AREDN

Amateur Radio Emergency Data Network

AREDN HISTORY

- HSMM, or High Speed Multimedia, is the name of an ARRL sponsored technical Working Group dating back to January 2001.
- By January 2006 dissatisfied with ARRL's unwillingness to communicate the Working Groups Recommendations to the FCC, all but one member resigned.
- In that short period HSMM spawned BroadBand HamNet (BBHN) and several other similar efforts.
- In February of 2014 the BBHN Development Team agreed to enhance and extend the Linksys WRT54G genre of HSMM to better serve EmComm purposes.
- Amateur Radio Emergeny Data Network AREDN was born with the goal of utilizing Wireless Internet Service Provider (WISP) Commercial Radios.

WHAT AND WHY IS AREDN

- AREDN's design intent is to provide an Internet like Communications capability to support Organized EmComm that can function independently of the Power Grid and the Internet.
- As Amateur Radio Clubs investigate, test and experiment with AREDN, each can decide to what extent they will adhere to AREDN's design intent.
- During the process clubs will realize that achieving lofty goals will be easier than it sounds.
- Recognizing how easily an AREDN 'Island' can evolve, those who do get involved tend to collaborate and interconnect with adjacent 'islands'.

Major Differences between WiFi and Amateur HSMM / AREDN

PART 15 licensing, devices, users and business are much more limited than Amateurs……EIRP power levels and available frequencies.

Amateurs can use any antenna we can limited to the Part 97 1,500 watt EIRP limitation.

Practically, we do not need to make use of even 1 watt of transmitter output power. Cross polarized Planar and Dish Antennas make it happen.
For example… 500mw radio with 9 dbi gain antenna = 4 w EIRP, 19 dbi gain = 40w EIRP, 22 dbi gain = 79 w EIRP 30 dbi gain = 500 w EIRP

We may not ‘encrypt’ traffic on Amateur frequencies according to Part 97.

We may transmit traffic by any means at our disposal on behalf of all Emergency Communications efforts for protection of life and property.

THE ELEPHANT IN THE ROOM

- Can we transport Served Agency encrypted data streams while transmitting clear text SSID and Part 97 Call Signs at appropriate intervals?
- That is an area that ‘Armchair Lawyers’ will debate into eternity and is, in practice, irrelevant. The FCC has never made an issue of Amateurs transmitting a data stream for a Served Agency in whatever form it has been created, including wrapped in 256 bit AES and similar.
- Actually read Part 97, it is well worth the time.
- Download and search Part 97 for ‘encryption’. You won’t find it.

WHY DOES AMATEUR RADIO EXIST ?

- If/when you actually read Part 97, you learn that a major reason Amateur Radio Frequency Authorizations exist is to create and maintain a diversely located population of ‘Amateur ‘ Emergency Communicators.
- Amateur as in non commercial, non governmental organized volunteer entities are capable of and willing to undertake Emergency Communications, whenever & wherever needed.
- Amateurs, working together, always have and can still provide a Professional service sooner and in some ways more efficiently than any Commercial or Governmental Operation when it comes to Emergency communications.
- Your presence here suggests you do understand that trained, equipped and disciplined Amateurs are a National Emergency Response Resource.

UNDERSTAND THE FOLLOWING

- Technician Class Licenses have full privileges on the microwave bands
- No one has to configure their own radios.
- You just have to commit to learning to make good use of them.
- AREDN is like the Internet.
- AREDN is different than the Internet.

AREDN Offers 2 Non-Shared Channels on 2.4 GHz

2.4 GHz	Channel	-2	-1	0*	1	2	3	4	5	6
	Status	Ham Band			Shared Ham and ISM/WiFi Band					
	Freq	2.397	2.402	2.407	2.412	2.417	2.422	2.427	2.432	2.437

*Not available for use

24 Non-Shared Channels on 3.4 GHz

3.4 GHz	Channel	76	77	78	79	80	81	82	83	84	85	86	87
	Status	Ham Band											
	Freq	3.380	3.385	3.390	3.395	3.400	3.405	3.410	3.415	3.420	3.425	3.430	3.435

	88	89	90	91	92	93	94	95	96	97	98	99
	3.440	3.445	3.450	3.455	3.460	3.465	3.470	3.475	3.480	3.485	3.490	3.495

Refer to your local band plan for coordination

52 Channels, 7 Non-Shared, on 5.8 GHz

5.8 GHz	Channel	133	134	135	136	137	138	139	140	141	142	143	144	145
	Status	Shared Ham and ISM/WiFi Band												
	Freq	5.665	5.670	5.675	5.680	5.685	5.690	5.695	5.700	5.705	5.710	5.715	5.720	5.725

	146	147	148	149	150	151	152	153	154	155	156	157	158
	5.730	5.735	5.740	5.745	5.750	5.755	5.760	5.765	5.770	5.775	5.780	5.785	5.790

	159	160	161	162	163	164	165	166	167	168	169	170	171
	Shared Ham and ISM/WiFi Band												
	5.795	5.800	5.805	5.810	5.815	5.820	5.825	5.830	5.835	5.840	5.845	5.850	5.855

	172	173	174	175	176	177	178	179	180	181	182	183	184
						Ham Band							
	5.860	5.865	5.870	5.875	5.880	5.885	5.890	5.895	5.900	5.905	5.910	5.915	5.920

Refer to your local band plan for coordination

EMCOMM Today

The typical Emcomm message-passing scenario today involves the sender conveying the message to a ham, who transcribes it onto an ICS-213 form. Then the message is spoken over VHF/UHF radio to another ham who writes it down on another ICS-213 form. The form is then delivered to the recipient, who reads it and signs it. The acknowledgment is then conveyed back over the radio to the sending ham who confirms the receipt to the originator.

Emcomm "Customer" expectations aren't being met

Andre Hansen, K6AH

EMCOMM Today

Customer expectations differ wildly than this. They expect the continued use of tools with which they are accustomed: email, phone service, chat, and other web-based tools specific to their roles within the organization.

Over $4B in ham-compatible radios is sold to non-hams each year and most hams wouldn't recognize them to be ham radios. These devices follow the 802.11 standard and operate in several of our microwave bands. They are all around us, and coupled with the privileges our license offers, we should be using this technology to deliver on these customer expectations.

Andre Hansen, K6AH

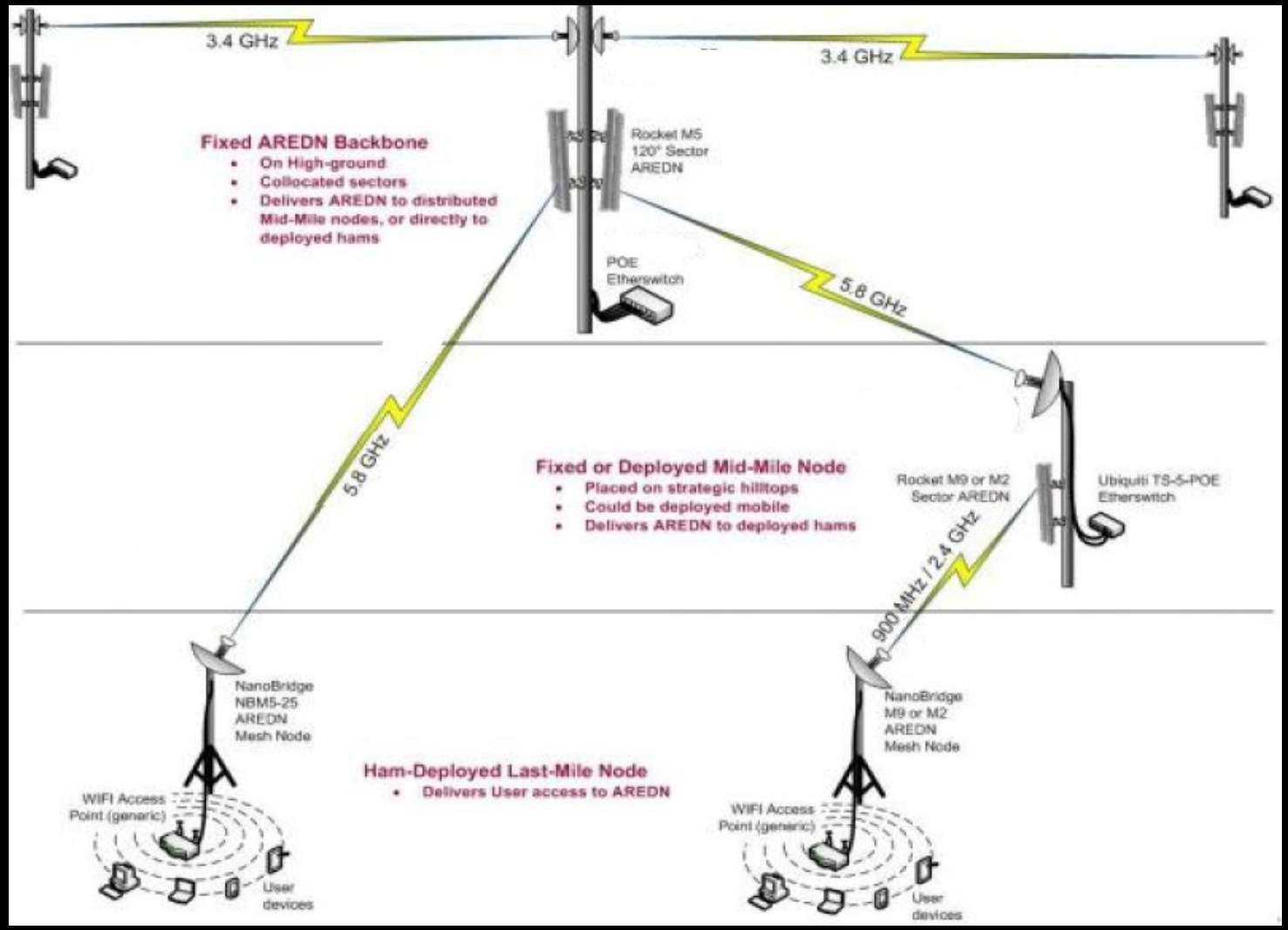
WHAT CAN YOU DO ON AN AREDN NETWORK TODAY?

- Use VoIP Phones, and properly configured smart cell phones to call other Mesh users.
- Use 'Mesh-chat', a replicating multi user texting system for instantaneous text messaging within a network. Each message is date and time stamped and can be read by all other Mesh users in a given network.
- Use Laptops and Multimedia VoIP Phones to have video conferences.
- See and control IP Cams remotely across an network.
- Send and receive email without the Internet.
- Send and receive forms, files, videos without the Internet.
- View MESH only web sites and watch MESH only video broadcasts.
- If you can do it on the Internet and it does not require access to an Internet hosted server, It works on AREDN.

APPLICATIONS: EMERGENCY NETWORKS

- **Game changer** … High-speed network … anywhere
- New capabilities for large files and streaming (voice/video), Fixed backbone and distribution infrastructure, Portable "ad-hoc" network nodes in the field
- WiFi network transparently replaces the cellular network when outside coverage area or cell network is down. Make calls, send texts as usual with your smartphone … transparent to the end user
- Backup network access to Internet, agency websites, etc.
- Establish an intranet ("private Internet") for an incident. Remotely view and control webcams, collect monitoring device data. Post shelter information (list of evacuees, etc.) and securely share patient records.
- Mobile command and operational field units can have full network capabilities in the field

Mesh Network Architecture



Equipment and Cost

Roll over image to zoom in

TP-Link CPE210 2.4GHz 300Mbps 9dBi High Power Outdoor CPE/Access Point, 2.4GHz 300Mbps, 802.11b/g/n, dual-polarized 9dBi directional antenna, Passive POE (CPE210)

by TP-Link

★★★★☆ 299 customer reviews | 271 answered questions

Amazon's Choice for "cpe210"

Price: $39.98 & FREE Shipping. Details

Arrives before Christmas. Choose delivery option in checkout.

Free Amazon product support included

Model: 2.4GHz 9dBi

2.4GHz 9dBi	5GHz 13dBi	5GHz 23dBi
$39.98	$47.99	$69.95

Service: Get professional installation Details

Without expert installation	Include installation
	+$147.51 per unit

What's included with service

- Built-in 9dBi 2x2 dual-polarized directional MIMO antenna
- Adjustable transmission power from 0 to 27dBm/500mW
- System-level optimizations for more than 5Km Long range wireless transmission
- TP-LINK Pharos tdma (Time-Division-Multiple-Access) technology improves product performance in throughput, capacity and latency performance
- Centralized management system - Pharos control
- Ap/ client/ Repeater/ AP router/ AP client router (WISP) operation modes
- Passive PoE adapter supports up to 60 meter (200 feet) power over Ethernet deployment and allows the device to be reset remotely

Compare with similar items

Equipment and Cost

Ubiquiti Nanostation NSM5, 5GHz, 802.11a/n Hi-power 20 dBm Minimum, 2x2 MIMO AirMax TDMA PoE Station

by Ubiquiti Networks

4.5 out of 5 stars 203 customer reviews | 179 answered questions

List Price: $89.00

Price: $79.40 & **FREE Shipping**. Details

You Save: $9.60 (11%)

Note: Available at a lower price from other sellers that may not offer free Prime shipping.

Arrives before Christmas. Choose delivery option in checkout.

Free Amazon product support included

- Time Division Multiple Access, integrated airMAX (MIMO TDMA protocol) technology.
- Dual Ethernet, 4 LED signal strength indicator, Intelligent POE, Capable of high-speed, carrier-class links
- Frequency Range: 5.745-5.825 Ghz, Gain 16 dBi, Max Power Consumption 8W
- Access (TDMA) airMAX protocol allows each client to send and receive data using pre-designated time slots scheduled by an intelligent AP controller

Compare with similar items

New (54) from $75.99 & FREE shipping.

Report incorrect product information.

Cambium Networks ePMP 5 GHz Force 190 Integrated High-Gain Antenna - Wireless Subscriber Module - Outdoor CPE - 200 Mbps...

5 out of 5 stars 1 | $99.00 prime

Shop now ›

Ad feedback

Equipment and Cost

Ubiquiti PowerBeam M2 Wireless Bridge (PBE-M2-400)

by Ubiquiti Networks

★★★★★ 7 customer reviews | 9 answered questions

List Price: $395.00

Price: $89.28 & FREE Shipping

You Save: $305.72 (77%)

Expected to arrive after Christmas. Need a gift quickly? Send the gift of Prime or an Amazon Gift Card by email or text message.

- Integrated radio design
- Plug-and-Play installation
- Incredible antenna "Beam" performance
- Advanced software technology

Compare with similar items

New (9) from $89.28 & FREE shipping.

Report incorrect product information.

Google WiFi system, 1-Pack - Router replacement for whole home coverage - NLS-1304-25

★★★★½ 5048 | $99.00 ✓prime

Shop now ›

Ad feedback

Equipment and Cost

Ubiquiti PBE-M5-300-ISO 5GHz PowerBeam M5 airMAX 300mm ISO RF Isolated Reflector

Be the first to review this item

Price: $99.00 & **FREE Shipping**

Expected to arrive after Christmas. **Need a gift quickly?** Send the gift of Prime or an Amazon Gift Card by email or text message.

New (5) from $99.00 & FREE shipping.

Specifications for this item

Brand Name	Ubiquiti Networks
EAN	0602003746444
Item Weight	9.7 ounces
Model Number	PBE-M5-300-ISO
Part Number	PBE-M5-300-ISO
UPC	602003746444

See more product details

Equipment and Cost

Roll over image to zoom in

Ubiquiti ROCKETM5 5GHz Hi Power 2x2 MIMO TDMA airMAX BaseStation (ROCKETM5)

by Ubiquiti Networks

4.0 out of 5 stars 51 customer reviews | 42 answered questions

List Price: $89.00

Price: $80.53 & **FREE Shipping**. Details

You Save: $8.47 (10%)

Note: Available at a lower price from other sellers that may not offer free Prime shipping.

Arrives before Christmas. Choose delivery option in checkout.

Free Amazon product support included

- Processor : Atheros MIPS 24KC, 400MHz
- Memory: 64MB SDRAM, 8MB Flash
- Networking Interface : 1 X 10/100 BASE-TX (Cat. 5, RJ-45) Ethernet Interface
- RF Connector: 2x RPSMA (Waterproof)
- Power supply : 24V, 1A POE Supply Included
- Updated Bullets:
- High Performance MIMO 2x2 TDMA Architecture

Show more

Compare with similar items

Used & new (47) from $37.00 + $5.49 shipping

Report incorrect product information.

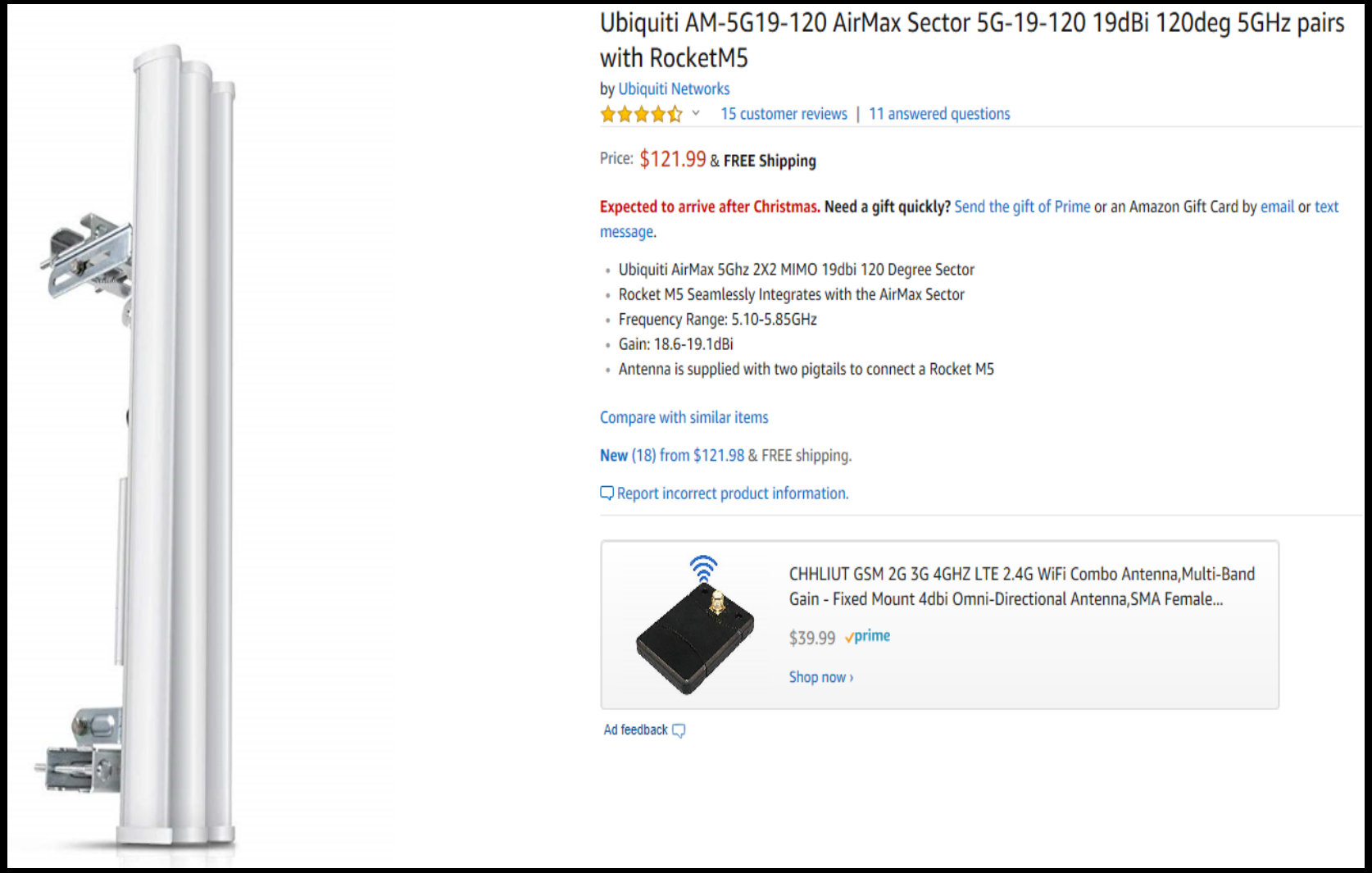
Cambium Networks ePMP 5 GHz Force 190 Integrated High-Gain Antenna - Wireless Subscriber Module - Outdoor CPE - 200 Mbps...

5.0 out of 5 stars 1 | $99.00 prime

Shop now ›

Ad feedback

Equipment and Cost



Ubiquiti AM-5G19-120 AirMax Sector 5G-19-120 19dBi 120deg 5GHz pairs with RocketM5

by Ubiquiti Networks

15 customer reviews | 11 answered questions

Price: $121.99 & **FREE Shipping**

Expected to arrive after Christmas. Need a gift quickly? Send the gift of Prime or an Amazon Gift Card by email or text message.

- Ubiquiti AirMax 5Ghz 2X2 MIMO 19dbi 120 Degree Sector
- Rocket M5 Seamlessly Integrates with the AirMax Sector
- Frequency Range: 5.10-5.85GHz
- Gain: 18.6-19.1dBi
- Antenna is supplied with two pigtails to connect a Rocket M5

Compare with similar items

New (18) from $121.98 & FREE shipping.

Report incorrect product information.

Equipment and Cost

Ubiquiti NanoSwitch Outdoor 4-Port PoE Passthrough Switch (N-SW)

by Ubiquiti Networks

4.0 out of 5 stars 6 customer reviews | 8 answered questions

Price: $37.26 & **FREE Shipping**

Expected to arrive after Christmas. **Need a gift quickly?** Send the gift of Prime or an Amazon Gift Card by email or text message.

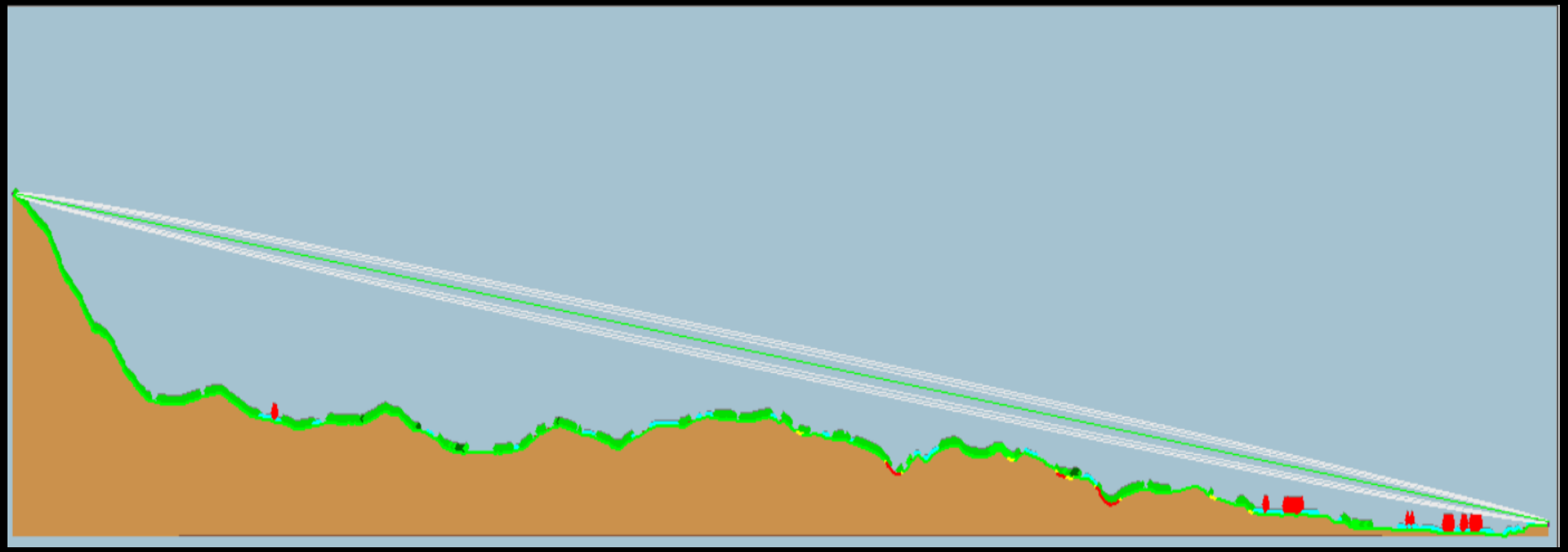
- UPC: 817882021708
- Weight: 1.200 lbs

New (24) from $37.26 & FREE shipping.

Report incorrect product information.

Propagation Studies
Red Cross Monroe County PA

Propagation Studies
Red Cross Monroe County PA



Propagation Studies
Red Cross Monroe County PA

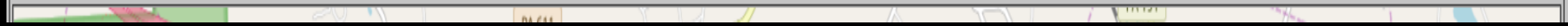
Performance		
Distance	**15.209**	**km**
Precision	10.0	m
Frequency	5850.000	MHz
Equivalent Isotropically Radiated Power	39.716	W
System gain	201.01	dB
Required reliability	70.000	%
Received Signal	-72.93	dBm
Received Signal	50.52	µV
Fade Margin	**60.09**	**dB**

Propagation Studies
Stroudsburg High School

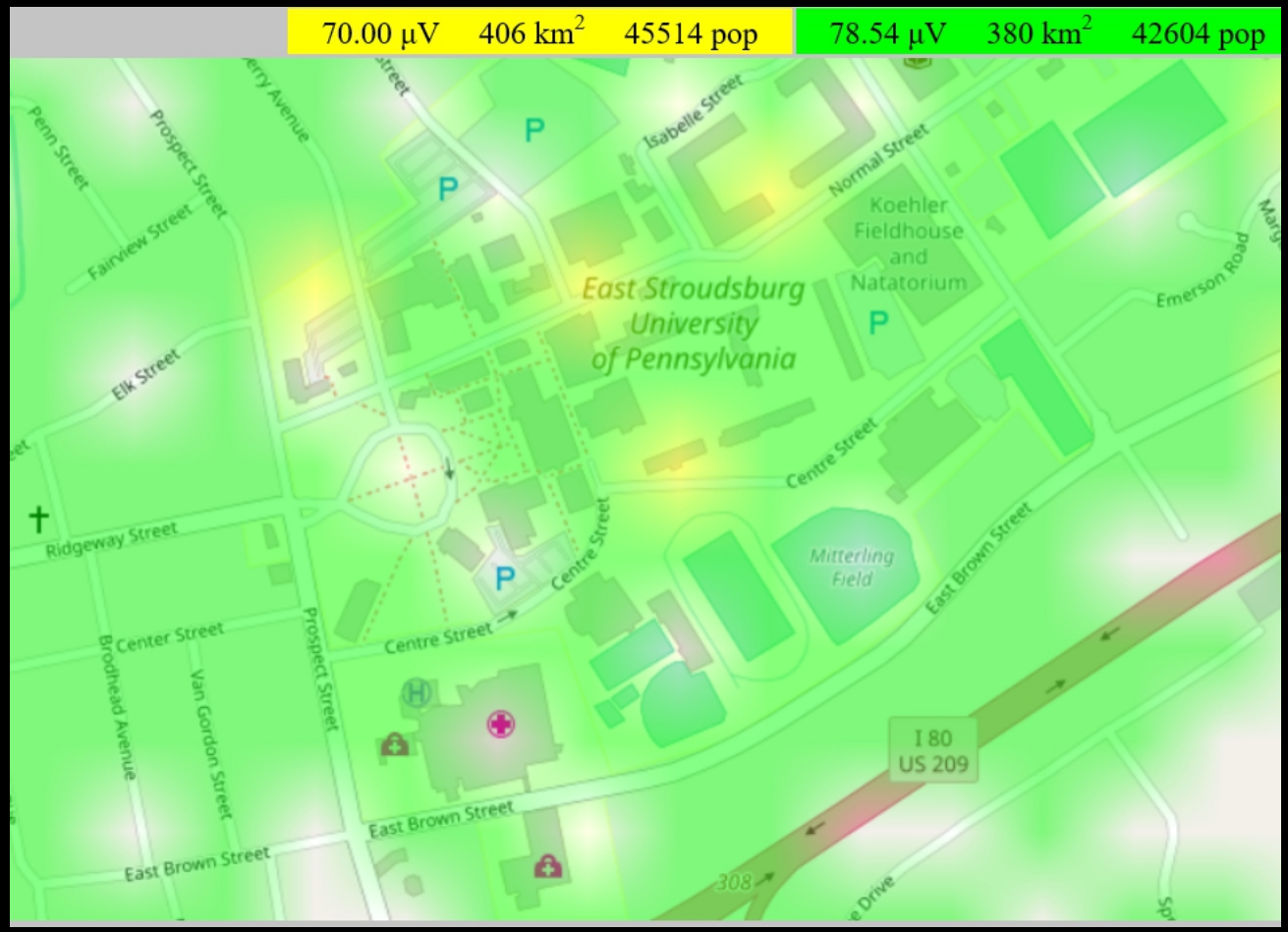
Propagation Studies
Stroudsburg High School

Propagation Studies
Stroudsburg High School

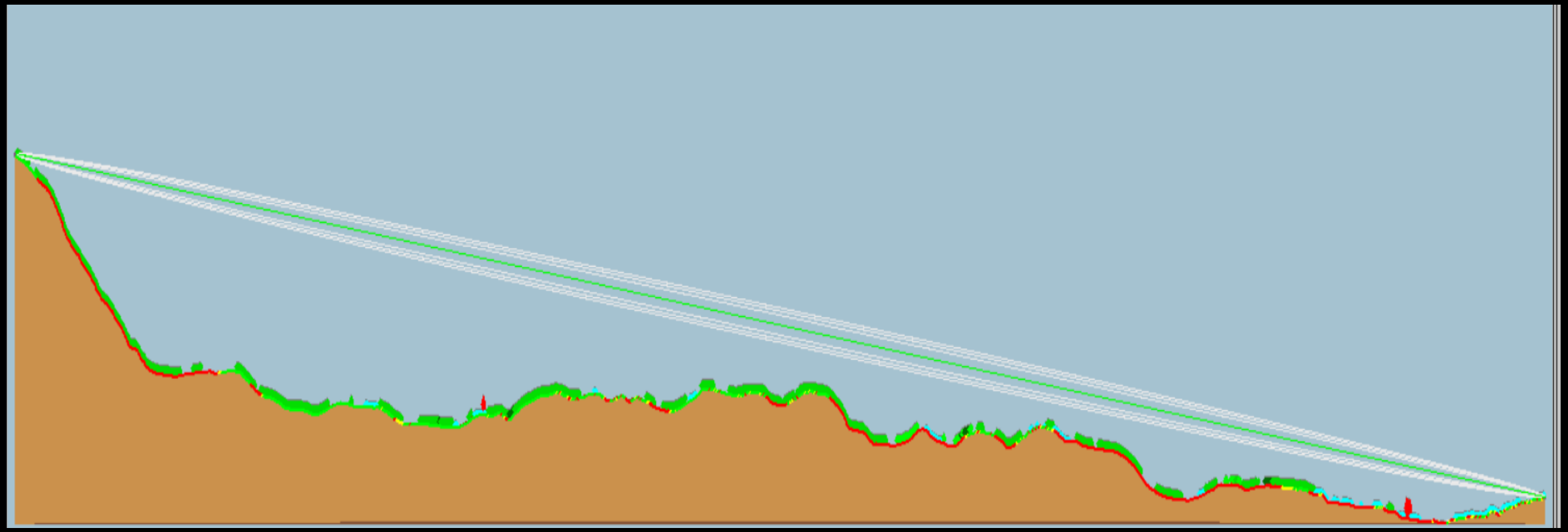
Performance		
Distance	**13.687**	**km**
Precision	10.0	m
Frequency	5850.000	MHz
Equivalent Isotropically Radiated Power	39.716	W
System gain	141.01	dB
Required reliability	70.000	%
Received Signal	-68.23	dBm
Received Signal	86.82	µV
Fade Margin	**4.79**	**dB**



Propagation Studies
Lehigh Valley, Pocono Hospital



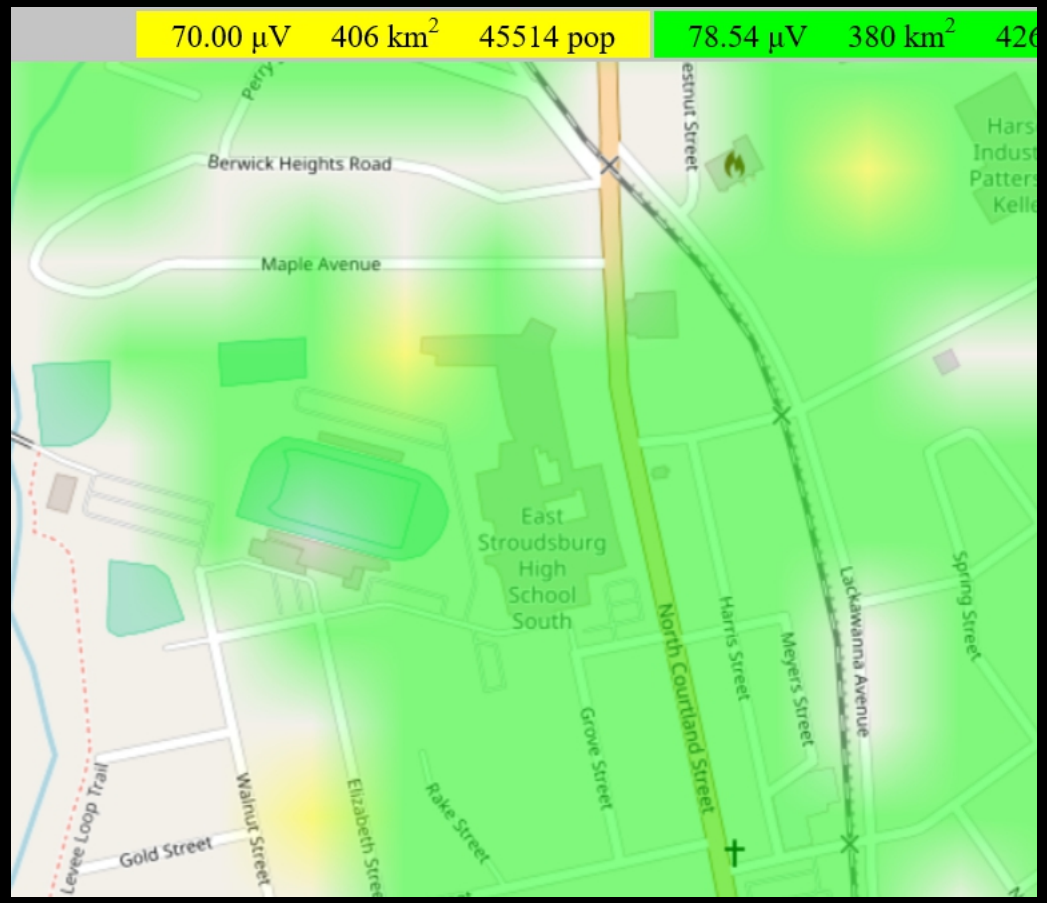
Propagation Studies
Lehigh Valley, Pocono Hospital



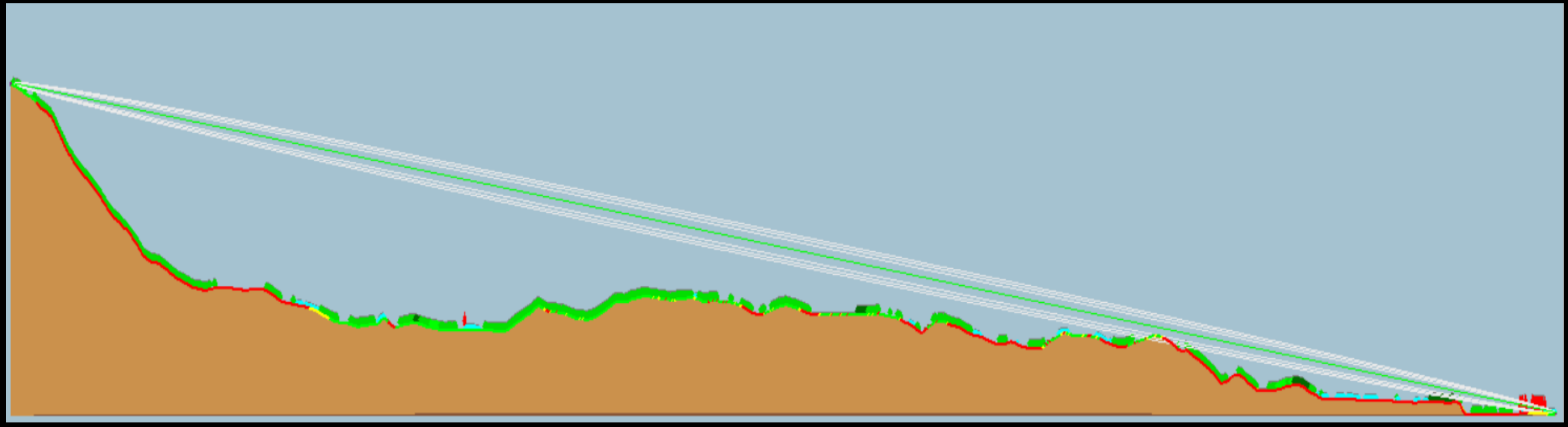
Propagation Studies
Lehigh Valley, Pocono Hospital

Performance		
Distance	**15.641**	**km**
Precision	10.0	m
Frequency	5850.000	MHz
Equivalent Isotropically Radiated Power	39.716	W
System gain	141.01	dB
Required reliability	70.000	%
Received Signal	-69.58	dBm
Received Signal	74.31	µV
Fade Margin	**3.44**	**dB**

Propagation Studies
East Stroudsburg High School



Propagation Studies
East Stroudsburg High School

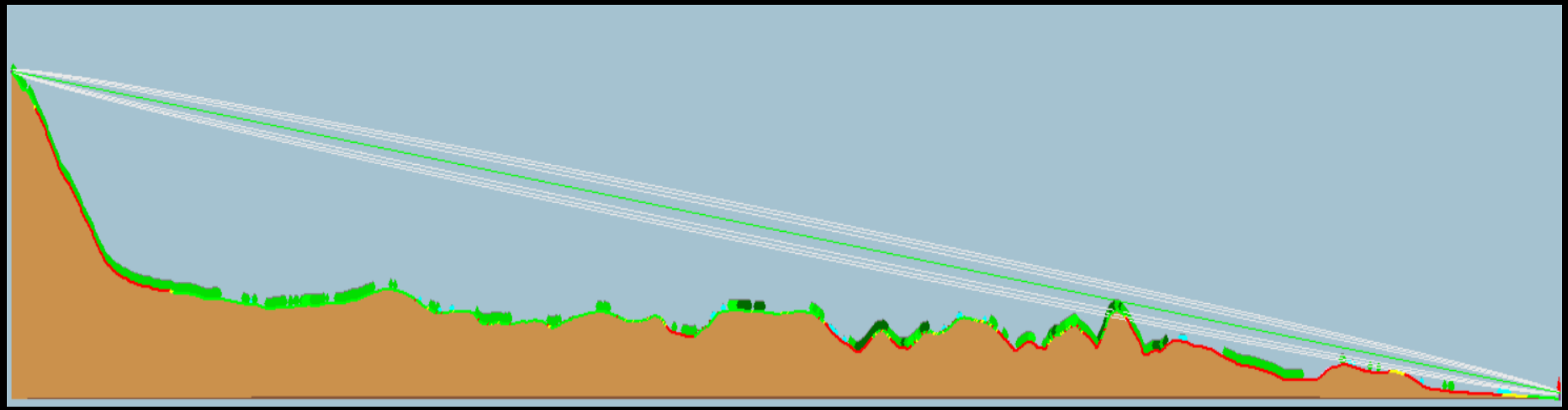


Propagation Studies
East Stroudsburg High School

Performance		
Distance	**14.422**	**km**
Precision	10.0	m
Frequency	5850.000	MHz
Equivalent Isotropically Radiated Power	39.716	W
System gain	141.01	dB
Required reliability	70.000	%
Received Signal	-69.69	dBm
Received Signal	73.35	µV
Fade Margin	**3.33**	**dB**

Propagation Studies
West End Fair Grounds

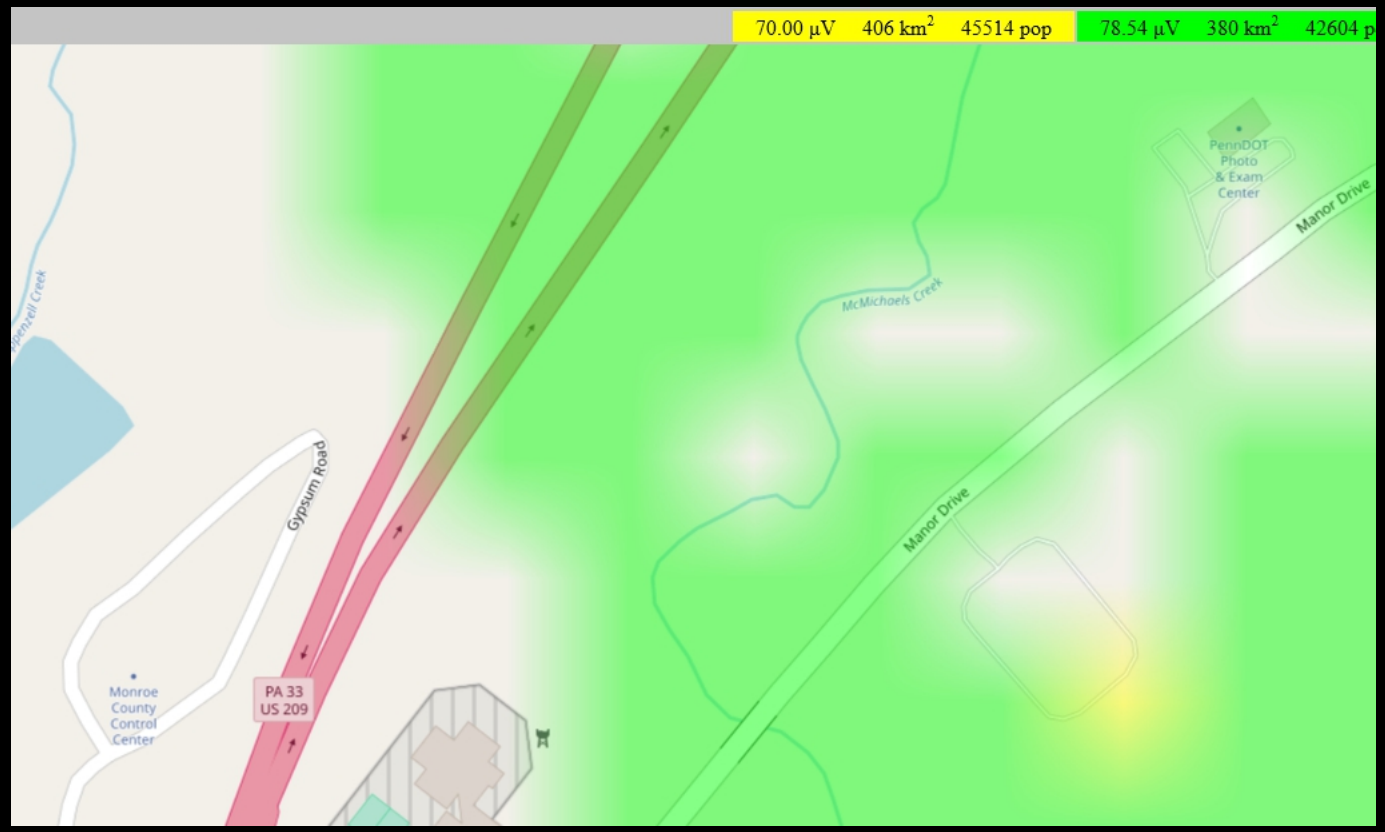
Propagation Studies
West End Fair Grounds



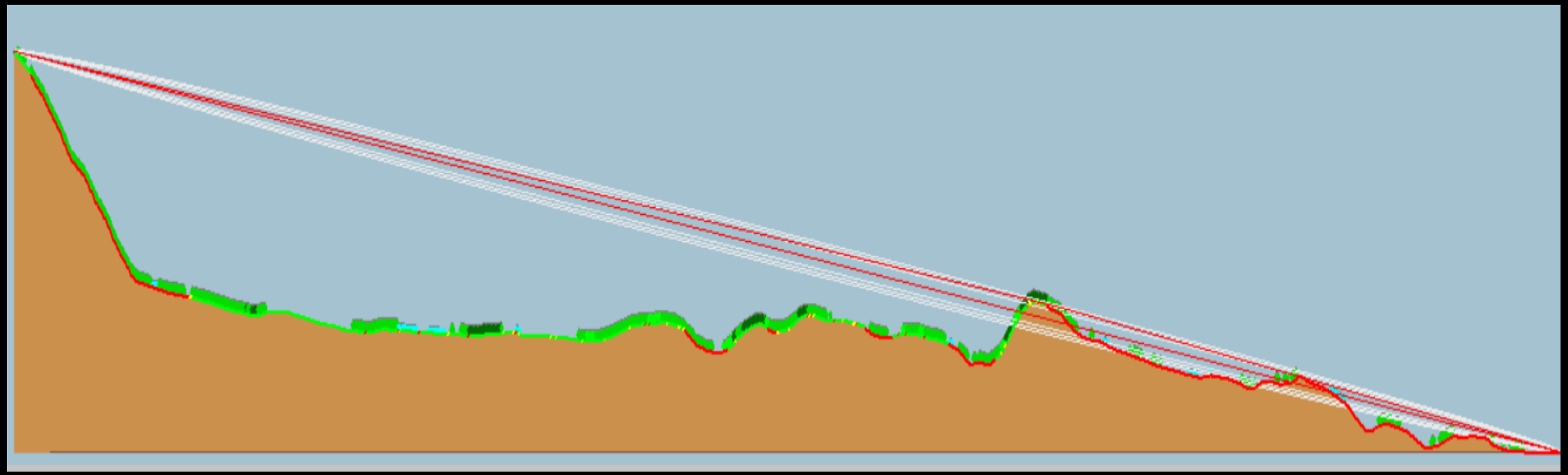
Propagation Studies
West End Fair Grounds

Performance		
Distance	**16.033**	**km**
Precision	10.0	m
Frequency	5850.000	MHz
Equivalent Isotropically Radiated Power	39.716	W
System gain	141.01	dB
Required reliability	70.000	%
Received Signal	-68.93	dBm
Received Signal	80.09	µV
Fade Margin	**4.09**	**dB**

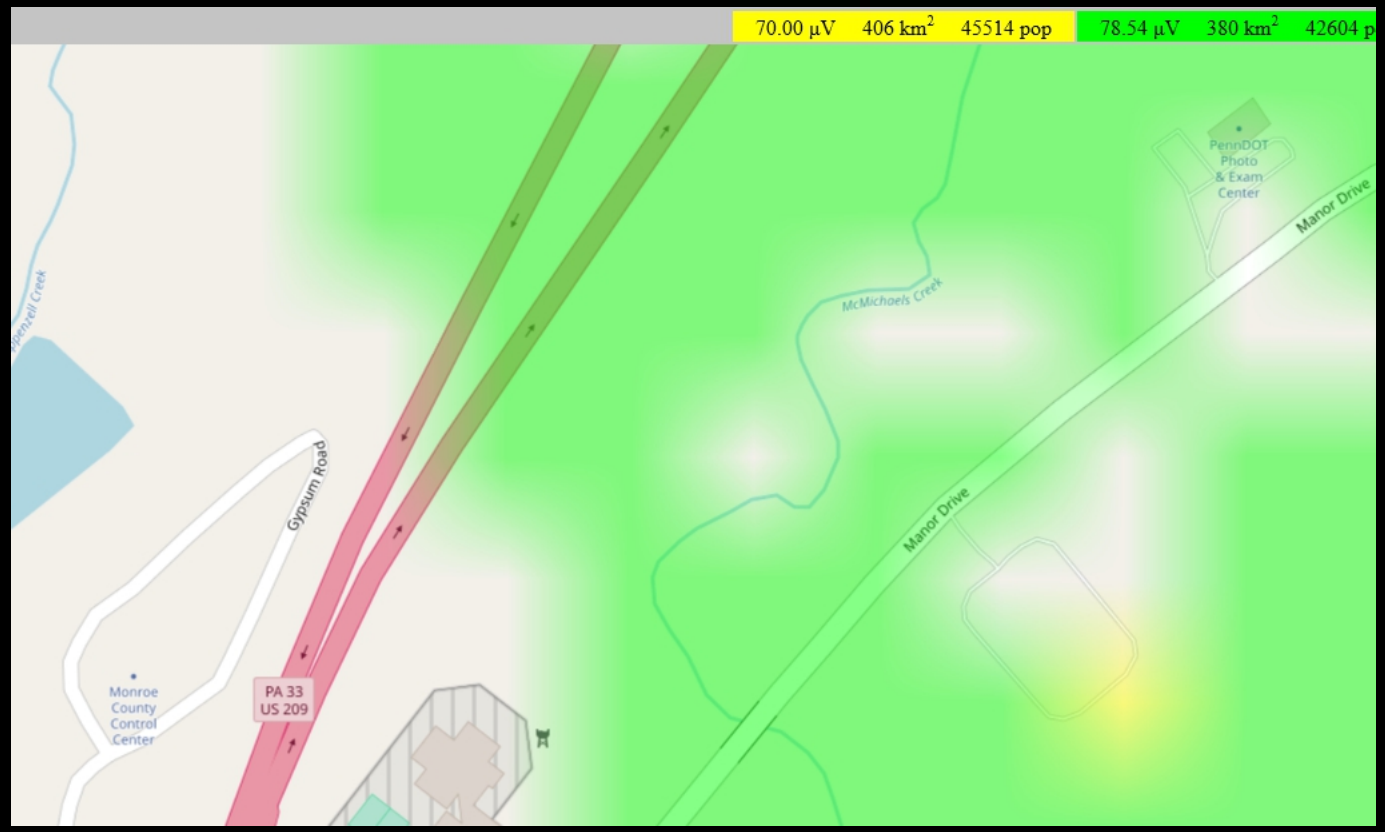
Propagation Studies
Monroe County 911 Center



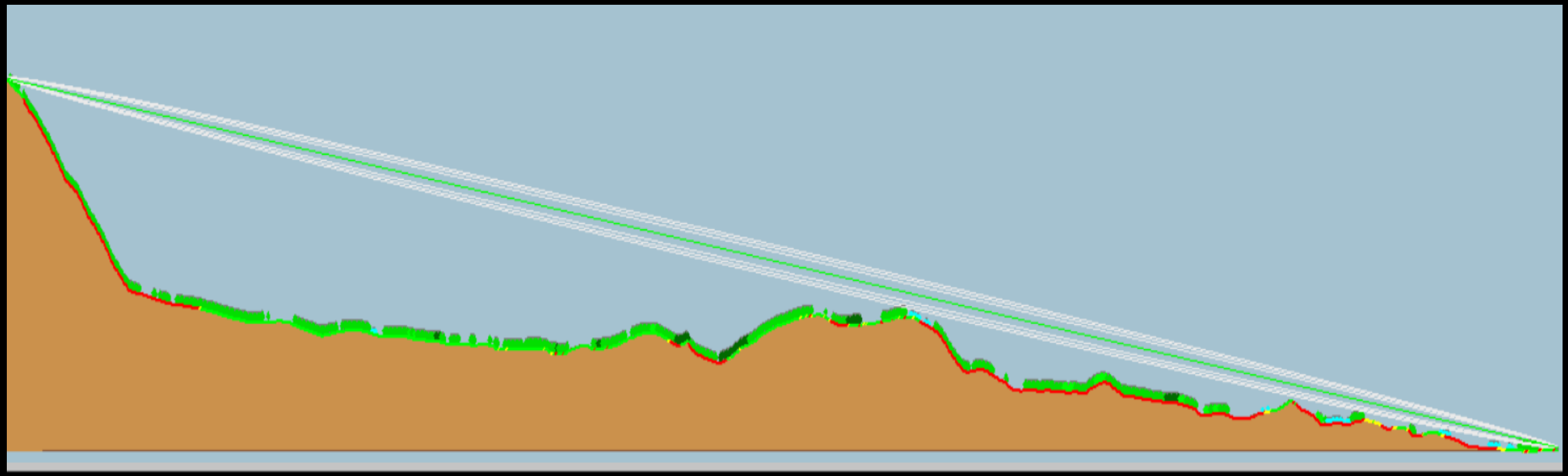
Propagation Studies
Monroe County 911 Center



Propagation Studies
Monroe County 911 Center



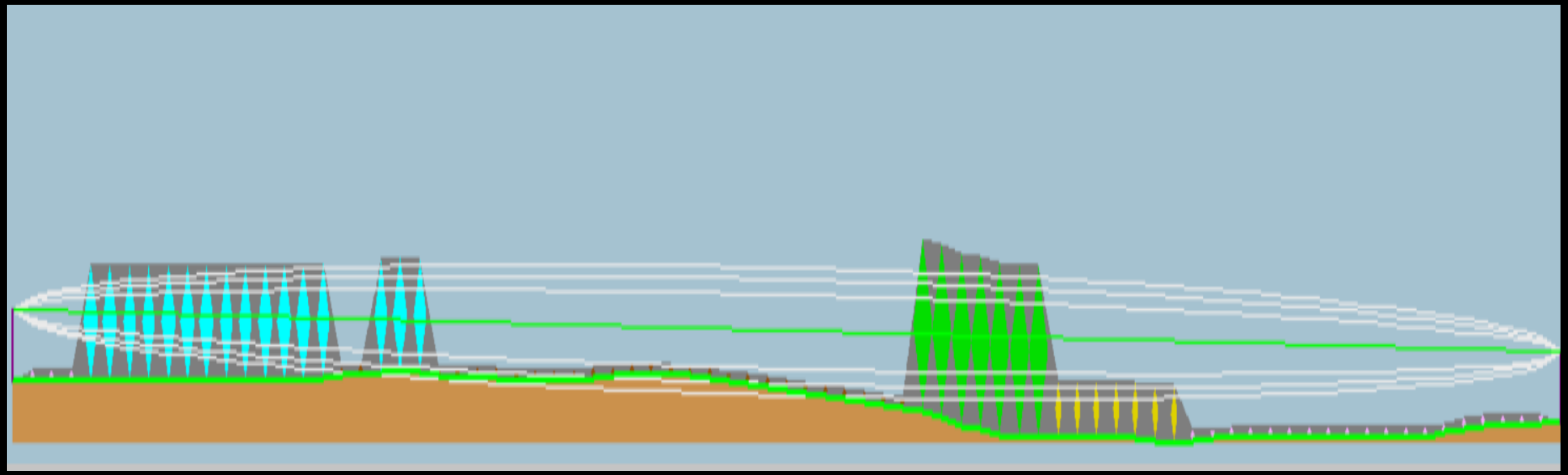
Propagation Studies
Monroe County DMV



Propagation Studies
Monroe County DMV

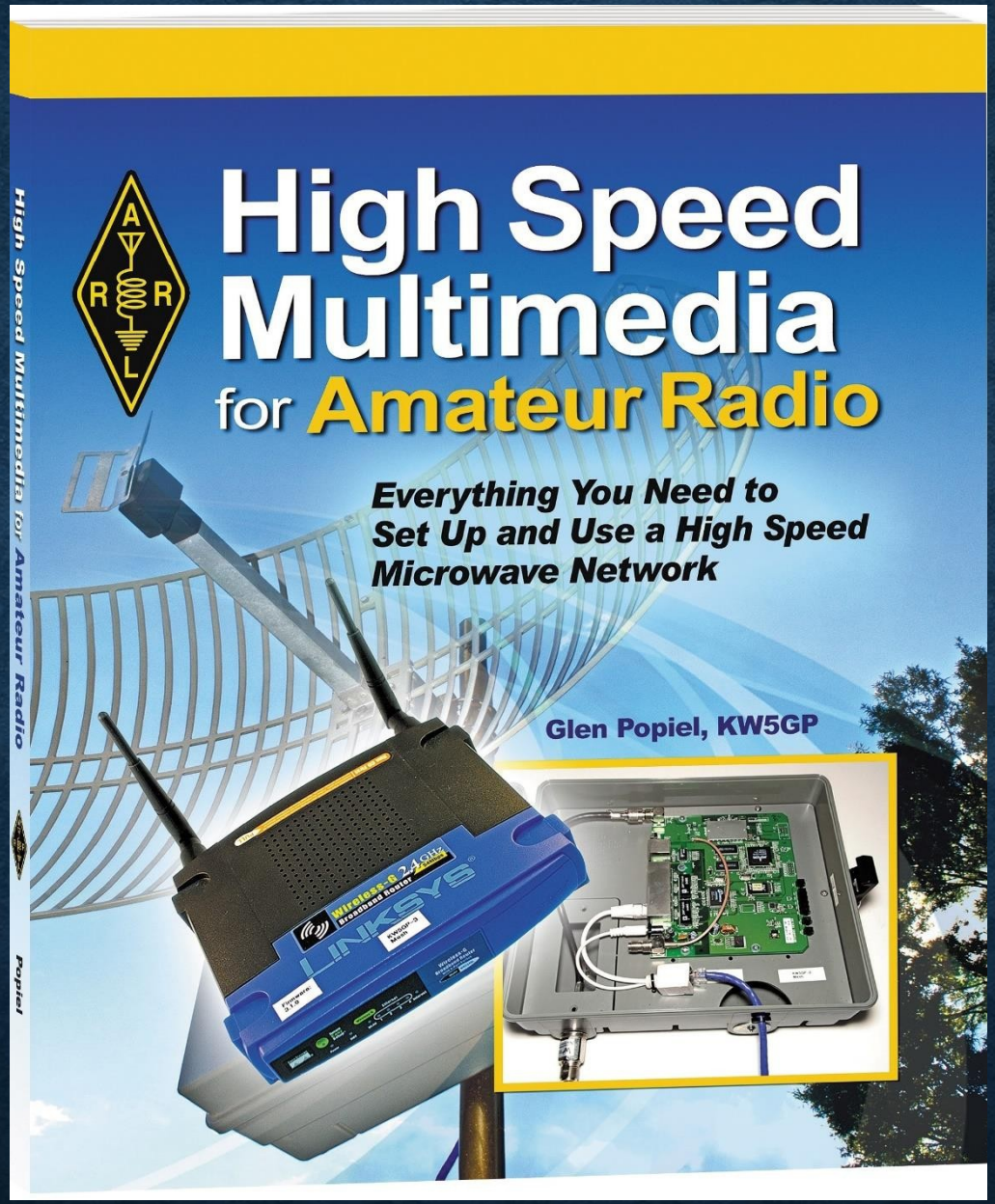
Performance		
Distance	**11.282**	**km**
Precision	10.0	m
Frequency	5850.000	MHz
Equivalent Isotropically Radiated Power	39.716	W
System gain	141.01	dB
Required reliability	70.000	%
Received Signal	-63.76	dBm
Received Signal	145.29	µV
Fade Margin	**9.27**	**dB**

Propagation Studies
Monroe County DMV – 911 Center



Propagation Studies
Monroe County DMV – 911 Center

Performance		
Distance	**0.793**	**km**
Precision	9.9	m
Frequency	5850.000	MHz
Equivalent Isotropically Radiated Power	39.716	W
System gain	141.01	dB
Required reliability	70.000	%
Received Signal	-54.72	dBm
Received Signal	411.26	µV
Fade Margin	**18.30**	**dB**



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Demonstration