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3 HIF317.160

4 ``CHALLENGES AND OPPORTUNITIES IN THE 5 GHZ SPECTRUM BAND''

5 WEDNESDAY, NOVEMBER 13, 2013

6 House of Representatives,

7 Subcommittee on Communications and Technology

8 Committee on Energy and Commerce

9 Washington, D.C.

10 The Subcommittee met, pursuant to call, at 2:27 p.m., in
11 Room 2123 of the Rayburn House Office Building, Hon. Greg
12 Walden [Chairman of the Subcommittee] presiding.

13 Members present: Representatives Walden, Latta,
14 Shimkus, Terry, Blackburn, Scalise, Lance, Guthrie, Long,
15 Ellmers, Eshoo, Braley, Lujan, Dingell, Butterfield and
16 Waxman (ex officio).

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17 Staff present: Gary Andres, Staff Director; Ray Baum,
18 Senior Policy Advisor/Director of Coalitions; Matt Bravo,
19 Professional Staff Member; Andy Duberstein, Deputy Press
20 Secretary; Kelsey Guyselman, Counsel, Telecom; Grace Koh,
21 Counsel, Telecom; Gib Mullan, Chief Counsel, CMT; David Redl,
22 Counsel, Telecom; Charlotte Savercool, Legislative
23 Coordinator; Tom Wilbur, Digital Media Advisor; Roger
24 Sherman, Democratic Chief Counsel; Shawn Chang, Democratic
25 Chief Counsel, Communications and Technology; Margaret
26 McCarthy, Democratic Professional Staff Member; Kara van
27 Stralen, Democratic Policy Analyst; and Patrick Donovan,
28 Democratic FCC Detailee.

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|
29 Mr. {Walden.} I am going to call to order the
30 Subcommittee on Communications and Technology for our hearing
31 on ``Challenges and Opportunities of the 5 Gigahertz Spectrum
32 Band.'' With unanimous consent, Mr. Waxman has to be down at
33 the White House. Without objection, I would like to start
34 and allow him to give his opening statement as a courtesy to
35 the former chairman, unless anybody wants to object or--I
36 didn't think so. So we will start. I know it is out of
37 protocol and all, but we actually try and get along here from
38 time to time. So I would yield to Mr. Waxman and allow him
39 to give his statement since he has to depart.

40 Mr. {Waxman.} Thank you, Mr. Chairman. I thank you and
41 Ms. Eshoo for your courtesy to allowing me to go forward.
42 And I thank my other colleagues that are here for not
43 objecting. I appreciate we are holding this hearing on the
44 promises and challenges of freeing up additional spectrum in
45 the 5 gigahertz band for next generation Wi-Fi services.

46 Public Safety and Spectrum Act of 2012 contained a small
47 but important revision requiring NTIA and the FCC to study
48 and open up additional spectrum for unlicensed and services

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49 in the 5 gigahertz band. Many members of this committee,
50 including Ranking Member Eshoo and Congresswoman Matsui,
51 worked hard to ensure this provision was included in the
52 final legislation. And because of these efforts, superfast
53 unlicensed services known as gigabit Wi-Fi are closer than
54 ever to becoming a reality. We know that unlicensed spectrum
55 has been an incredible economic success story. The
56 development of Wi-Fi could not have happened without it. But
57 as existing unlicensed bands become increasingly congested,
58 we must open up additional frequencies for Wi-Fi services to
59 meet skyrocketing consumer demand. And the potential for
60 delivering unprecedented data speed over gigabit Wi-Fi
61 networks promises to transform the 5 gigahertz band into a
62 test bed for breakthroughs in innovation.

63 Unlicensed spectrum is essential to our Nation's
64 wireless broadband ecosystem in unlocking the potential of
65 the 5 gigahertz band is critical to maintaining our global
66 leadership in mobile broadband. Making more Wi-Fi spectrum
67 available does not come without challenges.

68 As a threshold matter, we must ensure incumbent systems
69 in the band, whether they are operated by federal or

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70 commercial users, are fully protected from harmful
71 interference. In particular, the lifesaving potential of
72 state of the art driver warning systems must not be
73 undermined. We are in the early stage in opening up the 5
74 gigahertz band, and I believe any process going forward must
75 be fair, transparent and driven by engineering. As I stated
76 last year, the Administration should continue to pursue an
77 all of the above approach to make more spectrum available for
78 commercial mobile broadband services. This approach includes
79 opening up underutilized spectrum for sharing. In an
80 increasingly crowded spectrum world, spectrum sharing shall
81 be the new normal, not the exception. All stakeholders
82 should work together to develop sound technical solutions to
83 make this possible.

84 I would like to welcome our impressive panel of experts.
85 Mr. Knapp, welcome back to our committee. We have always
86 appreciated your efforts to explain highly technical issues
87 in language policy makers can understand most of the time.
88 And I know you will help us again today. I look forward to
89 hearing from all of our panel of experts.

90 Finally, I would like to take a moment, a personal

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91 privilege to acknowledge Roger Sherman, as today's hearing
92 will be the last he will participate in as a member of our
93 committee staff. Members of the committee know Roger not
94 only for his deep expertise on telecommunications matters
95 before this subcommittee, but also his wise guidance as
96 Democratic Chief Counsel. Roger's dedication and knowledge
97 and pragmatism truly exemplify the best of public service.
98 Fortunately, Roger will still work closely with us in his new
99 role as a wireless bureau chief of the Federal Communications
100 Commission. In that capacity, he will play an instrumental
101 role in ensuring the success of the upcoming spectrum
102 auctions, including the broadcast incentive auction. This is
103 perhaps the FCC's most critical responsibility in the coming
104 years at FCC. Chairman Wheeler couldn't have picked a better
105 person for the job. I know others may want to comment on his
106 leaving us as well. I hope everyone will join me in
107 congratulating Roger on this new opportunity, and we wish him
108 all the success. I have 39 seconds. I am going to yield to
109 Ms. Eshoo.

110 [The prepared statement of Mr. Waxman follows:]

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111 ***** COMMITTEE INSERT *****

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|
112 Ms. {Eshoo.} Or I will use my time when you acknowledge
113 me.

114 Mr. {Waxman.} Okay. Good.

115 Ms. {Eshoo.} Thank you.

116 Mr. {Waxman.} Thank you, both.

117 Ms. {Eshoo.} Thank you.

118 Mr. {Walden.} The gentleman yields back his time. I
119 want to join the gentleman in honoring Roger and thanking him
120 for his many years of service here on the committee and for
121 the people of America, and your continued service. Let the
122 record show, I already have a draft letter to you in your new
123 role. And, you know, it has a couple of minor things I am
124 sure you can fix. But we are delighted that you are going to
125 stay part of the public process. And we welcome you in your
126 new role. We regret you leaving here, but we wish you God
127 speed and great fortune and safety.

128 Mr. {Waxman.} And we want your responses by 9:00 a.m.
129 tomorrow morning.

130 Mr. {Walden.} Mr. Waxman, that would be 8:00. Yeah,
131 that is probably on time.

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132 Mr. {Waxman.} Okay.

133 Mr. {Walden.} All right. We will get back into regular
134 order here, and I will give my opening remarks.

135 The subcommittee meets today to continue our oversight
136 of the FCC's progress in implementing the spectrum provisions
137 Congress passed last year as part of that Middle Class Tax
138 Relief and Job Creation Act of 2012. While much has been
139 made of the incentive auctions, and those first of their kind
140 auctions are incredibly important, we also took concrete
141 steps to improve access to spectrum for unlicensed
142 technologies like Wi-Fi in the 5 gigahertz band. Today, we
143 will hear from witnesses that could give us an update on
144 their progress in implementing those sections and what
145 challenges exist to increased unlicensed use.

146 Unlicensed wireless technologies have become an
147 indispensable part of our information infrastructure in the
148 United States. As a complement to both our residential and
149 business wired internet connections, as well as a component
150 of our mobile wireless devices, Wi-Fi, perhaps the most
151 prolific use of unlicensed spectrum, has spread from its
152 humble origins in a technical community to near ubiquity. It

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153 now helps farmers in rural America allocate water and
154 fertilizer to meet the exact specific needs of crops, thus
155 increasing productivity and reducing costs. It has allowed
156 business of all kinds to more efficiently manage inventories,
157 distribution and manufacturing processing, thus increasing
158 productivity. It allows consumers to communicate on the go
159 and to watch the video services they want, where and when
160 they want to.

161 Unlicensed spectrum technologies have allowed all of us
162 to use devices that have made our lives safer and more
163 convenient, connected, informative and entertaining. It has
164 and will continue to help created billions of dollars of
165 economic growth and hundreds of thousands of jobs across all
166 of America.

167 Spectrum provisions that were signed into law last year
168 had their beginnings in this subcommittee. We instructed the
169 NTIA and the FCC to begin the process of bringing additional
170 spectrum into the unlicensed marketplace by first asking them
171 to assess the feasibility of doing so without causing harmful
172 interference to licensed operators already operating the
173 band. Just as we had a central focus on ensuring that

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174 broadcaster remained a viable service after the incentive
175 auction, so too did we have a focus on ensuring that new
176 unlicensed uses were in addition to and not interfering with
177 existing licensed services. The 5 gigahertz ecosystem is
178 teeming with existing uses from critical government radar
179 systems to commercial satellites. There are a host of
180 licensed services that are already deployed in this band.

181 Today, we will also hear from one of the promising but
182 unrealized license uses of this band, intelligent
183 transportation systems for smarter, safer vehicles. However,
184 it is important to also note that 5 gigahertz is also
185 currently being used for Wi-Fi and other unlicensed uses.
186 Thanks to technical rules that limit power and require
187 certain mitigation technologies, these systems are currently
188 meeting our licensed and unlicensed needs without interfering
189 with one another.

190 So we are looking forward to hearing from our very
191 qualified panel of witnesses this afternoon on both the
192 potential that this spectrum holds to fuel the next
193 generation of unlicensed wireless technologies and benefits
194 they would bring, but also the technical and economic

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195 challenges to making the most of this band. I think I speak
196 for many of my colleagues when I say that we are excited to
197 see the fruits of this subcommittee's labor come to fruition
198 in the form of faster and more abundant Wi-Fi, but not at the
199 expense of existing licensed services. These services can
200 coexist. And thanks to the hard work of the industries and
201 agencies represented by our witnesses today, we don't have to
202 choose between better internet access and safer cars. So I
203 thank you for being here. And I look forward to your
204 testimony.

205 [The prepared statement of Mr. Walden follows:]

206 ***** COMMITTEE INSERT *****

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|
207 Mr. {Walden.} With that, I would recognize the
208 gentleman, the vice chair of the subcommittee from Ohio, Mr.
209 Latta.

210 Mr. {Latta.} I thank the Chairman for yielding, and I
211 appreciate our panel of witnesses for being with us today.
212 And I look forward to hearing from your testimony today. I
213 am going to begin by thanking my colleague, the gentlelady
214 from California, Ms. Matsui, for working with me during our
215 consideration of the jump starting opportunity with the
216 Broadband Spectrum Act, which is ultimately included in the
217 larger Middle Class Tax Relief and Job Creation Act, to
218 include the language directing the FCC, NTIA and other
219 agencies to study spectrum sharing possibilities in the 5
220 gigahertz band.

221 In the past, we have discussed the Federal Government's
222 use of spectrum and the opportunities that exist for
223 improving their use of this valuable asset, as well as our
224 continued oversight of the upcoming incentive auction.
225 Today's hearing offers us yet another opportunity to examine
226 a portion of our Nation's overall spectrum policy. The 5

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227 gigahertz band presents a unique opportunity to spur
228 innovation and improve the performance of our licensed
229 spectrum network by offloading much of the mobile data
230 traffic to Wi-Fi hotspots.

231 While I understand and respect the concerns that will be
232 raised here today, I am confident the industry experts can
233 find a way to optimize this valuable real estate and avoid
234 harmful interference. The fact remains that we are in the
235 midst of a spectrum crunch. And to remain the world's
236 leading innovator and ensure consumer demand is met, we must
237 find ways to utilize spectrum more efficiently, making
238 decisions on technical merits rather than the politics of the
239 past.

240 Again, I would like to thank our witnesses for being
241 here today. I look forward to your testimony. And Mr.
242 Chairman, I yield back.

243 [The prepared statement of Mr. Latta follows:]

244 ***** COMMITTEE INSERT *****

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|
245 Mr. {Walden.} The gentleman yields back. The Chair
246 recognizes the gentlelady from California, Ms. Eshoo, ranking
247 member for opening statement.

248 Ms. {Eshoo.} Thank you, Mr. Chairman, and welcome to
249 our wonderful panel, amongst them my constituents. So
250 welcome. And I am sorry someone turned down the thermostat.
251 But just think, you are going to get back to California
252 before I do. So thank you for being here.

253 Given the tremendous growth in Wi-Fi usage and the need
254 to maintain our Nation's lead in developing gigabit Wi-Fi
255 technology, thank you, Mr. Chairman, for holding today's
256 hearing on the 5 gigahertz spectrum band.

257 The United States has been a world leader in unlicensed
258 spectrum, and I think that this is something that we can't
259 ever under-appreciate its importance and the importance that
260 we not just rest on our laurels, but that we continue to
261 build on that. I have what I would term as a love affair
262 with unlicensed. And I am very proud that in the spectrum
263 bill to have really used those two terms--those two words,
264 unlicensed spectrum, just over and over and over and over

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265 again to make sure that we honored what that represents for
266 our country and the innovation platform that it is. Now,
267 dating back to the FCC's decision nearly 30 years ago to open
268 up spectrum for unlicensed use, we have been on a very
269 important glide path since then. And since that time,
270 billions of devices have been sold, and technologies such as
271 Wi-Fi and Bluetooth. I can't live without Bluetooth. I
272 don't know about the rest of you. I mean, you get in the car
273 and, you know, you would be hauled off to jail in California
274 if you are seen holding any kind of device in your hand. So
275 it is a reminder to me of how practical the uses are, how
276 many they are and that they are really integrated into our
277 lives. They are household names. They are enjoyed by
278 millions of consumers around the country.

279 Now, by one estimate, in-home Wi-Fi alone may be
280 generating between \$4.3 and \$12.6 billion a year in U.S.
281 economic value. That is pretty serious money, even around
282 here. That is a lot. And I want to see it grow. When
283 adding the larger unlicensed ecosystem, the figure rises to
284 anywhere between \$50 and \$100 billion annually. But as Wi-Fi
285 demand has increased, so has congestion. And more than one

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286 member has already spoken of this, particularly in the high
287 trafficked areas such as airports, convention centers and
288 university campuses.

289 With congestion increasing and consumers demanding
290 faster data speeds, the FCC announced a proposal earlier this
291 year to unleash up to 195 megahertz of spectrum in the 5
292 gigahertz band for unlicensed use. In July, to ensure the
293 agency's timely implementation of the proposal, I wrote to
294 Acting Chairwoman Clyburn, along with Representatives Latta,
295 Matsui and Issa. In our letter, we emphasized the importance
296 of spectrum sharing and urged the FCC to proceed
297 expeditiously with collaboratively testing that includes both
298 incumbents and the Wi-Fi industry. I look forward to hearing
299 an update on these issues during today's hearing. And I know
300 that you are fully prepared for that, right? And good
301 answers for us. While the--happy answers.

302 While the 5 gigahertz band is an important component of
303 the 21st century unlicensed spectrum policy, it is
304 complementary and not a substitute for low-band spectrum
305 below 1 gigahertz. In fact, one such company who is
306 innovating in this space is Adaptrum, a Silicon Valley

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307 startup. And last week, they shared this story with a
308 bipartisan group of congressional staffers and explained how
309 the superior propagation factors found in the television band
310 will unlock new unlicensed innovations such as rural
311 broadband access which so many members of this committee on
312 both sides of the aisle have such a keen interest and
313 responsibility for, and expanded urban applications that
314 wouldn't be possible in higher bands of spectrum.

315 So I think the time to act is now. The FCC should move
316 expeditiously to harmonize existing rules and make more
317 spectrum available for gigabit Wi-Fi. And again, I want to
318 thank each one of our witnesses for being here today and
319 testifying. And at some point, maybe at the end of the
320 hearing, I'd like to get some great words of praise and
321 commendation to Roger Sherman. But I have certainly gone
322 past my time. And I yield back, Mr. Chairman. Thank you.

323 [The prepared statement of Ms. Eshoo follows:]

324 ***** COMMITTEE INSERT *****

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|

325 Mr. {Walden.} Gentlelady yields back.

326 Ms. {Eshoo.} And thank you for allowing Mr. Waxman and
327 all members for that unanimous consent request to--it was a
328 gentlemanly thing to do.

329 Mr. {Walden.} Happy to do it.

330 Ms. {Eshoo.} Um-hum.

331 Mr. {Walden.} So anyone on the Republican side seek the
332 last 5 minutes, or should we move on to the witnesses?

333 {Voice.} Move on.

334 Mr. {Walden.} All right. So we will expedite our
335 hearing and go to the experts. And we are delighted to have
336 each of you here. Thank you for your submitted testimony,
337 your willingness to give the abbreviated versions this
338 morning, or this afternoon, and take our questions. We will
339 lead off with the chief office--Chief of the Office of
340 Engineering and Technology of the Federal Communications
341 Commission, Mr. Julius Knapp. Julius, it is good to have you
342 back before the committee. We--I concur with Mr. Waxman. It
343 is always helpful as you translate technical engineering
344 issues into understandable policies. So the microphone is

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345 yours sir, and go ahead.

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346 ^STATEMENTS OF JULIUS KNAPP, CHIEF, OFFICE OF ENGINEERING AND
347 TECHNOLOGY, FEDERAL COMMUNICATIONS COMMISSION; JOHN KENNEY,
348 PRINCIPAL RESEARCH MANAGER, TOYOTA INFO TECHNOLOGY CENTER;
349 TOM NAGEL, SENIOR VICE PRESIDENT, BUSINESS DEVELOPMENT,
350 COMCAST; AND BOB FRIDAY, VICE PRESIDENT AND CHIEF TECHNOLOGY
351 OFFICER, CISCO

|
352 ^STATEMENT OF JULIUS KNAPP

353 } Mr. {Knapp.} Thank you. Good afternoon, Chairman
354 Walden, Ranking Member Eshoo and members of the subcommittee.
355 Thank you for this opportunity to provide you with the status
356 report of the FCC's efforts to provide more access to
357 unlicensed spectrum in the 5 gigahertz frequency band. As
358 the very title of this hearing reads, this process presents
359 numerous engineering challenges. But increased access to
360 unlicensed spectrum in this band could greatly accelerate
361 growth in expansion of new Wi-Fi technology, offering faster
362 speeds, increasing overall capacity and reducing congestion
363 at hotspots. Unlicensed spectrum has been a phenomenal

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364 success story. Innovations that utilize these airwaves
365 affect virtually every aspect of our daily lives, including
366 Wi-Fi networks that we use in our homes and at public
367 hotspots, Bluetooth technology for connecting mobile devices
368 with wireless headsets and speakers, and for connecting
369 computer tablets and keyboards, electronic keys for opening
370 car doors, identification badges for secure access to
371 buildings, and many other products that are too numerous to
372 mention. Unlicensed technologies have spurred creation of
373 entire new industries in jobs to the benefit of businesses,
374 consumers and our overall economy.

375 Congress recognized the importance of providing
376 additional spectrum for both licensed and unlicensed use in
377 the Middle Class Tax Relief and Jobs Creation Act. This law
378 specifically directs the NTIA and the FCC to examine the
379 potential for expanded unlicensed use in the 5 gigahertz
380 spectrum. In February of this year, the Commission adopted a
381 notice of proposed rulemaking, or NPRM, that satisfies the
382 requirements of Section 6406(a) of the Act. The Commission's
383 NPRM was focused on 3 separate portions of the 5 gigahertz
384 band. The first portion involves 100 megahertz of existing

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385 unlicensed spectrum at the low end of the band. The
386 Commission proposed to remove the restriction on indoor use
387 and to allow higher power consistent with the other parts of
388 the 5 gigahertz unlicensed spectrum. These actions would
389 make the spectrum much more usable for Wi-Fi and other
390 technologies.

391 The second portion of the NPRM would make 120 megahertz
392 of spectrum available in the middle of the 5 gigahertz band,
393 essentially filling in the gap that exists in the existing 5
394 gigahertz spectrum. It would create a large contiguous
395 block. This would allow more flexibility to accommodate the
396 greater bandwidths of the latest technologies. This band is
397 used by the Department of Defense and a number of other
398 federal agencies.

399 The third portion would make 75 megahertz of spectrum
400 available to extend the upper end of the 5 gigahertz
401 unlicensed band. This spectrum is allocated for intelligent
402 transportation services such as the dedicated short range
403 communication systems, or DSRC, for vehicle to vehicle and
404 vehicle to infrastructure technology. These actions would
405 make up to 195 megahertz of additional spectrum available for

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406 unlicensed use in the 5 gigahertz band, a 35 percent increase
407 of the 555 that is available there now. They would also
408 enable greater use of the latest industry Wi-Fi standard
409 802.11ac that uses wider channel bandwidths of up to 160
410 megahertz to provide data rates of 1 gigabit per second or
411 more.

412 Because of the existing incumbent users in the three 5
413 gigahertz band, making more spectrum usable, or usable at all
414 for unlicensed use will be challenging. But the importance
415 of the 5 gigahertz band and the benefits of unlicensed
416 spectrum generally are clear, and the Commission has
417 indicated its strong desire to move forward in seeking to
418 resolve these challenges.

419 Finally, I want to emphasize that the Commission has not
420 proposed to take away any incumbent user's right to operate
421 as a licensed service in the 5 gigahertz band. As with all
422 unlicensed services, these devices may not cause harmful
423 interference to licensed services and must accept whatever
424 interference that they receive. It is my hope that all
425 parties will work together in good faith to overcome these
426 technical and policy challenges, and that we will be able to

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427 find a way to effectively share the spectrum that I describe
428 today. Thank you, and I look forward to your questions.

429 [The prepared statement of Mr. Knapp follows:]

430 ***** INSERT 1 *****

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|
431 Mr. {Walden.} Mr. Knapp, thank you for your
432 presentation and your testimony, and we look forward to
433 speaking with you more about that. We are going to go now--
434 make sure I get the right title--to Mr. Kenney, who is the
435 Principle Research Manager for Toyota Info Technology Center.
436 Mr. Kenney, we are delighted to have you here today. We look
437 forward to your testimony as well, sir. Go ahead.

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438 ^STATEMENT OF JOHN KENNEY

439 } Mr. {Kenney.} Chairman Walden, Ranking Member Eshoo,
440 members of the subcommittee, thank you for the opportunity to
441 testify before you today. My name is John Kenney. I am a
442 principal researcher at the Toyota Info Technology Center in
443 Mountain View, California, where I lead our vehicular
444 networking research team.

445 Despite remarkable advances in the crashworthiness of
446 vehicles, tens of thousands of Americans are still dying in
447 traffic accidents each year. We firmly believe that the next
448 great opportunity to reduce fatalities rests with
449 technologies that will prevent crashes in the first place.
450 Dedicated short range communication, or DSRC, is such a
451 technology. DSRC enables vehicles to communicate with each
452 other. DSRC vehicles broadcast precise information such as
453 location, speed and acceleration several times per second
454 over a range of a few hundred meters. Other DSRC vehicles
455 receive these messages, use them to determine if any
456 neighboring vehicles pose a collision threat, and then warn

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457 drivers of those threats. DSRC vehicles can also receive
458 safety-related information from roadside infrastructure such
459 as the state of an upcoming traffic light or the presence of
460 ice, a disabled vehicle or a pedestrian in the road.

461 NHTSA concluded that connected vehicle technology has
462 the potential to address approximately 80 percent of crashes
463 involved non-impaired drivers. They further determined that
464 DSRC at 5.9 gigahertz is ``the only communication option at
465 this time capable of effectively and reliably providing the
466 safety of life capability.'' DSRC can and almost certainly
467 will be used for other non-safety applications.

468 Just as the Internet has moved far beyond its original
469 email and file transfer applications, DSRC is also likely to
470 unleash innovative connected car applications that go far
471 beyond collision avoidance. I recognize that there is some
472 skepticism about DSRC and concerns that the benefits are
473 being overstated, or that the automakers will never bring the
474 technology to market. I can assure you that Toyota is
475 committed to DSRC as a critical safety technology. We have
476 already commercialized DSRC in other markets and would like
477 to bring it to drivers in the United States in the near

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478 future.

479 And we are not alone in this. The auto industry has
480 been working hard here in the United States to pave the way
481 for DSRC deployment, leading to the publication of core
482 technical standards in 2009 and 2010. U.S. DOT is also
483 conducting research and field testing with Toyota and other
484 automobile companies to prepare for widespread deployment of
485 crash avoidance systems that use DSRC. At this point, pre-
486 production prototypes have been developed and are currently
487 supporting large scale evaluations of applications that
488 address the most critical crash scenarios.

489 In August, Toyota and seven other automakers completed a
490 year-long connected vehicle pilot program with U.S. DOT in
491 Michigan. The model deployment, which included nearly 3,000
492 DSRC vehicles, demonstrated vehicle to vehicle applications
493 in real world driving scenarios and verified the maturity and
494 stability of the standards. The results from the pilot are
495 expected to inform a regulatory decision by the agency of
496 DSRC technology by the end of this year.

497 As you are well aware, the FCC issued an NPRM earlier
498 this year that solicited comments on opening the 5.9

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499 gigahertz spectrum to unlicensed devices. Toyota is not
500 conceptually opposed to sharing the spectrum and believes
501 that it may be possible for DSRC and unlicensed devices to
502 coexist in the band. However, we also believe that the
503 creation of a sharing framework, or the implementation of
504 sharing rules, should not be considered unless and until,
505 one, a viable sharing spectrum sharing technology is
506 identified and, two, rigorous testing verifies that there is
507 no harmful interference from unlicensed devices.

508 Interference that results in delayed or missed driver
509 warnings will undermine the system's entire foundation,
510 rendering it essentially useless and putting the future of
511 DSRC technology in the United States at risk. Although we
512 are strongly committed to it, the automobile industry cannot
513 responsibly deploy safety of life, DSRC technology, unless
514 the possibility of harmful interference from unlicensed
515 devices is ruled out.

516 Toyota is committed to helping validate a technical
517 sharing solution once one has been identified. We have been
518 actively engaged with the Wi-Fi community and other
519 stakeholders who are exploring possible sharing solutions

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520 that alleviate any risk of harmful interference from
521 unlicensed devices. But we are not there yet, and it is
522 going to take more time to see if we can get there. Until
523 then, the FCC should refrain from taking any further action
524 in the 5.9 gigahertz band.

525 Thank you. I look forward to your questions.

526 [The prepared statement of Mr. Kenney follows:]

527 ***** INSERT 2 *****

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|
528 Mr. {Walden.} Mr. Kenney, thank you for testifying. We
529 will now turn to Mr. Nagel. Tom Nagel is the Senior Vice
530 President of Business Development at Comcast. Mr. Nagel,
531 thank you for being with us. And please, go ahead.

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|

532 ^STATEMENT OF TOM NAGEL

533 } Mr. {Nagel.} Chairman Walden, Ranking Member Eshoo and
534 members of the subcommittee, thank you for the opportunity to
535 testify. I am pleased to discuss the many benefits of Wi-Fi
536 and how the 5 gigahertz band is critical to ensuring Wi-Fi
537 continues to serve as a platform for innovation, investment
538 and economic growth, all without harming incumbent users.

539 At Comcast, one of my primary responsibilities has been
540 the strategic development of our wireless efforts, and in
541 particular our Wi-Fi efforts. Comcast operates a Wi-Fi
542 network that has expanded exponentially in less than 2 years,
543 from 5,000 access points last year to nearly 350,000 access
544 points today. We have also partnered with other cable
545 operators to give our customers access to more than 100,000
546 hotspots, with many more to come.

547 My experience in building and operating Comcast networks
548 shows me firsthand the important role that Wi-Fi plays in the
549 broadband marketplace. Consumers use Wi-Fi for cost
550 effective and robust wireless access to the Internet. And

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551 various studies confirm that unlicensed services like Wi-Fi
552 contribute tens of billions of dollars in economic value each
553 year.

554 Wi-Fi networks have also proven to be valuable during
555 emergencies. In the aftermath of Hurricane Sandy last year
556 and the attack of the Boston Marathon this year, licensed
557 wireless networks were temporarily overloaded or down
558 completely. In both cases, Comcast opened its Wi-Fi network
559 to provide free access to anybody with a Wi-Fi enabled device
560 so that people could receive urgent information and
561 communicate with loved ones. All consumers with a Wi-Fi
562 enabled device can use Wi-Fi, regardless of their wireless
563 carrier. So it is a powerful and flexible tool in
564 emergencies.

565 However, two challenges stand in the way of its
566 continued growth. First, the spectrum used in Wi-Fi today is
567 severely congested, especially in densely populated areas.
568 And without quick action, consumers will begin to experience
569 reduced Wi-Fi performance. To address this problem, we must
570 ensure there is sufficient unlicensed spectrum to meet
571 growing consumer demand. The 5 gigahertz band is critical to

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572 this effort. Second, the next generation of Wi-Fi, often
573 called gigabit Wi-Fi, requires larger channels than are
574 currently available and technical rules that facilitate
575 reasonable deployments. Gigabit Wi-Fi can only be done in
576 the 5 gigahertz band. If we fail to make the necessary
577 changes, we risk falling behind other nations that will
578 deploy the next generation of Wi-Fi.

579 Fortunately, Congress, the Administration and the FCC
580 have already taken steps towards addressing these challenges.
581 Comcast commends Congress and this committee for passing the
582 Spectrum Act of 2012 which specifically identified the 5
583 gigahertz band as a powerful and unique resource for Wi-Fi.
584 And we strongly support the FCC's implementation efforts.
585 The FCC has proposed two unlicensed bands in the 5 gigahertz
586 and sensible changes to existing bands. These improvements
587 are essential to relieving the existing Wi-Fi congestion and
588 providing enough spectrum to support gigabit Wi-Fi.

589 Importantly, under the FCC's proposals, Wi-Fi will be
590 able to share the 5 gigahertz band without causing harmful
591 interference to existing users. This approach maximizes the
592 value of spectrum for all Americans. Although portions of

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593 the 5 gigahertz band may present complicated technical
594 issues, in some sub-bands, the FCC has a clear path to move
595 forward now. Specifically, the FCC should adopt its proposed
596 rule changes in the UNII-1 band, which would make 100
597 megahertz available for Wi-Fi almost immediately.
598 Importantly, the Department of Defense recently announced it
599 does not need access to UN81. That means that just one
600 company uses all 100 megahertz for a small group of
601 customers. And technical studies have shown that proposed
602 rule changes would not cause harmful interference to the
603 incumbent in the band. And this should be our top near-term
604 priority.

605 Comcast is also enthusiastic about expanding Wi-Fi
606 operations to the UNII-4 band. We have reached out to the
607 ITS companies to find a sharing solution that protects ITS
608 and allows for Wi-Fi investment. Now is the perfect moment
609 to do so because there are no commercially deployed ITS
610 vehicles using the 5 gigahertz band. We are willing to be
611 flexible to ensure that ITS is protected. We ask that the
612 ITS interests also agree to be flexible.

613 There is a solution to be had. The days where

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614 incumbents can hold exclusive rights to unutilized or
615 underutilized spectrum have long since passed. Wi-Fi
616 services in the 5 gigahertz band will offer enormous economic
617 benefits and social benefits. Comcast is committed to
618 working with Congress, the Administration, the FCC and
619 incumbents to reach solutions that will maximize the value of
620 the 5 gigahertz band to this Nation. Thank you, and I look
621 forward to your questions.

622 [The prepared statement of Mr. Nagel follows:]

623 ***** INSERT 3 *****

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|

624 Mr. {Walden.} Mr. Nagel, thank you for your testimony.
625 We appreciate it. And now we go to Bob Friday, who is the
626 Vice-President and Chief Technology Officer of Cisco. Mr.
627 Friday, thank you for joining us. We look forward to your
628 testimony, sir.

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|

629 ^STATEMENT OF BOB FRIDAY

630 } Mr. {Friday.} Chairman Walden--

631 Mr. {Walden.} And if you could just touch that little
632 microphone button there?

633 Mr. {Friday.} So Chairman Walden, Ranking Member Eshoo
634 and members of the subcommittee, thank you for the
635 opportunity to appear before you today. It is an honor. Mr.
636 Chairman, we are in the midst of a technology revolution to
637 mobilize the Internet. And it is transforming the way
638 Americans and billions of people around the world
639 collaborate, communicate and connect to the Internet. The
640 education customers I work with are incorporating video,
641 mobile applications into their curriculum with up to 100
642 students in auditoriums, accessing the network
643 simultaneously. Health customers are relying on Wi-Fi to
644 educate patients--devices and provide nurses instant access
645 to medical records, and manufacturing customers are
646 increasingly Wi-Fi to enable workers on the factory floor to
647 have real-time video conversations with experts anywhere in

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648 the world.

649 What do these things all have in common? They all
650 depend on Wi-Fi for connectivity. In these areas and so many
651 more, Wi-Fi has become a central way for people to access the
652 Internet. But a new challenge has emerged due to Wi-Fi's
653 spectacular success. There is a looming spectrum crunch in
654 front of us, which if not addressed will slow activity,
655 economic growth, and economic technology leadership and
656 mobility. The Wi-Fi--the widespread adoption of Wi-Fi, it
657 began in the early 2000s when most of us here got us first
658 taste of mobile Internet at our homes, coffee shops, hotels
659 and airports. Today, Wi-Fi's reach has expanded into the
660 workplace, air travel and many other locations. And Wi-Fi
661 will become a critical complement, a safety valve if you
662 will, to our cellular networks in helping offload mobile
663 Internet traffic from our licensed spectrum.

664 By 2017, 66 percent of all mobile Internet traffic,
665 fully two-thirds, will either start or end on a Wi-Fi
666 network. Without offloading licensed spectrum networks, we
667 will simply be overwhelmed. In just over a decade, Wi-Fi has
668 become a dynamic economic driver leading to over 37 billion

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669 dollars of economic value for the U.S. economy every year.
670 And it is the foundation for a whole new mobile app economy
671 that it has created more than 500,000 new jobs since 2007.

672 The development of Wi-Fi is one of the great American
673 innovation stories. Thirty years ago, unlicensed spectrum
674 was considered junk or garbage spectrum, a place for
675 tinkerers and/or vendors to build low-powered devices of
676 limited use. Then the FCC came up with a simple ideal,
677 change the rules to allow spectrum technologies to share
678 unlicensed bands with the one caveat, no harmful interference
679 to incumbent users. Innovators and entrepreneurs rushed in.
680 Wi-Fi was born, and the results have been breathtaking. Six
681 billion Wi-Fi enabled devices have been shipped since 2000,
682 and this number is expected to grow to 15 billion by 2017.
683 Wi-Fi has become the industry standard alongside cellular for
684 connecting to the Internet now.

685 Wi-Fi will be a driver in the development of the
686 Internet as well. We are moving to an Internet of everything
687 that will connect people, process, data and things that is
688 leading to profound changes in manufacturing, agriculture,
689 energy and dozens of other sectors. But this potential is

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690 limited by the looming spectrum crunch.

691 So what can be done here? The industry has a major role
692 to play, particularly in the development and deployment of
693 next generation of Wi-Fi known as 802.11ac. This technology
694 is more efficient and can handle vastly more traffic than
695 previous generations. It will deliver throughputs of 1
696 gigabit per second or faster, hence the name gigabit Wi-Fi.
697 Here in front of me, I have the first Cisco gigabit Wi-Fi
698 access point. In June of 2013, it became the first
699 enterprise access point to have a gigabit Wi-Fi
700 certification, 1 of over 190 devices that have been certified
701 to date. So gigabit Wi-Fi is real. It is here. It is
702 needed to meet the exploding demand for video. But to
703 realize that full potential of gigabit Wi-Fi, wider bands of
704 contiguous spectrum are needed. So policymakers have a major
705 role to play as well providing more spectrum.

706 The Energy and Commerce Committee led the way in 2012
707 when you directed the FCC and NTIA to study the feasibility
708 of sharing additional spectrum for Wi-Fi in the 5 gigahertz
709 span. And I want to thank you for your leadership on this,
710 as well as the effort to establish voluntary incentive

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711 auctions. To be sure there are some significant technical
712 challenges in the 5 gigahertz band, it is not clear spectrum.
713 It contains incumbent uses important for national security
714 and public safety. And it is imperative that Wi-Fi not
715 create harmful interference to these incumbent systems. And
716 Cisco will not settle for less. Yet with the leadership from
717 the FCC and the NTIA, and the cooperation of our industry
718 partners, we are confident that technology solutions to these
719 challenges can and will be found.

720 The bottom line, adding more spectrum for broadband and
721 Wi-Fi will lead to new ecosystems, new industries, new jobs,
722 as well as help ensure economic technological leadership
723 around the globe.

724 Cisco stands ready to work with this committee and other
725 policymakers to find solutions to the important challenges
726 before us, and I want to thank you for your time.

727 [The prepared statement of Mr. Friday follows:]

728 ***** INSERT 4 *****

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|

729 Mr. {Walden.} Mr. Friday, thank you. And I think we
730 all agree, this is a huge opportunity for the country for
731 innovation and technology for new jobs, new devices,
732 replacement of all our existing devices so we can communicate
733 faster.

734 I have a question for the group. Qualcomm, which
735 manufactures equipment for both intelligent transportation
736 applications and Wi-Fi, has suggested that moving ITS
737 operations to the top of the ITS band and then excluding them
738 from sharing with Wi-Fi would solve many of the challenges in
739 the UNII-4 band. I'd like to ask unanimous consent to enter
740 into the record to the comments of Qualcomm in the FCC's
741 proceedings on this matter without objection.

742 [The information follows:]

743 ***** COMMITTEE INSERT *****

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|
744 Mr. {Walden.} So, Mr. Friday, let's start with you. Do
745 you agree with Qualcomm's approach?

746 Mr. {Friday.} So if we look at Qualcomm, we think the
747 proposal has merit in terms of spectrum efficiency. We think
748 it may be a little late in the game, given that ITS is as far
749 down the path as they are. So yes, we think it has merit,
750 but we think it may be a little late to the discussion.

751 Mr. {Walden.} Does that mean it is too late for the
752 discussion?

753 Mr. {Friday.} No, I don't think it is too late. I
754 think it is something that is worthy to take a look at. But
755 I think we acknowledge that the ITS has done a lot of work on
756 the DSRP.

757 Mr. {Walden.} Right.

758 Mr. {Friday.} And we are sensitive to that.

759 Mr. {Walden.} Okay. Mr. Knapp, is there anything about
760 the top of the ITS band, as opposed to the bottom, that would
761 moot the work that has been done over the last decade on ITS?

762 Mr. {Knapp.} Sir, I think ITS has envisioned that it
763 would have the entire 75 merits, and has been planning for

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764 that. So we did not tee up the question of whether we should
765 change the allocation. And generally, with unlicensed, it
766 shares on an un-interference basis, so it would be a
767 completely different direction than was teed up in the
768 Commission's notice.

769 Mr. {Walden.} Mr. Kenney, if this arrangement did
770 indeed prevent harmful interference to ITS, would Toyota
771 support such an outcome?

772 Mr. {Kenney.} Sir, first of all, we appreciate our
773 friends from Qualcomm stepping up with this idea. We invite
774 everyone to put ideas on the table. We think that there are
775 a couple of fundamental problems with it, which we have
776 documented in our FCC filings. One of them is that it has a
777 premise that all of the safety critical communication could
778 be compressed into one or two channels. And the fact is that
779 is just not true. With the plans that we have for using the
780 spectrum for collisions avoidance, for public safety, for
781 automated driving, for security, for a number of other
782 things, we need all of the spectrum, and we plan to have
783 safety critical communication in all of it. So that premise
784 that underlies their proposal just doesn't quite bear out.

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785 The second motivation that they offered for putting this
786 forward was that it was a way to streamline this whole
787 process, perhaps to--it may be something we can all agree to
788 in this space of a couple of months and skip all of this.
789 But that misses the point that we have been--for our v-to-v
790 collision avoidance work, we have been concentrating on
791 testing rigorously, and with our current band plan. And if
792 we were to change and reshuffle the deck, so to speak, we
793 would need to repeat a lot of that testing. We would incur a
794 lot of delay. We would have to worry about cross channel
795 interference issues, for an example that we haven't had to
796 worry about yet.

797 Mr. {Walden.} Sure. So let me ask you two questions.
798 I think you began this effort '93 or thereabouts. How--what
799 is your timeline do you think--and I realize you are
800 innovating as you go, trying to get this right. And the
801 second point, are there non-sort of safety security
802 communications in the 75 megahertz of band--in other words,
803 is it all critical safety, or are there other offerings that
804 could be moved somewhere else?

805 Mr. {Kenney.} Yeah. So with the regard to the timeline

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806 question, as you probably know, we are at a fairly critical
807 point waiting for the NHTSA regulatory direction. There are
808 a number of different deployment paths we can take once we
809 get that direction. It will become much clearer. But we are
810 at a pre-deployment phase. We--our technology is mature.
811 The fact that our European colleagues are committed to deploy
812 this in only 2 years from now is evidence of that.

813 Mr. {Walden.} Are they using the same band?

814 Mr. {Kenney.} Yeah, they are--well, they are using a
815 subset of it. They have 30 megahertz that is the subset of
816 our 75.

817 Mr. {Walden.} And are they able to do everything there
818 that you are proposing to do here?

819 Mr. {Kenney.} Well, they are planning to augment that
820 with two additional allocations as time goes on. So they are
821 starting with 30, then they are going to go to 50 and then
822 they are going to go to 70. So it would be 70 that matches
823 us.

824 Mr. {Walden.} Is the 30 admission critical? Is it
825 safety security first?

826 Mr. {Kenney.} Yeah, that is what they are starting

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827 with.

828 Mr. {Walden.} And is the other, will it be safety? Or
829 is it additional--

830 Mr. {Kenney.} I think that it remains to be seen. What
831 they are saying is that the middle 30--their 30 is in the
832 middle of our 70, if you will. And that is safety critical.
833 They are planning to put some non-safety applications in the
834 next 20.

835 Mr. {Walden.} What would that be? Give me an example.

836 Mr. {Kenney.} Examples of that might be infrastructure
837 to vehicle communication to provide navigation assistance or
838 traffic updates.

839 Mr. {Walden.} Okay.

840 Mr. {Kenney.} Or even commercial services to tell you
841 what you can access in the road up ahead.

842 Mr. {Walden.} I see. All right.

843 Mr. {Kenney.} But to come to your second question then.

844 Mr. {Walden.} Yeah.

845 Mr. {Kenney.} Yes, there are non-safety critical
846 communications that will be in our band. But they won't be--
847 they won't have a dedicated channel. They will be mixed in

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848 at a lower priority below, if you will, the safety critical
849 communication that we planned to put in these channels.

850 Mr. {Walden.} I see. Yeah. All right. Thank you, Mr.
851 Kenney. My time has expired. I will turn to my friend from
852 California, Ms. Eshoo, for 5 minutes.

853 Ms. {Eshoo.} Thank you, Mr. Chairman. And thank you to
854 each one of you, important and very interesting testimony.

855 I want to start out, Mr. Nagel, by thanking you and
856 Comcast for what you did during the tragedy in Boston by--you
857 know, for the use of your network. And you know, it is
858 stories like that that always remind me in the hearing room
859 or whatever I am doing here that we have a wonderful sense of
860 unity about us, even though we have got lots of problems,
861 challenges, some we create, others are there and we have to,
862 you know, address them. But it is wonderful to hear you talk
863 about that. And so I salute you. I think the entire
864 committee does. Thank you.

865 Mr. Knapp, I leaned over and I said to my colleagues,
866 Henry said that Mr. Knapp is terrific at breaking down
867 everything so we can understand it, and I am having a hard
868 time understanding you. So I want to dig into your testimony

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869 and see where we are making some progress here. The DoD
870 recently indicated that it doesn't intend to add additional
871 systems to the 5150 and the 5250 megahertz band, also known
872 as UNII-1 band. Do you think that the FCC can proceed to
873 make the band available for higher power outdoor Wi-Fi
874 services on an expedited basis?

875 Mr. {Knapp.} So--

876 Ms. {Eshoo.} Because that would be an important step, I
877 think.

878 Mr. {Knapp.} Yeah, we are certainly considering that.
879 The issue--

880 Ms. {Eshoo.} Seriously? You are--are you considering
881 it seriously?

882 Mr. {Knapp.} Whether we can address that lower piece
883 first, it was not a subject to the additional studies.

884 Ms. {Eshoo.} Uh-huh.

885 Mr. {Knapp.} But just to be clear, there were
886 oppositions that were filed by the satellite industry.

887 Ms. {Eshoo.} Um-hum.

888 Mr. {Knapp.} And we are busy analyzing that work.

889 Ms. {Eshoo.} I see. Okay. Well, that is hopeful. To

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890 Mr. Friday at Cisco, thank you again. You brought a very
891 important and hopeful message to us in terms of what all of
892 this represents. It is my understanding that Cisco is
893 advocating a listen, detect, avoid approach to successfully
894 manage interference at the 5.9 mega--gigahertz. Does this
895 mean that Wi-Fi and DSRC could coexist peacefully? Put your
896 microphone on. I am dying to hear your answer.

897 Mr. {Friday.} Yeah. No. Thank you.

898 Ms. {Eshoo.} Yeah.

899 Mr. {Friday.} No. Thank you for the question. And,
900 yes, Cisco has proposed a solution to co-share the band with
901 DSRC.

902 Ms. {Eshoo.} Um-hum.

903 Mr. {Friday.} We have looked at DSRC. The roots of
904 DSRC comes from .11.

905 Ms. {Eshoo.} Um-hum.

906 Mr. {Friday.} So compared to radar, it has the same DNA
907 as .11. We think there is a relatively easy way to share the
908 band and be able to detect DSRC signals and basically vacate
909 the band within the blink of an eye once we detect those
910 signals.

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911 Ms. {Eshoo.} Excellent. So to Mr. Kenney, what Mr.
912 Friday just described sounds exciting to me and reasonable.
913 Do you agree?

914 Mr. {Kenney.} Yes.

915 Ms. {Eshoo.} Good.

916 Mr. {Kenney.} So as to echo my earlier statement, we
917 are very happy that Cisco has stepped up with this idea, and
918 we think that it has real potential. The fact that there is
919 this common DNA, if you will, between the DSRC underlying
920 technology and Wi-Fi is a positive that makes it so that they
921 should be able to detect us and vacate the channel when they
922 detect us.

923 Ms. {Eshoo.} Um-hum. Um-hum. And to Mr. Friday and
924 Mr. Nagel, can you describe the difference in consumer
925 experience between existing Wi-Fi and gigabit Wi-Fi?

926 Mr. {Nagel.} Sure. You know, today what we have is we
927 have a Wi-Fi environment. We have all spoken about how we
928 all use it. It is highly digestible. It is in everywhere we
929 are. And I think one of the things we are experiencing today
930 is that we use it a lot. And so one of the components of
931 that experience is is that in certain places we get

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932 congestion, and the things we want to do aren't we can't do
933 the as much as we used to. What gigabit Wi-Fi does is that
934 it really begins to expand our ability to drive very, very
935 high rates of information to not just one device but multiple
936 devices, maybe even hundreds of devices. And so the platform
937 that is getting built for an individual user will feel
938 faster. It will feel better. It will feel like I am more
939 connected. Just like I always had an Ethernet, you know,
940 cord right into the back of my device that none of our
941 devices have, it will feel very similar to that.

942 Equally importantly though, as you think about gigabit
943 Wi-Fi, there is a consumer experience side. But once you
944 build it, then you have this platform that you mentioned, you
945 know, rightly which is it is an innovation platform. Once
946 you build it, you're going to have lots of companies that
947 come out and begin to go deeper and build great things we
948 don't even know about today.

949 Ms. {Eshoo.} Um-hum. Wonderful. Do I still have some
950 time?

951 Mr. {Friday.} And to add on what Tom was saying is--

952 Ms. {Eshoo.} Um-hum.

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953 Mr. {Friday.} The customers that we are working with
954 right now, like in the universities and higher ed, the use
955 cases that we are seeing are in these auditorium and
956 classroom cases where they are actually getting into a
957 congestion problem where students cannot get access to the
958 curriculum on time.

959 Ms. {Eshoo.} Um-hum. Um-hum.

960 Mr. {Friday.} So that is where Wi gig brings the
961 capacity we need to be able to solve these--these type of use
962 cases. The other consumer use case we are seeing right now
963 is in our healthcare industry.

964 Ms. {Eshoo.} Um-hum.

965 Mr. {Friday.} You know, the healthcare industry has
966 been probably at the leading edge of adopting a Wi-Fi. You
967 know, when you go into these hospitals now, besides the
968 nurses, we have connected probably more devices in the
969 healthcare space--and this is becoming a critical issue now
970 of how to make sure that all these healthcare--

971 Ms. {Eshoo.} No, I have seen it at Lucile Packard
972 Children's Hospital in the operating room.

973 Mr. {Friday.} Yeah. And it has become--

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974 Ms. {Eshoo.} Yeah.

975 Mr. {Friday.} You know, they--you know, the healthcare
976 industry is a good example where they have become highly
977 reliant on Wi-Fi to connect the sensors to all the people.

978 Ms. {Eshoo.} Thank you very much. Mr. Chairman, I am
979 sure I have gone past my time. Thank you.

980 Mr. {Walden.} You are welcome. I will turn now to the
981 vice chair of the full committee, Ms. Blackburn, for 5
982 minutes.

983 Mrs. {Blackburn.} Thank you, Mr. Chairman. I want to
984 thank all of you for being here. And, Mr. Friday, and I want
985 to thank you for mentioning the healthcare. We see so much
986 of this in Nashville, and there is a tremendous amount of
987 cross-usage and innovation. And one of the things we hear
988 regularly from people is, you know, what are we going to do
989 about the spectrum crisis that is coming and as they do
990 connect more healthcare devices. We are seeing firsthand how
991 important that is going to be.

992 I want to ask you a question. Going into your
993 testimony, you said that a successful outcome to the FCC's
994 current examination of 5 gigahertz means that Wi-Fi cannot

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995 create harmful interference to those incumbent systems. So
996 let us touch on that for just a minute. And see here, tell
997 me what you think needs to happen to find a solution that
998 protects against harmful interference to the incumbents, and
999 also accommodates some of these new unlicensed devices and
1000 technologies that can continue to help grow the economy but
1001 also expand the usage, the healthcare--we have a lot of
1002 entertainment product in Nashville that is trying to share
1003 the space. We had--I see your heads all nodding. Last week
1004 was CMA week in Nashville. And, of course, with all the
1005 performances and tours, this is something that we discussed a
1006 good bit. So if you will just speak to that for a couple of
1007 minutes? I think I have got constituents that would be
1008 interested to hear your answer.

1009 Mr. {Friday.} Yeah, so when you look where unlicensed
1010 started with, the whole premise was sharing without harmful
1011 interference to the incumbents. You know, the journey
1012 started back in the '80s with spread spectrum, and that was
1013 kind of the initial technology that we brought to share the
1014 spectrum. DFS was the next technology we brought to share
1015 with the radar bands, and USIS. The work we are working with

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1016 the ITS community right now is really another detection
1017 technology. In this case, we think it is a relatively simple
1018 technology since we have the same DNA. You know, when we
1019 look forward in how we can share the other bands, we are
1020 looking to new technologies like databases. You know, and we
1021 believe that, you know, as we move into this mobile Internet
1022 world, you know, given spectrum as a fixed resource, you
1023 know, we are going to have to start developing more sharing
1024 technologies to keep up with the mobile demand that we see
1025 happening in that space.

1026 Mrs. {Blackburn.} Okay. Mr. Nagel, did you want to
1027 comment on that?

1028 Mr. {Nagel.} You know, I think the Wi-Fi area in
1029 general is a great way to take fantastic broadband speeds we
1030 are all used to that are sitting at our desk in our home, in
1031 our office and make it available outside of that, that
1032 footprint. It is mobile broadband, and it is probably the
1033 best implementation of it to where you can do really, really,
1034 really fast speeds. Gigabit Wi-Fi is one of those things
1035 that allows us to do that. And it is one of the reasons why
1036 we are here is because we won't be able to do those things if

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1037 we don't solve some of these spectrum issues, especially in
1038 the unlicensed band in the 5 gigahertz, both at the lower end
1039 but also at the upper end.

1040 I think when you think about--if you look at what is
1041 happening in the UNII-1, that especially with the DoD saying
1042 they don't need access to it, it is a great place for us to
1043 begin to bring rural spectrum and be able to bring it to bear
1044 quickly. So if we decided to do that, the FCC ruled that
1045 way. Your devices you have in your hand today, the access
1046 points that we are deploying can utilize that spectrum very,
1047 very quickly. So we would be able to alleviate rural
1048 spectrum crunches in those locations in places that are
1049 education, healthcare, those types of things. Where people
1050 are gathered, Wi-Fi is a fantastic solution. And it is why
1051 we need those spectrum to do more of that, but also broader
1052 channels so we can do more of it at the same time in the same
1053 location. So it is solving both problems, more unlicensed
1054 spectrum and then also aggregating the channels so we can get
1055 the gigabit Wi-Fi working at the same time.

1056 Mrs. {Blackburn.} Okay. Mr. Knapp, let me ask you
1057 this. We talked a little bit--Mr. Nagel mentioned in his

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1058 testimony UNII-1. And I want to ask you if you think with
1059 one company operating in that 100 megahertz if the FCC has
1060 the information to act now on sharing in that space?

1061 Mr. {Knapp.} So the issue in that space is simpler than
1062 the sharing we are talking about in the other bands. We have
1063 a full record. I expect there will be ongoing dialog on the
1064 1 issue that is outstanding, and that is the sharing with the
1065 satellite service. Bear in mind that the services that are
1066 allocated spectrum, and in this case satellite, are protected
1067 against interference from unlicensed. So whatever we do here
1068 needs to assure that there won't be interference to the
1069 satellite service.

1070 Mrs. {Blackburn.} Right. I appreciate that. I just
1071 think that as we--regardless of which space it is, I think it
1072 is incumbent upon us to make certain that we are using it
1073 wisely. Yield back.

1074 Mr. {Walden.} Gentlelady yields back. At this time,
1075 the chair recognizes the gentleman from Michigan. Thank you.

1076 Mr. {Dingell.} Mr. Chairman, I thank you for your
1077 courtesy. I commend you for the hearing. I have a number of
1078 questions which will require simple yes or no answers.

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1079 From the onstart, I do recognize economic and
1080 technological benefits associated with wireless growth.
1081 However, with regard to unlicensed use in the 5850-5925
1082 megahertz band, I believe that we can all agree that
1083 protecting vehicle occupant safety is a goal of paramount
1084 importance. To that end, I reference the Federal
1085 Communications Commission Acting Chairman Clyburn's November-
1086 -rather September 26 letter to me stating users of part 15
1087 devices must not cause harmful interference to the licensed
1088 services in the 5 Ghz band.

1089 To Mr. Knapp, is it correct that the National
1090 Telecommunications and Information Administration, NTIA,
1091 released a report on unlicensed use of the 5350-5470
1092 megahertz and the 5850-5925 megahertz bands in January 2013,
1093 yes or no?

1094 Mr. {Knapp.} Yes.

1095 Mr. {Dingell.} Now, Mr. Knapp, I believe it is also
1096 correct that NTIA's report identified a number of
1097 interference risks in the 5925 megahertz band associated with
1098 unlicensed use, included--and concluded that further study
1099 and analysis is necessary in order to mitigate such risks, is

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1100 that correct?

1101 Mr. {Knapp.} That is correct. Yes.

1102 Mr. {Dingell.} Now, Mr. Knapp, is it true that the
1103 Federal Communications Commission's February 20, 2013, Notice
1104 of Proposed Rulemaking seeks comments on harmful interference
1105 protection requirements to permit gigabit Wi-Fi devices to
1106 operate in the 5 gigahertz bands, yes or no?

1107 Mr. {Knapp.} Yes.

1108 Mr. {Dingell.} Now, Mr. Knapp, is it true that
1109 Associate Administrator Karl B. Nebbia of the Office
1110 Inspector Management at NTIA sent you a letter dated June 10,
1111 2013, in response to the Commission's Notice of Proposed
1112 Rulemaking in which Nebbia raised concerns about potential
1113 harmful interference between unlicensed devices and DSRC
1114 systems, yes or no?

1115 Mr. {Knapp.} Yes.

1116 Mr. {Dingell.} Now, Mr. Knapp, is the Commission
1117 actively engaged in--with the wireless industry, automakers,
1118 the Department of Transportation and other incumbent users to
1119 resolve any possible harmful interference issues associated
1120 with the unlicensed use in the 5850-5925 megahertz band, yes

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1121 or no?

1122 Mr. {Knapp.} Yes. Yes.

1123 Mr. {Dingell.} And will the Commission continue to be

1124 interested in that matter in the future?

1125 Mr. {Knapp.} Yes.

1126 Mr. {Dingell.} And they have got to simply because you

1127 have potential for very destructive interference, is that

1128 right?

1129 Mr. {Knapp.} Yes.

1130 Mr. {Dingell.} Now, Mr. Knapp, given that the

1131 Commission licensed the intelligent transportation system

1132 service almost 50--15 years ago, is it reasonable to say that

1133 it would be premature for the Commission to authorize

1134 unlicensed use of the 5850-5925 megahertz band before studies

1135 are completed that confirmed that such use would not cause

1136 harmful interference with ITS services and other incumbent

1137 users, yes or no?

1138 Mr. {Knapp.} Yes, we would need a complete record.

1139 Mr. {Dingell.} Now, Mr. Knapp, in your experience, is

1140 it conceivable that the Commission would approve unlicensed

1141 use of the 5850-5925 megahertz band, which is the one used by

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1142 autos, before definitively establishing no risk of harmful
1143 interference with ITS systems or establishing practical
1144 strategies to mitigate such risk, yes or no?

1145 Mr. {Knapp.} No, we would not act until the engineering
1146 work is complete.

1147 Mr. {Dingell.} Thank you. Now, Mr. Knapp,
1148 alternatively, is the Commission considering moving forward
1149 with rulemaking openings up only the 5350-5470 megahertz band
1150 to unlicensed use, yes or no?

1151 Mr. {Knapp.} Only the 5--could you repeat the question?
1152 I am sorry.

1153 Mr. {Dingell.} Go ahead and say it the way you think it
1154 is best should be said.

1155 Mr. {Knapp.} I don't expect we would move on these
1156 bands that are being studied. The one that we are
1157 considering where we have a complete record is the lower
1158 piece, the existing band.

1159 Mr. {Dingell.} I certainly thank you. Mr. Chairman, I
1160 ask unanimous consent that I have two additional minutes. I
1161 have got a lot of questions. I think they are useful to the
1162 committee.

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1163 Mr. {Walden.} Without objection, we would be delighted
1164 to have you continue this line of inquiry.

1165 Mr. {Dingell.} You are most gracious, and I thank my
1166 colleagues. Now, Mr. Friday and Mr. Nagel, are Cisco and
1167 Comcast in agreement with the unlicensed--rather than for
1168 unlicensed use of the 5925 megahertz band to be permitted,
1169 the risk of harmful interference with ITS systems must be
1170 mitigated?

1171 Mr. {Friday.} Yes.

1172 Mr. {Dingell.} Yes or no?

1173 Mr. {Friday.} Yes.

1174 Mr. {Nagel.} Yes.

1175 Mr. {Dingell.} Thank you, gentlemen. To again, Mr.
1176 Friday and Mr. Nagel, are Cisco and Comcast in agreement with
1177 both Wi-Fi and ITS systems that they can share the upper 5
1178 gigahertz band without causing harmful interference to one
1179 another, yes or no?

1180 Mr. {Friday.} Yes.

1181 Mr. {Nagel.} Yes.

1182 Mr. {Dingell.} Thank you, gentlemen. Now, will you
1183 please submit for the record any harmful interference

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1184 mitigation proposals for your--that your companies have
1185 developed? And would our other panel members please also
1186 submit that? Now, again, Mr. Friday and Mr. Nagel, will
1187 Cisco and Comcast actively engage with automakers to identify
1188 harmful interference mitigation solutions in the 5925
1189 megahertz band, yes or no?

1190 Mr. {Friday.} Yes.

1191 Mr. {Nagel.} Yes.

1192 Mr. {Dingell.} Thank you, gentlemen. Now, a word here
1193 from Mr. Kenney. Mr. Kennedy, does--Kenney, does Toyota
1194 appreciate the potential economic and technological events
1195 of--benefits freeing up more spectrum for unlicensed use, yes
1196 or no?

1197 Mr. {Kenney.} Yes.

1198 Mr. {Dingell.} Now, Mr. Kenney, will Toyota actively
1199 engage with the tech community to identify harmful
1200 interference, mitigation, solutions in the 5925 megahertz
1201 band, yes or no?

1202 Mr. {Kenney.} Yes.

1203 Mr. {Dingell.} Mr. Kenney, all the same, does Toyota
1204 agree with--that the Federal Communications Commission should

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1205 proceed only on the basis of a solid record concerning
1206 harmful interference mitigation before approving unlicensed
1207 use of the band 5925, yes or no?

1208 Mr. {Kenney.} Yes.

1209 Mr. {Dingell.} Mr. Chairman, you have been abundantly
1210 gracious. And to my colleagues, I express my thanks.

1211 Mr. {Terry.} Mr. Chairman?

1212 Mr. {Walden.} Yes?

1213 Mr. {Terry.} Can I state for the record that the reason
1214 why I did not object was Michigan's kindness in allowing the
1215 Huskers to score that last touchdown in the last 2 minutes
1216 for a victory?

1217 Mr. {Walden.} You know, the gentleman from Nebraska, I
1218 was hoping to go the entire hearing without discussing
1219 football. We didn't do so well as Ducks on Thursday night.
1220 So we will have that discussion later. Now, we will turn to
1221 the gentleman from Ohio, I think is up next, Mr. Latta, for 5
1222 minutes.

1223 Mr. {Latta.} Well, thanks, Mr. Chairman. And again,
1224 thanks for our panel. You know, one of the things we have
1225 talked about in this committee--subcommittee is that industry

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1226 usually is much further ahead than Congress or the regulators
1227 would be, really might be two, three, four steps behind. And
1228 that is why it is so important to have you before us today to
1229 hear your testimony. And if just go down the line, you know,
1230 we have been having questions as to where we are looking at
1231 today. But I would really like to ask everyone, and also
1232 from Mr. Knapp with the Commission as to where do you--you
1233 know, we are talking about where we are today, where we are
1234 going to be in 5 years or 10 years. Just if you were looking
1235 at a crystal ball, just, you know--just briefly just tell me
1236 where you think--because I know that, Mr. Friday, in your
1237 testimony, you stated that, you know, between the Wi-Fi side
1238 over the last decade generated about 37 billion dollars. But
1239 where are we going to be in the next 5 years, because this is
1240 changing so quickly. Where do you think we are going to be?

1241 Mr. {Knapp.} So, you know, I think if you look at what
1242 is happening right now, as I mentioned, we are kind of moving
1243 from what I call a mobile voice paradigm, right? We are
1244 moving from this paradigm to a very mobile video paradigm on
1245 this here. So 5 years from now, I suspect we are going to
1246 see many more sharing technologies.

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1247 Ms. {Eshoo.} Yeah.

1248 Mr. {Knapp.} You know, when you look at the problem of
1249 this and this, this requires 100 times more capacity, which
1250 is going to require 100 times more from the fixed resource we
1251 have. So I think we are going to have to see more licensed
1252 spectrum policy, and I think we are going to have to really
1253 leverage the sharing spectrum policy going forward.

1254 Mr. {Latta.} Mr. Nagel?

1255 Mr. {Nagel.} Well, I think that is why--I think there
1256 are other things we will find as well. And that is that it
1257 is not just individual devices that we are going to want to
1258 have more capacity for, because they require it. It is going
1259 to be that all of us have lots of devices as well. And this
1260 will occur both inside the home with the Internet of things
1261 as we have almost everything in our home begin to connect,
1262 and we are controlling our house. And it is one of the
1263 reasons why as we look to the future, we are sitting here
1264 today, right? I mean, we look at--as we see the growth--I
1265 mean, just looking at our network and the network that we
1266 built in Wi-Fi, we have triple digit growth in sessions and
1267 users and tonnage literally every year. And it is not a

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1268 baby. It is accelerating. And without some of the things we
1269 are talking about here today, I think it really becomes
1270 critical. And I think it really requires both sort of true,
1271 deep consideration, both in the UNII-1 band, which we have
1272 been talking about, but also in the UNII-4 band. I think one
1273 of the struggles that we have it when we look at sort of what
1274 has been going on in the ITS is that this is something that
1275 was thought of 15 years ago, and the world has changed so
1276 radically. You are asking what is going to happen in the
1277 next 5 years. If you looked 15 years ago what has happened
1278 that having 75 megahertz sort of dedicated seems something
1279 that was really developed, you know, thought of and
1280 conceptualized 15 years ago, if we don't sort of fix this
1281 today and really work through how Wi-Fi is going to be a part
1282 of that band, it is only going to get more expensive down the
1283 road, because there is not a lot of other spectrum to do
1284 gigabit Wi-Fi in.

1285 Mr. {Latta.} Thank you. Mr. Kenney, you know, you were
1286 talking about what could be going on with cars talking back
1287 and forth between each other. But, you know, when is it
1288 going to be that for instance, have that car drive us home or

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1289 drive us to work?

1290 Mr. {Kenney.} Well, we hope to all live to experience
1291 that, don't we? That would be great. Yeah, I think in 5 or
1292 10 years, we are going to see a very different driving
1293 experience than we have today. And with respect to this
1294 period of time we have been doing research on DSRC, we are
1295 now on the threshold of being able to cash in on that
1296 research. And I think in 5 and 10 years, our drivers are
1297 going to be able to experience the benefits of having a car
1298 that can intelligently help them avoid the most dangerous
1299 driving situations. So I think that the connected car is
1300 going to be a very exciting place to be in 5 and 10 years.

1301 Mr. {Latta.} And, Mr. Knapp, hearing all of that, and
1302 with the FCC, how do we--and how do you work at the FCC to
1303 make sure all these things can happen that we don't--you
1304 know, we work with the industry out here to make sure that
1305 the regulations that are promulgated make these things come
1306 to pass?

1307 Mr. {Knapp.} Absolutely. And I wished I knew what was
1308 going to happen in 5 years. What I can tell you is this. It
1309 is--we try to ensure that the opportunities are there with at

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1310 least regulation as absolutely needed so that the innovators
1311 can flourish. Personally, I think the sky is the limit. And
1312 there are things that have happened already that nobody would
1313 have predicted. There is synergy between licensed and
1314 unlicensed in ways where 5 or 6 years ago we were arguing
1315 about which is better, when in fact the two of them
1316 complement each other.

1317 From, you know, the standpoint of the things we are
1318 discussing today, we are going to have to continue to drive
1319 spectrum efficiency and these kinds of advanced sharing
1320 techniques that we are working on. They are hard. They take
1321 a lot of thought and a lot of work and testing to make
1322 happen. And we are going to have to keep driving down that
1323 path. Sharing isn't the only solution. I think we will
1324 still be looking at bands where reallocation makes sense.
1325 But these are going to tough issues.

1326 Mr. {Latta.} Thank you very much. Mr. Chairman, I see
1327 my time has expired and I yield back.

1328 Mr. {Walden.} The gentleman yields back. We now turn
1329 to Mr. Butterfield for 5 minutes.

1330 Mr. {Butterfield.} Thank you very much, Mr. Chairman,

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1331 to the ranking member for convening this very important
1332 hearing today. As most of you certainly know, I served on
1333 this committee--subcommittee some years ago and went off the
1334 committee to be the ranking on another committee. And with
1335 the election of Senator Markey now, I find myself back on
1336 this committee and glad that I am here. There has been so
1337 much--there might be a round of applause, not for me, but for
1338 Mr. Markey, I suppose. But just listening to the testimony
1339 and just reviewing the material for today, we have made great
1340 advances over the last 4 or 5 years that no one could even
1341 imagine. And, Mr. Knapp, I think you just hit the nail right
1342 on the head a few minutes ago. It is just limitless of what
1343 innovation can mean, not only for the bottom line of your
1344 companies but for the prosperity of our country. And so I
1345 want to thank you for all that you do, and thank you for your
1346 investment in the future.

1347 I am going to start with Mr. Nagel. Mr. Nagel, I heard
1348 Mr. Friday a moment ago say that devices that support gigabit
1349 Wi-Fi already exist. I am not sure I fully understand and
1350 appreciate that. Is that correct?

1351 Mr. {Nagel.} Well, I--it is correct in the sense that

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1352 devices have within them the brains and their antennas and
1353 all that to make gigabit Wi-Fi work. What it doesn't have is
1354 access to the spectrum. So you can build the electronics to
1355 make it work and be future proof, which is what they have
1356 begun to do. And a lot of the equipment we are deploying is
1357 also capable of doing similar types of things.

1358 What is necessary though is for us to make and move
1359 forward on some of the 5 gigahertz decisions that are in
1360 front of us today. So the first would be UNII-1. We have
1361 already mentioned that all the information is in on the
1362 record, and the FCC is in the process of making some of its
1363 decision. Our view is that we can do a lot within UNII-1 and
1364 begin to bring big channels, which is really what you need.
1365 So most--like most devices today, Wi-Fi use 20 megahertz
1366 channels. When you get to enough, you will put 160 megahertz
1367 together. And it is that concatenated spectrum band that
1368 allows you to do that amount of speed at one time. But it
1369 requires that spectrum and the unlicensed spectrum. And so
1370 that is where the 5 gigahertz becomes very, very important,
1371 not just in UNII-1, which is by far the easiest decision to
1372 make, we think, but also in UNII-4. And it does require

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1373 harder decisions, but ones we ought to make now before we get
1374 too far down the road.

1375 Mr. {Butterfield.} But typically, certification and
1376 approval usually take a long time after spectrum, would that
1377 be correct? After the spectrum is made available, typically
1378 it takes awhile to get it perfected?

1379 Mr. {Nagel.} You know, it is an area--honestly, it is
1380 an area that I am not familiar with. I think generally that
1381 it gets--actually, I am not sure how to answer that, to be
1382 honest with you. I think that as devices get built, as long
1383 as they are within the Wi-Fi standard, I think you can work
1384 within that band. Generally, when you get new bands is when
1385 you have to go through another approval, but it is not my
1386 area of expertise. So--

1387 Mr. {Butterfield.} All right. In your testimony, you
1388 describe, Mr. Nagel, the growing importance of Wi-Fi in times
1389 of crisis. Can you elaborate on some of the examples of when
1390 this technology has proven valuable in times of crisis, and
1391 explain the role that Wi-Fi can play in going forward in
1392 emergencies?

1393 Mr. {Nagel.} Sure. I would love to. I mean, we have

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1394 some examples that Comcast has been involved with. The first
1395 is Hurricane Sandy. We experienced it up in the Northeast.
1396 And, you know, when the hurricane came through, a lot of the
1397 licensed cellular networks were down. So what would end up
1398 happening is that we--you know, we had some of our Wi-Fi
1399 access points that were up and running, and people would
1400 actually go to those access points. They would connect with
1401 any of their devices. They didn't have to be cellular
1402 specific. And they could actually reach the Internet. They
1403 might have to walk a few hundred yards, because that is the
1404 closest one that they had, or maybe even further. But just
1405 having that connectivity was essential to those people who
1406 were essentially without knowledge of what was going on and
1407 when people were coming to help them.

1408 Mr. {Butterfield.} All right. Thank you. Mr.
1409 Chairman, since I don't have 50 years on this committee, I
1410 won't ask unanimous consent to extend my time. And so this
1411 will be my last question. Mr. Kenney, what is your response--
1412 --but I want you to promise me that when I do get the years on
1413 this subcommittee, I will have that deference.

1414 Mr. {Walden.} Let me suggest, Mr. Butterfield--

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1415 Mr. {Butterfield.} Yes?

1416 Mr. {Walden.} I won't be here, unless there are
1417 incredible medical advances.

1418 Ms. {Eshoo.} I am going to leave a note in the drawer--

1419 Mr. {Walden.} Yeah. And you can go ahead and ask
1420 today, but you probably wouldn't get anything.

1421 Mr. {Butterfield.} Thank you. Very quickly, Mr.

1422 Kenney, what is your response to the proposal by Cisco that
1423 would require Wi-Fi devices to detect and avoid the presence
1424 of DSRC systems on the channels that they wish to use?

1425 Mr. {Kenney.} We think that the Cisco detection
1426 proposal is a sound foundation to build on. We think there
1427 are a lot of unanswered questions about some of the technical
1428 details. But we look forward to exploring that as part of
1429 our outreach with the Wi-Fi community.

1430 Mr. {Butterfield.} With the note in the drawer, I will
1431 yield back. Thank you.

1432 Mr. {Walden.} The gentleman yields back. We welcome
1433 you to the committee. We turn now to the gentleman from
1434 Illinois, Mr. Shimkus.

1435 Mr. {Shimkus.} Thank you, Mr. Chairman. It is a good

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1436 hearing. I am really kind of learning a lot. It is a great
1437 committee. It is just highly technologically focused for a
1438 lot of us. So this is what I am getting out of the hearing
1439 so far, the gigabit Wi-Fi is the best, right? That the 5
1440 gigahertz is the best band for unlicensed use of Wi-Fi, is
1441 that--Mr. Kenney and Mr. Friday, you seem to think that the
1442 sharing aspect might work.

1443 And Mr. Friday thinks it is almost too late to propose
1444 movement for this 10 year use of the automobile industry on
1445 this ITS system at the upper band. You have the impression
1446 that it is probably too late to go down that route, am I
1447 correct?

1448 Mr. {Friday.} I would say I don't have--I don't know.
1449 I would say that the ITS has been working on it for a long
1450 time. But no, I don't know if it is too late or not. I just
1451 think it has been a long--they have been down that path for
1452 quite a while.

1453 Mr. {Shimkus.} And, Mr. Kenney, I am sure you agree
1454 that you like your spot and you want to keep it?

1455 Mr. {Kenney.} Yeah. That is right. We think that the
1456 allocation decisions that the FCC has made in the past make a

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1457 lot of sense.

1458 Mr. {Shimkus.} Mr. Nagel, do you want to chime in on
1459 this? Because that seems what today is--

1460 Mr. {Nagel.} I do.

1461 Mr. {Shimkus.} You know--

1462 Mr. {Nagel.} I do want to chime in on it. I think it
1463 is an important point. So, you know, we all see what is
1464 happening in the broadband space is that we are struggling to
1465 keep up with the spectrum demands of just people connecting,
1466 and the economic value and innovation that that is bringing
1467 to the country. That the spectrum allocation has been made
1468 in the UNII-4 band is--was made long before any of this rapid
1469 growth happened.

1470 Mr. {Shimkus.} It was when it was termed kind of a junk
1471 space is what was mentioned earlier.

1472 Mr. {Nagel.} It was a junk space. No one quite knew
1473 what to do with it. And so I think it is really important
1474 for us not to think about is it too late, but what is the
1475 right thing for us to do for both aspects of the American
1476 economy. One is clearly we agree with the concept of vehicle
1477 to vehicle safety. I think we would never want to do

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1478 anything that would harm that. We also know that the 75
1479 megahertz is not going to be used wholly for vehicle to
1480 vehicle safety. There are components of it that are going to
1481 have other business aspects.

1482 The second thing we know through the recently released
1483 GAO report is that it is decades before the capability of
1484 vehicle to vehicle, sort of the full benefits, are going to
1485 be realized, primarily because the life of the fleet requires
1486 it to have this built in, you have to go in and kill--you
1487 know, have all the cars off the road. There will be some
1488 benefits early on, but it will be awhile. The other thing
1489 the GAO report states is that there is significant components
1490 of this whole infrastructure that are--they are sort of
1491 unknown. They are still in development. They--they back
1492 office component, all the pieces. So when I look at it, I
1493 see 75 megahertz of spectrum that we know Wi-Fi can share
1494 with them. We would want to protect the vehicle to vehicle.
1495 But that the idea of 75 sort of underutilized spectrum
1496 probably doesn't make great policy says long term. And yet
1497 there is--I think what we would like to see is not a decision
1498 about whether Cisco makes sense or not, that is one of the

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1499 proposals, but there are at least two proposals, maybe more.
1500 But we would like to see really rolling our sleeves up,
1501 engineer to engineer, with real compromise, trying to solve
1502 the problem of not how do I just protect all the 75 megahertz
1503 of band, but how do I make Wi-Fi work within it and make it a
1504 viable business. And I think--but also protect the safety
1505 issue within the band.

1506 Mr. {Shimkus.} And isn't in the--actually, I am visual
1507 too. So I have been watching this the whole time we have
1508 been having the hearing. So in the--in the UNII-4, in the
1509 upper area, if it was--if there was movement there, and they
1510 are not using all the 75, you do have a big band there for
1511 the applications--the Wi-Fi applications--but isn't there
1512 also a better debate where then you don't have the
1513 interference issue? Couldn't you engineer it so--I mean, we
1514 went through a lot--

1515 Mr. {Nagel.} Yeah, I think we went through the live
1516 square debate. It is--

1517 Mr. {Shimkus.} Yeah. Unfortunately, I don't want to go
1518 through that again.

1519 Mr. {Nagel.} It is important to realize that what we

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1520 are not saying--Wi-Fi is not intended to replace the
1521 incumbent. So the idea has never been within any of these
1522 bands to say that incumbent doesn't--shouldn't use that
1523 space, let us move them. Wi-Fi by its nature is a sharing
1524 technology. It is meant to work within the context of the
1525 fact that you have incumbents. And its purpose is to not
1526 cause harmful interference. And where it does, we have to
1527 work through some of the technical details. It is the
1528 technical details that are required for us to sit down, both
1529 between the Wi-Fi and the ITS groups, and sit down and design
1530 what is the right thing from the beginning, from sitting here
1531 where we are before it gets so far down the road that we have
1532 really underutilized spectrum which probably doesn't make
1533 sense long term.

1534 Mr. {Shimkus.} Mr. Chairman, my time has expired.
1535 Thank you very much.

1536 Mr. {Walden.} Thank you, gentleman. I will now turn to
1537 the gentleman from Nebraska, Mr. Terry, for 5 minutes.

1538 Mr. {Terry.} Thank you. I appreciate this. Yeah, that
1539 is a very pretty chart. The--all the questions probably have
1540 already been asked, but not everyone has asked them. So I am

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1541 going to continue. But, Mr. Kenney, why don't we go through
1542 on--it does seem that they are saying, Mr. Nagel, Mr. Friday
1543 and Knapp that there is room for both. I think reading
1544 between the lines, they didn't say it, but maybe Mr. Nagel
1545 and Mr. Friday would say they would love to have 100 percent
1546 of that band. But the reality is it has been set aside for
1547 the auto industry. I really like the idea of the vehicle to
1548 vehicle communications. I do think that is going to save
1549 lives. I like that we are getting into the 21st century in
1550 the automobile industry. That is exciting.

1551 So you have concerns that if it is shared and there is
1552 possibility of interference that that then creates safety
1553 issues. And your vehicle to vehicle is not--communications
1554 is not reliable, then it can actually make it more dangerous
1555 on the road, not just safer. But with your thinking, it is
1556 going to communicate and tell you to stop, and it is not
1557 communicating, you are more likely to get into a wreck then.
1558 So from the automobile perspective, is there room to share?
1559 Is there danger posed in sharing?

1560 Mr. {Kenney.} Yes and yes. So with regard to is there
1561 room to share, I think the--one way to think about that

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1562 question is how would sharing work. And without being too
1563 technical, I would like to suggest that it be on a special
1564 basis. And that means that in the roadways where the
1565 vehicles are, that is not where the Wi-Fi should be using 5.9
1566 gigahertz. If there--there are places where Wi-Fi can use
1567 5.9 gigahertz, in the living room for entertainment purposes,
1568 or in a rural area where there aren't cars driving by. And
1569 we think that that can probably be quite fine. But we don't
1570 want to have a mom driving a car down the road with kids in
1571 the backseat, and because she happens to be driving by a
1572 coffee shop that is using Wi-Fi, her collision avoidance
1573 systems turns off and she isn't able to avoid a collision
1574 that she otherwise could have, or because her kids are
1575 playing some games in the backseat, whether their devices are
1576 talking to each other using Wi-Fi technology. That shouldn't
1577 be using 5.9 gigahertz Wi-Fi. That should use one of the
1578 other bands.

1579 So there is room to share, more on a special basis.
1580 There are places where it can work. There are places where
1581 it shouldn't work.

1582 Mr. {Terry.} Well, is there concerns--again, getting to

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1583 what the chairman brought up at the beginning. If you are
1584 just using the top of the band, and you are allowing the rest
1585 of the band barely below that, is there going to be concerns
1586 about interference?

1587 Mr. {Kenney.} Well, yeah. It is--let me state very
1588 clearly that we are not only going to be using the top of the
1589 band, and we are not only going to be using--we are not only
1590 going to be able to put our safety critical communication in
1591 the top of the band. We have 75 megahertz, and we expect in
1592 the deployments--

1593 Mr. {Terry.} To use all of that?

1594 Mr. {Kenney.} To be using all of it, and all of those
1595 channels will be carrying critical information. Not all the
1596 information will be critical, but all the channels will have
1597 critical information. So it is not possible to compress it
1598 into 1 or 2 channels.

1599 Mr. {Terry.} Okay. Well, anybody--Mr. Nagel, Mr.
1600 Friday would like to comment further or--

1601 Mr. {Friday.} No, I think--I mean, we have been working
1602 very closely with the ITS on the sharing. I mean, I think
1603 maybe Tom's point was if we had started from scratch, you

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1604 know, and we had built sharing into the original ITS design,
1605 would we have done something slightly different? And I think
1606 working with the ITS though, they have been very cooperative
1607 on trying to find, given where we are, the right solution for
1608 sharing in the band.

1609 Mr. {Terry.} Okay. Now, there was some comment made,
1610 not here but before the meeting, that it is taking 10 years
1611 to get here, and maybe the auto industry should have been
1612 built out by now. I guess the conclusion to that, if you
1613 take it, is therefore you should have to give it up. What do
1614 you think about that thought, Mr. Kenney?

1615 Mr. {Kenney.} Yeah, I think that the automotive
1616 industry isn't consumer electronics. And when we are talking
1617 about safety of life, one thing I have found since I have
1618 been working for Toyota is that we take it very seriously and
1619 we are very careful about deploying these technologies. So
1620 we now have the benefit of that period of time of intensive
1621 research. We have reached the threshold. We are ready to
1622 start deploying.

1623 Mr. {Terry.} All right. Thank you. My time is up.

1624 Mr. {Walden.} The gentleman's time has expired. We go

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1625 now to the gentleman from Missouri, Mr. Long, for 5 minutes.

1626 Mr. {Long.} Thank you, Mr. Chairman. Mr. Kenney, when
1627 you see these ads on TV with cars that, you know, they have
1628 you stop so you don't get into an accident, or maybe 2 cars
1629 ahead of you it tells you about an accident up there, now
1630 that is not the 5 gigahertz, is it that those rely on?

1631 Mr. {Kenney.} You are correct. Most of those types of
1632 technologies that you see advertised today are based on
1633 sensor systems that the car has, maybe it is a radar or a
1634 camera system that can detect these dangerous situations.

1635 Mr. {Long.} So wouldn't that portend that you could
1636 share these or not need those?

1637 Mr. {Kenney.} Well, we think that those technologies
1638 are critical as well. We view the vehicle to vehicle
1639 communication as complementary to that. There are
1640 limitations of those sensor based systems. They--their
1641 ranges are limited. Communication can go further. If there
1642 is a vehicle in between you and the danger, the sensor may
1643 not be able to see it, whereas communication can let you know
1644 about it. If there is a vehicle coming--

1645 Mr. {Long.} So it could be used in that instance on the

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1646 5--

1647 Mr. {Kenney.} I am sorry?

1648 Mr. {Long.} The 5 gigahertz could be used in that

1649 instance?

1650 Mr. {Kenney.} Yeah. Yes.

1651 Mr. {Long.} To prevent an accident?

1652 Mr. {Kenney.} So we think that the 5.9 gigahertz
1653 communication and the sensor based systems on vehicles will
1654 work together to give us a very safe driving experience.

1655 Mr. {Long.} But that is futuristic? That is not
1656 happening now? They are not using that now?

1657 Mr. {Kenney.} The communication part is not yet
1658 deployed, but that is coming very soon.

1659 Mr. {Long.} Okay. And, Mr. Knapp, I have got a
1660 question regarding the dedicated short range communications.
1661 My constituents' privacy is real important to them. So for
1662 people back in my district, do you think the FCC will propose
1663 protections of an individual's privacy so car companies won't
1664 be sending personalized advertisements to individuals based
1665 on where their car is located?

1666 Mr. {Knapp.} So the Commission has provided the

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1667 spectrum. The standards are developed by the industry,
1668 including privacy protections. And I think the GAO report
1669 had addressed the importance--the need for the standards to
1670 address this. And I know that the industry has been taking
1671 those things into account. The FCC generally has not set
1672 standards specifically for that.

1673 Mr. {Long.} That doesn't work unless they mandate that
1674 all cars have this, is that correct, or--

1675 Mr. {Knapp.} So the technology contemplates
1676 communication between vehicles. And so some of speculated
1677 that a percentage of the vehicles would provide an added
1678 benefit. But the idea is that eventually all of the vehicles
1679 would have this technology. As compared to what we just
1680 heard described, the radars that are built in, the car
1681 basically works autonomously. I don't need to communicate or
1682 worry about whether something is installed in somebody else's
1683 car.

1684 Mr. {Long.} Okay. Mr. Chairman, I yield back.

1685 Mr. {Walden.} The gentleman yields back the balance of
1686 his time. And I think that takes care of all our members and
1687 their questions. I do have a unanimous consent request, a

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1688 letter--a report from CSC and Intel Sat, detailing
1689 interference concerns of satellite providers in the 5.9
1690 gigahertz band, and a GAO report by Mr. Nagel that he
1691 referenced--I am sorry--referenced on the benefits and
1692 challenges of ITS. So we would like to put in the record
1693 without objection. So ordered.

1694 [The information follows:]

1695 ***** COMMITTEE INSERT *****

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1696 Ms. {Eshoo.} Mr. Chairman?

1697 Mr. {Walden.} Gentlelady from--

1698 Ms. {Eshoo.} I would just close out the hearing today
1699 by saying thank you to Roger Sherman for his superb service
1700 here. I really don't know what we are going to do without
1701 Roger. That is how fabulous he really is. He is, I think in
1702 many ways, in a class by himself, and I think that it is an
1703 eloquent statement about him that the new chairman of the
1704 Federal Communications Commission has chosen him, named him
1705 as the acting chief of the FCC's Wireless Telecommunications
1706 Bureau. I don't know how many members know his background.
1707 In the 111th Congress, Roger--he began here. And he has
1708 really been the backbone of this subcommittee. And he has
1709 led the staff in a way that really brought out the best
1710 leadership qualities of everyone that was part of the team.
1711 And I think that that is the mark of a leader, and a
1712 confident leader. He has supported members and staff on
1713 every issue we have tackled. He really has been the
1714 indispensable person here. His strategic guidance, his
1715 expertise, his professionalism are all going to be missed, I

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1716 think, by every member of the committee, and to our
1717 colleagues on--here on the subcommittee on the other side of
1718 the aisle. I think when we go to negotiate, you are going to
1719 miss Roger as well.

1720 {Voice.} No.

1721 Ms. {Eshoo.} You may even be relieved that he is not
1722 there. But he is not going to be far away. He is not going
1723 to be far away.

1724 Mr. {Walden.} That is right. We are going to subpoena
1725 him and have him under oath now. And I have got several
1726 questions.

1727 Ms. {Eshoo.} Yeah. So I have no doubt that Roger
1728 Sherman is going to make extraordinary contributions at the
1729 FCC. We all look forward to working with you in the new
1730 role, Roger. And, you know, from a very deep respectful
1731 place, we salute you. You have devoted yourself. You could
1732 make so much money outside of this institution. But he has--
1733 he remains with it because he has such a great commitment to
1734 it. And I think that that is a very important story for the
1735 American people, because he is here to help to create wins
1736 for our country. And I don't think there could be any more

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1737 beautiful commitment. And we need people like you to
1738 continue on in public service. You have certainly enhanced
1739 my and all of ours here. So we are going to miss you. We
1740 thank you enormously. We thank you enormously for everything
1741 that you have done. And I will never ever forget it. I am a
1742 better legislator because of you. But more importantly, you
1743 have made great contributions to the entire subcommittee and
1744 the full committee. So God bless you. Go forward and do
1745 great things at the FCC. And when things aren't working out,
1746 you are going to be our point man. We are not letting you
1747 go. So, Mr. Chairman--

1748 Mr. {Walden.} And remember--

1749 Ms. {Eshoo.} --thank you.

1750 Mr. {Walden.} Remember that the FCC is an offshoot of
1751 the Congress. And so never forget that either as you go
1752 downtown.

1753 Ms. {Eshoo.} That is right. Yeah. Yeah. Thank you.

1754 Mr. {Walden.} How about a round of applause for Roger
1755 Sherman?

1756 Ms. {Eshoo.} Thank you, Mr. Sherman.

1757 Mr. {Walden.} And on that happy and appropriate note,

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1758 that concludes our hearing. We thank our witnesses again for
1759 sharing your comments with us, your testimony, your counsel
1760 and guidance. And we stand adjourned.

1761 [Whereupon, at 3:59 p.m., the subcommittee was
1762 adjourned.]