Intertek Testing Services

FCC Part 15.239 Test Report
for
Innovative Wireless Products
on the
Low Power Transmitter
Model: QS-10 (860/2700)
FCC ID: NWH-0700Q15F

Test Report #: 20155382
Date of Report: July 30, 2000

Job #: J2015538
Date of Test: July 27, 2000

Total No. of Pages Contained in this Report: 13

Table of Contents

1.0 Summary of Test Results

Model: QS-10 (860/2700)
FCC ID: NWH-0700Q15F

TEST	REFERENCE	RESULTS
Bandwidth	15.239(a)	Pass
Radiated Emission	15.239(b)	Pass
Out of Band Radiated Emission	15.239(c)	Pass
AC Conducted Emission	15.207	N/A
Radiated Emission from Digital Part	15.109	Pass
Antenna Requirement	15.203	Pass

Based on the test results, the tested sample was found to be in compliance with the FCC Part 15 requirements.

We attest to the accuracy of this report.

Test Engineer: _____ Date: 8/3/00
Xi-Ming Yang

Engineering Mgr. _____ Date: 8/3/00
David Chernomordik

2.0 General Description

2.1 Product Description

The Innovative Wireless Products Model QS-10 is a low power transmitter device use for cellular devices.

A pre-production version of the sample was received on July 27, 2000 in good condition.

Overview of the EUT	
Manufacturer, Model & FCC ID of transmitter module	N/A
Type of Equipment	[x] Transmitter only [ ] Transceiver
Type of Transmission	[x] FM
Actual Frequency Range, MHz	88.1 MHz – 107.9 MHz
Number of Channels	
Antenna Requirement	[X] The EUT uses a permanently connected antenna. [ ] The antenna is affixed to the EUT using a unique connector which allows for a replacement of a broken antenna, but does not use a standard antenna jack or electrical connector. [ ] The EUT requires professional installation (attach supporting documentation if using this option).

2.2 Related Submittal(s) Grants

This report is for use with an application for certification of a low power transmitter. One transmitter is included in the application. This specific report details the emission characteristics of the transmitter.

2.3 Test Methodology

Both AC mains line-conducted and radiated emission measurements were performed according to the procedures in ANSI C63.4 (1992). All measurements were performed in Open Area Test Sites. Preliminary scans were performed in the Open Area Test Sites only to determine worst case modes. For each scan, the procedure for maximizing emissions in Appendices D and E were followed. All Radiated tests were performed at an antenna to EUT distance of 3 meters, unless stated otherwise in the "Justification Section" of this Application.

2.4 Test Facility

The open area test site and conducted measurement facility used to collect the radiated data is Site 1. This test facility and site measurement data have been fully placed on file with the FCC and NVLAP accredited.

3.0 System Test Configuration

3.1 Justification

For emission testing, the equipment under test (EUT) was configured for testing in a typical fashion (as a customer would normally use it). During testing, all cables were manipulated to produce worst case emissions.

For the measurements, the EUT is attached to a cardboard box (if necessary) and placed on the wooden turntable. If the EUT attaches to peripherals, they are connected and operational (as typical as possible). The EUT is wired to transmit full power without modulation.

The signal is maximized through rotation and placement in the three orthogonal axes. The antenna height and polarization are varied during the search for maximum signal level. The antenna height is varied from 1 to 4 meters. Detector function is in peak mode. Radiated emissions are taken at three meters unless the signal level is too low for measurement at that distance. If necessary, a pre-amplifier is used and/or the test is conducted at a closer distance. All readings are extrapolated back to the equivalent three meters reading using inverse scaling with distance.

Small loop antenna was used at close distance measurement of bandwidth and band edge plots.

Maximum sensitivity frequency 1 kHz audio was input to the other cellular phone which was wirelessly connected to the cellular phone connected conductively to the EUT. The value was adjusted until the saturation period.

3.2 EUT Exercising Software

The EUT exercise program used during radiated and conducted testing was designed to exercise the various system components in a manner similar to a typical use.

For emissions testing, the units were setup to transmit continuously to simplify the measurement methodology. Care was taken to ensure proper power supply voltages during testing.

3.3 Mode of Operation During Test

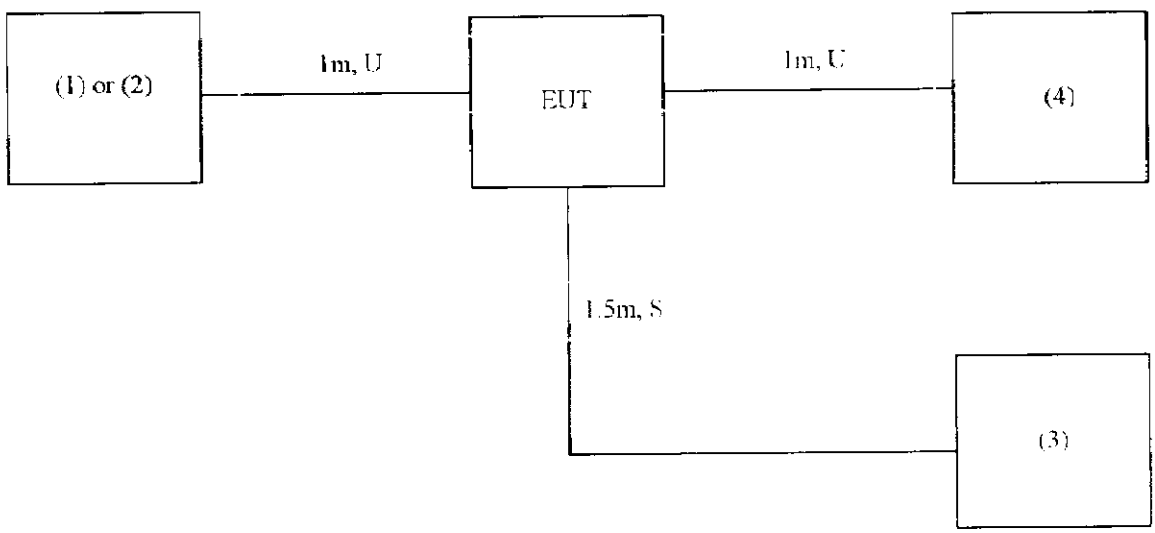
The EUT was continuously transmitting.

3.4 System Test Configuration

3.4.1 Support Equipment

Item #	Description	Model No.	Serial No.	FCC ID
1	Cellular Phone	Qualcomm 860	N/A	OVFQCP-860
2	Cellular Phone	Qualcomm 2700	N/A	JPCAEP12
3	Microphone	N/A	N/A	N/A
4	12VDC Battery	N/A	N/A	N/A

3.4.2 Block Diagram of Test Setup



* = EUT ** = No ferrites on video cable	S = Shielded; F = With Ferrite U = Unshielded

3.5 Equipment Modification

Any modifications installed previous to testing by Innovative Wireless Products will be incorporated in each production model sold/leased in the United States.

3.6 Additions, deviations and exclusions from standards

None

4.0 Emission Results

AC line conducted emission measurements were performed from 0.45 MH to 30 MHz. Analyzer resolution is 10 kHz or greater.

Radiated emission measurements were performed from 30 MHz to 5000 MHz. Analyzer resolution is 100 kHz or greater for 30 MHz to 1000 MHz, 1 MHz for >1000 MHz.

Data is included of the worst case configuration (the configuration which resulted in the highest emission levels). A sample calculation, configuration photographs and data tables of the emissions are included. All measurements were performed with peak detection unless otherwise specified.

4.1 Field Strength Calculation

The field strength is calculated by adding the Antenna Factor and Cable Factor, and subtracting the Amplifier Gain (if any) from the measured reading. The basic equation with a sample calculation is as follows:

FS = RA + AF + CF - AG

where FS = Field Strength in dB(μV/m)
RA = Receiver Amplitude (including preamplifier) in dB(μV)
CF = Cable Attenuation Factor in dB
AF = Antenna Factor in dB/m
AG = Amplifier Gain in dB

In the following table(s), the reading shown on the data table reflects the preamplifier gain. An example for the calculations in the following table is as follows:-

FS = RR + LF

where FS = Field Strength in dB(μV/m)
RR = RA - AG in dB(μV)
LF = CF + AF in dB

Assume a receiver reading of 52.0 dB(μV) is obtained. The antenna factor of 7.4 dB/m and cable factor of 1.6 dB is added. The amplifier gain of 29 dB is subtracted, giving a field strength of 32 dB(μV/m). This value in dB□V/m was converted to its corresponding level in μV/m.

RA = 52.0 dB(μV)
RR = 23.0 dB(μV)
LF = 9.0 dB

AF = 7.4 dB/m
CF = 1.6 dB
AG = 29.0 dB

FS = RR + LF
FS = 23 + 9 = 32 dB(μV/m)

Level in μV/m = Common Antilogarithm {[32 dB(μV/m)]/20} = 39.8 μV/m

4.2 Radiated Emission Data

The data on the following pages list the significant emission frequencies, the limit and the margin of compliance.

Results:	Passed by 0.9 dB at 88.1 MHz

Note: a) All emissions not reported are at least 20 dB below the limits

Radiated Emissions Test Data

Company:	Innovative Wireless Products	**Model #:**	QS-10(860/2700)	**Standard_**	**FCC § 15B**		
EUT:		**S/N #:**		**Limits_**	2		
Project #:		**Test Date:**	July 27, 2000	**Test Distance_**	3	meters	
Test Mode:	Tx @ 88.1	**Engineer:**	Xi-Ming Y.	**Duty Relaxation**	0	dB	

	Antenna Used			Pre-Amp Used			Cable Used			Transducer Used
Number:	1	7	0	5	0	0	5	0	0	0
Model:	EMCO 3143	EM LPA-25	None	CDI_P950	None	None	NPS665	None	None	None

Frequency	Reading	Detector	Ant.	Amp.	Ant. Pol.	Ant. Factor	Pre-Amp	Insert. Loss	D. C. F.	Net	Limit @3m	Margin
MHz	dB(μV)	P/A/Q	#	#	H/V	dB(1/m)	dB	dB	dB	dB(μV/m)	dB(μV/m)	dB
88.10E+0	38.1	Peak	1	0	H	8.1	0.0	0.9	0.0	47.1	48.0	-0.9
38.40E+0	12.0	Peak	1	0	H	10.8	0.0	0.5	0.0	23.3	40.0	-16.7
57.66E+0	13.0	Peak	1	0	H	5.0	0.0	0.7	0.0	18.7	40.0	-21.3
176.20E+0	27.0	Peak	1	0	H	9.2	0.0	1.4	0.0	37.6	43.5	-5.9
264.30E+0	11.0	Peak	1	0	H	12.5	0.0	1.8	0.0	25.3	46.0	-20.7
352.40E+0	10.7	Peak	1	0	H	15.4	0.0	2.2	0.0	28.3	46.0	-17.7
440.50E+0	10.0	Peak	1	0	H	17.0	0.0	2.3	0.0	29.3	46.0	-16.7
528.60E+0	9.0	Peak	1	0	H	18.7	0.0	2.5	0.0	30.2	46.0	-15.8
616.70E+0	10.0	Peak	1	0	H	19.5	0.0	2.7	0.0	32.2	46.0	-13.8
704.80E+0	12.0	Peak	1	0	H	21.1	0.0	3.0	0.0	36.1	46.0	-9.9
792.90E+0	9.0	Peak	1	0	H	22.1	0.0	3.0	0.0	34.1	46.0	-11.9
881.00E+0	10.0	Peak	1	5	H	23.7	12.7	3.4	0.0	24.4	46.0	-21.6

Notes:

a) D.C.F. Distance Correction Factor

b) Insert. Loss (dB) = Cable A + Cable B + Cable C

c) Net (dB) = Reading + Antenna Factor - Pre-amp + Insert. Loss. - Transducer Loss - Duty Relaxation (transmitter only).

d) Negative signs (-) in Margin column signify levels below the limits.

e) All other emissions not reported are below the equipment noise floor which is at least 20 dB below the limits.

Radiated Emissions Test Data

Company:	Innovative Wireless Products	**Model #:**	QS-10(860/2700)	**Standard_**	**FCC § 15B**	
EUT:		**S/N #:**		**Limits_**	2	
Project #:		**Test Date:**	July 27, 2000	**Test Distance_**	3	meters
Test Mode:	Tx @ 98.0	**Engineer:**	Xi-Ming Y.	**Duty Relaxation**	0	dB

	Antenna Used			Pre-Amp Used			Cable Used			Transducer Used
Number:	1	7	0	5	0	0	5	0	0	0
Model:	EMCO 3143	EM LPA-25	None	CDI_P950	None	None	NPS665	None	None	None

Frequency	Reading	Detector	Ant.	Amp.	Ant. Pol.	Ant. Factor	Pre-Amp	Insert. Loss	D. C. F.	Net	Limit @3m	Margin
MHz	dB(μV)	P/A/Q	#	#	H/V	dB(1/m)	dB	dB	dB	dB(μV/m)	dB(μV/m)	dB
98.00E+0	38.5	Peak	1	0	H	7.6	0.0	0.9	0.0	47.0	48.0	-1.0
38.40E+0	11.0	Peak	1	0	H	10.8	0.0	0.5	0.0	22.3	40.0	-17.7
57.66E+0	13.2	Peak	1	0	H	5.0	0.0	0.7	0.0	18.9	40.0	-21.1
196.00E+0	24.0	Peak	1	0	H	11.0	0.0	1.5	0.0	36.5	43.5	-7.0
294.00E+0	12.0	Peak	1	0	H	13.5	0.0	1.8	0.0	27.3	46.0	-18.7
392.00E+0	12.0	Peak	1	0	H	15.4	0.0	2.2	0.0	29.6	46.0	-16.4
490.00E+0	10.2	Peak	1	0	H	17.9	0.0	2.3	0.0	30.4	46.0	-15.6
588.00E+0	9.5	Peak	1	0	H	19.4	0.0	2.9	0.0	31.8	46.0	-14.2
686.00E+0	10.5	Peak	1	0	H	20.7	0.0	3.0	0.0	34.2	46.0	-11.8
784.00E+0	11.0	Peak	1	0	H	22.5	0.0	3.0	0.0	36.5	46.0	-9.5
882.00E+0	12.0	Peak	1	0	H	23.7	0.0	3.4	0.0	39.1	46.0	-6.9
980.00E+0	9.0	Peak	1	5	H	23.6	9.4	3.5	0.0	26.7	54.0	-27.3

Notes:

a) D.C.F. :Distance Correction Factor

b) Insert. Loss (dB) = Cable A + Cable B + Cable C

c) Net (dB) = Reading + Antenna Factor - Pre-amp + Insert. Loss - Transducer Loss - Duty Relaxation (transmitter only).

d) Negative signs (-) in Margin column signify levels below the limits.

e) All other emissions not reported are below the equipment noise floor which is at least 20 dB below the limits.

Radiated Emissions Test Data

Company:	Innovative Wireless Products	**Model #:**	QS-10(860/2700)	**Standard_**	**FCC § 15B**	
EUT:		**S/N #:**		**Limits_**	2	
Project #:		**Test Date:**	July 27, 2000	**Test Distance_**	3	meters
Test Mode:	Tx @ 107.9MHz	**Engineer:**	Xi-Ming Y.	**Duty Relaxation**	0	dB

	Antenna Used			Pre-Amp Used			Cable Used			Transducer Used
Number:	1	7	0	5	0	0	5	0	0	0
Model:	EMCO 3143	EM LPA-25	None	CDI_P950	None	None	NPS665	None	None	None

Frequency	Reading	Detector	Ant.	Amp.	Ant. Pol	Ant. Factor	Pre-Amp	Insert. Loss	D. C. F.	Net	Limit @3m	Margin
MHz	dB(μV)	P/A/Q	#	#	H/V	dB(1/m)	dB	dB	dB	dB(μV/m)	dB(μV/m)	dB
107.90E+0	38.9	Peak	1	0	H	7.2	0.0	1.0	0.0	47.1	48.0	-0.9
38.40E+0	11.3	Peak	1	0	H	10.8	0.0	0.5	0.0	22.6	40.0	-17.4
57.66E+0	12.5	Peak	1	0	H	5.0	0.0	0.7	0.0	18.2	40.0	-21.8
215.80E+0	13.0	Peak	1	0	H	11.1	0.0	1.5	0.0	25.6	43.5	-17.9
431.60E+0	12.0	Peak	1	0	H	17.2	0.0	2.3	0.0	31.5	46.0	-14.5
539.50E+0	11.0	Peak	1	0	H	19.0	0.0	2.5	0.0	32.5	46.0	-13.5
647.40E+0	10.0	Peak	1	0	H	20.7	0.0	2.7	0.0	33.4	46.0	-12.6
755.30E+0	11.0	Peak	1	0	H	21.9	0.0	3.0	0.0	35.9	46.0	-10.1
863.20E+0	12.0	Peak	1	0	H	23.1	0.0	3.4	0.0	38.5	46.0	-7.5
971.10E+0	11.5	Peak	1	0	H	23.4	0.0	3.5	0.0	38.4	54.0	-15.6
1079.00E+0	9.0	Peak	1	0	H	24.0	0.0	3.6	0.0	36.6	54.0	-17.4
980.00E+0	9.0	Peak	1	5	H	23.6	9.4	3.5	0.0	26.7	54.0	-27.3

Notes:

a) D.C.F.:Distance Correction Factor

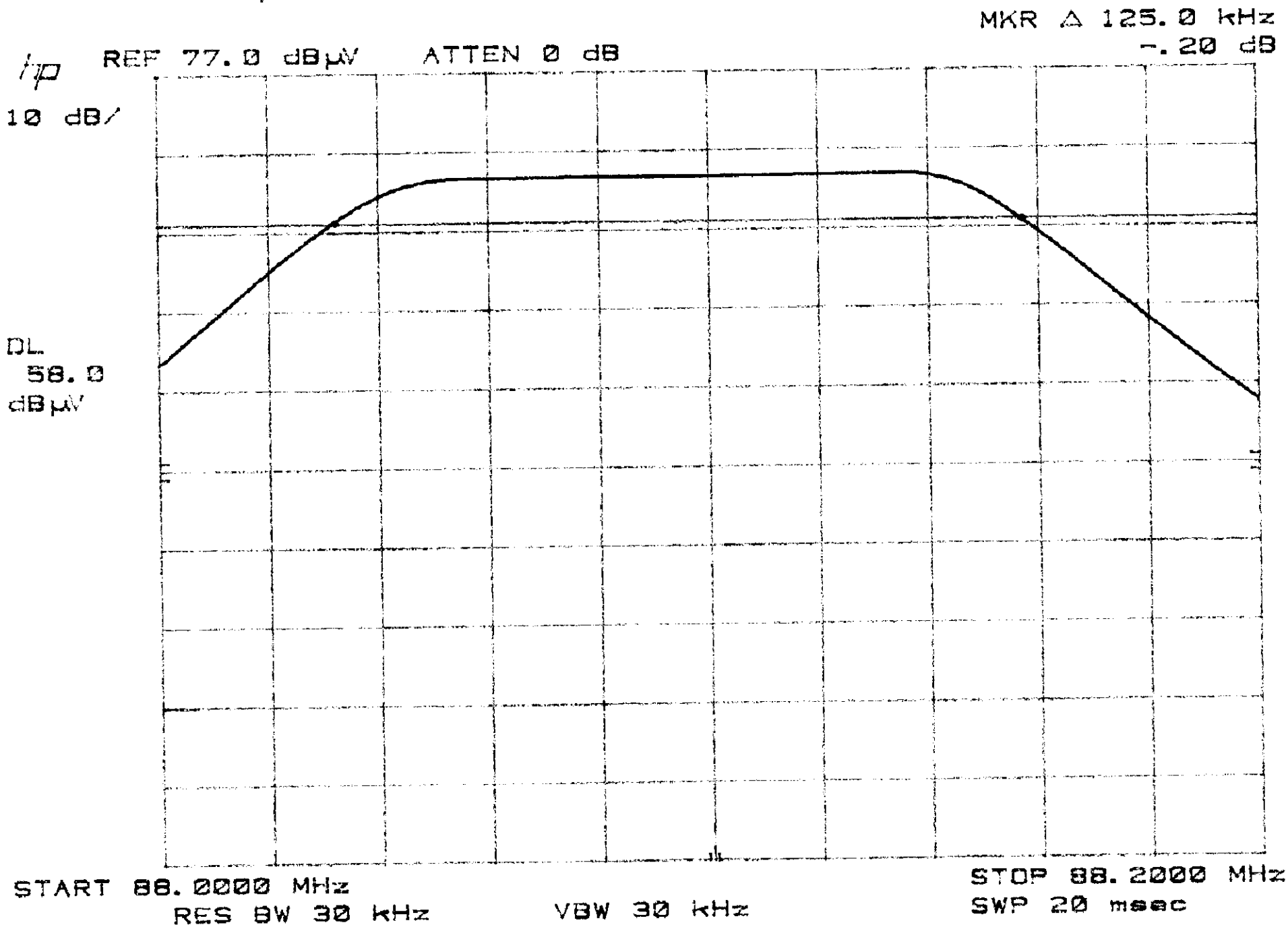
b) Insert. Loss (dB) = Cable A + Cable B + Cable C .

c) Net (dB) = Reading + Antenna Factor - Pre-amp + Insert. Loss. - Transducer Loss - Duty Relaxation (transmitter only).

d) Negative signs (-) in Margin column signify levels below the limits.

e) All other emissions not reported are below the equipment noise floor which is at least 20 dB below the limits.

QS-10(860)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hp
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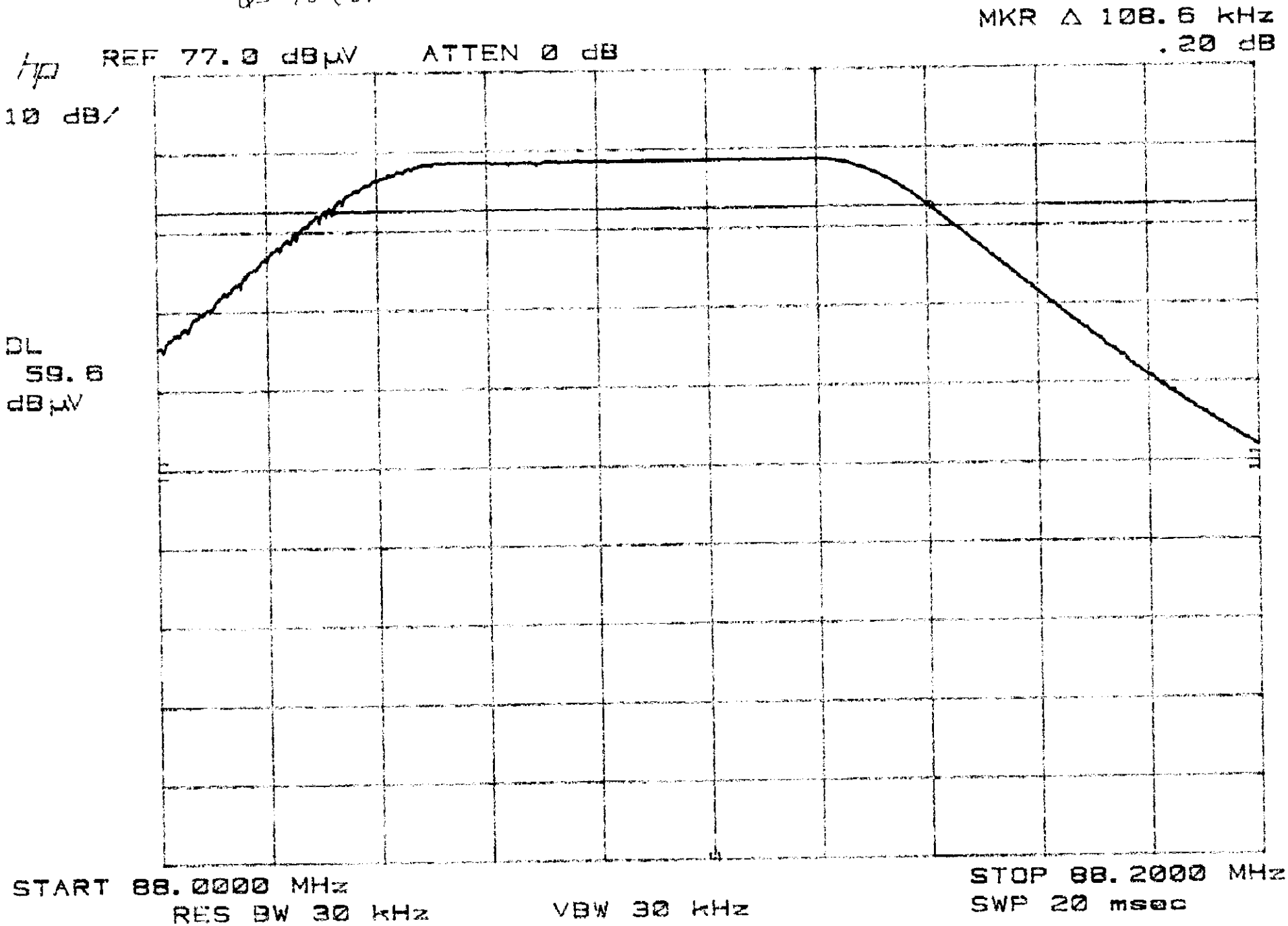
ATTEN 0 dB
10 dB/
DL
58.0
dBμV
START 88.0000 MHz
RES BW 30 kHz
VBW 30 kHz
STOP 88.2000 MHz
SWP 20 msec

QS-10 (2700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.20 dB
REF 77.0 dBμV
ATTEN 0 dB
10 dB/
DL
59.6
dBμV
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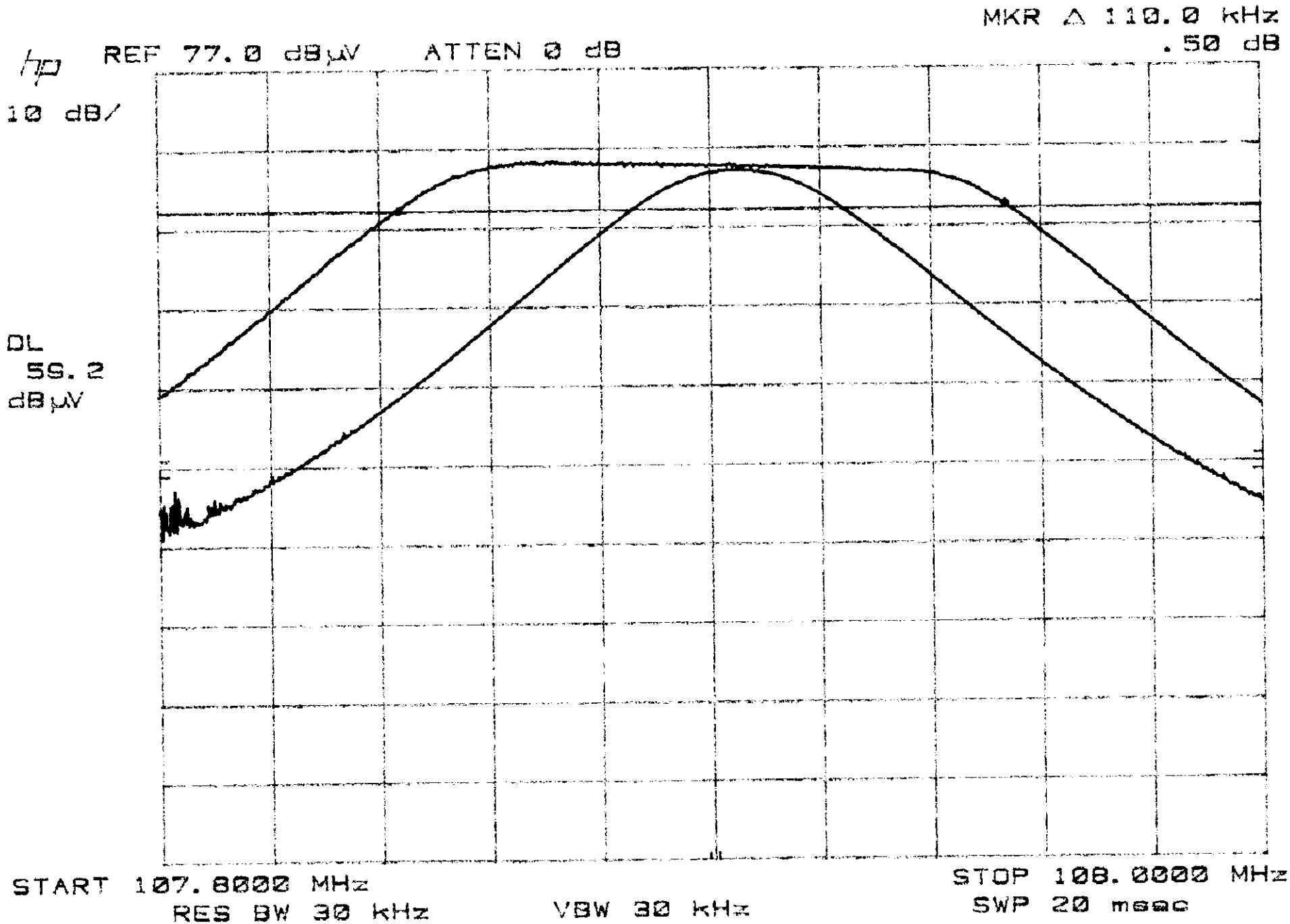
VBW 30 kHz
STOP 88.2000 MHz
SWP 20 msec

QS-10 (860)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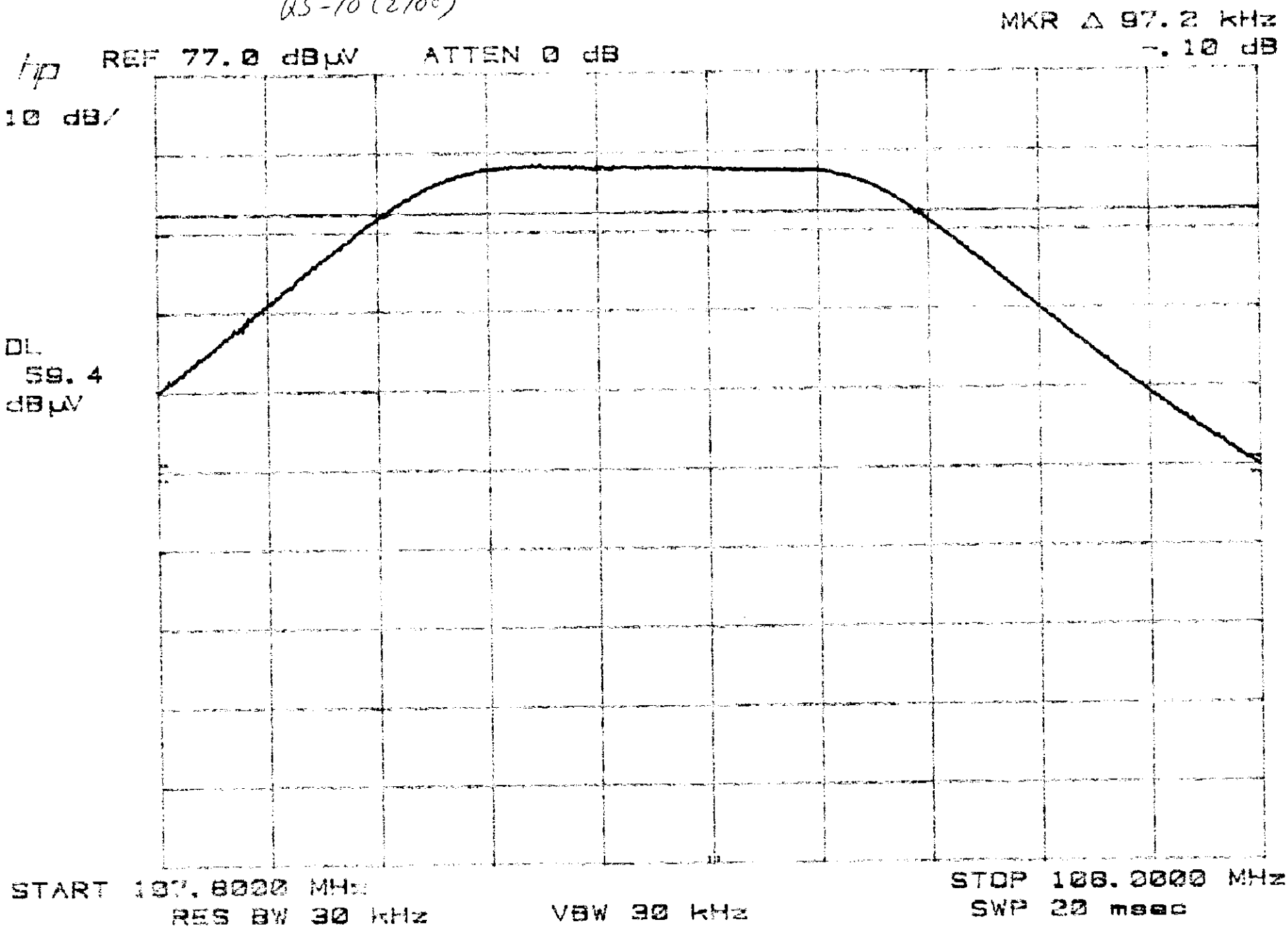
.50 dB
REF 77.0 dBµV
ATTEN 0 dB
10 dB/
DL
55.2
dBµV
START 107.8000 MHz
RES BW 30 kHz
VBW 30 kHz
STOP 108.0000 MHz
SWP 20 msec

QS-10 (270°)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-.10 dB
hp REF 77.0 dBµV ATTEN 0 dB
10 dB/
DL
59.4
dBµV
START 137.8000 MHz
RES BW 30 kHz
VBW 30 kHz
STOP 168.0000 MHz
SWP 20 msec

4.3 Conducted Emission Data

The data on the following pages list the significant emission frequencies, the limit and the margin of compliance.

Results:	**N/A, the unit is battery powered device**

Note: a) A complete scan from 0.45 - 30 MHz was made.

5.0 Antenna Requirement

X	The transmitter uses a permanently connected antenna.
	The antenna is affixed to the EUT using a unique connector that allows for replacement of a broken antenna, but does NOT use a standard antenna jack or electrical connector.
	The EUT requires professional installation. Please refer to the attached documentation for details).

6.0 Miscellaneous Information or Other Comments

None