DESCRIPTIVE INFORMATION

Subsection		Description
2.1033(c)(1)	Applicant:	Shintom Co., Ltd. 1-19-20 Shin-Yokohama, Kohoku-Ku Yokohama 222-0033, Japan
	Manufacturer:	Shintom Co., Ltd.
2.1033(c)(2)	FCC ID: BFYT3017	
2.1033(c)(3)	Installation and Operating Instructions: See Exhibit 20.	
2.1033(c)(4)	Emission Types: 40K0F8W and 40K0F1D	
2.1033(c)(5)	Frequency Range: 824.04 to 848.97 MHz	
2.1033(c)(6)	Range of Operating Power: +6.8dBm to +34.8dBm with the capability of reducing the maximum power in seven steps of 4dB each on command from a Land Station. Each power level is maintained within +2/-4dB of its nominal level over the temperature range of –30 to +60 degrees Centigrade and +15/-15 % change of the supply voltage, accumulative.	
2.1033(c)(7)	Maximum Power Rating: 3 Watts	
2.1033(c)(8)	DC Voltage and Current to the Final Amplifier Module:	
	Supply Voltage:	13.7 V DC
	Drain Voltage:	13.0 V DC
	Drain Current:	0.77 to 0.039 A
2.1033(c)(9)	Tune-Up Procedure:	See Exhibit 21.
2.1033(c)(10)	Circuit Diagrams:	
	Transceiver Block Diagram:	See Exhibit 15.
	Transceiver Schematic Diagram:	See Exhibit 16.
	TCXO System Block Diagram:	See Exhibit 17.
	VCXO Schematic Diagram:	See Exhibit 18.
	TX VCO Schematic Diagram:	See Exhibit 19.

DESCRIPTIVE INFORMATION (Continued)

Subsection Description

2.1033(c)(10) Function of Devices:

Reference No.	Function	Part No.
	Base Band Circuit	
IC403	Signal Audio Processing LSI (Including Base Band Filters, Pre-emphasis, Limiter, Mute Switch, Compandor, DTMF Signal Generator, Electrical Volume, D/A converters, Wideband Data Encoder, DSAT, DST Encoder, SAT Transponder, DSAT, DST Transponder, AFC Counter)	AK2336A
IC401	Speaker Amp.	NJM4580V
IC501	Microphone Amp.	BA10358FV
IC502	Hands Free IC	MC34118DW
Q402	Speaker Power Amp.	2SD1767T
Q403	Speaker Power Amp.	2SB1189T
	TCXO Block	
F302	Crystal	CX-91F(14.4MHz) or TSX-2(14.4MHz) or TOP-B(14.4MHz)
IC303	Crystal Oscillator IC which includes Temperature Sensor	TK11041M
Q303	OSC Transistor	UMX5NT
D303	Voltage-Variable Capacitance Diodes	HVU358T
D304	Voltage-Variable Capacitance Diodes	HVU358T

DESCRIPTIVE INFORMATION (Continued)

Subsection: Description

2.1033(c)(10) (Continued)

Reference No.	Function	Part No.
	PLL Synthesizer	
IC301	DUAL PLL IC	M64074GP
MX301	TX VCO	IL120
MX301	RX VCO	IL-121 or IL-121B
	RF Power Amplifier	
IC201	RF Power Amp. Module	PF0030-C
IC202	Automatic Power Cont.	BA10358F
Q203	TX Driver Amp.	2SC5015
	Digital Circuit	
IC601	Microprocessor	UPD78058GC107
IC404	Reset IC	XC61AN4002ML
IC602	EEPROM	AT24C16N10SI27
Q301	TX Enable Switch	DTA114TUT
Q201	TX Control Switch	UMC4N
	Power Supply	
IC701	Voltage Regulator	UPC78L05T
IC702	Voltage Regulator	UPC78L05T
Q701	Switching	2SJ325ZT
Q702	Switching	DTC114TUT
Q705	Switching	2SJ325ZT
Q706	Switching	2SC2412
Q707	Switching	DTC124EKT

DESCRIPTIVE INFORMATION (Continued)

Subsection	Description		
2.1033(c)(10) (Continued)			
	Reference No.	Function	Part No.
		Receiver	
	IC101	FM IC (2nd Local OSC., 2nd Mixer, 2nd IF Amp., 2nd IF Filter, FM Demodulator)	TA31181FN
	IC302	DUAL PLL	BU2630FV
	Q101	1st Mixer	2SC4903
	Q102	1st IF Amp.	2SC2412
	Q104	1st Local Buffer	2SC4903
	Q106	RF Amp.	2SC5015

2.1033(c)(10) Technical Description: See Exhibit 4.

2.1033(c)(10) Description of Frequency Stabilization System: (TCXO System)

The TCXO System consists of VCXO Circuit (F302, D303 D304,Q303) and Temperature Sensor (IC303), EEPROM (IC602),CPU (IC601), Signal Audio Processing LSI (DAC2, DAC3,AFC Counter Block inside IC403) and 2nd IF IC (IC101) of Receiver Section. See Exhibit 17 to 18.

DESCRIPTIVE INFORMATION (Continued)

Subsection	Description

2.1033(c)(10) (Continued)

With regard to the Frequency Stability:

1) The data which compensates the Frequency Temperature Characteristics of Crystal Oscillator (F302) is pre-recorded at EEPROM (IC602).
2) The information from Temperature Sensor (IC303) is Analyzed by CPU (IC601) and the environmental Temperature of Crystal Oscillator (F302) becomes known.
3) The data which compensates the Frequency Temperature Characteristics of Crystal Oscillator (F302) corresponding to the Environmental temperature of item 2 is read at CPU (IC601) from EEPROM. The result is outputted to DAC3 of Signal Audio Processing LSI (IC403).
4) The data outputted in the item 3 is converted to DC Voltage at DAC3. The result is outputted to Variable Capacitance Diodes (D304) to control Oscillating frequency of Crystal Oscillator (F302).
5) The fixed DC voltage is outputted to D303 by DAC2.

By the processes No. 1 to 5, Frequency Stability of ±2.5ppm is ensured under the temperature range of -30°C to +60°C.

On the other hand, when RF signal from a base Station is received.

6) The 2nd IF Signal Frequency from 2nd IF IC (IC101) of Receiver Section is counted with Counter Block (IC401) The result is led to CPU (IC601) and the error from the transmit frequency of the base station is calculated.
7) The data calculated at CPU (IC601) to minimize the error from the transmit frequency of the base station is outputted to DAC2 of Signal Audio Processing LSI (IC403).

DESCRIPTIVE INFORMATION (Continued)

Subsection	Description

2.1033(c)(10) (Continued)

8) The data outputted in the item 7 is converted to DC Voltage at DAC2. The result is outputted to Variable Capacitance Diode (D303) to control Oscillating Frequency of Crystal Oscillator (F302).

The Frequency Stability of ±1.0ppm is ensured by Automatic Frequency Control (AFC) System which consists of the processes No. 6 to 8.

The result of AFC control is as follows:

9) The data which compensates Frequency Temperature Characteristics of Crystal Oscillator (F302) Recorded at EEPROM (IC602) is renewed.

10) For the renewal, the information from Temperature Sensor (IC303) is analyzed by CPU (IC601). The data portion corresponding to the environmental temperature of Crystal Oscillator (F302) is renewed.

By renewing the data which compensates the Frequency Temperature Characteristics of Crystal Oscillator (F302) recorded at EEPROM (IC602), the Frequency Stability of ±1.0ppm is further maintained as stable status under the temperature range of –30℃ to +60℃.

The above is operational explanation of the TCXO System.

2.1033(c)(10) Description of Circuits for Suppression of Spurious Radiation, for Limiting Modulation, and for Limiting Power:

Means for Attenuation of Spurious Emissions:
Spurious and Harmonic Suppression is obtained by Proper shielding techniques, and the use of filters. The following data are attached as reference:

DESCRIPTIVE INFORMATION (Continued)

Subsection	Description

2.1033(c)(10) (Continued)

SAT Filter Response: See Exhibit 23.
ST and Wide Band Data Filter Response: See Exhibit 24.
Post-Limiter Filter Response: See Exhibit 25.

Means of Limiting Modulation:
This transmitter is equipped with a device which automatically prevents Modulation in excess of 100 %. This device, an instantaneous deviation control circuit, precedes the modulator of the transmitter. It is instantaneous in action for controlling the modulating wave introduced into the transmitter's frequency modulator. The modulation limiter is incorporated in the Signal Audio Processing LSI (IC403).

The deviation limit can be set to the Channel Width Requirement of ±12KHz with the Electrical Volume incorporated in IC401. The deviation of Wide Band Data and Signaling Tone can be set to a Maximum of ±8KHz with the Electrical Volume Incorporated in IC403.

The modulating waveform of the signaling channel follows the format specified in the Cellular Compatibility Standards specified in OET Bulletin 53 as referenced in Section 22.915 (a) of the FCC rules.

Means for Limiting Power:
Power limiting is obtained via the Automatic Power Control (AFC) Circuit. Adjustment of the transmitter's power for each of the 8 levels is made according to data stored in EEPROM (IC602).

2.1033(c)(11) Equipment Identification:
Equipment's Identification Label and its intended location are shown in Exhibit 5 (FCC Label), and in Exhibit 6 (Photograph of Back View of Transceiver showing FCC Label).

DESCRIPTIVE INFORMATION (Continued)

Subsection — Description

2.1033(c)(12) Photographs:
A complete set of the photographs showing external and internal views of circuit details and construction are provided. See Exhibit 6 to 13.

2.1033(c)(13) Not applicable

2.1033(c)(14) Standard Test Conditions:

The following conditions and procedures were followed during testing of this transmitter:

Room temperature: 23 - 27 Degrees Celsius
Room Humidity: 30 – 50 %
Supply Voltage: 13.7 V DC

Prior to testing, the unit was tuned-up according to the manufacturer's alignment procedure.
Test procedures were according to EIA specification IS19B.

The following equipment were used for testing.

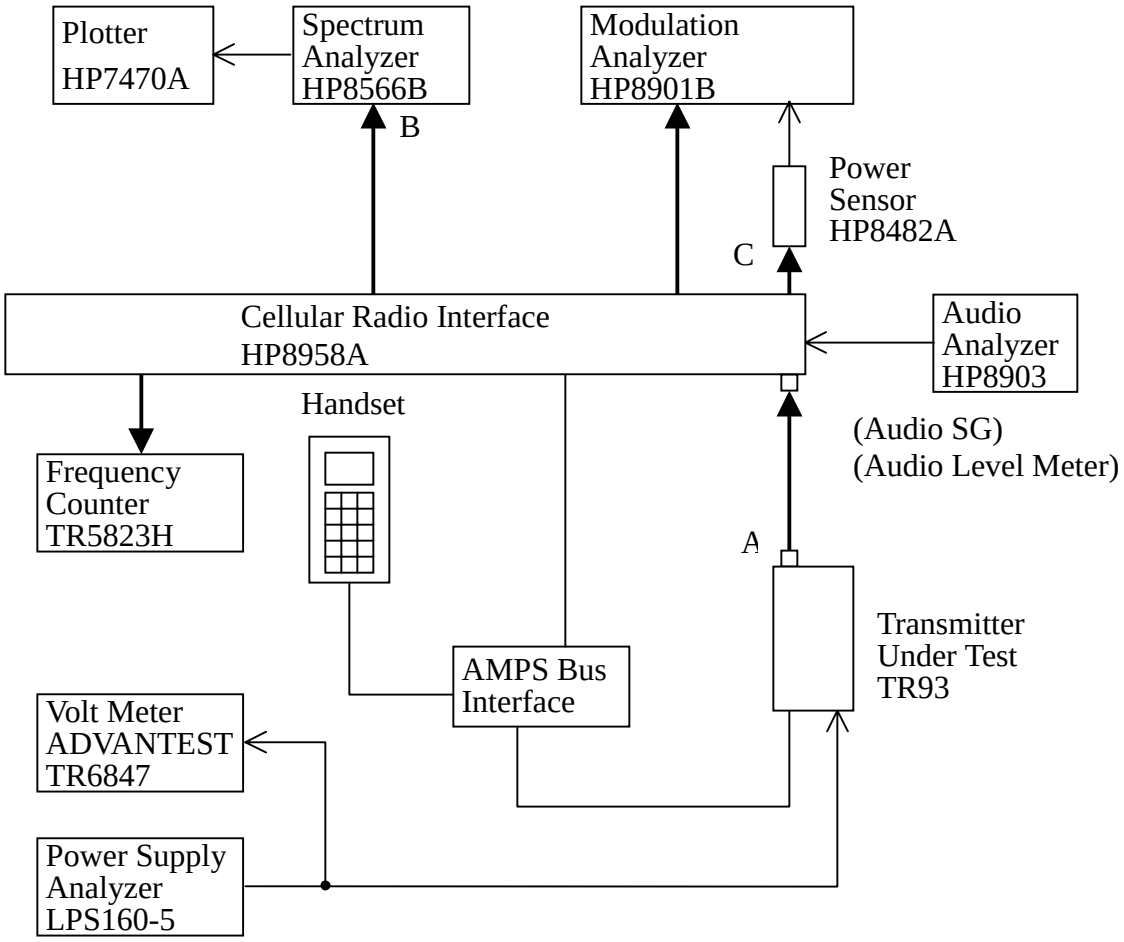
Equipment	Manufacturer	Type No.
Modulation Analyzer	Hewlett Packard	8901B
Power Sensor	Hewlett Packard	8482A
Audio Analyzer	Hewlett Packard	8903A
Spectrum Analyzer	Hewlett Packard	8566B
RF Signal Generator	Hewlett Packard	8642A
RF Signal Generator	Hewlett Packard	8642A
RF Signal Generator	Hewlett Packard	8665A
Cellular Interface	Hewlett Packard	8958A
Plotter	Hewlett Packard	7470A
Power Supply	Hewlett Packard	6024A
AF Signal Generator	Matsushita	VP7214A
Frequency Counter	Advantest	TR5823H
Volt Meter	Advantest	TR6847
Power Supply	Leader	LPS160-5

DESCRIPTIVE INFORMATION (Continued)

Subsection Description

2.1033 (c)(14) (Continued)

Standard Set-up:



Attenuation (A--B):33.8dB
(A--C):23.1dB

DESCRIPTIVE INFORMATION (Continued)

Subsection	Description
2.1033(c)(15)	Not Applicable
2.1033(c)(16)	Not Applicable
2.1033(c)(17)	Not Applicable
2.1046(a)(c)	RF Power Output: The test set-up for RF Power Output is as per Page 9 of Exhibit 3. The Power Output was then measured. Supply Voltage: 13.7 V DC Modulation: None Results:

Channel No.	Nominal Frequency (MHz)	Power Output (Watts)	
		Hi	Low
991	824.04	2.812	0.00582
383	836.49	3.006	0.00498
799	848.97	2.576	0.00516

Note: Channel capacity = 832

DESCRIPTIVE INFORMATION (Continued)

Subsection	Description
2.1047(a) 22.915(d)(1)	Transmitter Audio Frequency Response: The test set-up for the Transmitter Frequency Response is as per Page 9 of Exhibit 3. (Using HP8901B Modulation Meter). Operate the transmitter with the compressor disabled, and monitor the output with a frequency deviation meter of standard test receiver without standard 750-microsecond de-emphasis, with expandor disabled. Apply the sine wave audio input to the transmitter external audio input port, vary the modulating frequency from 300 to 3000 Hz, and observe the input levels necessary to maintain a constant ±2.9KHz system deviation. Adjust the audio input frequency to 1000 Hz, and adjust the input level to 20 dB greater than that required to produce ±8KHz deviation. Note the output level on the frequency deviation meter or standard test receiver. Using this output level as reference (0dB), Vary the modulating frequency from 3000 Hz to 30,000 Hz, and observe the change in output while maintaining a constant audio input level. The results are shown in Exhibit 26 (2 Pages). Response of Post-Limiter Filter: The low pass filter installed between the modulation limiter and the modulation stage is incorporated in the Signal Audio Processing LSI (IC403). The response of this filter is shown in Exhibit 25.
2.1047 (b) 22.915(b)(1),(c)	Modulation Limiting: The test set-up for the Modulation Limiting is as per Page 9 of Exhibit 3. The deviation is to be observed by varying the input voltage. Test has been performed for three different modulation frequencies. The results are shown in Exhibit 27.

DESCRIPTIVE INFORMATION (Continued)

Subsection	Description
2.1049(c)(1) 22.917	Occupied Bandwidth: The test set-up for the Occupied Bandwidth is as per Page 9 of Exhibit 3. The Audio SG was adjusted to the frequency of 1 KHz. The output level was set to ±6 KHz deviation. With level constant, the frequency was set to 2,500 Hz. Then the audio signal level was increased by 16 dB. In addition, occupied bandwidth data was obtained for The SAT (Supervisory Audio Tone), ST (Signaling Tone), WBD (Wideband Data), and DTMF (Dual Tone Multi Frequencies). The results are also shown on the attached graphs: Occupied Bandwidth (No modulation): See Exhibit 28. Occupied Bandwidth (Audio): See Exhibit 29. Occupied Bandwidth (SAT): See Exhibit 30. Occupied Bandwidth (Audio Plus SAT): See Exhibit 31. Occupied Bandwidth (DTMF Plus SAT): See Exhibit 32. Occupied Bandwidth (WBD) (2 Pages): See Exhibit 33. Occupied Bandwidth (ST): See Exhibit 34. Occupied Bandwidth (SAT Plus ST): See Exhibit 35.
2.1051 22.917	Spurious Emission at Antenna Terminal: The test set-up for the Spurious Emission at the Antenna Terminal is as per Page 9 of Exhibit 3. The level of the carrier and the various conducted spurious and harmonic frequencies were measured by means of a calibrated Spectrum Analyzer. The spectrum was scanned from the lowest frequency generated in the equipment to 10 GHz.

DESCRIPTIVE INFORMATION (Continued)

Subsection	Description
2.1051 22.917	(Continued)

Output Power: 3.0 Watts
Modulation Condition: Audio Plus SAT

Audio:
Frequency: 2,500 Hz
Input Level: 16 dB greater than the level to Produce <6KHz deviation

SAT:
Frequency: 6,000 Hz
Deviation: ±2KHz

Harmonics — Spurious Level Below Carrier (dBc) (Nominal Frequency in MHz)

	824.04	836.49	848.97
2nd	< -65 dBc	< -65 dBc	< -65 dBc
3rd to 6th	< -70 dBc	< -70 dBc	< -70 dBc
7th to 11th	< -65 dBc	< -65 dBc	< -65 dBc

All other Spurious of Readings were below -65 dBc.

Limit: -(43 + 10 log 3.0) dBc = -47.8 dBc.

Power outputs of 0.190, 0.0048 watts were measured, and the results were the same as those shown. The graphs measured by the spectrum analyzer are shown in Exhibit 36 (5 Pages).

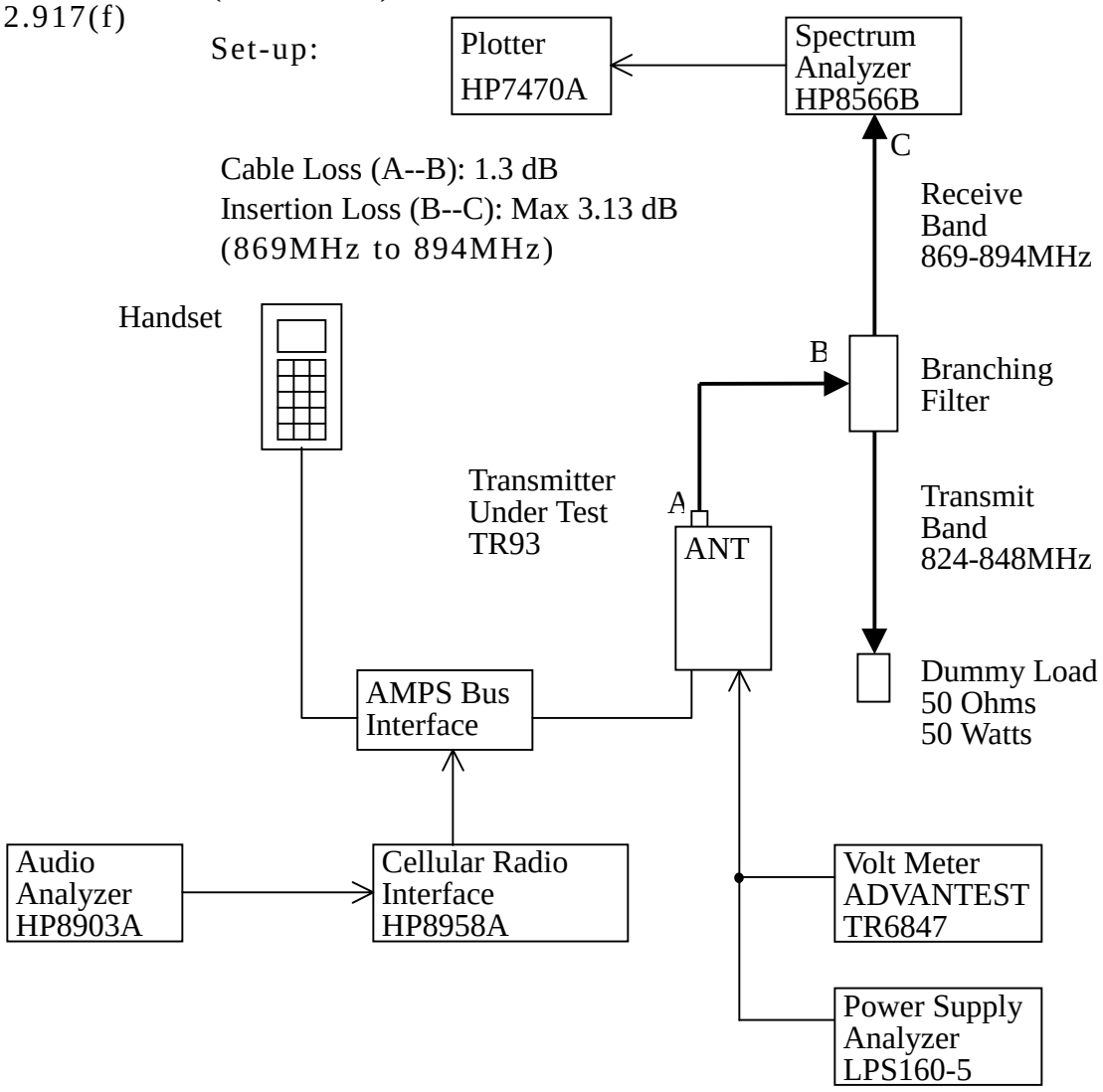
2.1051
22.917(f)

Spurious Emission at Antenna Terminal:
The test set-up for the spurious emission in the receiving frequency band is as per the following figure.

The mean power of any emissions appearing in the base station frequency range from the transmitter were measured by means of a calibrated spectrum analyzer.

DESCRIPTIVE INFORMATION (Continued)

Subsection	Description
2.1051 22.917(f)	(Continued) Set-up:



DESCRIPTIVE INFORMATION (Continued)

Subsection	Description
2.1051 22.917(f)	(Continued) Results: The spectrum was scanned in the frequency range of 869-894 MHz. Then the level of emissions were below -90 dBm. Limit: Below -80 dBm. Carrier frequency of 824.04, 836.49, 848.97 MHz and power outputs of 3.0, 0.19, 0.0048 watts were measured, and the results were the same as those shown previously. The graphs measured by the spectrum analyzer are shown in Exhibit 37 (3 Pages).
2.1053 22.917 22.913(a)	Field Strength of Spurious Radiation: The measurement was performed by KEC (Kansai Electronic Industry Development Center). The report of measurement by KEC is attached as Exhibit 22.
2.1055(a)(1)	Frequency Stability-Temperature Variation: The EUT was placed in a temperature chamber, decreased to -30°C, and permitted to stabilize for one hour. Power was applied and maximum frequency change within one minute was measured. With the power OFF, temperature was raised in 10°C (or 15°C) steps. The next step was permitted to stabilize for one half hour. Power was applied and frequency was measured. Carrier frequency: 836.49 MHz Supply Voltage: 13.7 V DC

DESCRIPTIVE INFORMATION (Continued)

Subsection Description

2.1055(a)(1) (Continued)

Results:

Temperature (°C)	Frequency (MHz)	Frequency (Hz)	Change (ppm)
-30.0	836.490243	243	0.290
-20.0	836.490133	133	0.159
-10.0	836.490074	74	0.088
0.0	836.489971	-29	-0.035
10.0	836.489798	-202	-0.241
25.0	836.489834	-166	-0.198
40.0	836.489833	-167	-0.200
50.0	836.489920	-80	-0.096
60.0	836.490065	65	0.078

See Exhibit 38.

2.1055(d) Frequency Stability-Voltage Variation:
The test set-up for the Frequency Stability-Voltage Variation is as per Page 9 of Exhibit 3.

With power OFF, the sample was permitted to stabilize at +25±2°C. Power was then applied from 80% to 120% of the standard test voltage (STV). The frequency change within one minute was recorded.

Carrier Frequency: 836.49 MHz

STV (%)	Supply Voltage (Vdc)	Frequency (MHz)	Frequency (Hz)	Change (ppm)
80	10.96	836.489848	-152	-0.182
85	11.65	836.489860	-140	-0.167
90	12.33	836.489824	-176	-0.210
95	13.02	836.489834	-166	-0.198
100	13.70	836.489964	-36	-0.043
105	14.39	836.489918	-82	-0.098
110	15.07	836.489850	-150	-0.179
115	15.76	836.489836	-164	-0.196
120	16.44	836.489840	-160	-0.191

Limit: ±2.5ppm = ±2091 Hz

See Exhibit 39.

DESCRIPTIVE INFORMATION (Continued)

Subsection	Description

2.1091 Radiofrequency radiation exposure

The worst-case exposure with the standard installation of the transceiver: BFYT3017 is expected to be applied to a vehicle occupant sitting on the center of rear seat.

The SAR (Specific Absorption Rate) measurement was performed by 3D-EMC Laboratory, Inc.

The report of measurement by 3D-EMC Laboratory, Inc. is attached as Exhibit 14
.

22.919(a)(b)(c) Electronic Serial Number:

The transceiver FCC ID: BFYT3017 has an Electronic Serial Number (ESN) of 32 bit which is uniquely written at the factory. The host component of ESN (EEPROM) is soldered to the main circuit board of the transceiver and contains encoded information of 128 bit memory.

The 128 bit memory includes ESN (32 bit), check-sum-adjust (8 bit), checksum (8 bit), and an additional information (80 bit).
The additional information includes a random data which depends on an individual transceiver unit.
The checksum will be used for checking whether the 128 bit memory is correct or not.
The 128 bit memory is encoded by particular method and the encoded data (128 bit) is written into the host component (EEPROM) in the transceiver unit at the factory.

The method of encoding 128 bit memory is a kind of bit location conversion from 128 bit to 128 bit and then ESN bits are spread over various non-sequential memory location.
The operating software within the transceiver decodes the encoded 128 bit memory and check whether the decoded 128 bit memory is correct or not. The 128 bit memory which is not correct causes the software to make the transceiver inoperative.
Therefore, the ESN is not alterable in the field without the information of 128 bit memory with respect to the structure, the encoding method performed in the factory and the checking method.
And any attempt to remove, tamper with, or change ESN will render the transceiver inoperative.

DESCRIPTIVE INFORMATION (Continued)

Subsection	Description
22.921 FCC99-96	911 Call Processing Procedures In case “911” calls are made, Transceiver FCC ID: BFYT3017 incorporates a special procedure to process “9-1-1” call under the available system regardless of A/B system selection. The special procedure is conformed to Automatic A/B Roaming-Intelligent Retry described in paragraphs 31 to 42 of FCC99-96.