



MTARA NEWS



The President's Message

Hello, MTARA members ~~

Summer is winding down, and we're looking back on, among other MTARA activities, providing communications for the Mountain Top Days Parade in Running Springs, the Tour de Big Bear, and the week-long Route 66 On The Air, where Whiskey 6 Charlie made and received many contacts from the station at the Wigwam Motel on Route 66 in Rialto.

Looking forward, the Kodiak Ultra Marathons, comprising five foot races ranging from 10 kilometers to 100 miles, will take place Oct. 13 – 15 in, above, and around Big Bear. MTARA volunteers are still needed for this event.

Be aware of the Rim Communities Resource Alliance (RCRA), a new organization founded by longtime Crestline resident and activist Rudy Westervelt. This is a consortium of all the organizations on the mountain top that come together to prepare for and respond to emergency situations that challenge Rim residents on a regular basis. The RCRA is developing a website that will be a crucial source of information about all the resources available during emergencies, and how to access those resources. Once the website is up and running, we'll let you know.

Our next in-person meeting is Tuesday, Oct. 3, at 7 p.m. at the Lake Arrowhead Community Presbyterian Church. The session will be devoted to Skywarn training, presented by Alex Tardy, Warning Coordination Meteorologist with NOAA. Mr. Tardy is driving from San Diego in order to make his presentation to us, so we plan to start the meeting promptly at 7 p.m., in order that Mr. Tardy can complete our training session and get home at a decent hour. Please plan on arriving to the meeting a little early.

Hope to see you then.

Seven Three, Everyone ~~ Lorna

Officers

- **President:**
Lorna Polley, KJ6GFS
- **Vice-President:**
Chet Olson, AE6CO
- **Treasurer:**
Nancy Karlson, K6CUB
- **Secretary/Newsletter**
Debbie Johnson, WB6LVC
- **Ed/Membership:**
Tracy Lenocker, WM6T
- **Past Presidents:**
Chrystal Stenberg, KK6API
John Snedden, KT7P
Vic Marquez, KK6WKI

The Rim of the World ARES group is an ARRL affiliated organization and part of the Mountain Top Amateur Radio Association

Monthly Club Meetings

Club meetings are held on the first Tuesday of each month. The meeting begins at 7:00 p.m. and lasts until approximately 9:00 p.m.

Our meetings are open to everyone; so bring a friend, and keep the hobby growing. There is always a presentation that will pique your interest and add to your knowledge.

All upcoming meetings, beginning with July 5, 2022, will be held at the Lake Arrowhead Community Presbyterian Church, 351 South State Highway 173, Lake Arrowhead, CA 92352

Membership

Membership in MTARA is open to any individual interested in learning more about Amateur Radio. An FCC issued license is not required, but is encouraged. Membership is on an annual basis, running for the calendar year. There are no prorated membership fees. Club fees are \$20.00 for a single membership and \$30.00 for a family membership. The necessary forms can be found on the club's home page @ MTARA.club. Current members only need to send in their dues to MTARA, PO Box 2441, Lake Arrowhead, Ca. New members will need to download and send in their forms and payment to the same address.



TREASURER'S REPORT

Our beginning September Balance was:

\$10,125

Income:

\$1610

73, Nancy K6CUB

Local Weekly Nets

	Repeater	Time	Activity	Purpose
Monday	MTARA—2	7:00 p.m.	Weekly Check-In	MTARA News
Monday	144.330 MHz	8:00 p.m.	“Gordo Net”	Simplex Readiness
Tuesday	MTARA—5	7:00 p.m.	“Debbie Net”	Educational Topics
Wednesday	HF	7:30 p.m. First Wednesday	7.223 MHz	Band(s) Status
Friday	MTARA—5	5:00 p.m.	YL Happy Hour	It’s Friday
Daily	CBARC	7:00 a.m.	Tech. Net	Elmer Sessions

Upcoming Calendar Of Events

- Year-Long Activity “Volunteers OnThe Air” VOTA vota.arrl.org
- October 3rd—MTARA Club Meeting
- October 7th-8th—ARRL Simulated Emergency Test
- October 13th-15th—Kodiak Ultra Marathon Run
- October 16th-20—School Club Roundup
- October 20th-22nd—Pacificon, San Ramon Marriott, San Ramon, CA
- October 20th-22nd—Scouts Jamboree On the Air
- October 28th-29th—ARRL EME Contest 50 to 1296 MHz
- October 28th-29th—CQWW DX SSB Contest
- November 4th-6th—ARRL November Sweepstakes CW
- November 5th—Daylight Savings Time Ends
- November 18th-20—ARRL November Sweepstakes SSB

Tour de Big Bear by WB6LVC

Early in the morning, on Saturday, August 5th, Gary and I headed over to Jenks Lake West where we set up our communication site. We were right next to the Aid Station being run by the Big Bear Lions Club. We were at the farthest point from Start/Finish, waiting for the first rider to show up. It was a beautiful morning, as you can see from the photos. For a while, we listened to other locations, using their check-ins to make sure our radios were working properly. Then, around 10:00, the first riders appeared on the road. Most headed to the aid station for water and snacks. As soon as they were ready to move on, they made a U-Turn and headed up Jenks Lake Road into the mountain area. From that point on, it was non-stop, checking in bib numbers and relaying traffic as needed. I must mention that the Aid Station was getting a lot of attention. They had picked a theme to make their group quite memorable. They made their area part of Alice in Wonderland. The signs all mentioned terms from the story. "Drink this," "Eat that," "This way to the Mad Hatter's Tea Party" and so on. All the members dressed in character. There was the Cheshire Cat, the Red Queen, the Madhatter, Tweedle Dum or maybe Tweedle Dee, and Alice, of course!

I am not going to relate all of the jobs and activities as we just did at our club meeting on September 5th. (If you were not there, a quick summary is listed in the club minutes on the website.) It was a great reenactment of how our presence was crucial



in helping this major event to run smoothly. Most notably was our response to the injury to the young man between South Fork and our location site. Gary/AA6GJ was the "first responder" to this accident and helped to pinpoint the location so that emergency workers could arrive at the site and quickly and efficiently administer aid and transportation to the injured person. Another reason to remember that "when all else fails, Ham Radio is there!"





Get Your Kicks on Route 66...or FT8...or SSB by WB6LVC



You all know that the song melody just ran through your head as you read the title to this piece. Except it didn't include all the references to Ham Radio. But on Saturday, September 16th, you would have made them part of the song if you had stopped by The Wigwam Motel on Route 66 in Rialto/San Bernardino and joined members of CBARC and MTARA running their rigs for the *Route 6*

On the Air contest and making contacts as W6C.

Early that morning, members of CBARC came over to the motel and set up the tables, chairs and pop-ups along with the antenna that had an amazing connection setup for all the different coaxial connectors to run different frequencies and bands. They also brought snacks and water for all of the operators. Gary and I arrived as they were finishing all of this. Next came Nancy and Dede, our first operators of the day. Following them were Jo, Matt and Gail as well as Tracy and Jodi.



Dave and Tina stopped by to check out the operation. A very exciting portion of the day was the presence of Ramon from CBARC. He is a brand-new ham who had only had his license for 3 weeks! He spent the entire day with us, mostly working FT8, which

he found fascinating. Ramon said that this would work great at his home location. It's always such a great feeling when you can encourage and educate a new Ham with activities he/she had not yet taken part in. The teams worked all day, from 10:00-4:00



Unfortunately, the bands were not great and there were other QSO contests on the air. But getting contacts and tallying up points was not the point of the day for us. It was the comradery between the operators and the chance to share our event with the public (Yes, many people stopped by and asked what we were doing), sharing the history of the event and what amateur radio brings to those who have it as a hobby as well as the participation and support of public events and emergencies.

Moe, Sean, and Ramon helping to set up CBARC's DX Commander Antenna. Together with the Triplexer unit and the Bandpass Filters, we were able to feed both transmitters into one antenna. It was perfect!



Here we have Dede, K6DDZ and Nancy, K6CUB operating SSB on 20 meters as Gary, AA6GJ looks on. In the background is Jeff, W6JJR and Moe AC2M from CBARC, visiting with Ron one of our various visitors during the day.

Ramon, KO6BBM enjoying operating FT8 on 10 Meters. He made 40 contacts. He even had DX to Australia! Great job, Ramon!!

Ponder the Pool by AA6GJ

Ponder the Pool is a way for us as Amateur Radio Enthusiasts to dive into selected questions more deeply from each of the current FCC pool of questions used to create the randomly generated Examinations for the Technician, General, and Amateur Extra License. Ponder the Pool is helpful to individuals who are studying for an exam or simply to review concepts that we have already learned.

Because, as we know, if we don't use it, we lose it.

This time we will ponder two NEW questions from the NEW General Class License Pool:

G8A13 – What is a link budget?

G8A14 – What is link margin?

A **link budget** is a summary of a communications link that tries to take into account all factors which have an impact on the received signal strength. It is often used to determine the minimum amount of output power required at the transmitter for a given signal strength at the receiver, and takes into consideration power output, antenna gains, propagation losses, acceptable signal fading, and other factors (for example, for long cable runs, cable attenuation may be a factor, and at microwave frequencies, losses due to absorption in atmospheric gases become a significant factor for Earth-bound links).

To make a link budget, you need to add the following values:

- Transmitter output power
- Transmitter antenna gain in the desired direction.
- Propagation loss
- Receiver antenna gain in the desired direction.

The **link margin** is the amount of power that is available to overcome signal loss and interference in a communications link. It is calculated by subtracting the **receiver sensitivity** from the **received power**. The link margin is expressed in dBm, where dBm is a unit of power relative to 1 milliwatt.

For example, if the received power is -50 dBm and the receiver sensitivity is -70 dBm, then the link margin would be 20 dBm.

The link margin can be used to determine the minimum amount of output power required at the transmitter for a given signal strength at the receiver. It also considers factors such as power output, antenna gains, propagation losses, acceptable signal fading, and other factors.

A few elementary values are required to make up a **link budget**. For unobstructed line of sight communications, which is the primary propagation mode on VHF and up, propagation losses can be estimated using the equation:

$$L_p = 20 \log \left(4\pi \frac{d}{\lambda} \right)$$

Where d is the distance covered and λ is the wavelength of the operating frequency. When the two use the same units (for example, meters), L_p comes out in dB and expresses the propagation attenuation (loss) between two isotropic antennas. For example, the propagation loss for 20 km at 146 MHz is approximately 102 dB. Note that the determining factor is the distance in terms of wavelengths between the two antennas, so the loss goes up by 6 dB for every doubling of either the physical distance or the frequency (halving of the wavelength).

No antenna is perfectly isotropic, and the common dipole has a gain of approximately 2.15 dBi (dB over isotropic) broadside to the antenna. Directional antennas generally have their gain specified as either dBi or dBd (dB over dipole, which is dBi - 2.15 dB, so 3 dBd = 5.15 dBi).

To ease calculations, we convert the power output of the transmitter to dB. Using dB throughout turns many a multiplication and division problem into an addition and subtraction problem which greatly simplifies calculations. For example, a 50 W (high power) Kenwood TM-V71A transmitter puts out +47 dBm.

To make the link budget, at a minimum we add the transmitter output power, transmitter antenna gain in the desired direction, propagation loss and receiver antenna gain in the desired direction.

By making the calculations in dBm which relative to 1 mW, this comes down to addition and subtraction.

As a very simple example, for our Kenwood TM-V71A 50 W transmitter with dipoles at both ends broadside to each other, over an unobstructed 20 km path using a frequency of 146 MHz (2.00-meter wavelength), we get:

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+47 dBm power output
+2.15 dBi transmitter antenna gain
-102 dB propagation loss, 20 km at 146 MHz
+2.15 dBi receiver antenna gain
=====
-50.7 dBm signal strength at receiver

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If the minimum usable signal at the receiver for the modulation and bandwidth in use, taking into account natural and receiver noise, is -90 dBm, this gives us a link margin of about **40 dB** (90-50.7 = 39.3 dB), which is huge. This of course means that in theory, we can reduce our output power by a corresponding amount, maintaining communications with only +10 dBm output, as seen below:

+10 dBm power output
+2.15 dBi transmitter antenna gain
-102 dB propagation loss, 20 km at 146 MHz
+2.15 dBi receiver antenna gain
=====
-87.7 dBm signal strength at receiver

Admittedly, the above link budget gives us for all intents and purposes very little margin. ($90 - 87.7 = 2.3$ dB). To maintain communications over this path using this equipment and mode of transmission, everything must work out absolutely perfectly.

To have a 10 dB margin for issues such as fading, we'd need to use +18 dBm (slightly less than 100 mW = +20 dBm) power output, which is achievable with practically *any* handheld radio.

A link budget for an HF link, or an obstructed VHF link, is much more complex because the propagation losses are harder to calculate than for a pure line-of-sight link, but the general principle remains exactly the same. A complete link budget for a line-of-sight link will at least include the following factors:

- + Transmitter output power
- Attenuation in the transmitter's antenna cabling, including any impedance matching network
- + Transmitter antenna gain in the direction of the receiver.
- Propagation loss in free space
- Attenuation due to absorption in atmospheric gases
- Margin for attenuation due to rain
- Margin for attenuation in tree foliage
- Margin for attenuation due to reflection against walls etc.
- Margin for signal fading
- + Receiver antenna gain in the direction of the transmitter.
- Attenuation in the receiver's antenna cabling, including any impedance matching network
- = Signal strength at the receiver input terminals, to be compared with the minimum necessary signal strength.

It is important to note that several of these factors (propagation loss, atmospheric absorption, foliage losses, and so on) are heavily dependent on the operating frequency. This means that a link budget for one frequency is unlikely to be applicable at another frequency, even if nothing else changes.

That is why the official answer to these questions are:

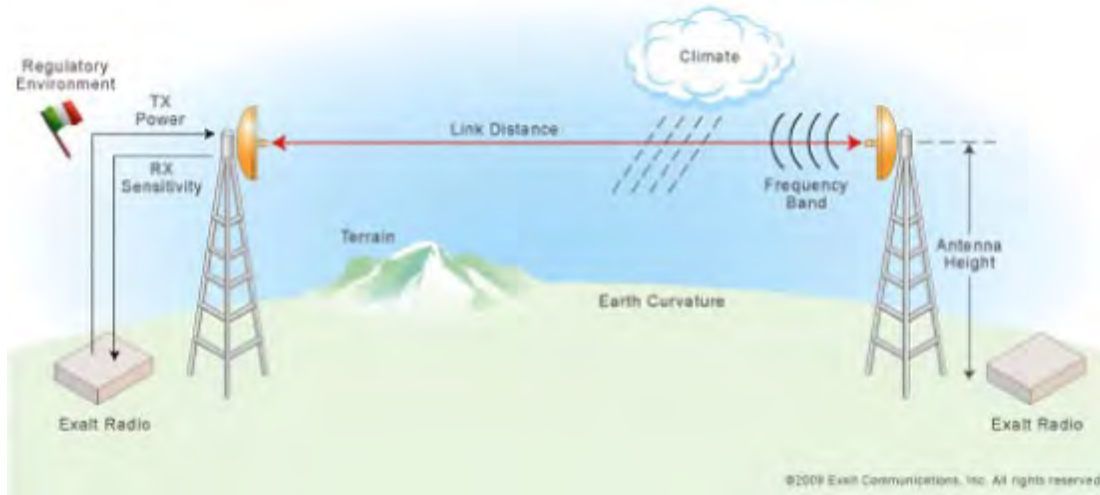
G8A13 – The sum of transmit power and antenna gains minus system losses as seen at the receiver.

G8A14 – The difference between received power level and minimum required signal level at the input to the receiver.

That's *Ponder the Pool* for another month. I hope it was helpful.

Stay tuned, next month we will come up with another question to ponder. 73 – Gary

If you have any questions or comments, drop me an email at AA6GJ@arrl.net



⇒ I used the tables on the next pages for the calculations in this article.

Power to dB conversion chart

1 mW	=	0 dBm				
2 mW	=	3 dBm				
5 mW	=	7 dBm	Note: dBm and dBW values shown here are rounded to the nearest whole number			
<u>10 mW</u>	=	<u>10 dBm</u>				
20 mW	=	13 dBm				
40 mW	=	16 dBm				
50 mW	=	17 dBm	=	0.05 W		
<u>100 mW</u>	=	<u>20 dBm</u>	=	<u>0.1 W</u>		
200 mW	=	23 dBm	=	0.2 W		
400 mW	=	26 dBm	=	0.4 W		
500 mW	=	27 dBm	=	0.5 W		
1,000 mW	=	30 dBm	=	1 W	=	0 dBW
		31 dBm	=	1.25 W	=	1 dBW
		32 dBm	=	1.5 W	=	2 dBW
		33 dBm	=	2 W	=	3 dBW
		34 dBm	=	2.5 W	=	4 dBW
		35 dBm	=	3 W	=	5 dBW
		36 dBm	=	4 W	=	6 dBW
		37 dBm	=	5 W	=	7 dBW
	Max "QRP" level					
		40 dBm	=	10 W	=	10 dBW
		43 dBm	=	20 W	=	13 dBW
		<u>47 dBm</u>	=	<u>50 W</u>	=	<u>17 dBW</u>
		50 dBm	=	100 W	=	20 dBW
		53 dBm	=	200 W	=	23 dBW
	56 dBm	=	400 W	=	26 dBW	
	57 dBm	=	500 W	=	27 dBW	
	60 dBm	=	1,000 W	=	30 dBW	
	<u>62 dBm</u>	=	<u>1,500 W</u>	=	<u>32 dBW</u>	

<i>a</i>	<i>b</i>	<i>c</i>	<i>d</i>
	$b = 10 \log (a \cdot 1000)$		$d = 10 \log c$

Note: logs are base 10

Note also: $b = d + 30$

73 de ZL2iFB

dBm TO MICROVOLTS CONVERSION CHART (For 50 Ω System)

dBm	uV	dBm	uV	dBm	uV
0	224,000	-47	1,000	-94	4.47
-1	200,000	-48	891	-95	3.99
-2	178,000	-49	795	-96	3.55
-3	159,000	-50	709	-97	3.17
-4	141,000	-51	633	-98	2.82
-5	126,000	-52	563	-99	2.52
-6	112,000	-53	501	-100	2.24
-7	100,000	-54	447	-101	2.00
-8	89,100	-55	399	-102	1.78
-9	79,500	-56	355	-103	1.59
-10	70,900	-57	317	-104	1.41
-11	63,300	-58	282	-105	1.26
-12	56,300	-59	252	-106	1.12
-13	50,100	-60	224	-107	1.00
-14	44,700	-61	200	-108	0.891
-15	39,900	-62	178	-109	0.795
-16	35,500	-63	159	-110	0.709
-17	31,700	-64	141	-111	0.633
-18	28,200	-65	126	-112	0.563
-19	25,200	-66	112	-113	0.501
-20	22,400	-67	100	-114	0.447
-21	20,000	-68	89.1	-115	0.399
-22	17,800	-69	79.5	-116	0.355
-23	15,900	-70	70.9	-117	0.317
-24	14,100	-71	63.3	-118	0.282
-25	12,600	-72	56.3	-119	0.252
-26	11,200	-73	50.1	-120	0.224
-27	10,000	-74	44.7	-121	0.200
-28	8,900	-75	39.9	-122	0.178
-29	7,950	-76	35.5	-123	0.159
-30	7,090	-77	31.7	-124	0.141
-31	6,330	-78	28.2	-125	0.126
-32	5,630	-79	25.2	-126	0.112
-33	5,010	-80	22.4	-127	0.100
-34	4,470	-81	20.0	-128	0.0891
-35	3,990	-82	17.8	-129	0.0795
-36	3,550	-83	15.9	-130	0.0709
-37	3,170	-84	14.1	-131	0.0633
-38	2,820	-85	12.6	-132	0.0563
-39	2,520	-86	11.2	-133	0.0501
-40	2,240	-87	10.0	-134	0.0447
-41	2,000	-88	8.91	-135	0.0399
-42	1,780	-89	7.95	-136	0.0355
-43	1,590	-90	7.09	-137	0.0317
-44	1,410	-91	6.33	-138	0.0282
-45	1,260	-92	5.63	-139	0.0252
-46	1,120	-93	5.01	-140	0.0224

V-71 RCVR Sensitivity
0.16 Microvolt = -123

dBm or **dBmW** (decibel-milliwatts) is a unit of level used to indicate that a power level is expressed in decibels (dB) with reference to one milliwatt (mW). It is used in radio, microwave, and fiber-optical communication networks as a convenient measure of absolute power because of its capability to express both very large and very small values in a short form¹. The formula for calculating dBm measurement is **10 x log (signal strength per milliwatts)**.

Amateur Radio Exams Now Online or In-Person!

No Paper! All Electronic! Very Cool!

with K6DDZ & AA6GJ

Now that MTARA is back to in-person meetings, amateur radio testing will be offered before each meeting. Testing will cover all three elements (Technician, General and Amateur Extra). Remote (online) testing is also available by appointment.

For MTARA in-person or remote testing, please go to **K6DDZ.com - Amateur Radio Testing Made Simple.**

ONLY ONE CLICK to:

Order Gordon West's study materials

HamStudy.org Practice Tests (all levels)

Schedule a Test (in-person or remote)

Get Your FCC Registration Number (FRN)

Pay for Your Test

...and even click to Gary's (AA6GJ) video training for more in-depth knowledge

Let's keep it simple! Any questions, email Dede Hermon at DedeK6DDZ@gmail.com

And if you are DTH (Down the Hill)

You can test all classes of license with the

**West End Amateur Radio
Group**



That's my team AA6GJ and the Group

If you are interested, drop me an email at AA6GJ@arrl.net to set a time, either online or in-person or to just get information. We can help you with your FRN, too.

73,

Gary

<https://GaryRJohnson.org>

Mountain Top Amateur Radio Association

The Amateur's Code by Paul M. Segal, W9EEA (1928)

The Radio Amateur is:

CONSIDERATE never knowingly operating in such a way as to lessen the pleasure of others.

LOYAL offering loyalty, encouragement and support to other amateurs, local clubs and the American Radio Relay League, through which Amateur Radio in the United States is represented nationally and internationally.

PROGRESSIVE with knowledge abreast of science, a well built and efficient station, and operation beyond reproach.

FRIENDLY with slow and patient operation when requested, friendly advice and counsel to the beginner, kindly assistance, co-operation and consideration for the interests of others. These are the hallmarks of the amateur spirit.

BALANCED Radio is an avocation, never interfering with duties owed to family, job, school or commu-

MTARA Shirts, Jackets, and More

We have many items available with our club logo.

The information for ordering is as follows:

- Name Tags—Harlan Technologies, Name Tags by Gene (715) 340-1299, www.hampubs.com
- Mouse Pads—Check with Jodi, WA6JL
- Polo Shirts—Port Authority 510L Dark Green, 510K Dark Green, Long Sleeve Dark Green.—Check with Brandy
- Jackets—Forest Green or Black J317. Sizes Small to 6X
- Brandy will also embroider hats. You must supply the hat.
- Contact:

Hurt Ink

2651 Coleen Lane

San Bernardino, CA 92407

(909) 815-6852

hurtink815@gmail.com

www.hurtink.com

