

HUGHES PRODUCTS

ELECTRON TUBE DIVISION

TRAVELING WAVE AMPLIFIERS

BACKWARD WAVE AMPLIFIERS

BACKWARD WAVE OSCILLATORS

MAS-1D

1 KW S-BAND TRAVELING-WAVE AMPLIFIER

This periodically focused S-band traveling-wave tube produces in excess of 1 kw over an octave frequency band (2.0 - 4.0 kMc) and yet the packaged weight is only 7 lb, including the magnets. The large bandwidth is especially important for countermeasure applications and some of the newer communications systems.

By cascading two of these tubes the 1 kw output is maintained with only 1 mw of drive power. The rugged method of assembly and packaging has yielded excellent performance in severe environments.

SPECIFICATIONS

POWER OUTPUT	1 kw peak 5 w average	HEATER POWER	28 w 6.5 v
POWER INPUT	1 w	INSERTION LOSS OF TUBE (BEAM OFF)	55 db minimum
FREQUENCY RANGE	2.0 - 4.0 kMc	R-F CONNECTORS	type N
SATURATION GAIN	30 db	WEIGHT OF TUBE AND MAGNET	6.9 lbs
MAXIMUM DUTY CYCLE	0.005	OVER-ALL DIMENSIONS	15" long x 2 1/4" o.d. (excluding connectors)
BEAM VOLTAGE	7.0 kv	COOLING REQUIREMENTS	air cooled
BEAM CURRENT	1.4 amps		
EFFICIENCY	18%		
GUN TYPE	convergent flow, Brillouin focusing		
CATHODE CAPACITANCE	7 μ f		

A high μ gridded gun for this tube is currently under development.

LOU-2 LOU-2B

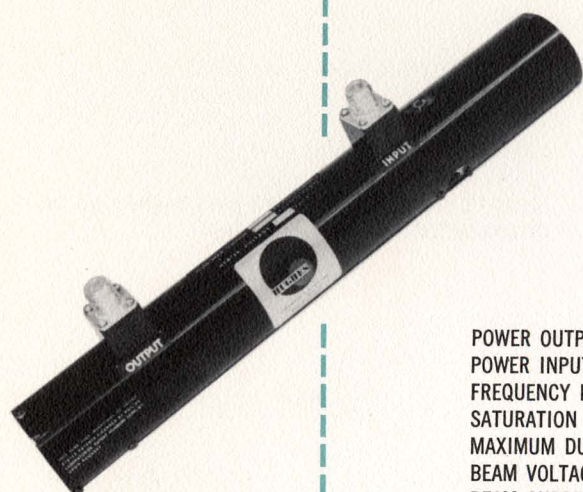
K_u-BAND PERMANENT MAGNET FOCUSED BACKWARD-WAVE OSCILLATORS

The LOU-2 K_u-band backward wave oscillator, electronically tunable over a frequency range of 12 to 18 kMc, is an ideal signal source for microwave signal generators, panoramic receivers and spectrum analyzers, frequency scan and navigational radars, microwave relay links, and countermeasures equipment. Power output over this wide frequency range is 10 to 60 milliwatts and the signal-to-noise ratio is extremely high.

Focused by a permanent magnet, the LOU-2 is housed in a light, compact package. The uniform permanent magnet provides a stable focusing field over a wide temperature range. In addition it acts as a heat-sink for the tube so that no cooling is required.

SPECIFICATIONS (LOU - 2 & LOU - 2B)

POWER OUTPUT	10 - 60 mw	R-F CONNECTORS	RG-91/U waveguide with UG-541/U flange
FREQUENCY RANGE	12 - 18 kMc	WEIGHT OF TUBE AND MAGNET	11.5 lbs
TUNING VOLTAGE	500 - 1900 v	OVER-ALL DIMENSIONS	LOU-2 5" height, 5 1/2" width, 10" length
ANODE 1 VOLTAGE	200 v		LOU-2B 6 1/8" height, 3 7/32" width, 9 3/2" length
MAXIMUM VOLTAGE	1900 v		
TOTAL CATHODE CURRENT	8 ma		
HEATER VOLTAGE	6.3 v		
HEATER CURRENT	0.6 amp		



LOU-2



LOU-2B

PAS-2B

S-BAND LOW NOISE BACKWARD-WAVE AMPLIFIER

An inherent feature of backward wave amplifiers is a narrow, electronically tunable passband which automatically provides image rejection and good selectivity. The PAS-2B combines this feature with the protection against crystal burn-out which results from a low saturation power level. Extremely low noise figure and high insertion loss are its unique features and provide improved sensitivity, receiver isolation, and anti-jamming performance.

This extremely low-noise voltage-tuned S-band backward wave amplifier represents a new concept in microwave receiver design. It is the latest stage in a continuing development of such tubes for r-f preamplifiers in radar, communications, and search receivers. The noise figures produced, lower than those obtainable with any other traveling-wave tube, are possible because of the significant advance represented by the Hughes low-noise gun.



SPECIFICATIONS

LOW-NOISE TUNING RANGE	2.0 - 4.0 kMc with noise figure under 8.0 db	INPUT-OUTPUT ISOLATION	greater than 50 db (beam off)
MINIMUM NOISE FIGURE	less than 4.0 db	TUNING VOLTAGE	180 - 1150 v
GAIN	10 - 25 db for low-noise operation	MAXIMUM VOLTAGE	2750 v
MIDBAND BANDWIDTH	11 mc at 15 db gain	HEATER POWER	10 w
MIDBAND TUNING RATE	2 mc/v	MAGNETIC FIELD	1000 gauss (solenoid focused)
SATURATION POWER LEVEL	1 mw	RF CONNECTORS	Type TNC

PAX-1

X-BAND LOW NOISE BACKWARD-WAVE AMPLIFIER

The 4.5 db noise figure at X-band of this backward wave amplifier offers attractive possibilities for improving many existing radar and communication receivers. This significant improvement over currently available components is principally due to the Hughes low-noise electron gun which exploits a recent discovery in noise phenomena. Another

attraction of this device is its narrow bandwidth which is electronically tunable over the X-band spectrum. This feature provides receiver selectivity, image rejection, and anti-jamming capability. The limiting characteristic and the isolation between the input and output terminals yield excellent protection against crystal burnout.



SPECIFICATIONS

OPTIMUM FREQUENCY	8.5 - 9.5 kMc
NOISE FIGURE	4.5 db minimum, 5 db average
GAIN	greater than 20 db
BANDWIDTH	12 mc \pm 2 mc
TUNING RATE	6.0 mc/v
SATURATION POWER OUTPUT	0.2 mw
INPUT-OUTPUT ISOLATION	greater than 50 db
TUNING VOLTAGE	420 - 650 v
MAXIMUM VOLTAGE	1500 v
FILAMENT POWER	6 w
MAGNETIC FIELD	1300 gauss (solenoid focused)
R-F CONNECTORS	RG-52/U waveguide with UG-39/U flange

CREATING A NEW WORLD WITH ELECTRONICS

HUGHES PRODUCTS

Please write for additional information:

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