

SIMATIC NET

Industrial Wireless LAN Performance data SCALANCE W700 802.11ax

Reference Manual

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Legal information

Warning notice system

This manual contains notices you have to observe in order to ensure your personal safety, as well as to prevent damage to property. The notices referring to your personal safety are highlighted in the manual by a safety alert symbol, notices referring only to property damage have no safety alert symbol. These notices shown below are graded according to the degree of danger.

DANGER

indicates that death or severe personal injury **will** result if proper precautions are not taken.

WARNING

indicates that death or severe personal injury **may** result if proper precautions are not taken.

CAUTION

indicates that minor personal injury can result if proper precautions are not taken.

NOTICE

indicates that property damage can result if proper precautions are not taken.

If more than one degree of danger is present, the warning notice representing the highest degree of danger will be used. A notice warning of injury to persons with a safety alert symbol may also include a warning relating to property damage.

Qualified Personnel

The product/system described in this documentation may be operated only by **personnel qualified** for the specific task in accordance with the relevant documentation, in particular its warning notices and safety instructions. Qualified personnel are those who, based on their training and experience, are capable of identifying risks and avoiding potential hazards when working with these products/systems.

Proper use of Siemens products

Note the following:

WARNING

Siemens products may only be used for the applications described in the catalog and in the relevant technical documentation. If products and components from other manufacturers are used, these must be recommended or approved by Siemens. Proper transport, storage, installation, assembly, commissioning, operation and maintenance are required to ensure that the products operate safely and without any problems. The permissible ambient conditions must be complied with. The information in the relevant documentation must be observed.

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Disclaimer of Liability

We have reviewed the contents of this publication to ensure consistency with the hardware and software described. Since variance cannot be precluded entirely, we cannot guarantee full consistency. However, the information in this publication is reviewed regularly and any necessary corrections are included in subsequent editions.

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Security information

Siemens provides products and solutions with industrial security functions that support the secure operation of plants, systems, machines and networks.

In order to protect plants, systems, machines and networks against cyber threats, it is necessary to implement – and continuously maintain – a holistic, state-of-the-art industrial security concept. Siemens' products and solutions constitute one element of such a concept.

Customers are responsible for preventing unauthorized access to their plants, systems, machines and networks. Such systems, machines and components should only be connected to an enterprise network or the internet if and to the extent such a connection is necessary and only when appropriate security measures (e.g. firewalls and/or network segmentation) are in place.

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Siemens' products and solutions undergo continuous development to make them more secure. Siemens strongly recommends that product updates are applied as soon as they are available and that the latest product versions are used. Use of product versions that are no longer supported, and failure to apply the latest updates may increase customer's exposure to cyber threats.

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<https://www.siemens.com/industrialsecurity> (<https://www.siemens.com/industrialsecurity>).

Frequency / modulation

Frequency

ETSI, USA, Canada

- 11b/g/n/ax ISM band: 2.412 GHz - 2.472 GHz
- 11a/n/ac/ax ISM band: 5.180 GHz - 5.825 GHz

Modulation

- 802.11a: OFDM (BPSK, QPSK, 16-QAM, 64-QAM)
- 802.11b: DSSS (BPSK, DQPSK, CCK)
- 802.11g: OFDM (BPSK, QPSK, 16-QAM, 64-QAM)
- 802.11n: OFDM (BPSK, QPSK, 16-QAM, 64-QAM)
- 802.11ac: OFDM (BPSK, QPSK, 16-QAM, 64-QAM, 128-QAM, 256-QAM)
- 802.11ax: OFDM (BPSK, QPSK, 16-QAM, 64-QAM, 128-QAM, 256-QAM, 1024-QAM)

Data transmission speed

2.1 IEEE 802.11abg

The following table shows the data transmission speeds with 802.11a, 802.11b and 802.11g.

Protocol	Transmission speed in Mbps
802.11a	6 9 12 18 24 36 48 54
802.11b	1 2 5,5 11
802.11g	6 9 12 18 24 36 48 54

All transmission types support the automatic fallback function.

2.2 IEEE 802.11n

The following table shows the data transmission speeds with 802.11n.

HT ⁽¹⁾ MCS index ⁽²⁾	Spatial streams	Transmission speed in Mbps			
		20 MHz channel		40 MHz channel	
		800 ns GI ⁽³⁾	400 ns GI ⁽³⁾	800 ns GI ⁽³⁾	400 ns GI ⁽³⁾
0	1	6,5	7,2	13,5	15,0
1	1	13,0	14,4	27,0	30,0
2	1	19,5	21,7	40,5	45,0
3	1	26,0	28,9	54,0	60,0
4	1	39,0	43,3	81,0	90,0
5	1	52,0	57,8	108,0	120,0
6	1	58,5	65,0	121,5	135,0
7	1	65,0	72,2	135,0	150,0
8	2	13,0	14,4	27,0	30,0

2.3 IEEE 802.11ac

HT ⁽¹⁾ MCS index ⁽²⁾	Spatial streams	Transmission speed in Mbps			
		20 MHz channel		40 MHz channel	
		800 ns GI ⁽³⁾	400 ns GI ⁽³⁾	800 ns GI ⁽³⁾	400 ns GI ⁽³⁾
9	2	26,0	28,9	54,0	60,0
10	2	39,0	43,3	81,0	90,0
11	2	52,0	57,8	108,0	120,0
12	2	78,0	86,7	162,0	180,0
13	2	104,0	115,6	216,0	240,0
14	2	117,0	130,0	243,0	270,0
15	2	130,0	144,4	270,0	300,0
16	3	19,5	21,7	40,5	45,0
17	3	39,0	43,3	81,0	90,0
18	3	58,5	65,0	121,5	135,0
19	3	78,0	86,7	162,0	180,0
20	3	117,0	130,7	243,0	270,0
21	3	156,0	173,3	324,0	360,0
22	3	175,5	195,0	364,5	405,0
23	3	195,0	216,7	405,0	450,0
24	4	26,0	28,9	54,0	60,0
25	4	52,0	57,8	108,0	120,0
26	4	78,0	86,7	162,0	180,0
27	4	104,0	115,6	216,0	240,0
28	4	156,0	173,3	324,0	360,0
29	4	208,0	231,1	432,0	480,0
30	4	234,0	260,0	486,0	540,0
31	4	260,0	288,9	540,0	600,0

⁽¹⁾ High Throughput data field

⁽²⁾ Modulation and Coding Scheme index

⁽³⁾ Guard Interval

All transmission types support the automatic fallback function.

2.3 IEEE 802.11ac

The following table shows the data transmission speeds with 802.11ac.

VHT ⁽¹⁾ MCS in- dex ⁽²⁾	Spa- tial strea ms	Transmission speed in Mbps							
		20 MHz channel		40 MHz channel		80 MHz channel		160 MHz channel	
		Guard interval		Guard interval		Guard interval		Guard interval	
		800 ns	400 ns	800 ns	400 ns	800 ns	400 ns	800 ns	400 ns
0	1	6,5	7,2	13,5	15,0	29,3	32,5	58,5	65
1	1	13,0	14,4	27,0	30,0	58,5	65,0	117	130
2	1	19,5	21,7	40,5	45,0	87,8	97,5	175,5	195

VHT ⁽¹⁾ MCS in- dex ⁽²⁾	Spa- tial strea ms	Transmission speed in Mbps							
		20 MHz channel		40 MHz channel		80 MHz channel		160 MHz channel	
		Guard interval		Guard interval		Guard interval		Guard interval	
		800 ns	400 ns	800 ns	400 ns	800 ns	400 ns	800 ns	400 ns
3	1	26,0	28,9	54,0	60,0	117,0	130,0	234	260
4	1	39,0	43,3	81,0	90,0	175,5	195,0	351	390
5	1	52,0	57,8	108,0	120,0	234,0	260,0	468	520
6	1	58,5	65,0	121,5	135,0	263,3	292,5	526,5	585
7	1	65,0	72,2	135,0	150,0	292,5	325,0	585	650
8	1	78,0	86,7	162,0	180,0	351,0	390,0	702	780
9	1	-	-	180,0	200,0	390,0	433,3	780	866,7
0	2	13,0	14,4	27,0	30,0	58,5	65,0	117	130
1	2	26,0	28,9	54,0	60,0	117,0	130,0	234	260
2	2	39,0	43,3	81,0	90,0	175,5	195,0	351	390
3	2	52,0	57,8	108,0	120,0	234,0	260,0	468	520
4	2	78,0	86,7	162,0	180,0	351,0	390,0	702	780
5	2	104,0	115,6	216,0	240,0	468,0	520,0	936	1040
6	2	117,0	130,0	243,0	270,0	526,5	585,0	1053	1170
7	2	130,0	144,4	270,0	300,0	585,0	650,0	1170	1300
8	2	156,0	173,3	324,0	360,0	702,0	780,0	1404	1560
9	2	-	-	360,0	400,0	780,0	866,7	1560	1733,3
0	3	19,5	21,7	40,5	45,0	87,8	97,5	175,5	195
1	3	39,0	43,3	81,0	90,0	175,5	195,0	351	390
2	3	58,5	65,0	121,5	135,0	263,3	292,5	526,5	585
3	3	78,0	86,7	162,0	180,0	351,0	390,0	702	780
4	3	117,0	130,7	243,0	270,0	526,5	585,0	1053	1170
5	3	156,0	173,3	324,0	360,0	702,0	780,0	1404	1560
6	3	175,5	195,0	364,5	405,0	-	-	1579,5	1755
7	3	195,0	216,7	405,0	450,0	877,5	975,0	1755	1950
8	3	234,0	260,0	486,0	540,0	1053,0	1170,0	2106	2340
9	3	260,0	288,9	540,0	600,0	1170,0	1300,0	-	-
0	4	26,0	28,9	54,0	60,0	117,0	130,0	234	260
1	4	52,0	57,8	108,0	120,0	234,0	260,0	468	520
2	4	78,0	86,7	162,0	180,0	351,0	390,0	702	780
3	4	104,0	115,6	216,0	240,0	468,0	520,0	936	1040
4	4	156,0	173,3	324,0	360,0	702,0	780,0	1404	1560
5	4	208,0	231,1	432,0	480,0	936,0	1040,0	1872	2080
6	4	234,0	260,0	486,0	540,0	1053,0	1170,0	2106	2340
7	4	260,0	288,9	540,0	600,0	1170,0	1300,0	2340	2600
8	4	312,0	346,7	648,0	720,0	1404,0	1560,0	2808	3120
9	4	-	-	720,0	800,0	1560,0	1733,3	3120	3466,7

⁽¹⁾ Very High Throughput data field

⁽²⁾ Modulation and Coding Scheme index

2.4 IEEE 802.11ax

All transmission types support the automatic fallback function.

2.4 IEEE 802.11ax

The following table shows the data transmission speeds with 802.11ax.

HE ⁽¹⁾ MCS in- dex ⁽²⁾	Spatial streams	Transmission speed in Mbps								
		20 MHz channel			40 MHz channel			80 MHz channel		
		Guard interval			Guard interval			Guard interval		
		0.8 μ s	1.6 μ s	3.2 μ s	0.8 μ s	1.6 μ s	3.2 μ s	0.8 μ s	1.6 μ s	3.2 μ s
0	1	8.6	8.1	7.3	17.2	16.3	14.6	36.0	34.0	44012.0
1	1	17.2	16.3	14.6	34.4	32.5	29.3	72.1	68.1	61.3
2	1	25.8	24.4	21.9	51.6	48.8	43.9	108.1	102.1	91.9
3	1	34.4	32.5	43919.0	68.8	65.0	58.5	144.1	136.1	122.5
4	1	51.6	48.8	43.9	103.2	97.5	87.8	216.2	204.2	183.8
5	1	68.8	65.0	58.5	137.6	130.0	117.0	288.2	272.2	245.0
6	1	77.4	73.1	65.8	154.9	146.3	131.6	324.3	306.3	275.6
7	1	86.0	81.3	73.1	172.1	162.5	146.3	360.3	340.3	306.3
8	1	103.2	97.5	87.8	206.5	195.0	175.5	432.4	408.3	367.5
9	1	114.7	108.3	97.5	229.4	216.7	195.0	480.4	453.7	408.3
10	1	129.0	121.9	109.7	258.1	243.8	219.4	540.4	510.4	459.4
11	1	143.4	135.4	121.9	286.8	270.8	243.8	600.5	567.1	510.4
0	2	17.2	16.3	14.6	34.4	32.5	29.3	72.1	68.1	61.3
1	2	34.4	32.5	43919.0	68.8	65.0	58.5	144.1	136.1	122.5
2	2	51.6	48.8	43.9	103.2	97.5	87.8	216.2	204.2	183.8
3	2	68.8	65.0	58.5	137.6	130.0	117.0	288.2	272.2	245.0
4	2	103.2	97.5	87.8	206.5	195.0	175.5	432.4	408.3	367.5
5	2	137.6	130.0	117.0	275.3	260.0	234.0	576.5	544.4	490.0
6	2	154.9	146.3	131.6	309.7	292.5	263.3	648.5	612.5	551.3
7	2	172.1	162.5	146.3	344.1	325.0	292.5	720.6	680.6	612.5
8	2	206.5	195.0	175.5	412.9	390.0	351.0	864.7	816.7	735.0
9	2	229.4	216.7	195.0	458.8	433.3	390.0	960.8	907.4	816.7
10	2	258.1	243.8	219.4	516.2	487.5	438.8	1080.9	1020.8	918.8
11	2	286.8	270.8	243.8	573.5	541.7	487.5	1201.0	1134.3	1020.8

⁽¹⁾ High Efficiency data field

⁽²⁾ Modulation and Coding Scheme index

All transmission types support the automatic fallback function.

Note

For 802.11ax and OFDMA the data rates can be calculated for resource units of different sizes. You can find the table for the OFDMA mode on the documentation CD supplied with the product.

Transmit power

3.1 Frequency band 2.4 GHz

The table below shows the maximum values that are possible for each sending antenna connector.

- Tolerance ± 2 dBm

Protocol	Transmission speed	Max. transmit power (dBm)			Receiver sensitivity (dBm)
		2.412 GHz	2.442 GHz	2.472 GHz	2.442 GHz
802.11g	6 Mbit/s	20	20	20	-92
	12 Mbit/s	20	20	20	-89
	54 Mbit/s	20	20	20	-75
802.11n HT20	MCS 0	20	20	20	-90
	MCS 7	20	20	20	-73
802.11n HT40	MCS 0	20	20	20	-88
	MCS 7	20	20	20	-70
802.11ax HE20	MCS 0	20	20	20	-90
	MCS 7	20	20	20	-62
802.11ax HE40	MCS 0	20	20	20	-88
	MCS 7	20	20	20	-60

3.2 Frequency band 5 GHz

The table below shows the maximum values that are possible for each sending antenna connector.

Tolerance ± 2 dBm

Max. conducted power

The value is the summed transmit power of all active antenna connections.

The calculation is made according to the following scheme:

- 1 antenna connection
max. transmit power = Max. conducted power
- 2 antenna connections
max. transmit power + 3 dBm = Max. conducted power

3.2 Frequency band 5 GHz

Protocol	Transmission speed	Max. transmit power (dBm)			Receiver sensitivity (dBm)
		5.18 GHz	5.5 GHz	5.745 GHz	5.5 GHz
802.11a	6 Mbit/s	20	20	20	-90
	12 Mbit/s	20	20	20	-87
	54 Mbit/s	20	20	17	-74
802.11n HT20	MCS0	20	20	20	-90
	MCS7	20	20	17	-71
802.11n HT40	MCS0	20	20	20	-87
	MCS7	20	20	17	-68
802.11ac VHT20	MCS0	20	20	20	-90
	MCS8	20	20	16	-69
802.11ac VHT40	MCS0	20	20	20	-87
	MCS9	20	19	16	-65
802.11ac VHT80	MCS0	20	20	20	-85
	MCS9	20	18	16	-60
802.11ax HE20	MCS0	20	20	20	-90
	MCS11	20	18	15	-60
802.11ax HE40	MCS0	20	20	20	-87
	MCS11	20	18	15	-57
802.11ax HE80	MCS0	20	20	20	-84
	MCS11	20	17	15	-51