

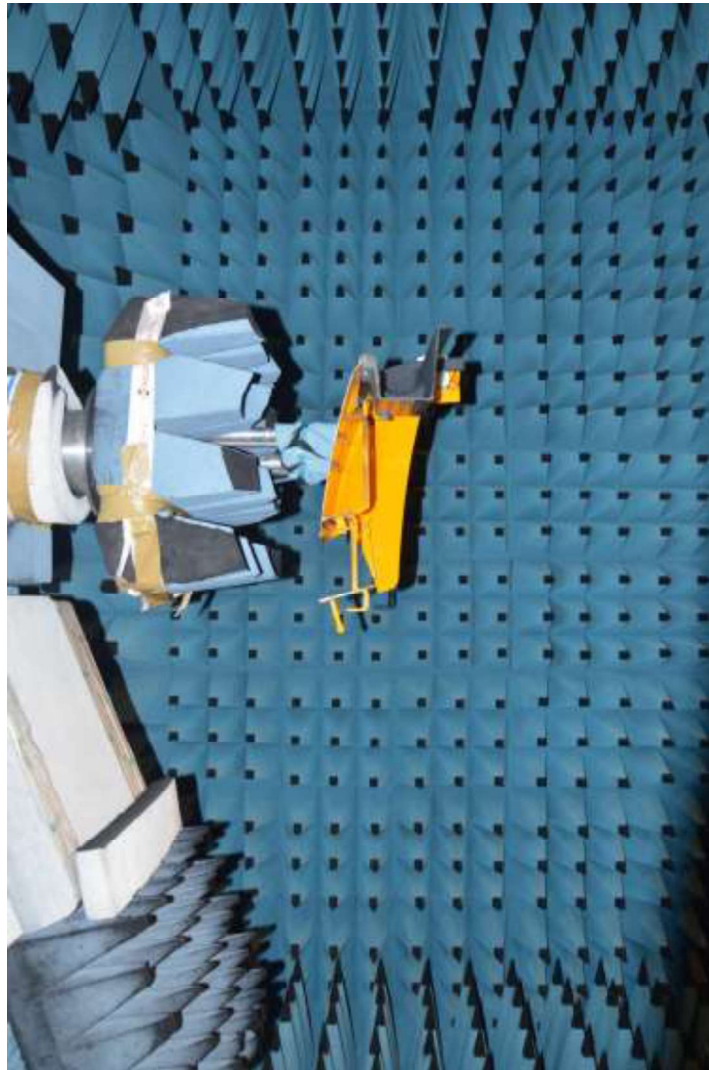


Figure 3-38 UWB Antenna with vehicle parts in position A (front)

3.4.1 Antenna Gain

File	NF_DRWG_UWB-Proto-A1_01.NSI				NF_DRWG_UWB-Proto-WagenteileVR_07.NSI				NF_DRWG_UWB-Proto-WagenteileHR_06.NSI			
			Gain [dBi] cable loss compensated	Efficiency			Gain [dBi] cable loss compensated	Efficiency			Gain [dBi] cable loss compensated	Efficiency
Frequency	MaxFF	Glo	Directivity		MaxFF	Glo	Directivity		MaxFF	Glo	Directivity	
3.0	2.58	4.96	0.96	40%	4.12	5.90	2.50	46%	7.46	8.82	5.83	50%
3.1	2.19	5.05	1.50	44%	3.69	6.06	3.01	50%	5.62	7.57	4.93	54%
3.2	1.93	5.09	1.93	48%	3.44	6.14	3.43	54%	4.75	6.95	4.74	60%
3.3	1.12	4.95	1.69	47%	3.07	6.46	3.64	52%	3.81	6.95	4.38	55%
3.4	1.52	5.22	2.15	49%	3.90	7.04	4.53	56%	2.21	5.79	2.84	51%
3.5	1.42	5.40	2.78	55%	3.38	6.73	4.73	63%	2.32	6.00	3.67	59%
3.6	1.09	5.47	2.92	56%	2.96	6.79	4.78	63%	2.68	6.68	4.51	61%
3.7	0.50	5.58	3.04	56%	2.42	6.89	4.96	64%	2.12	6.76	4.66	62%
3.8	-1.07	5.66	2.89	53%	0.80	6.83	4.76	62%	0.32	6.49	4.28	60%
3.9	-1.70	5.72	2.79	51%	-0.28	6.51	4.21	59%	0.11	6.83	4.60	60%
4.0	-1.62	5.76	2.83	51%	-0.36	6.50	4.09	57%	0.33	7.19	4.79	58%
4.1	-0.94	5.97	2.89	49%	0.16	6.62	3.99	55%	0.83	7.45	4.66	53%
4.2	-0.63	5.90	3.00	51%	0.24	6.35	3.88	57%	1.52	7.79	5.15	54%
4.3	-0.64	5.95	2.65	47%	-0.30	5.82	2.99	52%	1.62	7.90	4.91	50%
4.4	-1.16	6.06	2.34	43%	-0.93	5.85	2.57	47%	0.74	8.16	4.25	41%
4.5	-1.54	6.05	2.75	47%	-1.44	5.73	2.85	51%	1.20	9.07	5.49	44%
4.6	-1.55	5.88	2.63	47%	-1.16	5.89	3.02	52%	1.43	8.77	5.61	48%
4.7	-1.12	5.79	2.86	51%	-0.20	6.48	3.78	54%	0.25	7.03	4.23	52%
4.8	-1.39	5.72	3.13	55%	-0.53	6.31	3.99	59%	0.06	6.92	4.58	58%
4.9	-2.43	5.70	2.32	46%	-1.13	6.64	3.62	50%	-0.51	7.65	4.24	46%
5.0	-2.48	5.65	2.04	44%	-0.89	7.00	3.63	46%	-1.10	7.16	3.42	42%
5.1	-2.80	5.57	2.38	48%	-1.08	7.12	4.10	50%	-0.64	7.49	4.53	51%
5.2	-2.80	5.58	3.08	56%	-1.01	7.22	4.87	58%	-0.21	7.64	5.66	63%
5.3	-2.73	5.56	2.97	55%	-0.76	7.21	4.94	59%	0.57	8.43	6.27	61%
5.4	-3.95	5.62	2.44	48%	-2.32	7.04	4.07	50%	-1.58	7.84	4.81	50%
5.5	-4.47	5.78	1.84	40%	-2.98	7.16	3.34	41%	-2.48	7.28	3.83	45%
5.6	-3.64	5.75	1.80	40%	-1.99	7.32	3.44	41%	-1.37	7.21	4.07	48%
5.7	-3.46	5.59	2.33	47%	-1.67	7.20	4.11	49%	-0.93	7.38	4.86	56%
5.8	-4.08	5.55	2.36	48%	-2.14	7.11	4.30	52%	-1.36	7.54	5.07	57%
5.9	-4.96	5.55	1.66	41%	-3.11	7.12	3.52	44%	-2.14	7.77	4.48	47%
6.0	-5.87	5.64	1.64	40%	-4.23	7.08	3.28	42%	-3.25	7.86	4.25	44%
6.1	-6.24	5.49	1.84	43%	-4.61	6.91	3.47	45%	-3.73	7.51	4.35	48%
6.2	-5.28	5.57	2.32	47%	-3.95	6.59	3.64	51%	-2.69	7.35	4.90	57%
6.3	-4.97	5.76	2.72	50%	-4.01	6.41	3.68	53%	-2.74	7.08	4.95	61%
6.4	-5.21	5.88	2.81	49%	-4.08	6.70	3.95	53%	-3.41	7.04	4.61	57%
6.5	-5.11	6.03	2.59	45%	-3.59	7.16	4.11	50%	-3.06	7.14	4.64	56%
6.6	-5.82	5.93	2.53	46%	-4.10	7.18	4.25	51%	-3.46	7.02	4.88	61%
6.7	-6.36	5.89	2.86	50%	-4.50	7.28	4.71	55%	-4.22	6.91	4.99	64%
6.8	-6.08	6.26	3.38	51%	-5.07	6.83	4.39	57%	-4.70	6.87	4.75	61%
6.9	-5.59	6.60	3.52	49%	-4.98	6.85	4.13	53%	-4.90	6.83	4.21	55%
7.0	-5.41	6.70	3.62	49%	-4.10	7.59	4.92	54%	-4.73	6.88	4.29	55%

Table 3-1: Measured antenna gain and efficiency of the UWB antenna [left side, the UWB antenna without antenna housing, in the middle the UWB antenna with car parts in the position A, right side, the UWB antenna with car parts in the position B].

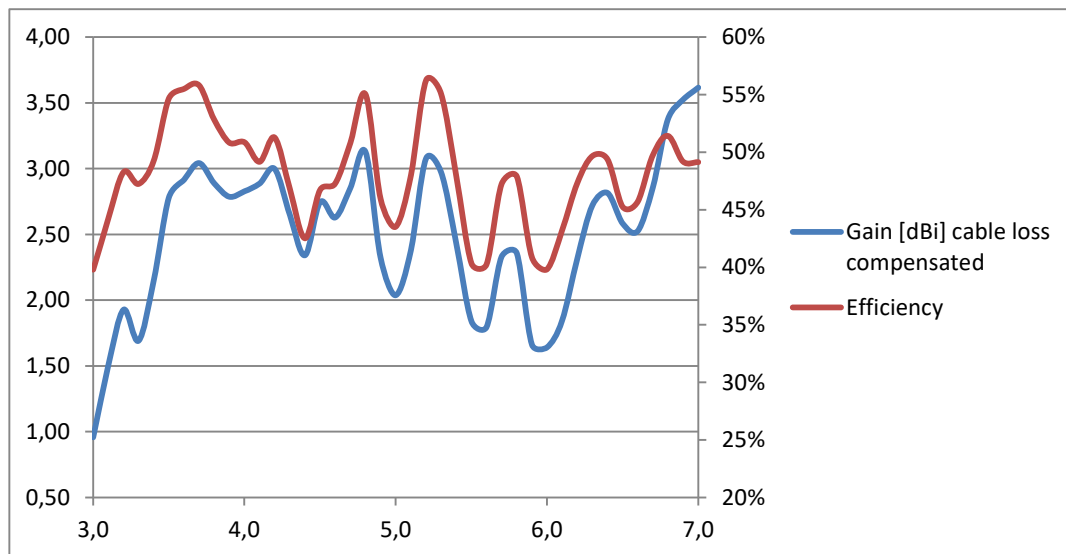


Figure 3-39: Antenna gain in dBi and efficiency for the UWB antennas without additional components.

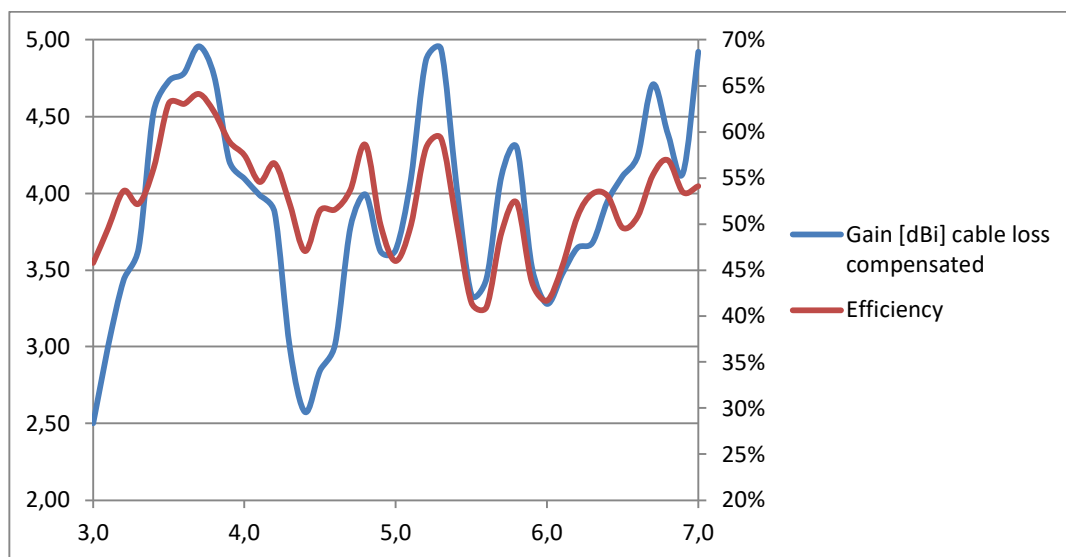


Figure 3-40: Antenna gain in dBi and efficiency for the UWB antennas with vehicle parts in position A.

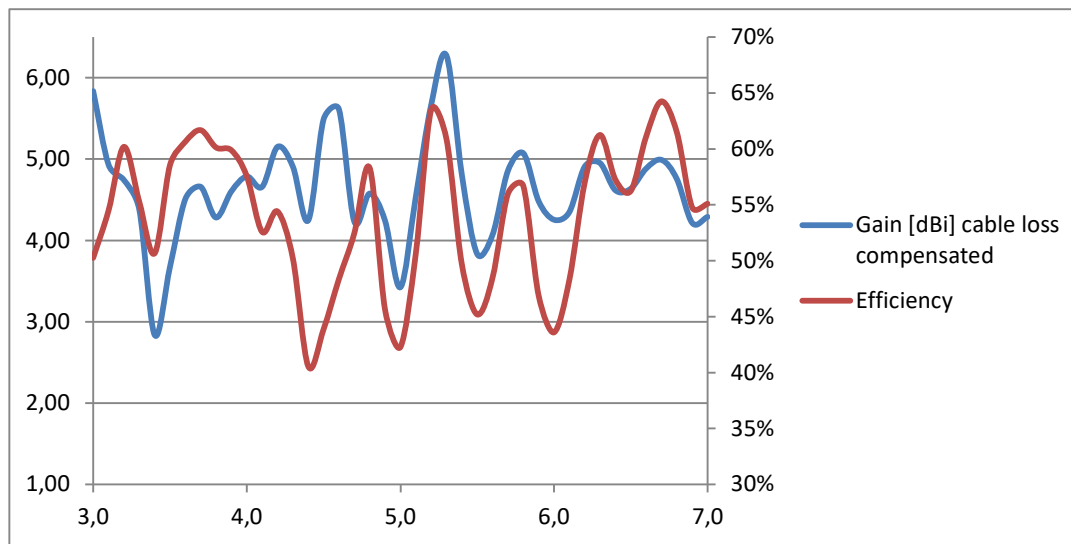


Figure 3-41: Antenna gain in dBi and efficiency for the UWB antennas with vehicle parts in position B.

3.4.2 Back side antenna with nearby vehicle components

Back side antenna measured realized gain pattern together with parts of the vehicle at the frequency 3.5 GHz is demonstrated.

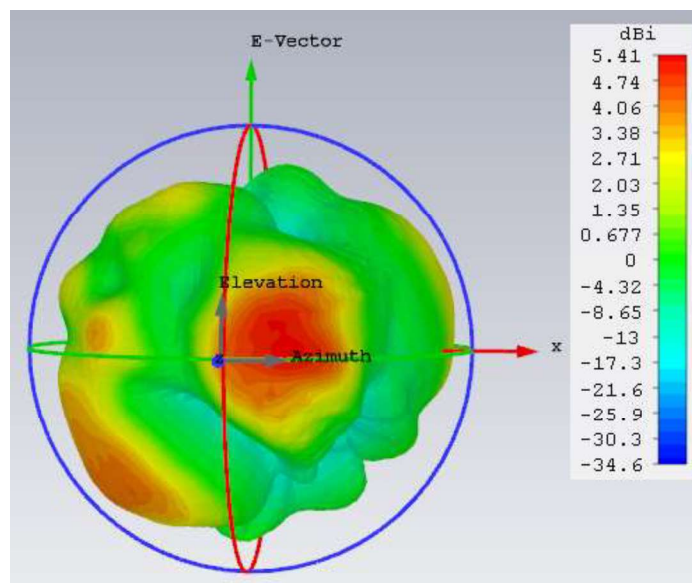


Figure 42: 3D Co-polarization measured realized gain at 3.5 GHz of the back side antenna, together with the vehicle parts.