TAOGLAS

Datasheet

NCP.5820

Part No:
NCP.5820

Description:

NB-IoT SMD Ceramic Antenna

For Bands 5, 8 and 20

Features:

Small size, small footprint SMD antenna

Global NB-IoT Coverage for:

Band 5, 824-894MHz

Band 8, 880-960MHz

Band 20, 791-862mHz

High efficiency across each band

Dimensions: 14.1 x 8.3 x 2mm

Automotive IATF16949 Production and Quality Approved

RoHS & Reach Compliant

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Ireland ISO 9001: 2015 Certified

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1. Introduction

The evolution of IoT connectivity has seen an urgent need for low power applications that can connect thousands of devices to the internet and Narrowband IoT (NB-IoT) is a new way to facilitate this demand. For a small compact embedded antenna, the Taoglas NCP.5820 fits will fit in many size challenged designs without performance compromises.

The Taoglas NCP.5820 supports Bands 5 (824-894MHz), 8 (880-960MHz) and 20 (791-862MHz) providing global NB-IoT coverage and demonstrates excellent efficiency across all bands.

The antenna measures just 14.1x8.3x2mm and as it is a surface mount antenna, it can be easily integrated into the smallest of devices. It allows device designers to take advantage of all of the benefits of NB-IoT technology, including reduced power consumption and increased battery life; increased system capacity and spectrum efficiency; and extended coverage in both rural and deep indoors environments all with a very small form factor. For Testing, the NCP.5820 can be supplied with the evaluation board NCPD.5820 – see section 5.

Overall, this antenna is suitable for applications that need to meet the following requirements:

- Small footprint, low profile design factor
- SMD Components for assembly accuracy and reliability
- Excellent antenna efficiency helping to maintain better system gain, hence better device send and receive sensitivity (TRP & TIS)
- Excellent antenna efficiency to aid lower power consumption and increased battery life
- Global coverage for device roaming
- 100% quality and performance testing prior to shipping for reliability and consistency

For more information or support with integrating this antenna into your device, please contact your regional Taoglas customer support team.

2. Specifications

Band 5,8 Electrical		
	Band 5	Band 8
Frequency (MHz)	824~894	880~960
Peak Gain (dBi)*	0.6	1.2
Average Gain (dB)*	-3.5	-2.7
Efficiency (%) *	53.5	60.7
Return Loss (dB)*	<-4.5	<-5

Band 5,8,20 Electrical			
	Band 5	Band 8	Band 20
Frequency (MHz)	824~894	880~960	791~862
Peak Gain (dBi)*	1.1	1.7	-0.3
Average Gain (dB)*	-3.9	-3.1	-4.3
Efficiency (%) *	47	53.1	38.7
Return Loss (dB)*	<-4.5	<-5	<-4.5
Impedance	50 Ω		
Maximum Input Power	5W		

Mechanical	
Antenna Dimensions	14.1mm x 8.3mm x 2mm
Material	Ceramic
Weight	0.76 g
Soldering Type	SMD through Reflow

Environmental	
Operation Temperature	-40°C ~ +85°C
Storage Temperature	-40°C ~ +85°C
Humidity	Non-condensing 65°C 95% RH
Moisture Sensitivity Level (MSL)	3 (168 Hours)

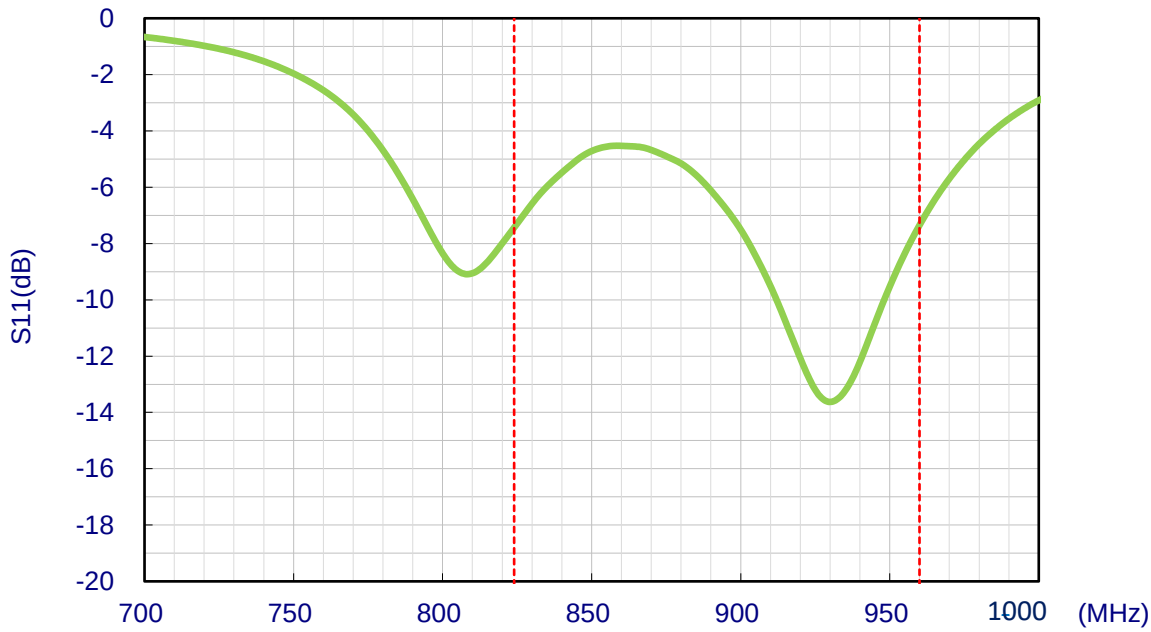
*Note: All measurements were conducted with SMD on a 115*35mm evaluation board with 100mm length ground plane and matching circuit. See EVB drawing and matching circuit diagram in Section 5 and Section 7.

3. Antenna Characteristics

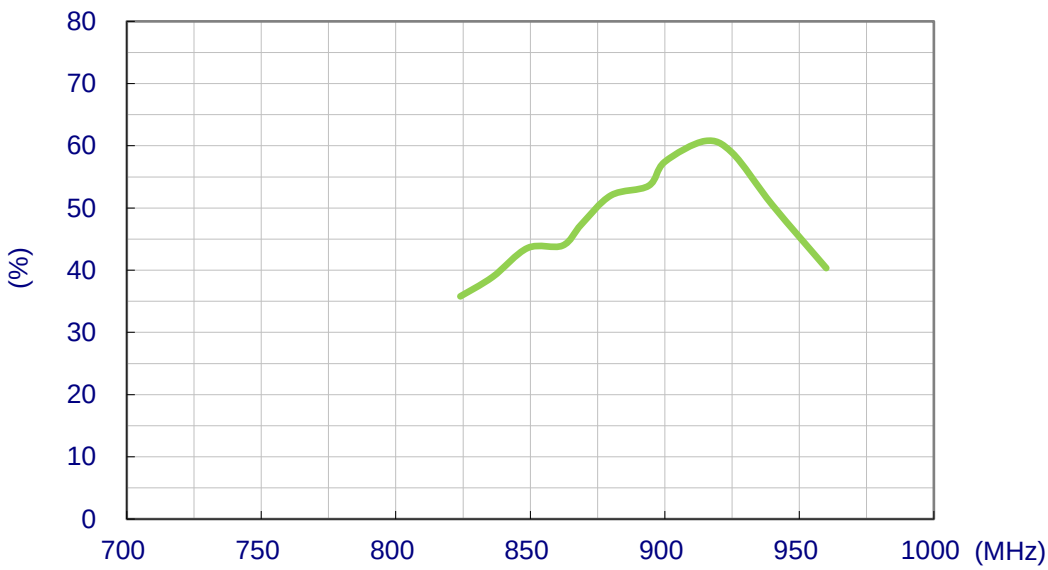
All data was measured on the evaluation board illustrated in Section 5.4, with the documented matching circuit, section 7

3.1 Band 5 & 8 configuration

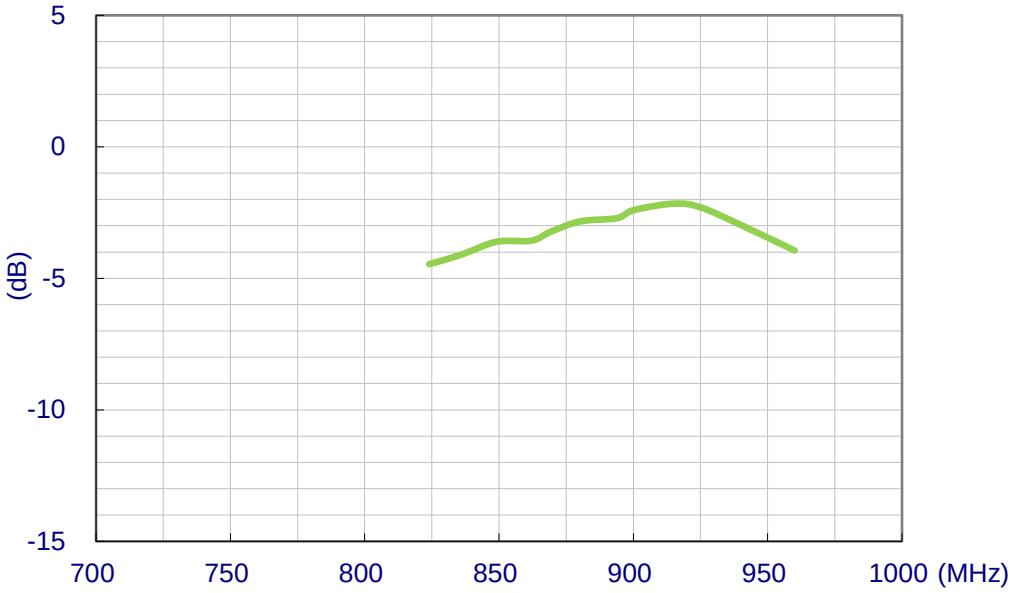
Return Loss



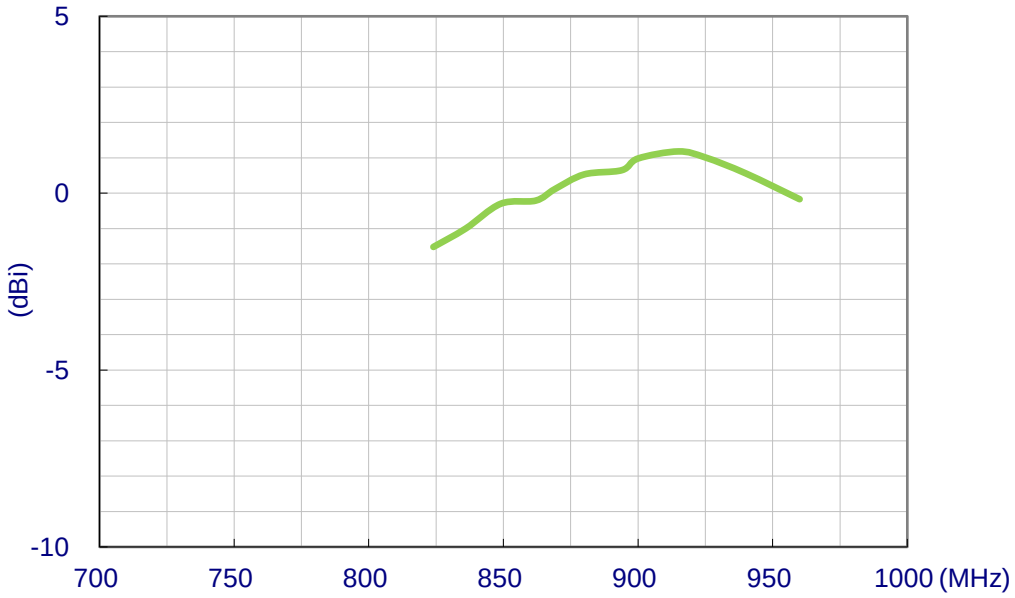
Efficiency



Average Gain

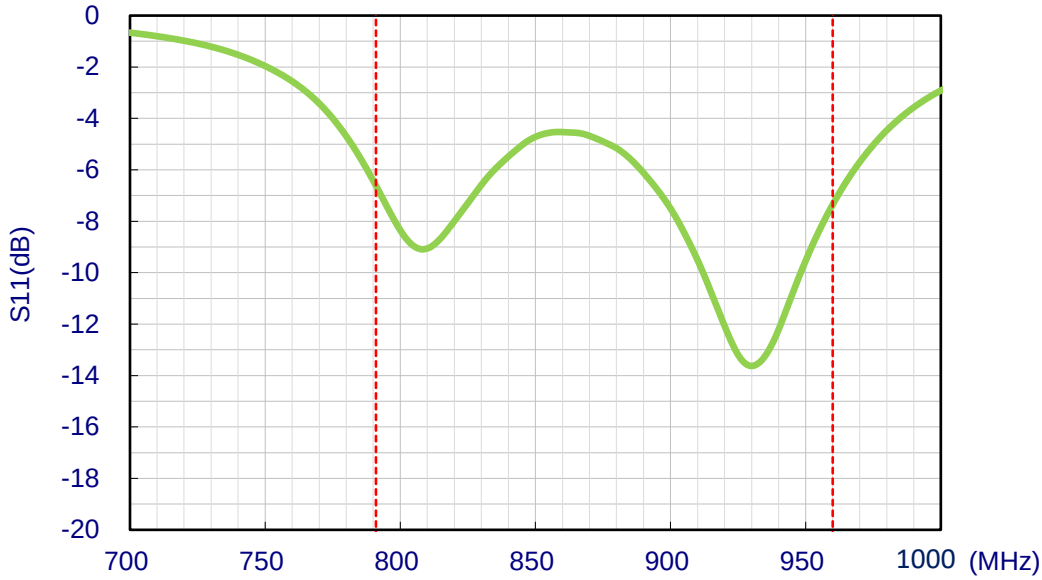


Peak Gain

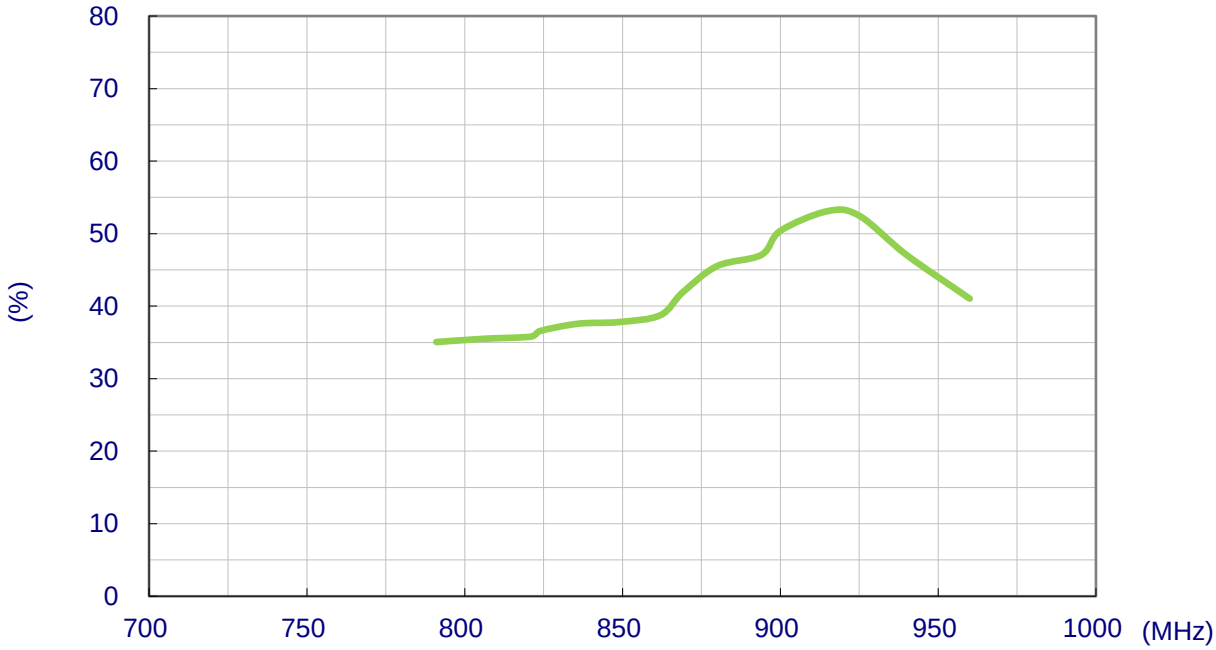


3.2 Band 5,8 & 20 configuration

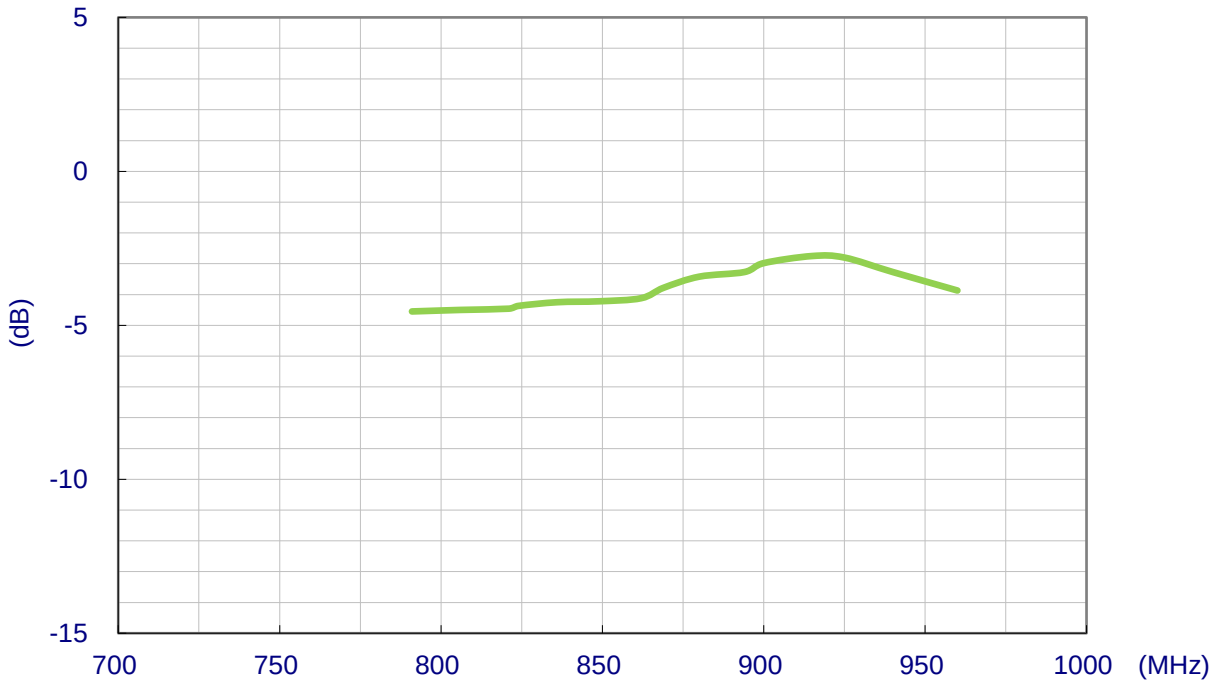
Return Loss



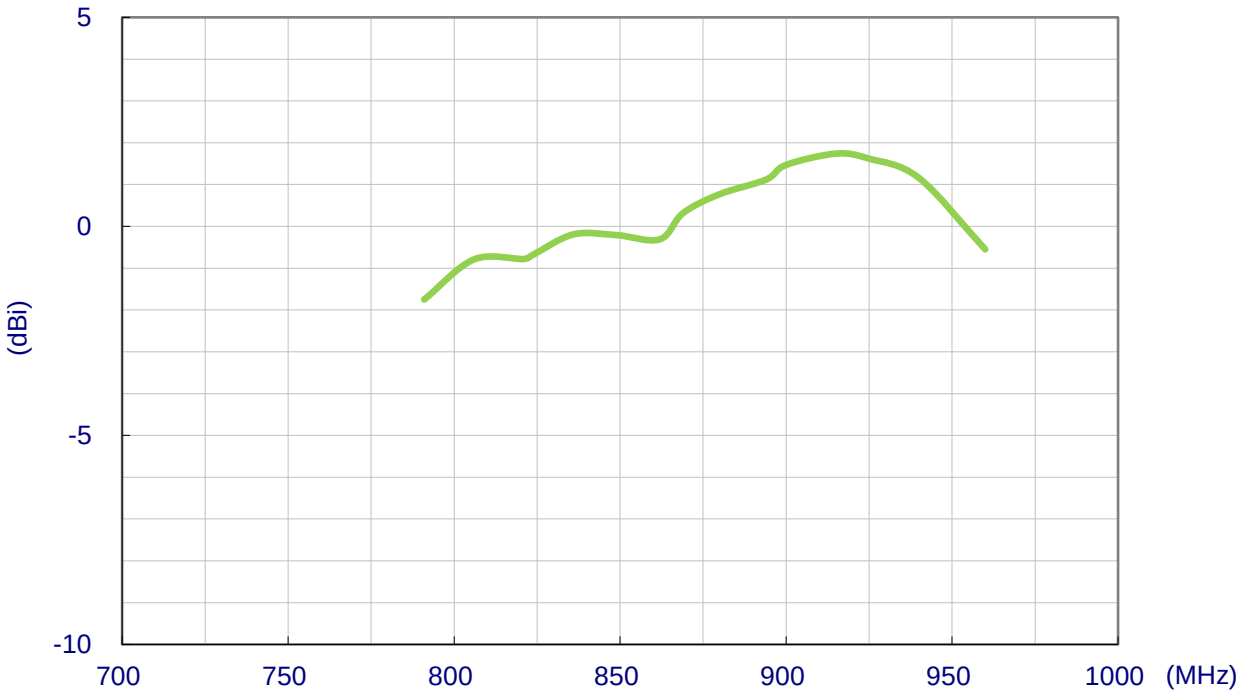
Efficiency



Average Gain

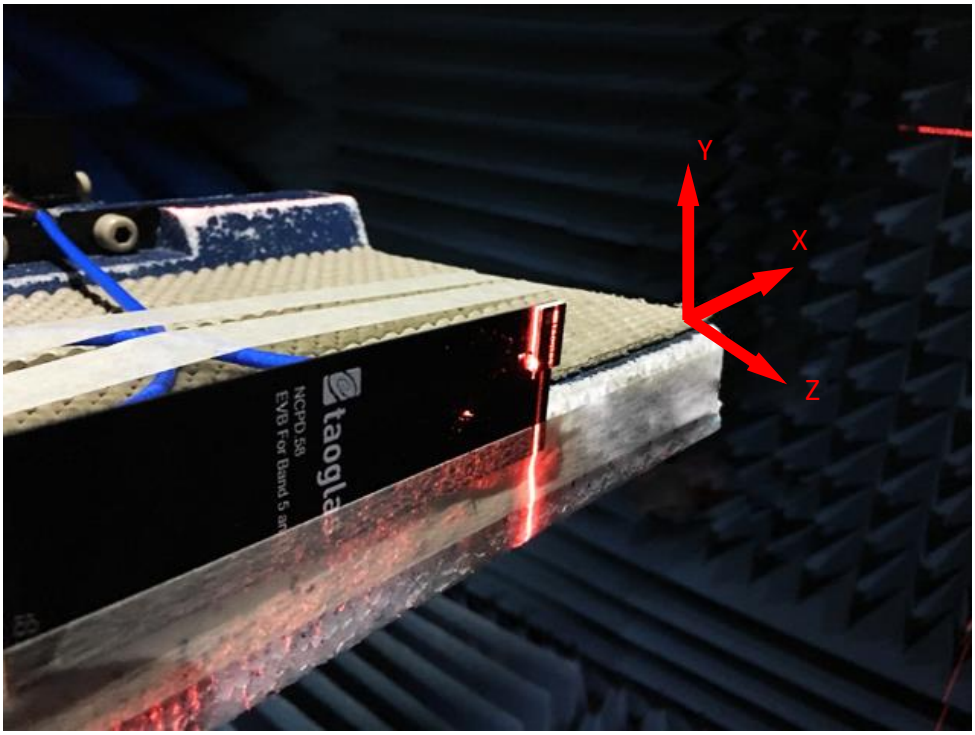


Peak Gain



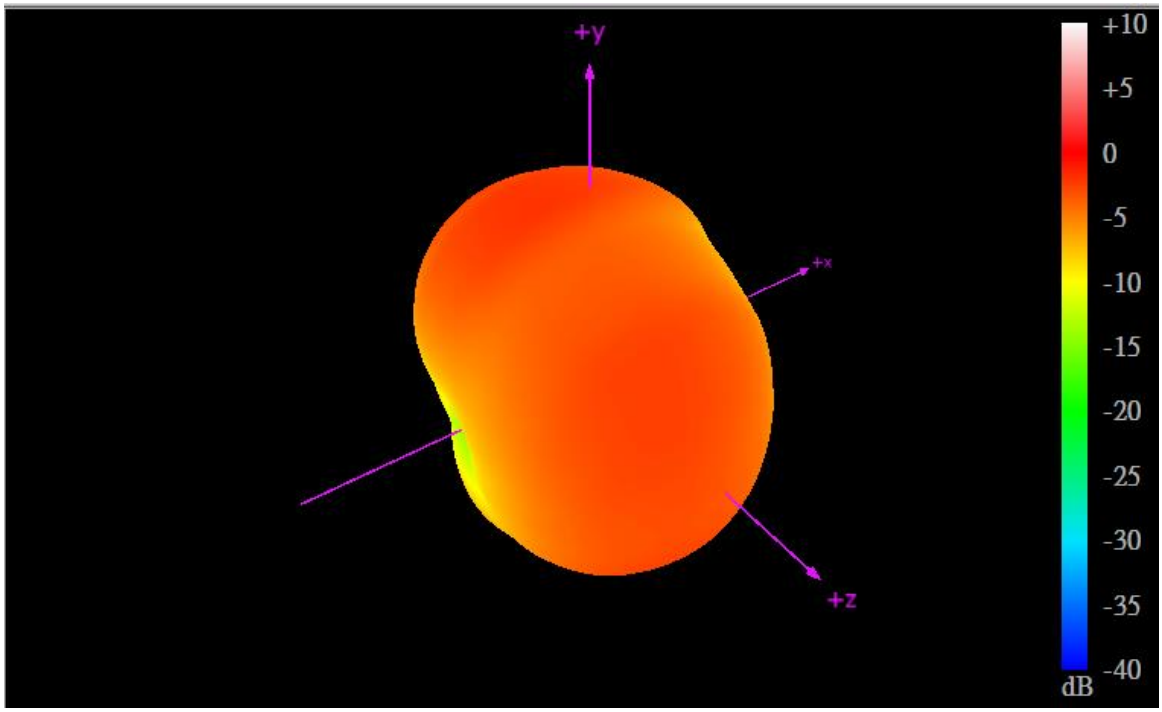
4. Radiation Patterns

4.1 Test Setup Band 5 & 8 configuration

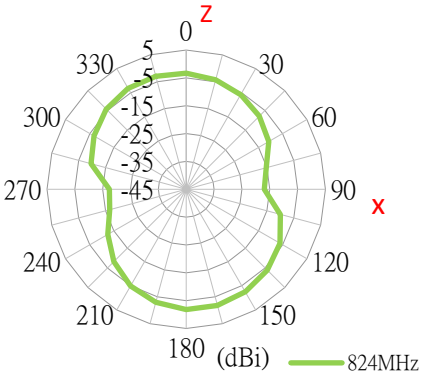


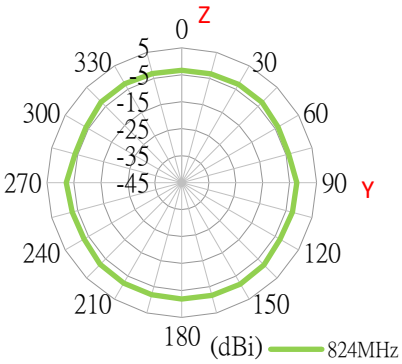
On Evaluation Board (NCPD.5820)

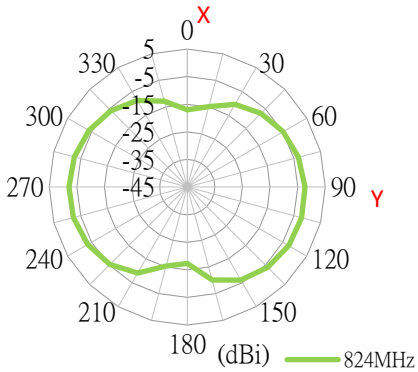
4.2 824 MHz 3D and 2D Radiation Patterns



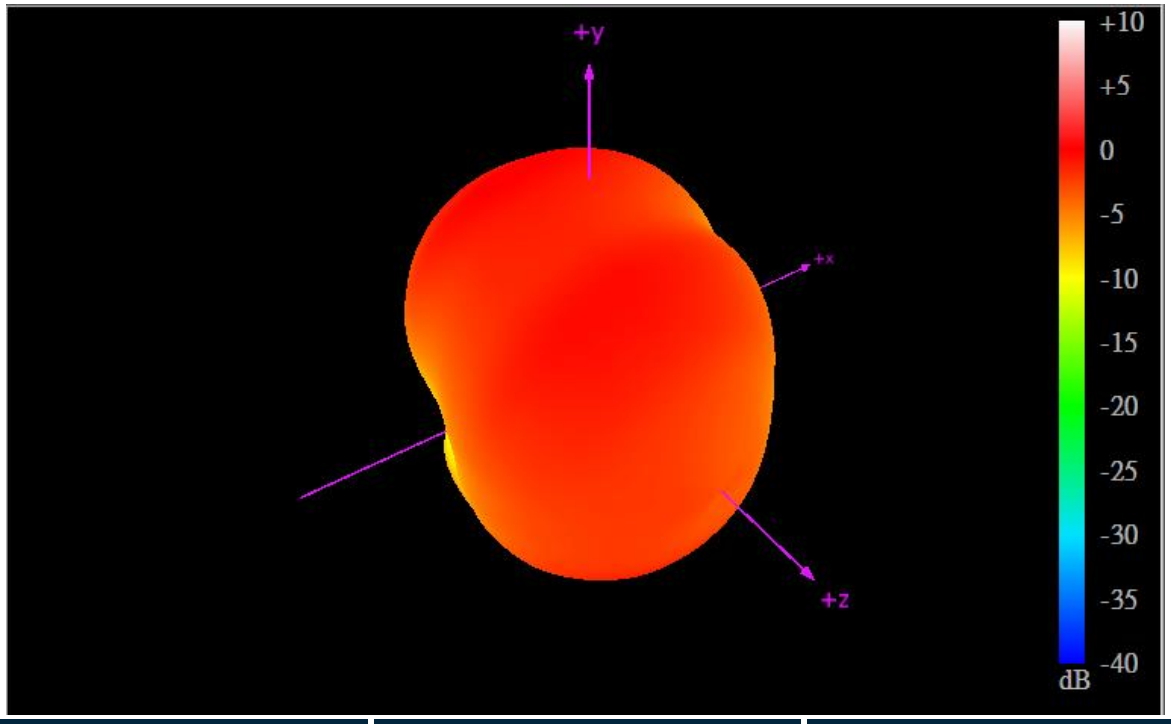
XZ Plane	YZ Plane	XY Plane



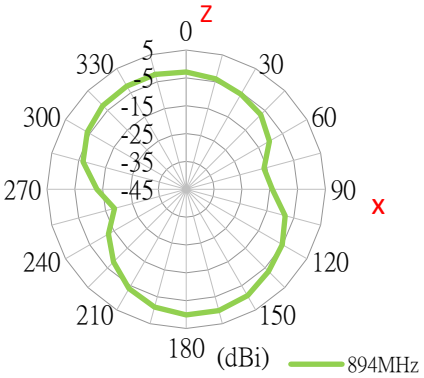


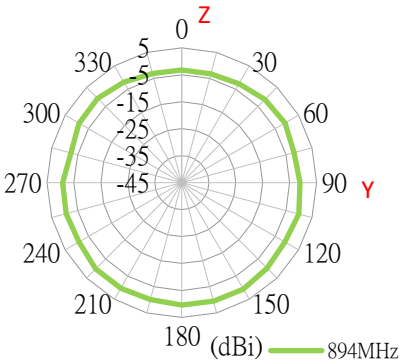


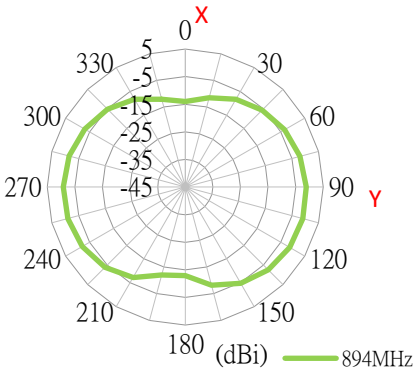
4.3 894 MHz 3D and 2D Radiation Patterns



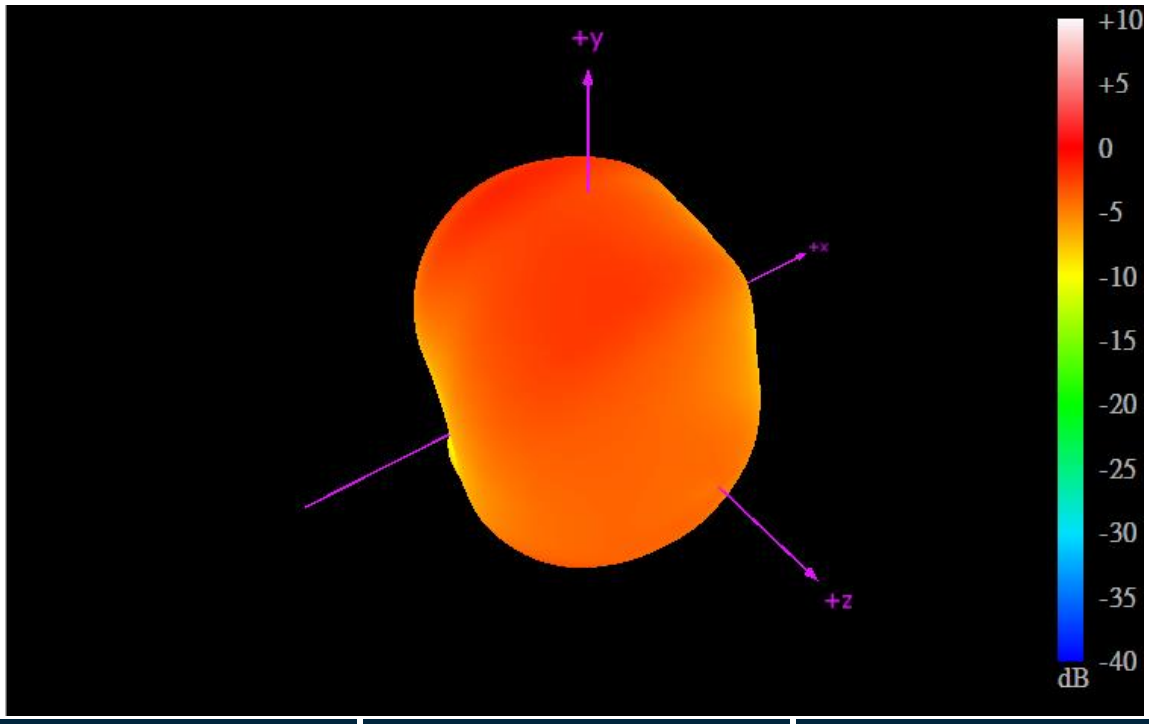
XZ Plane	YZ Plane	XY Plane



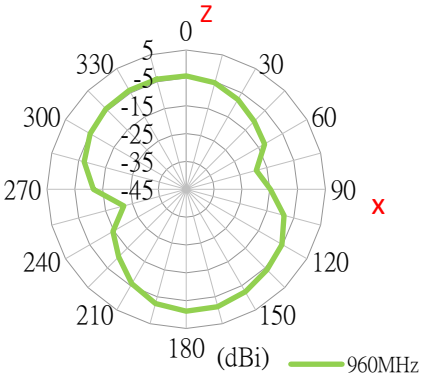


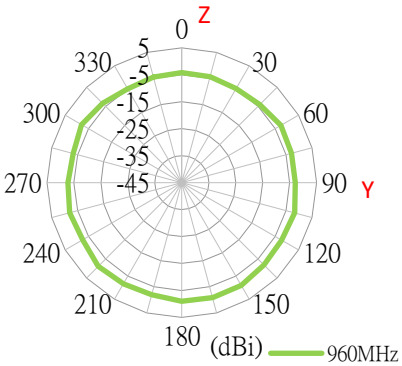


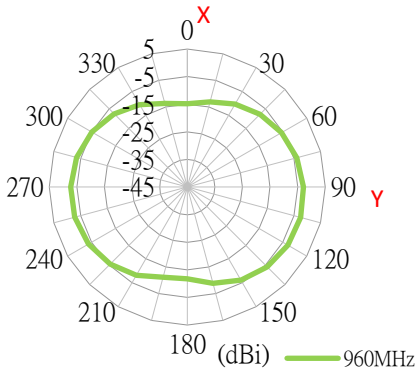
4.4 960 MHz 3D and 2D Radiation Patterns



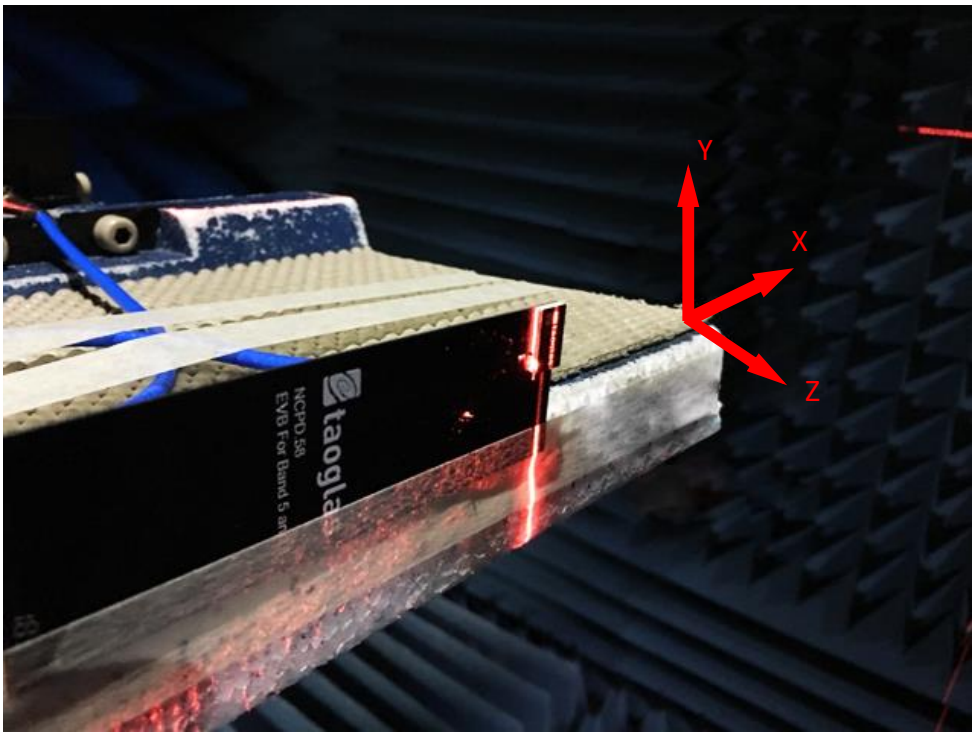
XZ Plane	YZ Plane	XY Plane





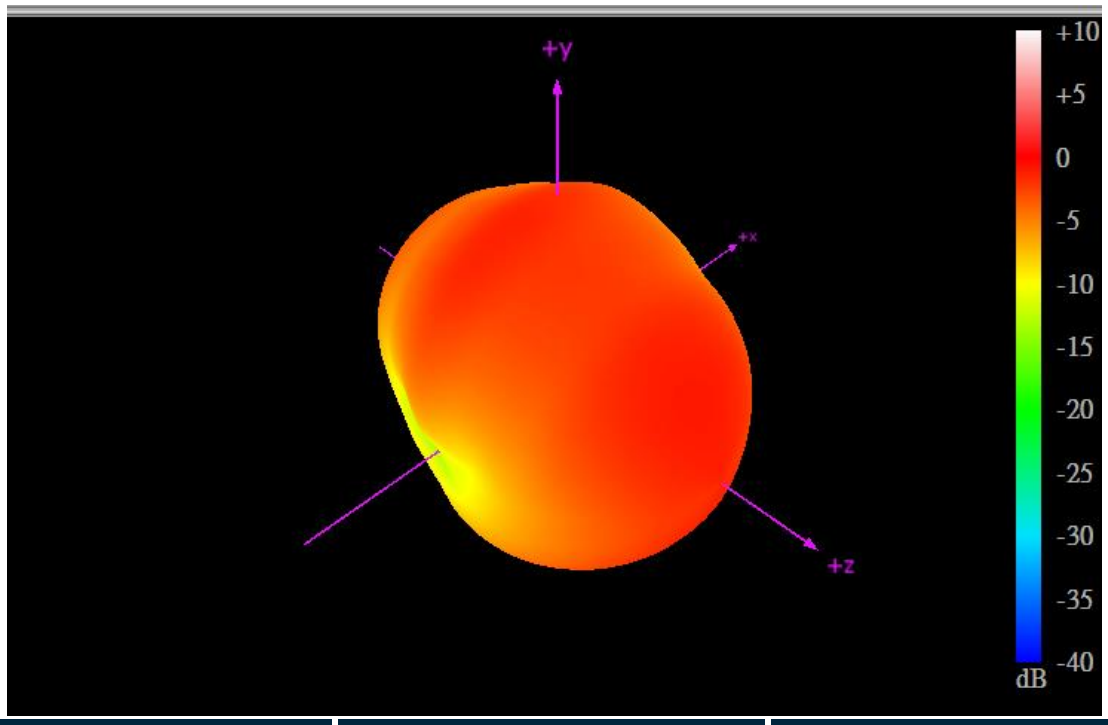


4.5 Test Setup Band 5,8 & 20 configuration

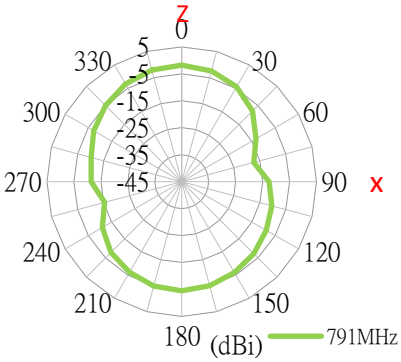


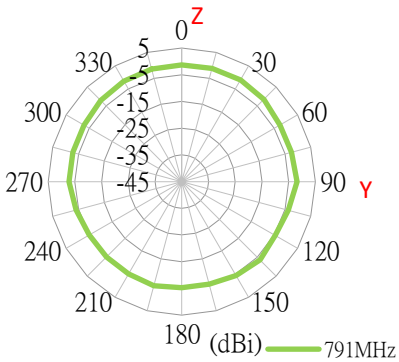
On Evaluation Board (NCPD.5820)

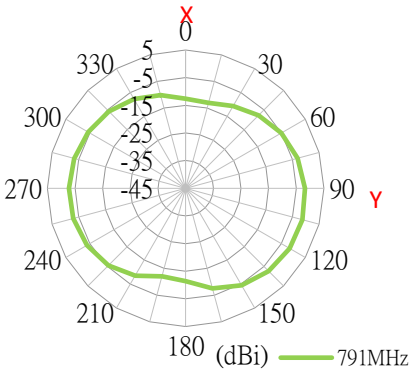
4.6 791MHz 3D and 2D Radiation Patterns



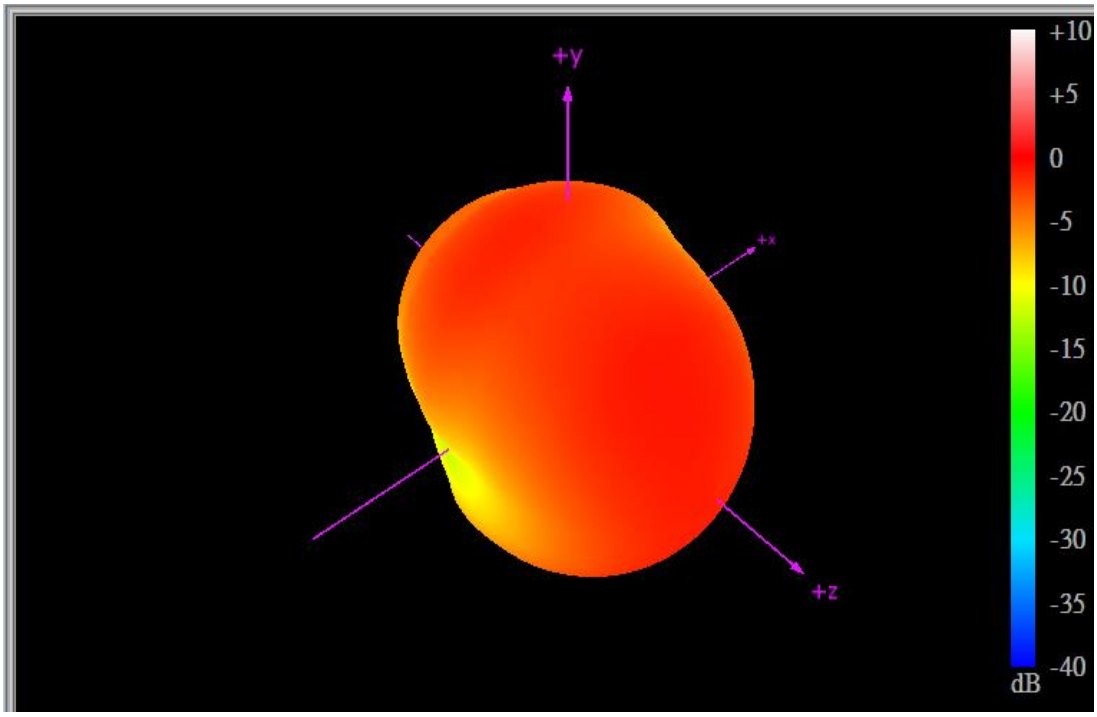
XZ Plane	YZ Plane	XY Plane



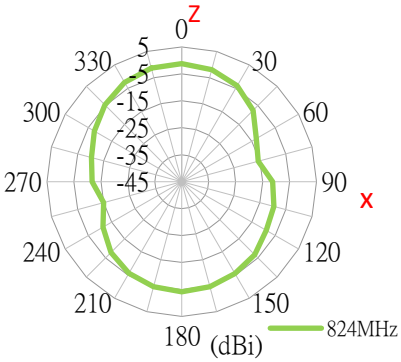


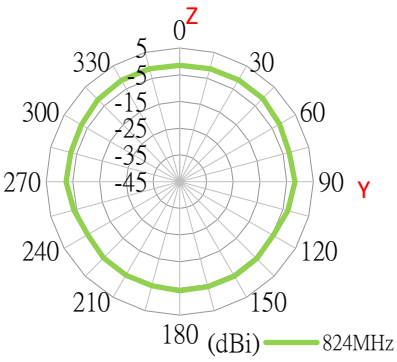


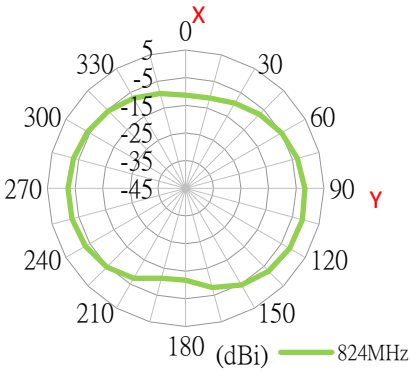
4.7 824 MHz 3D and 2D Radiation Patterns



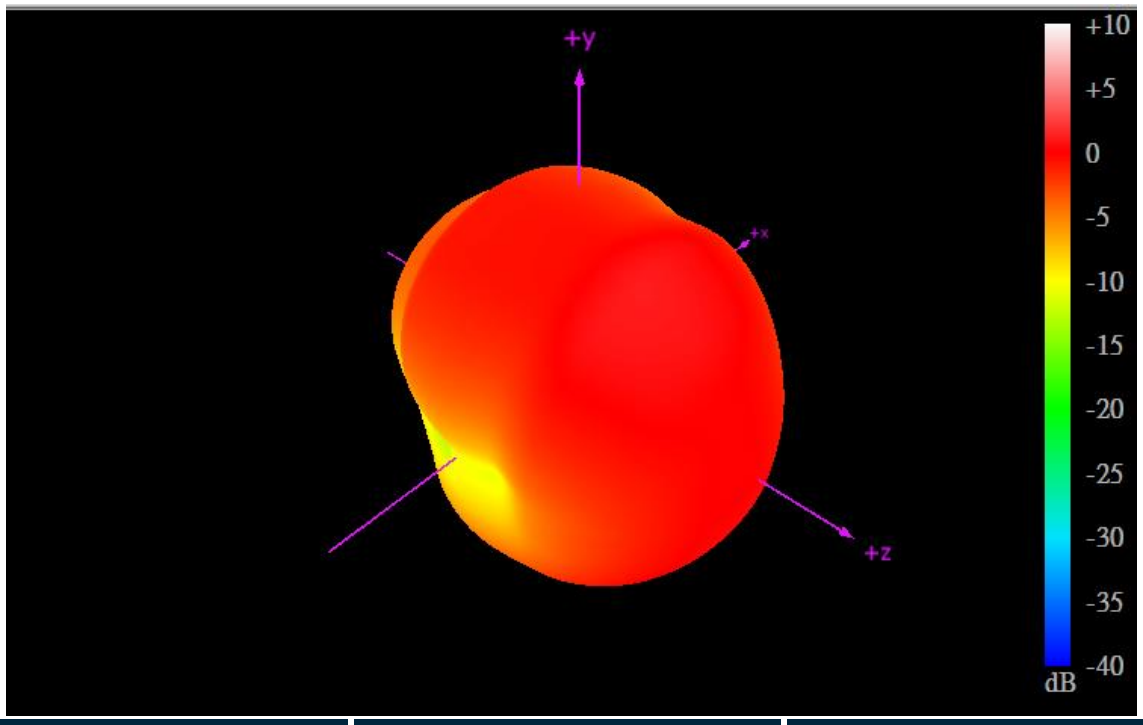
XZ Plane	YZ Plane	XY Plane



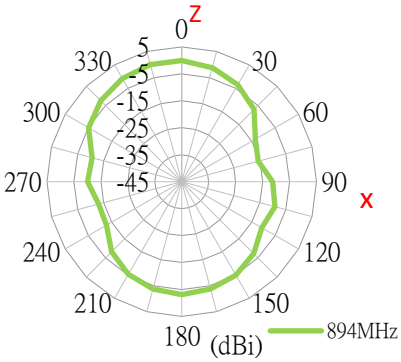


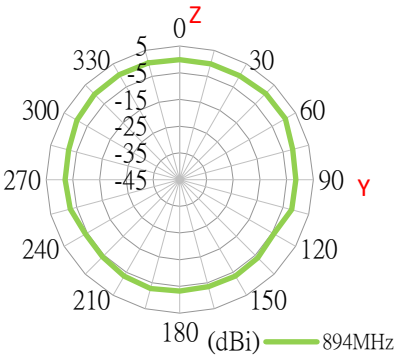


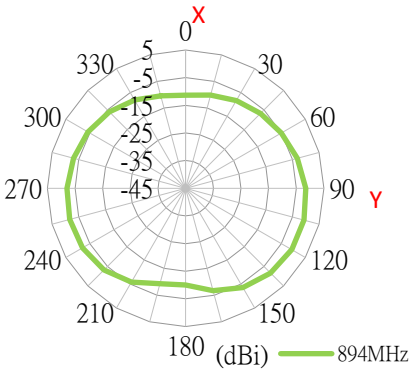
4.8 894 MHz 3D and 2D Radiation Patterns



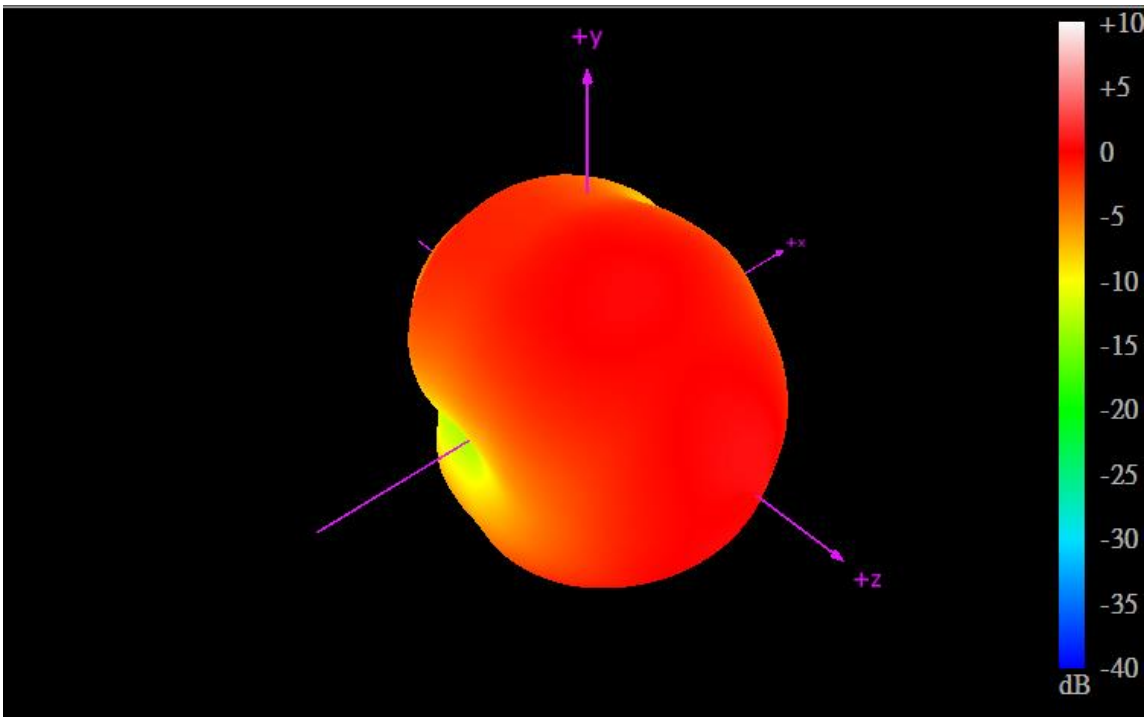
XZ Plane	YZ Plane	XY Plane



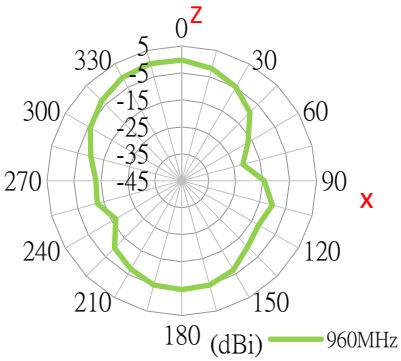


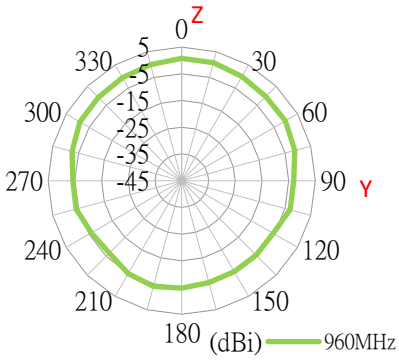


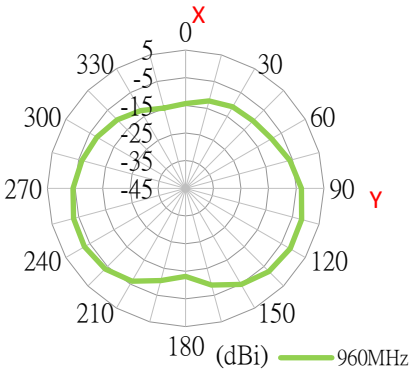
4.9 960 MHz 3D and 2D Radiation Patterns



XZ Plane	YZ Plane	XY Plane







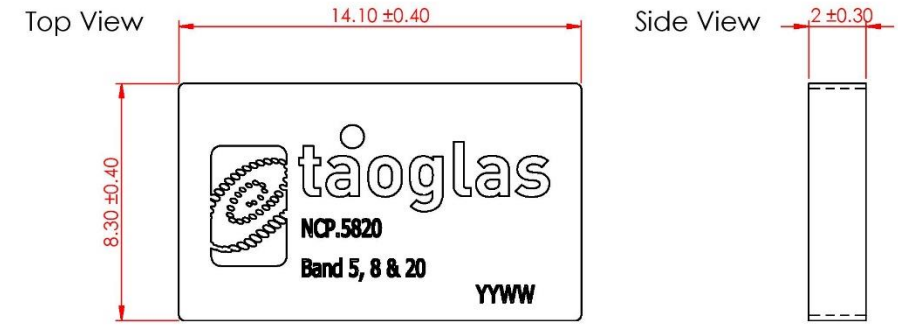
5. Mechanical Drawings(Units: mm)

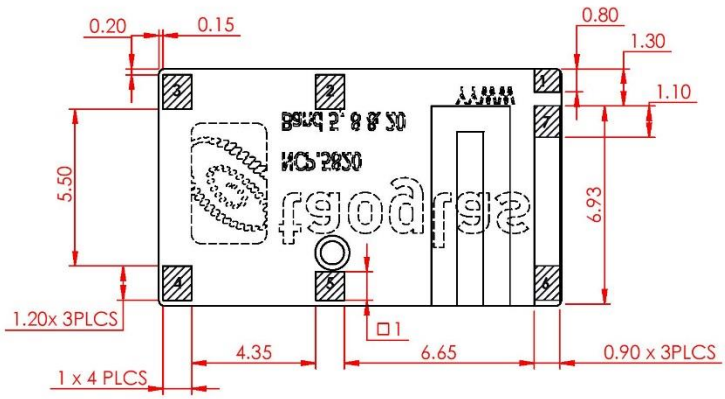
5.1 Antenna Drawing

ISO NO: xxx

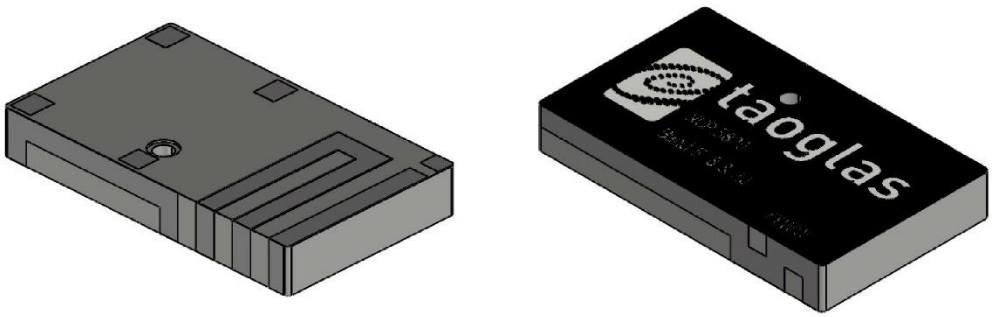
<Release>

REV	ZONE	DESCRIPTION	ENG	APPROVED	ISSUED DATE
D01		Initial Design	WLE	xxx	15/8/19
D02		Pad numbering updated	WLE	NW	15/11/19





PIN:	DESCRIPTION:
1	Feed (50 ohm)
2,3,4,5,6	NC
7	Ground Feed



Note:

1. Pads 2,3,4 are the same size

UNLESS OTHERWISE SPECIFED TOLERANCES ON:
.X±0.2
XX.±0.5 .XX±0.1
X.±0.3 .XXX±0.05

DATE: 15/8/19 | MAT'L: Ceramic
UNIT: mm | FINISH: Black
THIRD ANGLE PROJECTION | SCALE: 5:1

APPROVED BY: | CHECKED BY: | DRAWN BY: WLE | CUSTOMERS SIGNATURE / DATE

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REV D02

TITLE. : NB-IoT SMD Ceramic Antenna For Bands 5 , 8 and 20

PART NO. : NCP.5820

5.2 Paste Area

ISO NO: xxx

<Release>

REV	ZONE	DESCRIPTION	ENG	APPROVED	ISSUED DATE
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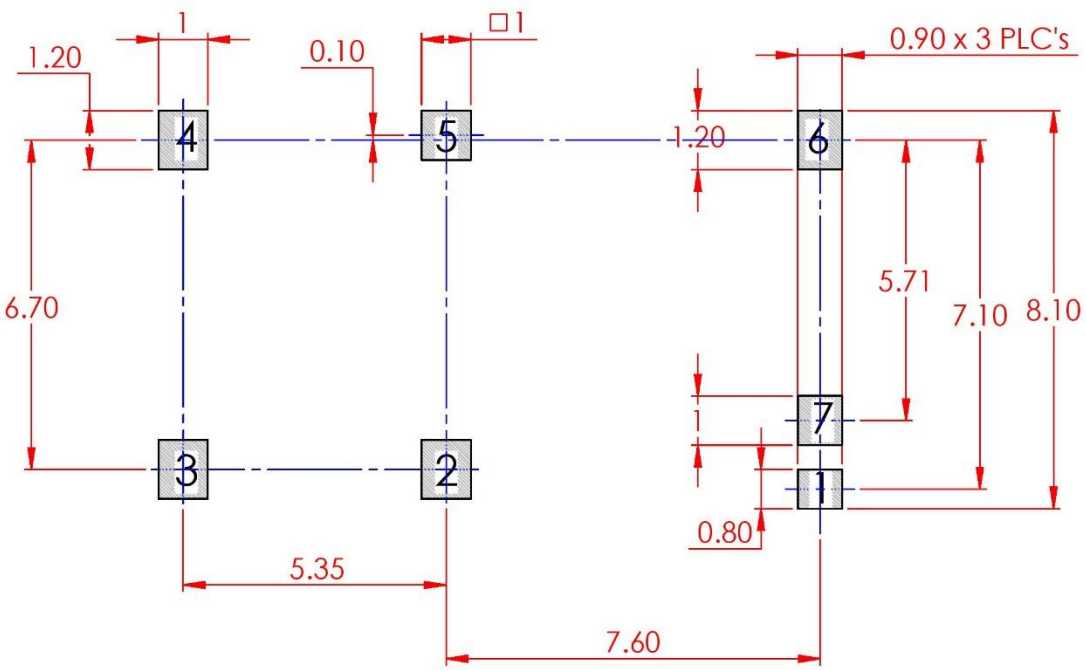
D02		Pad numbering updated	WLE	NW	15/11/19

Antenna Footprint:



Notes:

1. Pads 2,3,4 are the same size
2. For PCB Solder mask allow 0.1mm larger than pad shown
3. For PCB Solder paste allow 90% area pad shown

UNLESS OTHERWISE SPECIFED TOLERANCES ON:
.X±0.2
XX.±0.5 .XX±0.1
X.±0.3 .XXX±0.05

DATE: 23/08/19
UNIT: mm
THIRD ANGLE PROJECTION
MAT'L: CERAMIC
FINISH: NA
SCALE: 8:1

APPROVED BY: CHECKED BY: DRAWN BY: WLE CUSTOMERS SIGNATURE / DATE

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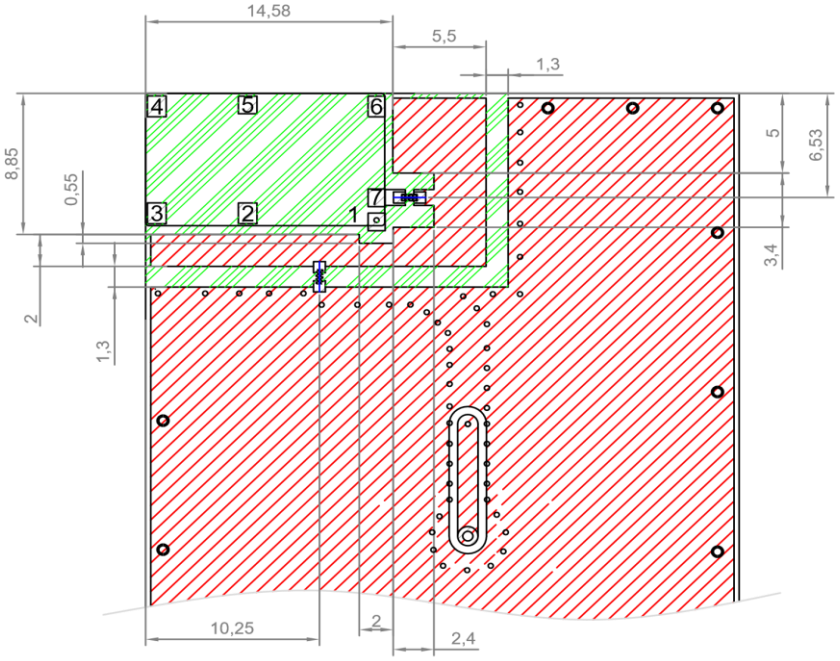
REV D02

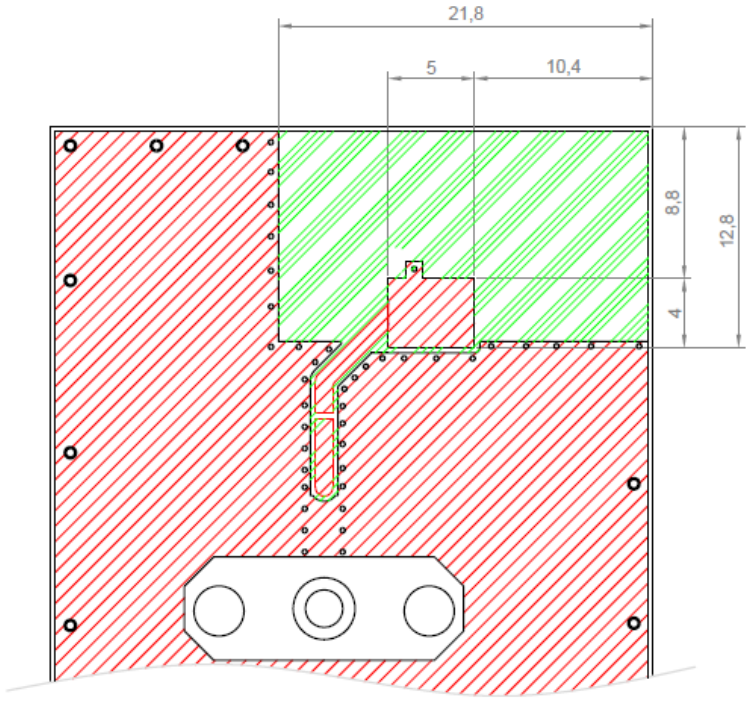
TITLE. : NB-IoT SMD Ceramic Antenna For Bands 5 , 8 and 20

PART NO. : NCP 5820

5.3 Copper Keep-Out Areas



Top View (Keep-out area)



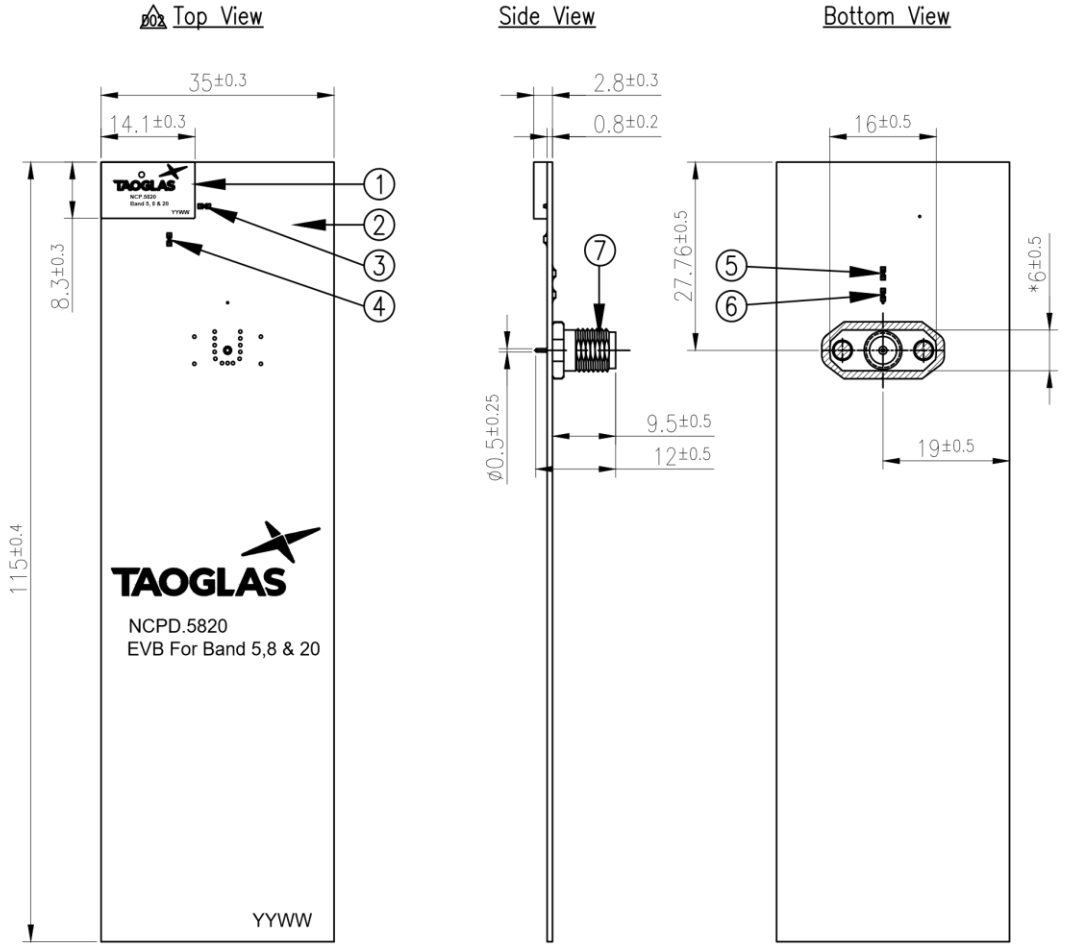
Bottom View (Keep-out area)

Note:
1. Soldered area
2. Copper area
3. Ground Clearance Area

5.4 Evaluation Board

ISO NO: EDW-18-8-6319 <Release>

REV	ZONE	DESCRIPTION	ENG	APPROVED	ISSUED DATE
D01	ALL	Initial Design	Alster	Haley	2018/10/15
D02	ALL	Replace the new LOGO <ECR-18-8-259>	Aron	Aaron	2019/11/12
D03	ALL	Update BOM<ECR-18-8-141>	Aron	Clark	2019/12/17



	Name	P/N	Material	Finish	QTY
1	NCP.5820 Patch Antenna	001518I000000A	Ceramic	Clear	1
2	NB-Iot EVB PCB	100218I000000A	IT-180 0.8t	Black	1
D03 3	Component (0402)	----------	Ceramic	Natural	1
D03 4	Component (0402)	----------	Ceramic	Natural	1
D03 5	Component (0402)	----------	Ceramic	Natural	1
D03 6	Component (0402)	----------	Ceramic	Natural	1
7	SMA(F)ST PCB	200413B000002A	Brass	Au Plated	1

Note:
1. All material must be RoHS compliant
2. Soldered area
3. Logo & Text Ink Printing : White

UNLESS OTHERWISE SPECFIED TOLERANCES ON: .X± 0.2 XX.± 0.5 .XX± 0.1 X.± 0.3 .XXX± 0.05

DATE: 2018/10/15 | MAT'L: | UNIT: mm | FINISH: | THIRD ANGLE PROJECTION | SCALE: 1/1

APPROVED BY: Haley | CHECKED BY: Amos/Jack | DRAWN BY: Alster | CUSTOMERS SIGNATURE / DATE

TAOGLAS. TW Design Centre

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REV D03

TITLE. : NCP.5820 on Evaluation Board with 5 pcs

PART NO. : NCPD.5820

6. Antenna Integration Guide

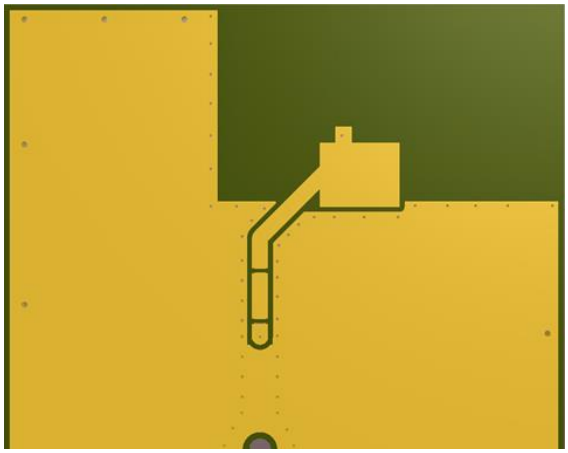
6.1 Integration Guide

Whatever the size of the PCB, the ideal location for the antenna is as illustrated in the below diagram; on the PCB's shortest side, in the left corner. This allows placement of the optimized matching components alongside the antenna.

6.2 PCB Layout

The footprint and clearance on the PCB must comply with the antenna specification. The PCB layout shown in the diagram below demonstrates the antenna footprint and the clearance required. The component should be close to Pin 7.

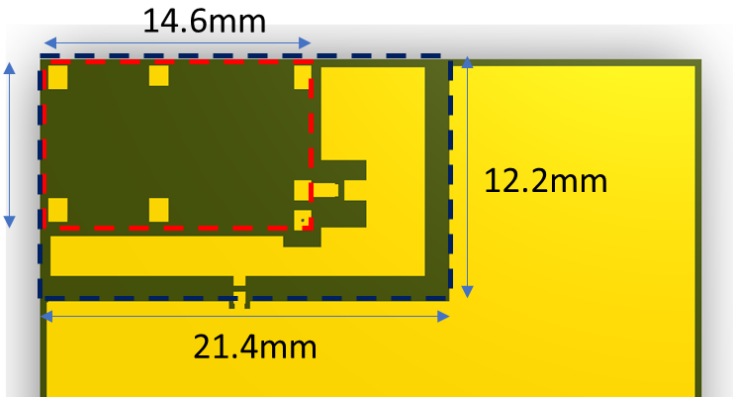
Topside



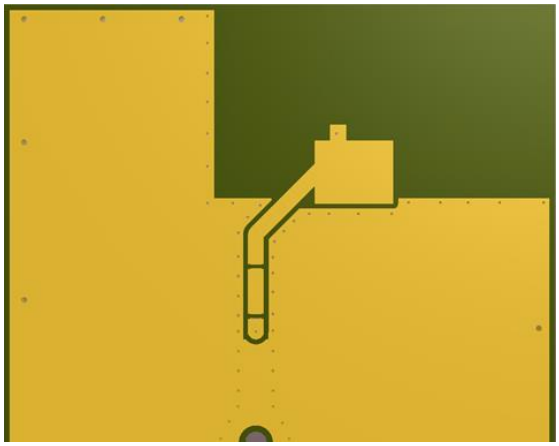
Bottom Side

6.3 PCB Clearance

In the figure in this section, the footprint and clearance are defined through all layers on the PCB. Only the antenna pads and connections to feed and GND are present within this clearance area (marked RED). The clearance area required is 14.6 x 8.9 (mm). An additional clearance area (marked BLACK) is also needed for the antenna to operate 21.4 x 12.2 (mm).



Topside

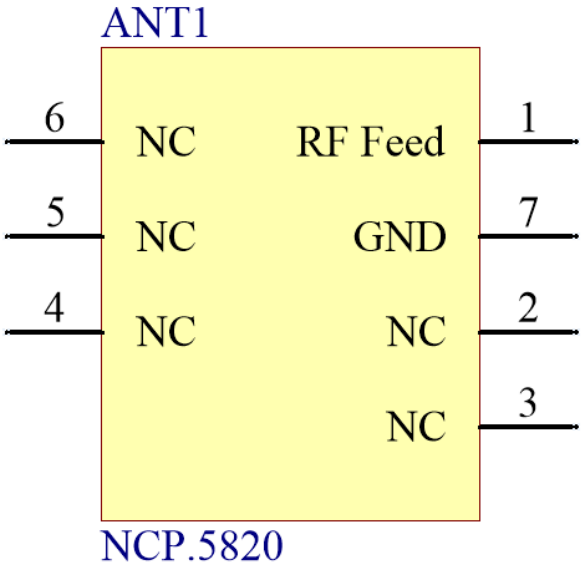


Bottom Side

6.4 Schematic Symbol and Pin Definitions

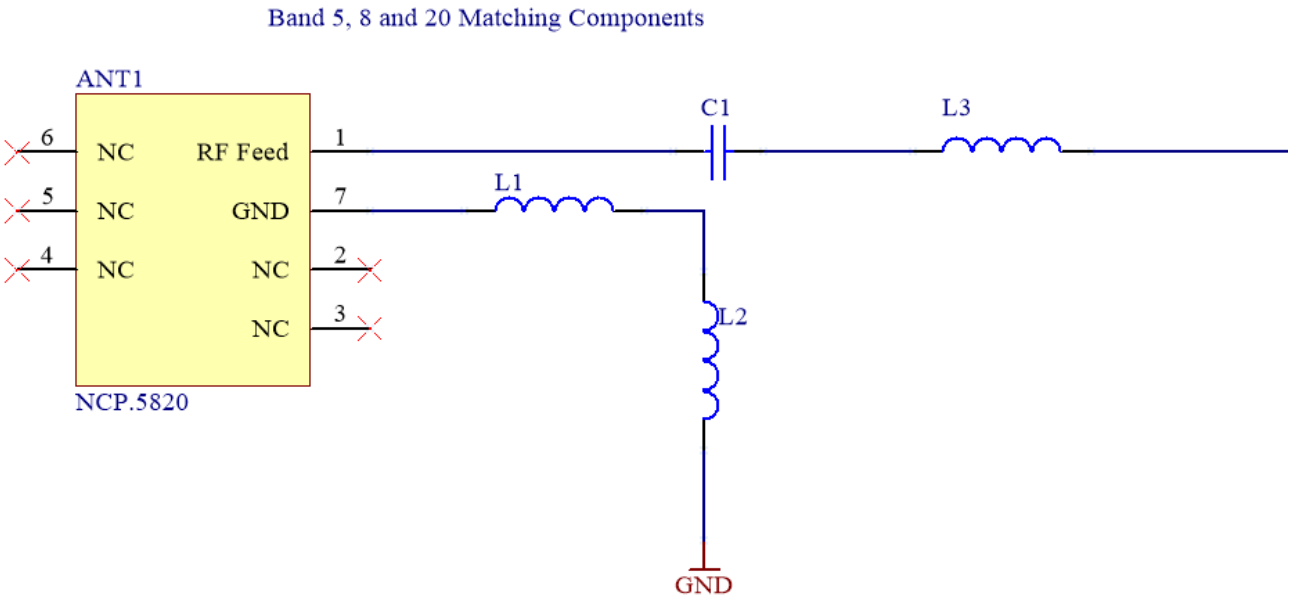
The circuit symbol for the antenna is shown below. The antenna has 7 pins with only two as functional. All other pins are for mechanical strength.

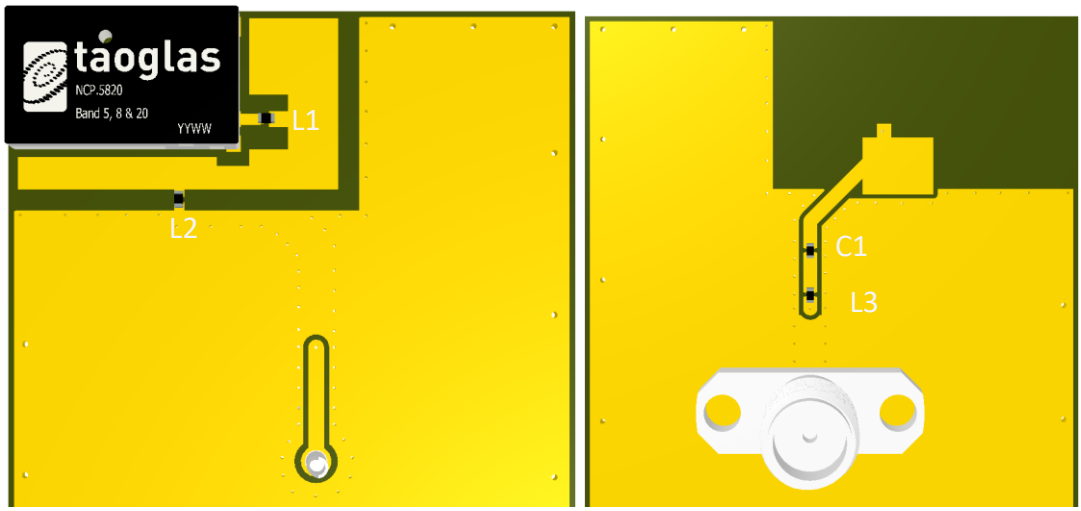
Pin	Description
1	RF Feed
7	Ground
2, 3, 4, 5, 6	Not Connected



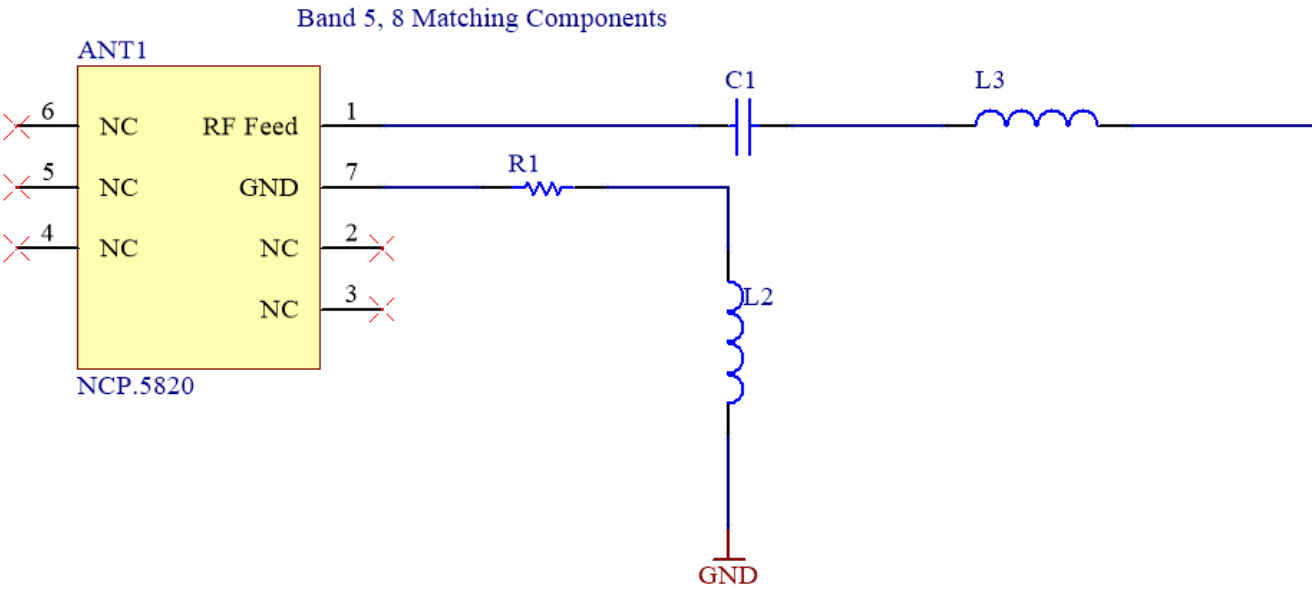
7. Evaluation Board Matching Circuit

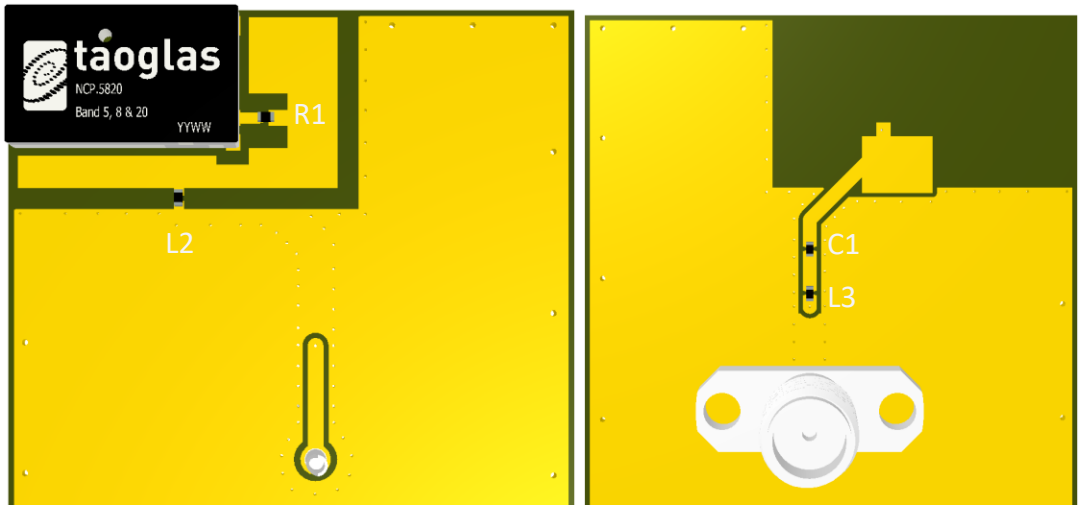
The antenna may need a matching circuit that can be optimized for each product integration. The matching circuit will require up to four components and the following circuit should be designed into the PCB. Not all components may be required but should be included as a precaution. The matching network must be placed close to the antenna feed to ensure it is more effective for matching the antenna.





Band 5,8 and 20 Matching Components			
Designator	Type	Value	Description
C1	Capacitor	0.5pF	Murata GJM1555 series
L1	Inductor	1.5nH	Murata LQG15HS series
L2	Inductor	6.8nH	Murata LQG15HS series
L3	Inductor	33nH	Murata LQG15HS series

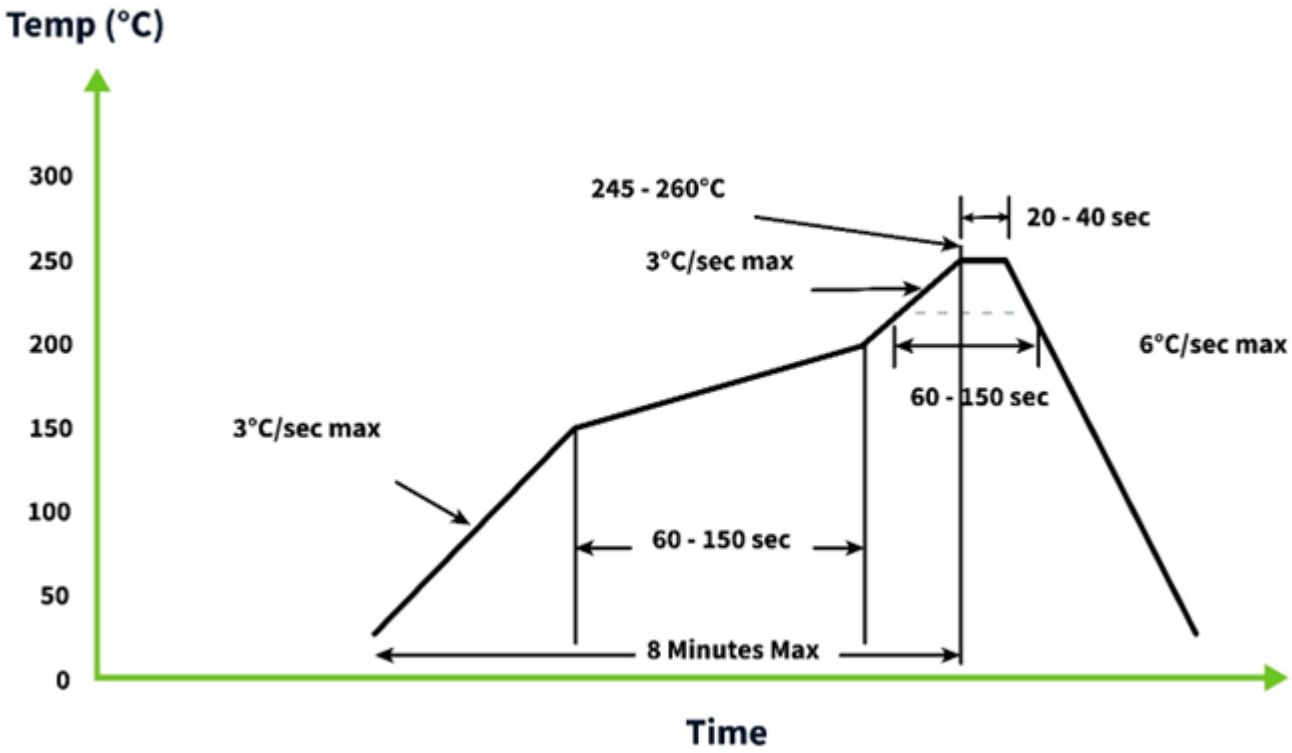




Band 5,8 Matching Components			
Designator	Type	Value	Description
C1	Capacitor	0.5pF	Murata GJM1555 series
L2	Inductor	5.6nH	Murata LQG15HS series
L3	Inductor	33nH	Murata LQG15HS series
R1	Resistor	0 Ω	Vishay Dale CRCW0402 series

8. Solder Reflow Profile

The NCP.5820 can be assembled by following the recommended soldering temperatures are as follows:



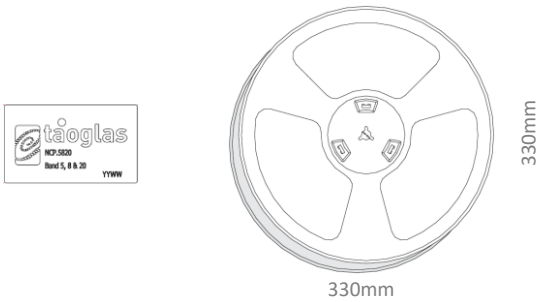
*Temperatures listed within a tolerance of +/- 10º C

Smaller components are typically mounted on the first pass, however, we do advise mounting the NCP.5820 when placing larger components on the board during subsequent reflows.

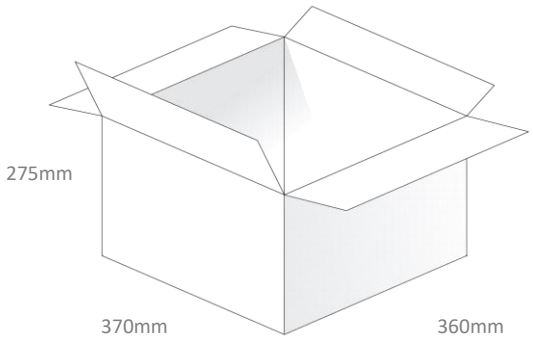
Note: Soldering flux classified ROL0 under IPC J-STD-004 is recommended.

9. Packaging

700pcs NCP.5820 per Tape & Reel
Dimensions: 330**330*47mm
Weight: 1.1Kg



3500 pcs in one carton
Dimensions: 370*360*275mm
Weight: 5.6Kg



Changelog for the datasheet

SPE-18-8-098 – NCP.5820

Revision: J (Current Version)	
Date:	2023-10-26
Changes:	Added Solder Reflow Profile
Author:	Cesar Sousa

Previous Revisions

Revision: I	
Date:	2021-09-15
Changes:	Added MSL information
Author:	Erik Landi

Revision: D	
Date:	2018-12-04
Changes:	Added Automotive IATF16949
Changes Made by:	Jack Conroy

Revision: H	
Date:	2019-12-17
Changes:	Updated Eval drawings
Author:	Jack Conroy

Revision: C	
Date:	2018-10-11
Changes:	Added Automotive IATF16949
Changes Made by:	Sean Hancox

Revision: G	
Date:	2019-12-11
Changes:	Updated Matching Circuit
Changes Made by:	Jack Conroy

Revision: B	
Date:	2018-09-27
Changes:	Updated Packaging spec sheet
Changes Made by:	Russell Meyler

Revision: F	
Date:	2019-09-19
Changes:	Updated template, updated footprint
Changes Made by:	Jack Conroy

Revision: A	
Date:	2018-09-11
Changes:	Initial Datasheet Release
Changes Made by:	Jack Conroy

Revision: E	
Date:	2018-12-13
Changes:	Added Pin layout
Changes Made by:	Jack Conroy

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