

Testing was performed using the mode(s) of operation and configuration(s) noted within the report. The individuals and/or the organization requesting the test provided the modes, configurations and settings used to complete the evaluation. The actual test parameters are specified in the test data, this includes items such as investigated frequency range (scanned) and test levels. The testing methods and performance specifications, as well as the test site used for the evaluation are indicated in the test data.

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Cal. Due
Analyzer - Spectrum Analyzer	Keysight	N9010A	AFN	2021-01-06	2022-01-06
Block - DC	Fairview Microwave	SD3379	AMM	2020-09-21	2021-09-21
Generator - Signal	Agilent	N5173B	TIW	2020-07-17	2023-07-17

TEST DESCRIPTION

The antenna port spurious emissions were measured at the RF output terminal of the EUT through 3 different attenuation configurations which continues through to the RF input of the spectrum analyzer. Analyzer plots utilizing a resolution bandwidth called out by the client's test plan were made for each modulation type from 9 KHz to 20 GHz. The peak conducted power of spurious emissions, up to the 10th harmonic of the transmit frequency, were investigated to ensure they were less than the limits also called out by the client's test plan shown below.

The measurement methods are detailed in KDB971168 D01v03 section 6 and ANSI C63.26-2015.

Per FCC 2.1057(a)(1) and RSS Gen 6.13, the upper level of measurement is the 10th harmonic of the highest fundamental frequency.

These measurements are for frequency band after the first 1.0 MHz bands immediately outside and adjacent to the frequency block.

Per section FCC 24.238(a) and RSS-133 section 6.5, the power of any emission outside of the authorized operating frequency range cannot exceed -13 dBm for a 1 MHz measurement bandwidth. The limit is adjusted to -19 dBm [-13 dBm - 10 log (4)] per FCC KDB 662911D01 v02r01 because the BTS may operate as a 4 port MIMO transmitter.

The limit for the 9kHz to 150kHz frequency range was adjusted to -49dBm to correct for a spectrum analyzer RBW of 1kHz versus required RBW of 1MHz [i.e.: -49dBm = -19dBm -10log(1MHz/1kHz)]. The limit for the 150kHz to 20MHz frequency range was adjusted to -39dBm to correct for a spectrum analyzer RBW of 10kHz versus required RBW of 1MHz [i.e.: - 39dBm = -19dBm -10log(1MHz/10kHz)]. The required limit of -19dBm with a RBW of > 1MHz was used for all other frequency ranges.

RF conducted emissions testing was performed only on one port. The testing was performed on the same version of hardware (FXFC) as the original certification test. The FXFC antenna ports are essentially electrically identical (the RF power variation between antenna ports is small as shown in the original certification testing) and antenna port 3 was selected to perform the testing under this effort as allowed by ANSI C63.26-2015 paragraph 5.7.2i.



					TbtTx 2019.08.30.0	XMit 2020.12.30.0
EUT:	FXFC (FCC/ISED C2PC)			Work Order:	NOKI0029	
Serial Number:	1M152245671			Date:	28-Apr-21	
Customer:	Nokia Solutions and Net	works		Temperature:	23.5 °C	
Attendees:	David Le John Battanav	200		Humidity:	51 8% PH	
Brojost	Nono	ong		Baramatria Braz	1011 mbor	
Tested but	None Drandan Habba		Bauran E4 V/DC	Barometric Fres.		
Tested by:	Brandon Hobbs		Power: 54 VDC	Job Site:	1702	
LEST SPECIFICATI	IONS		lest Method			
FCC 24E:2021			ANSI C63.26:2015			
RSS-133 Issue 6:20	013+A1:2018		RSS-133 Issue 6:2013+A1:2018			
COMMENTS						
All measurement na	ath losses were accounte	d for in the reference level offest including	any attenuators filters and DC blocks Band n2 carrie	rs were enabled at maximmum power	(80watts/carrier)	
		a for in the reference lever onest mondaring		is were chabled at maximitain power	(oowarts/carrier)	
DEVIATIONS FROM	I TEST STANDARD					
Configuration #	1,2,3	1	2.1.1			
		Signature	Frequency			
			Range	Value (dBm)	Limit (dBm)	Result
3and n2, 1930 MHz	- 1990 MHz, 5G NR Port 3					
	5 MHz Bandy	vdith QPSK Modulation				
		Mid Channel 1960 MHz	9 kHz - 150 kHz	-63.5	-49	Pass
		Mid Channel 1960 MHz	150 kHz - 20 MHz	-05.0	-39	Pass
		Mid Channel, 1900 MHZ		-01.3	-39	F d 5 5
		Mid Channel, 1960 MHZ		-25.8	-19	Pass
		Mid Channel, 1960 MHz	1910 MHz - 2010 MHz	-25.3	-19	Pass
		Mid Channel, 1960 MHz	3 GHz - 11 GHz	-45.8	-19	Pass
		Mid Channel, 1960 MHz	11 GHz - 20 GHz	-41.7	-19	Pass
		16-QAM Modulation				
		Mid Channel, 1960 MHz	9 kHz - 150 kHz	-64.4	-49	Pass
		Mid Channel, 1960 MHz	150 kHz - 20 MHz	-61.3	-39	Pass
		Mid Channel, 1960 MHz	20 MHz - 3 GHz	-26.0	-19	Pass
		Mid Channel, 1960 MHz	1010 MHz 2010 MHz	-20.0	-10	Pass
		Mid Channel, 1900 MHz		-24.3	-19	FdSS
		Mid Channel, 1960 MHZ	3 GHZ - 11 GHZ	-45.5	-19	Pass
		Mid Channel, 1960 MHz	11 GHz - 20 GHz	-41.8	-19	Pass
		64-QAM Modulation				
		Mid Channel, 1960 MHz	9 kHz - 150 kHz	-64.5	-49	Pass
		Mid Channel, 1960 MHz	150 kHz - 20 MHz	-61.7	-39	Pass
		Mid Channel, 1960 MHz	20 MHz - 3 GHz	-25.9	-19	Pass
		Mid Channel, 1960 MHz	1010 MHz - 2010 MHz	-25.1	-10	Pass
		Mid Channel, 1960 Milz	2 CU = 11 CU =	-23.1	-13	Dasa
		Mid Channel, 1960 MHZ	3 GHZ - 11 GHZ	-45.0	-19	Pass
		Mid Channel, 1960 MHZ	11 GHZ - 20 GHZ	-41.7	-19	Pass
		256-QAM Modulation				
		Mid Channel, 1960 MHz	9 kHz - 150 kHz	-63.4	-49	Pass
		Mid Channel, 1960 MHz	150 kHz - 20 MHz	-61.0	-39	Pass
		Mid Channel, 1960 MHz	20 MHz - 3 GHz	-25.7	-19	Pass
		Mid Channel, 1960 MHz	1910 MHz - 2010 MHz	-25.2	-19	Pass
		Mid Channel 1960 MHz	3 GHz - 11 GHz	-45.6	-19	Pass
		Mid Channel, 1960 MHz	11 GHz - 20 GHz		-19	Pass
	10 MHz Band	dwdith			-10	1 435
		256-QAM Modulation				
		Mid Channel, 1960 MHz	9 kHz - 150 kHz	-67.3	-49	Pass
		Mid Channel, 1960 MHz	150 kHz - 20 MHz	-63.9	-39	Pass
		Mid Channel 1960 MHz	20 MHz - 3 GHz	-25.9	-19	Pass
		Mid Channel, 1060 MHz	1010 MHz - 2010 MHz	-20.0	-10	Pare
		Mid Chappel 1060 MHz		-24.0	-10	n ass Dace
		Mid Charmel, 1900 MHz		-45.0	-19	Fd55
	45.141.5	Mid Channel, 1960 MHZ	11 GHZ - 20 GHZ	-41.7	-19	Pass
	15 MHz Band	256-QAM Modulation				
		Mid Channel 1960 MHz	9 kHz - 150 kHz	-68.1	-49	Pass
		Mid Channel, 1060 Mile		-30.1	20	Pass
		Wid Channel, 1960 MHZ		-65.3	-39	Pass
		Mid Channel, 1960 MHz	20 MHz - 3 GHz	-25.9	-19	Pass
		Mid Channel, 1960 MHz	1910 MHz - 2010 MHz	-24.8	-19	Pass
		Mid Channel, 1960 MHz	3 GHz - 11 GHz	-45.7	-19	Pass
		Mid Channel, 1960 MHz	11 GHz - 20 GHz	-41.6	-19	Pass
	20 MHz Band	Jwdith 256-OAM Modulation				
				74.0	40	Dett
		Mid Channel, 1960 MHz	9 KHZ - 150 KHZ	-/1.9	-49	Pass
		Mid Channel, 1960 MHz	150 kHz - 20 MHz	-67.0	-39	Pass
		Mid Channel, 1960 MHz	20 MHz - 3 GHz	-25.8	-19	Pass
		Mid Channel, 1960 MHz	1910 MHz - 2010 MHz	-25.3	-19	Pass
		Mid Channel, 1960 MHz	3 GHz - 11 GHz	-45.4	-19	Pass
		Mid Channel, 1060 MHz	11 GHz - 20 GHz		-10	Pare
			11 002 - 20 002	-41.0	-19	F d b b





鱦 Key	sight Spectrur	m Analyzer - Elemer	nt Materials Technolo	gy						
LXI RL	-	RF 50 Ω	DC I	PNO: Fast ↔→ Gain:Low	Trig: Free I Atten: 6 dl	Run B	Avg Type: Avg Hold:	RMS 100/100	09:19:04 TF	AM Apr 28, 2021 ACE 1 2 3 4 5 6 TYPE A DET A NNNN
10 dE	R Bidiv R	ef Offset 9.3 d ef -1.70 dBi	B m						Mkr1 1 -61.	62.4 kHz 318 dBm
-11.7										
-21.7										
-31.7										
-41.7										-39.00 dBM
-51.7	1									
-61.7	Non March	~ <u>.</u>								
-61.7	Υ	and the state of t								
-91.7			in failuraid for air line priorie		alayin) addaday a tarabaa					
							ne fa felier i den ander den den den den	and the product of th	mail and a standay	atomatic interactions of the
Start #Res	t 0.150 N s BW 10	/Hz kHz		#VB	W 30 kHz*			Sweep	Stop 2 245.3 ms	0.000 MHz (8001 pts)
MSG							STATUS			





0

#VBW 3.0 MHz*

STATUS

Start 1.91000 GHz #Res BW 1.0 MHz Stop 2.01000 GHz Sweep 1.067 ms (8001 pts)





				STATUS	
Start 11.000 GHz #Res BW 1.0 MHz	#VI	BW 3.0 MHz	*		Sweep
-56.0					
-46.0					
-36.0					
-36.0					

♦¹

Stop 20.000 GHz 16.00 ms (20001 pts)





Range Value (dBm) Limit (dBm) Result
150 kHz - 20 MHz -61.25 -39 Pass

🇾 Ke	ysight Spectrur	n Analyzer - Element I	Materials Technolo	gy						
L <mark>XI</mark> R	L	RF 50 Ω DC	F	PNO: Fast 🔸	SENSE:INT	A A	LIGN OFF Avg Type: Avg Hold: 1	RMS 100/100	09:07:42 TR T	AM Apr 28, 2021 ACE 1 2 3 4 5 6 YPE A WWWW DET A N N N N N
10 di	Re B/div R e	ef Offset 9.3 dB ef -1.70 dBm	lt	-Gain:Low	Atten: 6 di	•			Mkr1 1 -61.	50.0 kHz 248 dBm
-11.7										
-21.7										
-31.7										39.00 dBm
-41.7										
-51.7	1									
-71.7	Way white	~								
-81.7		North Contraction								
-91.7				edi da se forma di serie de se d	Without a to a training to a	W. Maray Independent	liebet kenned op istensom bis			
										dente providente de
Star #Re	t 0.150 N s BW 10	1Hz kHz		#VB	W 30 kHz*			Sweep	Stop 2 245.3 ms	0.000 MHz (8001 pts)
MSG							STATUS			









#VBW 3.0 MHz*

Start 11.000 GHz #Res BW 1.0 MHz ø

Stop 20.000 GHz

Sweep 16.00 ms (20001 pts)

STATUS





📜 Ke	ysight S	Spectrum Ar	nalyzer - Element	Materials Technolo	gy						
R R	L	RF	50 Ω D	0		SENSE:INT	<u>∧</u> A	LIGN OFF		09:14:13	3 AM Apr 28, 2021
				I	PNO: Fast 🔸	. Trig: Free Atten: 6 d	Run B	Avg Type: Avg Hold: 1	RMS 100/100	IT	ACE 1 2 3 4 5 6 TYPE A WWWWW DET A NNNNN
10 di Log	B/div	Ref (Ref	0ffset 9.3 d⊟ -1.70 dBm							Mkr1 1 -61.	50.0 kHz 683 dBm
-11.7											
24.7											
-21.7											
											-39.00 dBm
-51.7	1										
-61.7	.	all. adda									
-71.7			Mar North Mark								
			"The second	-							
					Contraction of the local division of the loc	nenetal an an an an Angalian	an a start and a start of the start of the	uniter and a state of the	teris teristication and a state of the	A Restauring on A day services	
Star	1 0.1	50 MH	7							Stop 2	20.000 MHz
#Re	s BV	V 10 KH	Iz		#VB	W 30 kHz*			Sweep	245.3 m	s (8001 pts)
MSG								STATUS			









#VBW 3.0 MHz*

Start 11.000 GHz #Res BW 1.0 MHz ****1

Stop 20.000 GHz

Sweep 16.00 ms (20001 pts)

STATUS





Keysight Sp	pectrum Ana	lyzer - Elemer	nt Materials Technol	ogy							
LXI RL	RF	50 Ω	DC		SE	NSE:INT	a dia a	ALIGN OFF		09:17:	23 AM Apr 28, 2021
				PNO: Fast + IFGain:Low	••	Trig: Free Atten: 6 d	Run B	Avg Type: Avg Hold: 1	RMS 100/100		TRACE 1 2 3 4 5 6 TYPE A WWWWW DET A NNNN
10 dB/div	Ref Of Ref -	fset 9.3 d 1.70 dBr	B n							Mkr1 -61	182.3 kHz I.025 dBm
-11.7											
-21.7											
-31.7											-39,00 dBm
-41.7											
-51.7											
-61.7	Minia Maria										
-81.7		The state									
-91.7			National Anti-Mary Sec.	and the second	in last a fr	fur you have also	antisi shata darta -	ter an a			
									ter in the grade of the spectrum	line and a star way the set.	ngtination, tradient/sized, da
Start 0.1 #Res BW	50 MHz / 10 kHz			#V	/BW	30 kHz*			Swe	Stop ep 245.3 n	20.000 MHz 1s (8001 pts)
MSG								STATUS			





#VBW 3.0 MHz*

STATUS

Start 1.91000 GHz #Res BW 1.0 MHz Stop 2.01000 GHz Sweep 1.067 ms (8001 pts)





MSG						000-000 000-00 0	STATUS			
Star #Re	t 11.000 GH s BW 1.0 M	Hz IHz		#VB	W 3.0 MHz	*		Sweep	Stop 2 16.00 ms	20.000 ((20001
-50.0										
-56.0										
-46.0			· · · · · · · · · · · · · · · · · · ·							
										● ¹
26.0										
										-19.0

iHz ots)















MSG						STATUS			
Star #Re	t 11.000 GI s BW 1.0 N	Hz IHz	#VB	W 3.0 MHz	t.		Sweep	Stop 2 16.00 ms	20.000 GHz (20001 pts)
-56.0									
-46.0									
40.0									• '
-36.0									
-26.0									
-16.0									-19.00 dBm











#VBW 3.0 MHz*

STATUS

Start 1.91000 GHz #Res BW 1.0 MHz Stop 2.01000 GHz Sweep 1.067 ms (8001 pts)





#VBW 3.0 MHz*

Start 11.000 GHz #Res BW 1.0 MHz ****1

Stop 20.000 GHz

Sweep 16.00 ms (20001 pts)

STATUS















ISG					STATUS			
Start 11.000 GH #Res BW 1.0 MI	lz Hz	#VB	W 3.0 MHz*	t		Sweep	Stop 2 16.00 ms	20.000 (20001
-56.0								
46.0		 						.
-36.0								1
-26.0								



Testing was performed using the mode(s) of operation and configuration(s) noted within the report. The individuals and/or the organization requesting the test provided the modes, configurations and settings used to complete the evaluation. The actual test parameters are specified in the test data, this includes items such as investigated frequency range (scanned) and test levels. The testing methods and performance specifications, as well as the test site used for the evaluation are indicated in the test data.

TEST EQUIPMENT

Description	Manufacturer	Model	ID	Last Cal.	Cal. Due
Block - DC	Fairview Microwave	SD3379	AMM	2020-09-21	2021-09-21
Analyzer - Spectrum Analyzer	Keysight	N9010A	AFN	2021-01-06	2022-01-06
Generator - Signal	Agilent	N5173B	TIW	2020-07-17	2023-07-17

TEST DESCRIPTION

The method of section 5.2.4.5 of ANSI C63.26 was used to make the measurement. The method uses trace averaging across ON and OFF times of EUT transmissions using the spectrum analyzer's RMS detector. Following the measurement a duty cycle correction was applied by adding [10log(1/D)], where D is the duty cycle, to the measured power to compute the PSD during the transmit times.

RF conducted emissions testing was performed only on one port. The testing was performed on the same version of hardware (FXFC) as the original certification test. The FXFC antenna ports are essentially electrically identical (the RF power variation between antenna ports is small as shown in the original certification testing) and antenna port 3 was selected to perform the testing under this effort as allowed by ANSI C63.26-2015 paragraphs 5.2.5.3, 5.7.2i and 6.4.

The total PSD of all antenna ports (at the radio output) were determined per ANSI C63.26-2015 paragraph 6.4.3.2.4.

The EIRP calculations were based upon ANSI C63.26-2015 sections 6.4.3.2.4, section 6.4.6.3, section 6.4.5.3 and section 6.4.5.2

The applicable FCC and ISED regulatory requirement for EIRP are provided below:

FCC Requirements: 24.232 Power and antenna height limits.

(a)(2) Base stations with an emission bandwidth greater than 1 MHz are limited to 1640 watts/MHz equivalent isotropically radiated power (EIRP) with an antenna height up to 300 meters HAAT, except as described in paragraph (b) below.
 (a)(3) Base station antenna heights may exceed 300 meters HAAT with a corresponding reduction in power; see Tables 1 and 2 of this section.

(b)(2) Base stations that are located in counties with population densities of 100 persons or fewer per square mile, based upon the most recently available population statistics from the Bureau of the Census, with an emission bandwidth greater than 1 MHz are limited to 3280 watts/MHz equivalent isotropically radiated power (EIRP) with an antenna height up to 300 meters HAAT.

ISED Requirements RSS-133 Section 6.4/SRSP-510 section 5.1.1:

SRSP-510 section 5.1 Radiated power and antenna height limits for base stations

For base stations with a channel bandwidth greater than 1 MHz, the maximum e.i.r.p. is limited to 3280 watts/MHz e.i.r.p. (i.e., no more than 3280 watts e.i.r.p. in any 1 MHz band segment) with an antenna height above average terrain (HAAT) up to 300 metres. Fixed or base stations operating in urban areas are limited to a maximum allowable e.i.r.p. of 1640 watts/MHz e.i.r.p. Base station antenna heights above average terrain may exceed 300 metres with a corresponding reduction in e.i.r.p. according to the following table:



01011101

EUT	FXFC (FCC/ISED C2PC)					Work Order	TbiTx 2019.08.30.0	XMit 2020.12.30.0
Serial Number:	1M152245671					Date:	27-Apr-21	
Customer: Attendees	Nokia Solutions and Network David Le. John Rattanayong	IS				Temperature: Humidity:	22.8 °C 49.4% RH	
Project:	None					Barometric Pres.:	1014 mbar	
Tested by:	Brandon Hobbs		Power: 54 VDC			Job Site:	TX05	
FCC 24E:2021	10113		ANSI C63.26:2015					
RSS-133 Issue 6:2	013+A1:2018		RSS-133 Issue 6:20	13+A1:2018				
COMMENTS All measurement p	oath losses were accounted fo	r in the reference level offest including any	attenuators, filters and DC bloc	ks. Band n2 carri	ers are enabled at ma	ximum power (80 watt	s/carrier). The following is t	he power
spectral density (P	SD) measurements at the rad	io output ports. The PSD was measured for	a single carrier on port 3. The t	otal PSD for multi	port (2x2 MIMO & 4x4	MIMO) operation was	determinded based upon Al	NSI 63.26
clause 6.4.3.2.4 (10	0 Log Nout). The total PSD for	two port operation is single port PSD +3dB	[i.e. 10 Log(2)]. The total PSD for	or four port opera	tion is single port PS	D +6dB [i.e. 10 Log(4)]	•	
None	WIEST STANDARD							
			- /1 /					
Configuration #	2	Signature	Jal					
	•		Initial Value	Duty Cycle	Single Port	Two Port (2x2 MIMO)	Four Port (4x4 MIMO)	
Band n2, 1930 MHz	z - 1990 MHz. 5G NR		dBm/MHz	Factor (dB)	dBm/MHz == PSD	dBm/MHz == PSD	dBm/MHz == PSD	
,	Port 3							
	5 MHz Bandwdith	K Modulation						
		Low Channel, 1932.5 MHz	42.680	0	42.7	45.7	48.7	
		Mid Channel, 1960 MHz High Channel, 1987,5 MHz	42.889	0	42.9 42.7	45.9 45.7	48.9 48.7	
	16-0	AM Modulation	42.000	5				
		Low Channel, 1932.5 MHz Mid Channel, 1960 MHz	42.695 42.870	0	42.7 42.9	45.7 45.9	48.7 48.9	
		High Channel, 1987.5 MHz	42.626	ő	42.6	45.6	48.6	
	64-0	AM Modulation	42 776	0	42.8	45.8	48.8	
		Mid Channel, 1960 MHz	42.956	0	43.0	46.0	49.0	
	256	High Channel, 1987.5 MHz	42.705	0	42.7	45.7	48.7	
	200	Low Channel, 1932.5 MHz	42.912	0	42.9	45.9	48.9	
		Mid Channel, 1960 MHz High Channel, 1987 5 MHz	43.057	0	43.1	46.1 45.8	49.1 48.8	
	10 MHz Bandwdit	h	42.132	Ū	42.0	40.0	40.0	
	QPS	K Modulation	39 582	0	39.6	42.6	45.6	
		Mid Channel, 1960 MHz	39.744	0	39.7	42.0	45.7	
	16.0	High Channel, 1985 MHz	39.454	0	39.5	42.5	45.5	
	10-0	Low Channel, 1935 MHz	40.297	0	40.3	43.3	46.3	
		Mid Channel, 1960 MHz	40.461	0	40.5	43.5	46.5	
	64-0	QAM Modulation	40.132	0	40.1	45.1	40.1	
		Low Channel, 1935 MHz Mid Channel, 1960 MHz	39.688	0	39.7	42.7	45.7	
		High Channel, 1985 MHz	39.485	0	39.5	42.5	45.5	
	256-	QAM Modulation	39 709	0	30.7	42.7	45.7	
		Mid Channel, 1960 MHz	39.818	0	39.8	42.8	45.8	
	15 MHz Bandwdit	High Channel, 1985 MHz	39.750	0	39.8	42.8	45.8	
	QPS	SK Modulation						
		Low Channel, 1937.5 MHz Mid Channel, 1960 MHz	37.844	0	37.8	40.8	43.8	
		High Channel, 1982.5 MHz	37.815	Ő	37.8	40.8	43.8	
	16-0	DAM Modulation	30 338	0	30.3	423	45.3	
		Mid Channel, 1960 MHz	39.408	õ	39.4	42.4	45.4	
	64-0	High Channel, 1982.5 MHz	39.278	0	39.3	42.3	45.3	
	04-0	Low Channel, 1937.5 MHz	37.957	0	38.0	41.0	44.0	
		Mid Channel, 1960 MHz High Channel, 1982 5 MHz	37.983 37.765	0	38.0 37.8	41.0 40.8	44.0 43.8	
	256-	QAM Modulation	01.100	Ū	07.0	40.0	40.0	
		Low Channel, 1937.5 MHz Mid Channel, 1960 MHz	37.994 37.982	0	38.0 38.0	41.0 41.0	44.0 44.0	
		High Channel, 1982.5 MHz	37.899	Ő	37.9	40.9	43.9	
	20 MHz Bandwdit	h SK Modulation						
		Low Channel, 1940 MHz	36.668	0	36.7	39.7	42.7	
		Mid Channel, 1960 MHz High Channel, 1980 MHz	36.782 36.688	0	36.8 36.7	39.8 39.7	42.8 42.7	
	16-0	AM Modulation	00.000	5	55.7	55.7		
		Low Channel, 1940 MHz Mid Channel, 1960 MHz	38.300 38.356	0	38.3 38.4	41.3 41.4	44.3 44.4	
		High Channel, 1980 MHz	38.302	0	38.3	41.3	44.3	
	64-0	AM Modulation	36 730	0	36.7	39.7	42.7	
		Mid Channel, 1960 MHz	36.850	Ő	36.9	39.9	42.9	
	256	High Channel, 1980 MHz QAM Modulation	36.668	0	36.7	39.7	42.7	
	200	Low Channel, 1940 MHz	36.801	0	36.8	39.8	42.8	
		Mid Channel, 1960 MHz High Channel, 1980 MHz	36.860 36.735	0	36.9 36.7	39.9 39.7	42.9 42.7	
		• · · · ·						





#Res BW 1.0 WHZ	#VBW 3.0 MHz	STATUS	#Swee	p 601.0 ms (601 pts)
Center 1.960000 GHz		*	# a	Span 10.00 MHz
-34.0				
-24.0				
-14.0				
-4.00				
6.00				
16.0				<u> </u>
26.0				
36.0				
46.0	11			





#VBW 3.0 MHz*

Span 10.00 MHz #Sweep 601.0 ms (601 pts)

Center 1.932500 GHz #Res BW 1.0 MHz





#VBW 3.0 MHz*

Span 10.00 MHz #Sweep 601.0 ms (601 pts)

Center 1.987500 GHz #Res BW 1.0 MHz





Center 1.960000 GHz #Res BW 1.0 MHz	#VBW 3.0 MH	Z*	#Swee	Span 10.00 MHz p 601.0 ms (601 pts)
35.0				
25.0				
15.0				
5.00				
5.00				
25.0				
35.0				、





Center 1.932500 GHz #Res BW 1.0 MHz	#VBW	3.0 MHz*	#Swee	Span 9 601.0 m	10.00 MHz is (601 pts)
-35.0					
-25.0					
-15.0				}	
.5.00				\longrightarrow	
5.00					
15.0					
35.0				\	
25.0					





		IFGain:Low	#Atten: 30 dB				
0 dB/div	Ref Offset 42.03 dB Ref 55.00 dBm				M	(r1 1.987 42.	400 GHz 792 dBm
5.0			<u>↓</u> 1				
5.0							
5.0						\	
5.0							
	/						
5.0						\	
i.o							
enter 1. Res BW	987500 GHz 1.0 MHz	#VB	W 3.0 MHz*		#Swee	Span ep 601.0 m	10.00 MHz s (601 pts
9				STATUS			





#VBW 3.0 MHz*

STATUS





#VBW 3.0 MHz*

Span 20.00 MHz #Sweep 601.0 ms (601 pts)

Center 1.93500 GHz #Res BW 1.0 MHz





#VBW 3.0 MHz*

Span 20.00 MHz #Sweep 601.0 ms (601 pts)

Center 1.98500 GHz #Res BW 1.0 MHz





STATUS





#VBW 3.0 MHz*

STATUS

Span 20.00 MHz #Sweep 601.0 ms (601 pts)

Center 1.93500 GHz #Res BW 1.0 MHz





#VBW 3.0 MHz*





#VBW 3.0 MHz*

Span 25.00 MHz #Sweep 601.0 ms (601 pts)

Center 1.96000 GHz #Res BW 1.0 MHz





#VBW 3.0 MHz*

Span 25.00 MHz #Sweep 601.0 ms (601 pts)

Center 1.93750 GHz #Res BW 1.0 MHz





MSG		STATUS
Center 1.98250 GHz #Res BW 1.0 MHz	#VBW 3.0 MHz*	Span 25.00 MHz #Sweep 601.0 ms (601 pts)
-38.0		
-28.0		
-18.0		
-8.00		
200		
12.0		





#VBW 3.0 MHz*

Span 25.00 MHz #Sweep 601.0 ms (601 pts)

Center 1.96000 GHz #Res BW 1.0 MHz





#VBW 3.0 MHz*

Span 25.00 MHz #Sweep 601.0 ms (601 pts)

Center 1.93750 GHz #Res BW 1.0 MHz





#VBW 3.0 MHz*



	Initial Value	Duty Cycle	G NR, Port 3, 20 MH Single Port	Two Port (2x2	MIMO) Fou	r Port (4x4 MIMO)	lz
	dBm/MHz	Factor (dB)	dBm/MHz == PS	D dBm/MHz ==	PSD dE	Sm/MHz == PSD	
	36.668	0	36.67	39.67		42.67	
Kevsight Spectrum	Analyzer - Element Materials Te	hnology					
X RL RF	- 50 Ω DC		SENSE:INT	ALIGN OFF	1:	2:13:42 PM Apr 27, 2021	
		PNO: Fast 🔸	Trig: Free Run	Avg Hold: 100/10	0		
		IFGain:Low	#Atten: 30 dB		Milard 4	940 70 CH-	
Ref	Offset 42.03 dB				WIKE	36.668 dBm	
40.0			1_				
40.0							
30.0					<u>}</u>		
					ł,		
20.0							
10.0							
					l l		
0.00							
40.0							
-10.0							
-20.0							
-30.0							
-40.0							
-40.0							
Center 1 0400						nan 35.00 MHz	
#Res BW 1.0	MHz	#VB\	W 3.0 MHz*		#Sweep 601	.0 ms (601 pts)	
MSG				STATUS			
		1 1000 MILL E					
	Initial Value	12 - 1990 MHZ, 50 Duty Cycle	Sinale Port	Two Port (2x2	MIMO) Fou	r Port (4x4 MIMO)	IZ
	dBm/MHz	Factor (dB)				· · /	
-				D dBm/MHz ==	PSD dE	Sm/MHz == PSD	
	36.782	0	36.78	D dBm/MHz == 39.78	PSD dE	8m/MHz == PSD 42.78	
Variabt Spectrum	36.782		36.78	D dBm/MHz == 39.78	PSD dE	3m/MHz == PSD 42.78	
Keysight Spectrum	36.782 Analyzer - Element Materials Teo 50 Ω DC	hnology	36.78	D dBm/MHz == 39.78	PSD dE	Im/MHz == PSD 42.78 2:45:22 PM Apr 27, 2021	
Keysight Spectrum	36.782 Analyzer - Element Materials Teo 50 Ω DC	0 hnology PNO: Fast ↔→	36.78	D dBm/MHz == 39.78 ▲ ALIGN OFF #Avg Type: RMS Avg[Hold: 100/10	• PSD dE	Im/MHz == PSD 42.78 2:45:22 PM Apr 27, 2021 TRACE 2:34:56 TRACE 2:34:56 TYPE 2:34:56	
Keysight Spectrum XI RL RF	Analyzer - Element Materials Tel 50 Ω DC	0 hnology PNO: Fast → IFGain:Low	dbin/mrz == r3 36.78 sense:inti Trig: Free Run #Atten: 30 dB	D dBm/MHz == 39.78 ALIGN OFF #Avg Type: RMS Avg[Hold: 100/10	• PSD dE	Sm/MHz == PSD 42.78 2:45:22 PM Apr 27, 2021 TRACE 2:3 4 5 0 TPRE 2:3 4 5 0 OPET & AAAAA OPET & AAAAA	
Keysight Spectrum XI RL RF 10 dB/div Ref	36.782	PNO: Fast	36.78 36.78 SENSE:INT Trig: Free Run #Atten: 30 dB	D dBm/MHz == 39.78 ALIGN OFF #Avg Type: RMS Avg Hold: 100/10	• PSD dE	42.78 42.78 TRACE 1 2 3 4 5 0 TYPE A AMAAA .968 28 GHz 36.782 dBm	
Keysight Spectrum X RL Rf 10 dB/div Re	36.782	0 hnology PNO: Fast → IFGain:Low	36.78 SENSE:INT Trig: Free Run #Atten: 30 dB	D dBm/MHz == 39.78	• PSD de	3m/MHz == PSD 42.78 245:22 PM Apr 27, 2021 TRACE 1, 2, 3, 4, 5, 6 DET A AAAAA .968 28 GHz 36.782 dBm	
Keysight Spectrum X RL Rf 10 dB/div Re Log 40.0	36.782	NO: Fast →	36.78 SENSE:INT Trig: Free Run #Atten: 30 dB	D dBm/MHz == 39.78 ALIGN OFF #Avg Type: RMS Avg Hold: 100/10	: PSD dE	3m/MHz == PSD 42.78 2:45:22 PM Apr 27, 2021 TRACE 1 2 34 5 5 TYPE 1 2 35 5 TYPE 1 2 5	
Keysight Spectrum X RL Rf 10 dB/div Re 40.0	36.782	PNO: Fast →	36.78 SENSE:INT Trig: Free Run #Atten: 30 dB	D dBm/MHz == 39.78	PSD dE	3m/MHz == PSD 42.78 2:45:22 PM Apr 27, 2021 TRACE 2 2 3 4 5 6 TYPE 4 3 6 7 8 2 6 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7	
Keysight Spectrum X RL RF 10 dB/div Re 40.0 30.0	Analyzer - Element Materials Tel 5 0Ω DC 7 Offset 42.03 dB f 50.00 dBm	O hnology PNO: Fast → IFGain:Low	36.78 SENSE:INT Trig: Free Run #Atten: 30 dB	D dBm/MHz == 39.78	• PSD dE	3m/MHz == PSD 42.78 2:45:22 PM Apr 27, 2021 TRACE 2 3 4 5 6 TYPE AAAAAA .968 28 GHz 36.782 dBm	
Keysight Spectrum X RL RF 10 dB/div Re 40.0 30.0	Analyzer - Element Materials Tele 50 Ω DC 7 Offset 42.03 dB 7 50.00 dBm	O hnology PNO: Fast → IFGain:Low	36.78 SENSE:INT Trig: Free Run #Atten: 30 dB	D dBm/MHz == 39.78 ALIGN OFF #Avg Type: RMS Avg Hold: 100/10	• PSD dE	3m/MHz == PSD 42.78 2:45:22 PM Apr 27, 2021 TRACE 1 2 3 4 5 6 TYPE A AAAAA .968 28 GHz 36.782 dBm	
Keysight Spectrum X RL RF 10 dB/div Re 40.0 30.0	Analyzer - Element Materials Tele 50 Ω DC	O PNO: Fast → IFGain:Low	36.78 SENSE:INT Trig: Free Run #Atten: 30 dB	D dBm/MHz == 39.78 ALIGN OFF #Avg Type: RMS Avg Hold: 100/10	PSD dE	3m/MHz == PSD 42.78 2:45:22 PM Apr 27, 2021 TRACE 1 2 3 4 5 6 TYPE A AAAAA .968 28 GHz 36.782 dBm	
Keysight Spectrum X RL RF 10 dB/div Re 40.0 30.0 20.0	36.782	O PNO: Fast → IFGain:Low	36.78 SENSE:INT Trig: Free Run #Atten: 30 dB	D dBm/MHz == 39.78 ALIGN OFF #Avg Type: RMS Avg Hold: 100/10	PSD dE	3m/MHz == PSD 42.78	
Keysight Spectrum R RL RF 10 dB/div Re 40 0 30.0 10.0	36.782	O PNO: Fast → IFGain:Low	36.78 SENSE:INT Trig: Free Run #Atten: 30 dB	D dBm/MHz == 39.78 ALIGN OFF #Avg Type: RMS Avg Hold: 100/10	PSD dE	3m/MHz == PSD 42.78 2:45:22 PM Apr 27, 2021 TRACE 1 2 3 4 5 6 TYPE A AAAAA .968 28 GHz 36.782 dBm	
Keysight Spectrum R L RF 10 dB/div Ref 40.0	36.782	PNO: Fast IFGain:Low	36.78 SENSE:INT Trig: Free Run #Atten: 30 dB	D dBm/MHz == 39.78 ALIGN OFF #Avg Type: RMS Avg Hold: 100/10	PSD dE	3m/MHz == PSD 42.78 42.78 2:45:22 PM Apr 27, 2021 TRACE 1 2 3 4 5 6 TYPE A AAAAA 968 28 GHz 36.782 dBm	
Keysight Spectrum R L RF 10 dB/div Ref 30.0	36.782	PNO: Fast IFGain:Low	36.78 SENSE:INT Trig: Free Run #Atten: 30 dB	D dBm/MHz == 39.78 ALIGN OFF #Avg Type: RMS Avg Hold: 100/10	PSD dE	3m/MHz == PSD 42.78 2:45:22 PM Apr 27, 2021 TRACE 1 2 3 4 5 6 TYPE A AAAAA 968 28 GHz 36.782 dBm	

#VBW 3.0 MHz*

STATUS

Span 35.00 MHz #Sweep 601.0 ms (601 pts)

Center 1.96000 GHz #Res BW 1.0 MHz



	Initial Value dBm/MHz 36.688	- 1990 MHz, 50 Duty Cycle Factor (dB) 0	S NR, Port 3, 20 MHz Ba Single Port dBm/MHz == PSD 36.69	andwdith, QPSK Modulati Two Port (2x2 MIMO) dBm/MHz == PSD 39.69	on , High Channel, 1980 Four Port (4x4 MIMO) dBm/MHz == PSD 42.69
Keysight Spectrum Analy RL RF	yzer - Element Materials Techn 50 Ω DC	ology S PNO: Fast	ENSE:INT A	LIGN OFF #Avg Type: RMS Avg Hold: 100/100	01:48:25 PM Apr 27, 2021 TRACE 1 2 3 4 5 6 TYPE A WWWW
Ref Off	set 42.03 dB	IFGain:Low	#Atten: 30 dB	M	lkr1 1.972 53 GHz
	0.00 dBm				
40.0		♦ ¹			
30.0					
20.0					
10.0					
0.00					
-10.0					
-20.0					·
-30.0					
-40.0					
Center 1.98000 C #Res BW 1.0 MH	GHz z	#VBV	V 3.0 MHz*	#Swee	Span 35.00 MHz ep 601.0 ms (601 pts)
MSG				STATUS	
	Band n2, 1930 MHz Initial Value	- 1990 MHz, 5G Duty Cycle	NR, Port 3, 20 MHz Ba Single Port	ndwdith, 16-QAM Modula Two Port (2x2 MIMO)	ation, Low Channel, 1940 Four Port (4x4 MIMO
	dBm/MHz 38.3	Factor (dB) 0	dBm/MHz == PSD 38.30	dBm/MHz == PSD 41.30	dBm/MHz == PSD 44.30
Keysight Spectrum Anal	dBm/MHz 38.3	Factor (dB) 0	dBm/MHz == PSD 38.30	dBm/MHz == PSD 41.30	dBm/MHz == PSD 44.30
🕅 Keysight Spectrum Analı 100 R.L. RF	dBm/MHz 38.3 yzer - Element Materials Techn 50 Ω DC	PNO: Fast	dBm/MHz == PSD 38.30 ENSE:INT Trig: Free Run #Atran: 30 dB	dBm/MHz == PSD 41.30 IGN OFF #Avg Type: RMS Avg Hold: 100/100	dBm/MHz == PSD 44.30
Keysight Spectrum Analy RL RF RE RF	dBm/MHz 38.3 yzer - Element Materials Techn 50 Ω DC	PNO: Fast →	dBm/MHz == PSD 38.30 ENSE:INT ENSE:INT Trig: Free Run #Atten: 30 dB	dBm/MHz == PSD 41.30 IGN OFF #Avg Type: RMS Avg Hold: 100/100	dBm/MHz == PSD 44.30 12:22:17 PM Apr 27, 202 TARCE [] 2 2 4 5 TARCE [] 2 3 4 TARCE [] 3 4 TAR
Keysight Spectrum Analy RL RF 10 dB/dIV Ref 5	dBm/MHz 38.3 yzer - Element Materials Techn 50 Ω DC set 42.03 dB 1.00 dBm	Factor (dB) 0 ology PNO: Fast IFGain:Low	dBm/MHz == PSD 38.30 ENSE:INT Trig: Free Run #Atten: 30 dB	dBm/MHz == PSD 41.30 IGN OFF #Avg Type: RMS Avg Hold: 100/100	dBm/MHz == PSD 44.30
Keysight Spectrum Analy R R RF 10 dB/div Ref 5	dBm/MHz 38.3 yzer - Element Materials Techn 50 Ω DC //set 42.03 dB 1.00 dBm	PNO: Fast +++	dBm/MHz == PSD 38.30 ENSE:INT	dBm/MHz == PSD 41.30	dBm/MHz == PSD 44.30 12:22:17 PM Apr 27, 2021 TRACE 2 3 4 5 6 TYPE 2 3 5 7 TYPE 2 3 5 7 TYPE 2 3 5 7 TYPE 2 5 7
I Keysight Spectrum Anal R RL RF IO dB/div Ref Off -09 41.0 31.0	dBm/MHz 38.3 yzer - Element Materials Techn 50 Ω DC Seet 42.03 dB 1.00 dBm	PNO: Fast IFGain:Low	dBm/MHz == PSD 38.30 ENSE:INT ▲A Trig: Free Run #Atten: 30 dB	dBm/MHz == PSD 41.30	dBm/MHz == PSD 44.30
Keysight Spectrum Analy R RL RF Ref Off 10 dB/div Ref 5 0 41.0 31.0 21.0	dBm/MHz 38.3 yzer - Element Materials Techn 50 Ω DC Fset 42.03 dB 1.00 dBm	Factor (dB) 0 clogy PNO: Fast IFGain:Low	dBm/MHz == PSD 38.30 ENSE:INT Trig: Free Run #Atten: 30 dB	dBm/MHz == PSD 41.30 LIGN OFF #Avg Type: RMS Avg Hold: 100/100	dBm/MHz == PSD 44.30
Keysight Spectrum Analy RL RF 10 dB/div Ref 57 41.0 31.0 21.0 11.0	dBm/MHz 38.3 yzer - Element Materials Techn 50 Ω DC fset 42.03 dB 1.00 dBm	PNO: Fast IFGain:Low	dBm/MHz == PSD 38.30 ENSE:INT Trig: Free Run #Atten: 30 dB	dBm/MHz == PSD 41.30	dBm/MHz == PSD 44.30
Keysight Spectrum Anal R L RF Code B/div Ref 5 41.0 31.0 21.0	dBm/MHz 38.3 yzer-Element Materials Techn 50 Ω DC Set 42.03 dB 1.00 dBm	Factor (dB) 0 ology PNO: Fast IFGain:Low	dBm/MHz == PSD 38.30 ENSE:INT Trig: Free Run #Atten: 30 dB	dBm/MHz == PSD 41.30 LIGN OFF #Avg Type: RMS Avg Hold: 100/100	dBm/MHz == PSD 44.30
Keysight Spectrum Analy R L RF Ref Off 10 dB/div Ref 5 41.0	dBm/MHz 38.3 yzer - Element Materials Techn 50 Ω DC set 42.03 dB 1.00 dBm	PRO: Fast PNO: Fast IFGain:Low	dBm/MHz == PSD 38.30 ENSE:INT Trig: Free Run #Atten: 30 dB	dBm/MHz == PSD 41.30 LIGN OFF #Avg Type: RMS Avg Hold: 100/100	dBm/MHz == PSD 44.30
RL RF RL RF	dBm/MHz 38.3 yzer - Element Materials Techn 50 Ω DC Fset 42.03 dB 1.00 dBm	Factor (dB) 0 clogy PNO: Fast IFGain:Low	dBm/MHz == PSD 38.30 ENSE:INT Trig: Free Run #Atten: 30 dB	dBm/MHz == PSD 41.30 IGN OFF #Avg Type: RMS Avg Hold: 100/100	dBm/MHz == PSD 44.30

#VBW 3.0 MHz*

STATUS

Span 35.00 MHz #Sweep 601.0 ms (601 pts)

Center 1.94000 GHz #Res BW 1.0 MHz





210 110 100 100 100 100 100 100	MSG						STATUS			
	Cent #Res	ter 1.98000 s BW 1.0 M	GHz IHz	#VB	W 3.0 MHz*	t.		#Swee	Span ep 601.0 m	35.00 MHz s (601 pts)
	-39.0									
	-29.0									
	-19.0									
	-9.00									
	1.00									
	21.0		}					}	\ \	



Ва	nd n2, 1930 MHz	: - 1990 MHz, 5G	NR, Port 3, 20 MHz B	andwalth, 64-QAM Modula	ation, Low Channel, 1940 M	Hz
	Initial Value dBm/MHz	Duty Cycle Factor (dB)	Single Port dBm/MHz == PSD	Two Port (2x2 MIMO) dBm/MHz == PSD	Four Port (4x4 MIMO) dBm/MHz == PSD	
	36.73	0	36.73	39.73	42.73	
Keysight Spectrum Analyzer	- Element Materials Tech	nology				
CKIRL RF	50 Ω DC	S	ENSE:INT	#Avg Type: RMS	12:29:59 PM Apr 27, 2021 TRACE 1 2 3 4 5 6	
		PNO: Fast	Trig: Free Run #Atten: 30 dB	Avg Hold: 100/100	DET A A A A A A	
		IFGall.Low	Witten: 00 db	N	kr1 1 9/6 59 CHz	
Ref Offsei 10 dB/div Ref 49 f	t 42.03 dB 10 dBm				36.730 dBm	
				1		
39.0						
29.0						
19.0						
9.00	السول المع					
-1.00						
-11.0						
					L	
-21.0						
-31.0						
01.0						
-41.0						
Cepter 1 94000 GH	7				Spap 35.00 MHz	
	2				601.0 mg (601 nto)	
#Res BW 1.0 MHz		#VBV	V 3.0 MHz*	#Swee	ep 001.0 ms (001 pts)	
#Res BW 1.0 MHz		#VBV	V 3.0 MHz*	#Swee	ep 801.0 ms (801 pts)	
#Res BW 1.0 MHz		#VBV	V 3.0 MHz*	#Swee		
#Res BW 1.0 MHz	nd n2, 1930 MHz	#VBV	V 3.0 MHz* NR, Port 3, 20 MHz B	#Swee status andwdith, 64-QAM Modula	ation, Mid Channel, 1960 MH	łz
#Res BW 1.0 MHz	nd n2, 1930 MHz Initial Value	#VBV - 1990 MHz, 5G Duty Cycle	NR, Port 3, 20 MHz B Single Port	#SWed status andwdith, 64-QAM Modula Two Port (222 MIMO	ation, Mid Channel, 1960 Mł Four Port (4x4 MIMO)	łz
Here SW 1.0 MHz	nd n2, 1930 MHz Initial Value dBm/MHz 26 95	#VBV - 1990 MHz, 5G Duty Cycle Factor (dB)	NR, Port 3, 20 MHz Single Port dBm/MHz == PSD	#Swer	ation, Mid Channel, 1960 Mk Four Port (4x4 MIMO) dBm/MHz == PSD	iz
#Res BW 1.0 MHz	nd n2, 1930 MHz Initial Value dBm/MHz 36.85	#VBV - 1990 MHz, 5G Duty Cycle Factor (dB) 0	NR, Port 3, 20 MHz* NR, Port 3, 20 MHz B Single Port dBm/MHz == PSD 36.85	#Swee status andwdith, 64-QAM Modula Two Port (2x2 MIMO) dBm/MHz == PSD 39.85	ation, Mid Channel, 1960 Mk Four Port (4x4 MIMO) dBm/MHz == PSD 42.85	łz
#Res BW 1.0 MHz	nd n2, 1930 MHz Initial Value dBm/MHz 36.85	#VBV	V 3.0 MH2* NR, Port 3, 20 MHz B Single Port dBm/MHz == PSD 36.85	#Swee status andwdith, 64-QAM Modula Two Port (2x2 MIMO) dBm/MHz == PSD 39.85	ation, Mid Channel, 1960 Mk Four Port (4x4 MIMO) dBm/MHz == PSD 42.85	łz
#Res BW 1.0 MHz MSG Ba Ba Keysight Spectrum Analyzer N RL RP 1	nd n2, 1930 MHz Initial Value dBm/MHz 36.85 - Element Materials Tech	#VBV	V 3.0 MHZ* NR, Port 3, 20 MHz B Single Port dBm/MHz == PSD 36.85 ENSE:INT	#Swee	ation, Mid Channel, 1960 Mk Four Port (4x4 MIMO) dBm/MHz == PSD 42.85	łz
#Res BW 1.0 MHz MSG Ba Ba Keysight Spectrum Analyzer X RL RF 1	nd n2, 1930 MHz Initial Value dBm/MHz 36.85 - Element Materials Tech 30 R DC	#VBV	V 3.0 MHZ* NR, Port 3, 20 MHz B Single Port dBm/MHz == PSD 36.85 ENSE:INT Trig: Free Run	#Swec status andwdith, 64-QAM Modula Two Port (2x2 MIMO) dBm/MHz == PSD 39.85 ALIGN OFF #Avg Type: RMS Avg Type: RMS	ation, Mid Channel, 1960 MF Four Port (4x4 MIMO) dBm/MHz == PSD 42.85	łz
#Res BW 1.0 MHz MBG BI Keyright Spectrum Analyzer X RL RF :	nd n2, 1930 MHz Initial Value dBm/MHz 36.85 - Element Materials Tech	#VBV - 1990 MHz, 5G Duty Cycle Factor (dB) 0 nology PNO: Fast →→	V 3.0 MHZ* NR, Port 3, 20 MHz B Single Port dBm/MHz == PSD 36.85 ENSE:INT Trig: Free Run #Atten: 30 dB	#Swee status andwdith, 64-QAM Modula Two Port (2x2 MIMO) dBm/MHz == PSD 39.85 ALIGN OFF #Avg Type: RMS Avg Hold: 100/100	ation, Mid Channel, 1960 MF Four Port (4x4 MIMO) dBm/MHz == PSD 42.85	łz
#Res BW 1.0 MHz Msg Bit Keysight Spectrum Analyzer Of RL RP 1 Ref Offset	nd n2, 1930 MHz Initial Value dBm/MHz 36.85 • Element Materials Tech 50 Ω DC	#VBV	NR, Port 3, 20 MHz* Single Port dBm/MHz == PSD 36.85 ENSE:INT Trig: Free Run #Atten: 30 dB	#Swee	ation, Mid Channel, 1960 MF Four Port (4x4 MIMO) dBm/MHz == PSD 42.85 01:30:23 PM Apr 27, 2021 TRACE 2 3 4 5 TYPE A AAAAA DET AAAAAA	łz
#Res BW 1.0 MHz Msg Ba	nd n2, 1930 MHz Initial Value dBm/MHz 36.85 - Element Materials Tech 50 Q DC 242.03 dB 10 dBm	#VBV	NR, Port 3, 20 MHz Single Port dBm/MHz == PSD 36.85 ENSE:INT Trig: Free Run #Atten: 30 dB	#Swee status andwdith, 64-QAM Modula Two Port (2x2 MIMO) dBm/MHz == PSD 39.85 ALIGN OFF #Avg Type: RMS Avg Hold: 100/100	ation, Mid Channel, 1960 MF Four Port (4x4 MIMO) dBm/MHz == PSD 42.85 01:30:23 PM Apr 27, 2021 TRACE 2 34 3 TAPE A AAAAA DET AAAAAA Ikr1 1.968 34 GHz 36.850 dBm	łz
#Res BW 1.0 MHz Msg Ba	nd n2, 1930 MHz Initial Value dBm/MHz 36.85 - Element Materials Tech 50 Ω DC c 42.03 dB 0 dBm	#VBV - 1990 MHz, 5G Duty Cycle Factor (dB) 0 nology PNO: Fast →	NR, Port 3, 20 MHz* Single Port dBm/MHz == PSD 36.85 ENSE:INT Trig: Free Run #Atten: 30 dB	#Swec	ation, Mid Channel, 1960 MF Four Port (4x4 MIMO) dBm/MHz == PSD 42.85 01:30:23 PM Apr 27, 2021 TRACE 12:34.35 TYPE A MAAAAA Ikr1 1.968 34 GHz 36.850 dBm	łz
#Res BW 1.0 MHz Msg Ba	nd n2, 1930 MHz Initial Value dBm/MHz 36.85 - Element Materials Tech 50 Ω DC t 42.03 dB 0 dBm	#VBV - 1990 MHz, 5G Duty Cycle Factor (dB) 0 nology PNO: Fast →	V 3.0 MHZ [±] NR, Port 3, 20 MHz B Single Port dBm/MHz == PSD 36.85 ENSE:INT Trig: Free Run #Atten: 30 dB	#Swer	ation, Mid Channel, 1960 MF Four Port (4x4 MIMO) dBm/MHz == PSD 42.85 01:30:23 PM Apr 27, 2021 TRACE 12 34 55 TYPE AAAAAA kr1 1.968 34 GHz 36.850 dBm	łz
#Res BW 1.0 MHz Msg Ba	nd n2, 1930 MHz Initial Value dBm/MHz 36.85 - Element Materials Tech 50 Ω DC t 42.03 dB 00 dBm	#VBV - 1990 MHz, 5G Duty Cycle Factor (dB) 0 nology PNO: Fast →	NR, Port 3, 20 MHZ* Single Port dBm/MHz == PSD 36.85 ENSE:INT ▲ Trig: Free Run #Atten: 30 dB	#SWed	ation, Mid Channel, 1960 MF Four Port (4x4 MIMO) dBm/MHz == PSD 42.85 01:30:23 PM Apr/27, 2021 TRACE II 23 43 5 TYPE A AAAAA Ikr1 1.968 34 GHz 36.850 dBm	łz
#Res BW 1.0 MHz MSG Ba	nd n2, 1930 MHz Initial Value dBm/MHz 36.85 - Element Materials Tech 50	#¥VBV	V 3.0 MHZ* NR, Port 3, 20 MHz B Single Port dBm/MHz == PSD 36.85 ENSE:INT ▲ Trig: Free Run #Atten: 30 dB	#SWet	ation, Mid Channel, 1960 MF Four Port (4x4 MIMO) dBm/MHz == PSD 42.85 01:30:23 PM Apr 27, 2021 TRACE II 23 43 00 TYPE A VANAWA DET A AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA	łz
#Res BW 1.0 MHz MSG Ba	nd n2, 1930 MHz Initial Value dBm/MHz 36.85 - Element Materials Tech 50 2 DC t 42.03 dB 00 dBm	#¥VBV	NR, Port 3, 20 MHz 8 Single Port dBm/MHz == PSD 36.85 ENSE:INT Trig: Free Run #Atten: 30 dB	#Swer	ation, Mid Channel, 1960 Mk Four Port (4x4 MIMO) dBm/MHz == PSD 42.85 01:30:23 PM Apr 27, 2021 TRACE 12.34 So DET AAAAAA kr1 1.968 34 GHz 36.850 dBm	łz
#Res BW 1.0 MHz MSG Ba Ba Keysight Spectrum Analyzer Ref Offse Cog 40 0 30 0 20 0	nd n2, 1930 MHz Initial Value dBm/MHz 36.85 - Element Materials Tech 50 Q DC t 42.03 dB 00 dBm	#¥VBV	NR, Port 3, 20 MHz 8 Single Port dBm/MHz == PSD 36.85 ENSE:INT Trig: Free Run #Atten: 30 dB	#Swer	ation, Mid Channel, 1960 Mk Four Port (4x4 MIMO) dBm/MHz == PSD 42.85 01:30:23 PM Apr27, 2021 TRACE 0 2 34 50 DET AAAAAA Ikr1 1.968 34 GHz 36.850 dBm	łz
#Res BW 1.0 MHz Msg BI Keyright Spectrum Analyzer Ref Offse 10 dB/div Ref 50.0 30 0 20 0	nd n2, 1930 MHz Initial Value dBm/MHz 36.85 - Element Materials Tech 50 Ω DC t 42.03 dB 00 dBm	#¥VBV	V 3.0 MHZ* NR, Port 3, 20 MHz B Single Port dBm/MHz == PSD 36.85 ENSE:INT Trig: Free Run #Atten: 30 dB	#Swer	ation, Mid Channel, 1960 Mk Four Port (4x4 MIMO) dBm/MHz == PSD 42.85 01:30:23 PM Apr 27, 2021 TRACE 2 2 3 4 50 DET A A A A A A Ikr1 1.968 34 GHz 36.850 dBm	łz

#VBW 3.0 MHz*

STATUS

Span 35.00 MHz #Sweep 601.0 ms (601 pts)

Center 1.96000 GHz #Res BW 1.0 MHz



	Band n2, 1930 MHz	- 1990 MHz, 5G	NR, Port 3, 20 MHz Ba	ndwdith, 64-QAM Modula	ation, High Channel, 1980
	Initial Value dBm/MHz	Duty Cycle Factor (dB)	Single Port dBm/MHz == PSD	Two Port (2x2 MIMO) dBm/MHz == PSD	Four Port (4x4 MIMO dBm/MHz == PSD
	36.668	0	36.67	39.67	42.67
Kevsight Spectrum Ar	nalvzer - Element Materials Techn	ology			
CXI RL RF	50 Ω DC	S	ENSE:INT		02:07:42 PM Apr 27, 2021 TRACE 1 2 3 4 5 6
		PNO: Fast +++	Trig: Free Run #Atten: 30 dB	Avg Hold: 100/100	DET A A A A A A
Ref	Offset 42.03 dB			Ν	lkr1 1.975 74 GHz
10 dB/div Ref	49.00 dBm				36.668 dBm
20.0		1			
39.0					
29.0	/				
19.0	/				
9.00	1				
-1.00					
11.0	{				
-11.0	/				
-21.0					
-31.0					
-41.0					
Center 1.98000) GHz				Span 35.00 MHz
#Res BW 1.0 M	1Hz	#VB\	N 3.0 MHz*	#Swe	ep 601.0 ms (601 pts)
MSG				STATUS	
	Band n2, 1930 MHz -	1990 MHz, 5G	NR, Port 3, 20 MHz Ba	ndwdith, 256-QAM Modu	ation, Low Channel, 1940
	dBm/MHz	Factor (dB)	dBm/MHz == PSD	dBm/MHz == PSD	dBm/MHz == PSD
	36.801	0	36.80	39.80	42.80
🗾 Keysight Spectrum Ar	nalyzer - Element Materials Techn	ology			
KARL RF	50 Ω DC	5	ENSE:INT	LIGN OFF #Avg Type: RMS	12:39:07 PM Apr 27, 2021 TRACE 1 2 3 4 5 6
		PNO: Fast +++ IFGain:Low	Trig: Free Run #Atten: 30 dB	Avg Hold: 100/100	
Ref (Offset 42.03 dB			N	lkr1 1.942 04 GHz
10 dB/div Ref	49.00 dBm				36.801 dBm
39.0			<u>_</u> 1		
39.0			↓ 1		
39.0 29.0			∮ ¹		
39.0 29.0 19.0			∳ ¹		
39.0 29.0 19.0			∳ 1		
39.0 29.0 9.00					
39.0 29.0 19.0 					
39 0 29 0 19 0 9 00 -1.00			1 		
39.0 29.0 19.0 9.00 -1.00 -11.0			1 		

#VBW 3.0 MHz*

STATUS

Span 35.00 MHz #Sweep 601.0 ms (601 pts)

Center 1.94000 GHz #Res BW 1.0 MHz



Ba	nd n2, 1930 MHz - 1	990 MHz, 5G	NR, Port 3, 20 M	Hz Bandwdith, 2	256-QAM Modul	ation, Mid C	Channel, 1960 N	MHz
	Initial Value dBm/MHz	Duty Cycle Factor (dB)	Single Po dBm/MHz ==	rt Two Po PSD dBm	ort (2x2 MIMO) /MHz == PSD	Four Po dBm/N	rt (4x4 MIMO) MHz == PSD	
	36.86	0	36.86		39.86		42.86	
🗱 Keysight Spectrum Analyze	er - Element Materials Technolo	ogy						
KAIRL RF	50 Ω DC	s	ENSE:INT	ALIGN OFF #Avg Ty	/pe: RMS	01:36:3 T	RACE 1 2 3 4 5 6	
		PNO: Fast +++ FGain:Low	Trig: Free Run #Atten: 30 dB	Avg Ho	d: 100/100			
Ref Offse 10 dB/div Ref 49.	et 42.03 dB 00 dBm				Μ	lkr1 1.96 36	62 04 GHz .860 dBm	
Log				. 1				
39.0				<u>•</u>				
29.0	/							
40.0	/				1			
9.00								
-1.00								
44.0						ł		
-11.0	/					ł		
-21.0								
-31.0								
41.0								
-41.0								
Center 1.96000 GH	łz					Spar	1 35.00 MHz	
#Res BW 1.0 MHz		#VBV	V 3.0 MHz*	STATUS	#Swee	ep 601.0 r	ns (601 pts)	
Bai	nd n2, 1930 MHz - 1 Initial Value	990 MHz, 5G Duty Cycle	NR, Port 3, 20 M Single Po	Hz Bandwdith, 2 rt Two Po	256-QAM Modula ort (2x2 MIMO)	ation, High (Four Po	Channel, 1980 rt (4x4 MIMO)	MHz
· · · · · · · · · · · · · · · · · · ·	dBm/MHz	Factor (dB)	dBm/MHz ==	PSD dBm	/MHz == PSD	dBm/N	MHz == PSD	
I	30.733	U	30.74	I	39.14	1	42./4	1
Keysight Spectrum Analyze	r - Element Materials Technolo	ogy	ENSE-INT			02-15-2	5 PM Apr 27, 2021	
	50 x 00	PNO: Fast	Trig: Free Run	#Avg Ty Avg Ho	/pe: RMS ld: 100/100	T		
Ref Offse	et 42.03 dB	r-Gain:Low	#Atten. 30 ab		M	lkr1 <u>1.9</u> 8	32 04 GHz	
10 dB/div Ref 49.	00 dBm					36	.735 dBm	
				<u>1</u>				
39.0								
29.0								
19.0	/							
9.00						1		

#VBW 3.0 MHz*

STATUS

Span 35.00 MHz #Sweep 601.0 ms (601 pts)

Center 1.98000 GHz #Res BW 1.0 MHz



EIRP Calculations for Four Port MIMO Operations

EIRP calculations are needed at each transmitter location to optimize base station operational performance while meeting regulatory requirements. Each cell site installation needs to consider the power measurements in the radio certification report as well as site specific regulatory requirements (such as antenna height, population density, etc.), site installation parameters (line loss between antenna and radio, antenna parameters, etc.) and base station operational parameters (MIMO operational setup, carrier power level, channel bandwidth, modulation type, etc.) to optimize performance. Transmitter output power may be reduced (from maximum) by base station setup parameters. Base station antennas are selected by the customer.

Kathrein antenna assembly model "80011867(Y2)" has a gain (dBi) of 17.3 \pm 0.3dB (maximum gain of 17.6dBi was used for the EIRP calculation) for Band n2 was used for this calculation. This antenna assembly has a pair of \pm 45° cross-polarized radiators used for Band n2. The four antenna RF inputs (used for Band n2) on the antenna assembly are as follows: Y1+ L5 (+45°), Y1- L6 (-45°), Y2+ R7 (+45°) and Y2- R8 (-45°). Four FXFC transmitter outputs are connected to the antenna assembly RF inputs.

Equivalent Isotropically Radiated Power (EIRP) is calculated (as specified in ANSI C63.26-2015 section 6.4 for a system of correlated output signals) from the results of power measurements (highest measured PSD for each channel bandwidth type). The maximum antenna gain was used for this calculation. The cable loss between the antenna and transmitter is site dependent (will not be 0 dB) but for this worst case EIRP calculation 0 dB was used. Calculations of worst-case EIRP for four port MIMO are as follows:

Parameter	5 MHz Ch BW	10 MHz Ch BW	15 MHz Ch BW	20 MHz Ch BW
Worst Case PSD/Antenna Port	43.1 dBm/MHz	40.5 dBm/MHz	39.4 dBm/MHz	38.4 dBm/MHz
Cable Loss (site dependent)	0 dB	0 dB	0 dB	0 dB
Maximum Antenna Gain (G _{Ant})	17.6 dBi	17.6 dBi	17.6 dBi	17.6 dBi
Directional Gain = G _{Ant} + 10Log (2)	20.6 dBi	20.6 dBi	20.6 dBi	20.6 dBi
See Note 1				
EIRP for Antenna Y1 +45* EIRP for Ant Y1 +45*=	63.7 dBm/MHz	61.1 dBm/MHz	60 dBm/MHz	59 dBm/MHz
PSD/ant port - Cable Loss + Dir Gain				
EIRP for Antenna Y1 -45*	63.7 dBm/MHz	61.1 dBm/MHz	60 dBm/MHz	59 dBm/MHz
EIRP subtotal for	63.7 dBm/MHz	61.1 dBm/MHz	60 dBm/MHz	59 dBm/MHz
Y1 +45°and Y1 -45*	or	or	or	or
See Note 2	2340 Watts/MHz	1288 Watts/MHz	1000 Watts/MHz	794 Watts/MHz
EIRP for Antenna Y2 +45*	63.7 dBm/MHz	61.1 dBm/MHz	60 dBm/MHz	59 dBm/MHz
EIRP for Antenna Y2 -45*	63.7 dBm/MHz	61.1 dBm/MHz	60 dBm/MHz	59 dBm/MHz
EIRP subtotal for	63.7 dBm/MHz	61.1 dBm/MHz	60 dBm/MHz	59 dBm/MHz
Y2 +45° and Y2 -45*	or	or	or	or
See Note 2	2340 Watts/MHz	1288 Watts/MHz	1000 Watts/MHz	794 Watts/MHz
EIRP Total =	4680 Watts/MHz	2576 Watts/MHz	2000 Watts/MHz	1588 Watts/MHz
Y1 +45°and Y2 +45°	or	or	or	or
See Note 3	66.7 dBm/MHz	64.1 dBm/MHz	63 dBm/MHz	62 dBm/MHz

Note 1: The directional gain was calculated for two antennas since there are a pair of cross-polarized radiators. See ANSI C63.26 sections 6.4.5.3.3a) & 6.4.5.3.1a), and KDB 662911D01v02r01 paragraphs F)2)c)(i) & F)2)a)(i) for guidance.

Note 2: The EIRP per antenna polarity is required to be below the regulatory limit as described in ANSI C63.26-2015 section 6.4.6.3 b)2) and KDB 662911 D02v01 page 3 example (2) since the two transmitter outputs to each antenna are 90 degree-phase shifted relative to each other (cross-polarized radiators).

Note 3: Antenna Y1 an Y2 are correlated - the EIRPs are required to be summed and be below the regulatory limit as described in ANSI C63.26-2015 section 6.4.6.3 b)3) and KDB 662911 D02v01 page 3 example (3).

Calculation Summary

The worst case FXFC four port MIMO EIRP levels using antenna assembly model "80011867(Y2)" are:

- (1) Less than the FCC and ISED (3280 W/MHz or 65.16 dBm/MHz) EIRP Regulatory Limits for 10, 15 & 20MHz channel bandwidths
- (2) Over the FCC/ISED (3280 W/MHz or 65.16 dBm/MHz) EIRP Regulatory Limits by 1.54 dB for the 5MHz channel bandwidth. EIRP calculations are needed at each transmitter location to optimize base station operational performance while meeting regulatory requirements as noted above.

(3) Less than the FCC and ISED (1640 W/MHz or 62.15 dBm/MHz) EIRP Regulatory Limits for the 20MHz channel bandwidth

(4) Over the FCC/ISED (1640 W/MHz or 62.15 dBm/MHz) EIRP Regulatory Limits by 0.85 dB for the 15MHz channel bandwidth, by 1.95 dB for the 10MHz channel bandwidth, and by 4.55 dB for the 5MHz channel bandwidth. EIRP calculations are needed at each transmitter location to optimize base station operational performance while meeting regulatory requirements as noted above.



End of Test Report