

# EMC/EMI Test Report

## Client Information:

Applicant Name: Telektron (India)  
Applicant Address: 105, Veena Industrial Estate, Off New Link Road, Andheri West, Mumbai - 400 053, India  
Manufacturer's Name: Telektron (India)  
Manufacturer's Address: 105, Veena Industrial Estate, Off New Link Road, Andheri West, Mumbai - 400 053, India

## Product Information:

Product Name: **Pressure Transducer**  
Model No.: TK-U5 10 Bar  
Serial No: 2386200  
Brand Name: Telektron

## Product Standard EN 50121-3-2:2016+A1:2019

Test and Reference standards  
Conducted emission and Radiated emission as per **EN 55011:2016**,  
Immunity to radiated radio frequency, Electromagnetic field as per **IEC 61000-4-3:2006+A1:2007+A2:2010**,  
Immunity to Electric fast transient/burst as per **IEC 61000-4-4:2012**,  
Surge immunity test as per **IEC 61000-4-5:2014+A1:2017**,  
Immunity to conducted disturbances as per **IEC 61000-4-6: 2013**

Report No.: ATL2190012021  
ULR: TC644621000002154F  
Date of Issue: 23/08/2021  
Date of Receipt: 07/08/2021  
Test Date: 16/08/2021 to 19/08/2021

## Test laboratory : Alpha Test House

198-199, MIE, Phase-1, Bahadurgarh, Haryana-124507 (India)

This device has been tested and found to comply with the stated standard(s), and tests results indicated in the test report and are applicable only to the tested sample identified in the report.

Tested by: Mr. Manish Kumar

Approved by: Mr. Sunil Kumar Yadav



Note: This report shall not be reproduced except in full, without the written approval of **Alpha Test House**. This test report must not be used by the client to claim product endorsement.

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| <b>1 Summary</b>   |                                     |                                      |               |
|--|-------------------------------------|--------------------------------------|---------------|
| <b>Test name</b>   | <b>Reference standard</b>           | <b>Required performance criteria</b> | <b>Result</b> |
| <b>Conducted emission</b>  | EN 55011:2016                       | Limits                               | Pass          |
| <b>Radiated emission</b>   | EN 55011:2016                       | Limits                               | Pass          |
| <b>Immunity to radiated radio frequency, Electromagnetic field</b> | IEC 61000-4-3: 2006+A1:2007+A2:2010 | 'A'                                  | Pass          |
| <b>Immunity to fast transient/burst</b>                            | IEC 61000-4-4: 2012                 | 'A'                                  | Pass          |
| <b>Surge immunity test</b>   | IEC 61000-4-5: 2014+A1:2017         | 'B'                                  | Pass          |
| <b>Immunity to conducted disturbances in RF common mode</b>        | IEC 61000-4-6: 2013                 | 'A'                                  | Pass          |

Note:

If the product as tested complies with the specification or requirement, the EUT is deemed to comply and is issued a 'PASS' grade. If not, 'FAIL' grade is issued.

N/A is an abbreviation for Not Applicable.

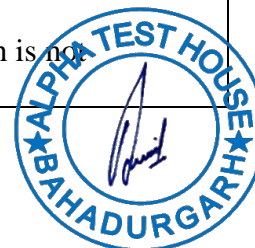
### 1.1 General Performance Criteria

**Performance criterion A:** The apparatus shall continue to operate as intended during and after the test. No degradation of performance or loss of function is allowed below a performance level specified by the manufacturer, when the apparatus is used as intended.

**Performance criterion B:** temporary loss of function or degradation of performance which ceases after the disturbance ceases, and from which the equipment under test recovers its normal performance, without operator intervention.

**Performance criterion C:** temporary loss of function or degradation of performance, the correction of which requires operator intervention.

**Performance criterion D:** loss of function or degradation of performance which is not recoverable, owing to damage to hardware or software, or loss of data.



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## 1.2 Measurement Uncertainty

The listed uncertainties are the worst case uncertainty for the entire range of measurement. Please note that the uncertainty values are provided for informational purposes only and are not used in determining the PASS/FAIL results.

| S.no. | item               | Frequency range | Expanded Uncertainty<br>(k=2) (±) |
|-------|--------------------|-----------------|-----------------------------------|
| 1.    | Conducted Emission | 150kHz-30MHz    | 2.4dB                             |
| 2.    | Radiated Emission  | 30MHz-1GHz      | 2.58dB                            |
| 3.    | Radiated Emission  | 1GHz-6GHz       | 2.58dB                            |

## 2 Test Facility

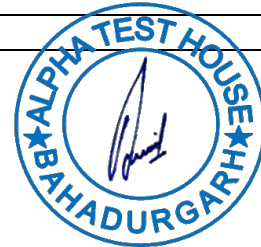
The test facility is recognized, certified or accredited by the NABL .

### 2.1 Deviation From Standard

None

### 2.2 Abnormalities from standard conditions

None



### 3 General Information

#### 3.1 General Description of EUT

|                     |  |
|---------------------|--|
| Manufacturer        | Telektron (India)  |
| Product Name        | Pressure Transducer  |
| Product Description | A pressure transducer is a device which converts an applied pressure into a measurable electrical signal. This application is used to continuously sense the depth of the object run during the underwater phase. Range of pressure transducers will be selected based on the operational depth. |
| Model No.           | TK-U5 10 Bar   |
| Serial No.          | 2386200  |
| Brand Name          | Telektron  |
| Rating              | Output: 0-5VDC<br>Range: 0-10 bar<br>Supply: ±15VDC  |
| Equipment Class     | A  |

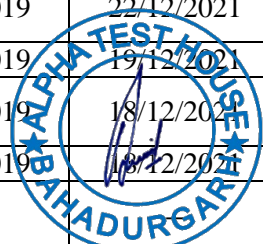
Note:

1. For a more detailed features description, please refer to the manufacturer's specifications or the user manual.
2. for the test results, the EUT had been tested with all conditions. But only the worst case was shown in test report.



### 4 Equipments List for All Test Items

| Conducted emissions test equipment   |                              |                             |                   |            |               |
|--|------------------------------|-----------------------------|-------------------|------------|---------------|
| No.  | Test Equipment               | Manufacturer                | Model No.         | Cal. Date  | Cal. Due Date |
| 1.   | EMI Test Receiver            | R & S                       | ESR7              | 08/09/2020 | 07/09/2022    |
| 2.   | LISN                         | R & S                       | ENV432            | 08/09/2020 | 07/09/2022    |
| 3.   | 8- Wire ISN for CAT 6        | R & S                       | ENY81-CA6         | 15/09/2020 | 14/09/2022    |
| 4.   | Eight- Wire ISN              | R & S                       | ENY81             | 15/09/2020 | 14/09/2022    |
| 5.   | CVP                          | Schwarz beck                | CVP 9222          | 05/01/2021 | 04/01/2023    |
| 6.   | Current Probe                | R & S                       | EZ-17             | 09/09/2020 | 08/09/2022    |
| Radiated emission test equipment   |                              |                             |                   |            |               |
| No.  | Test Equipment               | Manufacturer                | Model No.         | Cal. Date  | Cal. Due Date |
| 1.   | EMI Test Receiver            | R & S                       | ESR7              | 08/09/2020 | 07/09/2022    |
| 2.   | TRILOG Broadband Antenna     | Schwarz beck                | VULB 9162         | 05/01/2021 | 04/01/2023    |
| Immunity to radiated radio frequency, Electromagnetic field test equipment |                              |                             |                   |            |               |
| No.  | Test Equipment               | Manufacturer                | Model No.         | Cal. Date  | Cal. Due Date |
| 1.   | Stacked Log Periodic Antenna | Schwarz beck                | STLP 9129         | 06/01/2021 | 05/01/2023    |
| 2.   | Signal Generator             | R & S                       | SMB100A           | 10/09/2020 | 09/09/2022    |
| 3.   | Single Band Power Amplifier  | R & S                       | BBA150 BC250      | 11/09/2020 | 10/09/2022    |
| 4.   | Dual Band Power Amplifier    | R & S                       | BBA150 D110E100   | 04/01/2021 | 03/01/2023    |
| Immunity to fast transient/burst test equipment                            |                              |                             |                   |            |               |
| No.  | Test Equipment               | Manufacturer                | Model No.         | Cal. Date  | Cal. Due Date |
| 1.   | Combined Generator           | PRIMA                       | PRM61245TA        | 18/09/2020 | 17/09/2022    |
| Surge immunity test equipment  |                              |                             |                   |            |               |
| No.  | Test Equipment               | Manufacturer                | Model No.         | Cal. Date  | Cal. Due Date |
| 1.   | Combined Generator           | PRIMA                       | PRM61245TA        | 18/09/2020 | 17/09/2022    |
| Immunity to conducted disturbances in RF common mode test equipment        |                              |                             |                   |            |               |
| No.  | Test Equipment               | Manufacturer                | Model No.         | Cal. Date  | Cal. Due Date |
| 1.   | Signal Generator             | R & S                       | SMB100A           | 10/09/2020 | 09/09/2022    |
| 2.   | Single Band Power Amplifier  | R & S                       | BBA150-A125       | 11/09/2020 | 10/09/2022    |
| 3.   | Power Line CDN               | FCC                         | FCC-801-M2/M3-32A | 23/12/2019 | 22/12/2021    |
| 4.   | Signal Line CDN              | FCC                         | FCC-801-T4-RJ45-1 | 23/12/2019 | 22/12/2021    |
| 5.   | Signal Line CDN              | FCC                         | F-090407-1004-1A  | 23/12/2019 | 22/12/2021    |
| 6.   | EM Injection Clamp           | FCC                         | F-2031-A-23mm     | 20/12/2019 | 19/12/2021    |
| 7.   | Bulk Current Injection Probe | FCC                         | F-120-8           | 19/12/2019 | 18/12/2021    |
| 8.   | RF Current Probe             | FCC                         | F-52B             | 19/12/2019 | 18/12/2021    |
| 9.   | Attenuator 150W, 6dB         | Bird Electronic Corporation | 150-A-FFN-06      | --         | --            |



## 5 Emission Tests as per EN 55011:2016

### 5.1 Conducted Emissions

#### 5.1.1 Test Limits

Limits for conducted disturbances of class A group 1 equipment measured on a test site (d.c. Power port)

| Frequency Range (MHz) | QP dB(μV) | AV dB(μV) |
|-----------------------|-----------|-----------|
| 0.15 to 0.5           | 97 to 89  | 84 to 76  |
| 5 to 30               | 89        | 76        |

Note: 1) The limits decrease linearly with the logarithm of the frequency in the 0.15MHz to 0.5MHz

2) The bandwidth of detector is set at 9kHz.





**5.1.2 Conducted emissions test set-up**

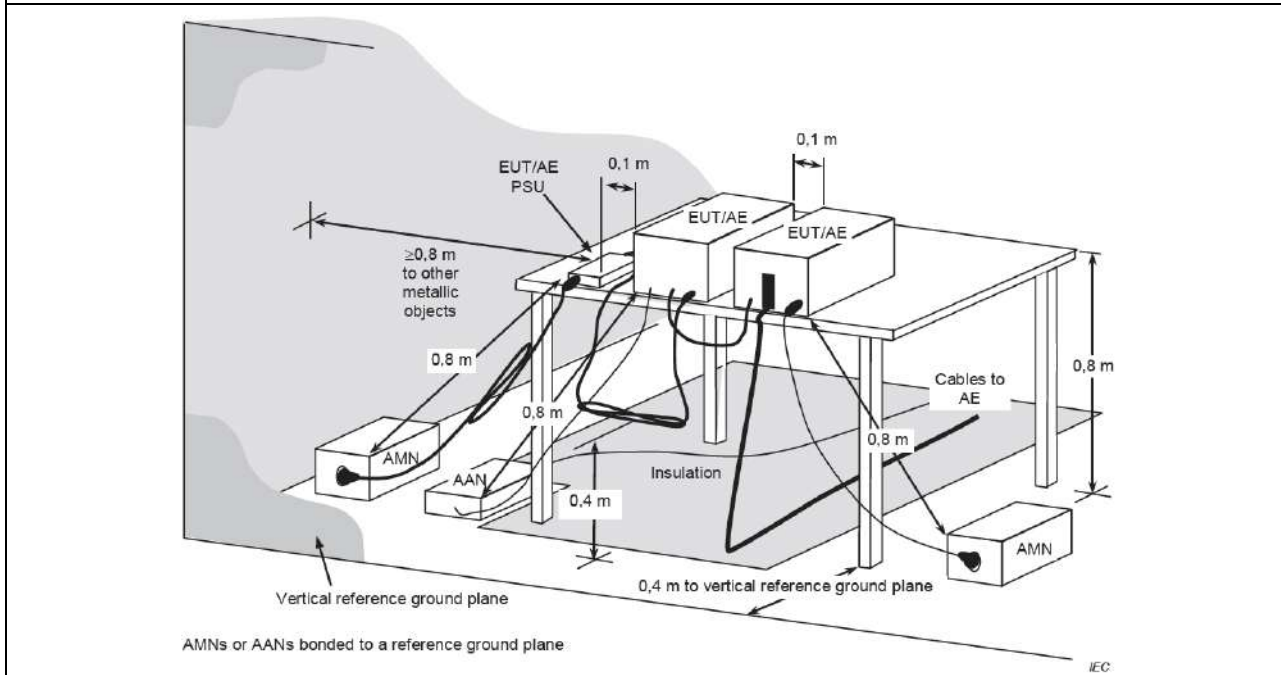


Figure: conducted emission measurement showing AMN & AAN position

The RGP shall have a minimum size of 2 m by 2 m and shall extend a minimum of 0.5 m beyond the EUT, local AE and associated cabling in all directions.

The measurement shall be performed using a vertical RGP. The rear of the EUT, local AE and associated cabling shall be 0.4 m from the vertical RGP. All ground planes in use shall be bonded together. AMN(s) and AAN(s) in use shall be bonded to either the vertical RGP or other metal planes bonded to it.

The portions of signal cables that hang over the rear of the table shall be positioned at a distance of 0.4 m from the vertical RGP and no less than 0.4 m from any horizontal RGP bonded to the vertical RGP. If necessary, maintain the separations using a fixture made of non-conductive material with an appropriate dielectric constant

The 0.8 m distance specified between EUT/AE/PSU and AMN/AAN, is applicable only to the EUT being measured. If the device is AE then it shall be  $\geq 0.8$  m.

The cable under test shall be positioned 0.04 m from the vertical RGP and run at this position between the EUT and AE. This restriction does not apply to the section of the cable passing through the voltage probe.



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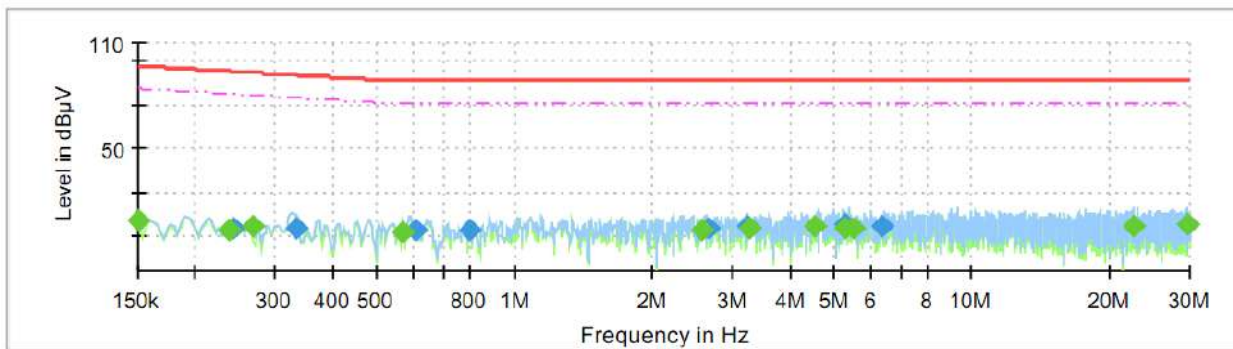
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Group: EMC Test Facility

**5.1.3 Test Result of Conducted Emissions**

|              |                          |                       |                            |             |
|--------------|--------------------------|-----------------------|----------------------------|-------------|
| Testing date | Ambient Temperature (°C) | Relative Humidity (%) | Atmospheric Pressure (kPa) |             |
| 16/08/2021   | 23.4                     | 45                    | 97.8                       |             |
| EUT Supply   | Test Mode                | Tested Line           | Used Coupling Device       | Test Result |
| 15V DC       | Normal operating mode    | +Ve (L1)              | LISN                       | Pass        |



| Frequency (MHz) | QuasiPeak (dBµV) | Average (dBµV) | Limit (dBµV) | Margin (dB) | Meas. Time (ms) | Bandwidth (kHz) | Line | Filter | Corr. (dB) |
|-----------------|------------------|----------------|--------------|-------------|-----------------|-----------------|------|--------|------------|
| 0.150000        | ---              | 8.63           | 84.00        | 75.37       | 1.0             | 9.000           | L1   | ON     | 10.3       |
| 0.236115        | ---              | 3.38           | 80.99        | 77.60       | 1.0             | 9.000           | L1   | ON     | 10.2       |
| 0.243160        | 4.86             | ---            | 93.79        | 88.93       | 1.0             | 9.000           | L1   | ON     | 10.2       |
| 0.268235        | ---              | 5.11           | 80.14        | 75.03       | 1.0             | 9.000           | L1   | ON     | 10.2       |
| 0.332115        | 4.67             | ---            | 91.72        | 87.05       | 1.0             | 9.000           | L1   | ON     | 10.2       |
| 0.570795        | ---              | 2.59           | 76.00        | 73.41       | 1.0             | 9.000           | L1   | ON     | 10.2       |
| 0.606795        | 3.85             | ---            | 89.00        | 85.15       | 1.0             | 9.000           | L1   | ON     | 10.2       |
| 0.799325        | 3.46             | ---            | 89.00        | 85.54       | 1.0             | 9.000           | L1   | ON     | 10.2       |
| 2.563580        | ---              | 3.70           | 76.00        | 72.30       | 1.0             | 9.000           | L1   | ON     | 10.4       |
| 2.647580        | 4.59             | ---            | 89.00        | 84.41       | 1.0             | 9.000           | L1   | ON     | 10.4       |
| 3.247565        | 5.14             | ---            | 89.00        | 83.86       | 1.0             | 9.000           | L1   | ON     | 10.3       |
| 3.255565        | ---              | 4.94           | 76.00        | 71.06       | 1.0             | 9.000           | L1   | ON     | 10.3       |
| 4.543590        | ---              | 5.19           | 76.00        | 70.81       | 1.0             | 9.000           | L1   | ON     | 10.5       |
| 5.253425        | ---              | 4.80           | 76.00        | 71.20       | 1.0             | 9.000           | L1   | ON     | 10.5       |
| 5.257425        | 6.29             | ---            | 89.00        | 82.71       | 1.0             | 9.000           | L1   | ON     | 10.5       |
| 5.490615        | ---              | 4.18           | 76.00        | 71.82       | 1.0             | 9.000           | L1   | ON     | 10.4       |
| 6.376500        | 6.01             | ---            | 89.00        | 82.99       | 1.0             | 9.000           | L1   | ON     | 10.4       |
| 22.566245       | ---              | 5.77           | 76.00        | 70.23       | 1.0             | 9.000           | L1   | ON     | 10.9       |
| 29.567205       | 7.10             | ---            | 89.00        | 81.90       | 1.0             | 9.000           | L1   | ON     | 11.0       |
| 29.579205       | ---              | 7.08           | 76.00        | 68.92       | 1.0             | 9.000           | L1   | ON     | 11.0       |



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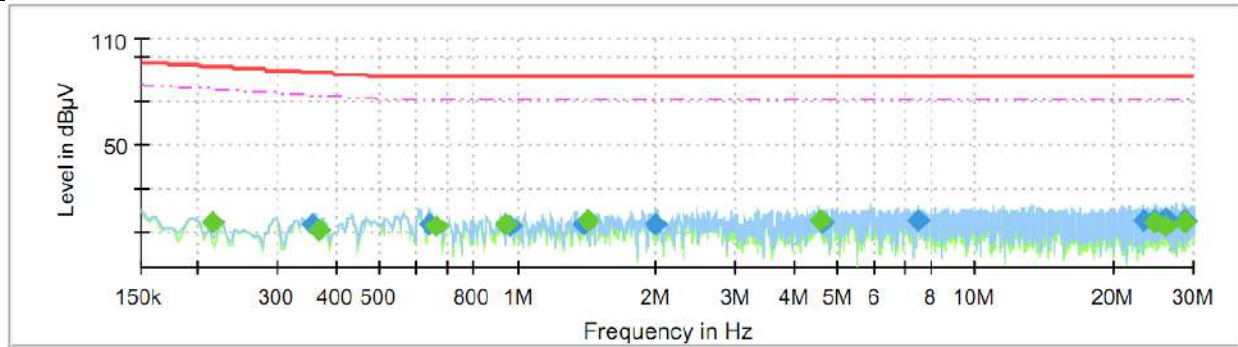
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Discipline: Electronics Testing

Group: EMC Test Facility

| EUT Supply | Test Mode             | Tested Line | Used Coupling Device | Test Result |
|------------|-----------------------|-------------|----------------------|-------------|
| 15V DC     | Normal operating mode | -Ve (N)     | LISN                 | Pass        |



| Frequency (MHz) | QuasiPeak (dBµV) | Average (dBµV) | Limit (dBµV) | Margin (dB) | Meas. Time (ms) | Bandwidth (kHz) | Line | Filter | Corr. (dB) |
|-----------------|------------------|----------------|--------------|-------------|-----------------|-----------------|------|--------|------------|
| 0.214265        | ---              | 5.82           | 81.63        | 75.81       | 1.0             | 9.000           | N    | ON     | 10.2       |
| 0.355575        | 4.56             | ---            | 91.27        | 86.71       | 1.0             | 9.000           | N    | ON     | 10.2       |
| 0.367575        | ---              | 1.45           | 78.04        | 76.59       | 1.0             | 9.000           | N    | ON     | 10.2       |
| 0.643690        | 4.15             | ---            | 89.00        | 84.85       | 1.0             | 9.000           | N    | ON     | 10.3       |
| 0.659690        | ---              | 3.56           | 76.00        | 72.44       | 1.0             | 9.000           | N    | ON     | 10.3       |
| 0.936460        | ---              | 4.30           | 76.00        | 71.70       | 1.0             | 9.000           | N    | ON     | 10.3       |
| 0.957770        | 3.70             | ---            | 89.00        | 85.30       | 1.0             | 9.000           | N    | ON     | 10.3       |
| 1.387015        | 3.89             | ---            | 89.00        | 85.11       | 1.0             | 9.000           | N    | ON     | 10.3       |
| 1.427015        | ---              | 7.16           | 76.00        | 68.84       | 1.0             | 9.000           | N    | ON     | 10.3       |
| 1.988670        | 4.03             | ---            | 89.00        | 84.97       | 1.0             | 9.000           | N    | ON     | 10.4       |
| 4.603950        | ---              | 6.43           | 76.00        | 69.57       | 1.0             | 9.000           | N    | ON     | 10.5       |
| 4.607950        | 6.07             | ---            | 89.00        | 82.93       | 1.0             | 9.000           | N    | ON     | 10.5       |
| 7.455040        | 6.47             | ---            | 89.00        | 82.53       | 1.0             | 9.000           | N    | ON     | 10.6       |
| 23.456195       | 6.61             | ---            | 89.00        | 82.39       | 1.0             | 9.000           | N    | ON     | 11.3       |
| 24.535030       | 6.84             | ---            | 89.00        | 82.16       | 1.0             | 9.000           | N    | ON     | 11.3       |
| 24.567030       | ---              | 5.73           | 76.00        | 70.27       | 1.0             | 9.000           | N    | ON     | 11.3       |
| 25.950640       | 7.96             | ---            | 89.00        | 81.04       | 1.0             | 9.000           | N    | ON     | 11.4       |
| 25.958640       | ---              | 3.65           | 76.00        | 72.35       | 1.0             | 9.000           | N    | ON     | 11.4       |
| 28.633320       | ---              | 5.52           | 76.00        | 70.48       | 1.0             | 9.000           | N    | ON     | 11.5       |
| 28.675825       | 7.15             | ---            | 89.00        | 81.85       | 1.0             | 9.000           | N    | ON     | 11.5       |



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## 5.2 Radiated Emissions

### 5.2.1 Test Limits

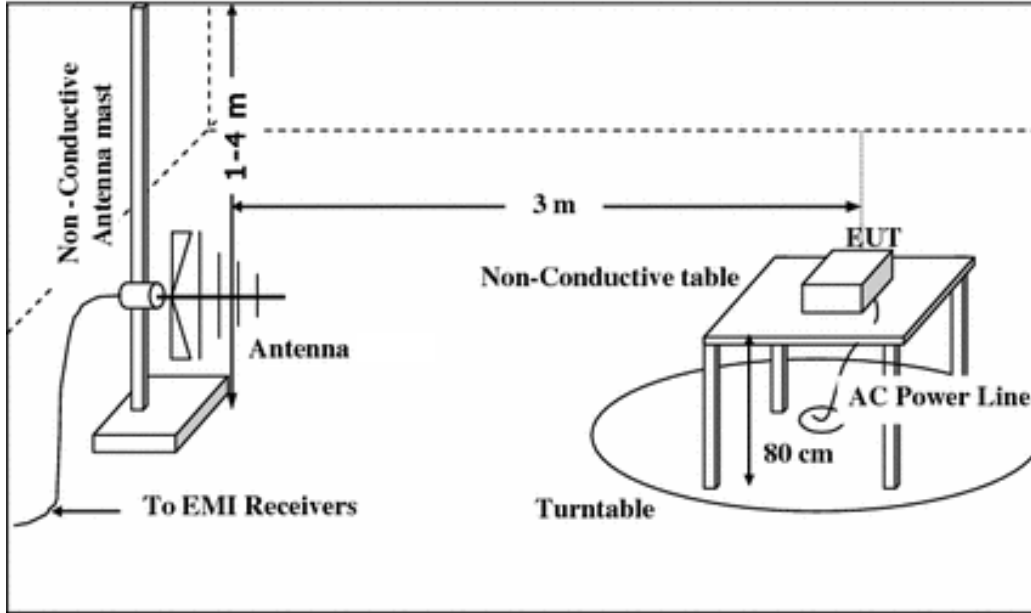
Electromagnetic radiation disturbance limits for class A group 1 equipment,  
measurement distance 3m

| Frequency Range<br>(MHz) | limits<br>dB( $\mu$ V/m) |
|--------------------------|--------------------------|
|                          | Quasi Peak               |
| 30 to 230                | 50                       |
| 230 to 1000              | 57                       |

Note: The bandwidth of detector is set at 120 kHz



**5.2.2 Radiated emissions test set-up**



The EUT is placed on a non-conductive setup table with height of 0.8m. as shown in figure of EUT arrangement.

The EUT and all support equipment received power from the outlet socket under the turntable.

The EUT and local AE shall be arranged in the most compact practical arrangement within the test volume. The central point of the arrangement shall be positioned at the centre of the turntable. The measurement distance is the shortest horizontal distance between an imaginary circular periphery just encompassing this arrangement and calibration point of the antenna.

The table was rotated 360 degrees to determine the position of the highest radiation.

The antenna height is varied between one meter and four meters above ground to find the maximum value of the field strength both horizontal polarization and vertical polarization of the antenna is set to make the measurement.



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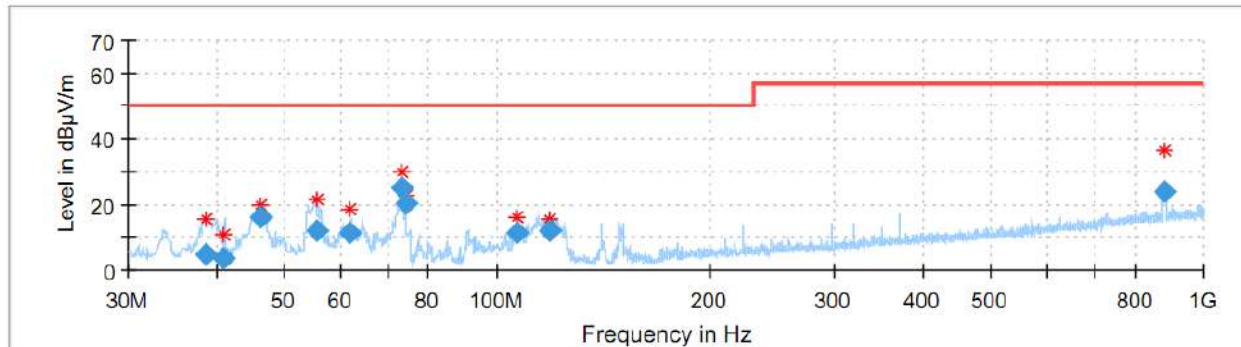
Date: 23/08/2021

Discipline: Electronics Testing

Group: EMC Test Facility

**5.2.3 Test Result of Radiated Emissions**

|              |                          |                       |                            |
|--------------|--------------------------|-----------------------|----------------------------|
| Testing date | Ambient Temperature (°C) | Relative Humidity (%) | Atmospheric Pressure (kPa) |
| 17/08/2021   | 23.5                     | 45                    | 97.8                       |
| EUT Supply   | Test Mode                | Antenna polarization  | Test Result                |
| 15V DC       | Normal operating mode    | H & V                 | Pass                       |



| Frequency (MHz) | QuasiPeak (dBµV/m) | Limit (dBµV/m) | Margin (dB) | Meas. Time (ms) | Bandwidth (kHz) | Height (cm) | Pol | Azimuth (deg) | Corr. (dB/m) |
|-----------------|--------------------|----------------|-------------|-----------------|-----------------|-------------|-----|---------------|--------------|
| 38.826165       | 4.70               | 50.00          | 45.30       | 1000.0          | 120.000         | 100.0       | V   | 1.0           | -27.2        |
| 41.109225       | 3.74               | 50.00          | 46.26       | 1000.0          | 120.000         | 203.0       | V   | 1.0           | -26.9        |
| 46.321035       | 16.06              | 50.00          | 33.94       | 1000.0          | 120.000         | 100.0       | V   | 180.0         | -26.1        |
| 55.520415       | 11.93              | 50.00          | 38.07       | 1000.0          | 120.000         | 202.0       | V   | 0.0           | -26.6        |
| 61.796465       | 11.22              | 50.00          | 38.78       | 1000.0          | 120.000         | 100.0       | V   | 1.0           | -27.8        |
| 73.182660       | 24.83              | 50.00          | 25.17       | 1000.0          | 120.000         | 202.0       | V   | 0.0           | -32.0        |
| 74.260840       | 20.24              | 50.00          | 29.76       | 1000.0          | 120.000         | 100.0       | V   | 1.0           | -32.4        |
| 106.593500      | 11.58              | 50.00          | 38.42       | 1000.0          | 120.000         | 100.0       | V   | 1.0           | -28.6        |
| 118.151500      | 11.97              | 50.00          | 38.03       | 1000.0          | 120.000         | 100.0       | V   | 89.0          | -30.3        |
| 877.944000      | 23.69              | 57.00          | 33.31       | 1000.0          | 120.000         | 100.0       | V   | 90.0          | -17.6        |



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## 6 Immunity Test

### 6.1 Immunity to Radiated, Radio Frequency, Electromagnetic Field (RS)

#### 6.1.1 Test Specification

|                                |                                     |
|--------------------------------|-------------------------------------|
| Required performance criteria: | A                                   |
| Standard:                      | IEC 61000-4-3: 2006+A1:2007+A2:2010 |
| Frequency Range:               | 80MHz -1000MHz                      |
| Field Strength :               | 10 V/m                              |
| Modulation:                    | 1kHz Sine Wave, 80% AM Modulation   |
| Frequency Step:                | 1 % of preceding frequency value    |
| Polarity of Antenna:           | Horizontal and Vertical             |
| Antenna Height:                | 1.5m                                |
| Dwell Time:                    | 3 seconds                           |



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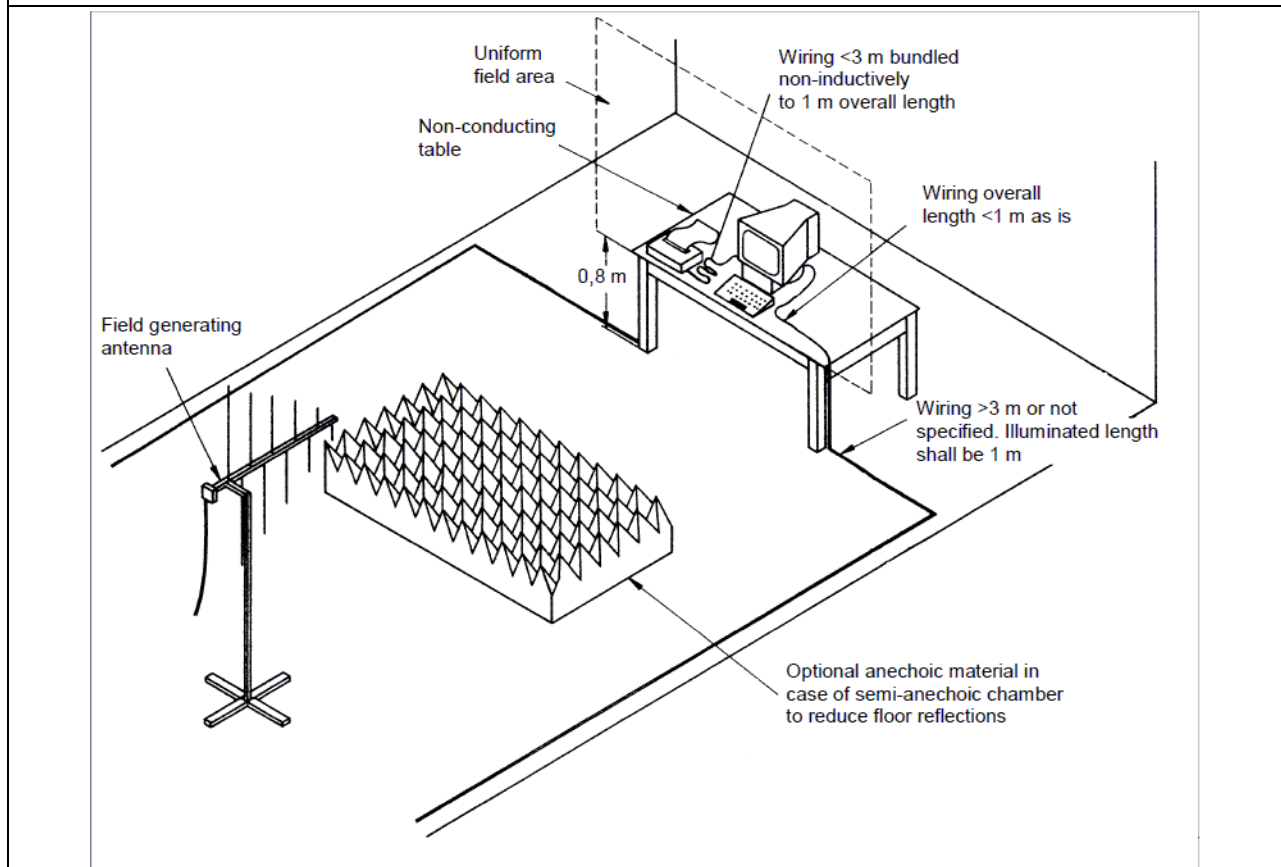
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### 6.1.2 Radiated Susceptibility Test Set-up



The EUT is placed on a non-conductive setup table with height of 0.8m. as shown in figure of EUT arrangement.

The EUT and all support equipment received power from the outlet socket under the turntable.

The EUT and local AE shall be arranged in the most compact practical arrangement within the test volume.

The EUT to transmit antenna distance is 3 meters

The test was performed with the EUT exposed to both vertically and horizontally polarized fields on each of the four sides.





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| 6.1.3 Test Result of Radiated Susceptibility |                          |             |                        |               |                                |        |
|--|--------------------------|-------------|------------------------|---------------|--------------------------------|--------|
| Testing date                                 | Ambient Temperature (°C) |             | Relative Humidity (%)  |               | Atmospheric Pressure (kPa)     |        |
| 18/08/2021                                   | 22.2                     |             | 51                     |               | 97.8                           |        |
| EUT Supply                                   |                          |             | Test Mode              |               |                                |        |
| 15V DC                                       |                          |             | Normal operating mode  |               |                                |        |
| Frequency                                    | Antenna Polarization     | Azimuth (°) | Applied Field Strength |               | Observed performance criterion | Result |
|  |                          |             | (V/m)                  | Modulation    |                                |        |
| 80MHz - 1000MHz                              | Horizontal               | 0           | 10                     | 80% AM (1kHz) | A                              | Pass   |
|  | Horizontal               | 90          | 10                     |               | A                              | Pass   |
|  | Horizontal               | 180         | 10                     |               | A                              | Pass   |
|  | Horizontal               | 270         | 10                     |               | A                              | Pass   |
|  | Vertical                 | 0           | 10                     |               | A                              | Pass   |
|  | Vertical                 | 90          | 10                     |               | A                              | Pass   |
|  | Vertical                 | 180         | 10                     |               | A                              | Pass   |
|  | Vertical                 | 270         | 10                     |               | A                              | Pass   |



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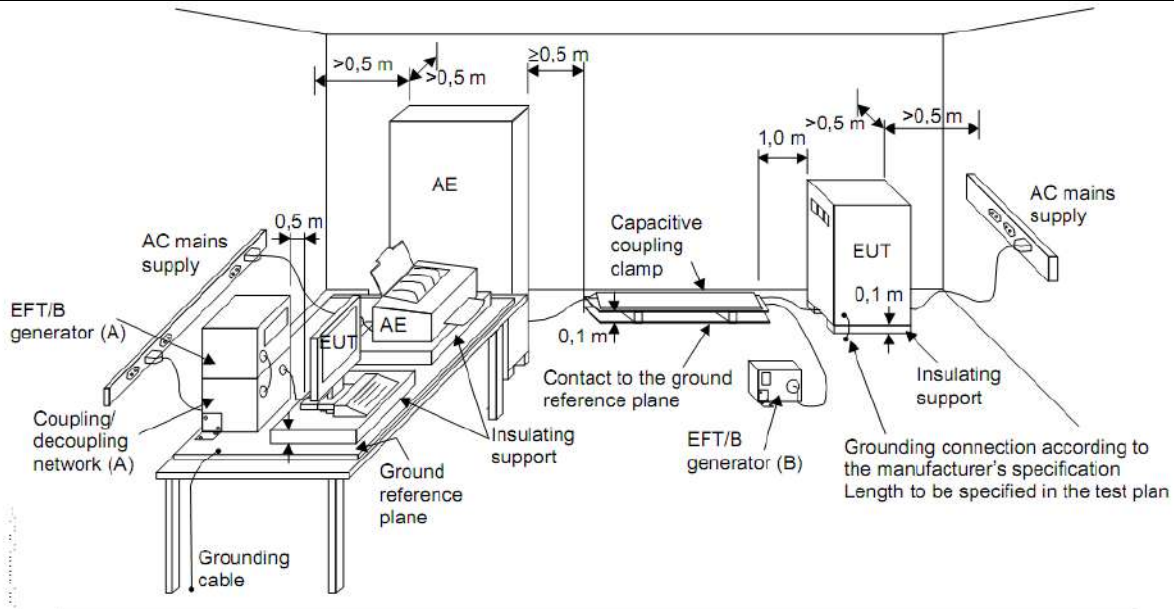
## 6.2 Immunity to Electrical Fast Transient/Burst (EFT/B)

### 6.2.1 Test Specification

|                                |                                     |
|--------------------------------|-------------------------------------|
| Required performance criteria: | A                                   |
| Standard:                      | IEC 61000-4-4:2012                  |
| Test Voltage:                  | ±1kV                                |
| Impulse Repetition Frequency:  | 5 kHz                               |
| Impulse Wave Shape:            | 5/50ns                              |
| Burst Duration:                | 15 ms for 5kHz Repetition Frequency |
| Burst Period:                  | 300 ms                              |
| Test Duration:                 | 1 minute                            |



**6.2.2 EFT/B Test Set-up**



- (A) location for supply line coupling
- (B) location for signal lines coupling

The configuration consisted of a wooden table 0.8 meters high standing with ground reference plane of 0.8m x 1m.

Table-top equipment and equipment normally mounted on ceilings or walls as well as built-in equipment shall be tested with the EUT located 0.1 m above the ground reference plane.

The test generator and the coupling/decoupling network shall be bonded to the ground reference plane.

The minimum distance between the EUT and all other conductive structures (including the generator, AE and the walls of a room), except the ground reference plane, should be more than 0.5 m.

All cables to the EUT should be placed on the insulation support 0.1 m above the ground reference plane. Cables not subject to electrical fast transients shall be routed as far as possible from the cable under test to minimize the coupling between the cables.

When using the coupling clamp, the minimum distance between the coupling plates and all other conductive surfaces (including the generator), except the ground reference plane beneath the coupling clamp and beneath the EUT, should be at least 0.5 m.



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| 6.2.3 Test Result of EFT/B Immunity Test |  |                          |     |   |                       |   |                            |   |        |
|--|--|--------------------------|-----|---|-----------------------|---|----------------------------|---|--------|
| Testing date                             |  | Ambient Temperature (°C) |     |   | Relative Humidity (%) |   | Atmospheric Pressure (kPa) |   |        |
| 18/08/2021                               |  | 23.2                     |     |   | 47                    |   | 97.8                       |   |        |
| EUT Supply                               |  |                          |     |   | Test Mode             |   |                            |   |        |
| 15V DC                                   |  |                          |     |   | Normal operating mode |   |                            |   |        |
| Impulse Repetition Frequency 5 kHz       |  |                          |     |   |                       |   |                            |   |        |
| Test Line                                | Test Levels, Polarity And Observed Performance Criterion |                          |     |   |                       |   |                            |   | Result |
|  | 0.5kV  |                          | 1kV |   | 2kV                   |   | 4kV                        |   |        |
|  | +  | -                        | +   | - | +                     | - | +                          | - |        |
| +Ve                                      | A  | A                        | A   | A |                       |   |                            |   | Pass   |
| -Ve                                      | A  | A                        | A   | A |                       |   |                            |   | Pass   |
| +Ve & -Ve                                | A  | A                        | A   | A |                       |   |                            |   | Pass   |

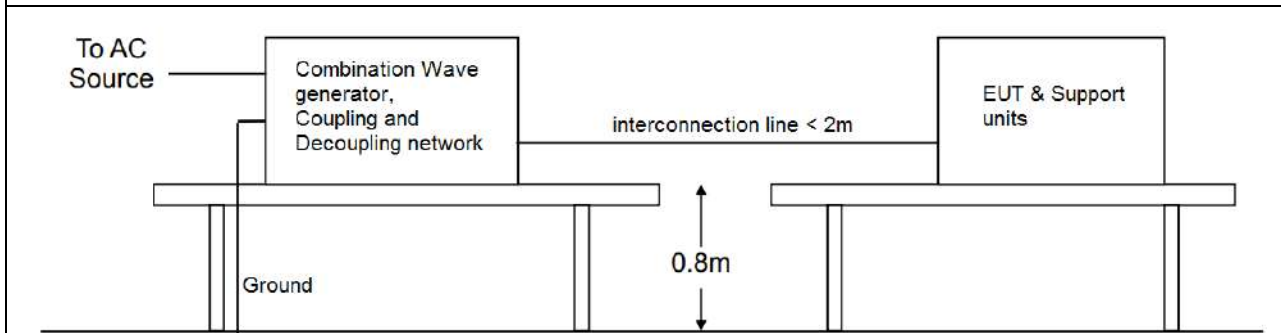


### 6.3 Surge Immunity Test

#### 6.3.1 Surge Immunity Test

|                                    |   |
|------------------------------------|---|
| Required performance criteria....: | B   |
| Standard.....:                     | IEC 61000-4-5:2014+A1:2017  |
| Wave-Shape.....:                   | 1.2/50 $\mu$ s Open Circuit Voltage<br>8/20 $\mu$ s Short Circuit Current |
| Test Voltage.....:                 | $\pm$ 1kV   |
| Pulse Repetition Rate.....:        | 1 time / minute   |
| Number of Tests.....:              | 5 positive and 5 negative at selected points                              |

#### 6.3.2 Surge Immunity Test Set-up



EUT was placed on a wooden table which is 0.8m above the ground. The interconnection line between the EUT and the coupling/decoupling network was bundled so as to make it less than 2 m in length.



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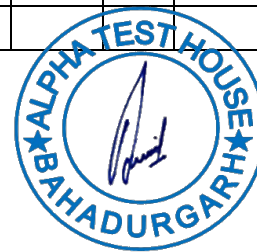
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Group: EMC Test Facility

| 6.3.3 Test Result of Surge Immunity Test |                 |  |   |     |   |                       |   |     |   |                            |
|--|-----------------|--|---|-----|---|-----------------------|---|-----|---|----------------------------|
| Testing date                             |                 | Ambient Temperature (°C)                                 |   |     |   | Relative Humidity (%) |   |     |   | Atmospheric Pressure (kPa) |
| 19/08/2021                               |                 | 23.2   |   |     |   | 46                    |   |     |   | 97.8                       |
| EUT Supply                               |                 |  |   |     |   | Test Mode             |   |     |   |                            |
| 15V DC                                   |                 |  |   |     |   | Normal operating mode |   |     |   |                            |
| coupling line                            | Phase angle (°) | Test Levels, Polarity And Observed Performance Criterion |   |     |   |                       |   |     |   | Result                     |
|  |                 | 0.5kV  |   | 1kV |   | 2kV                   |   | 4kV |   |                            |
|  |                 | +  | - | +   | - | +                     | - | +   | - |                            |
| +Ve & -Ve                                | -               | B  | B | B   | B |                       |   |     |   | Pass                       |
|  | -               | B  | B | B   | B |                       |   |     |   | Pass                       |
|  | -               | B  | B | B   | B |                       |   |     |   | Pass                       |
|  | -               | B  | B | B   | B |                       |   |     |   | Pass                       |



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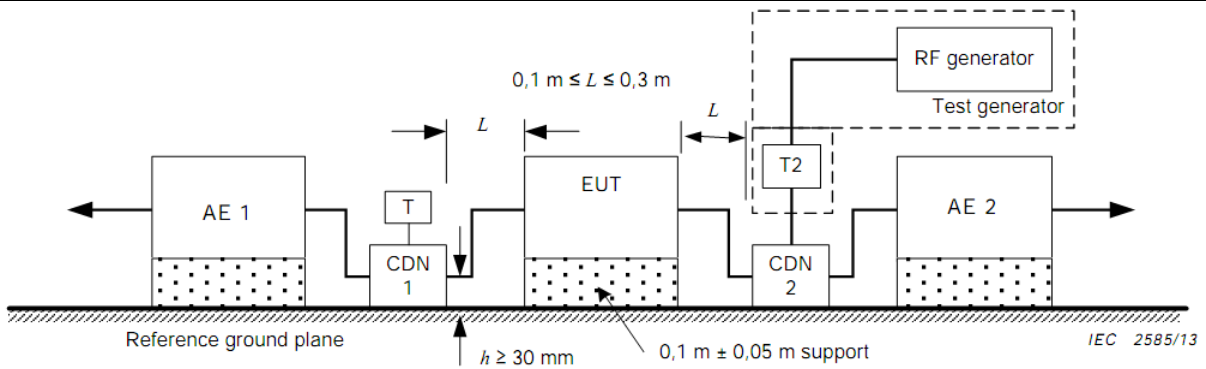
## 6.4 Immunity to conducted disturbances in RF common mode (CS)

### 6.4.1 Test Specification

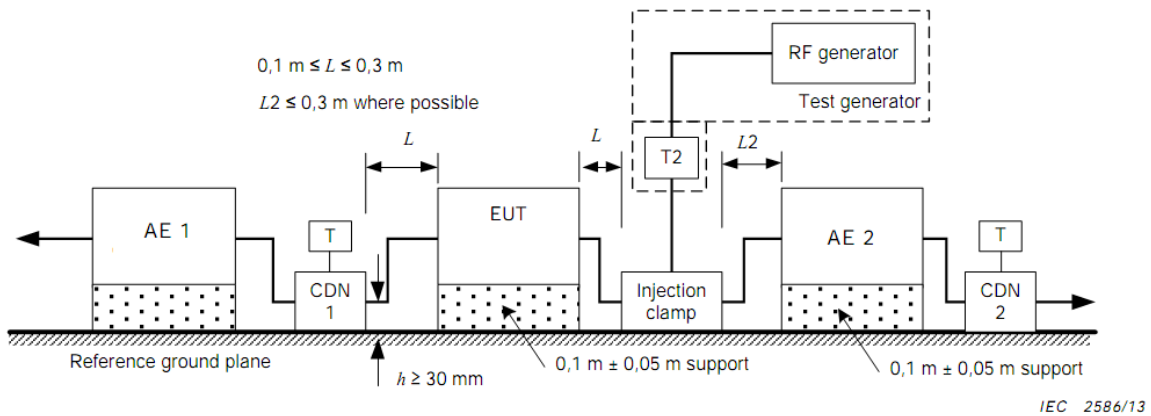
|                                |                                    |
|--------------------------------|------------------------------------|
| Required performance criteria: | A                                  |
| Standard:                      | IEC 61000-4-6:2013                 |
| Frequency Range:               | 0.15 MHz – 80 MHz                  |
| Voltage Level:                 | 10Vrms                             |
| Modulation:                    | 1kHz Sine Wave, 80%, AM Modulation |
| Frequency Step:                | 1 % of preceding frequency value   |
| Dwell Time:                    | 3 seconds                          |



**6.4.2 Conducted Susceptibility Test Set-up**



Schematic setup for immunity test used for CDN



Schematic setup for immunity test used for injection clamp

- T Termination 50 Ω
- T2 Power attenuator (6 dB)
- CDN Coupling and decoupling network
- Injection clamp: Current clamp or EM clamp

The equipment to be tested is placed on an insulating support of 0.1 m height above a reference ground plane. All cables exiting the EUT shall be supported at a height of at least 30 mm above the reference ground plane.

Where coupling and/or decoupling devices are required, they shall be located between 0.1 m and 0.3 m from the EUT . This distance is to be measured horizontally from the projection of the EUT on to the reference ground plane to the coupling and/or decoupling device.





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| 6.4.3 Test Result of Conducted Susceptibility |                          |             |                       |                               |        |
|---|--------------------------|-------------|-----------------------|-------------------------------|--------|
| Testing date                                  | Ambient Temperature (°C) |             | Relative Humidity (%) | Atmospheric Pressure (kPa)    |        |
| 19/08/2021                                    | 23.1                     |             | 47                    | 97.8                          |        |
| EUT Supply                                    |                          |             | Test Mode             |                               |        |
| 15V DC  |                          |             | Normal operating mode |                               |        |
| Test Frequency                                | Voltage (Vrms)           | Tested Line | Injection Method.     | Observed performance criteria | Result |
| 0.15 MHz – 80 MHz                             | 10                       | DC line     | Power line<br>CDN     | A                             | Pass   |



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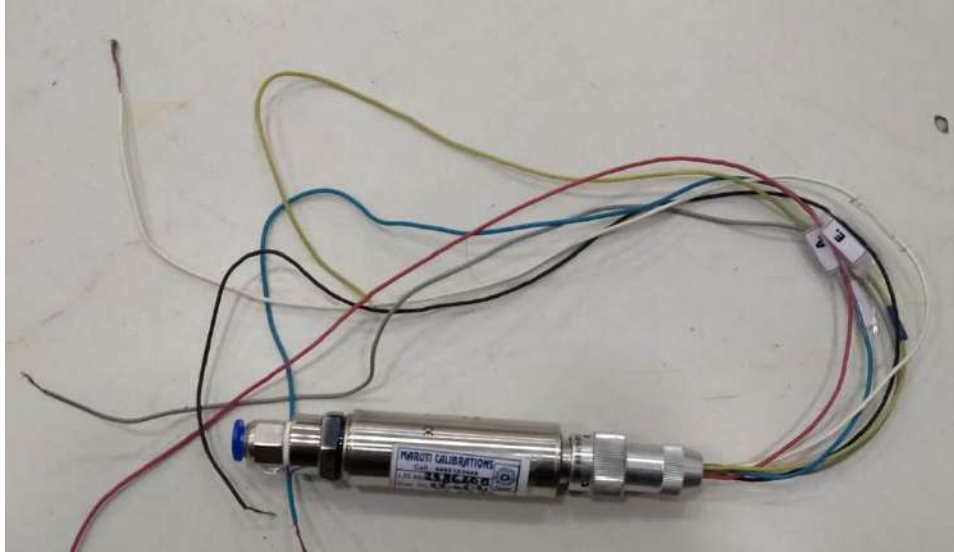
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## 7 Photographs of The EUT



\*\*\*END OF TEST REPORT\*\*\*