

# Antenna Test Report

**Report No.: EO/2014/20005**  
**Test Plan: Non-compliance with ISO17025**

**Applicant Name: Delta Electronics, INC.**  
**Manufacturer Name: Delta Electronics, INC.**

**Product Name: ZigBee Module**  
**Model Number: DFZM-E7211-DT0R**

**Measurements performed at**  
**SGS Taiwan Ltd.**  
**Taipei, Taiwan**

**Issued Date: April 03, 2014**

	Name	Date & Signature	Distribution
Prepared by:	Jose Ho Sr. Engineer	<i>Jose Ho</i> April 03, 2014	
Approved by:	Nick Hsu Asst. Manager	<i>Nick Hsu</i> April 03, 2014	

Unless otherwise stated the results shown in this test report refer only to the sample(s) tested and such sample(s) are retained for 90 days only.

除非另有說明，此報告結果僅對測試之樣品負責，同時此樣品僅保留90天。本報告未經本公司書面許可，不可部份複製。

This document is issued by the Company subject to its General Conditions of Service printed overleaf, available on request or accessible at [www.sgs.com/terms\\_and\\_conditions.htm](http://www.sgs.com/terms_and_conditions.htm) and, for electronic format documents, subject to Terms and Conditions for Electronic Documents at [www.sgs.com/terms\\_e-document.htm](http://www.sgs.com/terms_e-document.htm). Attention is drawn to the limitation of liability, indemnification and jurisdiction issues defined therein. Any holder of this document is advised that information contained hereon reflects the Company's findings at the time of its intervention only and within the limits of Client's instructions, if any. The Company's sole responsibility is to its Client and this document does not exonerate parties to a transaction from exercising all their rights and obligations under the transaction documents. This document cannot be reproduced except in full, without prior written approval of the Company. Any unauthorized alteration, forgery or falsification of the content or appearance of this document is unlawful and offenders may be prosecuted to the fullest extent of the law.

**Revision Version**

Report Number	Revision	Date	Memo
EO/2014/20005	00	2014/03/31	Initial creation of test report.
EO/2014/20005	01	2014/04/03	Modified Model Number.

**This test report contains a reference to the previous version test report that it replaces.**

Unless otherwise stated the results shown in this test report refer only to the sample(s) tested and such sample(s) are retained for 90 days only.

除非另有說明，此報告結果僅對測試之樣品負責，同時此樣品僅保留90天。本報告未經本公司書面許可，不可部份複製。

This document is issued by the Company subject to its General Conditions of Service printed overleaf, available on request or accessible at [www.sgs.com/terms\\_and\\_conditions.htm](http://www.sgs.com/terms_and_conditions.htm) and, for electronic format documents, subject to Terms and Conditions for Electronic Documents at [www.sgs.com/terms\\_e-document.htm](http://www.sgs.com/terms_e-document.htm). Attention is drawn to the limitation of liability, indemnification and jurisdiction issues defined therein. Any holder of this document is advised that information contained hereon reflects the Company's findings at the time of its intervention only and within the limits of Client's instructions, if any. The Company's sole responsibility is to its Client and this document does not exonerate parties to a transaction from exercising all their rights and obligations under the transaction documents. This document cannot be reproduced except in full, without prior written approval of the Company. Any unauthorized alteration, forgery or falsification of the content or appearance of this document is unlawful and offenders may be prosecuted to the fullest extent of the law.

## Measurement System Information

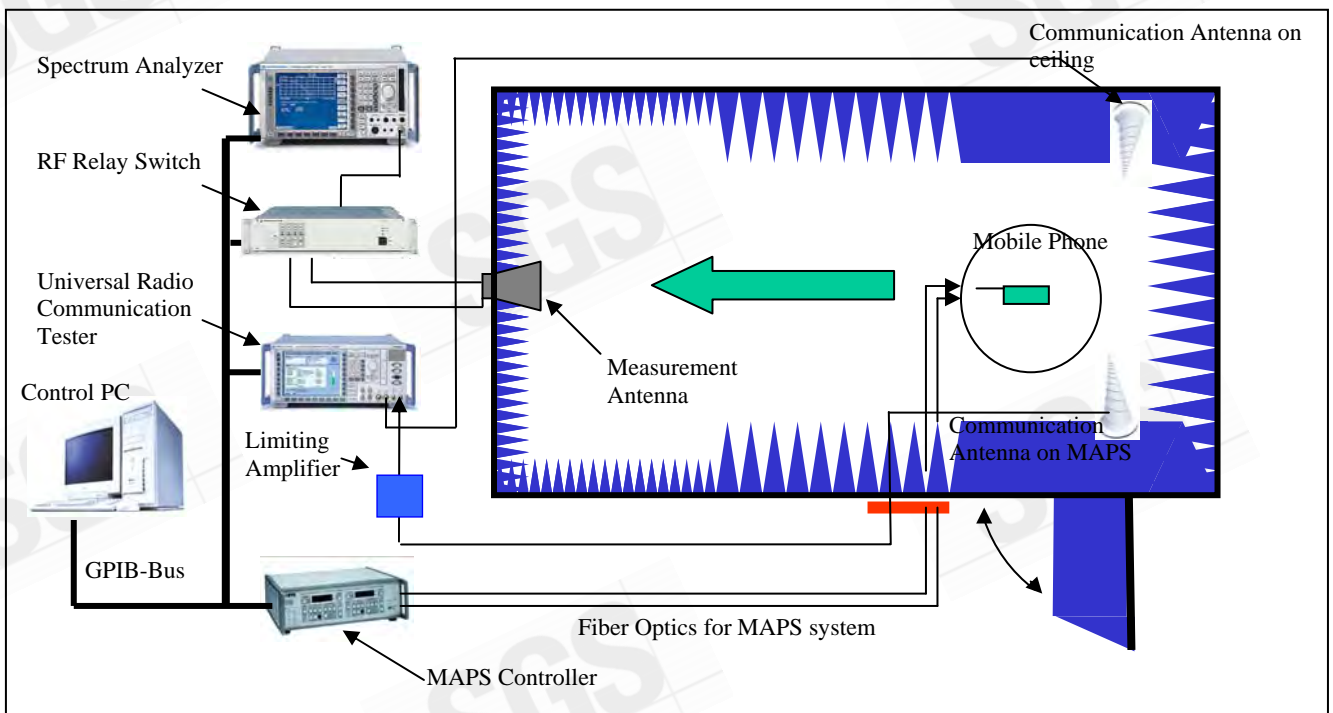
### General Information

#### Testing Condition:

- Temperature: 25±3°C
- Humidity: <80%

#### Measurement Facility:

- Measurement Chamber: ETS-Lindgren 3D fully anechoic chamber and its measuring system (AMS-8500)
- Base Station Simulator: Agilent E5515C (or R&S CMU200)
- ETS-Lindgren EMCO-2090 Auxiliary Ports RF Relay Switches
- Spectrum Analyzer: Agilent N9010A
- Network Analyzer: Agilent E5071C



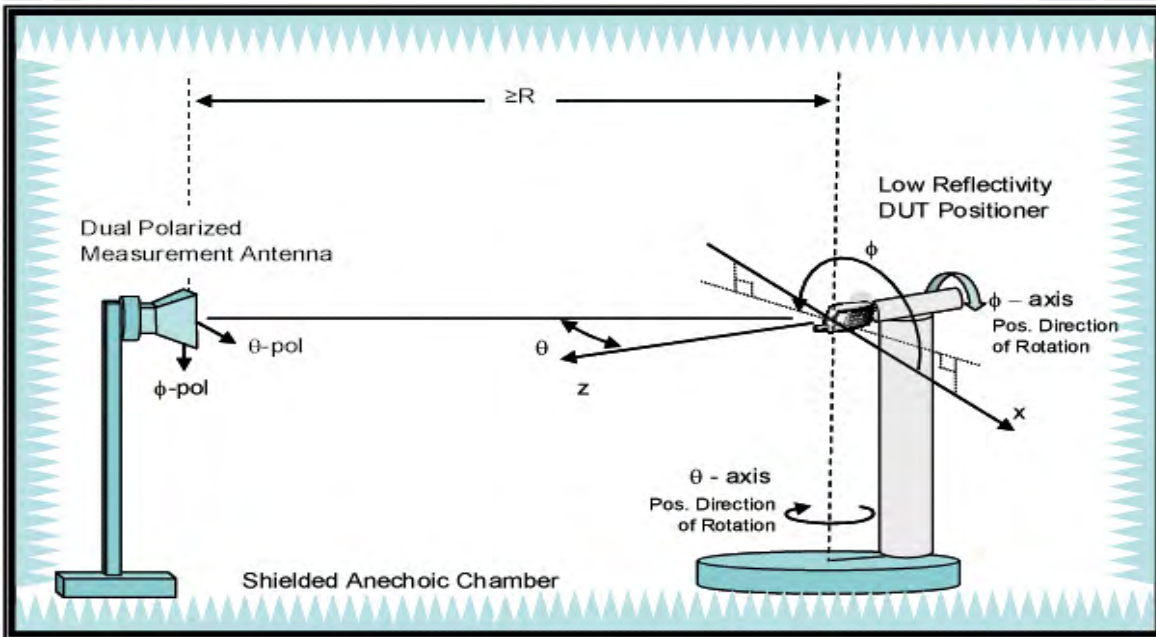
Unless otherwise stated the results shown in this test report refer only to the sample(s) tested and such sample(s) are retained for 90 days only.

除非另有說明，此報告結果僅對測試之樣品負責，同時此樣品僅保留90天。本報告未經本公司書面許可，不可部份複製。

This document is issued by the Company subject to its General Conditions of Service printed overleaf, available on request or accessible at [www.sgs.com/terms\\_and\\_conditions.htm](http://www.sgs.com/terms_and_conditions.htm) and, for electronic format documents, subject to Terms and Conditions for Electronic Documents at [www.sgs.com/terms\\_e-document.htm](http://www.sgs.com/terms_e-document.htm). Attention is drawn to the limitation of liability, indemnification and jurisdiction issues defined therein. Any holder of this document is advised that information contained hereon reflects the Company's findings at the time of its intervention only and within the limits of Client's instructions, if any. The Company's sole responsibility is to its Client and this document does not exonerate parties to a transaction from exercising all their rights and obligations under the transaction documents. This document cannot be reproduced except in full, without prior written approval of the Company. Any unauthorized alteration, forgery or falsification of the content or appearance of this document is unlawful and offenders may be prosecuted to the fullest extent of the law.

Measurements are performed in a ETS-Lindgren **AMS-8500** 3D fully anechoic test system. The test system includes a high-performance RF-shielded, rectangular anechoic chamber, a Multi-Axis Positioning System (MAPS), and *EMQuest™* **EMQ-100** data acquisition and analysis software. The geometry of the setup is specified below for reference.

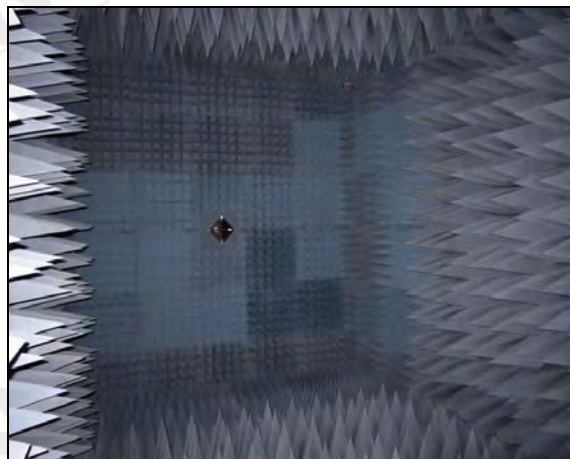
**Typical Setup for ETS-Lindgren AMS-8500:**



**Instruments View**



**Inside View**



Unless otherwise stated the results shown in this test report refer only to the sample(s) tested and such sample(s) are retained for 90 days only.

除非另有說明，此報告結果僅對測試之樣品負責，同時此樣品僅保留90天。本報告未經本公司書面許可，不可部份複製。

This document is issued by the Company subject to its General Conditions of Service printed overleaf, available on request or accessible at [www.sgs.com/terms\\_and\\_conditions.htm](http://www.sgs.com/terms_and_conditions.htm) and, for electronic format documents, subject to Terms and Conditions for Electronic Documents at [www.sgs.com/terms\\_e-document.htm](http://www.sgs.com/terms_e-document.htm). Attention is drawn to the limitation of liability, indemnification and jurisdiction issues defined therein. Any holder of this document is advised that information contained hereon reflects the Company's findings at the time of its intervention only and within the limits of Client's instructions, if any. The Company's sole responsibility is to its Client and this document does not exonerate parties to a transaction from exercising all their rights and obligations under the transaction documents. This document cannot be reproduced except in full, without prior written approval of the Company. Any unauthorized alteration, forgery or falsification of the content or appearance of this document is unlawful and offenders may be prosecuted to the fullest extent of the law.

**Testing Laboratory: Identification of the Responsible Test Laboratory.**

- **OTA Laboratory:**  
**SGS Taiwan Ltd. Electronics & Communication Laboratory**  
 No.134, Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan 24803.  
 Telephone: +886 2 2299 3279  
 Fax: +886 2 2298 0488  
 Internet: <http://www.tw.sgs.com>
- **Testing Location:**  
 No.134, Wu Kung Road, New Taipei Industrial Park, Wuku District, New Taipei City, Taiwan 24803.

**Details of Applicant:**

<b>Applicant's name:</b>	<b>Delta Electronics, INC.</b>
<b>Applicant's address:</b>	<b>3 Tungyan Road, Chungli Industrial Zone, Taoyuan County 32063 Taoyuan County Taiwan</b>
<b>Contact person:</b>	<b>RAY.CHEN / Manager</b>
<b>Telephone:</b>	<b>(03)4526107 Ext.8705</b>
<b>Fax:</b>	<b>886-3-4528707</b>
<b>E-mail:</b>	<b><a href="mailto:Ray.chen@delta.com.tw">Ray.chen@delta.com.tw</a></b>

**Details of Manufacturer:**

<b>Manufacturer's name:</b>	<b>Delta Electronics, INC.</b>
<b>Manufacturer's address:</b>	<b>250 Shangying Road, Guishan Industrial Zone, Taoyuan County 33341, Taiwan, R.O.C</b>
<b>Contact person:</b>	<b>GORDON.YIU / Manager</b>
<b>Telephone:</b>	<b>886-3-3591968 Ext:2989</b>
<b>Fax:</b>	<b>886-3-3591991</b>
<b>E-mail:</b>	<b><a href="mailto:Gordon.yiu@delta.com.tw">Gordon.yiu@delta.com.tw</a></b>

Unless otherwise stated the results shown in this test report refer only to the sample(s) tested and such sample(s) are retained for 90 days only.

除非另有說明，此報告結果僅對測試之樣品負責，同時此樣品僅保留90天。本報告未經本公司書面許可，不可部份複製。

This document is issued by the Company subject to its General Conditions of Service printed overleaf, available on request or accessible at [www.sgs.com/terms\\_and\\_conditions.htm](http://www.sgs.com/terms_and_conditions.htm) and, for electronic format documents, subject to Terms and Conditions for Electronic Documents at [www.sgs.com/terms\\_e-document.htm](http://www.sgs.com/terms_e-document.htm). Attention is drawn to the limitation of liability, indemnification and jurisdiction issues defined therein. Any holder of this document is advised that information contained hereon reflects the Company's findings at the time of its intervention only and within the limits of Client's instructions, if any. The Company's sole responsibility is to its Client and this document does not exonerate parties to a transaction from exercising all their rights and obligations under the transaction documents. This document cannot be reproduced except in full, without prior written approval of the Company. Any unauthorized alteration, forgery or falsification of the content or appearance of this document is unlawful and offenders may be prosecuted to the fullest extent of the law.

**Details of EUT:**

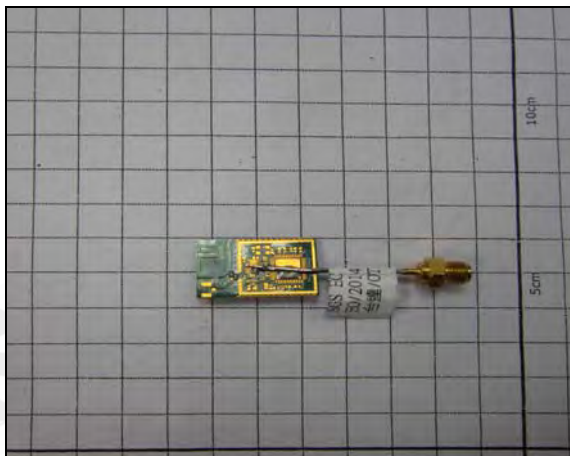
<b>Device Description:</b>	<b>ZigBee Module</b>
<b>Device Manufacturer:</b>	<b>Delta Electronics, INC.</b>
<b>Device Model:</b>	<b>DFZM-E7211-DT0R</b>
<b>Hardware Version:</b>	<b>N/A</b>
<b>Software Version:</b>	<b>N/A</b>
<b>IMEI:</b>	<b>N/A</b>
<b>FCC ID:</b>	<b>H79DFZM-E7210</b>
<b>Frequency Range:</b>	<b>2400MHz ~ 2500MHz</b> <b>Step size: 10MHz</b>
<b>Antenna Type:</b>	<b>Internal antenna</b>

**Duration of Tests:**

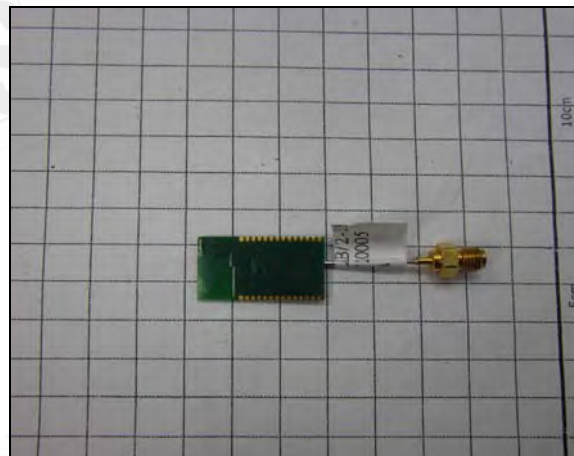
<b>Sample Receive Date:</b>	<b>2014-02-14</b>
<b>Test Starting Date:</b>	<b>2014-02-19</b>
<b>Test Ending Date:</b>	<b>2014-02-19</b>
<b>Report Issued Date:</b>	<b>2014-04-03</b>

**Photographs of EUT:**

**Front View**



**Back View**



Unless otherwise stated the results shown in this test report refer only to the sample(s) tested and such sample(s) are retained for 90 days only.

除非另有說明，此報告結果僅對測試之樣品負責，同時此樣品僅保留90天。本報告未經本公司書面許可，不可部份複製。

This document is issued by the Company subject to its General Conditions of Service printed overleaf, available on request or accessible at [www.sgs.com/terms\\_and\\_conditions.htm](http://www.sgs.com/terms_and_conditions.htm) and, for electronic format documents, subject to Terms and Conditions for Electronic Documents at [www.sgs.com/terms\\_e-document.htm](http://www.sgs.com/terms_e-document.htm). Attention is drawn to the limitation of liability, indemnification and jurisdiction issues defined therein. Any holder of this document is advised that information contained hereon reflects the Company's findings at the time of its intervention only and within the limits of Client's instructions, if any. The Company's sole responsibility is to its Client and this document does not exonerate parties to a transaction from exercising all their rights and obligations under the transaction documents. This document cannot be reproduced except in full, without prior written approval of the Company. Any unauthorized alteration, forgery or falsification of the content or appearance of this document is unlawful and offenders may be prosecuted to the fullest extent of the law.

**List of Equipment**

## Equipment Summary Sheet

Equipment Description	Manufacturer	Identification no.	Current calibration date	Next calibration date
Base station	Agilent	E5515C	2013/3/18	2015/3/18
Spectrum analyzer	Agilent	N9010A	2013/11/29	2015/11/29
Network analyzer	Agilent	E5071C	2013/10/28	2014/10/28
Measurement software	ETS-Lindgren	EMQuest 1.08	N/A	N/A
Multi axis positioning system(MAPSTM)	ETS-Lindgren	EMCO 2115	N/A	N/A
Multi axis positioning system(MAPSTM)	ETS-Lindgren	EMCO 2110	N/A	N/A
MAPSTM controller	ETS-Lindgren	EMCO 2090	N/A	N/A
Horn antenna	ETS-Lindgren	3164-04	N/A	N/A

Unless otherwise stated the results shown in this test report refer only to the sample(s) tested and such sample(s) are retained for 90 days only.

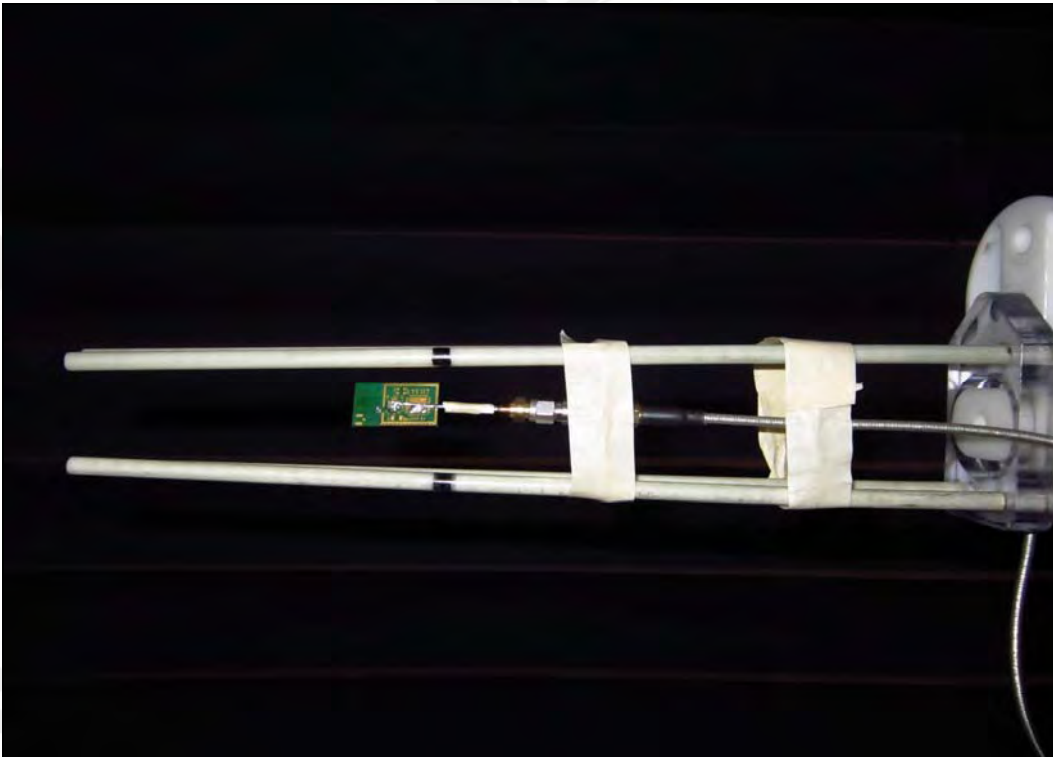
除非另有說明，此報告結果僅對測試之樣品負責，同時此樣品僅保留90天。本報告未經本公司書面許可，不可部份複製。

This document is issued by the Company subject to its General Conditions of Service printed overleaf, available on request or accessible at [www.sgs.com/terms\\_and\\_conditions.htm](http://www.sgs.com/terms_and_conditions.htm) and, for electronic format documents, subject to Terms and Conditions for Electronic Documents at [www.sgs.com/terms\\_e-document.htm](http://www.sgs.com/terms_e-document.htm). Attention is drawn to the limitation of liability, indemnification and jurisdiction issues defined therein. Any holder of this document is advised that information contained hereon reflects the Company's findings at the time of its intervention only and within the limits of Client's instructions, if any. The Company's sole responsibility is to its Client and this document does not exonerate parties to a transaction from exercising all their rights and obligations under the transaction documents. This document cannot be reproduced except in full, without prior written approval of the Company. Any unauthorized alteration, forgery or falsification of the content or appearance of this document is unlawful and offenders may be prosecuted to the fullest extent of the law.

## Antenna Gain and Efficiency

Test Results											
Frequency (MHz)	2400	2410	2420	2430	2440	2450	2460	2470	2480	2490	2500
Point Values											
Ant. Port Input Pwr. (dBm)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Tot. Rad. Pwr. (dBm)	-6.76	-6.76	-6.78	-7.03	-7.07	-7.12	-7.11	-7.06	-7.06	-6.98	-6.97
Peak EIRP (dBm)	0.11	0.08	0.01	-0.08	0.06	0.13	0.25	0.42	0.68	0.94	1.10
Directivity (dBi)	6.87	6.84	6.80	6.96	7.13	7.25	7.36	7.48	7.74	7.92	8.07
Efficiency (dB)	-6.76	-6.76	-6.78	-7.03	-7.07	-7.12	-7.11	-7.06	-7.06	-6.98	-6.97
Efficiency (%)	21.09	21.09	20.98	19.79	19.63	19.40	19.45	19.70	19.67	20.03	20.11
Gain (dBi)	0.11	0.08	0.01	-0.08	0.06	0.13	0.25	0.42	0.68	0.94	1.10
NHPRP ±Pi/4 (dBm)	-9.28	-9.28	-9.30	-9.57	-9.61	-9.66	-9.65	-9.60	-9.62	-9.56	-9.57
NHPRP ±Pi/6 (dBm)	-11.09	-11.06	-11.06	-11.33	-11.36	-11.42	-11.41	-11.36	-11.39	-11.34	-11.36
NHPRP ±Pi/8 (dBm)	-12.37	-12.34	-12.34	-12.63	-12.68	-12.76	-12.78	-12.76	-12.81	-12.78	-12.81
Upper Hem. PRP (dBm)	-11.77	-11.74	-11.72	-11.96	-11.97	-11.97	-11.92	-11.81	-11.77	-11.64	-11.58
Lower Hem. PRP (dBm)	-8.41	-8.42	-8.46	-8.72	-8.77	-8.85	-8.85	-8.83	-8.85	-8.80	-8.81

## Test Setup



Unless otherwise stated the results shown in this test report refer only to the sample(s) tested and such sample(s) are retained for 90 days only.

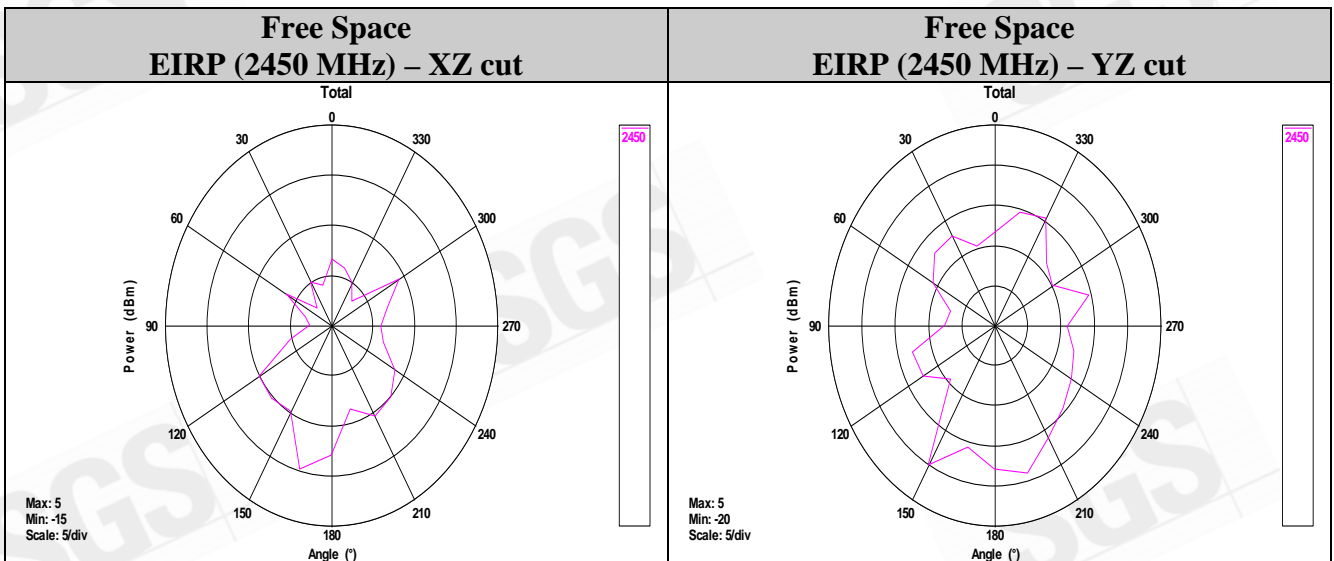
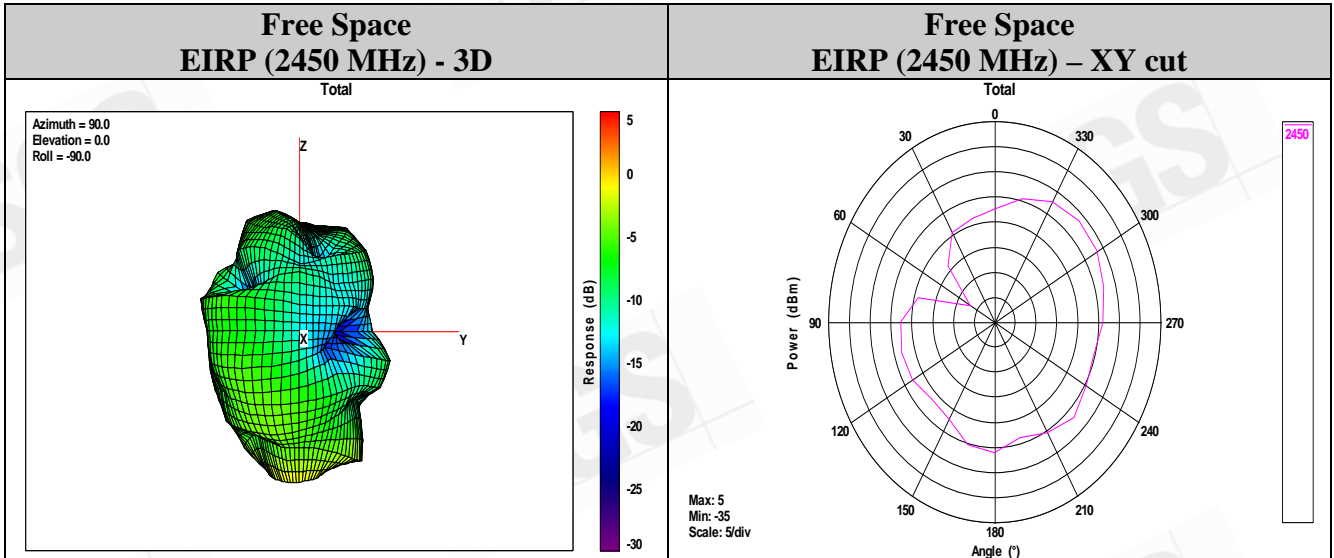
除非另有說明，此報告結果僅對測試之樣品負責，同時此樣品僅保留90天。本報告未經本公司書面許可，不可部份複製。

This document is issued by the Company subject to its General Conditions of Service printed overleaf, available on request or accessible at [www.sgs.com/terms\\_and\\_conditions.htm](http://www.sgs.com/terms_and_conditions.htm) and, for electronic format documents, subject to Terms and Conditions for Electronic Documents at [www.sgs.com/terms\\_e-document.htm](http://www.sgs.com/terms_e-document.htm). Attention is drawn to the limitation of liability, indemnification and jurisdiction issues defined therein. Any holder of this document is advised that information contained hereon reflects the Company's findings at the time of its intervention only and within the limits of Client's instructions, if any. The Company's sole responsibility is to its Client and this document does not exonerate parties to a transaction from exercising all their rights and obligations under the transaction documents. This document cannot be reproduced except in full, without prior written approval of the Company. Any unauthorized alteration, forgery or falsification of the content or appearance of this document is unlawful and offenders may be prosecuted to the fullest extent of the law.



## Antenna 3D Plot Matrix

All plots in this section show the total EIRP ( $EIRP_{\theta} + EIRP_{\phi}$ ) with the +x-axis pointing out of the page, +y-axis pointing right, and +z-axis pointing up.



## End of Report

Unless otherwise stated the results shown in this test report refer only to the sample(s) tested and such sample(s) are retained for 90 days only.

除非另有說明，此報告結果僅對測試之樣品負責，同時此樣品僅保留90天。本報告未經本公司書面許可，不可部份複製。

This document is issued by the Company subject to its General Conditions of Service printed overleaf, available on request or accessible at [www.sgs.com/terms\\_and\\_conditions.htm](http://www.sgs.com/terms_and_conditions.htm) and, for electronic format documents, subject to Terms and Conditions for Electronic Documents at [www.sgs.com/terms\\_e-document.htm](http://www.sgs.com/terms_e-document.htm). Attention is drawn to the limitation of liability, indemnification and jurisdiction issues defined therein. Any holder of this document is advised that information contained hereon reflects the Company's findings at the time of its intervention only and within the limits of Client's instructions, if any. The Company's sole responsibility is to its Client and this document does not exonerate parties to a transaction from exercising all their rights and obligations under the transaction documents. This document cannot be reproduced except in full, without prior written approval of the Company. Any unauthorized alteration, forgery or falsification of the content or appearance of this document is unlawful and offenders may be prosecuted to the fullest extent of the law.