



Report No.SH16030055E02

FCC EMC TEST REPORT

Issued to

TRIMBLE EUROPE B.V.

For

Rugged Smart Phone

Model Name : MobileMapper50_WiFi
Trade Name : Spectra Precision
Brand Name : Spectra Precision
Standard : 47 CFR Part 15 Subpart B
FCC ID : NZI-10900310
IC ID : 9288A-10900310
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by

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Change History

Issue	Date	Reason for change
1.0	Apr.15,2016	First edition



1. **General Information**

1.1 Applicant

TRIMBLE EUROPE B.V.

European Regional Fulfilment Centre Meerheide, 45 5521DZ Eersel THE NETHERLANDS

1.2 Manufacturer

TRIMBLE EUROPE B.V.

European Regional Fulfilment Centre Meerheide, 45 5521DZ Eersel THE NETHERLANDS



1.3 Description of EUT

EUT Type: Rugged Smart Phone
Brand Name.....: MobileMapper50_WiFi
Trade Name: Spectra Precision
Model Name: MobileMapper50_4G
Hardware Version.....: MM50.WiFi_V1.0
Software Version: MM50.WiFi.16.22.11
Extreme Voltages.....: High: 4.2V; Low:3.6V; Norm: 3.8V

For a more detailed description, please refer to Specification or User's Manual supplied by the applicant and/or manufacturer.



2. Facilities and Accreditations

2.1 Test Facility

Shanghai Skylabs Co., Ltd. Morlab Laboratory is a third party testing organization accredited by China National Accreditation Service for Conformity Assessment (CNAS) according to ISO/IEC 17025. The accreditation certificate number is L6644. A 9*6*6(m) fully anechoic chamber was used for the radiated spurious emissions test.

2.2 Environmental Conditions

Ambient temperature: 15~35°C

Relative humidity: 30~60%

Atmosphere pressure: 86-106kPa

2.3 Measurement Uncertainty

The uncertainty is calculated using the methods suggested in the "Guide to the Expression of Uncertainty in Measurement" (GUM) published by ISO.

Uncertainty of Conducted Emission: ± 1.76 dB

Uncertainty of Radiated Emission: ± 3.16 dB



2.4 List of Equipments Used

Description	Manufacturer	Model	Serial No.	Cal.Date	Cal.Due
Shielding Room	CHENGYU	5m×4m×3m	CR	2015.09.13	2year
EMI Test Receiver	R&S	ESCI7	100787	2015.8.5	1year
Artificial Mains Network	TESEQ	NNB 51	33285	2016.02.24	1year
3m Semi-anechoic Chamber	CHENGYU	9.2×6.25×6.15 m	SAR	2015.09.13	2year
Broadband Log Antenna	Schwarzbeck	VULB 9163	9163-561	2015.07.24	2year
Broadband Horn Antenna	Schwarzbeck	BBHA 9120 D	9120D-1033	2015.07.24	2year
Power Supplier	NF	ES2000S	9087735	2015.09.25	1year
Laptop	ACER	Aspire 4376ZG	LXPFY0C00 49352912216 01	/	
Laptop Adapter	LITEON	PA-1650-22	9801016502	/	
USB Data Cable	/	/	/	/	

NOTE:

Equipments listed above have been calibrated and are in the period of validation.



2.5 Test Standards and Results

The objective of the report is to perform testing according to 47 CFR Part 15 Subpart B:

No.	Identity	Document Title
1	47 CFR Part 15	Radio Frequency Devices

Test detailed items/section required by FCC rules and results are as below:

No.	Section	Description	Result
1	15.107 (a)	Conducted Emission	PASS
2	15.109 (a)	Radiated Emission	PASS
3	ANSI C63.4-2014	Radiated Emission	PASS



3. Test Conditions Setting

3.1 Test Mode

Before the measurement, the lithium battery was completely discharge. During the measurement, the lithium battery and the charger were installed, and the MS were in charging state

Mode 1: Traffic operating USB data transfer Mode

In this test mode, the EUT with a TransFlash Card embedded is connected with a PC via a special USB cable supplied by applicant. During the measurement, a communication link was established between the EUT and a System Simulator (SS), simultaneity, the date is transmitting between the PC and the TransFlash Card of the EUT

NOTE:

All configurations and test modes are performed, only the worst case is recorded in this report.



4. Emission Tests

4.1 Conducted Emission Measurement

4.1.1 Limits of Conducted Emission:

According to FCC section 15.107, the radio frequency voltage that is conducted back onto the AC power line on any frequency within the band 150kHz to 30MHz shall not exceed the limits in the following table, as measured using a 50 μ H/50 Ω line impedance stabilization network (LISN).

Frequency (MHz)	CLASS B (dBuV)	
	Quasi-peak	Average
0.15 - 0.5	66 - 56	56 - 46
0.50 - 5.0	56	46
5.0 - 30.0	60	50

NOTE:

(1) The lower limit shall apply at the band edges.

(2) The limit decreases linearly with the logarithm of the frequency in the range 0.15 - 0.50MHz.

4.1.2 Test Procedure

The EUT and support equipment, if needed, were set up as per the test configuration to simulate typical usage per the user's manual. When the EUT is a tabletop system, a wooden table with a height of 0.8 meters is used and is placed on the ground plane as per ANSI C63.4 (see Test Facility for the dimensions of the ground plane used). When the EUT is a floor standing equipment, it is placed on the ground plane, which has a 3-12 mm non-conductive covering to insulate the EUT from the ground plane.

All I/O cables were positioned to simulate typical actual usage as per ANSI C63.4.

EUT connected to Class B Computer/Laptop via USB data cable and data exchange mode. The Computer/Laptop installed by US power 120V/60Hz, through a Line Impedance Stabilization Network (LISN), which was supplied power source and was grounded to the ground plane.

The test program of the EUT was started. Emissions were measured on each current carrying line of the EUT using an EMI Test Receiver connected to the LISN powering the EUT.

The Receiver scanned from 150kHz to 30MHz for emissions in each of the test modes.

During the above scans, the emissions were maximized by cable manipulation.

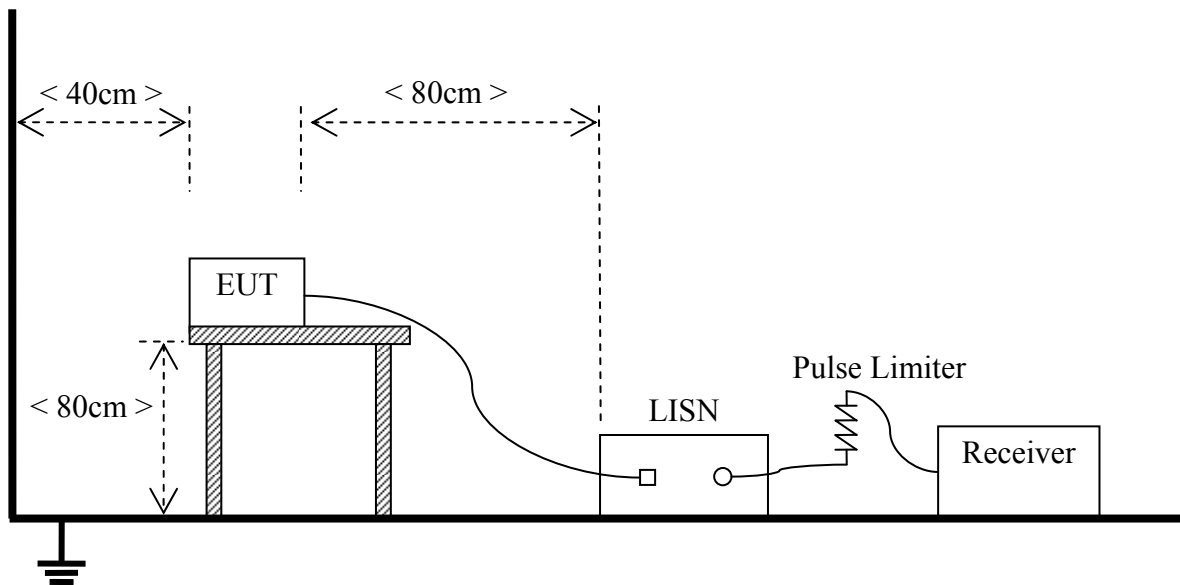
The test mode(s) described in Item 3.1 were scanned during the preliminary test.

After the preliminary scan, we found the test mode described in Item 3.1 producing the highest emission level.

The worst configuration of EUT and cable of the above highest emission level were recorded for reference of the final test.



4.1.3 Test Setup



4.1.4 Test Result

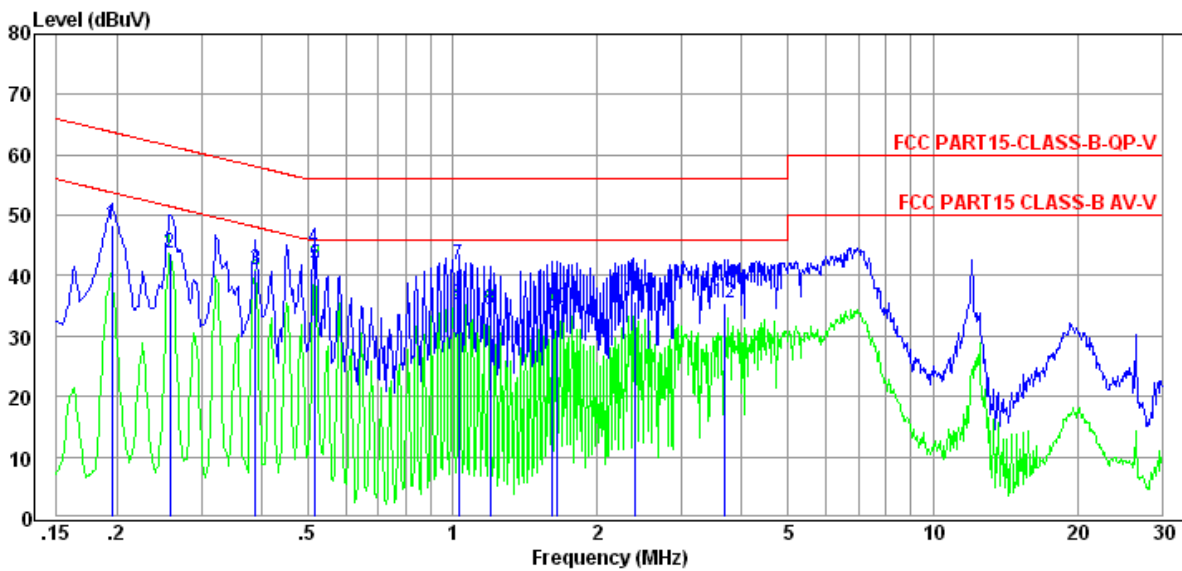
Test Verdict Recorded for Suspicious Points:

Line	Freq MHz	Result dBuV	Limit dBuV	Margin dB
QP	0.20	48.34	63.80	15.46
Average	0.26	43.78	51.49	7.71
Average	0.39	41.08	48.07	6.99
QP	0.52	44.62	56.00	11.38
Average	0.52	41.77	46.00	4.23
Average	1.03	35.31	46.00	10.69
QP	1.03	41.77	56.00	14.23
Average	1.20	34.47	46.00	11.53
QP	1.61	33.72	56.00	22.28
Average	1.65	34.52	46.00	11.48
QP	2.39	35.86	56.00	20.14
QP	3.68	35.49	56.00	20.51

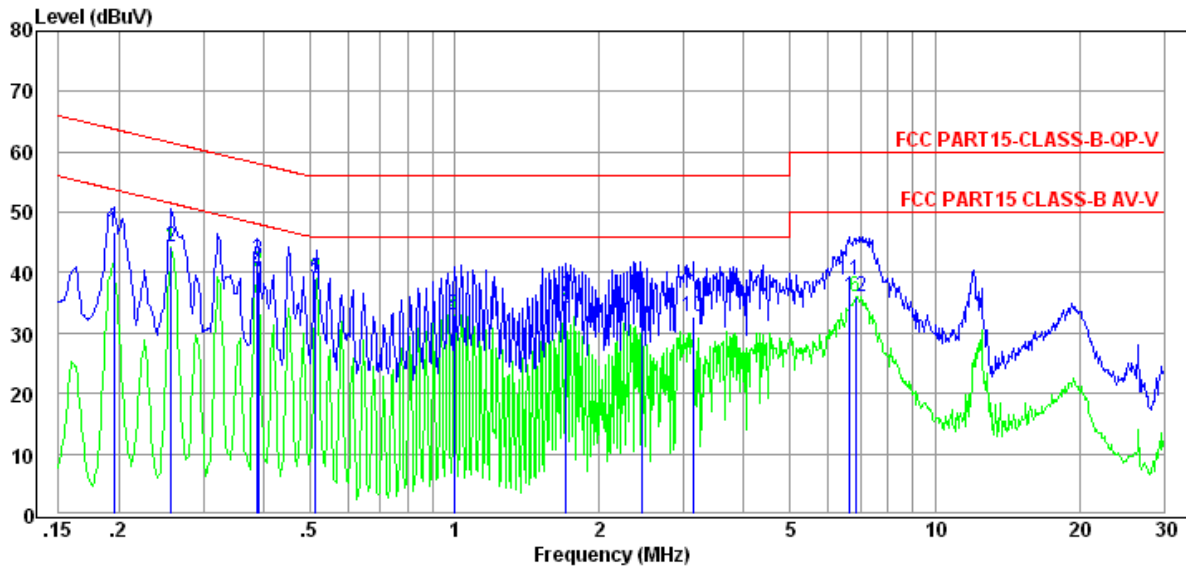


Neutral	Freq MHz	Result dBuV	Limit dBuV	Margin dB
QP	0.20	46.68	63.78	17.10
Average	0.26	44.15	51.52	7.37
QP	0.39	42.08	58.07	15.99
Average	0.39	40.02	48.06	8.04
Average	0.51	39.01	46.00	6.99
Average	1.00	33.07	46.00	12.93
QP	1.71	36.03	56.00	19.97
Average	1.71	34.07	46.00	11.93
QP	2.45	35.34	56.00	20.66
QP	3.15	32.64	56.00	23.36
QP	6.62	38.81	60.00	21.19
Average	6.84	35.93	50.00	14.07

Test Plot:



(Plot A: L Phase)



(Plot B: N Phase)



4.2 Radiated Emission Measurement

4.2.1 Limits of Radiated Emission

According to FCC section 15.109, the field strength of radiated emissions from unintentional radiators at a certain distance shall not exceed the following values:

Frequency (MHz)	Field Strength CLASS B (at 3m)	
	$\mu\text{V/m}$	$\text{dB}\mu\text{V/m}$
30 - 88	100	40.0
88 - 216	150	43.5
216 - 960	200	46.0
Above 960	500	54.0

NOTE:

- (1) *Field Strength ($\text{dB}\mu\text{V/m}$) = $20 \cdot \log[\text{Field Strength } (\mu\text{V/m})]$.*
- (2) *In the emission tables above, the tighter limit applies at the band edges.*

Frequency range of radiated measurements (For unintentional radiators)

Highest frequency generated or used in the device or on which the device operates or tunes (MHz)	Upper frequency of measurement range (MHz)
Below 1.705	30.
1.705-108	1000.
108-500	2000.
500-1000	5000.
Above 1000	5th harmonic of the highest frequency or 40 GHz, whichever is lower.

Note:

The highest frequency is 2472MHz, So 5th harmonic is 12.36GHz, the frequency range is from 30MHz to 13GHz



4.2.2 Test Procedure

The equipment was set up as per the test configuration to simulate typical usage per the user's manual. When the EUT is a tabletop system, a wooden turntable with a height of 0.8 meters is used which is placed on the ground plane. When the EUT is a floor standing equipment, it is placed on the ground plane which has a 3-12 mm non-conductive covering to insulate the EUT from the ground plane.

Support equipment, if needed, was placed as per ANSI C63.4.

All I/O cables were positioned to simulate typical usage as per ANSI C63.4.

The EUT received AC power source from the outlet socket under the turntable. All support equipment power received from another socket under the turntable.

The antenna was placed at 3 or 10 meter away from the EUT as stated in ANSI C63.4. The antenna connected to the Spectrum Analyzer via a cable and at times a pre-amplifier would be used.

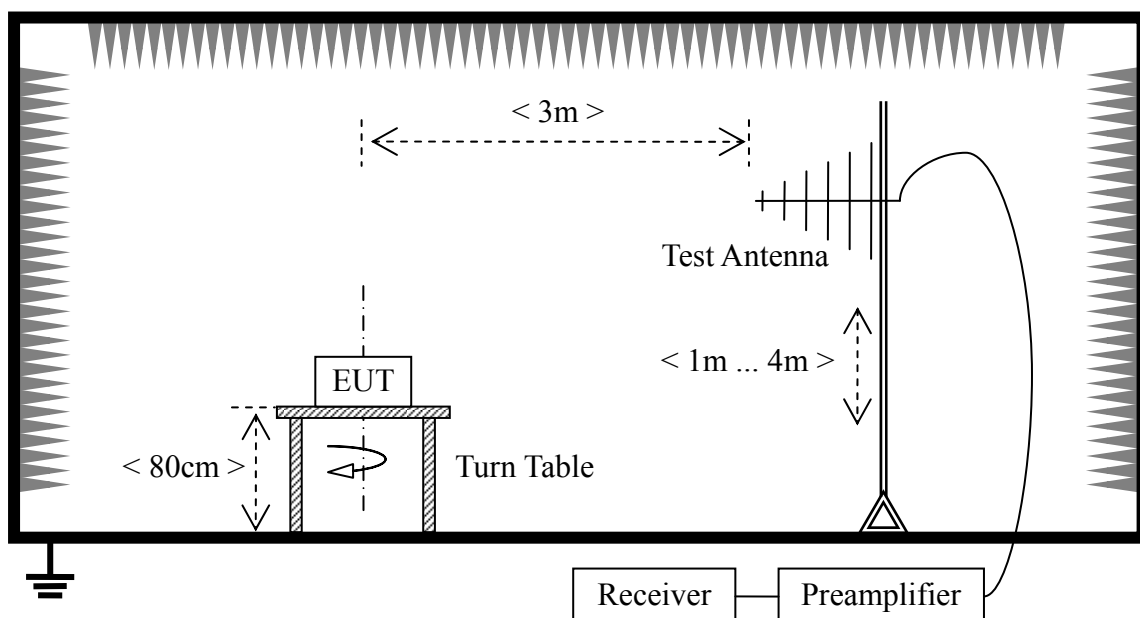
The Analyzer / Receiver quickly scanned from 30MHz to 40GHz. The EUT test program was started. Emissions were scanned and measured rotating the EUT to 360 degrees and positioning the antenna 1 to 4 meters above the ground plane, in both the vertical and the horizontal polarization, to maximize the emission reading level.

The test mode(s) described in Item 3.1 were scanned during the preliminary test:

After the preliminary scan, we found the test mode described in Item 3.1 producing the highest emission level.

The worst configuration of EUT and cable of the above highest emission level were recorded for reference of the final test

4.2.3 Test Setup





Test Verdict Recorded for Suspicious Points (30MHz~13GHz): Antenna Vertical

Frequency (MHz)	Level (dBuV)	Limit Line (dBuV)	Margin (dB)	Antenna Polarization	Result
54.84	17.03	40.00	22.97	Vertical	PASS
133.15	21.42	43.50	22.08	Vertical	PASS
339.59	21.74	46.00	24.26	Vertical	PASS
1198.38	22.08	54.00	31.92	Vertical	PASS
1329.62	24.58	54.00	29.42	Vertical	PASS
1803.07	28.22	54.00	25.78	Vertical	PASS
1923.20	30.68	54.00	23.32	Vertical	PASS
2890.57	34.83	54.00	19.17	Vertical	PASS
3862.94	30.20	54.00	23.80	Vertical	PASS

Test Verdict Recorded for Suspicious Points (30MHz~13GHz): Antenna Horizontal

Frequency (MHz)	Level (dBuV)	Limit Line (dBuV)	Margin (dB)	Antenna Polarization	Result
133.15	26.62	43.50	16.88	Horizontal	PASS
227.69	30.02	46.00	15.98	Horizontal	PASS
379.91	28.32	46.00	17.68	Horizontal	PASS
1483.18	36.49	54.00	17.51	Horizontal	PASS
1633.86	30.77	54.00	23.23	Horizontal	PASS
2077.24	29.34	54.00	24.66	Horizontal	PASS
2227.58	35.04	54.00	18.96	Horizontal	PASS
2888.46	35.82	54.00	18.18	Horizontal	PASS
5006.77	27.69	54.00	26.31	Horizontal	PASS



Annex A Photos of the EUT



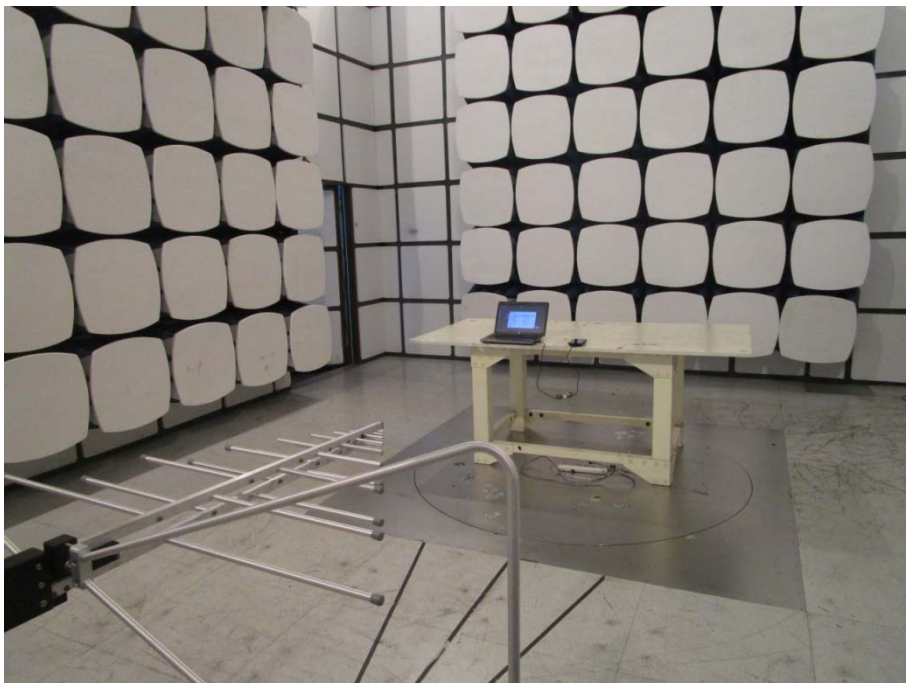


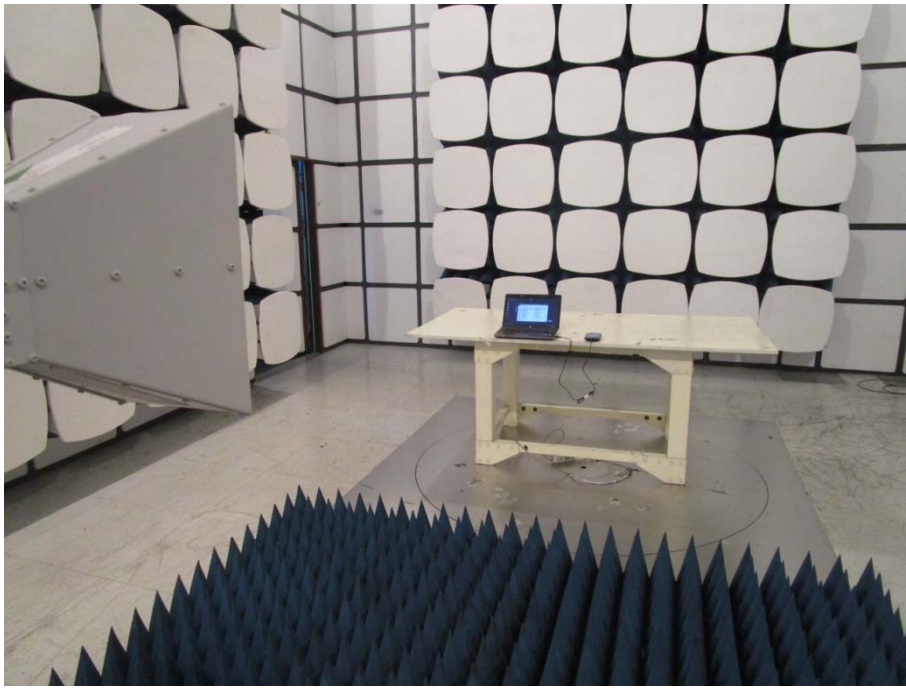
Annex B Photos of Test Setup

1. Conducted Emission



2. Radiated Emission





**** END OF REPORT ****