Israel Testing Laboratories

ACCREDITED
Cert. No. 1152.01
Electrical (EMC)

DATE: 19 June 2008

I.T.L. (PRODUCT TESTING) LTD.

FCC EMC/Radio Test Report

for

AeroScout Ltd.

Equipment under test:

TAG T3-BD

TAG-3500

Written by: _____
D. Shidlowsky, Documentation

Approved by: _____
A. Sharabi, Test Engineer

Approved by: _____
I. Raz, EMC Laboratory Manager

Cert. No. 1152.01
Electrical (EMC)

Measurement/Technical Report for

AeroScout Ltd.

TAG T3-BD

TAG-3500

FCC ID: Q3HTAG3500

19 June 2008

This report concerns: Original Grant x Class II change

Class B verification ___ Class A verification_____Class I change

Equipment type: Direct Sequence Spread Spectrum Transmitter

Request Issue of Grant:

x Immediately upon completion of review

Limits used:

CISPR 22 _____ Part 15 x

Measurement procedure used is ANSI C63.4-2003.

Application for Certification
prepared by:
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Kfar Bin Nun
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Israel
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Applicant for this device:
(different from "prepared by")
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TABLE OF CONTENTS

1. General Information

1.1 Administrative Information

Manufacturer:	AeroScout Ltd.
Manufacturer's Address:	3 Pekris St. Park Tamar Rehovot Israel, 76702 Tel: +972-8-936-9300 Fax: +972-8-936-5977
Manufacturer's Representative:	Edward Morodin
Equipment Under Test (E.U.T):	TAG T3-BD
Equipment Model No.:	TAG-3500
Equipment Serial No.:	200-2047-0000
Date of Receipt of E.U.T:	09.04.08
Start of Test:	09.04.08
End of Test:	15.04.08
Test Laboratory Location:	I.T.L (Product Testing) Ltd. Kfar Bin Nun, ISRAEL 99780
Test Specifications:	See Section 2

1.2 List of Accreditations

The EMC laboratory of I.T.L. is accredited by the following bodies:

1. The American Association for Laboratory Accreditation (A2LA) (U.S.A.), Certificate No. 1152.01.
2. The Federal Communications Commission (FCC) (U.S.A.), Registration No. 90715.
3. The Israel Ministry of the Environment (Israel), Registration No. 1104/01.
4. The Voluntary Control Council for Interference by Information Technology Equipment (VCCI) (Japan), Registration Numbers: C-1350, R-1285.
5. Industry Canada (Canada), File No. IC 4025.
6. TUV Product Services, England, ASLLAS No. 97201.
7. Nemko (Norway), Authorization No. ELA 207.

I.T.L. Product Testing Ltd. is accredited by the American Association for Laboratory Accreditation (A2LA) and the results shown in this test report have been determined in accordance with I.T.L.'s terms of accreditation unless stated otherwise in the report.

1.3 Product Description

The AeroScout™ T3BD Tag is a key component of the AeroScout™ Location System. These dedicated battery-powered Tags send Wi-Fi compatible messages at pre-defined intervals and can be attached to non-Wi-Fi assets in order to locate them. Tags send messages with their unique ID number that are detected by Location Receivers and used to estimate the Tag's location.

The AeroScout T3BD Tag is used to be integrated to customer equipment and enables the wireless network infrastructure to locate people and assets otherwise not connected to a wireless network. The tag can be used to track people in many valuable applications - child tracking in amusement parks, security personnel in enterprises, hospital patients and many more. Various types of equipment can be tagged. These include vehicles in parking lots; inventory in a manufacturing line; containers, forklifts and other assets for efficient supply chain management; shopping carts in supermarkets; and medical equipment in hospitals.

1.4 Test Methodology

Both conducted and radiated testing were performed according to the procedures in ANSI C63.4: 2003. Radiated testing was performed at an antenna to EUT distance of 3 meters.

1.5 Test Facility

The radiated emissions tests were performed at I.T.L.'s testing facility at Kfar Bin-Nun, Israel. This site is a FCC listed test laboratory (FCC Registration No. 90715, date of listing August 22, 2006).
I.T.L.'s EMC Laboratory is also accredited by A2LA, certificate No. 1152.01.

1.6 Measurement Uncertainty

Radiated Emission

The Open Site complies with the ±4 dB Normalized Site Attenuation requirements of ANSI C63.4-2003. In accordance with Paragraph 5.4.6.1 of this standard, this tolerance includes instrumentation calibration errors, measurement technique errors, and errors due to site anomalies.

2. System Test Configuration

2.1 Justification

The typical operation of the Tag (as a customer would normally use) is that the Tag wake up every predefine interval (from 1 sec to 3.5 hours) and it is set to be in receive mode for a period of 100uSec to sniff the air traffic (RSSI detection) and in the case that the channel is free it will transmit a message for a period of max 500uS.

The Tag includes a low frequency receiver, which is set to be in receiving mode continuously.

Due to the short period in transmit and receive mode in a typical operation mode, the tag was configured to be in continuous receive mode and in continuous transmit mode to test the tag behavior on those modes as it was found to be the worst case operating mode.

In additional, Tag T3500 enables two-way communication with an AP. Various features that require two-way communication is implemented in this tag, such as acknowledgment or over the air firmware/configuration upgrade. An optional variety of audio/visual indications are also possible.

Radiated emission screening was performed in 3 orthogonal orientations. The worst case orientation was the vertical position.

2.2 EUT Exercise Software

The Tag SW uses two working mode in typical operation a receive mode for the RSSI detection and then the Transmit mode.

In the testing SW configuration the Tag was configured to be on one of the two programmable test modes

1) Continuous receive mode

2) Continuous transmit mode.

The Low frequency receiver is active in the two test modes above.

The testing of those two modes was done on three different channels.

2.3 Special Accessories

No special accessories were needed to achieve compliance.

2.4 Equipment Modifications

No modifications were necessary in order o achieve compliance.

2.5 Configuration of Tested System

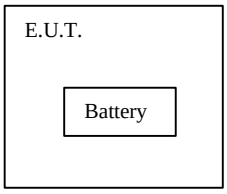

Figure 1. Configuration of Tested System

3. Theory of Operation

3.1 Theory of Operation

The AeroScout™ T3BD Tags are a component of the AeroScout™ Location System. These dedicated battery-powered Tags send Wi-Fi compatible messages at pre-defined intervals and can be attached to non-Wi-Fi assets in order to locate them. Tags send messages with their unique ID number that are detected by Location Receivers and used to estimate the Tag's location.

In the typical operation the Tag wakes up every predefined interval and sniffs the air interface in order to detect 802.11b transmissions (RSSI detection). If the air is free, the Tag transmits its preprogrammed 802.11b message (1 Mbps, DBPSK modulation). The Tag includes a low frequency magnetic receiver for remote control activation or detection by Exciter in programmable pre-defined range.

In additional, Tag T3500 enables two-way communication with an AP. Various features that require two-way communication is implemented in this tag, such as acknowledgment or over the air firmware/configuration upgrade. An optional variety of audio/visual indications are also possible.

4. Test Set-up Photos

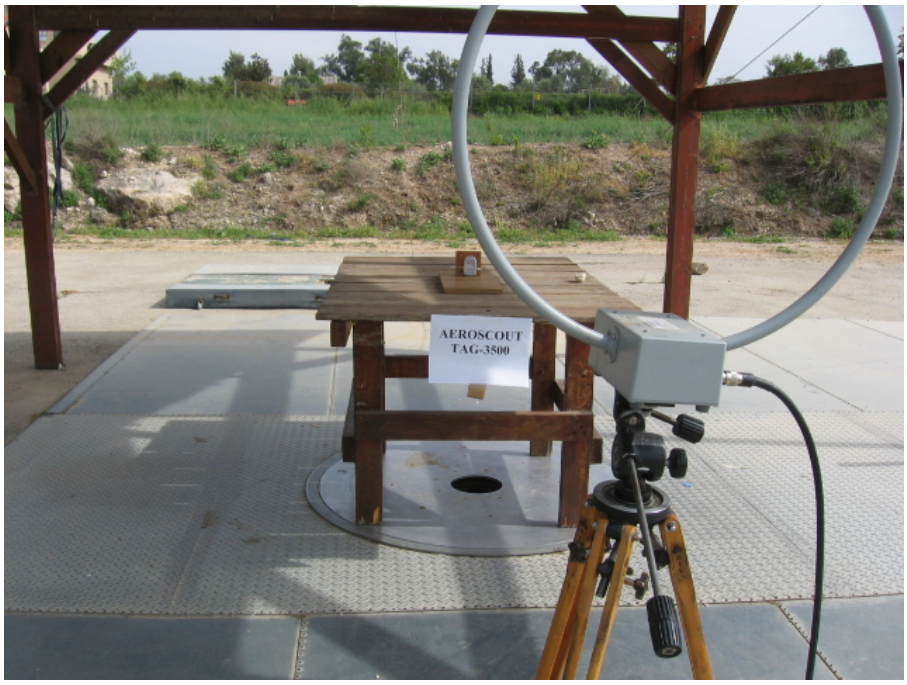

Figure 2. Radiated Emission Test

Figure 3. Radiated Emission Test

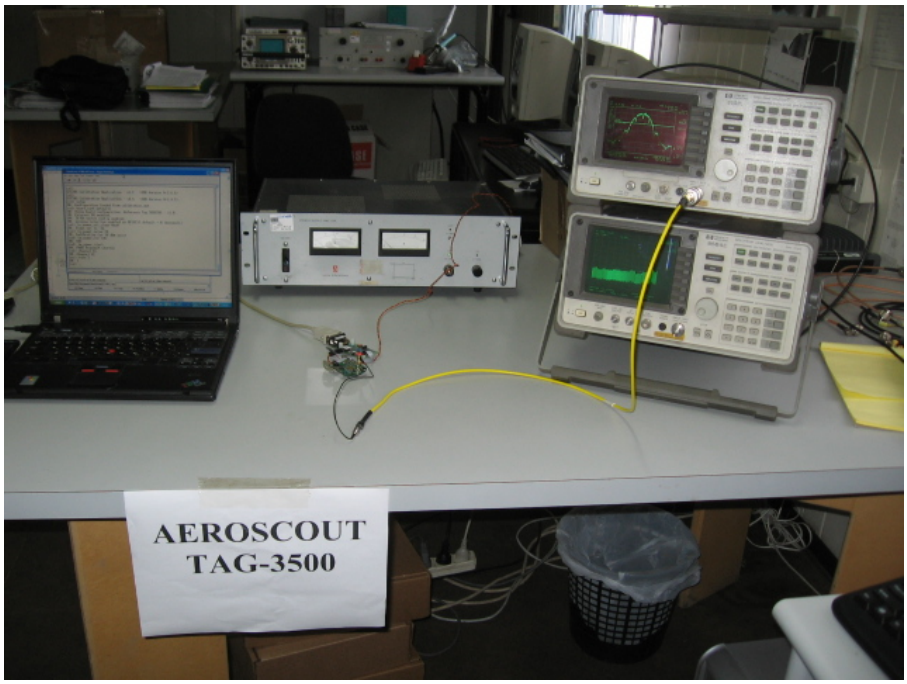

Figure 4. Conducted Emission From Antenna Port Tests

5. Spurious Radiated Emission in the Restricted Band Below 1 GHz

5.1 Test Specification

9kHz-1000 MHz, F.C.C., Part 15, Subpart C

5.2 Test Procedure

The E.U.T. operation mode and test set-up are as described in Section 3.

See Section 3.1 Justification of the System Test Configuration concerning the E.U.T. orientation for this test.

A preliminary measurement to characterize the E.U.T was performed inside the shielded room at a distance of 3 meters, using peak detection mode and broadband antennas. The preliminary measurements produced a list of the highest emissions. The E.U.T was then transferred to the open site, and placed on a remote-controlled turntable. The E.U.T was placed on a non-metallic table, 0.8 meters above the ground. The configuration tested is shown in Figure 3.1.

The frequency range 9 kHz-1000 MHz was scanned, and the list of the highest emissions was verified and updated accordingly.

The levels of the emissions within the frequency ranges of the restricted bands (Section 15.205 of FCC Part 15) were compared to the limits of the table in Section 15.209 (a), General Requirements.

The emissions were measured using a computerized EMI receiver complying to CISPR 16 requirements. The specification limits and applicable correction factors are loaded to the receiver via a 3.5" floppy disk.

In the frequency range 9 kHz-30 MHz, the loop antenna was rotated on its vertical axis, The antenna height (center of loop) was 1 meter.

In the frequency range 30-1000 MHz, the readings were maximized by adjusting the antenna height between 1-4 meters, the turntable azimuth between 0-360°, and the antenna polarization.

Verification of the E.U.T emissions was based on the following methods:

Turning the E.U.T on and off.
Using a frequency span less than 10 MHz.
Observation of the signal level during turntable rotation. Background noise is not affected by the rotation of the E.U.T.

The E.U.T. was tested at the operating frequencies of 2412, 2437, and 2462 MHz using the following modulations: BPSK and CCK.

5.3 Test Data

JUDGEMENT: Passed by 29.2 dB.

The margin between the emission level and the specification limit is 29.2 dB in the worst case at the frequency of 44.09 MHz, vertical polarization.

The EUT met the requirements of the F.C.C. Part 15, Subpart C, specification.

The results for all three operating frequencies and modulations were the same.

TEST PERSONNEL:

Tester Signature: _____ Date: 19.06.08

Typed/Printed Name: A. Sharabi

Radiated Emission

E.U.T Description	TAG T3-BD
Type	TAG-3500
Serial Number:	200-2047-0000

Specification: FCC Part 15, Subpart C

Antenna Polarization: Horizontal
Antenna: 3 meters distance
Frequency range: 30 MHz to 1000 MHz
Detectors: Peak, Quasi-peak

Signal Number	Frequency (MHz)	Peak dBuV/m	QP dBuV/m	QP Delta L 1 (dB)	Avg dBuV/m	Av Delta L 2 (dB)	Corr (dB)
1	44.000205	9.8	5.2	-34.8			12.6
2	66.002920	6.4	2.9	-37.1			10.2
3	131.999180	9.8	5.8	-37.7			14.0

Figure 5. Radiated Emission. Antenna Polarization: HORIZONTAL. Detectors: Peak, Quasi-peak

Note: QP Delta refers to the test results obtained minus specified requirement; thus a positive number indicates failure, and a negative result indicates that the product passes the test.

Radiated Emission

E.U.T Description	TAG T3-BD
Type	TAG-3500
Serial Number:	200-2047-0000

Specification: FCC Part 15, Subpart C

Antenna Polarization: Horizontal
Antenna: 3 meters distance

Frequency range: 30 MHz to 1000 MHz
Detectors: Peak, Quasi-peak

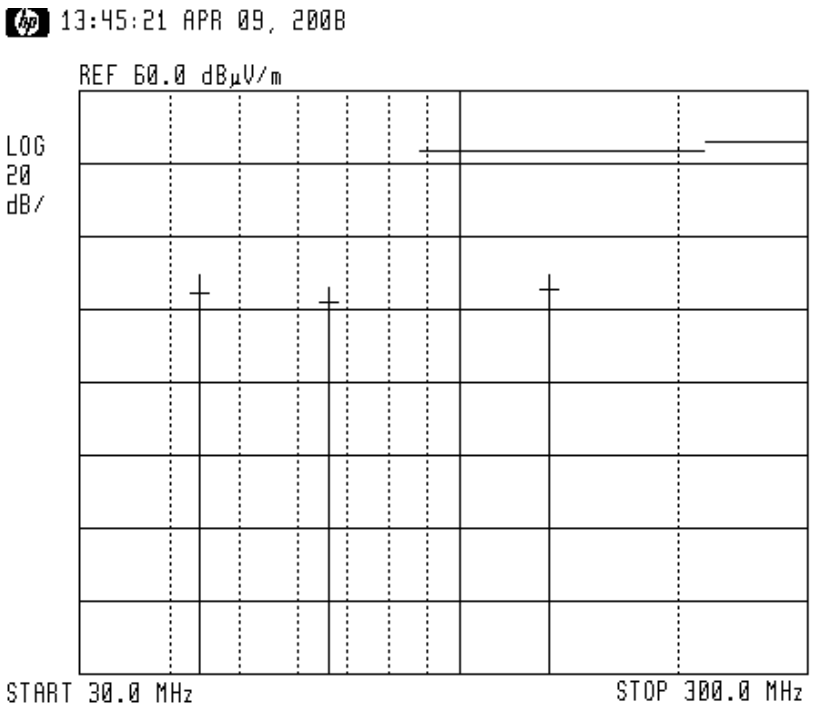

Figure 6. Radiated Emission. Antenna Polarization: HORIZONTAL Detectors: Peak, Quasi-peak

Note:

1. *Horizontal axis shows logarithmic frequency scale.*
2. *The vertical axis shows amplitude (in dB µV/m).*
3. *Peak detection is designated by the top of each vertical line.*
4. *Quasi-peak detection is designated by the first dash mark (from the top) of each vertical line.*

Radiated Emission

E.U.T Description TAG T3-BD
Type TAG-3500
Serial Number: 200-2047-0000

Specification: FCC Part 15, Subpart C

Antenna Polarization: Vertical
Antenna: 3 meters distance
Frequency range: 30 MHz to 1000 MHz
Detectors: Peak, Quasi-peak

Signal Number	Frequency (MHz)	Peak dBuV/m	QP dBuV/m	QP Delta L 1 (dB)	Avg dBuV/m	Av Delta L 2 (dB)	Corr (dB)
1	44.086900	16.6	10.8	-29.2			12.6
2	65.943350	14.5	8.5	-31.5			10.3
3	131.912750	14.6	9.1	-34.4			14.0
4	150.005150	19.0	13.9	-29.6			15.0

Figure 7. Radiated Emission. Antenna Polarization: VERTICAL. Detectors: Peak, Quasi-peak

Note: QP Delta refers to the test results obtained minus specified requirement; thus a positive number indicates failure, and a negative result indicates that the product passes the test.

Radiated Emission

E.U.T Description	TAG T3-BD
Type	TAG-3500
Serial Number:	200-2047-0000

Specification: FCC Part 15, Subpart C

Antenna Polarization: Vertical
Antenna: 3 meters distance

Frequency range: 30 MHz to 1000 MHz
Detectors: Peak, Quasi-peak

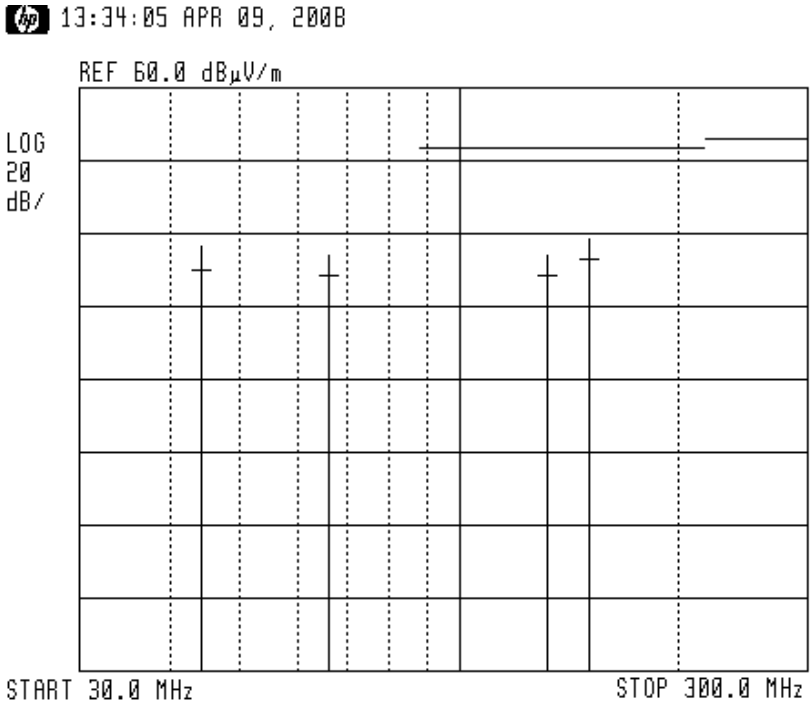

Figure 8. Radiated Emission. Antenna Polarization: VERTICAL. Detectors: Peak, Quasi-peak

Note:

1. *Horizontal axis shows logarithmic frequency scale.*
2. *The vertical axis shows amplitude (in dB µV/m).*
3. *Peak detection is designated by the top of each vertical line.*
4. *Quasi-peak detection is designated by the first dash mark (from the top) of each vertical line.*

5.4 Test Instrumentation Used, Radiated Measurements

Instrument	Manufacturer	Model	Serial Number	Calibration	Period
EMI Receiver	HP	85422E	3411A00102	November 12, 2007	1 year
RF Section	HP	85420E	3427A00103	November 12, 2007	1 year
Antenna Bioconical	ARA	BCD 235/B	1041	March 22, 2007	1 year
Antenna Log Periodic	ARA	LPD-2010/A	1038	November 22, 2007	1 year
Active Loop Antenna	EMCO	6502	9506-2950	October 15, 2007	1 year
Antenna Mast	ARA	AAM-4A	1001	N/A	N/A
Turntable	ARA	ART-1001/4	1001	N/A	N/A
Mast & Table Controller	ARA	ACU-2/5	1001	N/A	N/A
Printer	HP	LaserJet 2200	JPKGC19982	N/A	N/A

5.5 Field Strength Calculation

The field strength is calculated directly by the EMI Receiver software, and a "Correction Factors" data disk, using the following equation:

$$[dB\mu v/m]\ FS = RA + AF + CF$$

FS: Field Strength [dBμv/m]
RA: Receiver Amplitude [dBμv]
AF: Receiving Antenna Correction Factor [dB/m]
CF: Cable Attenuation Factor [dB]

No external pre-amplifiers are used.

6. Spurious Radiated Emission in the Restricted Band, Above 1 GHz

6.1 Radiated Emission Above 1 GHz

The E.U.T operation mode and test set-up are as described in Section 3.

See Section 3.1 Justification of the System Test Configuration concerning the E.U.T. orientation for this test.

A preliminary measurement to characterize the E.U.T was performed inside the shielded room, using peak detection mode and broadband antennas. The preliminary measurements produced a list of the highest emissions. The E.U.T was then transferred to the open site, and placed on a remote-controlled turntable. The E.U.T was placed on a non-metallic table, 0.8 meters above the ground. The configuration tested is shown in Figure 3.1.

The levels of the emissions within the frequency ranges of the restricted bands (Section 15.205 of FCC Part 15) were compared to the limits of the table in Section 15.209 (a), General Requirements.
In the frequency range 1-2.9 GHz, a computerized EMI receiver complying to CISPR 16 requirements was used.
In the frequency range 2.9-25.0 GHz, a spectrum analyzer including a low noise amplifier was used. During average measurements, the IF bandwidth was 1 MHz and the video bandwidth was 100Hz. During peak measurements, the IF bandwidth was 1 MHz and the video bandwidth was 3 MHz.
The test distance was 3 meters.
The readings were maximized by adjusting the antenna height between 1-4 meters, the turntable azimuth between 0-360°, and the antenna polarization.
Verification of the E.U.T emissions was based on the following methods: turning the E.U.T on and off; using a frequency span less than 10 MHz; observation of the signal level during turntable rotation. (Background noise is not affected by the rotation of the E.U.T.)

The E.U.T. was tested at the operating frequencies of 2412, 2442, and 2462 MHz using the following modulations: BPSK and CCK.

6.2 Test Data

JUDGEMENT: Passed by 3.4 dB

For the operation frequency of 2412 MHz, the margin between the emission level and the specification limit is 3.4 dB in the worst case at the frequency of 4822.00 MHz, horizontal polarization.

For the operation frequency of 2437 MHz, the margin between the emission level and the specification limit is 14.1 dB in the worst case at the frequency of 4875.00 MHz, horizontal polarization.

For the operation frequency of 2462 MHz, the margin between the emission level and the specification limit is 12.2 dB in the worst case at the frequency of 2483.50 MHz, horizontal polarization.

The results for all modulations were the same.

The EUT met the requirements of the F.C.C. Part 15, Subpart C, specification.

TEST PERSONNEL:

Tester Signature:  Date: 19.06.08

Typed/Printed Name: A. Sharabi

Radiated Emission Above 1 GHz

E.U.T Description	TAG T3-BD
Type	TAG-3500
Serial Number:	200-2047-0000

Specification: FCC, Part 15, Subpart C

Antenna Polarization: Horizontal/Vertical
Frequency range: 1.0 GHz to 25.0 GHz
Test Distance: 3 meters
Detector: Peak
Operation Frequency: 2412 MHz

Freq.	Polarity	Peak Amp	Peak. Specification	Peak. Margin
(MHz)	(H/V)	(dBµV/m)	(dB µV/m)	(dB)
4822.00	H	57.8*	74.0	-16.2
4822.00	V	53.1*	74.0	-20.9

Figure 9. Radiated Emission. Antenna Polarization: HORIZONTAL / VERTICAL. Detector: Peak

Margin refers to the test results obtained minus specified requirement; thus a positive number indicates failure, and a negative result indicates that the product passes the test.

"Peak Amp" includes correction factor.

* "Correction Factor" = Antenna Factor + Cable Loss- Low Noise Amplifier Gain + Band Pass Filter

Radiated Emission Above 1 GHz

E.U.T Description TAG T3-BD
Type TAG-3500
Serial Number: 200-2047-0000

Specification: FCC, Part 15, Subpart C

Antenna Polarization: Horizontal/Vertical
Frequency range: 1.0 GHz to 25.0 GHz
Test Distance: 3 meters
Detector: Average
Operation Frequency: 2412 MHz

Freq. (MHz)	Polarity (H/V)	Average Amp (dBµV/m)	Average Specification (dB µV/m)	Peak. Margin (dB)
4822.00	H	50.6*	54.0	-3.4
4822.00	V	39.4*	54.0	-14.6

Figure 10. Radiated Emission. Antenna Polarization: HORIZONTAL / VERTICAL. Detector: Average

Notes:

Margin refers to the test results obtained minus specified requirement; thus a positive number indicates failure, and a negative result indicates that the product passes the test.

"Average Amp" includes correction factor.

* "Correction Factor" = Antenna Factor + Cable Loss- Low Noise Amplifier Gain + Band Pass Filter

Radiated Emission Above 1 GHz

E.U.T Description	TAG T3-BD
Type	TAG-3500
Serial Number:	200-2047-0000

Specification: FCC, Part 15, Subpart C

Antenna Polarization: Horizontal/Vertical
Frequency range: 1.0 GHz to 25.0 GHz
Test Distance: 3 meters
Detector: Peak
Operation Frequency: 2437 MHz

Freq.	Polarity	Peak Amp	Peak. Specification	Peak. Margin
(MHz)	(H/V)	(dBµV/m)	(dB µV/m)	(dB)
4875.00	H	57.0*	74.0	-17.0
4875.00	V	52.3*	74.0	-21.7

Figure 11. Radiated Emission. Antenna Polarization: HORIZONTAL / VERTICAL. Detector: Peak

Margin refers to the test results obtained minus specified requirement; thus a positive number indicates failure, and a negative result indicates that the product passes the test.

"Peak Amp" includes correction factor.

* "Correction Factor" = Antenna Factor + Cable Loss- Low Noise Amplifier Gain + Band Pass Filter

Radiated Emission Above 1 GHz

E.U.T Description TAG T3-BD
Type TAG-3500
Serial Number: 200-2047-0000

Specification: FCC, Part 15, Subpart C

Antenna Polarization: Horizontal/Vertical
Frequency range: 1.0 GHz to 25.0 GHz
Test Distance: 3 meters
Detector: Average
Operation Frequency: 2437 MHz

Freq. (MHz)	Polarity (H/V)	Average Amp (dBµV/m)	Average Specification (dB µV/m)	Peak. Margin (dB)
4875.00	H	39.9*	54.0	-14.1
4875.00	V	38.9*	54.0	-15.1

Figure 12. Radiated Emission. Antenna Polarization: HORIZONTAL / VERTICAL. Detector: Average

Notes:

Margin refers to the test results obtained minus specified requirement; thus a positive number indicates failure, and a negative result indicates that the product passes the test.

"Average Amp" includes correction factor.

* "Correction Factor" = Antenna Factor + Cable Loss- Low Noise Amplifier Gain + Band Pass Filter

Radiated Emission Above 1 GHz

E.U.T Description	TAG T3-BD
Type	TAG-3500
Serial Number:	200-2047-0000

Specification: FCC, Part 15, Subpart C

Antenna Polarization: Horizontal/Vertical
Frequency range: 1.0 GHz to 25.0 GHz
Test Distance: 3 meters
Detector: Peak
Operation Frequency: 2462 MHz

Freq. (MHz)	Polarity (H/V)	Peak Amp (dBµV/m)	Peak. Specification (dB µV/m)	Peak. Margin (dB)
2483.50	H	54.2*	74.0	-17.3
2483.50	V	52.7*	74.0	-21.7
4923.00	H	57.7**	74.0	-16.3
4923.00	V	53.3**	74.0	-20.7

Figure 13. Radiated Emission. Antenna Polarization: HORIZONTAL / VERTICAL. Detector: Peak

Margin refers to the test results obtained minus specified requirement; thus a positive number indicates failure, and a negative result indicates that the product passes the test.

"Peak Amp" includes correction factor.

* "Correction Factor" = Antenna Factor + Cable Loss- Low Noise Amplifier Gain

** "Correction Factor" = Antenna Factor + Cable Loss- Low Noise Amplifier Gain + Band Pass Filter

Radiated Emission Above 1 GHz

E.U.T Description TAG T3-BD
Type TAG-3500
Serial Number: 200-2047-0000

Specification: FCC, Part 15, Subpart C

Antenna Polarization: Horizontal/Vertical
Test Distance: 3 meters
Operation Frequency: 2462 MHz
Frequency range: 1.0 GHz to 25.0 GHz
Detector: Average

Freq. (MHz)	Polarity (H/V)	Average Amp (dBµV/m)	Average Specification (dB µV/m)	Peak. Margin (dB)
2483.50	H	41.6*	54.0	-12.4
2483.50	V	41.5*	54.0	-12.5
4923.00	H	41.3**	54.0	-12.7
4923.00	V	39.4**	54.0	-14.6

Figure 14. Radiated Emission. Antenna Polarization: HORIZONTAL / VERTICAL. Detector: Average

Notes:

Margin refers to the test results obtained minus specified requirement; thus a positive number indicates failure, and a negative result indicates that the product passes the test.

"Average Amp" includes correction factor.

* Correction Factor = Antenna Factor + Cable Loss- Low Noise Amplifier Gain

** "Correction Factor" = Antenna Factor + Cable Loss- Low Noise Amplifier Gain + Band Pass Filter

6.3 Test Instrumentation Used, Radiated Measurements Above 1 GHz

Instrument	Manufacturer	Model	Serial Number	Calibration	Period
Receiver	HP	85422E	3411A00102	November 12, 2007	1 year
RF Section	HP	85420E	3427A00103	November 12, 2007	1 year
Antenna Mast	ARA	AAM-4A	1001	N/A	N/A
Turntable	ARA	ART-1001/4	1001	N/A	N/A
Mast & Table Controller	ARA	ACU-2/5	1001	N/A	N/A
Printer	HP	LaserJet 2200	JPKGC19982	N/A	N/A
Antenna-Log Periodic	A.H.System	SAS-200/511	253	February 4, 2007	2 years
Double Ridged Waveguide Horn Antenna	EMCO	3115	29845	March 15, 2006	2 years
Horn Antenna	ARA	SWH-28	1008	December 8, 2006	2 year
Low Noise Amplifier	DBS MICROWAVE	LNA-DBS-0411N313	013	November 2, 2007	1 year
Low Noise Amplifier	Sophia Wireless	LNA 28-B	232	February 8, 2007	1 year
Low Noise Amplifier	MK Milliwave	MKT6-3000 400-30-13P	399	February 8, 2007	1 year
Spectrum Analyzer	HP	8593EM	3536A00120	February 26, 2008	1 year
Spectrum Analyzer	HP	8546E	3442A00275	November 14, 2007	1 year
Printer	HP	LaserJet 2200	JPKGC19982	N/A	N/A

7. Maximum Transmitted Peak Power Output

7.1 Test procedure

The E.U.T. antenna terminal was connected to the Spectrum Analyzer through an external attenuator (20 dB) and an appropriate coaxial cable (cable loss = 1 dB). The Spectrum Analyzer was set to 1.0 MHz resolution BW. Peak power level was measured at selected operation frequencies.

The E.U.T. was tested at 2412, 2437, and 2462 MHz with the following modulations: BPSK (6Mbit/sec) and CCK (11Mbit/sec).

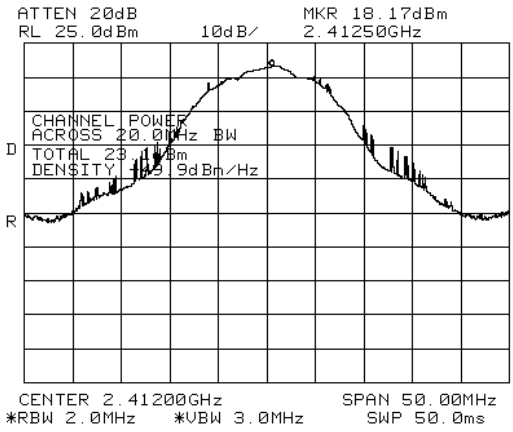

Figure 15 2412 BPSK

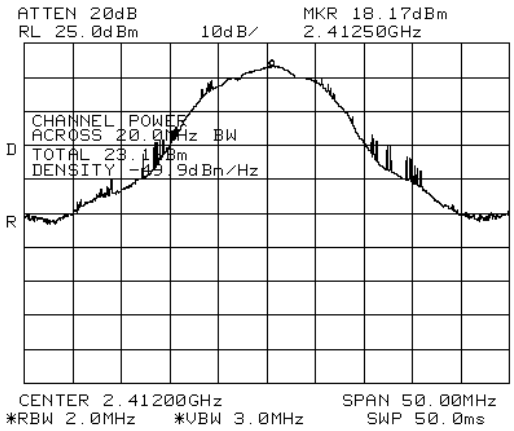

Figure 16 2412 MHz CCK

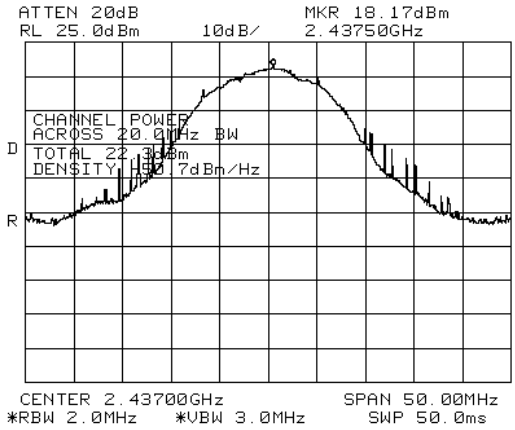

Figure 17 2437 MHz BPSK

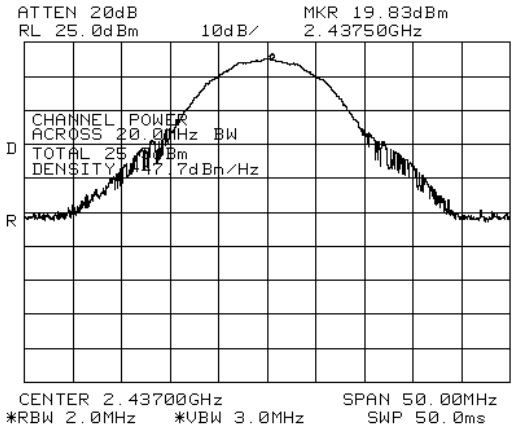

Figure 18 2437 MHz CCK

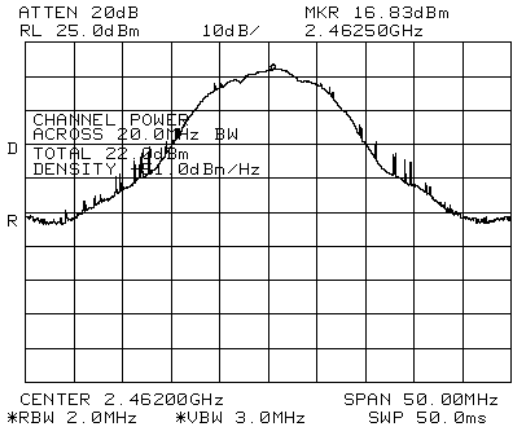

Figure 19 2462 MHz BPSK

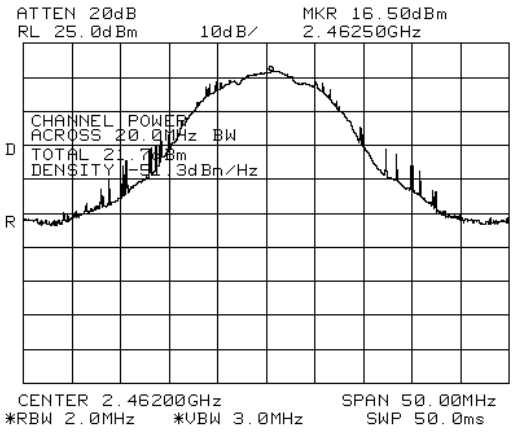

Figure 20 2462 MHz CCK

7.2 Results table

E.U.T. Description: TAG T3-BD
Model No.: TAG-3500
Serial Number: 1. 860M: 73903D 2. WCE: 739038
Specification: F.C.C. Part 15, Subpart C

Operation Frequency (MHz)	Modulation	Power (dBm)	Specification (dBm)	Margin (dB)
2412	BPSK	23.1	30.0	-6.9
	CCK	23.1	30.0	-6.9
2437	BPSK	22.3	30.0	-7.7
	CCK	25.5	30.0	-4.5
2462	BPSK	22.0	30.0	-8.0
	CCK	21.7	30.0	-8.3

Figure 21 Maximum Peak Power Output

JUDGEMENT: Passed by 4.5 dB

TEST PERSONNEL:
Tester Signature: _____ Date: 19.06.08
Typed/Printed Name: A. Sharabi

7.3 Test Equipment Used.

Peak Power Output

Instrument	Manufacturer	Model	Serial/Part Number	Calibration	
				Last Calibr.	Period
Spectrum Analyzer	HP	8564E	3442A00275	November 14, 2007	1 year
Attenuator	Jyebao	-	FAT-AM5AF5G6G2W20	May 9, 2007	1 year
Cable	Rhophase	KPS-5000-KPS	A1674	February 8, 2008	1 year

Figure 22 Test Equipment Used

8. Peak Power Output Out of 2400-2483.5 MHz Band

8.1 Test procedure

The E.U.T. antenna terminal was connected to the spectrum analyzer through an external attenuator (20 dB) and an appropriate coaxial cable (cable loss = 1.3 dB). The spectrum analyzer was set to 100 kHz resolution BW except for the frequency range 9 kHz-150 kHz where the RBW was set to 1kHz and the frequency range 150 kHz-10 MHz where the RBW was set to 10kHz. The frequency range from 9 kHz to 25 GHz was scanned. Level of spectrum components out of the 2400-2483.5 MHz was measured at the selected operation frequencies.

The E.U.T. was tested at 2412, 2437, and 2462 MHz with the following modulations: BPSK (6Mbit/sec) and CCK (11Mbit/sec).

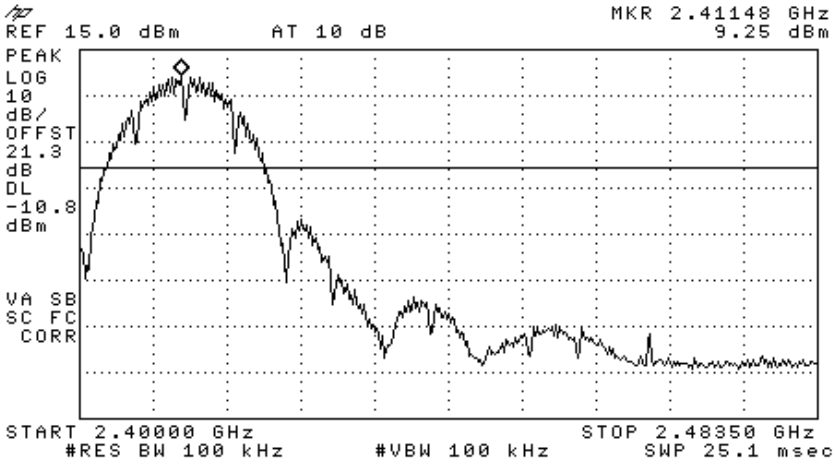

Figure 23 —2412 MHz BPSK

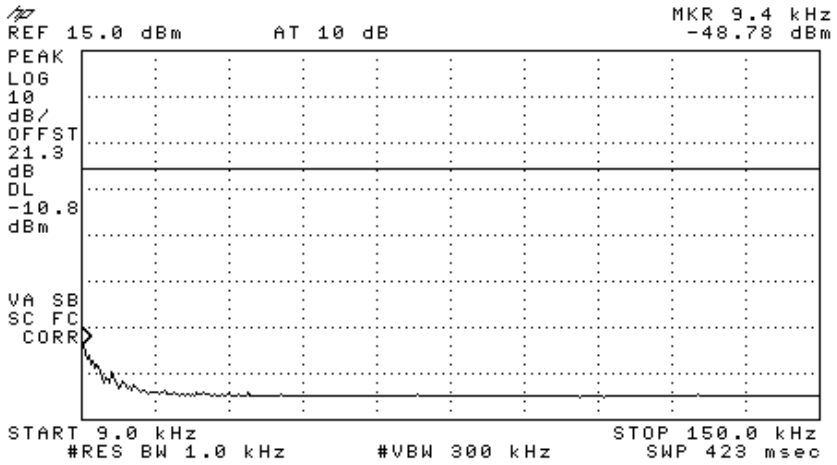

Figure 24 —2412 MHz BPSK

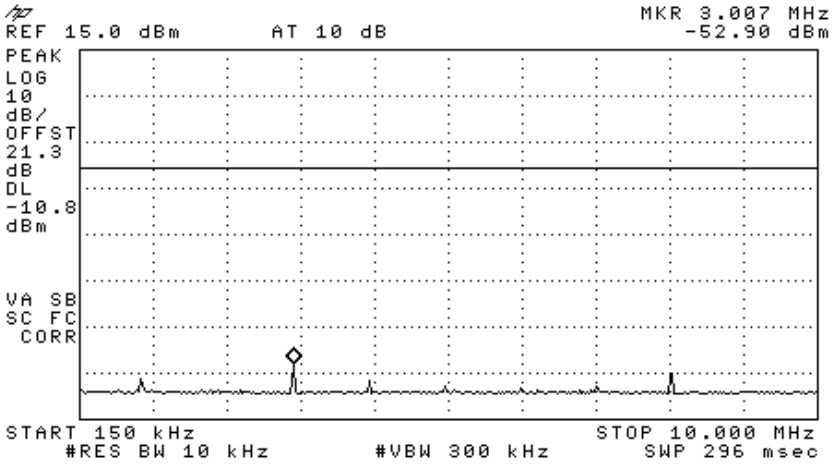

Figure 25 —2412 MHz BPSK

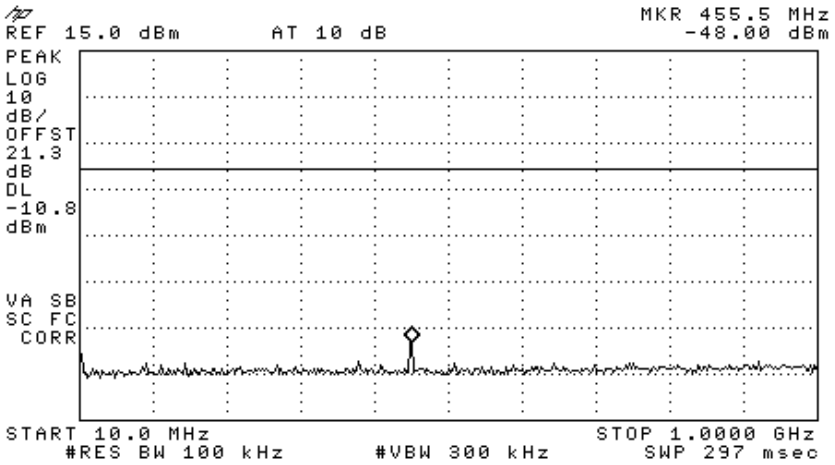

Figure 26 —2412 MHz BPSK

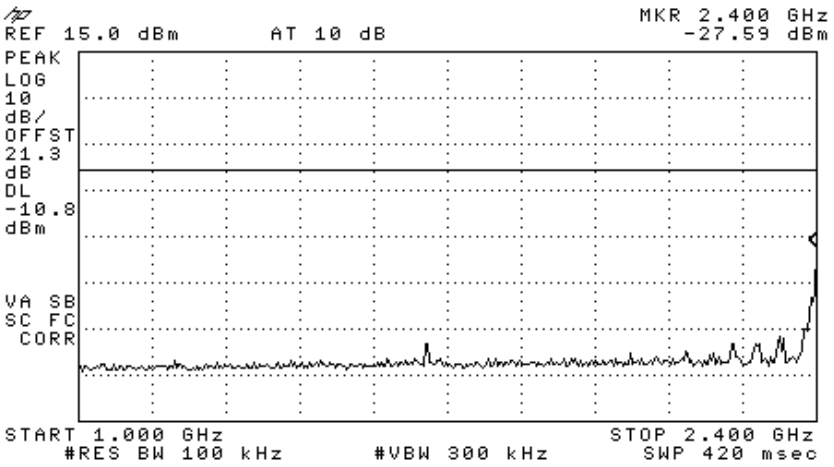

Figure 27 —2412 MHz BPSK

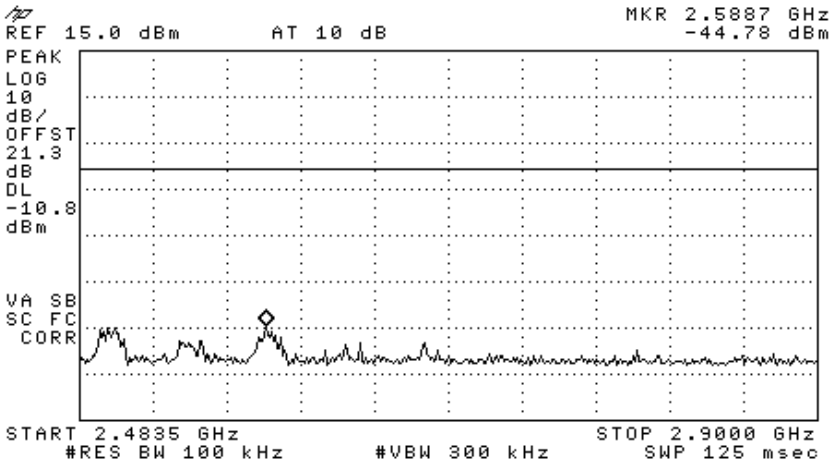

Figure 28 —2412 MHz BPSK

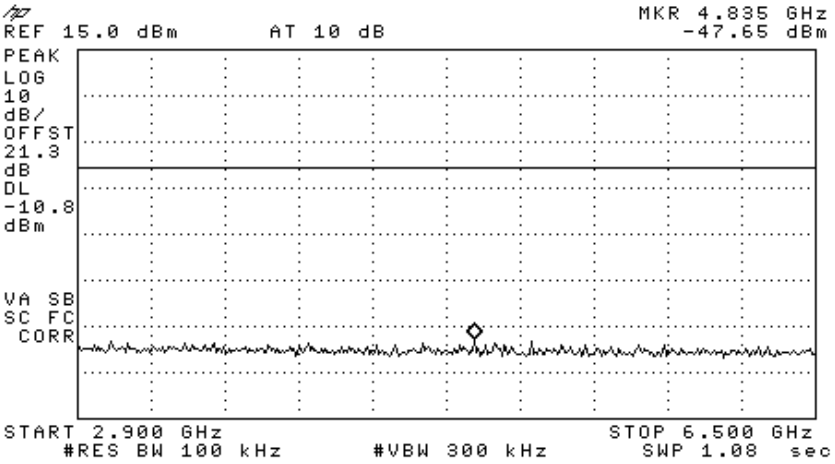

Figure 29 —2412 MHz BPSK

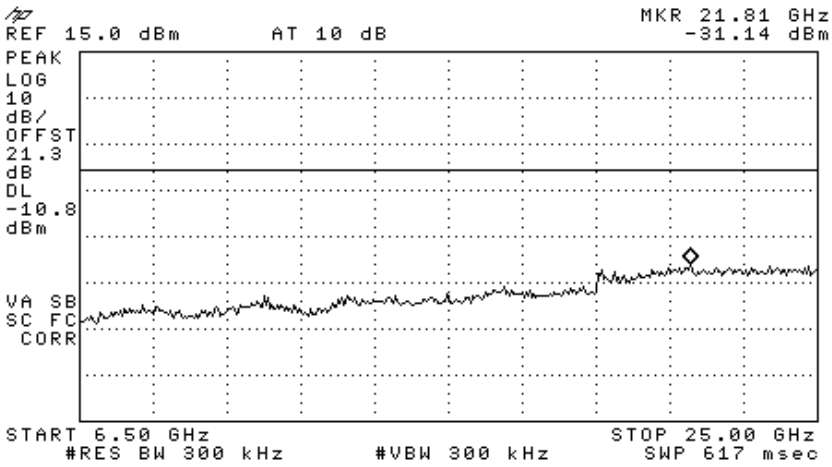

Figure 30 —2412 MHz BPSK

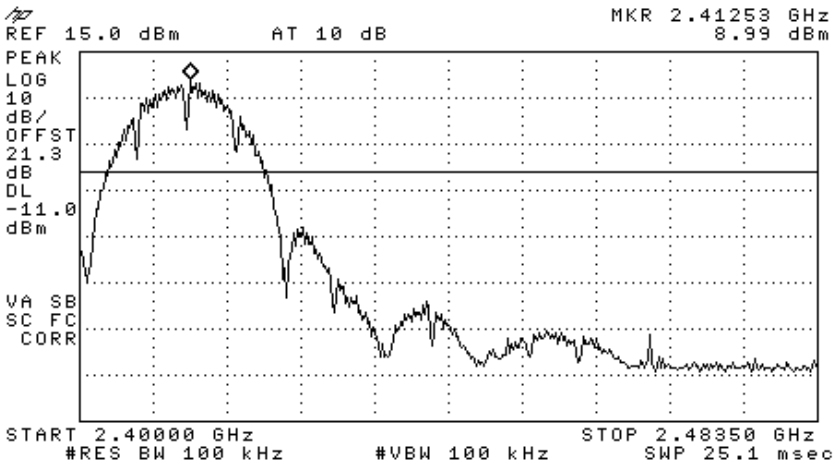

Figure 31 —2412 MHz CCK

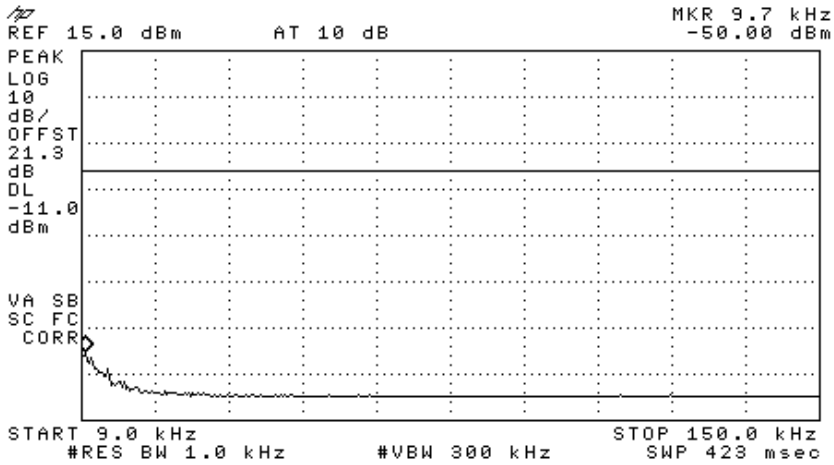

Figure 32 —2412 MHz CCK

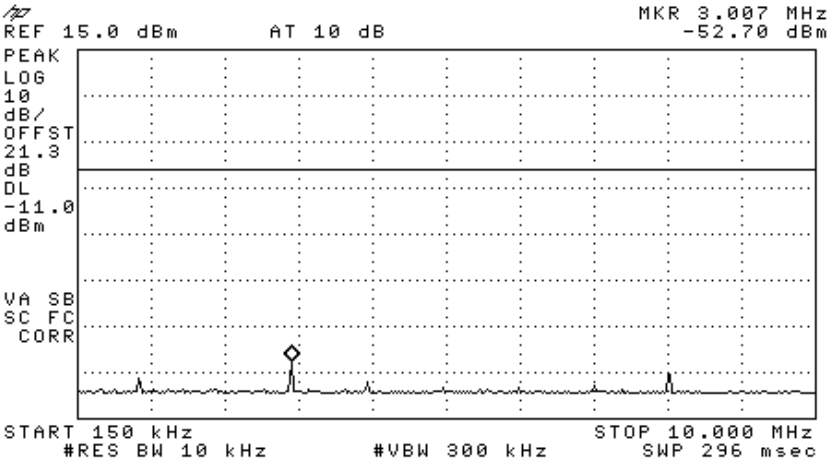

Figure 33 —2412 MHz CCK

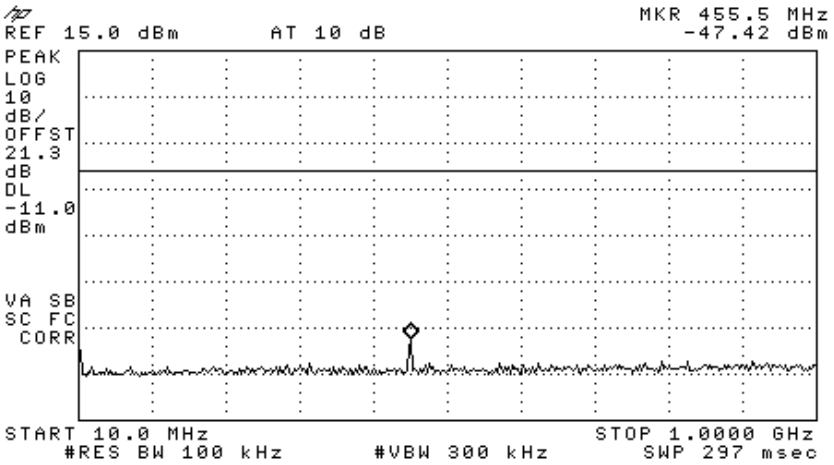

Figure 34 —2412 MHz CCK

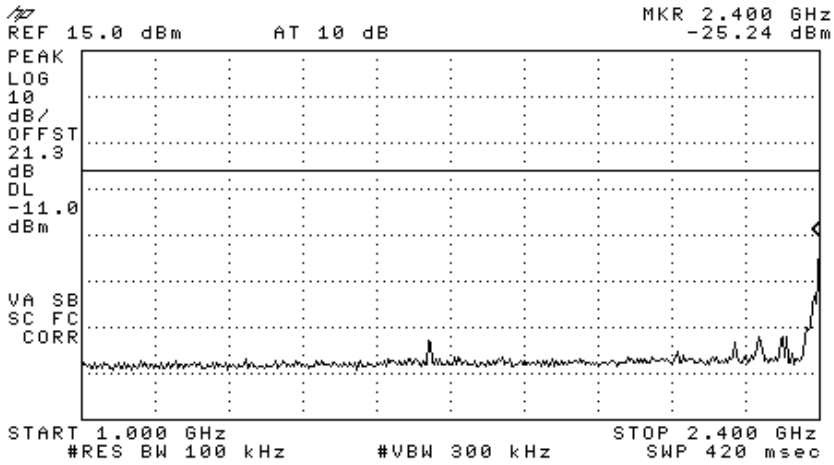

Figure 35 —2412 MHz CCK

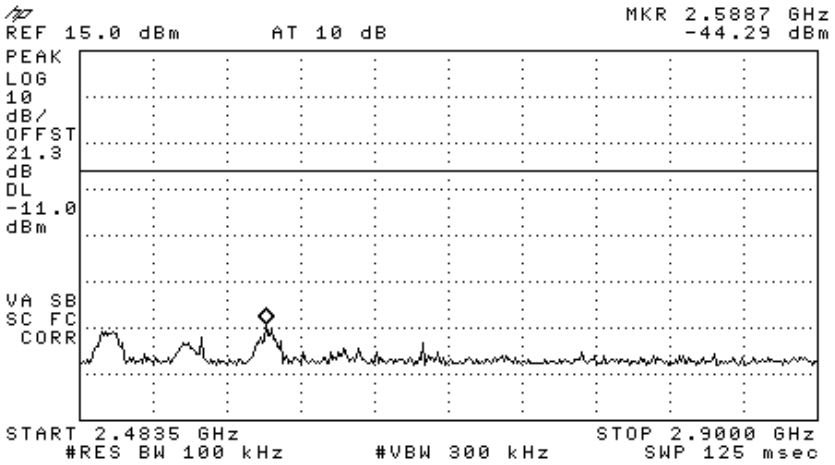

Figure 36 —2412 MHz CCK

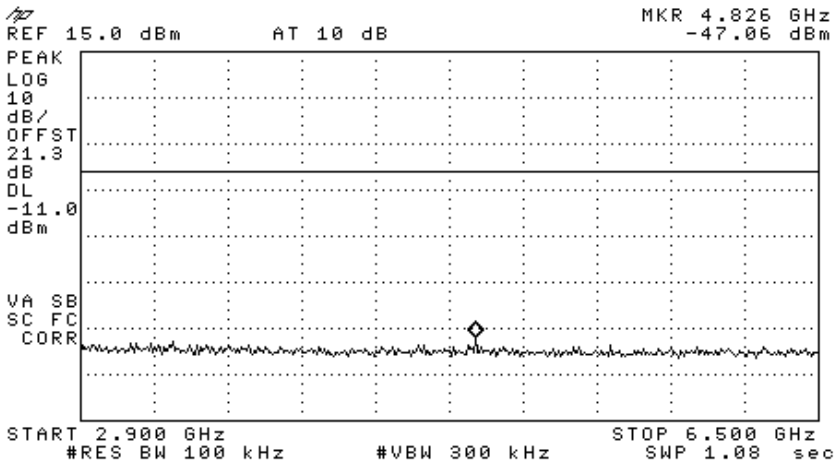

Figure 37 —2412 MHz CCK

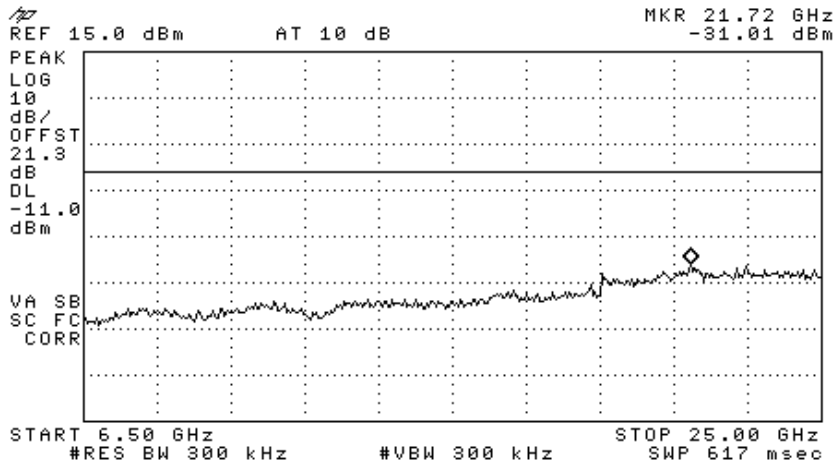

Figure 38 —2412 MHz CCK

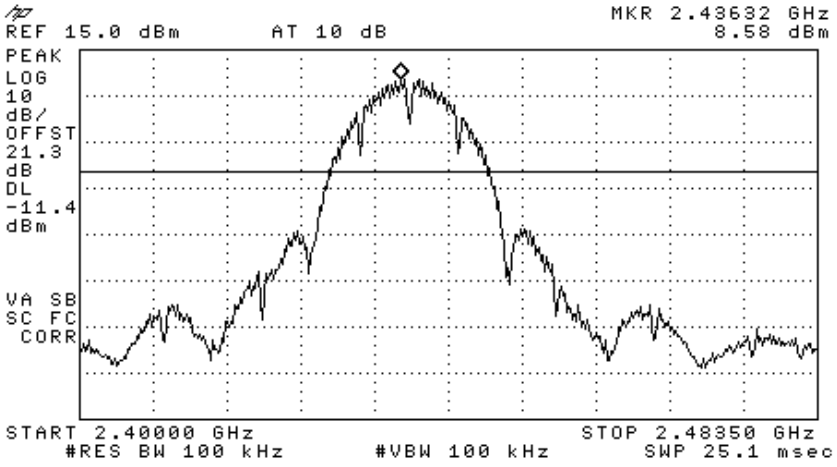

Figure 39 —2437 MHz BPSK

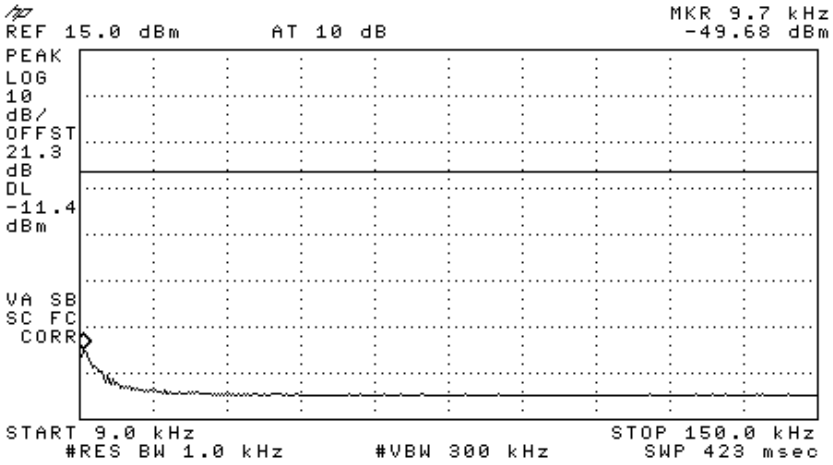

Figure 40 —2437 MHz BPSK

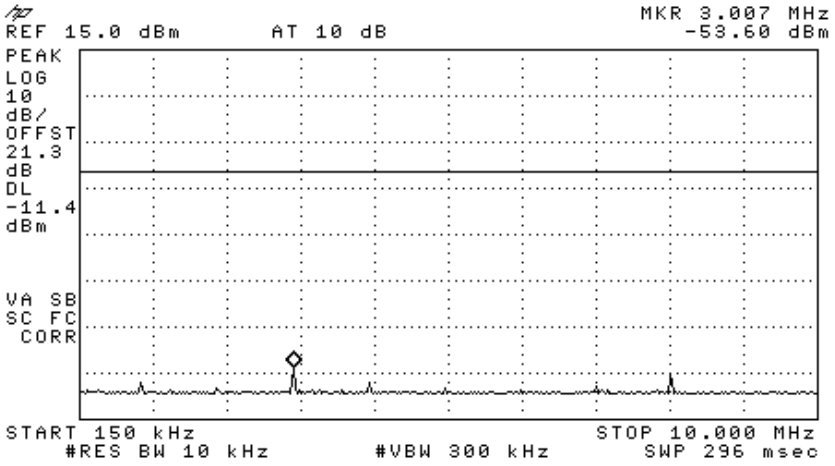

Figure 41 —2437 MHz BPSK

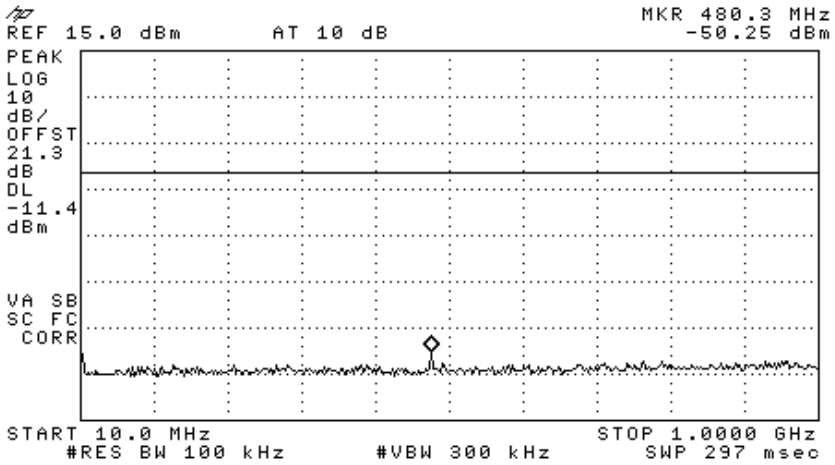

Figure 42 —2437 MHz BPSK

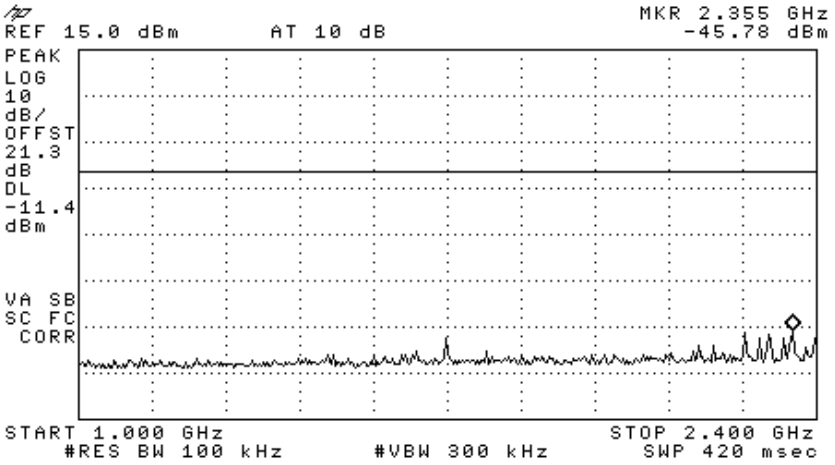

Figure 43 —2437 MHz BPSK

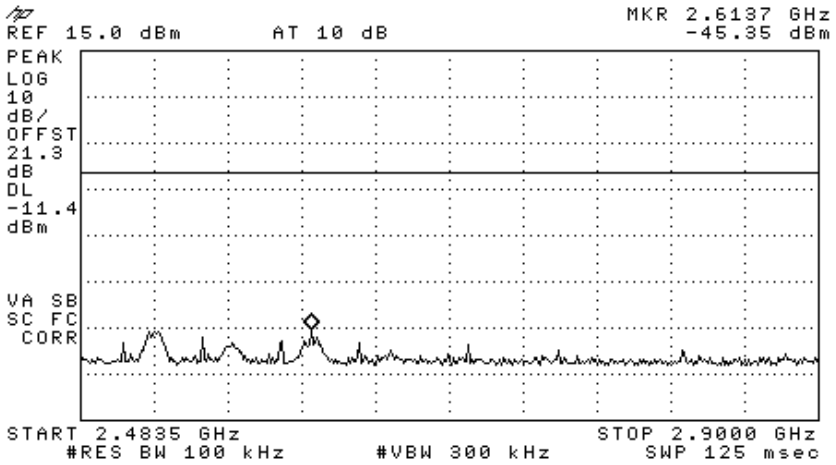

Figure 44 —2437 MHz BPSK

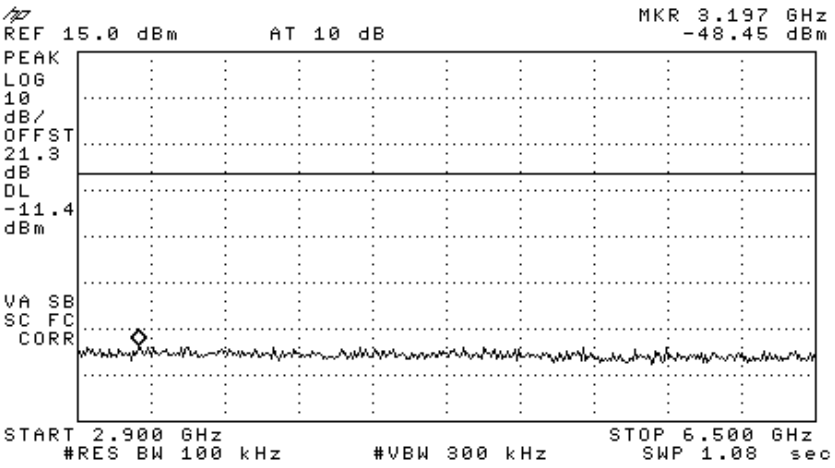

Figure 45 —2437 MHz BPSK

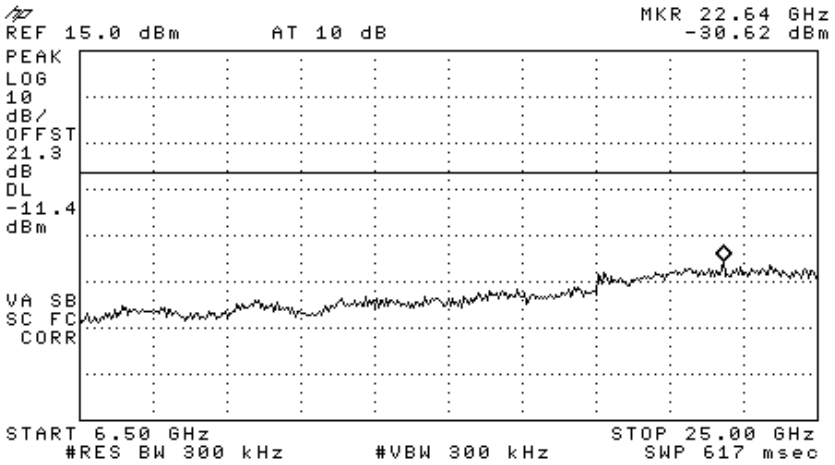

Figure 46 —2437 MHz BPSK

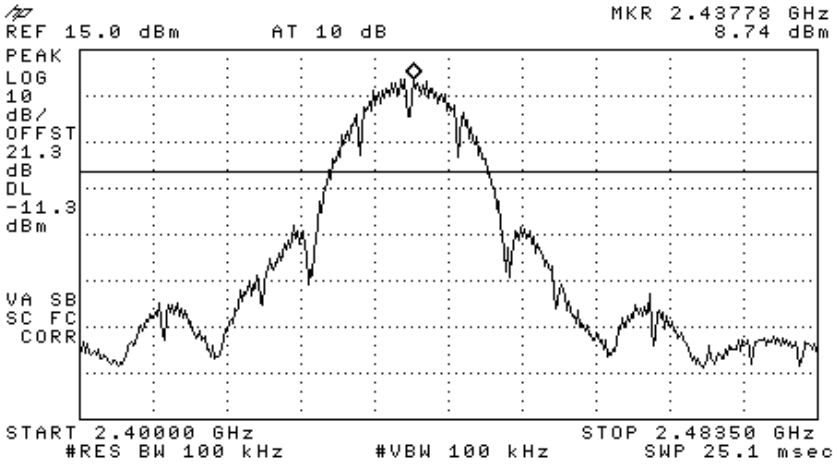

Figure 47 —2437 MHz CCK

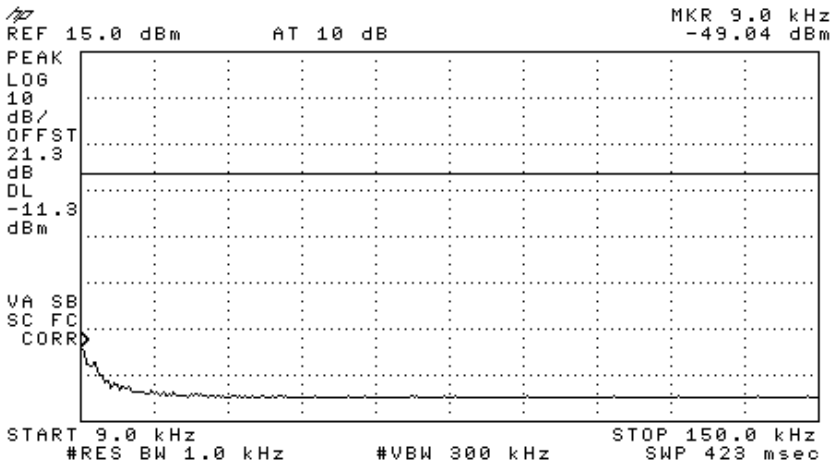

Figure 48 —2437 MHz CCK

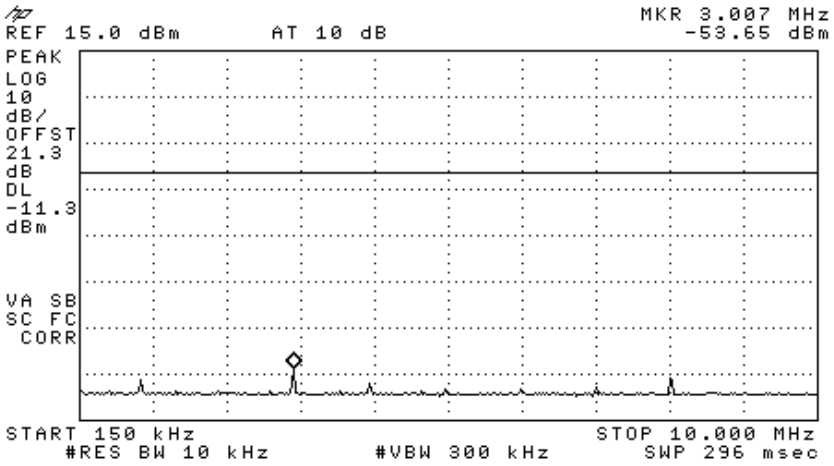

Figure 49 —2437 MHz CCK

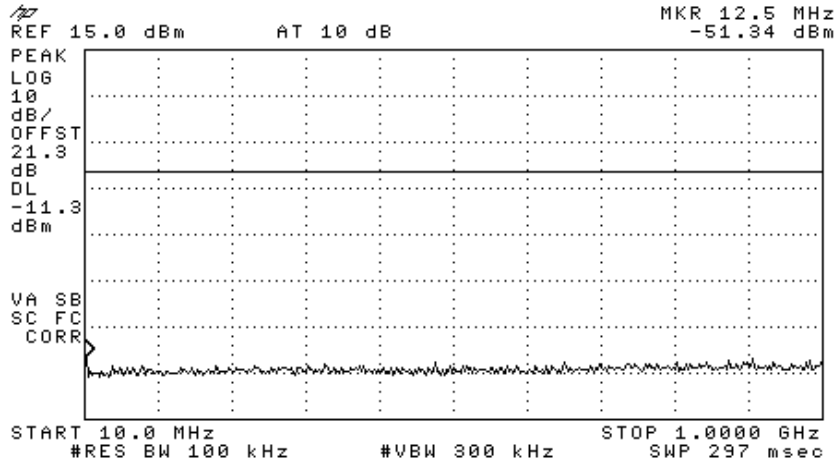

Figure 50 —2437 MHz CCK

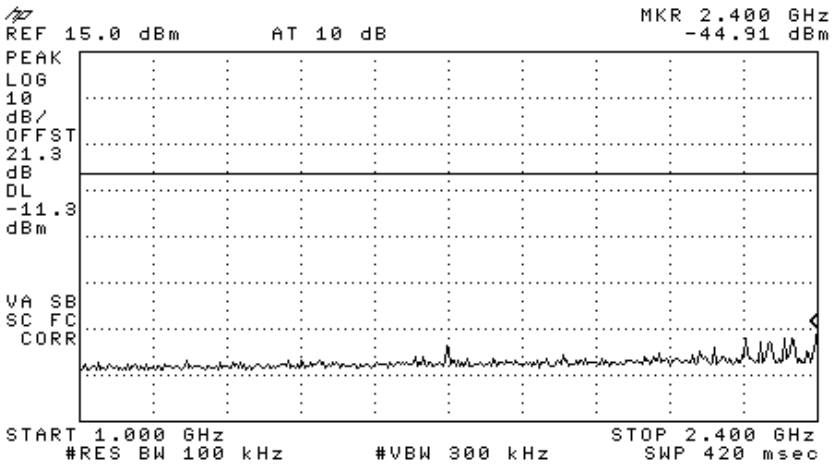

Figure 51 —2437 MHz CCK

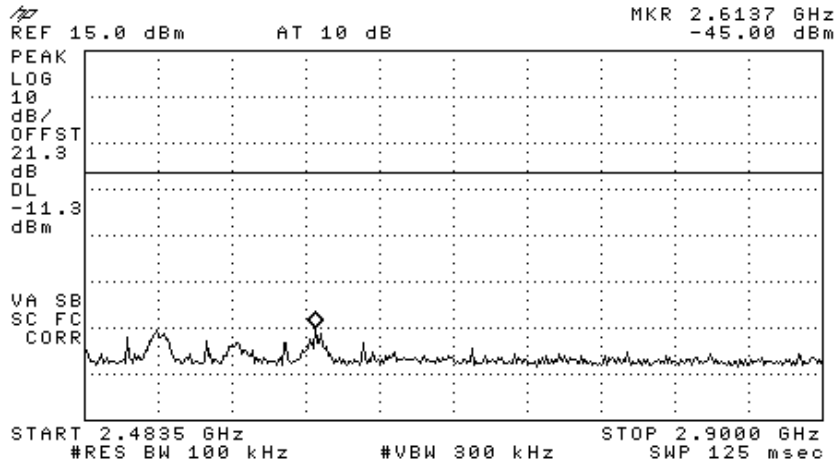

Figure 52 —2437 MHz CCK

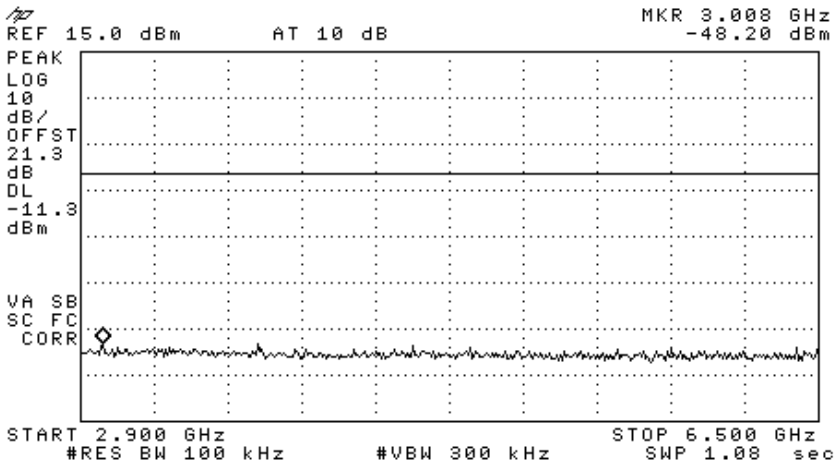

Figure 53 —2437 MHz CCK

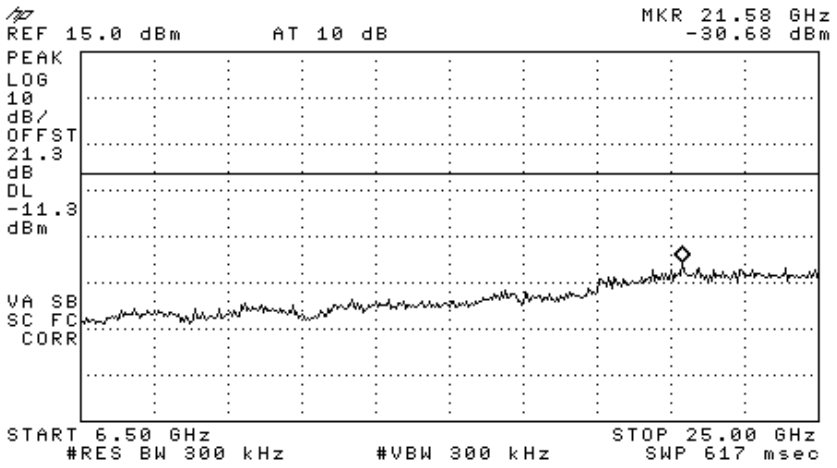

Figure 54 —2437 MHz CCK

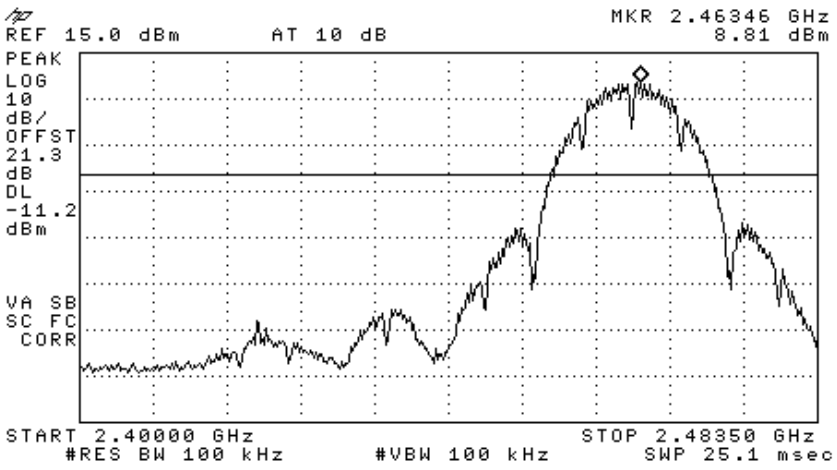

Figure 55 —2462 MHz BPSK

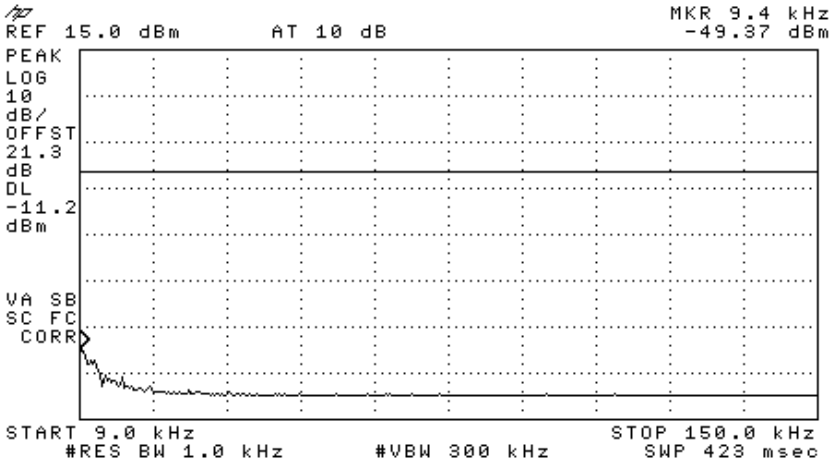

Figure 56 —2462 MHz BPSK

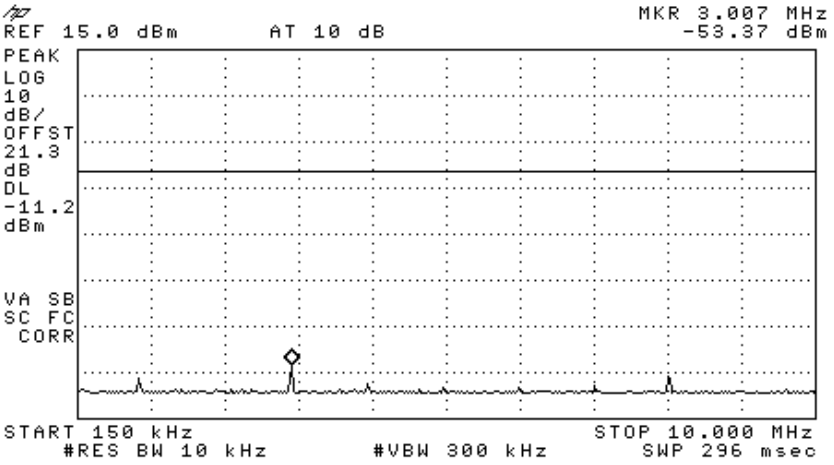

Figure 57 —2462 MHz BPSK

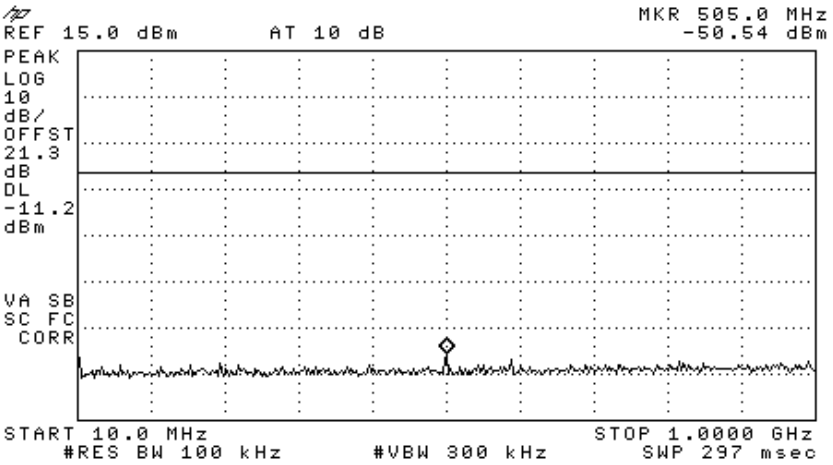

Figure 58 —2462 MHz BPSK

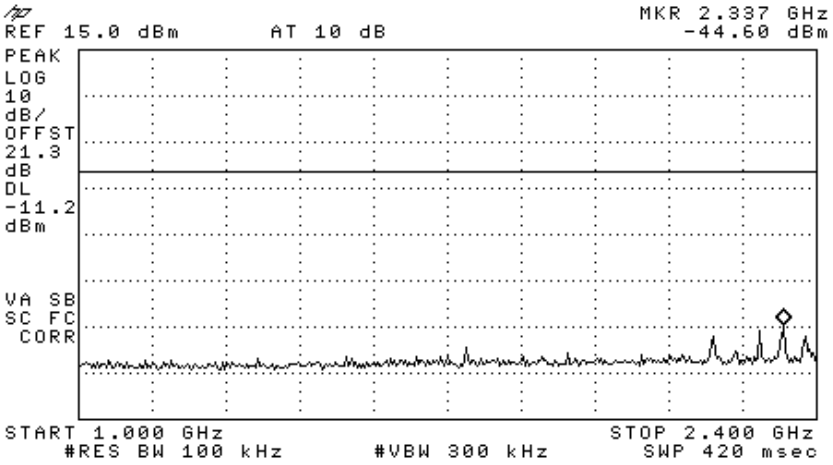

Figure 59 —2462 MHz BPSK

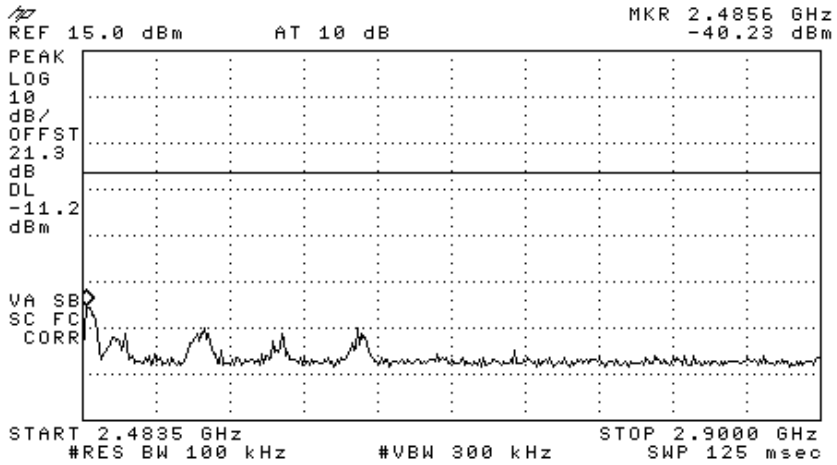

Figure 60 —2462 MHz BPSK

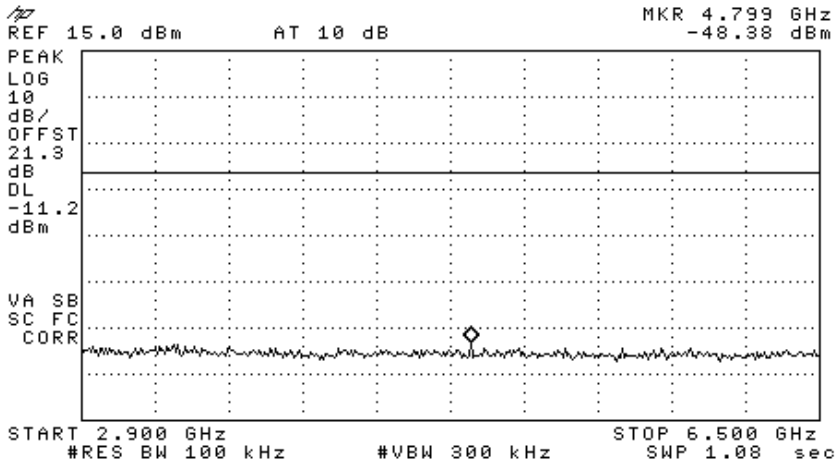

Figure 61 —2462 MHz BPSK

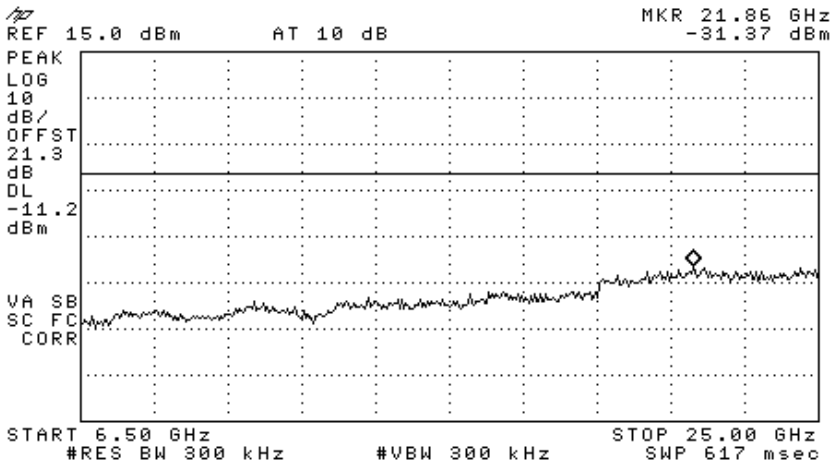

Figure 62 —2462 MHz BPSK

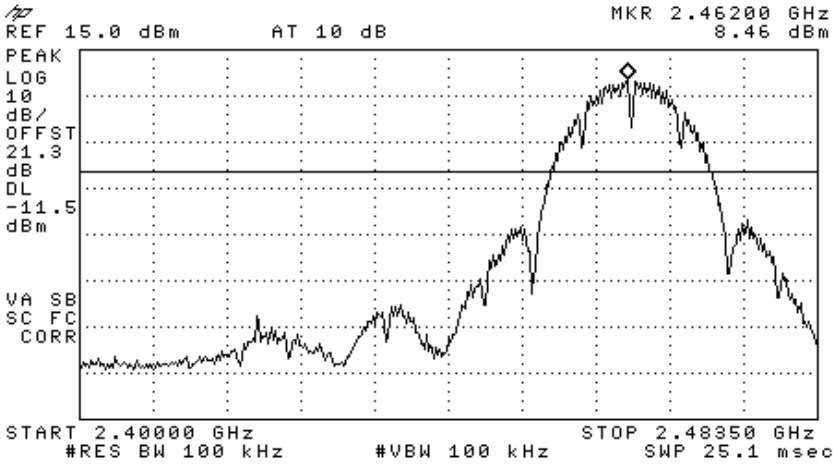

Figure 63 —2462 MHz CCK

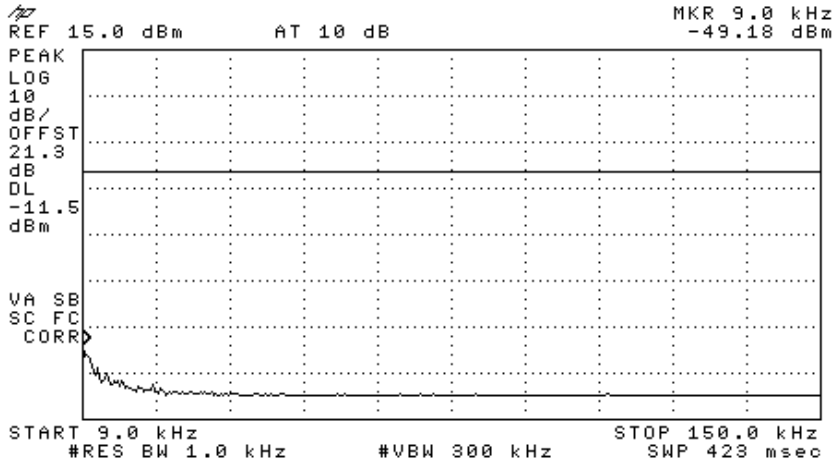

Figure 64 —2462 MHz CCK

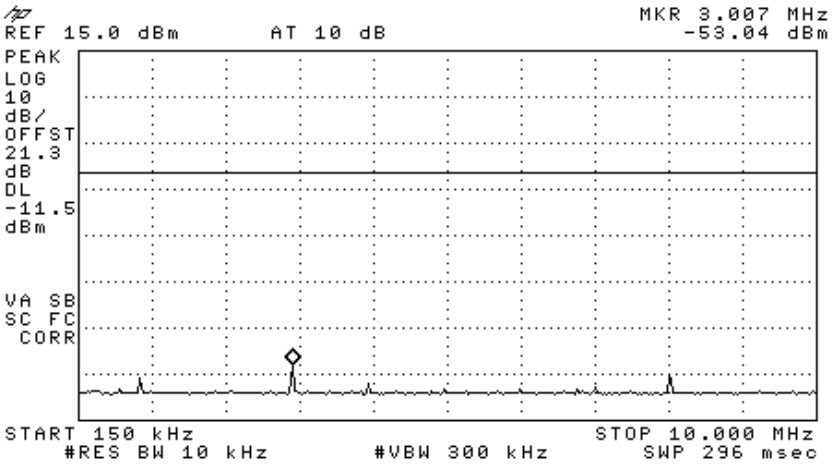

Figure 65 —2462 MHz CCK

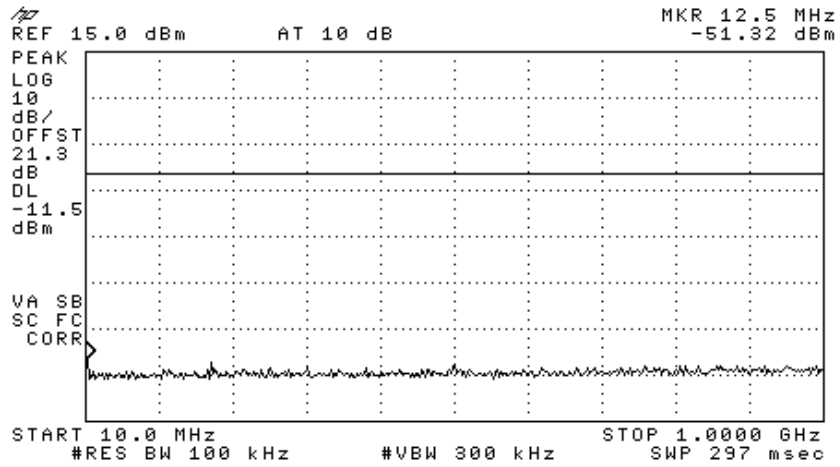

Figure 66 —2462 MHz CCK

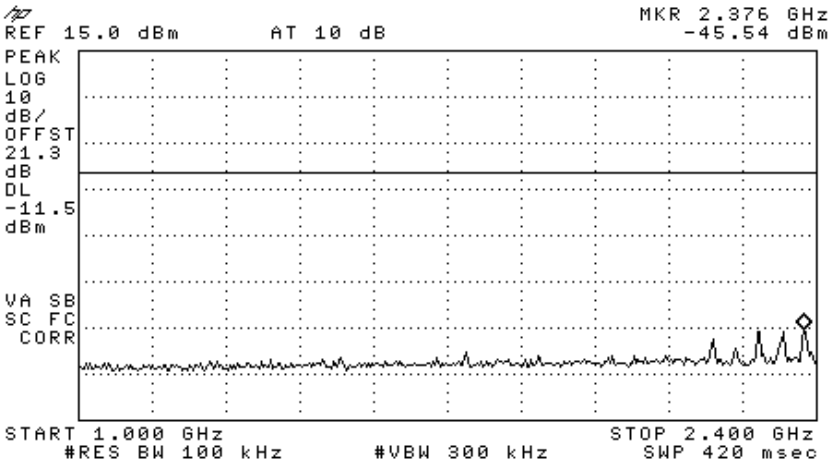

Figure 67 —2462 MHz CCK

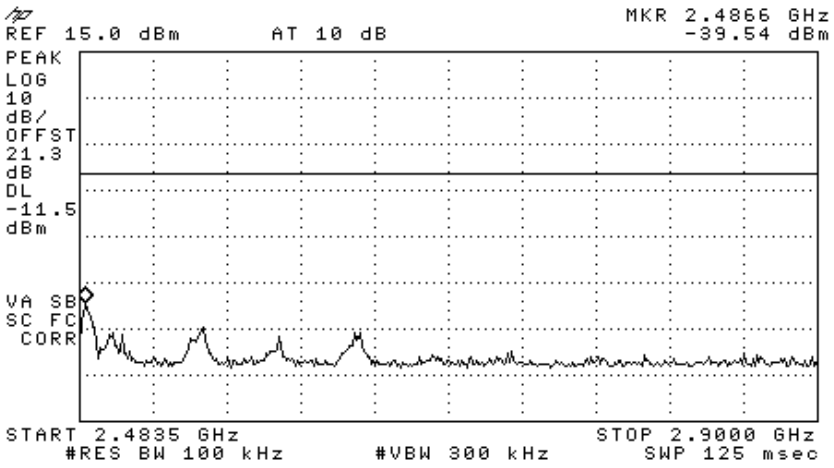

Figure 68 —2462 MHz CCK

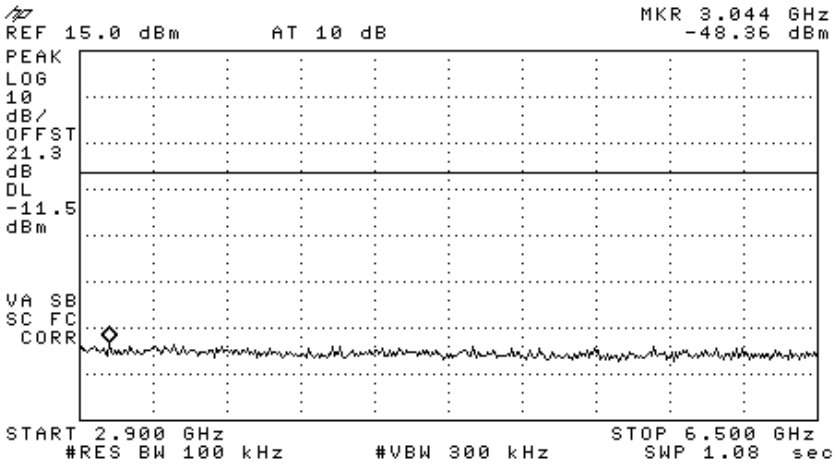

Figure 69 —2462 MHz CCK

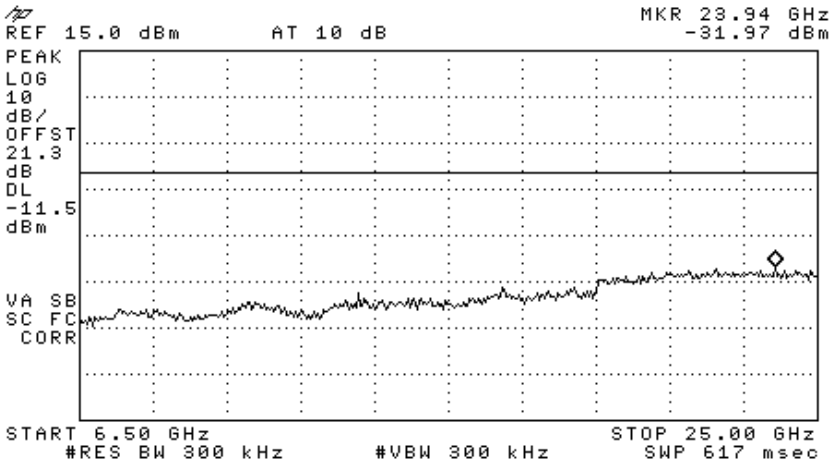

Figure 70 —2462 MHz CCK

8.2 Results table

E.U.T Description: TAG T3-BD
Model No.: TAG-3500
Serial Number: 200-2047-0000
Specification: F.C.C. Part 15, Subpart C (15.247)

Operation Frequency (MHz)	Modulation	Reading (dBc)	Specification (dBc)	Margin (dB)
2412	BPSK	36.79	20.0	-16.79
	CCK	34.24	20.0	-14.24
2437	BPSK	39.22	20.0	-19.22
	CCK	39.38	20.0	-19.38
2462	BPSK	40.17	20.0	-20.17
	CCK	40.47	20.0	-20.47

Figure 71 Peak Power Output of 2400-2483.5 MHz Band

JUDGEMENT: Passed by 14.24 dB

TEST PERSONNEL:
Tester Signature: _____ Date: 19.06.08
Typed/Printed Name: A. Sharabi

8.3 Test Equipment Used.

Peak Power Output of 2400-2438.5 MHz Band

Instrument	Manufacturer	Model	Serial/Part Number	Calibration	
				Last Calibr.	Period
Spectrum Analyzer	HP	8592L	3826A01204	March 5, 2008	1 year
Attenuator	Jyebao	-	FAT-AM5AF5G6G2W20	May 9, 2007	1 year
Cable	Rhophase	KPS-5000-KPS	A1674	February 8, 2008	1 year

Figure 72 Test Equipment Used

9. 6 dB Minimum Bandwidth

9.1 Test procedure

The E.U.T. was set to the applicable test frequency. The E.U.T. antenna terminal was connected to the spectrum analyzer through an external attenuator (20 dB) and an appropriate coaxial cable (cable loss = 1.3 dB). The spectrum analyzer was set to 100 kHz resolution BW. The spectrum bandwidth of the E.U.T. at the point of 6 dB below maximum peak power was measured and recorded.

The E.U.T. was tested at 2412, 2437, and 2462 MHz with the following modulations: BPSK (6Mbit/sec) and CCK (11Mbit/sec).

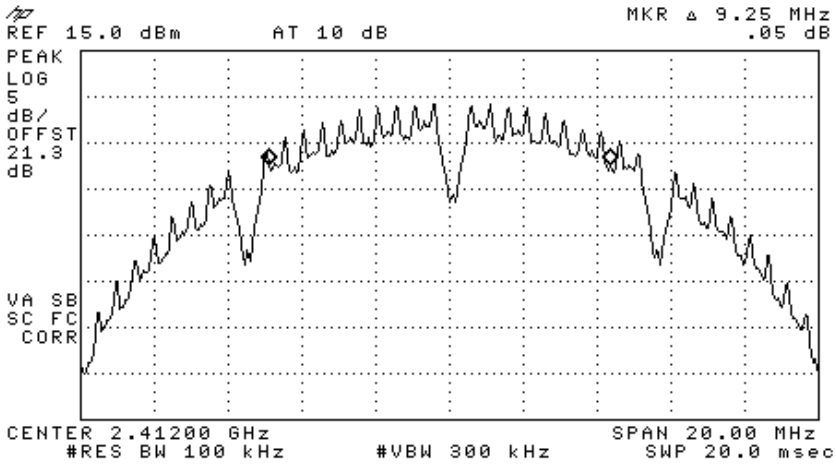

Figure 73 —2412 MHz BPSK

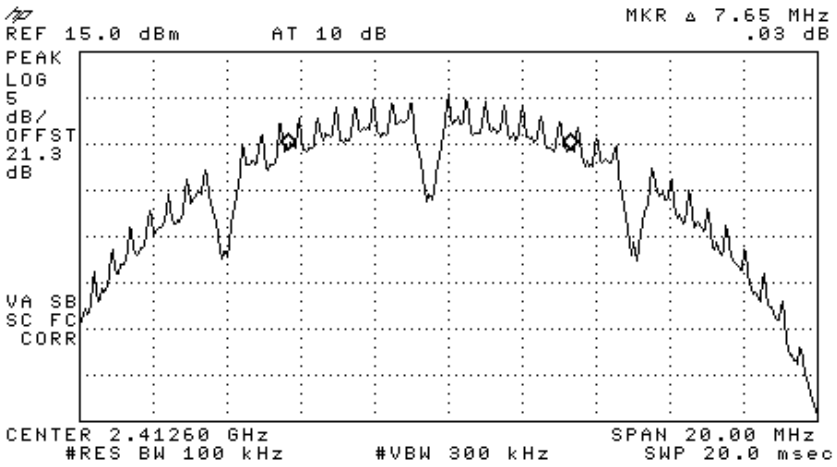

Figure 74 —2412 MHz CCK

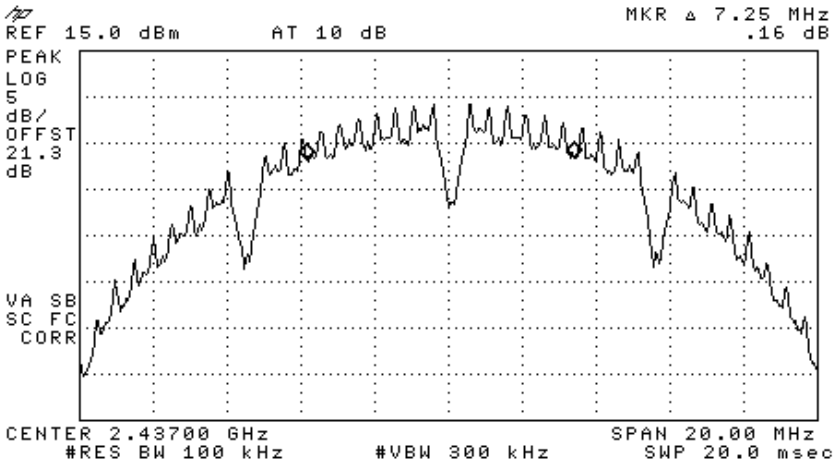

Figure 75 —2437 MHz BPSK

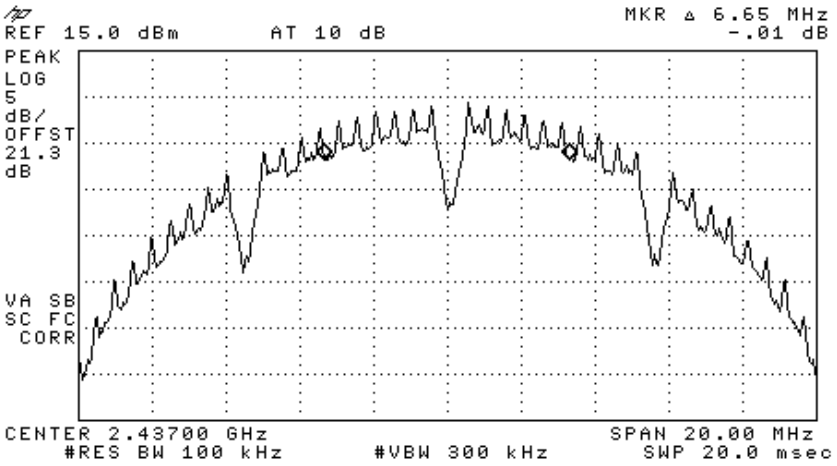

Figure 76 —2437 MHz CCK

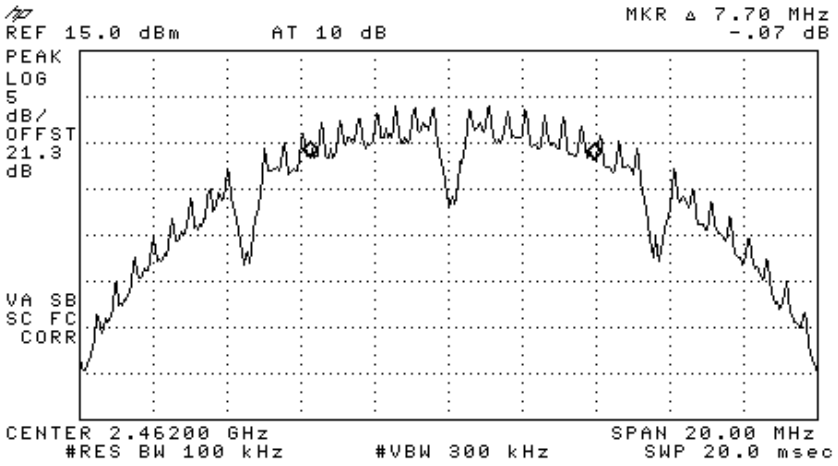

Figure 77 —2462 MHz BPSK

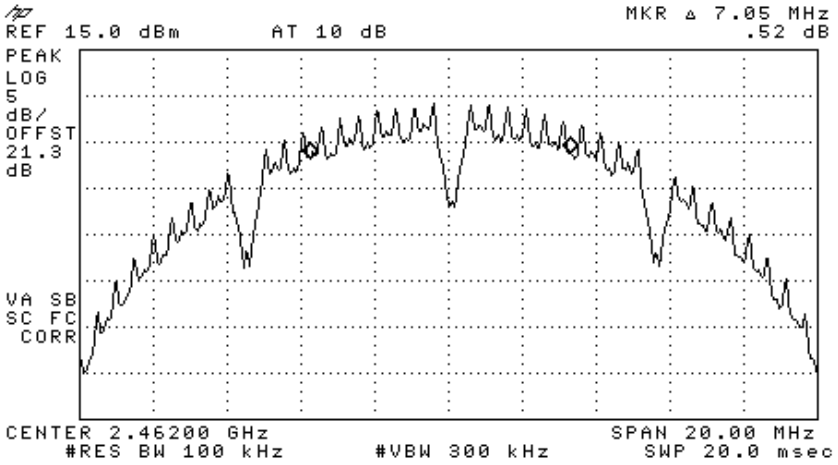

Figure 78 —2642 MHz CCK

9.2 Results table

E.U.T Description: TAG T3-BD
Model No.: TAG-3500
Serial Number: 200-2047-0000
Specification: F.C.C. Part 15, Subpart C: (15.247-a2)

Operation Frequency (MHz)	Modulation	Reading (MHz)	Specification (MHz)
2412	BPSK	9.25	0.5
	CCK	7.65	0.5
2437	BPSK	7.25	0.5
	CCK	6.65	0.5
2462	BPSK	7.70	0.5
	CCK	7.05	0.5

Figure 79 6 dB Minimum Bandwidth

JUDGEMENT: Passed

TEST PERSONNEL:

Tester Signature: _____ Date: 19.06.08

Typed/Printed Name: A. Sharabi

9.3 Test Equipment Used.

6 dB Minimum Bandwidth

Instrument	Manufacturer	Model	Serial/Part Number	Calibration	
				Last Calibr.	Period
Spectrum Analyzer	HP	8592L	3826A01204	March 5, 2008	1 year
Attenuator	Jyebao	-	FAT-AM5AF5G6G2W20	May 9, 2007	1 year
Cable	Rhophase	KPS-5000-KPS	A1674	February 8, 2008	1 year

Figure 80 Test Equipment Used

10. Band Edge Spectrum

[In Accordance with section 15.247(c)]

10.1 Test procedure

The E.U.T. antenna terminal was connected to the spectrum analyzer through an external attenuator (20 dB) and an appropriate coaxial cable
(cable loss = 1.3 dB). The spectrum analyzer was set to 100 kHz resolution BW. Maximum power level below 2400 MHz and above 2483.5 MHz was measured relative to power level at 2412 MHz, and 2462 MHz correspondingly.

The E.U.T. was tested using the following modulations: BPSK (1Mbit/sec) and CCK (11Mbit/sec).

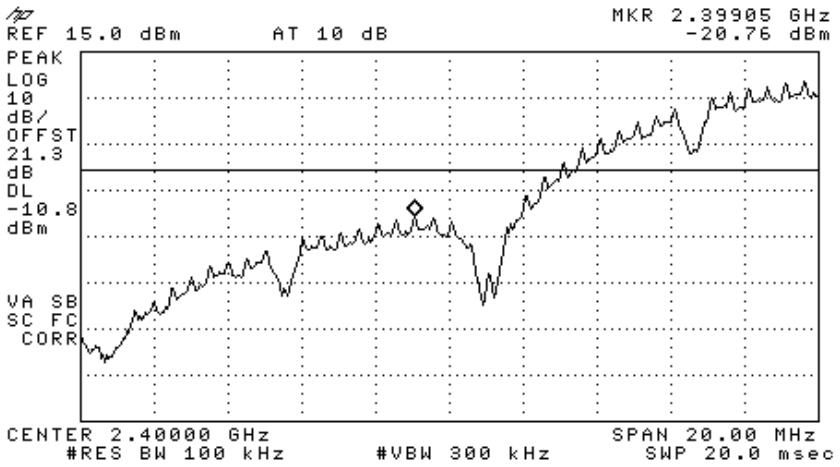

Figure 81 —2412 MHz BPSK

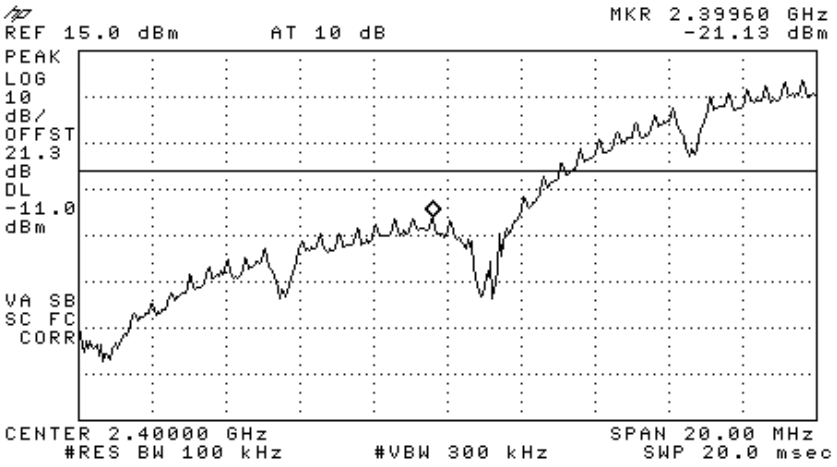

Figure 82 —2412 MHz CCK

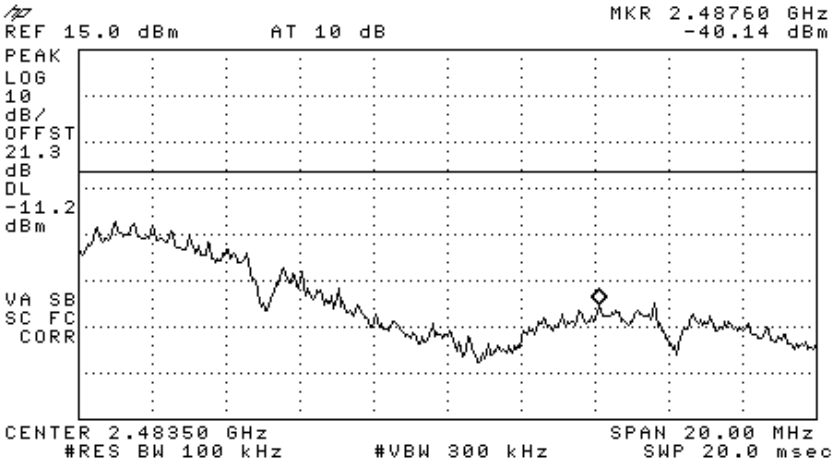

Figure 83 —2462 MHz BPSK

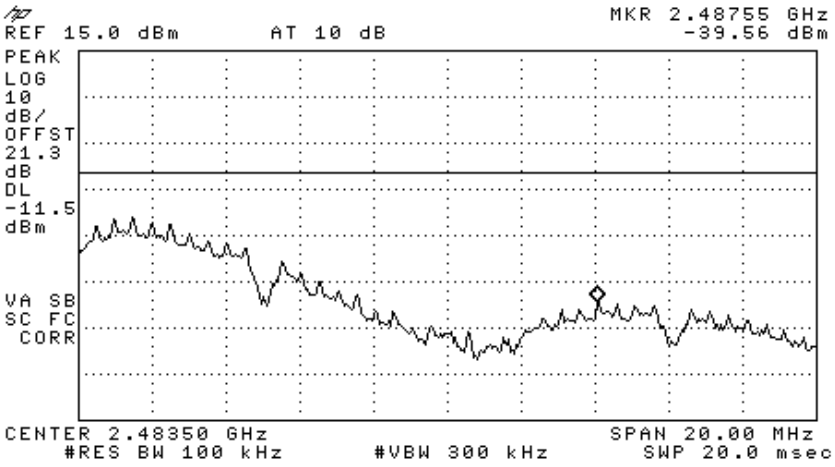

Figure 84 —2462 MHz CCK

10.2 Results table

E.U.T. Description: TAG T3-BD
Model No.: TAG-3500
Serial Number: 200-2047-0000
Specification: F.C.C. Part 15, Subpart C (15.247)

Operation Frequency (MHz)	Modulation	Band Edge Frequency (MHz)	Spectrum Level (dBc)	Specification (dBc)	Margin (dB)
2412	BPSK	2399.05	29.96	20.0	-9.96
	CCK	2399.60	30.13	20.0	-10.13
2462	BPSK	2487.60	48.94	20.0	-28.94
	CCK	2487.55	48.06	20.0	-28.06

Figure 85 Band Edge Spectrum

JUDGEMENT: Passed by 9.96 dB

TEST PERSONNEL:
Tester Signature: _____ Date: 19.06.08
Typed/Printed Name: A. Sharabi

10.3 Test Equipment Used.

Band edge Spectrum

Instrument	Manufacturer	Model	Serial/Part Number	Calibration	
				Last Calibr.	Period
Spectrum Analyzer	HP	8592L	3826A01204	March 5, 2008	1 year
Attenuator	Jyebao	-	FAT-AM5AF5G6G2W20	May 9, 2007	1 year
Cable	Rhophase	KPS-5000-KPS	A1674	February 8, 2008	1 year

Figure 86 Test Equipment Used

11. Transmitted Power Density

[In accordance with section 15.247(d)]

11.1 Test procedure

The E.U.T. antenna terminal was connected to the spectrum analyzer through an external attenuator (20dB) and an appropriate coaxial cable
(cable loss = 1.3 dB). The spectrum analyzer was set to 3 kHz resolution BW. and sweep time of 1 second for each 3 kHz “window”. The spectrum peaks were located at each of the 3 operating frequencies.

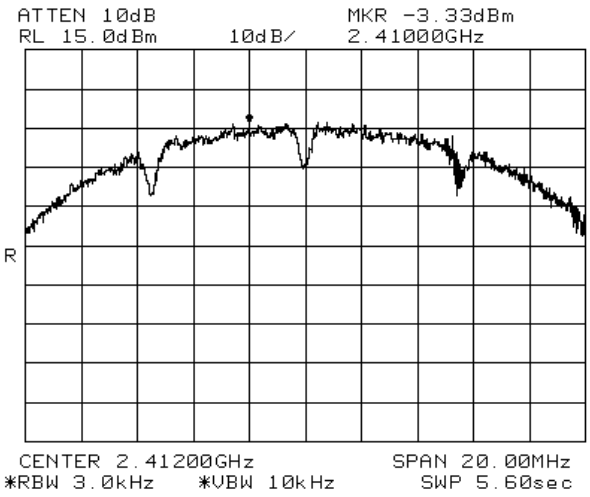

Figure 87 —2412 MHz BPSK

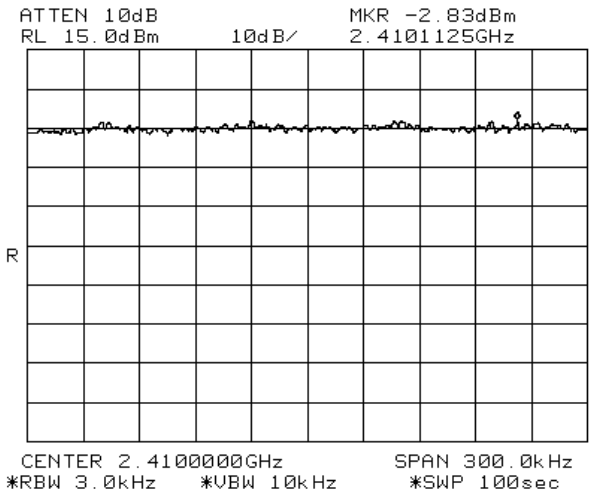

Figure 88 —2412 MHz BPSK

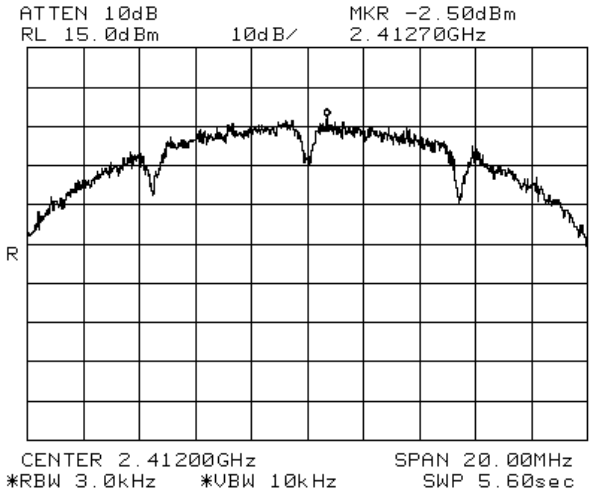

Figure 89 —2412 MHz CCK

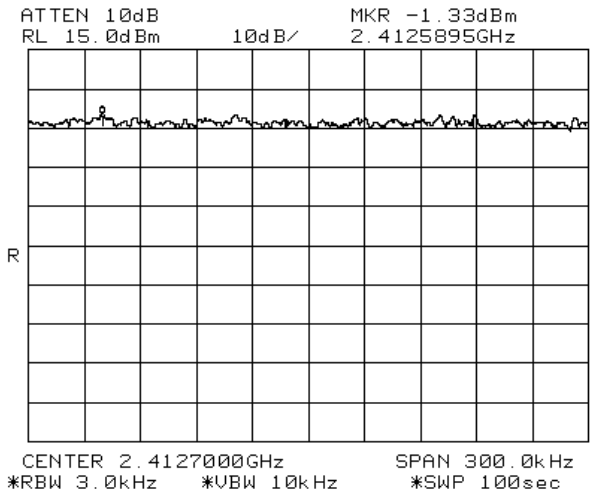

Figure 90 —2412 MHz CCK

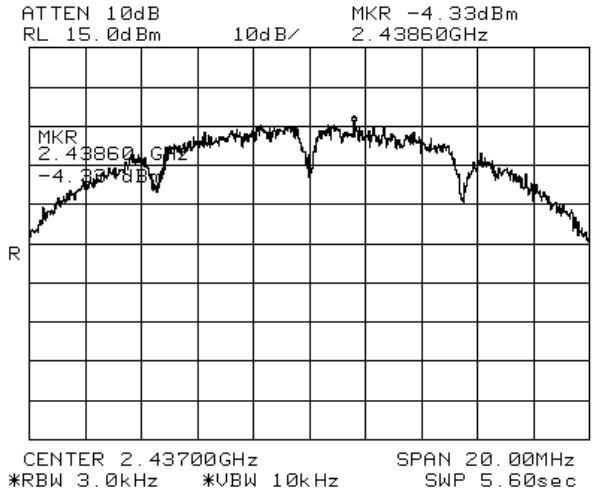

Figure 91 —2437 MHz BPSK

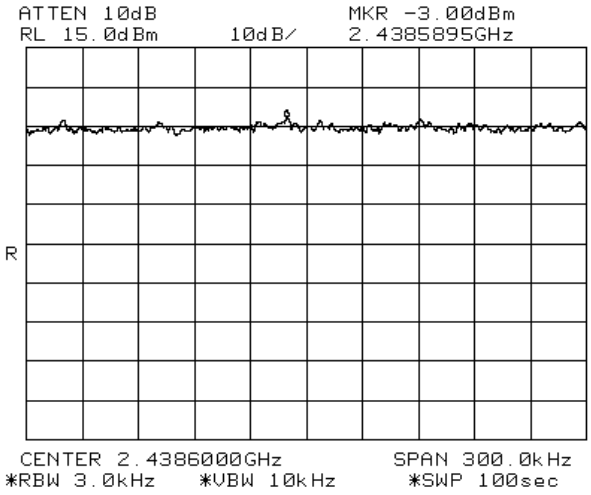

Figure 92 —2437 MHz BPSK

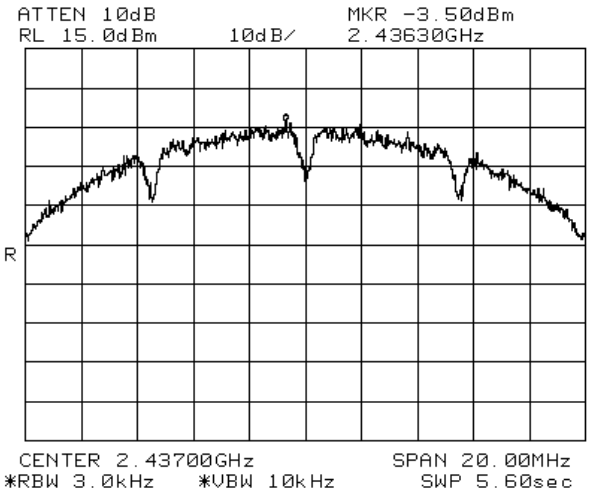

Figure 93 —2437 MHz CCK

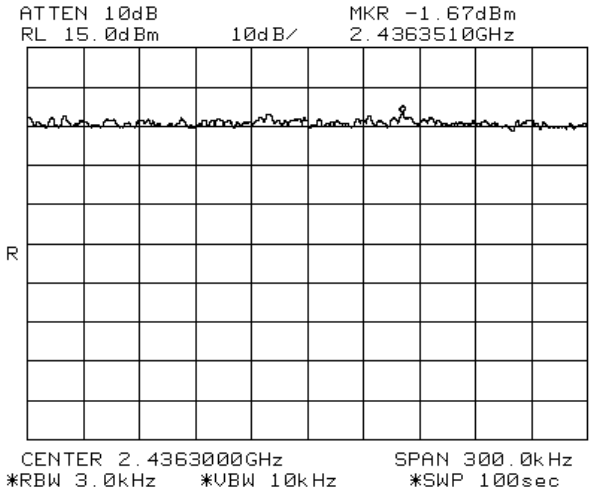

Figure 94 —2437 MHz CCK

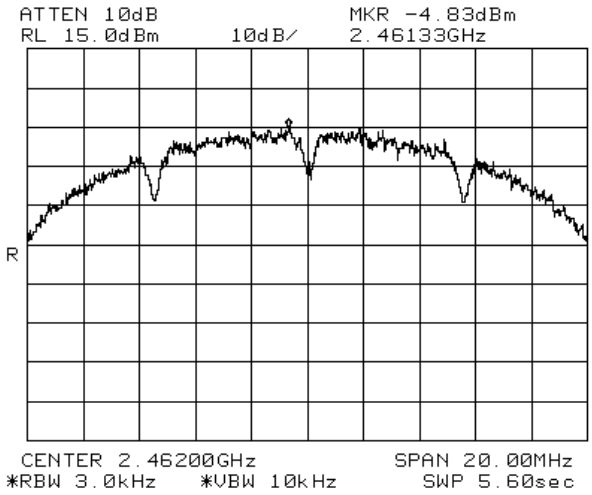

Figure 95 —2462 MHz BPSK

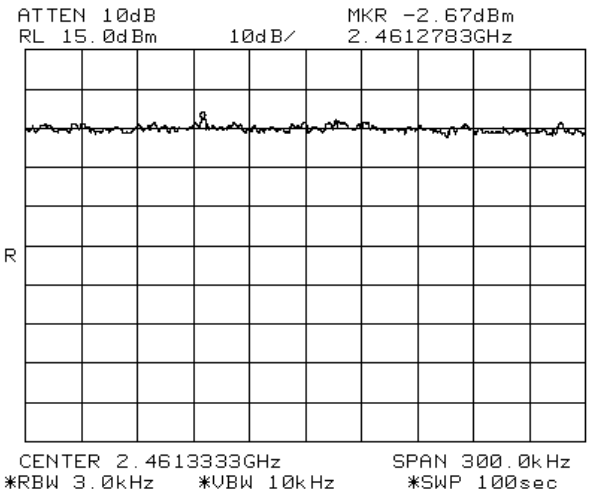

Figure 96 —2462 MHz BPSK

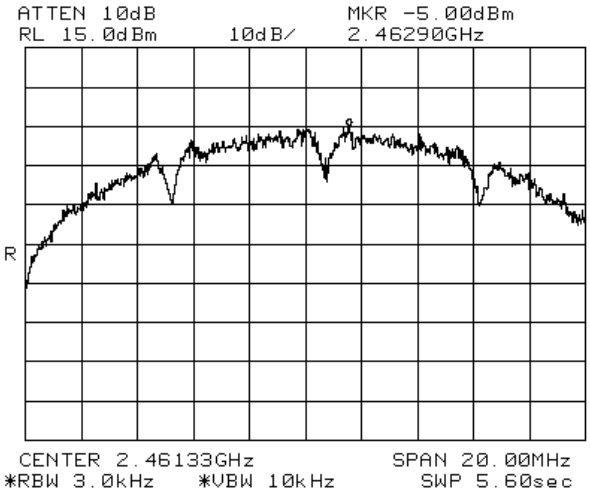

Figure 97 —2462 MHz CCK

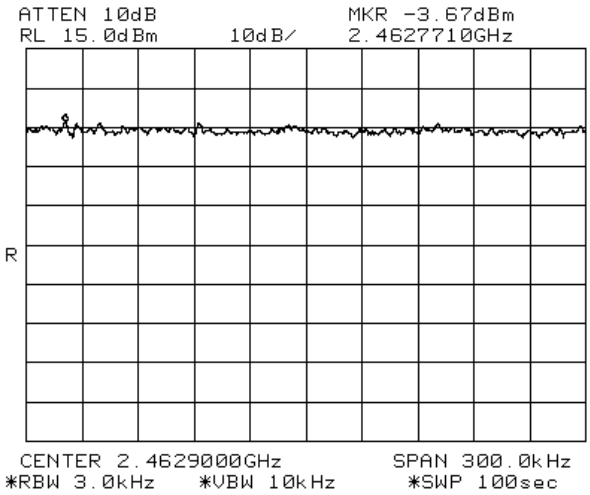

Figure 98 —2462 MHz CCK

11.2 Results table

E.U.T. Description: TAG T3-BD
Model No.: TAG-3500
Serial Number: 200-2047-0000
Specification: F.C.C. Part 15, Subpart C (15.247)

Operation Frequency (MHz)	Modulation	Reading Spectrum Analyzer (dBm)	Specification (dBm)	Margin (dB)
2412	BPSK	-2.83	8.0	-10.83
2412	CCK	-1.33	8.0	-9.33
2437	BPSK	-3.00	8.0	-11.00
2437	CCK	-1.67	8.0	-9.67
2462	BPSK	-2.67	8.0	-10.67
2462	CCK	-3.67	8.0	-11.67

Figure 99 Test Results

JUDGEMENT: Passed by 9.33 dB

TEST PERSONNEL:

Tester Signature: _____ Date: 19.06.08

Typed/Printed Name: A. Sharabi

11.3 Test Equipment Used.

Transmitted Power Density

Instrument	Manufacturer	Model	Serial/Part Number	Calibration	
				Last Calibr.	Period
Spectrum Analyzer	HP	8564E	3442A00275	November 14, 2007	1 year
Attenuator	Jyebao	-	FAT-AM5AF5G6G2W20	May 9, 2007	1 year
Cable	Rhophase	KPS-5000-KPS	A1674	February 8, 2008	1 year

Figure 100 Test Equipment Used

12. Antenna Gain

The antenna gain is -1 dBi.

13. R.F Exposure/Safety Calculation

Typical uses of the E.U.T. are tracking of children in amusement parks, security personnel in enterprises, hospital patients, and many more . The E.U.T. is typically worn on a wristband. The typical distance between the E.U.T. and the user in the worst case application, is <2.5 cm.

Calculation of Maximum Permissible Exposure (MPE)

Based on Section 1.1307(b)(1) Requirements

(a) FCC limits at 2437 MHz is: $1\frac{mW}{cm^2}$

Using table 1 of Section 1.1310 limit for general population/uncontrolled exposures, the above level is an average over 30 minutes.

(b) The power density produced by the E.U.T. is

$$S = \frac{P_t G_t}{4\pi R^2}$$

P_t- Transmitted Power 355mw (Peak)

G_T- Antenna Gain, -1 dBi = 0.9

R- Distance from Transmitter using 1cm worst case

(c) The peak power density is :

$$S_p = \frac{355}{4\pi(1)^2} = 2.25\frac{mW}{cm^2}$$

(d) The duty cycle of transmission in actual worst case is 500 microsecond “on” and 1 second “Off”.

The average power over 30 minutes is:

$$P_{AV} = \frac{355 \times 0.5}{1000} = 0.071mW$$

(e) The averaged power density of the E.U.T. is:

$$S_{AV} = \frac{0.071}{4\pi(1)^2} = 4.5\times10^{-3}\frac{mW}{cm^2}$$

(f) This is 3 orders of magnitude below the FCC limit.

14. APPENDIX A - CORRECTION FACTORS

14.1 Correction factors for CABLE

from EMI receiver to test antenna at 3 meter range.

FREQUENCY (MHz)	CORRECTION FACTOR (dB)
10.0	0.3
20.0	0.6
30.0	0.8
40.0	0.9
50.0	1.1
60.0	1.2
70.0	1.3
80.0	1.4
90.0	1.6
100.0	1.7
150.0	2.0
200.0	2.3
250.0	2.7
300.0	3.1
350.0	3.4
400.0	3.7
450.0	4.0
500.0	4.3
600.0	4.7
700.0	5.3
800.0	5.9
900.0	6.3
1000.0	6.7

FREQUENCY (MHz)	CORRECTION FACTOR (dB)
1200.0	7.3
1400.0	7.8
1600.0	8.4
1800.0	9.1
2000.0	9.9
2300.0	11.2
2600.0	12.2
2900.0	13.0

NOTES:

1. The cable type is RG-214.

2. The overall length of the cable is 27 meters.

3. The above data is located in file 27MO3MO.CBL on the disk marked "Radiated Emission Tests EMI Receiver".

14.2 Correction factors for CABLE

from EMI receiver to test antenna at 3 meter range.

FREQUENCY (GHz)	CORRECTION FACTOR (dB)
1.0	1.2
2.0	1.6
3.0	2.0
4.0	2.4
5.0	3.0
6.0	3.4
7.0	3.8
8.0	4.2
9.0	4.6
10.0	5.0
12.0	5.8

NOTES:

1. The cable type is RG-8.

2. The overall length of the cable is 10 meters.

14.3 Correction factors for CABLE

from spectrum analyzer to test antenna above 2.9 GHz

FREQUENCY (GHz)	CORRECTION FACTOR (dB)	FREQUENCY (GHz)	CORRECTION FACTOR (dB)
1.0	1.9	14.0	9.1
2.0	2.7	15.0	9.5
3.0	3.5	16.0	9.9
4.0	4.2	17.0	10.2
5.0	4.9	18.0	10.4
6.0	5.5	19.0	10.7
7.0	6.0	20.0	10.9
8.0	6.5	21.0	11.2
9.0	7.0	22.0	11.6
10.0	7.5	23.0	11.9
11.0	7.9	24.0	12.3
12.0	8.3	25.0	12.6
13.0	8.7	26.0	13.0

NOTES:

1. The cable type is SUCOFLEX 104 E manufactured by SUHNER.

2. The cable is used for measurements above 2.9 GHz.

3. The overall length of the cable is 10 meters.

12.6 Correction factors for LOG PERIODIC ANTENNA

Type LPD 2010/A
at 3 and 10 meter ranges.

Distance of 3 meters

FREQUENCY (MHz)	AFE (dB/m)
200.0	9.1
250.0	10.2
300.0	12.5
400.0	15.4
500.0	16.1
600.0	19.2
700.0	19.4
800.0	19.9
900.0	21.2
1000.0	23.5

Distance of 10 meters

FREQUENCY (MHz)	AFE (dB/m)
200.0	9.0
250.0	10.1
300.0	11.8
400.0	15.3
500.0	15.6
600.0	18.7
700.0	19.1
800.0	20.2
900.0	21.1
1000.0	23.2

NOTES:

1. *Antenna serial number is 1038.*
2. *The above lists are located in file number 38M3O.ANT for a 3 meter range, and file number 38M100.ANT for a 10 meter range.*
3. *The files mentioned above are located on the disk marked "Radiated Emission Test EMI Receiver".*

14.4 Correction factors for LOG PERIODIC ANTENNA

Type SAS-200/511
at 3 meter range.

FREQUENCY (GHz)	ANTENNA FACTOR (dB)
1.0	24.9
1.5	27.8
2.0	29.9
2.5	31.2
3.0	32.8
3.5	33.6
4.0	34.3
4.5	35.2
5.0	36.2
5.5	36.7
6.0	37.2
6.5	38.1

FREQUENCY (GHz)	ANTENNA FACTOR (dB)
7.0	38.6
7.5	39.2
8.0	39.9
8.5	40.4
9.0	40.8
9.5	41.1
10.0	41.7
10.5	42.4
11.0	42.5
11.5	43.1
12.0	43.4
12.5	44.4
13.0	44.6

NOTES:

1. *Antenna serial number is 253.*
2. *The above lists are located in file number SAS3M0.ANT for a 3 meter range.*
3. *The files mentioned above are located on the disk marked "Antenna Factors".*

14.5 Correction factors for BICONICAL ANTENNA

Type BCD-235/B, at 3 meter range

FREQUENCY (MHz)	AFE (dB/m)
20.0	19.4
30.0	14.8
40.0	11.9
50.0	10.2
60.0	9.1
70.0	8.5
80.0	8.9
90.0	9.6
100.0	10.3
110.0	11.0
120.0	11.5
130.0	11.7
140.0	12.1
150.0	12.6
160.0	12.8
170.0	13.0
180.0	13.5
190.0	14.0
200.0	14.8
210.0	15.3
220.0	15.8
230.0	16.2
240.0	16.6
250.0	17.6
260.0	18.2
270.0	18.4
280.0	18.7
290.0	19.2
300.0	19.9
310	20.7
320	21.9
330	23.4
340	25.1
350	27.0

NOTES:

1. Antenna serial number is 1041.

2. The above list is located in file 19BC10M1.ANT on the disk marked "Radiated Emissions Tests EMI Receiver".

14.6 Correction factors for Double-Ridged Waveguide Horn

Model: 3115, S/N 29845
at 3 meter range.

FREQUENCY (GHz)	ANTENNA FACTOR (dB 1/m)	ANTENNA Gain (dBi)	FREQUENCY (GHz)	ANTENNA FACTOR (dB 1/m)	ANTENNA Gain (dBi)
1.0	24.8	5.4	10.0	38.8	11.4
1.5	26.1	7.6	10.5	38.9	11.8
2.0	28.6	7.7	11.0	39.0	12.1
2.5	29.8	8.4	11.5	39.6	11.8
3.0	31.4	8.4	12.0	39.8	12.0
3.5	32.4	8.7	12.5	39.6	12.5
4.0	33.7	8.6	13.0	40.0	12.5
4.5	33.4	9.9	13.5	39.8	13.0
5.0	34.5	9.7	14.0	40.2	13.0
5.5	35.1	9.9	14.5	40.6	12.9
6.0	35.4	10.4	15.0	41.3	12.4
6.5	35.6	10.8	15.5	39.5	14.6
7.0	36.2	10.9	16.0	38.8	15.5
7.5	37.3	10.4	16.5	40.0	14.6
8.0	37.7	10.6	17.0	41.4	13.4
8.5	38.3	10.5	17.5	44.8	10.3
9.0	38.5	10.8	18.0	47.2	8.1
9.5	38.7	11.1			

14.7 Correction factors for Horn Antenna

Model: SWH-28
at 1 meter range.

FREQUENCY (GHz)	AFE (dB /m)	Gain (dB1)
18.0	40.3	16.1
19.0	40.3	16.3
20.0	40.3	16.1
21.0	40.3	16.3
22.0	40.4	16.8
23.0	40.5	16.4
24.0	40.5	16.6
25.0	40.5	16.7
26.0	40.6	16.4

14.8 Correction factors for Horn Antenna

Model: V637

FREQUENCY (GHz)	AFE (dB /m)	Gain (dB1)
26.0	43.6	14.9
27.0	43.7	15.1
28.0	43.8	15.3
29.0	43.9	15.5
30.0	43.9	15.8
31.0	44.0	16.0
32.0	44.1	16.2
33.0	44.1	16.4
34.0	44.1	16.7
35.0	44.2	16.9
36.0	44.2	17.1
37.0	44.2	17.4
38.0	44.2	17.6
39.0	44.2	17.8
40.0	44.2	18.0

14.9 Correction factors for ACTIVE LOOP ANTENNA

Model 6502
S/N 9506-2950

FREQUENCY	Magnetic Antenna Factor	Electric Antenna Factor
(MHz)	(dB)	(dB)
.009	-35.1	16.4
.010	-35.7	15.8
.020	-38.5	13.0
.050	-39.6	11.9
.075	-39.8	11.8
.100	-40.0	11.6
.150	-40.0	11.5
.250	-40.0	11.6
.500	-40.0	11.5
.750	-40.1	11.5
1.000	-39.9	11.7
2.000	-39.5	12.0
3.000	-39.4	12.1
4.000	-39.7	11.9
5.000	-39.7	11.8
10.000	40.2	11.3
15.000	-40.7	10.8
20.000	-40.5	11.0
25.000	-41.3	10.2
30.000	42.3	9.2