



**Add value.
Inspire trust.**

Report on the EMC Testing of:

CELL ANALYSIS SYSTEM

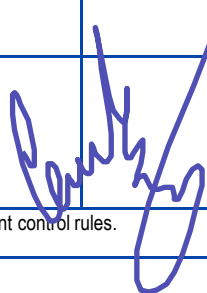
Model(s): V1

In accordance with
FCC 47 CFR Part 15B

Prepared for:
Cellanome, Inc.
1810 Embarcadero Road,
Suite 200, Palo Alto,
CA 94303 USA

COMMERCIAL-IN-CONFIDENCE

Document Number: 7191325762-EEC24/01 | Issue: 02

RESPONSIBLE FOR	NAME	DATE	SIGNATURE
Approved By	Foo Kai Maun	23 Sep 2024	
Prepared By	Quek Keng Huat	23 Sep 2024	

Signatures in this approval box have checked this document in line with the requirements of TÜV SÜD PSB document control rules.

EXECUTIVE SUMMARY

A sample of this product was tested and found to be compliant with the mentioned standard(s).



LA-2007-0380-A
LA-2007-0381-F
LA-2007-0382-B
LA-2007-0383-G
LA-2007-0384-G
LA-2007-0385-E
LA-2007-0386-C
LA-2010-0464-D
LA-2018-0702-B
LA-2018-0703-G
LA-2020-0747-L

The results reported herein have been performed in accordance with the terms of accreditation under the Singapore Accreditation Council. Inspections/Calibrations/Tests marked "Not SAC-SINGLAS Accredited" in this Report are not included in the SAC-SINGLAS Accreditation Schedule for our inspection body/laboratory.

Laboratory:
TÜV SÜD PSB Pte. Ltd.
15 International Business Park
TÜV SÜD @ IBP
Singapore 609937

Phone : +65-6778 7777
E-mail: info.sg@tuvsud.com
<https://www.tuvsud.com/sg>
Co. Reg : 199002667R

Regional Head Office:
TÜV SÜD Asia Pacific Pte. Ltd.
15 International Business Park
TÜV SÜD @ IBP
Singapore 609937
TÜV®

Page 1 of 28



Contents

1 Report Summary3

1.1 Report Modification Record3

1.2 Introduction4

1.3 Brief Summary of Results5

1.4 Product Information6

1.5 Deviations from the Standard7

1.6 EUT Modification Record7

1.7 Test Location(s)8

1.8 Test Facilities Registrations8

1.9 Supporting Equipment9

2 Test Details10

2.1 Conducted Emissions at Mains Terminals10

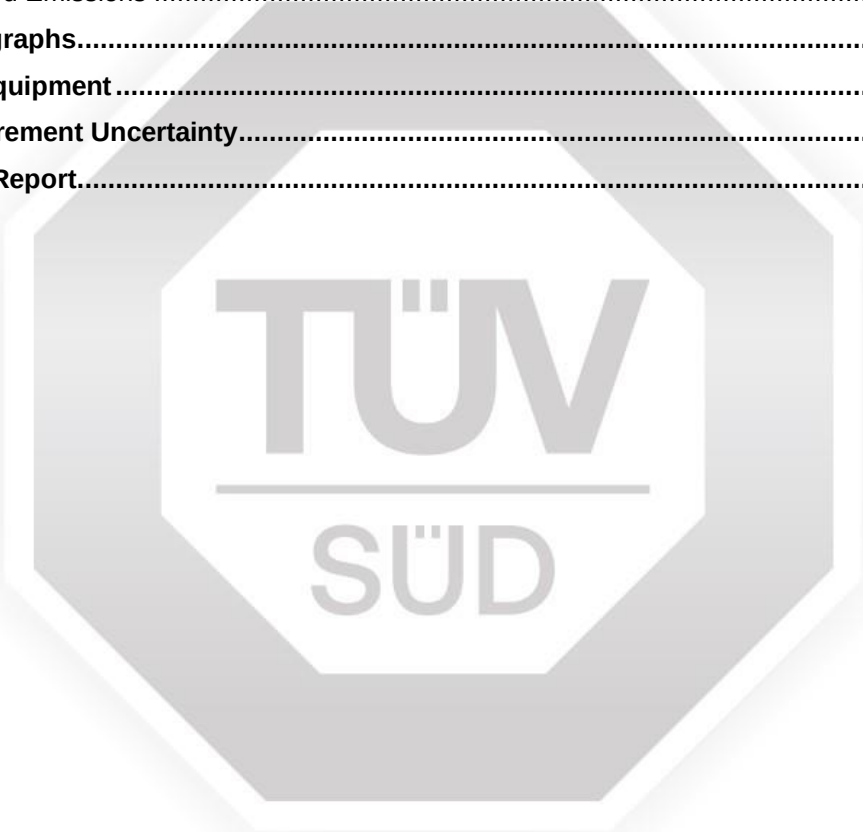
2.2 Radiated Emissions15

3 Photographs22

4 Test Equipment25

5 Measurement Uncertainty26

End of the Test Report28





1 Report Summary

1.1 Report Modification Record

Alterations and additions to this report will be issued to the holders of each copy in the form of a complete document.

Issue	Description of Change	Date of Issue
1	First Issue	18 Apr 2024
2	2 nd Issue – update applicant info	23 Sep 2024





1.2 Introduction

Applicant	:	Cellanome, Inc. 1810 Embarcadero Road, Suite 200, Palo Alto, CA 94303 USA
Manufacturer	:	Same as applicant
Factory	:	Refer to manufacturer
Model Number(s)	:	V1
Serial Number(s)	:	CEL-N3-5863
Number of Samples Tested	:	1
Test Sample(s) Condition	:	Good
Quotation Reference	:	5892745
Test Specification/Issue/Date	:	FCC 47 CFR 15B
Test Sample(s) Received Date	:	01 Feb 2024
Start of Test	:	01 Feb 2024
Finish of Test	:	06 Feb 2024



1.3 **Brief Summary of Results**

A brief summary of the tests carried out in accordance with the specifications as shown below.

Specification Clause	Test Description	Result	Comments/Base Standard
FCC 47 CFR 15B			
15.107	Conducted Emissions at Mains Terminals (Class A)	Pass	ANSI C63.4: 2014
15.109	Radiated Emissions (Class A)	Pass	ANSI C63.4: 2014

Notes

1. Cellanome, Inc. declares that the RFID module used for Chiller detect function and Flow Cell detect function are electrically identical. The only difference is the cable length to the antenna PCB. The Chiller RFID antenna cable is 30cm in length, while the Flow Cell RFID antenna cable is 80cm in length.





1.4 Product Information

1.4.1 Technical Description

Description	:	The Equipment Under Test(s) (EUT(s)) is a CELL ANALYSIS SYSTEM for single-cell multi-omics analysis at scale, which enables flexible exploration of cellular phenotype, function, behaviour, and underlying omics.
Microprocessor	:	ESP32 PICO V3 (on Pepper C1 v2.x) ESP32-D0WDQ6-V3 (on Pepper C1 v1.x)
Operating Frequency	:	240MHz (MCU operating frequency)
Clock / Oscillator Frequency	:	13.56MHz (RFID chip external oscillator)
Modulation	:	Amplitude Shift Keying (ASK)
Antenna Gain	:	0dBi
Port / Connectors	:	1 x AC Inlet 2 x USB A 1 x LAN port
Rated Power	:	Input 100V–240V 50Hz-60Hz 15A
Accessories	:	Nil



1.4.2 Test Configuration and Modes of Operation

Mode(s)	Description
Full Operation	The EUT was exercised in the following mode(s) throughout the test(s). a. CELL Analysis b. Flowcell RFID Polling c. Chiller RFID Polling

1.4.3 Performance Criteria and Monitoring Methods

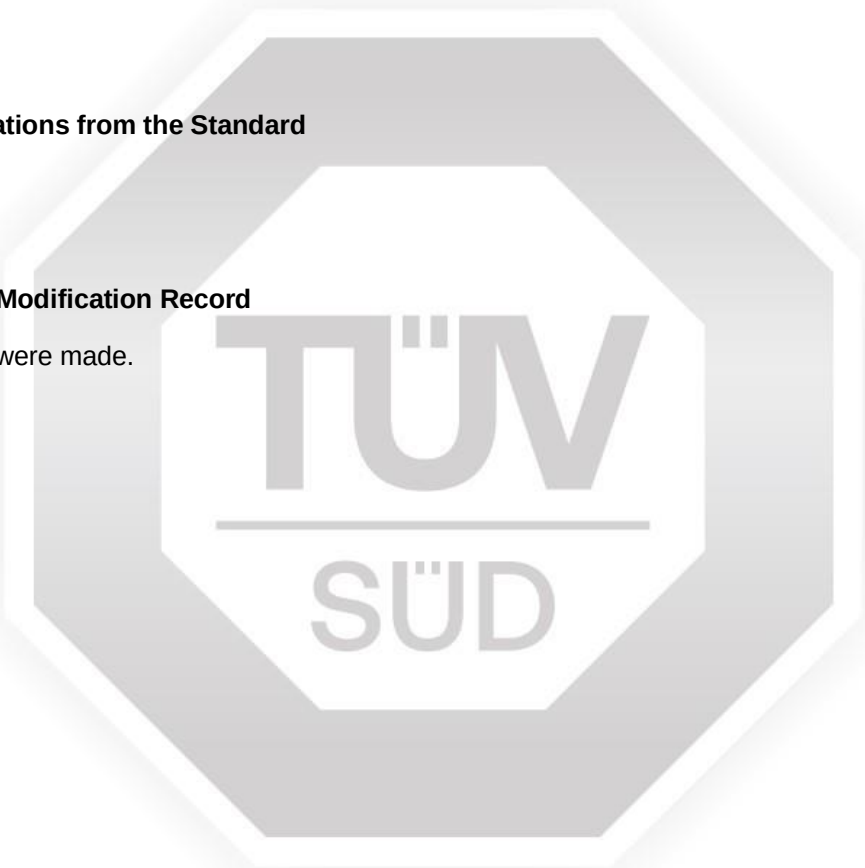
Not Applicable.

1.5 Deviations from the Standard

Nil.

1.6 EUT Modification Record

No modifications were made.





1.7 Test Location(s)

TÜV SÜD PSB Pte Ltd
Electrical & Electronics Centre (EEC), Product Services,
15 International Business Park
TÜV SÜD @ IBP
Singapore 609937

1.8 Test Facilities Registrations

Requirements	Registration Numbers
FCC	994109 (Test Firm Registration Number) SG0002 (Designation Number)
ISED	SGAP01 (CAB Identifier) 2932I (10m Semi-Anechoic Chamber)
VCCI	R-13324 (10m ANC), G-10203 (10mANC) R-20151 (3m RF Chamber - Lab 7), G-20149 (3m RF Chamber - Lab 7) C-14933 (C.E @ CEIBP) T-12403 (Telecom Ports @ CEIBP)
BSMI	SL2-IS-E-6001R [CNS-13803 (ISM Equipment)] SL2-IN-E-6001R [CNS-13438, CNS-15936 (IT Equipment)] SL2-R1/R2-E-6001R [CNS-13439, CNS-15936 (Broadcast Receivers)] SL2-A1-E-6001R [CNS-13783-1 (Household Appliances)] SL2-L1-E-6001R [CNS-14115 (Lighting Equipment)]
SABS	SABS/A-LAB/0030/2018
ASCA	TL-86



1.9 Supporting Equipment

Equipment Description (Including Brand Name)	Model, Serial & FCC ID Number	Cable Description (List Length, Type & Purpose)
Dlink Wireless AC1750 Dual-Band Gigabit Cloud Router	M/N: DIR-868L S/N: RZGE1F9013157 FCC ID: KA2IR868LA1	
Asian Power Devices Inc. AC Adapter	M/N: WA-36A12 S/N: 349159833-BAB FCC ID: SDoC	1.50 m unshielded power cable





2 **Test Details**

2.1 **Conducted Emissions at Mains Terminals**

2.1.1 **Test Limits**

AC Mains Port (Class A)

Frequency Range (MHz)	Limits (dBµV)	
	Quasi-peak (Q-P)	Average (AV)
0.15 - 0.5	79	66
0.5 - 30.0	73	60





2.1.2 Test Setup

- 2.1.2.1 The EUT and supporting equipment were set up in accordance with the requirements of the standard as shown in the setup photos.
- 2.1.2.2 The power supply for the EUT was fed through a $50\Omega/50\mu\text{H}$ EUT LISN, connected to filtered mains.
- 2.1.2.3 The RF OUT of the EUT LISN was connected to the EMI test receiver via a low-loss coaxial cable.
- 2.1.2.4 All other supporting equipment were powered separately from another LISN.

2.1.3 Test Method

- 2.1.3.1 The EUT was switched on and allowed to warm up to its normal operating condition.
- 2.1.3.2 A scan was made on the NEUTRAL line over the required frequency range using an EMI test receiver.
- 2.1.3.3 High peaks, relative to the limit line, were then selected.
- 2.1.3.4 The EMI test receiver was then tuned to the selected frequencies and the necessary measurements made with a receiver bandwidth setting of 9kHz. Both Quasi-peak and Average measurements were made.
- 2.1.3.5 The measurements were then repeated for the LIVE line.

Sample Calculation Example

At 20 MHz

Q-P limit (Class B) = 60.0 dB μV

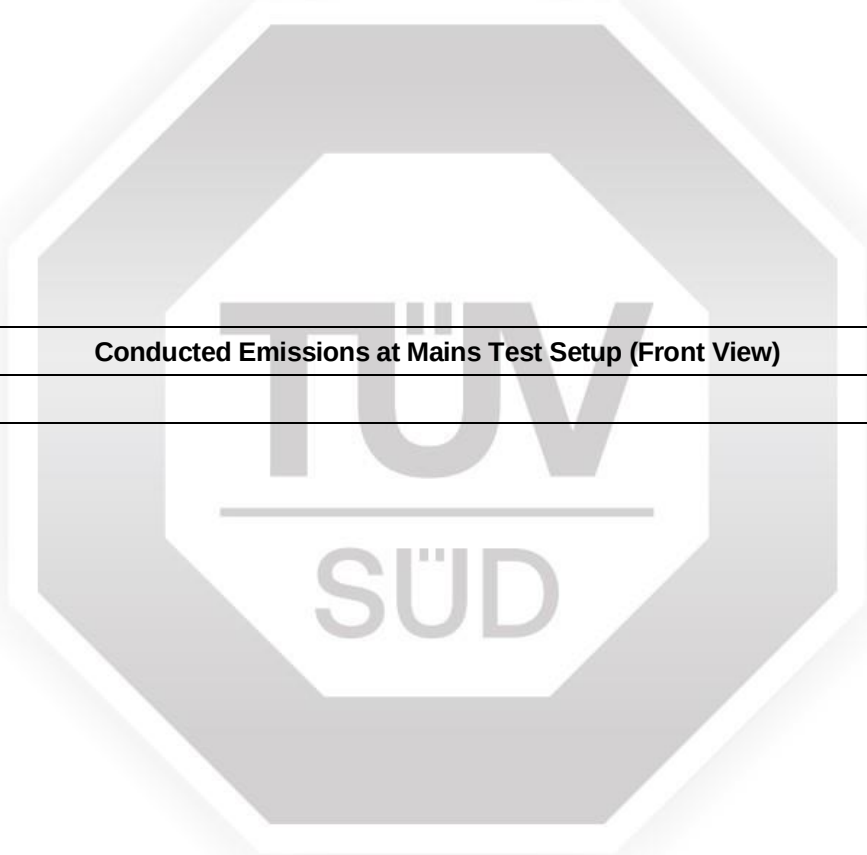
Transducer factor of LISN, pulse limiter & cable loss at 20 MHz = 11.2 dB

Q-P reading obtained directly from EMI Receiver = 40.0 dB μV
(Calibrated for system losses)

Therefore, Q-P margin = 60.0 - 40.0 = 20.0

i.e. 20.0 dB below Q-P limit

2.1.4 Test Setup Photographs



Conducted Emissions at Mains Test Setup (Front View)

Conducted Emissions at Mains Test Setup (Rear View)



2.1.5 Test Results

The detailed of the test results are shown below.

Operating Mode	Full Operation	Temperature	24°C
Test Input Power	120V 60Hz	Relative Humidity	51%
Line Under Test	AC Mains	Atmospheric Pressure	1029mbar
Class	A	Tested By	Nazrulhizat / Asyrul
RFID	Flowcell RFID	Test Date	06 Feb 2024

Frequency (MHz)	Q-P Value (dBμV)	Q-P Limit (dBμV)	Q-P Margin (dB)	AV Value (dBμV)	AV Limit (dBμV)	AV Margin (dB)	Line
0.1677	49.2	79.0	29.8	49.2	66.0	16.8	Neutral
0.2518	56.5	79.0	22.5	56.2	66.0	9.8	Neutral
0.3356	48.4	79.0	30.6	48.1	66.0	17.9	Neutral
0.4196	58.5	79.0	20.5	58.3	66.0	7.7	Neutral
0.5036	49.0	73.0	24.0	48.6	60.0	11.4	Neutral
18.7492	34.3	73.0	38.7	28.7	60.0	31.3	Live

Operating Mode	Full Operation	Temperature	24°C
Test Input Power	120V 60Hz	Relative Humidity	51%
Line Under Test	AC Mains	Atmospheric Pressure	1029mbar
Class	A	Tested By	Nazrulhizat / Asyrul
RFID	Chiller RFID	Test Date	06 Feb 2024

Frequency (MHz)	Q-P Value (dBμV)	Q-P Limit (dBμV)	Q-P Margin (dB)	AV Value (dBμV)	AV Limit (dBμV)	AV Margin (dB)	Line
0.1900	40.1	79.0	38.9	34.9	66.0	31.1	Neutral
0.1678	47.7	79.0	31.3	47.6	66.0	18.4	Live
0.2519	55.3	79.0	23.7	54.7	66.0	11.3	Live
0.4196	56.0	79.0	23.0	55.9	66.0	10.1	Live
0.5034	49.3	73.0	23.7	49.0	60.0	11.0	Live
6.4432	35.4	73.0	37.6	28.6	60.0	31.4	Live



Notes

1.	All possible modes of operation were investigated from 150kHz to 30MHz. Only the worst-case emissions measured, using the correct CISPR detectors, are reported. All other emissions were relatively insignificant.
2.	A "positive margin" indicates a PASS as it refers to the margin present below the limit line at the particular frequency. Conversely, a "negative margin" indicates a FAIL.
3.	EMI receiver Resolution Bandwidth (RBW) and Video Bandwidth (VBW) settings: <u>150kHz - 30MHz</u> RBW: 9kHz VBW: 30kHz





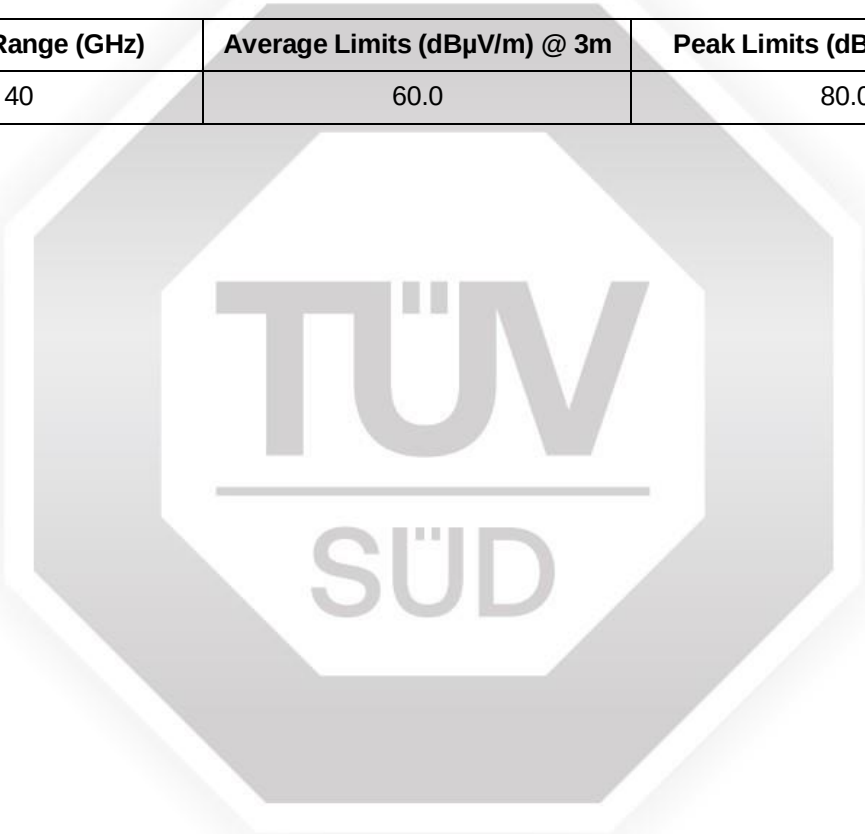
2.2 Radiated Emissions

2.2.1 Test Limits

Class A

Frequency Range (MHz)	Quasi-Peak Limits (dBµV/m) @ 10m
30 - 88	39.0
88 - 216	43.5
216 - 960	46.4
Above 960 - 1000	49.5
Note : At transition frequency, lower limit applies.	

Frequency Range (GHz)	Average Limits (dBµV/m) @ 3m	Peak Limits (dBµV/m) @ 3m
1 – 40	60.0	80.0





2.2.2 Test Setup

- 2.2.2.1 The EUT and supporting equipment were set up in accordance with the requirements of the standard as shown in the setup photos.
- 2.2.2.2 The filtered power supply for the EUT and supporting equipment were tapped from the appropriate power sockets located on the turntable.
- 2.2.2.3 The relevant broadband antenna was set at the required test distance away from the EUT and supporting equipment boundary.

2.2.3 Test Method

- 2.2.3.1 The EUT was switched on and allowed to warm up to its normal operating condition.
- 2.2.3.2 A pre-scan was carried out to pick the worst emission frequencies from the EUT. For EUT which is a portable device, the pre-scan was carried out by rotating the EUT through three orthogonal axes to determine which altitude and equipment arrangement produces such emissions.
- 2.2.3.3 The test was carried out at the selected frequency points obtained from the pre-scan. Maximization of the emissions, was carried out by rotating the EUT, changing the antenna polarization, and adjusting the antenna height in the following manner:
 - a. Vertical or horizontal polarization (whichever gave the higher emission level over a full rotation of the EUT) was chosen.
 - b. The EUT was then rotated to the direction that gave the maximum emission.
 - c. Finally, the antenna height was adjusted to the height that gave the maximum emission.
- 2.2.3.4 A Quasi-peak measurement was made for that frequency point if it was less than or equal to 1GHz. For frequency point that above 1GHz, both Peak and Average measurements were carried out.
- 2.2.3.5 The measurements were repeated for the next frequency point, until all selected frequency points were measured.

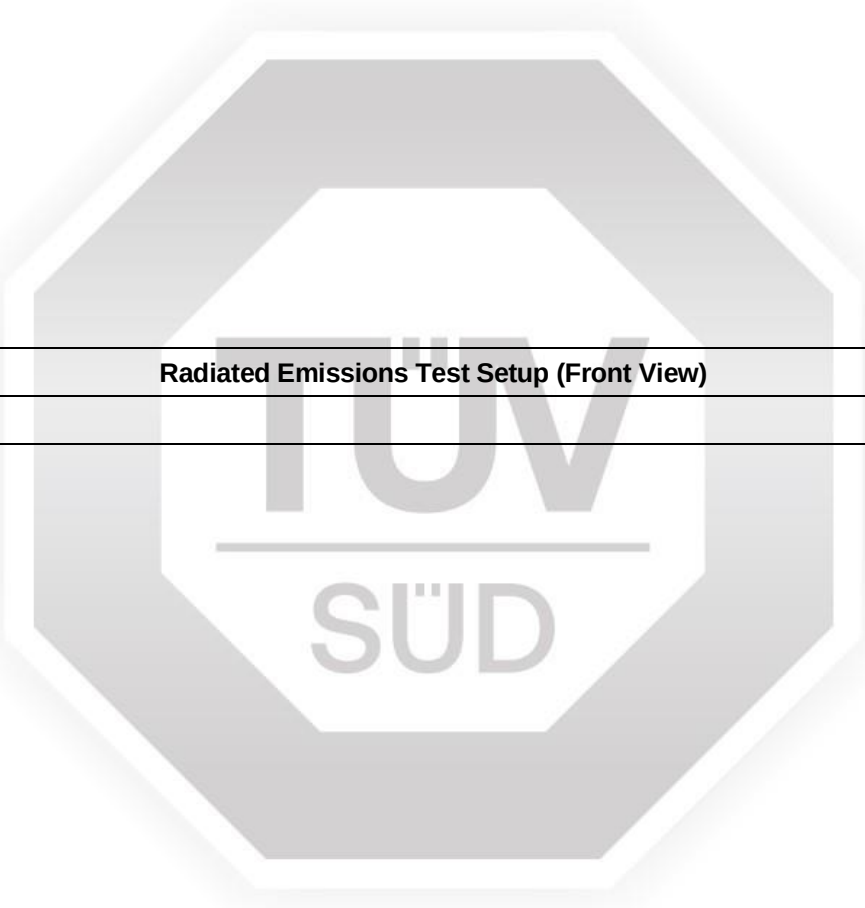
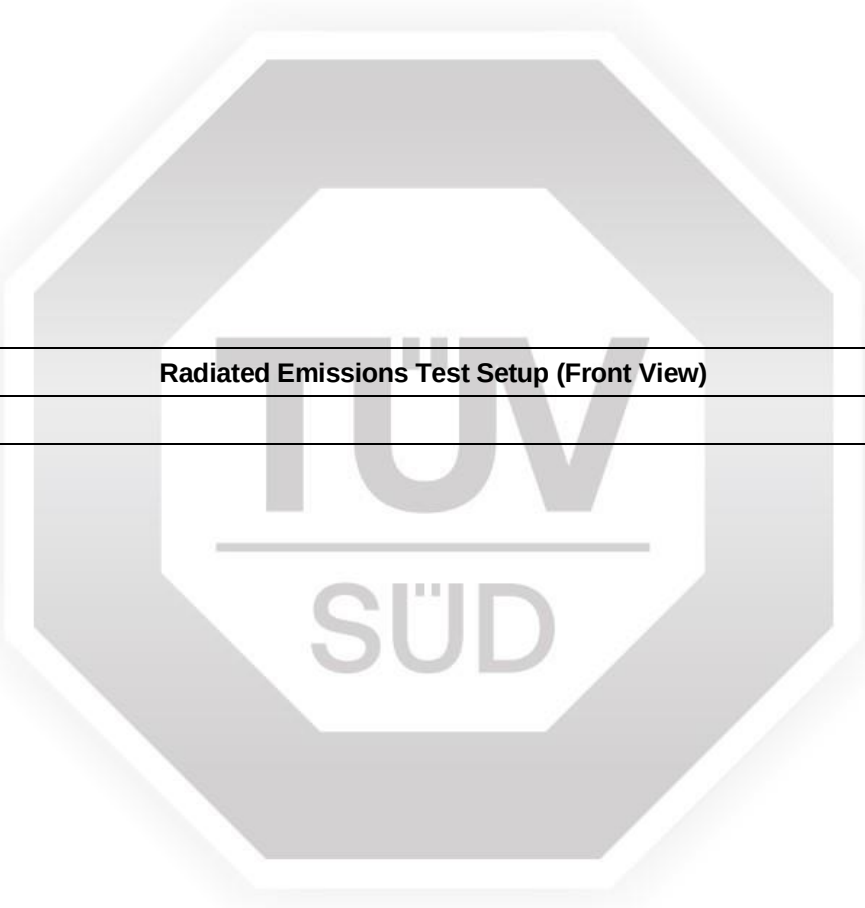
Sample Calculation Example

At 300 MHz	Q-P limit (Class B) = 37.0 dB μ V/m
Log-periodic antenna factor & cable loss at 300 MHz = 18.5 dB	
Q-P reading obtained directly from EMI Receiver = 31.0 dB μ V/m	
(Calibrated level including antenna factors & cable losses)	
Therefore, Q-P margin = 37.0 - 31.0 = 6.0	i.e. 6.0 dB below Q-P limit



2.2.4 Test Setup Photographs

30MHz – 1GHz Test Setup

	
Radiated Emissions Test Setup (Front View)	
	
Radiated Emissions Test Setup (Rear View)	



2.2.5 Test Results

The detailed of the test results are shown below.

Operating Mode	Full Operation	Temperature	27°C
Test Input Power	120V 60Hz	Relative Humidity	55%
Test Distance	10m (30MHz – 1GHz) 3m (1GHz – 2GHz)	Atmospheric Pressure	1020mbar
Class	A	Tested By	Anthony Toh
RFID	FlowCell RFID	Test Date	02 Feb 2024 & 05 Feb 2024

Emissions from 30MHz – 1GHz

Frequency (MHz)	Q-P Value (dBμV/m)	Q-P Limit (dBμV/m)	Q-P Margin (dB)	Height (cm)	Azimuth (Degrees)	Polarization (H/V)
54.2650	32.5	39.0	6.5	200	23	V
148.5150	32.0	43.5	11.5	100	164	V
419.9990	35.1	46.4	11.3	300	21	V
444.0020	35.7	46.4	10.7	200	9	V
594.0320	35.2	46.4	11.2	101	78	H
742.5270	37.6	46.4	8.8	399	210	V

Emissions above 1GHz – 2GHz

Freq (GHz)	Peak Value (dBμV/m)	Peak Limit (dBμV/m)	Peak Margin (dB)	AV Value (dBμV/m)	AV Limit (dBμV/m)	AV Margin (dB)	Height (cm)	Azimuth (Degrees)	Pol (H/V)
1.0394	53.1	80.0	26.9	45.5	60.0	14.5	300	3	H
1.7723	54.4	80.0	25.6	31.0	60.0	29.0	300	327	H
1.9306	49.7	80.0	30.3	39.8	60.0	20.2	101	12	V
--	--	--	--	--	--	--	--	--	--
--	--	--	--	--	--	--	--	--	--
--	--	--	--	--	--	--	--	--	--



Operating Mode	Full Operation	Temperature	27°C
Test Input Power	120V 60Hz	Relative Humidity	55%
Test Distance	10m (30MHz – 1GHz) 3m (1GHz – 2GHz)	Atmospheric Pressure	1020mbar
Class	A	Tested By	Anthony Toh
RFID	Chiller RFID	Test Date	02 Feb 2024 & 05 Feb 2024

Emissions from 30MHz – 1GHz

Frequency (MHz)	Q-P Value (dBμV/m)	Q-P Limit (dBμV/m)	Q-P Margin (dB)	Height (cm)	Azimuth (Degrees)	Polarization (H/V)
148.5150	31.9	43.5	11.6	101	157	V
420.0320	36.4	46.4	10.0	300	28	V
444.0020	37.3	46.4	9.1	300	21	V
594.0320	33.7	46.4	12.7	101	83	H
742.5270	38.1	46.4	8.3	399	202	V
891.0220	36.8	46.4	9.6	300	352	V

Emissions above 1GHz – 2GHz

Freq (GHz)	Peak Value (dBμV/m)	Peak Limit (dBμV/m)	Peak Margin (dB)	AV Value (dBμV/m)	AV Limit (dBμV/m)	AV Margin (dB)	Height (cm)	Azimuth (Degrees)	Pol (H/V)
1.0396	52.2	80.0	27.8	43.2	60.0	16.8	300	2	V
1.7765	54.6	80.0	25.4	32.4	60.0	27.6	365	329	H
1.8434	55.4	80.0	24.6	32.3	60.0	27.7	200	353	V
--	--	--	--	--	--	--	--	--	--
--	--	--	--	--	--	--	--	--	--
--	--	--	--	--	--	--	--	--	--



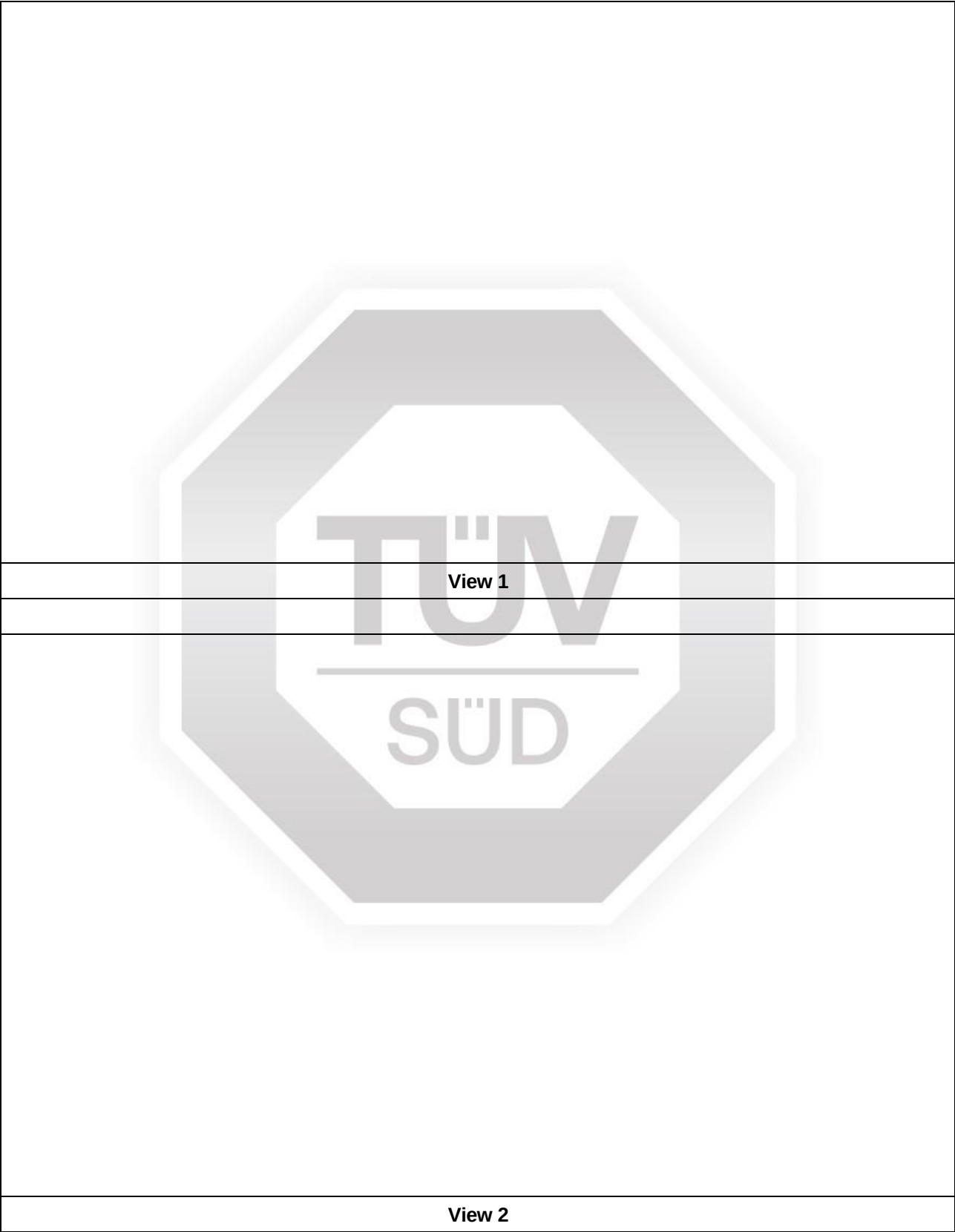
Notes

1.	All possible modes of operation were investigated. Only the worst-case emissions measured, using the correct CISPR detectors, are reported. All other emissions were relatively insignificant.
2.	A "positive margin" indicates a PASS as it refers to the margin present below the limit line at the particular frequency. Conversely, a "negative margin" indicates a FAIL.
3.	EMI receiver Resolution Bandwidth (RBW) and Video Bandwidth (VBW) settings: <u>30MHz - 1GHz</u> RBW: 120kHz VBW: 1MHz <u>1GHz – 2GHz</u> RBW: 1MHz VBW: 3MHz
4.	The highest frequency of internal sources of the EUT is between 108MHz and 500MHz, as such, the measurement was made up to 2GHz.
5.	"--" indicates no emissions were found and shows compliance to the limits.



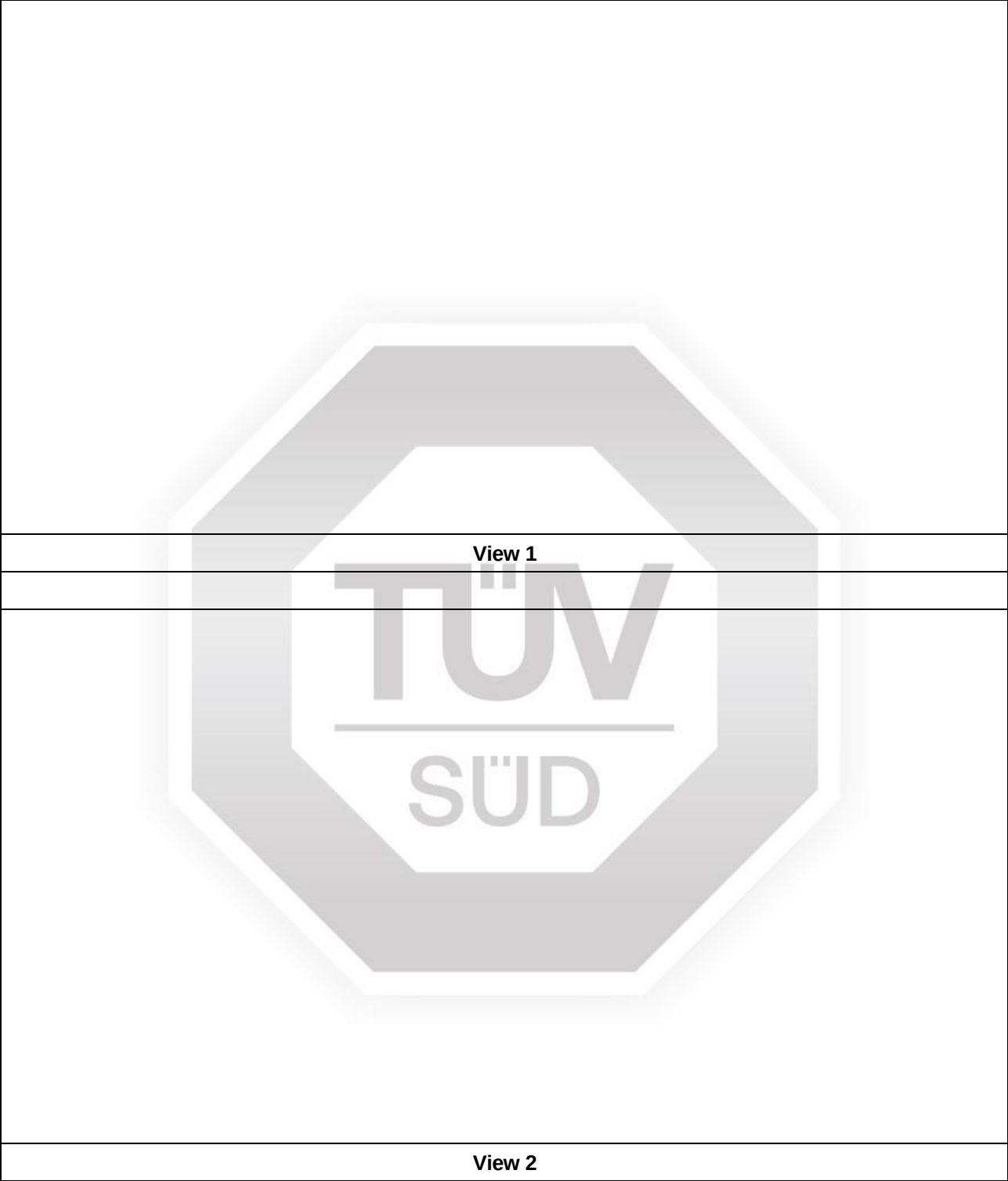


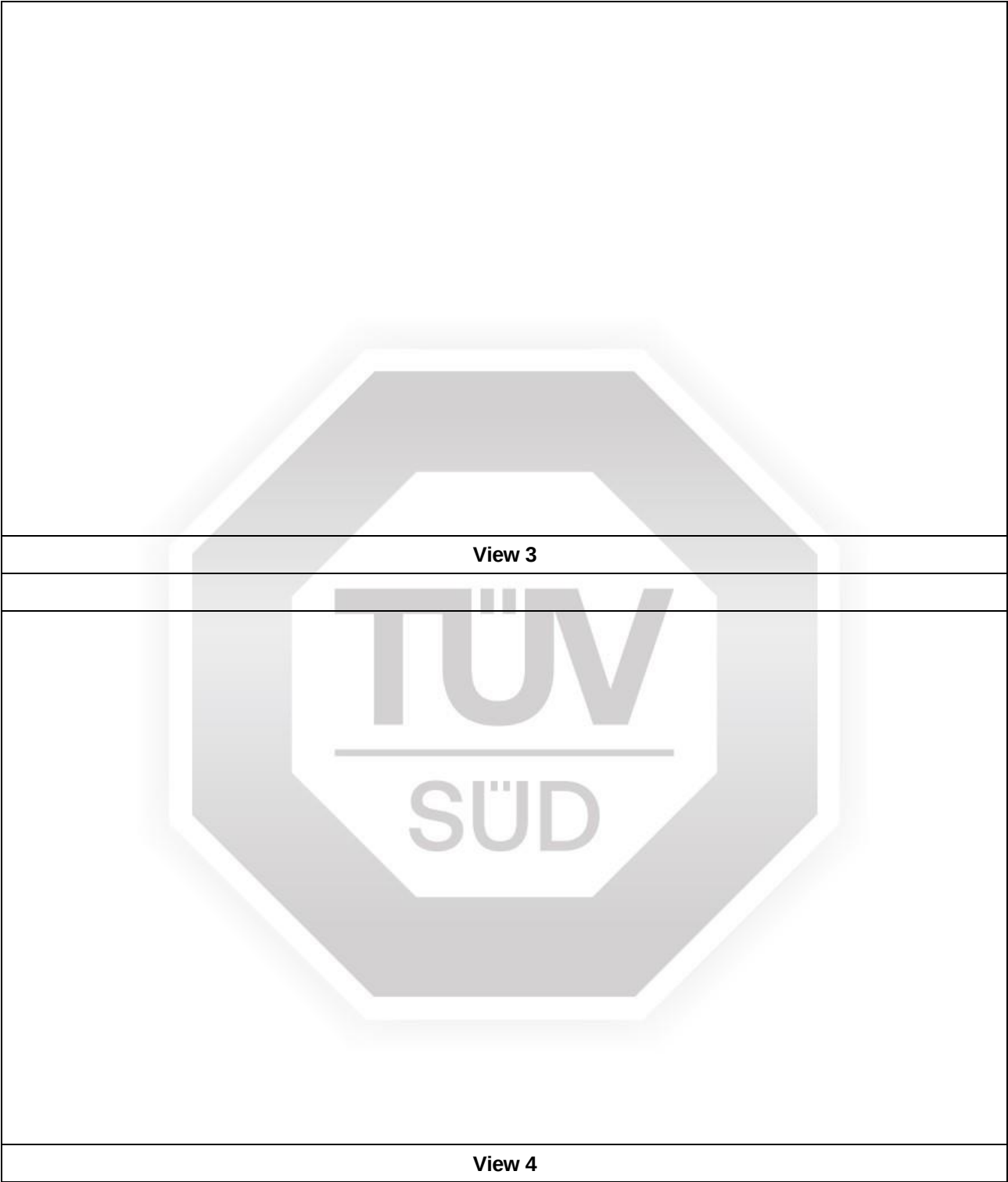
3 Photographs





PCB Photo







4 Test Equipment

Instrument	Model	S/No	Cal Due Date
Conducted Emissions at Mains Terminals			
R&S EMI Test Receiver (9kHz - 3GHz)	ESPI3	100349	09 May 2024
AFJ LISN	AFJ LT32C/10	32031929295	13 Jul 2024
Radiated Emissions			
R&S EMI Test Receiver (9kHz - 26.5GHz)	ESR26	101714	14 Sep 2024
TDK Bilog Antenna (30MHz – 1GHz)	HLP-3003C	130237	24 Jan 2025
Sonoma Preamplifier (1MHz – 1GHz)	310	254719	21 Apr 2024
Schwarzbeck Horn Antenna (1GHz- 18GHz)	BBHA 9120 D	932	24 Sep 2024
Miteq Preamplifier (1GHz – 6GHz)	AMF-2D-00500800-25-13P	2011153	19 Oct 2023





5 Measurement Uncertainty

All measured results are traceable to the SI units. The uncertainty of the measurement is at a confidence level of approximately 95%, with a coverage factor of 2.

Test Name	Measurement Uncertainty
Conducted Emissions at Mains Terminals	1.1dB (9kHz to 30MHz)
Radiated Emissions	<u>10m Anechoic Chamber (Lab 4)</u> 2.2dB (9kHz to 30MHz @ 10m) 3.1dB (30MHz to 1GHz @ 10m) 3.7dB (30MHz to 1GHz @ 3m) 4.7dB (>1GHz to 40GHz @ 3m) <u>3m RF Chamber (Lab7)</u> 3.6dB (30MHz to 1GHz @ 3m) 4.7dB (>1GHz to 40GHz @ 3m)





Please note that this Report is issued under the following terms :

1. This report applies to the sample of the specific product/equipment given at the time of its testing/calibration. The results are not used to indicate or imply that they are applicable to other similar items. In addition, such results must not be used to indicate or imply that TÜV SÜD PSB approves, recommends or endorses the manufacturer, supplier or user of such product/equipment, or that TÜV SÜD PSB in any way "guarantees" the later performance of the product/equipment. Unless otherwise stated in this report, no tests were conducted to determine long term effects of using the specific product/equipment.
2. The sample/s mentioned in this report is/are submitted/supplied/manufactured by the Client. TÜV SÜD PSB therefore assumes no responsibility for the accuracy of information on the brand name, model number, origin of manufacture, consignment or any information supplied.
3. Nothing in this report shall be interpreted to mean that TÜV SÜD PSB has verified or ascertained any endorsement or marks from any other testing authority or bodies that may be found on that sample.
4. This report shall not be reproduced wholly or in parts and no reference shall be made by the Client to TÜV SÜD PSB or to the report or results furnished by TÜV SÜD PSB in any advertisements or sales promotion.
5. Unless otherwise stated, the tests were carried out in TÜV SÜD PSB Pte Ltd, 15 International Business Park TÜV SÜD @ IBP Singapore 609937.
6. The tests carried out by TÜV SÜD PSB and this report are subject to TÜV SÜD PSB's General Terms and Conditions of Business and the Testing and Certification Regulations of the TÜV SÜD Group.

Effective 26 January 2021



End of the Test Report