The Hellgate Static
Oct 2024

Hellgate Amateur Radio Club
P.O. Box 3811, Missoula, MT. 59806-3811
Web: www.w7px.org

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Officers:

President: NZ7S
Vice-President: W7RPG
Treasurer: KJ7YHG
Secretary: K7MSO

Positions:

Emergency Coordinator: contact_us@w7px.org
QSLs, Awards: contact_us@w7px.org
Webmaster: contact_us@w7px.org
Asst Webmaster: editor@w7px.org
License Exams Contact VE:
harc.ve.testing@gmail.com
Static Editor: editor@w7px.org

Repeater Committee:

W7RPG (Chair)
K7QA --- Dec 2022 for (23/24)
KG7WYO – Dec 2022 for (23/24)
N7PAS -- Dec 2023 for (24/25)
KI7PCR -- Dec 2023 for (24/25)

Buy-Sell Operations hfc@w7px.org
W7XT, K0SN, K7QA

Coming Events 2024

Oct	14	Bitterroot Mushers Dirt Dash
Oct	14	HARC Testing, Meeting
Oct	17	Great Montana Shakeout Drill
Oct	19-20	JOTA/JOTI
Nov	05	Election Day
Nov	11	HARC Testing, Meeting

HARC Sep Meeting

Program: Unknown

RADIO TESTING EXAMS AND MEETING

The testing and meeting are on the 2nd Monday of each Month.
We are having in-person, electronic testing and monthly meetings.
The Radio license Exams are from 5:30-6:30PM
Meetings which start at 7:00PM (Program & Business).
Both will be held at **The Church of Jesus Christ of Latter Day Saints**, 3026 South Avenue West, across the street from Big Sky High School.
Use the North entrance as all others will be locked.

Published: 1 Oct 2024 @11:00 AM by N7PAS

9 Sep 2024 Exam Testing Results

Congratulations to:

1. **Jeffrey Abbott** of Missoula has passed his **Extra** exam. His call sign is **KK7QJH**.
2. **Matthew McNair** of Great Falls/Missoula has passed his **Techhnician** exam.
   His call sign is **KK7VGR**.

9 Sep 2024 HARC Meeting Minutes

Meeting called to order @ 7:05 PM

1. **Attendance:** N7PAS, W7RPG, K7MTD, KK7QJH, KK7NOM, N7BIO, N7JGS, K7INJ, K7MSO, AG7SW, K0SN, N7DLP, KF7GZR, K7QA, K0SN, W7XT., AI7XI. **Quorum - Y**
   Visitors: Karen Hogue KJ7TXY, Aaron Walton KK7SRR,
   Scott Holgate KK7UVC, Matthew McNair KK7VGR
   NOTE: 17 Members / 4 Visitors present. Thank you to all that attended.

2. **Last meeting minutes, Jul:** Motion to approve minutes: 1st N7DLP 2nd K7INJ
   Discussion __None_____ Vote: Passed
3. **Treasurer's report Jun, KJ7YHG:** _Absent, Nothing to report _____
   _____ Motion to approve report 1st _____ 2nd _____Vote: Tabled
4. **Repeater Committee W7RPG:** New repeater in programmed and ready to install. _____
   _____ 1st _____ 2nd _____ Vote: _none
5. **HF Committee Report K0SN:** _KF7BQ Terry Cook's equipment collected (See Harc Inventory – ___
   Lines 1-34) _____Motion to approve report 1st _____ 2nd _____ Vote: _none
6. **New Business:** **a. New** Repeater will be installed on Sep 13th – it will replace the old 04 repeater.
   b. Voting on new Constitution and By-Laws – Passed.
7. **Up Coming Events:**
   1.)
   2.)
8. **Net Control Operators**

Sep	04	N7PAS	Oct	02	N7PAS
Sep	11	K7MSO	Oct	09	K7MSO
Sep	18	W7RPG	Oct	16	_____
Sep	25	N7JGS	Oct	23	_____
___	__	_____	Oct	30	_____

9. **Good & Welfare:** 1.)

Meeting adjourned at 7:47 PM. Minutes by K7MSO

Program: DR-2X Repeater Demonstration By NZ7S.

NOTE: IF You signed up for HARC swag Please bring money's to pay for the items with you.
Original pictures you were shown price was for item only with out HARC embrodery
Item + Embroidery Pricing is shown below
Yellow Vests - $52.75, Black Vests - $94.00, Richardson- 312 cap - $24.25

HARC INVENTORY -- FOR SALE

HARC INVENTORY For Sale IF YOU DON'T LIKE PRICE, MAKE AN OFFER!

SEND EMAIL TO HFC@W7PX FOR INFO OR TO MAKE PURCHASE

Lines 1-34 are new additions to list, donated by Terry Cook. Check 'em out!!

Displayed values are for item in good working order after being tested.

Line	ITEM	MAKE	MODEL	CONDITION	VALUE	STORED	Remarks
1	Custom Hotspot	Nex-Gen		untested	?	NZ7S	
2	Speech Intel. Enhancer	MFJ	616	untested	$75.00	NZ7S	Ebay used price $150
3	SignaLink USB	Tigertronics		untested	$65.00	NZ7S	New price $130
4	VHF Hand Held	BendixKing	LPH5143	untested	$37.00	NZ7S	Ebay used $75
5	VHF Hand Held	Icom	F70DT	untested	$45.00	NZ7S	Ebay used $85
6	VHF Hand Held	Alinco	DJ-G5	untested	$65.00	NZ7S	Ebay used $130
7	Foot Switch	?	?	untested	?	NZ7S	
8	Mounting Bracket	Icom	MBF-1	untested	$25.00	NZ7S	w/suction Cup
9	QRM Eliminator	X-phase		untested	$30.00	NZ7S	
10	Aluminum Proj. box			untested	$5.00	NZ7S	
11	Hybrid Phone Patch	Heathkit		untested	$5.00	NZ7S	
12	2M/440 Mobile Xcvr	Kenwood	TM721A	untested	$50.00	NZ7S	inc. diplexer
13	Pactor controller	SCS	PTC-II Pro	untested	$150.00	NZ7S	Ebay used $400
14	Multi-mode TNC	AEA	PK232 MBX	untested	$25.00	NZ7S	Ebay used $50-200
15	Noise cancelling spkr	BHI	?	untested	$30.00	NZ7S	works by DSP
16	Foot switch	Clipper		untested	$15.00	NZ7S	
17	Mobile Antenna Tuner	Icom	AH-4	untested	$75.00	NZ7S	Ebay used $250-350
18	Auto. Antenna tuner	Icom	AT-140	New	$275.00	NZ7S	Used $350, new $575
19	Deluxe Versa Tuner	MFJ		untested	$55.00	NZ7S	Ebay used $70-250
20	Bracket for mobile rad.	Icom	MBF-4	untested	$5.00	NZ7S	Ebay used $15
21	External Speaker	Icom	SP-35	untested	$15.00	NZ7S	
22	Speaker Mic	Motorola		untested	$5.00	NZ7S	
23	Remote Software	Icom	RS-BA1	untested	?	NZ7S	
24	HF + 50 mhz. xcvr	Icom	IC-7300	untested	$500.00	NZ7S	DXE New $1100
25	HF Mobile Xcvr	Kenwood	TK-90	untested	$500.00	NZ7S	w/ALE module. $1300
26	HF Xcvr	Icom	F-8101	New	$2,000.00	NZ7S	w/ALE new $2850
27	HF Xcvr	Icom	F-8101	untested	$1,400.00	NZ7S	used
28	AutoTuner, 150W.(qty3	SGC	SG230	untested	$200.00	NZ7S	Ebay used $165-700
29	Auto Tuner, 500 W.	SGC	SG235	untested	$350.00	NZ7S	
30	Microphone w/ boom	Heil	HM 12	untested	$60.00	NZ7S	New $160
31	Electronic Keyer	Heathkit		untested	$20.00	NZ7S	
32	Mobile Antenna Mount	SGC	QMS-??	untested	$40.00	NZ7S	new $90-170
33	12V Power Supply	Samlex	SEC-1235M	untested	$50.00	NZ7S	new $190
34	Auto Tuner	SEA	??	untested	$40.00	NZ7S	
35	Computer	Dell	Latitude	Fair	$100.00	?	
36	Pow Supply 220-225mhz	Mirage	C106G	Good	$25.00	?	
37	Radio-Hand Held 2 met.	Realistic	HTX 202	Good	$50.00	?	

38	Portable Repeater		TM-241X2	?		?	
39	Triband Beam	Hy-Gain		Few Missing parts	$100.00	K0SN	
40	Tuner	Signal Corps	BC939B	Parts only	$25.00	K0SN	parts only, no cabinet
41	Speaker + Power Supply	Drake	MS-4 + AC4	Not tested	$75.00	K7QA	needs upgrade
42	Reflected Pwr Mtr	Heathkit	HM-15	Works	$10.00	K7QA	
43	Mobile Tuning Mtr	Heathkit	PM-2	Untested	$10.00	K7QA	
44	Trap Vertical	Hygain	14AVQ	Untested	$150.00	K7QA	
45	2 Mtr HH Transceiver	Realistic	HTX-202	Error Code	$25.00	K7QA	
46	Spkr. w/vol. control	Yaesu		Untested	$50.00	K7QA	
47	1993 ARRL Handbook			like new	free	K7QA	
48	Handbooks	ARRL	1950-1980	OK	Free	KGVO	
49	Vintage Mic	Astatic	JT-30	Untested	$50.00	KGVO	Ebay sales $50-300
50	13.8V, 20A power supp.	Astron	RS20A	No output	$15.00	KGVO	
51	RC checker	CDE		untested	$30.00	KGVO	
52	Rotor	CDE?		untested	$50.00	KGVO	w/ control head
53	Transceiver	Collins	RT-91ARC-2	untested	$100.00	KGVO	Aircraft Military
54	Transverter Interface	Down E. Micro		untested	offer	KGVO	
55	Low pass Filter	Drake	TV-3300	untested	$20.00	KGVO	
56	Receiver	Hallicrafters	SX-100	fair	$150.00	KGVO	
57	Receiver	Hallicrafters	SX-62B	untested, poor	$75.00	KGVO	no cabinet top
58	Vintage Speaker	Hallicrafters	PM 23	Nice, untested	$150.00	KGVO	
59	Vintage Speaker	Hammarlund	S-100	Nice, untested	$60.00	KGVO	
60	AC Power Supply	Heath Kit	HP-23-A	works		KGVO	for the HW-101
61	SSB Transceiver	Heath Kit	HW-101	needs repair		KGVO	Ebay $90-300
62	HF Xcvr + Power Supply	Heathkit		untested	$150.00	KGVO	
63	Oscilloscope	Heathkit	IO-4105	untested	$30.00	KGVO	
64	Power/SWR Meter	Heathkit	HM15	untested		KGVO	
65	Vertical antenna		Dipole 80	?		NOAA	
66	Receiver	Heathkit	HR-10	untested, poor	offer	KGVO	Ebay sales $100-300
67	SSB Adapter	Heathkit		untested	$40.00	KGVO	
68	Test Oscillator	HP	650A	untested	offer	KGVO	
69	Rotor Control	Hygain	DCU-1	untested	$200.00	KGVO	
70	2M FM Transceiver	Kenwood	TR7400A	no output	$10.00	KGVO	
71	HF Transceiver +Man	Kenwood	TS-520	non-working	$100.00	KGVO	
72	Transmitter	Meissner	9-1160 (tube)	good		KGVO	was in use
73	Voice Keyer	MFJ	MFJ-432	untested	$30.00	KGVO	
74	Fwd/Refl. pwr meter	Midland	23-126	untested	$10.00	KGVO	
75	2 mtr mobile Xcvr	Radio Shack	HTX-242	untested	$40.00	KGVO	
76	Field str/SWR meter	Radio Shack		untested	$10.00	KGVO	
77	VHF/UHF/FM amp	Radio Shack		untested	$20.00	KGVO	
78	Gen. Coverage Rvr.	Realistic	DX302	untested	$125.00	K7MTD	Ebay sales $80-350
79	Receiver	Signal Corps	R-392/URR	fair	$300.00	KGVO	Stromberg Carlson
80	VTVM	Simpson	311	untested	$25.00	KGVO	
81	Oscilloscope	Telequip.		untested	$20.00	KGVO	
82	Var. power resistors	Tru-ohm, etc		untested	$10.00	KGVO	box of ~20
83	Scanner	Uniden	BC9000	works	$50.00	KGVO	

84	BUG KEY	unknown		fair		KGVO	
85	Speaker	Yaesu	SP-8	Good,works	$125.00	K0SN	
86	Many electronic parts too numerous to list.				offer	KGVO	some free, door prizes
87	Misc. meters			untested,	$40.00	KGVO	2 boxes full
88	RCA male Patch cords			good	$10.00	KGVO	box of ~20
89	Peter Dahl 10 HY @ 1 A		new	new		KGVO	
90	Peter Dahl 40 HY @ .6 A		new	new		KGVO	
91	Peter Dahl 9 HY @ 1.5A		NEW	NEW	$200.00	KGVO	66 pounds - pick up only
92	Peter Dahl Swgng Choke		new	new		KGVO	
93	Antenna Tuner	Icom	AH-4			?	
94	Voice Synthesizer	Icom	UT-102			?	
95	Antenna Tuner + man	MFJ	MFJ-934			?	
96	RTTY CW	MFJ		?		?	
97	TRIPLEXER	Comet	CFX-324			K7MTD	
98	DUPLEXER	Comet		works		KGVO	
99	WATTMETER/SWR	MFJ	864	works	$10.00	K7MTD	
100	2 mtr, 30 Watt amp	Mirage	B23	works	$25.00	K7MTD	
101	Microphone	Astatic	D104, SE	needs work	offer	K7QA	
102	Vintage Mic	Astatic	JT-30	worn,untested	$50.00	KGVO	Ebay sales $50-300
103	Rotor Control	Hygain	DCU-1	untested	$100.00	KGVO	
104	Power Supply	Heathkit	HP23C	untested	$40.00	KGVO	Looks nice
105	VHF/UHF Transverter	Yaesu	FTV-700	untested		KGVO	Looks good
106	Transceiver-HF	Heathkit	SB-101	untested	$40.00	KGVO	Looks OK needs clean
107	Transmitter-HF	Heathkit	DX-20	untested	$30.00	KGVO	Looks good
108	Receiver	Knight	R-100	untested	$30.00	KGVO	
109	Tube Tester	Sencore	MightyMite7	untested	$30.00	KGVO	
110	RF Signal Generator	Heathkit		untested	$20.00	KGVO	
111	HF Transceiver	Yaesu	FT757GX	untested	$50.00	KGVO	Looks OK
112	Auto Antenna Tuner	Yaesu	FC-757AT	untested	$150.00	KGVO	Ebay used $300-400
113	Transmitter	Heathkit	DX-100B	untested	$30.00	KGVO	

HF COMMITTEE LOOKING FOR A FEW VOLUNTEERS
Some people are needed for following club projects.
Most will be done over the winter months.

- Testing and marketing of donated gear.
- Shipping sold gear.
- Maintenance & improvements on field day equipment- antennas, radio accessories, etc.
- Organizing club's equipment storage facility.
- Other items as decided by the HF committee.

Please send email to HFC@W7PX.org if you can help.

N7PAS, KK7NOM, and AG7SW with our escort from NOAA left the weather bureau at 12:00pm and arrived at Point 6 at 1:00pm. We had to move stuff around to gain access to the cabinet. We than removed to old 04 repeater and in the process diacovered that the old repeater was the shelf that held the duplexers in place. Luckly we found the support bar for the duplexers in the bottom of the cabinet and managed to get it installed. We removed the VHF 04 repeater, the UHF repeater, the UHF duplexer, the old controler, andPower Supply. By this time NZ7S had shown up with his equipment. We Installed the new System Fusion repeater in their place, connected it to the 04 duplexer ran some tests with NZ7S's equipment, set the power out at 25 watts, and put it on the air. Some of our first contacts were outside of what the old repeater wes pulling in. (This is good). Checked a few more things, looked around a bit, put things back in place and left around 3:00pm. Arrived back at the weather bureau shortly before 4:00pm. Thanks KK7NOM for the following pictures.

Original cabinet

04 repeater removed

UHF repeater & Duplexer removed

04 Antenna

NOAA Weather Radar Dome

Common Antennas You Need to Know About

By H. Ward Silver

Are you reading this on a tablet? The tablet depends on its built-in antenna for Wi-Fi connectivity, transferring files back and forth from another PC, or to use one of the many mobile phone networks blanketing populated areas. Even in the miniature flattened volumes that are the norm for today's wireless communication equipment, there has to be an antenna. It might be hidden, it might be tiny, but it's there. Knowing about common antennas is a good step toward effective data link (and other wireless) system design.

Dipole Basics

A while back, I discussed how to build a simple ground-plane antenna from a BNC connector and some lengths of wire. The ground-plane is basically "half a half-wave dipole," so let's back up a little bit and review the dipole. As the fundamental element at the root of many antenna designs, understanding the dipole places you on solid ground.

When referring to a dipole, the usual assumption is that the dipole is a thin conductor (like wire or rod), one-half wavelength (1/2 λ) long at the frequency being used, and that the feed line is attached in the center (a.k.a., "center-fed"). In fact, "dipole" is constructed from "di" (two) and "pole" (polarities) which describe the signal's effect on the dipole: The polarity of the voltage between the ends of the dipole reverses every half-cycle, causing current flow to reverse as well, sloshing back and forth along the dipole. Voltage is maximum at the ends of the dipole, and current is maximum in the middle as illustrated by **Figure 1**.

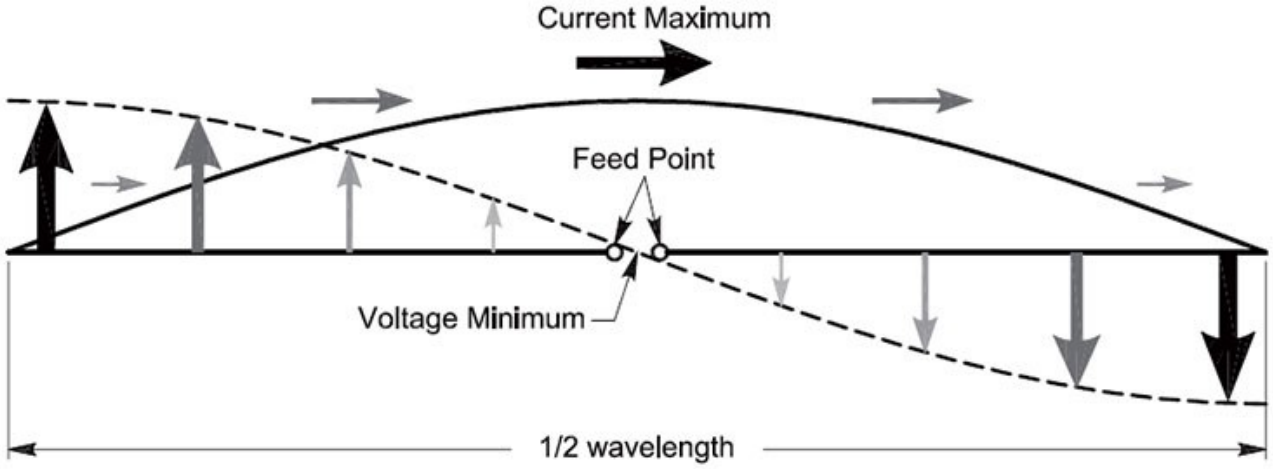


FIGURE 1. Current and voltage distribution along a half-wave dipole. *(Graphic courtesy of the American Radio Relay League.)*

The dipole radiates a signal caused by the electrons that make up the current being constantly accelerated or decelerated in response to the AC voltage created by energy from the feed line. In fact, radiation of electromagnetic (EM) waves only occurs when electric charge experiences positive or negative acceleration. (In radio and electronics, the charges are electrons but they could be anything with an electric charge.)

The strongest radiation of EM waves results from charge being accelerated along a straight line (like the dipole conductor); it is strongest at right angles to the flow of the charge. This results in the classic "figure 8" pattern of the dipole's radiation as shown in **Figure 2**.

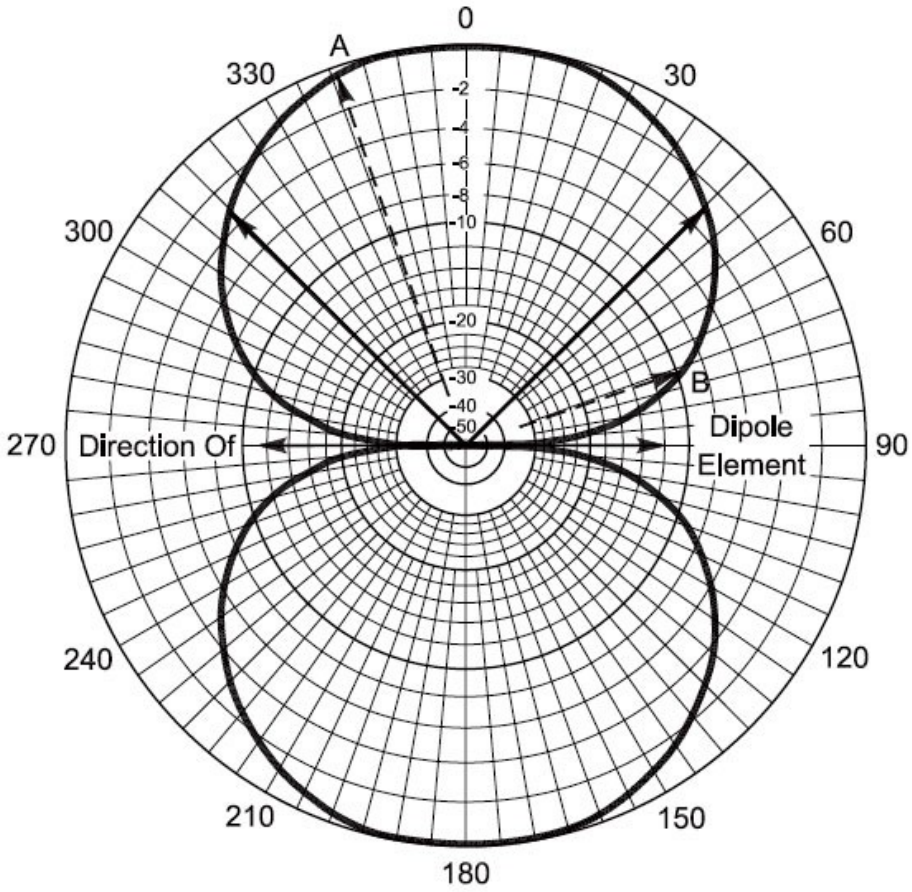


FIGURE 2. Radiation pattern of a half-wave dipole in free space shows the strongest signal radiated and received broadside to the dipole's axis. Distance from the origin to the solid curve represents signal strength in dB with respect to the maximum. The solid arrows at 45 and 135 degrees show the points at which signal strength is reduced by half (-3 dB). *(Graphic courtesy of the American Radio Relay League.)*

A physical dipole is a little shorter than the half-wavelength of an EM wave traveling in “free space,” meaning away from any conductive or refractive material. This is due to the effect of the wave traveling along the surface of the dipole’s conductor, called the antenna element. As the element is made thicker (larger wire, thicker rod, wider strip, etc.), the shortening effect gets stronger. You may see the equation length (in feet) = 468 / frequency (in MHz), but that is only applicable at relatively low frequencies (below 20 MHz), and for thin wire dipoles within a half-wavelength of the ground.

If you're building a dipole, determine the element dimensions by using an antenna modeling program that can account for this effect, use published lengths for a proven design, or be prepared to test and trim until you get the results you want.

Antennas Work Coming and Going

Regarding the radiation pattern in **Figure 2** — does it describe the antenna’s transmitting characteristics or receiving? It describes both!

Nearly all antennas are bilateral, meaning they behave the same for transmitted or received signals. This ability requires the antenna to not contain any non-linear materials such as some ferrites or magnetic materials. The antenna must also be operated at power levels that do not cause the antenna materials to operate non-linearly, such as from arcing or saturating.

Radiation?! Eek!

The word “radiation” tends to freak people out. In wireless, the radiated energy is non-ionizing and unable to liberate an electron from its host atom which would lead to chemical changes and, eventually, genetic damage. Electromagnetic radiation has not been shown to have any effect on living tissue except to heat it up — called “thermal effects.”

The term “radiation” is just used as a generic term for “giving off energy.” The frequency of the EM waves would have to be very, very, very much higher than radio frequencies — even microwave — before it would be of concern.

Ultra-violet rays that cause sunburn are at about the lowest frequency (longest wavelength) for which genetic damage would occur, and thus present a cancer risk. Wireless communication waves are many orders of magnitude less energetic and thus pose no such threat.

Yagi Antennas

Take a look above public safety agency stations, weather stations and tide gauges, government buildings, and so forth, and you'll see small antennas with several parallel elements made from aluminum rod. Wi-Fi and mobile phone "extender" antennas look the same as well, with numerous short parallel elements arranged along a central support (called a boom). These are Yagi (pronounced to rhyme with "baggy") antennas; more properly called Yagi-Uda arrays after the antenna's two inventors, Drs Yagi and Uda from the University of Tokyo.

Developed in the mid 1920s, the Yagi antenna has been a mainstay of HF, VHF, UHF, and microwave wireless communication ever since. (While Dr. Uda ["oo-dah"] was the primary inventor, his partner, Dr. Yagi could speak English and so became more closely identified with the antenna during a series of lectures introducing the design.)

The Yagi is a parasitic array, meaning that only one of the elements (the driven element) is actually connected to a feed line and the rest interact with the radiated EM waves. Each element is very similar to a dipole, but if you look closely, you'll see that the elements get longer toward the "back" of the antenna (the non-preferred direction) and shorter toward the "front."

The driven element is usually just a few percent shorter than an independent half-wavelength dipole. Elements in back of the driven element are called reflectors, and those in front of the driven element are called directors.

The non-driven elements interact with the signal radiated by the driven element — an effect called mutual coupling. Coupling means that the elements exchange energy by picking up and re-radiating signals. The re-radiated signal is also picked up and re-radiated by the other elements again and again. The coupling between elements, the spacing between them, and the effect of the element lengths on current in elements combine to reinforce signals toward (or from) the front and reject signals toward (or from) the back. This creates a "beam" antenna with a preferred direction for receiving and transmitting, which is called "gain" as explained in the sidebar.

What is Antenna Gain?

When a designer says a beam antenna has a gain of some number of dB, what do they mean?

First, the antenna does not create energy, it merely focuses it. Like a parabolic mirror, it does not generate light; it only reflects it in such a way as to concentrate it. Gain antennas do the same.

Imagine the isotropic antenna that radiates and receives equally in all directions. Its radiation pattern is a perfect circle. This antenna does not exist in practice, but is a useful mathematical reference.

Imagine the isotropic antenna's three-dimensional pattern as a round balloon with the air representing the radiated signal. A directional antenna "squeezes the balloon" so that the signal is suppressed in some directions and enhanced in others. It does not "create" energy — it merely redistributes it.

The comparison between the directional and isotropic antennas is measured in dBi — decibels with respect to an isotropic antenna which forms the reference for the calculation of dB. An antenna with 3 dBi of gain will transmit or receive a signal 3 dB stronger than an isotropic antenna in that specific direction.Another common reference antenna is the dipole, and gain (with respect to a dipole) is measured in dBd with the reference being the dipole's maximum free space gain broadside to the dipole as shown in **Figure 2**.

Figure 3 shows a three-element Yagi used for portable operation in direction finding. (For more information on these popular activities, see **en.wikipedia.org/wiki/Amateur_radio_direction_finding**.)

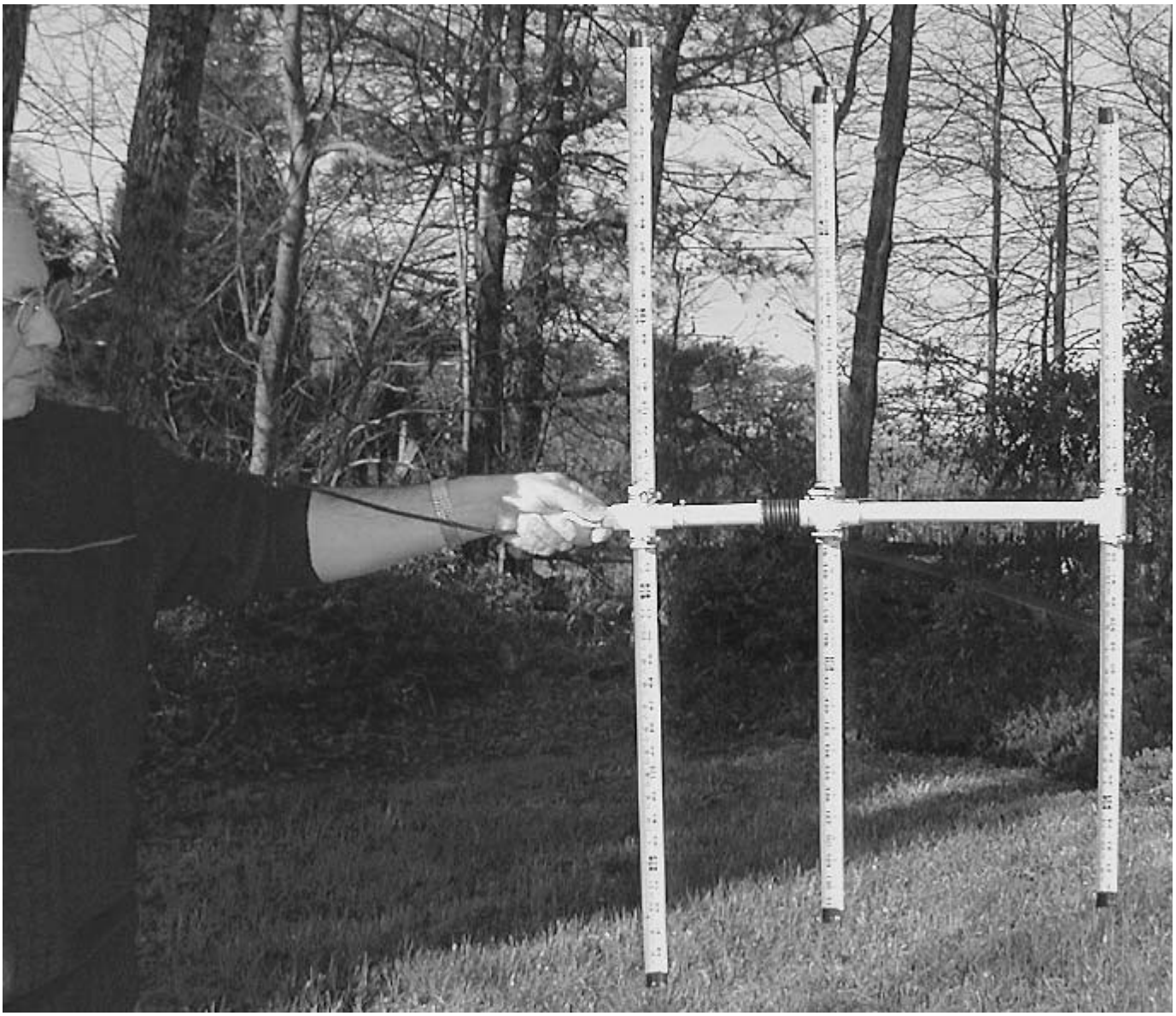


FIGURE 3. A three-element Yagi antenna made for portable direction finding use. The antenna consists of a reflector (left), driven element (middle), and director (right). This antenna has approximately 5 dB of gain in the forward direction (to the right) compared to the maximum signal radiated by a dipole.
(Graphic courtesy of the American Radio Relay League.)

This particular antenna’s elements are made from metal measuring tape so they can flex and bend without damage. You can clearly see the reflector at the back, the driven element in the middle, and the director element at the right. **Figure 4** shows the radiation pattern typical for such an antenna.

FIGURE 4. The T-28 log-periodic by Tennadyne covers 50 to 1,300 MHz. The 12 foot boom consists of a pair of square tubes that act as the feed line for the antenna.

Yagi antennas with a dozen elements or more — creating a very narrow beam — are not uncommon for frequencies above 100 MHz. At lower frequencies, the longer elements and boom require more robust construction materials and techniques.

The Biggest Yagi

The largest single amateur radio antenna ever built was a three-element behemoth Yagi for the 160 meter band (1.8 MHz) by the Finnish club, Radio Arcala, OH8X (**vk6ysf.com/Radio_Extremes.htm**). It had elements 59 meters long atop a 100 meter tower, and a boom so large a small car could be placed inside of it.

Compare that to a Yagi for Wi-Fi with the longest element approximately 6 cm long! Yet, the antennas operate on exactly the same principle of re-radiation and reinforcement.

Hams have a saying that, “If it stayed up last winter, it’s not big enough!” Well, the OH8X Yagi was certainly big enough, and unfortunately validated the saying by collapsing in the winter of 2013. Ironically, it was not the antenna that failed, it was the supporting tower!

If you would like to experiment with a Yagi antenna to improve your TV reception, pull in a distant FM station, or maybe extend the range of a 900 MHz data link, you can do so inexpensively by building the antenna yourself. Kent Britain WA5VJB has developed an entire line of Yagi antennas that can be constructed from nothing more than spare copper wire and a piece of 1x2 lumber. Kent’s “Cheap Yagis” website (**www.wa5vjb.com/yagi-pdf/cheapyagi.pdf**) provides all the details.

Log-Periodics

You may be thinking, “Ah hah, so my outside TV-FM antenna is a Yagi!” Not quite. While common TV antennas look like a Yagi, closer inspection shows that the dipole elements are bent forward in shallow vees and the feed line is connected to every element in a criss-cross pattern down the length of the array. This type of antenna is a log-periodic dipole array (LPDA, or more commonly, a log-periodic or just plain “log.”

Figure 4 shows a log-periodic antenna for 50 MHz through 1,300 MHz mounted above my house (the antenna elements are all horizontal — the antenna is not pointing at the sky).

The log-periodic’s name comes from the logarithmic spacing and length of the elements; it is defined entirely in terms of angles, such as the taper of the triangle surrounding the elements. The active region of the antenna “moves” back and forth along the array as the frequency changes. The dipole elements closest to the frequency of the signal radiate it or transmit it while the other elements remain electrically inert.

With a sufficient number of elements, a log can cover a very wide range of frequencies with consistent performance — even on the shortwave HF (high frequency) bands from 3-30 MHz. In fact, these antennas are popular with government and military stations because only one large antenna is needed to operate effectively on several bands instead of several dedicated antennas.

More Antenna Resources

The ARRL (American Radio Relay League) offers a lot of information on antennas to the public via the Technical Information Service (**www.arrl.org/radio-technology-topics**) and on the Tech Portal page (**www.arrl.org/tech-portal**) with links to third-party vendors and amateur reference sites. We’ve just scratched the surface of the world of antennas — these sites will help you learn more.

Inverted-F

One of the most popular antennas for wireless devices is the Inverted-F illustrated in **Figure 5**.

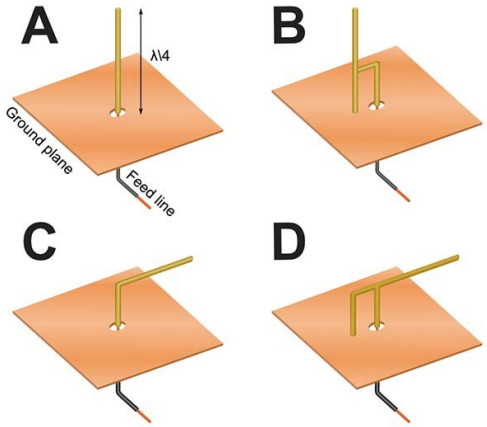


FIGURE 5. The Inverted-F antenna is a modified ground-plane (A) with the feed line connected at a point with the desired impedance (B). If the antenna is bent over the ground-plane at right angles (C), the feed point can still be attached away from the base (D) to provide a good impedance match. *(Graphic courtesy of Spinningspark at Wikipedia.)*

The mobile device and Wi-Fi band at 2.4 GHz has a wavelength of approximately 12.5 cm, so a 1/4-wavelength ground-plane antenna would be about 6.25 cm (2.5 inches) long. Even though this is small, it is still too big to be convenient for a phone or other pocket-sized device. As shown in the figure, though, the antenna can be bent over and is less than 1 cm above the ground plane at 2.4 GHz.

This is a much more manageable proposition for phones and similar items. Freescale Semiconductor's application note **"Compact Integrated Antennas"** shows typical inverted-F designs and variations on that theme.

Patch Antennas

Most people think an antenna has to be a wire or tube or rod. Not so! The antenna is only a convenient structure on which current can be made to flow and create the desired radiation pattern. It is the currents that radiate and receive signals, not the conductor on which they are flowing.

The patch antenna (and its relative, the slot) is a good example of such an antenna. **Figure 6**A shows a photo of two patch antennas used on the amateur 23 cm band near 1,300 MHz.

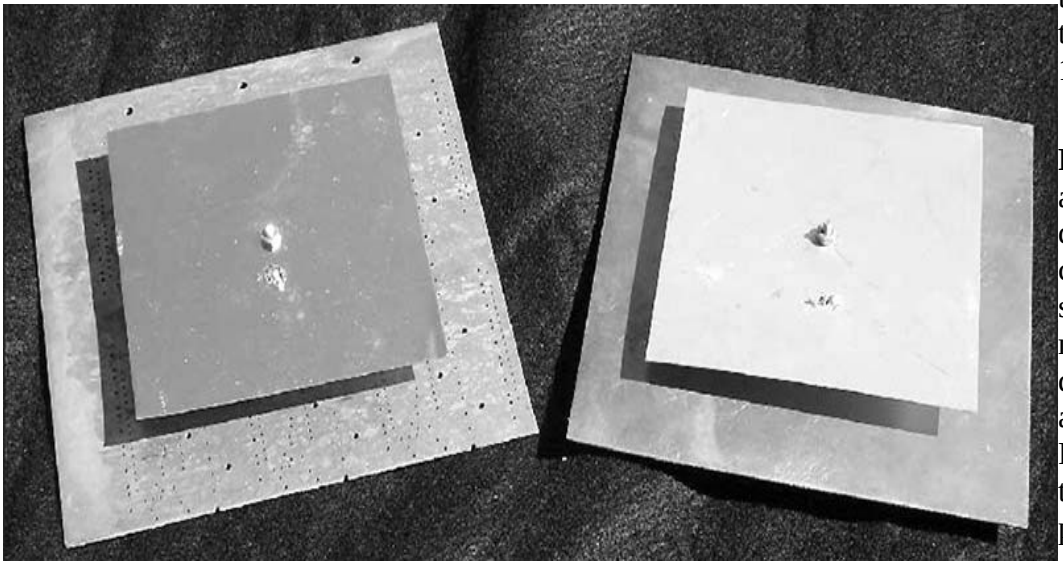
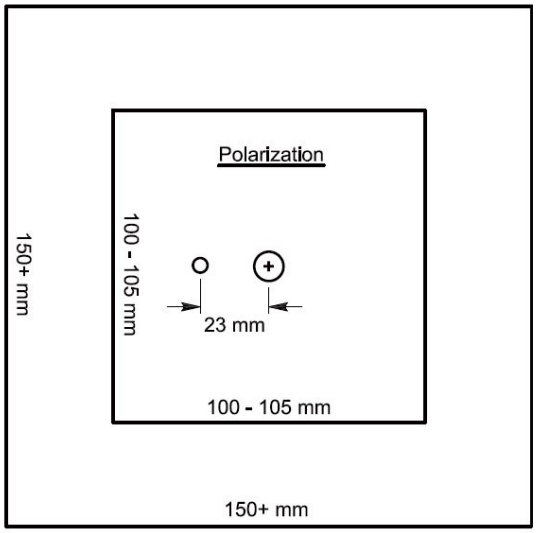


FIGURE 6A. The patch antennas shown here are designed for the amateur 23 cm band and are made from sheet metal (left) and PCB material (right). The basic design information for the antennas is given at B. Polarization is determined by the orientation of the feed point.

The feed line is attached a small distance from the center of the patch and a bit above an underlying ground plane as shown in **Figure 6B**.



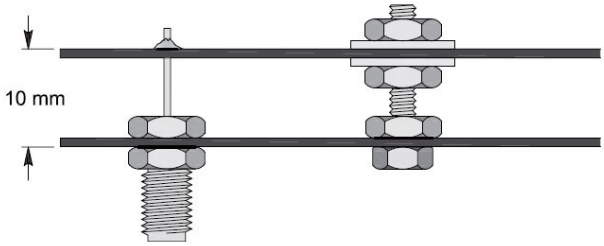


FIGURE 6B.

Energy from the feed line excites the entire patch surface, resulting in regions of maximum current. The resulting current patterns create a pattern similar to two parallel dipoles with their currents in-phase and spaced by approximately 1/2 wavelength. This creates 2-3 dBi of gain in an omnidirectional pattern above the patch ground plane. Sheet metal or the copper on a printed circuit board can be used so it's easy to see how this type of antenna might be a good choice for a thin flat electronic device!

The Operator as an Antenna

At the start of this article, I suggested that the wireless device user could be an antenna, too, and that's just what happens with a handheld VHF or UHF transceiver such as the popular Family Radio Service (FRS) units. The stubby "rubber duck" antenna provided with the transceiver is a ground plane antenna. So, where is the ground plane?

The case of the radio — if metallic — does some of that work, but it's not really big enough to do the job all that well. If the radio's case is plastic, then there is no ground plane at all! Or, is there?

Your hand wrapped around the body of the radio makes a very good capacitor, coupling strongly to the radio case or the internal electronics. RF at these high frequencies will flow through that capacitance to your skin and then along the surface of the skin for quite a distance.

Current flowing on a surface radiates and receives whether the surface is metal or a concoction of salt water and protein such as you! While your skin is pretty lossy, that extra antenna surface can make a big difference in communication range.

Can you hear me now? **NV**

HELLGATE AMATEUR RADIO CLUB

AGENDA – 14 Oct 2024 meeting

Meeting called to order at 7:__ PM (8 needed for business)
Introductions. Please make sure you signed the attendance sheet **Quorum Y/N ____**

Last meeting minutes, Sep: _____ Motion to approve minutes: 1St_____ 2nd_____
Discussion _____ Vote: P/F/T

Treasurer's report: KJ7HYG, _____Motion to approve report: 1St _____2nd _____
Discussion_____ _ Vote: P/F/T

Repeater Committee Report: W7RPG, _____Motion to approve report: 1St _____2nd _____
Discussion_____ _ Vote: P/F/T

HF Committee Report: K0SN, _____Motion to approve report: 1St_____2nd_____
Discussion _____ Vote: P/F/T

Events for 2024:

Oct	??	Bitterroot Mushers Dirt Dash, - We are not holding the dryland event this year. We could not coordinate the group members schedules with the limited dates available at Lubrecht. We have secured Lubrecht for Oct 10-12, 2025 - Sonya
Oct	14	HARC Testing, Meeting
Oct	17	Great Montana Shakeout Drill @ 10:17 AM (04 Net by K7MSO – 10:15-10:30)
Oct	19-20	JOTA/JOTI

HARC Net every Saturday morning @ 9:00 AM on 147.040 Repeater – Buy/Sell – During.

HARC Discussion List

1. _October – Nominations; and Voting in November for 2025 Officers _____
2. _Chair for Christmas dinner in December _____
3. _____

VHF Net Control Station assignments:

Oct	02	N7PAS	Nov	06	N7PAS
Oct	09	K7MSO	Nov	13	_____
Oct	16	_____	Nov	20	_____
Oct	23	_____	Nov	27	_____
Oct	30	_____	___	__	_____

Reminder: Backup is always the next person in line as the net control.
Good and Welfare. _____

*** Next Club meeting: Nov 11 ***
Is there any other business? _____
_____ Meeting is Adjourned at _:__ PM.

Program: Unknown

October 2024

Hellgate Amateur Radio Club

Calendar of Events

Board: NZ7S, W7RPG, KJ7THG, K7MSO

Editor - N7PAS

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
		1	2 ERC Net 7:30 on 146.900-88.5T BARC Net 8:15 on 146.720-203.5T HARC Net 9:00 on 147.040-No Tone	3	4	5 HARC Saturday Net 9:00AM on 147.040 Repeater.
6	7 HARC Testing 5:30 & Meeting 7:00PM Program: ??	8	9 ERC Net 7:30 on 146.900-88.5T BARC Net 8:15 on 146.720-203.5T HARC Net 9:00 on 147.040-No Tone	10	11	12 HARC Saturday Net 9:00AM on 147.040 Repeater.
13	14	15	16 ERC Net 7:30 on 146.900-88.5T BARC Net 8:15 on 146.720-203.5T HARC Net 9:00 on 147.040-No Tone	17 Great Montana Shake Out @10:17am	18	19 HARC Saturday Net 9:00AM on 147.040 Repeater JOTA/JOTI
20 JOTA/JOTI	21	22	23 ERC Net 7:30 on 146.900-88.5T BARC Net 8:15 on 146.720-203.5T HARC Net 9:00 on 147.040-No Tone	24	25	26 HARC Saturday Net 9:00AM on 147.040 Repeater
27	28	29	30 ERC Net 7:30 on 146.900-88.5T BARC Net 8:15 on 146.720-203.5T HARC Net 9:00 on 147.040-No Tone	31 Halloween		

HARC Events: 2024 (Actual Dates to be filled in as they become known)

#	Month	Day	Activity
1.	Monthly		MARS Interoperability Exercises – Eric NZ7S will keep us advised. 1st week of each month for 2024. Check in on 60 meters. Noon and 8 pm.
2.	April		Grizzly Triathlon
3.	April	27	Riverbank Run
4.	June	04	Trail Rail Run
5.	June	22-23	Field Day
6.	June	28-30	Missoula Marathon – See Coming Events – pg 1
7.	July	04	W7PX Special 4th of July Event – Cabin needs to be reserved.
8	July	19-21	Glacier Waterton Hamfest
9.	Sept	03	Fox Hunt ?? 1 per year on Saturday from 10:00AM to 4:00PM ←------- We are here
10.	Oct	??	Bitterroot Mushers Dirt Dash We have secured Lubrecht for Oct 10-12, 2025 and are planning to hold the event again next year and are excited to bring it back. Do you think your group would be interested? We sincerely appreciate your support and would have to significantly scale down our event without you
11.	Oct	17	Great Montana Shakeout Drill
12.	Oct	19-20	JOTA/JOTI
13.	Nov	05	Election Day - 5th
14.	Dec	07	Sky Warn Recognition Day (0000Z-2359Z = 1700 Fri – 1659 Sat) Frist Fri Evening – Sat Morning/Afternoon every December – as listed below. *2 December 2023, **7 December 2024**, 6 December 2025, 5 December 2026,* *4 December 2027, 2 December 2028, 1 December 2029*
15.	Dec	09	HARC Christmas Dinner Meeting