



Test Report

For

Applicant : Kai-Link Corporation Ltd.
Equipment Type : AV-Linker
Model : AVL-S1, AVL-S0
FCC ID : OIBKAV-LINKERS1

Report No. : 998H015T2



Test Report Certification

QuieTek Corporation

No.75-1, Wang-Yeh Valley, Yung-Hsing, Chiung-Lin,
Hsin-Chu County, Taiwan, R.O.C.

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E-Mail : quietek@ms24.hinet.net

Accredited by NIST(NVLAP), VCCI, BSMI, DNV, TUV

Applicant : Kai-Link Corporation Ltd.
Address : No.213, New-Pu Road, Hsinchu, Taiwan, R.O.C.
Equipment Type : AV-Linker
Model : AVL-S1, AVL-S0
FCC ID. : OIBKAV-LINKERS1
Measurement Standard : FCC Part 15
Intentional Radiators for Subpart C Paragraph 15.231
Measurement Procedure : ANSI C63.4 /1992
Operation Voltage : 120Vac/60Hz
Test Result : Complied
Test Date : Aug. 25, 1999
Report No. : 998H015T2



The Test Results relate only to the samples tested.

The test report shall not be reproduced except in full without the written approval of QuieTek Corporation.

This report must not be used to claim product endorsement by NVLAP any agency of the U.S. Government

Documented by: Shelly Fun

Test Engineer: Calien Kang

Approved: Gene Chang



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1. General Information

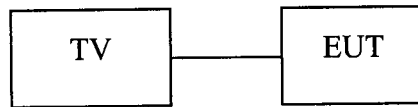
1.1 EUT Description

Applicant : Kai-Link Corporation Ltd.
Address : No.213, New-Pu Road, Hsinchu, Taiwan, R.O.C.
Equipment Type : AV-Linker
Model : AVL-S1, AVL-S0
FCC ID : OIBKAV-LINKERS1
Channel Number : 1
Working Frequency : 433 MHz
Operation Voltage : 120Vac/60Hz
Infrared Cable : Non-shielded, 1m
Audio/Video RCA Cable : Non-shielded, 1.8m
Power Adapter : Class 2 Transformer, Q-603
Cable Out: Non-shielded, 1.6m

- Remark :
1. This device is a 2.4GHz wireless AV Linker included a 2.4GHz receiving function, a 433MHz transmitting function, an Audio/Video port and a Infrared Remote function.
 2. This device has 2 different models but the designing circuit and construction are same. The AVL-S0 device is without IR-remote extender and the AVL-S1 is with IR-remote extender.
 3. These tests were conducted on a sample of the equipment for the purpose of demonstrating compliance with Part 15 Subpart C Paragraph 15.231.
 4. This device is a composite device in accordance with Part 15 regulations. The function for the 2.4Ghz receiving was, measured and made a test report that the report number is 999H015R1, certified under Verification.
 5. The transmitter will stop transmitting after 3 seconds if the button is held down. If the button release it will stop immediately. The circuit was modified to keep the transmitter keep "ON" all the time for testing purpose.

1.2 Tested System Details

The types for all equipment, plus descriptions of all cables used in the tested system (including inserted cards) are:



1.3 EUT Exercise Software

The EUT exercise program used during conducted testing was designed to exercise the EUT in a manner similar to a typical use. The exercise sequence is listed as below:

- 1.4.1 Setup the EUT and simulators as shown on 1.3.
- 1.4.2 Turn on the power of all equipment.
- 1.4.3 Audio/Video Data will emit the fundamental frequency with Audio/Video data to Receiver.
- 1.4.4 Repeat the above procedure 1.4.2 to 1.4.4

1.4 Test performed

Conducted emissions were investigated over the frequency range from **0.15MHz to 30MHz** using a receiver bandwidth of 9KHz.

Radiated emissions were investigated over the frequency range from **30MHz to 1000MHz** using a receiver bandwidth of 120KHz and the frequency range from **1Ghz to 4Ghz** using a receiver bandwidth of 1Mhz.

Radiated testing was performed at an antenna to EUT distance of 3 meters .

1.5 Test Facility

Ambient conditions in the laboratory:

Items	Required (IEC 68-1)	Actual
Temperature (°C)	15-35	20-35
Humidity (%RH)	25-75	50-65
Barometric pressure (mbar)	860-1060	950-1000

Site Description: November 3, 1998 File on
Federal Communications Commission
FCC Engineering Laboratory
7435 Oakland Mills Road
Columbia, MD 21046
Reference 31040/SIT1300F2



September 30, 1998 Accreditation on NVLAP
NVLAP Lab Code: 200347-0

February 23, 1999 Accreditation on DNV
Statement No. : 413-99-LAB11



December 8, 1998 Registration on VCCI
Registration No. for No.2 Shielded Room C-858
Registration No. for No.1 Open Area Test Site R-823
Registration No. for No.2 Open Area Test Site R-835



January 04, 1999 Accreditation on TÜV Rheinland
Certificate No.: I9865712-9901



Name of firm : QuieTek Corporation

Site location : No.75-1, Wang-Yeh Valley, Yung-Hsing Tsuen,
Chiung-Lin, Hsin-Chu County, Taiwan, R.O.C.

2. BandConducted Emission

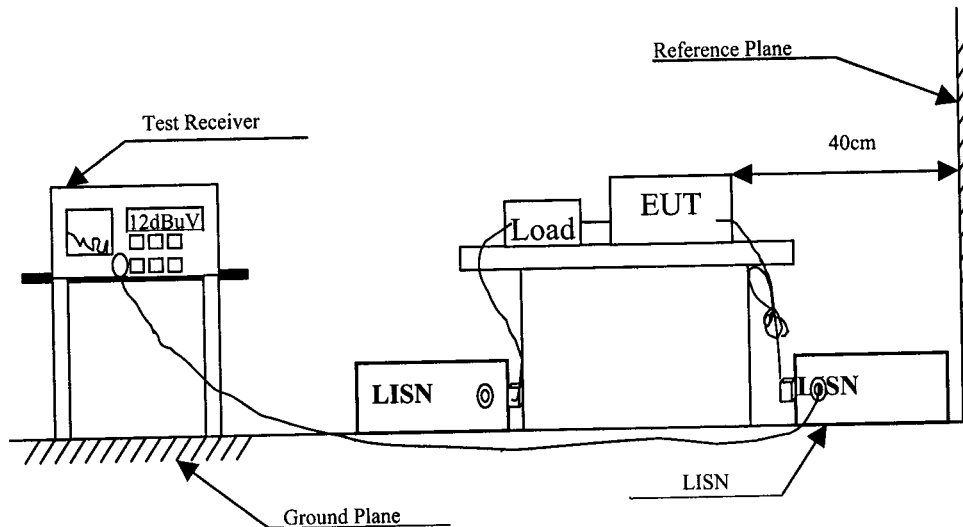
2.1 Test Equipment List

The following test equipment are used during the conducted emission test:

Item	Instrument	Manufacturer	Type No./Serial No	Last Cal..	Remark
1	Test Receiver	R & S	ESCS 30/825442/17	May, 1999	
2	L.I.S.N.	R & S	ESH3-Z5/825016/6	May, 1999	EUT
3	L.I.S.N.	Kyoritsu	KNW-407/8-1420-3	May, 1999	Peripherals
4	Pulse Limiter	R & S	ESH3-Z2	N/A	
5	N0.2 Shielded Room			N/A	

Note: All equipment upon which need to calibrated are with calibration period of 1 year.

2.2 Test Setup



2.3 Limits

FCC Part 15 Paragraph 15.207 (dBuV)		
Frequency MHz	Limits	
	uV	dBuV
0.45 - 30	250	48.0

2.4 Test Procedure

The EUT and simulators are connected to the main power through a line impedance stabilization network (L.I.S.N.). This provides a 50 ohm /50uH coupling impedance for the measuring equipment. The peripheral devices are also connected to the main power through a LISN that provides a 50ohm/50uH coupling impedance with 50ohm termination. (Please refers to the block diagram of the test setup and photographs.)

Both sides of A.C. line are checked for maximum conducted interference. In order to find the maximum emission, the relative positions of equipment and all of the interface cables must be changed according to ANSI C63.4 /1992 on conducted measurement.

The bandwidth of the field strength meter (R & S Test Receiver ESCS 30) is set at 9Khz.

2.5 Test Results

The conducted emission from the EUT is measured and shown in Attachment 1. The acceptance criterion was met and the EUT passed the test.

3. Radiated Emission

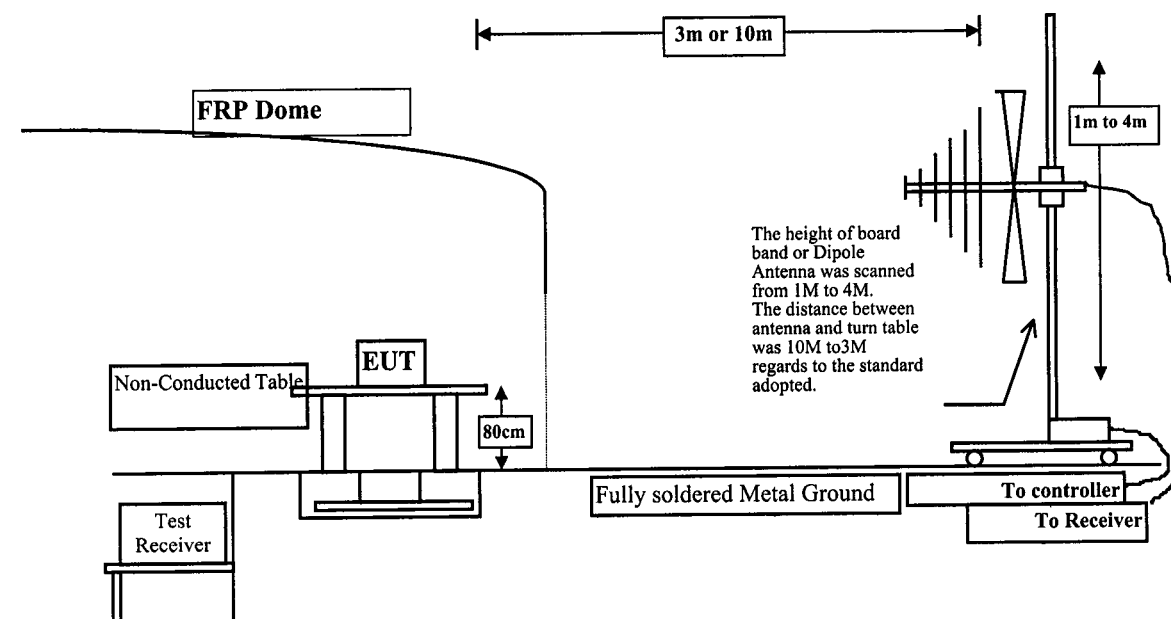
3.1 Test Equipment

The following test equipment are used during the radiated emission test:

Test Site		Equipment	Manufacturer	Model No./Serial No.	Last Cal.
Site # 1	X	Test Receiver	R & S	ESCS 30 / 825442/14	May, 1999
		Spectrum Analyzer	Advantest	R3261C / 71720140	May, 1999
		Pre-Amplifier	HP	8447D/3307A01812	May, 1999
	X	Bilog Antenna	Chase	CBL6112B / 12452	Sep., 1998
	X	Horn Antenna	EM	EM6917 / 103325	May, 1999
Site # 2	X	Test Receiver	R & S	ESCS 30 / 825442/17	May, 1999
		Spectrum Analyzer	Advantest	R3261C / 71720609	May, 1999
		Pre-Amplifier	HP	8447D/3307A01814	May, 1999
	X	Bilog Antenna	Chase	CBL6112B / 2455	Sep., 1998
	X	Horn Antenna	EM	EM6917 / 103325	May, 1999

- Note:
1. All equipment upon which need to calibrated are with calibration period of 1 year.
 - 2.. Mark "X" test instruments are used to measure the final test results.

3.2 Test Setup



3.3 Limits

➤ FCC Part 15 Subpart C Paragraph 15.231 Limit

Fundamental Frequency MHz	Field strength of fundamental		Field Strength of spurious emissions	
	uV/m	dBuV/m	uV/m	dBuV/m
40.66-40.70	2250	67.0	225	47.0
70-130	1250	61.9	125	41.9
130-174	1250-3750 ¹	61.9 – 71.5	125-375 ¹	41.9 – 51.5
174-260	3750	71.5	375	51.5
260-470	3750-12500 ¹	71.5 – 81.9	375-1250 ¹	51.5 – 61.9
above 470	12500	81.9	1250	61.9

Remarks : 1. RF Line Voltage (dBuV) = 20 log RF Line Voltage (uV)
 2. In the Above Table, the tighter limit applies at the band edges.
 3. Distance refers to the distance in meters between the measuring instrument antenna and the closed point of any part of the device or system.

➤ Frequencies in restricted band are complied to limits on Paragraph 15.209.

Frequency MHz	15.209 Limits (dBuV/m @3m)
30-88	40
88-216	43.5
216-960	46
Above 960	54

Remarks : 1. RF Line Voltage (dBuV) = 20 log RF Line Voltage (uV)
 2. In the Above Table, the tighter limit applies at the band edges.
 3. Distance refers to the distance in meters between the measuring instrument antenna and the closed point of any part of the device or system.

3.4 Test Procedure

The EUT and its simulators are placed on a turn table which is 0.8 meter above ground. The turn table can rotate 360 degrees to determine the position of the maximum emission level. The EUT was positioned such that the distance from antenna to the EUT was 3 meters . The antenna can move up and down between 1 meter and 4 meters to find out the maximum emission level.

Both horizontal and vertical polarization of the antenna are set on measurement. In order to find the maximum emission, all of the interface cables must be manipulated according to ANSI C63.4 /1992 on radiated measurement.

The bandwidth below 1Ghz setting on the field strength meter (R&S Test Receiver ESCS 30) is 120 Khz and above 1Ghz is 1Mhz.

3.5 Test Results

The radiated emission from the EUT is measured and shown in Attachment 1. The acceptance criterion was met and the EUT passed the test.



4. Occupied Bandwidth of Raidated Emission

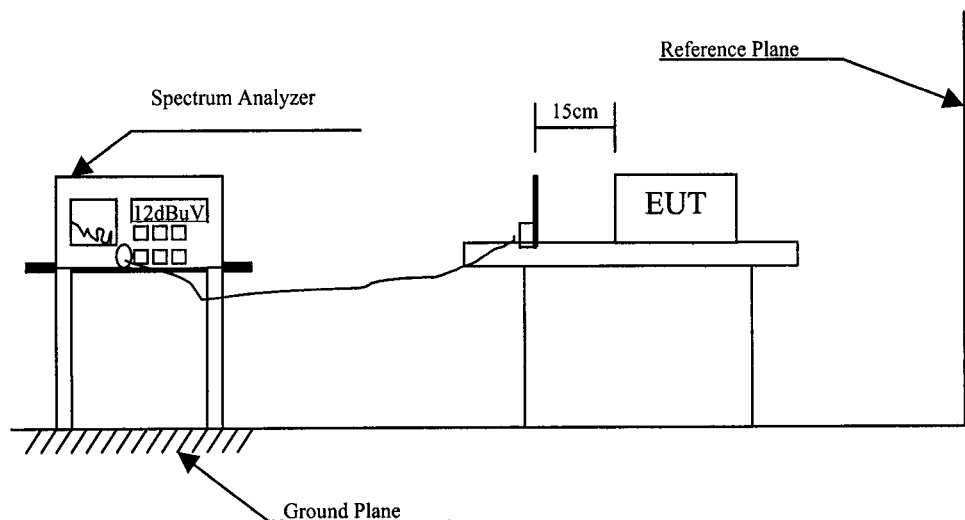
4.1 Test Equipment

The following test equipment are used during the radiated emission test:

Equipment	Manufacturer	Model No./Serial No.	Last Cal.
Spectrum Analyzer	Advantest	R3261C / 71720140	May, 1999
Monopole Antenna	QTK	MN2010 / 11001	Jun., 1999

Note: All equipment upon which need to calibrated are with calibration period of 1 year.

4.2 Test Setup



4.3 Limits

- (1) The bandwidth of the emission shall be no wider than 0.25% of the center frequency for devices operating above 70MHz and below 900MHz.
- (2) The bandwidth of the emission shall be no wider than 0.5% of the center frequency for devices operating above 900MHz.

4.4 Test Procedure

The EUT on a non-conducted table was positioned such that the distance from antenna to the EUT was 15cm.

Set the spectrum analyzer as follows:

Frequency Span : 2MHz
Resolution Bandwidth : 100KHz
Video bandwidth : 1MHz
Detector Function : Peak mode

The bandwidth of radiated emission is measured under the EUT condition produced the generated carrier signal.

4.5 Test Results

The radiated emission from the EUT is measured and shown in Attachment 1. The acceptance criterion was met and the EUT passed the test.



5. Duty Cycle Measurement

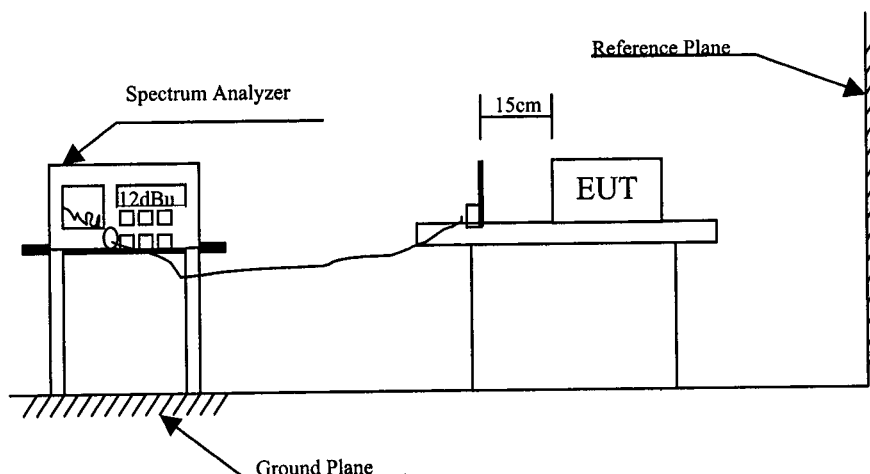
5.1 Test Equipment

The following test equipment are used during the radiated emission test:

Equipment	Manufacturer	Model No./Serial No.	Last Cal.
Spectrum Analyzer	Advantest	R3261C / 71720140	May, 1999
Monopole Antenna	QTK	MN2010 / 11001	Jun., 1999

Note: All equipment upon which need to calibrated are with calibration period of 1 year.

5.2 Test Setup



5.3 Test Procedure

The EUT on a non-conducted table was positioned such that the distance from antenna to the EUT was 15cm.

Set the spectrum analyzer as follows:

Sweep Span : 100ms
Resolution Bandwidth : 100KHz
Video bandwidth : 1MHz
Detector Function : Peak mode

The bandwidth of radiated emission is measured under the EUT condition produced the generated carrier signal.

5.4 Duty Cycle Factor

Refer to the printouts on the following page.

1 wide pulse at about 8.5ms and 43 narrow pulses at about 0.2ms each, total = 17.1ms

Total period between cycles is 100ms

$20\text{LOG}(17.1/100) = -15.4\text{dB}$

6. EMI Reduction Method During Compliance Testing

No modification was made during testing.



7. **Attachment**

Attachment 1: Summary of Test Results

Number of Pages: 8

Attachment 2: EUT Test Photographs

Number of Pages: 2

Attachment 3: EUT Detail Photographs

Number of Pages: 9



Attachment 1 : Summary of Test Results

The test results in the emission were performed according to the requirements of measurement standard and process. QuieTek Corporation is assumed full responsibility for the accuracy and completeness of these measurements. The test data of the emission are listed as the attached data.

All the tests were carried out with the EUT in normal operation, which was defined as:

(1) Mode 1: AVL-S1

The EUT passed all the tests.

The uncertainty is calculated in accordance with NAMAS NIS 81, The total uncertainty for this test is as follows:

➤ **Emission Test**

- Uncertainty in the Conducted Emission Test: $< \pm 2.0 \text{ dB}$
- Uncertainty in the field strength measured: $< \pm 4.0 \text{ dB}$



CONDUCTED EMISSION DATA

Date of Test : Aug. 25, 1999 EUT : AV-Linker
 Test Mode : Mode 1 Detect Mode : Quasi-Peak

Frequency	Cable	LISN	Reading Level	Measurement Level	Limits
	Loss	Factor	Line1	Line1	
MHz	dB	dB	dBuV	dBuV	dBuV
0.552	0.07	0.10	27.88	28.05	48.00
0.770	0.09	0.10	33.56	33.75	48.00
1.223	0.11	0.11	18.98	19.20	48.00
1.524	0.13	0.12	16.34	16.58	48.00
4.930	0.20	0.17	6.38	6.75	48.00
*19.876	0.35	0.45	33.14	33.94	48.00

Remarks :

1. " * " means that this data is the worst emission level.

CONDUCTED EMISSION DATA

Date of Test : Aug. 25, 1999 EUT : AV-Linker
 Test Mode : Mode 1 Detect Mode : Quasi-Peak & Average

Frequency	Cable	LISN	Reading Level	Measurement Level	Limits
	Loss	Factor	Line2	Line2	
MHz	dB	dB	dBuV	dBuV	dBuV
0.559	0.07	0.10	21.12	21.29	48.00
0.747	0.08	0.10	25.30	25.48	48.00
0.899	0.09	0.10	29.79	29.98	48.00
1.344	0.12	0.11	18.15	18.38	48.00
1.923	0.14	0.13	14.15	14.42	48.00
*20.036	0.35	0.45	30.93	31.74	48.00

Remarks :

1. " * " means that this data is the worst emission level.



Radiated Emission Data

Date of Test : Aug. 25, 1999 EUT : AV-Linker
 Test Mode : Mode 1 Test Site : No.1 Open Test Site

Frequency	Cable	Ant	Reading Level	Emission Level	Limits	Ant Table		
	Loss	Factor	Horizontal	Horizontal		Pos	Pos	
MHz	dB	dB/m	dBuV/m	dBuV/m	dBuV/m	cm	deg	
*40.250	1.25	14.60	2.01	17.87	40	269	14	
77.290	1.61	8.43	1.37	11.41	40	257	3	
116.257	1.98	12.49	0.37	14.84	43.5	235	159	
204.358	2.83	10.18	0.39	13.40	43.5	226	40	
296.247	3.71	13.43	0.13	17.26	46	223	14	
334.290	3.93	14.66	-0.35	18.24	46	206	103	

Remarks:

1. All Readings below 1GHz are Quasi-Peak, above are average value.
2. " * ", means this data is the worst emission level.
3. Emission Level = Reading Level + Antenna Factor + Cable loss



Radiated Emission Data

Date of Test : Aug. 25, 1999 EUT : AV-Linker
 Test Mode : Mode 1 Test Site : No.1 Open Test Site

Frequency	Cable	Ant	Reading Level	Emission Level	Limits	Ant	Table
	Loss	Factor	Vertical	Vertical		Pos	Pos
MHz	dB	dB/m	dBuV/m	dBuV/m	dBuV/m	cm	deg
50.340	1.35	8.23	1.69	11.27	40	195	42
73.025	1.56	8.53	1.24	11.33	40	164	33
137.260	2.19	11.78	0.24	14.21	43.5	164	41
216.270	2.94	9.64	0.97	13.56	43.5	114	24
367.150	4.10	15.70	0.17	19.97	46	145	37
*416.240	4.36	17.26	-0.21	21.41	46	132	6

Remarks:

1. All Readings below 1GHz are Quasi-Peak, above are average value.
2. " * ", means this data is the worst emission level.
3. Emission Level = Reading Level + Antenna Factor + Cable loss



Radiated Emission Data

Date of Test	: Aug. 25, 1999	EUT	:	AV-Linker
Test Mode	: Mode 1	Test Site	:	No.1 Open Test Site

Freq.	Cable	Probe	PreAMP	Reading	Measurement	Margin	Limit	Ant	Turn
MHz	Loss	Factor	dB	Level	Horizontal	dB	dBuV/m	cm	deg
	dB	dB/m	dB	dBuV	dBuV/m				

Quasi-Peak Detector

433.890	3.07	17.07	26.00	86.30	80.44	19.6	100.79	0	0
860.000	5.28	20.79	26.00	40.20	40.27	40.52	82.00	0	0

Peak Detector

1301.620	2.48	25.70	35.11	45.27	38.34	<42.45	82.00	0	0
1735.200	3.03	27.23	34.66	46.38	41.98	<38.81	82.00	0	0
2169.020	3.57	28.64	34.50	44.91	42.63	<38.16	82.00	0	0
2603.290	4.05	29.75	34.54	45.13	44.38	<36.41	82.00	0	0
3037.020	4.53	30.86	34.70	44.70	45.39	<35.4	82.00	0	0
3471.090	4.96	31.58	34.70	44.51	46.35	<34.44	82.00	0	0
3904.770	5.40	32.33	34.37	44.20	47.56	<33.23	82.00	0	0
4338.840	5.81	32.91	34.37	45.60	49.96	<30.83	82.00	0	0

Average Detector

433.890	3.07	1.67	26.00	86.30	65.04	15.75	80.79	0	0
860.000	5.28	5.39	26.00	40.20	24.87	35.92	62.00	0	0
1301.620	2.48	10.30	35.11	45.27	22.94	37.85	62.00	0	0
1735.200	3.03	11.83	34.66	46.38	26.58	34.21	62.00	0	0
2169.020	3.57	13.24	34.50	44.91	29.51	31.28	62.00	0	0
2603.290	4.05	14.35	34.54	45.13	28.98	31.81	62.00	0	0
3037.020	4.53	15.46	34.70	44.70	29.99	30.80	62.00	0	0
3471.090	4.96	16.18	34.70	44.51	30.99	29.84	62.00	0	0
3904.770	5.40	16.93	34.37	44.20	32.16	28.63	62.00	0	0
4338.840	5.81	17.51	34.37	45.60	34.56	26.23	62.00	0	0

Remarks:

1. “ * ”, means this data is the worst emission level.
2. For Average Detect: Probe Factor = Antenna Factor+Duty cycle Factor
3. Emission Level = Reading Level + Probe Factor + Cable loss-PreAmp



Radiated Emission Data

Date of Test	: Aug. 25, 1999	EUT	: AV-Linker
Test Mode	: Mode 1	Test Site	: No.1 Open Test Site

Freq.	Cable	Probe	PreAMP	Reading	Measurement	Margin	Limit	Ant	Turn
MHz	Loss	Factor	dB	Level	Horizontal	dB	dBuV/m	cm	deg

Peak Detector

433.890	3.07	16.68	26.00	83.32	77.07	23.72	100.79	0	0
864.000	5.30	20.93	26.00	47.52	47.75	33.04	82.00	0	0
1301.670	2.48	25.70	35.11	45.01	38.08	42.71	82.00	0	0
1735.250	3.03	27.23	34.66	44.44	40.04	40.75	82.00	0	0
2169.170	3.57	28.64	34.50	44.90	42.62	38.17	82.00	0	0
2603.490	4.05	29.75	34.54	45.13	44.38	36.41	82.00	0	0
3037.020	4.53	30.86	34.70	43.98	44.67	36.12	82.00	0	0
3470.890	4.96	31.58	34.70	43.64	45.48	35.31	82.00	0	0
3905.220	5.40	32.33	34.37	45.23	48.59	32.20	82.00	0	0
4338.840	5.81	32.91	34.37	43.13	47.49	33.30	82.00	0	0

Average Detector

433.890	3.07	1.40	26.00	83.32	61.67	19.12	80.79	0	0
864.000	5.30	5.53	26.00	47.52	32.35	28.44	62.00	0	0
1301.670	2.48	10.30	35.11	45.01	22.68	38.11	62.00	0	0
1735.250	3.03	11.83	34.66	44.44	24.64	36.15	62.00	0	0
2169.170	3.57	13.24	34.50	44.90	27.22	33.57	62.00	0	0
2603.490	4.05	14.35	34.54	45.13	28.98	31.81	62.00	0	0
3037.020	4.53	15.46	34.70	43.98	29.27	31.52	62.00	0	0
3470.890	4.96	16.18	34.70	43.64	30.08	30.71	62.00	0	0
3905.220	5.40	16.93	34.37	45.23	33.19	27.60	62.00	0	0
4338.840	5.81	17.51	34.37	43.13	32.09	28.70	62.00	0	0

Remarks:

1. “ * ”, means this data is the worst emission level.
4. For Average Detect: Probe Factor = Antenna Factor+Duty cycle Factor
2. Emission Level = Reading Level + Probe Factor + Cable loss--PreAmp



Occupied Bandwidth of Radiated Emission Data

Date of Test : Aug. 25, 1999 EUT : AV-Linker
 Test Mode : Mode 1 Test Site : No.1 Open Test Site

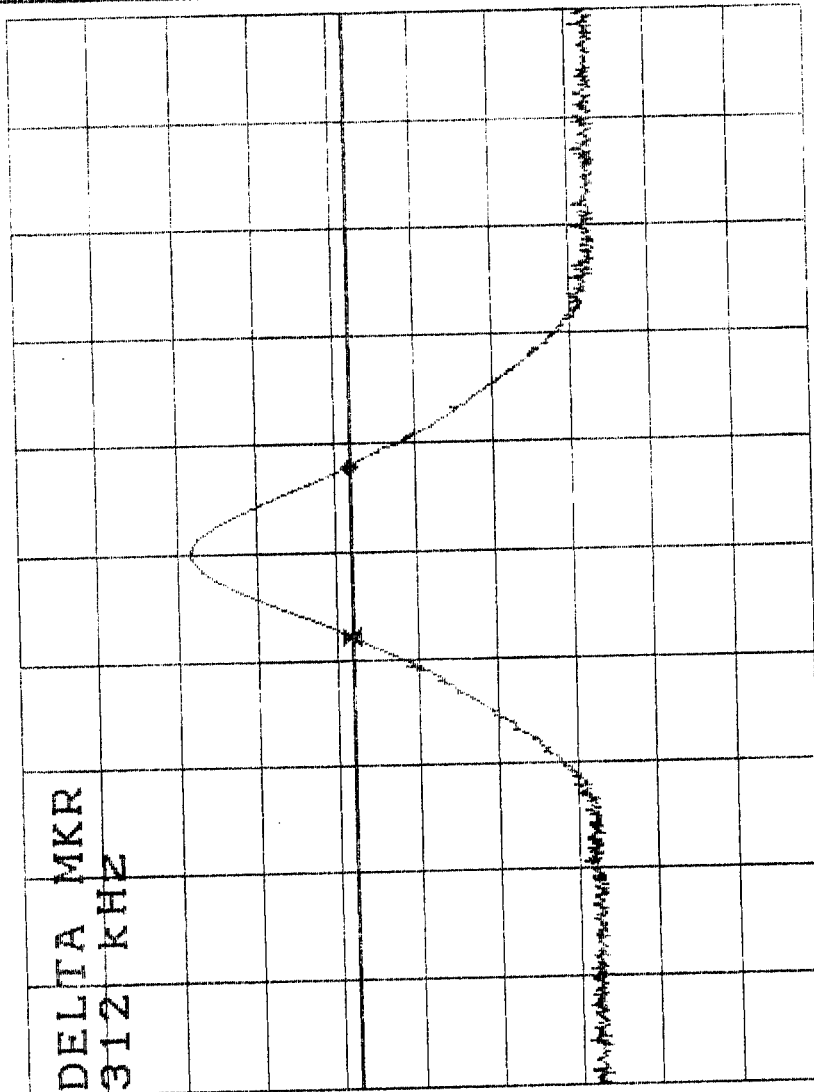
Center Frequency	433.890	MHz
Allowable Bandwidth (70-900 MHz:0.25%, Above 900MHz: 0.5%)	1084.725	kHz
Bandwidth at 20dB down (Max)	312	kHz
Result	Complied with regulation	
Reference Graphics	Fig.1 and Fig.2	



Sat 1999 Sep 4 11:14

REF 107.0 dBuV A_View D_Blank MKA 312 kHz
10 dB/ DL 65.3 dBuV 0.05 dB

DELTA MKR
312 KHZ



POS

CENTER 433.890 MHz SPAN 2.000 MHz
*RBW 100 kHz *VBW 1 MHz *SMP 500 ms *ATT 10 dB

Marker

Normal MKR

Delta MKR

Sig Track

ON OFF

Peak

Multi MKR

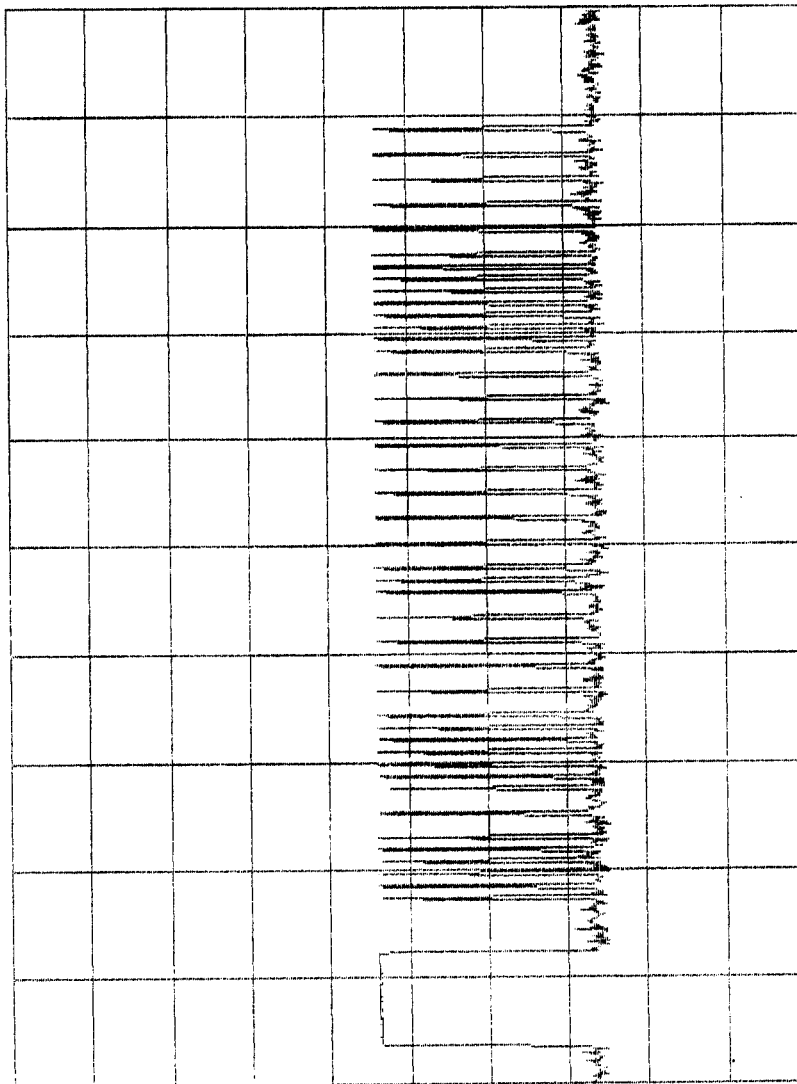
MKR OFF

more 1/3

Mon 1999 Sep 6 10:16

A_View B_Blank

REF 107.0 dBμV
10 dB/



CENTER 433.894000 MHz SPAN 0 Hz
*RBW 100 kHz *VBW 1 MHz *SMP 100 MS *ATT 10 dB

Trace A

Write A

View A

Blank A

Max Hold A

AVG A

Trace B

Trace Math