

Title: WLAN P1518 C5 10k Data Sheet

Ref.: ST.175, MP.315

WLAN P1518 C5 10k Data Sheet

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N° Rev.	Description
1	Simplified table in Sec. 3.3.2. Added maximum e minimum radiation level and direction in Appendix A.

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C5

2D CODE / 2D KÓD

Giorno / Day Anno / Rok

Part number / Číslo dílelo Stato revisione / Číslo revízie
Da aggiornare ad ogni cambio di revisione.
Aktualizovať pre každý zmeny revízie.

Duns number / Duns číslo
Settimani / Týždneň
Mese / Mesiac

2D CODE / 2D KÓD

Data ordine produzione /
Loto výroby objednávky

Codice fornitore / Kód dodávateľa

Data di Produzione / Datum výroby
Week/Year
VW 10560-D13

Stigla luogo di produzione / Kód krajiny výroby

Part number / Číslo dílelo
Logo VW 10514-S2

Stato revisione / Číslo revízie

N° progressivo da azzerare ad ogni lotto
Progressívne číslo, nastrovovať pre každým lote

1.5 ± 0.5 (17) 3 ± 0.5 (S) 20 ± 0.3

10.9 ± 0.3 (S) 15.05 ± 0.3 (S) 46 ± 0.3 (S) 56.35 ± 0.3

0.2 ± 0.2 25.4 ± 0.3

(S) 9.9 ± 0.3 (S) 5.3 ± 0.3

1 2 3 4

Pos. Codice Descrizione Pozis. Q.ta Min/Max

1	1560975	ETICH.ADES.25X17 POLIESTERE BIANCO	1	
2	2539800	GUSCIO SUPERIORE W-LAN	1	
3	1314746	CIRCUITO W-LAN BTX 10K ANTENNA P11518	1	
4	2539790	GUSCIO INFERIORE W-LAN	1	

Test elettrico secondo maschera di collaudo.
Elektrický test v súlade s kolaudačnou maskou.
Forza di strappo ogni singolo piolet dopo ribattitura a caldo: > 60N, secondo MP.285.
Traccia sonda pro každý po niovani za tepla > 60N, podľa MP.285.
Le superficiele delle parti in plastica devono essere esenti da ritiri e stracature.
Povrch plastových častí nesmie obsahovať poškodenia.

Disegnato/Disegnato
Salin N. 2405/16
Approvato/Číslo Approvato/Číslo
Documento approvato/Documentum
Prestato design/Projekt
P11518

Disegnato/Disegnato
Salin N. 2405/16
Approvato/Číslo Approvato/Číslo
Documento approvato/Documentum
Prestato design/Projekt
P11518

0.007

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antenne

ISOLA VICENTINA (VI) ITALY

ANTENNA W-LAN 4N0 035 500

7750122

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TECHNICAL NOTES

PCB Materials (FR4):
Isola PCL 370-HR
X NAN YA NPG-170

Layer Stack Legend

Material	Layer	Dielectric Material	Type	Gerber Thickness
Top Paste	Top Paste	Paste Mask	GTP	
Surface Material	Top Solder	Solder Resist	Paste Mask	GTS
Copper	Top Layer	Signal	GTL	oz
Substrate		FR-4	Dielectric	mm
Copper	Bottom Layer	Signal	GBL	oz
Surface Material	Bottom Solder	Solder Resist	Paste Mask	GBS
	Bottom Paste	Paste Mask	GBP	
Total thickness PCB Substrate + Copper (finished)				

Total Thickness:

PCB	1.6mm
Copper (finished)	1oz
Remark: 1oz = 35um, 1mil = 25um	

CONFORMAL COATING:
CORTONAL Fluorinated Coating Process FC-742

PCB informations (general specification document: CALEARO ST.047)

PTH minimum copper via holes thickness	Dium
Solder resist color	Green
Track finish	HASL-Lead free
Certification	IPC-A-600 Class:3 IPC-A-610 Class:3
Electrical test	none
Packaging	According to CALEARO STD110

Artwork master gerber files list:

Description	Layer name	Gerber file ref.	Extension
Gerber file	PCB Boundary	(GM10)	
Gerber file	Mechanical Layers	(GM1)	
Gerber file	Test Areas	(GMS2)	
Gerber file	Scoring layer	(GMS1)	
Excision Drill	Drill	(TXT)	

Profing:
PCB Outline according to layer PCB boundary (GM10)
Scoring cut permitted zones: Scoring layer (GM31)
Packaging:
According to CALEARO STD 110

Bottom Solder (Scale 2)

Bottom Layer (Scale 2)

Top Layer (Scale 2)

Top Solder (Scale 2)

Top Overlay (Scale 2)

BOM CY Materials

Item	Designator	Comment	Quantity
1	CNT1	Conn. M 90° Beige	1
2	R1	10kOhm	1

Drill Table

Symbol	Count	Hole Size	Plated	Note	Tolerance
Q	4	1.68mm	Plated	None	
# Total					

Drill Dimension View (Scale 2)

Scoring (Scale 2)

Testing Areas (Scale 2)

Details for V-grooves and break off:

V-groove depth 0.5
Break-off length 6.3mm
Break-off distance 6.3mm min distance

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Aug 10, 2017
Designer/Author: Enrico Toniolo

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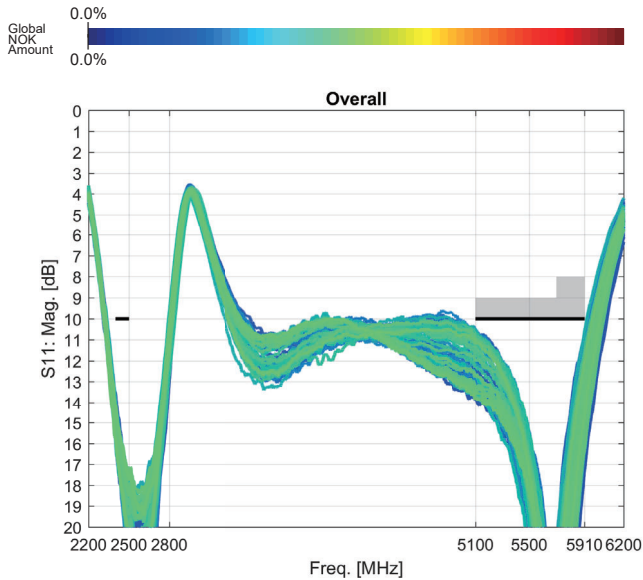
Ref.: ST.175, MP.315

2 Return Loss

The Return Loss has been measured with the setup described according to the Calearo Test Method 'MP.315'. The characterization of about 90 C5 samples has been carried out with two different types of sma-fakra adapter:

Pomona SMB Model 72979

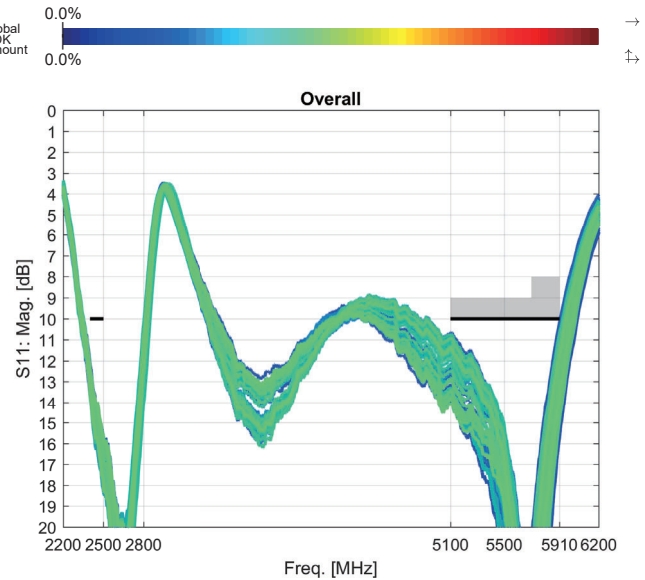
Total Samples = 89 | OK = 89 (100%) | NOK = 0 (0%)



(Return Loss) = 16.6 dB, (Return Power) = 2.64% and Δ (Return Power) = 3.10 dB
Overall evaluation for Freq. [MHz], f: (f>=2400 & f<=2500) | (f>=5100 & f<=5910)

Rosenberger Fakra 03 K 159-S20 S3

Total Samples = 88 | OK = 88 (100%) | NOK = 0 (0%)



(Return Loss) = 16.5 dB, (Return Power) = 2.71% and Δ (Return Power) = 3.24 dB
Overall evaluation for Freq. [MHz], f: (f>=2400 & f<=2500) | (f>=5100 & f<=5910)

Conclusion

The tested samples result 100 % OK: Return Loss $\geq$ 10 dB between 2400–2500 and 5100–5910 MHz.

Further details can be found in I170824tone1 of 10th August, 2017 and I170721tone1 of 21st July, 2017.

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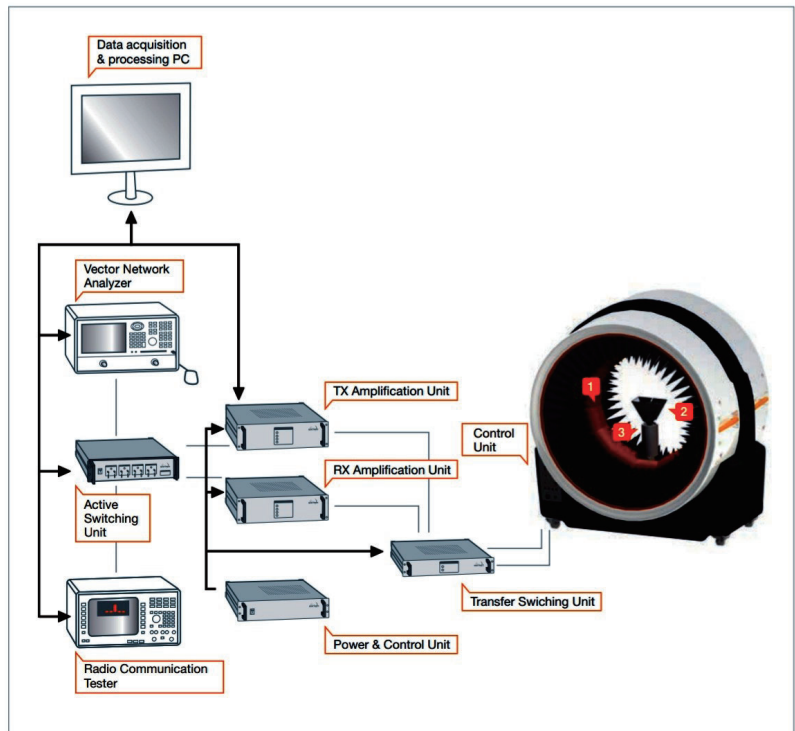
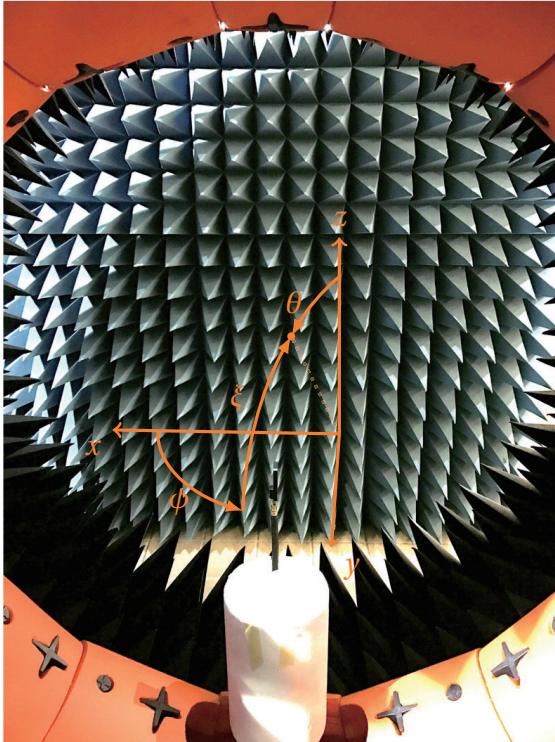
Ref.: ST.175, MP.315

3 Radiation Pattern

3.1 Setup

The radiation pattern of the sample 'EB159' has been measured using the following setup:

StarLab / Microwave Vision Italy s.r.l. - 00040 Pomezia (RM)



Frequencies = 2350, 2360, 2370, 2380, 2390, 2400, 2410, 2420, 2430, 2440, 2450, 2460, 2470, 2480, 2490, 2500, 2510, 2520, 2530, 2540, 2550, 4900, 5000, 5100, 5200, 5300, 5400, 5500, 5600, 5700, 5800, 5900, 5910, 6000 MHz.

⚠ A wideband (2200–6000 MHz) reference monocone 'SMC2200' on 1 mt diameter Ground Plane has been used as reference antenna, instead of many monopoles covering the whole bands. See also http://www.mvg-world.com/system/files/datasheet_antenna_2016_hd_monocones.pdf

More information, about this setup, could be found in 'I160419tone1 §5.3.4' or <http://www.mvg-world.com/products/fieldproductfamily/antenna-measurement-2/starlab>.

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3.2 Definitions

POLAR PATTERN

$G(\phi, \theta, f)$ is the measured (realized) gain magnitude of the A.U.T. expressed in dBi (referred to the isotropic antenna).

The total gain is the sum of the Vertical and Horizontal polarized component:

$$10^{G_{\text{Total}}/10} = 10^{G_{\text{Vpol}}/10} + 10^{G_{\text{Hpol}}/10}$$

LINEAR AVERAGE GAIN

$$\text{AVG}(f) = 20 \log_{10} \text{mean}_{\forall \phi, \theta \in [\theta_1, \theta_2]} 10^{G/20}$$

Global MIN-MAX

$$\text{Min}(f) = 20 \log_{10} \min_{\forall \theta, \phi} 10^{G/20}, \quad \text{Max}(f) = 20 \log_{10} \max_{\forall \theta, \phi} 10^{G/20}$$

Globally:

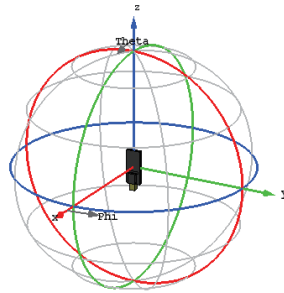
$$\text{Min} = \min_f \text{Min}(f), \quad \text{Max} = \max_f \text{Max}(f)$$

TOTAL EFFICIENCY

$$\epsilon = \frac{1}{4\pi} \int_0^{2\pi} \int_0^\pi 10^{G_{\text{Total}}(\theta, \phi)/10} \sin \theta \, d\theta \, d\phi$$

REFERENCE FRAME

(standalone)



Elevation $\xi = 90^\circ - \theta$.

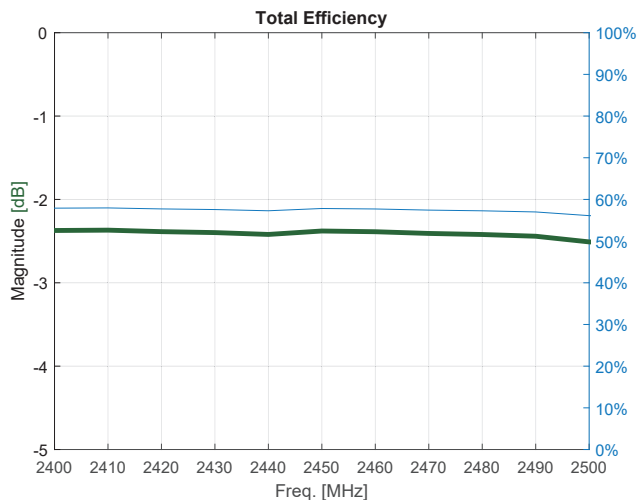
Title: WLAN P1518 C5 10k Data Sheet

Ref.: ST.175, MP315

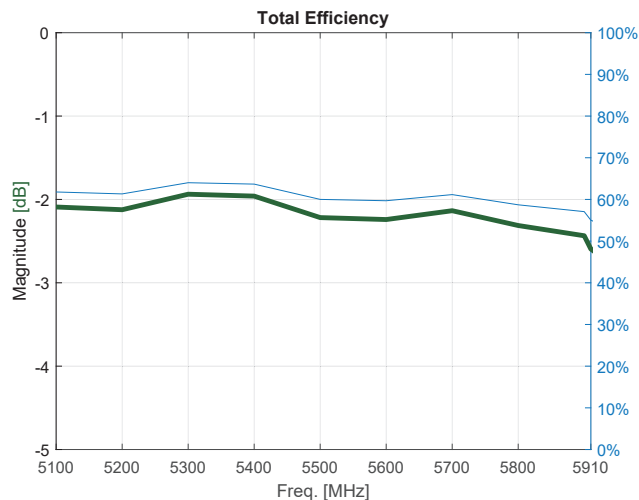
3.3 Results

3.3.1 Total Efficiency

Lower Band



Upper Band



Freq. (MHz)	Total Efficiency (dB)	%
2400	-2.37	57.91
2410	-2.37	57.96
2420	-2.39	57.72
2430	-2.40	57.57
2440	-2.42	57.28
2450	-2.38	57.83
2460	-2.39	57.71
2470	-2.41	57.44
2480	-2.42	57.27
2490	-2.44	57.00
2500	-2.51	56.11

Statistics on the whole band:

min	-2.51	56.11
mean	-2.41	57.44
max	-2.37	57.96
std	0.04	0.53

Freq. (MHz)	Total Efficiency (dB)	%
5100	-2.09	61.79
5200	-2.12	61.33
5300	-1.94	64.01
5400	-1.96	63.67
5500	-2.22	60.01
5600	-2.24	59.69
5700	-2.14	61.16
5800	-2.31	58.71
5900	-2.44	57.07
5910	-2.59	55.03

Statistics on the whole band:

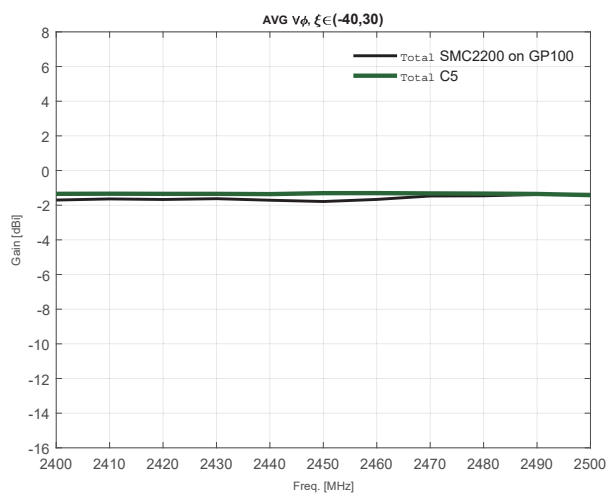
min	-2.59	55.03
mean	-2.20	60.25
max	-1.94	64.01
std	0.20	2.80

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3.3.2 Linear Average Gain for $-40^\circ \leq \xi \leq 30^\circ$

Lower Band

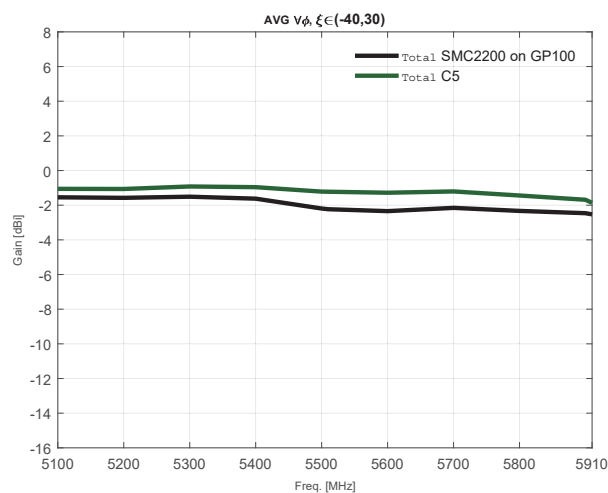


Freq. (MHz)	AVG (dBi)
2400	-1.36
2410	-1.36
2420	-1.37
2430	-1.37
2440	-1.38
2450	-1.33
2460	-1.33
2470	-1.35
2480	-1.36
2490	-1.38
2500	-1.45

Statistics on the whole band:

min	-1.45
mean	-1.37
max	-1.33
std	0.03

Upper Band



Freq. (MHz)	AVG (dBi)
5100	-1.14
5200	-1.17
5300	-1.05
5400	-1.11
5500	-1.40
5600	-1.49
5700	-1.41
5800	-1.64
5900	-1.96
5910	-2.15

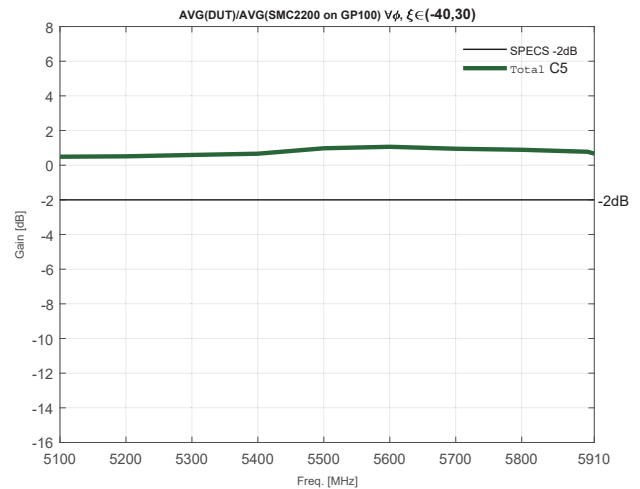
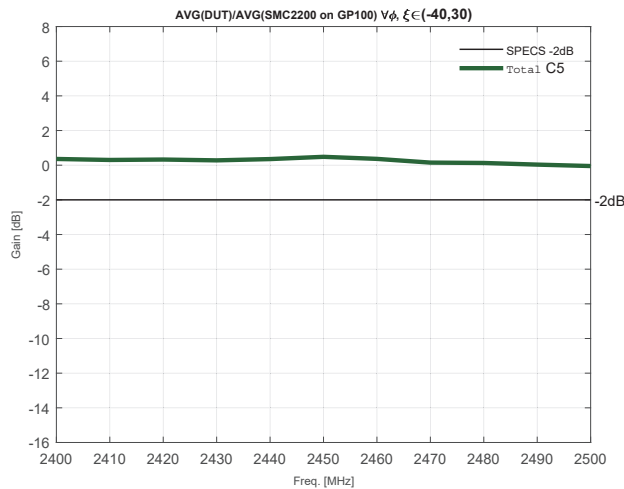
Statistics on the whole band:

min	-2.15
mean	-1.45
max	-1.05
std	0.37

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3.3.2.1 Comparison with Limits



Conclusion

As results from the comparison with the limits, the antenna radiation performances are compliant with specification limit of -2 dB from the reference monocone (ST.175): the minimum distance
min Δ AVG = -0.05 dB > -2 dB as shown in the table below:

Freq. (MHz)	Δ AVG (dB)
2400	0.36
2410	0.30
2420	0.33
2430	0.28
2440	0.35
2450	0.48
2460	0.36
2470	0.15
2480	0.13
2490	0.03
2500	-0.05

Statistics on the whole band:

min	-0.05
mean	0.25
max	0.48
std	0.16

Freq. (MHz)	Δ AVG (dB)
5100	0.49
5200	0.51
5300	0.59
5400	0.66
5500	0.98
5600	1.06
5700	0.95
5800	0.89
5900	0.77
5910	0.67

Statistics on the whole band:

min	0.49
mean	0.76
max	1.06
std	0.20

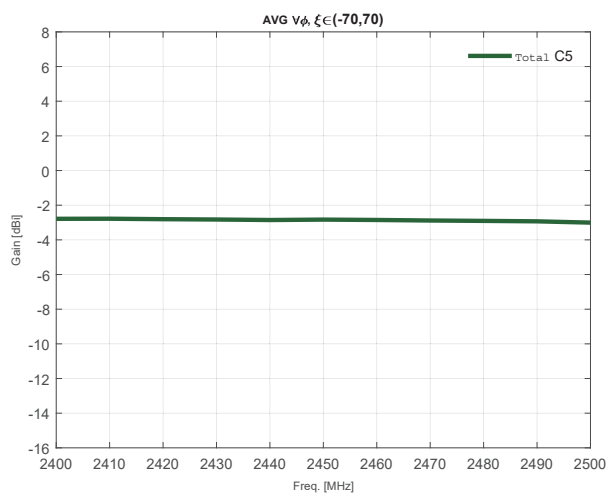
In Sec.3.3.3, the antenna mean performances on extended elevation (ξ) ranges will be represented, while the whole 3D polar pattern is shown for few frequencies in Sec.3.4.

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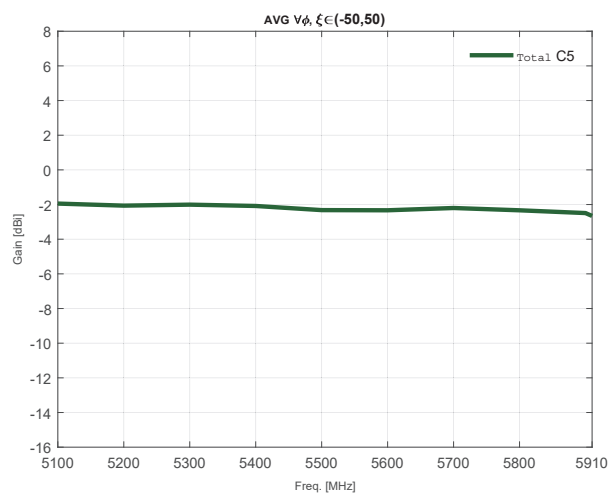
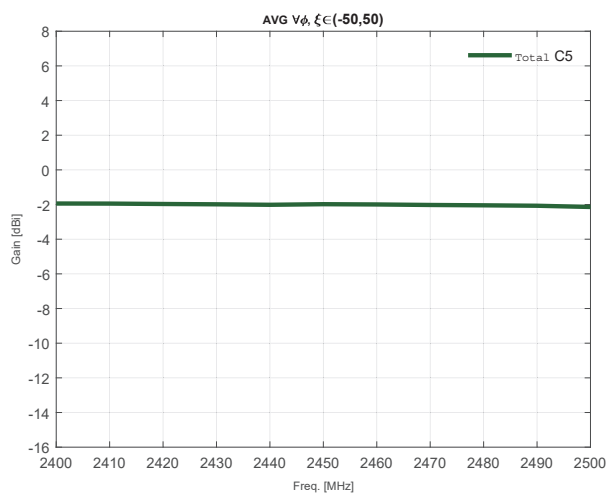
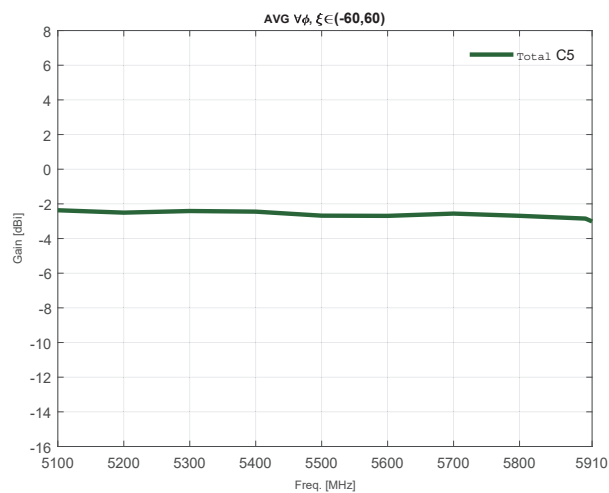
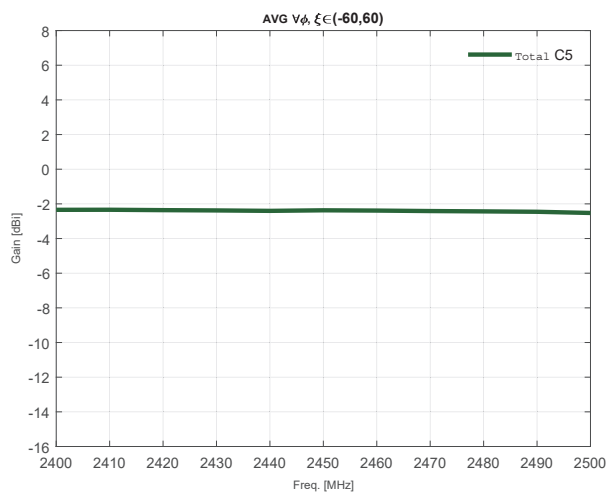
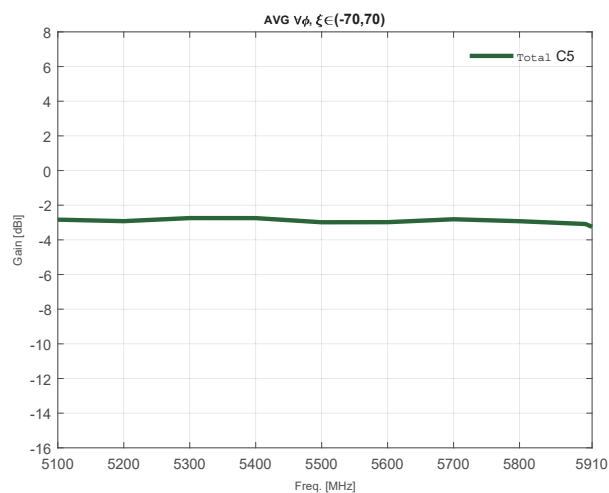
Ref.: ST.175, MP.315

3.3.3 Linear Average Gain for $|\xi| \leq 70, 60, 50^\circ$

Lower Band



Upper Band



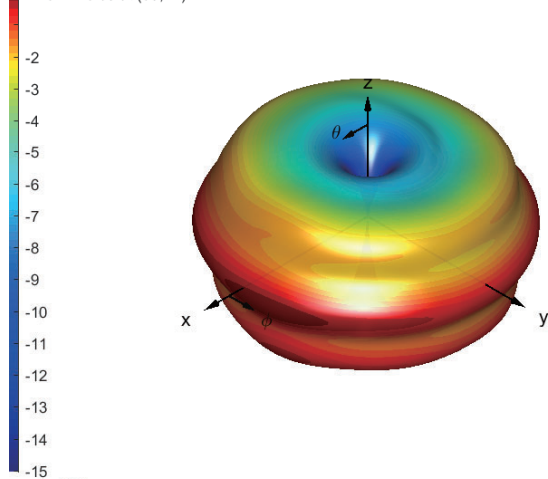
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3.4 3D Polar Pattern

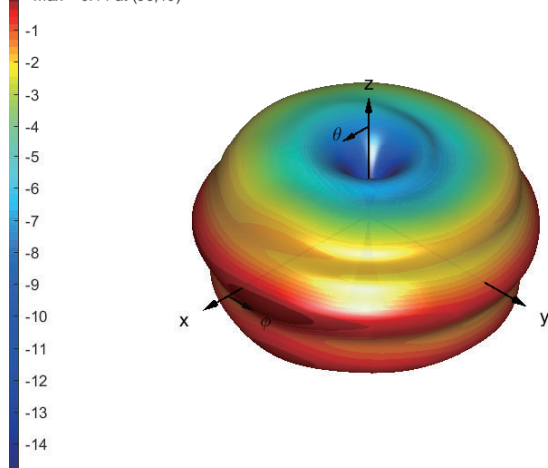
NORMALIZED TO MAX

Gain [dBi] (θ, ϕ) at 2400 MHz
max = -0.03 at (93,11)°



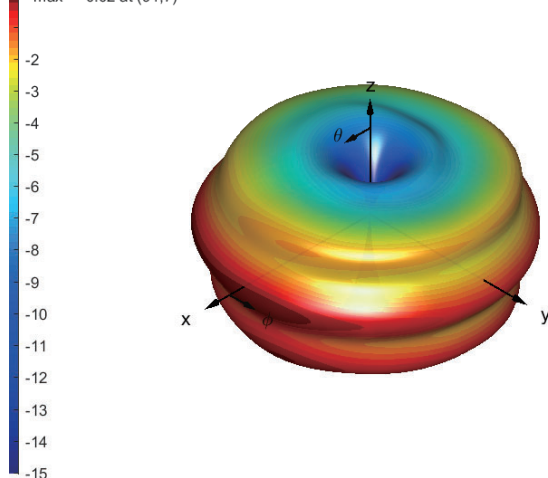
Total C5

Gain [dBi] (θ, ϕ) at 2450 MHz
max = 0.11 at (93,10)°



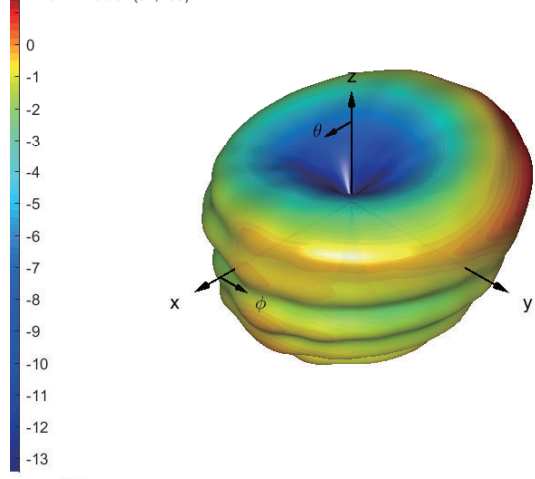
Total C5

Gain [dBi] (θ, ϕ) at 2500 MHz
max = -0.02 at (94,7)°



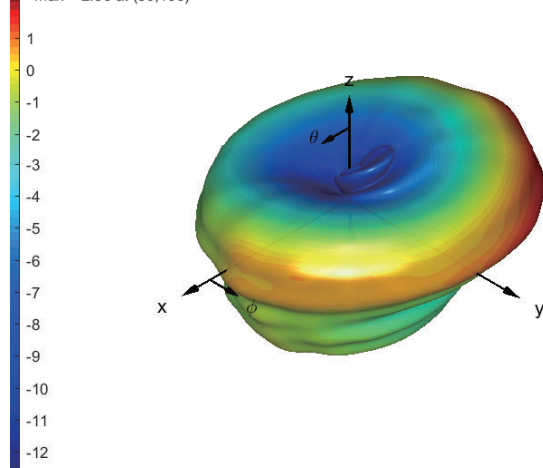
Total C5

Gain [dBi] (θ, ϕ) at 5100 MHz
max = 1.59 at (82,168)°



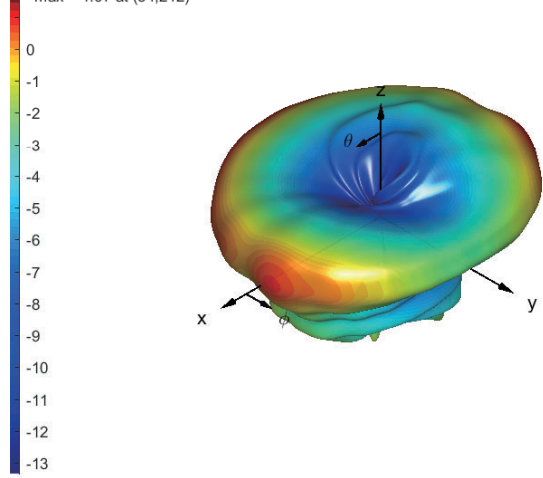
Total C5

Gain [dBi] (θ, ϕ) at 5500 MHz
max = 2.36 at (89,166)°



Total C5

Gain [dBi] (θ, ϕ) at 5910 MHz
max = 1.67 at (84,242)°



Total C5

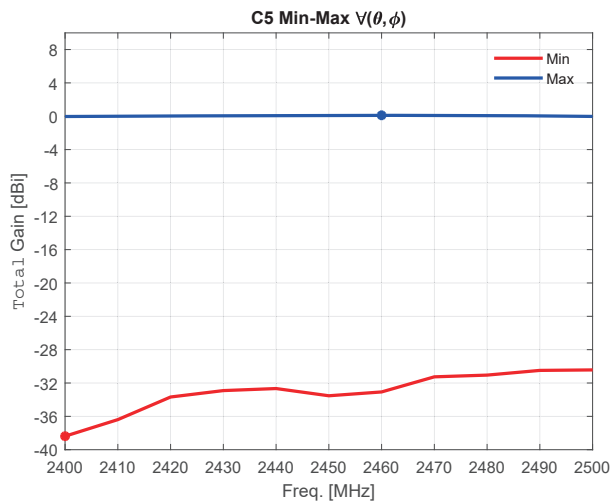
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Ref.: ST.175, MP.315

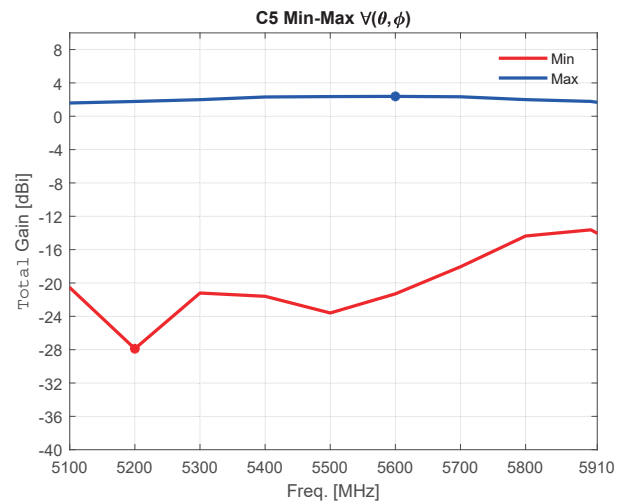
Appendix

A Global Min and Max values and directions

Lower Band



Upper Band



Freq. (MHz)	Min (dBi)	θ_{Min} (deg)	ϕ_{Min} (deg)	Max (dBi)	θ_{Max} (deg)	ϕ_{Max} (deg)
2400	-38.38	178	299	-0.03	93	11
2410	-36.39	178	299	0.02	93	12
2420	-33.68	178	298	0.04	93	12
2430	-32.91	177	294	0.05	93	11
2440	-32.66	177	293	0.05	93	11
2450	-33.53	177	291	0.11	93	10
2460	-33.07	177	291	0.11	93	9
2470	-31.26	177	293	0.10	93	7
2480	-31.05	178	293	0.07	93	7
2490	-30.49	177	293	0.04	93	6
2500	-30.43	178	293	-0.02	94	7

Freq. (MHz)	Min (dBi)	θ_{Min} (deg)	ϕ_{Min} (deg)	Max (dBi)	θ_{Max} (deg)	ϕ_{Max} (deg)
5100	-20.55	174	43	1.59	82	168
5200	-27.89	174	44	1.77	84	167
5300	-21.21	174	52	1.99	86	167
5400	-21.60	48	311	2.31	89	166
5500	-23.60	50	313	2.36	89	166
5600	-21.30	52	313	2.38	88	166
5700	-18.06	52	321	2.33	87	167
5800	-14.37	50	330	1.99	84	168
5900	-13.63	7	320	1.78	85	243
5910	-14.03	7	321	1.67	84	242

Globally:

Freq. (MHz)	Min (dBi)	θ_{Min} (deg)	ϕ_{Min} (deg)	Max (dBi)	θ_{Max} (deg)	ϕ_{Max} (deg)
2400	-38.38	178	299			
2460				0.11	93	9

Globally:

Freq. (MHz)	Min (dBi)	θ_{Min} (deg)	ϕ_{Min} (deg)	Max (dBi)	θ_{Max} (deg)	ϕ_{Max} (deg)
5200	-27.89	174	44			
5600				2.38	88	166

⚠ The Global Min and Max refer to the antenna placed in free-space as indicated in Sec. 3.2.