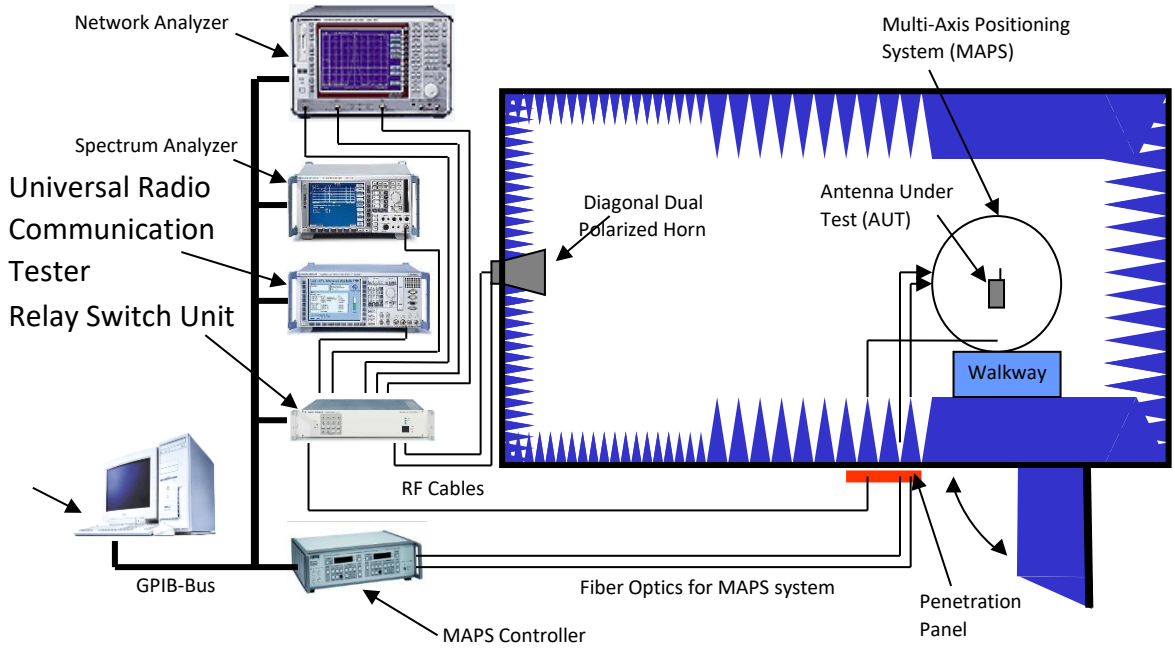
ANTENNA TEST REPORT

Applicant	**Drowsy Digital, Inc**
Address	850 New Burton Road, Suite 201, Dover DE 19904
Suppliers	**Molex Interconnect (Shanghai) Co., ltd.** 889 Yinglun Road, Waigaoqiao Free Trade Zone, Pudong, Shanghai
	Shenzhen Top-link Technologies Co.,Ltd. Bld.1, 11, Furui Rd., Fuhai Street, BaoAn District, Shenzhen City,GuangDong Province, China
Product	**OZLO Sleepbuds**
Product No.	**01001100201**
Model	**N/A**
Peak Gain	**Charge case antennae (PN: 1030042-01): 2dBi/open 0.8dBi/close**
	Earbud L antenna (PN: 1030001-01) : -6dBi
	Earbud R antenna (1030002-01) : -5.8dBi
Test person	**Liu Hai**
Date of test	**2023/09/20**

Approval	**Written**	**Reviewed**	**Approved**
	Liu Hai	**Andy Zhang**	**Chris Zhong**
Data	**2023/09/20**	**2023/09/20**	**2023/09/20**

1. MEASUREMENTS SETUP



2. TEST INSTRUMENTS

Equipment	Manufacturer	Model No.	Serial No.	Next Cal.
Antenna chamber	ETS-LINDGREN	AMS-8500	4063	2024/2/6
Signal Generator	Agilent	E5071C	MY46101560	2024/1/30
Spectrum Analyzer	ROHDE&SCHWARZ	FSP	100878	2024/4/7
Broad-Band Horn Antenna	ETS-LINDGREN	Model 3102	SN00066947	2024/8/25
Broad-Band Horn Antenna	ETS-LINDGREN	Model 3164-03	SN00064049	2024/8/25
Turn Table	ETS-LINDGREN	Model 2090	SN00105913	N/A
Controller	ROHDE&SCHWARZ	TS-RSP	100331	N/A
Test Software	ETS-LINDGREN	EMQUEST	EMQ-100	N/A

3. MEASUREMENTS DESCRIPTION

1. S Parameter Measurements

A testing method for evaluating the signal reflection performance of antennas. S Parameter measurements were done by using Network Analyzer –Agilent, the Return Loss of the antennas were obtained to ensure the efficiency over the operation frequency.

2. Antenna Radiation Patten Measurements

The distribution of radiation power from antennas in different directions. Radiation Pattern Measurements were done in the ETS-Lindgren anechoic chamber through radiation, the earbuds were set to continuous radiation and the AMS-8500 receive the RF power from 360 degree angles by using rotation of DUT (Device under test).

3. Antenna Gain Calculation

Antenna gain is an important parameter for measuring antenna radiation. The antenna gains will be calculated by ETS chamber software when radiation pattern tests are done.

4. TEST RESULTS

5.1 CHARGE CASE BLE ANTENNA VSWR

Frequency (MHz)	2400	2485
Open state	2.0	2.4
Close state	1.4	1.4

5.2 CHARGE CASE BT ANTENNA VSWR

Frequency (MHz)	2400	2485
Open state	2.6	1.5
Close state	1.1	1.3

5.3 EARBUD LEFT ANTENNA VSWR

Frequency (MHz)	2400	2485
Earbud Left	3.1	2.8

5.4 EARBUD RIGHT ANTENNA VSWR

Frequency (MHz)	2400	2485
Earbud Right	2.4	2.0

5.5 CHARGE CASE BLE ANTENNA EFFICIENCY

Frequency (MHz)	2400~2485
Open state	32
Close state	40

5.6 CHARGE CASE BT ANTENNA EFFICIENCY

Frequency (MHz)	2400~2485
Open state	29.7
Close state	30.3

5.7 EARBUD LEFT ANTENNA EFFICIENCY

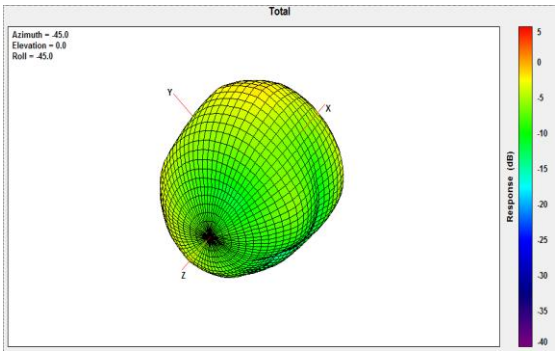
Frequency (MHz)	2400~2485
Earbud Left	8.2

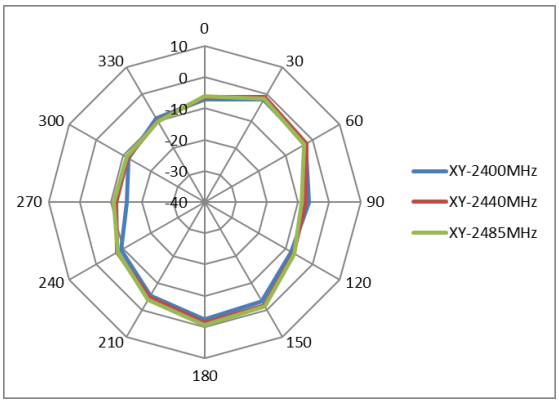
5.8 EARBUD RIGHT ANTENNA EFFICIENCY

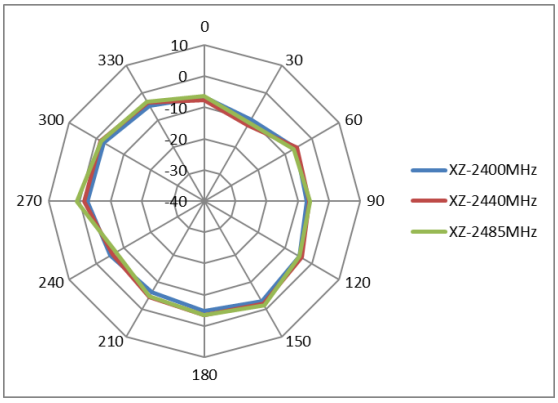
Frequency (MHz)	2400~2485
Earbud Right	8.4

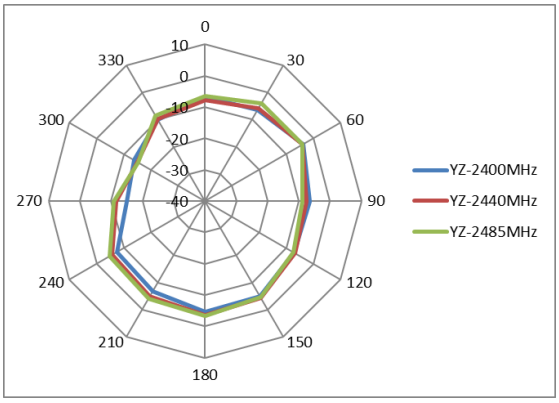
5.9 CHARGE CASE BLE ANTENNA OPEN STATE 2D

Frequency (MHz)		XY	XZ	YZ
2400	Peak Gain (dBi)	-2.1	-2.5	-3.8
	Degree	30°	270°	30°
2440	Peak Gain (dBi)	-1.3	-1.3	-3.5
	Degree	30°	270°	180°
2485	Peak Gain (dBi)	-0.6	-0.4	-3.4
	Degree	180°	270°	180°



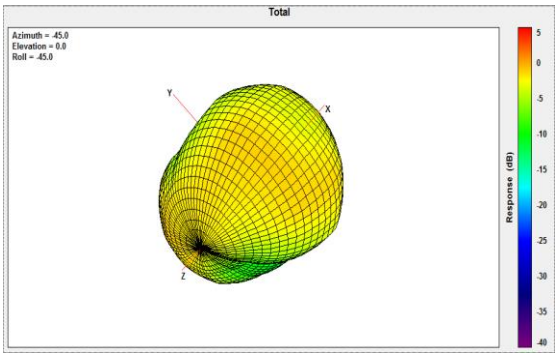


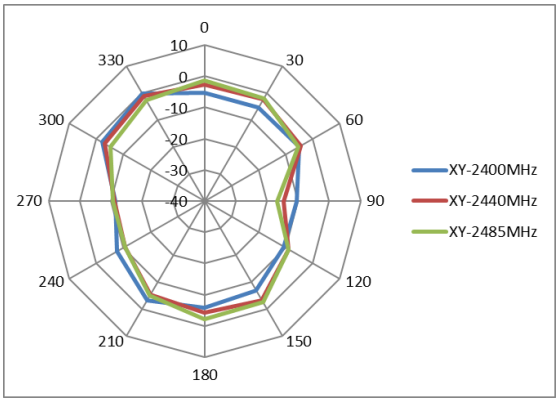


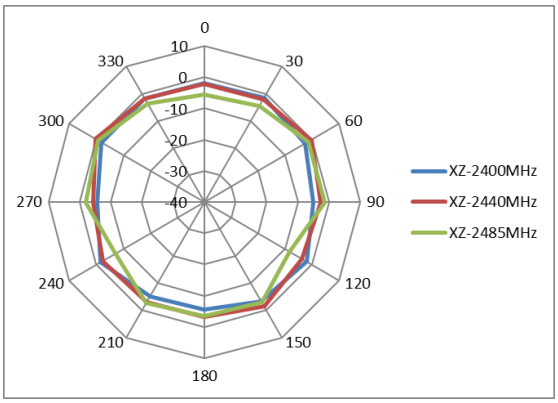


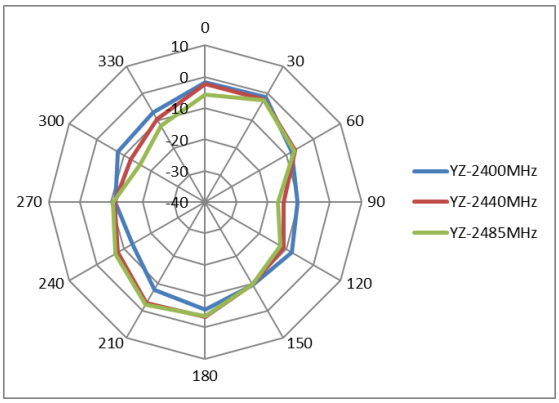
5.10 CHARGE CASE BLE ANTENNA CLOSE STATE 2D

Frequency (MHz)		XY	XZ	YZ
2400	Peak Gain (dBi)	-1	-1.4	-1.2
	Degree	330°	240°	30°
2440	Peak Gain (dBi)	-1.1	0.5	-2.1
	Degree	330°	180°	0°
2485	Peak Gain (dBi)	-1.4	-0.6	-2.2
	Degree	0°	180	210°



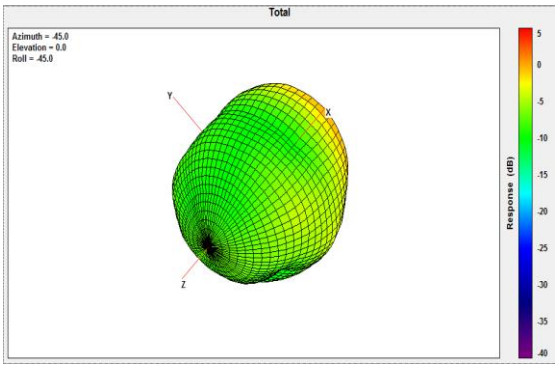


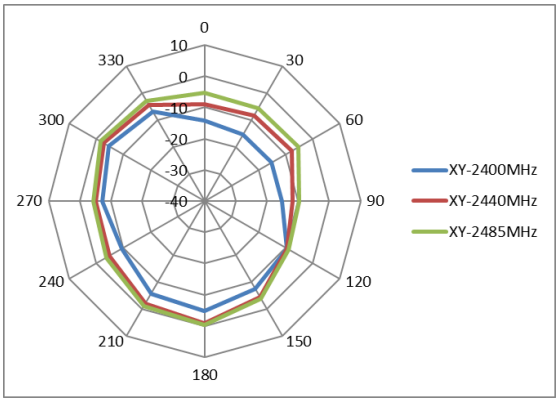


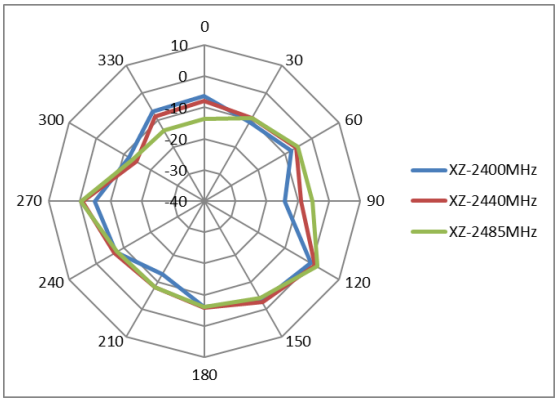


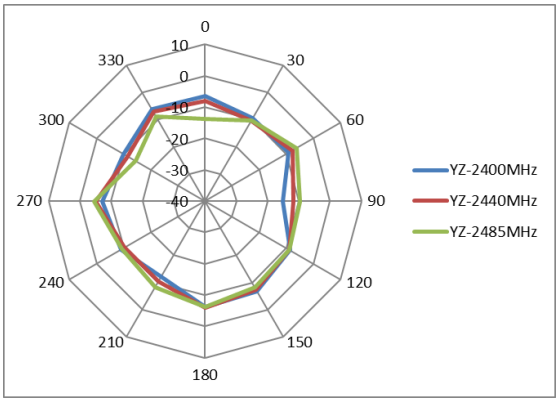
5.11 CHARGE CASE BT ANTENNA OPEN STATE 2D

Frequency (MHz)		XY	XZ	YZ
2400	Peak Gain (dBi)	-4.5	-0.6	-6
	Degree	300°	120°	330°
2440	Peak Gain (dBi)	-0.9	1.1	-5
	Degree	180°	120°	270°
2485	Peak Gain (dBi)	-0.3	2	-4.4
	Degree	180°	120°	270°



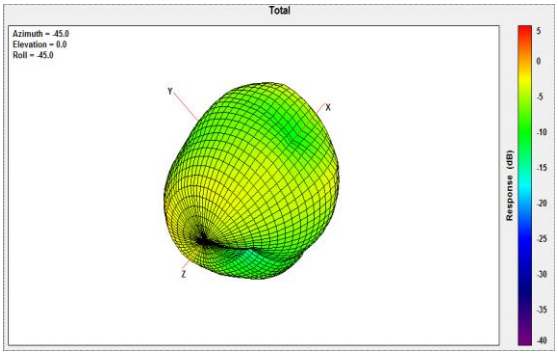


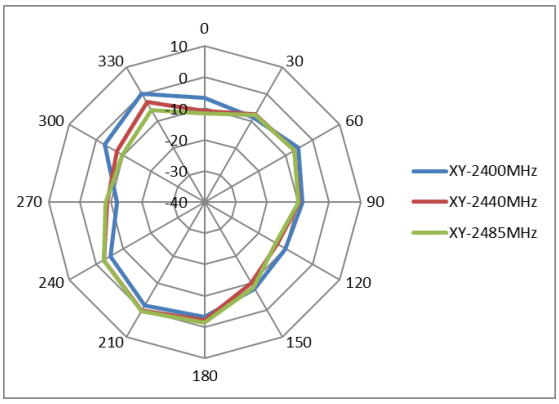


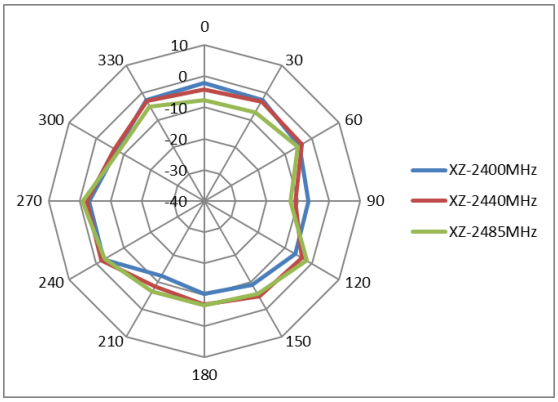


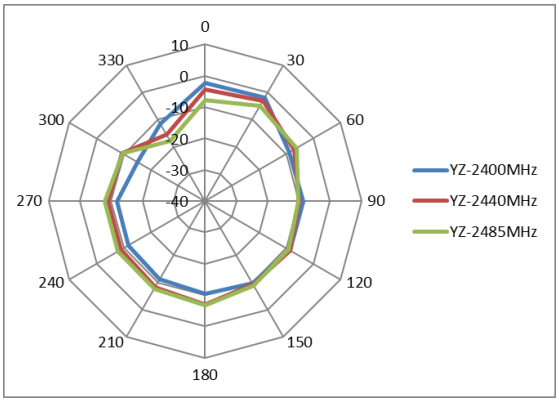
5.12 CHARGE CASE BT ANTENNA CLOSE STATE 2D

Frequency (MHz)		XY	XZ	YZ
2400	Peak Gain (dBi)	0.2	-2.2	-1.9
	Degree	330°	0°	30°
2440	Peak Gain (dBi)	0.1	-1.8	-3
	Degree	210°	240°	30°
2485	Peak Gain (dBi)	0.8	-0.8	-4.9
	Degree	210°	270°	30°



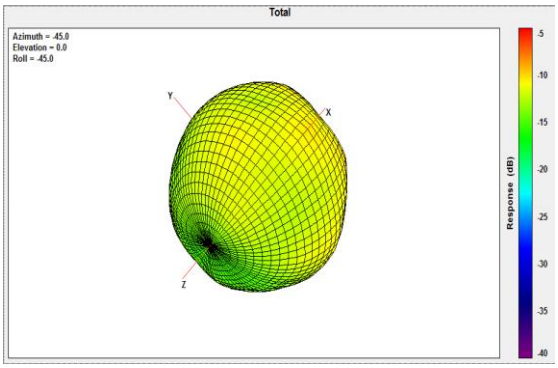


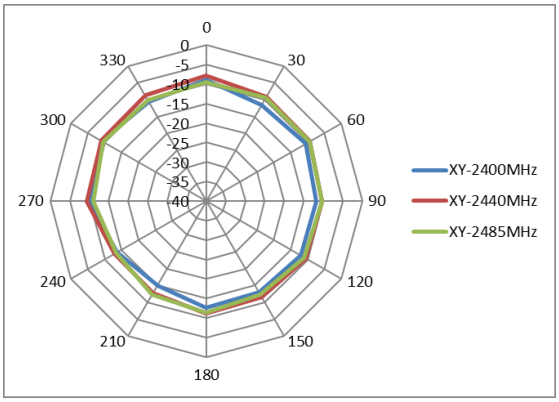


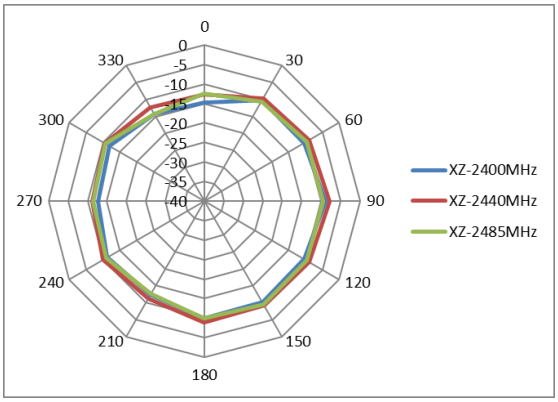


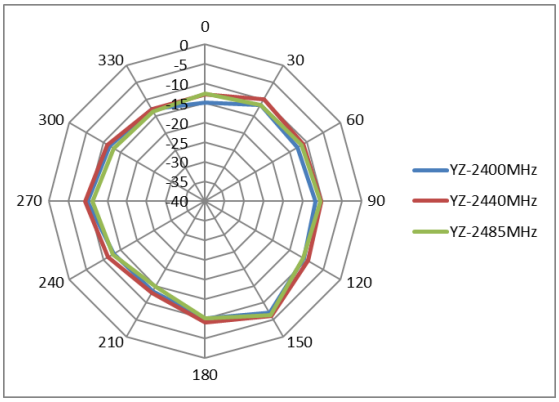
5.13 EARBUD LEFT ANTENNA 2D

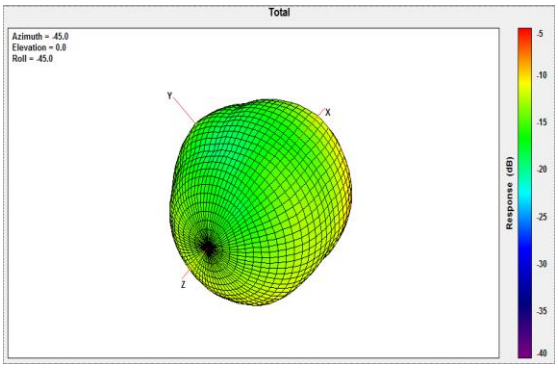
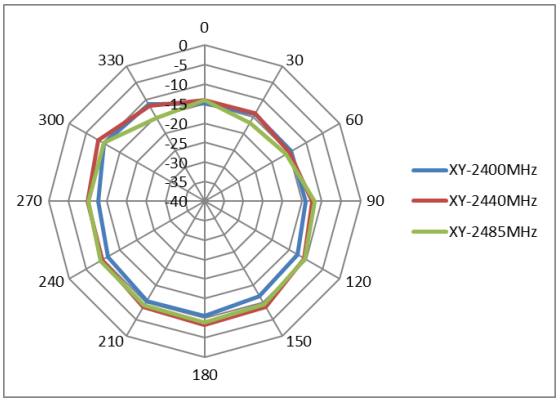
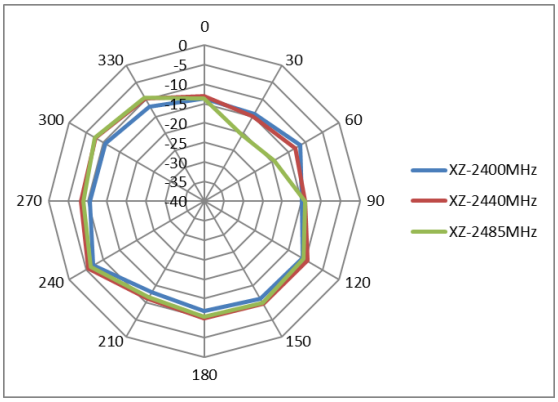
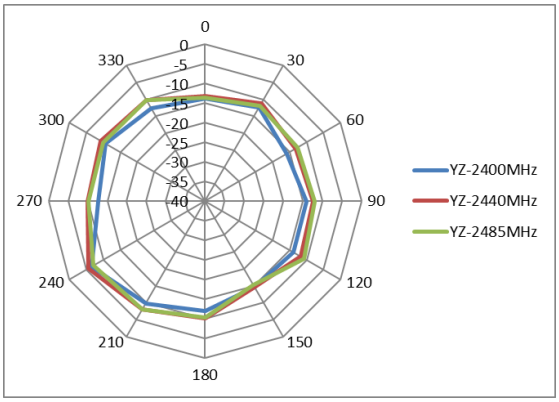
Frequency (MHz)		XY	XZ	YZ
2400	Peak Gain (dBi)	-8.9	-8.9	-7
	Degree	0°	90°	150°
2440	Peak Gain (dBi)	-7.7	-7.7	-6
	Degree	0°	90°	150°
2485	Peak Gain (dBi)	-9.4	-9.4	-6.4
	Degree	60°	120°	150°









5.14 EARBUD RIGHT ANTENNA 2D

Frequency (MHz)		XY	XZ	YZ
2400	Peak Gain (dBi)	-10.2	-7.1	-6.5
	Degree	300°	240°	240°
2440	Peak Gain (dBi)	-8.3	-5.8	-6
	Degree	180°	240°	240°
2485	Peak Gain (dBi)	-8.9	-6.2	-7
	Degree	180°	240°	240°