

S-CEM/EMCD/TR/2016-2017/DIGI-130

**EMI/EMC TEST REPORT FOR PHIRO PRO
MANUFACTURED BY
M/s. DIGIVISION ELECTRONICS LTD., CHENNAI**

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SAMEER-CENTRE FOR ELECTROMAGNETICS

(An Institution Setup by Ministry of Communications and Information Technology, Government of India)

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December 2016

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| | | |
|----------------------------|---|---|
| Equipment Under Test (EUT) | : | PHIRO PRO |
| Model Number of EUT | : | Phiro - Pro |
| Serial Numbers of EUT | : | 00-001 |
| Manufactured by | : | M/s. Digivision Electronics Ltd., Chennai |

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Test Request Particulars


1. Test Request From : M/s. Digivision Electronics Ltd., Chennai
2. Equipment Under Test (EUT) : Phiro Pro
3. Number of Test Sample(s) : One
4. Types of tests requested
(Applicable Standard) : Radiated Emission Measurement as per FCC Part 15 C, 2014
5. Manufacturer by : M/s. Digivision Electronics Ltd., Chennai
6. Model Number of EUT : Phiro - Pro
7. Serial Number of EUT : 00-001
8. Test Plan Concurred by
(Customer Representative) : Mr. Harish. A, Technical Engineer
Digivision Electronics Ltd., Chennai
9. EUT Arrived On : November 22, 2016
10. Tested On : November 22, 2016
11. Test Venue : SAMEER-CEM, Chennai
12. Status of the EUT on Receipt : Functional


Certified that the data reported in this report are valid only for the test sample mentioned above at the time of and under the stated conditions of measurement. Particulars on Manufacturer / Supplier, given in this report, are based on the information given by the customer, along with test request and SAMEER-CEM does not assume any responsibility for the correctness of that information for the above mentioned equipment under test.

Test Plan & Reviewed by:

Authorized Signatory:

Office Seal

For 
(Dr. Sanjay Baisakhiya)
Scientist - E


(P. Salih)
Scientist - E

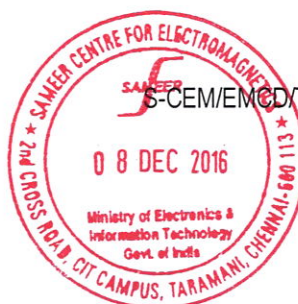


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**EMI/EMC TEST RESULTS AND SUMMARY FOR
PHIRO PRO**

EMC EMISSION TEST AND RESULTS

| Name of the Test | Basic Standard | AC/ DC / Signal Port / Enclosure | Specifications | Observations |
|-------------------|----------------|----------------------------------|---|-------------------|
| Radiated Emission | FCC Part 15 C | Enclosure | <u>Peak:</u> Above 960 MHz : 73.98 dB μ V/m <u>Average:</u> Above 960 MHz : 53.98 dB μ V/m | within the limits |



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RADIATED EMISSION MEASUREMENT

1. Applicable Standard: Measurement as per FCC Part 15 C, 2014

Test Procedure as per customer request based on ANSI C63.10, 2013

2. Test Instrumentation:

| Item Descriptions | Make | Model Number | Serial Number | Calibration date | Calibration due date |
|--------------------------------------|---------------|--------------|---------------|------------------|----------------------|
| EMI Receiver | R&S | ESI B7 | 100319 | 15/09/2016 | 15/09/2017 |
| Spectrum Analyzer | Agilent | 8563EC | 4439A03727 | 12/09/2016* | 12/09/2017* |
| Ultra log Antenna | R&S | HL562 | 100100 | 11/03/2015 | 11/03/2017 |
| Double Ridged Waveguide Horn Antenna | R&S | HF906 | 100108 | 02/09/2016 | 02/09/2018 |
| Shielded Semi Anechoic Chamber | Siepel-Hyfral | -- | F276 | 29/6/2016* | 29/6/2018* |

* Verified in-house

3. Test Frequency Range and Limits (3mtr. distance):

| Frequency (MHz) | Limits (dB μ V/m) | |
|-----------------|-----------------------|---------|
| | Peak | Average |
| Above 960 | 73.98 | 53.98 |

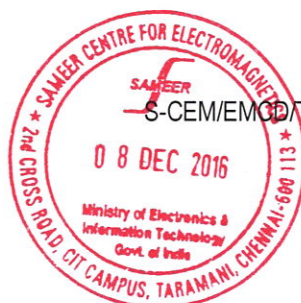
4. EUT Configuration: Given in Annexure-1

5. Test Procedure:

The Radiated Emissions from the EUT in the frequency range of 1GHz – 18GHz were picked up using Double Ridged Horn Antenna. The measurement was carried out inside the shielded semi anechoic chamber with EUT placed at 3m from the receiving antenna and at a height of 1.5m from the ground. Since a low dielectric material of 1.5m height was not available, a polystyrene table placed over a wooden table was used to increase the height, as described in ANSI C63.10 standard. The EUT was rotated from 0° - 360° and the receiving antenna height was varied from 1m to 2m to pickup maximum emissions. The measurement was done in the peak detection mode for both vertical and horizontal polarizations of the antenna. The emissions of considerable amplitude and their corresponding frequencies were analyzed thoroughly in peak detection mode. The emissions were recorded for horizontal and vertical orientations of the EUT. The emissions were recorded for the fundamental frequency of operation and first 5 harmonics of it.

6. Test Observation:

The Radiated Emissions from the EUT were observed to be within the limits of FCC Part 15 C standard in the test frequency range of 1 – 18 GHz. The measurement readings are given in table-1 below.



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Table -1

Low Channel – Horizontal Orientation of the EUT

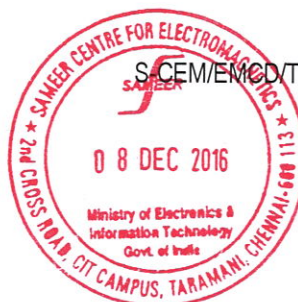
| Freq. (MHz) | Table Position (Degs) | Antenna Height (m) | Measured Peak level (dBμV) [A] | Antenna Factor (dB/m) [B] | Cable Loss (dB) [C] | Total QP level (dBμV/m) [D = A+B+C] | Limit (dBμV/m) [L] | Delta Level dB [L-D] | Test Observations |
|--------------------------------|-----------------------|--------------------|--------------------------------|---------------------------|---------------------|-------------------------------------|--------------------|----------------------|-------------------|
| Vertical Polarization | | | | | | | | | |
| 1.602 | 0 | 1 | 8.42 | 25.07 | 5.07 | 38.56 | 73.98 | 35.42 | Within the limit |
| 2.402 | 0 | 1 | 52.42 | 27.47 | 7.18 | 87.07 | 73.98 | -13.09 | * |
| 4.804 | 0 | 1 | 9 | 33.13 | 6.55 | 48.68 | 73.98 | 25.3 | Within the limit |
| 7.206 | 0 | 1 | 11.33 | 36.03 | 12.77 | 60.13 | 73.98 | 13.85 | Within the limit |
| 9.608 | 0 | 1 | 10.83 | 37.37 | 16.05 | 64.25 | 73.98 | 9.73 | Within the limit |
| 14.412 | 0 | 1 | 13 | 37.57 | 15.04 | 65.62 | 73.98 | 8.36 | Within the limit |
| 16.814 | 0 | 1 | 13.25 | 39.71 | 18.34 | 71.03 | 73.98 | 2.95 | Within the limit |
| 12.010 | 0 | 1 | 11.08 | 38.42 | 16.54 | 66.01 | 73.98 | 7.97 | Within the limit |
| Horizontal Polarization | | | | | | | | | |
| 1.602 | 0 | 1 | 8.50 | 25.07 | 5.07 | 38.64 | 73.98 | 35.34 | Within the limit |
| 2.402 | 70 | 2 | 51.42 | 27.57 | 7.18 | 86.07 | 73.98 | -12.09 | * |
| 4.804 | 0 | 1 | 08.42 | 33.13 | 6.55 | 48.10 | 73.98 | 25.88 | Within the limit |
| 7.206 | 0 | 1 | 11.33 | 36.03 | 12.77 | 60.13 | 73.98 | 13.85 | Within the limit |
| 9.608 | 0 | 1 | 11.75 | 37.37 | 16.05 | 65.17 | 73.98 | 8.81 | Within the limit |
| 14.412 | 0 | 1 | 10.50 | 37.57 | 15.04 | 65.43 | 73.98 | 8.55 | Within the limit |
| 16.814 | 0 | 1 | 12.67 | 39.71 | 18.34 | 65.29 | 73.98 | 8.69 | Within the limit |
| 12.010 | 0 | 1 | 13.08 | 38.42 | 16.54 | 71.13 | 73.98 | 2.85 | Within the limit |

* It is the intended frequency of operation of the EUT

Low Channel – Vertical Orientation of the EUT

| Freq. (MHz) | Table Position (Degs) | Antenna Height (m) | Measured Peak level (dBμV) [A] | Antenna Factor (dB/m) [B] | Cable Loss (dB) [C] | Total QP level (dBμV/m) [D = A+B+C] | Limit (dBμV/m) [L] | Delta Level dB [L-D] | Test Observations |
|--------------------------------|-----------------------|--------------------|--------------------------------|---------------------------|---------------------|-------------------------------------|--------------------|----------------------|-------------------|
| Vertical Polarization | | | | | | | | | |
| 1.602 | 151 | 1.4 | 8.32 | 25.07 | 5.07 | 38.46 | 73.98 | 35.52 | Within the limit |
| 2.402 | 268 | 1.3 | 53.31 | 27.47 | 7.18 | 87.96 | 73.98 | -13.98 | * |
| 4.804 | 0 | 1 | 8.42 | 33.13 | 6.55 | 48.10 | 73.98 | 25.88 | Within the limit |
| 7.206 | 0 | 1 | 11.58 | 36.03 | 12.77 | 60.38 | 73.98 | 13.6 | Within the limit |
| 9.608 | 0 | 1 | 10.67 | 37.37 | 16.05 | 64.09 | 73.98 | 9.89 | Within the limit |
| 12.010 | 0 | 1 | 10.50 | 38.42 | 16.51 | 65.43 | 73.98 | 8.55 | Within the limit |
| 14.412 | 0 | 1 | 13.33 | 37.57 | 15.04 | 65.95 | 73.98 | 8.03 | Within the limit |
| 16.814 | 0 | 1 | 13.42 | 39.71 | 18.34 | 71.47 | 73.98 | 2.51 | Within the limit |
| Horizontal Polarization | | | | | | | | | |
| 1.602 | 176 | 1.8 | 10.25 | 25.07 | 5.07 | 40.39 | 73.98 | 33.59 | Within the limit |
| 2.402 | 127 | 1.4 | 54.62 | 27.47 | 7.18 | 89.27 | 73.98 | -15.29 | * |
| 4.804 | 0 | 1 | 12.43 | 33.13 | 6.55 | 52.11 | 73.98 | 21.87 | Within the limit |
| 7.206 | 0 | 1 | 11.67 | 36.03 | 12.77 | 60.47 | 73.98 | 13.51 | Within the limit |
| 9.608 | 0 | 1 | 11.50 | 37.37 | 16.05 | 64.92 | 73.98 | 9.06 | Within the limit |
| 12.010 | 0 | 1 | 12.02 | 38.42 | 16.51 | 66.95 | 73.98 | 7.03 | Within the limit |
| 14.412 | 0 | 1 | 13.75 | 37.57 | 15.04 | 66.37 | 73.98 | 7.61 | Within the limit |
| 16.814 | 0 | 1 | 13.42 | 39.71 | 18.34 | 71.47 | 73.98 | 2.51 | Within the limit |

* It is the intended frequency of operation of the EUT



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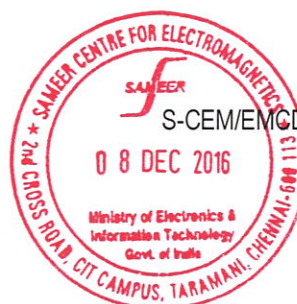
7. Enclosed Documents:

Plot 1 to 6 : Radiated Emissions from the EUT.

Annexure-2 : Photograph of EUT and Radiated Emission Measurement Setup.

Test Conducted by:

B. Srinath
(B. Srinath)
Research Scientist

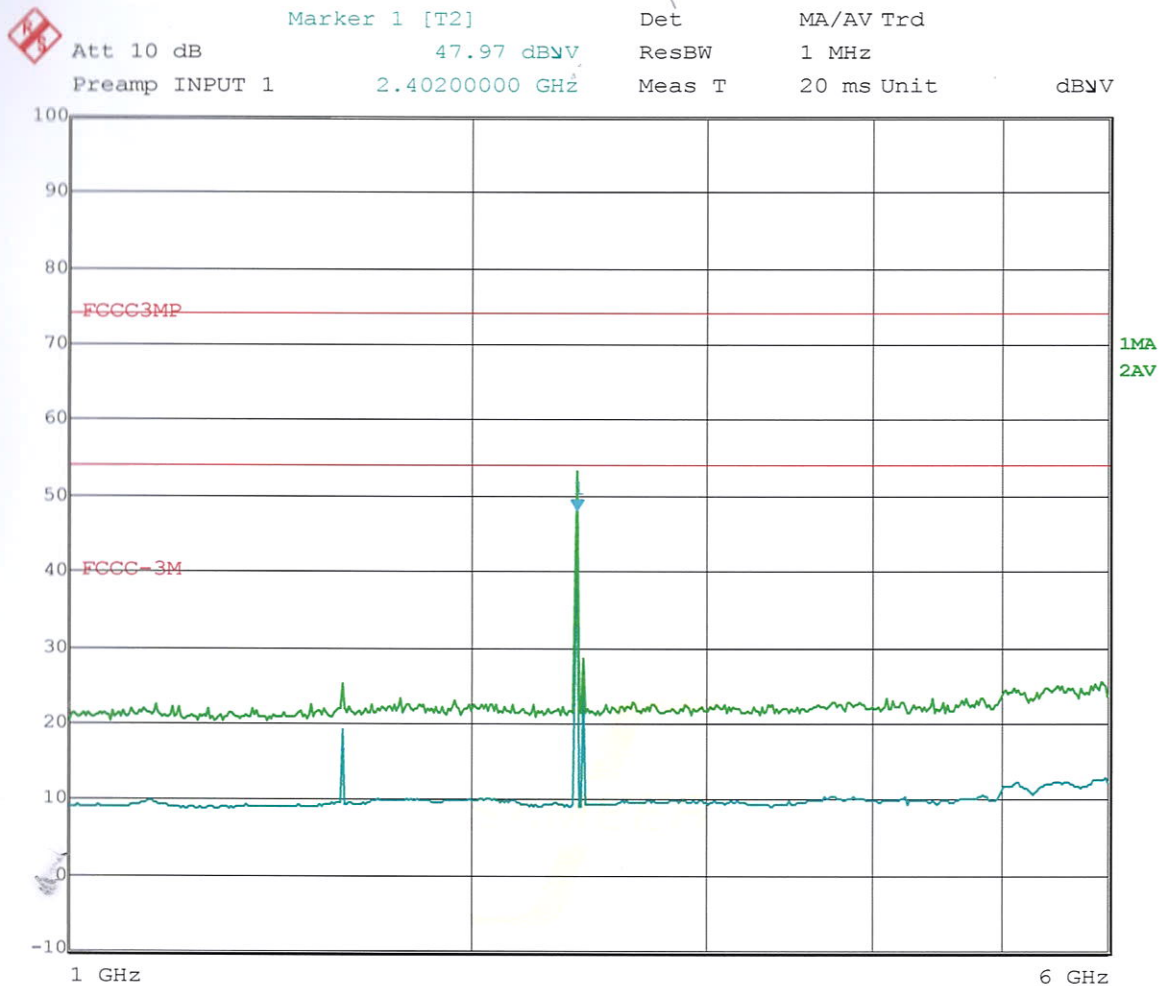


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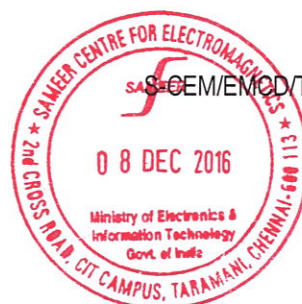
PLOT-1



Title: RADIATED EMISSION TEST AS PER ANSI C 63.10 LOW CHANNEL
 Comment B: EUT:PHIRO WITH BLUETOOTH, MAKE:PHIRO ROBOTIX USA, MODEL NO:P
 HIRO_PRO, S.NO:PHIRO 001, POS:176, ANT.HT:1.4m POL:HOR
 Date: 21.NOV.2016 16:24:54

Radiated Emission from EUT Vertical Orientation Low Channel 1-6 GHz (Horizontal Polarization)

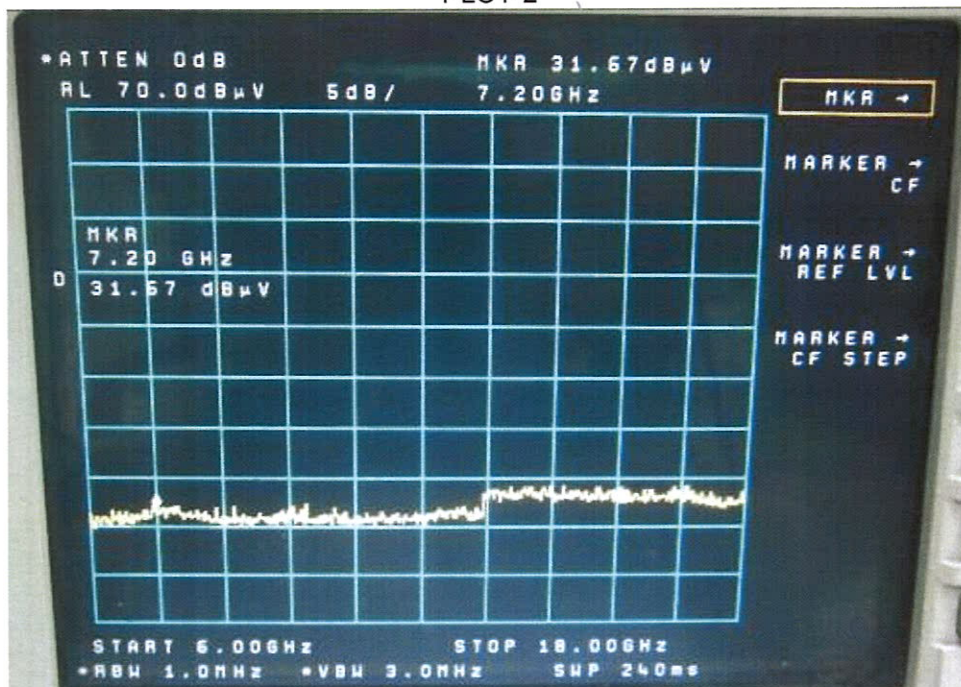
Note: The plot shows only the emission pattern from the EUT with peak detector and the values in the plot were not maximized emission as required by standard. For maximized emission please refer table-1



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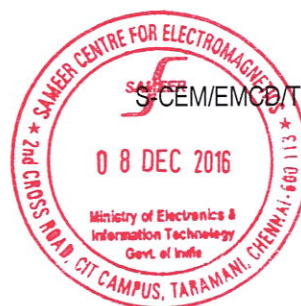
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PLOT-2



Radiated Emission from EUT Vertical Orientation Low channel 6-18 GHz (Horizontal Polarization)

Note: The plot shows only the emission pattern from the EUT with peak detector and the values in the plot were not maximized emission as required by standard. For maximized emission please refer table-1

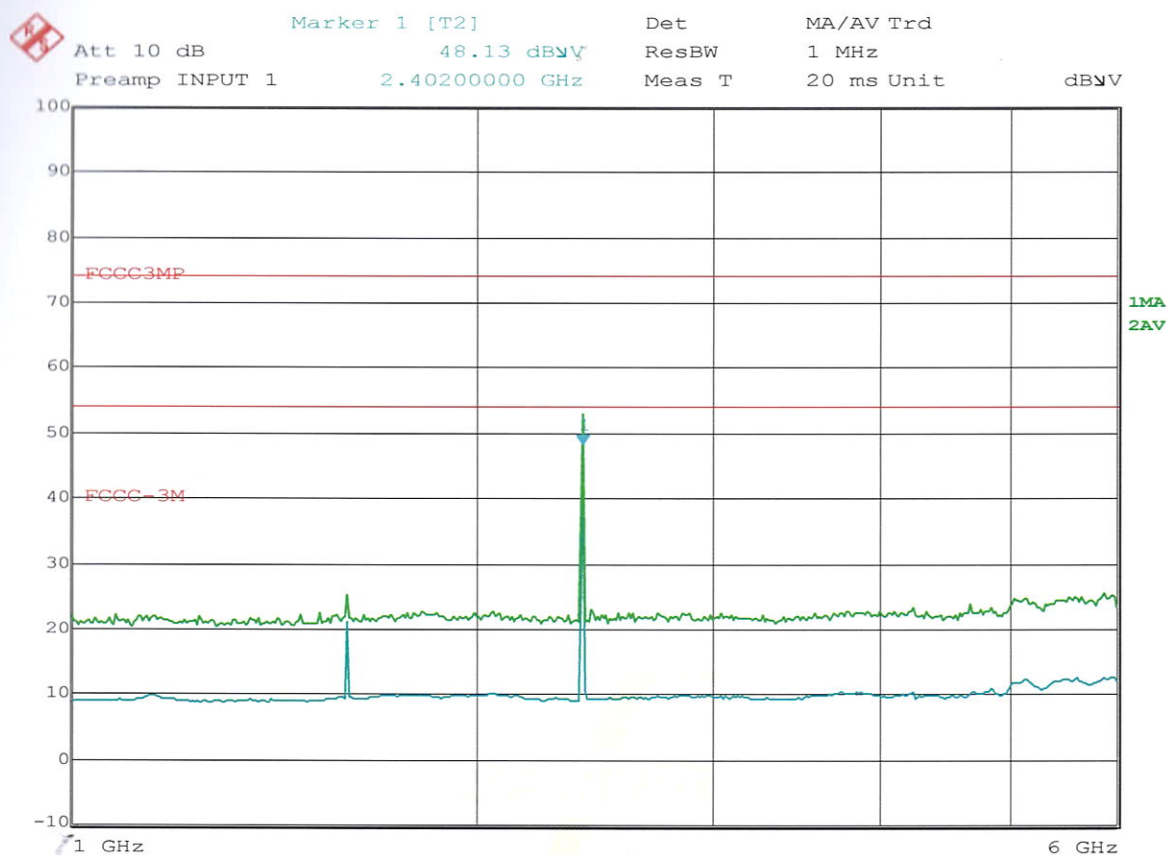


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| Serial Numbers of EUT | : | 00-001 | |
| Manufactured by | : | M/s. Digivision Electronics Ltd., Chennai | |

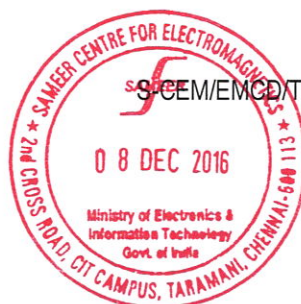
PLOT-3



Title: RADIATED EMISSION TEST AS PER ANSI C 63.10 LOW CHANNEL
Comment B: EUT:PHIRO WITH BLUETOOTH, MAKE:PHIRO ROBOTIX USA, MODEL NO:P
HIRO_PRO, S.NO:PHIRO 001, POS:268, ANT.HT:1.3m POL:VER
Date: 21.NOV.2016 15:56:31

Radiated Emission from EUT Vertical Orientation Low Channel 1 – 6 GHz (Vertical Polarization)

Note: The plot shows only the emission pattern from the EUT with peak detector and the values in the plot were not maximized emission as required by standard. For maximized emission please refer table-1

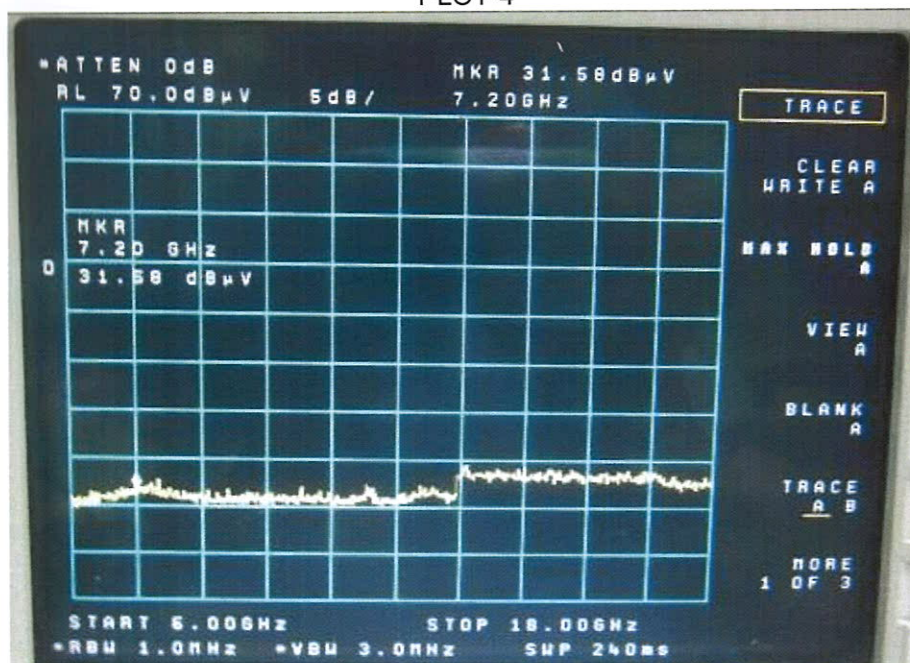


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| Manufactured by | : | M/s. Digivision Electronics Ltd., Chennai | |

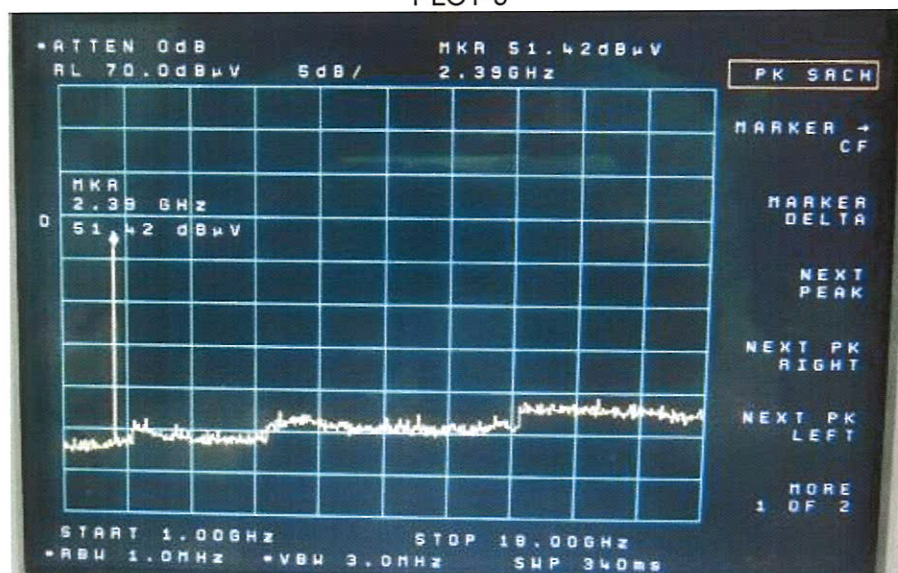
PLOT-4



Radiated Emission from EUT Vertical Orientation Low Channel 6 – 18 GHz (Vertical Polarization)

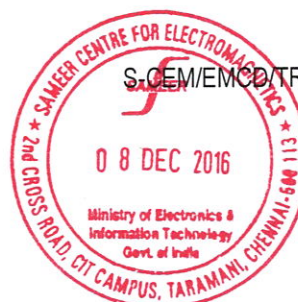
Note: The plot shows only the emission pattern from the EUT with peak detector and the values in the plot were not maximized emission as required by standard. For maximized emission please refer table-1

PLOT-5



Radiated Emission from EUT Horizontal Orientation Low Channel 1 – 18 GHz (Horizontal Polarization)

Note: The plot shows only the emission pattern from the EUT with peak detector and the values in the plot were not maximized emission as required by standard. For maximized emission please refer table-1

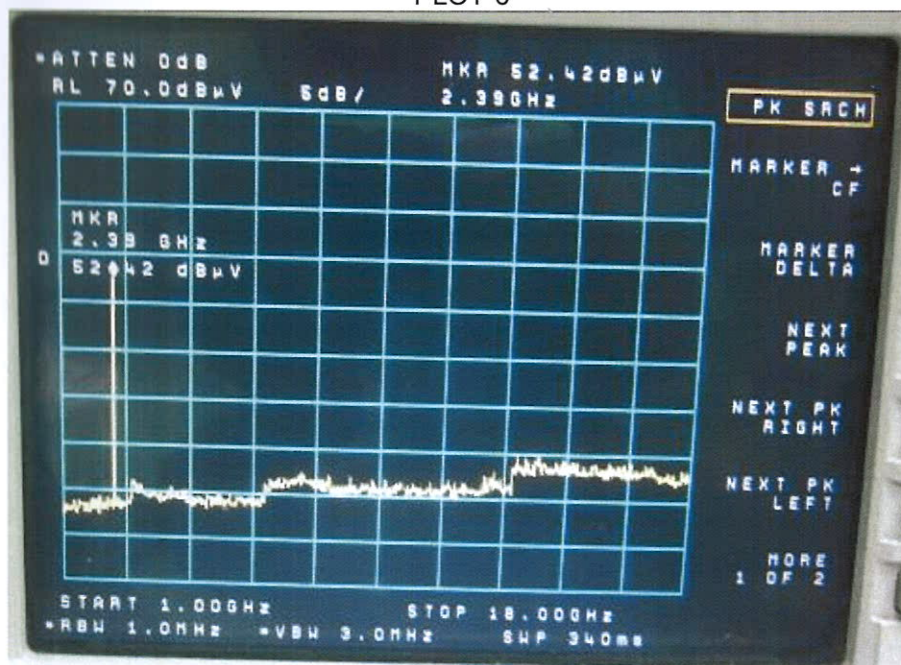


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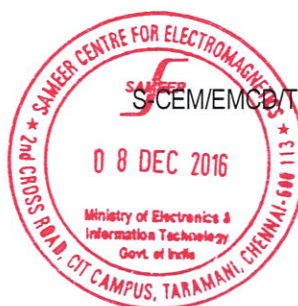
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PLOT-6



Radiated Emission from EUT Horizontal Orientation Low Channel 1 – 18 GHz (Vertical Polarization)

Note: The plot shows only the emission pattern from the EUT with peak detector and the values in the plot were not maximized emission as required by standard. For maximized emission please refer table-1



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Annexure - 1

(Given by Customer)

EUT Description:

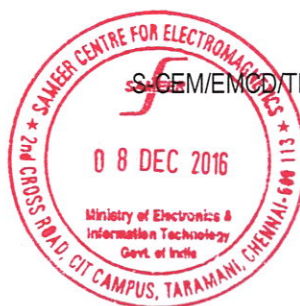
Phiro is an educational robot used to learning programming in a Graphical Manner.

EUT Configuration:

The EUT's Bluetooth was connected to the host PC through adapter to control the frequency of the Bluetooth. The EUT in normal condition operates only in hopping mode. Since the frequency to be held at LOW, MID, HIGH channels during the radiated emission test the adapter and PC were used.

Application:

It is used for Educational purpose



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