



RF Exposure evaluation

Applicant Data: SIEMENS AG
Östliche Rheinbrückenstr. 50
76187 Karlsruhe
Germany

Product Data: Industrial WLAN Access Point / Client
SCALANCE W700 / MSAX
MSAX-W1-RJ-E2 &
MSAX-W1-RJ-E2-NO
Siemens

WLAN 2,4 GHz and 5 GHz

mobile 20cm

General Population/Uncontrolled

FCC ID: LYHMSAXV1

IC: 267AA-MSAXV1

Standards
OET Bulletin 65 Edition 97-01 August 1997
RSS-102 Issue 5 – March 2015

FCC CFR 47, Part 2.1091: Radiofrequency radiation exposure evaluation: mobile devices.
FCC CFR 47, Part 2.1307: Actions that may have a significant environmental effect, for which Environmental Assessments (EAs) must be prepared.
FCC CFR 47, Part 2.1310: Radiofrequency radiation exposure limits.



RF Exposure evaluation

Maximum Permissible Exposure

As specified in Chapter e(1) of 47 CFR Part 1.1310 – Limits for Maximum Permissible Exposure (MPE)

Table (i) - Limits for Occupational/ Controlled Exposure

Frequency range (MHz)	Power density (mW/cm ²)
300 – 1500	f/300
1500 - 100000	5.0

Table (ii) – Limits for General Population/ Uncontrolled Exposure

Frequency range (MHz)	Power density (mW/cm ²)
300 – 1500	f/1500
1500 - 100000	1.0

As specified in Chapter 4 of RSS-102, Issue 5 – Exposure Limits

Table 4 - RF Field Strength Limits for Devices Used by the General Public (Uncontrolled Environment)

Frequency range (MHz)	Power density (W/m ²)	Power density (mW/cm ²)
300-6000	0.02619 f ^{0.6834}	mW/cm ² =W/m ² *0.1
6000-150000	10	1.0

Table 6 – RF Field Strength Limits for Controlled Use Devices (Controlled Environment)

Frequency range (MHz)	Power density (W/m ²)	Power density (mW/cm ²)
100-6000	0.6455 f ^{0.5}	mW/cm ² =W/m ² *0.1
6000-150000	50	1.0

RF Exposure evaluation

Calculations

Equation OET bulletin 65, page 18, edition 97-01:

$$S = P * G / (4 * \pi * R^2)$$

$$R = \sqrt{ (P * G / S_{lim} * 4 * \pi) }$$

$$G = S_{lim} * 4 * \pi * R^2 / P$$

Where:

S = power density (mW/cm²)

P = power input to the antenna (mW)

G = power gain of the antenna (mW)

R = distance to the centre of radiation of the antenna (cm)

S_{lim} = FCC / IC Limit (mW/cm²)

Simultaneous Transmission Considerations

The calculation below is used to consider situations in which simultaneous exposure to fields of different frequencies occur. The calculation is performed by the sum of each relative exposure for each equipment according to the following criteria.

$$\sum_{1}^N \frac{S_{eqn}}{S_{Limn}} = \frac{S_{eq1}}{S_{Lim1}} + \frac{S_{eq2}}{S_{Lim2}} + \dots + \frac{S_{eqN}}{S_{LimN}} \leq 1$$

Where:

S_{eq} = S = power density (mW/cm²)

S_{lim} = FCC / IC Limit (mW/cm²)



RF Exposure evaluation

<9	B1-802.11ac40	5180 - 5240	9	7,9433	19,75	94,42	28,75	749,98	0,1492	1,0000	0,1492	0,8508
<9	B2A-802.11ac40	5270 - 5310	9	7,9433	15,86	38,54	24,86	306,14	0,0609	1,0000	0,0609	0,9391
<9	B2C-802.11ac40	5510 - 5670	9	7,9433	16,33	42,97	25,33	341,29	0,0679	1,0000	0,0679	0,9321
<9	B2C+3-802.11ac	5710	9	7,9433	16,24	42,04	25,24	333,95	0,0664	1,0000	0,0664	0,9336
<9	B3-802.11ac40	5745 - 5825	9	7,9433	21,92	155,74	30,92	1237,09	0,2461	1,0000	0,2461	0,7539
<9	B1-802.11ac80	5210	9	7,9433	15,70	37,14	24,70	294,99	0,0587	1,0000	0,0587	0,9413
<9	B3-802.11ac80	5775	9	7,9433	24,44	277,97	33,44	2208,00	0,4393	1,0000	0,4393	0,5607
<9	B1-802.11ax20	5180 - 5240	9	7,9433	17,99	62,96	26,99	500,08	0,0995	1,0000	0,0995	0,9005
<9	B2A-802.11ax20	5260 - 5320	9	7,9433	17,86	61,09	26,86	485,29	0,0965	1,0000	0,0965	0,9035
<9	B2C-802.11ax20	5500 - 5700	9	7,9433	18,05	63,80	27,05	506,76	0,1008	1,0000	0,1008	0,8992
<9	B2C+3-802.11ax	5720	9	7,9433	17,86	61,09	26,86	485,29	0,0965	1,0000	0,0965	0,9035
<9	B3-802.11ax20	5745 - 5825	9	7,9433	20,43	110,32	29,43	876,31	0,1743	1,0000	0,1743	0,8257
<9	B1-802.11ax40	5180 - 5240	9	7,9433	18,93	78,18	27,93	621,04	0,1236	1,0000	0,1236	0,8764
<9	B2A-802.11ax40	5270 - 5310	9	7,9433	15,49	35,43	24,49	281,42	0,0560	1,0000	0,0560	0,9440
<9	B2C-802.11ax40	5510 - 5670	9	7,9433	15,87	38,63	24,87	306,84	0,0610	1,0000	0,0610	0,9390
<9	B2C+3-802.11ax	5710	9	7,9433	15,78	37,80	24,78	300,28	0,0597	1,0000	0,0597	0,9403
<9	B3-802.11ax40	5745 - 5825	9	7,9433	21,07	127,81	30,07	1015,22	0,2020	1,0000	0,2020	0,7980
<9	B1-802.11ax80	5210	9	7,9433	15,48	35,29	24,48	280,35	0,0558	1,0000	0,0558	0,9442
<9	B3-802.11ax80	5775	9	7,9433	19,23	83,73	28,23	665,12	0,1323	1,0000	0,1323	0,8677
<16/15,4	B1-802.11a	5180 - 5240	16	39,8107	11,84	15,29	27,84	608,70	0,1211	1,0000	0,1211	0,8789
<16/15,4	B2A-802.11a	5260 - 5320	16	39,8107	11,81	15,18	27,81	604,30	0,1202	1,0000	0,1202	0,8798
<16/15,4	B2C-802.11a	5500 - 5700	16	39,8107	11,34	13,61	27,34	542,00	0,1078	1,0000	0,1078	0,8922
<16/15,4	B2C+3-802.11a	5720	16	39,8107	11,25	13,32	27,25	530,33	0,1055	1,0000	0,1055	0,8945
<16/15,4	B3-802.11a	5745 - 5825	16	39,8107	18,52	71,09	34,52	2830,09	0,5630	1,0000	0,5630	0,4370
<16/15,4	B1-802.11n20	5180 - 5240	16	39,8107	11,77	15,02	27,77	598,08	0,1190	1,0000	0,1190	0,8810
<16/15,4	B2A-802.11n20	5260 - 5320	16	39,8107	12,10	16,23	28,10	646,13	0,1285	1,0000	0,1285	0,8715
<16/15,4	B2C-802.11n20	5500 - 5700	16	39,8107	11,41	13,85	27,41	551,37	0,1097	1,0000	0,1097	0,8903
<16/15,4	B2C+3-802.11n2	5720	16	39,8107	11,32	13,54	27,32	539,01	0,1072	1,0000	0,1072	0,8928
<16/15,4	B3-802.11n20	5745 - 5825	16	39,8107	18,32	67,85	34,32	2701,28	0,5374	1,0000	0,5374	0,4626
<16/15,4	B1-802.11n40	5180 - 5240	16	39,8107	12,41	17,40	28,41	692,74	0,1378	1,0000	0,1378	0,8622
<16/15,4	B2A-802.11n40	5270 - 5310	16	39,8107	11,43	13,91	27,43	553,92	0,1102	1,0000	0,1102	0,8898
<16/15,4	B2C-802.11n40	5510 - 5670	16	39,8107	11,25	13,32	27,25	530,33	0,1055	1,0000	0,1055	0,8945
<16/15,4	B2C+3-802.11n4	5710	16	39,8107	11,53	14,22	27,53	566,11	0,1126	1,0000	0,1126	0,8874
<16/15,4	B3-802.11n40	5745 - 5825	16	39,8107	19,41	87,37	35,41	3478,16	0,6920	1,0000	0,6920	0,3080
<16/15,4	B1-802.11ac20	5180 - 5240	16	39,8107	11,37	13,69	27,37	545,16	0,1085	1,0000	0,1085	0,8915
<16/15,4	B2A-802.11ac20	5260 - 5320	16	39,8107	11,77	15,02	27,77	598,08	0,1190	1,0000	0,1190	0,8810
<16/15,4	B2C-802.11ac20	5500 - 5700	16	39,8107	11,10	12,89	27,10	513,25	0,1021	1,0000	0,1021	0,8979
<16/15,4	B2C+3-802.11ac	5720	16	39,8107	10,91	12,34	26,91	491,30	0,0977	1,0000	0,0977	0,9023
<16/15,4	B3-802.11ac20	5745 - 5825	16	39,8107	17,93	62,02	33,93	2469,22	0,4912	1,0000	0,4912	0,5088
<16/15,4	B1-802.11ac40	5180 - 5240	16	39,8107	12,38	17,30	28,38	688,57	0,1370	1,0000	0,1370	0,8630
<16/15,4	B2A-802.11ac40	5270 - 5310	16	39,8107	11,33	13,58	27,33	540,51	0,1075	1,0000	0,1075	0,8925
<16/15,4	B2C-802.11ac40	5510 - 5670	16	39,8107	11,33	13,58	27,33	540,51	0,1075	1,0000	0,1075	0,8925
<16/15,4	B2C+3-802.11ac	5710	16	39,8107	11,33	13,58	27,33	540,51	0,1075	1,0000	0,1075	0,8925
<16/15,4	B3-802.11ac40	5745 - 5825	16	39,8107	19,37	86,55	35,37	3445,48	0,6855	1,0000	0,6855	0,3145
<16/15,4	B1-802.11ac80	5210	16	39,8107	12,03	15,97	28,03	635,62	0,1265	1,0000	0,1265	0,8735
<16/15,4	B3-802.11ac80	5775	16	39,8107	18,52	71,09	34,52	2830,09	0,5630	1,0000	0,5630	0,4370
<16/15,4	B1-802.11ax20	5180 - 5240	16	39,8107	11,43	13,90	27,43	553,53	0,1101	1,0000	0,1101	0,8899
<16/15,4	B2A-802.11ax20	5260 - 5320	16	39,8107	11,47	14,02	27,47	558,21	0,1111	1,0000	0,1111	0,8889
<16/15,4	B2C-802.11ax20	5500 - 5700	16	39,8107	10,81	12,05	26,81	479,73	0,0954	1,0000	0,0954	0,9046
<16/15,4	B2C+3-802.11ax	5720	16	39,8107	10,53	11,29	26,53	449,57	0,0894	1,0000	0,0894	0,9106
<16/15,4	B3-802.11ax20	5745 - 5825	16	39,8107	17,99	62,96	33,99	2506,34	0,4986	1,0000	0,4986	0,5014
<16/15,4	B1-802.11ax40	5180 - 5240	16	39,8107	11,79	15,09	27,79	600,56	0,1195	1,0000	0,1195	0,8805
<16/15,4	B2A-802.11ax40	5270 - 5310	16	39,8107	11,08	12,82	27,08	510,53	0,1016	1,0000	0,1016	0,8984
<16/15,4	B2C-802.11ax40	5510 - 5670	16	39,8107	10,89	12,28	26,89	488,92	0,0973	1,0000	0,0973	0,9027
<16/15,4	B2C+3-802.11ax	5710	16	39,8107	10,99	12,55	26,99	499,61	0,0994	1,0000	0,0994	0,9006
<16/15,4	B3-802.11ax40	5745 - 5825	16	39,8107	18,65	73,33	34,65	2919,31	0,5808	1,0000	0,5808	0,4192
<16/15,4	B1-802.11ax80	5210	16	39,8107	11,82	15,20	27,82	605,17	0,1204	1,0000	0,1204	0,8796
<16/15,4	B3-802.11ax80	5775	16	39,8107	18,29	67,47	34,29	2685,96	0,5344	1,0000	0,5344	0,4656

Note 1: only worst-case values are listed in the table above

Note 2: the duty cycle is included in the output power

Simultaneous (if applicable):

	WLAN 2,4 GHz	WLAN 5 GHz
(Seq / S _{lim})	0.1039	0.6920
Sum	0.7959	
Limit	1	
Conclusion	passed	



RF Exposure evaluation

<9	B1-802.11ac40	5180	9	7.9433	11,53	14,22	20,53	112,95	0,0225	0,9047	0,0248	0,8822
<9	B2A-802.11ac40	5270	9	7.9433	15,86	38,54	24,86	306,14	0,0609	0,9154	0,0665	0,8545
<9	B2C-802.11ac40	5510	9	7.9433	16,33	42,97	25,33	341,29	0,0679	0,9437	0,0719	0,8758
<9	B2C+3-802.11ac	5710	9	7.9433	16,24	42,04	25,24	333,95	0,0664	0,9670	0,0687	0,9005
<9	B3-802.11ac40	5745	9	7.9433	21,92	155,74	30,92	1237,09	0,2461	0,9710	0,2535	0,7249
<9	B1-802.11ac80	5210	9	7.9433	11,09	12,86	20,09	102,14	0,0203	0,9083	0,0224	0,8880
<9	B3-802.11ac80	5775	9	7.9433	24,44	277,97	33,44	2208,00	0,4393	0,9745	0,4508	0,5352
<9	B1-802.11ax20	5180	9	7.9433	10,78	11,96	19,78	94,96	0,0189	0,9047	0,0209	0,8858
<9	B2A-802.11ax20	5260	9	7.9433	17,86	61,09	26,86	485,29	0,0965	0,9142	0,1056	0,8177
<9	B2C-802.11ax20	5500	9	7.9433	18,05	63,80	27,05	506,76	0,1008	0,9425	0,1070	0,8417
<9	B2C+3-802.11ax	5720	9	7.9433	17,86	61,09	26,86	485,29	0,0965	0,9681	0,0997	0,8716
<9	B3-802.11ax20	5745	9	7.9433	20,43	110,32	29,43	876,31	0,1743	0,9710	0,1795	0,7967
<9	B1-802.11ax40	5180	9	7.9433	10,95	12,45	19,95	98,86	0,0197	0,9047	0,0217	0,8850
<9	B2A-802.11ax40	5270	9	7.9433	15,49	35,43	24,49	281,42	0,0560	0,9154	0,0612	0,8594
<9	B2C-802.11ax40	5510	9	7.9433	15,87	38,63	24,87	306,84	0,0610	0,9437	0,0647	0,8827
<9	B2C+3-802.11ax	5710	9	7.9433	15,78	37,80	24,78	300,28	0,0597	0,9670	0,0618	0,9072
<9	B3-802.11ax40	5745	9	7.9433	21,07	127,81	30,07	1015,22	0,2020	0,9710	0,2080	0,7691
<9	B1-802.11ax80	5210	9	7.9433	10,88	12,25	19,88	97,29	0,0194	0,9083	0,0213	0,8889
<9	B3-802.11ax80	5775	9	7.9433	19,23	83,73	28,23	665,12	0,1323	0,9745	0,1358	0,8422
<16/15,4	B1-802.11a	5180	16	39,8107	3,57	2,28	19,57	90,61	0,0180	0,9047	0,0199	0,8867
<16/15,4	B2A-802.11a	5260	16	39,8107	11,81	15,18	27,81	604,30	0,1202	0,9142	0,1315	0,7940
<16/15,4	B2C-802.11a	5500	16	39,8107	11,34	13,61	27,34	542,00	0,1078	0,9425	0,1144	0,8347
<16/15,4	B2C+3-802.11a	5720	16	39,8107	11,25	13,32	27,25	530,33	0,1055	0,9681	0,1090	0,8626
<16/15,4	B3-802.11a	5745	16	39,8107	18,52	71,09	34,52	2830,09	0,5630	0,9710	0,5798	0,4080
<16/15,4	B1-802.11n20	5180	16	39,8107	3,42	2,20	19,42	87,43	0,0174	0,9047	0,0192	0,8873
<16/15,4	B2A-802.11n20	5260	16	39,8107	12,10	16,23	28,10	646,13	0,1285	0,9142	0,1406	0,7857
<16/15,4	B2C-802.11n20	5500	16	39,8107	11,41	13,85	27,41	551,37	0,1097	0,9425	0,1164	0,8328
<16/15,4	B2C+3-802.11n2	5720	16	39,8107	11,32	13,54	27,32	539,01	0,1072	0,9681	0,1108	0,8609
<16/15,4	B3-802.11n20	5745	16	39,8107	18,32	67,85	34,32	2701,28	0,5374	0,9710	0,5534	0,4336
<16/15,4	B1-802.11n40	5180	16	39,8107	3,60	2,29	19,60	91,17	0,0181	0,9047	0,0200	0,8866
<16/15,4	B2A-802.11n40	5270	16	39,8107	11,43	13,91	27,43	553,92	0,1102	0,9154	0,1204	0,8052
<16/15,4	B2C-802.11n40	5510	16	39,8107	11,25	13,32	27,25	530,33	0,1055	0,9437	0,1118	0,8382
<16/15,4	B2C+3-802.11n4	5710	16	39,8107	11,53	14,22	27,53	566,11	0,1126	0,9670	0,1165	0,8544
<16/15,4	B3-802.11n40	5745	16	39,8107	19,41	87,37	35,41	3478,16	0,6920	0,9710	0,7126	0,2791
<16/15,4	B1-802.11ac20	5180	16	39,8107	3,14	2,06	19,14	82,07	0,0163	0,9047	0,0180	0,8884
<16/15,4	B2A-802.11ac20	5260	16	39,8107	11,77	15,02	27,77	598,08	0,1190	0,9142	0,1301	0,7952
<16/15,4	B2C-802.11ac20	5500	16	39,8107	11,10	12,89	27,10	513,25	0,1021	0,9425	0,1083	0,8404
<16/15,4	B2C+3-802.11ac	5720	16	39,8107	10,91	12,34	26,91	491,30	0,0977	0,9681	0,1010	0,8704
<16/15,4	B3-802.11ac20	5745	16	39,8107	17,93	62,02	33,93	2469,22	0,4912	0,9710	0,5059	0,4798
<16/15,4	B1-802.11ac40	5180	16	39,8107	3,50	2,24	19,50	89,05	0,0177	0,9047	0,0196	0,8870
<16/15,4	B2A-802.11ac40	5270	16	39,8107	11,33	13,58	27,33	540,51	0,1075	0,9154	0,1175	0,8079
<16/15,4	B2C-802.11ac40	5510	16	39,8107	11,33	13,58	27,33	540,51	0,1075	0,9437	0,1139	0,8362
<16/15,4	B2C+3-802.11ac	5710	16	39,8107	11,33	13,58	27,33	540,51	0,1075	0,9670	0,1112	0,8595
<16/15,4	B3-802.11ac40	5745	16	39,8107	19,37	86,55	35,37	3445,48	0,6855	0,9710	0,7059	0,2856
<16/15,4	B1-802.11ac80	5210	16	39,8107	3,20	2,09	19,20	83,10	0,0165	0,9083	0,0182	0,8918
<16/15,4	B3-802.11ac80	5775	16	39,8107	18,52	71,09	34,52	2830,09	0,5630	0,9745	0,5778	0,4115
<16/15,4	B1-802.11ax20	5180	16	39,8107	3,47	2,22	19,47	88,45	0,0176	0,9047	0,0194	0,8871
<16/15,4	B2A-802.11ax20	5260	16	39,8107	11,47	14,02	27,47	558,21	0,1111	0,9142	0,1215	0,8032
<16/15,4	B2C-802.11ax20	5500	16	39,8107	11,47	14,02	27,47	558,21	0,1111	0,9425	0,1178	0,8315
<16/15,4	B2C+3-802.11ax	5720	16	39,8107	10,81	12,05	26,81	479,73	0,0954	0,9681	0,0986	0,8727
<16/15,4	B3-802.11ax20	5745	16	39,8107	17,99	62,96	33,99	2506,34	0,4986	0,9710	0,5135	0,4724
<16/15,4	B1-802.11ax40	5180	16	39,8107	3,16	2,07	19,16	82,32	0,0164	0,9047	0,0181	0,8883
<16/15,4	B2A-802.11ax40	5270	16	39,8107	11,08	12,82	27,08	510,53	0,1016	0,9154	0,1110	0,8139
<16/15,4	B2C-802.11ax40	5510	16	39,8107	10,89	12,28	26,89	488,92	0,0973	0,9437	0,1031	0,8464
<16/15,4	B2C+3-802.11ax	5710	16	39,8107	10,99	12,55	26,99	499,61	0,0994	0,9670	0,1028	0,8676
<16/15,4	B3-802.11ax40	5745	16	39,8107	18,65	73,33	34,65	2919,31	0,5808	0,9710	0,5981	0,3903
<16/15,4	B1-802.11ax80	5210	16	39,8107	3,00	2,00	19,00	79,46	0,0158	0,9083	0,0174	0,8925
<16/15,4	B3-802.11ax80	5775	16	39,8107	18,29	67,47	34,29	2685,96	0,5344	0,9745	0,5483	0,4401

Note 1: only worst-case values are listed in the table above

Note 2: the duty cycle is included in the output power

Simultaneous (if applicable):

	WLAN 2,4 GHz	WLAN 5 GHz
(Seq / S _{lim})	0.1937	0.7126
Sum	0.9063	
Limit	1	
Conclusion	passed	