

Preliminary Test and Test-setup(Drawings)

Conducted Emission 450 kHz - 30 MHz:

The preliminary test was performed according to the description of ANSI C63.4-1992 Sec.7.2.3 (Preliminary AC Powerline Conducted Emissions Tests) and Sec.6.2.1 (Tabletop Equipment Tests). The preliminary test was carried out to investigate the frequency of the emission that has the highest amplitude relative to the limits within normal operating modes, cable positions, and a typical system configuration. In order to find out to the maximum emission, the preliminary test and a final test were performed in accordance with the following steps.

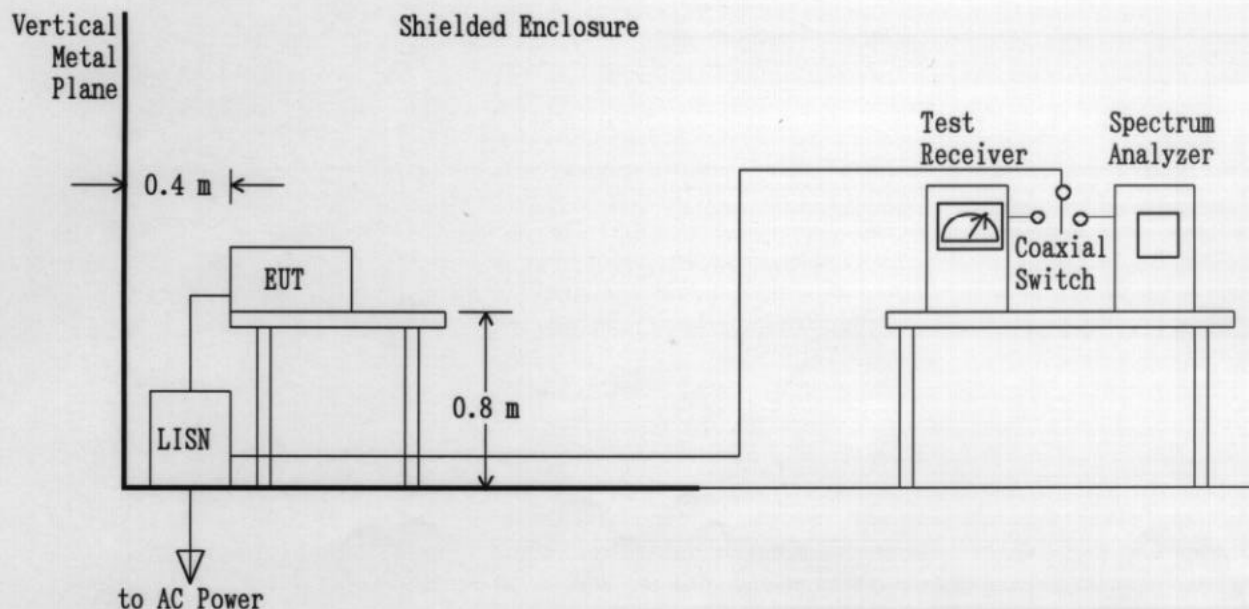
Step 1: One operation mode of the test system was setting.

Step 2: Using both of a spectrum analyzer and a test receiver, the emission's circumstance from the system was monitored in one of ten divided frequency bands of the specified frequency range (450 kHz - 30 MHz). The maximum emission in the band was found by changing the typical cable positions or cable manipulation under a typical system configuration and by selecting of current-carrying conductor. The level and the frequency at the one point which are regarded as relative high emission in the band was measured and recorded. This step was repeated until the ending frequency band.

Step 3: Return to step 1, if the other operation mode was possible to be setting.

Step 4: Based on the collected results, the operation mode produced the maximum emission was selected. The final test on the selected operation mode was performed. But if it was difficult to select the operation mode, the final tests on all operation modes were performed.

Step 5: Based on the same data, as result if the final measurement, at the worst point that has the highest amplitude relative to the limit the repeatability of the worst was reconfirmed. The photographs of the test system setup on the worst point were taken and recorded.



Radiated Emission (Magnetic Field) 9 kHz - 30 MHz:

The preliminary test was performed according to the description of ANSI C63.4-1992 Sec.8.3.1.1 (Preliminary Radiated Emissions Tests) and Sec.6.2.1 (Tabletop Equipment Tests).

The preliminary test was carried out to investigate the frequency of the emission that has the highest amplitude relative to the limits within normal operating modes, cable positions, and a typical system configuration. In order to find out to the maximum emission, the preliminary test and a final test were performed in accordance with the following steps.

Step 1: One operation mode of the test system was setting.

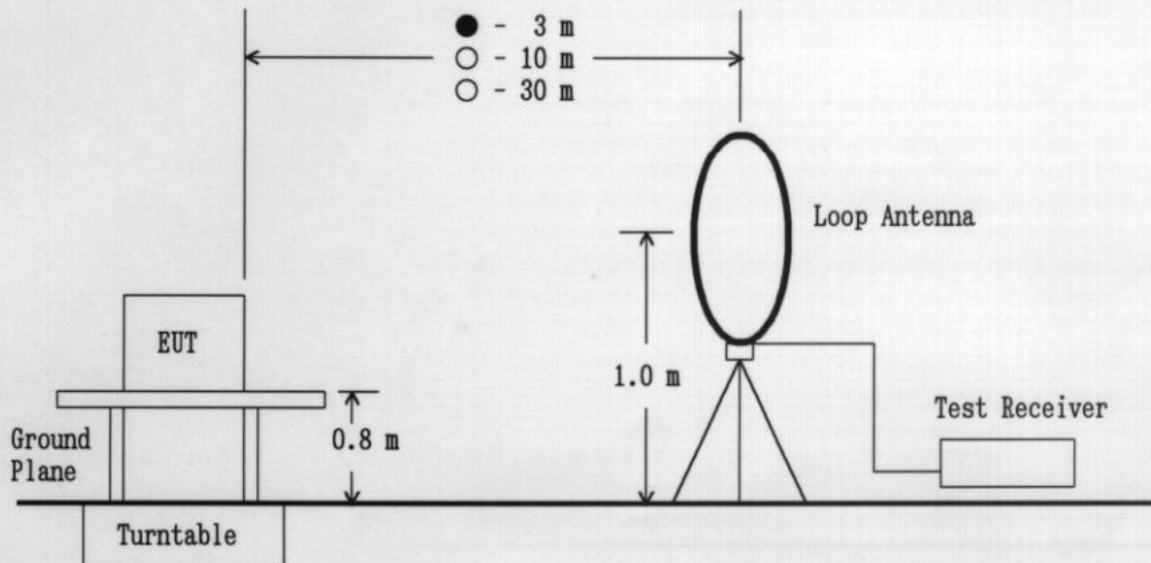
Step 2: In order to investigate the frequencies of maximum emissions, the loop antenna position was approached to the EUT and the significant frequency of the emission's circumstance from the test system were investigated. These data were recorded in the specified frequency band (9 kHz - 30 MHz).

Step 3: Using a test receiver and a loop antenna, the emission's circumstance from the test system was measured in according with ANSI C63.4-1992 Sec.8.3.1.2 (Final Radiated Emissions Tests) at each frequency which was found the higher emission referred to level vs. frequency on the list and which was measured by the loop antenna. The maximum emission was found by rotating three orthogonal axes under a typical system configuration.

Step 4: Return to step 1, if the other operation mode was possible to be setting.

Step 5: The worst result was reported arranging data of which was obtained and performed by one or plural operation modes as the final test.

At the worst point that has the highest amplitude relative to the limit the repeatability of the level was reconfirmed. The photographs of the tests system setup on the the worst point were taken and recorded.



Radiated Emission (Electric Field) 30 MHz - 1000 MHz:

The preliminary test was performed according to the description of ANSI C63.4-1992 Sec.8.3.1.1 (Preliminary Radiated Emissions Tests) and Sec.6.2.1 (Tabletop Equipment Tests).

The preliminary test was carried out to investigate the frequency of the emission that has the highest amplitude relative to the limits within normal operating modes, cable positions, and a typical system configuration. In order to find out to the maximum emission, the preliminary test and a final test were performed in accordance with the following steps.

Step 1: One operation mode of the test system was setting.

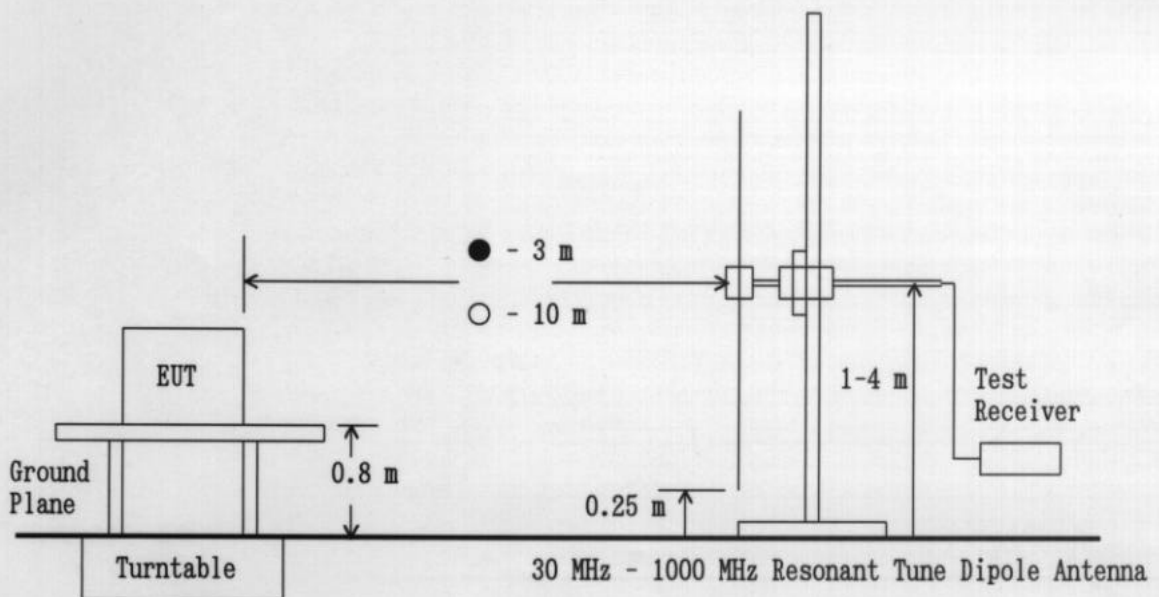
Step 2: Using a test receiver and a test antenna probe, the significant frequency of the emission's circumstance from the test system were investigated. These data were recorded every one of 22 divided bands in the specified frequency band (30 MHz - 1000 MHz).

Step 3: Using a test receiver and a resonant tuned dipole antenna, the emission's circumstance from the test system was measured in according with ANSI C63.4-1992 Sec.8.3.1.2 (Final Radiated Emissions Tests) at each frequency which was found the higher emission referred to level vs. frequency on the list and which was measured by the resonant tuned dipole antenna. The maximum emission was found by changing the cable positions or cable manipulation under a typical system configuration.

Step 4: Return to step 1, if the other operation mode was possible to be setting.

Step 5: The worst result was reported arranging data of which was obtained and performed by one or plural operation modes as the final test.

At the worst point that has the highest amplitude relative to the limit the repeatability of the level was reconfirmed. The photographs of the tests system setup on the the worst point were taken and recorded.



Radiated Emission (Electric Field) 1 GHz - 4 GHz:

The preliminary test was performed according to the description of ANSI C63.4-1992 Sec.8.3.1.1 (Preliminary Radiated Emissions Tests) and Sec.6.2.1 (Tabletop Equipment Tests).

The preliminary test was carried out to investigate the frequency of the emission that has the highest amplitude relative to the limits within normal operating modes, cable positions, and a typical system configuration. In order to find out to the maximum emission, the preliminary test and a final test were performed in accordance with the following steps.

Step 1: One operation mode of the test system was setting.

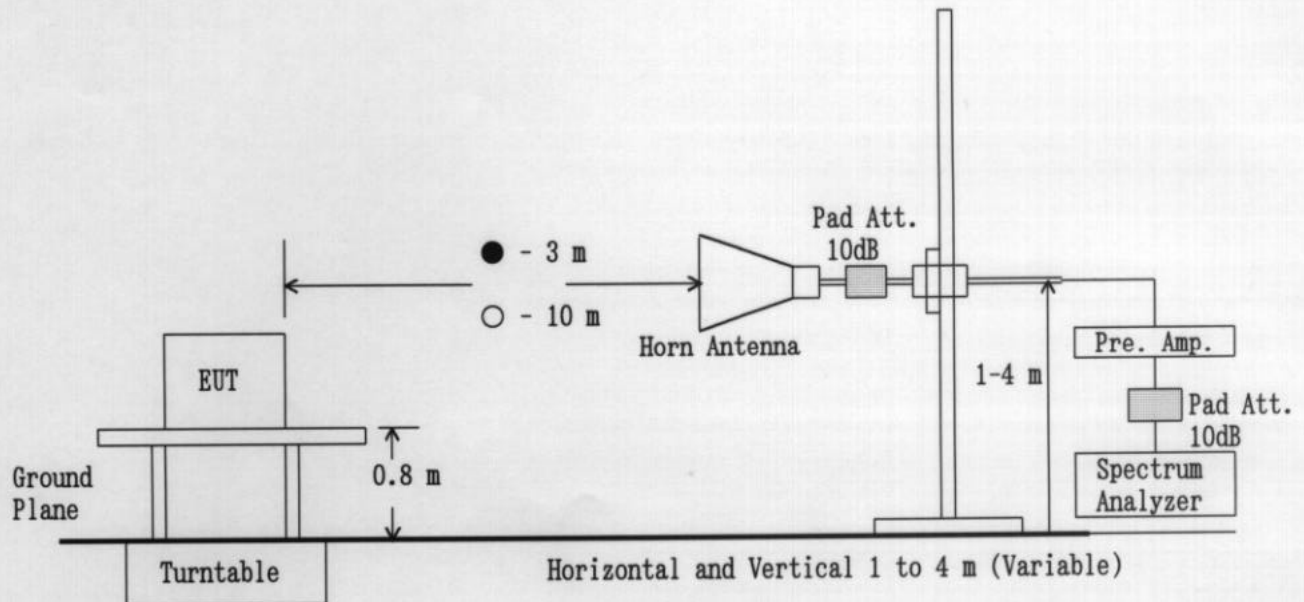
Step 2: In order to investigate the frequencies of maximum emissions, the horn antenna position was approached to the EUT and the significant frequency of the emission's circumstance from the test system were investigated. These data were recorded in the specified frequency band (1 GHz - 4 GHz).

Step 3: The emission's circumstance from the test system was measured in accordance with ANSI C63.4-1992, Sec.8.3.1.2 (Final Radiated Emissions Tests) at each frequency which was found higher emission referred to level vs. frequency on the list and which was measured in the specified distance using the horn antenna.

Step 4: Return to step 1, if the other operation mode was possible to be setting.

Step 5: The worst result was reported arranging data of which was obtained and performed by one or plural operation modes as the final test.

At the worst point that has the highest amplitude relative to the limit the repeatability of the level was reconfirmed. The photographs of the tests system setup on the the worst point were taken and recorded.

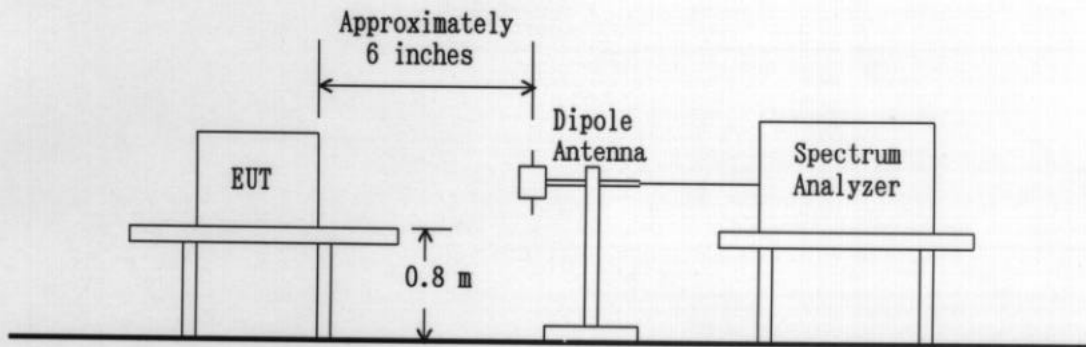


Spectrum Analyzer Setting:

Detector	Peak
RES BW	1 MHz
VIDEO BW	1 MHz
SPAN	0 Hz

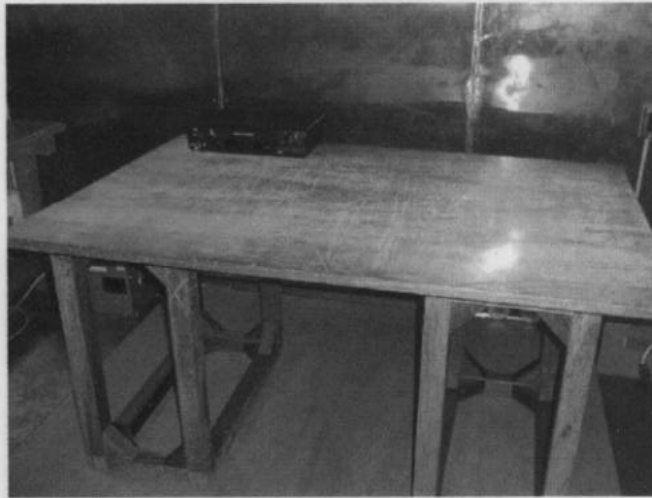
Occupied Bandwidth :

The test was performed according to the description of ANSI C63.4-1992 Sec.13.1.7 (Occupied Bandwidth Measurements) and FCC rule §15.231(c).

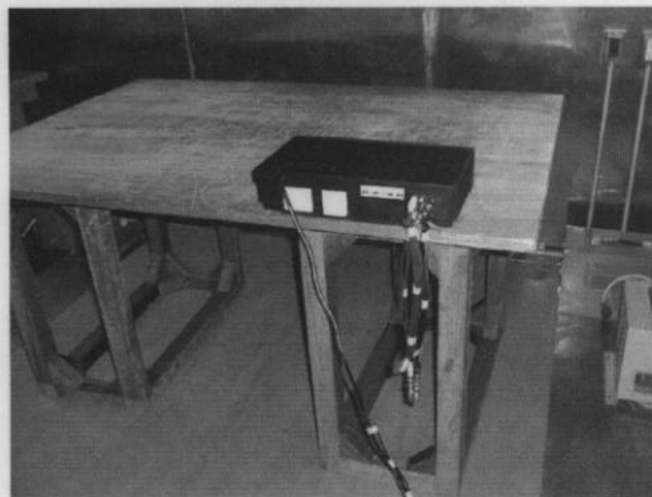


Test-Setup (Photographs) at worst case

Conducted Emission 450kHz - 30MHz:



Front View



Rear View



Side View

Radiated Emission 9kHz - 4GHz:



Front View



Rear View

Mains terminal Disturbance Measurement Intentional Radiator

Based on the test result of every test mode, the mode of operation that produce the conducted emission that has the highest amplitude is shown as follows:

Test Date: January 14, 1999

Temp.: 19 °C ; Humi.: 27 %

Frequency [MHz]	Correction Factor [dB]	Meter Readings dB(μV)				Limits dB(μV)	Results dB(μV)		Margin [dB]	Remarks (Note 2)
		VA-QP	VA-AV	VB-QP	VB-AV		QP	AV		
0.45	0.1	39.0	-	39.0	-	48.0	39.1	-	+ 8.9	A
0.76	0.1	33.0	-	33.0	-	48.0	33.1	-	+14.9	A
0.88	0.1	33.0	-	32.0	-	48.0	33.1	-	+14.9	A
1.28	0.2	35.0	-	33.0	-	48.0	35.2	-	+12.8	A
2.28	0.2	25.0	-	25.0	-	48.0	25.2	-	+22.8	A
3.58	0.3	21.0	-	21.0	-	48.0	21.3	-	+26.7	A
14.32	0.6	33.0	-	31.0	-	48.0	33.6	-	+14.4	A
19.13	0.7	20.0	-	18.0	-	48.0	20.7	-	+27.3	A
25.06	0.9	28.0	-	25.0	-	48.0	28.9	-	+19.1	A
28.64	0.9	33.0	-	31.0	-	48.0	33.9	-	+14.1	A

Sample of calculated result at 0.45 MHz, as the Minimum Margin point:

Correction Factor = 0.1 dB

+) Meter Reading = 39.0 dB(μV)

Result = 39.1 dB(μV)

Minimum Margin : 48.0 - 39.1 = 8.9(dB)

The point shown on "___" is the Minimum Margin Point.

Note 1:

1. The correction factors includes the LISN insertion loss and the cable loss.

Remarks:

Note 2	Detector Function	IF Bandwidth
A	CISPR QP	9 kHz
B	Average	10 kHz

Tester Signature : A. Hosoda

Type Name : Akio Hosoda

Electromagnetic Radiation Disturbance Measurement

Intentional Radiator

Based on the test result of every test mode, the mode of operation that produce the Radiated emission that has the highest amplitude is shown as follows:

Test Date: January 12, 1999
 Temp.: 18 °C ; Humi.: 38 %

Compliance with the peak limits

Frequency [MHz]	Antenna Factor dB(1/m)	Corr. Factor [dB]	Meter Readings dB(μV)		Limits (Peak) dB(μV/m)	Results (Peak) dB(μV/m)		Margin [dB]	Remarks (Note 2)
			Hori.	Vert.		Hori.	Vert.		
Fundamental									
390.0	20.9	4.1	49.0	40.0	99.2	74.0	65.0	+25.2	B
Harmonics									
780.0	27.5	6.1	24.0	22.0	79.2	57.6	55.6	+21.6	B
1170.0	21.2	-26.4	52.0	54.0	74.0	46.8	48.8	+25.2	C
1560.0	21.0	-26.2	45.0	47.0	74.0	39.8	41.8	+32.2	C
1950.0	21.6	-28.0	53.0	54.0	79.2	46.6	47.6	+31.6	C
2340.0	21.5	-21.8	44.0	< 35.0	74.0	43.7	< 34.7	+30.3	C
2730.0	21.5	-21.6	< 35.0	< 35.0	74.0	< 34.9	< 34.9	>+39.1	C
3120.0	22.0	-21.2	< 35.0	< 35.0	79.2	< 35.8	< 35.8	>+43.4	C
3510.0	22.3	-21.1	< 35.0	< 35.0	79.2	< 36.2	< 36.2	>+43.0	C
3900.0	34.5	-20.9	< 35.0	< 35.0	74.0	< 48.6	< 48.6	>+25.4	C

Compliance with the average limits

Frequency [MHz]	Antenna Factor dB(1/m)	Corr. Factor [dB]	Conv. Factor [dB]	Meter Readings dB(μV)		Limits (Ave.) dB(μV/m)	Results (Ave.) dB(μV/m)		Margin [dB]	Remarks (Note 2)
				Hori.	Vert.		Hori.	Vert.		
Fundamental										
390.0	20.9	4.1	-5.3	49.0	40.0	79.2	68.7	59.7	+10.5	B
Harmonics										
780.0	27.5	6.1	-5.3	24.0	22.0	59.2	52.3	50.3	+ 6.9	B
1170.0	21.2	-26.4	-5.3	52.0	54.0	54.0	41.5	43.5	+10.5	C
1560.0	21.0	-26.2	-5.3	45.0	47.0	54.0	34.5	36.5	+18.0	C
1950.0	21.6	-28.0	-5.3	53.0	54.0	59.2	41.3	42.3	+16.9	C
2340.0	21.5	-21.8	-5.3	44.0	< 35.0	54.0	38.4	< 29.4	+15.6	C
2730.0	21.5	-21.6	-5.3	< 35.0	< 35.0	54.0	< 29.6	< 29.6	>+24.4	C
3120.0	22.0	-21.2	-5.3	< 35.0	< 35.0	59.2	< 30.5	< 30.5	>+28.7	C
3510.0	22.3	-21.1	-5.3	< 35.0	< 35.0	59.2	< 30.9	< 30.9	>+28.3	C
3900.0	34.5	-20.9	-5.3	< 35.0	< 35.0	54.0	< 43.3	< 43.3	>+10.7	C

Sample of calculated result at 780.0 MHz (Average), as the Minimum Margin point:

Antenna Factor = 27.5 dB(1/m)
Corr. Factor = 6.1 dB
Conv. Factor = -5.3 dB
+) Meter Reading = 24.0 dB(μ V)
Result = 52.3 dB(μ V/m)

Minimum Margin : 59.2 - 52.3 = 6.9(dB)

The point shown on "____" is the Minimum Margin Point.

Note 1:

- 1)The highest frequency generated or used in the EUT: 390.0 MHz
- 2)The upper frequency of measurement range : 3900.0 MHz
- 3)The spectrum was scanned 9 kHz to 4 GHz and all emissions not reported were more than 20dB below the applied limits.
- 4)Corr. Factor (9 kHz - 30 MHz) : Factor is not applied (0 dB).
Corr. Factor (30 MHz - 1 GHz) : Cable Loss(dB)
Corr. Factor (1 GHz - 4 GHz) : Cable Loss(dB) + 20dB Pad Attenuator(dB) - Pre-Amplifier Gain(dB)
- 5)Conversion Factor was conducted as the duty rate 54.2 % : $20\log(0.542) = -5.3$ (dB)

Remarks:

Note 2	Detector Function	IF Bandwidth
A	Peak	10 kHz
B	Peak	120 kHz

Note 2	Detector Function	RES. B.W	V.B.W	Sweep T	Span
C	Peak (SP)	1 MHz	1 MHz	20 msec	0 Hz
D	Peak (SP)	100 kHz	100 kHz	20 msec	0 Hz

Tester Signature : A. Hosoda

Type Name : Akio Hosoda

Conversion Factor (Peak to Average) Calculation
Intentional Radiator

Test Date: January 14, 1999
Temp.: 24 °C ; Humi.: 46 %

The encoded waveform in the time domain is shown in page 25 - 26.
The coding in the waveform was set to obtain the maximum duty rate.

Description of the encoded waveform:

The period of the one pulse train observed at 20 msec. and 50 msec. The one pulse train in the waveform (A) is repeatedly transmitting during 4.9 sec. The duration of the 2 markers in the waveform (A) is the cycle of the one pulse train (16.90 msec.). In order to obtain the peak to average factor, calculation of the period of total on time was computed by personal computer.

Results was obtained by following:

$$\begin{aligned}\text{Duty rate} &= (\text{Maximum total on time}) / (\text{One pulse train}) \times 100 \\ &= 9.16 / 16.90 \times 100 \\ &= 54.2 \%\end{aligned}$$

Therefore,

$$\begin{aligned}\text{Conversion Factor} &= 20\log(0.542) \\ &= -5.3 \text{ dB}\end{aligned}$$

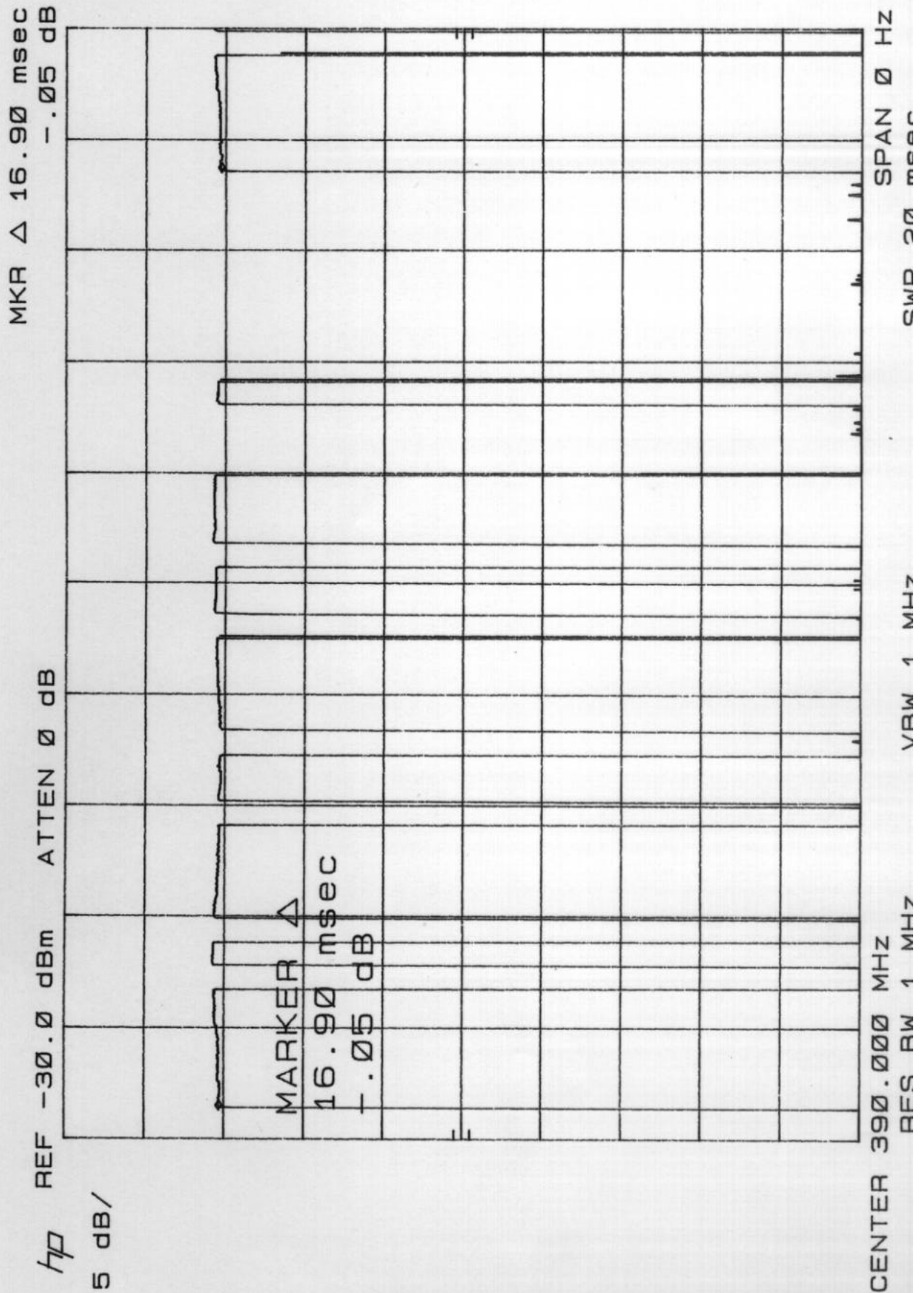
Tester Signature : A. Hosoda
Type Name : Akio Hosoda

JQA Application No. : KL8080617
Model No. : VRA671AT21
FCC ID : ADTVRA671

Regulation : CFR 47 FCC Rules Part 15
Issue Date : January 18, 1999

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The encoded waveform in the time domain(A)

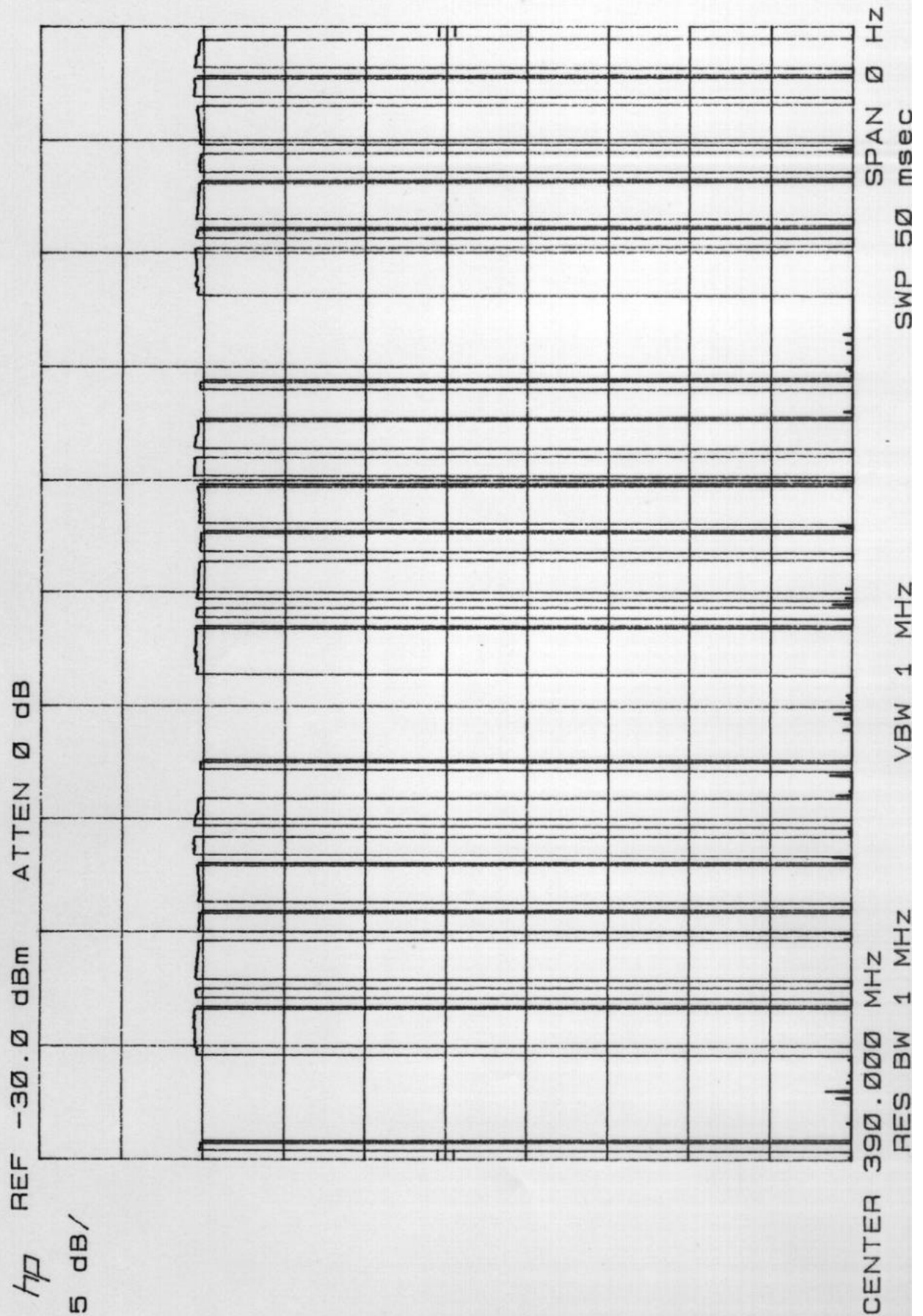


JQA Application No. : KL8080617
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Issue Date : January 18, 1999

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The encoded waveform in the time domain(B)



JQA Application No. : KL8080617
Model No. : VRA671AT21
FCC ID : ADTVRA671

Regulation : CFR 47 FCC Rules Part 15
Issue Date : January 18, 1999

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Occupied Bandwidth Measurement Intentional Radiator

Test Date: January 14, 1999
Temp.: 24 °C ; Humi.: 46 %

The result is shown in page 28.

The bandwidth is determined at the points 20 dB down from the modulated carrier.

Measurement condition :

The measurement of emission falling within 0.975 MHz band (0.25% of the center frequency 390 MHz) were made by using a spectrum analyzer with a resonant tuned dipole antenna under the following modulation conditions of the EUT.

Modulation Signal (Internal) : The coding were set to be obtain the maximum duty rate.

Tester Signature : A. Hosoda
Type Name : Akio Hosoda

JQA Application No. : KL8080617
Model No. : VRA671AT21
FCC ID : ADTVRA671

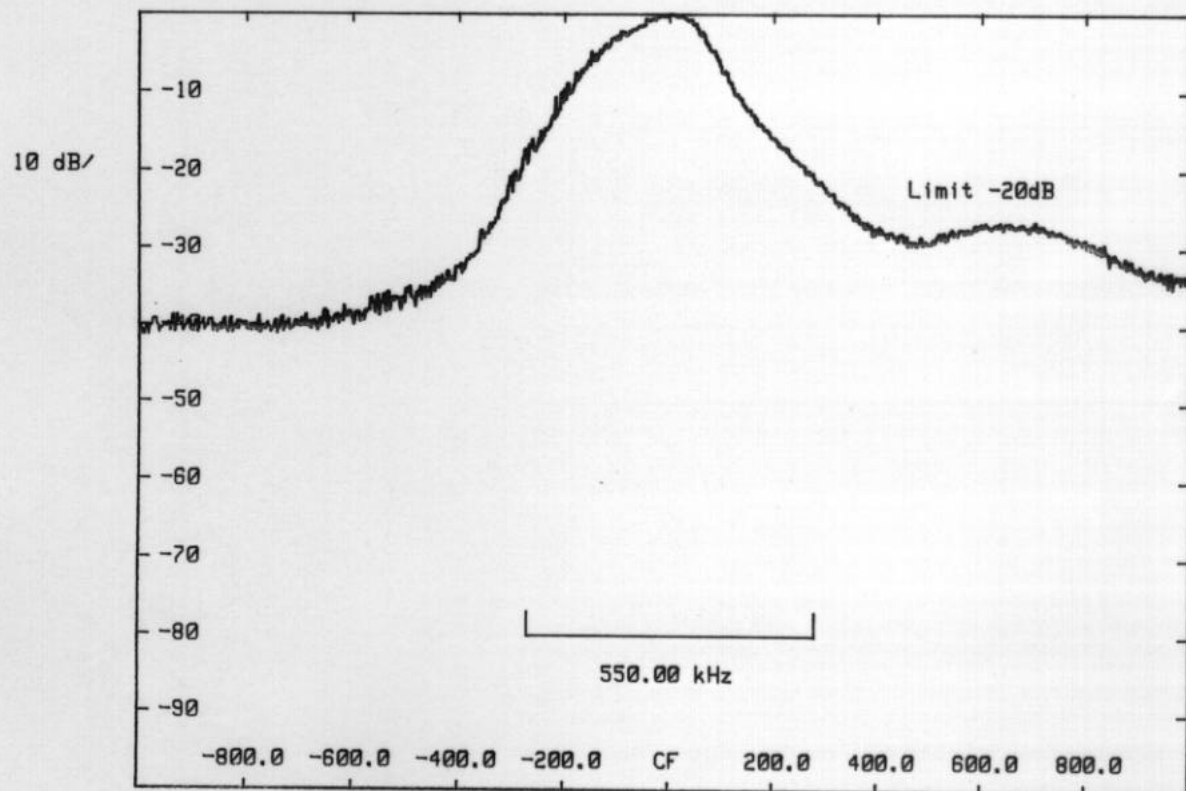
Regulation : CFR 47 FCC Rules Part 15
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Occupied Bandwidth:

EMISSION LIMITATION

FCC ID : ADTVRA671



CENTER 389.8500 MHz
RES BW 100.0 kHz

VBW 3 MHz

SPAN 2000.0 kHz
SWP 1.5 sec