TEST REPORT

FCC/ISED MPE Test for VM8000-F
Certification

APPLICANT
JVCKENWOOD Corporation

REPORT NO.
HCT-RF-2406-FI009-R2

DATE OF ISSUE
September 6, 2024

Tested by
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Applicant	**JVCKENWOOD Corporation** 1-16-2, Hakusan, Midori-ku, Yokohama-shi, Kanagawa, 226-8525 JAPAN
Product Name Model Name	MULTIBAND DIGITAL TRANSCEIVER VM8000-F
FCC ID IC	K44520000 282F-520000
Date of Test	April 15, 2024 ~ June 13, 2024
Location of Test	■ Permanent Testing Lab ☐ On Site Testing (Address: 74, Seoicheon-ro 578beon-gil, Majang-myeon, Icheon-si, Gyeonggi-do, Republic of Korea)
Test Standard Used	FCC Rule Part(s): § 1.1310, § 2.1091 ISED Rule: RSS-102 Issue 6 (December, 2023)
Test Results	PASS

REVISION HISTORY

The revision history for this test report is shown in table.

Revision No.	Date of Issue	Description
0	June 20, 2024	Initial Release
1	August 07, 2024	Deleted the results of BT, BT LE, DTS, UNII.
2	September 06, 2024	Added results for the general Population. (BT, BT LE, DTS, UNII)

Notice

Content
Engineering Statement: The measurements shown in this report were made in accordance with the procedures indicated, and the emissions from this equipment were found to be within the limits applicable. I assume full responsibility for the accuracy and completeness of these measurements, and for the qualifications of all persons taking them. It is further stated that upon the basis of the measurements made, the equipment tested is capable of operation in accordance with the requirements of the FCC/ISED Rules under normal use and maintenance.
The results shown in this test report only apply to the sample(s), as received, provided by the applicant, unless otherwise stated. The test results have only been applied with the test methods required by the standard(s).
The laboratory is not accredited for the test results marked *. Information provided by the applicant is marked **. Test results provided by external providers are marked ***.
When confirmation of authenticity of this test report is required, please contact www.hct.co.kr
The test results in this test report are not associated with the ((KS Q) ISO/IEC 17025) accreditation by KOLAS (Korea Laboratory Accreditation Scheme) / A2LA (American Association for Laboratory Accreditation) that are under the ILAC (International Laboratory Accreditation Cooperation) Mutual Recognition Agreement (MRA).

RF Exposure Statement

1. LIMITS

FCC (According to § 1.1310, § 2.1091 RF exposure is calculated.)

(i) Limits for Occupational/Controlled Exposure

Frequency range (MHz)	Electric field Strength (V/m)	Magnetic field Strength (A/m)	Power density (mW/cm^2)	Averaging time (minutes)
0.3 - 3.00	614	1.63	[a](100)	6
3.00 - 30	8242/f	4.89/f	[a](900/ f^2)	6
30 - 300	61.4	0.163	1.0	6
300 - 1500	.....	.....	f/300	6
1500 - 100.000	.....	.....	5	6

(ii) Limits for General Population/Uncontrolled Exposure

Frequency range (MHz)	Electric field Strength (V/m)	Magnetic field Strength (A/m)	Power density (mW/cm^2)	Averaging time (minutes)
0.3 - 1.34	614	1.63	[a](100)	30
1.34 - 30	824/f	2.19/f	[a](180/ f^2)	30
30 - 300	27.5	0.073	0.2	30
300 - 1500	.....	.....	f/1500	30
1500 - 100.000	.....	.....	1.0	30

F = frequency in MHz

[a] = Plane-wave equivalent power density

ISED (According to RSS-102 RF exposure is calculated.)

Table 7: RF field strength and power density limits for devices used by the general public (uncontrolled environment)

Frequency range (MHz)	Electric field (V_{RMS}/m)	Magnetic field (A_{RMS}/m)	Power density (W/m^2)	Reference period (minutes)
10-20	27.46	0.0728	2	6
20-48	$58.07 / f^{0.25}$	$0.1540 / f^{0.25}$	$8.944 / f^{0.5}$	6
48-300	22.06	0.05852	1.291	6
300-6000	$3.142\ f^{0.3417}$	$0.008335\ f^{0.3417}$	$0.02619\ f^{0.6834}$	6
6000-15000	61.4	0.163	10	6
15000-150000	61.4	0.163	10	$616000 / f^{1.2}$
150000-300000	$0.158\ f^{0.5}$	$4.21 \times 10^{-4}\ f^{0.5}$	$6.67 \times 10^{-5}\ f$	$616000 / f^{1.2}$

Note: f is frequency in MHz.

Table 8: RF field strength and power density limits for controlled-use devices (controlled environment)

Frequency range (MHz)	Electric field (V_{RMS}/m)	Magnetic field (A_{RMS}/m)	Power density (W/m^2)	Reference period (minutes)
10-20	61.4	0.163	10	6
20-48	$129.8 / f^{0.25}$	$0.3444 / f^{0.25}$	$44.72 / f^{0.5}$	6
48-100	49.33	0.1309	6.455	6
100-6000	$15.60\ f^{0.25}$	$0.04138\ f^{0.25}$	$0.6455\ f^{0.5}$	6
6000-15000	137	0.364	50	6
15000-150000	137	0.364	50	$616000 / f^{1.2}$
150000-300000	$0.354\ f^{0.5}$	$9.40 \times 10^{-4}\ f^{0.5}$	$3.33 \times 10^{-4}\ f$	$616000 / f^{1.2}$

Note: f is frequency in MHz.

2. MAXIMUM PERMISSIBLE EXPOSURE Prediction

Prediction of MPE limit at a given distance

$S = PG/4\pi R^2$

S = Power density

P = power input to antenna

- Duty cycle 50% was applied according to KDB 447498 D01
- KDB 447498 D01: The 50% duty factor only applies to exposure conditions where the radio operates with a mechanical PTT button.

G = power gain of the antenna in the direction of interest relative to an isotropic radiator

R = distance to the center of radiation of the antenna

3. FCC Result (Limits for devices used by the general public)

3-1. Bluetooth

Maximum output Power at antenna input terminal	6.00	dBm
Maximum output Power at antenna input terminal	3.98	mW
Duty 50%	1.99	mW
Prediction distance	40.00	cm
Prediction frequency	2402 – 2480	MHz
Antenna Gain(typical)	4.45	dBi
Antenna Gain(numeric)	2.786	-
Power density at prediction frequency(S)	0.0003	mW/cm^2
MPE limit for uncontrolled exposure at prediction frequency	1.0000	mW/cm^2

3-2. BT LE

Maximum output Power at antenna input terminal	6.00	dBm
Maximum output Power at antenna input terminal	3.98	mW
Duty 50%	1.99	mW
Prediction distance	40.00	cm
Prediction frequency	2402 – 2480	MHz
Antenna Gain(typical)	4.45	dBi
Antenna Gain(numeric)	2.786	-
Power density at prediction frequency(S)	0.0003	mW/cm^2
MPE limit for uncontrolled exposure at prediction frequency	1.0000	mW/cm^2

3-3. DTS

Maximum output Power at antenna input terminal	14.50	dBm
Maximum output Power at antenna input terminal	28.18	mW
Duty 50%	14.09	mW
Prediction distance	40.00	cm
Prediction frequency	2412 – 2462	MHz
Antenna Gain(typical)	4.45	dBi
Antenna Gain(numeric)	2.786	-
Power density at prediction frequency(S)	0.0020	mW/cm^2
MPE limit for uncontrolled exposure at prediction frequency	1.0000	mW/cm^2

3-4. UNII

Maximum output Power at antenna input terminal	12.00	dBm
Maximum output Power at antenna input terminal	15.85	mW
Duty 50%	7.92	mW
Prediction distance	40.00	cm
Prediction frequency	5180 – 5775	MHz
Antenna Gain(typical)	2.74	dBi
Antenna Gain(numeric)	1.879	-
Power density at prediction frequency(S)	0.0007	mW/cm^2
MPE limit for uncontrolled exposure at prediction frequency	1.0000	mW/cm^2

3-5. VHF

Maximum output Power at antenna input terminal	47.08	dBm
Maximum output Power at antenna input terminal	51000	mW
Duty 50%	25500	mW
Prediction distance	161.00	cm
Prediction frequency	150.00	MHz
Antenna Gain(typical)	2.15	dBi
Antenna Gain(numeric)	1.641	-
Power density at prediction frequency(S)	0.1284	mW/cm^2
MPE limit for uncontrolled exposure at prediction frequency	0.2000	mW/cm^2

3-6. UHF

Maximum output Power at antenna input terminal	46.63	dBm
Maximum output Power at antenna input terminal	46000	mW
Duty 50%	23000	mW
Prediction distance	138.00	cm
Prediction frequency	406.10	MHz
Antenna Gain(typical)	2.15	dBi
Antenna Gain(numeric)	1.641	-
Power density at prediction frequency(S)	0.1577	mW/cm^2
MPE limit for uncontrolled exposure at prediction frequency	0.2707	mW/cm^2

3-7. 700/ 800 MHz

Maximum output Power at antenna input terminal	44.77	dBm
Maximum output Power at antenna input terminal	30000	mW
Duty 50%	15000	mW
Prediction distance	90.00	cm
Prediction frequency	769.00	MHz
Antenna Gain(typical)	2.15	dBi
Antenna Gain(numeric)	1.641	-
Power density at prediction frequency(S)	0.2418	mW/cm^2
MPE limit for uncontrolled exposure at prediction frequency	0.5127	mW/cm^2

3-8. Simultaneous transmission operations

$$\sum_{i=1}^{n} \frac{Power\ density\ i}{Limit\ i} < 1$$

->Simultaneous MPE is

VHF(161 cm) + UNII(40 cm) + Bluetooth(40 cm) = 0.64318 < 1

VHF(161 cm) + DTS(40 cm) + Bluetooth(40 cm) = 0.64440 < 1

4. FCC Result (Limits for controlled-use devices)

4-1. VHF

Maximum output Power at antenna input terminal	47.08	dBm
Maximum output Power at antenna input terminal	51000	mW
Duty 50%	25500	mW
Prediction distance	67.00	cm
Prediction frequency	150.00	MHz
Antenna Gain(typical)	2.15	dBi
Antenna Gain(numeric)	1.641	-
Power density at prediction frequency(S)	0.7416	mW/cm^2
MPE limit for uncontrolled exposure at prediction frequency	1.0000	mW/cm^2

4-2. UHF

Maximum output Power at antenna input terminal	46.63	dBm
Maximum output Power at antenna input terminal	46000	mW
Duty 50%	23000	mW
Prediction distance	49.00	cm
Prediction frequency	406.10	MHz
Antenna Gain(typical)	2.15	dBi
Antenna Gain(numeric)	1.641	-
Power density at prediction frequency(S)	1.2506	mW/cm^2
MPE limit for uncontrolled exposure at prediction frequency	1.3537	mW/cm^2

4-3. 700/ 800 MHz

Maximum output Power at antenna input terminal	44.77	dBm
Maximum output Power at antenna input terminal	30000	mW
Duty 50%	15000	mW
Prediction distance	34.00	cm
Prediction frequency	769.00	MHz
Antenna Gain(typical)	2.15	dBi
Antenna Gain(numeric)	1.641	-
Power density at prediction frequency(S)	1.6940	mW/cm^2
MPE limit for uncontrolled exposure at prediction frequency	2.5633	mW/cm^2

5. ISED Result (Limits for devices used by the general public)

5-1. Bluetooth

Max Peak output Power at antenna input terminal	0.004	W
Duty 50%	0.002	W
Prediction distance	0.40	m
Prediction frequency	2402.00	MHz
Antenna Gain(typical)	4.45	dBi
Antenna Gain(numeric)	2.786	-
Power density at prediction frequency (S)	0.00277	W/m^2
Limit	5.351	W/m^2

5-2. BT LE

Max Peak output Power at antenna input terminal	0.004	W
Duty 50%	0.002	W
Prediction distance	0.40	m
Prediction frequency	2402.00	MHz
Antenna Gain(typical)	4.45	dBi
Antenna Gain(numeric)	2.786	-
Power density at prediction frequency (S)	0.00277	W/m^2
Limit	5.351	W/m^2

5-3. DTS

Max Peak output Power at antenna input terminal	0.028	W
Duty 50%	0.014	W
Prediction distance	0.40	m
Prediction frequency	2412.00	MHz
Antenna Gain(typical)	4.45	dBi
Antenna Gain(numeric)	2.786	-
Power density at prediction frequency (S)	0.01940	W/m^2
Limit	5.366	W/m^2

5-4. UNII

Max Peak output Power at antenna input terminal	0.016	W
Duty 50%	0.008	W
Prediction distance	0.40	m
Prediction frequency	5180.00	MHz
Antenna Gain(typical)	2.74	dBi
Antenna Gain(numeric)	1.879	-
Power density at prediction frequency (S)	0.00748	W/m^2
Limit	9.047	W/m^2

5-5. VHF

Max Peak output Power at antenna input terminal	51.00	W
Duty 50%	25.50	W
Prediction distance	1.61	m
Prediction frequency	138-144 148-174	MHz
Antenna Gain(typical)	2.15	dBi
Antenna Gain(numeric)	1.641	-
Power density at prediction frequency (S)	1.284	W/m^2
Limit	1.291	W/m^2

5-6. UHF

Max Peak output Power at antenna input terminal	46.00	W
Duty 50%	23.00	W
Prediction distance	1.38	m
Prediction frequency	406.10	MHz
Antenna Gain(typical)	2.15	dBi
Antenna Gain(numeric)	1.641	-
Power density at prediction frequency (S)	1.577	W/m^2
Limit	1.588	W/m^2

5-7. 700/ 800 MHz

Max Peak output Power at antenna input terminal	30.00	W
Duty 50%	15.00	W
Prediction distance	0.90	m
Prediction frequency	768.00	MHz
Antenna Gain(typical)	2.15	dBi
Antenna Gain(numeric)	1.641	-
Power density at prediction frequency (S)	2.418	W/m^2
Limit	2.455	W/m^2

5-8. Simultaneous transmission operations

$$\sum_{i=1}^{n} \frac{Power\ density\ i}{Limit\ i} < 1$$

->Simultaneous MPE is

VHF(1.61m) + UNII(0.4m) + Bluetooth(0.4m) = 0.99618 < 1
VHF(1.61m) + DTS(0.4m) + Bluetooth(0.4m) = 0.99897 < 1

6. ISED Result (Limits for controlled-use devices)

6-1. VHF

Max Peak output Power at antenna input terminal	51.00	W
Duty 50%	25.50	W
Prediction distance	0.67	m
Prediction frequency	138.00	MHz
Antenna Gain(typical)	2.15	dBi
Antenna Gain(numeric)	1.641	-
Power density at prediction frequency (S)	7.416	W/m^2
Limit	7.583	W/m^2

6-2. UHF

Max Peak output Power at antenna input terminal	46.00	W
Duty 50%	23.00	W
Prediction distance	0.49	m
Prediction frequency	406.10	MHz
Antenna Gain(typical)	2.15	dBi
Antenna Gain(numeric)	1.641	-
Power density at prediction frequency (S)	12.506	W/m^2
Limit	13.008	W/m^2

6-3. 700/ 800 MHz

Max Peak output Power at antenna input terminal	30.00	W
Duty 50%	15.00	W
Prediction distance	0.34	m
Prediction frequency	768.00	MHz
Antenna Gain(typical)	2.15	dBi
Antenna Gain(numeric)	1.641	-
Power density at prediction frequency (S)	16.940	W/m^2
Limit	17.889	W/m^2