Exhibit #11

Conducted RF and Spectral Etiquette Measurements to Support the Certification of the Wireless Office Base D100, FCC ID AL8-D100X.

Plantronics, John Mihelic, March 24, 2010.

I. Background

A. EUT description

The Wireless Office Base, D100, is a base station unit which can receive and transmit audio to/from its companion headset assembly. The base unit is a USB audio device that interfaces to a standard PC USB port. The base unit is an intentional radiator, designed in accordance with the requirements of 47CFR15 subpart D. This document reports compliance of the Base to the test parameters of C63.17-2006.

The Base EUT is capable of RF power control. The power control modes are fixed, or adaptive. Adaptive power control will allow the RF transmitter to adjust the output power from a maximum of 19dBm to a minimum of 2dBm in four 5-7dB steps. Fixed power mode does not allow power control. The user can select between adaptive or fixed but can not set the power range, this is done during EUT factory set up. Compliance to C63.17-2006 is documented in Appendix A which repeats any testing that may operate differently from maximum power mode or affect the access threshold. The Base companion device can initiate a link in a wideband mode using the P00J Longslot configuration for transmission and receive, but the Base does not perform the access threshold check or initiate the WBM communications traffic link; the companion headset performs the proper access checks per ANSI C63.17-2006 clause 8.3.1 or 2.

The specific unit tested is Base #1 for emissions bandwidth, spectral etiquette, and access criteria.
The RF output power and emissions testing was performed on the SAR test sample VB2 01CFE21F8.

B. Manufacturer's attestations, mandatory declarations and descriptions

The Wireless Office D100 Base uses digital modulation.

Clause 4.11 in C63.17-2006 requires the following declarations to be made by the manufacturer. These declarations are used in demonstrating compliance with certain sections of 47CFR15 subpart D, and in support of test parameters within C63.17-2006.

The channel plan.

Five RF carriers are used, as follows:

1928.448 MHz.
1926.720 MHz.
1924.992 MHz.
1923.264 MHz.
1921.536 MHz.

Maximum EUT antenna gain GA (dBi), and orientation and polarization for maximum gain.

The maximum Base EUT antenna gain is 3dBi.

Maximum peak power level

Maximum specified peak conducted power level for the Base EUTs is +19.5dBm.

Minimum peak power level

The maximum power level at the minimum RF power setting is specified peak conducted power level for the headset EUTs is +2dBm.

Emission bandwidth

Emission bandwidth measured according to the procedures of C63.17-2006 clause 6.1.3 for the Base EUT is 1.45MHz.

Nominal receive bandwidth

Nominal receive bandwidth is +/-500kHz.

Frame period and time slot plan, if TDMA techniques are used

The EUT system is a TDMA system which "further divides access in time" in the context of clause 6.2.2 of C63.17-2006. Frame period is 10mS. There are 24 timeslots per frame, with one of the first 12 timeslots used for the headset transmissions and one of the last 12 timeslots used for the base transmissions. Transmit and receive timeslots are 5mS apart in time. Transient events occur during which two non-adjacent timeslots may be in use by the base during the setup of the communications channel, or by both the base and the headset EUT as the system does a soft handoff in response to interference.

Minimum and maximum burst length, if TDMA techniques are used

Minimum burst length is 90uS, the beacon transmissions from the base when a communications channel is not open. Maximum burst length is 780uS, transmissions from the Base when a communications channel is open in wideband mode.

Minimum and maximum operating temperature range declared to the end-user

The minimum operating temperature is +4C.
The maximum operating temperature is +44C.

Whether a system built with the EUT does or does not operate under the provisions of 47CFR15.323(c)(10) to test for deferral only in conjunction with a companion device

The EUT system does not use the provisions of 47CFR15.323(c)(10) to enable testing for access criteria only in one element of the system. The headset EUTs implement the access criteria tests.

Whether a system built with the EUT does or does not implement the provisions of 47CFR15.323(c)(5) enabling the use of the upper threshold for deferral

The EUT system does implement the provisions of 47CFR15.323(c)(5), and uses the upper threshold for deferral.

The nominal value of the deferral threshold

The nominal value of the deferral threshold implemented in the Base EUTs is -61.1dBm. This is obtained from clause 4.3.3 of C63.17-2006, where

B = 1.45 MHz as declared for the Base,

P_{max} (from clause 4.3.1) is 19.5dBm, and

P_{EUT} is 18.62dBm, maximum, as declared.

The highest value of the deferral threshold implemented in the Base EUT in normal mode is-42.1dBm with fixed minimum power configuration or -61.1dBm when the EUT is set to allow maximum transmit power. The headset EUT performs the access threshold check prior to initiating a wide band traffic link. The nominal deferral threshold value used for access criteria testing was based on a typical output power of 20dBm or -61.1 dBm.

B = 1.45 MHz as declared for the headset,

P_{max} (from clause 4.3.1) is 19.5dBm, and

P_{EUT} is 2dBm, maximum, as declared (equipment in minimum output power setting).

Whether a system built using the EUT does or does not operate under the provisions of 47CFR15.323(c)(6) incorporating provisions for waiting for a channel to go clear

The EUT system does not use the provisions of 47CFR15.323(c)(6) to enable access to a particular channel when that channel goes clear.

Whether a system built using the EUT does or does not operate under the provisions of 47CFR15.323(c)(11) enabling the access criteria check on the receive channel while in the presence of collocated interferers

The EUT system does not use the provisions of 47CFR15.323(c)(11) to enable the monitoring of a time and spectrum window blocked by a co-located transmitter.

The provisions within the EUT for self-check, by which compliance with 47CFR15.319(f) is obtained

The Base EUT incorporates the following provisions by which compliance with 47CFR15.319(f) is obtained:

a. On powerup the unit will perform a self-test of permanent storage memory (ROM) by means of a sum/checksum validation.

b. On powerup the unit will perform a self-test of critical EEPROM settings (those which if in error could result in performance outside the UPCS specification limits) by means of a sum/checksum validation.

c. On powerup the unit will perform a self-test of RAM by means of a memory field validation.

d. The controller for the unit runs a watchdog service routine, which if the controller operations fail, results in a reset of the controller within 2.5 seconds of failure.

e. The controller for the unit provides a supply voltage monitoring circuit which resets the controller if the measured operating voltage is below the limit for which functionality is guaranteed.

Whether the EUT does or does not have the monitoring made through the radio receiver used for communication

The Base EUT monitors through the radio receiver which is also used for communication.

Whether the EUT does or does not transmit control and signaling channel(s)

The base EUT transmits a control and signaling channel, in accordance with the definition of C63.17-2006.

Nominal mains and battery voltage

The nominal supply voltage for the Base EUT is 5.0V (USB powered); not battery powered.

C. Standard test configurations

The tests of C63.17-2006 clauses 6.2, 7 and 8 are each done with the following test platform configurations:

1) Conducted emissions tests, Base EUT

2) Standard-specific tester, Base EUT.

3) With companion device and interference blocking, Base EUT.

In all testing, the headset companion device is a WH110 (FCC ID#AL8WH110), which is certified under test parameters of C63.17-2006. The configurations and setup instructions preparatory to executing the tests for each setup are as follows:

1) Conducted emissions tests, Base EUT.

For this configuration, the Base EUT is removed from its housing and an SMA connector mounted in place of the antenna at the 50-ohm feedpoint. The Base EUT is then directly connected to the input of the E4407B spectrum analyzer. The Base EUT's power is provided from a DC power supply. The base device is also connected to a serial control bus by which means a testing user-interface is provided, so that the RF carrier for the base companion device can be selected by means of administrative commands. The companion headset EUT operates in normal functional mode. The Base device is configured according to Figure 3 of C63.17-2006, with radiated coupling into the headset EUT so that the Base EUT may be measured while a communications channel is active but without the requirement for conducted coupling of the headset companion device.

2) Standard-specific tester, Base EUT

For this case, a standard-specific tester (the Rohde and Schwarz CMD60, for DECT with frequency extensions) is used both as a companion device and as a measuring instrument. This instrument measures a variety of radio parameters; it is used for the tests of clause 6.2 to measure timing and carrier frequency stability.

The tests for test platform configuration #2 will be performed with the EUT in a communications link with the CMD60 operating on 1921.536MHz. The Base is connected to a serial control bus by which a testing user-interface is provided. Channel and slot selection are made by means of the settings applied to the CMD60 in its role as companion device.

The EUT is removed from its housing, and placed within a computer-controlled temperature chamber. The EUT's serial test communications bus is brought out through a 4-wire cable to the controlling PC. An external 9.00V power supply supplies the Base EUT through one dedicated signal plus a shared ground, of this 4-wire cable, the signal and ground connecting to the EUT in place of the battery. The CMD60 RFIN/RFOUT port is connected to port 3 of a wideband 6dB resistive splitter, Weinschel model 1515 serial number MF536. Connection is made through a 48" RG142LL SMA-M/SMA-M cable. Port 2 of the splitter is connected to an E4407B spectrum analyzer (for monitoring) through a 36" and an 18" cable in tandem, each RG142LL and each an SMA-M/SMA-M cable, with an SMA F/F adapter interposed between the cables. Port 1 of the splitter is connected to the EUT through a 36" RG142LL SMA-M/SMA-M cable passing through the temperature chamber's access port and connected to an SMA-F/semi-rigid pigtail soldered directly to the EUT at the 50-ohm match feedpoint to the antenna, with the antenna removed.

The CMD60 is configured to emulate a headset unit for the Base EUT.

The CMD60 is configured to establish the communications channel on slot 4.

The output level from the CMD60 is set to -50dBm.

The CMD60 has an offset loaded of -18, to set the channel used to 1921.536MHz.

Using "Service Tool3" Version 3.5 running on the controlling PC and communicating with the Base EUT, the Base EUT is set up to enable connection to the CMD60.

The communications channel is started using the CMD60's "SETUP CONNECT" soft-key, and the test proceeds according to the specific clause.

The CMD60 is under GPIB control by means of a LabVIEW vi running on the controller PC, for the repetitive measurement of transmit parameters.

3) With companion device and interference blocking, Base EUT

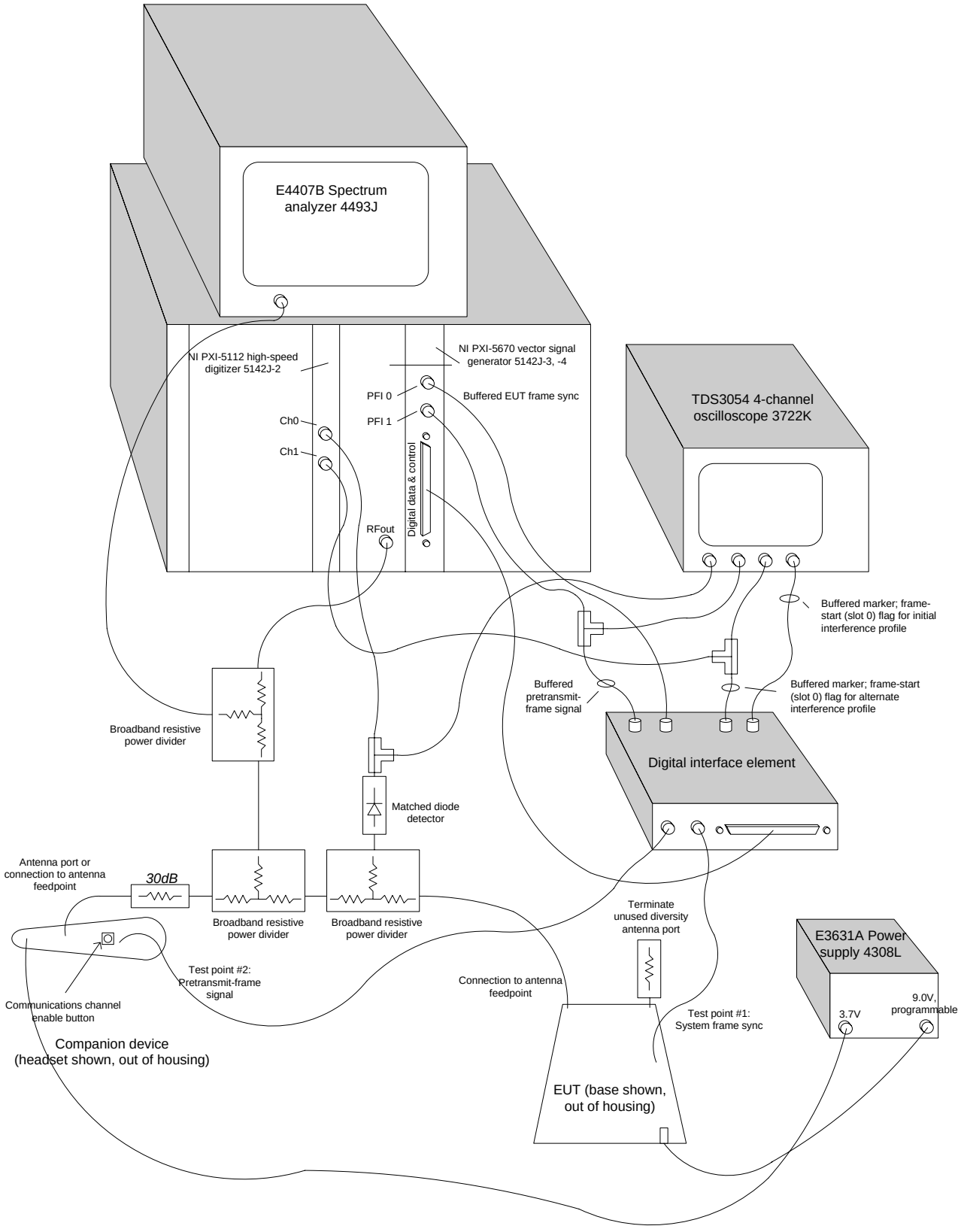


Fig. 1 - Detail of connections to Base EUT for the tests of clause 7 and clause 8 of C63.17-2006, for configuration 3, **With companion device and interference blocking, Base EUT.**

D. Calibration

Test instrumentation used for measurements, and the corresponding calibration certificates are as follows. All calibrations are NIST traceable.

1) CMD60 Digital Radio Communication Tester asset 5372J. Rohde and Schwarz, Inc.
Calibration certification 224540 issued by Micro Precision on 15-Jan-2008 due 15-Jan-2009.

2) TDS3014B 4-channel oscilloscope asset 4309K. Tektronix.
Calibration certification 224711 issued 15-Jan-2008 by Micro Precision due 15-Jan-2009.

3) Thermal Couple/Meter asset 3565R. Omega.
Calibration certification 360917 issued 8-Jul-2008 by Micro Precision due 8-Jul-2009.

4) E4418B power meter asset 5333H, Agilent.
Calibration certificate 224526 issued 01-15-08 by Micro Precision due 15-Jan-09.

5) HP9301A power sensor asset 5337J, Hewlett-Packard
Calibration certificate 224510 issued 01-15-08 by Micro Precision due 15-Jan-09.

6) E4407B spectrum analyzer asset 5336J, Agilent
Calibration certificate 224503 issued 15-Jan-08 by Micro Precision due 15-Jan-09.

7) E3631A power supply asset 4308L, Agilent
Calibration certificate 224750 issued 15-Jan-08 by Micro Precision due 15-Jan-09.

8) 34401A digital multimeter asset 5339H, Agilent
Calibration certificate 224751 issued 15-Jan-08 by Micro Precision due 15-Jan-09.

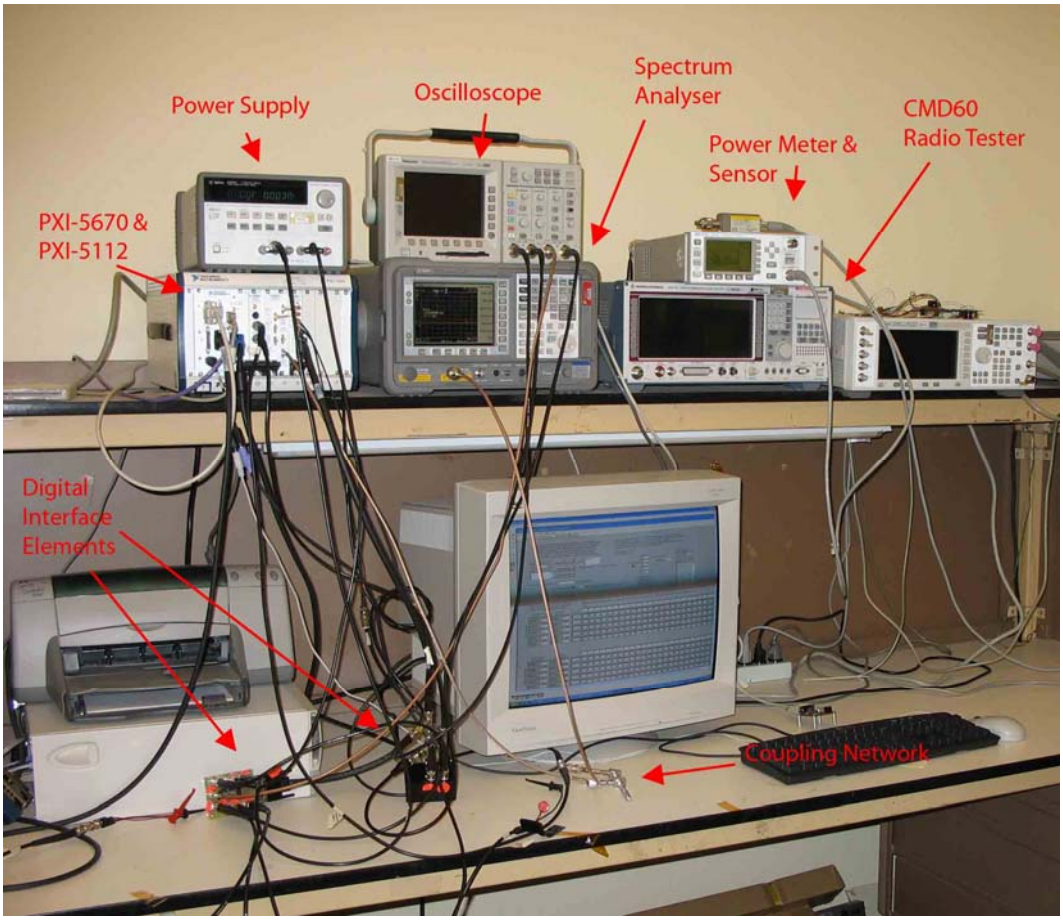


Fig. 2 – Test Bench with calibrated equipment configured with coupling network and digital interface elements

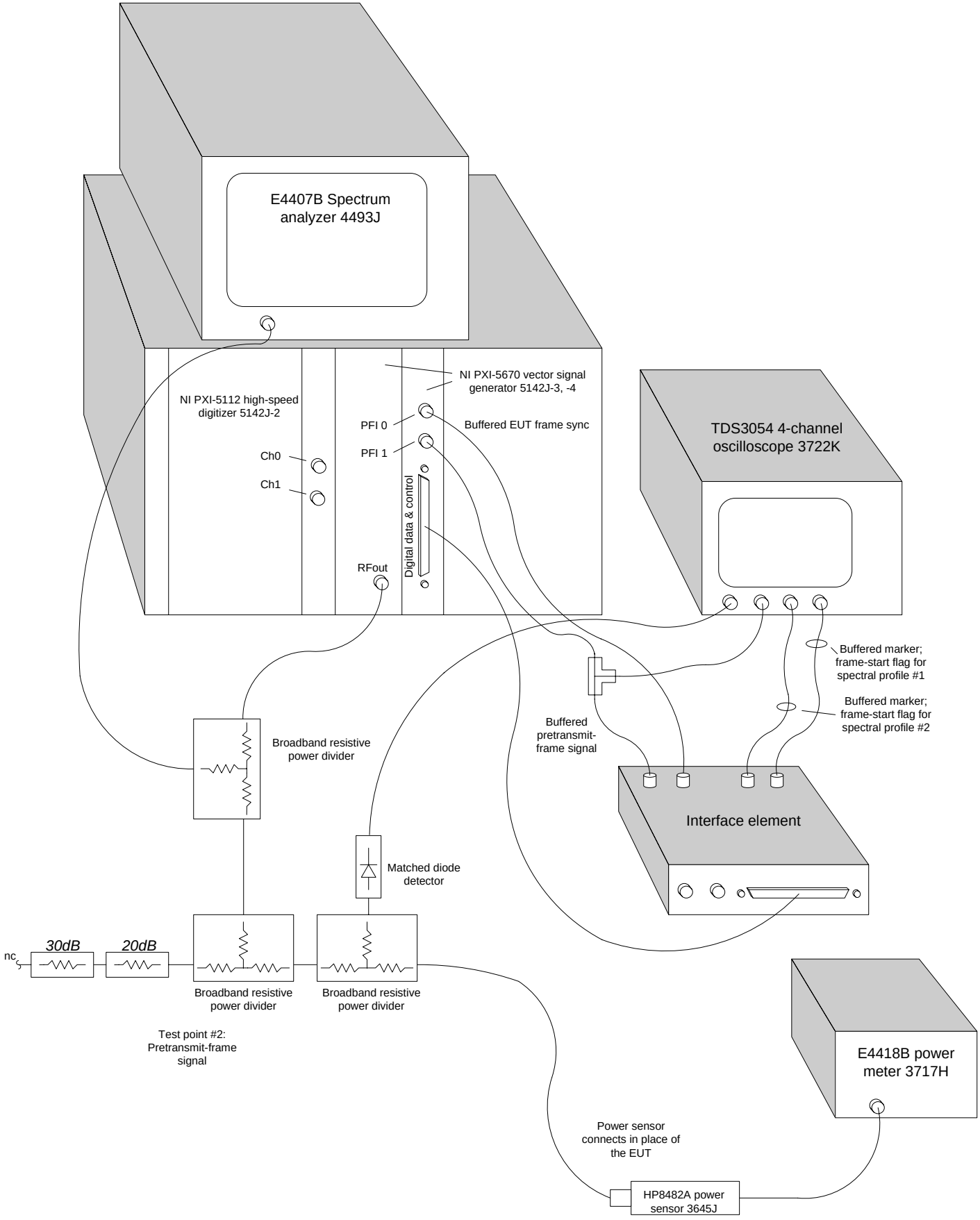


Fig. 3 - Detail of test system of clauses 7 and 8 of C63.17-2006, configured for calibration.

The splitter/combiner coupling network is transfer-calibrated integrated with the PXI-5670 vector RF signal generator. Calibration is a two-step process:

1) The PXI-5670 generator and coupling network output level and flatness are calibrated for accuracy using values measured using the E4418B power meter and E9301A power sensor.

2) The resulting single-carrier and all-carrier output levels are measured using the E4418B power meter and E9301A power sensor, as a check on the calibration.

Step 1, flatness and output level correction at -30 dBm.

E4418B settings:
Cal factor 97.1% for HP8482A #3545J at 2.0GHz.
Freq 1.925GHz.

The multi-carrier interference generator is set to a desired level of -30dBm for each carrier alone in turn, and the actual interference power is observed at the output of the cable connection to the EUT with the power meter and power head. The cal factors on the front panel of the controlling VI are then set to correct each carrier's level for PXI-5670 output error and the coupling network's loss.

Step 2, check of measured output levels for single carriers and all carriers together, with cal factors in place.

The PXI-5670 with fixed cal factors is set to make single carriers, each to measure alone. -30dBm +/- 0.1dB was measured at each of the five frequencies

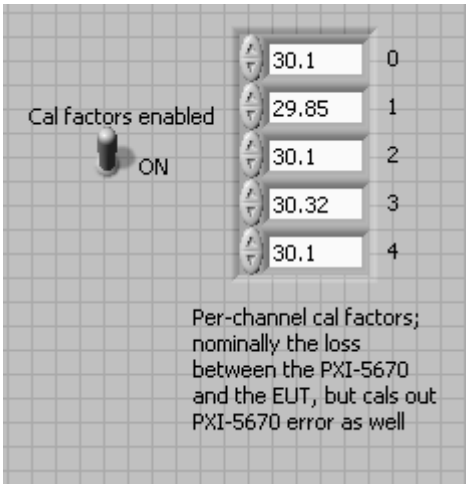


Fig. 4 - Screenshot from the control panel of the PXI-5670 with diagnostics enabled, showing the cal factors by channel. The top cal factor is for the top channel, 1928.448MHz, and the bottom cal factor is for the bottom channel, 1921.536MHz.

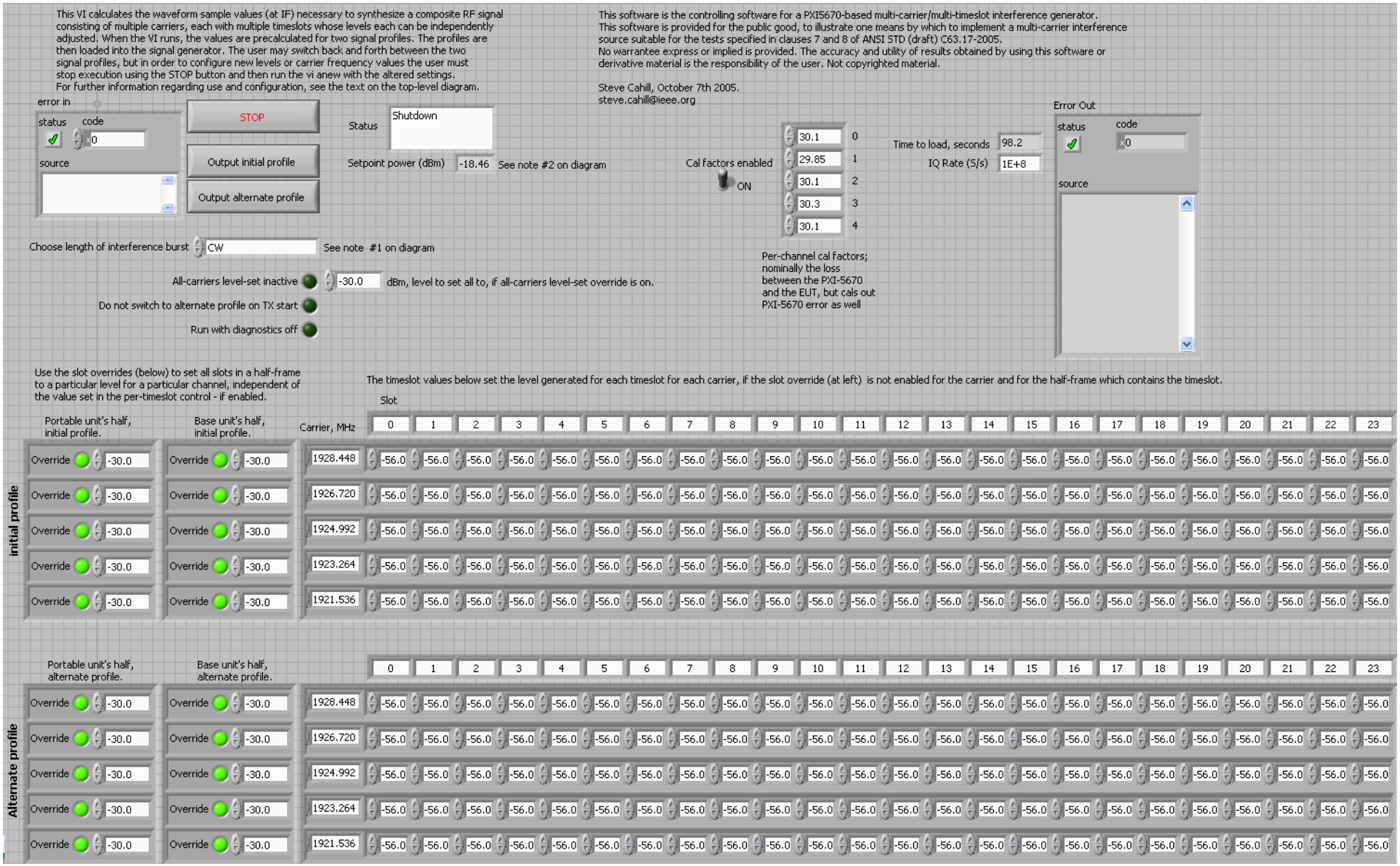


Fig. 5 - Screenshot of control VI for PXI-5670 taken with all carriers enabled, for -30dBm calibration accuracy test.

II. Test Results Summary Base EUT

Following the format of Annex A of C63.17-2006:

Type	47CFR15 Subpart D section	Reference within C63.17-2006	Test report pages	Test result	Margin
Scope	15.301 This subpart sets out the regulations for unlicensed personal communications services (PCS) devices operating in the 1910-1930 MHz frequency band.	Information			
Emission bandwidth	15.303(c) **emission bandwidth**: For purposes of this subpart, the emission bandwidth shall be determined by measuring the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, that are 26 dB down relative to the maximum level of the modulated carrier. Compliance with the emissions limits is based on the use of measurement instrumentation employing a peak detector function with an instrument resolutions bandwidth approximately equal to 1.0 percent of the emission bandwidth of the EUT under measurement.	Subclause 6.1.3			
Peak transmit power	15.303(f) **peak transmit power**: The peak power output as measured over an interval of time equal to the frame rate or transmission burst of the EUT under all conditions of modulation. Usually this parameter is measured as a conducted emission by direct connection of a calibrated test instrument to the equipment under test. If the EUT cannot be connected directly, alternative techniques acceptable to the Commission may be used.	Subclause 6.1.2			
PCS Devices	15.303(g) **personal communications service (PCS) devices [unlicensed]:** Intentional radiators operating in the frequency band 1920-1930 MHz that provide a wide array of mobile and ancillary fixed communication services to individuals and businesses.	Definition			
Spectrum Window	15.303(h) **spectrum window**: An amount of spectrum equal to the intended emission bandwidth in which operation is desired.	Definition			
Thermal noise power	15.303(j) **thermal noise power**: The noise power in watts defined by the formula N=*kTB* where N is the noise power in watts, *k* is Boltzmann's constant, *T* is the absolute temperature in degrees Kelvin (e.g., 295K), and *B* is the emission bandwidth of the EUT in hertz.	Definition			
Time window	15.303(k) **time window**: An interval of time in which transmission is desired.	Definition			

Equipment Authorization	15.305 Equipment authorization requirement. UPCS devices operating under this subpart shall be certificated by the Commission under the procedures in Subpart J of Part 2 of this Chapter before marketing. The application for certification must contain sufficient information to demonstrate compliance with the requirements of this subpart.	Information		Applicable	
Coordination	15.307 Coordination with fixed microwave service.	UTAM test		Coordination not required beginning April 2005	
UTAM Role	15.307(a) UTAM, Inc., is designated to coordinate and manage the transition of the 1910-1930 MHz band from private operational-fixed microwave service (OFS) operating under Part 94 of this Chapter to unlicensed PCS operations, conditioned upon submittal to and acceptance by the Commission of:(1) a funding plan that is equitable to all prospective manufacturers of unlicensed PCS devices; and (2) a plan for "band clearing" that will permit the implementation of noncoordinatable (nomadic) devices and, in particular, noncoordinatable data PCS devices, as promptly as possible. The responsibilities of UTAM, Inc. include, but are not limited to, relocation of existing OFS microwave stations pursuant to requirements established in ET Docket No. 92-9, negotiating costs of relocation, ensuring that comparable facilities are provided, and resolving any disputes of interference to OFS microwave operations from unlicensed PCS operations. These responsibilities shall terminate upon a determination by the Commission that interference to OFS microwave operations from unlicensed PCS operations is no longer a concern.	UTAM test		Coordination not required beginning April 2005	
UTAM Certification	15.307(b) Each application for certification of equipment operating under the provisions of this Subpart must be accompanied by an affidavit from UTAM, Inc. certifying that the applicant is a participating member of UTAM, Inc. In the event a grantee fails to fulfill the obligations attendant to participation in UTAM, Inc., the Commission may invoke administrative sanctions as necessary to preclude continued marketing and installation of devices covered by the grant of certification, including but not limited to revoking certification.	UTAM Test		Affidavit supplied – see Exhibit #12	
Cross Reference	15.309 Cross reference				
	15.309(a) The provisions of Subpart A of this Part apply to unlicensed PCS devices, except where specific provisions are contained in Subpart D.	Subclause 6.1.6			

	15.309(b) The requirements of Subpart D apply only to the radio transmitter contained in the UPCS device. Other aspects of the operation of a UPCS device may be subject to requirements contained elsewhere in this Chapter. In particular, a UPCS device that includes digital circuitry not directly associated with the radio transmitter also is subject to the requirements for unintentional radiators in Subpart B.	Subclause 6.1.6		See Exhibit #10a, #10b, reports of tests performed by Elliott Labs	Base EUT passes Class B digital device emissions test, 30 MHz to 1000MHz
Labeling	15.19(a) (3) All other devices shall bear the following statement in a conspicuous location on the device: This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation. (4) Where a device is constructed in two or more sections connected by wires and marketed together, the statement specified under paragraph (a) of this section is required to be affixed only to the main control unit. (5) When the device is so small or for such use that it is not practicable to place the statement specified under paragraph (a) of this section on it, the information required by this paragraph shall be placed in a prominent location in the instruction manual or pamphlet supplied to the user or, alternatively, shall be placed on the container in which the device is marketed. However, the FCC identifier or the unique identifier, as appropriate, must be displayed on the device.	Labels		See Exhibit #2, User Guide, which includes the required text.	Required text is included
Measurement Procedures	15.313 Measurement procedures. Measurements must be made in accordance with Subpart A, except where specific procedures are specified in Subpart D. If no guidance is provided, the measurement procedure must be in accordance with good engineering practice.	ANSI C63.17 (general)		AC line measurements and digital device measurements made at Elliott Labs; conducted RF measurements made at Plantronics	Requirement is met
Conducted limits	15.315 Conducted limits. An unlicensed PCS device that is designed to be connected to the public utility (AC) power line must meet the limits specified in 47CFR 15.207.	ANSI C63.4-2003		See Exhibits #10a, #10b, reports of tests performed by Elliott Labs	Base EUT passes the AC line conducted emissions test
Antenna requirement	15.317Antenna requirement. An unlicensed PCS device must meet the antenna requirement of 47CFR15.203.	Information		Base EUT uses internal and non-removable antenna	Base EUT meets the antenna requirements

General Technical Requirements	15.319 General technical requirements				
Frequency of operation	15.319(a) [reserved]				
Digital modulation	15.319(b) All transmissions must use only digital modulation techniques.	Subclause 6.1.4	P31	Plantronics declares that the Base EUT uses digital modulation only	Base EUT meets the requirement that only digital modulation may be used
Peak transmit power	15.319(c) Peak transmit power shall not exceed 100 microwatts multiplied by the square root of the emission bandwidth in hertz. Peak transmit power must be measured over any interval of continuous transmission using instrumentation calibrated in terms of an rms-equivalent voltage. The measurement results shall be properly adjusted for any instrument limitations, such as detector response times, limited RBW capability when compared to the emission bandwidth, sensitivity, etc., so as to obtain a true peak measurement for the emission in question over the full bandwidth of the channel.	Subclause 6.1.2	P25	Maximum measured power is +18.62dBm. Rated power is +19.5dBm. Legal maximum is +20.8dBm	Requirement is met
Power spectral density	15.319(d) Power spectral density shall not exceed 3 milliwatts in any 3 kHz bandwidth as measured with a spectrum analyzer having a RBW of 3 kHz.	Subclause 6.1.5	P31	Maximum measured power spectral density is -7.22dBm, Legal maximum is 3mW, +4.77dBm	Requirement is met
Antenna gain	15.319(e) The peak transmit power shall be reduced by the amount in decibels that the maximum directional gain of the antenna exceeds 3 dBi.	Subclause 4.3.1		Maximum antenna gain is declared to be less than +3dBi	Requirement is met
Operational failure requirement	15.319(f) The device shall automatically discontinue transmission in case of either absence of information to transmit or operational failure. These provisions are not intended to preclude transmission of control and signaling information or use of repetitive codes used by certain digital technologies to complete frame or burst intervals.	Declaration with explanation	P2	Base EUT incorporates a number of protection features – see section I.B of this document.	Requirement is met
Spurious emission	15.319(g) Notwithstanding other technical requirements specified in this subpart, attenuation of emissions below the general emission limits in 47CFR15.209 is not required.	Subclause 6.1.6			

Spurious emission transition limits	15.319(h) Where there is a transition between limits, the tighter limit shall apply at the transition point.	Information			
Safety exposure levels	15.319(i) Unlicensed PCS devices are subject to the radiofrequency radiation exposure requirements specified in §§1.1307(b), 2.1091 and 2.1093 of this chapter, as appropriate. All equipment shall be considered to operate in a "general population/uncontrolled" environment. Applications for equipment authorization of devices operating under this section must contain a statement confirming compliance with these requirements for both fundamental emissions and unwanted emissions. Technical information showing the basis for this statement must be submitted to the Commission upon request.	Refer to IEEE 1528-2003		See Exhibit #7a, #7b, #7c, SAR test report	SAR is under the allowed maximum
UPCS Device	15.323 Specific requirements for devices operating in the UPCS band.				
Emission bandwidth and power level	15.323(a) Operation shall be contained within the 1920-1930 MHz band. The emission bandwidth shall be less then 2.5 MHz. The power level shall be as specified in 47CFR15.319(c), but in no event shall the emission bandwidth be less than 50 kHz.	Subclause 6.1.3 and 6.1.2	P23	Base EUT emissions bandwidth is 1.45MHz.	Requirement is met within the 2.5MHz to 50kHz limits
Channel packing	15.323(b) [removed and reserved]				
Listen before transmit (LBT)	15.323(c) Isochronous devices must incorporate a mechanism for monitoring the time and spectrum windows that its transmission is intended to occupy. The following criteria must be met:				
Monitoring Time	15.323(c)(1) Immediately prior to initiating transmission, devices must monitor the combined time and spectrum windows in which they intend to transmit for a period of at least 10 milliseconds for systems designed to use a 10 millisecond or shorter frame period or at least 20 milliseconds for systems designed to use a 20 millisecond frame period.	Subclause 7.3.4	P70	Base EUT tests access criteria in the frame prior to initiation of transmission	Requirement is met
Monitoring threshold	15.323(c)(2) The monitoring threshold must not be more than 30 dB above the thermal noise power for a bandwidth equivalent to the emission bandwidth of the device.	Subclause 7.3.1		Base EUT uses the provisions of 47CFR15.323(c)(5) to enable the upper threshold, lower threshold is not used	Not applicable

Maximum transmit period	15.323(c)(3) If no signal above the threshold level is detected, transmission may commence and continue with the same emission bandwidth in the monitored time and spectrum windows without further monitoring. However, occupation of the same combined time and spectrum windows by a device or group of cooperating devices continuously over a period of time longer than 8 hours is not permitted without repeating the access criteria.	Subclause 8.2.2	P92	Base EUT verifies the channel access criteria every 4 hours when a communications channel is active, and will bring down the communications channel in 7:50 (hours:min) if access criteria is not met for a handover	Requirement is met
System acknowledgement	15.323(c)(4) Once access to specific combined time and spectrum windows is obtained an acknowledgement from a system participant must be received by the initiating transmitter within one second or transmission must cease. Periodic acknowledgements must be received at least every 30 seconds or transmission must cease. Channels used exclusively for control and signaling information may transmit continuously for 30 seconds without receiving an acknowledgement, at which time the access criteria must be repeated.	Subclause 8.1 or 8.2		Base EUT does transmit channels used exclusively for control and signaling	Not applicable
Least Interfered Channel, LIC	15.323(c)(5)				
;uLeast Interfered Channel selection	15.323(c)(5).1 If access to spectrum is not available as determined by the above and a minimum of 40 duplex system access channels are defined for the system, the time and spectrum windows with the lowest power level below a monitoring threshold of 50 dB above the thermal noise power determined for the emission bandwidth may be accessed.	Subclause 7.3.2 and 7.3.37		The Base EUT defines 60 duplex channels in narrow band mode. The Base can also operate in a wide band mode with 30 duplex channels, but the companion device always initiates the traffic channel communications in the wide band mode. Does not affect the threshold requirements for the Base.	Requirement is met

LIC confirmation	15.323(c)(5).2 A device utilizing the provisions of this paragraph must have monitored all access channels defined for its system within the last 10 seconds and must verify, within the 20 milliseconds (40 milliseconds for devices designed to use a 20 millisecond frame period) immediately preceding actual channel access, that the detected power of the selected time and spectrum windows is no higher than the previously detected value.	Subclause 7.3.3 and 7.3.4	p66	The Base EUT monitors the usable access channels at a refresh rate of less than 10 seconds, and then tests the access criteria for the intended communications channel in the frame prior to first transmission	Requirement is met
Power measurement resolution	15.323(c)(5).3 The power measurement resolution for this comparison must be accurate to within 6 dB.	Subclause 7.3.3	p66	The Base EUT's threshold for access is tested at -6dB and +1dB for correct selection	Requirement is met
Maximum spectrum occupancy	15.323(c)(5).4 No device or group of co-operating devices located within 1 meter of each other shall, during any frame period, occupy more than 6 MHz of aggregate bandwidth, or alternatively, more than one third of the time and spectrum windows defined by the system.	Declaration		The Base EUT and a headset companion device use 1/12th in narrow band mode, and 1/6th in wide band mode of 1.728MHz bandwidth, and do not use bandwidth in further cooperation with other devices at any range	Requirement is met
Random waiting	15.323(c)(6) If the selected combined time and spectrum windows are unavailable, the device may either select and monitor different windows or seek to use the same windows after waiting an amount of time, randomly chosen from a uniform random distribution between 10 and 150 milliseconds, commencing when the channel becomes available.	Subclause 8.1.3		The Base EUT always defers if the access criteria is not met, and does not take advantage of the option offered by 47CFR15.323(c)(6)	

Monitoring Requirements	15.323(c)(7)				
Monitoring Bandwidth	15.323(c)(7).1 The monitoring system bandwidth must be equal to or greater than the emission bandwidth of the intended transmission.	Subclause 7.4		Base EUT uses the same receiver pathway for monitoring as for communication	Requirement is met
Monitoring reaction time	15.323(c)(7).2 The monitoring system shall have a maximum reaction time less than 50xSQRT(2.5/emission bandwidth in MHz) μs for signals at the applicable threshold level but shall not be required to be less than 50 μs. If a signal is detected that is 6 dB or more above the applicable threshold level, the maximum reaction time shall be 35xSQRT(2.5/emission bandwidth in MHz) μs but shall not be required to be less than 35 μs.	Subclause 7.5	P71	Base EUT meets the required 50uS pulse detection threshold, and the 35uS pulse +6dB detection threshold	Requirement is met
Monitoring Antenna	15.323(c)(8) The monitoring system shall use the same antenna used for transmission, or an antenna that yields equivalent reception at that location.	Clause 4		Base EUT uses the same antennas for transmission and reception as for monitoring	Requirement is met
Monitoring threshold relaxation	15.323(c)(9) Devices that have a power output lower than the maximum permitted under the rules may increase their monitoring detection threshold by one decibel for each one decibel that the transmitter power is below the maximum permitted.	Clause 4		Base EUT uses a 0.8dB increase in threshold based on a maximum rated transmit power of +20dBm and permitted legal maximum of +20.8dBm	The requirement is met
Duplex system LBT	15.323(c)(10) An initiating device may attempt to establish a duplex connection by monitoring both its intended transmit and receive time and spectrum windows. If both the intended transmit and receive time and spectrum windows meet the access criteria, then the initiating device can initiate a transmission in the intended transmit time and spectrum window. If the power detected by the responding device can be decoded as a duplex connection signal from the initiating device, then the responding device may immediately begin transmitting on the receive time and spectrum window monitored by the initiating device.	Subclause 8.3		The Base EUT does not take advantage of this option	

Co-located device LBT	15.323(c)(11) An initiating device that is prevented from monitoring during its intended transmit window due to monitoring system blocking from the transmissions of a co-located (within one meter) transmitter of the same system, may monitor the portions of the time and spectrum windows in which they intend to receive over a period of at least 10 milliseconds. The monitored time and spectrum window must total at least 50 percent of the 10 millisecond frame interval and the monitored spectrum must be within 1.25 MHz of the center frequency of channel(s) already occupied by that device or co-located co-operating devices. If the access criteria is met for the intended receive time and spectrum window under the above conditions, then transmission in the intended transmit window by the initiating device may commence.	Subclause 8.4		The Base EUT does not take advantage of this option	
Fair access	15.323(c)(12) The provisions of (c)(10) or (c)(11) shall not be used to extend the range of spectrum occupied over space or time for the purpose of denying fair access to spectrum to other devices.	Information			
Adjacent emissions	15.323(d)				
Out-of-band emissions	15.323(d).1 Emissions shall be attenuated below a reference power of 112 milliwatts as follows: 30 dB between the band edge and 1.25 MHz above or below the band; 50 dB between 1.25 and 2.5 MHz above or below the band; and 60 dB at 2.5 MHz or greater above or below the band.	Subclause 6.1.6	p38	The Base EUT worst-case out-of-band emissions are at the 3rd harmonic, transmitting on the high carrier, at –42.04dBm. The legal maximum is -39.5dBm	Requirement is met
In-band unwanted emissions	15.323(d).2 Emissions inside the band must comply with the following emission mask: In the bands between 1B and 2B measured from the center of the emission bandwidth, the total power emitted by the device shall be at least 30 dB below the transmit power permitted for that device; in the bands between 2B and 3B measured from the center of the emission bandwidth, the total power emitted by an intentional radiator shall be at least 50 dB below the transmit power permitted for that radiator; in the bands between 3B and the band edge, the total power emitted by an intentional radiator in the measurement bandwidth shall be at least 60 dB below the transmit power permitted for that radiator. “B” is defined as the emission bandwidth of the device in hertz. Compliance with the emission limits is based on the use of measurement instrumentation employing peak detector function with an instrument resolution bandwidth approximately equal to 1.0 percent of the emission bandwidth of the device under measurement.	Subclause 6.1.6	p38	The Base EUT worst-case in-band emissions are for the transmitter on the high carrier, in the 3***B*** region, at not worse than -60.18dBm. 60dB below the permitted maximum (+20.8dBm) or -39.2dBm is allowed.	Requirement is met

Frame Requirement	15.323(e)				
Frame period	15.323(e).1 The frame period (a set of consecutive time slots in which the position of each time slot can be identified by reference to a synchronizing source) of an intentional radiator operating in this band shall be 20 milliseconds or 10 milliseconds/X where *X* is a positive whole number.	Subclause 6.2.3		The Base EUT uses a 10mS frame time	Requirement is met
Frame repetition stability	15.323(e).2 Each device that implements time division for the purposes of maintaining a duplex connection on a given frequency carrier shall maintain a frame-repetition rate with a frequency stability of at least 50 parts per millions (ppm).	Subclause 6.2.2		The Base EUT is part of a TDMA system, and so 15.323(e)(3) applies rather than 15.323(e)(2)	
TDMA repetition stability	15.323(e).3 Each device which further divides access in time in order to support multiple communication links on a given frequency carrier shall maintain a frame-repetition rate with a frequency stability of at least 10 ppm.	Subclause 6.2.2	p62	The Base EUT frame rate stability is measured at 0.0195ppm Allowed frame rate stability is 10ppm	Requirement is met
Jitter	15.323(e).4 The jitter (time-related, abrupt, spurious variations in the duration of the frame interval) introduced at the two ends of such a communication link shall not exceed 25 μs for any two consecutive transmissions.	Subclause 6.2.3	p63	The Base EUT has measured total jitter and offset of 0.00128us Allowed jitter and offset is 25uS	Requirement is met
Continuous transmit during frame	15.323(e).5 Transmissions shall be continuous in every time and spectrum window during the frame period defined for the device.	Subclause 6.2.3		The Base EUT does not use discontinuous transmission	Requirement is met
Carrier Stability	15.323(f)				

Carrier frequency stability (<10 ppm)	15.323(f).1 The frequency stability of the carrier frequency of the intentional radiator shall be maintained within ± 10 ppm over 1 hour or over the interval between channel access monitoring, whichever is shorter.	Subclause 6.2.1.1	p59	The Base EUT measured carrier frequency maximum and minimum deviations were -0.04 and --0.81ppm over one hour. +/-10ppm is allowed	Requirement is met
Carrier frequency stability (<10 ppm)	15.323(f).1 The frequency stability of the carrier frequency of the intentional radiator shall be maintained within ± 10 ppm over voltage extremes from 85% to 115%.	Subclause 6.2.1.2	p60	The Base EUT measured carrier frequency maximum and minimum deviations were -0.55 and -0.62ppm over voltage extremes. +/-10ppm is allowed	Requirement is met
Carrier frequency stability (extreme conditions)	15.323(f).2 The frequency stability shall be maintained over a temperature variation of +4C° C to +44° C at normal supply voltage.	Subclause 6.2.1.3	p61	The Base EUT measured carrier frequency stability over rated temperature was -1.34ppm and +1.19ppm +/-10ppm is allowed	The requirements are met

Clause 6.1.2 Peak transmit power, Base EUT

The Base EUT is configured as described in the introduction for the tests of clause 6.1. First the low, then the mid, then the high carrier are selected, and the peak power is observed for the Base EUT transmit burst for each carrier.

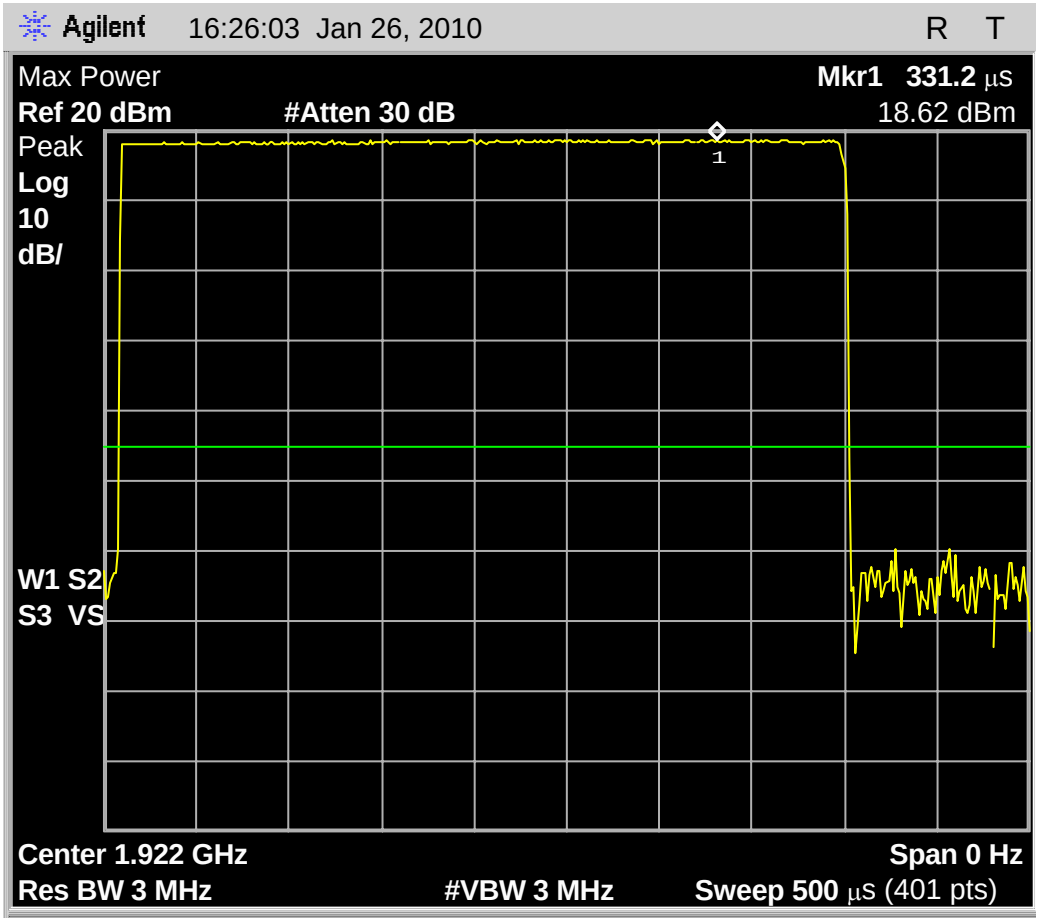


Fig. 8 - Base EUT transmit power received by spectrum analyzer configured according to the requirements of clause 6.1.2 of C63.17-2006, low carrier. Maximum observed transmit power is 18.62 dBm.

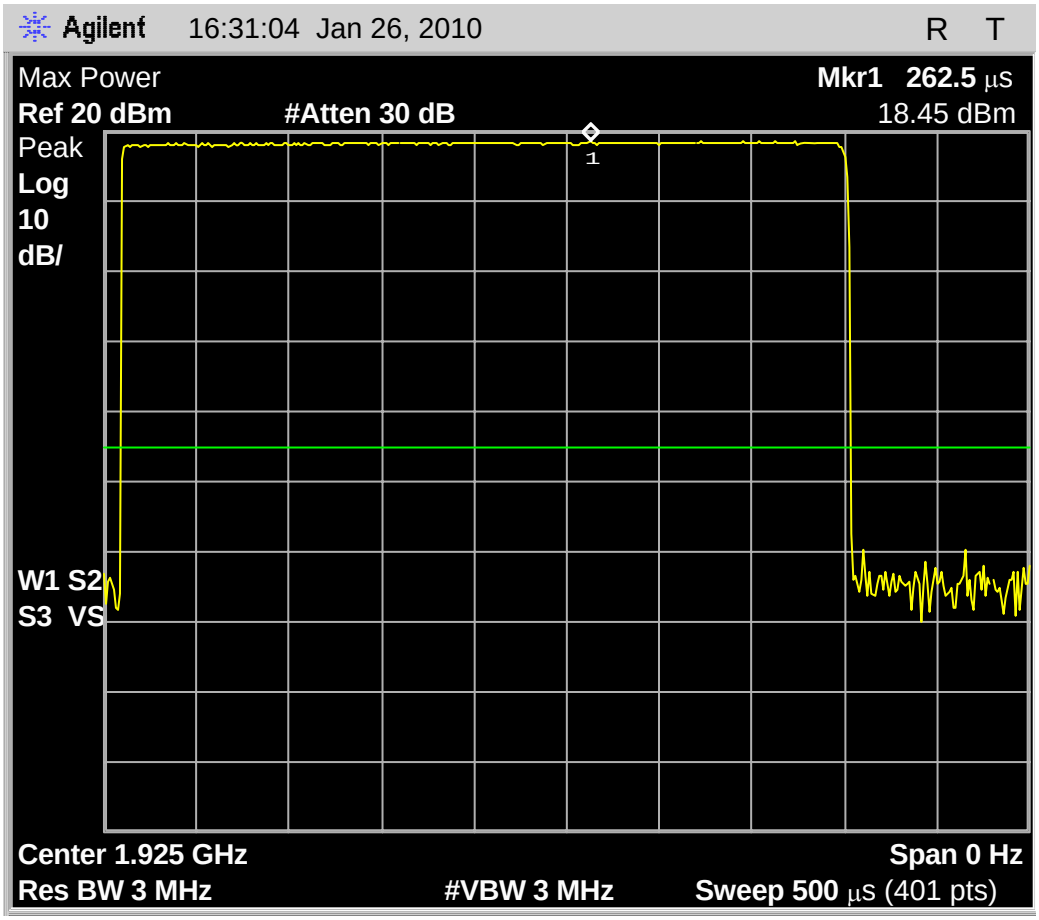


Fig. 9 - Base EUT transmit power received by spectrum analyzer configured according to the requirements of clause 6.1.2 of C63.17-2006, mid carrier. Maximum observed transmit power is 18.45 dBm

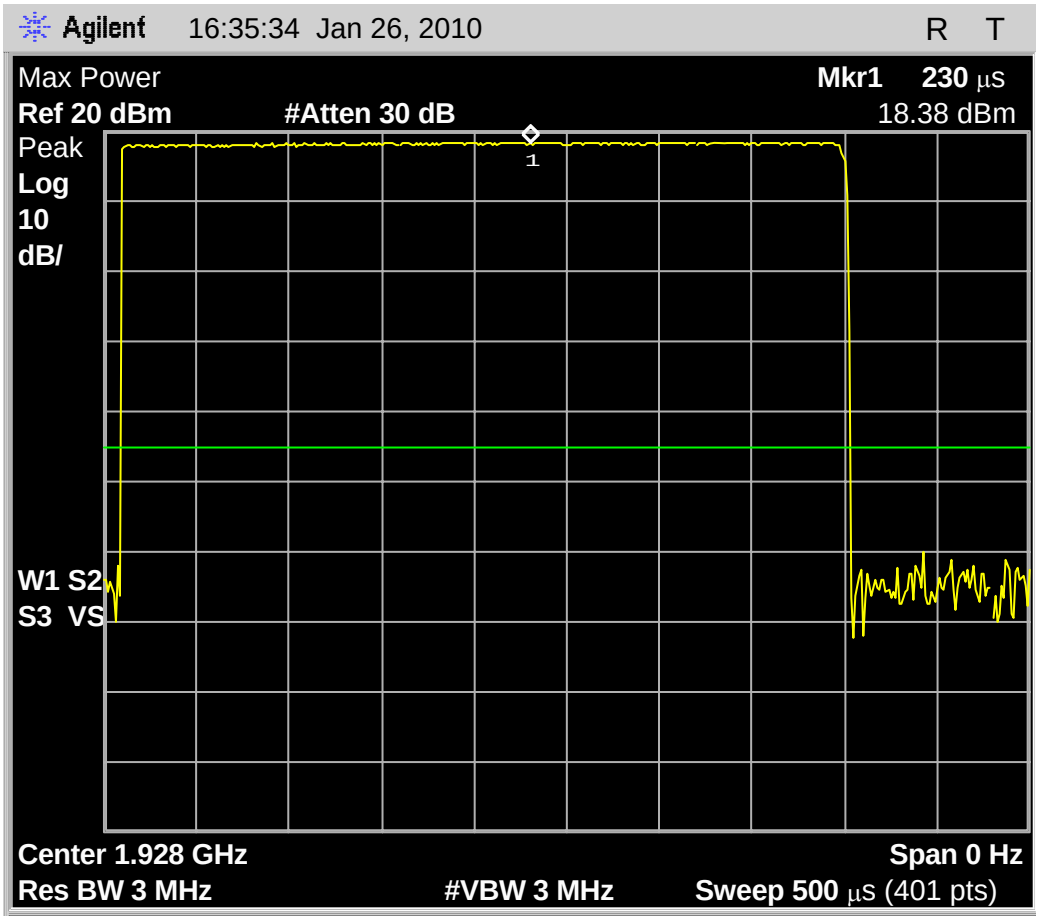


Fig. 10 - Base EUT transmit power received by spectrum analyzer configured according to the requirements of clause 6.1.2 of C63.17-2006, high carrier. Maximum observed transmit power is 18.38 dBm.

The maximum allowed transmit power is *Plimit*, which is, from clause 4.3.1 of C63.17-2006,

Plimit = 5(log***B***) – 10dBm,

for an EUT with maximum antenna gain not more than 3dBi (the maximum antenna gain for the Base EUT is 3dBi) and where ***B*** is the emissions bandwidth, 1.45 MHz for the Base EUT (see the measurements following for clause 6.1.3).

Solving for *Plimit* we obtain +20.8dBm.

The Base EUT has maximum observed transmit power of 18.62dBm, and meets the required limit of less than *Plimit*, passing the requirements of C63.17-2006 clause 6.1.2 with 2.18dB of margin.

*Clause 6.1.3 Emission bandwidth **B**, Base EUT*

The Base EUT is configured as described in the introduction for the tests of clause 6.1. First the low, then the mid, then the high carrier are selected, and the emission bandwidth is observed for the Base EUT transmit burst for each carrier.

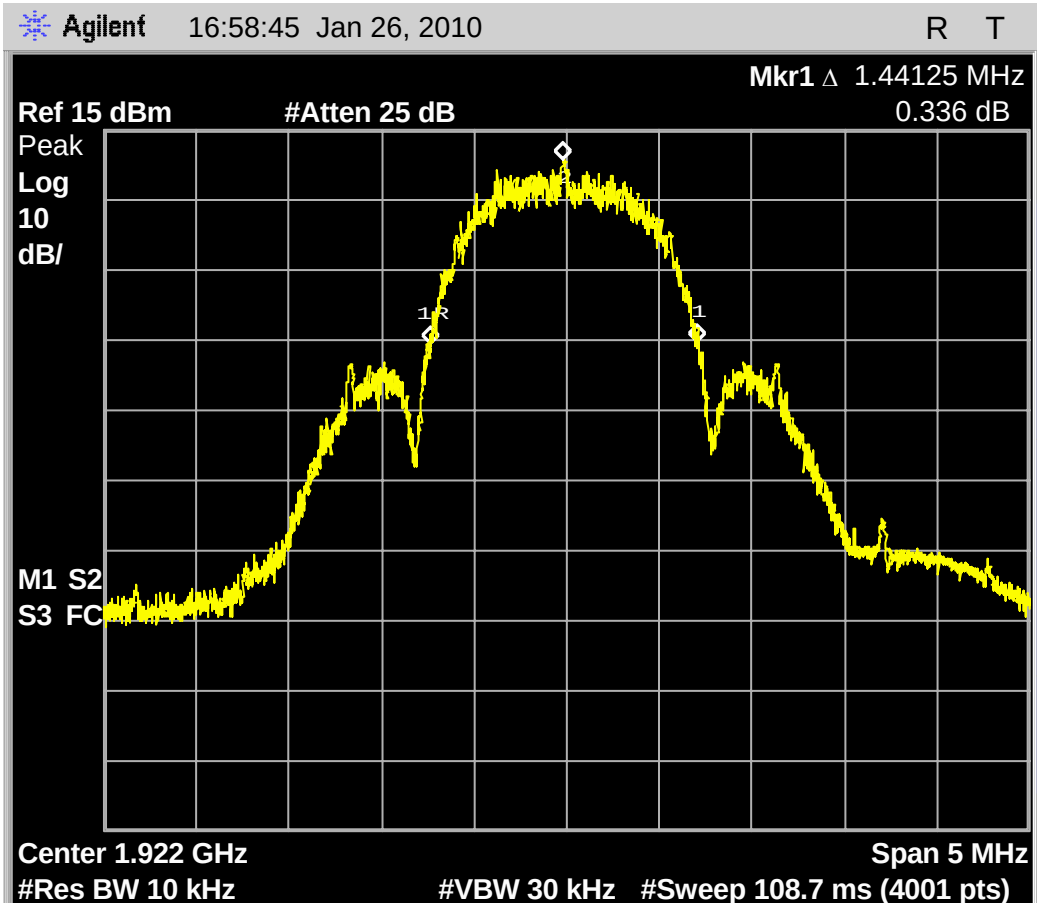


Fig. 11 - Base EUT, 1.45MHz emissions bandwidth on low carrier.

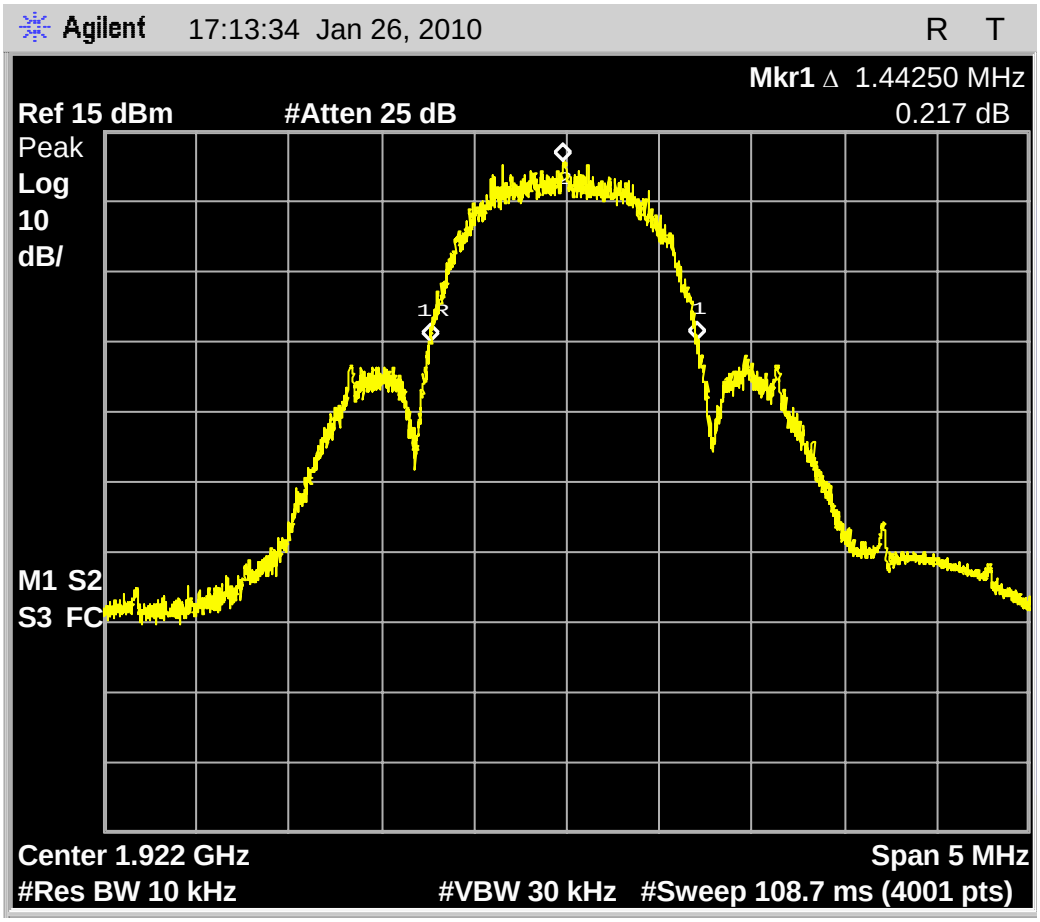


Fig. 12 - Base EUT, 1.45MHz emissions bandwidth on middle carrier.

Fig. 13 - Base EUT, 1.44MHz emissions bandwidth on high carrier.

The bandwidth ***B*** for the Base EUT used in further calculations according to the UPCS standard, from the center carrier, is then 1.45MHz.

The maximum allowed emission bandwidth *BlimitU* is 2.5MHz.

The minimum allowed emission bandwidth *BlimitL* is 50kHz,

The maximum observed emission bandwidth was 1.4425MHz. The minimum observed emission bandwidth was 1.4375MHz, so the Base EUT passes the test of clause 6.1.3 of C63.17-2006.

Clause 6.1.4 Modulation, Base EUT

Per the attestation in section I-B, the Base uses digital modulation and so meets the requirement of C63.17-2006

Clause 6.1.5 Power spectral density using the measured maximum method, Base EUT

The Base EUT is configured as described in the introduction for the tests of clause 6.1. First the low, then the mid, then the high carrier are selected, and the zero-span spectrum analyzer sweep is captured with the spectrum analyzer configured according to the requirements of 6.1.5 for each carrier.

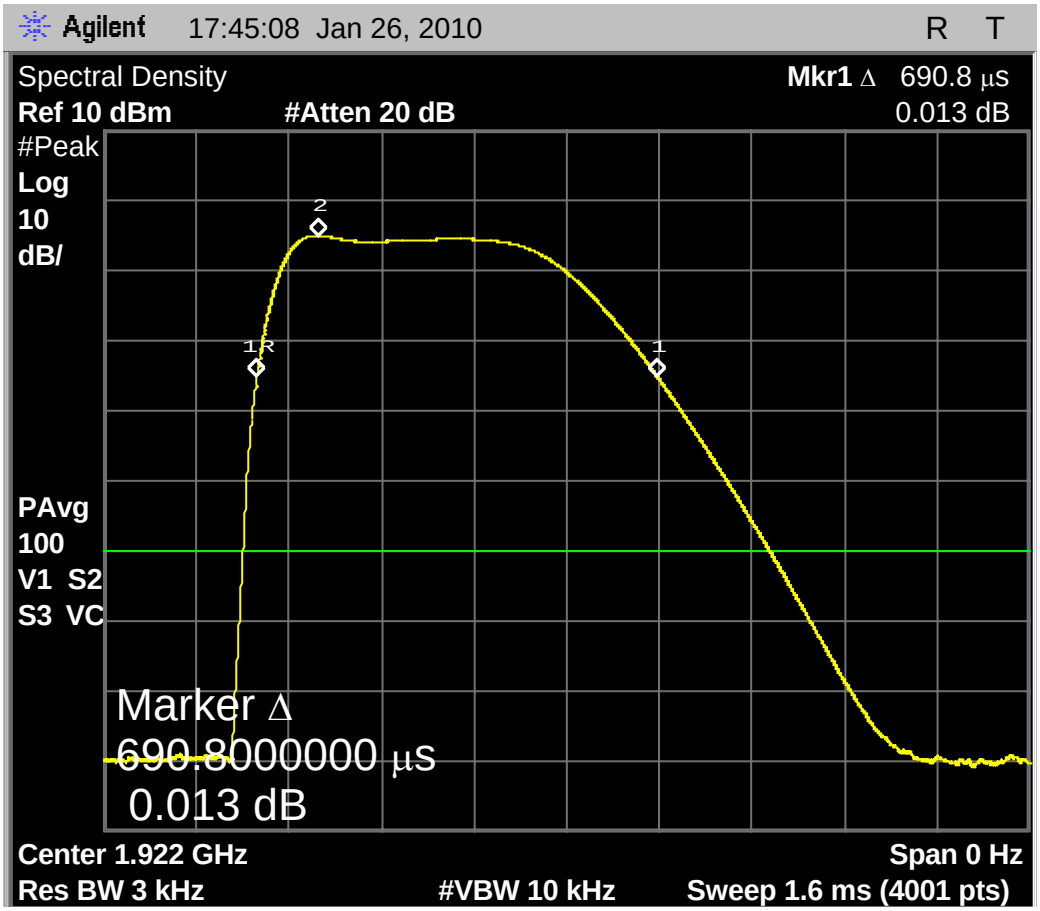
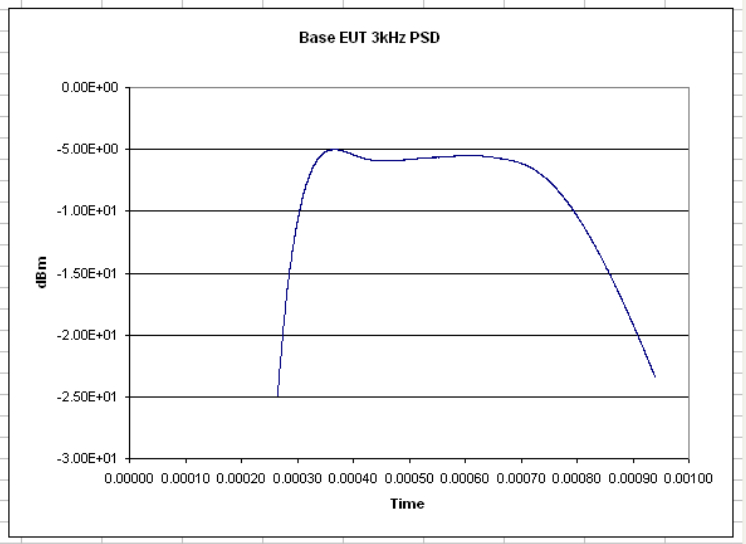


Fig. 14 – Zero-span sweep for Base EUT, low carrier, for 3kHz maximum power spectral density. The peak level is at -5.001dBm, and the interval between samples at the -20dB points is from 690.8us.

The data points for this trace were saved, and the power spectral density computed according to the requirements of 6.1.5, and per figure 4 of C63.17-2006, using an Excel spreadsheet.

Integrated maximum 3kHz-bandwidth transmit power for the Base EUT on the low channel was -7.28dBm, a margin of 12.05dB to the specification for maximum power spectral density.

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
1	01/26/10 17:58:10	A:\615L.CSV														
2	Title:	Spectral Density														
3	Model:	E4407B														
4	Serial Number:	MY45105325														
5	Center Frequency:	1921535950	Hz													
6	Span:	0	Hz													
7	Resolution Bandwidth:	3000	Hz													
8	Video Bandwidth:	10000	Hz													
9	Reference Level:	1.00E+01	dBm													
10	Sweep Time:	1.60E-03	Sec													
11	Num Points:	4001														
12	Sample frequency:	2500000	Hz													
13																
14		Trace 1														
15	Sec	dBm	power, W		Power summed:											
16	2.65E-04	-2.50E+01	3.19E-06		3.22E-01											
17	2.65E-04	-2.47E+01	3.37E-06													
18	2.66E-04	-2.45E+01	3.56E-06		Total pulse energy in 3kHz BW, Joules:											
19	2.66E-04	-2.43E+01	3.75E-06		1.29E-07											
20	2.66E-04	-2.40E+01	3.96E-06													
21	2.67E-04	-2.38E+01	4.16E-06		Pulse length (-20dBc), seconds											
22	2.67E-04	-2.36E+01	4.39E-06		0.00069											
23	2.68E-04	-2.34E+01	4.60E-06													
24	2.68E-04	-2.32E+01	4.84E-06		Average pulse power, W											
25	2.68E-04	-2.29E+01	5.09E-06		1.87E-04											
26	2.69E-04	-2.27E+01	5.36E-06													
27	2.69E-04	-2.25E+01	5.63E-06		Average pulse power, dBm											
28	2.70E-04	-2.23E+01	5.93E-06		-7.28											
29	2.70E-04	-2.21E+01	6.23E-06													
30	2.70E-04	-2.18E+01	6.54E-06													
31	2.71E-04	-2.16E+01	6.85E-06													
32	2.71E-04	-2.14E+01	7.19E-06													
33	2.72E-04	-2.12E+01	7.54E-06													
34	2.72E-04	-2.10E+01	7.91E-06													
35	2.72E-04	-2.08E+01	8.29E-06													
36	2.73E-04	-2.06E+01	8.67E-06													
1730	9.50E-04	-2.46E+01	3.43E-06													
1731	9.51E-04	-2.47E+01	3.39E-06													
1732	9.51E-04	-2.47E+01	3.37E-06													
1733	9.52E-04	-2.48E+01	3.33E-06													
1734	9.52E-04	-2.48E+01	3.30E-06													
1735	9.52E-04	-2.49E+01	3.26E-06													
1736	9.53E-04	-2.49E+01	3.23E-06													
1737	9.53E-04	-2.50E+01	3.19E-06													
1738	9.54E-04	-2.50E+01	3.16E-06													
1739																
1740																
1741																
1742																



TRACE164

Ready NUM

Fig. 15 – Screenshot of Excel file showing *PSDlimit* calculations for Base EUT, low carrier; -7.28dBm

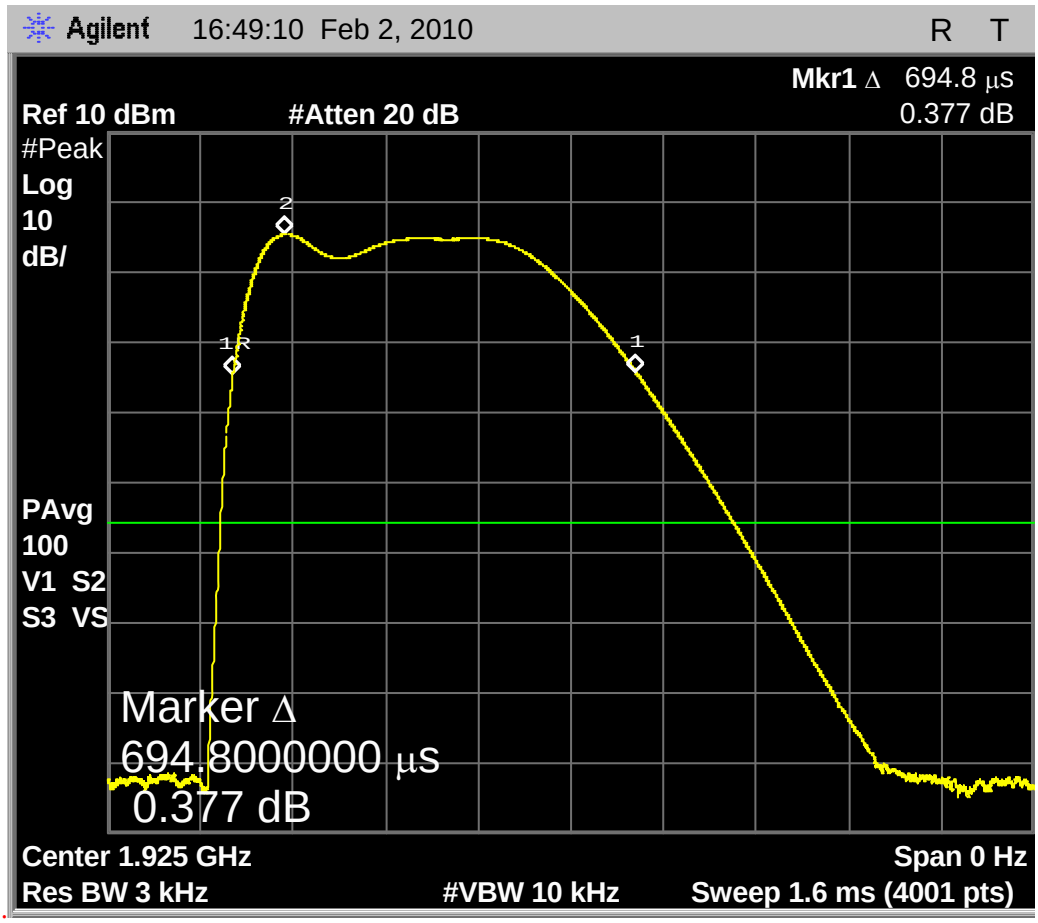


Fig. 16 – Zero-span sweep for Base EUT, middle carrier, for 3kHz maximum power spectral density. The peak level is at -4.61dBm, and the interval between samples at the -20dB points spans is 694.8us.

The data points for this trace were saved, and the power spectral density computed according to the requirements of 6.1.5, and per figure 4 of C63.17-2006, using an Excel spreadsheet,

“Clause 6_1_5 3kHz Base EUT midch.xls”

Integrated maximum 3kHz-bandwidth transmit power for the Base EUT on the mid channel was –7.22dBm, a margin of 11.99 to the specification for maximum power spectral density.

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
1	02/02/10 16:36:15	A:\615M.CSV														
2	Title:															
3	Model:	E4407B														
4	Serial Number:	MY45105325														
5	Center Frequency:	1924992000	Hz													
6	Span:	0	Hz													
7	Resolution Bandwidth:	3000	Hz													
8	Video Bandwidth:	10000	Hz													
9	Reference Level:	1.00E+01	dBm													
10	Sweep Time:	1.60E-03	Sec													
11	Num Points:	4001														
12	Sample frequency:	2500000	Hz													
13																
14		Trace 1														
15	Sec	dBm	power, W		Power summed:											
16	2.16E-04	-2.47E+01	3.42E-06		3.31E-01											
17	2.16E-04	-2.44E+01	3.62E-06													
18	2.17E-04	-2.42E+01	3.81E-06		Total pulse energy in 3kHz BW, Joules:											
19	2.17E-04	-2.40E+01	4.02E-06		1.32E-07											
20	2.18E-04	-2.37E+01	4.27E-06													
21	2.18E-04	-2.35E+01	4.48E-06		Pulse length (-20dBc), seconds											
22	2.18E-04	-2.33E+01	4.70E-06		0.00070											
23	2.19E-04	-2.30E+01	4.97E-06													
24	2.19E-04	-2.28E+01	5.23E-06		Average pulse power, W											
25	2.20E-04	-2.26E+01	5.51E-06		1.90E-04											
26	2.20E-04	-2.23E+01	5.82E-06													
27	2.20E-04	-2.21E+01	6.14E-06		Average pulse power, dBm											
28	2.21E-04	-2.19E+01	6.46E-06		-7.22											
29	2.21E-04	-2.17E+01	6.78E-06													
30	2.22E-04	-2.15E+01	7.12E-06													
31	2.22E-04	-2.12E+01	7.52E-06													
32	2.22E-04	-2.10E+01	7.89E-06													
33	2.23E-04	-2.08E+01	8.27E-06													
34	2.23E-04	-2.06E+01	8.68E-06													
35	2.24E-04	-2.04E+01	9.10E-06													
36	2.24E-04	-2.02E+01	9.55E-06													
1752	9.10E-04	-2.42E+01	3.77E-06													
1753	9.11E-04	-2.43E+01	3.74E-06													
1754	9.11E-04	-2.43E+01	3.69E-06													
1755	9.12E-04	-2.44E+01	3.65E-06													
1756	9.12E-04	-2.44E+01	3.60E-06													
1757	9.12E-04	-2.45E+01	3.58E-06													
1758	9.13E-04	-2.45E+01	3.53E-06													
1759	9.13E-04	-2.46E+01	3.49E-06													
1760	9.14E-04	-2.46E+01	3.46E-06													
1761																
1762																
1763																
1764																

TRACE164

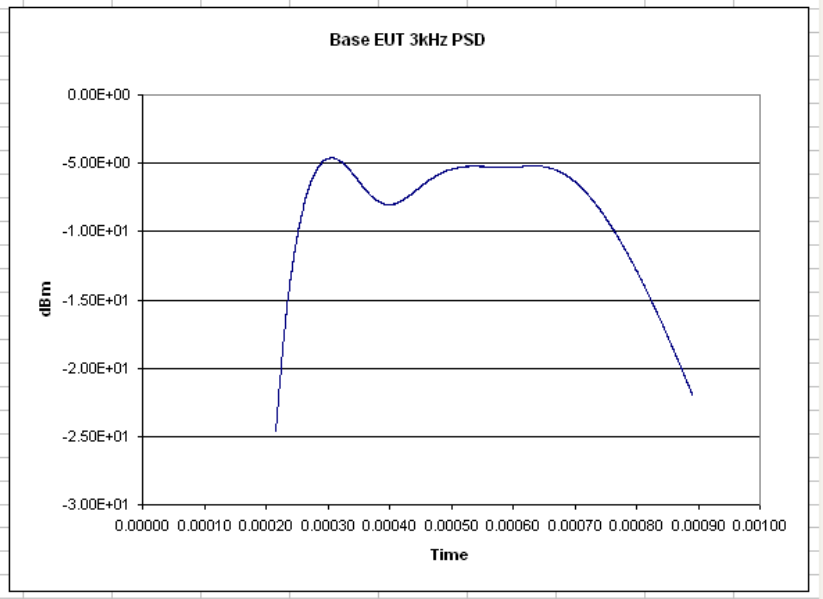


Fig. 17 – Screenshot of Excel file showing *PSDlimit* calculations for Base EUT, mid carrier; -7.22dBm.

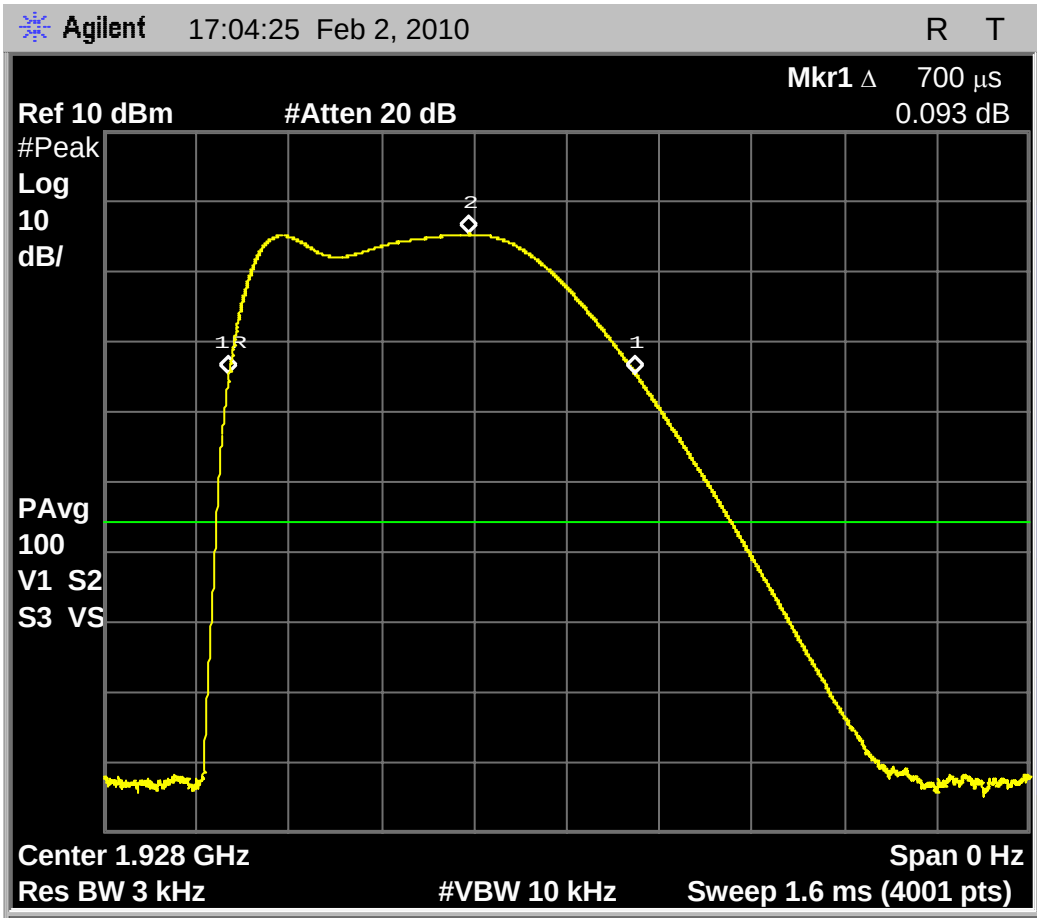


Fig. 18 – Zero-span sweep for Base EUT, high carrier, for 3kHz maximum power spectral density. The peak level is at -4.71dBm, and the interval between samples at the -20dB points is 700.0us.

The data points for this trace were saved, and the power spectral density computed according to the requirements of 6.1.5, and per figure 4 of C63.17-2006, using an Excel spreadsheet.

Integrated maximum 3kHz-bandwidth transmit power for the Base EUT on the high channel was –7.22dBm, a margin of 11.99dB to the specification for maximum power spectral density.

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
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2	Title:															
3	Model:	E4407B														
4	Serial Number:	MY45105325														
5	Center Frequency:	1928448000	Hz													
6	Span:	0	Hz													
7	Resolution Bandwidth:	3000	Hz													
8	Video Bandwidth:	10000	Hz													
9	Reference Level:	1.00E+01	dBm													
10	Sweep Time:	1.60E-03	Sec													
11	Num Points:	4001														
12	Sample frequency:	2500000	Hz													
13																
14		Trace 1														
15	Sec	dBm	power, W		Power summed:											
16	2.16E-04	-2.460E+01	3.47E-06		3.33E-01											
17	2.17E-04	-2.437E+01	3.66E-06													
18	2.17E-04	-2.415E+01	3.85E-06		Total pulse energy in 3kHz BW, Joules:											
19	2.18E-04	-2.390E+01	4.07E-06		1.33E-07											
20	2.18E-04	-2.367E+01	4.30E-06													
21	2.18E-04	-2.345E+01	4.52E-06		Pulse length (-20dBc), seconds											
22	2.19E-04	-2.325E+01	4.73E-06		0.00070											
23	2.19E-04	-2.302E+01	4.99E-06													
24	2.20E-04	-2.280E+01	5.24E-06		Average pulse power, W											
25	2.20E-04	-2.257E+01	5.53E-06		1.90E-04											
26	2.20E-04	-2.234E+01	5.84E-06													
27	2.21E-04	-2.213E+01	6.13E-06		Average pulse power, dBm											
28	2.21E-04	-2.191E+01	6.44E-06		-7.22											
29	2.22E-04	-2.171E+01	6.75E-06													
30	2.22E-04	-2.150E+01	7.08E-06													
31	2.22E-04	-2.127E+01	7.47E-06													
32	2.23E-04	-2.105E+01	7.85E-06													
33	2.23E-04	-2.086E+01	8.21E-06													
34	2.24E-04	-2.066E+01	8.59E-06													
35	2.24E-04	-2.044E+01	9.03E-06													
36	2.24E-04	-2.025E+01	9.45E-06													
60	9.14E-04	-2.423E+01	3.78E-06													
61	9.14E-04	-2.428E+01	3.73E-06													
62	9.15E-04	-2.432E+01	3.70E-06													
63	9.15E-04	-2.436E+01	3.66E-06													
64	9.16E-04	-2.443E+01	3.61E-06													
65	9.16E-04	-2.445E+01	3.59E-06													
66	9.16E-04	-2.451E+01	3.54E-06													
67	9.17E-04	-2.456E+01	3.50E-06													
68	9.17E-04	-2.461E+01	3.46E-06													
69	9.18E-04	-2.465E+01	3.43E-06													
70	9.18E-04	-2.469E+01	3.39E-06													
71	9.18E-04	-2.473E+01	3.37E-06													
72																

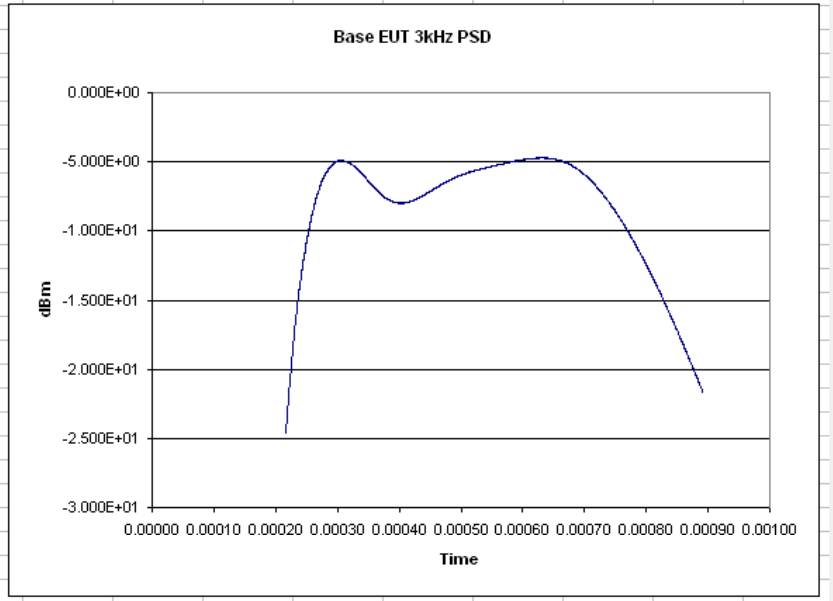

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Fig. 19 – Screenshot of Excel file showing *PSDlimit* calculations for Base EUT, high carrier; -7.22dBm.

The maximum allowed PSD, *PSDlimit*, is 3mW in any 3kHz bandwidth, or 4.77dBm. The maximum observed PSD for the Base EUT is –7.22dBm, meeting the requirements according to clause 6.1.5 of C63.17-2006 with 11.99dB of margin.

Clause 6.1.6 Emissions, Base EUT

The Base EUT is configured as described in the introduction for the tests of clause 6.1.

6.1.6.1 In-band unwanted emissions, Base EUT

For spectrum analyzer settings, 6.1.6.1 requires that the sweep time be no faster than one RBW (10kHz) every three transmit bursts (30mS, for this implementation). The in-band swept span is 10MHz, (1920MHz to 1930MHz) from the requirement that the swept span cover 3.5***B*** and where ***B*** = 1.45MHz, and to display the whole 10MHz in-band region. Accordingly, for a 10kHz resolution bandwidth, the sweep time is 30 seconds.

Tests are performed at low, mid and high carriers, 1921.536MHz, 1924.992MHz, and 1928.448MHz respectively.

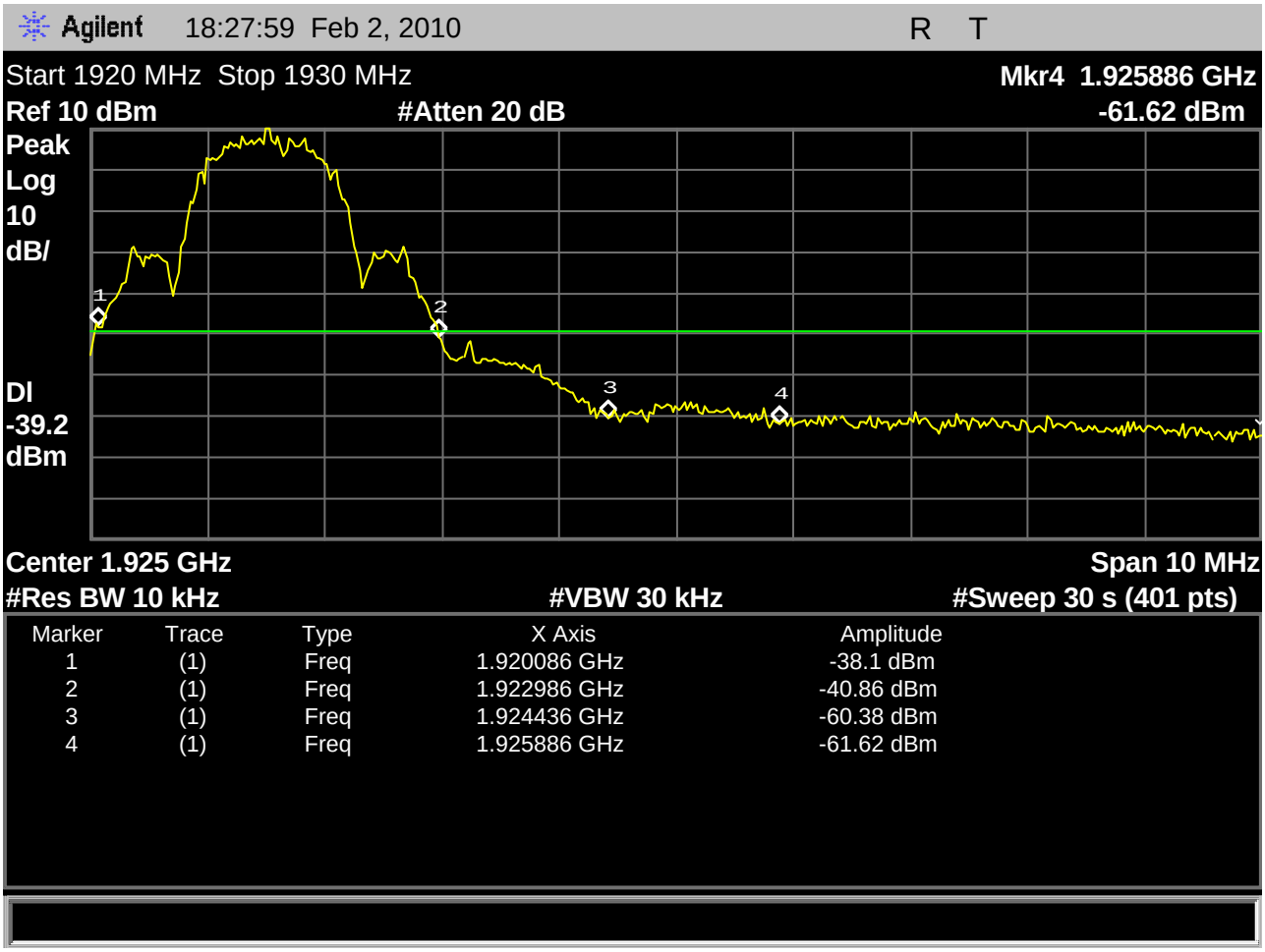

Fig. 20 - Spectrum analyzer screenshot for transmit emissions showing in-band unwanted emissions with the Base EUT transmitter at the lowest carrier, 1921.536MHz, according to the requirements of 6.1.6.1.

The green line is the -60dB level for unwanted emissions relative to the maximum allowed transmit signal level; -60dB emissions are required for in-band frequency separations from the carrier of 3***B*** and above, where ***B*** is the Base EUT emissions bandwidth. The markers are placed at 1***B***, 2***B*** and 3***B*** separations from the carrier, where the allowed limits are:

A) 1***B*** to 2***B*** separation: at least 30dB below the permitted level.

B) 2***B*** to 3***B*** separation: at least 50dB below the permitted level.

C) 3***B*** to in-band edge: at least 60dB below the permitted level

For region A (double sided in-band), the worst-case marker at 1920.01 MHz is at -38.10dBm, and 30dB below +20.8dBm= -9.2dBm is allowed, margin is 28.90dB.

For region B (single-sided in-band), the marker at 1924.4MHz is at –60.38dBm, and 50dB below +20.8dBm= -29.2dBm is allowed, margin is 31.18dB.

For region C (single-sided in-band), the marker at 1925.9MHz is at –61.62dBm, and 60dB below +20.8dBm= -39.2dBm is allowed, margin is 22.42dB.

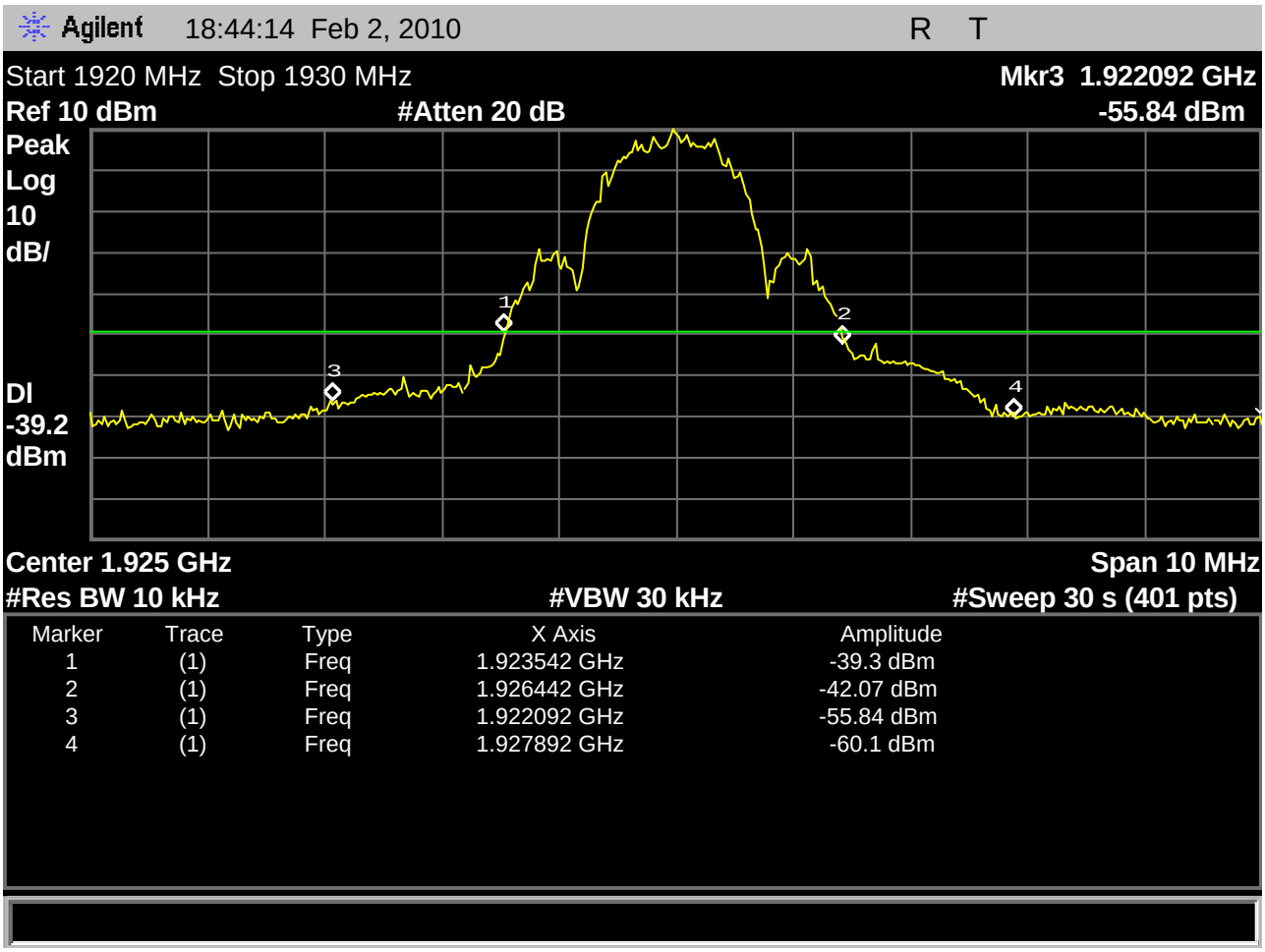

Fig. 21 - Spectrum analyzer screenshot for transmit emissions showing in-band unwanted emissions with the Base EUT transmitter at the middle carrier, 1924.992MHz, according to the requirements of 6.1.6.1.

The green line is the -60dB level for unwanted emissions relative to the maximum allowed transmit signal level; -60dB emissions are required for in-band frequency separations from the carrier of 3***B*** and above, where ***B*** is the Base EUT emissions bandwidth. The markers are placed at 1***B***, 2***B*** and 3***B*** separations from the carrier, where the allowed limits are:

A) 1***B*** to 2***B*** separation: at least 30dB below the permitted level.

B) 2***B*** to 3***B*** separation: at least 50dB below the permitted level.

C) 3***B*** to in-band edge: at least 60dB below the permitted level.

For region A (double-sided in-band), the worst-case marker at 1923.50MHz is at –39.3dBm, and 30dB below +20.8dBm=-9.2dBm is allowed, margin is 30.1dB.

For region B (double-sided in-band), the worst-case marker at 1927.89MHz is at –55.84dBm, and 50dB below +20.8dBm=-29.2dBm is allowed, margin is 26.64dB.

For region C, markers are not shown, but the emissions are not worse than the case for region B, and so, with 60dB below +20.8dBm= -39.2dBm is allowed, margin is at least 10.0dB.

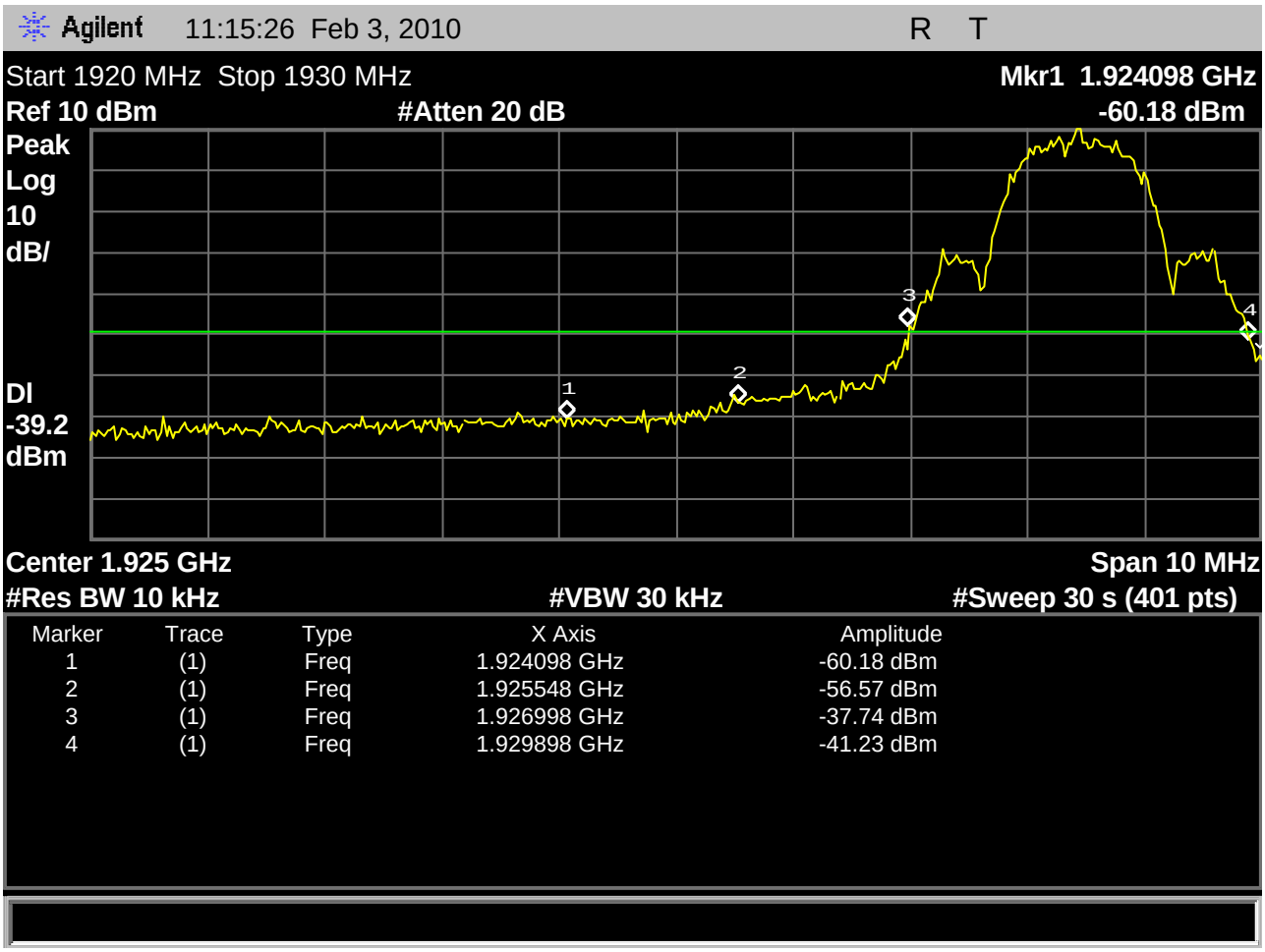

Fig. 22 - Spectrum analyzer screenshot for transmit emissions showing in-band unwanted emissions with the Base EUT transmitter at the highest carrier, 1928.448MHz, according to the requirements of 6.1.6.1.

The green line is the -60dB level for unwanted emissions relative to the maximum allowed transmit signal level; -60dB emissions are required for in-band frequency separations from the carrier of 3***B*** and above, where ***B*** is the Base EUT emissions bandwidth. The markers are placed at 1***B***, 2***B*** and 3***B*** separations from the carrier, where the allowed limits are:

A) 1***B*** to 2***B*** separation: at least 30dB below the permitted level.

B) 2***B*** to 3***B*** separation: at least 50dB below the permitted level.

C) 3***B*** to in-band edge: at least 60dB below the permitted level.

For region A (double sided in-band), the worst-case marker at 1926.99 MHz is at –37.74, and 30dB below +20.8dBm= -9.2dBm is allowed, margin is 28.54dB.

For region B (single-sided in-band), the marker at 1925.55MHz is at –56.57dBm, and 50dB below +20.8dBm= -29.2dBm is allowed, margin is 27.37dB.

For region C (single-sided in-band), the marker at 1924.09MHz is at –60.18dBm, and 60dB below +20.8dBm= -39.2dBm is allowed, margin is 20.98dB.

The tests of in-band unwanted emissions for the base EUT at low, mid and high carrier show that the base EUT meets the requirements of 6.1.6.1 with not less than 10.0dB of margin.

Clause 6.1.6.2 Out-of-band emissions, Base EUT

6.1.6.2 requires measurements be made adjacent to the band for the regions from band edge to 1.25MHz separation and also from 1.25MHz to 2.5MHz separation. Then for frequencies separated from the band by more than 2.5MHz, the test can be made either (from paragraph c of 6.1.6.2) as a conducted test against an emissions limit of -39.5dBm, or (from paragraph d of 6.1.6.2) as a radiated test according to the requirements of 47CFR15.209. Plantronics elects to use paragraph c, the conducted test.

The measurements are made at low (1921.536MHz) and then high (1928.448MHz) carrier, with the results presented in sections. Spectrum analyzer screenshots are presented as follows:

- For the region from 0 to 5MHz, to resolve low frequencies and differentiate the spectrum analyzer's DC response from an emissions peak, for paragraph c.

- For the region from 5MHz to 1915MHz, for paragraph c.

- For the region 5MHz region below the band edge (1915 to 1920MHz) to cover the requirements of paragraphs a and b.

- For the region 5MHz above the band edge (1930 to 1935MHz) to cover the requirements of paragraphs a and b.

The regions are measured according to the requirements for spectrum analyzer settings form 6.1.6.1 except as follows:

- The region from 5MHz to 1915MHz is measured in a 100kHz resolution bandwidth and 300kHz video bandwidth to achieve an improvement in test time without compromising accuracy – the wider bandwidth passes more potential emissions simultaneously and thus over-reports the emissions value for a spectral peak, but the EUT has sufficient margin in this region that the test conclusions are not affected. This allows a sweep time of only 573 seconds.

- The region above the band and up to the 10^{th} harmonic (19.3GHz) is measured in a 300kHz resolution bandwidth and 1MHz video bandwidth to achieve an improvement in test time again without compromising accuracy – the wider bandwidth allows a sweep time of only 1736.5 seconds.

The emissions peaks noted at the 2^{nd}, 3^{rd}, and 4^{th} harmonics are then measured in the resolution bandwidth according to the text of 6.1.6.2, for an accurate measurement of the margin to the specification.

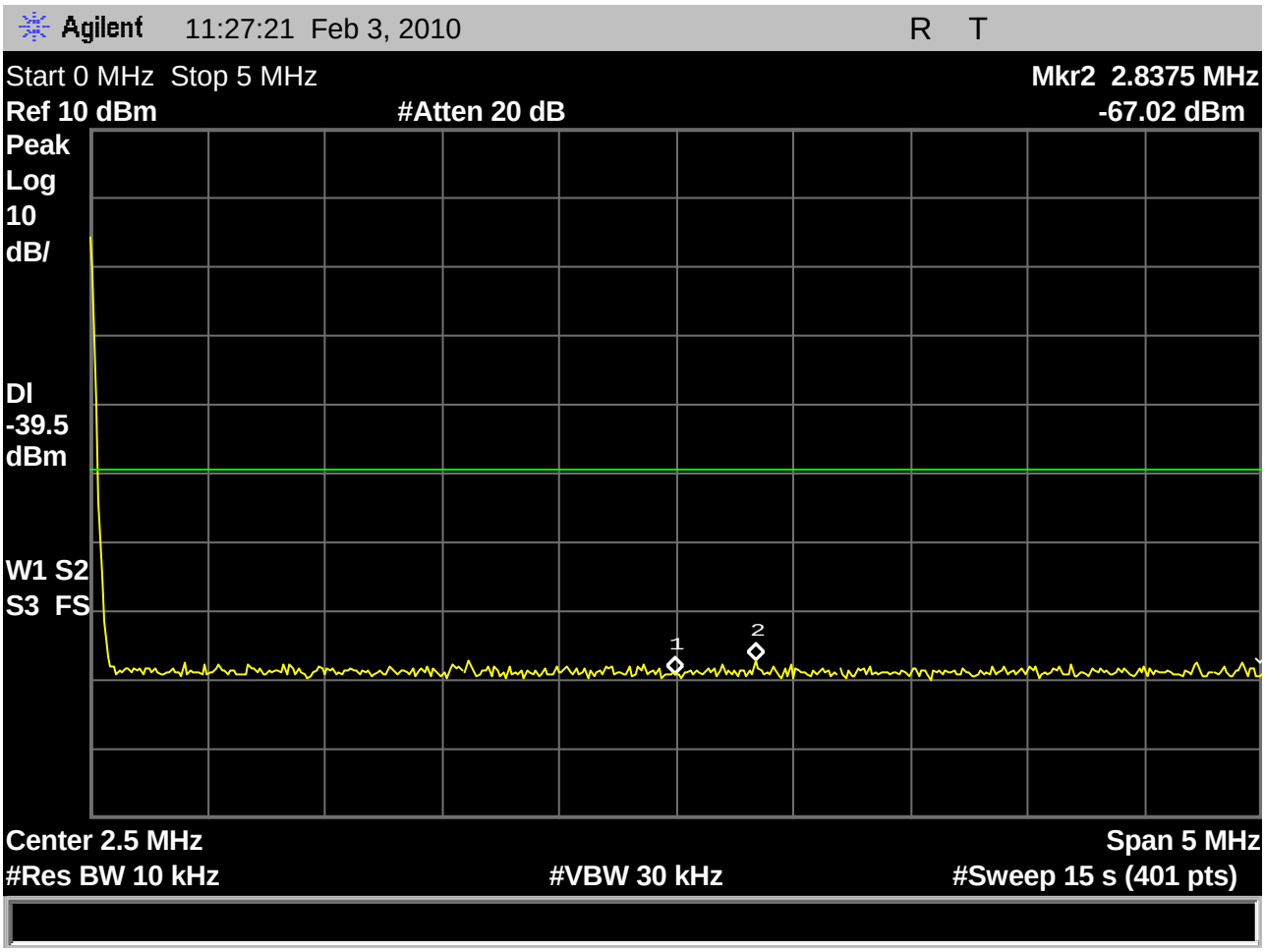

Fig. 23 – Base EUT out-of-band emissions showing the regions from DC to 5MHz, with the transmitter using the lowest carrier, 1921.536MHz.

This screenshot resolves the contribution made by the spectrum analyzer's DC response. Base EUT margin to the -39.5dBm out-of-band emissions specification exceeds 25dB in this region.

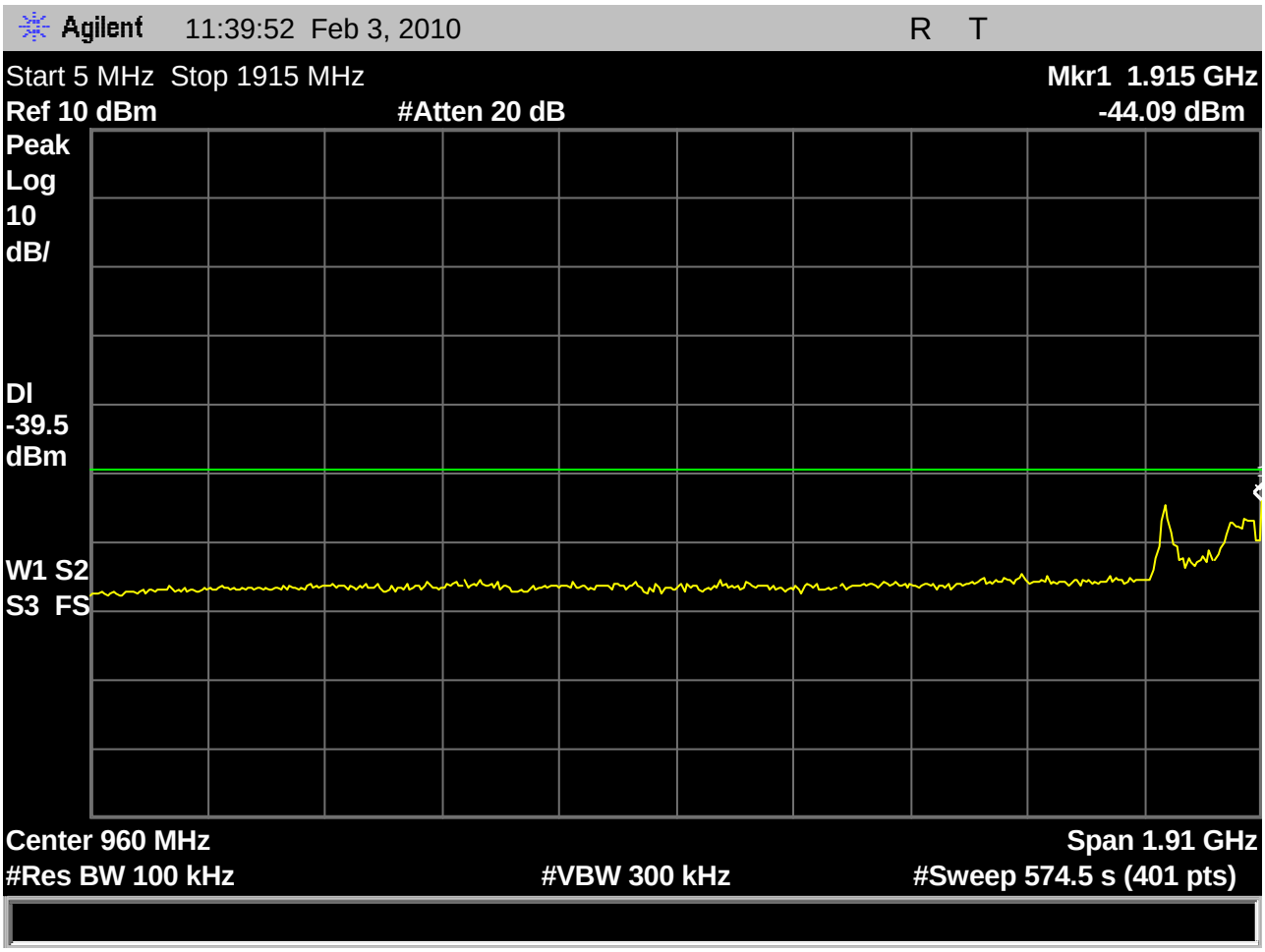

Fig. 24 – Base EUT out-of-band emissions showing the region from 5MHz to 1915MHz, with the transmitter using the lowest carrier, 1921.536MHz.

This screenshot shows a sweep made with resolution bandwidth increased to 100kHz to improve sweep time. Base EUT emissions at approximately -55dBm have margin to the -39.5dBm out-of-band emissions specification in this spectral region of 15.0dB in this region, even measured in a 10x-wider bandwidth than that in the test procedure of clause 6.1.6.

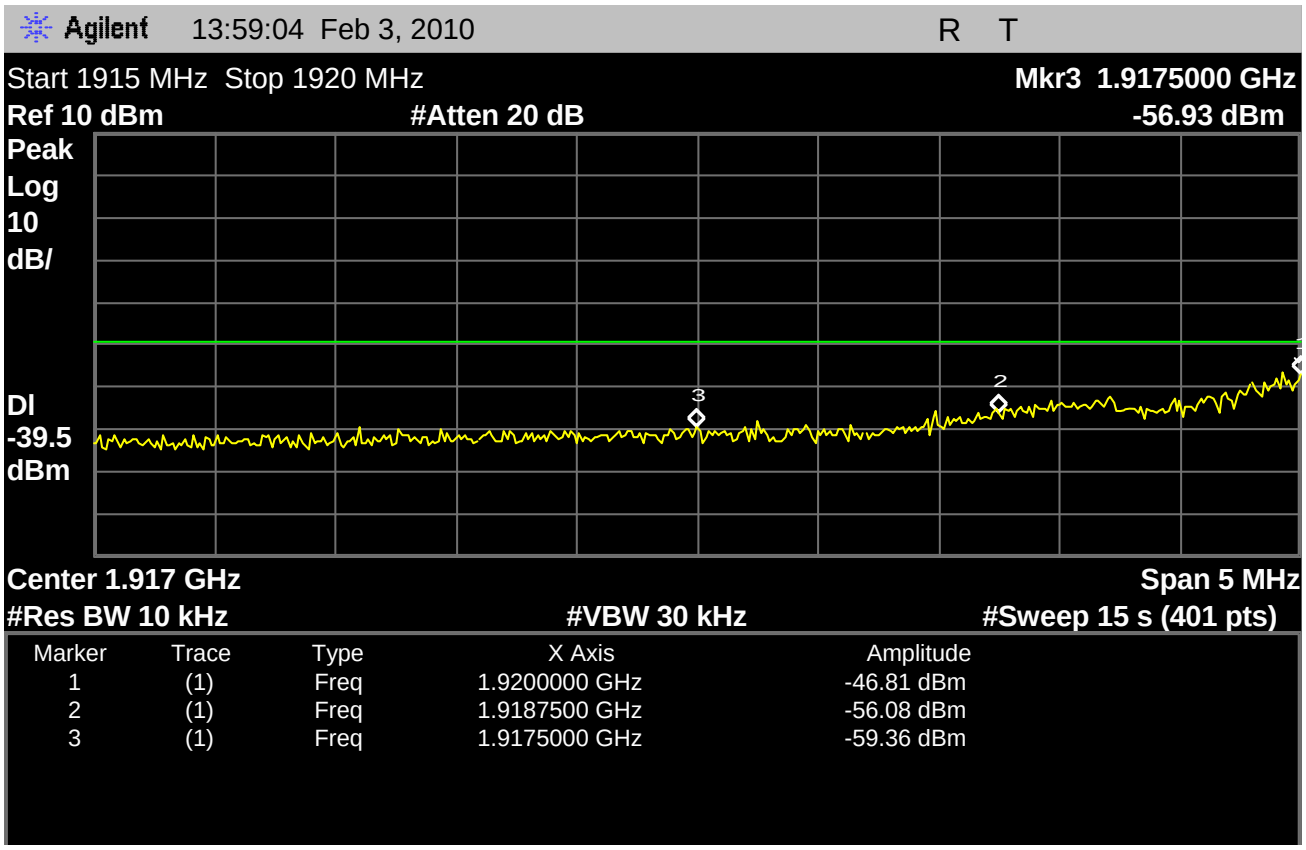

Fig. 25 – Base EUT out-of-band emissions showing the regions from band edge to -1.25MHz, and from -1.25MHz to -2.5MHz, with the Base EUT transmitting on the lowest carrier, 1921.536MHz. . Note the green display line is the spec limit marker only for the region outside +2.5MHz.

Margin to the specification of -9.5dBm in the region from band edge to -1.25MHz is found at marker 1, at –46.81dBm, and is 37.31dBm.

Margin to the specification of -29.5dBm in the region from -1.25MHz to -2.5MHz is found at marker 2, at –56.08dBm, and is 26.58dB.

Margin to the specification of -39.5dBm in the region outside -2.5MHz from the band is found at marker 3 at -59.36, and is 19.86dB.

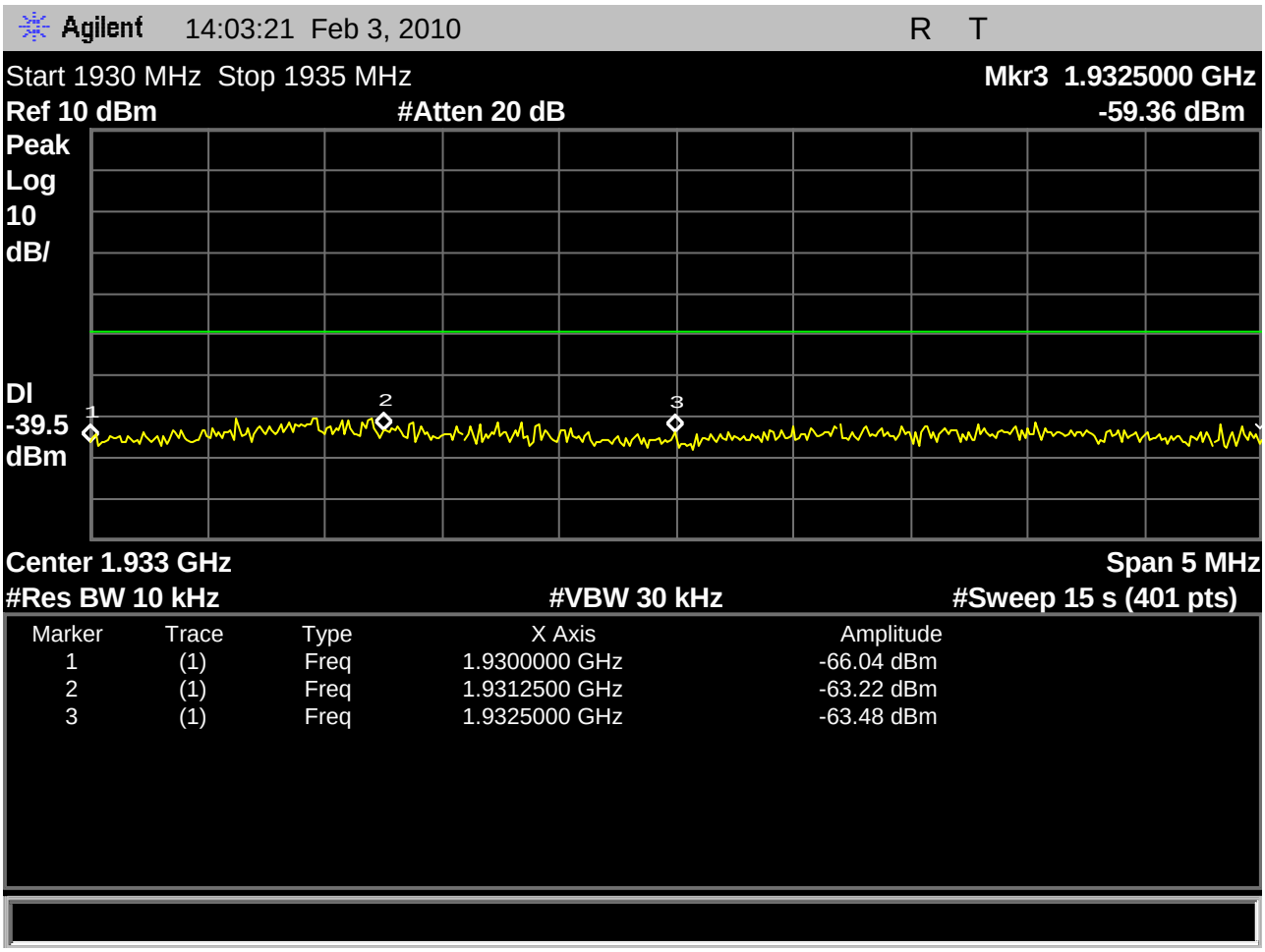

Fig. 26 – Base EUT out-of-band emissions showing the regions from band edge to +1.25MHz, and from +1.25MHz to +2.5MHz, with the Base EUT transmitting on the lowest carrier, 1921.536MHz.

Margins to the specification of -9.5dBm in the region from band edge to -1.25MHz, to the specification of -29.5dBm in the region from -1.25MHz to -2.5MHz, and to the specification of -39.5dBm in the region outside -2.5MHz from the band edge all exceed 20dB.

Fig. 27 – Base EUT out-of-band emissions including the regions from 1935MHz to 19.3GHz with the Base EUT transmitting on the lowest carrier, 1921.536MHz.

The least margin is at the 3rd harmonic of the transmitter. This measurement is made using a 300kHz resolution bandwidth in the interests of getting a manageable sweep time, 1736.5 seconds, but the 300kHz bandwidth passes considerably more unwanted emissions than the 10kHz obtained from the text of C63.17-2006 clause 6.1.6.

We can then re-do the test using narrow scans according to the requirements of 6.1.6 to resolve the margin in the proper measurement bandwidth.

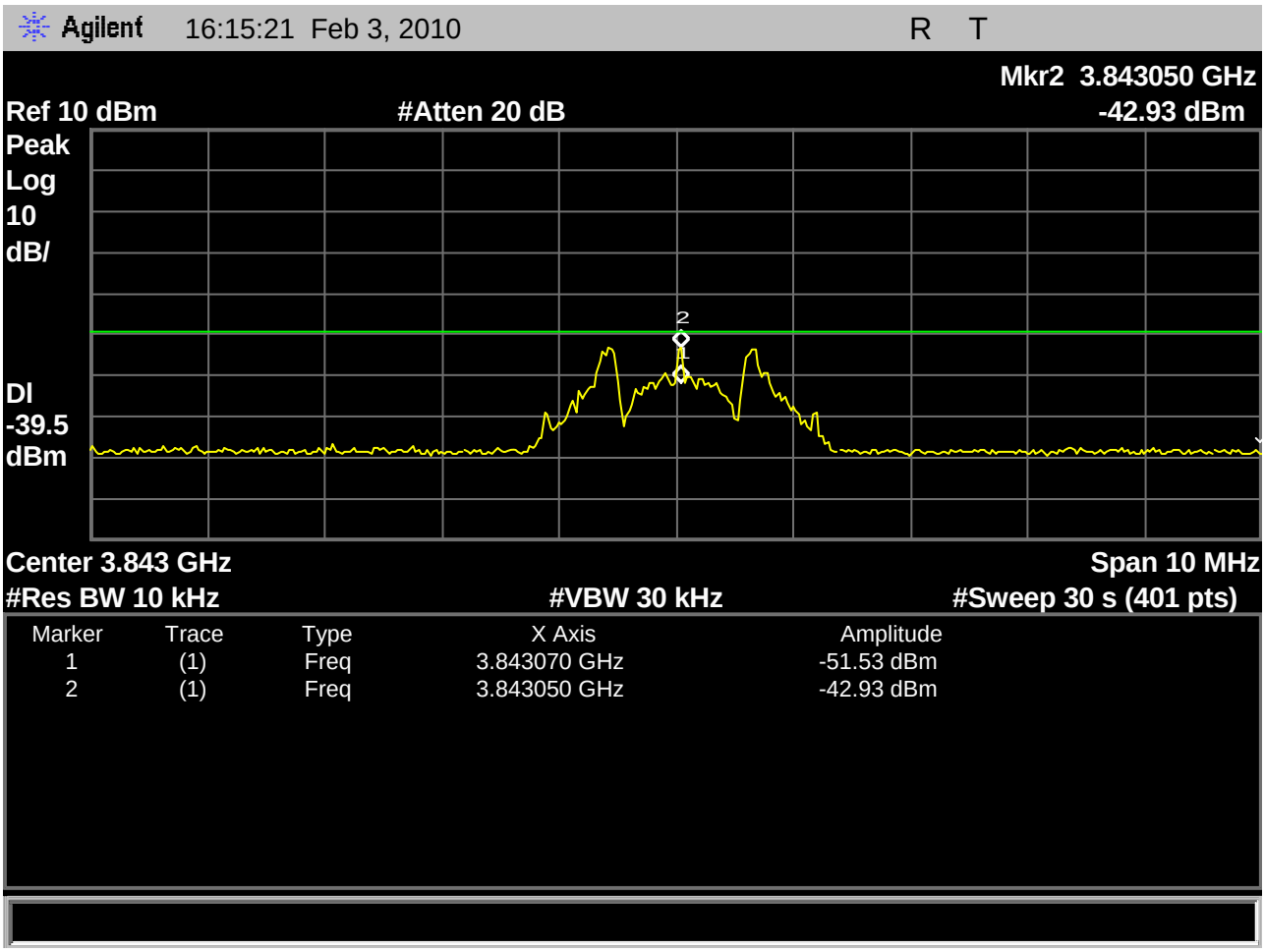

Fig. 28 – Base EUT out-of-band emissions in the region around the 2nd harmonic, with the Base EUT transmitting on the lowest carrier, 1921.536MHz.

This measurement was made according to the requirements of the text of 6.1.6, and, with the worst-case peak at –42.93dBm, shows margin to the -39.5dBm specification of 3.43dB.

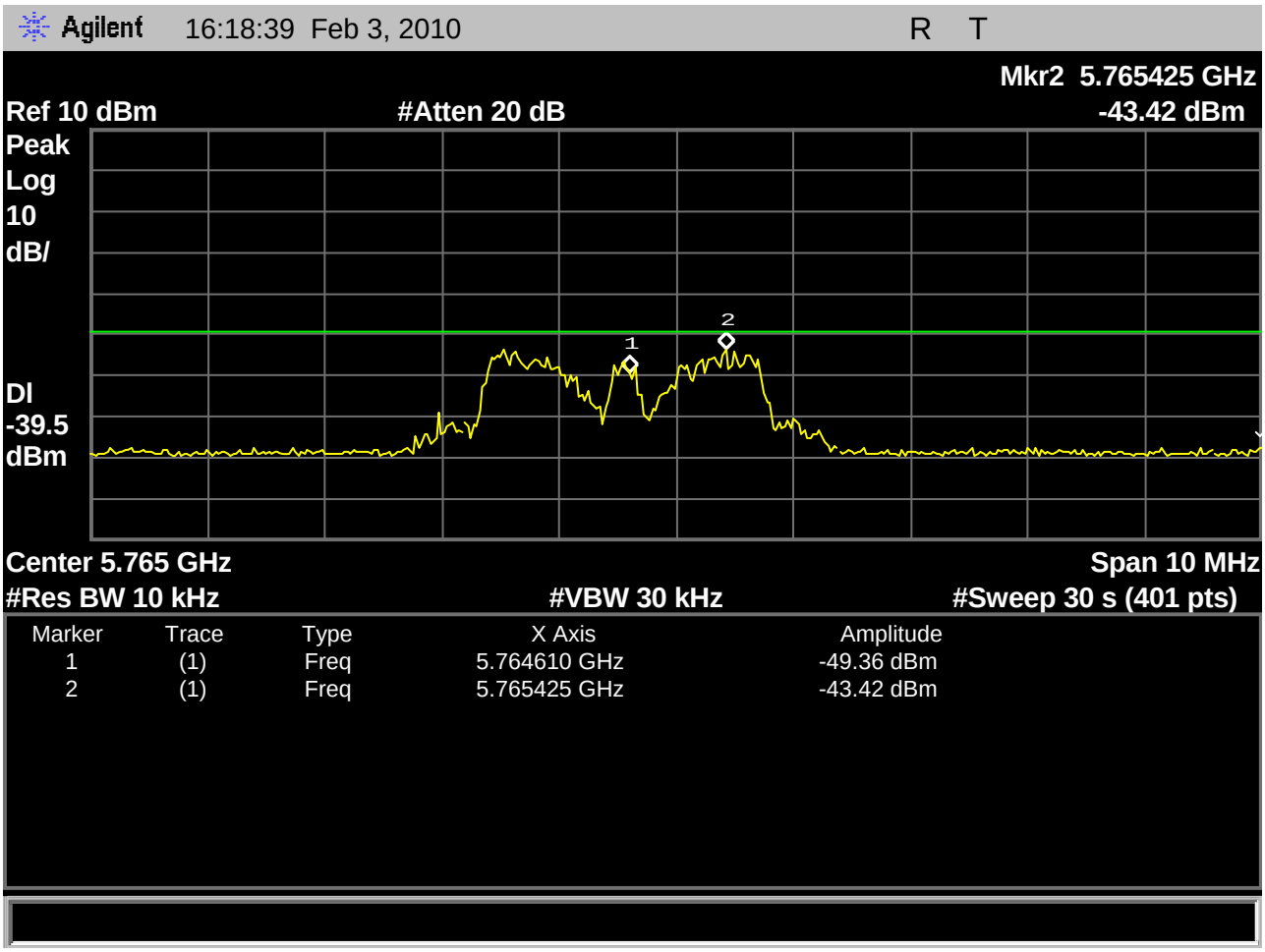

Fig. 29 – Base EUT out-of-band emissions in the region around the 3rd harmonic, with the Base EUT transmitting on the lowest carrier, 1921.536MHz.

This measurement was made according to the requirements of the text of 6.1.6, and, with the worst-case peak at –43.42dBm, shows margin to the -39.5dBm specification of 3.92dB.

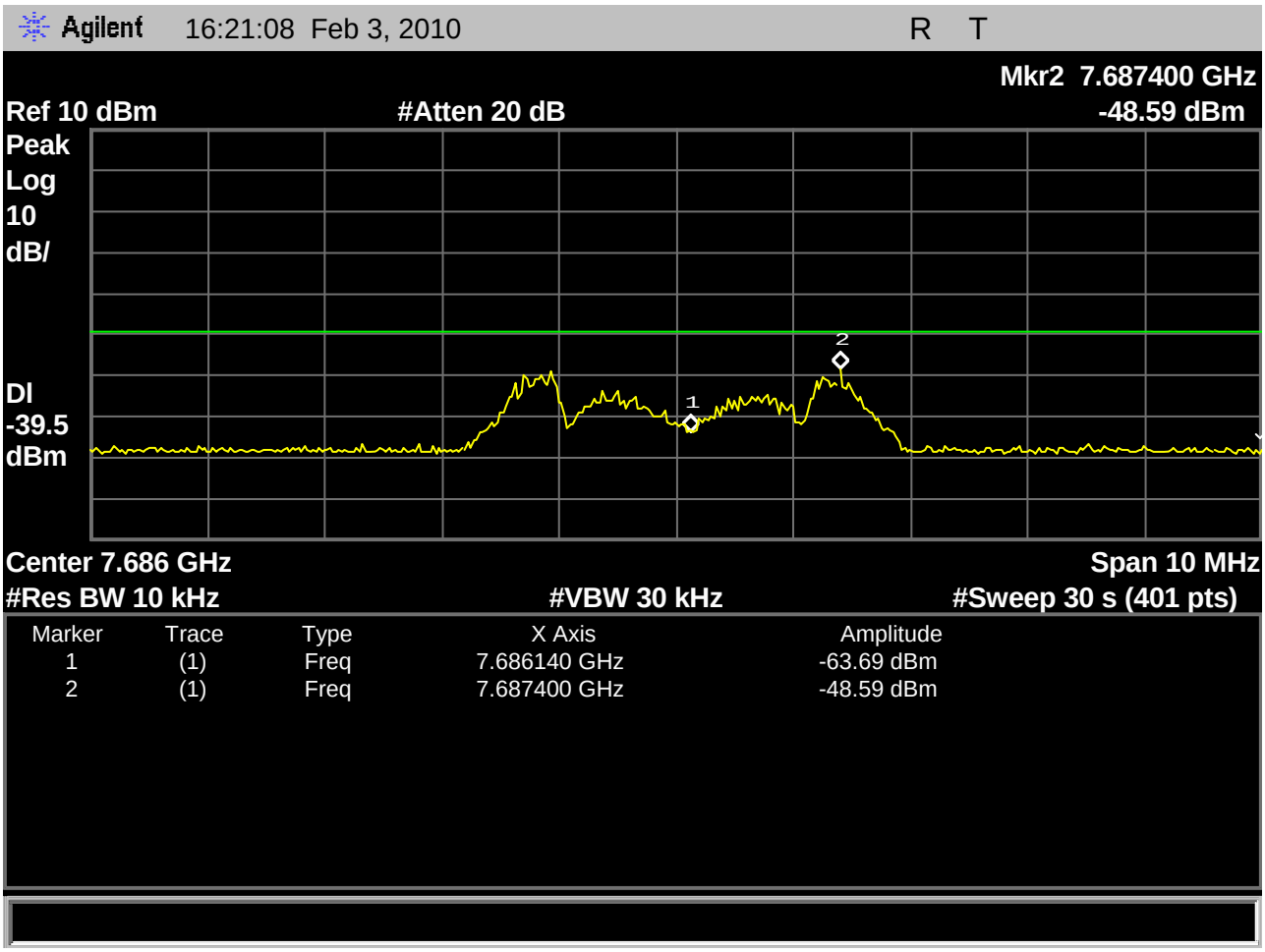

Fig. 30 – Base EUT out-of-band emissions in the region around the 4th harmonic, with the Base EUT transmitting on the lowest carrier, 1921.536MHz.

This measurement was made according to the requirements of the text of 6.1.6, and, with the worst-case peak at –48.59dBm, shows margin to the -39.5dBm specification of 9.09dB.

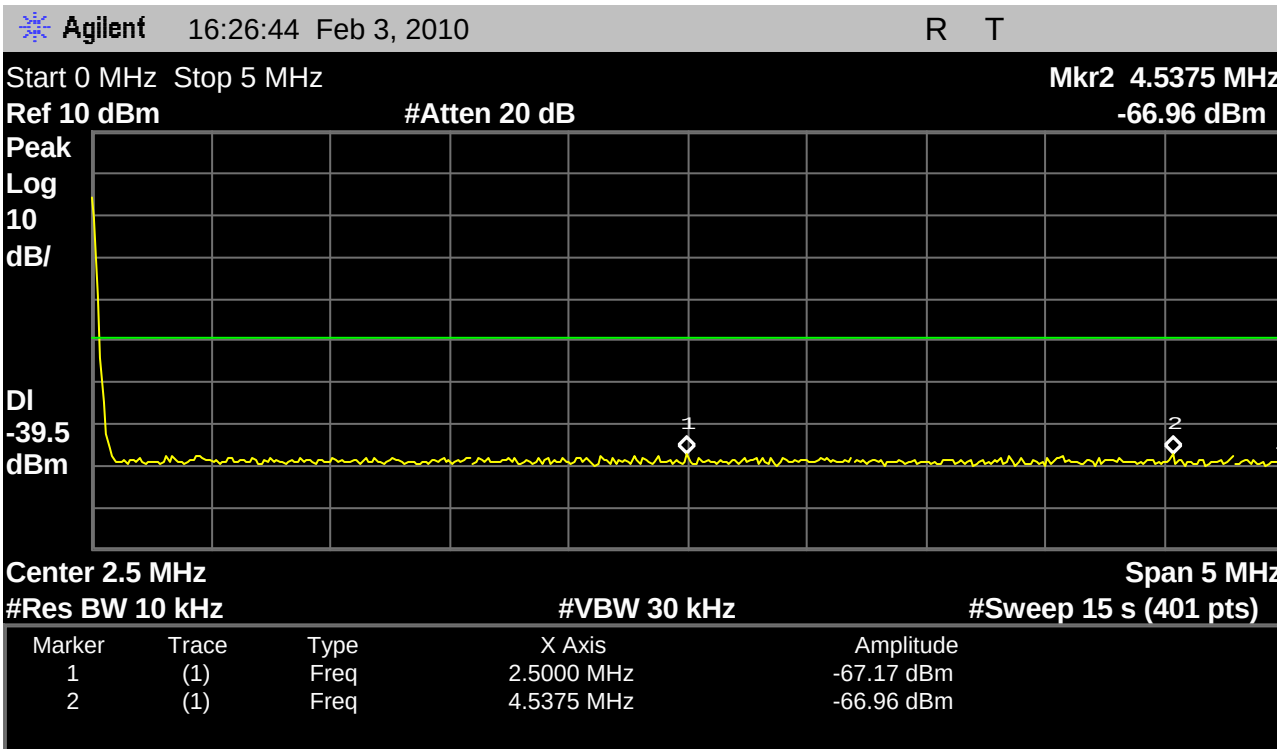

Fig. 31 – Base EUT out-of-band emissions showing the regions from DC to 5MHz, with the transmitter using the highest carrier, 1928.448MHz.

This screenshot resolves the contribution made by the spectrum analyzer's DC response. Base EUT margin to the -39.5dBm out-of-band emissions specification exceeds 25dB in this region.

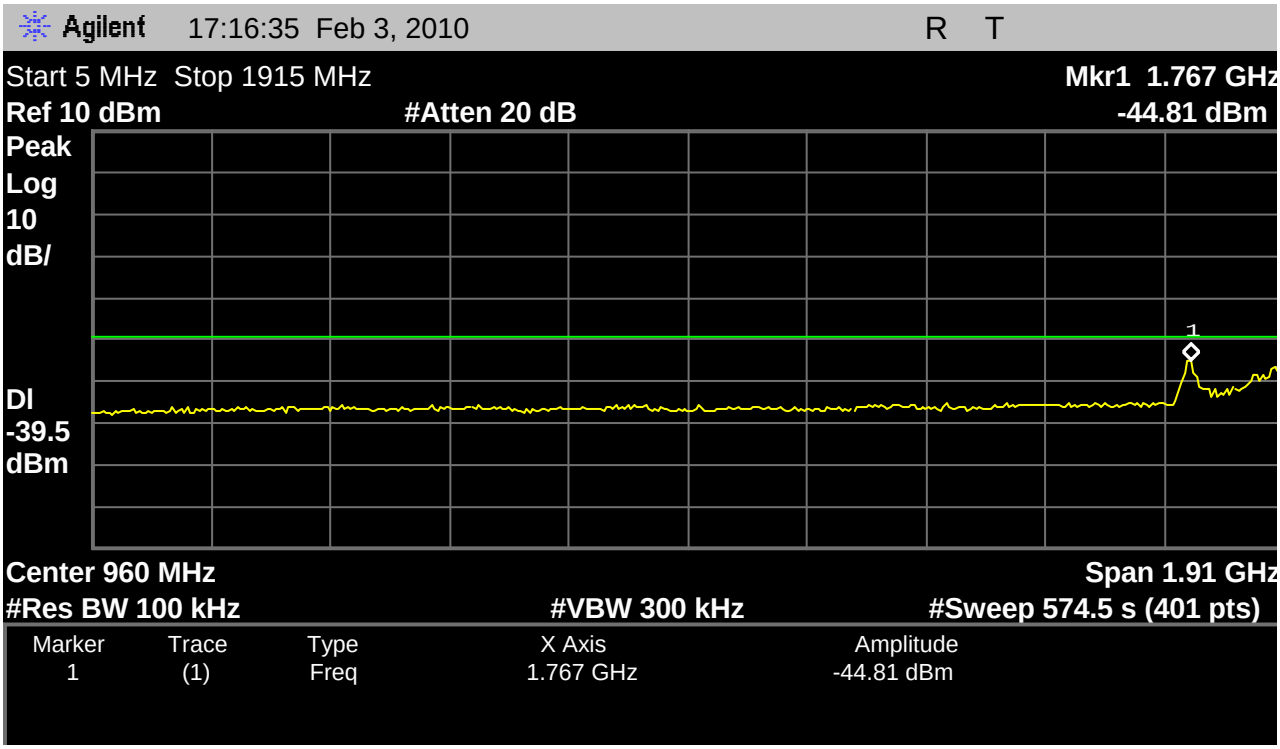

Fig. 32 – Base EUT out-of-band emissions showing the region from 5MHz to 1915MHz, with the transmitter using the highest carrier, 1928.448MHz.

This screenshot shows a sweep made with resolution bandwidth increased to 100kHz to improve sweep time. Base EUT emissions at –54.5dBm have margin to the -39.5dBm out-of-band emissions specification in this spectral region of 15.0dB in this region, even measured in a 10x-wider bandwidth than that of the text of the test procedure in clause 6.1.6.

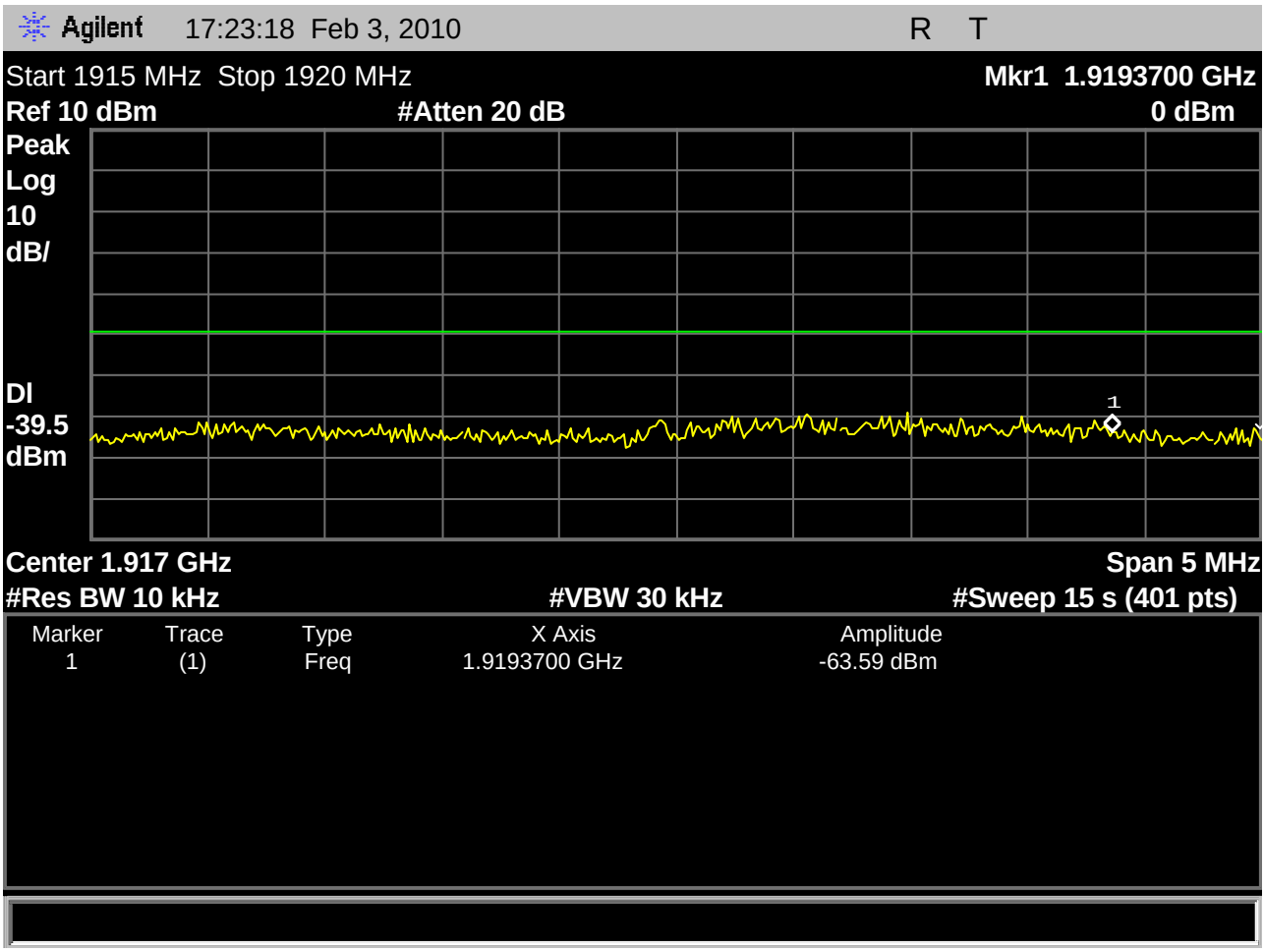

Fig. 33 – Base EUT out-of-band emissions showing the regions from band edge to -1.25MHz, and from -1.25MHz to -2.5MHz, with the Base EUT transmitting on the highest carrier, 1928.448MHz.

Margins to the specification of -9.5dBm in the region from band edge to -1.25MHz, to the specification of -29.5dBm in the region from -1.25MHz to -2.5MHz, and to the specification of -39.5dBm in the region outside -2.5MHz from the band edge all exceed 15dB.

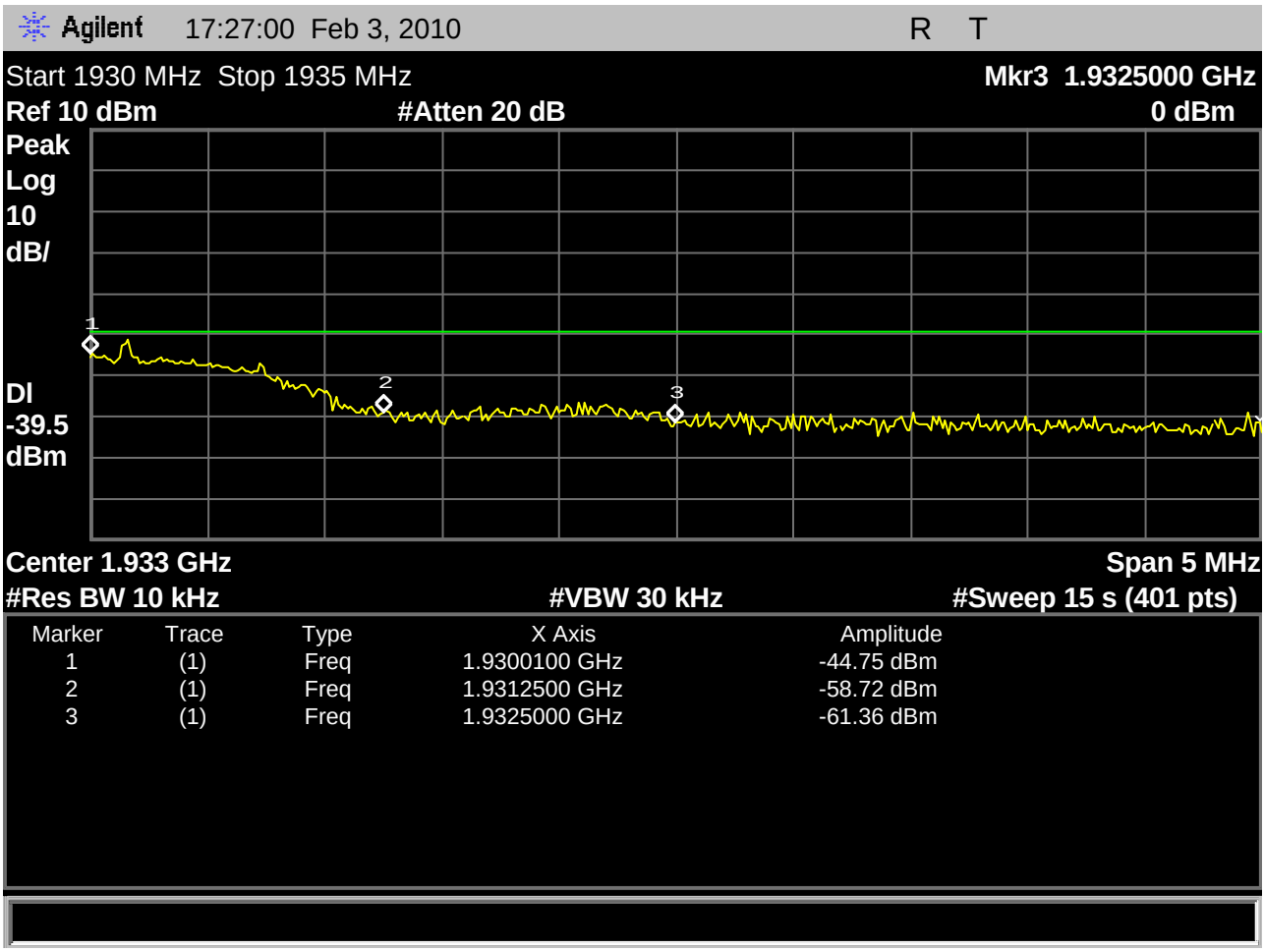

Fig. 34 – Base EUT out-of-band emissions showing the regions from band edge to +1.25MHz, and from +1.25MHz to +2.5MHz, with the Base EUT transmitting on the highest carrier, 1928.448MHz. Note the green display line is the spec limit marker only for the region outside +2.5MHz.

Margin to the specification of -9.5dBm in the region from band edge to +1.25MHz is found between markers 1 and 2 and is greater than 30dB.

Margin to the specification of -29.5dBm in the region from +1.25MHz to +2.5MHz is found between marker 2 & 3 and is -58.72dBm, and is 29.22dB.

Margin to the specification of -39.5dBm in the region outside +2.5MHz from the band edge is -61.36dBm and is 21.86 dB.

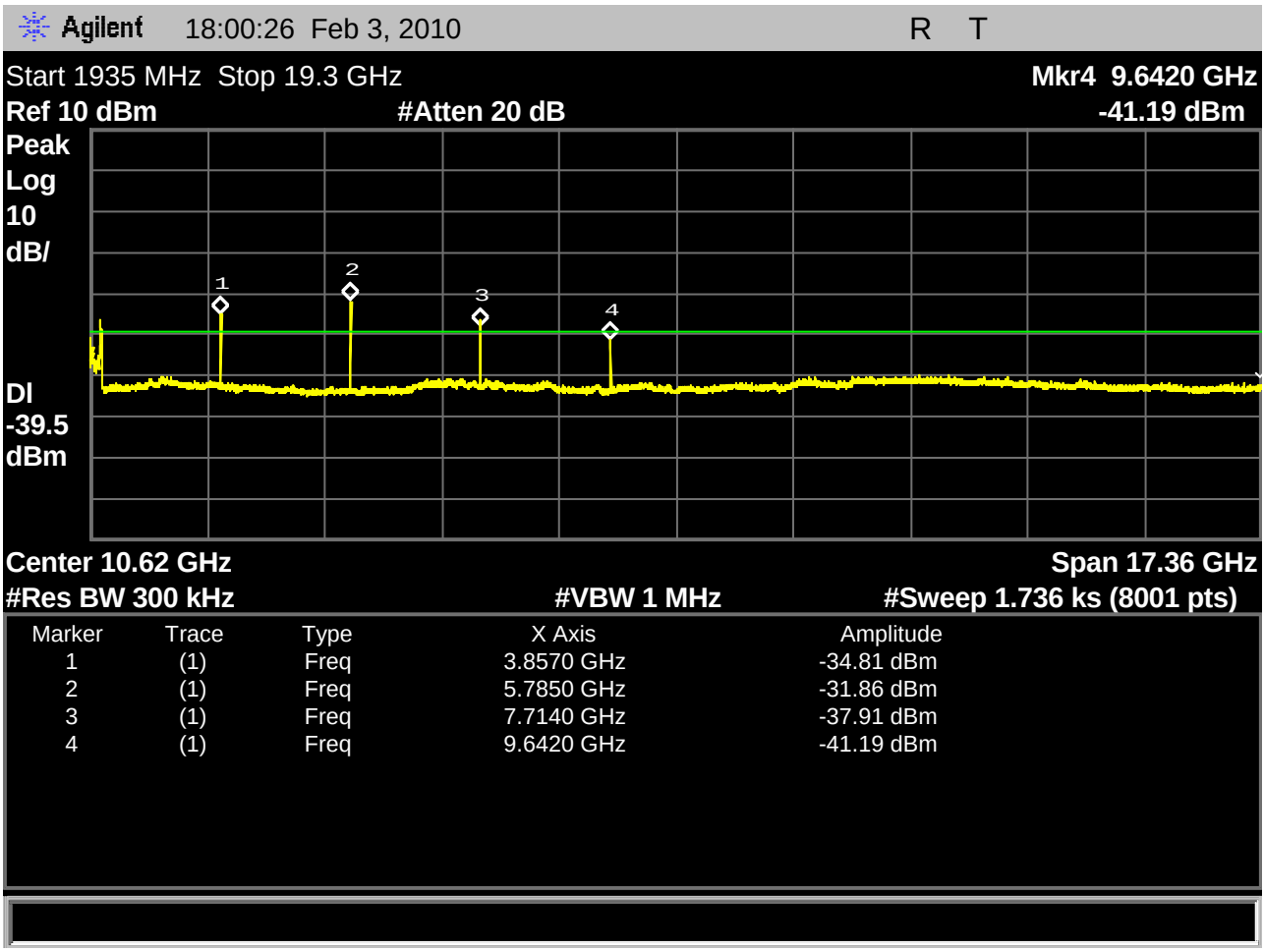

Fig. 35 – Base EUT out-of-band emissions including the regions from 1935MHz to 19.3GHz with the Base EUT transmitting on the highest carrier, 1928.448MHz.

The measurement is noise-limited. This measurement is made using a 300kHz resolution bandwidth in the interests of getting a manageable sweep time, 1736.5 seconds, but the 300kHz bandwidth passes considerably more unwanted emissions than the 10kHz obtained from the text of C63.17-2006 clause 6.1.6.

We then re-do the test using narrow scans according to the requirements of 6.1.6 to resolve the margin in the proper measurement bandwidth.

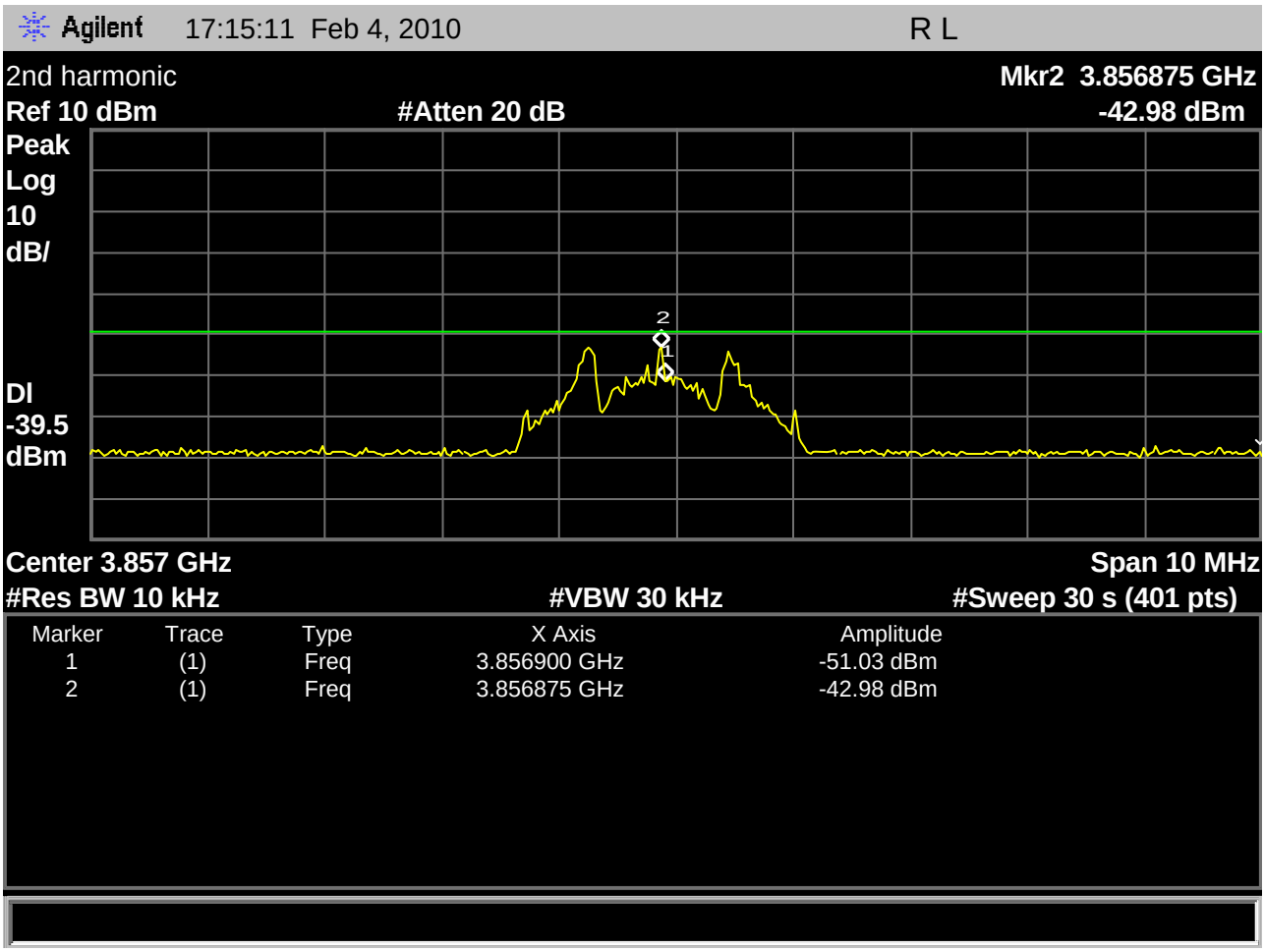

Fig. 36 – Base emissions measured in 10kHz resolution bandwidth in the region where the 1935MHz to 19.3GHz sweep at 300kHz observed a 2nd harmonic response, for the Base transmitting on the high carrier, 1928.448MHz. A peak of -42.98dBm is measured in the specified resolution bandwidth, a margin of 3.48dB from the -39.5dBm spec limit.

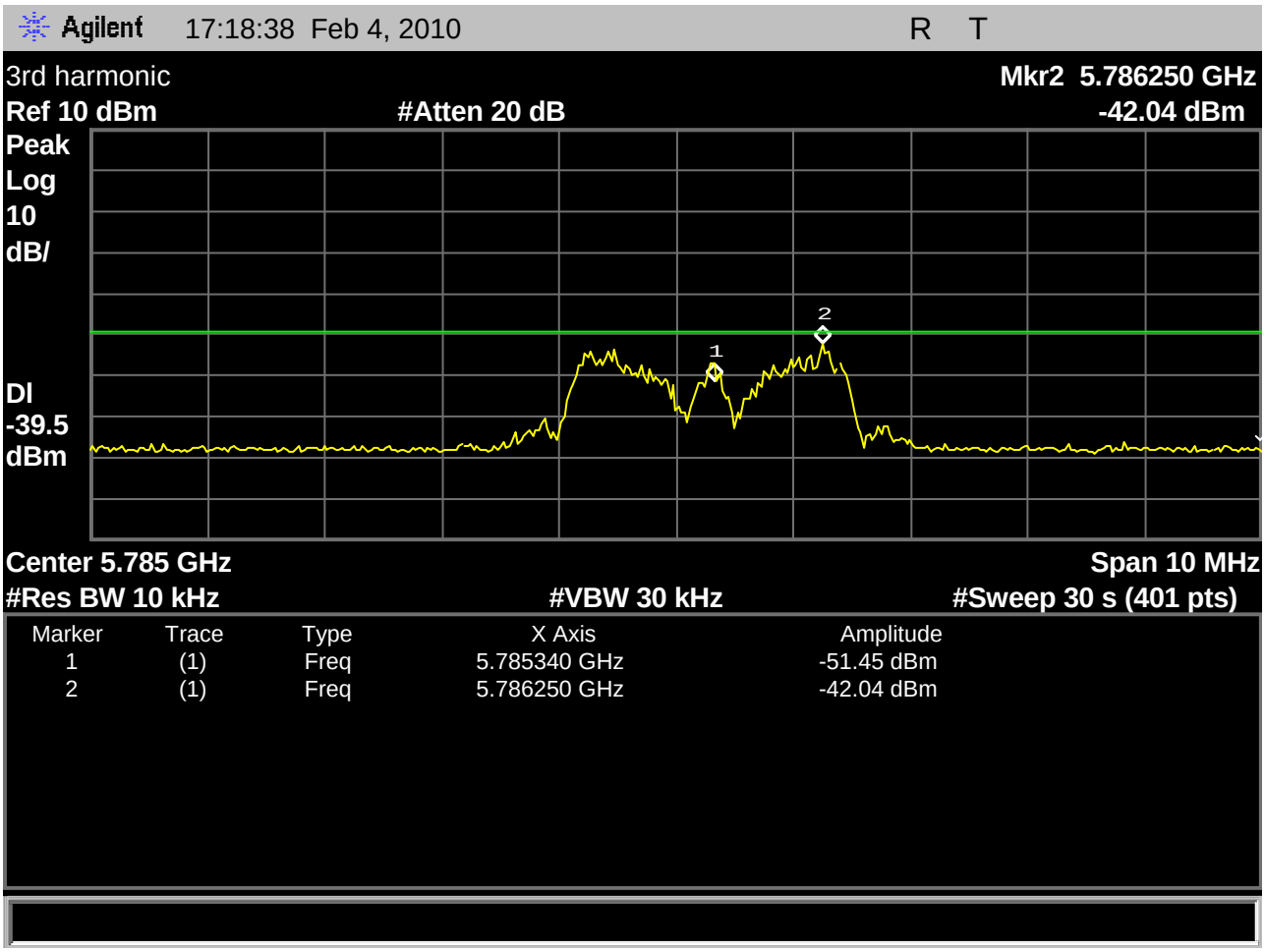

Fig. 37 – Base emissions measured in 10kHz resolution bandwidth in the region where the 1935MHz to 19.3GHz sweep at 300kHz observed a 3rd harmonic response, for the Base transmitting on the high carrier, 1928.448MHz. A peak of -42.04dBm is measured in the specified resolution bandwidth, a margin of 2.54dB from the -39.5dBm spec limit.

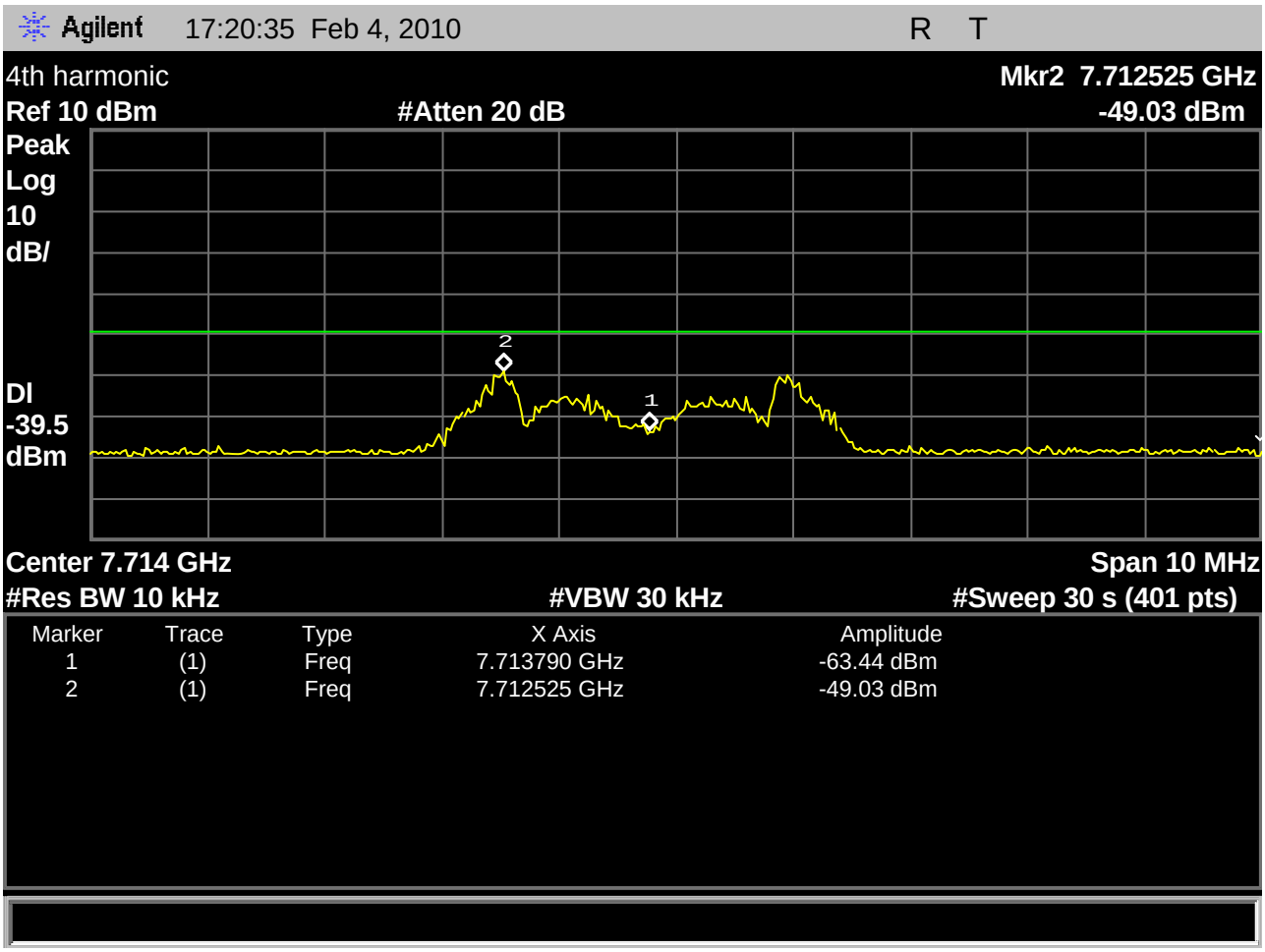

Fig. 38 – Base EUT out-of-band emissions in the region around the 4th harmonic, with the Base EUT transmitting on the highest carrier, 1928.448MHz.

This measurement was made according to the requirements of the text of 6.1.6, and, with the worst-case peak at –49.03dBm, shows margin to the -39.5dBm specification of 9.53dB.

The Base EUT meets the various out-of-band emissions requirements of clause 6.1 with worst-case margin of 2.54dB, under the worst-case conditions of transmitting on the low carrier, at the 3rd harmonic of the transmit signal.

B. Clause 6.2 Tests of frequency and time stability for the Base EUT

The test configuration for the tests of C63.17-2006 clauses 6.2.1.1 through 6.2.1.3 and 6.2.1 through 6.2.3 for the Base EUT is as follows:

The test platform and Base EUT are configured according to test configuration #2, **Standard-specific tester, Base EUT**, of section (I) of this document. The CMD60 is configured to report frequency offset with modulation removed, per the general requirements of 6.2.1. The number of transmit slots over which the measurement is made by the CMD60 is adjusted using the CONFIG MENU/TX TEST/MODULATION keystroke path. Set the number to 100 slots (bursts) to capture one second of signal, since there are 100 bursts per second, to generate one measurement of the mean value of the carrier frequency. The CMD60 measurement system calculates the mean value over each 100-slot measurement. The fixed channel used during the tests is the middle carrier, 1924.992MHz.

The particularities associated with the tests for each clause are discussed in the specific test report sections, following.

Clause 6.2.1 Carrier frequency stability, Base EUT.

Clause 6.2.1.1 for the Base EUT; mean carrier frequency drift with time.

The Base EUT is configured as described in the introduction for the tests of clause 6.2. The EUT power supply voltage is set to 9.0V. Ambient for the EUT is set to 20C. The data collection system runs for one hour, collecting mean carrier frequency measurements and recording the peak and mean values.

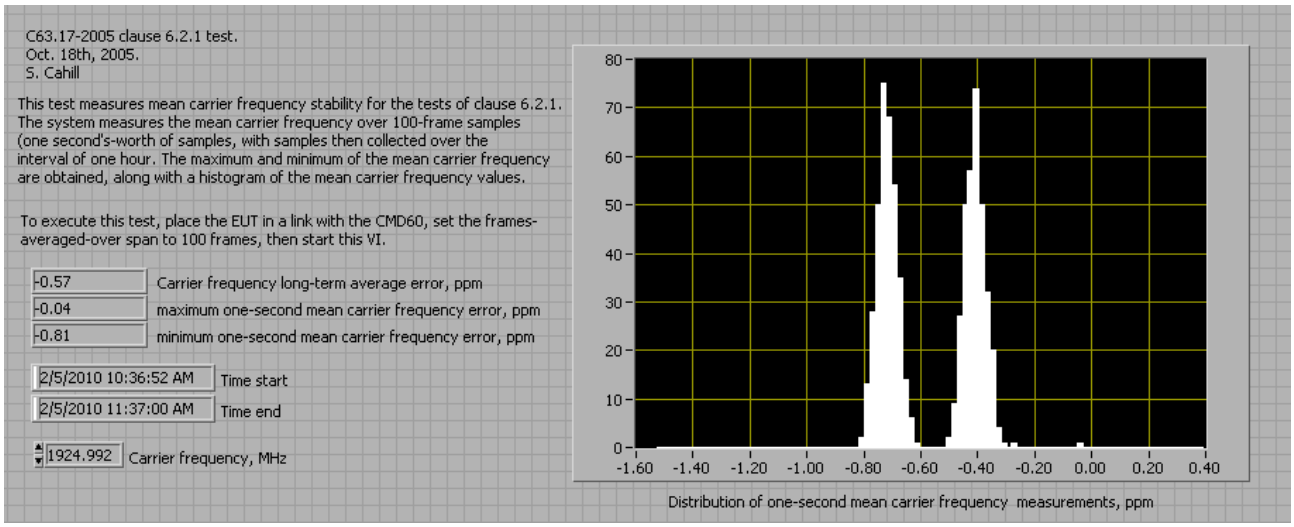

Fig. 39 - Measured one-second mean carrier frequency, Base EUT, and observed maximum, average value and observed minimum of the mean carrier frequency.

The nominal mean carrier frequency error relative to 1924.992MHz is 0.69ppm.

The observed maximum is -0.04ppm, for a maximum relative to nominal of +0.53ppm.

The observed minimum is -0.81ppm, for a change relative to nominal of -0.24ppm.

The Base EUT passes the test of clause 6.2.1.1; the mean carrier frequency is allowed to vary +/-10ppm over a one-hour test interval.

Clause 6.2.1.2 for the Base EUT, mean carrier frequency error over voltage:

Testing for the effects of battery voltage variation for the Base EUT, per the requirements of 47CFR15.323(f) and C63.17-2006. The Base EUT is configured as described in the introduction for the tests of clause 6.2. The EUT ambient is set to 20C. The EUT's mean carrier frequency is measured with the power supply set to 4.250V, 5.00V, and 5.750V, 85% of nominal, nominal, and 115% of nominal.

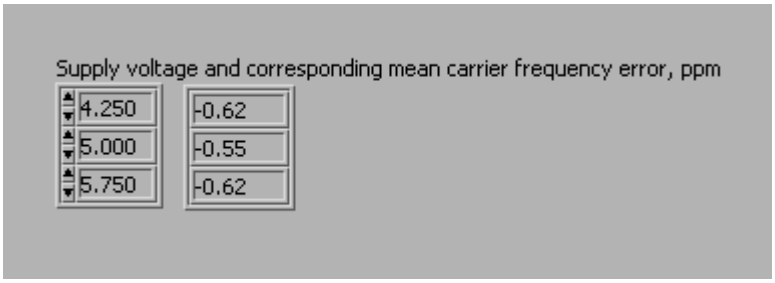

Fig. 40 - Measured mean carrier frequency, Base EUT , at 4.250V, 5.000V, and 5.750V.

The nominal mean carrier frequency error relative to 1924.992MHz is -0.55ppm.

The observed value at 4.250V is -0.62ppm, for a change relative to 9.000V of -0.07ppm.

The observed value at 5.750V is -0.62ppm, for a change relative to 20C ambient of -0.07ppm.

The Base EUT passes the test of clause 6.2.1.3; the mean carrier frequency is allowed to vary +/-10ppm over the supply voltage range from 85% to 115% of nominal.

Clause 6.2.1.3 for the Base EUT; mean carrier frequency change with temperature.

The Base EUT is configured as described in the introduction for the tests of clause 6.2. The EUT power supply voltage is set to 3.70V. The EUT's mean carrier frequency is then measured at the declared rated extremes (0C, then +45C) and at 20C, after a 60 minute soak at each temperature.

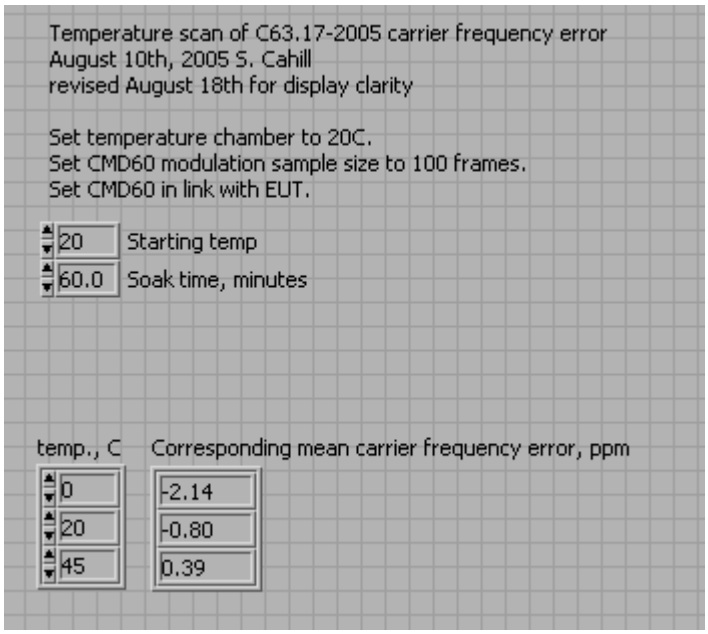

Fig. 41 - Measured mean carrier frequency, Base EUT, at 0C, +20C, +45C.

The nominal mean carrier frequency error relative to 1924.992MHz is -0.80ppm.

The observed value at 0C is -2.14ppm, for a change relative to 20C ambient of -1.34ppm.

The observed value at +45C is 0.39ppm, for a change relative to 20C ambient of +1.19ppm.

The Base EUT passes the test of clause 6.2.1.3; the mean carrier frequency is allowed to vary +/-10ppm over the declared rated temperature.

Clause 6.2.2 Frame repetition stability test for the Base EUT:

The Base EUT is configured as described in the introduction for the tests of clause 6.2.

The text of table 8 of 6.2.2 specifies the interval of each measurement (X, in the nomenclature used in C63.17-2006) to be as long as 1000 frames, and specifies measurements to be collected repetitively over an interval of at least one hour. For the test of 6.2.2, we obtain mean frame-repetition error measurements each over 1000 frames by configuring the CMD60 to report mean frame repetition error over 100 frames; each set of 10 responses is then averaged to derive a mean over 1000 frames, so to obtain one 1000-frame mean frame repetition error measurement. The data collection from the CMD60 is under the control of the controller PC. The data collection system runs until one hour has elapsed. From the frame repetition stability measurements the standard deviation of the frequency stability is calculated.

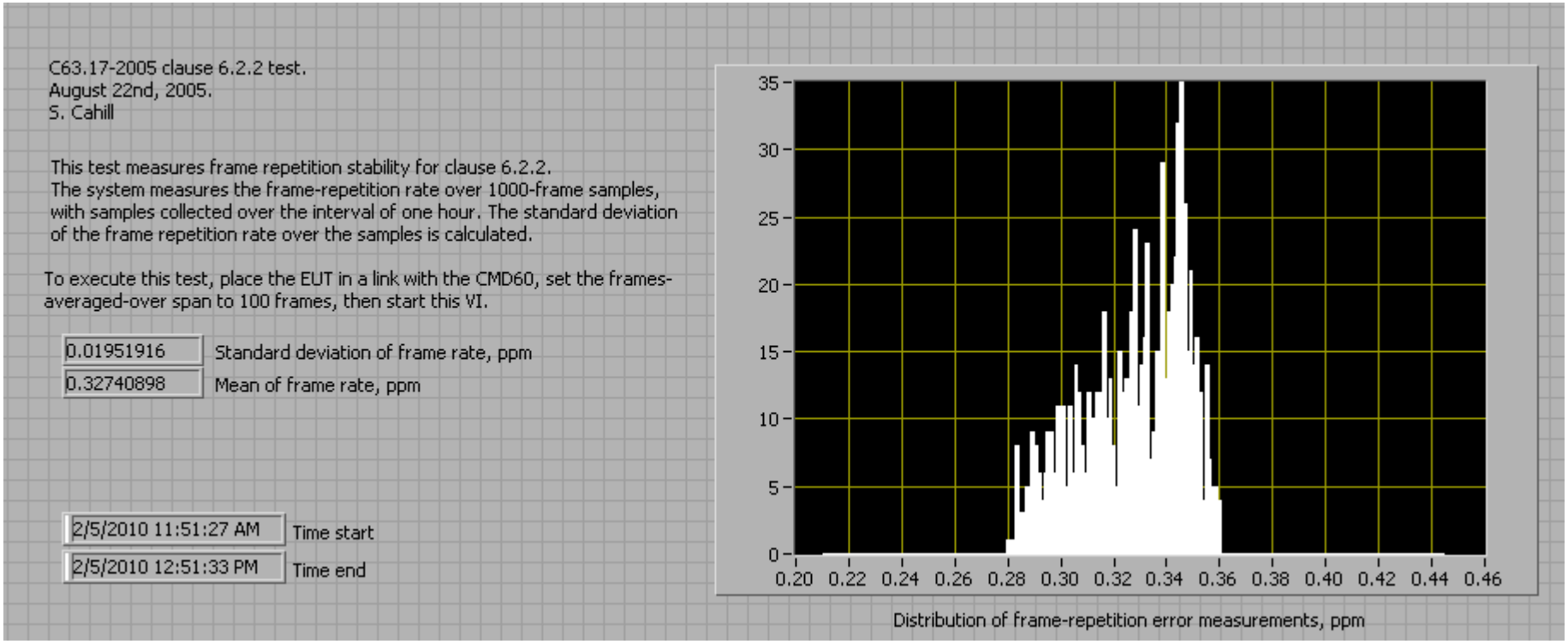

Fig. 42 - Test of Base EUT according to the conditions of clause 6.2.2 for frame repetition rate stability

The measured standard deviation of the frame rate or repetition period according to the requirements of clause 6.2.2 for the Base EUT is 0.01951916ppm.

The Base EUT passes the test of clause 6.2.2; the standard deviation of the frequency stability is to be such that three standard deviations of the frequency stability as measured through the error in the frame repetition rate shall not exceed 10ppm, and three standard deviations of the frequency stability for the base EUT is measured to be 0.32740898ppm.

Clause 6.2.3 Frame period and jitter test for the Base EUT:

The Base EUT is configured as described in the introduction for the tests of clause 6.2.

For the test of 6.2.3, the CMD60 is queried to report maximum and minimum frame length for two frames, for each measurement. In this way the lengths of individual frames are obtained; one is the maximum, the other is the minimum. The measurement of frame length is executed for 100,000 frames under the control of the data collection system, which runs for approximately 2 hours for each test. From the measured frame length data the standard deviation of the jitter and the maximum and minimum frame lengths are calculated according to the requirements of 6.2.3.

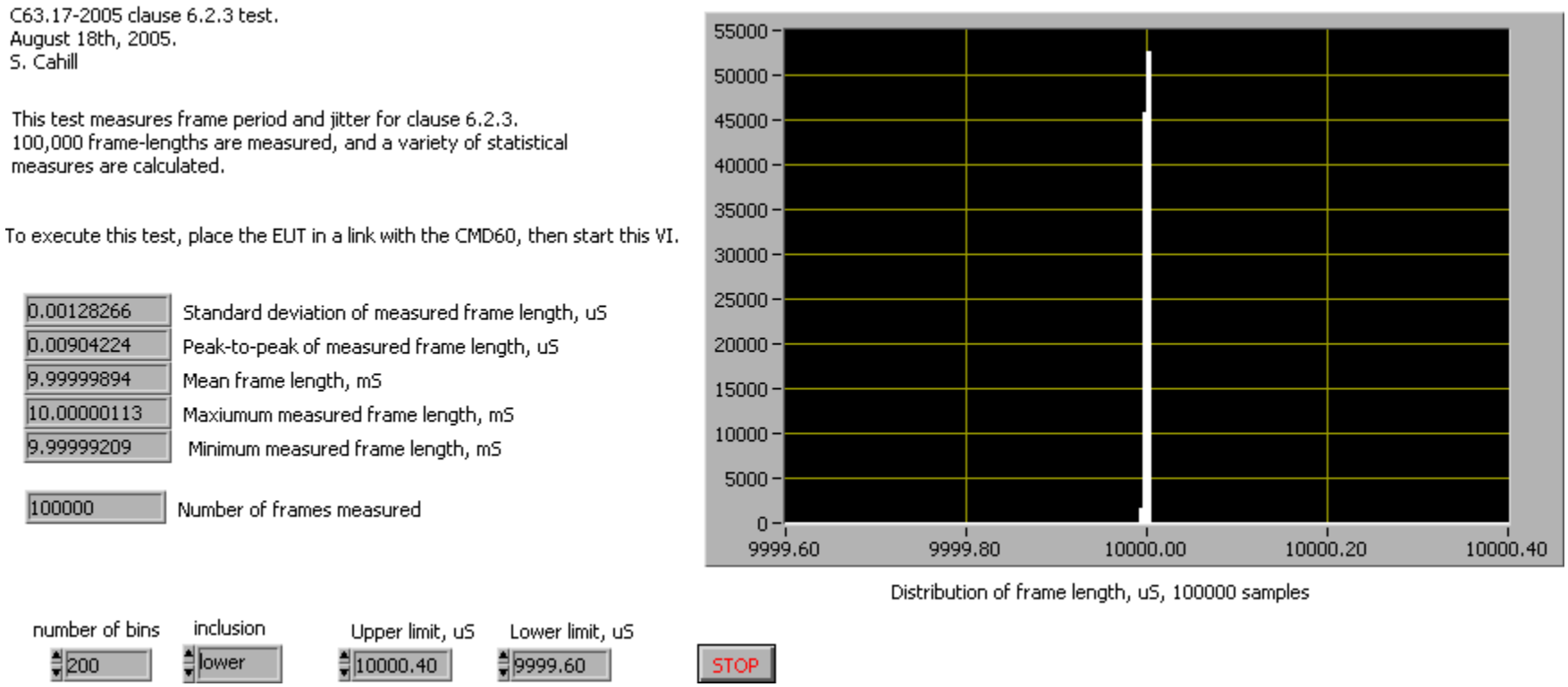

Fig. 43 - Test of Base EUT for frame period and jitter, according to the requirements of clause 6.2.3.

The measured mean value of the frame period is 9.99999894ms, which is 10ms with jitter offset of 0.00000106us and three standard deviations of 0.00128266us, totaling 0.010777us.

The Base EUT passes clause 6.2.3; the mean frame period is to be 10ms with jitter (three standard deviations) and offset totaling less than 25us.

IV. Tests of clause 7, Base EUT

A. Clause 7.3.2 Upper threshold for EUTs which implement the LIC procedure, Base EUT

The test platform, Base EUT is configured according to the requirements for implementing the test of 7.3.2(b) by means of test configuration #3, No companion headset device is necessary since the Base beacon will be brought up without a companion device after the proper access criteria check.

The multi-carrier interference generator (PXI-5670) is set to CW on all 5 carriers, and at level -45.1dBm, which is TU + UM + 10dB, where TU = -61.1dBm from the manufacturer's declarations and the measured emissions bandwidth and UM is defined in C63.17-2006 as 6dB. The transmit spectrum and interference spectrum are observed using the E4407B spectrum analyzer. Trigger is free-run, detection is peak, otherwise spectrum analyzer settings are as shown on the screenshot following. A trace (yellow) is captured and held at the initial interference -45.1dBm setting.

The multi-carrier interference generator level is then reduced incrementally in 1dB steps until the Base EUT begins to transmit the beacon. A max-hold signal (purple) captures the trace showing when transmissions of the communications channel begin. For each 1dB step, the Base EUT is powered down while the multi-carrier interference generator is set to the new level, and then powered up. A trace (blue) shows the interference carrier level at the level where Base transmissions first begin. A marker shows the delta between the -45.1dBm level and the level at which Base transmissions first begin.

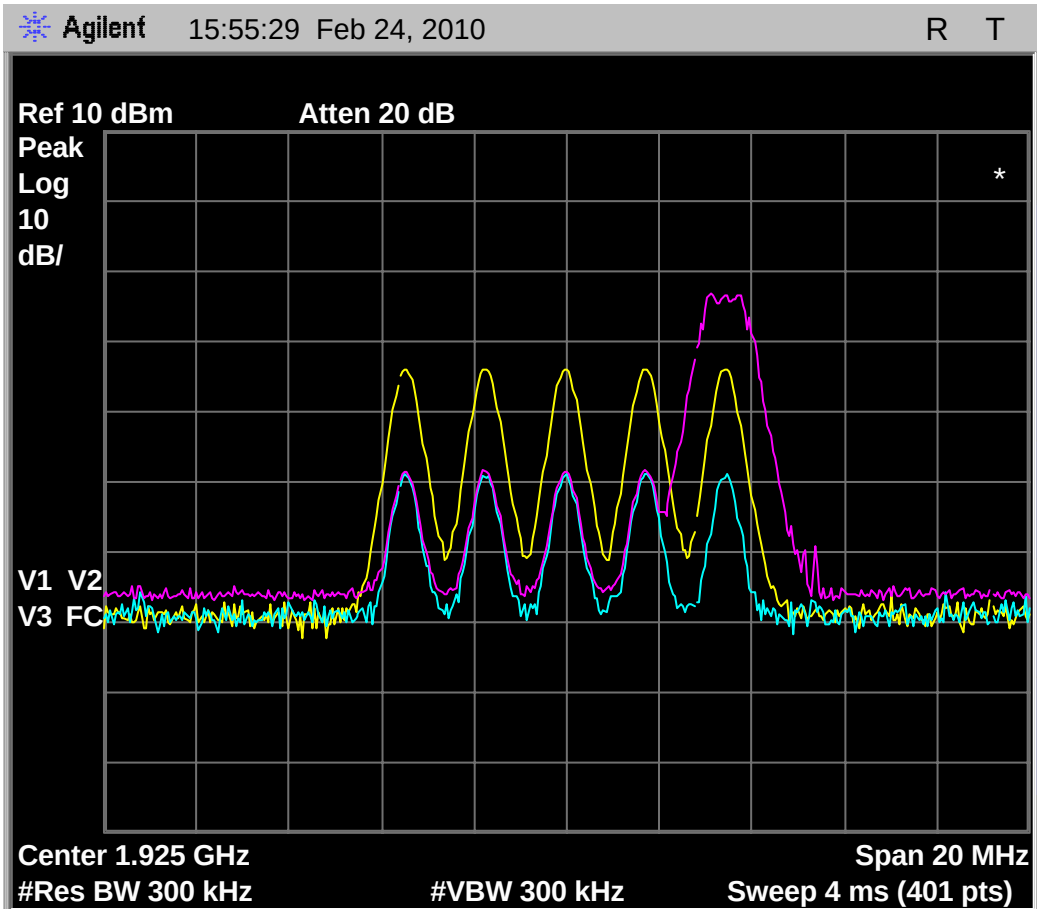

Fig. 44 - Emissions and interference profile spectrum, Base EUT, test 7.3.2.

A trace (yellow, 2nd from top) is captured and held at the initial interference level setting of -45.1dBm. Then the multi-carrier interference generator level is reduced incrementally in 1dB steps until the Base EUT will initiate a communications channel in response to a press of the TALK button. A max-hold signal (purple, top) captures the trace showing when transmissions of the beacon begin. A trace (blue, bottom) shows the interference carrier level at the level where transmissions first begin. A marker shows the delta between the -45.1dBm level and the level at which transmissions first begin.

The first interference level at which the Base EUT transmits is -61.0 dBm. The allowed upper limit is TU + UM = -55.6dBm, the Base EUT passes.

Note that absolute level at the spectrum analyzer and displayed above is a consequence of the relative losses between the EUT port of the combining network and the spectrum analyzer port, relative to the multi-carrier generator port, and does not reflect the signal level at the EUT input.

B. Clause 7.3.3 Least interfered channel (LIC) procedure test, Base EUT

The test platform, Base EUT is configured according to the requirements for implementing the test of 7.3.3 by means of test configuration #3, again companion device not needed to check LIC is selected when the Base beacon transmission begins.

The multi-carrier interference generator (PXI-5670) is set to CW at $T_U + U_M$ = -55.6dBm on three carriers; at 1928.448MHz, 1924.992MHz, and 1921.536MHz.

Clause 7.3.3(b)

The multi-carrier interference generator is additionally set to generate on f_1 a CW signal of level $T_L + U_M$ +7dB, or -68.1dBm (where $T_L = T_U$ - 20dB) and to generate on f_2 a CW signal of level $T_L + U_M$ = -75.1dBm, where f_1 = 1926.720MHz and f_2 = 1923.264MHz, the remaining two of the system's five carriers.

With this interference profile present, apply power to the Base EUT and verify the Base beacon is brought up on the LIC. Repeat the test five times while monitoring the spectrum using the E4407B spectrum analyzer to validate that, when this interference profile is applied to the Base EUT, the Base always chooses f_2 for the beacon transmissions.

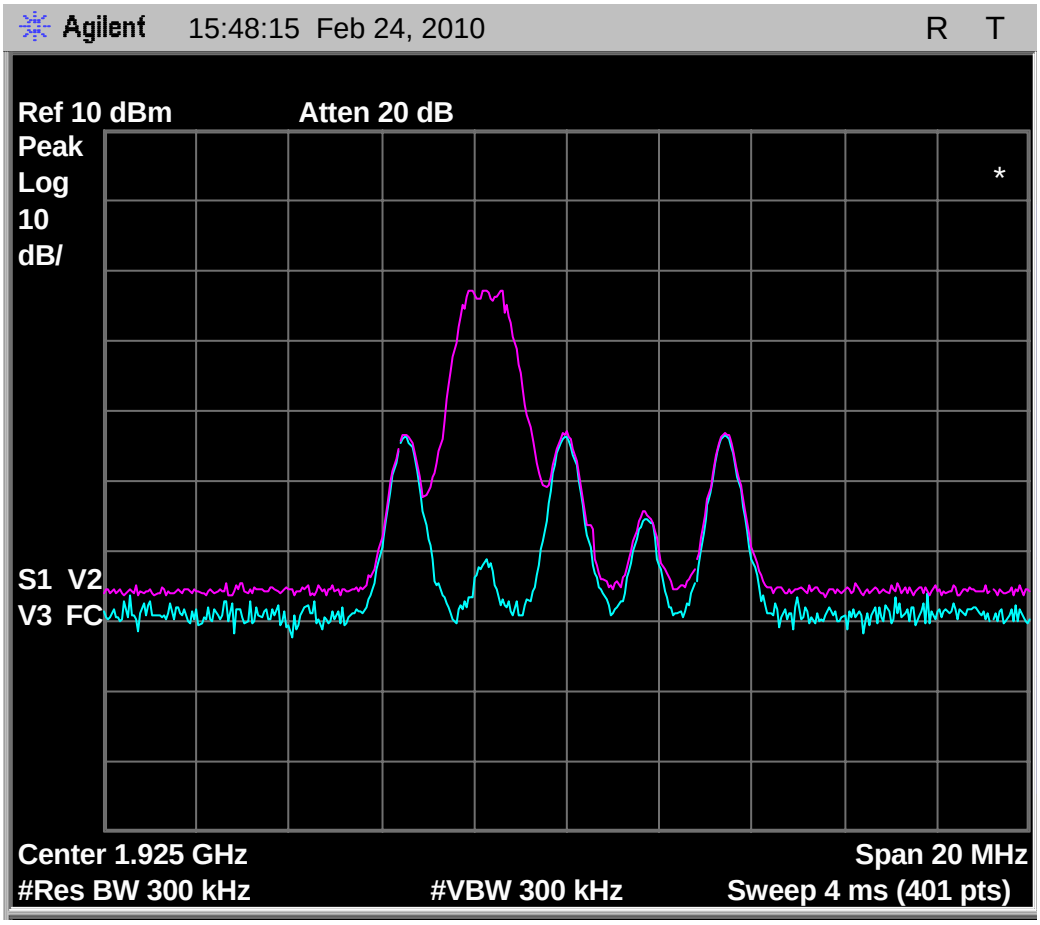

Fig. 45 - Emissions and interference profile spectrum, Base EUT, test 7.3.3(b).

A max-hold signal (purple, top) captures the trace showing where in the spectrum EUT transmissions are occurring. A trace (blue, bottom) shows the interference profile.

The Base EUT always transmits on f_2 (the carrier with the lower interference level) and so meets the requirement of not transmitting on f_1.

Clause 7.3.3(c)

Repeat the test of 7.3.3(b), except reverse the levels on f_1 and f_2. That is, the multi-carrier interference generator is now set to generate on f_1 a CW signal of level $T_L + U_M$, or -75.1dBm and to generate on f_2 a CW signal of level $T_L + U_M$ + 7dB = -68.1dBm, where f_1 = 1926.720MHz and f_2 = 1923.264MHz.

With this interference profile present, apply power to the Base EUT and verify the Base beacon is brought up on the LIC. Repeat the test five times while monitoring the spectrum using the E4407B spectrum analyzer to validate that, when this interference profile is applied to the Base EUT, the Base always chooses f_1 for the beacon transmissions.

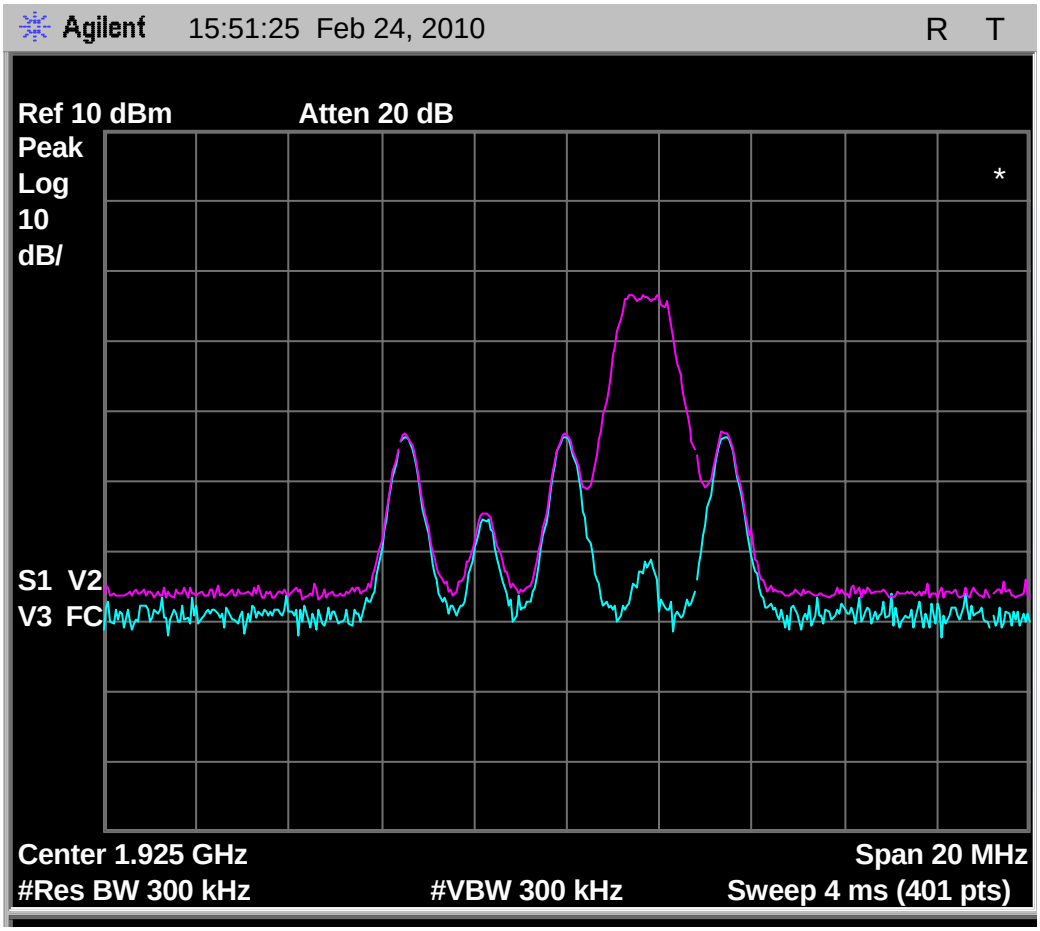

Fig. 46 - Emissions and interference profile spectrum, Base EUT, test 7.3.3(c).

The Base EUT always transmits on f_1 (the carrier with the lower interference level) and so meets the requirement that it never transmit on f_2.

Clause 7.3.3(d)

Repeat the test of 7.3.3(b), except the multi-carrier interference generator is now set to generate on f_1 a CW signal of level $T_L + U_M$ + 1dB or -74.1dBm and to generate on f_2 a CW signal of level $T_L + U_M$ - 6dB = -81.1dBm, where f_1 = 1926.720MHz and f_2 = 1923.264MHz.

With this interference profile present, apply power to the Base EUT and check that the Base beacon transmission is always on the LIC. Repeat the power up test five times while monitoring the spectrum using the E4407B spectrum analyzer to validate that, when this interference profile is applied to the Base EUT, the Base EUT always chooses f_2 for the communications channel.

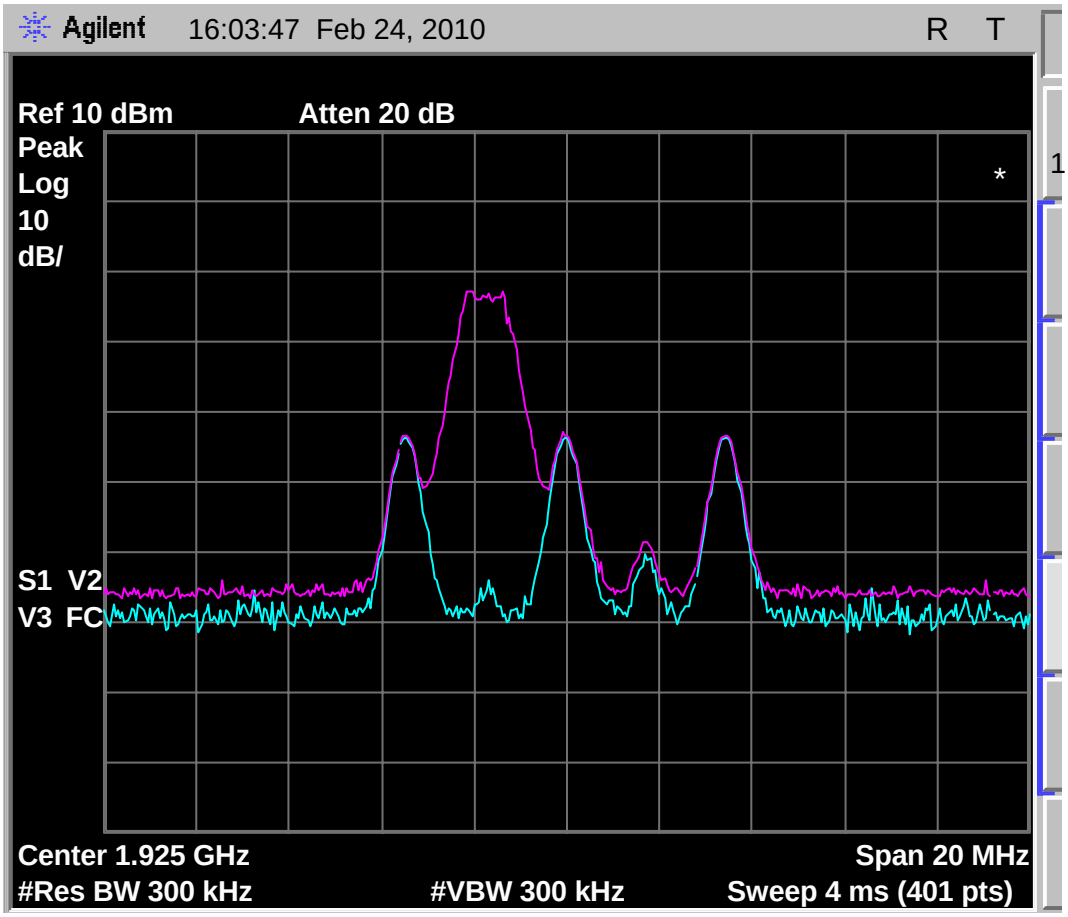

Fig. 47 - Emissions and interference profile spectrum, Base EUT, test 7.3.3(d).

The Base EUT always transmits on f_2 (the carrier with the lower interference level) and so meets the requirement that it never transmit on f_1.

Clause 7.3.3(e).

Repeat the test of 7.3.3(d), except reverse the levels on f_1 and f_2. That is, the multi-carrier interference generator is now set to generate on f_1 a CW signal of level $T_L + U_M$ - 6dB or -81.1dBm and to generate on f_2 a CW signal of level $T_L + U_M$ +1dB = -74.1dBm, where f_1 = 1926.720MHz and f_2 = 1923.264MHz.

With this interference profile present, apply power to the Base EUT and check that the Base beacon transmission is always on the LIC. Repeat the power up test five times while monitoring the spectrum using the E4407B spectrum analyzer to validate that, when this interference profile is applied to the Base EUT, the Base EUT always chooses f_1 for the communications channel.

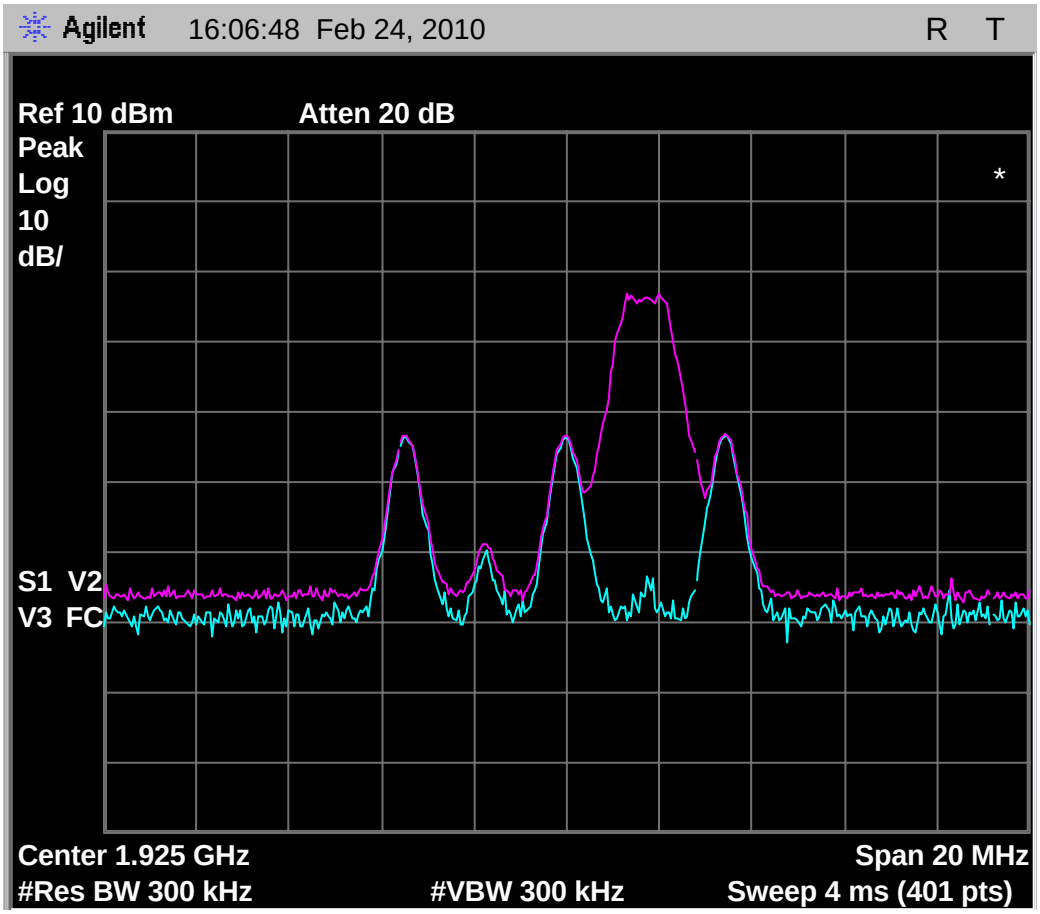

Fig. 48 - Emissions and interference profile spectrum, Base EUT, test 7.3.3(e).

The Base EUT always transmits on f_1 (the carrier with the lower interference level) and so meets the requirement that it never transmit on f_2.

C. Clause 7.3.4 Selected channel confirmation, Base EUT

Test not required for the Base, compliance to 7.3.4 is tested in the companion device (headset) report.

D. Clause 7.4 Threshold monitoring bandwidth Base EUT

The threshold monitoring is made through the radio receiver used by the EUT for communication, met by manufacturer declaration.

E. Clause 7.5 Reaction time and monitoring interval, Base EUT

The test platform, Base EUT is configured according to the requirements for implementing the test of 7.5(c) by means of test configuration #3.

The multi-carrier interference generator (PXI-5670) is set to interference pulse transmissions of 50us length, synchronized with the frame and slot timing of the Base device. The interference is present on all 5 carriers, and at level -55.1dBm, which is $T_U + U_M$.

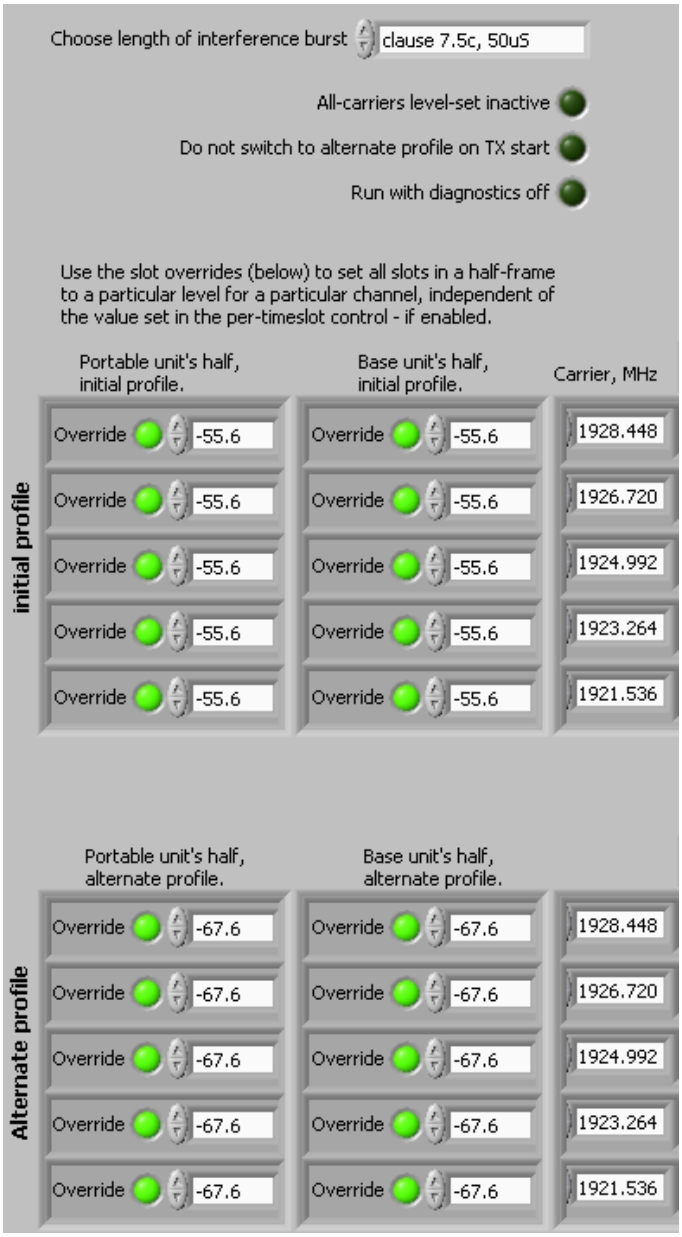

Fig. 49 - Control panel for multi-carrier interference generator, set to 50uS pulses in all timeslots on all carriers, for the test of 7.5(c).

Two interference profiles are loaded; one with all pulses at -55.6dBm, $T_U + U_M$, and the other at -67.1dBm, $T_U - U_M$. The first profile is used to demonstrate deferral for pulses 50uS long above the threshold, and the second profile is used to demonstrate non-deferral for 50uS pulses below the threshold.

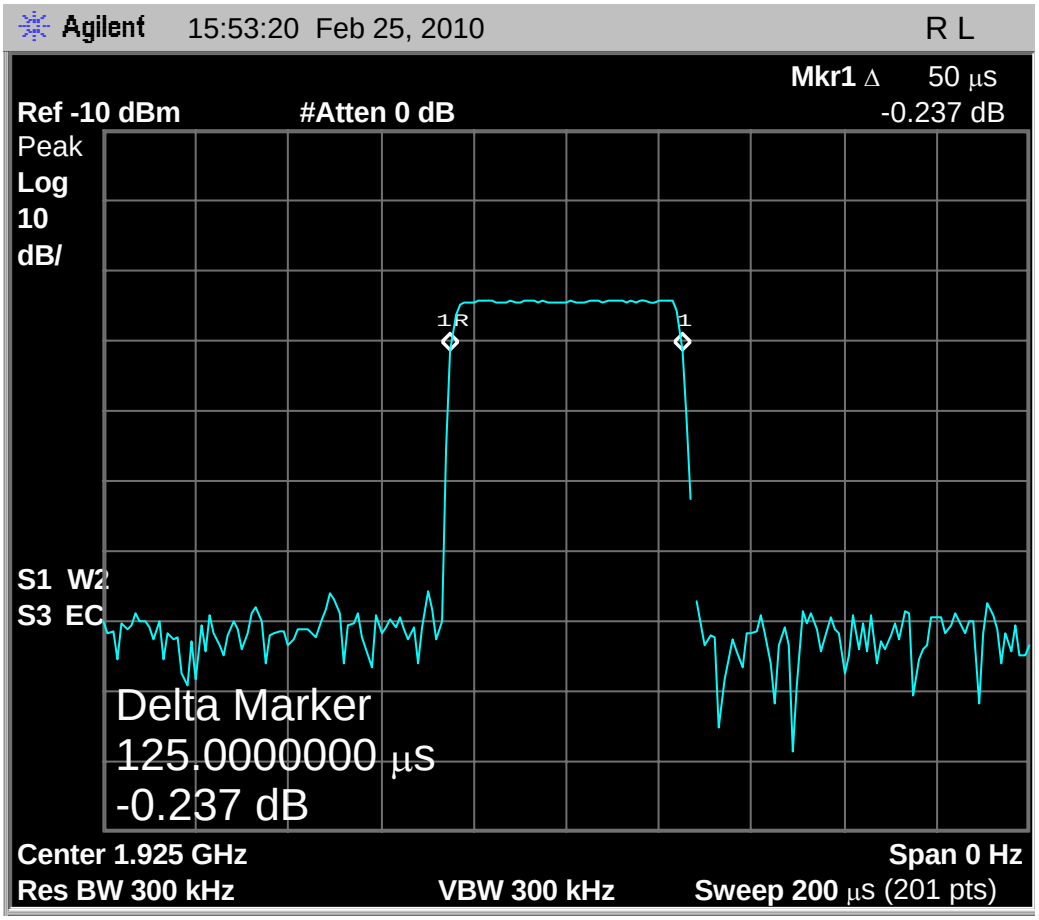

Fig. 50 - Interference pulse, one frame shown, for the test of 7.5(c).

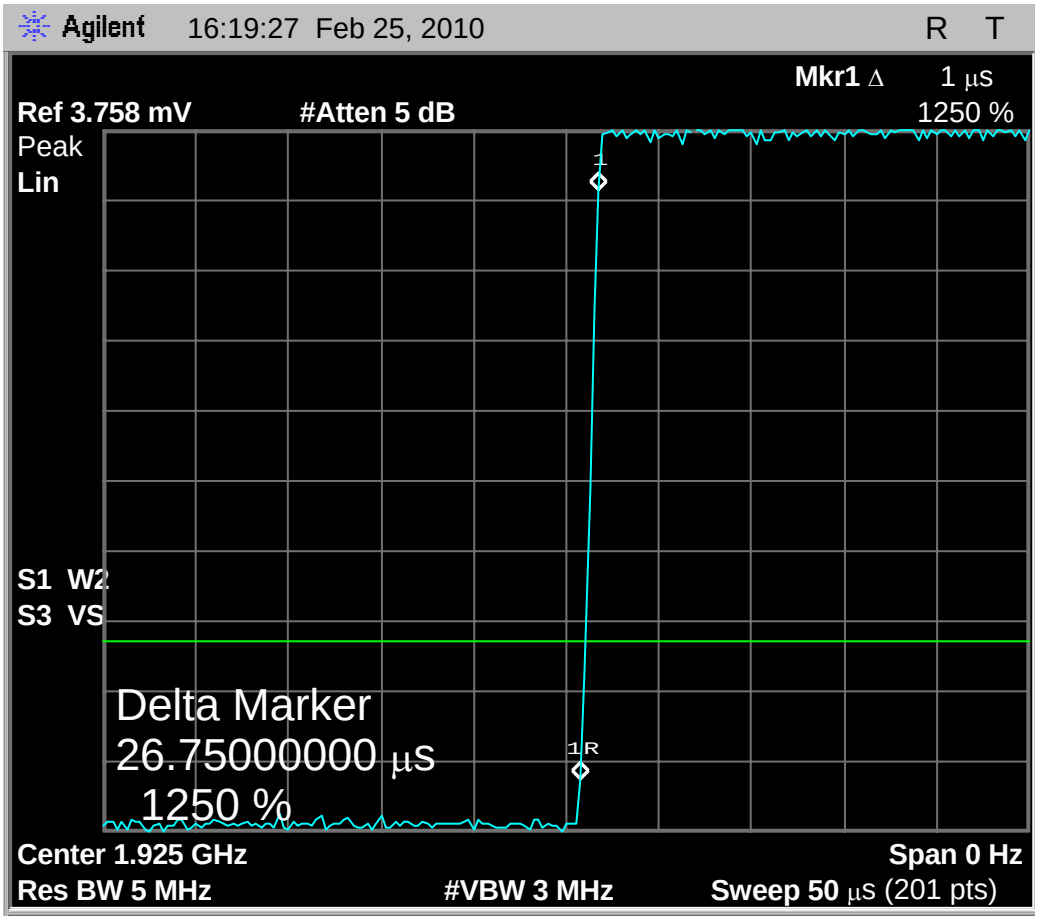

Fig. 51 - Rise time of interference pulse, per the requirements of 7.5 for less than 1uS for 10% to 90% transition.

Spectrum analyzer is set to linear response and the reference level adjusted so that 10% and 90% scale points can be observed. Fall time (not shown) is symmetrical.

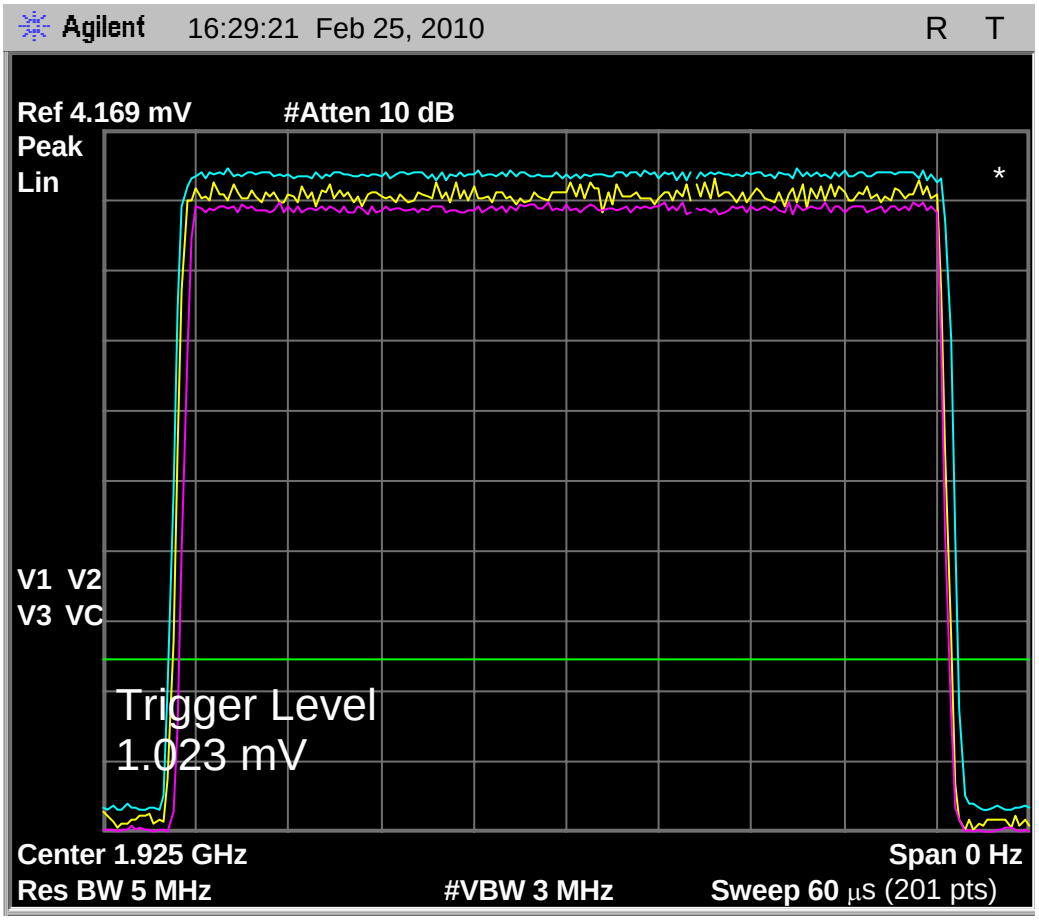

Fig. 52 – 50uS interference pulse for 7.5(c), duration and amplitude variation over the duration of the 50 uS pulse and over multiple pulses. Spectrum analyzer is set to linear response.

The requirement of 7.5 is for the pulse to be of constant amplitude (+/-5%) during the pulse. The top trace is a max-hold over 60 seconds, the bottom trace is a min-hold over 60 seconds, and the center trace is one pulse; total scale displayed is approximately 110% of the pulse amplitude. Pulse length is just under 50uS to ensure that the worst-case (minimum pulse length) test condition is exceeded.

Note that absolute level at the spectrum analyzer and displayed above is a consequence of the relative losses between the EUT port of the combining network and the spectrum analyzer port, relative to the multi-carrier generator port.

Clause 7.5(c)

The Base EUT is powered up with the interference conditions of 7.5(c) present. No transmissions from the Base EUT are observed. Note Base transmit power is approximately 20dB above the interference level as displayed on the spectrum analyzer plot, as shown in the non-deferral case with interference below threshold.

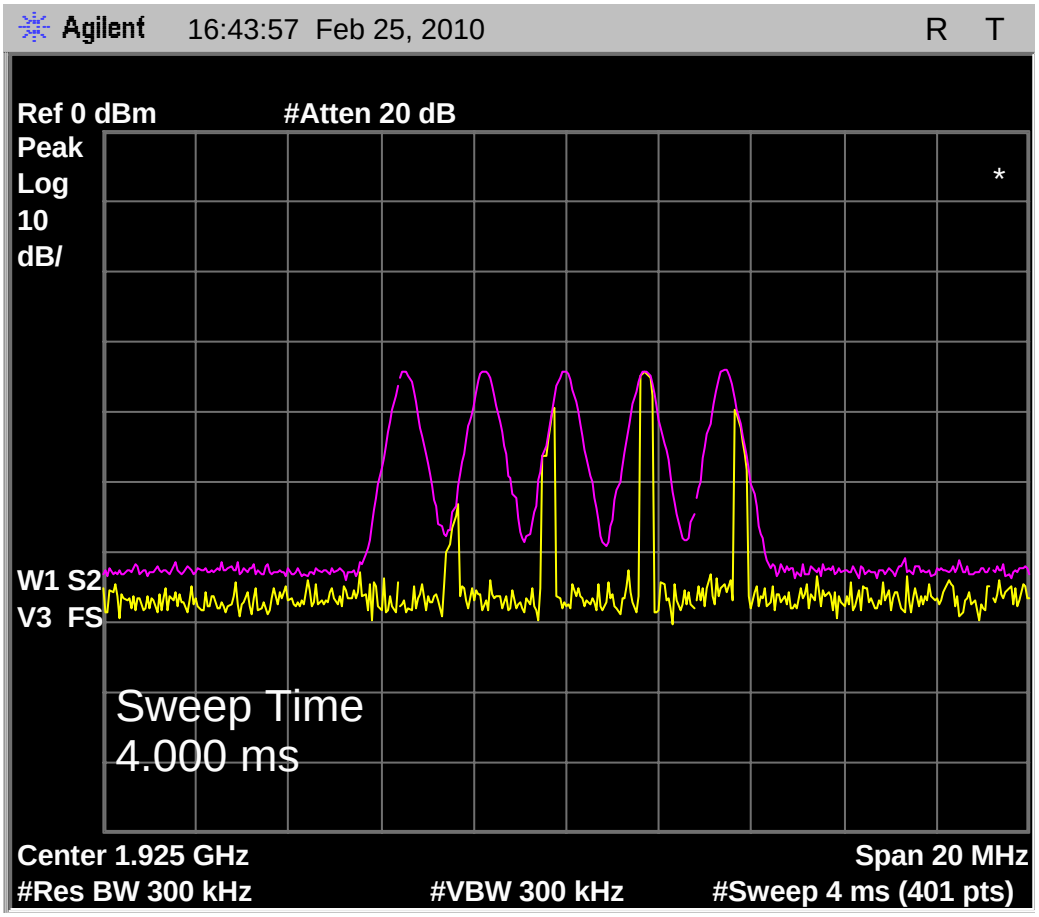

Fig. 53 - Base EUT shown deferring when all channels are blocked with 50uS pulses at $T_U + U_M$. Top trace is detected RF transmissions (no transmissions are detected), bottom trace is headset EUT transmission setup attempt series (as indicated by the software flag for getting-ready-to-transmit attempts) in response to the press of the TALK button, with each pulse of the software transmission-attempt flag then not being followed by the transmissions, due to the access criteria check failure.

The multi-carrier interference generator is then switched to the alternate interference profile, with pulses of level T_U - U_M, or -67.1dBm.

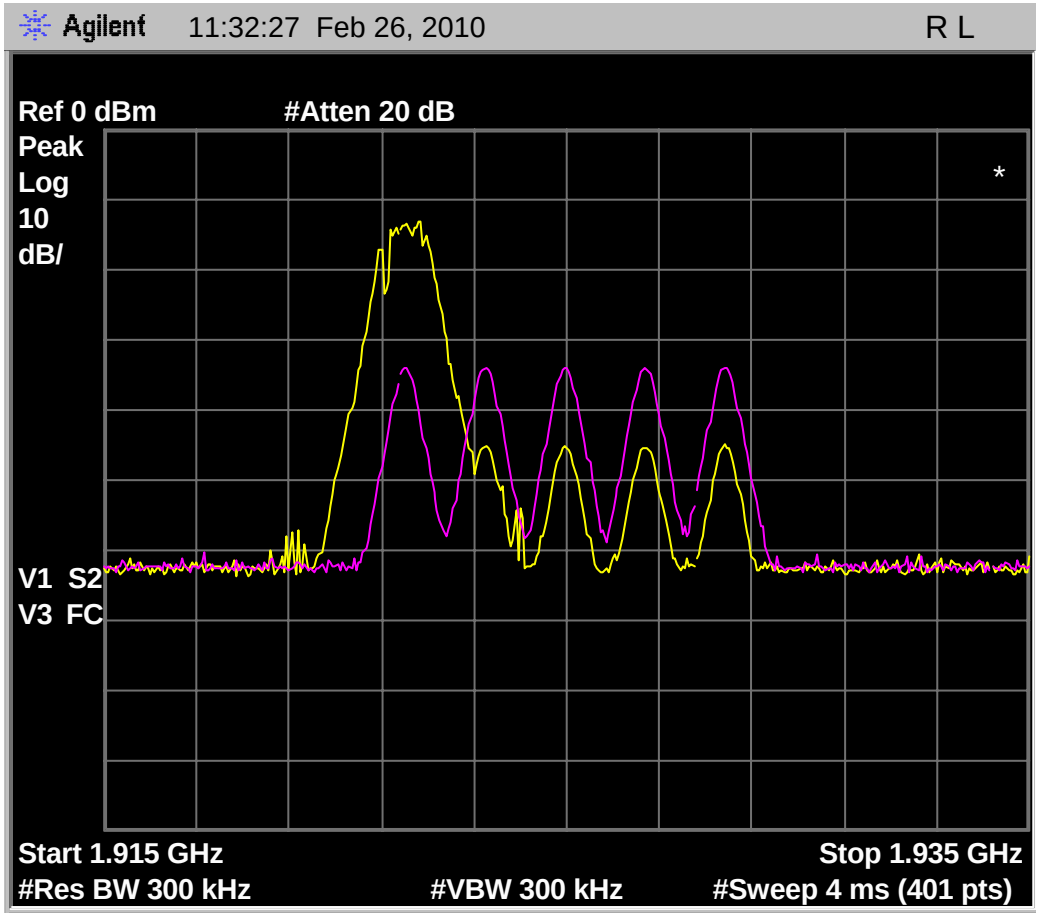

Fig. 54 - Transmit spectrum of 50uS interference pulses, with Base EUT no longer deferring with interference pulses of level T_U - U_M.

The purple trace is the max-hold capture over multiple sweeps of the initial T_U + U_M interference spectrum without EUT transmissions. The yellow trace is a max-hold capture of the interference and the Base EUT's successful transmission of the beacon when the interference is set to T_U - U_M.

Clause 7.5(d)

7.5(d) repeats the deferral test of 7.5(c), except that the transmit pulse length is reduced to 35uS (the allowed longer of the alternatives 35uS and 35*((1.25/B)^0.5), where B = 1.45MHz) and the level is allowed to increase to $T_U + U_M$ + 6dB, or -49.1dBm.

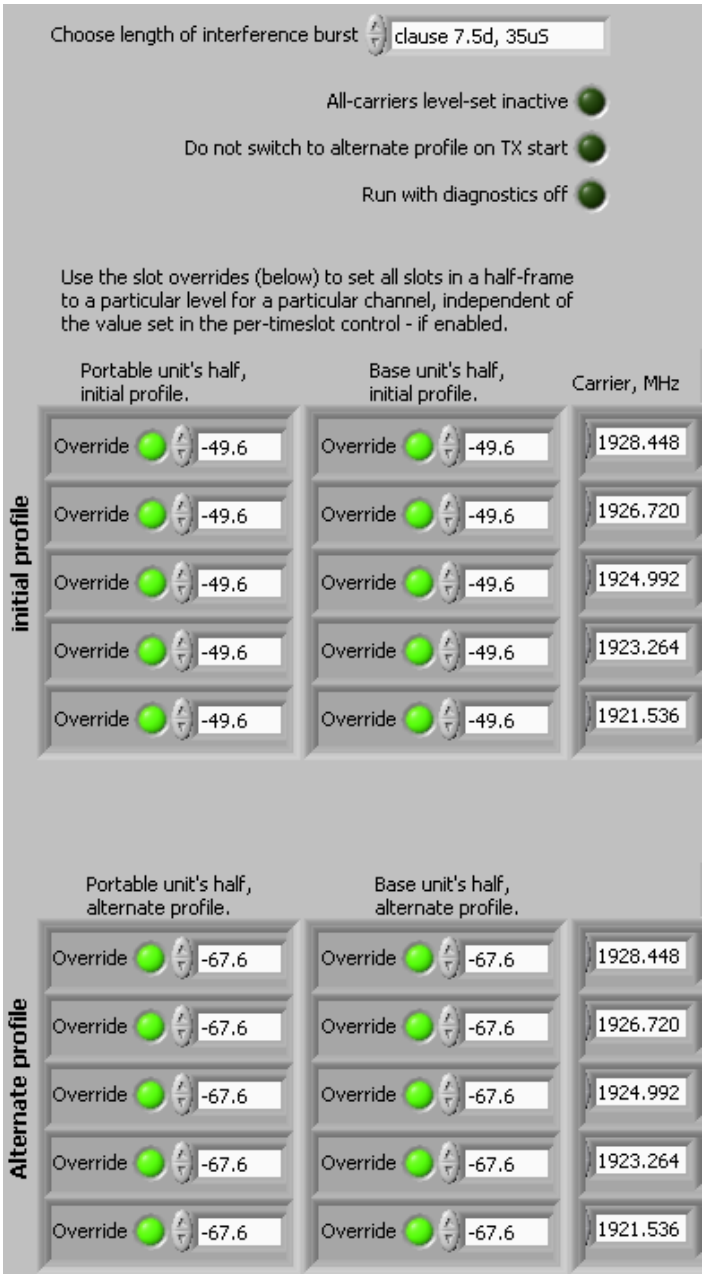

Fig. 55 - The control panel for the multi-carrier interference generator configured to make the interference profile required for 7.5(d).

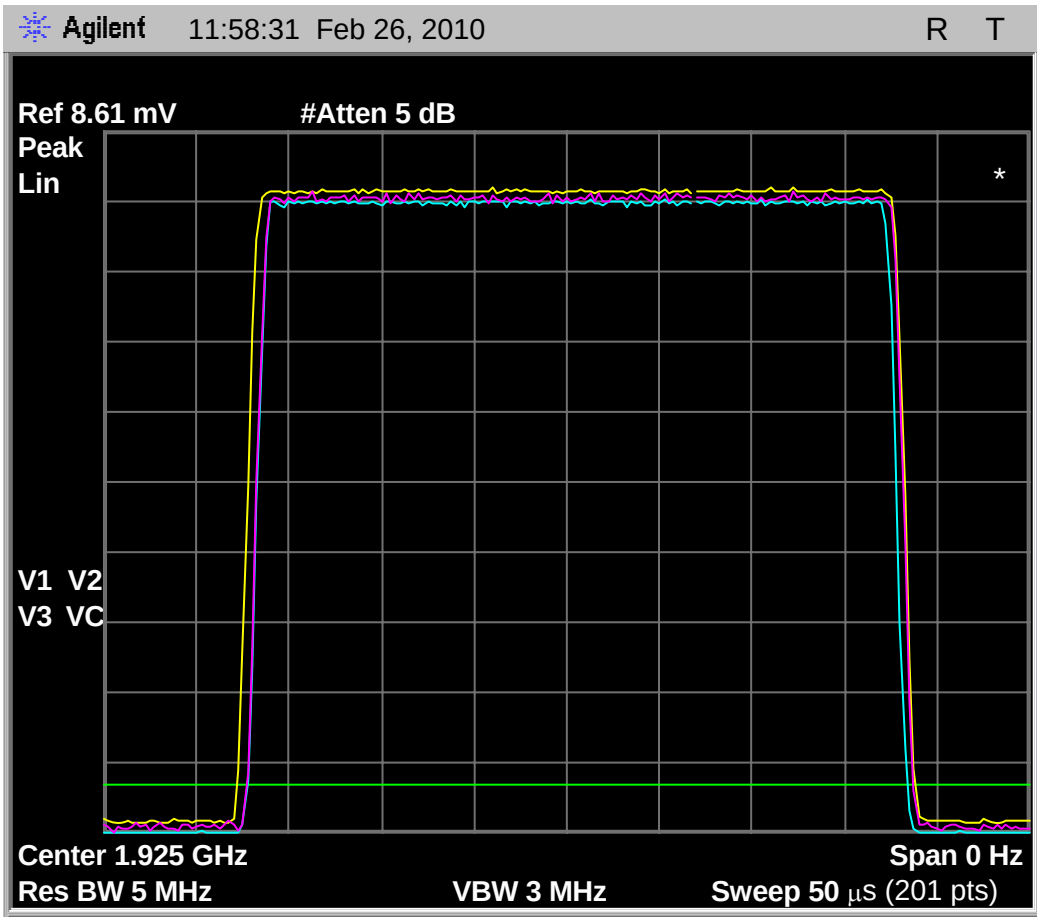

Fig. 56 - 35uS interference pulse for 7.5(d), duration and amplitude variation over the duration of the pulse and over multiple pulses. Spectrum analyzer is set to linear response.

Per-timeslot interference pulse as required for 7.5(d). Note the 6dB increase in level relative to the requirement of 7.5(c), though again level is measured by the spectrum analyzer connected to its port on the splitter/combiner interface to the EUT, and not as at the EUT.

The Base EUT is then powered up with the conditions of 7.5(d) present.

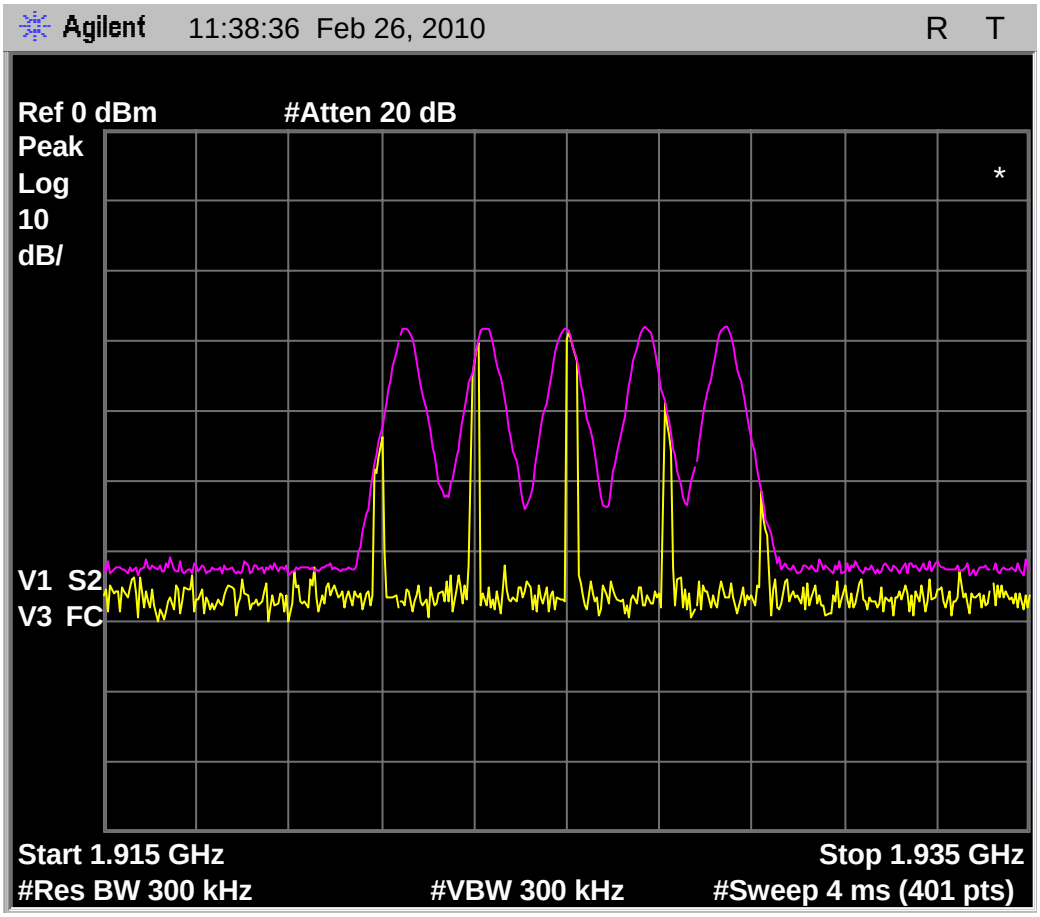

Fig. 57 - Transmit spectrum of 35uS interference pulses in each timeslot for each carrier, with Base EUT deferring due to interference pulses of $T_U + U_M$ + 6dB.

The transmit spectrum and interference spectrum are observed using the E4407B spectrum analyzer. Trigger is free-run, detection is peak, otherwise adjustments are as shown on the screenshot. The purple (top trace) shows the max-hold capture of many pulses as the spectrum analyzer sweeps in free-run, unsynchronized with respect to the multi-carrier generator. The yellow (bottom) trace shows a single sweep of the spectrum analyzer, sweeping past active interference pulses.

No transmissions from the base EUT are observed; the EUT is required to defer when pulses of 35uS are present at level $T_U + U_M$ + 6dB, the EUT does defer, and so passes the requirement of 7.5(d).

V. Tests of clause 8, Base EUT

The Base EUT does not transmit unacknowledged transmit control and signaling information, and so clause 8.1 does not apply.

A. Clause 8.1.1 Access Criteria Test Interval, Base EUT

The test platform, Base EUT and companion headset are configured according to the requirements for implementing the test of 8.1.1(b) by means of test configuration #5, with companion device and interference blocking, base EUT, of section (I) of this document.

The multi-carrier interference generator (PXI-5670) is set to TDMA mode (timeslot-synchronized with the base EUT) on all 5 carriers, and at level -55.6 (Tu+Um), except for timeslot 14 on 1924.992MHz, which has no interference. The transmit spectrum and interference spectrum are observed using the E4407B spectrum analyzer. Trigger is external, synchronized with the base EUT frame sync pulse.

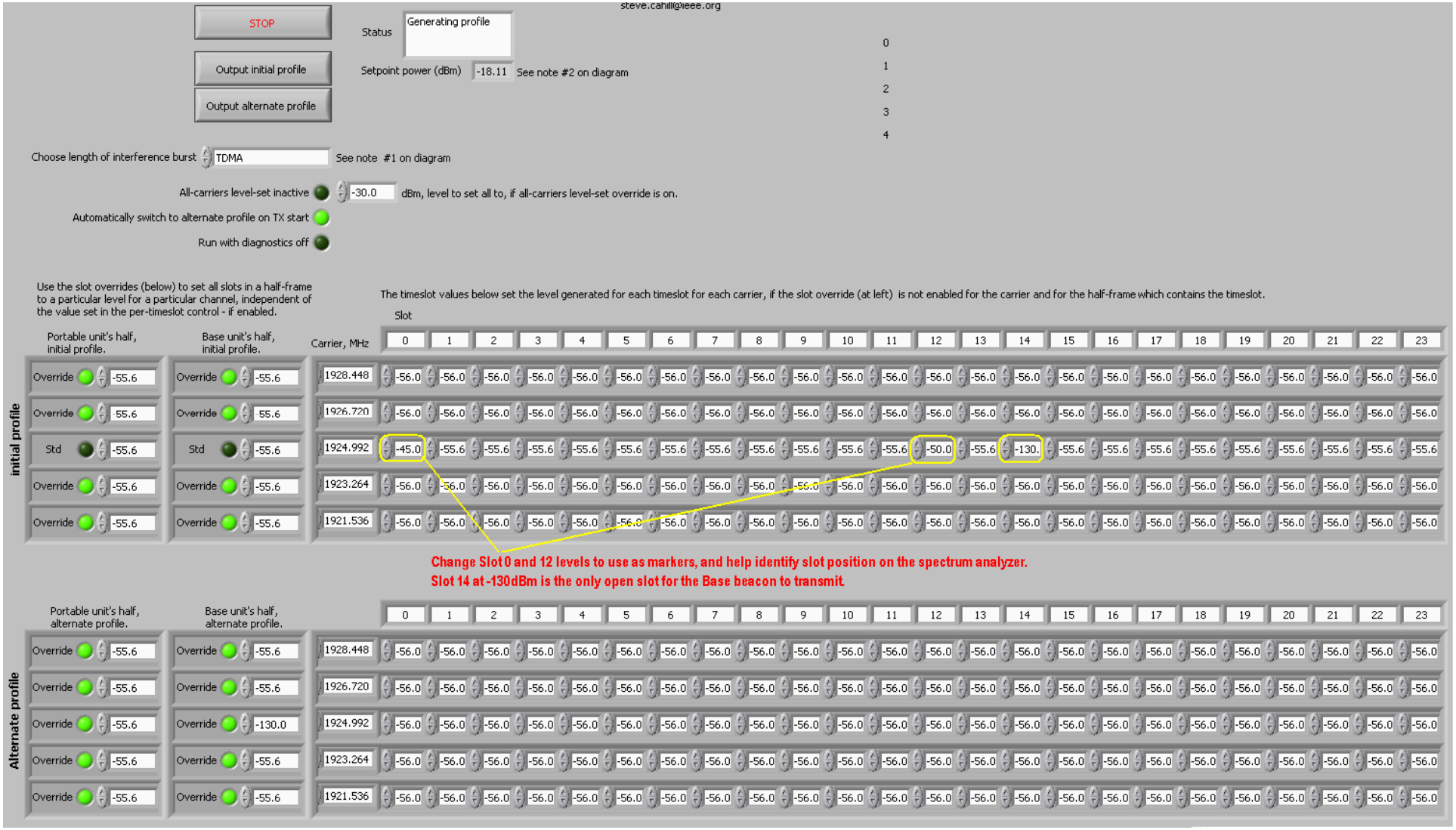

Fig. 58 - Multi-carrier interference generator configured according to the requirements for testing the Base EUT per 8.1.1, one slot opened for beacon transmit, see next spectrum analyzer plot.

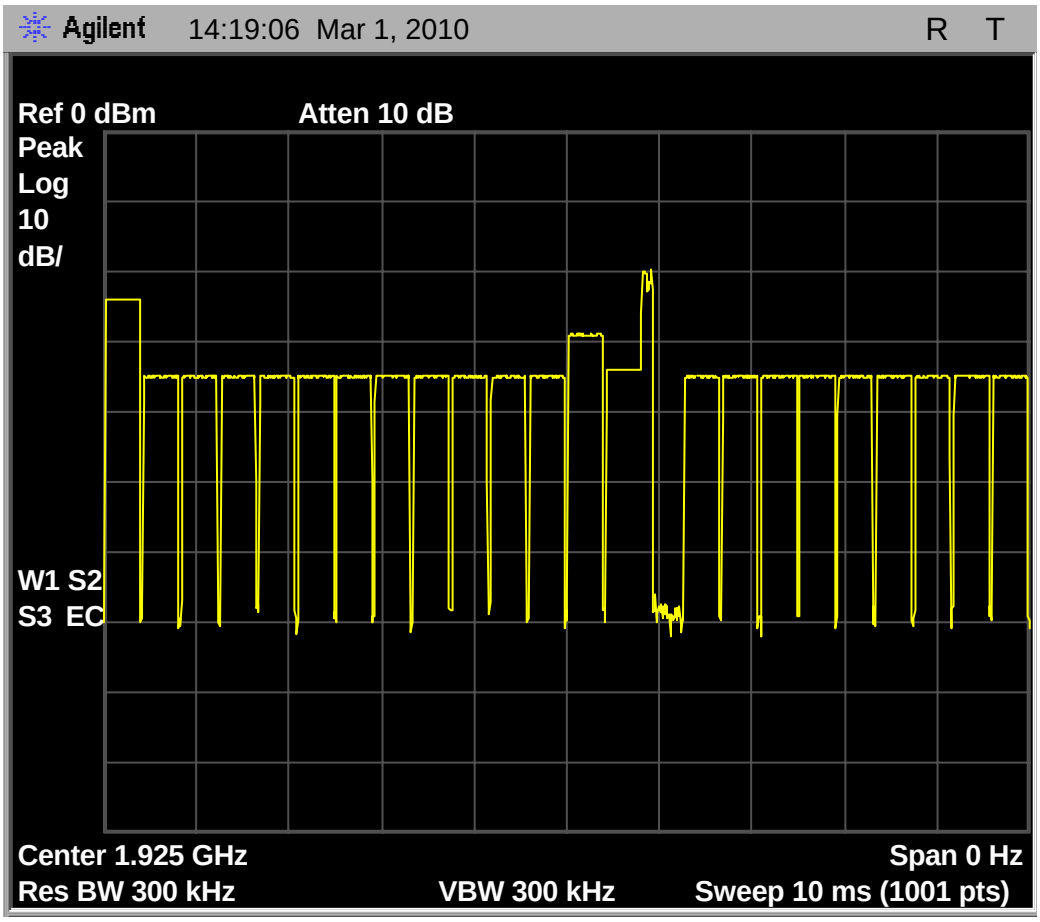

Fig. 59 – Zero-span (single frequency receiver mode) sweep of TDMA interference on carrier at 1924.993MHz, f_1, with Base EUT beacon transmissions in the single unblocked timeslot.

Carrier has a minimum of -55.6dBm (T_U+U_M) signal present in all TDMA timeslots on all carriers except slot 14 of 1924.992MHz. The interference was raised on slots 0 and 12 to help identify slot positions.

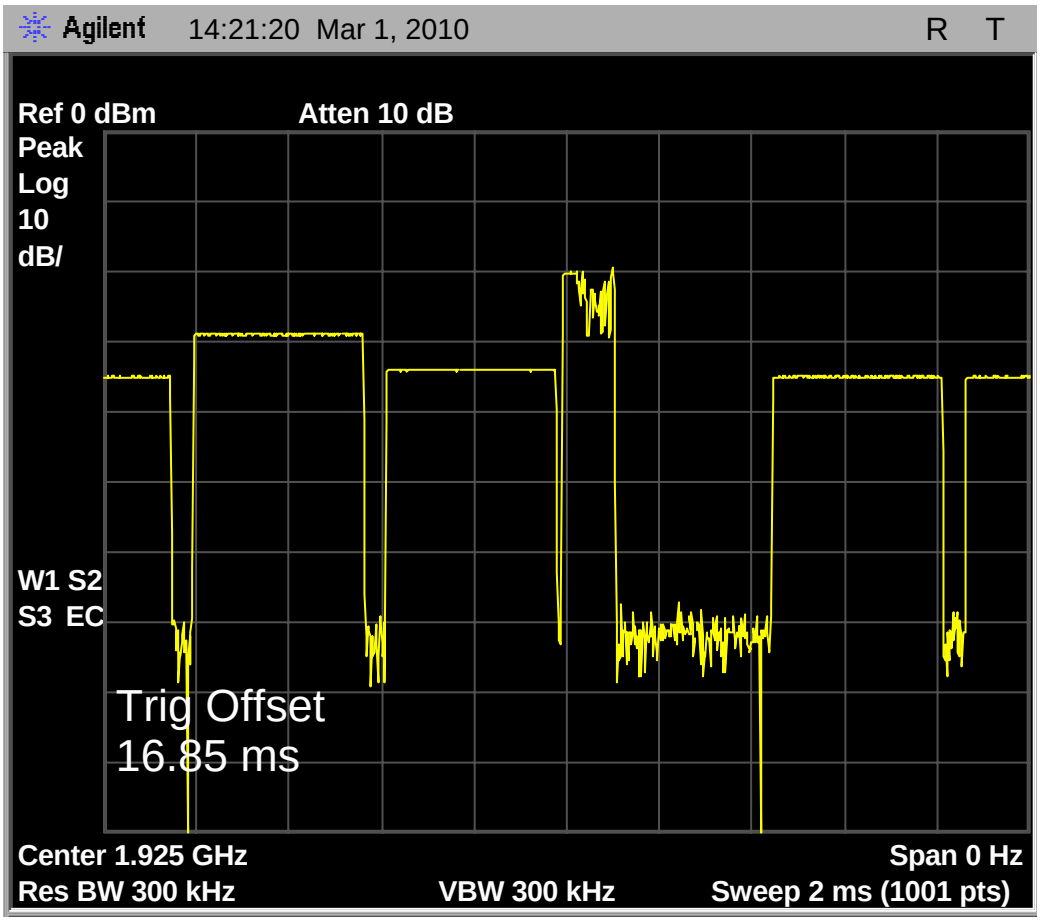

Fig. 60 – Zero-span (single frequency receiver mode) sweep of TDMA interference eon carrier at 1924.993MHz, f_1, with Base EUT beacon transmissions in single open timeslot.

The yellow trace is the interference and the Base EUT transmission in the interference free timeslot. The blue trace is the interference in the absence of the Base EUT transmissions, showing the open timeslot. The sweep images the open timeslot, the two timeslots on either side of it, and portions of the next adjacent timeslots.

The Base EUT transmits only on the unblocked timeslot on f_1, as required.

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The Base EUT is powered up, and an interval of time is allowed to permit the Base to begin beacon transmission.

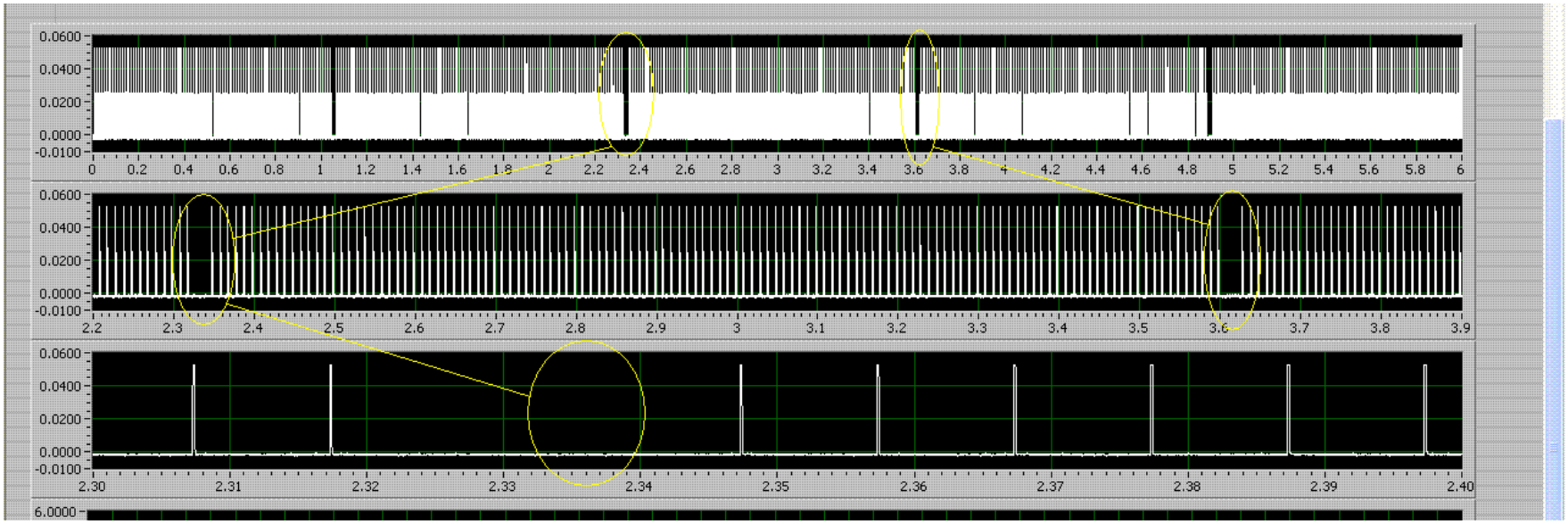

Fig. 61 – Capture of demodulated transmissions of Base EUT signaling transmissions; the signal present at the RF detector output. The resolution of detail may require viewing this document in electronic format at 150% resolution. Irreducible image artifacts occur in the top trace due to pixilation in the original screen capture.

Top trace is 6 seconds of transmissions, measuring the interval between pauses by the Base EUT to repeat the access criteria check requirement of 8.1.1. Five intervals are shown.

The middle trace is a zoom-in on the top trace showing one interval between pauses by the Base EUT with resolution sufficient to measure the interval accurately; pauses occur at 1.28 second intervals, meeting the 30 second maximum requirement.

The bottom trace is a further zoom-in showing a single pause and the once-per-frame transmissions in frames adjacent to the pause.
Sample rate was 200k samples per second.

The Base EUT uses for transmissions of the control and signaling channel the only open timeslot on f_1 when all other timeslots on f_1 and the other carriers are blocked.

The Base EUT pauses in its transmissions of the control and signaling channel to repeat the access criteria every 1.28 seconds, meeting the requirement that it do so at least as often as every 30 seconds.

Accordingly, the Base EUT meets the requirements of 8.1.1.

~~B.~~Clause 8.1.2 Access Criteria Test (47CFR15.323(c)6) not Implemented, Base EUT

This test is for devices which do not take advantage of the option to implement 47CFR15.323(c)(6). The purpose of this test is to demonstrate that the Base EUT moves the signaling and control transmissions to a new carrier meeting the access criteria, if the access criteria are no longer met when the Base EUT pauses and checks the access criteria on the current time and frequency combination.

The test platform, Base EUT and companion headset are configured according to the requirements for implementing the test of 8.1.2(b) by means of test configuration #5, with companion device and interference blocking, Base EUT, of section (I) of this document.

The multi-carrier interference generator (PXI-5670) is set to TDMA mode (timeslot-synchronized with the Base EUT) with initial interference profile active, with all carriers at level -55.6dBm ($T_U + U_M$) and so blocked except 1923.264MHz, f_1, which is set to
-67.6dBm ($T_U - U_M$) and so unblocked. The alternate interference profile has all carriers at level -55.6dBm except 1924.992MHz, f_2 which is set to -67.6dBm.

The Base EUT is then powered up. The transmit spectrum and interference spectrum are observed using the E4407B spectrum analyzer. Trigger is external, synchronized with the Base EUT frame sync pulse. The spectrum analyzer resolution bandwidth is configured to 1MHZ RBW so that the transmit signal can b determined to have changed carriers to an adjacent carrier; narrow enough to have selectivity by carrier, but not so narrow as to completely attenuate the transmissions on the adjacent channel when the Base EUT changes to the adjacent channel.

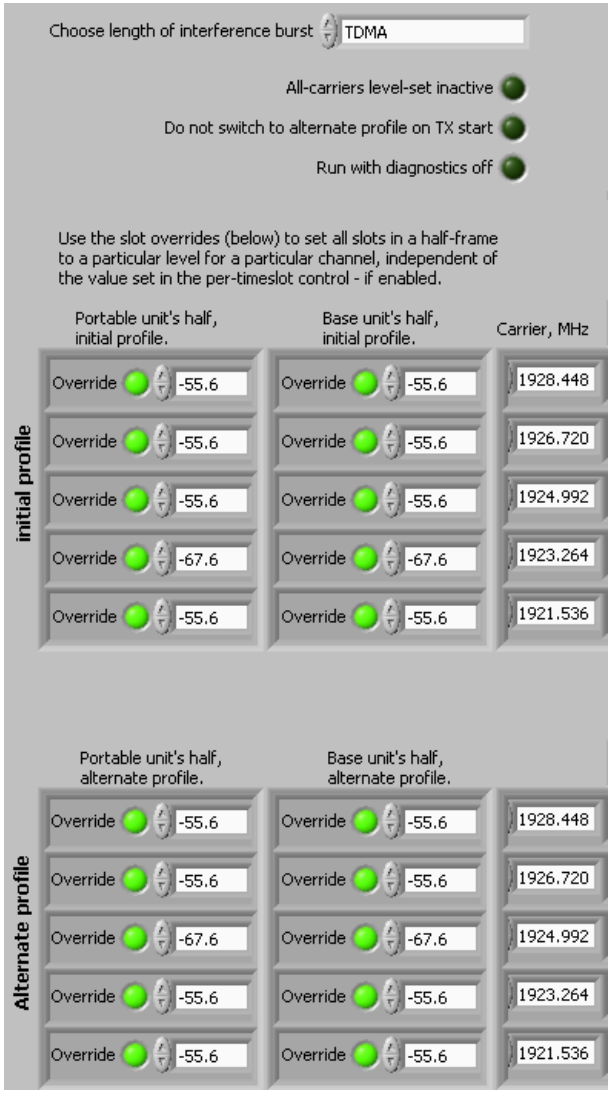

Fig. 62 – Control panel for the multi-carrier interference generator for the test of 8.1.2.

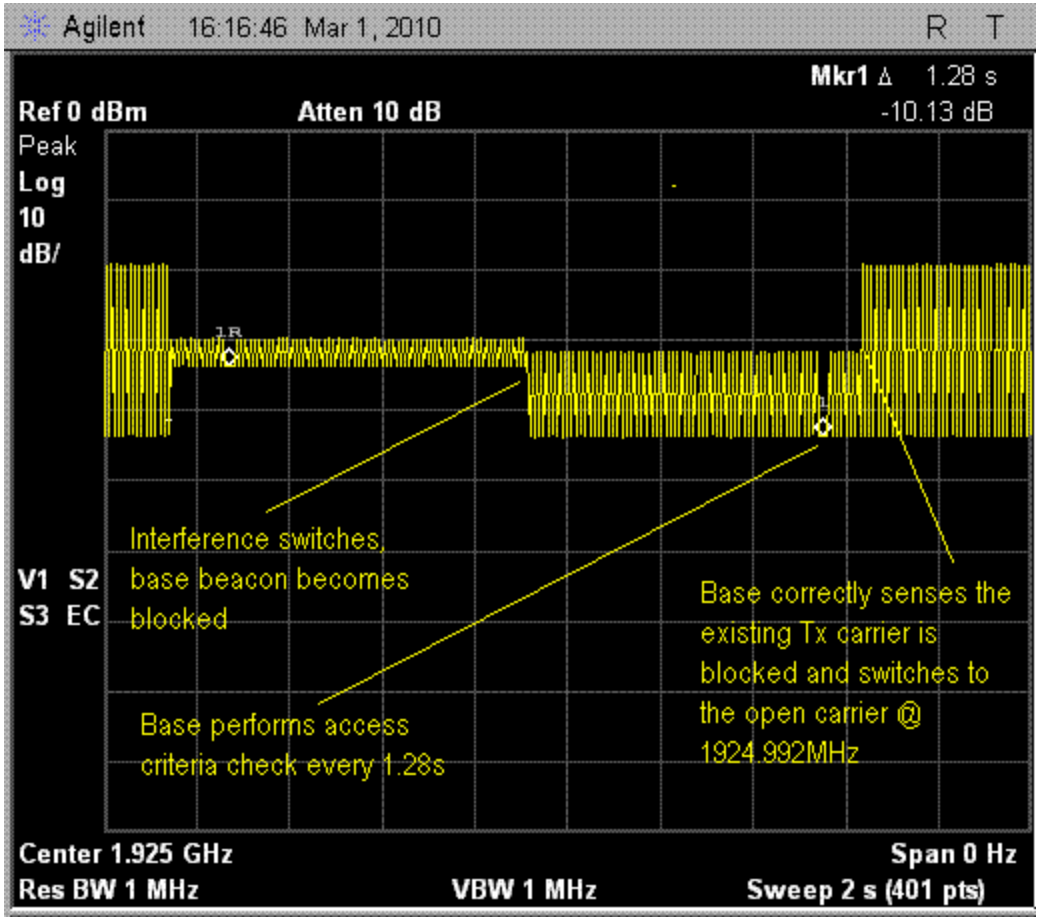

Fig. 63 – Zero span spectrum analyzer display of Base EUT pausing the transmission of signaling to check access criteria, finding the channel no longer meets the access criteria, and resuming transmissions on an alternate carrier.

The sweep starts with the Base EUT transmitting signaling information (the Beacon) on 1923.264MHz.
The interference switches to block the channel that is being used by the Base EUT for transmission.
The Base EUT (is allowed and) continues to transmit on the blocked channel until the next access criteria check performed every 1.28 seconds (spec is every 30 seconds maximum).
Base EUT determines the existing channel is blocked and moves to the open channel, 1924.992MHz.

The Base EUT moves its transmissions to the opened channel for which the access criteria are met, if it finds that the access criteria are not met in the timeslot presently used for signaling transmissions. Accordingly, the Base EUT meets the requirements of 8.1.2.

~~C.~~B. *Clause 8.2.1 Acknowledgement, Base EUT*

This test is to demonstrate that the Base EUT stops communications channel transmissions if acknowledgements stop. The Base EUT does not have a button to request a link be initiated, but the companion headset device is the only one that can actually bring up the link, so the portion of the 8.2.1 test that applies is only 8.2.1(c), in which transmissions should cease within 30 seconds if the Base stops receiving transmissions from the headset.

The test platform, Base EUT and companion headset are configured according to the requirements for implementing the test of 8.2.1(c) by means of test configuration #5, with companion device and interference blocking, Base EUT, of section (I) of this document, except the attenuation between the headset (the companion device) and the combining network is 50dB instead of 30dB.

The multi-carrier interference generator (PXI-5670) is set to CW mode with the initial interference profile active, with all carriers at level -55.6dBm ($T_U + U_M$) except carrier at 1924.992MHz, f_1, which is set to -130dBm. The alternate interference profile has all carriers at level -55.6dBm, so that all channels will become blocked when the interference profile is switched, except for the carrier at 1924.992MHz, f_1, which is set to -67.6dBm ($T_U - U_M$), so unblocked. The initial profile allows a normal communications link to be brought up. The alternate profile has interference on f_1, that is still below the Base threshold, but is high enough to prevent the Base EUT from hearing the attenuated headset transmissions when the alternate interference profile becomes active. A spectrum analyzer in zero span mode was used to determine the timing of when the active communications channel was brought down by the Base, and normal beacon transmission re-started (as the interference is below the threshold). Note: to ensure that the Base could not understand the headset transmit communications the headset talk button was pressed to see if the link could be brought down using the headset talk button, prior to performing this test. Signal levels were also monitored on the spectrum analyzer.

The Base EUT is then powered up. The TALK button on the headset is pressed and a communications channel established on f_1. Then the multi-carrier generator is switched to the alternate interference profile, and the Base is observed to terminate the communications channel prior to the allowed 30 seconds.

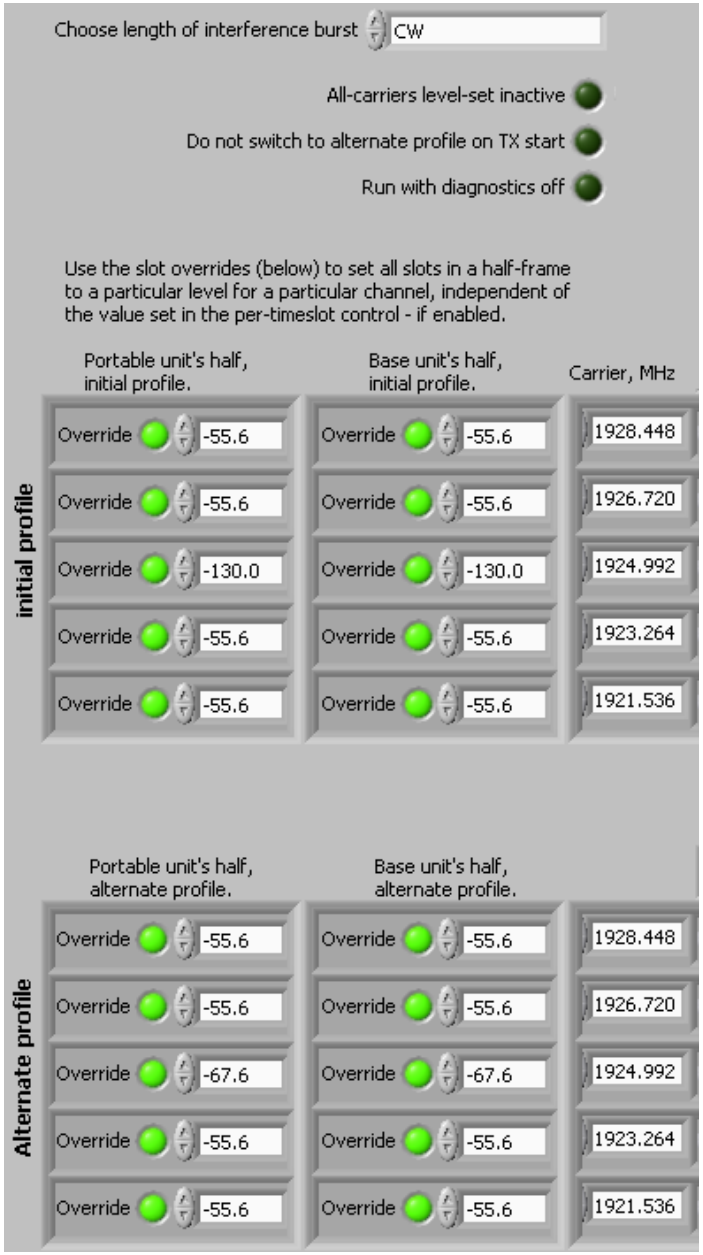

Fig. 64 - PXI-5670 multi-carrier interference generator control panel for the test of 8.2.1(c), for the Base EUT.

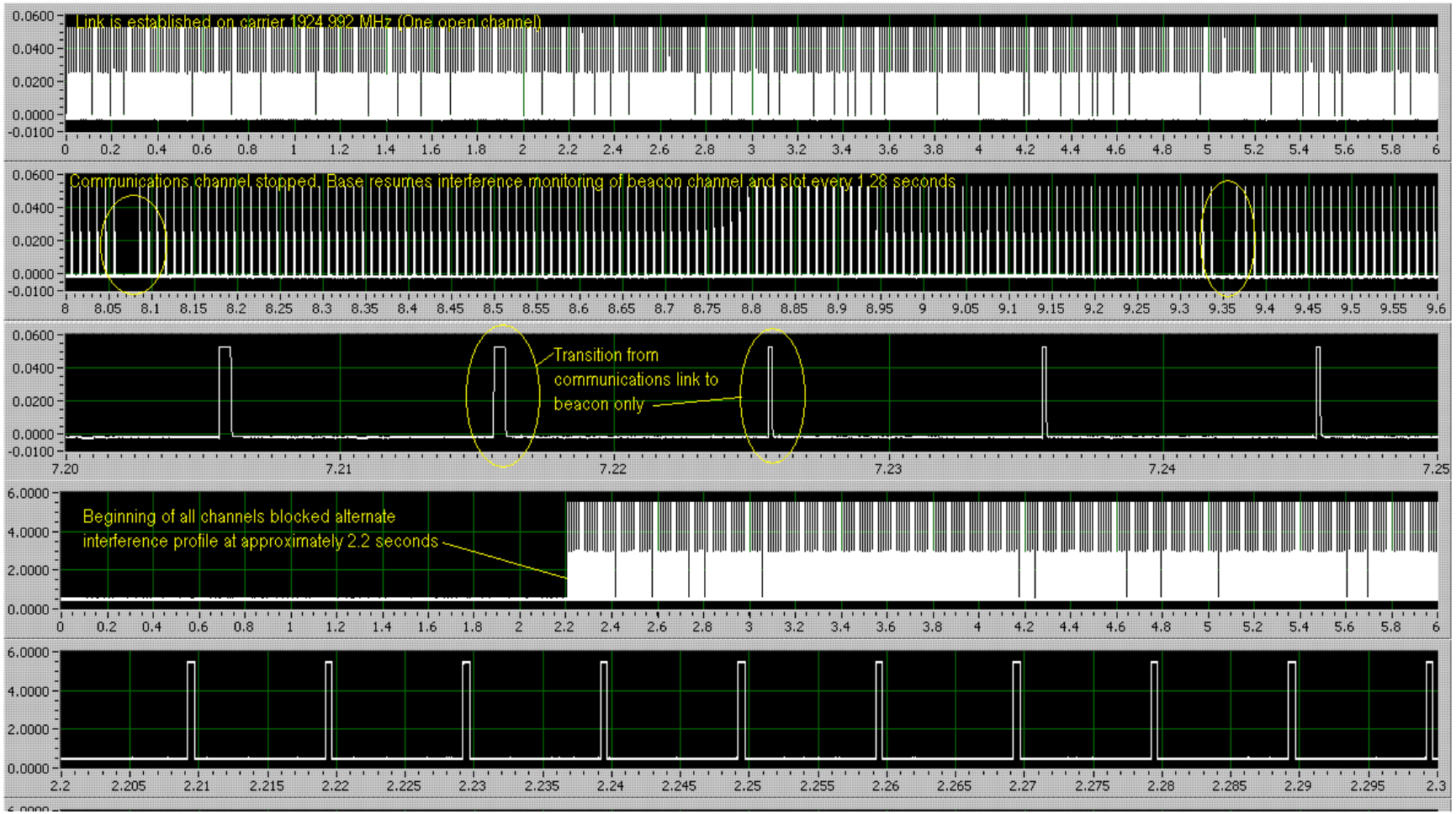

Fig. 65 – Capture of Base EUT transmission changing from communications link to beacon only.

RF detector (top trace) and pre-transmit flag (bottom trace) capture of Base EUT as the Base EUT goes from unblocked acknowledgement from the HS companion device, to blocked acknowledgement.

The top trace shows the normal RF detector output of the Base EUT in a communications link. After the link was established the interference profile was switched from initial unblocked channel, to the alternate interference profile of -67.6dBm which is still below the blocked transmit threshold (T_U-U_M), but blocks the Base from hearing the headset acknowledgements. The interference profile switch took place at approximately 2.2 seconds. The third trace from the top shows that at approximately 8.05 seconds the Base EUT discontinued the communications link, and transitioned back to transmitting the beacon (since the carrier is not blocked at -67.6dBm). The beacon transmission width is not as long as the communications transmit width. The second trace from the top also confirms that the Base EUT resumed normal operation with the beacon being brought down in order to check the interference level.

The Base EUT must cease communications channel transmissions within 30 seconds if acknowledgements from the companion device are lost, for an established communications channel. In the test shown, the Base ceases communications channel transmissions at t = 7.215seconds which is approximately 5 seconds after acknowledgements from the companion's device are lost, and so the Base EUT meets the requirements of 8.2.1(c).

~~D.C.~~ *Clause 8.2.2 Transmission duration, Base EUT*

Not applicable. The headset companion device performs the interference level checking once a communications link has been established. But to demonstrate the Base will not continue to transmit its beacon if all channels are blocked the Base EUT was powered up with one channel opened (no interference), and then the interference profile was switched to block all channels.

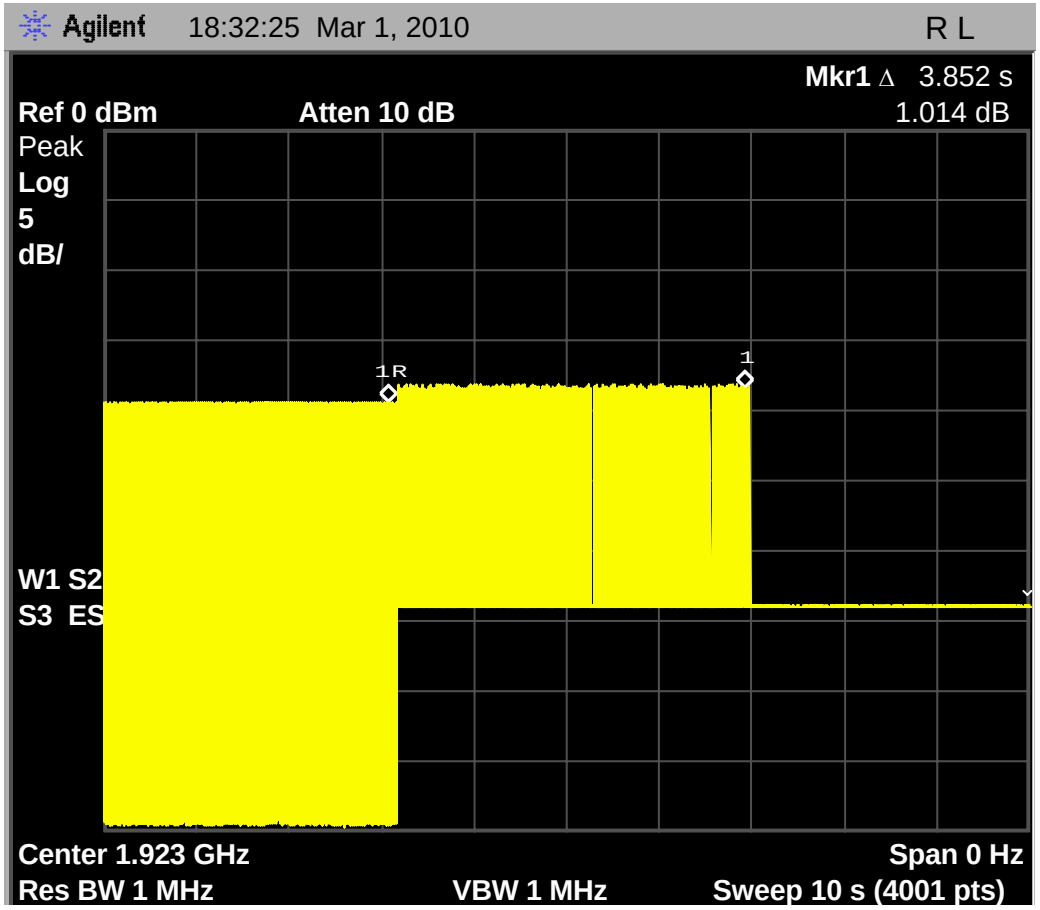

Fig. 66 – The spectrum analyzer zero span screen capture shows upon interference switch (at marker 1R), which now interference blocks the previously unblocked channel of 1923.264MHz, the beacon remains up, but prior to 30 seconds from the blocked interference the Base EUT beacon is brought down, since there are no open channels to move the beacon.

VI. Appendix A WBM (Wide Band Mode), Base EUT

Additional testing was performed to cover the audio Wide Band Mode (WBM) optional configuration of the "premium" variant of the D100 system. The WBM allows the system to establish a link in a wideband audio mode that reduces the number of traffic channels from 60 to 30 (due to the increase in number of timeslots required to send a traffic packet from one time slot in normal mode to 1.5 timeslots in CAT-iq WBM). In this implementation (Base with companion headset) only the headset can initiate a WBM traffic link, so the access threshold check does not effect the Base's operation. The Base only has to perform the access threshold check for its beacon only, as tested in the main body clause 7 and 8 of this report. Although the access criteria does not effect the Base, the Base still does communicate using the double slot traffic link and a few tests were repeated to ensure compliance.

The following tests were used as audits that demonstrate functionality did not change in WBM.

Clause 6 Power, emissions bandwidth, and out of band emissions were spot checked in WBM to ensure near identical performance to normal mode operation.

Clause 7 and 8: additional tests were not required; the Base always does the threshold access check for worst case maximum power mode prior to the start of beacon transmission, and cannot initiate a WBM traffic link.

A. Clause 6.1.2 Peak transmit power, Base EUT in WBM

The Base EUT is configured as described in the introduction for the tests of clause 6.1. Only the mid carrier was re-tested in WBM to confirm the output power is the same as normal mode prior to WBM compliance testing. Note the burst time (sweep time of the spectrum analyzer had to be doubled, but the output power difference is within expected repeatability.

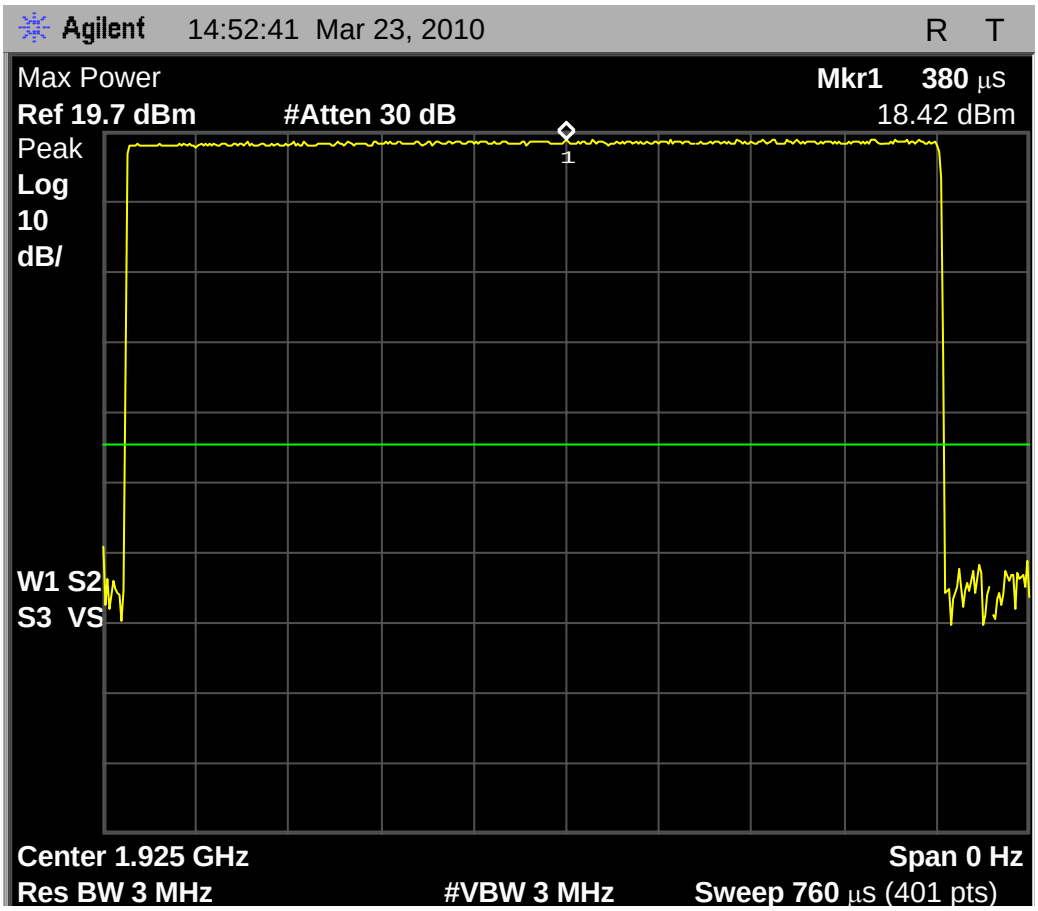

Fig. 67 - Base EUT transmit power received by spectrum analyzer configured according to the requirements of clause 6.1.2 of C63.17-2006, mid carrier. Maximum observed transmit power is 18.42 dBm in NBM; output power for normal mode on mid channel was 18.42dBm (Pmax = 19.5 dBm).

B. Clause 6.1.3 Emission bandwidth B, Base EUT in WBM

The Base EUT is configured as described in the introduction for the tests of clause 6.1.3 Only the mid carrier was re-tested in WBM to confirm the emissions BW is similar as normal mode, prior to WBM compliance testing.

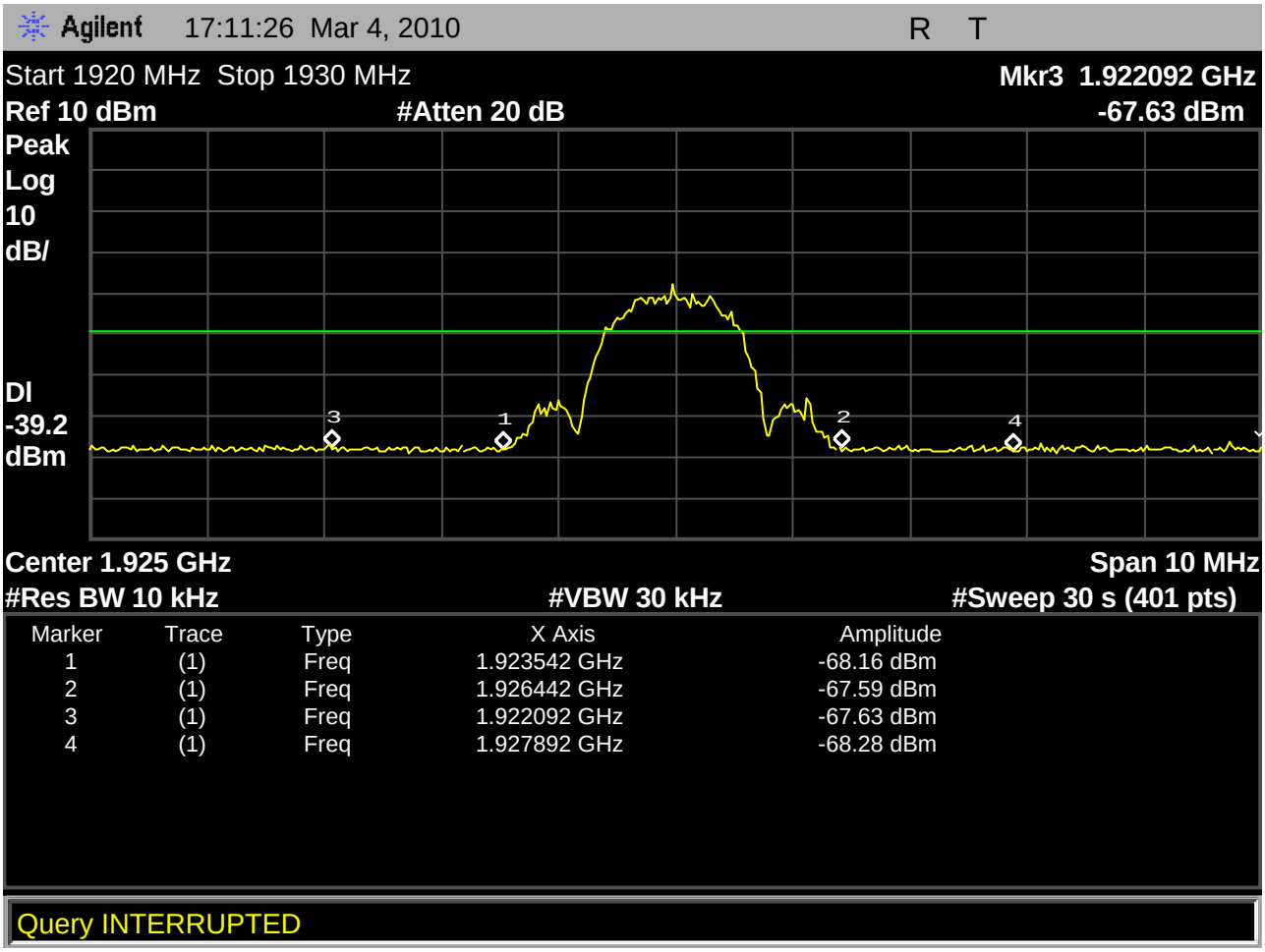

Fig. 68 - Base EUT in WBM, 1.45MHz (maximum of 2.5MHz, minimum of 50kHz) emissions bandwidth vs. 1.45MHz in normal mode.

Base EUT passes the emissions BW, and is unchanged in WBM vs. normal mode.

C. Clause 6.1.6 Emissions, Base EUT in WBM maximum power

The Base EUT is configured as described in the introduction for the tests of clause 6.1. Only the low carrier was re-tested in WBM to confirm the harmonics will not change with the WBM setting.

Harmonics levels were re-tested for WBM maximum power settings and the 2nd, 3rd, 4th, and 5th harmonic levels had less than 0.3dB difference between normal mode (1 slot) and WBM (2 slot) traffic channels; the switch to WBM had no effect on harmonic output. The large change in harmonic output level is due to output power level, and the maximum output power worst case. See the main body of this report, Clause 6.1 test results, and Appendix B where a harmonic scan was performed at minimum power output in WBM.

VII. Appendix B Power Control-minimum output power, Base EUT

Additional testing was performed to cover the ability of the Base EUT to adjust its RF power adaptively as needed to maintain the best possible audio connection while outputting the least amount of interference for other users. The power control feature is set by the Base EUT device to a maximum adaptive power control, a medium adaptive power control, or a fixed level.

The following tests were used as an audit for functionality that should not change in WBM.

Clause 6: Emissions bandwidth was tested in low power mode to verify EM BW does not change with the low output power in a WBM traffic communications link. An out of band emissions check was also performed to verify harmonics levels are better than in maximum output power mode.

Clause 7 and 8: additional tests were not required; the Base always uses the upper threshold access check for maximum output power prior to the start of beacon transmission. Note the Base cannot initiate a WBM traffic link.

A. Clause 6.1.3 Emission bandwidth, Base EUT, in minimum power mode and WBM

The Base EUT is configured as described in the introduction for the tests of clause 6.1. The Base EUT was placed in low power and wide band audio modes.

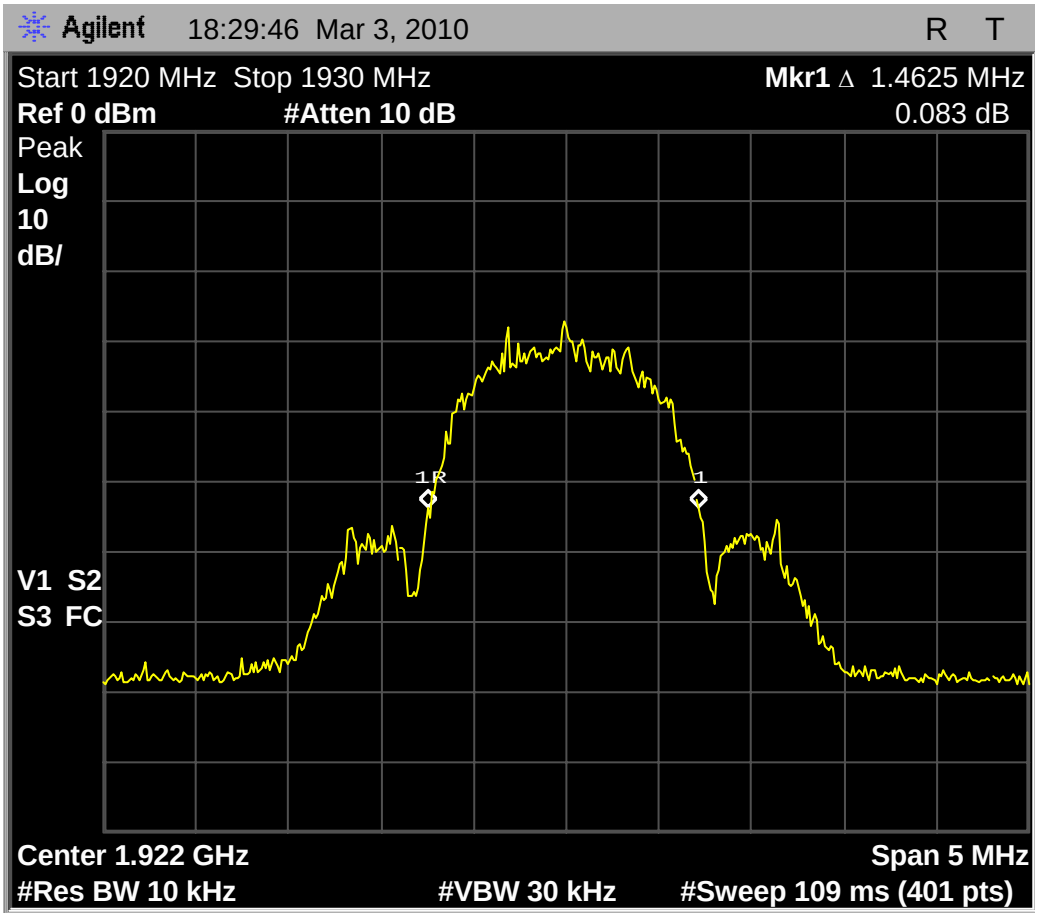

Fig. 69 - Base EUT in low power WBM, 1.46MHz emissions bandwidth on low carrier; vs. 1.44MHz in max power normal mode.

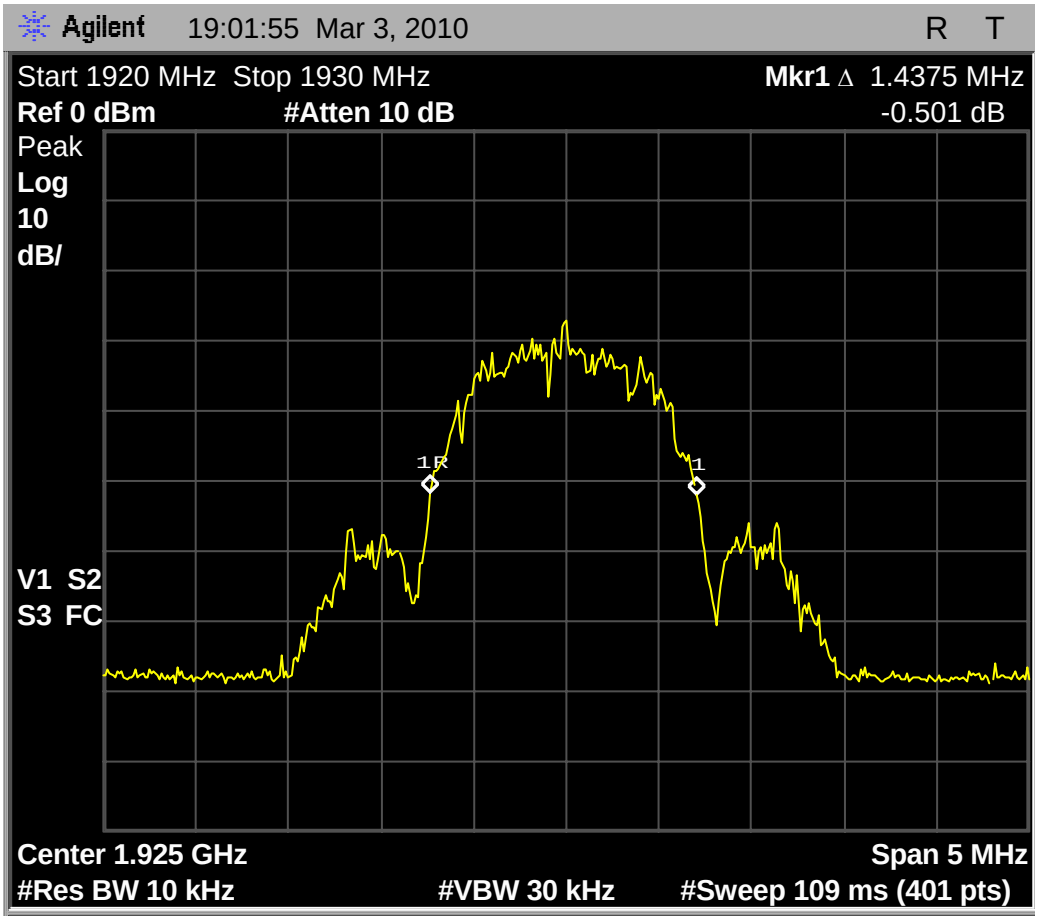

Fig. 70 - Base EUT in low power WBM, 1.44MHz emissions bandwidth on mid carrier vs. 1.45MHz in max power normal mode.

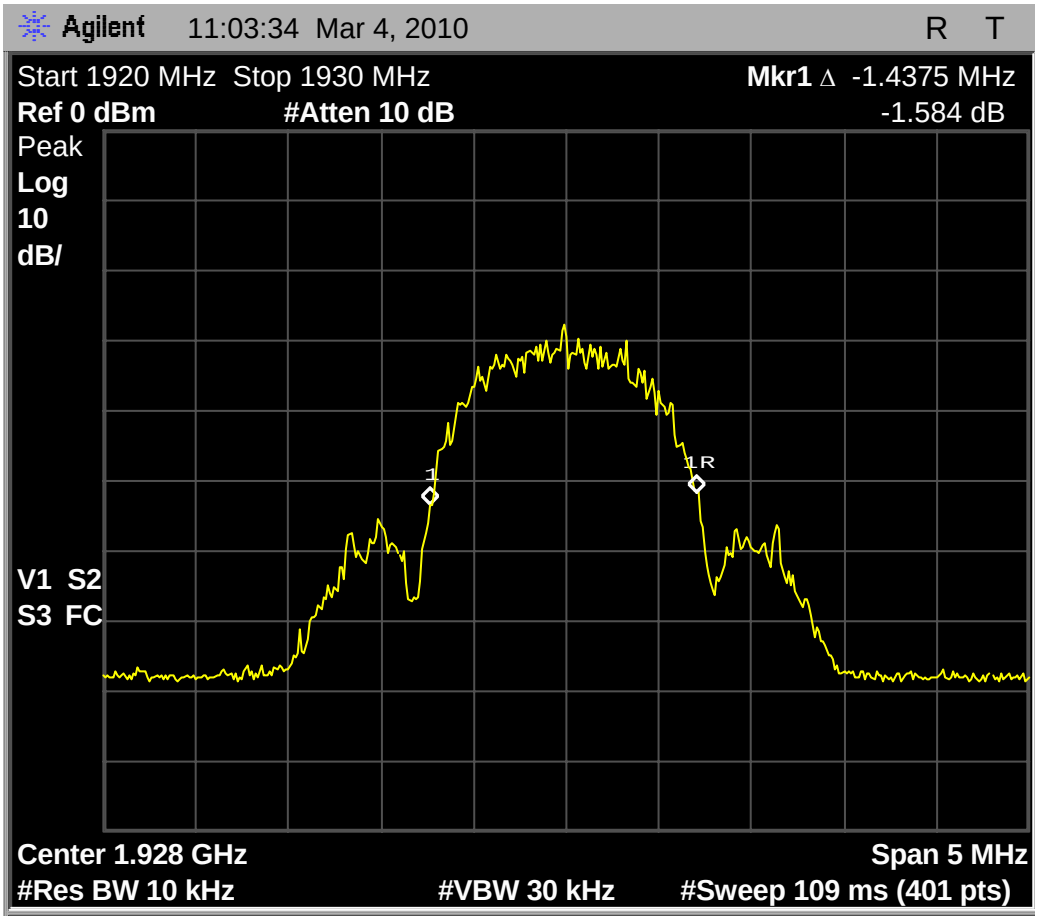

Fig. 71 - Base EUT in low power WBM, 1.44MHz emissions bandwidth on high carrier vs. 1.45MHz in max power normal mode.

There is no significant difference in the emissions bandwidth measured in low power and WBM of 1.45MHz vs. 1.45MHz in narrowband mode.

B. Clause 6.1.6 Emissions, Base EUT

The Base EUT is configured as described in the introduction for the tests of clause 6.1.

6.1.6.1 Out-of-band emissions, Base EUT was repeated in WBM and minimum power and only the second harmonic requires a measurement with the specified resolution bandwidth, all other harmonics were well below specification even when measured in the increased resolution bandwidth of 300kHz vs. the required 10kHz, see section 6.1.6 of main report.

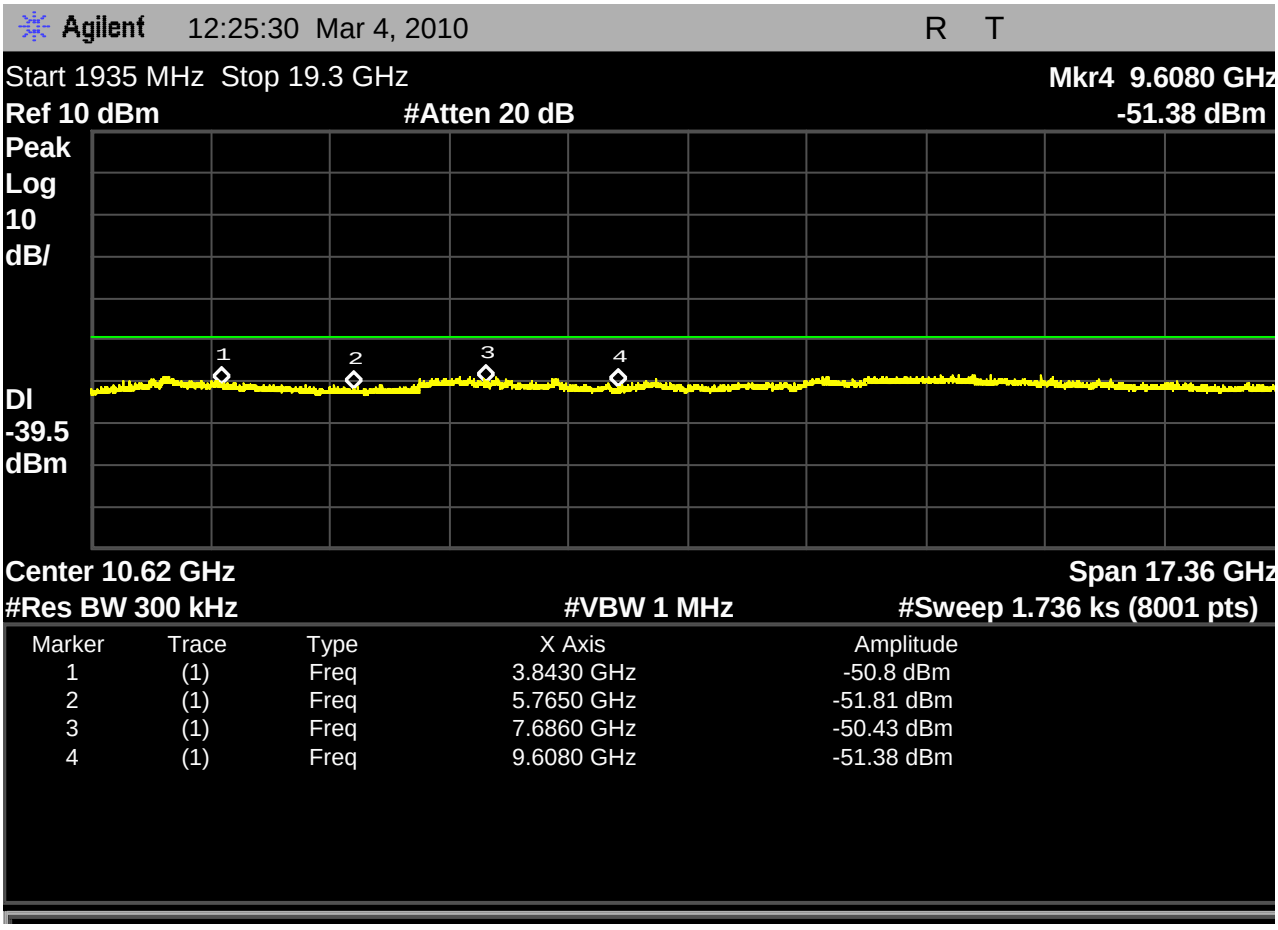

Fig. 72 - - Base EUT in minimum power WBM on low carrier. All harmonics are below specification in minimum power, even when measured in the 300kHz (greater) resolution bandwidth.

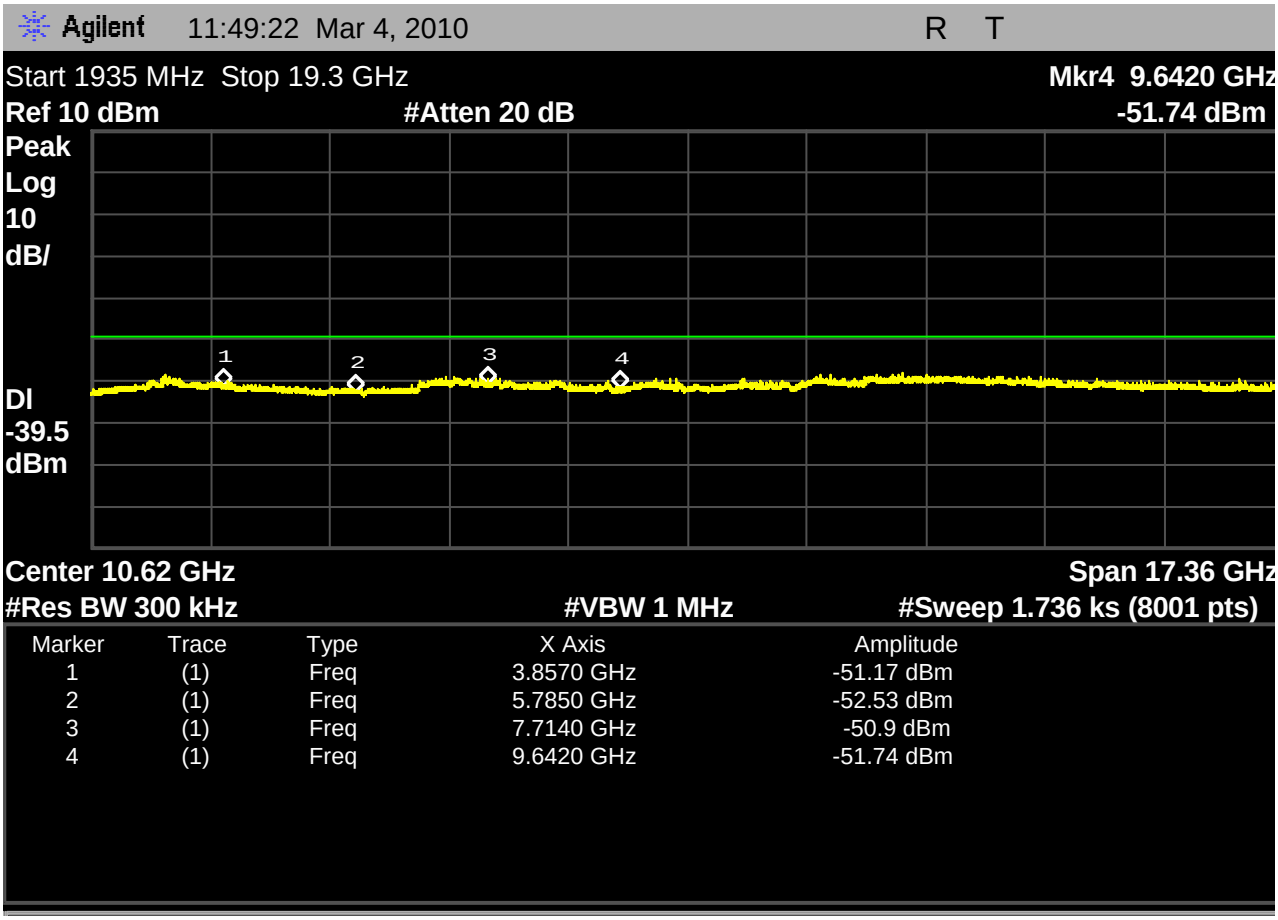

Fig. 73 - Base EUT in minimum power WBM on high carrier. All harmonics are below specification in minimum power, even when measured in the 300kHz (greater) resolution bandwidth.

Base EUT passes the emissions specifications with worst case harmonics in maximum power mode; see main body of report section 6.1.