

Product – Specification of the VW Gen 4 roof antenna
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3WA.035.507.E/ 3WA.035.507.F/ 3WA.035.507.G/
3WA.035.507.L/ 3WA.035.507.N

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Location: Molex CVS Hildesheim GmbH

Change History

Version	Date	Status	Handled by	Comments
1.0	26-Aug-2025	draft	MMI	Abstract for certification purpose
1.1	04-Sep-2025	draft	MMI	3WA035507N (RAN-102I) added aligned with VW – EEP/6 on Sep 4 th 2025

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1. INTRODUCTION

This document defines the specification for all variants of the VW Gen 4 roof antenna 3WA.035.507.A,B,C,E,F,G,L, N

Molex CVS products are directly delivered to OEMs automotive. The OEM is responsible for the for the assembly process of this products to the car. The end-user does not have to do any installations or adjustments.

2. GENERAL REMARKS

For all specified values appearing in this document, the following definitions are valid:

Min.: Minimal limit, minimal adjustable value of respective parameter

Nom.: Nominal or typical value of respective parameter with tolerance range at room temperature (25°C).
This tolerance range does not include the temperature response.

Max.: Maximal limit, maximal adjustable value of respective parameter

Design-range: This range defines the limits for all component parameters that must not be exceeded.

The Nominal – value must be chosen from within the Design – range.

Frequency-range: In this case the Min. and Max. value stands for that frequency-range within which the parameters, stated in this document, need to be met.

2.1 Variants

Model	Type	Customer Part number	Roof curvature	Functions
RAN-102	RAN-102e	3WA.035.507.A	Curved	GNSS L1 + L5; 2x Tel 5G; BTLE/WiFi 2.4 Ghz; BTLE/WiFi Dual 2.4 & 5 GHz; V2X;
RAN-102	RAN-102f	3WA.035.507.B	Curved	GNSS L1 + L5; 2x Tel 5G; BTLE/WiFi 2.4 Ghz; BTLE/WiFi Dual 2.4 & 5 GHz; V2X; Telestart
RAN-102	RAN-102a	3WA.035.507.C	Curved	GNSS L1 + L5; 2x Tel 5G; BTLE/WiFi 2.4 Ghz; BTLE/WiFi Dual 2.4 & 5 GHz; V2X; SDARS
RAN-102	RAN-102d	3WA.035.507.E	Flat	GNSS L1 + L5; 2x Tel 5G; BTLE/WiFi 2.4 Ghz; BTLE/WiFi Dual 2.4 & 5 GHz; V2X;
RAN-102	RAN-102c	3WA.035.507.F	Flat	GNSS L1 + L5; 2x Tel 5G; BTLE/WiFi 2.4 Ghz; BTLE/WiFi Dual 2.4 & 5 GHz; V2X; Telestart
RAN-102	RAN-102b	3WA.035.507.G	Flat	GNSS L1 + L5; 2x Tel 5G; BTLE/WiFi 2.4 Ghz; BTLE/WiFi Dual 2.4 & 5 GHz; V2X; SDARS
RAN-102	RAN-102j	3WA.035.507.L	flat	GNSS L1 + L5; 2x Tel 5G; BTLE/WiFi 2.4 Ghz; BTLE/WiFi Dual 2.4 & 5 GHz; V2X
RAN-102	RAN-102l	3WA.035.507.N	flat	GNSS L1 + L5; 2x Tel 5G; BTLE/WiFi 2.4 Ghz; BTLE/WiFi Dual 2.4 & 5 GHz; V2X; SDARS

4. ELECTRICAL PROPERTIES 3WA.035.507.C/G REVISION 07S – RAN-102(A/B)_ HW005

Unless otherwise stated, all data in this document apply for nominal requirements at 25°C.

Radiated measurements were done mounted on 1m ground plane

LNA measurements were done without housing and with SMA connector at the LNA input

The difference between 3WA.035.507.C/G (types RAN-102A/B) are mechanically roof curvatures according to chapters 2.1 & **Fehler! Verweisquelle konnte nicht gefunden werden..** There is no difference in antenna element design or PCBA design for 3WA.035.507.C/G (types RAN-102A/B).

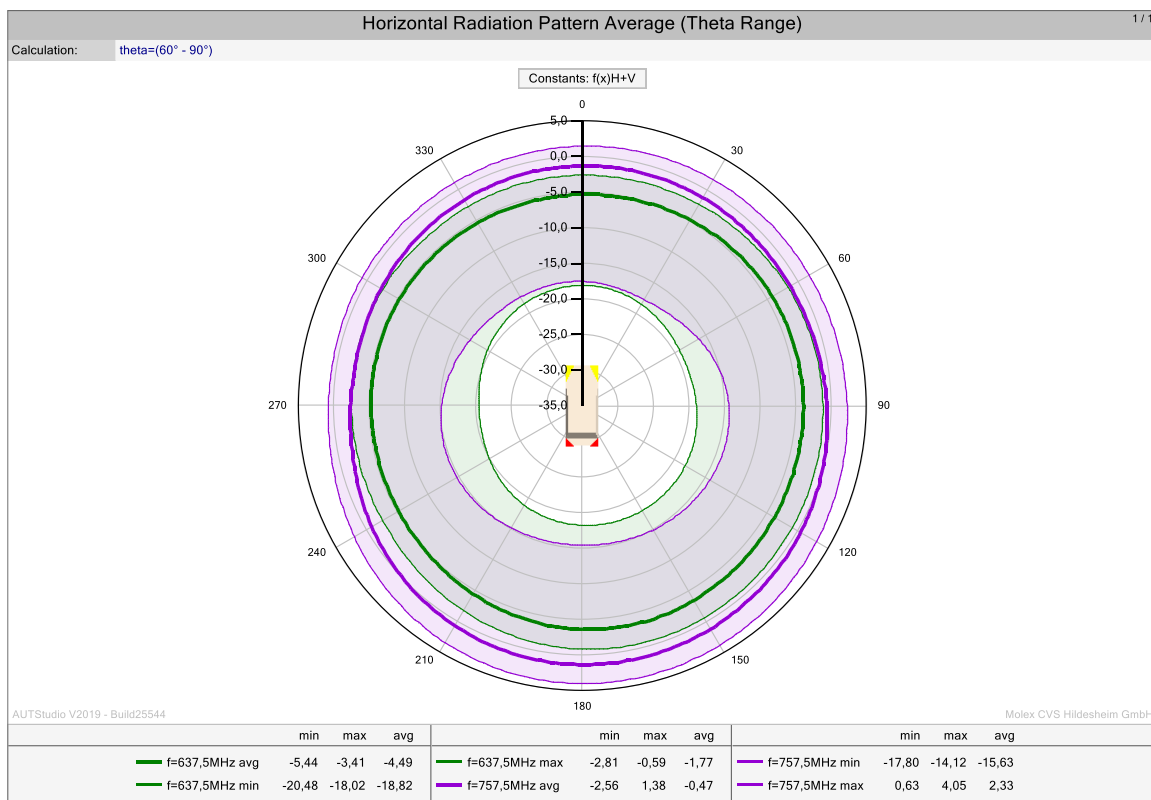
4.1 Measurement setup passive antennas (1 meter GND)

Measuring principle	Type of Measurement	Near field
	DUT<-> Sendeanenne	Satimo SG64 Measurement chamber Molex Hildesheim
	Near/Farfield transformation	Ja
	Referenzdokument	
Messparameter	Measurement condition	Chamber room
	Frequency Range	600 MHz – 6000 MHz
	Angle Range	
	Elevation	0° bis 180°
	Azimuth	0° - 360°
	Angle Step	1°
	Elevation	1°
	Azimuth	
	Time Domain	No
	Gate Start, Gate Stop	
	Gate Funktion	
	Translated Spherical Wave Expansion	No
	Probe Pattern	
	Compensation	No
	AnyGround	Yes for TEL1 & 2 No for BTLE/WIFI, WLAN HOME, C2X
	Measured Polarisation	Vertikal / Horizontal at

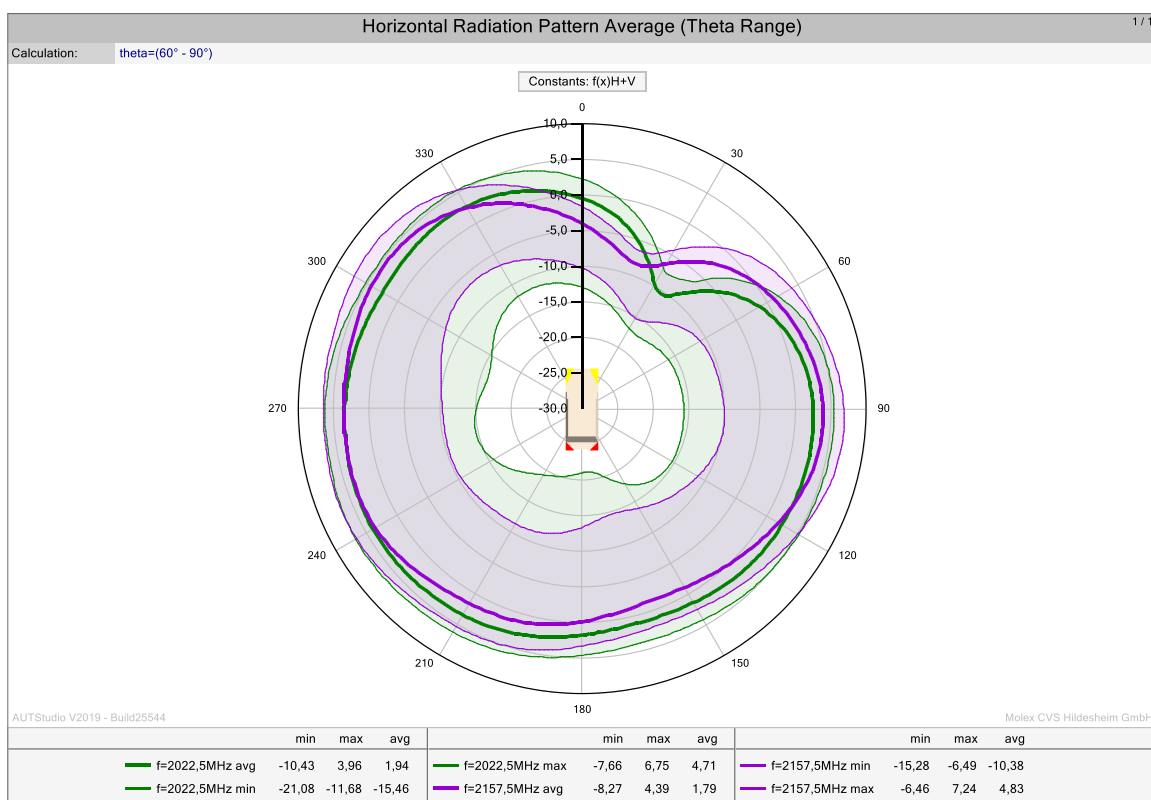
4.2 Tel1 5G

frequency band in MHz		partial average gain of freq. band in dBi (Theta=[60-90]°)			max. gain in partial area (Theta=[60-90]°)	min. gain in partial area (Theta=[60-90]°)	absolut maximum gain (Theta=[0-180]°)
begin	end	in freq. band in dBi	maximum	Minimum	in freq. band in dBi	in freq. band in dBi	in freq. band in dBi
617	894	-1,51	-0,09	-4,50	4,05	-20,48	4,05
1710	2170	1,54	1,99	1,11	7,24	-21,08	7,24
2500	2690	-0,14	0,41	-0,69	6,59	-33,43	6,59
3300	4200	-1,42	-0,229	-2,42	7,02	-61,36	7,02
4400	5000	-2,05	-1,49	-3,52	4,73	-65,31	4,73

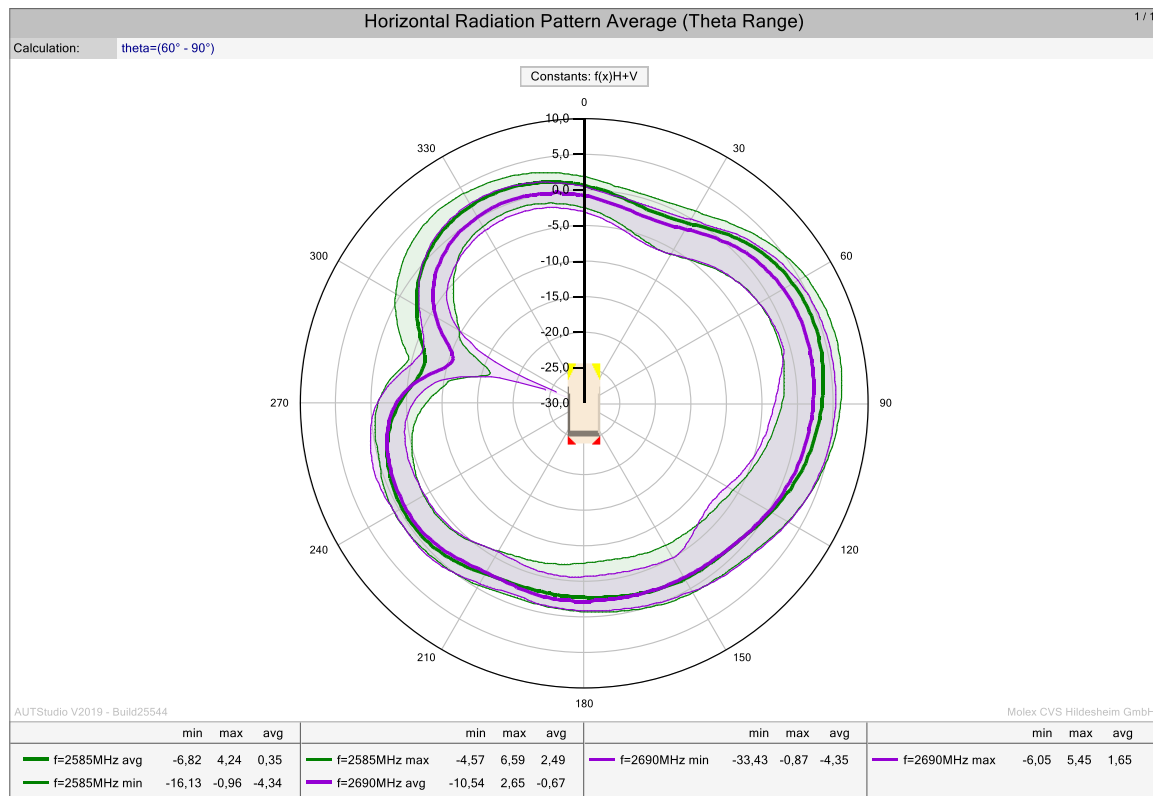
4.2.1 Radiation Pattern for Min-Max Gain @ frequency range 617MHz - 894MHz



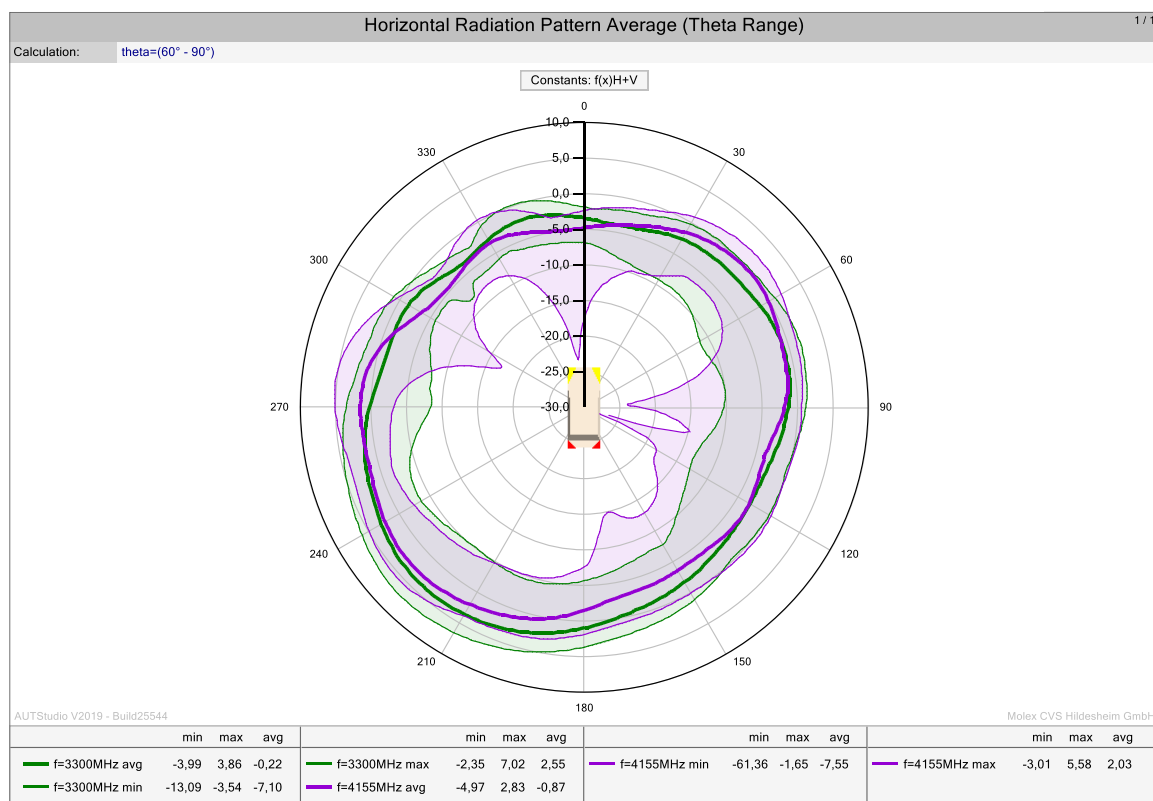
Radiation Pattern for Min-Max Gain @ frequency range 1710MHz - 2170MHz



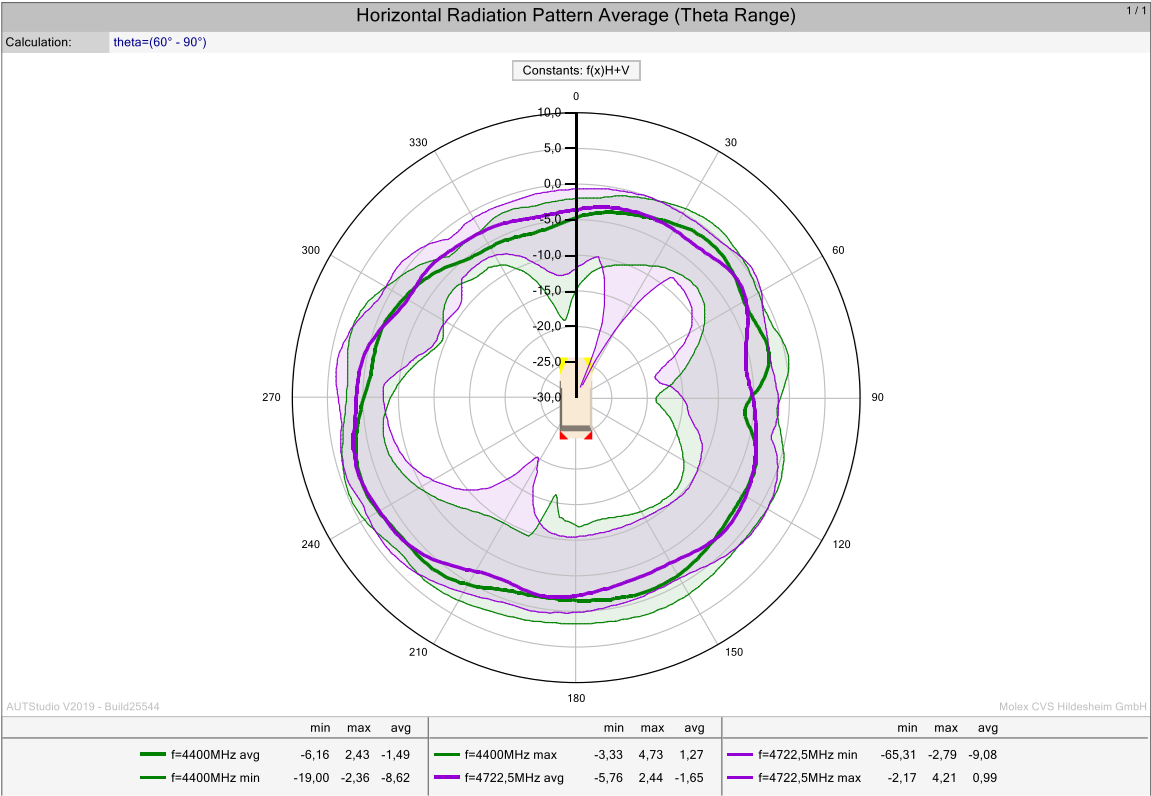
4.2.2 Radiation Pattern for Min-Max Gain @ frequency range 2500MHz - 2690MHz



4.2.3 Radiation Pattern for Min-Max Gain @ frequency range 3300MHz - 4200MHz



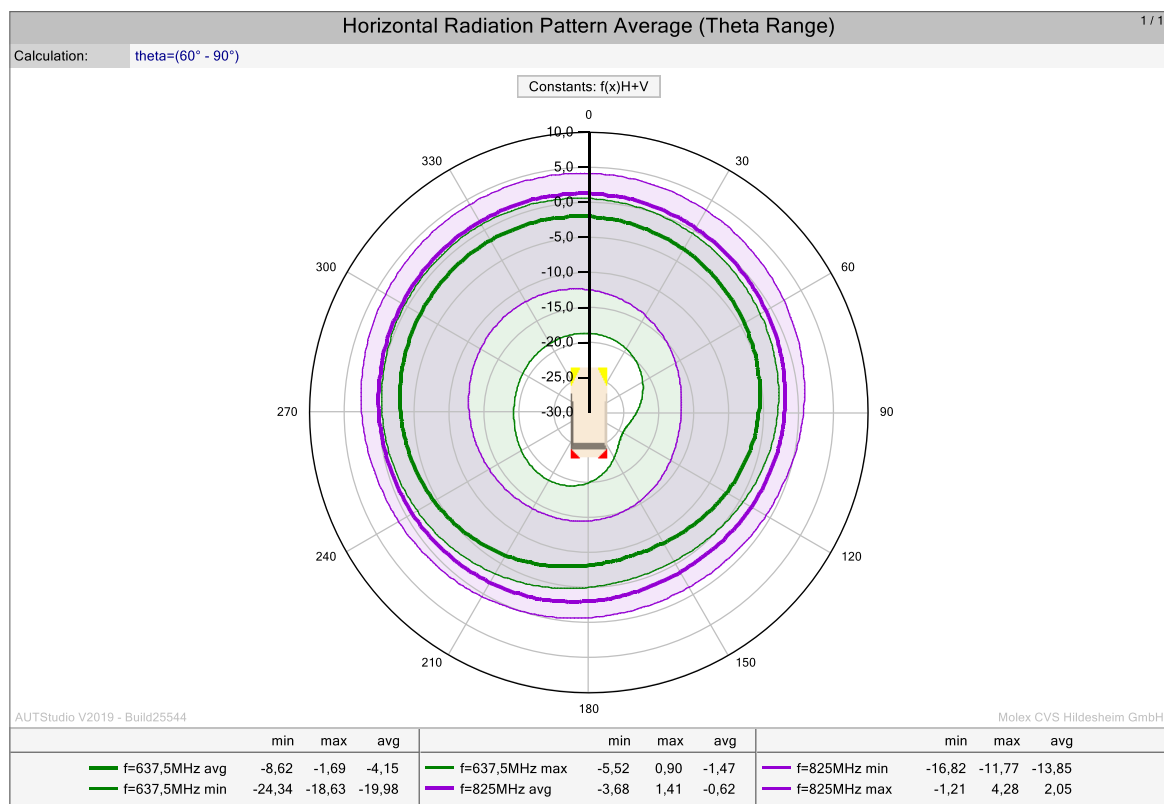
4.2.4 Radiation Pattern for Min-Max Gain @ frequency range 4400MHz - 5000MHz



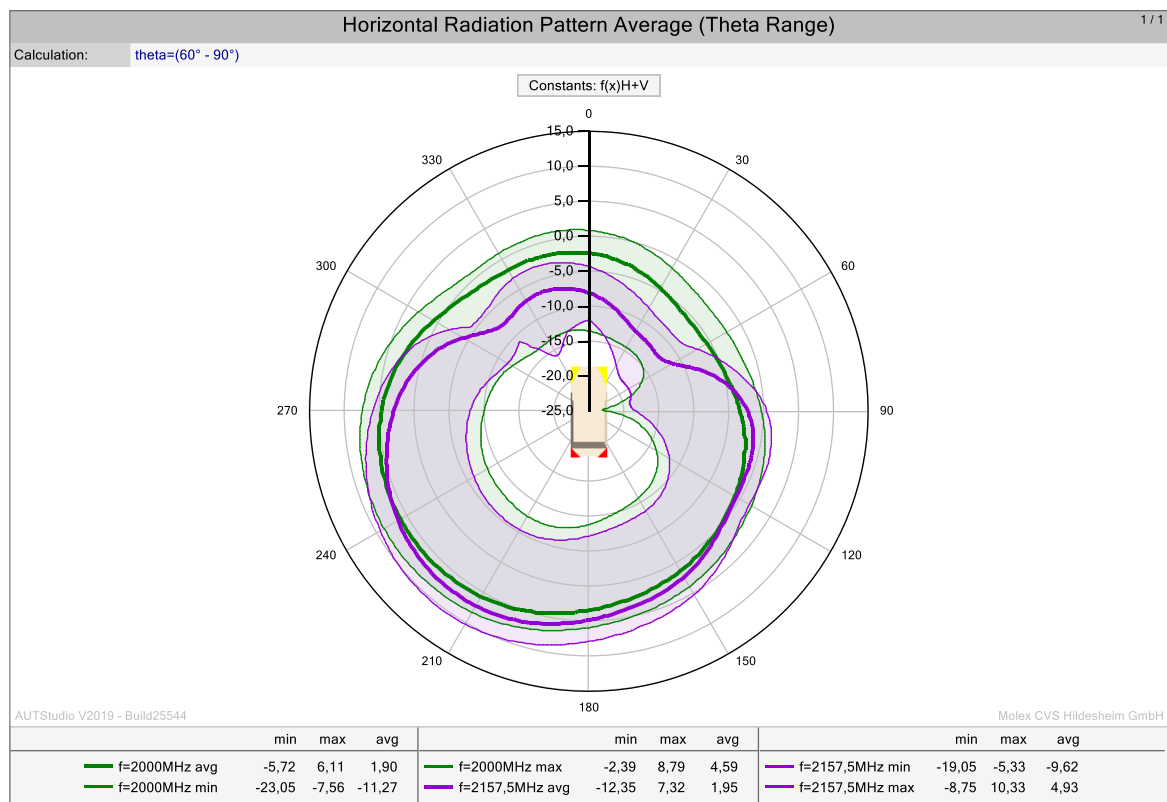
4.3 Tel2 5G

frequency band in MHz		partial average gain of freq. band in dBi (Theta=[60-90]°)			max. gain in partial area (Theta=[60-90]°)	min. gain in partial area (Theta=[60-90]°)	absolut maximum gain (Theta=[0-180]°)
begin	end	in freq. band in dBi	maximum	Minimum	in freq. band in dBi	in freq. band in dBi	in freq. band in dBi
617	894	-1,91	-0,55	-4,69	4,28	-27,18	4,28
1710	2170	1,33	2,16	-0,01	10,33	-23,05	10,33
2500	2690	0,27	0,78	-0,39	8,68	-40,25	8,68
3300	4200	-1,47	-0,58	-2,24	5,30	-46,60	5,30
4400	5000	-2,13	-1,12	-3,56	5,47	-43,87	5,47

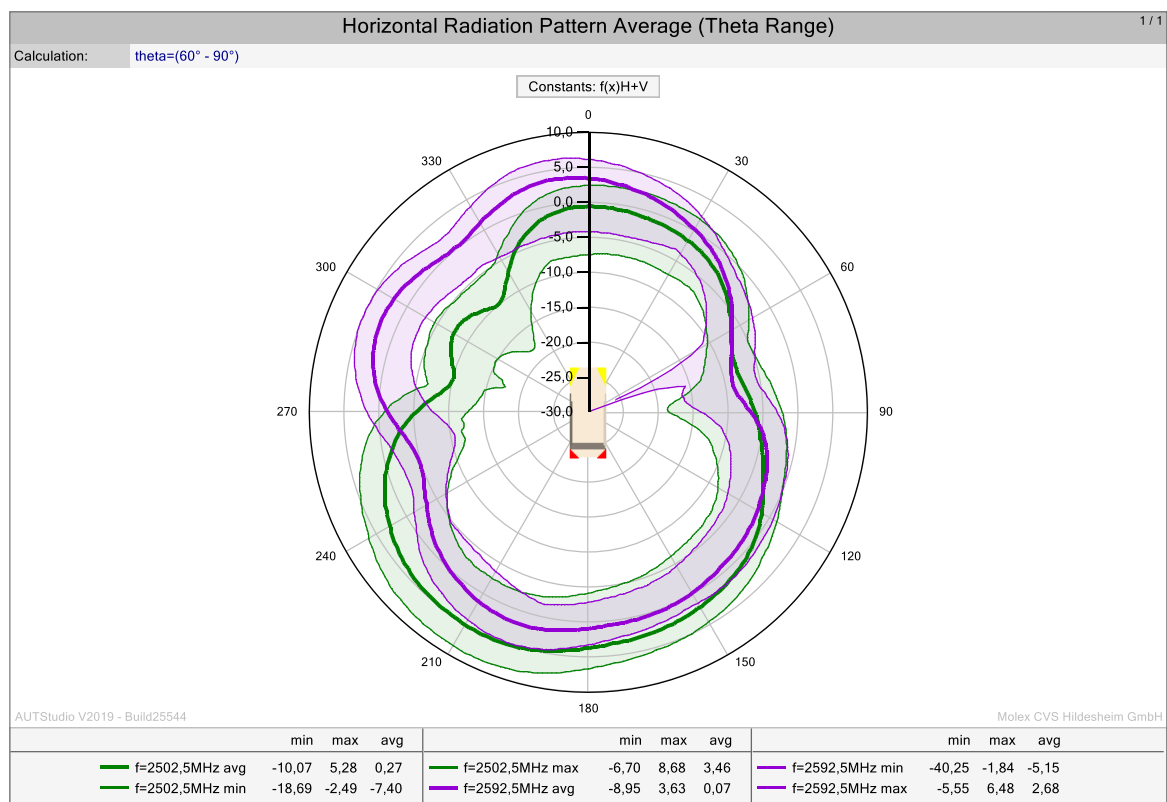
4.3.1 Radiation Pattern for Min-Max Gain @ frequency range 617MHz - 894MHz



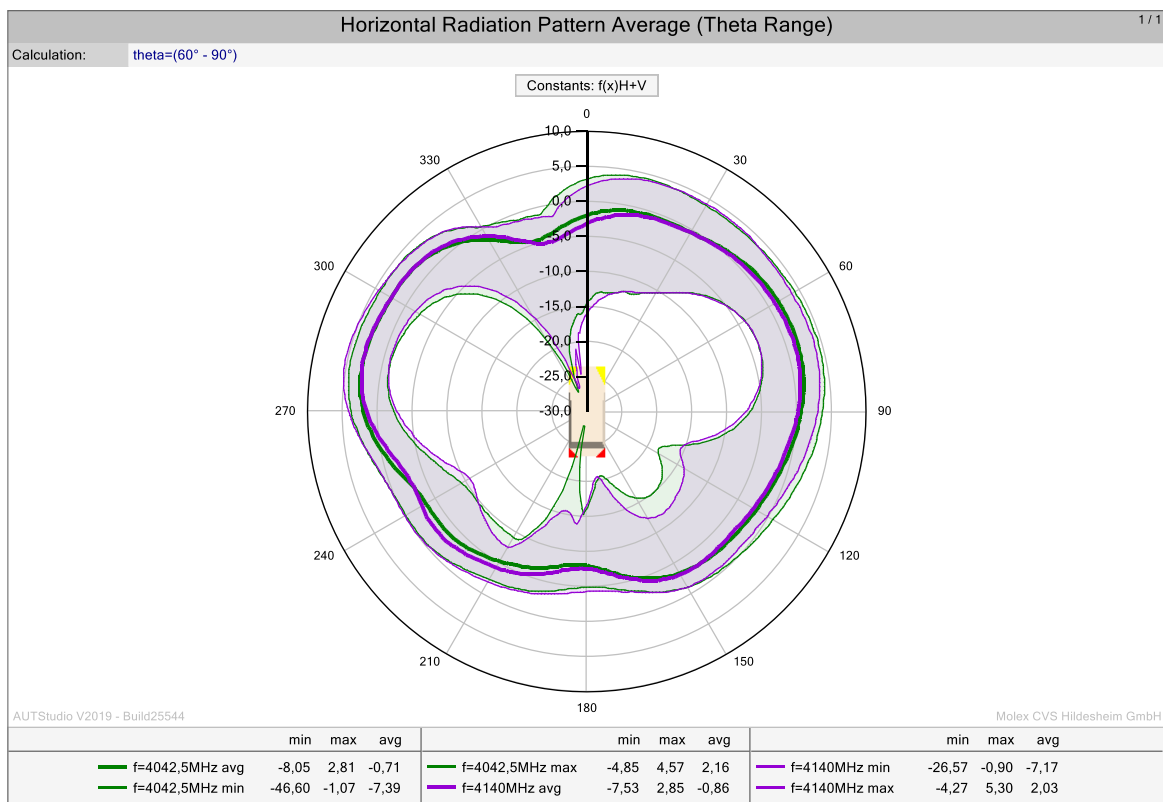
4.3.2 Radiation Pattern for Min-Max Gain @ frequency range 1710MHz - 2170MHz



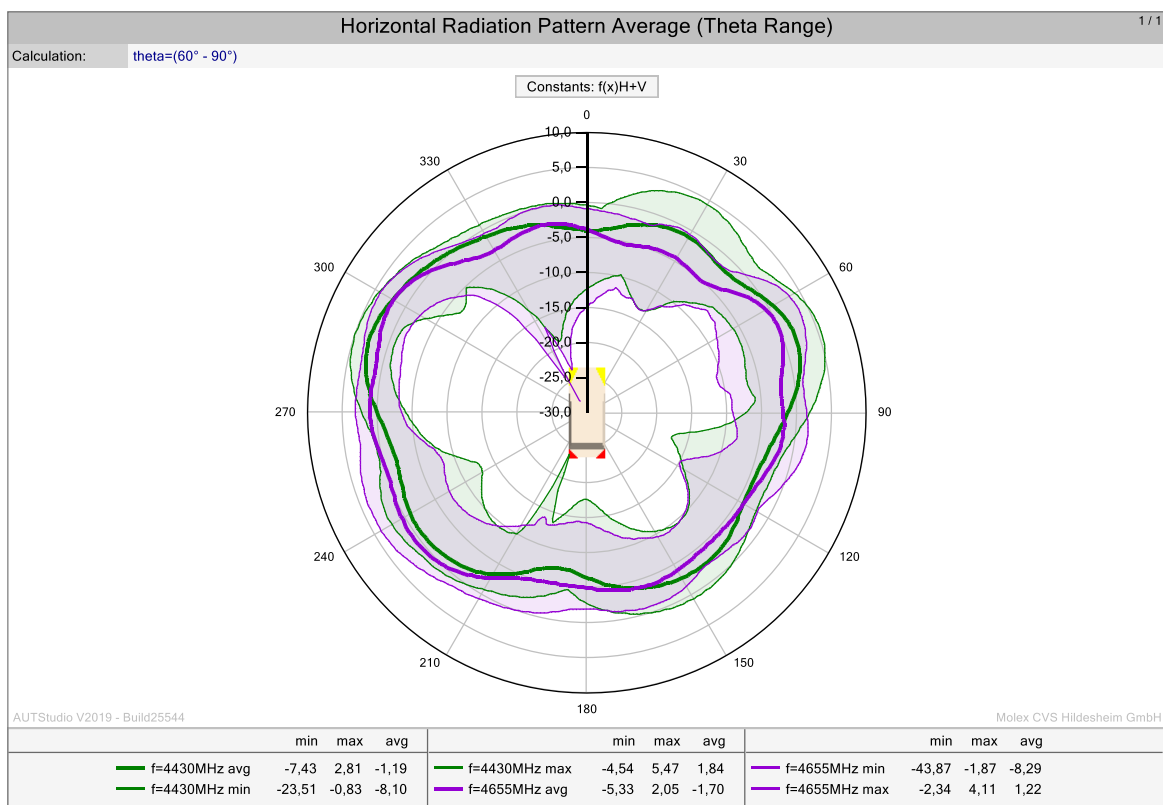
4.3.3 Radiation Pattern for Min-Max Gain @ frequency range 2500MHz - 2690MHz



4.3.4 Radiation Pattern for Min-Max Gain @ frequency range 3300MHz - 4200MHz



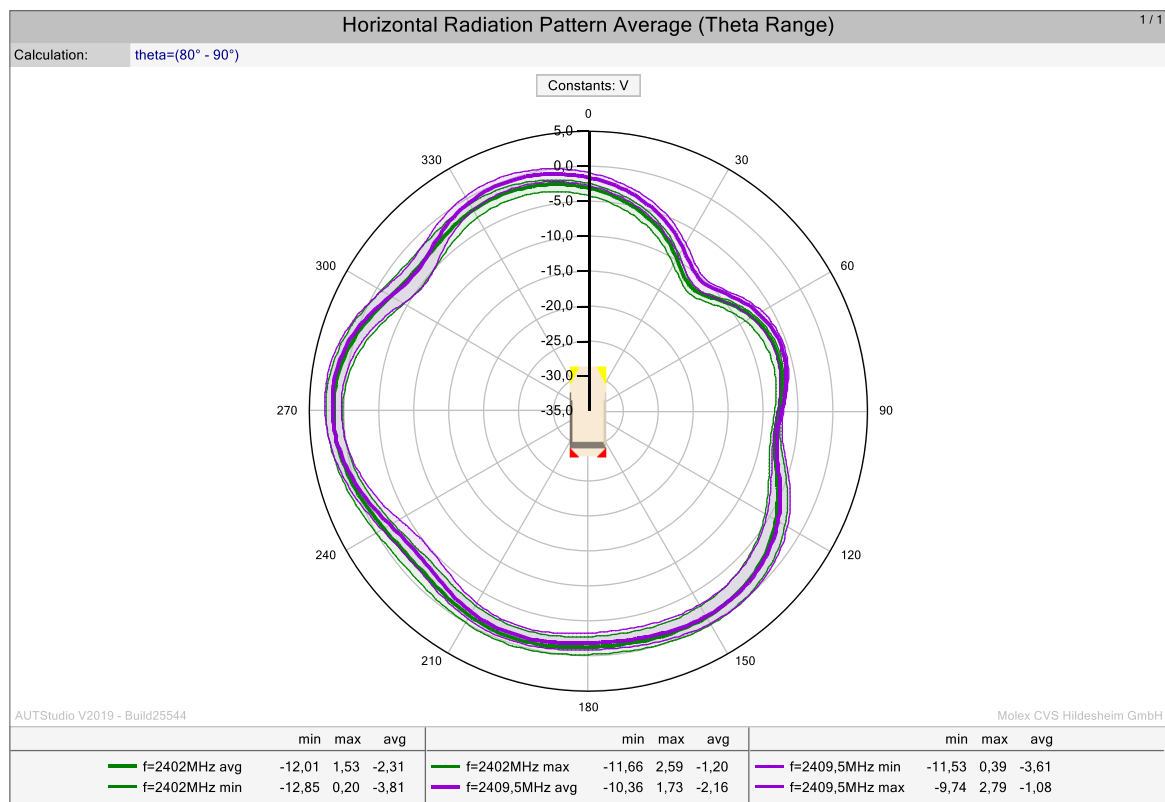
4.3.5 Radiation Pattern for Min-Max Gain @ frequency range 4400MHz - 5000MHz



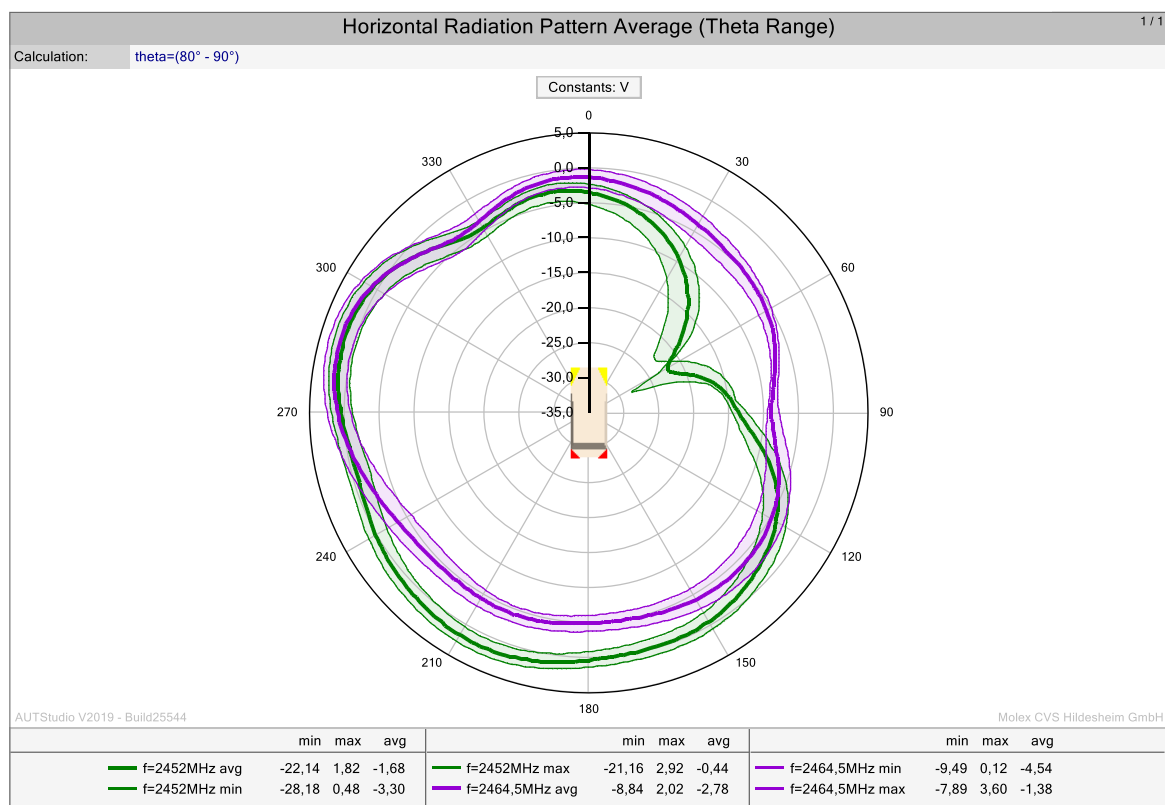
4.4 BTLE/WiFi 2.4 GHz

frequency band in MHz		partial average gain of freq. band in dBi (Theta=[80-90]°)			max. gain in partial area (Theta=[80-90]°)	min. gain in partial area (Theta=[80-90]°)	absolut maximum gain (Theta=[0-180]°)
begin	end	in freq. band in dBi	maximum	Minimum	in freq. band in dBi	in freq. band in dBi	in freq. band in dBi
2402	2410	-2,23	-2,16	-2,31	2,79	-12,85	3,63
2411	2475	-2,66	-1,25	-3,57	3,60	-28,18	4,70
2476	2480,9	-2,47	-2,38	-2,55	3,18	-15,08	4,35

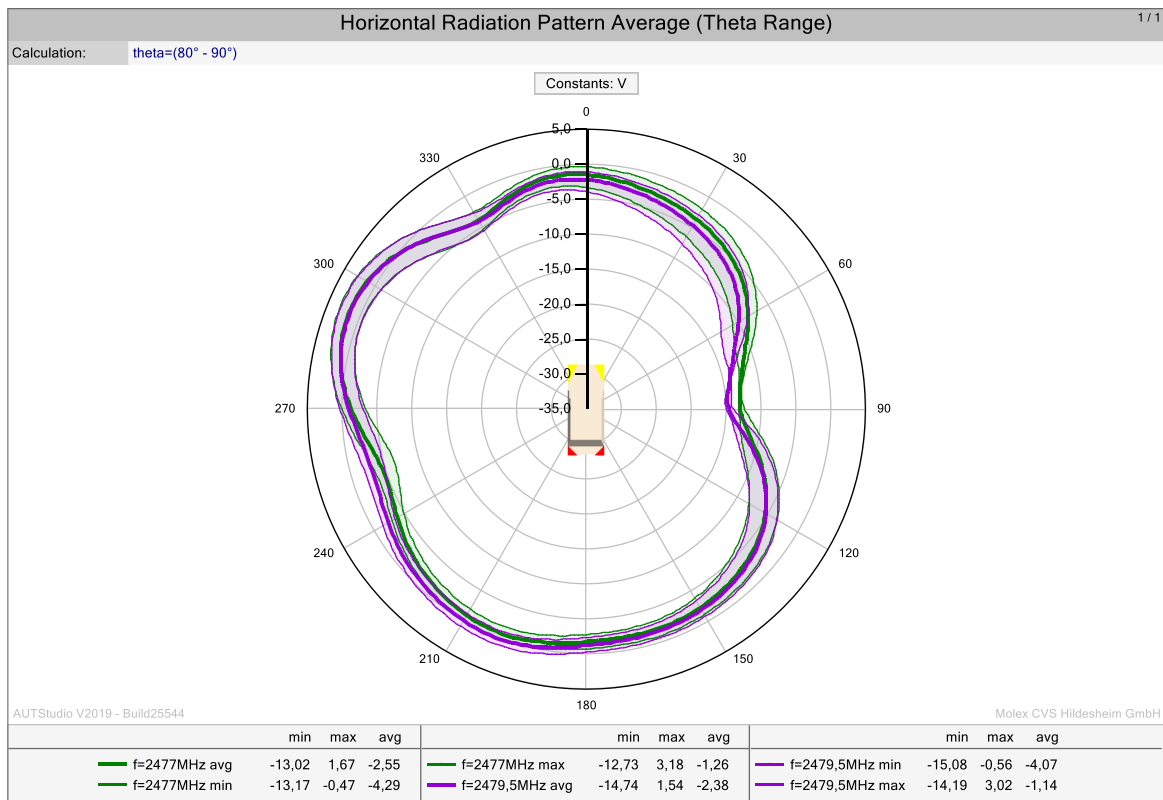
4.4.1 Radiation Pattern for Min-Max Gain @ frequency range 2402 MHz -2410 MHz



4.4.2 Radiation Pattern for Min-Max Gain @ frequency range 2411 MHz -2475 MHz



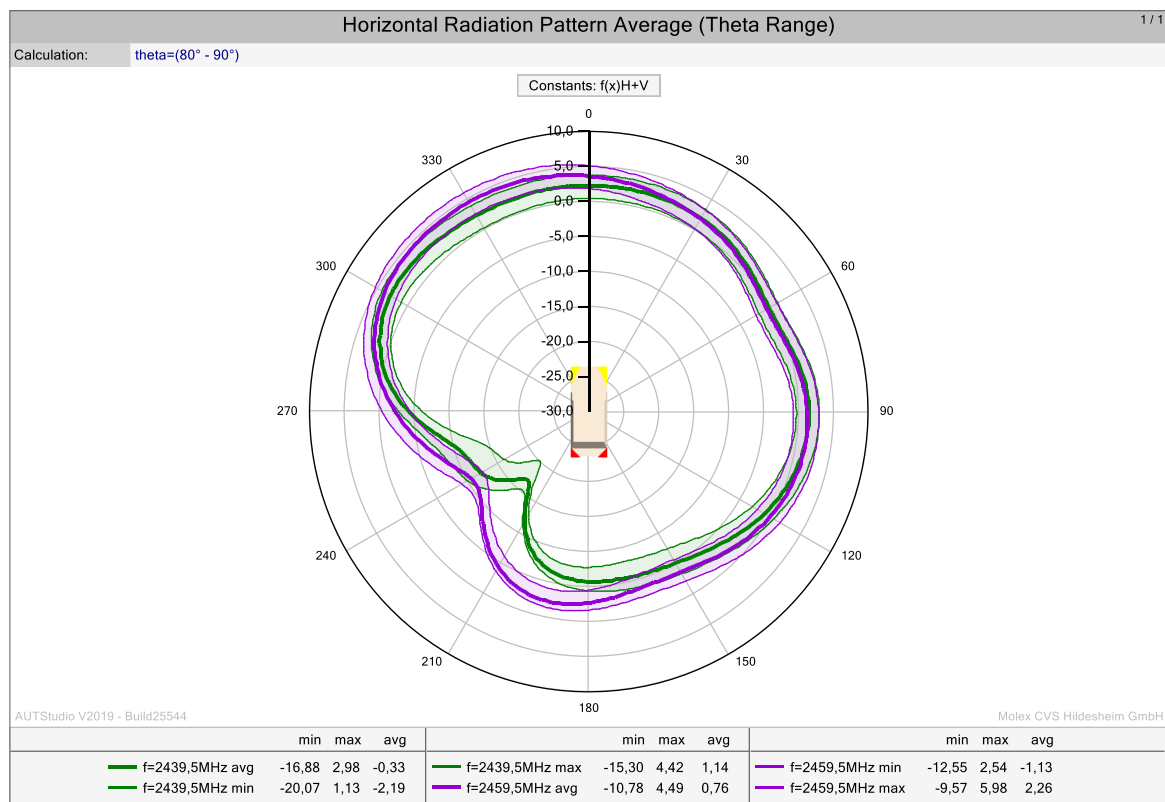
4.4.3 Radiation Pattern for Min-Max Gain @ frequency range 2476 MHz -2480,9 MHz



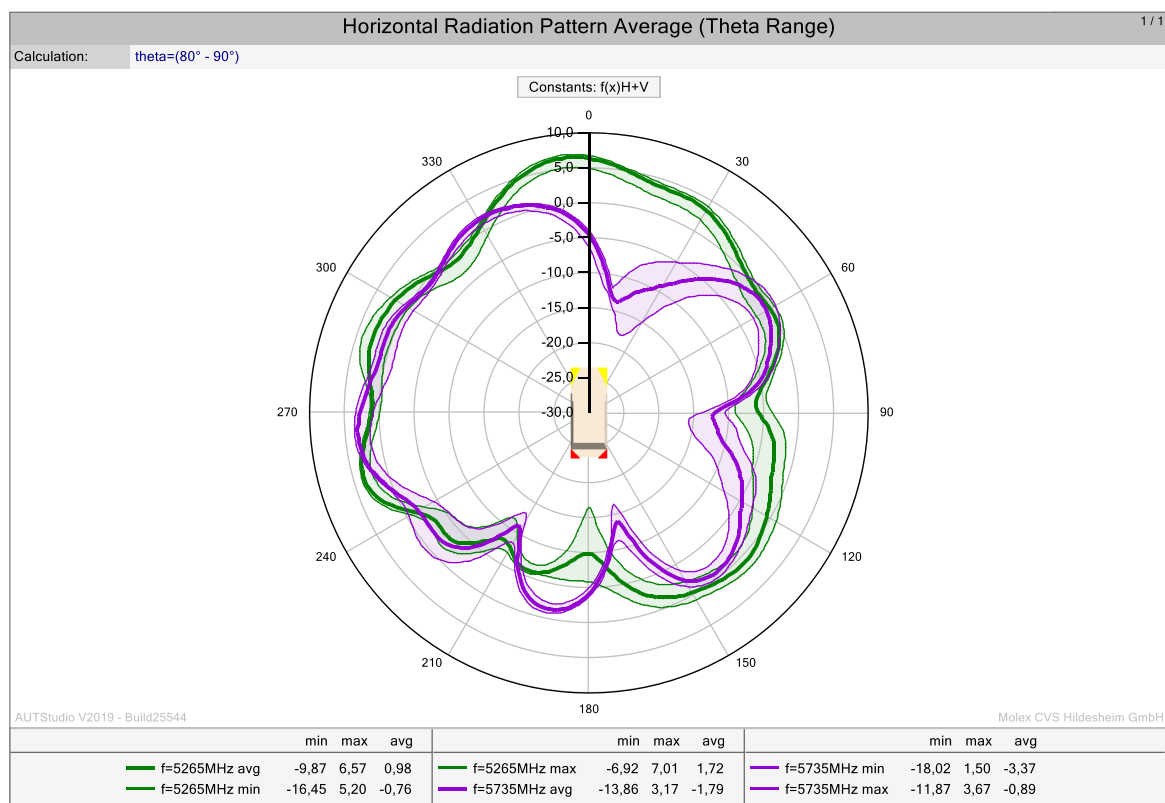
4.5 BTLE/WiFi Dual 2.4 & 5 GHz

frequency band in MHz		partial average gain of freq. band in dBi (Theta=[80-90]°)			max. gain in partial area (Theta=[80-90]°)	min. gain in partial area (Theta=[80-90]°)	absolut maximum gain (Theta=[0-180]°)
begin	end	in freq. band in dBi	maximum	Minimum	in freq. band in dBi	in freq. band in dBi	in freq. band in dBi
2402	2483,5	-0,17	0,77	-1,11	5,84	-51,23	6,68
5170	5835	-0,92	0,44	-3,24	6,99	-64,02	6,99

4.5.1 Radiation Pattern for Min-Max Gain @ frequency range 2402 MHz – 2483,5 MHz



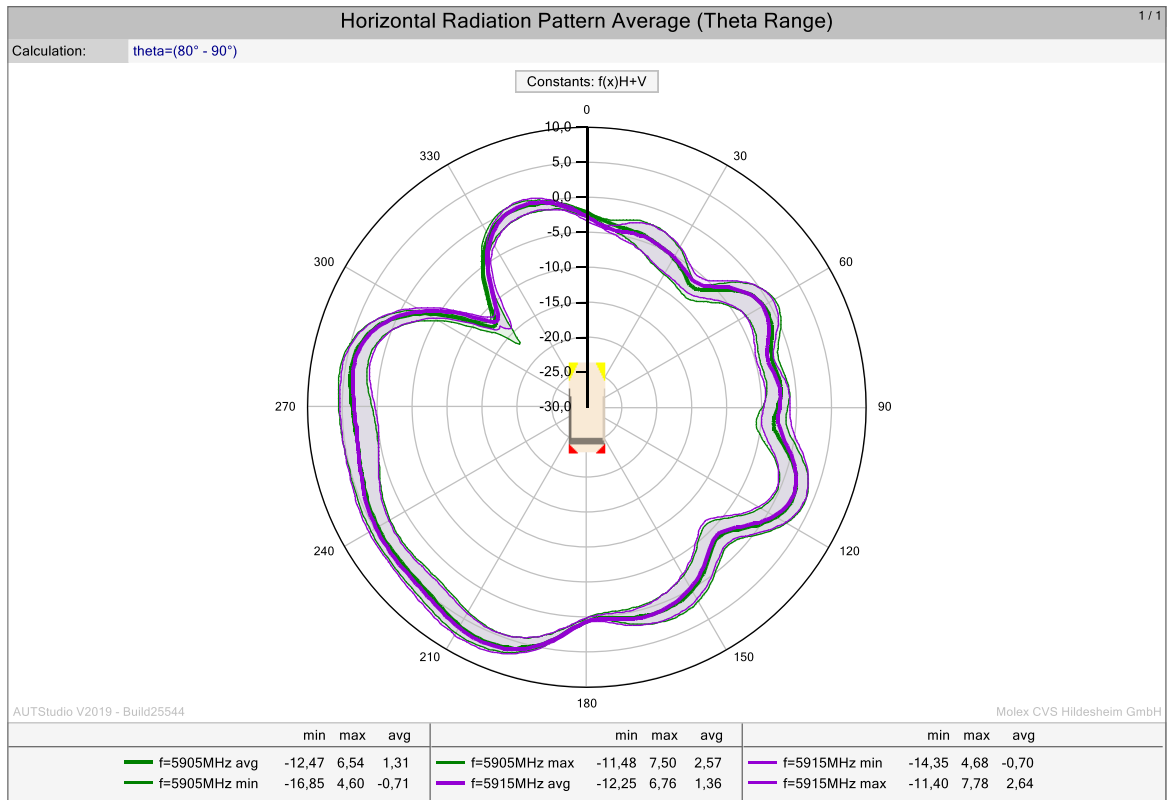
4.5.2 Radiation Pattern for Min-Max Gain @ frequency range 5170 MHz - 5831 MHz



4.6 C2X

frequency band in MHz		partial average gain of freq. band in dBi (Theta=[80-90]°)			max. gain in partial area (Theta=[80-90]°)	min. gain in partial area (Theta=[80-90]°)	absolut maximum gain (Theta=[0-180]°)
begin	end	in freq. band in dBi	maximum	Minimum	in freq. band in dBi	in freq. band in dBi	in freq. band in dBi
5855	5925	0,77	1,03	-0,12	7,76	-19,25	7,76

4.6.1 Radiation Pattern for Min-Max Gain @ frequency range 5855 MHz - 5925 MHz



7. ELECTRICAL PROPERTIES 3WA.035.507.N REVISION 01H & 01S – RAN-102L_ HW004

Unless otherwise stated, all data in this document apply for nominal requirements at 25°C.

Radiated measurements were done mounted on 1m ground plane

LNA measurements were done without housing and with SMA connector at the LNA input

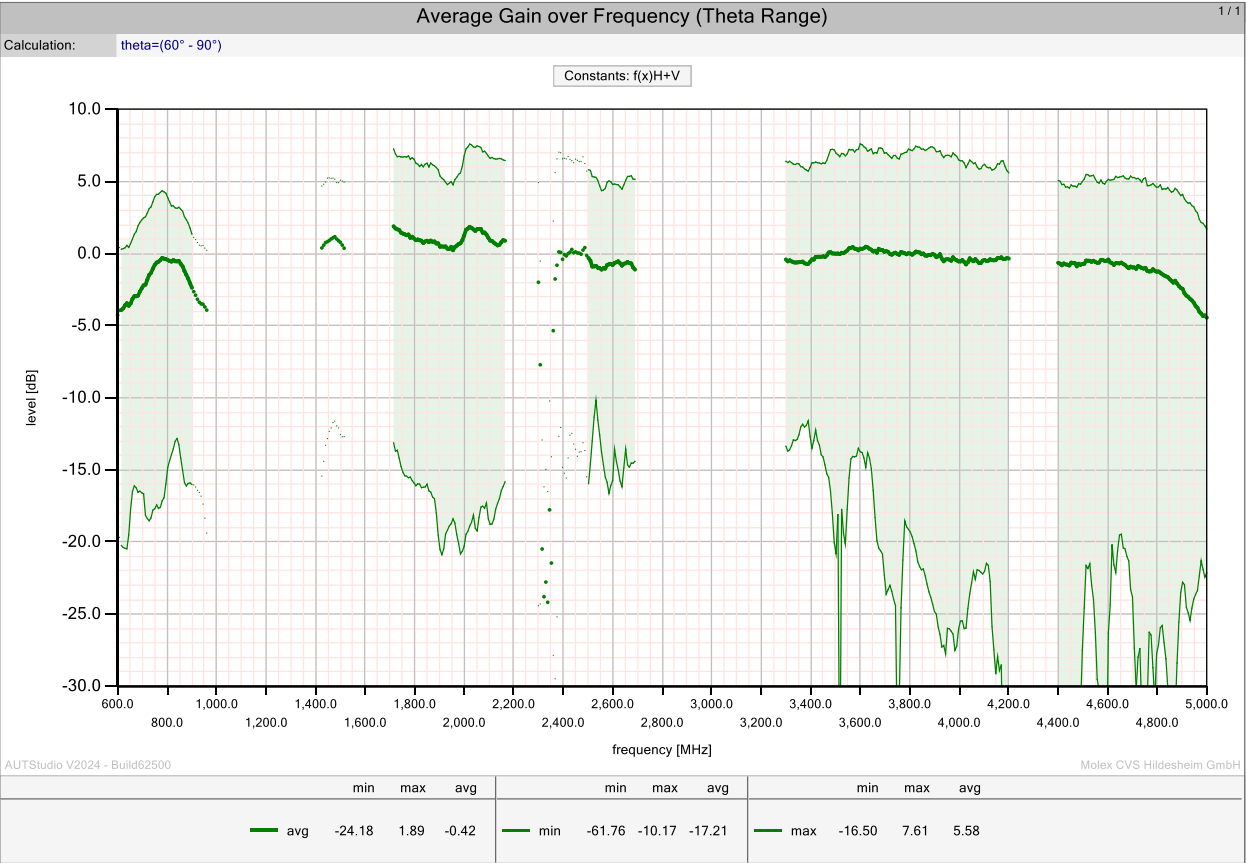
7.1 Measurement setup passive antennas (1 meter GND)

Measuring principle	Type of Measurement	Near field
	DUT<-> Sendeantenne	Satimo SG64 Measurement chamber Molex Hildesheim
	Near/Farfield transformation	Ja
	Referenzdokument	
Messparameter	Measurement condition	Chamber room
	Frequency Range	600 MHz – 6000 MHz
	Angle Range	
	Elevation	0° bis 180°
	Azimuth	0° - 360°
	Angle Step	
	Elevation	1°
	Azimuth	1°
	Time Domain	No
	Gate Start, Gate Stop	
	Gate Funktion	
	Translated Spherical Wave Expansion	No
	Probe Pattern	
	Compensation	No
	AnyGround	Yes for TEL1 & 2 No for BTLE/WIFI, WLAN HOME, C2X
	Measured Polarisations	Vertikal / Horizontal atl

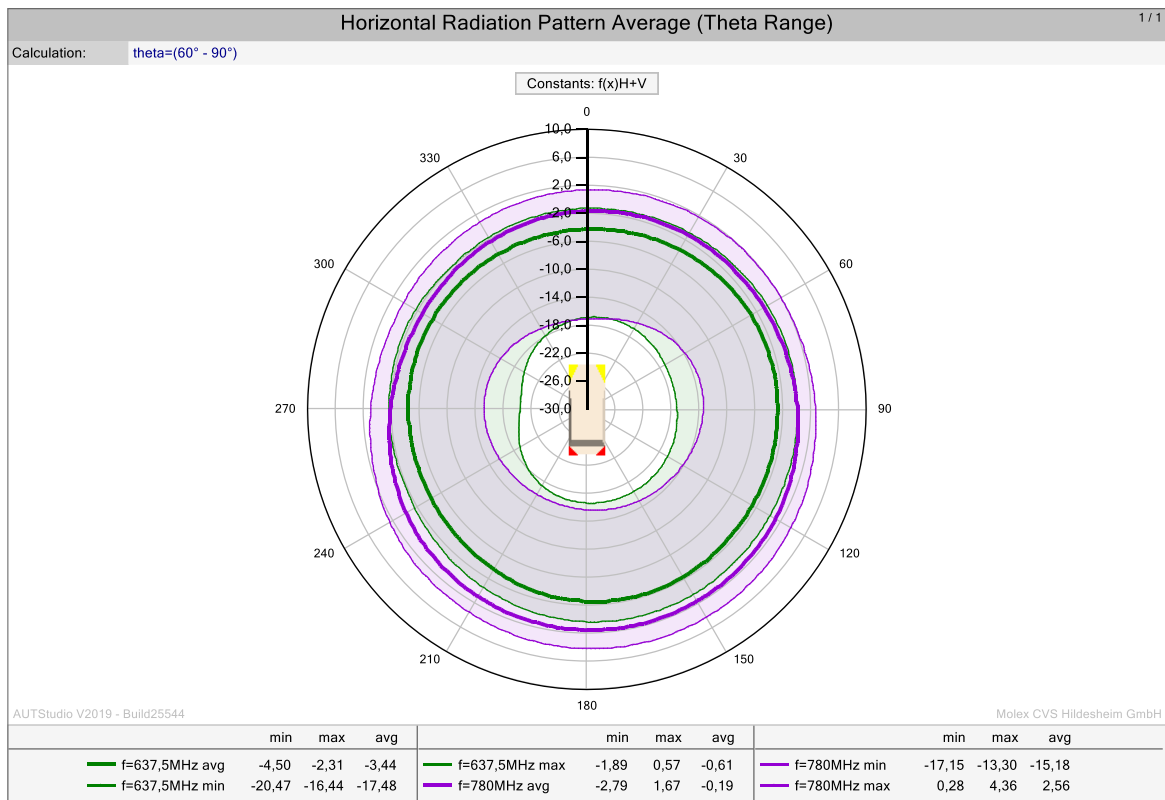
7.2 Tel1 5G

frequency band in MHz		partial average gain of freq. band in dBi (Theta=[60-90]°)			max. gain in partial area (Theta=[60-90]°)	min. gain in partial area (Theta=[60-90]°)	absolut maximum gain (Theta=[0-180]°)
begin	end	in freq. band in dBi	maximum	Minimum	in freq. band in dBi	in freq. band in dBi	in freq. band in dBi
617	894	-1,41	-0,19	-3,79	4,36	-20,47	3,97
1710	2170	1,09	1,90	0,27	7,60	-20,88	7,60
2500	2690	-0,76	-0,28	-1,10	5,82	-16,63	5,82
3300	4200	-0,12	0,50	-0,71	6,71	-41,56	7,61
4400	5000	-1,26	-0,39	-4,40	5,49	-43,44	5,49

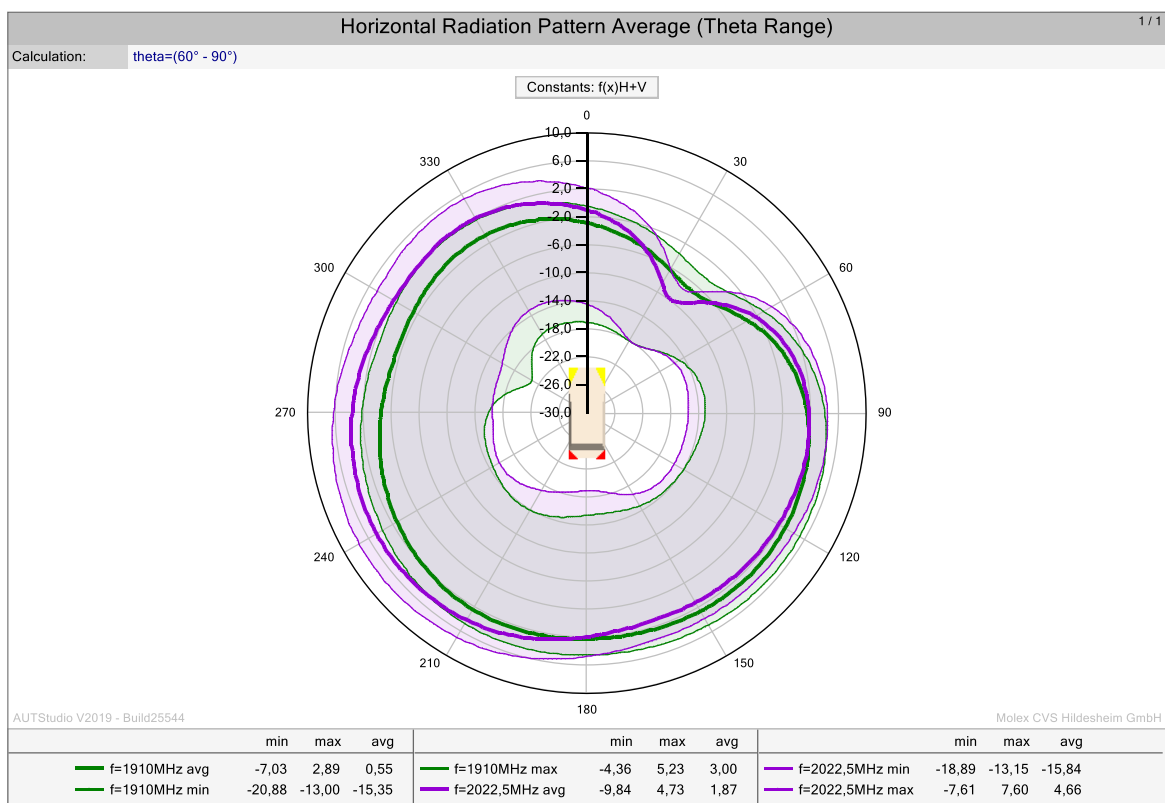
7.2.1 Average gain over Frequency



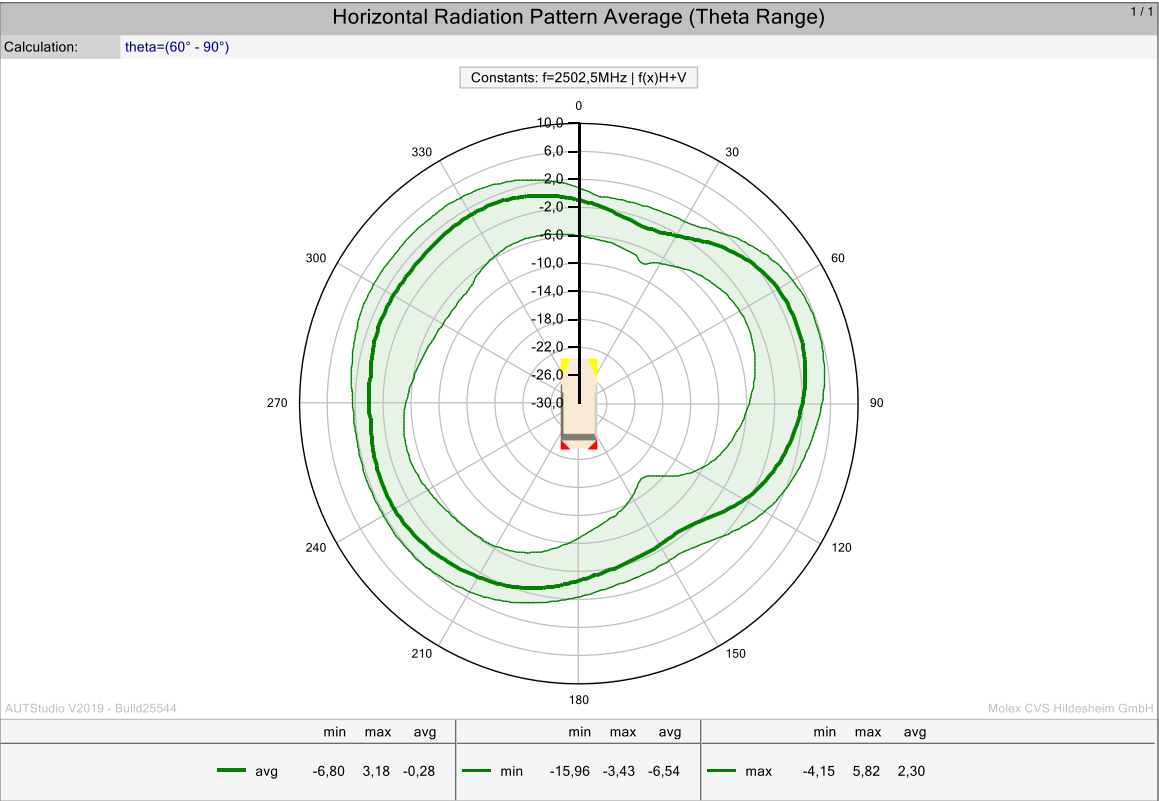
7.2.2 Radiation Pattern for Min-Max Gain @ frequency range 617MHz - 894MHz



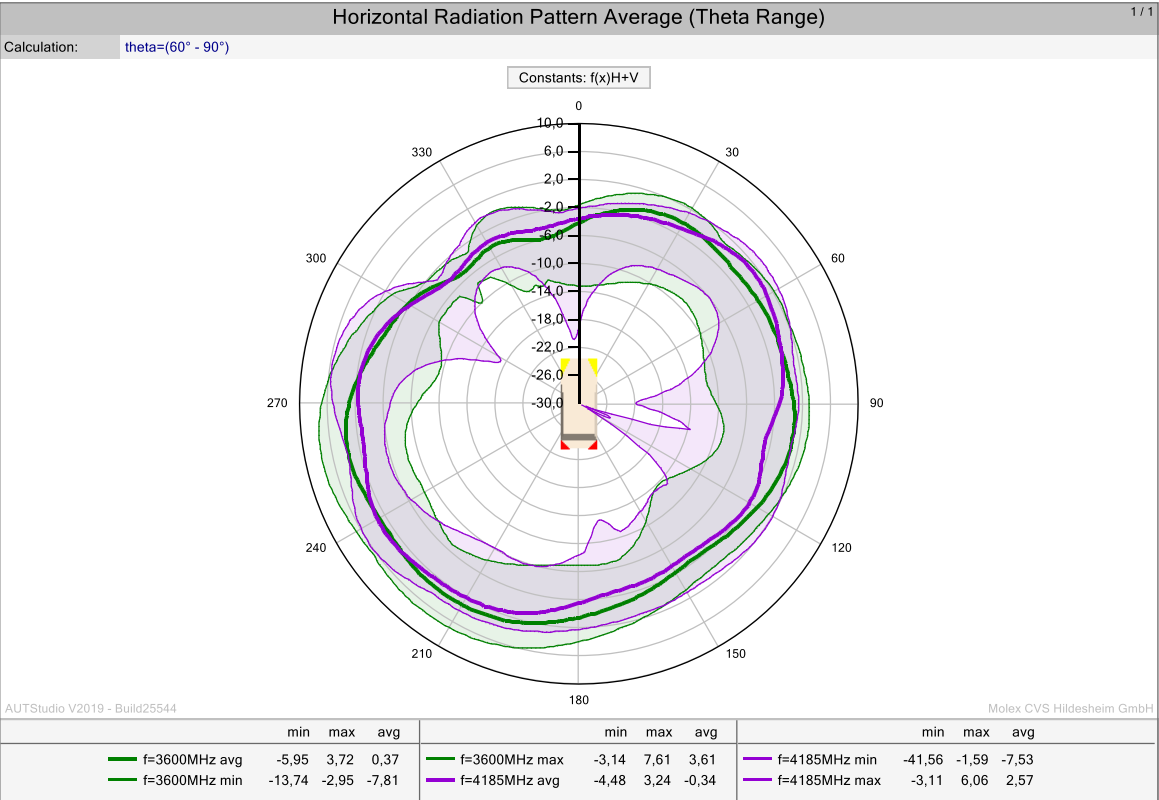
7.2.3 Radiation Pattern for Min-Max Gain @ frequency range 1710MHz - 2170MHz



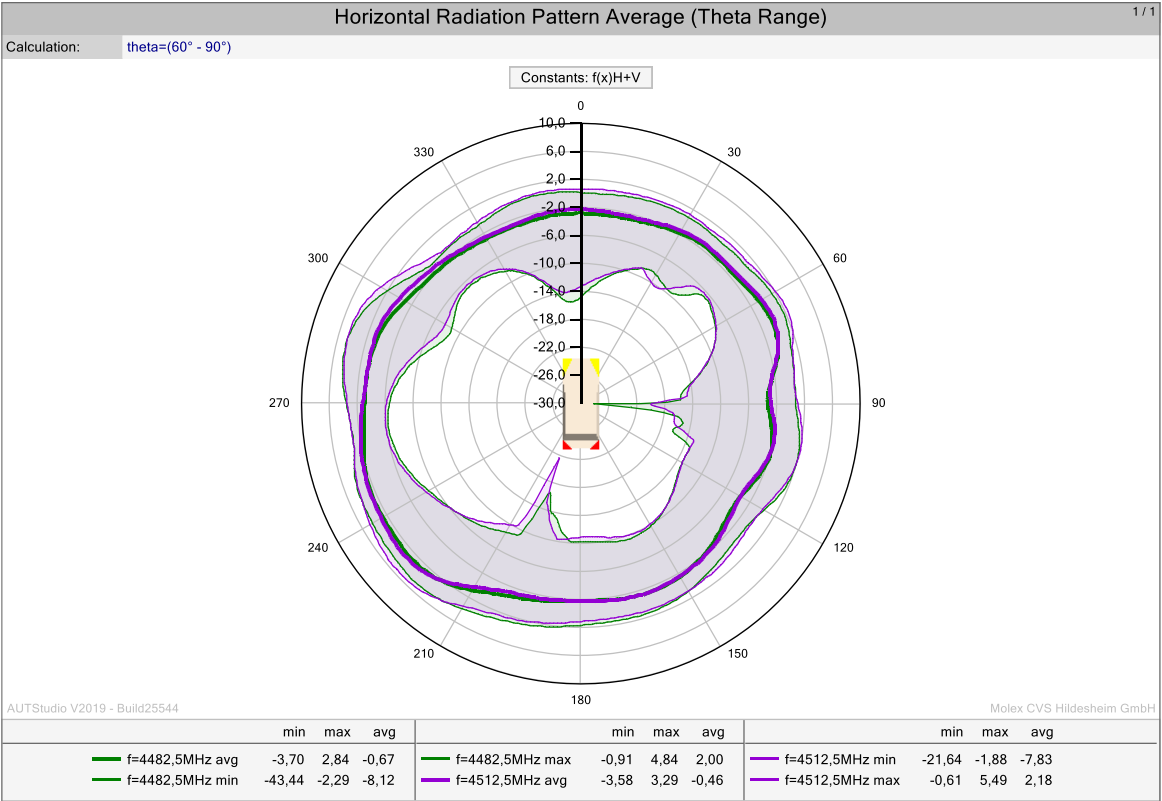
7.2.4 Radiation Pattern for Min-Max Gain @ frequency range 2500MHz - 2690MHz



7.2.5 Radiation Pattern for Min-Max Gain @ frequency range 3300MHz - 4200MHz



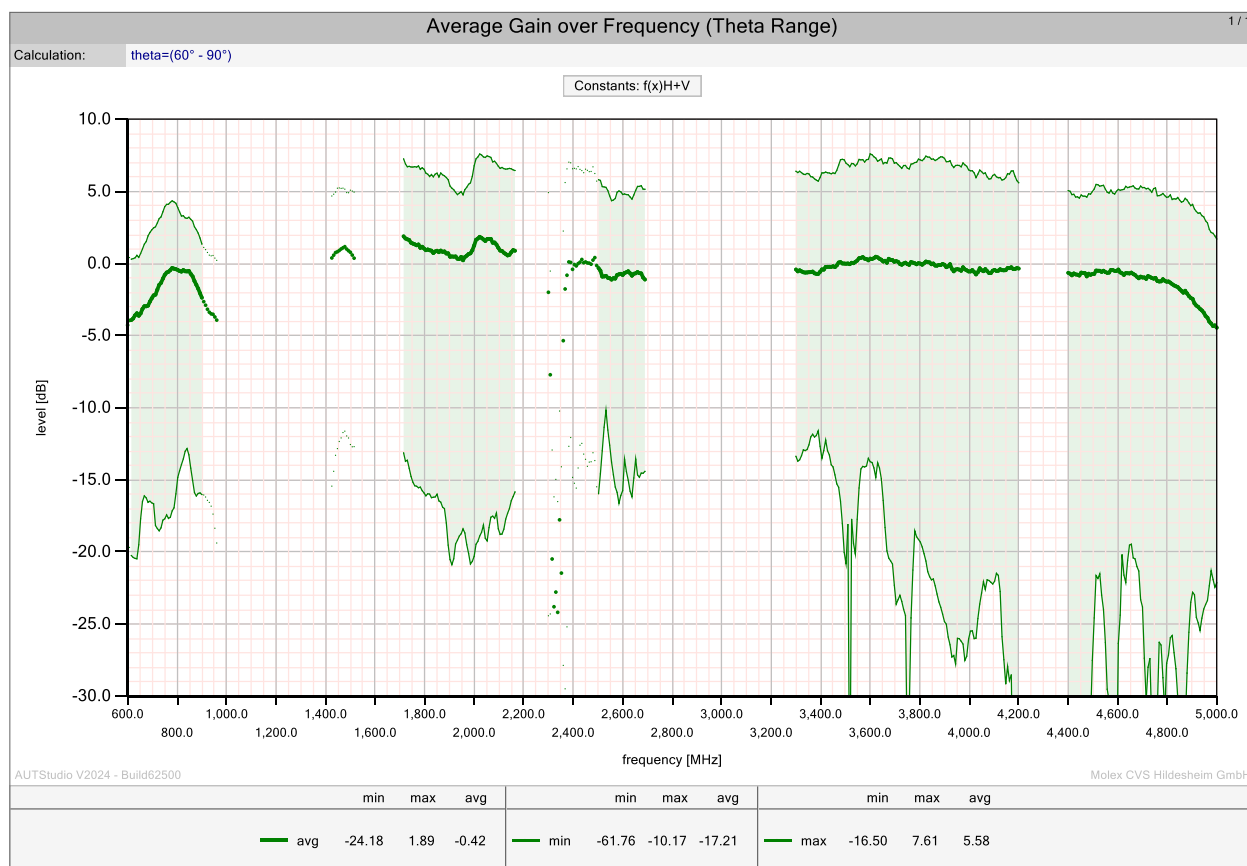
7.2.6 Radiation Pattern for Min-Max Gain @ frequency range 4400MHz - 5000MHz



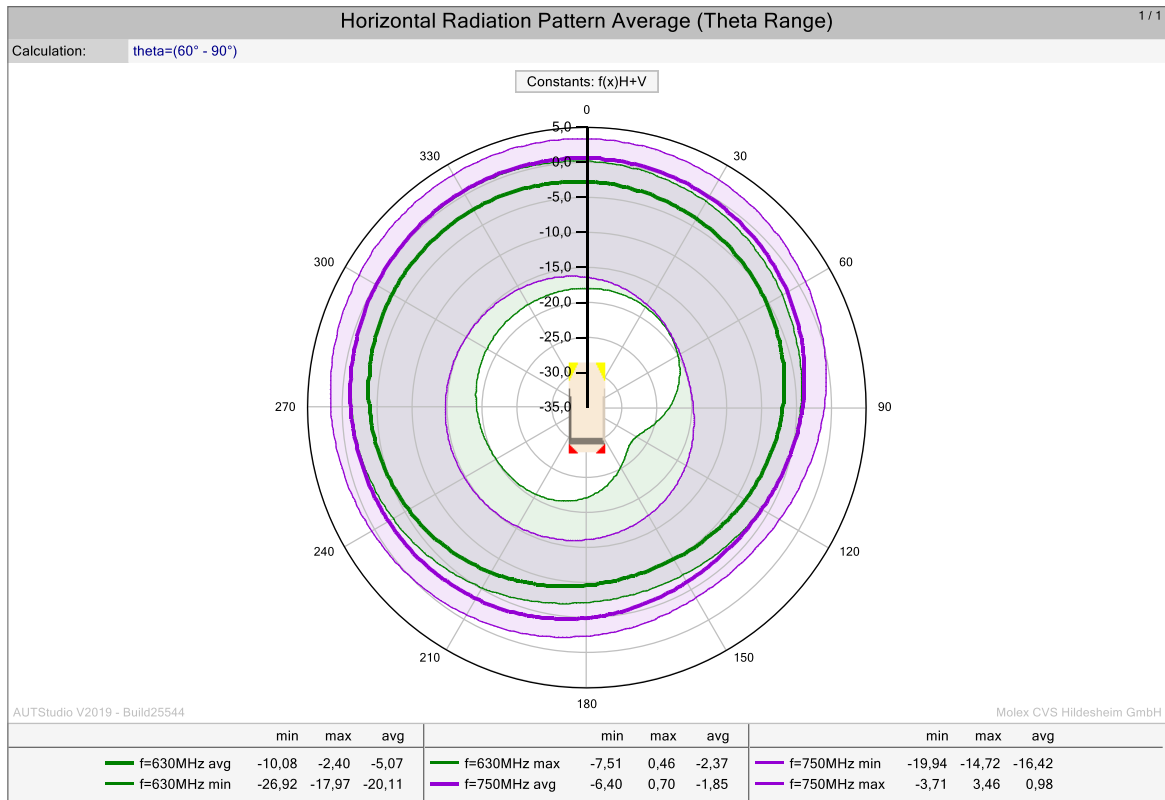
7.3 Tel2 5G

frequency band in MHz		partial average gain of freq. band in dBi (Theta=[60-90]°)			max. gain in partial area (Theta=[60-90]°)	min. gain in partial area (Theta=[60-90]°)	absolut maximum gain (Theta=[0-180]°)
begin	end	in freq. band in dBi	maximum	Minimum	in freq. band in dBi	in freq. band in dBi	in freq. band in dBi
617	894	-2,23	-1,37	-5,53	3,46	-26,92	3,46
1710	2170	0,75	1,78	-0,31	9,34	-34,82	9,34
2500	2690	-0,21	0,24	-0,77	7,79	-44,68	7,79
3300	4200	-0,02	0,72	-1,40	6,63	-45,19	6,63
4400	5000	-2,44	-0,46	-6,46	6,03	-40,94	6,03

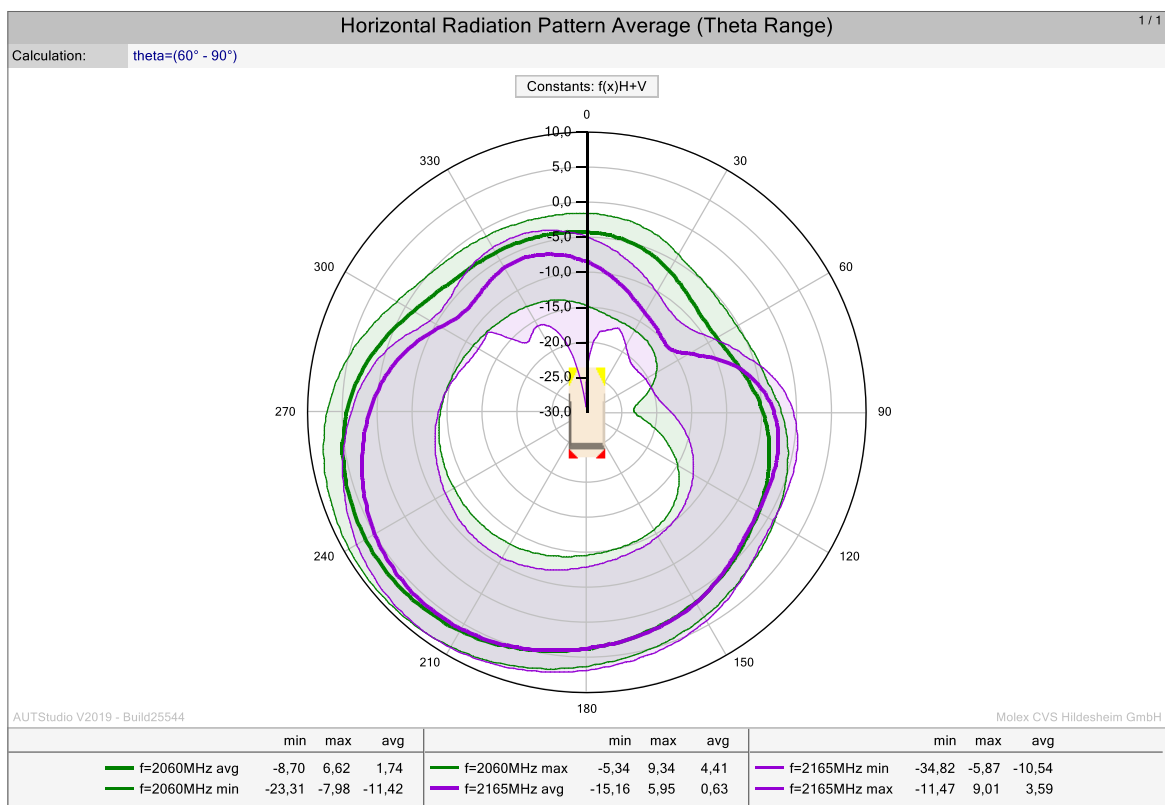
7.3.1 Average gain over Frequency



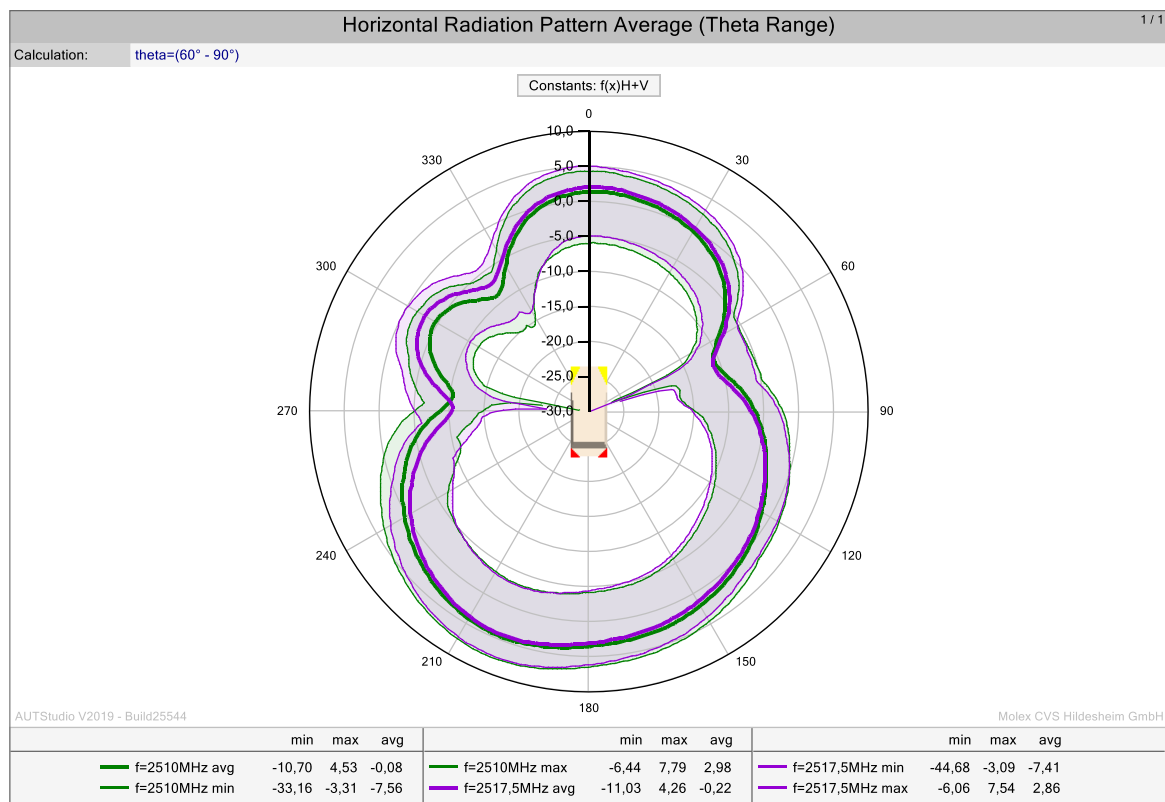
7.3.2 Radiation Pattern for Min-Max Gain @ frequency range 617MHz - 894MHz



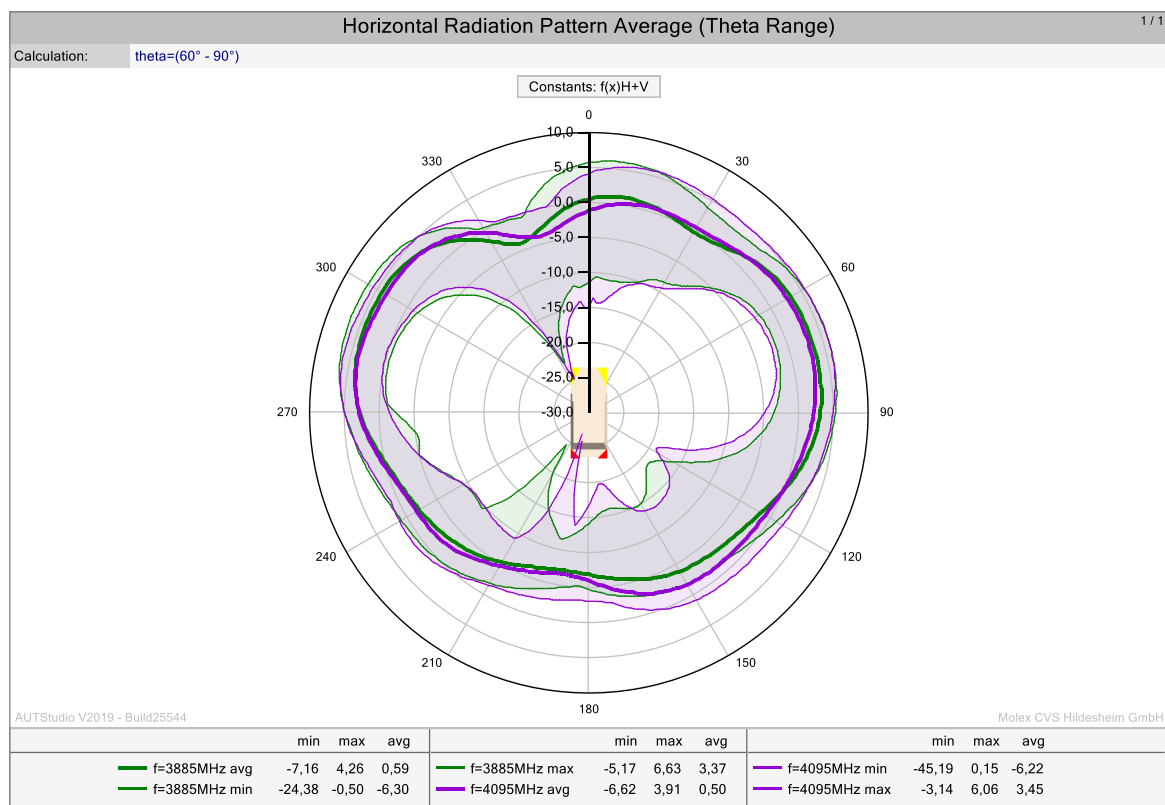
7.3.3 Radiation Pattern for Min-Max Gain @ frequency range 1710MHz - 2170MHz



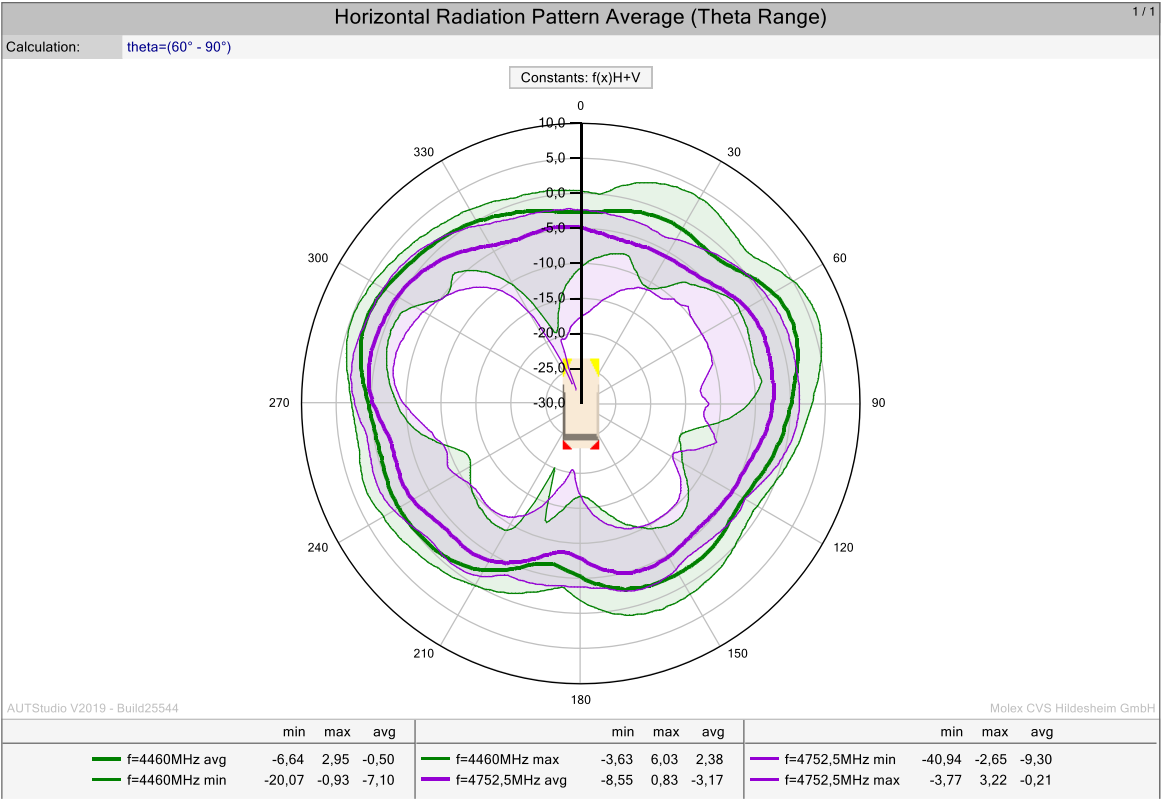
7.3.4 Radiation Pattern for Min-Max Gain @ frequency range 2500MHz - 2690MHz



7.3.5 Radiation Pattern for Min-Max Gain @ frequency range 3300MHz - 4200MHz



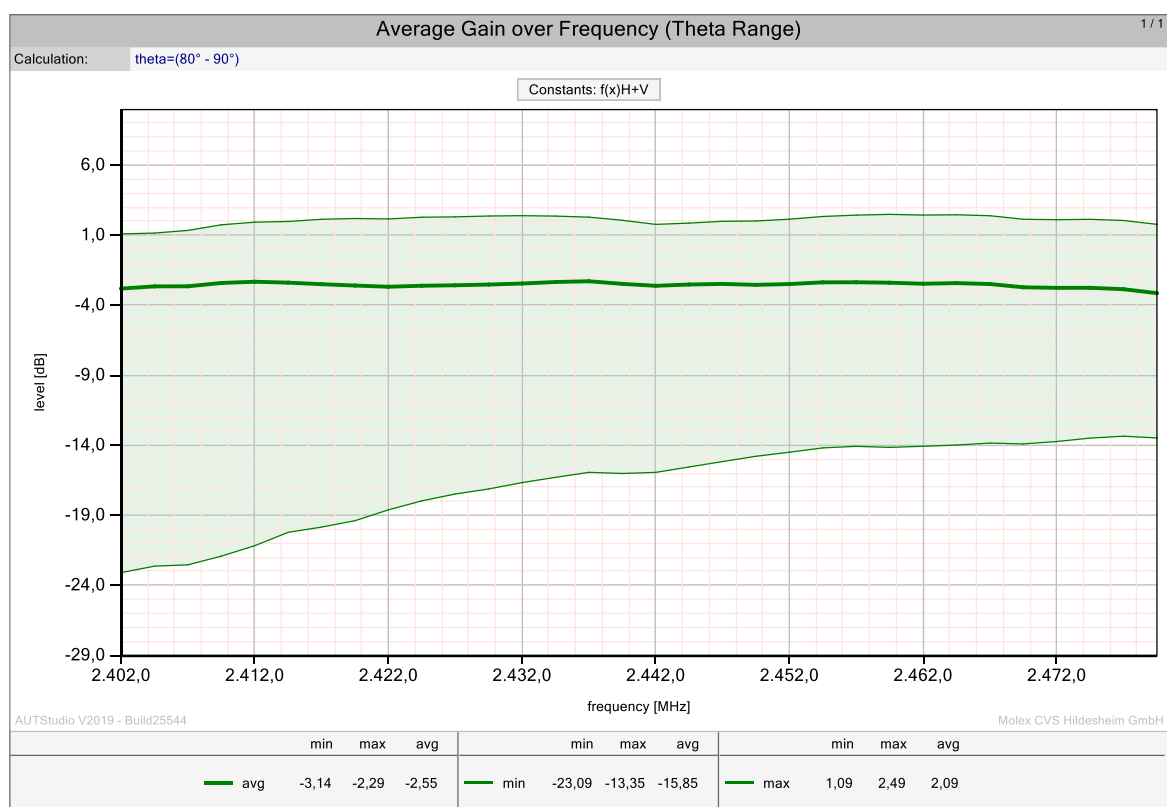
7.3.6 Radiation Pattern for Min-Max Gain @ frequency range 4400MHz - 5000MHz



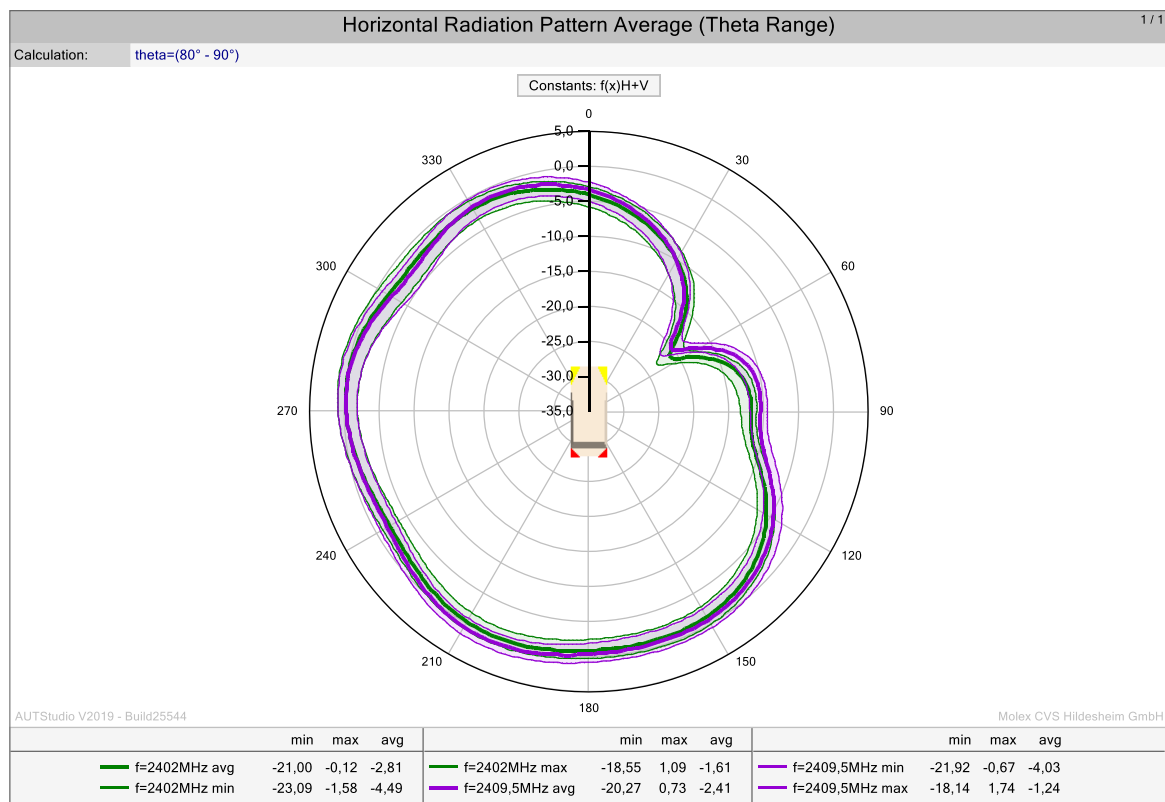
7.4 BTLE/WiFi 2.4 GHz

frequency band in MHz		partial average gain of freq. band in dBi (Theta=[80-90]°)			max. gain in partial area (Theta=[80-90]°)	min. gain in partial area (Theta=[80-90]°)	absolut maximum gain (Theta=[0-180]°)
begin	end	in freq. band in dBi	maximum	Minimum	in freq. band in dBi	in freq. band in dBi	in freq. band in dBi
2402	2410	-2,63	-2,41	-2,81	1,74	-23,09	2,34
2411	2475	-2,50	-2,29	-2,76	2,49	-21,92	3,37
2476	2480,9	-3,00	-2,86	-3,14	2,05	-13,48	2,82

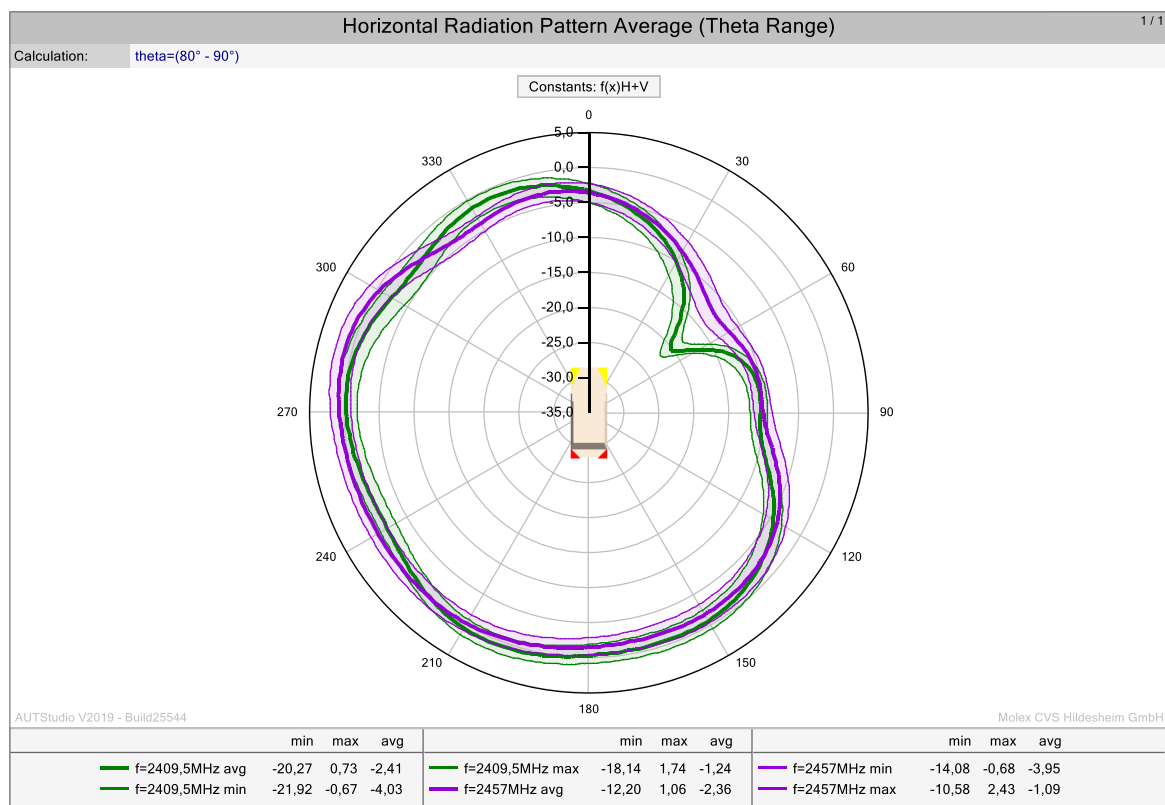
7.4.1 Average gain over Frequency



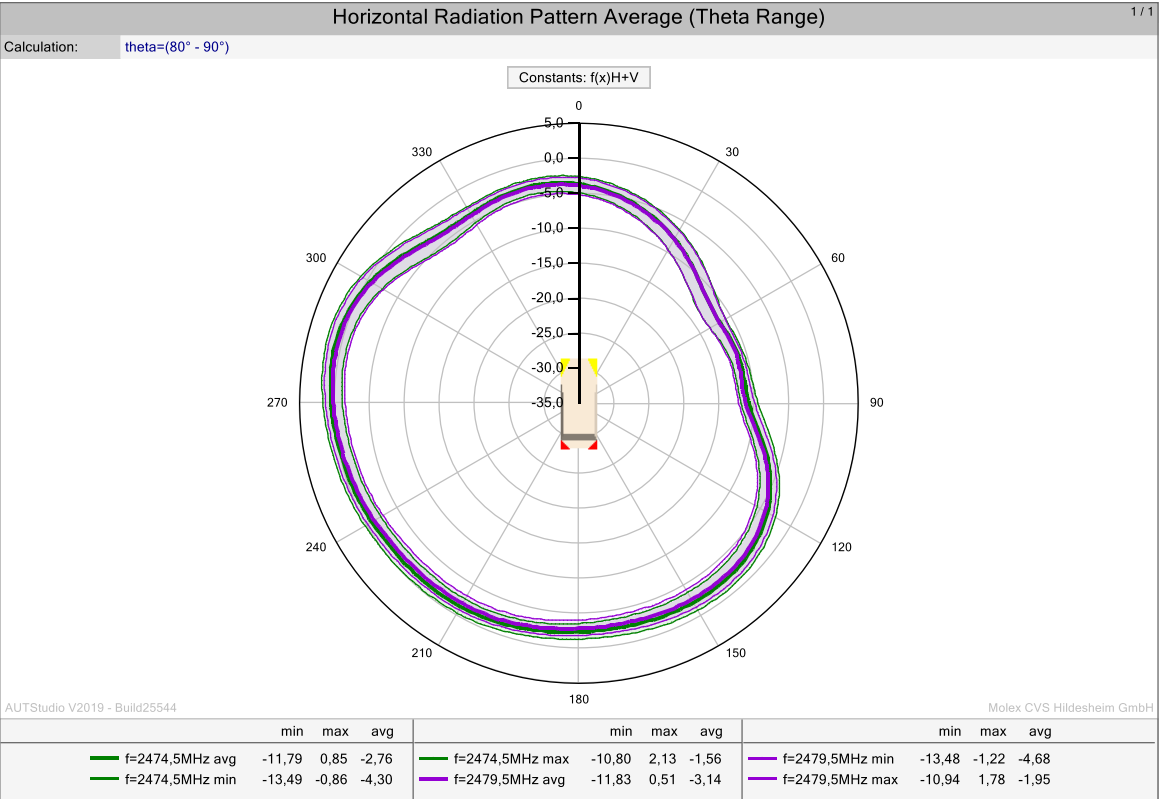
7.4.2 Radiation Pattern for Min-Max Gain @ frequency range 2402 MHz -2410 MHz



7.4.3 Radiation Pattern for Min-Max Gain @ frequency range 2411 MHz -2475 MHz



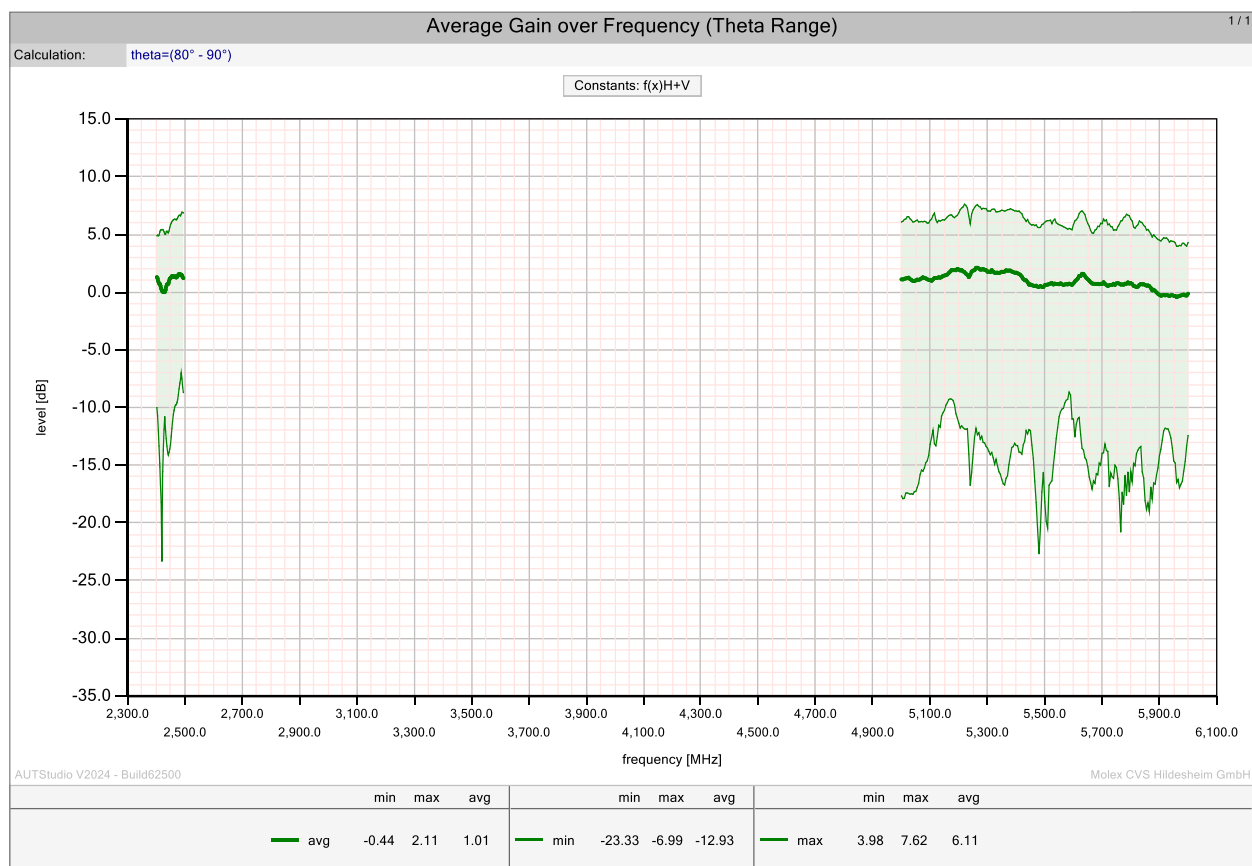
7.4.4 Radiation Pattern for Min-Max Gain @ frequency range 2476 MHz -2480,9 MHz



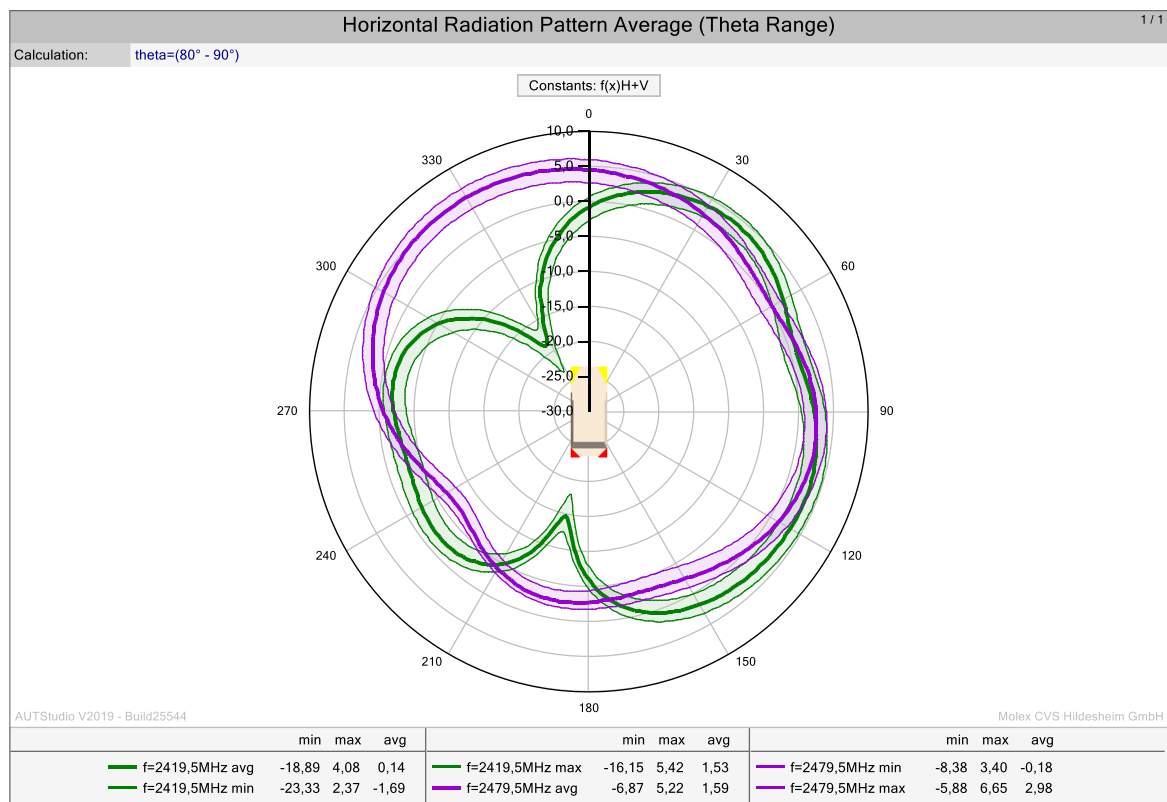
7.5 BTLE/WiFi Dual 2.4 & 5 GHz

frequency band in MHz		partial average gain of freq. band in dBi (Theta=[80-90]°)			max. gain in partial area (Theta=[80-90]°)	min. gain in partial area (Theta=[80-90]°)	absolut maximum gain (Theta=[0-180]°)
begin	end	in freq. band in dBi	maximum	Minimum	in freq. band in dBi	in freq. band in dBi	in freq. band in dBi
2402	2483,5	0,95	1,59	0,00	6,67	-23,33	7,45
5170	5835	1,15	2,09	0,40	7,62	-22,68	7,70

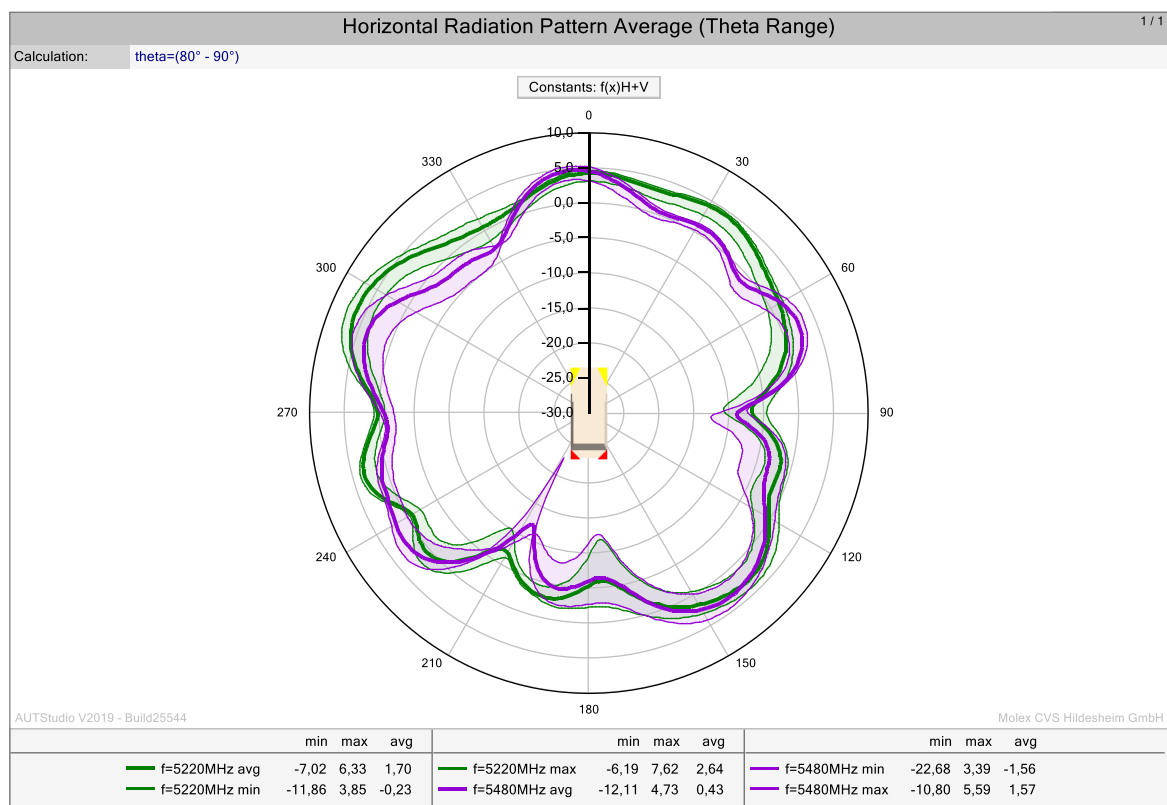
7.5.1 Average gain over Frequency



7.5.2 Radiation Pattern for Min-Max Gain @ frequency range 2402 MHz – 2483,5 MHz



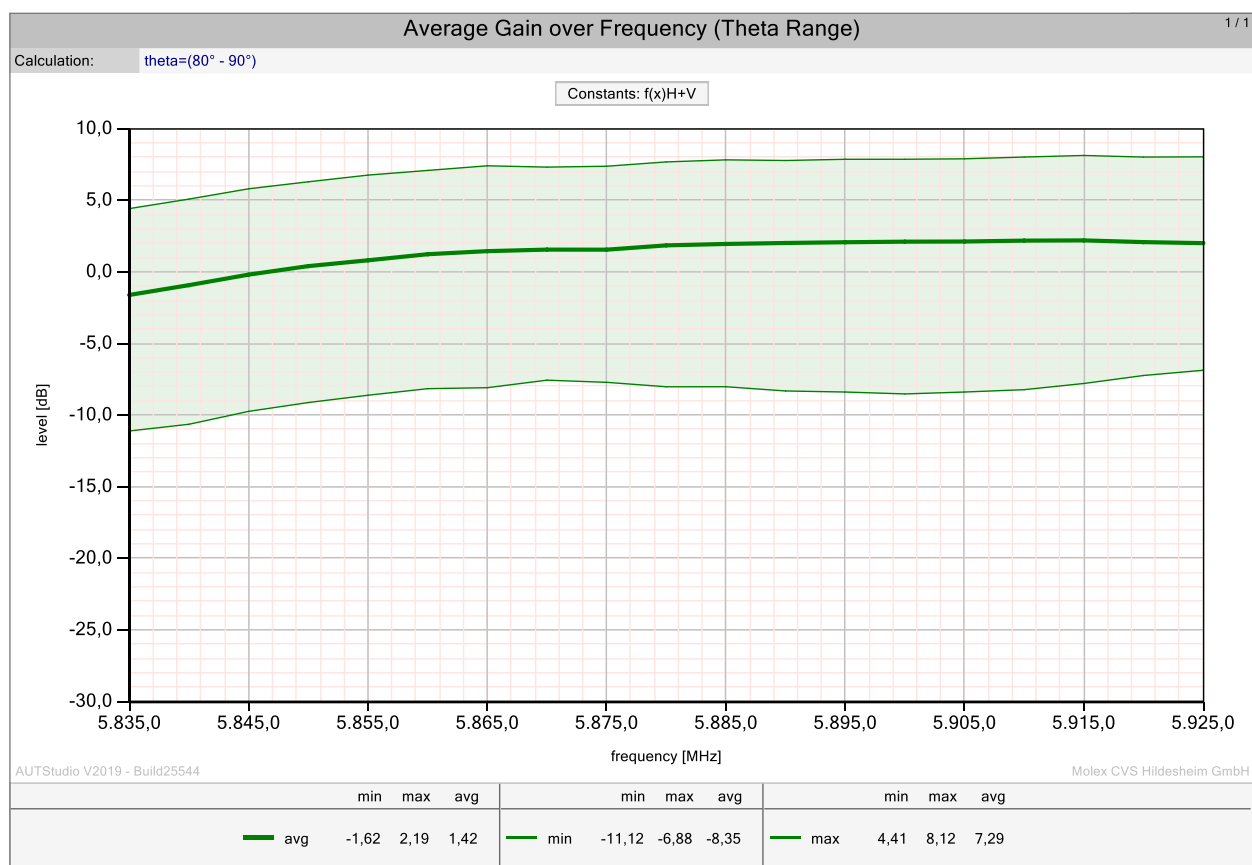
7.5.3 Radiation Pattern for Min-Max Gain @ frequency range 5170 MHz - 5831 MHz



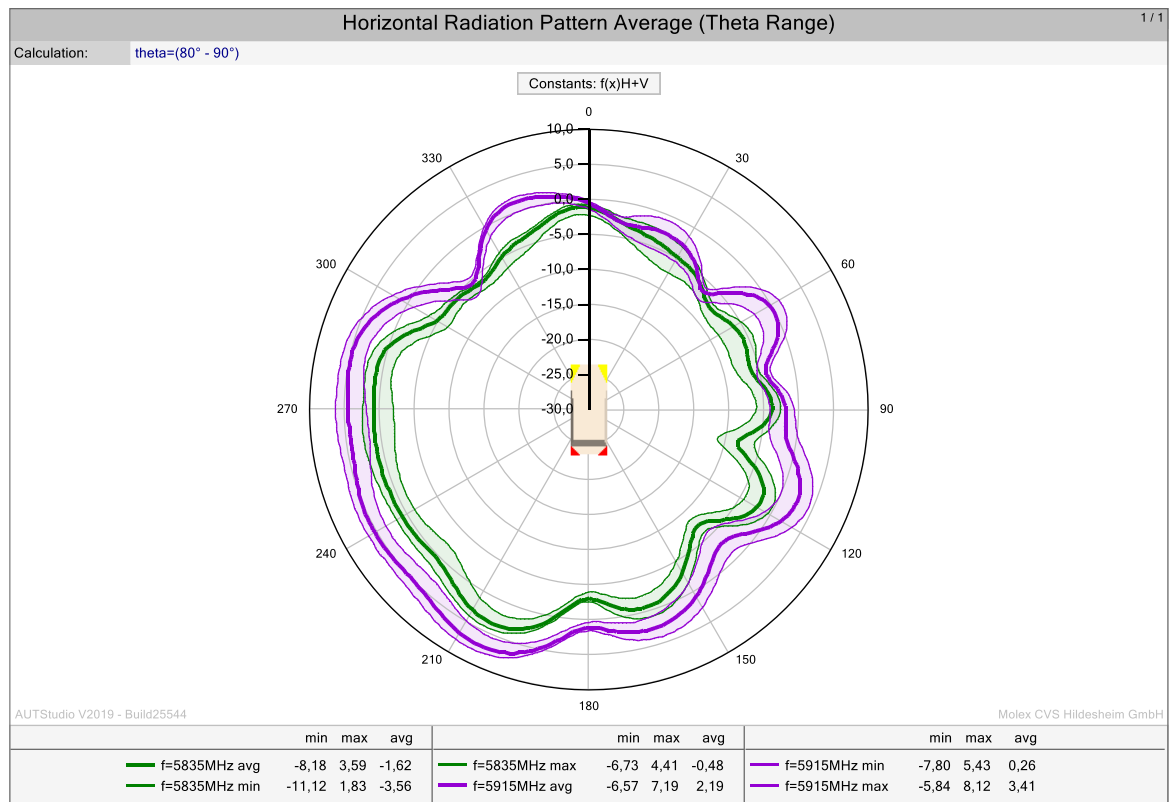
7.6 C2X

frequency band in MHz		partial average gain of freq. band in dBi (Theta=[80-90]°)			max. gain in partial area (Theta=[80-90]°)	min. gain in partial area (Theta=[80-90]°)	absolut maximum gain (Theta=[0-180]°)
begin	end	in freq. band in dBi	maximum	Minimum	in freq. band in dBi	in freq. band in dBi	in freq. band in dBi
5855	5925	1,42	2,19	-1,62	8,12	-11,12	8,12

7.6.1 Average gain over Frequency



7.6.2 Radiation Pattern for Min-Max Gain @ frequency range 5855 MHz - 5925 MHz



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