

IB Docket 13-213
RM - 11685

Curtrisha Banks

Subject: Analysis of Globalstar's TLPS Proposal using FCC Test Reports
Attachments: Globalstar's TLPS Will Not Work On iPhone 6_6 Plus; Globalstar Doesn't Know Whether Other Cellular Devices Will Work Either - Globalstar, Inc.pdf

Accepted / Filed

From: Gerst, Greg [mailto:greg@gerstcap.com]
Sent: Thursday, February 12, 2015 12:03 PM
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Subject: Analysis of Globalstar's TLPS Proposal using FCC Test Reports

FEB 24 2015

Federal Communications Commission
Office of the Secretary

FYI.

It seems like much of the contention around TLPS could be addressed by sending devices through the standard set of 15.247 tests, slightly modified to remove the >2483.5MHz limits, and add any appropriate limits at 2495MHz (or 2496?).

Unlike field tests conducted in a relatively uncontrolled RF environment, test reports from an FCC-accredited lab would allow for a quantifiable, comparable, and transparent results.

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Globalstar's TLPS Will Not Work On iPhone 6/6 Plus; Globalstar Doesn't Know Whether Other Cellular Devices Will Work Either

Feb. 12, 2015 6:15 AM ET

by: Gerst Capital, LLC

Summary

- Publicly filed FCC test reports refute Globalstar's claims that a "Broad and Immediate Ecosystem" of devices exist that are "already capable of utilizing Channel 14 with a device firmware modification".
- FCC test reports clearly show one of the most popular smartphones on the planet WILL NOT SUPPORT TLPS.
- Globalstar's claims can quickly and easily be proven (or not) by testing 802.11n Wi-Fi devices on Channel 14 at an FCC-accredited test facility.
- The FCC could resolve uncertainties around TLPS proposal by requiring devices to follow the existing compliance test process (modified for Ch14) required of every device sold in the US.

"802.11 compliant hardware is already capable of utilizing Channel 14 with a device firmware modification."

- "TECHNICAL EXHIBIT FOR EXPERIMENTAL LICENSE APPLICATION" for Globalstar's San Carlos, CA trial ([application submitted October 20, 2014](#), [trial approved on December 21, 2014](#))

"In fact every Wi-Fi device out there has the ability to see the spectrum as long as it is enabled through a software or firmware push. So the whole ecosystem is there. It can take-off immediately and I think that's why people are having conversations with us."

- Jay Monroe, 2013 Q1 Earnings Call

"Every chip in every device can already see channel 14 if it's told it's allowed to."

- Jay Monroe, Bloomberg FirstWord, December 11, 2014

"Thanks to iPhone 6 sales, Apple ties with Samsung for top smartphone rank"

- [Computerworld article](#), January 28, 2015

Please refer to [December's article](#) for background on technical issues discussed here. Subsequent to writing the earlier article, I discovered the publicly available test reports for all Wi-Fi enabled devices sold in the US.

Key Takeaway: Test Reports filed with the FCC prove Globalstar is making false claims regarding a software-only solution for TLPS operability on all existing devices. Furthermore, until FCC-Accredited labs execute the complete set of Wi-Fi compliance tests on Channel 14, Globalstar doesn't know which devices will support TLPS and which will not.

Reports Generated by FCC-Accredited Test Labs Clearly Indicate:

- The coexistence filter in the iPhone 6/6 Plus begins "rolling off" about 6MHz lower than expected. TLPS will not work on this device. There is no firmware upgrade.
 - Within the past year, manufacturers like Apple added support for Sprint's "Band 41" Service. Unlike other cellular bands in the US, Sprint's new service sits 12.5MHz away from the upper edge of the 2.4GHz unlicensed band, and only 1MHz away from GSAT's proposed TLPS channel.
 - It makes technical sense Apple (and every other "Tier 1" device manufacturer) would require a filter that "cuts off" at the lowest possible frequency while minimizing the impact on EXISTING free Wi-Fi channels.
 - Test Reports for "Band 41" and "Non-Band 41" iPhone 6/6 Plus phones use the same Wi-Fi hardware.

- TLPS will not work for any iPhone 6, whether it supports Sprint's new service or not.
- FCC reports confirm an issue identified in the last article: No Wi-Fi device has undergone even the most basic performance characterization in "TLPS Mode."
 - Every device sold in North America tests 802.11n performance on channels 1, 6, and 11.
 - Since September 2013, Apple added tests for Channels 12 & 13 that expose problems for TLPS/Channel 14 operation. These problems were not clearly identifiable for tests limited to channels 1, 6, and 11.
 - Problems uncovered by Apple's Channel 12 & 13 test data expose major regulatory and business risks for Globalstar. Existing devices would need to be run through a complete set of FCC tests operating on Channel 14/TLPS before Globalstar (or the FCC or any proposed partner) would even know whether it will work.
 - Their October trial application claims a "Broad and Immediate Ecosystem" of devices. However, Globalstar will not use ANY smartphones in the actual trial, opting instead for WiFi-only client devices that do not include coexistence filters. In addition, Globalstar will require Ruckus to remove the coexistence filter from the 7982 AP.
 - The company can easily refute this analysis by having an FCC-accredited test lab execute the full complement of Wi-Fi tests on an iPhone 6 using Channel 14.
 - Rather than conduct an extended set of uncontrolled (in an RF sense) field trials, the FCC could follow existing regulatory processes to prove the viability of TLPS in a relatively short time period. In addition, the process would result in transparent, technically rigorous results.

Basis of Analysis:

- All data taken from publicly filed FCC Part 15 test reports.

What is Globalstar's TLPS Proposal?

Simply put, TLPS would be a license to use Wi-Fi's Channel 14 in the 2.4GHz frequency band. The current, most advanced, version of Wi-Fi at 2.4GHz is 802.11n.

Given that 802.11n on Channel 14 is prohibited around the world, it makes sense that there is NOT A SINGLE PUBLICLY AVAILABLE TEST REPORT demonstrating if/how TLPS will work on any existing device.

2.4 GHz					
Channel Number	Center Frequency	North America (FCC)	Europe (ETSI)	Japan	ROW
1	2412				
2	2417				
3	2422				
4	2427				
5	2432				
6	2437				
7	2442				
8	2447				
9	2452				
10	2457				
11	2462				
12	2467				
13	2472				
14	2484				

Figure 1: 2.4GHz Wi-Fi Channels around the world (802.11n operation on

Channel 14 is prohibited worldwide)

What is an FCC Part 15 Test Report?

Since Wi-Fi operates in "unlicensed spectrum", it is important that all devices sold in the US conform to a common set of technical requirements. For instance, it would be possible for a single non-compliant device to prevent all other unlicensed band devices from operating in that area.

For this reason, the FCC requires all "Non-Licensed Transmitters" (WiFi, Bluetooth, etc.) be sent through a common set of tests conducted by an FCC-accredited test facility before being sold in the US.

The specific tests will vary depending on the frequency band used (ISM band, unlicensed PCS, U-NII, etc.) and the wireless technology employed (Wi-Fi, Bluetooth, ZigBee, etc.). In regards to Globalstar's TLPS proposal, we are concerned with a single frequency band (2.4GHz ISM band), and a single version of Wi-Fi (802.11n, 20MHz channel). The applicable specifications are found in the Code of Federal Regulations, Part 15, Subpart C (look here for a single document detailing the required tests).

All FCC-compliant devices receive an FCC ID number and the associated compliance test reports are searchable on the FCC website, or on sites like fccid.net.

Finding Apple's Publicly Filed Wi-Fi Test Reports

The following procedure will locate the Wi-Fi test report(s) for the Apple product of interest:

1. Go to the iPhone Wiki website and locate the FCC ID for the product of interest. NOTE: Not all FCC ID links will take you an "OET Exhibits List" containing the 2.4GHz Wi-Fi test reports. The following steps will get you to the Wi-Fi test reports used in this article.
2. Go to the FCC's "Equipment Authorization Search" engine and enter a "Grantee Code" equal to "BCG". The "Product Code" must include the exact characters in the remainder of the FCC ID. For example, the WiFi-only iPad Air 2 has a product code of "A1566" while the iPhone 6 has a product of "-E2816A"(don't forget the "-"). Click the "Search" button after entering Grantee/Product codes.
3. The next page should display a list of records ("Displaying records 1 through..."). Click on the "Detail" link only for those records that have "2480.0" in the "Upper Frequency in MHz" column. (NOTE: Not all records contain 2.4GHz Wi-Fi test reports). If reports aren't available for the "2480.0" records, try "2472.0".
4. In the "OET Exhibits List" look for reports with the acronym "DTS" or "DTS WLAN" in the title. A single device may have multiple Wi-Fi reports (for different product variants, or due to file size). Scan the report's table of contents for 802.11n tests in the 2.4GHz band.

FCC Test Filings Show Apple uses the Same Wi-Fi Module for "Band 41" and "Non-Band 41" Versions of the iPhone 6/6 Plus

The iPhone 6 and iPhone 6 Plus each have two versions. The iPhone 6/6 Plus A1586/A1524 support "Band 41" (and virtually every other LTE band around the world), while the A1549/A1522 models do not. That said, the iPhone 6 (FCC ID: BCG-E2816A) and iPhone 6 Plus (FCC ID: BCG-E2817A) have a single 2.4GHz Wi-Fi test report each. The following sections of each report indicate why.

(click to enlarge)

REPORT NO: 14U17673-E6C
FCC ID: BCG-E2816A

DATE: AUGUST 02, 2014

5. EQUIPMENT UNDER TEST

5.1. DESCRIPTION OF EUT

Model A1549 is a mobile phone with multimedia functions (music, application support, and video), Cellular GSM/GPRS/EGPRS/CDMA2000/EVDO Rev.A/ EVDO Rev.B /WCDMA/HSPA+/DC-HSDPA/LTE FDD & Carrier Aggregation radio, IEEE 802.11a/b/g/n/ac radio, Bluetooth radio and NFC. The rechargeable battery is not user accessible.

5.2. MAXIMUM OUTPUT POWER

For Maximum output power data, refer to Model A1586 FCC WLAN DTS report.

(click to enlarge)

REPORT NO: 14U17676-E6B
FCC ID: BCG-E2817A

DATE: AUGUST 02, 2014

5. EQUIPMENT UNDER TEST

5.1. DESCRIPTION OF EUT

Model A1522 is a mobile phone with multimedia functions (music, application support, and video), Cellular GSM/GPRS/EGPRS/CDMA2000/EVDO Rev.A/ EVDO Rev.B /WCDMA/HSPA+/DC-HSDPA/LTE FDD & Carrier Aggregation radio, IEEE 802.11a/b/g/n/ac radio, Bluetooth radio and NFC. The rechargeable battery is not user accessible.

5.2. MAXIMUM OUTPUT POWER

For Maximum output power, refer to Model A1524 FCC WLAN DTS report.

The iPhone 6 Model A1549 (no Band 41 support) references test results from the Model A1586 ("Sprint-enabled"), and the iPhone 6 Plus A1522 references results from the A1524. The "Sprint-enabled" and "Non-Sprint" iPhone 6/6 Plus use the same Wi-Fi hardware, and hence the same coexistence filter. Keep this in mind when someone says TLPS will only have problems for phones supporting Sprint s Band 41 (or Spark) service.

The iPhone 6 is a rare case where the iPhone Wiki site's FCC ID link takes you directly to a list containing the correct 2.4GHz Wi-Fi report. Open the report titled "A1586 DTS Report 1" and go to section 9.3.6 starting on page 80. (NOTE: Results for the iPhone 6 Plus can be found using BCG-E2817A and selecting the "A1524 DTS Report". Test results are nearly identical to the iPhone 6.)

The "Out-of-Band Emissions" tests are conducted to make sure signal levels at the low (2400MHz) and high (2483.5MHz) edges of the Wi-Fi band are below a specified limit. Ironically, technical requirements (tested in Section 10 of this report) driven by Globalstar's satellite operations are THE REASON the Wi-Fi community in the US can't use channels 12 & 13. (Ironic because Globalstar is now requesting they be allowed to ignore the exact technical limits that prevent everyone else from using these channels).

For our purposes, first look at the "In-Band Reference Level" plot at the top of page 81.

(click to enlarge)

REPORT NO: 14U17673-E5C
 FCC ID: BCG-E2816A

DATE: AUGUST 03, 2014

RESULTS

IN-BAND REFERENCE LEVEL

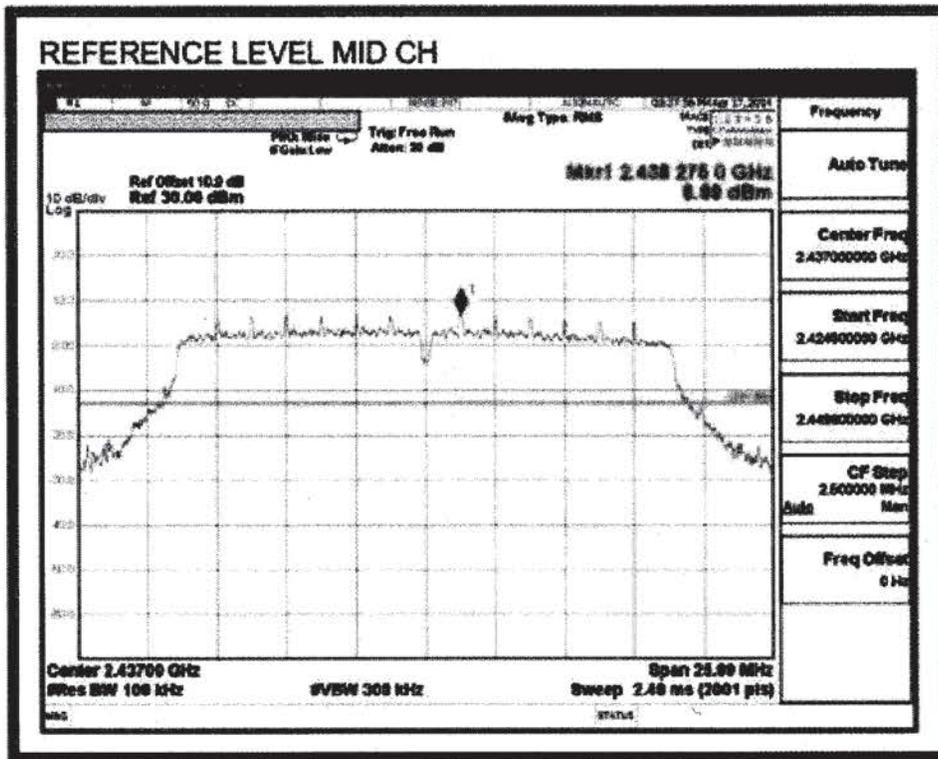


Figure 2: A "Clean" 802.11n Wi-Fi Signal (from iPhone 6 FCC Wi-Fi Test Report, top of page 81)

The figure above comes from a common type of RF test equipment called a "Spectrum Analyzer." Virtually every figure from every Wi-Fi test report is generated using this equipment. The horizontal axis measures frequency (in MHz), while the vertical axis measures power level (in dBm). This is a "frequency domain" representation of the iPhone 6's 802.11n Wi-Fi signal.

For the "In-Band Reference Level" measurement, the spectrum analyzer is set to a center frequency of 2437MHz (Channel 6). The purpose is to find a reference power level (green diamond) that is used to derive the maximum signal level allowed (horizontal green line) below 2400MHz and above 2483.5MHz. The relatively "flat" part of the spectrum represents the "in-channel" signal, or that portion of the signal carrying bits. The in-channel bandwidth of a "20 MHz" 802.11n channel is really only 17.5MHz.

(click to enlarge)

Structure of Operating Channel

WWiSE

- Channel divided into 0.3125 MHz subcarriers
- 20 MHz divided into 56 and 40 MHz into 112 subcarriers (4 pilot carriers)
- 54 data subcarriers in 20 MHz mode and 108 in 40 MHz
- 40 MHz supported only in 5 GHz band

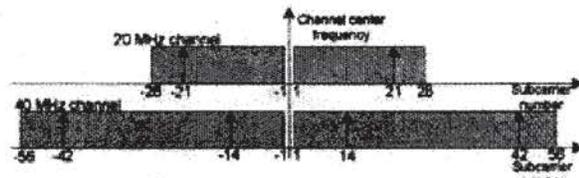


Figure 1. Channel Structure of WWiSE (Lőrincz, Josip & Begušić, Dinko, 2006).

TGnSync

- Channel divided into 0.3125 MHz subcarriers
- 20 MHz identical to 802.11a channel structure: 52 subcarriers with 4 pilot carriers
- 40 MHz channel divided into 128 subcarriers, 6 pilots. This makes 40 MHz mode 2.25 faster than 20 MHz

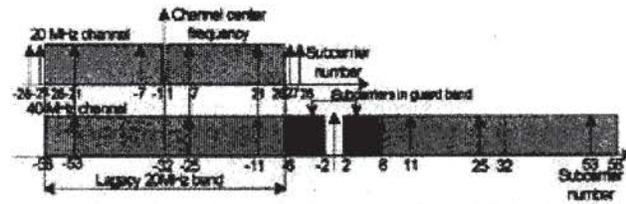


Figure 2. Channel Structure of TGn Sync (Lőrincz, Josip & Begušić, Dinko, 2006).

Figure 3: Details of 802.11n Frequency Domain

SIDE NOTE: In a February 9th, 2015 filing with the FCC, Globalstar attached the following slide.

(click to enlarge)

TLPS and 802.11 Channel 11

- Commonly used IEEE 802.11 channels 1-6-11 have 25 MHz separation
- Proposed TLPS in channel 14 has 22 MHz separation w. Ch.11

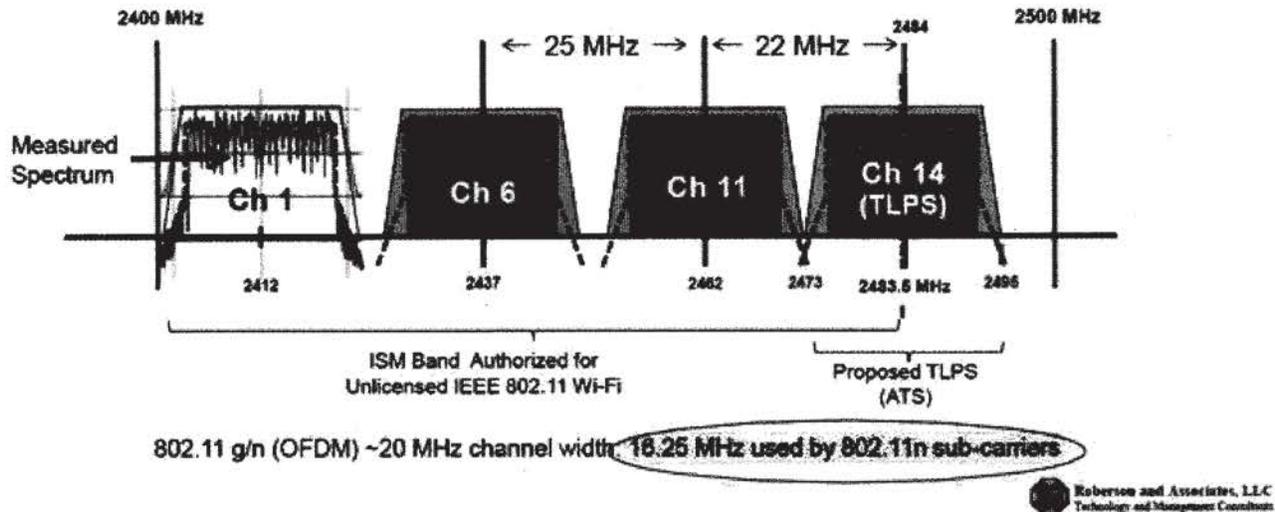


Figure 4: Globalstar Slide from February 9th, 2015 FCC Filing (highlighted their mention of portion of 802.11n carrying information)

Instead of an "in-channel" bandwidth of 17.5MHz, Globalstar implies only 16.25MHz of the channel is necessary. They compute this number by subtracting the four "pilot carriers" from the 56 total sub-carriers ($[56-4] * 0.3125 = 16.25\text{MHz}$). However, pilot carriers are a critical part of the 802.11n transmission scheme, primarily in frequency synchronization described as follows:

(click to enlarge)

Post-FFT synchronization methods usually perform the estimation of the remaining integer CFO left by pre-FFT frequency synchronization. Integer CFO can be estimated by correlating the received **pilot sub-carriers** with a shifted version of the known **pilot sub-carriers** [7]. Depending on spacing between **pilot sub-carriers**, this approach can estimate CFO range up to several multiple integers of sub-carrier spacing.

Using the **pilot sub-carrier** approach, one can also estimate sampling clock frequency offset by using a special **pilot sub-carrier** pattern. This integer CFO synchronization technique is only effectively performed after coarse timing synchronization and coarse frequency synchronization have been established (acquisition stage) to track the residual CFO errors, common phase error (CPE) left by pre-FFT frequency synchronization, and receiver local oscillator phase noise, respectively.

Implying the pilot carriers are unimportant demonstrates either a lack of technical understanding, or conscious obfuscation of the fact that losing pilot carriers will further impair TLPS (specifically, when pilot sub-carriers 21 and 28 are wiped out by a coexistence filter?!). Sorry Globalstar. You still have to worry about the full 17.5MHz of "in-channel" bandwidth. END OF SIDE NOTE

With the analyzer's "span" set to 25MHz (2.5MHz/division), we can verify the "in-channel" bandwidth by noting the flat part of the signal covers exactly 7 vertical "blocks" on the plot($7 * 2.5\text{MHz/division} = 17.5\text{MHz}$).

For our analysis, the most important characteristic of Figure 2 is the symmetry of the in-channel signal above and below channel 6's center frequency. Though there is a very slight "roll-off" on each side, the decline is roughly the same. This is a "clean" 802.11n signal, unimpaired by any Coexistence filter.

(click to enlarge)

AUTHORIZED BAND EDGE LOW CH

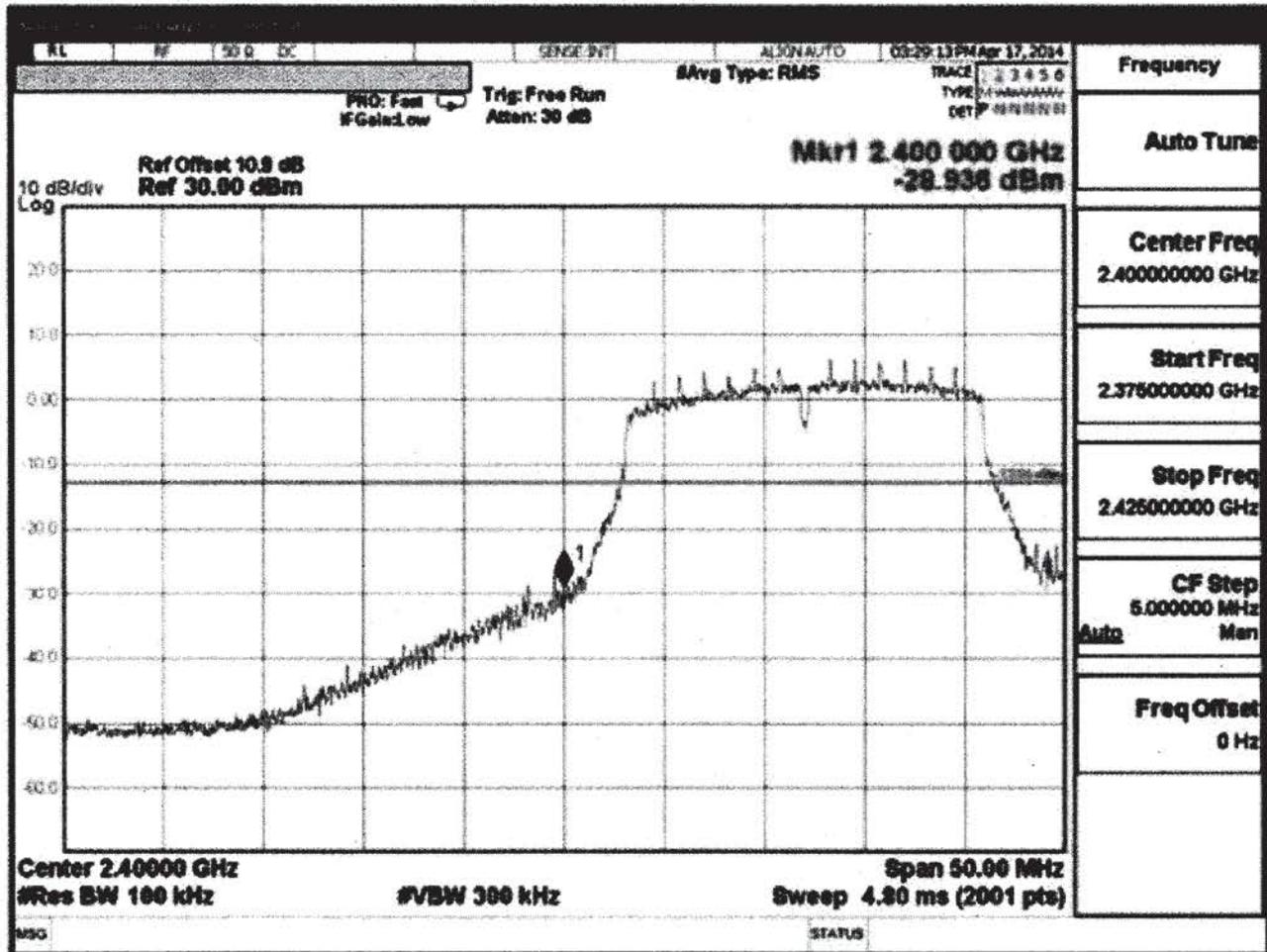


Figure 5: Lower Band Edge Test (Center=2400MHz, Span=50MHz) (from iPhone 6 FCC Wi-Fi Test Report, bottom of page 81)

For the "Low Band Edge" test, note the change in spectrum analyzer parameters (Span=50MHz vs. 25MHz, and Center= 2400MHz vs. 2437). The horizontal green line is the emissions limit derived from "Reference Level Mid Ch" test shown in Figure 2, while the green diamond at 2400MHz demonstrates the lower band edge power is well below the required level.

Aside from the different analyzer settings, compare the in-channel bandwidth of Channel 1 vs. Channel 6. Absent RF filtering effects, the signal profile for 1 & 6 should be virtually identical. However, we see Channel 1 is no longer symmetrical around the center, and we notice more "roll-off" on the left side.

(click to enlarge)

AUTHORIZED BAND EDGE HIGH CH 11

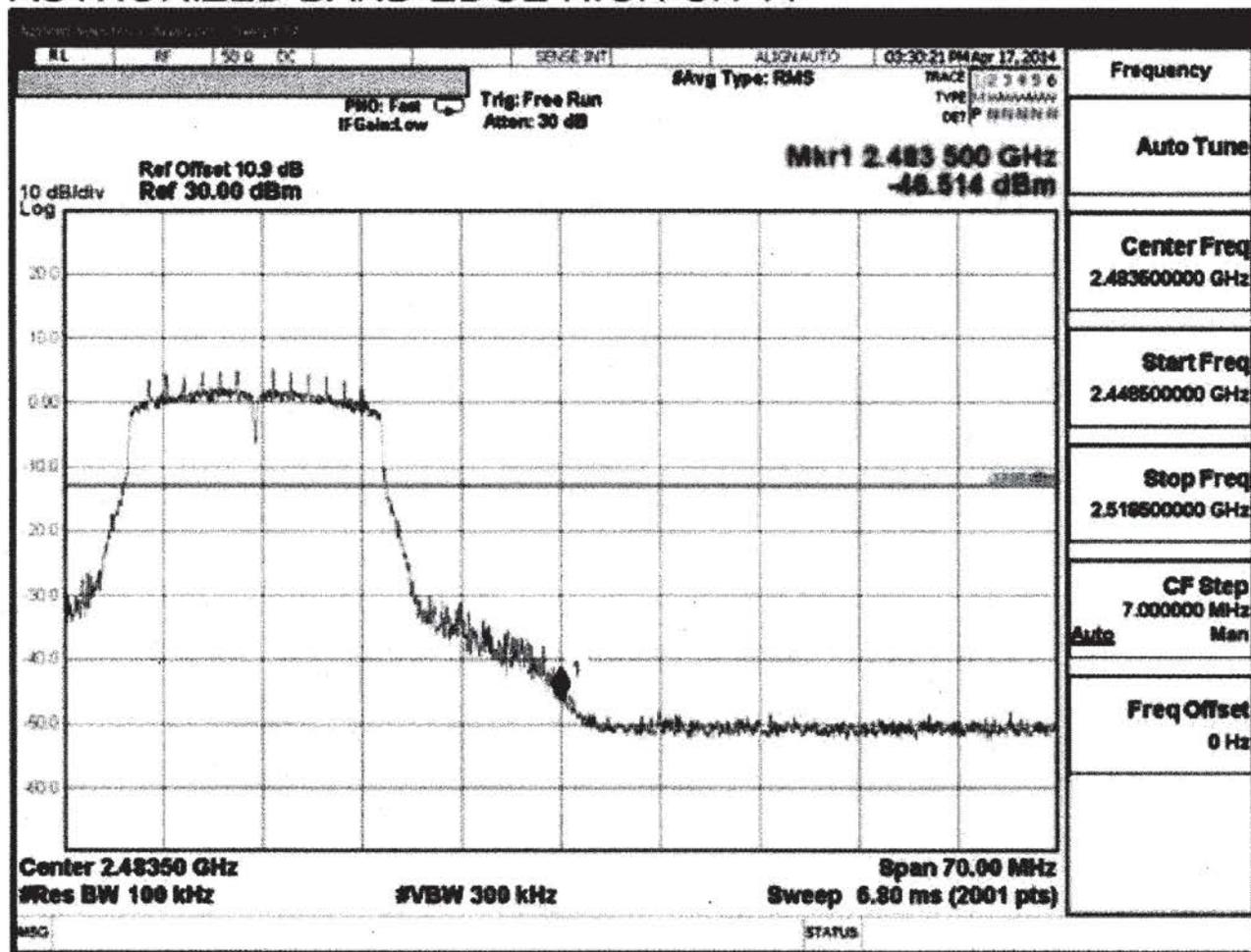


Figure 6: Channel 11 High Band Edge Test (Center=2483.5MHz, Span=70MHz)

(click to enlarge)

AUTHORIZED BAND EDGE HIGH CH 12

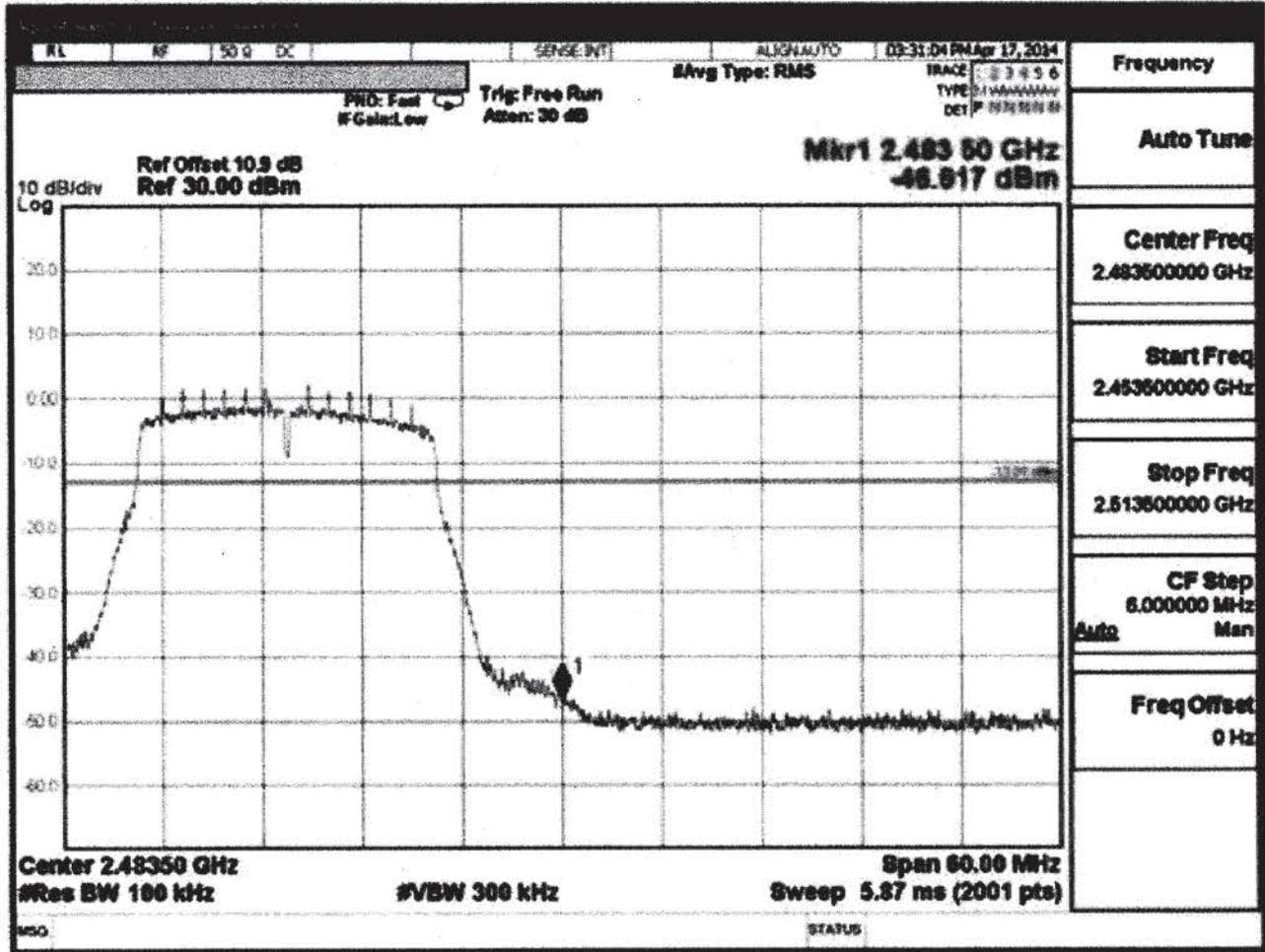


Figure 7: Channel 12 High Band Edge Test (Center=2483.5MHz, Span=60MHz)

(click to enlarge)

AUTHORIZED BAND EDGE HIGH CH 13

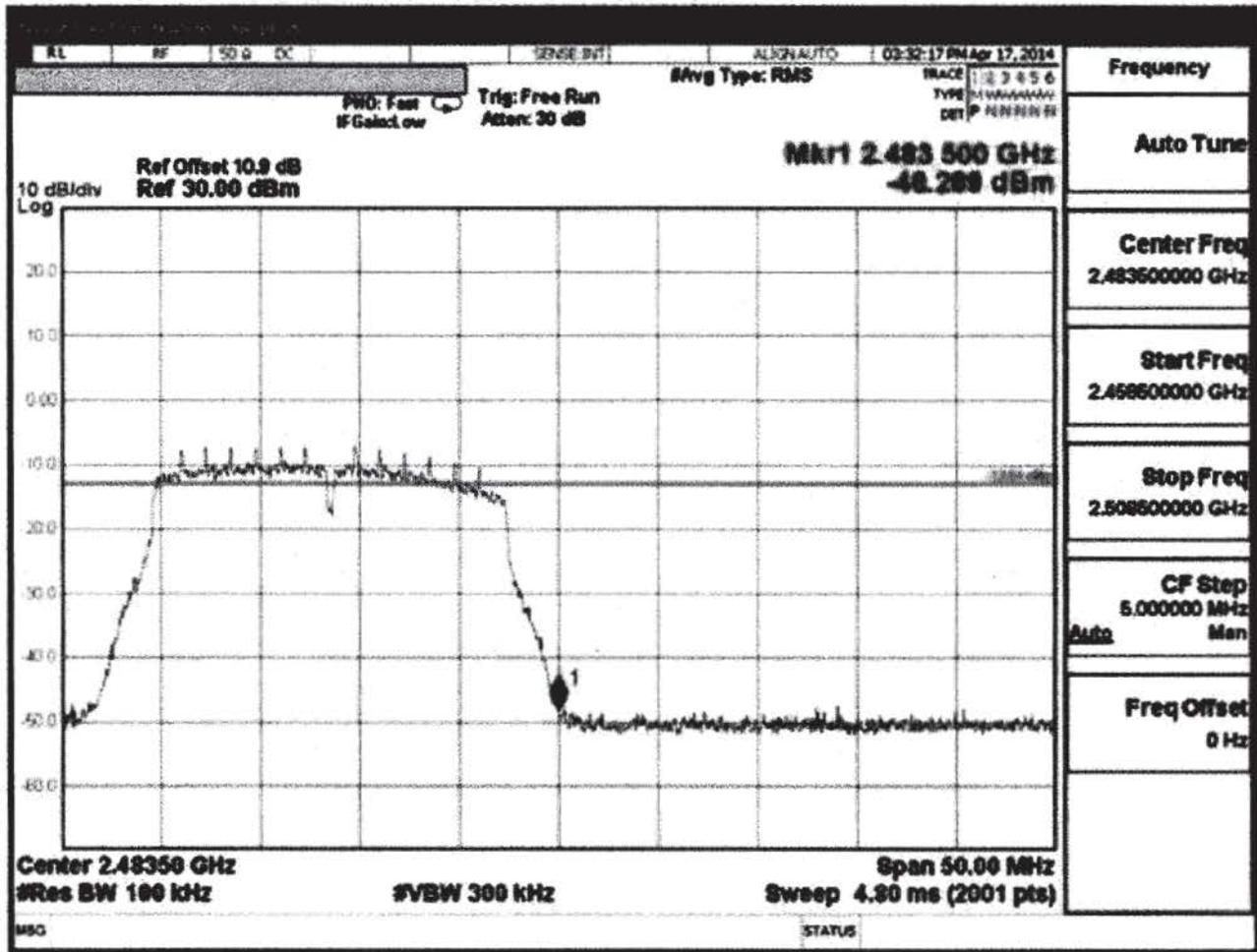


Figure 8: Channel 13 High Band Edge Test (Center=2483.5MHz, Span=50MHz)

(click to enlarge)

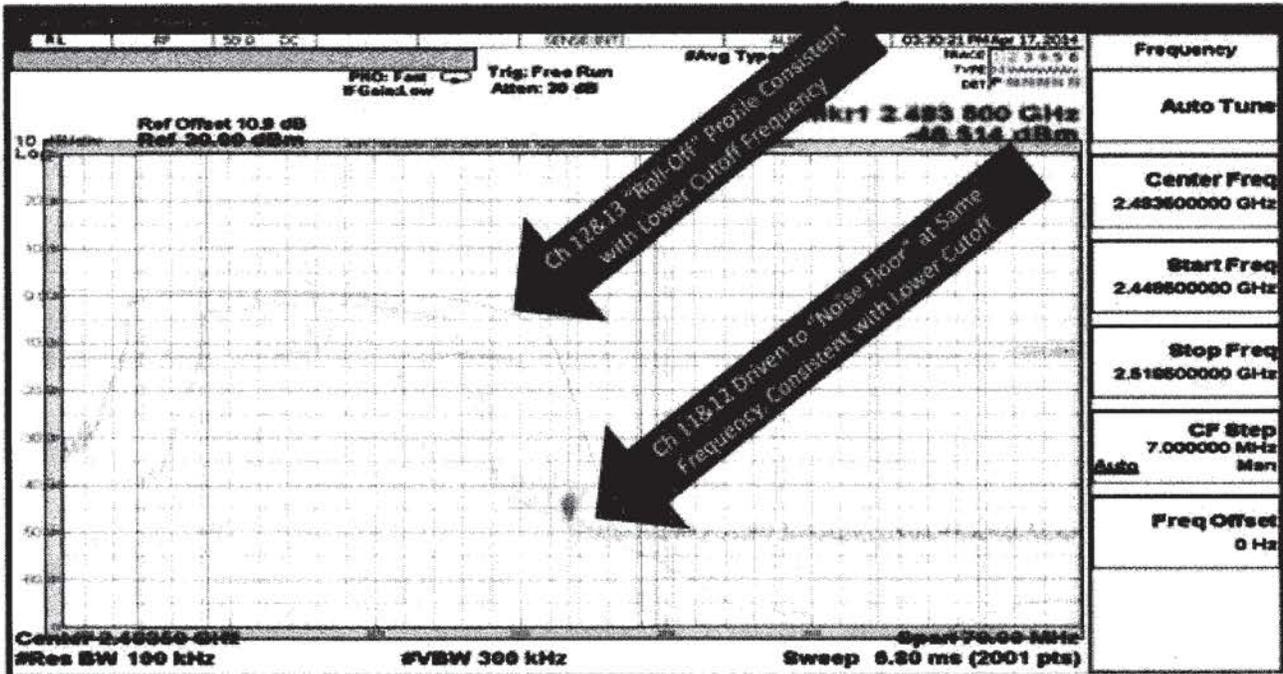


Figure 10: Channel 11, 12, & 13 iPhone 6 Test Results (Scaled, Overlaid): Apple Coexistence Filter Shift Consistent with In-Channel Roll-Off Profile on Channels 12 & 13, and Consistent with Out-of-Channel Signal Being Driven into the Noise Floor at the Same Frequency for Channel 11 & 12 Tests

(click to enlarge)

AUTHORIZED BAND EDGE HIGH CH 13

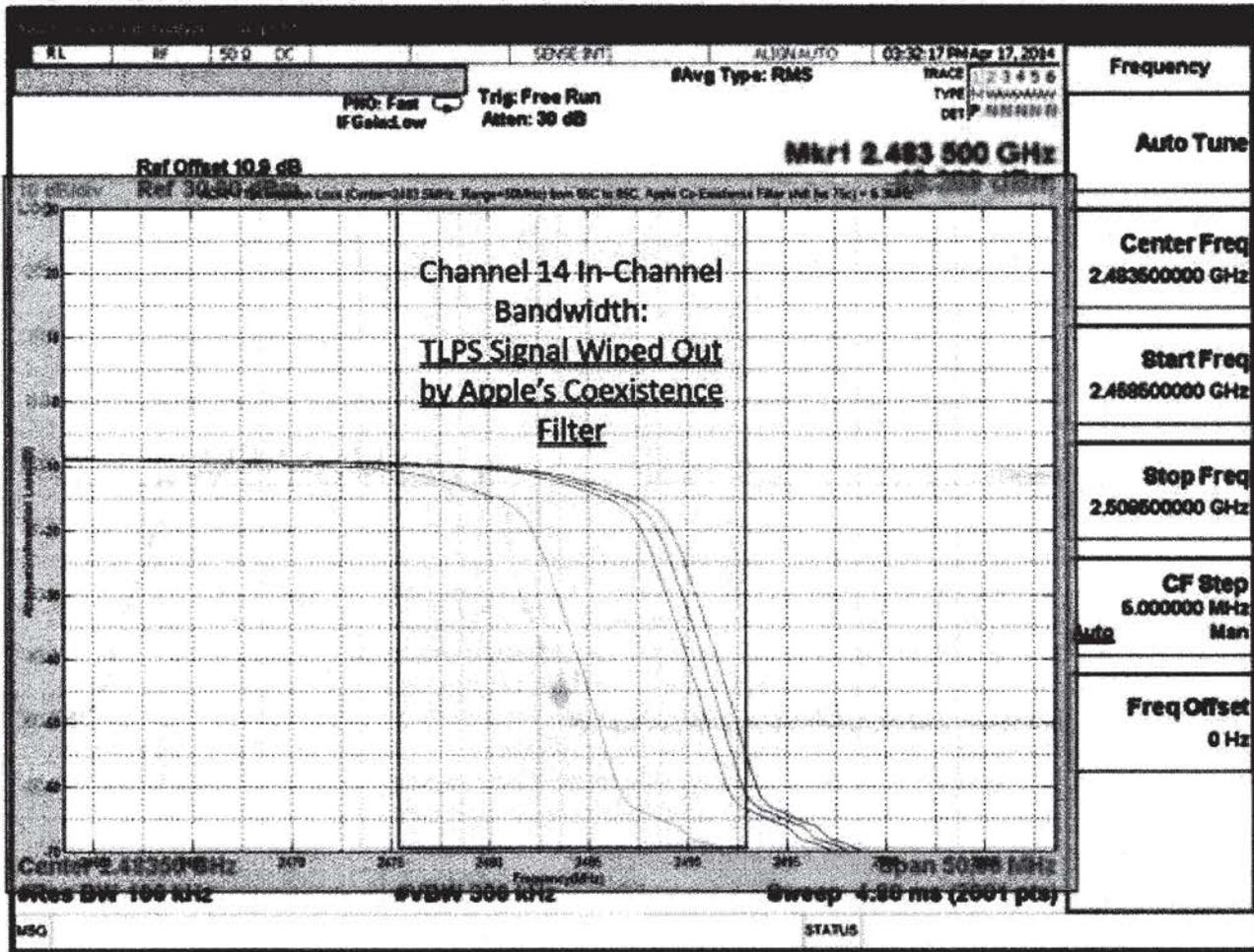


Figure 11: iPhone 6 Authorized Band Edge Test on Channel 13: Overlay of TLPS/Channel 14 "In-Channel" Bandwidth (Yellow Region)

The Channel 11, 12, and 13 test plots are all centered at 2483.5MHz, though the frequency span varies from 70MHz down to 50MHz. In comparing the plots above, notice the following:

- Channel 11:
 - Adjusting for different frequency span, the in-channel signal profile is similar to the Channel 6 reference plot, though we begin to see slightly more roll-off on the right side.
 - The out-of-channel signal is "driven into the noise floor" by 2484MHz, indicating the coexistence filter begins to materially attenuate the signal in the lower half of Channel 14/TLPS. (See Figures 6&7)
- Channel 12:
 - The in-channel signal profile loses symmetry, beginning to roll-off in the upper half. Scaling and overlaying Channel 12&13 tests show a consistent roll-off profile. Further evidence the coexistence filter begins to materially attenuate the signal in the lower half of Channel 14/TLPS. (See Figures 7&8)
 - The out-of-channel signal is driven into the noise floor at the same point as Channel 11, further confirming the coexistence filter begins to materially attenuate the signal in the lower half of Channel 14/TLPS. (See Figure 7)
- Channel 13:
 - The upper edge of the signal exhibits at least 6dB attenuation relative to the maximum in-channel level. As Figure 9 illustrates, the coexistence filter is beginning to roll-off >6MHz lower than the ACPF-7124 datasheet would imply. Shifting the ACPF-7124 filter profile lower by about 6.3 MHz (vs. 75C) precisely matches the Channel 13 roll-off profile.
 - Figure 9 shows the roll-off profile of channels 12&13 are consistent with a coexistence filter shifted about 6Mhz lower than the 7124.

- The iPhone 6 coexistence filter begins rolling-off much sooner than the ACPF-7124 data would suggest, clearly indicating another filter is being used. Any FBAR/BAW filter that starts to roll-off that low in frequency will decimate at least the upper half of channel 14.
- The in-channel and out-of-channel effects observed across Channels 11, 12, & 13 band edge tests (summarized in Figures 9-11) provide clear evidence Apple is using a coexistence filter that will decimate TLPS/Channel 14. Figure 11 highlights the in-channel bandwidth of TLPS/Channel 14 and shows TLPS will not work for any version of the iPhone 6 or 6 Plus.
- Industry sources confirm coexistence filter manufacturers provide propriety designs to Tier 1 manufacturers like Apple and Samsung. Publicly available coexistence filter specifications don't represent actual filters used across all manufacturers.
 - **Short of obtaining proprietary coexistence filter specifications from Apple, Samsung, and others, Globalstar has no way of knowing whether a given device could ever work on TLPS.**
 - Imagine the questions this raises with prospective partners.

Globalstar's Upcoming Trial

On October 20, 2014, Globalstar filed for an experimental trial license in San Carlos, CA. Contrast the following claims with analysis from above:

(click to enlarge)

Employing Channel 14 in the IEEE 802.11 specification to enable TLPS will create a number of unique advantages. These include:

(a) **Broad and Immediate Ecosystem** - 802.11 compliant hardware is **already capable of utilizing Channel 14 with a device firmware modification**. This means that TLPS will benefit from a substantial existing ecosystem, which can be utilized almost immediately.

(click to enlarge)

Research and Experiment Equipment

The proposed research and experiment program **will use existing 802.11 compliant devices** such as tablets, **smart phones** and other devices with 2.4 GHz 802.11 transceiver chipsets. The program will also use **existing 802.11 compliant access points**. In all cases, **firmware modifications to the transceiver will enable operation of 802.11 Channel 14**. Also, in all cases, conducted power output will not exceed 30 dBm and ERP will not exceed 36 dBm.

Though the October 20th trial application includes "smart phones", note the actual devices being used:

(click to enlarge)

Manufacturer

List below transmitting equipment to be installed (if experimental, so state) if additional rows are required, please submit equipment list as an exhibit:

Manufacturer	Model Number	No. Of Units	Experimental
Cisco	Aironet 1570	50	No
Cisco	Aironet 3700	50	No
Ruckus	ZoneFlex 7982	30	No
Microsoft	Surface Pro 3	80	No
Google	Nexus 7	80	No

Notice there are no smartphones listed. Between October 20th and now, perhaps Globalstar realized their "Broad and Immediate Ecosystem" isn't so broad after all.

As expected, the Microsoft Surface Pro 3 (FCC ID: C3K1631) band edge test shows this WiFi-only device doesn't have a coexistence filter.

(click to enlarge)

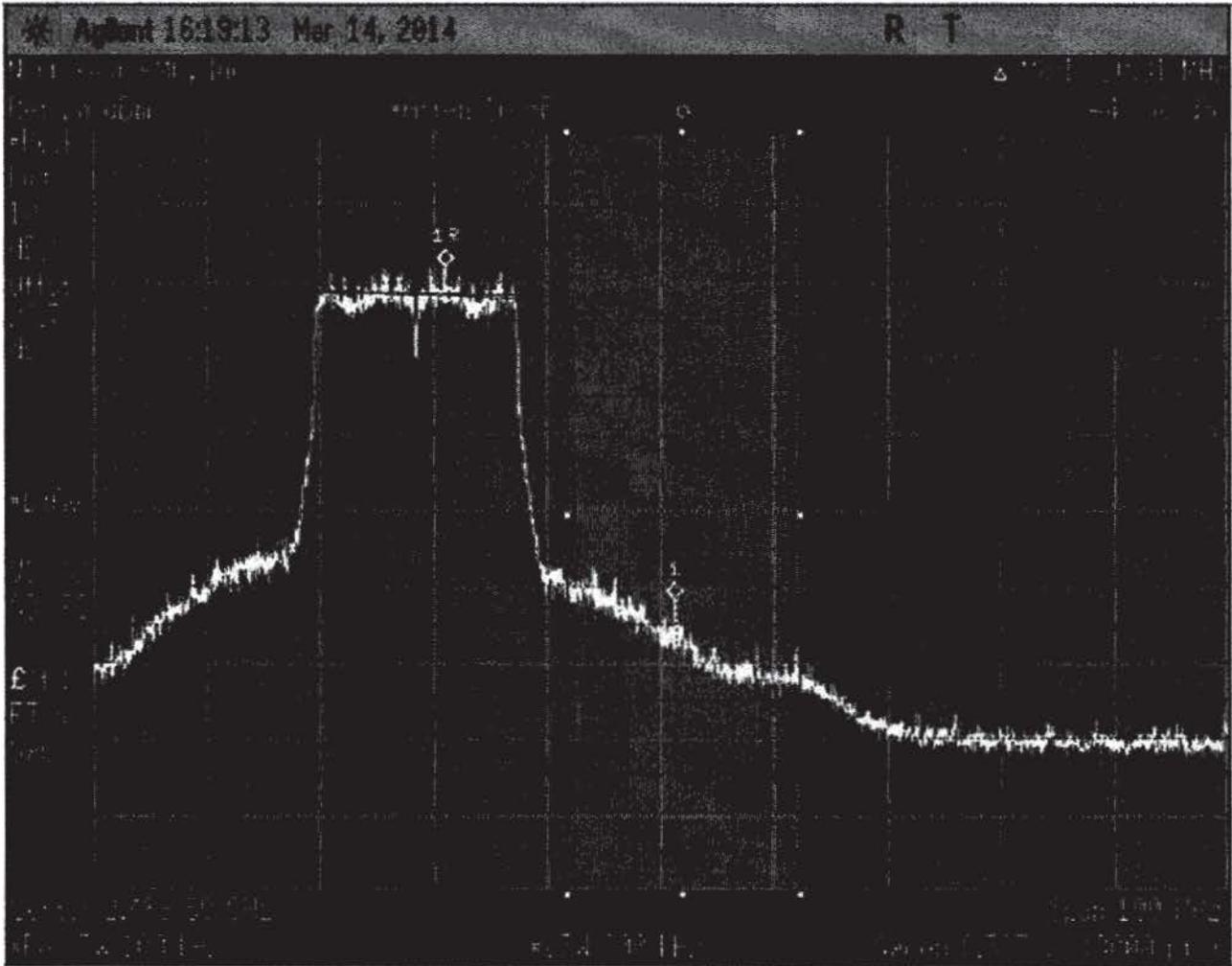


Figure 12: Microsoft Surface Pro 3 Authorized Band Edge Test on Channel 11: "Out-of-Channel" Signal Profile shows no Coexistence Filter

The WiFi-only Nexus 7 report (FCC ID: MSQK008) doesn't include a spectrum analyzer plot with a detailed view of the TLPS/Channel 14 frequency range.

Lest we forget, some (most?) Wi-Fi access points on the market today also have coexistence filters. Globalstar's trial will use the Ruckus 7982 (FCC ID: S9G-MPE2N33A) and Cisco Aironet 1570 (FCC ID: LDK102093P) & 3700 (FCC ID: LDK102087) Access Points. Recall their trial application claim: "The program will also use existing 802.11 compliant access points. **In all cases**, firmware modifications to the transceiver will enable operation of 802.11 Channel 14." The Ruckus 7982 test report begs to differ.

(click to enlarge)

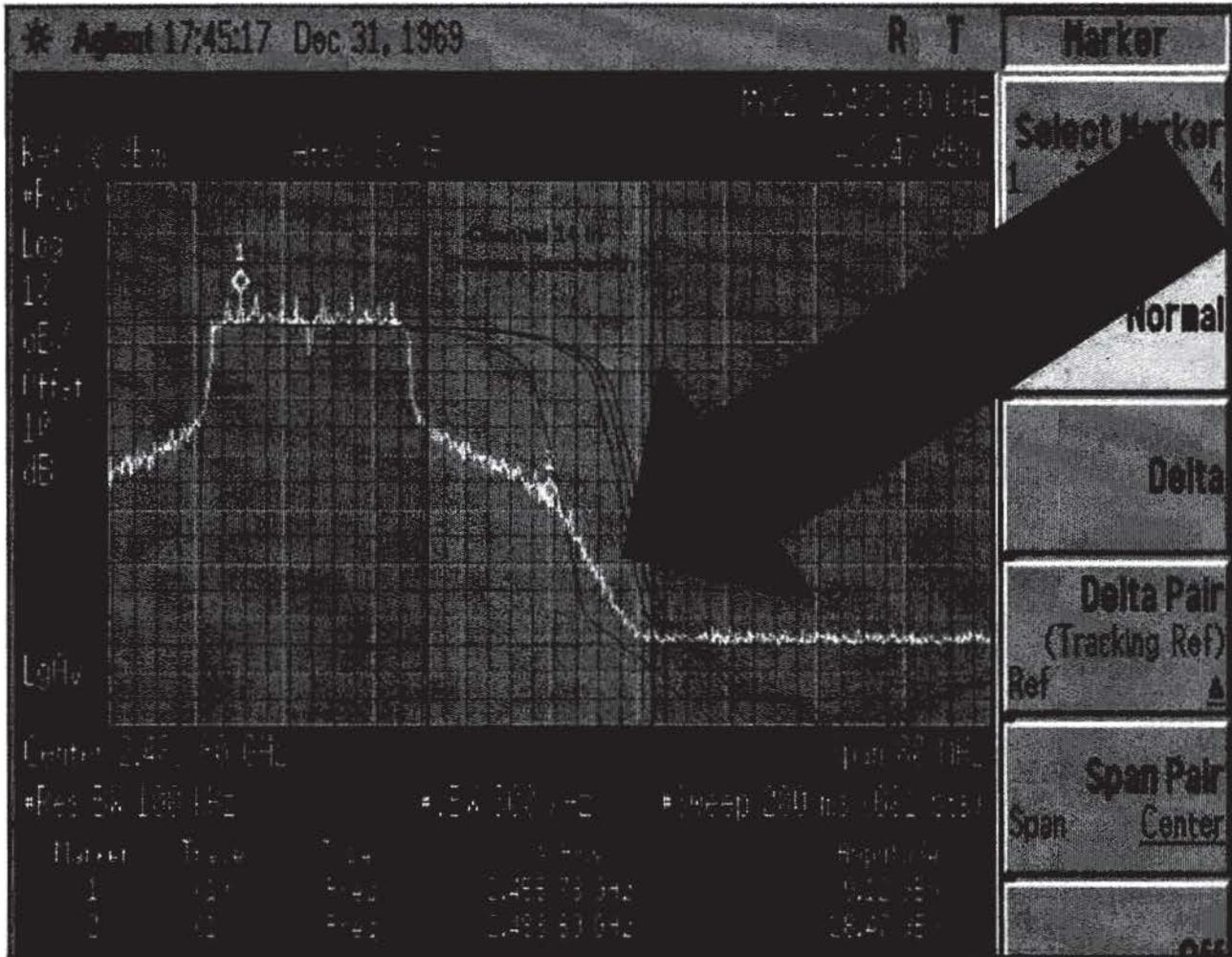


Figure 13: Ruckus 7982 AP Authorized Band Edge Test on Channel 11: "Out-of-Channel" Signal Profile shows Coexistence Filter. Contrary to Globalstar's claim of "firmware modifications" only, TLPS Trial will require hardware modification.

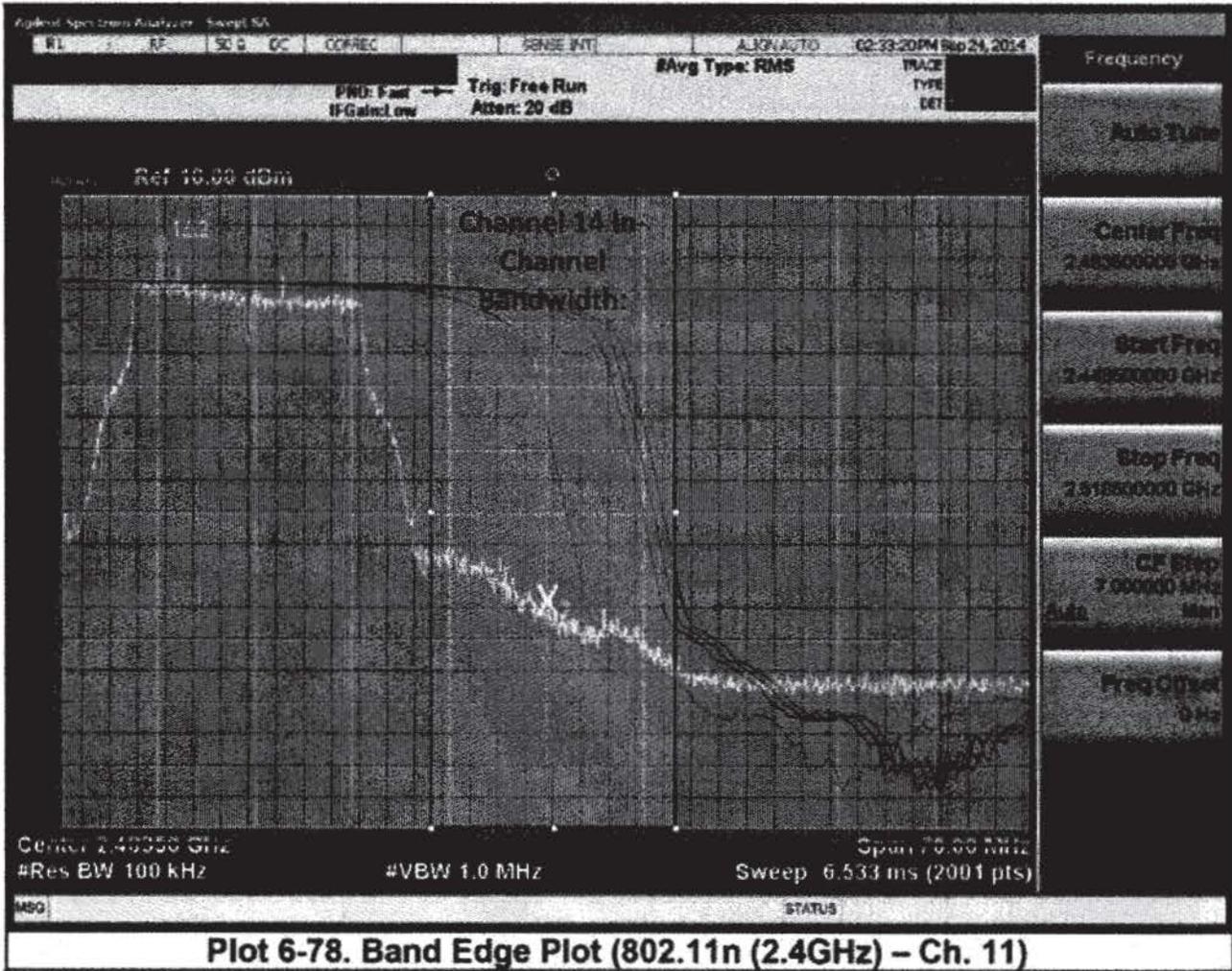
Unfortunately, the Cisco band edge tests do not include plots allowing for determination of whether a coexistence filter exists.

What about Other Smartphones?

The Apple iPhone 6/6 Plus isn't the only phone that will have problems working on TLPS/Channel 14. The following is a sampling of other popular phones. As Sprint's Band 41 "Spark" service rolls out further, more manufacturers will follow Apple's lead in developing phones that support this band. Assuming they also follow Apple's example by converging on a single Wi-Fi module design across different phone "flavors," we can expect more coexistence filter designs exhibiting a lower cut-off frequency (hence, wiping out TLPS/Channel 14).

Apple is unique in providing Wi-Fi test reports that include channel 12 and 13 results. For other manufacturers, the precise cutoff frequency location is less certain. That said, paying attention to the "out-of-channel" signal profile for other phones' tests can still give us a pretty good idea of which phones are likely to have problems. Judge for yourself.

(click to enlarge)



Plot 6-78. Band Edge Plot (802.11n (2.4GHz) – Ch. 11)

Figure 14: Samsung Galaxy S5 ("Non Band 41") Authorized Band Edge Test on Channel 11: Overlay of TLPS/Channel 14 "In-Channel" Bandwidth (Yellow Region) & Overlay ACPF-7124 at 65-85C , as well as Derived Apple Filter (Red): TLPS Impaired, even for phone designed without Sprint's Band 41 Service in mind (FCC ID: SMG870F)

(click to enlarge)

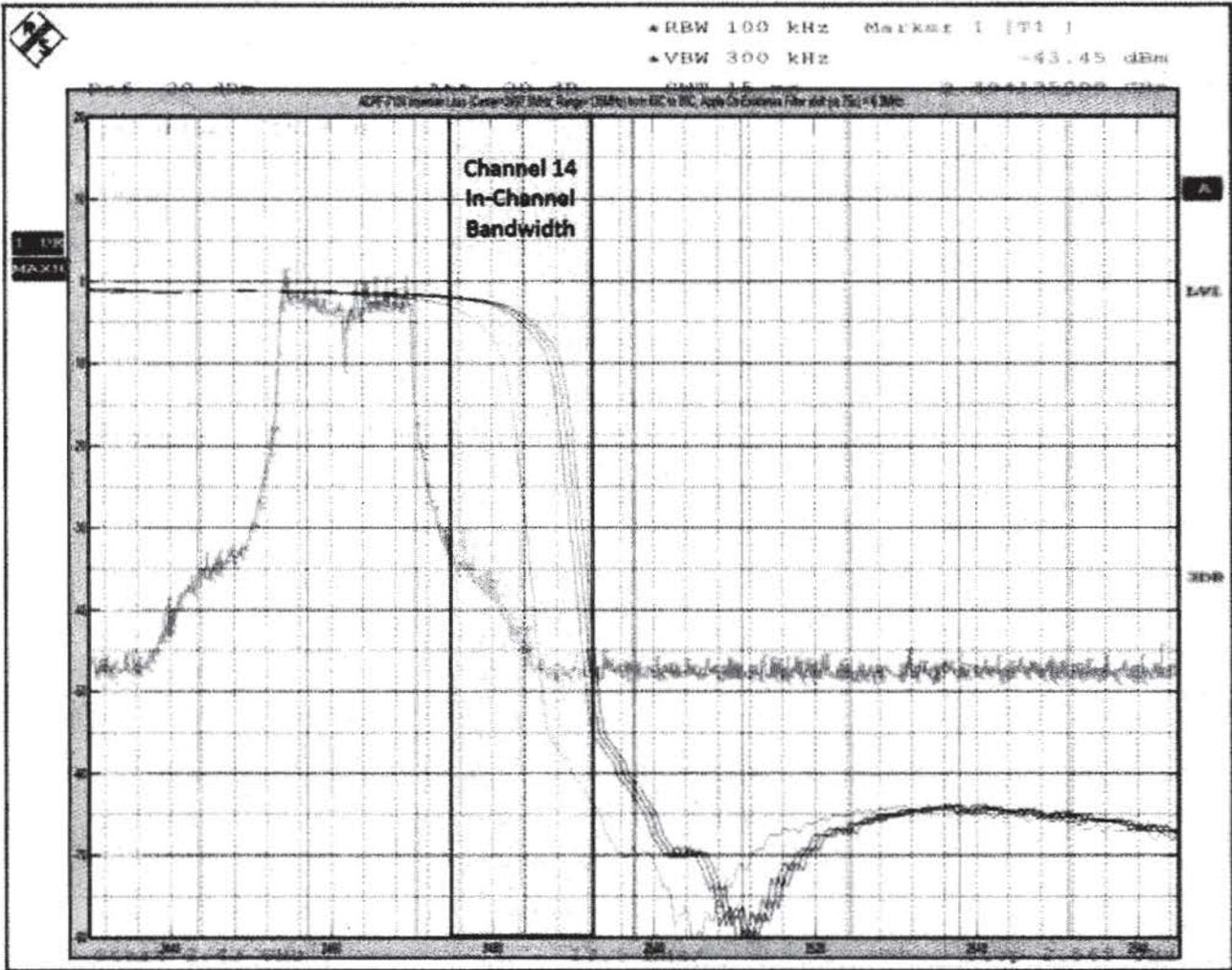


Figure 15: Moto X1 ("Band 41-enabled") Authorized Band Edge Test on Channel 11: Overlay of TLPS/Channel 14 "In-Channel" Bandwidth (Yellow Region) & Overlay ACPF-7124 at 65-85C , as well as Derived Apple Filter (Red): TLPS Won't Work (FCC ID: IHDT56QA3)

(click to enlarge)

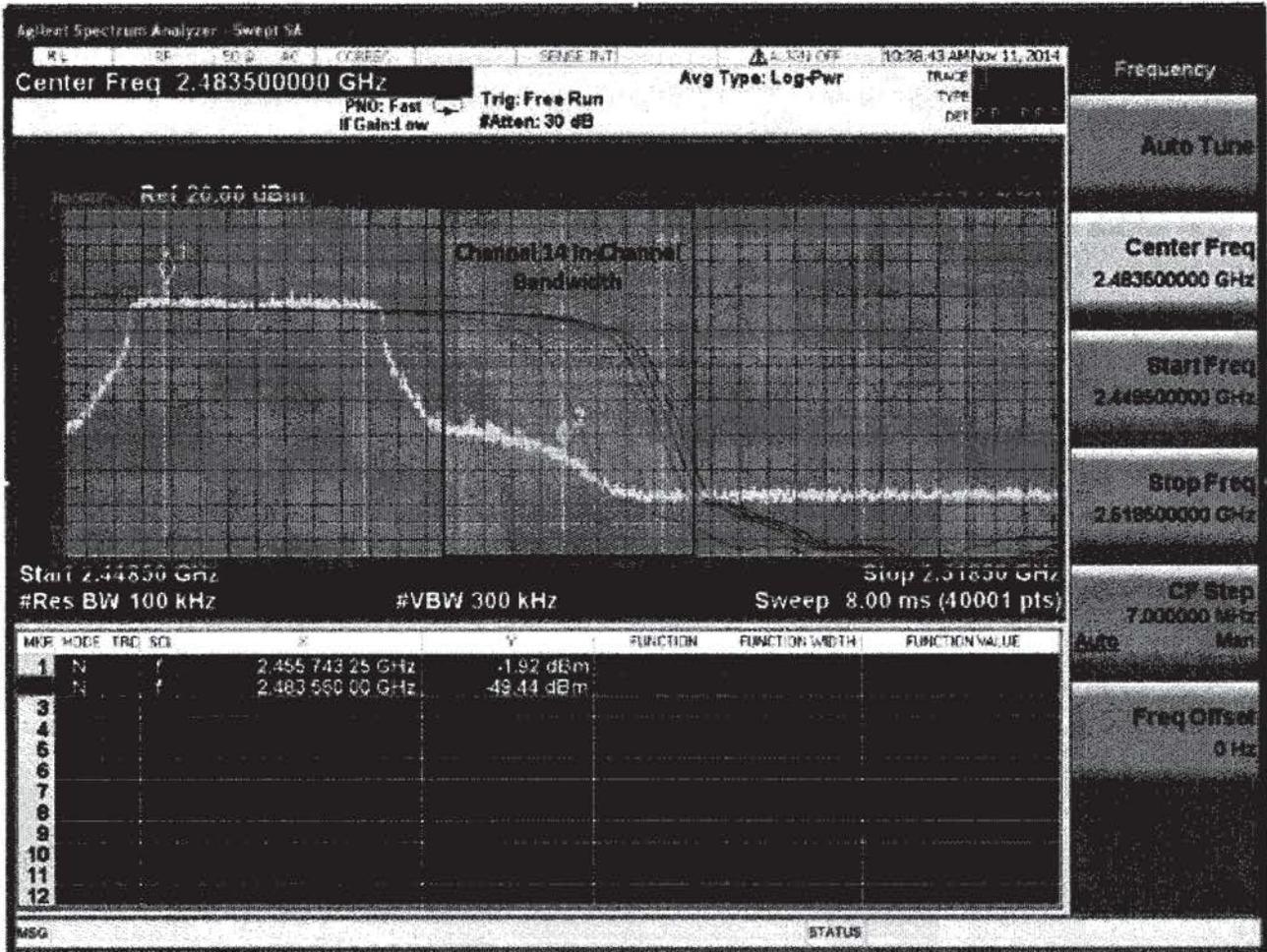


Figure 16: LG G3 ("Band 41-enabled") Authorized Band Edge Test on Channel 11: Overlay of TLPS/Channel 14 "In-Channel" Bandwidth (Yellow Region) & Overlay ACPF-7124 at 65-85C , as well as Derived Apple Filter (Red): TLPS Unlikely to Work (FCC ID: ZNFD855V)

Globalstar's obviously false claims of a "software/firmware-only" solution across ALL devices highlights a lack of technical diligence that has gone into their TLPS proposal so far. The issues uncovered by analyzing the FCC test reports indicates a high degree of technical and business risk that has not been addressed. In addition, the necessity of re-executing the FCC's mandated Wi-Fi tests **just to see if a given device will even work on Channel 14** seems likely to cause a regulatory nightmare.

Rather than waiting months for Globalstar to execute a series of un-controlled field tests, I propose the FCC do the following:

1. Require Globalstar to specify existing devices that will be used for TLPS (both client and access points). If Globalstar plans on deploying proprietary access points, require detailed specifications/modifications to existing AP's (for example, using the Ruckus 7982 with removal of the coexistence filter).
2. For every device that will be part of the TLPS "Ecosystem," require Globalstar to coordinate with each manufacturer to execute the full set of 802.11n Wi-Fi Part 15 compliance tests using FCC-accredited test labs.
3. As required of every other device sold in the US, publish the test results.

Following this simple process will give the FCC and the public a baseline for moving forward. At that point, TLPS-capable devices would be guaranteed to perform identically to devices operating on free Wi-Fi channels, as well as having a thorough technical understanding of potential issues (such as interference with adjacent unlicensed channels, and adjacent licensed channels like Sprint's Band 41 service).

While extended, amorphous Dooley-run field trials could last multiple quarters (or longer?), sending existing devices through FCC test labs could be done in a matter of weeks. The actual tests can be conducted over a period of days, with the longest lead item likely to be manufacturer's willingness to change software to enable Channel 14 testing.

Final Note

If you have difficulty locating specific FCC test reports, please feel free to contact me. Navigating the FCC's test report site is more challenging than it first seems (requirement for "character-exact" ID numbers, multiple records for the same device, different reports located under different records, etc.). In addition, if anyone finds a manufacturer besides Apple that publishes Wi-Fi test results for channels 12 & 13, I would be very interested to hear from you.