

TEST REPORT

No. AR19-0046100-01

performed in accordance with

**FCC Rules: Code of Federal Regulations (CFR) no. 47
Part 15 Subpart B Section 15.107 and 15.109**

PRODUCT	Augmented reality safety glasses and control unit
MODEL(s) TESTED	VISIONAR and VISIONAR – CONTROL UNIT
TRADE MARK(s)	UNIVET
APPLICANT	UNIVET S.r.l. ~ Via G. Prati, 87 ~ I-25086 Rezzato (BS)

Assessed by	Robertino Torri <i>[Laboratory technician]</i>	
Approved by	Giovanni Di Turi <i>[Laboratory manager]</i>	

Revision Sheet

Release No.	Date	Revision Description
Rev. 0	2019-12-02	First edition Digital signed - AR19-0046097-01_TR_FCC Part B_UNIVET - Glasses

1. GENERAL DATA

SAMPLE		
Samples received on	2019-10-30	(Item(s) sampled and sent by applicant)
IMQ reference samples	BEM	97592
Samples tested No.	1 for type	
Object under analysis recognition	Not carried out Except where stated, characteristics of products were taken from client description and were not verified by the laboratory	
Date of acceptance of test item	2019-10-30	
TEST LOCATION		
Testing dates	2019-10-30 ÷ 2019-11-29	
Testing laboratory.	IMQ S.p.A. - Via Quintiliano, 43 – I-20138 Milano	
Testing site	Via Quintiliano, 43 – I-20138 Milano	
ENVIRONMENTAL CONDITIONING		
Parameter	Measured	
Ambient Temperature	20.9 ÷ 22.5 °C	
Relative Humidity	54 ÷ 57 %	
Atmospheric Pressure	997 ÷ 1004 mbar	
The laboratory is monitored by a continuous environmental conditions measurements system. Temperature, humidity and pressure data are recorded on a weekly basis and stored in local archive.		
REMARKS		
Throughout this report a point is used as the decimal separator. The ability or reliability of this product to perform its intended function in a particular application has not been investigated. Unless otherwise specified, warnings, installation instruction and/or user manual provided with the sample have been checked in Italian or English version only. IMQ declines any responsibility derived from missing or wrong information provided aside by the applicant.		

2. REFERENCE DOCUMENT

	DOCUMENT	DATE	TITLE
<input checked="" type="checkbox"/>	47 CFR Part 15	2015	Radio Frequency Device
<input checked="" type="checkbox"/>	ANSI C63.4	2014	Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz
<input type="checkbox"/>	ANSI C63.10	2013	American National Standard for Testing Unlicensed Wireless Devices

3. EQUIPMENT UNDER TEST (EUT) DETAILS

GENERAL DATA (according to manufacturer declaration)

MODEL (basic)	Description
VISIONAR and VISIONAR – CONTROL UNIT	Augmented reality safety glasses and control unit
VARIANTS (derived)	Description
/	/

The VISIONAR – CONTROL UNIT contains the radio modules:

FCC ID:	N7NHL8548 (GSM and GPS)
FCC ID:	Z64-WL18SBMOD (Wi-Fi, BT and BLE)

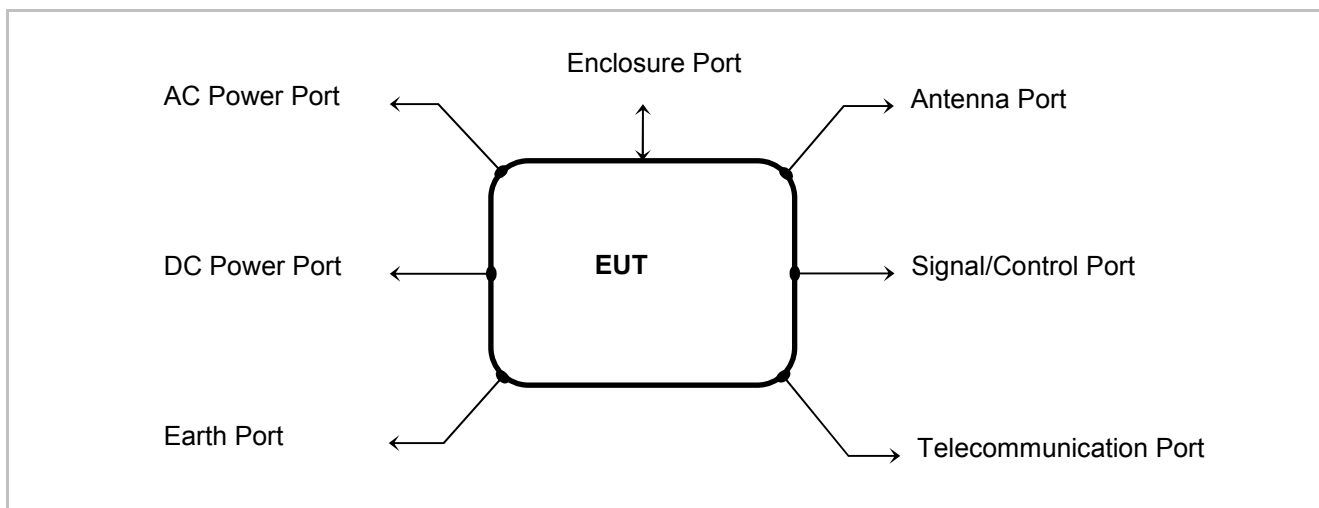
MANUFACTURER	UNIVET S.r.l. ~ Via G. Prati, 87 ~ I-25086 Rezzato (BS)
ASSEMBLY PLANT(s)	

EUT IDENTIFICATION

EUT composition		Glasses and control unit			
EUT classification		<input type="checkbox"/> Fixed	<input type="checkbox"/> Vehicular	<input checked="" type="checkbox"/> Portable	<input type="checkbox"/> Other
EUT standing		/			
Supply voltage		5 V DC by dedicated battery pack			
Temperature range		/			
Dimensions		/			
Mass of equipment		/			
Integrated radio module data					
Radio module		/			
Receiver category		/			
Modulation		/			
Number of channels		/	Channel bandwidth		/
Operating frequency		/			
Antenna	/	/			
	/	/			
	Type:	<input type="checkbox"/> Integral	<input type="checkbox"/> Dedicated	<input type="checkbox"/> External	

4. TEST CONFIGURATION OF UNIT UNDER TEST

EUT PORTS



Port	Description	Max length
Enclosure	Plastic	
AC power	/	/
DC power	5 V DC (internal dedicated battery pack)	/
Earth	/	/
Telecommunication	/	/
Signal & Control	/	/
Antenna	/	/

STATE OF THE EUT DURING TESTS

Ref.	Mode	Description
#1	Operating	Recharging battery of control unit with AC/DC adapter
#2	Operating	Glasses in normal operating mode (screen playback) supplied by control unit with Wi-Fi and GSM in transmission

SUPPORT EQUIPMENT

Defined as equipment needed for correct operation or loading of the EUT, but not considered as tested:

Equipment	Manufacturer	Model
AC/DC adapter for control unit battery recharging	SHENZHEN KEYU POWER SUPPLY TECHNOLOGY CO. LTD.	KA1602-0502000DEU

ELECTROMAGNETICALLY RELEVANT COMPONENTS

Component	No.	Manufacturer	Model
Main Board glasses	1	UNIVET	
Main board control unit	1	UNIVET	

RFI SUPPRESSION DEVICES

Component	No.	Manufacturer	Model
Ferrite one turn on cable in proximity of control unit out (see also photographic documentation)	1	WHURT	742 711 31 S

EMI PROTECTION DEVICES

Component	No.	Manufacturer	Model
/	/	/	/

EUT TECHNICAL DOCUMENTATION

Document	Reference
/	/

5. METHODS OF MEASUREMENT

All compliance measurements have been carried out using the procedures described in the standard ANSI C63.4:2014 and Section 15.31 of CFR47 Part 15 – Subpart A (General).

Additional test requirements have been adopted according to the reference Section indicated in the § 6 of this test report.

FREQUENCY RANGE INVESTIGATED

Conducted emission tests : from 150 kHz to 30 MHz.

Radiated emission tests: from 30 MHz to 13 GHz

6. SUMMARY OF TEST RESULTS

POSSIBLE TEST CASE VERDICTS:	
Test object meets the requirement	PASS
Test object does not meet the requirement	FAIL
Test case does not apply to the test object	N.A.
Test not performed	N.P.

CFR47 Part 15	TITLE	RESULT
§ 15.107	Conducted emission	PASS
§ 15.109	Radiated disturbances	PASS

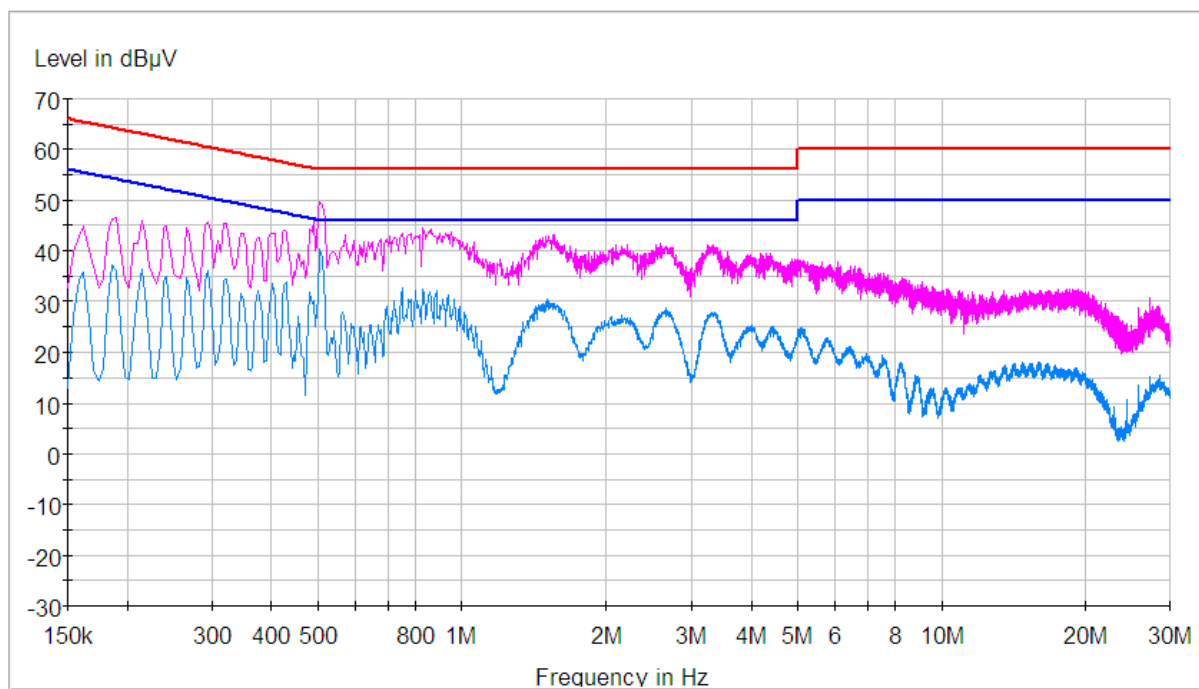
7. TEST RESULTS

7.1 CONDUCTED EMISSION

TEST REQUIREMENT	
Test setup	ANSI C63.4
Frequency range	150 kHz ÷ 30 MHz
IF bandwidth	9 kHz
EMC class	B
Limits	section 15.107
EUT operating condition	#1
Remark	None
Testing dates	2019-10-30

TEST RESULT
The EUT meets the requirements of sections 15.107.

TEST PROCEDURE
<ol style="list-style-type: none"> 1) The EUT was placed on a wooden table of size, 80 cm by 80 cm, raised 80 cm in which is located 40 cm away from the vertical wall the shielded room. 2) Each EUT power cord input cord was individually connected through a 50Ω/50μH LISN to the input power source. 3) Exploratory measurements were made to identify the frequency of the emission that had the highest amplitude relative to the limit by operating the EUT in a range of typical modes of operation, cable position, and with a typical system equipment configuration and arrangement. Based on the exploratory tests of the EUT, the one EUT cable configuration and arrangement and mode of operation that had produced the emission with the highest amplitude relative to the limit was selected for the final measurement. 4) The final test on all current-carrying conductors of all of the power cords to the equipment that comprises the EUT (but not the cords associated with other non-EUT equipment is the system) was then performed over the frequency range of 0.15 MHz to 30 MHz. 5) The measurements were made with the detector set to PEAK and AVERAGE amplitude within a bandwidth of 10 kHz during the measurements. 6) The measurements with Quasi-Peak detector are performed only for frequencies for which the Peak values are \geq (Q.P. limit - 6 dB).

MEASUREMENTS RESULTS**Port: AC MAINS power of AC/DC adapter for battery pack recharging**

7.2 RADIATED DISTURBANCES

TEST REQUIREMENT

Test setup	ANSI C63.4
Test facility	Semi-anechoic chamber
Test distance	3 meters
Frequency range	30 MHz to 13 GHz
IF bandwidth (below 30 MHz)	9 kHz
IF bandwidth (below 1,000 MHz)	120 kHz
IF bandwidth (above 1,000 MHz)	1 MHz
Deviation to test procedure	None
Limits	sections 15.109
EUT operating condition	#2 – with ferrite on cable near to control unit (see photographic documentation)
Remark	(*) In accordance with part 15.31 (f) (2), where the measurement distance was specified to be 30 or 300 meters, a correction factor was applied in order to permit measurement to be performed at a separation distance. The applied formula for limits at 3 meter is: Extrapolation (dB) = $40\log(300\text{meter} / 3\text{meter}) = +80\text{db}$ Extrapolation (dB) = $40\log(30\text{meter} / 3\text{meter}) = +40\text{db}$
Testing dates	2019-11-29

TEST RESULT

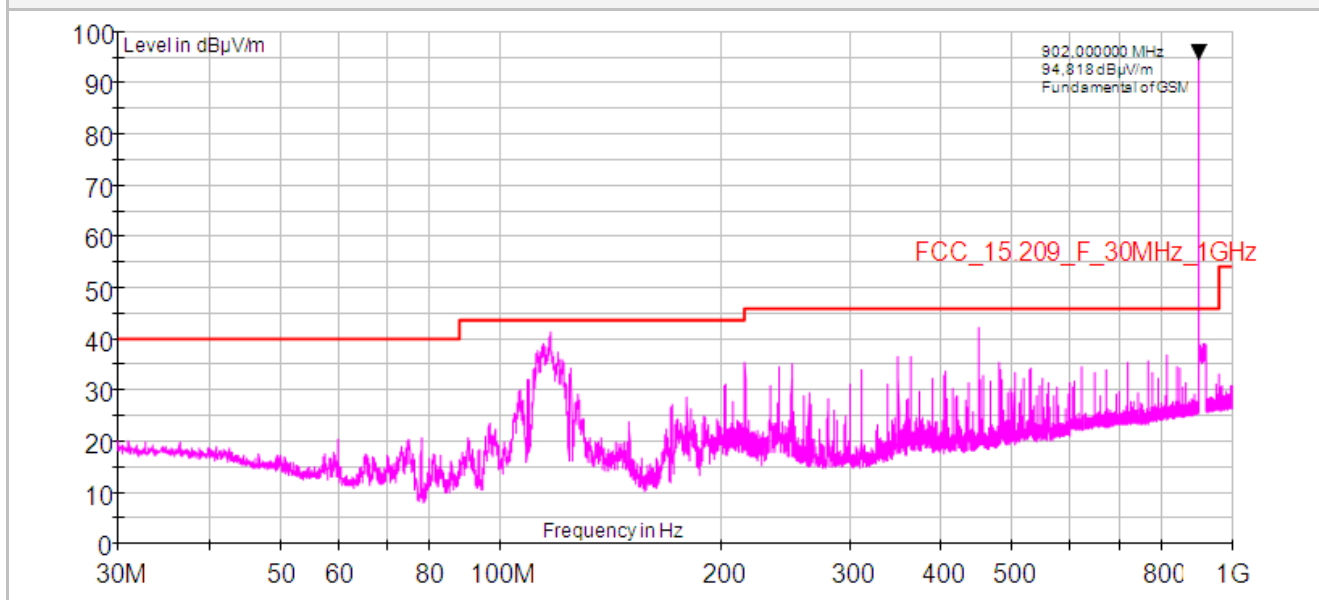
The EUT meets the requirements of sections 15.109

LIMITS FOR SPURIOUS

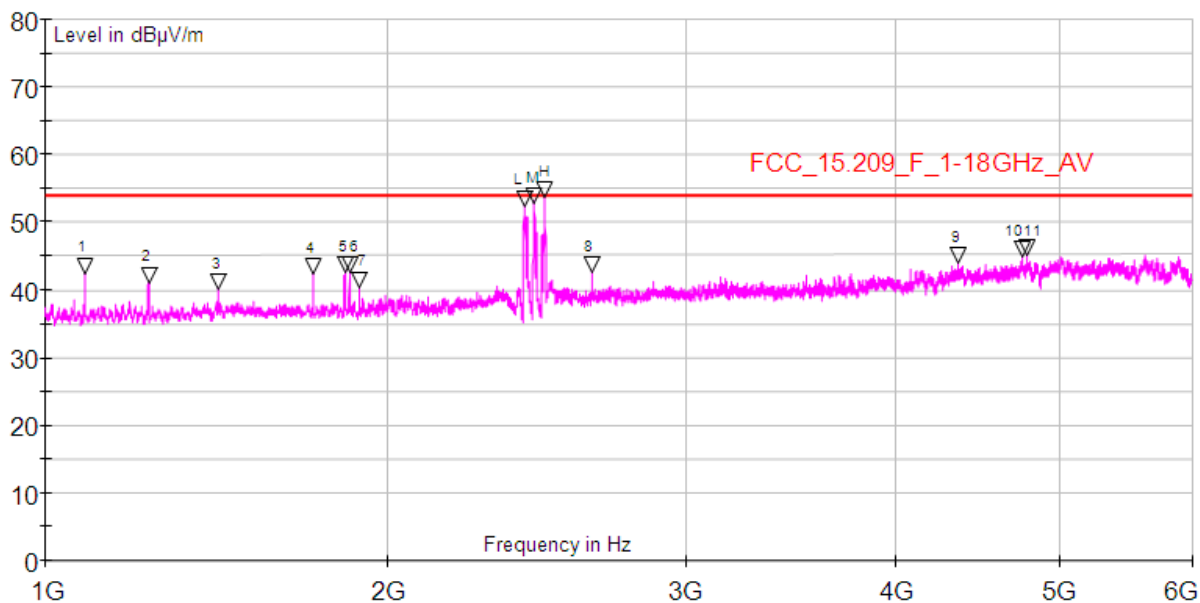
Band of operations	Limit $\mu\text{V/m}$	Limit $\text{dB}\mu\text{V/m}$
30÷88 MHz	100	40
88÷216 MHz	150	43,5
216÷960 MHz	200	46
Above 960MHz	500	54

TEST PROCEDURE

- 1) The EUT was placed on turntable which is 0.8 m above the ground plane
- 2) The turntable shall rotate from 0° to 360° degrees to determine the position of maximum emission level.
- 3) The EUT is positioned 3 m away from the receiving antenna which varied from 1 to 4 m to find the highest emission.
- 4) The measurements were made with the detector set to PEAK and AVERAGE amplitude within a bandwidth of 100 kHz below 1000 MHz and 1 MHz above 1000 MHz.
- 5) The receiving antenna was positioned in both horizontal and vertical polarization.
- 6) The measurements with Quasi-Peak detector, below 1000 MHz are performed only for frequencies for which the Peak values are \geq (Q.P. limit – 6 dB).

MEASUREMENTS RESULTS**Range: 30M ÷ 1 GHz - GSM & Wi-Fi channels**

Range: 1 ÷ 6 GHz - GSM & Wi-Fi channels



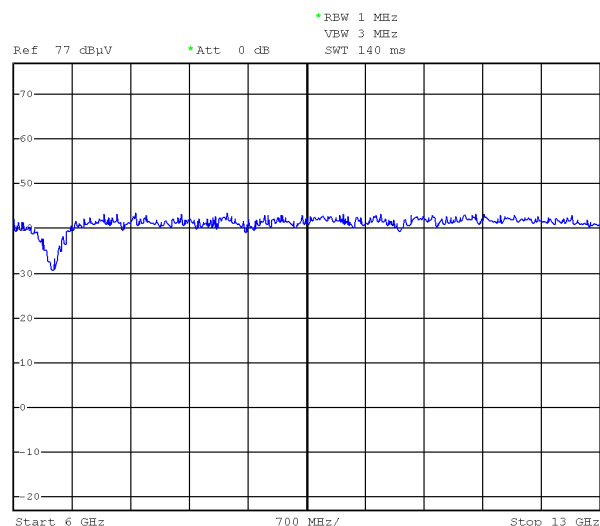
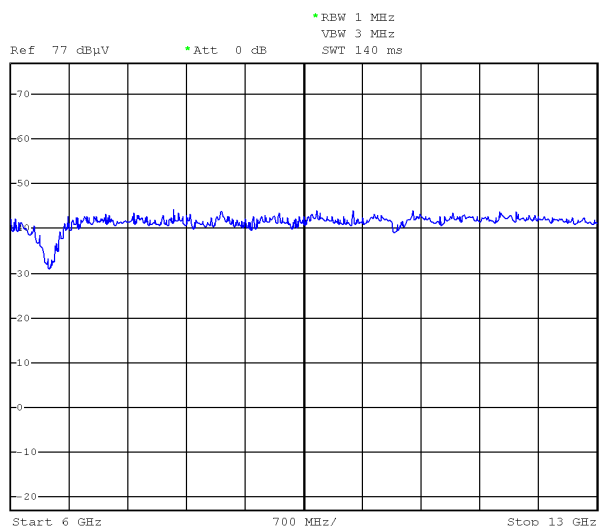
Marker no.	Frequency MHz	Level dBμV/m
1	1320	42.6
2	1440	41.2
3	1584	40.3
4	1804	42.6
5	1883	42.8
6	1895	42.8
7	1920	40.5
L (Wi-Fi lower channel)	2412	52.5
M (Wi-Fi middle channel)	2442	53.1
H (Wi-Fi higher channel)	2472	53.8
8	2640	42.8
9	4355	44.2
10	4755	45.1
11	4793	45.3

Range: 6 ÷ 13 GHz

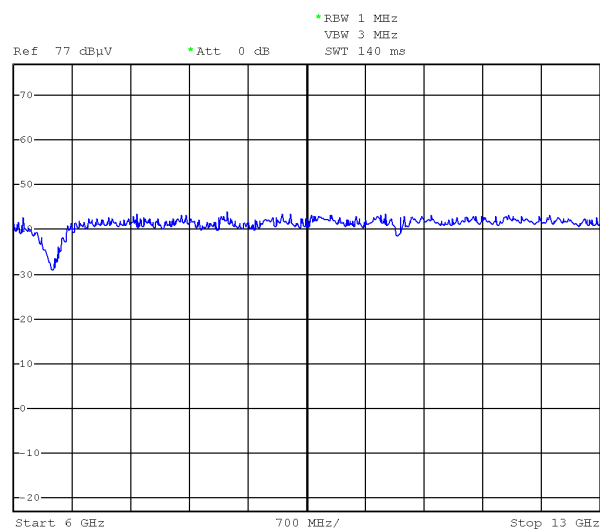
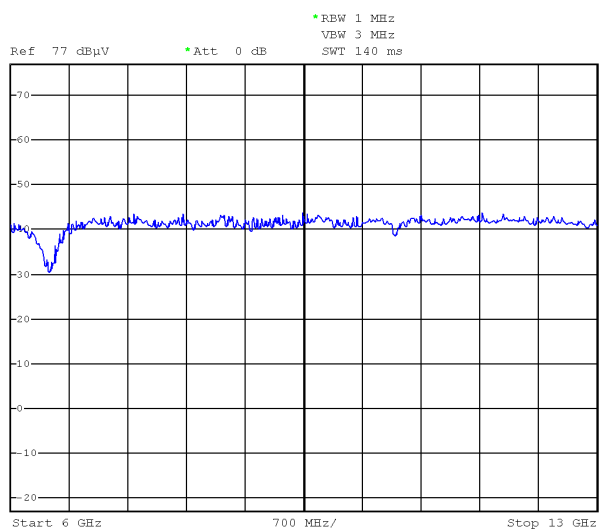
HORIZONTAL Antenna

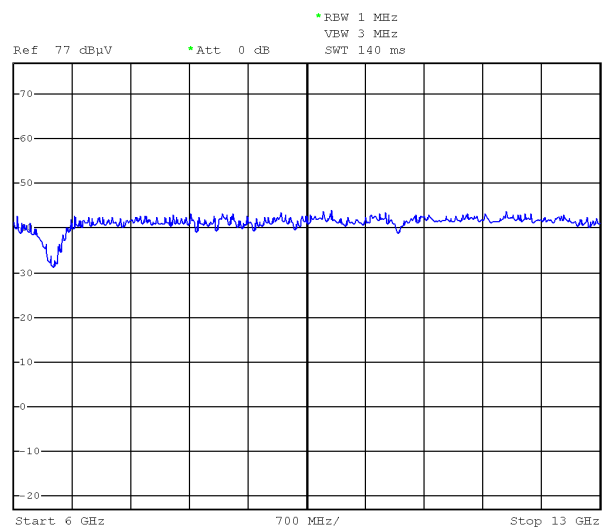
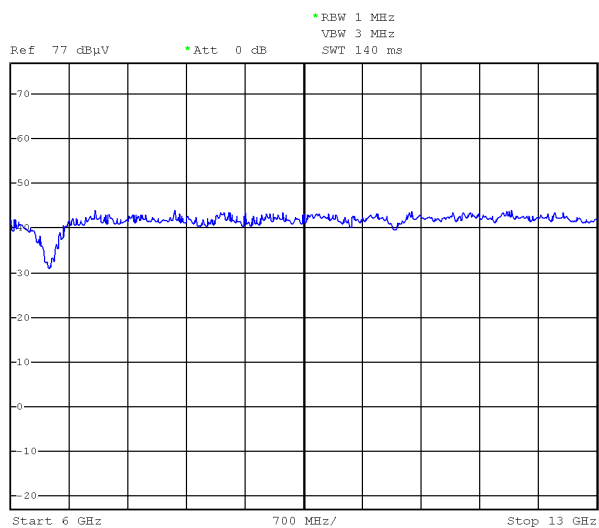
VERTICAL Antenna

GSM & Wi-Fi lower channel



GSM & Wi-Fi middle channel



GSM & Wi-Fi higher channel

8. MEASUREMENTS AND TESTS UNCERTAINTY

Unless otherwise stated the uncertainties for the tests and measurements are evaluated in according to IMQ Operational Instruction IO-LAB-001 and IO-LAB-004. and requirement of NIST Technical Note 1297 and NIS 81:1994 “The Treatment of Uncertainty in EMC Measurements”

The expanded uncertainty was calculated for all measurements and tests listed in this test report according to CISPR 16-4-2 “Specification for radio disturbance and immunity measuring apparatus and methods – Part 4-2: Uncertainty in EMC Measurements”, with UKAS document LAB 34 and is documented in the quality system accordance to ISO/IEC 17025.

Internal Procedure PG-037 ensures that the requirements for traceability of calibrations, of all test equipment requiring calibration, and calibration intervals are met.

Methods/Standard	Parameter	Expanded Uncertainty	Unit	Confidence level
Continuous disturbance	QP detector 9 – 150 kHz	2.5	dB	95%
	QP detector 150 k – 30 MHz	2.6	dB	95%
	QP detector using Voltage Probe	2.5	dB	95%
	QP detector using ISN	3.2	dB	95%
	QP detector using Current Probe	2.2	dB	95%
Radiated disturbance	QP detector (30 MHz - 100 MHz) H polarization	4.3	dB	95%
	QP detector (30 MHz - 100 MHz) V polarization	4.2	dB	95%
	QP detector (100 MHz - 200 MHz) H polarization	3.4	dB	95%
	QP detector (100 MHz - 200 MHz) V polarization	4.8	dB	95%
	QP detector (200 MHz - 1000 MHz) H polarization	3.9	dB	95%
	QP detector (200 MHz - 1000 MHz) V polarization	3.8	dB	95%
	P detector 1-6 GHz	4.8	dB	95%
	P detector 6 – 18 GHz	5.1	dB	95%

9. LIST OF MEASURING EQUIPMENT AND CALIBRATION INFORMATION

IMQ Serial Number	Instrument	Manufacturer	Type	Cal. date	Cal. Due	Calibration Company
P-01709	Shielded semi-anechoic chamber	SIDT	/	2019-10-21	2020-10-31	IMQ
P-02486	Turntable controller unit	FRANKONIA	FCTAM01	/	/	/
P-02488	Mast antenna	FRANKONIA	FAM4	/	/	/
S-05562	EMI Receiver	Rohde & Schwarz	ESU 8	2019-07-09	2020-07-31	Rohde & Schwarz
S-02122	Artificial Mains V-network	Rohde & Schwarz	ESH3-Z5	2019-05-21	2020-05-31	IMQ
S-06463	Log antenna	Schwarzbeck	VULB9160	2019-06-24	2020-06-30	NPL
S-03463	Horn Antenna	Schwarzbeck	BBHA 9120D	2017-07-21	2020-07-31	NPL
S-03542	Preamplifier	Hewlett Packard	HP 8449B	2019-03-27	2020-03-31	IMQ
W-00083-E	Software	Rohde & Schwarz	EMC 32 Vers. 8.53	/	/	/
H-00165	PC	/	/	/	/	/

10. PHOTOGRAPHIC DOCUMENTATION

EUT IDENTIFICATION – External views GLASSES and CONTROL UNIT



EUT IDENTIFICATION – External views GLASSES

EUT IDENTIFICATION – External views CONTROL UNIT

EUT IDENTIFICATION – External views BATTERY PACK OF CONTROL UNIT

EUT IDENTIFICATION – External views AC/DC ADAPTER AND BATTERY PACK OF CONTROL UNIT



EUT IDENTIFICATION – External views AC/DC ADAPTER



POSITION OF FERRITE FOR RADIATED EMISSIONS**END OF TEST REPORT**