WIRELESS MESH USING AMATEUR RADIO EMERGENCY DATA NETWORK

AREDN™
AMATEUR RADIO EMERGENCY DATA NETWORK

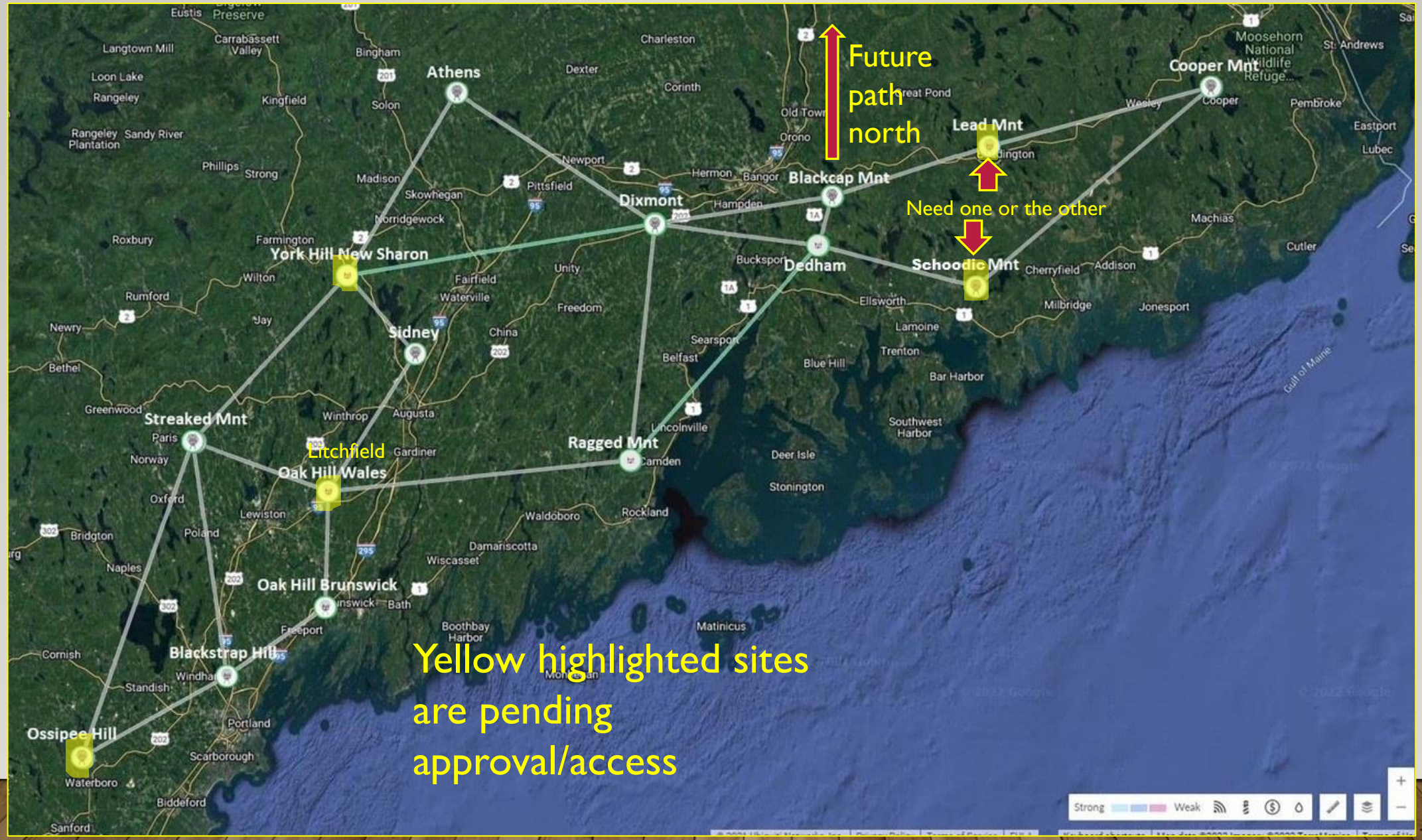
SUMMARY

- Grant Approved!!!
- Deployment Map
- What is AREDN?
- Frequencies
- Hardware and Firmware
- Ubiquiti Antennas
- Demo

GRANT APPROVED!!!

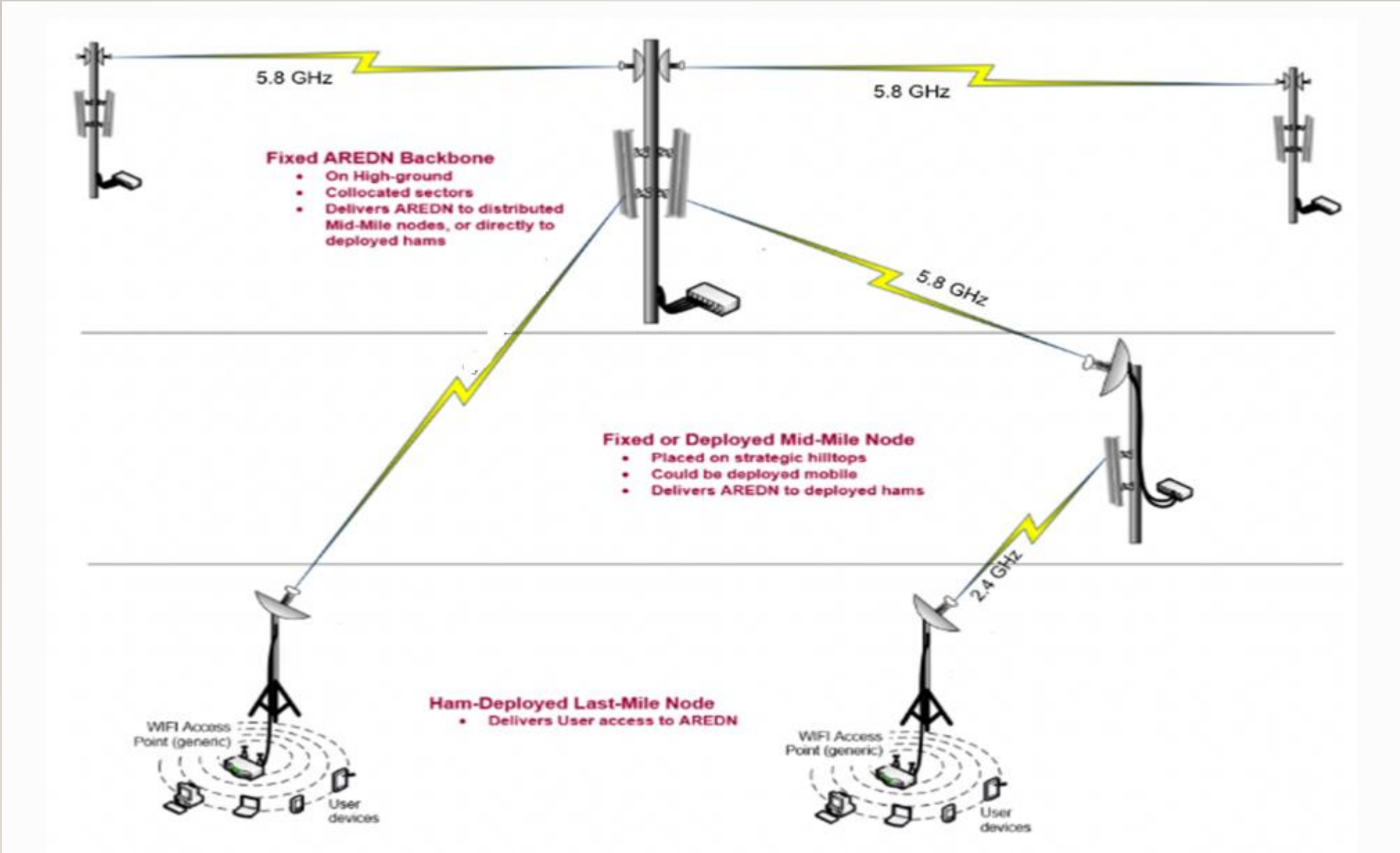
- We asked for just over $41K in a grant proposal and was approved/awarded by (ARDC) Amateur Radio Digital Communications.
- (MARF) Maine Amateur Radio Foundation provided the (501c3) status and administration to make the grant possible. http://mar.foundation
- Funds will be used to build a MESH backbone from Portland to Down East Maine
- Will utilize locations that have UFB New England Fusion Group repeaters hosted (for the most part)

DEPLOYMENT IN MAINE



DEPLOYMENT IN MAINE

- Lots of possibilities
  - ✓ Use of current repeater sites is a must to create a backbone
  - ✓ 5.8Ghz as the point-to-point backbone (to mesh repeater sites)
    - Use 120 deg panel antennas/devices to support home/portable users
    - Lots of channels to use to prevent overlap/interference
  - ✓ 2.4Ghz sub nodes for home/remote access per sites
    - Use 5Mhz width so we can divide between 2 channels per site
  - ✓ Packet BPQ nodes connected at sites (as needed) with VHF or UHF

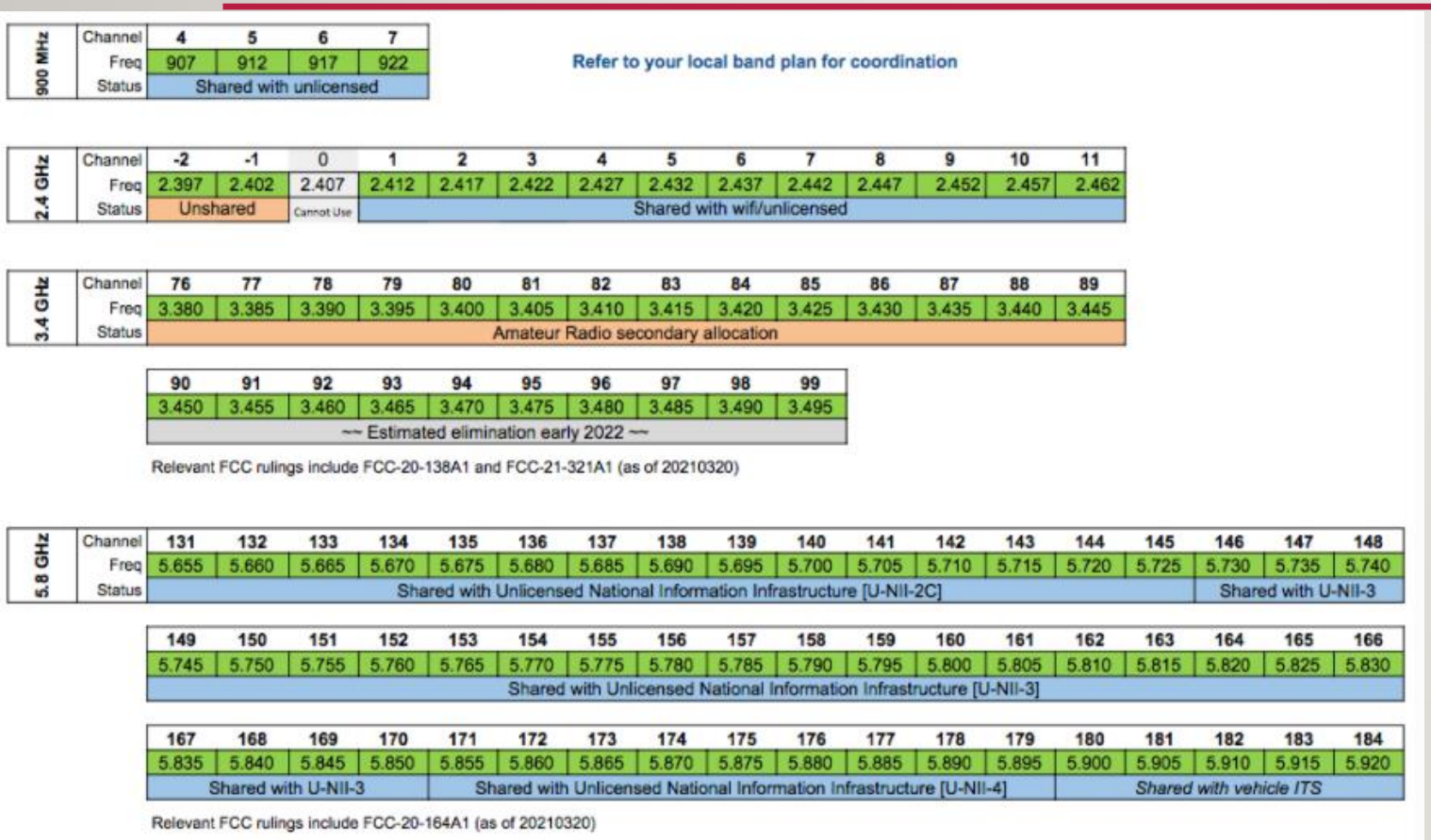

5.8 GHz
5.8 GHz
Fixed AREDN Backbone
On High-ground
Collocated sectors
Delivers AREDN to distributed Mid-Mile nodes, or directly to deployed hams
5.8 GHz
Fixed or Deployed Mid-Mile Node
Placed on strategic hilltops
Could be deployed mobile
Delivers AREDN to deployed hams
2.4 GHz
Ham-Deployed Last-Mile Node
Delivers User access to AREDN
WIFI Access Point (generic)
User devices
WIFI Access Point (generic)
User devices

WHAT IS AREDN?

Amateur Radio Emergency Data Network (arednmesh.org)

- What is AREDN? (Amateur Radio Emergency Data Network)
- Uses commercial off the shelf low-cost wireless equipment (access points) to create a self discovering network. (Ubiquiti, TP-Link, Mikrotik and GL.Inet)
- The access points are loaded with the AREDN firmware and become ham radios.
- AREDN development team formed in February 2015 to create this firmware
- AREDN team includes Project Managers, Programmers and Testers (All volunteers)

FREQUENCIES



900 MHz

Channel	4	5	6	7
Freq	907	912	917	922
Status	Shared with unlicensed			

Refer to your local band plan for coordination

2.4 GHz

Channel	-2	-1	0	1	2	3	4	5	6	7	8	9	10	11
Freq	2.397	2.402	2.407	2.412	2.417	2.422	2.427	2.432	2.437	2.442	2.447	2.452	2.457	2.462
Status	Unshared		Cannot Use	Shared with wifi/unlicensed										

3.4 GHz

Channel	76	77	78	79	80	81	82	83	84	85	86	87	88	89
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	3.440	3.445
Status	Amateur Radio secondary allocation													

90	91	92	93	94	95	96	97	98	99
3.450	3.455	3.460	3.465	3.470	3.475	3.480	3.485	3.490	3.495
~~ Estimated elimination early 2022 ~~									

Relevant FCC rulings include FCC-20-138A1 and FCC-21-321A1 (as of 20210320)

5.8 GHz

Channel	131	132	133	134	135	136	137	138	139	140	141	142	143	144	145	146	147	148
Freq	5.655	5.660	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	5.730	5.735	5.740
Status	Shared with Unlicensed National Information Infrastructure [U-NII-2C]															Shared with U-NII-3		

149	150	151	152	153	154	155	156	157	158	159	160	161	162	163	164	165	166
5.745	5.750	5.755	5.760	5.765	5.770	5.775	5.780	5.785	5.790	5.795	5.800	5.805	5.810	5.815	5.820	5.825	5.830
Shared with Unlicensed National Information Infrastructure [U-NII-3]																	

167	168	169	170	171	172	173	174	175	176	177	178	179	180	181	182	183	184
5.835	5.840	5.845	5.850	5.855	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
Shared with U-NII-3				Shared with Unlicensed National Information Infrastructure [U-NII-4]									*Shared with vehicle ITS*				

Relevant FCC rulings include FCC-20-164A1 (as of 20210320)

- 900 Mhz
  - 4 Channels and shared
- 2.4 Ghz
  - 13 Channels, 11 shared and 2 unshared
- 3.4 Ghz
  - 14 Channels shared, 10 removed
- 5.8 Ghz
  - 54 Channels (lots of room)
  - All shared

LINE OF SIGHT (LOS)

- LOS is a must. (get above tree line or between them)
- Microwave signals can go over 30 miles. (or one tree!)
- Two's company and Tree's a crowd ☺ (Per Orv W6BI)
- Demo Ubiquiti free LOS tool (link.ui.com)

(REPEATER SITE GEAR

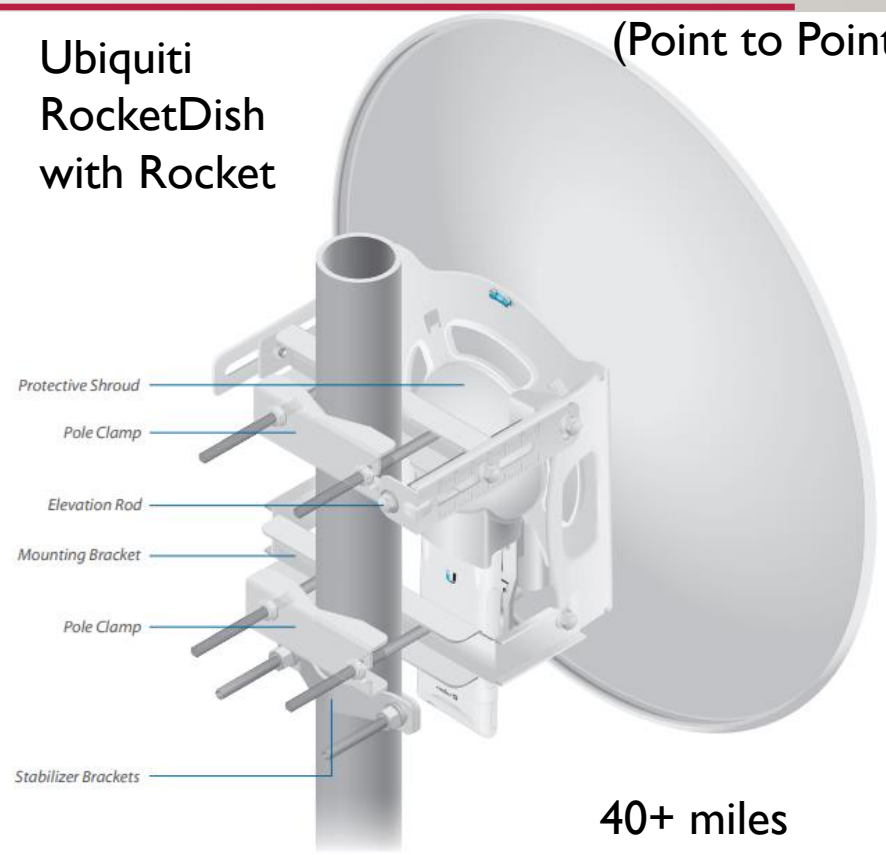
Ubiquiti LAP120 (End user)
16dBi

15+ miles

Ubiquiti (Point to Point)
PowerBeam 5AC
500mm 27dBi

28+ miles

Ubiquiti
RocketDish
with Rocket
(Point to Point)



40+ miles

Back View of the Fully Assembled RD-5G30-LW

HOME AND PORTABLE GEAR

(Most common and recommended)

Ubiquiti

Nanostation,

Rocket M5

Rocket AC5

Nanobeam

MikroTik

GL.iNet
(indoor rated)

HOW TO GET STARTED?

- Cory KU1U has started a working group for this effort for New England.
  - nemesh@groups.io | Home
- Get your own mesh node going (the more involved the bigger the mesh)
  - Device Selection Chart | Amateur Radio Emergency Data Network (arednmesh.org)
  - Supported Platform Matrix (arednmesh.org)
- Join the AREDN forums to build a better understanding (just about every question has been asked and answered (Read!) If you can't find the answer, ask a question)
  - Amateur Radio Emergency Data Network (arednmesh.org)
  - Maine | Amateur Radio Emergency Data Network (arednmesh.org)
- Make friends with repeater owners ☺
- Tunnelling is a temporary solution until an RF link is created. (as shown in my live demo today)

DEMO

- Demo Network
- AREDN® is a registered trademark of Amateur Radio Emergency Data Network, Inc

THANK YOU!