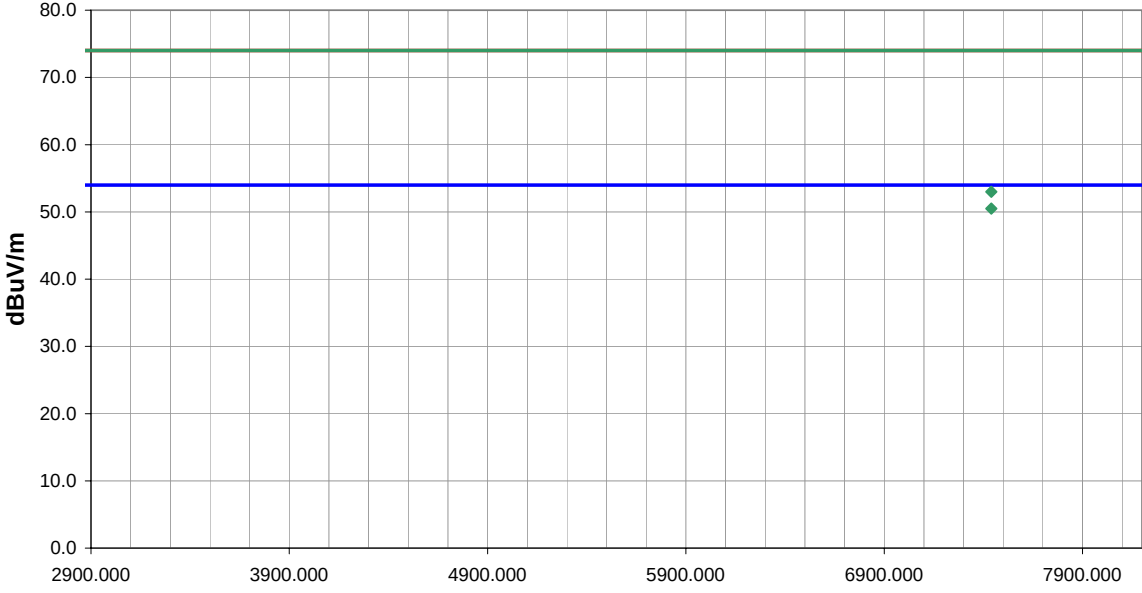


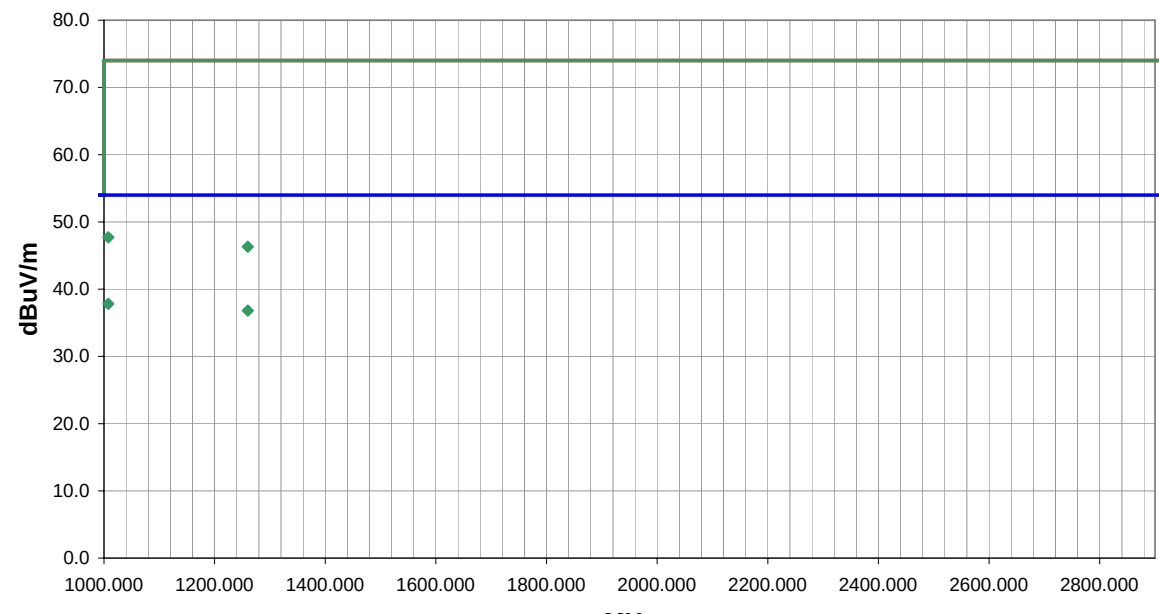
NORTHWEST EMC		RADIATED EMISSIONS DATA SHEET		ACQ 2005.1.3 EMI 2005.1.3								
EUT: VMVL2.1a			Work Order: 7LAY0038									
Serial Number: MV42001005			Date: 03/22/05									
Customer: Visteon			Temperature: 21									
Attendees: none			Humidity: 45%									
Cust. Ref. No.: N/A			Barometric Pressure: 29.84									
Tested by: Jonathan Peng		Power: 12VDC	Job Site: OC10									
TEST SPECIFICATIONS												
Specification: FCC 15.247(d) Spurious Radiated Emissions:2004		Method: ANSI C63.4:2003										
SAMPLE CALCULATIONS												
Radiated Emissions: Field Strength = Measured Level + Antenna Factor + Cable Factor - Amplifier Gain + Distance Adjustment Factor + External Attenuation												
Conducted Emissions: Adjusted Level = Measured Level + Transducer Factor + Cable Attenuation Factor + External Attenuator												
COMMENTS												
Low Channel - 2.402 GHz												
EUT OPERATING MODES												
Typical Operating Mode												
DEVIATIONS FROM TEST STANDARD												
No deviations.												
RESULTS			Test Distance (m)	Run #								
Pass			3	1								
Other			 Tested By:									
												
Freq (MHz)	Amplitude (dBuV)	Preamp (dB)	Chamber (dB)	Transducer (dB)	Cable (dB)	External Attenuation (dB)	Polarity/ Transducer Type	Detector (blank equal peaks [pk] from scan)	Distance Adjustment (dB)	Adjusted dBuV/m	Spec. Limit dBuV/m	Compared to Spec. (dB)
7206.087	42.6	33.0	0.0	36.0	8.3	0.0	V-Horn	AV	0.0	53.9	54.0	-0.1
7206.087	43.9	33.0	0.0	36.0	8.3	0.0	V-Horn	PK	0.0	55.2	74.0	-18.8

NORTHWEST EMC		RADIATED EMISSIONS DATA SHEET		ACQ 2005.1.3 EMI 2005.1.3								
EUT: VMVL2.1a			Work Order: 7LAY0038									
Serial Number: MV42001005			Date: 03/22/05									
Customer: Visteon			Temperature: 21									
Attendees: none			Humidity: 45%									
Cust. Ref. No.: N/A			Barometric Pressure: 29.84									
Tested by: Jonathan Peng		Power: 12VDC	Job Site: OC10									
TEST SPECIFICATIONS												
Specification: FCC 15.247(d) Spurious Radiated Emissions:2004		Method: ANSI C63.4:2003										
SAMPLE CALCULATIONS												
Radiated Emissions: Field Strength = Measured Level + Antenna Factor + Cable Factor - Amplifier Gain + Distance Adjustment Factor + External Attenuation												
Conducted Emissions: Adjusted Level = Measured Level + Transducer Factor + Cable Attenuation Factor + External Attenuator												
COMMENTS												
Low Channel - 2.402 GHz												
EUT OPERATING MODES												
Typical Operating Mode												
DEVIATIONS FROM TEST STANDARD												
No deviations.												
RESULTS			Test Distance (m)	Run #								
Pass			3	2								
Other			 Tested By:									
												
Freq (MHz)	Amplitude (dBuV)	Preamp (dB)	Chamber (dB)	Transducer (dB)	Cable (dB)	External Attenuation (dB)	Polarity/ Transducer Type	Detector (blank equal peaks [pk] from scan)	Distance Adjustment (dB)	Adjusted dBuV/m	Spec. Limit dBuV/m	Compared to Spec. (dB)
1259.355	29.9	33.9	0.0	26.1	3.5	10.0	H-Horn	AV	0.0	35.6	54.0	-18.4
1259.355	39.4	33.9	0.0	26.1	3.5	10.0	H-Horn	PK	0.0	45.1	74.0	-28.9

NORTHWEST EMC		RADIATED EMISSIONS DATA SHEET		ACQ 2005.1.3 EMI 2005.1.3								
EUT: VMVL2.1a			Work Order: 7LAY0038									
Serial Number: MV42001005			Date: 03/22/05									
Customer: Visteon			Temperature: 21									
Attendees: none			Humidity: 45%									
Cust. Ref. No.: N/A			Barometric Pressure: 29.84									
Tested by: Jonathan Peng		Power: 12VDC		Job Site: OC10								
TEST SPECIFICATIONS												
Specification: FCC 15.247(d) Spurious Radiated Emissions:2004			Method: ANSI C63.4:2003									
SAMPLE CALCULATIONS												
Radiated Emissions: Field Strength = Measured Level + Antenna Factor + Cable Factor - Amplifier Gain + Distance Adjustment Factor + External Attenuation												
Conducted Emissions: Adjusted Level = Measured Level + Transducer Factor + Cable Attenuation Factor + External Attenuator												
COMMENTS												
Middle Channel - 2.441 GHz												
EUT OPERATING MODES												
Typical Operating Mode												
DEVIATIONS FROM TEST STANDARD												
No deviations.												
RESULTS			Test Distance (m)		Run #							
Pass			3		3							
Other												
			 Tested By:									
												
Freq (MHz)	Amplitude (dBuV)	Preamp (dB)	Chamber (dB)	Transducer (dB)	Cable (dB)	External Attenuation (dB)	Polarity/ Transducer Type	Detector (blank equal peaks [pk] from scan)	Distance Adjustment (dB)	Adjusted dBuV/m	Spec. Limit dBuV/m	Compared to Spec. (dB)
1259.725	28.3	33.9	0.0	26.1	3.5	10.0	H-Horn	AV	0.0	34.0	54.0	-20.0
1259.725	37.5	33.9	0.0	26.1	3.5	10.0	H-Horn	PK	0.0	43.2	74.0	-30.8

NORTHWEST EMC		RADIATED EMISSIONS DATA SHEET		ACQ 2005.1.3 EMI 2005.1.3								
EUT: VMVL2.1a			Work Order: 7LAY0038									
Serial Number: MV42001005			Date: 03/22/05									
Customer: Visteon			Temperature: 21									
Attendees: none			Humidity: 45%									
Cust. Ref. No.: N/A			Barometric Pressure: 29.84									
Tested by: Jonathan Peng		Power: 12VDC	Job Site: OC10									
TEST SPECIFICATIONS												
Specification: FCC 15.247(d) Spurious Radiated Emissions:2004		Method: ANSI C63.4:2003										
SAMPLE CALCULATIONS												
Radiated Emissions: Field Strength = Measured Level + Antenna Factor + Cable Factor - Amplifier Gain + Distance Adjustment Factor + External Attenuation												
Conducted Emissions: Adjusted Level = Measured Level + Transducer Factor + Cable Attenuation Factor + External Attenuator												
COMMENTS												
Middle Channel - 2.441 GHz												
EUT OPERATING MODES												
Typical Operating Mode												
DEVIATIONS FROM TEST STANDARD												
No deviations.												
RESULTS			Test Distance (m)	Run #								
Pass			3	4								
Other			 Tested By:									
												
Freq (MHz)	Amplitude (dBuV)	Preamp (dB)	Chamber (dB)	Transducer (dB)	Cable (dB)	External Attenuation (dB)	Polarity/ Transducer Type	Detector (blank equal peaks [pk] from scan)	Distance Adjustment (dB)	Adjusted dBuV/m	Spec. Limit dBuV/m	Compared to Spec. (dB)
7323.175	38.7	33.0	0.0	36.3	8.4	0.0	H-Horn	AV	0.0	50.4	54.0	-3.6
7323.112	40.9	33.0	0.0	36.3	8.4	0.0	H-Horn	PK	0.0	52.6	74.0	-21.4

NORTHWEST EMC		RADIATED EMISSIONS DATA SHEET		ACQ 2005.1.3 EMI 2005.1.3								
EUT: VMVL2.1a			Work Order: 7LAY0038									
Serial Number: MV42001005			Date: 03/22/05									
Customer: Visteon			Temperature: 21									
Attendees: none			Humidity: 45%									
Cust. Ref. No.: N/A			Barometric Pressure: 29.84									
Tested by: Jonathan Peng		Power: 12VDC		Job Site: OC10								
TEST SPECIFICATIONS												
Specification: FCC 15.247(d) Spurious Radiated Emissions:2004			Method: ANSI C63.4:2003									
SAMPLE CALCULATIONS												
Radiated Emissions: Field Strength = Measured Level + Antenna Factor + Cable Factor - Amplifier Gain + Distance Adjustment Factor + External Attenuation												
Conducted Emissions: Adjusted Level = Measured Level + Transducer Factor + Cable Attenuation Factor + External Attenuator												
COMMENTS												
High Channel - 2.480 GHz												
EUT OPERATING MODES												
Typical Operating Mode												
DEVIATIONS FROM TEST STANDARD												
No deviations.												
RESULTS			Test Distance (m)		Run #							
Pass			3		5							
Other												
			 Tested By:									
												
Freq (MHz)	Amplitude (dBuV)	Preamp (dB)	Chamber (dB)	Transducer (dB)	Cable (dB)	External Attenuation (dB)	Polarity/ Transducer Type	Detector (blank equal peaks [pk] from scan)	Distance Adjustment (dB)	Adjusted dBuV/m	Spec. Limit dBuV/m	Compared to Spec. (dB)
7440.132	38.4	33.0	0.0	36.6	8.5	0.0	H-Horn	AV	0.0	50.5	54.0	-3.5
7440.007	40.9	33.0	0.0	36.6	8.5	0.0	H-Horn	PK	0.0	53.0	74.0	-21.0

NORTHWEST EMC		RADIATED EMISSIONS DATA SHEET		ACQ 2005.1.3 EMI 2005.1.3								
EUT: VMVL2.1a			Work Order: 7LAY0038									
Serial Number: MV42001005			Date: 03/22/05									
Customer: Visteon			Temperature: 21									
Attendees: none			Humidity: 45%									
Cust. Ref. No.: N/A			Barometric Pressure: 29.84									
Tested by: Jonathan Peng		Power: 12VDC		Job Site: OC10								
TEST SPECIFICATIONS												
Specification: FCC 15.247(d) Spurious Radiated Emissions:2004			Method: ANSI C63.4:2003									
SAMPLE CALCULATIONS												
Radiated Emissions: Field Strength = Measured Level + Antenna Factor + Cable Factor - Amplifier Gain + Distance Adjustment Factor + External Attenuation												
Conducted Emissions: Adjusted Level = Measured Level + Transducer Factor + Cable Attenuation Factor + External Attenuator												
COMMENTS												
High Channel - 2.480 GHz												
EUT OPERATING MODES												
Typical Operating Mode												
DEVIATIONS FROM TEST STANDARD												
No deviations.												
RESULTS			Test Distance (m)		Run #							
Pass			3		6							
Other			 Tested By:									
												
Freq (MHz)	Amplitude (dBuV)	Preamp (dB)	Chamber (dB)	Transducer (dB)	Cable (dB)	External Attenuation (dB)	Polarity/ Transducer Type	Detector (blank equal peaks [pk] from scan)	Distance Adjustment (dB)	Adjusted dBuV/m	Spec. Limit dBuV/m	Compared to Spec. (dB)
1007.837	32.7	34.0	0.0	25.9	3.2	10.0	H-Horn	AV	0.0	37.8	54.0	-16.2
1259.990	31.1	33.9	0.0	26.1	3.5	10.0	H-Horn	AV	0.0	36.8	54.0	-17.2
1007.837	42.6	34.0	0.0	25.9	3.2	10.0	H-Horn	PK	0.0	47.7	74.0	-26.3
1259.990	40.6	33.9	0.0	26.1	3.5	10.0	H-Horn	PK	0.0	46.3	74.0	-27.7

NORTHWEST		RADIATED EMISSIONS DATA SHEET				ACQ 2005.1.3 EMI 2005.1.3						
EMC												
EUT: VMVL2.1a		Work Order: 7LAY0038										
Serial Number: MV42001173		Date: 03/25/05										
Customer: Visteon		Temperature: 20										
Attendees: none		Humidity: 44%										
Cust. Ref. No.: N/A		Barometric Pressure: 30.08										
Tested by: Jonathan Peng		Power: 12VDC		Job Site: OC10								
TEST SPECIFICATIONS												
Specification: FCC 15.247(d) Spurious Radiated Emissions:2004		Method: ANSI C63.4:2003										
SAMPLE CALCULATIONS												
Radiated Emissions: Field Strength = Measured Level + Antenna Factor + Cable Factor - Amplifier Gain + Distance Adjustment Factor + External Attenuation												
Conducted Emissions: Adjusted Level = Measured Level + Transducer Factor + Cable Attenuation Factor + External Attenuator												
COMMENTS												
High Channel - 2.480 GHz												
EUT OPERATING MODES												
Typical Operating Mode												
DEVIATIONS FROM TEST STANDARD												
No deviations.												
RESULTS						Run #						
Pass						88						
Other												
						Tested By: _____						
Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Azimuth (degrees)	Height (meters)	Distance (meters)	External Attenuation (dB)	Polarity	Detector	Distance Adjustment (dB)	Adjusted dBuV/m	Spec. Limit dBuV/m	Compared to Spec. (dB)
2483.500	28.7	-0.2	148.0	1.3	3.0	20.0	H-Horn	AV	0.0	48.5	54.0	-5.5
2483.500	26.1	-0.2	208.0	1.0	3.0	20.0	V-Horn	AV	0.0	45.9	54.0	-8.1
2483.500	41.1	-0.2	208.0	1.0	3.0	20.0	V-Horn	PK	0.0	60.9	74.0	-13.1
2483.500	40.2	-0.2	148.0	1.3	3.0	20.0	H-Horn	PK	0.0	60.0	74.0	-14.0
2483.500	-3.4	-0.2	148.0	1.3	3.0	20.0	H-Horn	AV	0.0	16.4	54.0	-37.6
2483.500	-3.5	-0.2	208.0	1.0	3.0	20.0	V-Horn	AV	0.0	16.3	54.0	-37.7

BLUETOOTH APPROVALS
FCC Procedure Received from Joe Dichoso on 2-15-02

The following exhibit indicates the FCC Spread Spectrum requirements in Section 15.247 for devices meeting the Bluetooth Specifications in the 2.4 GHz band as of February 2001 operating in the USA. The purpose of this exhibit is to help expedite the approval process for Bluetooth devices. This exhibit provides items that vary for each device and also provides a list of items that are common to Bluetooth devices that explains the remaining requirements. The list of common items can be submitted for each application for equipment authorization. This exhibit only specifies requirements in Section 15.247, requirements in other rule Sections for intentional radiators such as in Section 15.203 or 15.207 must be also be addressed. A Bluetooth device is a FHSS transmitter in the data mode and applies as a Hybrid spread spectrum device in the acquisition mode.

For each individual device, the following items, 1-7 will vary from one device to another and must be submitted.

- 1) The occupied bandwidth in Section 15.247(a)(1)(ii).
- 2) Conducted output power specified in Section 15.247(b)(1).
- 3) EIRP limit in Section 15.247(b)(3).
- 4) RF safety requirement in Section 15.247(b)(4)
- 5) Spurious emission limits in Section 15.247(c).
- 6) Processing gain and requirements for Hybrids in Section 15.247(f) in the acquisition mode.
- 7) Power spectral density requirement in Section 15.247(f) in the acquisition mode.

For all devices, the following items, 1-12, are common to all Bluetooth devices and will not vary from one device to another. This list can be copied into the filing.

1 Output power and channel separation of a Bluetooth device in the different operating modes:

The different operating modes (data-mode, acquisition-mode) of a Bluetooth device don't influence the output power and the channel spacing. There is only one transmitter which is driven by identical input parameters concerning these two parameters. Only a different hopping sequence will be used. For this reason, the RF parameters in one op-mode is sufficient.

2 Frequency range of a Bluetooth device:

The maximum frequency of the device is: **2402 – 2480 MHz**.

This is according the Bluetooth Core Specification V 1.0B (+ critical errata) for devices which will be operated in the USA. Other frequency ranges (e.g. for Spain, France, Japan) which are allowed according the Core Specification must **not be** supported by the device.

3 Co-ordination of the hopping sequence in data mode to avoid simultaneous occupancy by multiple transmitters:

Bluetooth units which want to communicate with other units must be organized in a structure called piconet. This piconet consist of max. 8 Bluetooth units. One unit is the master the other seven are the slaves. The master co-ordinates frequency occupation in this piconet for all units. As the master hop sequence is derived from it's BD address which is unique for every Bluetooth device, additional masters intending to establish new piconets will always use different hop sequences.

4 Example of a hopping sequence in data mode:

Example of a 79 hopping sequence in data mode:

40, 21, 44, 23, 42, 53, 46, 55, 48, 33, 52, 35, 50, 65, 54, 67,
56, 37, 60, 39, 58, 69, 62, 71, 64, 25, 68, 27, 66, 57, 70, 59,
72, 29, 76, 31, 74, 61, 78, 63, 01, 41, 05, 43, 03, 73, 07, 75,
09, 45, 13, 47, 11, 77, 15, 00, 64, 49, 66, 53, 68, 02, 70, 06,
01, 51, 03, 55, 05, 04

5 Equally average use of frequencies in data mode and short transmissions:

The generation of the hopping sequence in connection mode depends essentially on two input values:

1. LAP/UAP of the master of the connection
2. Internal master clock

The LAP (lower address part) are the 24 LSB's of the 48 BD_ADDRESS. The BD_ADDRESS is an unambiguous number of every Bluetooth unit. The UAP (upper address part) are the 24 MSB's of the 48 BD_ADDRESS. The internal clock of a Bluetooth unit is derived from a free running clock which is never adjusted and is never turned off. For synchronization with other units, only the offsets are used. It has no relation to the time of the day. Its resolution is at least half the RX/TX slot length of 312.5 μ s. The clock has a cycle of about one day (23h30). In most case it is implemented as 28 bit counter. For the deriving of the hopping sequence the entire LAP (24 bits), 4 LSB's (4 bits) (Input 1) and the 27 MSB's of the clock (Input 2) are used. With this input values different mathematical procedures (permutations, additions, XOR-operations) are performed to generate the sequence. This will be done at the beginning of every new transmission.

Regarding short transmissions, the Bluetooth system has the following behavior:

The first connection between the two devices is established, a hopping sequence is generated. For transmitting the wanted data, the complete hopping sequence is not used and the connection ends. The second connection will be established. A new hopping sequence is generated. Due to the fact that the Bluetooth clock has a different value, because the period between the two transmission is longer (and it cannot be shorter) than the minimum resolution of the clock (312.5 μ s). The hopping sequence will always differ from the first one.

6 Receiver input bandwidth, synchronization and repeated single or multiple packets:

The input bandwidth of the receiver is 1 MHz.

In every connection, one Bluetooth device is the master and the other one is the slave. The master determines the hopping sequence (see chapter 5). The slave follows this sequence. Both devices shift between RX and TX time slot according to the clock of the master. Additionally the type of connection (e.g. single or multi-slot packet) is set up at the beginning of the connection. The master adapts its hopping frequency and its TX/RX timing is according to the packet type of the connection. Also, the slave of the connection uses these settings. Repeating of a packet has no influence on the hopping sequence. The hopping sequence generated by the master of the connection will be followed in any case. That means, a repeated packet will not be send on the same frequency, it is send on the next frequency of the hopping sequence

7 Dwell time in data mode

The dwell time of 0.3797s within a 30 second period in data mode is independent from the packet type (packet length). The calculation for a 30 second period is as follows:

Dwell time = time slot length * hop rate / number of hopping channels * 30s

Example for a DH1 packet (with a maximum length of one time slot)

Dwell time = 625 μ s * 1600 1/s / 79 * 30s = 0.3797s (in a 30s period)

For multi-slot packet the hopping is reduced according to the length of the packet.
Example for a DH5 packet (with a maximum length of five time slots)
 $\text{Dwell time} = 5 * 625 \mu\text{s} * 1600 * 1/5 * 1/\text{s} / 79 * 30\text{s} = 0.3797\text{s}$ (in a 30s period)
This is according the Bluetooth Core Specification V 1.0B (+ critical errata) for all Bluetooth devices. Therefore, all Bluetooth devices **comply** with the FCC dwell time requirement in the data mode.

This was checked during the Bluetooth Qualification tests.

The Dwell time in hybrid mode is approximately 2.6 mS (in a 12.8s period)

8 Channel Separation in hybrid mode

The nominal channel spacing of the Bluetooth system is 1Mhz independent of the operating mode.

The maximum "initial carrier frequency tolerance" which is allowed for Bluetooth is $f_{\text{center}} = 75 \text{ kHz}$.

This was checked during the Bluetooth Qualification tests (Test Case: TRM/CA/07-E) for three frequencies (2402, 2441, 2480 MHz).

9 Derivation and examples for a hopping sequence in hybrid mode

For the generation of the inquiry and page hop sequences the same procedures as described for the data mode are used (see item 5), but this time with different input vectors:

****For the inquiry hop sequence, a predefined fixed address is always used. This results in the same 32 frequencies used by all devices doing an inquiry but every time with a different start frequency and phase in this sequence.**

****For the page hop sequence, the device address of the paged unit is used as the input vector. This results in the use of a subset of 32 frequencies which is specific for that initial state of the connection establishment between the two units. A page to different devices would result in a different subset of 32 frequencies.**

So it is ensured that also in hybrid mode, the frequency is used equally on average.

Example of a hopping sequence in inquiry mode:

48, 50, 09, 13, 52, 54, 41, 45, 56, 58, 11, 15, 60, 62, 43, 47, 00, 02, 64, 68, 04, 06, 17, 21, 08, 10, 66, 70, 12, 14, 19, 23

Example of a hopping sequence in paging mode:

08, 57, 68, 70, 51, 02, 42, 40, 04, 61, 44, 46, 63, 14, 50, 48, 16, 65, 52, 54, 67, 18, 58, 56, 20, 53, 60, 62, 55, 06, 66, 64

10 Receiver input bandwidth and synchronization in hybrid mode:

The receiver input bandwidth is the same as in the data mode (1 MHz). When two Bluetooth devices establish contact for the first time, one device sends an inquiry access code and the other device is scanning for this inquiry access code. If two devices have been connected previously and want to start a new transmission, a similar procedure takes place. The only difference is, instead of the inquiry access code, a special access code, derived from the BD_ADDRESS of the paged device will be, will be sent by the master of this connection. Due to the fact that both units have been connected before (in the inquiry procedure) the paging unit has timing and frequency information about the page scan of the paged unit. For this reason the time to establish the connection is reduced.

11 Spread rate / data rate of the direct sequence signal

The Spread rate / Data rate in inquiry and paging mode can be defined via the access code. The access code is the only criterion for the system to check if there is a valid transmission or not. If you regard the presence of a valid access code as one bit of information, and compare it with the length of the access code of 68 bits, the Spread rate / Data rate will be 68/1.

12 Spurious emission in hybrid mode

The Dwell in hybrid mode is shorter than in data mode. For this reason the spurious emissions average level in data mode is worst case. The spurious emissions peak level is the same for both modes.