



TEST REPORT

APPLICANT : Reliance Communications LLC

PRODUCT NAME : Orbic Turbo 4G MHS

MODEL NAME : RC440L

BRAND NAME : Orbic

FCC ID : 2ABGH-RC440L

STANDARD(S) : 47 CFR Part 27, Subpart M
47 CFR Part 96

RECEIPT DATE : 2021-10-24

TEST DATE : 2021-10-25 to 2022-03-21

ISSUE DATE : 2022-03-31

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Change History		
Version	Date	Reason for change
1.0	2022-03-31	First edition



1. Technical Information

Note: Provide by applicant.

1.1. Applicant and Manufacturer Information

Applicant:	Reliance Communications LLC
Applicant Address:	91 Colin Drive, Unit 1, HOLBROOK, New York 11741, United States
Manufacturer:	Unimaxcomm
Manufacturer Address:	35F, HBC HuiLong Center Building-II Minzhi Street, Longhua, Shenzhen, P.R. China 518110



1.2. Equipment Under Test (EUT) Description

Product Name:	Orbic Turbo 4G MHS	
Hardware Version:	V1.0	
Software Version:	ORB440L_v1.0.0.2_BVT-NA	
IMEI:	35232832	
Modulation Type:	QPSK, 16QAM, 64QAM	
Operation Band:	Uplink: CA_7C; CA_41C; CA_48C	
Frequency Range:	LTE Band 7	Tx: 2500 MHz – 2570 MHz
		Rx: 2620 MHz – 2690 MHz
	LTE Band 41	Tx: 2496 MHz – 2690 MHz
		Rx: 2496 MHz – 2690 MHz
	LTE Band 48	Tx: 3550 MHz – 3700 MHz
		Rx: 3550 MHz – 3700 MHz
Channel Bandwidth:	LTE Band 7	5MHz, 10MHz, 15MHz, 20MHz
	LTE Band 41	5MHz, 10MHz, 15MHz, 20MHz
	LTE Band 48	5MHz, 10MHz, 15MHz, 20MHz
Antenna Type:	PIFA Antenna	
Antenna Gain:	LTE Band 7	2.70 dBi
	LTE Band 41	2.70 dBi
	LTE Band 48	2.00 dBi

Note 1: For a more detailed description, please refer to Specification or User's Manual supplied by the applicant and/or manufacturer.



REPORT No.: SZ22030298W01

1.3. Maximum ERP/EIRP and Emission Designator

Note: The test results were recorded in Report No.: SZ22030249W01.



1.4. Test Standards and Results

The objective of the report is to perform testing according to Part 2, Part 27 and Part 96 for the EUT FCC ID Certification:

No	Identity	Document Title
1	47 CFR Part 2	Frequency Allocations and Radio Treaty Matters; General Rules and Regulations
2	47 CFR Part 27	Miscellaneous Wireless Communications Services
3	47 CFR Part 96	Citizens Broadband Radio Service

Note 1: These items please refer to the 4G module report SZ22030249W01 (LTE CA) which The FCC ID is 2ABGH-RC101ML and the 4G module has been certified by Shenzhen Morlab Communications Technology Co., Ltd.

Note 2: There is no more evaluation for host RSE because the hosts are the same between hotspot and module when RSE test. For all test results, please refer to Report No.: SZ22030249W01.



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

Section	Description	Test Date	Test Engineer	Result	Method Determination /Remark
2.1046, 27.50(h)(2),	Transmitter Conducted Output Power and ERP/EIRP	Oct 25 to Oct 26, 2021	Li Hanbin	PASS	No deviation
2.1049	Occupied Bandwidth	Oct 26, 2021 to Mar 21, 2022	Li Hanbin/ Chenhaiju	PASS	No deviation
2.1055,	Frequency Stability	Oct 25 to Oct 26, 2021	Li Hanbin	PASS	No deviation
2.1051, 27.53(m)(4),	Conducted Spurious Emissions	Oct 27, 2021 to Mar 21, 2022	Li Hanbin/ Chenhaiju	PASS	No deviation
2.1051, 27.53(m)(4),	Band Edge	Oct 27 to Oct 28, 2021	Li Hanbin	PASS	No deviation
2.1051, 27.53(m)(4),	Radiated Spurious Emissions	Nov 8 to Nov 11, 2021	Yin Xiaogang	PASS	No deviation

Note 1: The tests were performed according to the method of measurements prescribed in KDB971168 D01 v03 and ANSI/TIA-603-E-2016.

Note 2: The path loss during the RF test is calibrated to correct the results by the offset setting in the test equipments. The ref offset 8dB contains two parts that cable loss 5dB and Attenuator 3dB.



1.5. Environmental Conditions

During the measurement, the environmental conditions were within the listed ranges:

Temperature (°C):	15 - 35
Relative Humidity (%):	30 - 60
Atmospheric Pressure (kPa):	86 - 106



2. 47 CFR Part 2 and 27M Requirements

2.1. Transmitter Conducted Output Power And ERP/EIPR

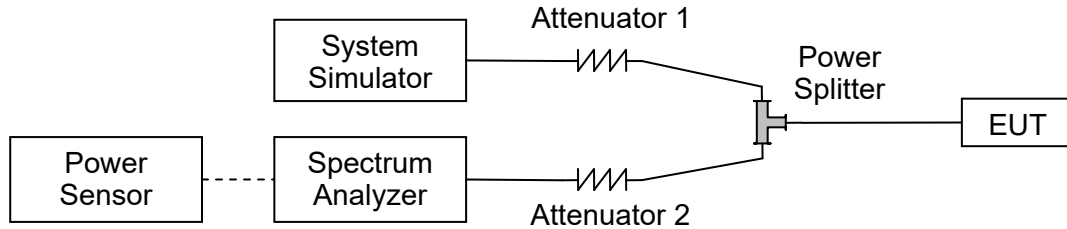
2.1.1. Requirement

According to FCC section 2.1046(a) for transmitters other than single sideband, independent sideband and controlled carrier radiotelephone, power output shall be measured at the RF output terminals when the transmitter is adjusted in accordance with the tune-up procedure to give the values of current and voltage on the circuit elements specified in FCC section 2.1033(c)(8).

According to FCC section 27.50 (h)(2) for LTE Band 7/41, Mobile and other user stations. Mobile stations are limited to 2 watts E.I.R.P. All user stations are limited to 2 watts transmitter output power.

According to FCC section 96.41(b) for LTE Band 48, the EIRP of any CBSD and End User Device must not exceed 23 dBm/10MHz.

2.1.1. Test Description



The EUT is coupled to the Spectrum Analyzer (SA) and the System Simulator (SS) with Attenuators through the Power Splitter; the RF load attached to the EUT antenna terminal is 50Ohm; the path loss as the factor is calibrated to correct the reading. The EUT is commanded by the SS to operate at the maximum output power. A call is established between the EUT and the SS.

2.1.2. Test procedure

KDB 971168 D01v03 Section 5.2 and ANSI/TIA-603-E-2016.

$EIRP \text{ (dBm)} = \text{Conducted Output Power (dBm)} + \text{Antenna Gain (dBi)}$

$ERP \text{ (dBm)} = EIPR \text{ (dBm)} - 2.15$



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2.1.3. Result

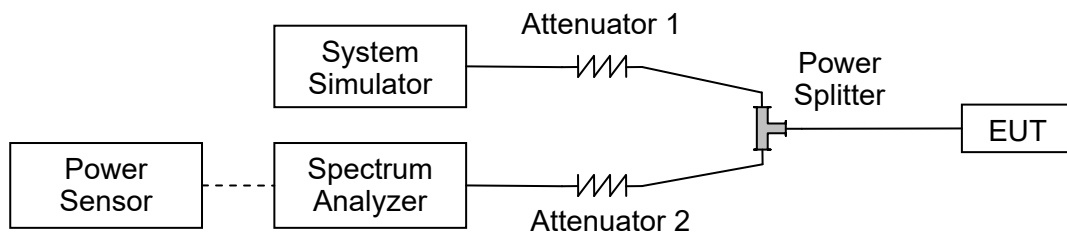
Note: The test results were recorded in Report No.: SZ22030249W01.

2.2. Occupied Bandwidth

2.2.1. Requirement

According to FCC section 2.1049, the occupied bandwidth is the frequency bandwidth such that, below its lower and above its upper frequency limits, the mean powers radiated are each equal to 0.5 percent of the total mean power radiated by a given emission. Occupied bandwidth is also known as the 99% emission bandwidth.

2.2.2. Test Description



The EUT is coupled to the Spectrum Analyzer (SA) and the System Simulator (SS) with Attenuators through the Power Splitter; the RF load attached to the EUT antenna terminal is 50Ohm; the path loss as the factor is calibrated to correct the reading. The EUT is commanded by the SS to operate at the maximum output power. A call is established between the EUT and the SS.

2.2.3. Test procedure

KDB 971168 D01v03 Section 4.1 and ANSI/TIA-603-E-2016.

2.2.4. Test Result

Note: The test results were recorded in Report No.: SZ22030249W01.

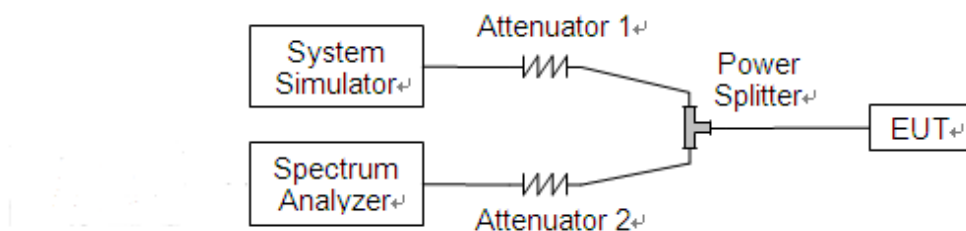
2.3. Conducted Spurious Emissions

2.3.1. Requirement

According to FCC section 2.1051, the power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least $43+10*\log(P)$ dB. This calculated to be -13dBm.

Additional requirement for LTE Band 7, 41, 48: The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least $55 + 10 \log(P)$ dB. This calculated to be -25dBm.

2.3.2. Test Description



The EUT is coupled to the Spectrum Analyzer (SA) and the System Simulator (SS) with Attenuators through the Power Splitter; the RF load attached to the EUT antenna terminal is 50Ohm; the path loss as the factor is calibrated to correct the reading. The EUT is commanded by the SS to operate at the maximum output power. A call is established between the EUT and the SS.

2.3.3. Test procedure

KDB 971168 D01v03 Section 6.0 and ANSI/TIA-603-E-2016.

2.3.4. Test Result

Note: The test results were recorded in Report No.: SZ22030249W01.



2.4. Band Edge

2.4.1. Requirement

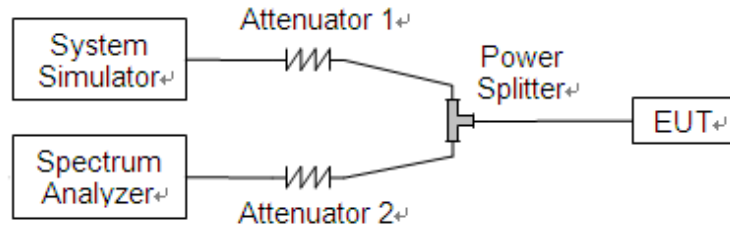
According to FCC section 2.1051, the power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least $43 + 10 \log (P)$ dB.

According to FCC section 27.53(m) (4), for mobile digital stations, the attenuation factor shall be not less than $40 + 10 \log (P)$ dB on all frequencies between the channel edge and 5 megahertz from the channel edge, $43 + 10 \log (P)$ dB on all frequencies between 5 megahertz and X megahertz from the channel edge, and $55 + 10 \log (P)$ dB on all frequencies more than X megahertz from the channel edge, where X is the greater of 6 megahertz or the actual emission bandwidth as defined in paragraph (m)(6) of this section. In addition, the attenuation factor shall not be less than $43 + 10 \log (P)$ dB on all frequencies between 2490.5 MHz and 2496 MHz and $55 + 10 \log (P)$ dB at or below 2490.5 MHz. Mobile Satellite Service licensees operating on frequencies below 2495 MHz may also submit a documented interference complaint against BRS licensees operating on channel BRS Channel 1 on the same terms and conditions as adjacent channel BRS or EBS licensees.

According to FCC section 96.41(e), for channel and frequency assignments made by the SAS to CBSDs, the conducted power of any CBSD emission outside the fundamental emission bandwidth of this section (whether the emission is inside or outside of the authorized band) shall not exceed -13 dBm/MHz within 0-10 megahertz above the upper SAS-assigned channel edge and within 0-10 megahertz below the lower SAS-assigned channel edge. At all frequencies greater than 10 megahertz above the upper SAS assigned channel edge and less than 10 MHz below the lower SAS assigned channel edge, the conducted power of any CBSD emission shall not exceed -25 dBm/MHz.

The conducted power of emissions below 3540 MHz or above 3710 MHz shall not exceed -25 dBm/MHz, and the conducted power of emissions below 3530 MHz or above 3720 MHz shall not exceed -40 dBm/MHz.

2.4.2. Test Description



The EUT is coupled to the Spectrum Analyzer (SA) and the System Simulator (SS) with Attenuators through the Power Splitter; the RF load attached to the EUT antenna terminal is 50Ohm; the path loss as the factor is calibrated to correct the reading. The EUT is commanded by the SS to operate at the maximum output power. A call is established between the EUT and the SS.

2.4.3. Test procedure

KDB 971168 D01v03 Section 6.0 and ANSI/TIA-603-E-2016.

2.4.4. Test Result

The center frequency of spectrum is the band edge frequency and span is 2MHz, Record the max trace into the test report.

Note: The test results were recorded in Report No.: SZ22030249W01.

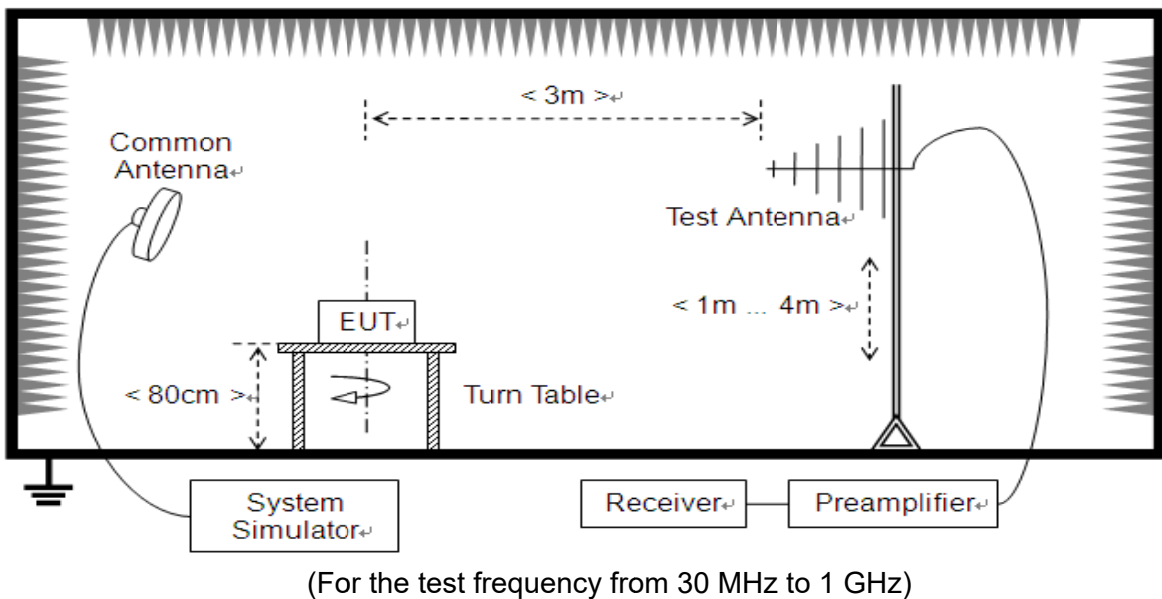
2.5. Radiated Spurious Emissions

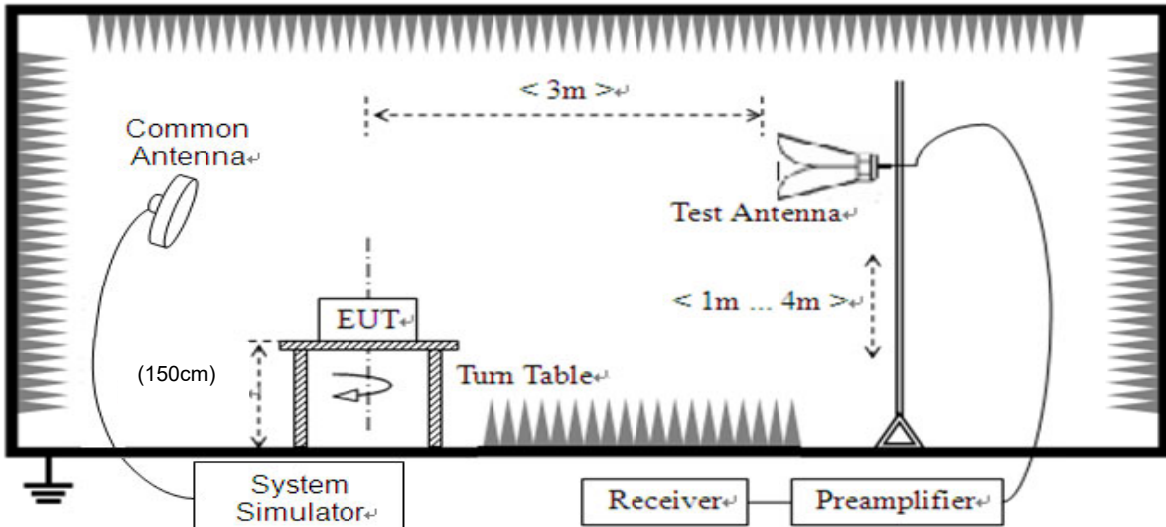
2.5.1. Requirement

According to FCC section 2.1051, the power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least $43 + 10 \log(P)$ dB. This calculated to be -13 dBm.

Additional requirement for LTE Band 7, 41: The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least $55 + 10 \log(P)$ dB. This calculated to be -25dBm.

2.5.2. Test Description





(For the test frequency above 1 GHz)

The EUT is located in a 3m Full-Anechoic Chamber, the cable loss, air loss and so on of the site as factors are pre-calibrated using the "Substitution" method, and calculated to correct the reading.

A call is established between the EUT and the SS via a Common Antenna. The EUT is commanded by the SS to operate at the maximum and minimum output power, and only the test result of the maximum output power was recorded.

In the frequency range above 30 MHz, Bi-Log Test Antenna (30 MHz to 1 GHz) and Horn Test Antenna (above 1 GHz) are used. Test Antenna is 3m away from the EUT. Test Antenna height is varied from 1m to 4m above the ground and the Turn Table is actuated to turn from 0° to 360° to determine the maximum value of the radiated power. The emission levels at both horizontal and vertical polarizations should be tested. The Filters consists of Notch Filters and High Pass Filter.

Note: when doing measurements above 1GHz, the EUT has been within the 3dB cone width of the horn antenna during horizontal antenna.

2.5.3. Test procedure

KDB 971168 D01v03 Section 5.8 and ANSI/TIA-603-E-2016.



2.5.4. Test Result

The measurement frequency range is from 30 MHz to the 10th harmonic of the fundamental frequency. Test Antenna height is varied from 1m to 4m above the ground, and the Turn Table is actuated to turn from 0° to 360°, both horizontal and vertical polarizations of the Test Antenna are used to find the maximum radiated power. Mid channels on all channel bandwidth verified. Only the worst RB size/offset presented.

The substitution corrections are obtained as described below:

$$A_{\text{SUBST}} = P_{\text{SUBST_TX}} - P_{\text{SUBST_RX}} - L_{\text{SUBST_CABLES}} + G_{\text{SUBST_TX_ANT}}$$

$$A_{\text{TOT}} = L_{\text{CABLES}} + A_{\text{SUBST}}$$

Where A_{SUBST} is the final substitution correction including receive antenna gain.

$P_{\text{SUBST_TX}}$ is signal generator level,

$P_{\text{SUBST_RX}}$ is receiver level,

$L_{\text{SUBST_CABLES}}$ is cable losses including TX cable,

$G_{\text{SUBST_TX_ANT}}$ is substitution antenna gain.

A_{TOT} is total correction factor including cable loss and substitution correction

During the test, the data of A_{TOT} was added in the Test Spectrum Analyze, so Spectrum Analyze reading is the final values which contain the data of A_{TOT} .

Note 1: The power of the EUT transmitting frequency should be ignored.

Note 2: 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.

Note 3: All bandwidth and test channel were considered and evaluated respectively by performing full test for each band, only the worst cases were recorded in this test report.

Note 4: The test results were recorded in Report No.: SZ22030249W01.



Annex A Test Uncertainty

Where relevant, the following measurement uncertainty levels have been estimated for test performed on the EUT as specified in CISPR 16-1-2:

Test items	Uncertainty
Output Power	± 2.22 dB
Bandwidth	$\pm 5\%$
Conducted Spurious Emission	± 2.77 dB
Band Edge	± 2.77 dB
Equivalent Isotropic Radiated Power	± 2.22 dB
Radiated Spurious Emissions	± 6 dB

When the test result is a critical value, we will use the measurement uncertainty give the judgment result based on the 95% confidence intervals.



Annex B Testing Laboratory Information

1. Identification of the Responsible Testing Laboratory

Company Name:	Shenzhen Morlab Communications Technology Co., Ltd.
Address:	FL.3, Building A, FeiYang Science Park, No.8 LongChang Road, Block 67, BaoAn District, ShenZhen, GuangDong Province, P. R. China
Telephone:	+86 755 36698555
Facsimile:	+86 755 36698525

2. Identification of the Responsible Testing Location

Name:	Shenzhen Morlab Communications Technology Co., Ltd.
Address:	FL.3, Building A, FeiYang Science Park, No.8 LongChang Road, Block 67, BaoAn District, ShenZhen, GuangDong Province, P. R. China

3. Facilities and Accreditations

All measurement facilities used to collect the measurement data are located at FL.3, Building A, FeiYang Science Park, Block 67, BaoAn District, Shenzhen, 518101 P. R. China. The test site is constructed in conformance with the requirements of ANSI C63.10-2013 and CISPR Publication 22; the FCC designation number is CN1192, the test firm registration number is 226174.



4. Test Equipments Utilized

4.1 Conducted Test Equipments

Equipment Name	Serial No.	Type	versions	Manufacturer	Cal. Date	Cal. Due
Power Splitter	NW521	1506A	N/A	Weinschel	N/A	N/A
Attenuator	N/A	10dB	N/A	Resnet	N/A	N/A
EXA Signal Analyzer	MY541705 56	N9030A	N/A	Keysight	2021.10.20	2022.10.19
System Simulator	62618305 72	MT8821C	0002214 22	Anritsu	2021.02.25	2022.02.24
					2022.02.14	2023.02.13
RF cable (30MHz-26GHz)	CB01	RF01	N/A	Morlab	N/A	N/A
Computer	T430i	Think Pad	N/A	Lenovo	N/A	N/A



4.2 Radiated Test Equipments

Equipment Name	Serial No.	Type	Manufacturer	Cal. Date	Cal. Due
Bi-Log Antenna	VULB 9163	9163-274	SCHWARZBECK	2019.11.23	2022.11.22
Horn Antenna	BBHA 9120D	9120D-963	SCHWARZBECK	2019.05.24	2022.05.23
Horn Antenna	BBHA9170	BBHA9170# 774	SCHWARZBECK	2019.07.26	2022.07.25
Receiver	N9038A	MY54130016	Agilent	2021.07.16	2022.07.15
Preamplifier	S020180L3203	61171/61172	LUCIX CORP.	2021.07.16	2022.07.15
Preamplifier	S10M100L3802	46732	LUCIX CORP.	2021.07.16	2022.07.15
Preamplifier	S180265M3001	46732	LUCIX CORP.	2021.07.16	2022.07.15
System Simulator	CMW500	152038	R&S	2021.10.21	2022.10.20

————— END OF REPORT —————