

Manufacturer: Topcon Positioning Systems, Inc.

Name: Oscar Frau

FCC: WR4-CL55

Title: Project handler

Signature: 

MPE limits (§1.1310)

	Mode	Frequency MHz	Duty Cycle %	Power dBm	Antenna		EIRP ¹ dBm	EIRP mW	Distance cm	PD ² mW/cm ²	PD Limit ³ mW/cm ²	Margin dB	2.1091 EIRP	2.1091 EIRP	PD/PD Limit	Worst PD/PD values to be considered
					Gain ⁶ dBi								Limit ⁴ mW	Margin dB		
SARA-U201	WCDMA ^{5,6,7}	826,4	100	25	4,94		29,94	986,3	30	0,087	0,551	8,01	1561	1,99	0,15829	0,15829
SARA-U201	WCDMA ^{5,6,7}	1852,4	100	25	5,40		30,40	1096,5	30	0,097	1,00	10,13	2834	4,12	0,09695	
SATEL-TR49	UHF 900 MHz ^{8,9}	902,2	100	29	0		29,03	800,0	30	0,071	0,601	9,30	1705	3,29	0,11761	0,11761
CL55 ¹⁰	WIFI 2.4GHz ^{7,10}	2412	100	26,9	5,06		31,96	1570,4	30	0,139	1,00	8,57	2834	2,56	0,13885	
CL55 ¹⁰	WIFI 5GHz ^{7,10}	5180	100	16,4	5,63		22,03	159,6	30	0,014	1,00	18,50	2834	12,49	0,01411	0,13885
CL55 ¹⁰	WIFI 5GHz ^{7,10}	5260	100	17,0	5,63		22,63	183,2	30	0,016	1,00	17,90	2834	11,89	0,01620	
CL55 ¹⁰	WIFI 5GHz ^{7,10}	5500	100	14,6	5,63		20,23	105,4	30	0,009	1,00	20,30	2834	14,29	0,00932	
CL55 ¹⁰	WIFI 5GHz ^{7,10}	5745	100	13,2	5,63		18,83	76,4	30	0,007	1,00	21,70	2834	15,69	0,00675	
CL55 ¹⁰	BT Classic ^{7,10}	2402	100	9,4	5,06		14,46	27,9	30	0,002	1,00	26,07	2834	20,06	0,00247	0,00247
CL55 ¹⁰	BLE ^{7,10}	2402	100	2,5	5,06		7,56	5,7	30	0,001	1,00	32,97	2834	26,96	0,00050	
Co-Location =			0,15829	+	0,11761		+	0,13885	+	0,00247	=	0,4	< 1			

¹EIRP = (Power dBm + Antenna Gain dBi) + 10 x Log (Duty Cycle % / 100)
²PD = EIRP / (4πr²D²)
³CFR 47 Part 1, §1.1310(e), table 1 (General Population/Uncontrolled Exposure)
⁴CFR 47 Part 1, §1.1307 (b)(3)(i)
⁵See FCC ID: XPY1CGM5NNN, IC: 8595A-1CGM5NNN, HVIN: SARA-U201
⁶See CETECOM GmbH, T E S T R E P O R T, No.: 16-1-0111601T02a-C1, Declared maximum conducted output power and Max. positive tolerance according to manufacturer at page 11 section 4.2.1.1 and page 12 section 4.2.2.1
⁷See Taoglas type MA245.LBIC.008 (with 0.4m cable) datasheet
⁸FCC ID: MRBSATEL-TA37, IC: 2422A-SATELTA37, HVIN: SATEL-TR49
⁹See ComAnt type CA915H_A antenna datasheet
¹⁰FCC ID: WR4-CL55, IC: 6050B-CL55, HVIN: CL55

§2.1091 EIRP Limit
§1.1307 (b)(3)(i)(C) exemption limit

RF Source	f	R	λ	λ/2π	R/(λ/2π)	Threshold ERP W	Threshold EIRP W	Threshold EIRP mW	EIRP mW	Margin dB
300-1500	MHz	m	m	m						
	826,4	0,30	0,363	0,0578	5,19	0,95201	1,561	1561	986	1,99
	902,2	0,30	0,333	0,0529	5,67	1,03933	1,705	1705	800	3,29
1500-100000	1852,4	0,30	0,162	0,0258	11,6	1,728	2,834	2834	1096,5	4,12
	2412	0,30	0,124	0,0198	15,2	1,728	2,834	2834	1570,4	2,56
	5180	0,30	0,058	0,0092	32,55	1,728	2,834	2834	159,6	12,49
	5260	0,30	0,057	0,0091	33,05	1,728	2,834	2834	183,2	11,89
	5500	0,30	0,055	0,0087	34,56	1,728	2,834	2834	105,4	14,29
	5745	0,30	0,052	0,0083	36,10	1,728	2,834	2834	76,4	15,69
	2402	0,30	0,125	0,0199	15,09	1,728	2,834	2834	27,9	20,06
	2402	0,30	0,125	0,0199	15,09	1,728	2,834	2834	5,7	26,96

§2.1091 EIRP Limit
§1.1307 (b)(3)(i)(B) exemption limit

0.3 GHz ≤ f < 1.5 GHz (20 cm < d ≤ 40 cm)					
f	ERP _{20cm}	Pth = ERP _{20cm}	Pth = ERP _{20cm}	EIRP	Margin
GHz	mW	mW	mW	mW	dB
0,8264	1686	1686	2765	986,3	4,48
0,9022	1840	1840	3018	800,0	5,77
f	ERP _{20cm}	Pth = ERP _{20cm}	Pth = ERP _{20cm}	EIRP	Margin
GHz	mW	mW	mW	mW	dB
1852,4	3060	3060	5018	1096,5	6,61
2412	3060	3060	5018	1570,4	5,05
5180	3060	3060	5018	159,6	14,98
5260	3060	3060	5018	183,2	14,38
5500	3060	3060	5018	105,4	16,78
5745	3060	3060	5018	76,4	18,18
2402	3060	3060	5018	27,9	22,55
2402	3060	3060	5018	5,7	29,45