Brand: Walsin
Model: RFECA3216060A1T

Radiation Pattern

Project name	P/N	Designation (Model name)
Yoko KBD	820-010388	YR0087

Date	Engineer/Location	Result	Approver
6/8/2022	Damin/SEG EE	PASS	

Links

Project GSites Link	https://sites.google.com/a/logitech.com/ee-evt/home
Schematic Link	https://drive.google.com/drive/folders/1AcHMFrE0d8EesE1n7o-o9qYcBioUHKn5
Layout Link	https://drive.google.com/drive/folders/1AcHMFrE0d8EesE1n7o-o9qYcBioUHKn5

DUT list

DUT name	#52		
Origin (PB)	PB1		
21L Rev.			
FW version	B04		

Modifications	ZH		

Equipment list

Description	Inventory Number
FAC 2.4GHz Chamber	
Measurement Horn Antenna (SZ)	
PA Switch Box, (CH)	
Low Noise Amplifier, Amplifier Research LN1G11	
Spectrum Analyser, Agilent E4405B	
Dell Optiplex 745	

Table of content

Purpose

Measure the output power radiated for all azimuthal angles rotating the DUT around its 3 peculiar planes for both polarizations
(Horizontal and Vertical) of the measuring antenna

Setup

Test 1

Test procedure

GTEM cell (CH)

Step 1: Put the DUT either in Pseudo_CW or True_CW mode with the FW approval

Step 2: Place the DUT in the GTEM cell on the positioner using the corresponding plastic made fixture, in order to have it correctly centered and oriented on its main peculiar plane (plane 1= usage position) (*)

Step 3: Measure the Radiation Pattern with Radiation Pattern routine:

@ 3 frequencies: low (2405MHz), medium (2444MHz) and high (2474MHz)

Co-Polar option measurement

If fail according to criteria defined in criteria section below, then retest:

@ 3 frequencies: low (2405MHz), medium (2444MHz) and high (2474MHz)

Cross-Polar option measurement

Step 4: Place the DUT in the GTEM cell on the positioner using the corresponding plastic made fixture, in order to have it correctly centered and oriented on its second peculiar plane (plane 2 = edge position) (*)

Step 5: Measure the Radiation Pattern with Radiation Pattern routine:

@ 1 frequency: medium (2444MHz)

Perform both Co-Polar and Cross-Polar options measurements

Step 6: Place the DUT in the GTEM cell on the positioner using the corresponding plastic made fixture, in order to have it correctly centered and oriented on its third peculiar plane (plane 3 = stand up position) (*)

Step 7: Measure the Radiation Pattern with Radiation Pattern routine:

@ 1 frequency: medium (2444MHz)

Perform both Co-Polar and Cross-Polar options measurements

RF anechoic chamber (SZ):

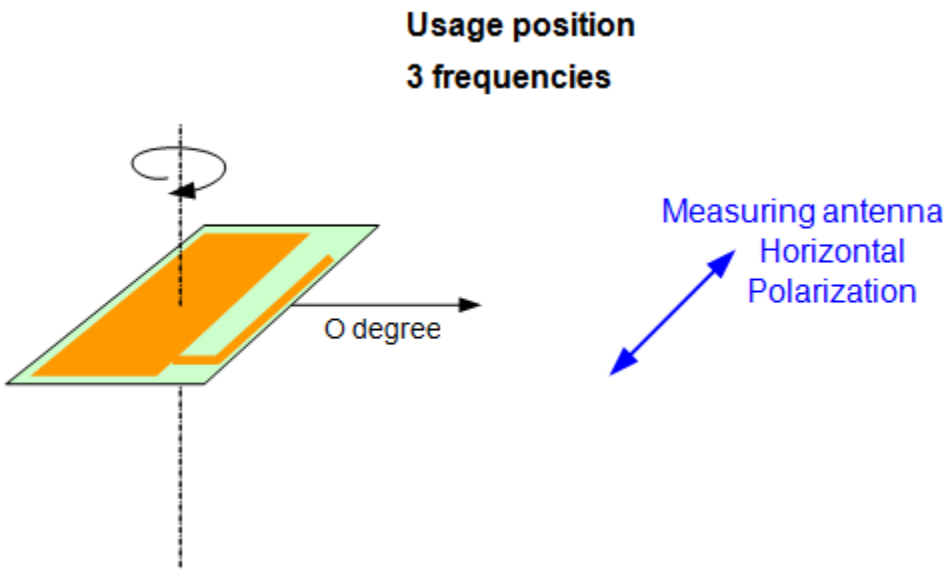
Step 1: Put the DUT either in Pseudo_CW or True_CW mode with the FW approval

Step 2: Place the DUT in the anechoic chamber on the turning table in order to have it correctly centered and oriented on its main peculiar plane (plane 1 = usage position) (*)

Step 3: Measure the Radiation Pattern:

@ 3 frequencies: low (2405MHz), medium (2444MHz) and high (2474MHz)

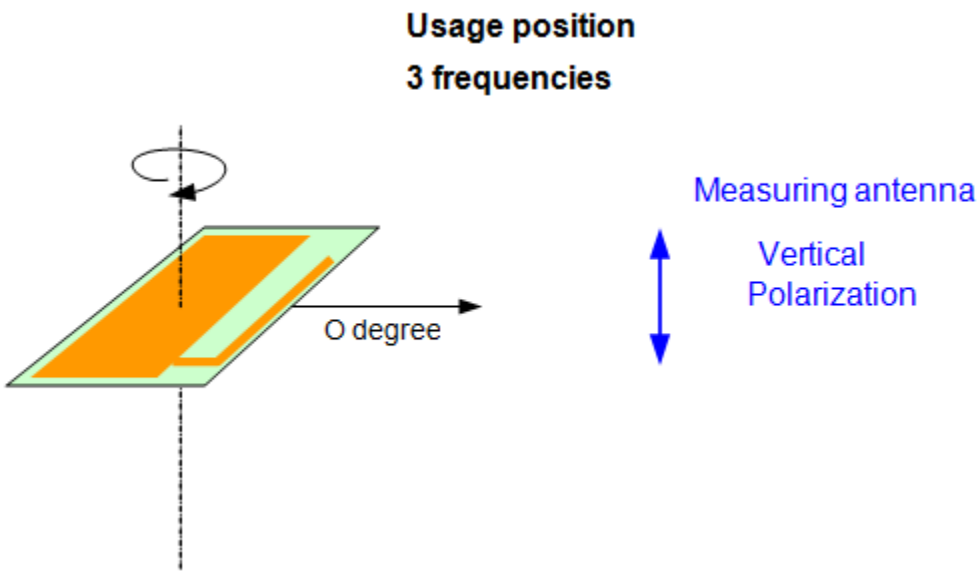
Horizontal polarization for measuring antenna



If fail according to criteria defined in criteria section below, then retest:

@ 3 frequencies: low (2405MHz), medium (2444MHz) and high (2474)

Vertical polarization for measuring antenna

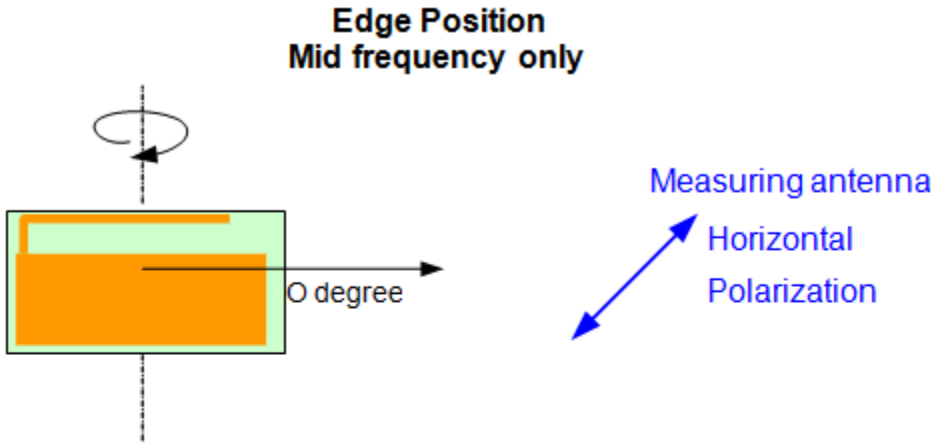


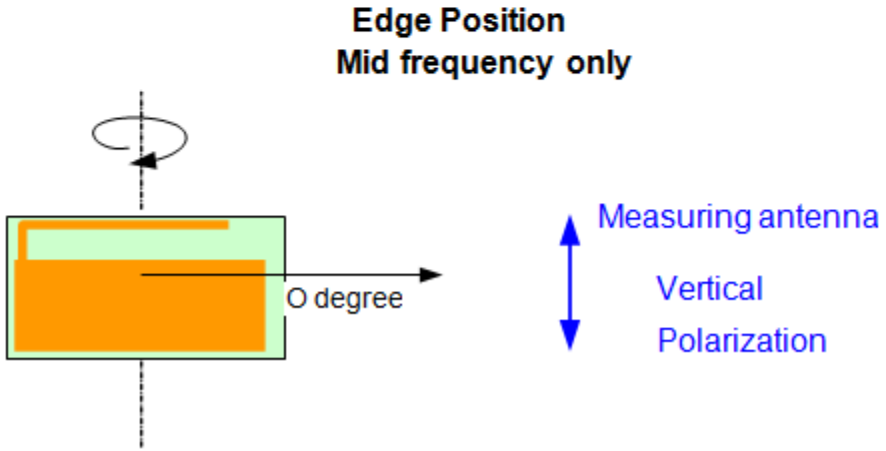
Step 4: Place the DUT in the anechoic chamber on the turning table in order to have it correctly centered and oriented on its second peculiar plane (plane 2 = Edge position) (*)

Step 5: Measure the Radiation Pattern with Radiation Pattern routine

@ 1 frequency: medium (2444MHz)

Perform both Horizontal and Vertical polarization of the measuring antenna.



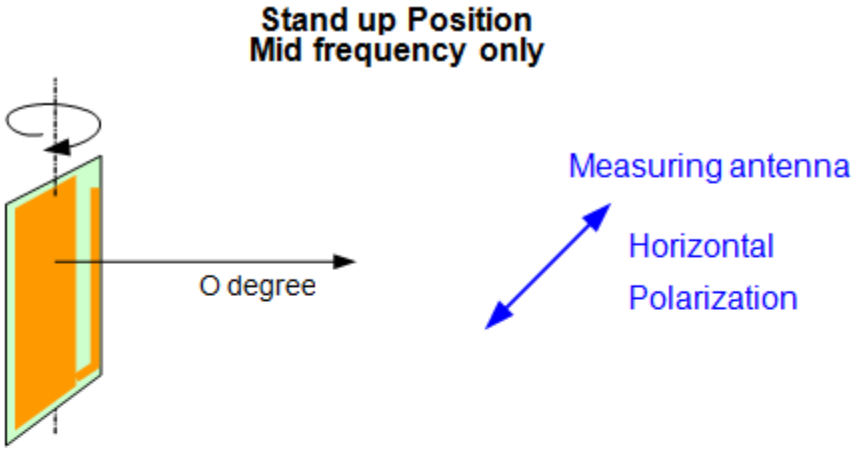


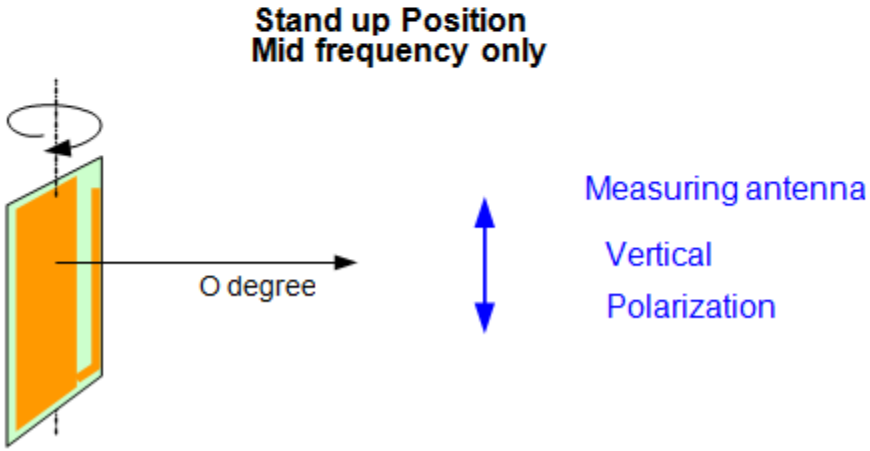
Step 6: Place the DUT in the anechoic chamber on the turning table in order to have it correctly centered and oriented on its third peculiar plane (plane 3 = Stand up) (*)

Step 7: Measure the Radiation Pattern:

@ 1 frequency: medium (2444MHz)

Perform both Horizontal and Vertical polarization of the measuring antenna.





(*): For a dongle, either plug it in a test fixture as a stand alone configuration or in a small laptop (weight < 2Kg) as a test tool.

Test conditions

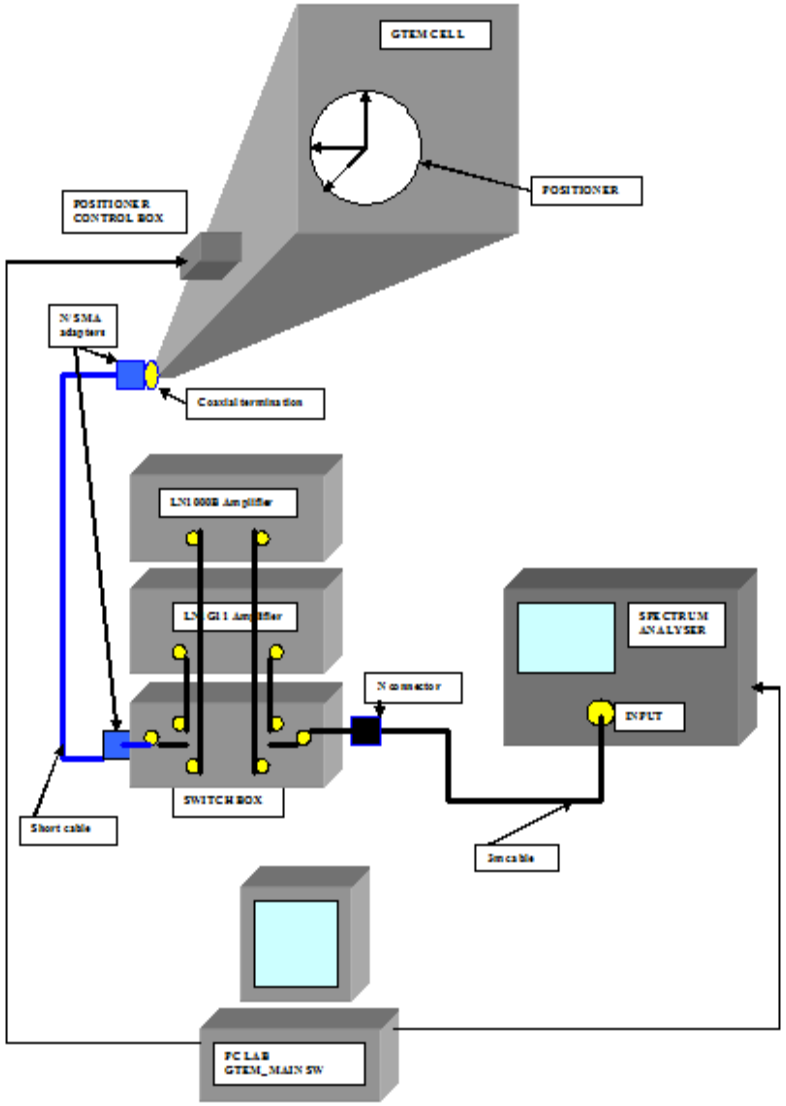
1 unit

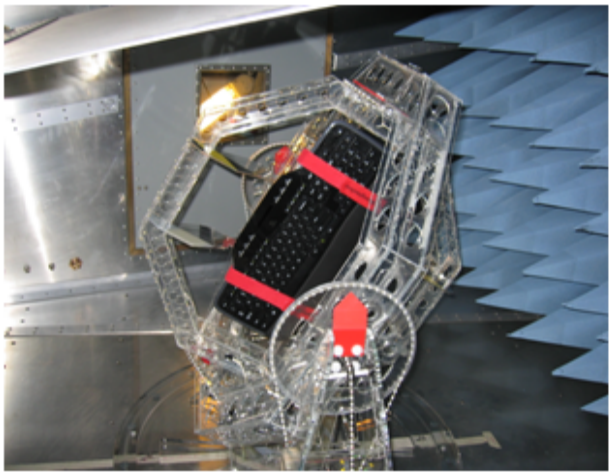
Temperature: Ambient temperature

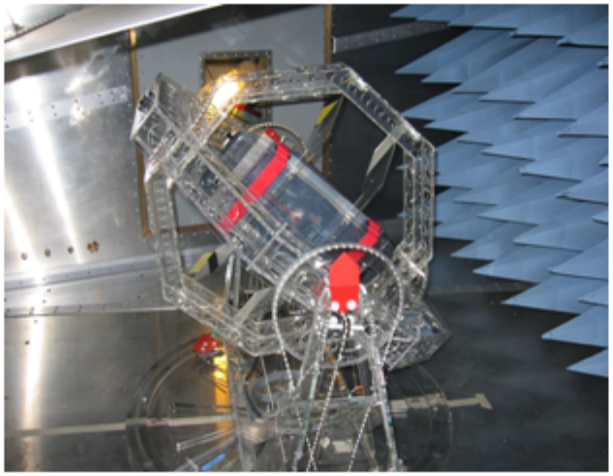
Voltage: Fresh batteries

Test setup

GTEM cell (CH)

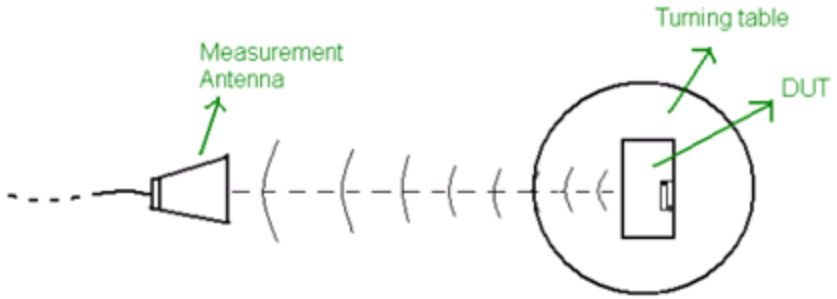




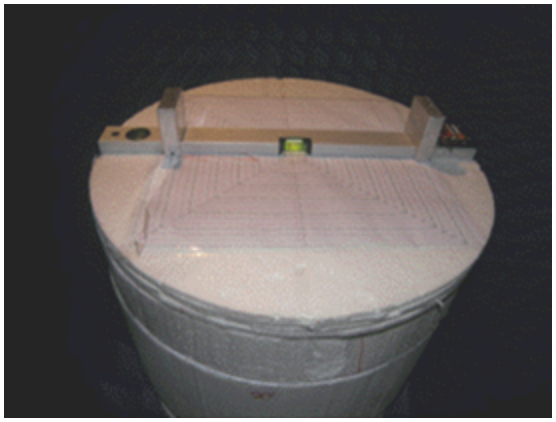


RF anechoic chamber (SZ):

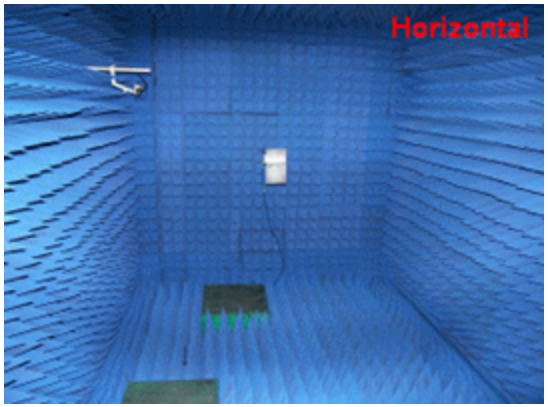
Bloc diagram

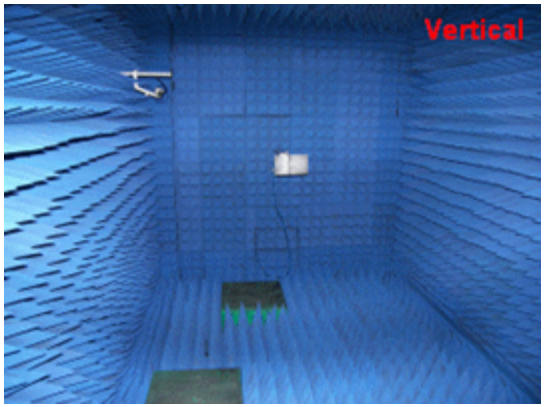


Calibration the position between turning table & Horn antenna with the gradiometer:



Definition of Horizontal & Vertical polarization of the horn antenna:





Criteria

Test 1

Criterion 1 is: Max radiated power > = conducted power - 3dB
At least one direction when the ERP is Max radiated power – 3dB within +/- 45° azimuth angle at front
DUT on usage position for the 3 frequencies

Criterion 2 is: Nulls should be < -10dB / Max radiated power within +/- 45° azimuth angle at front.
DUT on usage position for the 3 frequencies

Measurements

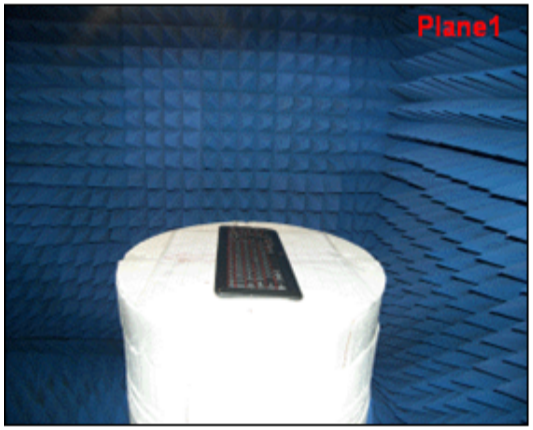
Test 1

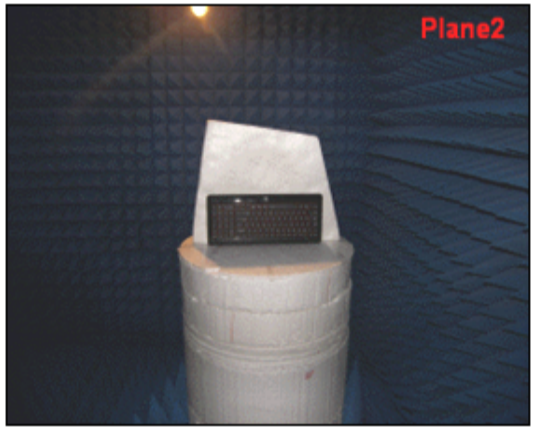
Bench Setup ***Paste here the actual pictures and delete examples below***

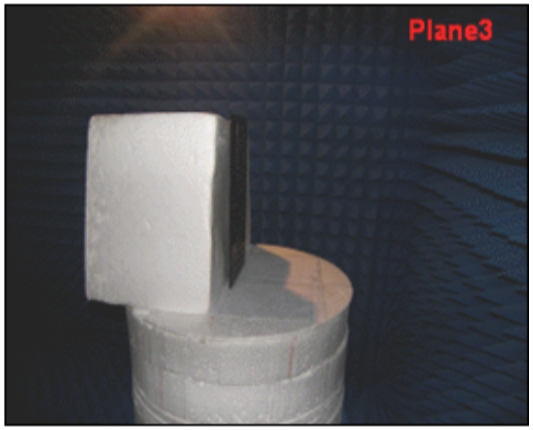
RF anechoic chamber (SZ):

Definition of DUT Plane1 (usage position) & Plane2 (edge position) & Plane3 (stand up Position):

Keyboard

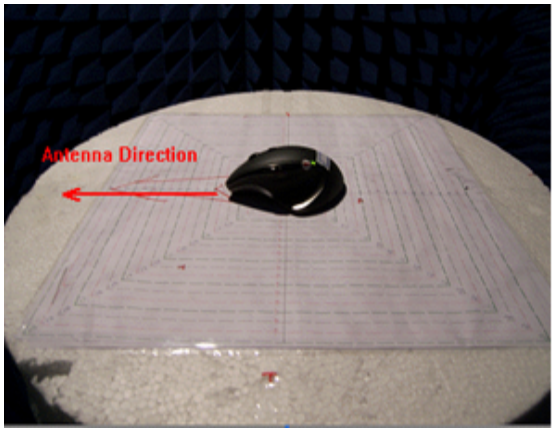


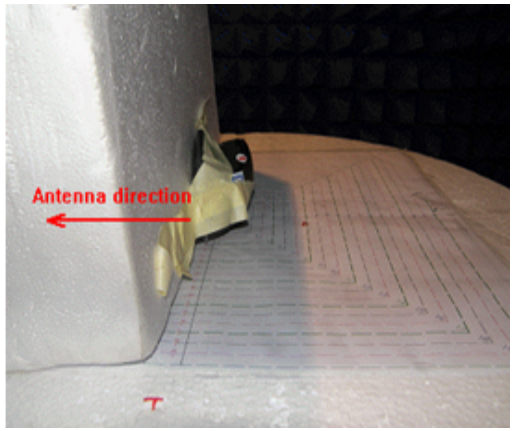




Mouse

DUT plane 1 DUT plane 2 DUT plane 3





Measurement results

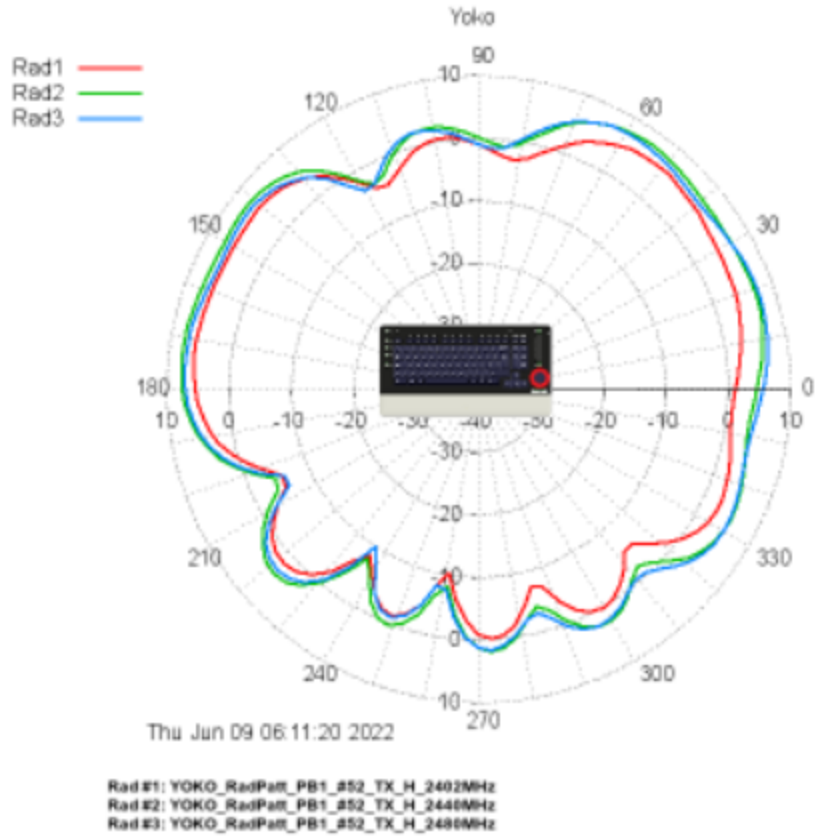
DUT on usage position Measuring Antenna :	Conducted power(*)	Max Radiated Power	Antenna gain			Azimuth Angle @ Max Radiated Power			Null within +/- 45° azimuth angle		
Co-Polar (CH) / Horizontal	[dBm]	[dBm]		Limit	Test Result	[°]	Limit	Test Result	[dB]	Limit	Test Result

(SZ) results											
@ 2402 MHz	**7.03**	**5.82**	-1.21	**Conducted**	**PASS**	**171**	Within +/- 45 °	**PASS**	**-4.5**	**-10dB**	**PASS**
@ 2440 MHz	**7.19**	**7.83**	0.64	**power +/- 3dB**	**PASS**	**54**	at front	**PASS**	**-3.5**	**-10dB**	**PASS**
@ 2480 MHz	**7.10**	**7.51**	0.41		**PASS**	**18**		**PASS**	**-3.6**	**-10dB**	**PASS**

(*) results from conducted power test item
Data:Link

Plots examples

RF anechoic chamber (SZ):
@ 3 frequencies: low (2402MHz), medium (2440MHz) and high (2480MHz), Horizontal position for measuring antenna



[imgfile: tmp/Yoko _gnuplot20220609-12699-4eles6-0.png]

Radiation pattern #1:

YOKO_RadPatt_PB1_#52_TX_H_2402MHz

Average power = **0.71 dBm**
Front average power = **2.67 dBm** (From 0 deg to 180 deg)

Min power = **-10.17 dBm** @ -99.00 deg
Max power = **5.82 dBm** @ 171.00 deg

Radiation pattern #2:

YOKO_RadPatt_PB1_#52_TX_H_2440MHz

Average power = **2.95 dBm**
Front average power = **4.81 dBm** (From 0 deg to 180 deg)

Min power = **-8.08 dBm** @ -99.00 deg
Max power = **7.83 dBm** @ 54.00 deg

Delta max power = **2.01 dBm**
Delta average power = **2.24 dBm**
Delta front average power = **2.14 dBm**

Radiation pattern #3:

YOKO_RadPatt_PB1_#52_TX_H_2480MHz

Average power = **2.66 dBm**
Front average power = **4.46 dBm** (From 0 deg to 180 deg)

Min power = **-10.06 dBm** @ -123.00 deg
Max power = **7.51 dBm** @ 18.00 deg

Delta max power = **1.69 dBm**
Delta average power = **1.95 dBm**
Delta front average power = **1.79 dBm**

Conclusions

Summary of the test measurements / criteria & comments if needed

Decision: PASS