LERMAN SENTER PLLC

WASHINGTON, DC

STEPHEN E. CORAN
202.416.6744
SCORAN@LERMANSENTER.COM

April 23, 2014

Marlene H. Dortch, Secretary
Federal Communications Commission
445 12th Street, SW
Washington, DC 20554

Re: *Expanding the Economic and Innovation Opportunities of Spectrum Through Incentive Auctions,* GN Docket No. 12-268

Revisions to Rules Authorizing the Operation of Low Power Auxiliary Stations in the 698-806 MHz Band, WT Docket No. 08-166

Public Interest Spectrum Coalition, Petition for Rulemaking Regarding Low Power Auxiliary Stations, Including Wireless Microphones, and the Digital Television Transition, WT Docket No. 08-167

Amendment of Parts 15, 74 and 90 Of the Commission's Rules Regarding Low Power Auxiliary Stations, Including Wireless Microphones, ET Docket No. 10-24

Notice of Oral Ex Parte Presentation

Dear Ms. Dortch:

On behalf of the Wireless Internet Service Providers Association ("WISPA"), this is to provide notice that, on April 22, 2014, Alex Phillips, WISPA's Treasurer and FCC Committee Chair,[1] and the undersigned met with Louis Peraertz, Legal Advisor to Commissioner Mignon Clyburn to discuss issues related to the amount and utility of unlicensed spectrum in the TV bands.

The discussion focused primarily on the TV white space spectrum that would be available between TV Channels 21 and 37 for fixed unlicensed use after the auction and re-packing of TV stations. The WISPA representatives explained that, despite regulatory and legislative uncertainty and engineering challenges associated with developing equipment capable of communicating with the geolocation databases, American companies were successfully manufacturing, shipping, installing and deploying TV white space equipment in rural areas. In many cases, these deployments are occurring in areas where it is not economically efficient to deploy wireline technologies such as fiber, cable and DSL and where other unlicensed bands do

[1] Mr. Phillips is also President of Highspeedlink, a wireless Internet service provider based in Harrisonburg, Virginia.

not possess the propagation characteristics to reach unserved Americans. The WISPA representatives emphasized the absence of any sub-1 GHz spectrum for unlicensed use, other than the 902-928 MHz band that is congested and lacking recent innovation.

We further explained that, with adequate TV white space spectrum, fixed wireless Internet service providers ("WISPs") would have the ability to increase the number of subscribers receiving fixed wireless services by about one million, representing additional subscriber revenues of about $500 million. In addition, WISPs could save about two-thirds of the costs of tower rental and utility costs because the superior propagation characteristics of sub-1 GHz spectrum require less infrastructure than other unlicensed bands. Mr. Phillips noted that, in areas where a consumer has a choice between obtaining broadband service from a WISP and a larger carrier, the WISP provides a competitive balance.

Mr. Phillips discussed the ongoing TV white space trial in Blackstone, Virginia near the Fort Pickett National Guard base. Mr. Phillips stated that the deployment utilizes two non-contiguous channels of six megahertz each and is able to penetrate thick foliage to provide 10 Mbps downstream speeds. He further explained that other unlicensed bands, including the 900 MHz band, would not work, and that there are many other areas in rural southern Virginia where TV white space would be the only viable fixed broadband solution.

The WISPA representatives also discussed a trial conducted by Cal.net, a WISP located in rural El Dorado County, California marked by thick forests and deep valleys where wireline service is unavailable and other wireless bands are inadequate for broadband service. The trial pointed out the superior propagation characteristics of TV band spectrum when tested alongside 902-928 MHz band and 3650-3700 MHz links. It was pointed out that in some cases, TV band spectrum was the only spectrum of the three tested that could complete a link, and that in all cases, the TV band link provided better throughput.[2]

The WISPA representatives encouraged the Commission to adopt and implement re-packing rules and procedures that would optimize the amount and viability of contiguous spectrum for unlicensed fixed broadband service. The WISPA representatives noted the significant barriers resulting from the full six-megahertz of adjacent-channel protection each TV station has on both sides of its six-megahertz channel. WISPA reiterated its position demonstrating the spectrally-efficient ways that remaining white space could be optimized to maximize the availability and utility of unlicensed spectrum for fixed broadband use.[3] These optimization methods include (a) allowing TV and LPTV stations to share channels where technically feasible, (b) identifying for LPTV displacement applications those channels that maximize the amount of the remaining spectrum for fixed unlicensed use, and (c) enforcing rules to prohibit database protection for LPTV stations that do not timely convert to digital operations or go dark for periods exceeding the time frames permitted by Commission rules. In addition, it was suggested that unlicensed operations within any Channel 37 exclusion zones should be

[2] A copy of a presentation delivered by Cal.net's CTO at an industry conference in January 2014 is attached hereto.
[3] *See* Comments of WISPA, Docket No. 12-268, *et al.* (filed Jan. 25, 2013) at 12-29.

permitted with the consent of the incumbent user following good faith negotiations, a process employed for operation within government Quiet Zones.

The WISPA representatives also reiterated their view that the Commission should apply its maximum bidding credit for very small businesses that choose to participate in the forward auction.

Pursuant to Section 1.1206 of the Commission's Rules, this letter is being filed electronically via the Electronic Comment Filing System in the above-captioned proceeding.

Respectfully submitted,

Stephen E. Coran
Counsel to the Wireless Internet Service Providers Association

cc: Louis Peraertz

January 29 - 31, 2014 • Miami Beach Convention Center • Miami, Florida

SUPER Wi-Fi SUMMIT™

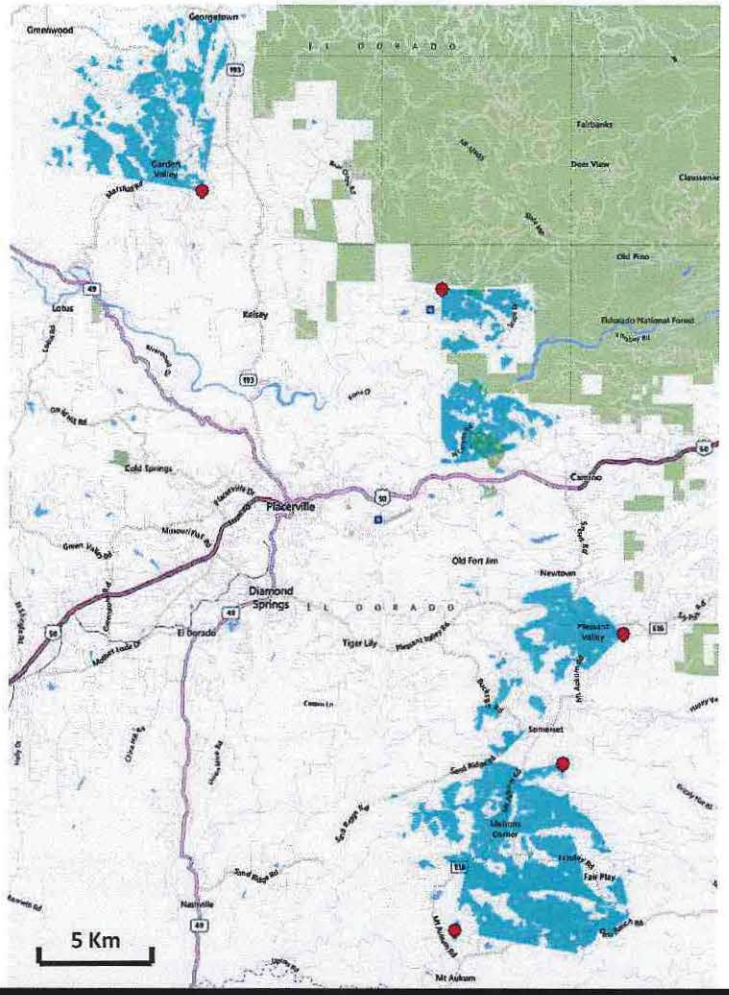
The Global Spectrum Sharing & TV White Space Event™

Window of Opportunity: The WISPs Moving Past the Trials

Ken Garnett
CTO, Cal.net, Inc.

Rural Broadband TVWS Deployment

- Test Phase
  - April – December, 2013
  - Five base station sites in El Dorado County, California
    - Up to 9 customer units per base station
  - Operated under FCC Special Temporary Authority
- Commercial deployment
  - Starts February 2014



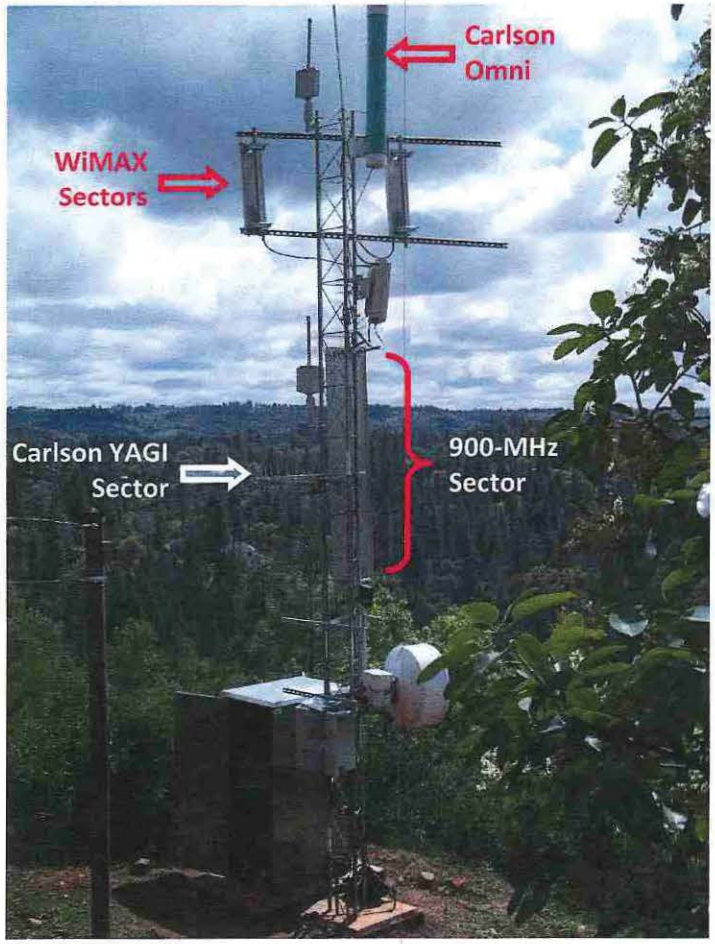
Challenging Rural Environment

- Thick forests, deep valleys
- Thousands of un-served homes & businesses
- Other wireless broadband technologies are inadequate
- Wire-line broadband service is unavailable

TVWS Comparative Field Testing

- Comparing the performance and capabilities of TVWS with other typical non-line-of-sight technologies used in rural broadband settings
  - 3.65 GHz WiMAX, with MIMO
  - 900 MHz
  - In heavily forested and hilly terrain
  - Utilizing Carlson Wireless Technologies' "Rural Connect" TVWS product line

The Initial Test Site

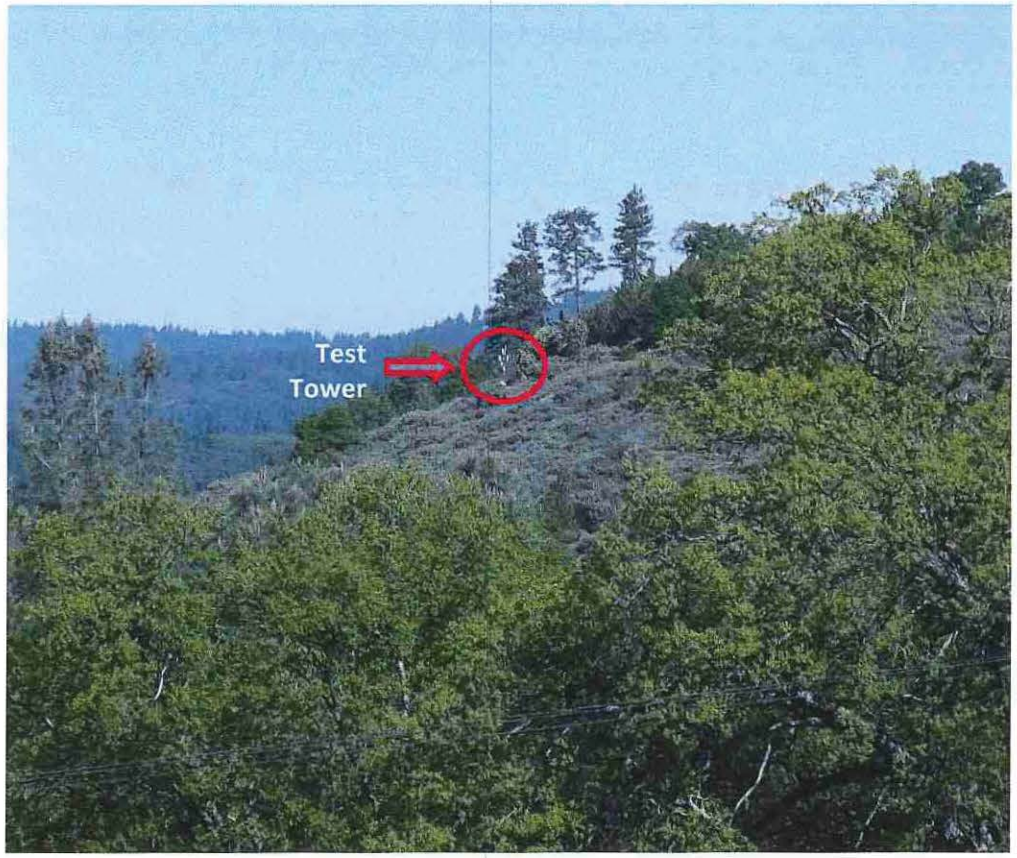


Test Tower Site

Antennae Close-up

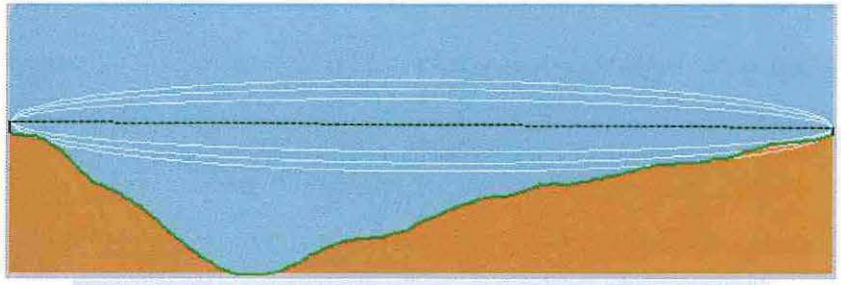
Baseline Establishment

Nearby Line of Sight



Distance from A.P. (Km)	Deviation from Sector Centerline	Fresnel (at 470 MHz)	Foliage	Terrain Clearance
1.27	4.9°	1.1	Line of Sight	Clear

	Signal Strength or SNR	Modulation	Download Speed (Mbps)	Upload Speed (Mbps)	Latency (ms)
TVWS Sector	34 Up 36 Down	QAM16 1 None	7.56	3.53	120
3.65-GHz	-48	64 QAM 5/6	4.10	4.90	82
900-MHz	-72	CCK	3.26	3.38	17



Profile Cross Section (Access Point at Left)

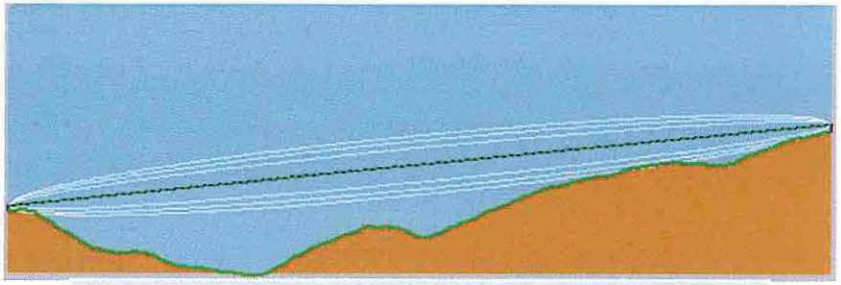
Test Location "A"

Tree Obstruction, Only

Distance from A.P. (Km)	Deviation from Sector Centerline	Fresnel (at 470 MHz)	Foliage	Terrain Clearance
2.13	-17.7°	0.9	Nearby Trees	Clear

	Signal Strength or SNR	Modulation	Download Speed (Mbps)	Upload Speed (Mbps)	Latency (ms)
TVWS Sector	11 Up 15 Down	QPSK 1 Conv	1.63	0.89	122
3.65-GHz	-87 *	QPSK ½	5.63	0.24	90
900-MHz	-88 RNA 8	N/C	N/C	N/C	N/C

(*) 3.65-GHz signal too weak for reliable installation



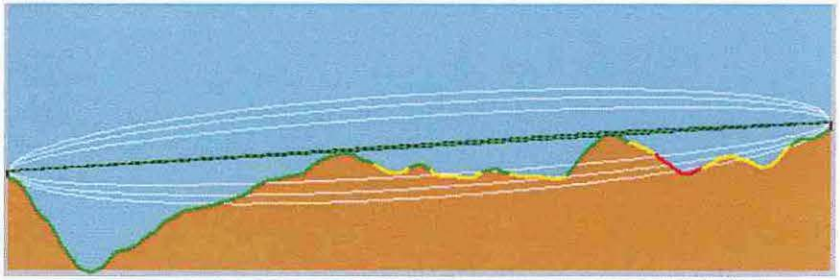
Profile Cross Section (Access Point at Left)

Test Location "B"

Tree & Terrain Obstructions, on Sector Center

Distance from A.P. (Km)	Deviation from Sector Centerline	Fresnel (at 470 MHz)	Foliage	Terrain Clearance
3.79	2.6°	- 0.1	Nearby Trees	Minor Obstruction

	Signal Strength or SNR	Modulation	Download Speed (Mbps)	Upload Speed (Mbps)	Latency (ms)
TVWS Sector	16 Up 22 Down	QPSK 1 Conv Punct	2.65	1.40	122
3.65-GHz	N/C	N/C	N/C	N/C	N/C
900-MHz	-89 RNA 7	N/C	N/C	N/C	N/C



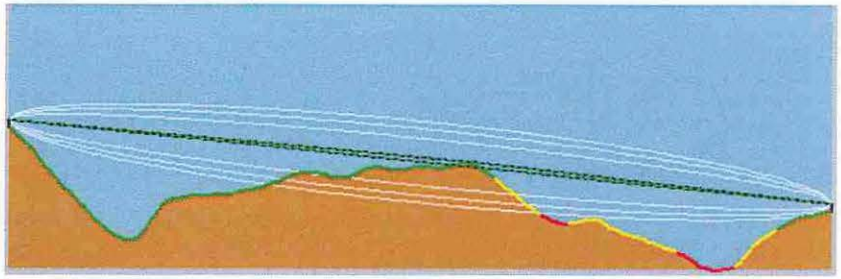
Profile Cross Section (Access Point at Left)

Test Location "C"

Tree & Terrain Obstructions, at Sector Edge

Distance from A.P. (Km)	Deviation from Sector Centerline	Fresnel (at 470 MHz)	Foliage	Terrain Clearance
2.21	48.4°	- 0.2	Nearby Trees	Minor Obstruction

	Signal Strength or SNR	Modulation	Download Speed (Mbps)	Upload Speed (Mbps)	Latency (ms)
TVWS Sector	14 Up 23 Down	QPSK 1 Conv	1.80	0.92	126
3.65-GHz	N/C	N/C	N/C	N/C	N/C
900-MHz	-83 RNA 11	N/C	N/C	N/C	N/C



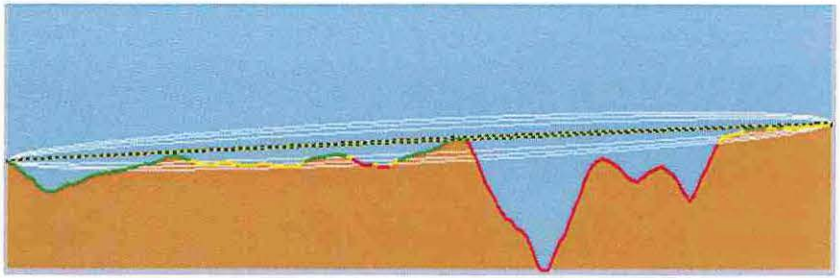
Profile Cross Section (Access Point at Left)

Test Location "D"

Tree & Terrain Obstructions, on Sector Center, Long Range

Distance from A.P. (Km)	Deviation from Sector Centerline	Fresnel (at 470 MHz)	Foliage	Terrain Clearance
7.32	4.6°	- 0.2	Distant Trees	Multiple Obstructions

	Signal Strength or SNR	Modulation	Download Speed (Mbps)	Upload Speed (Mbps)	Latency (ms)
TVWS Sector	11 Up 20 Down	QPSK 1 Conv	1.80	1.00	120
3.65-GHz	N/C	N/C	N/C	N/C	N/C
900-MHz	-87 RNA 7	N/C	N/C	N/C	N/C



Profile Cross Section (Access Point at Left)

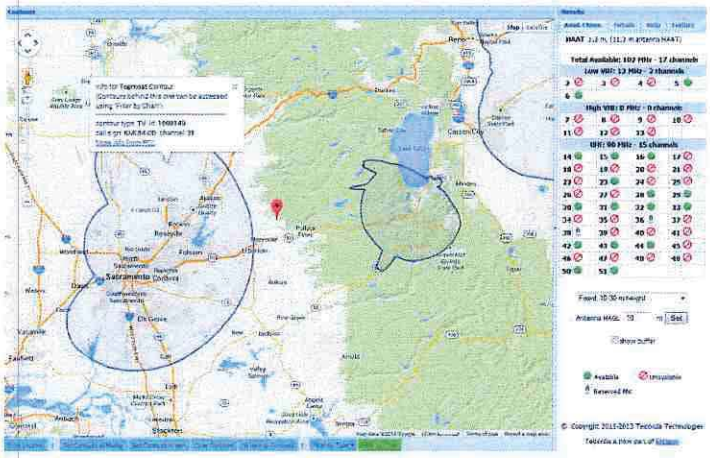
Site Analysis

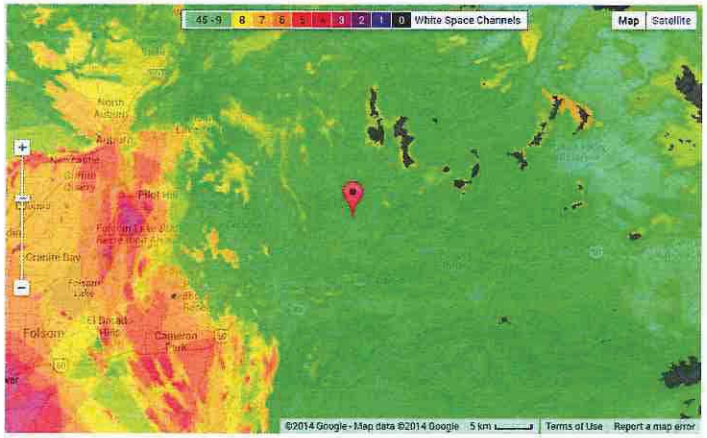
- Use every tool available!
  - From the office: <u>All</u> spectrum databases
    - Each database provides different useful data
  - In the field: Spectrum analyzer
    - Provides vitally important validation (or refutation) of database info

Site HAAT: 3.89 meters

Channel Number	Frequency Range (MHz)	Allowable Antenna Height (meters AGL)	Noise Floor (dBm)
6	82-88	30	-113.3
5	76-82	30	-111.8
16	482-488	30	-111.8
31	572-578	26.1	-106.6
33	584-590	30	-96.0
30	566-572	30	-95.8
43	644-650	30	-95.1
29	560-566	30	-94.9
51	692-698	30	-92.8
42	638-644	30	-87.2
15	476-482	30	-87.0
50	686-692	30	-83.7
23	524-530	26.1	-83.0
44	650-656	30	-81.8
28	554-560	30	-75.2
32	578-584	30	-75.1
14	470-476	30	-73.3

Click here for more information about what White Space Plus has to offer.





Caveats

- Sharing spectrum with licensed users
  - Can cause problems for WISPs
    - E.g.: They can modify transmitter power, direction, or location
  - Keep spare channels available to switch to
- Lower channels have diurnal variations
  - SNR can degrade noticeably at night
- Installations require more effort than typical
  - Customer antenna configuration and positioning

Results

- Works great!! (Within limitations)
  - In comparison with WiMAX & 900-MHz, through trees, with minor or no terrain obstructions
  - Ecstatic customers are getting up to 3 Mbps through thick forests where alternative systems fail
- For best QoS, don't exceed limitations
  - SNR must be > 7 (QPSK or better modulation)
  - For customer pre-qualification purposes, our imposed range limit is 7.5 Km *NLOS* (YMMV!)

Cal.net

Thank You!

Ken Garnett
kgarnett@cal.net
530-672-1078