



HUGGINS LABORATORIES, INC.

999 East Arques Avenue · Sunnyvale, California
PHONE 408-736-9330 TWX 408-737-9992

Here is the data you requested on Huggins' products.

If, after reviewing this material, you find that your requirement demands a special design, the Huggins' sales representative in your area will welcome the opportunity to assist you, or please feel free to contact us directly if you wish.

Thank you for your interest. We look forward to fulfilling your microwave and infrared needs.

Cordially,

HUGGINS LABORATORIES, INC.

Huggins' sales representative in your area is:

INTERNATIONAL DIVISION
750 THIRD AVENUE,
NEW YORK, 17, N. Y.

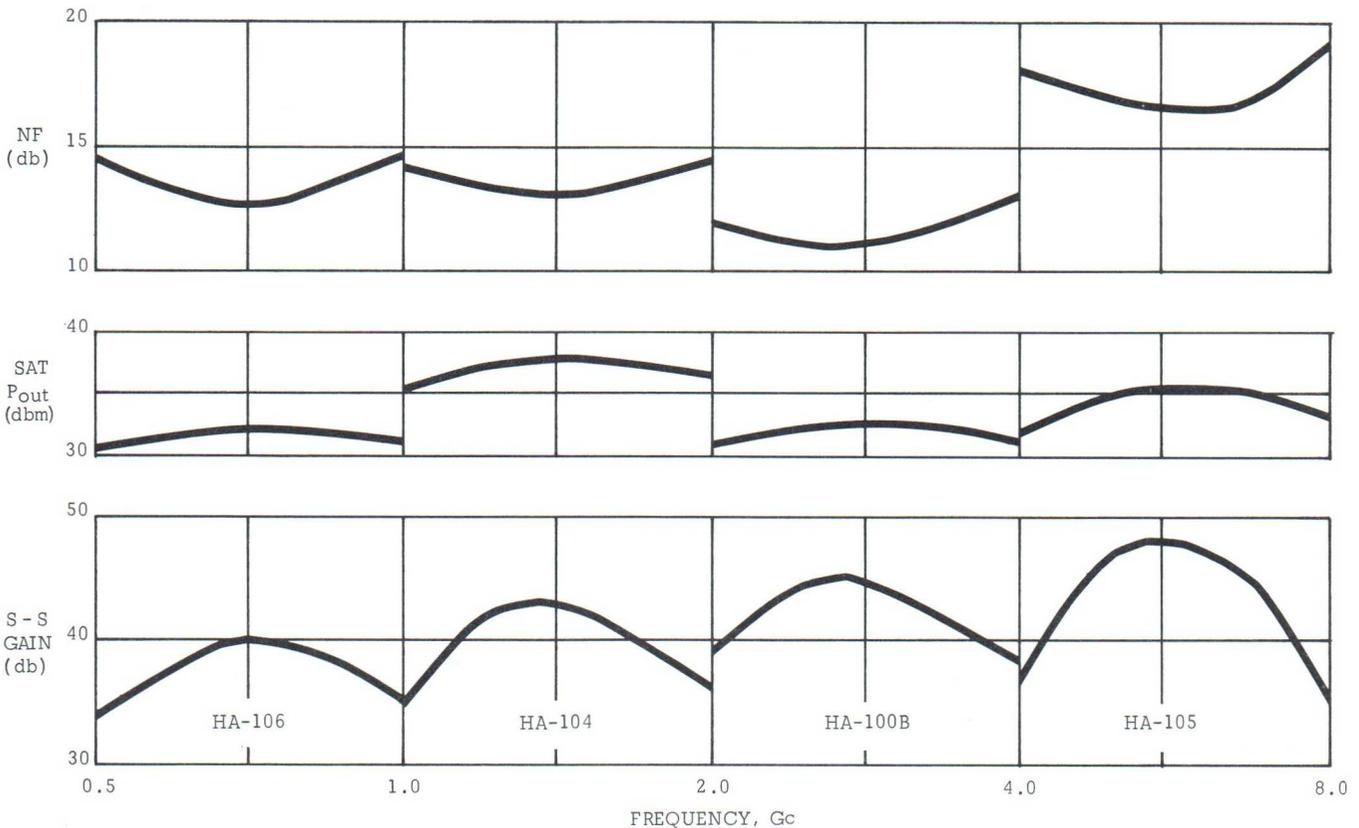
HUGGINS offers a broad spectrum of capabilities ... TUBES: TWTs, BWOs, and High Vacuum Rectifiers; INSTRUMENTATION: μ W Sweep and Nanosecond Pulse Generators, μ W Amplifiers, Power Supplies, Transient Detectors, and Infrared; FERRITES: Circulators, Isolators, Modulators, and Phase Shifters.

ALL NEW ...

1 to 5 WATT PPM LOW-NOISE TWTs



PPM FOCUSED - LIGHTWEIGHT - RUGGED
 UHF THROUGH C-BAND - LIBERAL WARRANTY
 AIR OR CONVECTION COOLED CONFIGURATIONS



ALSO...

HA-107 : 1-2 Gc, 30 db S-S Gain, 5 w P_{out}, 20 db NF

HA-100 : 2-4 Gc, 35 db S-S Gain, 1 w P_{out}, 15 db NF

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TYPE

HA — 100B

LNT

S-BAND

13 DB NF

PPM-FOCUSED HIGH-POWER, LOW-NOISE S-BAND AMPLIFIER

PERFORMANCE CHARACTERISTICS

FREQUENCY	2.0 TO 4.0 GC
MINIMUM SMALL -SIGNAL GAIN	35 DB
MINIMUM SATURATION POWER OUTPUT	30 DBM
MAXIMUM NOISE FIGURE*	13 DB
MINIMUM COLD ATTENUATION (INPUT TO OUTPUT)	60 DB
MAXIMUM VSWR: INPUT, OUTPUT (BEAM OFF)	2 : 1

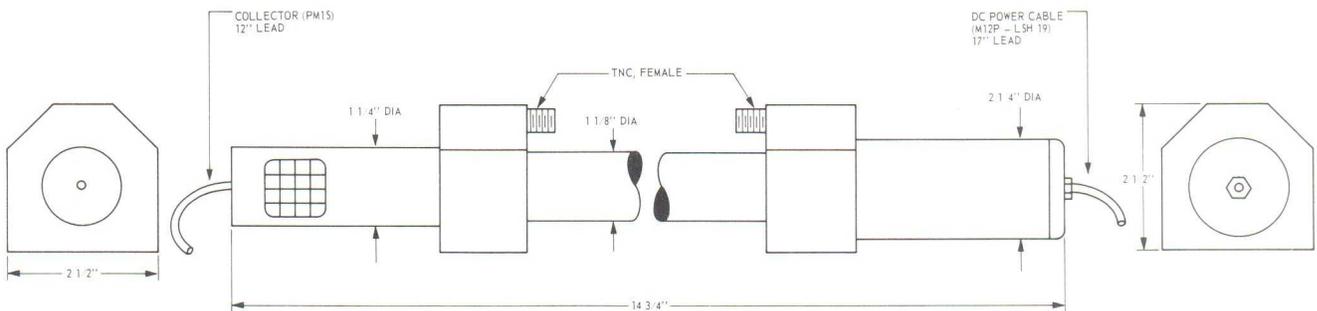
POWER SUPPLY REQUIREMENTS

ELEMENT	REQUIRED RANGES	
	VOLTAGE	CURRENT
COLLECTOR ¹	800 TO 1000 V	0 TO 25.0 MA
HELIX	800 TO 1000 V	0 TO 3.0 MA
ANODE 1	50 TO 300 V	0 TO 0.001 MA
ANODE 2	100 TO 400 V	0 TO 0.001 MA
ANODE 3	200 TO 600 V	0 TO 0.001 MA
ANODE 4 ²	-500 TO -200 V	0 TO 0.001 MA
CATHODE ³	0 V	0 TO 25.0 MA
HEATER	7.0	0 TO 1.2 AMP

¹ Insulated. ² Can be used for gating, noise figure may increase. ³ Voltage reference.

FOCUSING PERIODIC PERMANENT MAGNET

MECHANICAL CHARACTERISTICS



AUXILIARY COOLING REQUIRED 5 CFM @ 1/2" H₂O

MOUNTING POSITION ANY

ENVIRONMENT CAN BE MANUFACTURED TO MIL SPECS

WEIGHT 5-1/4 LBS

* A lower noise figure can be achieved by optimizing the tube for narrowband operation.

TYPE
HA - 100B
 LNT

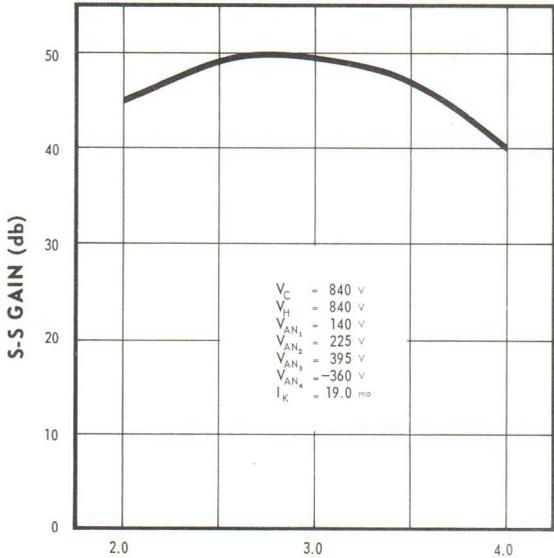
S-BAND 13 DB NF

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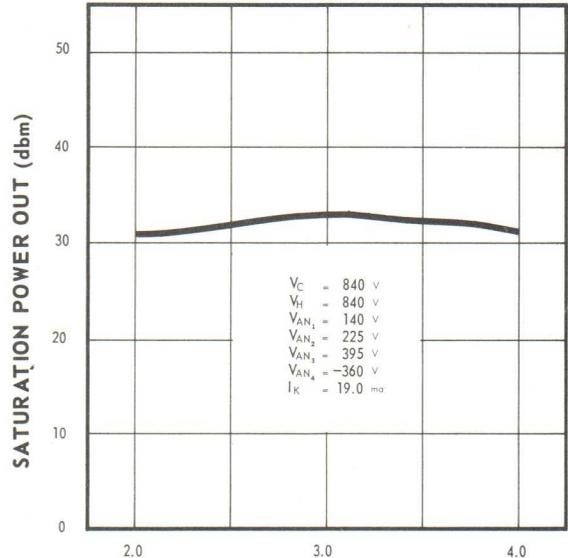
Sunnyvale, California
 TWX: 408-737-9992

TYPICAL OPERATING CHARACTERISTICS



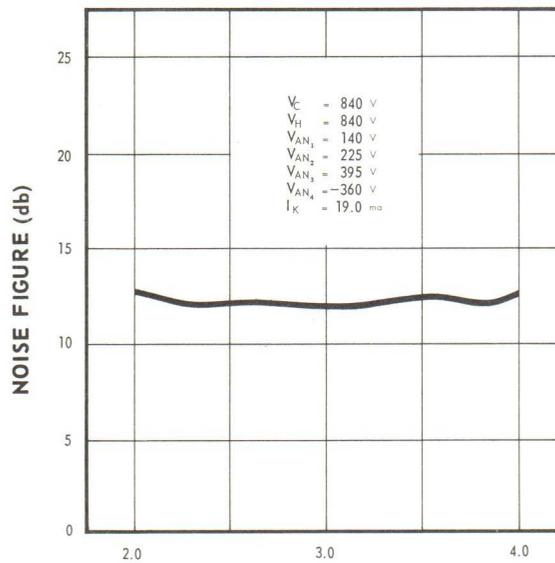
FREQUENCY, G_c

SMALL-SIGNAL GAIN



FREQUENCY, G_c

POWER OUTPUT



FREQUENCY, G_c

NOISE FIGURE

SPECIFICATION SHEET

ELECTRON TUBE, TYPE HA-29AL *8656*

Description: 10 mw to 400 mw power output, periodic permanent magnet focused, traveling wave amplifier for operation from 2.5 to 2.9 GHz. CW operation.

Parameters	Ef	If	Ik	Ec1	Ec2	Iw	Ew
Units	Vac	A	mAdc	Vdc	Vdc	mAdc	Vdc
Maximum	6.9	1.2	6.0	-100	350	2.0	700
Minimum	5.7	0.7	---	---	---	---	---
Test Conditions	6.3	---	---	0	Note 6	---	Note 6

Parameters	Eb	Ib	Du	Pin	T	Collector Seal Temp
Units	Vdc	mAdc	---	dbm	°C	°C
Maximum	800	6.0	cw	30	+85	+150
Minimum	---	---	cw	---	-65	----
Test Conditions	700	---	cw	-15	+26	----

The absolute maximum and minimum ratings define the upper and lower limits of electrical inputs which may be applied to the tube without danger of permanent damage. The electrical input ratings necessary to provide the required tube performance are specified elsewhere.

GENERAL

REF.	REQUIREMENTS OR TEST	CONDITIONS	SYM	LIMITS		UNITS
				MIN	MAX	
---	Mounting Position	Any	---	---	---	---
---	Cooling	Conduction through mounting feet to an adequate heat sink	---	---	---	---
---	RFI Filtering	Note 2	---	90	---	db
---	Weight	-----	---	---	4.5	Pounds
---	Construction	All metal shield	---	---	---	---
---	Internal Connections	No tube electrode shall be internally grounded.	---	---	---	---
---	Focusing	Periodic permanent magnet	---	---	---	---
---	R.F. Connector	UG-23E/U, Type N	---	---	---	---
---	D.C. Connector	Winchester M12P-M12S locking spring or equivalent.	---	---	---	---
50.2	Hold Period	----	t	48	---	Hours
4.7.8	Service Life Guarantee	----	t	1000	---	Hours

QUALIFICATION

3.2	Qualification	Required	---	---	---	---
E-1021	Temperature Cycling	No voltages	T	-65	+85	°C
E-1011	Humidity	Operating	---	95	---	%

QUALIFICATION (Cont.)

REF.	REQUIREMENTS OR TEST	CONDITIONS	SYM	LIMITS		UNITS
				MIN	MAX	
E-1006	Salt Spray	No Voltage	---	---	---	---
---	Vibration	Note 3	---	---	---	---
---	Shock	Note 4	---	---	---	---

QUALITY CONFORMANCE INSPECTION - PART 1

3.7	Marking	Note 5	---	---	---	---
D-20	Dimensions	Figure 1	---	---	---	---
E-1301	Heater Current	tk = 180 seconds Ef = 6.3 Vac	If	0.7	1.2	Aac
---	Cathode Voltage	Note 6	Ek	---	0	Vdc
---	Cathode Current	Note 6	Ik	---	6	mAdc
---	Grid 1 Voltage	Note 6	Ecl	---	0	Vdc
---	Grid 1 Current	Note 6	Icl	---	0.2	mAdc
---	Anode Voltage	Note 6	Eb	150	300	Vdc
---	Anode Current	Note 6	Ib	---	0.1	mAdc
---	Collector Voltage	Note 6	---	686	714	Vdc
---	Collector Current	Note 6	---	---	6	mAdc
---	Helix Voltage	Note 6	Ew	575	675	Vdc
---	Helix Current	Note 6	Iw	---	2	mAdc
---	Large Signal Gain	Note 7	---	35	41	db
---	Power Output Variation	Note 8	Δ Po	---	2	db

QUALITY CONFORMANCE INSPECTION - PART 1 (Continued)

REF.	REQUIREMENTS OR TEST	CONDITIONS	SYM	LIMITS		UNITS
				MIN	MAX	
---	Intermodulation Product	Note 9	Ip	---	Note 9	db
---	Power Output at the Point of Tube Saturation	F = 2.5 to 2.9 GHz	Po	---	+26	dbm
---	Spurious Power Output	Pi = 0 Note 10	spo	---	-10	dbm
---	Spurious Oscillation	Note 11	---	---	-40	dbm
---	Noise Figure	F = 2.5 to 2.9 GHz	NF	---	25	db
---	Stability	Note 12	---	---	---	---
---	Voltage Standing Wave Ratio (Hot)	F = 2.5 to 2.9 GHz	VSWR	---	2:1	---
---	Voltage Standing Wave Ratio (Cold)	F = 2.5 to 2.9 GHz	VSWR	---	2:1	---
---	Cold Circuit Loss	F = 2.5 to 2.9 GHz	VSWR	40	---	db

QUALITY CONFORMANCE INSPECTION - PART II

NONE

QUALITY CONFORMANCE INSPECTION - PART III

4.7	Life Test	Operating	t	1000	---	Hours
4.7.3	Life Test End Points	Note 13	---	---	---	---
4.5 & E-1136	Container Drop	Note 14	---	---	---	---

Note 1: The requirements and tests of the latest issue of Military Specification MIL-E-1 shall apply except as otherwise noted herein.

Note 2: Power inputs shall be internally filtered to provide a minimum of 90 db attenuation from 25 Mc to 500 Mc.

Note 3: The tube shall not exhibit interruptions or discontinuities in the power output when subjected to vibration tests as follows:

- a) Vibration for not less than 120 seconds.
- b) Vibration in each of 3 mutually perpendicular planes.
- c) Total excursion at double amplitude as follows.

<u>Frequency(Hz)</u>	<u>Amplitudes</u>
5 to 15	0.075 \pm 0.012(0.150 total displacement)
16 to 25	0.050 \pm 0.008(0.100 total displacement)
26 to 33	0.025 \pm 0.004(0.050 total displacement)

Note 4: Shock The tube shall be capable of normal operation without damage or failure before, during and after being subjected to shock tests in accordance with MIL-STD-202, method 205B, test condition C except that the number of drops shall be six and shall be applied in the direction indicated in Figure 1 when actual mounting conditions are simulated. The shock test pulse shall be half-sine wave of 11 milliseconds duration and maximum peak intensity of 50 G.

Note 5: Markings shall include the following:

- a) E.I.A. registration number
- b) Label containing optimum helix and anode operating voltages.
- c) Appropriate connector labels as shown and located in Figure 1.

Note 6: The tube is intended to be operated CW in the saturated mode. Power in shall be not less than -15 dbm. The required anode and helix voltages (referred to cathode) for optimum operation in this mode with a collector potential of 700 Vdc \pm 2% relative to the grounded cathode shall be specified for each tube by the manufacturer; in no case shall the specified anode and helix voltages transcend the limits listed under "Quality Conformance Inspection - Part I."

Note 7: Large signal gain shall be checked across the operating band with optimum electrode voltages per Note 6, Pin = -15 dbm, and 50 ohm input and output termination impedance.

Note 8: Power output variation shall be checked with optimum electrode voltages per Note 6. Pin shall be continuously increased from -15 dbm to -7 dbm across the operating band. Over this entire range of input power and frequency variation the power output shall vary no more than 2 db. The power output shall never be less than 100 mw for any Pin within the range of -15 dbm to -7 dbm.

Note 9: The intermodulation products, intermodulation product frequency equal to twice the signal A frequency minus the signal B frequency, for the input signal A and input signal B frequencies given below shall be recorded for signal A at -7 dbm and signal B at -20 dbm. Each intermodulation product power level shall be less than the power level of the corresponding signal B when signal B only is applied to the tube.

<u>Signal A Frequency(GHz)</u>	<u>Signal B Frequency(GHz)</u>	<u>Intermodulation Product Frequency(GHz)</u>
2.5	2.45	2.55
2.6	2.55	2.65
2.7	2.50	2.90
2.8	2.75	2.85
2.9	3.05	2.75

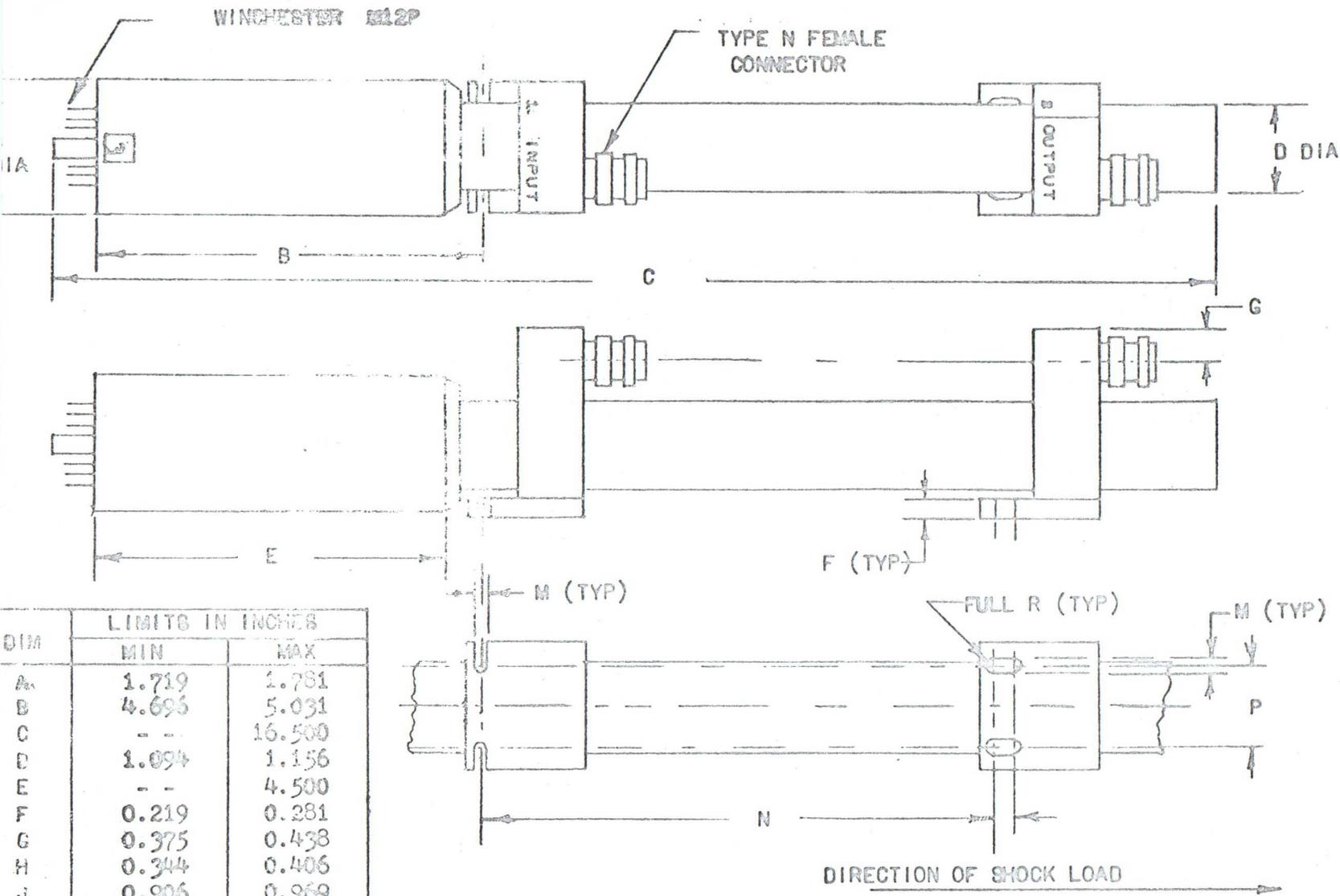
Note 10: The tube input shall be connected to a variable short and the output connected to an appropriate 10 db directional coupler with a broad-response crystal detector connected to the coupling arm. The output of the directional coupler shall be connected to variable phase short through a 3 db pad. The recorded spurious power output shall be the maximum signal detected at the crystal as the phase of the shorts are varied through one wavelength at 2.7 GHz.

Note 11: With tube operating at 2.7 GHz, -7 dbm input, all spurious oscillations shall be less than -40 dbm when the helix voltage is varied from 575 to 675 volts while the anode voltage is 300 volts.

Note 12: The tube shall be unconditionally stable for any arbitrary input and output impedance terminations and shall not suffer any permanent damage under these conditions.

Note 13: Life test end points shall be defined as the time when the power output reaches 75 mw peak under conditions of optimum electrode voltages, -15 dbm input at 2.7 GHz and the tube operating into a matched 50 ohm load.

Note 14: The packaged tube shall be dropped in accordance with Paragraph 4.5 and E-1136 of Specification MIL-E-1. After test the tube shall meet the requirements of Quality Conformance Inspection Part I as outlined herein.



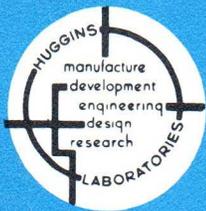
DIM	LIMITS IN INCHES	
	MIN	MAX
A	1.719	1.781
B	4.696	5.031
C	- -	16.500
D	1.094	1.156
E	- -	4.500
F	0.219	0.281
G	0.375	0.438
H	0.344	0.406
J	0.906	0.969
K	1.625	1.688
L	2.438	2.500
M	0.204	0.210
N	7.563	7.625
P	1.052	1.072

PIN CONNECTIONS

- A - GRID
- C - ANODE
- E - HELIX
- H - COLLECTOR
- K - HTR-CATHODE
- M - HEATER
- N - CAPSULE

MECHANICAL CONFIGURATION

FIGURE 1



HUGGINS LABORATORIES, INC.

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TRAVELING WAVE TUBE

HA - 109

LNT 10 WATT
 L-BAND 15 DB NF

10 WATT, LOW NOISE, PPM FOCUSED, L BAND

PERFORMANCE CHARACTERISTICS

FREQUENCY	1.0 TO 2.0 GC
MINIMUM SMALL -SIGNAL GAIN	30 DB
MINIMUM SATURATION POWER OUTPUT	40 DBM
MAXIMUM NOISE FIGURE*	15 DB
MINIMUM COLD ATTENUATION (INPUT TO OUTPUT)	70 DB
MAXIMUM VSWR: INPUT, OUTPUT (BEAM OFF)	2 : 1

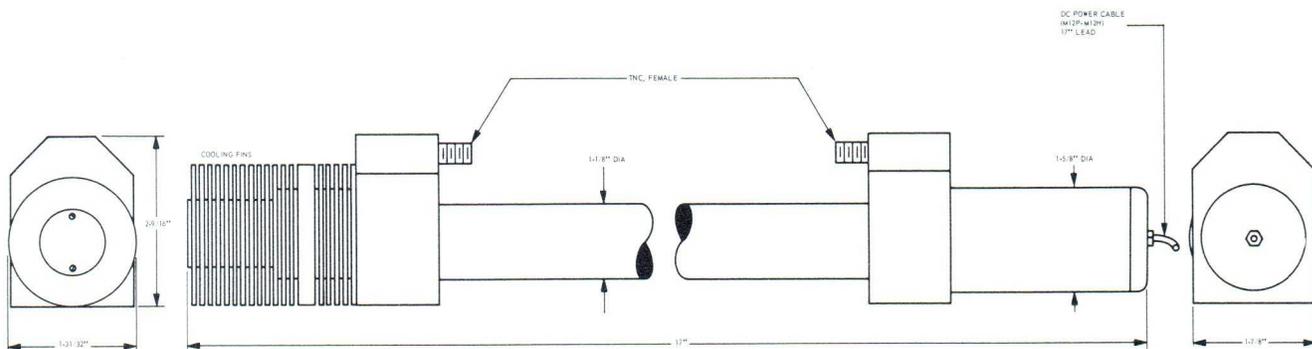
POWER SUPPLY REQUIREMENTS

ELEMENT	REQUIRED RANGES	
	VOLTAGE	CURRENT
COLLECTOR	1000 TO 1500 V	0 TO 100.0 MA
HELIX	1000 TO 1500 V	0 TO 30.0 MA
ANODE 1 ¹	0 TO 500 V	0 TO 0.5 MA
ANODE 2	0 TO 600 V	0 TO 0.5 MA
ANODE 3	200 TO 800 V	0 TO 0.5 MA
ANODE 4	-500 TO 0 V	0 TO 0.5 MA
CATHODE ²	0 V	0 TO 100.0 MA
HEATER	7.0 V	0 TO 2.0 AMP

¹ Can be used for gating, noise figure may increase. ² Voltage reference.

FOCUSING PERIODIC PERMANENT MAGNET

MECHANICAL CHARACTERISTICS



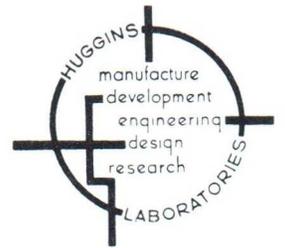
AUXILIARY COOLING REQUIRED	80 CFM**
MOUNTING POSITION	ANY
ENVIRONMENT	CAN BE MANUFACTURED TO MIL SPECS
WEIGHT	6 LBS

* A lower noise figure can be achieved by optimizing the tube for narrowband operation.

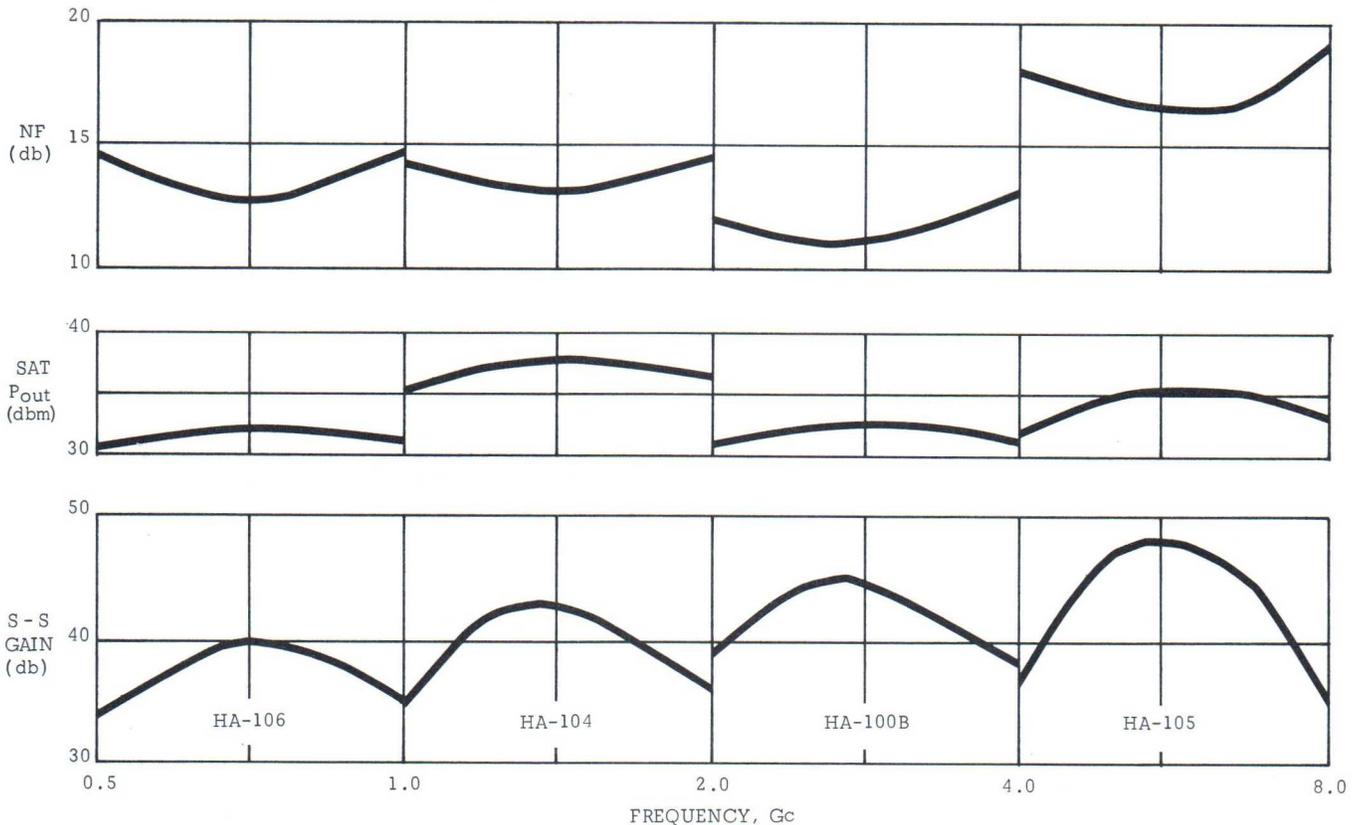
** A blower rated at 80 CFM at 0" static pressure is recommended to blow air directly across the collector cooling fins.

ALL NEW ...

1 to 5 WATT PPM LOW-NOISE TWTs



PPM FOCUSED - LIGHTWEIGHT - RUGGED
UHF THROUGH C-BAND - LIBERAL WARRANTY
AIR OR CONVECTION COOLED CONFIGURATIONS



ALSO...

HA-107 : 1-2 Gc , 30 db S-S Gain , 5 w P_{out} , 20 db NF

HA-100 : 2-4 Gc , 35 db S-S Gain , 1 w P_{out} , 15 db NF



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REVISED
SPECIFICATION
SHEET

HUGGINS 1-WATT, LOW NOISE TWT AMPLIFIERS

0.5 Gc to 11.0 Gc

Recent breakthroughs in traveling wave tube technology at Huggins Laboratories have made possible the addition of seven new models to our broad line of non-stop quality low noise TWT amplifiers.

Each model incorporates the pace-setting features embodied in all Huggins TWT amplifiers...features such as attractive and functional design, unitized mechanical construction, conveniently located voltage adjustments and test points, adequate TWT protection, two-piece dust cover, and advanced electrical plug-in modules.

SPECIFICATIONS

Small-Signal Gain:	30 db minimum
Saturation Power Output:	30 dbm minimum
Noise Figure:	13 - 20 db maximum
Spurious Modulation:	40 db minimum below signal
Focusing:	PPM
Input, Output Connectors:	Type N, female (except Model 148D)
Input, Output Impedance:	50 ohms, 2 : 1 maximum VSWR
Input Power:	115 vac, 50-60 cps, 500 watts maximum
Weight:	approximately 40 pounds
Size: Models 130D, 145D, 146D;	5-3/16" x 16-3/8" x 20-3/4" (H x W x D)
Models 142D, 144D, 148D, 149D;	6-15/16" x 16-3/8" x 20-3/4" (H x W x D)

Model	Frequency (Gc)	Minimum S-S Gain (db)	Minimum Sat P _{out} (dbm)	Maximum NF (db)
142D	0.5 to 1.0	30	30	20
144D	1.0 to 2.0	30	33	15
149D	1.0 to 2.0	30	37	20
130D	2.0 to 4.0	35	30	15
146D	2.0 to 4.0	30	30	13
145D	4.0 to 8.0	30	30	20
148D*	7.0 to 11.0	30	30	20

* Waveguide



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SPECIFICATION

SHEET

HUGGINS 10 WATT AMPLIFIERS

1.0 Gc to 11.0 Gc

Designed for reliable operation, Huggins 400 Series Traveling Wave Tube Amplifiers are ideal for driving high power CW tubes, antenna pattern measurements, component check-out, and buffer applications.

SPECIFICATIONS

Saturation Power Output: 10 watts minimum

Input, Output Connectors: Type N, female

Input, Output Impedance: 50 ohms, 3:1 maximum VSWR

Focusing: PPM unless otherwise specified

Controls: Power On-Off, Focus, Helix Voltage, Anode Voltage

Metering: Helix Voltage, Helix Current, Collector Current

Power Supply Regulation: High Voltages, $\pm 0.05\%$; Filament Voltage, $\pm 0.5\%$; Ripple, 30 mv peak

Protection: Helix Overload; High Voltage Primary Power Fuse; Filament Fuse; Filament Warmup; Solenoid Primary Fuse, delayed removal of solenoid field, and solenoid thermal overload on Model 402

Input Power: 115 vac, 50-60 cps, 500 watts maximum (Model 402, 1000 watts maximum)

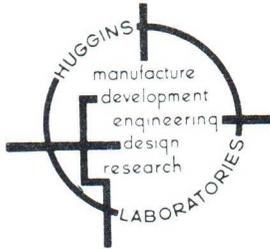
Model	Frequency (Gc)	Minimum S-S Gain (db)	Minimum Gain at Rated P _{out} (db)	Approx Weight (lbs)	Size, inches			Unit Price ¹ (rack mount)
					Panel Height	Panel Width	Depth	
401	1.0 to 2.0	30	30	60	10-1/4	19	20	\$ 4,450.00
402 ²	2.0 to 4.0	30	--	80	10-1/4	19	17-5/8	2,675.00
405	4.0 to 8.0	34	30	60	8-3/4	19	17-5/8	3,630.00
409	7.0 to 11.0	40	30	60	10-1/4	19	17-5/8	5,500.00

¹ Cabinet models \$ 30.00 additional

² Solenoid focused

Prices are f.o.b. Sunnyvale, California, terms net 30 days

Delivery: 30 days



HUGGINS LABORATORIES, INC.

999 East Arques Avenue · Sunnyvale, California

ERRATA SHEET

Huggins' Microwave Components and Instruments Catalog

September 1, 1963 Issue

PAGE	MODEL	CHANGE
15	305D	Gain at Rated Power Out: 30 db min
16	205D	Saturation Power Out: 13 dbm min
17	304D	Gain at Rated Power Out: 30 db min
24	SL-43-1, SL-43-2, SL-43-3, S-43-2, S-43-3, S-43-4, GL-43-3, G-43-1, G-43-2, J-42-16, XL-43-1, XL-41-2, X-43-10, X-43-16, M-42-1, X-43-17, M-42-2, Ku-43-11, Ku-43-13, Ku-43-12 K-43-1	Isolation: 20 db Insertion Loss: 0.3 db Input VSWR: 1.2 max
25	CN-52-25	Should read CN-42-25
26	J-42-14 J-42-15 J-43-26 J-42-17	Isolation: 20 db Insertion Loss: 0.3 db Input VSWR: 1.2,max
26	- -	COMMUNICATIONS heading should read HIGH POWER HIGH POWER heading should read COMMUNICATIONS Reverse titles on photographs

HUGGINS TWT AMPLIFIERS

Revised Price Schedule
 Effective April 1, 1964

Low Noise-PPM Focused
 (Rack Mount)

<u>Model</u>	<u>Unit Price</u>
110D	\$4,100
129D	4,850
140D	4,100
*150D	4,100
123D	4,100
126D	4,850
141D	4,850

Low Power-Solenoid Focused
 (Rack Mount)

<u>Model</u>	<u>Unit Price</u>
202D	\$2,650
207D	2,450
208D	2,450
209D	2,450
214D	2,500
216D	2,550
219D	2,700

Low Noise-Solenoid Focused
 (Rack Mount)

101D	\$5,050
102D	4,550
103D	3,800
104D	3,300
106D	4,800
107D	4,550
108D	3,800
109D	3,300
112D	3,300
114D	4,050
115D	3,800
117D	3,300
119D	4,300
120D	3,800
121D	3,300
124D	3,800
125D	3,800
128D	3,300

Low Noise, Intermediate Power
 PPM Focused (Rack Mount)

*142D	\$4,350
*144D	4,350
*149D	4,350
*146D	4,350
*145D	4,350

High Power-PPM Focused
 (Rack Mount)

401D	\$4,450
405D	Price available on request
409D	Price available on request

High Power-Solenoid Focused

402D	\$2,900
------	---------

Low Power-PPM Focused
 (Rack Mount)

200D	\$3,075
203D	3,075
205D	2,350
210D	2,350
212D	2,625
217D	2,600

Intermediate Power-PPM
 Focused (Rack Mount)

342D	\$4,000
324D	2,450
304D	2,450
309D	2,850
328D	3,200
315D	2,850
319D	2,700

* New Instruments

(Continued on other side)

Price Revision (Continued)
April 1, 1964

Intermediate Power-Solenoid Focused
(Rack Mount)

300D	\$3,200
325D	2,550
302D	2,550
303D	2,550
308D	2,700
321D	3,200
314D	2,950
318D	2,700

Portable Instruments

Low Noise, Low Power

111D	\$4,200
118D	4,200
122D	4,200
127D	4,200

Low Power

201D	\$3,075
204D	3,075
206D	2,350
211D	2,350
213D	2,625
218D	2,600

Intermediate Power

305D	\$2,450
310D	2,850
313D	3,100
323D	2,850

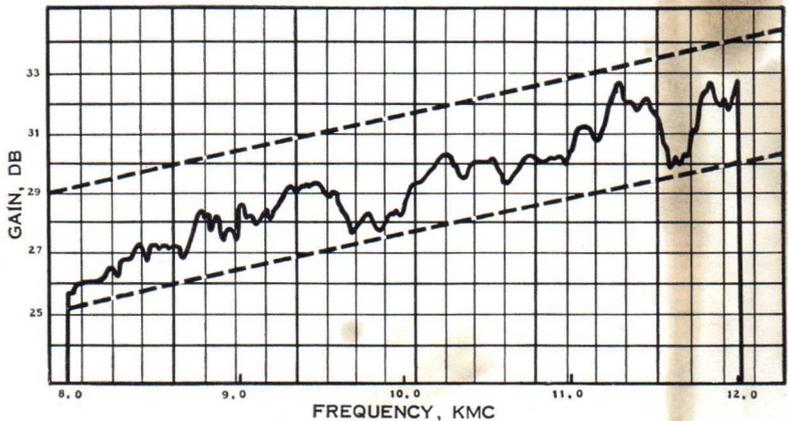
Low Noise, Intermediate Power

*147D	\$4,450
*151D	4,450

* New Instruments

6

SLOPE GAIN TWT FOR IMPROVED SYSTEM OPERATION



RECORDED PLOT OF SMALL SIGNAL GAIN VS FREQUENCY OF A MODIFIED HUGGINS HA-20 PM FOCUSED TWT AMPLIFIER

The production department at Huggins Laboratories has become very adept at providing traveling wave tubes having specific performance characteristics. These characteristics generally have stressed achievement of a prescribed small signal gain as a function of frequency over definite frequency bands, depending on customer requirements.

As an example, tubes can be provided in which small signal gain varies at some prescribed rate as a function of frequency. The use of a TWT whose gain increases as frequency increases makes it possible to compensate for losses of other microwave system components, which generally increase with frequency, also. The over-all result is a system which, between two given points, has a response which is very nearly independent of frequency. Traveling wave tubes having such properties have been supplied over several specific frequency ranges within the 2.0 to 12.4 KMC bands.

The curve above gives an example of the extent to which the small signal response of a TWT amplifier may be controlled. Here, the modification of a

standard X-band PM-focused amplifier resulted in an average gain which increased by 1.5 db per 1000 MC increase in frequency over the 8.0 to 12.0 KMC band. Response of this type is possible with no adjustment necessary by the user external to the tube — the curve is presented with all potentials and currents fixed. Other types of gain responses are also possible, such as TWT amplifiers whose gain varies at some fixed rate over certain particular frequency bands.

The curve is a plot made with a pen recorder used in conjunction with a constant power system. This system makes use of a gridded low-level TWT and the use of feedback to control its output such that it is very nearly constant as a function of frequency and drive (over certain input level ranges). Such a system is described in Huggins Engineering Note, Number 8, "The use of the TWT in constant power systems."

A copy of this is available upon your request, and is bound in our two-volume catalog set which is also available should you not already be on our mailing list. Submit inquiry on company letterhead.

HUGGINS LABORATORIES, INC.

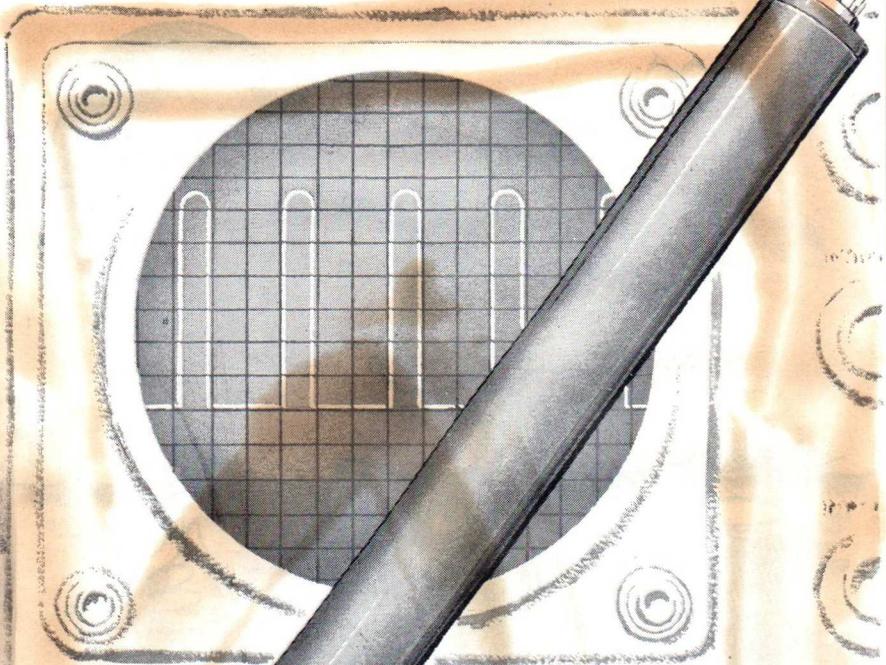


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TWTs PULSED FOR POWER

Huggins Pulsed Amplifiers are designed to provide more power on their broad frequency band. Normally operating with a 10% duty cycle, they produce a peak power 10 times their CW output. Small signal and saturation gain are increased by as much as 10 DB.

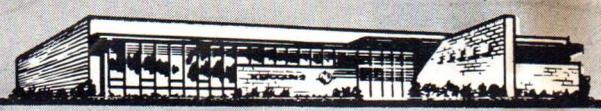
Huggins Laboratories produces solenoid and PPM* focused pulsed amplifiers:



Freq.	Solenoid	PPM	CW	Pulsed
2-4 kmc	PA-4	PA-6	100 mw	1 watt
2-4 kmc	PA-3	PA-10	1 watt	10 watt
4-8	PA-7	PA-8	100 mw	1 watt
8-11	PA-1	PA-9	100 mw	1 watt
8.2-12.4	PA-5		50 mw	.5 watt

*Periodic Permanent Magnet

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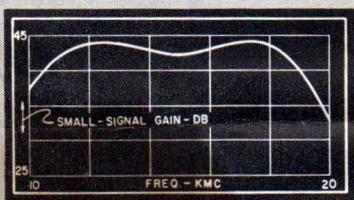
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TRD

... another "first" *

A TRAVELING WAVE TUBE with 10 KMC BANDWIDTH



HUGGINS introduces the NEW HA - 82

Available for delivery now is this Traveling Wave Tube which includes such features as an extremely wide frequency range . . . 10 to 20 KMC, with a minimum of 25 db small-signal gain and 1 MW saturation power output.

The HA-82 finds use in reconnaissance systems, Doppler simulator systems, as a driver for higher power tubes, etc.—many areas which previously required two or more tubes. This space, weight, and cost reduction, coupled with improved system reliability lend the HA-82 to airborne as well as fixed base applications.



Other commercially available "firsts" from Huggins include:

- First forward wave amplifier in 1952
- First backward wave oscillator in 1954
- First PPM focused traveling wave tube in 1956
- First electrostatically focused TWT in 1958

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Openings exist in our expanding R&D program for Traveling Wave Tube and Microwave Vacuum Tube Engineers. Contact R.A. Huggins, 999 East Arques Avenue, Sunnyvale, California, REgent 6-9330

