Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, D.C. 20554

In the Matter of	)	
	)	
International Comparison and Consumer Survey Requirements in the Broadband Data Improvement Act	)	GN Docket No. 09-47
	)	
A National Broadband Plan for Our Future	)	GN Docket No. 09-51
	)	
Inquiry Concerning the Deployment of Advanced Telecommunications Capability to All Americans in a Reasonable and Timely Fashion, and Possible Steps to Accelerate Such Deployment Pursuant to Section 706 of the Telecommunications Act of 1996, as Amended by the Broadband Data Improvement Act	)	GN Docket No. 09-137

COMMENTS OF FIBERTOWER CORPORATION,
THE RURAL TELECOMMUNICATIONS GROUP, INC., AND
SPRINT NEXTEL CORPORATION – NBP PUBLIC NOTICE #11

FiberTower Corporation ("FiberTower"), the Rural Telecommunications Group, Inc. ("RTG"), and Sprint Nextel Corporation ("Sprint Nextel") (collectively, the "Coalition") submit these Comments in response to the Federal Communications Commission's ("FCC" or "Commission") Public Notice entitled "Comment Sought on Impact of Middle and Second Mile Access on Broadband Availability and Deployment," released on October 8, 2009 in the above-captioned proceeding.[1] In the *Notice*, the FCC seeks comment on "the price, cost, and availability of middle mile and second mile connectivity, with a focus on rural, unserved, and

[1] *Comment Sought on Impact of Middle and Second Mile Access on Broadband Availability and Deployment – NBP Public Notice #11*, GN Docket Nos. 09-47, 09-51, 09-137, Public Notice, DA 09-2196 (rel. Oct. 8, 2009) ("*Notice*").

underserved areas."[2] It also asks, "What are the technology options for providing adequate middle mile connectivity for the next 5-10 years?"[3]

The Coalition is pleased that the FCC recognizes the importance of cost-effective middle mile backhaul solutions, particularly in rural areas. As the Commission explains, "[t]o provide broadband service to consumers and small businesses in an area, a broadband Internet service provider needs to have adequate, reasonably priced, and efficiently provided access to . . . middle mile connectivity."[4] Sprint Nextel, FiberTower, and RTG have filed numerous pleadings in the Commission's TV White Spaces proceeding encouraging the Commission to allow licensed, fixed use of the White Spaces on UHF TV Channels 21-35 and 39-51 for: (1) up to six vacant White Spaces channels second or greater adjacent to a TV broadcast station in rural counties; and (2) any vacant White Spaces channels third or greater adjacent to a TV broadcast station in all counties.[5]

New, higher-powered, licensed, point-to-point service in a portion of the TV White Spaces could provide an important tool to reduce the costs of middle mile backhaul by as much as 80-90% in rural areas and enhance broadband deployment. The favorable propagation

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[2] *Id.* at 3.

[3] *Id.* at 2.

[4] *Id.*

[5] *See, e.g.*, *Ex Parte* filing by FiberTower, Sprint Nextel, RTG, and COMPTEL, ET Docket Nos. 04-186, 02-380 (filed Oct. 28, 2009) ("October 28th *Ex Parte*"); Request for Expedited Consideration filed by FiberTower, RTG, COMPTEL, and Sprint Nextel, ET Docket Nos. 04-186, 02-380 (filed July 14, 2009); Reply to Oppositions filed by FiberTower, RTG, COMPTEL, and Sprint Nextel, ET Docket Nos. 04-186, 02-380 (filed May 18, 2009); Petition for Reconsideration filed by FiberTower, RTG, COMPTEL, and Sprint Nextel, ET Docket Nos. 04-186, 02-380 (filed Mar. 19, 2009); *Ex Parte* filing by FiberTower, Sprint Nextel, RTG, and COMPTEL, ET Docket Nos. 04-186, 02-380 (filed Oct. 31, 2008); "Optimizing the TV Bands White Spaces: A Licensed, Fixed-Use Model for Interference-Free Television and Increased Broadband Deployment in Rural and Urban Areas," *Ex Parte* filing by FiberTower and RTG, ET Docket Nos. 04-186, 02-380 (filed Oct. 2, 2007). The Coalition also filed Comments in the National Broadband Plan Proceeding in response to Public Notice # 6 regarding spectrum for broadband services. *See* Comments of FiberTower, RTG, COMPTEL, and Sprint Nextel – NBP Public Notice # 6, GN Docket Nos. 09-47, 09-51, and 09-137 (filed Oct. 23, 2009).

characteristics of the TV White Spaces make the bands ideal for backhauling traffic over very long distances (*e.g.*, 50-70 miles and longer) at low cost.[6] For example, a single 75-mile or longer wireless backhaul link could be constructed at a cost of $100,000 – $200,000 using two small lightweight antennas, whereas covering the same distance using 3.65 GHz, 6 GHz, or higher frequency spectrum would require as many as four relay towers and a total of 10 six-foot diameter dish antennas, at a cost of $3 million or more. When the received signal-to-noise ratio is sufficient, these links would be able to operate with up to 128 QAM with a maximum data rate of approximately 41 Mbps in a 6 MHz channel (64 QAM is likely to be more typical, with a maximum data rate of approximately 28 Mbps gross and 20-25 Mbps net after coding).[7]

The Coalition has also conducted a comparative survey of various microwave and TV Bands fixed path lengths available in Utah, including data on the existing number of links, the average and maximum length of the links, antenna gain, and antenna size issues. As shown in the attached slides, the survey highlights the many advantages of the TV Bands channels for point-to-point services such as middle mile backhaul.[8] For example, compared to the microwave bands, smaller, lighter, and less expensive antennas are available for the TV Bands, and off-the-shelf equipment is available for UHF Channels 21-51.[9] In addition, unlike the heavily used 6 GHz band, where additional links would be unavailable in many locations (including in rural

[6] Distance is directly correlated to different variables, which include and are not limited to: power, signal availability, data throughput, antenna characteristics and locations, and channel placement within the TV White Spaces.

[7] These rates could be doubled by using dual polarization, and the rates could be lower for longer links with a low received signal-to-noise ratio.

[8] *See* "Licensed, Fixed Use of the TV White Spaces," attached at 4, 9, 12-16. These slides were filed previously in the TV White Spaces proceeding as part of an *ex parte* notice. *See* October 28th *Ex Parte*.

[9] *See id.* at 4, 13-16.

areas), TV White Spaces channels are widely available in rural unserved and underserved areas – where 15 to 45 or more channels often lie fallow.[10]

As noted previously, the Coalition's proposal will not provide a solution for all of the special access or backhaul problems (or eliminate the need for the FCC to take separate action on pending special access issues). Nevertheless, it will provide an urgently needed, cost-effective tool for affordable middle mile backhaul for wireless carriers and Internet service providers in rural areas, with a dramatic cost savings compared to other backhaul options available for providing wireless broadband to remote communities. Therefore, the Commission should act quickly on this pending proposal to license new fixed, point-to-point services in the TV White Spaces.

Respectfully submitted,

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November 4, 2009

[10] *See id.* at 6-8, 13.

Licensed, Fixed Use of the TV White Spaces

October 27, 2009

Chronology of Major Events

- October 18, 2006 – FCC releases First R&O/Further Notice inviting comment on licensed operations in TV bands
- October 2, 2007 – FiberTower and RTG file their “White Paper” proposing a licensed, fixed model
- January-October, 2008 – Sprint Nextel, T-Mobile, NTCA, COMPTEL, and the Rural Independent Competitive Alliance file letters of support
- June 25, 2008 – COMPTEL, RTG, Sprint Nextel, and FiberTower submit draft of proposed technical rules

Chronology of Major Events

- October 29, 2008 – RTG, COMPTEL, Sprint Nextel, and FiberTower submit revised proposed technical rules
- November 4, 2008 – FCC adopts Second R&O/MO&O
- March 19, 2009 – FiberTower, RTG, COMPTEL, and Sprint Nextel file Petition for Reconsideration
- June 12, 2009 – DTV transition completed
- July 14, 2009 – FiberTower, RTG, COMPTEL, and Sprint Nextel file Request for Expedited Consideration of their Petition for Reconsideration

Benefits of Licensed, Fixed Use

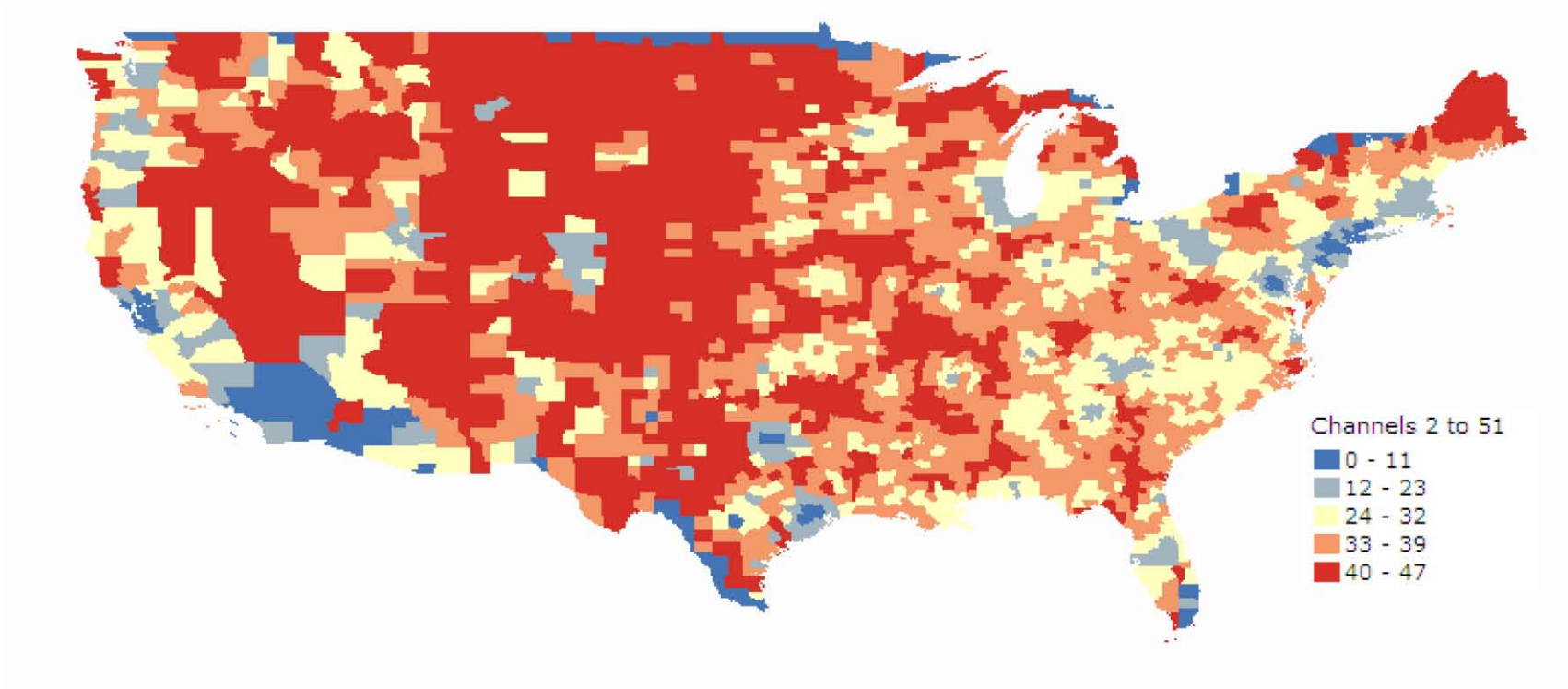
- Ideal for long-range, inexpensive wireless backhaul, particularly in rural areas
- Equipment available now; would spur immediate broadband deployment to unserved and underserved rural areas and benefit consumers directly
- Fosters regulatory certainty and protects incumbent users, particularly broadcasters
- Other unlicensed or licensed uses not precluded

Licensing

- Site-by-site basis under Part 101
- Only on UHF TV Channels 21-35 (512-596 MHz) and 39-51 (620-698 MHz)
- Make available six vacant channels in rural counties; must be 2nd or greater adjacent channel to TV broadcast station
- Also make available 3rd or greater adjacent channels in all counties

How Much TV White Space Exists?

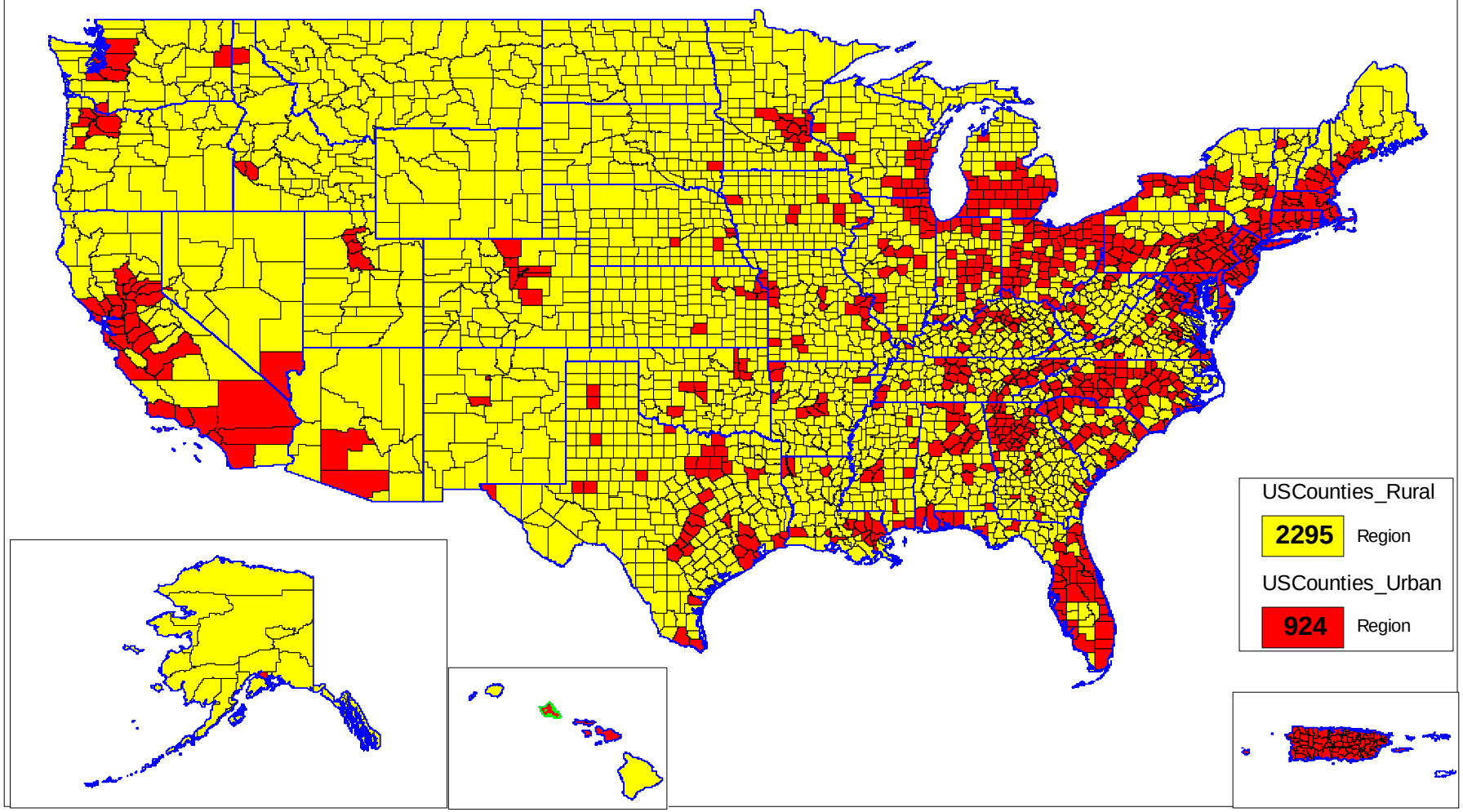
White Space Availability by County



Source: *Ex Parte Letter*, October 1, 2009, filed in ET Dkt. 04-186 by Wiltshire & Grannis LLP, on behalf of Dell, Inc., Microsoft Corp., and Spectrum Bridge Inc.

Rural Areas Have Lots of White Space

Note: Urban = POP Density >= 100 pers/sqmi , Rural = POP Density < 100 pers/sqmi



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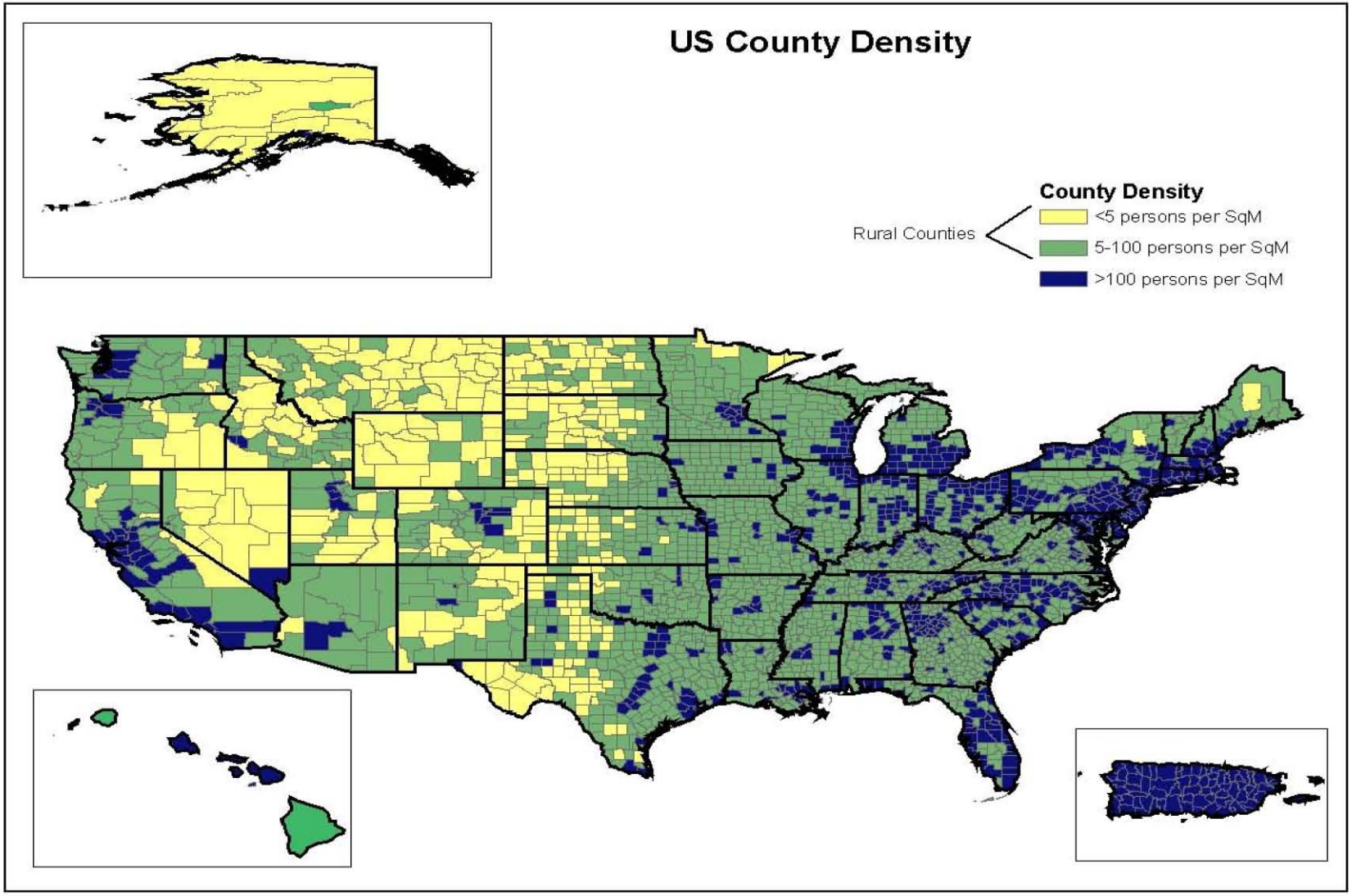


Source: FCC's 13th CMRS Report (2009)

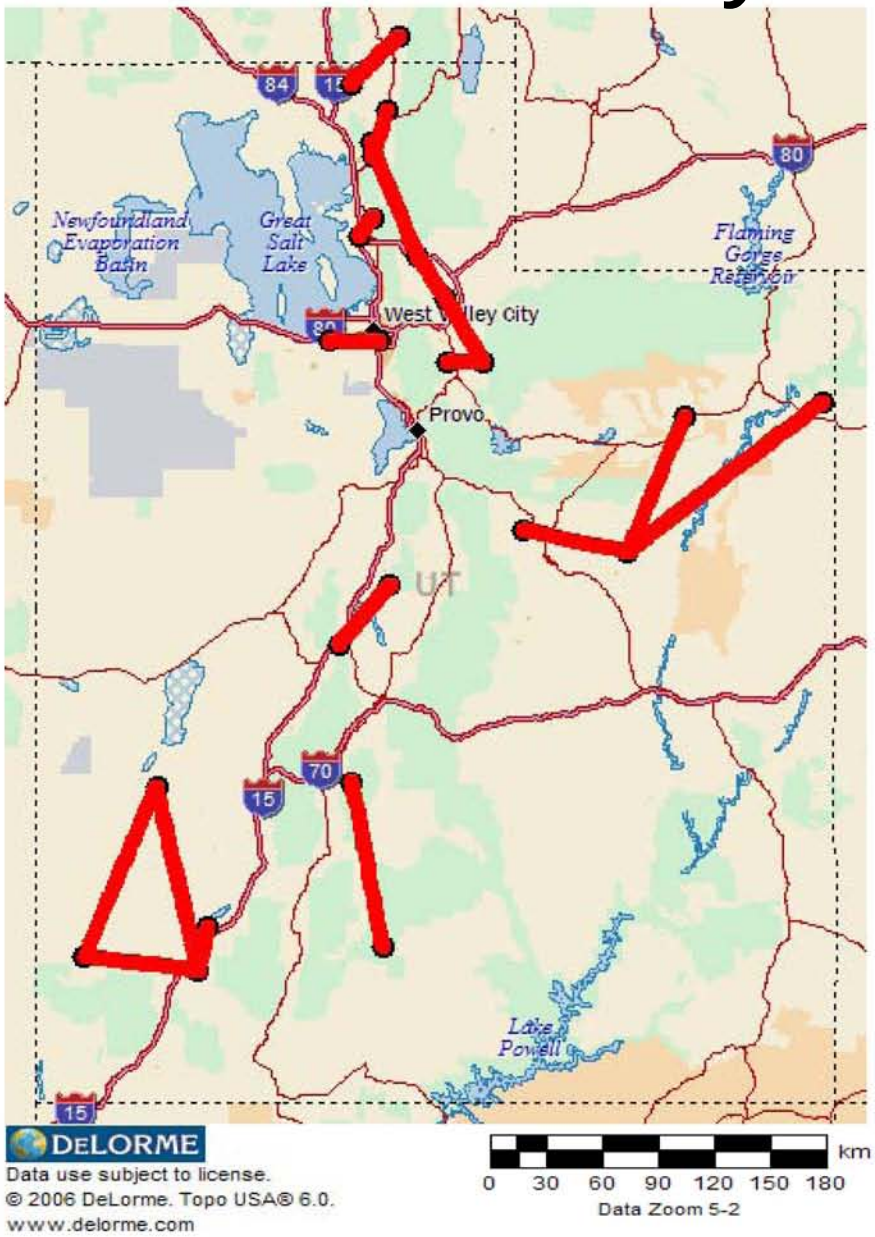
Data Rates

- When received signal-to-noise ratio is sufficient, links would be able to operate with up to 128 QAM (maximum data rate ~ 41 Mbps in 6 MHz channel)
  - 64 QAM likely to be more typical; max. data rate ~ 28 Mbps gross, and 20-25 Mbps net after coding
  - Rate could be doubled by using dual polarization
  - Rates could be less for longer links with low received signal-to-noise ratio

TV Band Links in Use Today

25 licensed TV band fixed links in Utah:

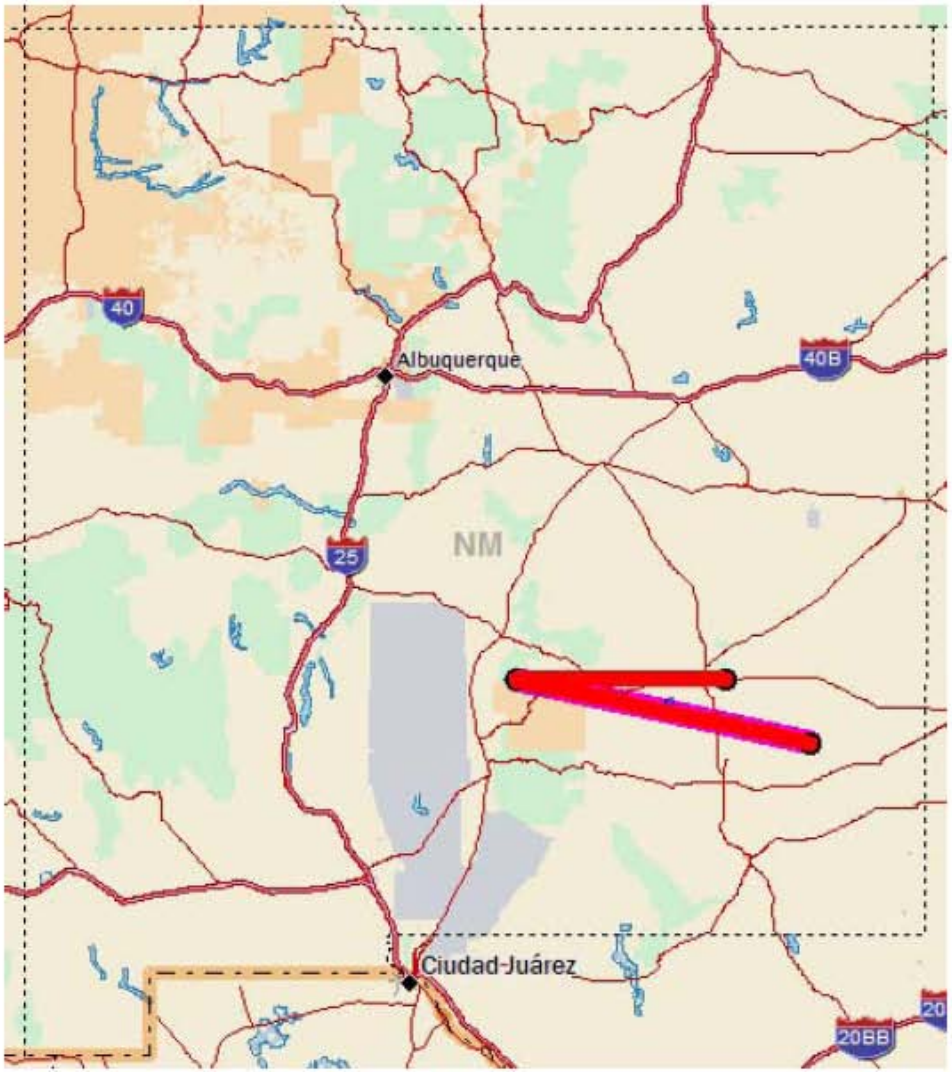
- range in length from 11.7 km (7.3 mi.) to 131.3 km (81.6 mi.)
- six links longer than 65 km (40 mi.)
- average length is 51 km (32 mi.)



Longest TV Band Link (116 mi.)

WPNI810:

- TV intercity relay, formerly licensed to Acme Television License of New Mexico
- two paths
- Buck Peak/Ruidoso to Roswell, 130 km (81 mi.)
- Buck Peak/Ruidoso to rural Chaves County, 186.5 km (116 mi.)
- Both use 62 dBm EIRP and 18 dBi gain antennas
- Buck Peak 2700 m higher elevation than rural Chaves County path end



Path Length Modeling

- With urban power limits (24 dBW/6 MHz), modeling indicates path lengths of ~40 miles w/ 99.995% reliability
- With rural power limits (35 dBW/6 MHz), modeling indicates path lengths of ~70 miles w/ 99.995% reliability
  - Distances can be greater from mountain-top locations
  - Distances can be shorter depending on terrain roughness and multipath conditions
  - Rain fading and atmospheric absorption not a factor at UHF (but are factors for microwave bands)

Microwave Path Lengths

Using FCC's ULS database for Utah

Band	# Links	Avg. Length (km)	Max. Length (km)	Ant. Gain (dBi)	Ant. Size (feet)
UHF TV	25	51.1	186.5	16-18	3'x5.5'
6 GHz	1,652	51.6	166	38.8-46.4*	6'-15'
11 GHz	682	25.1	99.7	33.7-49.8	4'-10'
18 GHz	318	11.9	48.1	30-48.5	8'
23 GHz	176	4.2	20	30-46.9	1'-4'

- 32 links > 130 km (80 mi.): all use 42-45.6 dBi gain antennas (10'-15')
- 313 links w/6' antennas: avg. len. 32 km, max 100 km

TV Band vs. Microwave Antennas

Smaller, Lighter, Less Expensive

KATHREIN SCALA DIVISION

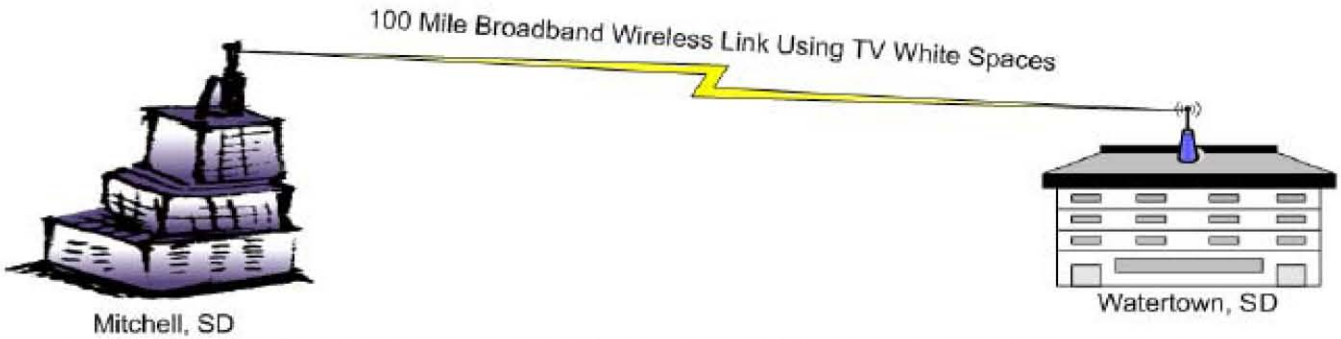
PR-TV series
PARAFLECTOR® ANTENNA
15.5 to 17 dBd gain
470 to 862 MHz

ANDREW A CommScope Company

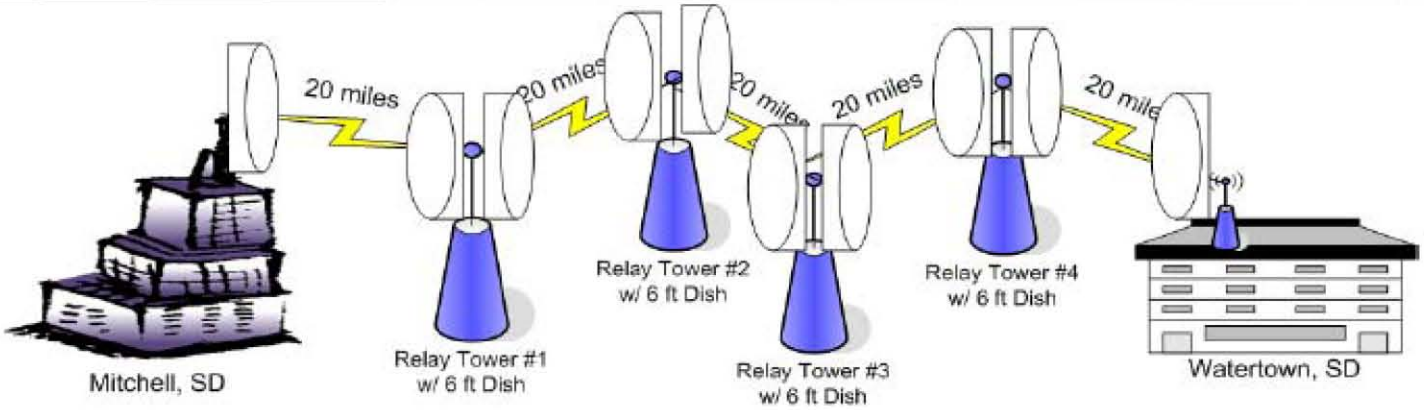
P10-102-P7A
Parabolic Antenna
47 dBi
10.2-10.7 GHz

PR-TV	Antenna	P10-102-P7A
1.7 X 0.9 m (68” X 36”)	Size	3 m (10 ft) diameter
38 lb.	Weight	317 lb.
$1,664 for two, plus installation	Cost	$10,940 for two, plus installation and weather shielding; similar shielded antenna – HP10-107-D1A – $26,960 for two

100 Mile broadband connection cost comparison



100 Miles using TV White Spaces (450-698 MHz): Small lightweight grill-style antenna fits on building/tower. Cost <$100,000-200,000



6 GHz or 3.65 GHz . Total cost: >$3million. Fiber Optic costs even more!

Spectrum Usage – What's Available

Frequencies	Typical Path Length	Maximum Channel Bandwidth	Maximum Channel Capacity (typical)	Minimum Dish Diameter	Typical Weight, including mount
400 – 700 MHz (in Progress)	30 - 75+ Miles	6 MHz	25 Mbps*	< 3x6 Ft (smaller available for different applications)	< 35 lbs
4 GHz	20+ Miles	20 MHz	DS-3+	8 Ft	500 lbs
6.1 GHz	20+ Miles	30 MHz	OC-3	6 Ft	360 lbs
6.7 GHz	20+ Miles	10 MHz	DS-3	6 Ft	360 lbs
10 GHz	10 Miles	5 MHz	16 x T1	2 Ft	33 lbs
11 GHz	8 Miles	40 MHz	OC-3	2 Ft	33 lbs
18 GHz	4 Miles	80 MHz	OC-3, OC-3+	2 Ft	33 lbs
23 GHz	2 Miles	50 MHz	OC-3	1 Ft	21 lbs
24 / 39 GHz	1.5 Miles	200-700 MHz	1 Gbps	9" (in market)	< 20 lbs

* Assumes 64 QAM. 50 Mbps achievable by using two 6 MHz TV channels or two antennas with different polarizations; > 40 Mbps may be achievable with 128 QAM over shorter distances