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VERITAS

Test Report for ASSA ABLOY AB • Report No. EW0235-7 Issue 5



TEST REPORT



Applicant	ASSA ABLOY AB
Address	Formansvagen 11 Stockholm, SE-117 43 Sweden

FCC ID	Y88-MBM1CC2640
ISED IC	9504A-MBM1CC2640
Product	MBM1CC2640
FVIN	2.1
Model/HVIN	MBM1CC2640
Additional Models & Model Difference	N/A
Date of tests	Jul 19, 2022 to Aug 10, 2022

The tests have been carried out according to the requirements of the following standard:

- FCC Part 15 Subpart C 15.247
- RSS-247 Issue 2

CONCLUSION: The submitted sample was found to COMPLY with the test requirement

Tested by Ryan Brown Sr. EMC/Wireless Engineer	Approved by Yunus Faziloglu Wireless Manager
	
	Date: Apr-18-2023

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RELEASE CONTROL RECORD

ISSUE NO.	REASON FOR CHANGE	DATE ISSUED
1	Original release	Feb-13-2023
2	Corrected REMI Test Equipment List	Feb-16-2023
3	Added Plots For 18-25GHz	Feb-21-2023
4	Power setting added to Section 3.1 Modifications to Section 4.2.1 and 4.2.3: To add distance correction factors below 30MHz RSS-Gen E-field and H-field relation note Further clarifications to test procedures 18-25GHz data tables modified to show noise floor levels in Section 4.2.7	Apr-04-2023
5	Added FCC Part 15 Subpart B and ISED Canada ICES-003 compliance statements to Section 1	Apr-18-2023

1 SUMMARY OF TEST RESULTS

The EUT has been tested against the following requirements:

APPLIED STANDARD: FCC PART 15, SUBPART C (SECTION 15.247), RSS-247				
STANDARD SECTION		TEST TYPE AND LIMIT	APPLICABLE	RESULT
47CFR15	RSS			
15.207	Gen 8.8	AC Power Line Conducted Emissions	Y	PASS
15.205 15.209	247 3.3 247 5.5 Gen 8.9 Gen 8.10	Radiated Spurious Emissions	Y	PASS
15.247(d)	247 5.5	Conducted Spurious Emissions	N/A	N/A
15.247(a)(2)	247 5.2(a)	6dB Bandwidth	N/A	N/A
--	Gen 6.7	99% Occupied Bandwidth	N/A	N/A
15.247(b)(3)	247 5.4(d)	Conducted Output Power	N/A	N/A
15.247(e)	247 5.2(b)	Power Spectral Density	N/A	N/A
15.203	Gen 6.8	Antenna Requirement	N/A	N/A

Note 1: This report only includes test data for radiated spurious emissions and AC power line conducted emissions in a new host (HMN: DR100).

Note 2: DR100 (with the BLE module installed and active) complies with unintentional emissions requirements of FCC Part 15 Subpart B and ISED Canada ICES-003 Issue 7. Test report is on file with the applicant.



2 MEASUREMENT UNCERTAINTY

The listed uncertainties are the worst-case uncertainty for the entire range of measurement. Please note that the uncertainty values are provided for informational purposes only and are not used in determining the PASS/FAIL results. Values for measurement uncertainty are calculated per ETSI TR 100 028 (2001).

Measurement	Expanded Uncertainty k=2	Maximum allowable uncertainty
Radio frequency (@ 2.4GHz)	3.23 x 10 ⁻⁸	1 x 10 ⁻⁷
RF power, conducted	0.40dB	0.75dB
Maximum frequency deviation: Within 300Hz and 6kHz of audio frequency / Within 6kHz and 25kHz of audio frequency	3.4% 0.3dB	5% 3dB
Adjacent channel power	1.9dB	3dB
Conducted spurious emission of transmitter, valid up to 12.75GHz	2.39dB	3dB
Conducted emission of receivers	1.3dB	3dB
Radiated emission of transmitter, valid up to 26.5GHz	3.9dB	6dB
Radiated emission of transmitter, valid up to 80GHz	3.3dB	6dB
Radiated emission of receiver, valid up to 26.5GHz	3.9dB	6dB
Radiated emission of receiver, valid up to 80GHz	3.3dB	6dB
Humidity	2.37%	5%
Temperature	0.7°C	1.0°C
Time	4.1%	10%
RF Power Density, Conducted	0.4dB	3dB
DC and low frequency voltages	1.3%	3%
Voltage (AC, <10kHz)	1.3%	2%
Voltage (DC)	0.62%	1%

The above reflects a 95% confidence level

This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k = 2.



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3 GENERAL INFORMATION

3.1 GENERAL DESCRIPTION OF EUT

PRODUCT	MBM1CC2640
MODEL NO.	MBM1CC2640
ADDITIONAL MODEL	N/A
FCC ID	Y88-MBM1CC2640
ISED IC	9504A-MBM1CC2640
NOMINAL VOLTAGE	24VDC (Host operating voltage)
RADIO TECHNOLOGY	Bluetooth Low Energy
MODULATION TYPES	GFSK
DATA RATES	1Mbps
POWER SETTING	Default (12) for all channels
OPERATING FREQUENCY	2402-2480MHz

This report only includes test data for radiated spurious emissions and AC power line conducted emissions in a new host (HMN: DR100).



3.2 DESCRIPTION OF TEST MODES

40 channels are provided for BLE (GFSK):

CHANNEL	FREQ. (MHZ)	CHANNEL	FREQ. (MHZ)	CHANNEL	FREQ. (MHZ)	CHANNEL	FREQ. (MHZ)
0	2402	10	2422	20	2442	30	2462
1	2404	11	2424	21	2444	31	2464
2	2406	12	2426	22	2446	32	2466
3	2408	13	2428	23	2448	33	2468
4	2410	14	2430	24	2450	34	2470
5	2412	15	2432	25	2452	35	2472
6	2414	16	2434	26	2454	36	2474
7	2416	17	2436	27	2456	37	2476
8	2418	18	2438	28	2458	38	2478
9	2420	19	2440	29	2460	39	2480

3.2.1. CONFIGURATION OF SYSTEM UNDER TEST

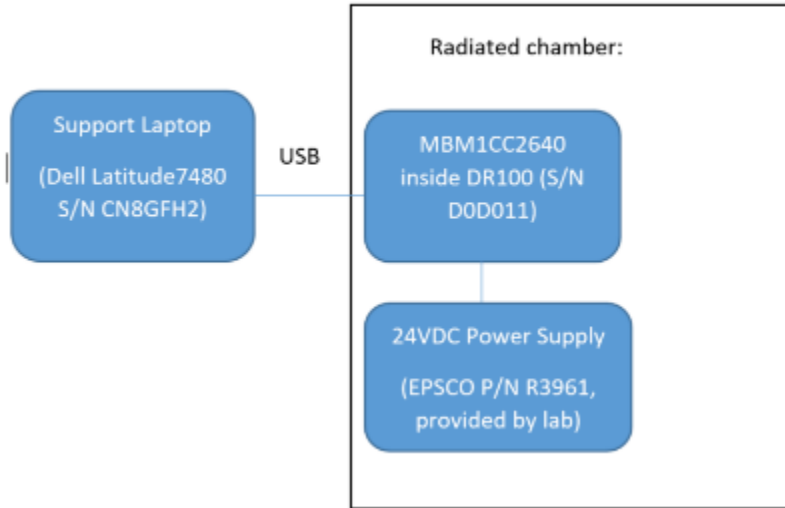
The MBM1CC2640 BLE module was inside the Aperio V3 Wireless Door Relay (Model: DR100) during testing. A support laptop was used to configure the channel frequency.

TEST MODE	DESCRIPTION
A	Continuous transmission with modulation

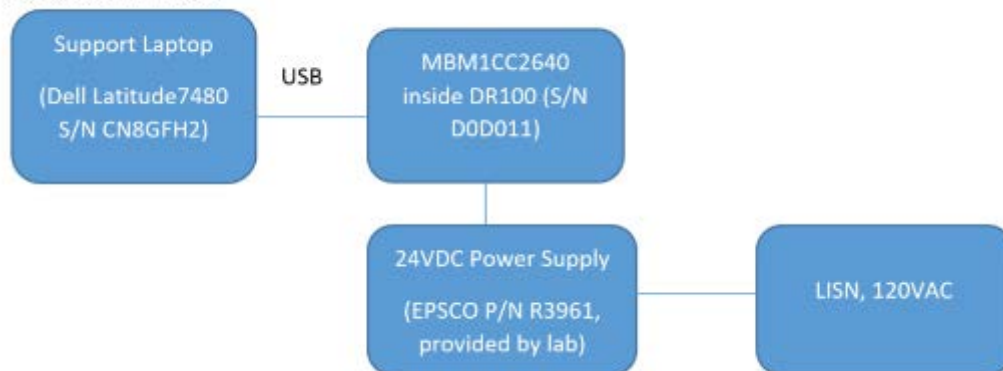


TEST SETUP BLOCK DIAGRAMS:

Radiated setup



Conducted Emissions





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3.2.2. TEST MODE APPLICABILITY AND TESTED CHANNEL DETAIL

Following channels/modes were selected for the applicable tests below.

TEST	TEST MODE	AVAILABLE CHANNELS	TESTED CHANNEL	MODULATION TYPE	DATA RATE (Mbps)	Notes
RSE<1G	A	0 to 39	0, 19, 39	GFSK	1	1, 2
RSE≥1G	A	0 to 39	0, 19, 39	GFSK	1	2
RBE	A	0 to 39	0, 39	GFSK	1	2
PLCE	A	0 to 39	19	GFSK	1	--

Note 1: Testing below 30MHz was limited to 2 channels only since no emissions were detected in this range.

Note 2: Host was in normal installation (upright) position during testing.

RSE<1G: Radiated Spurious Emissions Below 1GHz

RSE≥1G: Radiated Spurious Emissions Above 1GHz

RBE: Radiated Band-edge

PLCE: Power Line Conducted Emissions



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3.3 GENERAL DESCRIPTION OF APPLIED STANDARDS

According to the specifications of the manufacturer, EUT must comply with the requirements of the following standards:

FCC Part 15 Subpart C 15.247

RSS-247 Issue 2

558074 D01 15.247 Meas Guidance v05r02

ANSI C63.10-2013

Note: All tests were performed and recorded per the above standards.

3.4 DESCRIPTION OF SUPPORT UNITS

Support Equipment	Model #	Serial #
Laptop	Dell Latitude 7480	CN8GFH
DC Power Supply	EPSCO R3961	N/A
DC Power Supply	Eventek KPS3010D	N/A



4 TEST TYPES AND RESULTS

4.1 CONDUCTED EMISSIONS MEASUREMENT

4.1.1 LIMITS OF CONDUCTED EMISSIONS MEASUREMENT

FREQUENCY OF EMISSION (MHz)	CONDUCTED LIMIT (dBµV)	
	Quasi-peak	Average
0.15 ~ 0.5	66 to 56	56 to 46
0.5 ~ 5	56	46
5 ~ 30	60	50

NOTE: 1.The lower limit shall apply at the transition frequencies.
 2. The limit decreases in line with the logarithm of the frequency in the range of 0.15 to 0.50MHz.

4.1.2 TEST INSTRUMENTS

Rev. 8/26/2022

Spectrum Analyzers / Receivers /Preselectors	Range	MN	Mfr	SN	Asset	Cat	Calibration Due	Calibrated on		
Rental EXA Signal Analyzer(1118472)	9KHz-26.5GHz	N9010A-526;K	AT	MY51170010	1118472	I	10/27/2022	10/27/2021		
Rental EXA Signal Analyzer(1118473)	9KHz-26.5GHz	N9010A-526;N	AT	MY51170076	1118473	I	8/5/2022	8/5/2021		
LISNs/Measurement Probes	Range	MN	Mfr	SN	Asset	Cat	Calibration Due	Calibrated on		
LISN Asset 2092	9KHz-30MHz	NNLK 8121	Schwarzbeck	NNLK 8121-662	2092	I	10/25/2022	10/25/2021		
Conducted Test Sites (Mains / Telco)	FCC Code	VCCI Code	Cat	Calibration Due	Calibrated on					
CEMI 1	719150	A-0015	III	NA	N/A					
CEMI 5	719150	A-0015	III	NA	N/A					
Meteorological Meters/Chambers	MN	Mfr	SN	Asset	Cat	Calibration Due	Calibrated on			
Weather Clock (Pressure Only)	BA928	Oregon Scientific	C3166-1	831	I	11/23/2022	11/23/2020			
Asset #2657	1235C97	Control Company	200435369	2657	I	8/18/2025	8/18/2022			
Asset #2657	1235C97	Control Company	200435369	2657	I	8/23/2022	7/23/2020			
Cables	Range	Mfr	Cat	Calibration Due	Calibrated on					
CEMI-02	9kHz - 2GHz	C-S	II	2/17/2023	2/17/2022					
CEMI-15	9kHz - 2GHz	C-S	II	2/17/2023	2/17/2022					
Attenuators	Range	MN	Mfr	SN	Asset	Cat	Calibration Due	Calibrated on		
20dB ATT(A#2506)	9kHz-2GHz	PE7014-20	Pasternack	2016	2506	II	8/3/2023	8/3/2022		
20dB ATT(A#2506)	9kHz-2GHz	PE7014-20	Pasternack	2016	2506	II	8/4/2022	8/4/2021		

All equipment is calibrated using standards traceable to NIST or other nationally recognized calibration standard.



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4.1.3 TEST PROCEDURES

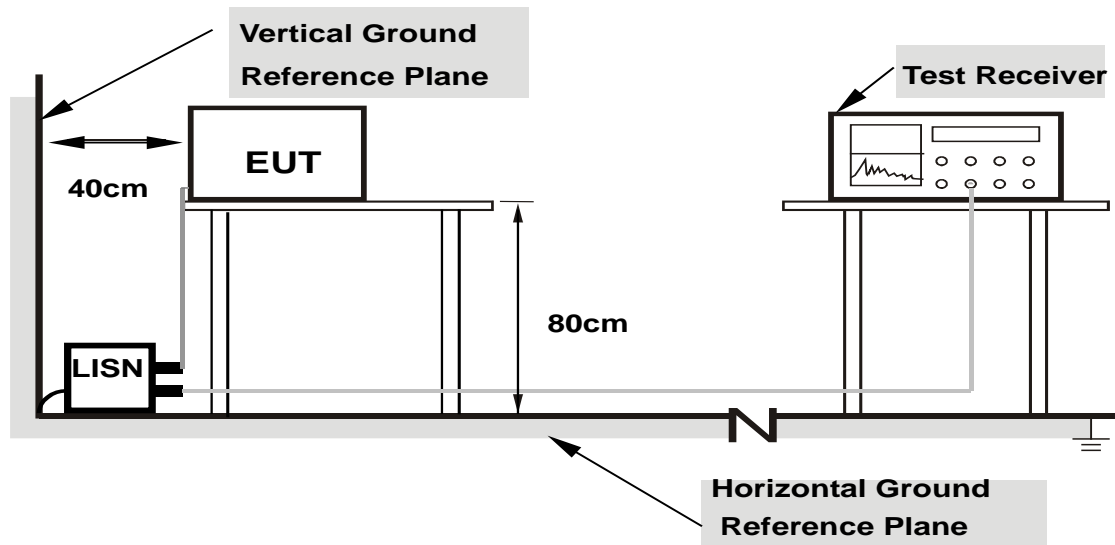
- a. The EUT was placed 0.4 meters from the conducting wall of the shielded room with EUT being connected to the power mains through a line impedance stabilization network (LISN). Other support units were connected to the power mains through another LISN. The two LISNs provide 50 ohm/ 50uH of coupling impedance for the measuring instrument.
- b. Both lines of the power mains connected to the EUT were checked for maximum conducted interference.
- c. The frequency range from 150kHz to 30MHz was searched. Emission levels under (Limit - 20dB) was not recorded. RBW of 9kHz and VBW of 30kHz were used during measurement.

NOTE: All modes of operation were investigated and the worst-case emissions are reported.

4.1.4 DEVIATION FROM TEST STANDARD

No deviation.

4.1.5 TEST SETUP



- Note:**
- 1.Support units were connected to second LISN.
 - 2.Both of LISNs (AMN) are 80 cm from EUT and at least 80 from other units and other metal planes

For the actual test configuration, please refer to Test Setup Photos exhibit.

4.1.6 EUT OPERATING CONDITIONS

- a. Turned on the power and connected all equipment.
- b. EUT was operated according to manufacturer's specifications.



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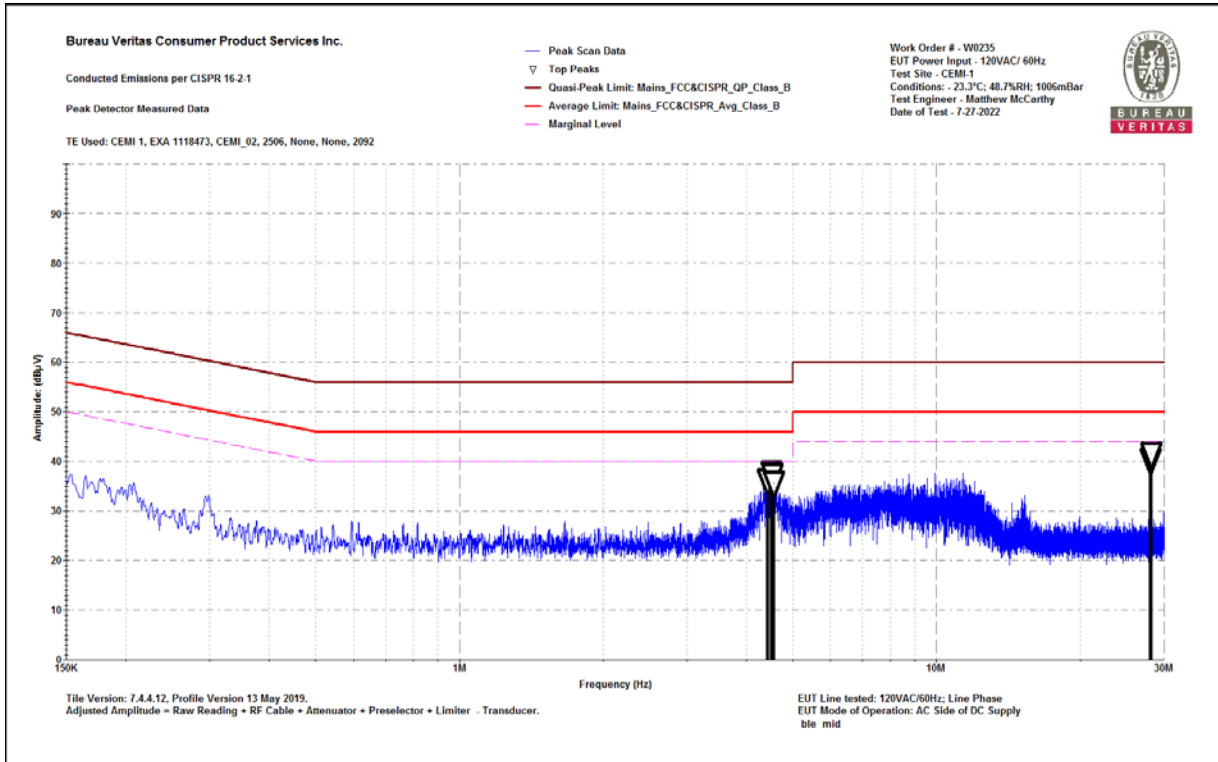
4.1.7 TEST RESULTS

Bureau Veritas Consumer Product Services Inc.
 Conducted Emissions per CISPR 16-2-1
 Peak Detector Data
 Notes:
 EUT Line tested: 120VAC/60Hz; Line Phase
 EUT Mode of Operation: AC Side of DC Supply
 ble mid

Work Order # - W0235
 EUT Power Input - 120VAC/ 60Hz
 Test Site - CEMI-1
 Conditions: - 23.3°C; 48.7%RH; 1006mBar
 Test Engineer - Matthew McCarthy
 Date of Test - 7-27-2022

Frequency (MHz)	Raw Pk Reading (dBµV)	Correction Factor (dB)	Adjusted Pk Amplitude (dBµV)	QP Lim: Mains_FCC&CISPR_QP_Class_B (dBµV)	Margin to the QP Limit (dB)	Pk to QP Limit Results (Pass/Fail)	Worst Margin (QP Limit) (dB)	Av Lim: Mains_FCC&CISPR_Avg_Class_B (dBµV)	Margin to Avg Limit (dB)	Pk to Avg Limit Results (Pass/Fail)	Worst Margin (Avg Limit) (dB)
4.434	15.6	20.4	36.1	56	-19.9	PASS		46	-9.9	PASS	
4.505	17.2	20.4	37.7	56	-18.3	PASS	-18.3	46	-8.3	PASS	-8.3
4.533	16.8	20.4	37.2	56	-18.8	PASS		46	-8.8	PASS	
4.56	15.2	20.4	35.7	56	-20.3	PASS		46	-10.3	PASS	
28.041	19.5	20.7	40.2	60	-19.8	PASS		50	-9.8	PASS	
28.134	20.7	20.7	41.5	60	-18.5	PASS		50	-8.5	PASS	

Line PK



Line PK

Bureau Veritas Consumer Product Services Inc.

One Distribution Center Circle, #1 Littleton, MA

Tel.: (978) 486-8880 Fax: (978) 486-8828



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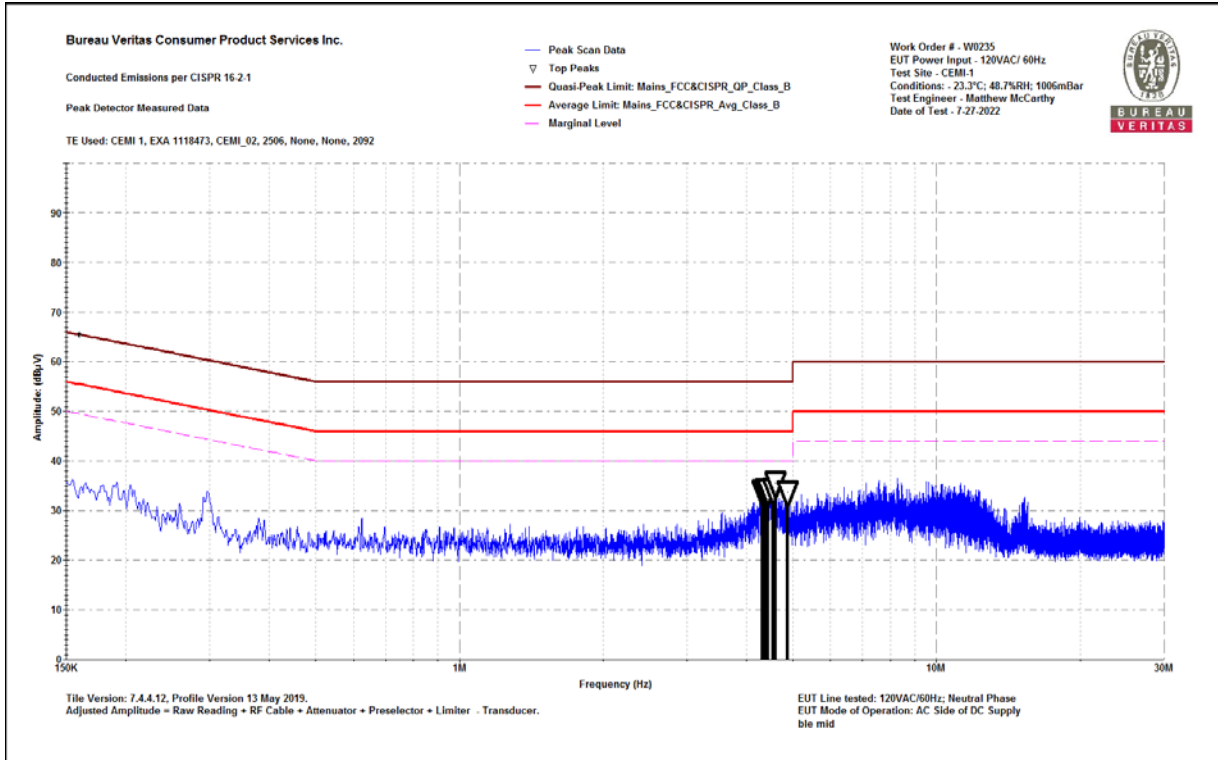


Bureau Veritas Consumer Product Services Inc.
 Conducted Emissions per CISPR 16-2-1
 Peak Detector Data
 Notes:
 EUT Line tested: 120VAC/60Hz; Neutral Phase
 EUT Mode of Operation: AC Side of DC Supply
 ble mid

Work Order # - W0235
 EUT Power Input - 120VAC/ 60Hz
 Test Site - CEM1-1
 Conditions: - 23.3°C; 48.7%RH; 1006mBar
 Test Engineer - Matthew McCarthy
 Date of Test - 7-27-2022

Frequency (MHz)	Raw Pk Reading (dBµV)	Correction Factor (dB)	Adjusted Pk Amplitude (dBµV)	QP Lim: Mains_FCC&CISPR_QP_Class_B (dBµV)	Margin to the QP Limit (dB)	Pk to QP Limit Results (Pass/Fail)	Worst Margin (QP Limit) (dB)	Av Lim: Mains_FCC&CISPR_R_Avg_Class_B (dBµV)	Margin to Avg Limit (dB)	Pk to Avg Limit Results (Pass/Fail)	Worst Margin (Avg Limit) (dB)
4.311	13.4	20.4	33.8	56	-22.2	PASS		46	-12.2	PASS	
4.379	13.6	20.4	34	56	-22	PASS		46	-12	PASS	
4.425	13.5	20.4	33.9	56	-22.1	PASS		46	-12.1	PASS	
4.547	13.7	20.4	34.1	56	-21.9	PASS		46	-11.9	PASS	
4.599	15	20.4	35.5	56	-20.5	PASS	-20.5	46	-10.5	PASS	-10.5
4.877	13.3	20.4	33.7	56	-22.3	PASS		46	-12.3	PASS	

Neutral PK



Neutral PK

Bureau Veritas Consumer Product Services Inc.

One Distribution Center Circle, #1 Littleton, MA

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4.2 RADIATED EMISSIONS MEASUREMENT

4.2.1 LIMITS OF RADIATED EMISSIONS MEASUREMENT

Radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emissions limits specified in Section 15.209(a).

FREQUENCIES (MHz)	FIELD STRENGTH (microvolts/meter)	MEASUREMENT DISTANCE (meters)
0.009 ~ 0.490	2400/F(kHz)	300
0.490 ~ 1.705	24000/F(kHz)	30
1.705 ~ 30.0	30	30
30 ~ 88	100	3
88 ~ 216	150	3
216 ~ 960	200	3
Above 960	500	3

NOTE:

- The lower limit shall apply at the transition frequencies.
- $dB\mu V/m = 20 \cdot \log(\mu V/m)$.
- As specified in 15.35(b), for frequencies above 1000MHz, field strength limits are based on the use of measurement instrumentation employing an average detector function. However, there is also a limit on the peak level of the emissions that is 20 dB above the maximum permitted average emission limit.
- Limit conversion below 30MHz is done by using the square of an inverse linear distance extrapolation factor (40 dB/decade) as allowed in FCC 15.31(f)(2).
 $Limit(3m) = Limit(30m) + 40 \cdot \log(30/3) = Limit(30m) + 40$
 $Limit(3m) = Limit(300m) + 40 \cdot \log(300/3) = Limit(300m) + 80$
- RSS-GEN Table 6 H-field limits are 51.5dB lower than FCC 15.209(a) E-field limits. Measurements are performed in terms of magnetic field and converted to electric field using the free space impedance of 377Ω ($E\text{-field} = H\text{-field} + 51.5$). Therefore resulting pass/fail margin would be the same if an E-field reading is compared to an E-field limit or an H-field reading is compared to an H-field limit.



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4.2.2 TEST INSTRUMENTS

Rev. 8/17/2022

Spectrum Analyzers / Receivers /Preselectors		Range	MN	Mfr	SN	Asset	Cat	Calibration Due	Calibrated on
Gold		100Hz-26.5 GHz	E4407B	Agilent	MY45113816	1284	I	1/27/2023	1/27/2022
2093 MXE EMI Receiver		20Hz-26.5GHz	N9038A	Agilent	MY51210181	2093	I	3/7/2023	3/7/2022
Radiated Emissions Sites		FCC Code	IC Code	VCCI Code	Range	Asset	Cat	Calibration Due	Calibrated on
EMI Chamber 2		719150	2762A-7	A-0015	30-1000MHz	1686	I	12/5/2022	12/5/2020
EMI Chamber 2		719150	2762A-7	A-0015	1-18GHz	1686	I	12/8/2022	12/8/2020
Preamps /Couplers Attenuators / Filters		Range	MN	Mfr	SN	Asset	Cat	Calibration Due	Calibrated on
8449B HF Preamp		1-18GHz	8449B	Agilent	1149055		II	11/10/2022	11/10/2021
8447F Rental PA		9KHz-1.3GHz	84477F	HP	3113A05395		II	10/18/2022	10/18/2021
2116 BRF		0.009-18000MHz	BRM50702	Micro-Tronics	G226	2116	II	11/10/2022	11/10/2021
Antennas		Range	MN	Mfr	SN	Asset	Cat	Calibration Due	Calibrated on
Red-Brown Bilog		30-2000MHz	JB1	Sunol	A0032406	1218	I	4/28/2023	4/28/2021
Blue Horn		1-18Ghz	3117	ETS	157647	1861	I	4/26/2023	4/26/2021
Small Loop		10kHz-30MHz	PLA-130/A	ARA	1024	755	I	8/25/2022	8/25/2020
Large Loop		20Hz-5MHz	6511	EMCO	9704-1154	67	I	8/21/2022	8/21/2020
HF (White) Horn		18-26.5GHz	801-WLM	Waveline	758	758	III	Verify before Use	date of test
Meteorological Meters/Chambers			MN	Mfr	SN	Asset	Cat	Calibration Due	Calibrated on
Weather Clock (Pressure Only)			BA928	Oregon Scientific	C3166-1	831	I	11/23/2022	11/23/2020
Asset #2656			1235C97	Control Company	200435359	2656	I	8/23/2022	7/23/2020
Cables		Range		Mfr			Cat	Calibration Due	Calibrated on
Asset #2474		9KHz-18GHz		MegaPhase			II	11/9/2022	11/9/2021
Asset #2610		9KHz-18GHz		Pasternack			II	3/16/2023	3/16/2022
Asset #2583		9KHz-18GHz		Pasternack			II	2/17/2023	2/17/2022
Asset #2323		1-26.5GHz	TM26-S1S1-120	MEGAPHASE	17139101 002		II	9/10/2022	9/10/2021

All equipment is calibrated using standards traceable to NIST or other nationally recognized calibration standard.



4.2.3 TEST PROCEDURES

- a. The EUT was placed on the top of a rotating table 1.5 meters (above 1GHz) and 0.8 meters (below 1GHz) above the ground at a 3 meters semi-anechoic chamber.
- b. For below 30MHz, a loop antenna with its lowest point 1m above the ground was placed 3m away from the EUT and it was rotated 0 and 90 degrees around its vertical axis.
- c. In 30MHz-1GHz range, a biconilog antenna was mounted on a variable-height antenna tower and placed 3m away from the EUT. Antenna height was varied from 1 meter to 4 meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna were investigated. The table was rotated 360 degrees to determine the position of the highest radiation.
- d. In 1GHz-6GHz range, a horn antenna was mounted on a variable-height antenna tower and placed 3m away from the EUT. Antenna height was varied from 1 meter to 4 meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna were investigated. The table was rotated 360 degrees to determine the position of the highest radiation. Using the same antenna, the measurement distance was reduced to 1m in 6-18GHz range.
- e. In 18-25GHz a smaller horn antenna was used to make measurements at 0.1m away from the EUT.
- f. The following bandwidths were used during radiated spurious emissions:

Freq. (MHz)	RBW	VBW	Pre-scan	Final
0.009-0.15	200Hz	1kHz	Peak	Quasi Peak
0.15-30	9kHz	30kHz	Peak	Quasi Peak
30-1000	120kHz	300kHz	Peak	Quasi Peak
>1000	1MHz	3MHz	Peak	Peak Max Hold and RMS Power Avg Trace Max Hold (Note 1)

BLE radio test mode duty-cycle was approximately 67%.

If peak measurements were below the applicable limit, QPk and RMS measurements were not performed.

Note 1: Per KDB 558074 D01 v05r02 Section 11 QA#3(b); in accordance with ANSI C63.10-2013 Section 11.12.2.5.2 with trace mode set to Max Hold without the need for further correction factor adjustments described in 11.12.2.5.2 i).

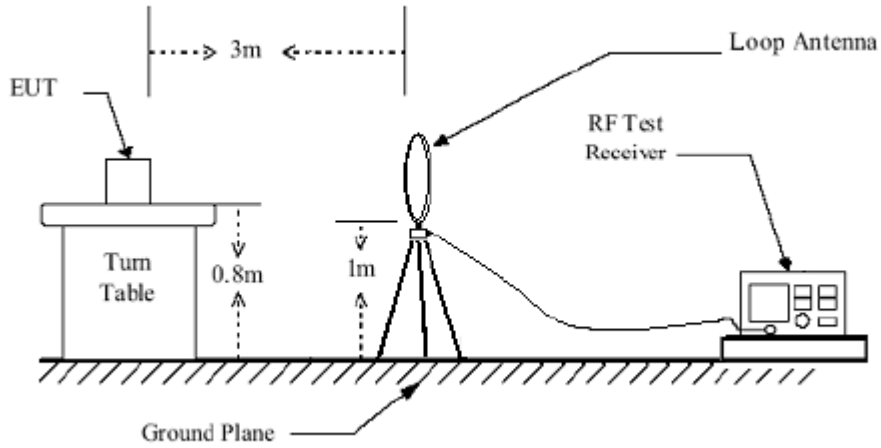


4.2.4 DEVIATION FROM TEST STANDARD

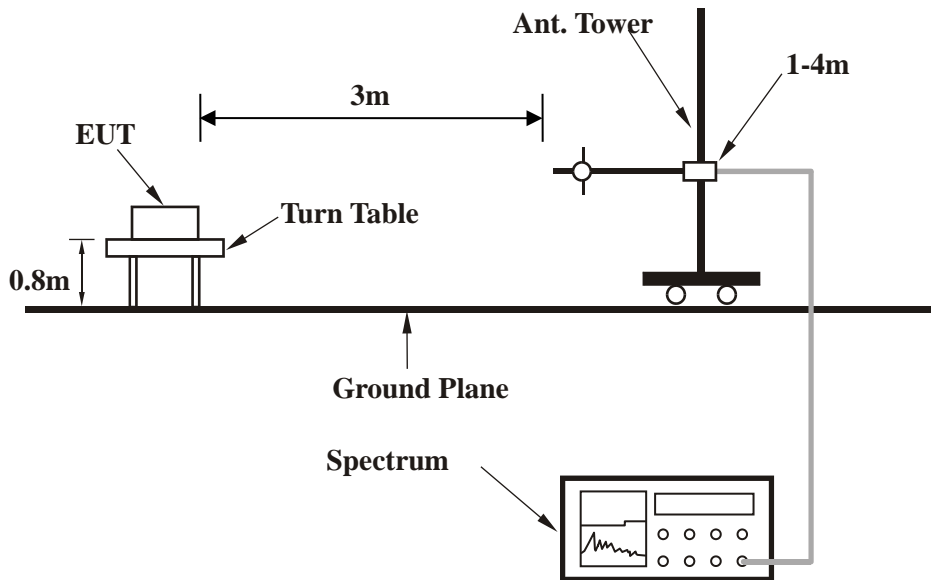
No deviation.

4.2.5 TEST SETUP

Below 30MHz test setup

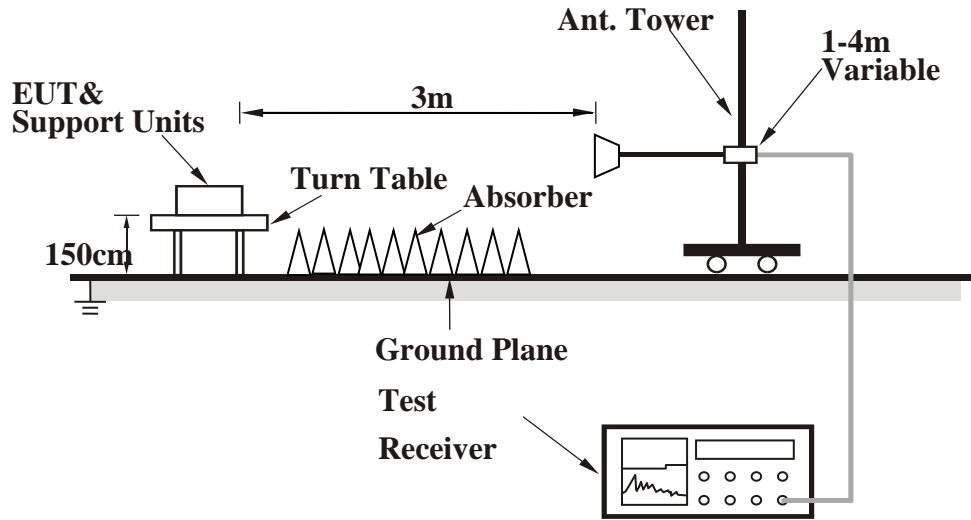


Below 1GHz test setup





Above 1GHz test setup



Note: For the actual test configuration, please refer to the Test Setup Photos exhibit.

4.2.6 EUT OPERATING CONDITIONS

EUT was operated according to the manufacturer's specifications.



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Test Report for ASSA ABLOY AB • Report No. EW0235-7 Issue 5

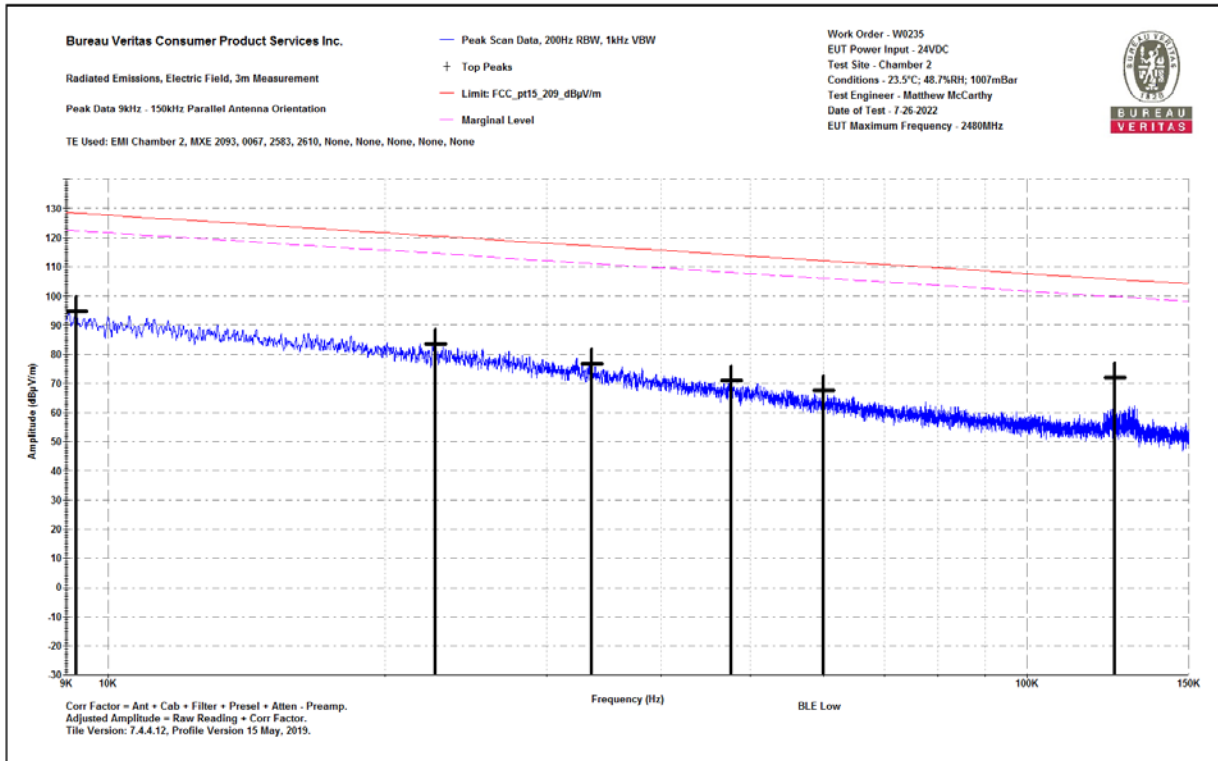


4.2.7 TEST RESULTS

Emissions below 1GHz

Results for BLE 1Mbps GFSK Channel 0

No emissions within 10dB of the limit were identified in 9kHz-30MHz range. Only plots shown below.

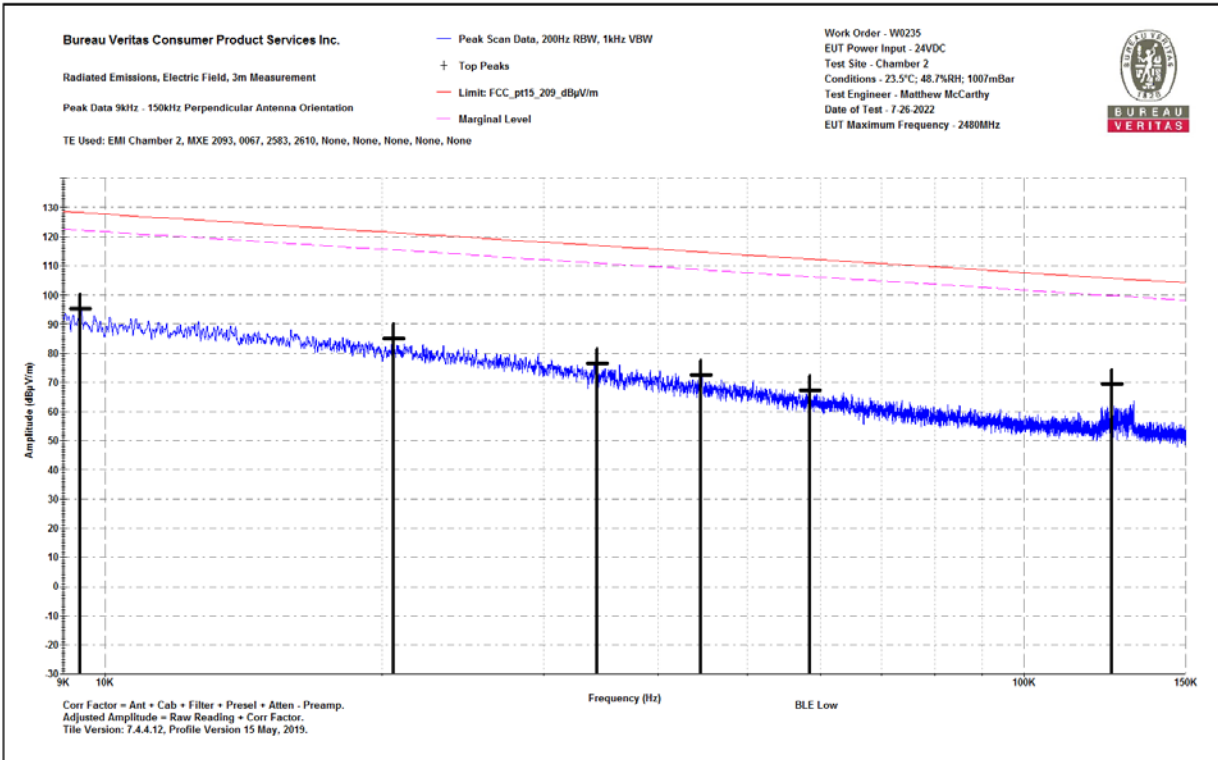


0.009-0.15MHz Parallel

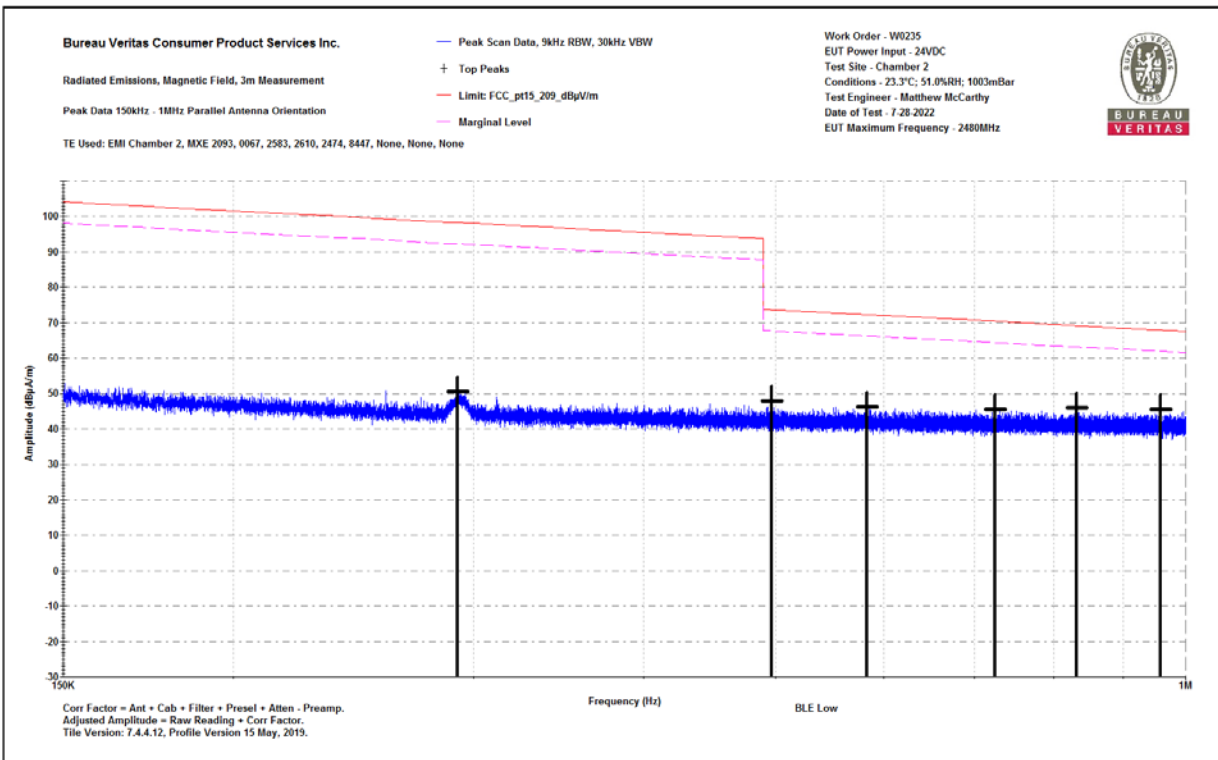


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Test Report for ASSA ABLOY AB • Report No. EW0235-7 Issue 5



0.009-0.15MHz Perpendicular



0.15-1MHz Parallel

Bureau Veritas Consumer Product Services Inc.

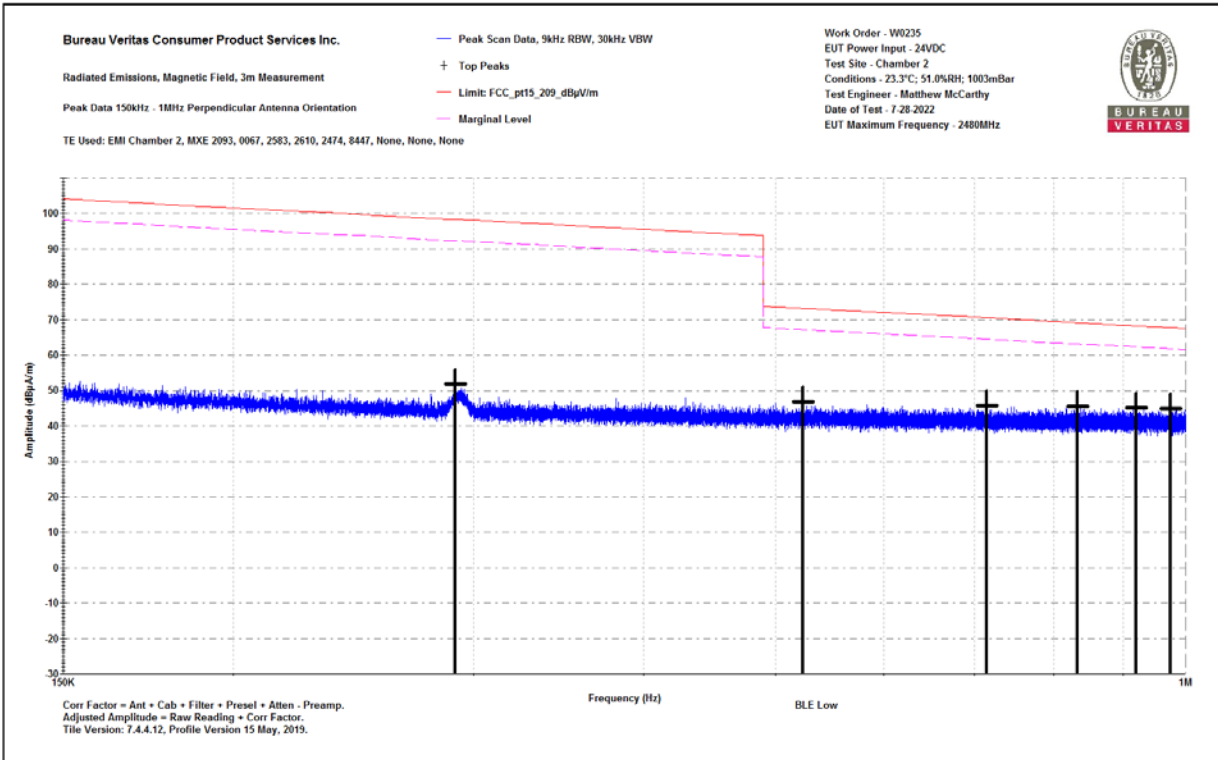
One Distribution Center Circle, #1 Littleton, MA

Tel.: (978) 486-8880 Fax: (978) 486-8828

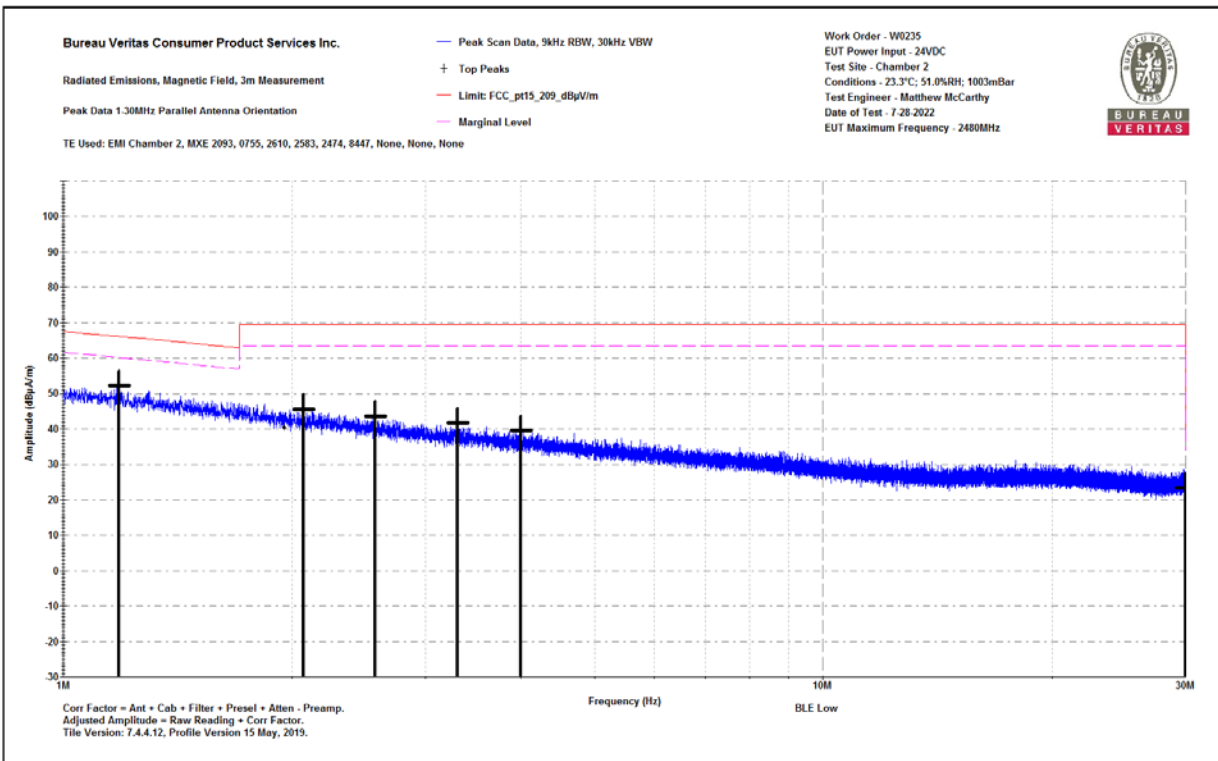


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Test Report for ASSA ABLOY AB • Report No. EW0235-7 Issue 5



0.15-1MHz Perpendicular



1-30MHz Parallel

Bureau Veritas Consumer Product Services Inc.

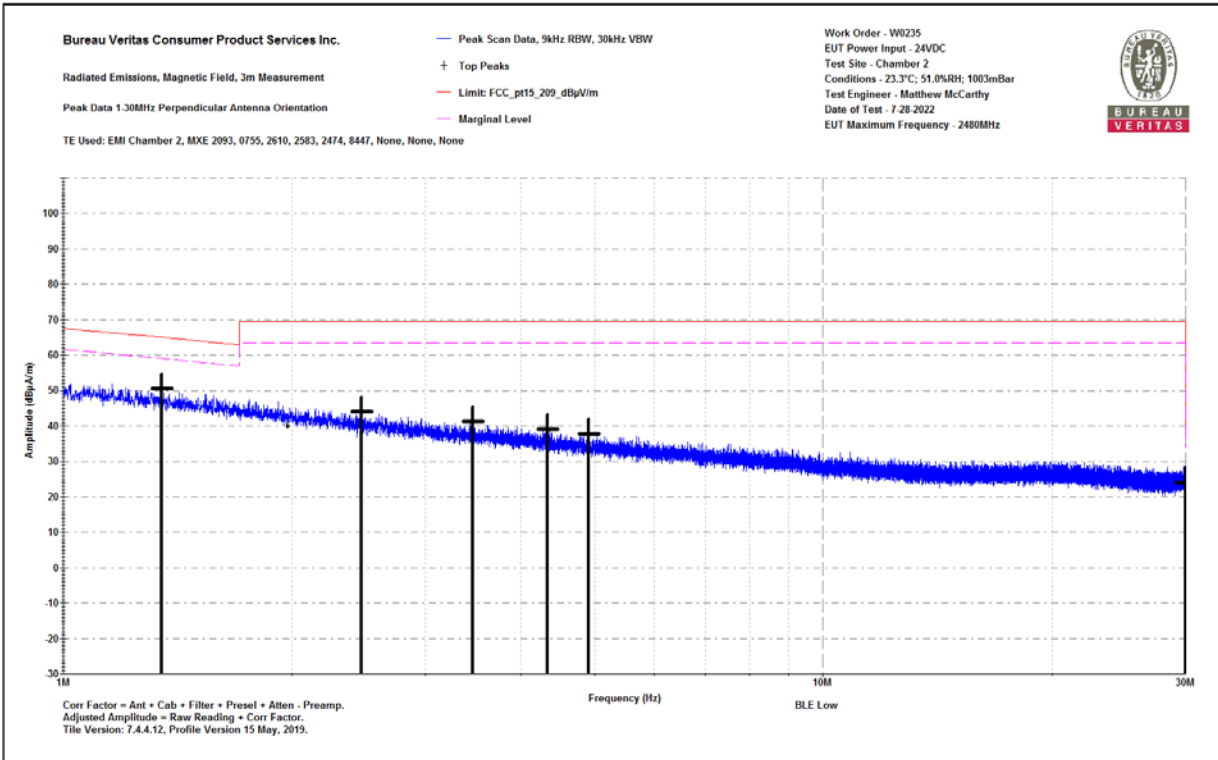
One Distribution Center Circle, #1
Littleton, MA

Tel.: (978) 486-8880
Fax: (978) 486-8828



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1-30MHz Perpendicular



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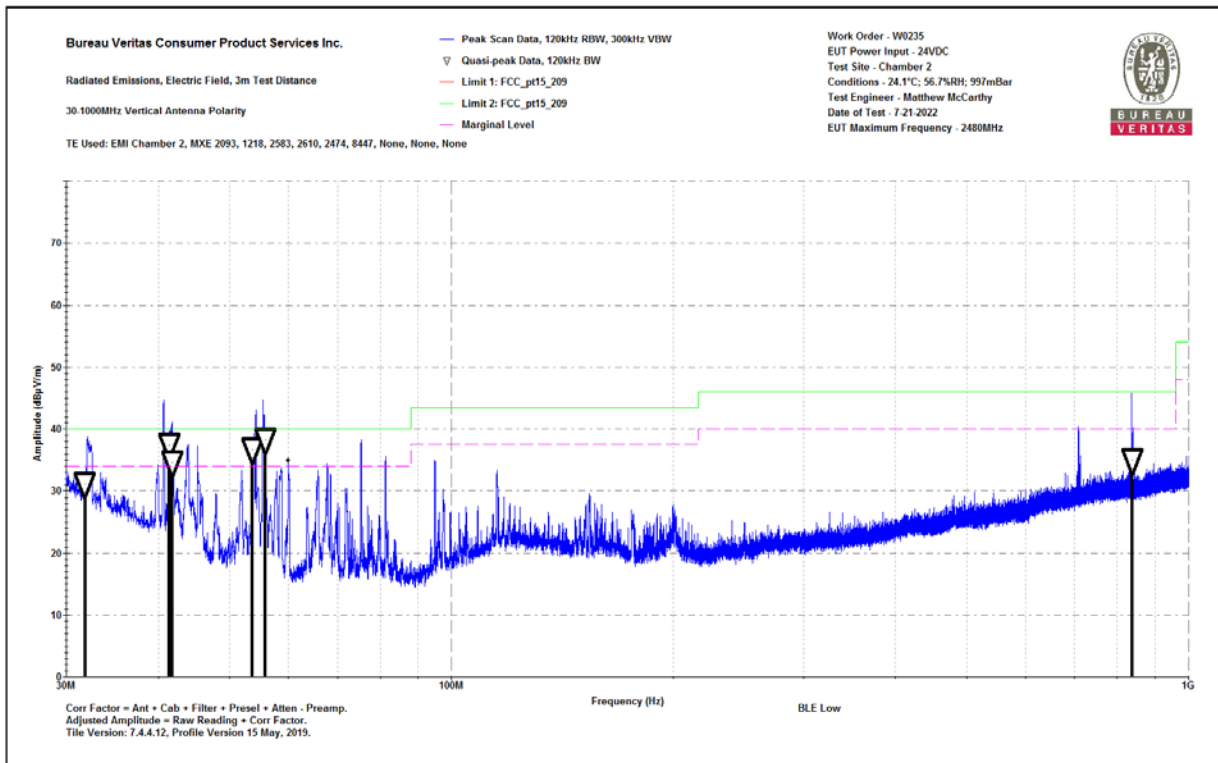
Bureau Veritas Consumer Product Services Inc.
Radiated Emissions Electric Field 3m Distance
30-1000MHz Vertical Data

Work Order - W0235
EUT Power Input - 24VDC
Test Site - Chamber 2
Conditions - 24.1°C; 56.7%RH; 997mBar
Test Engineer - Matthew McCarthy
Date of Test - 7-21-2022

Notes:
BLE Low
0

Frequency (MHz)	Raw QP Reading (dBµV)	Correction Factor (dB/m)	Adjusted QP Amplitude (dBµV/m)	Lim1: FCC_pt15_209 (dBµV/m)	Margin to Lim1 (dB)	Test Results Lim1 (Pass/Fail)	Worst Margin Lim1 (dB)	Antenna Height (cm)	EUT Azimuth (degrees)
31.806	30.6	0.6	31.2	40	-8.8	PASS		116	20
41.406	44.1	-6.7	37.4	40	-2.6	PASS		125	200
41.775	41.5	-6.9	34.6	40	-5.4	PASS		203	12
53.717	48.8	-12.1	36.7	40	-3.3	PASS		125	201
55.93	50.5	-12.2	38.3	40	-1.7	PASS	-1.7	175	107
837.771	31.1	3.8	34.9	46	-11.1	PASS		125	72

30-1000MHz Vertical



30-1000MHz Vertical



BUREAU VERITAS

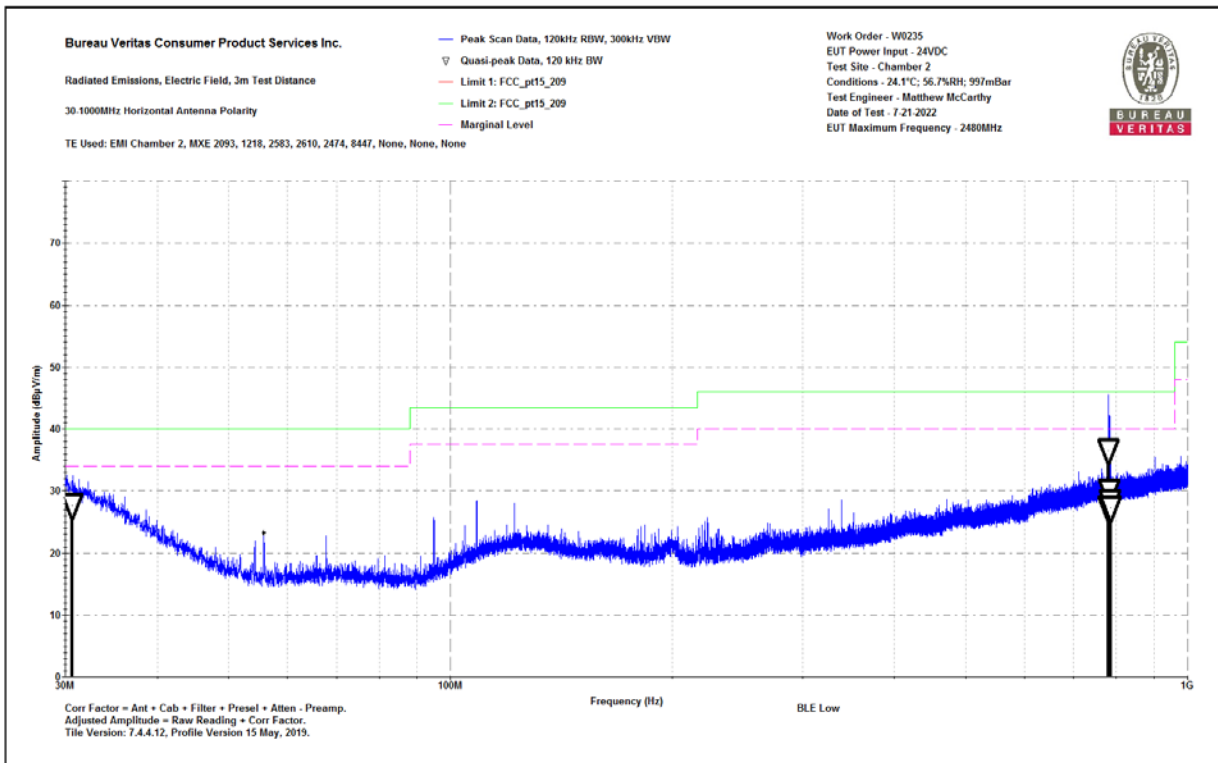
Test Report for ASSA ABLOY AB • Report No. EW0235-7 Issue 5



Bureau Veritas Consumer Product Services Inc. Radiated Emissions Electric Field 3m Distance 30-1000MHz Horizontal Data Notes: BLE Low 0	Work Order - W0235 EUT Power Input - 24VDC Test Site - Chamber 2 Conditions - 24.1°C; 56.7%RH; 997mBar Test Engineer - Matthew McCarthy Date of Test - 7-21-2022
--	---

Frequency (MHz)	Raw QP Reading (dBµV)	Correction Factor (dB/m)	Adjusted QP Amplitude (dBµV/m)	Lim1: FCC_pt15_2 09 (dBµV/m)	Margin to Lim1 (dB)	Test Results Lim1 (Pass/Fail)	Worst Margin Lim1 (dB)	Antenna Height (cm)	EUT Azimuth (degrees)
30.679	26.2	1.4	27.7	40	-12.3	PASS		137	210
779.995	23.8	3.4	27.3	46	-18.7	PASS		167	110
780.05	33.1	3.4	36.6	46	-9.4	PASS	-9.4	104	299
783.442	26.7	3.3	30	46	-16	PASS		118	304
784.527	25.1	3.3	28.4	46	-17.6	PASS		175	315
786.101	24	3.3	27.3	46	-18.7	PASS		245	338

30-1000MHz Horizontal



30-1000MHz Horizontal



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Test Report for ASSA ABLOY AB • Report No. EW0235-7 Issue 5



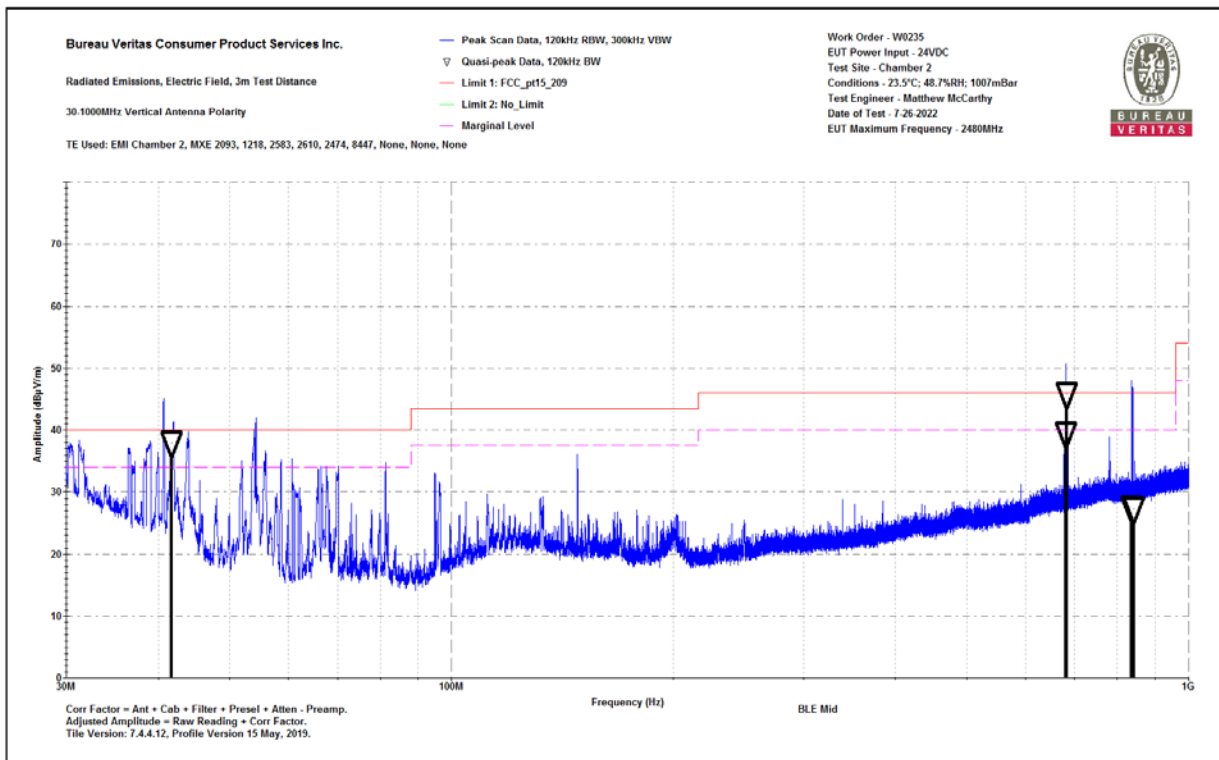
Results for BLE 1Mbps GFSK Channel 19

No emissions within 20dB of the limit were identified in 9kHz-30MHz range. Only plots shown below.

Bureau Veritas Consumer Product Services Inc. Radiated Emissions Electric Field 3m Distance 30-1000MHz Vertical Data Notes: BLE Mid 0	Work Order - W0235 EUT Power Input - 24VDC Test Site - Chamber 2 Conditions - 23.5°C; 48.7%RH; 1007mBar Test Engineer - Matthew McCarthy Date of Test - 7-26-2022
--	--

Frequency (MHz)	Raw QP Reading (dBµV)	Correction Factor (dB/m)	Adjusted QP Amplitude (dBµV/m)	Lim1: FCC_pt15_2 09 (dBµV/m)	Margin to Lim1 (dB)	Test Results Lim1 (Pass/Fail)	Worst Margin Lim1 (dB)	Antenna Height (cm)	EUT Azimuth (degrees)
41.673	44.8	-6.9	37.9	40	-2.1	PASS		113	245
681.612	38	1.4	39.4	46	-6.6	PASS		136	25
682.978	44.5	1.4	45.8	46	-0.2	PASS	-0.2	214	13
836.264	23.5	3.8	27.4	46	-18.6	PASS		131	86
839.474	23.5	3.8	27.3	46	-18.7	PASS		149	155
841.729	23.5	3.8	27.3	46	-18.7	PASS		141	178

30-1000MHz Vertical



30-1000MHz Vertical



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Test Report for ASSA ABLOY AB • Report No. EW0235-7 Issue 5



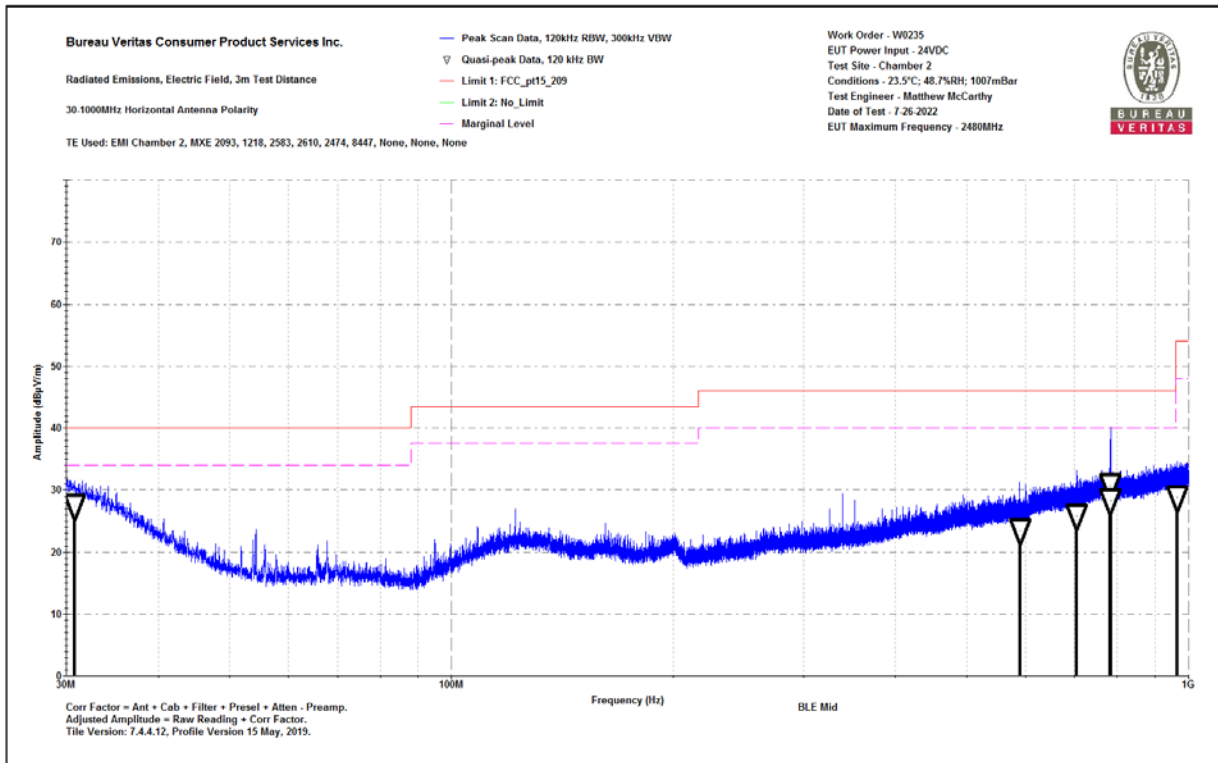
Bureau Veritas Consumer Product Services Inc.
Radiated Emissions Electric Field 3m Distance
30-1000MHz Horizontal Data

Work Order - W0235
EUT Power Input - 24VDC
Test Site - Chamber 2
Conditions - 23.5°C; 48.7%RH; 1007mBar
Test Engineer - Matthew McCarthy
Date of Test - 7-26-2022

Notes:
BLE Mid
0

Frequency (MHz)	Raw QP Reading (dBµV)	Correction Factor (dB/m)	Adjusted QP Amplitude (dBµV/m)	Lim1: FCC_pt15_209 (dBµV/m)	Margin to Lim1 (dB)	Test Results (Pass/Fail)	Worst Margin Lim1 (dB)	Antenna Height (cm)	EUT Azimuth (degrees)
30.796	26.1	1.3	27.5	40	-12.5	PASS	-12.5	105	110
590.367	23.7	-0.2	23.5	46	-22.5	PASS		169	78
705.406	24.1	1.8	25.9	46	-20.1	PASS		157	20
781.897	27.4	3.4	30.8	46	-15.2	PASS		112	155
783.501	25	3.3	28.3	46	-17.7	PASS		108	202
964.122	23	5.8	28.8	54	-25.2	PASS		168	25

30-1000MHz Horizontal



30-1000MHz Horizontal



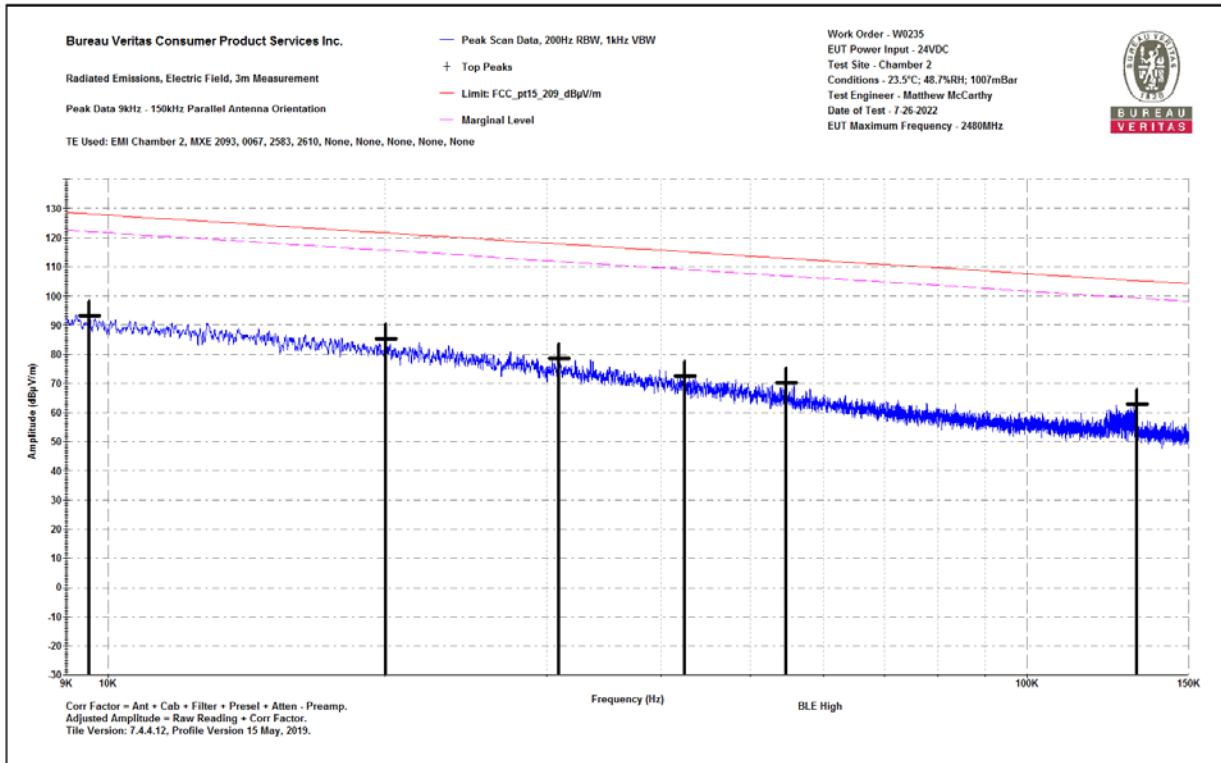
BUREAU VERITAS

Test Report for ASSA ABLOY AB • Report No. EW0235-7 Issue 5

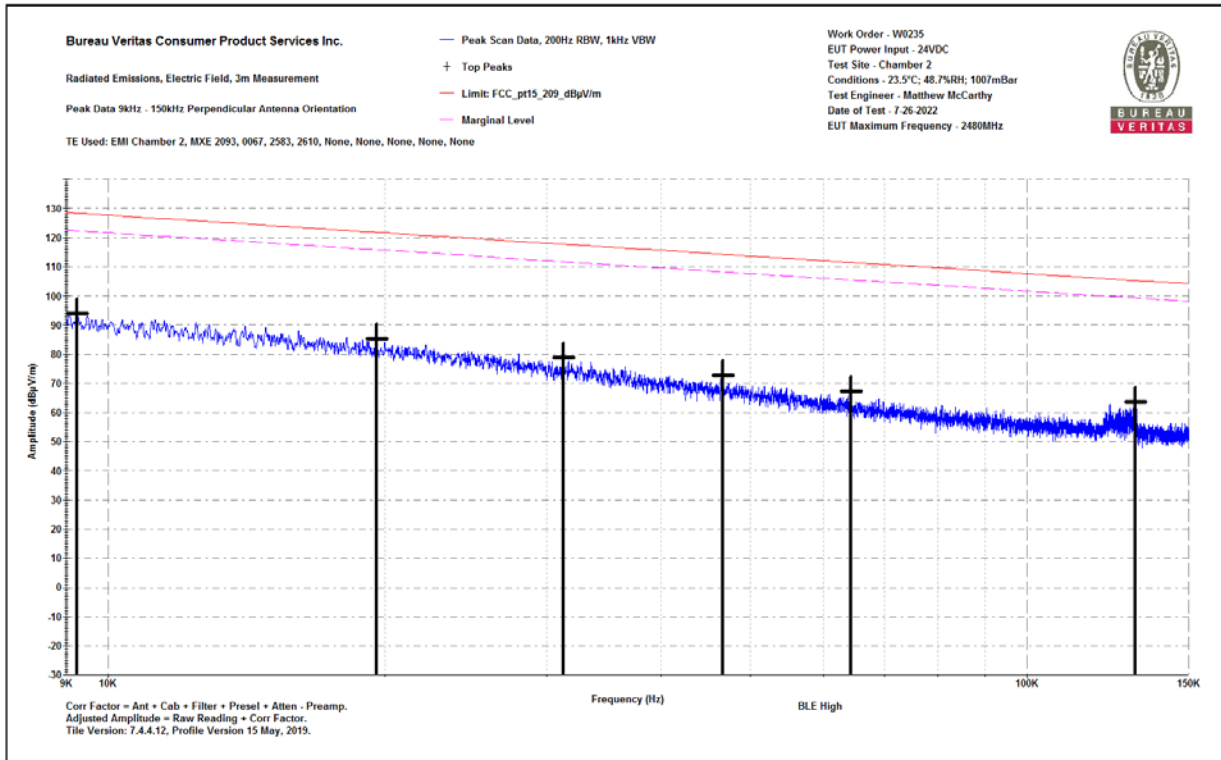


Results for BLE 1Mbps GFSK Channel 39

No emissions within 10dB of the limit were identified in 9kHz-30MHz range. Only plots shown below.



0.009-0.15MHz Parallel



0.009-0.15MHz Perpendicular

Bureau Veritas Consumer Product Services Inc.

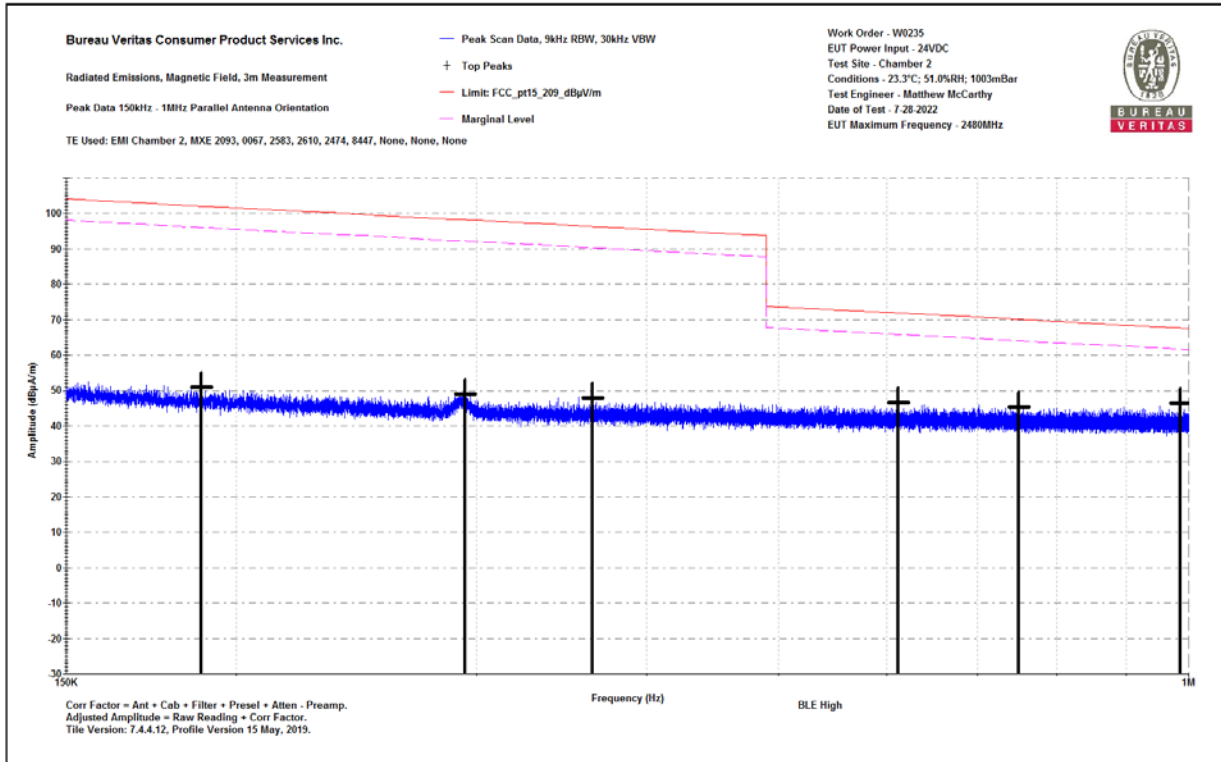
One Distribution Center Circle, #1 Littleton, MA

Tel.: (978) 486-8880 Fax: (978) 486-8828

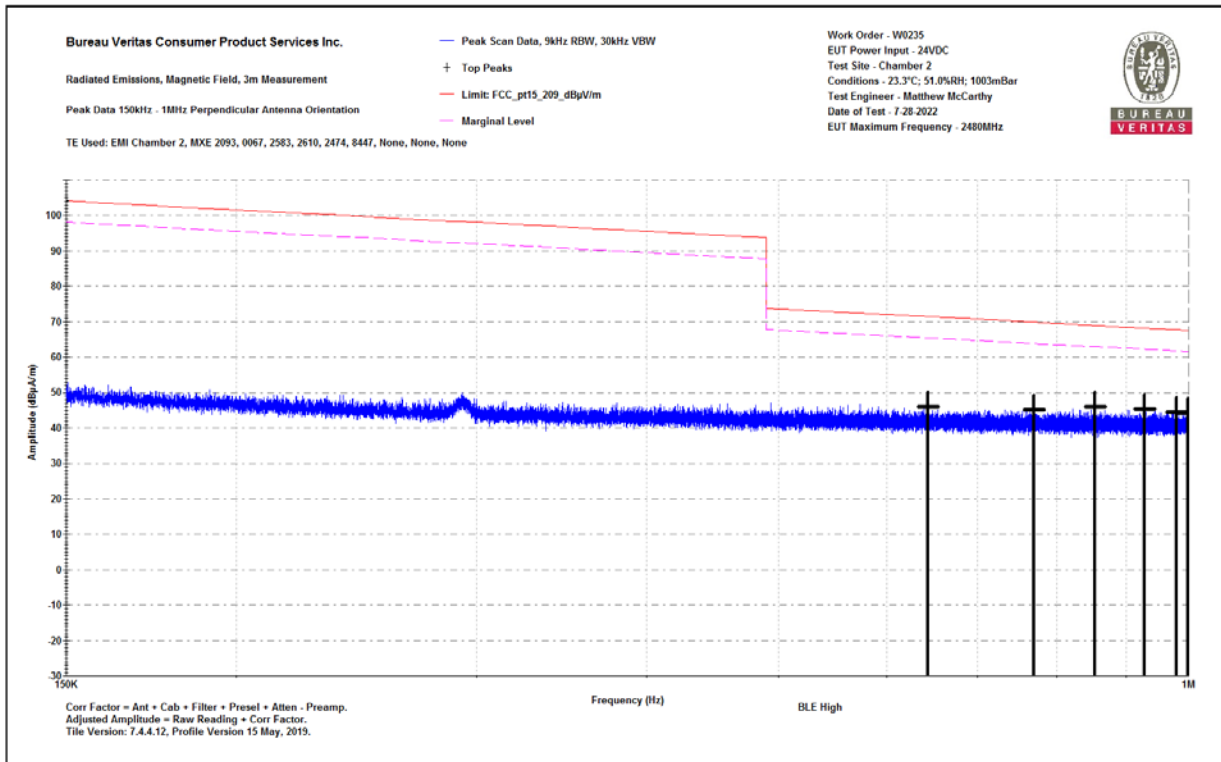


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Test Report for ASSA ABLOY AB • Report No. EW0235-7 Issue 5



0.15-1MHz Parallel



0.15-1MHz Perpendicular

Bureau Veritas Consumer Product Services Inc.

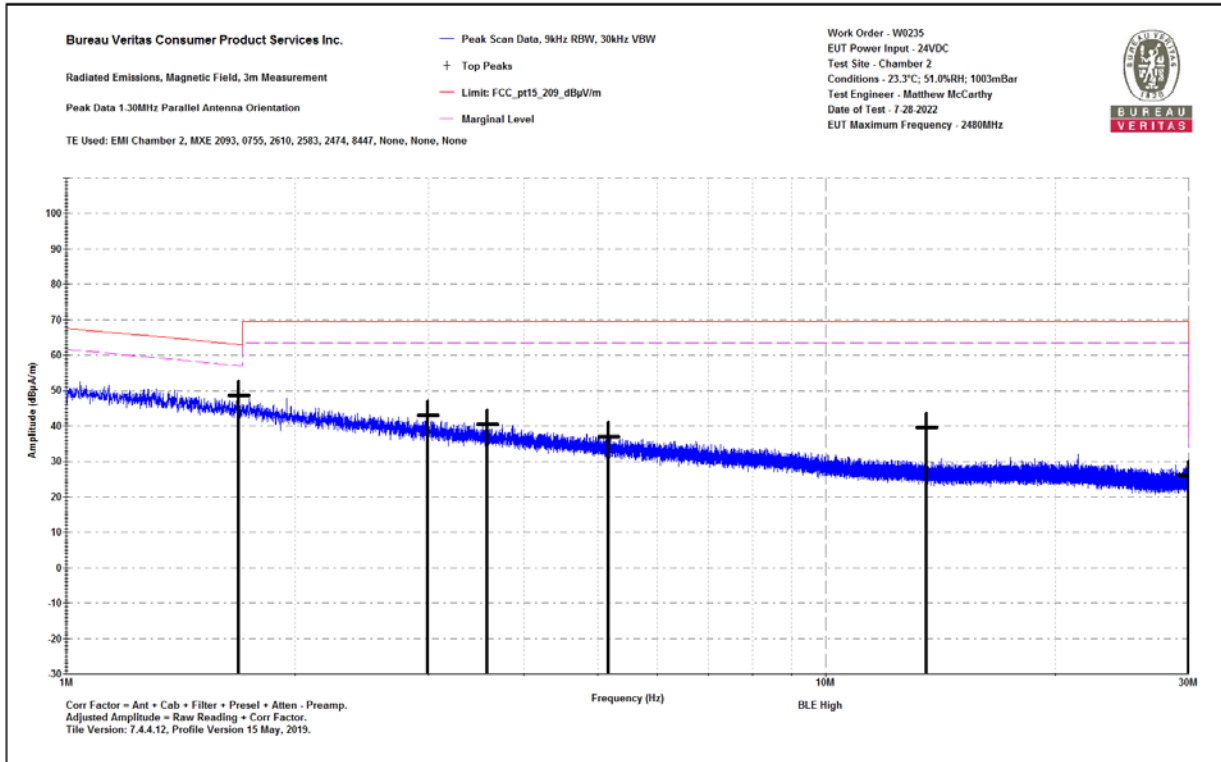
One Distribution Center Circle, #1
Littleton, MA

Tel.: (978) 486-8880
Fax: (978) 486-8828

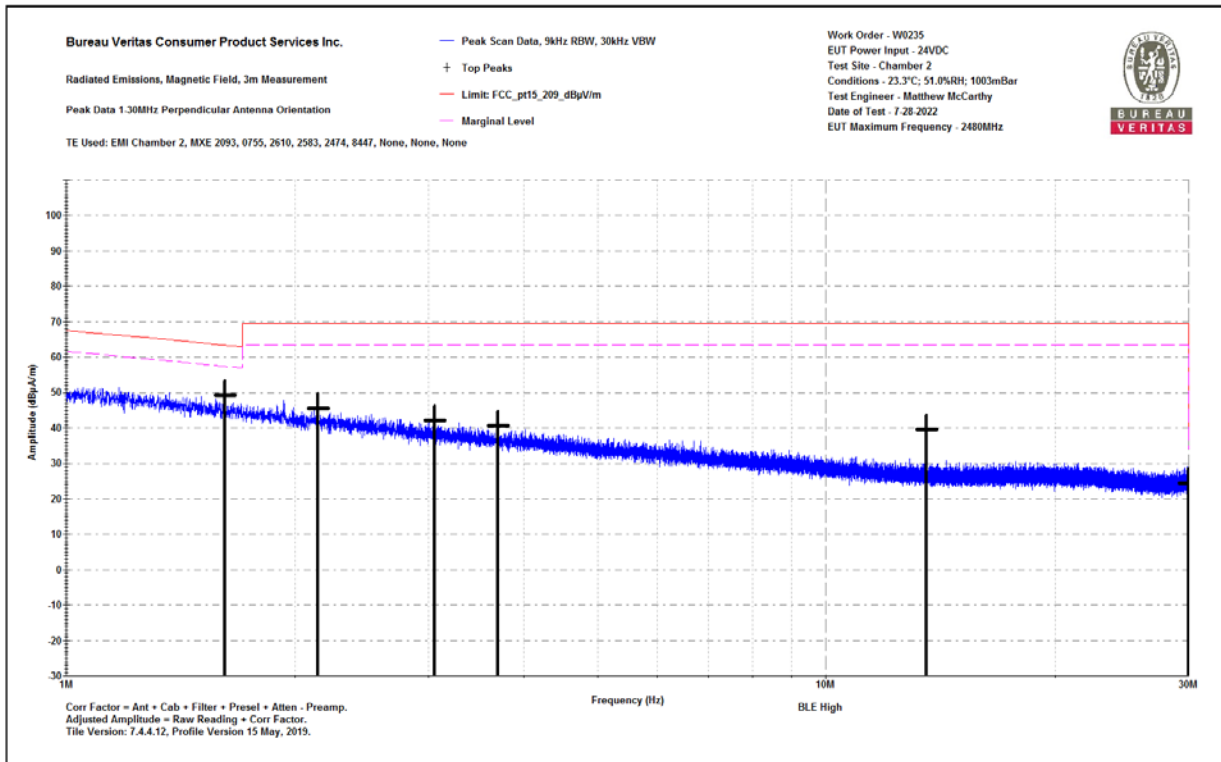


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Test Report for ASSA ABLOY AB • Report No. EW0235-7 Issue 5



1-30MHz Parallel



1-30MHz Perpendicular

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Test Report for ASSA ABLOY AB • Report No. EW0235-7 Issue 5



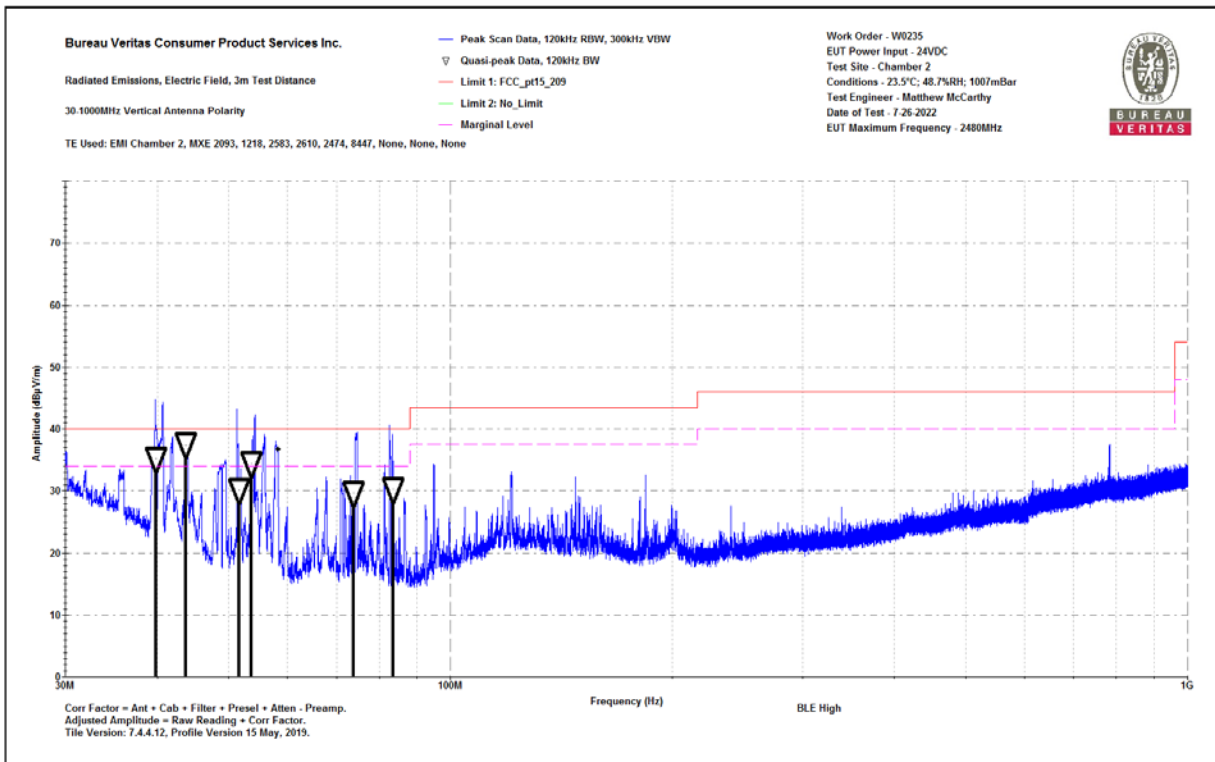
Bureau Veritas Consumer Product Services Inc.
Radiated Emissions Electric Field 3m Distance
30-1000MHz Vertical Data

Work Order - W0235
EUT Power Input - 24VDC
Test Site - Chamber 2
Conditions - 23.5°C; 48.7%RH; 1007mBar
Test Engineer - Matthew McCarthy
Date of Test - 7-26-2022

Notes:
BLE High
0

Frequency (MHz)	Raw QP Reading (dBµV)	Correction Factor (dB/m)	Adjusted QP Amplitude (dBµV/m)	Lim1: FCC_pt15_209 (dBµV/m)	Margin to Lim1 (dB)	Test Results Lim1 (Pass/Fail)	Worst Margin Lim1 (dB)	Antenna Height (cm)	EUT Azimuth (degrees)
39.795	40.8	-5.6	35.2	40	-4.8	PASS		118	10
43.764	45.7	-8.2	37.5	40	-2.5	PASS	-2.5	108	25
51.673	41.9	-11.7	30.2	40	-9.8	PASS		175	65
53.633	46.5	-12.1	34.4	40	-5.6	PASS		125	294
73.881	41.2	-11.6	29.6	40	-10.4	PASS		216	25
83.506	42.3	-12.1	30.3	40	-9.7	PASS		157	18

30-1000MHz Vertical



30-1000MHz Vertical

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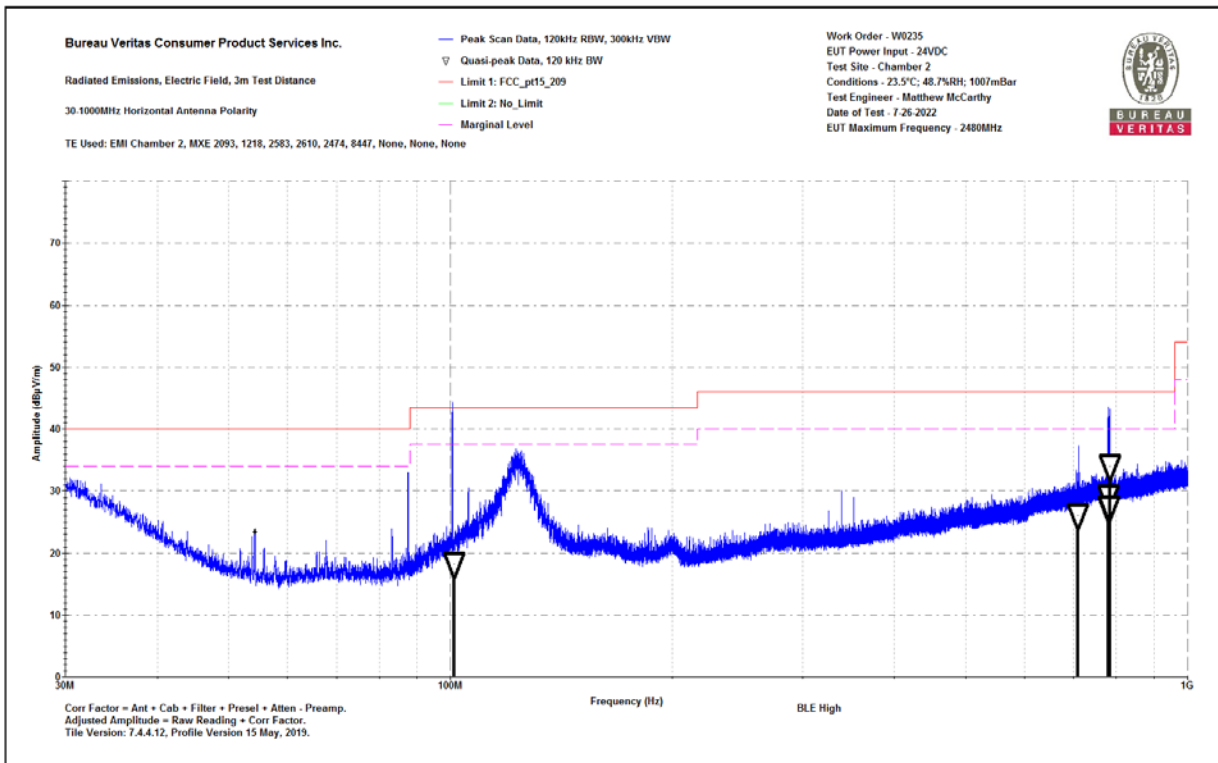
Test Report for ASSA ABLOY AB • Report No. EW0235-7 Issue 5



Bureau Veritas Consumer Product Services Inc. Radiated Emissions Electric Field 3m Distance 30-1000MHz Horizontal Data Notes: BLE High 0	Work Order - W0235 EUT Power Input - 24VDC Test Site - Chamber 2 Conditions - 23.5°C; 48.7%RH; 1007mBar Test Engineer - Matthew McCarthy Date of Test - 7-26-2022
---	--

Frequency (MHz)	Raw QP Reading (dBµV)	Correction Factor (dB/m)	Adjusted QP Amplitude (dBµV/m)	Lim1: FCC_pt15_2 09 (dbµV/m)	Margin to Lim1 (dB)	Test Results Lim1 (Pass/Fail)	Worst Margin Lim1 (dB)	Antenna Height (cm)	EUT Azimuth (degrees)
101.212	27.3	-9.1	18.2	43.5	-25.3	PASS		223	296
709.925	24.2	2	26.1	46	-19.9	PASS		225	69
779.726	25.6	3.4	29	46	-17	PASS		110	45
779.958	23.8	3.4	27.3	46	-18.7	PASS		104	20
782.301	24	3.4	27.4	46	-18.6	PASS		193	32
785.381	30.6	3.3	33.9	46	-12.1	PASS	-12.1	147	296

30-1000MHz Horizontal



30-1000MHz Horizontal



BUREAU VERITAS

Test Report for ASSA ABLOY AB • Report No. EW0235-7 Issue 5



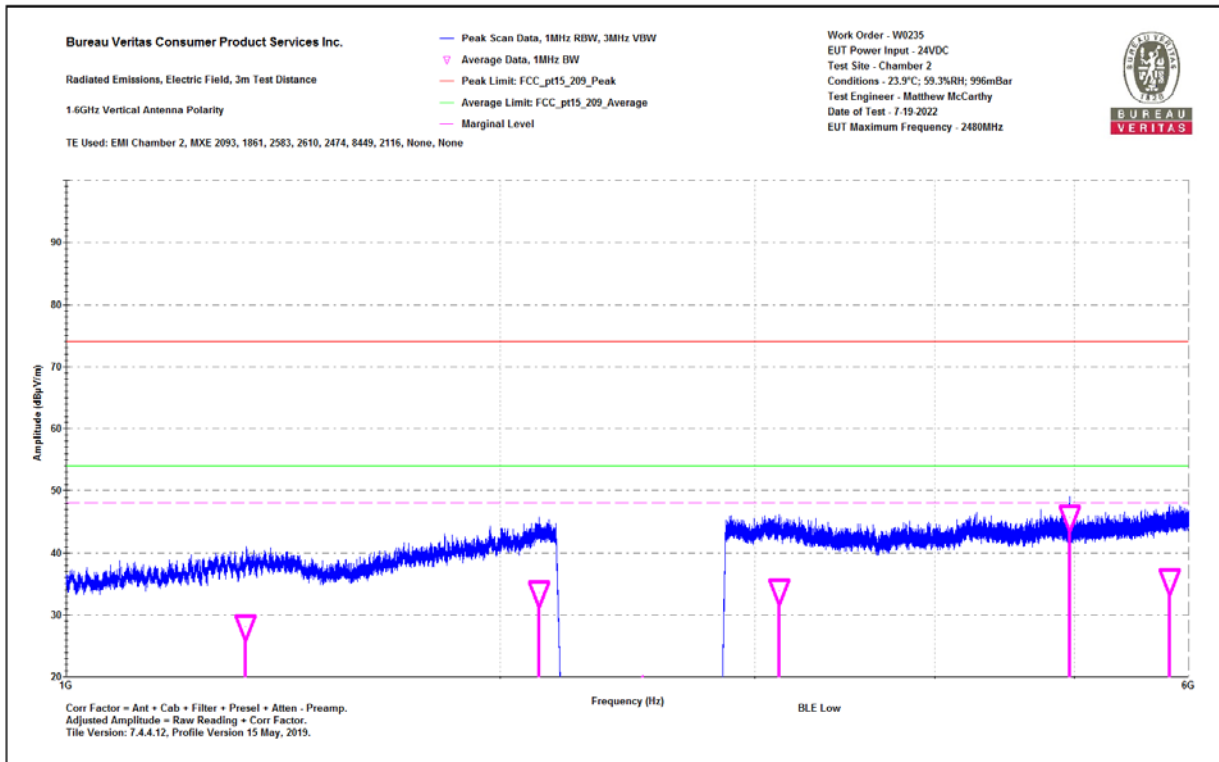
Emissions above 1GHz

Results for BLE 1Mbps GFSK Channel 0

Bureau Veritas Consumer Product Services Inc. Radiated Emissions Electric Field 3m Distance 1-6GHz Vertical Data Notes: BLE Low	Work Order - W0235 EUT Power Input - 24VDC Test Site - Chamber 2 Conditions - 23.9°C; 59.3%RH; 996mBar Test Engineer - Matthew McCarthy Date of Test - 7-19-2022
---	---

Frequency (MHz)	Raw Peak Reading (dBµV)	Raw Avg Reading (dBµV)	Correction Factor (dB/m)	Adjusted Peak Amplitude (dBµV/m)	Pk Lim: FCC_pt15_20_9_Peak (dBµV/m)	Peak Margin (dB)	Peak Results (Pass/Fail)	Worst Peak Margin (dB)	Adjusted Avg Amplitude (dBµV/m)	Av Lim: FCC_pt15_20_9_Average (dBµV/m)	Avg Margin (dB)	Avg Results (Pass/Fail)	Worst Avg Margin (dB)	Antenna Height (cm)	EUT Azimuth (degrees)
1332.1	46	35.7	-7.6	38.4	74	-35.6	PASS		28.1	54	-25.9	PASS		210	264
2127.6	44.2	35.4	-1.9	42.3	74	-31.7	PASS		33.5	54	-20.5	PASS		100	274
3120.5	44.5	34.4	-0.5	44	74	-30	PASS		33.9	54	-20.1	PASS		275	258
5816.8	42.8	33.3	2.2	45	74	-29	PASS	-29	35.5	54	-18.5	PASS	-18.5	106	135

1-6GHz Vertical



1-6GHz Vertical



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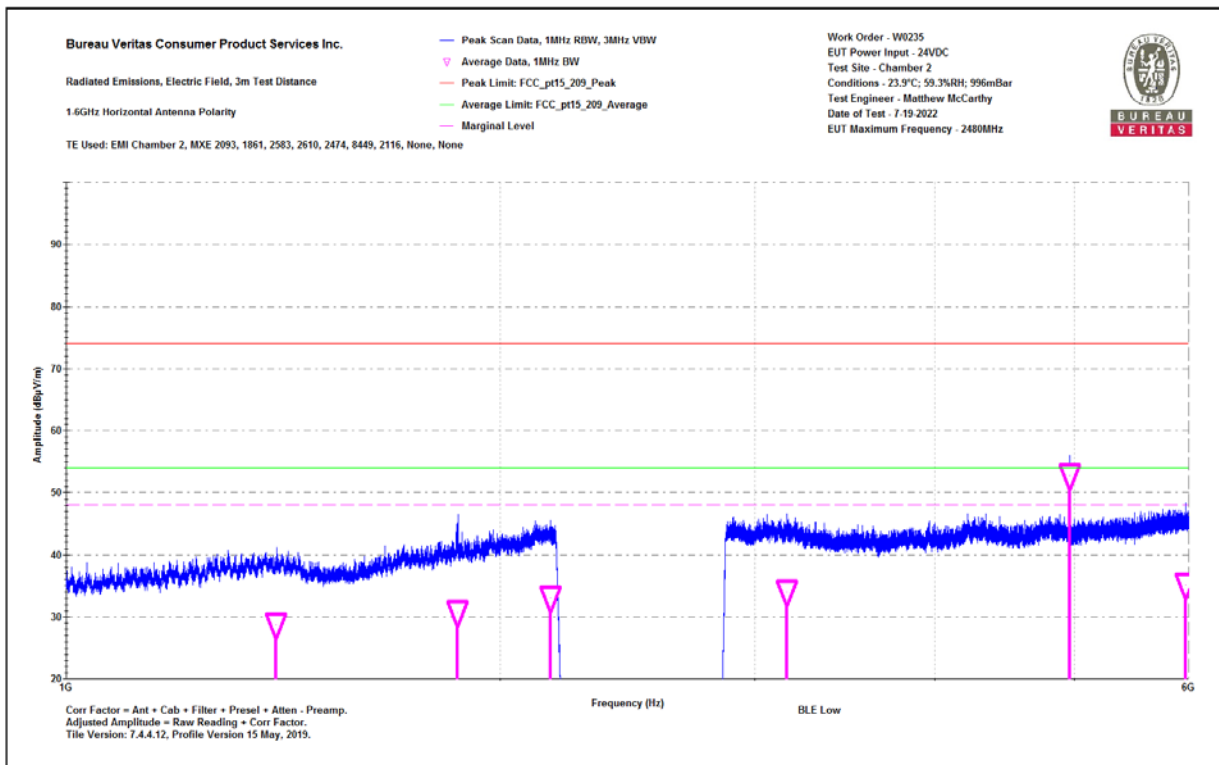
Test Report for ASSA ABLOY AB • Report No. EW0235-7 Issue 5



Bureau Veritas Consumer Product Services Inc. Radiated Emissions Electric Field 3m Distance 1-6GHz Horizontal Data Notes: BLE Low 0	Work Order - W0235 EUT Power Input - 24VDC Test Site - Chamber 2 Conditions - 23.9°C; 59.3%RH; 996mBar Test Engineer - Matthew McCarthy Date of Test - 7-19-2022
--	---

Frequency (MHz)	Raw Peak Reading (dBµV)	Raw Avg Reading (dBµV)	Correction Factor (dB/m)	Adjusted Peak Amplitude (dBµV/m)	Pk Lim: FCC_pt15_20_9_Peak (dBµV/m)	Peak Margin (dB)	Peak Results (Pass/Fail)	Worst Peak Margin (dB)	Adjusted Avg Amplitude (dBµV/m)	Av Lim: FCC_pt15_20_9_Average (dBµV/m)	Avg Margin (dB)	Avg Results (Pass/Fail)	Worst Average Margin (dB)	Antenna Height (cm)	EUT Azimuth (degrees)
1398.3	45.8	36	-7.2	38.5	74	-35.5	PASS		28.8	54	-25.2	PASS		275	107
1867.2	45.1	34.8	-4.1	41	74	-33	PASS		30.7	54	-23.3	PASS		107	203
2165.3	43.6	34.8	-1.7	41.9	74	-32.1	PASS		33.1	54	-20.9	PASS		223	46
3158.3	44.2	34.3	-0.2	44	74	-30	PASS		34.1	54	-19.9	PASS		185	68
5973.3	42	32.6	2.5	44.5	74	-29.5	PASS	-29.5	35.1	54	-18.9	PASS	-18.9	111	310

1-6GHz Horizontal



1-6GHz Horizontal

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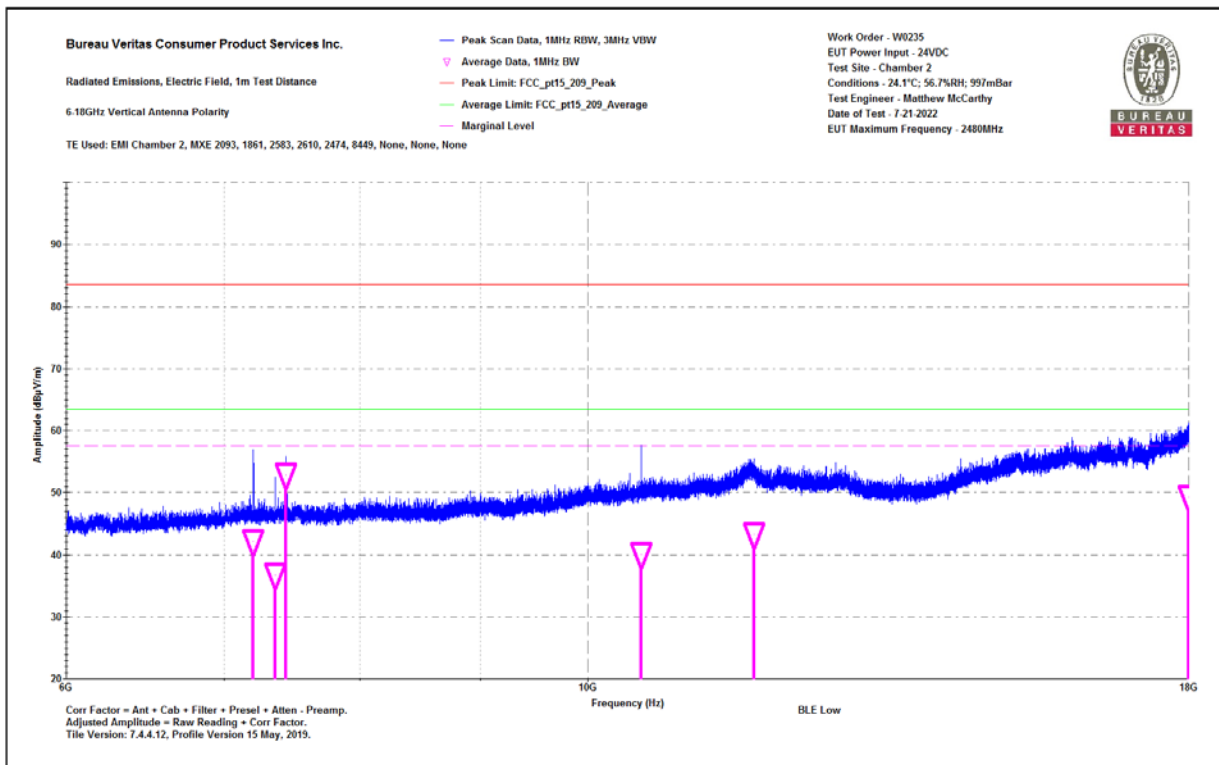
Test Report for ASSA ABLOY AB • Report No. EW0235-7 Issue 5



Bureau Veritas Consumer Product Services Inc. Radiated Emissions Electric Field 1m Distance 6-18GHz Vertical Data Notes: BLE Low 0	Work Order - W0235 EUT Power Input - 24VDC Test Site - Chamber 2 Conditions - 24.1°C; 56.7%RH; 997mBar Test Engineer - Matthew McCarthy Date of Test - 7-21-2022
---	---

Frequency (MHz)	Raw Peak Reading (dBµV)	Raw Avg Reading (dBµV)	Correction Factor (dB/m)	Adjusted Peak Amplitude (dBµV/m)	Pk Lim: FCC_pt15_20_9_Peak (dBµV/m)	Peak Margin (dB)	Peak Results (Pass/Fail)	Worst Peak Margin (dB)	Adjusted Avg Amplitude (dBµV/m)	Av Lim: FCC_pt15_20_9_Average (dBµV/m)	Avg Margin (dB)	Avg Results (Pass/Fail)	Worst Avg Margin (dB)	Antenna Height (cm)	EUT Azimuth (degrees)
7206.3	47.4	38.7	3.4	50.9	83.5	-32.6	PASS		42.1	63.5	-21.4	PASS		100	25
7362.1	42.7	33.6	3.1	45.9	83.5	-37.6	PASS		36.8	63.5	-26.7	PASS		100	0
10531.5	41.5	33.7	6.3	47.9	83.5	-35.6	PASS		40	63.5	-23.5	PASS		100	7
11766.7	45.1	35.8	7.4	52.5	83.5	-31	PASS		43.2	63.5	-20.3	PASS		200	309
17995.7	42.6	34.4	14.9	57.5	83.5	-26	PASS	-26	49.3	63.5	-14.2	PASS	-14.2	200	223

6-18GHz Vertical



6-18GHz Vertical



BUREAU VERITAS

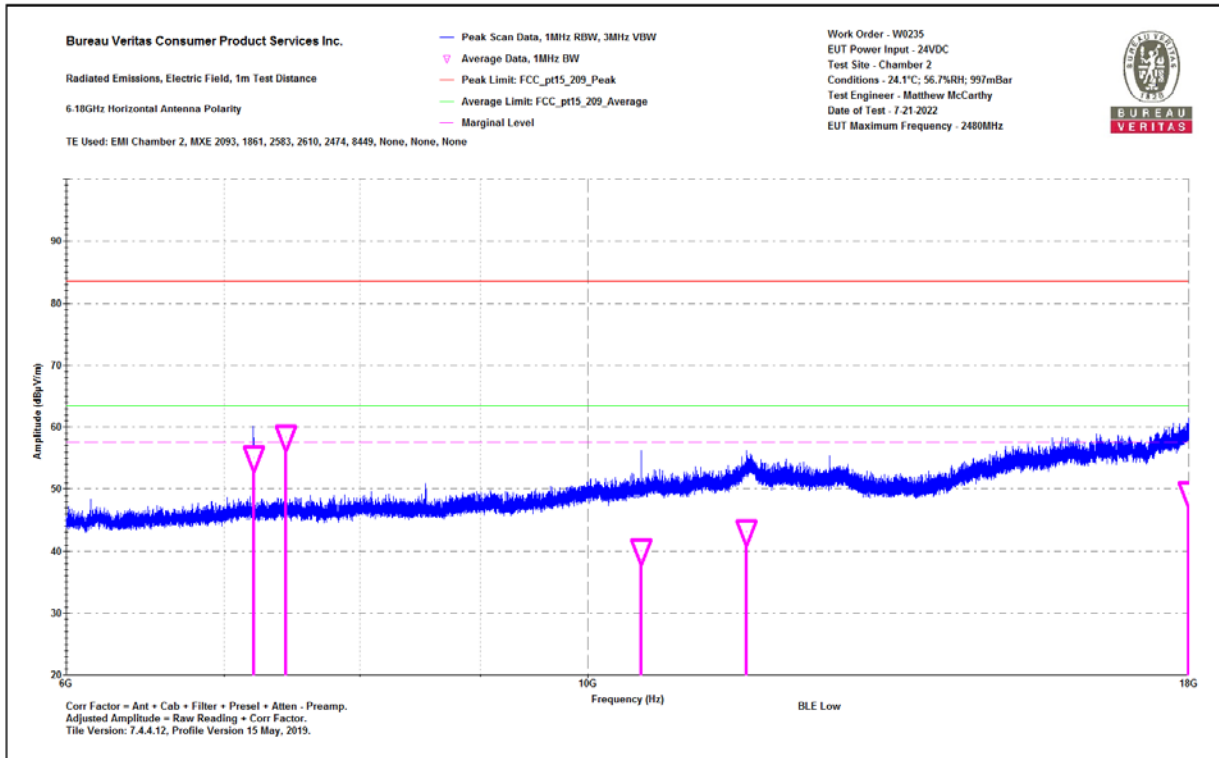
Test Report for ASSA ABLOY AB • Report No. EW0235-7 Issue 5



Bureau Veritas Consumer Product Services Inc. Radiated Emissions Electric Field 1m Distance 6-18GHz Horizontal Data Notes: BLE Low 0	Work Order - W0235 EUT Power Input - 24VDC Test Site - Chamber 2 Conditions - 24.1°C, 56.7%RH; 997mBar Test Engineer - Matthew McCarthy Date of Test - 7-21-2022
---	---

Frequency (MHz)	Raw Peak Reading (dBµV)	Raw Avg Reading (dBµV)	Correction Factor (dB/m)	Adjusted Peak Amplitude (dBµV/m)	Pk Lim: FCC_pt15_20_9_Peak (dBµV/m)	Peak Margin (dB)	Peak Test Results (Pass/Fail)	Worst Peak Margin (dB)	Adjusted Avg Amplitude (dBµV/m)	Av Lim: FCC_pt15_20_9_Average (dBµV/m)	Avg Margin (dB)	Avg Test Results (Pass/Fail)	Worst Avg Margin (dB)	Antenna Height (cm)	EUT Azimuth (degrees)
7206.7	56.3	51.7	3.4	59.8	83.5	-23.7	PASS	-23.7	55.1	63.5	-8.4	PASS	-8.4	158	339
10532.3	48.1	33.7	6.3	54.4	83.5	-29.1	PASS		40	63.5	-23.5	PASS		195	70
11672.6	44.3	35.6	7.5	51.9	83.5	-31.6	PASS		43.1	63.5	-20.4	PASS		157	90
17999	43.2	34.4	14.9	58.1	83.5	-25.4	PASS		49.3	63.5	-14.2	PASS		108	55

6-18GHz Horizontal



6-18GHz Horizontal

Bureau Veritas Consumer Product Services Inc.

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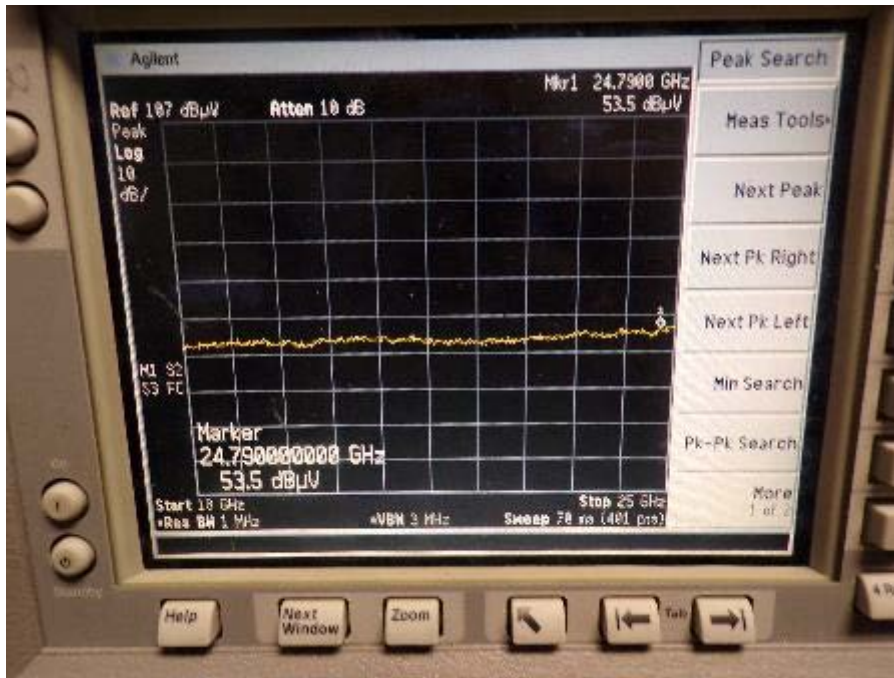
Test Report for ASSA ABLOY AB • Report No. EW0235-7 Issue 5



Radiated Emissions Table

Date: 28-Jul-22		Company: Assa Abloy				Work Order: W0235													
Engineer: Matthew McCarthy		EUT Desc: DR100 Door Relay				EUT Operating Voltage/Frequency: 24VDC													
Temp: 23.3		Humidity: 51%				Pressure: 1003mBar													
Frequency Range: 18-25GHz						Measurement Distance: 0.1 m													
Notes: BLE Low						EUT Max Freq: 2480MHz													
Antenna Polarization (H/V)	Frequency (MHz)	Peak Reading (dBµV)	Average Reading (dBµV)	Preamp Factor (dB)	Antenna Factor (dB/m)	Cable Factor (dB)	Adjusted Peak Reading (dBµV/m)	Adjusted Avg Reading (dBµV/m)	15.209			15.209							
									Limit (dBµV/m)	Margin (dB)	Result (Pass/Fail)	Limit (dBµV/m)	Margin (dB)	Result (Pass/Fail)					
BLE Low Noise Floor	24790.0	53.5	53.5	41.4	40.2	9.7	62.0	62.0	103.5	-41.5	Pass	83.5	-21.5	Pass					
Table Result:										Pass		by		-21.5 dB		Worst Freq:		24790.0 MHz	
Test Site: EMI Chamber 2		Cable 1: Asset #2323				Cable 2: ---				Cable 3: ---									
Analyzer: Gold		Preamp: 18-26.5GHz				Antenna: 18-26.5GHz Horn				Preselector: ---									
CSsoft Radiated Emissions Calculator v 1.017.222										Copyright Curtiss-Strauss LLC 2000									
Adjusted Reading = Reading - Preamp Factor + Antenna Factor + Cable Factor																			

18-25GHz



18-25GHz

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Test Report for ASSA ABLOY AB • Report No. EW0235-7 Issue 5



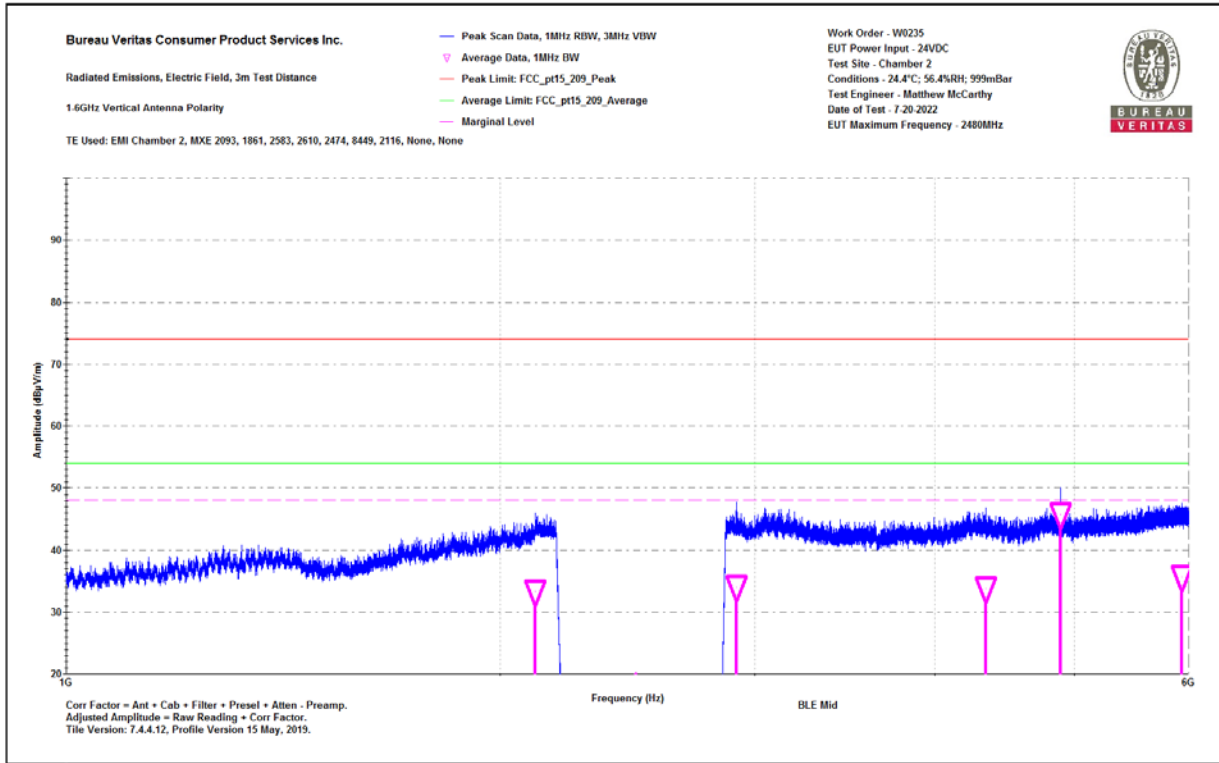
Results for BLE 1Mbps GFSK Channel 19

Bureau Veritas Consumer Product Services Inc.
Radiated Emissions Electric Field 3m Distance
1-6GHz Vertical Data
Notes:
BLE Mid

Work Order - W0235
EUT Power Input - 24VDC
Test Site - Chamber 2
Conditions - 24.4°C; 56.4%RH; 999mBar
Test Engineer - Matthew McCarthy
Date of Test - 7-20-2022

Frequency (MHz)	Raw Peak Reading (dBµV)	Raw Avg Reading (dBµV)	Correction Factor (dB/m)	Adjusted Peak Amplitude (dBµV/m)	Pk Lim: FCC_pt15_20_9_Peak (dBµV/m)	Peak Margin (dB)	Peak Results (Pass/Fail)	Worst Peak Margin (dB)	Adjusted Avg Amplitude (dBµV/m)	Av Lim: FCC_pt15_20_9_Average (dBµV/m)	Avg Margin (dB)	Avg Results (Pass/Fail)	Worst Avg Margin (dB)	Antenna Height (cm)	EUT Azimuth (degrees)
2113.2	44.1	35.4	-2.1	42	74	-32	PASS		33.3	54	-20.7	PASS		283	256
2914.8	43.6	34.4	-0.4	43.2	74	-30.8	PASS		34	54	-20	PASS		196	197
4341	42.5	33.5	0.3	42.8	74	-31.2	PASS		33.8	54	-20.2	PASS		297	17
5932.6	43.6	33.2	2.5	46.1	74	-27.9	PASS	-27.9	35.6	54	-18.4	PASS	-18.4	275	74

1-6GHz Vertical



1-6GHz Vertical

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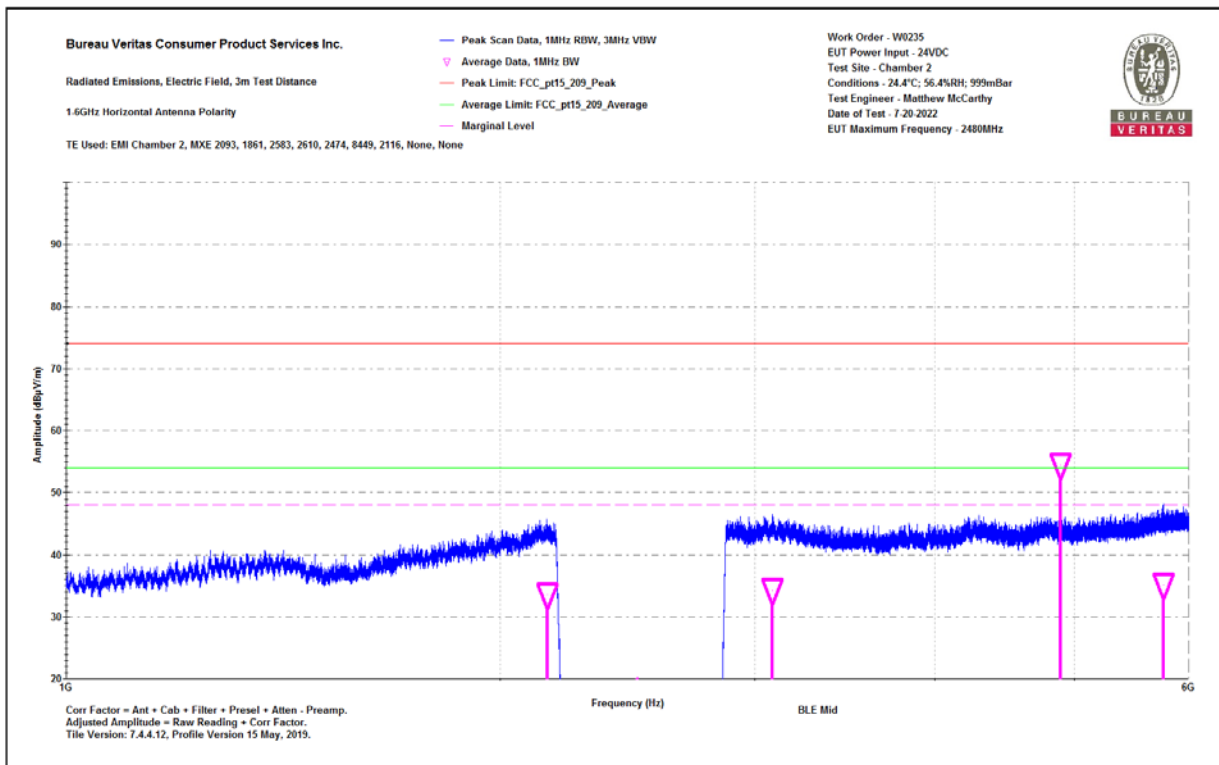


Bureau Veritas Consumer Product Services Inc.
Radiated Emissions Electric Field 3m Distance
1-6GHz Horizontal Data
Notes:
BLE Mid

Work Order - W0235
EUT Power Input - 24VDC
Test Site - Chamber 2
Conditions - 24.4°C; 56.4%RH; 999mBar
Test Engineer - Matthew McCarthy
Date of Test - 7-20-2022

Frequency (MHz)	Raw Peak Reading (dBµV)	Raw Avg Reading (dBµV)	Correction Factor (dB/m)	Adjusted Peak Amplitude (dBµV/m)	FCC_pt15_20_9_Peak (dBµV/m)	Pk Lim: FCC_pt15_20_9_Peak (dB)	Peak Results (Pass/Fail)	Worst Peak Margin (dB)	Adjusted Avg Amplitude (dBµV/m)	FCC_pt15_20_9_Average (dBµV/m)	Av Lim: FCC_pt15_20_9_Average (dB)	Avg Margin (dB)	Avg Results (Pass/Fail)	Worst Average Margin (dB)	Antenna Height (cm)	EUT Azimuth (degrees)
2154.9	43.9	35.3	-1.8	42.1	74	-31.9	PASS		33.5	54	-20.5	PASS		209	29	
3087.1	44.1	34.8	-0.6	43.6	74	-30.4	PASS		34.3	54	-19.7	PASS		213	150	
5760.7	42	33.2	2	43.9	74	-30.1	PASS	-30.1	35.1	54	-18.9	PASS	-18.9	296	8	

1-6GHz Horizontal



1-6GHz Horizontal



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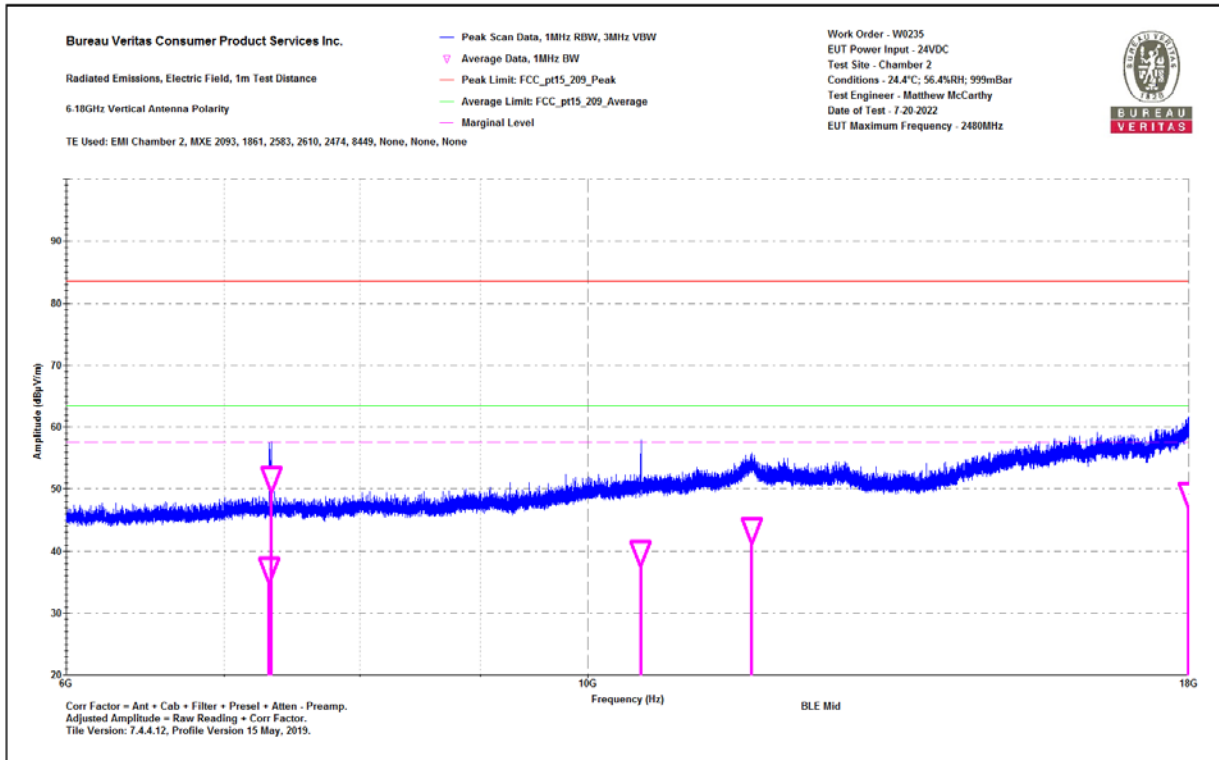
Test Report for ASSA ABLOY AB • Report No. EW0235-7 Issue 5



Bureau Veritas Consumer Product Services Inc. Radiated Emissions Electric Field 1m Distance 6-18GHz Vertical Data Notes: BLE Mid 0	Work Order - W0235 EUT Power Input - 24VDC Test Site - Chamber 2 Conditions - 24.4°C; 56.4%RH; 999mBar Test Engineer - Matthew McCarthy Date of Test - 7-20-2022
---	---

Frequency (MHz)	Raw Peak Reading (dBµV)	Raw Avg Reading (dBµV)	Correction Factor (dB/m)	Adjusted Peak Amplitude (dBµV/m)	Pk Lim: FCC_pt15_20_9_Peak (dBµV/m)	Peak Margin (dB)	Peak Results (Pass/Fail)	Worst Peak Margin (dB)	Adjusted Avg Amplitude (dBµV/m)	Av Lim: FCC_pt15_20_9_Average (dBµV/m)	Avg Margin (dB)	Avg Results (Pass/Fail)	Worst Avg Margin (dB)	Antenna Height (cm)	EUT Azimuth (degrees)
7319.2	45.5	34	3.2	48.7	83.5	-34.8	PASS		37.2	63.5	-26.3	PASS		100	13
10528.9	49	33.6	6.3	55.3	83.5	-28.2	PASS		39.9	63.5	-23.6	PASS		200	271
11736.5	44.8	36	7.5	52.3	83.5	-31.2	PASS		43.5	63.5	-20	PASS		190	223
17999	42.5	34.3	14.9	57.4	83.5	-26.1	PASS	-26.1	49.2	63.5	-14.3	PASS	-14.3	200	196

6-18GHz Vertical



6-18GHz Vertical

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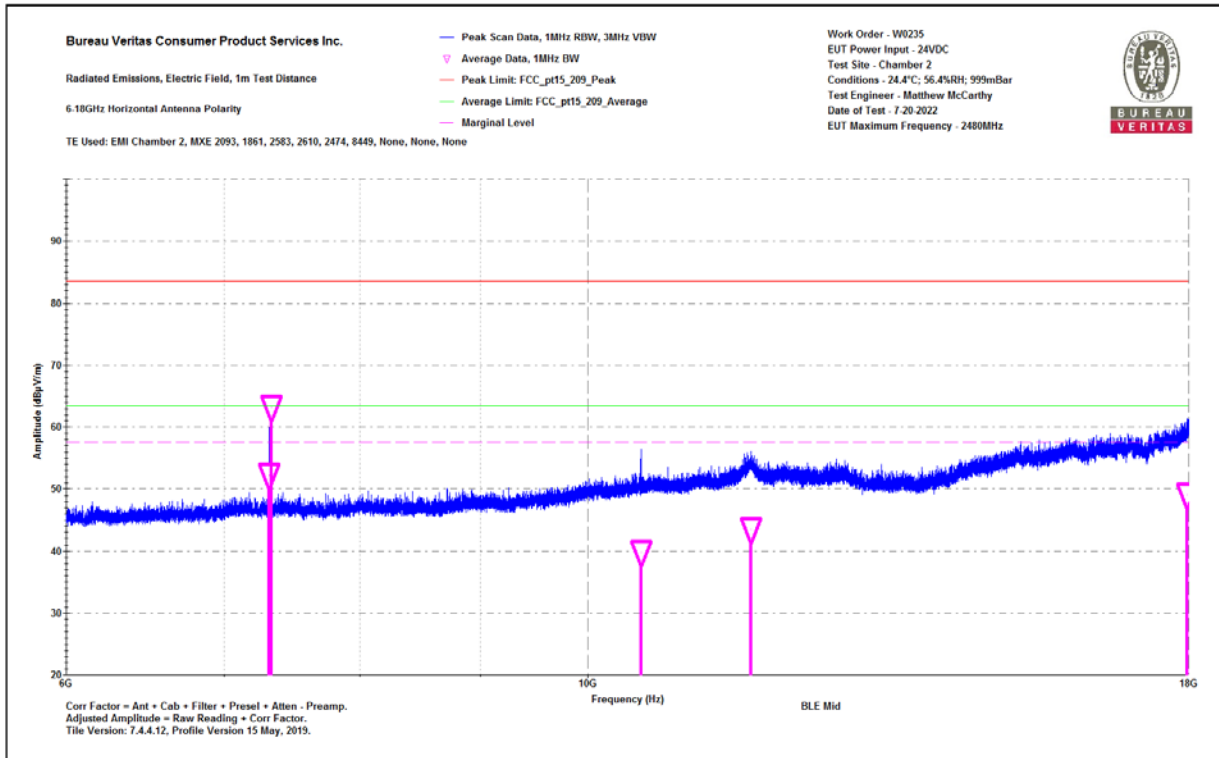


Bureau Veritas Consumer Product Services Inc.
Radiated Emissions Electric Field 1m Distance
6-18GHz Horizontal Data
Notes:
BLE Mid

Work Order - W0235
EUT Power Input - 24VDC
Test Site - Chamber 2
Conditions - 24.4°C; 56.4%RH; 999mBar
Test Engineer - Matthew McCarthy
Date of Test - 7-20-2022

Frequency (MHz)	Raw Peak Reading (dBµV)	Raw Avg Reading (dBµV)	Correction Factor (dB/m)	Adjusted Peak Amplitude (dBµV/m)	Pk Lim: FCC_pt15_20 9_Peak (dBµV/m)	Peak Margin (dB)	Peak Test Results (Pass/Fail)	Worst Peak Margin (dB)	Adjusted Avg Amplitude (dBµV/m)	Av Lim: FCC_pt15_20 9_Average (dBµV/m)	Avg Margin (dB)	Avg Test Results (Pass/Fail)	Worst Avg Margin (dB)	Antenna Height (cm)	EUT Azimuth (degrees)
7319.8	55.3	49.1	3.2	58.5	83.5	-25	PASS	-25	52.2	63.5	-11.3	PASS	-11.3	149	0
10531.5	42.7	33.5	6.3	49	83.5	-34.5	PASS		39.9	63.5	-23.6	PASS		176	125
11731.1	45.3	36	7.5	52.8	83.5	-30.7	PASS		43.5	63.5	-20	PASS		137	292
17974.9	43.9	34.4	14.6	58.5	83.5	-25	PASS		49	63.5	-14.5	PASS		175	110

6-18GHz Horizontal



6-18GHz Horizontal

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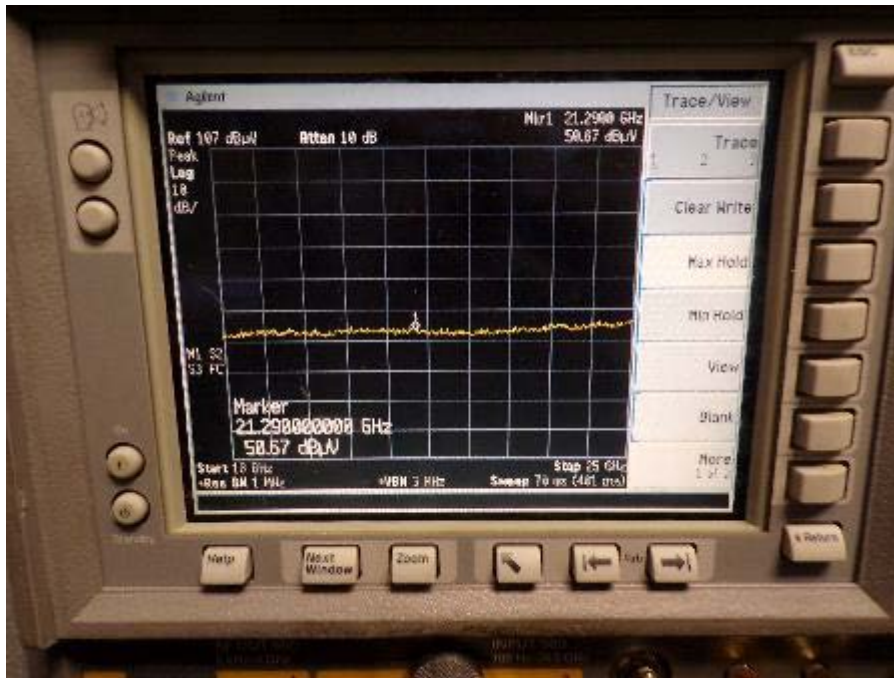
Test Report for ASSA ABLOY AB • Report No. EW0235-7 Issue 5



Radiated Emissions Table

Date: 28-Jul-22		Company: Assa Abloy						Work Order: W0235										
Engineer: Matthew McCarthy		EUT Desc: DR100 Door Relay						EUT Operating Voltage/Frequency: 24VDC										
Temp: 23.3		Humidity: 51%						Pressure: 1003mBar										
Frequency Range: 18-25GHz						Measurement Distance: 0.1 m												
Notes: BLE Mid						EUT Max Freq: 2480MHz												
Antenna Polarization (H/V)	Frequency (MHz)	Peak Reading (dBµV)	Average Reading (dBµV)	Preamp Factor (dB)	Antenna Factor (dBm)	Cable Factor (dB)	Adjusted Peak Reading (dBµV/m)	Adjusted Avg Reading (dBµV/m)	15.209			15.209						
									Limit (dBµV/m)	Margin (dB)	Result (Pass/Fail)	Limit (dBµV/m)	Margin (dB)	Result (Pass/Fail)				
BLE Mid Noise Floor	21290.0	50.7	50.7	42.7	40.2	9.5	57.7	57.7	103.5	-45.8	Pass	83.5	-25.8	Pass				
Table Result:										Pass			by -25.8 dB			Worst Freq: 21290.0 MHz		
Test Site: EMI Chamber 2		Cable 1: Asset #2323				Cable 2: ---				Cable 3: ---								
Analyzer: Gold		Preamp: 18-26.5GHz				Antenna: 18-26.5GHz Horn				Preselector: ---								
CSsoft Radiated Emissions Calculator v 1.017.222												Copyright Curtiss-Straus LLC 2000						
Adjusted Reading = Reading - Preamp Factor + Antenna Factor + Cable Factor																		

18-25GHz



18-25GHz

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Test Report for ASSA ABLOY AB • Report No. EW0235-7 Issue 5

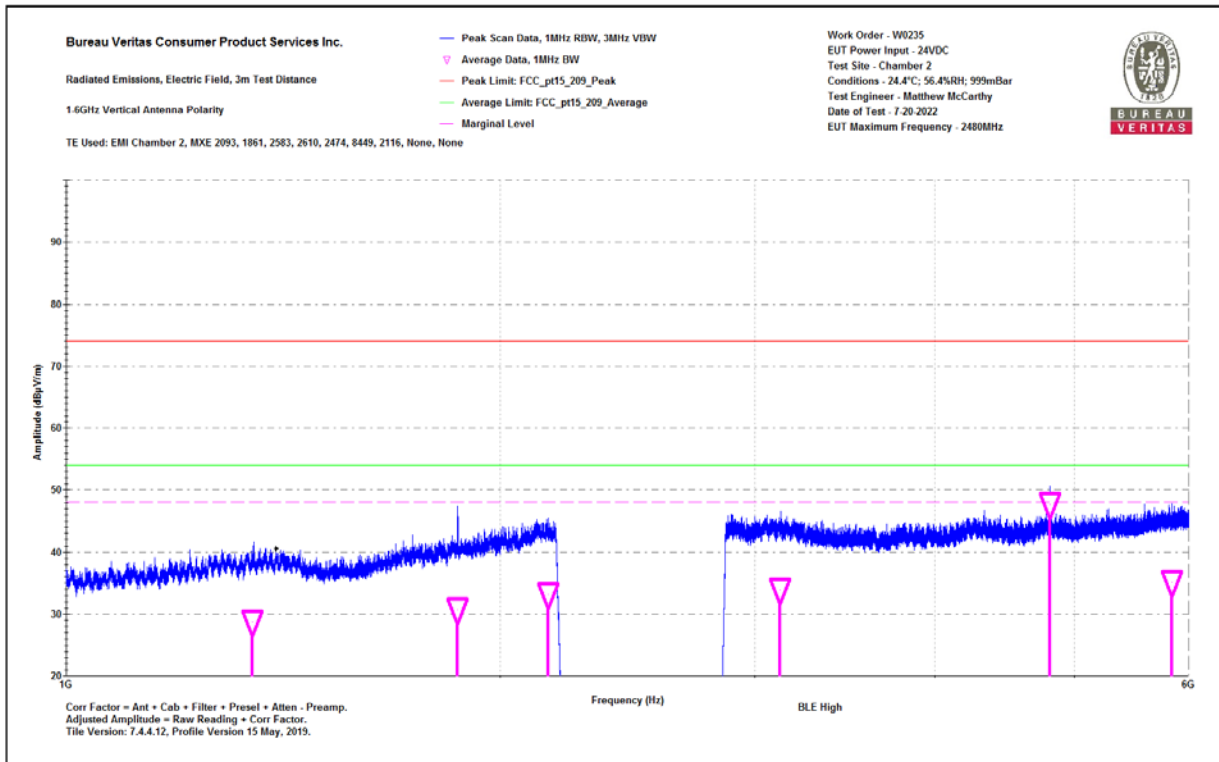


Results for BLE 1Mbps GFSK Channel 39

Bureau Veritas Consumer Product Services Inc. Radiated Emissions Electric Field 3m Distance 1-6GHz Vertical Data Notes: BLE High 0	Work Order - W0235 EUT Power Input - 24VDC Test Site - Chamber 2 Conditions - 24.4°C; 56.4%RH; 999mBar Test Engineer - Matthew McCarthy Date of Test - 7-20-2022
---	---

Frequency (MHz)	Raw Peak Reading (dBµV)	Raw Avg Reading (dBµV)	Correction Factor (dB/m)	Adjusted Peak Amplitude (dBµV/m)	Pk Lim: FCC_pt15_20_9_Peak (dBµV/m)	Peak Margin (dB)	Peak Results (Pass/Fail)	Worst Peak Margin (dB)	Adjusted Avg Amplitude (dBµV/m)	Av Lim: FCC_pt15_20_9_Average (dBµV/m)	Avg Margin (dB)	Avg Results (Pass/Fail)	Worst Avg Margin (dB)	Antenna Height (cm)	EUT Azimuth (degrees)
1346.6	47	36.2	-7.4	39.6	74	-34.4	PASS		28.7	54	-25.3	PASS		298	307
1868.1	44.7	34.8	-4	40.6	74	-33.4	PASS		30.7	54	-23.3	PASS		294	61
2159.3	43.6	35	-1.8	41.8	74	-32.2	PASS		33.2	54	-20.8	PASS		285	232
3125.2	42.7	34.4	-0.4	42.3	74	-31.7	PASS		34	54	-20	PASS		125	288
5843.5	43.1	32.9	2.2	45.3	74	-28.7	PASS	-28.7	35.2	54	-18.8	PASS	-18.8	209	118

1-6GHz Vertical



1-6GHz Vertical



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Test Report for ASSA ABLOY AB • Report No. EW0235-7 Issue 5

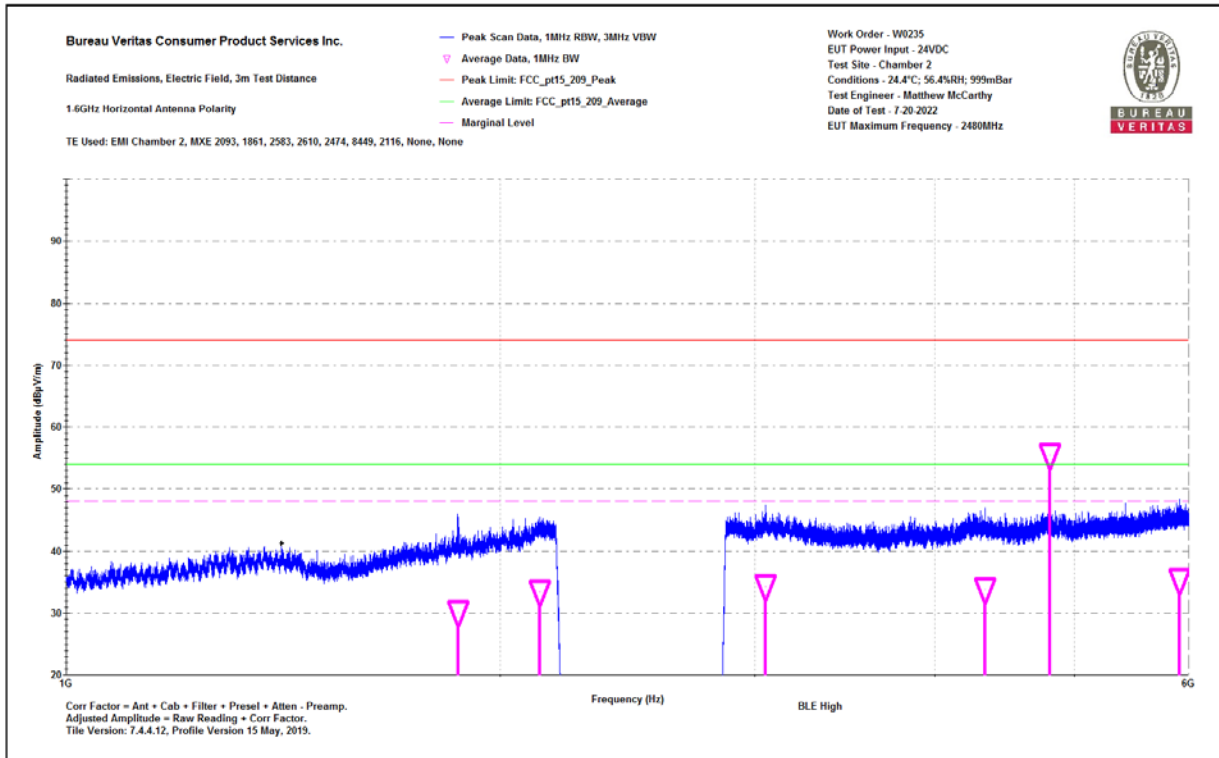


Bureau Veritas Consumer Product Services Inc.
 Radiated Emissions Electric Field 3m Distance
 1-6GHz Horizontal Data
 Notes:
 BLE High

Work Order - W0235
 EUT Power Input - 24VDC
 Test Site - Chamber 2
 Conditions - 24.4°C; 56.4%RH; 999mBar
 Test Engineer - Matthew McCarthy
 Date of Test - 7-20-2022

Frequency (MHz)	Raw Peak Reading (dBµV)	Raw Avg Reading (dBµV)	Correction Factor (dB/m)	Adjusted Peak Amplitude (dBµV/m)	Pk Lim: FCC_pt15_20_9_Peak (dBµV/m)	Peak Margin (dB)	Peak Results (Pass/Fail)	Worst Peak Margin (dB)	Adjusted Avg Amplitude (dBµV/m)	Av Lim: FCC_pt15_20_9_Average (dBµV/m)	Avg Margin (dB)	Avg Results (Pass/Fail)	Worst Average Margin (dB)	Antenna Height (cm)	EUT Azimuth (degrees)
1869.7	43.5	34.1	-4	39.5	74	-34.5	PASS		30.1	54	-23.9	PASS		100	11
2129.4	45.7	35.3	-1.9	43.8	74	-30.2	PASS		33.5	54	-20.5	PASS		125	269
3051.8	42.7	34.8	-0.4	42.3	74	-31.7	PASS		34.3	54	-19.7	PASS		275	46
4336.8	41.8	33.5	0.3	42.1	74	-31.9	PASS		33.8	54	-20.2	PASS		220	227
5914.4	42.7	32.8	2.4	45.1	74	-28.9	PASS	-28.9	35.3	54	-18.7	PASS	-18.7	193	290

1-6GHz Horizontal



1-6GHz Horizontal



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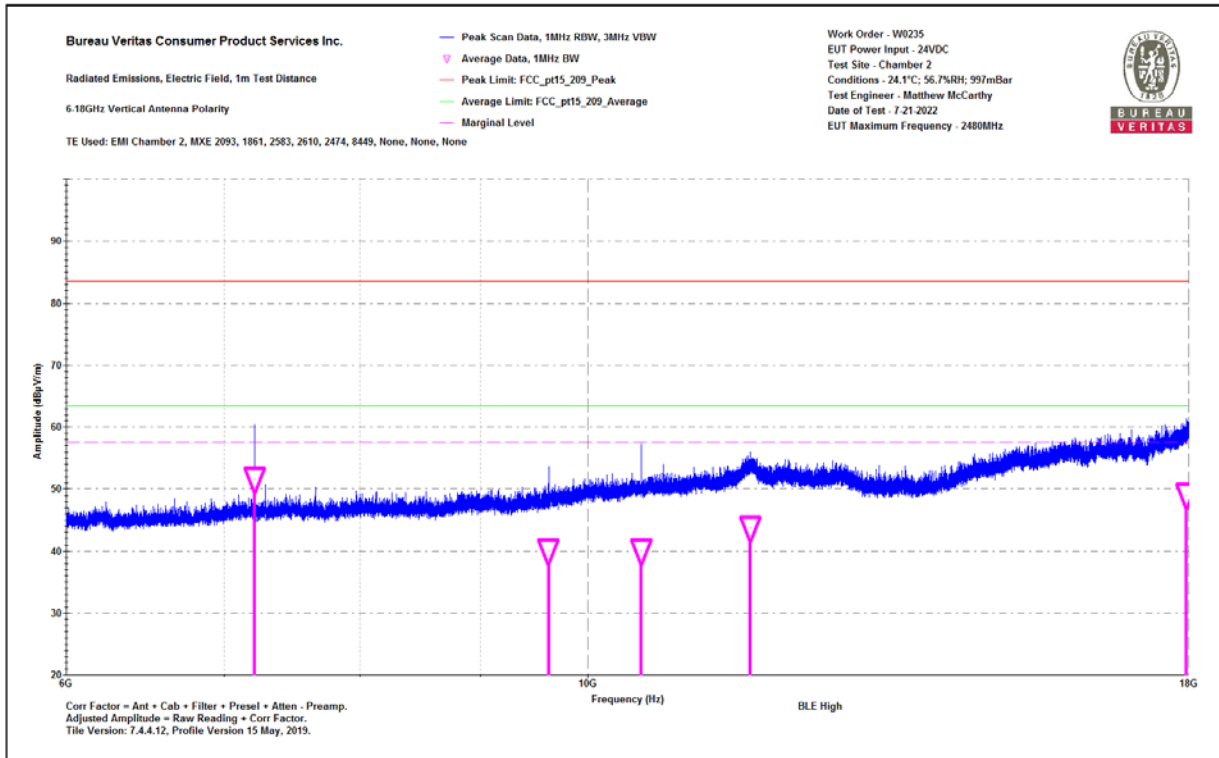
Test Report for ASSA ABLOY AB • Report No. EW0235-7 Issue 5



Bureau Veritas Consumer Product Services Inc. Radiated Emissions Electric Field 1m Distance 6-18GHz Vertical Data Notes: BLE High 0	Work Order - W0235 EUT Power Input - 24VDC Test Site - Chamber 2 Conditions - 24.1°C; 56.7%RH; 997mBar Test Engineer - Matthew McCarthy Date of Test - 7-21-2022
--	---

Frequency (MHz)	Raw Peak Reading (dBµV)	Raw Avg Reading (dBµV)	Correction Factor (dB/m)	Adjusted Peak Amplitude (dBµV/m)	Pk Lim: FCC_pt15_20_9_Peak (dBµV/m)	Peak Margin (dB)	Peak Results (Pass/Fail)	Worst Peak Margin (dB)	Adjusted Avg Amplitude (dBµV/m)	Av Lim: FCC_pt15_20_9_Average (dBµV/m)	Avg Margin (dB)	Avg Results (Pass/Fail)	Worst Avg Margin (dB)	Antenna Height (cm)	EUT Azimuth (degrees)
10532.1	42.9	33.7	6.3	49.2	83.5	-34.3	PASS		40.1	63.5	-23.4	PASS		184	234
11718.2	44.7	36.2	7.5	52.3	83.5	-31.2	PASS		43.7	63.5	-19.8	PASS		192	241
17961.2	45.2	34.5	14.5	59.7	83.5	-23.8	PASS	-23.8	49	63.5	-14.5	PASS	-14.5	131	110

6-18GHz Vertical



6-18GHz Vertical



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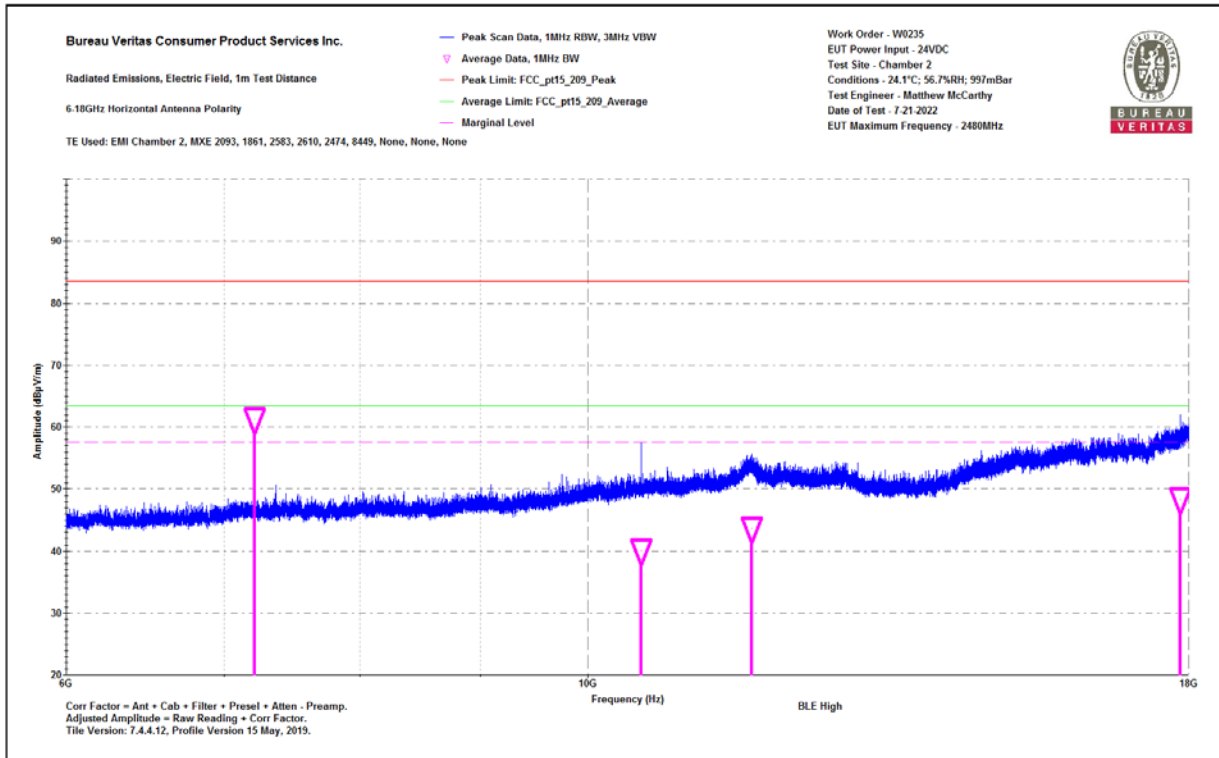
Test Report for ASSA ABLOY AB • Report No. EW0235-7 Issue 5



Bureau Veritas Consumer Product Services Inc. Radiated Emissions Electric Field 1m Distance 6-18GHz Horizontal Data Notes: BLE High	Work Order - W0235 EUT Power Input - 24VDC Test Site - Chamber 2 Conditions - 24.1°C; 56.7%RH; 997mBar Test Engineer - Matthew McCarthy Date of Test - 7-21-2022
---	---

Frequency (MHz)	Raw Peak Reading (dBµV)	Raw Avg Reading (dBµV)	Correction Factor (dB/m)	Adjusted Peak Amplitude (dBµV/m)	FCC_pt15_20_9_Peak (dBµV/m)	Peak Margin (dB)	Peak Test Results (Pass/Fail)	Worst Peak Margin (dB)	Adjusted Avg Amplitude (dBµV/m)	FCC_pt15_20_9_Average (dBµV/m)	Avg Margin (dB)	Avg Test Results (Pass/Fail)	Worst Avg Margin (dB)	Antenna Height (cm)	EUT Azimuth (degrees)
10532.1	48.4	33.7	6.3	54.7	83.5	-28.8	PASS		40	63.5	-23.5	PASS		150	135
11735.2	46	36.1	7.5	53.5	83.5	-30	PASS		43.6	63.5	-19.9	PASS		175	79
17854.3	42.5	34.7	13.6	56.1	83.5	-27.4	PASS	-27.4	48.3	63.5	-15.2	PASS	-15.2	102	194

6-18GHz Horizontal



6-18GHz Horizontal



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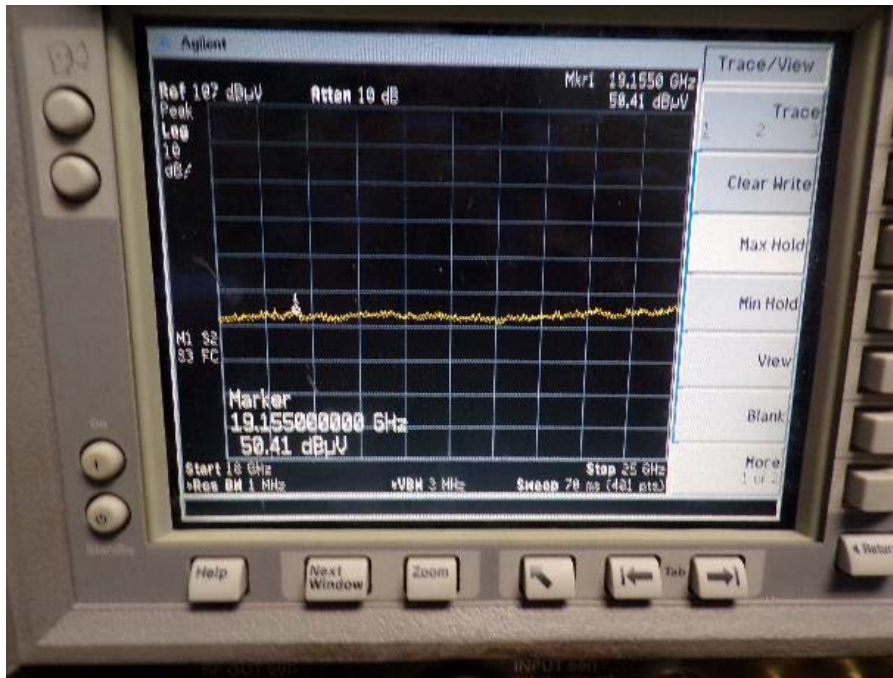
Test Report for ASSA ABLOY AB • Report No. EW0235-7 Issue 5



Radiated Emissions Table

Date: 28-Jul-22		Company: Assa Abloy				Work Order: W0235								
Engineer: Matthew McCarthy		EUT Desc: DR100 Door Relay				EUT Operating Voltage/Frequency: 24VDC								
Temp: 23.3		Humidity: 51%				Pressure: 1003mBar								
Frequency Range: 18-25GHz						Measurement Distance: 0.1 m								
Notes: BLE High						EUT Max Freq: 2480MHz								
Antenna Polarization (H/V)	Frequency (MHz)	Peak Reading (dBµV)	Average Reading (dBµV)	Preamp Factor (dB)	Antenna Factor (dB/m)	Cable Factor (dB)	Adjusted Peak Reading (dBµV/m)	Adjusted Avg Reading (dBµV/m)	15.209			15.209		
									Limit (dBµV/m)	Margin (dB)	Result (Pass/Fail)	Limit (dBµV/m)	Margin (dB)	Result (Pass/Fail)
BLE High Noise Floor	19155.0	50.4	50.4	40.8	40.3	9.1	59.0	59.0	103.5	-44.5	Pass	83.5	-24.5	Pass
Table Result: Pass by -24.5 dB										Worst Freq: 19155.0 MHz				
Test Site: EMI Chamber 2		Cable 1: Asset #2323				Cable 2: ---				Cable 3: ---				
Analyzer: Gold		Preamp: 18-26.5GHz				Antenna: 18-26.5GHz Horn				Preselector: ---				
CSsoft Radiated Emissions Calculator v 1.017.222										Copyright Curtiss-Straus LLC 2000				
Adjusted Reading = Reading - Preamp Factor + Antenna Factor + Cable Factor														

18-25GHz



18-25GHz

BLE 1Mbps GFSK Radiated Band-edge:

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Test Report for ASSA ABLOY AB • Report No. EW0235-7 Issue 5



Radiated Emissions Table														
Date: 19-Jul-22			Company: Assa Abloy						Work Order: W0235					
Engineer: Matthew McCarthy			EUT Desc: DR100 Door Relay						EUT Operating Voltage/Frequency: 24V DC					
Temp: 23.9°C			Humidity: 59%						Pressure: 996mBar					
Frequency Range: Band Edge									Measurement Distance: 3 m					
Notes: EUT Max Freq: 2480														
Antenna Polarization (H/V)	Frequency (MHz)	Peak Reading (dBµV)	Average Reading (dBµV)	Preamp Factor (dB)	Antenna Factor (dB/m)	Cable Factor (dB)	Adjusted Peak Reading (dBµV/m)	Adjusted Avg Reading (dBµV/m)	FCC Class B High Frequency - Peak			FCC Class B High Frequency - Average		
									Limit (dBµV/m)	Margin (dB)	Result (Pass/Fail)	Limit (dBµV/m)	Margin (dB)	Result (Pass/Fail)
BLE Low CH + Zigbee Low Ch														
V	2390.0	54.464	50.2	38.7	32.2	2.8	50.8	46.5	74.0	-23.2	Pass	54.0	-7.5	Pass
H	2390.0	58.802	52.8	38.7	32.2	2.8	55.1	49.1	74.0	-18.9	Pass	54.0	-4.9	Pass
BLE High CH + Zigbee High Ch														
V	2483.5	65.394	51.4	38.8	32.4	3.0	62.0	48.0	74.0	-12.0	Pass	54.0	-6.0	Pass
H	2483.5	64.088	52.6	38.8	32.4	3.0	60.7	49.2	74.0	-13.3	Pass	54.0	-4.8	Pass
Table Result: Pass by -4.8 dB Worst Freq: 2483.5 MHz														
Test Site: EMI Chamber 1			Cable 1: Asset #2583						Cable 2: Asset #2610			Cable 3: Asset #2474		
Analyzer: Asset #2093			Preamp: Asset #8449B						Antenna: Blue Horn					
CSsoft Radiated Emissions Calculator v 1.017.222														
Adjusted Reading = Reading - Preamp Factor + Antenna Factor + Cable Factor														
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In addition, 2.2GHz to 2.8GHz notch filter range was checked for emissions and no emissions were found.



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Test Report for ASSA ABLOY AB • Report No. EW0235-7 Issue 5



4 PHOTOGRAPHS OF THE TEST CONFIGURATION

Please refer to the Test Setup Photos exhibit.



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Test Report for ASSA ABLOY AB • Report No. EW0235-7 Issue 5



5 APPENDIX A – MODIFICATIONS

No modifications were made to the EUT during testing.

---END OF REPORT---