SAN BERNARDINO MICROWAVE SOCIETY, Incorporated

FOUNDED IN 1955

A NON-PROFIT AMATEUR TECHNICAL ORGANIZATION DEDICATED TO THE ADVANCEMENT OF COMMUNICATIONS ABOVE 1000 MC.

W6IFE Newsletter

August 2009 Edition

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At the **6 August 2009 SBMS** meeting the "Tech Talk" will be " Minimizing DC losses in portable equipment- Including AC supplies". by Doug, K6JEY. The SBMS meets at the American Legion Hall 1024 Main Street (south of the 91 freeway) in Corona, CA at 1900 hours local time on the first Thursday of each month. Check out the SBMS web site at http://www.ham-radio.com/sbms/.

REMINDER- NO PARKING IN THE CHURCH LOT

Last meeting- Judy and Tom from Rhode & Schwarz came to our meeting and presented several instruments that we would love to have in our shops. There is to be a BBQ at Dennis' QTH following the Tune Up Party on 25 July at Fairview Park in Costa Mesa. Chris, N9RIN would like more feedback from those building the 3 GHz SBMS project. The SBMS 2GHz and Up Contest results were Northern Lights Radio Society with 17 operators had 87,099 points; San Bernardino Microwave Society with 3 operators had 12, 885 points; San Diego Microwave Group had 7 operators with 9,908 points and the 50 MHz and Up Group had 1 operator and 1,288 points. 24 people present.

Scheduling.
1-2 Aug ARRL UHF Contest
15-16 Aug ARRL 10 GHz and Up contest
3 September- Not confirmed yet. CARMA Array Correlated design. David Hawkins from OVRO.
12-13 Sept ARRL Sept VHF QSO Party.
19-20 Sept ARRL 10 GHz and up contest
25-27 Sept 2009 ARRL/TAPR Digital Com Conference Chicago, IL.
1 October- Mismatch Losses- Dick Kolbly, K6HIJ

23-25 Oct Microwave Update 2009 Dallas TX
5 November- 1296 station design tricks and techniques- Larry, Jeff and Doug
3 December- Suggestions for equipping a beginner, intermediate, and advanced home laboratory.
7 January- Getting on 47 GHz- station and equipment design and approaches.
4 February- Open- Suggestions?
MUD 2010 Wednesday October 20 ----- Sunday October 24 Los Angeles area. SBMS sponsoring it.

Activity reported at the July SBMS meeting: Dick, WB6DNX did some UHF repeater work; Dennis, W6DQ is getting his shop and lab set up at home; Chuck, WA6EXV is revamping his 10 GHz rig; Bill WA6QYR did some noise figure testing; Walt did some more building on the instruments for demonstrating in physical optics how microwave works; Mike KI6OQT is collecting stuff to learn about amateur radio; Rein, W6SZ is doing EME; Tom, WB6UZZ worked on his shop; Stan, KE6ZC worked Field Day on 440 and 1.2 GHz; Mel, WA6JBD did more on his 10 GHz rig; Dan W6DFW built some more 10 GHz omni antennas; Dick, K6HIJ did more work on the Qualcomm board 10 GHZ rig; Jerry, N7EME had his 10 GHz rig to show; Larry, K6HLH worked Field Day and the VHF contest; Jeff, KN6VR did some power supply work; there were several checking in via ATV.

Wants and Gots for sale.
Want-Old CB's, 160-10 meter rig, oscilloscopes, test equipment, antennas and rotors to learn amateur radio and electronics from —Mike KI6OQT ki6oqt@yahoo.com 310-591-7841.

Threads
Feed placement-
Hello everyone. Been lurking here for a while. Now I could use a little help here with my calculations if someone would like to double-check them for me.
I am using this formula to figure out placement of my feed: f = (D * D) / (16 * c)
Focal length = f Depth = c Diameter = D
This is what my dish measures out to in inches: D = 59 c = 10.5
If I am doing the math correctly: f = (59 * 59) / (16 * 10.5) this should come out to 20.720238095 inches. Am I correct or should I be using metric for the numbers? I am planning to use one of WA5VJB's pc board three element yagis for 23cms. Is there anything that I should look at or plan on that I need to know about before making this a permanent mount? This is going to be something to toy with during next weekends VHF QSO contest and during Field Day in three weeks. Can only supply 10 watts from the radio then about twenty feet of hard line to the feed. Nothing very high power, but it should allow us to hear things and MAYBE make a few contacts using WSJT. Thanks in advance, James W8ISS

Hi James, Your calculations appear to be correct. You can use any units for those formulas as long as they are all in the same units (e.g. all inches, all feet, all cm, etc.) Your f/D ratio is just about 0.35, which is reasonable for a dish and is about what that feed is optimized for, if I remember correctly. I found a couple 2" or 2.5" long threaded N barrel connectors at a ham fest. These things seem to be very difficult to come by (unless you want to pay a small fortune for them), but if you put two nuts on one of them and mount it in the center of the dish, you can use it to fine-tune the distance of the feed to the dish. Use an N connector and a length of transmission line, which puts the feed in approximately the right distance to start with. For a 20-inch feed length, I'd recommend the 0.25-inch diameter semi-rigid hardline that DEM has. The 0.141" hardline might be a little too light. 73, Zack W9SZ

Its ratios, metric or inches will work. Now where is the phase center of the feed? That's what should be at the focal point. Contacts are easier on CW, I think. I've worked Houston and Sandusky from the middle of Iowa with the right conditions on 1296 with a 27-element loop yagi and 3.3 watts in the shack (3/4" CATV hardline up the tower). 73, Jerry, K0CQ

I should have mentioned that this is going to be for EME contacts, not terrestrial. The beams we do use aren't on an AZ/EL system. The dish is one of those old Radio Shack C-band dishes that they sold back in the early 1990's. The copyright notice in the manual says 1993 and that the F to D is 0.38.
Just trying to use what I do have laying around here before I do anything elaborate. I know that this is NOT

an optimal setup but I think it will get us started at least and be able to hear the EME from the Echoes of Apollo during FD in three weeks. James W8ISS

A five-foot dish will do quite nicely with the 60, 80, 100, and 150-foot radio telescopes being lined up for this event. For ordinary 23cm EME it's too small for CW/SSB but may work with digital modes and 100w. I did some path link analysis for 1296 and 10-GHz for working the 40m Owens Valley Radio Telescope (which may be of interest to folks considering listening to Echoes of Apollo): http://www.kl7uw.com/emeOVROcalc.htm A five foot dish will see a 40m dish running 100w with SNR ~ 10dB on 1296. If the small dish transmits with 20w the signal at the OVRO dish will be received at about SNR ~ 0 dB. 73, Ed - KL7UW BP40iq, 6m - 3cm
144-EME: FT-847, mgf-1801, 4x-xp20, 8877-600w
1296-EME: DEMI-Xvtr, 0.30 dBNF, 4.9m dish, 60/300W (not QRV)
http://www.kl7uw.com AK VHF-Up Group

Mid-Atlantic VHF Conference

Now accepting registration, papers, abstracts, and speakers for the 2009 Mid-Atlantic VHF Conference Saturday, September 26 Mt. Carmel Club, Plymouth Meeting, PA
Early Bird Package $50 (before Aug 28) for conference and all meals
Beginners Session 1-4PM is FREE
Sponsored by the Packrats -- info and registration at packratvhf.com
Please submit your paper on amateur VHF, UJF and microwave communications including theory, construction, operation, antennas, roving, VHF related software and hardware. Please send your papers for presentation and proceedings to:
Paul Drexler, W2PED pdrexler@hotmail.com

UHF Field Strength Meter with LED Array Display

Introduction

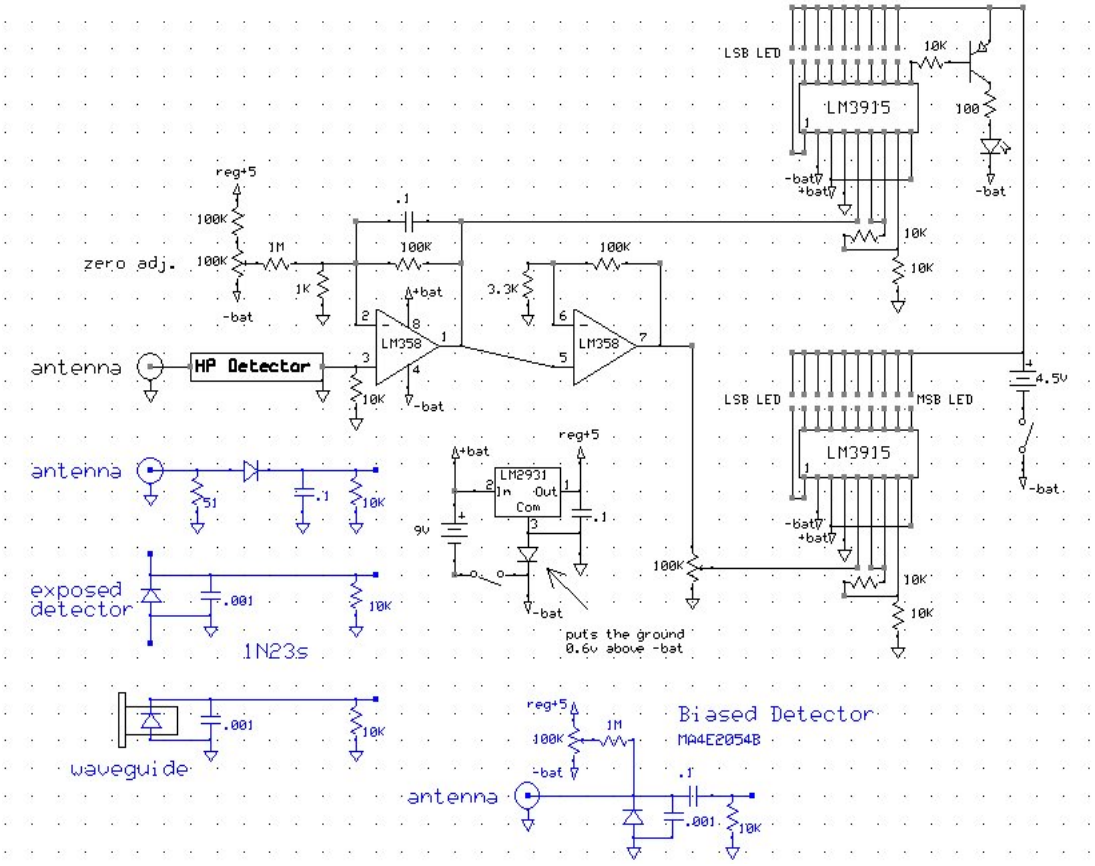
This is about my third or fourth Field Strength Meter (FSM). I seem to have made a hobby out of FSMs. As most of you know, an FSM is a crystal set plus a DC amplifier, where the point is to display the power in the vicinity of a strong source rather than to listen to any particular station. Most of my FSMs have the detector out on the end of a wand so I can use them to demonstrate some aspect of microwave radiation. I can turn it to show polarization, or to show how interference (mulitpath) leaves places in the space infront of the source with nulls and peaks. I have an arm (called a goniometer) that makes a two foot arc out infront of my various sources. With an FSM on the arm, it will reveal the antenna pattern. Microwave hams could use an FSM to find leaks in their setup. You can find focus of a badly aligned dish. Or just have fun showing non-ham friends what an electromagnetic wave looks like. Sort of. Broadband

One can tune the front end before detection to narrow the input a bit, but usually an FSM

takes in all that the antenna can receive. That's about an octave; 5GHz to 10GHz for example. That much bandwidth limits your gain to much lower values than you are used to with communications receivers. In the microwave band, the broad band noise you are competing with, is amplifier noise, not environment noise. I find I can't do better than a gain of about a thousand or so. (~60 db) This is adiquate for the distances and devices I play with; a few feet from sources of a few milliwatts. All my sources are used motion sensors. Surprisingly, motion sensors use standard waveguide hardware so it is easy to mount surplus WR90 or WR42 waveguides, horns, circulators. Dick Bremer gave me an E-H tuner which makes the setup look very scientific.

Detector Sources

My horns and detectors are from eBay also. Usually in the form of early Fuzzbusters. (For some reason, even the oldest police radar detectors do not use standard waveguide sizes. So they are only useful for their detectors.) Fortunately there is little collector value in old Fuzzbuster so you can get the old ones for little more than the cost of shipping. Only the old ones (look for the word "vintage") have parts that are big enough to work with. There's two 1N23's in the first version of Fuzzbuster. One of them is used as a switch in the same cavity with the one used as a detector. The one used as a detector is always the more sensitive of the two but either one works in an FSM. A more consistent source of detectors is the Schottky MA4E2054B (replacement for the HSMS-8202) from Down East Microwave for a dollar a piece. They are really mixers which means you have to bias them to get them to detect anything. It takes about a 100 mV. They are consistently better than the best 1N23 I own but they are not easy to work with because the are SMDs.

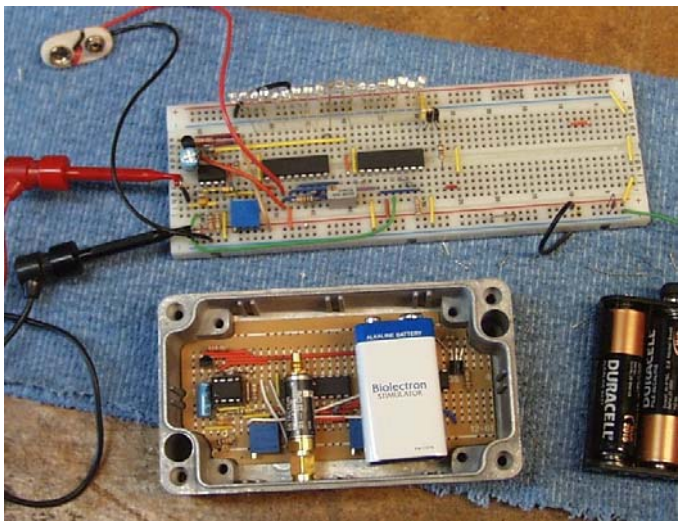


The Circuit

The most important discovery I've made recently in working with opamps is the LM2931 voltage regulator. Everyone knows by heart "LM317" but for the past 20 years or so, that part has been old school. For some reason the amateurs just don't get the message. With the LM2931 you can let your battery go down to within .5 volts of the voltage being held, as opposed to 1.5 with an LM317. There are a number of kinds of LM2931. You want the three lead TO92 size fixed voltage type.

I don't know how unusual this is, but I've chosen to make the plus and minus opamp power leads assymetric; 0.75 negative battery and 8V positive battery. The LM358 is sold as a "single supply" opamp but I found that if you run it with two supplies you can use a fine-adjust offset circuit (on a regulated supply) to allow the amplifier to sense closer to zero. (No deadband.) It's in the noise, but I'd rather see the noise and be able to adjust it out than not know how much I'm missing. Since the input is always positive going, I can make the minus side a minimum amount; a single diode drop is enough. That's what the diode is for under the regulator in the schematic. I played with a more expensive FET front end opamp (OP275) and found that it needs a minimum of 1.5 volts minus battery.

The LM3915s are logarithmic LED drivers. And there's two of them for a range of 60 db. That range is just about the limit of a typical FSM by the way. The bandwidth out of the amplifiers is reduced by the capacitor across the 100K resistor in the feedback of the first stage. If you change that resistor to increase the gain, don't forget to change the capacitor too or you will end up with response too slow to be useful. Reducing the other resistor in the feedback divider would be better if you want to increase the gain. Below 330 ohms, that first LED can be adjusted to the flickery state but you are constantly fiddling with the trimmer. (In a true logarithmic display there is no zero. It makes sense then, that you would adjust the gain and offset so the first LED is flickering with the noise.) Notice that the LM3915s are referenced to the opamps ground but the power for the LEDs come from the AA cells with a separate ground. I'm sure it was designed that way since the LED drive current is quite a bit higher than a nine volt battery can supply. Three cells is enough to drive even the white LEDs. Two cells is more than enough if all the LEDs are red LEDs. (I have four cells since my charger can't take an odd number of cells.) With the low drop out regulator on the bias, I wouldn't be surprised if you could run the whole thing on the four AA cells. The 3db per step on the LM3915 means that with two of them, the more sensitive one has to have a separate 30db amplifier stage (a factor of about 32). The trim-pot between stages was surpisingly easy to adjust. You just watch the LEDs as they ripple up when you create a smooth change in signal. The resistors on pins 7 and 8 of the LM3915 control the LED drive current and the reference scale. But I could not figure it out. The ap notes for this device are unbelievably complicated on this subject. What I have works, but don't ask me how to change anything. The current is 3ma for each LED which seems about right. Just for fun there's a PNP transistor on the most significant bit output to drive a large LED (30 ma). You know you hit the limit when that baby kicks in. There's a bit more dynamic range left but not enough for three LM3915s.

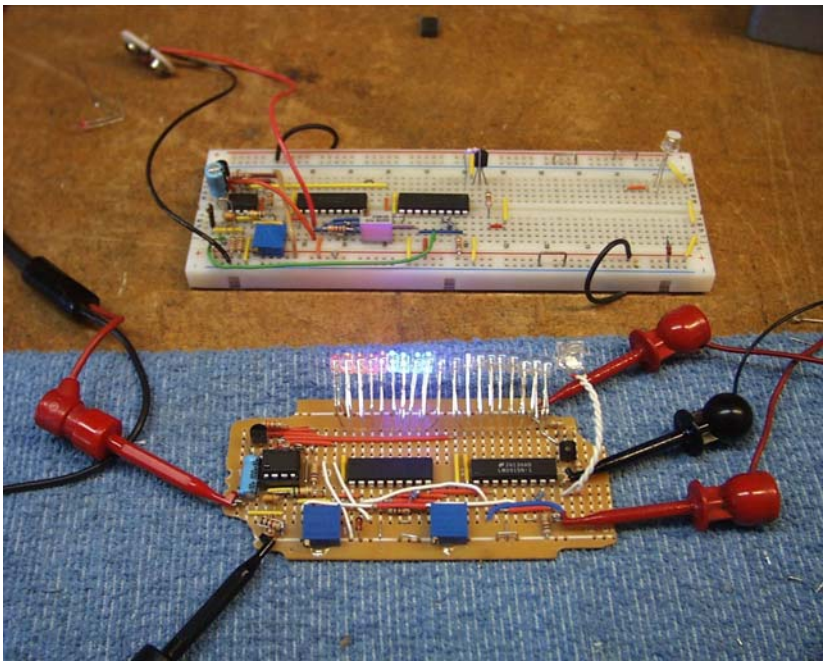


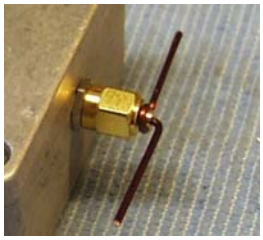
Hardware

The metal box seemed to help with the noise. I'm not sure if the LED battery being on the outside is a problem or not. This is the first FSM without a gain range switch or even a front-end pot. I am counting on the 60db of overall dynamic range and the fact that's 20 LEDs. Besides there's no room for a range switch or pot. Machining the holes for the LEDs wasn't easy. You can't just use a drill press. The holes actually touch each other and the drill will merely slide over into the previous one. It has to be done on a mill if you want them as close as shown. It looks good of course but the main reason to hold them so close is to use the very leads the LEDs come with rather than hand soldering extension wires to each one. Even that is a stretch because the spacing between LEDs is on tenth inch centers (2.54 mm) and the diamter of LEDs is 3.0 mm.

Soldering

As you can see in the photo, I use push-lead protoboards. The neatest trick in using protoboards is to buy two of everything and then copy the circuit over to the soldered version, part for part. Don't transfer the circuit over; make an additional circuit. Since all the parts on a PCB costs less than the the blank PCB they go on, and the box costs more than everything else combined, buying twice the parts is an affordable thing to do. ALWAYS have at least two of everything. If it doesn't work you can go back to the protoboard and see what you did wrong. The better reason is later on, when you want to modify it. Keep the protoboard version in tact (they only cost a few bucks more the soldered version). You can evaluate changes on the protoboard before commiting to soldering the changes.





Playing With It
I used an SMA chassis mount connector on the front end, but a BNC would be better if you have the room. The larger connector is much more convenient for sticking in wires for antennas. One of the applications I have in mind for this is learning about baluns right where the antenna connects. I've had to purchase an SMA to BNC to build up the center conductor diameter to a useful size. (To maintain the impedance, SMA center conductor has to be quite small in diameter.) The loss in signal is noticeable going a few feet with RG174 to a remote antenna. I have a helical antenna that I love to show off. It works better connected directly but it is much easier to work with, with a foot or two of coax between antenna and FSM. If you are a beginner at UHF antennas, I have this word of advice on antennas. I find that the spacing between ground plane reflector and active element is much more critical than element length. So exending the connector an inch or two might be handy if you want room to place a reflector behind it and adjust its distance to the active element.
Walter Clark--

Phil Lee, W6HCC our Colorado transplant--
I spoke with Phil Lee, W6HCC in Colorado today about his doings—He has gotten in to grid chasing on 1296, 432 and 10 GHz. He has 5w and 4 ft dish on 1296. He is on 432 with 75w. The rover station has 8w with a 4 ft'r on 10 GHz. Phil is using Bill, N0RZ as the base station.
Bill has a 10w system with 32 inch dish on 30 ft tower for 10 GHz…Bill has an EME quality station on 1296 MHz with 1500w. The 432 station is just 100w. Bill is a good operator so the grids are easer to come by once the technical problems are over come. Phil has 38 grids on 432 MHz, 50 grids on 1296 MHz. And on 10 GHz, Phil has 77 grids. DX is 415 miles. They mostly use airplane scatter for the grid contacts.
The area guys have Home QTH to QTH schedules at 8 pm nightly on various bands. They operate 902 MHz, 1296Mhz, 2.3GHz and 10GHz over the week nightly
Bill WA6QYR

Some reference materials for those looking to pick up information—
ARRL UHF/Microwave Experimenters Manual copyright 1990 (out of print)
ARRL UHF/Microwave Projects Manual—1994 copyright. available
ARRL UHF/Microwave Projects Manual vol 2- 1997 copyright available
ARRL CD with projects 1 and 2 available
International Microwave Handbook joint ARRL/RSGB 2002 published available
RSGB Microwave Projects published 2003, 2005 available
RSGB Microwave Projects 2 published 2005 available

Some reference web sites:
www.microwave101.com has a number of calculators and reference data.
www.minicircuits.com/pages/mcl_nf_calc.html. Cascade stage Noise figure calculator.
www1.sphere.ne.jp/I-lab/tool/nf/ cascade stage noise figure calculator.
//vk1od.net/calc/y.htm cascade stage noise figure calculator.

www.w6pql.com has a lot of kits for EME and other stuff of interest to hams.

Hello Microwavers,
I have attached the pdf file of the results from yesterday's 2009 Tune Up Party held at Fairview Park in Costa Mesa, CA. Kerry Banke, N6IZW provided the test equipment and entered the results into a spreadsheet. Other members of the Microwave Group of San Diego also participated in the testing including Greg Baily K6QPV, Lee Scheppmann KD0IF, Joe Loughlin KE6PHB, and Ed Munn W6OYJ.
When you look at the results, note the columns labeled " MDS Gen dBm" and "Meas - Calc".
The first of these gives the assessment of your receiving capability. You want the largest negative number compared to other stations that have the same size antenna.

In the second column you want the number to be zero or most positive. This is a comparison of all factors you provided including your transmit power and antenna size or gain, compared to the expected calculated result.
A few dB difference can probably be expected due to the range setup, reflections, etc. But if you more than 5-6 dB below that of comparable stations, then you have some troubleshooting to do before the summer contests kick off.
These results will be also provided and maintained on the SBMS web pages along with earlier year's results for comparison.
73s and Good Luck in the upcoming contests! Ed Munn w6oyj@amsat.org
or remunn@earthlink.net
Here is a link to the 2009 Tune Up Party results on the SBMS web pages.
www.ham-radio.com/sbms/sd/mdserpindx.htm
Hope it works for you. 73s from Ed

Doug, K6JEY John, KJ6HZ and Rein, W6SZ have been playing on 2 meter EME and here are some results for 25 July.
”We had a good weekend with everything working and even made about 6 contacts. Here are a couple of pictures that Helen took of us. We were using two 12el K1FO antennas and about 300 watts. Not bad considering the activity was light. All digital contacts. Here's the log: KB8RQ, JM1WBB, W5UN, K7MI, K1JT, WA4EWV We copied 8J1AXA, and were heard by VK2KU .” Doug

Ed, WX6DX digging in the boxes of "free stuff" at the SBMS July meeting.

. The San Bernardino Microwave Society is a technical amateur radio club affiliated with the ARRL having a membership of over 90 amateurs from Hawaii and Alaska to the east coast and beyond. Dues are $15 per year, which includes a badge and monthly newsletter. Your mail label indicates your call followed by when your dues are due. Dues can be sent to the treasurer as listed under the banner on the front page. If you have material you would like in the newsletter please send it to Bill WA6QYR at 247 Rebel Road Ridgecrest, CA 93555, bburns@ridgecrest.ca.us, or phone 760-375-8566. The newsletter is generated about the 15th of the month and put into the mail at least the week prior to the meeting. This is your newsletter. SBMS Newsletter material can be copied as long as SBMS is identified as source.

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