



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 February 2009 Edition

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At the **5 February 2009 SBMS** meeting the "Tech Talk" will be Dave, WA6CGR is doing solder school for surface mount devices. 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- Doug, K6JEY talked about compasses and how to use them. He had a number of compasses to share. Normal sighting compass is worse than 1 degree \$50. Better ones cost more, but need to add in deviation of field off old aero maps or topographic maps which can add lots of error to pointing angles. Thanks Doug. Paul KH6HME was in from Hawaii. Pat, N6RMJ is working on MUD 2010 contract with hotel. Membership voted \$500 deposit for hotel. The Society 3GHz project transverter is coming along. It looks to be in the \$60 level for the board and parts with out LO. Jerry N7EME is working on the cost of the LO. There was a 5.0 earthquake during the meeting. Mike KO6S of Claremont was our visitor. Discussion was held for a March 7 SBMS valentines dinner. 24 people present.

Activity reported at the January 2009 SBMS meeting: Jeff KN6VR packaged his rubidium oscillator; Doug, K6JEY did some EME fine tuning; Larry K6HLH had a foot of snow and will be on 10 GHz for the VHF contest; Pat, N6RMJ is working on 1296 MHz with 4 bays of 55 loop yagi and 50 watts at antenna; Eric AF6EP is working on 2.4 GHz; Dan W6DFW milled some slot antennas on his CNC toy; Joonho, KG6MQS has his 24 GHz rig running; Dick, K6HIJ had been gone to Hawaii for the holidays and has an HP8970 NF meter; Chris, N9RIN is working on a 10 GHz link for a robot; Mel, WA6JBD worked on computer; Ed, WX6DX talked about new EMI requirements in 2009 ; Michelle W5NYV has a SBMS

prototype 3GHz transverter to adapt to AMSAT project; Paul, NB5MU is working on AMSAT software; Ed, W6OYJ indicated the Santiago beacon had an unknown problem and a replacement is in work and he had the 20th grid from Mt Soledad; Bill, WA6QYR modified one of the LNAs; Chuck, WA6EXV worked on his rubidium; Dick, WB6DNX has his rubidium in a box; there were a couple of check-ins on the ATV net.



Doug's compass collection.



Dan W6DFW slot antenna for 10 GHZ.

Southeastern VHF conference

This is just a reminder that the SVHFS 2009 conference will be in Charlotte April 24th and 25th. I am still accepting technical papers with the closing date being March 2nd. If you have a presentation you would like to make please notify me by the same date, March 2nd.

If you wish to participate in the Design Contest, I need to be notified by Feb2nd of your intentions. If anyone is on the fence about submitting an entry you can e-mail me at design@downeastmicrowave.com or call me to discuss it. Please see the SVHFS or the Downeast Microwave websites for further info and rules

of the contest.

Feel free to pass this e-mail on to others or post it on any VHF/UHF/ uWavereflector not found in the heading.

Thanks and see you there! Steve, N2CEI

2009 Southeastern VHF Society

Annual Award for Design Achievement

The SVHFS is pleased to announce the continuance of its "Design competition for the advancement in circuit design of VHF through Microwave and related circuitry". This competition commonly known as the

SVHFS Design Contest will take place again this year culminating with the final judging at this years conference in Charlotte, NC on April 25th. This competition has brought about many great designs for the VHF/UHF/Microwave amateur community. This year we hope to keep the tradition by attempting to attract designers from outside of the Southeast region of the United States. Rules for the contest are simple and straightforward and can be reviewed in the judging criteria section on the following pages. Basically the

designs should be "Hardware Oriented" centered around VHF, UHF, and Microwave operation and auxiliary circuits. We anticipate this years awards will be like the 2008 contest with first place being \$2500 in prizes and gift certificates, second place being \$1000 in value, third place of \$300 and fourth place being \$200 value. After reading the Judging Criteria, If you have any questions and/or wish to express the desire to participate, please contact Steve Kostro, N2CEI, Design Contest Panel Chairman by e-mail at design@downeastmicrowave.com. I will be more than happy to discuss any details with you concerning the

Design contest, contest rules, design criteria, Deadline Dates, or your design in general. The following official Judging criteria will be posted at the Southeast VHF Society's web site <http://www.svhfs.org> and at the Down East Microwave web site <http://www.downeastmicrowave.com>

Judging Criteria for the 2009 SVHFS Design Contest

Circuit designs should focus on VHF through Microwave applications or IF signal processing for this range. Competition is open to any SVHFS member. Conference attendance, which is mandatory, includes your membership fee. Design entries will be final judged by the Design Contest Panel (the Panel) at the 2009 conference on April 25th. The Design Contest Panel Chairman is Steve Kostro, N2CEI (design@downeastmicrowave.com) and is responsible for selecting the Panel. Entries will be critiqued in 5 categories listed below. Point vales are 0-5 per category with a perfect score being 25 or more points. Extra points may be awarded as stated below.

Judging Categories

1. For new and innovative circuit designs, or novel uses of the components used.
Complexity is not the key to winning. A simple circuit may demonstrate the novel use of a component and will be judged on par with all other entrants. An example of Innovation may be a control circuit or interface (including microprocessors) that promote ease of use, protection, safety, or improved performance of any VHF/UHF/Microwave RF or IF device used in Amateur Radio. Extra points will be awarded for "Extreme Cleverness" by impressing the judges!

2. For exceptional circuit performance measured against established norms.

Demonstration of your design's functionality to the Panel is mandatory! You will be responsible to demonstrate the function of your circuit and allow the panel to perform test as they see fit. Your design may also be subjected to a performance test during the conference at the Panel's discretion. A short question and answer session will coincide with the demonstration. Extra points may be awarded for performance beyond what is considered the established norm.

3. For construction technique, craftsmanship, and aesthetics.

This is a design contest but neatness does count. If you submit a black box, the Panel will require a visual internal inspection. You are not required to have professionally made circuit boards but if your construction skills are lacking, you **may** have the submitted design assembled by some one else. The goal is to provide the Judges the opportunity to establish the relationship of the hardware to the documents provided and provide a clear view of the physical design.

4. For documentation, schematics, publication of design and presentation.

Full documentation of the design will be published in the conference proceedings. A presentation of your design to the conference attendees is mandatory. The Panel will be critiquing your presentation for its contents and your ability to answer questions posed by the conference attendees. Your design, documentation and presentation must be exclusive to the SVHFS Conference and not published anywhere prior to April 25th, 2009.

5. Designs should be original work, practical, and use readily available components.

The design should be reproducible by any willing amateur radio operator. It should be generic in nature but in example, could be focused on one type of amateur transceiver or accessory. If software is required it should be of a "shareware" nature or provided by the circuit designer. The Panel will scrutinize any specialty software since this is a "Hardware" oriented design contest. Components utilized may be surplus or obsolete as long as a valid source for procurement is listed. No "One of a Kinds"! It should be original work but sometimes there is a better way of doing an existing circuit. Please state the design goal and inspiration of the design in the documentation.

Design Contest Deadline Dates and Times

Feb. 2nd. Final notification to Chairman by e-mail of design entry (design@downeastmicrowave.com).

Mar. 2nd Submission of paper to be published in SVHFS proceedings
(SVHFS2009@downeastmicrowave.com).

Mar. 27th Preliminary Presentation or outline due to Chairman by e-mail

Apr. 24th Design submission by 10 AM. (Preliminary Judging)

Apr. 25th Design presentation starts 1 PM. (Final Judging)

2008 SVHFS Conference Design Contest Winners and Awards

1st place N5AC, Steve Hicks \$2500.00 in prizes

2nd place G4HUP, Dave Powis \$1000.00 in prizes

3rd place W1GHZ, Paul Wade \$300.00 in prizes

4th place W4WSR, Ott Fiebel \$200.00 in prizes

5th and 6th participation prize of \$100.00 awarded to NA4NN, Jim Hagen and WA1ZMS, Brian Justin

TO: KE5FX, K0CQ, es CT1DMK de K2RIW 12/31/08

Dear John, Gerald, Luis, and the Microwave Group,

--WHAT LIMITERS CAN & CAN NOT DO --

INTRODUCTION -- What an Ideal Limiter (plus filter) is capable of doing is a mystery to many engineers.

A GOOD BOOK -- One of the best books on the subject is an oldie but goody: "Lectures on

Communication System Theory", E.J. Baghdaddy, McGraw-Hill, 1961.

>From my understanding, I believe Baghdaddy is saying the following:

1. You have to consider the Am and the FM (angular modulation) spurs separately, as well as separately considering the interference from a second independent signal being present in the channel.
2. A Ideal Limiter is capable of suppressing the AM modulation component that's present on a single signal by many dB per Limiter stage. You have to be careful to select a Limiter that has a very low AM-to-PM conversion characteristic. In other words, be wary of the "Capacitive-swing" (C-swing) of the Limiting stage.
3. When a second (separate) interfering signal is present in the channel, an ideal Limiter will suppress the weaker signal by 6.02 dB per "Limiter plus Filter" stage, as long as there is sufficient amplitude difference between the signals, so that the stronger Carrier can "capture" the limiter.
4. I don't believe a Limiter can suppress the Phase or Frequency modulated sidelobes that are present on a single carrier. They have to be eliminated (or frequency filtered) back at the PLL plus amplifier (and multiplier) stages.

BAGHDADDY'S HIGH CAPTURE RATIO FM RCVR -- Baghdaddy described the construction of a very good FM Broadcast RCVR (by 1961 standards) that had a well designed series of Limiters (with well-designed filters between them) plus a Discriminator, that had a "Capture Ratio" of 0.997. That means that a co-channel Interfering Signal could be as strong as 99.7% of the voltage of the Desired Signal (a difference of 0.026 dB), and after the Limiter-Discriminator stages the offending signal was suppressed by more than 20 dB.

MIXER as a LIMITER? -- I believe it may require a series of tests to tell us if a particular brand of a Doubly-Balanced Mixer (DBM), that has an over-driven LO Signal, will behave as a low C-swing Limiter stage.

A DBM AS A PULSE FORMING NETWORK -- I think the answer is yes for most DBM brands because I have used a Ku-band DBM as an X-band sub-nanosecond RF pulse-forming network, and it behaved beautifully. There was no evidence of capacitive effects. I put an RF CW Signal into the LO Port; I took the RF Pulse output from the RF Port; and I put the DC-coupled 0.25 nanosecond Video Pulses into the IF Port. I placed attenuators on all ports to control the mismatched reflections, and I carefully DC-balanced the Video Pulse input. The internal balancing of the DBM isolated the LO-to-RF coupling by 30 dB. The presence of the Video Pulses on the IF Port removed the balancing (the isolation) resulting in a 29 dB on-off ratio.

Essentially none of the sub-nanosecond Video Pulses appeared in the RF output. I cascaded two DBM's in this manor, and they achieved more than 50 dB of on-off ratio while producing one million pulses per second of 0.25 nanoseconds duration each (a Duty Factor of $2.5E-4$ or 0.025%). Careful timing attention is required for the Video cabling between the DBM's because a 0.25 ns pulse is only 2 inches long inside the coaxial cable.

RF Pulses this fast cannot be crystal detected for observation. They must be observed on a Sampling Oscilloscope that is observing a very repetitive series of events. Each RF Pulse was three cycles of an X-band signal. The net result was a Radar system that had a range resolution of a few inches while finding the bi-static reflecting objects that were present in an Anechoic Chamber that was being "tuned" for a performance improvement.

73 es Good LO Synthesizing, Dick, K2RIW

----- Forwarded Message -----

Subject: Re: [Mw] Spurs and mixer style.

Date: Monday 29 December 2008 11:42 pm

From: "Dr. Gerald N. Johnson" <geraldj@storm.weather.net>

To: Microwave list <microwave@echo.valinet.com>

On Mon, 2008-12-29 at 20:21 -0800, John Miles wrote:

Driving harder or limiting I understand they will be present at the output also, I have no doubt about that but the big question is would they be the same dBc down or will they be worst (because of the limiting process)?

In general you can't make frequency spurs worse by clipping the waveform, and diode-mixer LO ports should be driven to saturation.

The optimal way to square up a waveform is probably a series of saturating gain blocks with band pass filters between them, where the filter bandwidths increase gradually from one stage to the next. You need a lot of gain to achieve really fast edges, but too much broadband gain in one stage adds both AM and PM noise.

One of the worst things you can do is feed a slow edge of barely-adequate amplitude to a broadband diffamp or other limiting stage. I once did some troubleshooting on a friend's DDS/PLL synthesizer (<http://www.ke5fx.com/ssa/lo1.html>). It had serious spur/noise problems, and I couldn't see why to save my life, until one of the changes I made had the side effect of increasing the amplitude available at the input of the comparator used to drive the PLL chip's reference input. Suddenly all the problems went away.

So, fast edges are almost always a Good Thing, and that means that sine waves should be sent through one or more limiting or clipping stages. Waveforms that linger near the switching threshold (normally the zero crossing) will appear to have more jitter and higher-amplitude spurs.

And that's precisely where the amplitude spurs get converted to jitter and so FM spurs by adding and subtracting from the carrier amplitude right at threshold.

If Luis could stand band pass filtering, he'd clean up the spurs with that. I don't see limiting whether progressive or in one stage cleaning up the dds spurs. -- john, KE5FX

73, Jerry, K0CQ

Microwave mailing list

microwave@lists.valinet.com

<http://www.valinet.com/mailman/listinfo/microwave>

Hello SBMS'ers,

At the Jan. 8th meeting a motion was passed to do a limited run (30 kits) of the 3456MHz transverter project. The cost was placed at \$60 for these kits for club members. There is always a possibility of more at a later time, but that will be up to the membership of the club. A sign-up sheet was passed around and 19 out of the 30 kits are spoken for. That leaves 11 left in case anyone is interested. If you would like a kit, I will take the first 11 to respond to this email.

Here is some info as a reminder (also see MUD 2008 handbook):

- 1.The transverter will use a 2-meter intermediate frequency (IF), with 1/2 watt of transmit drive. The unit shall be capable of operation on either the United States frequency of 3456 MHz, or the European frequency of 3400 MHz.
- 2.A single coaxial connector will be used between the IF radio and the transverter. Switching between transmit and receive functions will be by means of a push-to-talk (PTT) signal. A FT-817 IF radio is what I had in mind when making the circuits.
- 3.The single local oscillator will be separate from the transverter assembly.
- 5.Microwave transmit and receive signals shall be on separate connectors.
- 6.Transmit power is rated at approximately 10mW. My spectrum analyzer and power meters are not calibrated, but that is the level I have seen. The output level can vary all the way down to about 3mW. It is dependent on the LO drive level and the IF drive level. From what I can tell with the equipment I have, a LO power of +13dBm and an IF level of +27dBm will give the ~10mW out.
- 7.An external LNA and final PA are required.
- 8.A case and input/output connectors of your choice are needed.

Please keep in mind these are kits and not assembled boards. All of the circuitry is surface mount except for the voltage regulator and a couple of Molex connectors. If you are not able to solder surface mount components, please consider this kit carefully or maybe have someone build it for you that can solder surface mount parts. Thanks and 73's, Chris n9rin

----- SBMS on ATV

San Bernardino Microwave Society Meeting

Topic of the next Tech Talk: Compass Techniques and Types.

Meeting is on January 8th from 7:00 to 9:00 PM PT Starts @ 0300 UTC to 0500 UTC.

Here is the cool part. Some of our group put the meeting on the local ATV network. That way ATVers can watch the meeting and participate. (Its two way TV of course). On a second level, it has been streamed to the Internet so that still more people can participate and watch. I am not sure how robust the server is, but I checked in once from Baltimore and it was exciting. Here is the instructions for the rest of the path: www.batc.tv them go to members streams and click on KE6BXT www.ac6rb.com then click on option #1 or #2 I mention this, not because I am giving the talk, but because I am amazed and appreciative of the huge amount of effort and skill that has gone into this. Gary W6KVG and his team are excellent video graphers. Some TV stations don't do as well. The setup is really quite extensive and well run. Then there is the ATN network and the computer interface group. It is a pretty big effort and has taken lots of cooperation and effort. Let us know how you like it. Of course it would be nice to see other clubs similarly available as well. Due North Doug K6JEY

Sub degree pointing compass

Hi Rex and others, You are into a realm where I think a compass is not going to work. Here are two suggestions-

Method one is simple but may not be accurate enough: Put an astronomical finder scope on your dish so that you can move it in elevation. A standard 10x50 will do. With the known position of the sun and moon in AZ/EL for that time you can calibrate your compass rose. However, there are multiple mechanical interactions that could spoil the accuracy and your compass would have to be pretty elaborate. Perhaps like an EME dish, use an encoder for AZ and DVM readout.

Method two is much more accurate and reliable-Find a "go to" telescope like a Meade LX 200 at about the 8" size. A quick call to an astronomy club should yield good results. You could also use an equatorial mount. Radio in the daytime and astronomy at night. Not a bad combination. Mount the optical tube on the mount and do a two star alignment with daytime objects: The sun, moon, Jupiter, some of the brightest stars all are visible in the daytime sky. With a successful alignment, then replace the optical tube with your dish and put the scope in the terrestrial mode. (The LX series will do this). It should give you AZ/EL readings that are correct and should stay that way over a period of many hours. I regularly get arc second accuracy from my scope. The optical tubes come off of the fork arms quite easily. You would only have to add an adaptor. If your dish is light and small then you could mount it on a dovetail bar on top of the scope and not have to remove the tube. It should work smoothly and easily. with a ten-inch scope you could probably see the guy you are working! If you have access to this type of mount it may be the cheapest and easiest way to go. Glad to answer questions. I'll try to add this to my talk. Doug K6JEY

Hello ALL for those of you who did not get it the first time is is the link to the

SBMS XMAS Party 2008

<http://n6rmj.com/pictures/SBMS-XMAS-2008/>

Pat N6RMJ

Hi, I thought I would put next week's talk on line so that you can read it before or during the meeting. With our TV participants and members who can't be at the meeting, I thought it might be a good thing to do.

Let me know what you think. I have a couple of references that are interesting. I know what you are saying, "Then why go to the meeting?" Besides missing the food at Sizzler and the camaraderie, you won't get to see and play with the compasses I am going to bring. I have one of each of the types in the talk. (Including a WW1 1916 compass).

Here is the website, thanks to Rein, with the talk and two pdf files. One is the Long Beach Airport chart and the other is a map of lines of isogonic variation in North

America.

http://www.nitehawk.com/k6jey/k6jey_download.html

Let me know what you think about the idea of putting the talk on line, and feel free to bring your favorite compass to the meeting. Doug K6JEY

Digital TV Fred, 8VSB demodulators and active equalizers have come a long way in the last 10 years. They are no longer sensitive to multipath, (it does need a few extra dB of signal to fill in the nulls in the pass band) and you can feed them two signals the same level, and it will lock on one and ignore the other. This is being used with On-Channel-Repeaters. If there is a part of town with very weak signals, they put a lower power transmitter, on the same Channel, in that area.

The TV set grabs the best one and ignores the other. Wild to watch on a portable 8VSB receiver. You walk along the street, and the program flips from TX1 to TX2. Invisible to the typical user.

Try having two transmitters on the same channel, running the same program, with ZERO interference apparent to the user with NTSC or DVB. California can have many ATV 8VSB repeaters using the same frequency!!!! Just different in time like CDMA cell phones.

8VSB/COFDM comparisons were run as apart of the Consumer Electronics Association R4 and R5 committees. COFDM was better, but only because the COFDM standard requires a higher transmit power. When 8VSB and COFDM we react the same TX power level, 8VSB won.

Kent Britain WA5VJB CEA R4 and R5 committees.

Fred Spinner wrote: There is a California ham, N6QQQ

(<http://nsayer.blogspot.com/2008/11/first-atsc-transmission-from-n6qqq.html>)

that is trying to have an ATSC ATV repeater output. He isn't having nearly as much luck with it as the guys in Ohio did with their DVB-S equipment. For many of the reasons I mentioned to him in his blogs.

I personally hope that if there is a standard for Digital Amateur ATV it isn't ATSC. It's a fairly picky signal to cleanly modulate, and it

is 6 MHz wide. The modulation mode is inefficient compared to other (more modern) modes, is very sensitive to multipath and is inflexible about smaller bandwidths. So far experiments at low power have not gone well.

The DVB-S or DVB-S2 standards are more suitable for ham use as they are variable bandwidth (from about 1.5 to 30 MHz), are codec independent (read: H.264/MPEG-4 AVC) and are likely to use much less spectrum than current VSB AM ATV instead of the same (or more). They will also have multipath issues, but most ATVer's I know of use beams from fixed locations and this works fine from most of the experiments done with it in Europe. DVB-S receivers are \$30 on e-bay now and S2 are about \$100. Most are able to cover 23cm in their IF, so I imagine a preamp and maybe a filter is all that would need to be added for ham use.

For "on the move", DVB-T is a better standard than ATSC since it's COFDM.

Cable ready HDTV's generally by design will not tune 8VSB on the cable channels, just QAM (8/64). So there will be issues with using "standard" sets to pick up 420 MHz Ham ATSC. N6QQQ is suggesting down converters, but that makes the receivers more costly than a DVB-S box for the end user (receiver).

I'd like to see a "ham priced" FPGA based modulator (USB 2.0 with a computer to drive data into it so it's inexpensive) for DVB-S or DVB-S2 but don't have the time (and probably skill) to do one on my own time. The N6QQQ setup was several thousands of dollars and using "professional" equipment is even more.

Still it's interesting and it has a secondary use of high speed data transfer, which I think us hams, have severally slacked off on for a long time. Fred, W0FMS

Jan 6, 2009 10:27:00 AM, wa5vjb@flash.net wrote: Yes You will have to play with the Auto Search Function on many TV's. But Cable Ch 57, and 58 will still be in the 420-450 MHz ham band. All the ATV repeaters in Texas use 421 and 427 MHz outputs so you can watch them on Cable-Ready TV's. The TV itself will then decide to use either the NTSC or 8VSB demodulators. Kent WA5VJB

Dave hartzell wrote: Just curious, will off the shelf HDTV's have the ability to receive broadcasts in any of our bands? On Tue, Jan 6, 2009 at 6:42 AM, Luis Cupido <cupido@mail.ua.pt> wrote: Hi Mike. There are many designs around, and it is not difficult. I have info on a few designs myself, mainly from F, ON, DL and PA) The big Digital-ATV revolution started 13 years ago when the DJ8DW made the first 50Km QSO on 29Nov1995 ;-)

Frequency west brick schematic

Jerry, I have schematics on my web site. Search for Brick

<http://www.ko4bb.com/cgi-bin/manuals.pl>

Didier KO4BB

-----Original Message----- From: microwave-bounces@lists.valinet.com [mailto:microwave-bounces@lists.valinet.com] On Behalf Of Dr. Gerald N. Johnson Sent: Monday, January 05, 2009 9:33 PM To: Microwave list

Subject: [Mw] Frequency West crystal oscillator.

Does anyone have a parts layout to go with the schematic or do I have to take mine apart. Its set to use crystals from 99 to 104 and I want to use a 106.5 crystal and it won't oscillate. There's a fixed cap across the oscillator-tuning cap that I need to remove. Where's it? That oscillator is spread over the top half of the board. 73, Jerry, K0CQ

Not sure if everybody has seen it but the FCC has released coverage plots for the major markets comparing the coverage of Analog to DTV.

>From the FCC Webpage: 12/23/08

FCC Reports Show Analog and Digital Coverage of TV Stations.

News Release: Word

<http://hraunfoss.fcc.gov/edocs_public/attachmatch/DOC-287579A1.doc> |

Acrobat <http://hraunfoss.fcc.gov/edocs_public/attachmatch/DOC-287579A1.pdf>

Map Book of All Full-Power Digital <<http://www.fcc.gov/dtv/markets/>>

Television Stations Authorized by the FCC

Map Book For Full-Power <<http://www.fcc.gov/dtv/markets/report2.html>>

Digital Television Stations Having Significant Changes in Coverage

73,N1SZ FM19ld

Wants and Gots for sale.

NONE requested.



Doug, K6JEY holding his Chinese military compass during his talk. 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.

San Bernardino Microwave Society newsletter
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