FCC Test Report

Automata Technologies Ltd
EVA V4 Industrial Robot

In accordance with FCC 47 CFR Part 15B and ICES-003

Prepared for: Automata Technologies Ltd
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UNITED KINGDOM

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Document 75950079-02 Issue 01

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AJ Lawson.			
NAME	**JOB TITLE**	**RESPONSIBLE FOR**	**ISSUE DATE**
Andy Lawson	Senior Engineer	Authorised Signatory	22 October 2020

Signatures in this approval box have checked this document in line with the requirements of TÜV SÜD document control rules.

EXECUTIVE SUMMARY
A sample of this product was tested and found to be compliant with FCC 47 CFR Part 15B and ICES-003: 2019 and 2019 for the tests detailed in section 1.3.

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Contents

Report Summary

1.1 Report Modification Record

Alterations and additions to this report will be issued to the holders of each copy in the form of a complete document.

Issue	Description of Change	Date of Issue
1	First Issue	22 October 2020

Table 1

1.2 Introduction

Applicant	Automata Technologies Ltd
Manufacturer	Automata Technologies Ltd
Model Number(s)	EVA V4 Industrial Robot
Serial Number(s)	U1021 (0075950079-TSR0001)
Hardware Version(s)	R15
Software Version(s)	4.0.0
Number of Samples Tested	1
Test Specification/Issue/Date	FCC 47 CFR Part 15B and ICES-003: 2019 and 2019
Test Plan/Issue/Date	AUTO/TP/200194 Issue 1
Order Number Date	ATL-PO-0197 22-September-2020
Date of Receipt of EUT	12-October-2020
Start of Test	12-October-2020
Finish of Test	16-October-2020
Name of Engineer(s)	Colin Mckean and Matthew Smart
Related Document(s)	ANSI C63.4: 2014

1.3 Brief Summary of Results

A brief summary of the tests carried out in accordance with FCC 47 CFR Part 15B and ICES-003 is shown below.

Section	Specification Clause	Test Description	Result	Comments/Base Standard
Configuration and Mode: AC Powered - 120 V AC - Highly dynamic toolpath				
2.1	15.109 and 6.2	Radiated Disturbance	Pass	ANSI C63.4: 2014
2.2	15.107 and 6.1	Conducted Disturbance at Mains Terminals	Pass	ANSI C63.4: 2014

Table 2

1.4 Declaration of Build Status

MAIN EUT			
MANUFACTURING DESCRIPTION	Industrial Robotic Arm		
MANUFACTURER	Automata Technologies Ltd.		
MODEL NAME/NUMBER	EVA V4 Industrial Robot		
PART NUMBER	EVA V4		
SERIAL NUMBER	U1021 and U1058 were supplied as representative EUTs for testing		
HARDWARE VERSION	R15		
SOFTWARE VERSION	4.0.0		
PSU VOLTAGE/FREQUENCY/CURRENT	Power supply separate to robot. See section below.		
HIGHEST INTERNALLY GENERATED / USED FREQUENCY	1 GHz Pre-approved 2.4 GHz Wi-Fi module also contained within the EUT (disabled during EMC testing).		
FCC ID (if applicable)	See TUV SUD BABT 736 Form Supplied by Automata Certificates for pre-approved wi-fi module provided to TUV		
INDUSTRY CANADA ID (if applicable)	No applications made to Industry Canada. Can TUV do this on our behalf? Certificates for pre-approved wi-fi module provided to TUV		
TECHNICAL DESCRIPTION (a brief description of the intended use and operation)	EVA is a small robotic arm intended for a range of different applications in an industrial environment (e.g. pick and place, machine tending, product testing, etc.)		
COUNTRY OF ORIGIN	China		
RF CHARACTERISTICS (if applicable)			
TRANSMITTER FREQUENCY OPERATING RANGE (MHz)	2412 – 2462 MHz		
RECEIVER FREQUENCY OPERATING RANGE (MHz)	2412 – 2462 MHz		
INTERMEDIATE FREQUENCIES	CH1: 2412 MHz CH2: 2417 MHz CH3: 2422 MHz CH4: 2427 MHz CH5: 2432 MHz CH6: 2437 MHz CH7: 2442 MHz CH8: 2447 MHz CH9: 2452 MHz CH10: 2457 MHz CH11: 2462 MHz		
EMISSION DESIGNATOR(S): (i.e. G1D, GXW)	19M7D1D		
MODULATION TYPES: (i.e. GMSK, QPSK)	802.11b : DSSS (DBPSK / DQPSK / CCK) 802.11g/n : OFDM (BPSK / QPSK / 16QAM / 64QAM)		
OUTPUT POWER (W or dBm)	18.90 dBm (measured conducted/EIRP) in 802.11g CH7, 6Mbps		
SEPARATE BATTERY/POWER SUPPLY (if applicable)			
MANUFACTURING DESCRIPTION	External AC-DC Power Adapter. Class II		
MANUFACTURER	Fidus		
TYPE	External Class II Supply		
PART NUMBER	MDA20024-C8		
PSU VOLTAGE/FREQUENCY/CURRENT	I/P: 90 to 264 VAC (47 to 63 Hz) O/P: 24 VDC (8.3 A / 199 W)		
COUNTRY OF ORIGIN	China		
MODULES (if applicable)			
MANUFACTURING DESCRIPTION	Wi-Fi module	Click to edit	Click to edit
MANUFACTURER	Texas Instruments Inc	Click to edit	Click to edit
TYPE	Single Modular	Click to edit	Click to edit
POWER	0.2432 W	Click to edit	Click to edit
FCC ID	Z64-WL18DBMOD	Click to edit	Click to edit
INDUSTRY CANADA ID	451I-WL18DBMOD	Click to edit	Click to edit

EMISSION DESIGNATOR	19M7D1D	Click to edit	Click to edit
DHSS/FHSS/COMBINED OR OTHER	DSSS / OFDM	Click to edit	Click to edit
COUNTRY OF ORIGIN	USA	Click to edit	Click to edit
ANCILLARIES (if applicable)			
MANUFACTURING DESCRIPTION	Click to edit	Click to edit	Click to edit
MANUFACTURER	Click to edit	Click to edit	Click to edit
TYPE	Click to edit	Click to edit	Click to edit
PART NUMBER	Click to edit	Click to edit	Click to edit
SERIAL NUMBER	Click to edit	Click to edit	Click to edit
COUNTRY OF ORIGIN	Click to edit	Click to edit	Click to edit

Table 3

I hereby declare that the information supplied is correct and complete.

Name: Mike Grout
Position held: Technical Lead - Safety and Compliance
Date: 15/10/2020

1.5 Product Information

1.5.1 Technical Description

The Equipment Under Test (EUT) was an Automata Technologies Ltd EVA V4 Industrial Robot.

The EUT is a small robotic arm intended for a range of different applications in an industrial environment (e.g. pick and place, machine tending, product testing.)

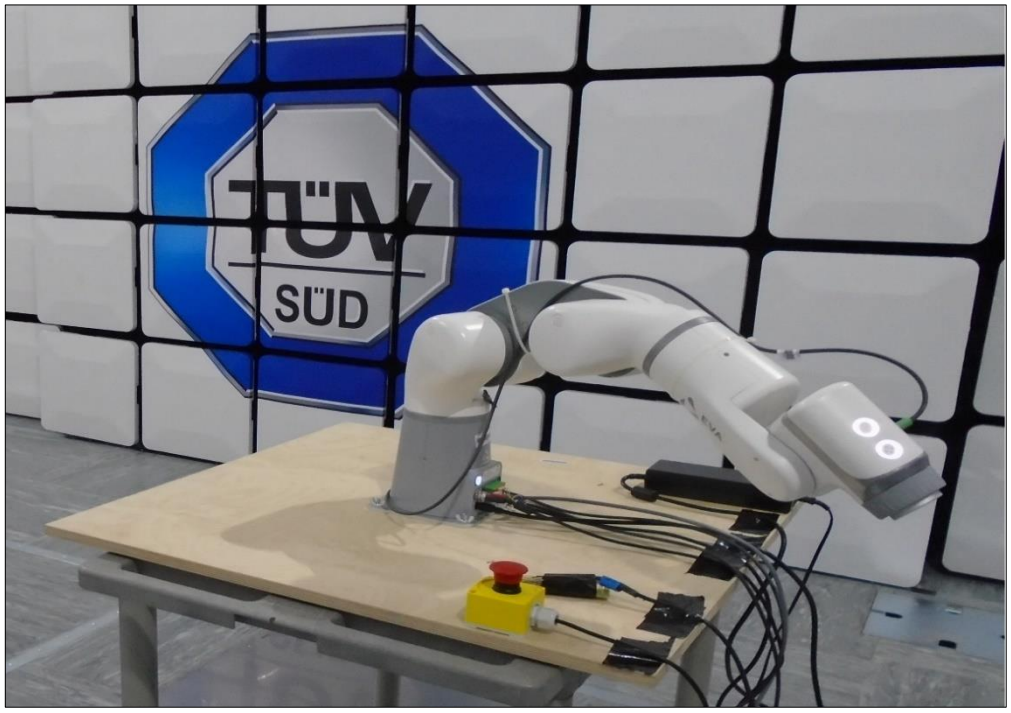

Figure 1 – General View

1.5.2 EUT Port/Cable Identification

Port	Max Cable Length specified	Usage	Type	Screened
AC Power Port	2 m	Mains Power	120 V AC to DC adapter.	No
Telecomm Port	10 m	Ethernet	RJ45	Yes
Signal/Control Port 1	3 m	Loop Back	Custom Connection	No
Signal/Control Port 2	1.5 m	E-Stop	Custom Connection	No

Table 4

1.5.3 Test Configuration

Configuration	Description
AC Powered - 120 V AC	The EUT was powered from a 120 V 60 Hz AC to DC power converter. Connected to the EUT was: One CAT 5 ethernet cable which was connected to a monitoring laptop. One Emergency stop cable which was connected to an emergency stop button. Two Cables which were connected to a loopback PCB.

Table 5

1.5.4 Modes of Operation

Mode	Description
Highly dynamic toolpath	The EUT was powered and constantly exercised the motors across all six of the EUTs movement planes.

Table 6

1.6 Deviations from the Standard

No deviations from the applicable test standard were made during testing.

1.7 EUT Modification Record

The table below details modifications made to the EUT during the test programme.

The modifications incorporated during each test are recorded on the appropriate test pages.

Modification State	Description of Modification still fitted to EUT	Modification Fitted By	Date Modification Fitted
Model: EVA V4 Industrial Robot, Serial Number: U1021 (0075950079-TSR0001)			
0	As supplied by the customer	Not Applicable	Not Applicable

Table 7

1.8 Test Location

TÜV SÜD conducted the following tests at our Fareham Test Laboratory.

Test Name	Name of Engineer(s)	Accreditation
Configuration and Mode: AC Powered - 120 V AC - Highly dynamic toolpath		
Radiated Disturbance	Colin Mckean and Matthew Smart	UKAS
Conducted Disturbance at Mains Terminals	Colin Mckean	UKAS

Table 8

Office Address:

Octagon House
Concorde Way
Segensworth North
Fareham
Hampshire
PO15 5RL
United Kingdom

2 Test Details

2.1 Radiated Disturbance

2.1.1 Specification Reference

FCC 47 CFR Part 15B and ICES-003, Clause 15.109 and 6.2
AUTO/TP/200194 Issue 1 Clause 6.3

2.1.2 Equipment Under Test and Modification State

EVA V4 Industrial Robot, S/N: U1021 (0075950079-TSR0001) - Modification State 0

2.1.3 Date of Test

12-October-2020

2.1.4 Test Method

The EUT was setup according to ANSI C63.4, clause 5.2.

The EUT was placed on a non-conductive table 0.8 m above a reference ground plane. A vertical coupling plane was placed 0.4 m from the EUT boundary.

A Line Impedance Stabilisation Network (LISN) was directly bonded to the ground-plane. The EUT was located so that the distance between the boundary of the EUT and the closest surface of the LISN was 0.8 m.

Interconnecting cables that hanged closer than 0.4 m to the ground plane were folded back and forth in the centre forming a bundle 0.3 m to 0.4 m long.

Input and output cables were terminated with equipment or loads representative of real usage conditions.

The EUT was configured to give the highest level of emissions within reason of a typical installation as described by the manufacturer.

2.1.5 Example Calculation

Below 1 GHz:

Quasi-Peak level (dBµV/m) = Receiver level (dBµV) + Correction Factor (dB/m)
Margin (dB) = Quasi-Peak level (dBµV/m) - Limit (dBµV/m)

Above 1 GHz:

CISPR Average level (dBµV/m) = Receiver level (dBµV) + Correction Factor (dB/m)
Margin (dB) = CISPR Average level (dBµV/m) - Limit (dBµV/m)

Peak level (dBµV/m) = Receiver level (dBµV) + Correction Factor (dB/m)
Margin (dB) = Peak level (dBµV/m) - Limit (dBµV/m)

2.1.6 Example Test Setup Diagram

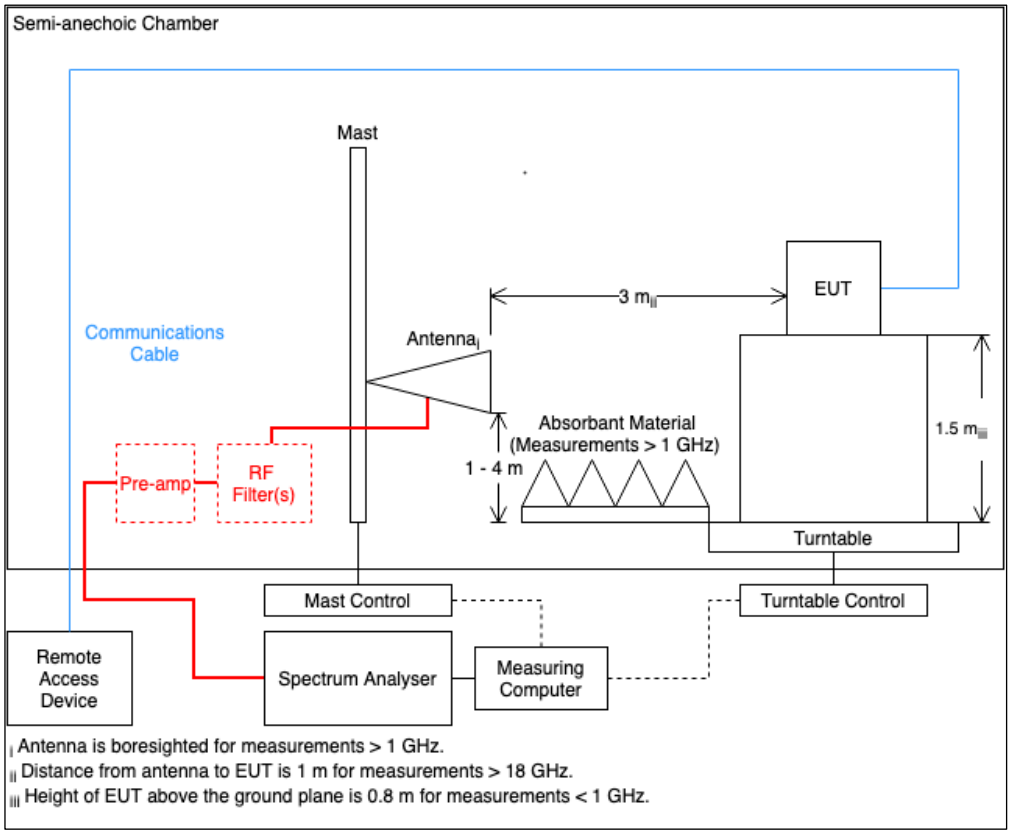

Figure 2 – Radiated Disturbance

2.1.7 Environmental Conditions

Ambient Temperature	20.3 - 20.4 °C
Relative Humidity	42.5 - 42.9 %

2.1.8 Specification Limits

Required Specification Limits, Field Strength - Class B Test Limit at a 3 m Measurement Distance		
Frequency Range (MHz)	Test Limit (µV/m)	Test Limit (dBµV/m)
30 to 88	100	40.0
88 to 216	150	43.5
216 to 960	200	46.0
Above 960	500	54.0
Supplementary information: Note 1. A Quasi-peak detector is to be used for measurements below 1 GHz. Note 2. A CISPR Average detector is to be used for measurements above 1 GHz. Note 3. The Peak test limit above 1 GHz is 20 dB higher than the CISPR Average test limit.		

Table 9

2.1.9 Test Results

Results for Configuration and Mode: AC Powered - 120 V AC - Highly dynamic toolpath.

This test was performed to the requirements of the Class B limits.

Performance assessment of the EUT made during this test: Pass

Detailed results are shown below.

Highest frequency generated or used within the EUT: 2.4 GHz
Which necessitates an upper frequency test limit of: 30 GHz

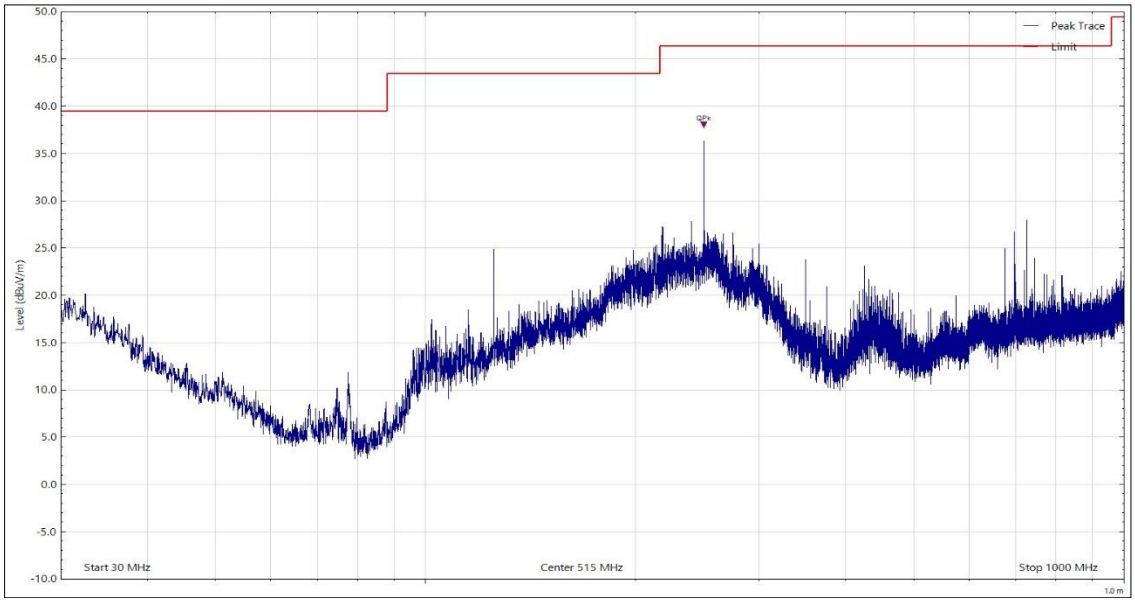

Figure 3 - 30 MHz to 1 GHz, Quasi-Peak, Horizontal

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Detector	Angle (°)	Height (cm)	Polarisation	Orientation
250.009	37.6	46.4	-8.8	Q-Peak	143	103	Horizontal	-

Table 10

No other final measurements were made as all other peak emissions seen above the measurement system noise floor during the pre-scan were greater than 10 dB below the test limit.

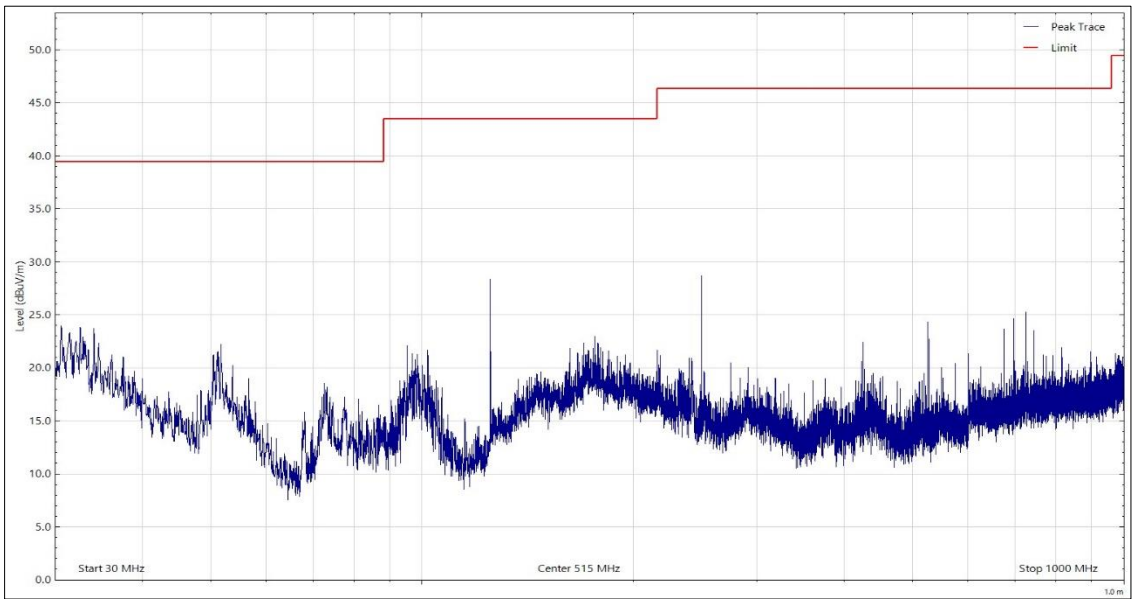

Figure 4 - 30 MHz to 1 GHz, Quasi-Peak, Vertical

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Detector	Angle (°)	Height (cm)	Polarisation	Orientation
*								-

Table 11

*No final measurements were made as all peak emissions seen above the measurement system noise floor during the pre-scan were greater than 10 dB below the test limit.

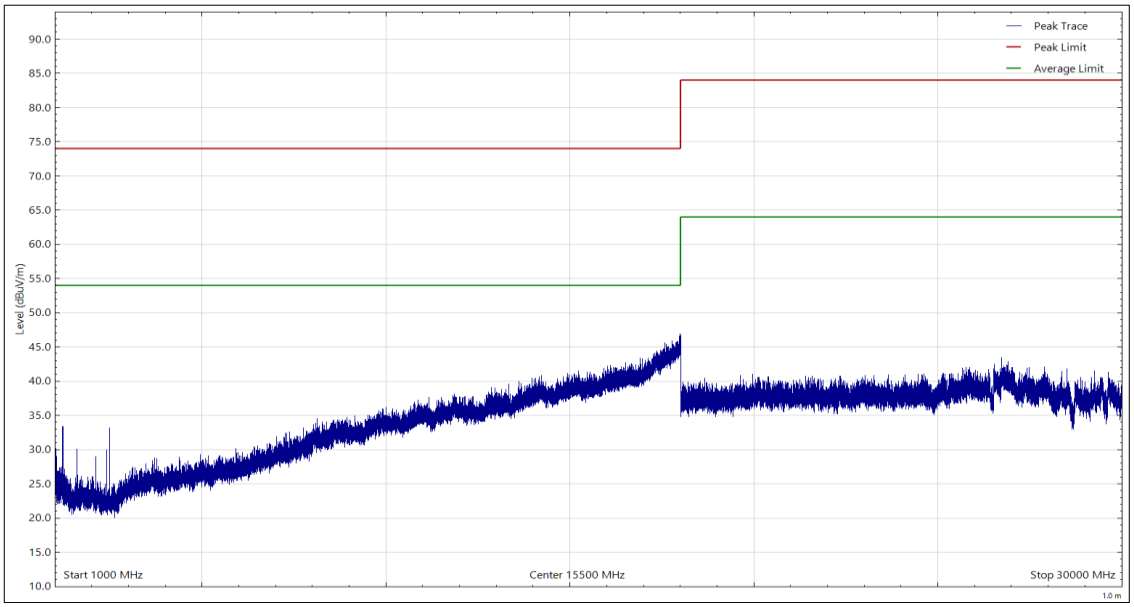

Figure 5- 1 GHz to 30 GHz, Peak & CISPR Average, Horizontal

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Detector	Angle (°)	Height (cm)	Polarisation	Orientation
								-

Table 12

*No final measurements were made as all peak emissions seen above the measurement system noise floor during the pre-scan were greater than 10 dB below the test limit.

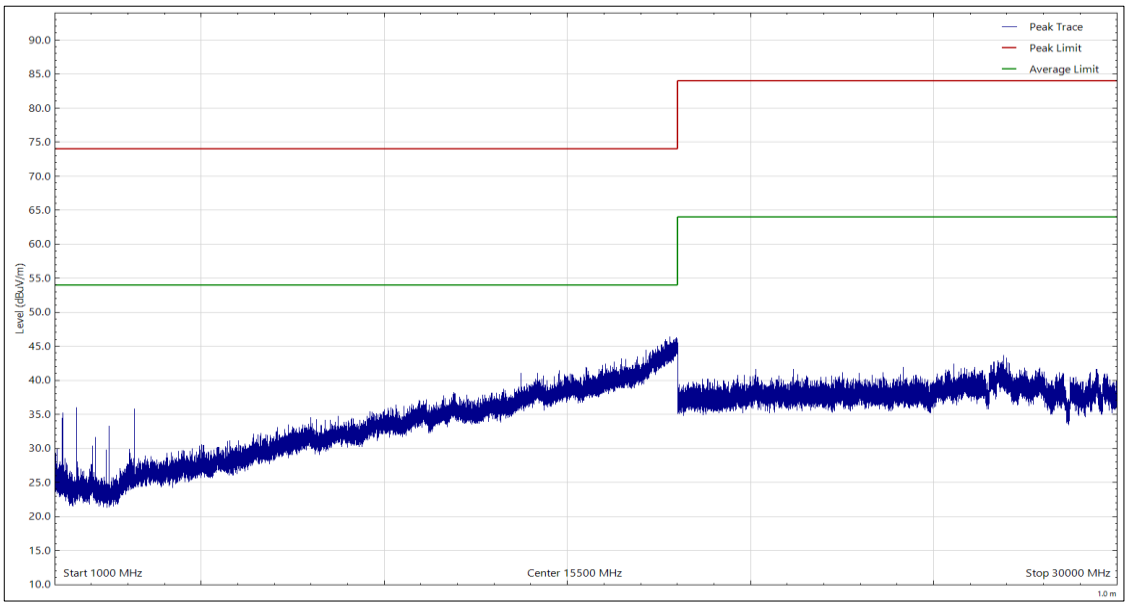

Figure 6- 1 GHz to 30 GHz, Peak & CISPR Average, Vertical

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Detector	Angle (°)	Height (cm)	Polarisation	Orientation
								-

Table 13

*No final measurements were made as all peak emissions seen above the measurement system noise floor during the pre-scan were greater than 10 dB below the test limit.

Figure 7 - Test Setup - 30 MHz to 1 GHz

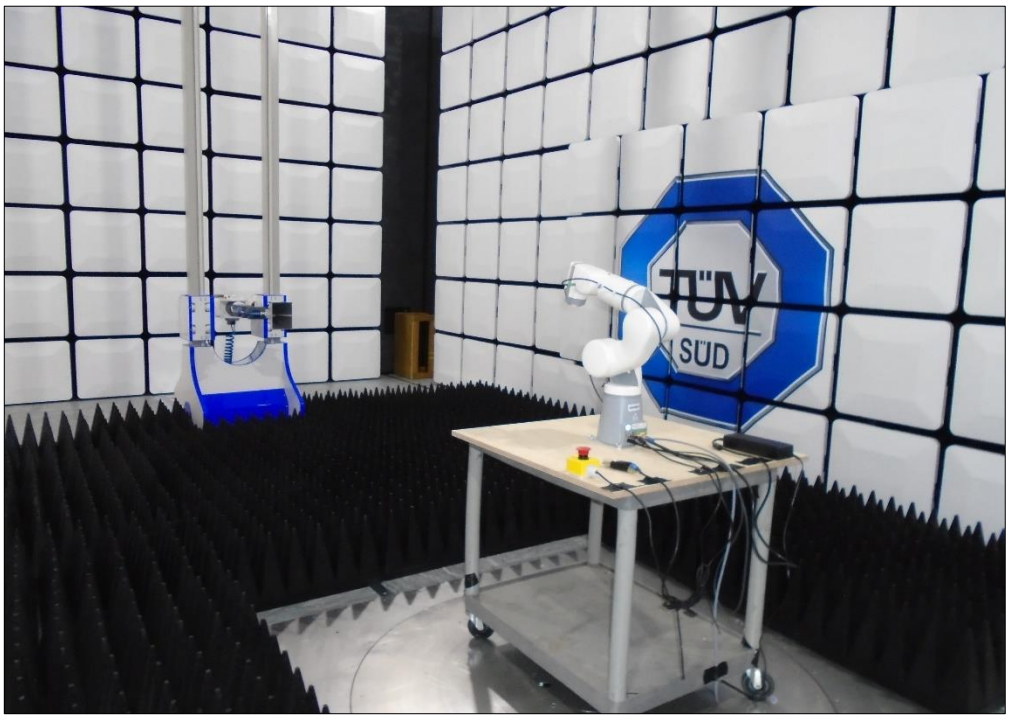

Figure 8 - Test Setup - 1 GHz to 18 GHz

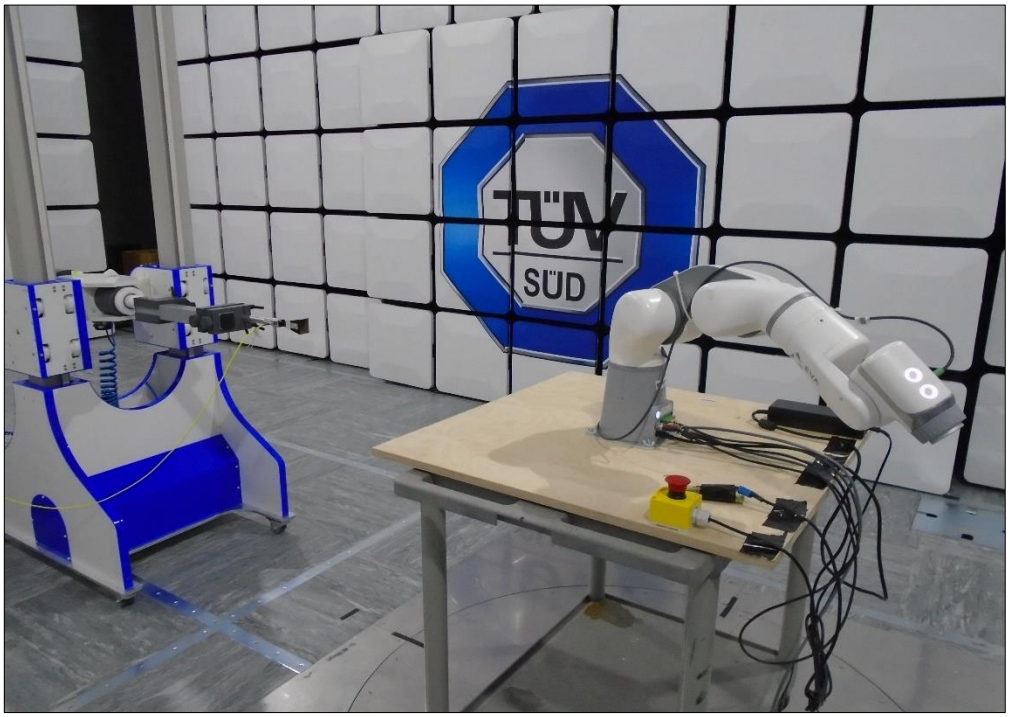

Figure 9 - Test Setup - 18 GHz to 30 GHz

2.1.10 Test Location and Test Equipment Used

This test was carried out in EMC Chamber 12.

Instrument	Manufacturer	Type No	TE No	Calibration Period (months)	Calibration Due
3m Semi Anechoic Chamber	MVG	EMC-3	5621	36	11-Aug-2023
EmX Emissions Software	TUV SUD	V1.6.3	5125	-	Software
EMI Test Receiver	Rohde & Schwarz	ESU40	3506	12	03-Jan-2021
EMI Test Receiver	Rohde & Schwarz	ESW44	5527	12	06-Feb-2021
Turntable & Mast Controller	Maturo Gmbh	NCD/498/2799.01	5612	-	TU
Tilt Antenna Mast TAM 4.0-P	Maturo Gmbh	TAM 4.0-P	5613	-	TU
Cable (18 GHz)	Rosenberger	LU7-036-1000	5031	12	22-Jul-2021
1m K-Type Cable	Junkosha	MWX241-01000KMSKMS/A	5511	12	03-Apr-2021
8m N Type Cable	Junkosha	MWX221-08000NMSNMS/B	5519	12	24-Mar-2021
Cable (Yellow, Rx, Km-Km 2m)	Scott Cables	KPS-1501-2000-KPS	4527	6	22-Dec-2020
Preamplifier (30dB 1GHz to 18GHz)	Schwarzbeck	BBV 9718 C	5261	12	07-Apr-2021
18GHz - 40GHz Pre-Amplifier	Phase One	PSO4-0087	1534	12	18-Feb-2021
Antenna with permanent attenuator (Bilog)	Chase	CBL6143	2904	24	30-Sep-2021
Broadband Horn Antenna (1-10 GHz)	Schwarzbeck	BBHA 9120 B	5611	12	22-Sep-2021
DRG Horn Antenna (7.5-18 GHz)	Schwarzbeck	HWRD750	5610	12	22-Sep-2021
Antenna 18-40GHz (Double Ridge Guide)	Link Microtek Ltd	AM180HA-K-TU2	230	24	27-Jul-2022

Table 14

TU - Traceability Unscheduled

2.2 Conducted Disturbance at Mains Terminals

2.2.1 Specification Reference

FCC 47 CFR Part 15B and ICES-003, Clause 15.107 and 6.1
AUTO/TP/200194 Issue 1 Clause 6.3

2.2.2 Equipment Under Test and Modification State

EVA V4 Industrial Robot, S/N: U1021 (0075950079-TSR0001) - Modification State 0

2.2.3 Date of Test

12-October-2020

2.2.4 Test Method

The EUT was setup according to ANSI C63.4, clause 5.2.

The EUT was placed on a non-conductive table 0.8 m above a reference ground plane. A vertical coupling plane was placed 0.4 m from the EUT boundary.

A Line Impedance Stabilisation Network (LISN) was directly bonded to the ground-plane. The EUT was located so that the distance between the boundary of the EUT and the closest surface of the LISN was 0.8 m.

Interconnecting cables that hanged closer than 0.4 m to the ground plane were folded back and forth in the centre forming a bundle 0.3 m to 0.4 m long.

Input and output cables were terminated with equipment or loads representative of real usage conditions.

The EUT was configured to give the highest level of emissions within reason of a typical installation as described by the manufacturer.

2.2.5 Example Calculation

Quasi-Peak level (dBµV) = Receiver level (dBµV) + Correction Factor (dB)
Margin (dB) = Quasi-Peak level (dBµV) - Limit (dBµV)

CISPR Average level (dBµV) = Receiver level (dBµV) + Correction Factor (dB)
Margin (dB) = CISPR Average level (dBµV) - Limit (dBµV)

2.2.6 Example Test Setup Diagram

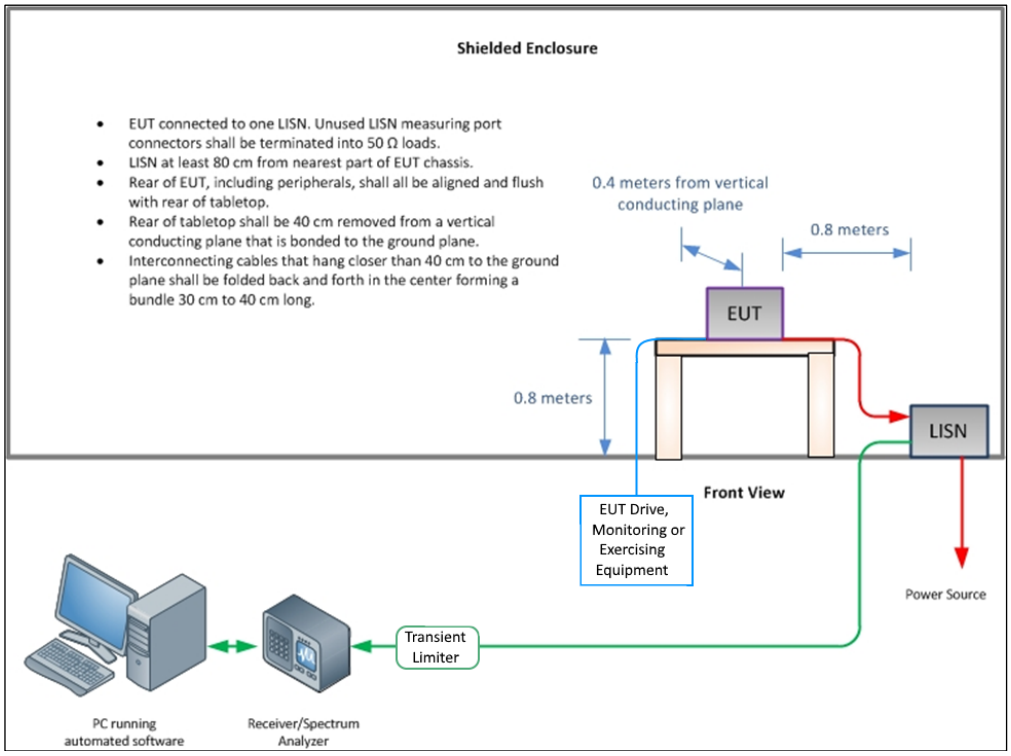

Figure 10 - Conducted Disturbance

2.2.7 Environmental Conditions

Ambient Temperature	19.1 °C
Relative Humidity	44.8 %

2.2.8 Specification Limits

Required Specification Limits - Class B			
Line Under Test	Frequency Range (MHz)	Quasi-Peak Test Limit (dBµV)	CISPR Average Test Limit (dBµV)
AC Power Port	0.15 to 0.5	66 to 56[(1)]	56 to 46[(1)]
	0.5 to 5	56	46
	5 to 30	60	50
Supplementary information: Note 1. Decreases with the logarithm of the frequency.			

Table 15

2.2.9 Test Results

Results for Configuration and Mode: AC Powered - 120 V - Highly dynamic toolpath.

This test was performed to the requirements of the Class B limits.

Performance assessment of the EUT made during this test: Pass

Detailed results are shown below.

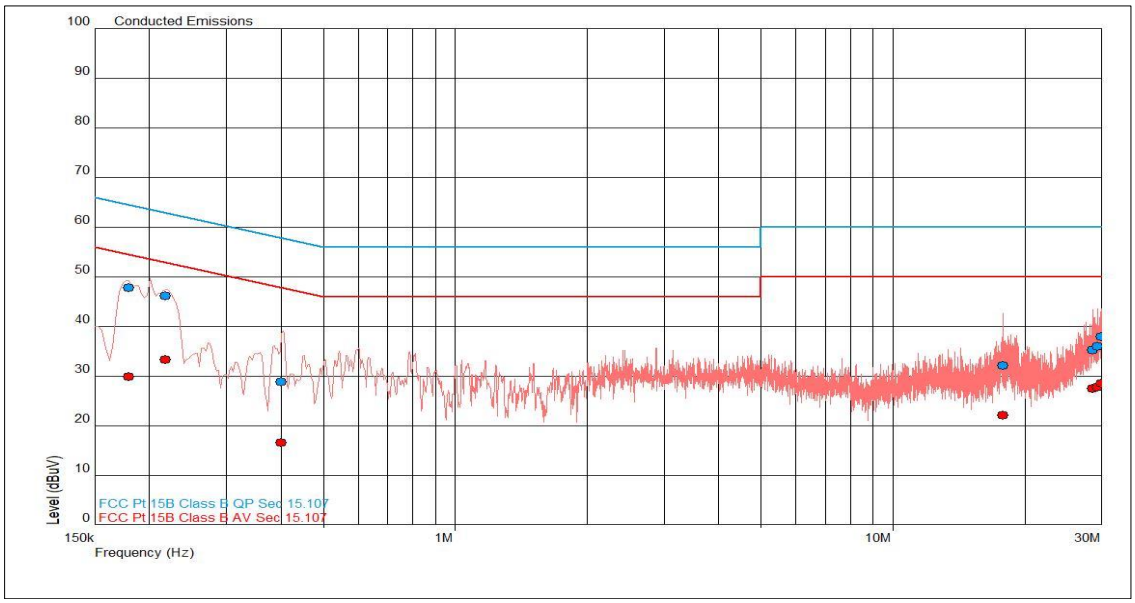

Figure 11 - Graphical Results - AC Power Port Live Line

Frequency (MHz)	Quasi-Peak Level (dBµV)	Quasi-Peak Limit (dBµV)	Quasi-Peak Margin (dB)	CISPR Average Level (dBµV)	CISPR Average Limit (dBµV)	CISPR Average Margin (dB)
0.180	47.8	64.5	-16.7	29.9	54.5	-24.6
0.218	46.1	62.9	-16.8	33.4	52.9	-19.5
0.401	28.8	57.8	-29.0	16.6	47.8	-31.3
17.854	32.1	60.0	-27.9	22.2	50.0	-27.8
28.564	35.3	60.0	-24.7	27.5	50.0	-22.5
29.302	36.0	60.0	-24.0	27.8	50.0	-22.2
29.955	38.1	60.0	-21.9	28.6	50.0	-21.4

Table 16

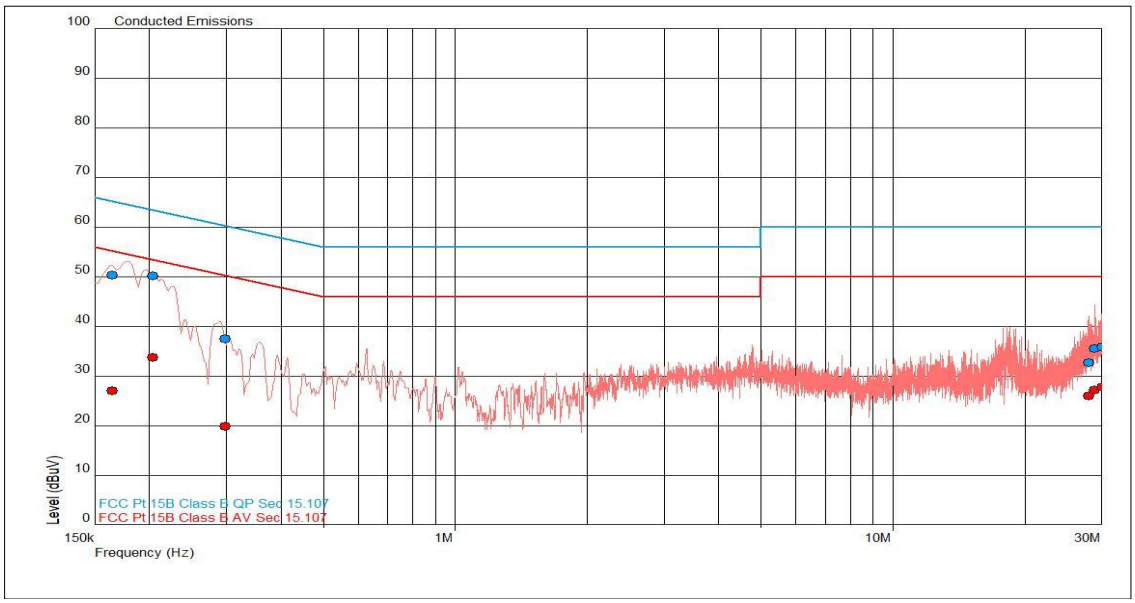

Figure 12 - Graphical Results - AC Power Port Neutral Line

Frequency (MHz)	Quasi-Peak Level (dBµV)	Quasi-Peak Limit (dBµV)	Quasi-Peak Margin (dB)	CISPR Average Level (dBµV)	CISPR Average Limit (dBµV)	CISPR Average Margin (dB)
0.165	50.4	65.2	-14.8	27.1	55.2	-28.1
0.204	50.2	63.4	-13.3	33.9	53.4	-19.6
0.298	37.6	60.3	-22.7	19.9	50.3	-30.4
28.034	32.7	60.0	-27.3	26.1	50.0	-23.9
28.949	35.6	60.0	-24.4	27.2	50.0	-22.8
30.001	35.8	0.0	35.8	27.8	0.0	27.8

Table 17

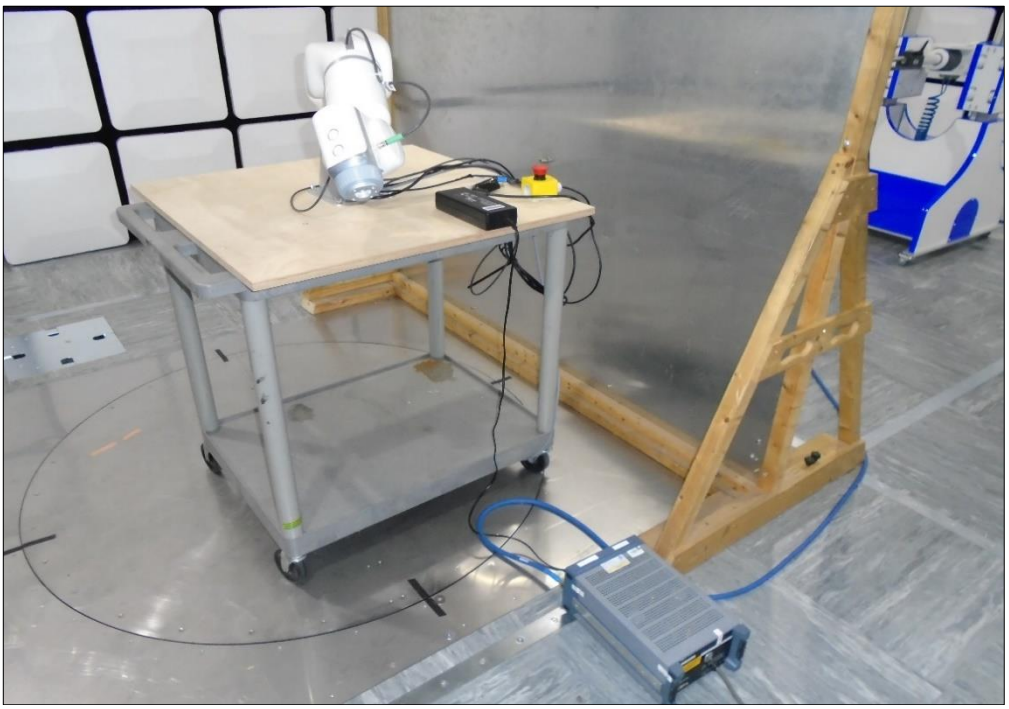

Figure 13 - Test Setup

2.2.10 Test Location and Test Equipment Used

This test was carried out in EMC Chamber 12.

Instrument	Manufacturer	Type No	TE No	Calibration Period (months)	Calibration Due
3m Semi Anechoic Chamber	MVG	EMC-3	5621	36	11-Aug-2023
Compliance 5 Emissions	Teseq	V5.26.51	3275	-	Software
EMI Test Receiver	Rohde & Schwarz	ESU40	3506	12	03-Jan-2021
Transient Limiter	Hewlett Packard	11947A	2377	12	26-Feb-2021
LISN	Rohde & Schwarz	ESH3-Z5	1390	12	27-Jan-2021
Cable (18 GHz)	Rosenberger	LU7-036-1000	5031	12	22-Jul-2021
8m N Type Cable	Junkosha	MWX221-08000NMSNMS/B	5519	12	24-Mar-2021

Table 18

3 Test Equipment Information

3.1 General Test Equipment Used

Instrument	Manufacturer	Type No	TE No	Calibration Period (months)	Calibration Due
Thermo-Hygro-Barometer	PCE Instruments	PCE-THB-40	5481	12	18-Mar-2021
True RMS Multimeter	Fluke	179	4007	12	31-Oct-2020
Thermo-Hygro-Barometer	PCE Instruments	PCE-THB-40	5473	12	16-Mar-2021

Table 19

4 Incident Reports

No incidents reports were raised.

5 Measurement Uncertainty

For a 95% confidence level, the measurement uncertainties for defined systems are:

Test Name	Measurement Uncertainty
Radiated Disturbance	30 MHz to 1 GHz, Bilog Antenna, ±5.2 dB 1 GHz to 40 GHz, Horn Antenna, ±6.3 dB
Conducted Disturbance at Mains Terminals	150 kHz to 30 MHz, LISN, ±3.7 dB

Table 20

Worst case error for both Time and Frequency measurement 12 parts in 10^6.

Measurement Uncertainty Decision Rule

Determination of conformity with the specification limits is based on the decision rule according to IEC Guide 115: 2007, clause 4.4.3 and 4.5.1.