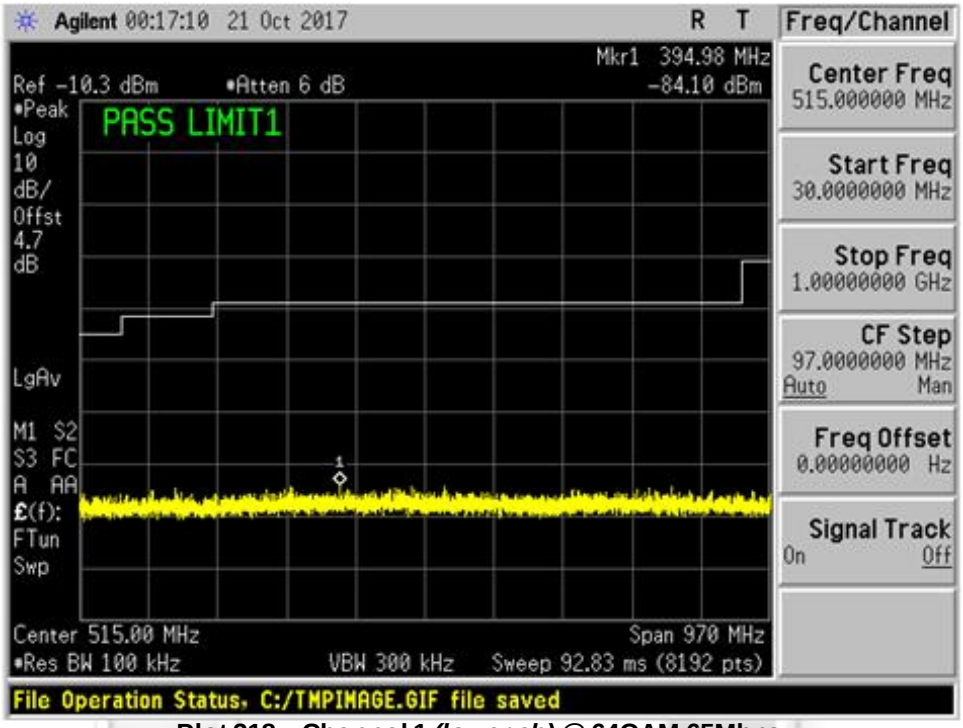
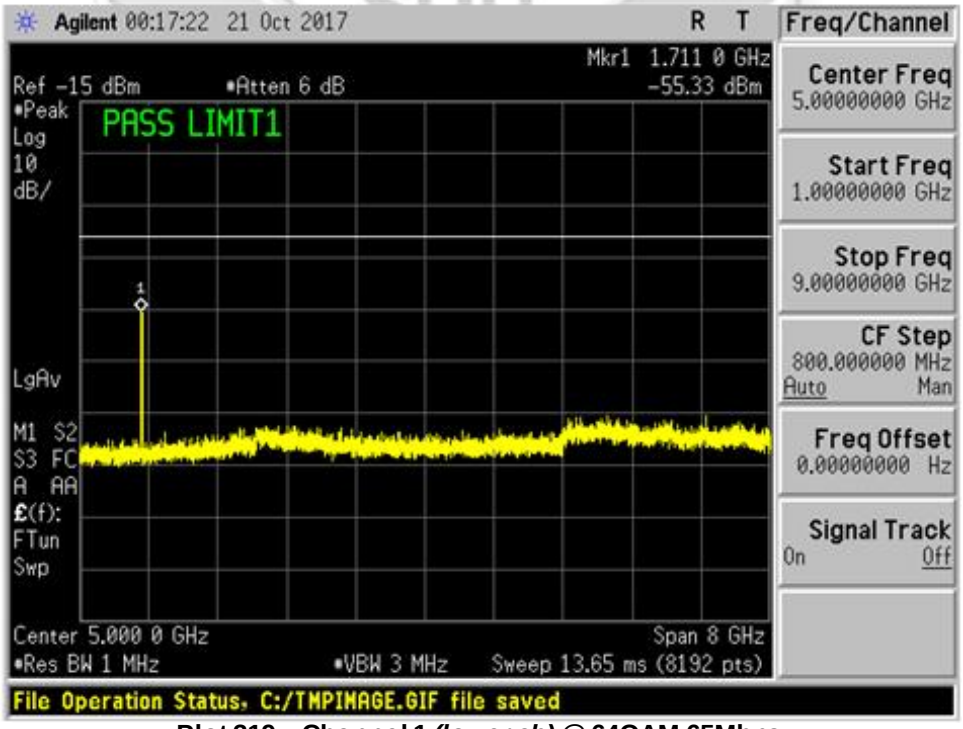
RF Conducted Spurious Emissions (Restricted) Plots – 802.11n(20MHz) Peak

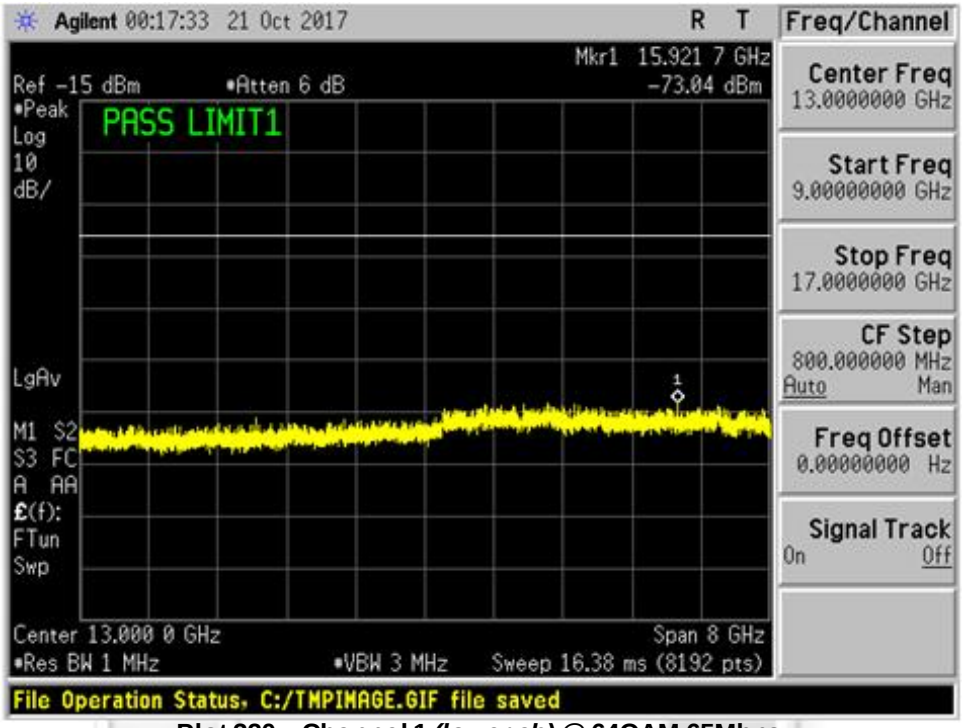


Plot 318 – Channel 1 *(lower ch)* @ 64QAM 65Mbps

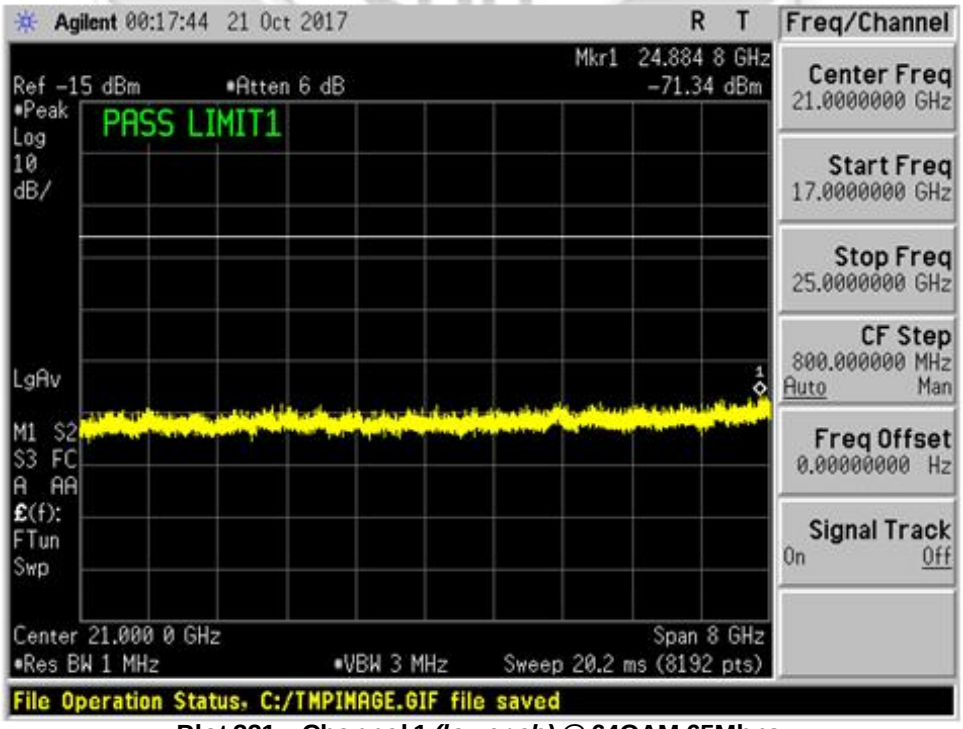


Plot 319 – Channel 1 *(lower ch)* @ 64QAM 65Mbps

RF Conducted Spurious Emissions (Restricted) Plots – 802.11n(20MHz) Peak



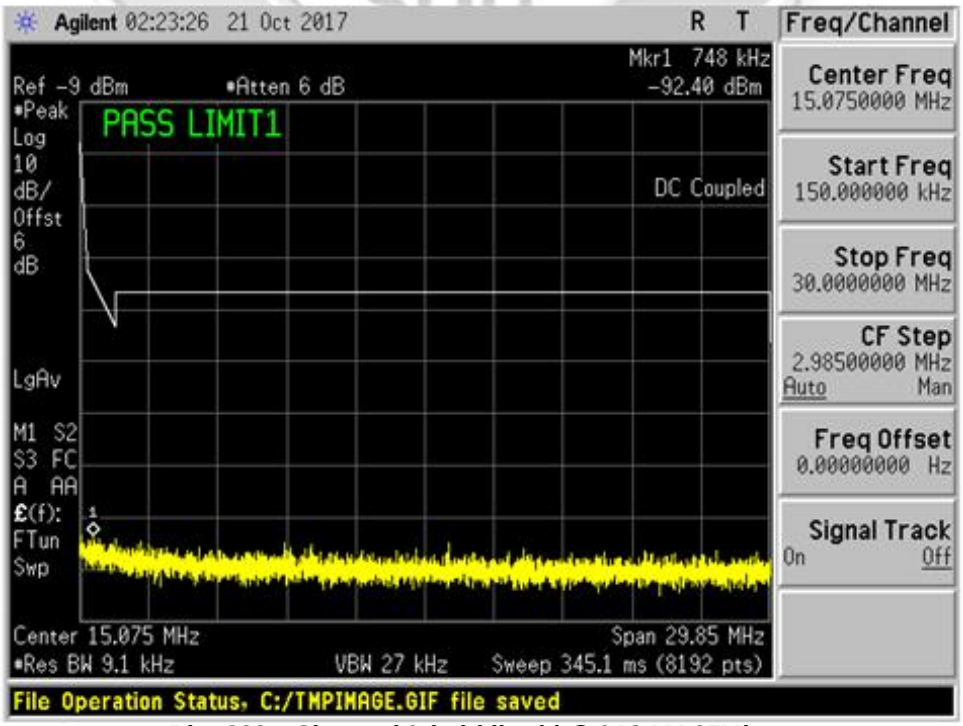
Plot 320 – Channel 1 *(lower ch)* @ 64QAM 65Mbps



Plot 321 – Channel 1 *(lower ch)* @ 64QAM 65Mbps

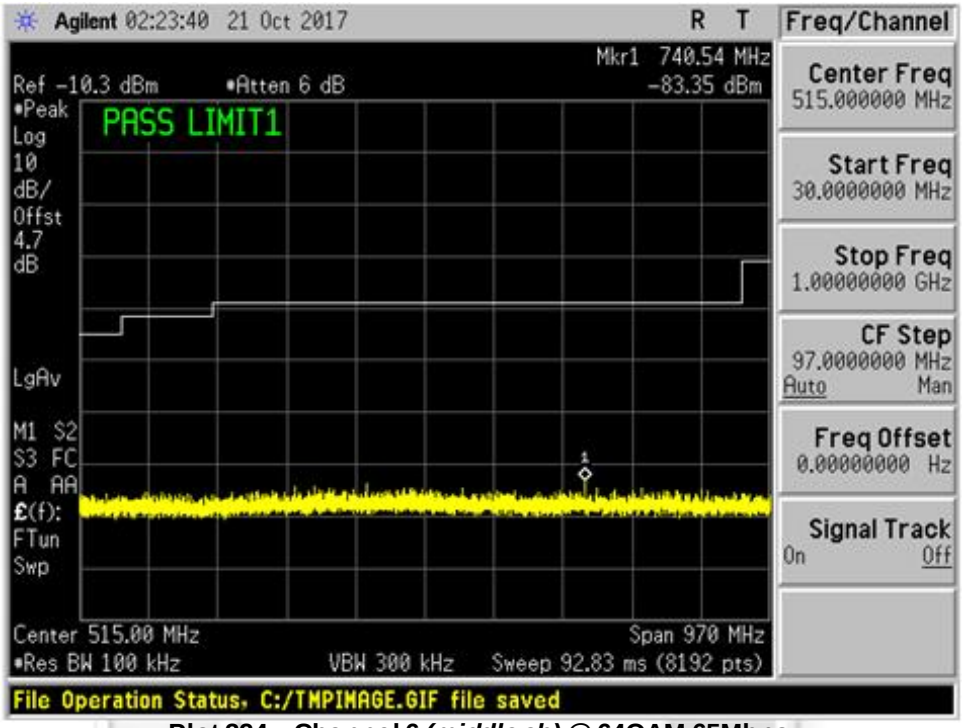
RF Conducted Spurious Emissions (Restricted) Plots – 802.11n(20MHz) Peak

Plot 322 – Channel 6 *(middle ch)* @ 64QAM 65Mbps

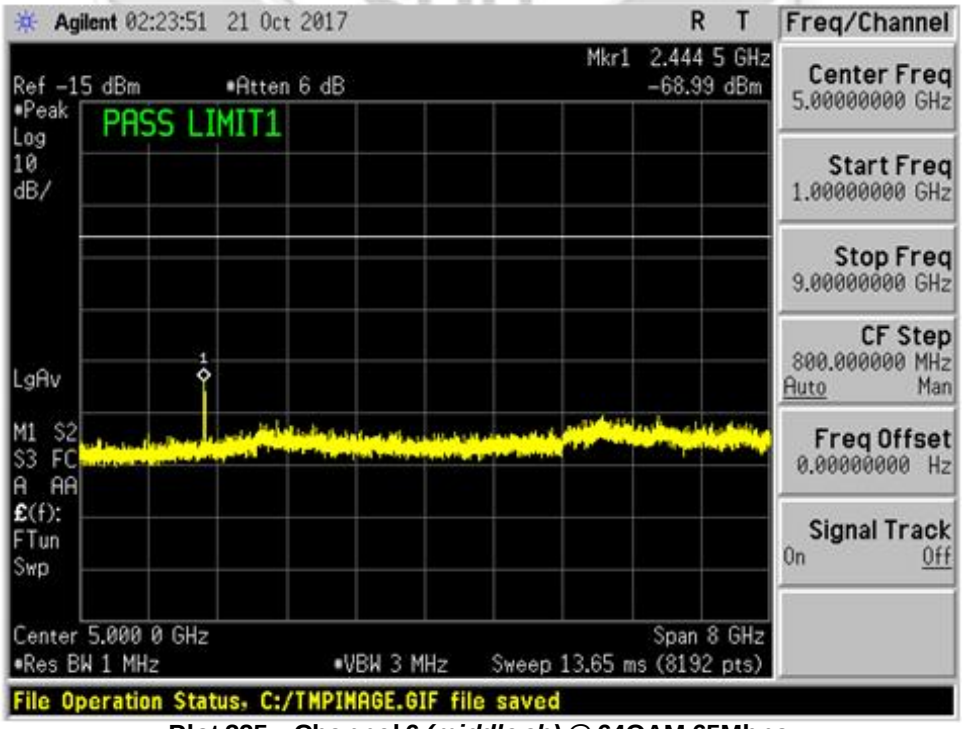


Plot 323 – Channel 6 *(middle ch)* @ 64QAM 65Mbps

RF Conducted Spurious Emissions (Restricted) Plots – 802.11n(20MHz) Peak

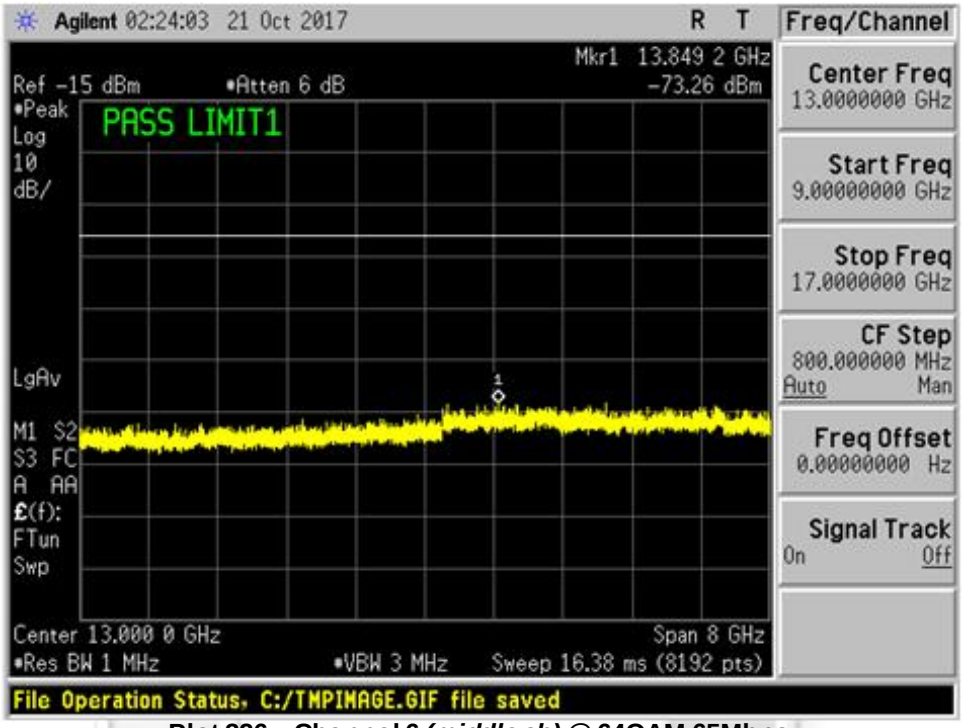


Plot 324 – Channel 6 *(middle ch)* @ 64QAM 65Mbps

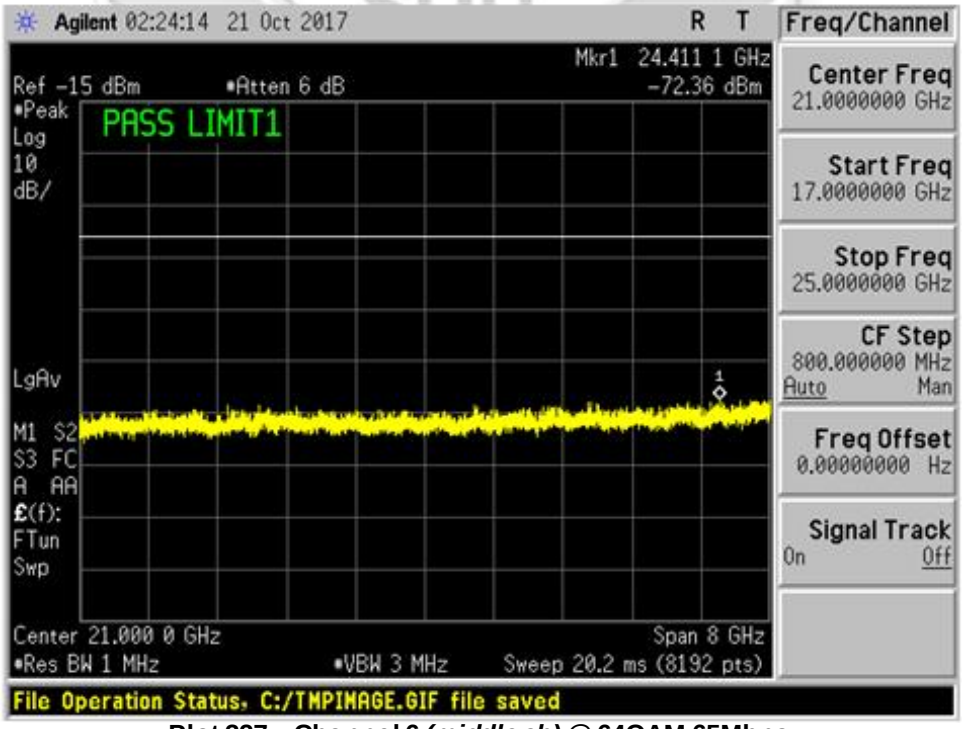


Plot 325 – Channel 6 *(middle ch)* @ 64QAM 65Mbps

RF Conducted Spurious Emissions (Restricted) Plots – 802.11n(20MHz) Peak



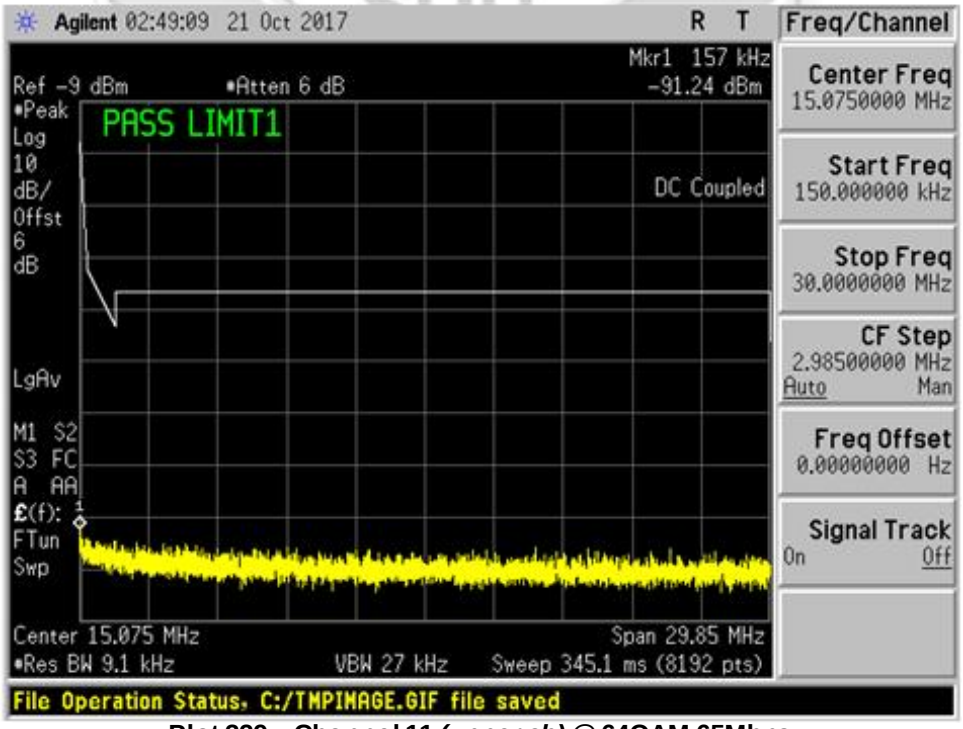
Plot 326 – Channel 6 *(middle ch)* @ 64QAM 65Mbps



Plot 327 – Channel 6 *(middle ch)* @ 64QAM 65Mbps

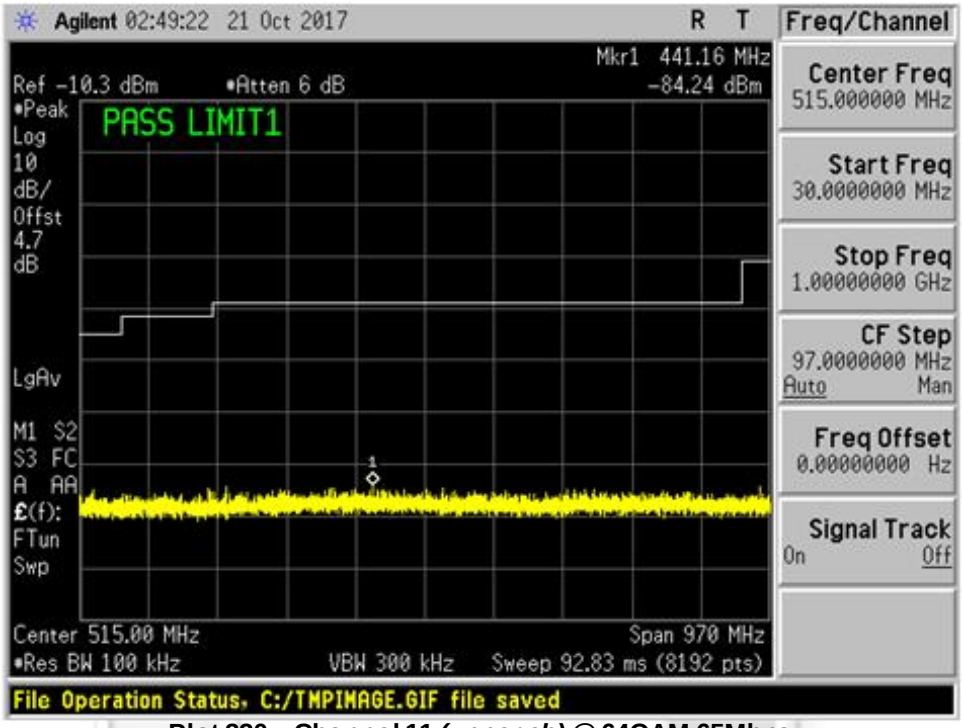
RF Conducted Spurious Emissions (Restricted) Plots – 802.11n(20MHz) Peak

Plot 328 – Channel 11 *(upper ch)* @ 64QAM 65Mbps

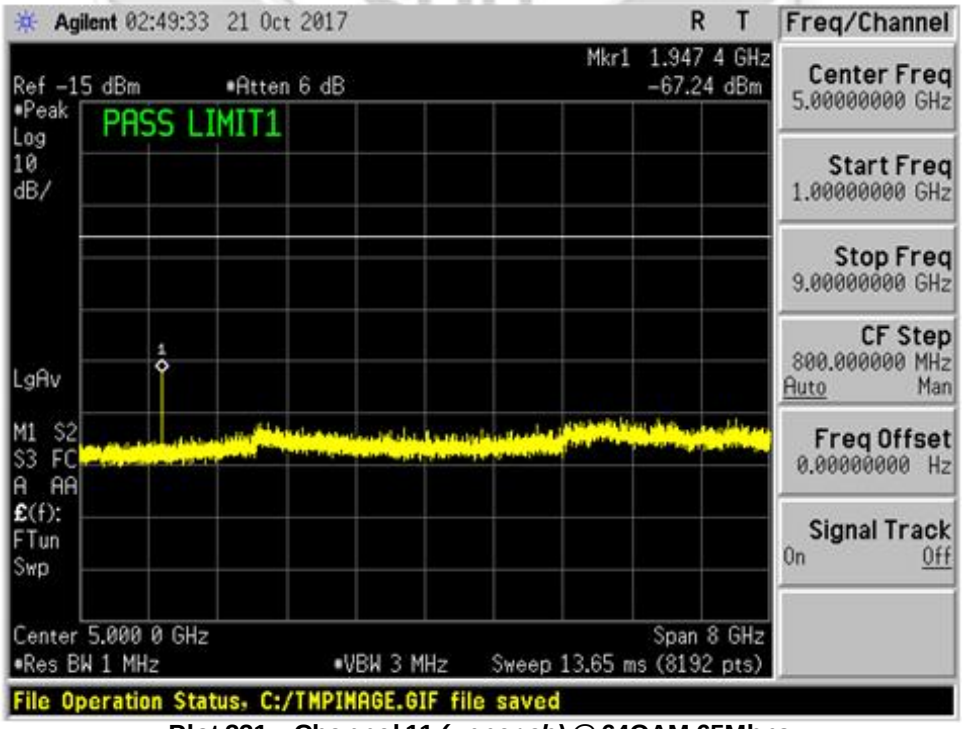


Plot 329 – Channel 11 *(upper ch)* @ 64QAM 65Mbps

RF Conducted Spurious Emissions (Restricted) Plots – 802.11n(20MHz) Peak

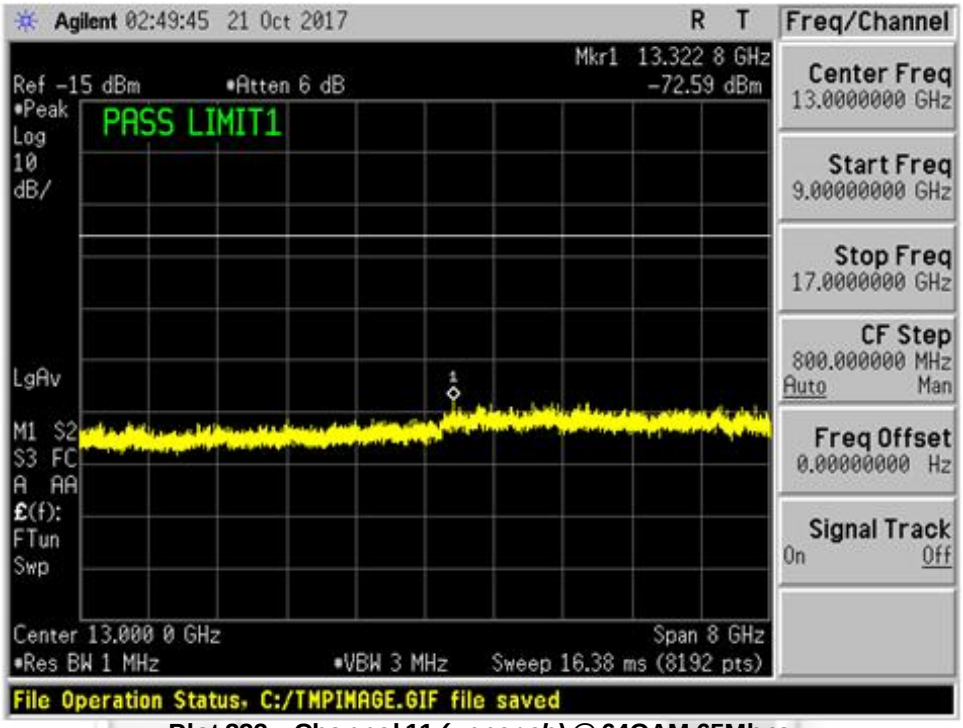


Plot 330 – Channel 11 *(upper ch)* @ 64QAM 65Mbps

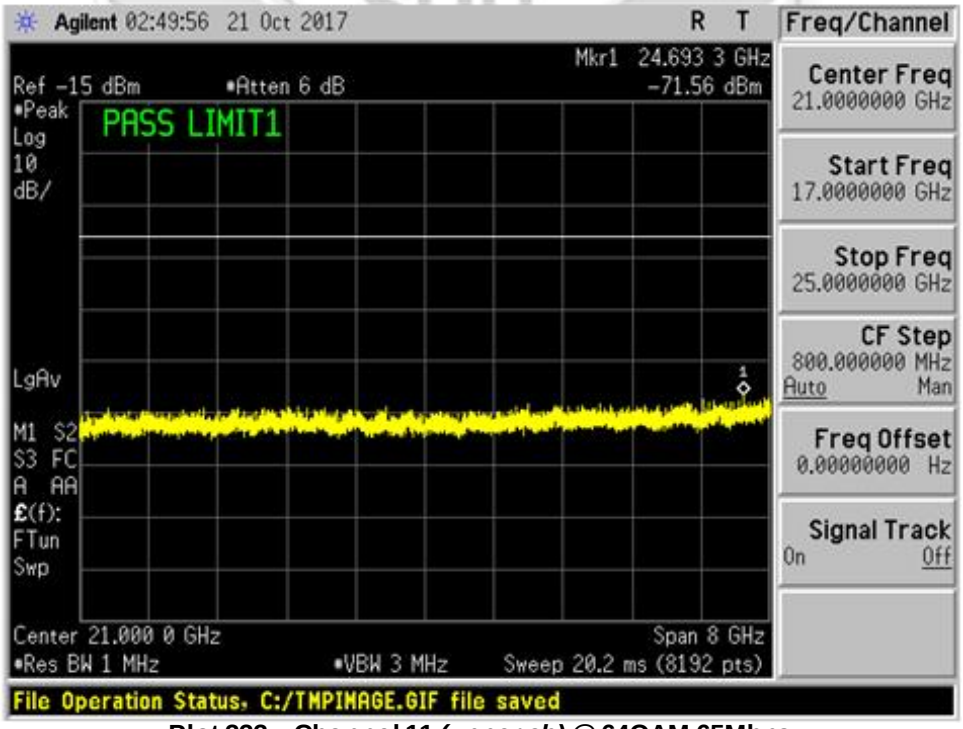


Plot 331 – Channel 11 *(upper ch)* @ 64QAM 65Mbps

RF Conducted Spurious Emissions (Restricted) Plots – 802.11n(20MHz) Peak



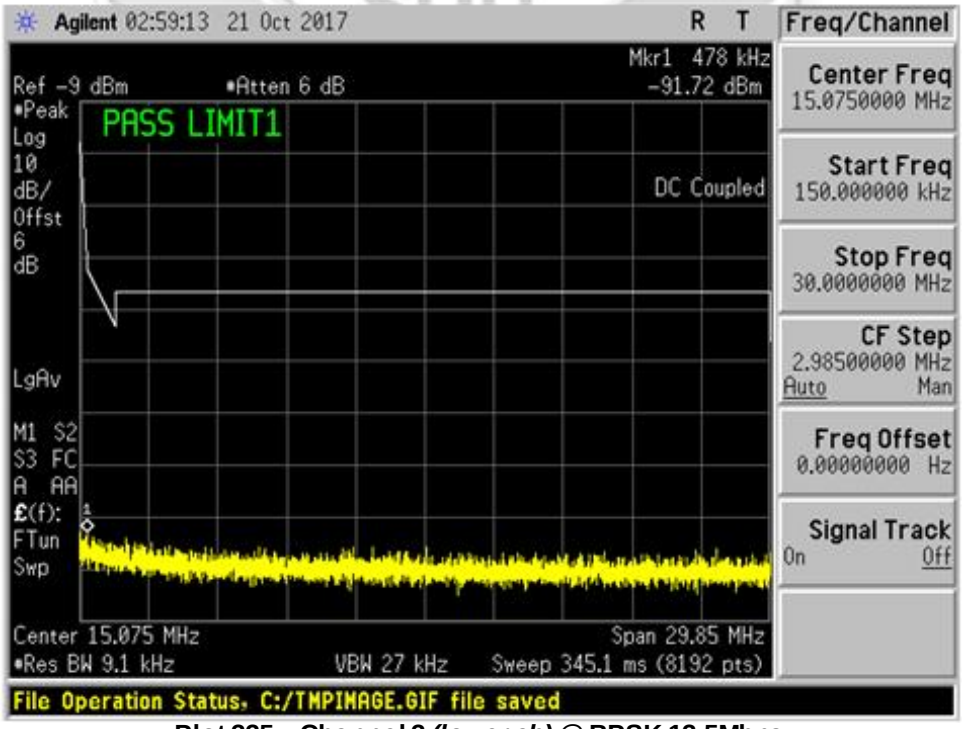
Plot 332 – Channel 11 *(upper ch)* @ 64QAM 65Mbps



Plot 333 – Channel 11 *(upper ch)* @ 64QAM 65Mbps

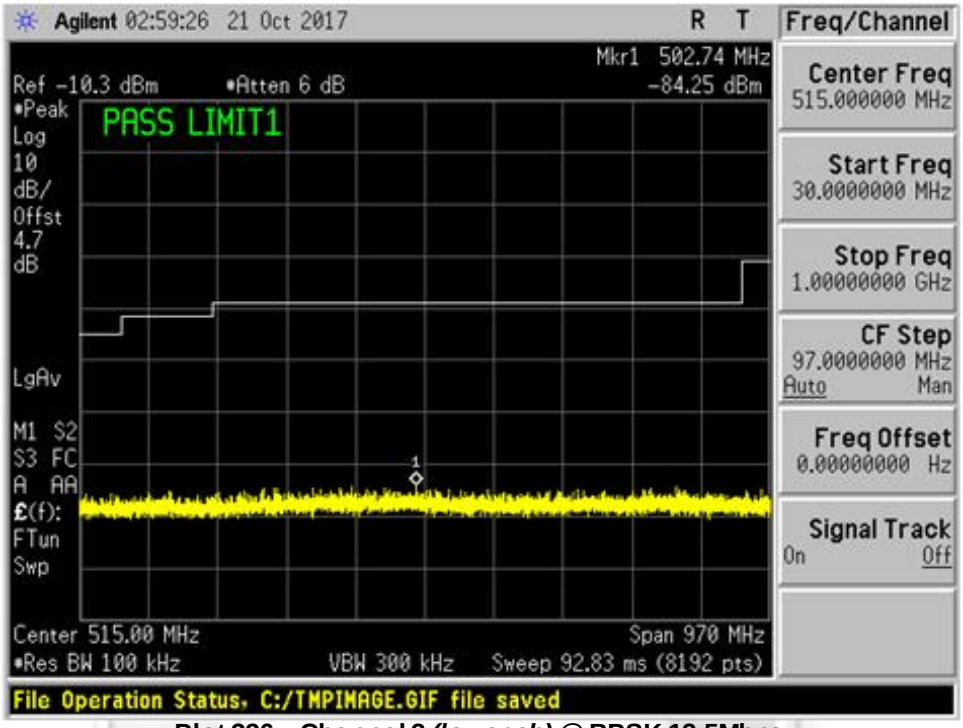
RF Conducted Spurious Emissions (Restricted) Plots – 802.11n(40MHz) Peak

Plot 334 – Channel 3 *(lower ch)* @ BPSK 13.5Mbps

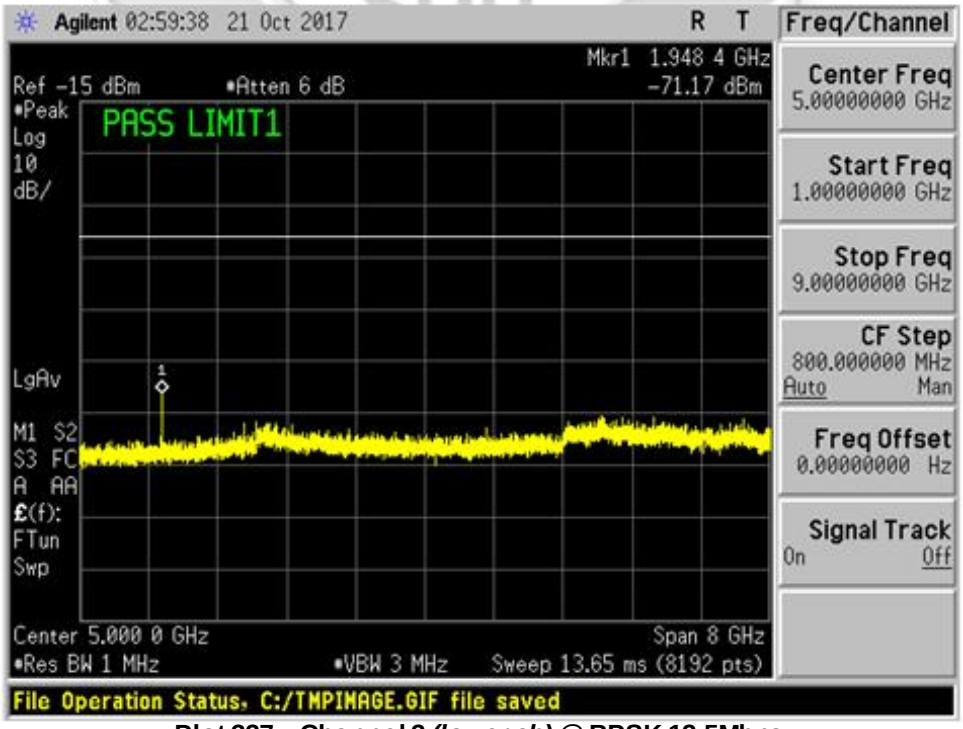


Plot 335 – Channel 3 *(lower ch)* @ BPSK 13.5Mbps

RF Conducted Spurious Emissions (Restricted) Plots – 802.11n(40MHz) Peak

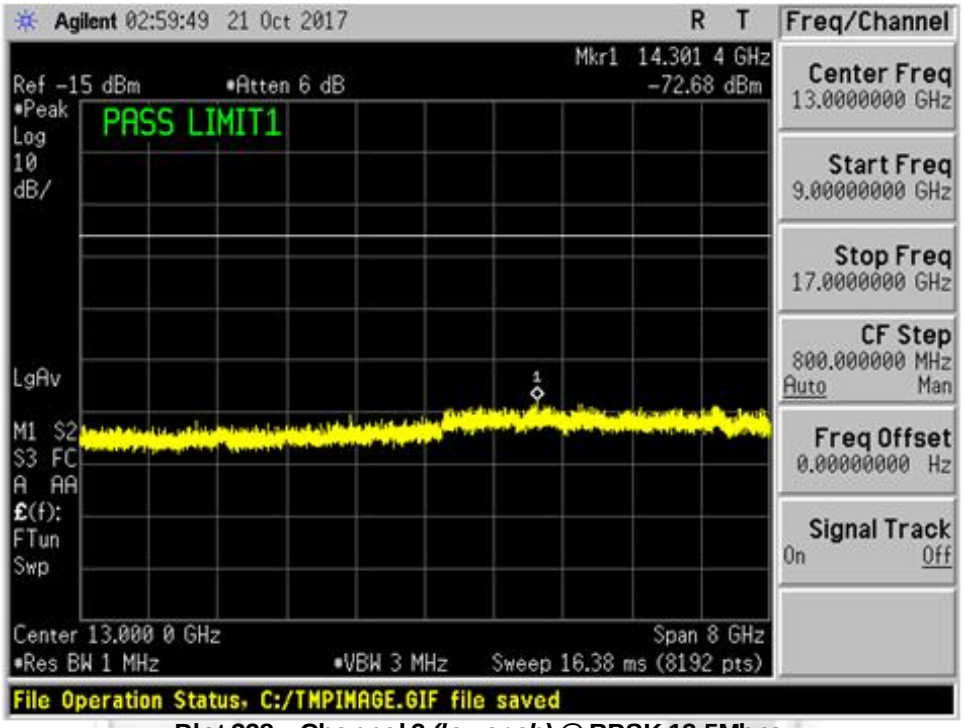


Plot 336 – Channel 3 *(lower ch)* @ BPSK 13.5Mbps

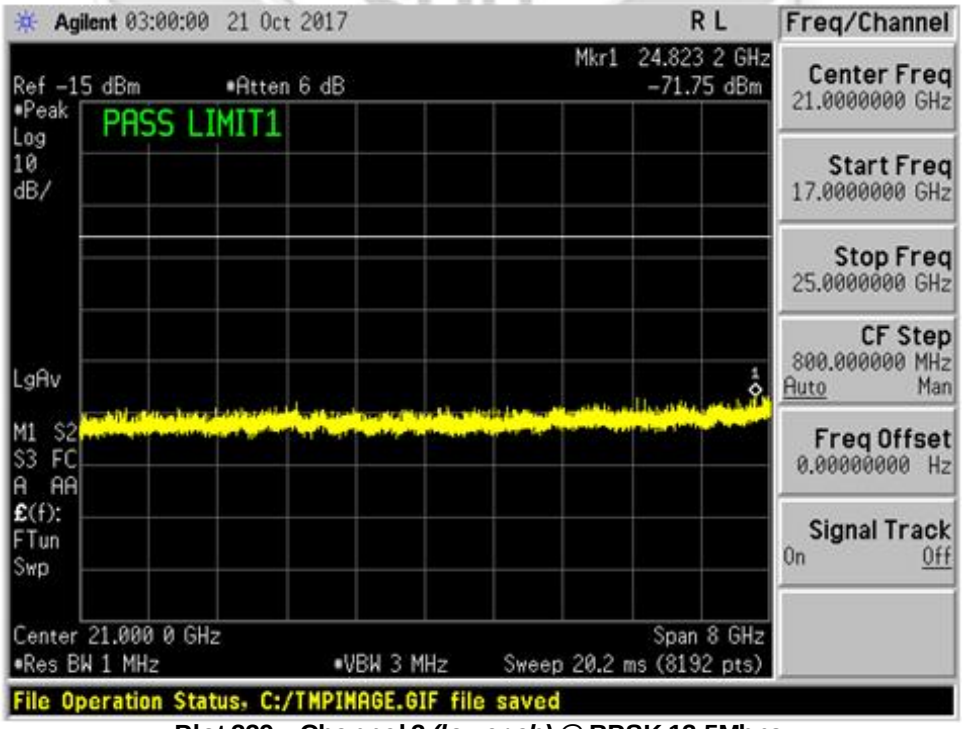


Plot 337 – Channel 3 *(lower ch)* @ BPSK 13.5Mbps

RF Conducted Spurious Emissions (Restricted) Plots – 802.11n(40MHz) Peak



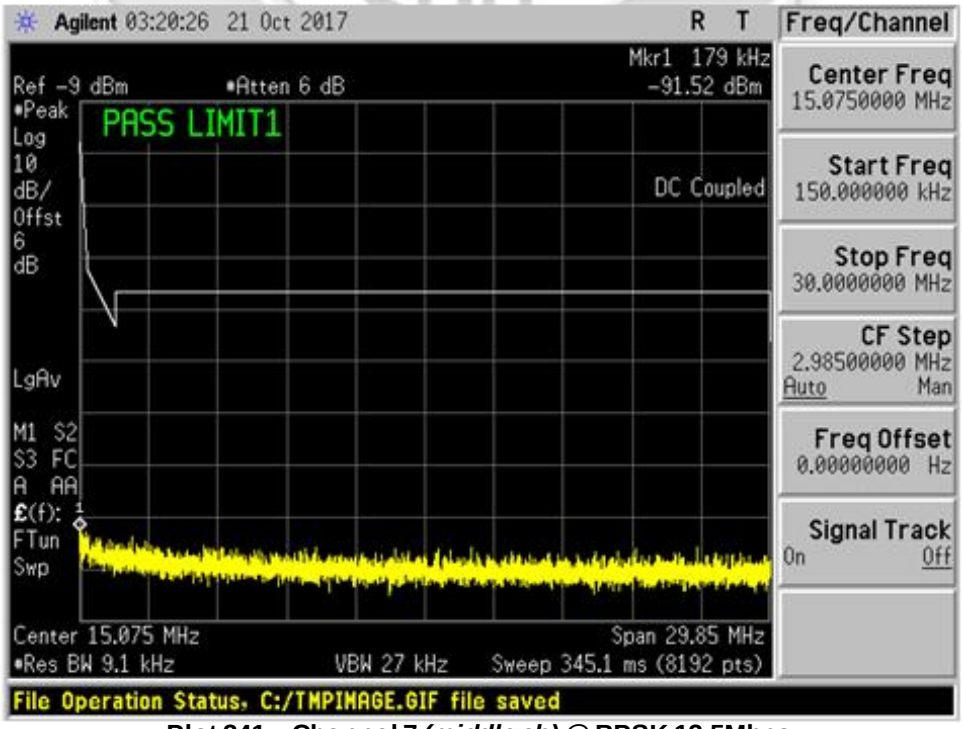
Plot 338 – Channel 3 *(lower ch)* @ BPSK 13.5Mbps



Plot 339 – Channel 3 *(lower ch)* @ BPSK 13.5Mbps

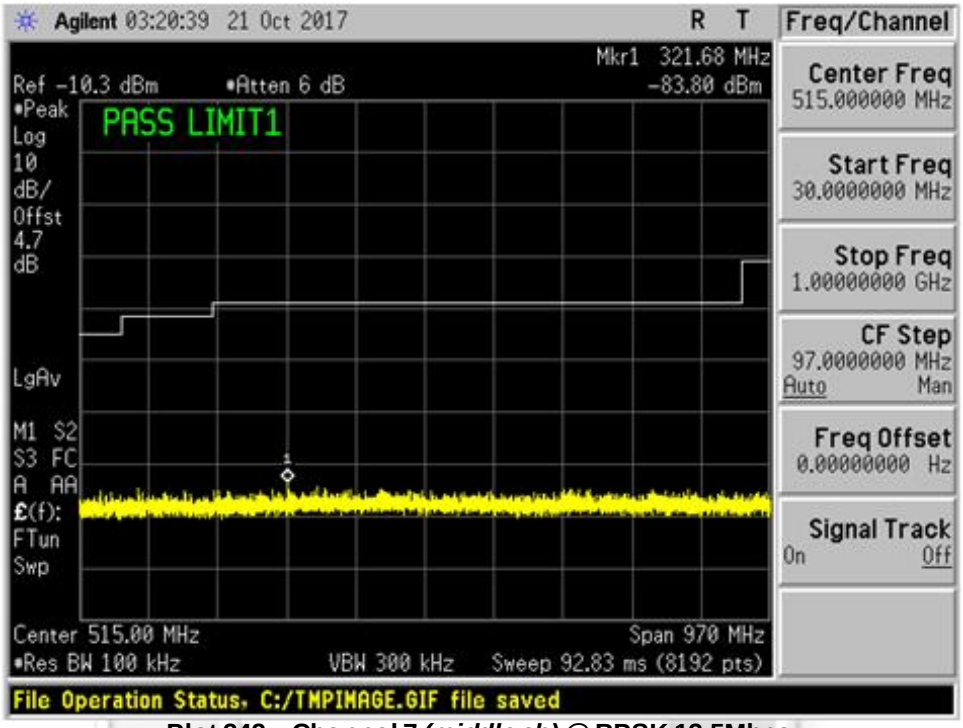
RF Conducted Spurious Emissions (Restricted) Plots – 802.11n(40MHz) Peak

Plot 340 – Channel 7 *(middle ch)* @ BPSK 13.5Mbps

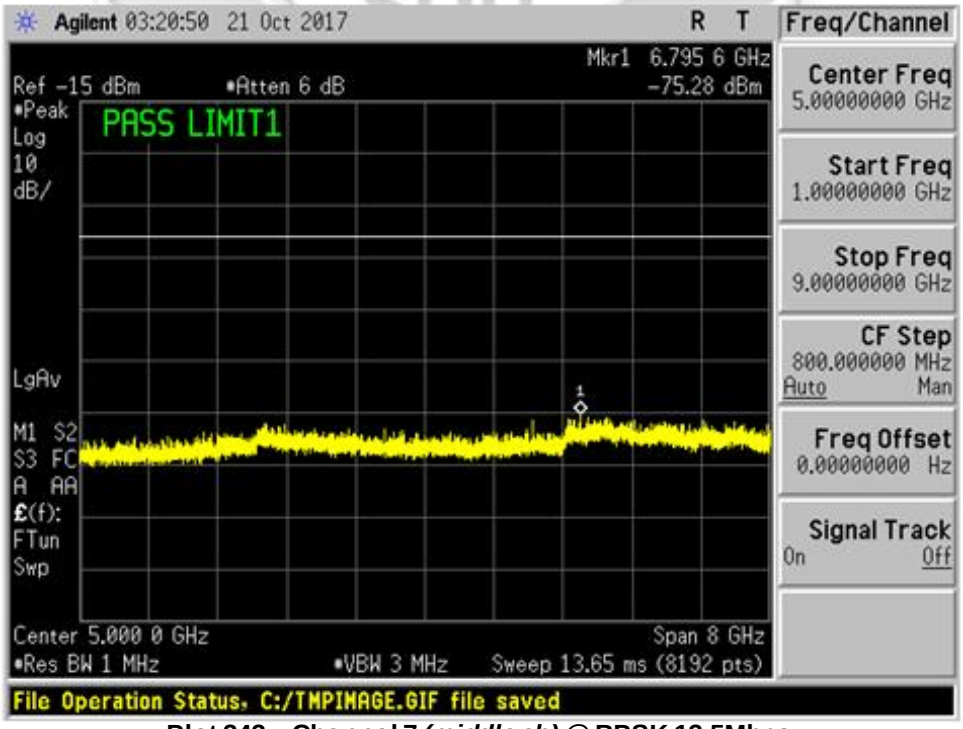


Plot 341 – Channel 7 *(middle ch)* @ BPSK 13.5Mbps

RF Conducted Spurious Emissions (Restricted) Plots – 802.11n(40MHz) Peak

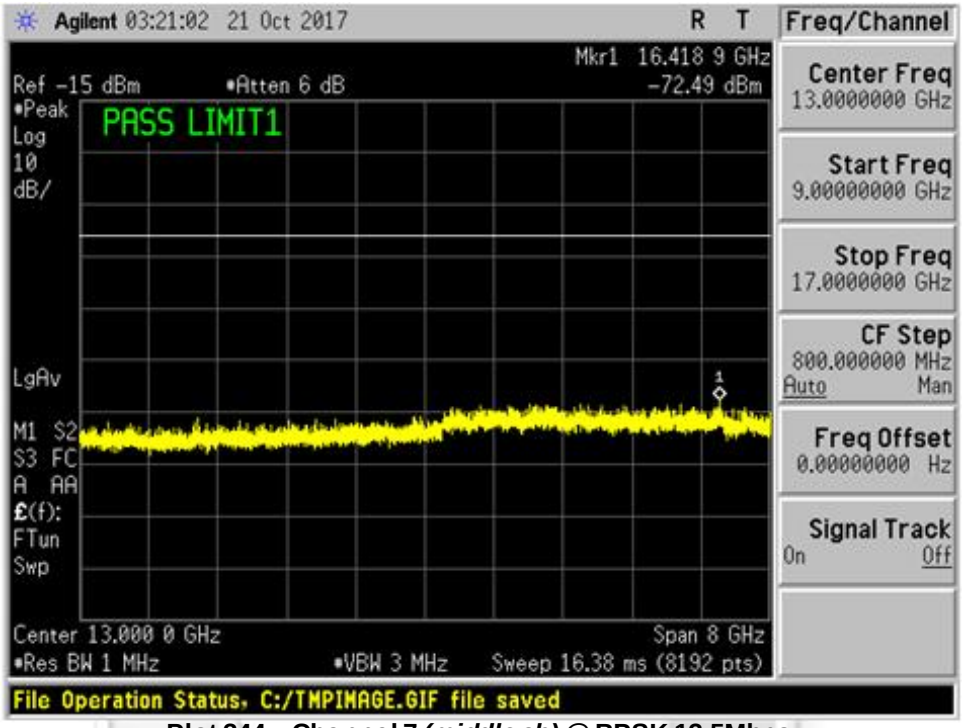


Plot 342 – Channel 7 *(middle ch)* @ BPSK 13.5Mbps

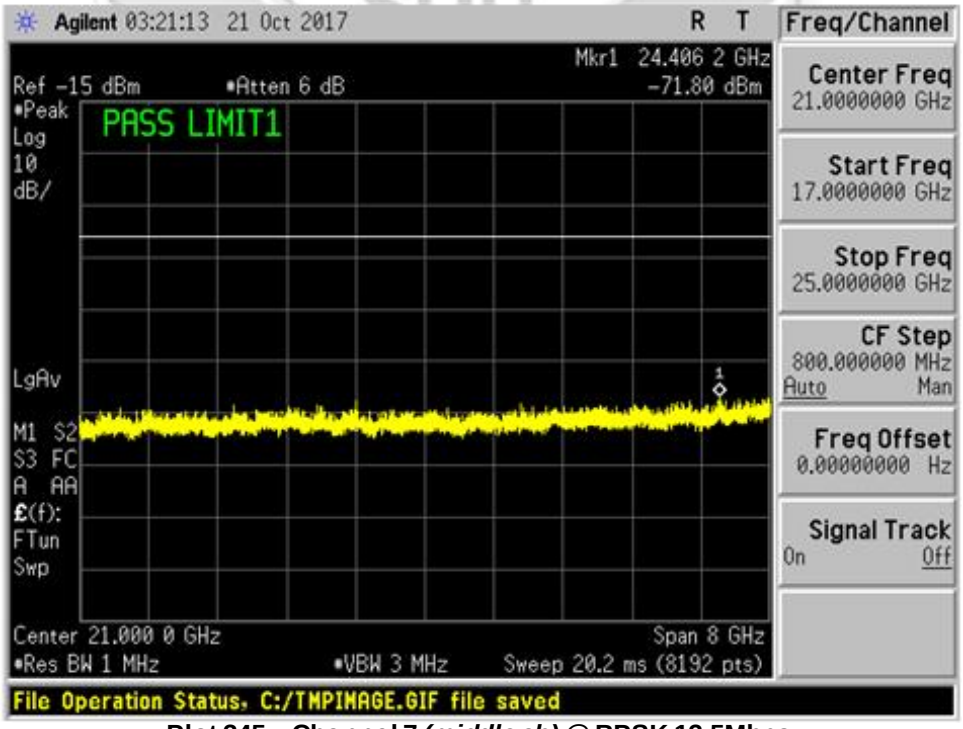


Plot 343 – Channel 7 *(middle ch)* @ BPSK 13.5Mbps

RF Conducted Spurious Emissions (Restricted) Plots – 802.11n(40MHz) Peak



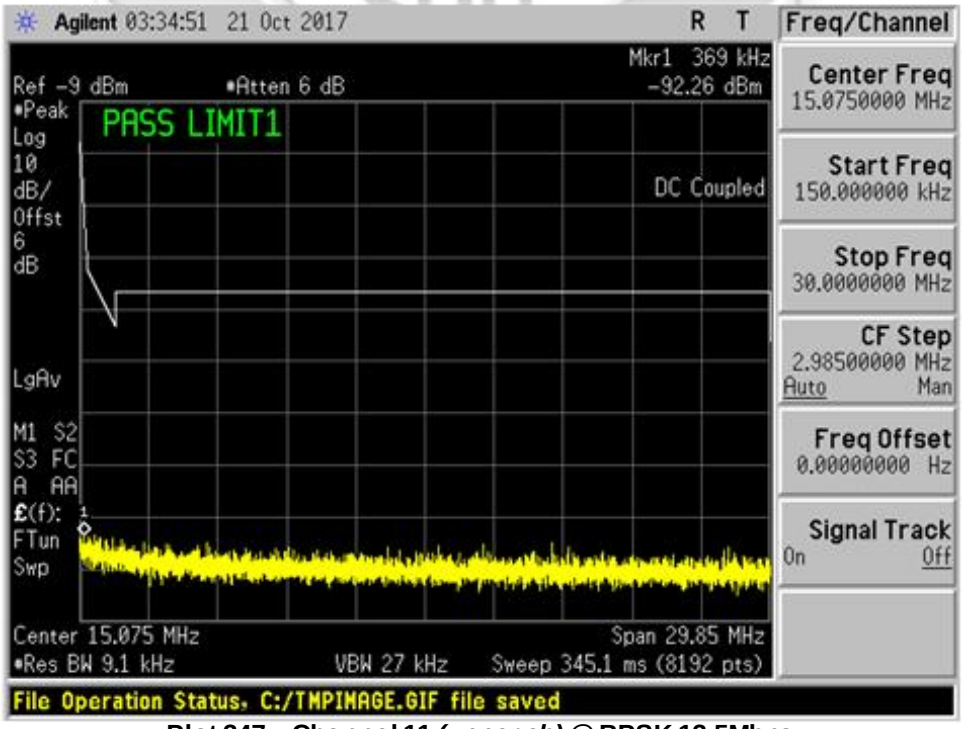
Plot 344 – Channel 7 *(middle ch)* @ BPSK 13.5Mbps



Plot 345 – Channel 7 *(middle ch)* @ BPSK 13.5Mbps

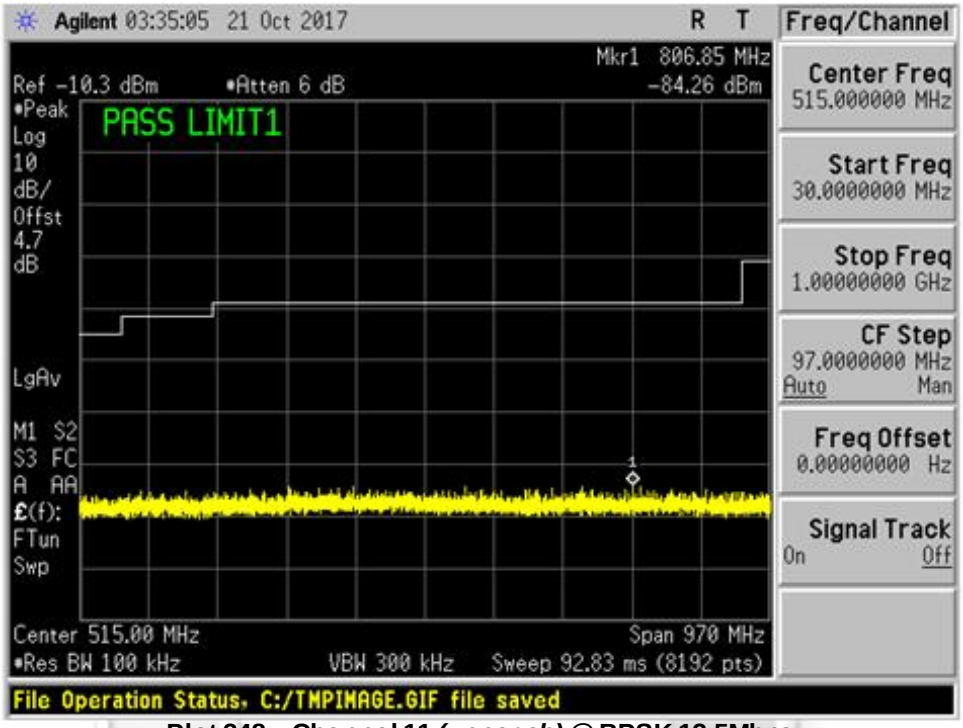
RF Conducted Spurious Emissions (Restricted) Plots – 802.11n(40MHz) Peak

Plot 346 – Channel 11 *(upper ch)* @ BPSK 13.5Mbps

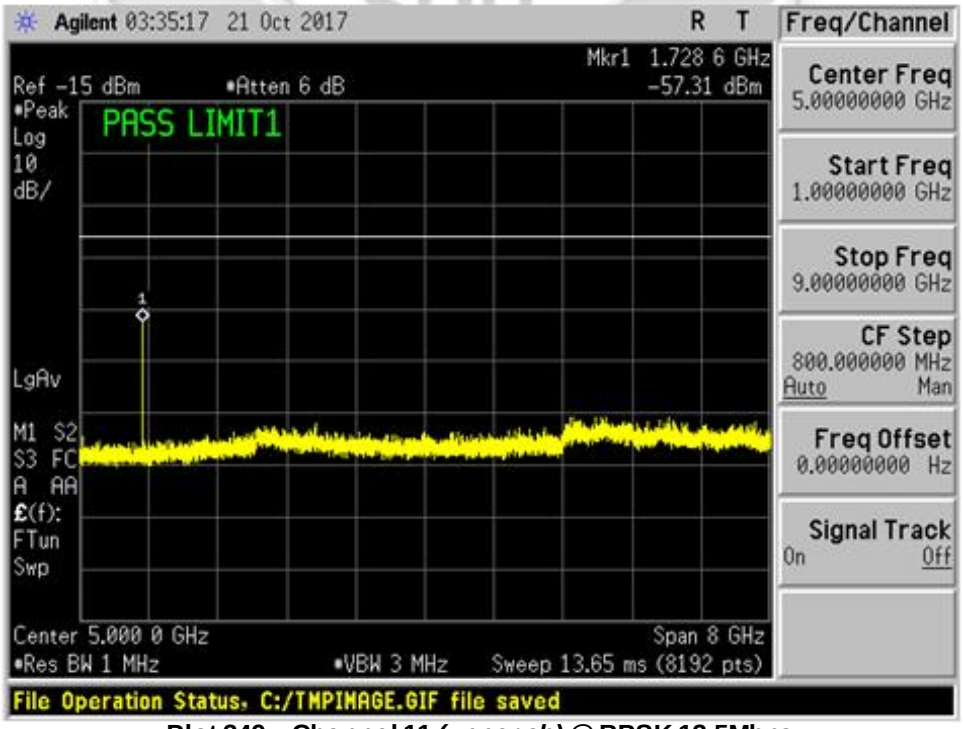


Plot 347 – Channel 11 *(upper ch)* @ BPSK 13.5Mbps

RF Conducted Spurious Emissions (Restricted) Plots – 802.11n(40MHz) Peak

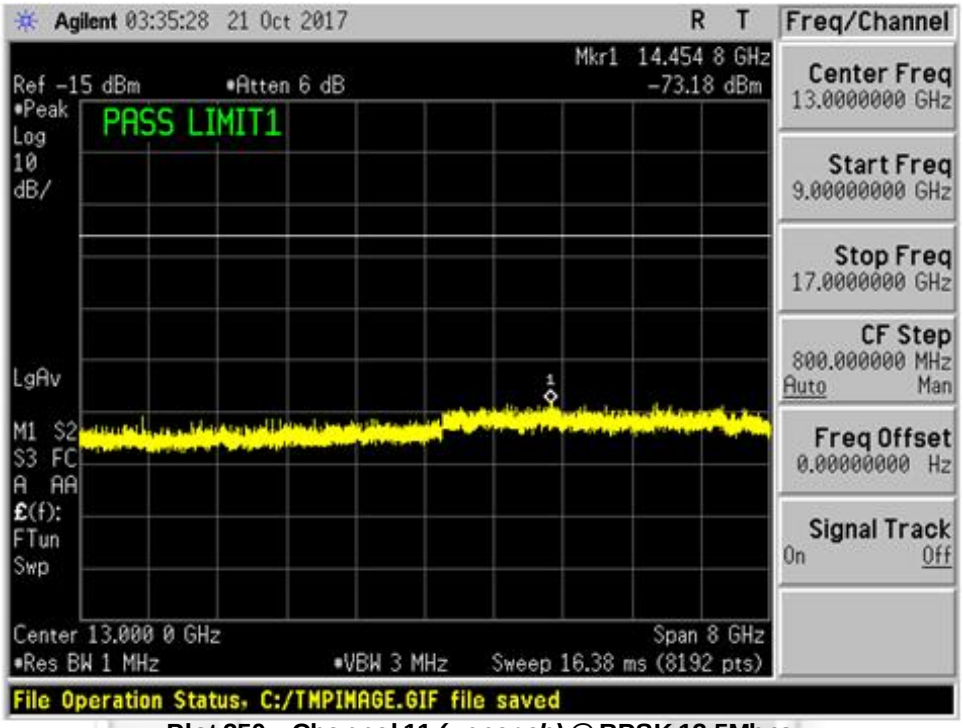


Plot 348 – Channel 11 *(upper ch)* @ BPSK 13.5Mbps

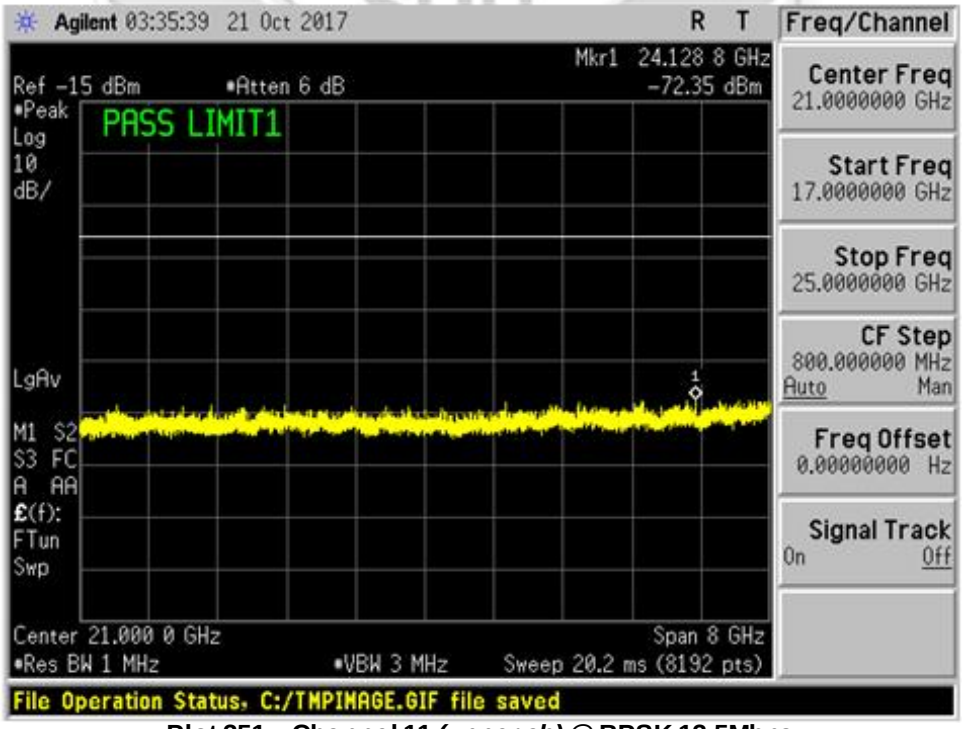


Plot 349 – Channel 11 *(upper ch)* @ BPSK 13.5Mbps

RF Conducted Spurious Emissions (Restricted) Plots – 802.11n(40MHz) Peak



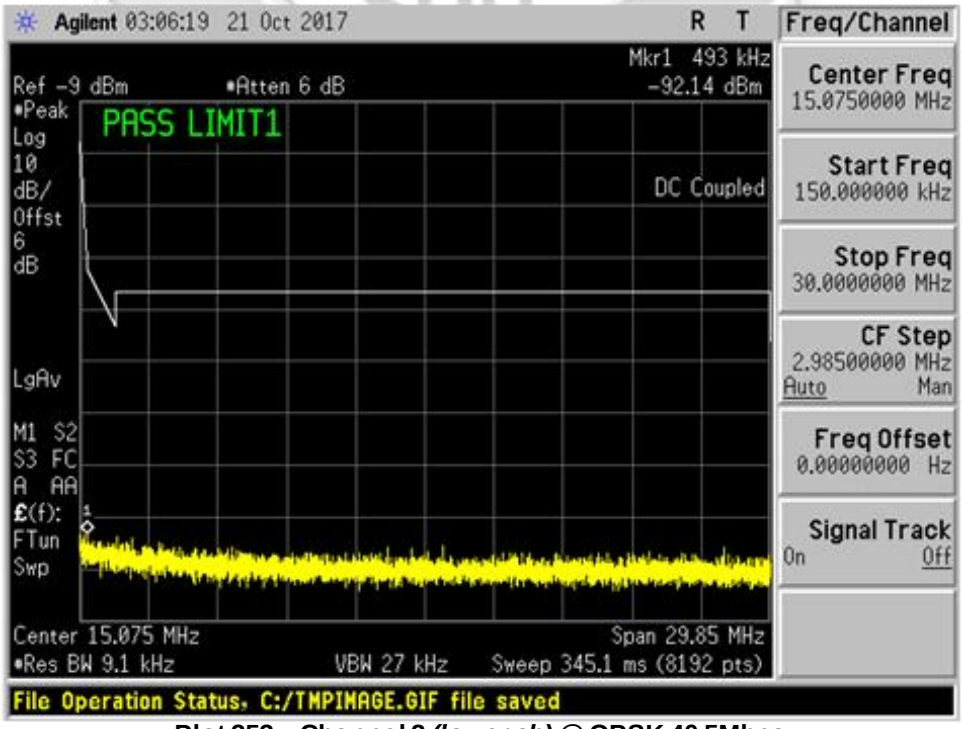
Plot 350 – Channel 11 *(upper ch)* @ BPSK 13.5Mbps



Plot 351 – Channel 11 *(upper ch)* @ BPSK 13.5Mbps

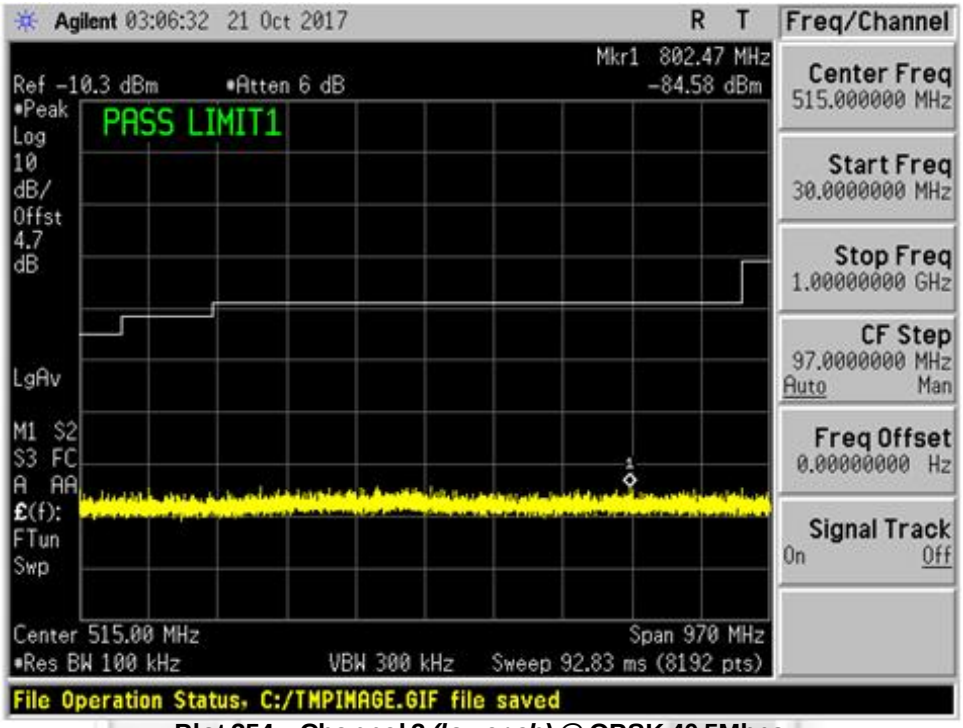
RF Conducted Spurious Emissions (Restricted) Plots – 802.11n(40MHz) Peak

Plot 352 – Channel 3 *(lower ch)* @ QPSK 40.5Mbps

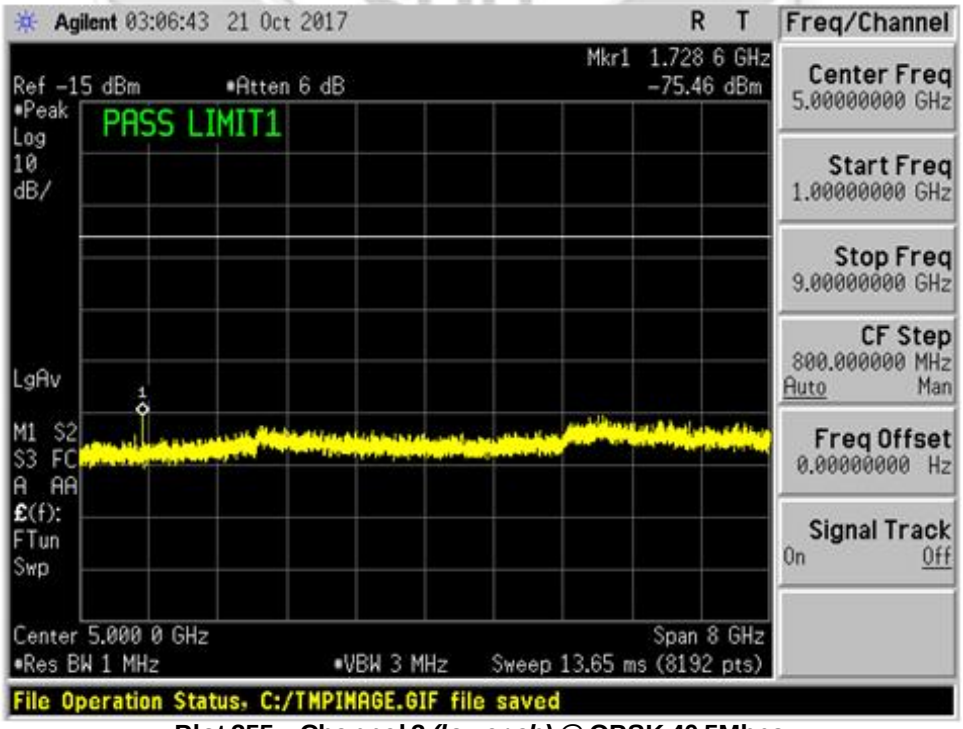


Plot 353 – Channel 3 *(lower ch)* @ QPSK 40.5Mbps

RF Conducted Spurious Emissions (Restricted) Plots – 802.11n(40MHz) Peak

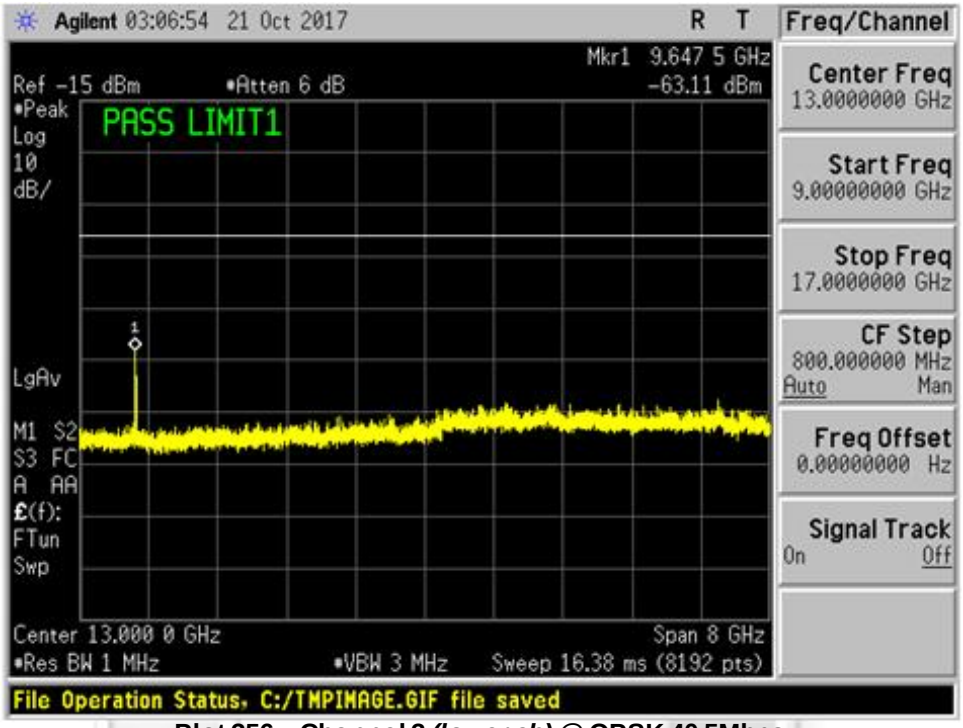


Plot 354 – Channel 3 *(lower ch)* @ QPSK 40.5Mbps

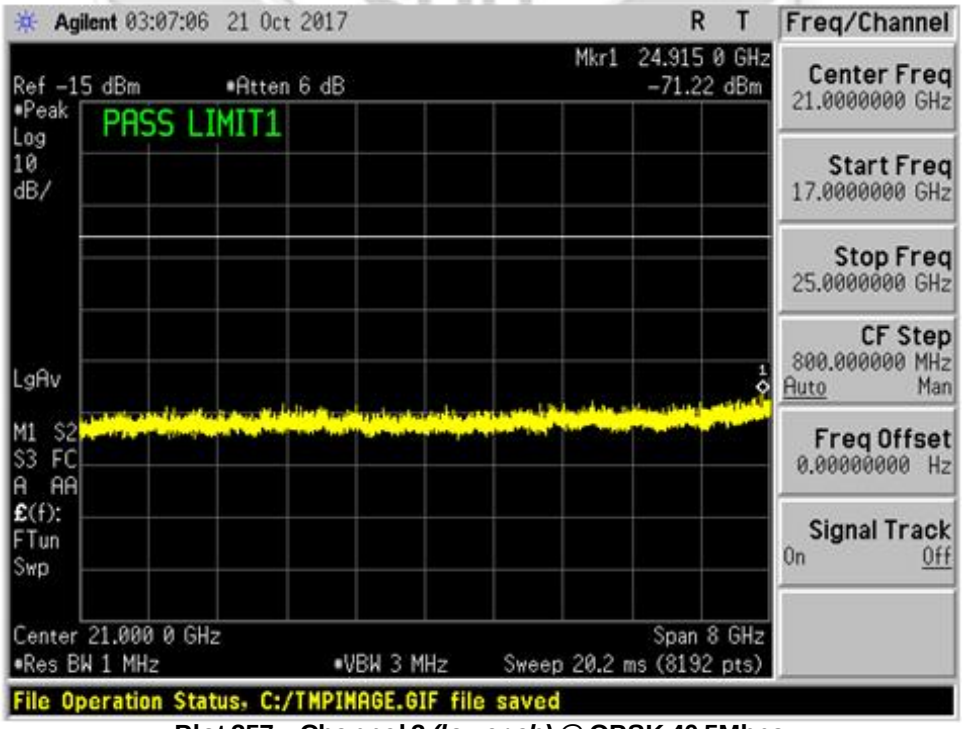


Plot 355 – Channel 3 *(lower ch)* @ QPSK 40.5Mbps

RF Conducted Spurious Emissions (Restricted) Plots – 802.11n(40MHz) Peak



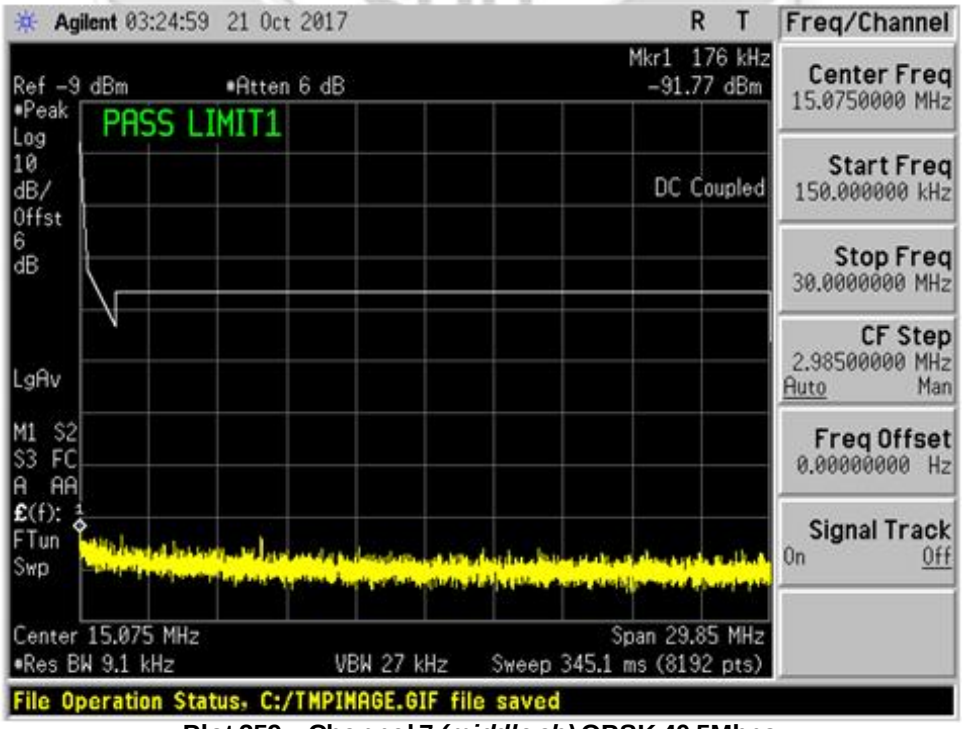
Plot 356 – Channel 3 *(lower ch)* @ QPSK 40.5Mbps



Plot 357 – Channel 3 *(lower ch)* @ QPSK 40.5Mbps

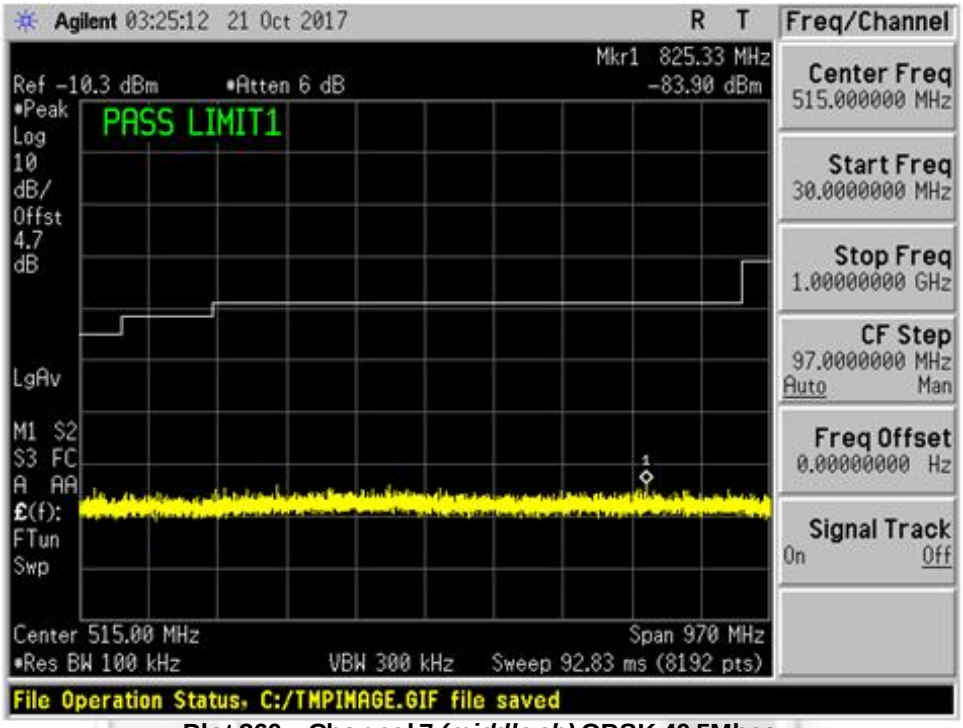
RF Conducted Spurious Emissions (Restricted) Plots – 802.11n(40MHz) Peak

Plot 358 – Channel 7 *(middle ch)* QPSK 40.5Mbps

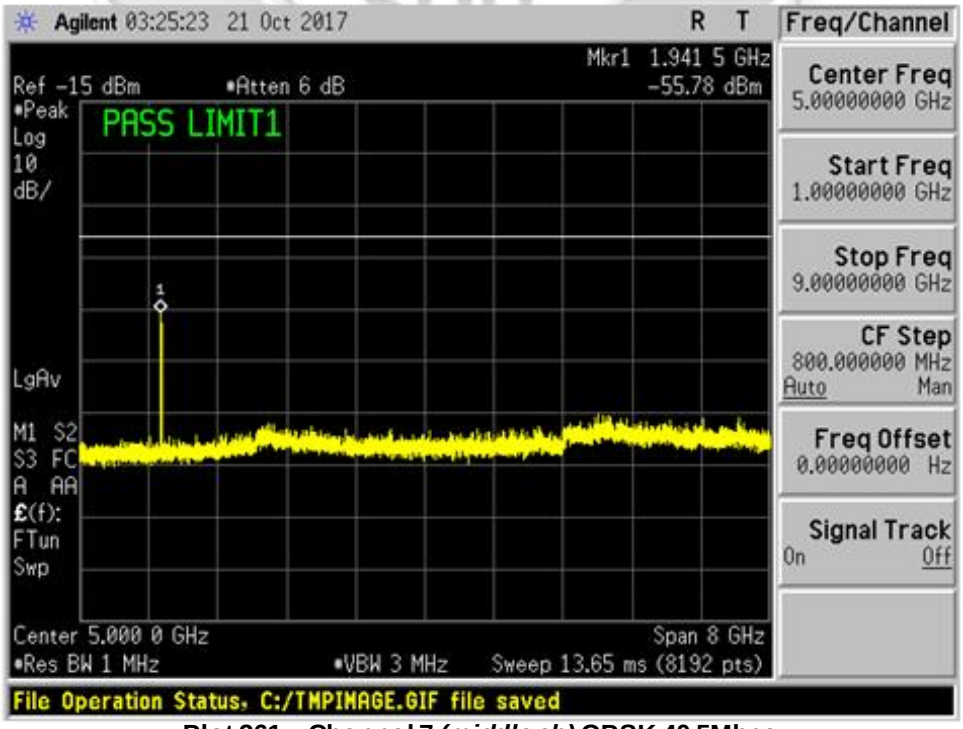


Plot 359 – Channel 7 *(middle ch)* QPSK 40.5Mbps

RF Conducted Spurious Emissions (Restricted) Plots – 802.11n(40MHz) Peak

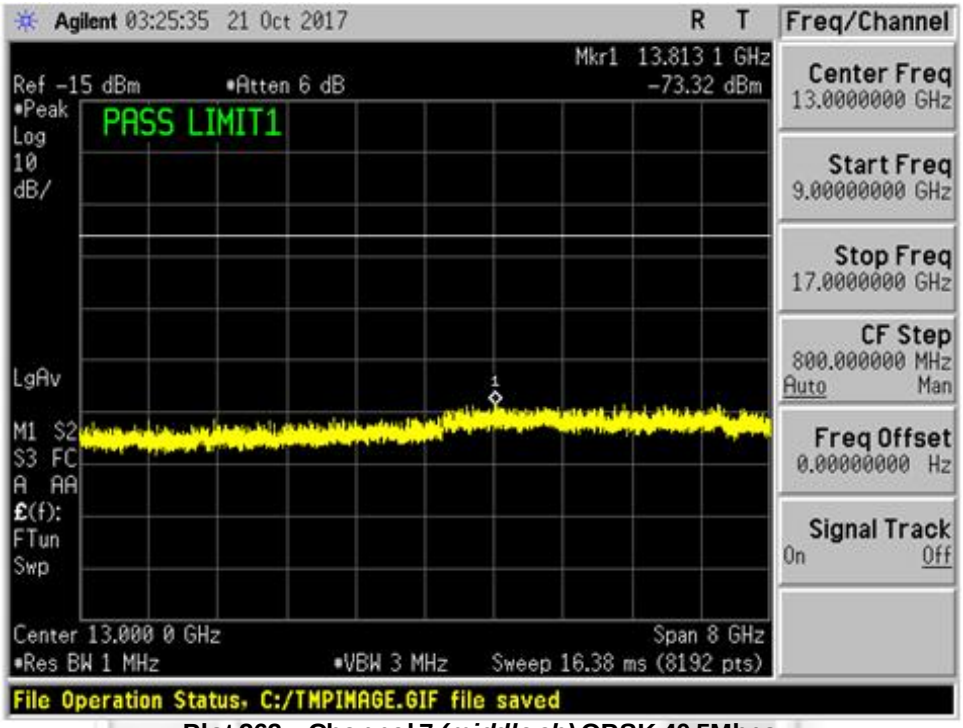


Plot 360 – Channel 7 *(middle ch)* QPSK 40.5Mbps

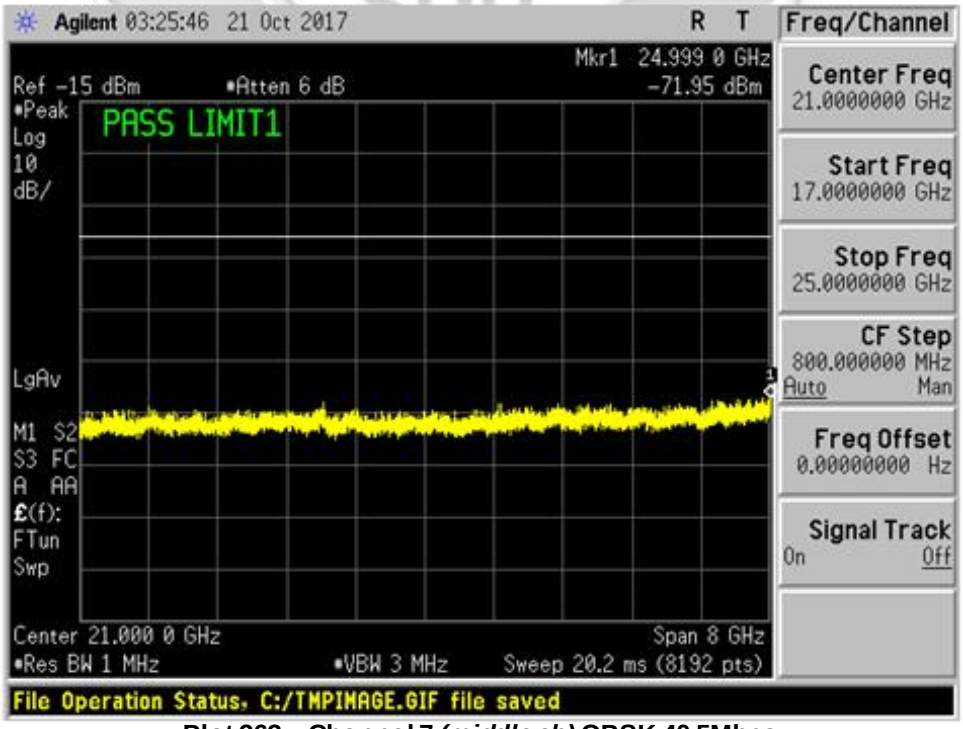


Plot 361 – Channel 7 *(middle ch)* QPSK 40.5Mbps

RF Conducted Spurious Emissions (Restricted) Plots – 802.11n(40MHz) Peak



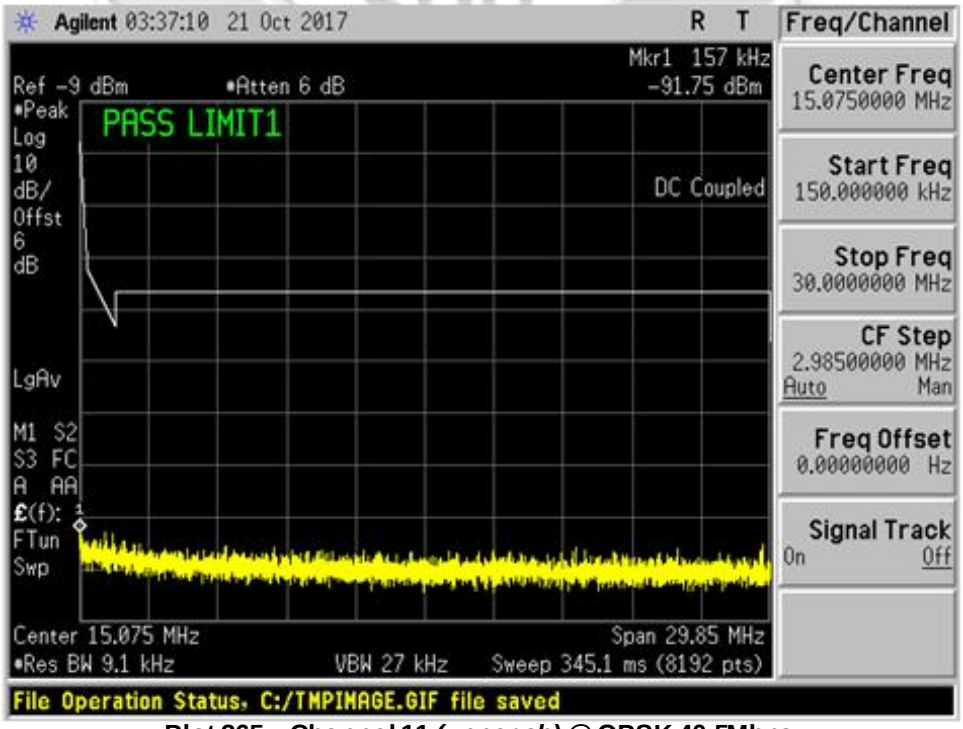
Plot 362 – Channel 7 *(middle ch)* QPSK 40.5Mbps



Plot 363 – Channel 7 *(middle ch)* QPSK 40.5Mbps

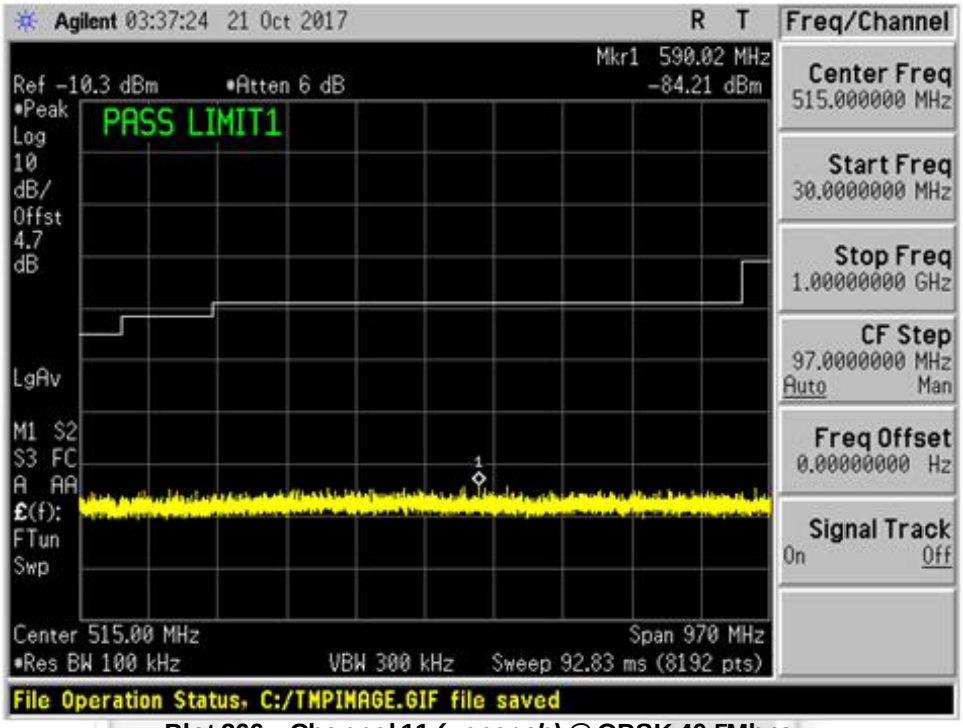
RF Conducted Spurious Emissions (Restricted) Plots – 802.11n(40MHz) Peak

Plot 364 – Channel 11 *(upper ch)* @ QPSK 40.5Mbps

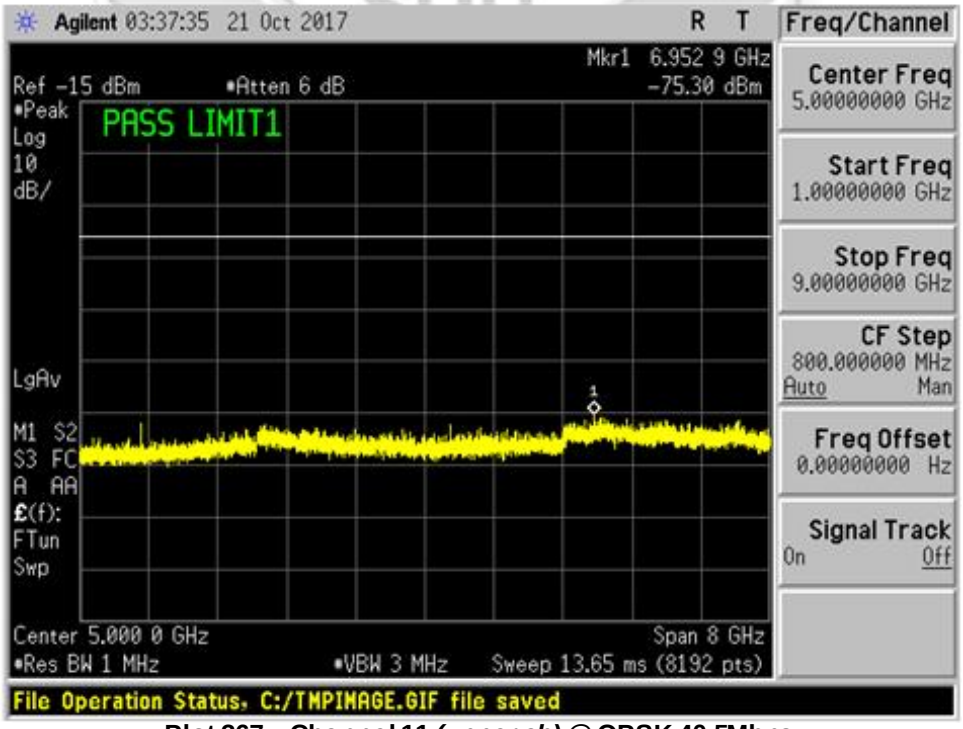


Plot 365 – Channel 11 *(upper ch)* @ QPSK 40.5Mbps

RF Conducted Spurious Emissions (Restricted) Plots – 802.11n(40MHz) Peak

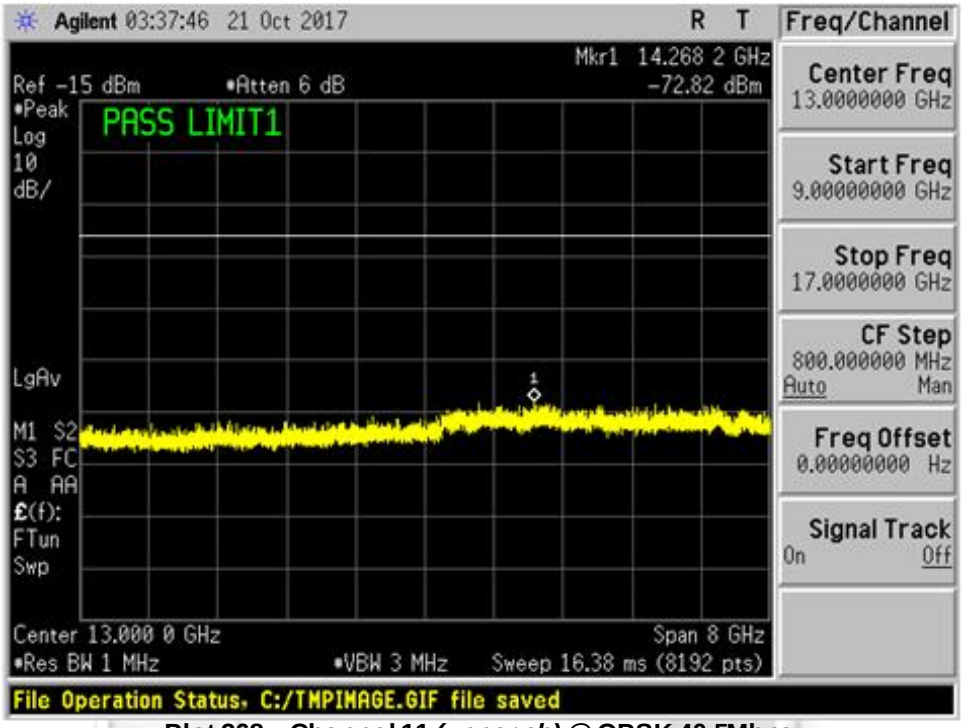


Plot 366 – Channel 11 *(upper ch)* @ QPSK 40.5Mbps

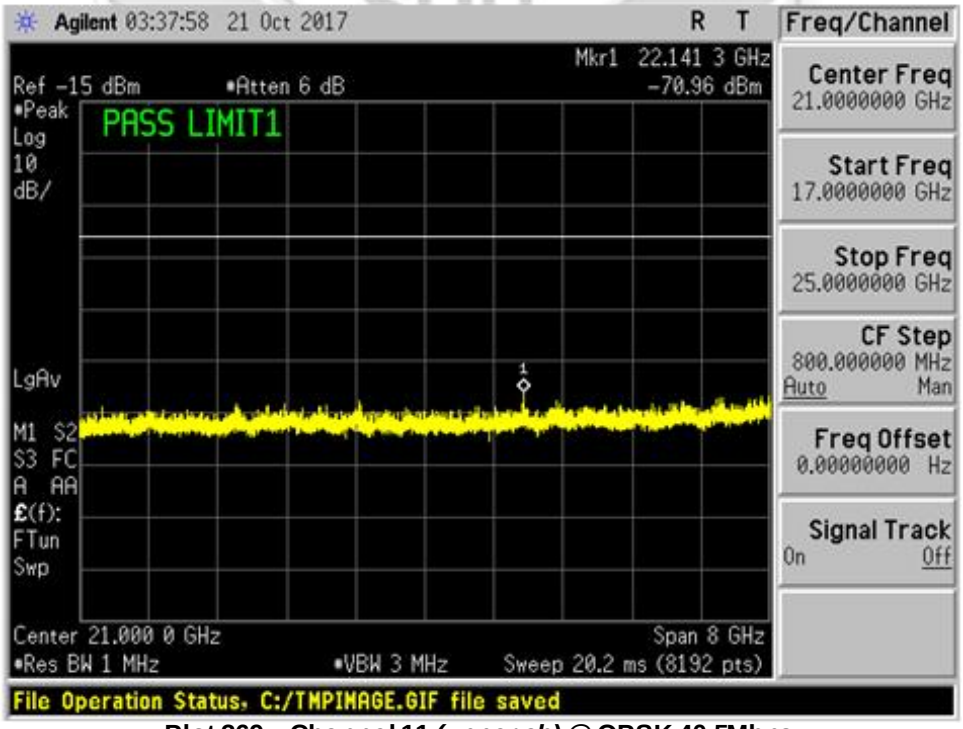


Plot 367 – Channel 11 *(upper ch)* @ QPSK 40.5Mbps

RF Conducted Spurious Emissions (Restricted) Plots – 802.11n(40MHz) Peak



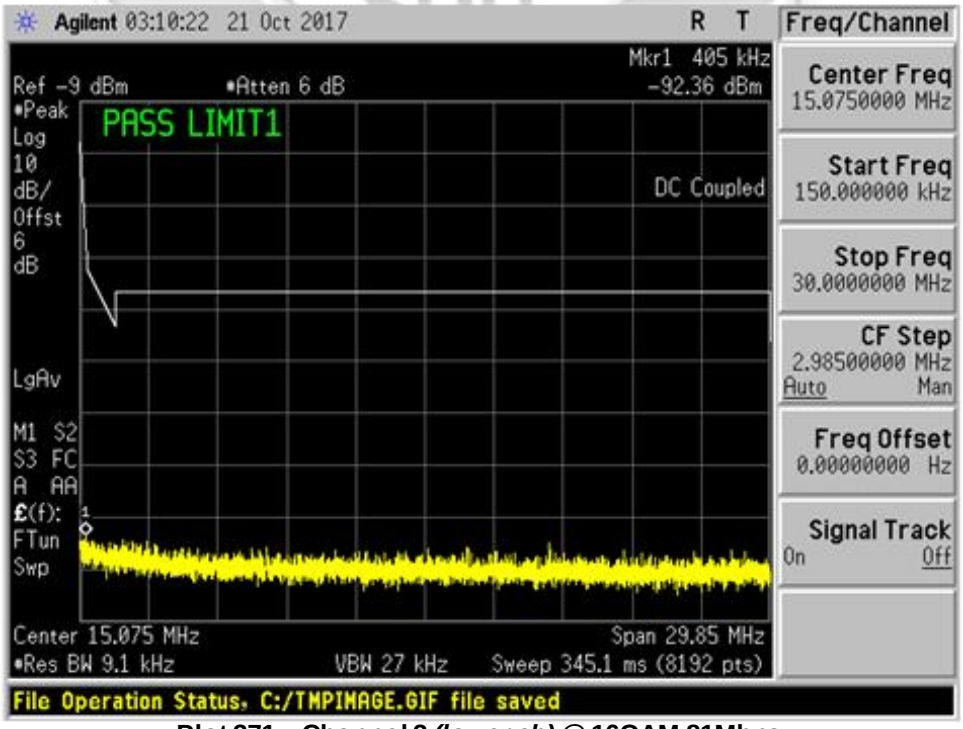
Plot 368 – Channel 11 *(upper ch)* @ QPSK 40.5Mbps



Plot 369 – Channel 11 *(upper ch)* @ QPSK 40.5Mbps

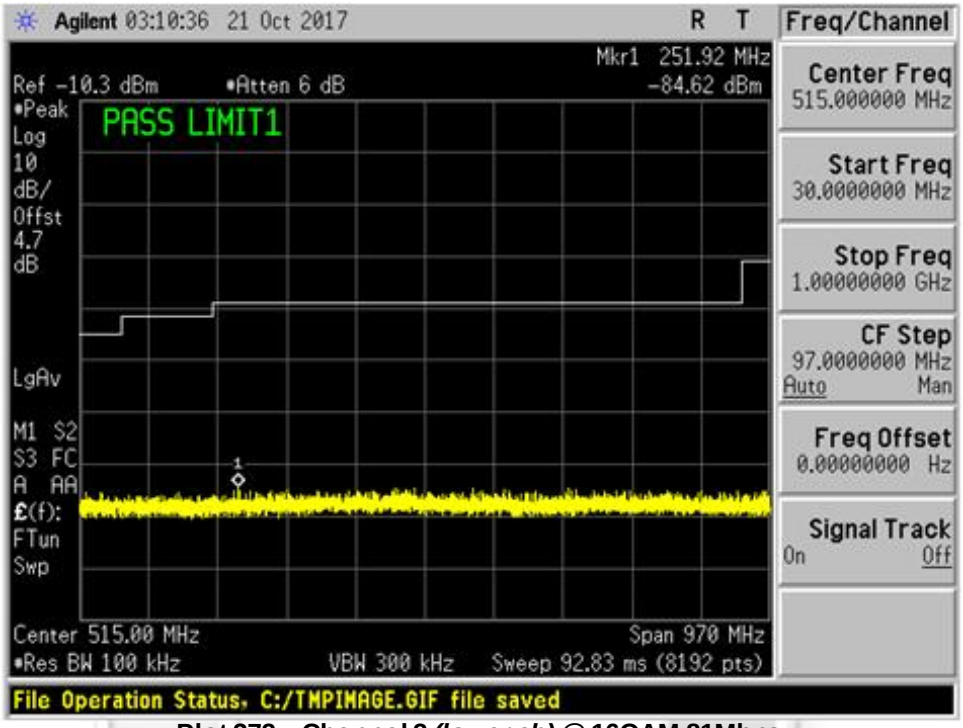
RF Conducted Spurious Emissions (Restricted) Plots – 802.11n(40MHz) Peak

Plot 370 – Channel 3 *(lower ch)* @ 16QAM 81Mbps

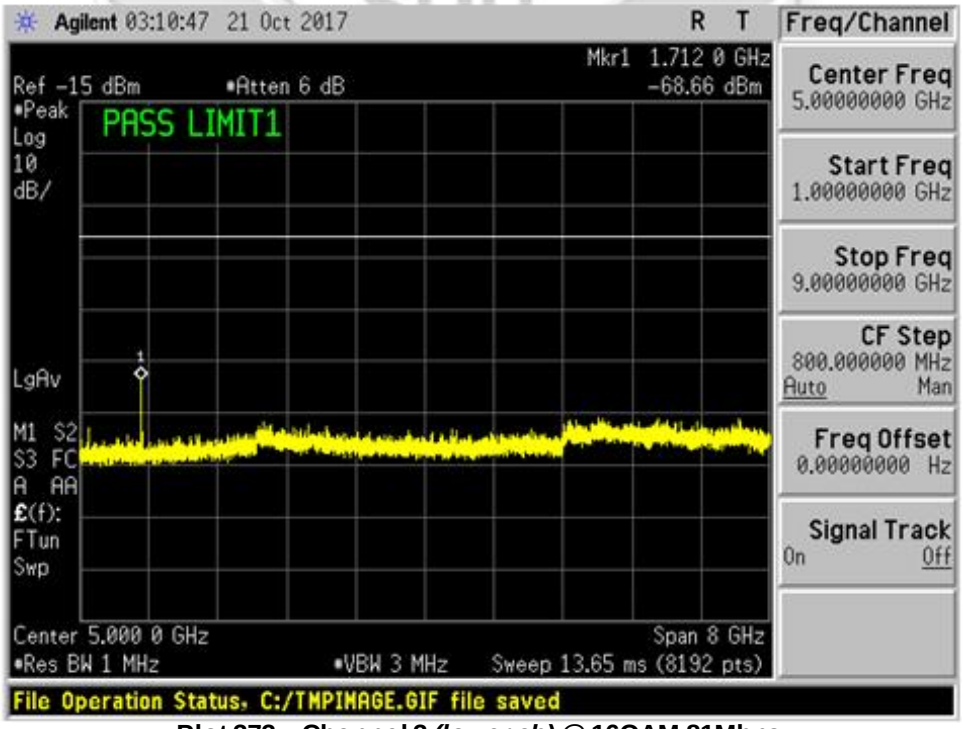


Plot 371 – Channel 3 *(lower ch)* @ 16QAM 81Mbps

RF Conducted Spurious Emissions (Restricted) Plots – 802.11n(40MHz) Peak

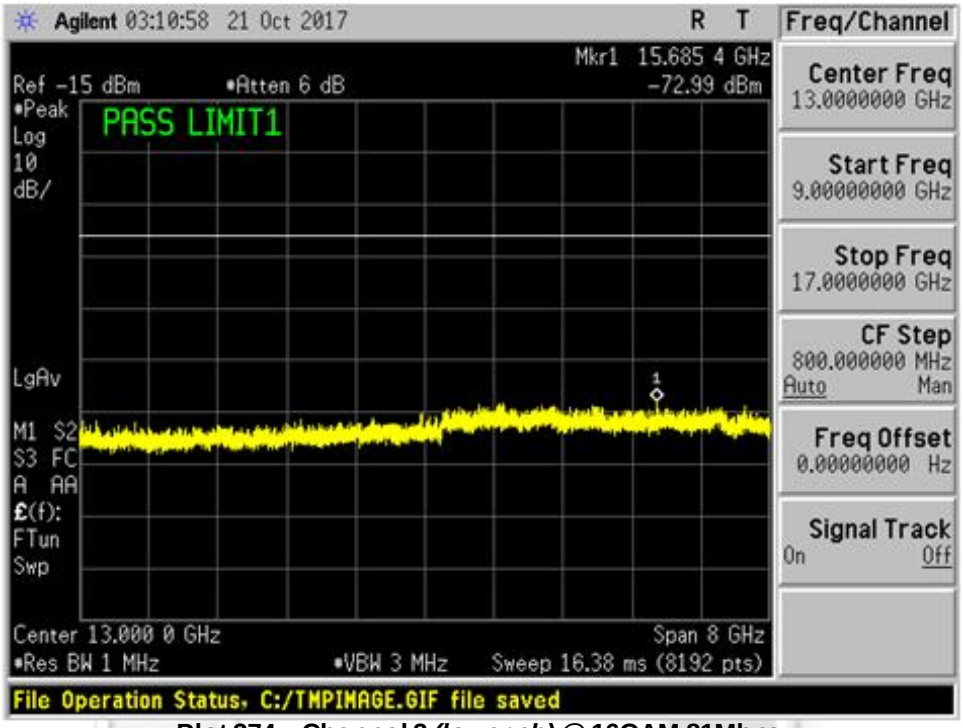


Plot 372 – Channel 3 *(lower ch)* @ 16QAM 81Mbps

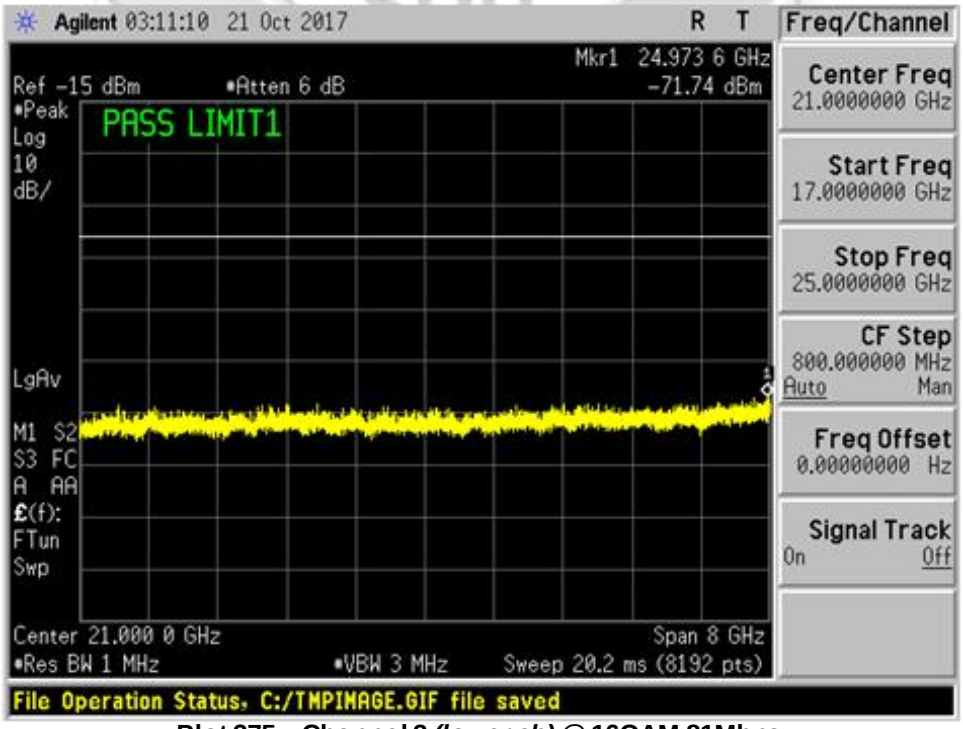


Plot 373 – Channel 3 *(lower ch)* @ 16QAM 81Mbps

RF Conducted Spurious Emissions (Restricted) Plots – 802.11n(40MHz) Peak



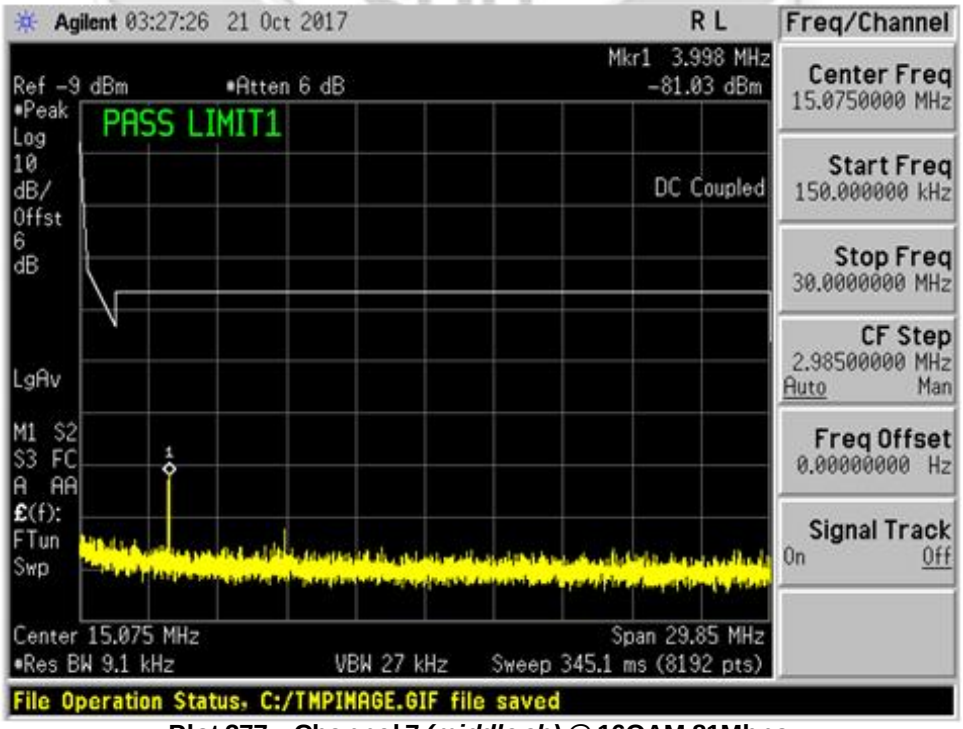
Plot 374 – Channel 3 *(lower ch)* @ 16QAM 81Mbps



Plot 375 – Channel 3 *(lower ch)* @ 16QAM 81Mbps

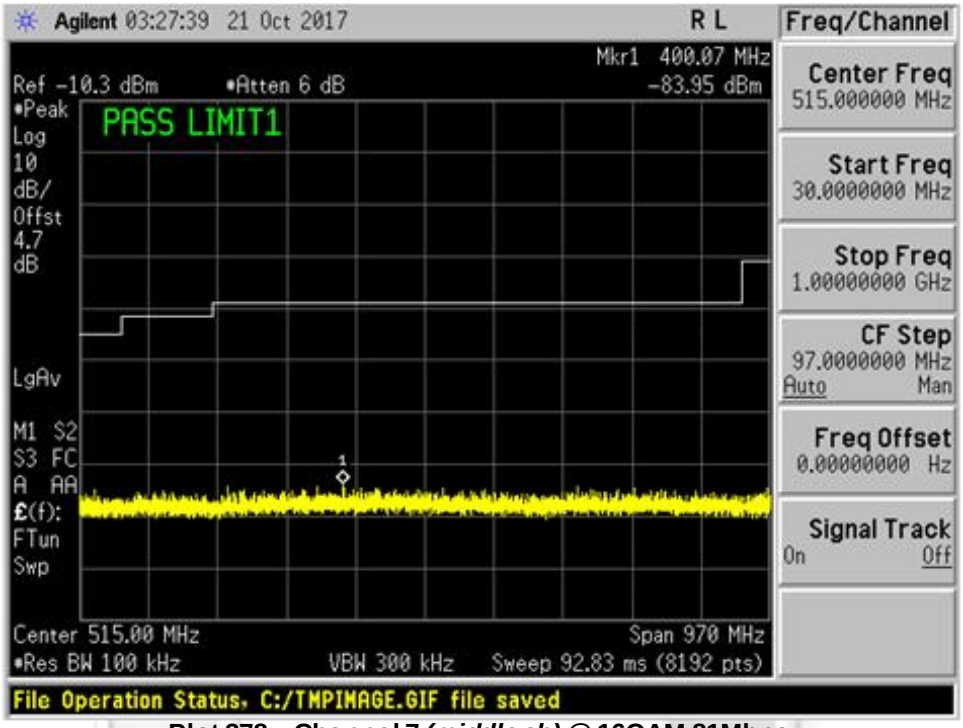
RF Conducted Spurious Emissions (Restricted) Plots – 802.11n(40MHz) Peak

Plot 376 – Channel 7 *(middle ch)* @ 16QAM 81Mbps

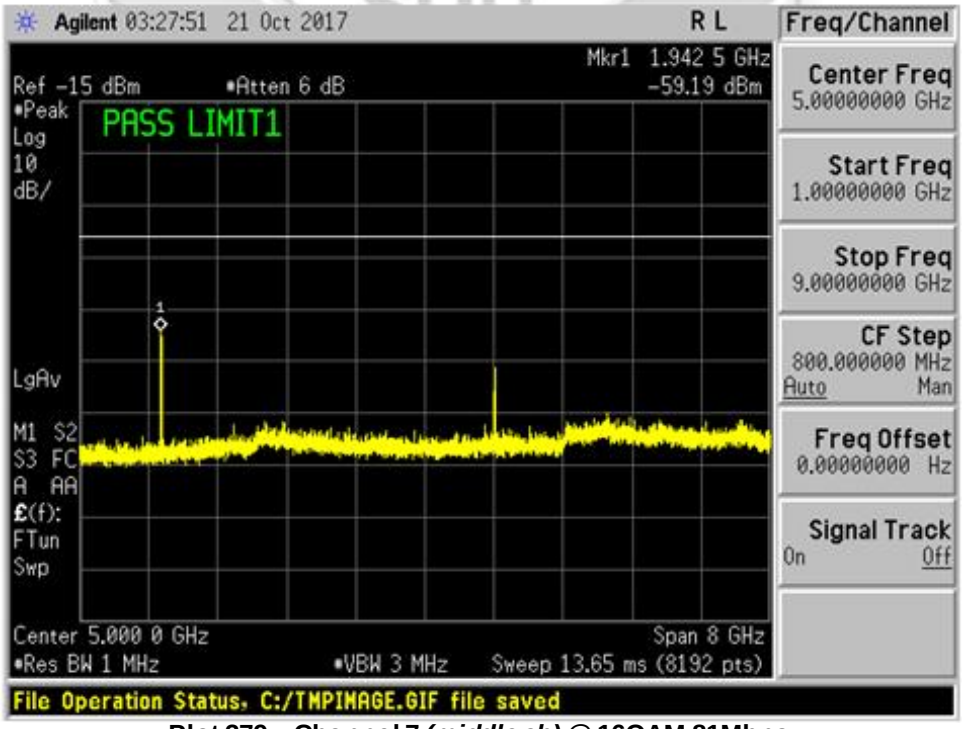


Plot 377 – Channel 7 *(middle ch)* @ 16QAM 81Mbps

RF Conducted Spurious Emissions (Restricted) Plots – 802.11n(40MHz) Peak

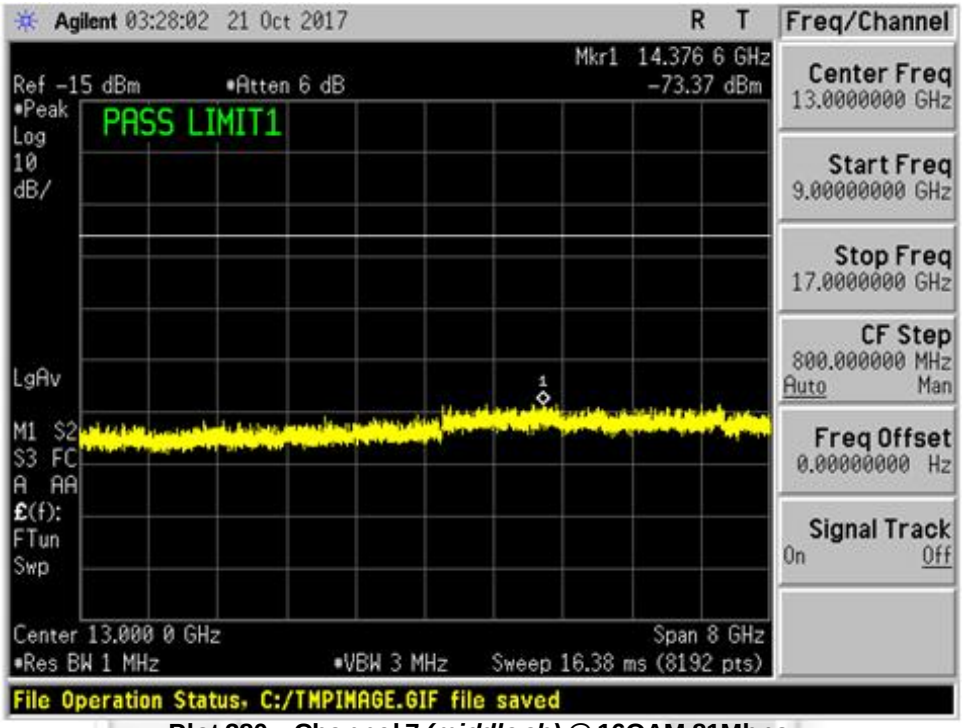


Plot 378 – Channel 7 *(middle ch)* @ 16QAM 81Mbps

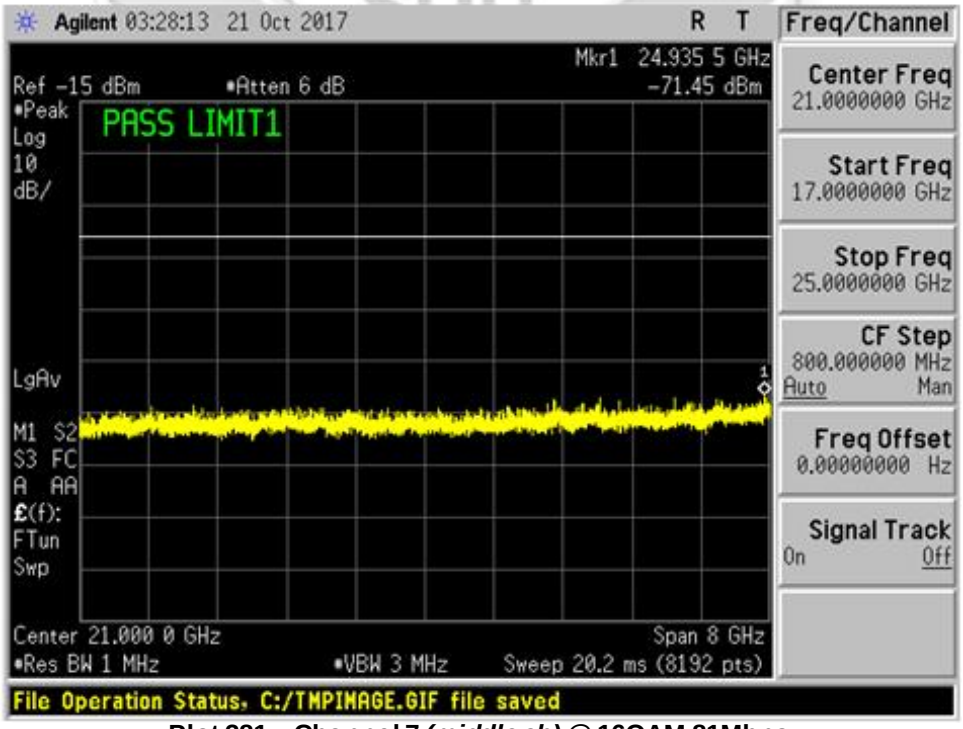


Plot 379 – Channel 7 *(middle ch)* @ 16QAM 81Mbps

RF Conducted Spurious Emissions (Restricted) Plots – 802.11n(40MHz) Peak



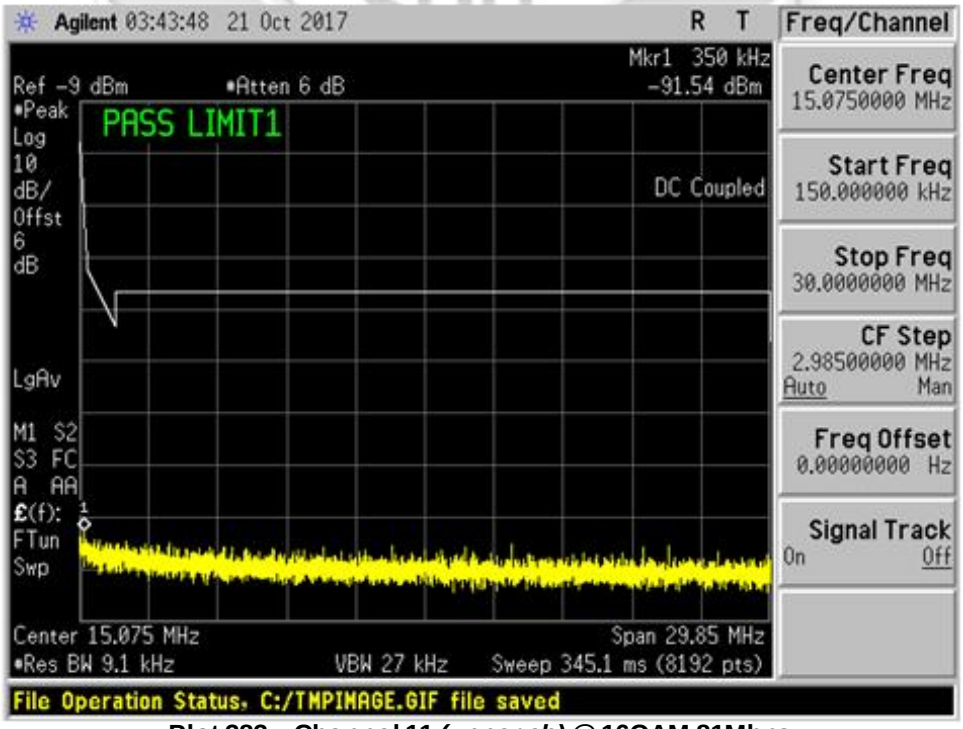
Plot 380 – Channel 7 *(middle ch)* @ 16QAM 81Mbps



Plot 381 – Channel 7 *(middle ch)* @ 16QAM 81Mbps

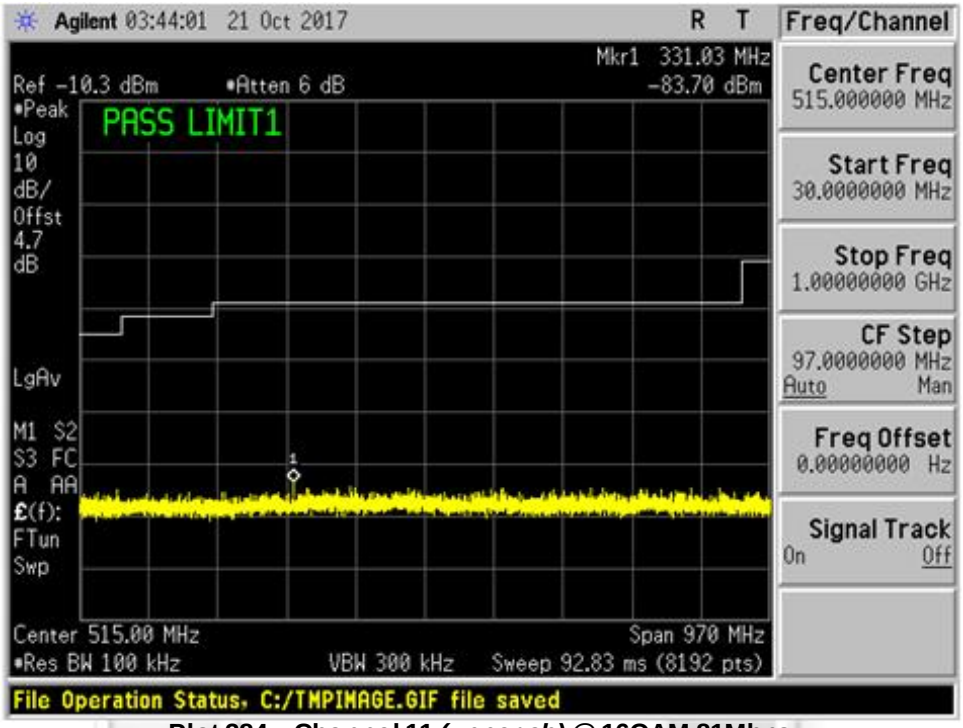
RF Conducted Spurious Emissions (Restricted) Plots – 802.11n(40MHz) Peak

Plot 382 – Channel 11 *(upper ch)* @ 16QAM 81Mbps

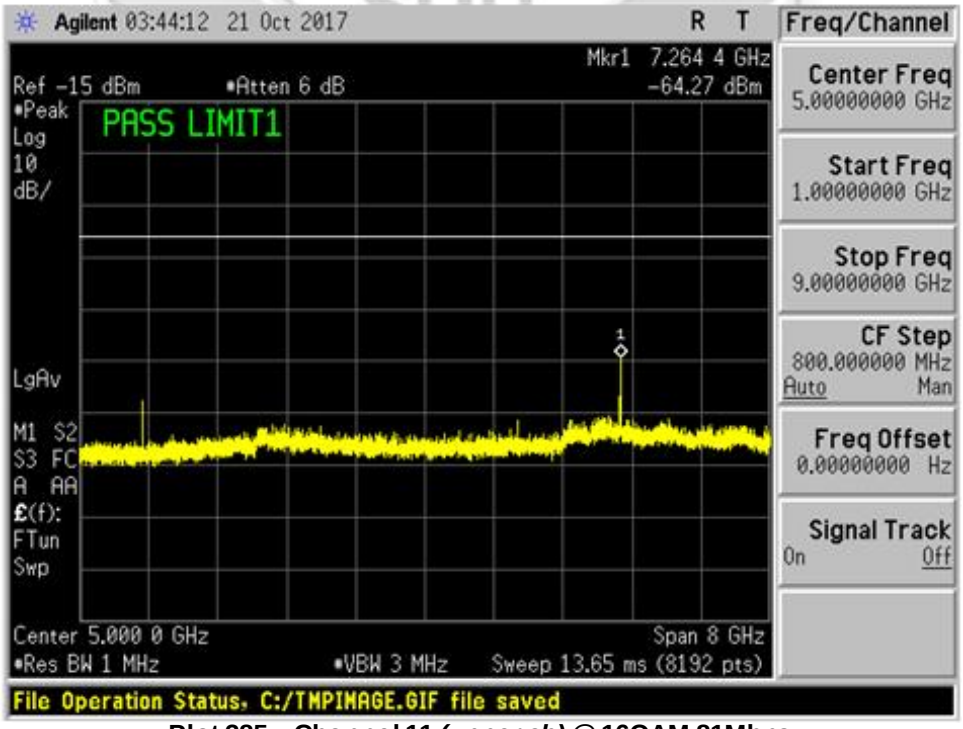


Plot 383 – Channel 11 *(upper ch)* @ 16QAM 81Mbps

RF Conducted Spurious Emissions (Restricted) Plots – 802.11n(40MHz) Peak

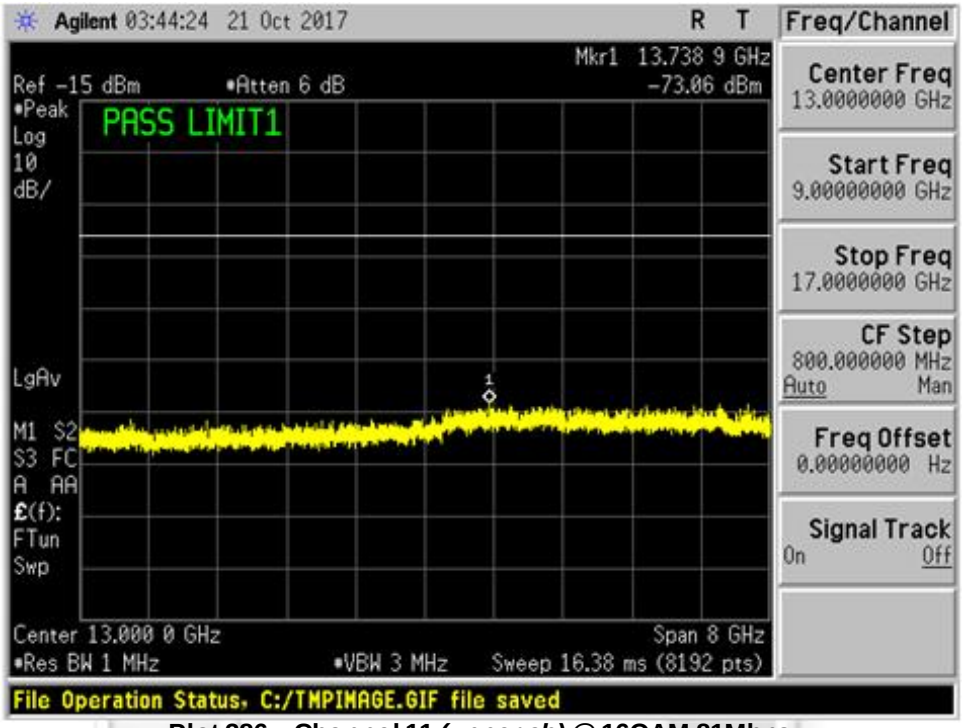


Plot 384 – Channel 11 *(upper ch)* @ 16QAM 81Mbps

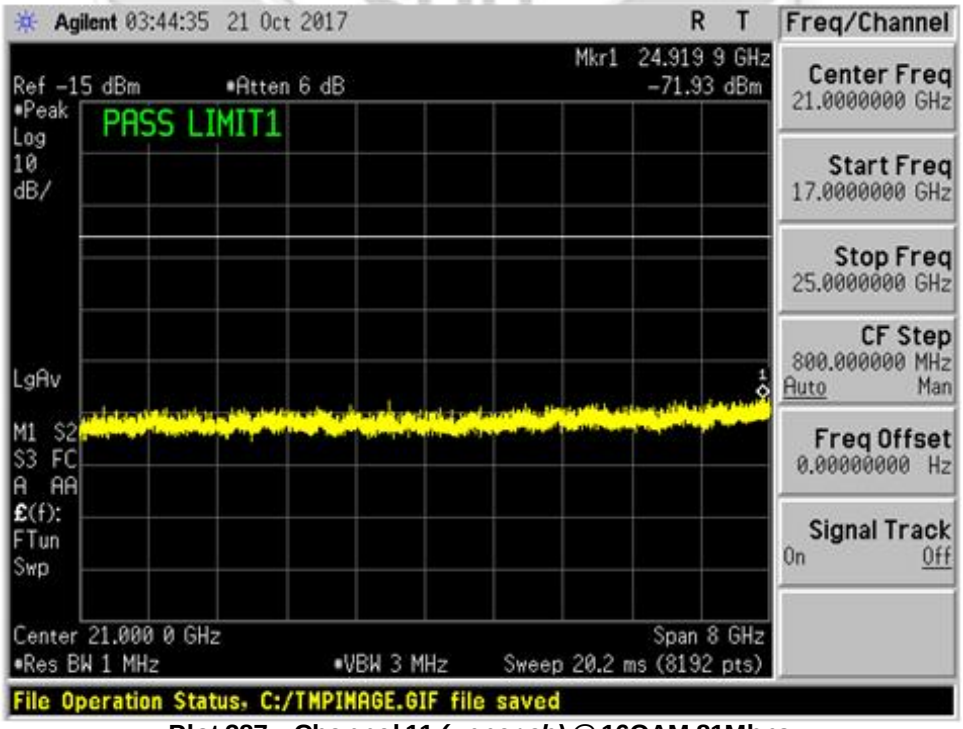


Plot 385 – Channel 11 *(upper ch)* @ 16QAM 81Mbps

RF Conducted Spurious Emissions (Restricted) Plots – 802.11n(40MHz) Peak



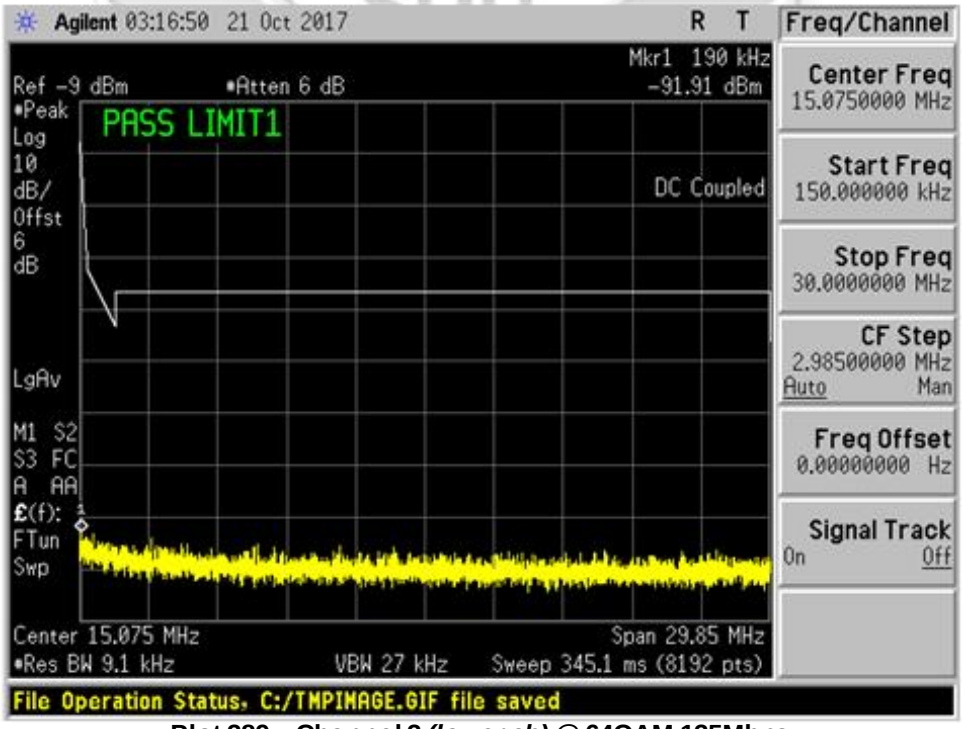
Plot 386 – Channel 11 *(upper ch)* @ 16QAM 81Mbps



Plot 387 – Channel 11 *(upper ch)* @ 16QAM 81Mbps

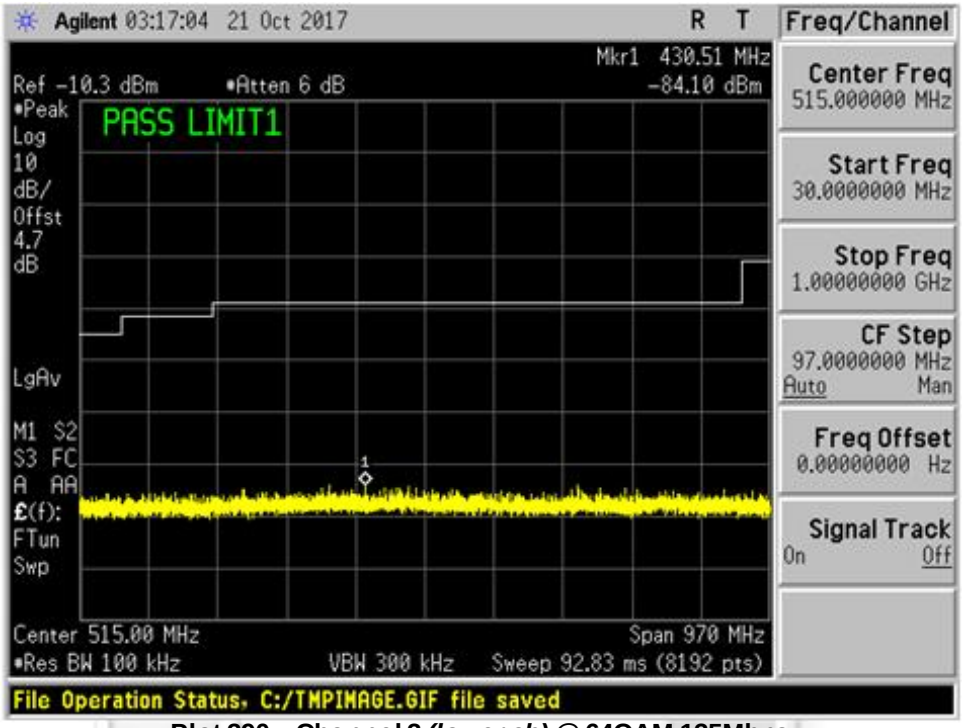
RF Conducted Spurious Emissions (Restricted) Plots – 802.11n(40MHz) Peak

Plot 388 – Channel 3 *(lower ch)* @ 64QAM 135Mbps

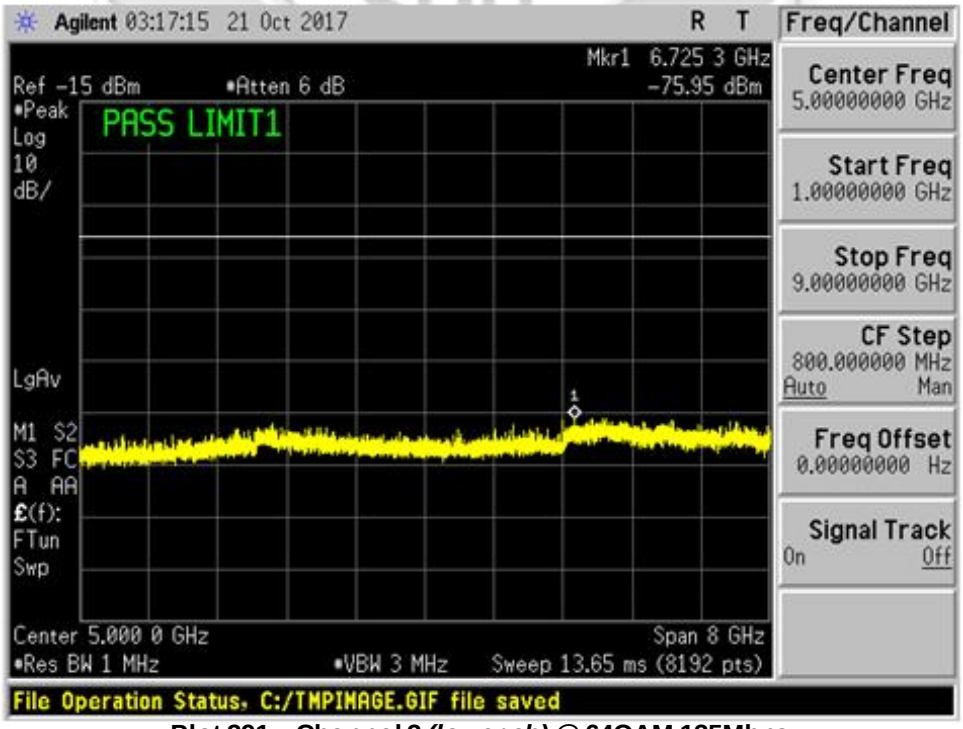


Plot 389 – Channel 3 *(lower ch)* @ 64QAM 135Mbps

RF Conducted Spurious Emissions (Restricted) Plots – 802.11n(40MHz) Peak

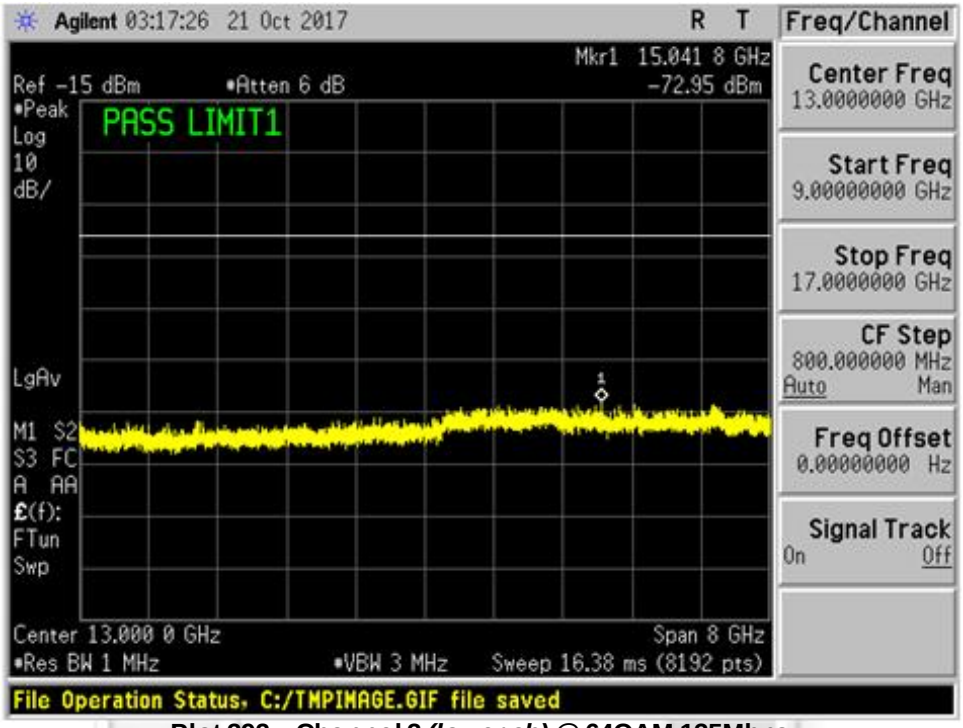


Plot 390 – Channel 3 *(lower ch)* @ 64QAM 135Mbps

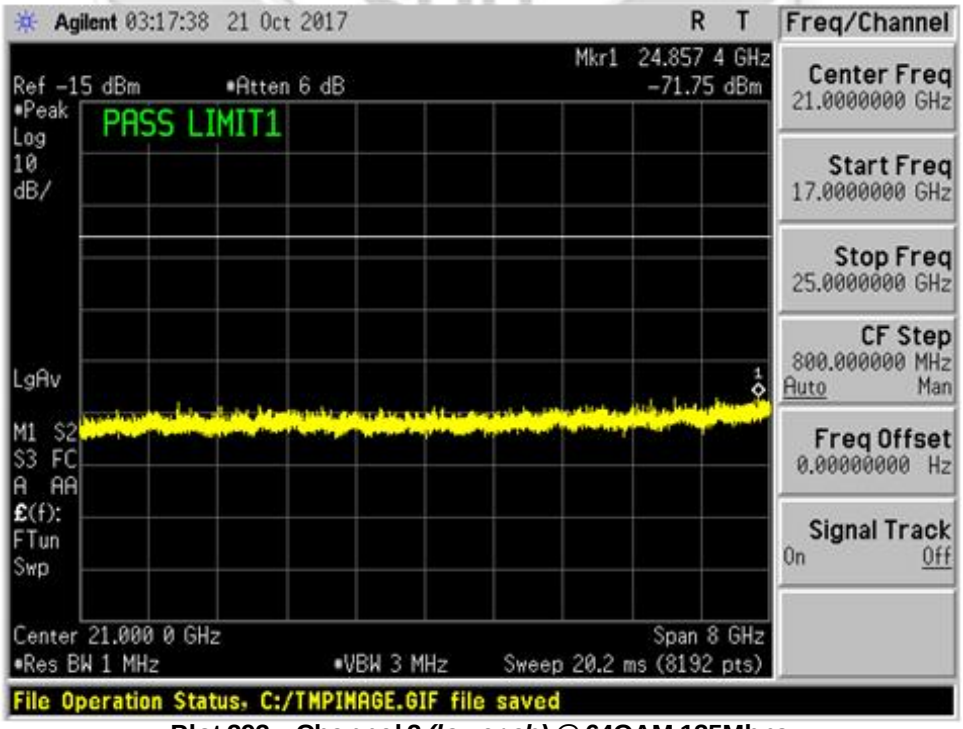


Plot 391 – Channel 3 *(lower ch)* @ 64QAM 135Mbps

RF Conducted Spurious Emissions (Restricted) Plots – 802.11n(40MHz) Peak



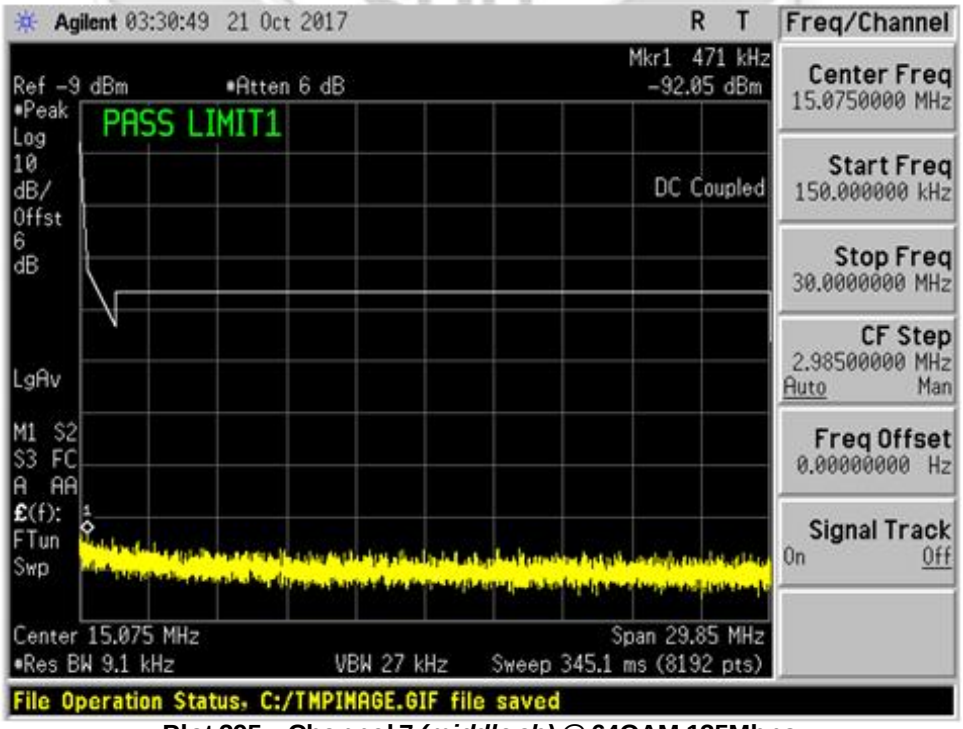
Plot 392 – Channel 3 *(lower ch)* @ 64QAM 135Mbps



Plot 393 – Channel 3 *(lower ch)* @ 64QAM 135Mbps

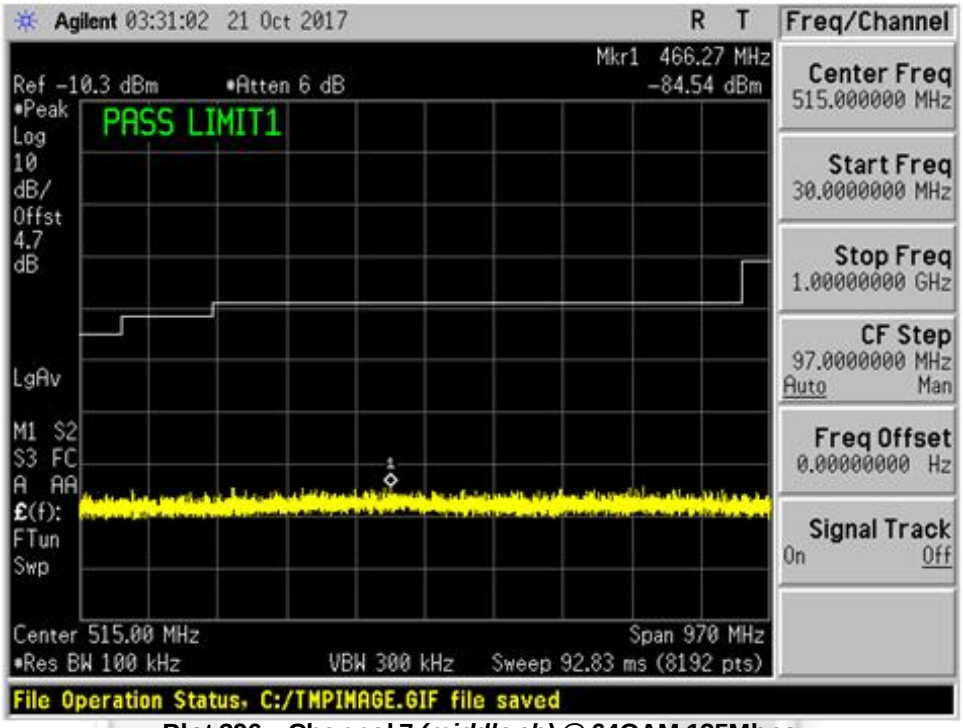
RF Conducted Spurious Emissions (Restricted) Plots – 802.11n(40MHz) Peak

Plot 394 – Channel 7 *(middle ch)* @ 64QAM 135Mbps

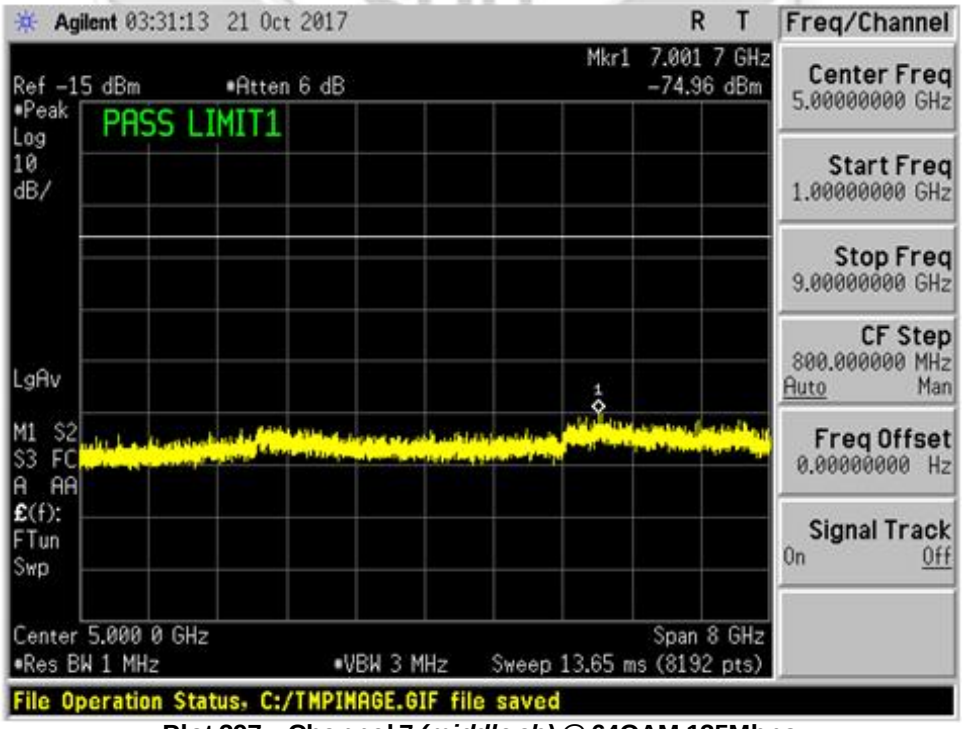


Plot 395 – Channel 7 *(middle ch)* @ 64QAM 135Mbps

RF Conducted Spurious Emissions (Restricted) Plots – 802.11n(40MHz) Peak

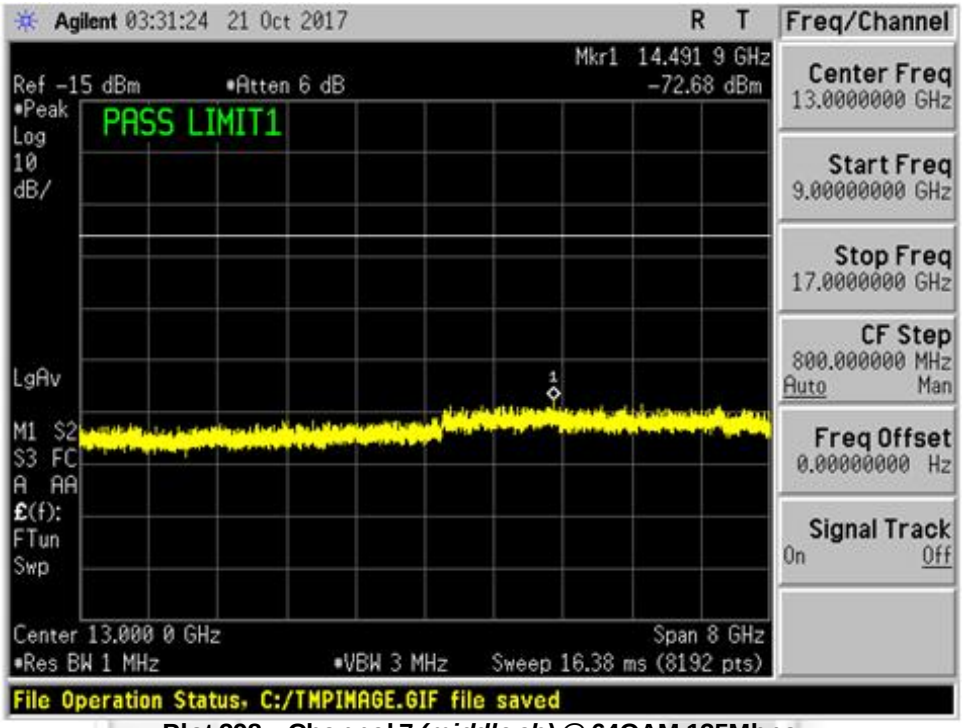


Plot 396 – Channel 7 *(middle ch)* @ 64QAM 135Mbps

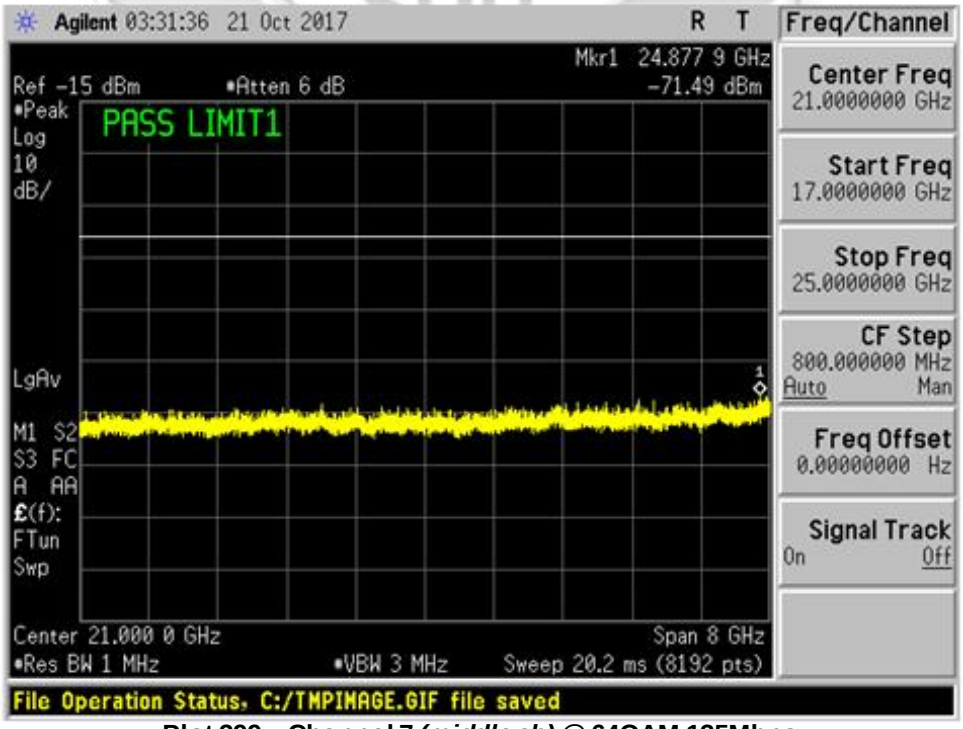


Plot 397 – Channel 7 *(middle ch)* @ 64QAM 135Mbps

RF Conducted Spurious Emissions (Restricted) Plots – 802.11n(40MHz) Peak



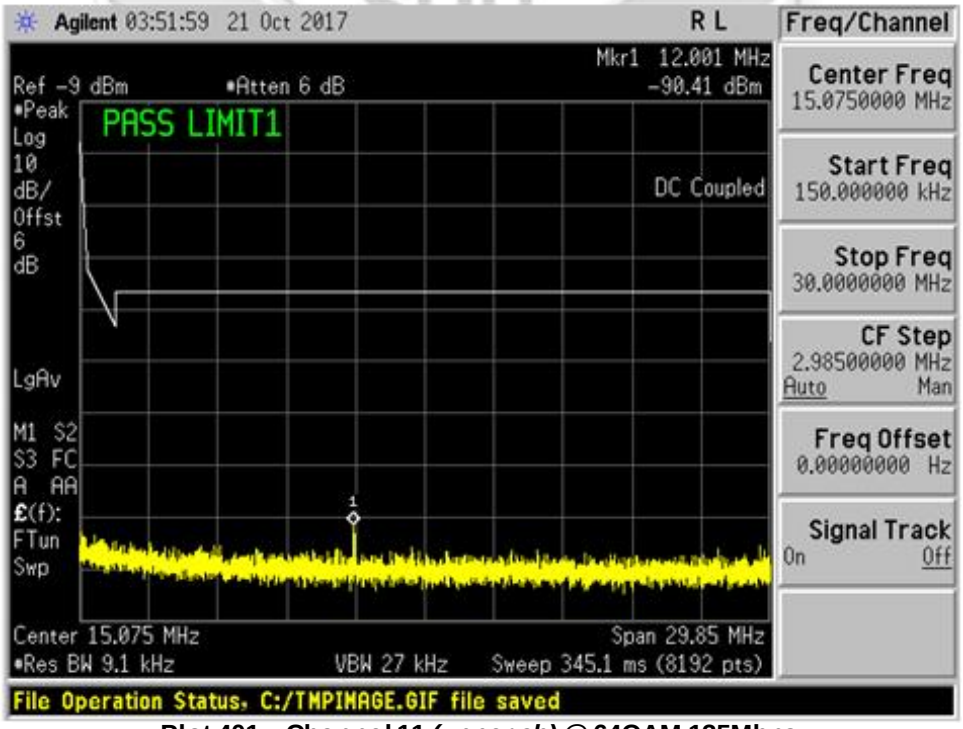
Plot 398 – Channel 7 *(middle ch)* @ 64QAM 135Mbps



Plot 399 – Channel 7 *(middle ch)* @ 64QAM 135Mbps

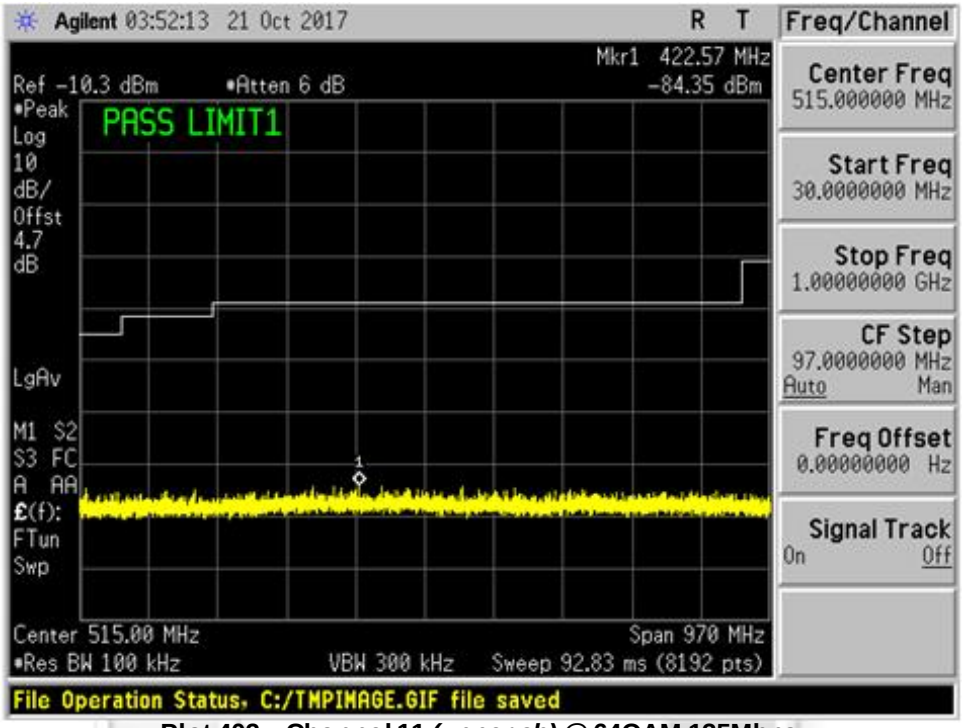
RF Conducted Spurious Emissions (Restricted) Plots – 802.11n(40MHz) Peak

Plot 400 – Channel 11 *(upper ch)* @ 64QAM 135Mbps

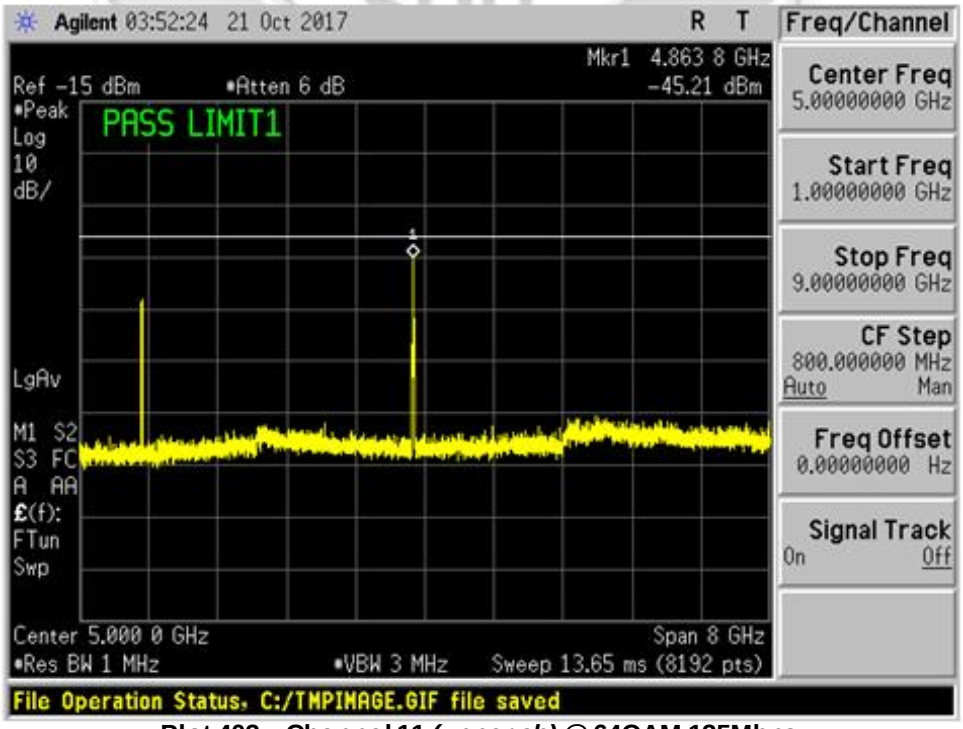


Plot 401 – Channel 11 *(upper ch)* @ 64QAM 135Mbps

RF Conducted Spurious Emissions (Restricted) Plots – 802.11n(40MHz) Peak

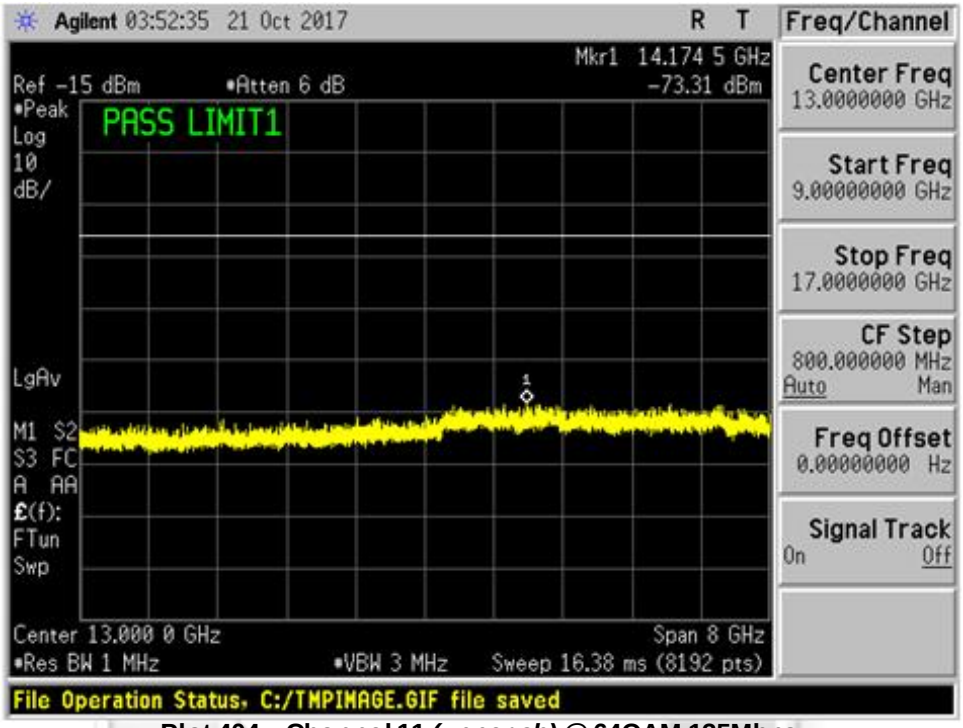


Plot 402 – Channel 11 *(upper ch)* @ 64QAM 135Mbps

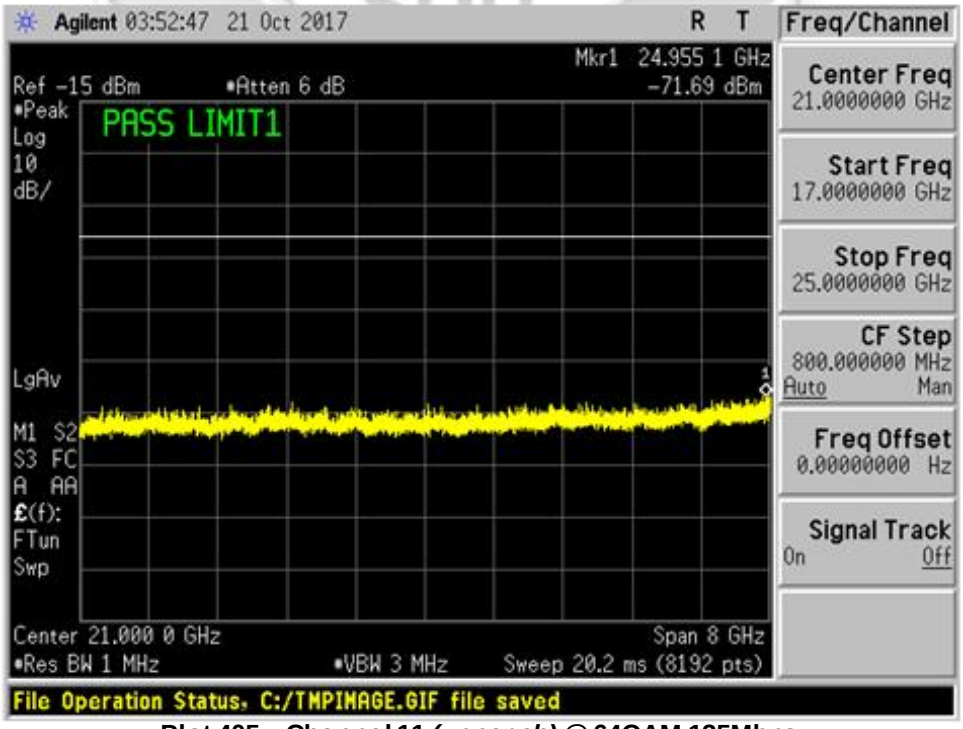


Plot 403 – Channel 11 *(upper ch)* @ 64QAM 135Mbps

RF Conducted Spurious Emissions (Restricted) Plots – 802.11n(40MHz) Peak



Plot 404 – Channel 11 *(upper ch)* @ 64QAM 135Mbps



Plot 405 – Channel 11 *(upper ch)* @ 64QAM 135Mbps

47 CFR FCC Part 15.247(d) Band Edge Compliance (Conducted) Limits

The EUT shows compliance to the requirements of this section, which states in any 100kHz bandwidth outside the frequency band in which the spread spectrum intentional radiator (EUT) is operating, the radio frequency power that is produced by the EUT shall be at least 20dB below that in the 100kHz bandwidth within the band that contains the highest level of desired power.

47 CFR FCC Part 15.247(d) Band Edge Compliance (Conducted) Test Instrumentation

Instrument	Model	S/No	Cal Due Date
Agilent Spectrum Analyzer	E4440A	MY45304764	04 Jan 2018
BK Precision Multi Range DC Power Supply	9111	459G14131	23 Nov 2017

47 CFR FCC Part 15.247(d) Band Edge Compliance (Conducted) Test Setup

1. The EUT and supporting equipment were set up as shown in the setup photo.
2. The power supply for the EUT was connected to a filtered mains.
3. The RF antenna connector was connected to the spectrum analyser via a low-loss coaxial cable.
4. The resolution bandwidth (RBW) and the video bandwidth (VBW) of the spectrum analyser were respectively set to 100kHz and 300kHz.
5. All other supporting equipment were powered separately from another filtered mains.

47 CFR FCC Part 15.247(d) Band Edge Compliance (Conducted) Test Method

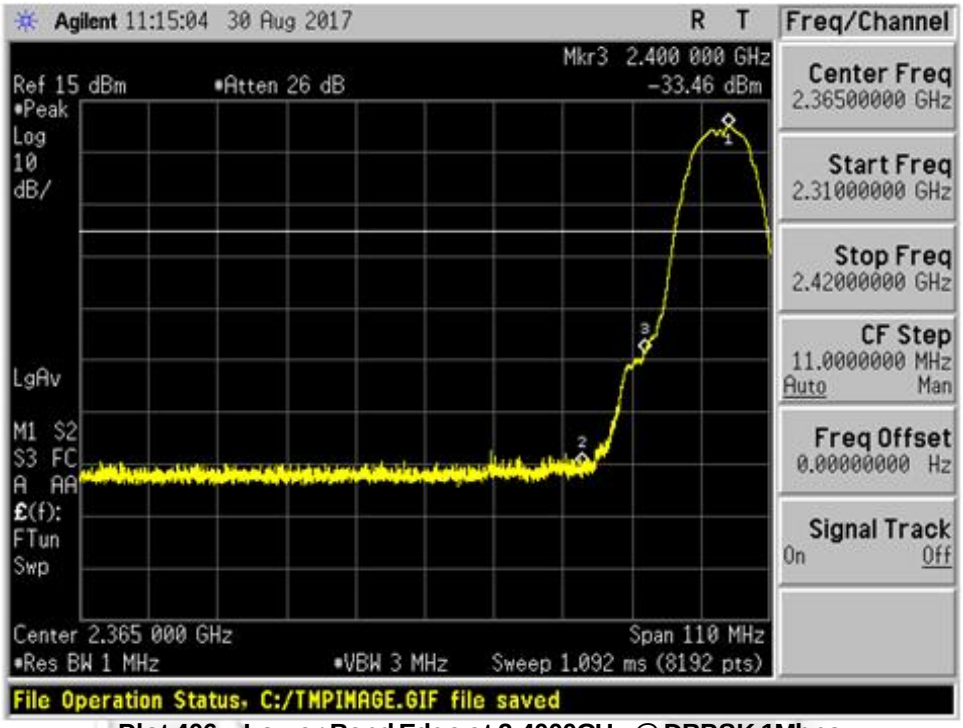
1. The EUT was switched on and allowed to warm up to its normal operating condition. The EUT was then configured to operate in the test mode with specified modulation and data rate.
2. The frequency span of the spectrum analyser was set to wide enough to capture the lower band edge of the transmission band, 2.400GHz and any spurious emissions at the band edge (within 2MHz of the band edge).
3. The spectrum analyser was set to max hold to capture any spurious emissions within the span. The signal capturing was continuous until no further spurious emissions were detected.
4. Repeat steps 1 to 3 with all possible modulations and data rates.
5. The steps 2 to 4 were repeated with the frequency span of the spectrum analyser was set to wide enough to capture the upper band edge frequency of the transmission band, 2.4835GHz and the any spurious emissions at the band-edge.

47 CFR FCC Part 15.247(d) Band Edge Compliance (Conducted) Results

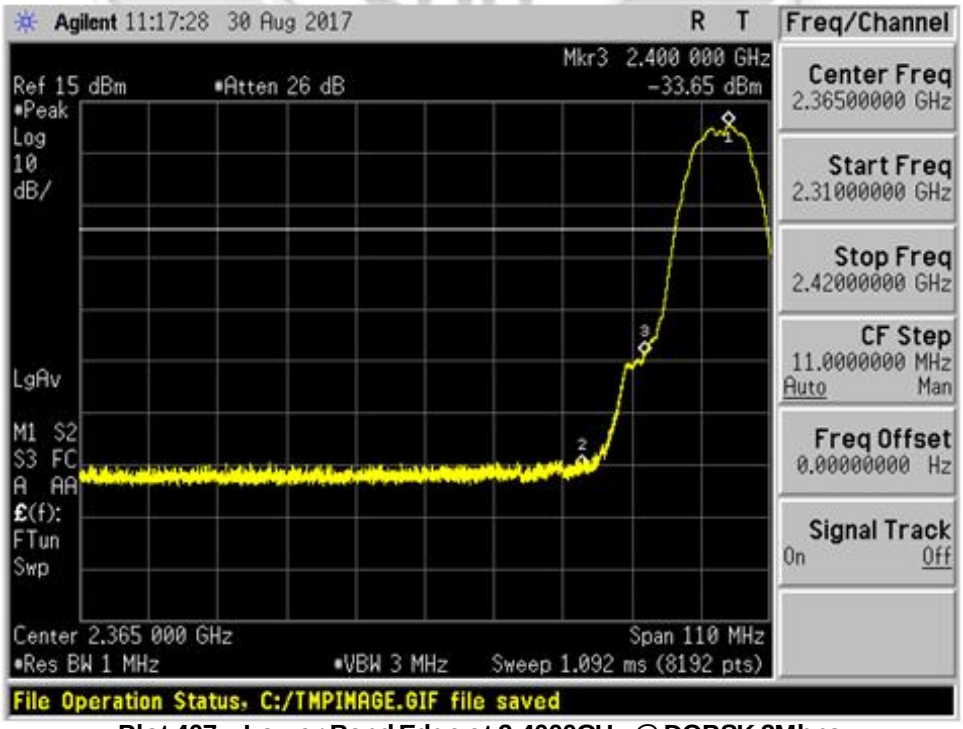
Test Input Power	12.5Vdc	Temperature	24°C
Attached Plots	406 – 435	Relative Humidity	60%
		Atmospheric Pressure	1030mbar
		Tested By	Chang Wai Kit

No significant signal was found and they were below the specified limit.

Band Edge Compliance (Conducted) Plots – 802.11b

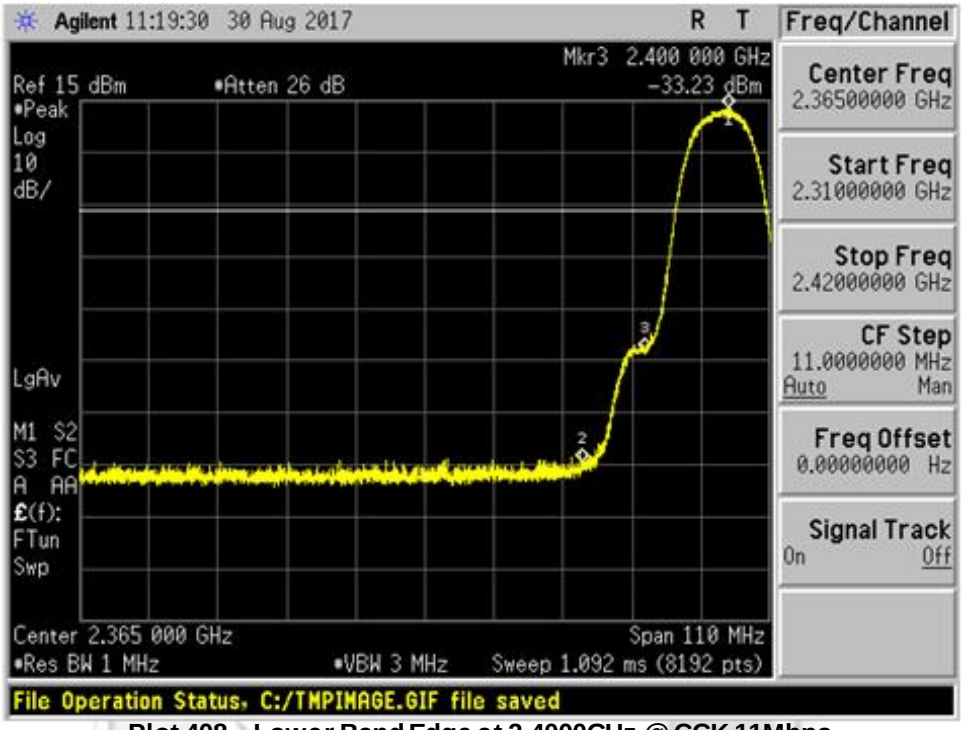


Plot 406 – Lower Band Edge at 2.4000GHz @ DBPSK 1Mbps



Plot 407 – Lower Band Edge at 2.4000GHz @ DQPSK 2Mbps

Band Edge Compliance (Conducted) Plots – 802.11b



Plot 408 – Lower Band Edge at 2.4000GHz @ CCK 11Mbps

Band Edge Compliance (Conducted) Plots – 802.11b

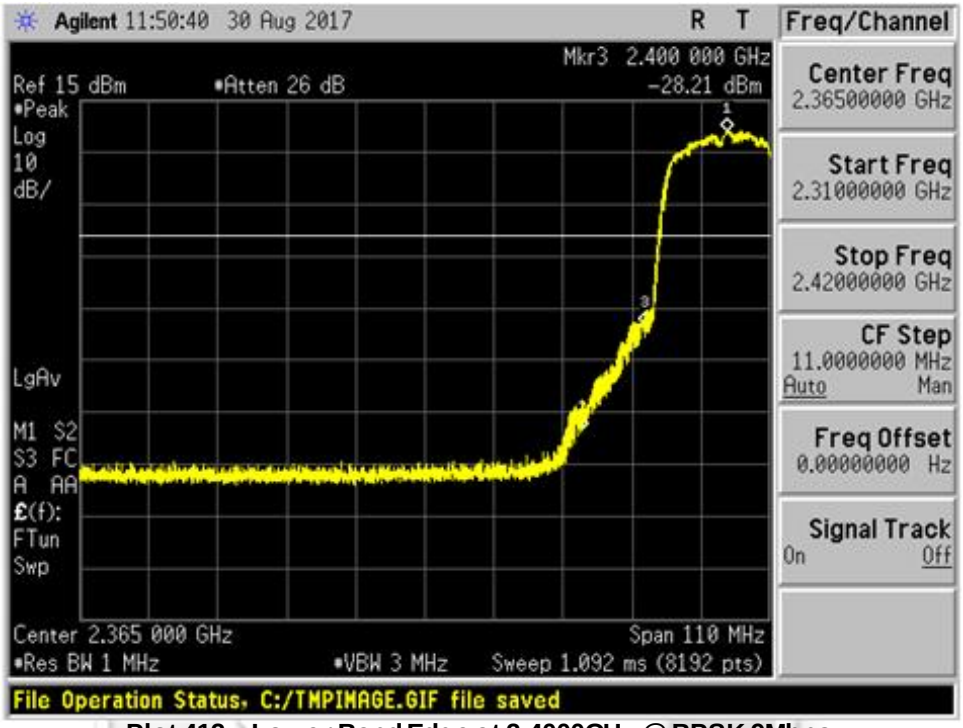
Plot 409 – Upper Band Edge at 2.4835GHz @ DBPSK 1Mbps

Plot 410 – Upper Band Edge at 2.4835GHz @ DQPSK 2Mbps

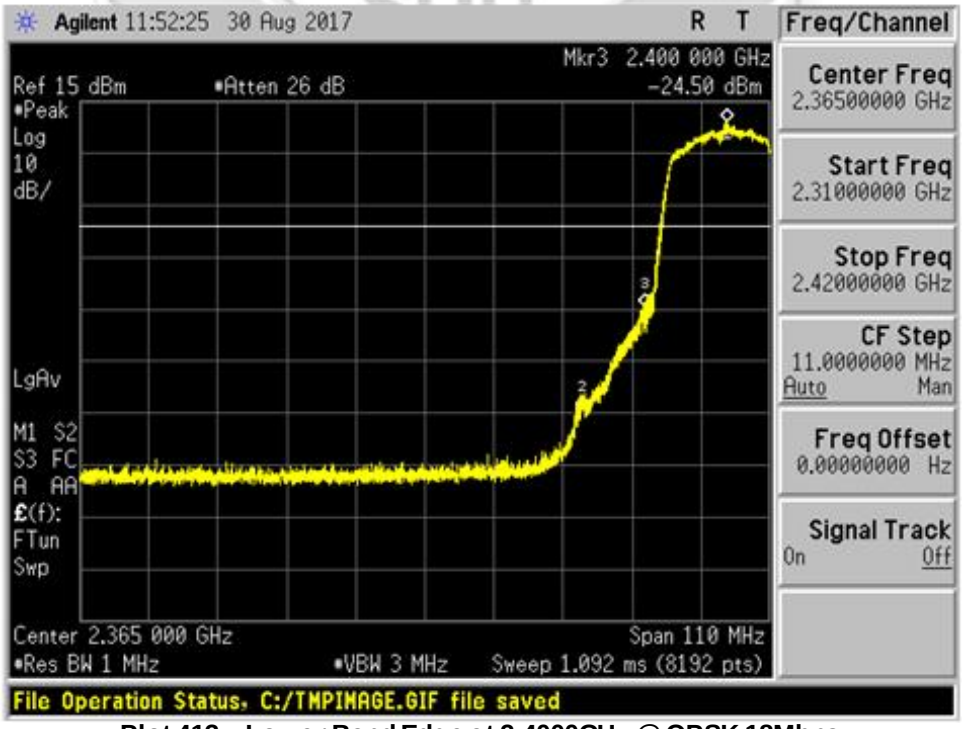
Band Edge Compliance (Conducted) Plots – 802.11b

Plot 411 – Upper Band Edge at 2.4835GHz @ CCK 11Mbps

Band Edge Compliance (Conducted) Plots – 802.11g

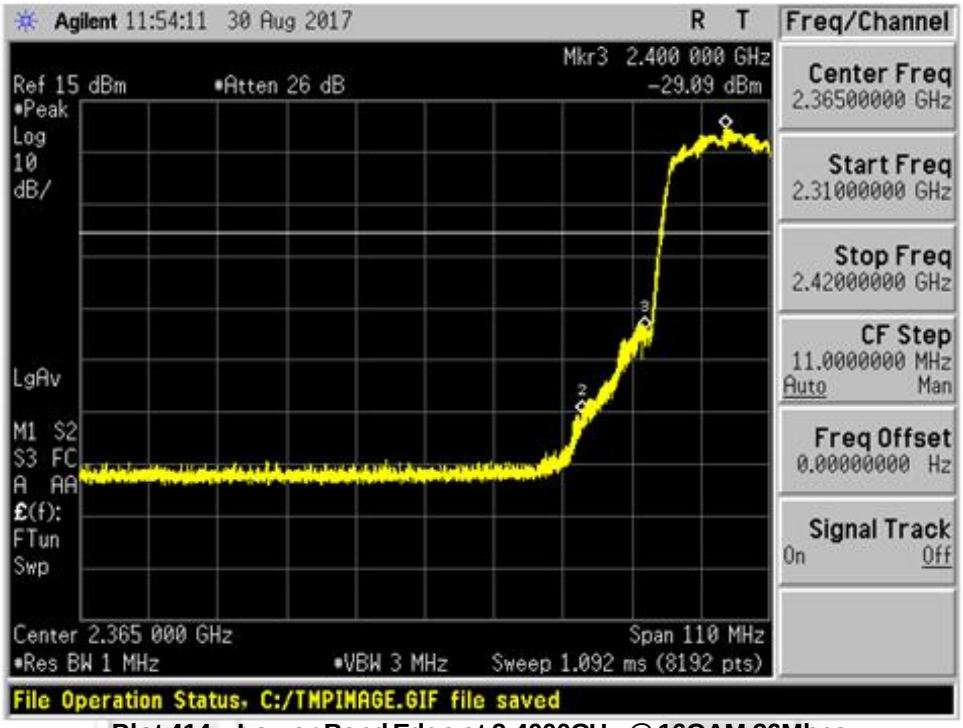


Plot 412 – Lower Band Edge at 2.4000GHz @ BPSK 9Mbps

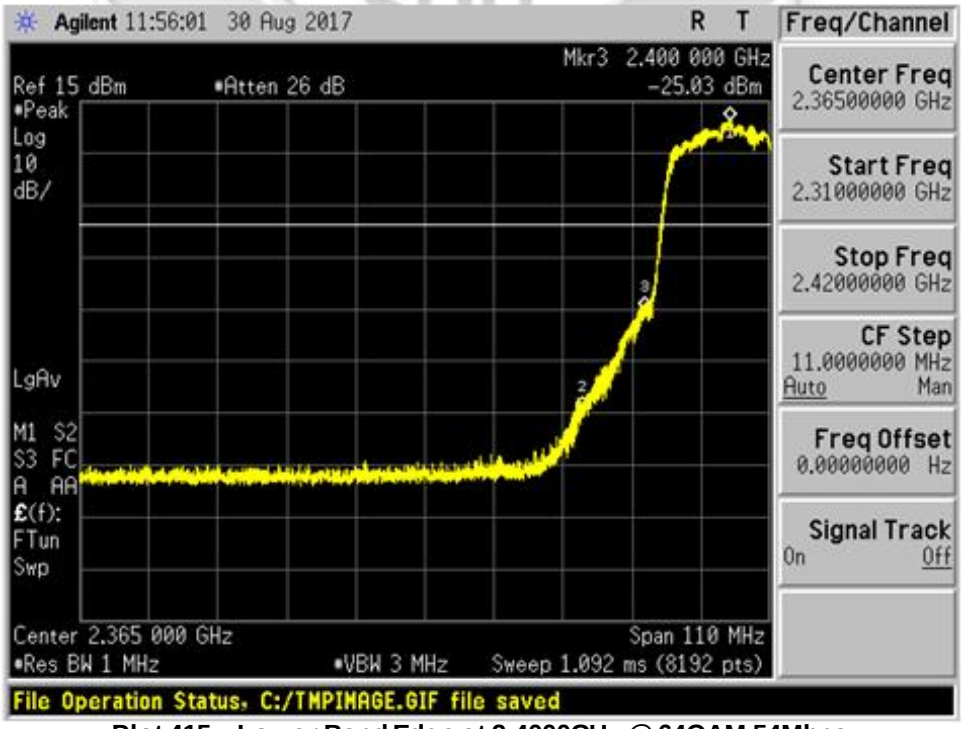


Plot 413 – Lower Band Edge at 2.4000GHz @ QPSK 18Mbps

Band Edge Compliance (Conducted) Plots – 802.11g

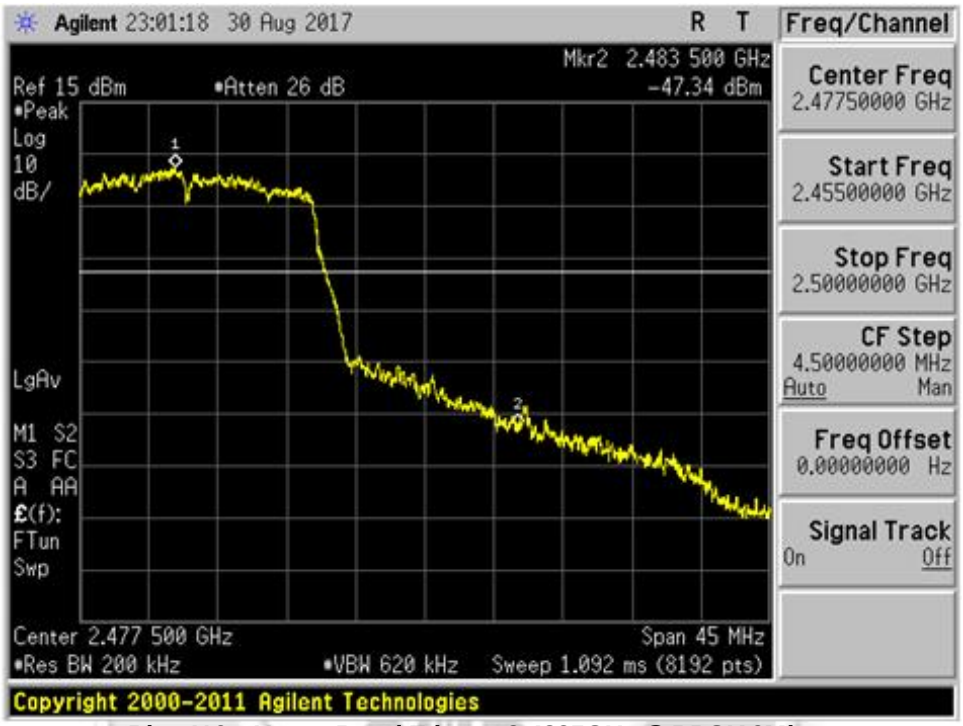


Plot 414 – Lower Band Edge at 2.4000GHz @ 16QAM 36Mbps

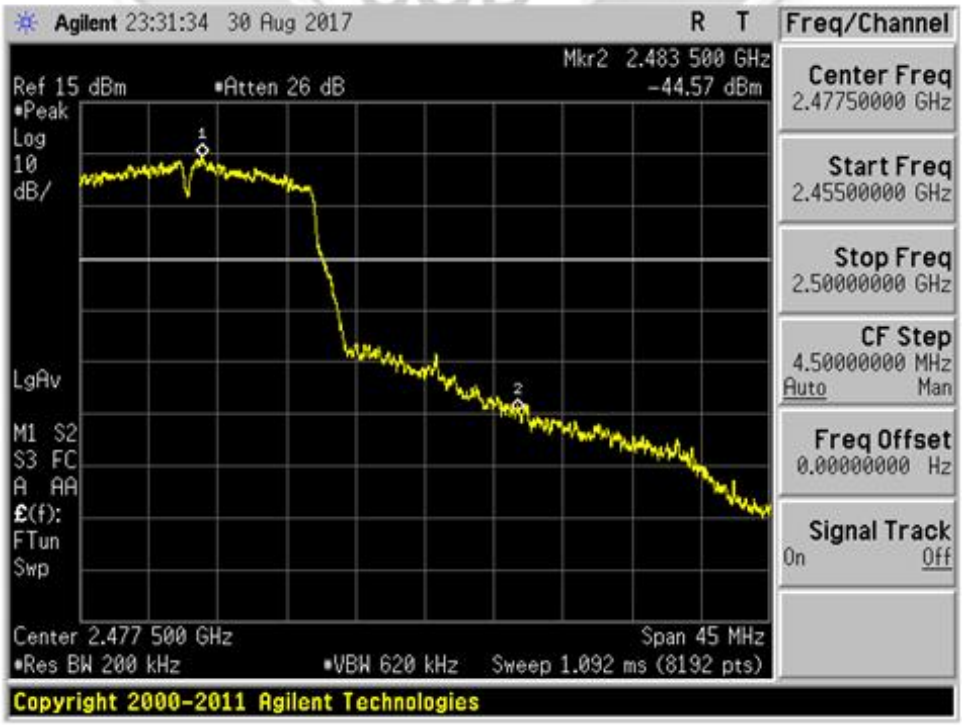


Plot 415 – Lower Band Edge at 2.4000GHz @ 64QAM 54Mbps

Band Edge Compliance (Conducted) Plots – 802.11g

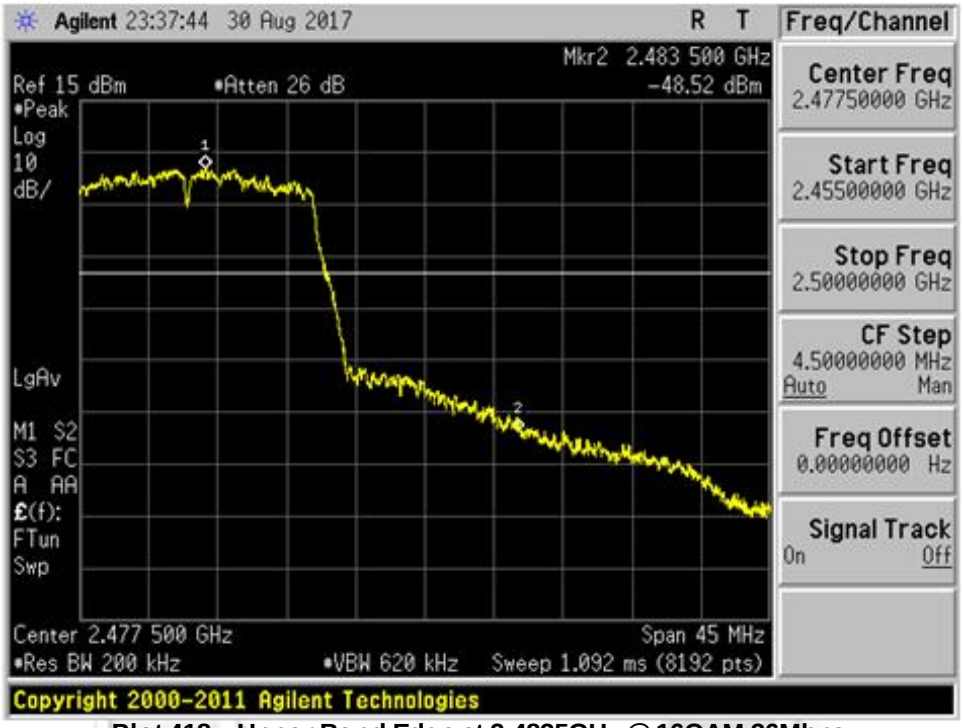


Plot 416 – Upper Band Edge at 2.4835GHz @ BPSK 9Mbps



Plot 417 – Upper Band Edge at 2.4835GHz @ QPSK 18Mbps

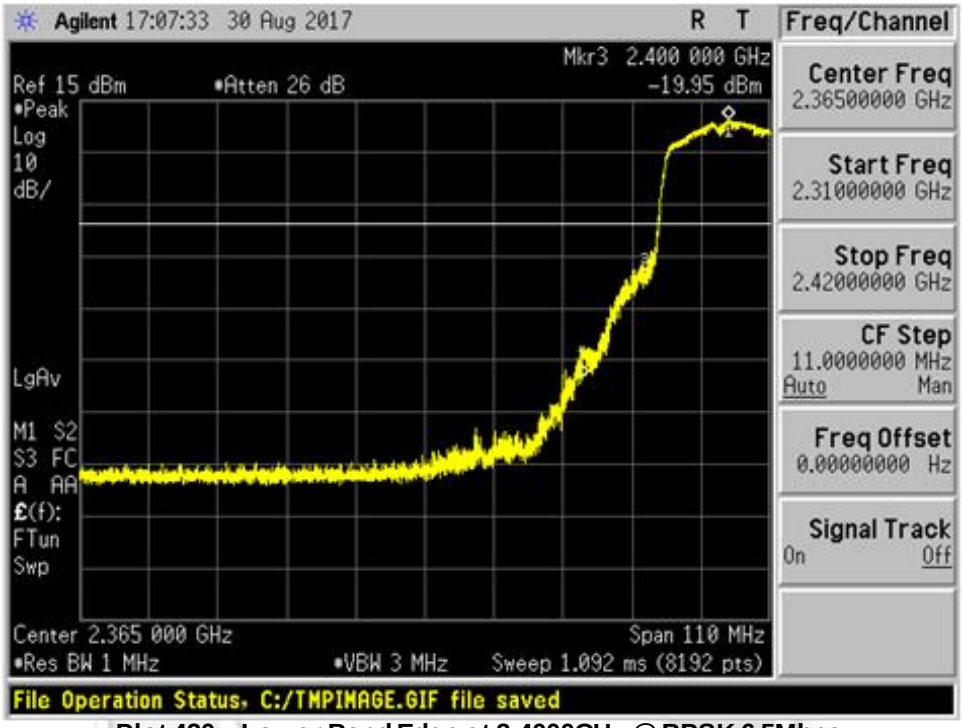
Band Edge Compliance (Conducted) Plots – 802.11g



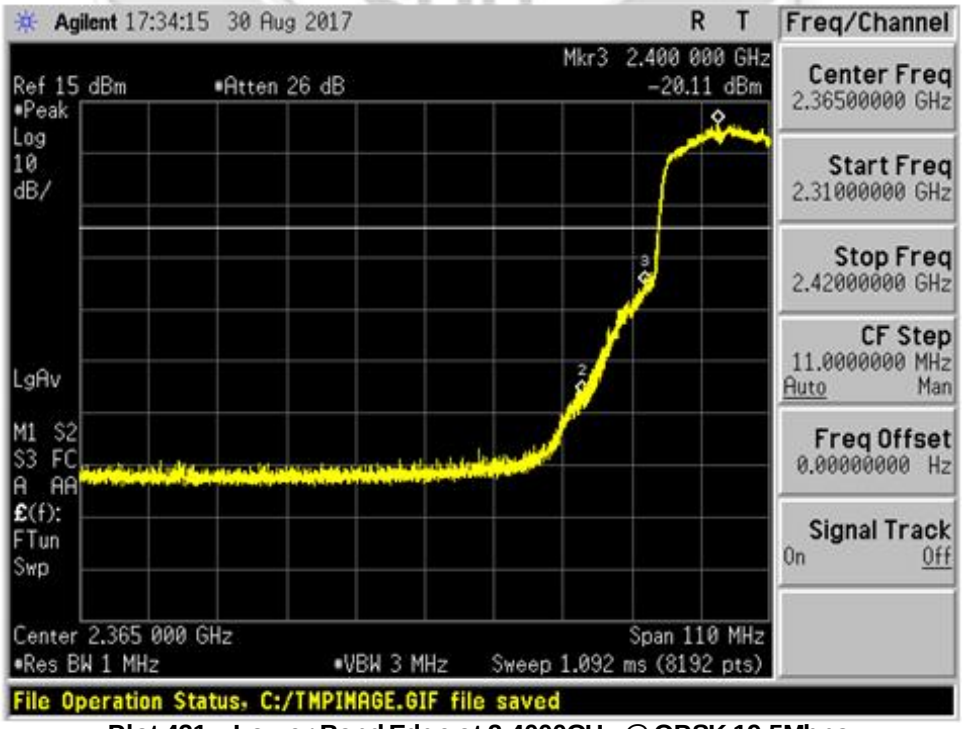
Plot 418 – Upper Band Edge at 2.4835GHz @ 16QAM 36Mbps

Plot 419 – Upper Band Edge at 2.4835GHz @ 64QAM 54Mbps

Band Edge Compliance (Conducted) Plots – 802.11n (20MHz)

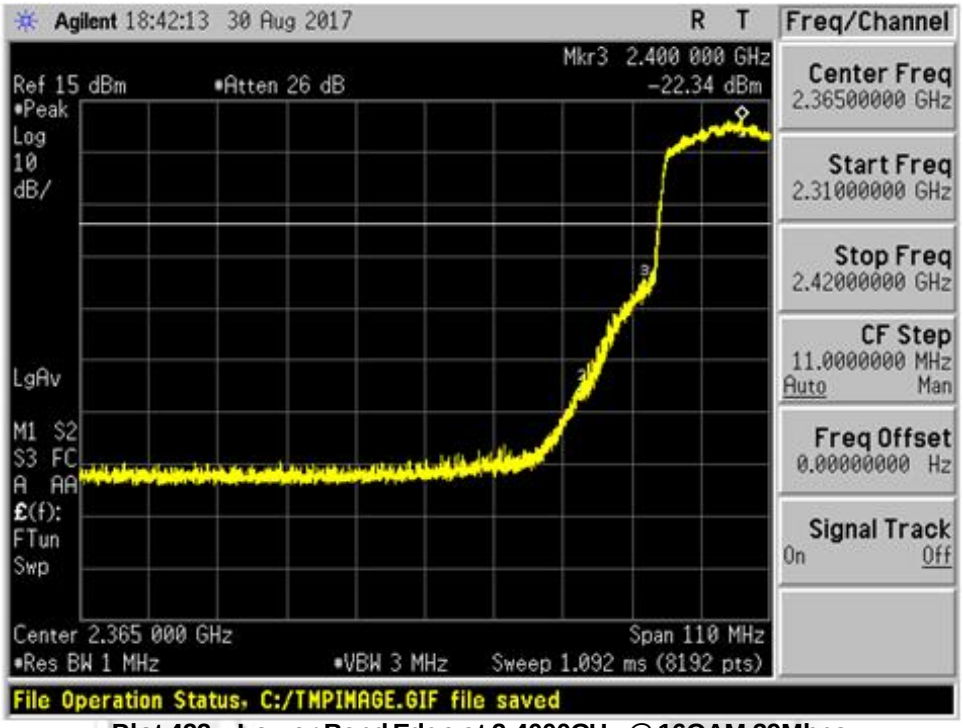


Plot 420 – Lower Band Edge at 2.4000GHz @ BPSK 6.5Mbps

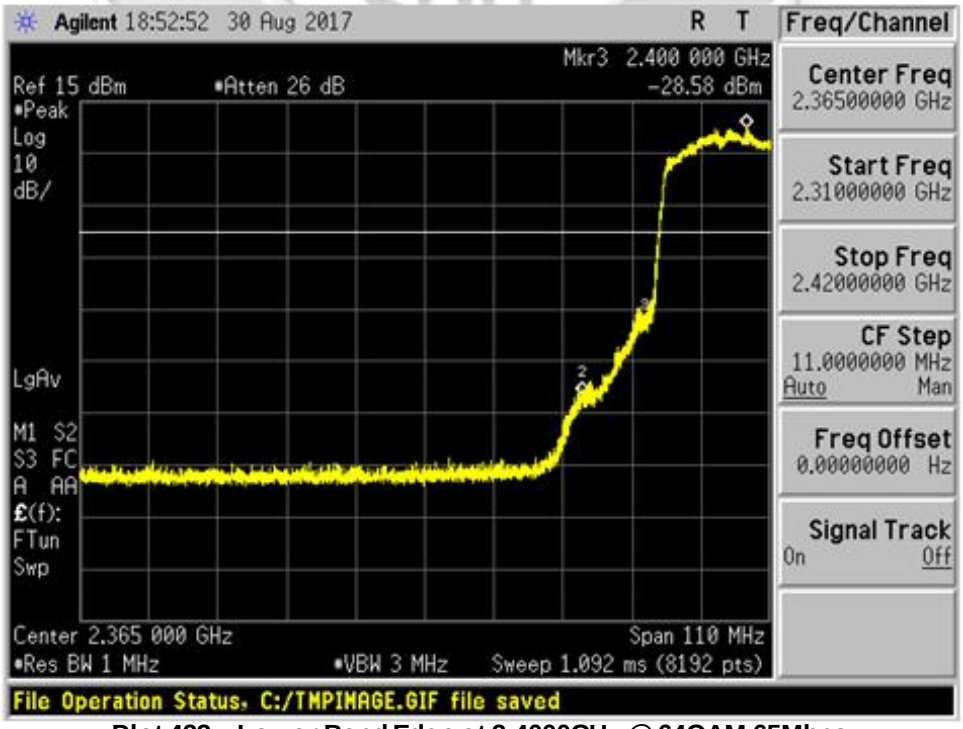


Plot 421 – Lower Band Edge at 2.4000GHz @ QPSK 19.5Mbps

Band Edge Compliance (Conducted) Plots – 802.11n (20MHz)



Plot 422 – Lower Band Edge at 2.4000GHz @ 16QAM 39Mbps



Plot 423 – Lower Band Edge at 2.4000GHz @ 64QAM 65Mbps

Band Edge Compliance (Conducted) Plots – 802.11n (20MHz)

Plot 424 – Upper Band Edge at 2.4835GHz @ BPSK 6.5Mbps

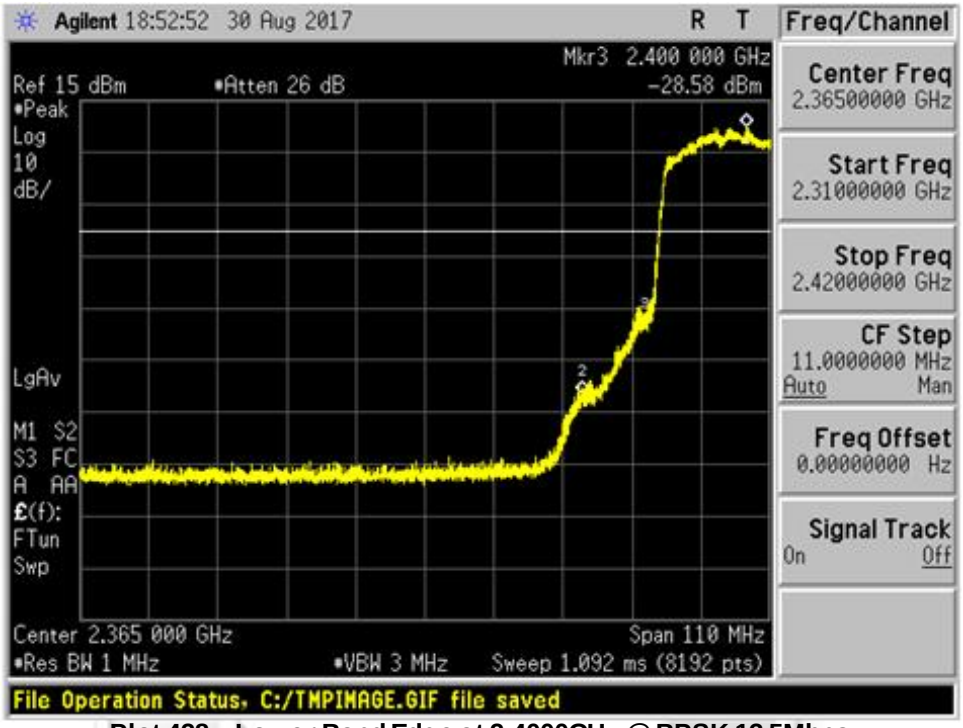
Plot 425 – Upper Band Edge at 2.4835GHz @ QPSK 19.5Mbps

Band Edge Compliance (Conducted) Plots – 802.11n (20MHz)

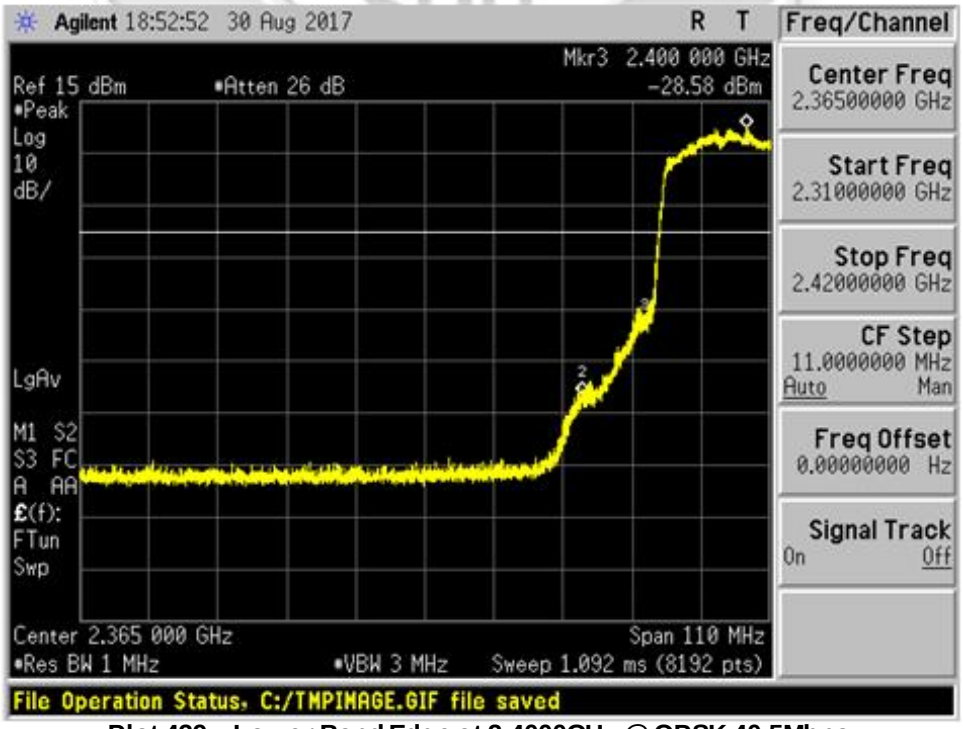
Plot 426 – Upper Band Edge at 2.4835GHz @ 16QAM 39Mbps

Plot 427 – Upper Band Edge at 2.4835GHz @ 64QAM 65Mbps

Band Edge Compliance (Conducted) Plots – 802.11n (40MHz)

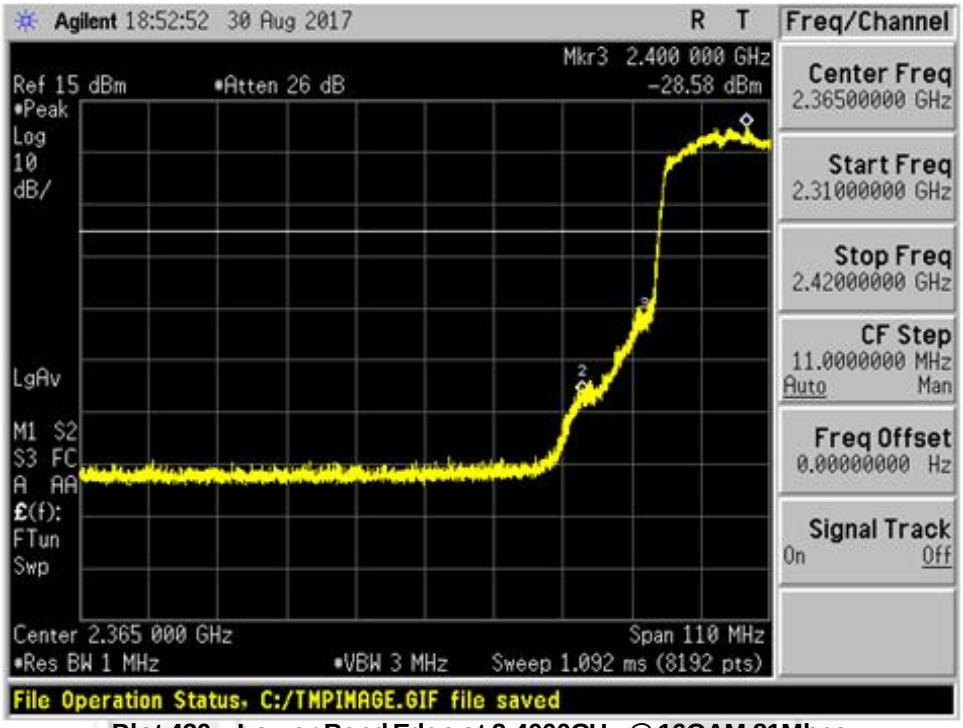


Plot 428 – Lower Band Edge at 2.4000GHz @ BPSK 13.5Mbps

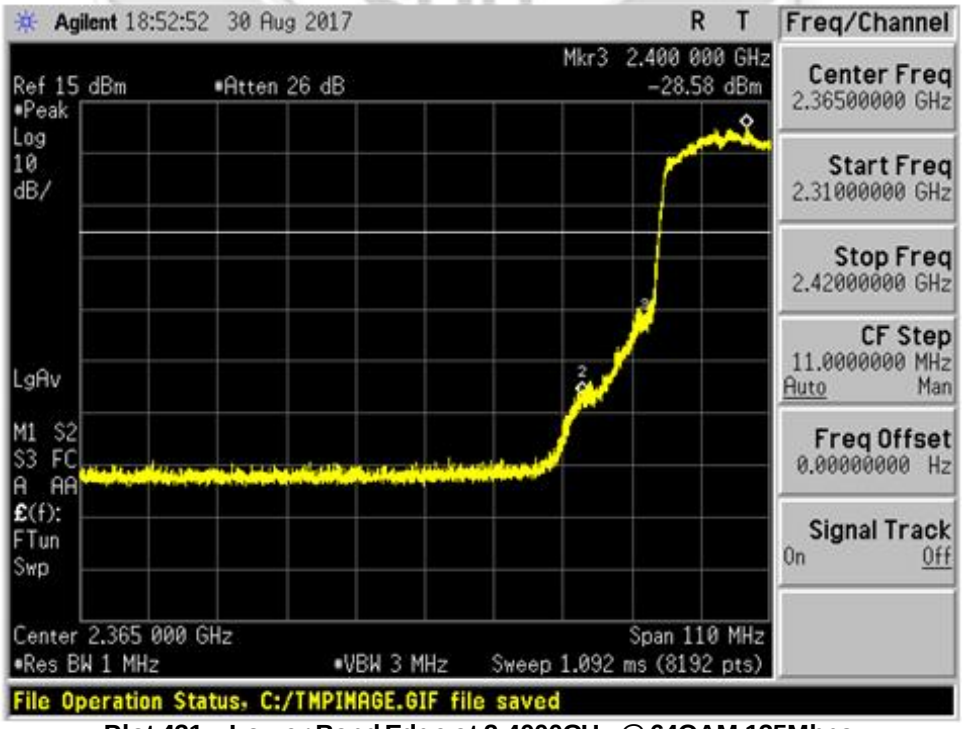


Plot 429 – Lower Band Edge at 2.4000GHz @ QPSK 40.5Mbps

Band Edge Compliance (Conducted) Plots – 802.11n (40MHz)

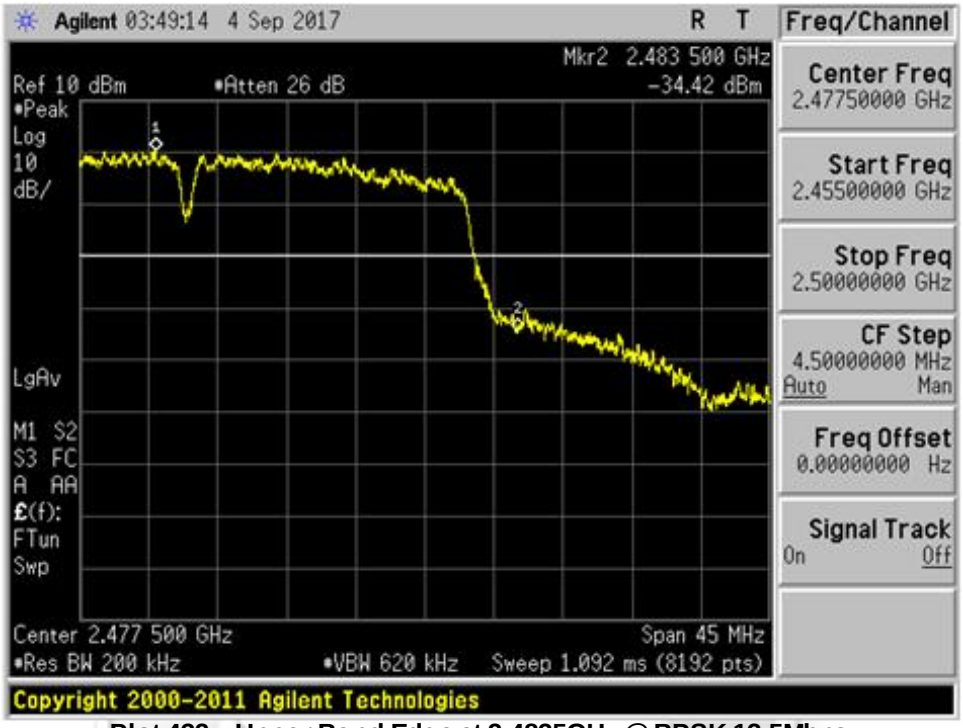


Plot 430 – Lower Band Edge at 2.4000GHz @ 16QAM 81Mbps



Plot 431 – Lower Band Edge at 2.4000GHz @ 64QAM 135Mbps

Band Edge Compliance (Conducted) Plots – 802.11n (40MHz)

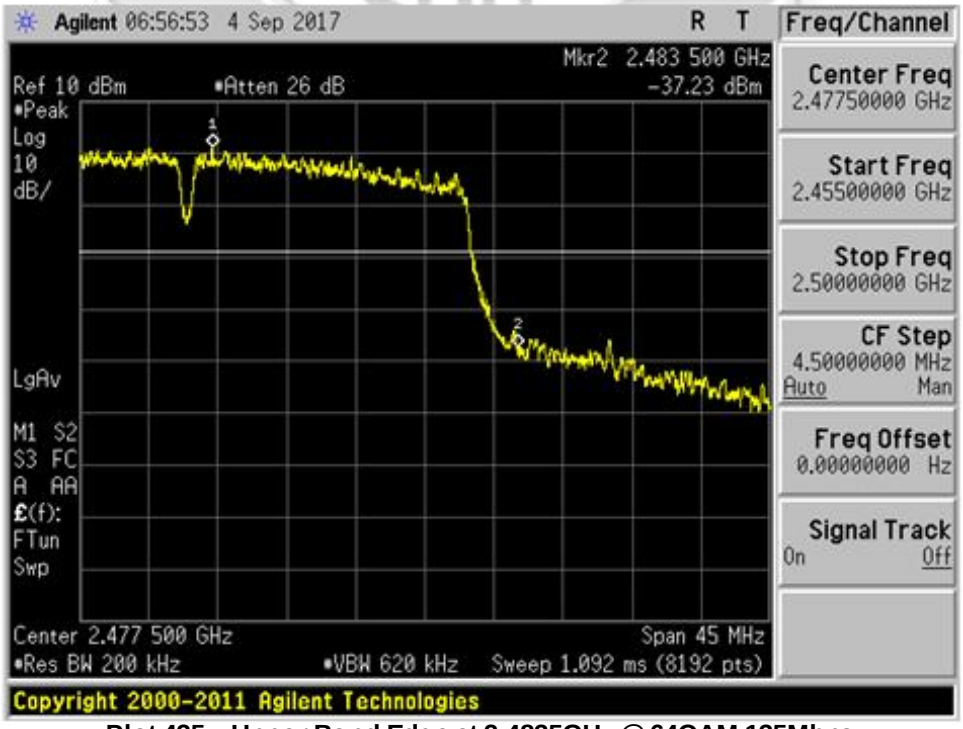


Plot 432 – Upper Band Edge at 2.4835GHz @ BPSK 13.5Mbps

Plot 433 – Upper Band Edge at 2.4835GHz @ QPSK 40.5Mbps

Band Edge Compliance (Conducted) Plots – 802.11n (40MHz)

Plot 434 – Upper Band Edge at 2.4835GHz @ 16QAM 81Mbps



Plot 435 – Upper Band Edge at 2.4835GHz @ 64QAM 135Mbps

BAND EDGE COMPLIANCE (RADIATED) TEST

47 CFR FCC Part 15.247(d) Band Edge Compliance (Radiated) Limits

The EUT shows compliance to the requirements of this section, which states in any 100kHz bandwidth outside the frequency band in which the spread spectrum intentional radiator (EUT) is operating, the radio frequency power that is produced by the EUT shall be at least 20dB below that in the 100kHz bandwidth within the band that contains the highest level of the desired power. In addition, radiated emissions which fall in the restricted bands shall comply to the radiated emission limits specified in 15.209.

47 CFR FCC Part 15.247(d) Band Edge Compliance (Radiated) Test Instrumentation

Instrument	Model	S/No	Cal Due Date
R&S EMI Test Receiver	ESU40	100355	14 Sep 2018
Eletro-Metrics Double Ridged Antenna (Horn) Antenna (1-18GHz)	EM-6961	6525	08 Apr 2018
R&S Preamplifier (1GHz -18GHz)	SCU18	102191	10 Mar 2018

47 CFR FCC Part 15.247(d) Band Edge Compliance (Radiated) Test Setup

1. The EUT and supporting equipment were set up as shown in the setup photo.
2. The power supply for the EUT was connected to a filtered mains.
3. The resolution bandwidth (RBW) and the video bandwidth (VBW) of the spectrum analyser were respectively set to 100kHz and 300kHz to show compliance of spurious at band edges are at least 20dB below the carriers. For restricted band spurious at band edges, peak and average measurement plots were taken using the following setting:
   a. Peak Plot:
      RBW = 1MHz, VBW = 3RBW
   b. Average Plot
      RBW = 1MHz, VBW = 10Hz
4. All other supporting equipment were powered separately from another filtered mains.

47 CFR FCC Part 15.247(d) Band Edge Compliance (Radiated) Test Method

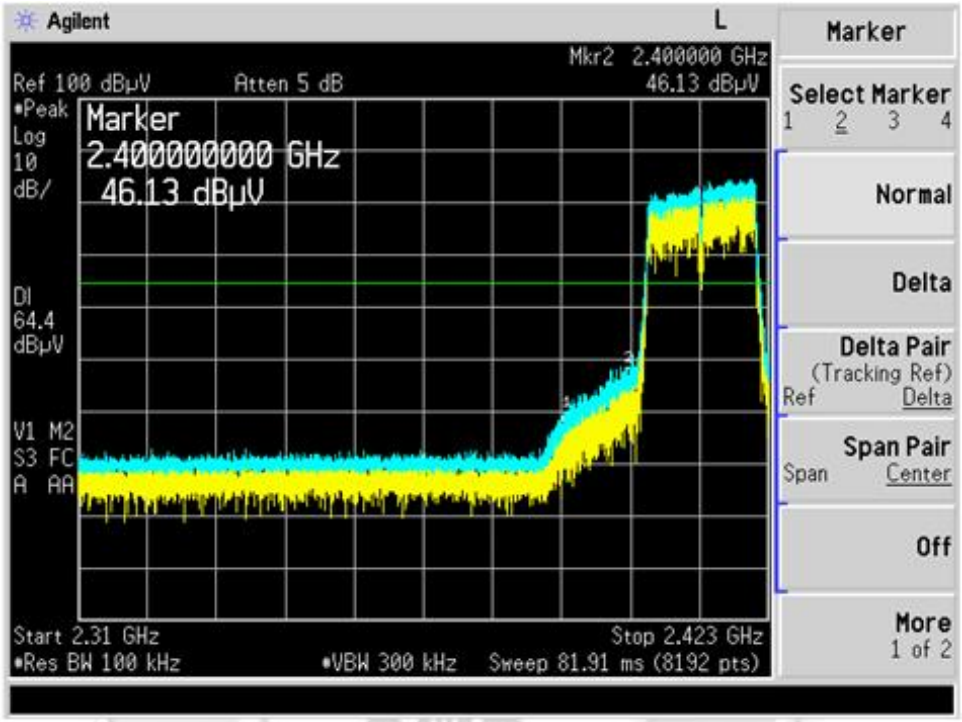
1. The EUT was switched on and allowed to warm up to its normal operating condition. The EUT was then configured to operate in the test mode with specified modulation and data rate.
2. The frequency span of the spectrum analyser was set to wide enough to capture the lower band edge of the transmission band, 2.400GHz and any spurious emissions at the band edge.
3. The spectrum analyser was set to max hold to capture any spurious emissions within the span. The signal capturing was continuous until no further spurious emissions were detected.
4. Repeat steps 1 to 3 with all possible modulations and data rates.
5. The steps 2 to 4 were repeated with the frequency span of the spectrum analyser was set to wide enough to capture the upper band edge frequency of the transmission band, 2.4835GHz and the any spurious emissions at the band-edge.

47 CFR FCC Part 15.247(d) Band Edge Compliance (Radiated) Results

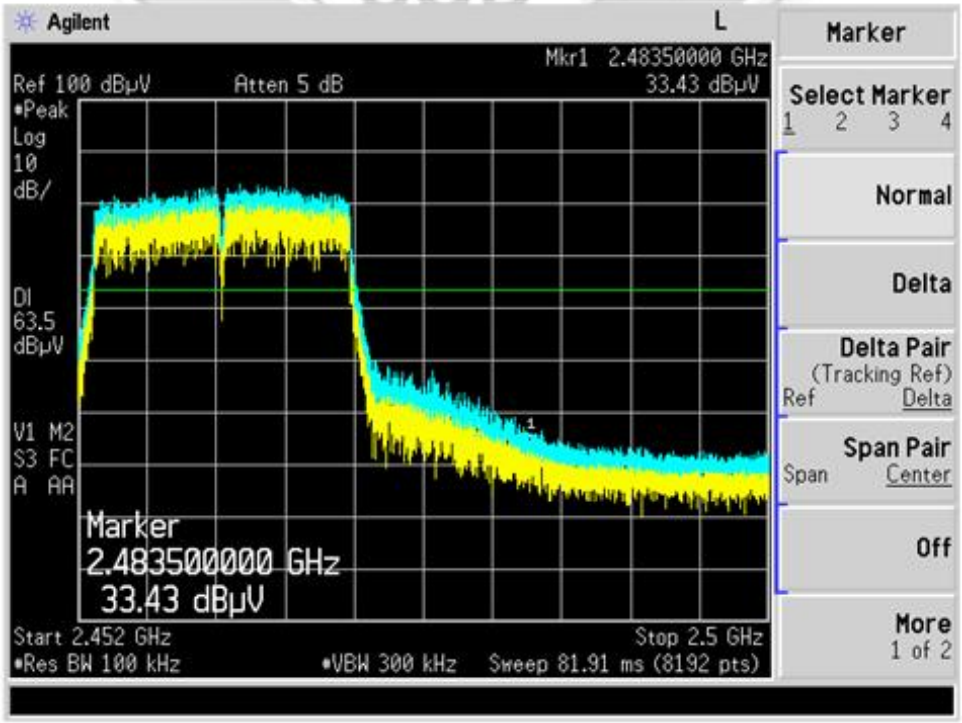
Test Input Power	12.5Vdc	Temperature	24°C
Attached Plots	436 – 447	Relative Humidity	60%
		Atmospheric Pressure	1030mbar
		Tested By	Kelvin Cheng

No significant signal was found and they were below the specified limit.

Band Edge Compliance (Radiated) Plots (20dB Delta from Carrier at Band Edge) – 802.11n(20MHz) 64QAM @ 65Mbps (Worst)

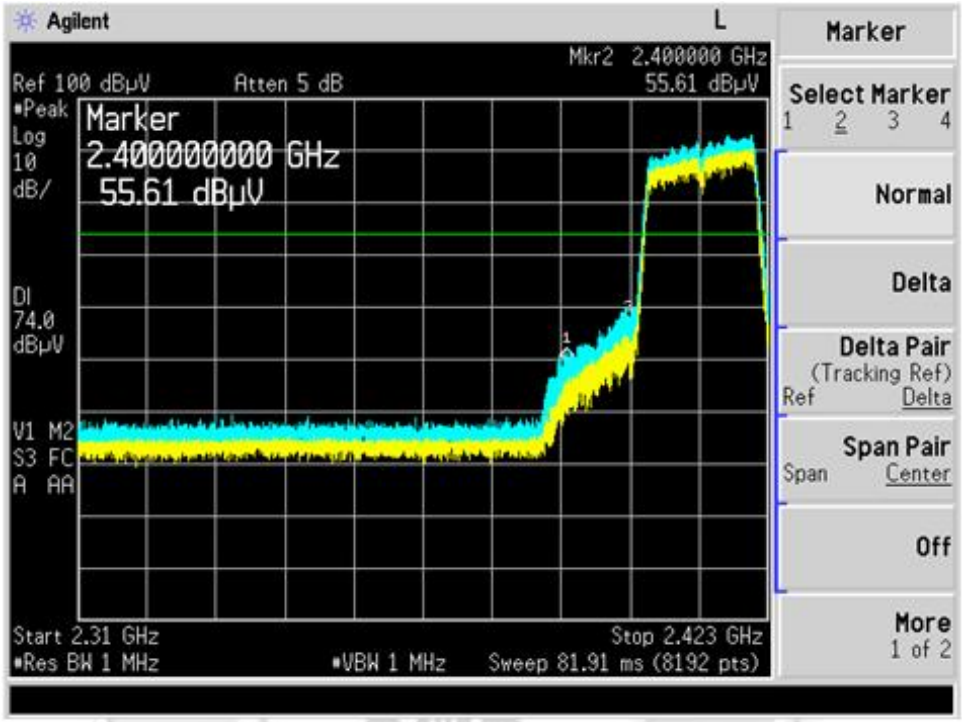


Plot 436 – Lower Band Edge at 2.4000GHz

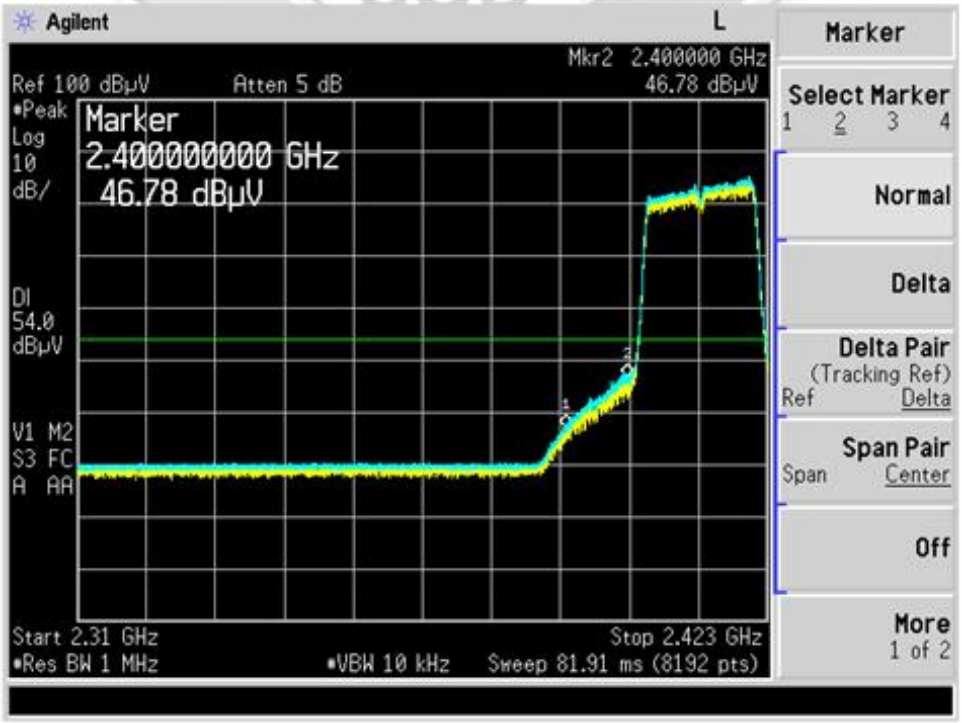


Plot 437 – Upper Band Edge at 2.4835GHz

Band Edge Compliance (Radiated) Plots (Restricted Band) – 802.11n(20MHz) 64QAM @ 65Mbps (Worst)

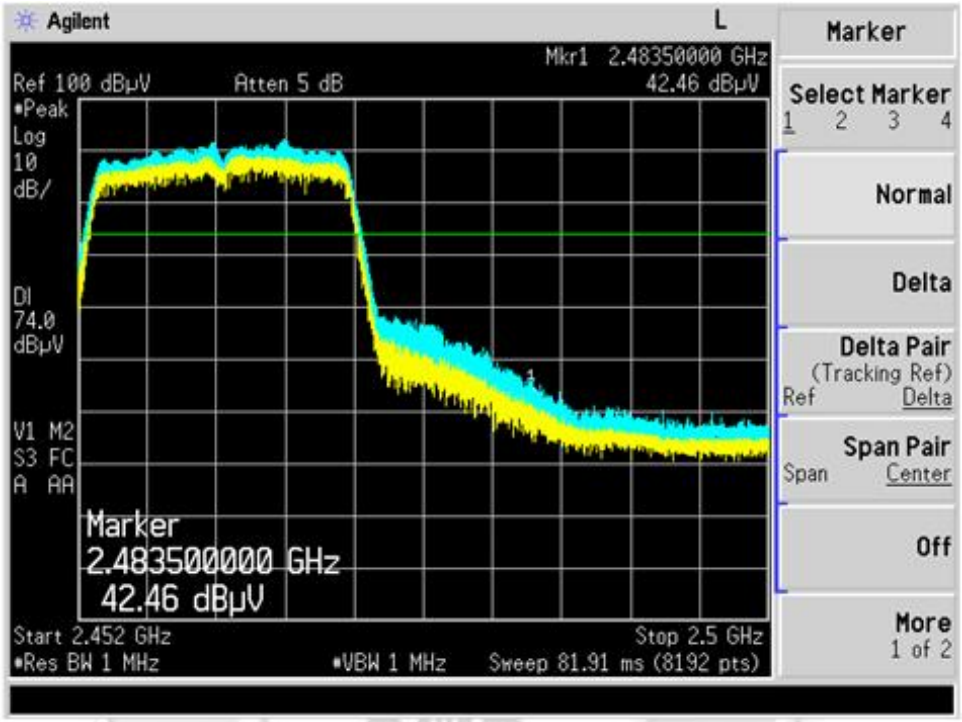


Plot 438 – Peak Plot at Lower Band Edge at 2.4000GHz

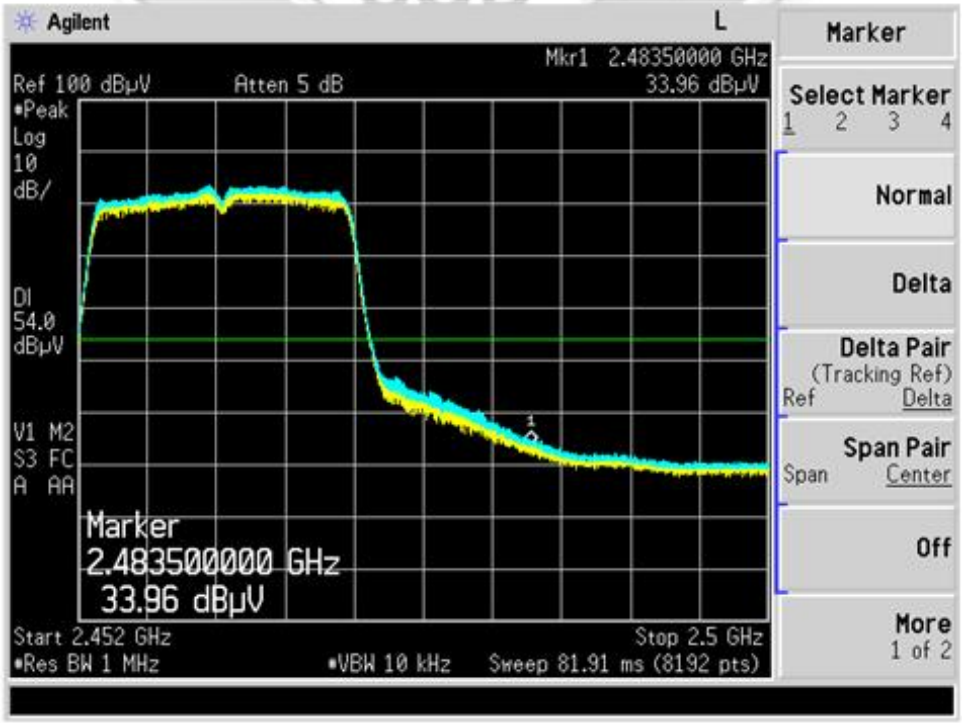


Plot 439 – Average Plot at Lower Band Edge at 2.4000GHz

Band Edge Compliance (Radiated) Plots (Restricted Band) – 802.11n(20MHz) 64QAM @ 65Mbps (Worst)

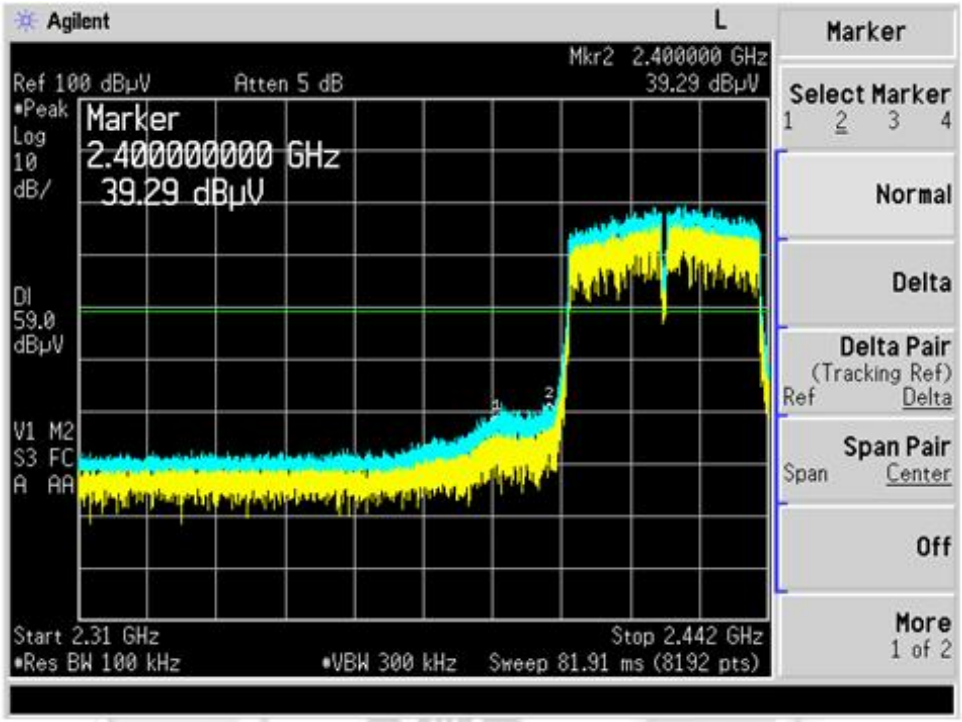


Plot 440 – Peak Plot at Upper Band Edge at 2.4835GHz

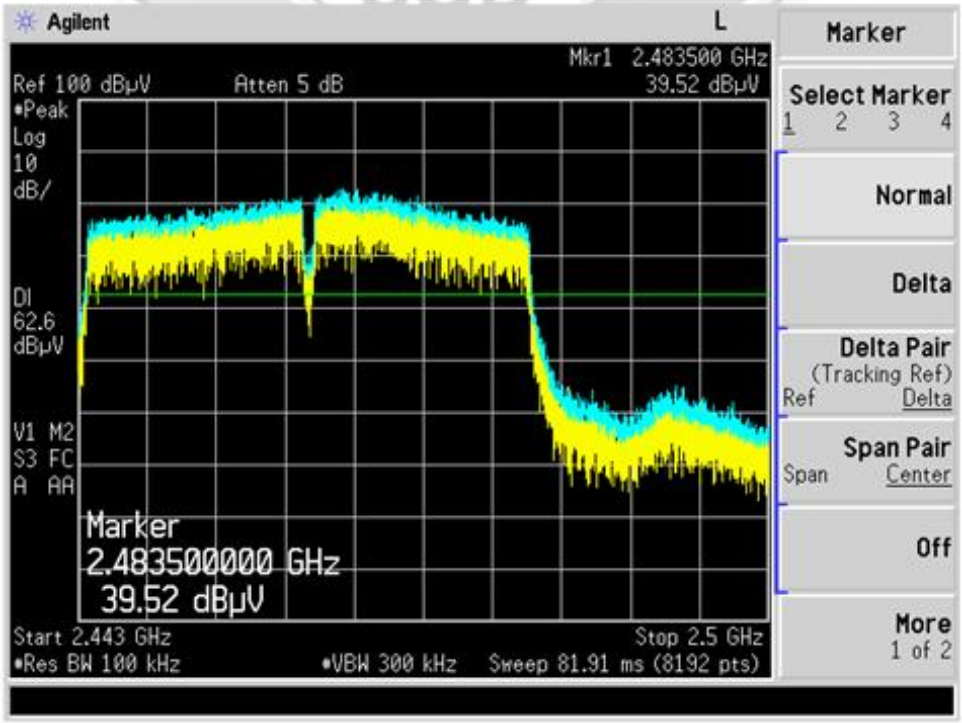


Plot 441 – Average Plot at Upper Band Edge at 2.4835GHz

Band Edge Compliance (Radiated) Plots (20dB Delta from Carrier at Band Edge) – 802.11n(40MHz) 64QAM @ 135Mbps (Worst)

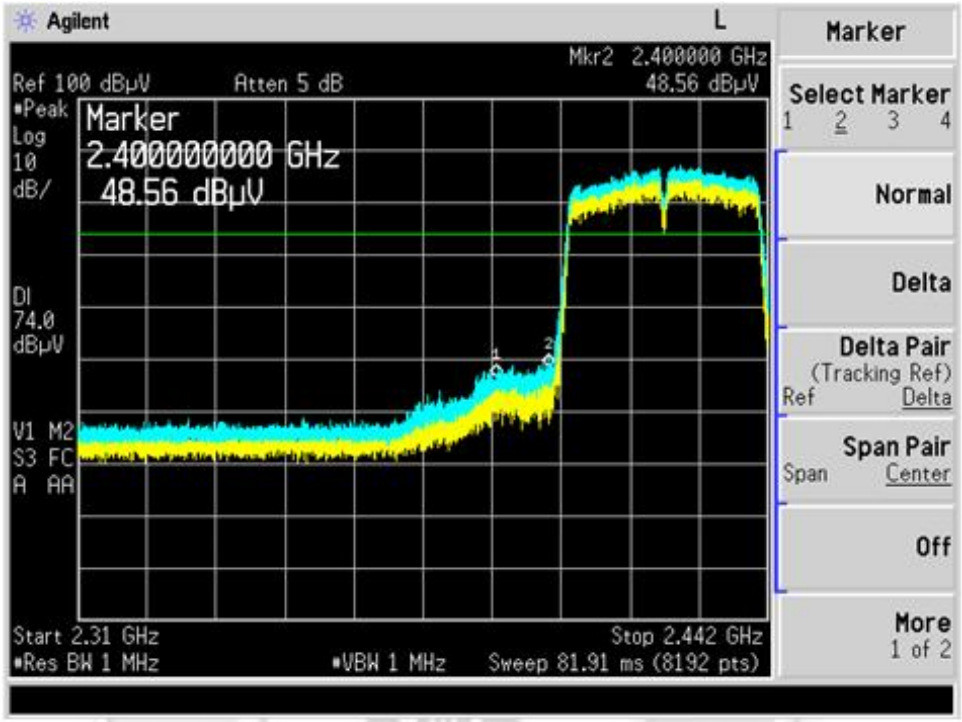


Plot 442 – Lower Band Edge at 2.4000GHz

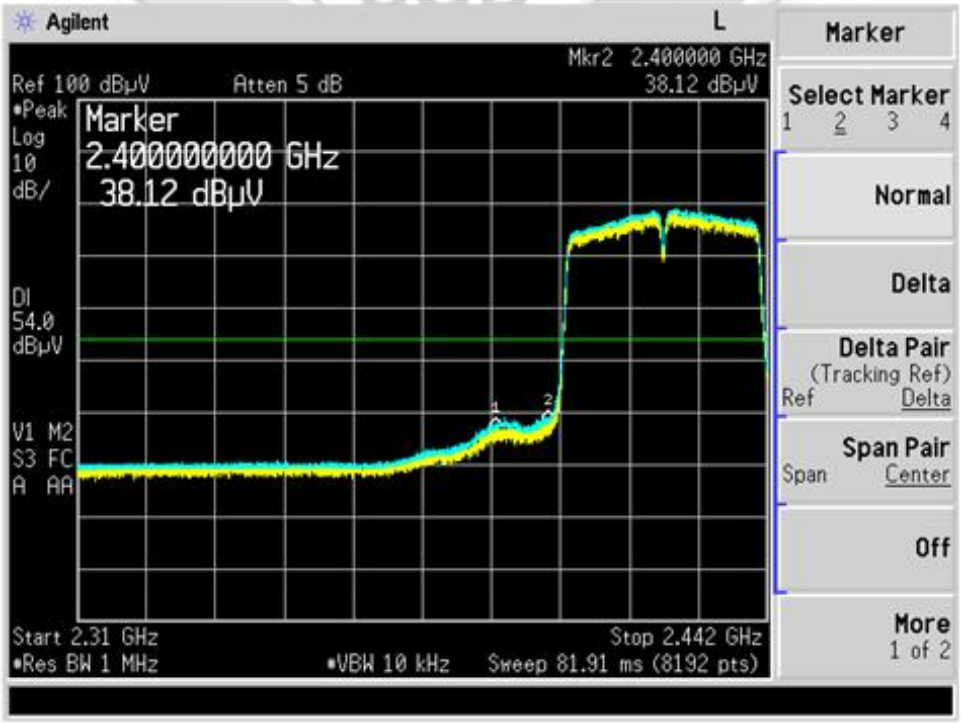


Plot 443 – Upper Band Edge at 2.4835GHz

Band Edge Compliance (Radiated) Plots (Restricted Band) – 802.11n(40MHz) 64QAM @ 135Mbps (Worst)

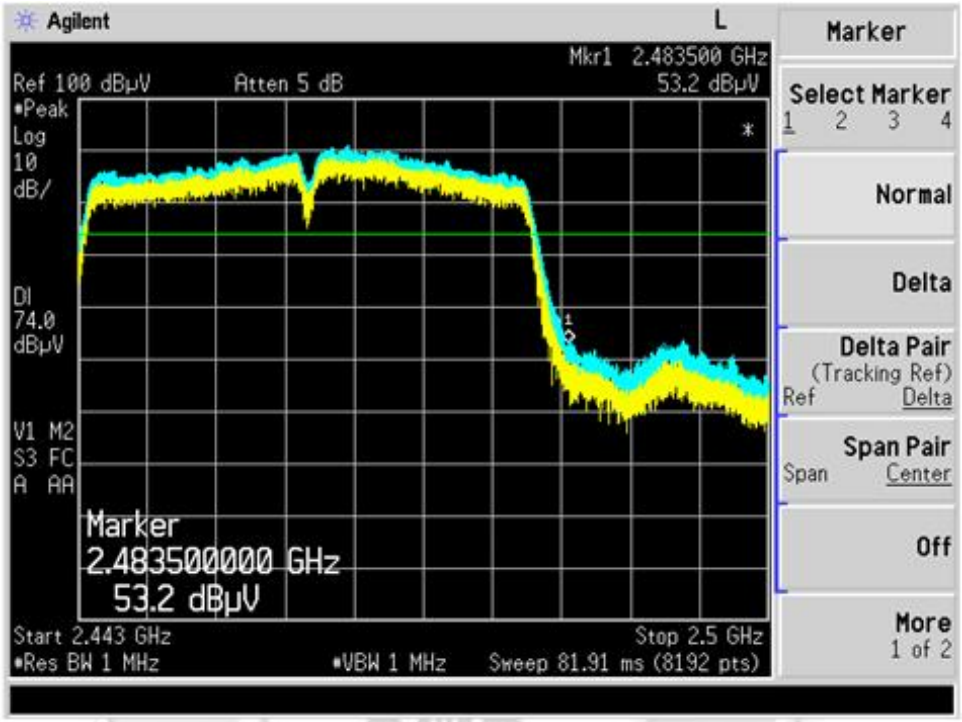


Plot 444 – Peak Plot at Lower Band Edge at 2.4000GHz

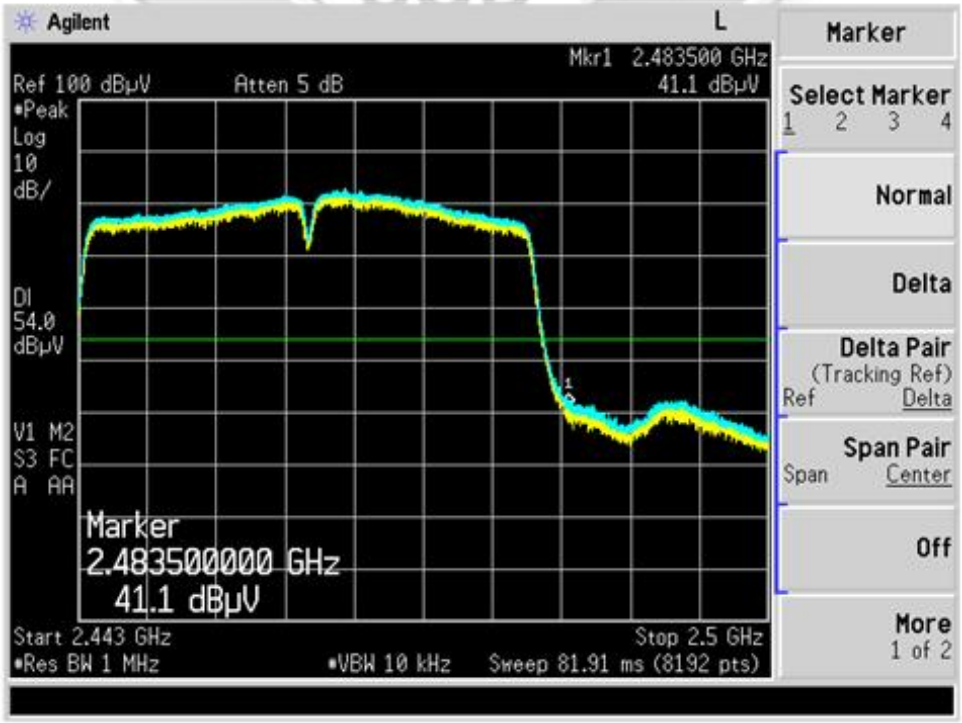


Plot 445 – Average Plot at Lower Band Edge at 2.4000GHz

Band Edge Compliance (Radiated) Plots (Restricted Band) – 802.11n(40MHz) 64QAM @ 135Mbps (Worst)



Plot 446 – Peak Plot at Upper Band Edge at 2.4835GHz



Plot 447 – Average Plot at Upper Band Edge at 2.4835GHz

47 CFR FCC Part 15.247(e) Peak Power Spectral Density Limits

The EUT shows compliance to the requirements of this section, which states the peak power spectral density conducted from the intentional radiator (EUT) to the antenna shall not be greater than 8dBm (6.3mW) in any 3kHz band during any time interval of continuous transmission.

47 CFR FCC Part 15.247(e) Peak Power Spectral Density Test Instrumentation

Instrument	Model	S/No	Cal Due Date
Agilent Spectrum Analyzer	E4440A	MY45304764	04 Jan 2018
BK Precision Multi Range DC Power Supply	9111	459G14131	23 Nov 2017

47 CFR FCC Part 15.247(e) Peak Power Spectral Density Test Setup

1. The EUT and supporting equipment were set up as shown in the setup photo.
2. The power supply for the EUT was connected to a filtered mains.
3. The RF antenna connector was connected to the spectrum via a low-loss coaxial cable.
4. The resolution bandwidth (RBW), video bandwidth (VBW) and span of the spectrum analyser were set to the following:
   RBW = 3kHz
   VBW = 3RBW
   Span = 1.5 times the channel bandwidth (6dB Bandwidth)
   Sweep time = auto couple
5. All other supporting equipment were powered separately from another filtered mains.

47 CFR FCC Part 15.247(e) Peak Power Spectral Density Test Method

1. The EUT was switched on and allowed to warm up to its normal operating condition. The EUT was then configured to operate in the test mode at lower channel with specified modulation and data rate.
2. The peak of the transmitting frequency was detected with the marker peak function of the spectrum analyser.
3. The peak power density of the transmitting frequency was plotted and recorded.
4. Repeat steps 1 to 3 with all possible modulations and data rates.
5. The steps 2 to 4 were repeated with the transmitting frequency was set to middle and upper channel respectively.

47 CFR FCC Part 15.247(e) Peak Power Spectral Density Results

Test Input Power	12.5Vdc	Temperature	24°C
Attached Plots	448 – 492	Relative Humidity	60%
		Atmospheric Pressure	1030mbar
		Tested By	Chang Wai Kit

802.11b

Channel	Channel Frequency (GHz)	Peak Power Spectral Density (mW)	Limit (mW)	Modulation @ Data Rate
1 *(lower ch)*	2.412	0.142	6.3	DBPSK @ 1Mbps
		0.169	6.3	DQPSK @ 2Mbps
		0.139	6.3	CCK @ 11Mbps
6 *(mid ch)*	2.437	0.055	6.3	DBPSK @ 1Mbps
		0.239	6.3	DQPSK @ 2Mbps
		0.200	6.3	CCK @ 11Mbps
11 *(upper ch)*	2.462	0.054	6.3	DBPSK @ 1Mbps
		0.249	6.3	DQPSK @ 2Mbps
		0.203	6.3	CCK @ 11Mbps

802.11g

Channel	Channel Frequency (GHz)	Peak Power Spectral Density (mW)	Limit (mW)	Modulation @ Data Rate
1 *(lower ch)*	2.412	0.026	6.3	BPSK @ 9Mbps
		0.045	6.3	QPSK @ 18Mbps
		0.033	6.3	16QAM @ 36Mbps
		0.055	6.3	64QAM @ 54Mbps
6 *(mid ch)*	2.437	0.026	6.3	BPSK @ 9Mbps
		0.054	6.3	QPSK @ 18Mbps
		0.042	6.3	16QAM @ 36Mbps
		0.052	6.3	64QAM @ 54Mbps
11 *(upper ch)*	2.462	0.028	6.3	BPSK @ 9Mbps
		0.055	6.3	QPSK @ 18Mbps
		0.042	6.3	16QAM @ 36Mbps
		0.067	6.3	64QAM @ 54Mbps

47 CFR FCC Part 15.247(e) Peak Power Spectral Density Results

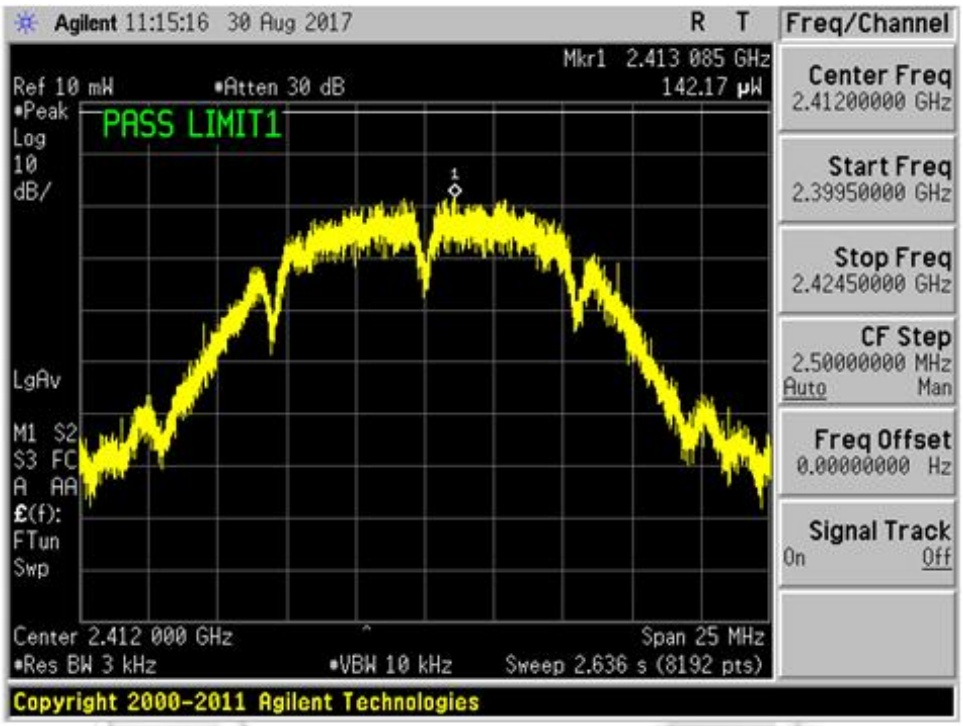
802.11n (20MHz)

Channel	Channel Frequency (GHz)	Peak Power Spectral Density (mW)	Limit (mW)	Modulation @ Data Rate
1 *(lower ch)*	2.412	0.047	6.3	BPSK @ 6.5Mbps
		0.057	6.3	QPSK @ 19.5Mbps
		0.052	6.3	16QAM @ 39Mbps
		0.032	6.3	64QAM @ 65Mbps
6 *(mid ch)*	2.437	0.044	6.3	BPSK @ 6.5Mbps
		0.060	6.3	QPSK @ 19.5Mbps
		0.053	6.3	16QAM @ 39Mbps
		0.044	6.3	64QAM @ 65Mbps
11 *(upper ch)*	2.462	0.045	6.3	BPSK @ 6.5Mbps
		0.055	6.3	QPSK @ 19.5Mbps
		0.049	6.3	16QAM @ 39Mbps
		0.045	6.3	64QAM @ 65Mbps

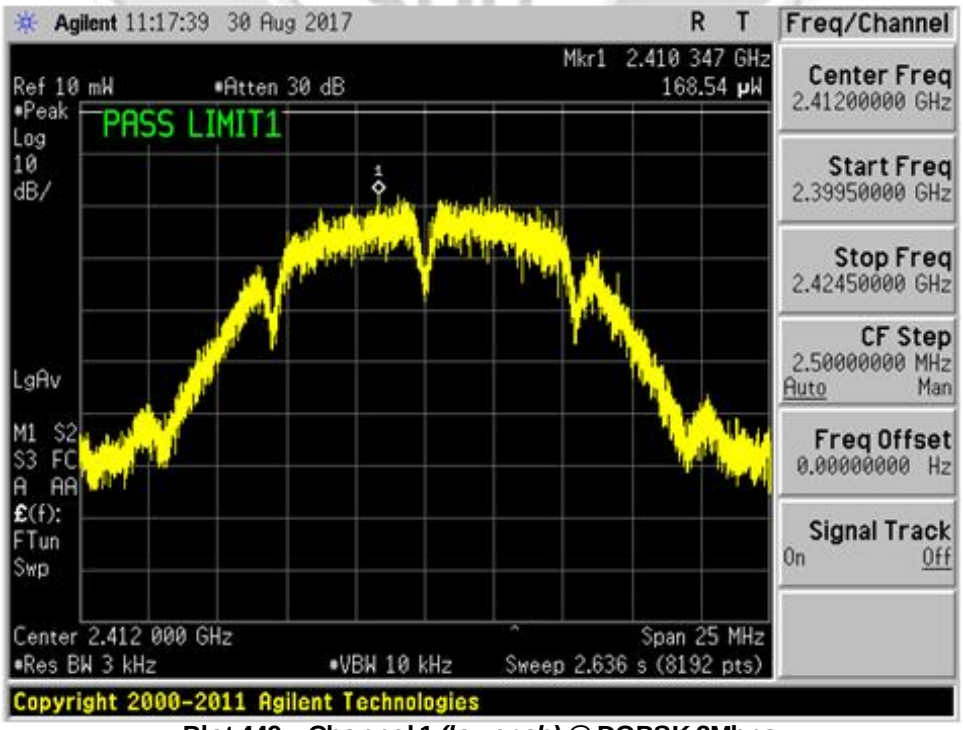
802.11n (40MHz)

Channel	Channel Frequency (GHz)	Peak Power Spectral Density (mW)	Limit (mW)	Modulation @ Data Rate
3 *(lower ch)*	2.422	0.026	6.3	BPSK @ 13.5Mbps
		0.049	6.3	QPSK @ 40.5Mbps
		0.047	6.3	16QAM @ 81Mbps
		0.032	6.3	64QAM @ 135Mbps
7 *(mid ch)*	2.442	0.020	6.3	BPSK @ 13.5Mbps
		0.026	6.3	QPSK @ 40.5Mbps
		0.032	6.3	16QAM @ 81Mbps
		0.035	6.3	64QAM @ 135Mbps
11 *(upper ch)*	2.462	0.022	6.3	BPSK @ 13.5Mbps
		0.032	6.3	QPSK @ 40.5Mbps
		0.057	6.3	16QAM @ 81Mbps
		0.048	6.3	64QAM @ 135Mbps

Peak Power Spectral Density Plots – 802.11b

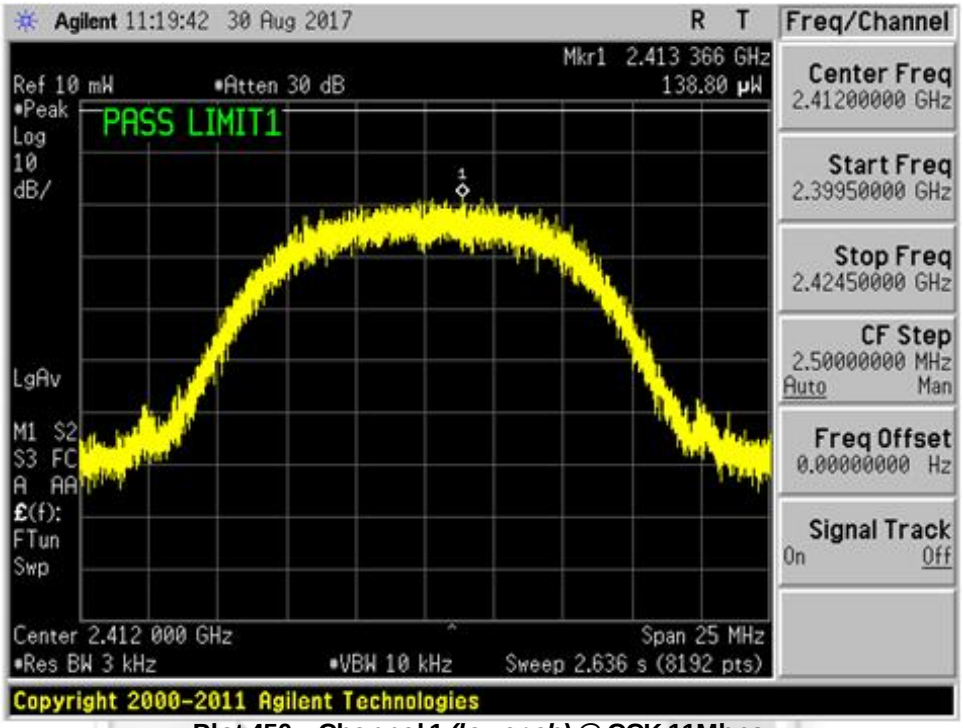


Plot 448 – Channel 1 *(lower ch)* @ DBPSK 1Mbps



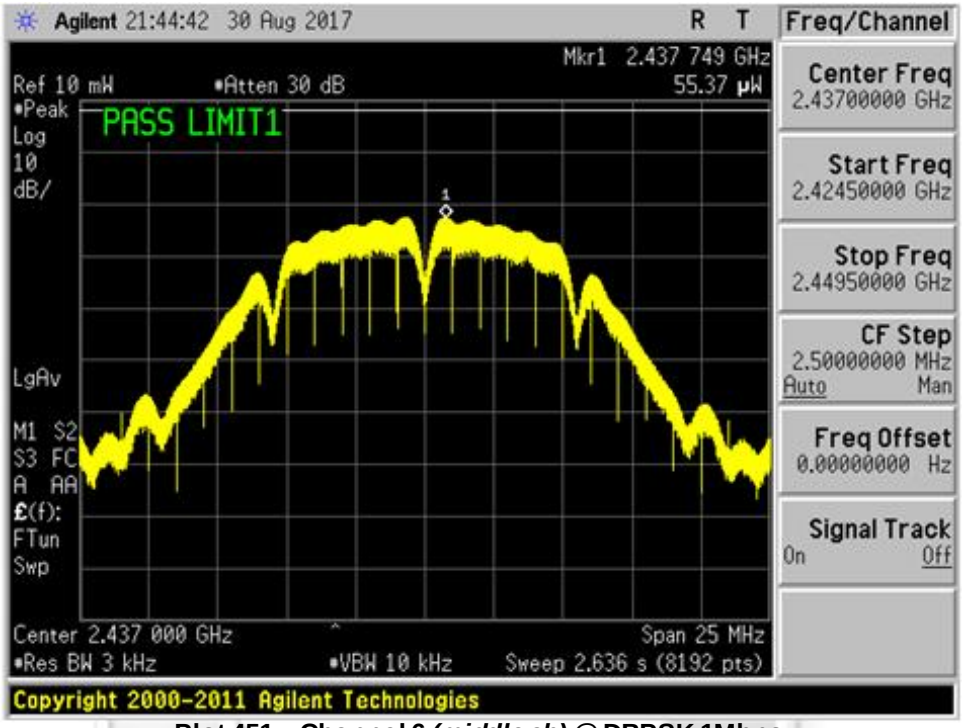
Plot 449 – Channel 1 *(lower ch)* @ DQPSK 2Mbps

Peak Power Spectral Density Plots – 802.11b

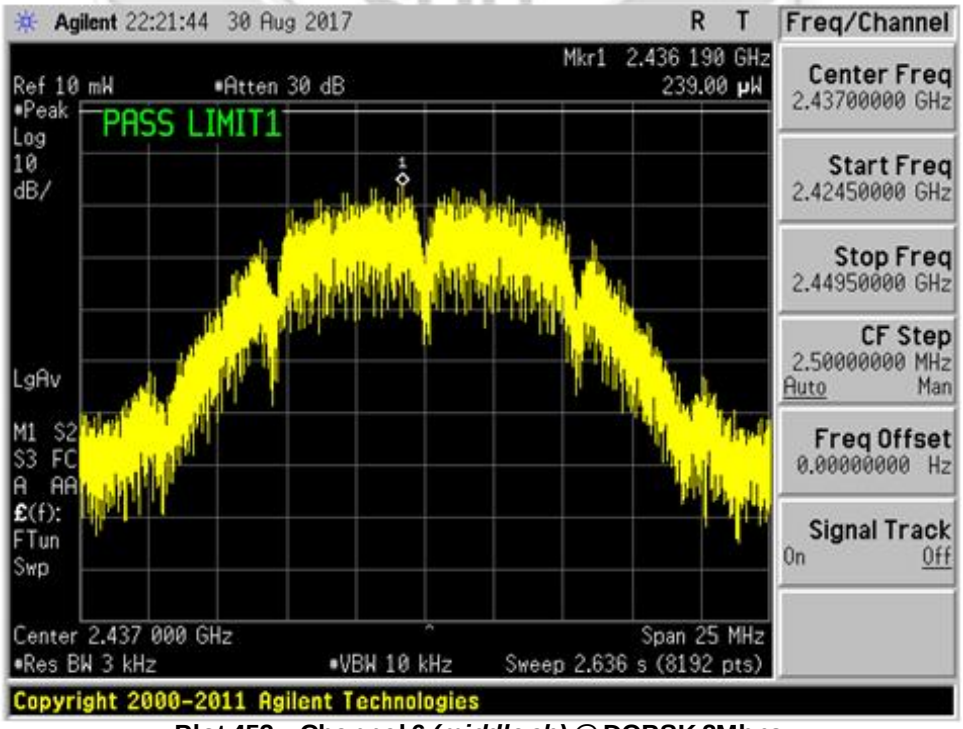


Plot 450 – Channel 1 *(lower ch)* @ CCK 11Mbps

Peak Power Spectral Density Plots – 802.11b

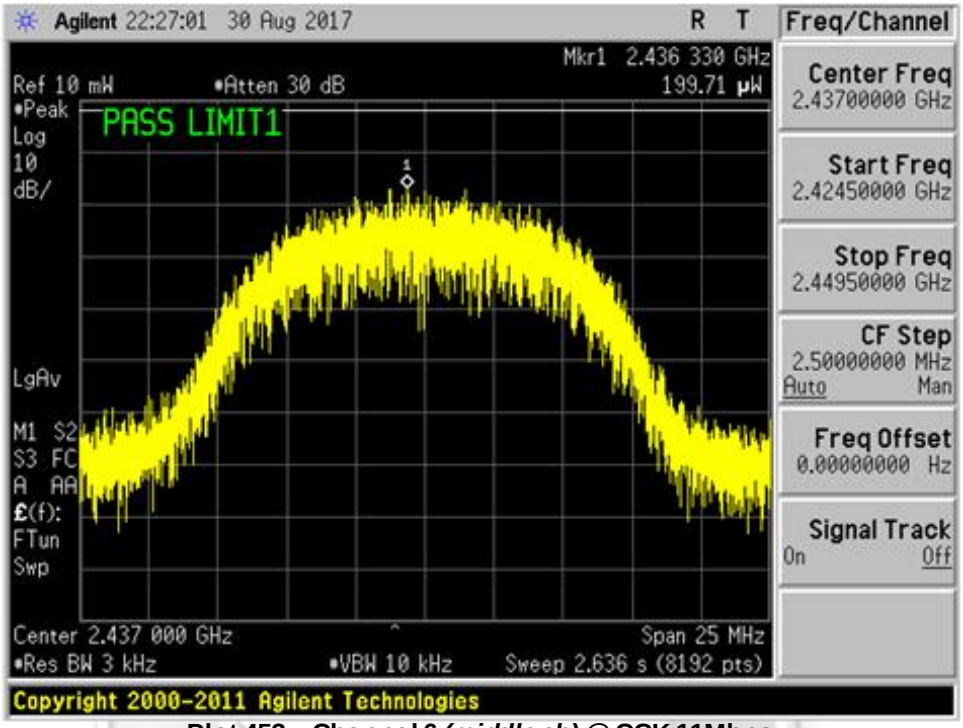


Plot 451 – Channel 6 *(middle ch)* @ DBPSK 1Mbps



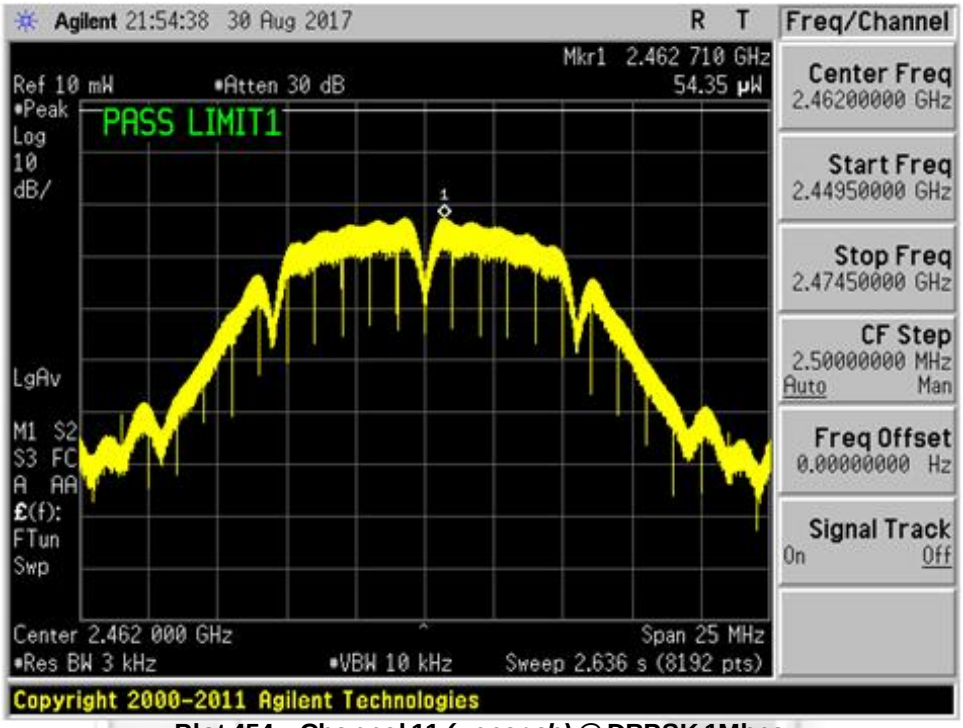
Plot 452 – Channel 6 *(middle ch)* @ DQPSK 2Mbps

Peak Power Spectral Density Plots – 802.11b

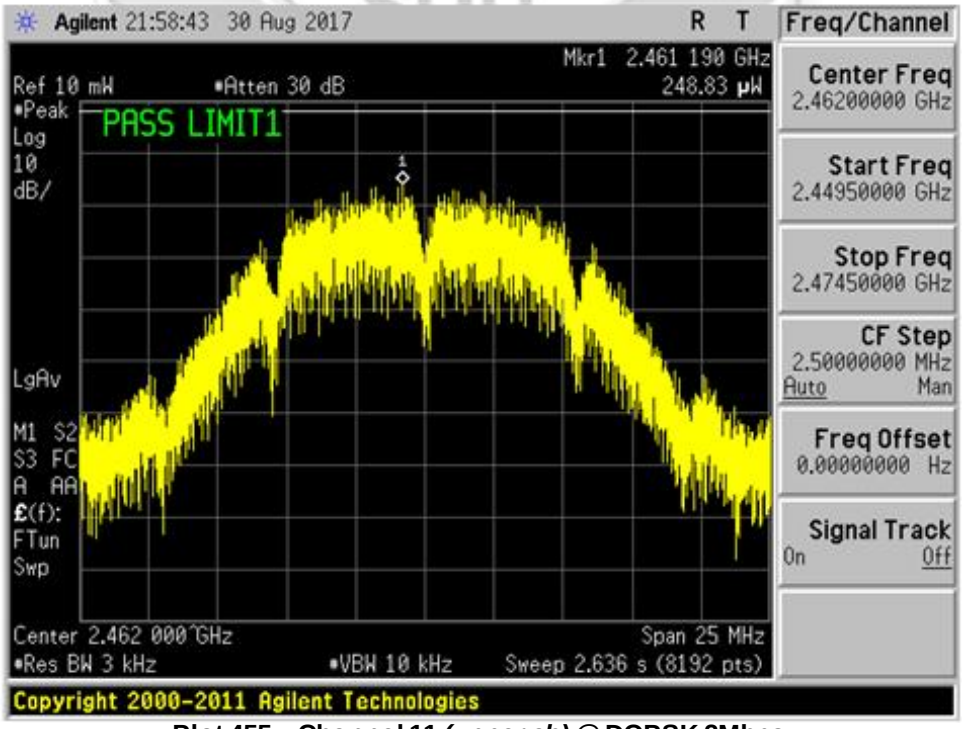


Plot 453 – Channel 6 *(middle ch)* @ CCK 11Mbps

Peak Power Spectral Density Plots – 802.11b

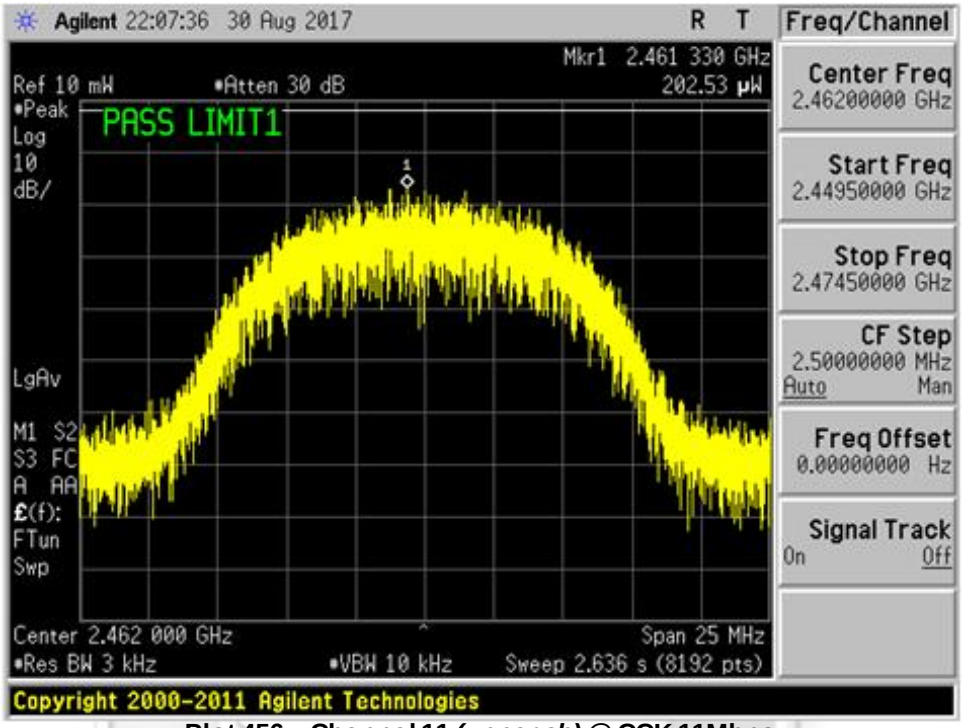


Plot 454 – Channel 11 *(upper ch)* @ DBPSK 1Mbps



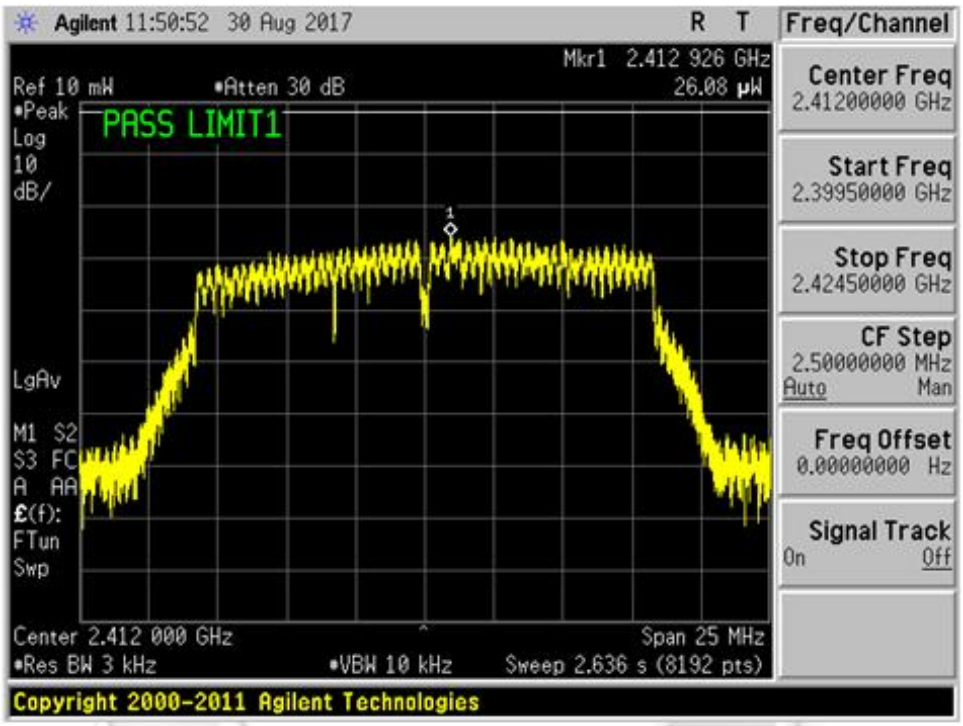
Plot 455 – Channel 11 *(upper ch)* @ DQPSK 2Mbps

Peak Power Spectral Density Plots – 802.11b

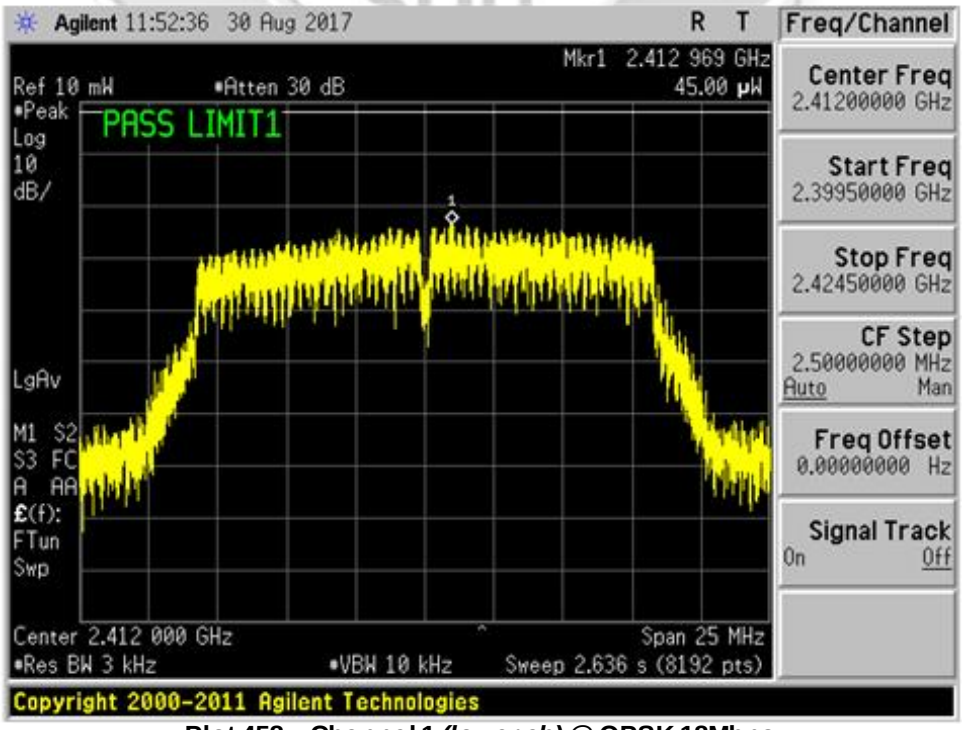


Plot 456 – Channel 11 *(upper ch)* @ CCK 11Mbps

Peak Power Spectral Density Plots – 802.11g

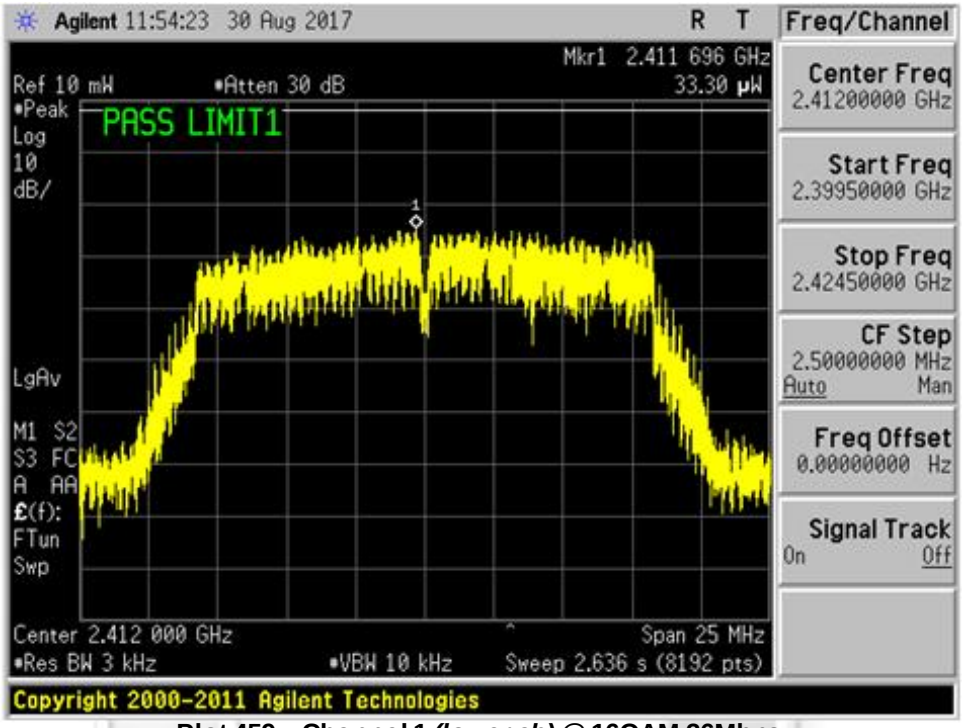


Plot 457 – Channel 1 *(lower ch)* @ BPSK 9Mbps

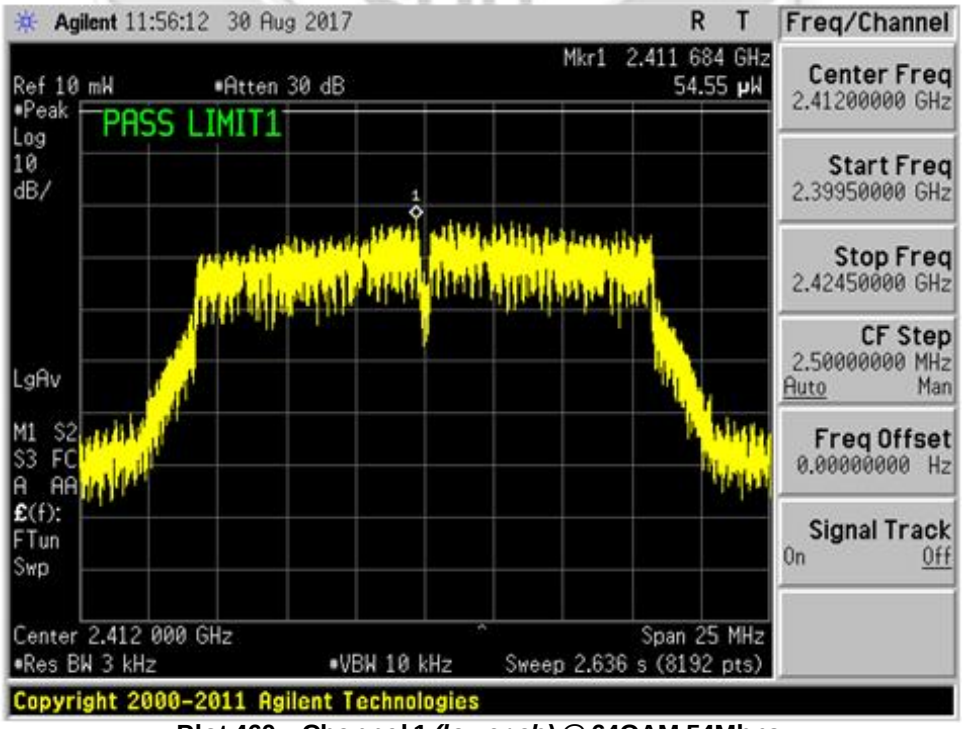


Plot 458 – Channel 1 *(lower ch)* @ QPSK 18Mbps

Peak Power Spectral Density Plots – 802.11g

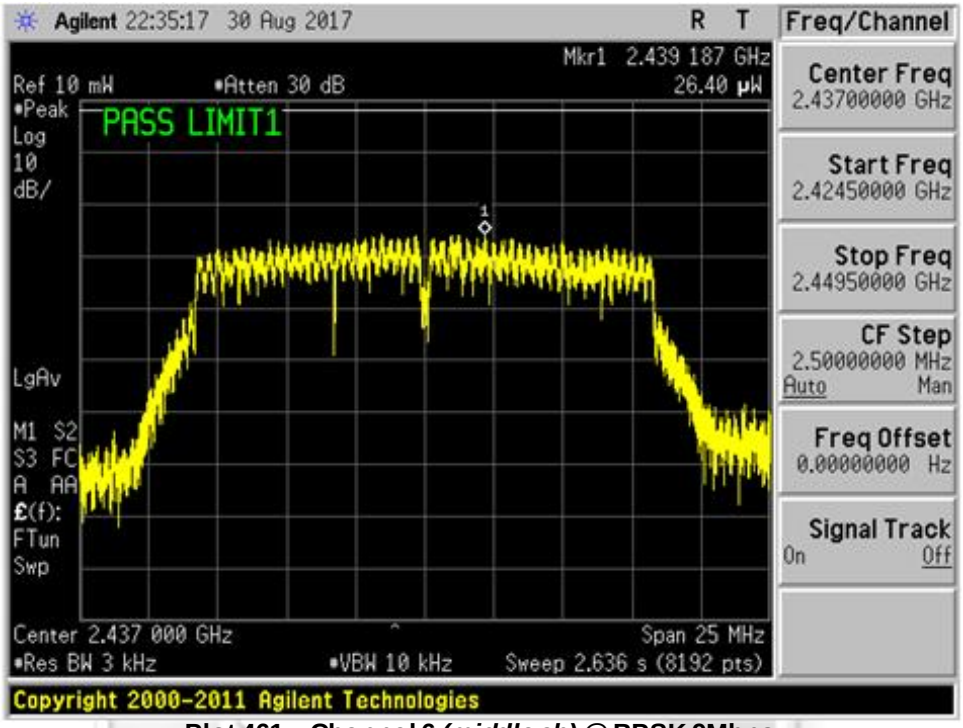


Plot 459 – Channel 1 *(lower ch)* @ 16QAM 36Mbps

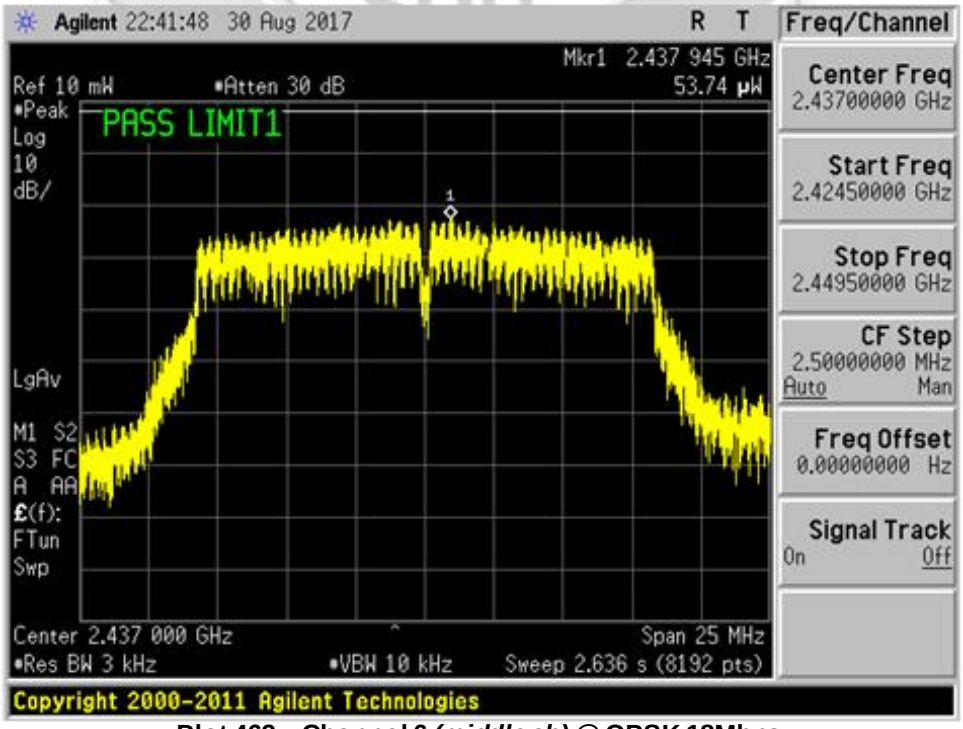


Plot 460 – Channel 1 *(lower ch)* @ 64QAM 54Mbps

Peak Power Spectral Density Plots – 802.11g

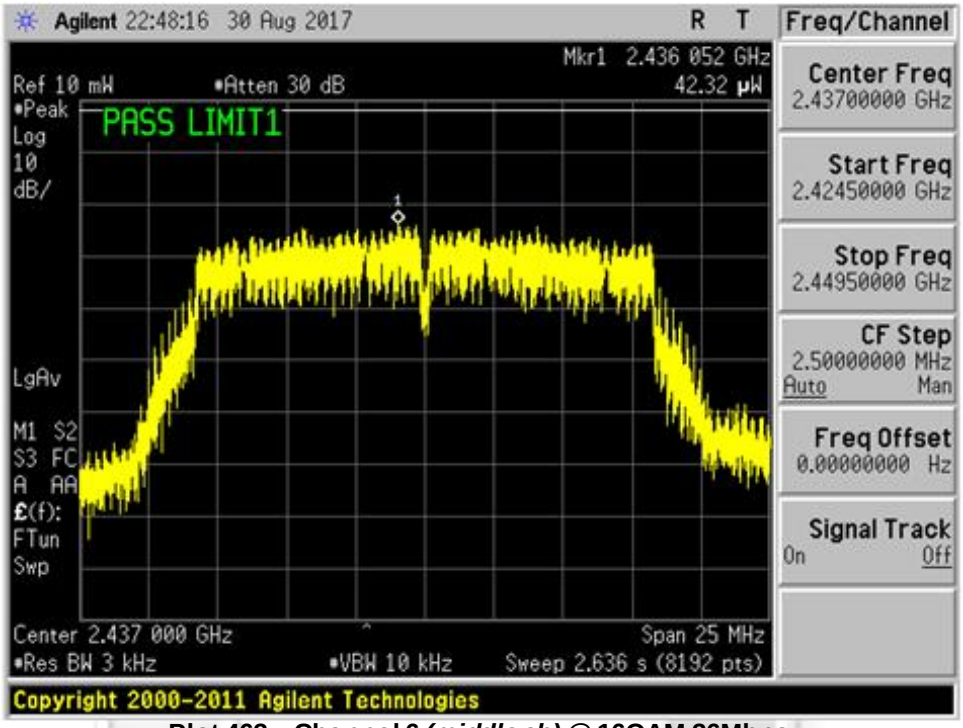


Plot 461 – Channel 6 *(middle ch)* @ BPSK 9Mbps

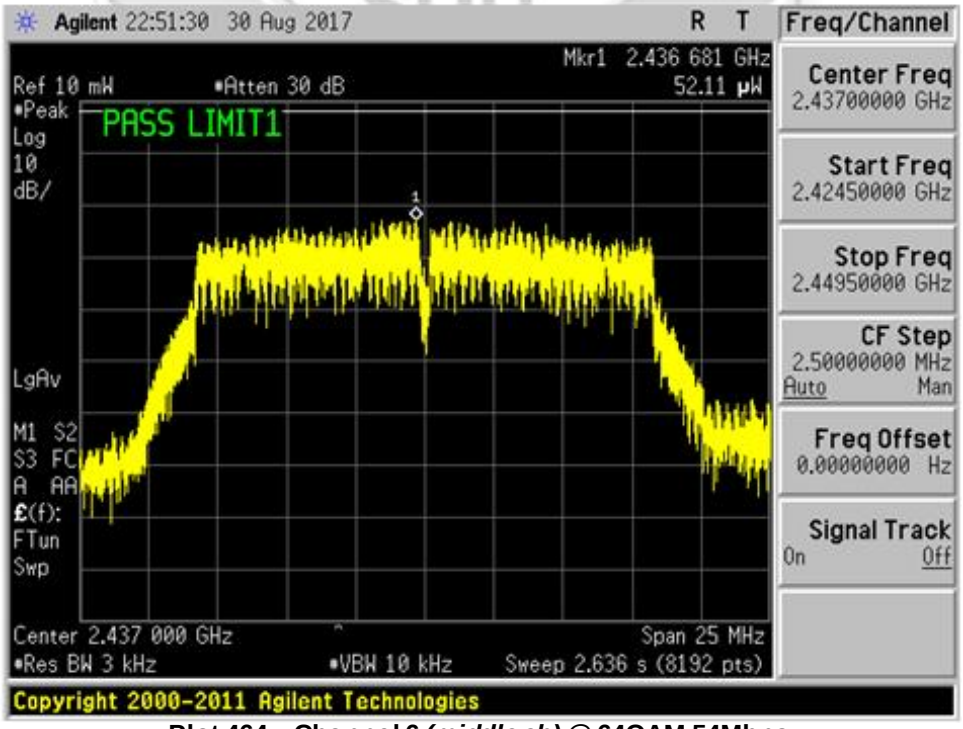


Plot 462 – Channel 6 *(middle ch)* @ QPSK 18Mbps

Peak Power Spectral Density Plots – 802.11g

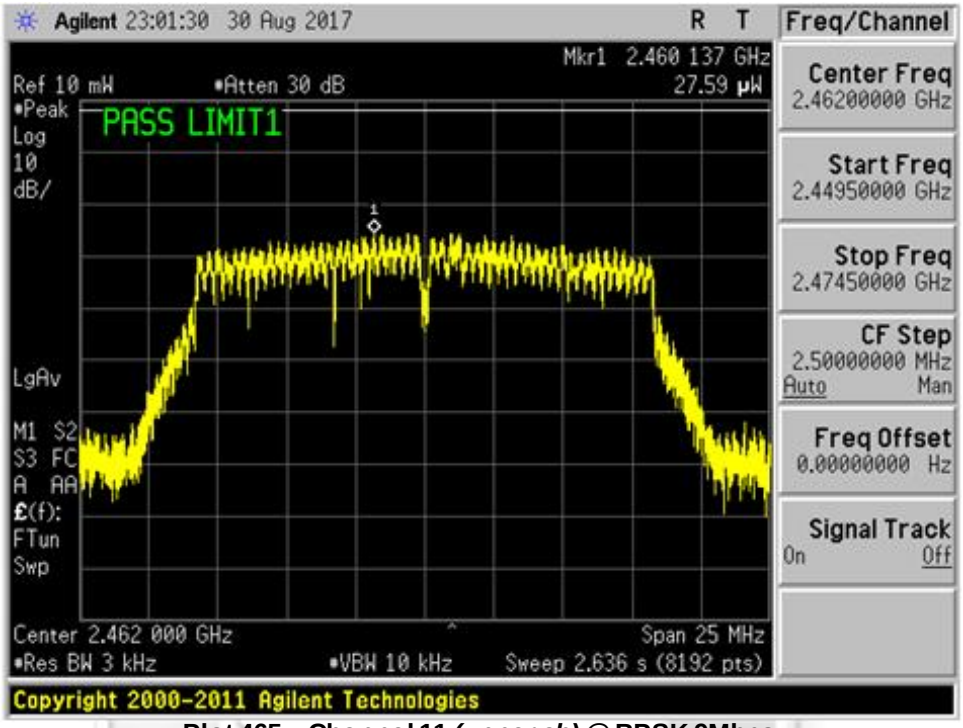


Plot 463 – Channel 6 *(middle ch)* @ 16QAM 36Mbps

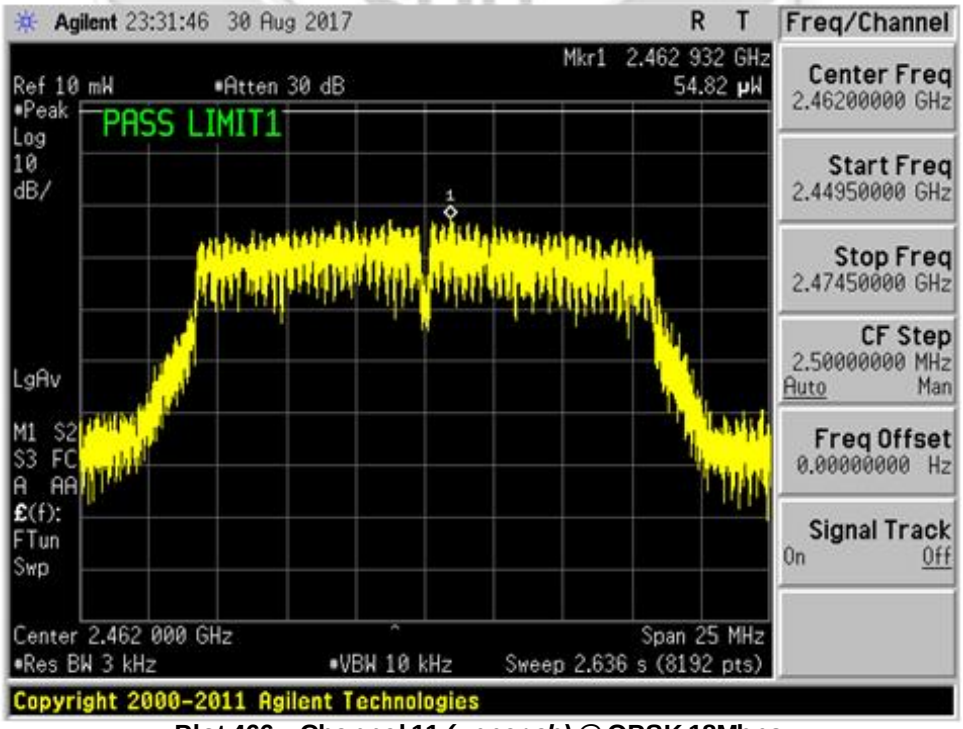


Plot 464 – Channel 6 *(middle ch)* @ 64QAM 54Mbps

Peak Power Spectral Density Plots – 802.11g

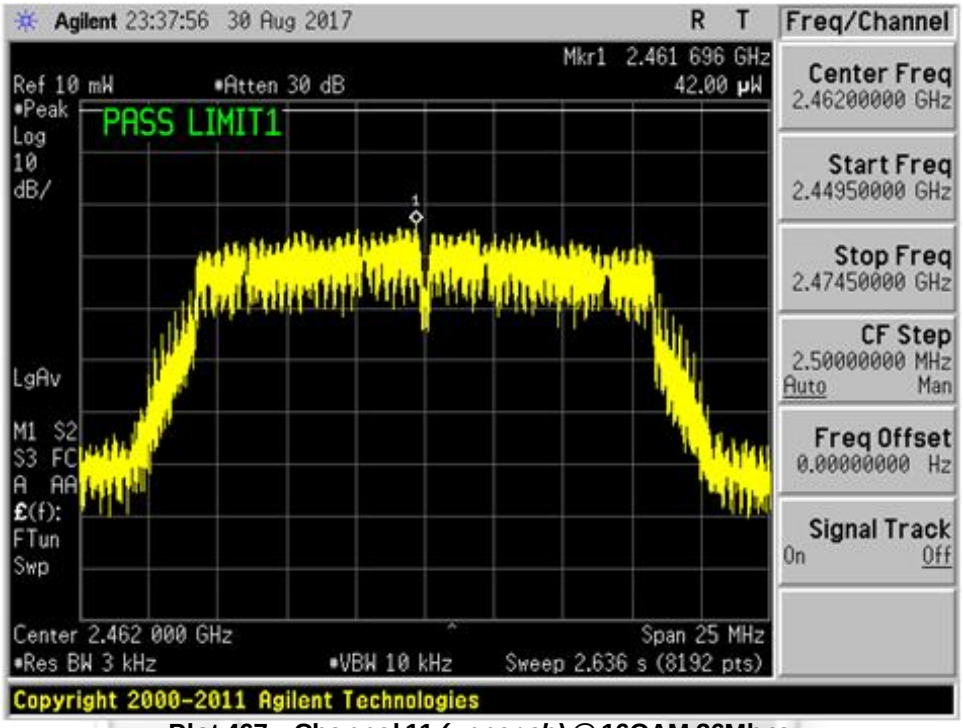


Plot 465 – Channel 11 *(upper ch)* @ BPSK 9Mbps

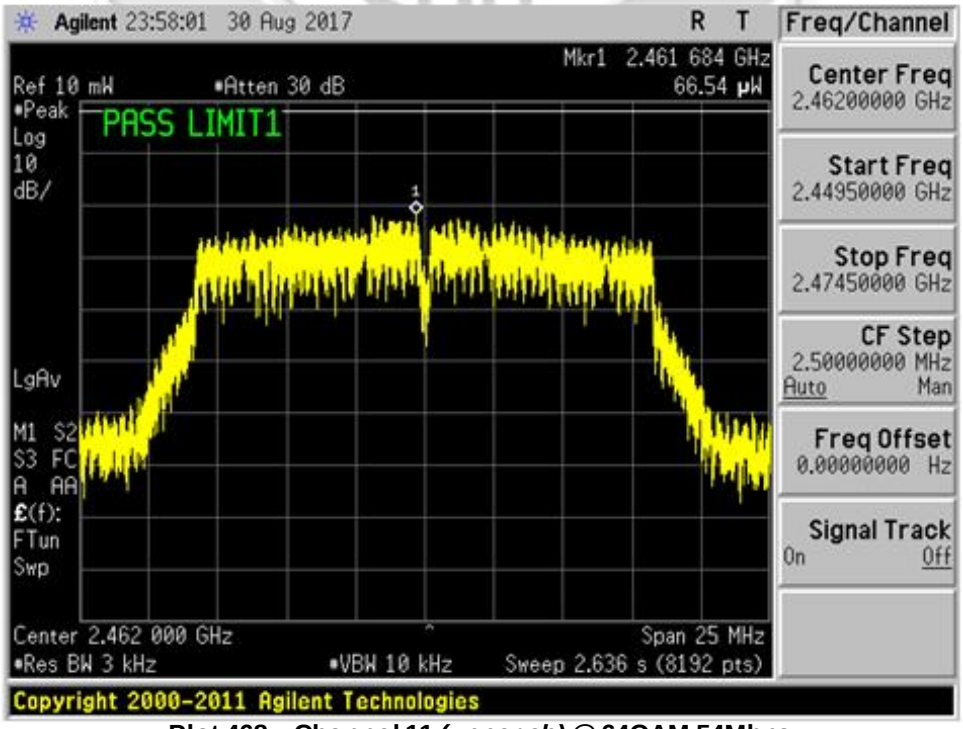


Plot 466 – Channel 11 *(upper ch)* @ QPSK 18Mbps

Peak Power Spectral Density Plots – 802.11g

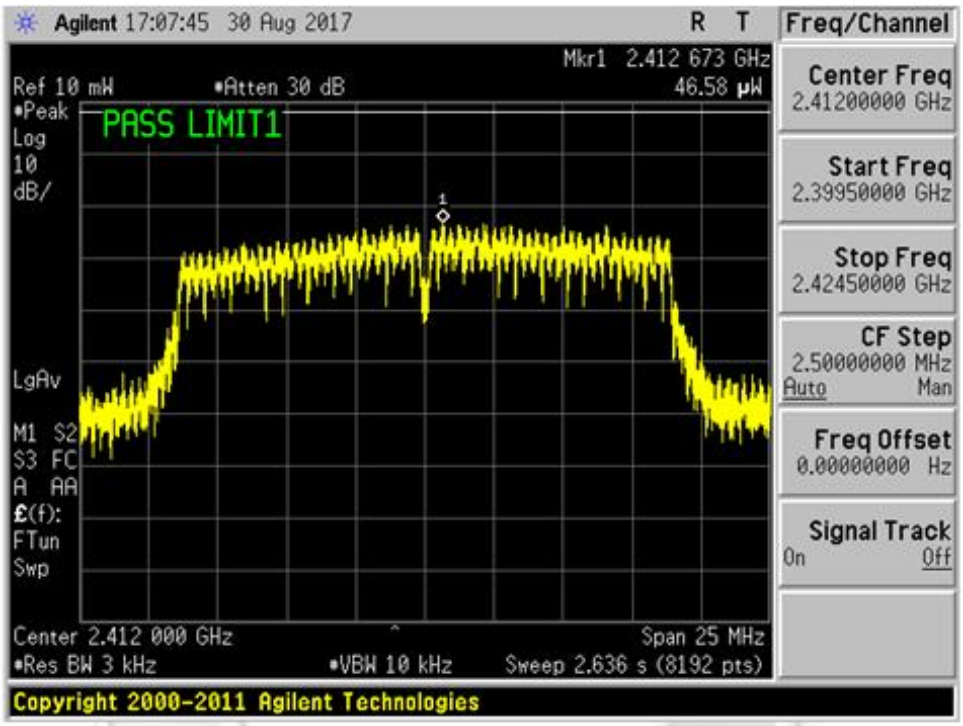


Plot 467 – Channel 11 *(upper ch)* @ 16QAM 36Mbps

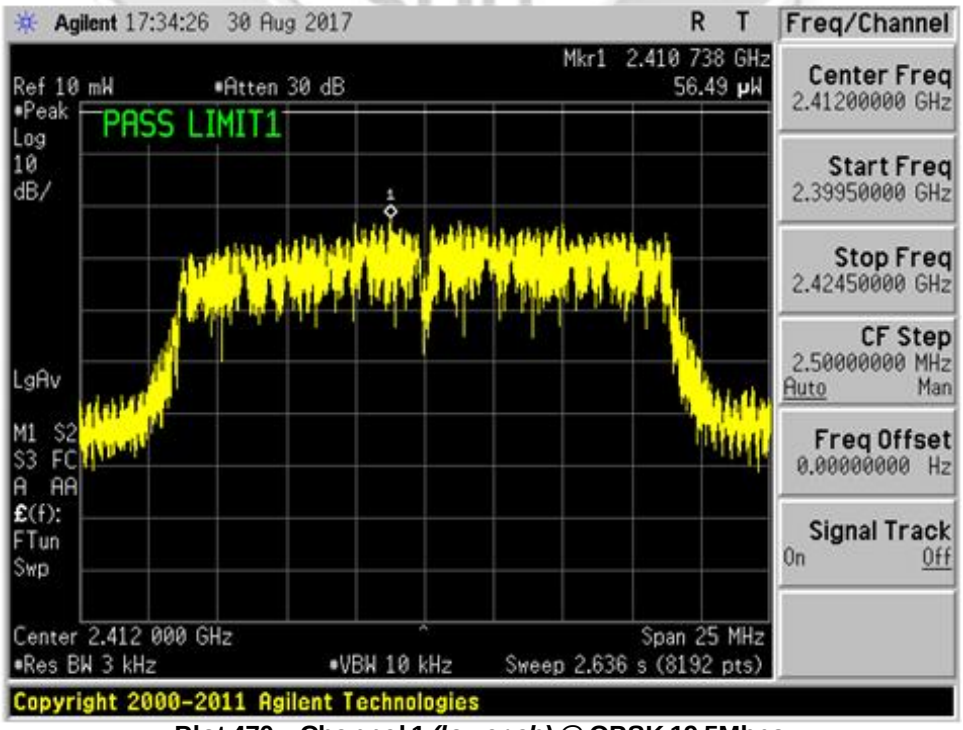


Plot 468 – Channel 11 *(upper ch)* @ 64QAM 54Mbps

Peak Power Spectral Density Plots – 802.11n (20MHz)

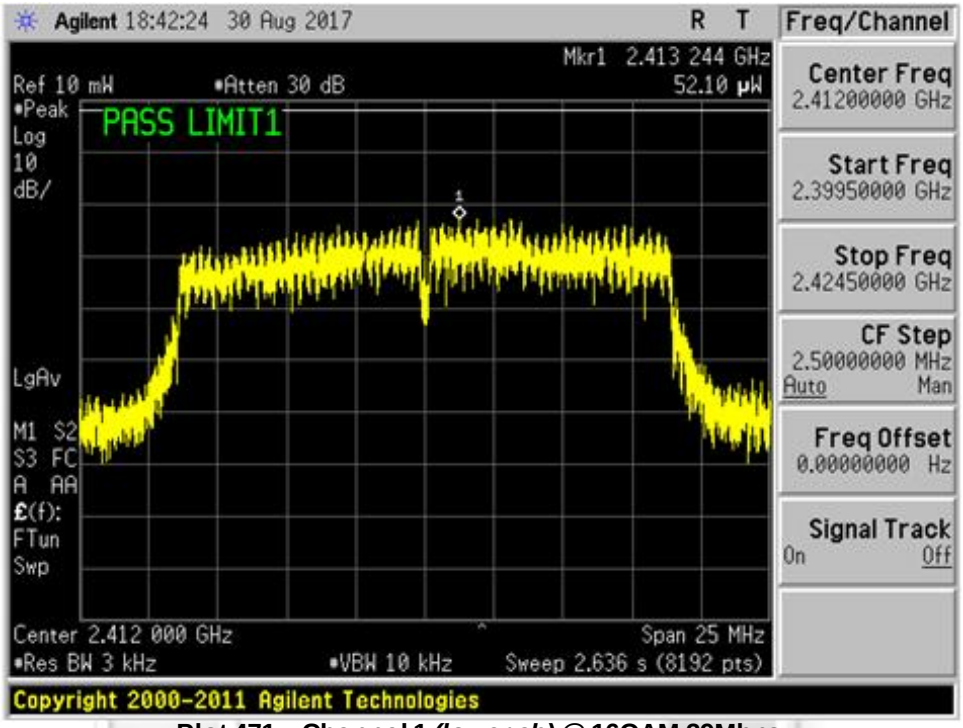


Plot 469 – Channel 1 *(lower ch)* @ BPSK 6.5Mbps

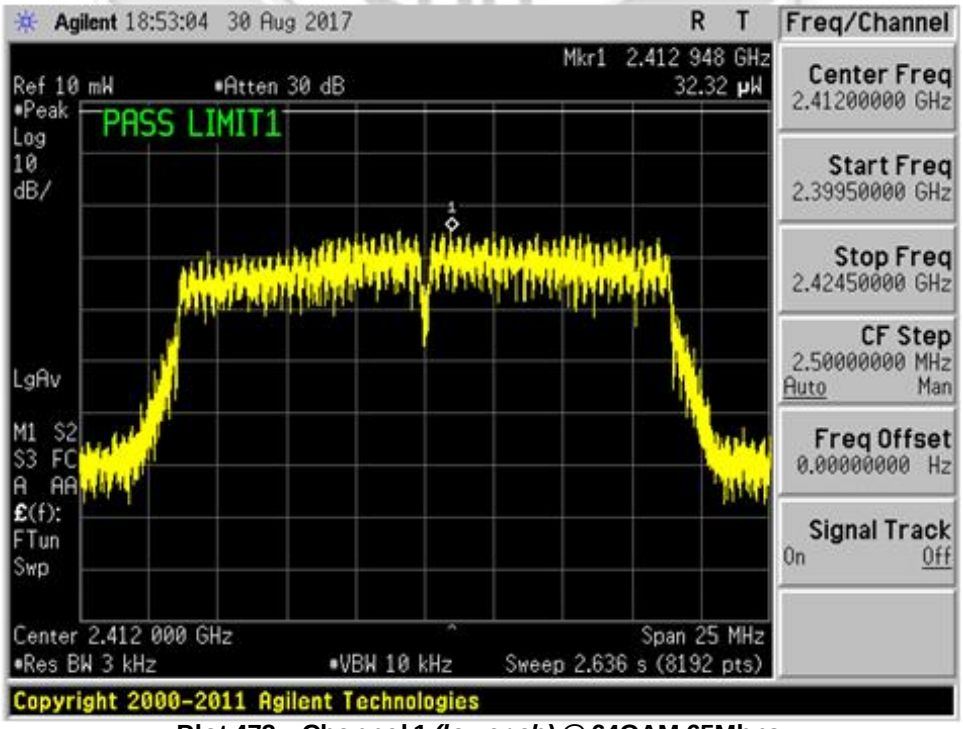


Plot 470 – Channel 1 *(lower ch)* @ QPSK 19.5Mbps

Peak Power Spectral Density Plots – 802.11n (20MHz)

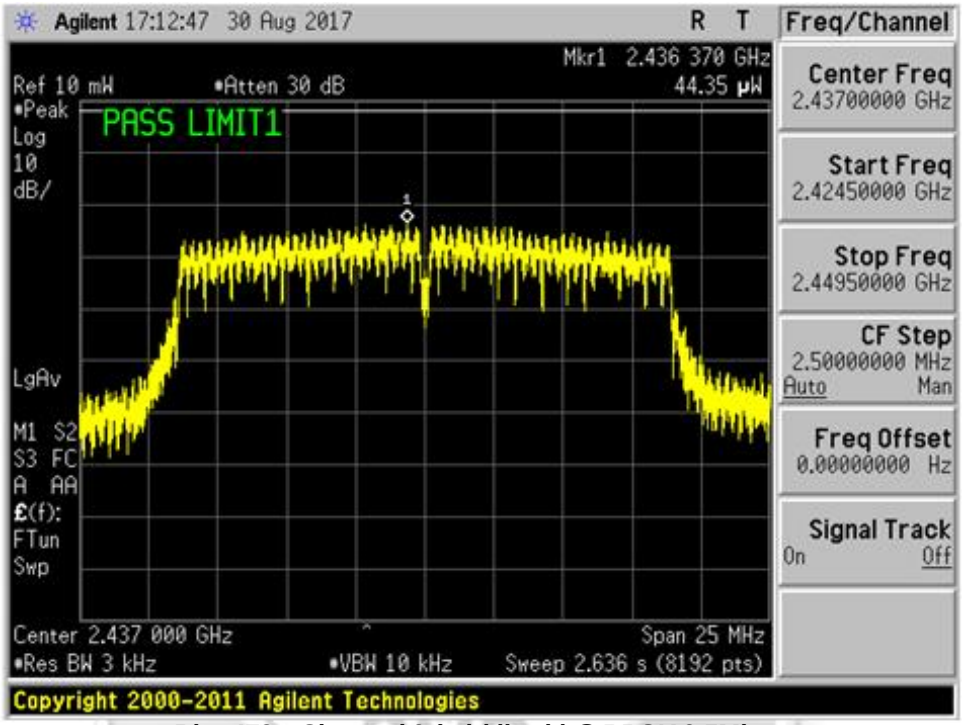


Plot 471 – Channel 1 *(lower ch)* @ 16QAM 39Mbps

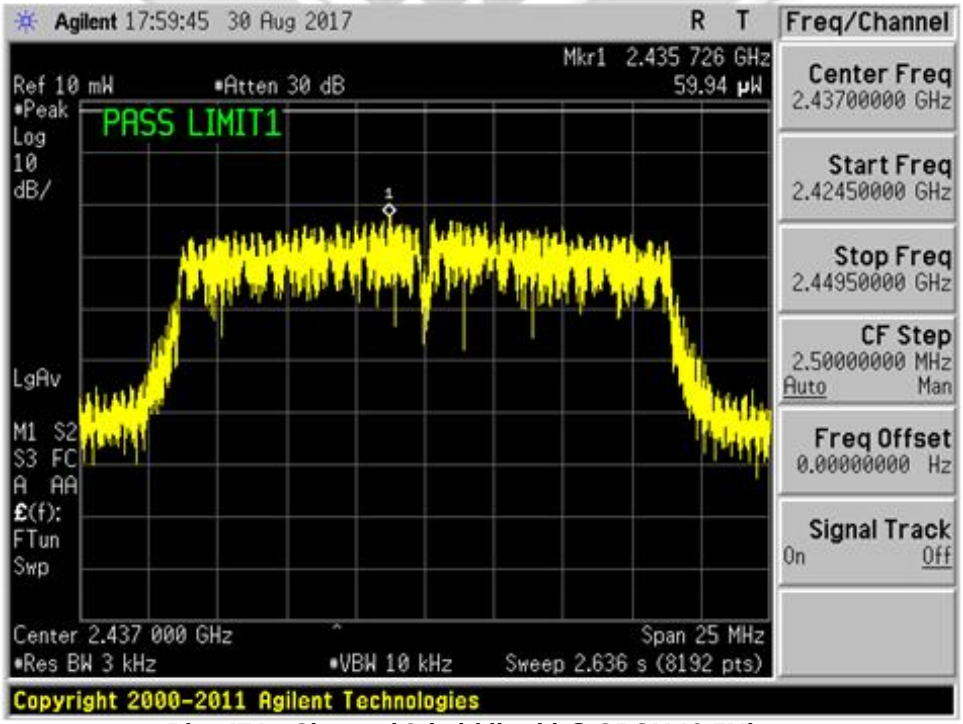


Plot 472 – Channel 1 *(lower ch)* @ 64QAM 65Mbps

Peak Power Spectral Density Plots – 802.11n (20MHz)

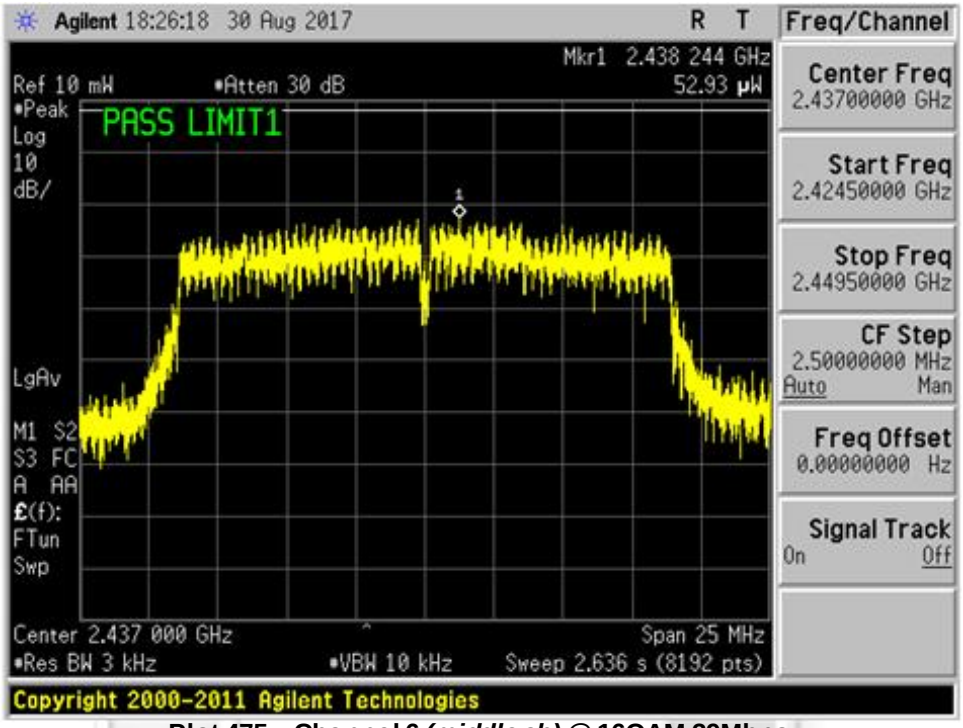


Plot 473 – Channel 6 *(middle ch)* @ BPSK 6.5Mbps

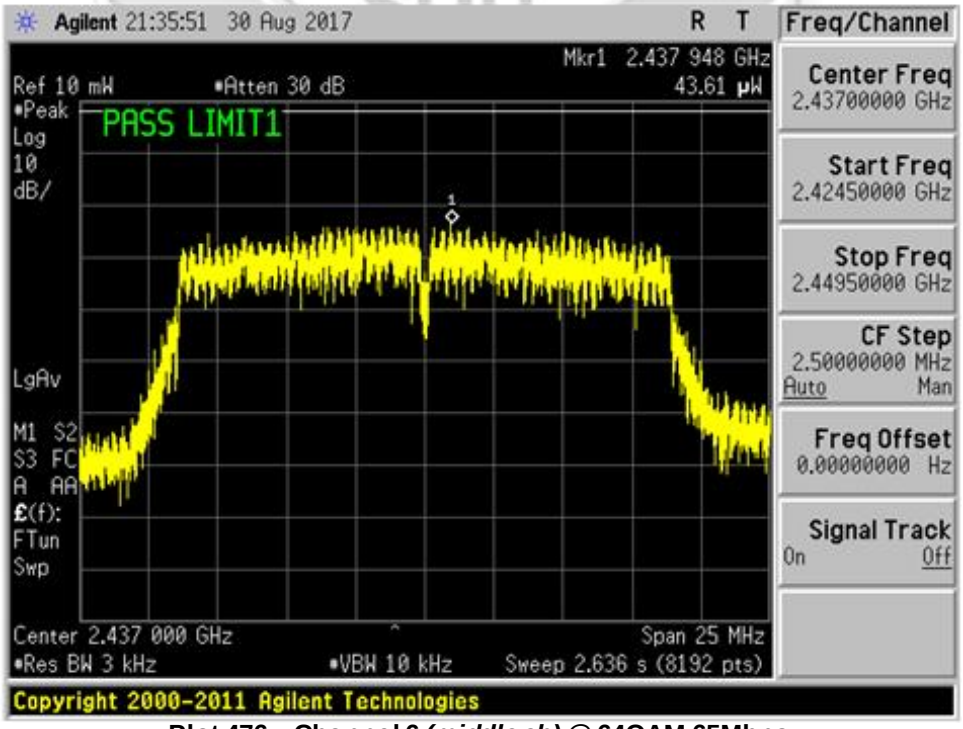


Plot 474 – Channel 6 *(middle ch)* @ QPSK 19.5Mbps

Peak Power Spectral Density Plots – 802.11n (20MHz)

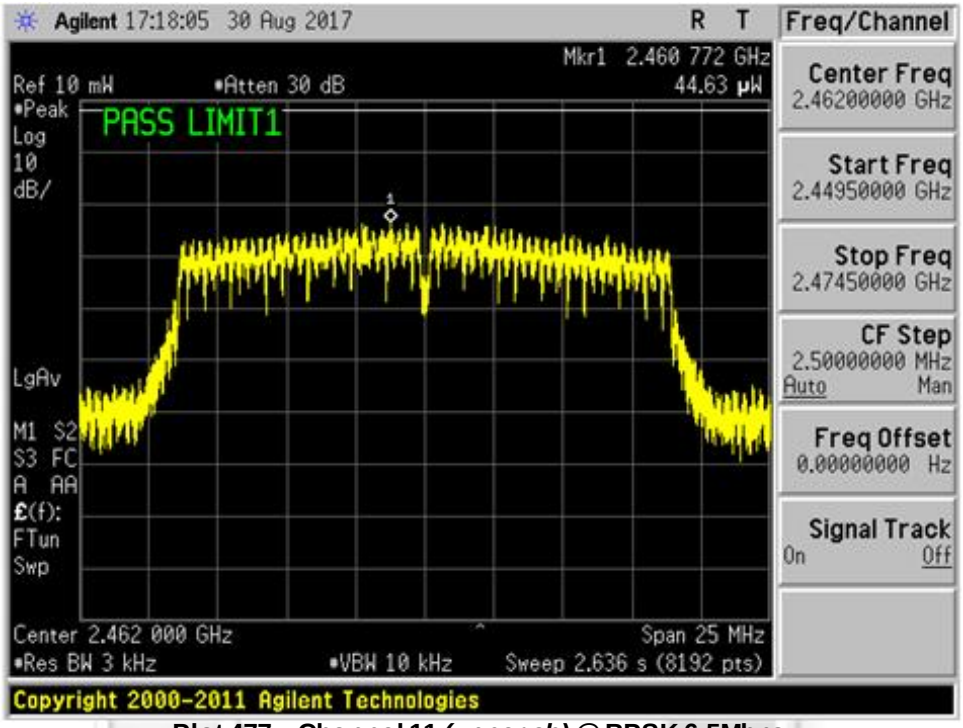


Plot 475 – Channel 6 *(middle ch)* @ 16QAM 39Mbps

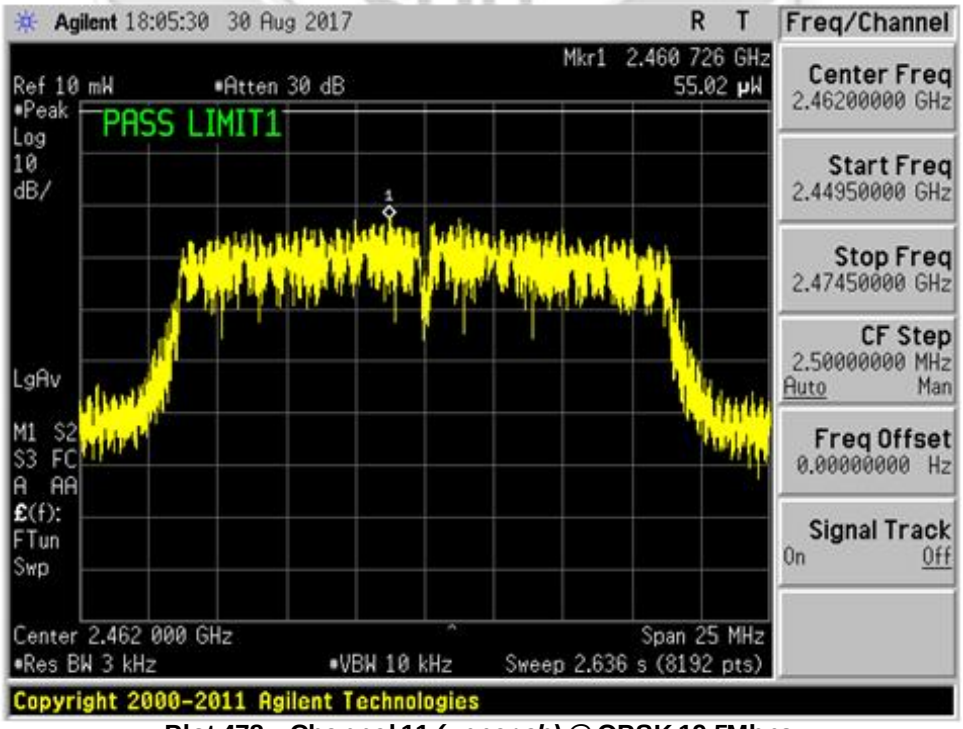


Plot 476 – Channel 6 *(middle ch)* @ 64QAM 65Mbps

Peak Power Spectral Density Plots – 802.11n (20MHz)

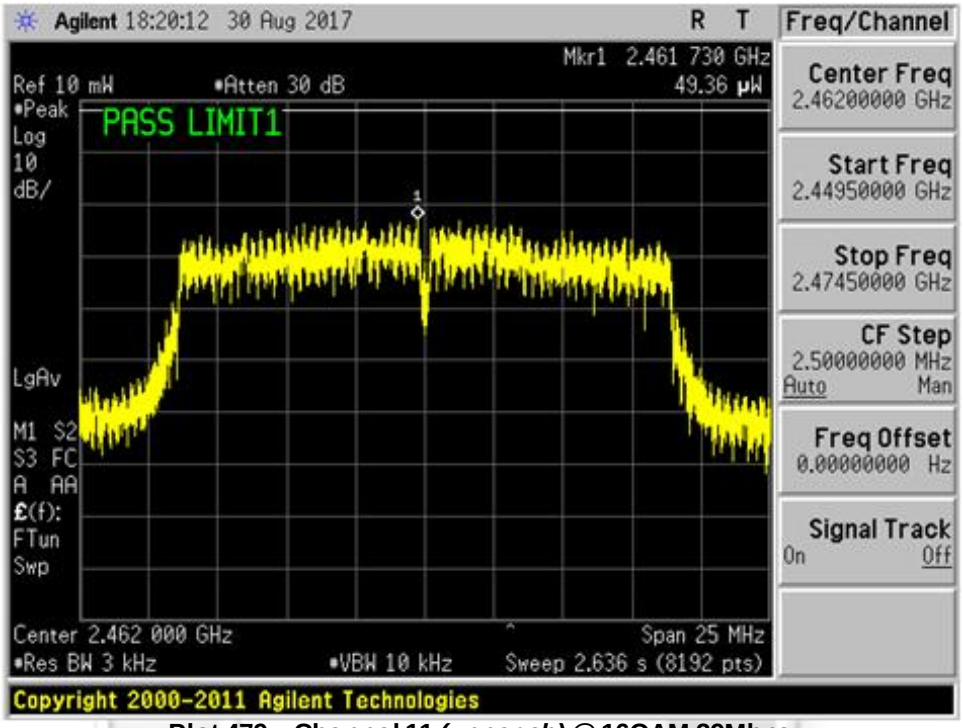


Plot 477 – Channel 11 *(upper ch)* @ BPSK 6.5Mbps

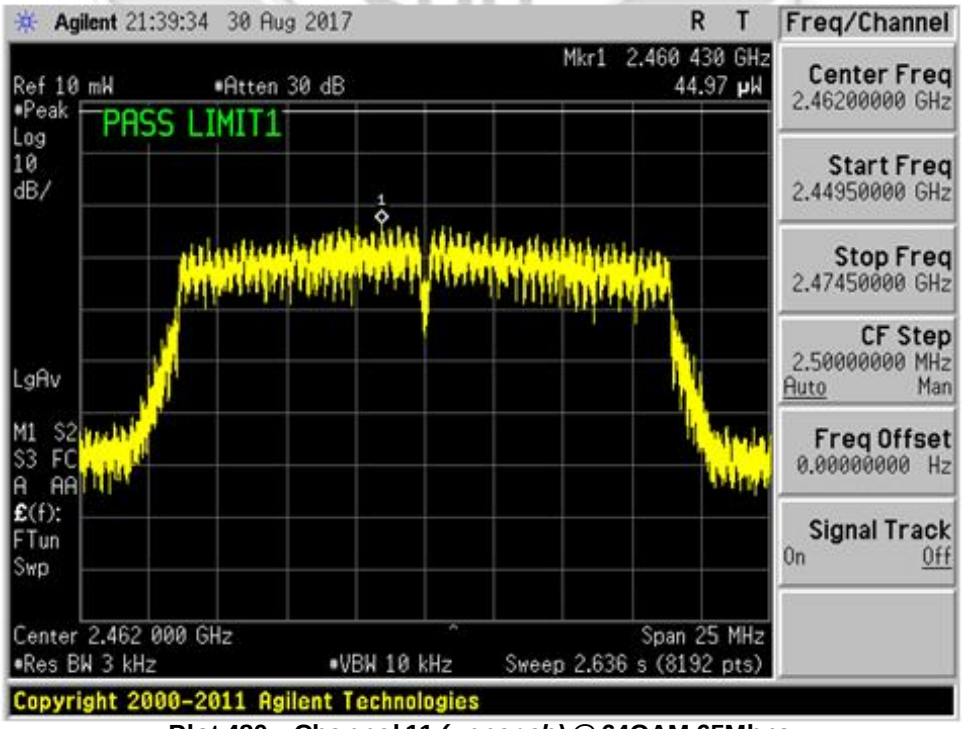


Plot 478 – Channel 11 *(upper ch)* @ QPSK 19.5Mbps

Peak Power Spectral Density Plots – 802.11n (20MHz)

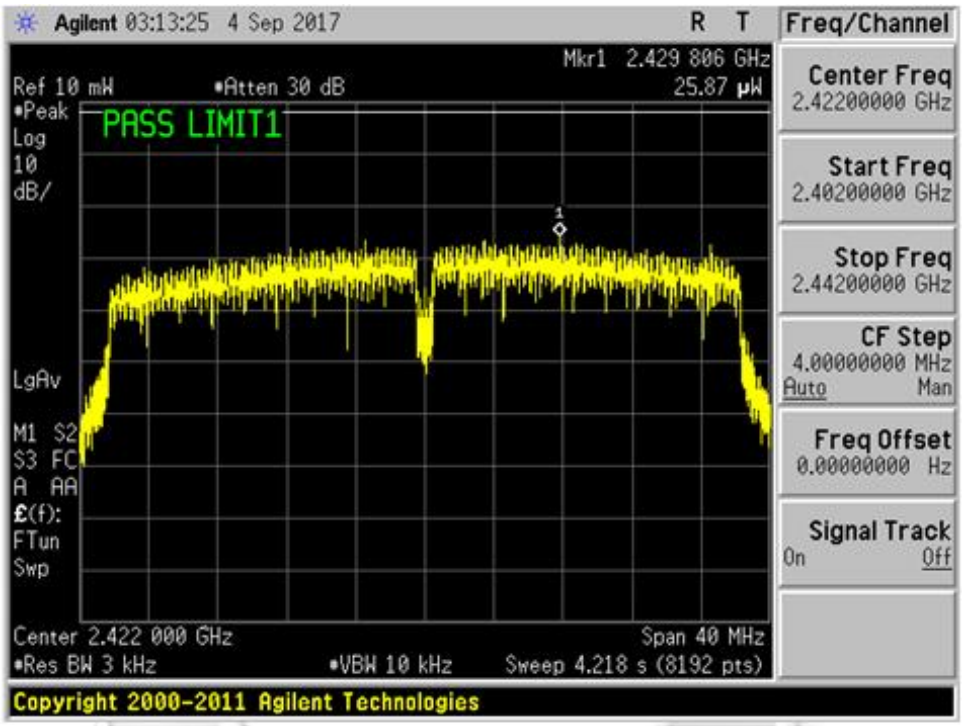


Plot 479 – Channel 11 *(upper ch)* @ 16QAM 39Mbps

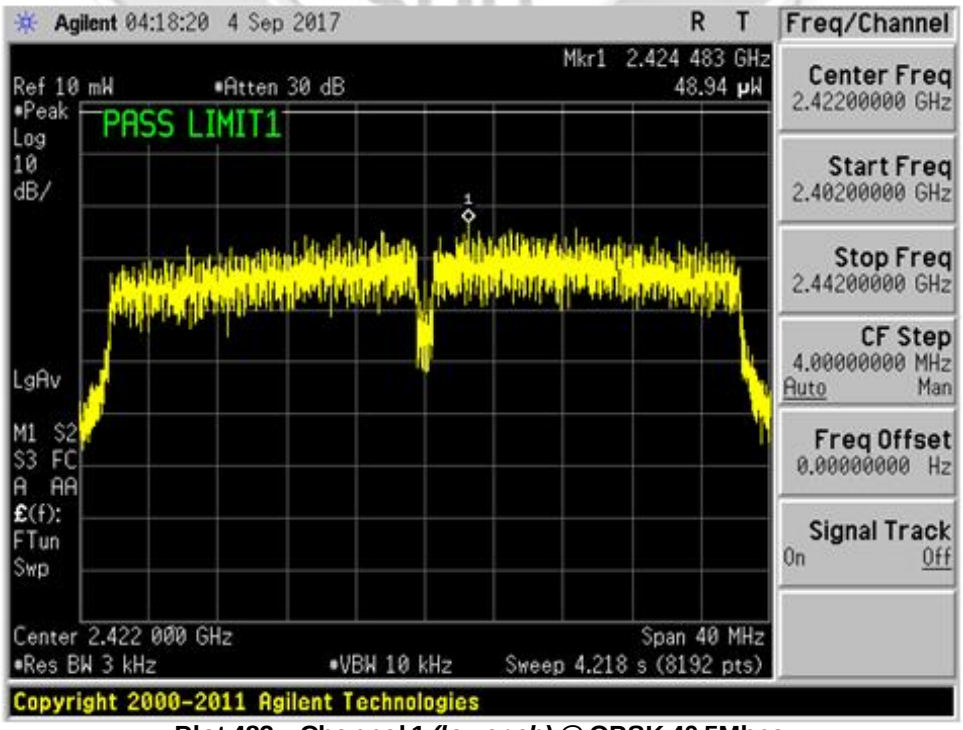


Plot 480 – Channel 11 *(upper ch)* @ 64QAM 65Mbps

Peak Power Spectral Density Plots – 802.11n (40MHz)

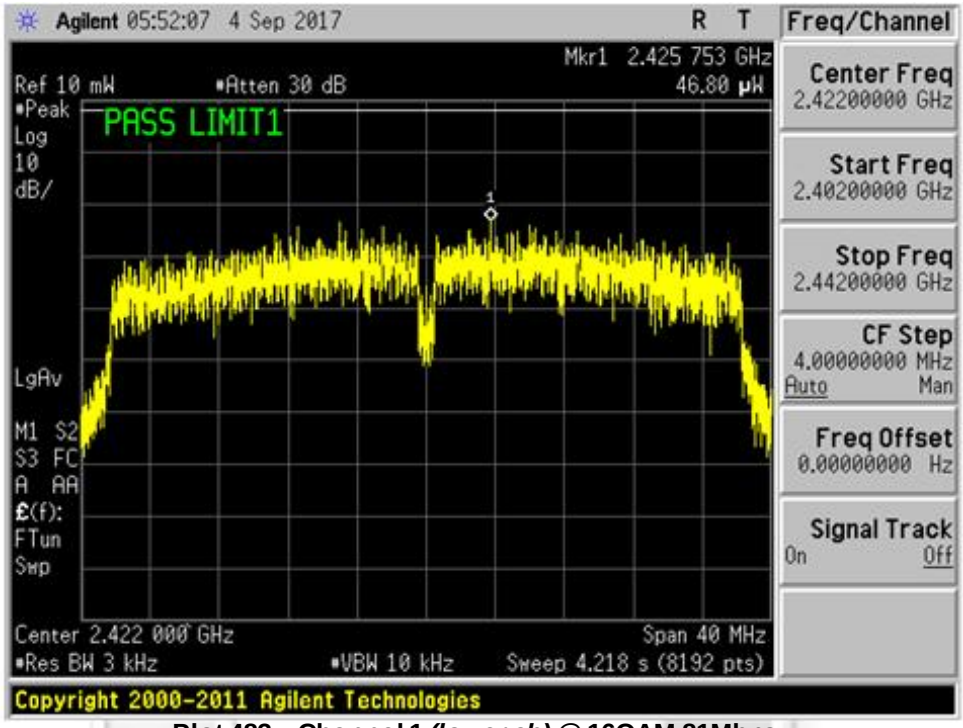


Plot 481 – Channel 1 *(lower ch)* @ BPSK 13.5Mbps

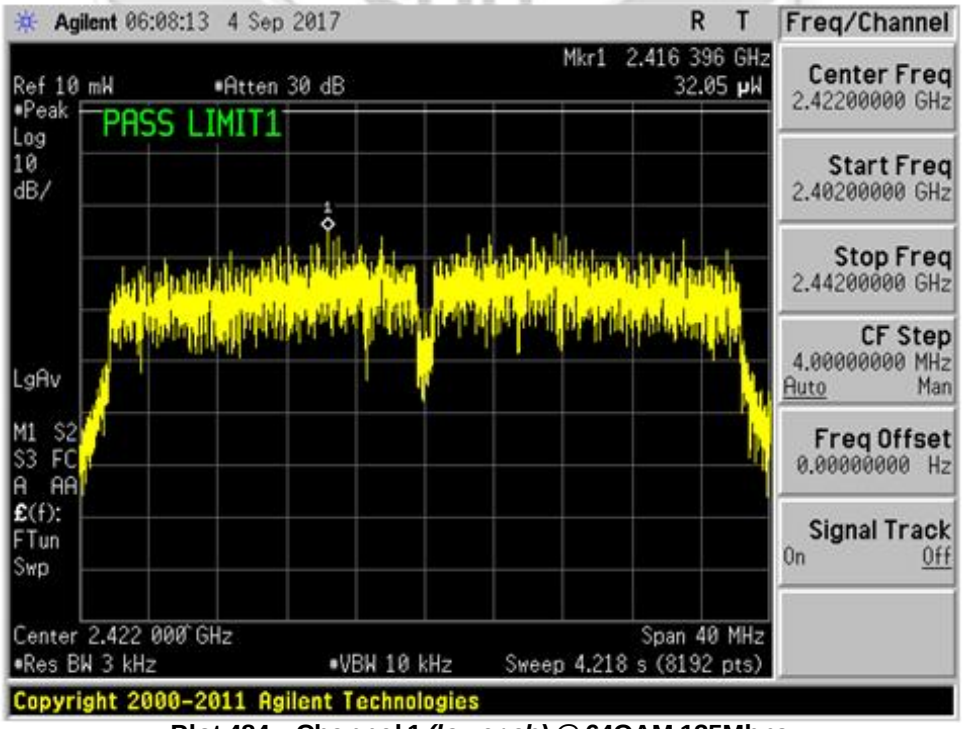


Plot 482 – Channel 1 *(lower ch)* @ QPSK 40.5Mbps

Peak Power Spectral Density Plots – 802.11n (40MHz)

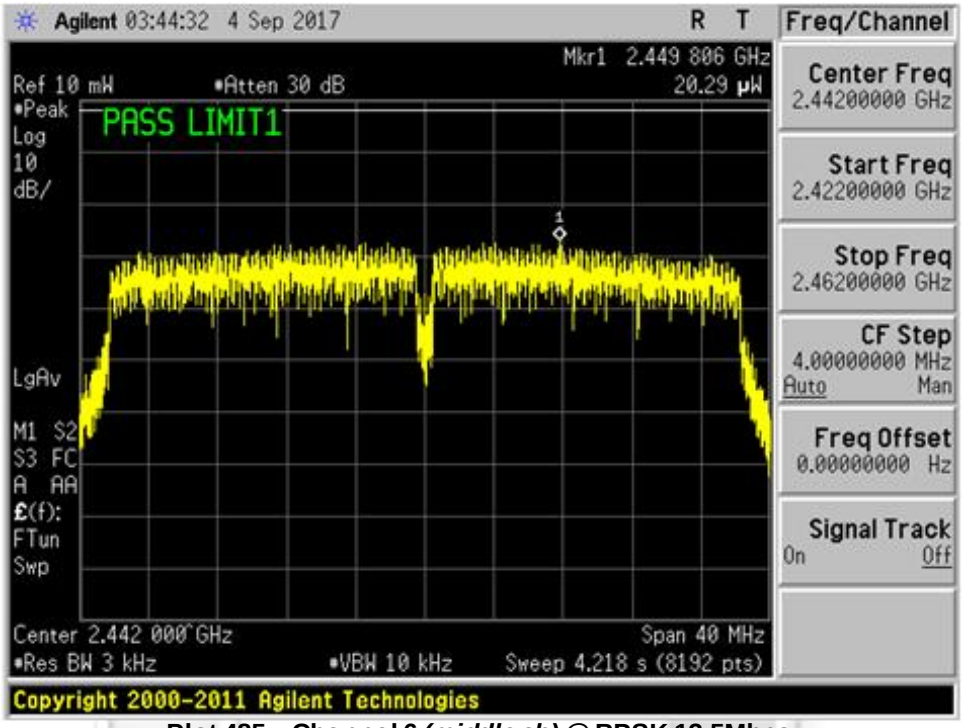


Plot 483 – Channel 1 *(lower ch)* @ 16QAM 81Mbps

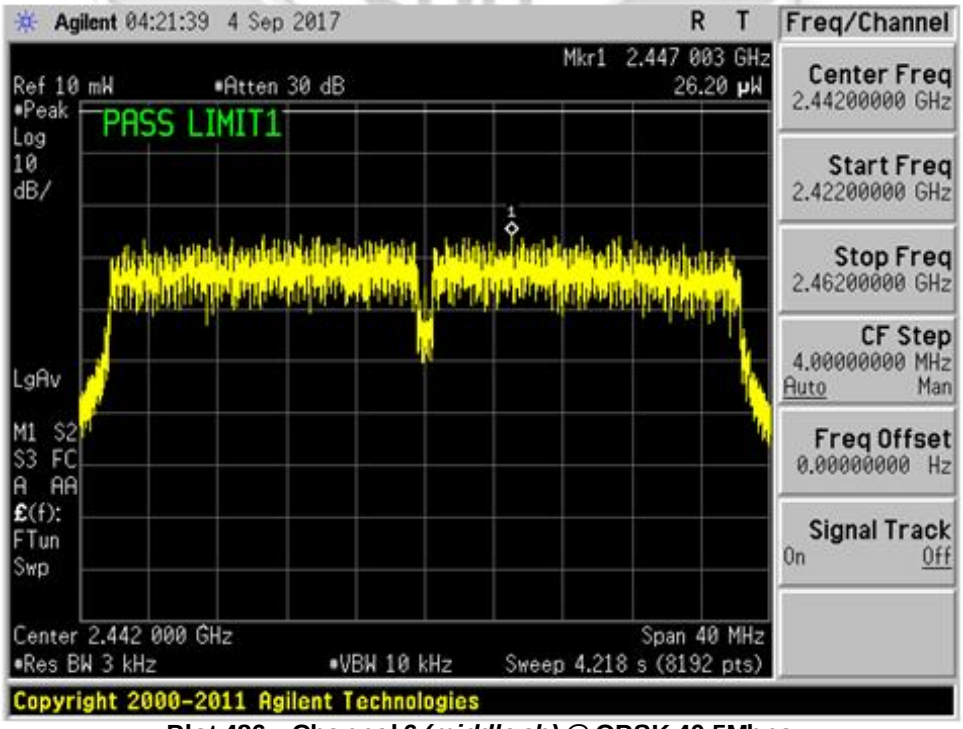


Plot 484 – Channel 1 *(lower ch)* @ 64QAM 135Mbps

Peak Power Spectral Density Plots – 802.11n (40MHz)

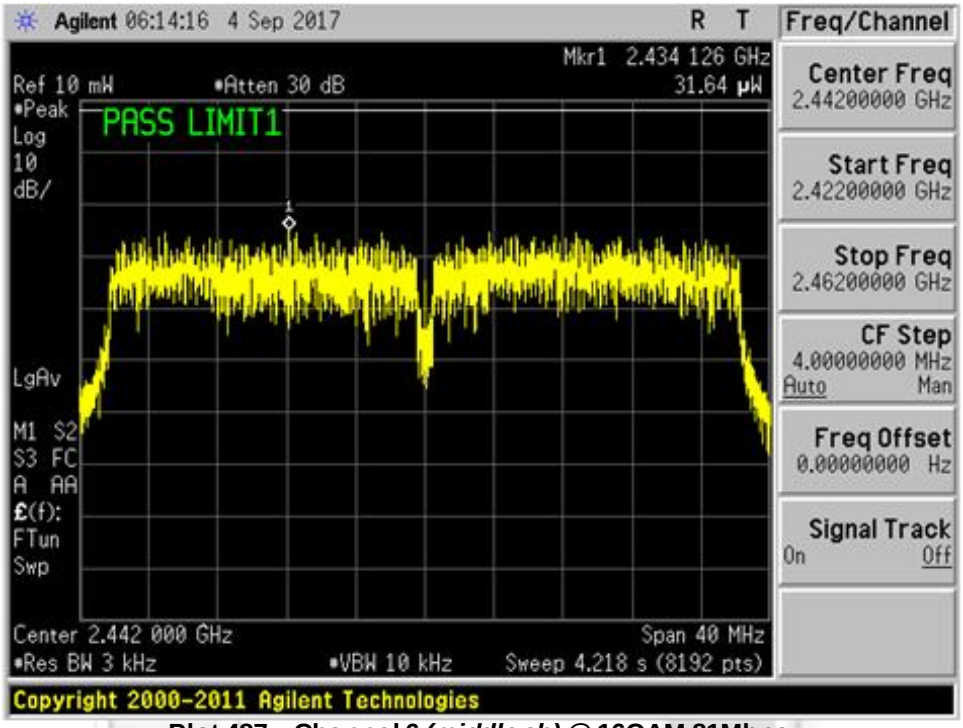


Plot 485 – Channel 6 *(middle ch)* @ BPSK 13.5Mbps

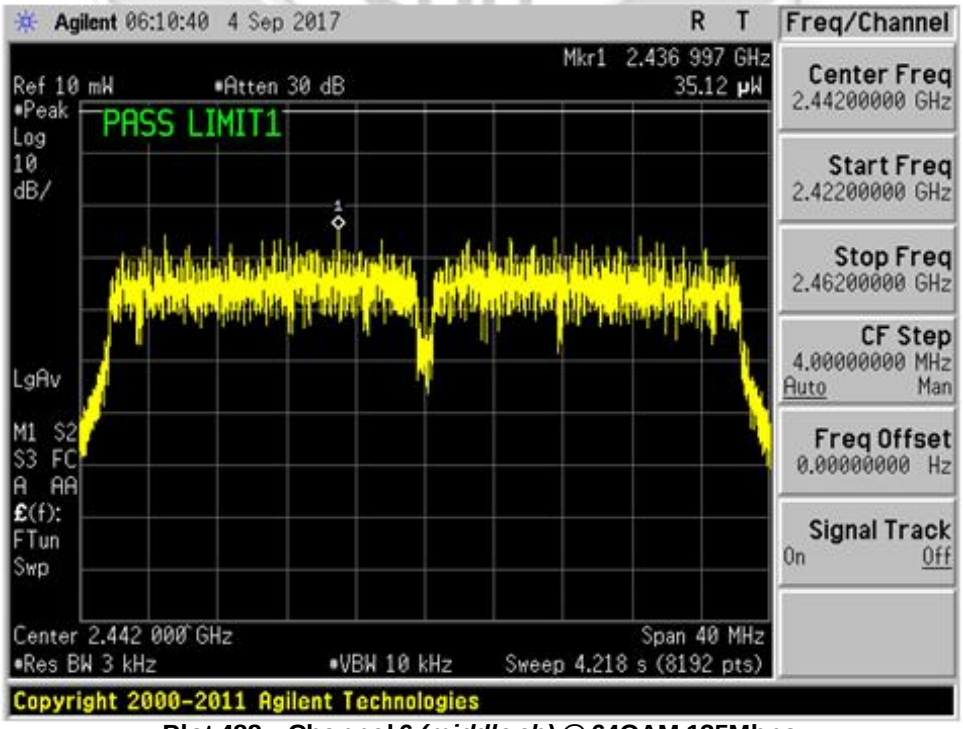


Plot 486 – Channel 6 *(middle ch)* @ QPSK 40.5Mbps

Peak Power Spectral Density Plots – 802.11n (40MHz)

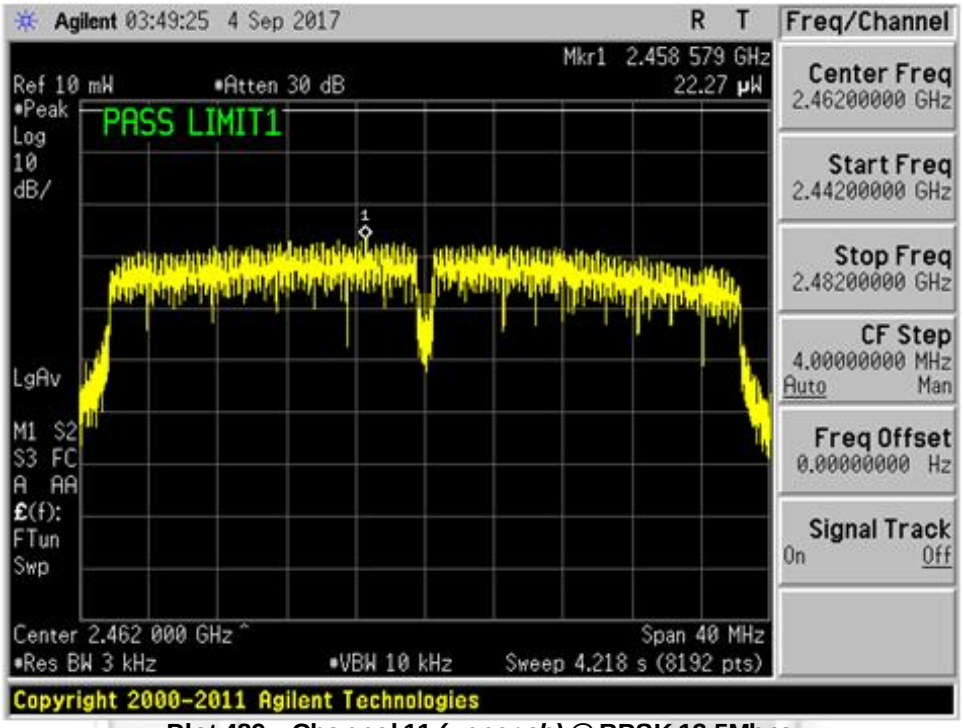


Plot 487 – Channel 6 *(middle ch)* @ 16QAM 81Mbps

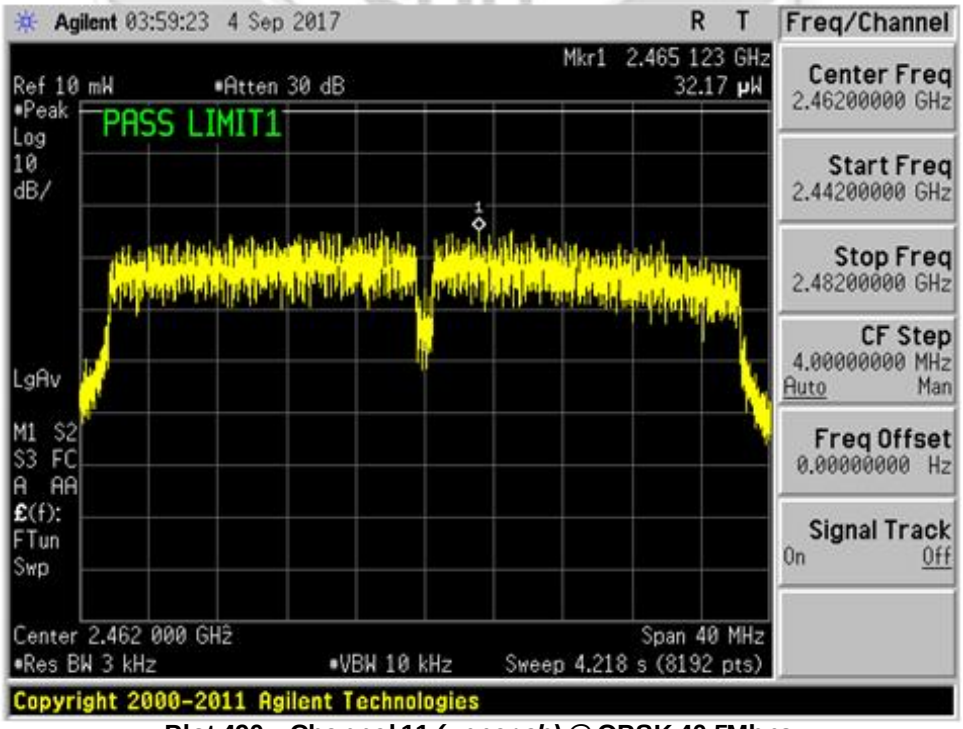


Plot 488 – Channel 6 *(middle ch)* @ 64QAM 135Mbps

Peak Power Spectral Density Plots – 802.11n (40MHz)

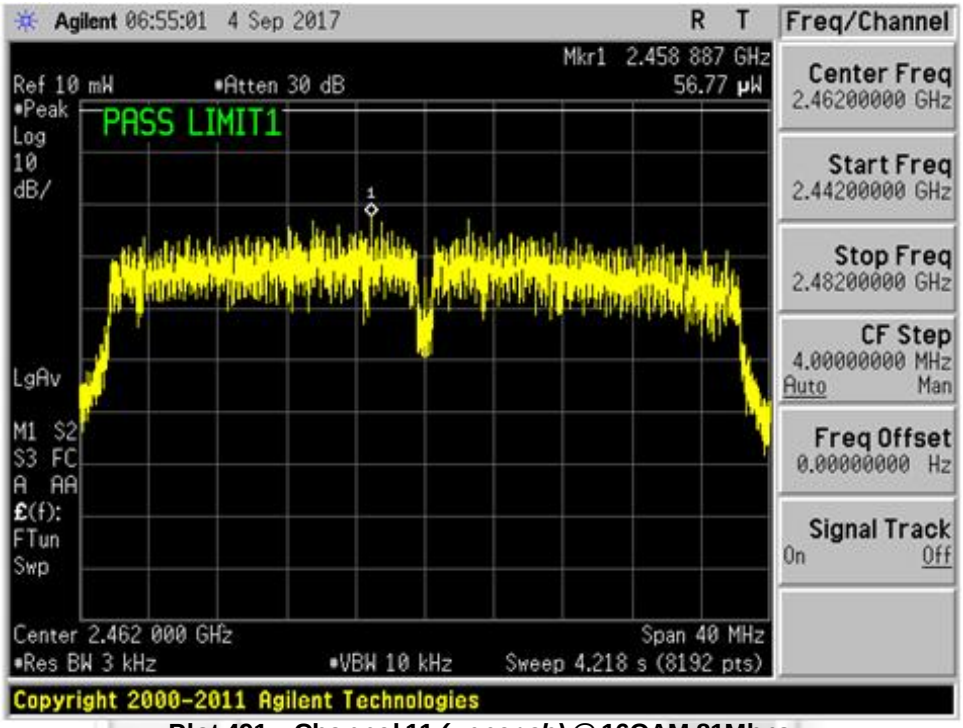


Plot 489 – Channel 11 *(upper ch)* @ BPSK 13.5Mbps

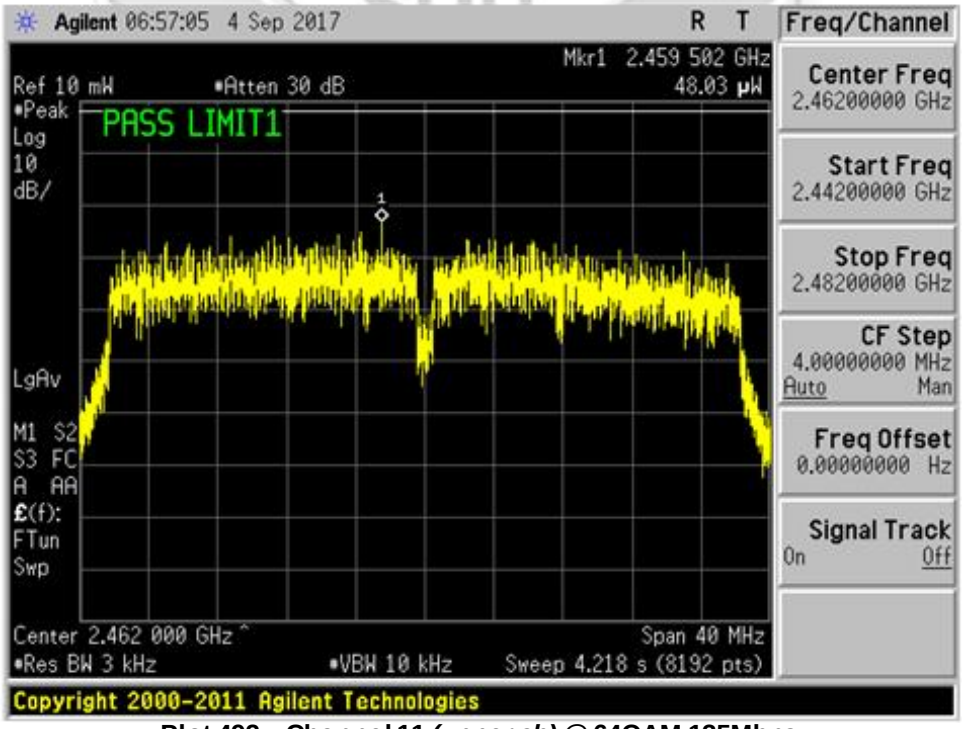


Plot 490 – Channel 11 *(upper ch)* @ QPSK 40.5Mbps

Peak Power Spectral Density Plots – 802.11n (40MHz)



Plot 491 – Channel 11 *(upper ch)* @ 16QAM 81Mbps



Plot 492 – Channel 11 *(upper ch)* @ 64QAM 135Mbps

MAXIMUM PERMISSIBLE EXPOSURE (MPE) TEST

47 CFR FCC Part 1.1310 Maximum Permissible Exposure (MPE) Limits

The EUT shows compliance to the requirements of this section, which states the MPE limits for general population / uncontrolled exposure are as shown below:

Frequency Range (MHz)	Electric Field Strength (V/m)	Magnetic Field Strength (A/m)	Power Density (mW/cm^2)	Average Time (min)
0.3 - 1.34	614	1.63	100 Note 2	30
1.34 - 30	824 / f	2.19 / f	$180 / f^2$ Note 2	30
30 - 300	27.5	0.073	0.2	30
300 - 1500	-	-	f / 1500	30
1500 - 100000	-	-	1.0	30
Notes				
1. f = frequency in MHz				
2. Plane wave equivalent power density				

47 CFR FCC Part 1.1310 Maximum Permissible Exposure (MPE) Test Instrumentation

Instrument	Model	S/No	Cal Due Date
PMM 8053 Portable Field Meter	8053	0220J10308	20 Jan 2019
PMM EP330 Electric Field Probe	EP330	1010J10301	20 Jan 2019
R&S Universal Radio Communication Tester	CMU 200	837587/068	24 Dec 2017

47 CFR FCC Part 1.1310 Maximum Permissible Exposure (MPE) Test Setup

1. The EUT and supporting equipment were set up as shown on the setup photo.
2. The relevant field probe was positioned at least 20cm away from the EUT and supporting equipment boundary.

47 CFR FCC Part 1.1310 Maximum Permissible Exposure (MPE) Test Method

1. The EUT was switched on and allowed to warm up to its normal operating condition.
2. The test was first carried out at one of the positions / sides of the EUT.
3. Power density measurement (mW/cm^2) was made using the field meter set to the required averaging time.
4. Steps 2 and 3 were repeated for the next position and its associate EUT operating mode, until all possible positions and modes were measured.

Sample Calculation Example

At 2400 MHz, limit = 1.0 mW/cm^2

Power density reading obtained directly from field meter = 0.3 mW/cm^2 averaged over the required 30 minutes.

Therefore, margin = 0.3 – 1.0 = -0.7 mW/cm^2 i.e. 0.7 mW/cm^2 below limit

47 CFR FCC Part 1.1310 Maximum Permissible Exposure (MPE) Results

Test Input Power	12.5Vdc	Temperature	24°C
Test Distance	20cm	Relative Humidity	60%
Mode	GSM 850 + WiFi 802.11b @ 11MBps (Worst)	Atmospheric Pressure	1030mbar
		Tested By	Chelmin Li

Channel	Channel Frequency (GHz)	Power Density Value (mW/cm^2)	Averaging Time (min)	Limit (mW/cm^2)
1 *(lower ch)*	2.412	0.0023	30	1.0
6 *(mid ch)*	2.437	0.0032	30	1.0
11 *(upper ch)*	2.462	0.0369	30	1.0

Notes

1. All possible modes of operation were investigated. Only the worst case highest radiation levels were measured. Measurements were taken at the required averaging time. All other radiation levels were relatively insignificant.
2 A "positive" margin indicates a PASS as it refers to the margin present below the limit line at the particular frequency. Conversely, a "negative" margin indicates a FAIL.
3 Maximum Permissible Exposure Measurement Uncertainty
All test measurements carried out are traceable to national standards. The uncertainty of the measurement at a confidence level of approximately 95%, with a coverage factor of 2, in the range 0.1MHz – 3GHz is ±15.0%.

Please note that this Report is issued under the following terms :

1. This report applies to the sample of the specific product/equipment given at the time of its testing/calibration. The results are not used to indicate or imply that they are applicable to other similar items. In addition, such results must not be used to indicate or imply that TÜV SÜD PSB approves, recommends or endorses the manufacturer, supplier or user of such product/equipment, or that TÜV SÜD PSB in any way "guarantees" the later performance of the product/equipment. Unless otherwise stated in this report, no tests were conducted to determine long term effects of using the specific product/equipment.

2. The sample/s mentioned in this report is/are submitted/supplied/manufactured by the Client. TÜV SÜD PSB therefore assumes no responsibility for the accuracy of information on the brand name, model number, origin of manufacture, consignment or any information supplied.

3. Nothing in this report shall be interpreted to mean that TÜV SÜD PSB has verified or ascertained any endorsement or marks from any other testing authority or bodies that may be found on that sample.

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5. Unless otherwise stated, the tests were carried out in TÜV SÜD PSB Pte Ltd, No.1 Science Park Drive Singapore 118221.

July 2011