Polyvision Corp.

BTTX01

Test Report

May 23, 2003

Report No. POLV0037

Report Prepared By:

1-888-EMI-CERT

NORTHWEST EMC

22975 NW Evergreen Parkway
Suite 400
Hillsboro, Oregon 97124

Certificate of Test

Issue Date: May 23, 2003
Polyvision Corp.
Model : BTTX01

Emissions

Description	Pass	Fail
FCC 15.247, Spurious Radiated Emissions	☒	☐
FCC 15.247, Output Power	☒	☐
FCC 15.247, Band Edge Compliance	☒	☐
FCC 15.247, Spurious Conducted Emissions	☒	☐
FCC 15.247, Power Spectral Density	☒	☐
FCC 15.247, Occupied Bandwidth	☒	☐
FCC 15.207, AC Power Line Conducted Emissions	☒	☐

The equipment was tested in the configuration and mode(s) of operation provided by the client. The specific tests and test levels were specified by the client. Any additional tests, or product configurations that should be tested are the responsibility of the client. Product compliance is the responsibility of the client.

Modifications made to the product

- See the modifications page of the report

Deviations to the test standard

- No deviations were made to standard test methods.

Test Facility

- The measurement facility used to collect the data is located at:
  Northwest EMC, Inc.; 22975 NW Evergreen Parkway, Suite 400; Hillsboro, OR 97124
  Phone: (503) 844-4066 Fax: 844-3826
  This site has been fully described in a report filed with the FCC (Federal Communications Commission), and accepted by the FCC in a letter maintained in our files.

Approved By:

Don Facteau, IS Manager

This Report may only be duplicated in its entirety. The results of this test pertain only to the sample(s) tested, the specific description is noted in each of the individual sections of the test report supporting this certificate of test.

Revision Number	Description	Date	Page Number
00	None		

FCC: The Open Area Test Sites, and conducted measurement facilities, have been fully described in reports filed with the FCC and accepted by the FCC in letters maintained in our files.

TCB: Northwest EMC has been accredited by ANSI to ISO/IEC Guide 65 as a product certifier. We have been designated by the FCC as a Telecommunications Certification Body (TCB). This allows Northwest EMC to certify transmitters to FCC specifications in accordance with 47 CFR 2.960 and 2.962.

A2LA: Accreditation has been granted to Northwest EMC, Inc. to perform the Electromagnetic Compatibility (EMC) tests described in the Scope of Accreditation. Assessment performed to ISO/IEC 17025.
Certificate Number: 1936-01, Certificate Number: 1936-02, Certificate Number 1936-03

Australia/New Zealand: The National Association of Testing Authorities (NATA), Australia has been appointed by the ACA as an accreditation body to accredit test laboratories and competent bodies for EMC standards. Accredited test reports or assessments by competent bodies must carry the NATA logo. Test reports made by an overseas laboratory that has been accredited for the relevant standards by an overseas accreditation body that has a Mutual Recognition Agreement (MRA) with NATA are also accepted as technical grounds for product conformity. The report should be endorsed with the respective logo of the accreditation body. (A2LA)

TÜV Product Service: Included in TUV Product Service Group's Listing of Recognized Laboratories. It qualifies in connection with the TUV Certification after Recognition of Agent's Testing Program for the product categories and/or standards shown in TUV's current Listing of CARAT Laboratories available from TUV. A certificate was issued to represent that this laboratory continues to meet TUV's CARAT Program requirements.
Certificate No. USA0302C

TÜV Rheinland: Authorized to carryout EMC tests by order and under supervision of TÜV Rheinland. This authorization is based on "Conditions for EMC-Subcontractors" of November 1992.

NEMKO: Assessed and accredited by NEMKO (Norwegian testing and certification body) for European emissions and immunity testing. As a result of NEMKO's laboratory assessment, they will accept test results from Northwest EMC, Inc. for product certification (Authorization No. ELA 119).

Technology International: Assessed in accordance with ISO Guide 25 defining the general international requirements for the competence of calibration and testing laboratories and with ITI assessment criteria LACO196. Based upon that assessment Interference Technology International, Ltd., has granted approval for specifications implementing the EU Directive on EMC (89/336/EEC and amendments). The scope of the approval was provided on a Schedule of Assessment supplied with the certificate and is available upon request.

Industry Canada: Accredited by Industry Canada for performance of radiated measurements. Our open area test sites comply with RSP 100, Issue 7, section 3.3.

VCCI: Accepted as an Associate Member to the VCCI, Acceptance No. 564. Conducted and radiated measurement facilities have been registered in accordance with Regulations for Voluntary Control Measures, Article 8. *(Registration Nos. - Evergreen: C-1071 and R-1025, Trails End: C-694 and R-677, Sultan: C-905, R-871 and R-1172, North Sioux City C-1246, R-1185 and R-1217)*

BSMI: Northwest EMC has been designated by NIST and validated by C-Taipei (BSMI) as a CAB to conduct tests as described in the APEC Mutual Recognition Agreement. License No.SL2-IN-E-1017.

CAB: Designated by NIST and validated by the European Commission as a Conformity Assessment Body (CAB) to conduct tests and approve products to the EMC directive and transmitters to the R&TTE directive, as described in the U.S. - EU Mutual Recognition Agreement

GOST: Northwest EMC, Inc. has been assessed and accredited by the Russian Certification bodies Certinform VNIINMASH, CERTINFO, SAMTES, and Federal CHEC, to perform EMC and Hygienic testing for Information Technology Products. As a result of their laboratory assessment, they will accept test results from Northwest EMC, Inc. for product certification

Scope of Accreditations

	FCC	NIST	TUV PS	TUV Rheinland	Nemko	Technology International	Industry Canada	BSMI	VCCI	GOST	NATA
IEC 1000-4-2			✓	✓	✓	✓					
IEC 1000-4-3			✓	✓	✓	✓					
IEC 1000-4-4			✓	✓	✓	✓					
IEC 1000-4-5			✓	✓	✓	✓					
IEC 1000-4-6			✓	✓	✓	✓					
IEC 1000-4-8			✓	✓	✓	✓					
IEC 1000-4-11			✓	✓	✓	✓					
IEC 1000-3-2			✓	✓	✓	✓					
IEC 1000-3-3			✓	✓	✓	✓					
AS/NZS 3548											✓
CNS 13438								✓			
ISO/IEC Guide 25			✓	✓	✓	✓		✓			
ISO/IEC17025			✓	✓	✓	✓					
Radiated Emissions			✓	✓	✓	✓	✓	✓	✓	✓	
Conducted Emissions			✓	✓	✓	✓	✓	✓	✓	✓	
OATS Sites	✓		✓	✓	✓	✓	✓	✓	✓	✓	
Hillsboro 5-Meter Chamber (EV01)	✓		✓	✓	✓	✓	✓	✓	✓	✓	
TCB for Licensed Transmitters	✓										
TCB for un-Licensed Transmitters	✓										
Cab for R&TTE		✓									
CAB for EMC		✓									

What is measurement uncertainty?

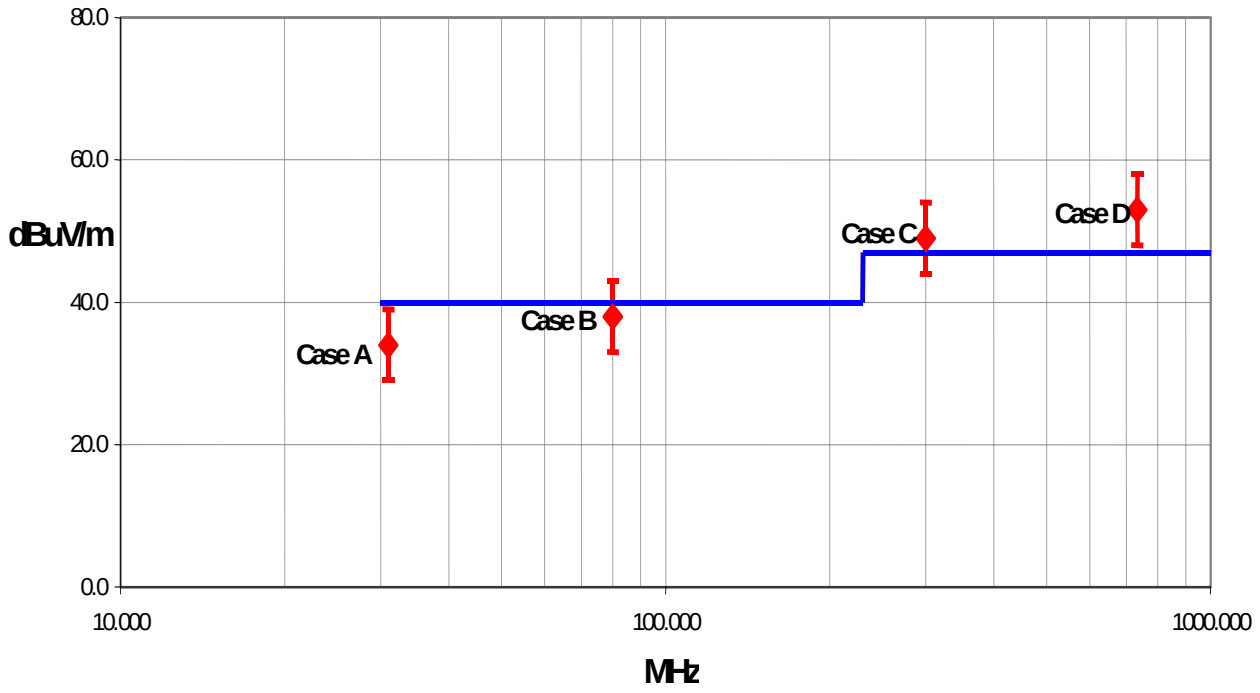
When a measurement is made, the result will be different from the true or theoretically correct value. The difference is the result of tolerances in the measurement system that cannot be completely eliminated. To the extent that technology allows us, it has been our aim to minimize this error. The following statement of measurement uncertainty is used to reflect the accuracy of the measured result as compared with its "true" value. In the case of transient tests (ESD, EFT, Surge, Voltage Dips and Interruptions), the test equipment has been demonstrated by calibration to provide at least a 95% confidence that it complies with the test specification requirements.

The following documents were the basis for determining the uncertainty levels of our measurements:

- "ISO Guide to the Expression of Uncertainty in Measurements", October 1993
- "NIS81: The Treatment of Uncertainty in EMC Measurements", May 1994
- "IEC CISPR 16-3 A1 f1 Ed.1: Radio-interference measurements and statistical techniques", December 2000

How might measurement uncertainty be applied to test results?

If the diamond marks the measured value for the test and the vertical bars bracket the range of + and – measurement uncertainty, then test results can be interpreted from the diagram below.



Test Result Scenarios:
Case A: Product complies.
Case B: Product conditionally complies. It is not possible to say with 95% confidence that the product complies.
Case C: Product conditionally does not comply. It is not possible to say with 95% confidence that the product does not comply.
Case D: Product does not comply.

Radiated Emissions ≤ 1 GHz

Value (dB)

Test Distance	Probability Distribution	Biconical Antenna 3m	Biconical Antenna 10m	Log Periodic Antenna 3m	Log Periodic Antenna 10m	Dipole Antenna 3m	Dipole Antenna 10m
Combined standard uncertainty $u_c(y)$	normal	+ 1.86 - 1.88	+ 1.82 - 1.87	+ 2.23 - 1.41	+ 1.29 - 1.26	+ 1.31 - 1.27	+ 1.25 - 1.25
Expanded uncertainty **U** (level of confidence ≈ 95%)	normal (k=2)	+ 3.72 - 3.77	+ 3.64 - 3.73	+ 4.46 -2.81	+ 2.59 - 2.52	+ 2.61 - 2.55	+ 2.49 - 2.49

Radiated Emissions > 1 GHz

Value (dB)

	Probability Distribution	Without High Pass Filter	With High Pass Filter
Combined standard uncertainty $u_c(y)$	normal	+ 1.29 - 1.25	+ 1.38 - 1.35
Expanded uncertainty **U** (level of confidence ≈ 95%)	normal (k=2)	+ 2.57 - 2.51	+ 2.76 - -2.70

Conducted Emissions

	Probability Distribution	Value (+/- dB)
Combined standard uncertainty ***uc(y)***	normal	1.48
Expanded uncertainty **U** (level of confidence ≈ 95 %)	normal (k = 2)	2.97

Radiated Immunity

	Probability Distribution	Value (+/- dB)
Combined standard uncertainty ***uc(y)***	normal	1.05
Expanded uncertainty **U** (level of confidence ≈ 95 %)	normal (k = 2)	2.11

Conducted Immunity

	Probability Distribution	Value (+/- dB)
Combined standard uncertainty ***uc(y)***	normal	1.05
Expanded uncertainty **U** (level of confidence ≈ 95 %)	normal (k = 2)	2.10

Legend

$u_c(y)$ = square root of the sum of squares of the individual standard uncertainties

U = combined standard uncertainty multiplied by the coverage factor: **k**. This defines an interval about the measured result that will encompass the true value with a confidence level of approximately 95%. If a higher level of confidence is required, then k=3 (CL of 99.7%) can be used. Please note that with a coverage factor of one, uc(y) yields a confidence level of only 68%.

California

Orange County Facility

41 Tesla Ave.
Irvine, CA 92618
(888) 364-2378
FAX (503) 844-3826

Oregon

Evergreen Facility

22975 NW Evergreen Pkwy.,
Suite 400
Hillsboro, OR 97124
(503) 844-4066
FAX (503) 844-3826

Oregon

Trails End Facility

30475 NE Trails End Lane
Newberg, OR 97132
(503) 844-4066
FAX (503) 537-0735

South Dakota

North Sioux City Facility

745 N. Derby Lane
P.O. Box 217
North Sioux City, SD 57049
(605) 232-5267
FAX (605) 232-3873

Washington

Sultan Facility

14128 339th Ave. SE
Sultan, WA 98294
(888) 364-2378
FAX (360) 793-2536

Party Requesting the Test

Company Name:	Polyvision Corp.
Address:	14523 SW Millikan Way Ste. 130
City, State, Zip:	Beaverton, OR, 97005
Test Requested By:	Jeff Traw
Model:	BTTX01
First Date of Test:	5-13-2003
Last Date of Test:	5-15-2003
Receipt Date of Samples:	5-13-2003
Equipment Design Stage:	Pre-Production
Equipment Condition:	No visual damage.

Information Provided by the Party Requesting the Test

Clocks/Oscillators:	None provided at time of test
I/O Ports:	Serial

Functional Description of the EUT (Equipment Under Test):

Bluetooth module.

Client Justification for EUT Selection:

The product is an engineering sample, representative of the final product.

Client Justification for Test Selection

These tests satisfy the requirements for FCC Part 15.247

Other Information:

None provided at time of test.

Equipment modifications				
Item #	Test	Date	Modification	Note
1	Radiated Emissions	05-13-2003	No EMI suppression devices were added or modified during this test.	Same configuration as delivered.
2	Conducted Emissions	05-13-2003	No EMI suppression devices were added or modified during this test.	Same configuration as in previous test.
3	Output Power	05-15-2003	No EMI suppression devices were added or modified during this test.	Same configuration as in previous test.
4	Spurious RF Conducted Emissions	05-15-2003	No EMI suppression devices were added or modified during this test.	Same configuration as in previous test.
5	Band Edge Compliance	05-15-2003	No EMI suppression devices were added or modified during this test.	Same configuration as in previous test.
6	Occupied Bandwidth	05-15-2003	No EMI suppression devices were added or modified during this test.	Same configuration as in previous test.
7	Power Spectral Density	05-15-2003	No EMI suppression devices were added or modified during this test.	Same configuration as in previous test.

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:
120 VAC, 60 Hz.

Software\Firmware Applied During Test			
Exercise software	Standard Production Firmware	Version	5.2
Description			
The system was tested using standard operating production firmware to exercise the functions of the device during the testing. The firmware was operated via the serial interface from Windows Hyper Terminal.			

EUT and Peripherals

Description	Manufacturer	Model/Part Number	Serial Number
Bluetooth Module	Polyvision Corp.	BTTX01	Unknown
AC power adapter	Ault	P41050400A012G	N/A
Antenna	Gigant	Titanis	N/A

Cables

Cable Type	Shield	Length (m)	Ferrite	Connection 1	Connection 2
DC power	No	1.0	No	Bluetooth Module	AC power adapter
Serial	Yes	4.5	No	Bluetooth Module	Unterminated

PA = Cable is permanently attached to the device. Shielding and/or presence of ferrite may be unknown.

Measurement Equipment

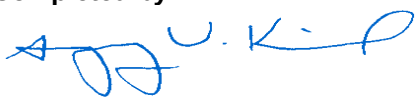
Description	Manufacturer	Model	Identifier	Last Cal	Interval
Spectrum Analyzer	Tektronix	2784	AAO	02/26/2003	24 mo

Test Description

Requirement: Per 47 CFR 15.247(a)(1)(ii), the 20 dB bandwidth of a hopping channel must be less than 1 MHz. The measurement is made with the spectrum analyzer's resolution bandwidth set to ≥1% of the 20dB bandwidth, and the video bandwidth set to greater than or equal to the resolution bandwidth.

Configuration: The occupied bandwidth was measured with the EUT set to low, medium, and high transmit frequencies. The measurement was 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.

Completed by:



NORTHWEST EMC

EMISSIONS DATA SHEET

Rev BETA 01/30/01

EUT:	BTTX01			Work Order:	POLV0037
Serial Number:	none			Date:	05/15/03
Customer:	Polyvision Corp.			Temperature:	21 degrees C
Attendees:	none	Tested by:	Greg Kiemel	Humidity:	35% RH
Customer Ref. No.:	N/A	Power:	120 V, 50 Hz	Job Site:	EV06

TEST SPECIFICATIONS

Specification:	47 CFR 15.247(a)(1)(ii)	Year:	Most Current	Method:	DA 00-705, ANSI C63.4	Year:	1992

SAMPLE CALCULATIONS

COMMENTS

EUT OPERATING MODES

Modulated by PRBS at maximum data rate

DEVIATIONS FROM TEST STANDARD

None

REQUIREMENTS

The maximum 20dB bandwidth of the hopping channel is 1 MHz

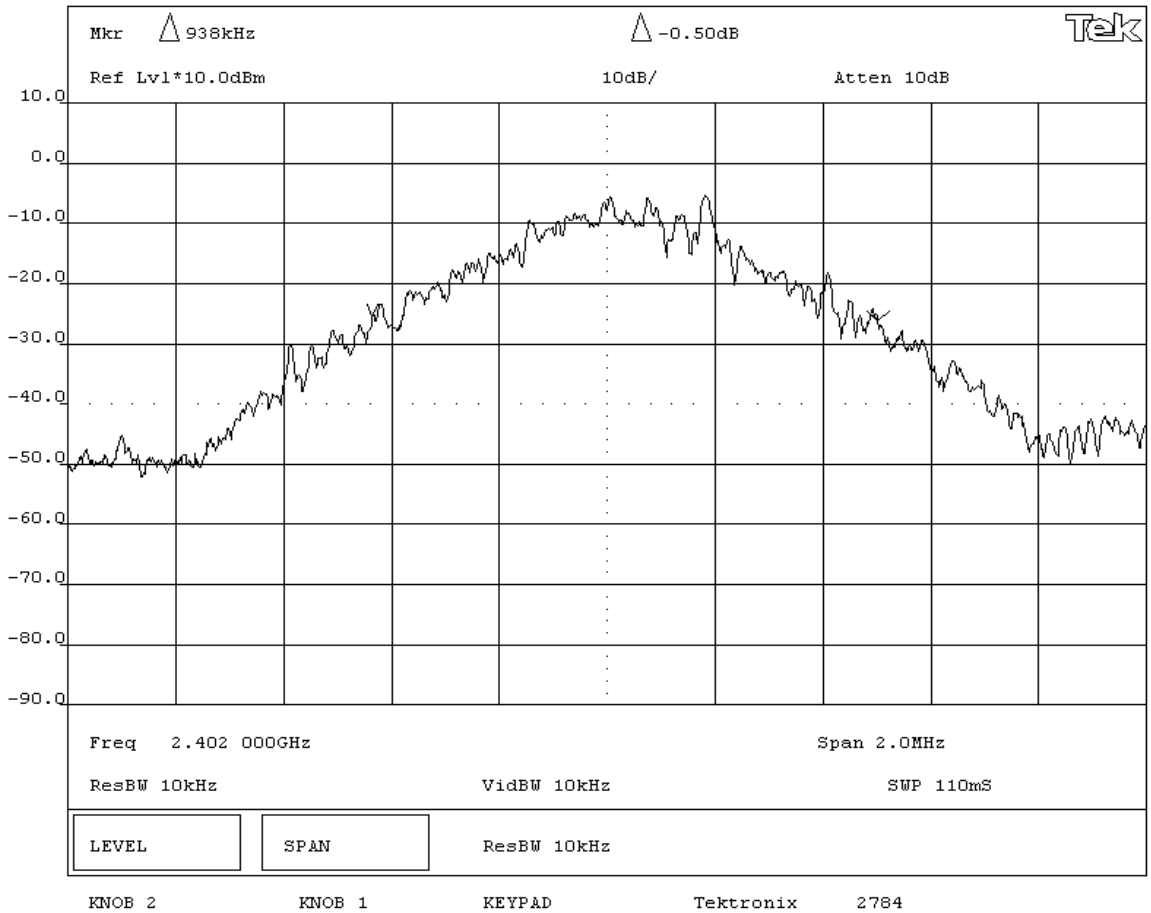
RESULTS	BANDWIDTH
Pass	938 kHz

SIGNATURE

Tested By: _____

DESCRIPTION OF TEST

20dB Bandwidth - Low Channel



NORTHWEST
EMC

EMISSIONS DATA SHEET

Rev BETA
01/30/01

EUT:	BTTX01			Work Order:	POLV0037
Serial Number:	none			Date:	05/15/03
Customer:	Polyvision Corp.			Temperature:	21 degrees C
Attendees:	none	Tested by:	Greg Kiemel	Humidity:	35% RH
Customer Ref. No.:	N/A	Power:	120 V, 50 Hz	Job Site:	EV06

TEST SPECIFICATIONS

Specification:	47 CFR 15.247(a)(1)(ii)	Year:	Most Current	Method:	DA 00-705, ANSI C63.4	Year:	1992

SAMPLE CALCULATIONS

COMMENTS

EUT OPERATING MODES

Modulated by PRBS at maximum data rate

DEVIATIONS FROM TEST STANDARD

None

REQUIREMENTS

The maximum 20dB bandwidth of the hopping channel is 1 MHz

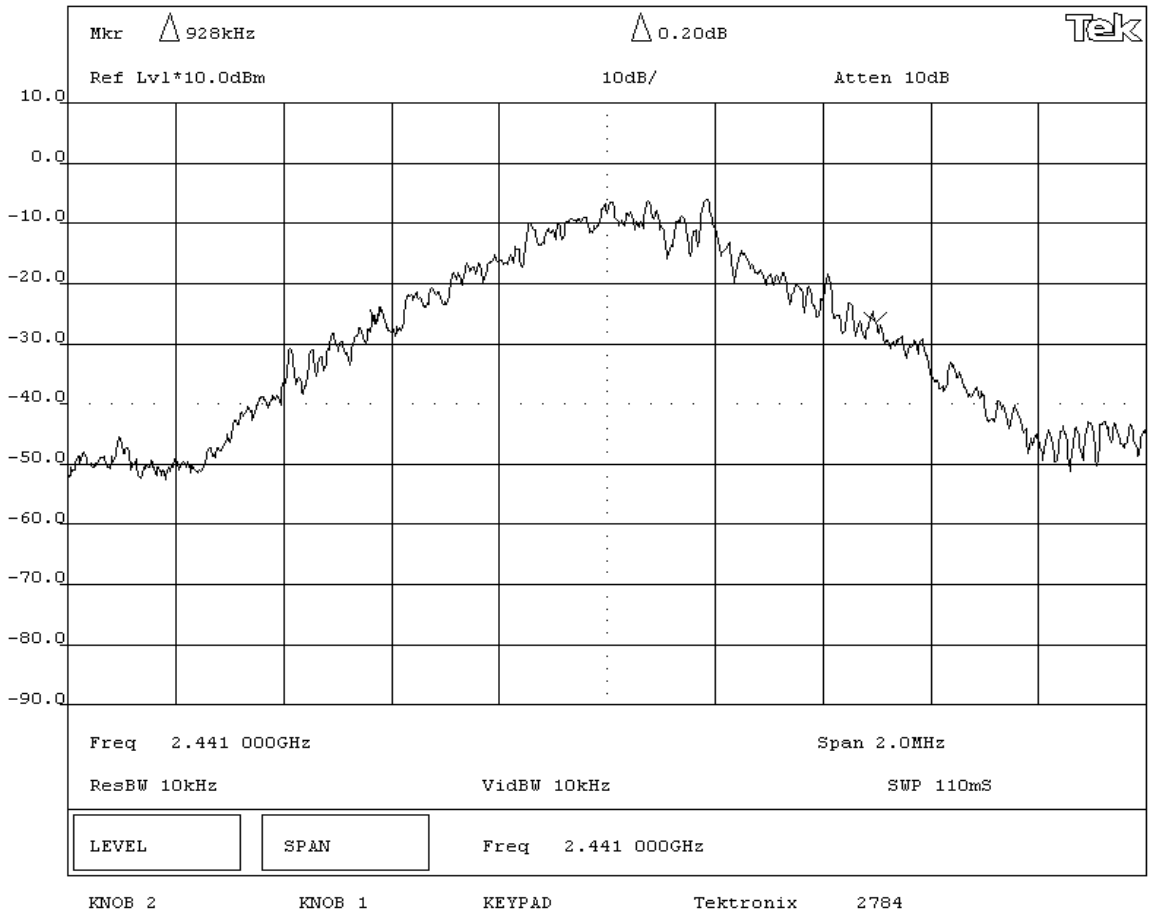
RESULTS	BANDWIDTH
Pass	928 kHz

SIGNATURE

Tested By: _____

DESCRIPTION OF TEST

20dB Bandwidth - Mid Channel



NORTHWEST
EMC

EMISSIONS DATA SHEET

Rev BETA
01/30/01

EUT:	BTTX01			Work Order:	POLV0037
Serial Number:	none			Date:	05/15/03
Customer:	Polyvision Corp.			Temperature:	21 degrees C
Attendees:	none	Tested by:	Greg Kiemel	Humidity:	35% RH
Customer Ref. No.:	N/A	Power:	120 V, 50 Hz	Job Site:	EV06

TEST SPECIFICATIONS

Specification:	47 CFR 15.247(a)(1)(ii)	Year:	Most Current	Method:	DA 00-705, ANSI C63.4	Year:	1992

SAMPLE CALCULATIONS

COMMENTS

EUT OPERATING MODES

Modulated by PRBS at maximum data rate

DEVIATIONS FROM TEST STANDARD

None

REQUIREMENTS

The maximum 20dB bandwidth of the hopping channel is 1 MHz

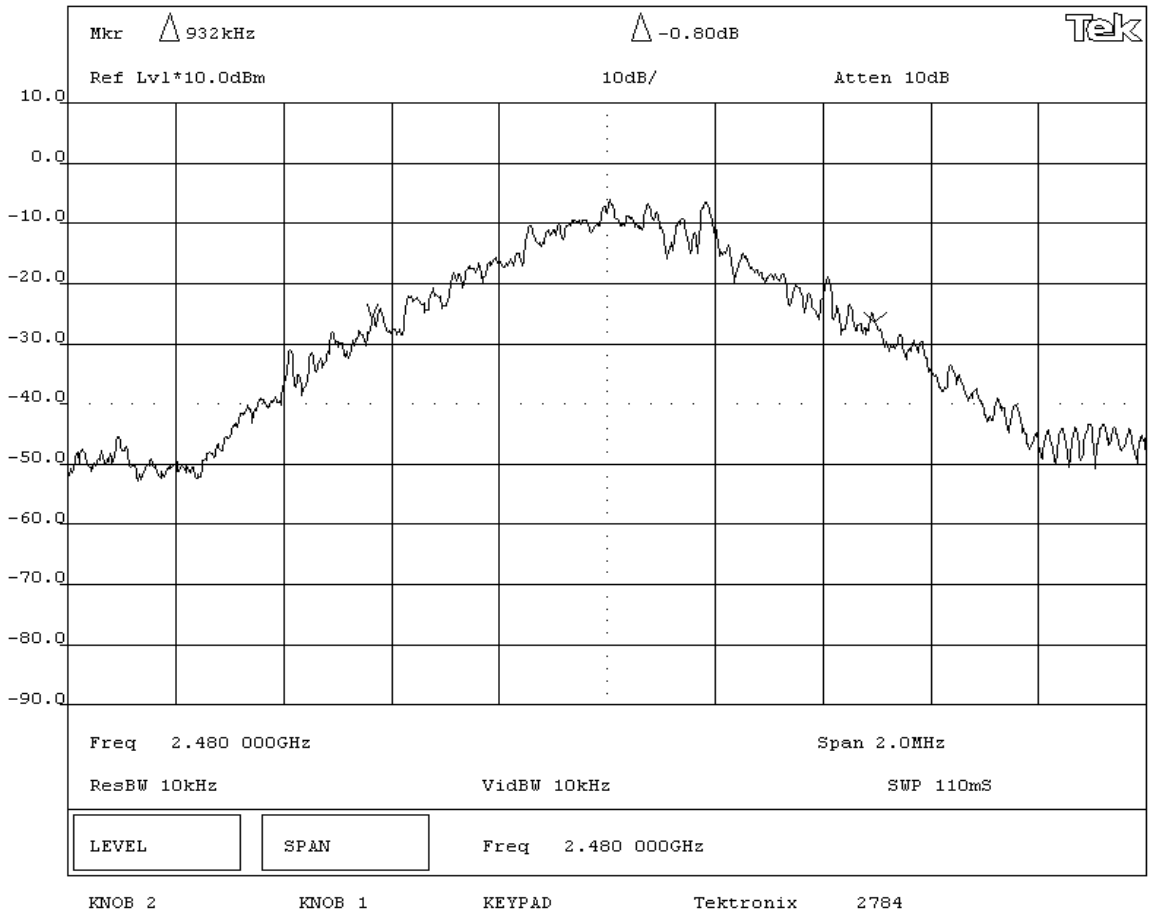
RESULTS	BANDWIDTH
Pass	932 kHz

SIGNATURE

Tested By: _____

DESCRIPTION OF TEST

20dB Bandwidth - High Channel



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:
120 VAC, 60 Hz.

Software\Firmware Applied During Test			
Exercise software	Standard Production Firmware	Version	5.2
Description			
The system was tested using standard operating production firmware to exercise the functions of the device during the testing. The firmware was operated via the serial interface from Windows Hyper Terminal.			

EUT and Peripherals

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Bluetooth Module	Polyvision Corp.	BTTX01	Unknown
AC power adapter	Ault	P41050400A012G	N/A
Antenna	Gigant	Titanis	N/A

Cables

Cable Type	Shield	Length (m)	Ferrite	Connection 1	Connection 2
DC power	No	1.0	No	Bluetooth Module	AC power adapter
Serial	Yes	4.5	No	Bluetooth Module	Unterminated

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	Tektronix	2784	AAO	02/26/2003	24 mo

Test Description

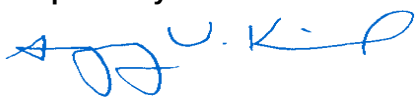
Requirement: Per 47 CFR 15.247(b)(1), the maximum peak output power must not exceed 1 Watt. The measurement is made using either a peak power meter, or a spectrum analyzer using the following settings:

- Resolution bandwidth set to greater than the 6 dB bandwidth of the modulated carrier, and
- The video bandwidth set to greater than or equal to the resolution bandwidth.

Configuration: The peak output power was measured with the EUT set to low, medium, and high transmit frequencies. The measurement was made using a direct connection between the RF output of the EUT and a spectrum analyzer. The EUT was transmitting at its maximum data rate in a no hop mode.

De Facto EIRP Limit: Per 47 CFR 15.247 (b)(1-3), the EUT meets the de facto EIRP limit of +36dBm.

Completed by:



NORTHWEST EMC

EMISSIONS DATA SHEET

Rev BETA 01/30/01

EUT:	BTTX01			Work Order:	POLV0037
Serial Number:	none			Date:	05/15/03
Customer:	Polyvision Corp.			Temperature:	21 degrees C
Attendees:	none	Tested by:	Greg Kiemel	Humidity:	35% RH
Customer Ref. No.:	N/A	Power:	120 V, 50 Hz	Job Site:	EV06

TEST SPECIFICATIONS

Specification:	47 CFR 15.247(b)(1)	Year:	Most Current	Method:	DA 00-705, ANSI C63.4	Year:	1992

SAMPLE CALCULATIONS

COMMENTS

EUT OPERATING MODES

Modulated by PRBS at maximum data rate

DEVIATIONS FROM TEST STANDARD

None

REQUIREMENTS

Maximum peak conducted output power does not exceed 1 Watt

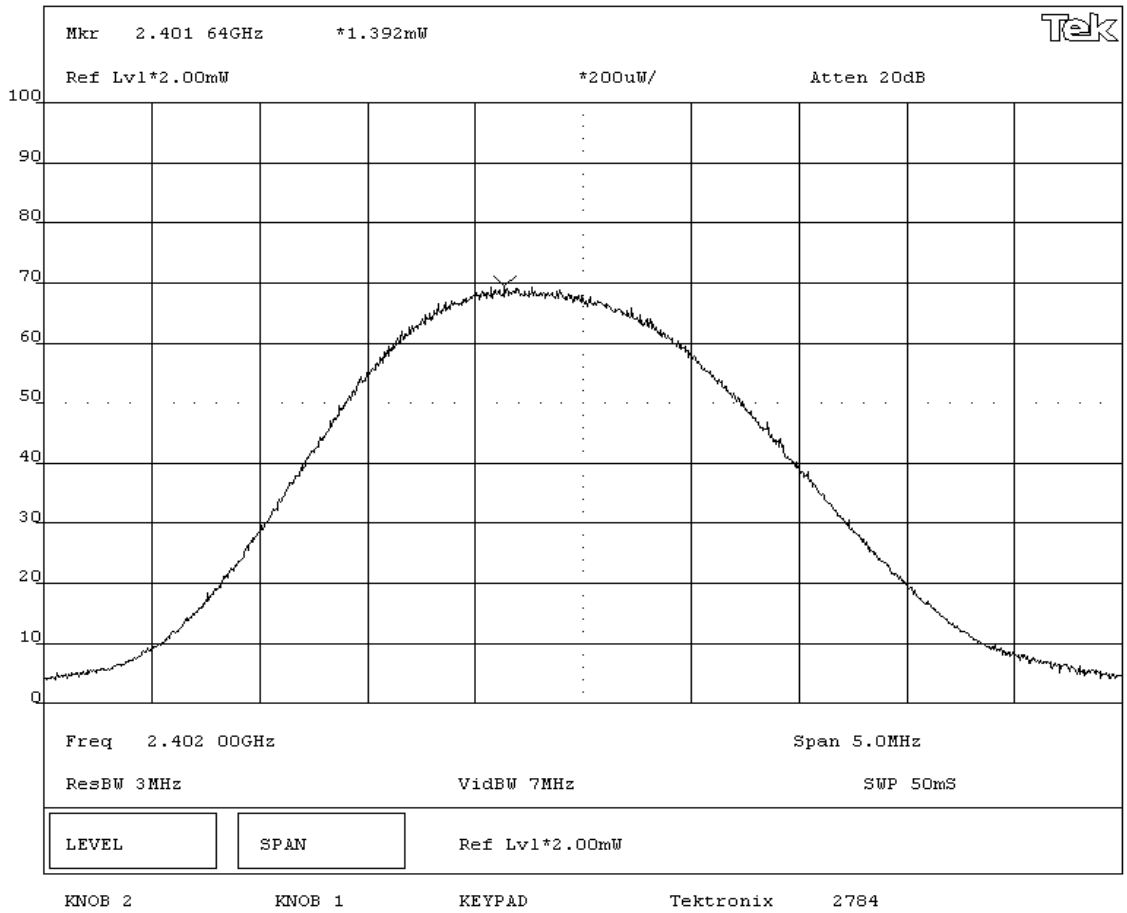
RESULTS	AMPLITUDE
Pass	1.392 mW

SIGNATURE

Tested By: _____

DESCRIPTION OF TEST

Output Power - Low Channel



NORTHWEST EMC

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Specification:	47 CFR 15.247(b)(1)	Year:	Most Current	Method:	DA 00-705, ANSI C63.4	Year:	1992

SAMPLE CALCULATIONS

COMMENTS

EUT OPERATING MODES

Modulated by PRBS at maximum data rate

DEVIATIONS FROM TEST STANDARD

None

REQUIREMENTS

Maximum peak conducted output power does not exceed 1 Watt

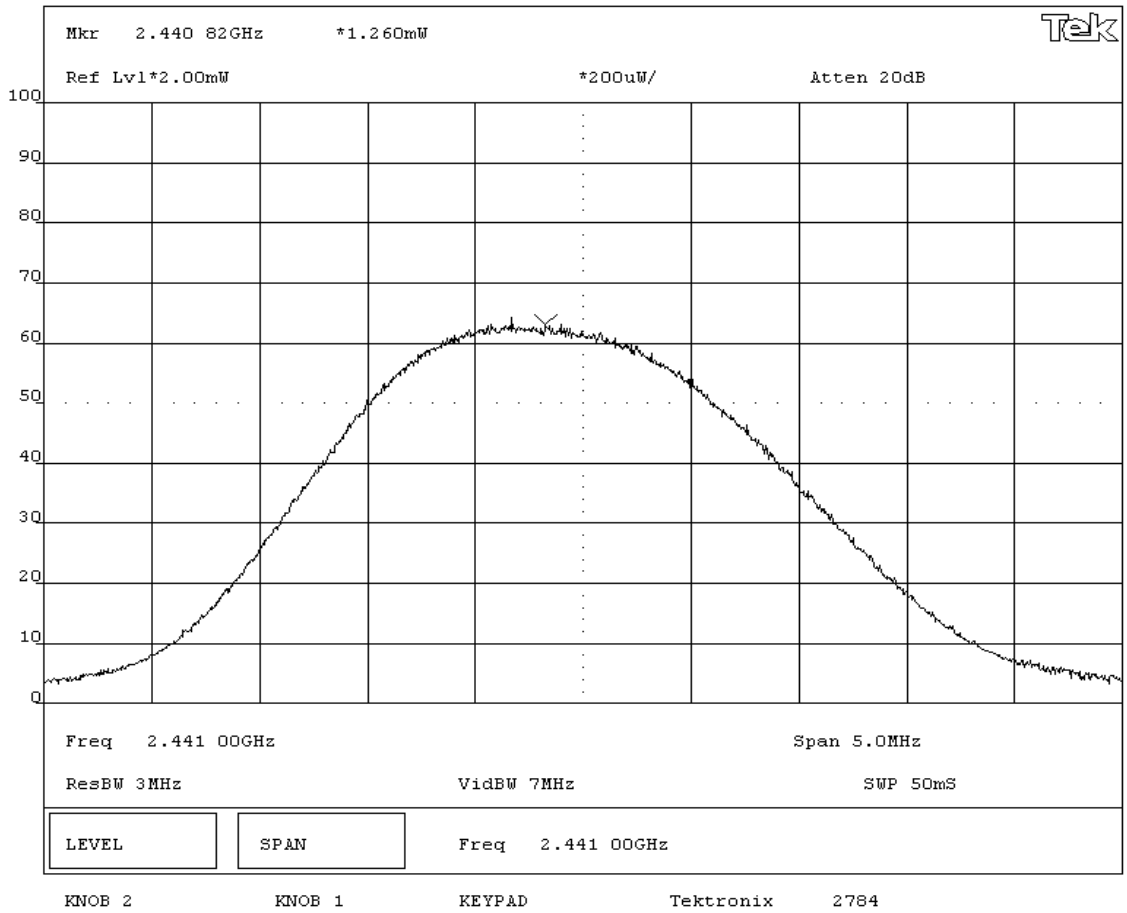
RESULTS	AMPLITUDE
Pass	1.260 mW

SIGNATURE

Tested By: _____

DESCRIPTION OF TEST

Output Power - Mid Channel



NORTHWEST EMC

EMISSIONS DATA SHEET

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Attendees:	none	Tested by:	Greg Kiemel	Humidity:	35% RH
Customer Ref. No.:	N/A	Power:	120 V, 50 Hz	Job Site:	EV06

TEST SPECIFICATIONS

Specification:	47 CFR 15.247(b)(1)	Year:	Most Current	Method:	DA 00-705, ANSI C63.4	Year:	1992

SAMPLE CALCULATIONS

COMMENTS

EUT OPERATING MODES

Modulated by PRBS at maximum data rate

DEVIATIONS FROM TEST STANDARD

None

REQUIREMENTS

Maximum peak conducted output power does not exceed 1 Watt

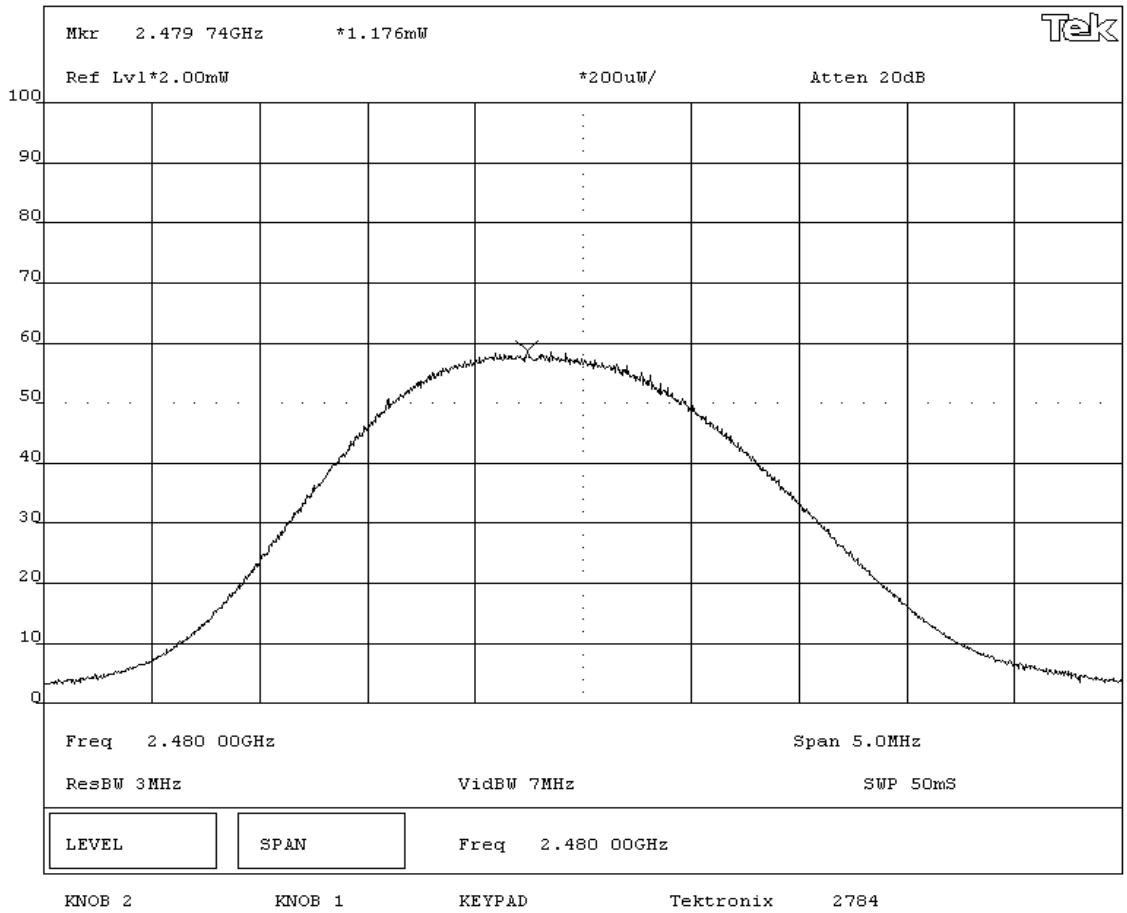
RESULTS	AMPLITUDE
Pass	1.176 mW

SIGNATURE

Tested By: _____

DESCRIPTION OF TEST

Output Power - High Channel



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Channels in Specified Band Investigated:
Low
High

Operating Modes Investigated:
No Hop

Data Rates Investigated:
Maximum

Output Power Setting(s) Investigated:
Maximum

Power Input Settings Investigated:
120 VAC, 60 Hz.

Software\Firmware Applied During Test			
Exercise software	Standard Production Firmware	Version	5.2
Description			
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AC power adapter	Ault	P41050400A012G	N/A
Antenna	Gigant	Titanis	N/A

Band Edge Compliance of RF Conducted Emissions

Cables

Cable Type	Shield	Length (m)	Ferrite	Connection 1	Connection 2
DC power	No	1.0	No	Bluetooth Module	AC power adapter
Serial	Yes	4.5	No	Bluetooth Module	Unterminated

PA = Cable is permanently attached to the device. Shielding and/or presence of ferrite may be unknown.

Measurement Equipment

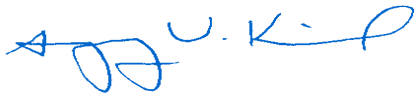
Description	Manufacturer	Model	Identifier	Last Cal	Interval
Spectrum Analyzer	Tektronix	2784	AAO	02/26/2003	24 mo

Test Description

Requirement: Per 47 CFR 15.247(c), 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 at the edges of the authorized band were measured with the EUT set to low and high transmit frequencies. The measurement was 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. The channels closest to the band edges were selected. The spectrum was scanned across each band edge from 5 MHz below the band edge to 5 MHz above the band edge.

Completed by:



NORTHWEST EMC

EMISSIONS DATA SHEET

Rev BETA 01/30/01

EUT:	BTTX01			Work Order:	POLV0037
Serial Number:	none			Date:	05/15/03
Customer:	Polyvision Corp.			Temperature:	21 degrees C
Attendees:	none	Tested by:	Greg Kiemel	Humidity:	35% RH
Customer Ref. No.:	N/A	Power:	120 V, 50 Hz	Job Site:	EV06

TEST SPECIFICATIONS

Specification:	47 CFR 15.247(c)	Year:	Most Current	Method:	DA 00-705, ANSI C63.4	Year:	1992

SAMPLE CALCULATIONS

COMMENTS

EUT OPERATING MODES

Modulated by PRBS at maximum data rate

DEVIATIONS FROM TEST STANDARD

None

REQUIREMENTS

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

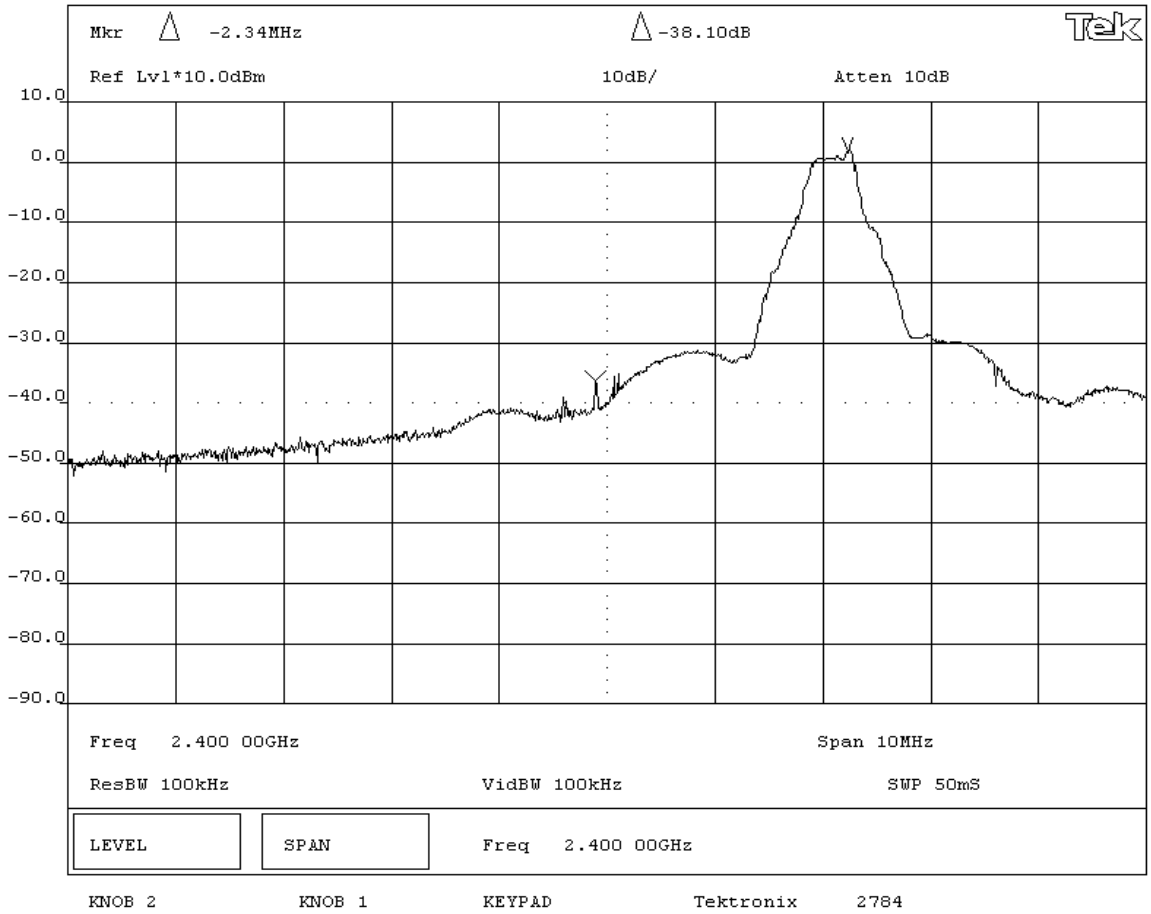
RESULTS	AMPLITUDE
Pass	-38.10 dBc

SIGNATURE

Tested By: _____

DESCRIPTION OF TEST

Band Edge Compliance - Low Channel



NORTHWEST EMC

EMISSIONS DATA SHEET

Rev BETA 01/30/01

EUT:	BTTX01			Work Order:	POLV0037
Serial Number:	none			Date:	05/15/03
Customer:	Polyvision Corp.			Temperature:	21 degrees C
Attendees:	none	Tested by:	Greg Kiemel	Humidity:	35% RH
Customer Ref. No.:	N/A	Power:	120 V, 50 Hz	Job Site:	EV06

TEST SPECIFICATIONS

Specification:	47 CFR 15.247(c)	Year:	Most Current	Method:	DA 00-705, ANSI C63.4	Year:	1992

SAMPLE CALCULATIONS

COMMENTS

EUT OPERATING MODES

Modulated by PRBS at maximum data rate

DEVIATIONS FROM TEST STANDARD

None

REQUIREMENTS

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

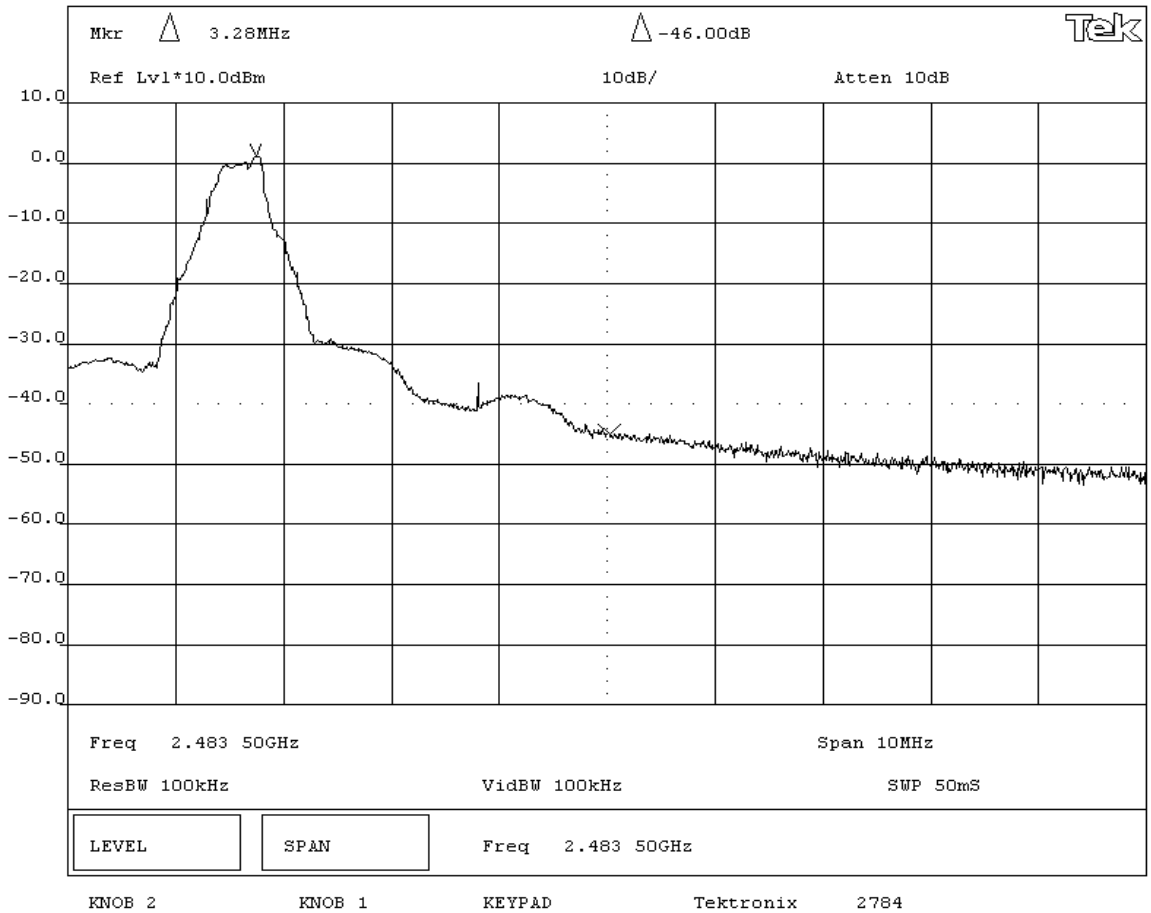
RESULTS	AMPLITUDE
Pass	-46 dBc

SIGNATURE

Tested By: _____

DESCRIPTION OF TEST

Band Edge Compliance - High Channel



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:
120 VAC, 60 Hz.

Frequency Range Investigated			
Start Frequency	30 MHz	Stop Frequency	25 GHz

Software\Firmware Applied During Test			
Exercise software	Standard Production Firmware	Version	5.2
Description			
The system was tested using standard operating production firmware to exercise the functions of the device during the testing. The firmware was operated via the serial interface from Windows Hyper Terminal.			

EUT and Peripherals

Description	Manufacturer	Model/Part Number	Serial Number
Bluetooth Module	Polyvision Corp.	BTTX01	Unknown
AC power adapter	Ault	P41050400A012G	N/A
Antenna	Gigant	Titanis	N/A

Cables

Cable Type	Shield	Length (m)	Ferrite	Connection 1	Connection 2
DC power	No	1.0	No	Bluetooth Module	AC power adapter
Serial	Yes	4.5	No	Bluetooth Module	Unterminated

PA = Cable is permanently attached to the device. Shielding and/or presence of ferrite may be unknown.

Measurement Equipment

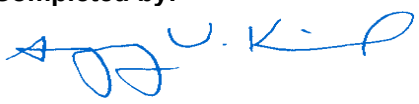
Description	Manufacturer	Model	Identifier	Last Cal	Interval
Spectrum Analyzer	Tektronix	2784	AAO	02/26/2003	24 mo

Test Description

Requirement: Per 47 CFR 15.247(c), 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.

Completed by:



NORTHWEST EMC

EMISSIONS DATA SHEET

Rev BETA 01/30/01

EUT:	BTTX01			Work Order:	POLV0037
Serial Number:	none			Date:	05/15/03
Customer:	Polyvision Corp.			Temperature:	21 degrees C
Attendees:	none	Tested by:	Greg Kiemel	Humidity:	35% RH
Customer Ref. No.:	N/A	Power:	120 V, 50 Hz	Job Site:	EV06

TEST SPECIFICATIONS

Specification:	47 CFR 15.247(c)	Year:	Most Current	Method:	DA 00-705, ANSI C63.4	Year:	1992

SAMPLE CALCULATIONS

COMMENTS

EUT OPERATING MODES

Modulated by PRBS 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

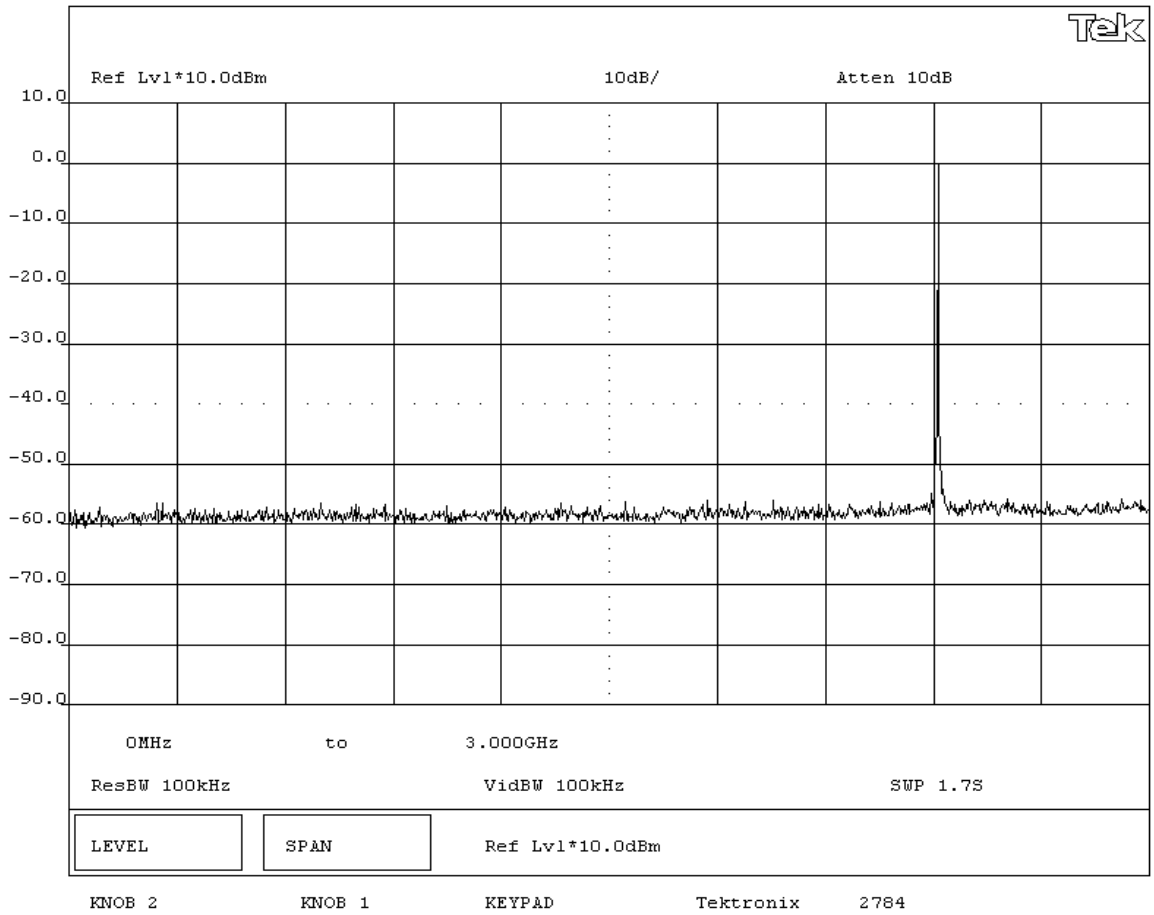
Pass

SIGNATURE

Tested By: _____

DESCRIPTION OF TEST

Antenna Conducted Spurious Emissions - Low Channel 0MHz-3GHz



NORTHWEST
EMC

EMISSIONS DATA SHEET

Rev BETA
01/30/01

EUT:	BTTX01			Work Order:	POLV0037
Serial Number:	none			Date:	05/15/03
Customer:	Polyvision Corp.			Temperature:	21 degrees C
Attendees:	none	Tested by:	Greg Kiemel	Humidity:	35% RH
Customer Ref. No.:	N/A	Power:	120 V, 50 Hz	Job Site:	EV06

TEST SPECIFICATIONS

Specification:	47 CFR 15.247(c)	Year:	Most Current	Method:	DA 00-705, ANSI C63.4	Year:	1992

SAMPLE CALCULATIONS

COMMENTS

EUT OPERATING MODES

Modulated by PRBS 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

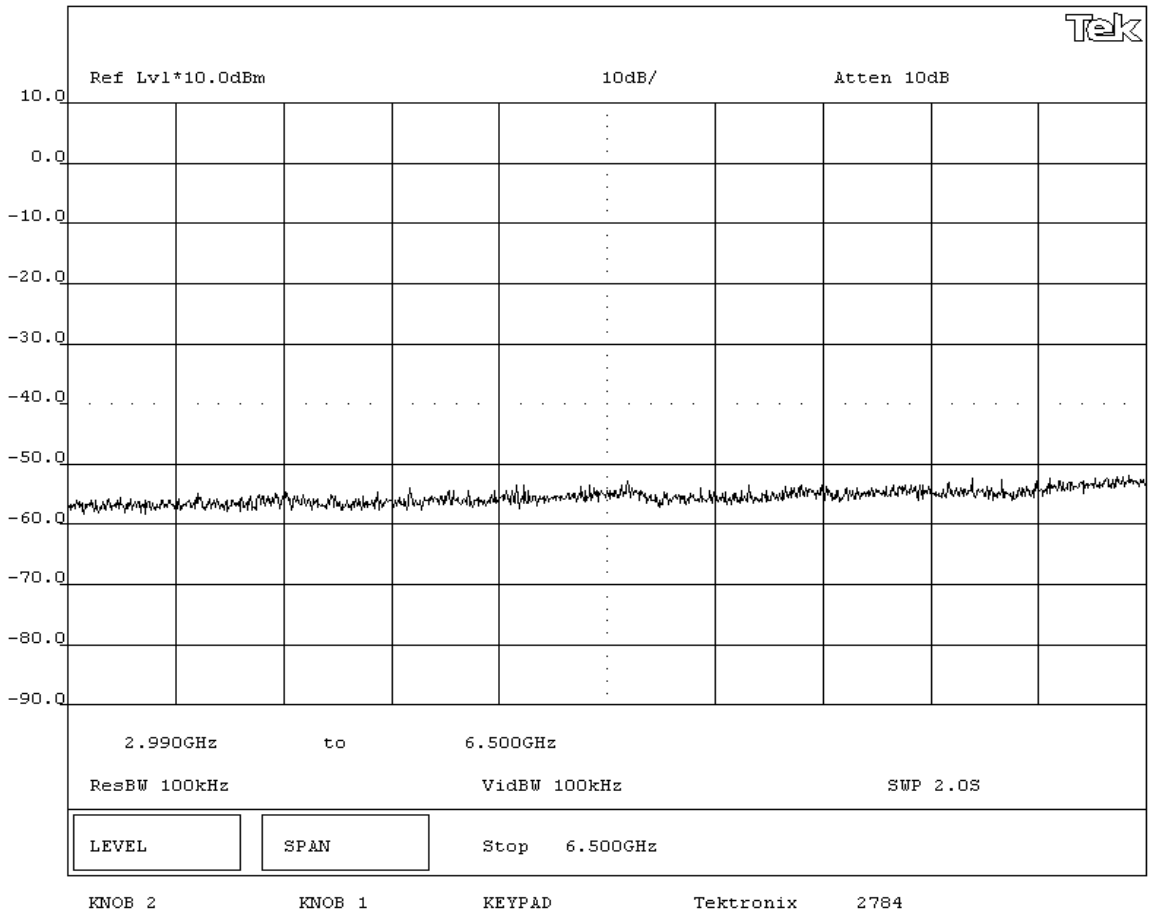
Pass

SIGNATURE

Tested By: _____

DESCRIPTION OF TEST

Antenna Conducted Spurious Emissions - Low Channel 3GHz-6.5GHz



NORTHWEST EMC

EMISSIONS DATA SHEET

Rev BETA 01/30/01

EUT:	BTTX01			Work Order:	POLV0037
Serial Number:	none			Date:	05/15/03
Customer:	Polyvision Corp.			Temperature:	21 degrees C
Attendees:	none	Tested by:	Greg Kiemel	Humidity:	35% RH
Customer Ref. No.:	N/A	Power:	120 V, 50 Hz	Job Site:	EV06

TEST SPECIFICATIONS

Specification:	47 CFR 15.247(c)	Year:	Most Current	Method:	DA 00-705, ANSI C63.4	Year:	1992

SAMPLE CALCULATIONS

COMMENTS

EUT OPERATING MODES

Modulated by PRBS 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

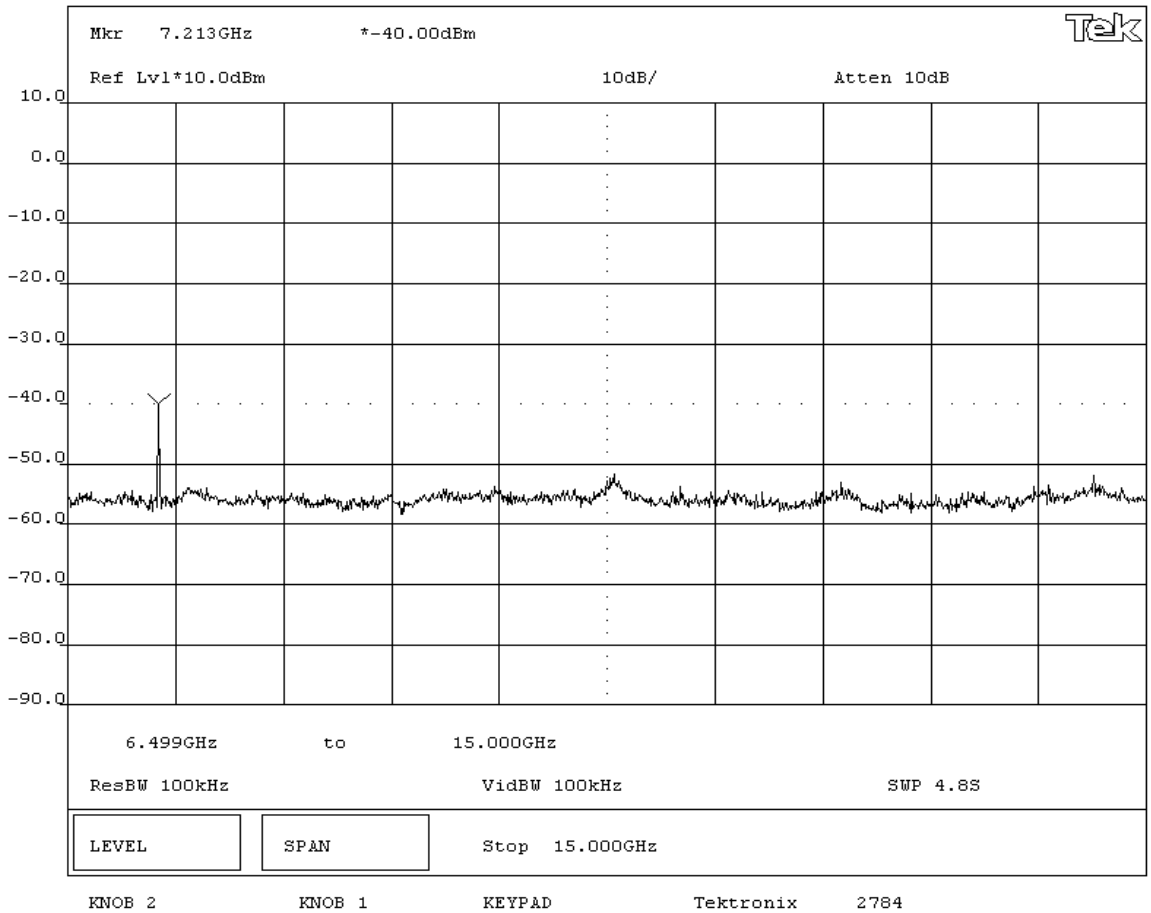
Pass

SIGNATURE

Tested By: A. U. Kiemel

DESCRIPTION OF TEST

Antenna Conducted Spurious Emissions - Low Channel 6.5GHz-15GHz



NORTHWEST EMC

EMISSIONS DATA SHEET

Rev BETA 01/30/01

EUT:	BTTX01			Work Order:	POLV0037
Serial Number:	none			Date:	05/15/03
Customer:	Polyvision Corp.			Temperature:	21 degrees C
Attendees:	none	Tested by:	Greg Kiemel	Humidity:	35% RH
Customer Ref. No.:	N/A	Power:	120 V, 50 Hz	Job Site:	EV06

TEST SPECIFICATIONS

Specification:	47 CFR 15.247(c)	Year:	Most Current	Method:	DA 00-705, ANSI C63.4	Year:	1992

SAMPLE CALCULATIONS

COMMENTS

EUT OPERATING MODES

Modulated by PRBS 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

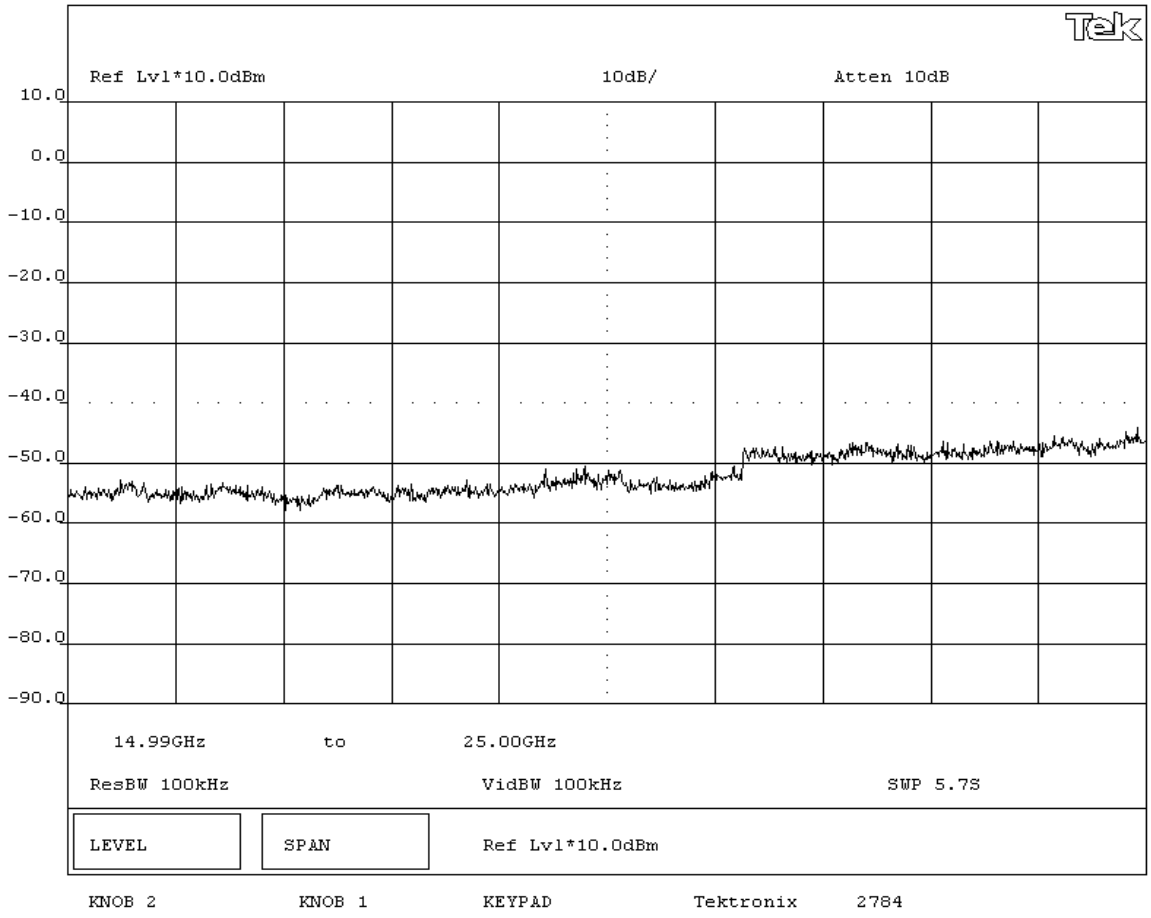
Pass

SIGNATURE

Tested By: _____

DESCRIPTION OF TEST

Antenna Conducted Spurious Emissions - Low Channel 15GHz - 25GHz



NORTHWEST EMC

EMISSIONS DATA SHEET

Rev BETA 01/30/01

EUT:	BTTX01			Work Order:	POLV0037
Serial Number:	none			Date:	05/15/03
Customer:	Polyvision Corp.			Temperature:	21 degrees C
Attendees:	none	Tested by:	Greg Kiemel	Humidity:	35% RH
Customer Ref. No.:	N/A	Power:	120 V, 50 Hz	Job Site:	EV06

TEST SPECIFICATIONS

Specification:	47 CFR 15.247(c)	Year:	Most Current	Method:	DA 00-705, ANSI C63.4	Year:	1992

SAMPLE CALCULATIONS

COMMENTS

EUT OPERATING MODES

Modulated by PRBS 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

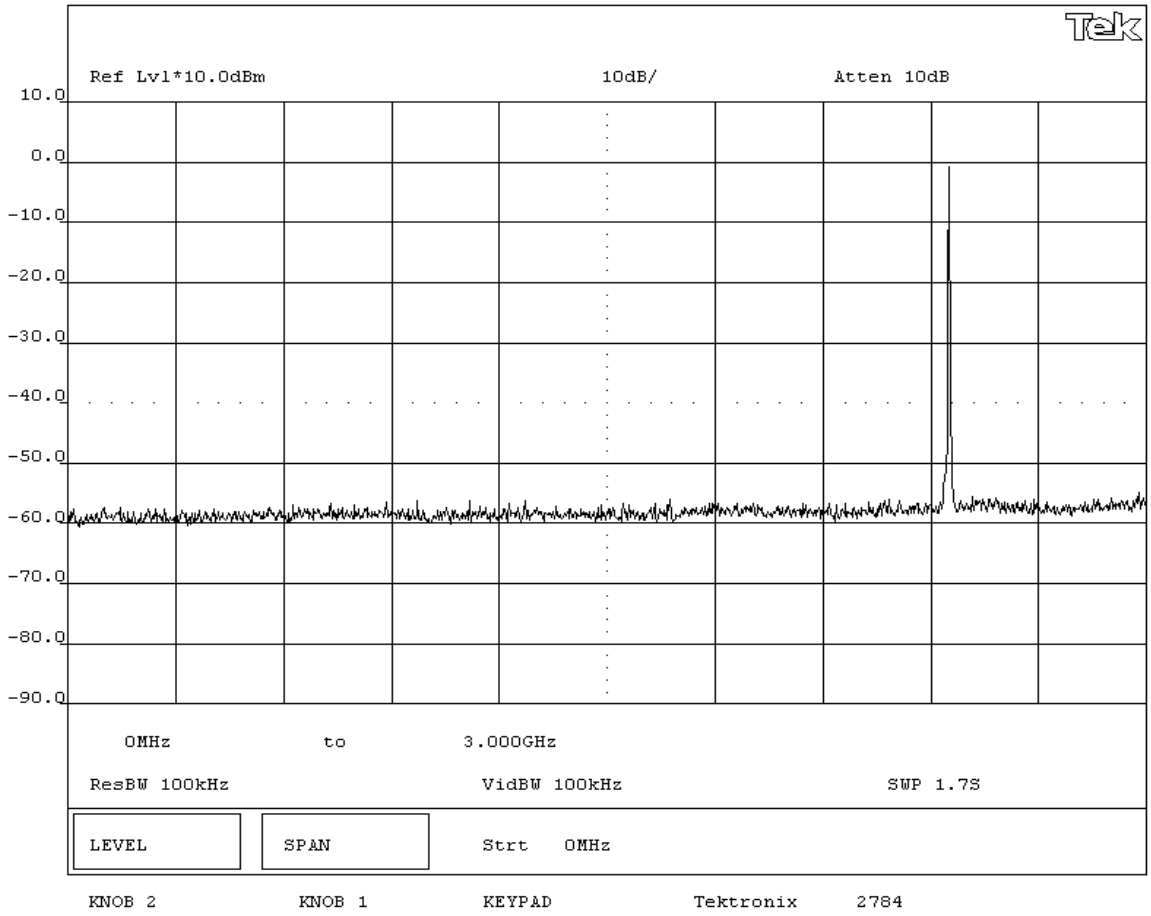
Pass

SIGNATURE

Tested By: _____

DESCRIPTION OF TEST

Antenna Conducted Spurious Emissions - Mid Channel 0MHz-3GHz



NORTHWEST EMC

EMISSIONS DATA SHEET

Rev BETA 01/30/01

EUT:	BTTX01			Work Order:	POLV0037
Serial Number:	none			Date:	05/15/03
Customer:	Polyvision Corp.			Temperature:	21 degrees C
Attendees:	none	Tested by:	Greg Kiemel	Humidity:	35% RH
Customer Ref. No.:	N/A	Power:	120 V, 50 Hz	Job Site:	EV06

TEST SPECIFICATIONS

Specification:	47 CFR 15.247(c)	Year:	Most Current	Method:	DA 00-705, ANSI C63.4	Year:	1992

SAMPLE CALCULATIONS

COMMENTS

EUT OPERATING MODES

Modulated by PRBS 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

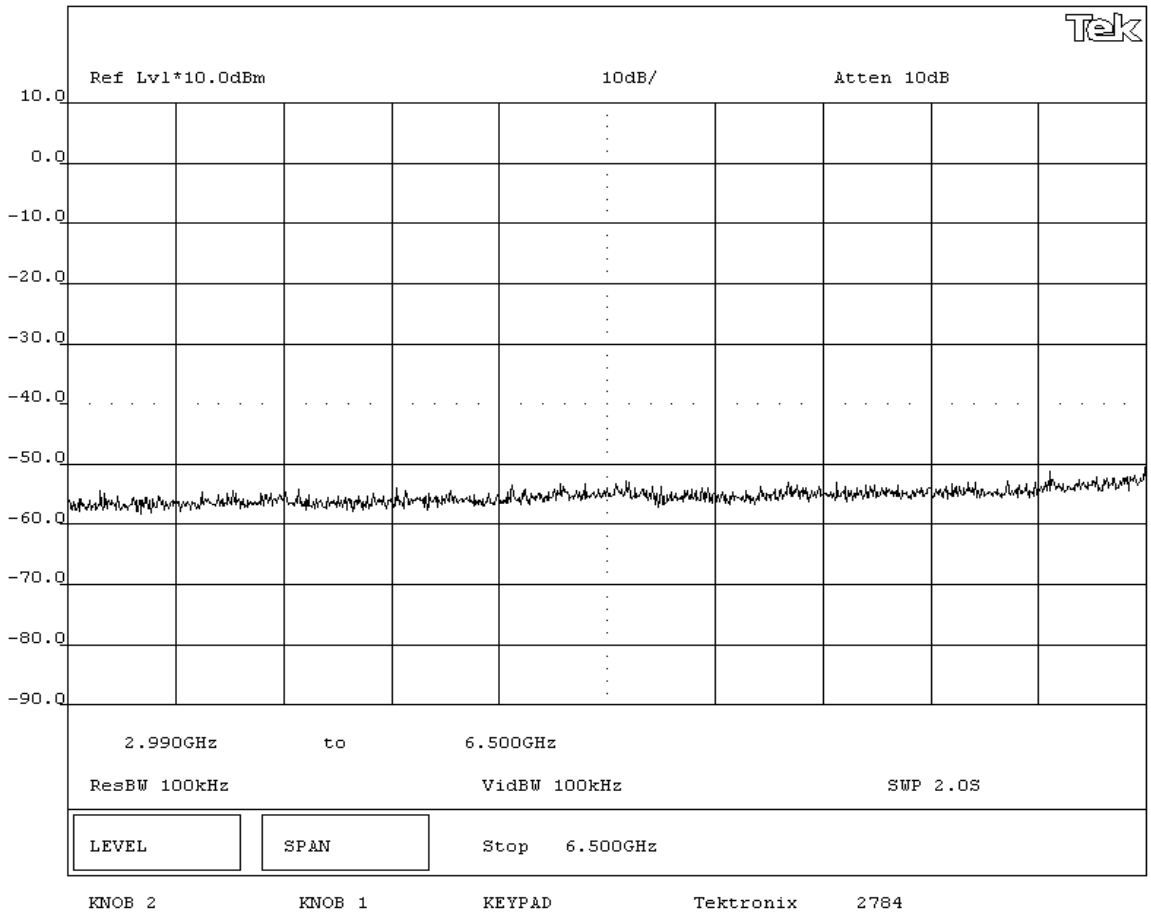
Pass

SIGNATURE

Tested By: A. U. Kiemel

DESCRIPTION OF TEST

Antenna Conducted Spurious Emissions - Mid Channel 3GHz-6.5GHz



NORTHWEST EMC

EMISSIONS DATA SHEET

Rev BETA 01/30/01

EUT:	BTTX01			Work Order:	POLV0037
Serial Number:	none			Date:	05/15/03
Customer:	Polyvision Corp.			Temperature:	21 degrees C
Attendees:	none	Tested by:	Greg Kiemel	Humidity:	35% RH
Customer Ref. No.:	N/A	Power:	120 V, 50 Hz	Job Site:	EV06

TEST SPECIFICATIONS

Specification:	47 CFR 15.247(c)	Year:	Most Current	Method:	DA 00-705, ANSI C63.4	Year:	1992

SAMPLE CALCULATIONS

COMMENTS

EUT OPERATING MODES

Modulated by PRBS 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

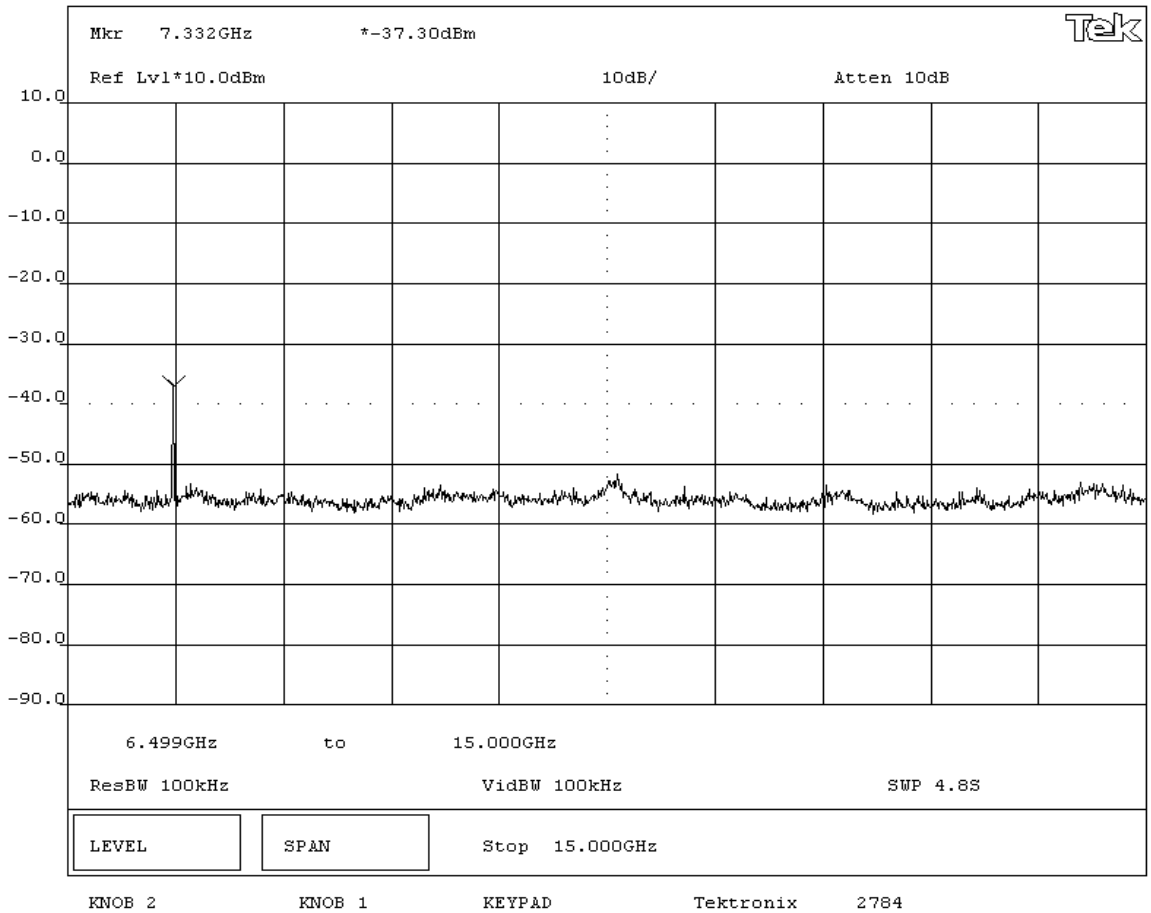
Pass

SIGNATURE

Tested By: _____

DESCRIPTION OF TEST

Antenna Conducted Spurious Emissions - Mid Channel 6.5GHz-15GHz



NORTHWEST EMC

EMISSIONS DATA SHEET

Rev BETA 01/30/01

EUT:	BTTX01			Work Order:	POLV0037
Serial Number:	none			Date:	05/15/03
Customer:	Polyvision Corp.			Temperature:	21 degrees C
Attendees:	none	Tested by:	Greg Kiemel	Humidity:	35% RH
Customer Ref. No.:	N/A	Power:	120 V, 50 Hz	Job Site:	EV06

TEST SPECIFICATIONS

Specification:	47 CFR 15.247(c)	Year:	Most Current	Method:	DA 00-705, ANSI C63.4	Year:	1992

SAMPLE CALCULATIONS

COMMENTS

EUT OPERATING MODES

Modulated by PRBS 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

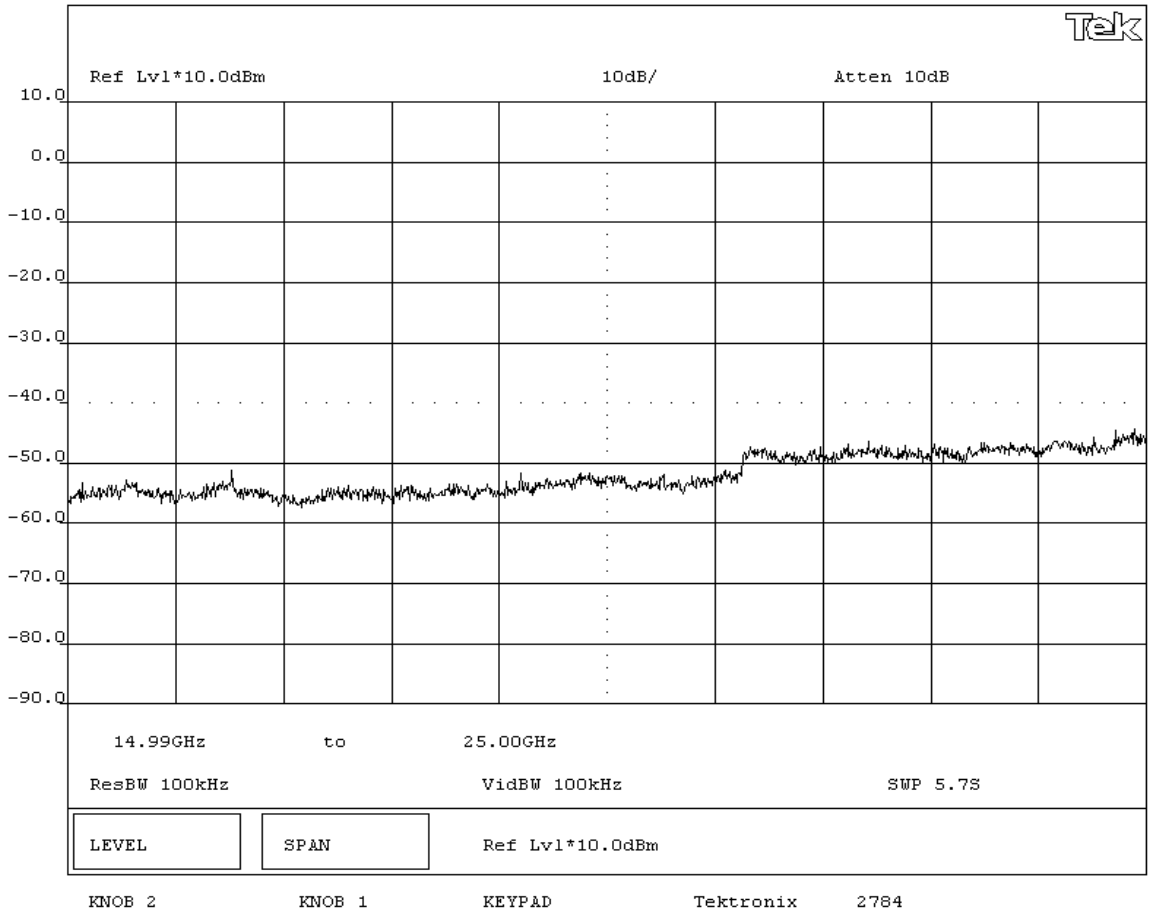
Pass

SIGNATURE

Tested By: _____

DESCRIPTION OF TEST

Antenna Conducted Spurious Emissions - Mid Channel 15GHz-25GHz



NORTHWEST
EMC

EMISSIONS DATA SHEET

Rev BETA
01/30/01

EUT:	BTTX01			Work Order:	POLV0037
Serial Number:	none			Date:	05/15/03
Customer:	Polyvision Corp.			Temperature:	21 degrees C
Attendees:	none	Tested by:	Greg Kiemel	Humidity:	35% RH
Customer Ref. No.:	N/A	Power:	120 V, 50 Hz	Job Site:	EV06

TEST SPECIFICATIONS

Specification:	47 CFR 15.247(c)	Year:	Most Current	Method:	DA 00-705, ANSI C63.4	Year:	1992

SAMPLE CALCULATIONS

COMMENTS

EUT OPERATING MODES

Modulated by PRBS 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

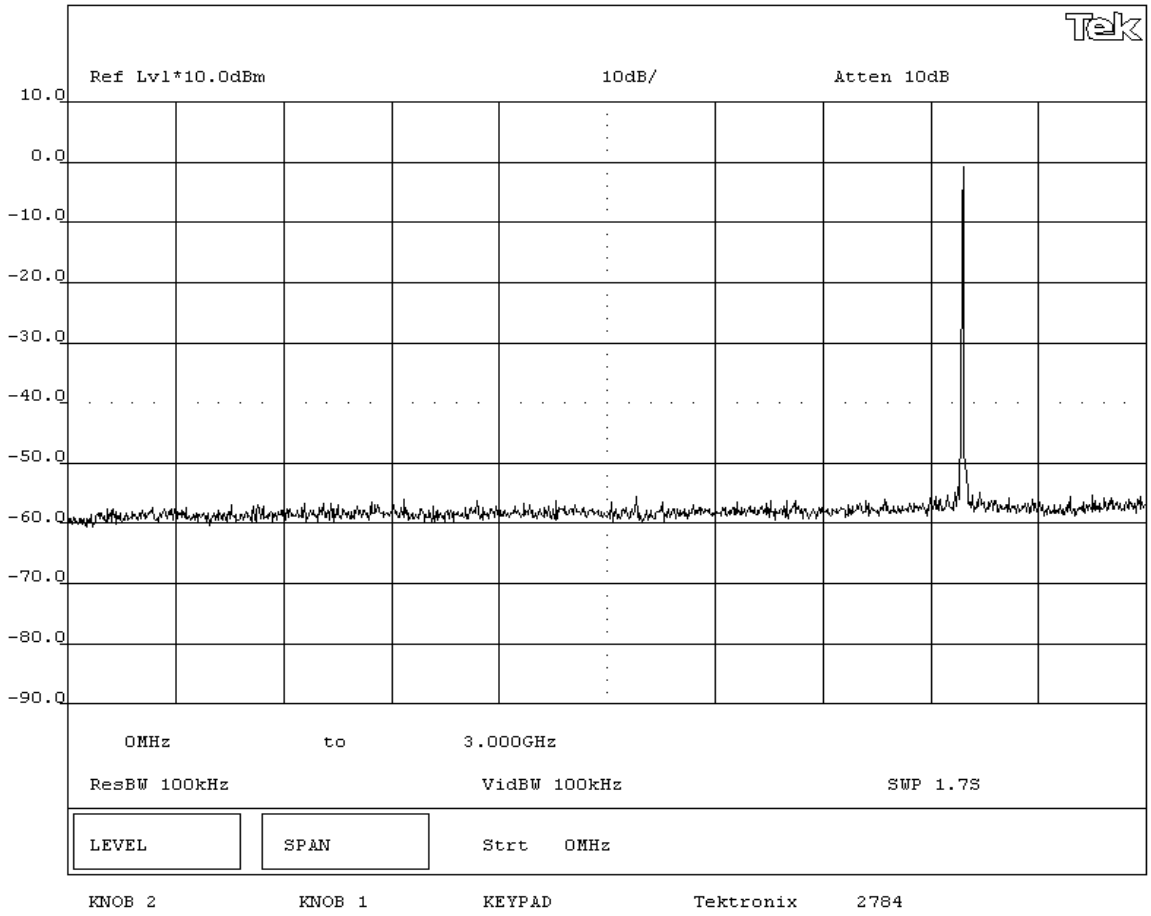
Pass

SIGNATURE

Tested By: _____

DESCRIPTION OF TEST

Antenna Conducted Spurious Emissions - High Channel 0MHz-3GHz



NORTHWEST EMC

EMISSIONS DATA SHEET

Rev BETA 01/30/01

EUT:	BTTX01			Work Order:	POLV0037
Serial Number:	none			Date:	05/15/03
Customer:	Polyvision Corp.			Temperature:	21 degrees C
Attendees:	none	Tested by:	Greg Kiemel	Humidity:	35% RH
Customer Ref. No.:	N/A	Power:	120 V, 50 Hz	Job Site:	EV06

TEST SPECIFICATIONS

Specification:	47 CFR 15.247(c)	Year:	Most Current	Method:	DA 00-705, ANSI C63.4	Year:	1992

SAMPLE CALCULATIONS

COMMENTS

EUT OPERATING MODES

Modulated by PRBS 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

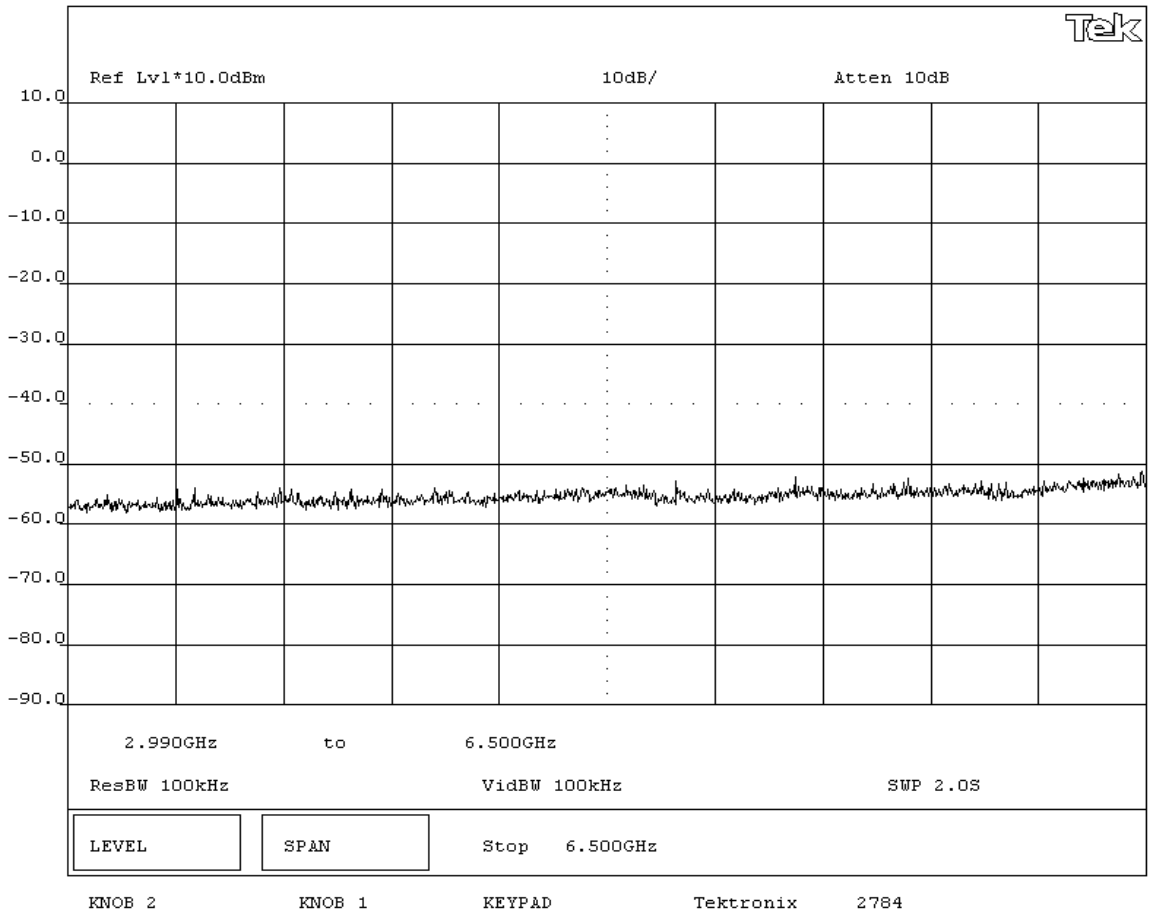
Pass

SIGNATURE

Tested By: _____

DESCRIPTION OF TEST

Antenna Conducted Spurious Emissions - High Channel 3GHz-6.5GHz



NORTHWEST EMC

EMISSIONS DATA SHEET

Rev BETA 01/30/01

EUT:	BTTX01			Work Order:	POLV0037
Serial Number:	none			Date:	05/15/03
Customer:	Polyvision Corp.			Temperature:	21 degrees C
Attendees:	none	Tested by:	Greg Kiemel	Humidity:	35% RH
Customer Ref. No.:	N/A	Power:	120 V, 50 Hz	Job Site:	EV06

TEST SPECIFICATIONS

Specification:	47 CFR 15.247(c)	Year:	Most Current	Method:	DA 00-705, ANSI C63.4	Year:	1992

SAMPLE CALCULATIONS

COMMENTS

EUT OPERATING MODES

Modulated by PRBS 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

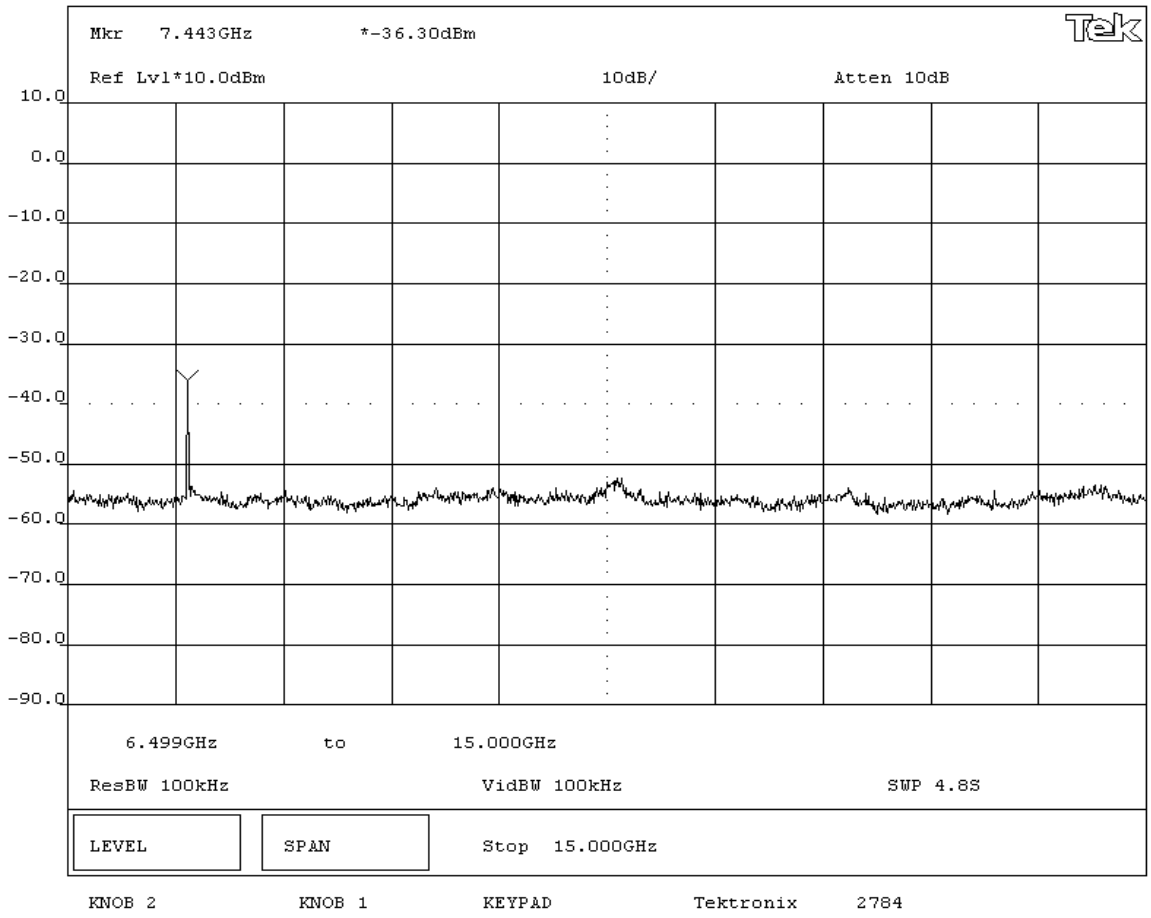
Pass

SIGNATURE

Tested By: _____

DESCRIPTION OF TEST

Antenna Conducted Spurious Emissions - High Channel 6.5GHz-15GHz



NORTHWEST EMC

EMISSIONS DATA SHEET

Rev BETA 01/30/01

EUT:	BTTX01			Work Order:	POLV0037
Serial Number:	none			Date:	05/15/03
Customer:	Polyvision Corp.			Temperature:	21 degrees C
Attendees:	none	Tested by:	Greg Kiemel	Humidity:	35% RH
Customer Ref. No.:	N/A	Power:	120 V, 50 Hz	Job Site:	EV06

TEST SPECIFICATIONS

Specification:	47 CFR 15.247(c)	Year:	Most Current	Method:	DA 00-705, ANSI C63.4	Year:	1992

SAMPLE CALCULATIONS

COMMENTS

EUT OPERATING MODES

Modulated by PRBS 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

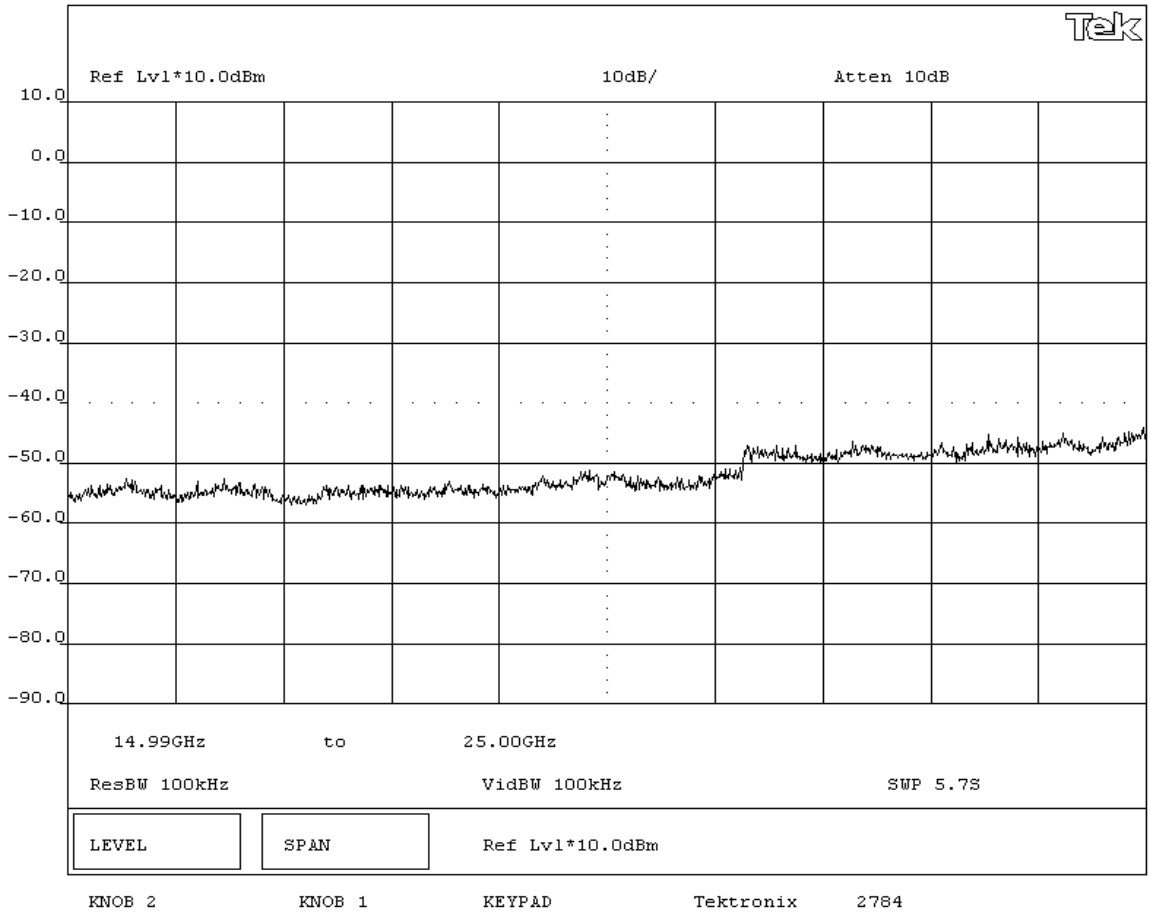
Pass

SIGNATURE

Tested By: _____

DESCRIPTION OF TEST

Antenna Conducted Spurious Emissions - High Channel 15GHz-25GHz



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:
120 VAC, 60 Hz.

Software\Firmware Applied During Test			
Exercise software	Standard Production Firmware	Version	5.2
Description			
The system was tested using standard operating production firmware to exercise the functions of the device during the testing. The firmware was operated via the serial interface from Windows Hyper Terminal.			

EUT and Peripherals

Description	Manufacturer	Model/Part Number	Serial Number
Bluetooth Module	Polyvision Corp.	BTTX01	Unknown
AC power adapter	Ault	P41050400A012G	N/A
Antenna	Gigant	Titanis	N/A

Cables

Cable Type	Shield	Length (m)	Ferrite	Connection 1	Connection 2
DC power	No	1.0	No	Bluetooth Module	AC power adapter
Serial	Yes	4.5	No	Bluetooth Module	Unterminated

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	Tektronix	2784	AAO	02/26/2003	24 mo

Test Description

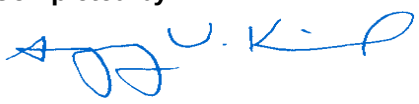
Requirement: Per 47 CFR 15.247(d), the peak power spectral density conducted from the antenna port of a direct sequence transmitter must not be greater than +8 dBm in any 3 kHz band during any time interval of continuous transmission.

Configuration: The peak power spectral density measurements were measured with the EUT set to low, mid, and high transmit frequencies. The measurement was 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 using direct sequence modulation. Per the procedure outlined in FCC 97-114, the spectrum analyzer was used as follows:

> The emission peak(s) were located and zoom in on within the passband. The resolution bandwidth was set to 3 kHz, the video bandwidth was set to greater than or equal to the resolution bandwidth. The sweep speed was set equal to the span divided by 3 kHz (sweep = (SPAN/3 kHz)). For example, given a span of 1.5 MHz, the sweep should be 1.5 x 106 ÷ 3 x 103 = 500 seconds. External attenuation was used and added to the reading. The following FCC procedure was used for modifying the power spectral density measurements:

"If the spectrum line spacing cannot be resolved on the available spectrum analyzer, the noise density function on most modern conventional spectrum analyzers will directly measure the noise power density normalized to a 1 Hz noise power bandwidth. Add 34.8 dB for correction to 3 kHz."

Completed by:



NORTHWEST EMC

EMISSIONS DATA SHEET

Rev BETA 01/30/01

EUT:	BTTX01			Work Order:	POLV0037
Serial Number:	none			Date:	05/15/03
Customer:	Polyvision Corp.			Temperature:	21 degrees C
Attendees:	none	Tested by:	Greg Kiemel	Humidity:	35% RH
Customer Ref. No.:	N/A	Power:	120 V, 50 Hz	Job Site:	EV06

TEST SPECIFICATIONS

Specification:	47 CFR 15.247(d)	Year:	Most Current	Method:	FCC 97-114, ANSI C63.4	Year:	1992

SAMPLE CALCULATIONS

Meter reading on spectrum analyzer is internally compensated for cable loss and external attenuation.
Power Spectral Density per 3kHz bandwidth = Power Spectral Density per 1 Hz bandwidth + Bandwidth Correction Factor.
Bandwidth Correction Factor = 10*log(3kHz/1Hz)

COMMENTS

EUT OPERATING MODES

Modulated by PRBS at maximum data rate

DEVIATIONS FROM TEST STANDARD

None

REQUIREMENTS

Maximum peak power spectral density conducted from a DSSS transmitter does not exceed 8 dBm in any 3 kHz band

RESULTS | **AMPLITUDE**

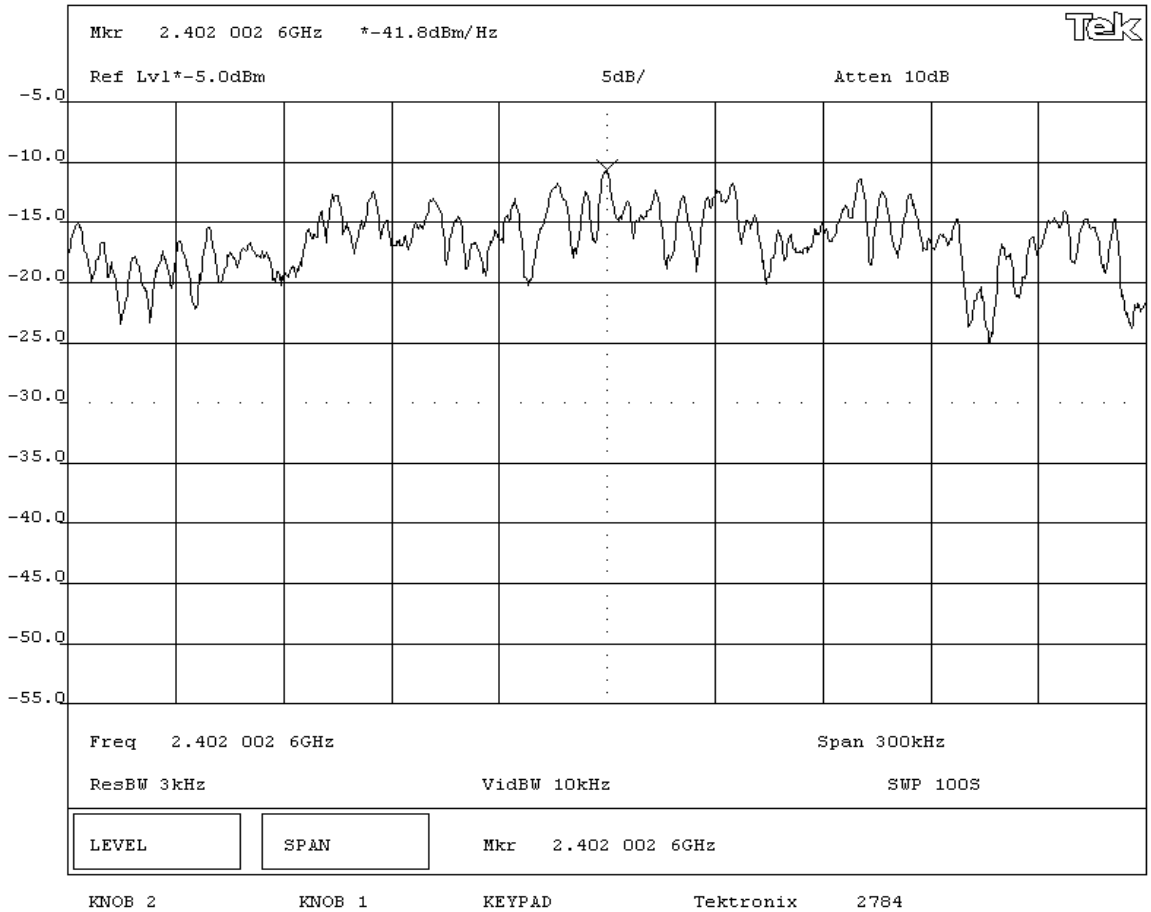
Pass | Power Spectral Density = -7.0 dBm / 3kHz

SIGNATURE

Tested By: A. U. Kiemel

DESCRIPTION OF TEST

Power Spectral Density - Low Channel



NORTHWEST
EMC

EMISSIONS DATA SHEET

Rev BETA
01/30/01

EUT:	BTTX01			Work Order:	POLV0037
Serial Number:	none			Date:	05/15/03
Customer:	Polyvision Corp.			Temperature:	21 degrees C
Attendees:	none	Tested by:	Greg Kiemel	Humidity:	35% RH
Customer Ref. No.:	N/A	Power:	120 V, 50 Hz	Job Site:	EV06

TEST SPECIFICATIONS

Specification:	47 CFR 15.247(d)	Year:	Most Current	Method:	FCC 97-114, ANSI C63.4	Year:	1992

SAMPLE CALCULATIONS

Meter reading on spectrum analyzer is internally compensated for cable loss and external attenuation

Power Spectral Density per 3kHz bandwidth = Power Spectral Density per 1 Hz bandwidth + Bandwidth Correction Factor.

Bandwidth Correction Factor = 10*log(3kHz/1Hz)

COMMENTS

EUT OPERATING MODES

Modulated by PRBS at maximum data rate

DEVIATIONS FROM TEST STANDARD

None

REQUIREMENTS

Maximum peak power spectral density conducted from a DSSS transmitter does not exceed 8 dBm in any 3 kHz band

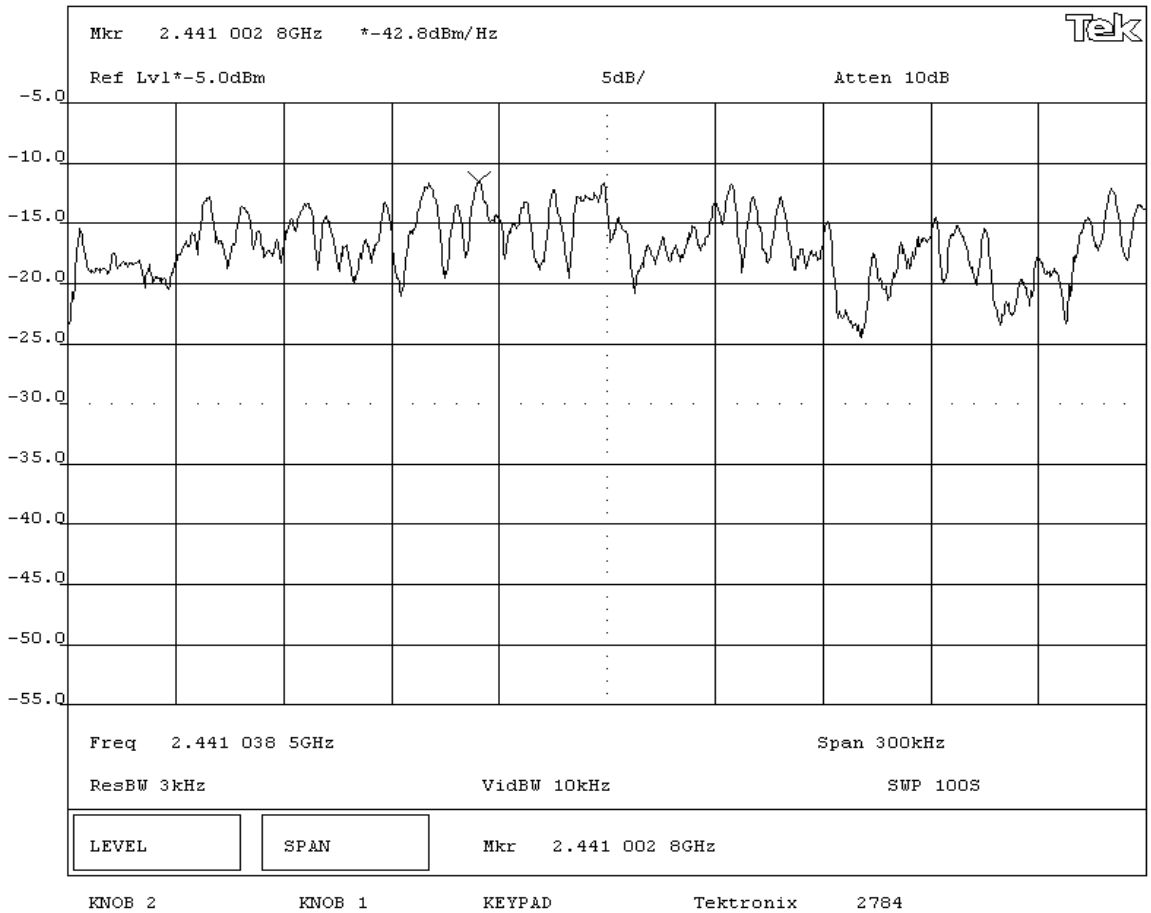
RESULTS	AMPLITUDE
Pass	Power Spectral Density = -8.0 dBm / 3kHz

SIGNATURE

Tested By: _____

DESCRIPTION OF TEST

Power Spectral Density - Mid Channel



NORTHWEST EMC

EMISSIONS DATA SHEET

Rev BETA 01/30/01

EUT:	BTTX01			Work Order:	POLV0037
Serial Number:	none			Date:	05/15/03
Customer:	Polyvision Corp.			Temperature:	21 degrees C
Attendees:	none	Tested by:	Greg Kiemel	Humidity:	35% RH
Customer Ref. No.:	N/A	Power:	120 V, 50 Hz	Job Site:	EV06

TEST SPECIFICATIONS

Specification:	47 CFR 15.247(d)	Year:	Most Current	Method:	FCC 97-114, ANSI C63.4	Year:	1992

SAMPLE CALCULATIONS

Meter reading on spectrum analyzer is internally compensated for cable loss and external attenuation

Power Spectral Density per 3kHz bandwidth = Power Spectral Density per 1 Hz bandwidth + Bandwidth Correction Factor.

Bandwidth Correction Factor = 10*log(3kHz/1Hz)

COMMENTS

EUT OPERATING MODES

Modulated by PRBS at maximum data rate

DEVIATIONS FROM TEST STANDARD

None

REQUIREMENTS

Maximum peak power spectral density conducted from a DSSS transmitter does not exceed 8 dBm in any 3 kHz band

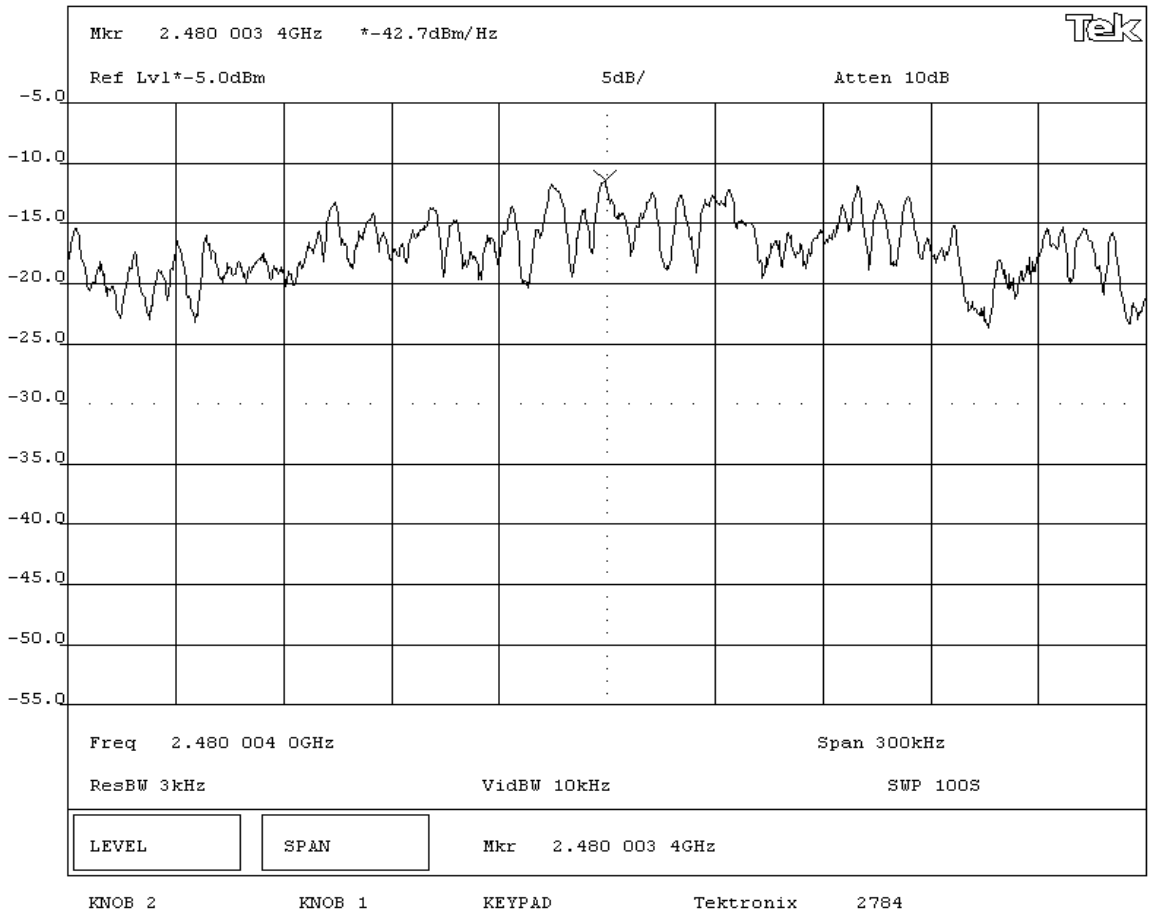
RESULTS	AMPLITUDE
Pass	Power Spectral Density = -7.9 dBm / 3kHz

SIGNATURE

Tested By: A. U. Kiemel

DESCRIPTION OF TEST

Power Spectral Density - High Channel



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

Antennas Investigated:
Swivel Dipole

Data Rates Investigated:
Maximum

Output Power Setting(s) Investigated:
Maximum

Power Input Settings Investigated:
120 VAC, 60 Hz.

Frequency Range Investigated			
Start Frequency	30 MHz	Stop Frequency	25 GHz

Software\Firmware Applied During Test

Exercise software	Standard Production Firmware	Version	5.2
Description			
The system was tested using standard operating production firmware to exercise the functions of the device during the testing. The firmware was operated via the serial interface from Windows Hyper Terminal.			

EUT and Peripherals

Description	Manufacturer	Model/Part Number	Serial Number
Bluetooth Module	Polyvision Corp.	BTTX01	Unknown
AC power adapter	Ault	P41050400A012G	N/A
Swivel Dipole Antenna	Gigant	Titanis	N/A

Cables

Cable Type	Shield	Length (m)	Ferrite	Connection 1	Connection 2
DC power	Yes	1.2	PA	Bluetooth Module	AC power adapter
Serial	Yes	3.0	No	Bluetooth Module	Unterminated

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	8566B	AAL	01/07/2003	12 mo
Spectrum Analyzer Display	Hewlett Packard	85662A	AALD	01/07/2003	12 mo
Pre-Amplifier	Amplifier Research	LN1000A	APS	01/06/2003	12 mo
Antenna, Biconilog	EMCO	3141	AXE	12/31/2001	36 mo
Pre-Amplifier	Miteq	AMF-4D-005180-24-10P	APJ	01/06/2003	12 mo
Antenna, Horn	EMCO	3115	AHC	08/12/2002	12 mo
Antenna, Horn	EMCO	3160-09	AHG	01/15/2000	39 mo
Pre-Amplifier	Miteq	AMF-4D-005180-24-10P	APC	07/09/2002	12 mo
Pre-Amplifier	Miteq	JSD4-18002600-26-8P	APU	01/17/2000	39 mo
High Pass Filter	RLC Electronics	F-100-4000-5-R (HPF>4GHz up to	HFF	05/01/2003	12 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 only antenna to be used with the EUT was tested. The EUT was configured for low, mid, and high band transmit frequencies. The EUT was transmitting at its maximum data rate in a no hop mode. The spectrum was scanned from 30 MHz to 25 GHz. In addition, measurements were made in the restricted band of 2.4835 to 2.5 GHz to verify compliance. While scanning, emissions from the EUT were maximized by rotating the EUT, adjusting the 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.

Since the dwell time per channel of the hopping signal was less than 100 ms, the readings obtained with the 10 Hz VBW were further reduced by a “duty cycle correction factor” of 24.7 dB, derived from 20log(dwell time/100ms), where the EUT’s maximum dwell time in any 100mS period was measured to be 5.8 mS.

Band-edge compliance for peak emissions in the restricted band of 2.4835 GHz to 2.5 GHz was confirmed by using the “marker-delta” method described in FCC Public Notice DA 00-705:

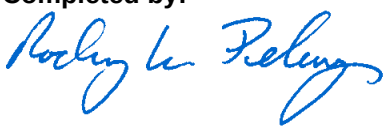
1. In-band field strength of the fundamental was measured in both polarities
2. Amplitude delta between the fundamental and highest band-edge emission was measured in both polarities.
3. For each polarity, the amplitude delta from step #2 was subtracted from the field strength level of step #1.

The resultant field strengths were used to determine compliance of peak and average emissions with band-edge requirements.

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
Measurements were made using the bandwidths and detectors specified. No video filter was used.			

Completed by:



NORTHWEST EMC

OATS DATA SHEET

REV df3.10 03/10/2003

EUT:	BTTX01			Work Order:	POLV0037
Serial Number:	none			Date:	05/13/03
Customer:	Polyvision Corp.			Temperature:	70
Attendees:	Jeff Traw			Humidity:	40%
Cust. Ref. No.:				Barometric Pressure	30.06
Tested by:	Rod Peloquin	Power:	120VAC/60Hz	Job Site:	EV01

TEST SPECIFICATIONS

Specification:	FCC Part 15.247(c)	Year:	2001
Method:	ANSI C63.4	Year:	1992

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

EUT OPERATING MODES

Modulated PRBS at maximum data rate, maximum power out

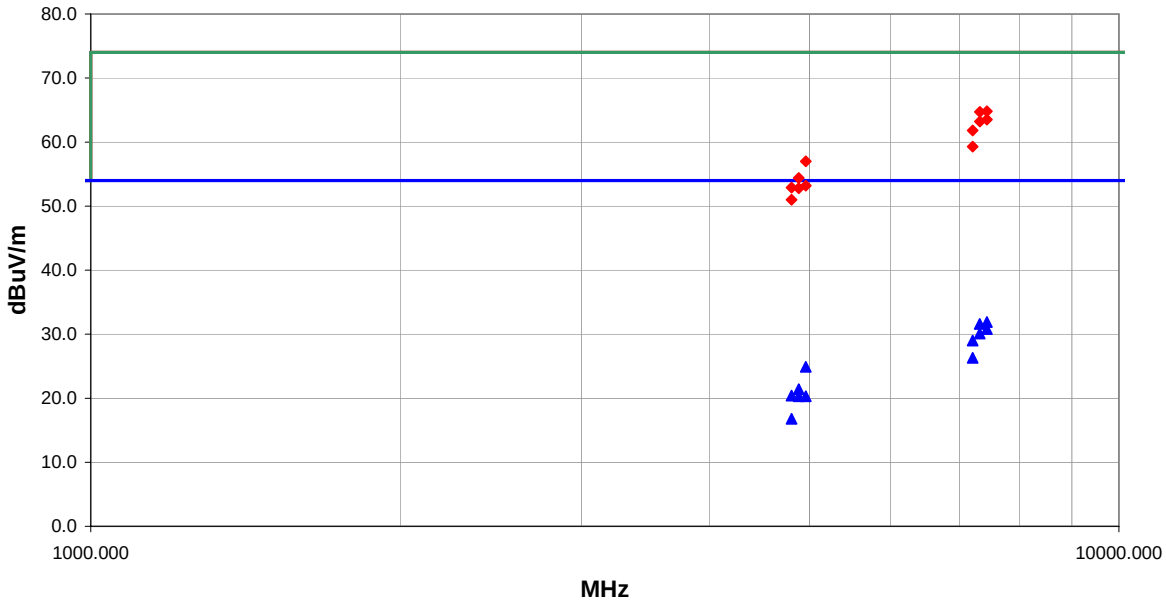
DEVIATIONS FROM TEST STANDARD

No deviations.

RESULTS	Run #
Pass	2

Other

Tested By:



Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Azimuth (degrees)	Height (meters)	Duty Cycle Correction Factor	External Attenuation (dB)	Polarity	Detector	Distance Adjustment (dB)	Adjusted dBuV/m	Spec. Limit dBuV/m	Compared to Spec. (dB)	Comments
7440.000	45.2	11.4	258.0	1.8	24.7	0.0	V-Horn	AV	0.0	31.9	54.0	-22.1	high channel
7323.000	45.3	11.0	259.0	1.8	24.7	0.0	V-Horn	AV	0.0	31.6	54.0	-22.4	mid channel
7440.000	44.1	11.4	349.0	1.6	24.7	0.0	H-Horn	AV	0.0	30.8	54.0	-23.2	high channel
7323.000	43.8	11.0	349.0	1.6	24.7	0.0	H-Horn	AV	0.0	30.1	54.0	-23.9	mid channel
7206.000	43.2	10.5	16.0	1.3	24.7	0.0	H-Horn	AV	0.0	29.0	54.0	-25.0	low channel
7206.000	40.5	10.5	273.0	1.0	24.7	0.0	V-Horn	AV	0.0	26.3	54.0	-27.7	low channel
4960.000	43.2	6.4	64.0	1.4	24.7	0.0	H-Horn	AV	0.0	24.9	54.0	-29.1	high channel
4882.000	39.9	6.2	302.0	1.5	24.7	0.0	H-Horn	AV	0.0	21.4	54.0	-32.6	mid channel
4804.000	39.2	5.9	50.0	1.5	24.7	0.0	H-Horn	AV	0.0	20.4	54.0	-33.6	low channel
4960.000	38.6	6.4	24.0	1.5	24.7	0.0	V-Horn	AV	0.0	20.3	54.0	-33.7	high channel
4882.000	38.8	6.2	357.0	1.4	24.7	0.0	V-Horn	AV	0.0	20.3	54.0	-33.7	mid channel
4804.000	35.6	5.9	311.0	1.7	24.7	0.0	V-Horn	AV	0.0	16.8	54.0	-37.2	low channel
7440.180	53.4	11.4	258.0	1.8	0.0	0.0	V-Horn	PK	0.0	64.8	74.0	-9.2	high channel
7323.132	53.7	11.0	259.0	1.8	0.0	0.0	V-Horn	PK	0.0	64.7	74.0	-9.3	mid channel
7440.144	52.1	11.4	349.0	1.6	0.0	0.0	H-Horn	PK	0.0	63.5	74.0	-10.5	high channel
7323.132	52.2	11.0	349.0	1.6	0.0	0.0	H-Horn	PK	0.0	63.2	74.0	-10.8	mid channel
7206.132	51.3	10.5	16.0	1.3	0.0	0.0	H-Horn	PK	0.0	61.8	74.0	-12.2	low channel
7206.000	48.8	10.5	273.0	1.0	0.0	0.0	V-Horn	PK	0.0	59.3	74.0	-14.7	low channel
4960.000	50.6	6.4	64.0	1.4	0.0	0.0	H-Horn	PK	0.0	57.0	74.0	-17.0	high channel
4882.000	48.2	6.2	302.0	1.5	0.0	0.0	H-Horn	PK	0.0	54.4	74.0	-19.6	mid channel
4960.000	46.8	6.4	24.0	1.5	0.0	0.0	V-Horn	PK	0.0	53.2	74.0	-20.8	high channel
4804.000	47.0	5.9	50.0	1.5	0.0	0.0	H-Horn	PK	0.0	52.9	74.0	-21.1	low channel
4882.000	46.6	6.2	357.0	1.4	0.0	0.0	V-Horn	PK	0.0	52.8	74.0	-21.2	mid channel
4804.000	45.1	5.9	311.0	1.7	0.0	0.0	V-Horn	PK	0.0	51.0	74.0	-23.0	low channel

NORTHWEST
EMC

OATS DATA SHEET

REV
df3.10
03/10/2003

EUT:	BTTX01			**Work Order:**	POLV0037
Serial Number:	none			**Date:**	05/13/03
Customer:	Polyvision Corp.			**Temperature:**	70
Attendees:	Jeff Traw			**Humidity:**	40%
Cust. Ref. No.:				**Barometric Pressure**	30.06
Tested by:	Dan Haas	**Power:**	120VAC/60Hz	**Job Site:**	EV01

TEST SPECIFICATIONS

Specification:	FCC Part 15.247 Class B	**Year:**	2001
Method:	ANSI C63.4	**Year:**	1992

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

EUT OPERATING MODES

Modulated PRBS at maximum data rate, maximum power out

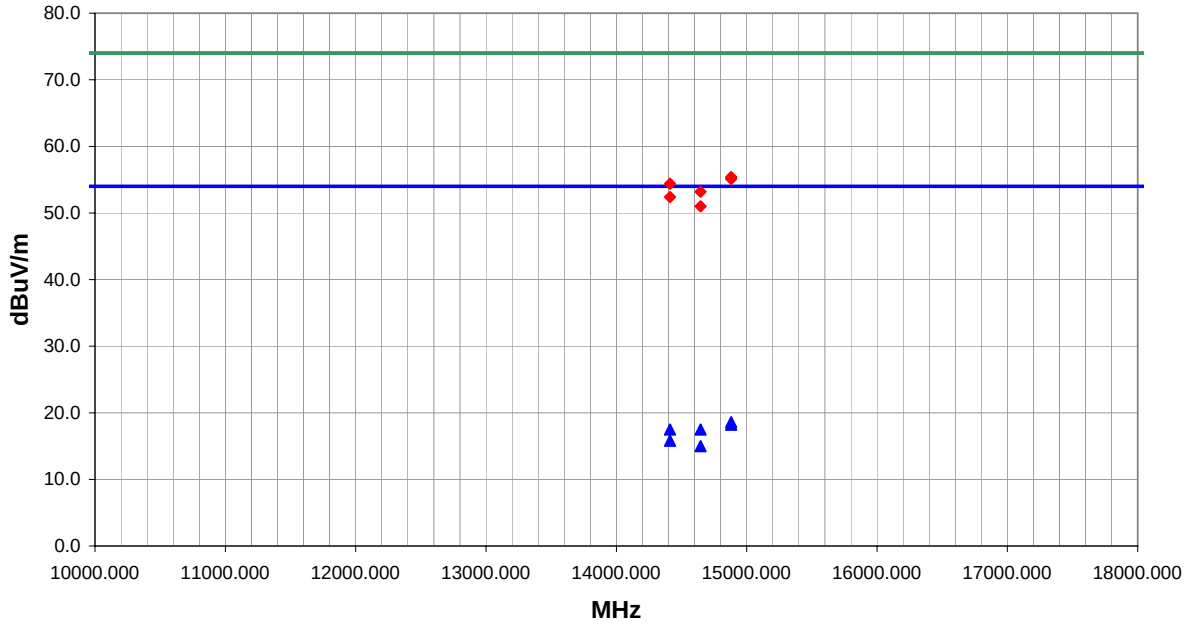
DEVIATIONS FROM TEST STANDARD

No deviations.

RESULTS	**Run #**
Pass	2

Other

Tested By:



Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Azimuth (degrees)	Height (meters)	Duty Cycle Correction Factor	External Attenuation (dB)	Polarity	Detector	Distance Adjustment (dB)	Adjusted dBuV/m	Spec. Limit dBuV/m	Compared to Spec. (dB)	Comments
14880.980	33.0	10.3	337.0	1.3	24.7	0.0	H-Horn	AV	0.0	18.6	54.0	-35.4	high channel
14880.980	32.6	10.3	29.0	1.0	24.7	0.0	V-Horn	AV	0.0	18.2	54.0	-35.8	high channel
14646.090	31.7	10.5	310.0	1.1	24.7	0.0	H-Horn	AV	0.0	17.5	54.0	-36.5	mid channel
14412.150	31.5	10.7	80.0	1.1	24.7	0.0	H-Horn	AV	0.0	17.5	54.0	-36.5	low channel
14412.150	29.8	10.7	338.0	1.0	24.7	0.0	V-Horn	AV	0.0	15.8	54.0	-38.2	low channel
14646.090	29.2	10.5	308.0	1.0	24.7	0.0	V-Horn	AV	0.0	15.0	54.0	-39.0	mid channel
14880.980	45.1	10.3	337.0	1.3	0.0	0.0	H-Horn	PK	0.0	55.4	74.0	-18.6	high channel
14880.980	44.8	10.3	29.0	1.0	0.0	0.0	V-Horn	PK	0.0	55.1	74.0	-18.9	high channel
14412.150	43.7	10.7	80.0	1.1	0.0	0.0	H-Horn	PK	0.0	54.4	74.0	-19.6	low channel
14646.090	42.7	10.5	310.0	1.1	0.0	0.0	H-Horn	PK	0.0	53.2	74.0	-20.8	mid channel
14412.150	41.7	10.7	338.0	1.0	0.0	0.0	V-Horn	PK	0.0	52.4	74.0	-21.6	low channel
14646.090	40.5	10.5	308.0	1.0	0.0	0.0	V-Horn	PK	0.0	51.0	74.0	-23.0	mid channel

NORTHWEST EMC

OATS DATA SHEET

REV df3.10 03/10/2003

EUT:	BTTX01			Work Order:	POLV0037
Serial Number:	none			Date:	05/13/03
Customer:	Polyvision Corp.			Temperature:	70
Attendees:	Jeff Traw			Humidity:	40%
Cust. Ref. No.:				Barometric Pressure	30.06
Tested by:	Rod Peloquin	Power:	120VAC/60Hz	Job Site:	EV01

TEST SPECIFICATIONS

Specification:	FCC Part 15.247(c)	Year:	2001
Method:	ANSI C63.4	Year:	1992

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

EUT OPERATING MODES

Modulated PRBS at maximum data rate, maximum power out

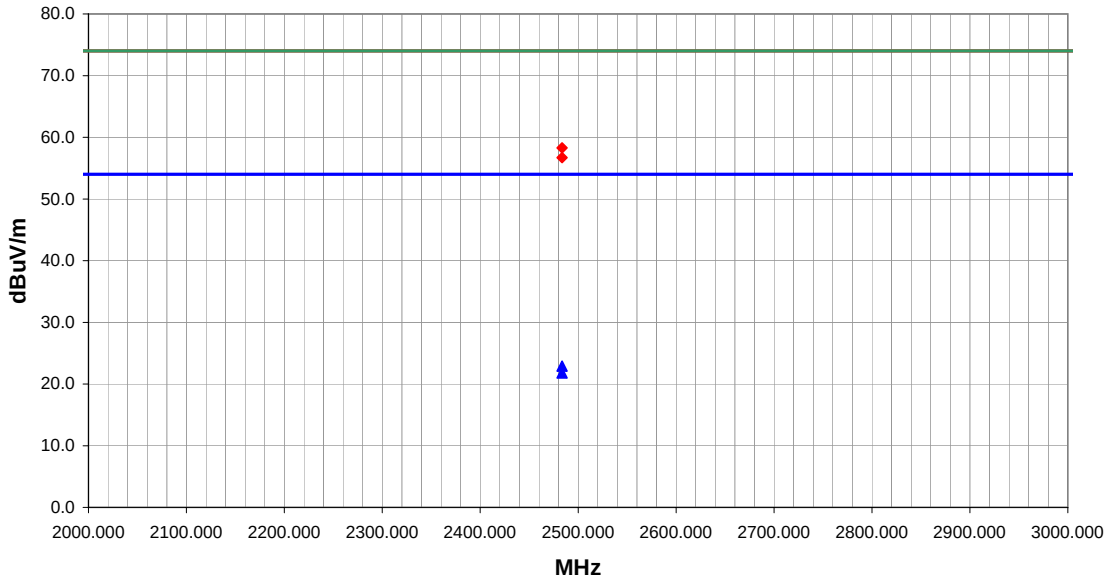
DEVIATIONS FROM TEST STANDARD

No deviations.

RESULTS	Run #
Evaluation	2

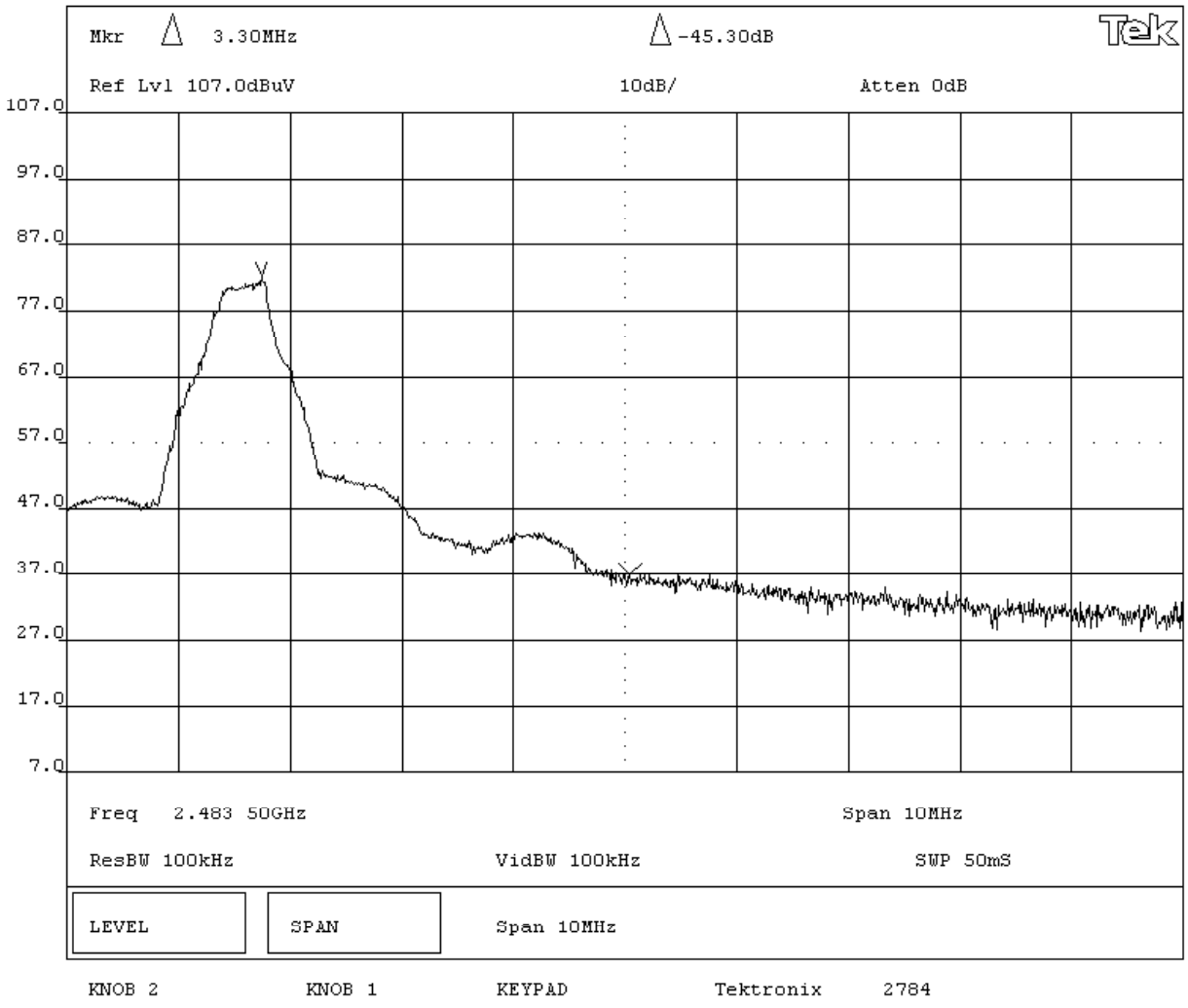
Other

Tested By:

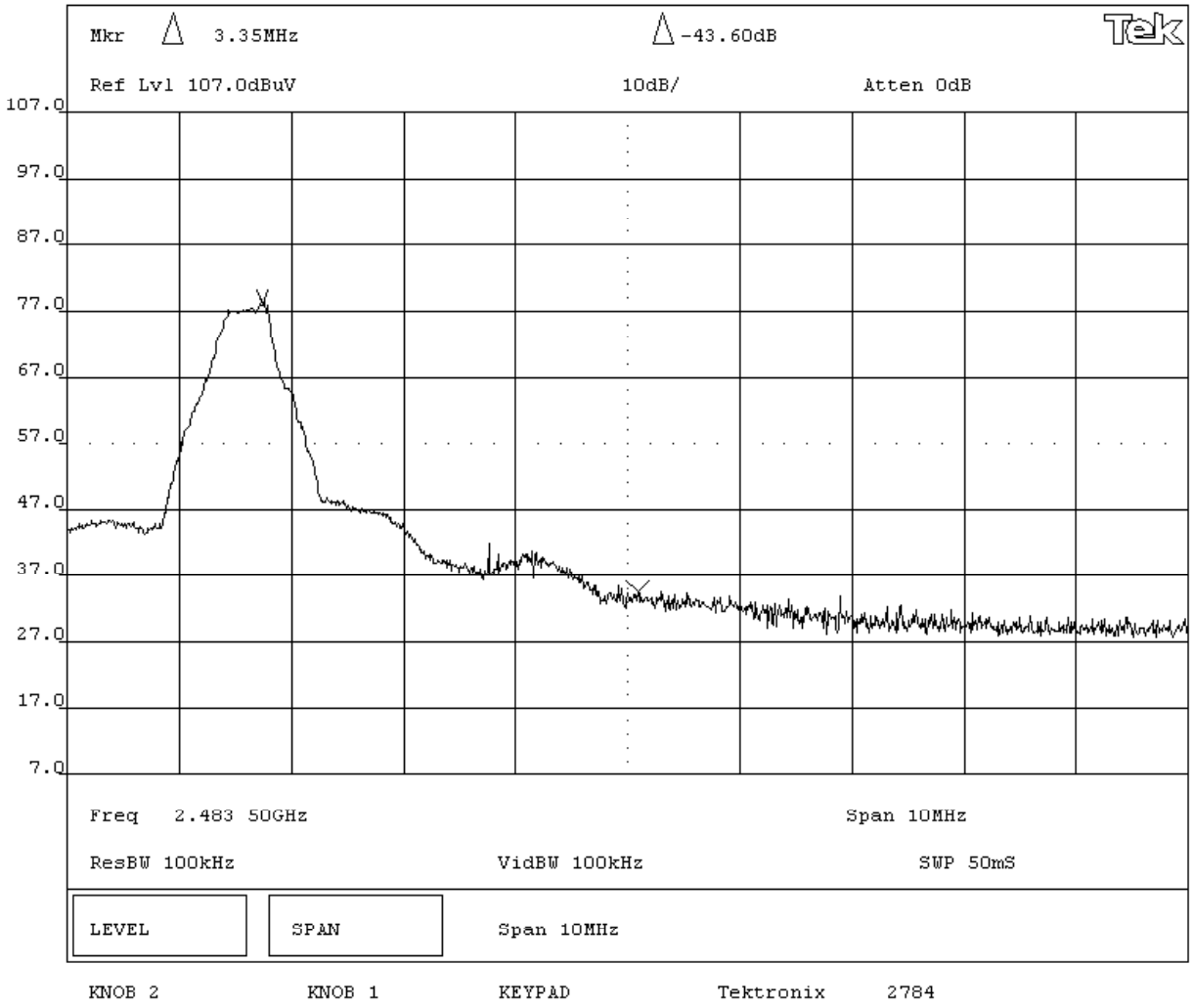


Freq (MHz)	Amplitude (dBuV)	Factor (dB)	Azimuth (degrees)	Height (meters)	Duty Cycle Correction Factor	External Attenuation (dB)	Polarity	Detector	Distance Adjustment (dB)	Adjusted dBuV/m	Spec. Limit dBuV/m	Compared to Spec. (dB)	Comments
2480.000	71.9	1.0	148.0	1.0	24.7	20.0	V-Horn	AV	0.0	68.2	N/A	N/A	Fundamental, high channel
2480.000	69.1	1.0	307.0	1.4	24.7	20.0	H-Horn	AV	0.0	65.4	N/A	N/A	Fundamental, high channel
2483.500	N/A	N/A	258.0	1.8	24.7	20.0	V-Horn	AV	0.0	22.9	54.0	-31.1	Marker-Delta method used to calculate Adjusted Level. Adjusted Level = 68.2dBµ/Vm - 45.3
2483.500	N/A	N/A	259.0	1.8	24.7	20.0	H-Horn	AV	0.0	21.8	54.0	-32.2	Marker-Delta method used to calculate Adjusted Level. Adjusted Level = 65.4dBµ/Vm - 43.6
2480.000	82.6	1.0	148.0	1.0	0.0	20.0	V-Horn	PK	0.0	103.6	N/A	N/A	Fundamental, high channel
2480.000	79.3	1.0	307.0	1.4	0.0	20.0	H-Horn	PK	0.0	100.3	N/A	N/A	Fundamental, high channel
2483.500	N/A	N/A	258.0	1.8	0.0	20.0	V-Horn	PK	0.0	58.3	74.0	-15.7	Marker-Delta method used to calculate Adjusted Level. Adjusted Level = 103.6dBµ/Vm - 45.3
2483.500	N/A	N/A	259.0	1.8	0.0	20.0	H-Horn	PK	0.0	56.7	74.0	-17.3	Marker-Delta method used to calculate Adjusted Level. Adjusted Level = 100.3dBµ/Vm - 43.6

Radiated Band Edge, Marker Delta Method, Vertical Polarity



Radiated Band Edge, Marker Delta Method, Horizontal Polarity



NORTHWEST EMC

DUTY CYCLE CORRECTION FACTOR

Rev BETA 01/30/01

EUT:	BTTX01			Work Order:	POLV0037
Serial Number:	none			Date:	05/13/03
Customer:	Polyvision Corporation			Temperature:	23 degrees C
Attendees:	Jeff Traw	Tested by:	Rod Peloquin	Humidity:	38% RH
Customer Ref. No.:	N/A	Power:	120VAC/60Hz%	Job Site:	EV06

TEST SPECIFICATIONS

Specification:	47 CFR 15.247(a)(1)(ii)	Year:	Most Current	Method:	DA 00-705, ANSI C63.4	Year:	1992

SAMPLE CALCULATIONS

Duty Cycle Correction Factor = 20 * log [(Total transmit time in any 100mS period) / (100mS)]

COMMENTS

EUT OPERATING MODES

Modulated by PRBS at maximum data rate. Hopping carrier. Data mode.

DEVIATIONS FROM TEST STANDARD

None

REQUIREMENTS

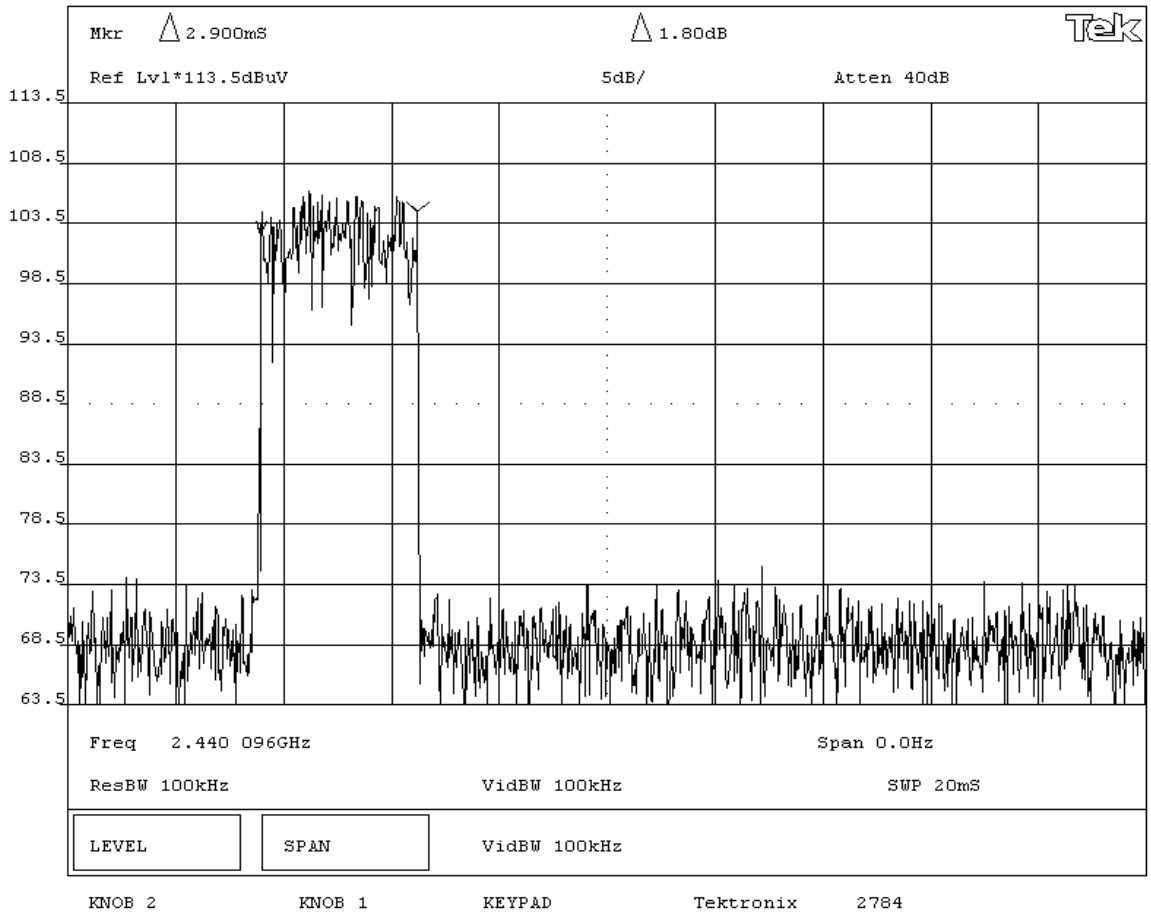
RESULTS	DWELL TIME DURING A SINGLE TRANSMISSION
Pass	2.9 mS

SIGNATURE

Tested By: _____

DESCRIPTION OF TEST

Time of Occupancy (Dwell Time) - Single Transmission



NORTHWEST EMC

DUTY CYCLE CORRECTION FACTOR

Rev BETA 01/30/01

EUT:	BTTX01			Work Order:	POLV0037
Serial Number:	none			Date:	05/13/03
Customer:	Polyvision Corporation			Temperature:	23 degrees C
Attendees:	Jeff Traw	Tested by:	Rod Peloquin	Humidity:	38% RH
Customer Ref. No.:	N/A	Power:	120VAC/60Hz%	Job Site:	EV06

TEST SPECIFICATIONS

Specification:	47 CFR 15.247(a)(1)(ii)	Year:	Most Current	Method:	DA 00-705, ANSI C63.4	Year:	1992

SAMPLE CALCULATIONS

Duty Cycle Correction Factor = 20 * log [(Total transmit time in any 100mS period) / (100mS)]

COMMENTS

EUT OPERATING MODES

Modulated by PRBS at maximum data rate. Hopping carrier. Data mode.

DEVIATIONS FROM TEST STANDARD

None

REQUIREMENTS

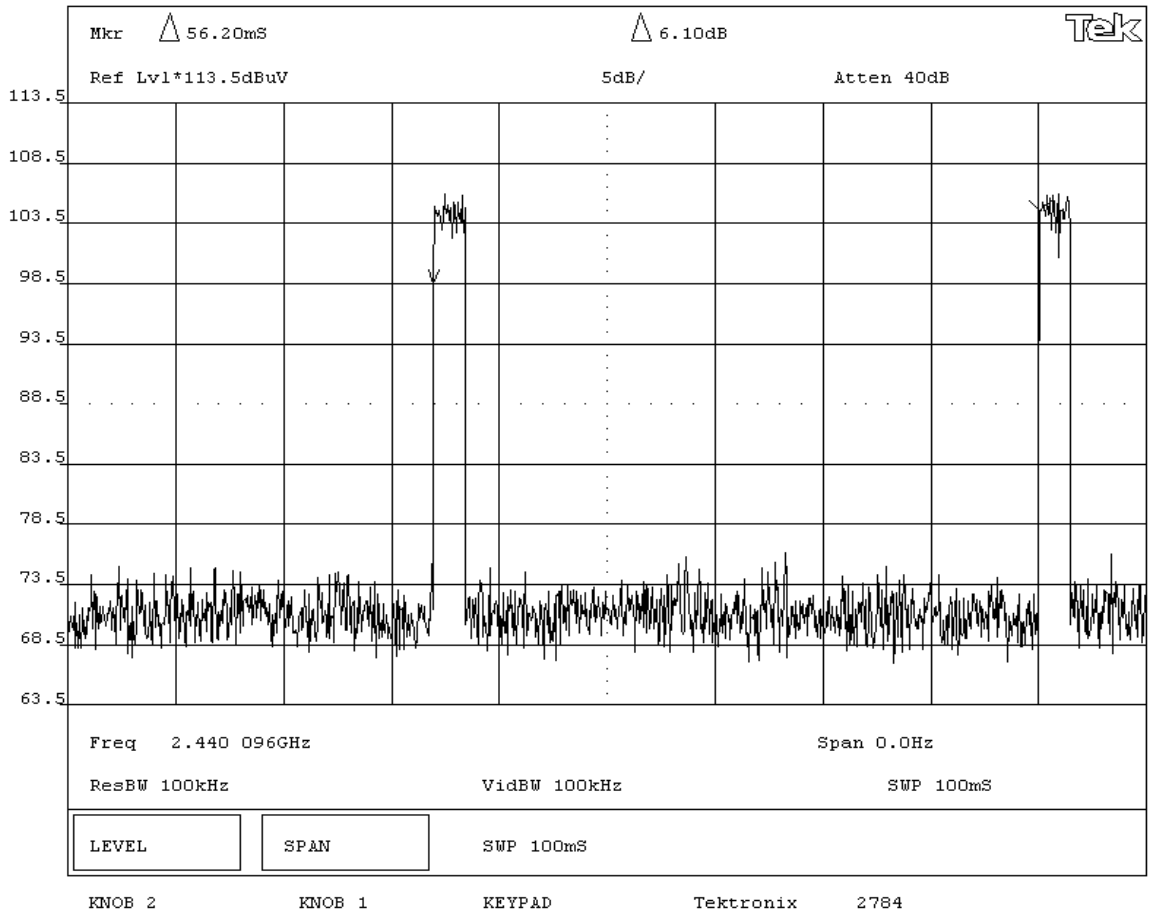
RESULTS	NUMBER OF TRANSMISSIONS DURING A 100mS PERIOD
Pass	2

SIGNATURE

Tested By: _____

DESCRIPTION OF TEST

Time of Occupancy (Dwell Time) - Number of transmissions during a 100mS period



Justification

The individuals and/or the organization requesting the test provided the modes, configurations and settings available to evaluate. All of the EUT parameters listed below were investigated. This includes, but may not be limited to, CPU speeds, video resolution settings, operational modes, and input voltages.

Operating Modes Investigated:
Transmitting data

Power Input Settings Investigated:
120 VAC, 60 Hz

Software\Firmware Applied During Test			
Operating system	N/A	Version	Unknown
Exercise software	Standard Production Software	Version	Unknown
Description			
The system was tested using standard operating modes, which do not require software. Modulated PRBS at maximum data rate, maximum power output.			

EUT and Peripherals in Test Setup Boundary

Description	**Manufacturer**	**Model/Part Number**	**Serial Number**
Bluetooth Module	Polyvision Corp.	BTTX01	Unknown
AC power adapter	Ault	P41050400A012G	N/A
Antenna	Gigant	Titanis	N/A

Cables

Cable Type	**Shield**	**Length (m)**	**Ferrite**	**Connection 1**	**Connection 2**
DC power	No	1.0	No	Bluetooth Module	AC power adapter
Serial	Yes	4.5	No	Bluetooth Module	Unterminated

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	8566B	AAL	01/07/2003	12 mo
Spectrum Analyzer Display	Hewlett Packard	85662A	AALD	01/07/2003	12 mo
Quasi-Peak Adapter	Hewlett-Packard	85650A	AQF	01/07/2003	12 mo
LISN	Solar	9252-50-R-24-BNC	LIP	12/12/2002	12 mo
High Pass Filter	TTE	H97-100k-50-720B	HFC	01/02/2003	12 mo

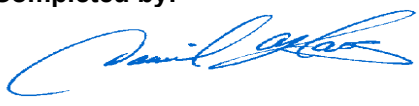
Test Description

Using the mode of operation and configuration noted within this report, conducted emissions tests were performed. The frequency range investigated (scanned), is also noted in this report. Conducted power line measurements are made, unless otherwise specified, over the frequency range from 150 kHz to 30 MHz to determine the line-to-ground radio-noise voltage that is conducted from the EUT power-input terminals that are directly (or indirectly via separate transformer or power supplies) connected to a public power network. Equipment is tested with power cords that are normally used or that have electrical or shielding characteristics that are the same as those cords normally used. Typically those measurements are made using a LISN (Line Impedance Stabilization Network), the 50 Ω measuring port is terminated by a 50 Ω EMI meter or a 50 Ω resistive load. All 50 Ω measuring ports of the LISN are terminated by 50Ω.

Measurement Bandwidths

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
Measurements were made using the bandwidths and detectors specified. No video filter was used.			

Completed by:



NORTHWEST EMC

CONDUCTED EMISSIONS DATA SHEET

REV df3.10 03/10/2003

EUT:	BTTX01			Work Order:	POLV0037
Serial Number:	none			Date:	05/13/03
Customer:	Polyvision Corp.			Temperature:	72
Attendees:	Jeff Traw			Humidity:	33%
Cust. Ref. No.:				Barometric Pressure	29.88
Tested by:	Dan Haas	Power:	120VAC/60Hz	Job Site:	EV01

TEST SPECIFICATIONS

Specification:	CISPR22 Class A	Year:	1997
Method:	ANSI C63.4	Year:	1992

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

EUT OPERATING MODES

Low Channel, Modulated PRBS at maximum data rate, maximum power out

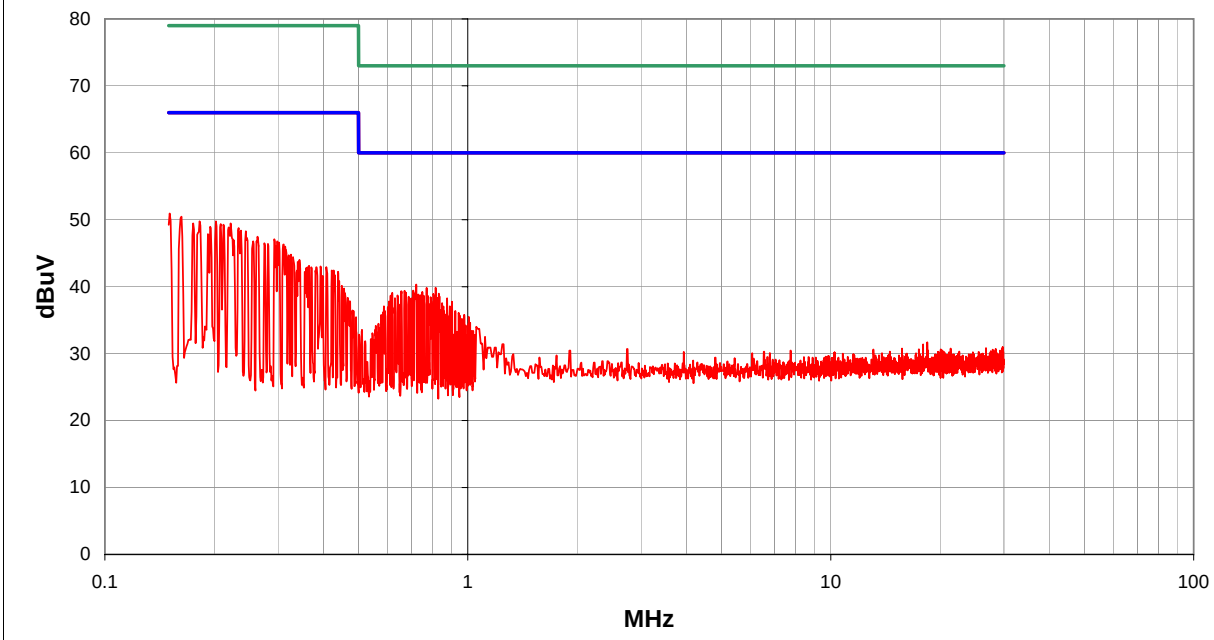
DEVIATIONS FROM TEST STANDARD

No deviations.

RESULTS	Line	Run #
Pass	L1	1

Other

Tested By:



Freq (MHz)	Amplitude (dBuV)			Transducer (dB)	Cable (dB)	External Attenuation (dB)		Detector (blank equal peaks [PK] from scan)		Adjusted dBuV	Spec. Limit dBuV	Compared to Spec. (dB)
0.151	30.8			0.0	0.1	20.0				50.9	66.0	-15.1
0.163	30.3			0.0	0.1	20.0				50.4	66.0	-15.6
0.202	29.6			0.0	0.2	20.0				49.8	66.0	-16.2
0.182	29.6			0.0	0.2	20.0				49.8	66.0	-16.2
0.222	29.3			0.0	0.2	20.0				49.5	66.0	-16.5
0.175	29.3			0.0	0.2	20.0				49.5	66.0	-16.5
0.209	29.2			0.0	0.2	20.0				49.4	66.0	-16.6
0.212	29.1			0.0	0.2	20.0				49.3	66.0	-16.7
0.195	28.8			0.0	0.2	20.0				49.0	66.0	-17.0
0.234	28.6			0.0	0.2	20.0				48.8	66.0	-17.2
0.237	28.2			0.0	0.2	20.0				48.4	66.0	-17.6
0.245	28.1			0.0	0.2	20.0				48.3	66.0	-17.7
0.192	27.7			0.0	0.2	20.0				47.9	66.0	-18.1
0.263	27.3			0.0	0.2	20.0				47.5	66.0	-18.5
0.293	26.9			0.0	0.2	20.0				47.1	66.0	-18.9
0.227	26.8			0.0	0.2	20.0				47.0	66.0	-19.0
0.299	26.6			0.0	0.2	20.0				46.8	66.0	-19.2
0.256	26.6			0.0	0.2	20.0				46.8	66.0	-19.2
0.302	26.4			0.0	0.2	20.0				46.6	66.0	-19.4
0.275	26.3			0.0	0.2	20.0				46.5	66.0	-19.5

NORTHWEST EMC

CONDUCTED EMISSIONS DATA SHEET

REV df3.10 03/10/2003

EUT:	BTTX01	Work Order:	POLV0037
Serial Number:	none	Date:	05/13/03
Customer:	Polyvision Corp.	Temperature:	72
Attendees:	Jeff Traw	Humidity:	33%
Cust. Ref. No.:		Barometric Pressure	29.88
Tested by:	Dan Haas	Power: 120VAC/60Hz	Job Site: EV01

TEST SPECIFICATIONS

Specification:	CISPR22 Class A	Year:	1997
Method:	ANSI C63.4	Year:	1992

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

EUT OPERATING MODES

Low Channel, Modulated PRBS at maximum data rate, maximum power out

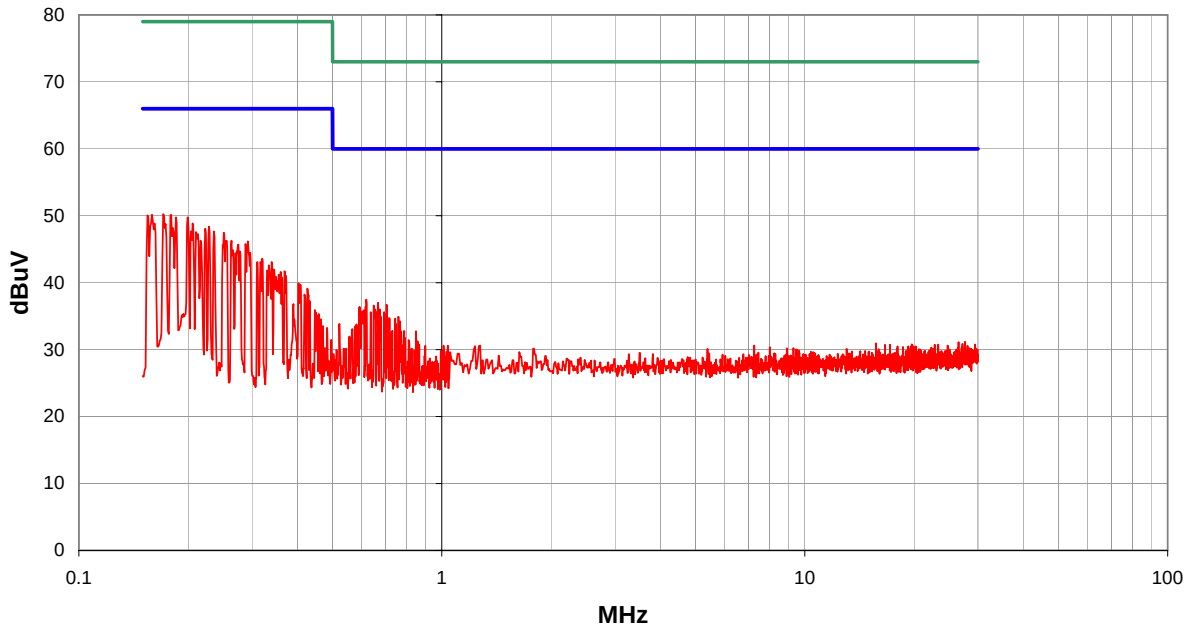
DEVIATIONS FROM TEST STANDARD

No deviations.

RESULTS	Line	Run #
Pass	N	2

Other

Tested By:



Freq (MHz)	Amplitude (dBuV)			Transducer (dB)	Cable (dB)	External Attenuation (dB)		Detector (blank equal peaks [PK] from scan)		Adjusted dBuV	Spec. Limit dBuV	Compared to Spec. (dB)
0.171	30.1			0.0	0.1	20.0				50.2	66.0	-15.8
0.180	30.0			0.0	0.2	20.0				50.2	66.0	-15.8
0.159	30.0			0.0	0.1	20.0				50.1	66.0	-15.9
0.155	29.9			0.0	0.1	20.0				50.0	66.0	-16.0
0.200	29.6			0.0	0.2	20.0				49.8	66.0	-16.2
0.185	29.6			0.0	0.2	20.0				49.8	66.0	-16.2
0.206	28.7			0.0	0.2	20.0				48.9	66.0	-17.1
0.228	28.2			0.0	0.2	20.0				48.4	66.0	-17.6
0.223	27.9			0.0	0.2	20.0				48.1	66.0	-17.9
0.236	27.5			0.0	0.2	20.0				47.7	66.0	-18.3
0.210	27.4			0.0	0.2	20.0				47.6	66.0	-18.4
0.251	27.3			0.0	0.2	20.0				47.5	66.0	-18.5
0.263	26.1			0.0	0.2	20.0				46.3	66.0	-19.7
0.255	26.1			0.0	0.2	20.0				46.3	66.0	-19.7
0.217	26.1			0.0	0.2	20.0				46.3	66.0	-19.7
0.292	26.0			0.0	0.2	20.0				46.2	66.0	-19.8
0.288	25.6			0.0	0.2	20.0				45.8	66.0	-20.2
0.275	25.5			0.0	0.2	20.0				45.7	66.0	-20.3
0.278	24.5			0.0	0.2	20.0				44.7	66.0	-21.3
0.297	24.3			0.0	0.2	20.0				44.5	66.0	-21.5

NORTHWEST EMC

CONDUCTED EMISSIONS DATA SHEET

REV df3.10 03/10/2003

EUT:	BTTX01	Work Order:	POLV0037
Serial Number:	none	Date:	05/13/03
Customer:	Polyvision Corp.	Temperature:	72
Attendees:	Jeff Traw	Humidity:	33%
Cust. Ref. No.:		Barometric Pressure	29.88
Tested by:	Dan Haas	Power: 120VAC/60Hz	Job Site: EV01

TEST SPECIFICATIONS

Specification:	CISPR22 Class A	Year:	1997
Method:	ANSI C63.4	Year:	1992

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

EUT OPERATING MODES

Mid Channel, Modulated PRBS at maximum data rate, maximum power out

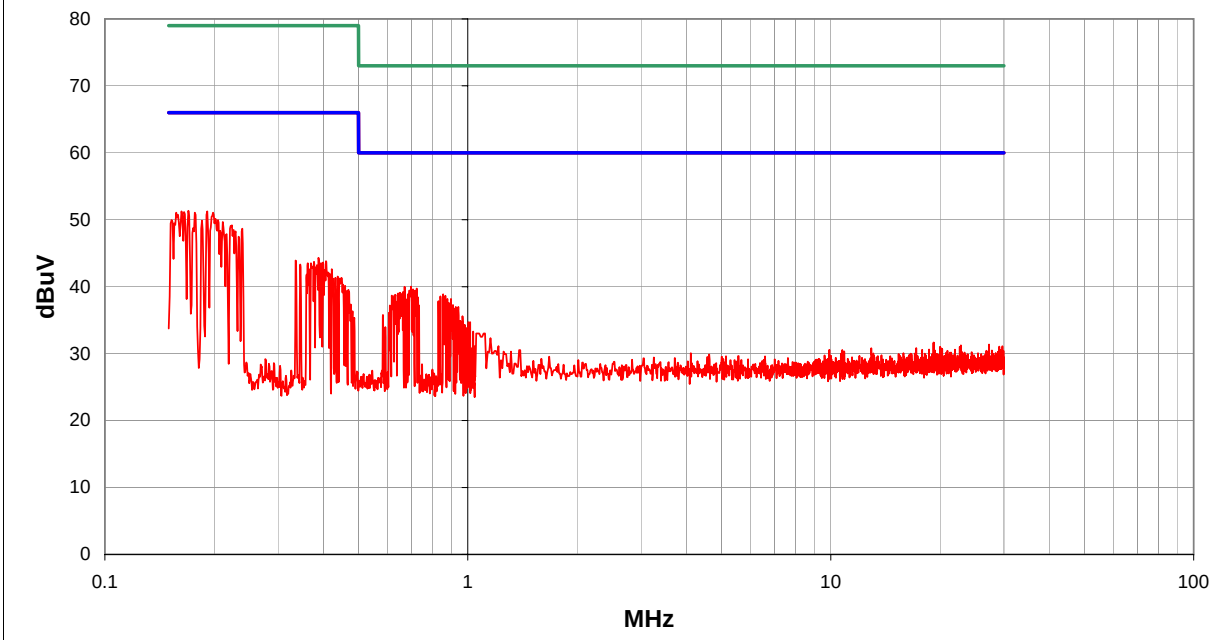
DEVIATIONS FROM TEST STANDARD

No deviations.

RESULTS	Line	Run #
Pass	L1	3

Other

Tested By:



Freq (MHz)	Amplitude (dBuV)			Transducer (dB)	Cable (dB)	External Attenuation (dB)		Detector (blank equal peaks [PK] from scan)		Adjusted dBuV	Spec. Limit dBuV	Compared to Spec. (dB)
0.170	31.2			0.0	0.1	20.0				51.3	66.0	-14.7
0.191	31.1			0.0	0.2	20.0				51.3	66.0	-14.7
0.163	31.1			0.0	0.1	20.0				51.2	66.0	-14.8
0.165	31.0			0.0	0.1	20.0				51.1	66.0	-14.9
0.199	30.9			0.0	0.2	20.0				51.1	66.0	-14.9
0.177	30.9			0.0	0.2	20.0				51.1	66.0	-14.9
0.157	30.9			0.0	0.1	20.0				51.0	66.0	-15.0
0.153	29.8			0.0	0.1	20.0				49.9	66.0	-16.1
0.185	29.7			0.0	0.2	20.0				49.9	66.0	-16.1
0.211	29.5			0.0	0.2	20.0				49.7	66.0	-16.3
0.224	29.0			0.0	0.2	20.0				49.2	66.0	-16.8
0.239	28.5			0.0	0.2	20.0				48.7	66.0	-17.3
0.208	28.2			0.0	0.2	20.0				48.4	66.0	-17.6
0.229	28.1			0.0	0.2	20.0				48.3	66.0	-17.7
0.217	27.7			0.0	0.2	20.0				47.9	66.0	-18.1
0.234	27.3			0.0	0.2	20.0				47.5	66.0	-18.5
0.697	19.7			0.0	0.3	20.0				40.0	60.0	-20.0
0.669	19.7			0.0	0.3	20.0				40.0	60.0	-20.0
0.723	19.4			0.0	0.3	20.0				39.7	60.0	-20.3
0.706	19.3			0.0	0.3	20.0				39.6	60.0	-20.4

NORTHWEST EMC

CONDUCTED EMISSIONS DATA SHEET

REV df3.10 03/10/2003

EUT:	BTTX01	Work Order:	POLV0037
Serial Number:	none	Date:	05/13/03
Customer:	Polyvision Corp.	Temperature:	72
Attendees:	Jeff Traw	Humidity:	33%
Cust. Ref. No.:		Barometric Pressure	29.88
Tested by:	Dan Haas	Power: 120VAC/60Hz	Job Site: EV01

TEST SPECIFICATIONS

Specification:	CISPR22 Class A	Year:	1997
Method:	ANSI C63.4	Year:	1992

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

EUT OPERATING MODES

Mid Channel, Modulated PRBS at maximum data rate, maximum power out

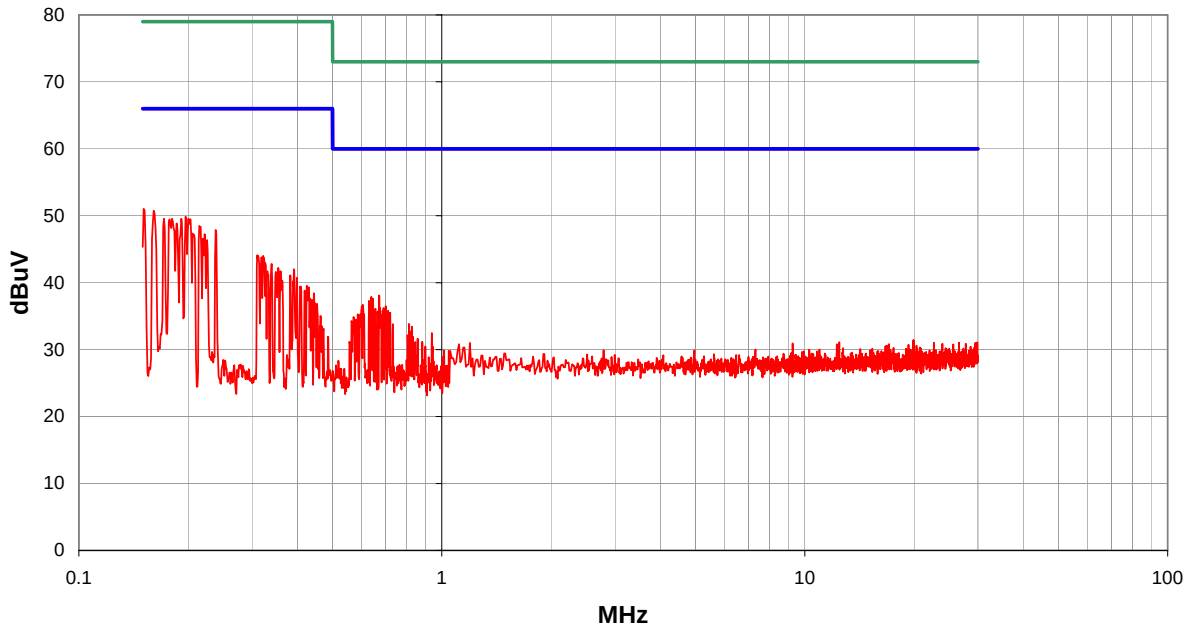
DEVIATIONS FROM TEST STANDARD

No deviations.

RESULTS	Line	Run #
Pass	N	4

Other

Tested By:



Freq (MHz)	Amplitude (dBuV)			Transducer (dB)	Cable (dB)	External Attenuation (dB)		Detector (blank equal peaks [PK] from scan)		Adjusted dBuV	Spec. Limit dBuV	Compared to Spec. (dB)
0.151	30.9			0.0	0.1	20.0				51.0	66.0	-15.0
0.161	30.6			0.0	0.1	20.0				50.7	66.0	-15.3
0.197	29.7			0.0	0.2	20.0				49.9	66.0	-16.1
0.200	29.4			0.0	0.2	20.0				49.6	66.0	-16.4
0.191	29.4			0.0	0.2	20.0				49.6	66.0	-16.4
0.181	29.4			0.0	0.2	20.0				49.6	66.0	-16.4
0.172	29.4			0.0	0.1	20.0				49.5	66.0	-16.5
0.186	28.7			0.0	0.2	20.0				48.9	66.0	-17.1
0.215	28.3			0.0	0.2	20.0				48.5	66.0	-17.5
0.238	27.7			0.0	0.2	20.0				47.9	66.0	-18.1
0.206	27.2			0.0	0.2	20.0				47.4	66.0	-18.6
0.222	27.1			0.0	0.2	20.0				47.3	66.0	-18.7
0.220	26.4			0.0	0.2	20.0				46.6	66.0	-19.4
0.226	26.2			0.0	0.2	20.0				46.4	66.0	-19.6
0.672	17.8			0.0	0.3	20.0				38.1	60.0	-21.9
0.310	23.9			0.0	0.2	20.0				44.1	66.0	-21.9
0.322	23.8			0.0	0.2	20.0				44.0	66.0	-22.0
0.640	17.6			0.0	0.3	20.0				37.9	60.0	-22.1
0.318	23.6			0.0	0.2	20.0				43.8	66.0	-22.2
0.646	17.3			0.0	0.3	20.0				37.6	60.0	-22.4

NORTHWEST EMC

CONDUCTED EMISSIONS DATA SHEET

REV df3.10 03/10/2003

EUT:	BTTX01			Work Order:	POLV0037
Serial Number:	none			Date:	05/13/03
Customer:	Polyvision Corp.			Temperature:	72
Attendees:	Jeff Traw			Humidity:	33%
Cust. Ref. No.:				Barometric Pressure	29.88
Tested by:	Dan Haas	Power:	120VAC/60Hz	Job Site:	EV01

TEST SPECIFICATIONS

Specification:	CISPR22 Class A	Year:	1997
Method:	ANSI C63.4	Year:	1992

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

EUT OPERATING MODES

High Channel, Modulated PRBS at maximum data rate, maximum power out

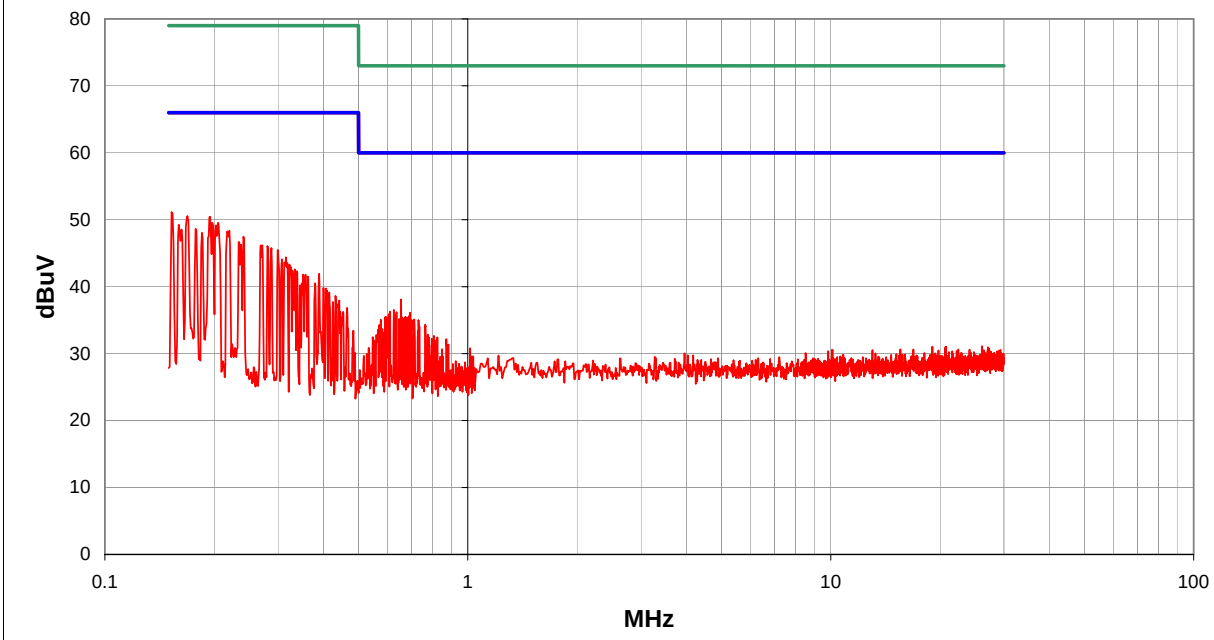
DEVIATIONS FROM TEST STANDARD

No deviations.

RESULTS	Line	Run #
Pass	L1	5

Other

Tested By:



Freq (MHz)	Amplitude (dBuV)			Transducer (dB)	Cable (dB)	External Attenuation (dB)		Detector (blank equal peaks [PK] from scan)		Adjusted dBuV	Spec. Limit dBuV	Compared to Spec. (dB)
0.153	31.0			0.0	0.1	20.0				51.1	66.0	-14.9
0.169	30.4			0.0	0.1	20.0				50.5	66.0	-15.5
0.195	30.3			0.0	0.2	20.0				50.5	66.0	-15.5
0.205	29.4			0.0	0.2	20.0				49.6	66.0	-16.4
0.198	29.4			0.0	0.2	20.0				49.6	66.0	-16.4
0.160	29.1			0.0	0.1	20.0				49.2	66.0	-16.8
0.178	28.5			0.0	0.2	20.0				48.7	66.0	-17.3
0.220	28.2			0.0	0.2	20.0				48.4	66.0	-17.6
0.185	27.9			0.0	0.2	20.0				48.1	66.0	-17.9
0.241	27.3			0.0	0.2	20.0				47.5	66.0	-18.5
0.235	26.5			0.0	0.2	20.0				46.7	66.0	-19.3
0.237	26.1			0.0	0.2	20.0				46.3	66.0	-19.7
0.272	26.0			0.0	0.2	20.0				46.2	66.0	-19.8
0.281	25.9			0.0	0.2	20.0				46.1	66.0	-19.9
0.288	25.6			0.0	0.2	20.0				45.8	66.0	-20.2
0.299	25.3			0.0	0.2	20.0				45.5	66.0	-20.5
0.316	24.2			0.0	0.2	20.0				44.4	66.0	-21.6
0.654	17.8			0.0	0.3	20.0				38.1	60.0	-21.9
0.308	23.9			0.0	0.2	20.0				44.1	66.0	-21.9
0.323	23.1			0.0	0.2	20.0				43.3	66.0	-22.7

NORTHWEST EMC

CONDUCTED EMISSIONS DATA SHEET

REV df3.10 03/10/2003

EUT:	BTTX01			Work Order:	POLV0037
Serial Number:	none			Date:	05/13/03
Customer:	Polyvision Corp.			Temperature:	72
Attendees:	Jeff Traw			Humidity:	33%
Cust. Ref. No.:				Barometric Pressure	29.88
Tested by:	Dan Haas	Power:	120VAC/60Hz	Job Site:	EV01

TEST SPECIFICATIONS

Specification:	CISPR22 Class A	Year:	1997
Method:	ANSI C63.4	Year:	1992

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

EUT OPERATING MODES

High Channel, Modulated PRBS at maximum data rate, maximum power out

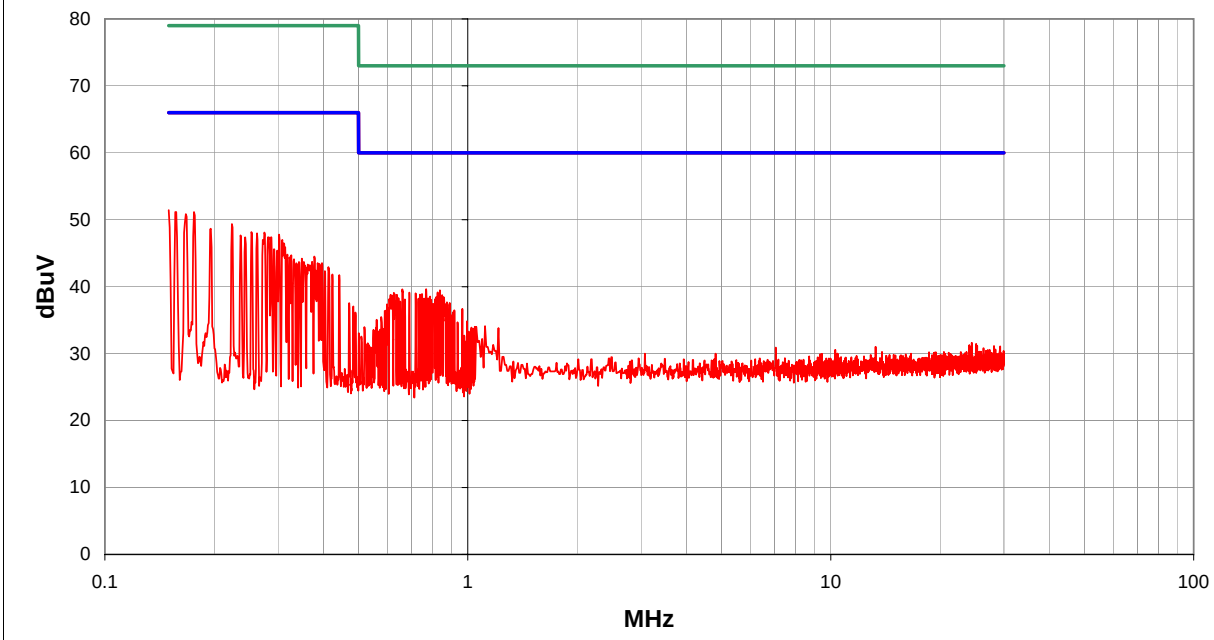
DEVIATIONS FROM TEST STANDARD

No deviations.

RESULTS	Line	Run #
Pass	N	6

Other

Tested By:



Freq (MHz)	Amplitude (dBuV)			Transducer (dB)	Cable (dB)	External Attenuation (dB)		Detector (blank equal peaks [PK] from scan)		Adjusted dBuV	Spec. Limit dBuV	Compared to Spec. (dB)
0.150	31.3			0.0	0.1	20.0				51.4	66.0	-14.6
0.176	31.0			0.0	0.2	20.0				51.2	66.0	-14.8
0.157	31.0			0.0	0.1	20.0				51.1	66.0	-14.9
0.167	30.7			0.0	0.1	20.0				50.8	66.0	-15.2
0.224	29.2			0.0	0.2	20.0				49.4	66.0	-16.6
0.196	28.5			0.0	0.2	20.0				48.7	66.0	-17.3
0.254	28.0			0.0	0.2	20.0				48.2	66.0	-17.8
0.275	27.9			0.0	0.2	20.0				48.1	66.0	-17.9
0.263	27.8			0.0	0.2	20.0				48.0	66.0	-18.0
0.302	27.6			0.0	0.2	20.0				47.8	66.0	-18.2
0.236	27.5			0.0	0.2	20.0				47.7	66.0	-18.3
0.288	27.2			0.0	0.2	20.0				47.4	66.0	-18.6
0.283	27.2			0.0	0.2	20.0				47.4	66.0	-18.6
0.244	27.2			0.0	0.2	20.0				47.4	66.0	-18.6
0.308	26.8			0.0	0.2	20.0				47.0	66.0	-19.0
0.767	19.3			0.0	0.3	20.0				39.6	60.0	-20.4
0.660	19.3			0.0	0.3	20.0				39.6	60.0	-20.4
0.293	25.4			0.0	0.2	20.0				45.6	66.0	-20.4
0.838	19.1			0.0	0.4	20.0				39.5	60.0	-20.5
0.299	25.2			0.0	0.2	20.0				45.4	66.0	-20.6

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 M**Hz.
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 µs. 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 µs). 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 a 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 µs * 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)
Dwell time = 5 * 625 µs * 1600 * 1/5 *1/s / 79 * 30s = 0.3797s (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 fcenter = 75 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.