1. VERIFICATION OF COMPLIANCE

COMPANY NAME	:	HBC ELECTRONIC FUNKTECHNIK GMBH HALLER STRASSE 49-53 CRAILSHEIM 74564 GERMANY
CONTACT PERSON	:	WOLFGANG BRENDEL / PRESIDENT
TELEPHONE NO	:	(01149)7951-393-855
EUT DESCRIPTION	:	INDUSTRIAL WIRELESS RADIO REMOTE CONTROL TRANSMITTER
MODEM NAME	:	SNTU 1.0
DATE TESTED	:	July 15, 1998

TECHNICAL LIMITS	TEST RESULT
Radiated Emission of fundamental Frequency	PASSED
Radiated Emission of Harmonic Frequency	PASSED
Radiated Emission Outside the Band	PASSED

The above equipment was tested by Compliance Certification Services Inc. for compliance with the requirements set forth in CFR 47 PART 15 SUBPART C. This said equipment in the configuration described in this report shows the maximum emission levels emanating from equipment are within the compliance requirements.

MIKE C.I. KUO / VICE PRESIDENT
COMPLIANCE CERTIFICATION SERVICES, INC.

2. DESCRIPTION OF EQUIPMENT UNDER TEST (EUT)

CHASSIS TYPE	**PLASTIC**
Frequency Range	**902 - 918 MHz**
Synthesizer	**FUS 671/3**
Type of Transmitter	**Frequency Modulated**
Antenna Gain (dBi)	**5 dBi**
Antenna Requirement	**Permanently Attached (Internal)**
DC voltage	**6V DC**
Emission Designator	**F2D**
Associated Receiver	**HBC Electronic Funktechnik GmbH, Model No:SYS735**

3. TEST LOCATION

All emissions tests were performed at:

Compliance Certification Services
561F Monterey Road
Morgan Hill, CA 95087

CCS has site descriptions on file with the FCC for 10 and 3 meter site configurations.
CCS is a NVLAP accredited facility.

4. TEST RESULT SUMMARY

Radiated Emissions
Test Requirement: 15.249(A)(B)

Measurement Equipment Used:

HP Spectrum Analyzer/8566B
HP Spectrum Display/85662A
HP Quasi-Peak Detector/85650A
HP Pre-Amp(P5)/8447D
Emco Log-Periodic Antenna/3146

TEST SETUP FOR MEASUREMENT OF FUNDAMENTAL FREQUENCY

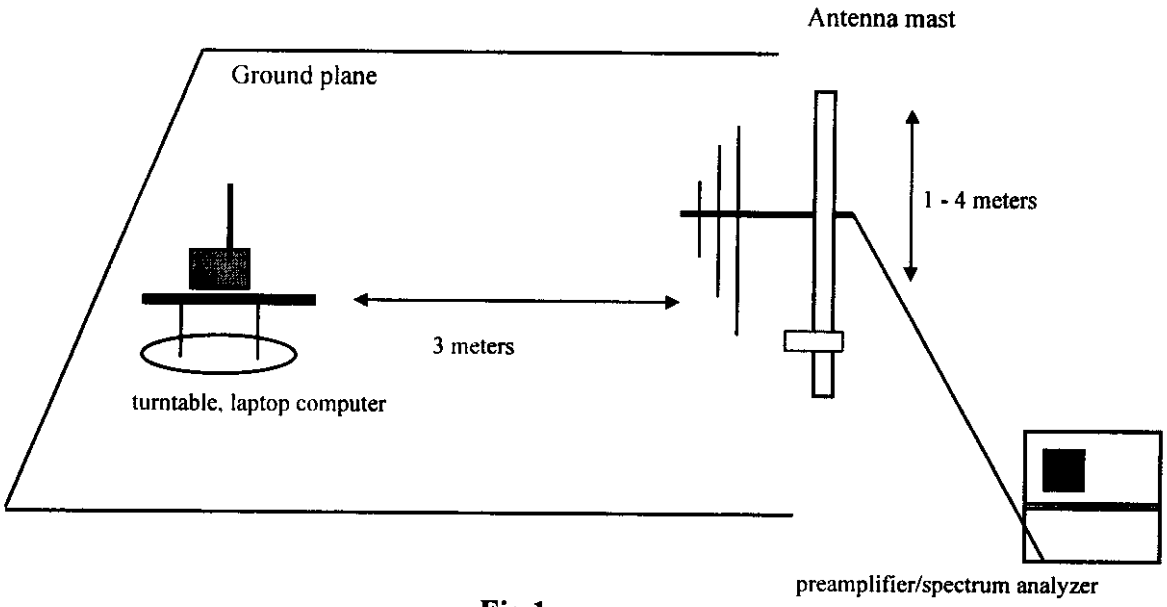


Fig.1

Test Procedures

1) Place the EUT on the turntable as shown. The EUT was placed as close as possible to the center of the turntable with the axis of rotation going through the EUT antenna when in vertical or horizontal polarization. Activated any auxiliary input or control equipment required to produce EUT's normal modulated output signal

2) The log periodic search antenna was place at a distance of 3 meters. The antenna was raised and lowered, the EUT rotated on the turntable, until the EUT azimuth, antenna elevation, and antenna polarity were found which yielded maximum received emission levels on the spectrum analyzer.

3) The EUT is capable of operating at different frequencies, measurement of fundamental were performed for a channel near the bottom of the operating band, a channel near the middle of the operating band, and a channel near the top of the operating band. For handheld devices or EUT's that have no specified orientation during normal operation was placed standing-up(y-axis), on its side(x-axis), and laying down(z-axis). Steps (1) and (2) were repeated for each orientation and for low, middle and high channels of EUT.

Test Results: Please refer to attached data.

Compliance Engineering Services Inc.

Project No. : 98E7540
Report No. : 980715C3
Date : 07/15/1998
Time : 14:52
Test Engr : JUAN MARTINEZ

>> 3 M RADIATED EMISSION DATA <<

Company : HBC-ELECTRONICS FUNKTECHNIK GMBH
Equipment Under Test : INDUSTRIAL CRANE REMOTE CONTROL TRANSMITTER
Test Configuration : EUT ONLY
Type of Test : FCC 15.249(A,C)
Mode of Operation : TX

Freq.	dBuV	PreAmp	Ant	Cable	dBuV/m	Limit	Margin	Pol	Hgt(m)	Az
CONTINUING FROM REPORT# 980713B1.										
LOW CHANNEL (902.5MHz)										
Z-AXIS:										
902.50	87.80	-27.76	21.87	3.94	85.85	94.00	-8.15	V	2.0	135
Y-AXIS:										
902.50	87.10	-27.76	21.87	3.94	85.15	94.00	-8.85	V	1.0	270
X-AXIS:										
902.50	90.70	-27.76	21.87	3.94	88.75	94.00	-5.25	V	2.5	127
X-AXIS:										
902.50	90.40	-27.76	22.90	3.94	89.48	94.00	-4.52	H	1.0	180
Y-AXIS:										
902.50	88.70	-27.76	22.90	3.94	87.78	94.00	-6.22	H	1.0	227
Z-AXIS:										
902.50	89.75	-27.76	22.90	3.94	88.83	94.00	-5.17	H	1.0	45

Total # of data 6
V. c2.2

Compliance Engineering Services Inc.

Project No. : 98E7540
Report No. : 980713B1
Date : 07/13/1998
Time : 15:31
Test Engr : PETE K

>> 3 M RADIATED EMISSION DATA <<

Company : HBC
Equipment Under Test : SNTU REMOTE CONTROL TRANSMITTER
Test Configuration : EUT ONLY
Type of Test : FCC 15.249(A,C)
Mode of Operation : TX

Freq.	dBuV	PreAmp	Ant	Cable	dBuV/m	Limit	Margin	Pol	Hgt(m)	Az
Y-AXIS										
LP 2120 ; Pre-pamp = 8447D-P8 2944A06589:										
909.75	83.20	-27.47	22.63	6.11	84.47	94.00	-9.53	H	1.0	0
X-AXIS										
909.75	80.00	-27.47	22.63	6.11	81.27	94.00	-12.73	H	1.0	0
Z-AXIS										
909.75	78.90	-27.47	22.63	6.11	80.17	94.00	-13.83	H	1.0	0
Z-AXIS										
909.75	82.80	-27.47	22.02	6.11	83.46	94.00	-10.54	V	1.0	0
X-AXIS										
909.75	84.30	-27.47	22.02	6.11	84.96	94.00	-9.04	V	1.0	0
Y-AXIS										
909.75	78.20	-27.47	22.02	6.11	78.86	94.00	-15.14	V	1.0	0
Y-AXIS										
916.30	79.40	-27.44	22.74	6.13	80.83	94.00	-13.17	H	1.0	0
X-AXIS										
916.30	77.83	-27.44	22.74	6.13	79.26	94.00	-14.74	H	1.0	0
Z-AXIS										
916.30	75.20	-27.44	22.74	6.13	76.63	94.00	-17.37	H	1.0	0
Z-AXIS										
916.30	82.10	-27.44	22.12	6.13	82.91	94.00	-11.09	V	1.0	0
X-AXIS										
916.30	81.60	-27.44	22.12	6.13	82.41	94.00	-11.59	V	1.0	0
Y-AXIS										
916.30	78.20	-27.44	22.12	6.13	79.01	94.00	-14.99	V	1.0	0

Total # of data 16
V. b2.2

Radiated Emissions
Test Requirement: 15.249(A)(B)

Measurement Equipment Used:

Emco Horn Antenna/3146
HP Pre-Amp (1 – 26.5 GHz)/8449B
HP Spectrum Analyzer/8593EM
FSY High Pass Filter(1.802GHz)/001
FLEXCO cable/20761; 19ft. coaxial cable (loss: .9dB/ft @ 26GHz)

TEST SETUP FOR MEASUREMENT OF FUNDAMENTAL HARMONICS ABOVE 1GHz

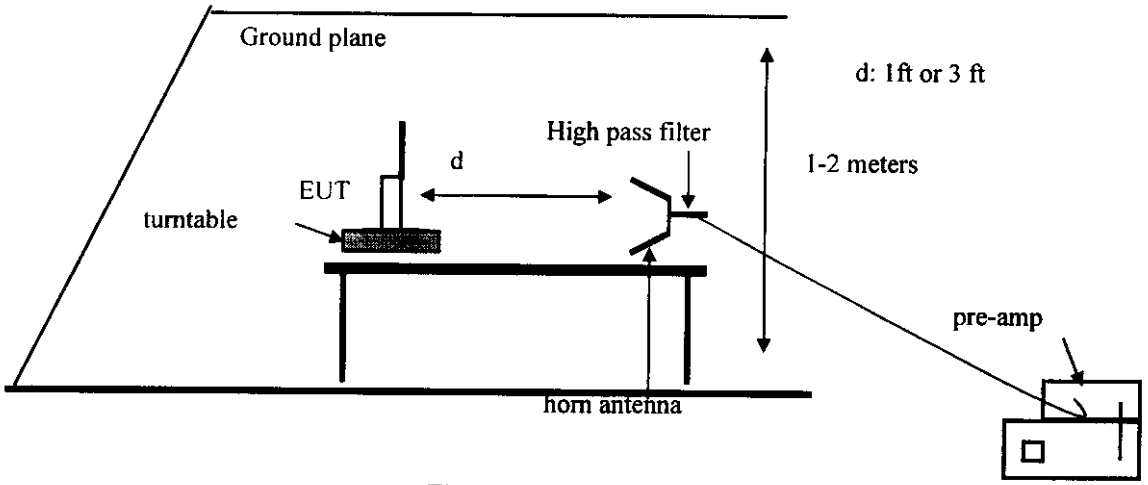


Fig. 1

Test Procedures

1. The EUT was placed on a lazy Susan on the OATS wooden turntable. The search antenna was placed 3 ft. from the EUT.

2. The turntable was slowly rotated to locate the direction of maximum emission. Once maximum direction was determined, the search antenna was raised and lowered in both vertical and horizontal polarizations.

3. The EUT is capable of operating at different frequencies, measurement of fundamental harmonics were performed for a channel near the bottom of the operating band, a channel near the middle of the operating band, and a channel near the top of the operating band. For handheld devices or EUT's that have no specified orientation during normal operation was placed standing-up(y-axis), on its side(x-

axis), and laying down(z-axis). Steps (1) and (2) were repeated for each orientation and for low, middle and high channels of EUT.

Test result: Please refer to attached spreedsheets.

Compliance Certification Services
Fcc Part 15.249(A)

7/15/1998
Juan Martinez
Site C(1Meter)

HBC-ELECTRONICS FUNKTECHNIK GMBH
CRANE TRANSMITTER (902 - 918 MHz)
S/N: 735-K10213

*f*o=902.5MHz

F(MHz)	*PK* dBuv	*AV* dBuv	AF (dB)	CL (dB)	AMP (dB)	DIST (dB)	OTHER (dB)	TOTAL (dBuV/m)		LIMIT (dBuV/m)		MARGIN (dBuV/m)	
Y-AXIS								*PK*	*AV*	*PK*	*AV*	*PK*	*AV*
1807	57.49	55.15	26	1.23	-35	-10.5	1	40	38	74	54	-34	-16
2710	55.42	53.29	30	3.5	-35	-10.5	1	44	42	74	54	-30	-12
3614	53.99	51.64	32.9	4.38	-35	-10.5	1	47	44	74	54	-27	-9.6
4517	53.82	50.59	32.4	5.18	-35	-10.5	1	47	44	74	54	-27	-10
5420(*N*)	39.56	36.48	34.9	5.74	-35	-10.5	1	36	33	74	54	-38	-21
6.322(*N*)	40.58	34.78	35.3	6.08	-35	-10.5	1	37	32	74	54	-37	-22
7228(*N*)	44.83	37.45	36.5	6.65	-35	-10.5	1	43	36	74	54	-31	-18
8102(*N*)	45.26	38.71	37.1	7.6	-35	-10.5	1	45	39	74	54	-29	-15
9035(*N*)	46.46	40.15	38.3	7.98	-35	-10.5	1	48	42	74	54	-26	-12
X-AXIS													
1807	57.63	56.07	26	1.23	-35	-10.5	1	40	39	74	54	-34	-15
2710	54.35	51.03	30	3.5	-35	-10.5	1	43	40	74	54	-31	-14
3614	52.79	49.42	32.9	4.38	-35	-10.5	1	46	42	74	54	-28	-12
4517	51.66	48.26	32.4	5.18	-35	-10.5	1	45	41	74	54	-29	-13
5420(*N*)	55.04	52.57	34.9	5.74	-35	-10.5	1	51	49	74	54	-23	-5.3
6.322(*N*)	44.83	36.81	35.3	6.08	-35	-10.5	1	42	34	74	54	-32	-20
7228(*N*)	47.56	38.9	36.5	6.65	-35	-10.5	1	46	38	74	54	-28	-16
8102(*N*)	48.75	37.12	37.1	7.6	-35	-10.5	1	49	37	74	54	-25	-17
9035(*N*)	47.26	38.58	38.3	7.98	-35	-10.5	1	49	40	74	54	-25	-14

Z-AXIS

1807	56.28	53.82	26	1.23	-35	-10.5	1	39	37	74	54	-35	-17
2710	57.94	57.94	30	3.5	-35	-10.5	1	47	47	74	54	-27	-7.1
3614	58.64	56.68	32.9	4.38	-35	-10.5	1	51	49	74	54	-23	-4.5
4517	52.67	49.24	32.4	5.18	-35	-10.5	1	46	42	74	54	-28	-12
5420(***N***)	55.44	52.59	34.9	5.74	-35	-10.5	1	52	49	74	54	-22	-5.3
6.322(***N***)	45.77	36.54	35.3	6.08	-35	-10.5	1	43	33	74	54	-31	-21
7228(***N***)	48.95	39.78	36.5	6.65	-35	-10.5	1	48	38	74	54	-26	-16
8102(***N***)	48.75	36.89	37.1	7.6	-35	-10.5	1	49	37	74	54	-25	-17
9035(***N***)	47.89	37.02	38.3	7.98	-35	-10.5	1	50	39	74	54	-24	-15

NOTE: ALL MEASUREMENTS ARE HORIZONTAL MEASUREMENTS.

N: Noise Floor
AF: Antenna Factor
AMP: Pre-amp gain
CL: Cable loss
DIST: Distance Correction(10.5dB, 3ft.)
OTHER: High pass filter insertion loss
FSY Microwave high pass filter (***f***o=1.802GHz)

	RES	VBW
PK:	1MHz	1MHz
AV:	1MHz	10Hz

PK: Peak
AV: Average

Compliance Certification Services
Fcc Part 15.249(A)

7/15/1998
Juan Martinez
Site C(1Meter)

HBC-ELECTRONICS FUNKTECHNIK GMBH
CRANE TRANSMITTER (902 - 918 MHz)
S/N: 735-K10213

*f*o=909.9MHz

F(MHz)	*PK* dBuv	*AV* dBuv	AF (dB)	CL (dB)	AMP (dB)	DIST (dB)	OTHER (dB)	TOTAL (dBuV/m)		LIMIT (dBuV/m)		MARGIN (dBuV/m)	
Z-AXIS								*PK*	*AV*	*PK*	*AV*	*PK*	*AV*
1819	51.94	49.78	26	2.66	-35	-10.5	1	36	34	74	54	-38	-20
2729	47.69	43.87	30	3.8	-35	-10.5	1	37	33	74	54	-37	-21
3639	58.89	57.65	33	4.75	-35	-10.5	1	52	51	74	54	-22	-3.1
4549	52.08	49.31	32.4	5.32	-35	-10.5	1	45	43	74	54	-29	-11
5459	47.25	42.11	35	5.89	-35	-10.5	1	44	39	74	54	-30	-16
6369(*N*)	41.11	36.89	35.3	6.46	-35	-10.5	1	38	34	74	54	-36	-20
7279(*N*)	44.95	38.97	36.5	6.65	-35	-10.5	1	44	38	74	54	-30	-16
8189(*N*)	46.95	40.78	37.2	7.41	-35	-10.5	1	47	41	74	54	-27	-13
9099(*N*)	45.64	39.78	38.3	7.79	-35	-10.5	1	47	41	74	54	-27	-13
X-AXIS													
1819	56.25	54.05	26	2.66	-35	-10.5	1	40	38	74	54	-34	-16
2729	45.3	38.01	30	3.8	-35	-10.5	1	35	27	74	54	-39	-27
3639	57.24	55.24	33	4.75	-35	-10.5	1	50	48	74	54	-24	-5.5
4549	50.74	47.58	32.4	5.32	-35	-10.5	1	44	41	74	54	-30	-13
5459	46.03	39.66	35	5.89	-35	-10.5	1	42	36	74	54	-32	-18
6369(*N*)	41.11	36.89	35.3	6.46	-35	-10.5	1	38	34	74	54	-36	-20
7279(*N*)	44.95	38.97	36.5	6.65	-35	-10.5	1	44	38	74	54	-30	-16
8189(*N*)	46.95	40.78	37.2	7.41	-35	-10.5	1	47	41	74	54	-27	-13
9099(*N*)	45.64	39.78	38.3	7.79	-35	-10.5	1	47	41	74	54	-27	-13

Y-AXIS

1819	52.69	49.99	26	2.66	-35	-10.5	1	37	34	74	54	-37	-20
2729	47.97	42.16	30	3.8	-35	-10.5	1	37	31	74	54	-37	-23
3639	53.88	52.31	33	4.75	-35	-10.5	1	47	46	74	54	-27	-8.4
4549	53.17	50.41	32.4	5.32	-35	-10.5	1	46	44	74	54	-28	-10
5459	45.11	39.06	35	5.89	-35	-10.5	1	42	35	74	54	-33	-19
6369(*N*)	41.11	36.89	35.3	6.46	-35	-10.5	1	38	34	74	54	-36	-20
7279(*N*)	44.95	38.97	36.5	6.65	-35	-10.5	1	44	38	74	54	-30	-16
8189(*N*)	46.95	40.78	37.2	7.41	-35	-10.5	1	47	41	74	54	-27	-13
9099(*N*)	45.64	39.78	38.3	7.79	-35	-10.5	1	47	41	74	54	-27	-13

NOTE: ALL MEASUREMENTS ARE HORIZONTAL MEASUREMENTS.

N: Noise Floor
AF: Antenna Factor
AMP: Pre-amp gain
CL: Cable loss
DIST: Distance Correction(10.5dB, 3ft.)
OTHER: High pass filter insertion loss
FSY Microwave high pass filter (***f***o=1.802GHz)

	RES	**VBW**
PK:	1MHz	1MHz
AV:	1MHz	10Hz

PK: Peak
AV: Average

Compliance Certification Services
Fcc Part 15.249(A)

7/15/1998
Juan Martinez
Site C(1Meter)

HBC-ELECTRONICS FUNKTECHNIK GMBH
CRANE TRANSMITTER (902 - 918 MHz)
S/N: 735-K10213

*f*o=916.35MHz

F(MHz)	*PK* dBuv	*AV* dBuv	AF (dB)	CL (dB)	AMP (dB)	DIST (dB)	OTHER (dB)	TOTAL (dBuV/m)		LIMIT (dBuV/m)		MARGIN (dBuV/m)	
Y-AXIS								*PK*	*AV*	*PK*	*AV*	*PK*	*AV*
1832	50.4	47.58	26	2.27	-35	-10.5	1	34	31	74	54	-40	-23
2748	42.55	36.1	30	3.5	-35	-10.5	1	32	25	74	54	-42	-29
3665	52.75	50.4	33	4.38	-35	-10.5	1	46	43	74	54	-28	-11
4581	52.49	49.67	32.4	5.25	-35	-10.5	1	46	43	74	54	-28	-11
5498	42.81	34.05	35	5.6	-35	-10.5	1	39	30	74	54	-35	-24
6414(*N*)	39.34	32.65	35.3	6.46	-35	-10.5	1	37	30	74	54	-37	-24
7330(*N*)	43.25	36.89	36.5	6.65	-35	-10.5	1	42	36	74	54	-32	-18
8247(*N*)	46.4	40.12	37.2	7.41	-35	-10.5	1	47	40	74	54	-27	-14
9163(*N*)	46.3	39.58	38.3	7.79	-35	-10.5	1	48	41	74	54	-26	-13
X-AXIS													
1832	52.63	48.69	26	2.27	-35	-10.5	1	36	32	74	54	-38	-22
2748	41.3	35.9	30	3.5	-35	-10.5	1	30	25	74	54	-44	-29
3665	53.44	53.44	33	4.38	-35	-10.5	1	46	46	74	54	-28	-7.7
4581	50.12	47.18	32.4	5.25	-35	-10.5	1	43	40	74	54	-31	-14
5498	42.29	34.39	35	5.6	-35	-10.5	1	38	30	74	54	-36	-24
6414(*N*)	42.46	36.48	35.3	6.46	-35	-10.5	1	40	34	74	54	-34	-20
7330(*N*)	47.34	41.48	36.5	6.65	-35	-10.5	1	46	40	74	54	-28	-14
8247(*N*)	48.15	42.35	37.2	7.41	-35	-10.5	1	48	42	74	54	-26	-12
9163(*N*)	47.32	40.78	38.3	7.79	-35	-10.5	1	49	42	74	54	-25	-12

Z-AXIS

1832	50.72	48.45	26	2.27	-35	-10.5	1	34	32	74	54	-40	-22
2748	47.9	41.63	30	3.5	-35	-10.5	1	37	31	74	54	-37	-23
3665	59.69	58.45	33	4.38	-35	-10.5	1	53	51	74	54	-21	-2.7
4581	51.51	48.5	32.4	5.25	-35	-10.5	1	45	42	74	54	-29	-12
5498	45.81	40.46	35	5.6	-35	-10.5	1	42	37	74	54	-32	-17
6414(***N***)	39.34	32.65	35.3	6.46	-35	-10.5	1	37	30	74	54	-37	-24
7330(***N***)	43.25	36.89	36.5	6.65	-35	-10.5	1	42	36	74	54	-32	-18
8247(***N***)	46.4	40.12	37.2	7.41	-35	-10.5	1	47	40	74	54	-27	-14
9163(***N***)	46.3	39.58	38.3	7.79	-35	-10.5	1	48	41	74	54	-26	-13

NOTE: ALL MEASUREMENTS ARE HORIZONTAL MEASUREMENTS.

N: Noise Floor
AF: Antenna Factor
AMP: Pre-amp gain
CL: Cable loss
DIST: Distance Correction(10.5dB, 3ft.)
OTHER: High pass filter insertion loss
FSY Microwave high pass filter (***f***o=1.802GHz)

	RES	**VBW**
PK:	1MHz	1MHz
AV:	1MHz	10Hz

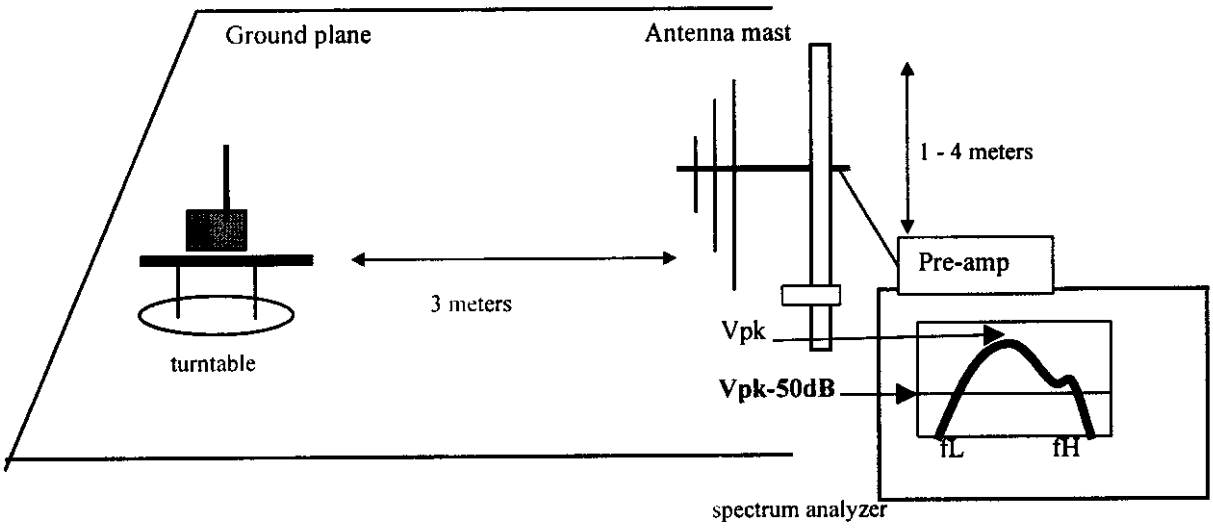
PK: Peak
AV: Average

Out of Band Emissions
Test Requirement: 15.249(C)

Measurement Equipment Used:

HP Spectrum Analyzer/8566B
HP Spectrum Display/85662A
HP Quasi-Peak Detector/85650A
HP Pre-Amp(P5)/8447D
Emco Log-Periodic Antenna/3146

Test Set-Up



Test Procedures

1. The EUT was configured on wooden turntable as shown on figure 2. The log periodic search antenna was place at a distance of 3 meters. The antenna was raised and lowered, the EUT rotated on the turntable, until the EUT azimuth, antenna elevation, and antenna polarity were found which yielded maximum received emission levels on the spectrum analyzer.

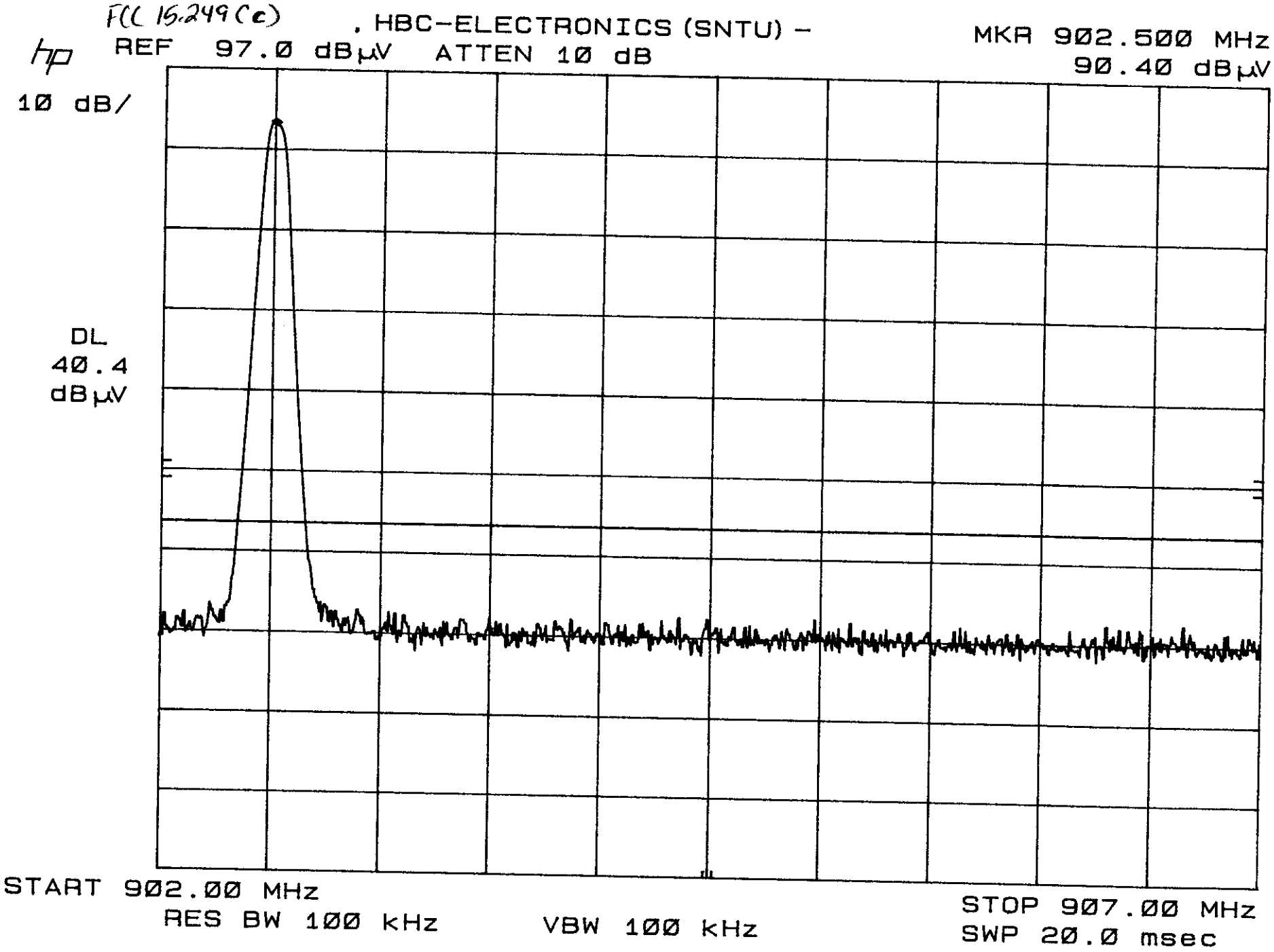
2. Spectrum analyzer START and STOP frequencies are set to the limits of the specified frequency band under which the EUT is operating, fL being the low end of the band, fH being the high end of the band. The DISPLAY LINE was set 50dB below the maximum peak of the signal. The EUT was set to operate on its lowest frequency.

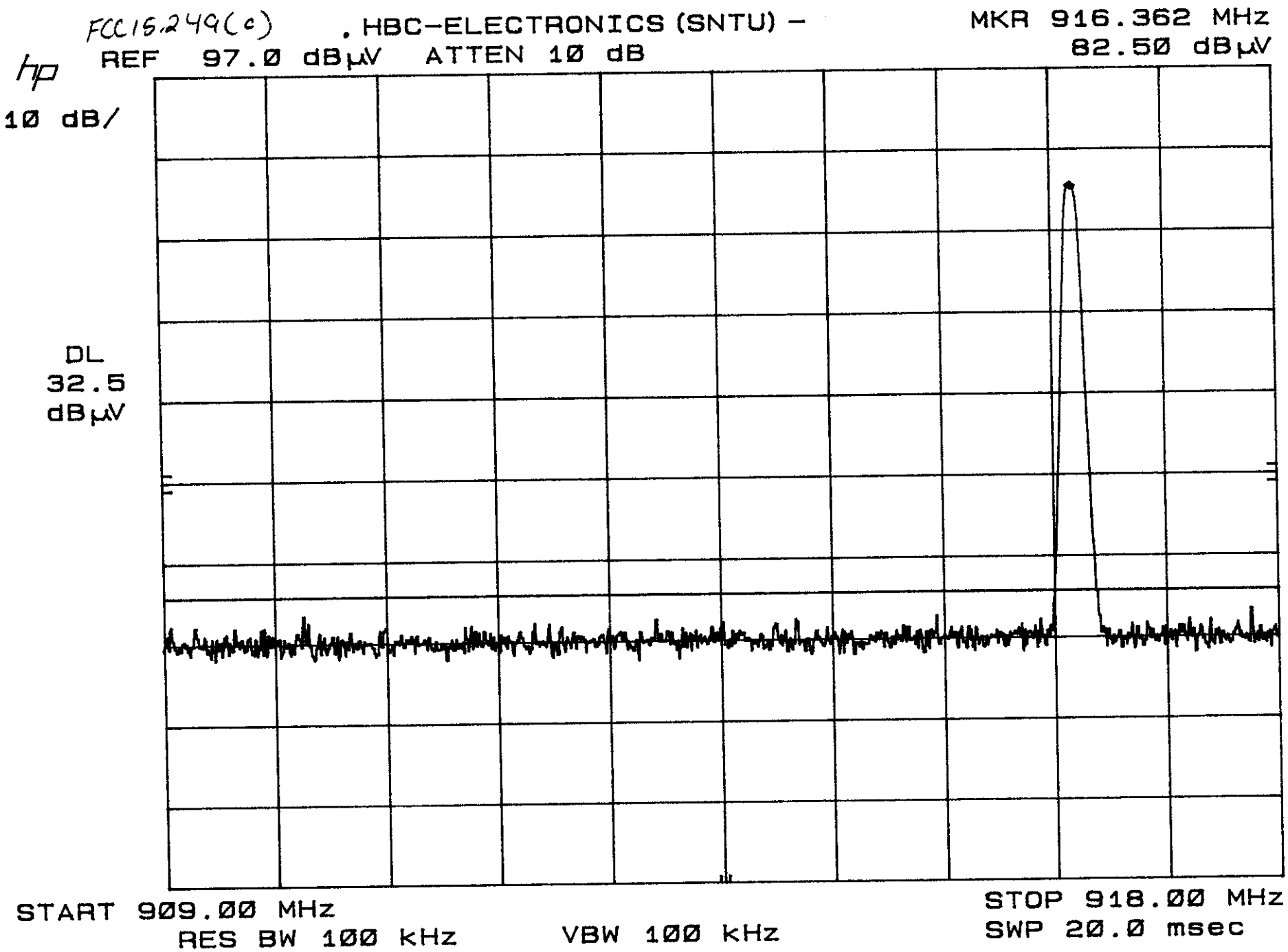
3. While the transmitter is operating, the analyzer MAX HOLD function was used to capture the envelope of the transmitters occupied bandwidth.

4. Steps (1) and (2) were repeated for the High channel.

Test Results:

All signals outside 902MHz and 918MHz were at least 50 dB below the fundamental. Refer to attached spectrum analyzer charts.


FCC 15.249(e)
. HBC-ELECTRONICS (SNTU) -
hp
REF 97.0 dBμV ATTEN 10 dB
MKR 902.500 MHz
90.40 dBμV
10 dB/
DL
40.4
dBμV
START 902.00 MHz
RES BW 100 kHz
VBW 100 kHz
STOP 907.00 MHz
SWP 20.0 msec


FCC15.249(c)
. HBC-ELECTRONICS (SNTU) -
MKR 916.362 MHz
82.50 dBµV
REF 97.0 dBµV ATTEN 10 dB
10 dB/
DL
32.5
dBµV
START 909.00 MHz
RES BW 100 kHz
VBW 100 kHz
STOP 918.00 MHz
SWP 20.0 msec