RF EXPOSURE EVALUATION REPORT

Product Name:	Machine Control Terminal
Trade Mark:	FJDynamics
Model No.:	MT-10
Report Number:	24102114224RFC-3
Test Standards:	FCC 47 CFR Part 1 Subpart I
FCC ID:	2A2LL-MT10
Test Result:	PASS
Date of Issue:	February 8, 2025

Prepared for:

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Date: February 8, 2025

Version

Version No.	Date	Description
V1.0	February 8, 2025	Original

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1. GENERAL INFORMATION

1.1 CLIENT INFORMATION

Applicant:	FJ Dynamics Co., Ltd.
Address of Applicant:	21F, Das Tower, No. 28, 1st South Keji Road, Nanshan District, Shenzhen, China
Manufacturer:	FJ Dynamics Co., Ltd.
Address of Manufacturer:	21F, Das Tower, No. 28, 1st South Keji Road, Nanshan District, Shenzhen, China

1.2 EUT INFORMATION

Product Name:	Machine Control Terminal		
Model No.:	MT-10		
Trade Mark:	FJDynamics		
DUT Stage:	Identical Prototype		
EUT Supports Function: (Provided by the customer)	GSM Bands:	GSM850/PCS 1900	
	CDMA:	BC0	
	UTRA Bands:	WCDMA Band II/ Band V	
	E-UTRA Bands:	FDD Band 2/ 4/ 5/ 7	
		TDD Band 38/ 40/ 41	
	2.4 GHz ISM Band:	IEEE 802.11b/g/n	
		Bluetooth 5.0	
	RNSS Rx Band:	1559 MHz to 1610 MHz	GLONASS/ GPS
Sample Received Date:	October 21, 2024		
Remark: The above EUT's information was provided by customer. Please refer to the specifications or user's manual for more detailed description.			

1.3 PRODUCT SPECIFICATION SUBJECTIVE TO THIS STANDARD

For 2.4 GHz ISM Band of Wi-Fi	
Frequency Band:	2400 MHz to 2483.5 MHz
Frequency Range:	2412 MHz to 2472 MHz
Support Standards:	IEEE 802.11b, IEEE 802.11g, IEEE 802.11n-HT20, IEEE 802.11n-HT40
Type of Modulation:	IEEE 802.11b: DSSS(CCK, DQPSK, DBPSK) IEEE 802.11g: OFDM(64-QAM, 16-QAM, QPSK, BPSK) IEEE 802.11n-HT20: OFDM(64-QAM, 16-QAM, QPSK, BPSK) IEEE 802.11n-HT40: OFDM(64-QAM, 16-QAM, QPSK, BPSK)
Data Rate:	IEEE 802.11b: Up to 11 Mbps IEEE 802.11g: Up to 54 Mbps IEEE 802.11n-HT20: Up to MCS7 IEEE 802.11n-HT40: Up to MCS7
Number of Channels:	IEEE 802.11b: 13 IEEE 802.11g: 13 IEEE 802.11n-HT20: 13 IEEE 802.11n-HT40: 9
Channel Separation:	5 MHz
Antenna Type: (Provided by the customer)	FPCB Antenna
Antenna Gain: (Provided by the customer)	2.31 dBi
Maximum Peak Power:	IEEE 802.11b: 13.71 dBm IEEE 802.11g: 16.62 dBm IEEE 802.11n-HT20: 17.31 dBm IEEE 802.11n-HT40: 17.42 dBm

For Bluetooth	
Frequency Band:	2400 MHz to 2483.5 MHz
Frequency Range:	2402 MHz to 2480 MHz
Bluetooth Version:	Bluetooth LE
Type of Modulation:	GFSK
Number of Channels:	40
Channel Separation:	2 MHz
Antenna Type: (Provided by the customer)	FPCB Antenna
Antenna Gain: (Provided by the customer)	2.31 dBi
Maximum Peak Power:	-4.72 dBm

For Bluetooth	
Frequency Band:	2400 MHz to 2483.5 MHz
Frequency Range:	2402 MHz to 2480 MHz
Bluetooth Version:	Bluetooth LE
Type of Modulation:	GFSK
Number of Channels:	40
Channel Separation:	2 MHz
Antenna Type: (Provided by the customer)	FPCB Antenna
Antenna Gain: (Provided by the customer)	2.31 dBi
Maximum Peak Power:	-4.72 dBm

For 2/3/4G		
Support Networks:	GSM, WCDMA, LTE	
Frequency Bands:	GSM/GPRS/EDGE 850:	824.2-848.8 MHz
	GSM/GPRS/EDGE 1900:	1850.2-1909.8 MHz
	CDMA BC0:	824.7-848.31 MHz
	WCDMA Band II:	1852.4-1907.6 MHz
	WCDMA Band IV:	1712.4-1752.6 MHz
	WCDMA Band V:	826.4-846.6 MHz
	LTE FDD:	Band 2/ 4/ 5/ 7/ 12/ 13/ 17/ 66/71
	LTE TDD:	Band 38/ 41
Antenna Type:	FPCB Antenna	
Antenna Gain:	GSM 850:	-6.06 dBi
	PCS 1900:	-1.29 dBi
	CDMA BC0:	-6.06 dBi
	WCDMA Band II:	-1.29 dBi
	WCDMA Band V:	-6.06 dBi
	LTE Band 2:	-1.29 dBi
	LTE Band 4:	0.54 dBi
	LTE Band 5:	-6.06 dBi
	LTE Band 7:	2.61 dBi
	LTE Band 38:	1.18 dBi

	LTE Band 40:	1.70 dBi
	LTE Band 41:	1.84 dBi

1.4 OTHER INFORMATION

None.

1.5 GENERAL DESCRIPTION OF APPLIED STANDARDS

The EUT is a RF product, according to the specifications of the manufacturers. It must comply with the requirements of the following standards:

FCC 47 CFR Part 1 Subpart I

All test items have been performed and recorded as per the above standards

1.6 DEVIATION FROM STANDARDS

None.

1.7 ABNORMALITIES FROM STANDARD CONDITIONS

None.

1.8 OTHER INFORMATION REQUESTED BY THE CUSTOMER

None.

2. EQUIPMENT LIST

Please refer to the RF test report.

3. MPE EVALUATION

3.1 REFERENCE DOCUMENTS FOR EVALUATION

No.	Identity	Document Title
1	FCC 47 CFR Part 1 Subpart I	PROCEDURES IMPLEMENTING THE NATIONAL ENVIRONMENTAL POLICY ACT OF 1969
2	KDB 447498 D01 General RF Exposure Guidance v06	RF EXPOSURE PROCEDURES AND EQUIPMENT AUTHORIZATION POLICIES FOR MOBILE AND PORTABLE DEVICES

3.2 MPE COMPLIANCE REQUIREMENT

3.2.1 Limits

3.2.1.1 FCC 47 CFR Part 1 Subpart I

According to §1.1307(b)(1), system operating under the provisions of this section shall be operating in a manner that the public is not exposed to radio frequency energy level in excess limit for maximum permissible exposure.

Limits for Occupational / Controlled Exposure

Frequency range (MHz)	Electric Field Strength (E) (V/m)	Magnetic Field Strength (H) (A/m)	Power Density (S) (mW/cm^2)	Averaging Times $\|E\|^2$, $\|H\|^2$ or S (minutes)
0.3-3.0	614	1.63	(100)*	6
3.0-30	1842/f	4.89/f	(900/f)*	6
30-300	61.4	0.163	1.0	6
300-1500	/	/	F/300	6
1500-100000	/	/	5	6

Limits for General Population / Uncontrolled Exposure

Frequency range (MHz)	Electric Field Strength (E) (V/m)	Magnetic Field Strength (H) (A/m)	Power Density (S) (mW/cm^2)	Averaging Times $\|E\|^2$, $\|H\|^2$ or S (minutes)
0.3-1.34	614	1.63	(100)*	30
1.34-30	824/f	2.19/f	(180/f)*	30
30-300	27.5	0.073	0.2	30
300-1500	/	/	F/1500	30
1500-100000	/	/	**1**	30

Note: f = frequency in MHz: * = Plane-wave equivalents power density.

3.2.2 Test Procedure

Software provided by client enabled the EUT to transmit and receive data at lowest, middle and highest channel individually.

3.3 MPE CALCULATION METHOD

FCC 47 CFR Part 1 Subpart I

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

S = power density (in appropriate units, e.g., mw/cm^2)

P = power input to the antenna (in appropriate units, e.g., mw)

G = power gain of the antenna in the direction of interest relative to an isotropic radiator, the power gain factor is normally numeric gain.

R = 20cm distance to the center of radiation of the antenna (in appropriate units, e.g., cm)

3.4 MPE CALCULATION RESULTS

Note: *For the test results, the EUT had been tested with all conditions. But only the worst case was shown in test report.*

3.4.1 For WLAN & Bluetooth

Operating Mode	Freq.	Declared maximum conducted Average output power	Max. positive tolerance according manufacturer	Max. Antenna Gain	Calculated maximum EIRP	Declared maximum EIRP	MPE Limit	MPE Value
	(MHz)	(dBm)		(dBi)	(dBm)	(mW)	(mW/cm^2)	
IEEE 802.11b	2412-2472	11.5	1	2.31	14.81	30.2691	1	0.0060
IEEE 802.11g	2412-2472	7.5	1	2.31	10.81	12.0504	1	0.0024
IEEE 802.11n20	2412-2472	7.5	1	2.31	10.81	12.0504	1	0.0024
IEEE 802.11n40	2422-2462	7.0	1	2.31	10.31	10.7399	1	0.0021
Bluetooth	2402-2480	-6.0	1	2.31	-2.69	0.5383	1	0.0001

3.4.2 For WWAN

Operating Mode	Freq.	Declared maximum conducted Average output power	Max. positive tolerance according manufacturer	Max. Antenna Gain	Calculated maximum EIRP	Declared maximum EIRP	MPE Limit	MPE Value
	(MHz)	(dBm)		(dBi)	(dBm)	(mW)	(mW/cm^2)	
GSM/GPRS 850 (GMSK, 2Tx-slot) (Frame-Averaged)	824.2-848.8	26.5	+0.5/-1.5	-6.06	20.94	124.1652	0.5495	0.0247
GSM/GPRS 1900 (GMSK, 2Tx-slot) (Frame-Averaged)	1850.2-1909.8	24.0	+0.5/-1.5	-1.29	23.21	209.4112	1	0.0417
CDMA BC0 (RMS-Value)	824.7-848.31	25.0	+0.5/-1.5	-6.06	19.44	87.9023	0.5509	0.0175
WCDMA FDD Band 2 (RMS-Value)	1852.4-1907.6	25.0	+0.5/-1.5	-1.29	24.21	263.6331	1	0.0524
WCDMA FDD Band 5 (RMS-Value)	826.4-846.6	25.0	+0.5/-1.5	-6.06	19.44	87.9023	0.5509	0.0175
LTE Band 2 (RMS-Value)	1850-1910	24.5	+0.5/-1.5	-1.29	23.71	234.9633	1	0.0467
LTE Band 4 (RMS-Value)	1710-1755	24.5	+0.5/-1.5	0.54	25.54	358.0964	1	0.0712
LTE Band 5 (RMS-Value)	824–849	24.5	+0.5/-1.5	-6.06	18.94	78.3430	0.5493	0.0156
LTE Band 7 (RMS-Value)	2500-2570	25.0	+0.5/-1.5	2.61	28.11	647.1426	1	0.1287
LTE Band 38 (RMS-Value)	2570-2620	25.0	+0.5/-1.5	1.18	26.68	465.5861	1	0.0926
LTE Band 40 (RMS-Value)	2305-2315, 2350-2360	23.0	+0.5/-1.5	1.70	25.2	331.1311	1	0.0659
LTE Band 41 (RMS-Value)	2535-2655	25.0	+0.5/-1.5	1.84	27.34	542.0009	1	0.1078

1). The EIRP and ERP calculated method is shown as below:
EIRP = Average Power + Antenna Gain
ERP = EIRP – 2.15dB
2). Frame-averaged power = 10 x log (Burst-averaged power mW x Slot used / 8)

3.4.3 Simultaneous Multi-band Transmission MPE Analysis

3.4.2.1 List of Mode for Simultaneous Multi-band Transmission

No.	Configurations	Support/Not Support
1	WLAN + Bluetooth	No
2	WWAN + WLAN	Yes
3	WWAN + BT	Yes
4	WWAN + WLAN + Bluetooth	No

Note:

1) The WLAN and Bluetooth cannot transmit simultaneously, so there is no co-location test requirement for WLAN and Bluetooth.
2) Both GSM/WCDMA/CDMA and LTE can transmit through either WWAN MAIN Ant. However, only one technology (GSM or WCDMA or LTE or CDMA) can transmit from an antenna at a time, and the other technology transmits through the other antenna.

3.4.2.1 Results for transmit simultaneously

For MPE ratios

No.	Operating Mode	Limits (mW/cm^2)	Maximum MPE Value (mw/cm^2)	MPE ratios
1	GSM/GPRS 850	0.5495	0.0247	0.0449
2	GSM/GPRS 1900	1	0.0417	0.0417
3	CDMA BC0	0.5509	0.0175	0.0318
4	WCDMA FDD Band 2	1	0.0524	0.0524
5	WCDMA FDD Band 5	0.5509	0.0175	0.0318
6	LTE Band 2	1	0.0467	0.0467
7	LTE Band 4	1	0.0712	0.0712
8	LTE Band 5	0.5493	0.0156	0.0284
9	LTE Band 7	1	0.1287	0.1287
10	LTE Band 38	1	0.0926	0.0926
11	LTE Band 40	1	0.0659	0.0659
12	LTE Band 41	1	0.1078	0.1078
13	WLAN	1	0.0060	0.0060
14	BT	1	0.0001	0.0001

Note 1: According to KDB 447498 D01 General RF Exposure Guidance v06, At the transmit simultaneously calculation method is as follows:

Transmit simultaneously MPE = Σ of MPE ratios

MPE ratios = Field strengths or power density / MPE limit at the test frequency

For Transmit simultaneously MPE

No.	Configurations	Maximum MPE Ratios			Transmit simultaneously	Limit	Results
		Max. WWAN MPE Ratios	Max. WLAN MPE Ratios	Max. BT MPE ratios			
1	WWAN + WLAN	0.1287	0.0060	--	0.1347	1	PASS
2	WWAN + BT	0.1287	--	0.0001	0.1288	1	PASS

Note 1: According to KDB 447498 D01 General RF Exposure Guidance v06, At the transmit simultaneously calculation method is as follows:

Transmit simultaneously MPE = Σ of MPE ratios

MPE ratios = Field strengths or power density / MPE limit at the test frequency

APPENDIX 1 PHOTOS OF TEST SETUP

N/A

APPENDIX 2 PHOTOS OF EUT CONSTRUCTIONAL DETAILS

Refer to Appendix 2 for EUT external and internal Photos.

*** End of Report ***