Exhibit #11

Conducted RF and spectral etiquette measurements to support the certification of the CA12CD Base and CA12CD Remote, AL8CA12CDXXXX and AL8CA12CDYYYY.

Plantronics, Ron Meck, August 23, 2006.

Contents:

I) Background

I-A. EUT Description

The Plantronics Model CA12CD is a cordless push-to-talk (PTT) headset adapter made to provide wireless communications and PTT functionality for dispatch operations. The system consists of a base unit that interfaces to a dispatch console communication system, and a remote unit with PTT that communicates with the base station. The remote unit has an "Ultra" style, quick disconnect connector, which attaches to a Plantronics "H" top headset that is worn by the user. The base unit provides a docking cradle for charging the remote unit and a spare battery, and is provided with an AC power adapter. Both the remote unit and the base unit are intentional radiators, designed in accordance with the requirements of 47CFR15 subpart D.

The specific units tested were base unit #31 and headset #32.

I-B. Manufacturer's Attestations, Mandatory Declarations and Descriptions

The CA12CD Remote Unit and CA12CD Base Station Unit both use digital modulation.

Clause 4.11 in V3.3 of (draft) C63.17-2005 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 V3.3 of (draft) C63.17-2005.

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 remote EUT antenna gain is 0dBi. The antenna is elliptically polarized with the major axis of polarization normal to the top external surface of the remote disposed away from the user's hand and/or body, and with the minor axis of polarization parallel to the length of the major axis of the remote. Two identical collocated antennas are provided for the base EUT, within the definition of V3.3 of (draft) C63.17-2005. The maximum base EUT antenna gain is 3dBi. The antennas are elliptically polarized with the major axis of polarization vertical from the top left and right corners of the base, and with the minor axis of polarization normal to the front and back surfaces of the base for left and right antennas.

Maximum peak power level
Maximum specified peak conducted power level for both the base and the remote EUT is +4dBm.

Emission bandwidth
Emission bandwidth measured according to the procedures of V3.3 (draft) C63.17-2005 clause 6.1.3 for the base EUT is 1.47MHz.

Emission bandwidth measured according to the procedures of V3.3 (draft) C63.17-2005 clause 6.1.3 for the remote unit EUT is 1.49MHz.

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 V3.3 (draft) C63.17-2005. Frame period is 10mS. There are 24 timeslots per frame, with one of the first 12 timeslots used for the remote 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 remote 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 390uS, transmissions from the remote when a communications channel is open.

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. Both the base and the remote 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 both the base and the headset EUTs is -46.0 dBm. This is obtained from clause 4.3.3 of V3.3 (draft) C63.17-2005, where
B = 1.47 MHz as declared for the base,
B = 1.49 MHz as declared for the remote,
P_{max} (from clause 4.3.1) is 20.8dBm, and
P_{EUT} is 5 dBm, maximum, as declared.

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

a. On power-up the unit will perform a self-test of permanent storage memory (ROM) by means of a sum/checksum validation.
b. On powe-rup 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 power-up the unit will perform a self-test of RAM by means of a memory field write/readback/invert/write/readback validation.
d. The controller for the unit will be provided with a watchdog circuit and mainline watchdog service routine which, if the controller operations fail, results in a reset of the controller within 5 seconds of failure.
e. The controller for the unit will be provided with a supply voltage monitoring circuit which resets the controller if the measured operating voltage is below the limit for which functionality is guaranteed.

f. The unit will be provided with a supply voltage monitoring circuit which disconnects the supply if the measured operating voltage is above the limit for which functionality is guaranteed.

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

a. On power-up of an element of the system (base unit, or remote unit) the unit will perform a self-test of permanent storage memory (ROM) by means of a sum/checksum validation.
b. On power-up 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 power-up the unit will perform a self-test of RAM by means of a memory field write/readback/invert/write/readback validation.
d. The controller for the unit will be provided with a watchdog circuit and mainline watchdog service routine which, if the controller operations fail, results in a reset of the controller within 5 seconds of failure.
e. The controller for the unit will be provided with a supply voltage monitoring circuit which resets the controller if the measured operating voltage is below the limit for which functionality is guaranteed.

The base unit incorporates a primary and a secondary regulator in tandem; if the mains supply increases, multi-point failures would be necessary before an out-of-condition voltage could be applied to the transmit lineup.

Whether the EUT does or does not have the monitoring made through the radio receiver used for communication
Both the base and the headset EUTs monitor through the radio receiver 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 V3.3 (draft) C63.17-2005.
The headset EUT does not transmit a signaling and control channel.

Nominal mains and battery voltage
The nominal mains voltage for the base EUT is 120V at the AC adapter, corresponding to 9V at the EUT input connection.
The nominal battery voltage for the headset EUT is 3.7V.

I-C. Standard test configurations

The tests of C63.17-2005 clauses 6.2, 7 and 8 are each done with the following test platform configurations:

1) **Conducted emissions tests, base EUT.**
2) **Conducted emissions tests, remote EUT.**
3) **Standard-specific tester, base EUT.**
4) **Standard-specific tester, remote EUT.**
5) **With companion device and interference blocking, base EUT.**
6) **With companion device and interference blocking, remote EUT.**

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 directly (or on a small semi-rigid feed-line) in place of antenna 0 at the 50-ohm feed point. The base EUT is then directly connected to the input of the E4407B spectrum analyzer. The base EUT's normal AC adapter is used as a power source. The base EUT is connected to a serial control bus by which means a testing user-interface is provided, so that RF carrier can be selected by means of administrative commands; administrative commands are also used to cause the base EUT to use only antenna 0. The base EUT otherwise operates in normal functional mode. The companion device remote unit is configured according to Figure 3 of V3.3 of (draft) C63.17-2005, with radiated coupling into the base EUT so that the base EUT may be measured while a communications channel is active but without the requirement for conducted coupling of the remote companion device.

2) Conducted emissions tests, Remote EUT.

For this configuration, the remote EUT is removed from its housing and an SMA connector mounted in place of the antenna at the 50-ohm feedpoint. The remote EUT is then directly connected to the input of the E4407B spectrum analyzer. The remote EUT's is powered from a laboratory power supply for testing. The base companion device is 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 (and thus the headset EUT) can be selected by means of administrative commands if necessary. The remote EUT operates in normal functional mode. The base companion device is configured according to Figure 3 of V3.3 of (draft) C63.17-2005, with radiated coupling into the headset EUT so that the headset EUT may be measured while a communications channel is active but without the requirement for conducted coupling of the base companion device.

3) Standard-specific tester, Base EUT.

For this configuration, 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.

The tests for test platform configuration #1 will be performed with the EUT in a communications link with the CMD60 operating on 1924.992MHz. The base is connected to a serial control bus by which means a testing user-interface is provided, so that channel and slot selection is possible.

The EUT is removed from its housing, and placed within the Tenney Jr. or equivalent computer-controlled temperature chamber. The EUT's test communications bus is brought out through a 4-wire cable to the controlling PC. An external 9V power supply feeds the normal DC power supply cable in place of the AC adapter, and is brought into the temperature chamber to supply the base EUT through its normal DC power supply jack.

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" cable and an 18" cable in tandem each an RG142LL 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 a 20dB attenuator attached to an SMA-F/semi-rigid pigtail soldered directly to the EUT at the 50-ohm match feedpoint in place of antenna 0.

The CMD60 is configured to send a message to the EUT to cause it to freeze the EUT diversity on ANTENNA 0.

The CMD60 is configured emulate a remote headset unit, and to establish the communications channel on slot 0.
The output level from the CMD60 is set to -40dBm.
The CMD60 has an offset loaded of -18, to set the channel used to 1924.992MHz.
Using “Plt-tool 1.25.17” running on the controlling PC and communicating with the base EUT over the aforementioned serial control bus, the base EUT is set up to bring up a beacon on channel 1924.992MHz, and slot 0, and 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 of V3.3 of (draft) C63.17-2005.
The CMD60 is under GPIB control by means of a LabVIEW vi running on the controller PC, for the repetitive measurement of transmit parameters.

4) Standard-specific tester, Remote 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.

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 remote 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 3.70V power supply supplies the headset 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 a 20dB attenuator attached 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 base unit, providing a beacon on slot 0 with proper identifier for the headset EUT, in this case 005F8754E0.
The CMD60 is configured to establish the communications channel on slot 2.
The output level from the CMD60 is set to -40dBm.
The CMD60 has an offset loaded of -18, to set the channel used to 1921.536MHz.

Using “Plt-tool 1.25.17” running on the controlling PC and communicating with the headset EUT, the headset 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.

5) With companion device and interference blocking, base EUT

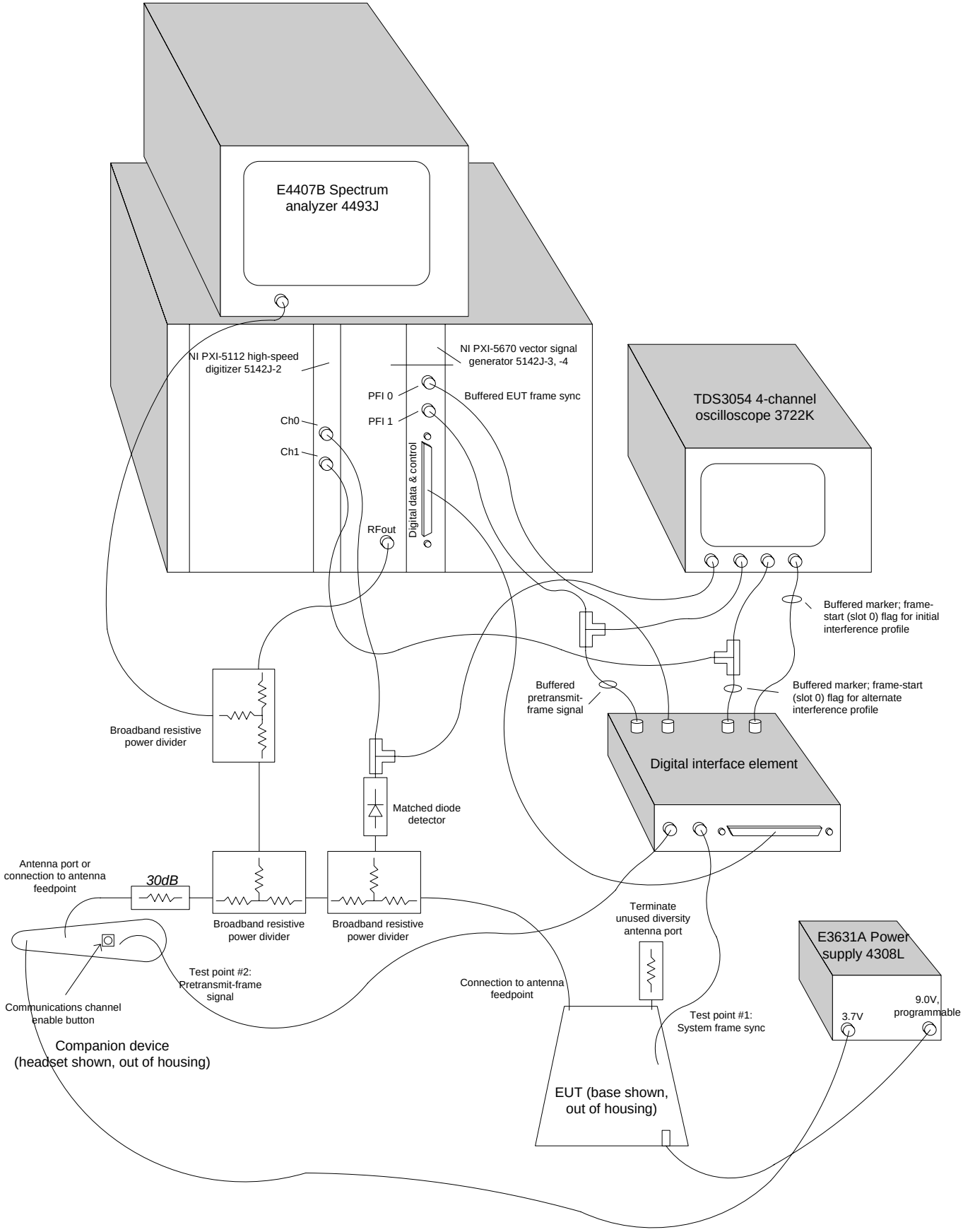

Fig. 1 - Detail of connections to Base EUT for the tests of clause 7 and clause 8 of V3.3 (draft) C63.17-2005. All RF cables are RG142LL.

6) With companion device and interference blocking, Remote EUT

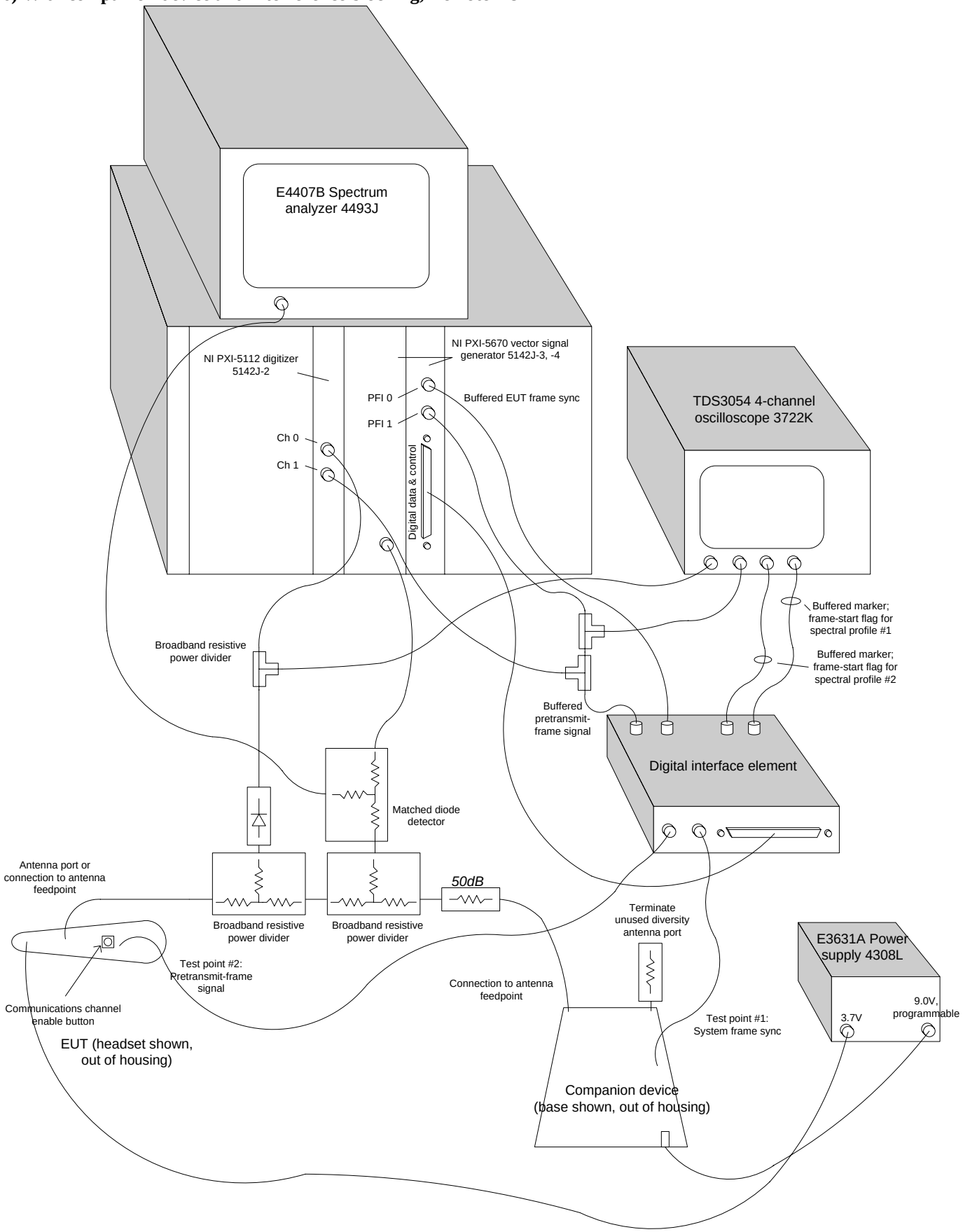

Fig. 2 - Detail of connections to Remote (headset) EUT for the tests of clause 7 and clause 8 of V3.3 (draft) C63.17-2005, for configuration 6, **With companion device and interference blocking, headset EUT.** All RF cables are RG142LL or equivalent .

I-D. Calibration

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

1) CMD60 Digital Radiocommunication Tester asset 5212J. Rohde and Schwarz, Inc.
Calibration by Valutronics on 2/24/06 due 1/31/07.

2) TDS3014B 4-channel oscilloscope asset 3722K. Tektronix.
Calibration by Micro-Precision 1/10/06 due 1/10/07.

3) Tenney Jr temperature chamber asset 4046E. Tenney Environmental.
Calibration certification 190189A issued 12-Aug-2005 by Thermotron due 12-Aug-2006.

4) E4418B Power Meter asset 5334H, Agilent.
Calibration by Agilent 12/15/05 due 8/1/07

5) E9301A Power sensor asset 3645J, Agilent
Calibration by Agilent 12/15/05 due 8/1/07

6) E4407B spectrum analyzer asset 4357J, Agilent
Calibration by Micro-Precision 1/10/06 due 1/10/07

I-E Auxiliary Equipment

Test Instrumentation used for measurements calibrated with above equipment where applicable for power level setting.

1) E3631A power supply asset 4308L, Agilent

2) PXI-5670 (PXI-5610/5421 composite instrument) vector signal generator asset 5142J-3, -4, National Instruments

3) PXI-5112 high-speed digitizer asset 5142J-2, National Instruments

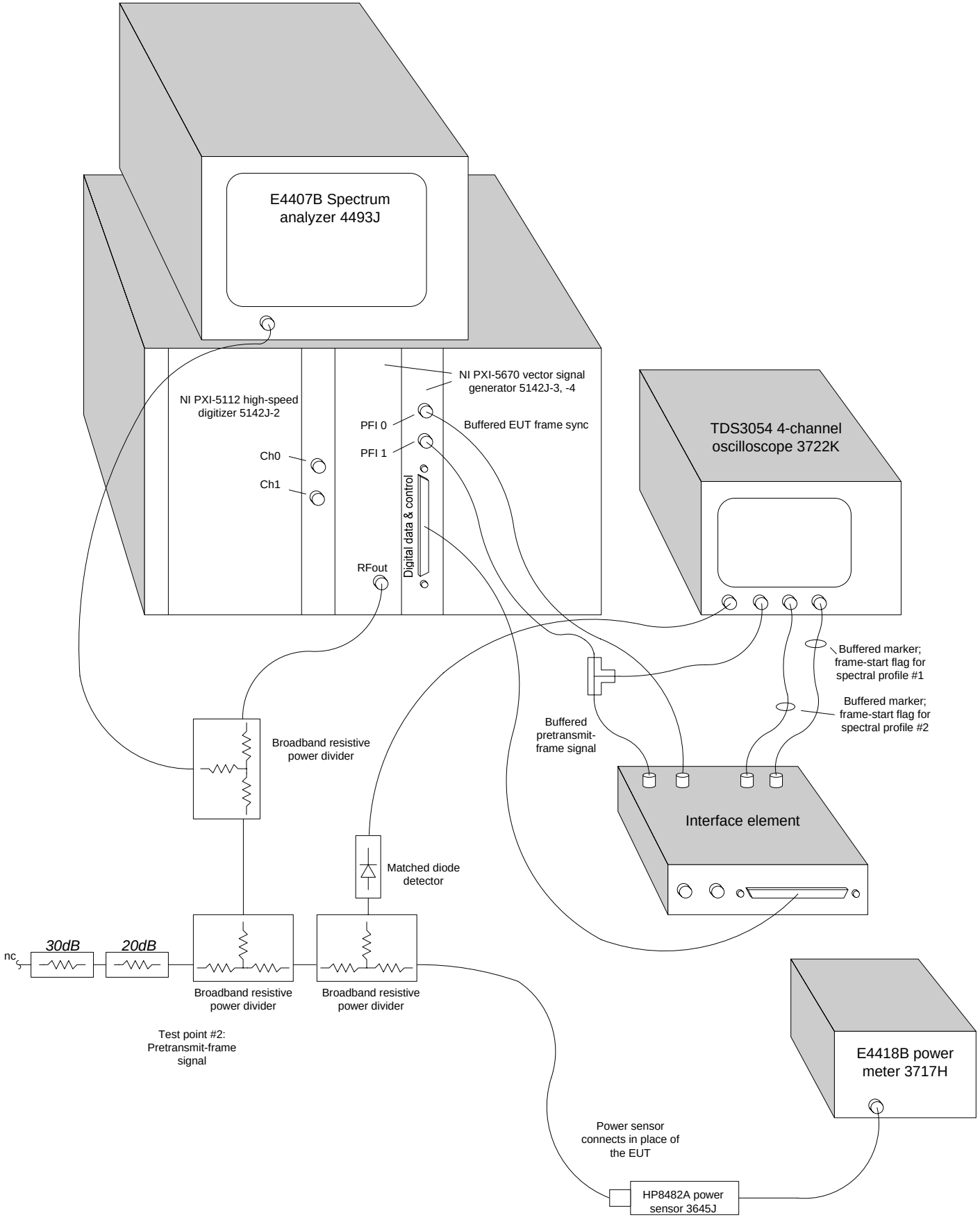

Fig. 3 - Detail of test system of clauses 7 and 8 of V3.3 (draft) C63.17-2005, configured for calibration. All RF cables are RG142LL.

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 HP8482A power sensor.
2) The resulting single-carrier and all-carrier output levels are measured using the E4418B power meter and HP8482A power sensor, as a check on the calibration.

Step 1, flatness and output level correction at -40 dBm.

E4418B settings:
E-Series Power Sensor
Frequency 1.925GHz.

Frequency of carrier	Level delivered to power meter connected in place of EUT
1928.448 MHz	-39.98 dBm
1926.720 MHz	-40.06 dBm
1924.992 MHz	-40.04 dBm
1923.264 MHz	-40.14 dBm
1921.536 MHz	-39.89 dBm

All carriers enabled -33.4 dBm (target is 7.0 dB higher for 5 carriers at -40dBm, relative to a single carrier; actual is 6.6 dB)

Calibration measurements were taken as described on July 10, 2006 by Ron Meck. All carriers measured August 30, 2006.

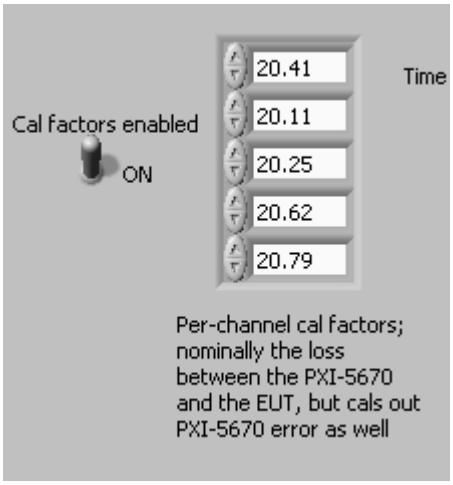

Fig. 4 - Screenshot from the control panel of the PXI-5670 with diagnostics enabled, showing the cal factors by channel. The top cal factor is for the top channel, 1928.448MHz, and the bottom cal factor is for the bottom channel, 1921.536MHz.

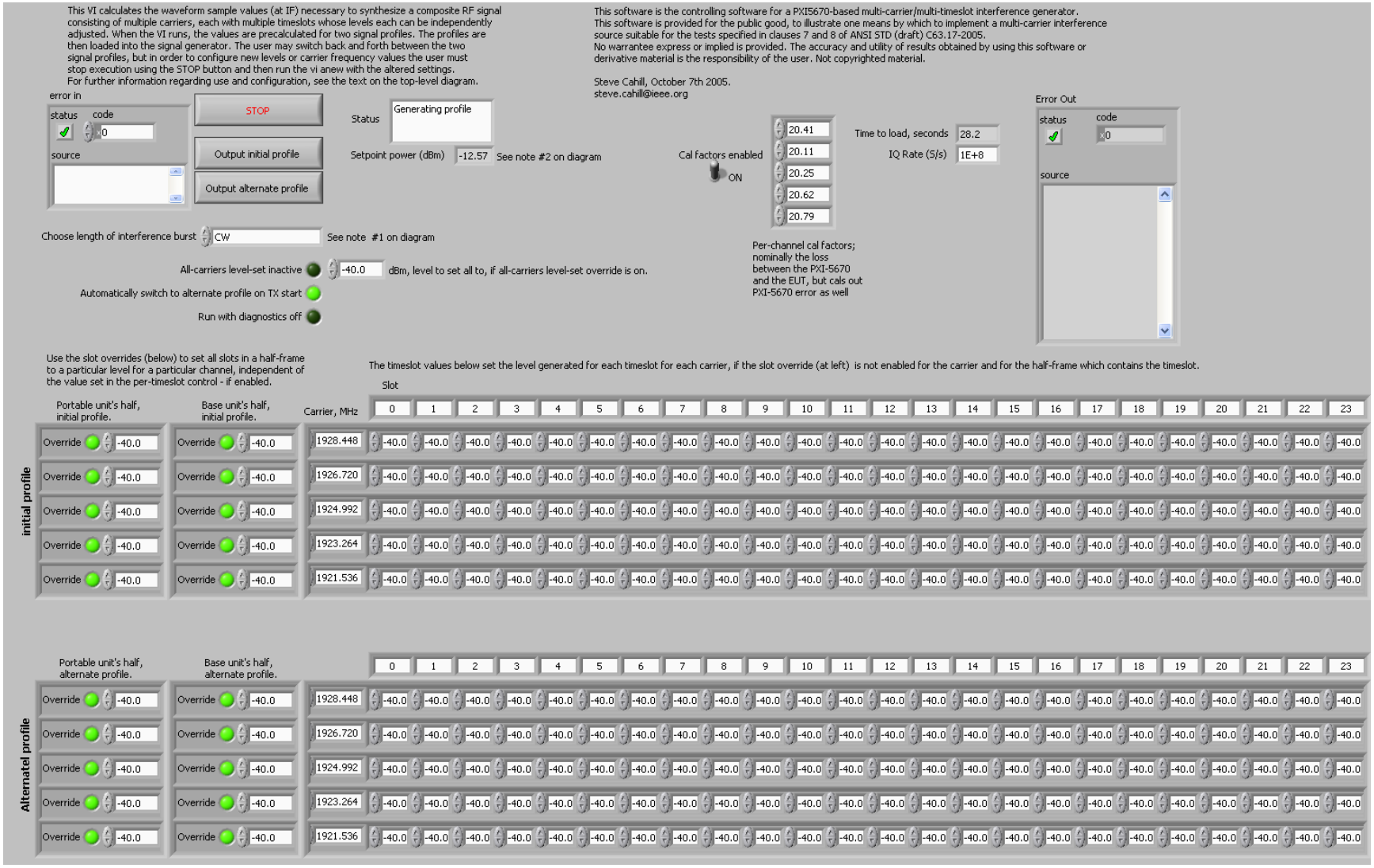

Fig. 5 - Screenshot of control VI for PXI-5670 taken with all carriers enabled, for -40dBm calibration accuracy test.

III) Test results summary

III-A. Base EUT

Following the format of Annex A of V3.3 (draft) C63.17-2005:

Type	47CFR15 Subpart D section	Reference within V3.3 (draft) C63.17-2005	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 Exhibits #10a, #10b, tests performed by Elliott Labs	Base EUT passes Class B digital device 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	
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, tests performed by Elliott Labs	Base EUT passes the AC line conducted emissions test
Antenna requirement	15.317 Antenna 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	P46	Plantronics declares that the CA12CD 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	P40 - 42	Maximum measured power is +2.8 dBm. Rated power is +5 dBm. Legal maximum is +20.8dBm	18.0 dB
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	P46 - 51	Maximum measured power spectral density is -24.14dBm, Legal maximum is 3mW, +4.77dBm	28.91 dB
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	P4 - 5	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, base SAR test report	SAR is well 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	P43 - 45	Base EUT emissions bandwidth is 1.47MHz.	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	P88 - 94	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, the 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	P116	Base EUT verifies the channel access criteria every 4 hours when a communications channel is active	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	P109 - 112	Base EUT tests the channel access criteria every 1.28 seconds when transmitting control and signaling information	Requirement is met
Least Interfered Channel, LIC	15.323(c)(5)				
Least 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 7.3.3		The system defines 60 duplex channels	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	P84 - 94	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	P84 - 87	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 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	P95 - 104	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 **Error! Reference source not found.**		Base EUT uses a 15.8dB increase in threshold based on a maximum rated transmit power of +5dBm and permitted legal maximum of +20.8dBm	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 6.1.6.2	P56 - 72	The base EUT worst-case out-of-band emissions are at the 2nd harmonic, transmitting on the high carrier, at -59.9dBm. The legal maximum is -39.5dBm	20.4 dB
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 6.1.6.1	P52 - 55	The base EUT worst-case in-band emissions are for the transmitter on the middle carrier, in the 3***B*** region, at not worse than -64.11dBm. 60dB below the permitted maximum (+20.8dBm) or -39.2dBm is allowed.	24.91dB
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	P80	The base EUT frame rate stability is measured at 0.01216ppm 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	P81	The base EUT has measured total jitter and offset of 0.01479uS 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	P77	The base EUT measured carrier frequency maximum and minimum deviations were +0.67 and -2.43 ppm over one hour. +/-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 -20° C to +50° C at normal supply voltage, and over a variation in the primary supply voltage of 85 percent to 115 percent of the rated supply voltage at a temperature of 20° C.	Subclause 6.2.1.3	P79	The base EUT measured carrier frequency stability over rated temperature was +2.696ppm and -1.99ppm. +/-10ppm is allowed	The requirements are met

Carrier frequency stability (battery)	15.323(f).3 For equipment that is capable only of operating from a battery, the frequency stability tests shall be performed using a new battery without any further requirement to vary supply voltage.	Subclause 6.2.1.2	P78	The base EUTU measured carrier frequency stability over voltage was +0.2 and -0.06ppm. +/-10ppm is allowed	Requirement is met

III-B. Remote EUT

Following the format of Annex A of V3.3 (draft) C63.17-2005:

Type	47CFR15 Subpart D section	Reference within V3.3 (draft) C63.17-2005	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	Remote 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	Remote EUT passes the AC line conducted emissions test
Antenna requirement	15.317 Antenna requirement. An unlicensed PCS device must meet the antenna requirement of 47CFR15.203.	Information		Remote EUT uses internal and non-removable antenna	Remote 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	P125	Plantronics declares that the CA12CD Remote EUT uses digital modulation only	Remote 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	P119 - 121	Maximum measured power is +0.71dBm. Rated power is +5dBm. Legal maximum is +20.8dBm	20.09 dB
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	P125 - 130	Maximum measured power spectral density is -23.70 dBm, Legal maximum is 3mW, +4.77dBm	28.47 dB
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	P4 - 5	Remote 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 #7b, 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	P122 - 124	Remote EUT emissions bandwidth is 1.49MHz.	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	P166 - 168	Remote 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		Remote 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	P182	Remote EUT verifies the channel access criteria every 4 hours when a communications channel is active	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		Remote EUT does not transmit channels used exclusively for control and signaling	Not applicable
Least Interfered Channel, LIC	15.323(c)(5)				
Least 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 7.3.3		The system defines 60 duplex channels	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	P162 - 168	The remote 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	P162 - 165	The remote 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 remote EUT and a base companion device use 1/12th 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 remote 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		Remote 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	P169 - 172	Remote 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		Remote 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		Remote EUT uses a 15.8dB increase in threshold based on a maximum rated transmit power of +5dBm 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 remote 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 remote 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 6.1.6.2	P135 - 150	The remote EUT worst-case out-of-band emissions are at the 2nd harmonic, transmitting on the low carrier, at -51.24 dBm. The legal maximum is -39.5dBm	11.74 dB
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 6.1.6.1	P131 - 134	The remote EUT worst-case in-band emissions are for the transmitter on the middle carrier, in the 3***B*** region, at not worse than -64.32 dBm. 60dB below the permitted maximum (+20.8dBm) or -39.2dBm is allowed.	25.12 dB
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 remote 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 remote 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	P158	The remote EUT frame rate stability is measured at 0.097632 ppm 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	P159	The remote EUT has measured total jitter and offset of 0.22162uS 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 remote 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	P155	The remote EUT measured carrier frequency maximum and minimum deviations were +068 and -0.69ppm over one hour. +/-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 -20° C to +50° C at normal supply voltage, and over a variation in the primary supply voltage of 85 percent to 115 percent of the rated supply voltage at a temperature of 20° C.	Subclause 6.2.1.3	P157	The remote EUT measured carrier frequency stability over rated temperature was +0.83ppm and -0.52ppm +/-10ppm is allowed	The requirements are met

Carrier frequency stability (battery)	15.323(f).3 For equipment that is capable only of operating from a battery, the frequency stability tests shall be performed using a new battery without any further requirement to vary supply voltage.	Subclause 6.2.1.2	P156	The remote EUT is battery-powered and so no stability test is required.	

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.

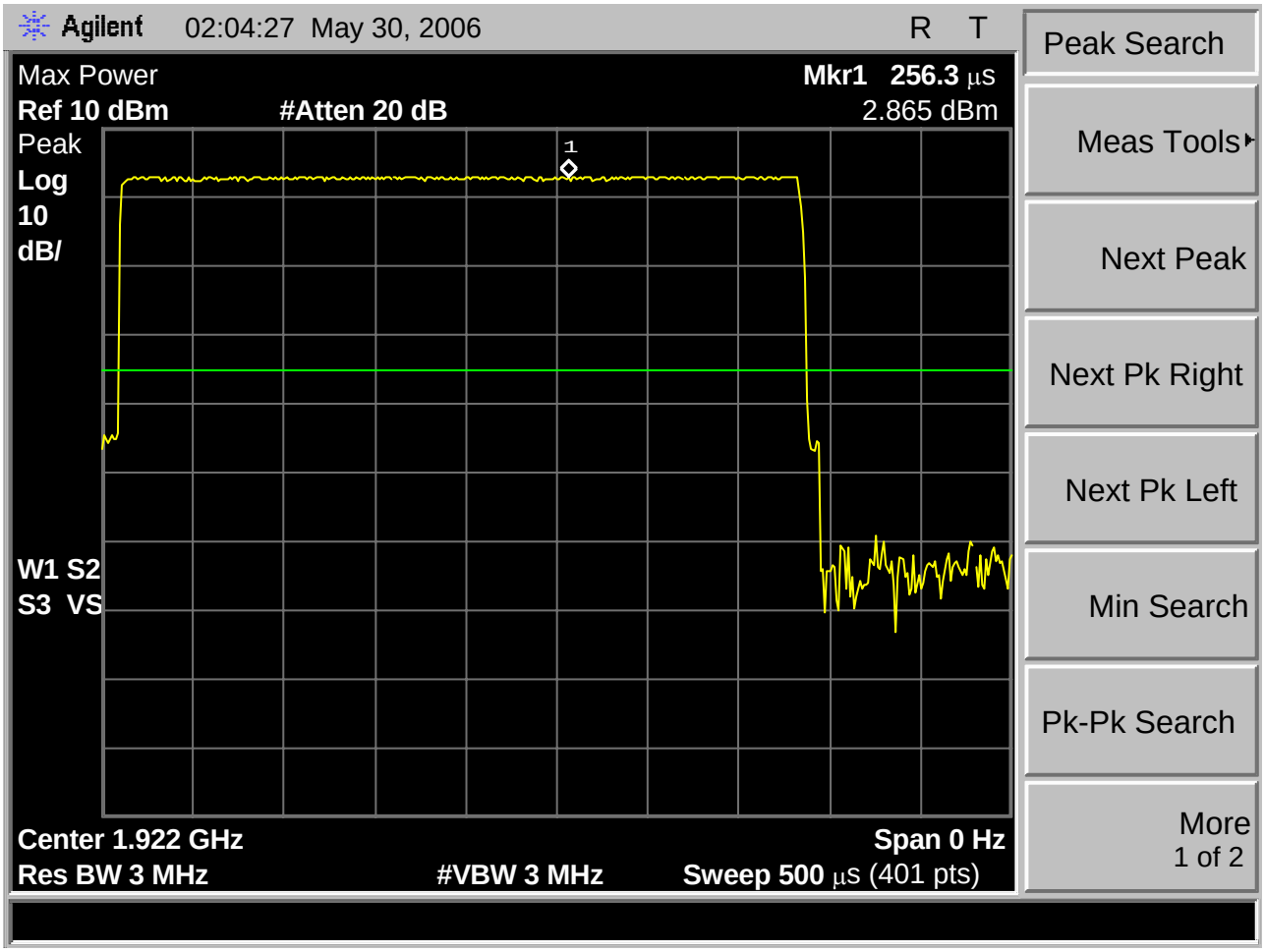

Fig. 10 Base EUT transmit power received by spectrum analyzer configured according to the requirements of clause 6.1.2 of V3.3 of (draft) C63.17-2005, low carrier. Maximum observed transmit power is 2.57dBm.

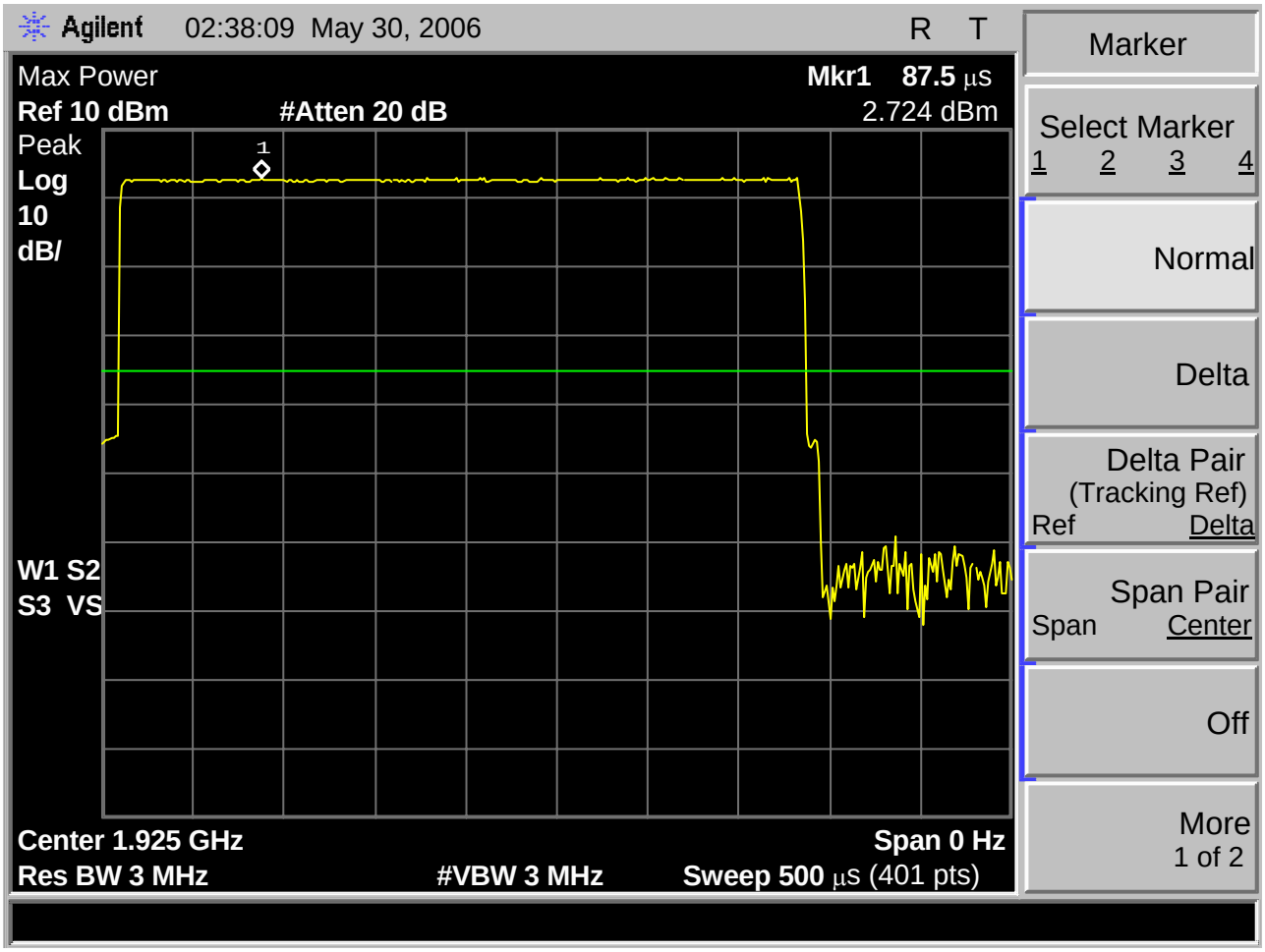

Fig. 11- Base EUT transmit power received by spectrum analyzer configured according to the requirements of clause 6.1.2 of V3.3 of (draft) C63.17-2005, mid carrier. Maximum observed transmit power is 2.72dBm.

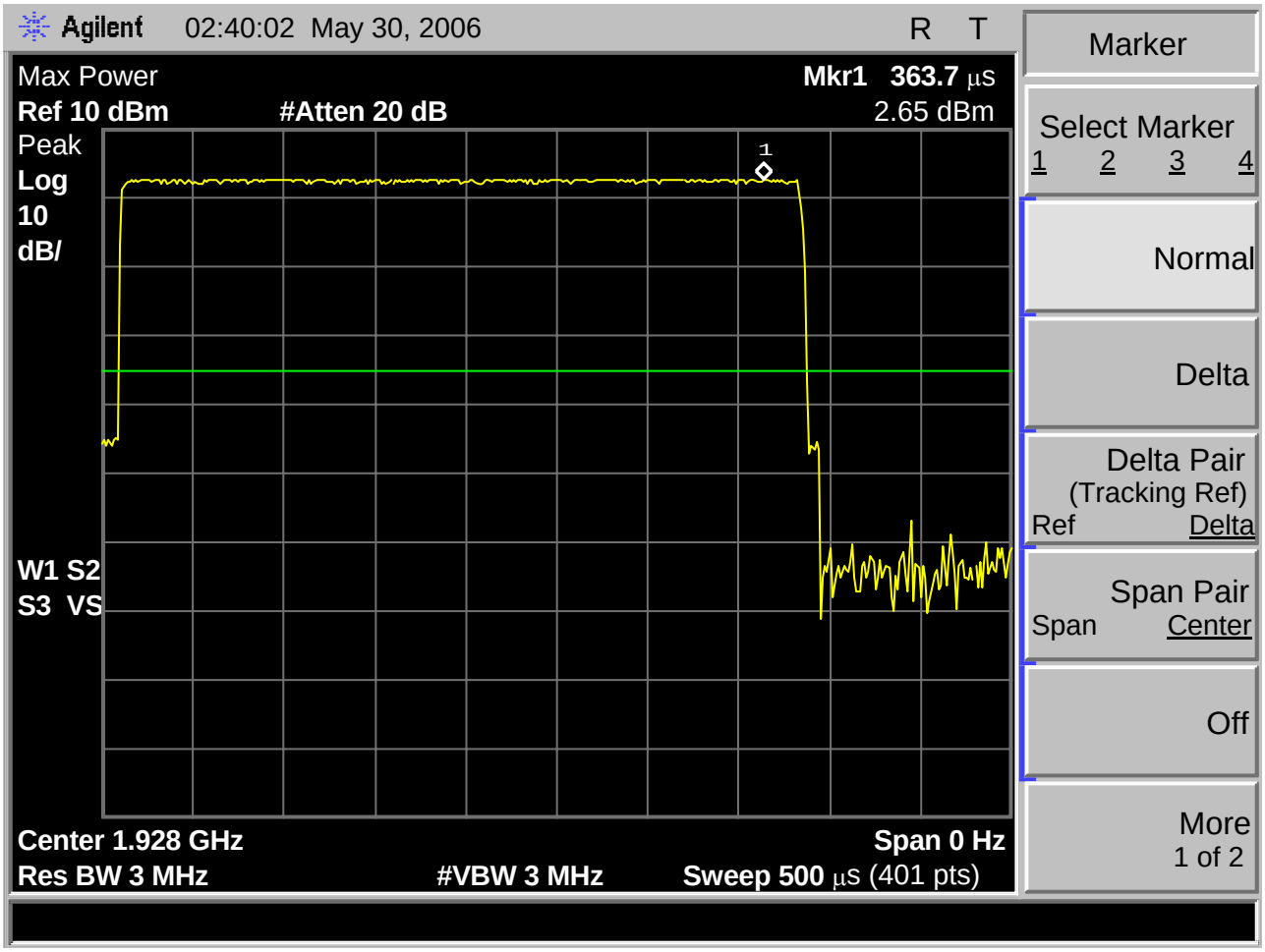

Fig. 12 - Base EUT transmit power received by spectrum analyzer configured according to the requirements of clause 6.1.2 of V3.3 of (draft) C63.17-2005, high carrier. Maximum observed transmit power is 2.65dBm.

The maximum allowed transmit power is *Plimit*, which is, from clause 4.3.1 of V3.3 of (draft) C63.17-2005,

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, 1.44 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 2.87dBm, and meets the required limit of less than *Plimit*, passing the requirements of V3.3 (draft) C63.17-2005 clause 6.1.2 with 17.9dB of margin.

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.

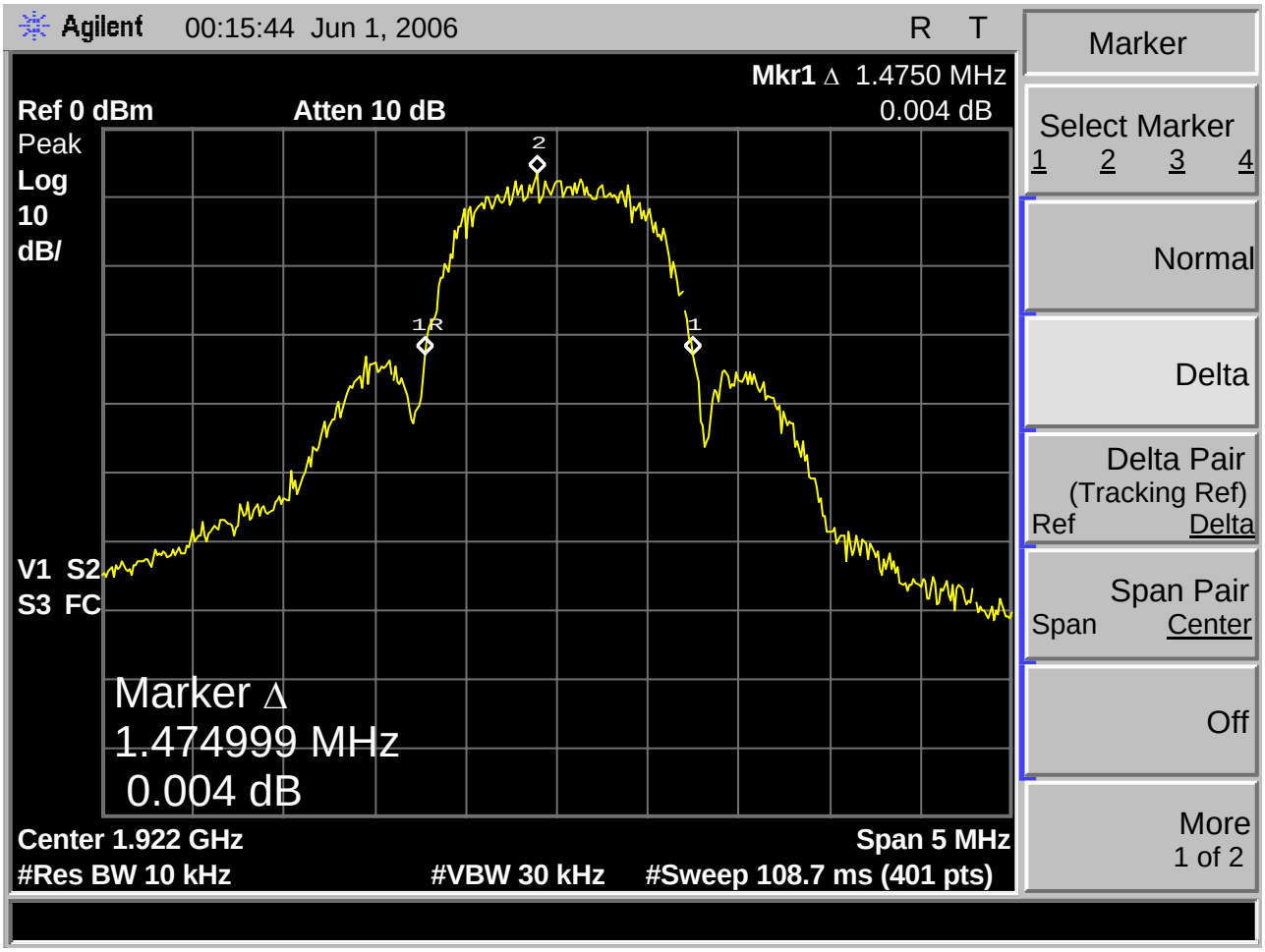

Fig. 13 - Base EUT, 1.47MHz emissions bandwidth on low carrier.

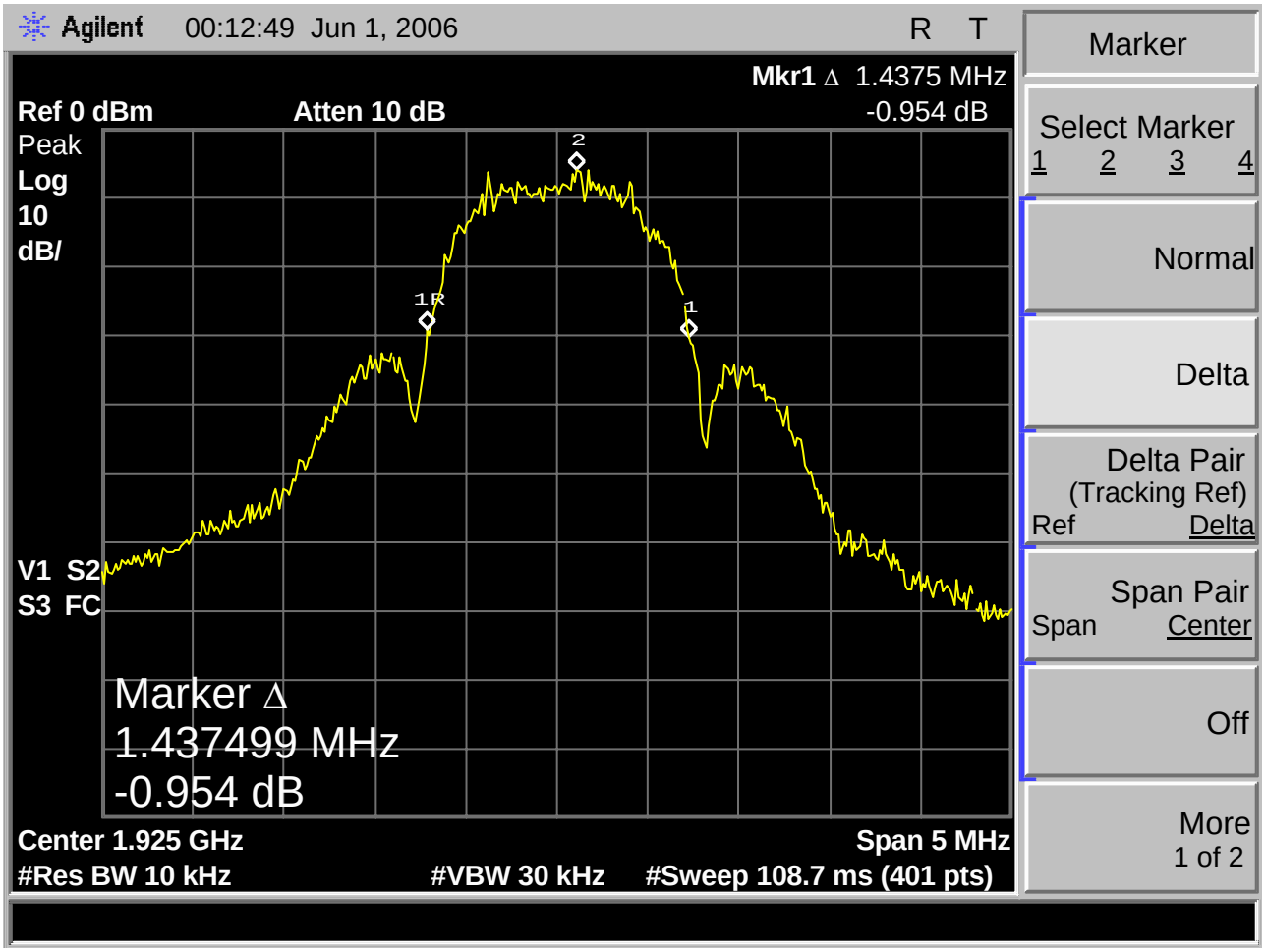

Fig. 14 - Base EUT, 1.44MHz emissions bandwidth on middle carrier.

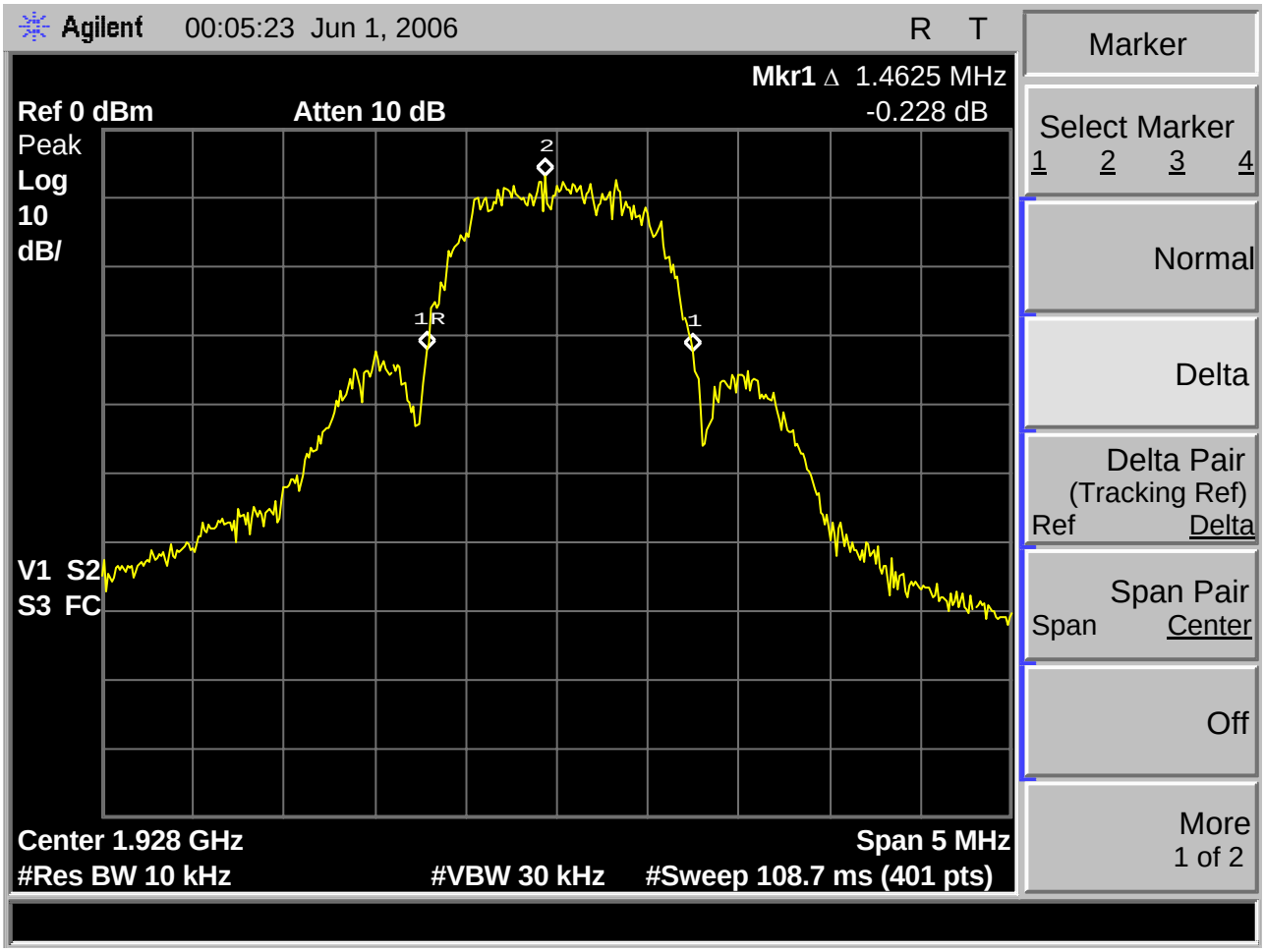

Fig. 15 - Base EUT, 1.46MHz emission bandwidth on high carrier.

The bandwidth ***B*** for the base EUT used in further calculations according to the UPCS standard, from the center carrier, is then 1.44MHz.

The maximum allowed emission bandwidth *BlimitU* is 2.5MHz.
The minimum allowed emission bandwidth *BlimitL* is 50kHz,

The maximum observed emission bandwidth was 1.47MHz. The minimum observed emission bandwidth was 1.44MHz, so the base EUT passes the test of clause 6.1.3 of V3.3 (draft) C63.17-2005.

6.1.4 Modulation, base EUT

Per the attestation in section I-B, the base uses digital modulation and so meets the requirement of V3.3 (draft) C63.17-2005

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.

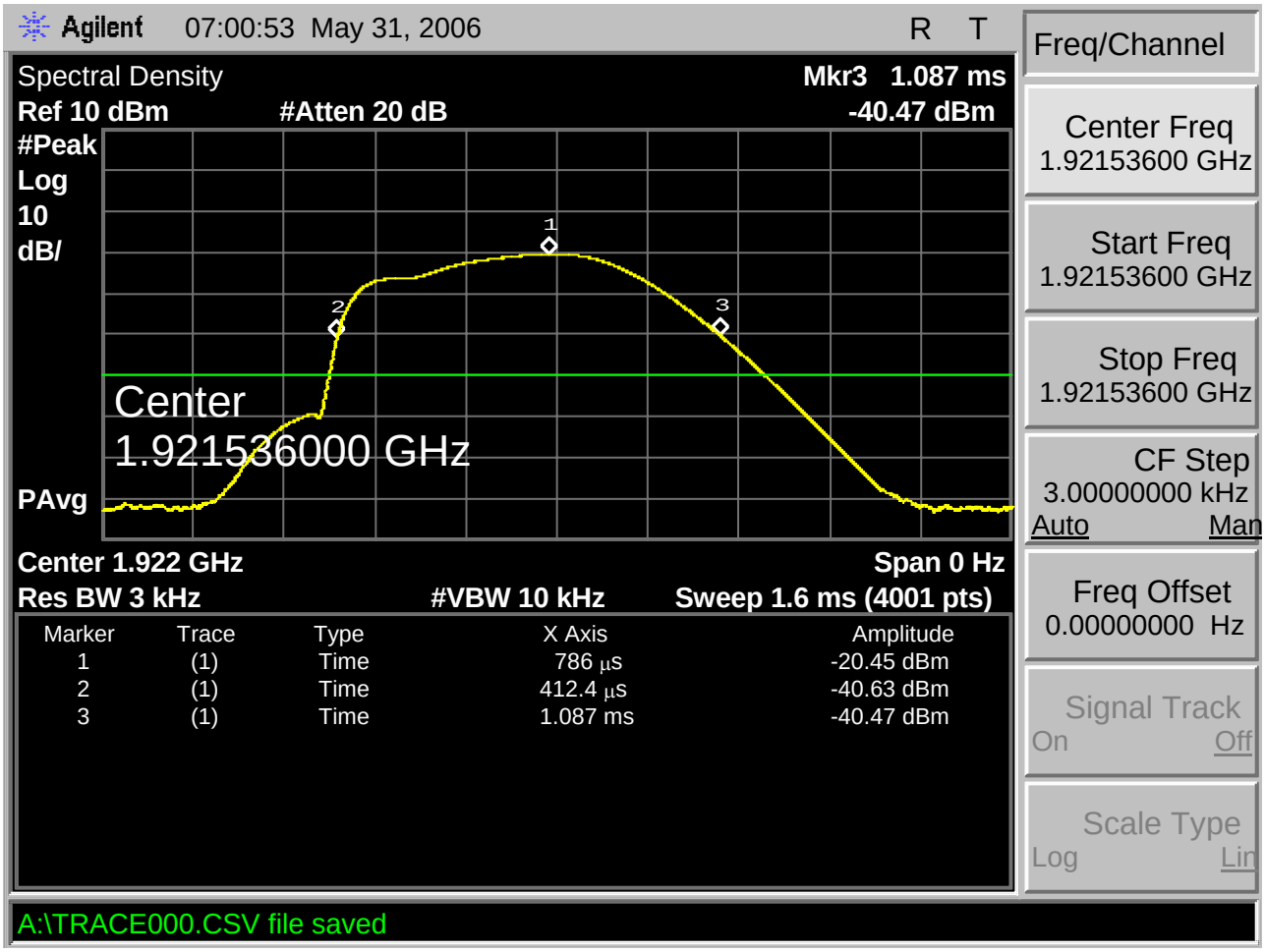

Fig. 16 – Zero-span sweep for base EUT, low carrier, for 3kHz maximum power spectral density. The peak level is at -20.45Bm, and the interval between samples at the -20dB points is 674.6uS.

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 V3.3 (draft) C63.17-2005, using an Excel spreadsheet,
"Clause 6_1_5 3kHz base EUT lowch.xls"

Integrated maximum 3kHz-bandwidth transmit power for the base EUT on the low channel was -23.83dBm, a margin of 28.60dB to the specification for maximum power spectral density.

05/31/06 07:01:42	A:\F16FPLW.CSV			
Title:	Spectral Density			
Model:	E4407B			
Serial Number:	MY45105325			
Center Frequency:	1921536000	Hz		
Span:	0	Hz		
Resolution Bandwidth:	3000	Hz		
Video Bandwidth:	10000	Hz		
Reference Level:	1.00E+01	dBm		
Sweep Time:	1.60E-03	Sec		
Num Points:	4001			
Sample frequency:	2500000	Hz		
	Trace 1			
Sec	dBm	power, W	Power summed:	
4.12E-04	-4.06E+01	8.65167E-08	6.98E-03	
4.13E-04	-4.04E+01	9.13272E-08		
4.13E-04	-4.02E+01	9.62942E-08	Total pulse energy in 3kHz BW, Joules:	
4.14E-04	-4.00E+01	1.00809E-07	2.79E-09	
4.14E-04	-3.98E+01	1.05633E-07		
4.14E-04	-3.95E+01	1.11276E-07	Pulse length (-20dBc), seconds	
4.15E-04	-3.94E+01	1.15904E-07	0.0006746	
4.15E-04	-3.91E+01	1.22236E-07		
4.16E-04	-3.89E+01	1.28617E-07	Average pulse power, W	
4.16E-04	-3.87E+01	1.35332E-07	4.14E-06	
4.16E-04	-3.85E+01	1.41156E-07		
4.17E-04	-3.83E+01	1.47197E-07	Average pulse power, dBm	
4.17E-04	-3.81E+01	1.53815E-07	-23.83	
4.18E-04	-3.79E+01	1.60435E-07		
4.18E-04	-3.78E+01	1.66456E-07		
4.18E-04	-3.76E+01	1.73021E-07		
1.09E-03	-4.03E+01	9.31108E-08		
1.09E-03	-4.03E+01	9.23422E-08		
1.09E-03	-4.04E+01	9.11591E-08		
1.09E-03	-4.05E+01	8.98463E-08		
1.09E-03	-4.05E+01	8.87156E-08		
1.09E-03	-4.05E+01	8.83283E-08		
1.09E-03	-4.06E+01	8.71766E-08		
1.09E-03	-4.06E+01	8.65366E-08		
1.09E-03	-4.07E+01	8.55067E-08		

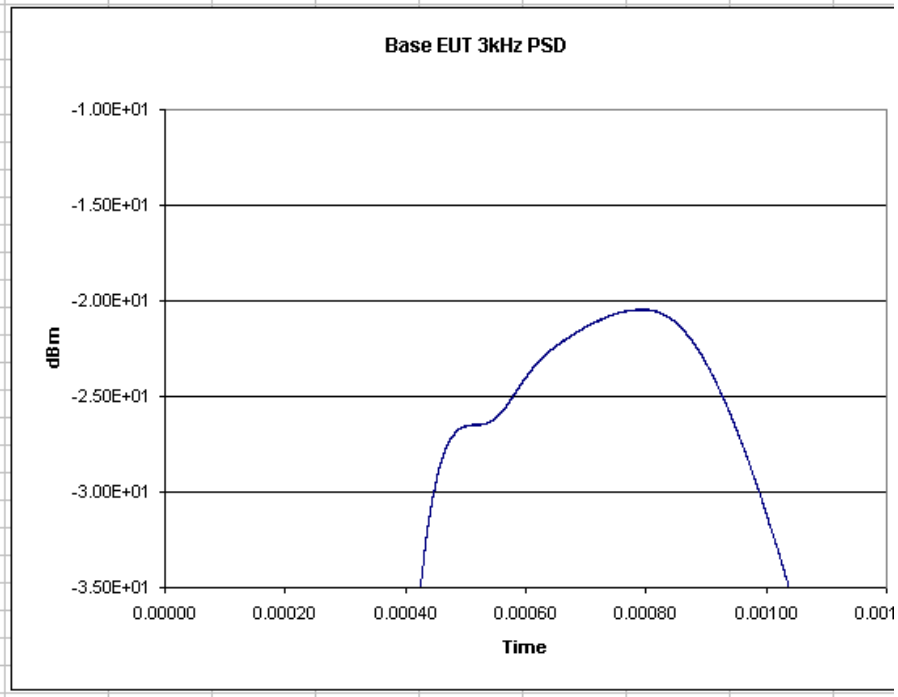

Fig 17 – Screenshot of Excel file showing *PSDlimit* calculations for base EUT, low carrier; -23.83dBm.

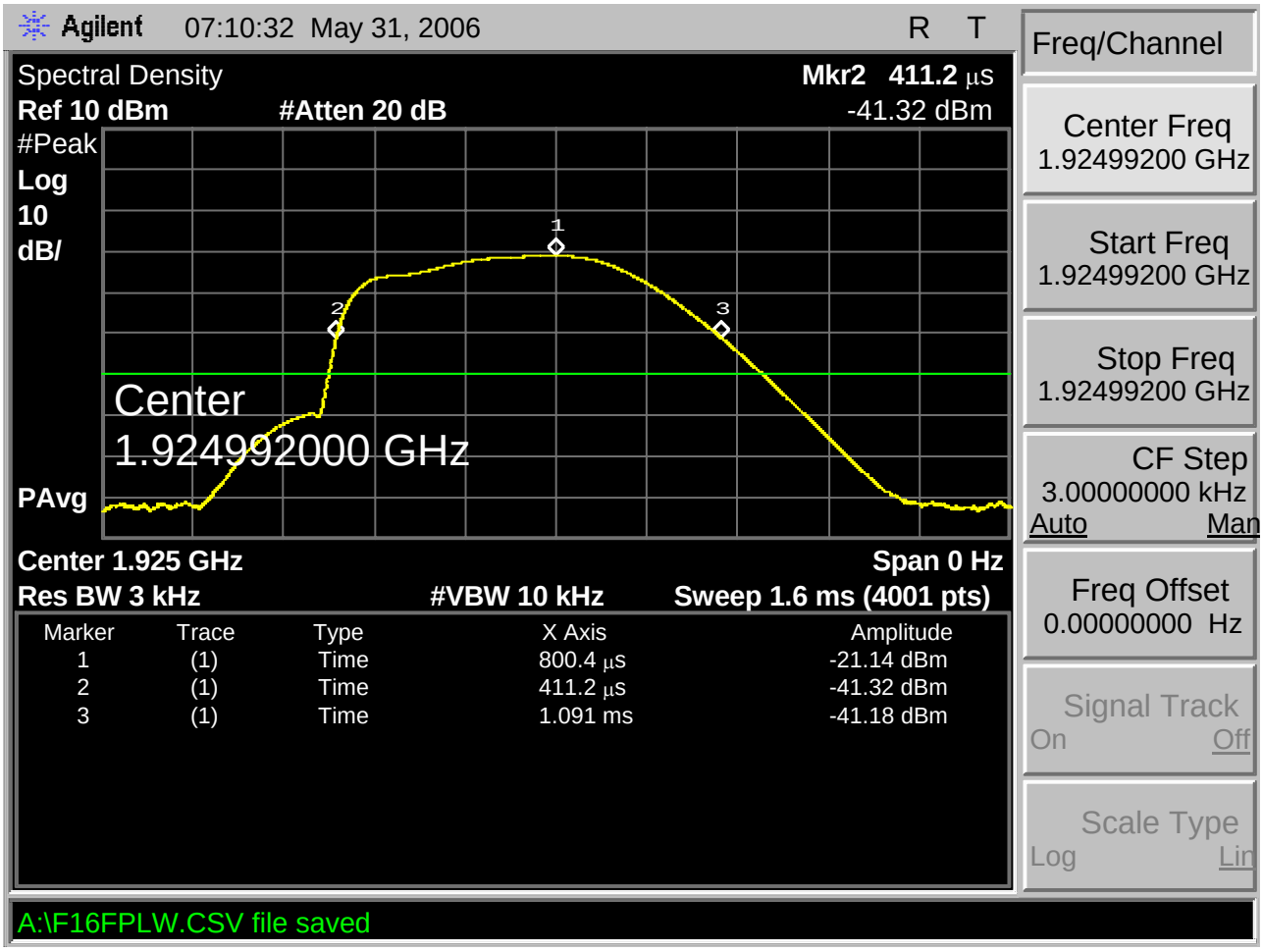

Fig. 18 – Zero-span sweep for base EUT, middle carrier, for 3kHz maximum power spectral density. The peak level is at -21.14dBm, and the interval between samples at the -20dB points is 679.8uS.

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 V3.3 (draft) C63.17-2005, 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 -24.14dBm, a margin of 25.91dB to the specification for maximum power spectral density.

05/31/06 07:11:27	A:\F18FPMD.CSV			
Title:	Spectral Density			
Model:	E4407B			
Serial Number:	MY45105325			
Center Frequency:	1924992000	Hz		
Span:	0	Hz		
Resolution Bandwidth:	3000	Hz		
Video Bandwidth:	10000	Hz		
Reference Level:	1.00E+01	dBm		
Sweep Time:	1.60E-03	Sec		
Num Points:	4001			
Sample frequency:	2500000	Hz		
	Trace 1			
Sec	dBm	power, W	Power summed:	
4.11E-04	-4.13E+01	7.38074E-08	6.55E-03	
4.12E-04	-4.11E+01	7.80189E-08		
4.12E-04	-4.08E+01	8.29087E-08	Total pulse energy in 3kHz BW, Joules:	
4.12E-04	-4.06E+01	8.77607E-08	2.62E-09	
4.13E-04	-4.03E+01	9.24272E-08		
4.13E-04	-4.01E+01	9.71852E-08	Pulse length (-20dBc), seconds	
4.14E-04	-3.99E+01	1.02141E-07	0.0006798	
4.14E-04	-3.97E+01	1.07523E-07		
4.14E-04	-3.95E+01	1.1259E-07	Average pulse power, W	
4.15E-04	-3.93E+01	1.18195E-07	3.85E-06	
4.15E-04	-3.91E+01	1.2428E-07		
4.16E-04	-3.88E+01	1.30437E-07	Average pulse power, dBm	
4.16E-04	-3.86E+01	1.37499E-07	-24.14	
4.16E-04	-3.84E+01	1.43747E-07		
4.17E-04	-3.82E+01	1.49934E-07		
4.17E-04	-3.81E+01	1.56279E-07		
1.09E-03	-4.09E+01	8.14142E-08		
1.09E-03	-4.09E+01	8.04081E-08		
1.09E-03	-4.10E+01	7.96159E-08		
1.09E-03	-4.10E+01	7.86321E-08		
1.09E-03	-4.11E+01	7.7464E-08		
1.09E-03	-4.12E+01	7.66479E-08		
1.09E-03	-4.12E+01	7.6243E-08		
1.09E-03	-4.12E+01	7.52662E-08		
1.09E-03	-4.13E+01	7.43875E-08		
1.09E-03	-4.13E+01	7.36207E-08		

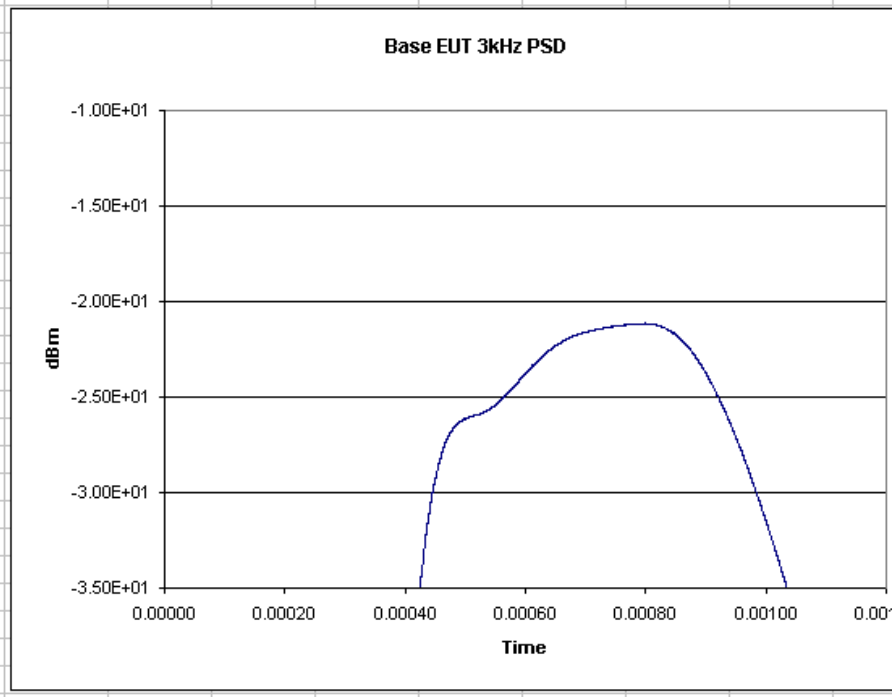

Fig 19 – Screenshot of Excel file showing PSDlimit calculations for base EUT, mid carrier; -24.14dBm.

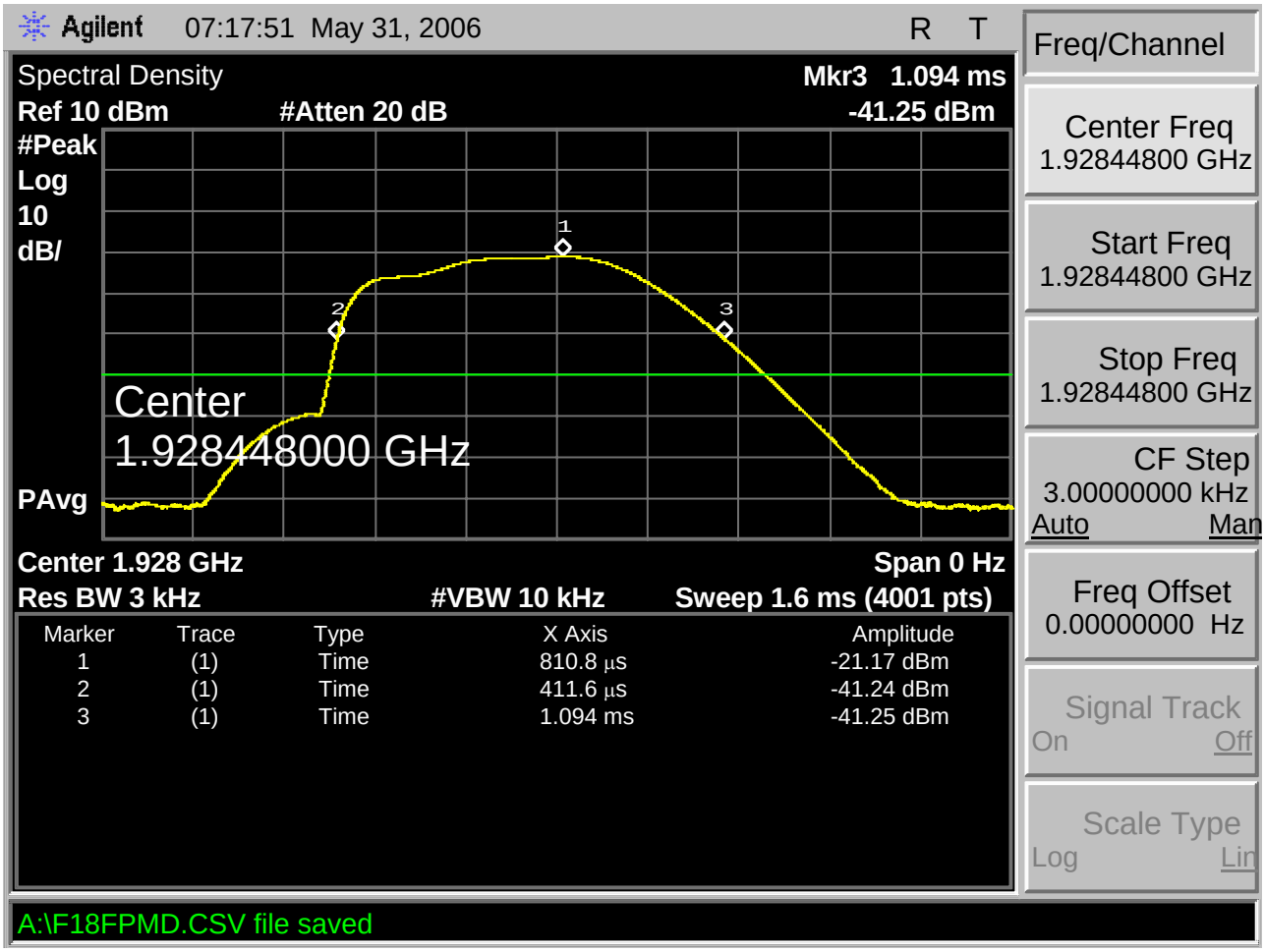

Fig. 20 – Zero-span sweep for base EUT, high carrier, for 3kHz maximum power spectral density. The peak level is at -21.17dBm, and the interval between samples at the -20dB points is 682.4uS.

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 V3.3 (draft) C63.17-2005, using an Excel spreadsheet, "Clause 6_1_5 3kHz base EUT highch.xls".

Integrated maximum 3kHz-bandwidth transmit power for the base EUT on the high channel was –23.83dBm, a margin of 28.60dB to the specification for maximum power spectral density.

05/31/06 07:19:55	A:\F20FPHI.CSV			
Title:	Spectral Density			
Model:	E4407B			
Serial Number:	MY45105325			
Center Frequency:	1928448000	Hz		
Span:	0	Hz		
Resolution Bandwidth:	3000	Hz		
Video Bandwidth:	10000	Hz		
Reference Level:	1.00E+01	dBm		
Sweep Time:	1.60E-03	Sec		
Num Points:	4001			
Sample frequency:	2500000	Hz		
	Trace 1			
Sec	dBm	power, W	Power summed:	
4.12E-04	-4.12E+01	7.51104E-08	6.54E-03	
4.12E-04	-4.10E+01	7.93049E-08		
4.12E-04	-4.08E+01	8.41008E-08	Total pulse energy in 3kHz BW, Joules:	
4.13E-04	-4.05E+01	8.86543E-08	2.61E-09	
4.13E-04	-4.03E+01	9.35621E-08		
4.14E-04	-4.01E+01	9.79039E-08	Pulse length (-20dBc), seconds	
4.14E-04	-3.99E+01	1.02424E-07	0.0006824	
4.14E-04	-3.97E+01	1.07746E-07		
4.15E-04	-3.95E+01	1.12486E-07	Average pulse power, W	
4.15E-04	-3.93E+01	1.18386E-07	3.83E-06	
4.16E-04	-3.91E+01	1.23965E-07		
4.16E-04	-3.88E+01	1.30978E-07	Average pulse power, dBm	
4.16E-04	-3.86E+01	1.37025E-07	-24.17	
4.17E-04	-3.84E+01	1.43087E-07		
4.17E-04	-3.83E+01	1.4897E-07		
4.18E-04	-3.81E+01	1.56063E-07		
1.09E-03	-4.09E+01	8.16206E-08		
1.09E-03	-4.09E+01	8.06306E-08		
1.09E-03	-4.10E+01	7.9671E-08		
1.09E-03	-4.10E+01	7.87771E-08		
1.09E-03	-4.11E+01	7.83971E-08		
1.09E-03	-4.11E+01	7.72859E-08		
1.09E-03	-4.11E+01	7.67715E-08		
1.09E-03	-4.12E+01	7.55266E-08		

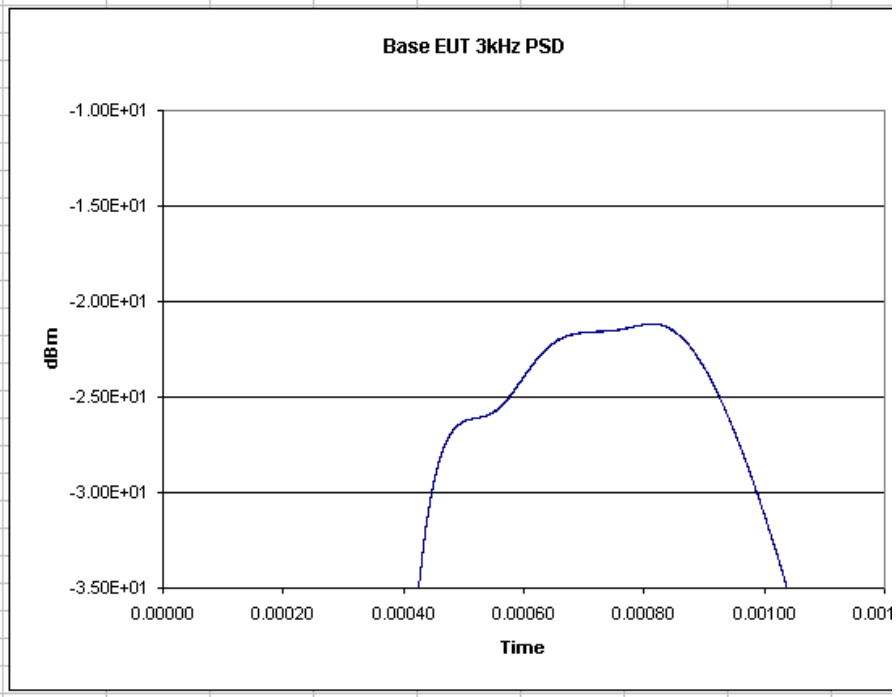

Fig 21 – Screenshot of Excel file showing *PSDlimit* calculations for base EUT, high carrier; -24.17dBm.

The maximum allowed PSD, *PSDlimit*, is 3mW in any 3kHz bandwidth, or 4.77dBm. The maximum observed PSD for the base EUT is -24.14dBm, meeting the requirements according to clause 6.1.5 of V3.3 (draft) C63.17-2005 with 28.91dB of margin.

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*** = 1.48 MHz, 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.

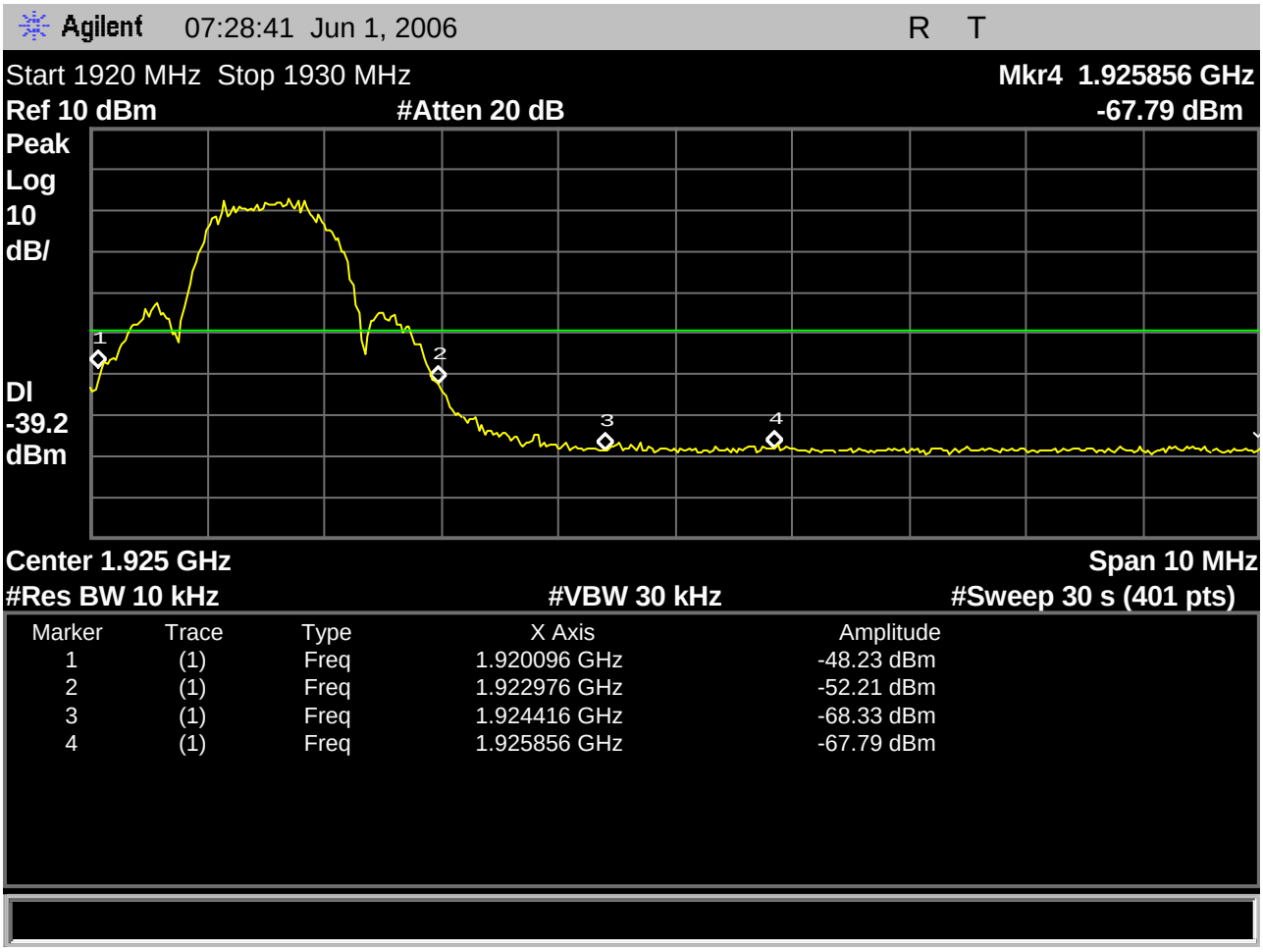

Fig 22 - Spectrum analyzer screenshot for transmit emissions showing inband unwanted emissions with the base EUT transmitter at the lowest carrier, 1921.536MHz, according to the requirements of 6.1.6.1.

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 1920.096 MHz is at -48.23dBm, and 30dB below 20.8dBm, or -9.2dBm is allowed, margin is 39.03dB.

For region B (single-sided in-band), the marker at 1924.41MHz is at -68.33dBm, and 50dB below 20.8dBm, or -29.2dBm is allowed, margin is 39.13dB.

For region C (single-sided in-band), the marker at 1925.86MHz is at -67.79dBm, and 60dB below 20.8dBm, or -39.2dBm is allowed, margin is 28.59dB.

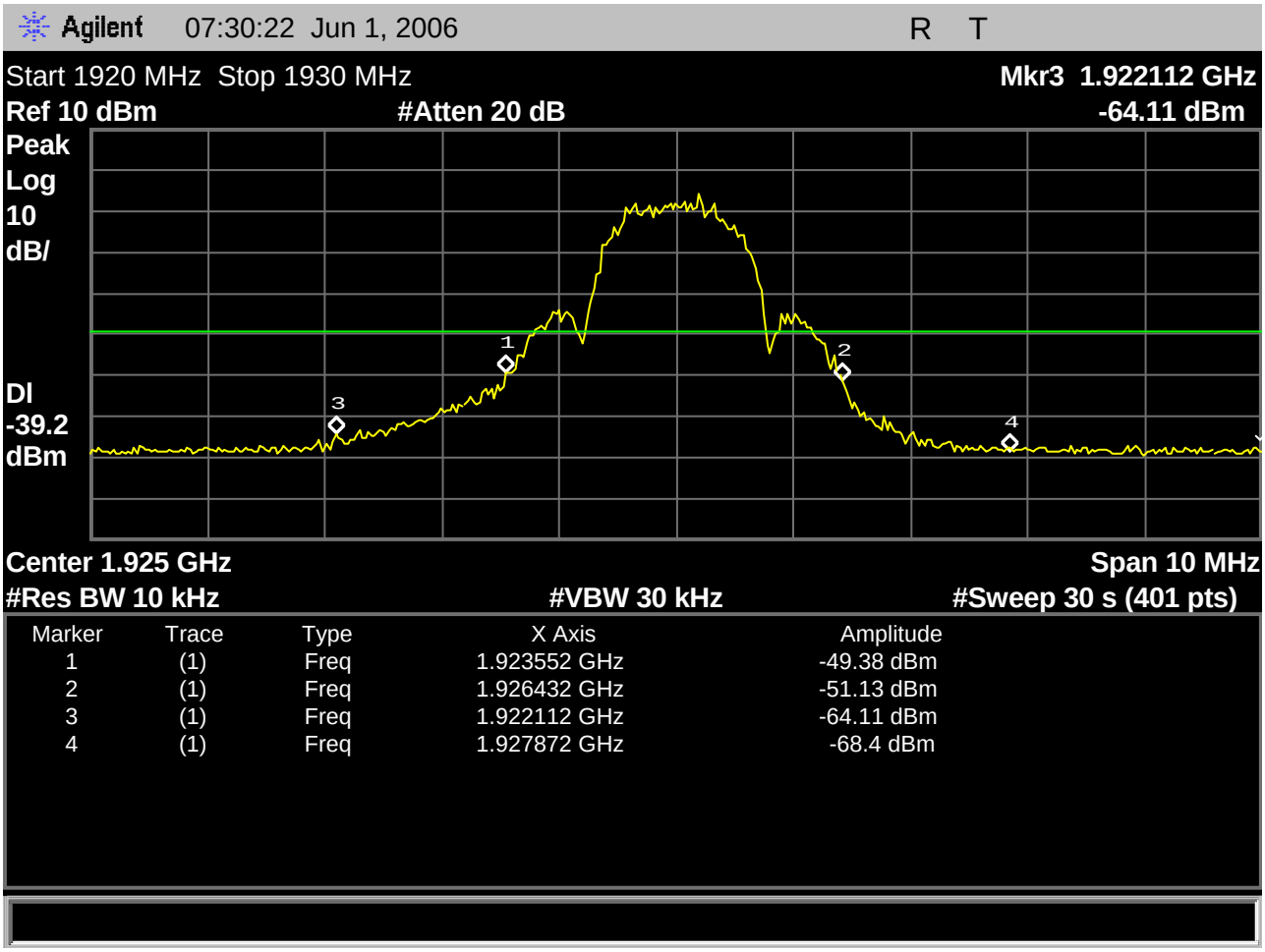

Fig. 23 - Spectrum analyzer screenshot for transmit emissions showing inband unwanted emissions with the base EUT transmitter at the middle carrier, 1924.992MHz, according to the requirements of 6.1.6.1.

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 1923.55MHz is at -49.38dBm, and 30dB below 20.8dBm, or -9.2dBm is allowed, margin is 40.18dB.

For region B (double-sided in-band), the worst-case marker at 1922.11MHz is at -64.11dBm, and 50dB below 20.8dBm, or -29.2dBm is allowed, margin is 34.91dB.

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, or -39.2dBm allowed, margin is at least 24.91dB.

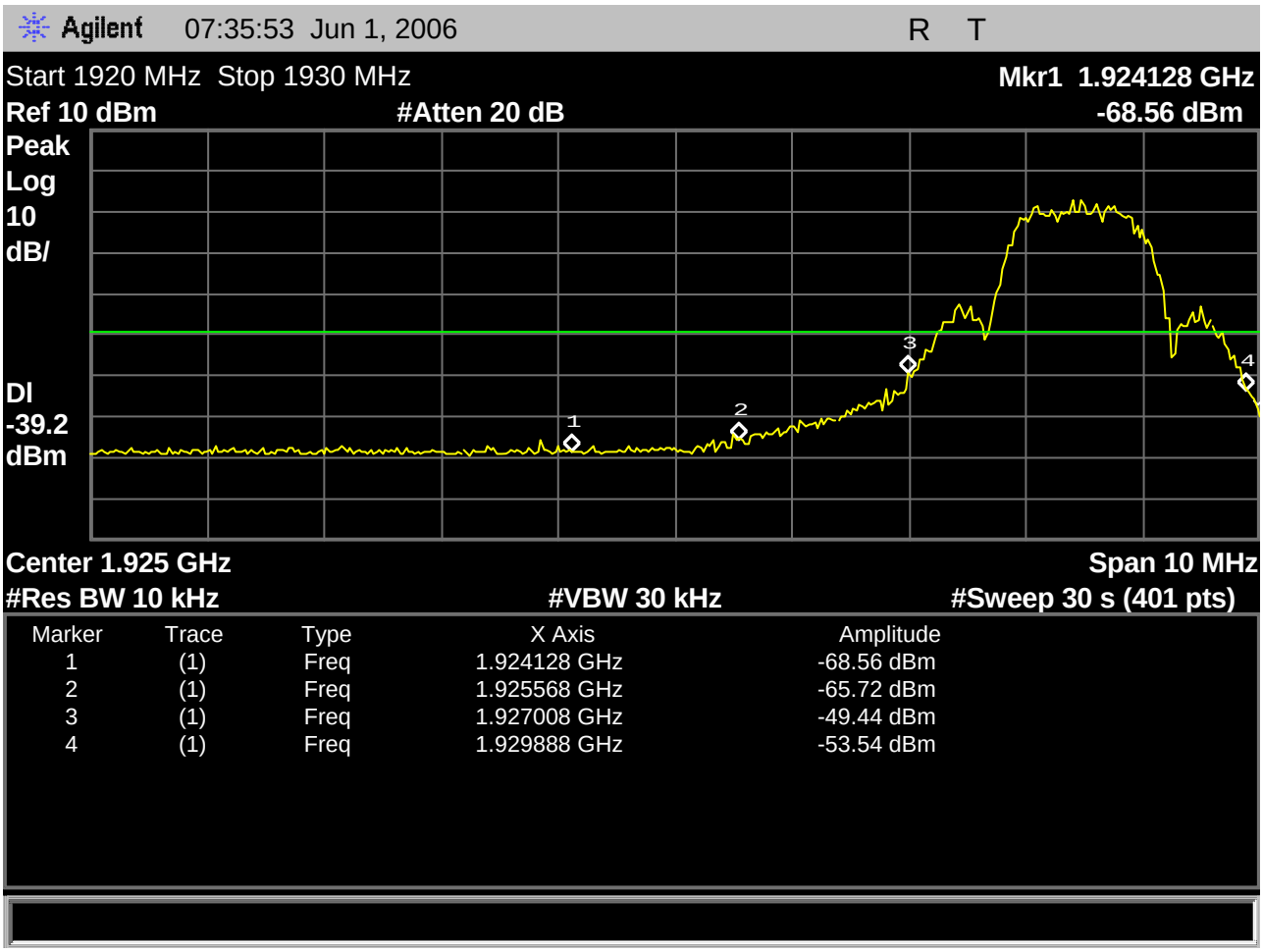

Fig. 24 - Spectrum analyzer screenshot for transmit emissions showing inband unwanted emissions with the base EUT transmitter at the highest carrier, 1928.448MHz, according to the requirements of 6.1.6.1.

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 3B and above, where B is the base EUT emissions bandwidth. The markers are placed at 1B, 2B and 3B separations from the carrier, where the allowed limits are:

A) 1B to 2B separation: at least 30dB below the permitted level.
B) 2B to 3B separation: at least 50dB below the permitted level.
C) 3B to in-band edge: at least 60dB below the permitted level

For region A (double sided in-band), the worst-case marker at 1927.00 MHz is at -49.44dBm, and 30dB below 20.8dBm, or -9.2dBm is allowed, margin is 40.24dB.

For region B (single-sided in-band), the marker at 1925.56MHz is at -65.72dBm, and 50dB below 20.8dBm, or -29.2dBm is allowed, margin is 36.52dB.

For region C (single-sided in-band), the marker at 1924.12MHz is at -68.56dBm, and 60dB below 20.8dBm, or -39.2dBm is allowed, margin is 29.36dB.

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 24.91dB of margin.

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 bandedge 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 bandedge (1915 to 1920MHz) to cover the requirements of paragraphs a and b.
- For the region 5MHz above the bandedge (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.

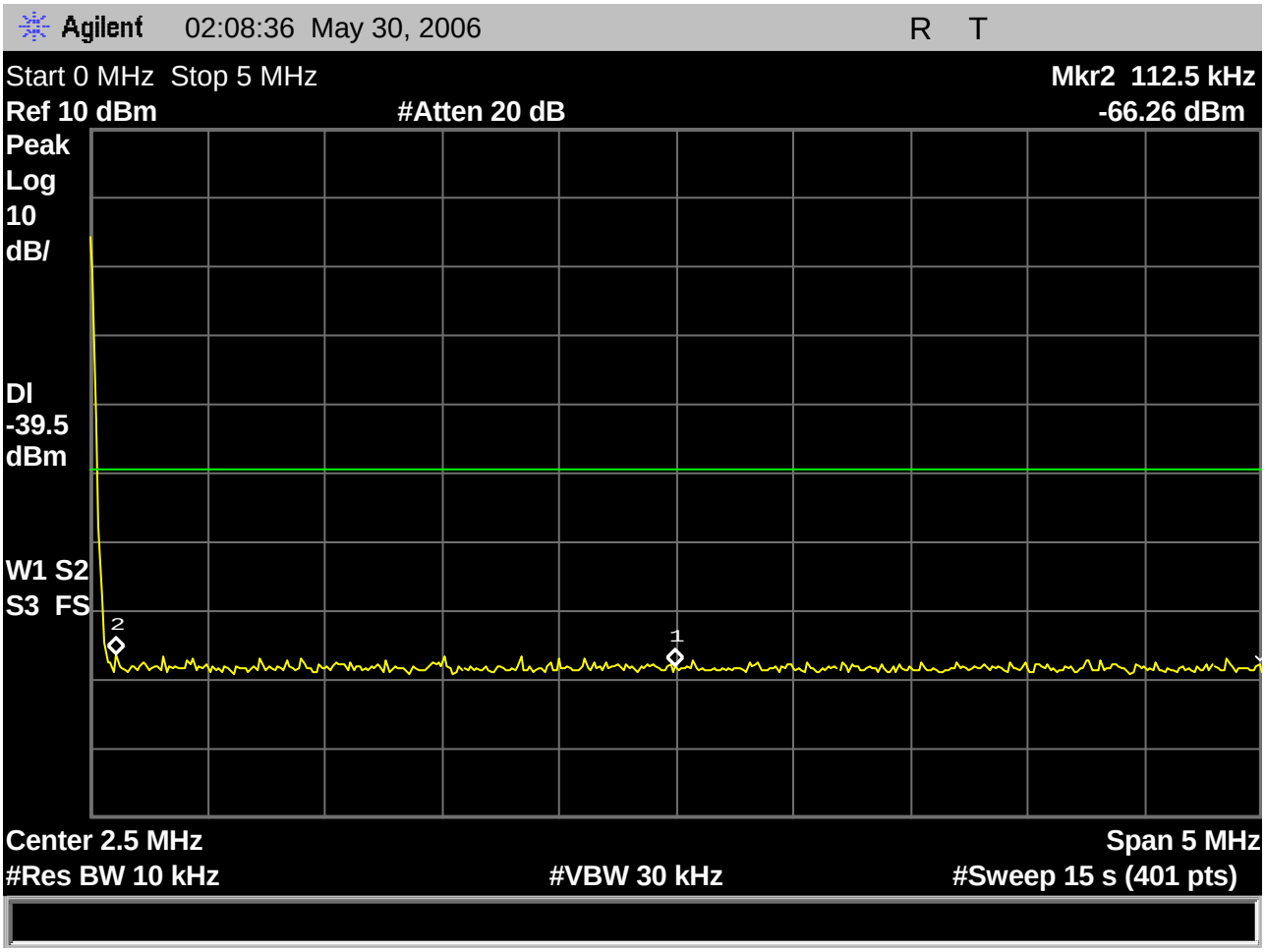

Fig. 25 – base EUT out-of-band emissions showing the regions from DC to 5MHz, with the transmitter using the lowest carrier, 1921.536MHz.

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.

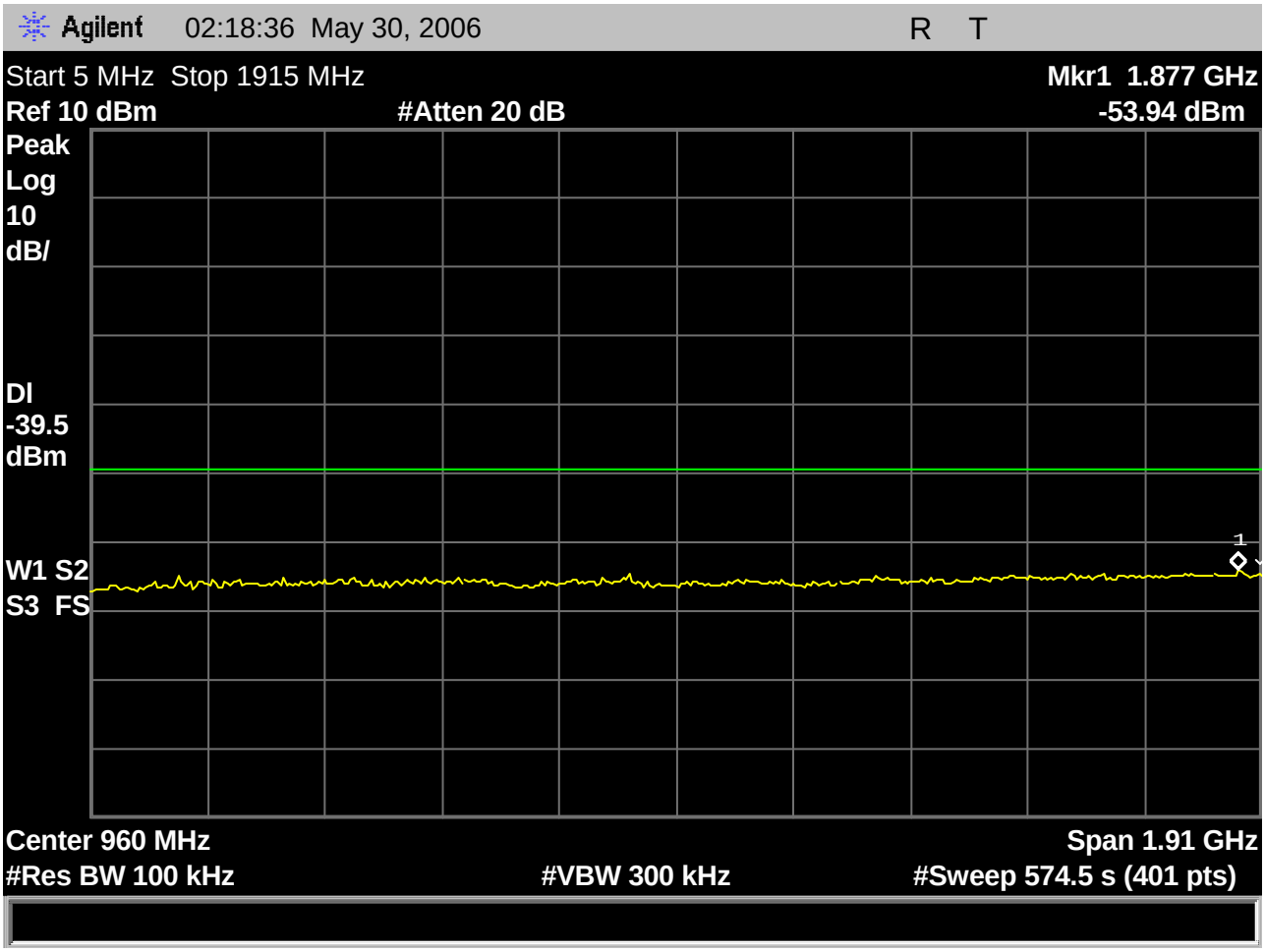

Fig. 26 – base EUT out-of-band emissions showing the region from 5MHz to 1915MHz, with the transmitter using the lowest carrier, 1921.536MHz.

This screenshot shows a sweep made with resolution bandwidth increased to 100kHz to improve sweep time. Base EUT margin to the -39.5dBm out-of-band emissions specification in this spectral region is 14.44dB in this region, even measured in the 10x-wider bandwidth than is in the text of the test procedure of 6.1.6.

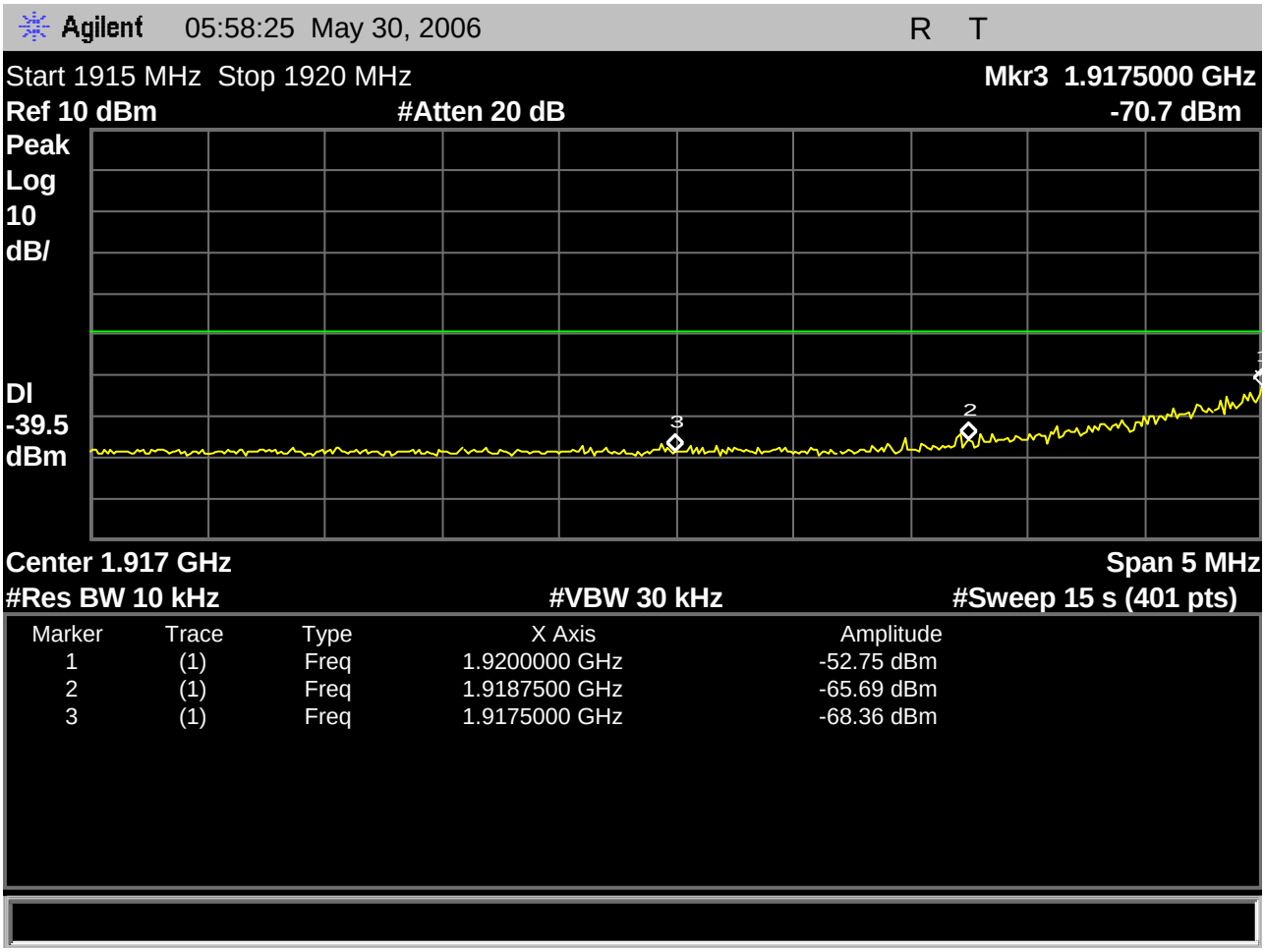

Fig. 27 – base EUT out-of-band emissions showing the regions from bandedge to -1.25MHz, and from -1.25MHz to -2.5MHz, with the base EUT transmitting on the lowest carrier, 1921.536MHz.

Margin to the specification of -9.5dBm in the region from bandedge to -1.25MHz is found at marker 1, at -52.75dBm, and is 43.25dBm.

Margin to the specification of -29.5dBm in the region from -1.25MHz to -2.5MHz is found at marker 2, at -65.69dBm, and is 36.19dB.

Margin to the specification of -39.5dBm in the region outside -2.5MHz from the bandedge exceeds 25dB.

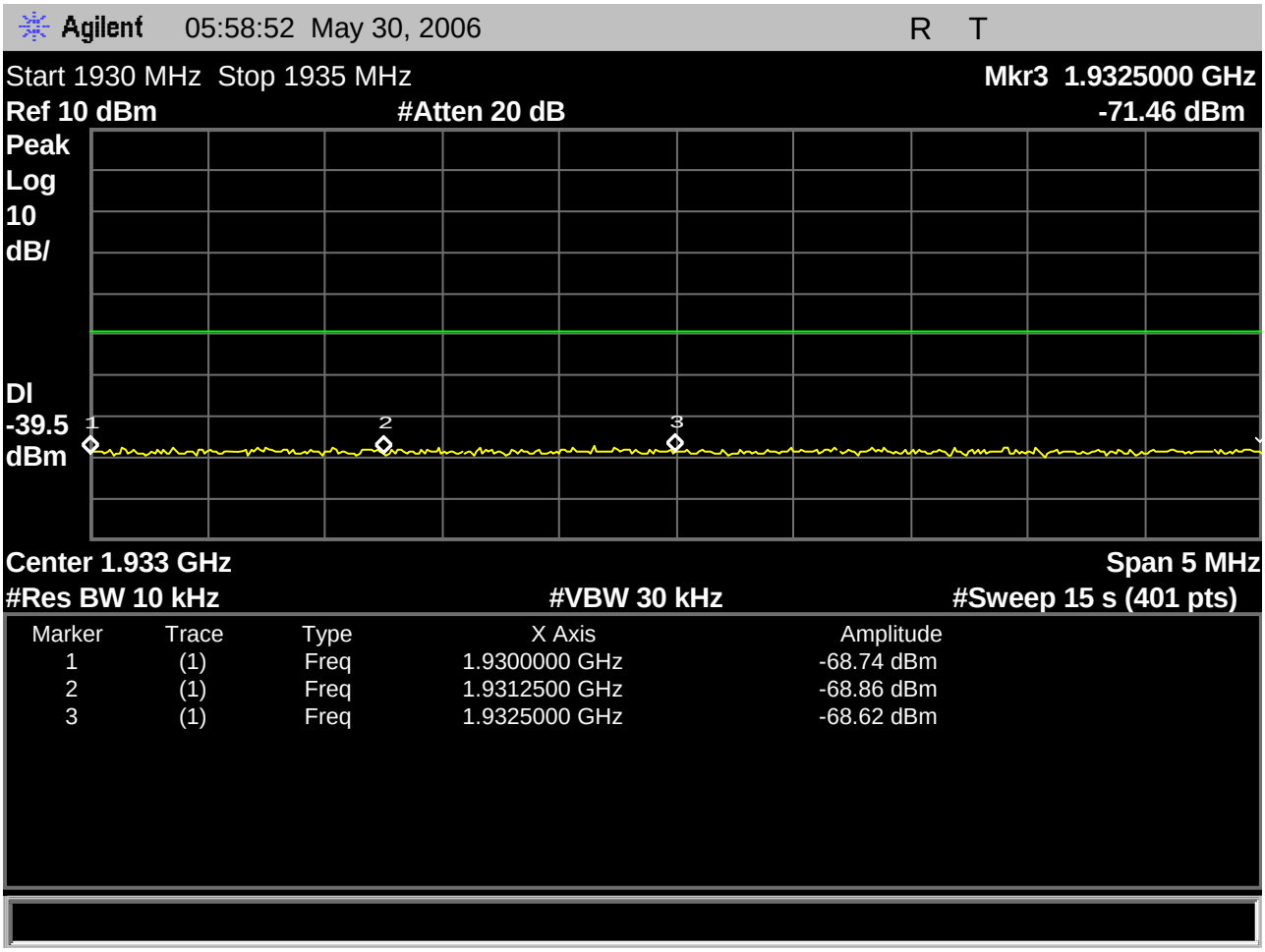

Fig. 28 – base EUT out-of-band emissions including the regions from bandedge to +1.25MHz, and from +1.25MHz to +2.5MHz, with the base EUT transmitting on the lowest carrier, 1921.536MHz

Least margin is for the -39.5dBm specification outside the +2.5MHz boundary and is 29.12dB.

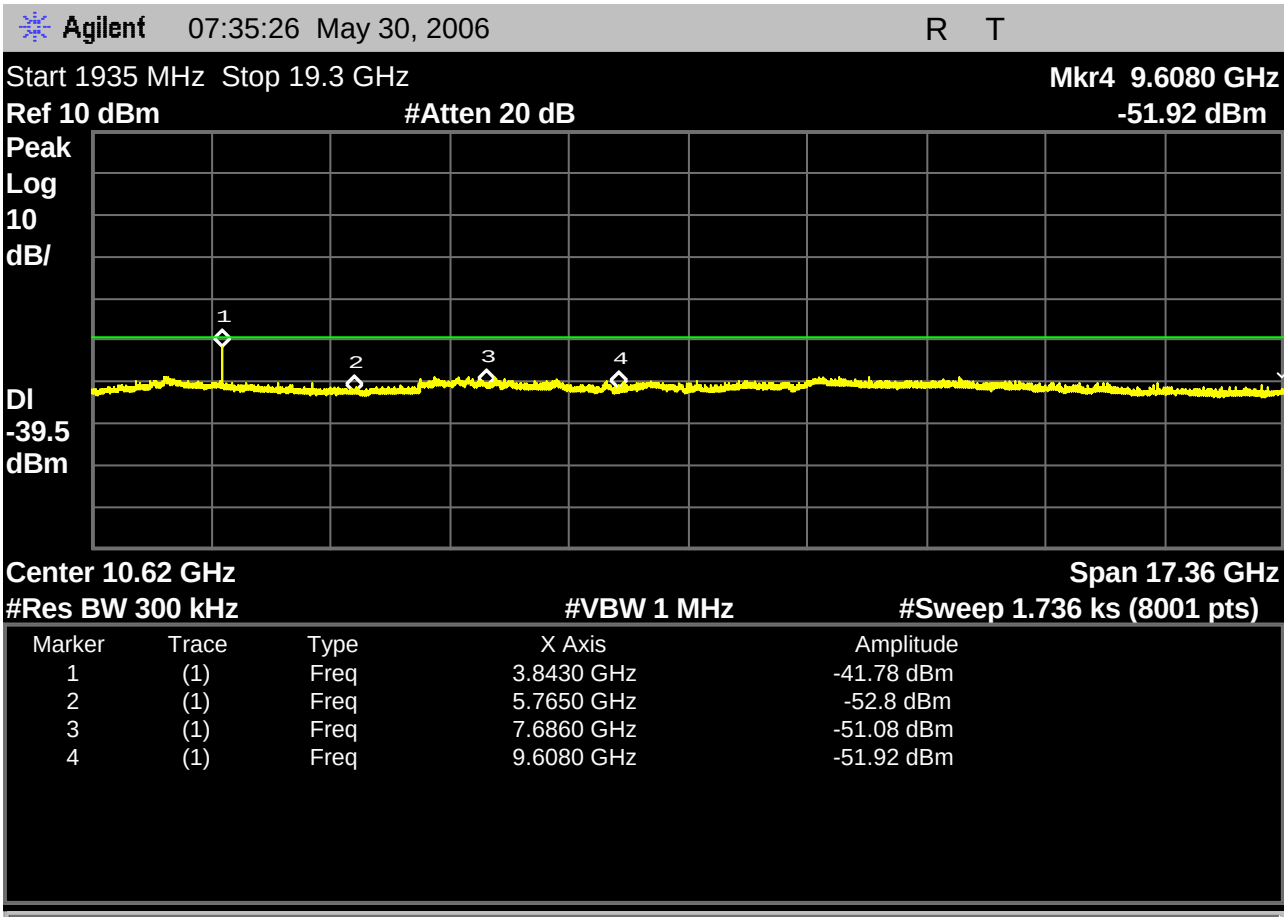

Fig. 29 – base EUT out-of-band emissions including the regions from 1935MHz to 19.3GHz with the base EUT transmitting on the lowest carrier, 1921.536MHz.

The least margin is at the 2nd 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 v3.3 (draft) C63.17-2005 clause 6.1.6. Even so, the margin to specification is 2.28dB. 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.

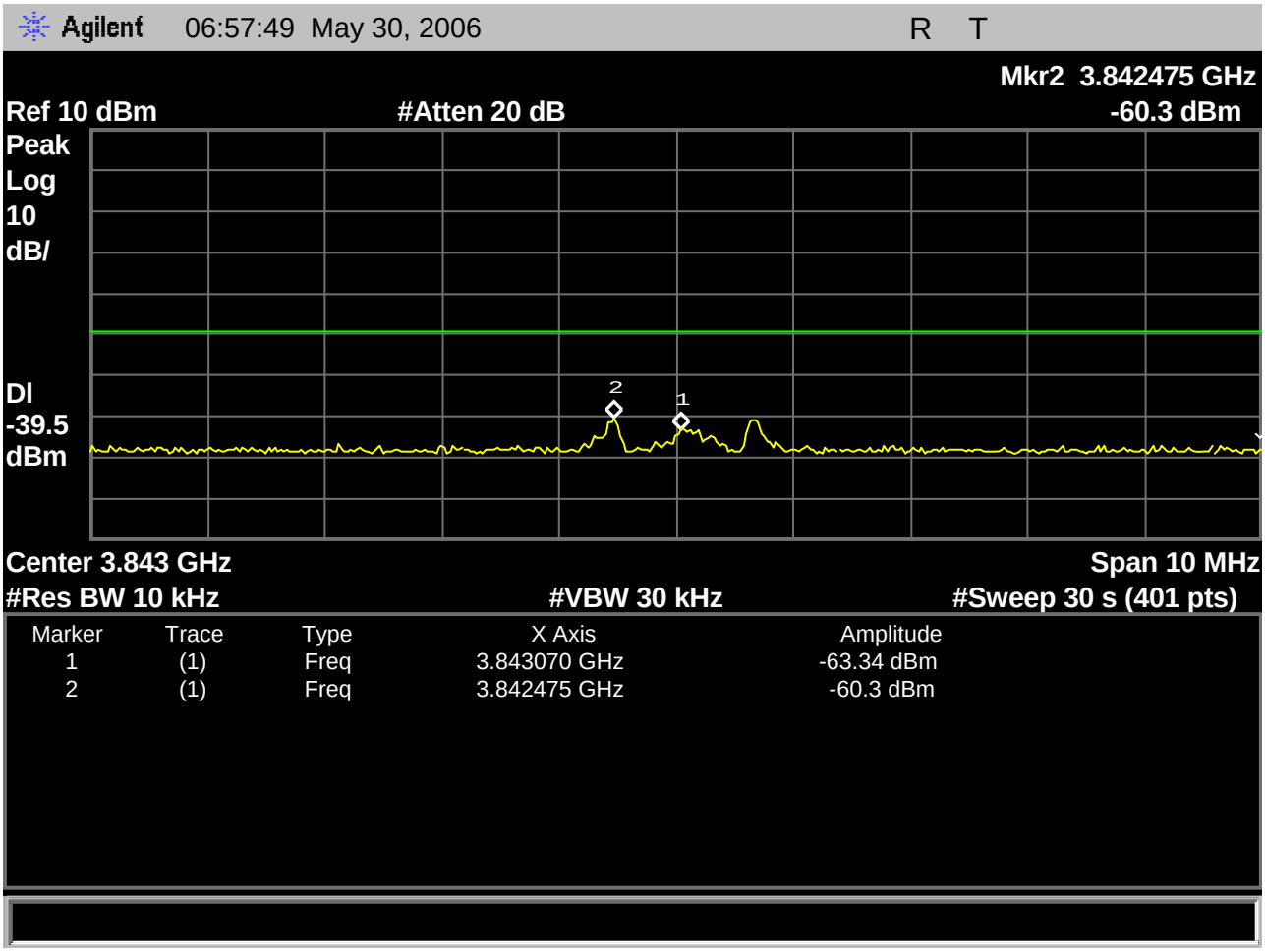

Fig. 30 – base EUT out-of-band emissions in the region around the 2nd harmonic, with the base EUT transmitting on the lowest carrier, 1921.536MHz.

This measurement was made according to the requirements of the text of 6.1.6, and, with the worst-case peak at –60.30dB, shows margin to the -39.5dBm specification of 20.80dB.

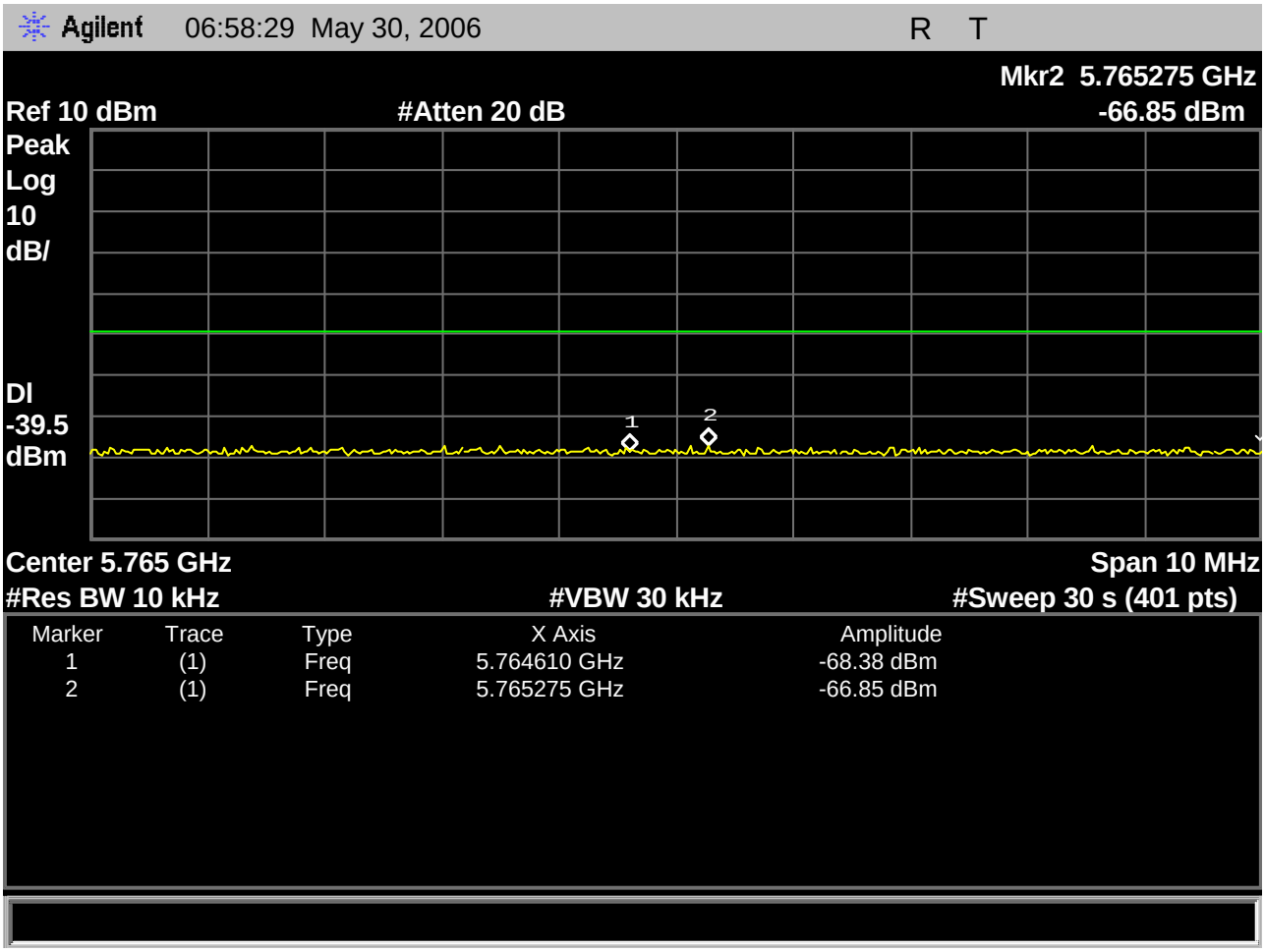

Fig. 31 – base EUT out-of-band emissions in the region around the 3rd harmonic, with the base EUT transmitting on the lowest carrier, 1921.536MHz.

This measurement was made according to the requirements of the text of 6.1.6, and, with the worst-case peak at -66.38dB, shows margin to the -39.5dBm specification of dB.

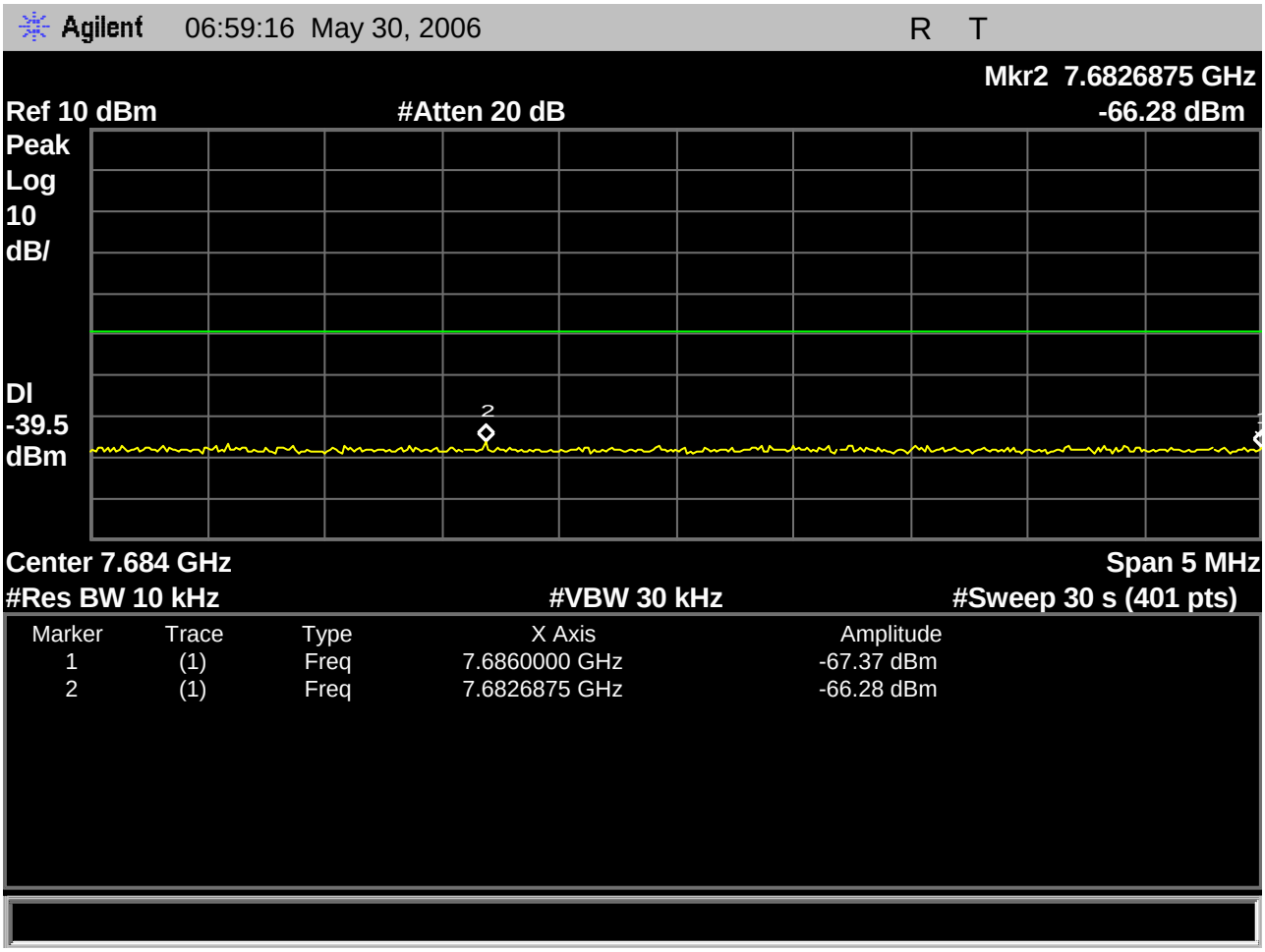

Fig. 32 – base EUT out-of-band emissions in the region around the 4th harmonic, with the base EUT transmitting on the lowest carrier, 1921.536MHz.

This measurement was made for completeness, the emissions are at the noise floor.

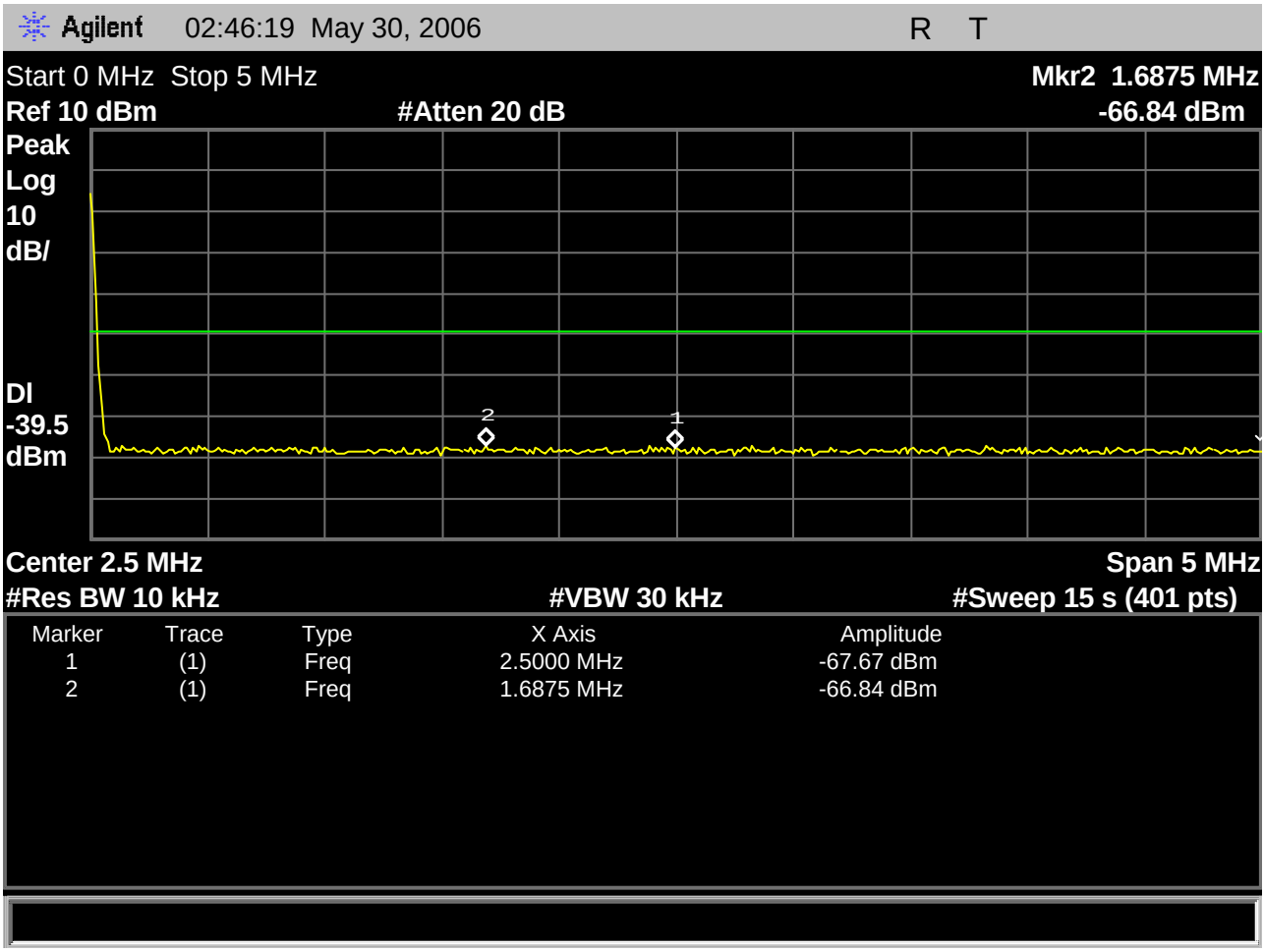

Fig. 33 – base EUT out-of-band emissions showing the regions from DC to 5MHz, with the transmitter using the highest carrier, 1928.448MHz.

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.

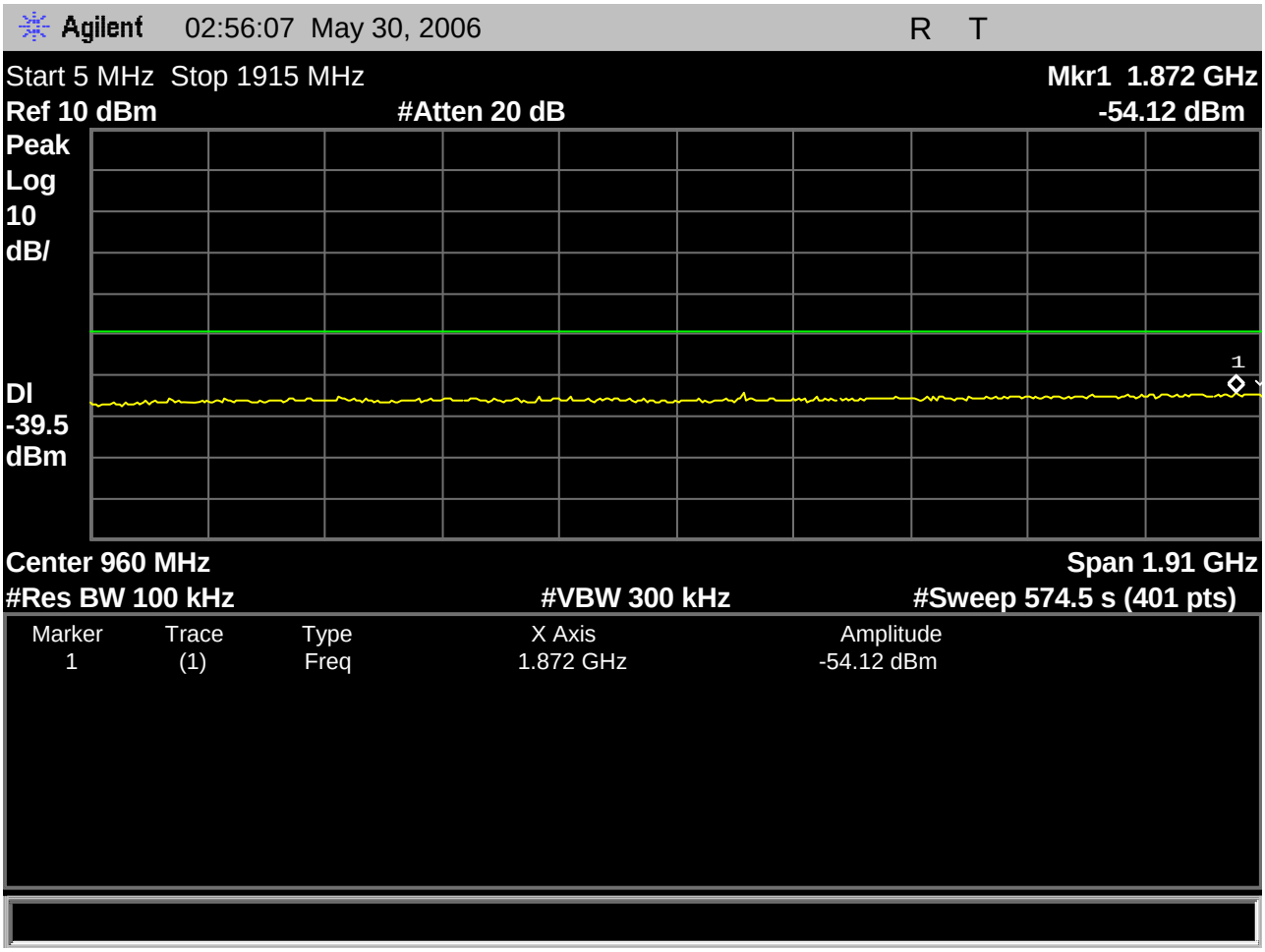

Fig. 34 – base EUT out-of-band emissions showing the region from 5MHz to 1915MHz, with the transmitter using the highest carrier, 1928.448MHz.

This screenshot shows a sweep made with resolution bandwidth increased to 100kHz to improve sweep time. Base EUT margin to the -39.5dBm out-of-band emissions specification in this spectral region is 14.62dB in this region, even measured in the 10x-wider bandwidth than is in the text of the test procedure in clause 6.1.6.

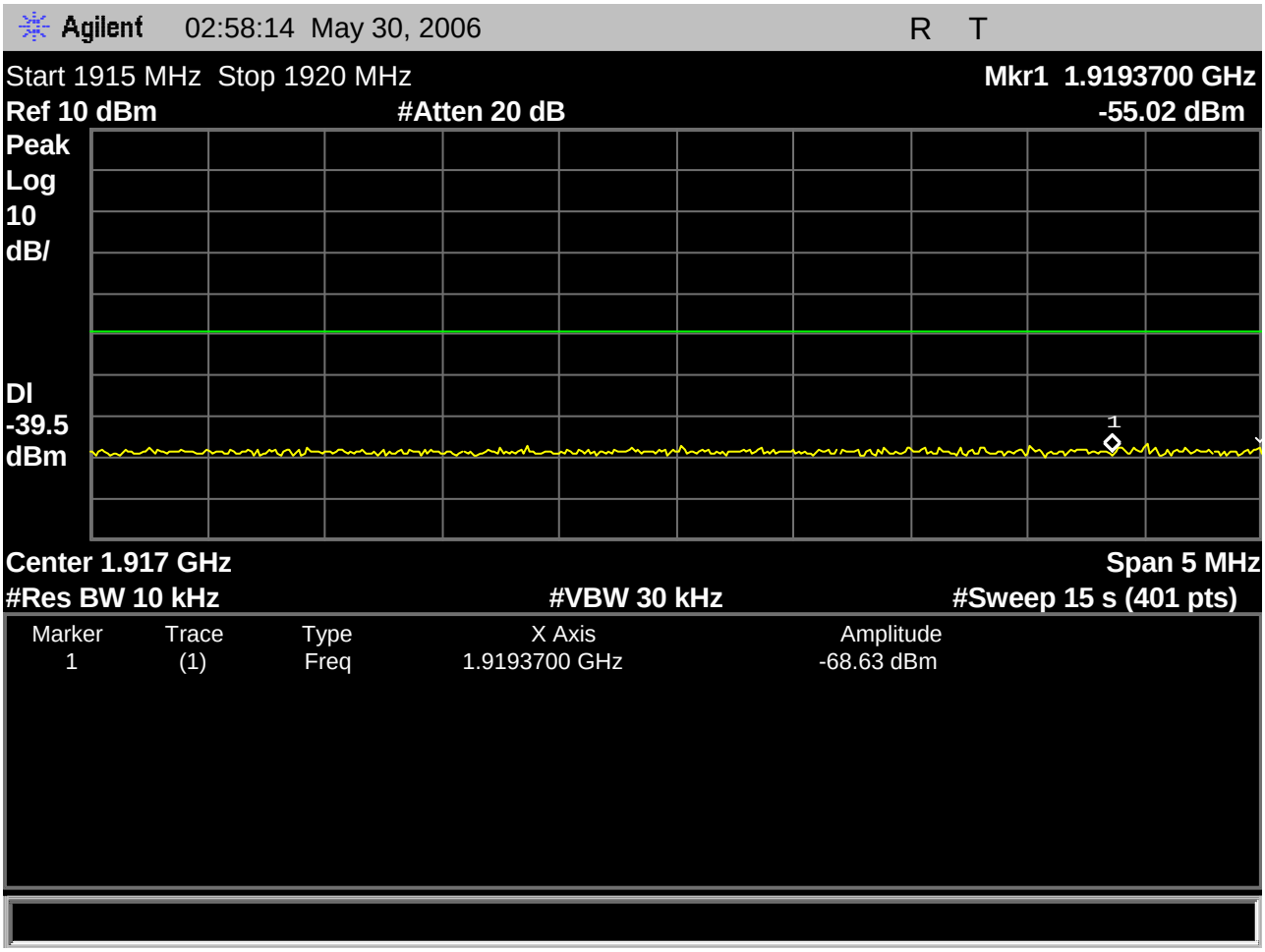

Fig. 35 – base EUT out-of-band emissions showing the regions from bandedge to -1.25MHz, and from -1.25MHz to -2.5MHz, with the base EUT transmitting on the highest carrier, 1928.448MHz.

Margins to the specification of -9.5dBm in the region from bandedge 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 bandedge all exceed 25dB.

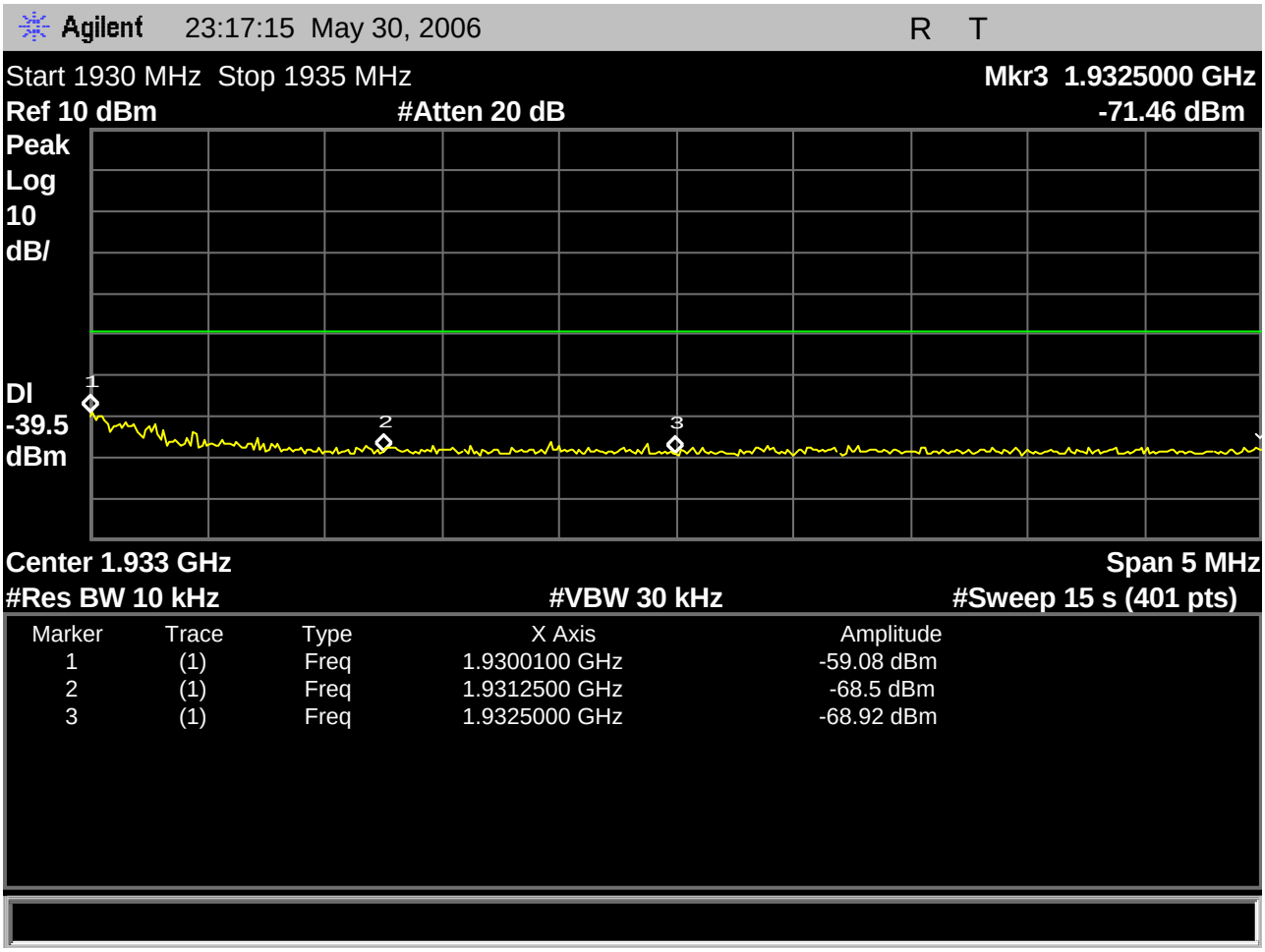

Fig. 36 – base EUT out-of-band emissions showing the regions from bandedge to +1.25MHz, and from +1.25MHz to +2.5MHz, with the base EUT transmitting on the highest carrier, 1928.448MHz.

Margin to the specification of -9.5dBm in the region from bandedge to +1.25MHz is found at marker 1, at -59.08 dBm, and is 49.58.

Margin to the specification of -29.5dBm in the region from +1.25MHz to +2.5MHz is found at markers 2, at –68.5 dBm, and is 39.0dB.

Margin to the specification of -39.5dBm in the region outside +2.5MHz from the bandedge exceeds 25dB

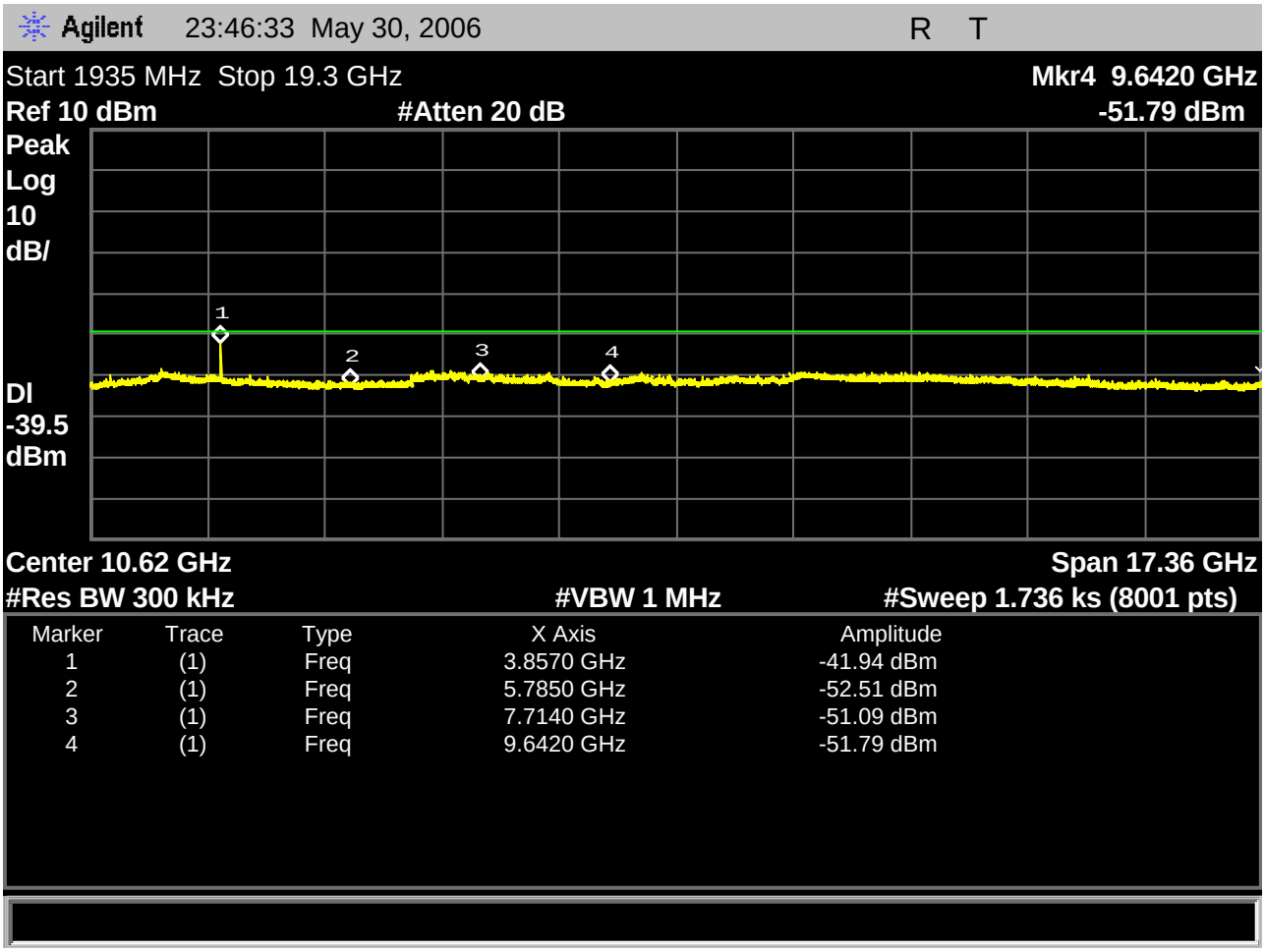

Fig. 37 – base EUT out-of-band emissions including the regions from 1935MHz to 19.3GHz with the base EUT transmitting on the highest carrier, 1928.448MHz.

The least margin is at the 2nd 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; the 300kHz bandwidth ove rtests in that it passes considerably more unwanted emissions than the 10kHz obtained from the text of v3.3 (draft) C63.17-2005 clause 6.1.6. Even so, the margin to specification is 2.44dB. 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.

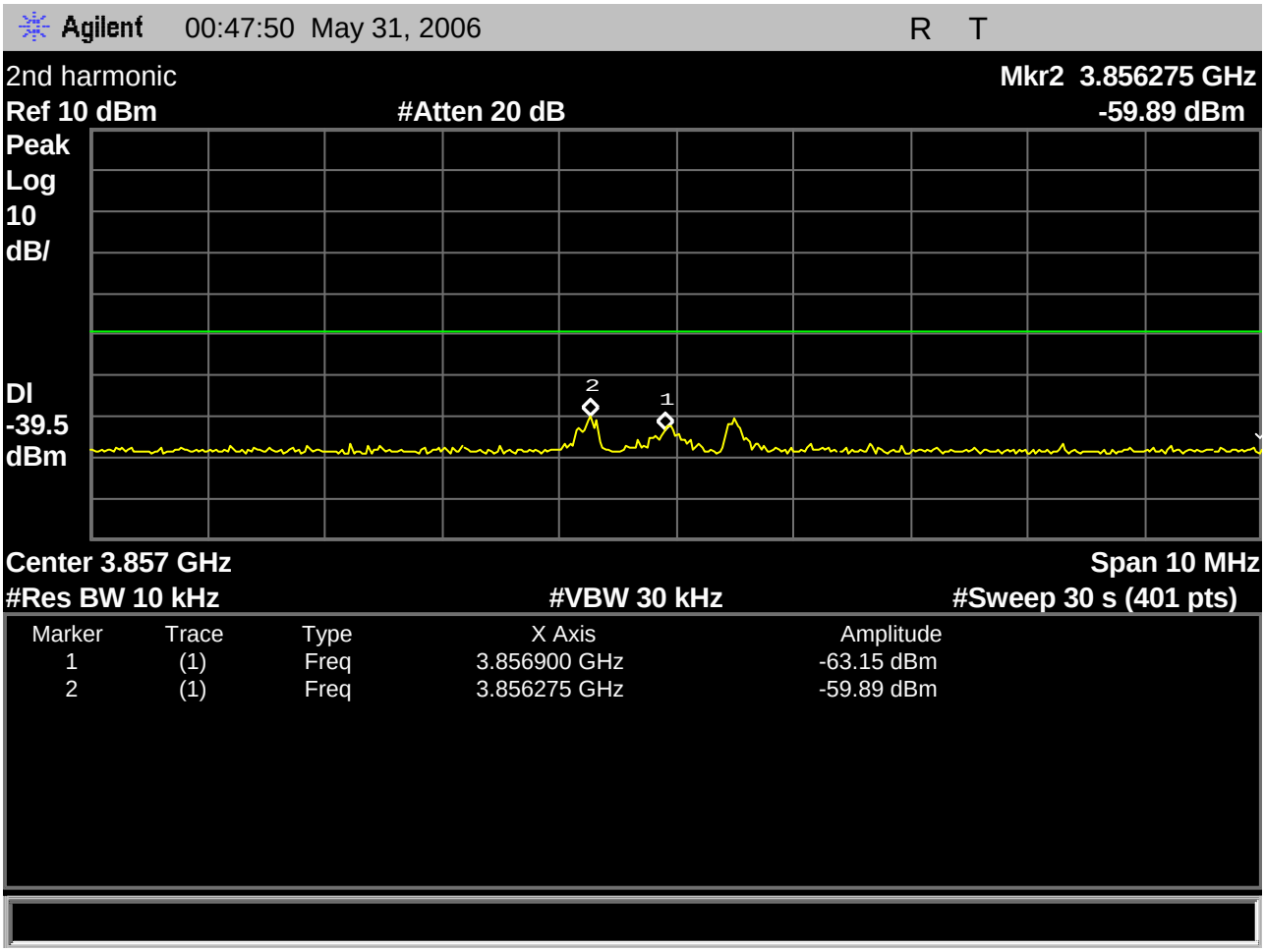

Fig. 38 – base EUT out-of-band emissions in the region around the 2nd harmonic, with the base EUT transmitting on the highest carrier, 1928.448MHz.

This measurement was made according to the requirements of the text of 6.1.6, and, with the worst-case peak at –59.89dBm, shows margin to the -39.5dBm specification of 20.39dB.

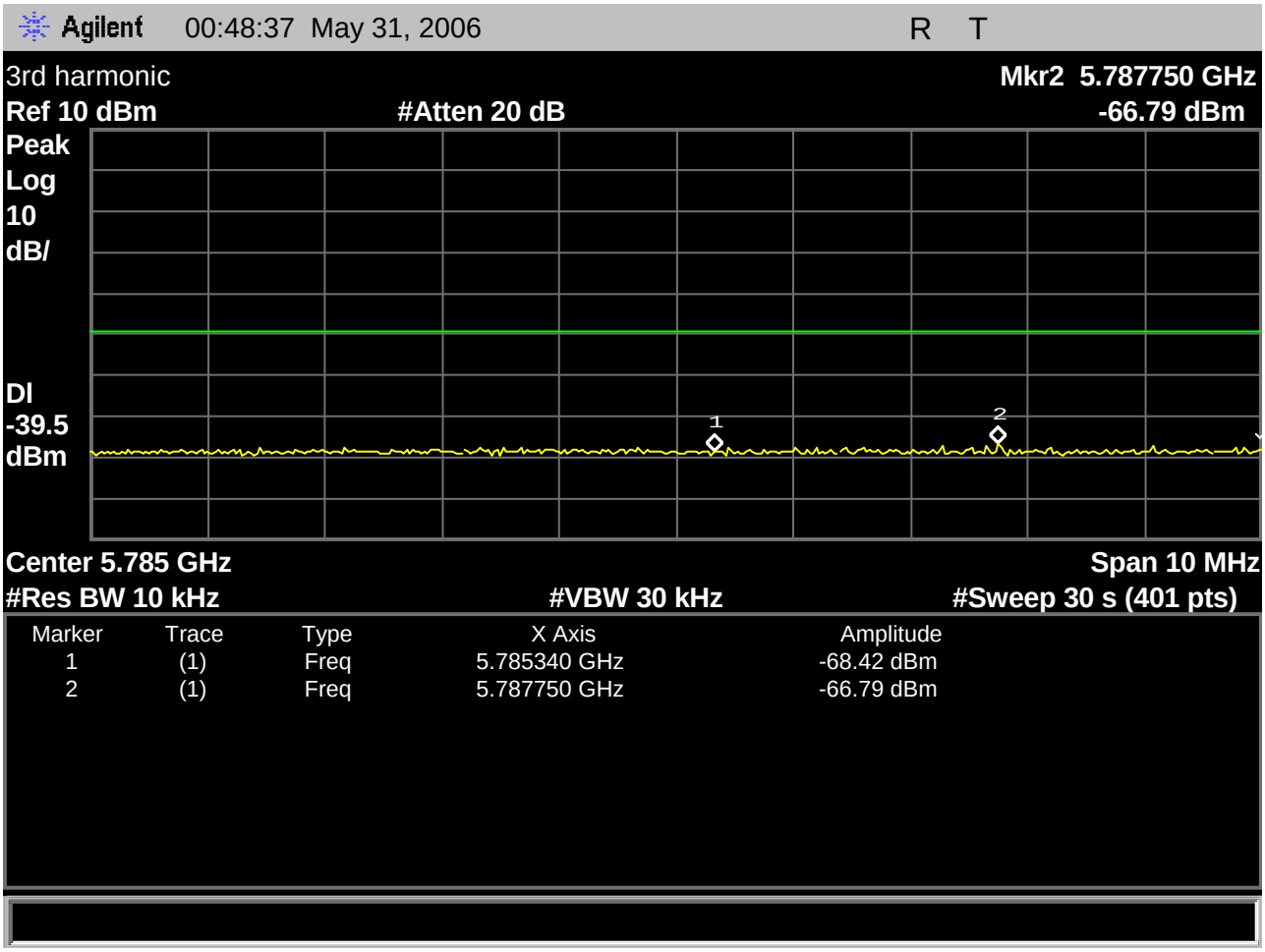

Fig. 39 – base EUT out-of-band emissions in the region around the 3rd harmonic, with the base EUT transmitting on the highest carrier, 1928.448MHz.

This measurement was made according to the requirements of the text of 6.1.6, and, with the worst-case peak at -66.79dB, shows margin to the -39.5dBm specification of 27.29dB.

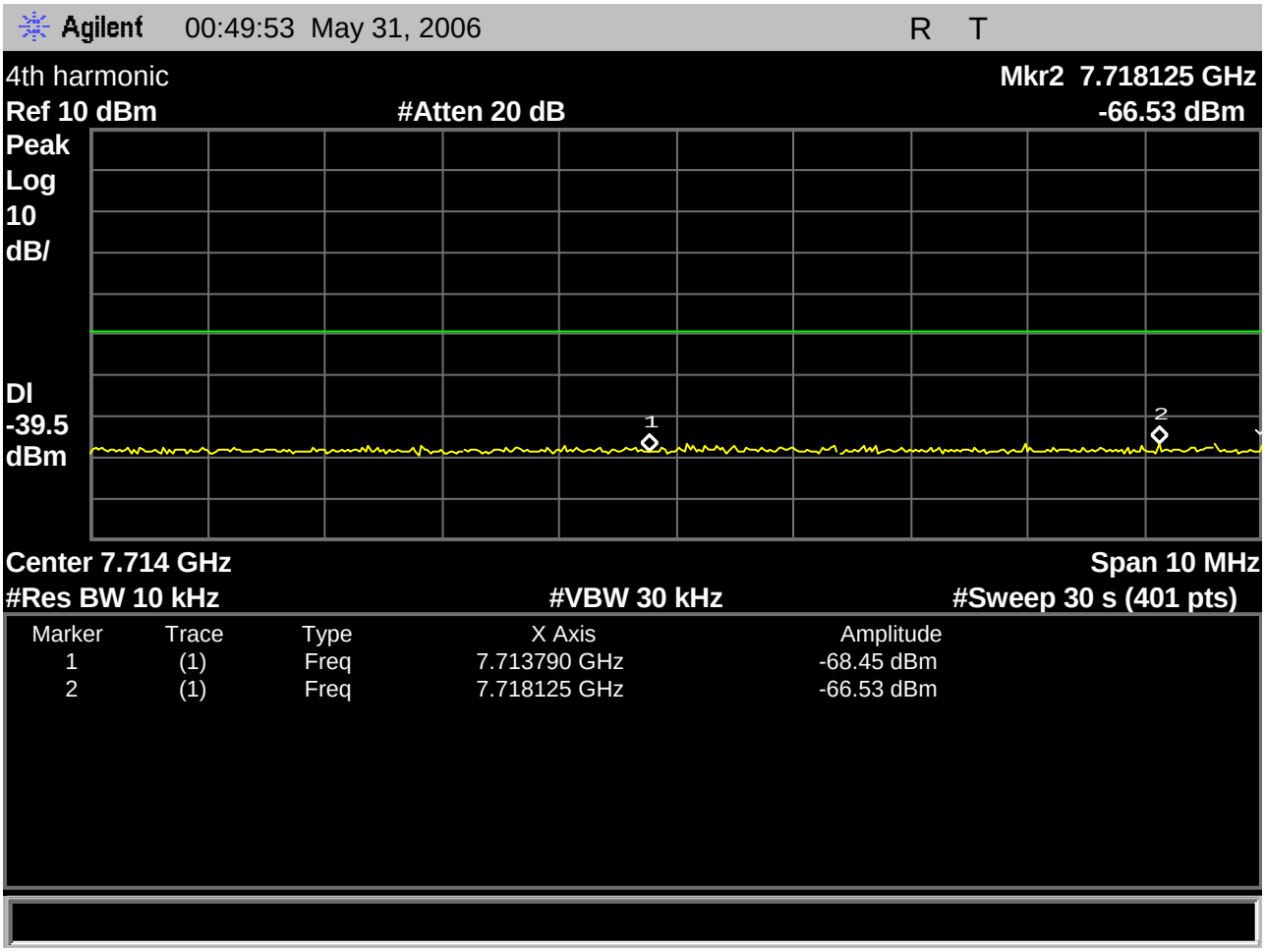

Fig. 40 – base EUT out-of-band emissions in the region around the 4th harmonic, with the base EUT transmitting on the highest carrier, 1928.448MHz.

This measurement was made for completeness, the emissions are at the noise floor.

The base EUT meets the various out-of-band emissions requirements of clause 6.1 with worst-case margin of 20.39dB, under the worst-case conditions of transmitting on the high carrier, at the 2nd harmonic of the transmit signal.

III-B. Clause 6.2 Tests of frequency and time stability for the base EUT

The test configuration for the tests of V3.3 (draft) C63.17-2005 clauses 6.2.1.1 through 6.2.1.3 and 6.2.1 through 6.2.3 is as follows:

The test platform and base EUT are configured according to test configuration #3, **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.

6.2.1 Carrier frequency stability, base EUT.

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 9.00V. 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.

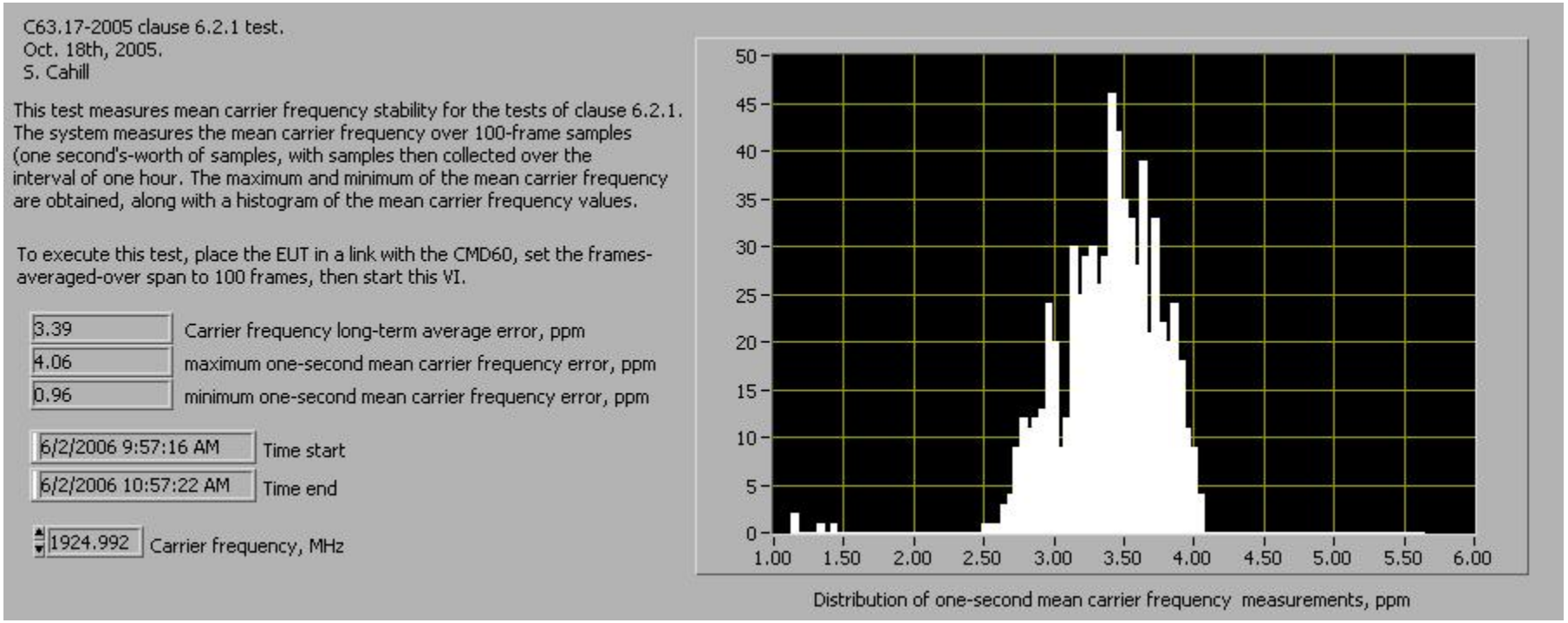

Fig. 44 - Measured one-second mean carrier frequency, base EUT, and observed maximum, average value and observed minimum of the mean carrier frequency.

The nominal mean carrier frequency error relative to 1924.992MHz is +3.39ppm.
The observed maximum is +4.06ppm, for a change relative to nominal of +0.67ppm.
The observed minimum is +0.96ppm, for a change relative to nominal of -2.43ppm.

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.

6.2.1.2 for the base EUT; mean carrier frequency change with supply voltage.
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 7.65V, 9.00V, and 10.35V, 85% of nominal, nominal, and 115% of nominal.

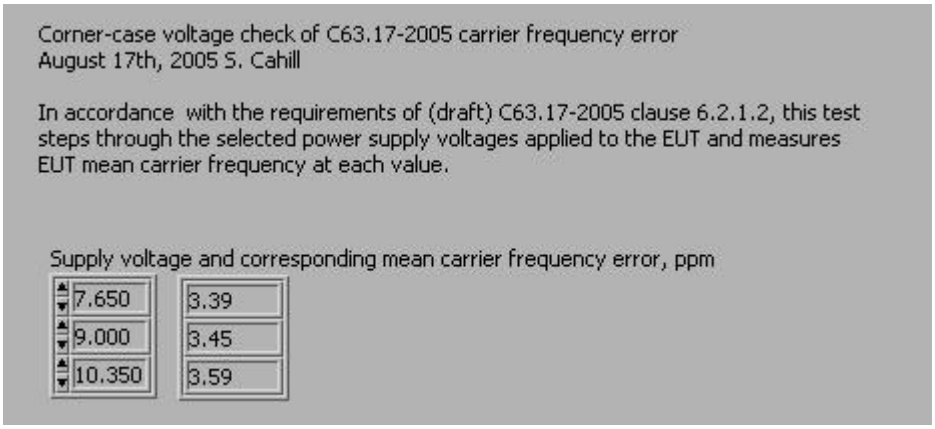

Fig. 45 - Measured mean carrier frequency, base EUT , at 85% of nominal supply voltage, nominal supply voltage, and 115% supply voltage.

The mean carrier frequency error for nominal supply voltage, relative to 1924.992MHz, is +3.45ppm.
The observed value for the error at 85% of nominal supply voltage is -3.39ppm, for a change relative to nominal supply voltage of -0.06ppm.
The observed value for the error at 115% of nominal supply voltage is also +3.59ppm, for a change relative to nominal supply voltage of +0.20ppm.

The base EUT nominal carrier frequency error is insensitive to supply voltage changes over the range of 85% to 115% of nominal, and so 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.

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 9.00V. The EUT's mean carrier frequency is measured at the declared rated extremes (+4C, then +44C) and at 20C, after a 60 minute soak at each temperature.

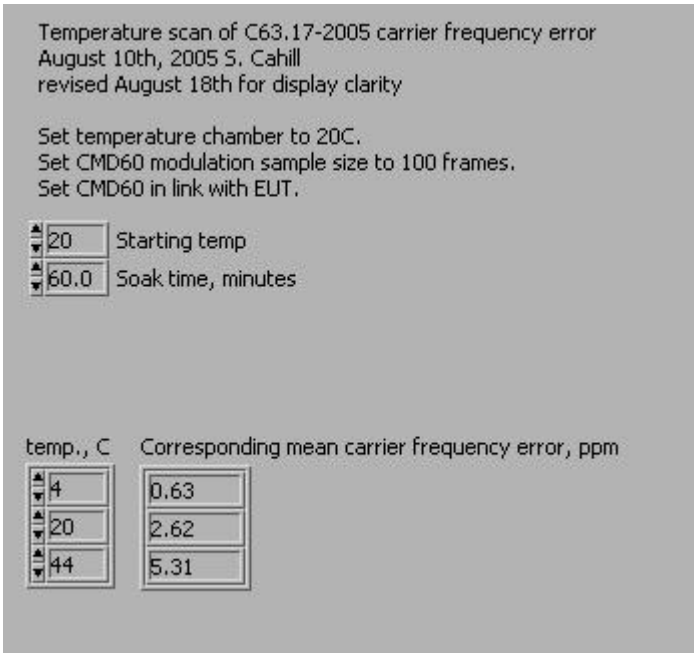

Fig. 46 - Measured mean carrier frequency, base EUT , at +4C, +20C, +44C.

The nominal mean carrier frequency error relative to 1924.992MHz is +2.62ppm.
The observed value at +4C is +0.63ppm, for a change relative to 20C ambient of -1.99ppm.
The observed value at +44C is +5.31ppm, for a change relative to 20C ambient of +2.69ppm.

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.

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 V3.3 (draft) C63.17-2005) 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.

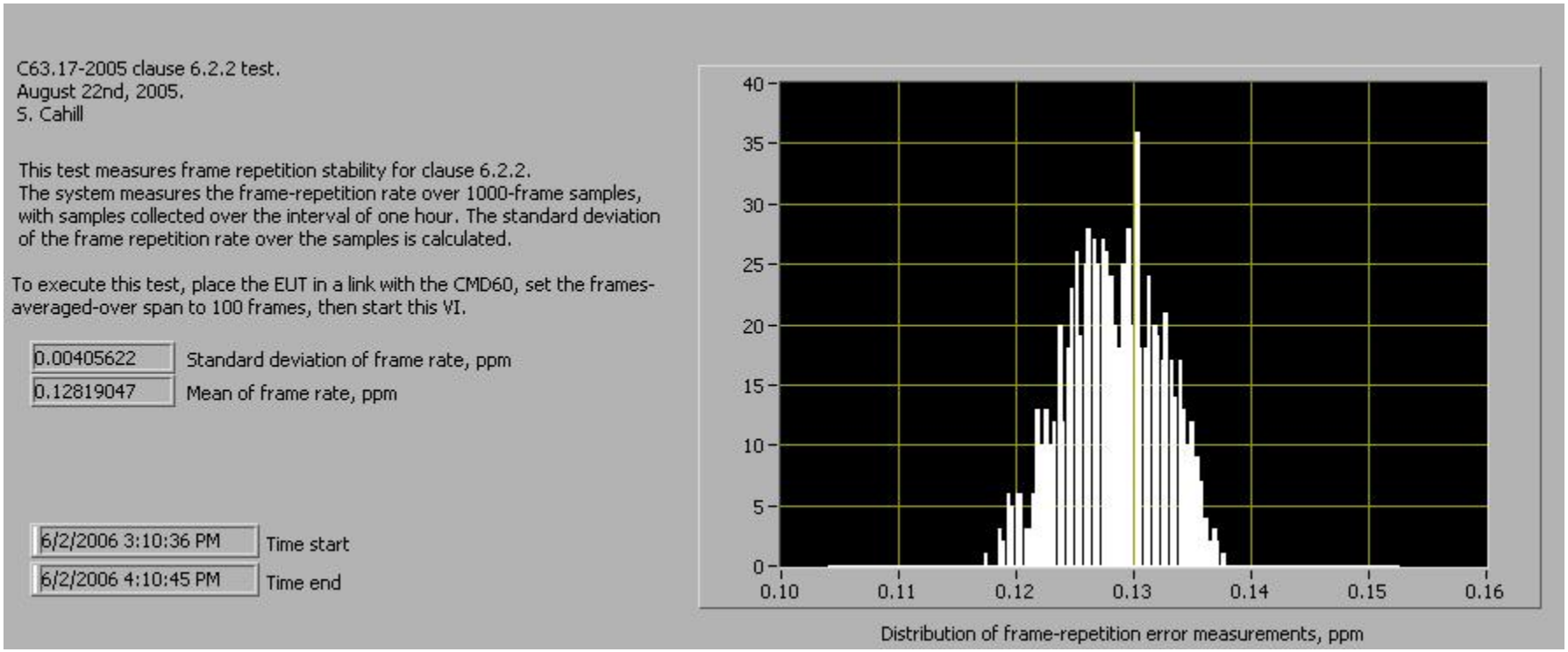

Fig. 47 - Test of base EUT according to the conditions of clause 6.2.2 for frame repetition rate stability

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 0.004056ppm.

The base EUT passes 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 0.01216ppm.

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.

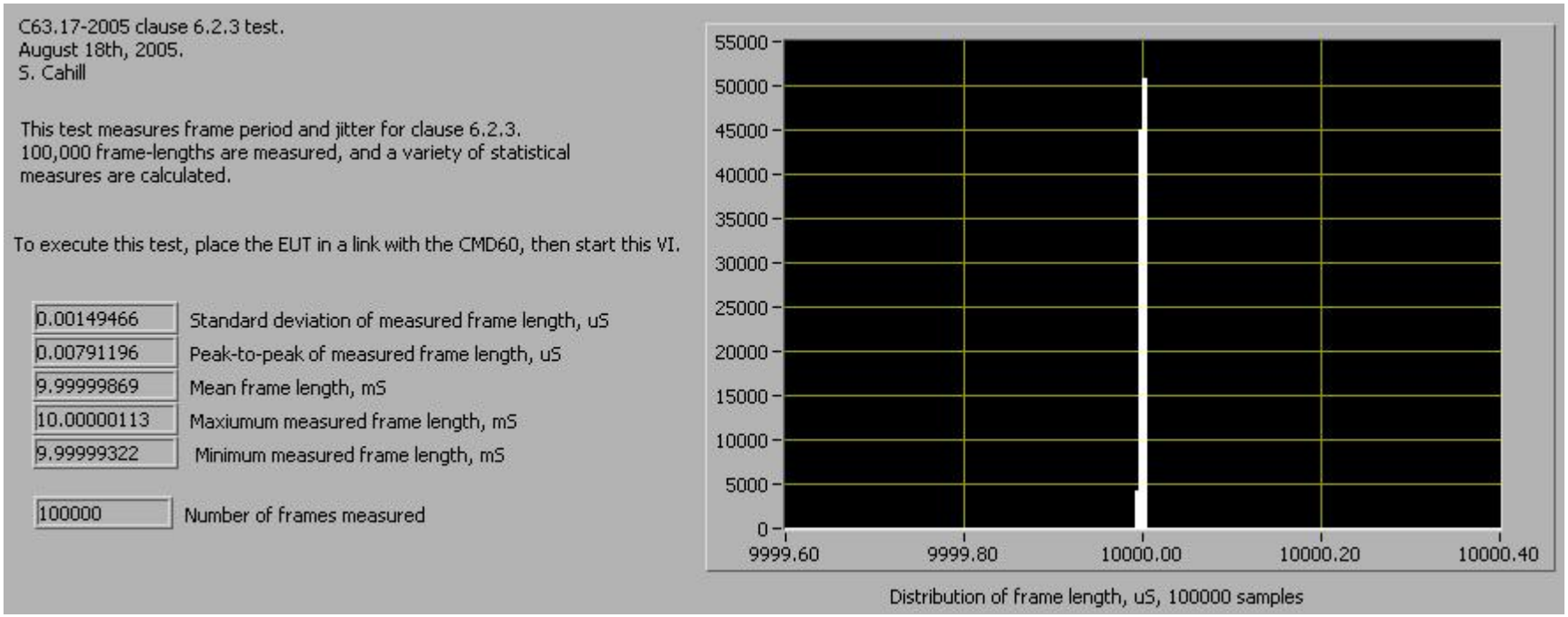

Fig. 48 - Test of base EUT according to the conditions of clause 6.2.3 for frame period and jitter.

The measured mean value of the frame period is 9.99999869mS, which is 10mS with jitter offset of 0.00131uS and three standard deviations of 0.013483uS, totaling 0.01479uS.

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

IV-A. Clause 7.3.2 Upper threshold for EUTs which implement the LIC procedure, base EUT

The test platform, base EUT and companion remote unit are configured according to the requirements for implementing the test of 7.3.2(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 CW on all 5 carriers, and at level -30.0dBm, which is T_U + U_M + 10dB, where T_U = -46.0 dBm from the manufacturer's declarations and the measured emissions bandwidth and U_M is defined in V3.3 (draft) C63.17-2005 as 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 following. A trace (yellow) is captured and held at the initial interference setting of -30.0dBm.

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 beacon begin. For each 1dB step, the base EUT is powered down while the multi-carrier interference generator is set to the new level. A trace (blue) shows the interference carrier level at the level where transmissions first begin. A marker shows the delta between the -30.0dBm level and the level at which transmissions first begin.

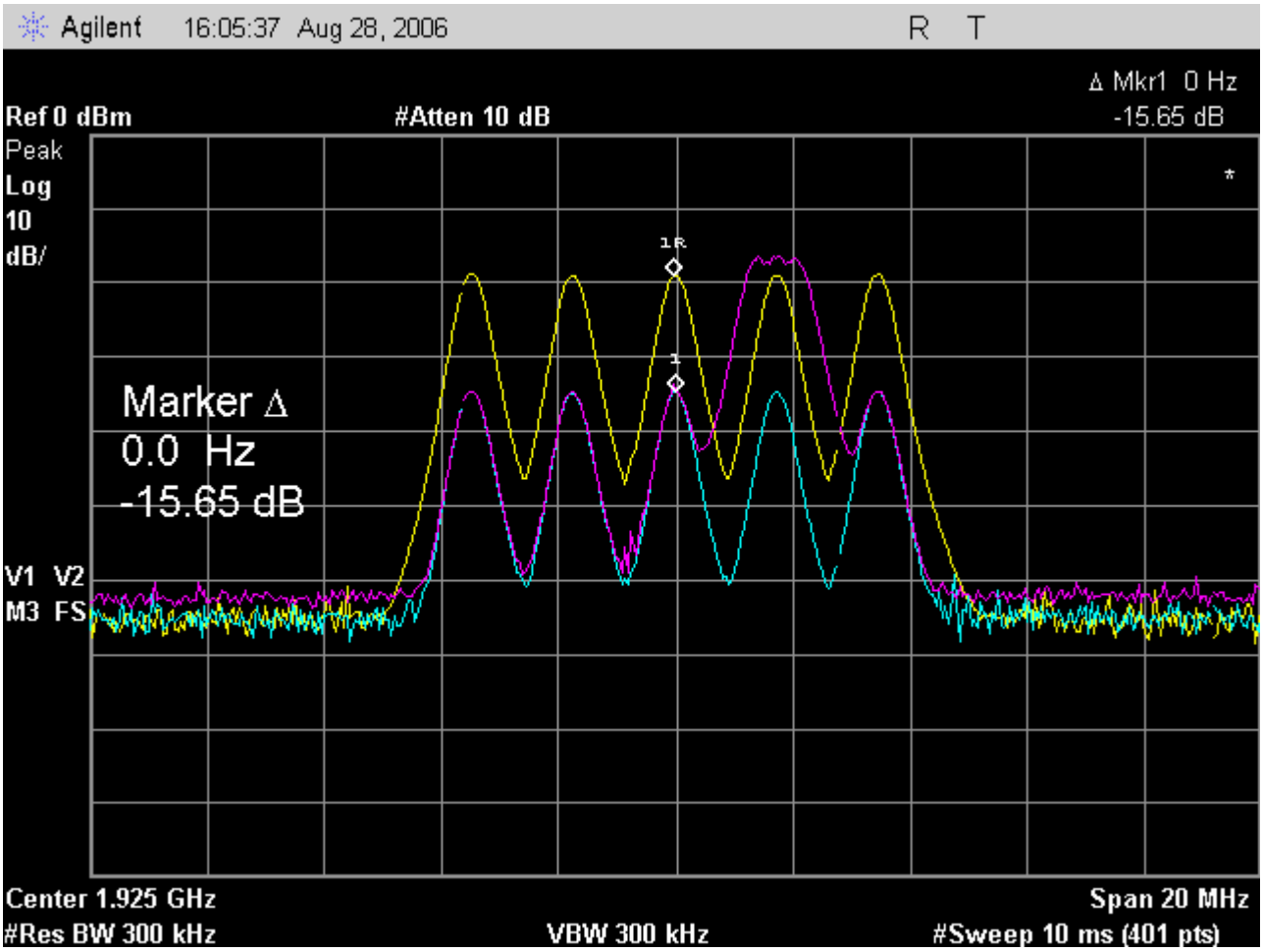

Fig. 49 - Emissions and interference profile spectrum, base EUT, test 7.3.2.

A trace (yellow, 2nd from top) is captured and held at the initial interference level setting of -30.0dBm. Then the multi-carrier interference generator level is reduced incrementally in 1dB steps until the base EUT begins to transmit the beacon. 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 -30.0 dBm level and the level at which transmissions first begin. For each 1dB step of reduced interference level, the base EUT is powered down while the multi-carrier interference generator is set to the new level.

The first interference level at which the base EUT transmits is -45.6dBm. The allowed upper limit is $T_U + U_M$ = -40 dBm, hence 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.

IV-B. Clause 7.3.3 Least interfered channel (LIC) procedure test, base EUT

The test platform, base EUT and companion remote unit are configured according to the requirements for implementing the test of 7.3.3 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 CW at $T_U + U_M$ = -40.0dBm on three carriers; at 1928.448MHz, 1924.992MHz, and 1921.536MHz.

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 -53 dBm (where $T_L = T_U$ - 20dB) and to generate on f_2 a CW signal of level $T_L + U_M$ = -60.0dBm, 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 the companion remote unit. Then press the TALK button on the remote to establish a link, then press again to release the communications channel. Repeat the communications channel establishment 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.

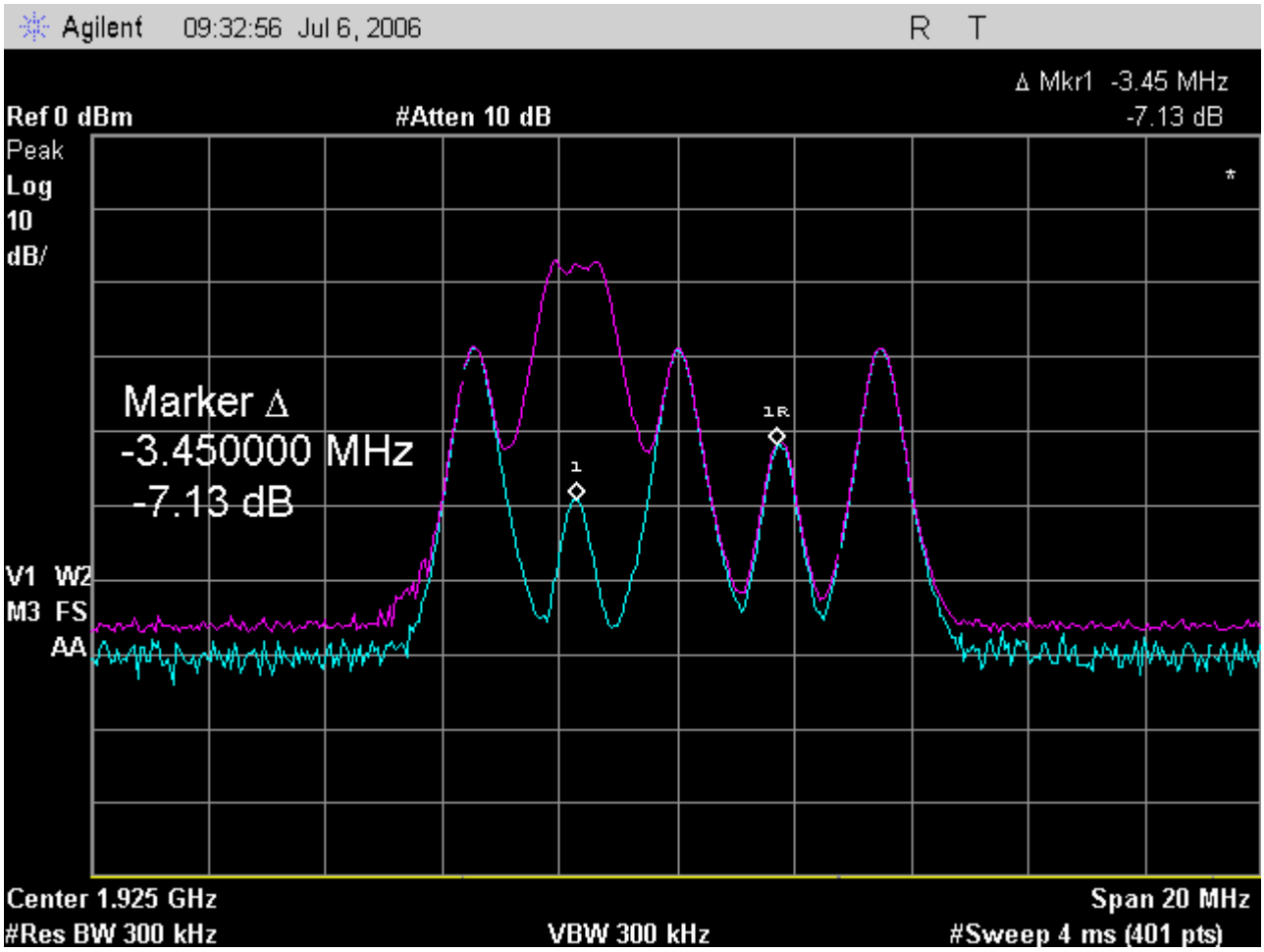

Fig. 50 - Emissions and interference profile spectrum, base EUT, test 7.3.3(b).
A max-hold signal (purple, top) captures the trace showing where in the spectrum EUT transmissions are occurring. A trace (blue, bottom) shows the interference profile.

The base EUT always transmits on f_2 (the carrier with the lower interference level) and so meets the requirement of 7.3.3(b) by not transmitting on f_1.

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 -60.0 dBm and to generate on f_2 a CW signal of level $T_L + U_M$ + 7dB = -53.0dBm, where f_1 = 1926.720MHz and f_2 = 1923.264MHz.

With this interference profile present, apply power to the base EUT and the companion remoter unit. Then press the TALK button on the remote to establish a communications channel, then press again to release the communications channel. Repeat the communications channel establishment 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.

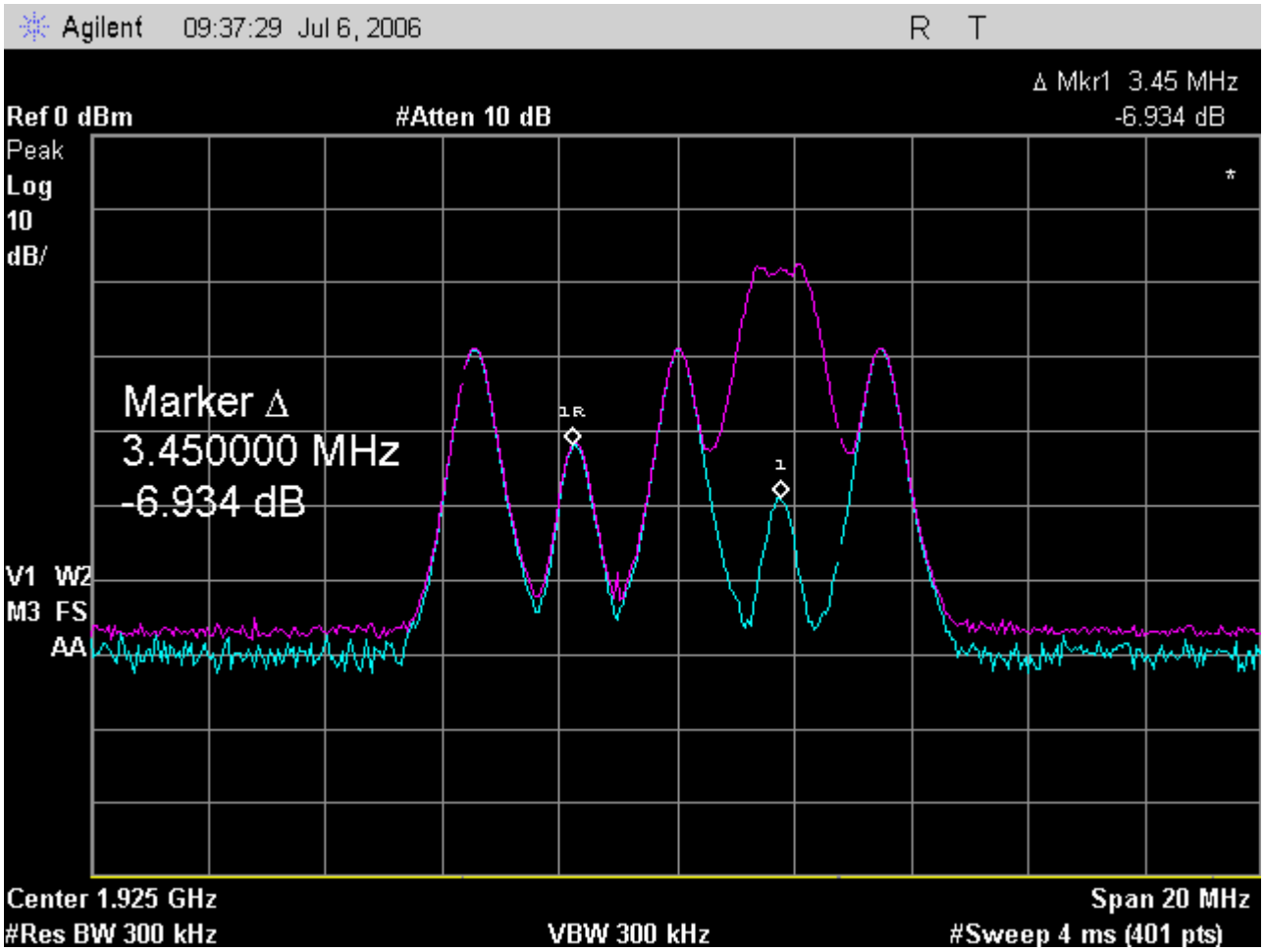

Fig. 51 - Emissions and interference profile spectrum, base EUT, test 7.3.3(c).

The base EUT always transmits on f_1 (the carrier with the lower interference level) and so meets the requirement of 7.3.3(c) that it never transmit on f_2.

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 $T_U + U_M$ + 1dB or -59.0 dBm and to generate on f_2 a CW signal of level $T_U + U_M$ - 6dB = -46dBm, where f_1 = 1926.720MHz and f_2 = 1923.264MHz.

With this interference profile present, apply power to the base EUT and the companion headset. Then press the TALK button on the remote unit to establish a communications channel, then press again to release the communications channel. Repeat the communications channel establishment 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.

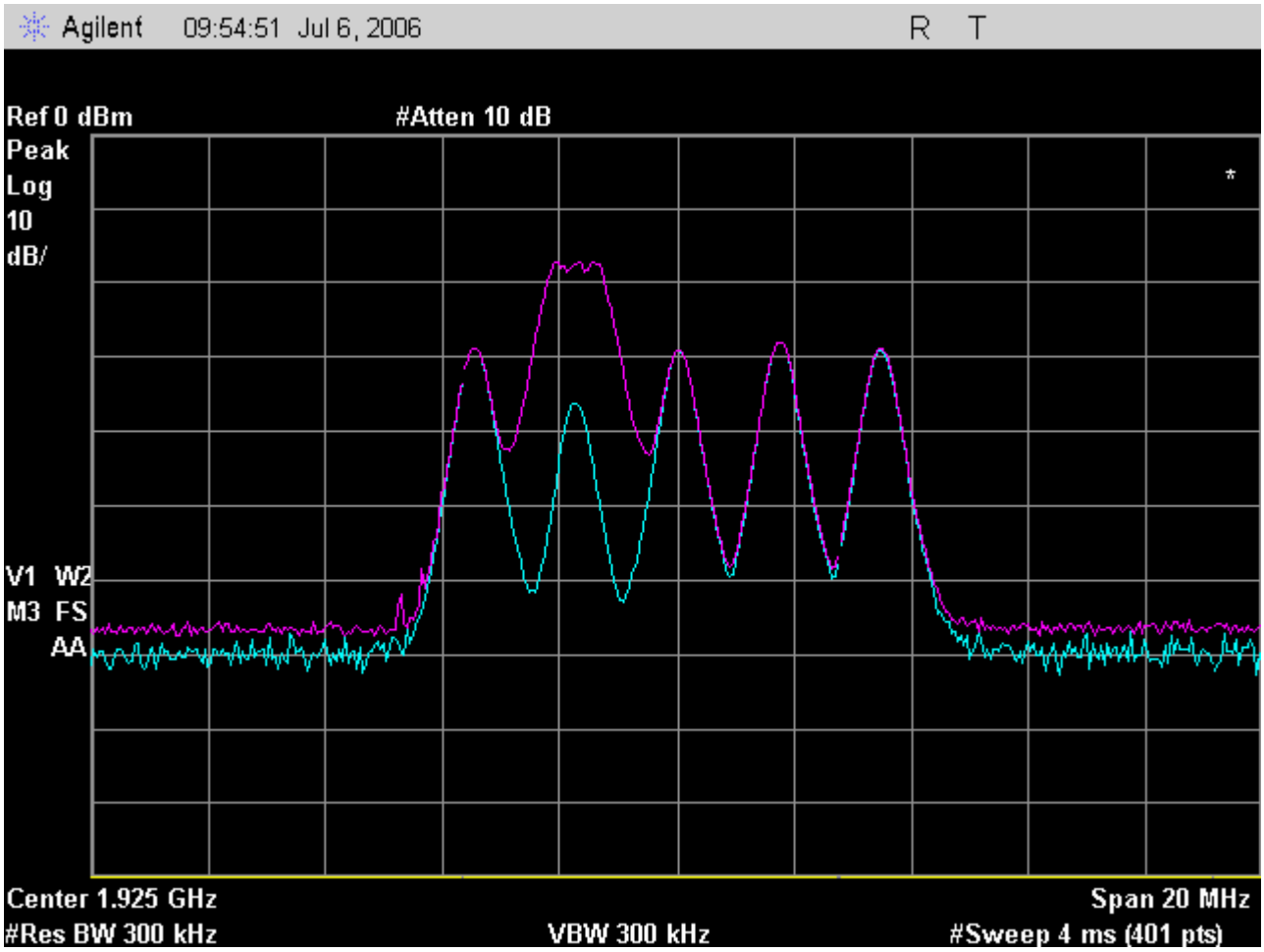

Fig. 52 - Emissions and interference profile spectrum, base EUT, test 7.3.3(d).

The base EUT always transmits on f_2 (the carrier with the lower interference level) and so meets the requirement of 7.3.3(d) that it never transmit on f_1.

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 -66.0dBm and to generate on f_2 a CW signal of level $T_L + U_M$ +1dB = -59.0 dBm, where f_1 = 1926.720MHz and f_2 = 1923.264MHz.

With this interference profile present, apply power to the base EUT and the companion remote unit. Then press the TALK button on the remote to establish a communications channel, then press again to release the communications channel. Repeat the communications channel establishment 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.

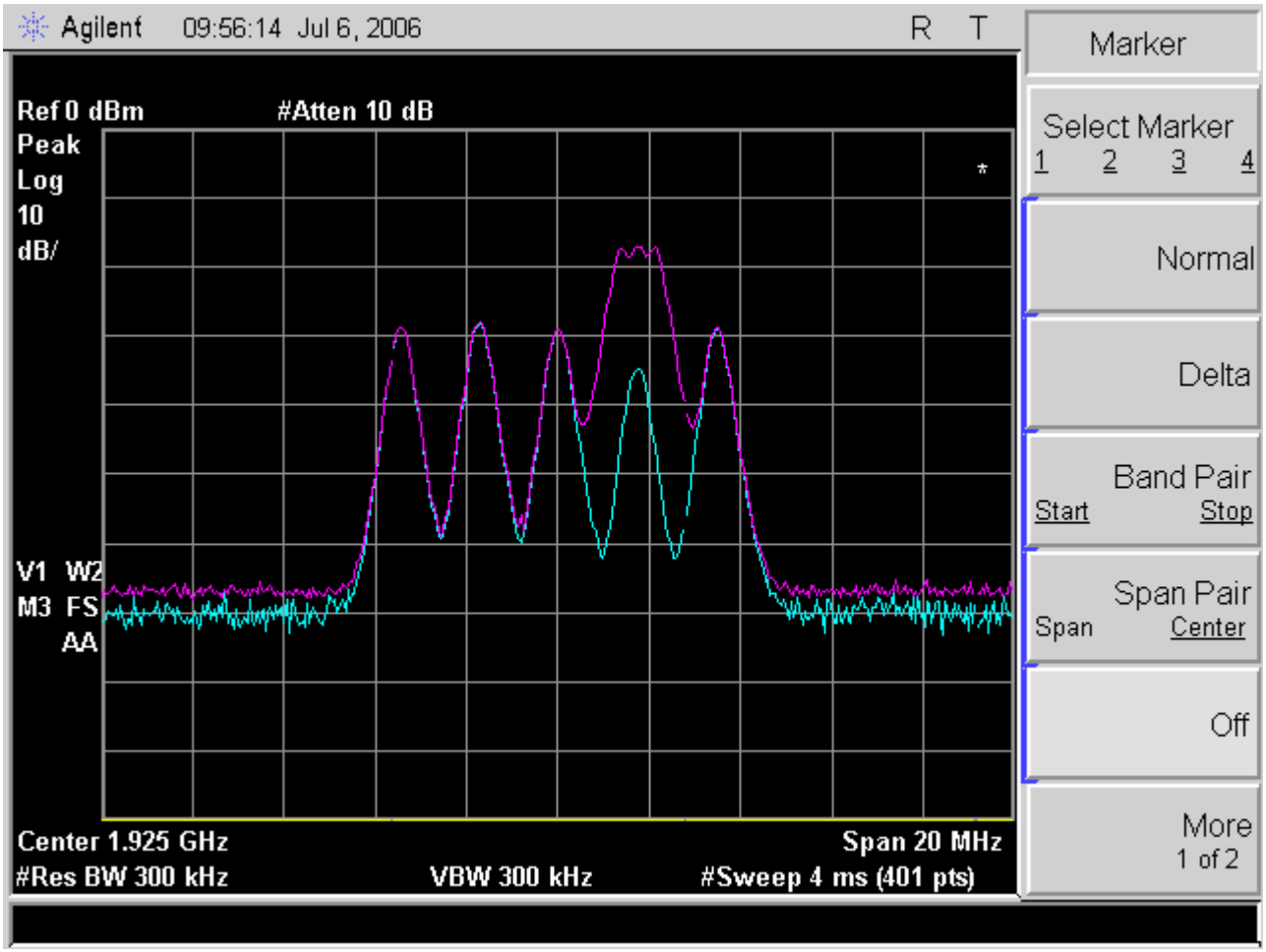

Fig. 53 - Emissions and interference profile spectrum, base EUT, test 7.3.3(e).

The base EUT always transmits on f_1 (the carrier with the lower interference level) and so meets the requirement of 7.3.3(e) that it never transmit on f_2.

IV-C. Clause 7.3.4 Selected channel confirmation, base EUT

The test platform, base EUT and companion remote unit are configured according to the requirements for implementing the test of 7.3.4 by means of test configuration #5, **With companion device and interference blocking, base EUT**, of section (I) of this document. An example of the monitoring function is shown below, with the multi-carrier interference generator configured to enable the automatic switch from the initial interference profile to the alternate interference profile based on the reception of the trigger signal generated by the headset in the frame prior to the initiation of transmission of the remote unit companion device and base EUT transmissions of communications channel.

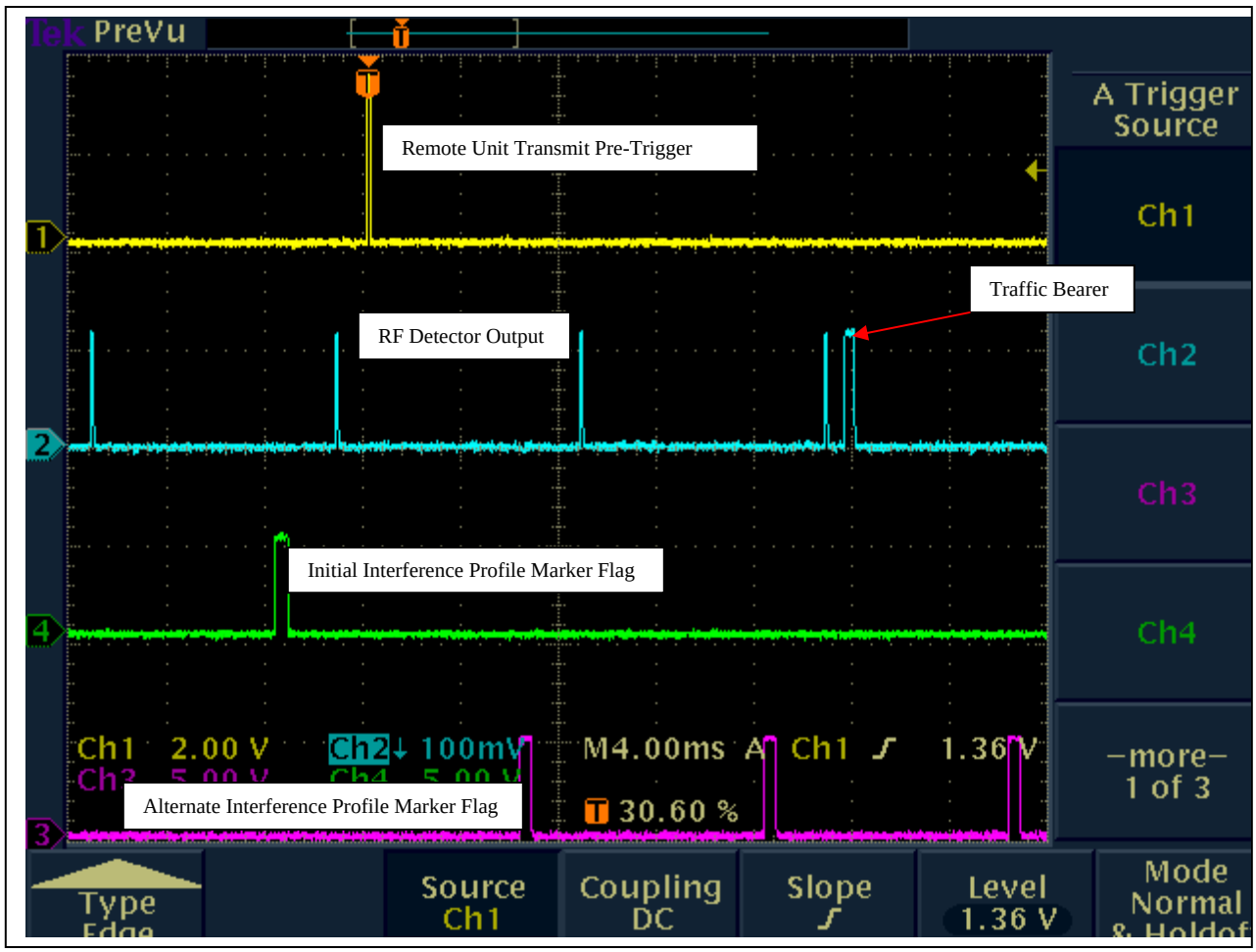

Fig. 54 - Example no-interference-present oscilloscope screenshot showing transition from initial to alternate interference profile in the frame before base EUT transmission of the communications channel. The notes text is best viewed at 150% magnification.

For this example no interference is present, so base does not defer. Green (third) trace is marker for slot 0 of initial interference profile. Purple (bottom) trace is marker for alternate interference profile. Blue (2nd from top) trace is output of RF detector, showing beacon and communications channel transmissions. Yellow (top) trace is output from the remote, which is generated by the remote unit in the frame prior to commencement of transmissions.

The multi-carrier interference generator (PXI-5670) initial interference profile is then set to CW at $T_U + U_M$ = -40.0 dBm on three carriers; at 1928.448MHz, 1924.992MHz, and 1921.536MHz, and additionally set to generate on f_1 a CW signal of level $T_U + U_M$, or -40.0dBm and to generate no interference on f_2, here f_1 = 1926.720MHz and f_2 = 1923.264MHz, the remaining two of the total system's five carriers.

The multi-carrier interference generator (PXI-5670) alternate interference profile is set to CW at $T_U + U_M$ = -40.0dBm on three carriers; at 1928.448MHz, 1924.992MHz, and 1921.536MHz, and additionally set to generate no interference on f_1, and to generate on f_2 a CW signal of level $T_U + U_M$, or -40.0dBm, where f_1 = 1926.720MHz and f_2 = 1923.264MHz, the remaining two of the total system's five carriers.

With this interference profile present, apply power to the base EUT and the companion remote unit. Then press the TALK button on the remote to establish a communications channel. Verify that the base EUT transmits on f_2, then press and release the TALK button on the headset to terminate the communications channel.

The multi-carrier interference generator is then configured to enable the automatic switch from the initial interference profile to the alternate interference profile based on the reception of the trigger signal generated by the headset in the frame prior to the initiation of transmission of the remote unit companion device and base EUT transmissions of communications channel signals.

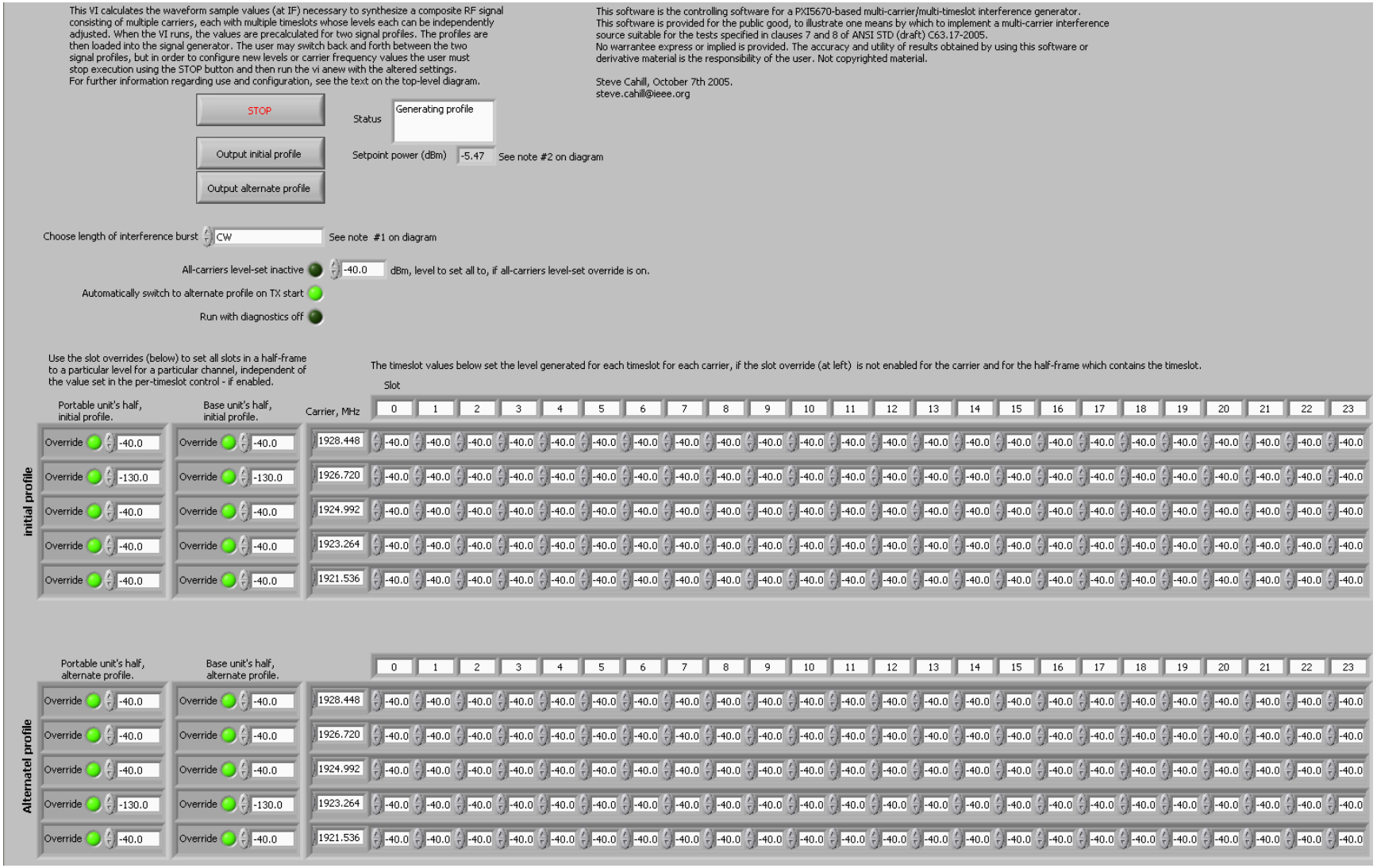

Fig. 55 - Control panel for multi-carrier generator, set for the test of 7.3.4, configured to switch interference profiles when trigger in frame prior to the initiation of control channel transmission is received.

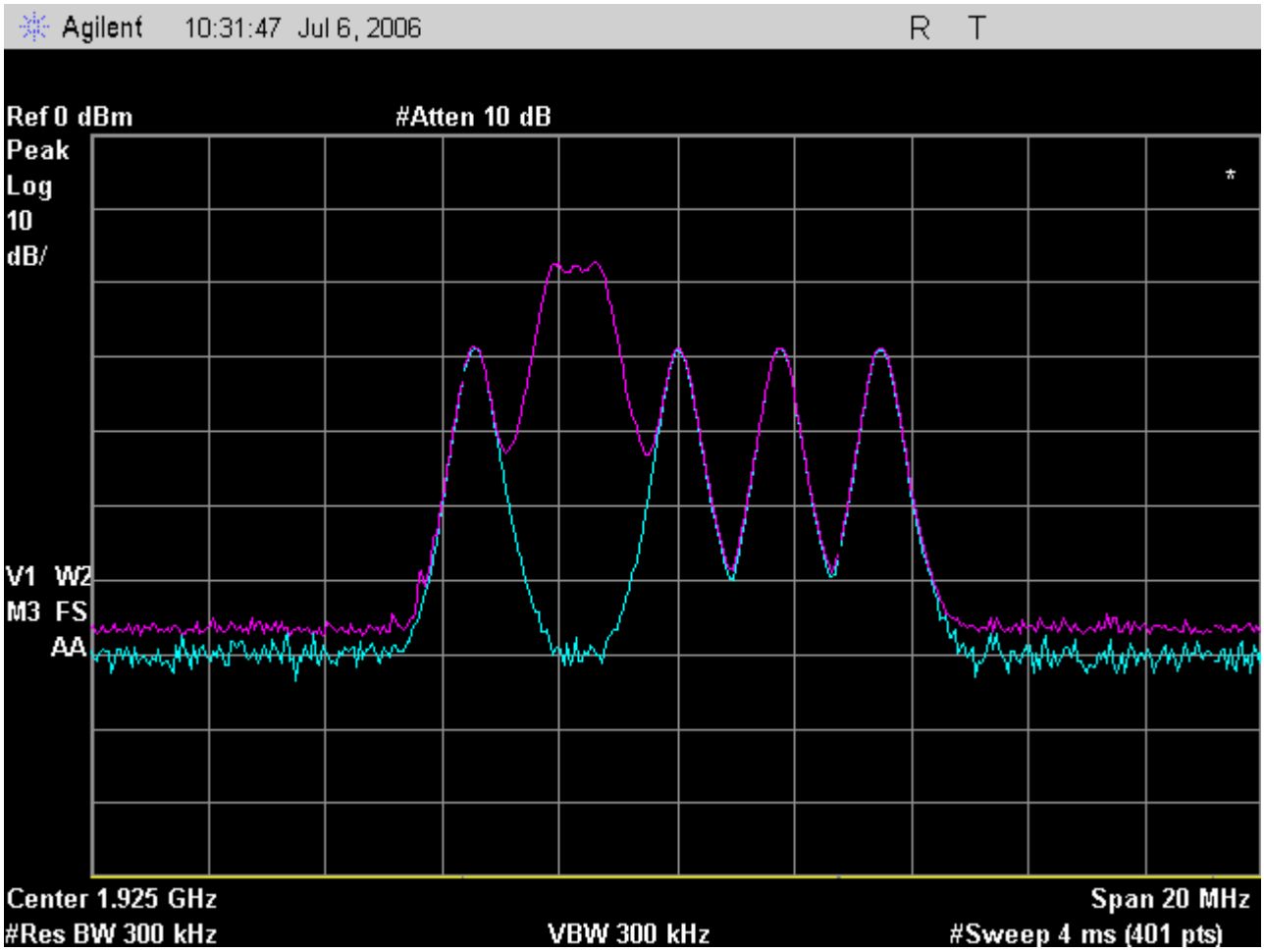

Fig. 56 - Spectrum showing initial interference profile, and transmissions on un-interfered carrier frequency f_2, for 7.3.4(b)

Blue (lower) trace is interference profile, purple (upper) trace is max-hold measurement including communications channel transmit signals.

For 7.3.4(c), cause the base EUT to attempt transmission of the communications channel.

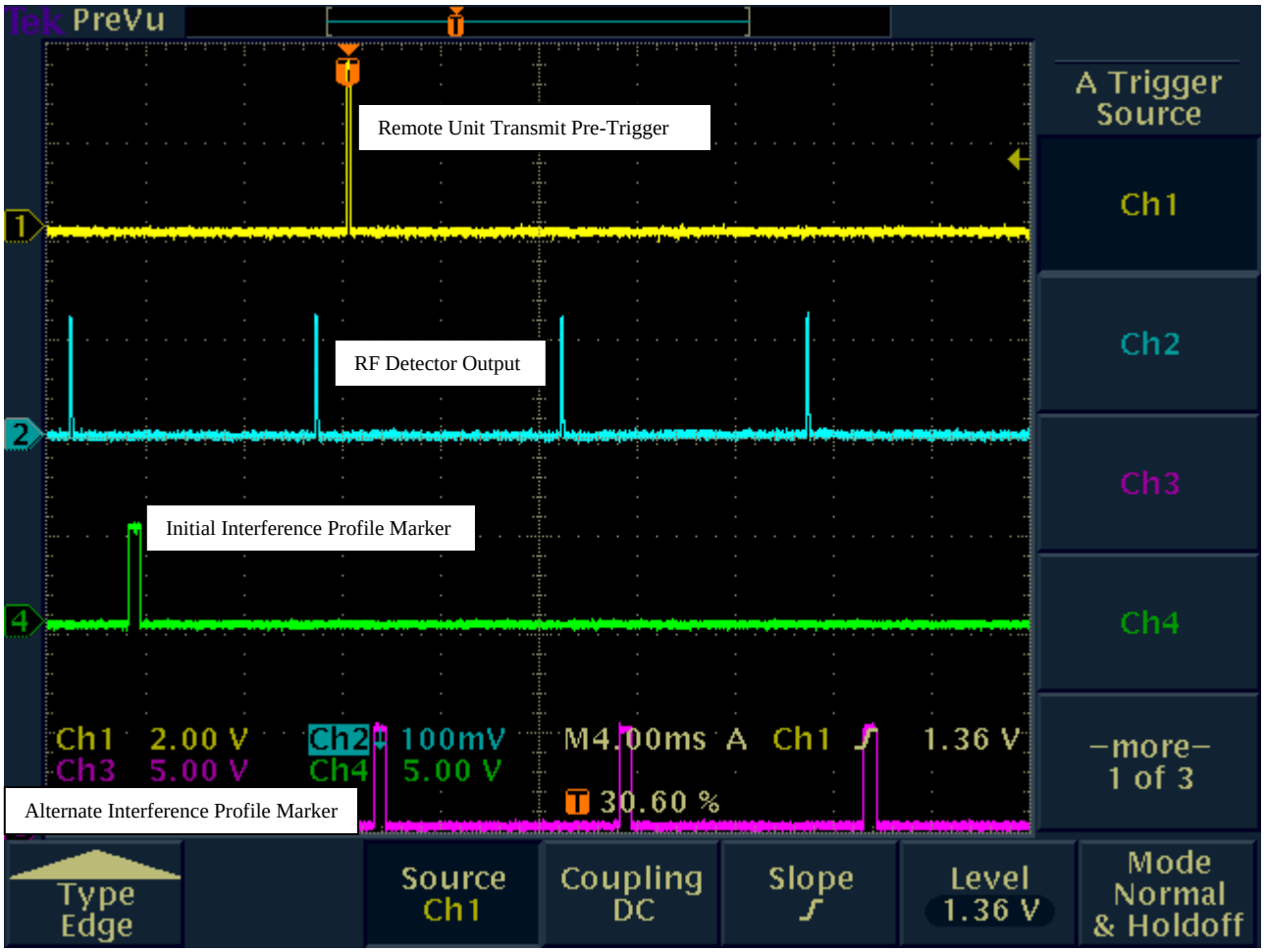

Fig. 57 - Screen shot of oscilloscope showing deferral by base EUT in the case where the interference profile changes in the frame previous to transmission and the selected time and frequency communications channel becomes blocked. Since the base defers, the traffic bearer does not appear as a wider detected RF pulse.

In the third from the top trace we see the marker for the last unblocked frame of the initial interference profile. In the top trace we see the remote unit generated flag that triggers the multi-carrier generator to switch to the alternate interference profile on the completion of the last frame of the initial interference profile, and marks the frame prior to the headset's transmission to the base requesting the setup of the communications channel. In the bottom trace we see the start of the first frame of the alternate interference profile in the frame which would be immediately prior to the first frame in which the base EUT would transmit the communications channel, if the base EUT did not defer; see previous non-deferring example. The second trace is the RF detector output showing only the beacon signal, the base has deferred.

We see that, for the case where the selected time/frequency communications channel has gone blocked in the frame previous to the frame for which transmission would begin in the unblocked case, the base does not initiate communications channel transmissions on the blocked time and frequency channel. Instead, the base checks all available time and frequency channels and selects an unblocked timeslot. Beacon transmissions do continue on the blocked timeslot in accordance with the requirement that transmissions cease for control and signaling information only after 30 seconds or less.

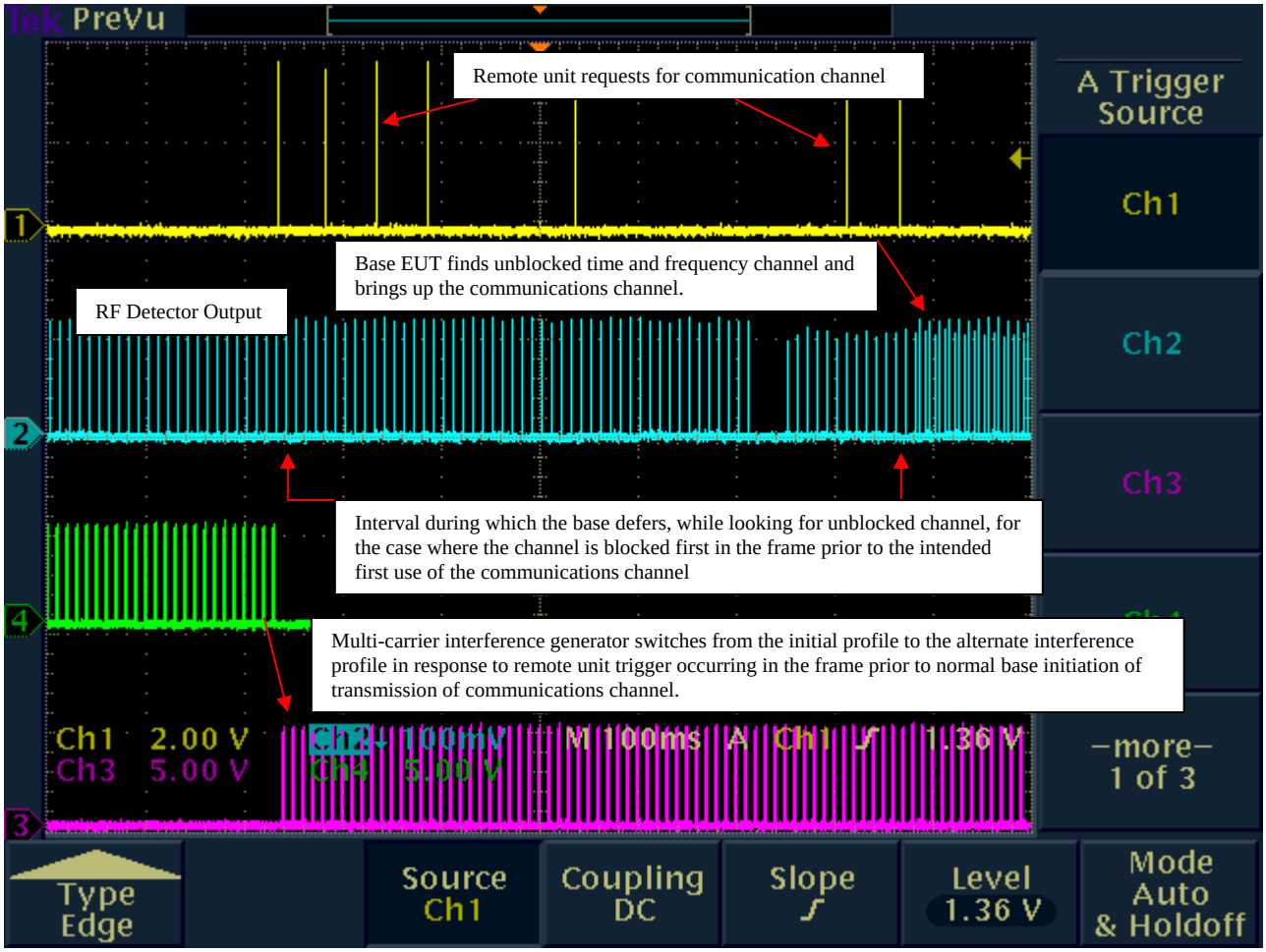

Fig. 58 - Screen shot of oscilloscope showing deferral by base EUT in the case where the interference profile changes in the frame previous to intended transmission and the selected time and frequency communications channel becomes blocked; and then later, transmission on unblocked channel.

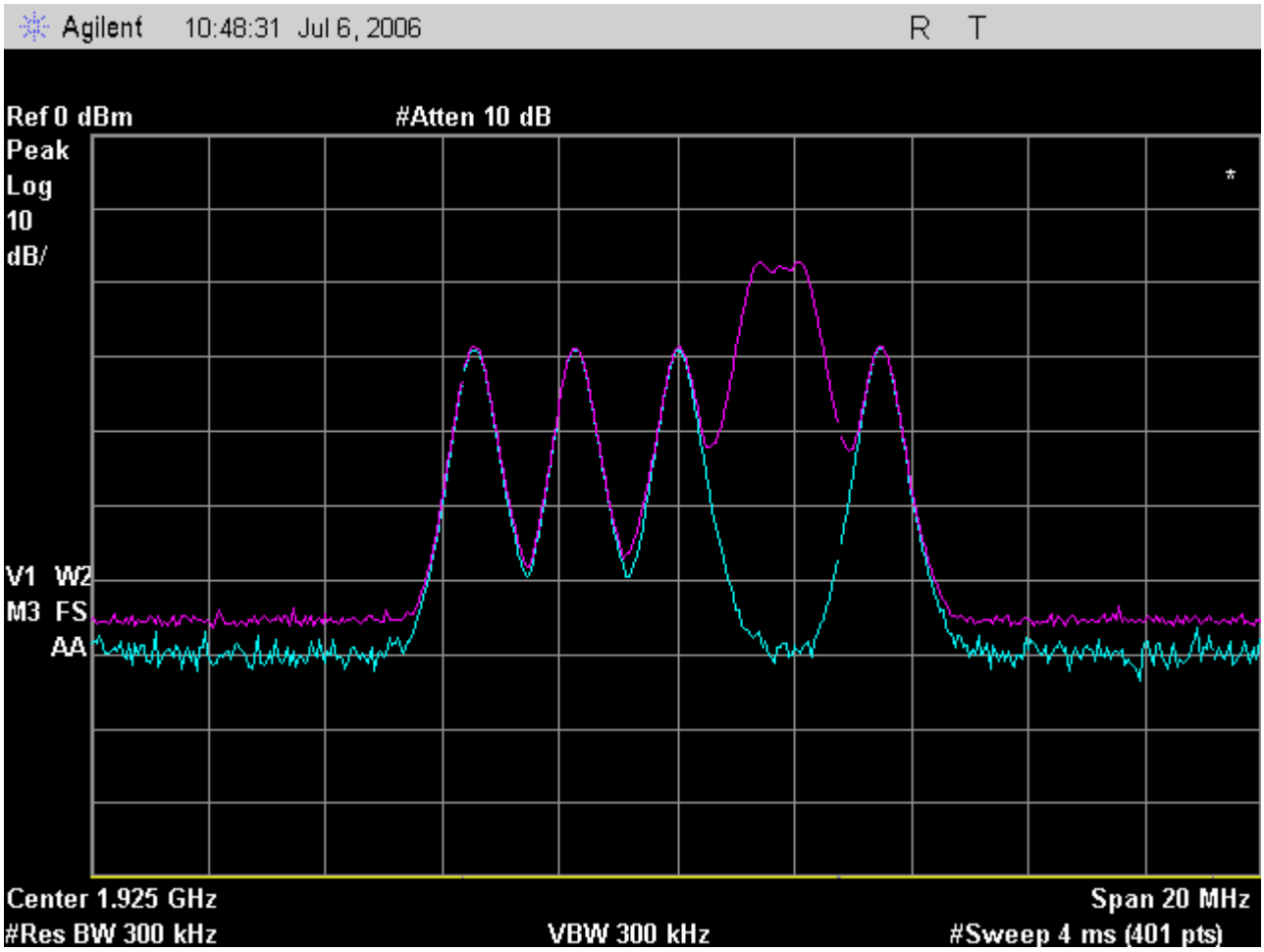

Fig. 59 - Spectrum showing alternate interference profile, and transmissions on un-interfered carrier frequency f_1, after 7.3.4(c).

The base EUT defers in response to the blocking of the intended time and frequency channel occurring first in the frame previous to the base EUT's intended transmission of the communications channel, and so passes the requirements.

IV-D. Clause 7.5 Reaction time and monitoring interval, base EUT

The test platform, base EUT and companion remote unit are configured according to the requirements for implementing the test of 7.5(c) by means of test configuration #3, **With companion device and interference blocking, base EUT**, of section (I) of this document.

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 EUT, on all 5 carriers, and at level -40.0 dBm, which is T_U + U_M.

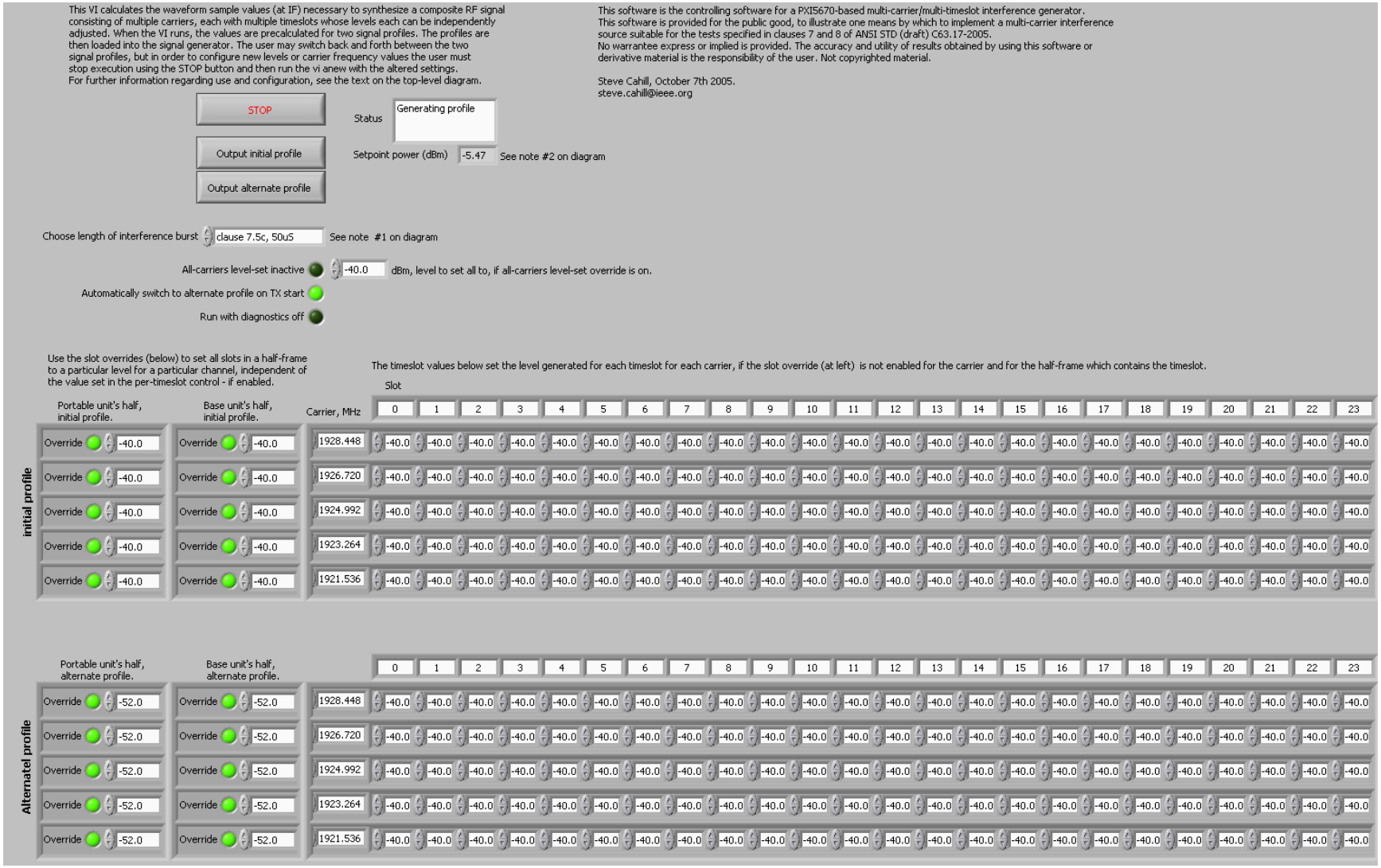

Fig. 60 - Control panel for multi-carrier interference generator, set to 50uS pulses in all timeslots on all carriers, for the test of 7.5(c).

Two interference profiles are loaded; one with all pulses at -40.0 dBm, $T_U + U_M$, and the other at -52.0dBm, $T_U - U_M$. 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.

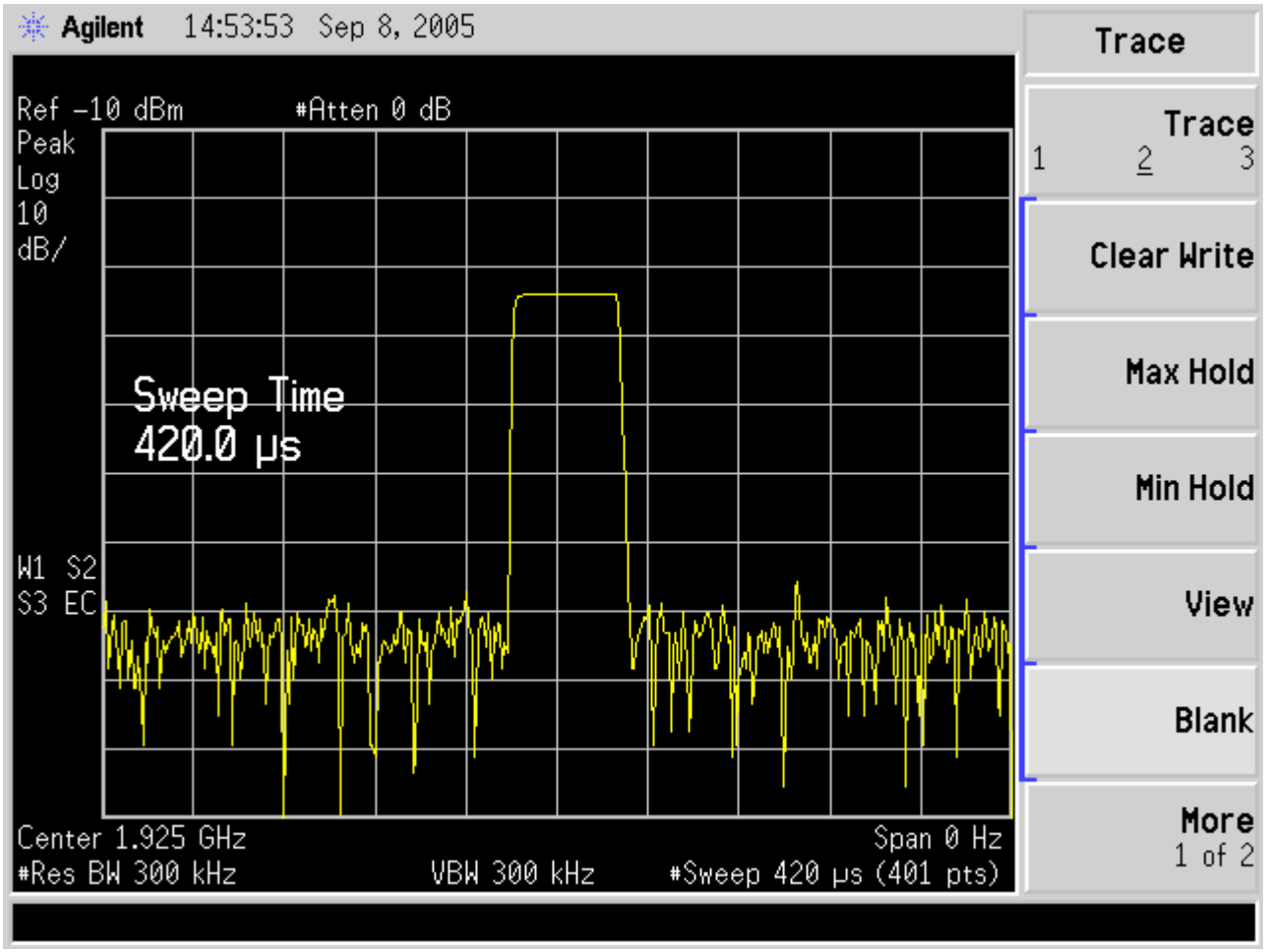

Fig. 61 - Interference pulse, one frame shown, for the test of 7.5(c).

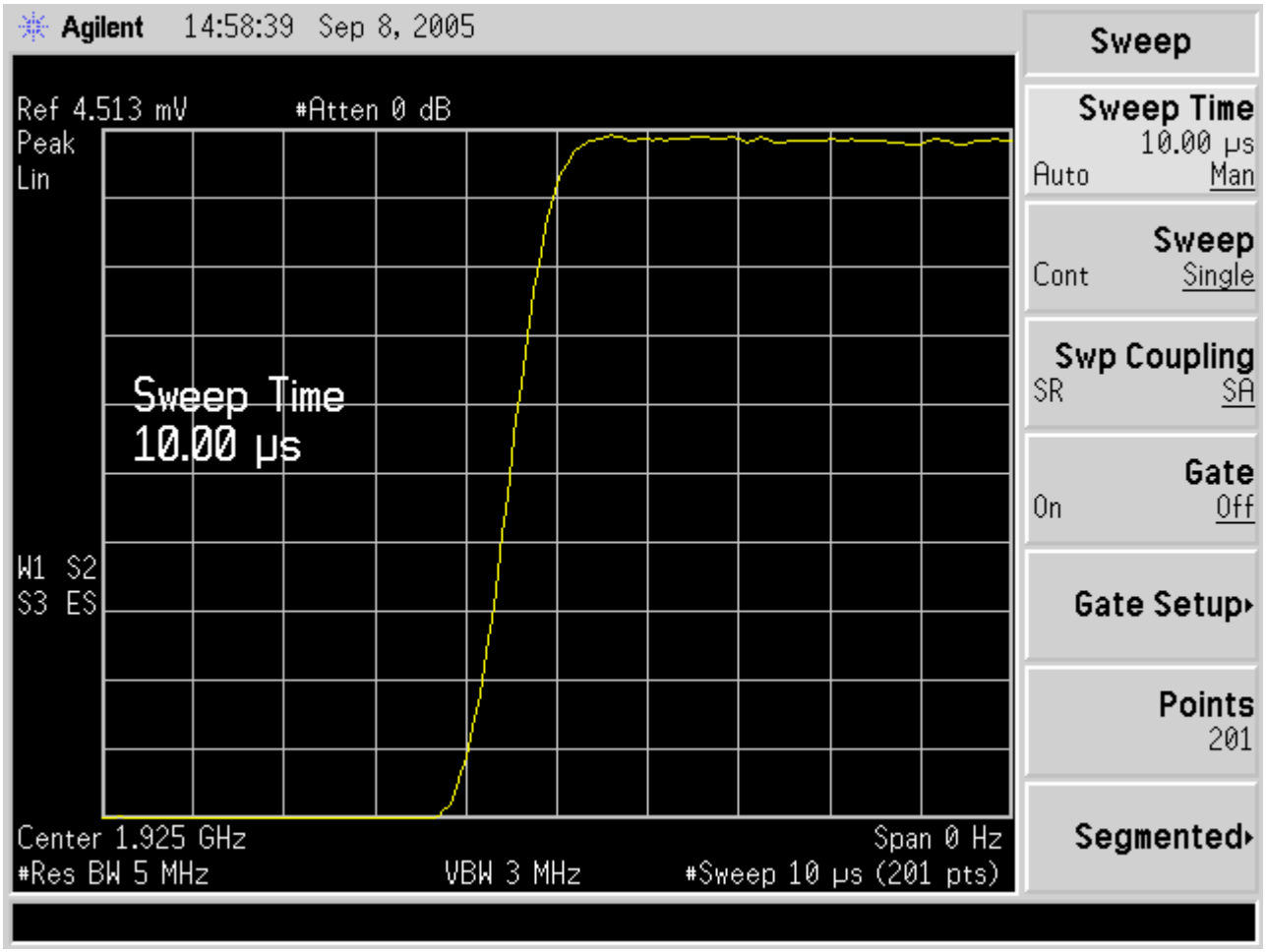

Fig. 62 - Rise time of interference pulse, per the requirements of 7.5 for less than 1uS for 10% to 90% transition.

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.

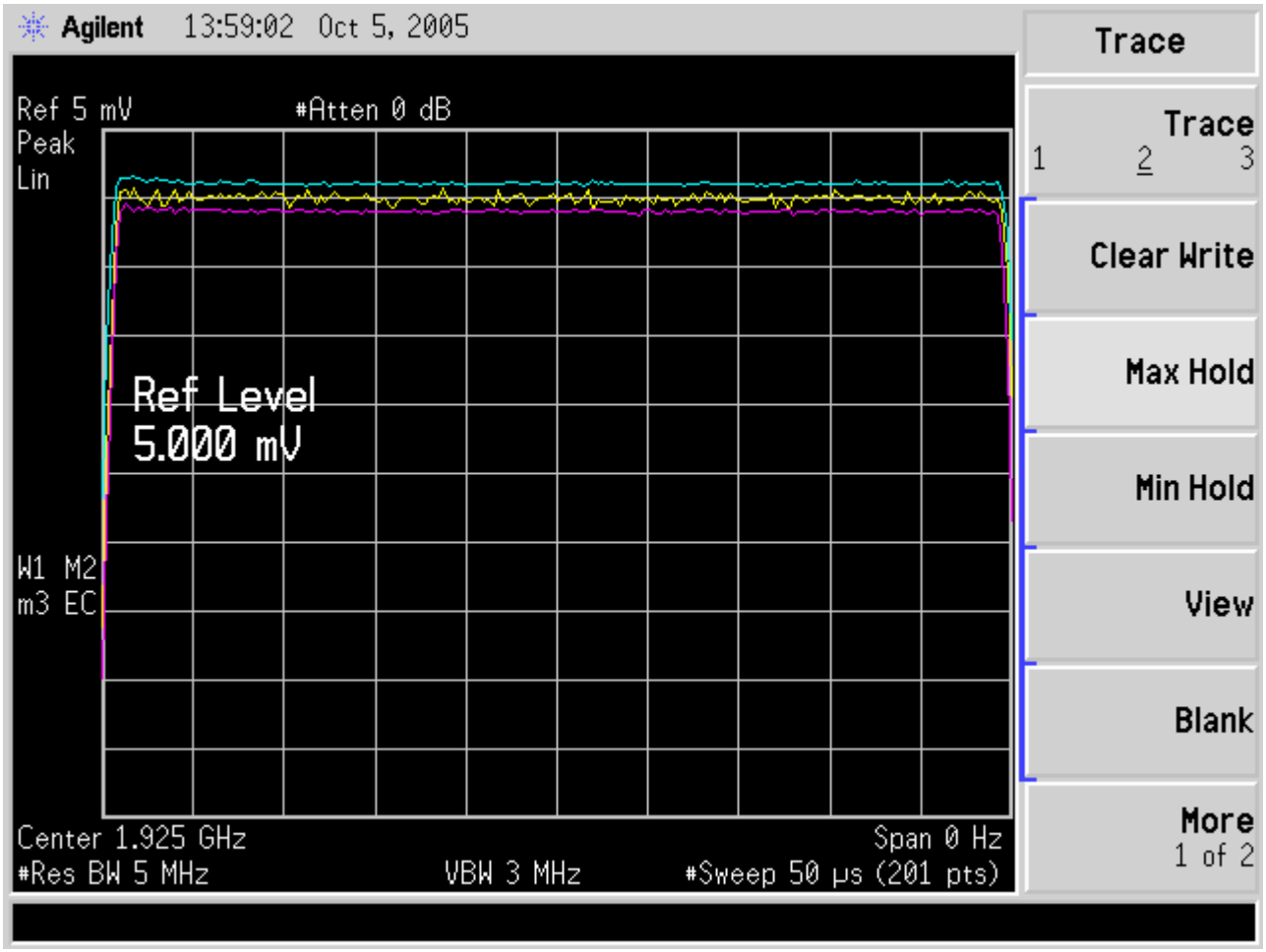

Fig. 63 – 50uS interference pulse for 7.5(c), duration and amplitude variation over the duration of the 50 uS pulse and over multiple pulses. Spectrum analyzer is set to linear response.

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 the level as 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 powered up with the interference conditions of 7.5(c) present.

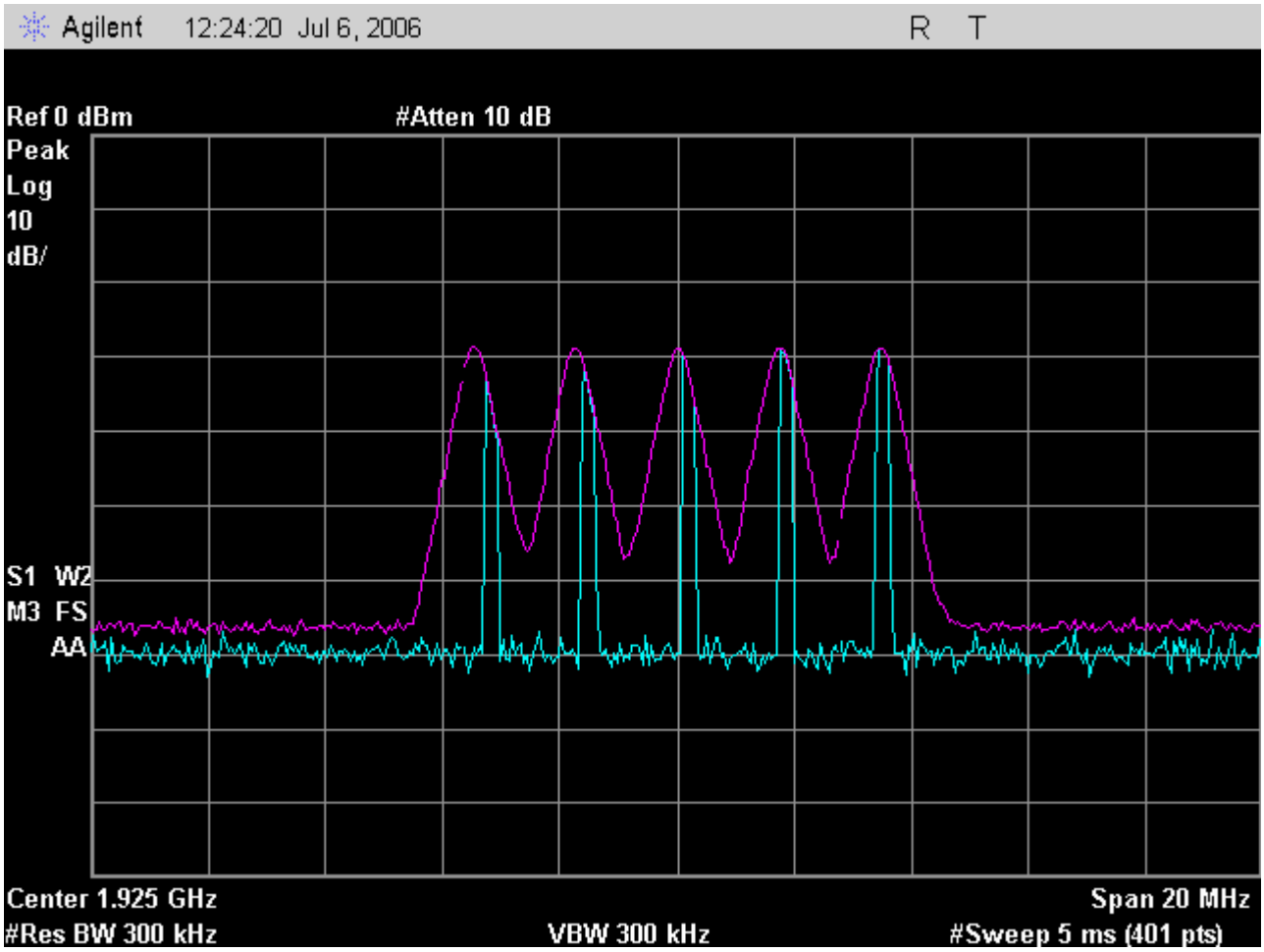

Fig. 64 - Transmit spectrum of 50uS interference pulses in each timeslot for each carrier, with base EUT deferring due to interference pulses of $T_U + U_M$.

The transmit spectrum and interference spectrum are observed using the E4407B spectrum analyzer. Trigger is free-run, detection is peak, other 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 blue (bottom) trace shows a single sweep of the spectrum analyzer, sweeping past active interference pulses.

No transmissions from the base EUT are observed.

The multi-carrier interference generator is then switched to the alternate interference profile, with pulses of level *TU - UM*, or -52.0 dBm.

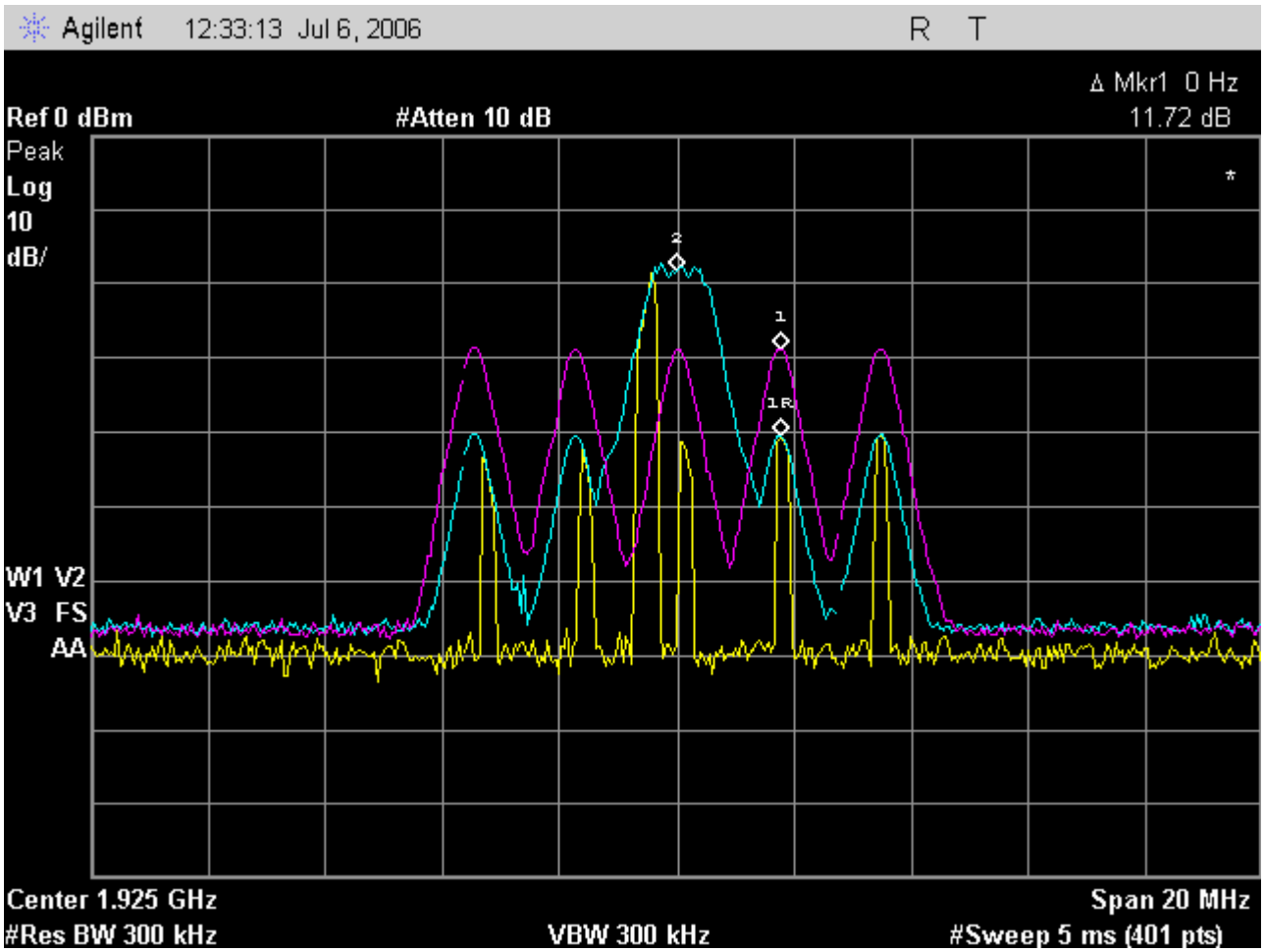

Fig. 65 - Transmit spectrum of 50uS interference pulses, with base EUT no longer deferring with interference pulses of level *TU - UM*.

The blue (top) trace is the max-hold capture over multiple sweeps of the initial *TU + UM* interference spectrum, and then the transmission of the base EUT when the interference level is dropped to *TU - UM*. The purple (middle) trace is a max-hold capture of the interference and the transmission when the interference is set to *TU - UM*. The yellow (lowest) trace is a single sweep of the spectrum with the interference at *TU - UM* and base transmission active. Proper transmission at *TU - UM* is shown in order to validate functionality.

The base EUT is to not transmit when pulses of 50uS length are present at *TU + UM*. The base EUT defers, and so meets the requirements of 7.5(c)

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 = 1.48MHz) and the level is allowed to increase to $T_U + U_M$ + 6dB, or -34.0dBm.

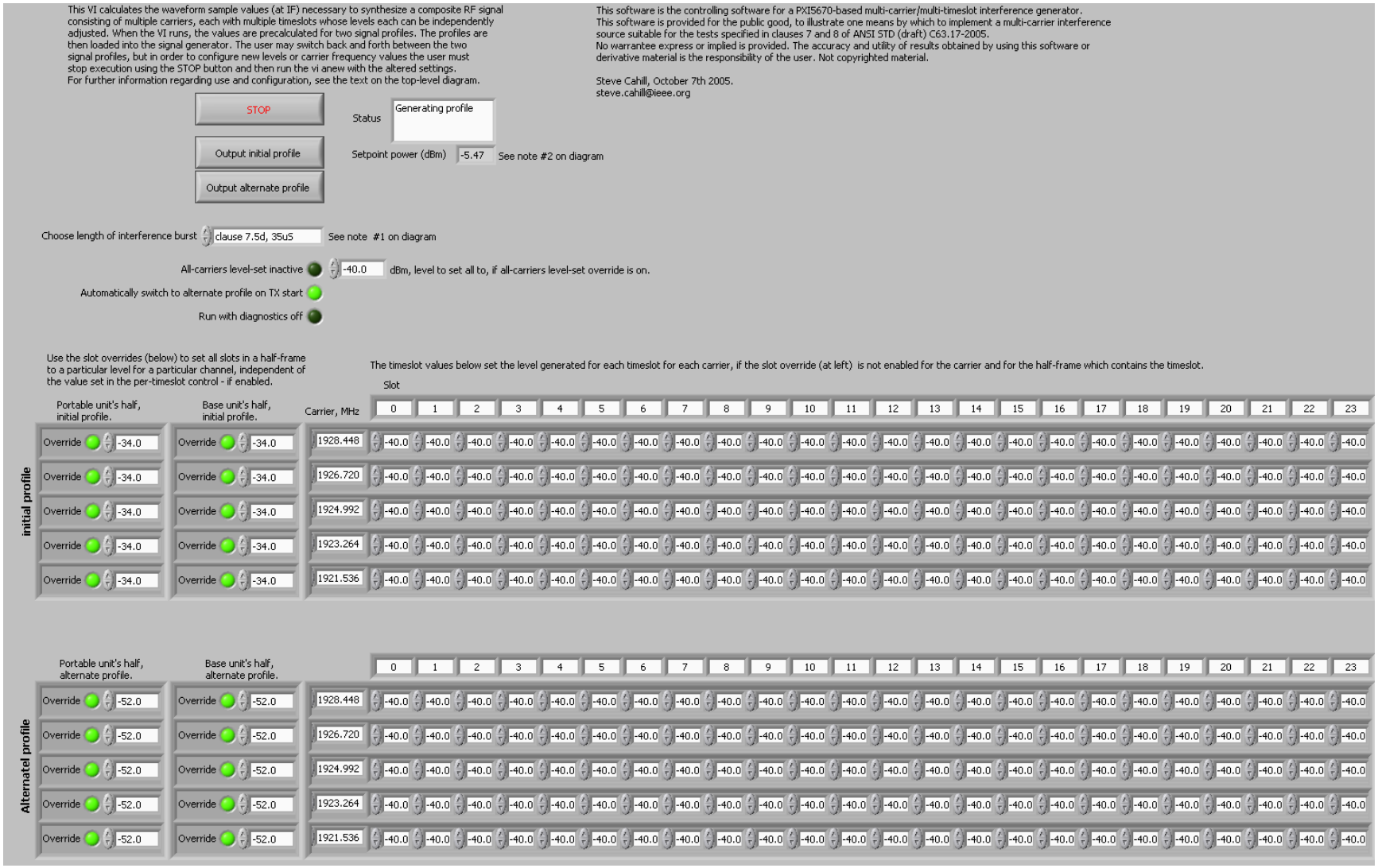

Fig. 66 - The control panel for the multi-carrier interference generator configured to make the interference profile required for 7.5(d).

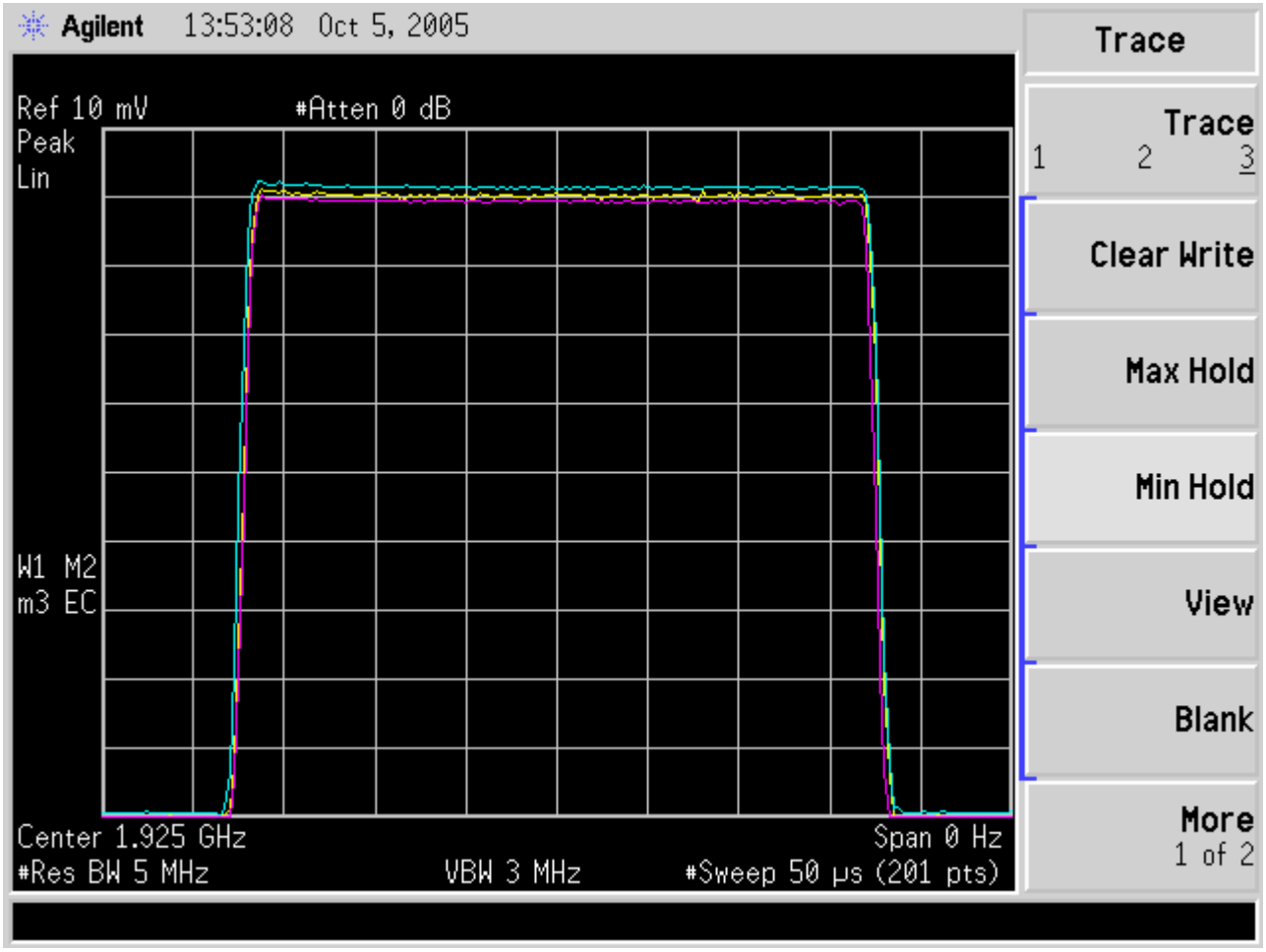

Fig. 67 - 35uS interference pulse for 7.5(d), duration and amplitude variation over the duration of the pulse and over multiple pulses. Spectrum analyzer is set to linear response.

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 unit is then powered up with the conditions of 7.5(d) present.

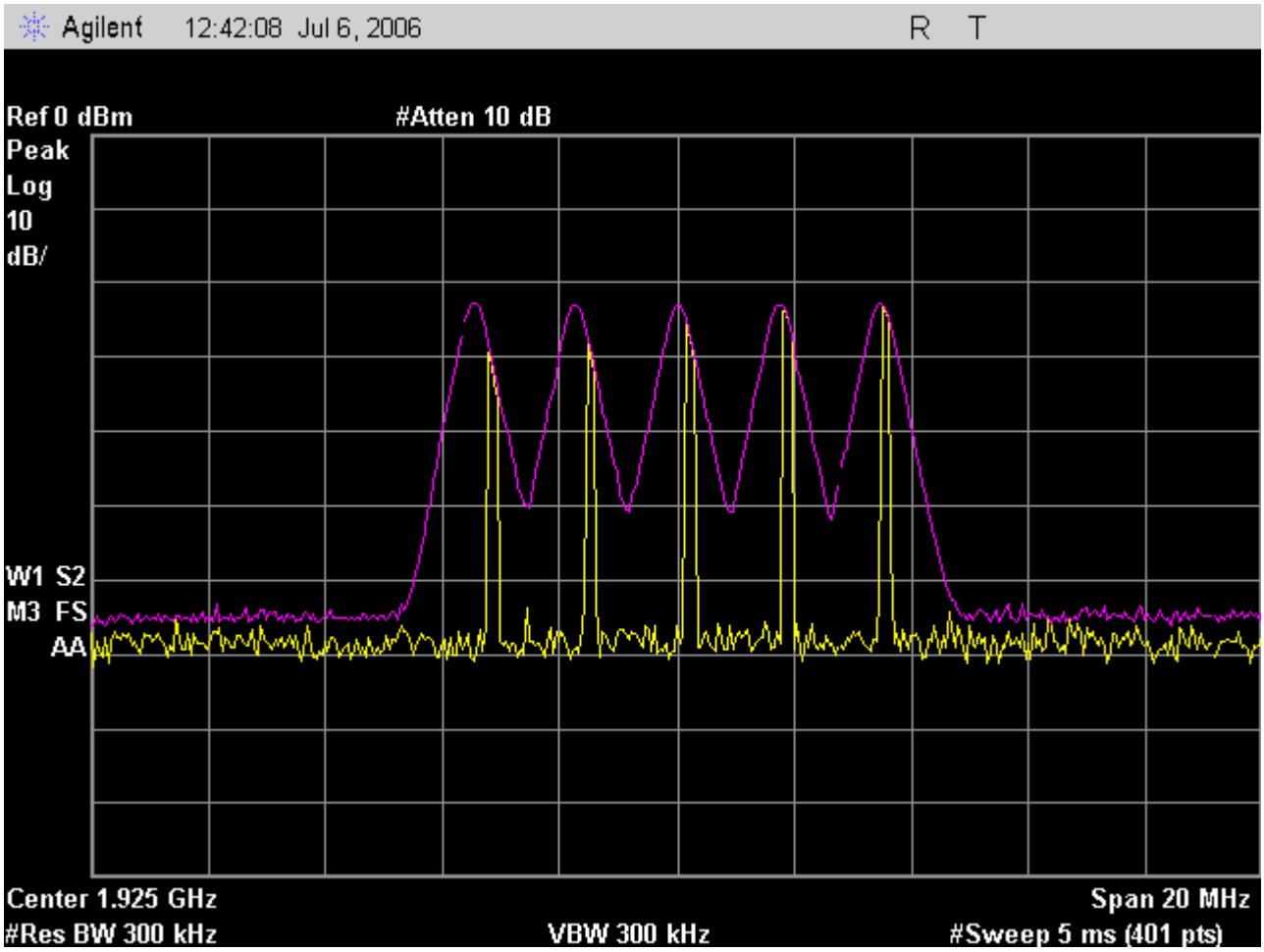

Fig. 68 - Transmit spectrum of 35uS interference pulses in each timeslot for each carrier, with base EUT deferring due to interference pulses of T_U + U_M + 6dB.

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 base EUT is required to defer when pulses of 35uS are present at level T_U + U_M + 6dB, the base EUT does defer, and so passes the requirement of 7.5(d).

V) Tests of clause 8, base EUT

V-A. Clause 8.1.1 Access criteria test interval, base EUT

The test platform, base EUT and companion remote unit 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 -40.0 Bm, 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.

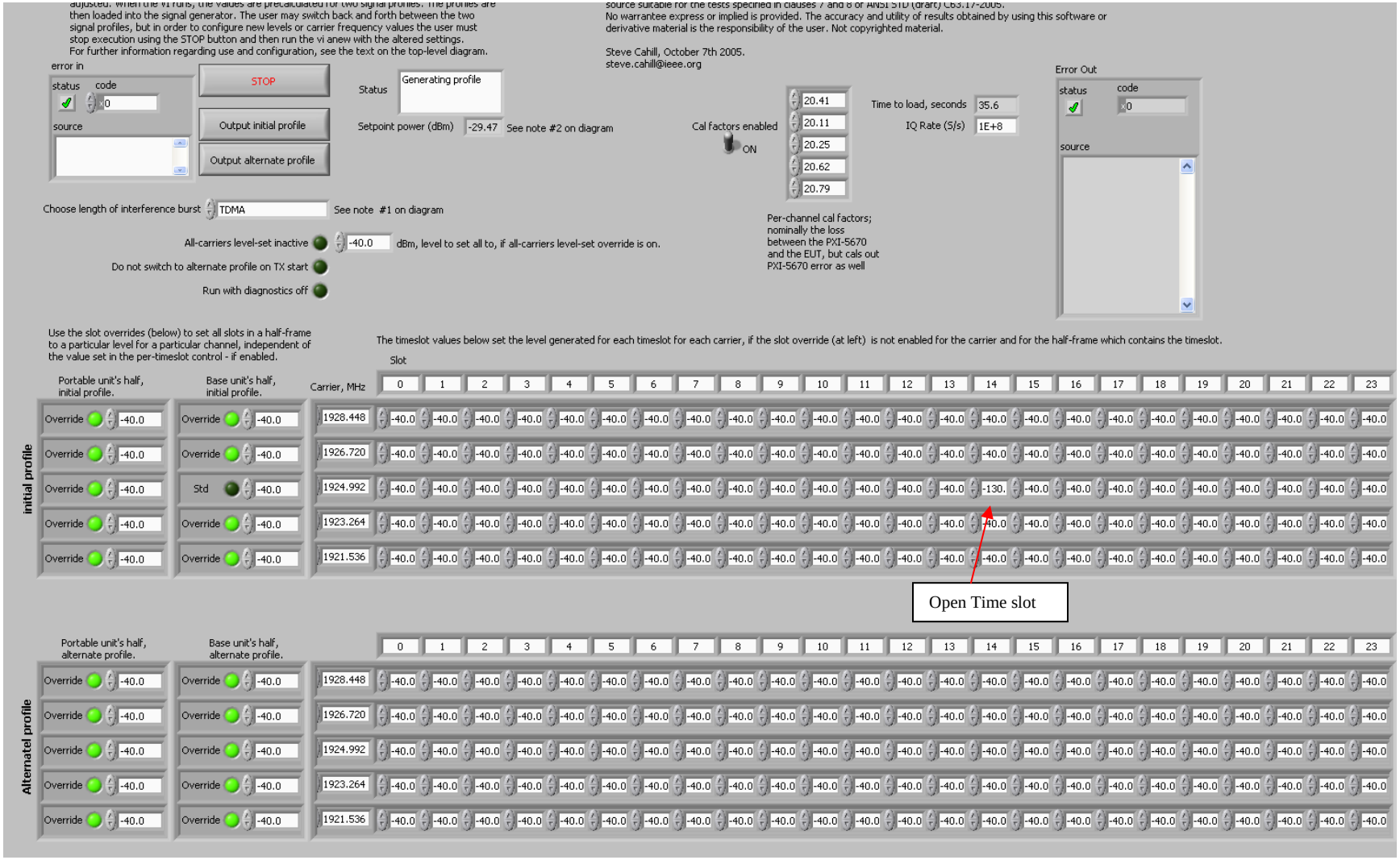

Fig. 69 - Control panel for multi-carrier interference generator configured with initial interference profile blocking all carriers and timeslots except slot 14 of 1924.992MHz.

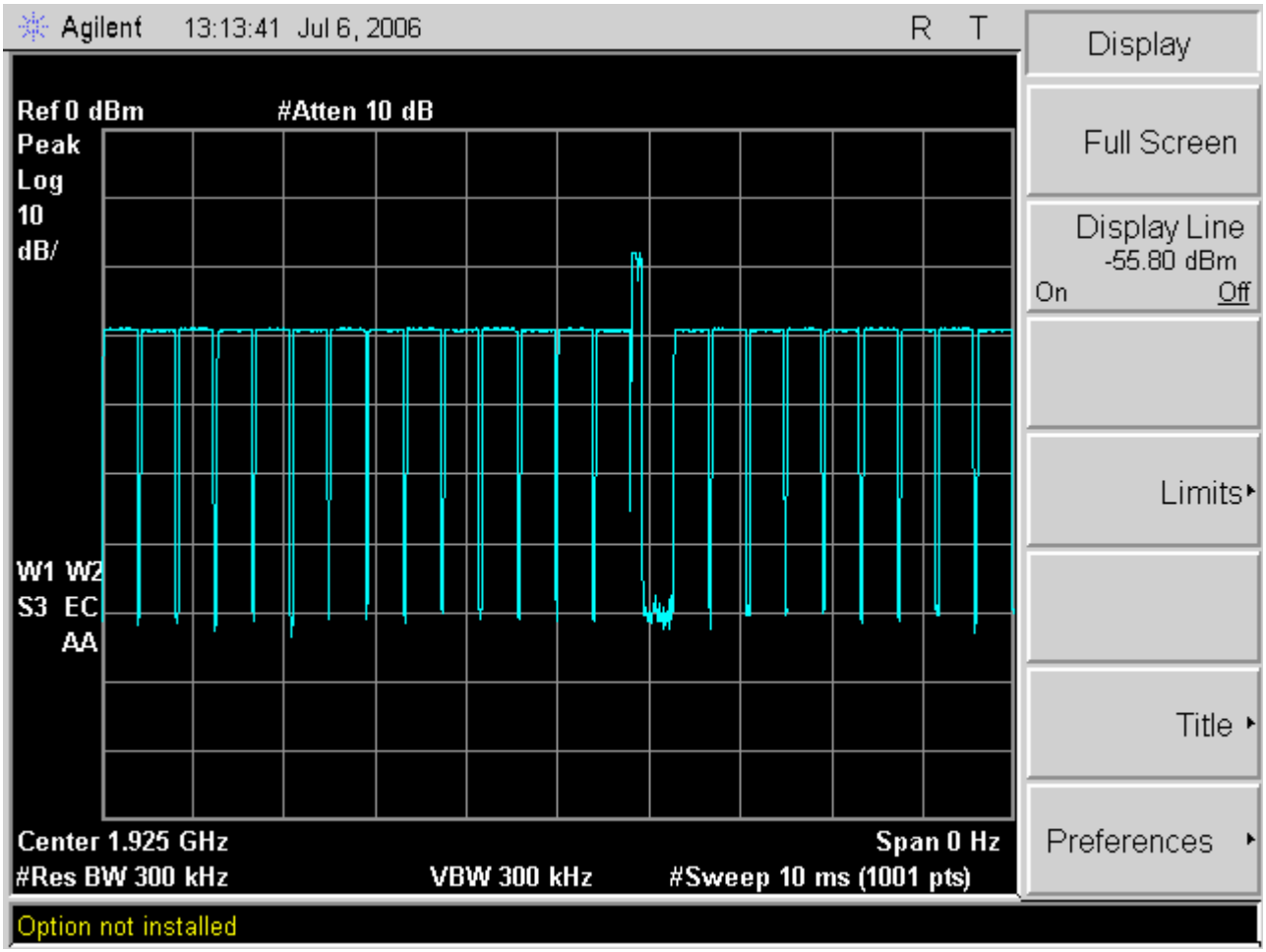

Fig. 70 - Zero-span (single frequency receiver mode) sweep of TDMA interference on carrier at 1924.992MHz, f_1, with base EUT transmission in single open timeslot.

Carrier has -40.0 dBm ($T_U + U_M$) signal present in all TDMA timeslots on all carriers except slot 14 of 1924.992MHz. The base EUT has found this single open timeslot and is using it to transmit its signaling beacon.

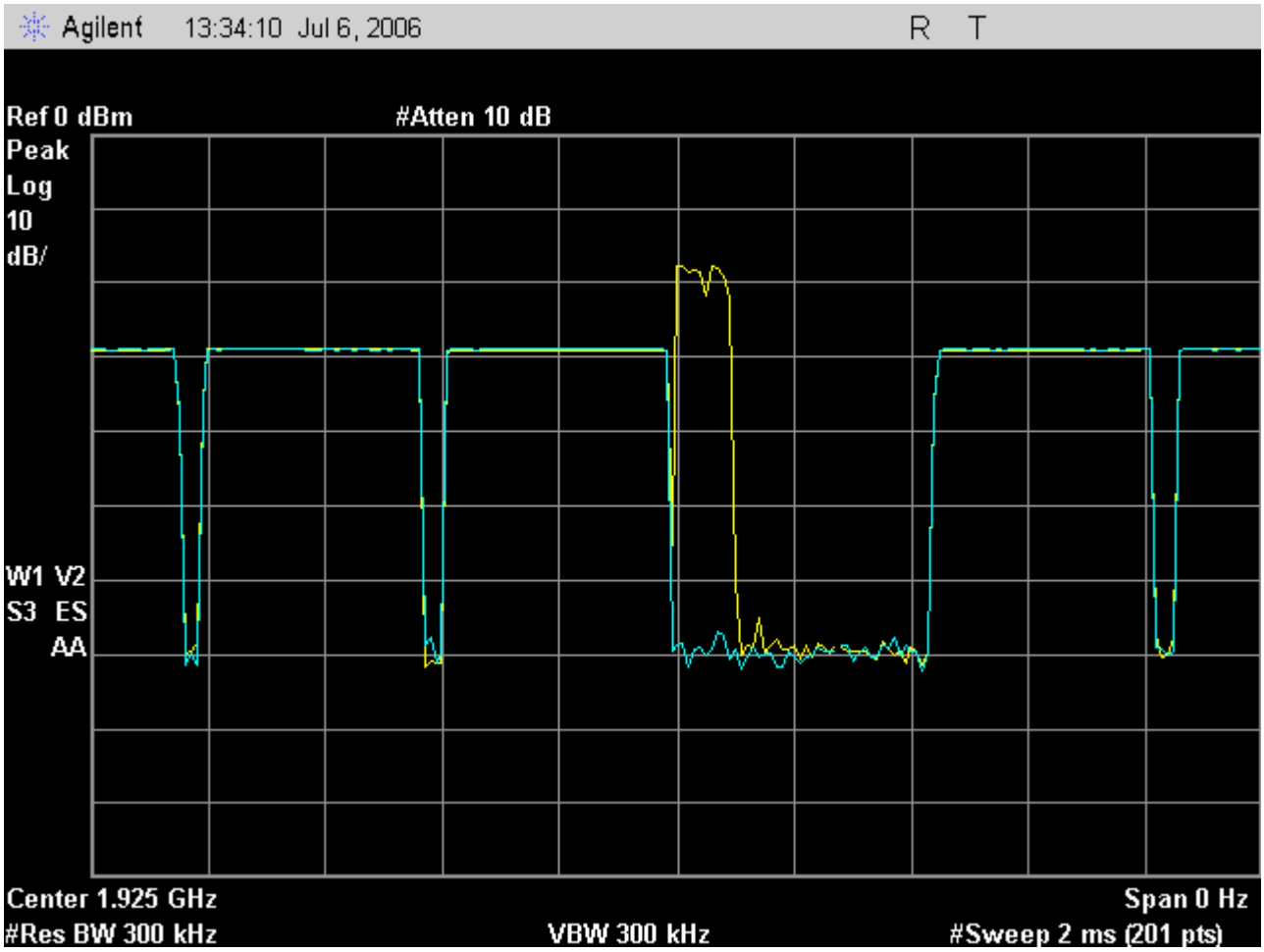

Fig. 71 - Zero-span (single frequency receiver mode) sweep of TDMA interference on carrier at 1924.992MHz, f_1, with base EUT transmission in single open timeslot, detail of open timeslot and transmission.

The yellow (upper) 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.

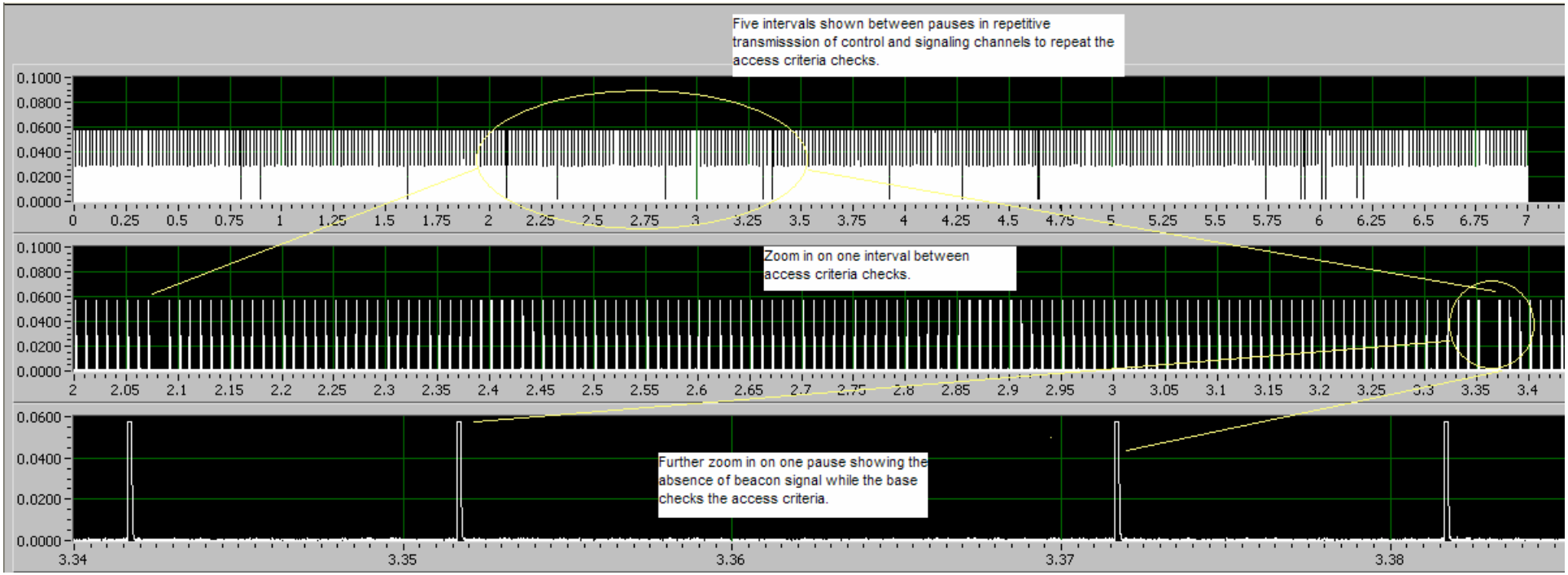

Fig. 72 - Capture of demodulated transmissions of base EUT control and signaling transmissions; the signal present at the RF detector output.
The resolution of detail may require viewing this document in electronic format at 150% resolution. Irreducible image artifacts occur in the top trace due to pixilation in the original screen-capture.

The top trace is 7 seconds of the 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 2.08 seconds and at 3.36 seconds, and the interval between pauses is then 1.28 seconds, 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, and usable vertical scale was +/-0.1V. The demodulated pulses have an amplitude scale factor of -1 applied for clarity.

- 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.

V-B. Clause 8.1.2 Access criteria functional 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 remote unit 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 -40.0 dBm ($T_U + U_M$) and so blocked except 1923.264MHz, f_1, which is set to -52.0dBm ($T_U - U_M$) and so unblocked. The alternate interference profile has all carriers at level -40.0 dBm except 1924.992MHz, f_2, which is set to -52.0 dBm.

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 be 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. 73 - Control panel for the multi-carrier interference generator for the test of 8.1.2.

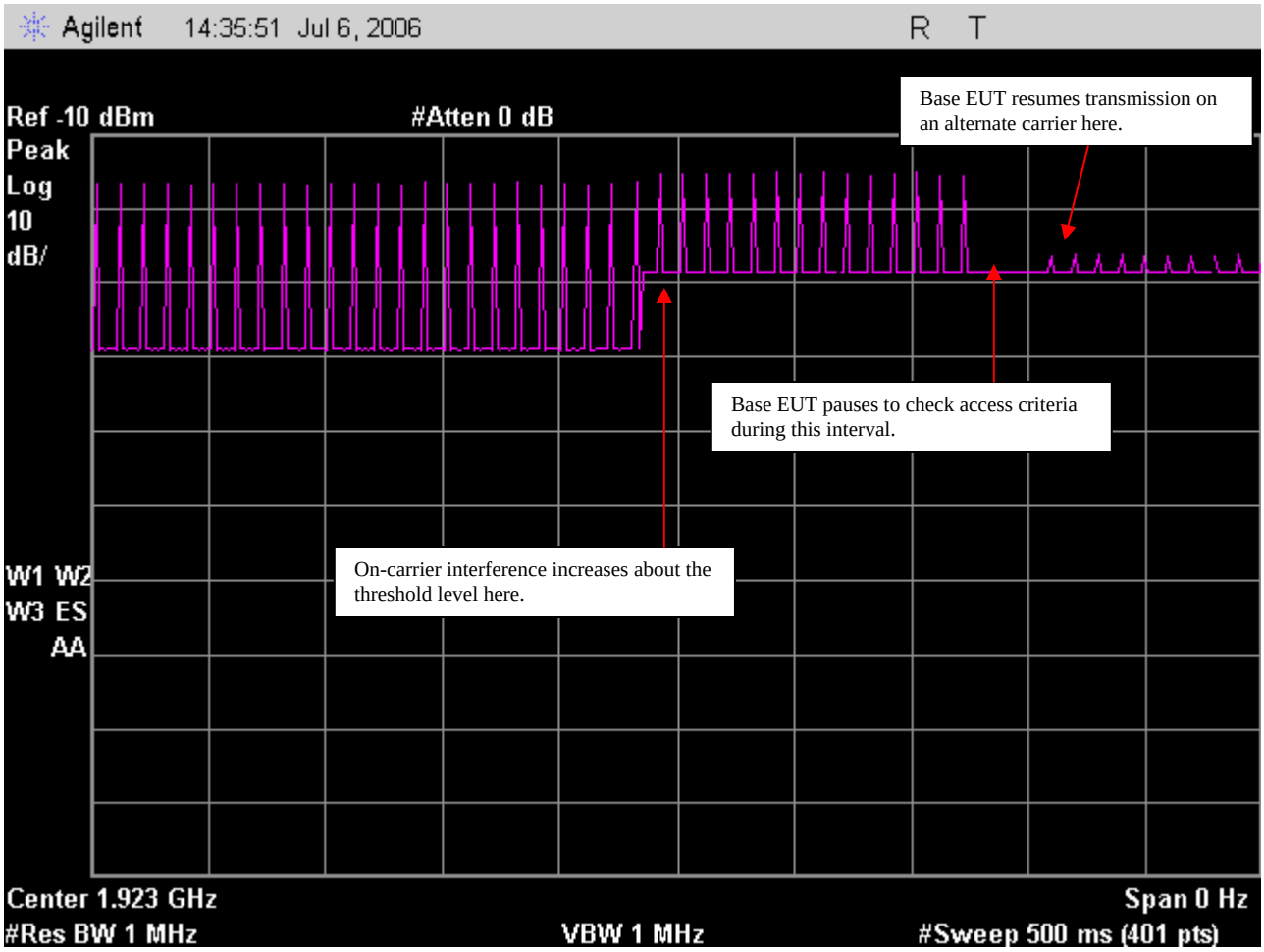

Fig. 74 - Zero-span spectrum analyzer display of base EUT pausing the transmission of control and signaling to check access criteria, finding that the channel no longer meets the access criteria, and resuming transmissions on an alternate carrier.

The sweep starts with the base EUT transmitting control and signaling information (the beacon) on 1923.264MHz. The interference level of the initial profile is -52.0 dBm (T_U - U_M), below the threshold. The interference level on 1923.264MHz is then raised to -40.0Bm (T_U + U_M, above the threshold) by switching to the alternate profile at 240mS into the sweep: at the same time, the level on 1924.992MHz is reduced to -52.0dBm (T_U - U_M, below the threshold), and at 370 mS into the sweep the base EUT pauses to check the access criteria. Finding that the access criteria are no longer met on 1923.264MHz, the base EUT moves transmissions to a different carrier (1924.992MHz) for which the access criteria are met, and the base EUT's transmit beacon signal reappears at a lower level on the display, visible still because the spectrum analyzer is set to 1MHz RBW and the signal is only somewhat attenuated by the instrument's selectivity at the new carrier frequency.

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

V-C. Clause 8.2.1 Acknowledgements, base EUT

This test is to demonstrate that the base EUT stops communications channel transmissions if acknowledgements stop. The base EUT does not start the activation of the communications channel (the remote companion unit does so, it has the TALK button and brings 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 modified in two ways:

1) The attenuation between the headset (the companion device) and the combining network is 70dB instead of 30dB.
2) The trigger input to the spectrum analyzer is changed from the base's frame sync signal to the alternate-waveform marker out of the multi-carrier signal generator.

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 -40.0dBm ($T_U + U_M$) except the carrier at 1924.992MHz, f_1, which is set to -130dBm. The alternate interference profile has all carriers at level -40.0dBm ($T_U + U_M$) except the carrier at f_1, which is set to -52.0dBm ($T_U - U_M$). The initial profile ensures that the system timing can be monitored by a zero-span sweep of the spectrum analyzer at f_1 and that the base EUT can hear the remote, there being no interference on f_1. The alternate profile has interference on f_1 that is still below the threshold, but is high enough to prevent the base EUT from hearing the attenuated headset transmissions when the alternate interference profile becomes active.

The base EUT is then powered up. The transmit spectrum and interference spectrum are observed using the E4407B spectrum analyzer. Trigger is external, the alternate-waveform marker. The trigger offset is set to -1 seconds so that the transition from unblocked to blocked can be observed.

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 30 seconds allowed.

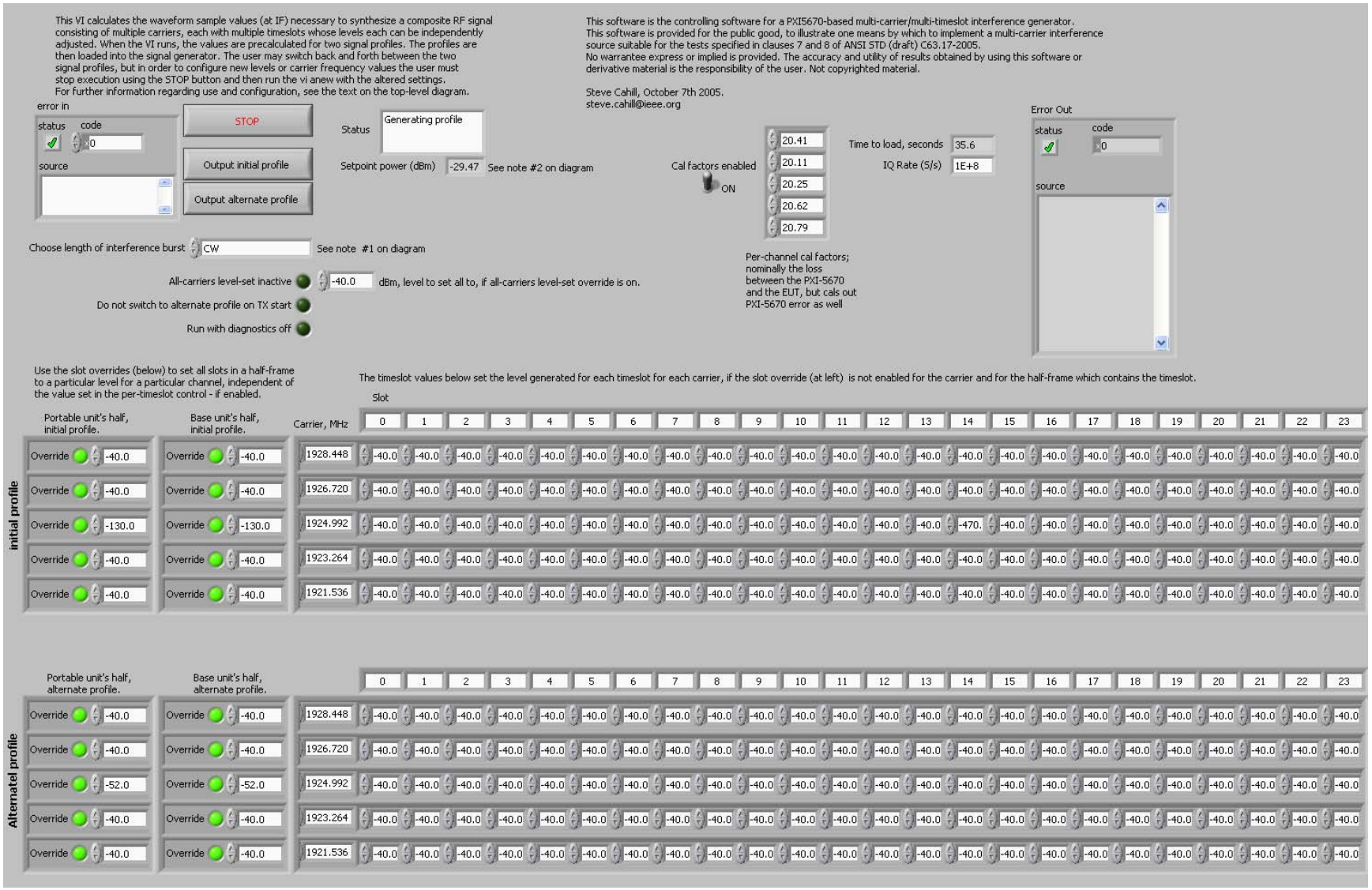

Fig. 75 - Control panel for the multi-carrier interference generator for the test of 8.2.1(c).

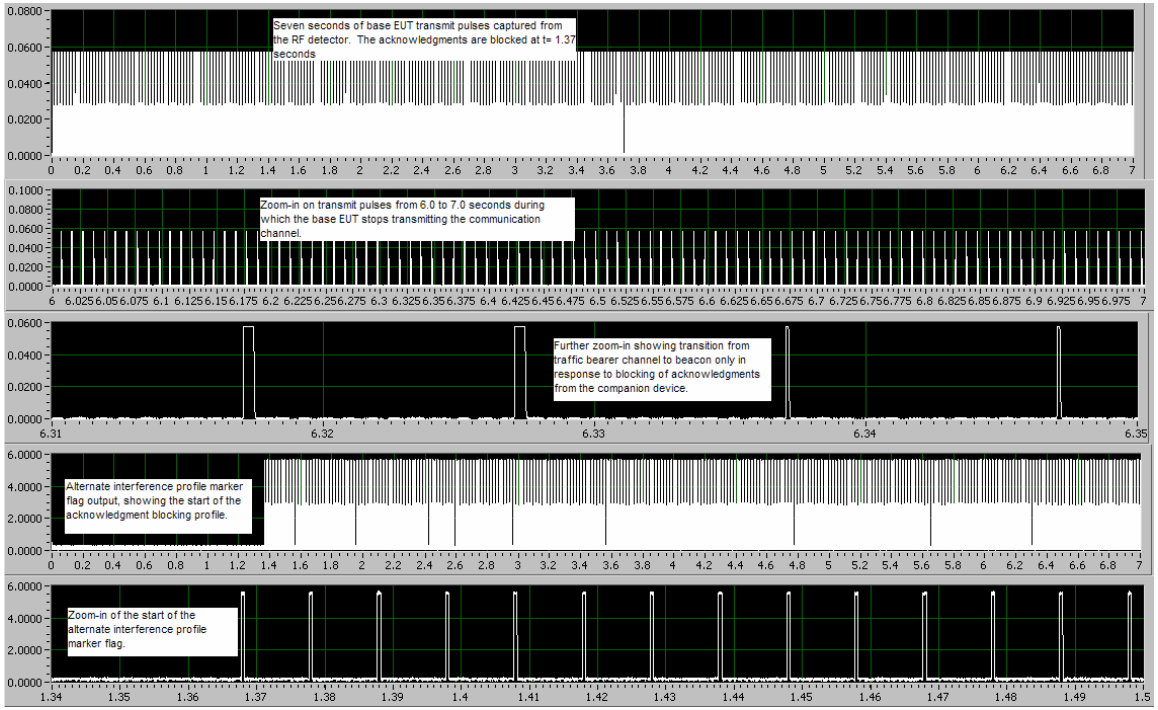

Fig. 76 - Capture of demodulated transmissions of base EUT control and signaling transmissions. The resolution of detail may require viewing this document in electronic format at 150% resolution. Irreducible image artifacts occur in the top trace due to pixilation in the original screen-capture. Sample rate was 200k samples per second. The pulses captured at the output of the RF detector have an amplitude scale factor of -1 applied for clarity.

The top trace is 7 seconds of the transmissions, capturing transmit bursts as generated at the output of the RF detector in combining network. The 2nd trace from the top is a zoom-in on the top trace showing the bursts in the interval from 6.0 to 7.0 seconds. The 3rd trace from the top is a further zoom-in showing the bursts in the interval from 6.3 seconds to 6.35 seconds, during which the base EUT ceases transmission of the communications channel and commences transmission of the beacon, in response to the loss of acknowledgements from the companion device, which has occurred previously due to the commencement of generation of the alternate interference profile. The initial interference profile has no interference generated on the carrier used by the base EUT and the companion device, and so the base EUT can receive transmissions from the companion device even though the signal from the companion device is attenuated by 70dB. The alternate interference profile, though, has transmissions received at the base at -57.5dBm, and so when the alternate interference profile begins, reception by the base EUT of transmissions (including acknowledgements) from the companion device are blocked. The fourth trace from the top is the alternate interference profile slot0 timing flag. This flag occurs at the start of slot 0 when the alternate interference profile is being generated, and the commencement of the occurrence of this flag at t = 1.368 seconds into this capture corresponds to the blocking of acknowledgements from the companion device by interference. The bottom trace is a further zoom-in showing the detail of the start of the alternate interference profile.

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 = 6.337 seconds, which is 4.969 seconds after acknowledgements from the companion device are lost., and so the base EUT meets the requirements of 8.2.1(c).

V-D. 8.2.2 Transmission duration, base EUT

This test is to demonstrate that the base EUT does not use the same channel continuously without executing the access criteria at least as often as every 8 hours.

Setup for 8.2.2 for the base EUT: transmission duration
The test platform, base EUT and companion headset are configured according to the requirements for implementing the test of 8.2.2 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 -40.0 dBm ($T_U + U_M$) except the carrier at 1924.992MHz, f_1, which is set to -130dBm. The alternate interference profile has all carriers at level -40.0 dBm ($T_U + U_M$) including the carrier at f_1. The initial profile ensures that the system timing can be monitored by a zero-span sweep of the spectrum analyzer at f_1, there being no interference on f_1. The alternate profile has interference on all channels that is high enough to prevent the base EUT from finding a channel in which the access criteria test permits transmissions, when the alternate interference profile becomes active.

The base EUT and companion remote device are then powered up. The output of the RF detector in the RF splitter/combiner matrix is monitored with a digital storage oscilloscope capturing timed traces. The TALK button on the headset is pressed and a communications channel established on f_1. The trace and time at which the communications channel is established is captured. Then the multi-carrier generator is switched to the alternate interference profile. The trace in which the base ceases transmissions due to the test and failure of the access criteria on all channels is then captured when the access criteria test is executed by the base EUT.

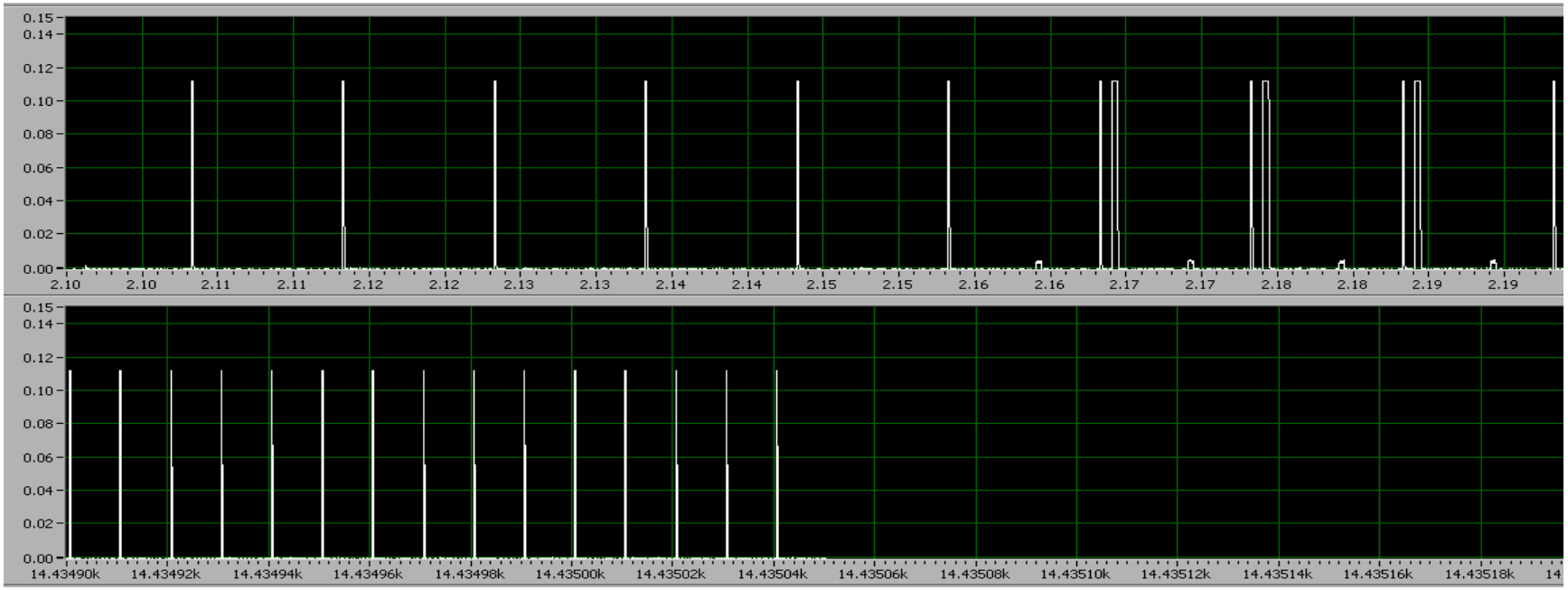

Fig. 77 - Two traces are shown here, both being the output of the RF detector in the splitter/combiner matrix, but at different times; one showing the initiation of the transmissions on the communications channel, and the 2nd showing termination at access criteria check failure.
The base EUT terminates transmissions after 14435.04 seconds, meeting 8.2.2; the base must execute the access criteria test at least as often as every 28800 seconds.

6.1.2 Peak transmit power, Remote unit EUT

The remote unit 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 headset EUT transmit burst for each carrier.

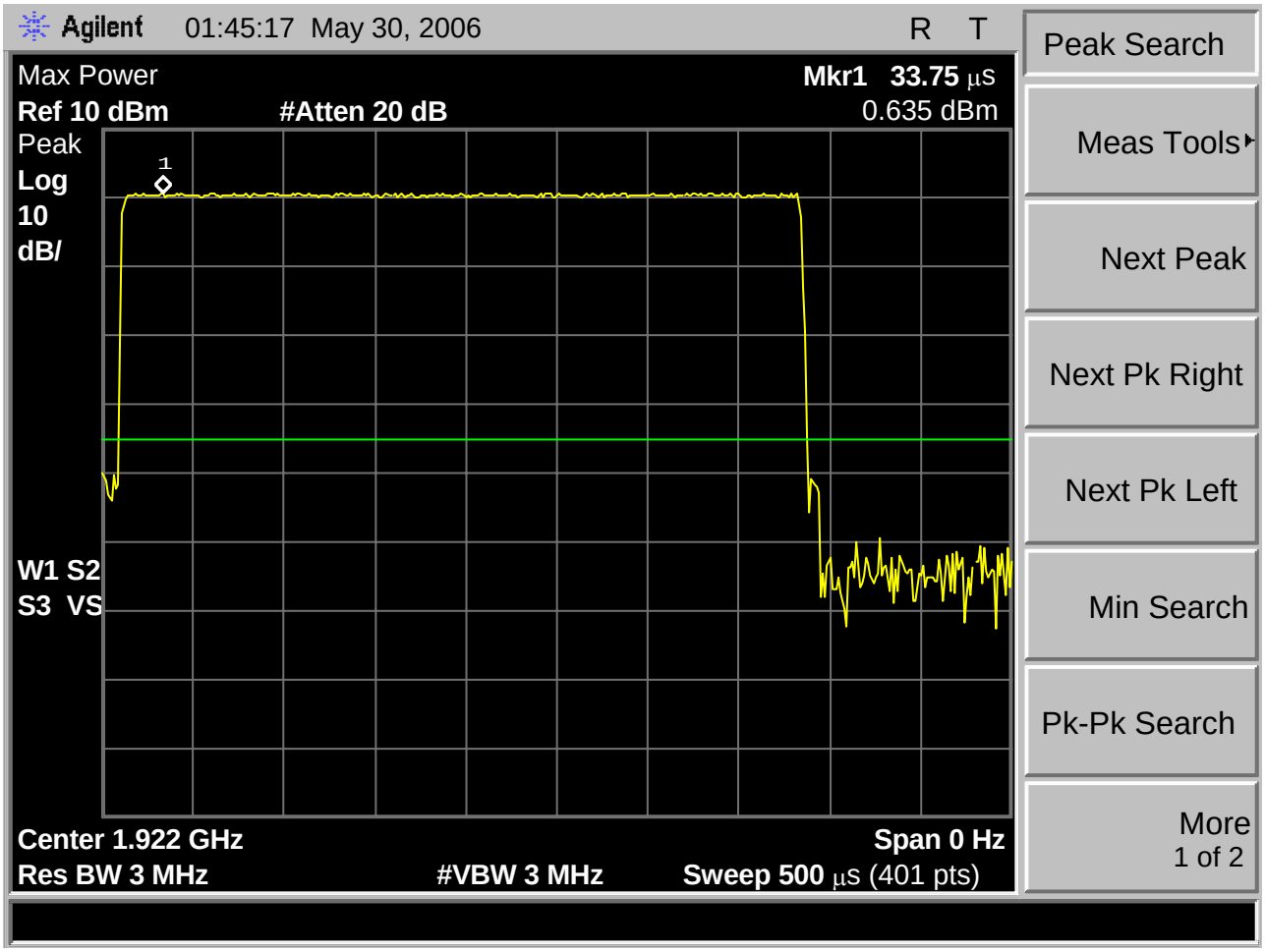

Fig. 80 - Remote EUT transmit power received by spectrum analyzer configured according to the requirements of clause 6.1.2 of V3.3 of (draft) C63.17-2005, low carrier. Maximum observed transmit power is 0.64dBm.

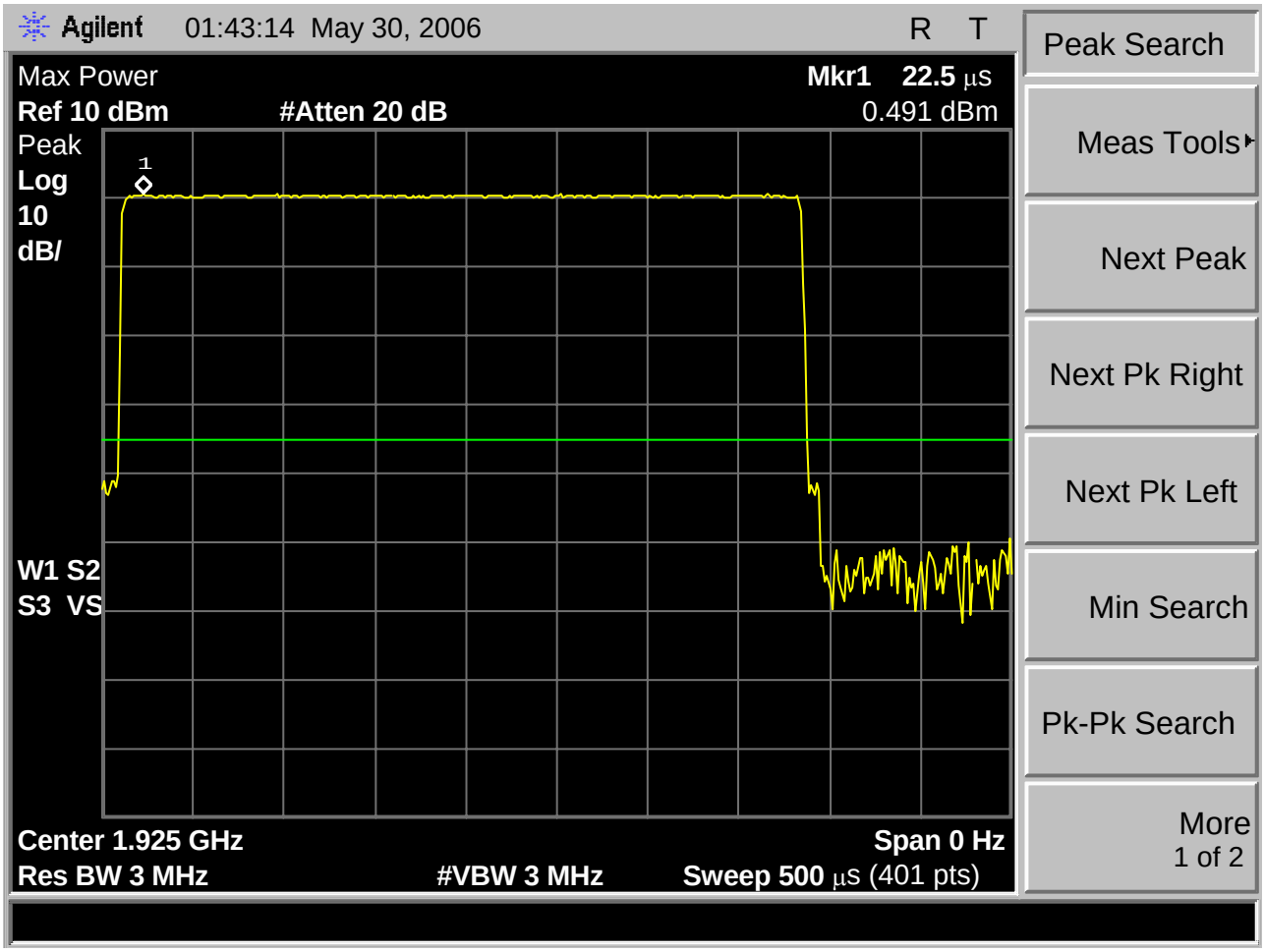

Fig. 81 - Remote EUT transmit power received by spectrum analyzer configured according to the requirements of clause 6.1.2 of V3.3 of (draft) C63.17-2005, mid carrier. Maximum observed transmit power is 0.49dBm

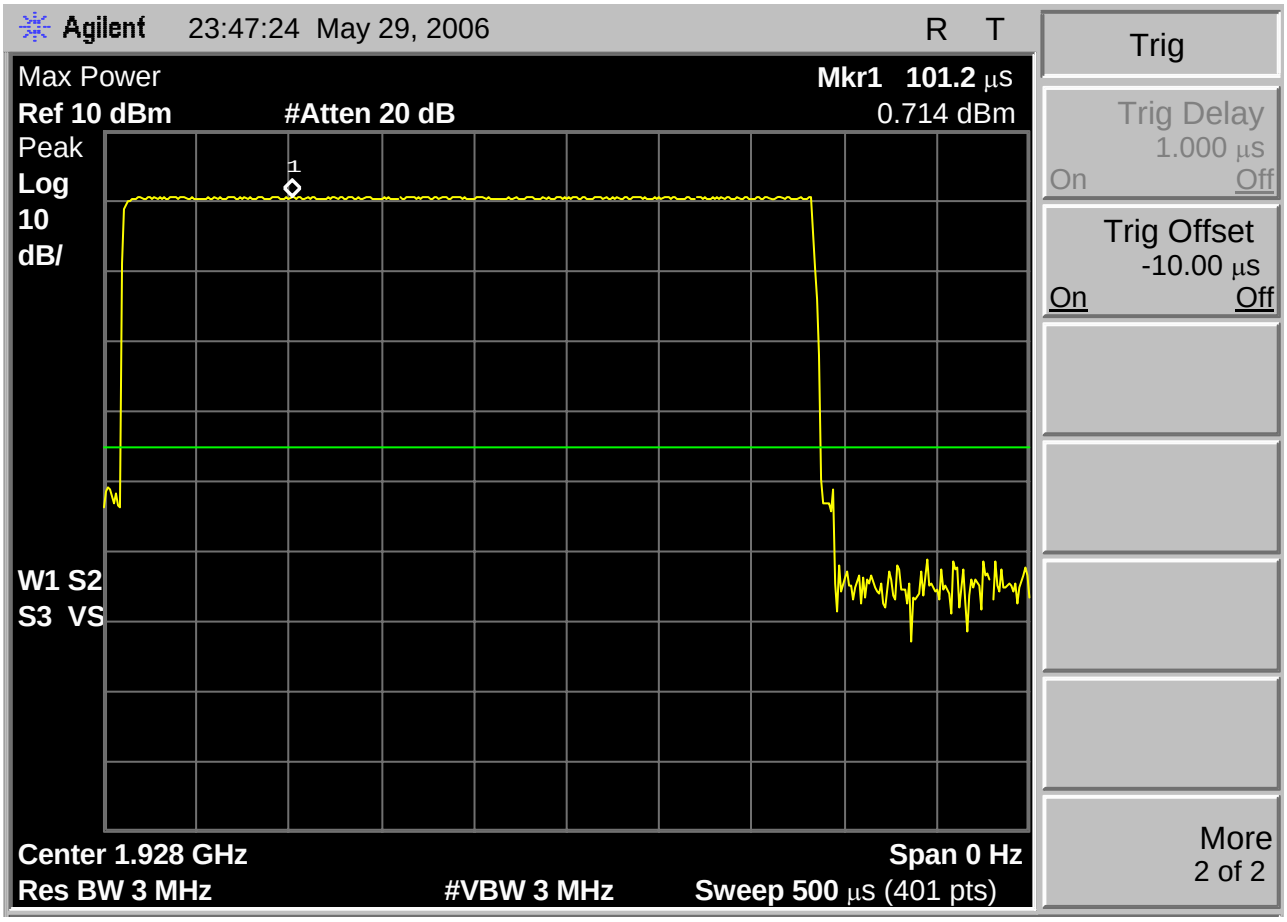

Fig. 82 -Remote EUT transmit power received by spectrum analyzer configured according to the requirements of clause 6.1.2 of V3.3 of (draft) C63.17-2005, high carrier. Maximum observed transmit power is 0.71dBm.

The maximum allowed transmit power is *Plimit*, which is, from clause 4.3.1 of V3.3 of (draft) C63.17-2005,

Plimit = 5(log***B***) – 10dBm,

for an EUT with maximum antenna gain not more than 3dBi (the maximum antenna gain for the headset EUT is 3dBi) and where ***B*** is the emissions bandwidth, 1.43 MHz for the headset EUT (see the measurements following for clause 6.1.3).

Solving for *Plimit* we obtain +20.8dBm.

The headset EUT has maximum observed transmit power of 0.71dBm, and meets the required limit of less than *Plimit*, passing the requirements of V3.3 (draft) C63.17-2005 clause 6.1.2 with 20.07dB of margin.

6.1.3 Emission bandwidth ***B***, Remote EUT

The remote 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 remote EUT transmit burst for each carrier.

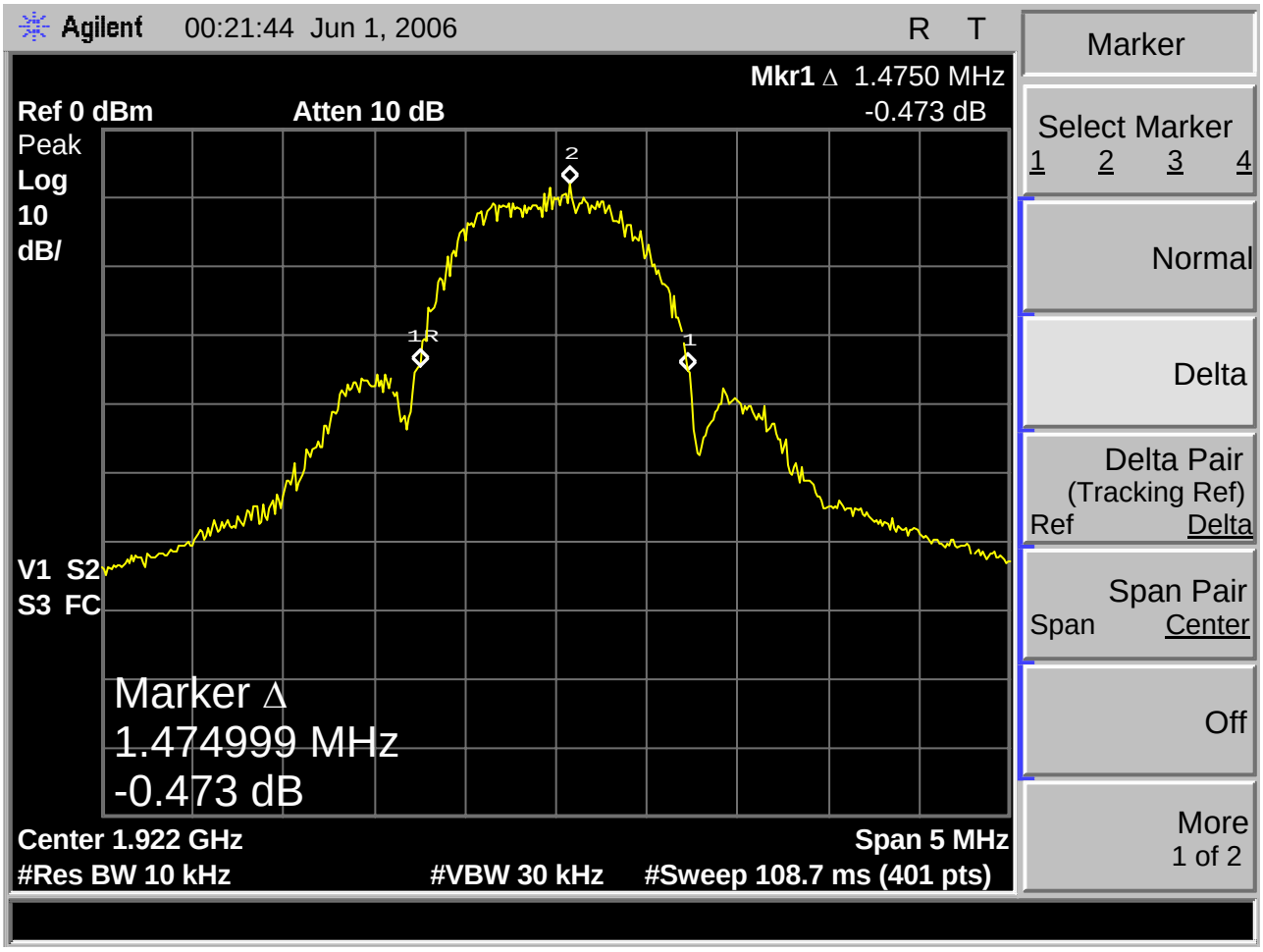

Fig. 83 - Remote EUT, 1.47MHz emissions bandwidth on low carrier.

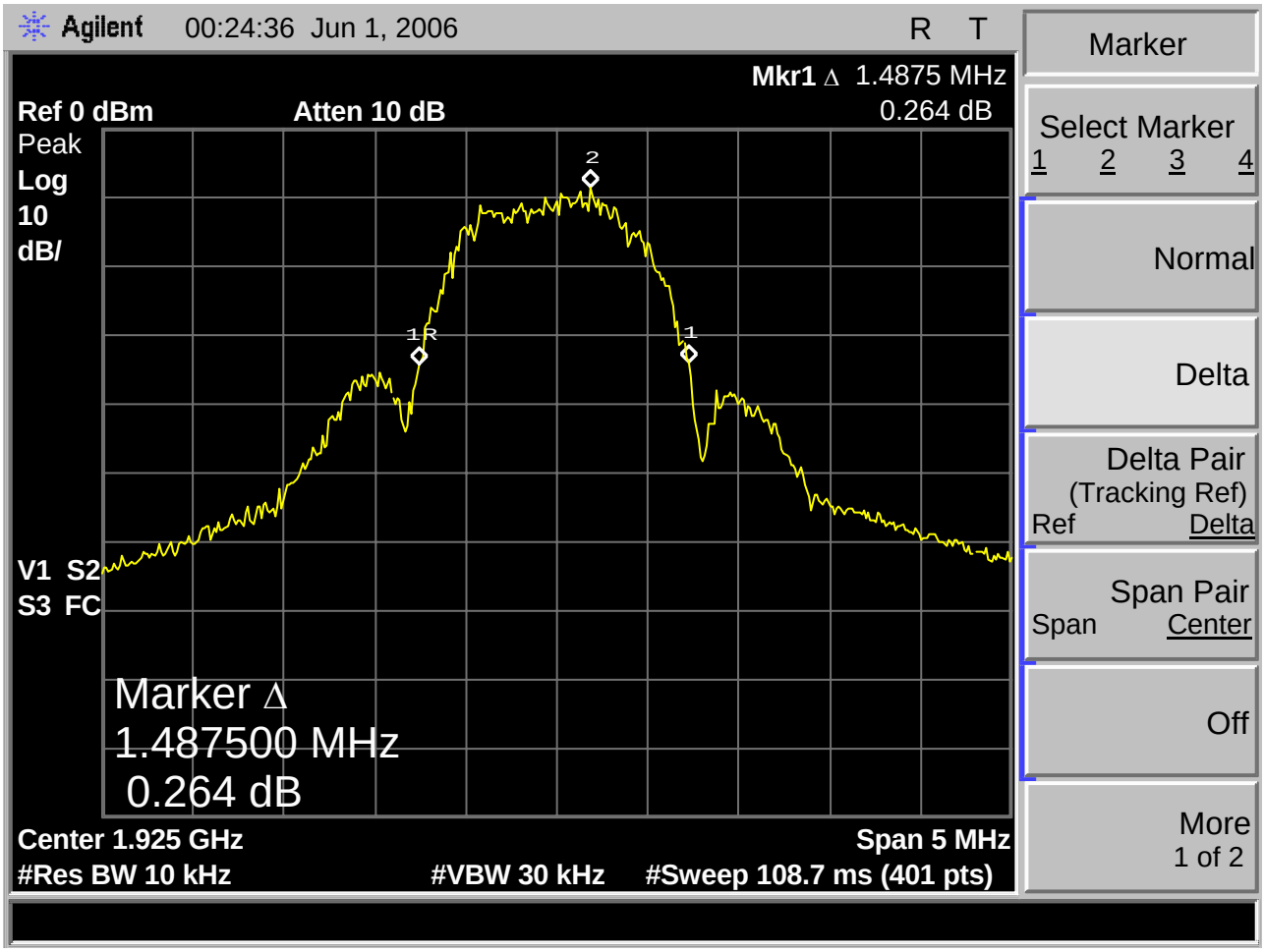

Fig. 84 - Remote EUT, 1.49MHz emissions bandwidth on middle carrier.

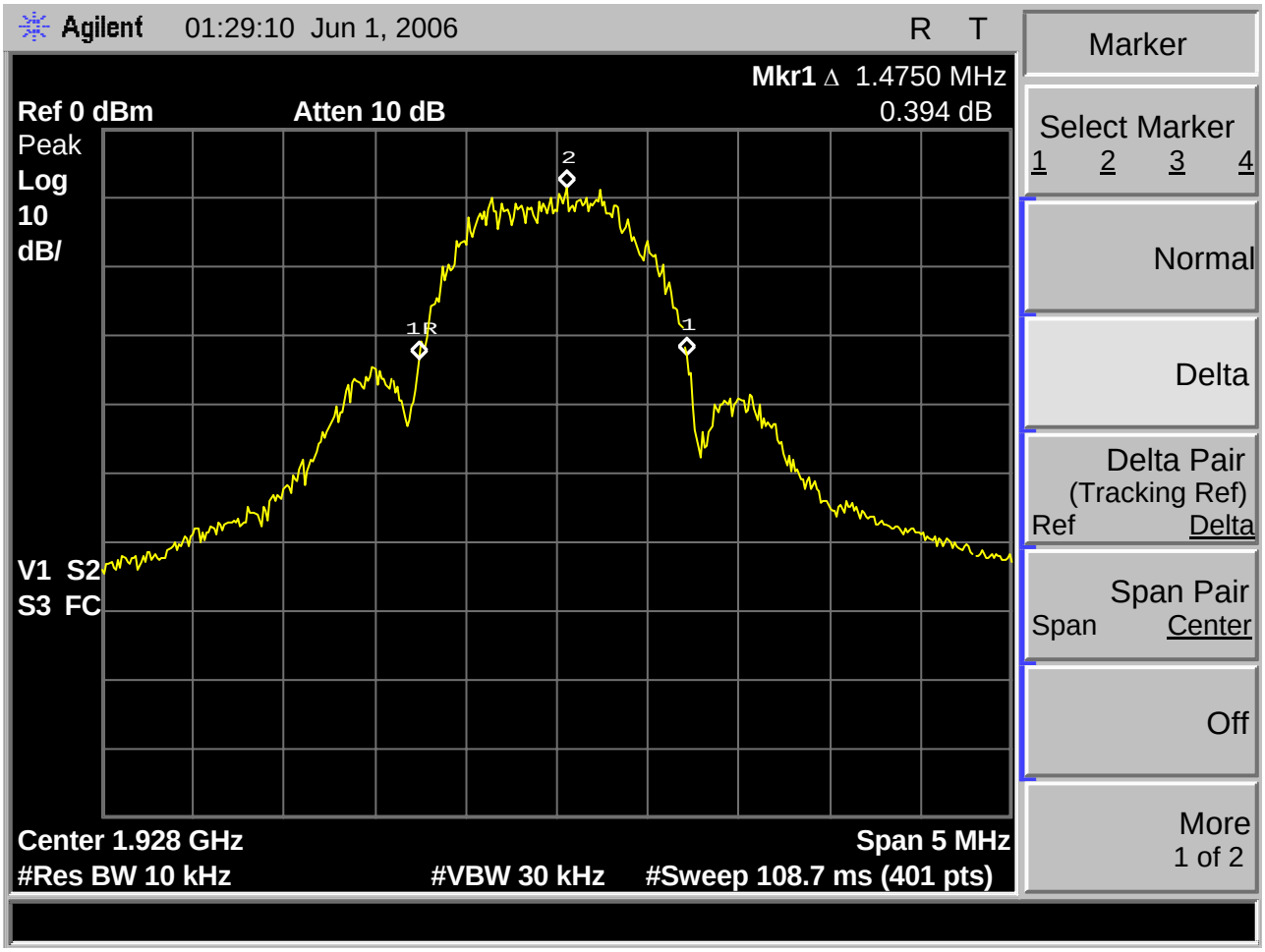

Fig. 85 - Remote EUT, 1.38MHz emissions bandwidth on high carrier.

The bandwidth ***B*** for the headset EUT used in further calculations according to the UPCS standard, from the center carrier, is then 1.49MHz.

The maximum allowed emission bandwidth *BlimitU* is 2.5MHz.
The minimum allowed emission bandwidth *BlimitL* is 50kHz,

The maximum observed emission bandwidth was 1.49MHz. The minimum observed emission bandwidth was 1.47MHz, so the remote EUT passes the test of clause 6.1.3 of V3.3 (draft) C63.17-2005.

6.1.4 Modulation, Remote EUT

Per the attestation in section I-B, the companion remote device uses digital modulation and so meets the requirement of V3.3 (draft) C63.17-2005

6.1.5 Power spectral density using the measured maximum method, remote EUT

The remote 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.

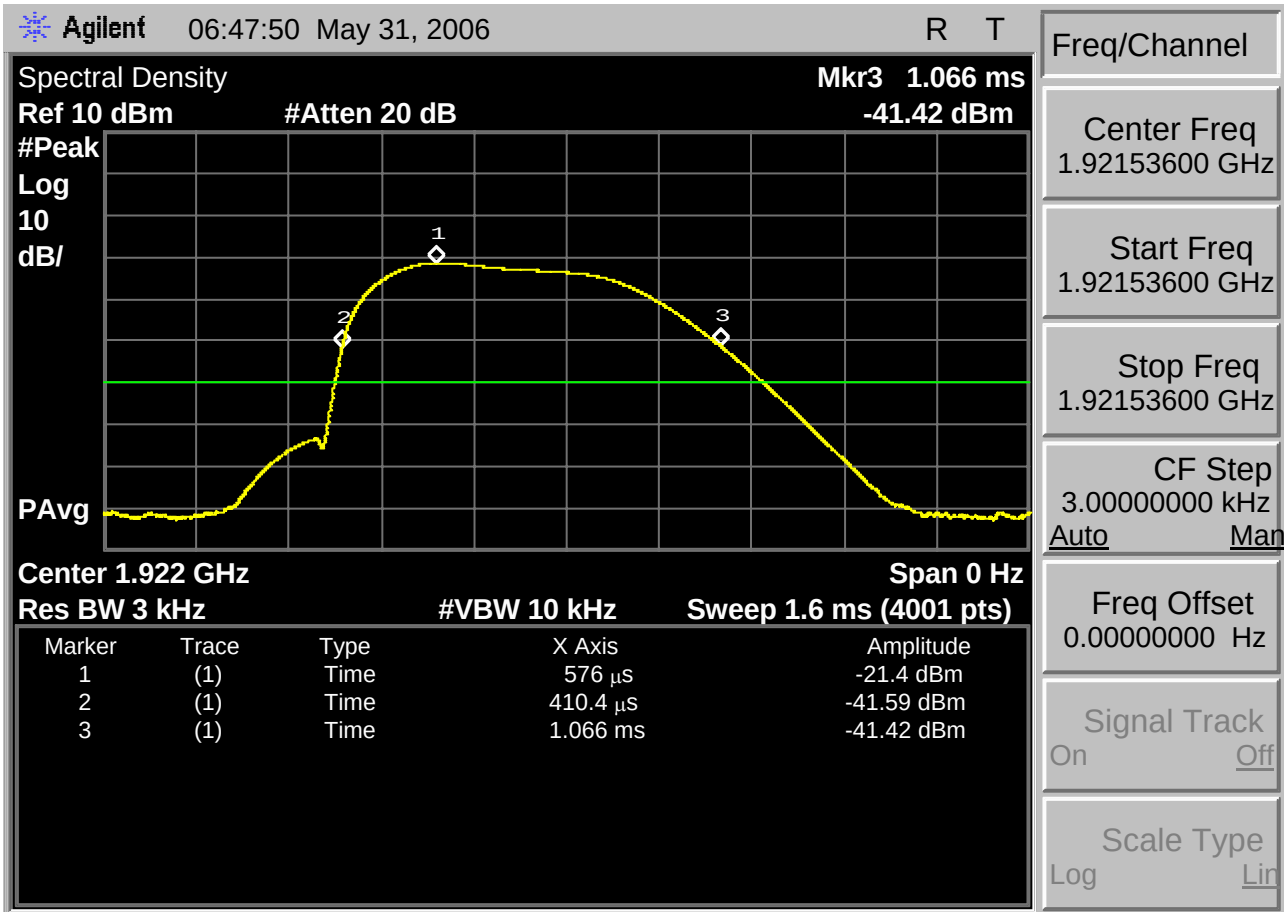

Fig. 86 – Zero-span sweep for remote EUT, low carrier, for 3kHz maximum power spectral density. The peak level is at –21.4dBm, and the interval between samples at the -20dB points is from 410.4uS to 1066uS, or 655.6uS.

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 V3.3 (draft) C63.17-2005, using an Excel spreadsheet,
“Clause 6_1_5 3kHz headset EUT lowch.xls”

Integrated maximum 3kHz-bandwidth transmit power for the remote EUT on the low channel was -24.51dBm, a margin of 29.28dB to the specification for maximum power spectral density.

05/31/06 06:51:06	A:\TRACE000.CSV			
Title:	Spectral Density			
Model:	E4407B			
Serial Number:	MY45105325			
Center Frequency:	1921536000	Hz		
Span:	0	Hz		
Resolution Bandwidth:	3000	Hz		
Video Bandwidth:	10000	Hz		
Reference Level:	10	dBm		
Sweep Time:	0.0016	Sec		
Num Points:	4001			
Sample frequency:	2500000	Hz		
	Trace 1			
Sec	dBm	power, W	Power summed:	
4.10E-04	-41.59	6.93426E-08	5.80E-03	
4.11E-04	-41.332	7.35868E-08		
4.11E-04	-41.106	7.75175E-08	Total pulse energy in 3kHz BW, Joules:	
4.12E-04	-40.846	8.23E-08	2.32E-09	
4.12E-04	-40.589	8.73172E-08		
4.12E-04	-40.363	9.19814E-08	Pulse length (-20dBc), seconds	
4.13E-04	-40.135	9.69393E-08	0.0006556	
4.13E-04	-39.934	1.01531E-07		
4.14E-04	-39.715	1.06782E-07	Average pulse power, W	
4.14E-04	-39.498	1.12254E-07	3.54E-06	
4.14E-04	-39.289	1.17788E-07		
4.15E-04	-39.107	1.22829E-07	Average pulse power, dBm	
4.15E-04	-38.875	1.29569E-07	-24.51	
4.16E-04	-38.636	1.36899E-07		
4.16E-04	-38.442	1.43153E-07		
4.16E-04	-38.252	1.49555E-07		
1.06E-03	-41.071	7.81448E-08		
1.06E-03	-41.098	7.76605E-08		
1.06E-03	-41.152	7.67008E-08		
1.06E-03	-41.187	7.60852E-08		
1.06E-03	-41.232	7.53009E-08		
1.07E-03	-41.294	7.42335E-08		
1.07E-03	-41.334	7.35529E-08		
1.07E-03	-41.36	7.31139E-08		
1.07E-03	-41.421	7.20941E-08		
1.07E-03	-41.443	7.17299E-08		
1.07E-03	-41.496	7.08598E-08		

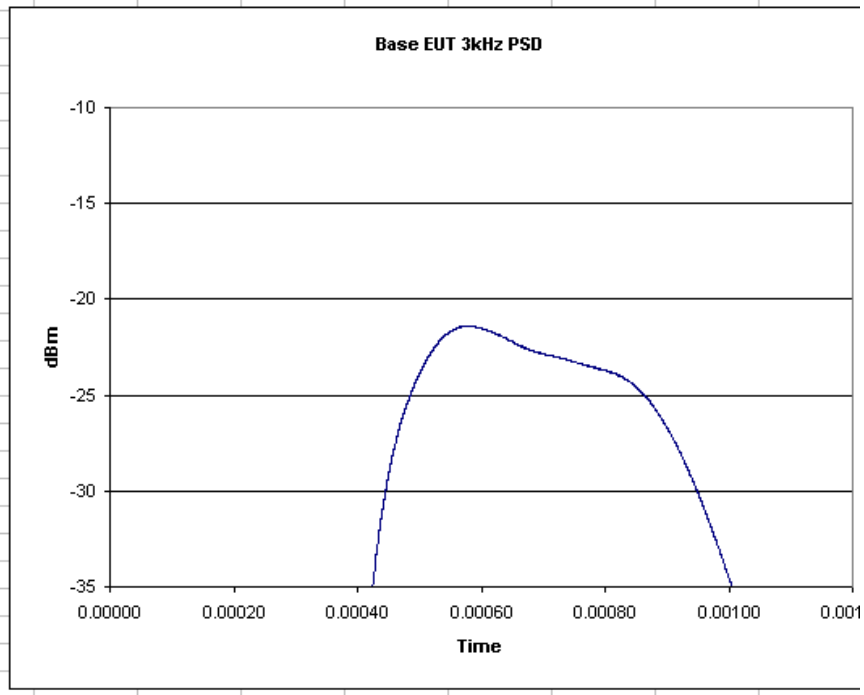

Fig 87 – Screenshot of Excel file showing *PSDlimit* calculations for remote EUT, low carrier; -24.51dBm.

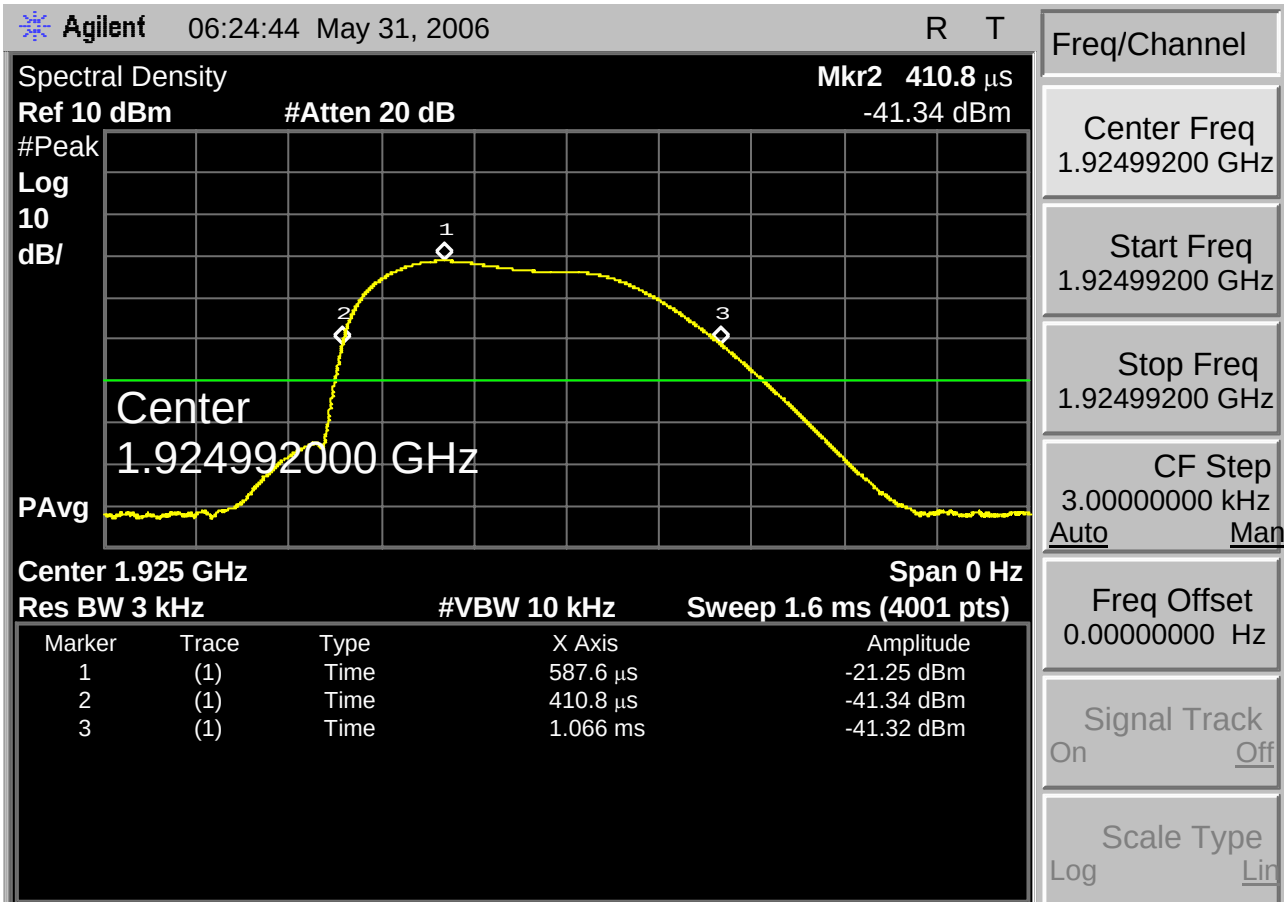

Fig. 88 – Zero-span sweep for remote EUT, middle carrier, for 3kHz maximum power spectral density. The peak level is at -21.25dBm, and the interval between samples at the -20dB points spans 410.8uS to 1066uS, or 656uS.

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 V3.3 (draft) C63.17-2005, using an Excel spreadsheet,
"Clause 6_1_5 3kHz headset EUT midch.xls"

Integrated maximum 3kHz-bandwidth transmit power for the remote EUT on the mid channel was -24.56dBm, a margin of 29.33dB to the specification for maximum power spectral density.

05/31/06 06:14:43	A:\F90PPHI.CSV			
Title:	Spectral Density			
Model:	E4407B			
Serial Number:	MY45105325			
Center Frequency:	1928447950	Hz		
Span:	0	Hz		
Resolution Bandwidth:	3000	Hz		
Video Bandwidth:	10000	Hz		
Reference Level:	1.00E+01	dBm		
Sweep Time:	1.60E-03	Sec		
Num Points:	4001			
Sample frequency:	2500000	Hz		
	Trace 1			
Sec	dBm	power, W	Power summed:	
4.10E-04	-4.18E+01	6.62674E-08	7.09E-03	
4.10E-04	-4.15E+01	7.03072E-08		
4.11E-04	-4.13E+01	7.41652E-08	Total pulse energy in 3kHz BW, Joules:	
4.11E-04	-4.11E+01	7.81808E-08	2.84E-09	
4.12E-04	-4.08E+01	8.30424E-08		
4.12E-04	-4.06E+01	8.8044E-08	Pulse length (-20dBc), seconds	
4.12E-04	-4.03E+01	9.29608E-08	0.0006560	
4.13E-04	-4.01E+01	9.76787E-08		
4.13E-04	-3.99E+01	1.02376E-07	Average pulse power, W	
4.14E-04	-3.97E+01	1.08019E-07	4.32E-06	
4.14E-04	-3.95E+01	1.13214E-07		
4.14E-04	-3.93E+01	1.18577E-07	Average pulse power, dBm	
4.15E-04	-3.90E+01	1.24825E-07	-23.64	
4.15E-04	-3.88E+01	1.31917E-07		
4.16E-04	-3.86E+01	1.38229E-07		
4.16E-04	-3.84E+01	1.44444E-07		
1.07E-03	-4.10E+01	7.94145E-08		
1.07E-03	-4.10E+01	7.8614E-08		
1.07E-03	-4.11E+01	7.76962E-08		
1.07E-03	-4.11E+01	7.70371E-08		
1.07E-03	-4.12E+01	7.60151E-08		
1.07E-03	-4.12E+01	7.51277E-08		
1.07E-03	-4.13E+01	7.41993E-08		
1.07E-03	-4.13E+01	7.34345E-08		
1.07E-03	-4.14E+01	7.28283E-08		
1.07E-03	-4.14E+01	7.22271E-08		
1.08E-03	-4.15E+01	7.1499E-08		

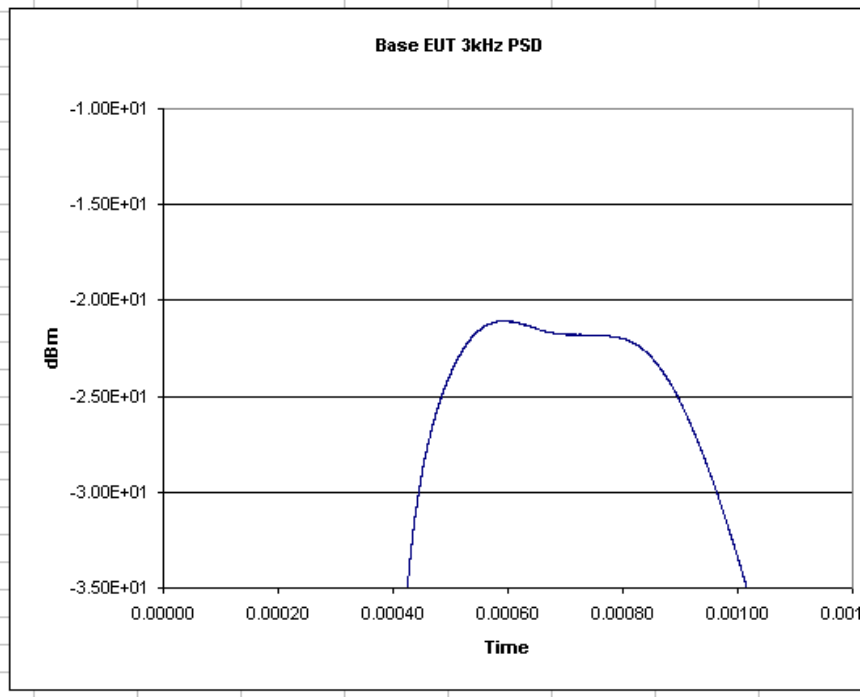

Fig. 89 – Screenshot of Excel file showing *PSDlimit* calculations for remote EUT, mid carrier; -24.56dBm.

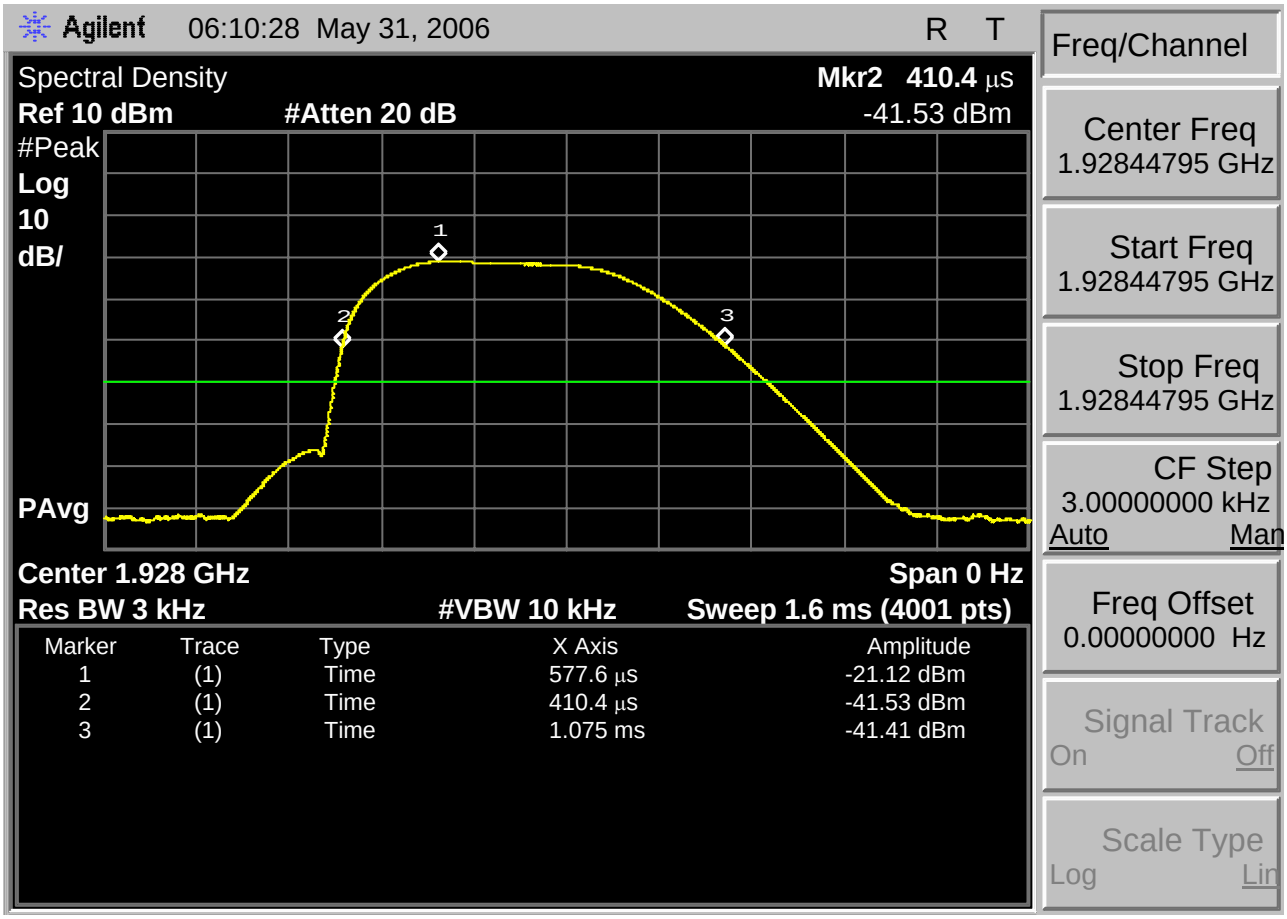

Fig. 90 – Zero-span sweep for remote EUT, high carrier, for 3kHz maximum power spectral density. The peak level is at -21.12dBm, and the interval between samples at the -20dB points is from 410.4uS to 1075uS, or 664.6uS.

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 V3.3 (draft) C63.17-2005, using an Excel spreadsheet,
"Clause 6_1_5 3kHz headset EUT highch.xls".

Integrated maximum 3kHz-bandwidth transmit power for the remote EUT on the low channel was –23.70dBm, a margin of 28.47dB to the specification for maximum power spectral density.

05/31/06 06:14:43	A:\F90PPHI.CSV			
Title:	Spectral Density			
Model:	E4407B			
Serial Number:	MY45105325			
Center Frequency:	1928447950	Hz		
Span:	0	Hz		
Resolution Bandwidth:	3000	Hz		
Video Bandwidth:	10000	Hz		
Reference Level:	1.00E+01	dBm		
Sweep Time:	1.60E-03	Sec		
Num Points:	4001			
Sample frequency:	2500000	Hz		
	Trace 1			
Sec	dBm	power, W	Power summed:	
4.10E-04	-4.18E+01	6.62674E-08	7.09E-03	
4.10E-04	-4.15E+01	7.03072E-08		
4.11E-04	-4.13E+01	7.41652E-08	Total pulse energy in 3kHz BW, Joules:	
4.11E-04	-4.11E+01	7.81808E-08	2.84E-09	
4.12E-04	-4.08E+01	8.30424E-08		
4.12E-04	-4.06E+01	8.8044E-08	Pulse length (-20dBc), seconds	
4.12E-04	-4.03E+01	9.29608E-08	0.0006646	
4.13E-04	-4.01E+01	9.76787E-08		
4.13E-04	-3.99E+01	1.02376E-07	Average pulse power, W	
4.14E-04	-3.97E+01	1.08019E-07	4.27E-06	
4.14E-04	-3.95E+01	1.13214E-07		
4.14E-04	-3.93E+01	1.18577E-07	Average pulse power, dBm	
4.15E-04	-3.90E+01	1.24825E-07	-23.70	
4.15E-04	-3.88E+01	1.31917E-07		
4.16E-04	-3.86E+01	1.38229E-07		
4.16E-04	-3.84E+01	1.44444E-07		
1.07E-03	-4.10E+01	7.94145E-08		
1.07E-03	-4.10E+01	7.8614E-08		
1.07E-03	-4.11E+01	7.76962E-08		
1.07E-03	-4.11E+01	7.70371E-08		
1.07E-03	-4.12E+01	7.60151E-08		
1.07E-03	-4.12E+01	7.51277E-08		
1.07E-03	-4.13E+01	7.41993E-08		
1.07E-03	-4.13E+01	7.34345E-08		
1.07E-03	-4.14E+01	7.28283E-08		
1.07E-03	-4.14E+01	7.22271E-08		
1.08E-03	-4.15E+01	7.1499E-08		

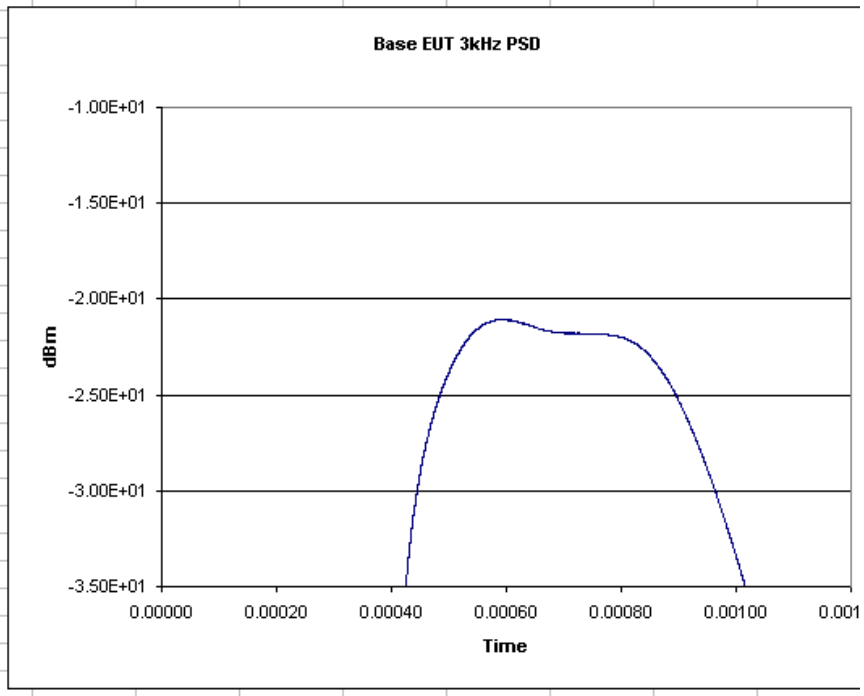

Fig. 91 – Screenshot of Excel file showing *PSDlimit* calculations for remote EUT, high carrier; -23.70dBm.

The maximum allowed PSD, *PSDlimit*, is 3mW in any 3kHz bandwidth, or 4.77dBm. The maximum observed PSD for the remote EUT is -23.70dBm, meeting the requirements according to clause 6.1.5 of V3.3 (draft) C63.17-2005 with 28.47dB of margin.

6.1.6 Emissions, Remote EUT

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

6.1.6.1 In-band unwanted emissions, remote 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*** = 1.49MHz, 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.

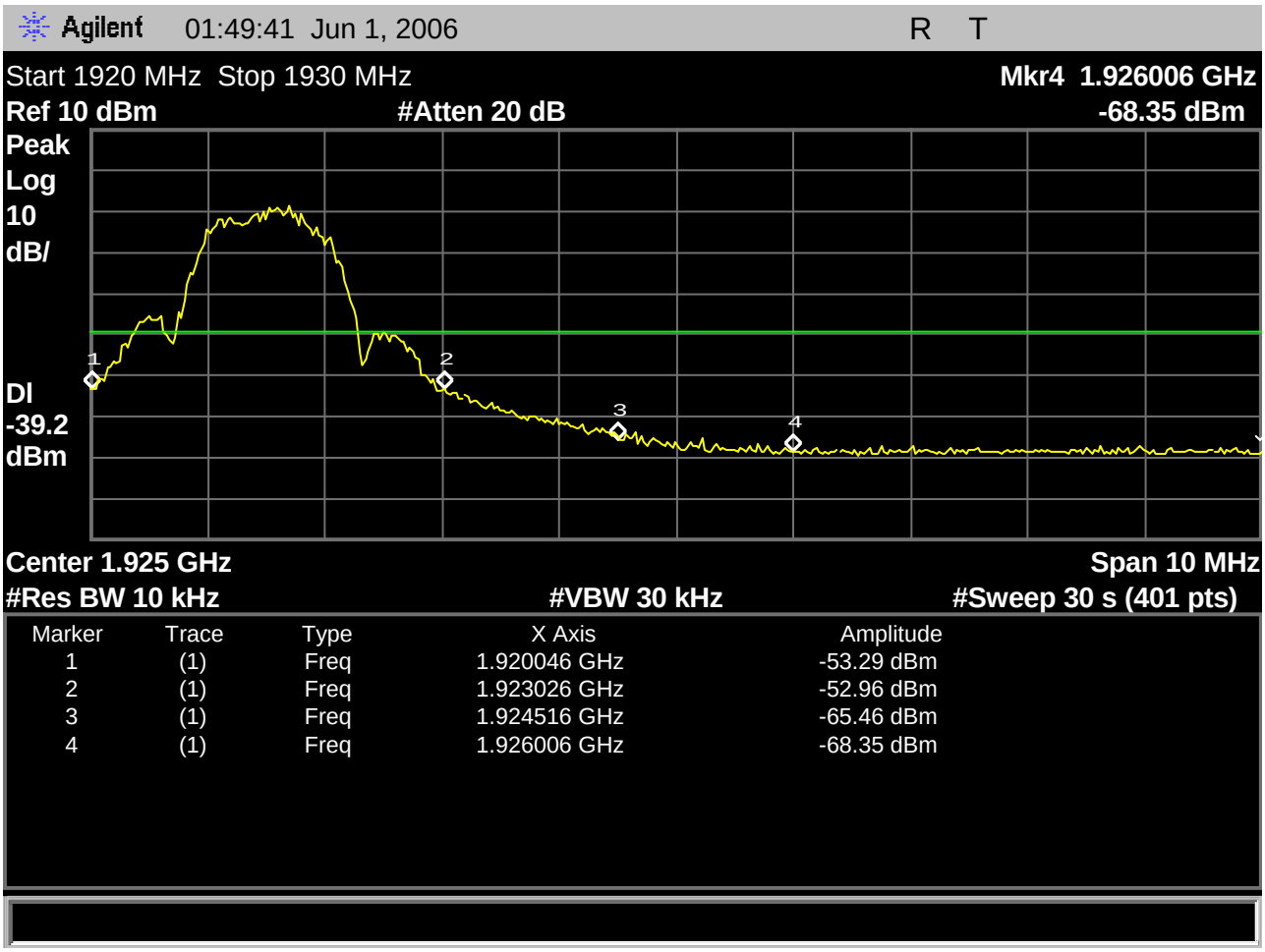

Fig. 92 - Spectrum analyzer screenshot for transmit emissions showing inband unwanted emissions with the remote EUT transmitter at the lowest carrier, 1921.536MHz, according to the requirements of 6.1.6.1.

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 3B and above, where B is the remote EUT emissions bandwidth. The markers are placed at 1B, 2B and 3B separations from the carrier, where the allowed limits are:

A) 1B to 2B separation: at least 30dB below the permitted level.
B) 2B to 3B separation: at least 50dB below the permitted level.
C) 3B to in-band edge: at least 60dB below the permitted level

For region A (double sided inband), the worst-case marker at 1920.05 MHz is at -52.96dBm, and 30dB below 20.8dBm, or -9.2dBm is allowed, margin is 43.76dB.

For region B (single-sided inband), the marker at 1924.52MHz is at -65.46dBm, and 50dB below 20.8dBm, or -29.2dBm is allowed, margin is 36.26dB.

For region C (single-sided inband), the marker at 1926.01MHz is at -68.35dBm, and 60dB below 20.8dBm, or -39.2dBm is allowed, margin is 29.15dB.

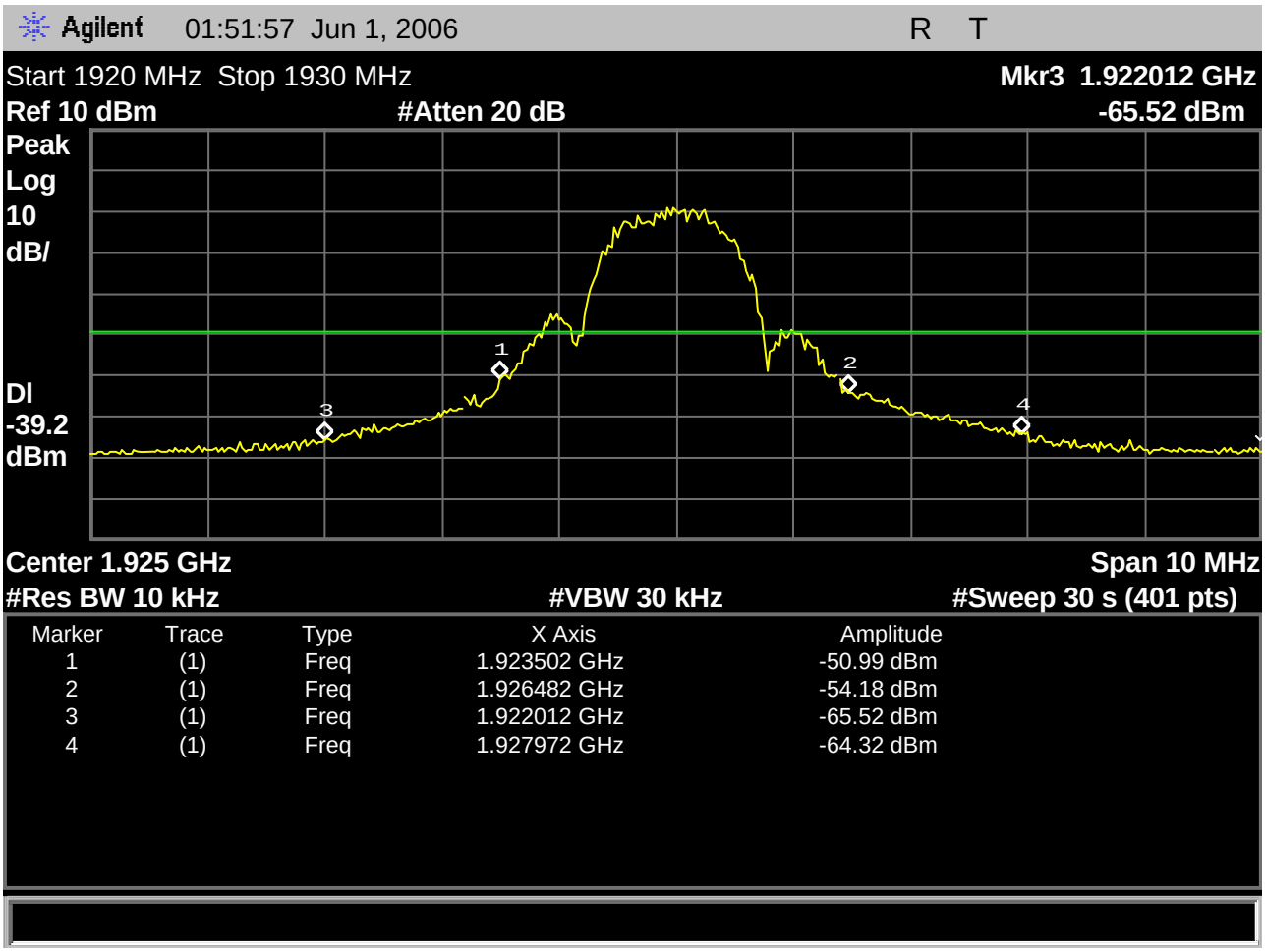

Fig. 93 - Spectrum analyzer screenshot for transmit emissions showing in-band unwanted emissions with the remote EUT transmitter at the middle carrier, 1924.992MHz, according to the requirements of 6.1.6.1.

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 3B and above, where B is the remote EUT emissions bandwidth. The markers are placed at 1B, 2B and 3B separations from the carrier, where the allowed limits are:

A) 1B to 2B separation: at least 30dB below the permitted level.
B) 2B to 3B separation: at least 50dB below the permitted level.
C) 3B 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 -50.99dBm, and 30dB below 20.8dBm, or -9.2dBm is allowed, margin is 41.79dB.

For region B (double-sided in-band), the worst-case marker at 1927.97MHz is at -64.32dBm, and 50dB below 20.8dBm, or -29.2dBm is allowed, margin is 35.12dB.

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, or -39.2dBm allowed, margin is at least 25.12dB.

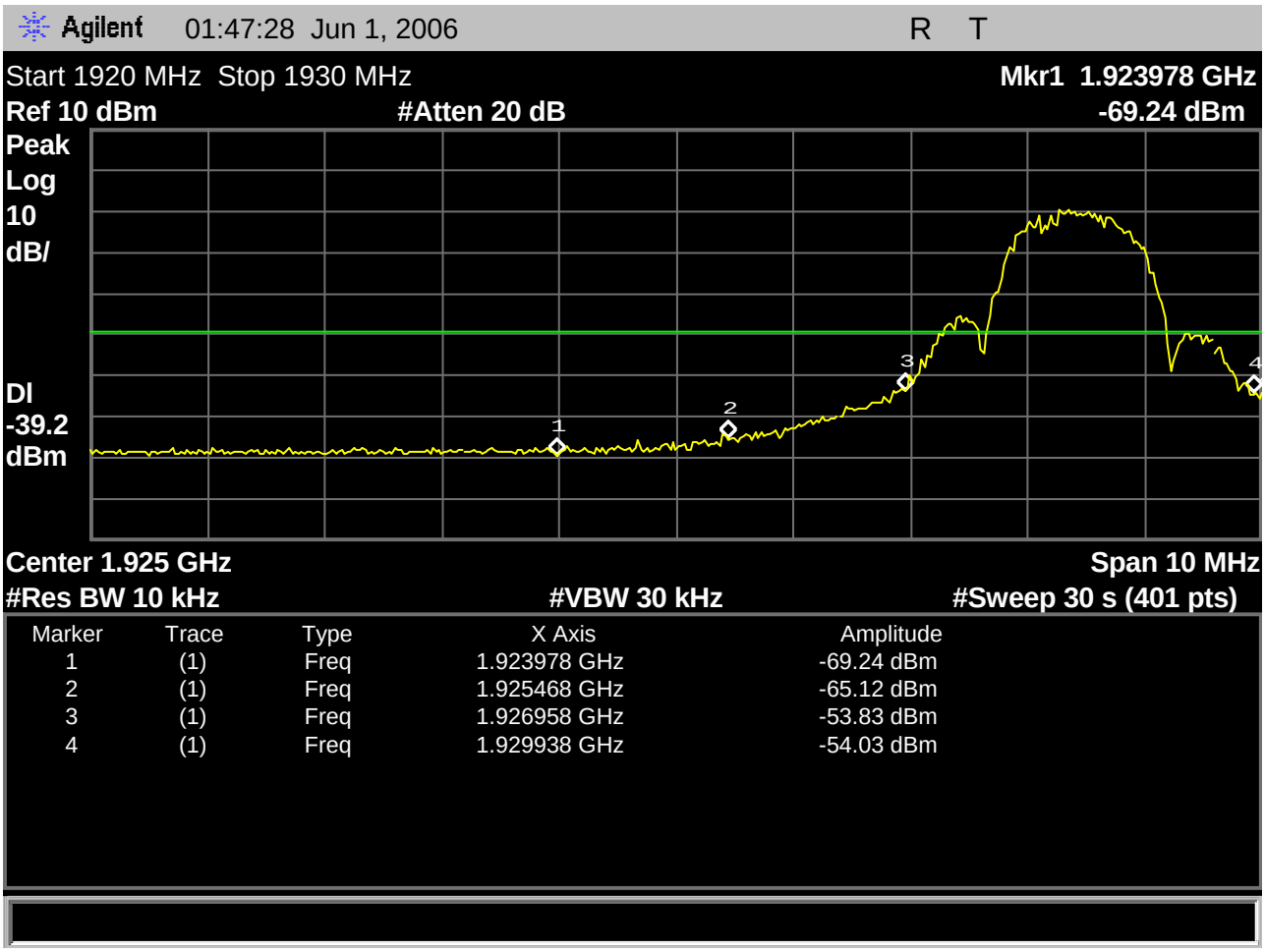

Fig. 94 - Spectrum analyzer screenshot for transmit emissions showing in-band unwanted emissions with the remote EUT transmitter at the highest carrier, 1928.448MHz, according to the requirements of 6.1.6.1.

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 3B and above, where B is the remote EUT emissions bandwidth. The markers are placed at 1B, 2B and 3B separations from the carrier, where the allowed limits are:

A) 1B to 2B separation: at least 30dB below the permitted level.
B) 2B to 3B separation: at least 50dB below the permitted level.
C) 3B to in-band edge: at least 60dB below the permitted level.

For region A (double sided in-band), the worst-case marker at 1926.96 MHz is at -53.83dBm, and 30dB below 20.8dBm, or -9.2dBm is allowed, margin is 44.63dB.

For region B (single-sided in-band), the marker at 1925.47MHz is at -65.12dBm, and 50dB below 20.8dBm, or -29.2dBm is allowed, margin is 35.92dB.

For region C (single-sided in-band), the marker at 1923.98MHz is at -69.24dBm, and 60dB below 20.8dBm, or -39.2dBm is allowed, margin is 30.04dB.

The tests of in-band unwanted emissions for the base EUT at low, mid and high carrier show that the remote EUT meets the requirements of 6.1.6.1 with not less than 25.12dB of margin.

6.1.6.2 Out-of-band emissions, Remote 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 300 kHz 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.

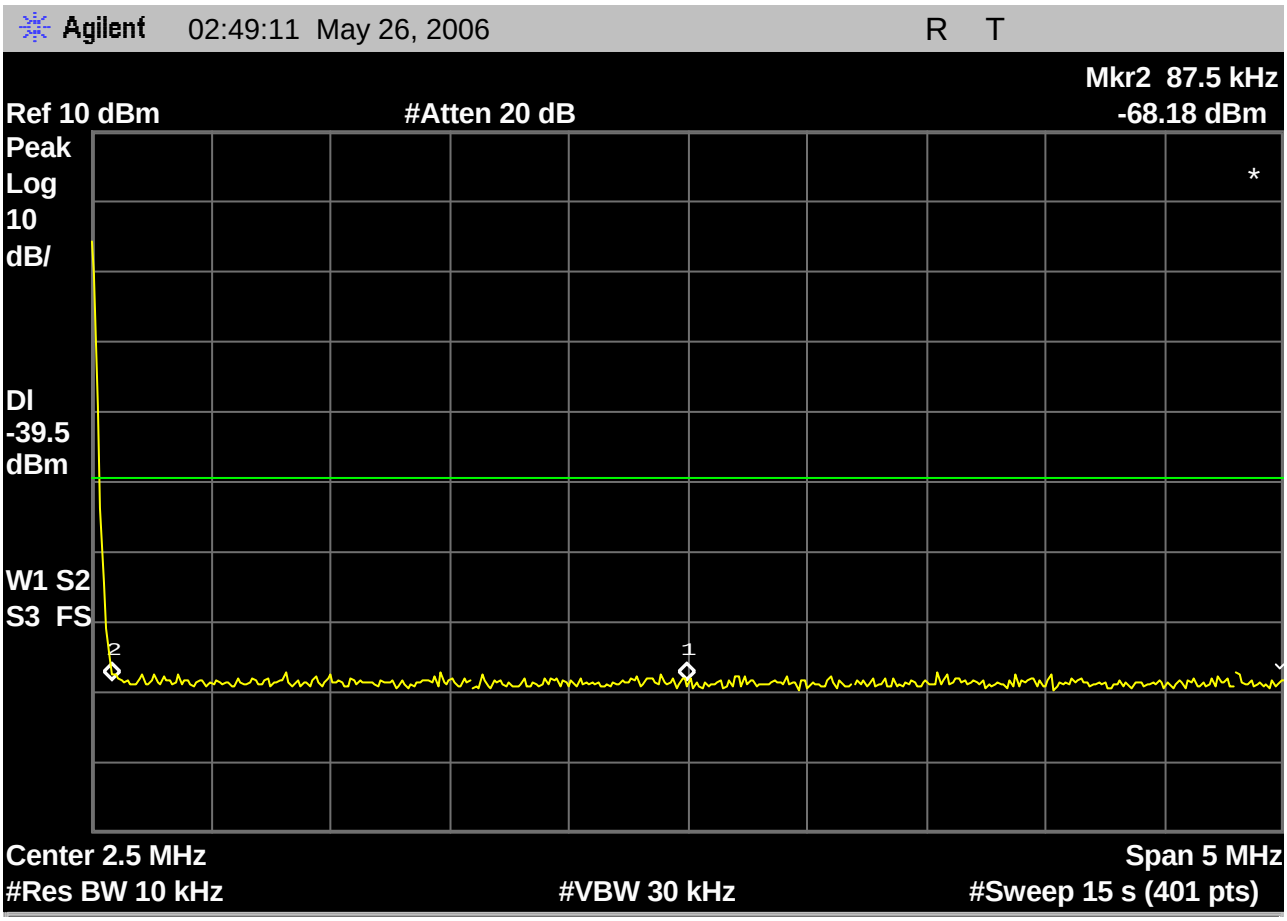

Fig. 95 – Remote EUT out-of-band emissions showing the regions from DC to 5MHz, with the transmitter using the lowest carrier, 1921.536MHz.

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

.

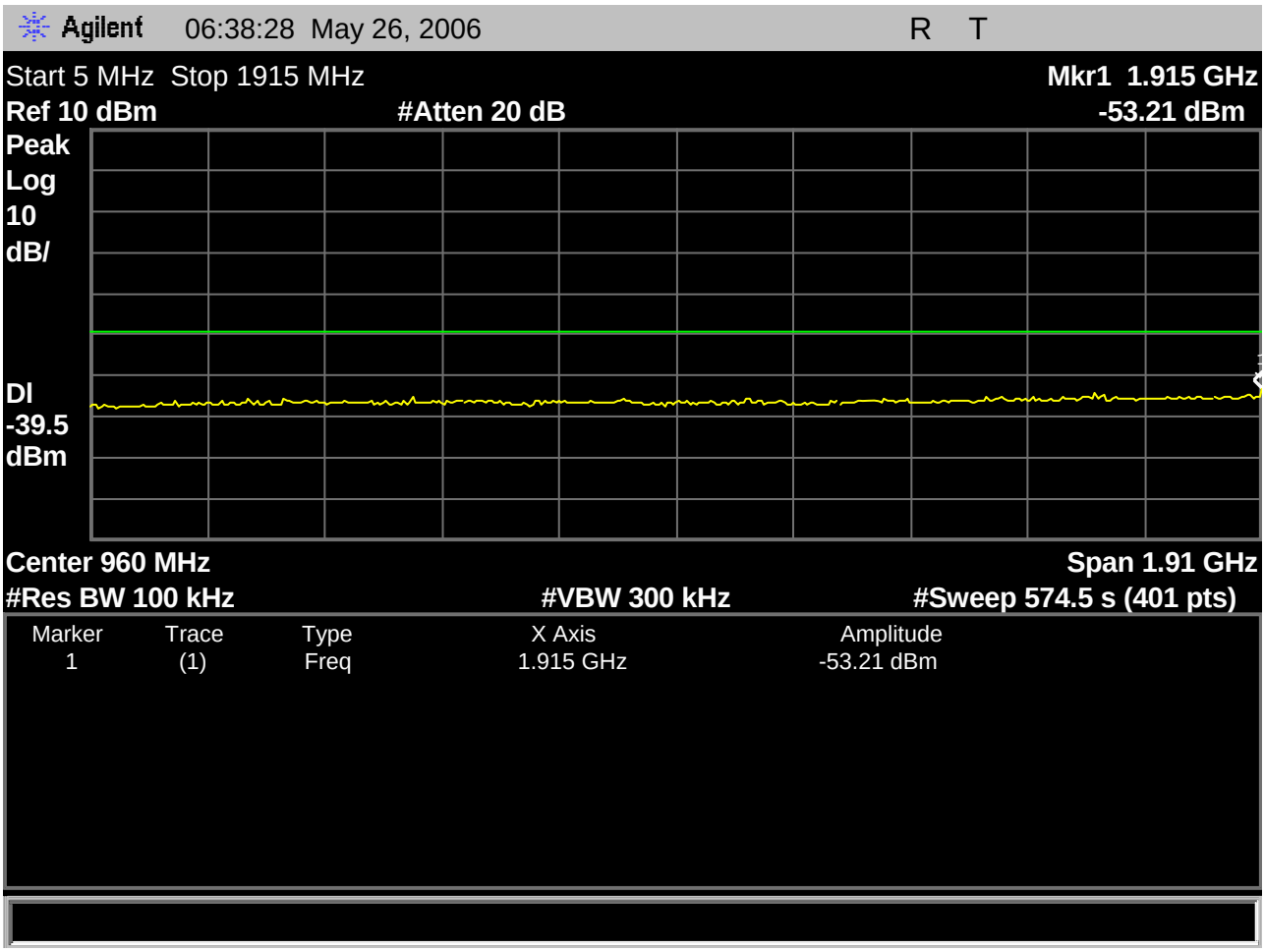

Fig. 96 – Remote EUT out-of-band emissions showing the region from 5MHz to 1915MHz, with the transmitter using the lowest carrier, 1921.536MHz.

This screenshot shows a sweep made with resolution bandwidth increased to 100 kHz to improve sweep time. Remote EUT emissions at -53.21dB have margin to the -39.5dBm out-of-band emissions specification in this spectral region of 13.71dB in this region, even measured in a 10x-wider bandwidth than that in the test procedure of clause 6.1.6.

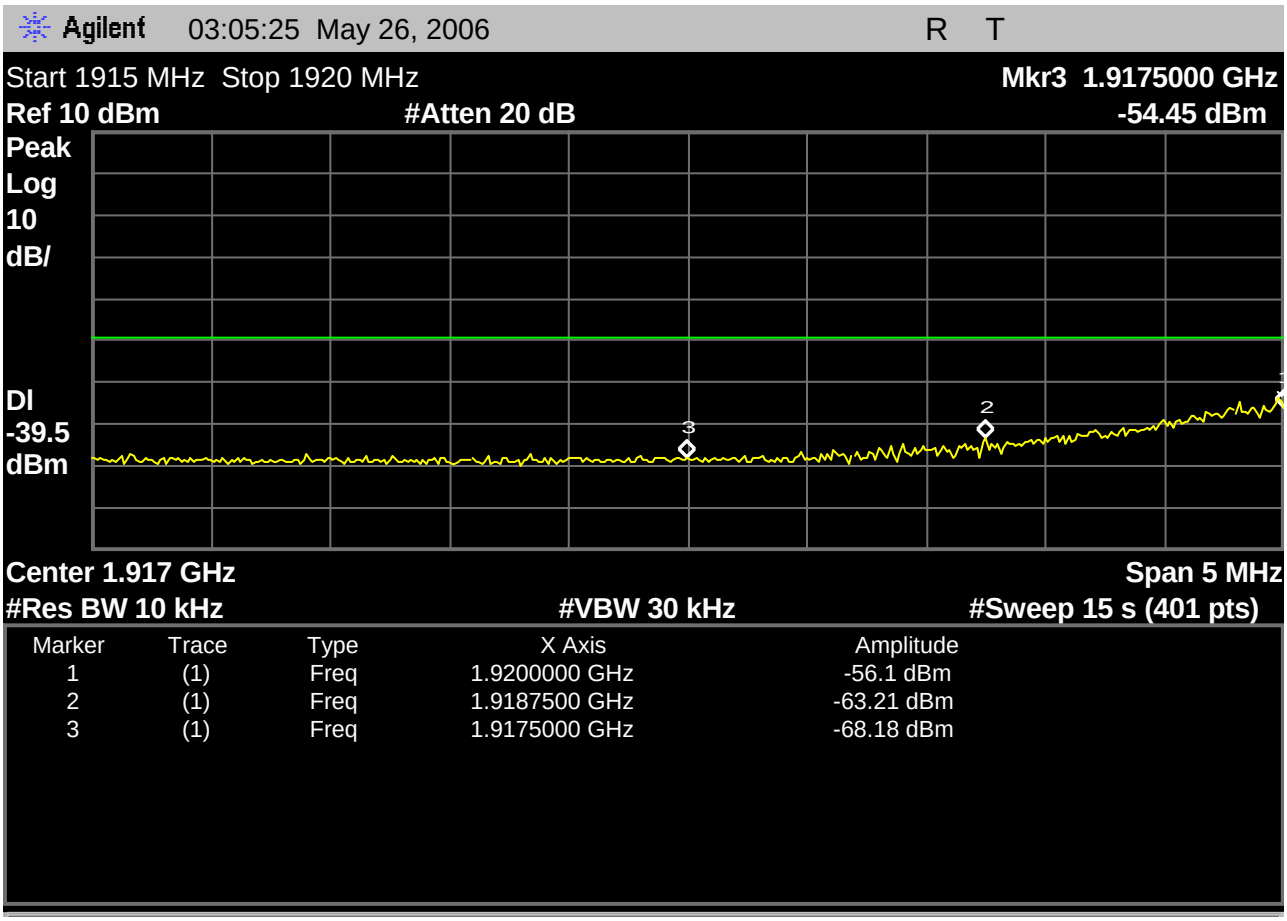

Fig. 97 – Remote EUT out-of-band emissions showing the regions from band edge to -1.25MHz, and from -1.25MHz to -2.5MHz, with the headset EUT transmitting on the lowest carrier, 1921.536MHz.

Margin to the specification of -9.5dBm in the region from band edge to -1.25MHz is found at marker 1, at -56.10dBm, and is 46.60dBm.

Margin to the specification of -29.5dBm in the region from -1.25MHz to -2.5MHz is found at marker 2, at -63.21dBm, and is 33.71dB.

Margin to the specification of -39.5dBm in the region outside -2.5MHz from the band edge exceeds 25dB.

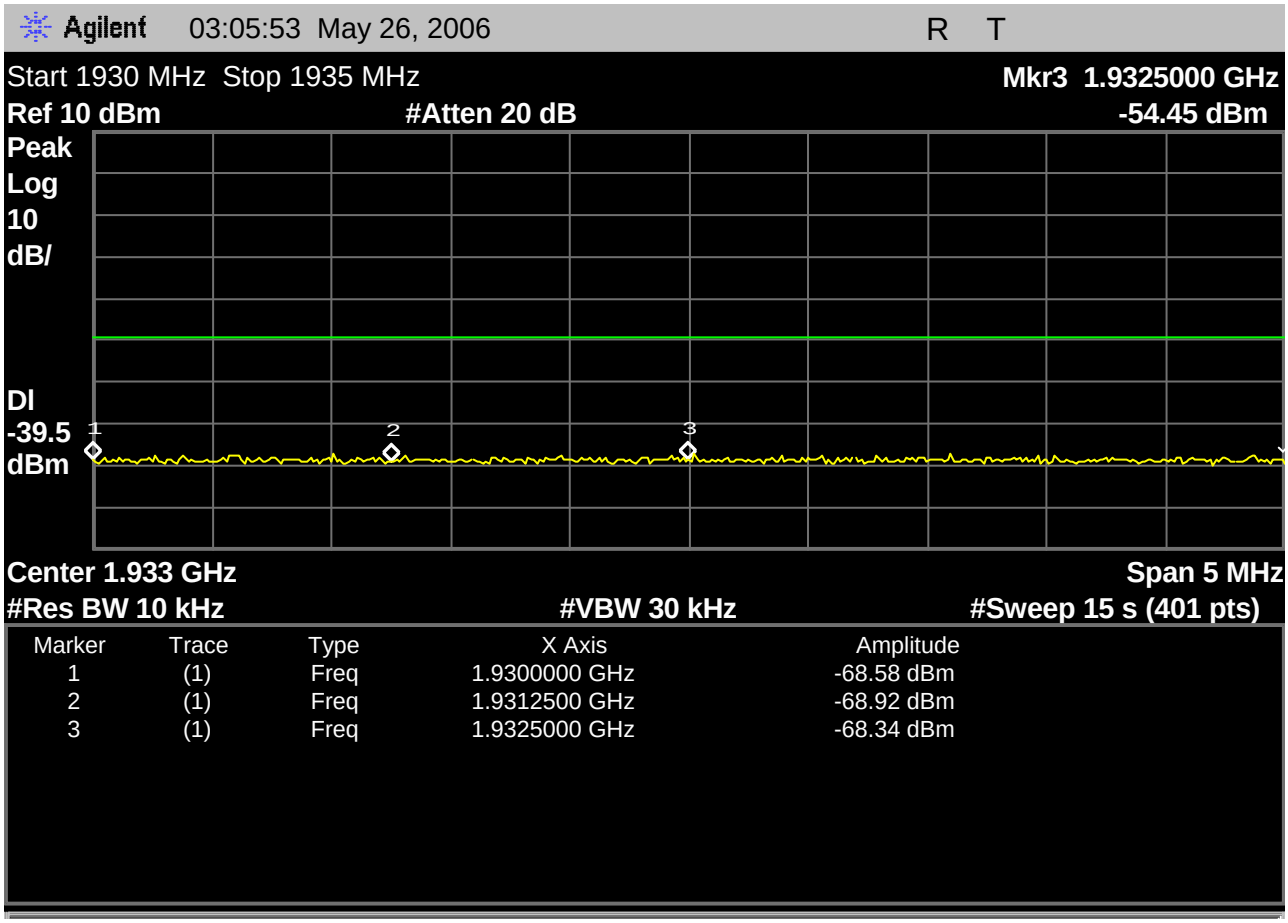

Fig. 98 – Remote EUT out-of-band emissions showing the regions from band edge to +1.25 MHz, and from +1.25MHz to +2.5MHz, with the headset EUT transmitting on the lowest carrier, 1921.536MHz.

Margins to the specification of -9.5dBm in the region from band edge to -1.25 MHz , 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 25dB.

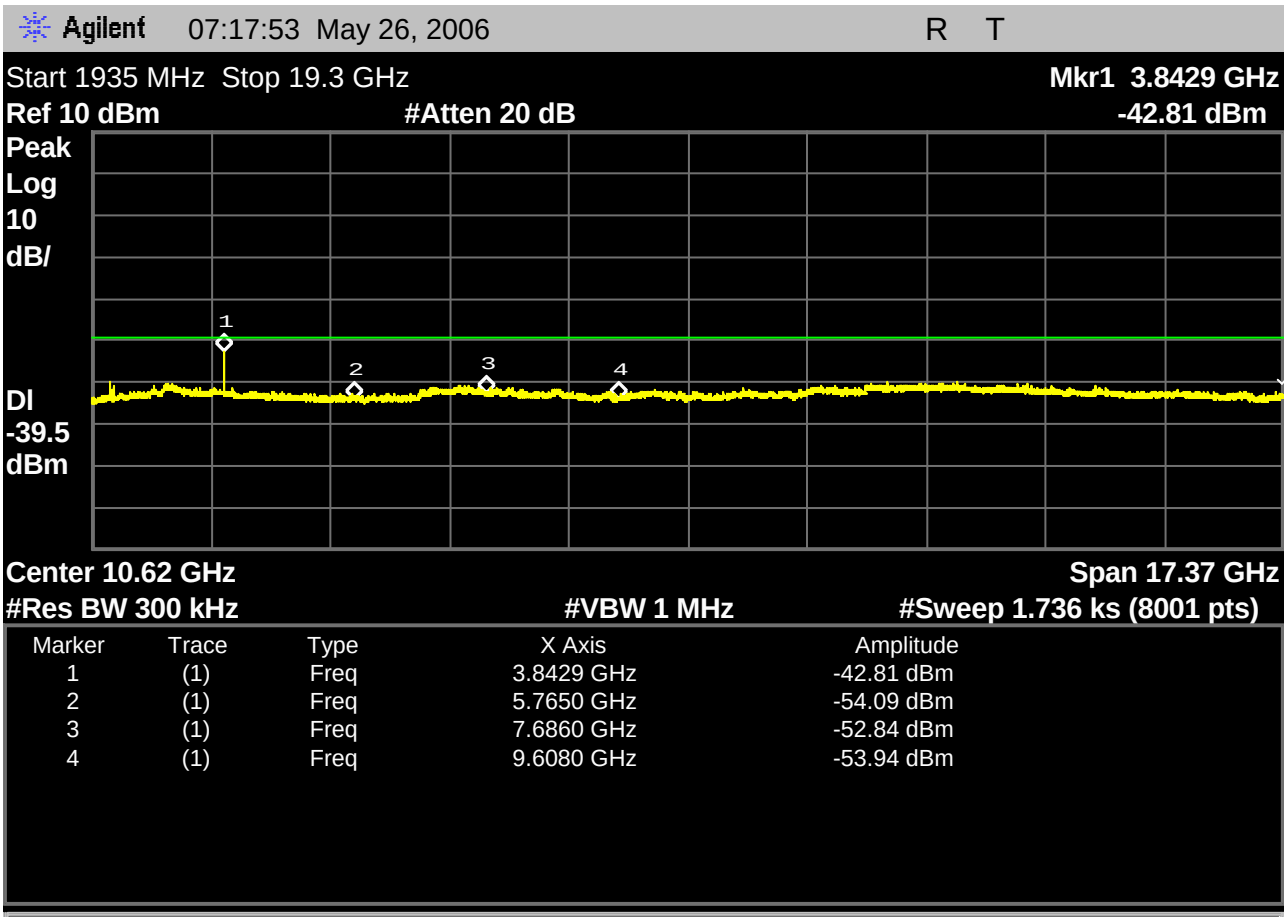

Fig. 99 – Remote EUT out-of-band emissions including the regions from 1935MHz to 19.3GHz with the headset EUT transmitting on the lowest carrier, 1921.536MHz.

The least margin is at the 2nd harmonic of the transmitter. This measurement is made using a 300 kHz 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 v3.3 (draft) C63.17-2005 clause 6.1.6. Even so, the margin to specification is 3.31dB, from the limit at -39.5dBm and the measured emission in 300kHz resolution bandwidth at -42.81 dBm . 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.

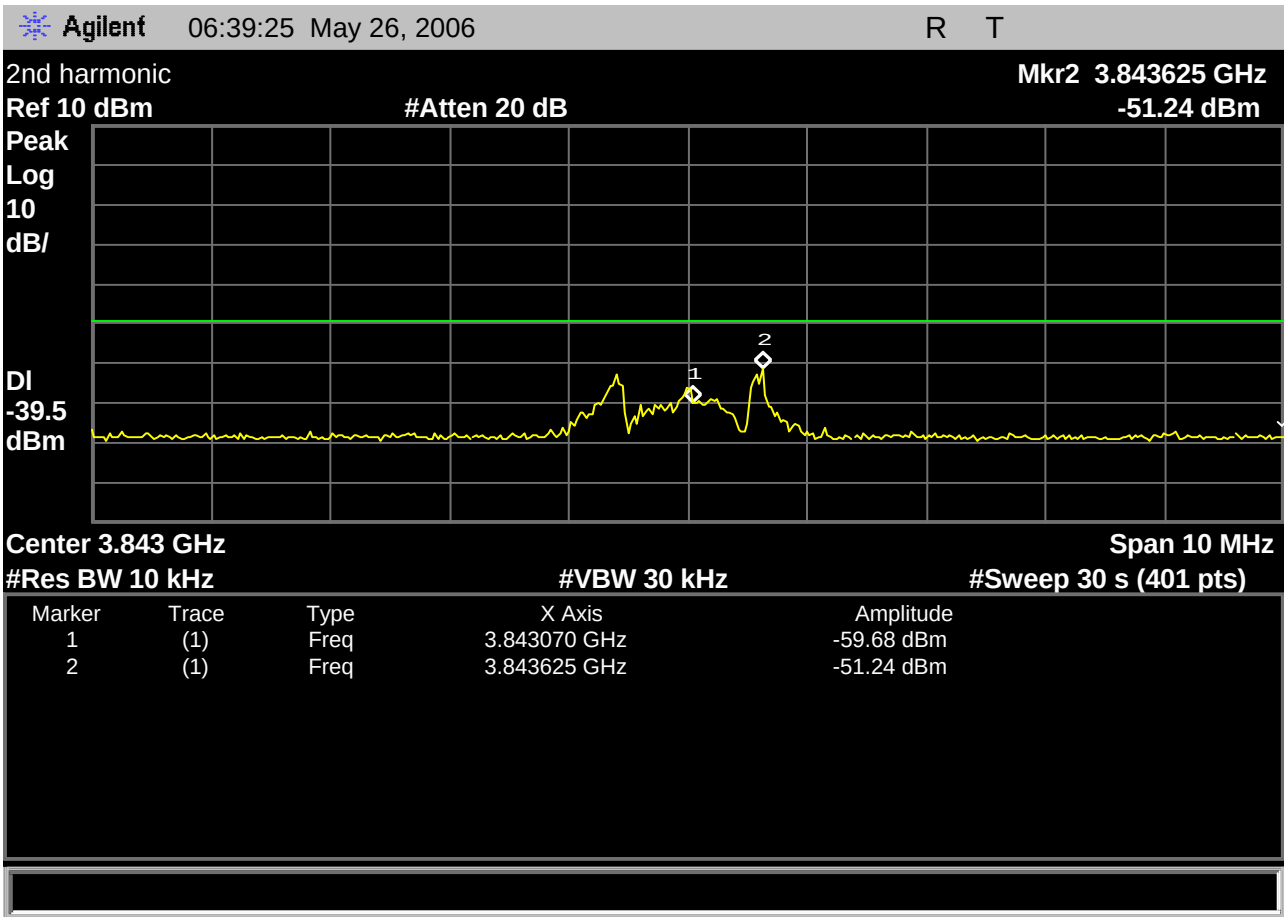

Fig. 100 –Remote EUT out-of-band emissions in the region around the 2nd harmonic, with the remote EUT transmitting on the lowest carrier, 1921.536MHz.

This measurement was made according to the requirements of the text of 6.1.6, and, with the worst-case peak at -51.24dBm, shows margin to the -39.5dBm specification of 11.74dB.

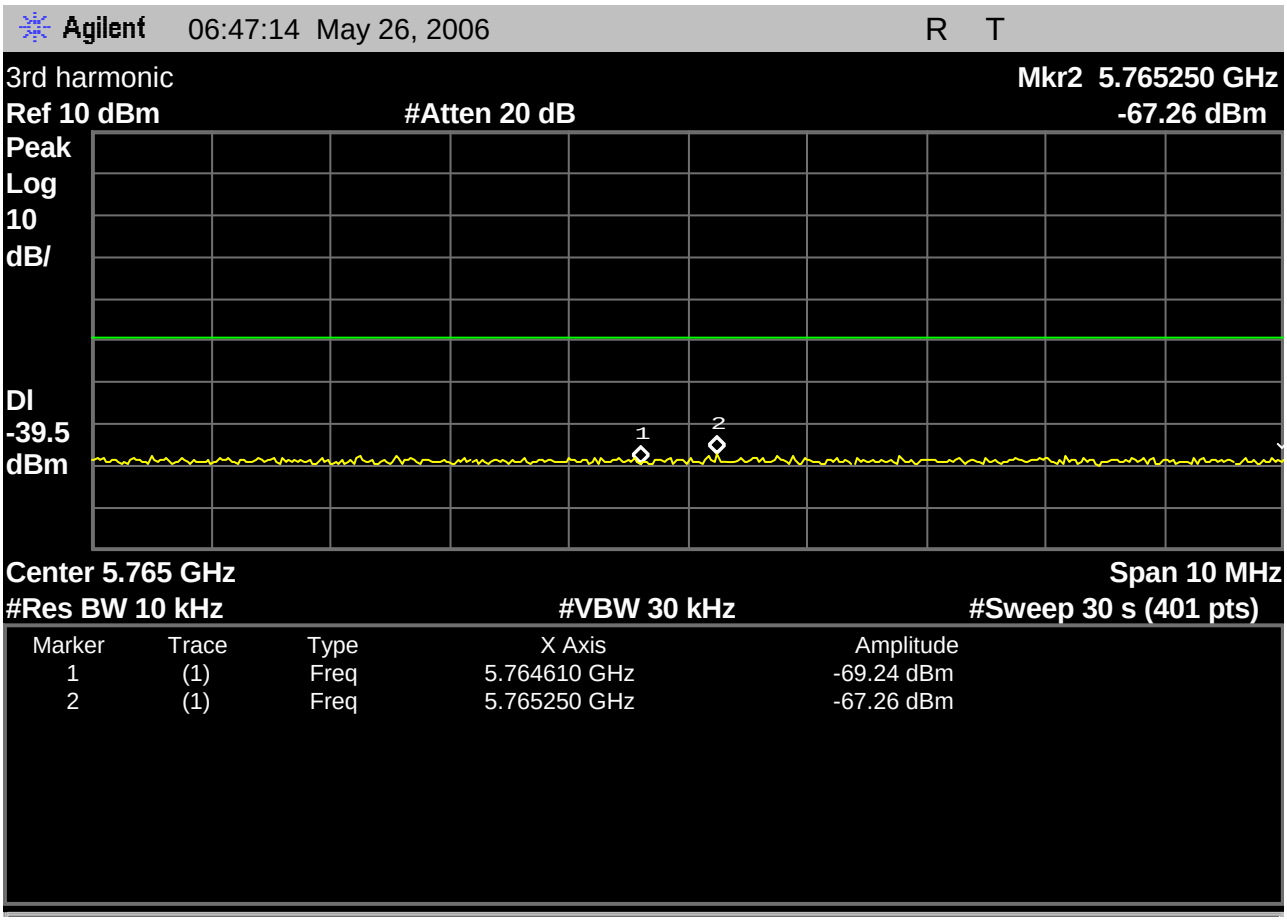

Fig. 101 – remote EUT out-of-band emissions in the region around the 3rd harmonic, with the remote EUT transmitting on the lowest carrier, 1921.536MHz.

This measurement was made according to the requirements of the text of 6.1.6, and, with the worst-case peak at -67.26dB, shows margin to the -39.5dBm specification of 27.76dB.

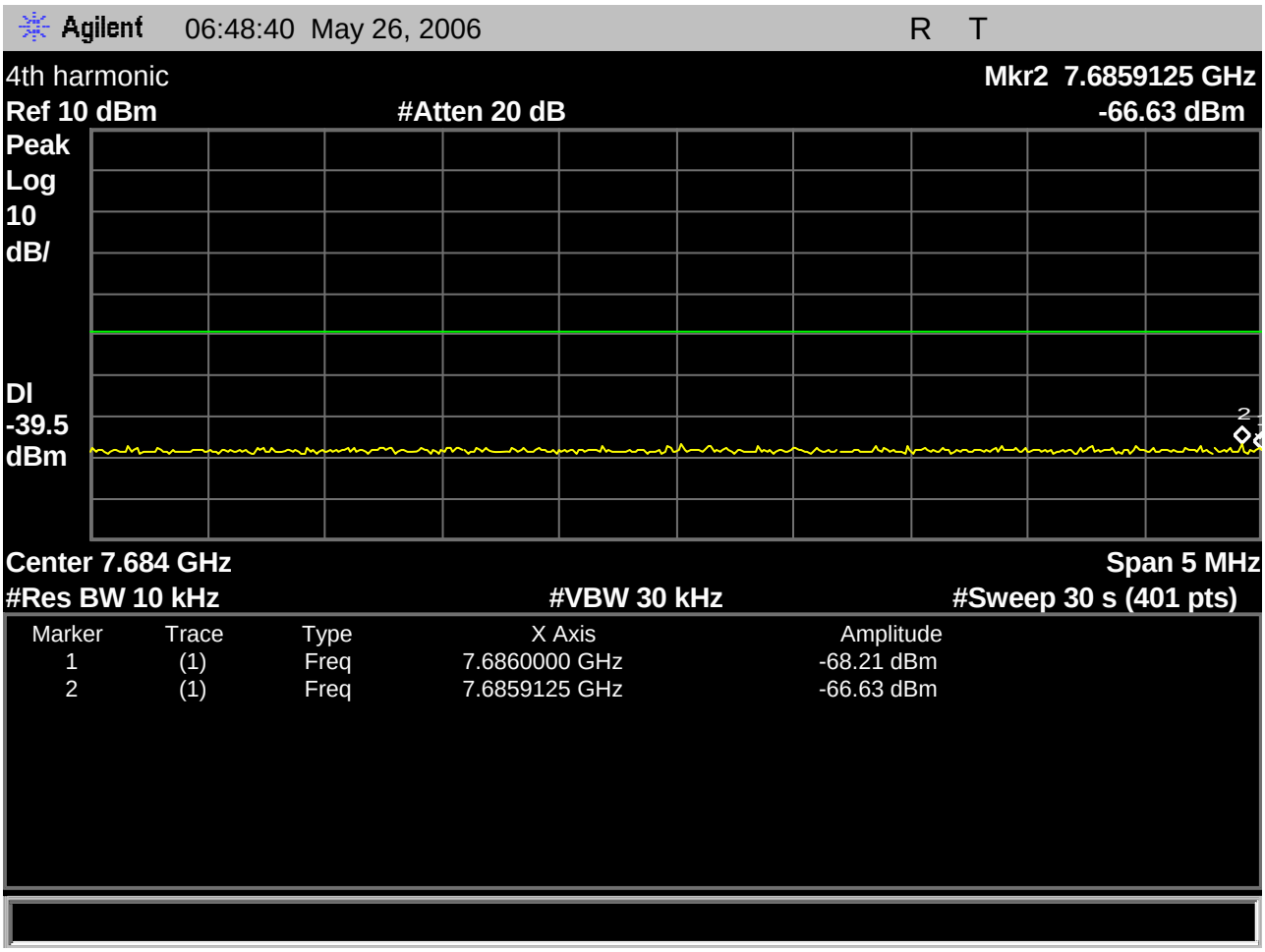

Fig. 102 –Remote EUT out-of-band emissions in the region around the 4th harmonic, with the remote EUT transmitting on the lowest carrier, 1921.536MHz.

This measurement was made for test completeness, the emissions are at the noise floor.

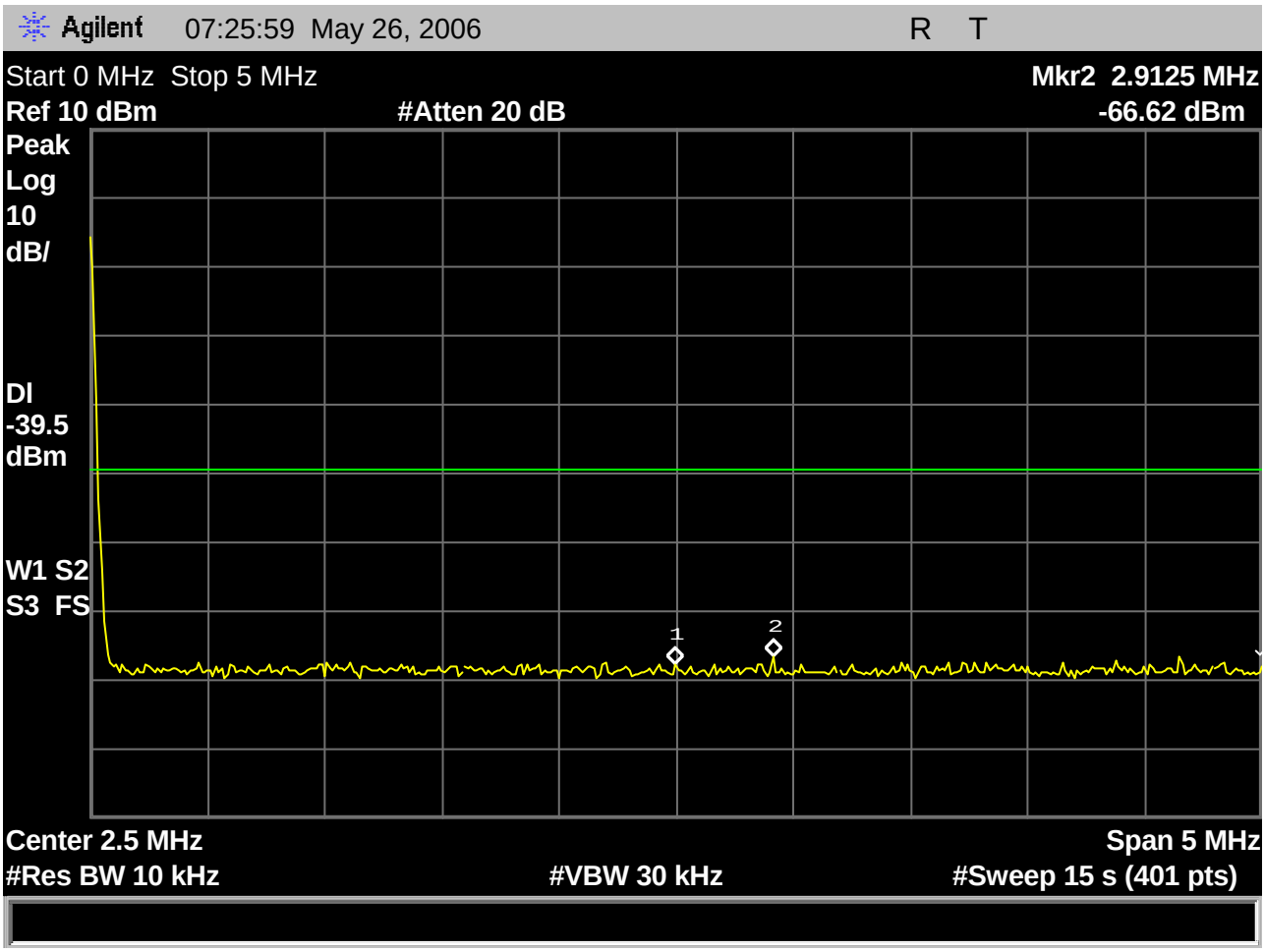

Fig. 103 – Remote EUT out-of-band emissions showing the regions from DC to 5MHz, with the transmitter using the highest carrier, 1928.448MHz.

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

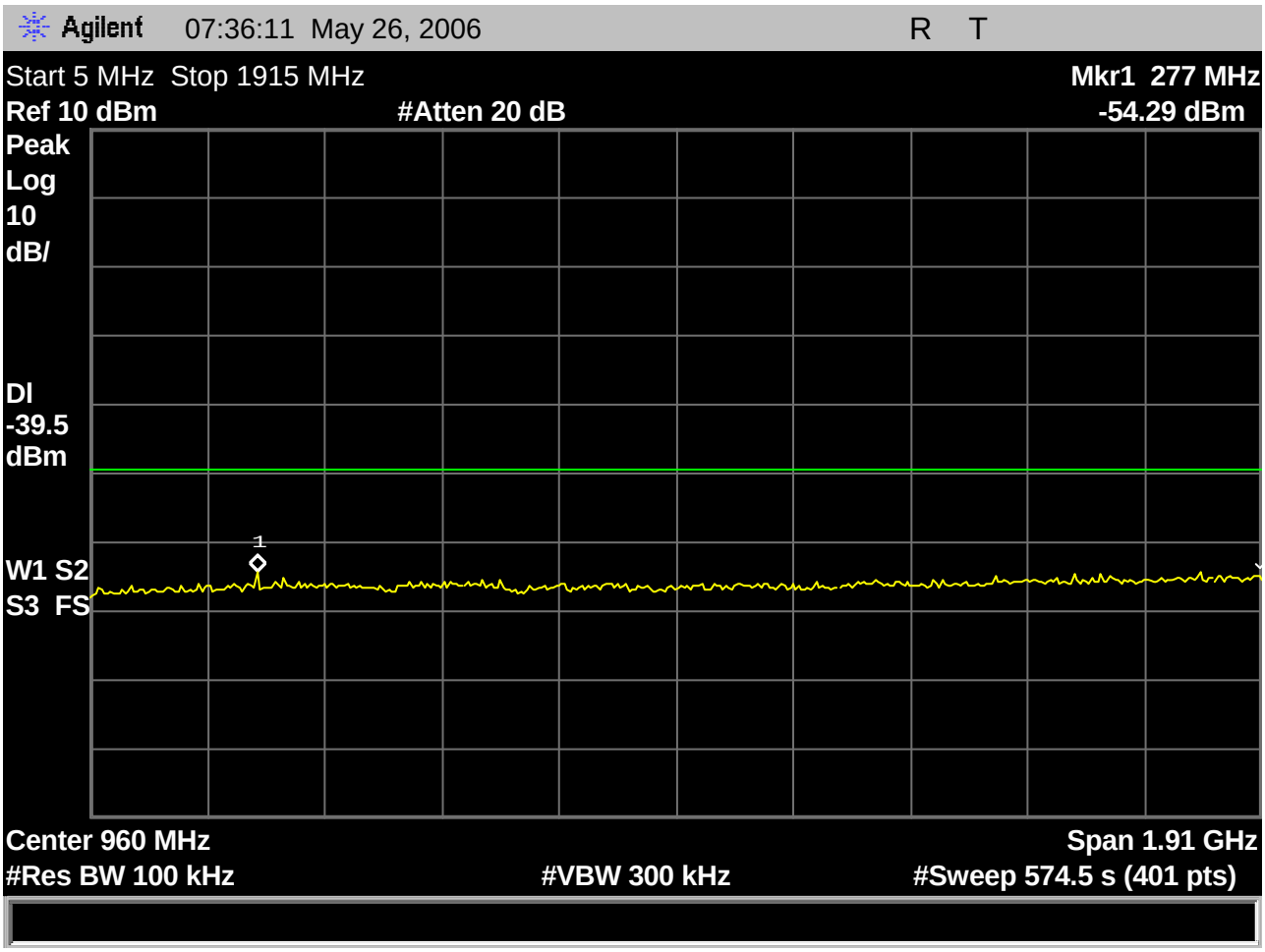

Fig. 104 – Remote EUT out-of-band emissions showing the region from 5MHz to 1915MHz, with the transmitter using the highest carrier, 1928.448MHz.

This screenshot shows a sweep made with resolution bandwidth increased to 100 kHz to improve sweep time. Remote EUT emissions at -54.29dB have margin to the -39.5dBm out-of-band emissions specification in this spectral region of 14.76dB in this region, even measured in a 10x-wider bandwidth than that of the text of the test procedure in clause 6.1.6.

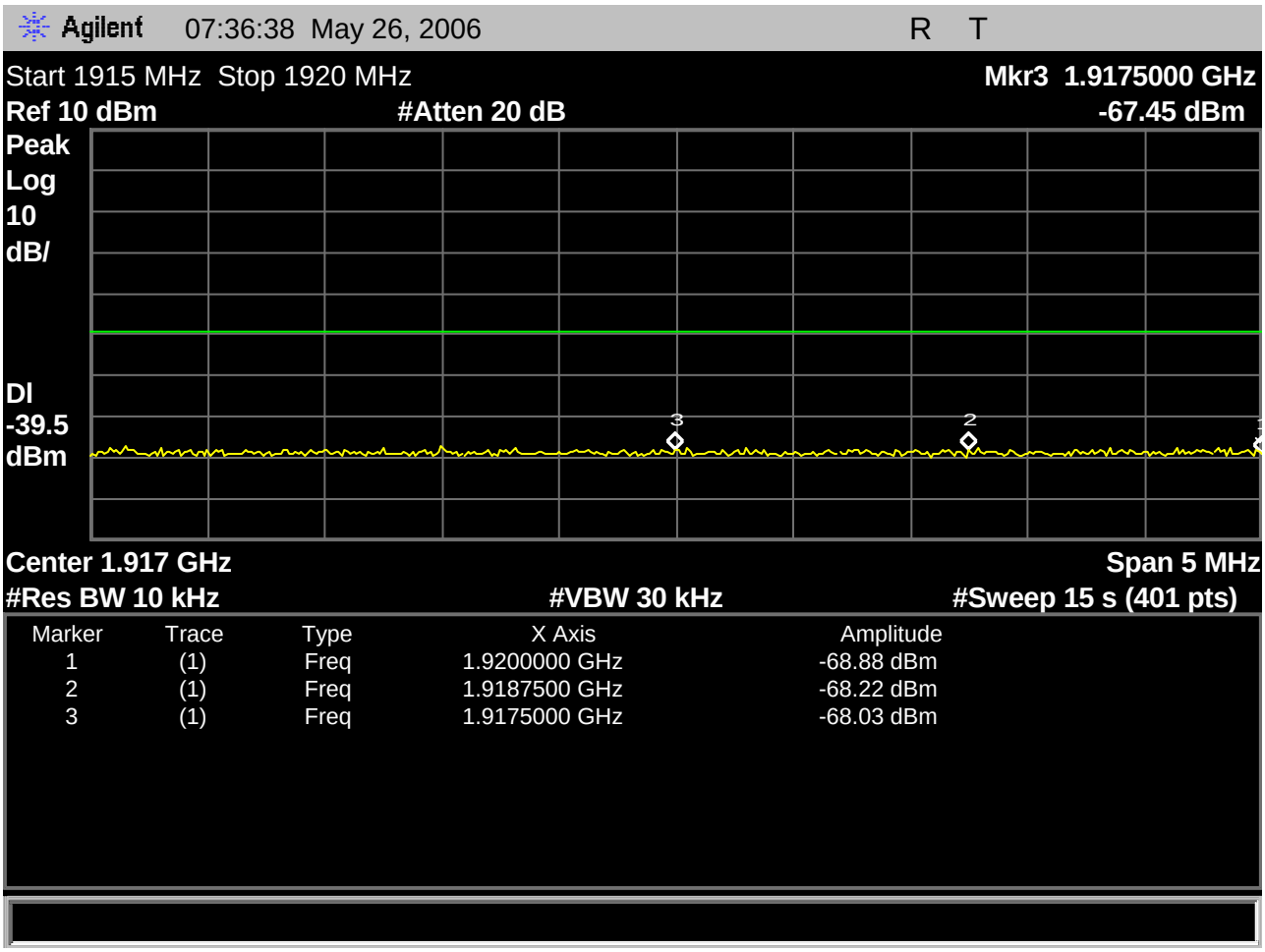

Fig. 105 –Remote EUT out-of-band emissions showing the regions from band edge to -1.25MHz, and from -1.25MHz to -2.5MHz, with the remote EUT transmitting on the highest carrier, 1928.448MHz.

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 bandedge all exceed 25dB.

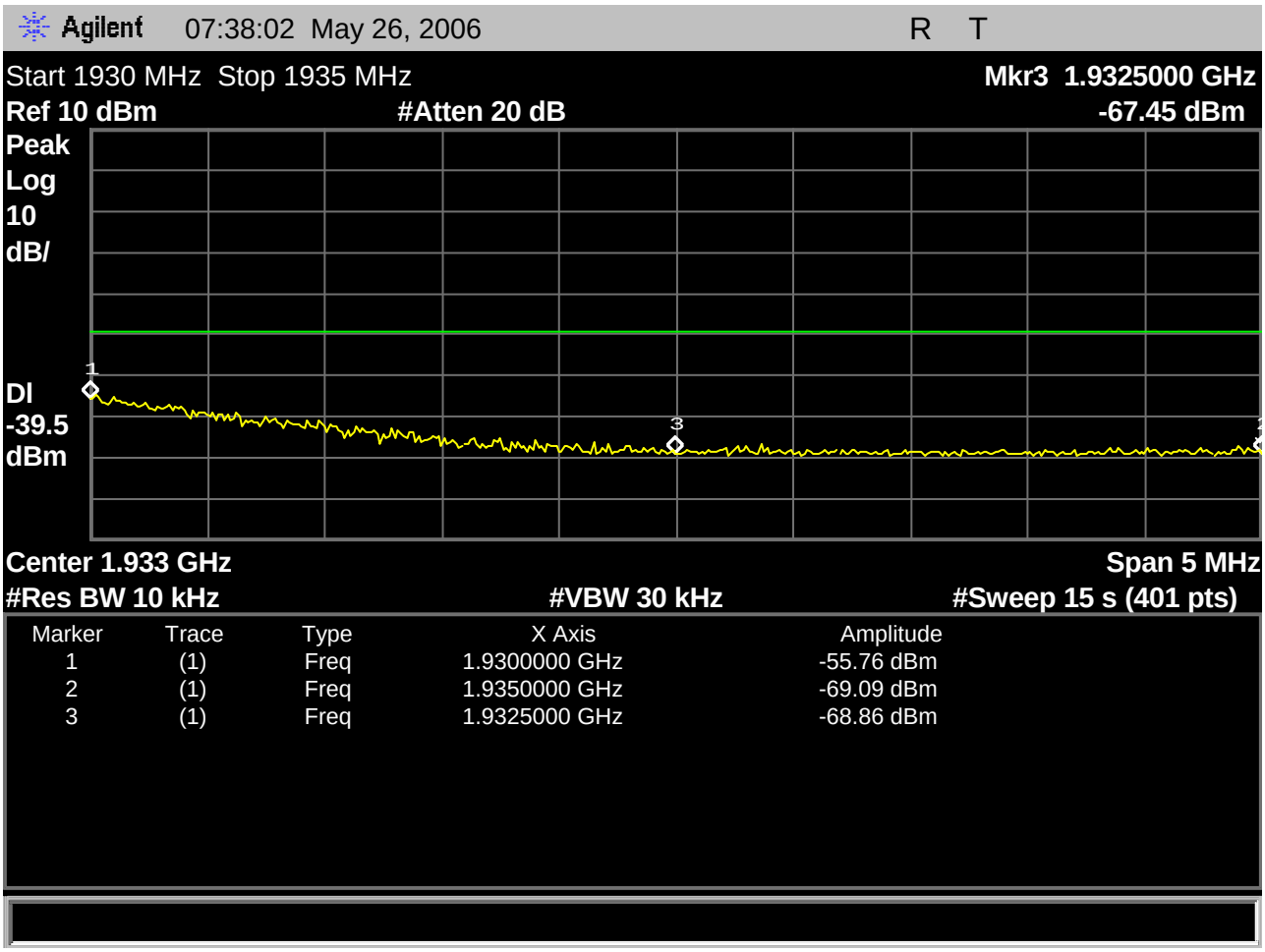

Fig. 106 – Remote EUT out-of-band emissions showing the regions from band edge to +1.25MHz, and from +1.25MHz to +2.5MHz, with the remote EUT transmitting on the highest carrier, 1928.448MHz.

Margin to the specification of -9.5dBm in the region from band edge to +1.25MHz is found at marker 1, at -55.76dBm, and is 46.26dBm.

Margin to the specification of -29.5dBm in the region from +1.25MHz to +2.5MHz is found at marker 2, at -69.09dBm, and is 39.59dB.

Margin to the specification of -39.5dBm in the region outside +2.5MHz from the band edge exceeds 25dB

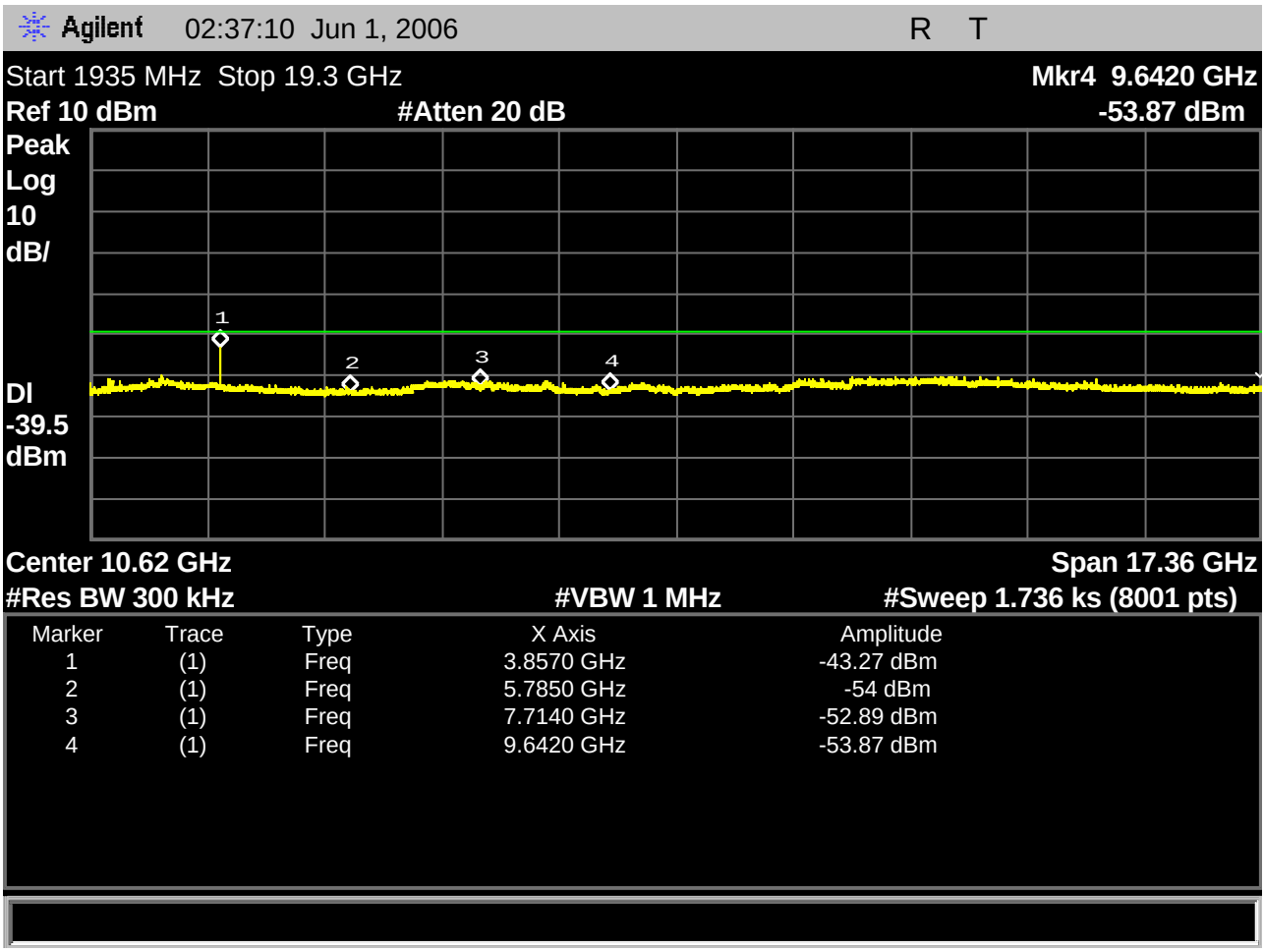

Fig. 107 – Remote EUT out-of-band emissions including the regions from 1935MHz to 19.3GHz with the remote EUT transmitting on the highest carrier, 1928.448MHz.

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 v3.3 (draft) C63.17-2005 clause 6.1.6.
Even so, the margin to specification for the noise-limited peak is 3.77dB. 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.

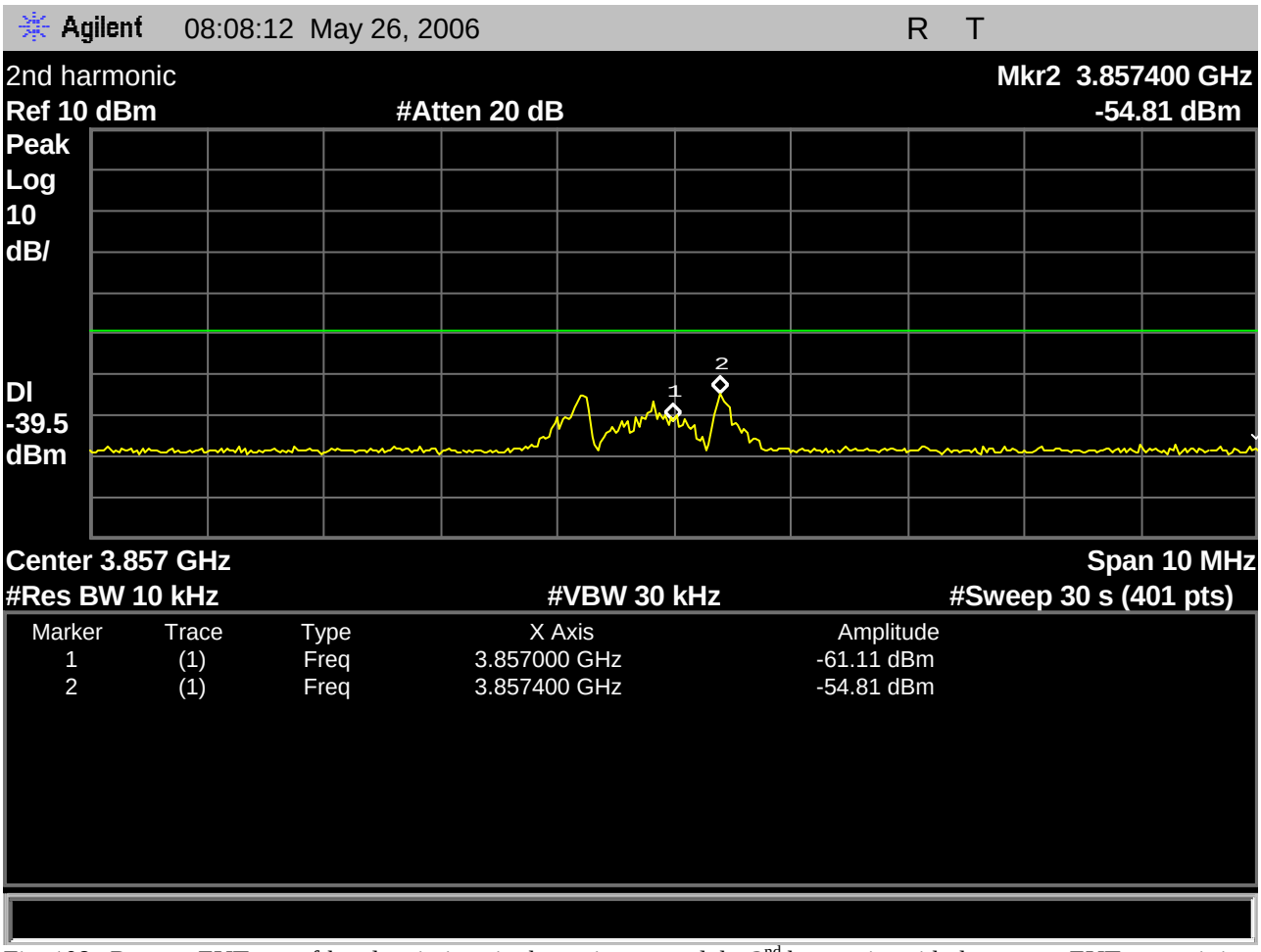

Fig. 108 –Remote EUT out-of-band emissions in the region around the 2nd harmonic, with the remote EUT transmitting on the highest carrier, 1928.448MHz.

This measurement was made according to the requirements of the text of 6.1.6, and, with the worst-case peak at -54.81dBm, shows margin to the -39.5dBm specification of 21.03dB.

The remote EUT meets the various out-of-band emissions requirements of clause 6.1 with worst-case margin of 11.74 dB, under the worst-case conditions of transmitting on the low carrier, at the 2nd harmonic of the transmit signal.

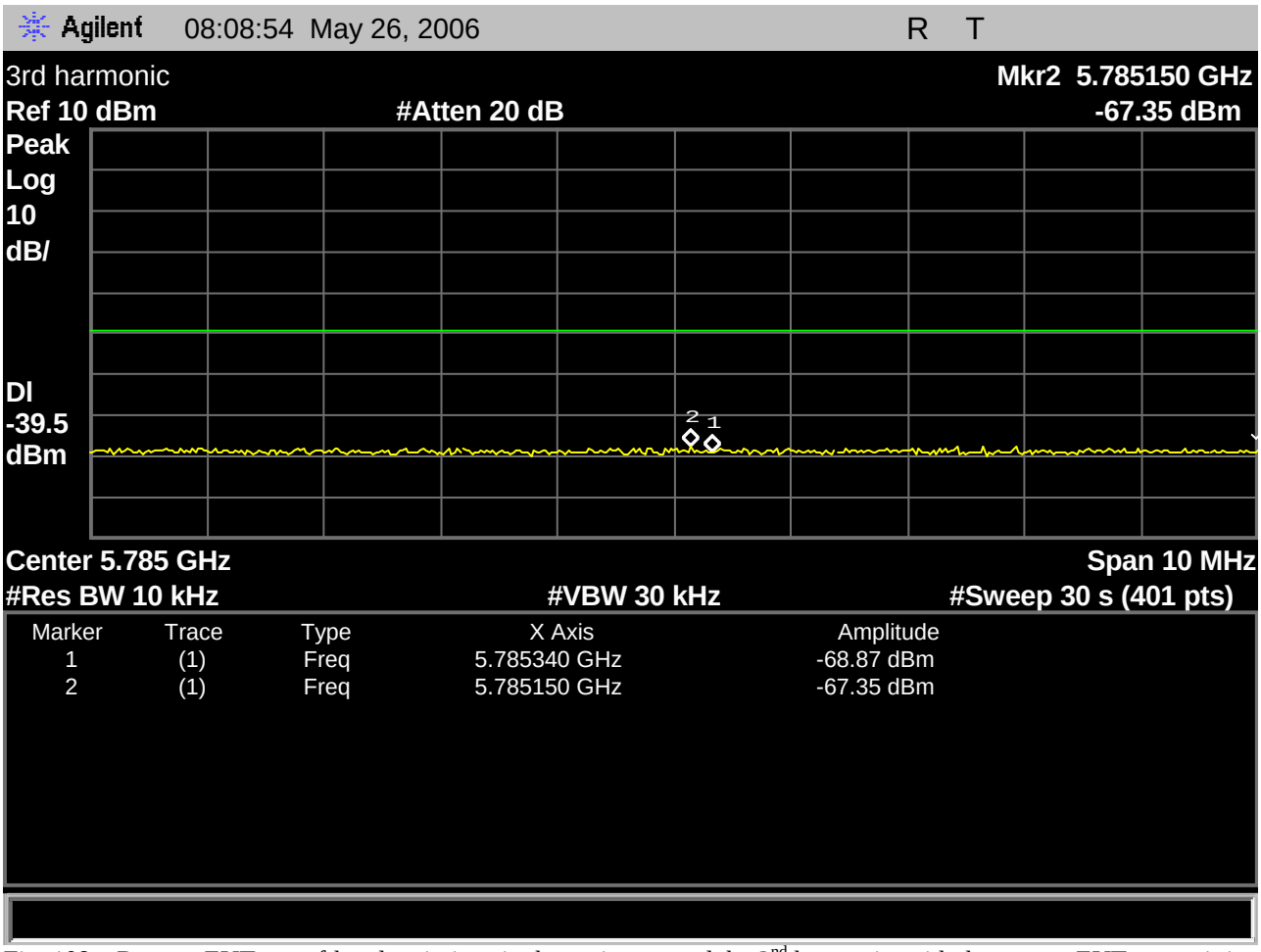

Fig. 109 – Remote EUT out-of-band emissions in the region around the 2nd harmonic, with the remote EUT transmitting on the highest carrier, 1928.448MHz.

This measurement was made according to the requirements of the text of 6.1.6, and, with the worst-case peak at –67.35dBm, shows margin to the -39.5dBm specification of 27.85dB.

The remote EUT meets the various out-of-band emissions requirements of clause 6.1 with worst-case margin of 14.61dB, under the worst-case conditions of transmitting on the low carrier, at the 2nd harmonic of the transmit signal.

VI-B. Clause 6.2 Tests of frequency and time stability for the remote EUT

The test configuration for the tests of V3.3 (draft) C63.17-2005 clauses 6.2.1.1 through 6.2.1.3 and 6.2.1 through 6.2.3 for the remote EUT is as follows:

The test platform and remote EUT are configured according to test configuration #4, **Standard-specific tester, headset 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.

6.2.1 Carrier frequency stability, Remote EUT.

6.2.1.1 for the remote EUT; mean carrier frequency drift with time.
The remote 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. 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.

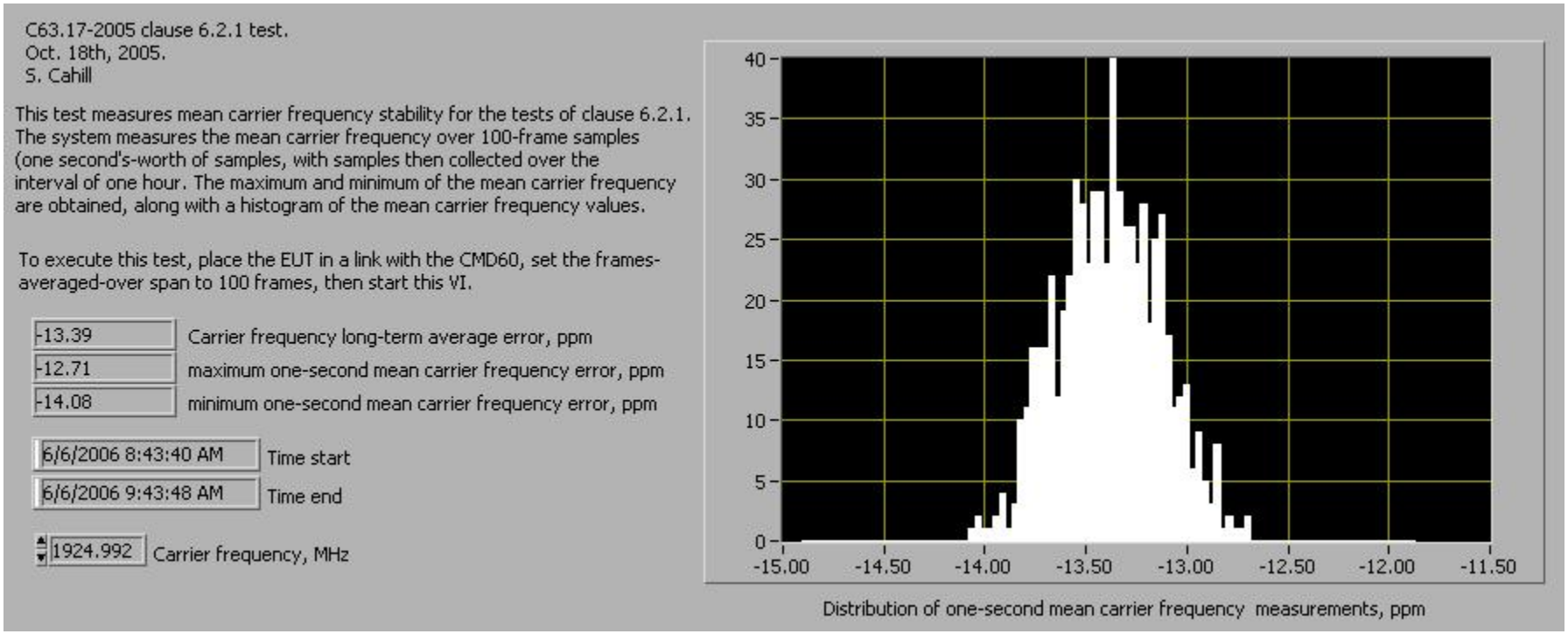

Fig. 113 - Measured one-second mean carrier frequency, remote EUT, and observed maximum, average value and observed minimum of the mean carrier frequency.

The nominal mean carrier frequency error relative to 1924.992MHz is -13.39ppm.
The observed maximum is -12.71ppm, for a maximum relative to nominal of +0.68ppm.
The observed minimum is -14.08ppm, for a change relative to nominal of -0.69ppm.

The headset 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.

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

This test is not applicable for battery powered devices V3.3 (draft) C63.17-2005

6.2.1.3 for the remote EUT; mean carrier frequency change with temperature.
The remote 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 (+4C, then +44C) and at 20C, after a 60 minute soak at each temperature.

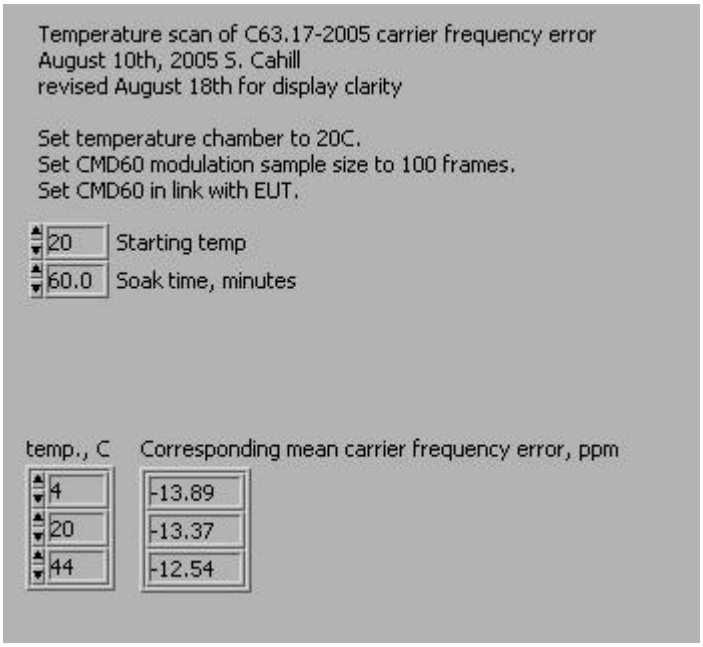

Fig. 115 - Measured mean carrier frequency, headset EUT , at +4C, +20C, +44C.

The nominal mean carrier frequency error relative to 1924.992MHz is –13.37ppm.
The observed value at +4C is -13.89ppm, for a change relative to 20C ambient of -0.52ppm.
The observed value at +44C is -5.22ppm, for a change relative to 20C ambient of +0.83ppm.

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

6.2.2 Frame repetition stability test for the remote EUT:

The remote 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 V3.3 (draft) C63.17-2005) 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.

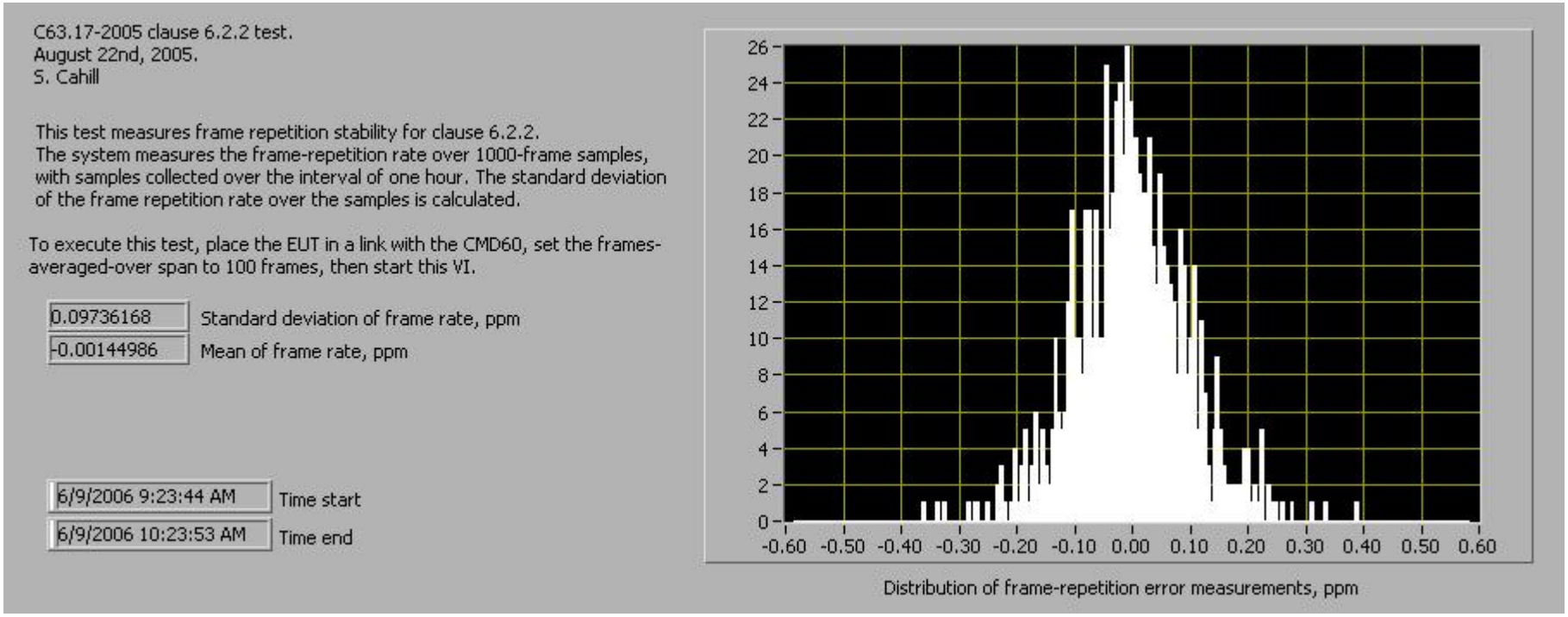

Fig. 116 - Test of remote EUT according to the conditions of clause 6.2.2 for frame repetition rate stability

The measured standard deviation of the frame rate or repetition period according to the requirements of clause 6.2.2 for the headset EUT is 0.097362ppm.

The remote 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 0.292086ppm.

6.2.3 Frame period and jitter test for the remote EUT:

The remote 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.

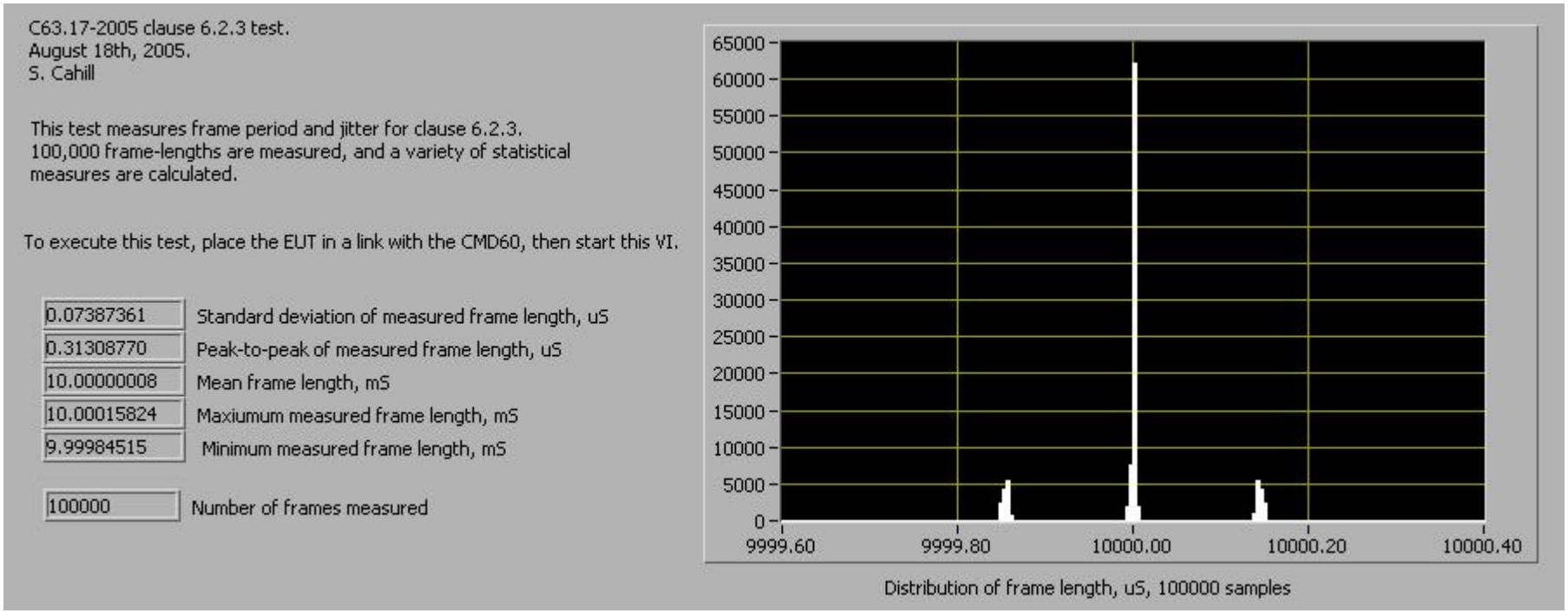

Fig. 117 - Test of remote EUT for frame period and jitter, according to the requirements of clause 6.2.3.

The measured mean value of the frame period is 10.00000008mS, which is 10mS with jitter offset of 0.00008uS and three standard deviations of 0.22162uS, totaling 0.2170uS.

The remote 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.

VII) Tests of clause 7, Remote Unit EUT

VII-A. Clause 7.3.2 Upper threshold for EUTs which implement the LIC procedure, remote EUT

The test platform, remote EUT and companion base unit are configured according to the requirements for implementing the test of 7.3.2(b) by means of test configuration #6, **With companion device and interference blocking, headset EUT**, of section (I) of this document.

The multi-carrier interference generator (PXI-5670) is set to CW on all 5 carriers, and at level -30.0dBm, which is T_U + U_M + 10dB, where T_U = -46 dBm from the manufacturer's declarations and the measured emissions bandwidth and U_M is defined in V3.3 (draft) C63.17-2005 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 -30.0 dBm setting.

The multi-carrier interference generator level is then reduced incrementally in 1dB steps until the remote EUT responds to the press of the TALK button by initiating a communications channel with the base. A max-hold signal (purple) captures the trace showing when transmissions of the communications channel begin. For each 1dB step, the headset EUT is powered down while the multi-carrier interference generator is set to the new level, then powered up. Each trial includes a delay to allow the headset EUT to locate the beacon transmission from the base companion device. A trace (blue) shows the interference carrier level at the level where remote transmissions first begin. A marker shows the delta between the -35.5dBm level and the level at which remote transmissions first begin.

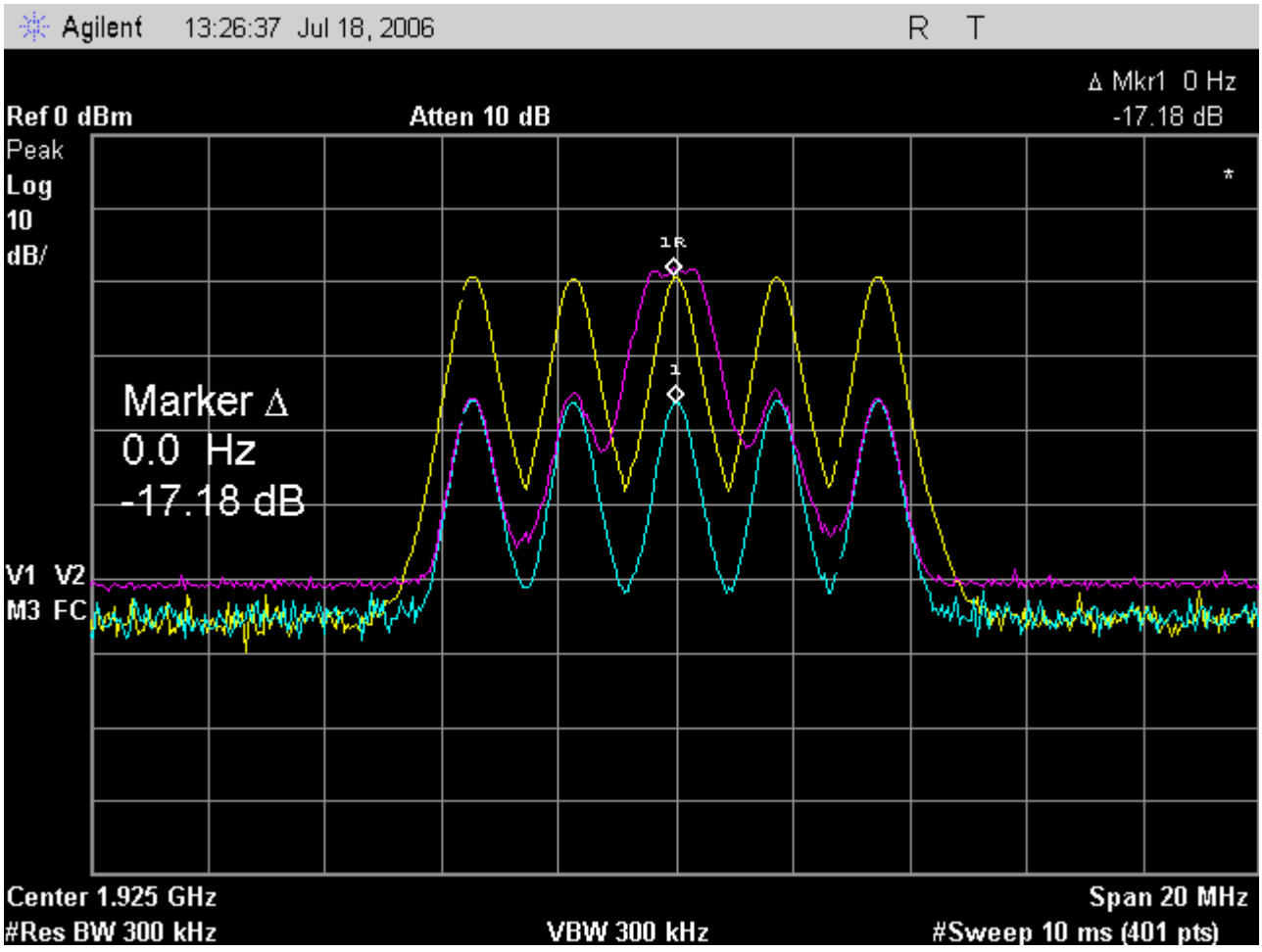

Fig. 118 - Emissions and interference profile spectrum, remote EUT, test 7.3.2.

A trace (yellow, 2nd from top) is captured and held at the initial interference level setting of -30.0dBm. Then the multi-carrier interference generator level is reduced incrementally in 1dB steps until the remote 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 -30.0dBm level and the level at which transmissions first begin.

The first interference level at which the remote EUT transmits is -47.2 dBm. The allowed upper limit is $T_U + U_M$ = -40.0 dBm, the headset 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.

VII-B. Clause 7.3.3 Least interfered channel (LIC) procedure test, remote EUT

The test platform, remote EUT and companion base unit are configured according to the requirements for implementing the test of 7.3.3 by means of test configuration #6, **With companion device and interference blocking, headset EUT**, of section (I) of this document.

The multi-carrier interference generator (PXI-5670) is set to CW at $T_U + U_M$ = -40.0dBm on three carriers; at 1928.448MHz, 1924.992MHz, and 1921.536MHz.

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 -53.0 dBm (where $T_L = T_U$ - 20dB) and to generate on f_2 a CW signal of level $T_L + U_M$ = -60.0dBm, 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 remote EUT and the companion base unit. Wait for the remote to detect the base companion device, then press the TALK button on the remote to initiate the communications channel. Repeat the communications channel establishment five times while monitoring the spectrum using the E4407B spectrum analyzer to validate that, when this interference profile is applied to the remote EUT, the remote always chooses f_2 for the communications channel.

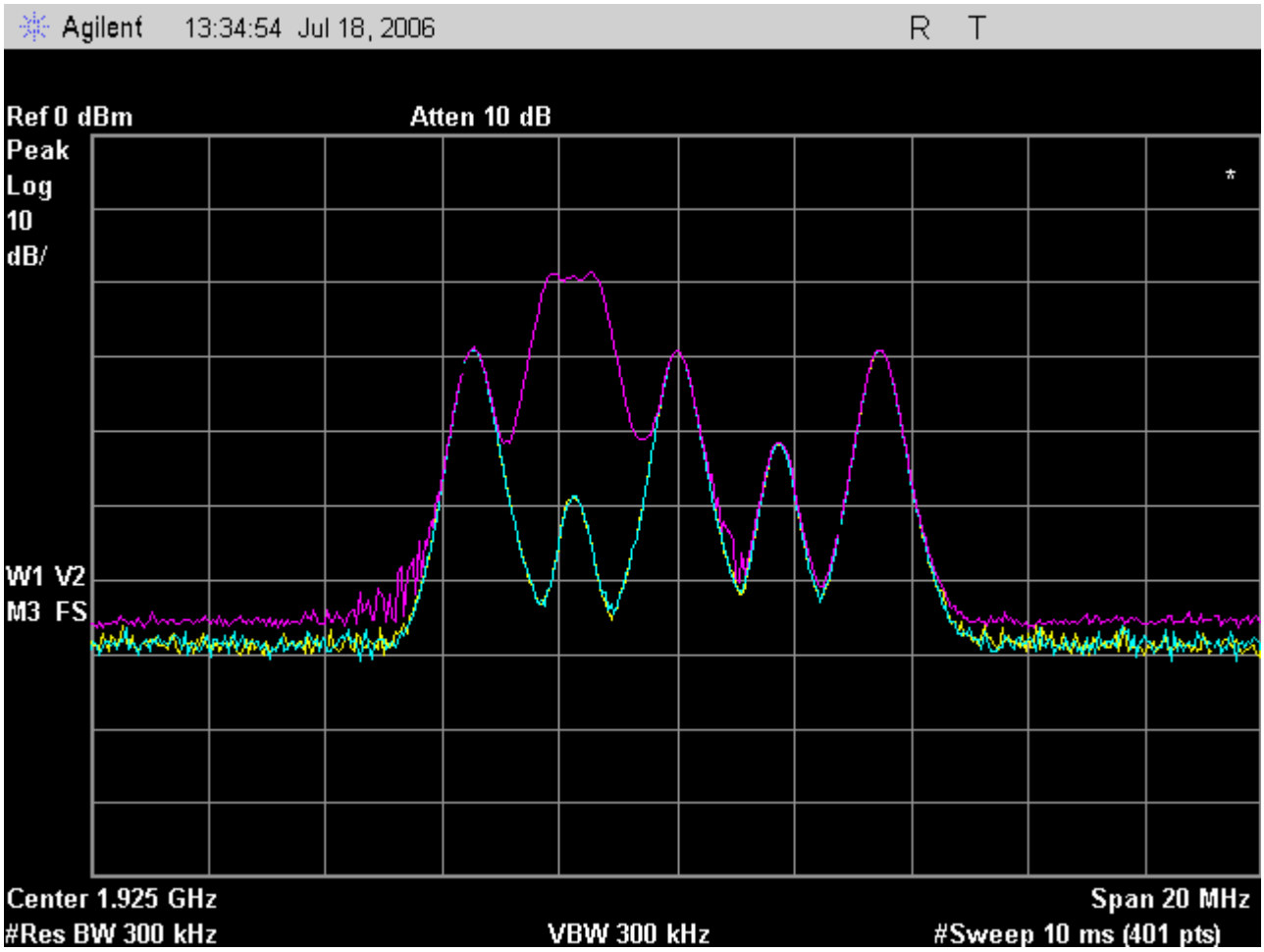

Fig. 119 - Emissions and interference profile spectrum, remote EUT, test 7.3.3(b).

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

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 -60.0dBm and to generate on f_2 a CW signal of level $T_L + U_M$ + 7dB = -53.0dBm, where f_1 = 1926.720MHz and f_2 = 1923.264MHz.

With this interference profile present, apply power to the remote EUT and the companion base unit. Wait for the remote to detect the base unit. Then press the TALK button on the remote to establish a communications channel. Repeat the communications channel establishment five times while monitoring the spectrum using the E4407B spectrum analyzer to validate that, when this interference profile is applied to the headset EUT, the headset EUT always chooses f_1 for the communications channel.

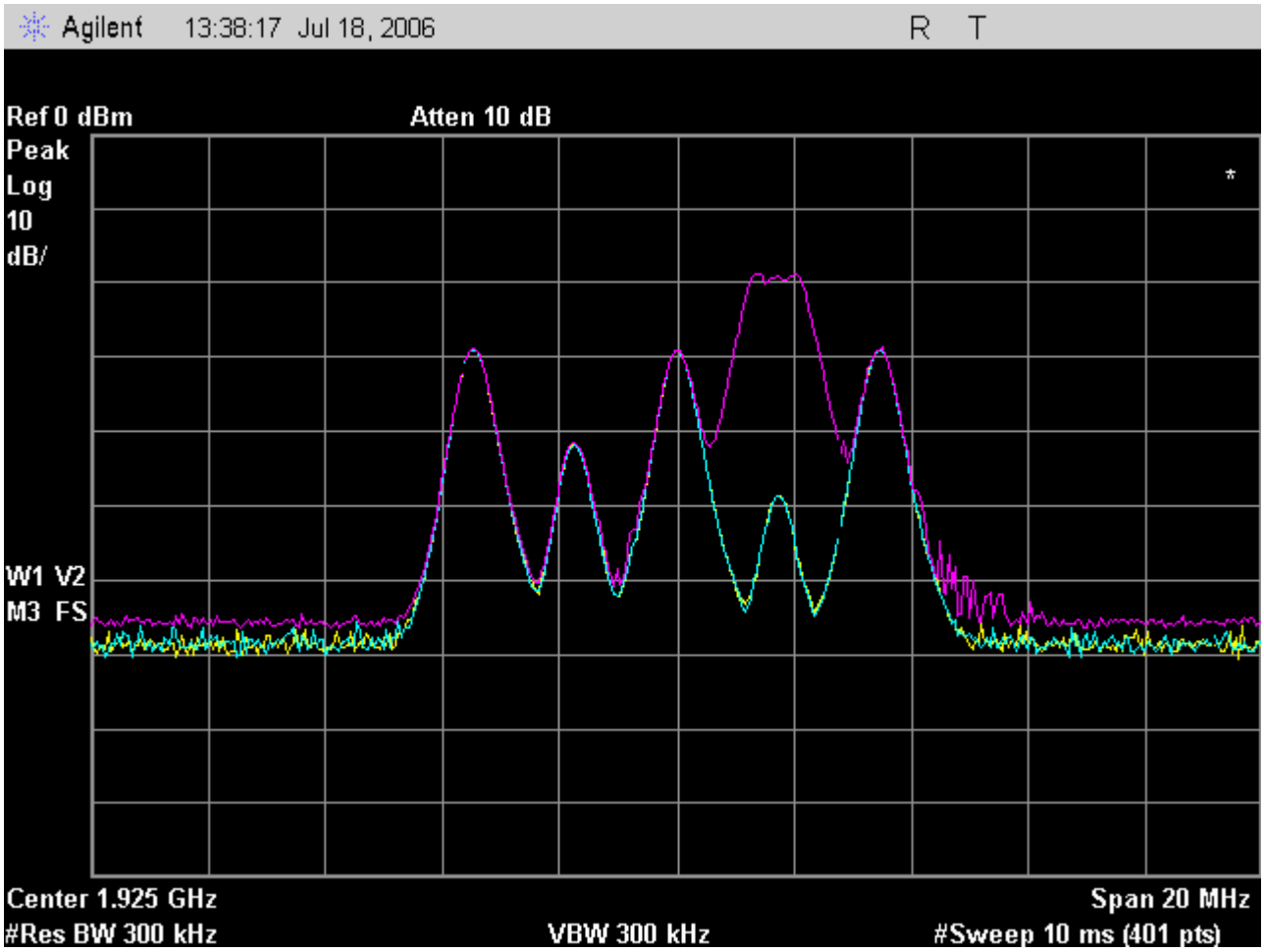

Fig. 120 - Emissions and interference profile spectrum, remote EUT, test 7.3.3(c).

The remote 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.

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 -59 dBm and to generate on f_2 a CW signal of level $T_L + U_M$ - 6dB = -66.0 dBm, where f_1 = 1926.720MHz and f_2 = 1923.264MHz.

With this interference profile present, apply power to the remote EUT and the companion base unit. Wait for the remote EUT to detect the base beacon transmission. Then press the TALK button on the remote to establish a communications channel. Repeat the communications channel establishment five times while monitoring the spectrum using the E4407B spectrum analyzer to validate that, when this interference profile is applied to the remote EUT, the remote EUT always chooses f_2 for the communications channel.

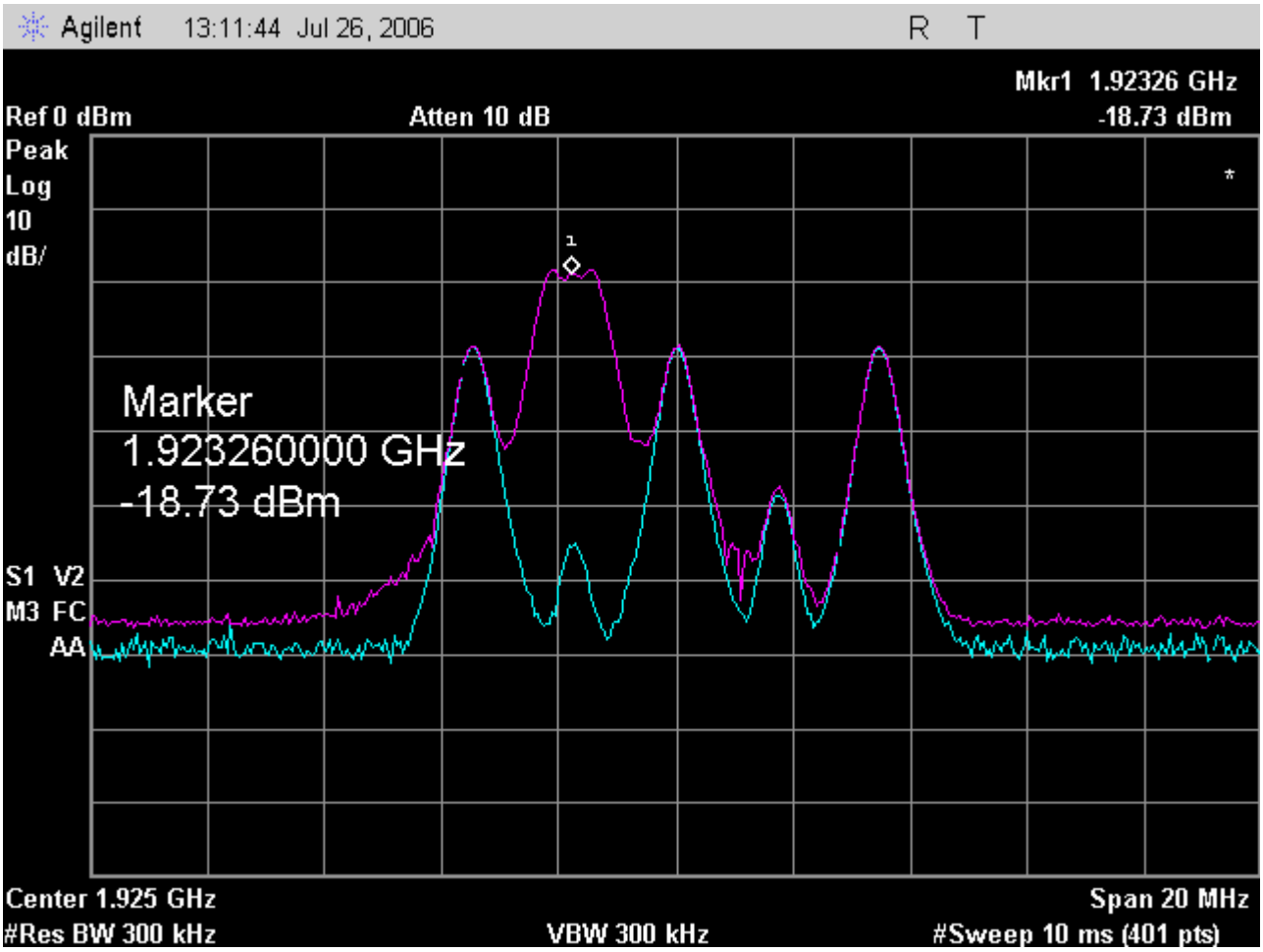

Fig. 121 - Emissions and interference profile spectrum, remote EUT, test 7.3.3(d).

The remote 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.

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 -66.0 dBm and to generate on f_2 a CW signal of level $T_L + U_M$ +1dB = --59.0 dBm, where f_1 = 1926.720MHz and f_2 = 1923.264MHz.

With this interference profile present, apply power to the remote EUT and the companion base unit. Wait for the remote EUT to detect the base unit's beacon transmissions. Then press the TALK button on the remote unit to establish a communications channel. Repeat the communications channel establishment five times while monitoring the spectrum using the E4407B spectrum analyzer to validate that, when this interference profile is applied to the remote EUT, the remote EUT always chooses f_1 for the communications channel.

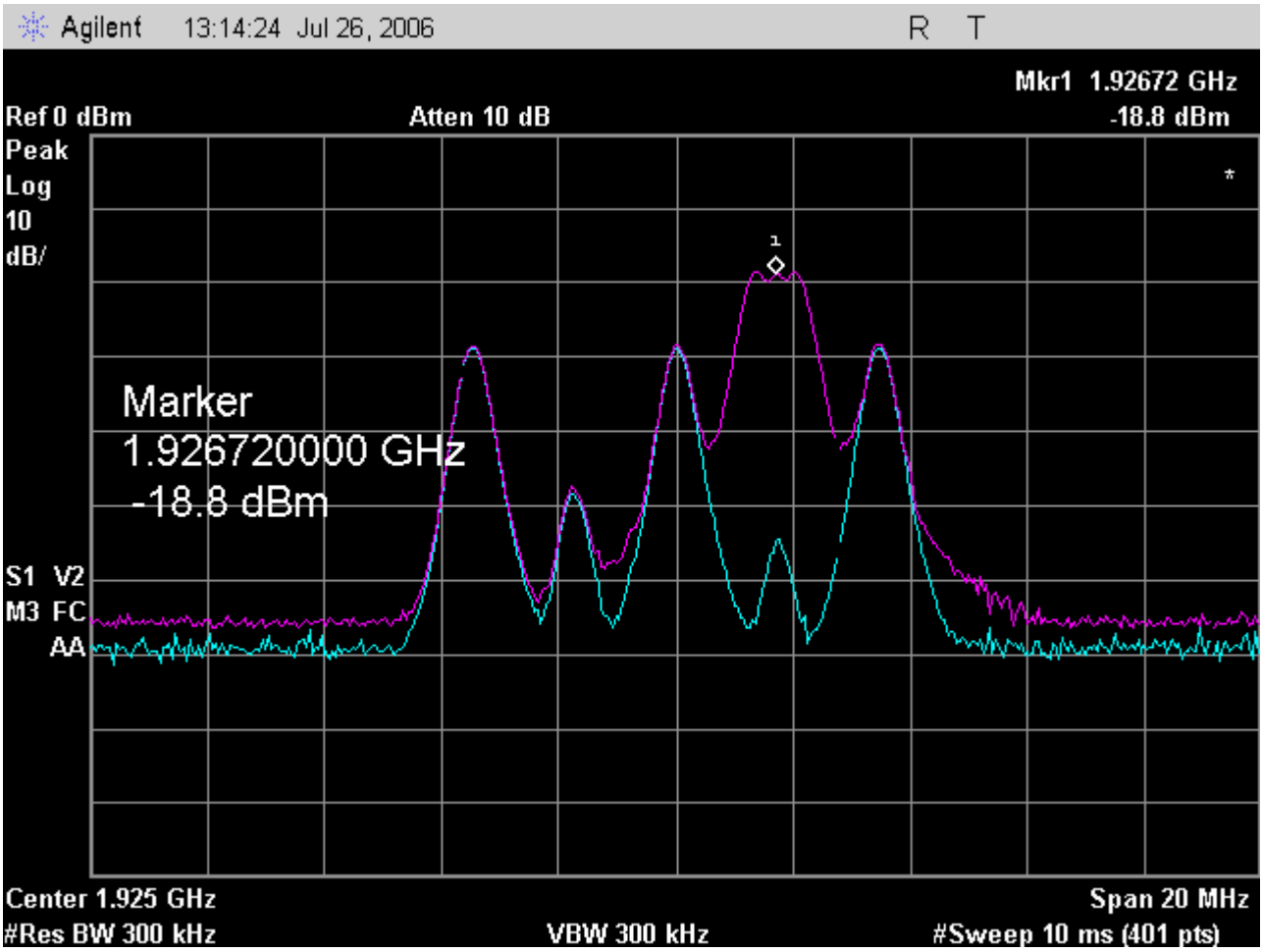

Fig. 122 - Emissions and interference profile spectrum, remote EUT, test 7.3.3(e).

The remote 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.

VII-C. Clause 7.3.4 Selected channel confirmation, remote EUT

The test platform, remote EUT and companion base unit are configured according to the requirements for implementing the test of 7.3.4 by means of test configuration #6, **With companion device and interference blocking, headset EUT**, of section (I) of this document. An example of the remote EUT's selected channel confirmation function is shown below, with the multi-carrier interference generator configured to enable the automatic switch from the initial interference profile to the alternate interference profile based on the reception of the trigger signal generated by the remote in the frame prior to the initiation of transmission of the remote companion device and base EUT transmissions of communications channel signals, but with the alternate interference profile configured so that the access criteria are met and transmission is allowed.

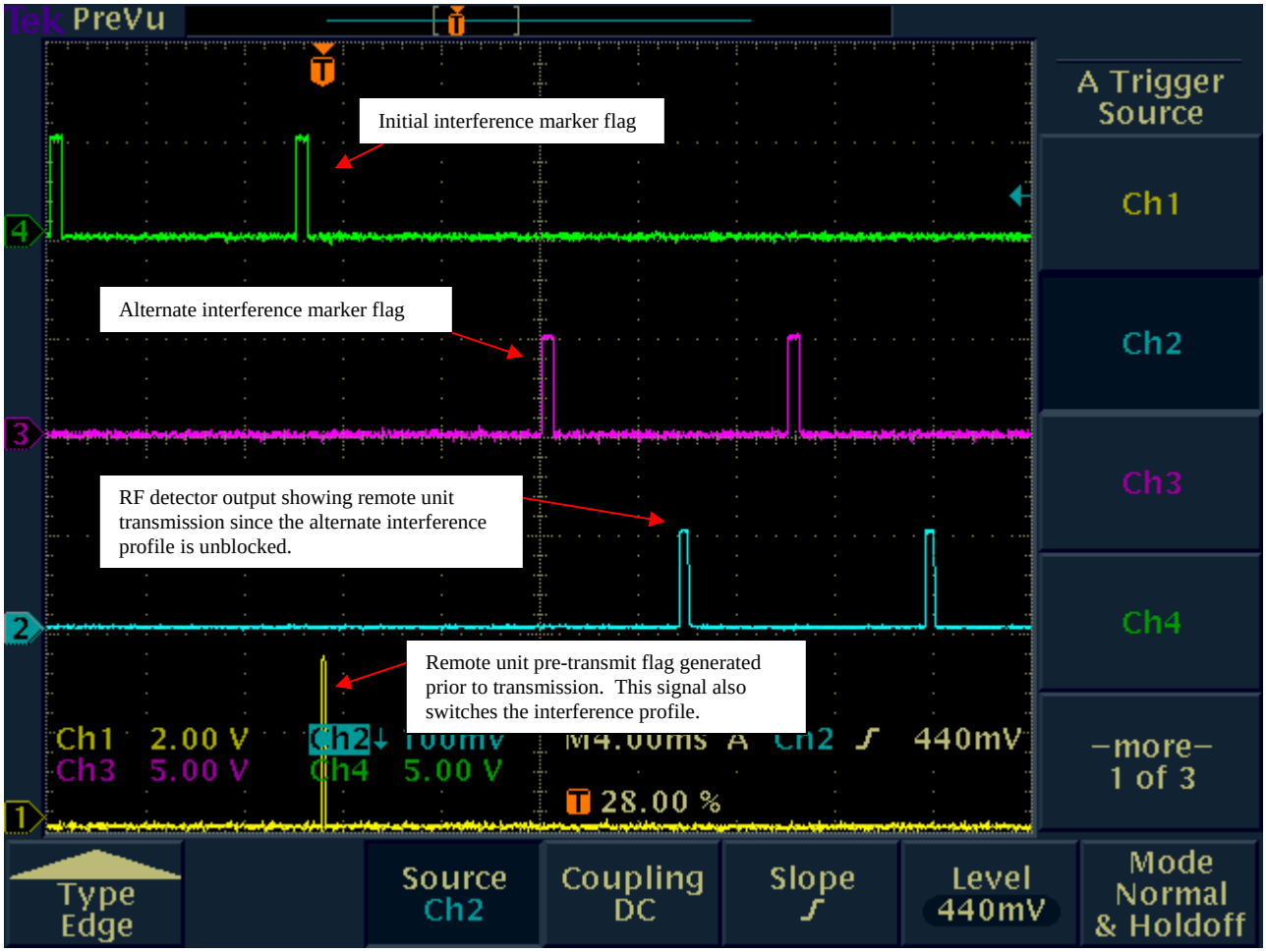

Fig. 123 - Example oscilloscope screenshot showing transition from initial to alternate interference profile in the frame before remote EUT initiation of transmission of the communications channel; for this example the alternate interference profile is configured to meet the access criteria. The text of the notes is best viewed at 150% magnification.

For this example no interference is present, so headset EUT does not defer. Green (top) trace is marker for slot 0 of initial interference profile. Purple (2nd from top) trace is marker for alternate interference profile. Blue (3rd from top) trace is output of RF detector, showing remote EUT communications channel transmissions. Yellow (bottom) trace is status flag output from the remote, sent by the remote in response to the press of the TALK button, in the frame two frames prior to the remote EUT's intended first transmit frame.

For the example above, the multi-carrier interference generator is configured to enable the automatic switch from the initial interference profile to the alternate interference profile based on the reception of the trigger signal generated by the remote in the frame prior to the initiation of transmission of the remote companion device and base EUT

transmissions of communications channel signals, but both the initial and alternate interference profiles are set to have the same carrier with no interference present; the headset EUT checks the access criteria in the frame prior to the first transmission, but the access criteria test passes and so the headset EUT begins transmissions immediately.

To execute the test with interference present, the multi-carrier interference generator (PXI-5670) initial interference profile is then set to CW at $T_U + U_M$ = -40.0 dBm on three carriers; at 1928.448MHz, 1924.992MHz, and 1921.536MHz, and additionally set to generate on f_1 a CW signal of level $T_U + U_M$, or -40.0 dBm and to generate no interference on f_2, here f_1 = 1926.720MHz and f_2 = 1923.264MHz, the remaining two of the total system's five carriers.

The multi-carrier interference generator (PXI-5670) alternate interference profile is set to CW at $T_U + U_M$ = -40.0 dBm on three carriers; at 1928.448MHz, 1924.992MHz, and 1921.536MHz, and additionally set to generate no interference on f_1, and to generate on f_2 a CW signal of level $T_U + U_M$, or -40.0 dBm, where f_1 = 1926.720MHz and f_2 = 1923.264MHz, the remaining two of the total system's five carriers. See section III-C, the tests of 7.3.4 as applied to the base EUT, for documentation of the interference characteristics.

Initially, the multi-carrier generator is configured not to switch to the alternate profile when the EUT begins transmissions. With this interference profile present, apply power to the remote EUT and the companion base unit. Then press the TALK button on the remote to establish a communications channel. Verify that the remote EUT transmits on f_2, then press and release the TALK button on the headset to terminate the communications channel. The multi-carrier interference generator is then configured to enable the automatic switch from the initial interference profile to the alternate interference profile, and the sequence repeated; for this case, the presence of the alternate interference profile beginning in the frame prior to the EUT's intended first transmit frame (and not meeting the access criteria) should be detected, and the EUT should defer, then select a channel for which the access criteria is met.

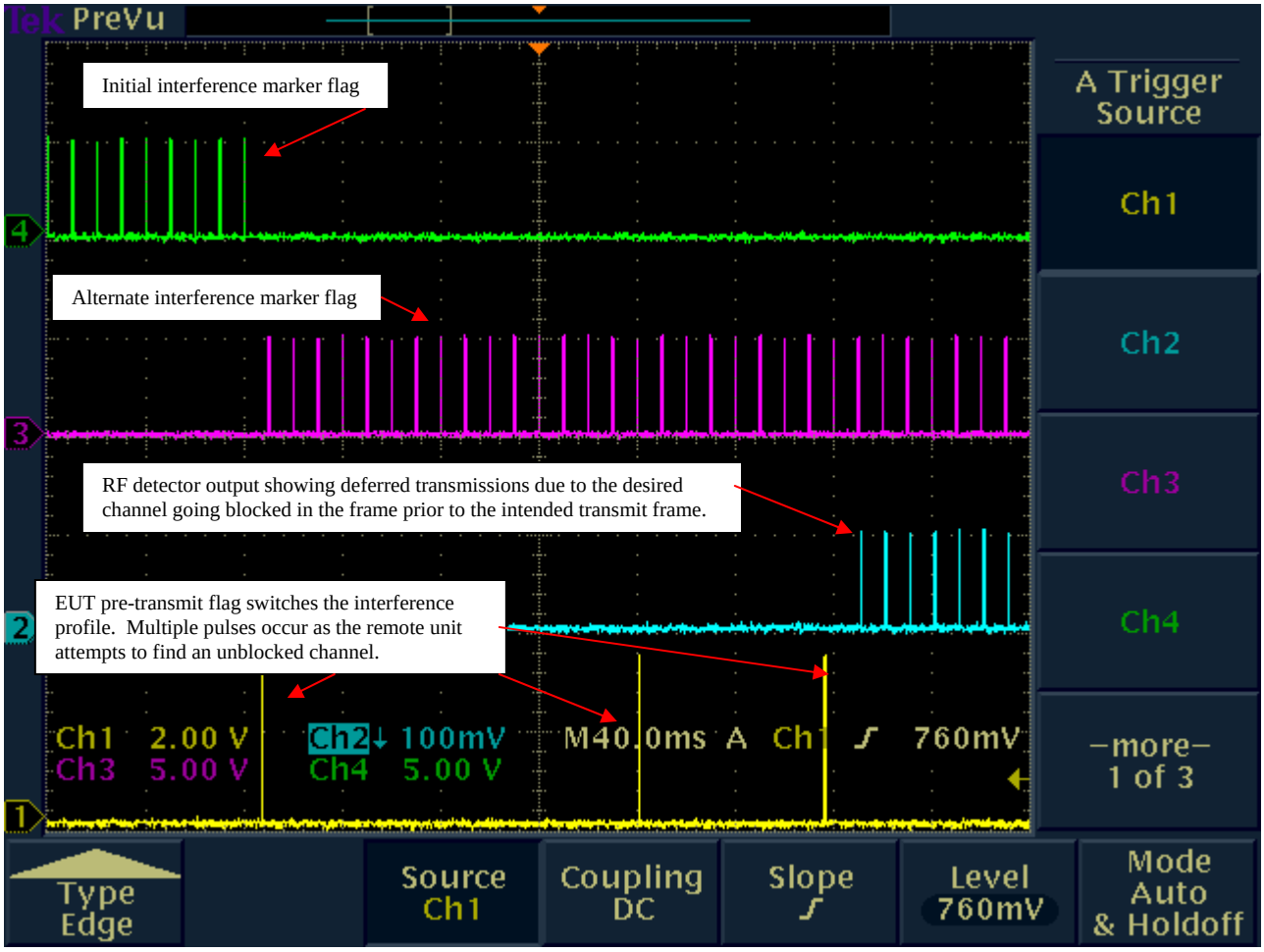

Fig. 124 - Screen shot of oscilloscope showing deferral by the remote EUT in the case where the interference profile changes in the frame previous to intended transmission and the selected time and frequency communications channel becomes blocked; and then later, transmission on unblocked channel.

The remote EUT detects that interference is present in the desired communications channel even when that interference first begins in the frame prior to the first intended transmit frame, and so meets the requirements of 7.3.4, selected channel confirmation.

VII-D. Clause 7.5 Reaction time and monitoring interval, remote EUT

The test platform, remote EUT and companion base unit are configured according to the requirements for implementing the test of 7.5(c) by means of test configuration #6, **With companion device and interference blocking, remote EUT**, of section (I) of this document.

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 companion device and so (since the remote EUT in turn synchronizes with the base unit) with the timing of the remote EUT. The interference is present on all 5 carriers, and at level -40.0 dBm, which is $T_U + U_M$. See section III-D, the tests of 7.5(c) as applied to the base EUT, for documentation of the interference characteristics.

The remote EUT is powered up with the interference conditions of 7.5(c) present. An interval of time is allowed for the remote EUT to find and synchronize to the base companion device. Then the remote unit TALK button is pressed; the RF detector in the signal combining network is monitored as is the pre-transmission signal generated by the remote EUT when it begins the initiation of transmission. No transmissions from the remote EUT are observed.

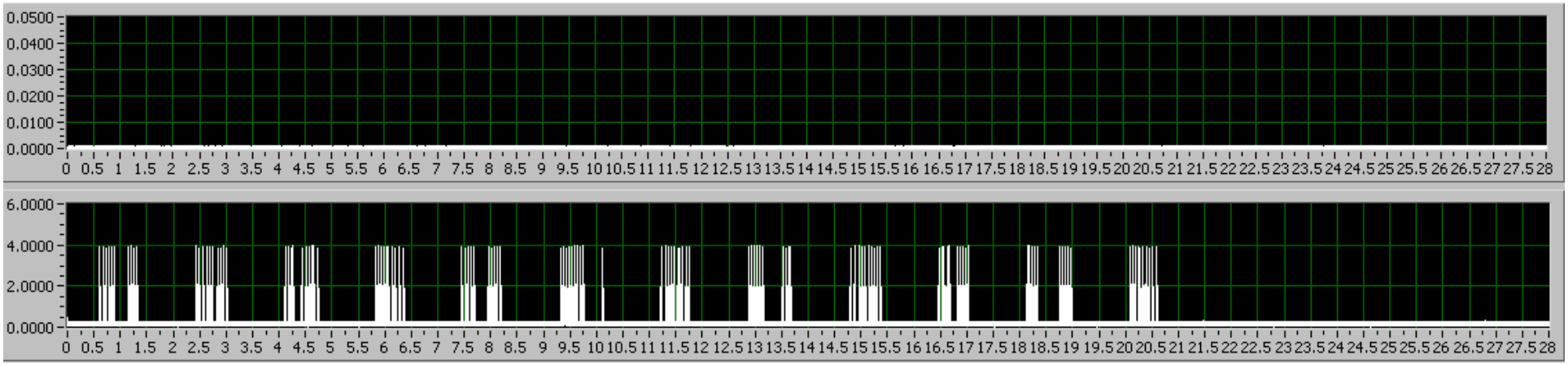

Fig. 125 - Remote EUT shown deferring when all channels are blocked with 50uS pulses at $T_U + U_M$. Top trace is detected RF transmissions (no transmissions are detected), bottom trace is the remote EUT transmission setup attempt series (as indicated by the software flag for getting-ready-to-transmit 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 -52.0 dBm.

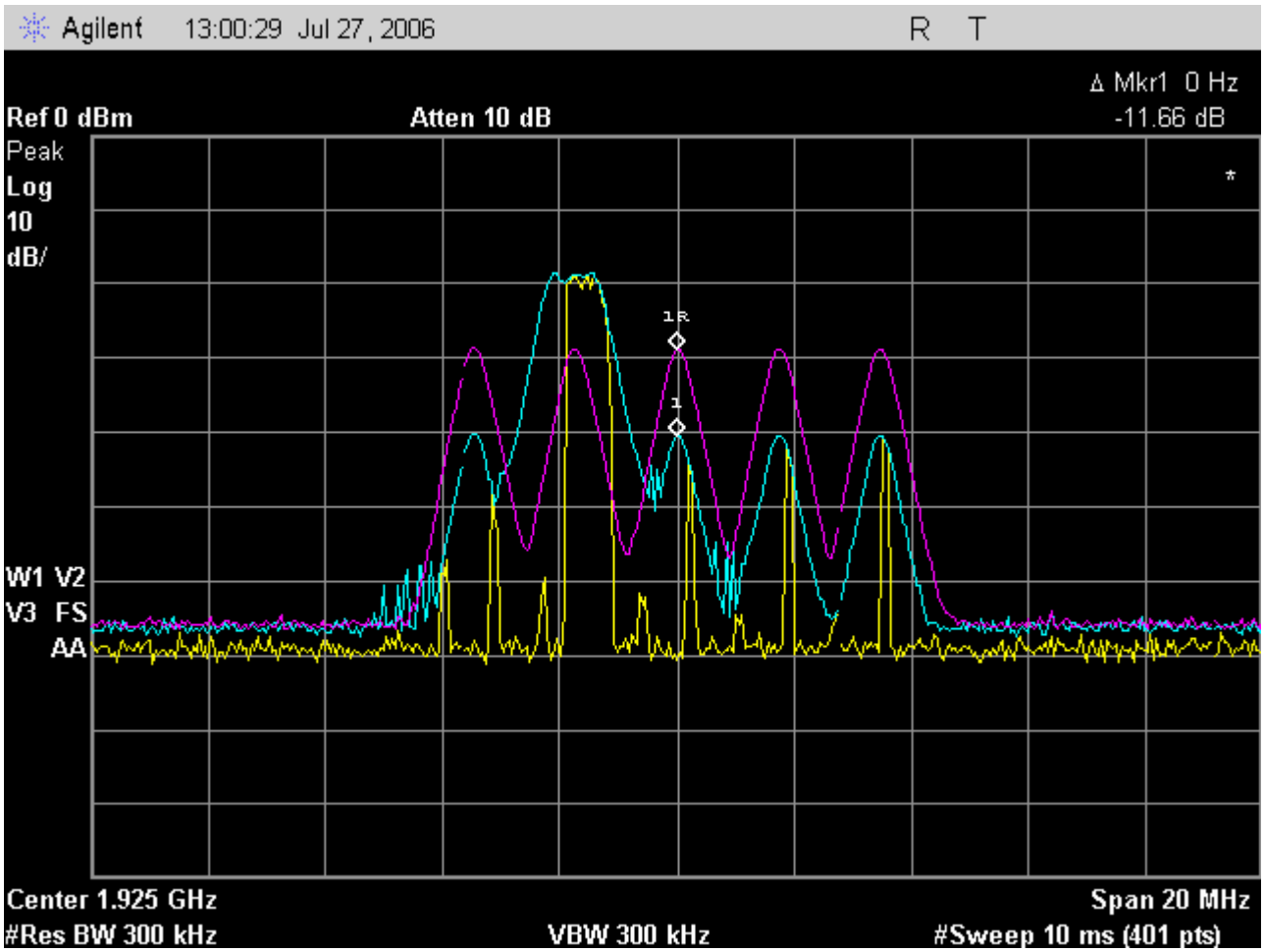

Fig. 126 - Transmit spectrum of 50uS interference pulses, with remote EUT no longer deferring with interference pulses of level T_U - U_M.

The purple (top) trace is the max-hold capture over multiple sweeps of the initial T_U + U_M interference spectrum without EUT transmissions. The blue (middle) trace is a max-hold capture of the interference and the remote EUT's successful transmission when the interference is set to T_U - U_M. The yellow (lowest) trace is a single sweep of the spectrum with the interference at T_U - U_M and remote EUT transmission active.

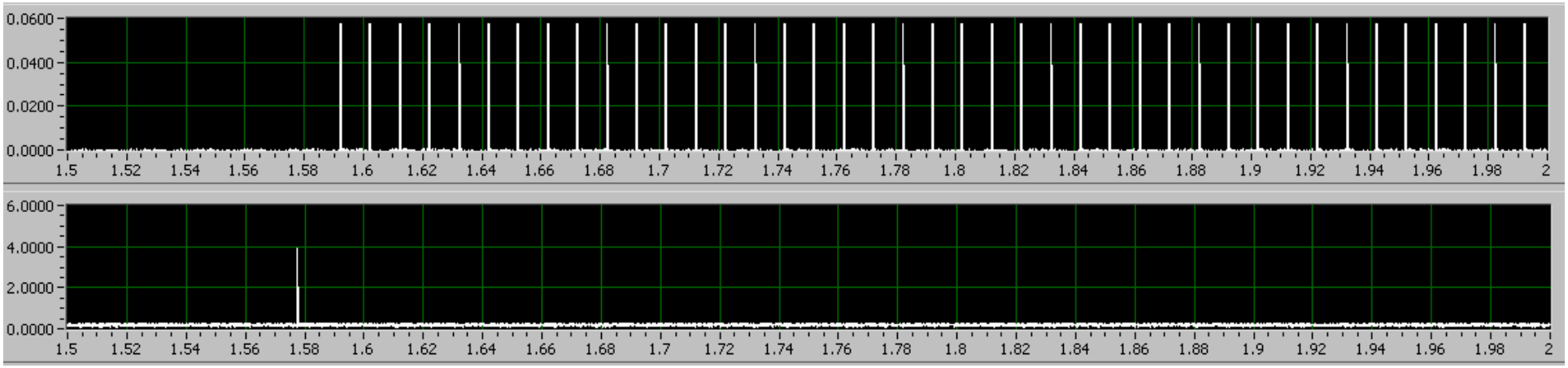

Fig. 127 - Normal initiation of transmissions by the remote EUT in the absence of over-threshold interference; the remote EUT software flags the start of the transmission setup (bottom trace) at t = 5.658 seconds, and transmit emissions are recovered by the RF detector (top trace) in the splitter/combiner network beginning at t = 1.586 seconds. Proper transmission at T_U - U_M is shown, to validate functionality and to illustrate the getting-ready-to-transmit marker, and the RF detector output.

The remote EUT defers transmission when pulses of level T_U + U_M are present with length 50uS, and so meets the requirements of 7.5(c).

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 = 1.49MHz) and the level is allowed to increase to $T_U + U_M$ + 6dB, or -34.0dBm.

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

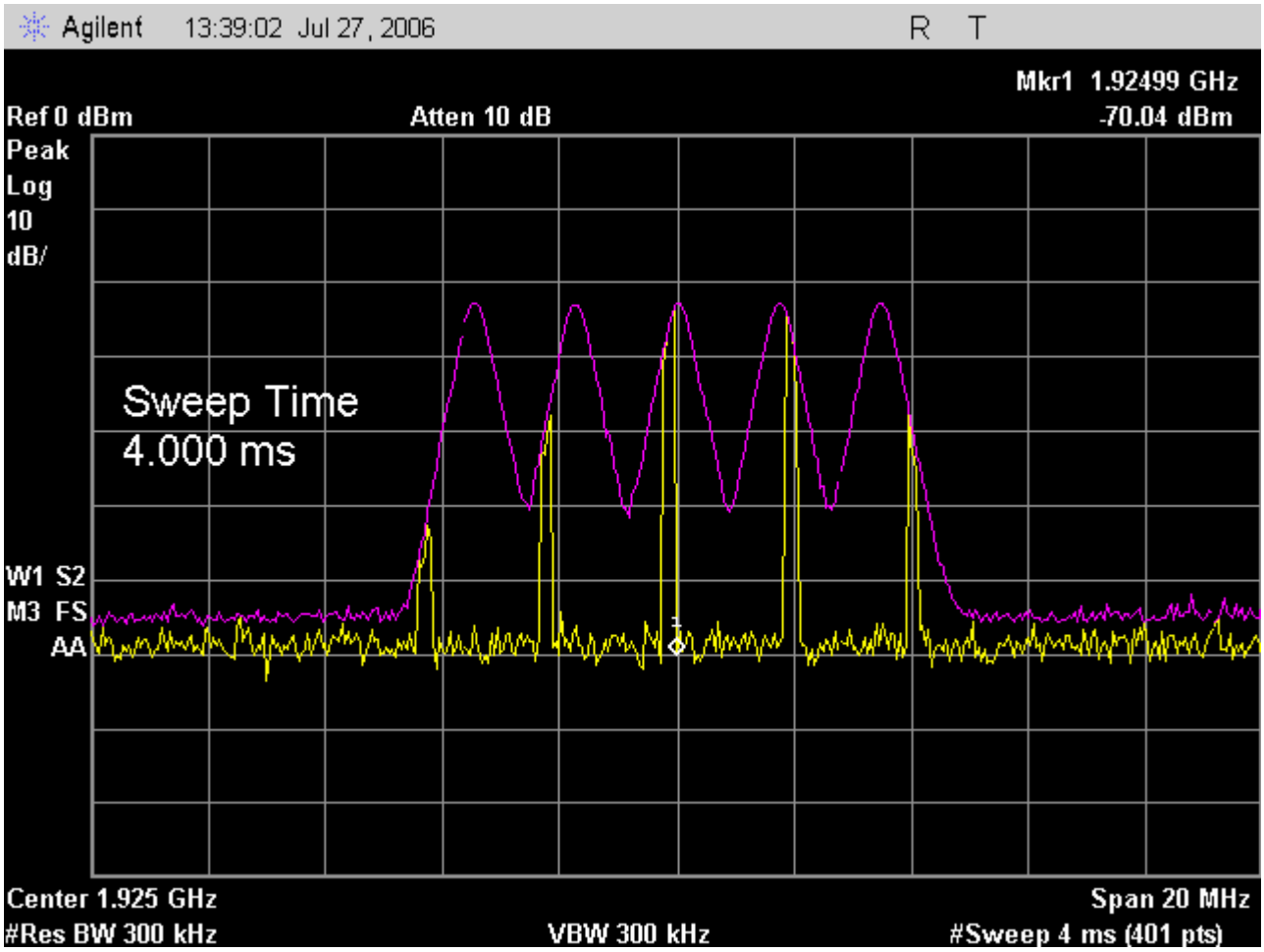

Fig. 128 - Transmit spectrum of 35uS interference pulses in each timeslot for each carrier, with remote EUT deferring due to interference pulses of $T_U + U_M$ + 6dB.

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 remote EUT are observed; the remote EUT is required to defer when pulses of 35uS are present at level $T_U + U_M$ + 6dB, the remote EUT does defer, and so passes the requirement of 7.5(d).

VIII) Tests of clause 8, Remote EUT

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

VIII-A. Clause 8.2.1 Acknowledgements, Remote EUT

8.2.1(a) is for EUT devices that can initiate transmission. This test is to demonstrate that the remote EUT stops communications channel transmissions within one second if an initial acknowledgement is not received. This test requires that, for the test case, the remote EUT hears the base companion device's transmissions but that the base companion device not hear the remote EUT's transmissions and so not generate an acknowledgement. This requirement is met by means of a timed application of interference beginning in exactly the frame that the remote EUT attempts to start a communications channel. The interference is at sufficient level that the base companion device cannot receive the remote EUT's transmission, and so does not transmit an acknowledgement. The timing of the generation of the interference is such that the remote EUT's test of the communications channel in the frame prior to the first transmit frame finds the interference not present, and transmission is permitted. This ensures that any necessary communications between the remote EUT and the base companion device may occur in the absence of interference, so as to ensure that the remote EUT's tested response is to the lack of an acknowledgement on the attempt to establish a communications channel, and not rather due to the lack of an initial mutual synchronization.

To ensure that the response of the remote EUT is to the lack of acknowledgement and not to the lack of the beacon signal from the base companion device, it is further necessary that the blocking by means of a high interference level is only during the remote EUT's transmit half of the frame. To accomplish this, the multi-carrier interference generator is operated in TDMA mode, synchronized with the frame timing of the base companion device and the remote EUT, and the multi-carrier interference generator is configured (when obstructing the acknowledgements) to apply the interference only in timeslots 0 – 11, the headset EUT's transmit timeslots; timeslots 12 – 23 (the base companion device's transmit timeslots) are left unobstructed.

This test requires that neither the base companion device nor the remote EUT be blocked from transmitting by the interference being at sufficient level that the access criteria is not met, but yet it requires that the base companion device not receive the remote EUT's transmit burst, and so does not generate an acknowledgement. To achieve this, the interference applied to block the remote-to-base timeslots must be received at the remote at a low enough level that the access criteria is still met. To do this, the test platform, remote EUT and companion base unit are configured according to the requirements for implementing the test of 8.2.1(a) by means of test configuration #6, **With companion device and interference blocking, remote (headset) EUT**, of section (I) of this document, modified with the addition of (nominally) 26dB of attenuation between the remote EUT and the splitter/combiner, and by changing the (nominal) 50dB of attenuation between the base companion device and the splitter/combiner to (nominal) 40dB. In this way the interference necessary to block reception by the base companion device of the remote transmissions is reduced to a level meeting the access criteria for both the remote EUT and the companion device.

Levels analysis:
- For the test, we set the PXI-5670 multi-carrier interference source to -26 dBm per carrier, referenced to the input to the EUT without the extra 26dB of input attenuation described above.
- Actual delivered input interference to the headset EUT is -52.0dBm, due to the added 26dB of attenuation. This is $T_U - U_M$, for which the access criteria is guaranteed to be met.
- The interference level appearing at the input to the base companion device is then -65dB, also meeting the access criteria at the base companion device.
- The base transmit signal arriving at the remote EUT sees 79dB of loss through the splitter/combiner and attenuators, nominally, which allows reliable communication in the absence of interference.
- The headset transmit signal arriving at the base companion device sees the same 79dB of loss, and again reliable communication is possible in the absence of interference.

When -26 dBm of per-carrier interference is applied in the timeslots used by the headset to transmit to the base, the interference level received at the base is -65dBm. -65dBm interference received at the base during the headset EUT's transmit timeslots blocks the reception of the headset EUT's transmission, which will be at -69dBm received at the base for a headset transmitting at the specified maximum +10dBm.

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 -22.5dBm except the carrier at 1924.992MHz, f_1, which is set to -130dBm for all slots. The alternate interference profile has all carriers at level -22.5dBm except the carrier at f_1, which is set to -31.5dBm for slots 0 – 11 and -130dBm for slots 12 - 23. The initial profile ensures that the base and remote will be restricted by the LIC algorithm to using the carrier at f_1 so that system timing can be monitored by a zero-span sweep of the spectrum analyzer at f_1. The alternate profile has interference on f_1 that is high enough to prevent the base EUT from hearing the remote transmissions. The test configuration is validated by powering up the remote EUT and the base companion device and verifying that the remote EUT can initiate a communications channel with the base companion device if the multi-carrier interference generator is prevented from switching to the alternate interference profile when the remote initiated the communications channel.

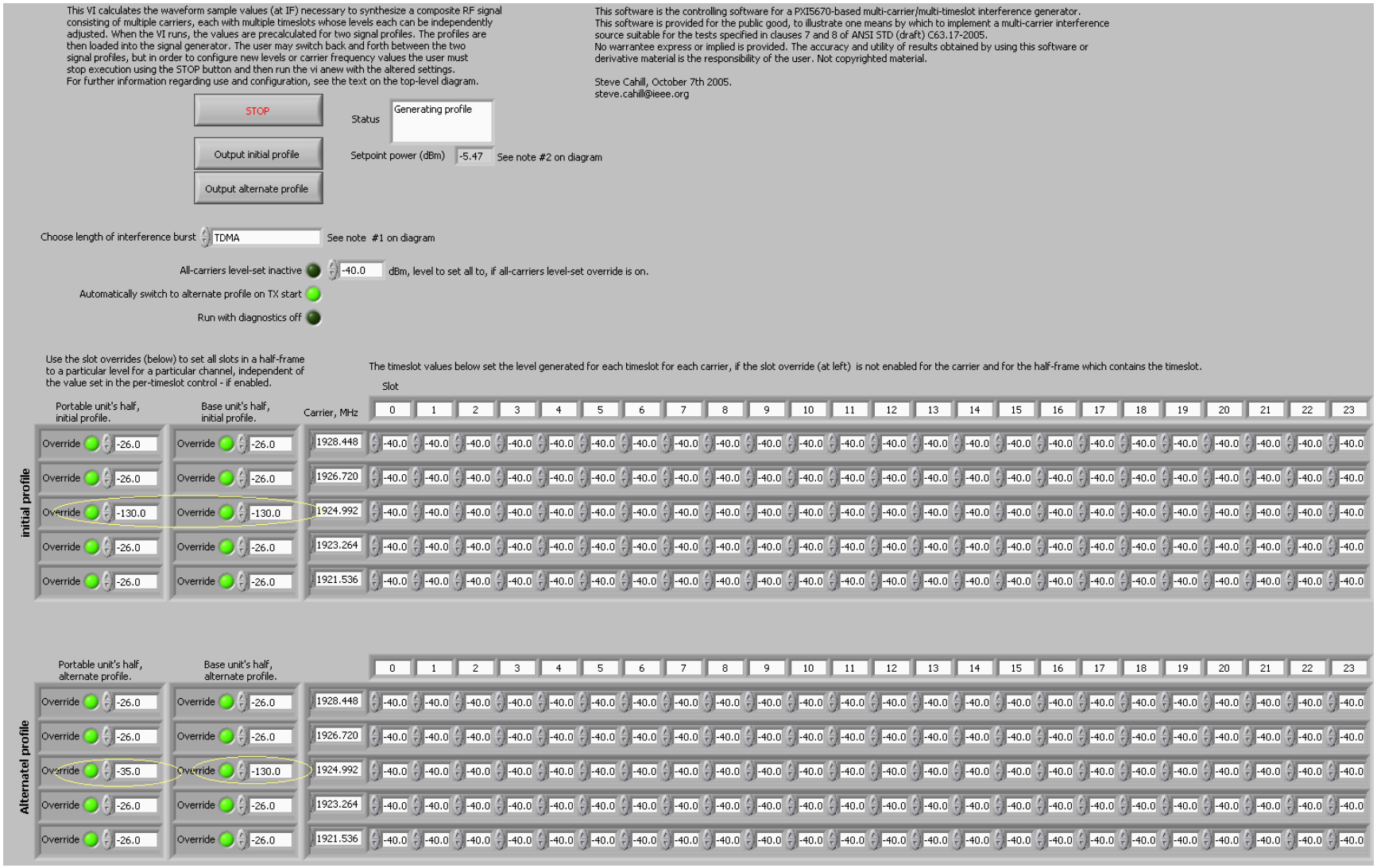

Fig. 129 - Multi-carrier interference generator configured according to the requirements for testing the remote EUT per 8.2.1(a), with automatic switching to the alternate interference profile enabled.

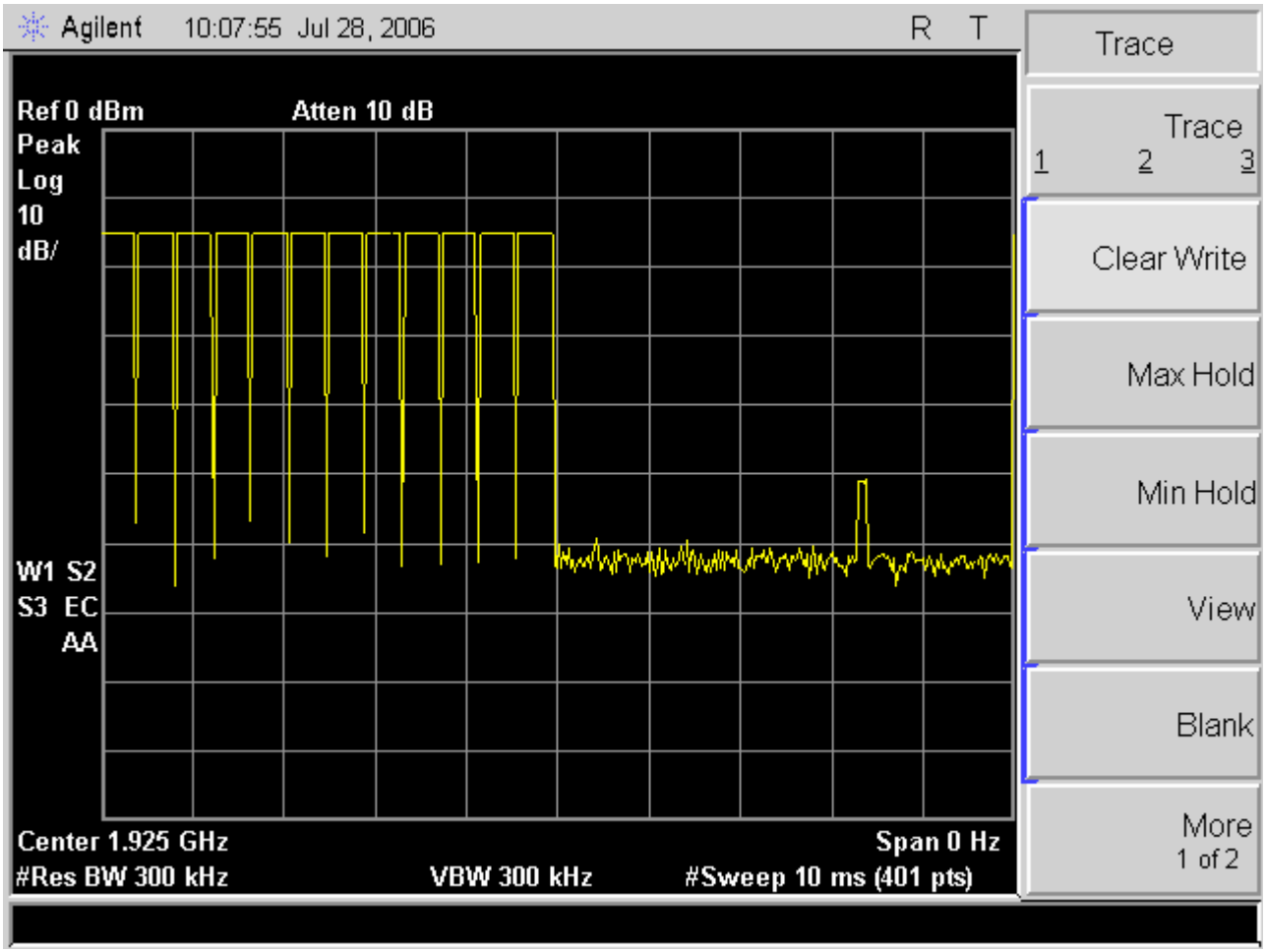

Fig. 130 - One frame of transmissions for a remote EUT and base companion device with a beacon present, interference present and high enough to block remote-to-base communications. Slots 0 – 11 have the interference present and slot 16 has the base companion device transmit beacon signal.

The remote EUT and the base companion device are powered up, and an interval of time is allowed to permit the remote EUT to synchronize to the base companion device's transmitted beacon, and to establish a normal idling mode, waiting for the user to establish a communications link by pressing the TALK button. The multi-carrier interference generator is then configured to enable the transition to the alternate profile when the remote EUT attempts to establish a communications channel, and the TALK button on the remote is pressed.

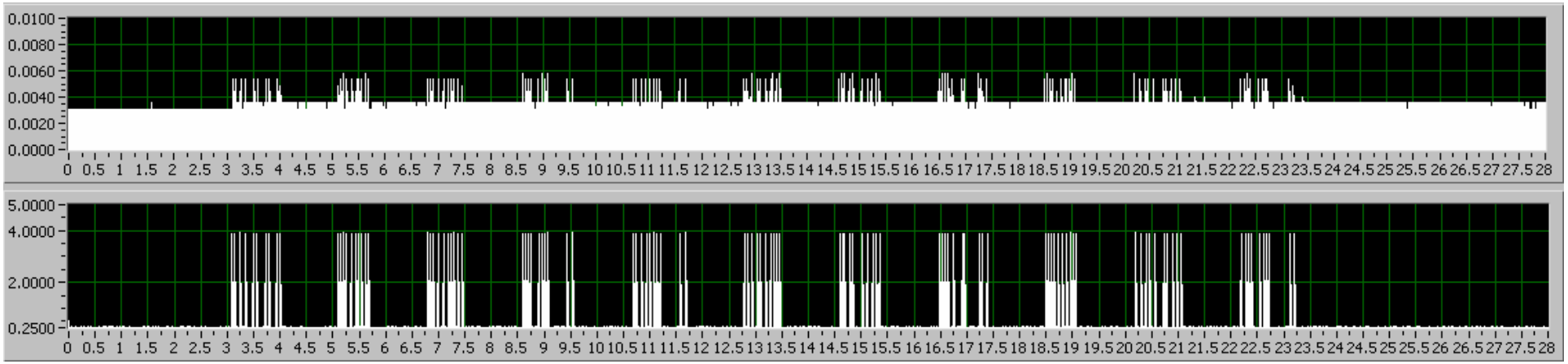

Fig. 131 - Screenshot of remote transmit-attempt flag activity (bottom trace) and RF detector output (top trace) vs. time with the alternate interference profile present and blocking the base from hearing the remote EUT and so generating an acknowledgement. The TALK button is pressed at t = 3 seconds, with the remote EUT idle but locked to the base companion device's beacon transmissions. The high "noise floor" on the upper trace is due to the RF detector's demodulation of the multi-carrier interference on all carriers, as the RF detector load was changed from 50 ohms at the oscilloscope input to 1megohm, to improve sensitivity, necessary due to the additive 26dB of loss for the detection of the remote EUT's transmit signal.

The remote makes multiple attempts to get an acknowledgement from the base over a span of about 20 seconds. Each transmission is a single frame in a particular timeslot (in which a particular communications channel would be established if an acknowledgement were received) rather than a full establishment of the communications channel

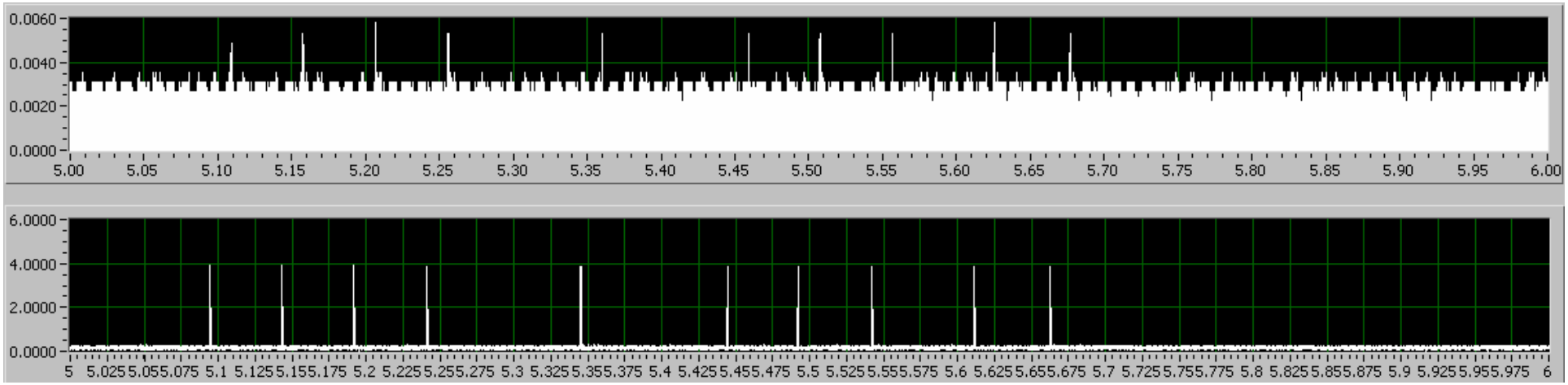

Fig. 132 - Screenshot zoom of the above two traces over the interval from 5 to 6 seconds, over which the remote EUT attempts 10 times to get an acknowledgement from the base companion device.

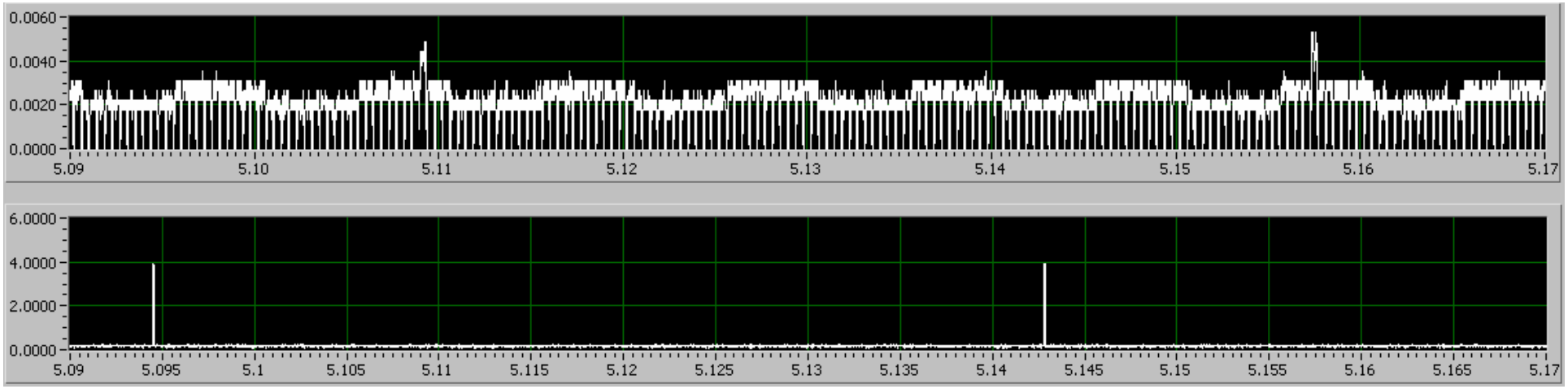

Fig. 133 - Screenshot detail showing the detail for two attempts to get an acknowledgement; the remote EUT's transmit-attempt flag and the corresponding single-frame transmission from the remote EUT to the base companion device to establish the communications channel. Note that the transmissions occur in different timeslots, corresponding to different communications channels, if an acknowledgement would have been received.

The remote EUT sends a single frame, a single transmission, in each attempt of repetitive attempts to establish a communications channel. In the absence of an acknowledgement from the base companion device, the remote transmits only in this 10mS frame for this communications channel, and so meets the requirements of 8.2.1(a) limiting transmissions on the communications channel to 1 second or less, in the absence of an initial acknowledgement.

8.2.1(b) for the remote EUT requires that, after the test of 8.2.1(a) , we unblock the acknowledgements from the base companion device to the remote EUT and validate that the remote EUT can establish a communications channel with the base companion device.

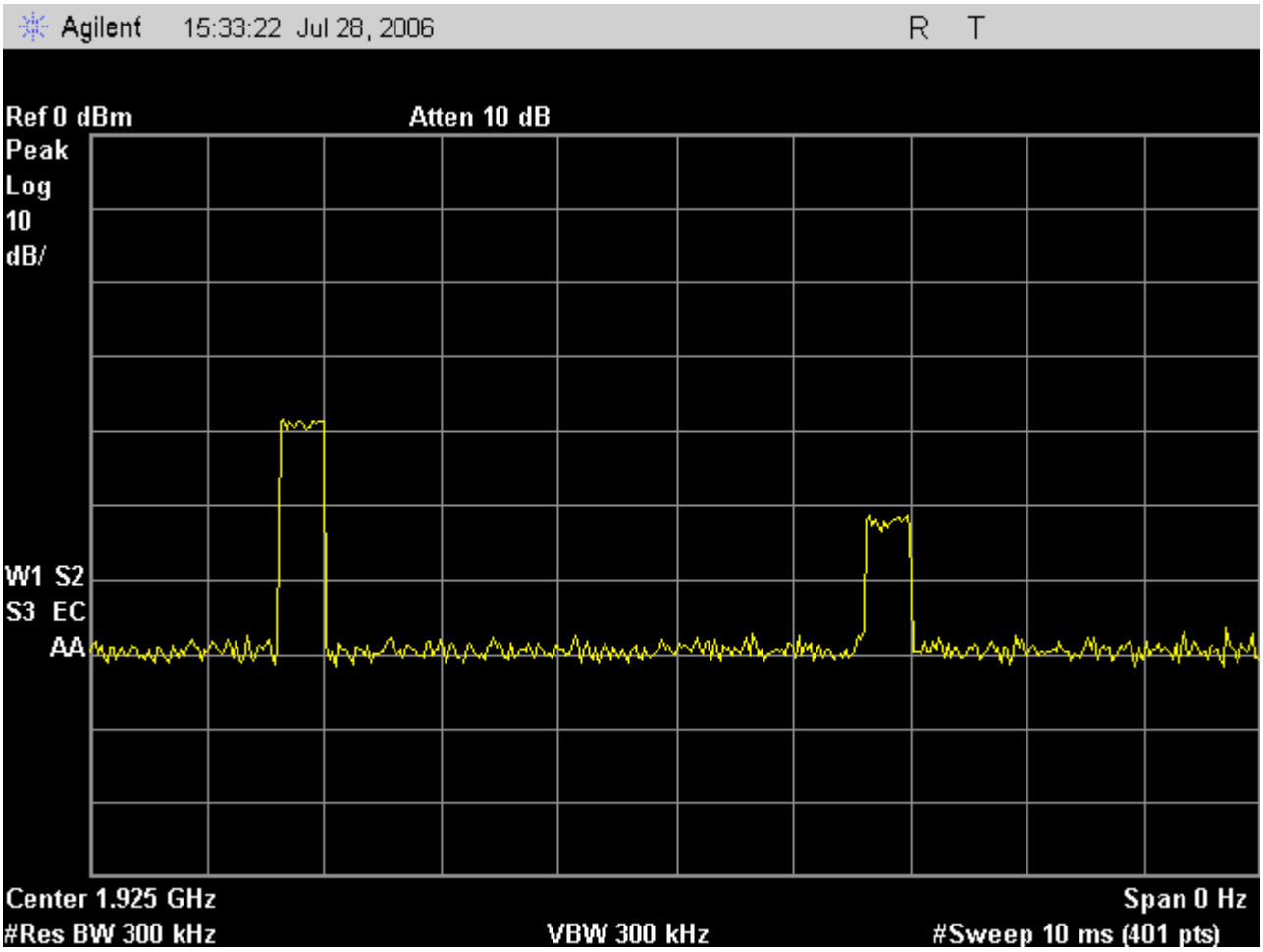

Fig. 134 - Screenshot of spectrum analyzer showing one frame of the channel with the initial interference profile present, which does not block the reception by the base EUT of the remote EUT's transmissions; an acknowledgement is generated when the remote EUT attempts to initiate the communications channel when the TALK button is pressed, and the communications channel is established, so the remote EUT meets the requirements of 8.2.1(b) for proper operation of the test setup when the acknowledgements are unblocked.

8.2.1(c) for the remote EUT is identical to the test of 8.2.1(a) except that the PXI-5670 multi-carrier interference generator is configured not to automatically switch to the alternate interference profile; rather, instead, the remote EUT and the base companion device are established in a communications channel, and then the multi-carrier interference generator is manually switched to the alternate profile. In addition, since it is not necessary to restrict the remote EUT to the use of a single RF carrier, and since the RF detector output can be used to show the timing between the onset of the blocking interference and the cessation of transmissions by the remote EUT, we configure all RF carriers with the interference profile used on f_1 for the test of 8.2.1(a); -130dBm for all timeslots for the initial interference profile, and -31.5dBm in timeslots 0 – 11 for all carriers and -130dBm in timeslots 12 – 23 for all carriers for the alternate profile.

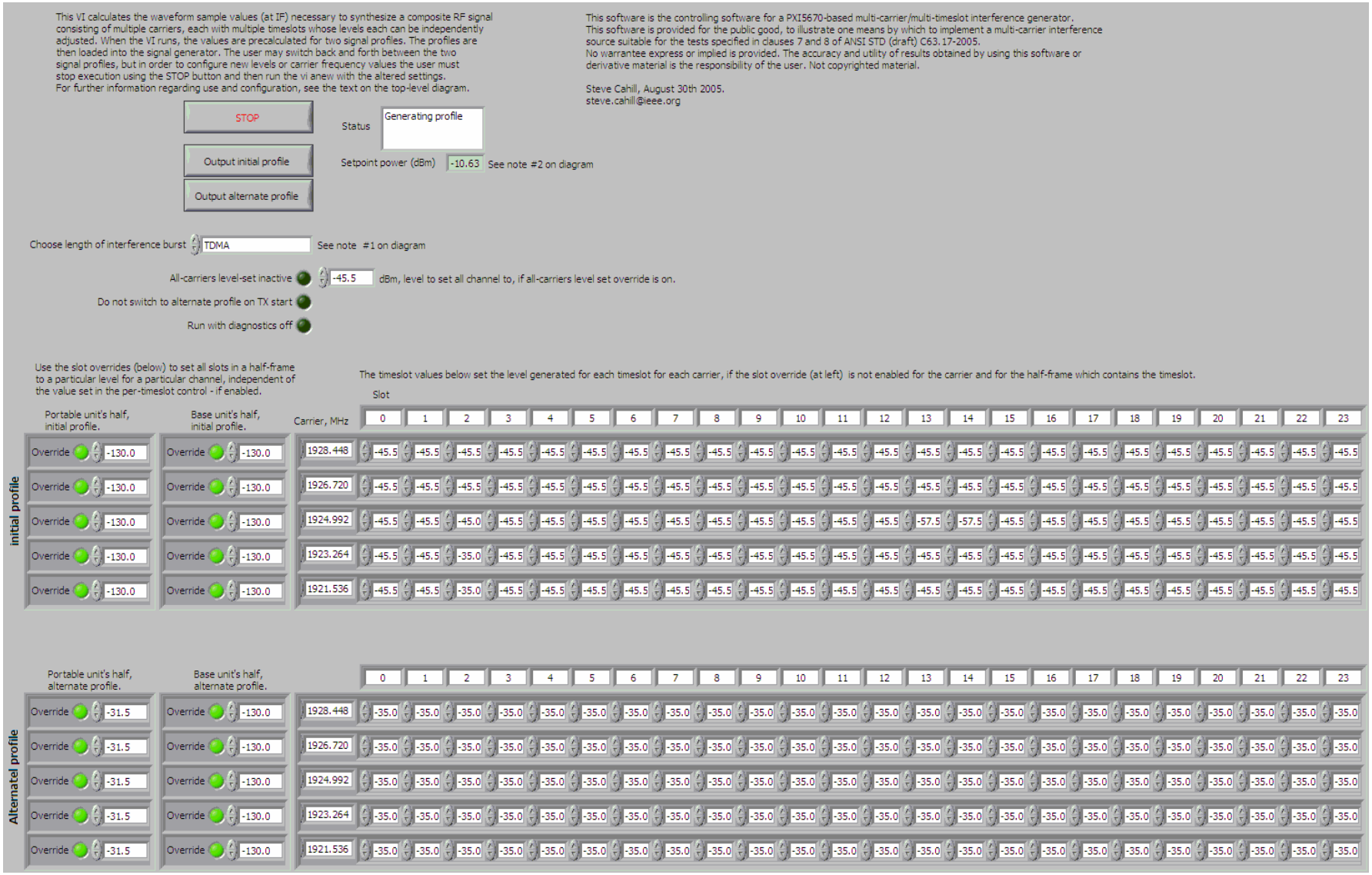

Fig. 135 - PXI-5670 multi-carrier interference generator control panel for the test of 8.2.1(c), for the remote EUT.

The remote EUT and base companion device are powered up and a period of time is allowed for the remote to enter idle but locked state, with the base companion device. The TALK button is then pressed, and the remote EUT establishes a communications channel with the base companion device. The multi-carrier interference generator is then switched to the alternate profile, which blocks the continuing acknowledgements transmitted from the base companion device to the remote EUT.

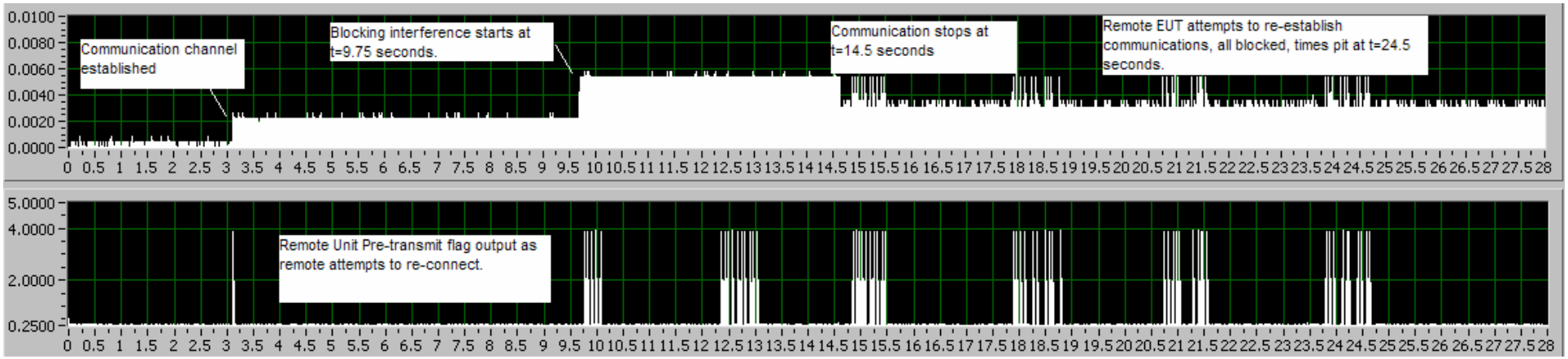

Fig. 136 - RF detector (top trace) and pre-transmit flag (bottom trace) captures as remote EUT goes through sequence of:

1) From idle-locked with no interference present, establish a communications channel by pressing the TALK button at t = 4.33 seconds.
2) At t = 12.45 seconds, apply interference that blocks reception at the base companion device of remote EUT transmissions. Base companion device immediately stops acknowledging transmissions. Remote responds by trying to establish another communications channel on an un-interfered timeslot and carrier. All timeslot and carriers are blocked, though.
3) At t = 17.2 seconds, remote EUT stops communications channel transmissions on the original, now blocked, communications channel.
4) From t = 12.45 seconds until t = 27.2 seconds, the remote EUT attempts to establish a communications channel on an unblocked timeslot and carrier. There are none, so the remote EUT times out and stops trying.

Top trace is the output of the RF detector at various times in this sequence of events. The bottom trace is remote EUT's pre-transmit flag, which pulses in the frame two frames prior to the intended transmit frame, and serves as a marker for remote EUT activities.

All remote EUT transmissions cease within 15 seconds of the loss of continuing acknowledgements from the base companion device, so meeting the requirement of 8.2.1(c) that transmissions cease within 30 seconds of the loss of acknowledgements.

VIII-B. Clause 8.2.2 Transmission duration, Remote EUT

This test is to demonstrate that the remote EUT executes the access criteria test at least as often as every 8 hours.

The test platform, remote EUT and companion base unit are configured according to the requirements for implementing the test of 8.2.2 by means of test configuration #6, **With companion device and interference blocking, headset EUT**, of section (I) of this document.

The multi-carrier interference generator (PXI-5670) is set to TDMA mode (timeslot-synchronized with the base companion device) with initial interference profile active, with all carriers at level -40.0dBm ($T_U + U_M$) except the carrier at 1924.992MHz, f_1, which is set to -130dBm. The alternate interference profile has all carriers at level -40.0dBm ($T_U + U_M$) including the carrier at f_1. The initial profile ensures that the system timing can be monitored by a zero-span sweep of the spectrum analyzer at f_1, there being no interference on f_1. The alternate profile has interference on all carriers, so blocking all channels when the alternate interference profile becomes active.

The remotet EUT and base companion device are then powered up. The output of the RF detector in the RF splitter/combiner matrix is monitored with a digital storage oscilloscope capturing timed traces. The TALK button on the remote is pressed and a communications channel established on f_1. The trace and time at which the communications channel is established is captured. Then the multi-carrier generator is switched to the alternate interference profile. The trace and time at which the remote EUT ceases transmissions due to the test and failure of the access criteria on all channels is then captured.

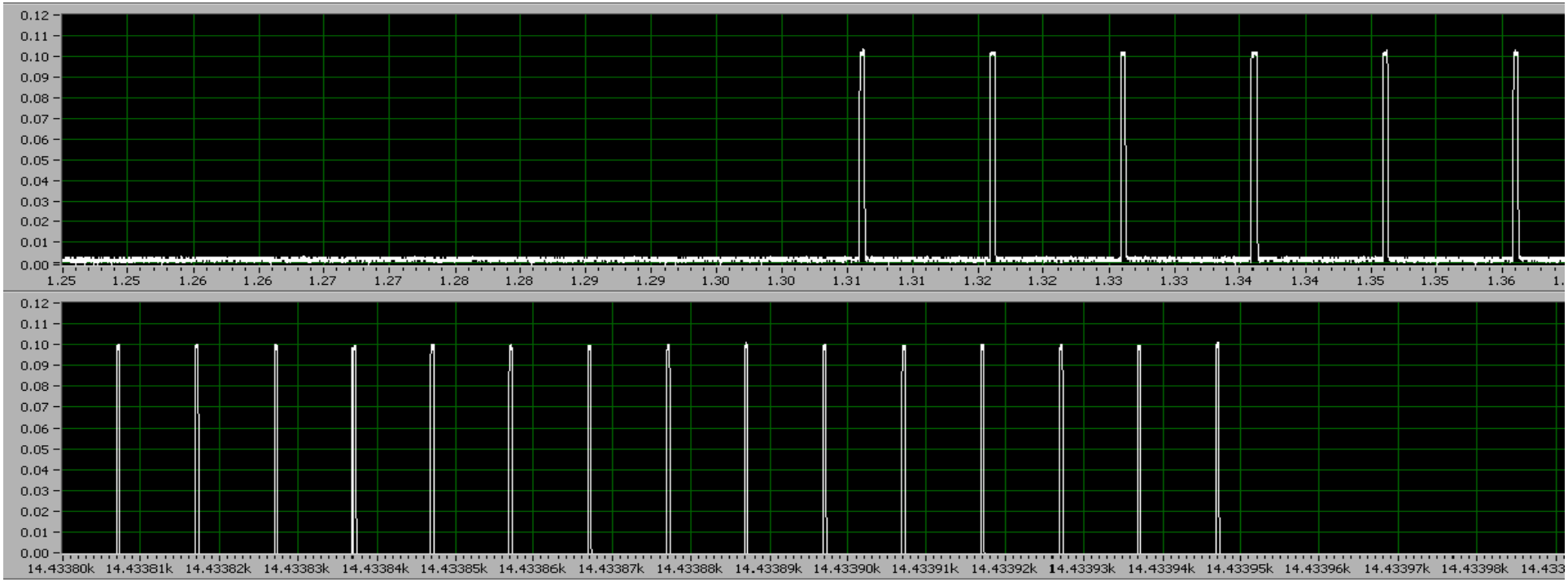

Fig. 137 - RF detector output showing timed initiation of remote EUT transmissions (top trace), then termination (bottom trace) when the remote EUT finds no channels passing the access criteria test. The remote EUT terminates transmissions at 14339.48 seconds, 14438.17 seconds after the start of transmissions, so meeting the requirement of 8.2.2 that the headset execute the access criteria test at least as often as every 28800 seconds.