



TEST REPORT

REPORT NUMBER : ANKK-102241
APPLICANT : NIHON KOHDEN CORPORATION
MODEL NUMBER : ZM-930PA
FCC ID : B6BZM-930PA
REGULATION : FCC Part 95 Subpart H

Akzo Nobel K. K.
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ABBREVIATIONS

LISN = Line Impedance Stabilization Network

AMN = Artificial Mains Network

ANT = Antenna

BBA = Broad-band Antenna

DIP = Dipole Antenna

AMP = Amplifier

ATT = Attenuator

EUT = Equipment Under Test

Q-P = Quasi-peak

AVG = Average

FSK = Frequency Shift Keying

SECTION 1. TEST CERTIFICATION

APPLICANT INFORMATION

Company	: NIHON KOHDEN CORPORATION
Address	: 31-4, Nishiiochiai 1-Chome, Shinjuku-ku, Tokyo 161-8560 Japan
Telephone number	: +81 3 5996 8057
Fax number	: +81 3 5996 8097

DESCRIPTION OF TEST ITEM

Kind of equipment	: Medical Telemetry Transmitter
Condition of equipment	: Pre production
Type	: Tabletop (Handheld type)
Trademark	: NIHON KOHDEN
FCC ID	: B6BZM-930PA
Model number	: ZM-930PA
Serial number	: 90002

TEST PERFORMED

Location	: Kashima No. 3 Test Site (FCC Reg. No. : 90433)
EUT received	: Sep. 17, 2002
Test started	: Sep. 17, 2002
Test completed	: Sep. 27, 2002
Regulation	: FCC Part 95 Subpart H Wireless Medical Telemetry Service (WMTS)
Test setup	: ANSI C63.4-1992

Report number : ANKK-102241

Report issue date : October 16, 2002

Test engineer : Kazuhiro Ando

Report approved by : Takeshi Yamanaka
[Site Manager]

Note

- The test result of this report is effective for equipment under test itself and under the test configuration described on the report.
- This test report does not assure that whether the test result taken in other testing laboratory is compatible or reproducible to the test result on this report or not.
- This test report shall not be reproduced except in full, without issuer's permission.

SECTION 2. SUMMARY OF RESULTS

Test	Reference	Result
Field Strength	95.1115(a)	Pass
Undesired Emissions	95.1115(b)	Pass
RF Safety	95.1125	Refer to an separate attachment
RF Power Output	2.1046	1.25 mW
Modulation Characteristics	2.1047	Not Applicable
Occupied Bandwidth	2.1049	16.5 kHz
Spurious Emissions at Antenna Terminals	2.1051	Pass
Frequency Stability	2.1055	-8.18 ppm (Temperature) 0.00 ppm (Voltage)

SECTION 3. EQUIPMENT UNDER TEST

The equipment under test (EUT) consisted of the following equipment.
Indication in the following left side column corresponds to Section 6.

Symbol	Item	Model No.	Serial No.	FCC ID / DoC	Manufacturer	Remarks
A)	Medical Telemetry Transmitter	ZM-930PA	90002	B6BZM-930PA	NIHON KOHDEN	

Power ratings of EUT : DC 3V, 0.110W

DoC : Device for Declaration of Conformity

3.1 Overview of EUT

Type of Emission	F7D
Frequency Range	608.0250 – 613.9750 MHz
RF Output Power	1.25 mW
Number of Channel	239
Channel Spacing	50 kHz (25 kHz when interleaved)
Modulation Method	FSK
Antenna Type	The shielded part of an Electro lead BR-906PA is used as antenna.

3.2 Port(s)/Connector(s) :

Port name	Connector type	Connector pin	Remarks
ECG/RESP socket	Original	8 pin	
S _p O ₂ socket	Original	9 pin	

3.3 Oscillator(s)/Crystal(s) :

Oscillator	Operating frequency	Board name	Remarks
3.840 MHz	3.840 MHz	Main Board	MCU G/A
12.8 MHz	608 - 614 MHz	Frequency Synthesizer Module	Highest frequency

SECTION 4. SUPPORT EQUIPMENT USED

No support equipment was provided for test.

SECTION 5. CABLE (S) USED

The following cable(s) was used for the test.

Indication number in the following left side column corresponds to Section 6.

Number	Name	Length	Shield	Connector	Core
1)	Electrode lead BR-906PA	0.80 m	Yes	Plastic	
2)	Finger probe TL-101T	1.60 m	Yes	Plastic	

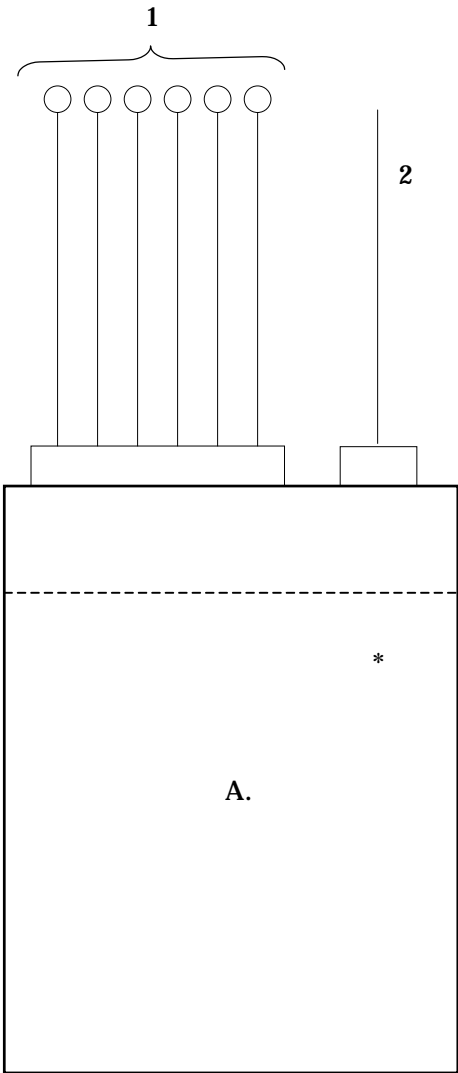
Note : No ferrite core is attached to the outer cables.

SECTION 6. CONSTRUCTION OF EQUIPMENT

The construction of EUT during the test was as follows.

System configuration

* : EUT



Symbols or numbers assigned to equipment or cables on this diagram are corresponded to the symbols or numbers assigned to equipment or cables on tables in Sections 3 to 5.

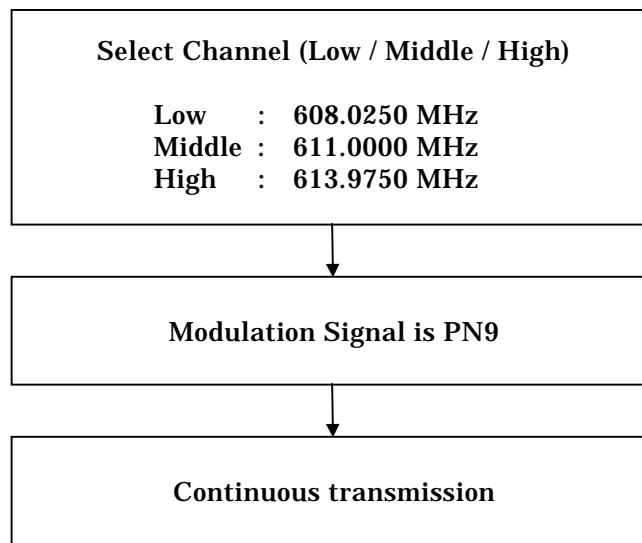
SECTION 7. GENERAL TEST CONDITIONS

The EUT was operated under the following conditions during the test.

7.1 Operating condition

The test was carried out with the transmitter set at maximum power in Test mode. EUT was examined in the operating conditions that had maximum emissions.

7.2 Operating flow



SECTION 8. TEST PROCEDURE(S)

Test was carried out under the following conditions.

Test was carried out with no deviations from standards and test methods.

8.1 Radiated Emission Test

8.1.1 Equipment Setup

System configuration and Equipment setup are shown on Section 6.

8.1.1.1 Table-Top Equipment

EUT is placed on the wooden table raised 0.8meter above the metal ground plane (turntable).

8.1.1.2 Interconnecting Cables

Excess part of the interconnecting cables longer than 1 meter are bundled in the center. Cables that hang closer than 40 cm to the ground plane is folded back and forth forming bundle 30 to 40 cm long, hanging approx, in the middle between ground plane and table.

8.1.2 Measuring Instruments

Brief description of Measuring Instruments are as follows;

8.1.2.1 Antennas

The broadband Tri-log antenna is used for measurement on the frequency range 30 – 1000 MHz.

The Double ridged guide antenna and the Standard gain horn antennas are used for frequency higher than 1000 MHz.

If uncertain result was obtained, the broadband antenna is replaced by the half wave length dipole, then measurement is carried out over again.

8.1.2.2 Pre-amplifier

The broadband pre-amplifier is used for radiated emission measurement.

The signal to noise ratio is improved by using pre-amplifier.

8.1.2.3 Spectrum Analyzer

The spectrum analyzer is used for preliminary measurement of frequency range 30 – 1000 MHz, and also used for final measurement of higher than 1000 MHz

8.1.2.4 EMI Test Receiver

The Quasi-peak detector (IF bandwidth : 120 kHz) built in test receiver is used for final measurement of the frequency 30 – 1000 MHz.

The test receiver is complied with the specification of the CISPR publication 16.

8.1.2.5 Turntable

The turntable is capable for EUT weight and rotatable 0 to 360 degree horizontally by remote control in the test room.

8.1.2.6 Antenna Mast

The antenna mast is attachable to all antennas described on clause 8.1.2.1 and antenna height is adjustable 1 to 4 meters continuously by remote control at the test room, and antenna polarization is also changed by the remote control.

8.1.3 Test Procedure

8.1.3.1 Preliminary Measurement

EUT is tested on all operating conditions.

The spectrum analyzer is set max-hold mode and swept during turntable was rotated 0 to 360 degree. Then spectrum chart are plotted out to detect the worst conditions in configuration, operating mode, or ambient noise notation.

8.1.3.2 Final Measurement

The EUT operated in the condition where maximum emission is detected in the preliminary test.

The turntable azimuth (EUT direction) and antenna height are adjusted the position so that maximum field strength is obtained for each frequency spectrum to be measured. The equipment and cables are arranged or manipulated within the range of the test standard in the above condition.

When the uncertain result was obtained, the measurement is retried by using the half wave dipole antenna instead of the broadband antenna.

SECTION 9. TEST DATA

9.1 Field Strength and Undesired Emission [95.1115(a), 95.1115(b)]

MEASUREMENT PROCEDURE:

1. The EUT was set to operate with following conditions.
 - Channel (Low / Middle / High)
2. The Receiver was setup using (30-1000MHz)
 - Quasi-peak mode : IF bandwidth = 120kHz
3. The Spectrum Analyzer was setup using (1000-7000MHz)
 - Average mode : RBW = 1MHz, VBW = 10Hz
4. Measurement distance was 3 meters.
5. Following data is the worst case.

Data of Channel (Low : 608.0250 MHz)**Akzo Nobel K. K.****Kashima No.3 Test Site****Field Strength and Undesired Emission**

APPLICANT	: NIHON KOHDEN CORPORATION	FILE NO.	: ANKK-102241
EUT NAME	: Medical Telemetry Transmitter	REGULATION	: FCC Part95 SubpartH
MODEL NO.	: ZM-930PA	TEST METHOD	: ANSI C63.4:1992
SERIAL NO.	: 90002	DISTANCE	: 3.0 [m]
TEST MODE	: CH9002(608.025MHz)	TEMPERATURE	: 25.0 [degC]
POWER SOURCE	: DC 3V	HUMIDITY	: 55.0 [%]
DATE TESTED	: Sep 27 2002		

ENGINEER : Kazuhiro Ando

FREQUENCY No	MODE [MHz]		READING [dBuV]		FACTOR [dB/m]		EMISSION [dBuV/m]		LIMIT [dBuV/m]	MARGIN [dB]	
			Hori	Vert	Hori	Vert	Hori	Vert		Hori	Vert
1	608.02	QP	65.1	63.3	31.1	31.1	96.2	94.4	106.0	9.8	11.6
2	1216.05	AVG	33.9	39.0	0.1	0.1	34.0	39.1	54.0	20.0	14.9
3	1824.08	AVG	28.0	28.1	2.9	2.9	30.9	31.0	54.0	23.1	23.0
4	2432.10	AVG	39.7	36.6	5.8	5.8	45.5	42.4	54.0	8.5	11.6
5	3040.13	AVG	29.0	27.6	8.6	8.6	37.6	36.2	54.0	16.4	17.8
6	3648.15	AVG	27.7	27.9	11.0	11.0	38.7	38.9	54.0	15.3	15.1
7	4256.18	AVG	27.9	28.0	12.8	12.8	40.7	40.8	54.0	13.3	13.2
8	4864.20	AVG	27.0	27.3	14.7	14.7	41.7	42.0	54.0	12.3	12.0

Other frequencies : Below the FCC Part95 SubpartH limit											
Emission Level = Read + Factor(Antenna,Antenna Pad,Cable,Preamp)											

Data of Channel (Middle : 611.0000 MHz)**Akzo Nobel K. K.****Kashima No.3 Test Site****Field Strength and Undesired Emission**

APPLICANT	: NIHON KOHDEN CORPORATION	FILE NO.	: ANKK-102241
EUT NAME	: Medical Telemetry Transmitter	REGULATION	: FCC Part95 SubpartH
MODEL NO.	: ZM-930PA	TEST METHOD	: ANSI C63.4:1992
SERIAL NO.	: 90002	DISTANCE	: 3.0 [m]
TEST MODE	: CH9240(611.000MHz)	TEMPERATURE	: 25.0 [degC]
POWER SOURCE	: DC 3V	HUMIDITY	: 55.0 [%]
DATE TESTED	: Sep 27 2002		

ENGINEER : Kazuhiro Ando

FREQUENCY No	MODE [MHz]		READING [dBuV]		FACTOR [dB/m]		EMISSION [dBuV/m]		LIMIT [dBuV/m]	MARGIN [dB]	
			Hori	Vert	Hori	Vert	Hori	Vert		Hori	Vert
1	611.00	QP	65.2	63.3	31.2	31.2	96.4	94.5	106.0	9.6	11.5
2	1222.00	AVG	35.1	40.9	0.1	0.1	35.2	41.0	54.0	18.8	13.0
3	1833.00	AVG	27.9	28.7	3.0	3.0	30.9	31.7	54.0	23.1	22.3
4	2444.00	AVG	39.4	36.3	5.8	5.8	45.2	42.1	54.0	8.8	11.9
5	3055.00	AVG	29.8	27.7	8.7	8.7	38.5	36.4	54.0	15.5	17.6
6	3666.00	AVG	28.3	28.5	11.0	11.0	39.3	39.5	54.0	14.7	14.5
7	4277.00	AVG	29.2	28.0	12.8	12.8	42.0	40.8	54.0	12.0	13.2
8	4888.00	AVG	28.0	27.2	14.8	14.8	42.8	42.0	54.0	11.2	12.0

Other frequencies : Below the FCC Part95 SubpartH limit											
Emission Level = Read + Factor(Antenna,Antenna Pad,Cable,Preamp)											

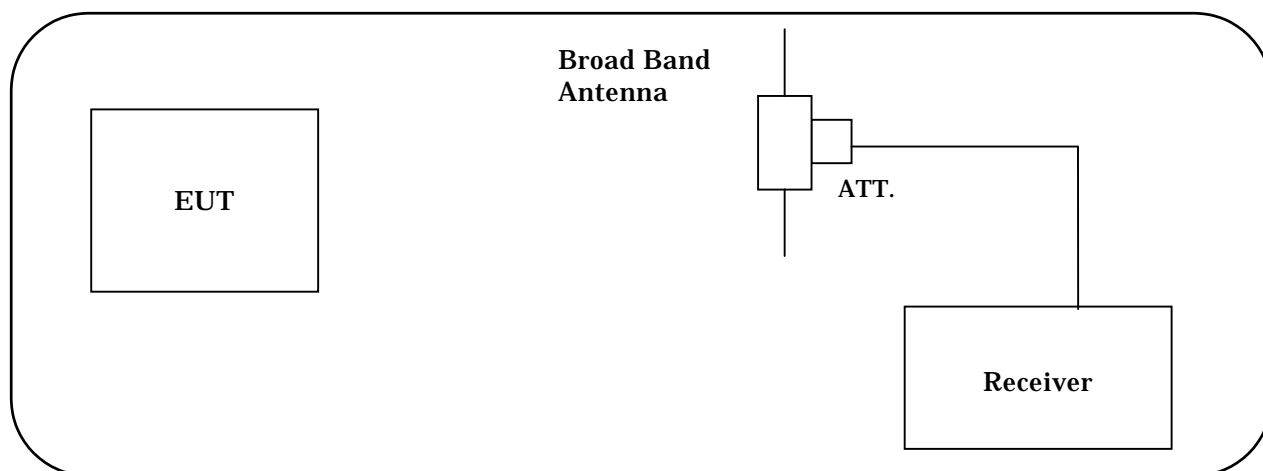
Data of Channel (High : 613.9750 MHz)**Akzo Nobel K. K.****Kashima No.3 Test Site****Field Strength and Undesired Emission**

APPLICANT	: NIHON KOHDEN CORPORATION	FILE NO.	: ANKK-102241
EUT NAME	: Medical Telemetry Transmitter	REGULATION	: FCC Part95 SubpartH
MODEL NO.	: ZM-930PA	TEST METHOD	: ANSI C63.4:1992
SERIAL NO.	: 90002	DISTANCE	: 3.0 [m]
TEST MODE	: CH9478(613.975MHz)	TEMPERATURE	: 25.0 [degC]
POWER SOURCE	: DC 3V	HUMIDITY	: 55.0 [%]
DATE TESTED	: Sep 27 2002		

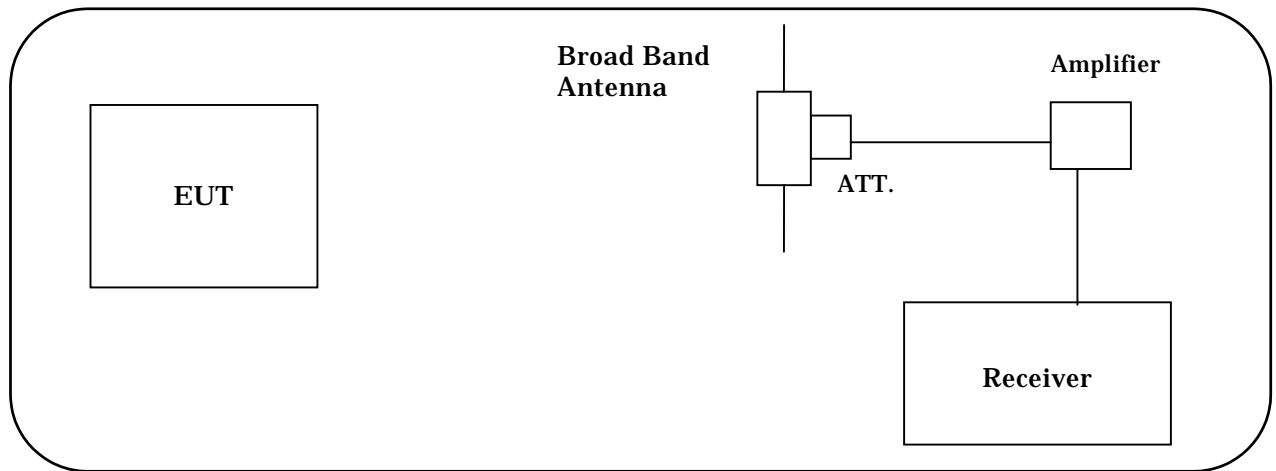
ENGINEER : Kazuhiro Ando

FREQUENCY No	MODE [MHz]		READING [dBuV]		FACTOR [dB/m]		EMISSION [dBuV/m]		LIMIT [dBuV/m]	MARGIN [dB]	
			Hori	Vert	Hori	Vert	Hori	Vert		Hori	Vert
1	613.98	QP	65.1	63.6	31.4	31.4	96.5	95.0	106.0	9.5	11.0
2	1227.95	AVG	33.8	41.2	0.1	0.1	33.9	41.3	54.0	20.1	12.7
3	1841.93	AVG	28.0	28.5	3.0	3.0	31.0	31.5	54.0	23.0	22.5
4	2455.90	AVG	39.3	36.0	6.0	6.0	45.3	42.0	54.0	8.7	12.0
5	3069.88	AVG	30.8	28.6	8.8	8.8	39.6	37.4	54.0	14.4	16.6
6	3683.85	AVG	28.5	28.4	11.2	11.2	39.7	39.6	54.0	14.3	14.4
7	4297.83	AVG	28.8	28.5	12.8	12.8	41.6	41.3	54.0	12.4	12.7
8	4911.80	AVG	27.5	27.0	14.9	14.9	42.4	41.9	54.0	11.6	12.1

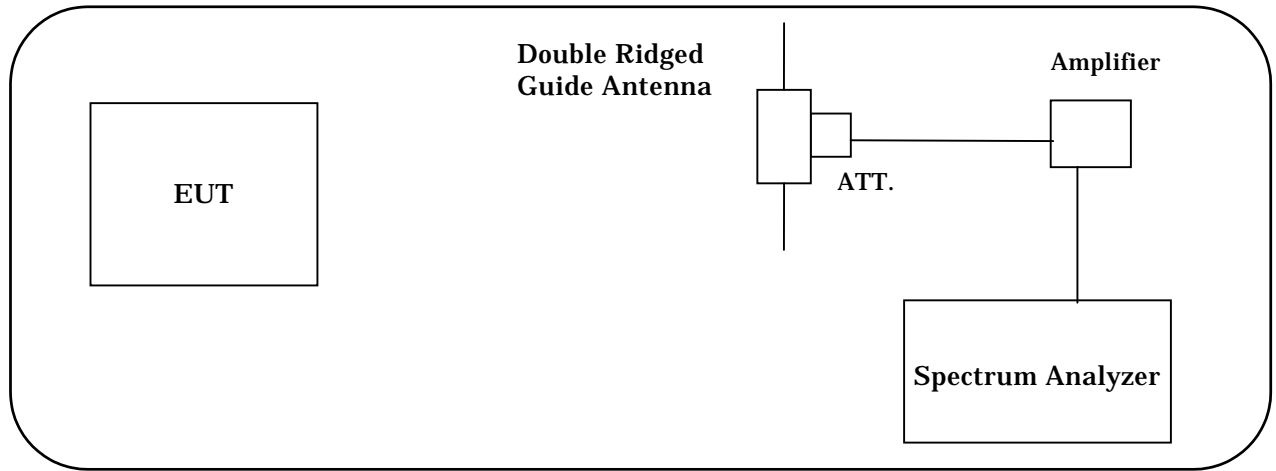
Other frequencies : Below the FCC Part95 SubpartH limit											
Emission Level = Read + Factor(Antenna,Antenna Pad,Cable,Preamp)											

TEST INSTRUMENTS CONFIGURATION (608 –614 MHz)**TEST INSTRUMENTS**

Instrument	Model No.	Serial No.	Manufacturer	Last cal. date	Period
Receiver	ESS	842886/011	Rohde & Schwarz	Mar. 5, 02	1 Year
6dB Attenuator	MP721B	M56993	Anritsu	Jan. 10, 02	1 Year
Broad Band Antenna	VULB9168	107	Schwarzbeck	Jul. 31, 02	1 Year

TEST INSTRUMENTS CONFIGURATION**(Radiated measurement : Frequency range 30 - 1000MHz)****TEST INSTRUMENTS**

Instrument	Model No.	Serial No.	Manufacturer	Last cal. date	Period
Receiver	ESS	842886/011	Rohde & Schwarz	Mar. 5, 02	1 Year
Amplifier	8447D	2443A03849	Hewlett Packard	Jan. 11, 02	1 Year
6dB Attenuator	MP721B	M56993	Anritsu	Jan. 10, 02	1 Year
Broad Band Antenna	VULB9168	107	Schwarzbeck	Jul. 31, 02	1 Year

TEST INSTRUMENTS CONFIGURATION**(Radiated measurement : Frequency range 1000 - 7000 MHz)****TEST INSTRUMENTS**

Instrument	Model No.	Serial No.	Manufacturer	Last cal. date	Period
Spectrum Analyzer	8564E	3643A00665	Hewlett Packard	Jun. 28, 02	1 Year
Amplifier	83051A	3332A00329	Hewlett Packard	Jun. 2, 02	1 Year
3dB Attenuator	6803.17.B	None	SUHNER	Jun. 2, 02	1 Year
Double Ridged Guide Antenna	3115	5044	EMCO	Jul. 9, 02	1 Year

9.2 Maximum Peak Output Power [2.1046]

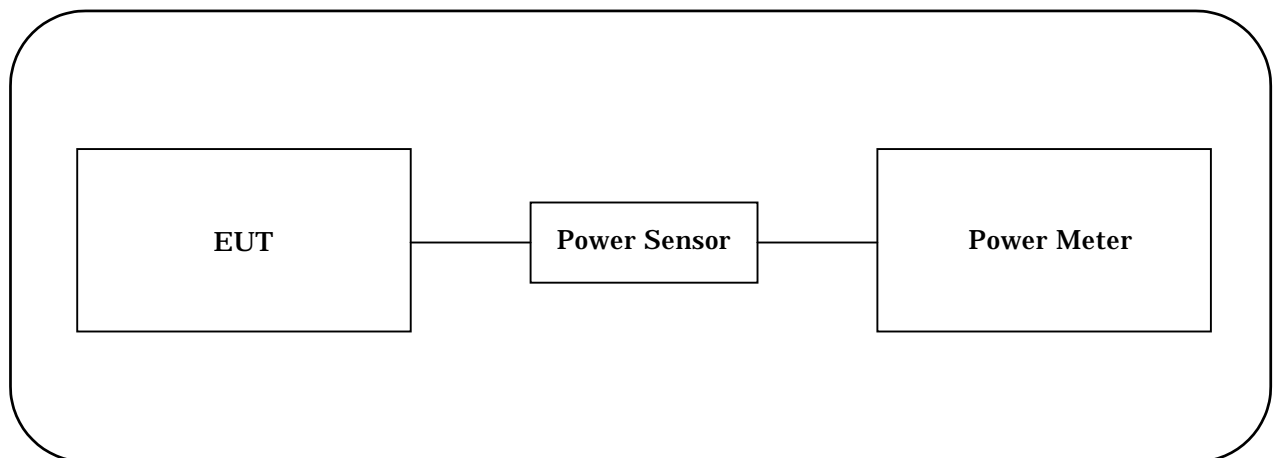
1. The EUT was set to operate with following conditions.
- Channel (Low / Middle / High)
2. The Power Meter was connected directly to the transmitter output.

Test date : September 27, 2002
 Temperature variation : 25 °C
 Humidity variation : 55 %

Channel	Frequency (MHz)	Reading (dBm)	Maximum Peak Output Power (mW)
Low	608.0250	0.93	1.25
Middle	611.0000	0.79	1.20
High	613.9750	0.70	1.14

Note: Maximum peak output power was detected at Channel Low.

TEST INSTRUMENTS CONFIGURATION



TEST INSTRUMENTS

Instrument	Model No.	Serial No.	Manufacturer	Last cal. date	Period
Power Meter	438A	2634A03211	HEWLETT PACKARD	Dec. 19, 01	1 Year
Power Sensor	8482A	2607A11551	HEWLETT PACKARD	Dec. 19, 01	1 Year

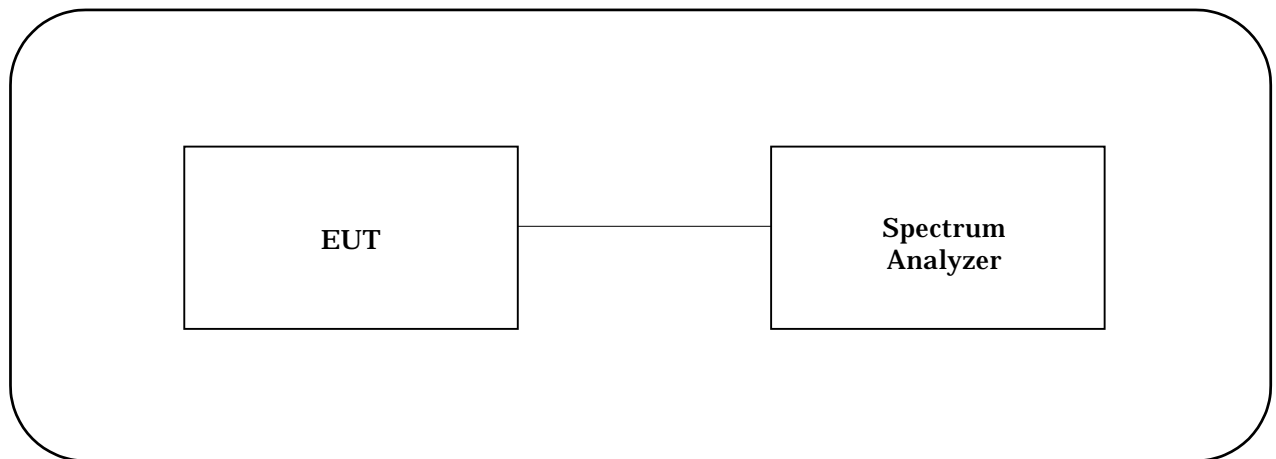
9.3 Occupied Bandwidth [2.1049]

MEASUREMENT PROCEDURE:

1. The EUT was set to operate with following conditions.
- Channel (Low / Middle / High)
2. The Spectrum Analyzer was connected directly to the transmitter output.

Channel	Frequency (MHz)	Occupied Bandwidth (kHz)	Chart
Low	608.0250	16.5	Page 22
Middle	611.0000	16.5	Page 22
High	613.9750	16.3	Page 23

TEST INSTRUMENTS CONFIGURATION



TEST INSTRUMENTS

Instrument	Model No.	Serial No.	Manufacturer	Last cal. date	Period
Spectrum analyzer	8563E	3337A01513	HEWLETT PACKARD	Apr. 4, 02	1 Year

Chart of Channel (Low : 608.0250 MHz)

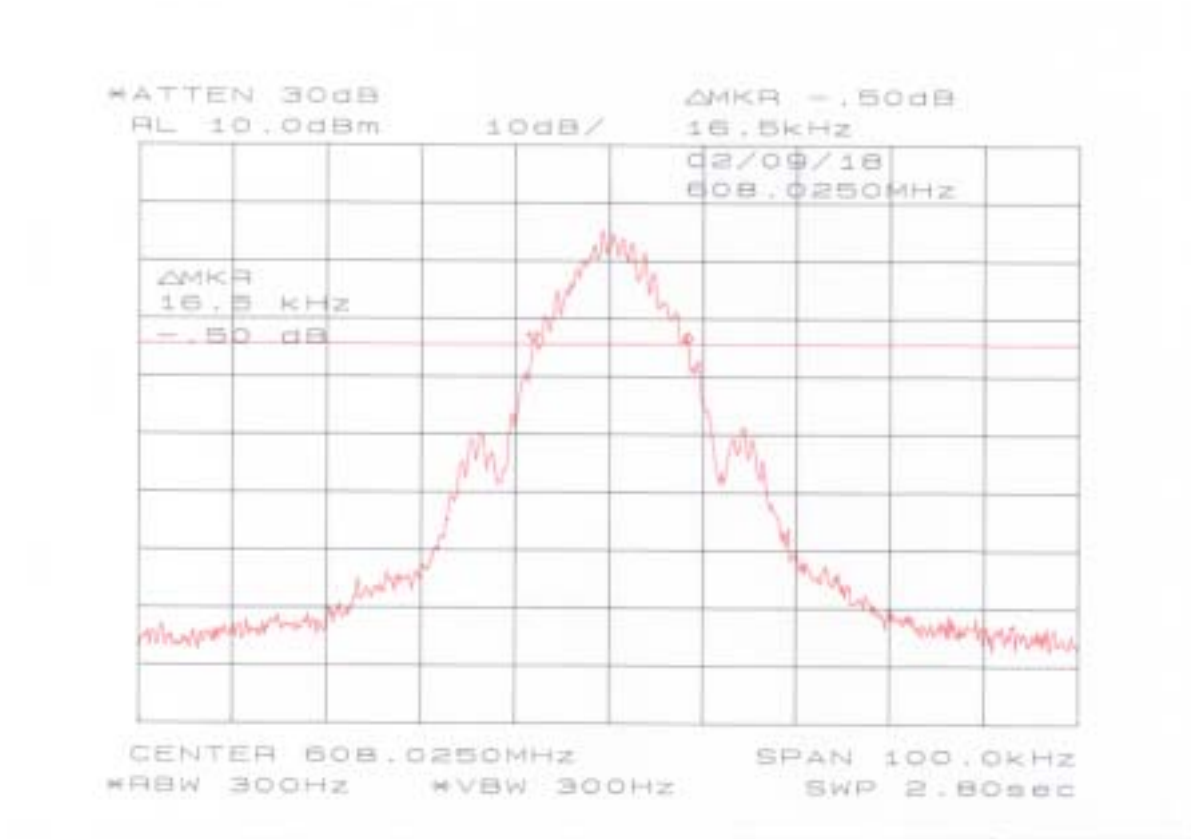


Chart of Channel (Middle : 611.0000 MHz)

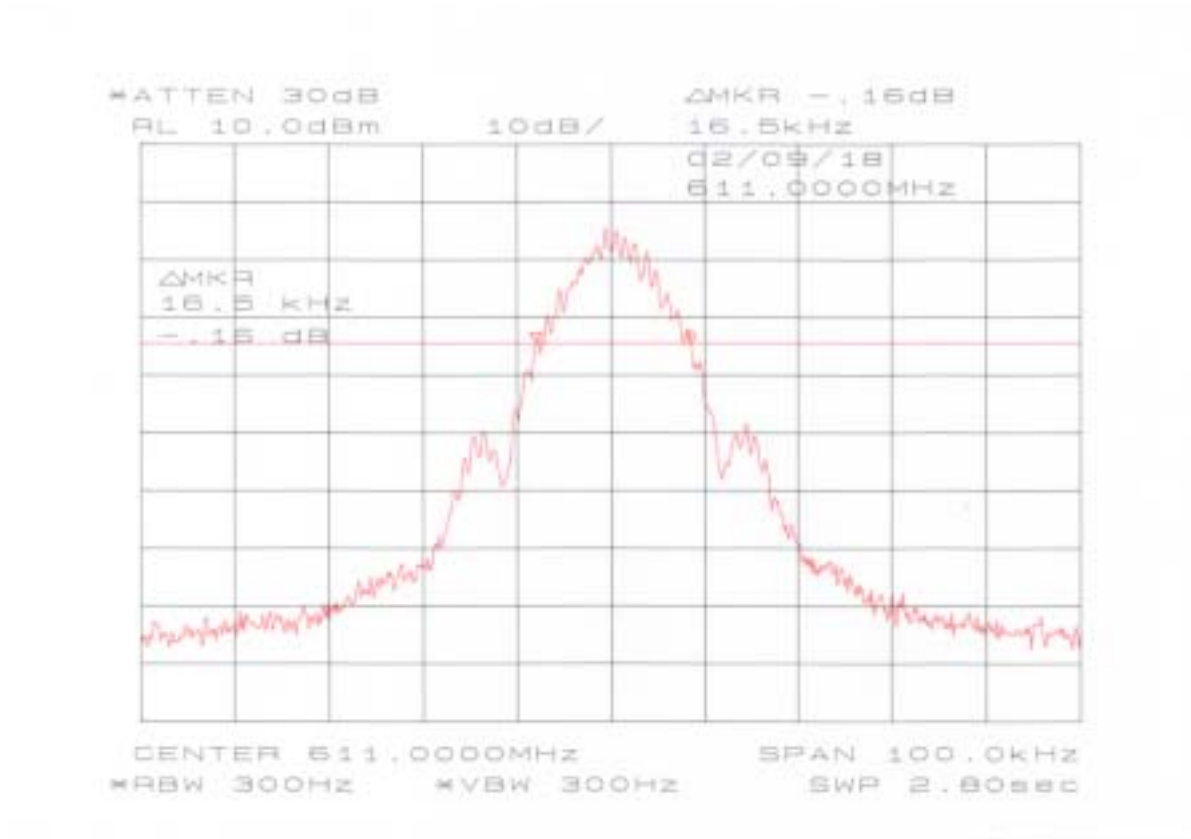
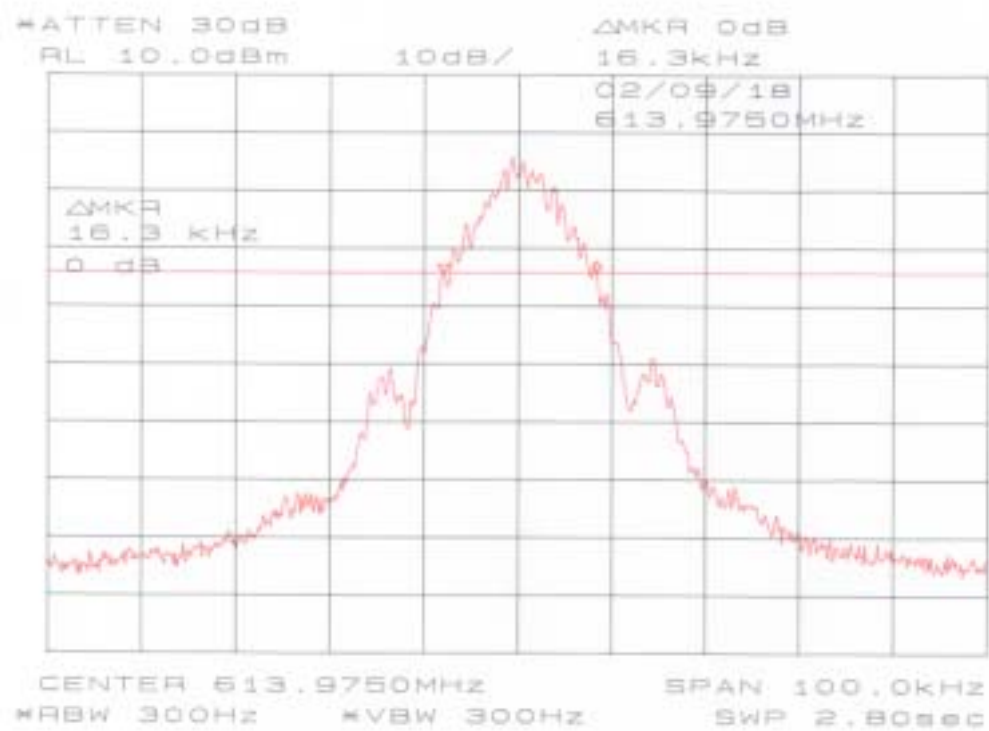


Chart of Channel (High : 613.9750 MHz)



9.4 Spurious Emissions at Antenna Terminals [2.1051]

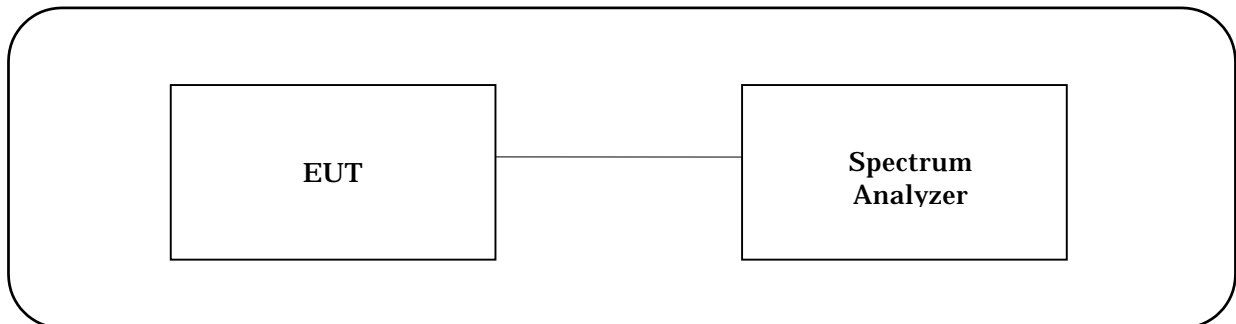
MEASUREMENT PROCEDURE:

1. The EUT was set to operate with following conditions.
- Channel (Low / Middle / High)
2. The Spectrum Analyzer was connected directly to the transmitter output.
3. The Spectrum analyzer was setup using RBW = 100kHz, VBW = 100kHz.
4. AS for the typical chart of the observed RF profiles, refer to Annex A.

Test date : September 27, 2002
 Temperature variation : 25 °C
 Humidity variation : 55 %

Channel	Frequency (MHz)	Chart
Low	608.0250	Annex A P 2-3
Middle	611.0000	Annex A P 3-4
High	613.9750	Annex A P 5-6

TEST INSTRUMENTS CONFIGURATION



TEST INSTRUMENTS

Instrument	Model No.	Serial No.	Manufacturer	Last cal. date	Period
Spectrum analyzer	8564E	3643A00665	HEWLETT PACKARD	Jun. 28, 02	1 Year

9.5 Frequency Stability [2.1055]

MEASUREMENT PROCEDURE:

1. The EUT was set to operate with following conditions.

- Channel (Low/ Middle / High)

2. The measurements were carried out in the temperature chamber.

Each measurement condition is as follows.

Frequency Stability for Temperature : -30°C to 50°C

Frequency Stability for Voltage : with the supply voltage varied between 85% and 115% of the nominal rated supply voltage

3. The Spectrum Analyzer was connected directly to the transmitter output.

Test date : September 18, 2002

Temperature variation : 22 °C

Humidity variation : 65 %

Frequency Stability for Temperature		
Assigned Frequency (MHz) : 611.0000		
Temperature, C	Measured Frequency (MHz)	Frequency Deviation (ppm)
50	611.0000	0.00
40	610.9992	-1.31
30	611.0017	2.78
20	611.0017	2.78
10	611.0017	2.78
0	611.0017	2.78
-10	611.0000	0.00
-20	610.9983	-2.78
-30	610.9950	-8.18

Frequency Stability for Voltage			
Assigned Frequency (MHz) : 611.0000			
%	Voltage	Measured Frequency (MHz)	Frequency Deviation (ppm)
	1.60	611.0000	0.00
85	2.55	611.0000	0.00
100	3.00	611.0000	0.00
	3.20	611.0000	0.00
115	3.45	611.0000	0.00

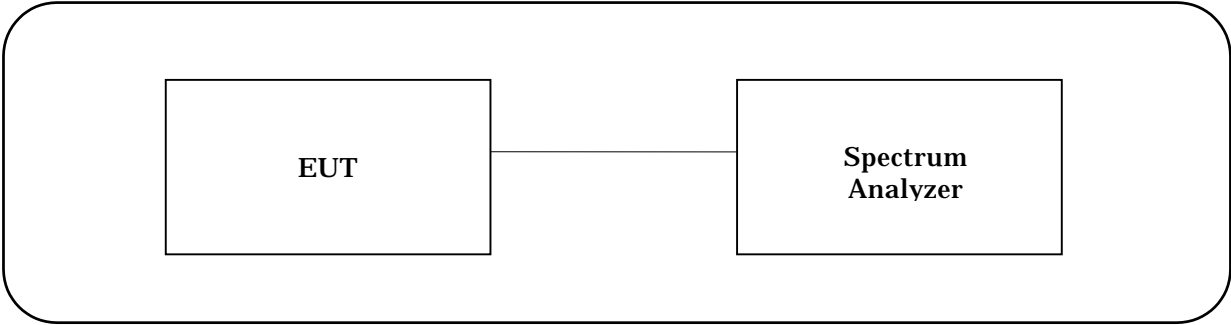
Note : Maximum frequency deviation equals -8.18 ppm.

However, operating environment of the EUT is specified in the user's manual as follows;

Operating temperature : 5 to 40°C

Operating voltage : 1.6 to 3.2V

TEST INSTRUMENTS CONFIGURATION



TEST INSTRUMENTS

Instrument	Model No.	Serial No.	Manufacturer	Last cal. date	Period
Spectrum analyzer	8563E	3337A01513	HEWLETT PACKARD	Apr. 4, 02	1 Year

SECTION 10. MEASUREMENT UNCERTAINTY

The uncertainty of the measurements performed for this report lies:

Field Strength and Undesired Emission	[95.1115(a), 95.115(b)]
30 – 1000 MHz	+/- 3.6 dB
Above 1 GHz	+/- 3.9 dB
Occupied Bandwidth	[2.1049]
.....	+/- 46.7 kHz
Spurious Emissions at Antenna Terminals	[2.1051]
.....	+/- 2.9 dB
Frequency Stability	[2.1055]
.....	+/- 46.7 kHz

Note on Radiated Emission measurement uncertainty

The following items are not included in the calculations in spite of their own uncertainty components because it is impracticable to find the value.

It is our problem awaiting solution in future.

(1) Repeatability of measurement

It is not possible to calculate repeatability since the measurement was carried out only one time.

(2) Antenna factor variation

The definition of measured (radiated electric field strength) is not completed on the referred standard(s).

(3) Loss of EUT radiation propagation

It is certainly one of the uncertainty components, however is not able to calculate.

Please note that these uncertainties are not reflected to the compliance judgement of the test results in this report.

SECTION 11. DESCRIPTION OF TEST LABORATORY

11.1 Outline of Akzo Nobel K. K. (formerly Akzo Kashima Limited), EMC Division

Akzo Nobel K. K., the country organization in Japan for Akzo Nobel NV, was established in 1968. The shares are owned by Akzo Nobel NV (100%). Akzo Nobel NV, headquartered in the Netherlands, is one of the world's leading companies in selected areas of chemicals, coatings, healthcare products and fibers with work force of approximately 70,000 people in over 50 countries.

In 1984, in order to respond to the growing testing demand, in particular, for FCC filing, Akzo Nobel K. K. started EMI testing business, installing the first open air test site in Kashima, Ibaraki prefecture. Further the business has been expanded by installing additional testing facilities not only in Ibaraki but also in other areas such as Shizuoka, Nagano, Kanagawa and Tochigi. As results, Akzo Nobel K. K. has now 16 open air test sites and 4 anechoic chambers for EMI/EMC testing. As the largest EMC testing laboratory in number of testing facilities and staffs, EMC Division has been organized separately in the company and independently operated in conformity with the requirements of ISO/IEC17025 for its competency as a testing laboratory.

Akzo Nobel K. K. EMC Division is the first foreign private laboratory accredited by NVLAP, National Voluntary Laboratory Accreditation Program-NIST, USA. The division has been certified, authorized and/or filed as a competent testing laboratory by various testing organizations/authorities as described below.

11.2 Filing, certification, authorization and accreditation list

EMI/EMC testing

FCC	(USA)
NVLAP	(USA)
NEMKO	(Norway)
VCCI	(Japan)
ETL SEMKO	(Sweden)
TÜV PRODUCT SERVICE	(Germany)

Telecommunications terminal testing

FCC	(USA)
NVLAP	(USA)
NATA	(Australia)
IC	(Canada)

Note 1 : NVLAP accreditation does not constitute any product endorsement by NVLAP or any agent of the U.S. Government.