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EME INFORMATION

MOON BOUNCE

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Dear EME-friends, Liebe EME-Freunde!

Hoping you have had an enjoyable summertime. - Now all are ready for the coming moonbounce tests again. Good luck and best success!

OE 6 HS , Editor

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A new country on 432-EME ! Since June 15,1978 the Yugoslave station YU 1 PKW (together with his friends YU 1 OAH,YU 1 OFQ) is active and having made many contacts via the moon. Antenna is a 256 el.collinear, polar-mounted.Antenna-gain is about 24,5 - 25,5 dB (isotropic).Preamp is mounted at the ant. using a BFT66. (1,1-1,2 NF,measured with a Rohde & Schwarz noise generator.Sun noise was abt. 11-13 dB in June. A Microwave Modules transverter MMT432/28s ahead of a modified FT101 with 600 Hz CW-filter is working fine.The TX is using a transverter (8 watts) into QQE6/40 (40 watts) driving a 4CX250B linear class C to 1.600 watts input.Output is 1.100 watts.Wkg. frequ. is 432.100 MHz. The new YU- VHF-manager YU 1 NAJ in Belgrade wrote me a very nice letter. He promised to give us EME-infos from time to time. Many thanks Sacha!

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Italy: Another nice and interesting letter reached me during my absence (vacation).Domenico, I 8 CVS giving some infos about his station. We are pleased to learn how he is earning his EME-successes near Napoli: I was starting with EME in April 1978 after visiting two times F 9 FT in Reims. During this time I have worked 4 continents and the following stations: I5MSH,F9FT,K3NSS,LX1DB,W4KD,K2UYH,JA6CZD,ZE5JJ and SM3AKW. My activity is limeted to the perigee skeds of K2UYH. My working conditions are: Antenna is 16 x 21 el F9FT-yagi.Preamp is mast mounted V244/83 plus

FJ203E. Converter is a MMC 432/28. IF - R4C Drake with 500 Hz XTL - filter. Azimuth and Elevation control by +/- 0,2°(ex RADAR selsyncs) Transmitter:Homebuild Transverter + 4CX250 driving a parallel 4CX250R in K2RIW circuit configuration.Output is 900/1000 watt at BIRD Mod. 43 wattmeter.Transmissionline: 25 m of RG 17 with a total loss of 2,5 dB. This means that only 500 watt is applied to the array. Next month the K2RIW-amp will be placed inside a water proofed box continer on top of the roof,than only 5 meter of RG 17 will be needed.

It is very coumbersome to establish the gain and the noise figure of systems like that.Even the best automatic noise figure generators can not give exact figurs that low -0,65 dB or 0,8 dB! I trust only on the overall performance of my system. Measuring the sun noise or $\frac{S+N}{N}$ using the sun as a reference radio source.Actually my $\frac{S+N}{N}$ is 13 dB of sun noise. F9FT is able to get 17,5 dB from a system identical to mine. But 4,5 dB is quite strange. My procedure of measurement is to excluae the RX- AGC,reduce gain and measure the audio voltage of the receiver with the antenna on the sun (V 1),measure the voltage V 2 with the antenna out of the sun. Than :

$$dB = 20 \log_{10} \frac{V\ 1}{V\ 2}$$

Best 73s Domenico, I 8 CVS

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from QST 7/1978

At last! Low-noise preamps for 432 and 1296

By Paul Wade,* WA2ZZF and Allen Katz,** K2UYH

Gallium-arsenide field-effect transistors (GaAs FETs) have recently come into use as low-noise microwave amplifiers. Amateur experimentation has shown that they can provide excellent performance on the uhf and lower microwave amateur bands. These devices, described in a recent article,[1] are rather expensive, particularly the ones characterized as C-band and X-band (4-12 GHz) microwave low-noise amplifiers. However, other GaAs FETs, characterized as *power amplifiers* for low and medium-power (up to 1/4 watt) microwave applications will provide almost the same noise figure at uhf and are being made available to amateurs. The power devices also have wide dynamic range, providing less intermodulation distortion and lower susceptibility to burnout. The receiver preamplifiers to be described are relatively simple to construct and have sufficient tuning range for almost any GaAs FET available.

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[1] Wade, "Introduction To GaAs Field Effect Transistors," *ham radio*, January 1978, p. 74.

Construction

These preamps for 432 MHz (Fig. 1) and 1296 MHz (Fig. 2) use power GaAs FETs made by Microwave Semiconductor Corp.; however, devices made by NEC (Nippon Electric Co.) perform at least as well, and many similar devices will also certainly work. Construction details may be seen in the photographs and schematic diagrams. The 432-MHz preamp constructed by K2UYH is built in a 2-1/4 × 1-1/2 × 1-inch (57 × 38 × 25-mm) box made of double-sided printed-circuit board. A cover plate is recommended but does not significantly affect tuning. The GaAs FET source is soldered to the central shield board with the drain lead projecting through a hole. Several other versions have been constructed; in one of these, the wire inductors are replaced by straps placed parallel to the bottom plate, and spaced approximately 1/8 inch (3 mm) above it; a typical strap dimension would be 3 inches (76.2 mm) long by 1/2-inch (13 mm) wide.

The 1296-MHz preamp built WA2ZZF is constructed in a 2-3/4 × 2-1/8 × 1-5/8-inch (70 × 54 × 41-mm) Minibox (BUD CU-3000A or equivalent). The GaAs FET is bolted between two pieces of 1/16-inch (1.6 mm) printed-circuit board, using 0-80 screws (available at many hobby shops). The lead height is just right to sit on top of the 50-Ω lines printed on these boards. The ground connection for the tuning capacitors is provided by mounting screws and by copper foil soldered around one edge of each board. The groundplane sides of the board are smoothly tinned to reduce copper-to-aluminum corrosion.

Handling Precautions

The MSC GaAs FETs have static-resistant gold gates, and are only susceptible to damage from overvoltage or excess heating. Some other types, particularly those of Japanese manufacture, have aluminum gates which are very sensitive to static burnout, and should be handled in the same manner as unprotected MOS devices. In any case, work quickly when soldering the devices and use a grounded

or cordless soldering iron. After assembly, the Zener diodes shown should protect the device in normal operation. Of course, it should be realized that these devices are physically small and require reasonably careful handling.

Adjustment and Performance

Normal operating voltages are V_{DS} = 1.5 to 3 V, V_{GS} = −0.5 to −2 V; gate current is negligible and may be supplied from a battery. Peak the tuning capacitors on a strong signal, then trim them and adjust the drain and gate voltages with the aid of a noise-figure meter or weak-signal source. Minimum noise figure occurs near the tuning for maximum gain. Output tuning should have little effect, but the noise figure is sensitive to the input tuning and gate voltage; varying the drain voltage should give a broad peaking of noise figure. Drain current is controlled by gate voltage. After peaking up the preamp, drain current will probably be between 20 and 100 mA.

It should be emphasized that these devices have extremely high gain at uhf and will readily oscillate unless adequate precautions are taken. Stability is obtained by the use of the resistor connected *directly* from the drain to ground, at the expense of some gain reduction. The values shown should provide adequate stability if good bypassing is used; gain will be around 20 dB at 432 MHz and 15 dB at 1296 MHz. Any increase in the value of these stabilizing resistors is at your own risk!

Typical noise figures to be expected with these preamps are on the order of 1 dB at 432 MHz and 3 dB or less at 1296 MHz. The devices are capable of even better performance than this; significant improvements are obtainable at 1296 MHz with attention to good uhf construction techniques and low-loss circuitry. However, the circuits shown are easily reproduced and still provide excellent performance. QST

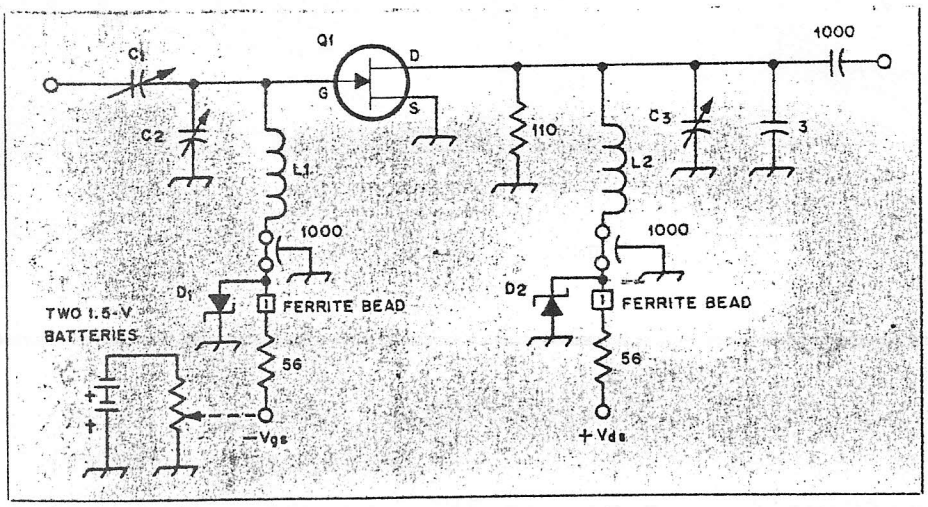

Fig. 3 — Schematic diagram of the 432 MHz preamplifier.
C1 — 0.3- to 3.5-pF piston trimmer (Johanson or JFD).
C2, C3 — 0.8- to 10-pF piston trimmer (Johanson or JFD).
D1, D2 — Zener diode, 5.6 volts (4.7 to 6.2 volts usable).
L1 — 1 turn no. 18 wire (see photo) or strip line (see text).
L2 — No. 18 wire, 0.9 inch (23 mm) long.
Q1 — GaAs FET (see text).

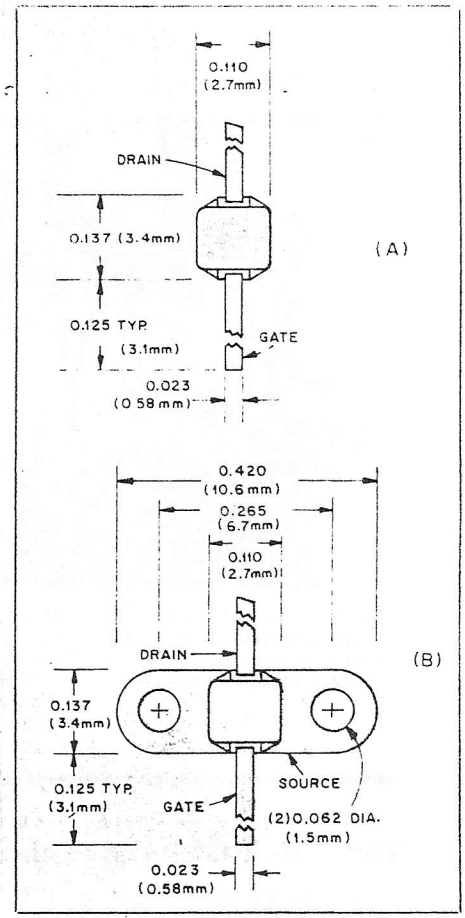

Fig. 5 — Dimensional information for the GaAs FET packages supplied by MSC. At A, case style 98, top view, and at B, top view of case style 97. Drain and source leads are spaced 0.065 inch (1.65 mm) above the bottom of the case. MSC designation for these case styles is Flipac.

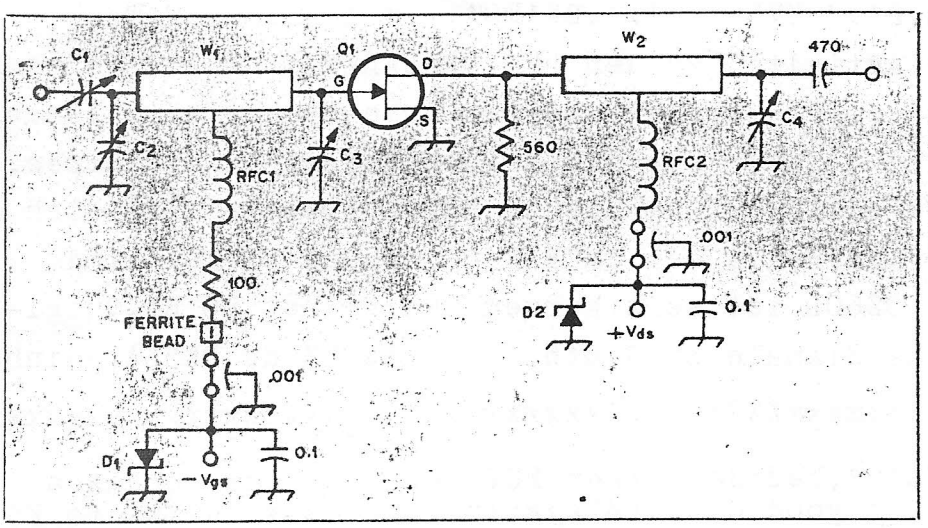

Fig. 4 — Schematic diagram of the 1296-MHz preamplifier.
C1, C2, C4 — 0.8- to 10-pF piston trimmer (Johanson or JFD). Note: C1 may be replaced by a fixed low-inductance capacitor of 10 pF or more.
C3 — 0.3- to 3.5-pF piston trimmer (Johanson or JFD).
D1, D2 — Zener diode, 5.6 V (4.7 to 6.2 V usable).
Q1 — GaAs FET (see text).
RFC1 — 3 turns, 1/16-in. (1.6 mm) ID, in lead of resistor, spaced wire diameter.
RFC2 — 5 turns no. 32 wire, 1/16-in. (1.6 mm) ID, spaced two wire diameters.
W1 — 50-Ω microstripline, 0.105 in. (2.7 mm) wide by 0.9 in. (23 mm) long on 1/16-in. (1.6 mm) thick double-sided G-10 printed-circuit board.
W2 — 50-Ω microstripline, 0.105 in. (2.7 mm) wide by 1.1-in. (28 mm) long on 1/16-in. (1.6 mm) thick double-sided G-10 printed-circuit board.

[Editor's Note: GaAs FETs selected for amateur use are being made available to amateurs by Microwave Semiconductor Corp. at a special amateur price of $40. These devices, designated MSC H001, are available only to licensed amateurs in quantity one to 10 units. To order, send certified check or money order (no cash) payable to HAM TRANS, P. O. Box 383, South Bound Brook, NJ 08880. Be sure to include your call sign with your order. Please do not call about these devices since this special offer is made possible by elimination of normal administrative costs. No phone orders will be accepted.]

Fig.1 and Fig.2 see on page 4!

./. LOW NOISE PREAMPS ,contd.

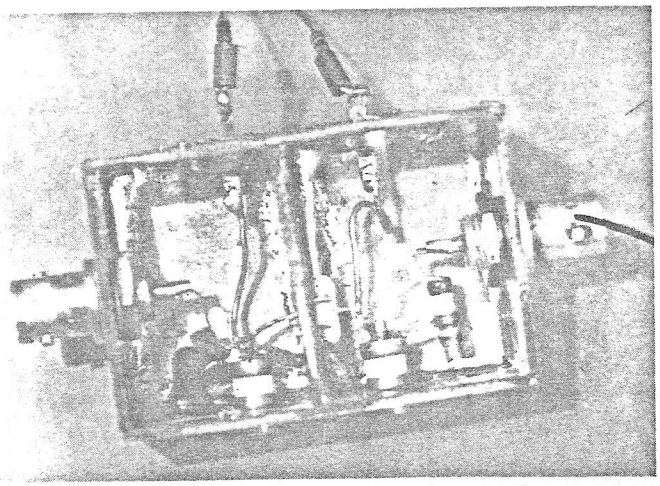

Fig. 1 — A 432-MHz GaAs FET preamplifier built by K2UYH. The transistor is mounted to the central shield by soldering the source lead directly to the copper foil. The drain lead of the transistor passes through a hole in the shield.

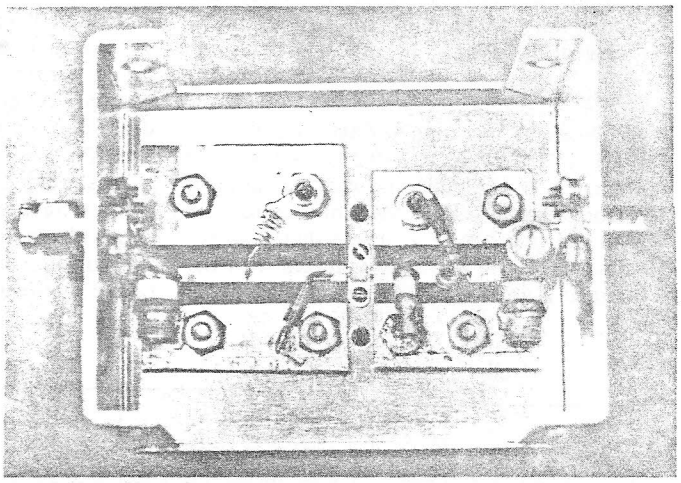

Fig. 2 — A 1296-MHz GaAs FET preamplifier built by WA2ZZF. In this model, the transistor is connected to striplines etched on glass-epoxy board. SMA-type coaxial connectors are shown, although type N or BNC connectors may be used.

Von OM Reinhard Kühn,DK5LA in Sörup-Flatzby,QTH EO 29 h,kommt der folgende Bericht,für den die Red.herzlich dankt.Reinhard schreibt: Vielen Dank für die Veröffentlichung meiner EME-Berichte.Ihr Blatt ist eine ausgezeichnete Informationsquelle für MB-Interessierte!Mit Spannung erwarte ich die nächste Ausgabe.Hier ein Logauszug meiner EME-Erfolge im Juli 1978: (Alles auf dem 2 Meterband!!)
1.7. W6PO,2.7.K1WHS,8.7.W7FN,DK2AM(nur 500 Watt und 40 el.Ant!),K1WHS, 11.7.DK1FSA,18.7.YV5zz,21.7.YV5zz,31.7.DK1FSA. Im August:5.8.W7FN,6.8. SM7BAE. Leider ist die Aktivität zu den "UNIVERSAL-WINDOW-Zeiten" sehr gering.In Amerika scheinen viele Stationen zu unbequemen Zeiten(Nacht-) selten QRV zu sein.Es sind immer nur die selben Rufzeichen zu hören. Ebenso sind Stationen wie z.B. HB9XM nie zu hören.(Beschäftigt sich dzt. mit Radio-Astronomie,Anm.d.Red.) Nur SM7BAE,OZ60L und DK1FGA sind ständig aktiv via Mond.OZ60L ist seit kurzem QRV.Er hat 80 El.Quagi-Antennen aufgebaut.Seine Signale sind ufb. Beste 73 de DK5LA,Reinhard

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From K2UYHs "432 EME NEWS",besides other HOT news we learn about a possibility for obtaining good COAX relays.If interested write to K3RYL, Keavin Leah, 2750 Belaire Road, BETHLEHEM, Pa. 18017 ,U.S.A.
V244`s:This excellent preamp-transistors may be obtained from:Geoff Krauss,WA2GFP, 16 Riviers Dr.,LATHAM, NY. 12110, USA.

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ENGLAND: A report of the OXFORD UNIVERSITY MB-team.

Tests,changes and further tests were the order of the day for the OX-FORD UNIVERSITY RADIO SOCIETY. Since their reception successes in the April half of the ARRL Moonbounce Competition the group-consisting of G3YGF,G8HDR,G4CNV and G3WDG-have made many improvements to their mb-re-ception equipment.They were still working on the preamps during the week preceding the May half of the eme-contest.The old BFR34A was remeasured for noise figure using the hot-cold resistor technique and revealed a noise figure of 1.6-1.7 dB. It was dicided to try to improve this figure, and much midnight oil was burned trying various transistors.They event-ually decided on an NE645 which measured 1.3dB nf-a significant improve-ment over the previous device.The group had no time left to erect the usual antenna array of four quad loop Yagi antennas at their favourite portable site.However,using a single quad Yagi and the new preamp feeding a Microwave Modules 432/28 transverter they decided to listen all night anyway.Unfortunatly the moon was no longer visible as it had clouded over, but the group were able to point the Yagi using a compass with a pendulum type elevation indicator in conjunction with details from a computer programm modified for FORTRAN by Geoff Grayer,G3NAQ. This is one of the programs made available free to moonbounce amateurs by W6PO of the EIMAC CORPORATION.(Write to:EIMAC DIVISION of VARIAN, 301 Industrial Way, SAN CARLOS, CA. 94070, USA. The free data package entitled"Everything you wanted to know about moonbounce")(Red.) G3YGF and G3WDG held the Yagi in position while G8HDR operated the receiver.Within 3 minutes of switching on, K3NSS was heard- varying between 1 and 8 dB above noise yet good solid copy. Before going home,the group checked the receiver sensitivity using ground noise,getting up to 2 dB more noise with the antenna pointing at the ground compared to the level when pointing at the sky, thus indicating reasonable good performance of the receiving system. After getting a few hours sleep the group set up the full ant.-system at one of the Oxford University sports grounds and started to listen for the moonbounce contest.Stations copied with the full setup on 432 MHz included DJ9QL,DL9KR,I5MSH,K2UYH,K3NSS,VE7BBG,W1XP,SM5BFK and our old friend Edgar Mueller,YV5ZZ of Caracas.

The Oxford group was pleasantly surprised at just how well some of the moonbounce signals were received on the improved set-up.The antenna array is most interesting.It consists of four 25-el.LOOP YAGIS in a square configuration with 7 ft. 6 in. separating each antenna.The feed arrangement is a fourway power divider network made with air coaxial cable as described in the RSGB VHF/UHF MANUAL, with 5 ft. of ANDREW's

FHJ-4 low-loss cable between each antenna and the divider.The preamp is mounted at the antenna to ensure minimum feeder loss.The group was measuring 10 dB of solar noise with the new system. The best signal heard during the contest was K3NSS,who was 15 dB above noise with peaks (due to libration fading) at much higher levels. K3NSS could be copied on the 2.5 KHz filter.The K3NSS signal has been commented on by many mb operators and its outstanding signal in Europe is due to the huge 85 ft dish antenna being used in the USA!

(RCC 7/78)

Russia: From the Russian magazine "RADIO" 8/1978 we learn about successful EME -tests of the stations UA 3 LBO and UA 3 LAW on 2 meters! The frquency given was 144.130 MHz.

xxXXxx6hs.

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DRUCKSACHE
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