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Certification Test Report

CFR 47 FCC Part 2 and Part 90, Subpart I

Model: MR803D

FCC ID.: BCR-803D15

Report No.: W7220-2

Revision: 0

Prepared for:	Andrew Corporation 108 Rand Park Drive Garner, North Carolina 27529
Author:	Tom Tidwell, Manager of Wireless Services
Issued:	11 July, 2007

Report Summary

NTS Plano

Accreditation Numbers: FCC: 101741
IC: 46405-4319 File # IC-4319-A

Applicant: Andrew Corporation

Customer Representative: Mike Williamson

EUT Description:

EUT Description	Manufacturer	Model	Revision	Serial Number
The EUT is a mini repeater used to enhance coverage of a SMR (Specialized Mobile Radio) network.	Andrew Corporation	MR803D	1	12

Test Summary

Appendix	Test/Requirement Description	Deviations from:			Pass / Fail	Applicable Rule Parts
		Base Standard	Test Basis	NTS Procedure		
A	RF Power Output	No	No	No	PASS	CFR 47, Part 2, Para. 2.1046 CFR 47, Part 90, Para. 90.205
B	Modulation Characteristics	No	No	No	PASS	CFR 47, Part 2, Para. 2.1047 CFR 47, Part 90, Para. 90.207
C	Occupied Bandwidth	No	No	No	PASS	CFR 47, Part 2, Para. 2.1049 CFR 47, Part 90, Para. 90.210
D	Spurious Emissions at Antenna Terminals	No	No	No	PASS	CFR 47, Part 2, Para. 2.1051 CFR 47, Part 90, Para. 90.210
E	Field Strength of Spurious Radiation	No	No	No	PASS	CFR 47, Part 2, Para. 2.1053 CFR 47, Part 90, Para. 90.210
F	Frequency Stability	No	No	No	PASS	CFR 47, Part 2, Para. 2.1055 CFR 47, Part 90, Para. 90.213
G	Transient Frequency Behaviour	No	No	No	PASS	CFR 47, Part 2, Para. 2.1055 CFR 47, Part 90, Para. 90.214

Test Result: The product presented for testing complied with test requirements as shown above.

This is to certify that the preceding report is true and correct to the best of my knowledge.

Robert Stevens,
Quality Assurance Manager

Tom Tidwell,
Wireless Test Engineer

Table of Contents

Register of revisions

Revision	Reason for Revision	Revision Date
0	Original	11 July, 2007

INTRODUCTION

1.1 PURPOSE

The purpose of this document is to describe the tests applied by NTS Plano to demonstrate compliance of the MR803D to FCC Part 90 Subpart I for Public Mobile Radio in accordance with the certification requirements of CFR 47, Part 2.

2.0 EUT DESCRIPTION

2.1 CONFIGURATION

Description of EUT

	Name	Model	Revision	Serial Number
EUT	MR803D 15 Mini Repeater	MR803D	1	10
RF Exposure Classification	Fixed indoors or outdoors. Minimum separation distance is 20 cm.			
Channels/Frequency Range	806– 824 MHz Uplink 851 – 869 MHz Downlink			
Power	0.063 watts			
TX antenna details	Maximum 12 dBi in accordance with the user manual			
Functional Description	The EUT is a F1-F1 repeater designed to enhance coverage of a Land Mobile Radio network operating in the Specialized Mobile Radio (SMR) bands.			

2.1.1 EUT POWER

Voltage	12 Vdc
Number of Feeds	2 (+ and Return)

2.2 EUT CABLES

Quantity	Model/Type	Routing		Shielded / Unshielded	Description	Cable Length (m)
		From	To			
1	AWG 18	External DC supply	EUT	Unshielded	DC supply cable	0.25

2.3 MODE OF OPERATION DURING TESTS

The MR803D was tested while in a continuous transmit mode. The rf input signal was tuned to a low, middle, and high channel to perform rf power output, occupied bandwidth, and spurious/harmonic tests. The EUT was setup to operate at the intended maximum power output available to the end user. Worst-case results are presented.

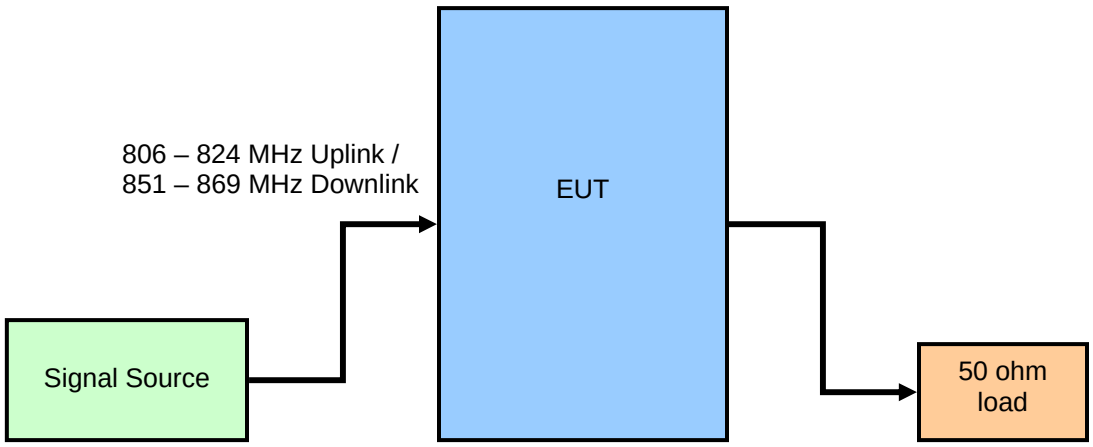
3.0 SUPPORT EQUIPMENT

3.1 CONFIGURATION

The radio was set to maximum gain and fed with an rf input signal at maximum level. This was the level at which an increase in input level did not correspond to an increase in rf output level.

3.2 TEST BED/PERIPHERAL CABLES

.None



APPENDICES

APPENDIX A: 2.1046 RF POWER OUTPUT

A.1. Base Standard & Test Basis

Base Standard	FCC PART 2.1046
Test Basis	TIA 603-C, 2004
Test Method	TIA 603-C, 2004

A.2. Specifications

90.205 Applicants for licenses must request and use no more power than the actual power necessary for satisfactory operation. Except where otherwise specifically provided for, the maximum power that will be authorized to applicants whose license applications for new stations are filed after August 18, 1995 is as follows:

(a) *Below 25 MHz.* For single sideband operations (J3E emission), the maximum transmitter peak envelope power is 1000 watts.
(b) *25–50 MHz.* The maximum transmitter output power is 300 watts.
(c) *72–76 MHz.* The maximum effective radiated power (ERP) for stations operating on fixed frequencies is 300 watts. Stations operating on mobile-only frequencies are limited to one watt transmitter output power.
(d) *150–174 MHz.* (1) The maximum allowable station ERP is dependent upon the station's antenna HAAT and required service area and will be authorized in accordance with table 1. Applicants requesting an ERP in excess of that listed in table 1 must submit an engineering analysis based upon generally accepted engineering practices and standards that includes coverage contours to demonstrate that the requested station parameters will not produce coverage in excess of that which the applicant requires.
(2) Applications for stations where special circumstances exist that make it necessary to deviate from the ERP and antenna heights in Table 1 will be submitted to the frequency coordinator accompanied by a technical analysis, based upon generally accepted engineering practices and standards, that demonstrates that the requested station parameters will not produce a signal strength in excess of 37 dBu at any point along the edge of the requested service area. The coordinator may then recommend any ERP appropriate to meet this condition.
(3) An applicant for a station with a service area radius greater than 40 km (25 mi) must justify the requested service area radius, which will be authorized only in accordance with table 1, note 4. For base stations with service areas greater than 80 km, all operations 80 km or less from the base station will be on a primary basis and all operations outside of 80 km from the base station will be on a secondary basis and will be entitled to no protection from primary operations.

Table 1_150-174 MHz_Maximum ERP/Reference HAAT for a Specific Service Area Radius

	Service area radius (km)									
	3	8	13	16	24	32	40	48[4]	64[4]	80[4]
Max. EIRP (w) [1]	1	28	178	500[2]	500[2]	500[2]	500[2]	500[2]	500[2]	500[2]
Up to ref. HAAT (m) [3]	15	15	15	15	33	65	110	160	380	670

(1) Maximum ERP indicated provides for a 37 dBu signal strength at the edge of the service area per FCC Report R-6602, Fig. 19 (See § 73.699, Fig.10).
(2) Maximum ERP of 500 watts allowed. Signal strength at the service area contour may be less than 37 dBu.
(3) When the actual antenna HAAT is greater than the reference HAAT, the allowable ERP will be reduced in accordance with the following equation:
$ERP_{allow} = ERP_{max} \times (HAAT_{ref} / HAAT_{actual})$ [2]
(4) Applications for this service area radius may be granted upon specific request with justification and must include a technical demonstration that the signal strength at the edge of the service area does not exceed 37 dBu.

(e) *217–220 MHz.* Limitations on power and antenna heights are specified in §90.259.

(f) *220–222 MHz.* Limitations on power and antenna heights are specified in §90.729.

(g) *421–430 MHz.* Limitations on power and antenna heights are specified in §90.279.

(h) *450–470 MHz.* (1) The maximum allowable station effective radiated power (ERP) is dependent upon the station's antenna HAAT and required service area and will be authorized in accordance with table 2. Applicants requesting an ERP in excess of that listed in table 2 must submit an engineering analysis based upon generally accepted engineering practices and standards that includes coverage contours to demonstrate that the requested station parameters will not produce coverage in excess of that which the applicant requires.

(2) Applications for stations where special circumstances exist that make it necessary to deviate from the ERP and antenna heights in Table 2 will be submitted to the frequency coordinator accompanied by a technical analysis, based upon generally accepted engineering practices and standards, that demonstrates that the requested station parameters will not produce a signal strength in excess of 39 dBu at any point along the edge of the requested service area. The coordinator may then recommend any ERP appropriate to meet this condition.

(3) An applicant for a station with a service area radius greater than 32 km (20 mi) must justify the requested service area radius, which may be authorized only in accordance with table 2, note 4. For base stations with service areas greater than 80 km, all operations 80 km or less from the base station will be on a primary basis and all operations outside of 80 km from the base station will be on a secondary basis and will be entitled to no protection from primary operations.

Table 2_450-470 MHz_Maximum ERP/Reference HAAT for a Specific Service Area Radius

	Service area radius (km)									
	3	8	13	16	24	32	40	48[4]	64[4]	80[4]
Max. EIRP (w) [1]	2	100	500[2]	500[2]	500[2]	500[2]	500[2]	500[2]	500[2]	500[2]
Up to ref. HAAT (m) [3]	15	15	15	27	63	125	250	410	950	2700

(1) Maximum ERP indicated provides for a 37 dBu signal strength at the edge of the service area per FCC Report R-6602, Fig. 19 (See § 73.699, Fig.10).
(2) Maximum ERP of 500 watts allowed. Signal strength at the service area contour may be less than 37 dBu.
(3) When the actual antenna HAAT is greater than the reference HAAT, the allowable ERP will be reduced in accordance with the following equation:
$ERP_{allow} = ERP_{max} \times (HAAT_{ref} / HAAT_{actual})$ [2]
(4) Applications for this service area radius may be granted upon specific request with justification and must include a technical demonstration that the signal strength at the edge of the service area does not exceed 37 dBu.

(i) *470–512 MHz.* Power and height limitations are specified in §§90.307 and 90.309.

(j) *764–776 MHz, 794–824 MHz, 851–869 MHz, 896–901 MHz and 935–940 MHz.* Power and height limitations are specified in §90.635.

(k) *902–928 MHz.* LMS systems operating pursuant to subpart M of this part in the 902–927.25 MHz band will be authorized a maximum of 30 watts ERP. LMS equipment operating in the 927.25–928 MHz band will be authorized a maximum of 300 watts ERP. ERP must be measured as peak envelope power. Antenna heights will be as specified in §90.353(h).

(l) *929–930 MHz.* Limitations on power and antenna heights are specified in §90.494.

(m) *1427–1429.5 MHz and 1429.5–1432 MHz.* Limitations on power are specified in §90.259.

(n) *2450–2483.5 MHz.* The maximum transmitter power is 5 watts.

(o) *4940–4990 MHz.* Limitations on power are specified in §90.1215.

(p) *5850–5925 MHz.* Power and height limitations are specified in subpart M of this part.

(q) *All other frequency bands.* Requested transmitter power will be considered and authorized on a case by case basis.

(r) The output power shall not exceed by more than 20 percent either the output power shown in the Radio Equipment List [available in accordance with §90.203(a)(1)] for transmitters included in this list or when not so listed, the manufacturer's rated output power for the particular transmitter specifically listed on the authorization.

A.3. Measurement Uncertainty

Expanded Uncertainty (K=2)
+1.11/-1.22

A.4. Deviations

Deviation Number	Time & Date	Description and Justification of Deviation	Deviation Reference			Approval
			Base Standard	Test Basis	NTS Procedure	
none						

A.5. Test Procedure

TIA 603-C, 2004

A.6. Test Results

The EUT is in compliance with the limits as specified above

A.7. Operating Mode During Test

The transmitter was tested while in a continuous transmit mode. The rf input signal was tuned to a low, middle, and high channel.

A.8. Sample Calculation

NA

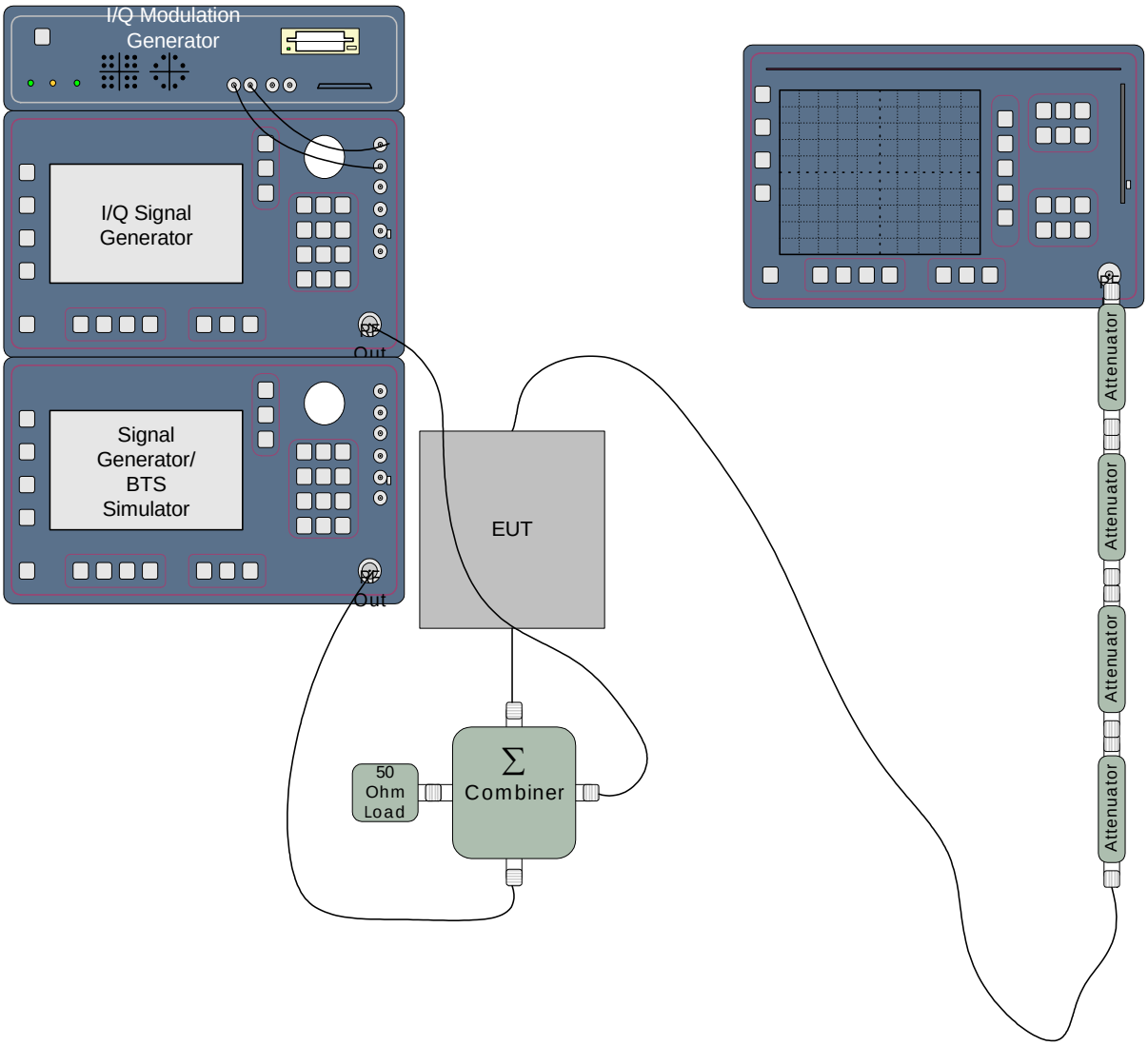
A.9. Test Data

Frequency (MHz)	Modulation Mode	RF Power Output at Antenna Terminals (dBm)
806.0125	F8W (Analogue)	+18
816.0000	F8W (Analogue)	+18
823.9875	F8W (Analogue)	+18
851.0125	F8W (Analogue)	+18
860.0000	F8W (Analogue)	+18
868.9875	F8W (Analogue)	+18
806.0125	GXW (iDEN)	+18
816.0000	GXW (iDEN)	+18
823.9875	GXW (iDEN)	+18
851.0125	GXW (iDEN)	+18
860.0000	GXW (iDEN)	+18
868.9875	GXW (iDEN)	+18

The rf power output was measured at the antenna terminals using a spectrum analyzer with Peak detector. The RBW was set to 20 MHz and the VBW was set to 30 MHz. The rf input level was increased until no further increase in rf output power was noted.

Test By: Tom Tidwell
Responsibility Manager of Wireless Services
Test Date: 21 May, 2007

A.10. Test Diagram



A.11. Tested By

Name: Tom Tidwell,
Function: Manager of Wireless Services
Test Date: 17 – 21 May, 2007

APPENDIX B: 2.1047 MODULATION CHARACTERISTICS

B.1. Base Standard & Test Basis

Base Standard	FCC 2.1047
Test Basis	FCC 2.1047 Modulation Characteristics
Test Method	TIA 603-C, 2004

B.2. Specifications

2.1047 – Modulation Characteristics

(a) *Voice modulated communication equipment.* A curve or equivalent data showing the frequency response of the audio modulating circuit over a range of 100 to 5000 Hz shall be submitted. For equipment required to have an audio low-pass filter, a curve showing the frequency response of the filter, or of all circuitry installed between the modulation limiter and the modulated stage shall be submitted.
(b) *Equipment which employs modulation limiting.* A curve or family of curves showing the percentage of modulation versus the modulation input voltage shall be supplied. The information submitted shall be sufficient to show modulation limiting capability throughout the range of modulating frequencies and input modulating signal levels employed.
(c) *Single sideband and independent sideband radiotelephone transmitters which employ a device or circuit to limit peak envelope power.* A curve showing the peak envelope power output versus the modulation input voltage shall be supplied. The modulating signals shall be the same in frequency as specified in paragraph (c) of §2.1049 for the occupied bandwidth tests.
(d) *Other types of equipment.* A curve or equivalent data which shows that the equipment will meet the modulation requirements of the rules under which the equipment is to be licensed.

90.209 - Bandwidth limitations

(a) Each authorization issued to a station licensed under this part will show an emission designator representing the class of emission authorized. The designator will be prefixed by a specified necessary bandwidth. This number does not necessarily indicate the bandwidth occupied by the emission at any instant. In those cases where §2.202 of this chapter does not provide a formula for the computation of necessary bandwidth, the occupied bandwidth, as defined in part 2 of this chapter, may be used in lieu of the necessary bandwidth.
(b) The maximum authorized single channel bandwidth of emission corresponding to the type of emission specified in §90.207 is as follows:
(1) For A1A or A1B emissions, the maximum authorized bandwidth is 0.25 kHz. The maximum authorized bandwidth for type A3E emission is 8 kHz.
(2) For operations below 25 MHz utilizing J3E emission, the bandwidth occupied by the emission shall not exceed 3000 Hz. The assigned frequency will be specified in the authorization. The authorized carrier frequency will be 1400 Hz lower in frequency than the assigned frequency. Only upper sideband emission may be used. In the case of regularly available double sideband radiotelephone channels, an assigned frequency for J3E emissions is available either 1600 Hz below or 1400 Hz above the double sideband radiotelephone assigned frequency.
(3) For all other types of emissions, the maximum authorized bandwidth shall not be more than that normally authorized for voice operations.
(4) Where a frequency is assigned exclusively to a single licensee, more than a single emission may be used within the authorized bandwidth. In such cases, the frequency stability requirements of §90.213 must be met for each emission.
(5) Unless specified elsewhere, channel spacings and bandwidths that will be authorized in the following frequency bands are given in the following table.

Standard Channel Spacing / Authorized Bandwidth		
Frequency (MHz)	Channel Spacing (kHz)	Authorized Bandwidth (kHz)
Below 25[(2)]		
25 – 50	20	20

72 – 76	20	20
150 – 174	7.5(1)	20/11.25/6(1), (3)
216 – 220(5)	6.25	20/11.25/6(5)
220 – 222	5	4
406 – 512(2)	6.25(1)	20/11.25/6(1), (3)
806 – 809 / 851 - 854	12.5	20
809 – 824 / 854 – 869	25	20
896 – 901 / 935 – 940	12.5	13.6
902 – 928(4)		
929 – 930	25	20
1427 – 1432(5)	12.5	12.5
2450 – 2483.52(2)		
Above 2500(2)		

(1) For stations authorized on or after August 18, 1995.
(2) Bandwidths for radiolocation stations in the 420-450 MHz band and for stations operating in bands subject to this footnote will be reviewed and authorized on a case-by-case basis.
(3) Operations using equipment using a 25 kHz bandwidth will be authorized a 20 kHz bandwidth. Operations using equipment designed to operate with a 12.5 kHz channel bandwidth will be authorized an 11.25 kHz bandwidth. Operations using equipment designed to operate with a 6.25 kHz channel bandwidth will be authorized a 6 kHz bandwidth. All stations must operate on channels with a bandwidth of 12.5 kHz or less beginning January 1, 2013, unless the operations meet the efficiency standard of §90.203(j)(3) unless specified elsewhere.
(4) The maximum authorized bandwidth shall be 12 MHz for non-multilateration LMS operations in the band 909.75-921.75 MHz and 2 MHz in the band 902.00-904.00 MHz. The maximum authorized bandwidth for multilateration LMS operations shall be 5.75 MHz in the 904.00-909.75 MHz band; 2 MHz in the 919.75-921.75 MHz band; 5.75 MHz in the 921.75-927.25 MHz band and its associated 927.25-927.50 MHz narrowband forward link; and 8.00 MHz if the 919.75-921.75 MHz and 921.75-927.25 MHz bands and their associated 927.25-927.50 MHz and 927.50-927.75 MHz narrowband forward links are aggregated.

Authorized Bandwidth from above table: 20 kHz

B.3. Measurement Uncertainty

Expanded Uncertainty (K=2)
+1.11/-1.22

B.4. Deviations

Deviation Number	Time & Date	Description and Justification of Deviation	Deviation Reference			Approval
			Base Standard	Test Basis	NTS Procedure	
none						

B.5. Test Method

EIA/TIA 603C

B.6. Test Results

Not Applicable. This device does not produce any modulation but merely processes a modulated rf waveform.

APPENDIX C: 2.1049 OCCUPIED BANDWIDTH

C.1. Base Standard & Test Basis

Base Standard	FCC 2.1049
Test Basis	FCC 2.1049 Occupied Bandwidth
Test Method	TIA 603-C, 2004

C.2. Specifications

90.210 Emission masks.
Except as indicated elsewhere in this part, transmitters used in the radio services governed by this part must comply with the emission masks outlined in this section. Unless otherwise stated, per paragraphs (d)(4), (e)(4), and (m) of this section, measurements of emission power can be expressed in either peak or average values provided that emission powers are expressed with the same parameters used to specify the unmodulated transmitter carrier power. For transmitters that do not produce a full power unmodulated carrier, reference to the unmodulated transmitter carrier power refers to the total power contained in the channel bandwidth. Unless indicated elsewhere in this part, the table in this section specifies the emission masks for equipment operating in the frequency bands governed under this part.

Applicable Emission Masks		
Frequency (MHz)	Mask for equipment with audio low-pass filter	Mask for equipment without audio low-pass filter
Below 25(1)	A or B	A or C
25 – 50	B	C
72 – 76	B	C
150 – 174(2)	B, D, or E	C, D, or E
150 paging only	B	C
220 – 222	F	F
421 – 512(2)	B, D, or E	C, D, or E
450 paging only	B	G
806 – 809 / 851 - 854	B	H
809 – 824 / 854 – 869(3)	B	G
896 – 901 / 935 – 940	I	J
902 – 928(4)	K	K
929 – 930	B	G
4940 – 4990	L or M	L or M
5850 - 5925(4)	-	-
All other bands	B	C

(1) Equipment using single sideband J3E emission must the requirements of Emission Mask A. Equipment using other emissions must meet the requirements of Emission Mask B or C, as applicable.
(2) Equipment designed to operate with a 25 kHz channel bandwidth must meet the requirements of Emission Mask B or C, as applicable. Equipment designed to operate with a 12.5 kHz channel bandwidth must meet the requirements of Emission Mask D, and equipment designed to operate with a 6.25 kHz channel bandwidth Must meet the requirements of Emission Mask E.
(3) Equipment used in this licensed to EA or non-EA systems shall comply with the emission mask provisions of § 90.691.
(4) DSRCS Roadside Units equipment in the 5850-5925 MHz band is governed under subpart M of this part.

C.3. Measurement Uncertainty

Expanded Uncertainty (K=2)
+1.11/-1.22

C.4. Deviations

Deviation Number	Time & Date	Description and Justification of Deviation	Deviation Reference			Approval
			Base Standard	Test Basis	NTS Procedure	
none						

C.5. Test Method

TIA 603-C, 2004

C.6. Test Results

Compliant. The device does not degrade the modulated rf waveform. This is demonstrated by comparing the input waveform to the output waveform.

C.7. Deviations from Normal Operating Mode During Test

None.

C.8. Sample Calculation

None.

C.9. Test Data

See plots following.

Figure 1 Analogue Output Uplink - FM 2.5 kHz tone @ 3 kHz deviation – Low Channel (806.0125 MHz)

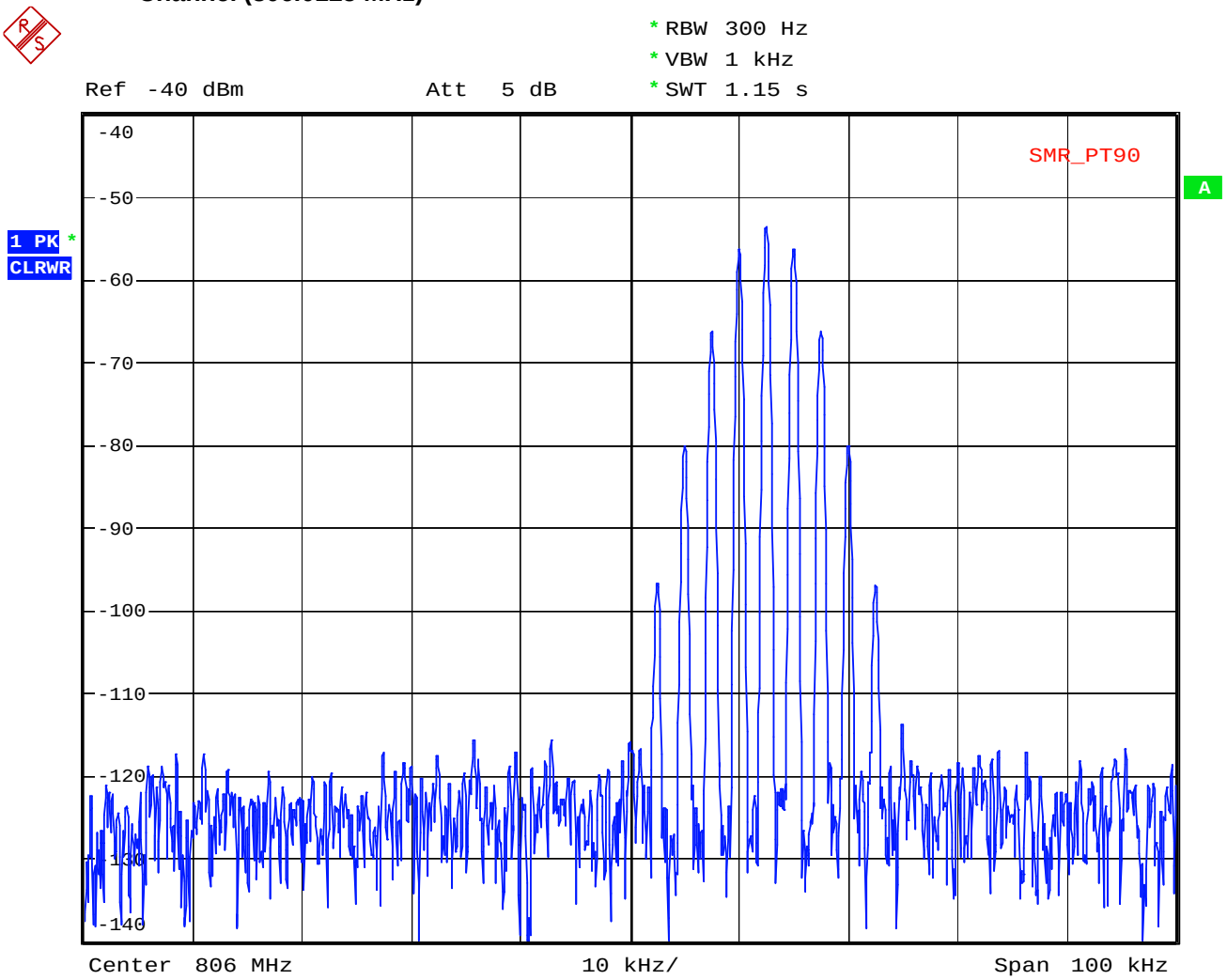
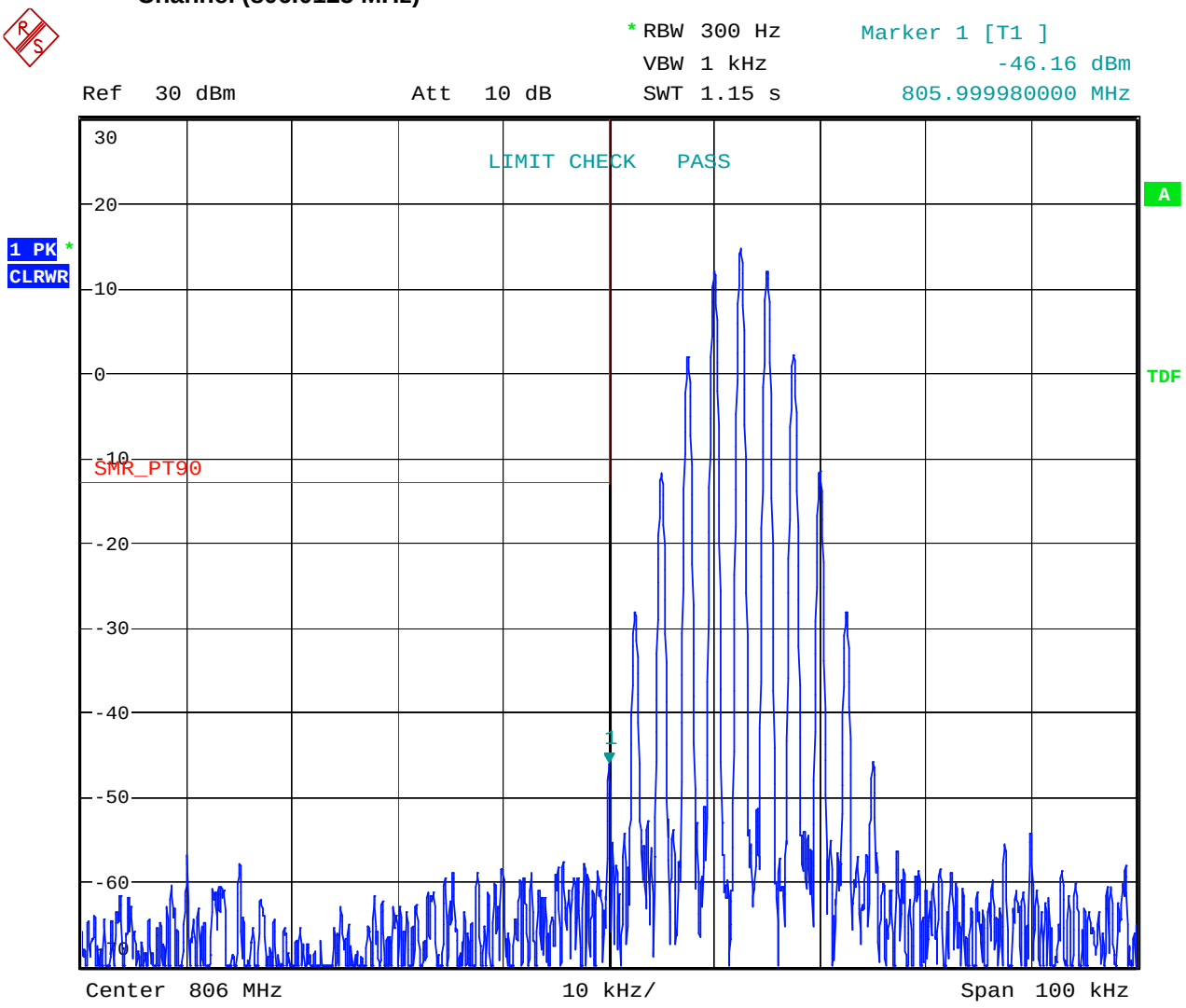


Figure 2 Analogue Output Uplink - FM 2.5 kHz tone @ 3 kHz deviation – Low Channel (806.0125 MHz)



Date: 22.MAY.2007 18:25:30

Figure 3 Analogue Input Uplink - FM 2.5 kHz tone @ 3 kHz deviation – Mid Channel (816.3625 MHz)

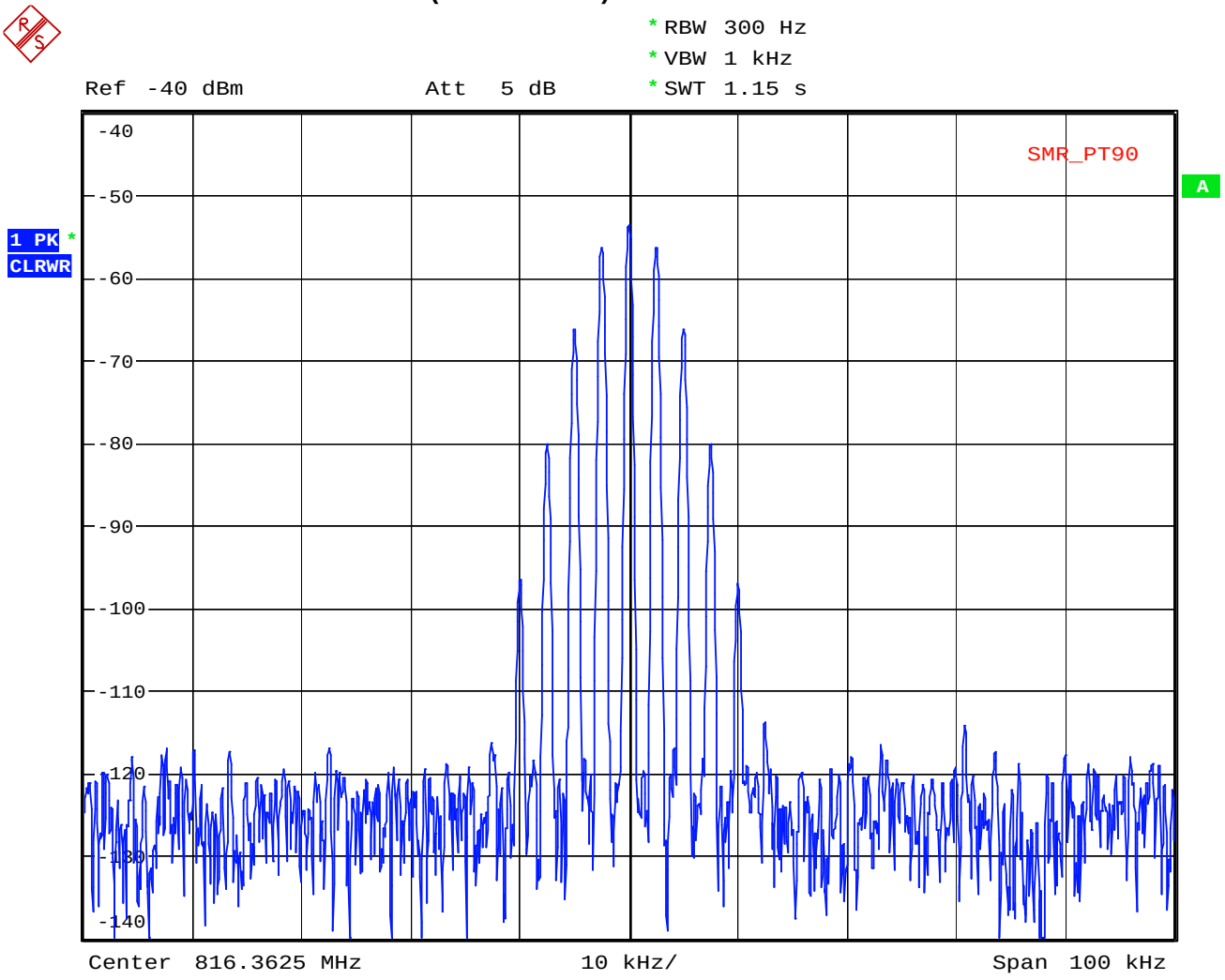
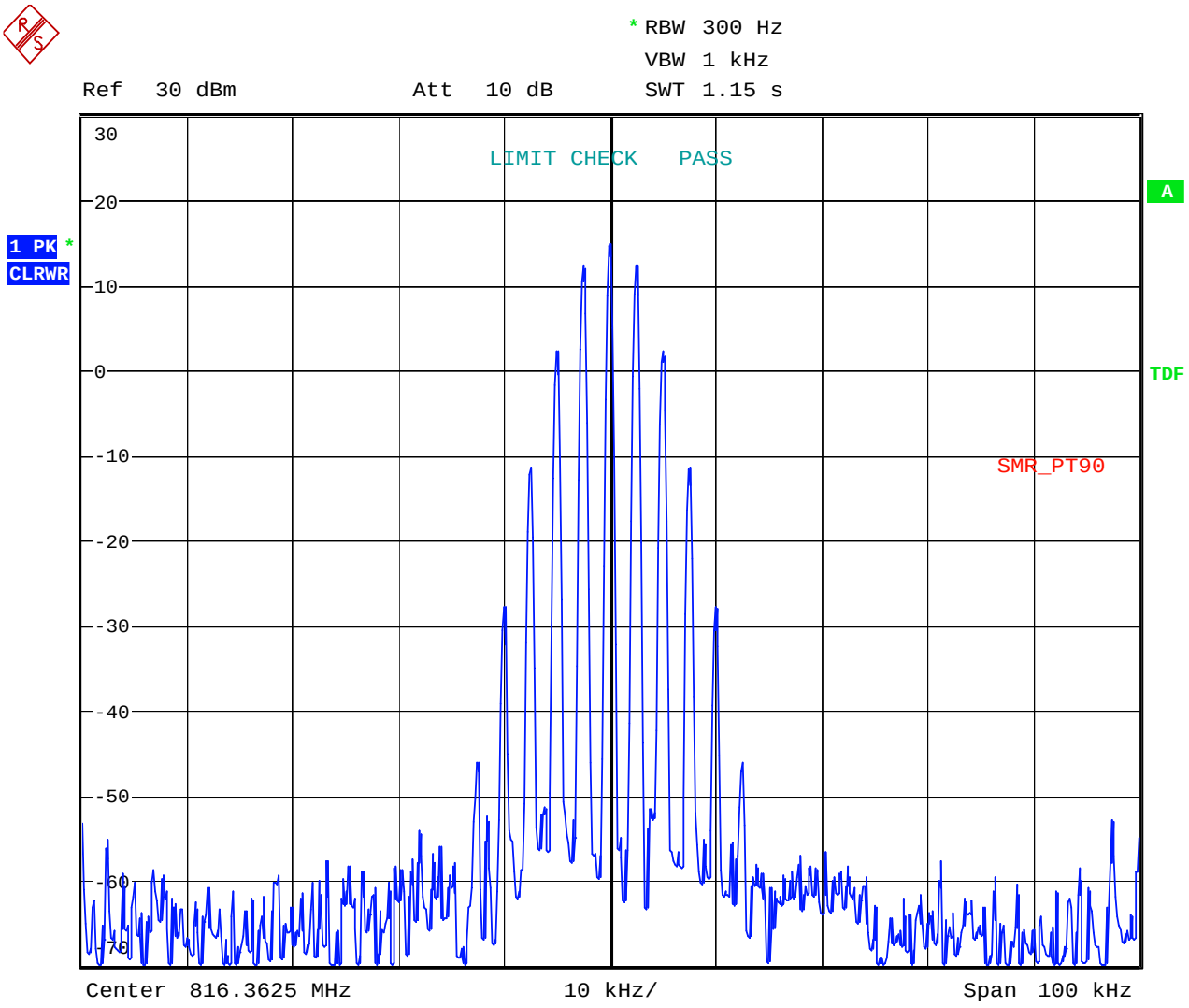


Figure 4 Analogue Output Uplink - FM 2.5 kHz tone @ 3 kHz deviation – Mid Channel (816.3625 MHz)



Date: 22.MAY.2007 18:28:54

Figure 5 Analogue Input Uplink - FM 2.5 kHz tone @ 3 kHz deviation – Upper Channel (823.9875 MHz)

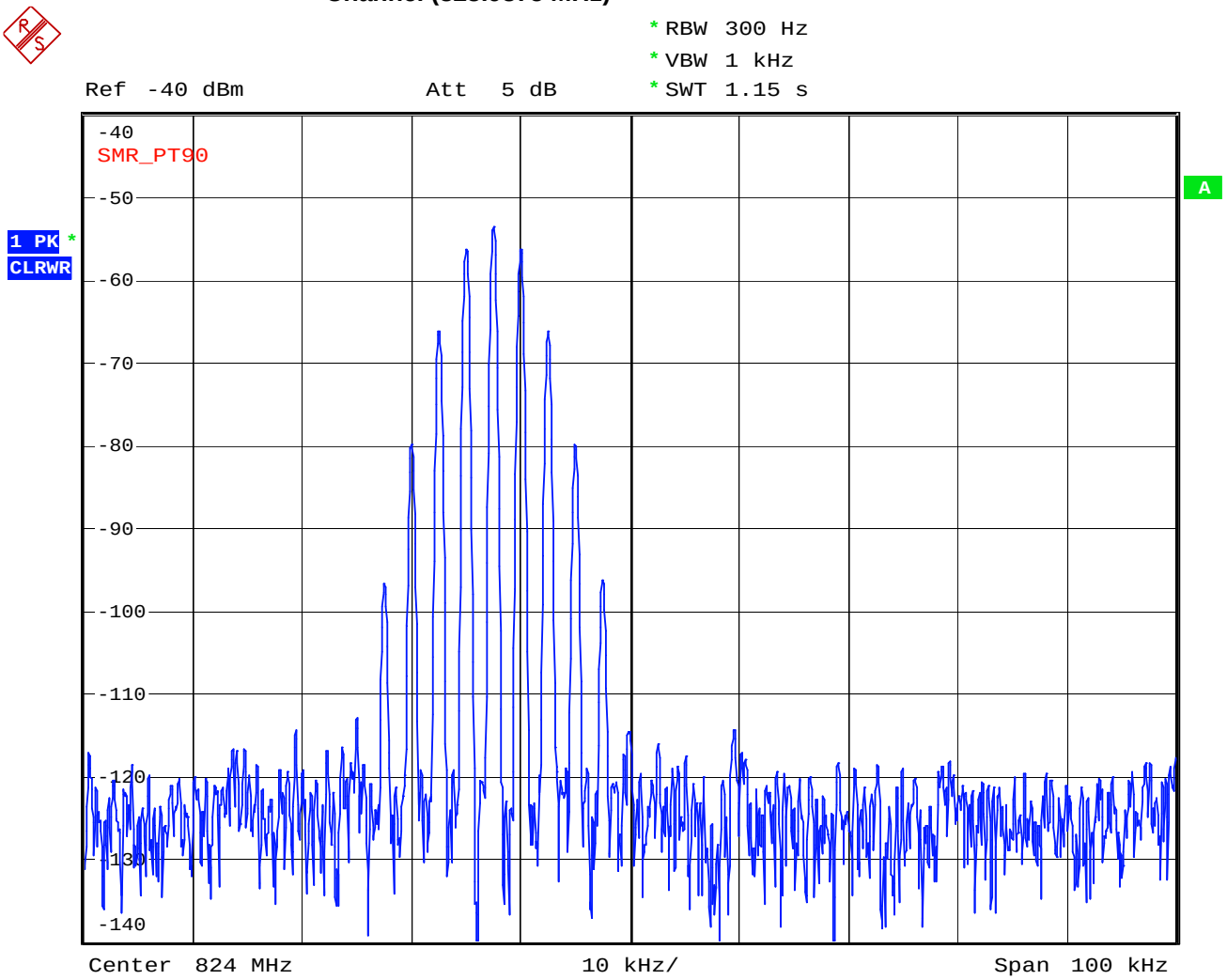
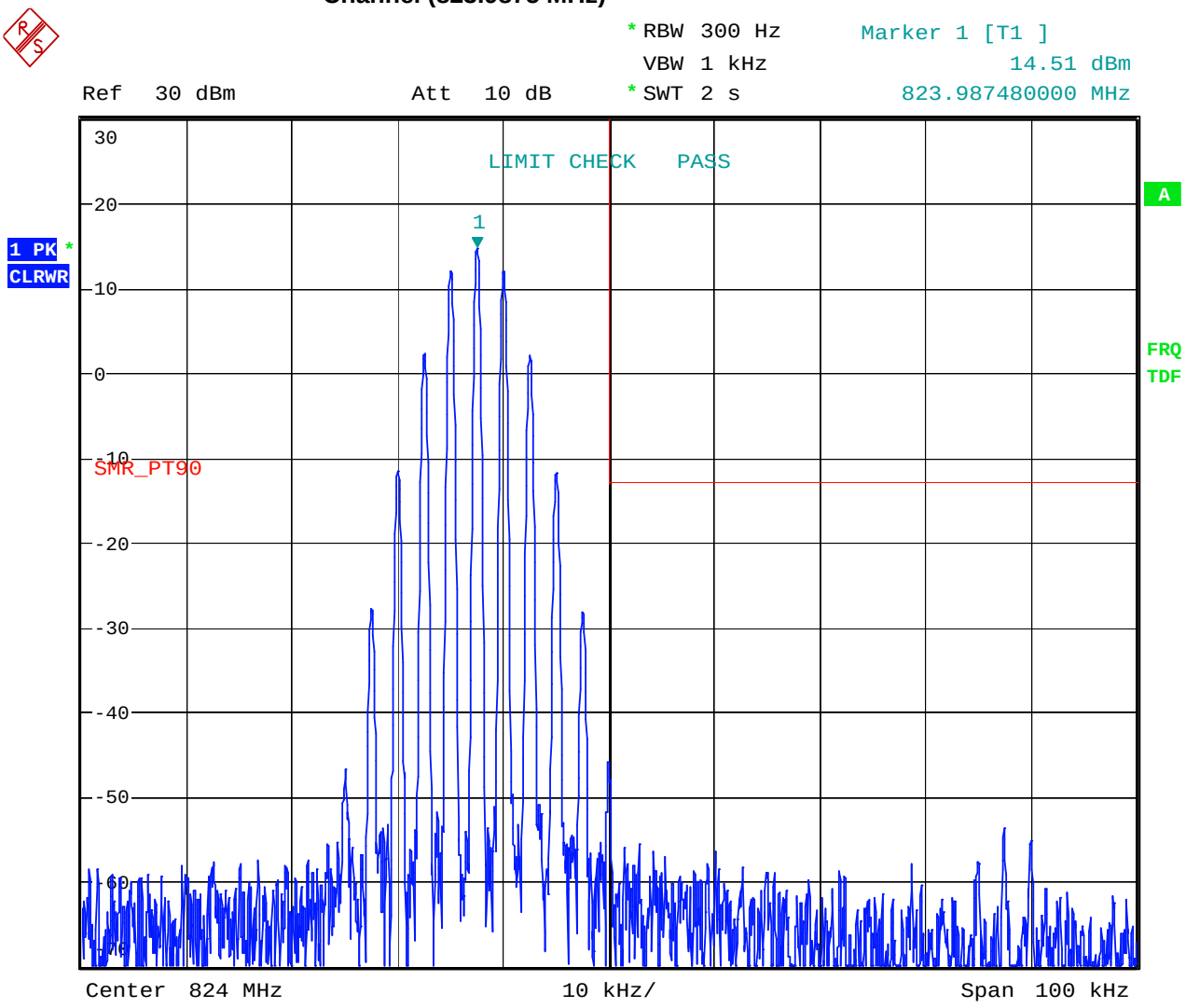


Figure 6 Analogue Output Uplink - FM 2.5 kHz tone @ 3 kHz deviation – Upper Channel (823.9875 MHz)



Date: 22.MAY.2007 15:17:06

Figure 7 iDEN Waveform Input Uplink – Low Channel (806.0125 MHz)

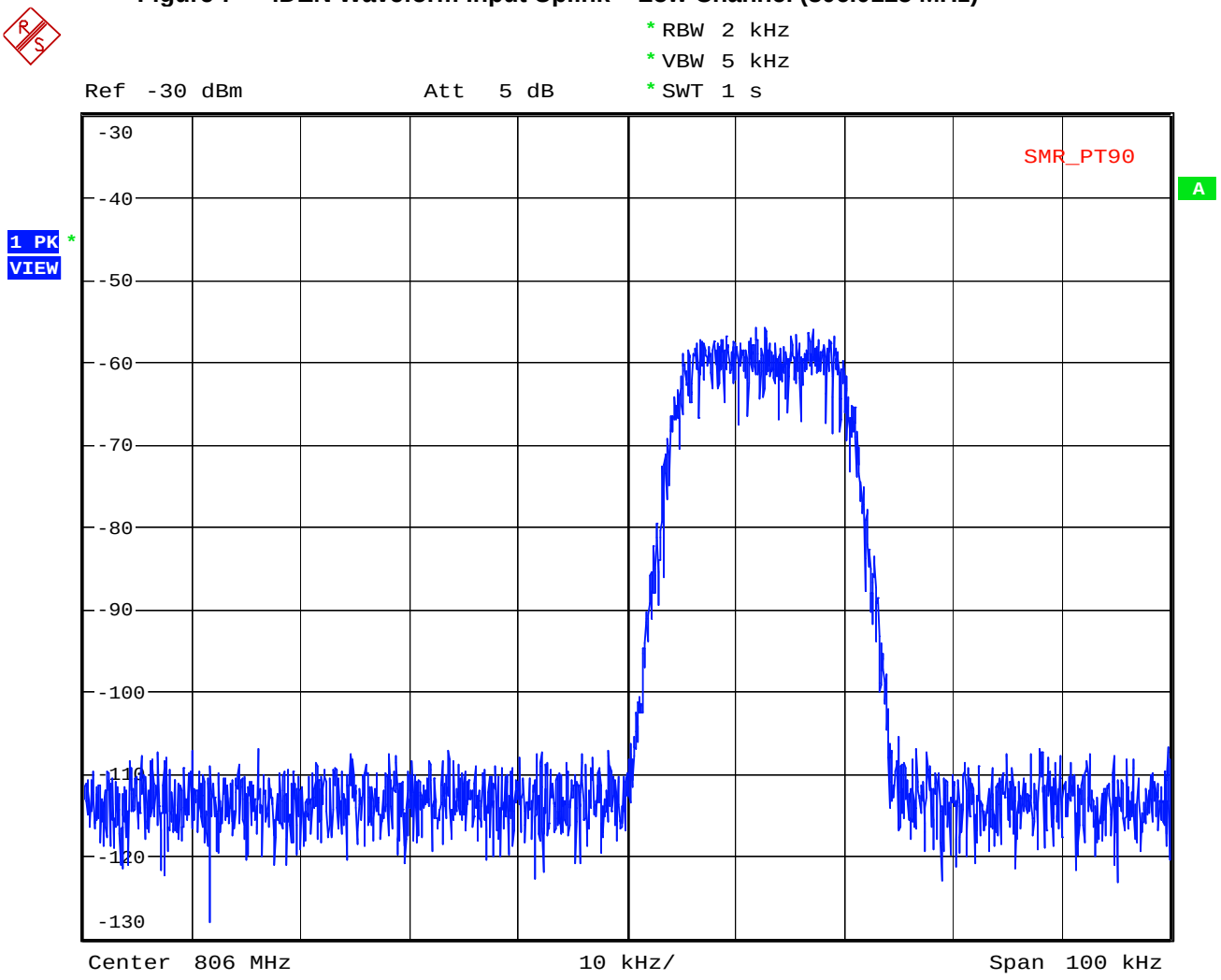
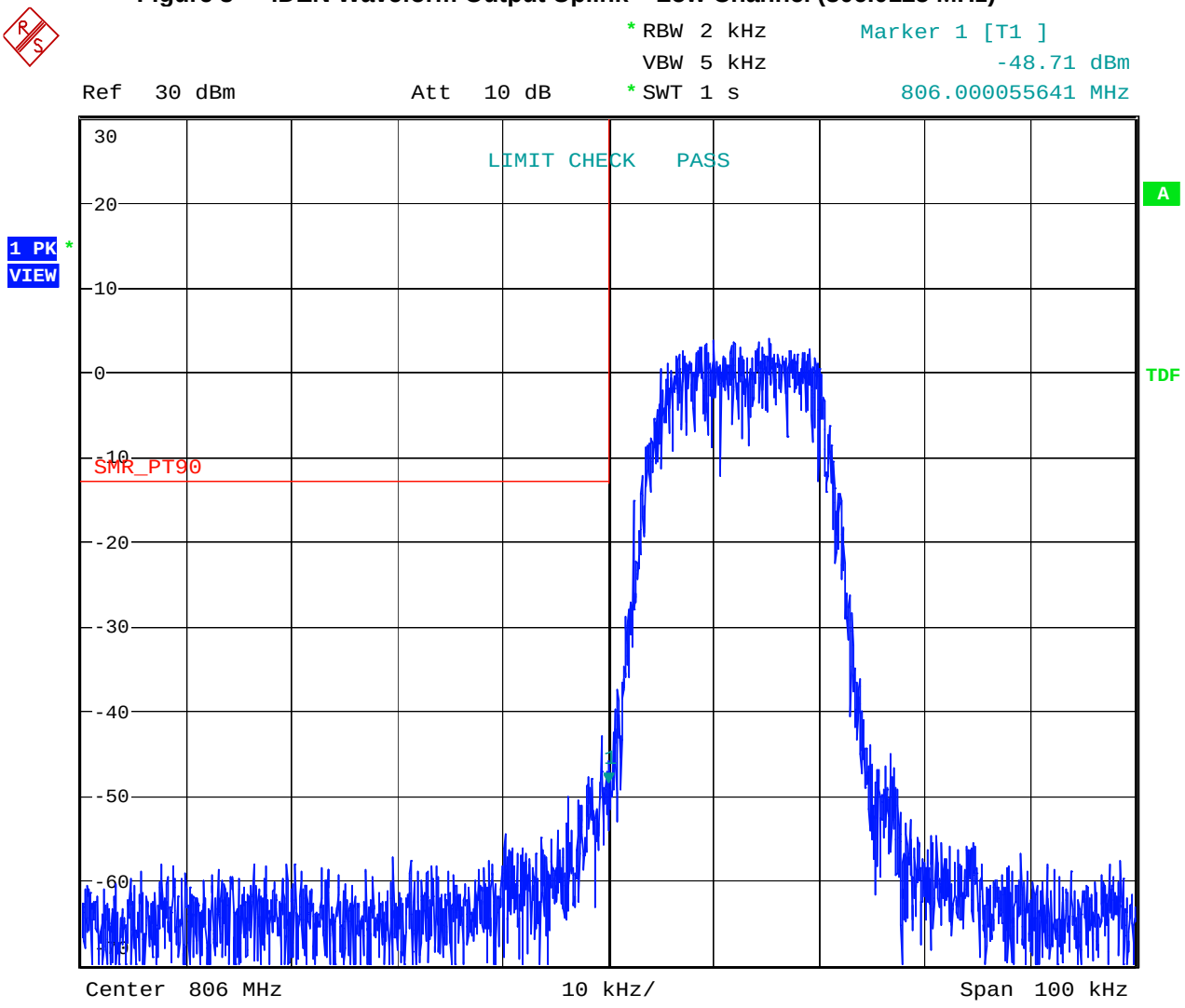


Figure 8 iDEN Waveform Output Uplink – Low Channel (806.0125 MHz)



Date: 21.MAY.2007 22:39:43

Figure 9 iDEN Waveform Input Uplink – Mid Channel (815.000 MHz)

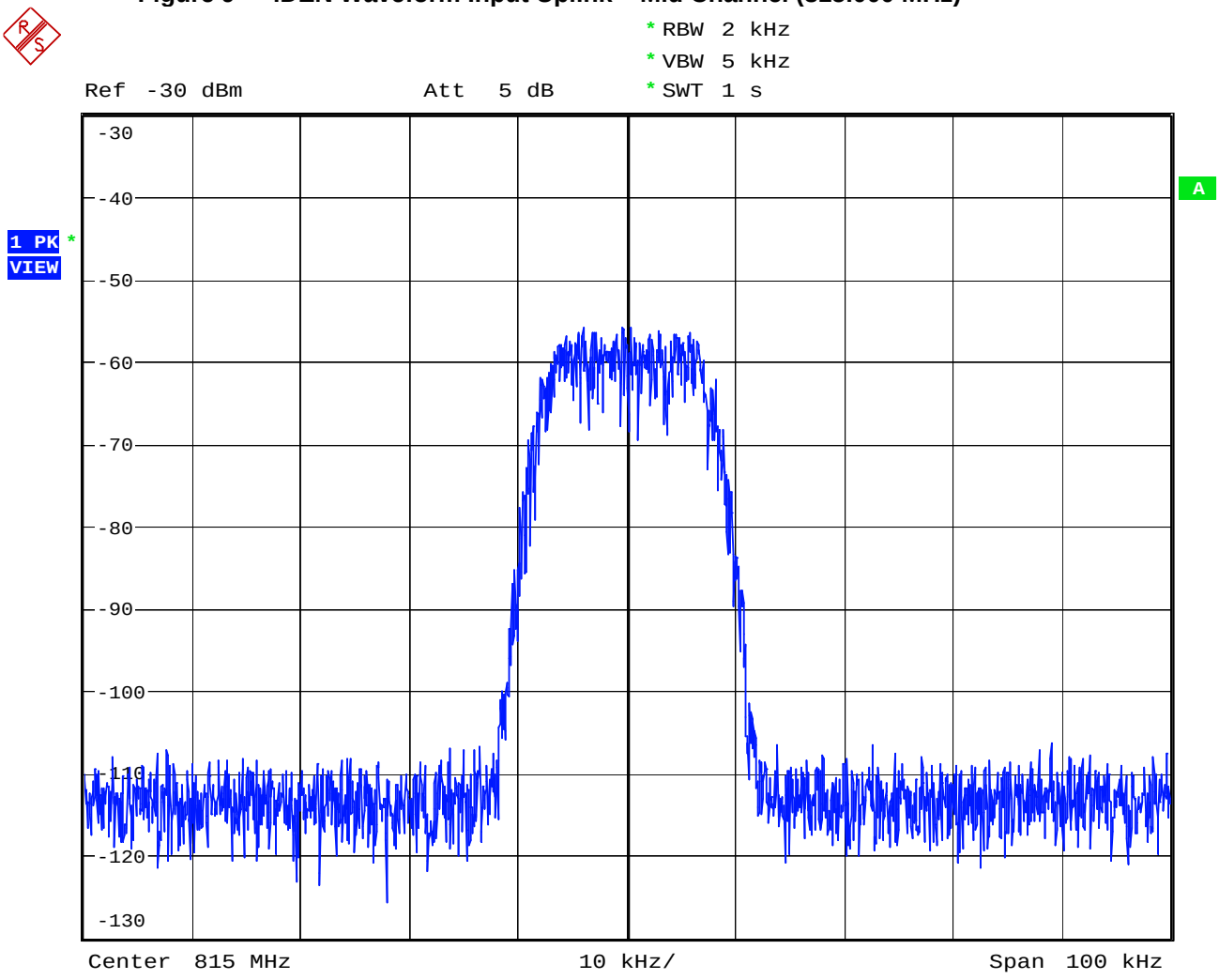
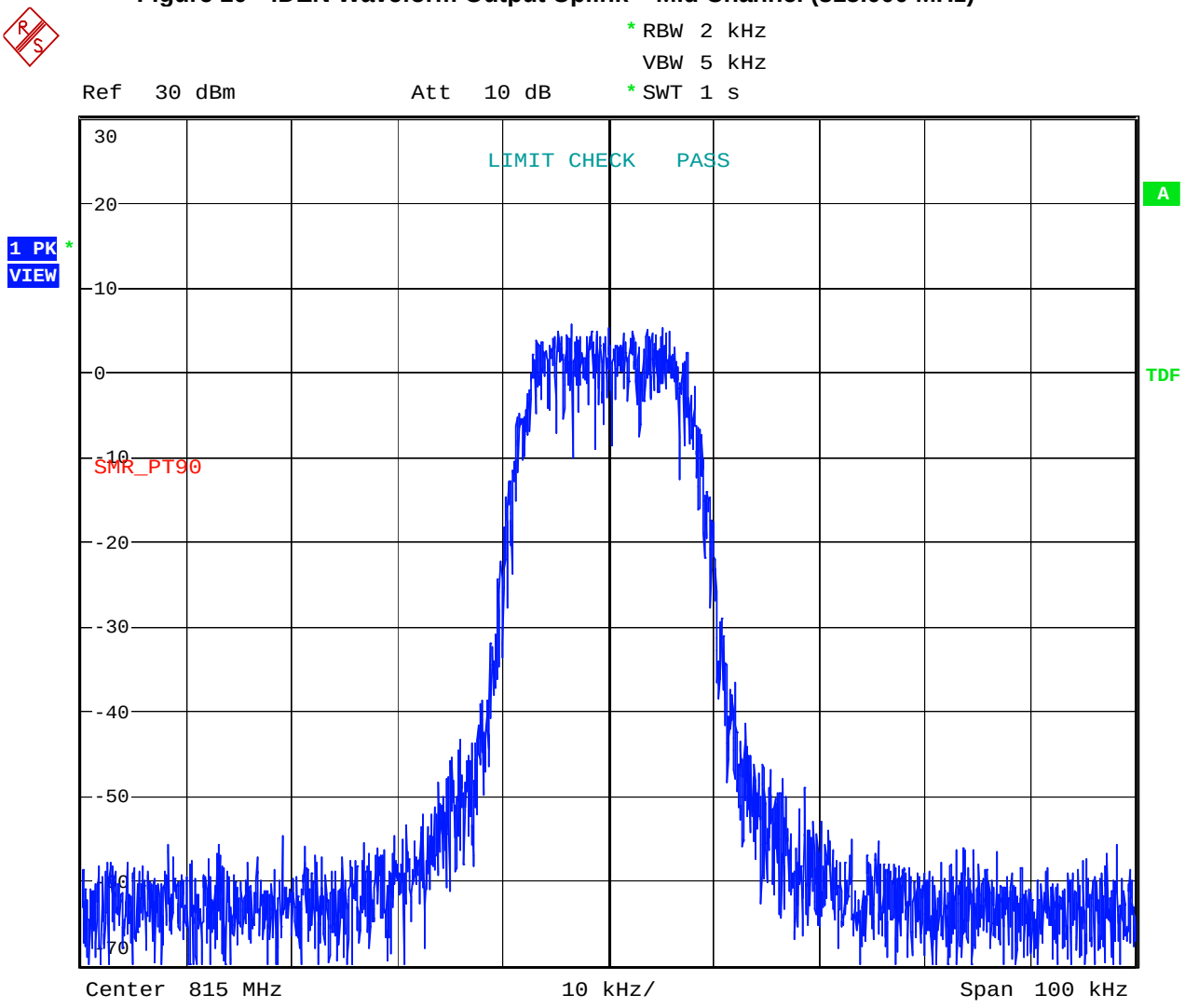


Figure 10 iDEN Waveform Output Uplink – Mid Channel (815.000 MHz)



Date: 21.MAY.2007 22:37:03

Figure 11 iDEN Waveform Input Uplink – Upper Channel (823.9875 MHz)

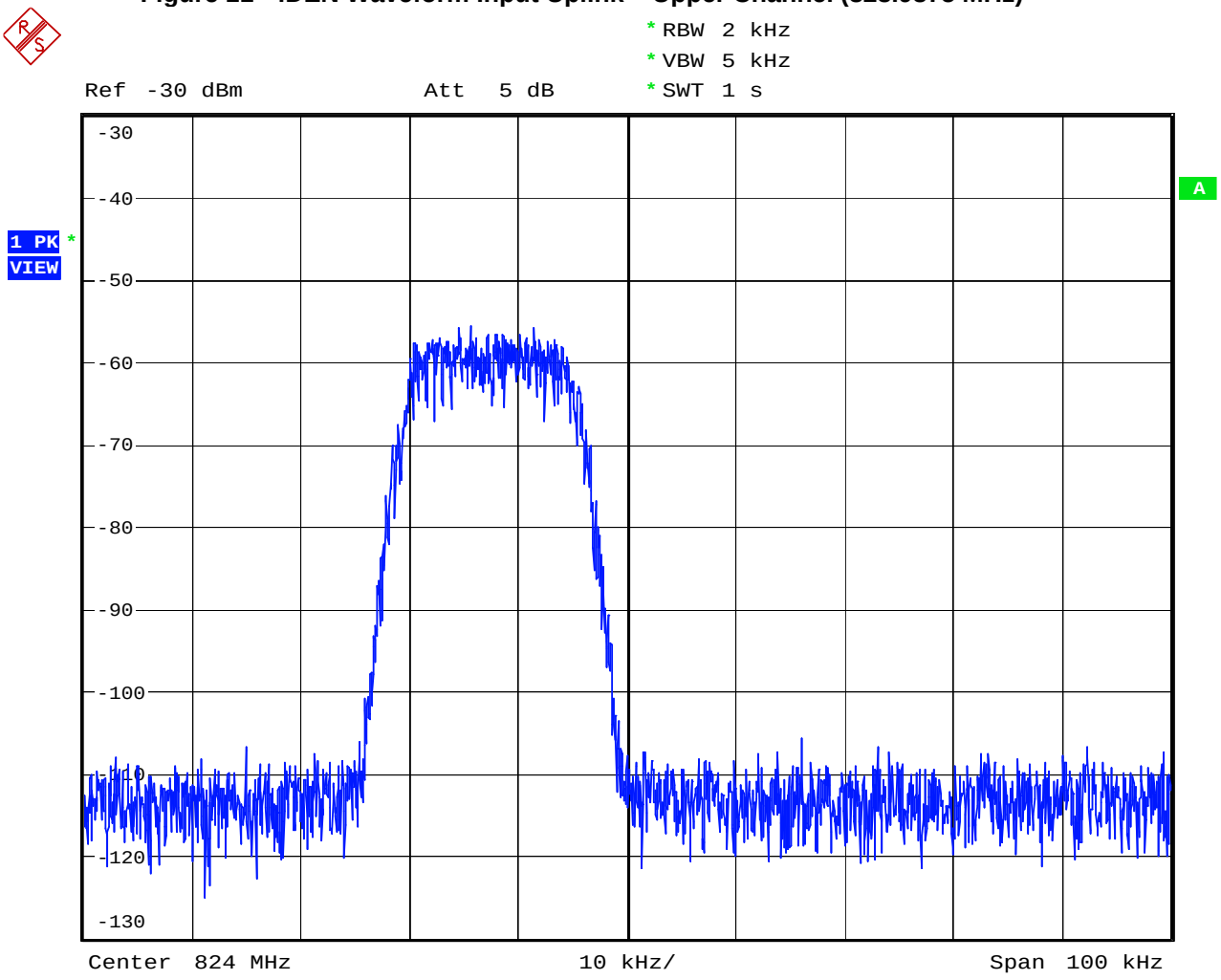
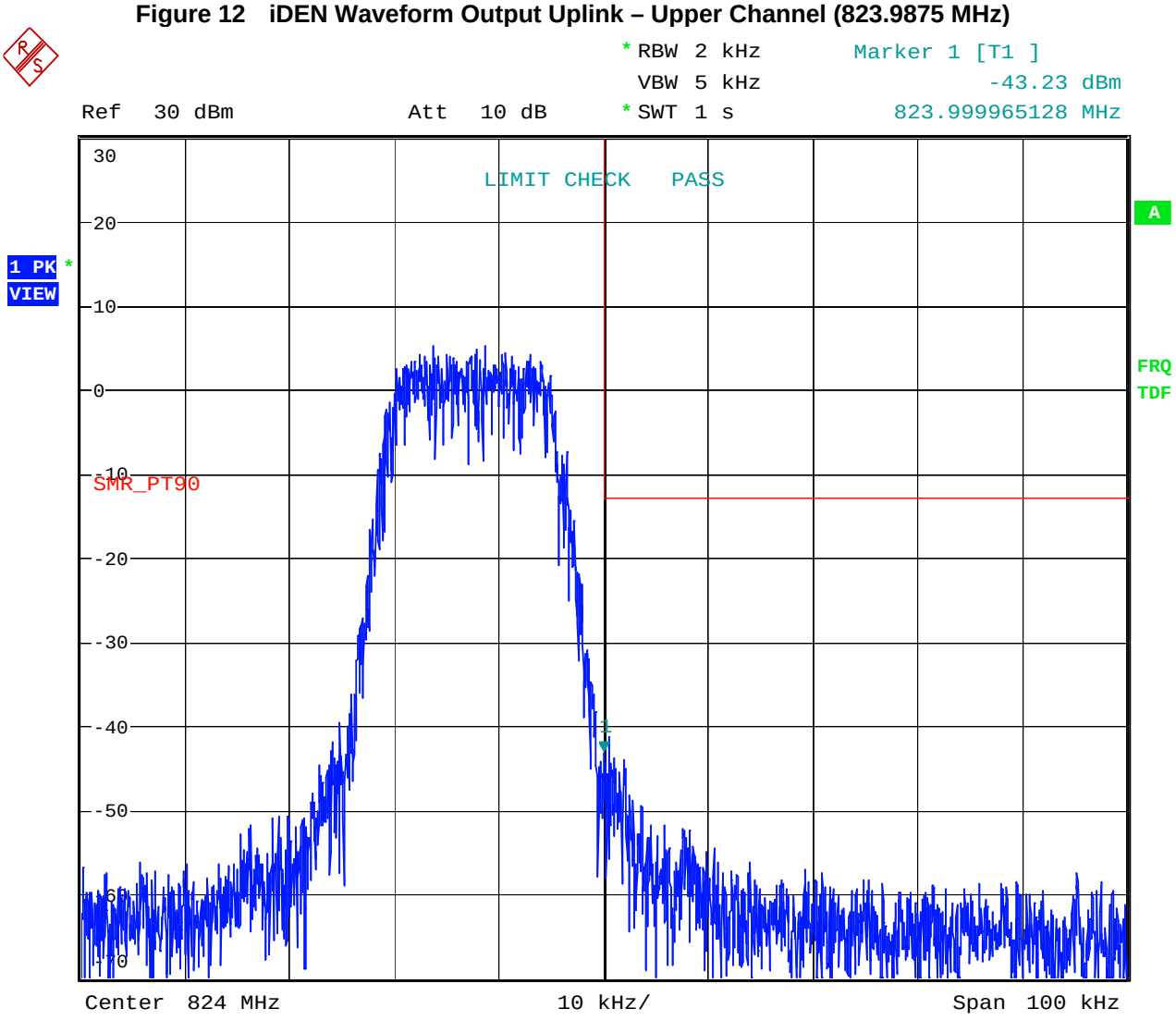


Figure 12 iDEN Waveform Output Uplink – Upper Channel (823.9875 MHz)



Date: 21.MAY.2007 22:51:00

Figure 13 Analogue Input Downlink – FM 2.5 kHz tone @ 3 kHz deviation – Low Channel (851.0125 MHz)

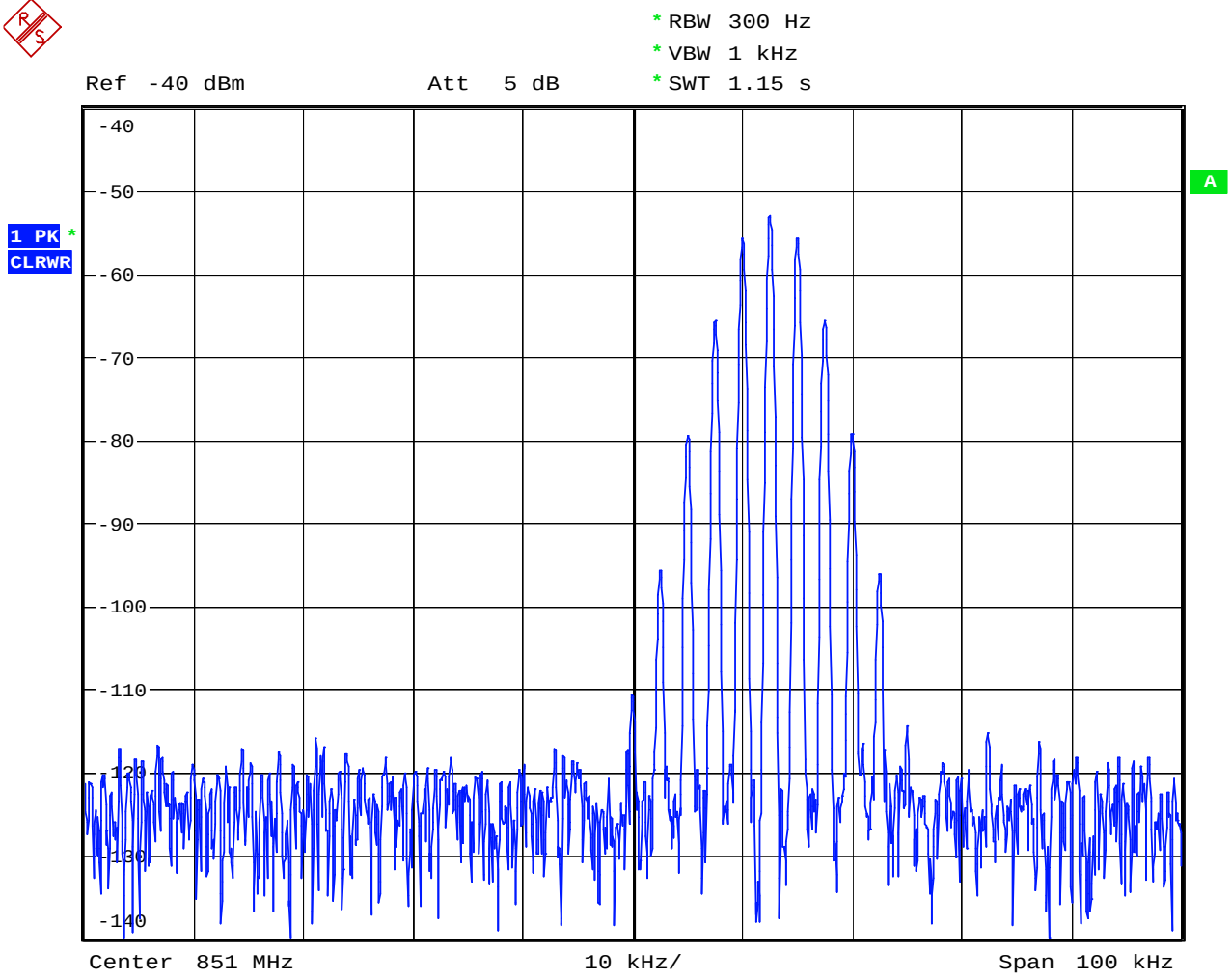
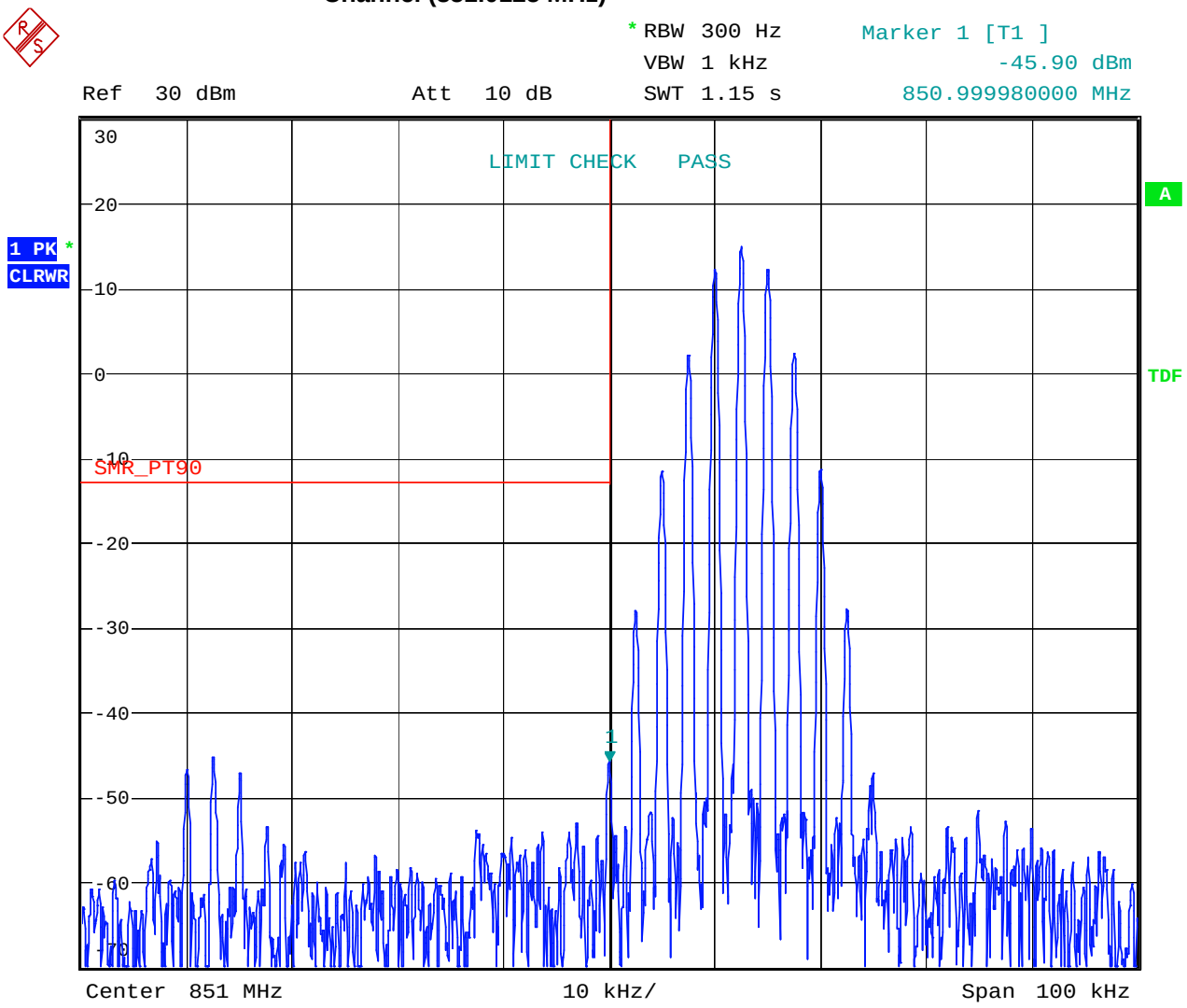


Figure 14 Analogue Output Downlink – FM 2.5 kHz tone @ 3 kHz deviation – Low Channel (851.0125 MHz)



Date: 22.MAY.2007 17:14:08

Figure 15 Analogue Input Downlink – FM 2.5 kHz tone @ 3 kHz deviation – Mid Channel (861.3625 MHz)

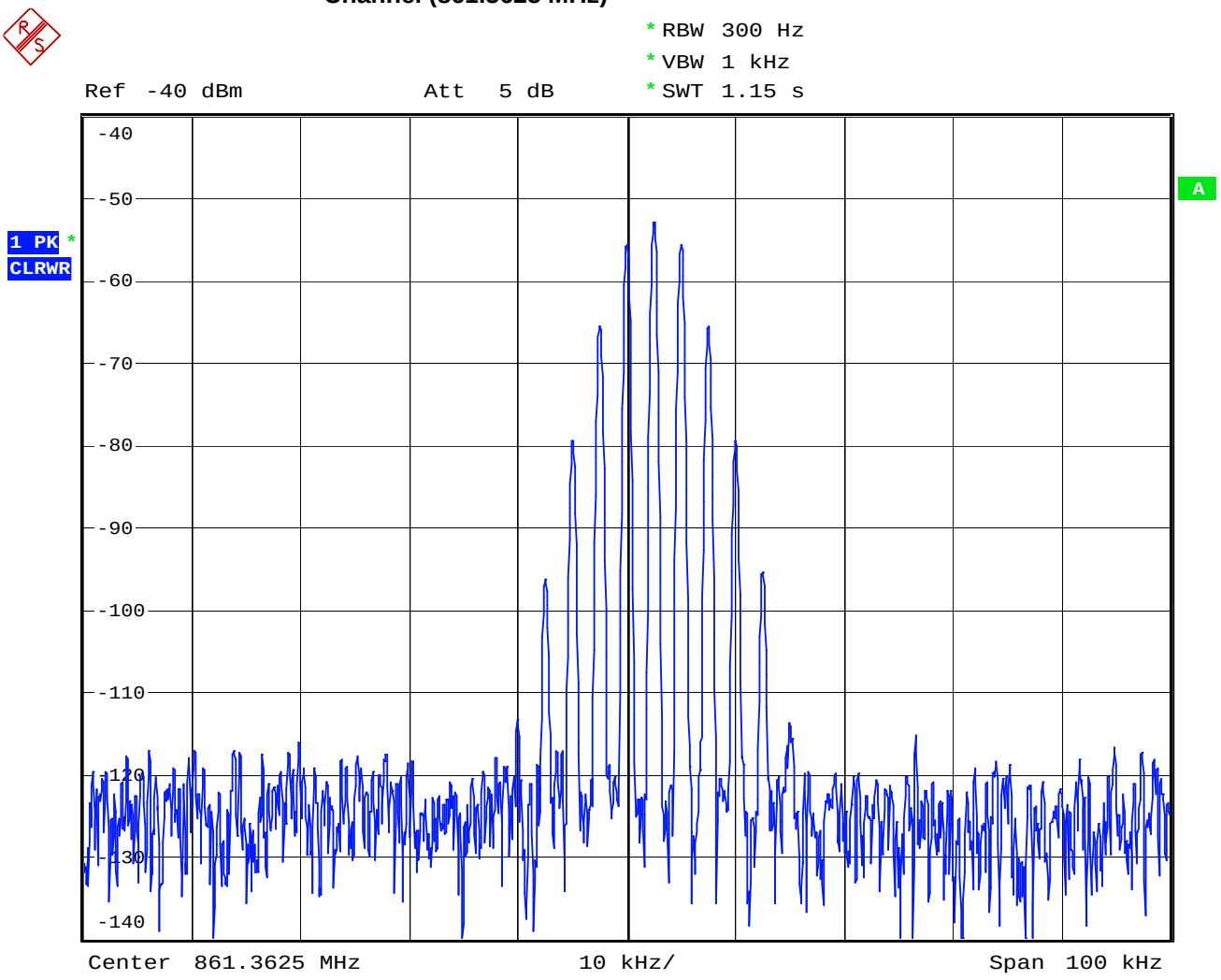
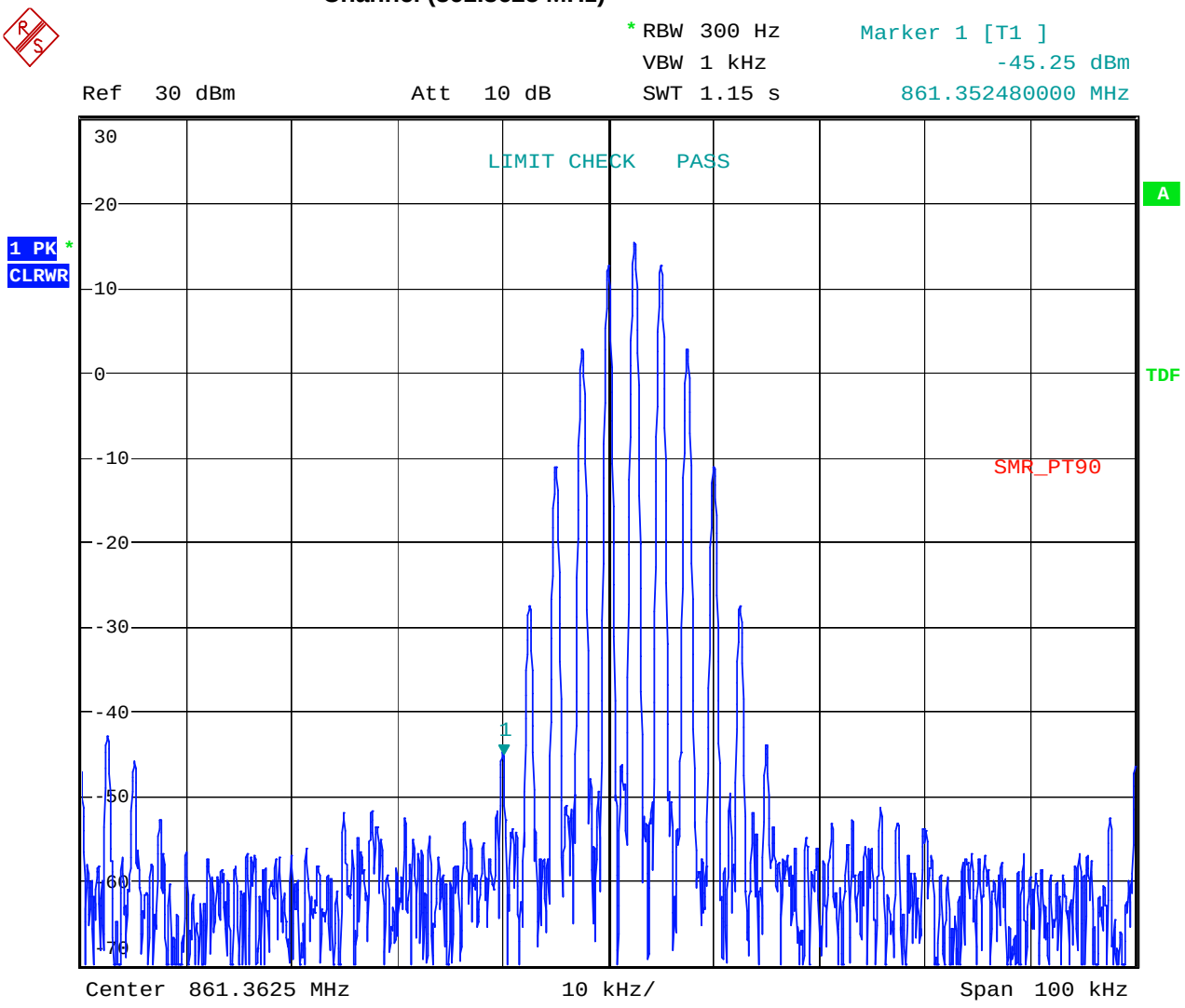


Figure 16 Analogue Output Downlink – FM 2.5 kHz tone @ 3 kHz deviation – Mid Channel (861.3625 MHz)



Date: 22.MAY.2007 17:13:05

Figure 17 Analogue Input Downlink – FM 2.5 kHz tone @ 3 kHz deviation – Upper Channel (868.9875 MHz)

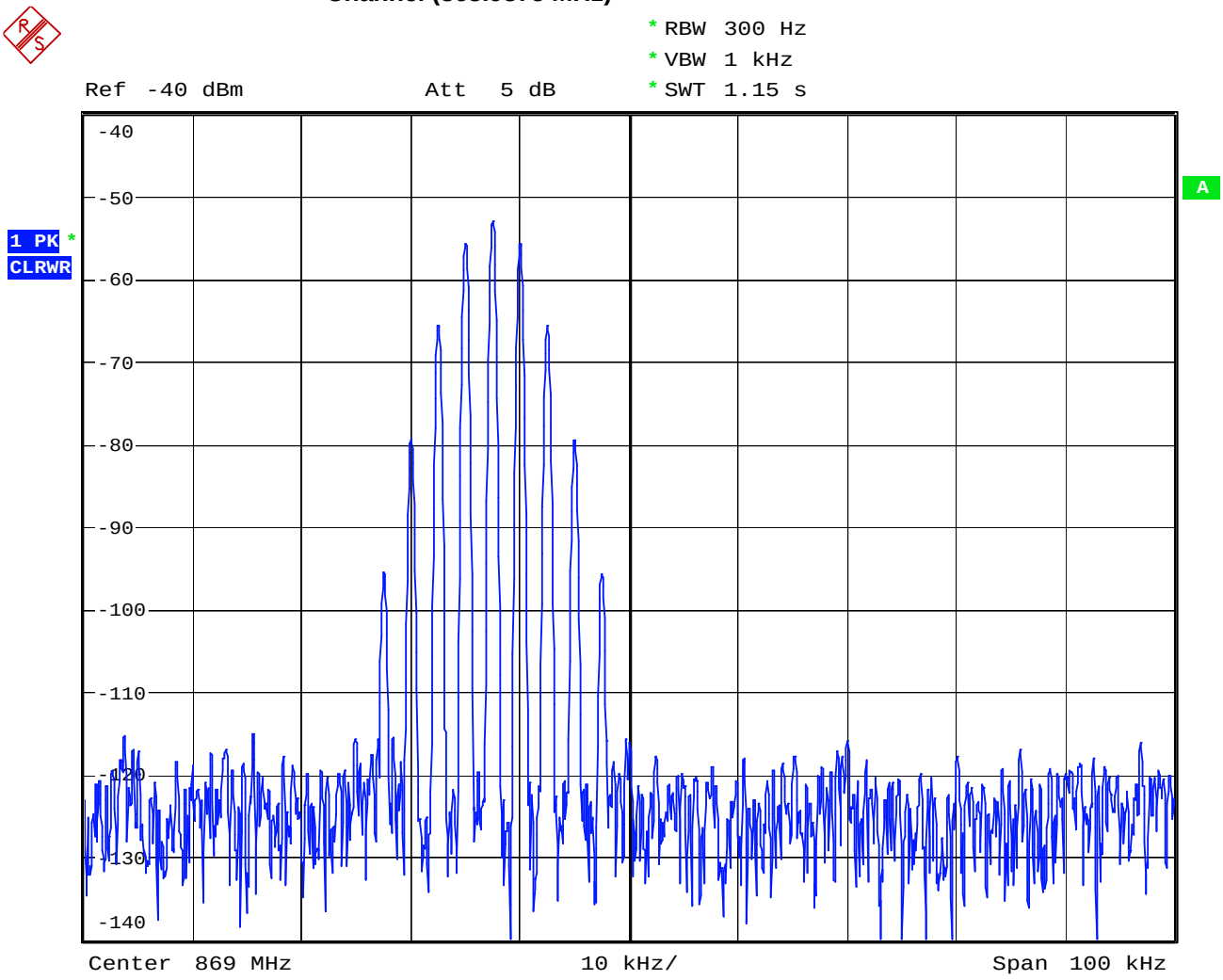
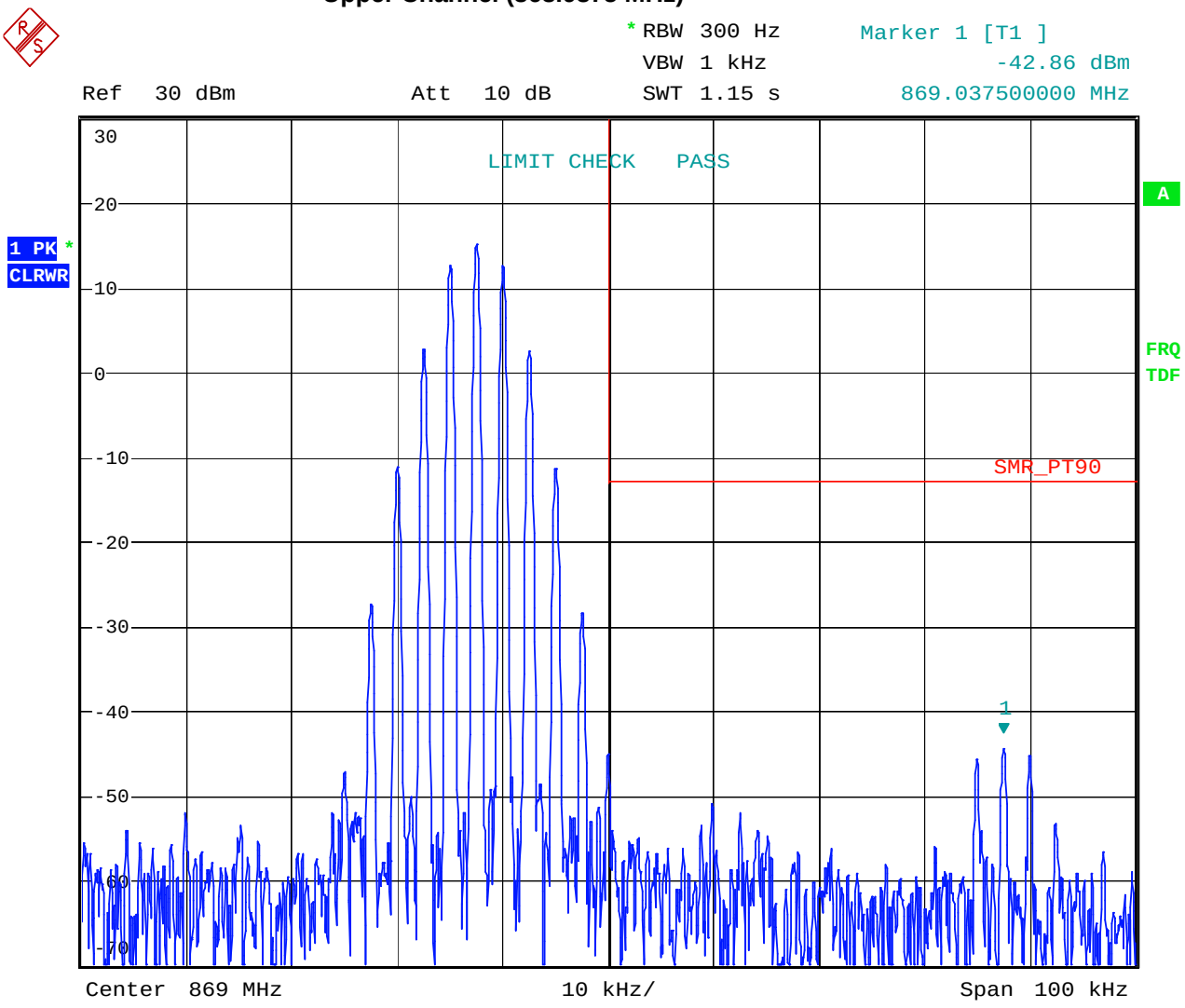


Figure 18 Analogue Output Downlink – FM 2.5 kHz tone @ 3 kHz deviation – Upper Channel (868.9875 MHz)



Date: 22.MAY.2007 17:09:33

Figure 19 iDEN Waveform Input Downlink – Low Channel (851.0125 MHz)

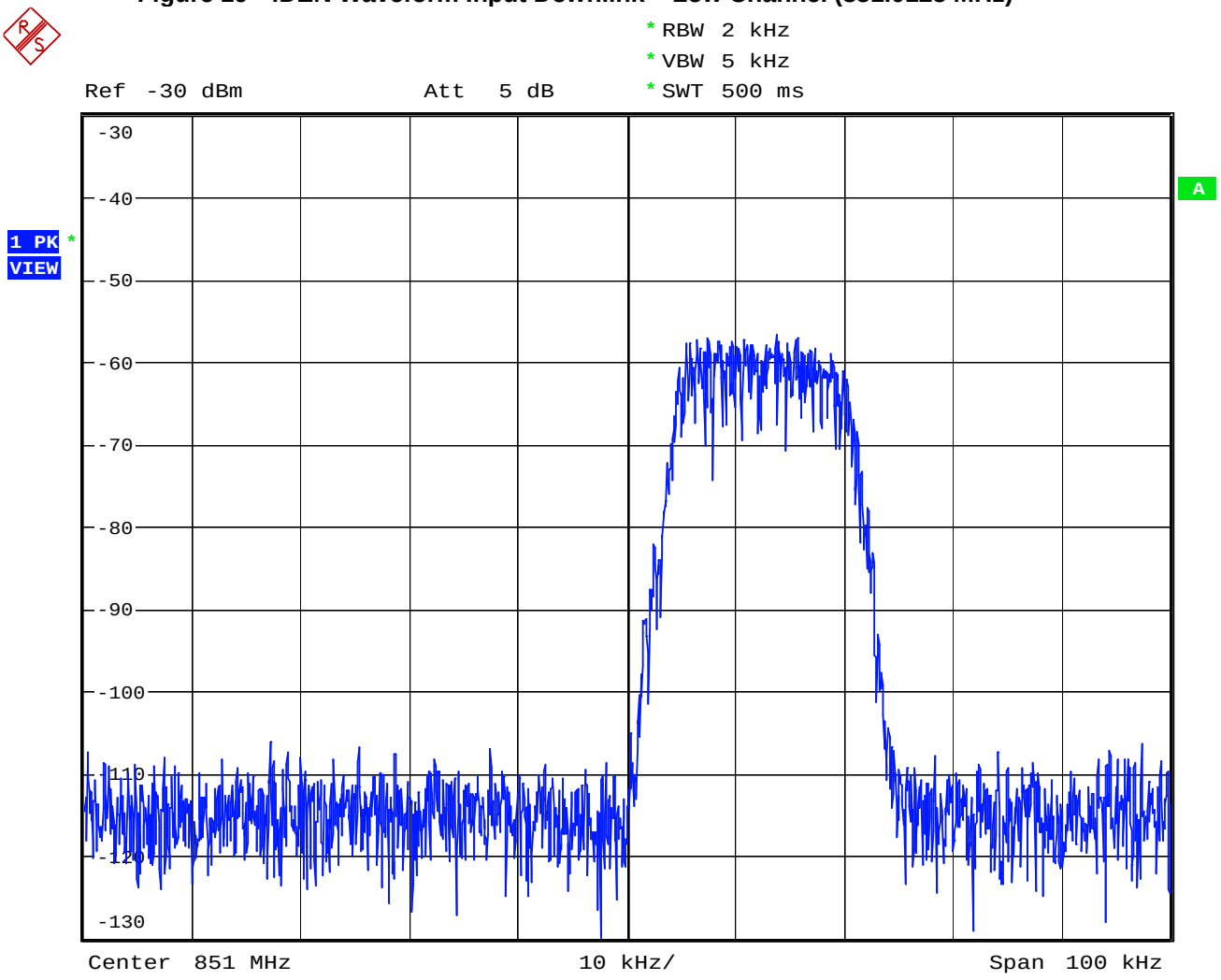
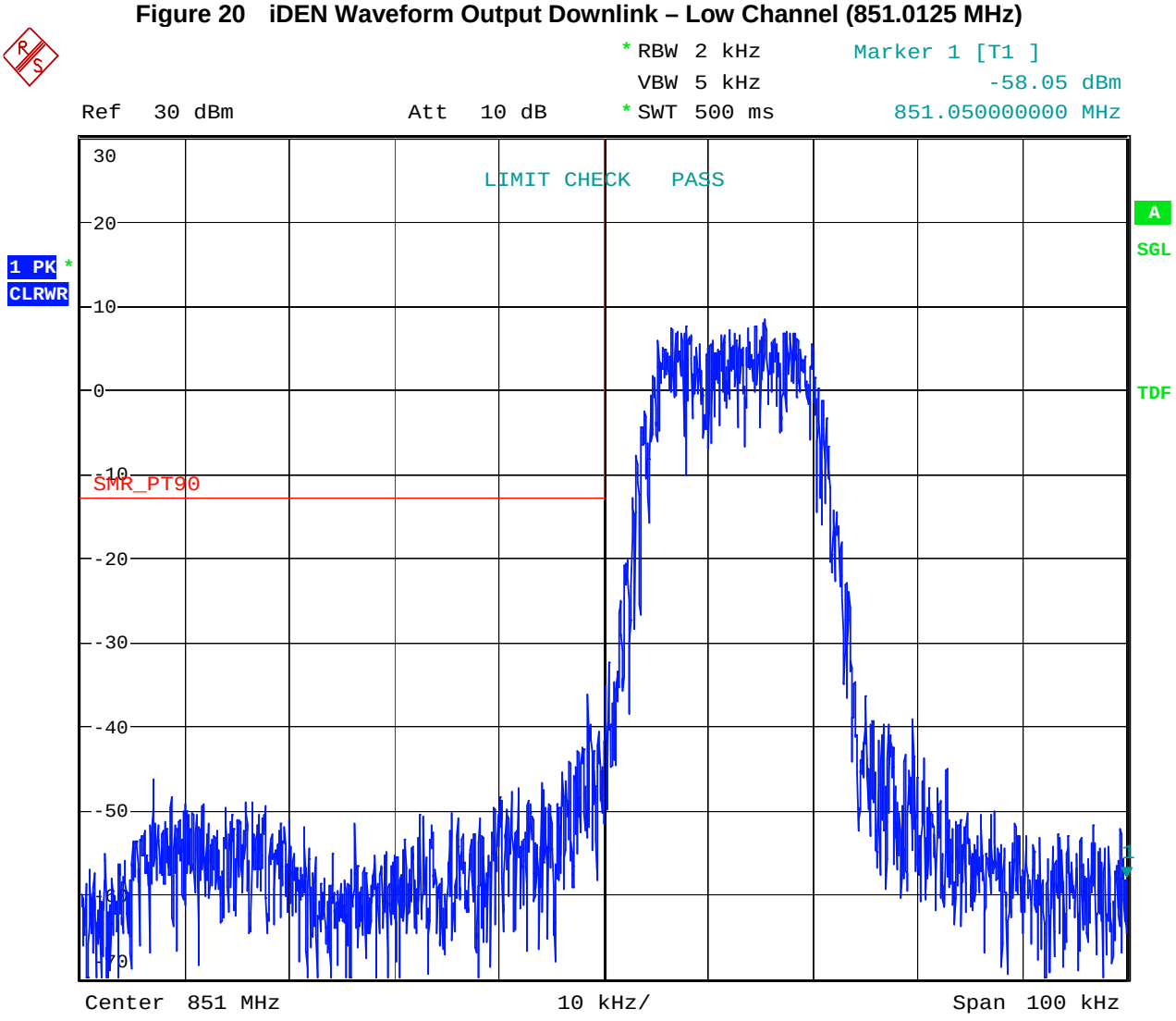


Figure 20 iDEN Waveform Output Downlink – Low Channel (851.0125 MHz)



Date: 22.MAY.2007 16:58:08

Figure 21 iDEN Waveform Input Downlink – Mid Channel (861.3625 MHz)

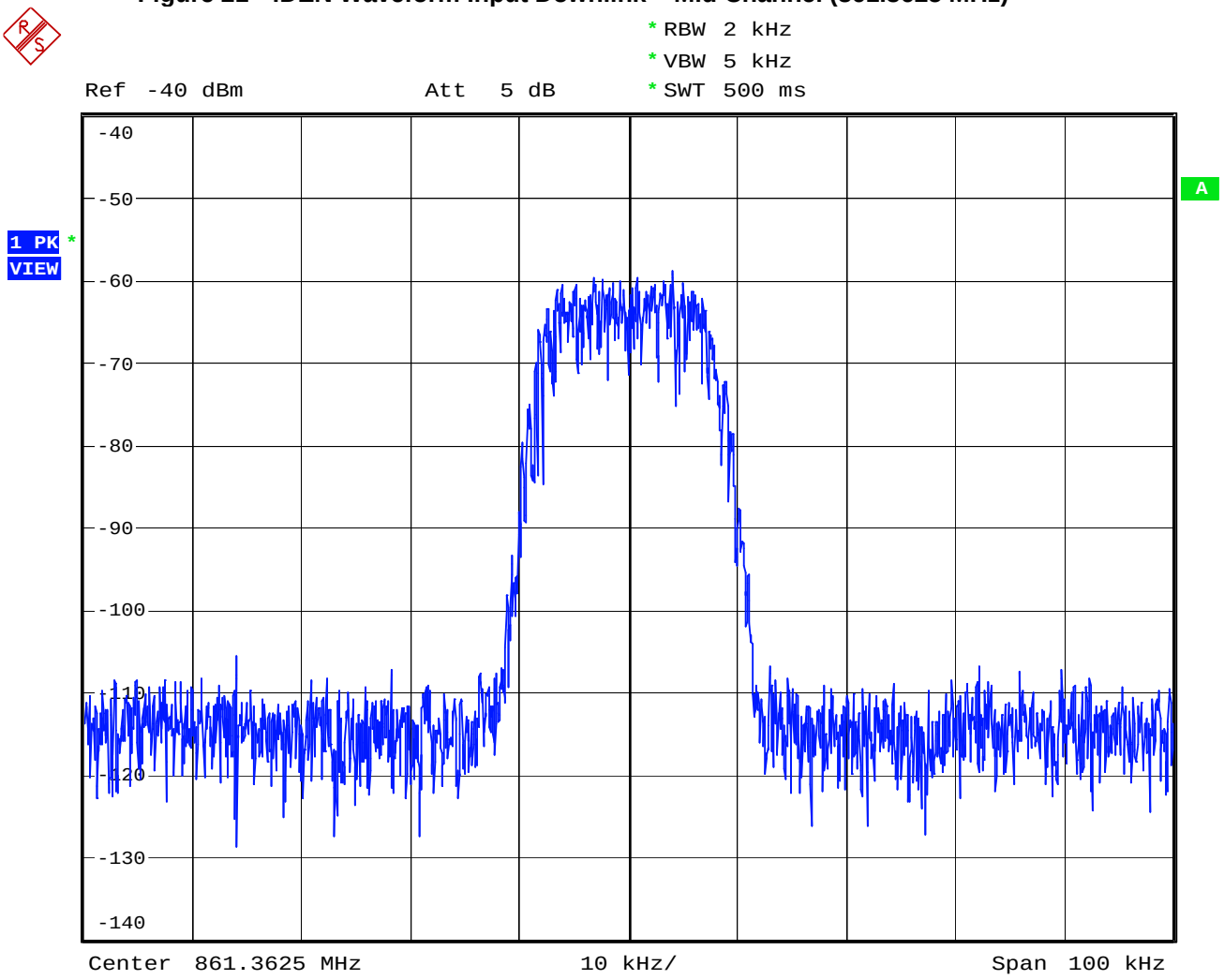
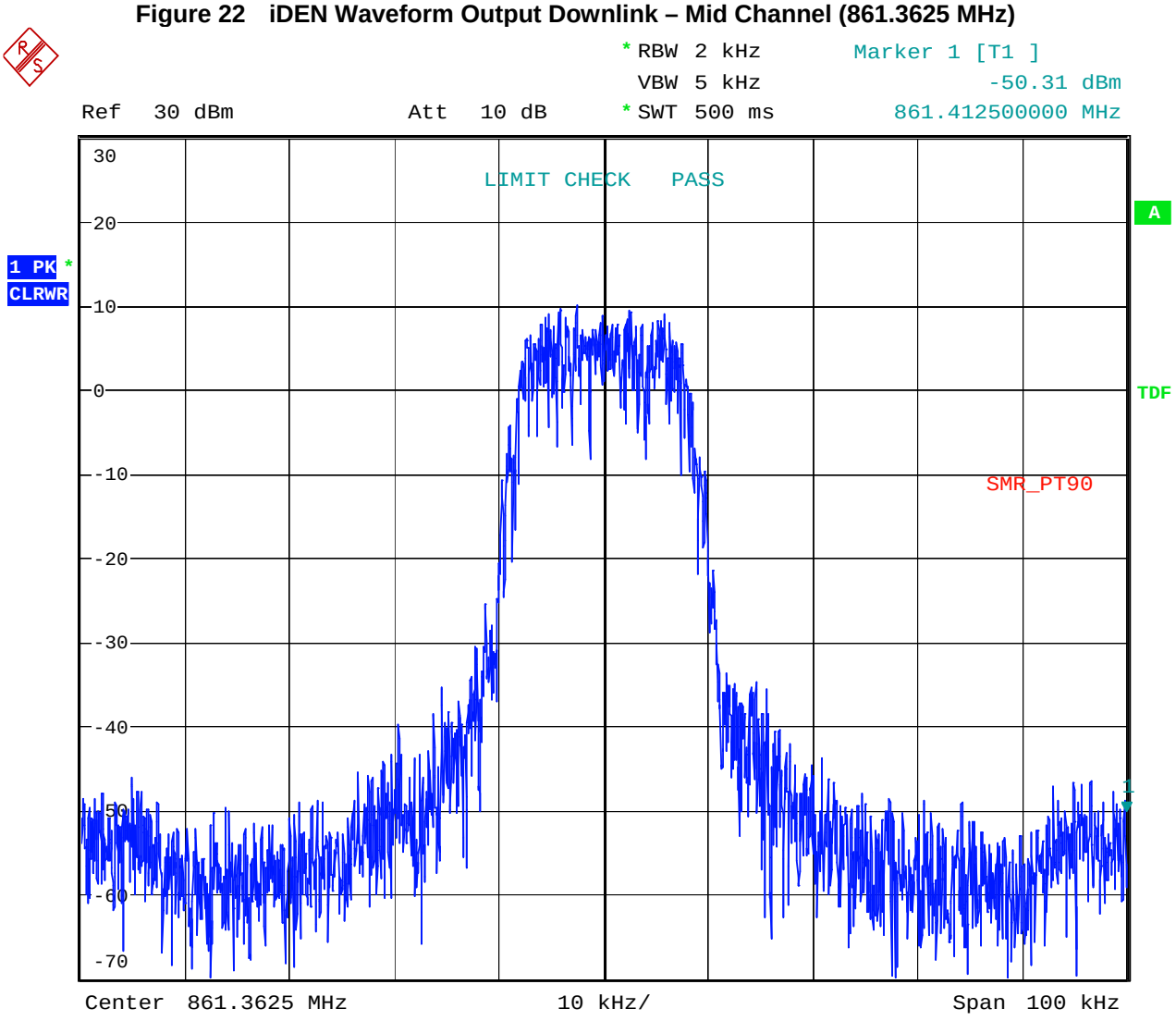


Figure 22 iDEN Waveform Output Downlink – Mid Channel (861.3625 MHz)



Date: 22.MAY.2007 16:35:16

Figure 23 iDEN Waveform Input Downlink – Upper Channel (868.9875 MHz)

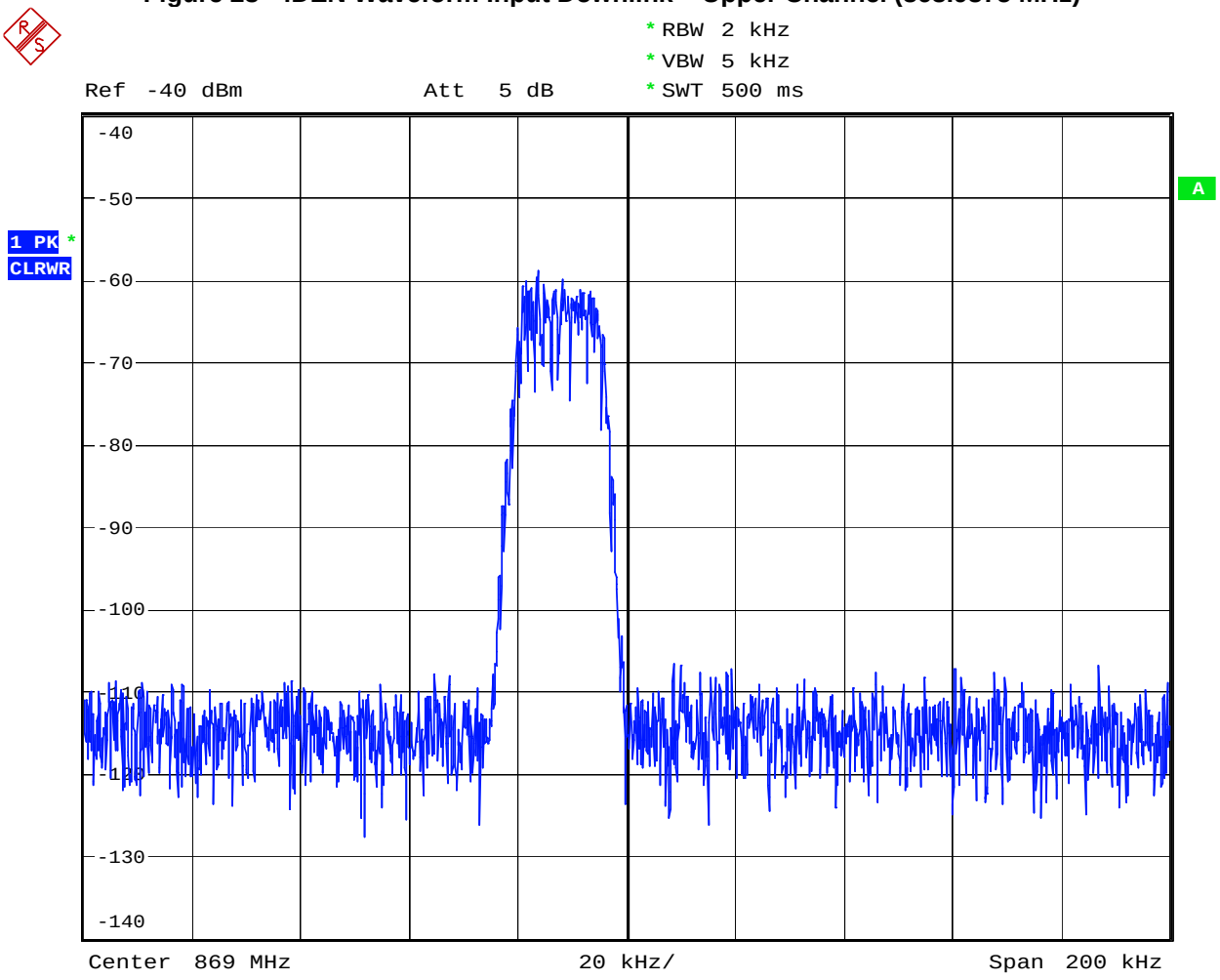
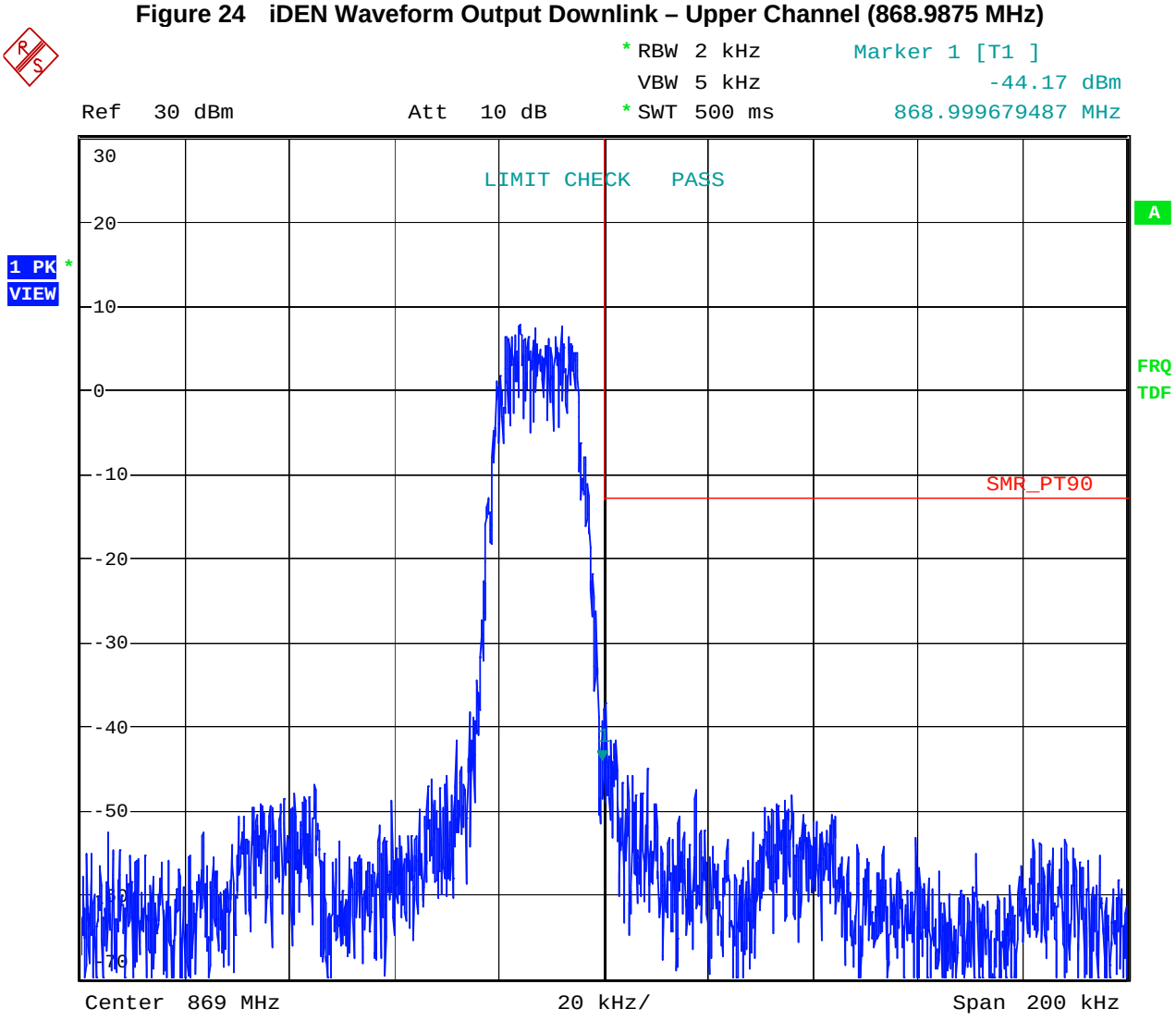
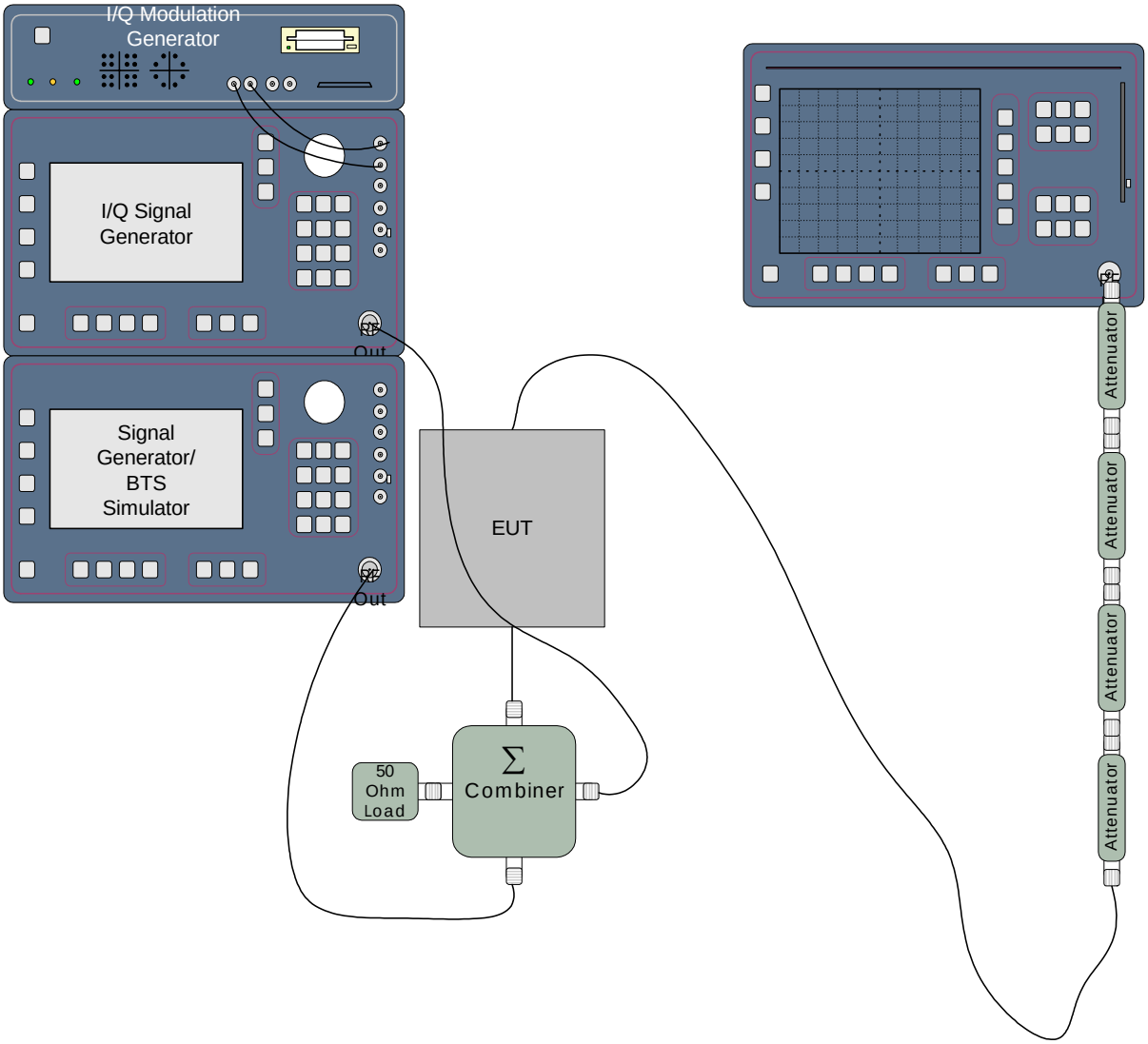


Figure 24 iDEN Waveform Output Downlink – Upper Channel (868.9875 MHz)



Date: 22.MAY.2007 17:06:12

C.10. Test Diagram



C.11. Tested By

Name: Tom Tidwell,
Function: Manager of Wireless Services
Test Date: 17 – 21 May, 2007

APPENDIX D: 2.1051 SPURIOUS EMISSIONS AT ANTENNA TERMINALS

D.1. Base Standard & Test Basis

Base Standard	FCC 2.1051
Test Basis	FCC 2.1051 Spurious Emissions at Antenna Terminals
Test Method	TIA 603-C, 2004

D.2. Specifications

90.210 Emission masks.
Except as indicated elsewhere in this part, transmitters used in the radio services governed by this part must comply with the emission masks outlined in this section. Unless otherwise stated, per paragraphs (d)(4), (e)(4), and (m) of this section, measurements of emission power can be expressed in either peak or average values provided that emission powers are expressed with the same parameters used to specify the unmodulated transmitter carrier power. For transmitters that do not produce a full power unmodulated carrier, reference to the unmodulated transmitter carrier power refers to the total power contained in the channel bandwidth. Unless indicated elsewhere in this part, the table in this section specifies the emission masks for equipment operating in the frequency bands governed under this part.

Applicable Emission Masks		
Frequency (MHz)	Mask for equipment with audio low-pass filter	Mask for equipment without audio low-pass filter
Below 25(1)	A or B	A or C
25 – 50	B	C
72 – 76	B	C
150 – 174(2)	B, D, or E	C, D, or E
150 paging only	B	C
220 – 222	F	F
421 – 512(2)	B, D, or E	C, D, or E
450 paging only	B	G
806 – 809 / 851 - 854	B	H
809 – 824 / 854 – 869(3)	B	G
896 – 901 / 935 – 940	I	J
902 – 928(4)	K	K
929 – 930	B	G
4940 – 4990	L or M	L or M
5850 - 5925(4)	-	-
All other bands	B	C

(1) Equipment using single sideband J3E emission must the requirements of Emission Mask A. Equipment using other emissions must meet the requirements of Emission Mask B or C, as applicable.
(2) Equipment designed to operate with a 25 kHz channel bandwidth must meet the requirements of Emission Mask B or C, as applicable. Equipment designed to operate with a 12.5 kHz channel bandwidth must meet the requirements of Emission Mask D, and equipment designed to operate with a 6.25 kHz channel bandwidth Must meet the requirements of Emission Mask E.
(3) Equipment used in this licensed to EA or non-EA systems shall comply with the emission mask provisions of § 90.691.
(4) DSRCS Roadside Units equipment in the 5850-5925 MHz band is governed under subpart M of this part.

D.3. Measurement Uncertainty

Expanded Uncertainty (K=2)
+1.11/-1.22

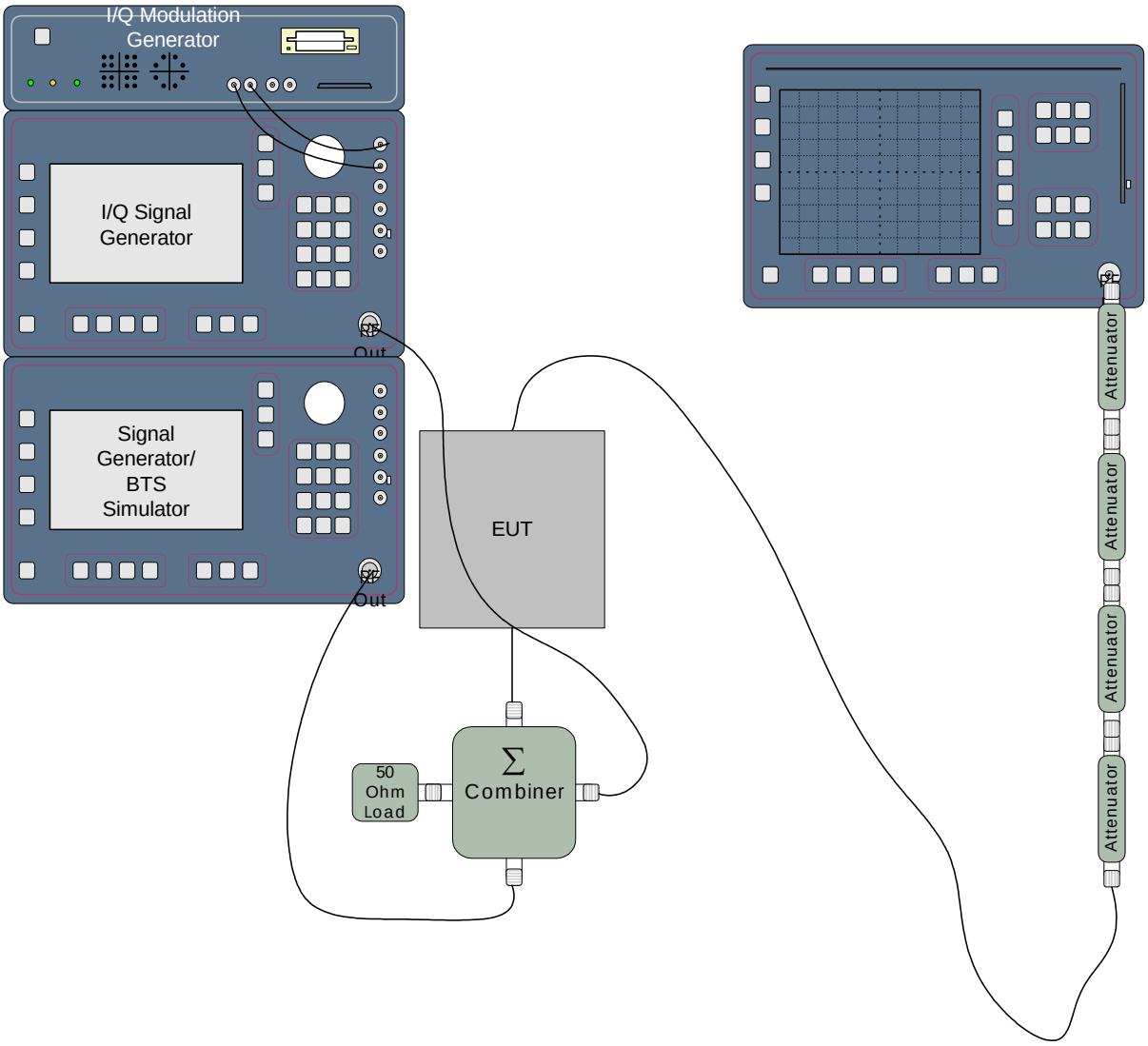
D.4. Deviations

Deviation Number	Time & Date	Description and Justification of Deviation	Deviation Reference			Approval
			Base Standard	Test Basis	NTS Procedure	
none						

D.5. Test Results

Compliant. All emissions meet the limits of the specified spectral mask.

D.6. Test Diagram



D.7. Test Data

See following pages.

Figure 25 Antenna Conducted Spurious - Uplink - Analogue

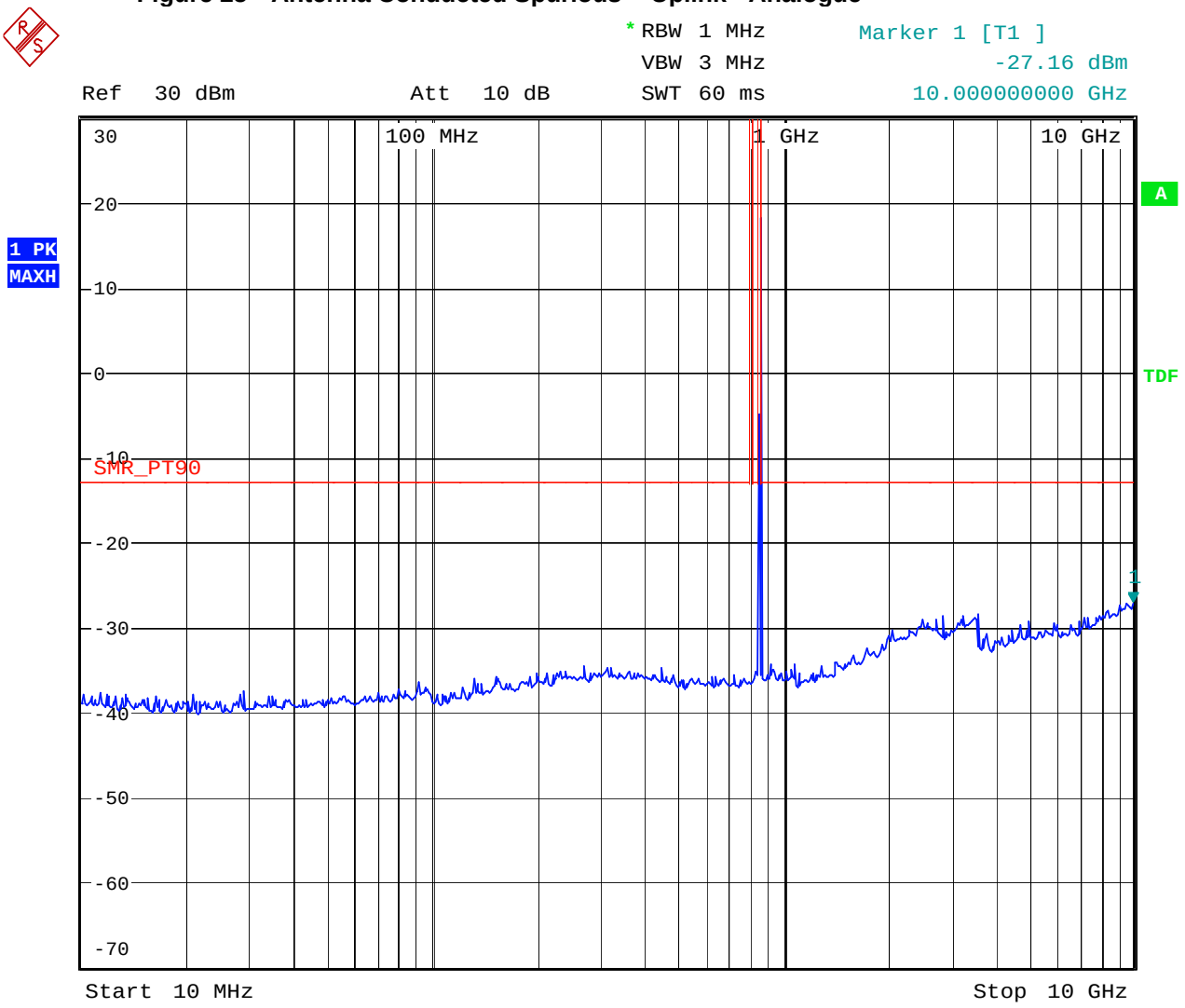


Figure 26 Antenna Conducted Spurious - Downlink - Analogue

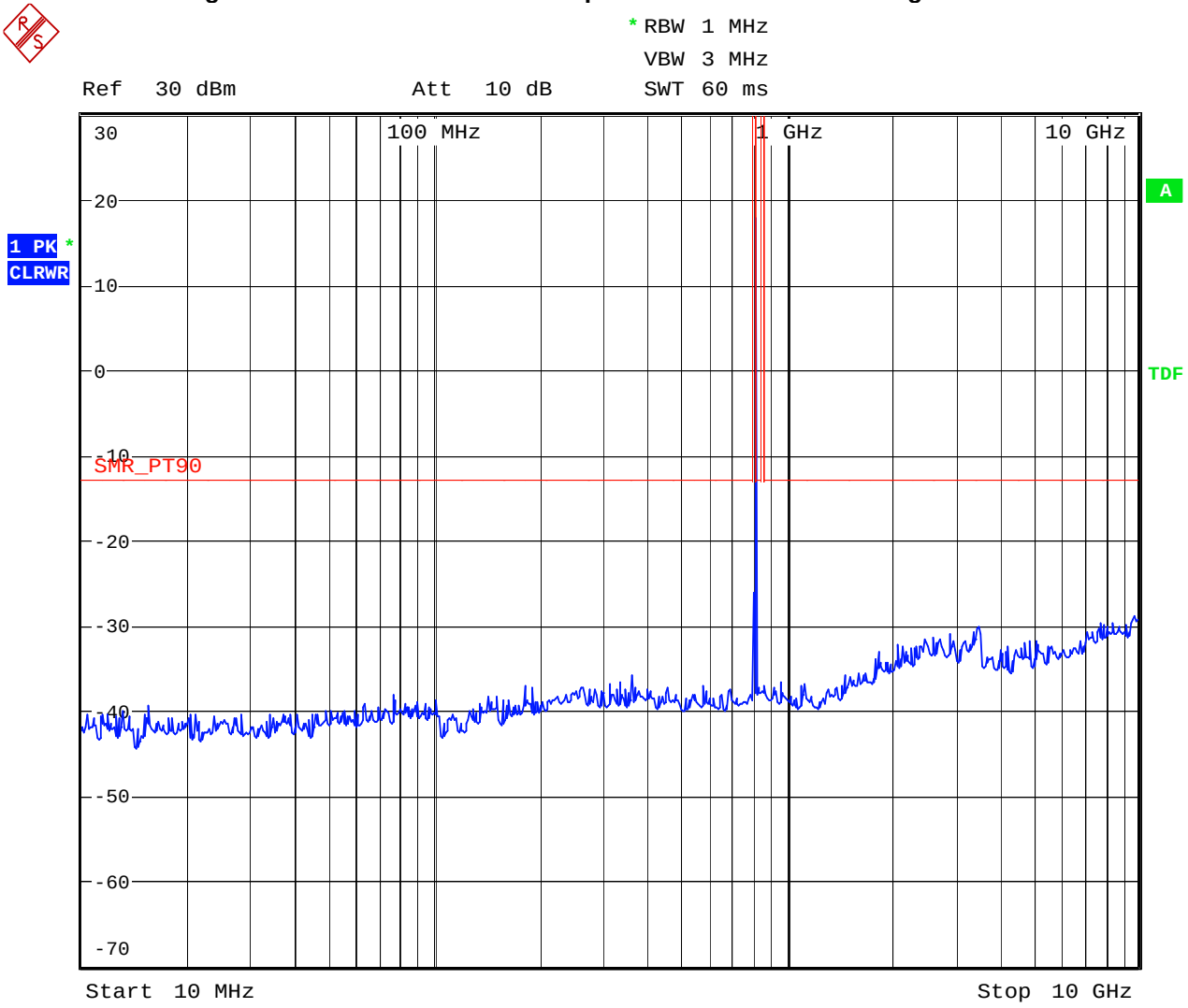


Figure 27 Antenna Conducted Spurious - Uplink - iDEN

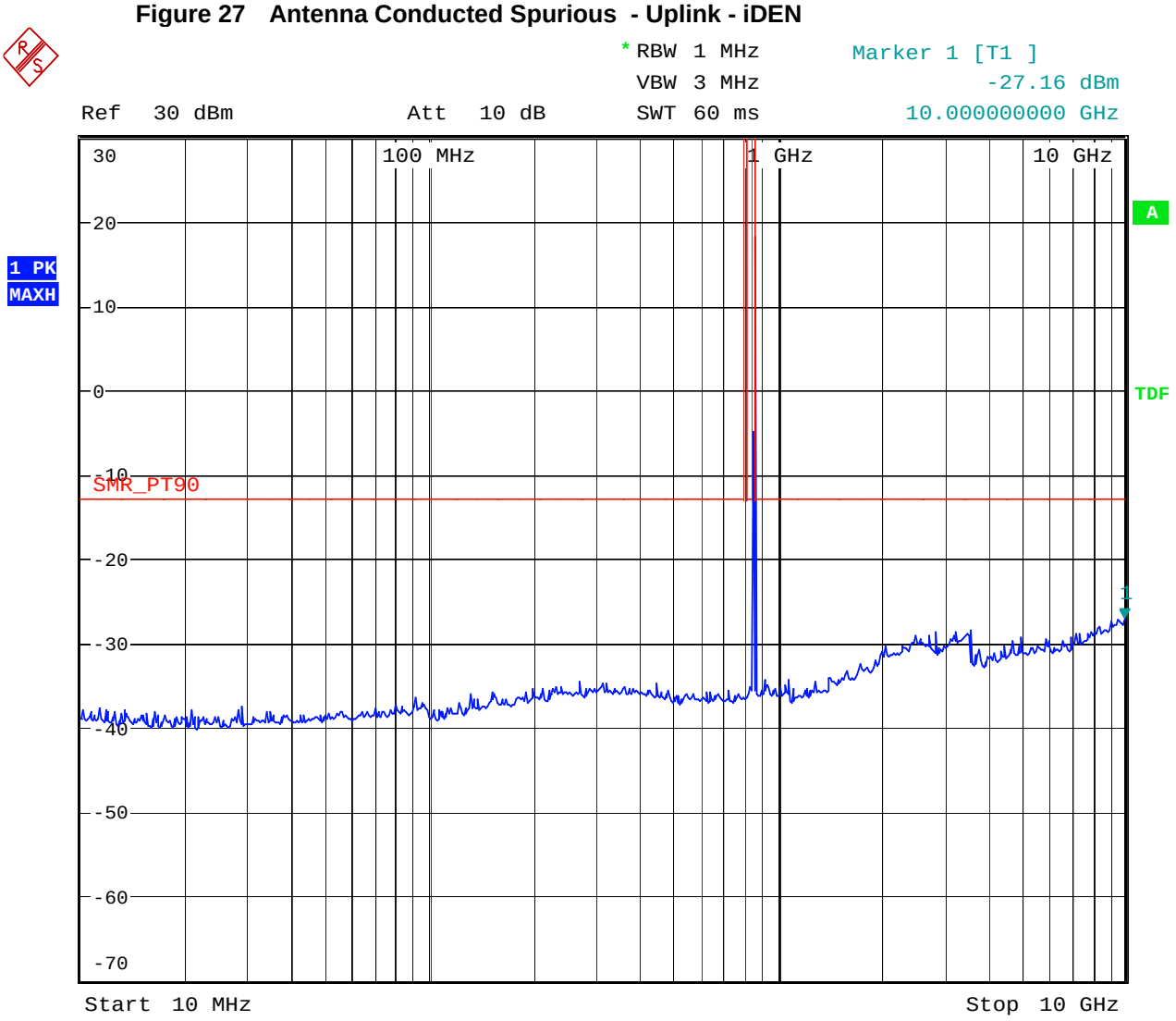


Figure 28 Antenna Conducted Spurious - Downlink - iDEN

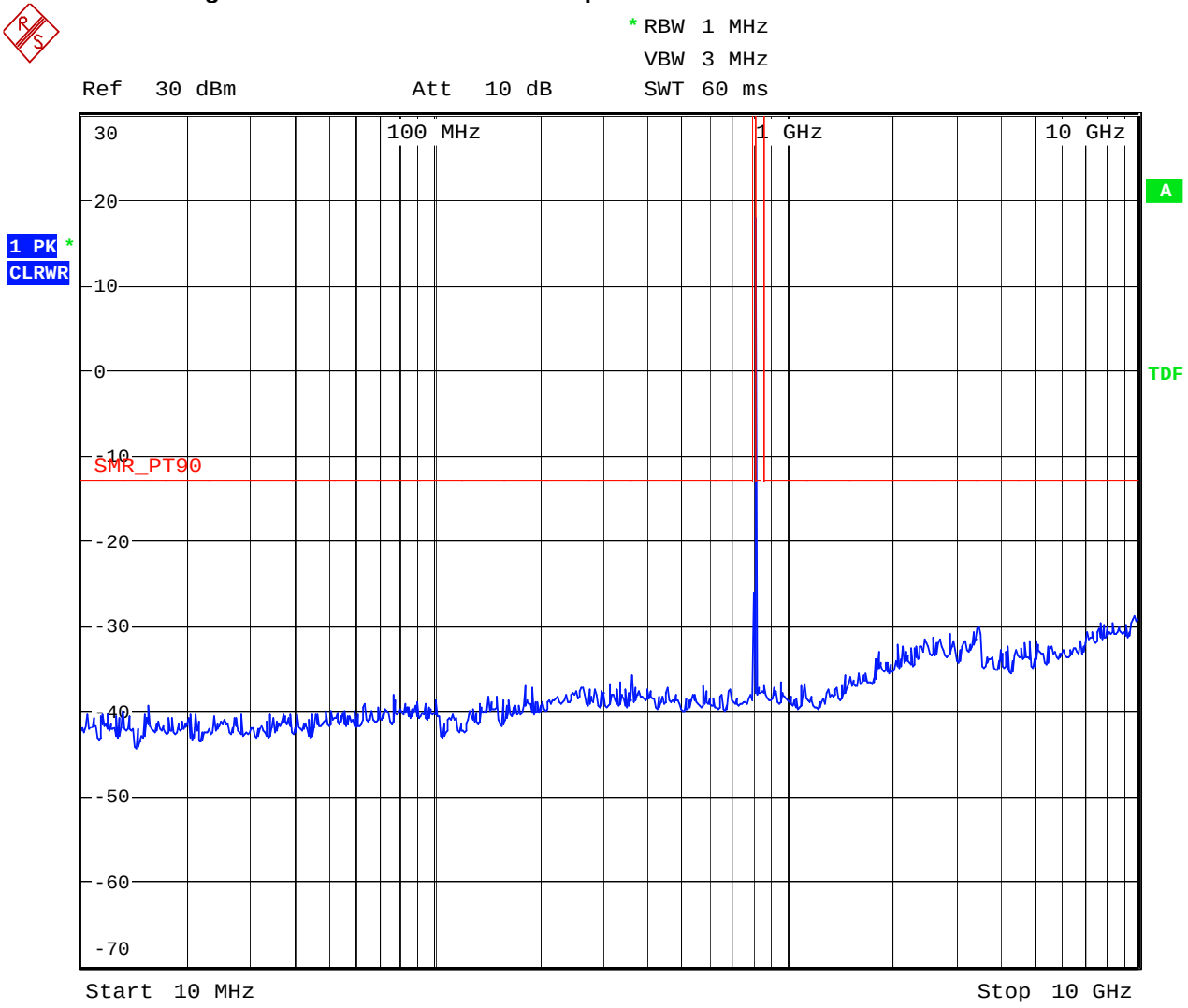


Figure 29 Intermodulation Spurious – Analogue - Uplink

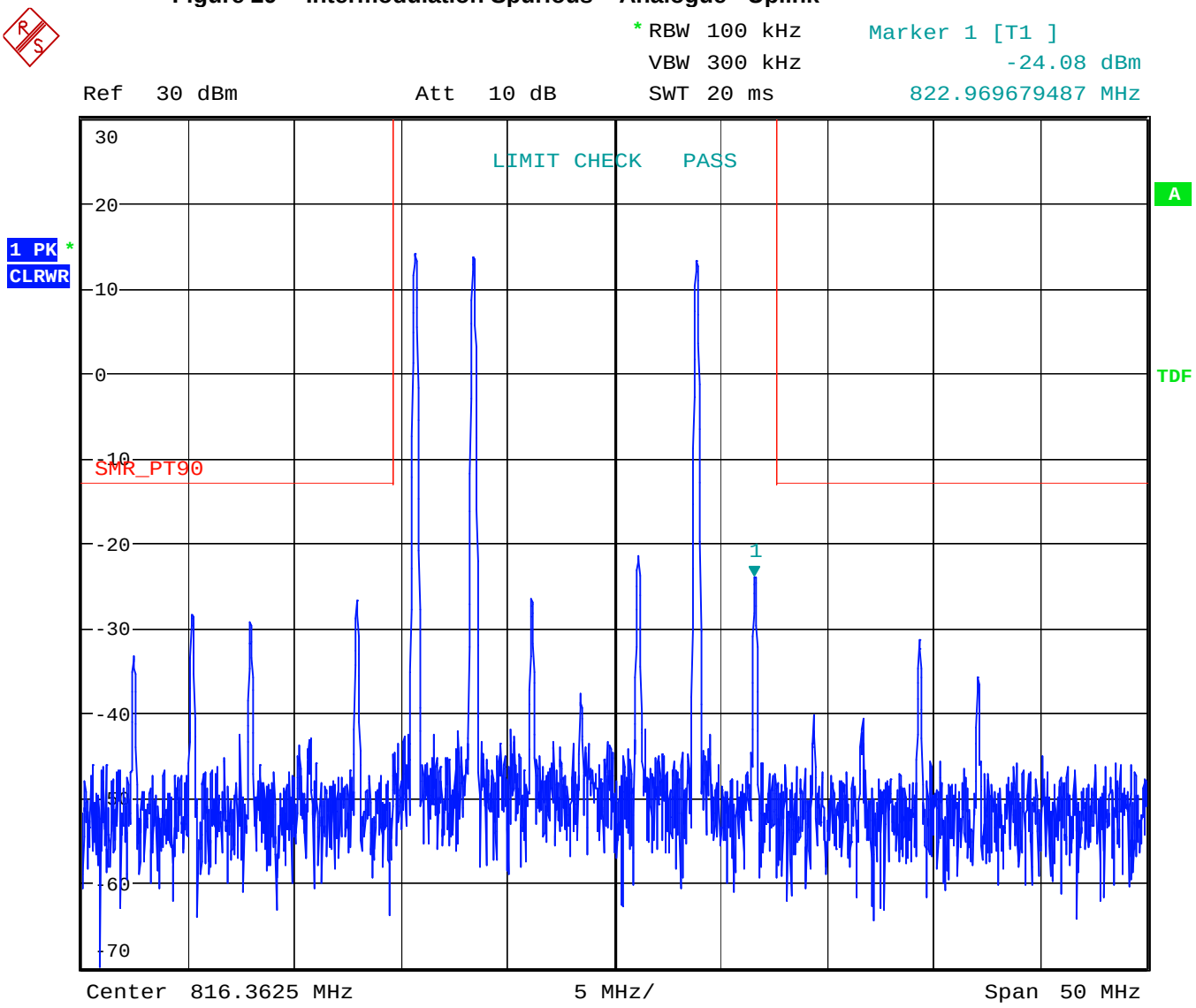


Figure 30 Intermodulation Spurious – iDEN - Uplink

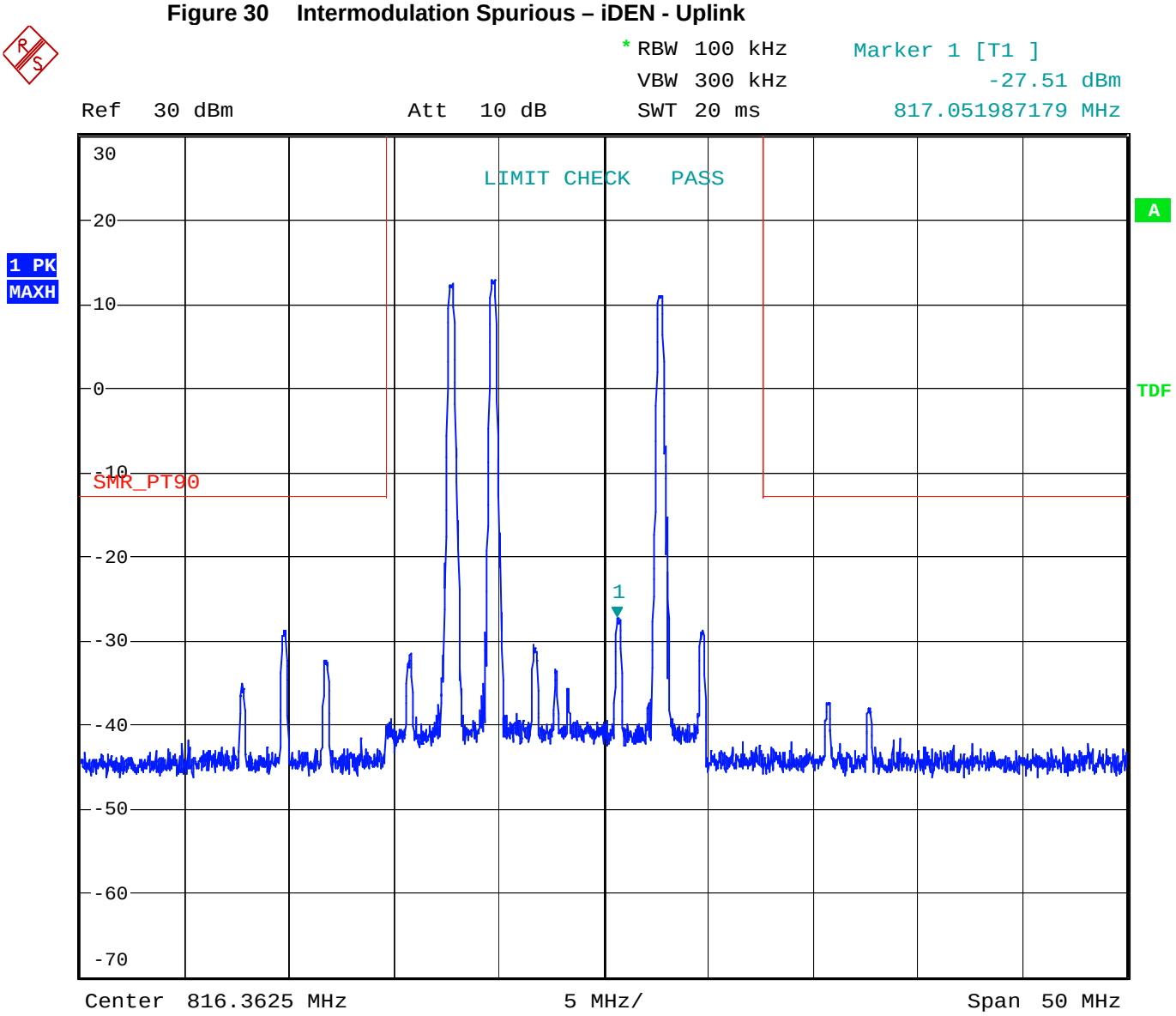


Figure 31 Intermodulation Spurious – Analogue - Downlink

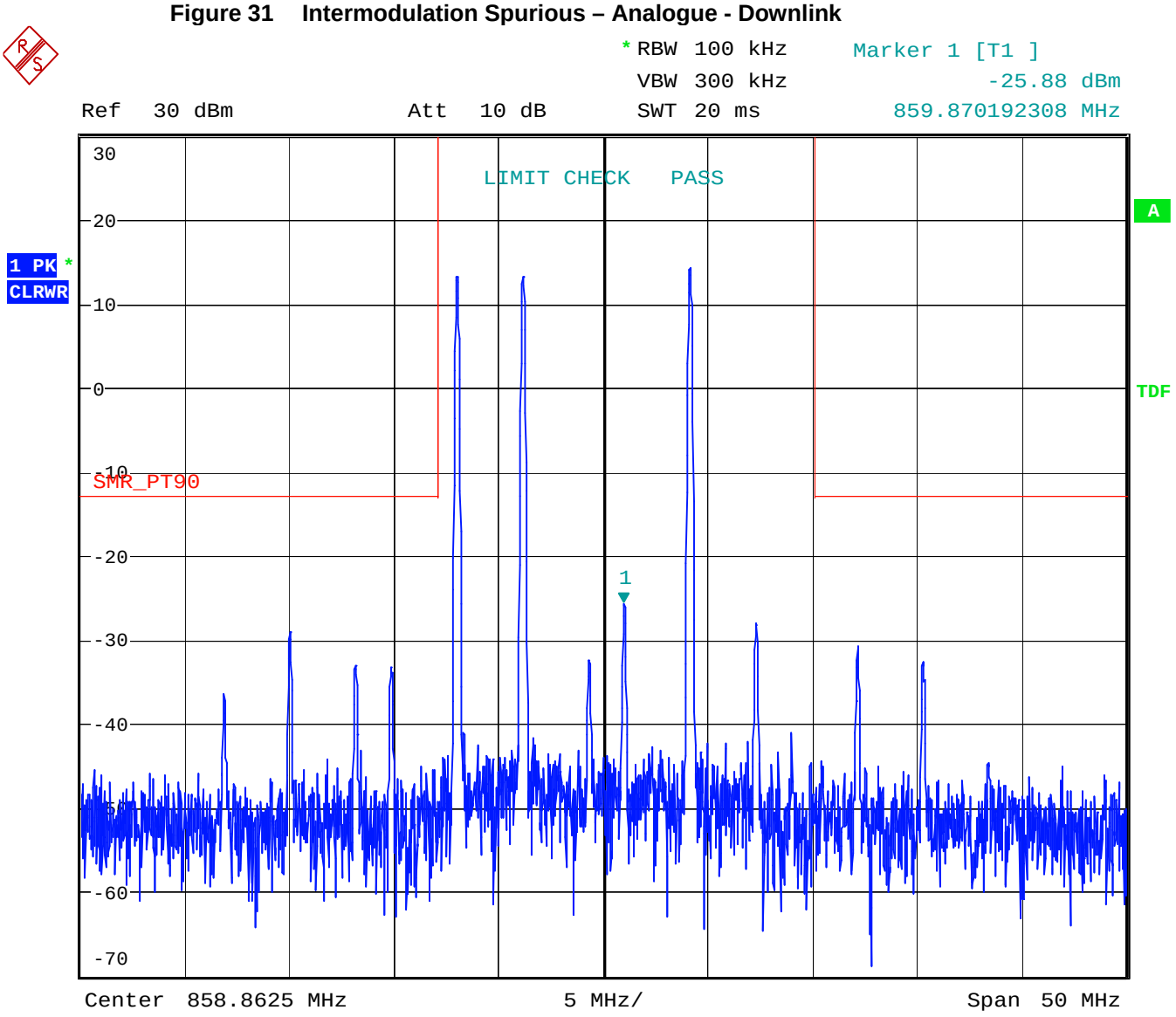


Figure 32 Intermodulation Spurious - iDEN

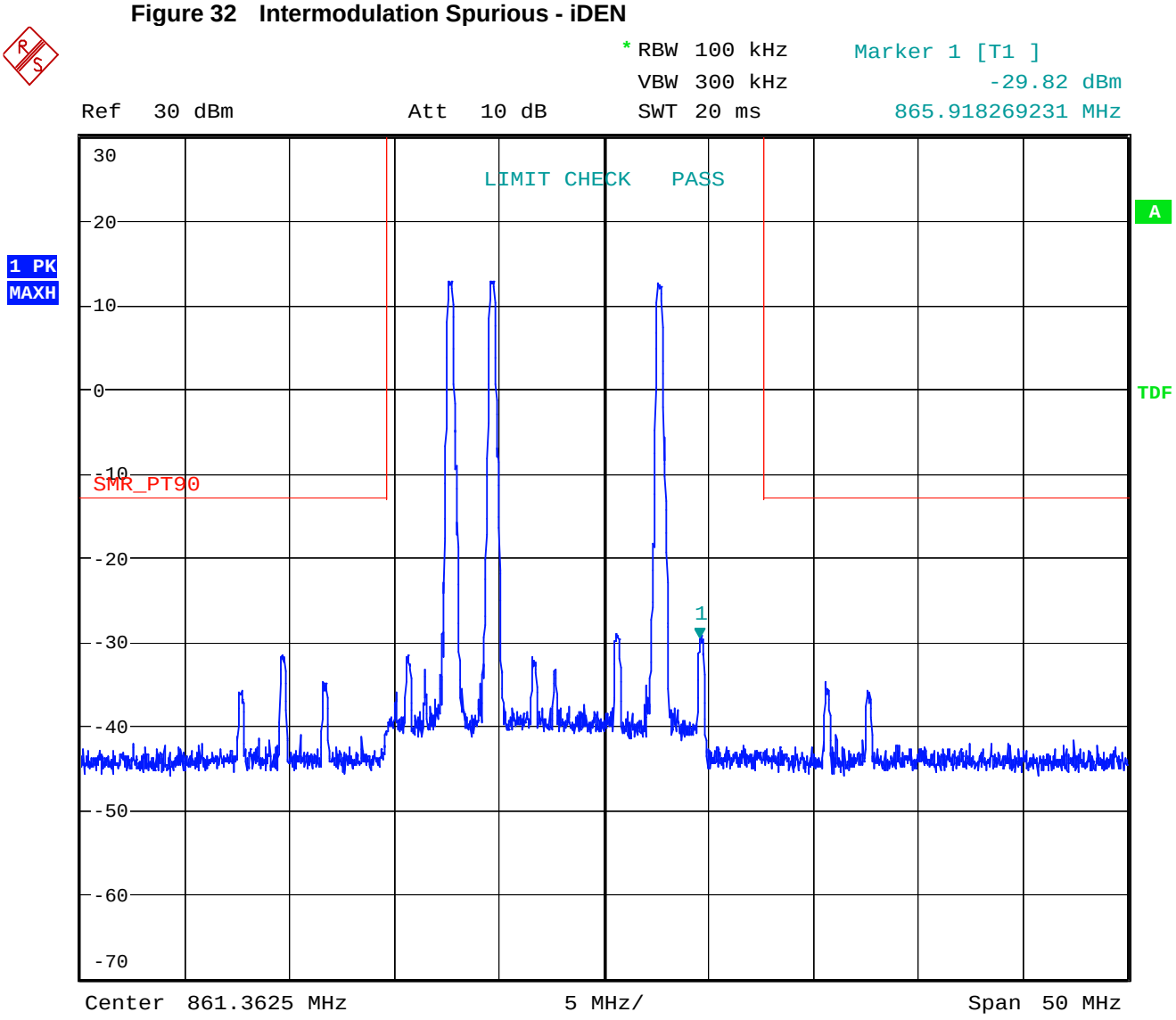


Figure 33 Low Band Edge – Analogue - Uplink

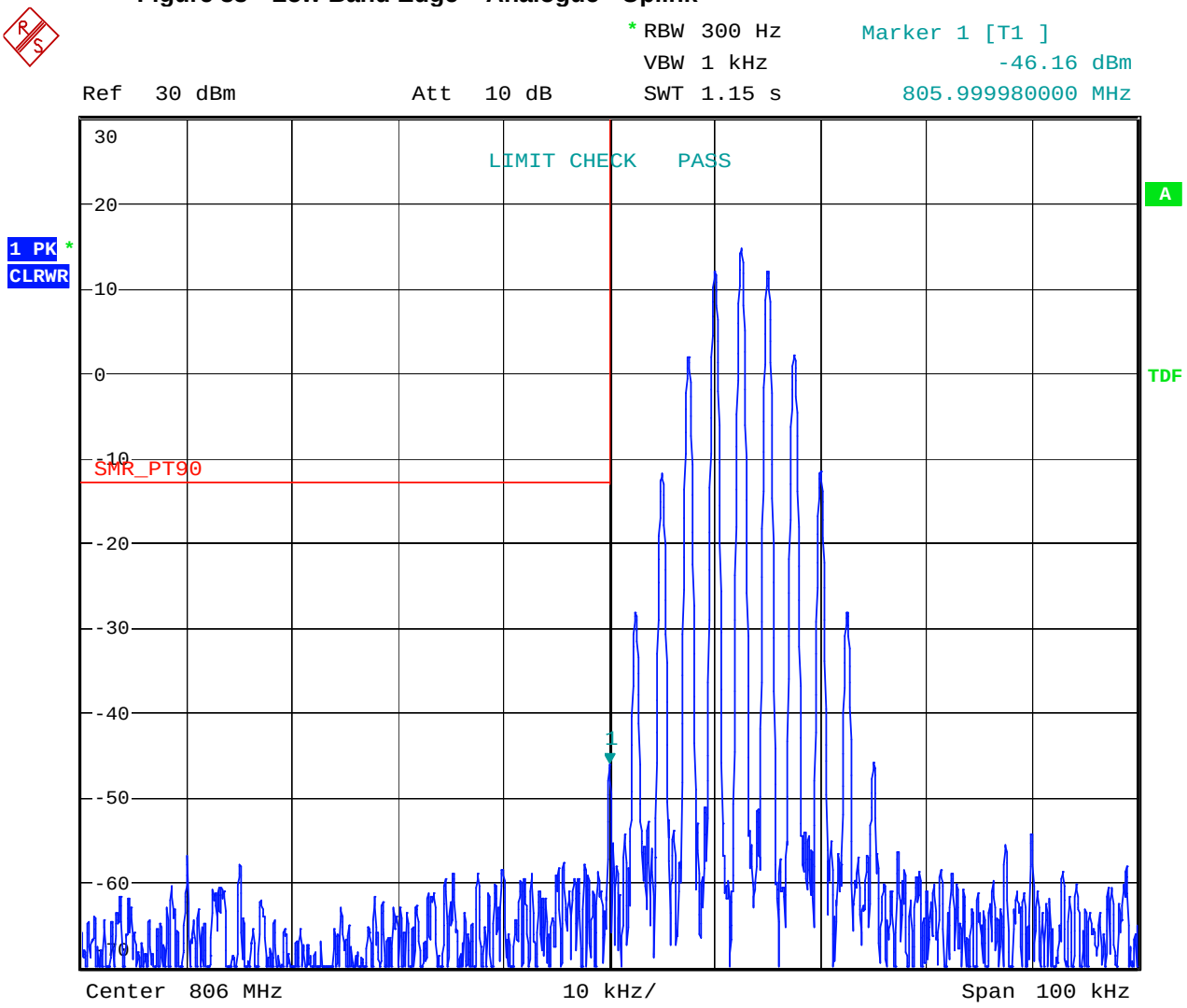


Figure 34 Upper Band Edge – Analogue - Uplink

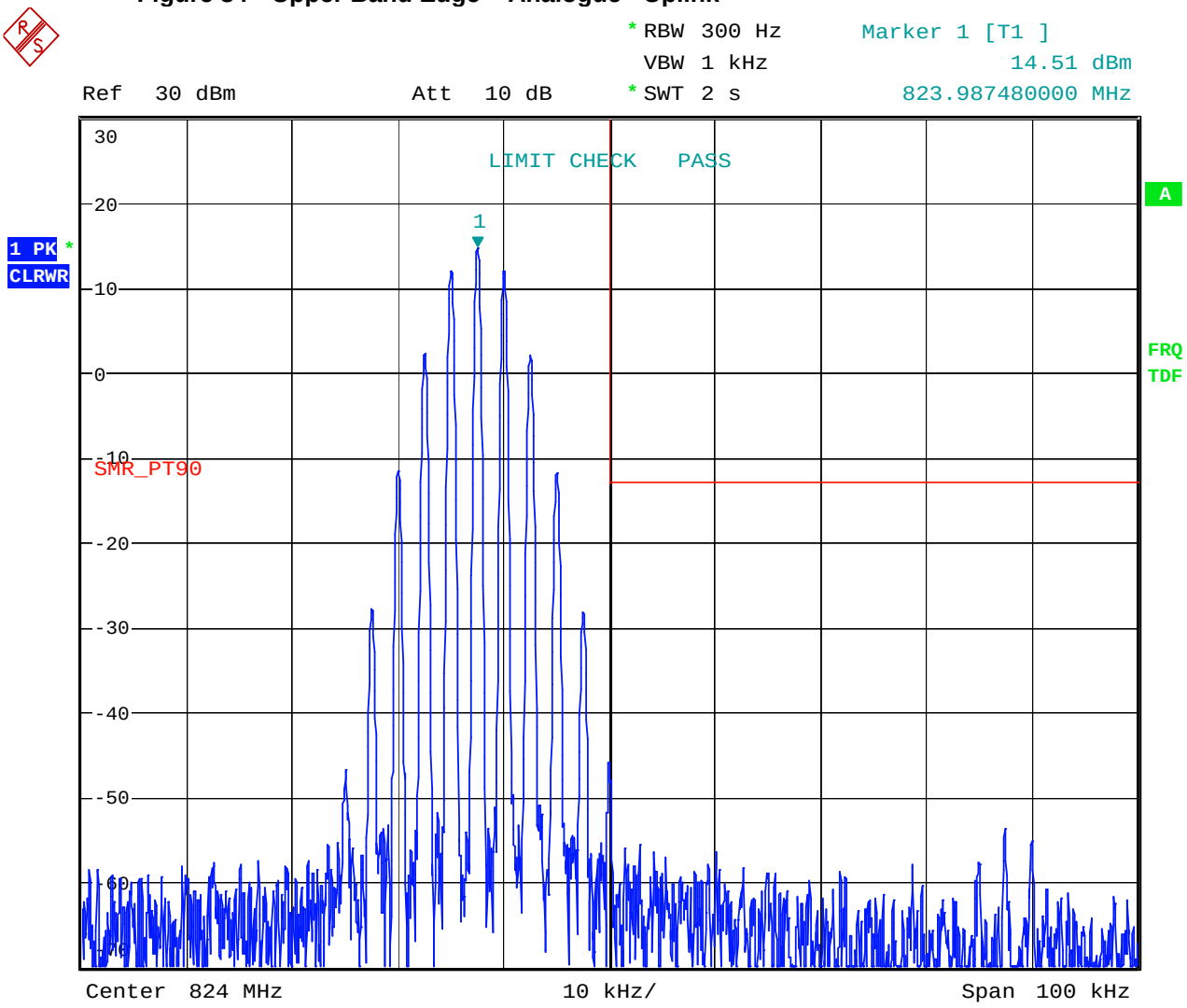


Figure 35 Low Band Edge – Analogue - Downlink

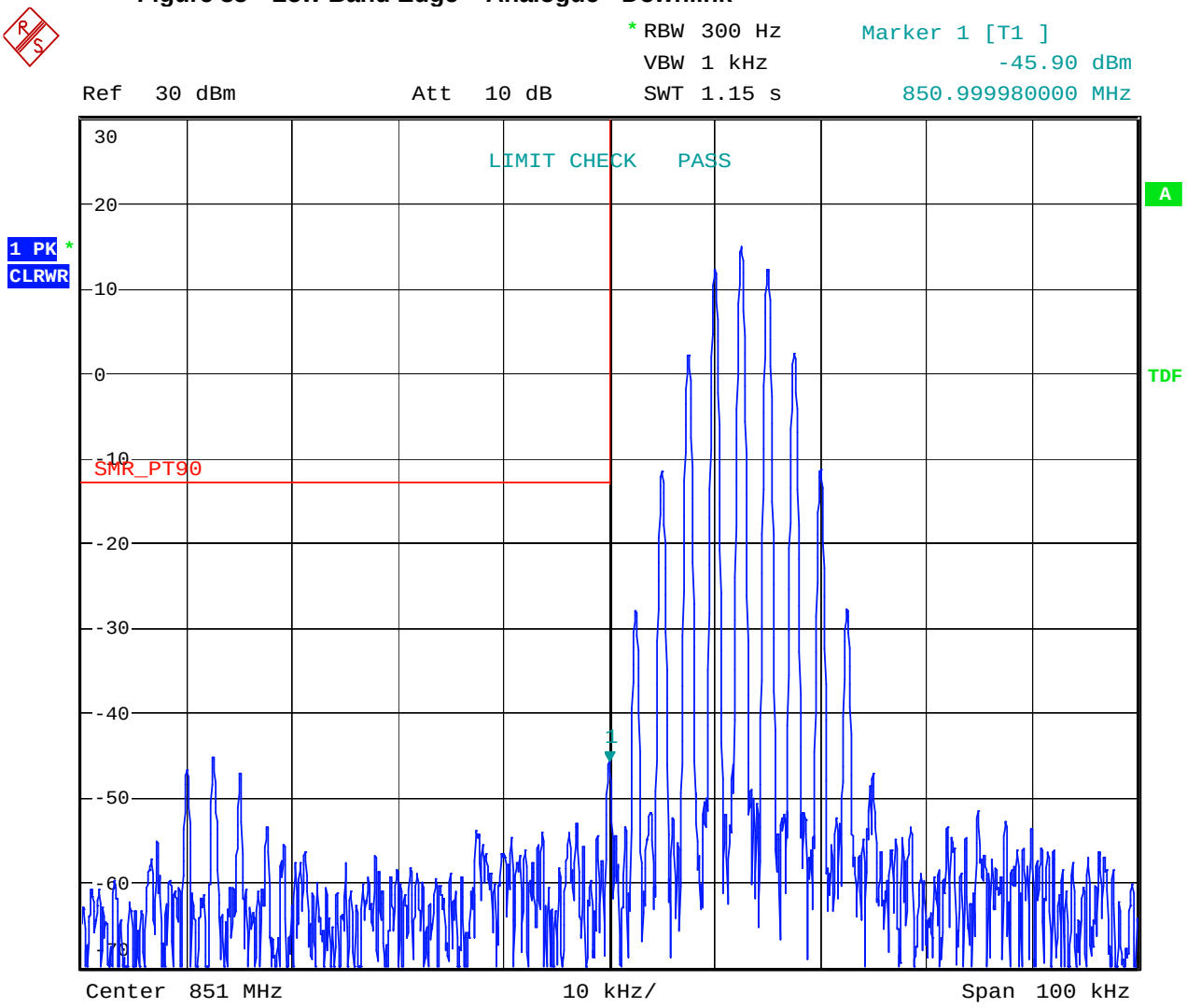


Figure 36 Upper Band Edge – Analogue - Downlink

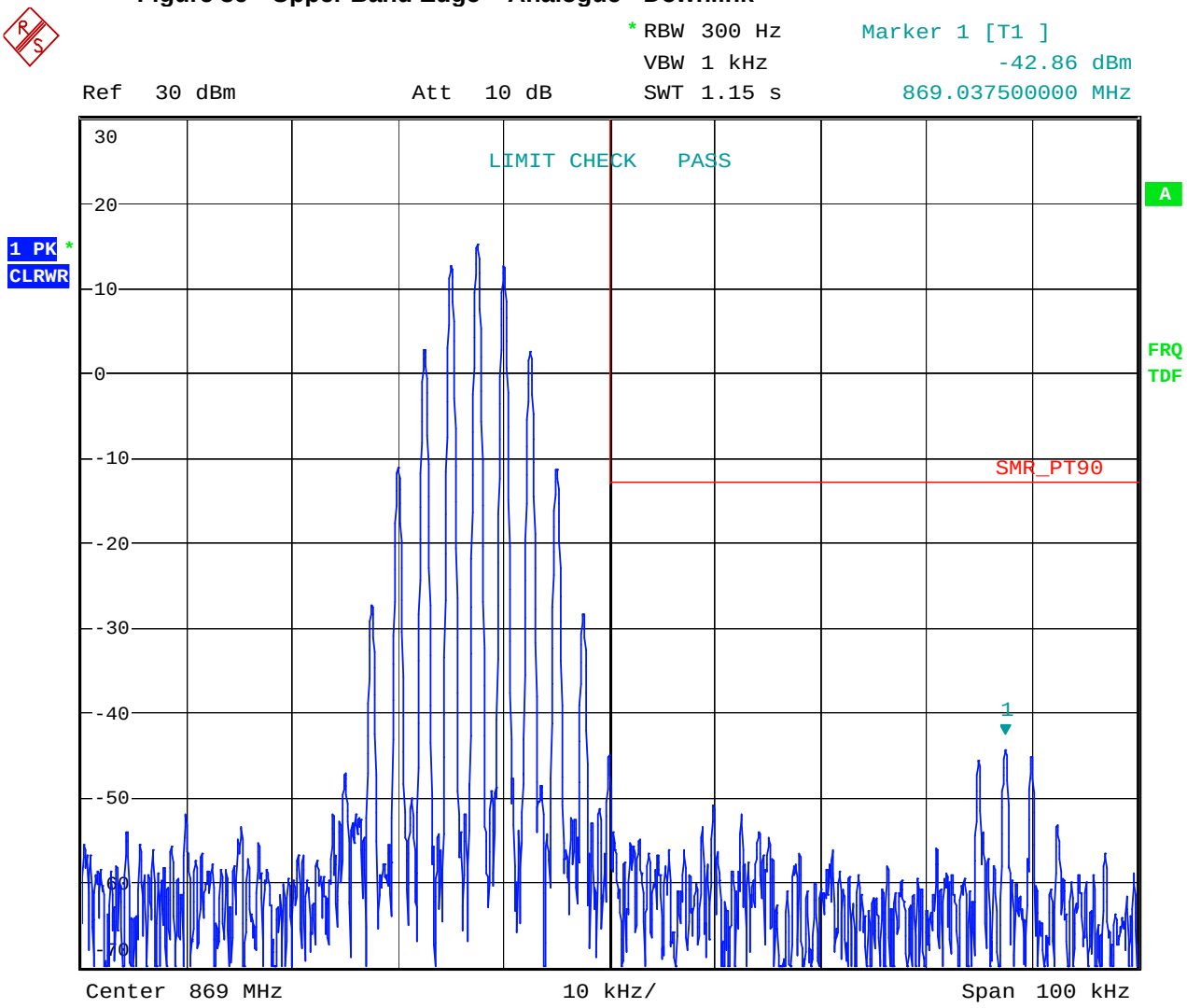


Figure 37 Lower Band Edge – iDEN - Uplink

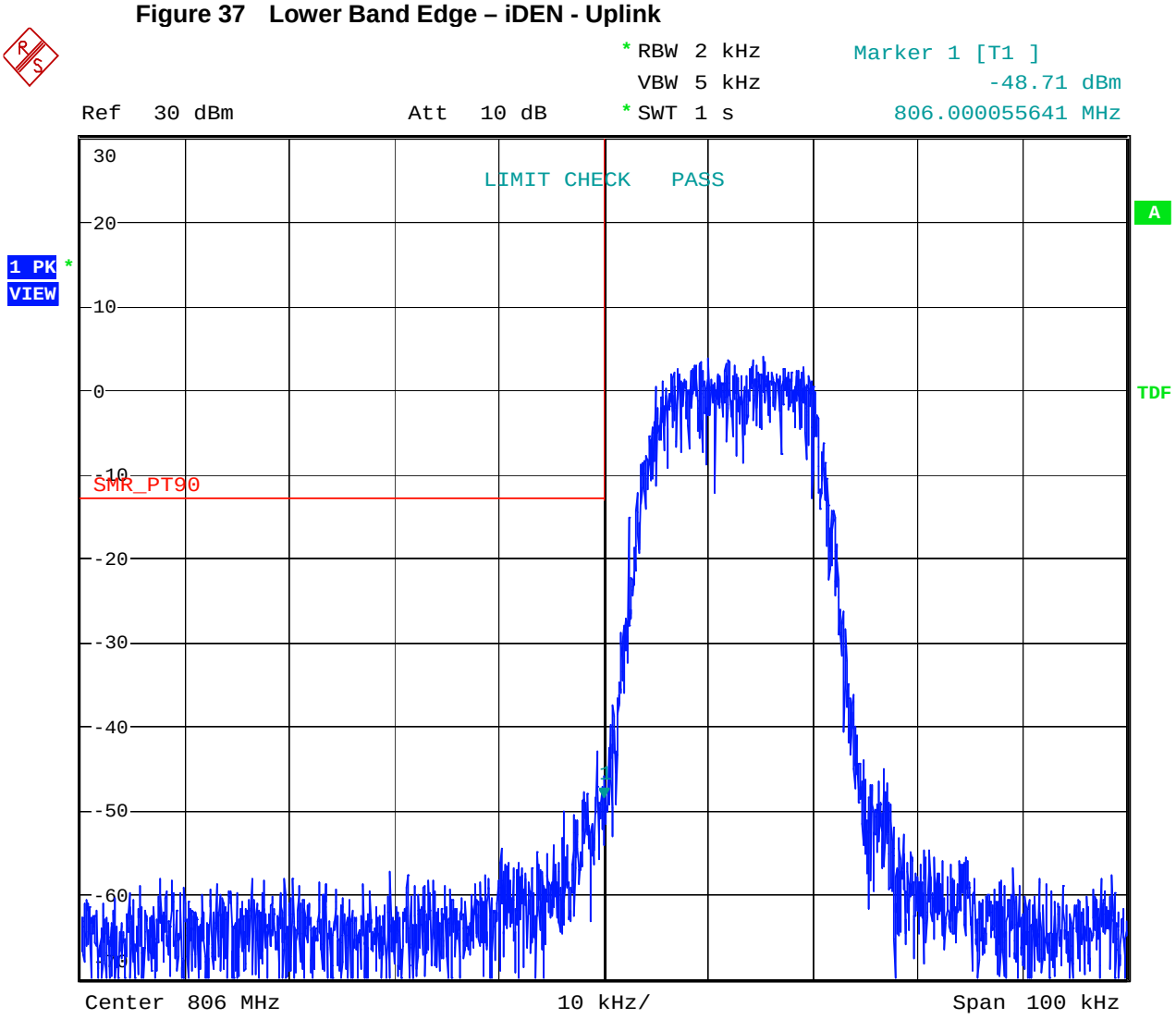


Figure 38 Upper Band Edge – iDEN - Uplink

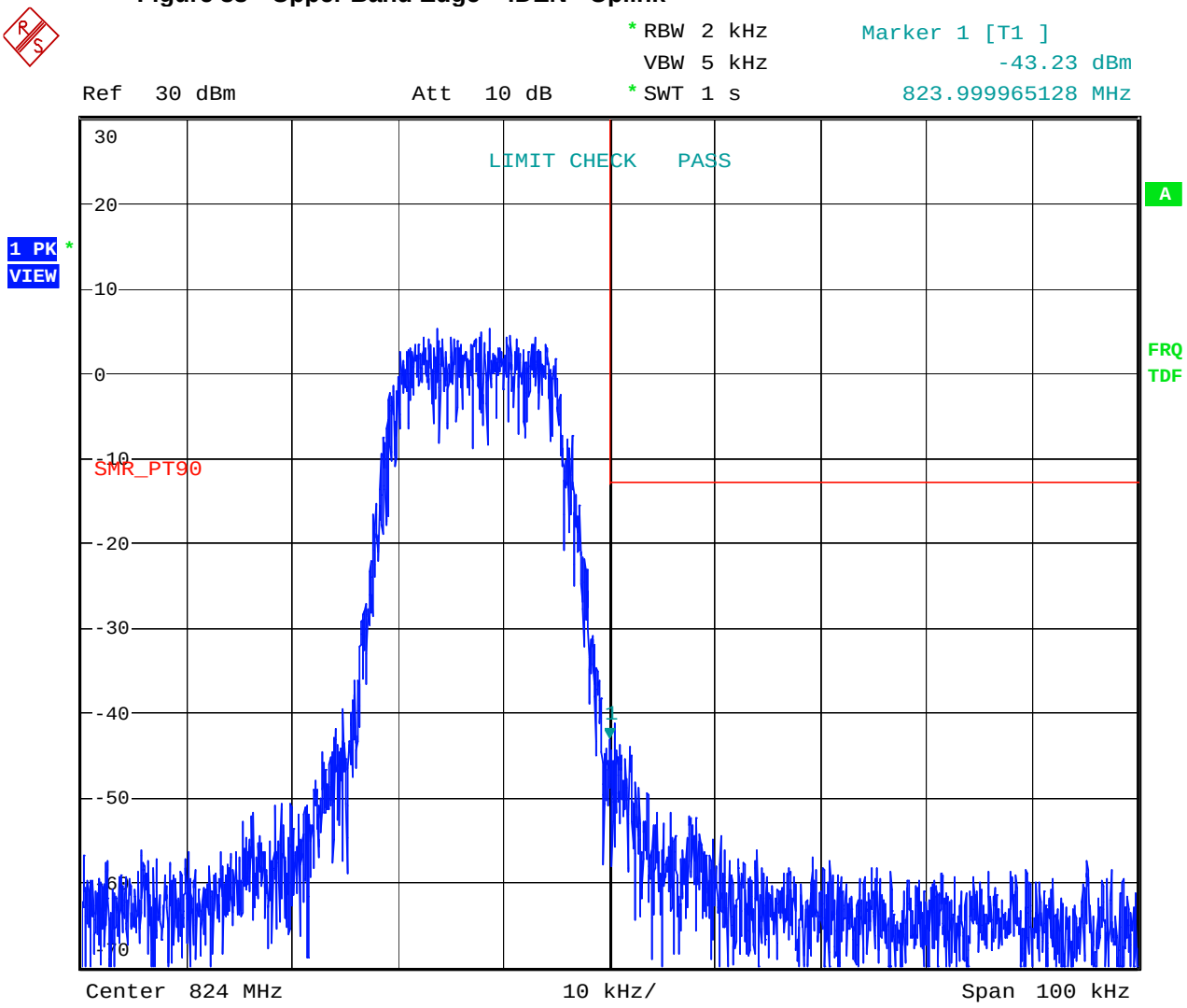


Figure 39 Lower Band Edge – iDEN - Downlink

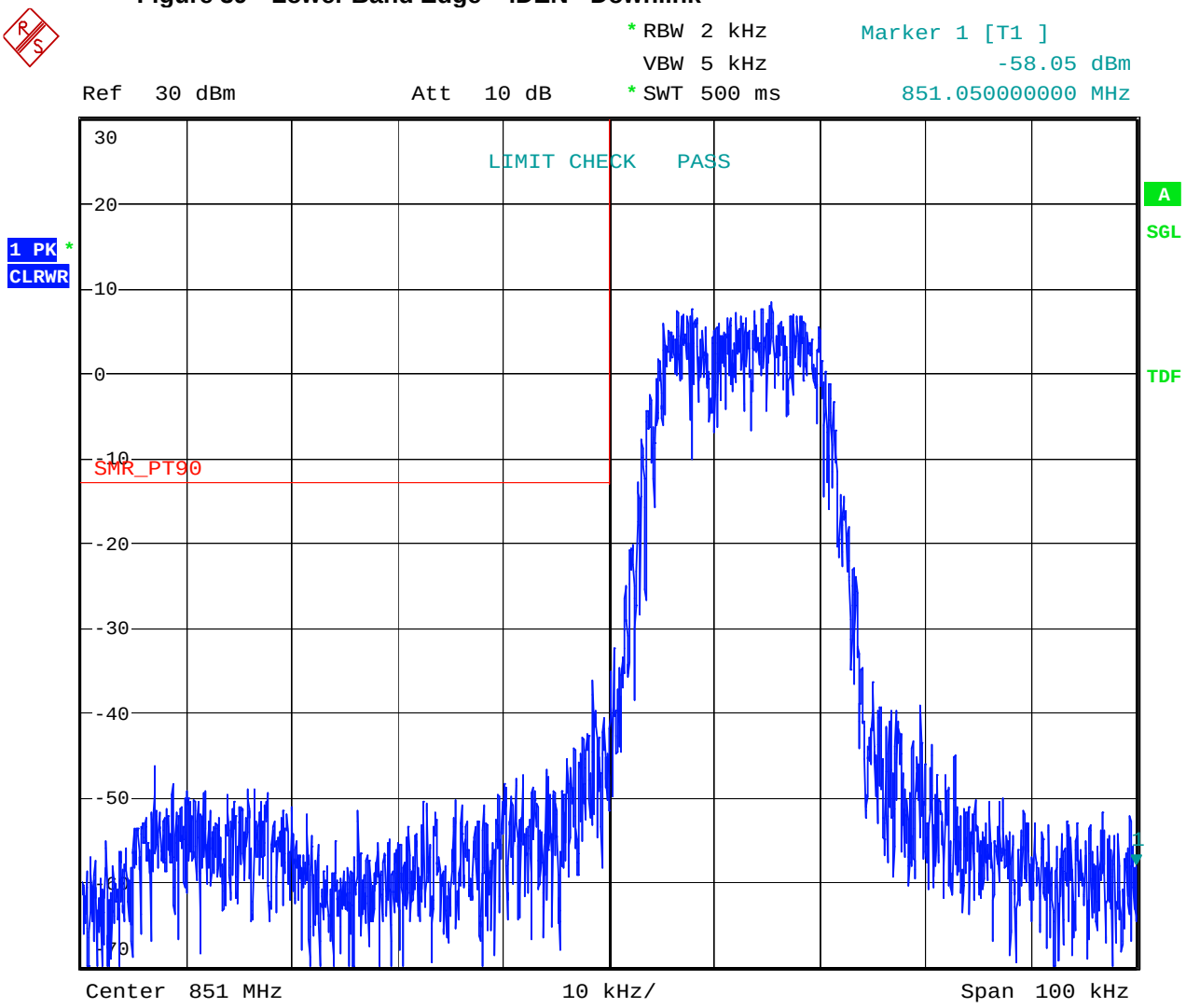
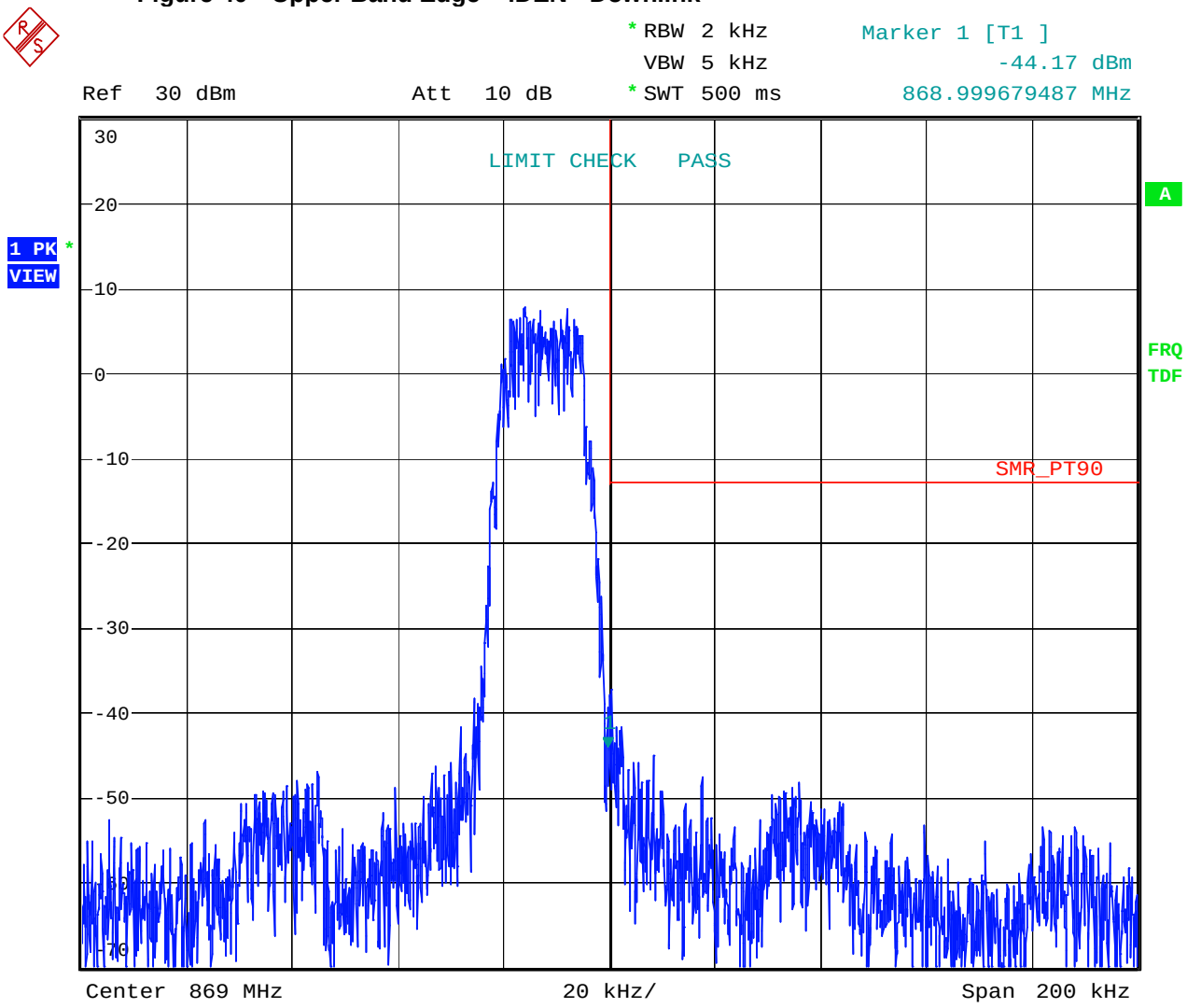


Figure 40 Upper Band Edge – iDEN - Downlink



D.8. Tested By

Name: Tom Tidwell,
Function: Manager of Wireless Services
Test Date: 17 – 21 May, 2007

APPENDIX E: 2.1053 FIELD STRENGTH OF SPURIOUS RADIATION

E.1. Base Standard & Test Basis

Base Standard	FCC 2.1053
Test Basis	FCC 2.1053 Field Strength of Spurious Radiation
Test Method	TIA 603-C, 2004 Substitution Antenna Method

E.2. Limits

90.210 Emission masks.
Except as indicated elsewhere in this part, transmitters used in the radio services governed by this part must comply with the emission masks outlined in this section. Unless otherwise stated, per paragraphs (d)(4), (e)(4), and (m) of this section, measurements of emission power can be expressed in either peak or average values provided that emission powers are expressed with the same parameters used to specify the unmodulated transmitter carrier power. For transmitters that do not produce a full power unmodulated carrier, reference to the unmodulated transmitter carrier power refers to the total power contained in the channel bandwidth. Unless indicated elsewhere in this part, the table in this section specifies the emission masks for equipment operating in the frequency bands governed under this part.

Applicable Emission Masks		
Frequency (MHz)	Mask for equipment with audio low-pass filter	Mask for equipment without audio low-pass filter
Below 25(1)	A or B	A or C
25 – 50	B	C
72 – 76	B	C
150 – 174(2)	B, D, or E	C, D, or E
150 paging only	B	C
220 – 222	F	F
421 – 512(2)	B, D, or E	C, D, or E
450 paging only	B	G
806 – 809 / 851 - 854	B	H
809 – 824 / 854 – 869(3)	B	G
896 – 901 / 935 – 940	I	J
902 – 928(4)	K	K
929 – 930	B	G
4940 – 4990	L or M	L or M
5850 - 5925(4)	-	-
All other bands	B	C

(1) Equipment using single sideband J3E emission must the requirements of Emission Mask A. Equipment using other emissions must meet the requirements of Emission Mask B or C, as applicable.
(2) Equipment designed to operate with a 25 kHz channel bandwidth must meet the requirements of Emission Mask B or C, as applicable. Equipment designed to operate with a 12.5 kHz channel bandwidth must meet the requirements of Emission Mask D, and equipment designed to operate with a 6.25 kHz channel bandwidth Must meet the requirements of Emission Mask E.
(3) Equipment used in this licensed to EA or non-EA systems shall comply with the emission mask provisions of § 90.691.
(4) DSRCS Roadside Units equipment in the 5850-5925 MHz band is governed under subpart M of this part.

E.3. Measurement Uncertainty

Expanded Uncertainty (K=2)
+1.11/-1.22

E.4. Test Results

Conforms. There were no emissions detected. The spectrum was investigated from 30 MHz – 10 GHz. The ambient levels are reported.

E.5. Test Data

Uplink

Project No:	Andrew Corporation W7220
Model:	MR803D
Comments:	Transmit at full rf output power (0.063 watts), 806.0125 MHz, 815 MHz, 823.0875 MHz Uplink
	There were no emissions detected. The readings below are noise floor.

Distance:	3 m	Standard:	CFR 47, Part 2.1043	RBW:	< 1 GHz = 120 kHz > 1 GHz = 1 MHz
VBW:	Peak = RBW	Avg. = RBW			

Antenna	Polarization	Frequency	Measured	Substitution Level	Substitution Antenna Gain	Final Measured Value		Peak Carrier Power		Minimum Attenuation Limit	Margin
	(V/H)	(MHz)	(dBm)	(dBm)	(dBd)	(dBm)	(watts)	(dBm)	(watts)	(dBc)	(dB)
Ambient	V	1630	-84.3	-68.1	6.2	-61.9	6.45654E-10	18	0.063	31	48.9
Ambient	H	1630	-94.6	-82.5	6.2	-76.3	2.34423E-11	18	0.063	31	63.3
Ambient	V	2445	-87.7	-69	6.2	-62.8	5.24807E-10	18	0.063	31	49.8
Ambient	V	2445	-96.0	-82.2	6.2	-76	2.51189E-11	18	0.063	32	62.0
Ambient	V	3260	-80.0	-66.1	9.2	-56.9	2.04174E-09	18	0.063	31	43.9
Ambient	H	3260	-96.0	-82.3	9.2	-73.1	4.89779E-11	18	0.063	33	58.1
Ambient	V	4075	-79.2	-69.3	9.2	-60.1	9.77237E-10	18	0.063	31	47.1
Ambient	H	4075	-95.7	-82.5	9.2	-73.3	4.67735E-11	18	0.063	34	57.3
Ambient	V	4890	-75.6	-71.0	9.2	-61.8	6.60693E-10	18	0.063	31	48.8
Ambient	H	4890	-68.0	-82.5	9.2	-73.3	4.67735E-11	18	0.063	31	60.3
Ambient	V	5705	-69.0	-71.1	10.1	-61.0	7.94328E-10	18	0.063	31	48.0
Ambient	H	5705	-69.0	-82.3	10.0	-72.3	5.88844E-11	18	0.063	31	59.3
Ambient	V	6520	-70.0	-69.4	10.4	-59.0	1.25893E-09	18	0.063	31	46.0
Ambient	H	6520	-70.0	-79.0	10.4	-68.6	1.38038E-10	18	0.063	31	55.6
Ambient	V	7335	-65.0	-74.9	10.1	-64.8	3.31131E-10	18	0.063	31	51.8
Ambient	H	7335.00	-65.0	-75.0	10.1	-64.9	3.23594E-10	18	0.063	31	51.9
Ambient	V	8150.00	-60.0	-72.7	11.2	-61.5	7.07946E-10	18	0.063	31	48.5
Ambient	H	8150.00	-60.0	-72.8	11.2	-61.6	6.91831E-10	18	0.063	31	48.6

Notes:
(1) A positive margin indicates a passing result
(2) If duty cycle correction is indicated, plots are included in the test report to validate the factor used.
(3) The minimum threshold of sensitivity was sufficient to detect signals within 20 dB of the -13 dBm limit over the frequency range 30 MHz - 10 GHz.

Downlink

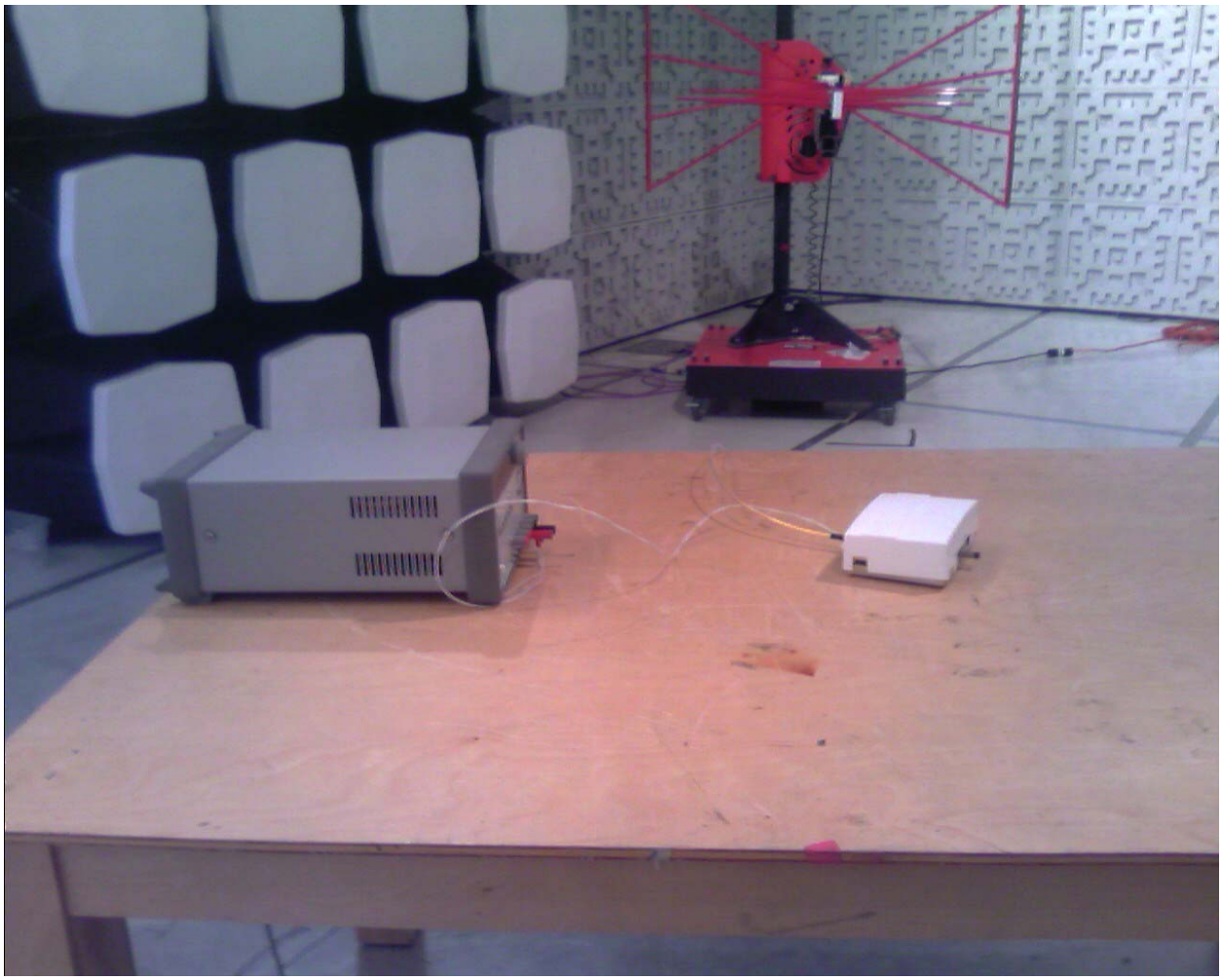
Project No:	Andrew Corporation W7220
Model:	MR803D
Comments:	Transmit at full rf output power (0.063 watts), 851.0125 MHz, 860 MHz, 868.0875 MHz Downlink
	There were no emissions detected. The readings below are noise floor.

Distance:	3 m	Standard:	CFR 47, Part 2.1043	RBW:	< 1 GHz = 120 kHz > 1 GHz = 1 MHz
VBW:	Peak = RBW	Avg. = RBW			

Antenna	Polarization	Frequency	Measured	Substitution Level	Substitution Antenna Gain	Final Measured Value		Peak Carrier Power		Minimum Attenuation Limit	Margin
	(V/H)	(MHz)	(dBm)	(dBm)	(dBd)	(dBm)	(watts)	(dBm)	(watts)	(dBc)	(dB)
Ambient	V	1612	-84.3	-68.4	6.2	-62.2	6.0256E-10	18	0.063	31	49.2
Ambient	H	1612	-94.6	-82.5	6.2	-76.3	2.34423E-11	18	0.063	31	63.3
Ambient	V	2418	-87.7	-72.1	6.2	-65.9	2.5704E-10	18	0.063	31	52.9
Ambient	V	2418	-96.0	-82.2	6.2	-76	2.51189E-11	18	0.063	32	62.0
Ambient	V	3224	-80.0	-66.1	9.2	-56.9	2.04174E-09	18	0.063	31	43.9
Ambient	H	3224	-96.0	-82.3	9.2	-73.1	4.89779E-11	18	0.063	33	58.1
Ambient	V	4030	-79.2	-69.3	9.2	-60.1	9.77237E-10	18	0.063	31	47.1
Ambient	H	4030	-95.7	-82.5	9.2	-73.3	4.67735E-11	18	0.063	34	57.3
Ambient	V	4836	-75.6	-71.0	9.2	-61.8	6.60693E-10	18	0.063	31	48.8
Ambient	H	4836	-68.0	-82.5	9.2	-73.3	4.67735E-11	18	0.063	31	60.3
Ambient	V	5642	-69.0	-70.8	10.1	-60.7	8.51138E-10	18	0.063	31	47.7
Ambient	H	5642	-69.0	-82.3	10.0	-72.3	5.88844E-11	18	0.063	31	59.3
Ambient	V	6448	-70.0	-69.4	10.4	-59.0	1.25893E-09	18	0.063	31	46.0
Ambient	H	6448	-70.0	-79.0	10.4	-68.6	1.38038E-10	18	0.063	31	55.6
Ambient	V	7254	-65.0	-74.9	10.1	-64.8	3.31131E-10	18	0.063	31	51.8
Ambient	H	7254.00	-65.0	-75.0	10.1	-64.9	3.23594E-10	18	0.063	31	51.9
Ambient	V	8060.00	-60.0	-72.7	11.2	-61.5	7.07946E-10	18	0.063	31	48.5
Ambient	H	8060.00	-60.0	-72.8	11.2	-61.6	6.91831E-10	18	0.063	31	48.6

Notes:
(1) A positive margin indicates a passing result
(2) If duty cycle correction is indicated, plots are included in the test report to validate the factor used.
(3) The minimum threshold of sensitivity was sufficient to detect signals within 20 dB of the -13 dBm limit over the frequency range 30 MHz - 10 GHz.

E.6. Test Setup Photos



E.7. Tested by:

Name:	Tom Tidwell,
Function:	Manager of Wireless Services
Test Date:	22 May, 2007

APPENDIX F: 2.1055 FREQUENCY STABILITY

F.1. Base Standard & Test Basis

Base Standard	FCC 2.1055
Test Method	TIA 603-C, 2004

F.2. Test Results

Not applicable. This device does not perform frequency translation on the rf input signal,

APPENDIX G: 90.214 TRANSIENT FREQUENCY BEHAVIOUR

G.1. Base Standard & Test Basis

Base Standard	90.214
Test Method	TIA 603-C, 2004

G.2. Test Results

Not applicable. This device is not a keyed carrier device. The rf amplifier is on continuously.

APPENDIX H: FILTER PLOTS

Figure 41 Uplink

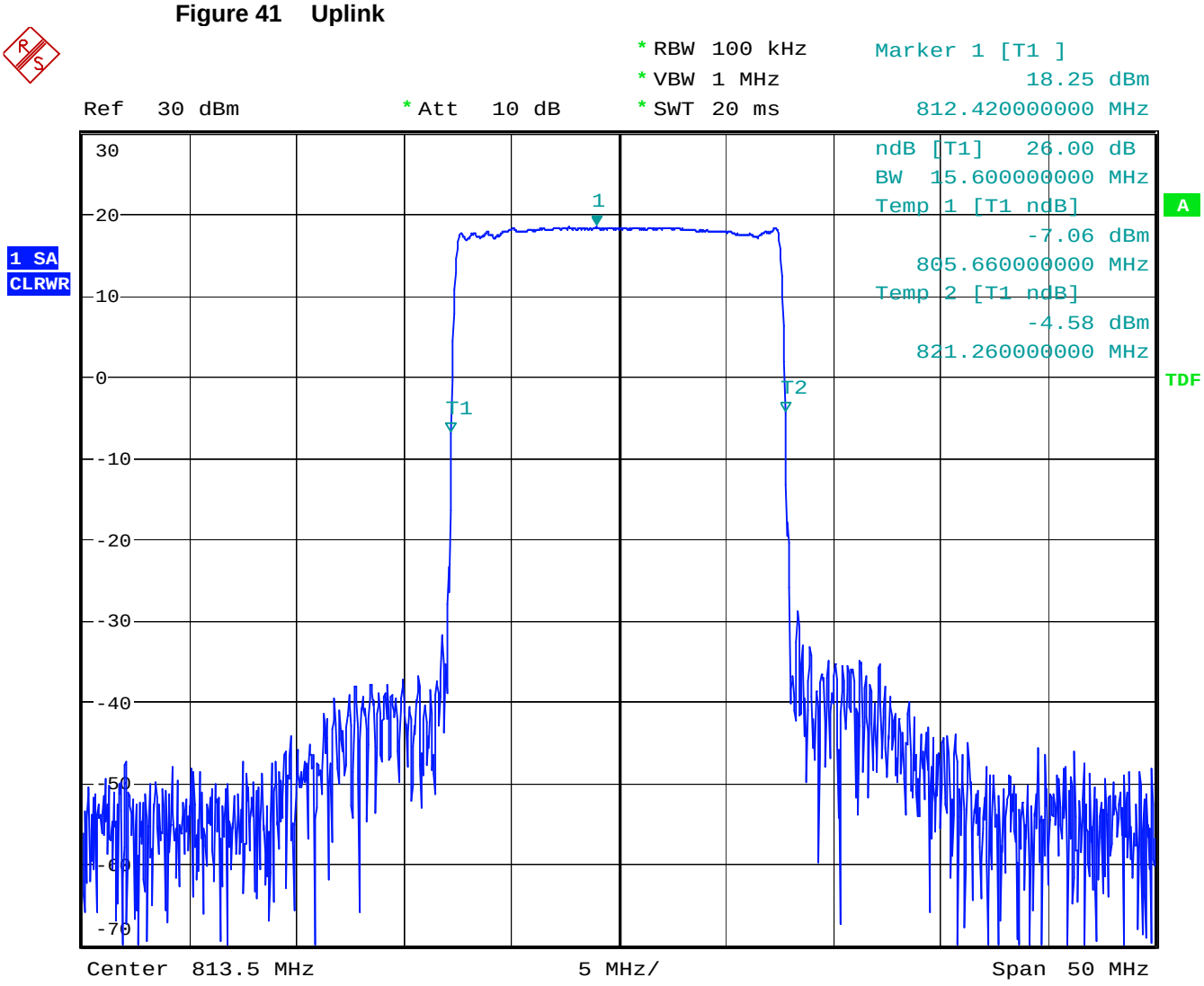
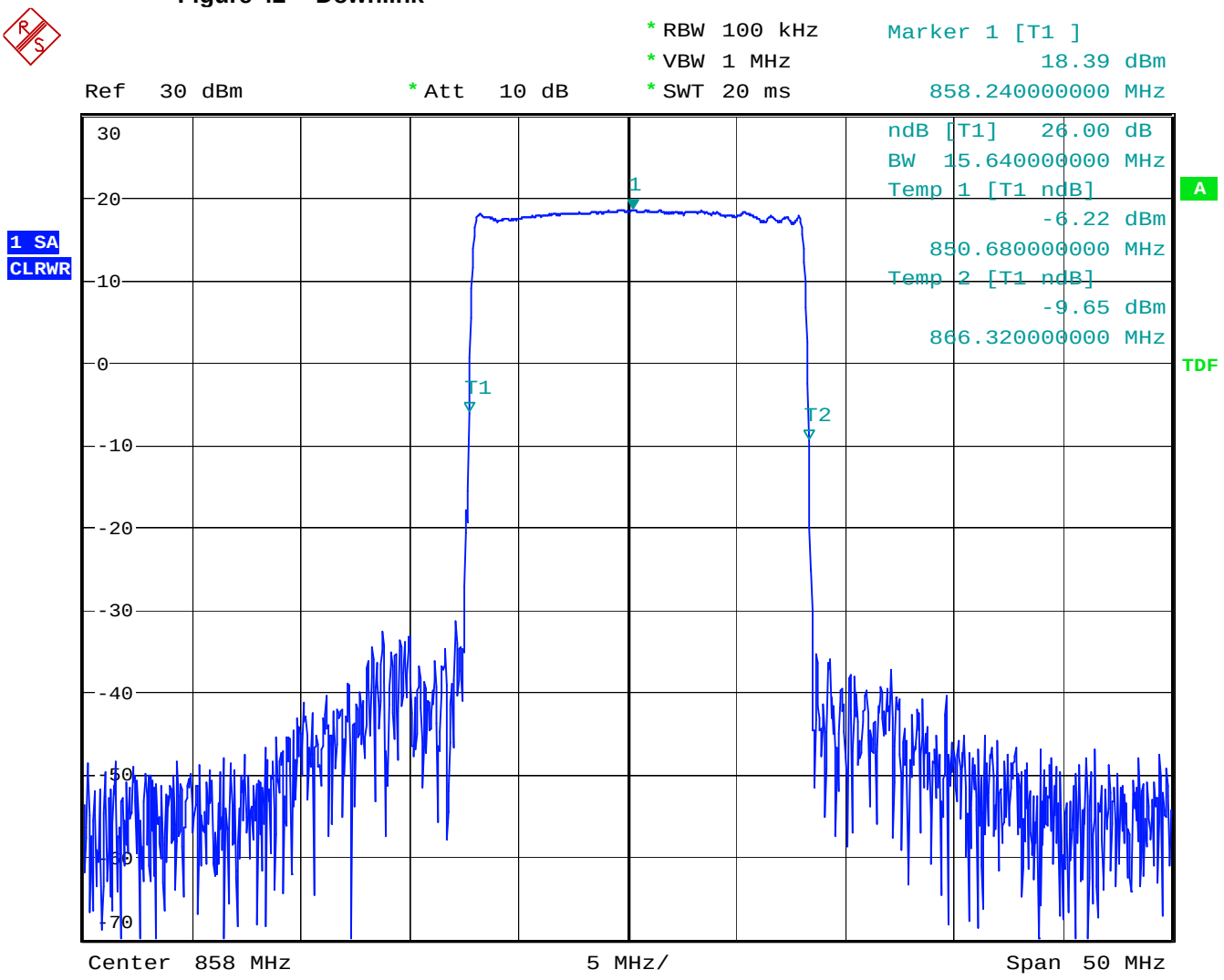


Figure 42 Downlink



APPENDIX I: TEST EQUIPMENT LIST

I.1. Radiated Emissions 30 MHz – 10 GHz Measurement Equipment

Description	Manufacturer	Type/Model	Calibration Frequency	Cal Due	NTS Control No.
3m ANECHOIC CHAMBER					
RX Bilog Antenna	ETS	3142C	12 Months	8/17/07	E1288P
Ref. Horn Antenna	ETS	3115	12 Months	11/1/07	E1019P
RX Horn Antenna	ETS	3115	12 Months	11/1/07	E1022P
High Frequency - Cable 1	MegaPhase	TM26-3135-144	12 Months	8/23/07	6070401001
Reference Antenna	ETS	3121 Dipole Set	12 months	8/8/07	S/N. 274
CONTROL ROOM					
Test Receiver	Rohde & Schwarz	FSQ26	12 Months	10/27/07	W1020P
High Frequency - Cable 2	MegaPhase	NA	12 Months	8/23/07	6070401002
Amplifier	HP	8449B	12 Months	6/30/08	E1010P

I.2. Antenna Conducted Emissions Measurement Equipment

Instrument	Manufacturer	Model	Calibration Frequency	Calibration Due
ANTENNA CONDUCTED EMISSIONS				
Spectrum Analyzer	Rohde & Schwarz	FSQ 26	12 Months	9/21/07
High Frequency - Cable 1	MegaPhase	TM26-3135-144	12 Months	8/23/07
10 dB attenuator	Wiltron	43KC-10	12 Months	8/23/07
20 dB attenuator	Inmet	36AH-20	12 Months	8/23/07
3 dB attenuator	Inmet	36AH-3	12 Months	8/23/07
3 dB attenuator	Inmet	36AH-3	12 Months	8/23/07
50 ohm loads	Amphenol	50R	12 Months	8/28/07
I/Q Signal Generator	Rohde & Schwarz	SMIQ 03	12 Months	8/25/07
I/Q Modulation Generator	Rohde & Schwarz	AMIQ	12 Months	8/28/07
Combiner	Mini-Circuits	ZFSC-2-2500	N/A	N/A*
IS-95 CDMA BTS simulator	Rohde & Schwarz	CMD80	N/A	N/A*

* This device was not used for calibrated measurements.

END OF DOCUMENT