

FCC

RF

TEST REPORT

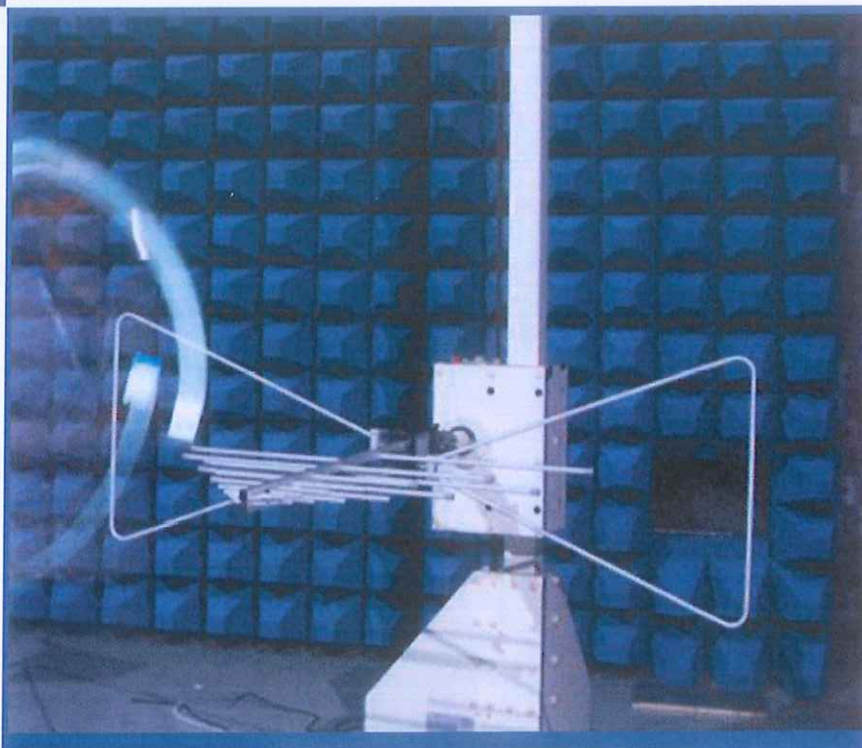
ISSUED BY
Shenzhen BALUN Technology Co., Ltd.



FOR
TPMS Activation and Diagnostic Tool

ISSUED TO
Launch Tech Co., Ltd

Launch Industrial Park, North of Wuhe Rd., Banxuegang, Longgang,
Shenzhen, Guangdong, P. R. China



Tested by: Hu Chao

Hu Chao

(Engineer)

Date Nov. 01, 2017

Approved by: Wei Yanquan

Wei Yanquan

(Chief Engineer)

Date Nov. 01, 2017

Report No.: BL-SZ1790069-601

EUT Name: TPMS Activation and Diagnostic Tool

Model Name: Creader 971

Brand Name: LAUNCH

Test Standard: FCC Part 15 C

FCC ID: XUJCR971

Test conclusion: Pass

Test Date: Sep. 13, 2017 ~ Sep. 20, 2017

Date of Issue: Nov. 01, 2017

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Revision History

Version	Issue Date	Revisions
<u>Rev. 01</u>	<u>Oct. 27, 2017</u>	<u>Initial Issue</u>
<u>Rev. 02</u>	<u>Nov.01, 2017</u>	<u>Clarify the item in ten chamber on page 17.Describe the calculation method of limit for different test distance in detail on page 13.</u>

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1 GENERAL INFORMATION

1.1 Identification of the Testing Laboratory

Company Name	Shenzhen BALUN Technology Co., Ltd.
Address	Block B, 1st FL, Baisha Science and Technology Park, Shahe Xi Road, Nanshan District, Shenzhen, Guangdong Province, P. R. China
Phone Number	+86 755 6685 0100

1.2 Identification of the Responsible Testing Location

Test Location	Shenzhen BALUN Technology Co., Ltd.
Address	Block B, 1st FL, Baisha Science and Technology Park, Shahe Xi Road, Nanshan District, Shenzhen, Guangdong Province, P. R. China
Accreditation Certificate	<p>The laboratory has been listed by Industry Canada to perform electromagnetic emission measurements. The recognition numbers of test site are 11524A-1.</p> <p>The laboratory is a testing organization accredited by FCC as a accredited testing laboratory. The designation number is CN1196.</p> <p>The laboratory is a testing organization accredited by American Association for Laboratory Accreditation(A2LA) according to ISO/IEC 17025.The accreditation certificate is 4344.01.</p> <p>The laboratory is a testing organization accredited by China National Accreditation Service for Conformity Assessment (CNAS) according to ISO/IEC 17025. The accreditation certificate number is L6791.</p>
Description	All measurement facilities used to collect the measurement data are located at Block B, FL 1, Baisha Science and Technology Park, Shahe Xi Road, Nanshan District, Shenzhen, Guangdong Province, P. R. China 518055

1.3 Laboratory Condition

Ambient Temperature	20°C~25°C
Ambient Relative Humidity	45% - 55%
Ambient Pressure	100 kPa - 102 kPa

1.4 Announce

- (1) The test report reference to the report template version v2.4.
- (2) The test report is invalid if not marked with the signatures of the persons responsible for preparing and approving the test report.
- (3) The test report is invalid if there is any evidence and/or falsification.
- (4) The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein.
- (5) This document may not be altered or revised in any way unless done so by BALUN and all revisions are duly noted in the revisions section.

- (6) Content of the test report, in part or in full, cannot be used for publicity and/or promotional purposes without prior written approval from the laboratory.

2 PRODUCT INFORMATION

2.1 Applicant Information

Applicant	Launch Tech Co., Ltd
Address	Launch Industrial Park, North of Wuhe Rd., Banxuegang, Longgang, Shenzhen, Guangdong, P. R. China

2.2 Manufacturer Information

Manufacturer	Launch Tech Co., Ltd
Address	Launch Industrial Park, North of Wuhe Rd., Banxuegang, Longgang, Shenzhen, Guangdong, P. R. China

2.3 Factory Information

Factory	N/A
Address	N/A

2.4 General Description for Equipment under Test (EUT)

EUT Type	TPMS Activation and Diagnostic Tool
Model Name Under Test	Creader 971
Series Model Name	Creader 971, Millennium TSAP
Description of Model name differentiation	TPMS Activation and Diagnostic Tool, the difference between Model Creader 971 and Millennium TSAP is only model name. The schematic and PCB Layout are the same.
Hardware Version	V1.00.002
Software Version	V02.38
Network and Wireless connectivity	315MHz, 433MHz, 125KHz

2.5 Ancillary Equipment

Ancillary Equipment 1	Battery	
	Brand Name	N/A
	Model No.	493667
	Serial No.	N/A
	Capacitance	3100 mAh
	Rated Voltage	3.8 V
	Limit Charge Voltage	4.35 V
Ancillary Equipment 2	Adapter	
	Brand Name	N/A
	Model No.	K05100-23
	Serial No.	N/A
	Rated Input	100-240 V~, 0.25 A, 50/60 Hz
	Rated Output	5 V _{DC} , 1.0 A
Ancillary Equipment 3	USB Cable	
	Length (Approx.)	0.8 m
Ancillary Equipment 4	Diagnosis of Line	
	Length (Approx.)	1.0 m

2.6 Technical Information

The requirement for the following technical information of the EUT was tested in this report:

Operating Frequency	110~205 kHz
Product Type	<input type="checkbox"/> Mobile <input checked="" type="checkbox"/> Portable <input type="checkbox"/> Fix Location
Antenna Type	spring loaded antenna
Antenna Gain	0 dBi
About Product	The EUT support the QI and PMA technology, and they have the same operating frequency.

3 SUMMARY OF TEST RESULTS

3.1 Test Standards

No.	Identity	Document Title
1	47 CFR Part 15, Subpart C (10-1-15 Edition)	Intentional Radiators
2	ANSI C63.10-2013	American National Standard for Testing Unlicensed Wireless Devices

3.2 Verdict

No.	Description	FCC Rule	Test Verdict	Result
1	Radiated Emission	15.209,15.215(b)	Pass	Annex A.1
2	Conducted Emission, AC Ports	15.207	Pass	Annex A.2
3	20 dB Bandwidth	15.215(c)	Pass	Annex A.3

3.3 Test Uncertainty

The following measurement uncertainty levels have been estimated for tests performed on the EUT as specified in CISPR 16-4-2. This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of $k=2$.

Measurement	Value
Conducted emissions (9 kHz-30 MHz)	3.23 dB
Radiated emissions (30 MHz-1 GHz)	4.30 dB
Radiated emissions (1 GHz-18 GHz)	4.81 dB

4 GENERAL TEST CONFIGURATIONS

4.1 Test Environments

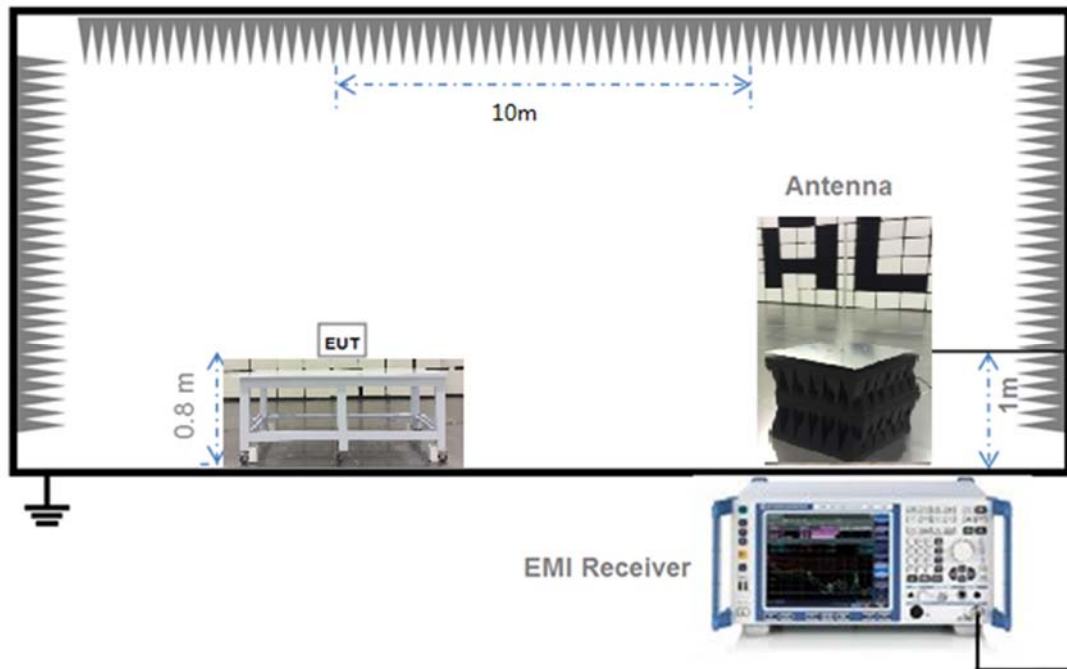
Relative Humidity	45% - 55%	
Atmospheric Pressure	100 kPa - 102 kPa	
Temperature	NT (Normal Temperature)	+22°C to +25°C
Working Voltage of the EUT	NV (Normal Voltage)	12 V

4.2 Test Equipment List

Description	Manufacturer	Model	Serial No.	Cal. Date	Cal. Due
EMI Receiver	ROHDE&SCHWARZ	ESRP	101036	2017.06.22	2018.06.21
Test Antenna-Rod(9 kHz-30 MHz)	SCHWARZBECK	VAMP 9243	9243-556	2017.06.22	2018.06.21
Test Antenna-Bi-Log(30 MHz-3 GHz)	SCHWARZBECK	VULB 9163	9163-624	2017.06.22	2018.06.21
Anechoic Chamber	EMC Electronic Co., Ltd	20.10*11.60*7.35m	N/A	2016.08.09	2018.08.08
EMI Receiver	ROHDE&SCHWARZ	ESRP	101036	2017.06.22	2018.06.21
LISN	SCHWARZBECK	NSLK 8127	8127-687	2017.06.22	2018.06.21
Shielded Enclosure	ChangNing	CN-130701	130703	N/A	N/A

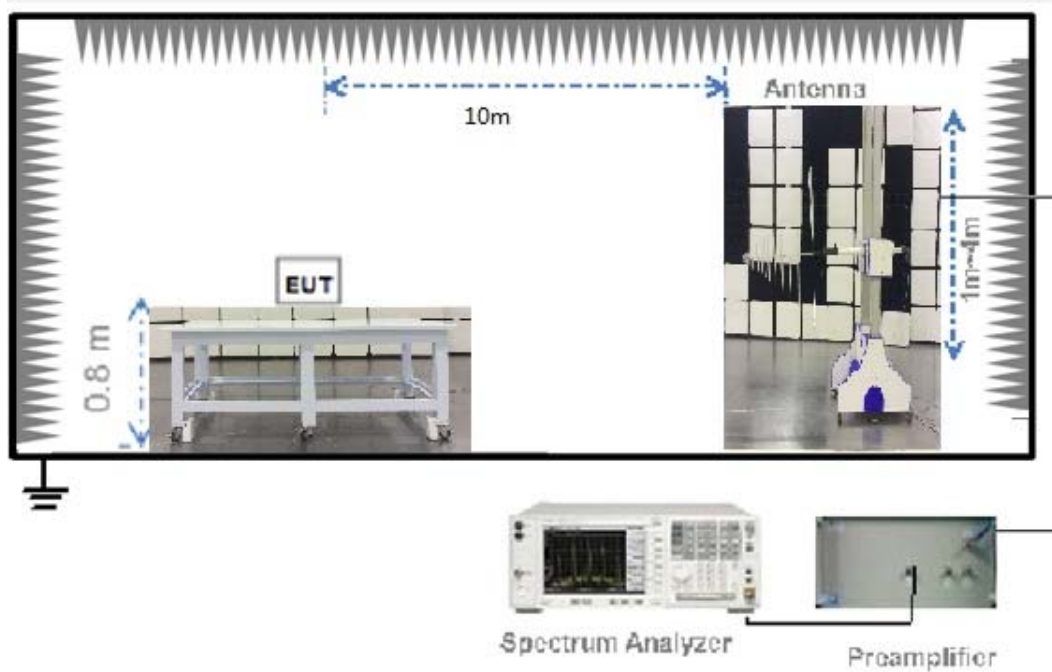
4.3 Test Setups

Test Setup 1



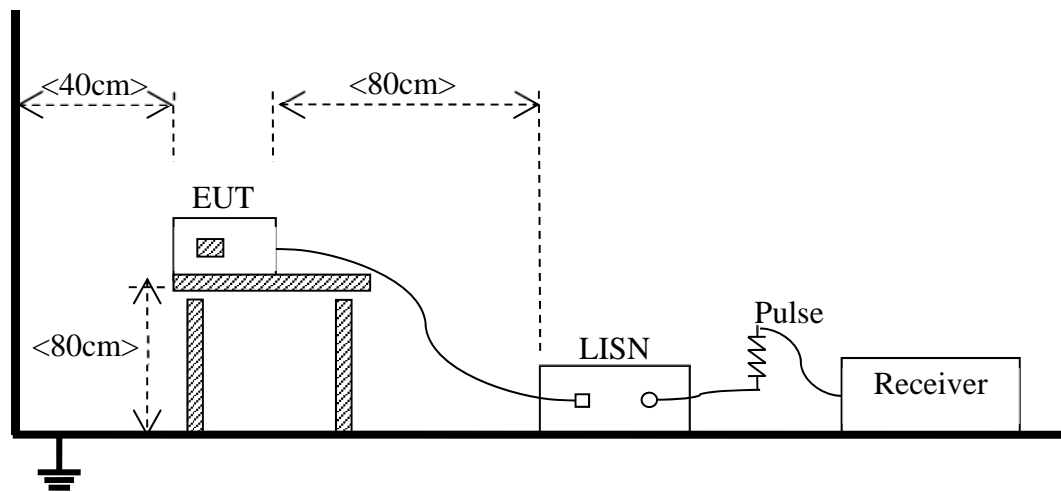
For Radiated Emission Test (Below 30 MHz))

Test Setup 2



(For Radiated Emission Test (30 MHz-1 GHz))

Test Setup 3



(For Conducted Emission, AC Ports Test)

5 TEST ITEMS

5.1 Emission Tests

5.1.1 Radiated Emission

5.1.1.1 Limit

Frequency (MHz)	Field Strength ($\mu\text{V/m}$)	Measurement Distance (m)
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:

- 1) Field Strength (dB $\mu\text{V/m}$) = $20 \cdot \log [\text{Field Strength } (\mu\text{V/m})]$.
- 2) In the emission tables above, the tighter limit applies at the band edges.
- 3) For above 1000 MHz, limit field strength of harmonics: 54 dB $\mu\text{V/m}$ @3 m (AV) and 74 dB $\mu\text{V/m}$ @3 m (PK)
- 4) At frequencies below 30 MHz, measurements may be performed at a distance closer than that specified in the regulations, when performing measurements at a closer distance than specified, the results shall be extrapolated to the specified distance by either making measurements at a minimum of two distances on at least one radial to determine the proper extrapolation factor or by using the square of an inverse linear distance extrapolation factor (40 dB/decade). For example, at the frequency 9 kHz, limit @10m = $20 \cdot \log (2400/f) + 40 \log (d_{\text{limit}}/d_{\text{measure}})$ where limit = 300m, $d_{\text{measure}}=10\text{m}$. limit @10m = $20 \cdot \log (2400/9) + 40 \log (300/10) = 107.5$ (dB $\mu\text{V/m}$).
- 5) At frequencies at or above 30 MHz, measurements may be performed at a distance other than what is specified provided, When performing measurements at a distance other than that specified, the results shall be extrapolated to the specified distance using an extrapolation factor of 20 dB/decade (inverse linear-distance for field strength measurements; inverse-linear-distance-squared for power density measurements). For example, at the frequency 30 MHz, limit @10m = $20 \cdot \log (100) + 20 \log (d_{\text{limit}}/d_{\text{measure}})$ where limit = 3m, $d_{\text{measure}}=10\text{m}$. limit @10m = $20 \cdot \log (100) + 20 \log (3/10) = 29.5$ (dB $\mu\text{V/m}$).

5.1.1.2 Test Setup

Refer to 4.3 section (test setup 1 to test setup 2) for radiated emission test, the photo of test setup please refer to ANNEX B.

5.1.1.3 Test Procedure

All Spurious Emission tests were performed in X, Y, Z axis direction. And only the worst axis test condition was recorded in this test report.

An initial pre-scan was performed in the chamber using the EMI Receiver in peak detection mode. Quasi-peak measurements were conducted based on the peak sweep graph. The EUT was measured by Bi-Log antenna with 2 orthogonal polarities.

5.1.1.4 Test Result

Please refer to ANNEX A.1.

5.1.2 Conducted Emission

5.1.2.1 Test Limit

Frequency range (MHz)	Conducted Limit (dB μ V)	
	Quasi-peak	Average
0.15 - 0.50	66 to 56	56 to 46
0.50 - 5	56	46
5 - 30	60	50

NOTE:

- 1) The limit is applicable to Class B ITE.
- 2) The lower limit shall apply at the band edges.
- 3) The limit decreases linearly with the logarithm of the frequency in the range 0.15 - 0.50 MHz.

5.1.2.2 Test Setup

Refer to 4.3 section test (test setup 3) for conducted emission, the photo of test setup please refer to ANNEX B.

5.1.2.3 Test Procedure

The EUT is connected to the power mains through a LISN which provides 50 Ω /50 μ H of coupling impedance for the measuring instrument. The test frequency range is from 150 kHz to 30 MHz. The maximum conducted interference is searched using Peak (PK), Quasi-peak (QP) and Average (AV) detectors; the emission levels that are more than the AV and QP limits, and that have narrow margins from the AV and QP limits will be re-measured with AV and QP detectors. Tests for both L phase and N phase lines of the power mains connected to the EUT are performed.

Devices subject to Part 15 must be tested for all available U.S. voltages and frequencies (such as a nominal 120 VAC, 50/60 Hz and 240 VAC, 50/60 Hz) for which the device is capable of operation. A device rated for 50/60 Hz operation need not be tested at both frequencies provided the radiated and line conducted emissions are the same at both frequencies.

5.1.2.4 Test Result

Please refer to ANNEX A.2.

5.1.3 20 dB Bandwidth

5.1.3.1 Limit

FCC §15.215(c)

The 20 dB bandwidth is known as the 99% emission bandwidth, or 20 dB bandwidth ($10 \cdot \log 1\% = 20$ dB) taking the total RF output power.

5.1.3.2 Test Setup

Refer to 4.3 section test (test setup 1) for test setup description for the antenna port. The photo of test setup please refer to ANNEX B.

5.1.3.3 Test Procedure

Use the following spectrum analyzer settings:

Span = approximately 2 to 3 times the 20 dB bandwidth, centered on a hopping channel

RBW \geq 1% of the 20 dB bandwidth

VBW \geq RBW

Sweep = auto

Detector function = peak

Trace = max hold

The EUT should be transmitting at its maximum data rate, Allow the trace to stabilize.

5.1.3.4 Test Result

Please refer to ANNEX A.3.

ANNEX A TEST RESULTS

A.1 Radiated Emission

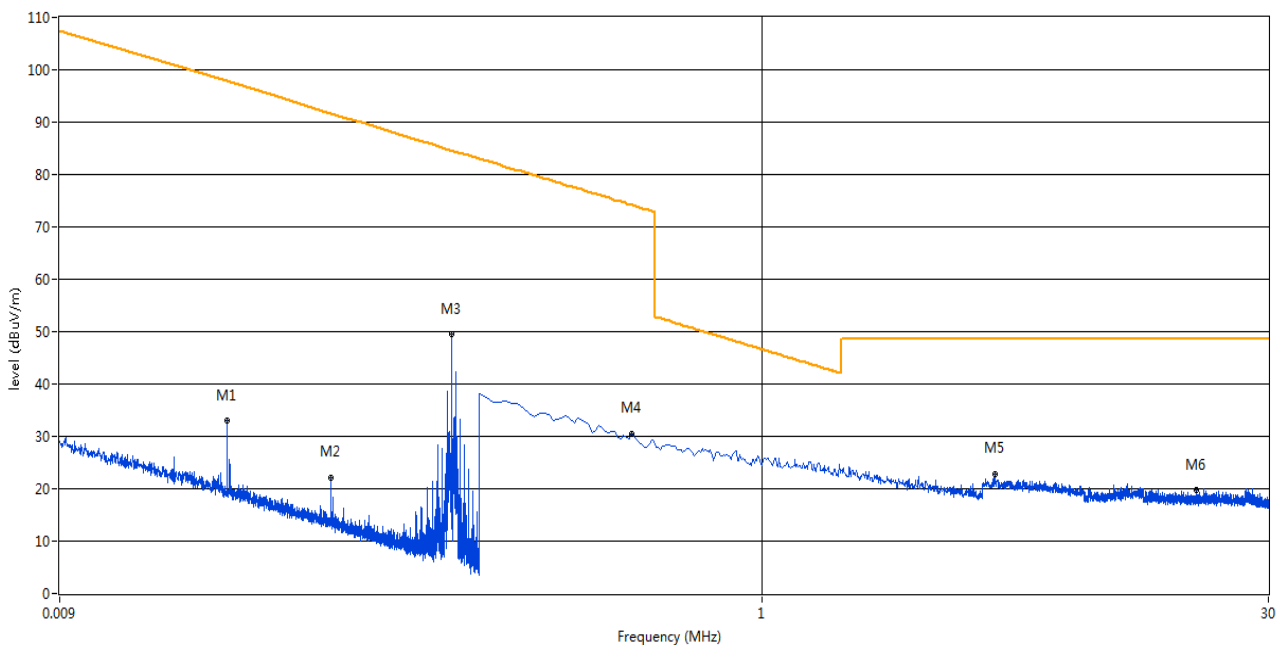
Note¹: The symbol of “--” in the table which means not application.

Note²: For the test data above 1 GHz, according the ANSI C63.4-2014, where limits are specified for both average and peak (or quasi-peak) detector functions, if the peak (or quasi-peak) measured value complies with the average limit, it is unnecessary to perform an average measurement.

Note³: The test item is carried out at 10m chamber.

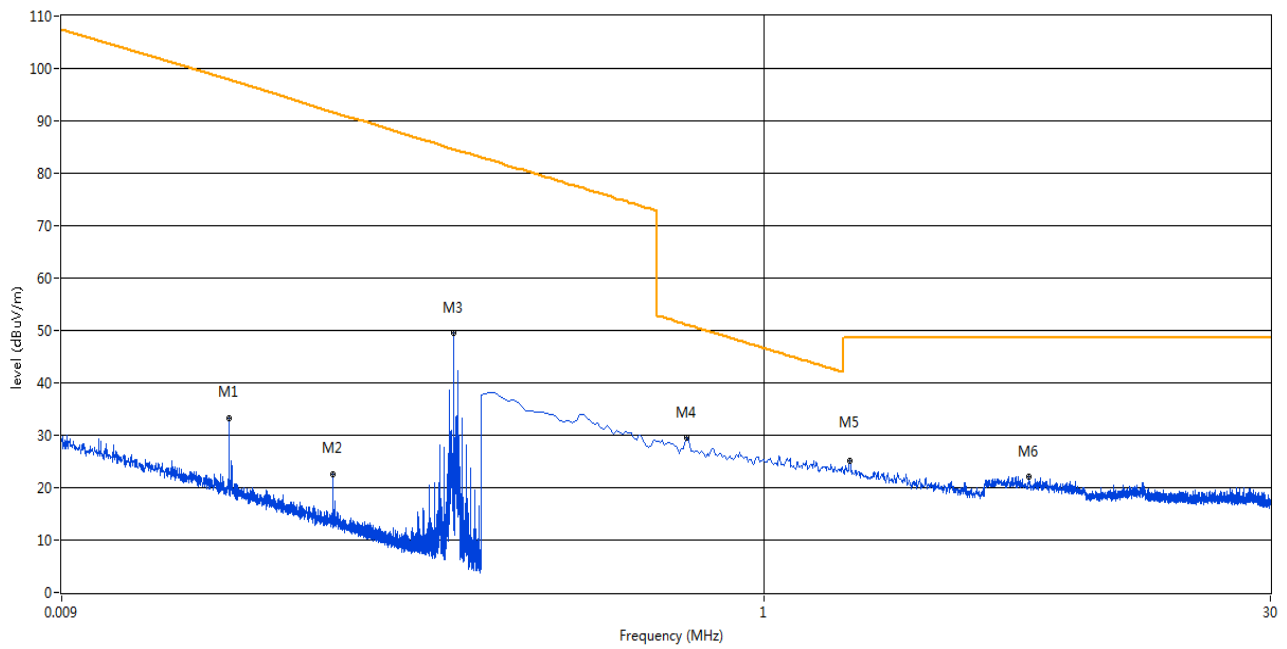
Test Data and Plots

A.1.1 Test Antenna Vertical, 9 kHz –30 MHz



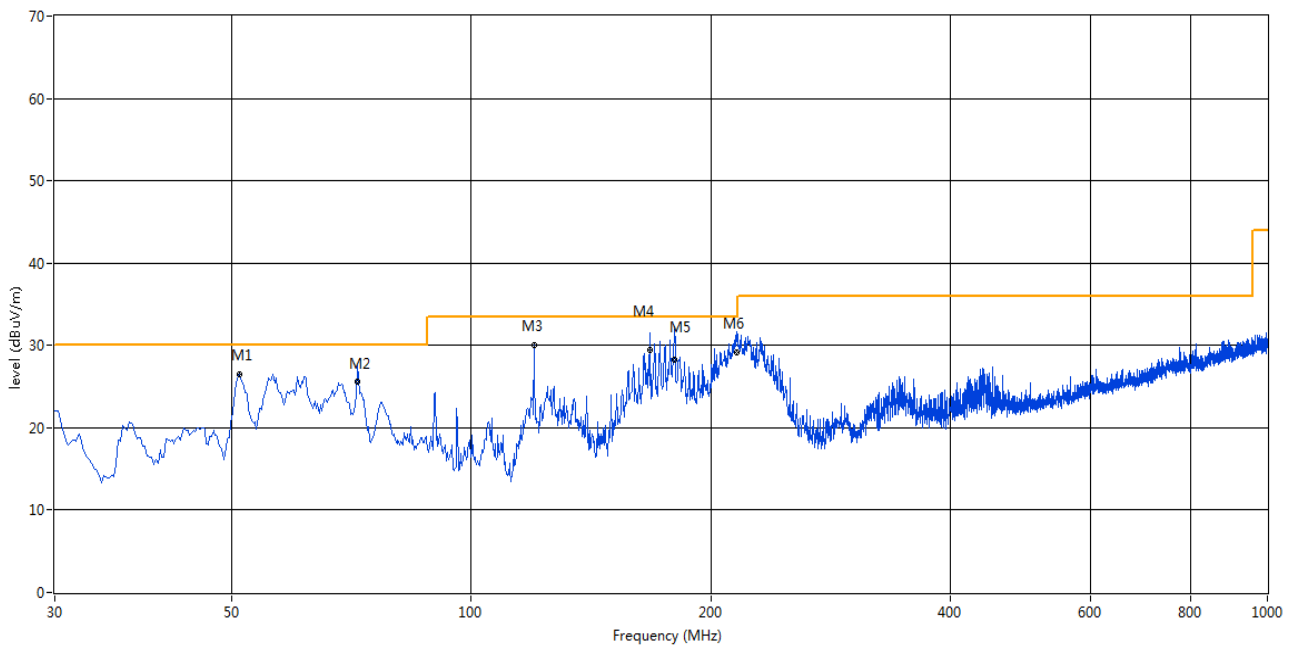
No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Margin (dB)	Detector	Table (o)	Height (cm)	ANT	Verdict
1	0.028	33.06	10.69	97.8	64.74	Peak	268.00	100	Vertical	Pass
2	0.055	22.03	10.61	91.7	69.67	Peak	152.00	100	Vertical	Pass
3	0.125	49.53	10.41	84.6	35.07	Peak	0.00	100	Vertical	N/A
4	0.419	30.38	10.14	74.1	43.72	Peak	44.00	100	Vertical	Pass
5	4.776	22.78	9.99	48.5	25.72	Peak	359.00	100	Vertical	Pass
6	18.503	19.66	10.15	48.5	28.84	Peak	291.00	100	Vertical	Pass

A.1.2 Test Antenna Horizontal, 9 kHz –30 MHz



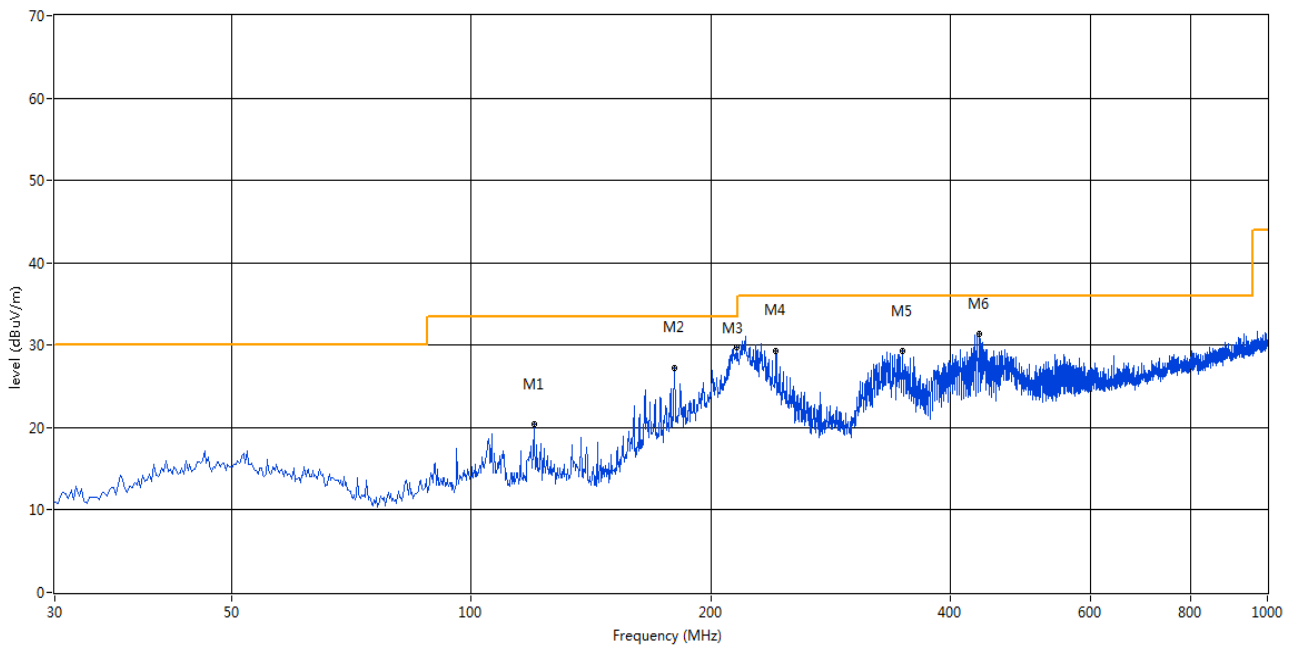
No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Margin (dB)	Detector	Table (o)	Height (cm)	ANT	Verdict
1	0.028	33.34	10.69	97.8	64.46	Peak	165.00	100	Horizontal	Pass
2	0.055	22.63	10.61	91.7	69.07	Peak	138.00	100	Horizontal	Pass
3	0.125	49.49	10.41	84.6	35.11	Peak	360.00	100	Horizontal	N/A
4	0.598	29.52	10.09	51.0	21.48	Peak	154.00	100	Horizontal	Pass
5	1.784	25.08	9.98	48.5	23.42	Peak	99.00	100	Horizontal	Pass
6	5.939	22.04	10.03	48.5	26.46	Peak	113.00	100	Horizontal	Pass

A.1.3 Test Antenna Horizontal, 30 MHz – 1 GHz



No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Margin (dB)	Detector	Table (o)	Height (cm)	ANT	Verdict
1	51.097	26.50	-19.07	30.0	3.50	Peak	10.00	200	Vertical	Pass
2	72.002	27.28	-23.66	30.0	2.72	Peak	0.00	232	Vertical	N/A
2*	72.002	25.57	-23.66	30.0	4.43	QP	0.00	232	Vertical	Pass
3	119.967	30.06	-21.74	33.5	3.44	Peak	251.00	100	Vertical	Pass
4	167.768	33.63	-22.27	33.5	-0.13	Peak	212.00	135	Vertical	N/A
4*	167.768	29.51	-22.27	33.5	3.99	QP	212.00	135	Vertical	Pass
5	180.529	32.23	-21.49	33.5	1.27	Peak	181.00	152	Vertical	N/A
5*	180.529	28.33	-21.49	33.5	5.17	QP	181.00	152	Vertical	Pass
6	215.881	33.98	-19.40	33.5	-0.48	Peak	165.00	118	Vertical	N/A
6*	215.881	29.15	-19.40	33.5	4.35	QP	165.00	118	Vertical	Pass

A.1.4 Test Antenna Horizontal, 30 MHz – 1 GHz



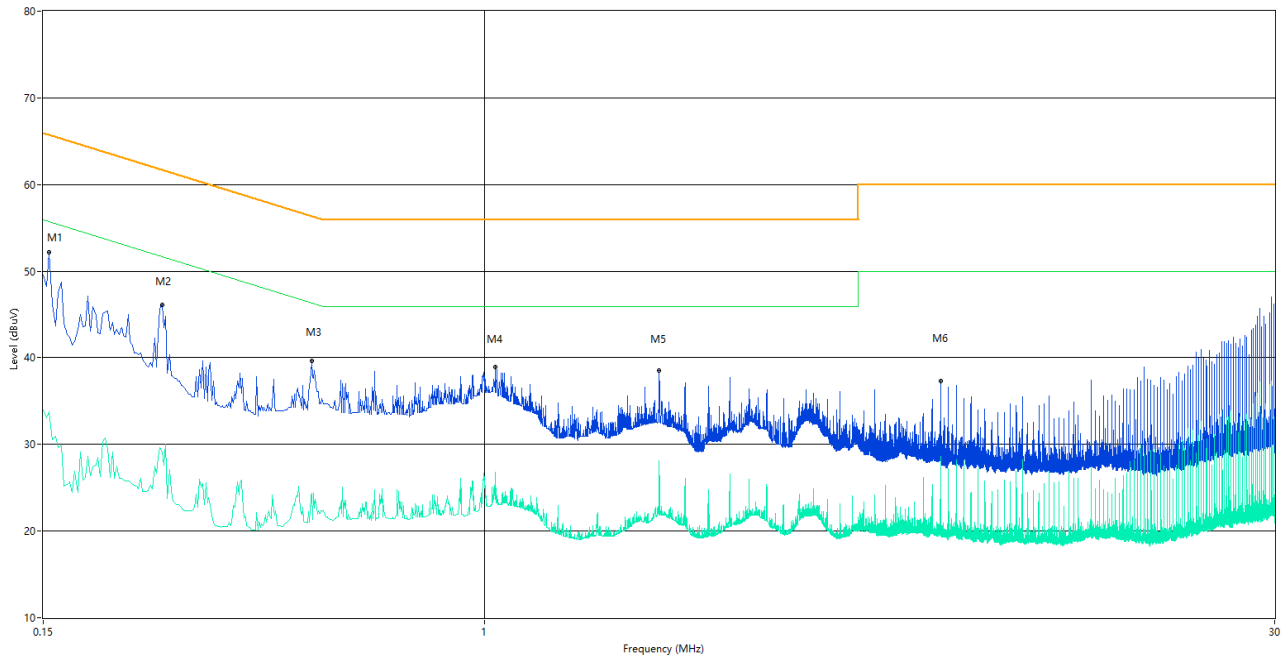
No.	Frequency (MHz)	Results (dBuV/m)	Factor (dB)	Limit (dBuV/m)	Margin (dB)	Detector	Table (o)	Height (cm)	ANT	Verdict
1	119.967	20.48	-21.74	33.5	13.02	Peak	325.00	300	Horizontal	Pass
2	180.108	27.21	-21.49	33.5	6.29	Peak	229.00	300	Horizontal	Pass
3	215.512	29.67	-19.41	33.5	3.83	Peak	99.00	300	Horizontal	Pass
4	241.460	29.26	-18.04	36.0	6.74	Peak	99.00	300	Horizontal	Pass
5	348.402	29.25	-14.57	36.0	6.75	Peak	80.00	200	Horizontal	Pass
6	434.975	31.37	-12.94	36.0	4.63	Peak	247.00	200	Horizontal	Pass

A.2 Conducted Emission

Note: Devices subject to Part 15 must be tested for all available U.S. voltages and frequencies (such as a nominal 120 VAC, 50/60 Hz and 240 VAC, 50/60 Hz) for which the device is capable of operation. So, The configuration 120 VAC, 60 Hz and 240 VAC, 50 Hz were tested respectively, but only the worst configuration (120 VAC, 60 Hz) shown here.

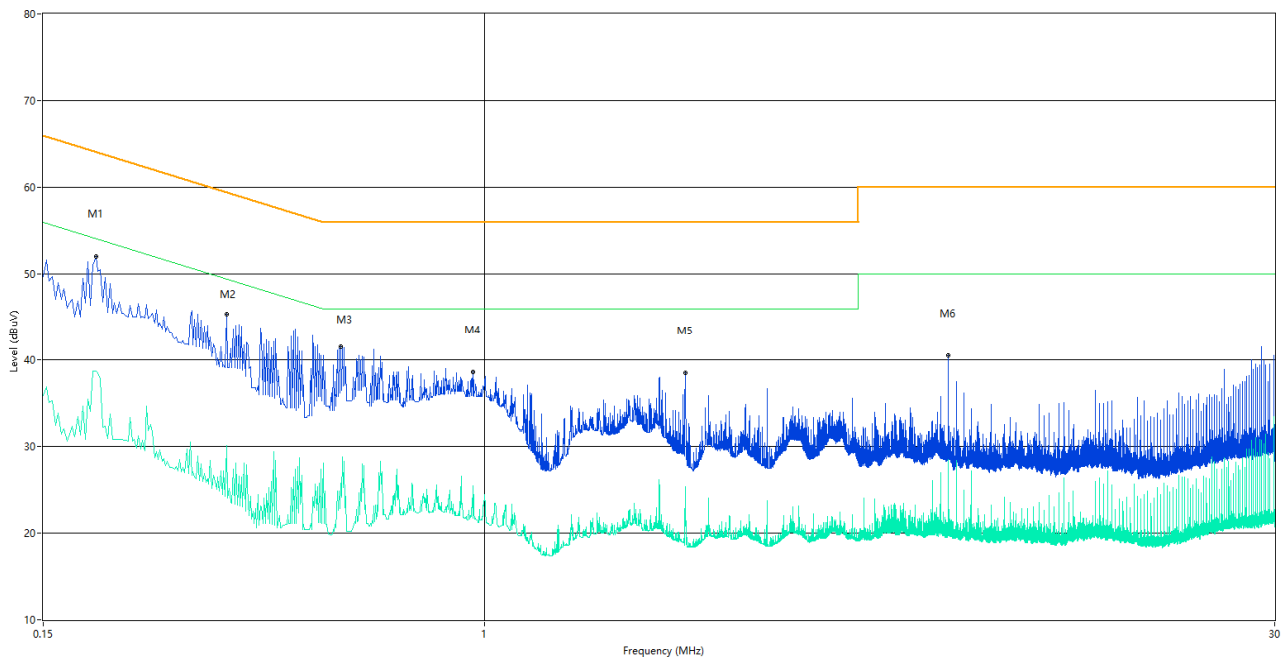
Test Data and Plots

A.2.1 L Phase



No.	Frequency (MHz)	Results (dBuV)	Factor (dB)	Limit (dBuV)	Margin (dB)	Detector	Line	Verdict
1	0.154	52.3	9.99	65.8	13.50	Peak	L Line	Pass
1**	0.154	33.7	9.99	55.8	22.10	AV	L Line	Pass
2	0.250	46.2	9.00	61.8	15.60	Peak	L Line	Pass
2**	0.250	29.1	9.00	51.8	22.70	AV	L Line	Pass
3	0.476	39.6	11.04	56.4	16.80	Peak	L Line	Pass
3**	0.476	24.3	11.04	46.4	22.10	AV	L Line	Pass
4	1.050	38.9	10.10	56.0	17.10	Peak	L Line	Pass
4**	1.050	26.8	10.10	46.0	19.20	AV	L Line	Pass
5	2.124	38.5	10.39	56.0	17.50	Peak	L Line	Pass
5**	2.124	28.1	10.39	46.0	17.90	AV	L Line	Pass
6	7.122	37.3	10.16	60.0	22.70	Peak	L Line	Pass
6**	7.122	26.1	10.16	50.0	23.90	AV	L Line	Pass

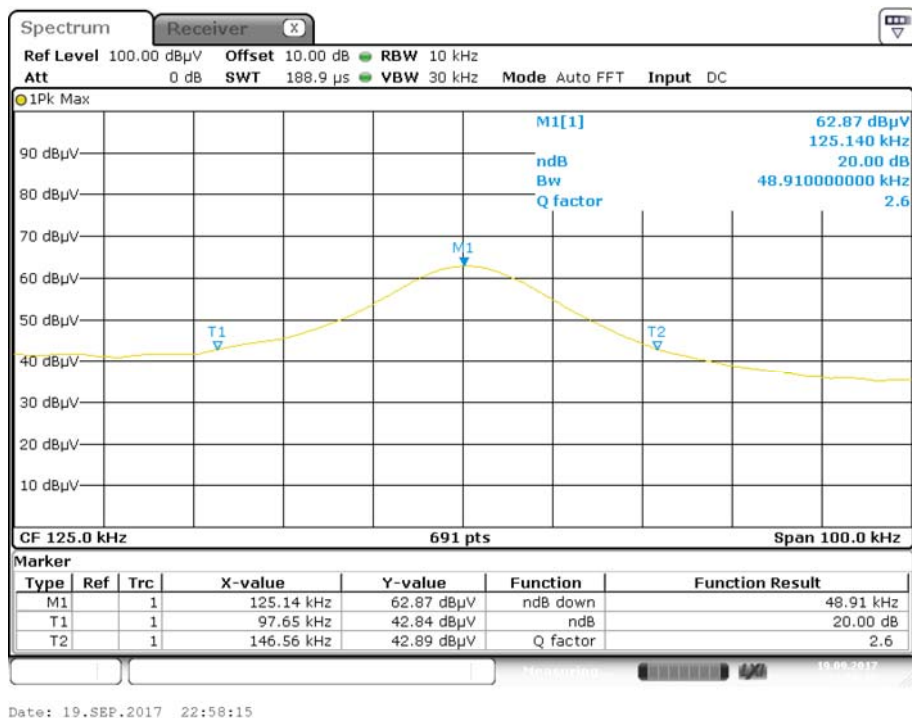
A.2.2 N Phase



No.	Frequency (MHz)	Results (dBuV)	Factor (dB)	Limit (dBuV)	Margin (dB)	Detector	Line	Verdict
1	0.188	52.0	9.49	64.1	12.10	Peak	N Line	Pass
1**	0.188	38.7	9.49	54.1	15.40	AV	N Line	Pass
2	0.330	45.4	11.05	59.5	14.10	Peak	N Line	Pass
2**	0.330	30.1	11.05	49.5	19.40	AV	N Line	Pass
3	0.540	41.6	9.22	56.0	14.40	Peak	N Line	Pass
3**	0.540	25.8	9.22	46.0	20.20	AV	N Line	Pass
4	0.954	38.5	10.22	56.0	17.50	Peak	N Line	Pass
4**	0.954	25.4	10.22	46.0	20.60	AV	N Line	Pass
5	2.378	38.5	10.51	56.0	17.50	Peak	N Line	Pass
5**	2.378	20.9	10.51	46.0	25.10	AV	N Line	Pass
6	7.374	40.5	10.05	60.0	19.50	Peak	N Line	Pass
6**	7.374	28.5	10.05	50.0	21.50	AV	N Line	Pass

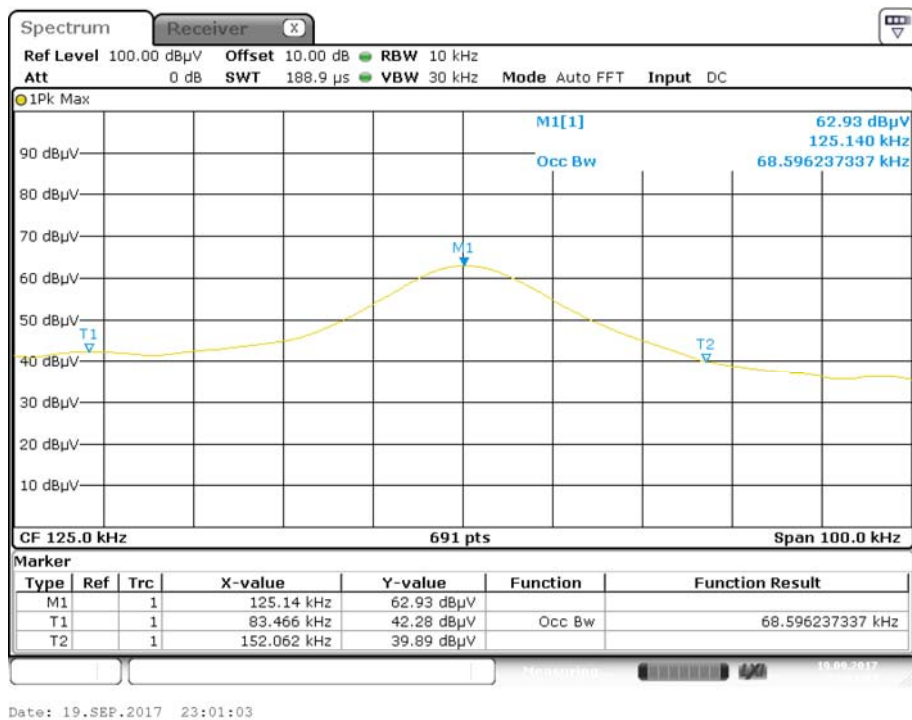
A.3 20 dB Bandwidth

Test Data and Plots



99% Occupied Bandwidth

Test Data and Plots



ANNEX B TEST SETUP PHOTOS

Please refer the document “BL-SZ1790069-AR.PDF”.

ANNEX C EUT EXTERNAL PHOTOS

Please refer the document “BL-SZ1790069-AW.PDF”.

ANNEX D EUT INTERNAL PHOTOS

Please refer the document “BL-SZ1790069-AI.PDF”.

--END OF REPORT--