

S-CEM/EMC-IR/TR/2016-2017/02

**INTENTIONAL RADIATOR RF TEST REPORT FOR DIGIVISION ELECTRONICS LTD  
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)

2<sup>nd</sup> Cross Road, CIT Campus, Taramani, Chennai - 600 113, India

Tel : +91-44-22541352 / 22541817 Fax : +91-44-22541424 / 1938 Email: [ccc@scemcd.gov.in](mailto:ccc@scemcd.gov.in) Web: [www.scemcd.gov.in](http://www.scemcd.gov.in)

October 2016

Equipment Under Test (EUT)	:	Phiro-Educational Toy	
Model Number of EUT	:	Phiro-001	
Serial Number of EUT	:	Phiro-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 - Educational Toy
3.	Number of Test Sample(s)	:	One
4.	Type of Tests Requested (Applicable Standard)	:	RF exposure measurement based on FCC 1.1310 (KDB 447498 D01 General RF Exposure Guidance V06)
5.	Manufacturer	:	M/s. Digivision Electronics Ltd., Chennai
6.	Model Number of EUT	:	Phiro-Pro
7.	Serial Number of EUT	:	Phiro Pro 00 0001
8.	Test plan concurred by (Customer Representative)	:	Mr. Harish, Technical Engineer. M/s.Digivision Electronics Ltd., Chennai
9.	EUT Arrived On	:	September 23, 2016
10.	Tested On	:	September 23, 2016
11.	Test Venue	:	SAMEER-CEM, Chennai
12.	Status of the EUT on Receipt	:	Functional

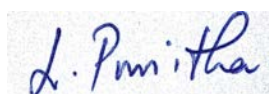
*Certified that the data reported in this report are valid only for the test sample mentioned above at the time of and under the stated conditions of measurement. Particulars on Manufacturer / Supplier, given in this report, are based on the information given by the customer, along with test request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

**Tested by:**



**(S.Sarathkrishna)**  
Research Scientist


**Reviewed by:**



**(L. Punitha)**  
Scientist - D


**Office Seal**



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**EMC-IR TEST FOR  
M/s. DIGIVISION ELECTRONICS LTD**

Sl.no	Name of the Test	Standard	Result
1	RF Exposure Measurement.	FCC 1.1310	Within the limit

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## 1. RF EXPOSURE MEASUREMENT.

### 1.1. Applicable Standard: Based on FCC 1.1310

#### 1.1.1 Limit

Frequency	Limit
1500-100,000 MHz	1mW/cm <sup>2</sup>

#### 1.1.2 Test Instrumentation:

Description	Make	Model Number	Serial Number	Cal Date	Cal due
Spectrum Analyser	Agilent	E4407B	MY44212122	01-Aug-2016	01-Aug-2017

#### 1.1.4 Test Procedures

- Maximum power of the EUT is measured using spectrum Analyser
- Applying Frii's transmission formula power density at 20 cm distance is calculated

$$\text{Frii's transmission formula, } P_d = \frac{P_{\text{out}} \cdot G}{4\pi r^2}$$

Where

$P_d$  = power density in mW/cm<sup>2</sup>

$P_{\text{out}}$  = output power to antenna in mW

$G$  = gain of antenna in linear scale

$\pi$  = 3.1416

$r$  = distance between observation point and center of the radiator in cm

#### 1.1.5 Test Observations


Antenna gain: 0 dBi:

Modulation	Frequency (MHz)	Average power to antenna (dBm)	Average power to antenna (mW)	Power density (mW/cm <sup>2</sup> )
GFSK	2402	-9.539	0.11	0.000443
GFSK	2441	-9.222	0.12	0.000476
GFSK	2480	-10.06	0.1	0.000393
PI/4 DQPSK	2402	-13.75	0.04	0.000168
PI/4 DQPSK	2441	-13.25	0.05	0.000188
PI/4 DQPSK	2480	-13.09	0.05	0.000195
8DPSK	2402	-13.70	0.04	0.00017
8DPSK	2441	-13.30	0.05	0.000186
8DPSK	2480	-10.13	0.1	0.000386

#### 1.1.6 SAR test exclusion

The 1-g and 10-g SAR test exclusion thresholds as per **KDB 447498 D01 General RF Exposure Guidance v06, section 4.3(a)** are determined by the following:

$[(\text{max. power of channel, including tune-up tolerance, mW}) / (\text{min. test separation distance, mm})] \cdot [\sqrt{f} \text{ (GHz)}] \leq 3.0$  for 1-g SAR, and  $\leq 7.5$  for 10-g extremity SAR, where

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- f(GHz) is the RF channel transmit frequency in GHz
- Power and distance are rounded to the nearest mW and mm before calculation
- Min. test separation distance is 5mm (Hand held device)

$[(\text{max. power of channel, including tune-up tolerance, mW}) / (\text{min. test separation distance, mm})] \cdot [\sqrt{f \text{ (GHz)}}] = [0.12 / 5] \cdot [\sqrt{2.441}] = \mathbf{0.037}$

Calculated value for 5mm is less than 3.0 for 1-g SAR, and  $\leq 7.5$  for 10-g extremity SAR.  
Therefore SAR test may be excluded

#### 1.1.6 Enclosed Documents:

Annexure – 1: EUT details and photograph

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## Annexure – 1

### Product details (Provided by customer)


**Digivision Electronic Ltd**  
Plot No - 279,285&286, Estate 2nd Main Road  
Burma Colony, Perungudi, Chennai – 600096



### Product Name: Phiro Pro

Description and Application
Phiro is an affordable programmable robot for kids ages 4-18 to learn computational thinking through coding and robotics in an easy and fun way. Students can code and control Phiro in 5 ways : without a computer - using sequential keys on the robot and with Swish Cards or with a computer - using Scratch 2.0, Snap! and Pocket Code, all open source software developed by Massachusetts Institute of Technology USA, UC Berkeley USA and University of Austria respectively.

Specifications	
Feature	Data
<b>Microcontroller</b>	ATmega 2560-16AU
<b>Operating Voltage</b>	4.5V-5.5V
<b>Connectivity</b>	Wireless Bluetooth HC-05 (2.4Ghz ISM band)
<b>Software interface</b>	Scratch, Snap 4 Arduino & Pocket Code(Android)
<b>Battery</b>	Rechargeable LI-PO (3.7v, 2000mah)
<b>Charging port type</b>	DC jack 1.1mm
<b>Sensors</b>	8 IR proximity sensors
<b>Locomotion</b>	2 DC motors (298:1 gear ratio, 75 RPM)
<b>PCB</b>	FR4 grade, 4 layers
<b>Speaker</b>	8ohms , 1watt

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### RF power measurement test set up

