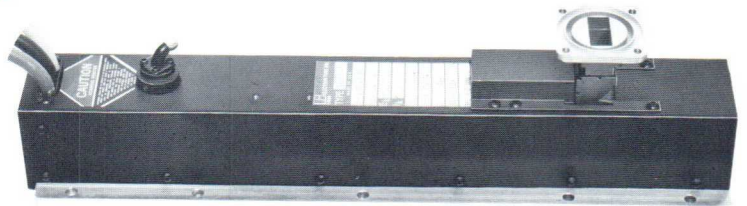


LITTON RING-LOOP TRAVELING WAVE TUBES

Multi-Kilowatt Pulsed
TWT's from D- through
J-bands



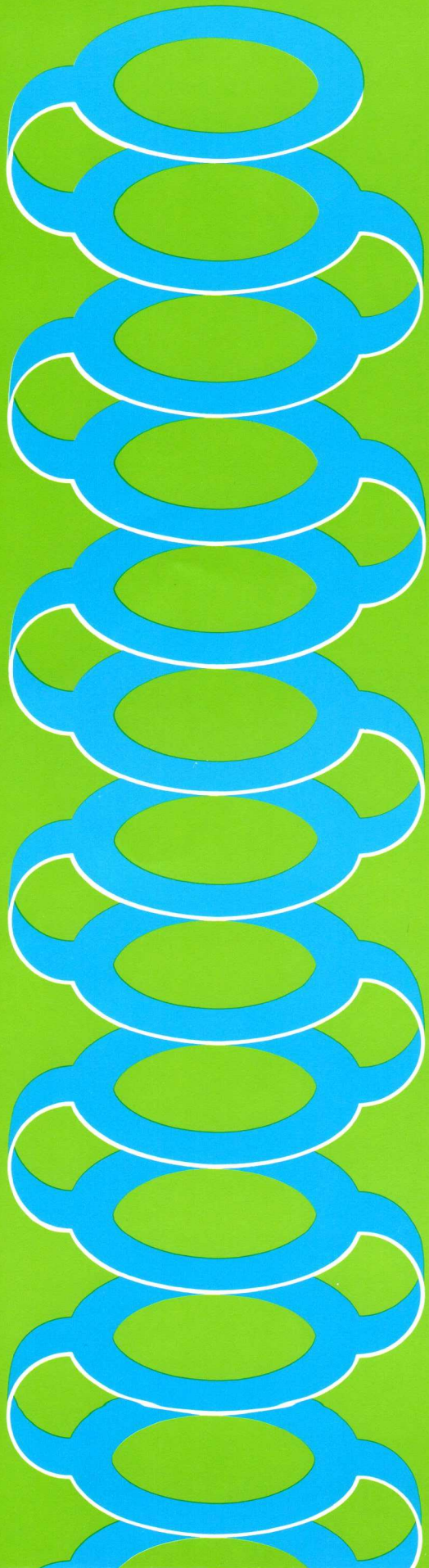
Features

Small Size
Light Weight
High Efficiency
Low Harmonic Output
Excellent Stability



LITTON PRECISION PRODUCTS

Division of Litton Precision Products Internat. Inc.
95 HIGH STREET, SLOUGH, SL1 1DH BERKS. ENGLAND
Telephone: Slough 28267. Cable Address: Littoncomp Slough
Telex No: 847548. VAT Registration No. 208 2607 82



Description

Litton Ring-Loop Traveling Wave Tubes produce multi-kilowatt, pulsed microwave power for radar, ECM, and linear accelerator applications. They are available in discrete frequency ranges from D- through J-bands with peak power outputs ranging from 1 to 24 kilowatts, and bandwidths from 7% to 20%.

By utilizing a ring-loop type of interaction circuit in this family of TWT's, Litton is able to offer high power and high efficiency in an exceptionally small, light weight package. As an additional benefit, the ring-loop circuit gives the systems designer the flexibility to select a tube which is custom tailored to his specific frequency range with minimum engineering cost.

Applications

Specific applications for Litton Ring-Loop TWT's include use in high resolution radar systems as drivers or output tubes, and in distributed arrays. They are also employed in threat-oriented ECM systems and as drivers in linear accelerators.

The Ring-Loop Circuit

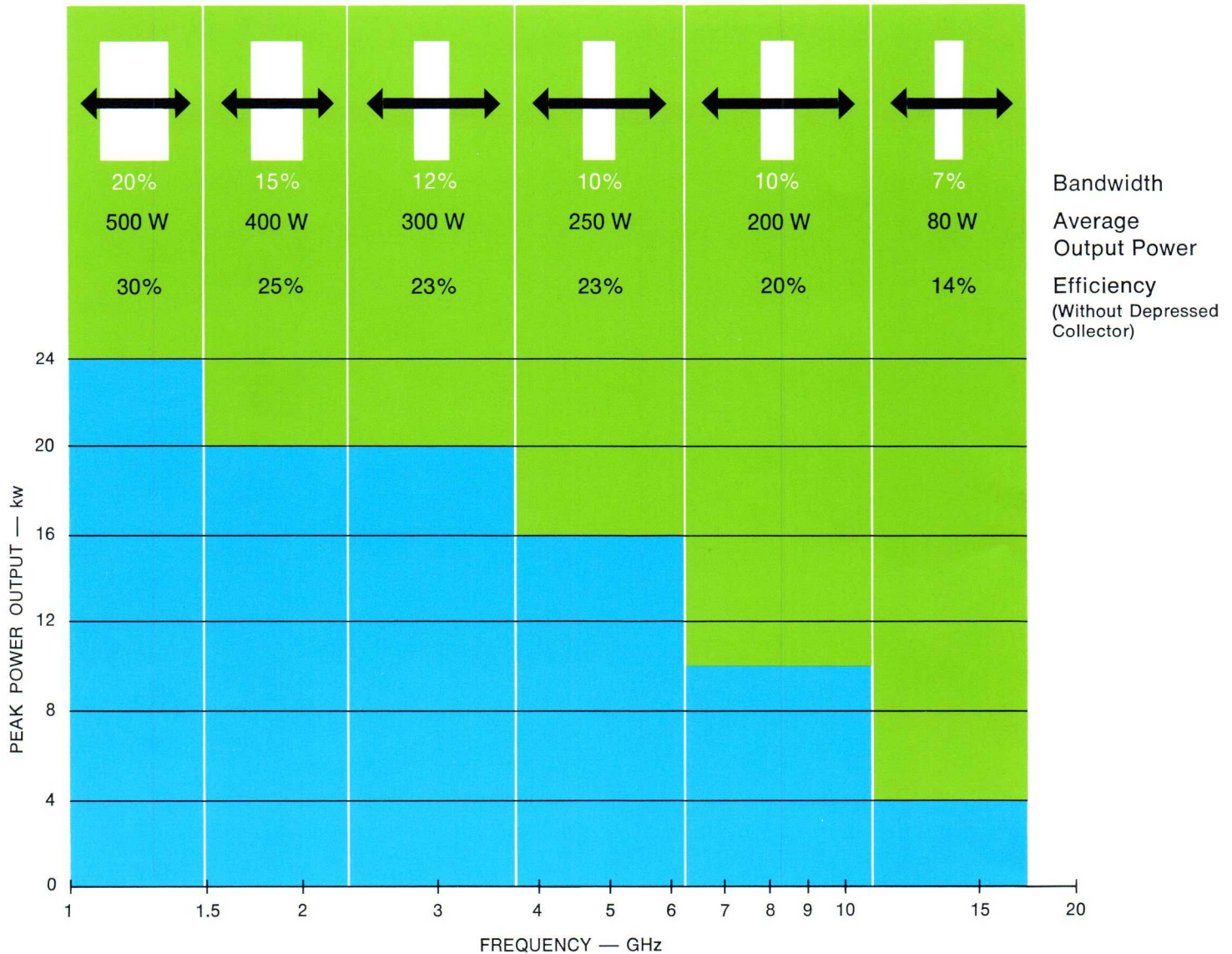
The ring-loop circuit shown at the left is the highest impedance, most stable, and most versatile member of the "ring bar" family of rf interaction circuits. This circuit provides a signal having a unique level of spectral purity, with harmonic power down 25 dB to 35 dB below the fundamental. It exhibits complete freedom from the backward wave oscillation problems which commonly occur with conventional helix circuits.

The high circuit impedance provides exceptionally high gain per wavelength which translates directly into TWT's with high efficiency, small size, light weight, and outstanding phase characteristics.

The ring-loop circuit is an extremely versatile design. By adjusting the ring-to-ring spacing on any one of Litton's six basic circuits, a tube can be produced at the exact frequency band, peak power, and gain specified. This means that a Ring-Loop TWT can be created for a specific requirement with minimum engineering cost, time delay, and technical risk.

Typical Performance

Typical of Litton's family of Ring-Loop Traveling Wave Tubes is the L-5476. The L-5476 provides 6 kilowatts peak power and 250 watts of average power output over the frequency range of 1.2 to 1.4 GHz, with 30 dB saturated gain at more than 30% rf efficiency. The tube is less than 19 inches long. Its total weight is only 6 pounds, while most traveling wave tubes having similar specifications would weigh more than 20 pounds. The chart on page 4 describes additional production tubes currently available in the Ring-Loop family.



Performance Capability — Litton Ring-Loop TWT's

The above chart presents the range of peak power, average power, bandwidth, and efficiency available from Litton's Ring-Loop family of pulsed TWT's. Peak power is displayed on the vertical axis; frequency, on a log scale, along the horizontal axis. The total frequency range is covered by 6 bands, one for each of Litton's ring-loop circuits. These are separated by vertical white lines on the chart. The nominal 1 dB saturation bandwidth, maximum average rf power, nominal rf efficiency, and peak rf power achievable are shown within each band. As indicated by the arrows, stated bandwidths may be selected anywhere within the frequency band of interest. Efficiency can be improved through the use of a depressed collector.

"Custom" Design

Suppose a TWT is required with 40 dB gain, 8 kilowatts peak power, and 2% duty, within an operating band of 2.5 to 2.7 GHz. Although a tube with these specifications does not appear in the table on page 4, the performance chart above shows that one can easily be custom tailored. The 8 kilowatt peak power requirement is well within the 20 kilowatt limit achievable with the third ring-loop circuit band from the left, and the 160 watts required for 2% duty at 8 kilowatts peak is less than the 300 watts maximum for that band. To arrive at a tube with the correct specifications, Litton engineers compute the ring-to-ring spacing required to center the 7.7% bandwidth (2.5 to 2.7 GHz) within the 12% rf circuit bandwidth. After incorporating the specifications for a depressed or non-depressed collector, and for conduction, air, or liquid cooling, the TWT can be fabricated from the basic components which are common to that particular ring-loop circuit band.

Production Ring-Loop TWT's

TUBE TYPE	FREQUENCY (GHz)	PEAK POWER (kw)	DUTY (%)	SAT. GAIN (dB)	NOMINAL VOLTAGE AND CURRENT		
					BEAM VOLTAGE (KV)	GRID PULSE (Volts)	BEAM CURRENT (Amps)
L-5476-50	1.2-1.4	6.0	4	30	9.5	75	2.0
L-5416-50	1.2-1.4	6.0	4	60	9.0	80	2.1
L-5570-50	1.2-1.4	7.0	4	50	10.5	100	2.6
L-5540-50	1.8-2.0	2.0	10	40	6.8	50	1.2
L-5550-50	2.8-3.2	1.5	4	60	6.8	90	1.1
L-5478	2.8-3.2	3.0	1	40	8.0	Not Gridded	1.6
L-5551-50	2.8-3.2	3.0	4	40	7.5	100	1.5
L-5538-50	3.1-3.5	2.0	4	40	6.6	90	1.2
L-5366-50	3.15-3.45	3.0	4	65	7.5	100	1.6
L-5565-50	3.1-3.5	11.0	1.5	40	15.5	120	2.8
L-5420-50	5.4-5.9	5.0	2	60	12.0	150	1.8
L-5542-50	9.0-10.0	5.0	1	50	12.0	150	1.8
L-5581-50	9.0-10.0	10.0	2	60	14.5	160	2.3
L-5411-50	16.0-16.7	1.5	1	65	10.0	110	1.1
L-5412-50	16.0-17.0	1.5	2	35	10.0	110	1.1
L-5531-50	16.0-17.0	1.0	2	60	10.0	110	1.1

This table lists the Ring-Loop Traveling Wave Tubes which are currently in production at Litton. If you require a TWT with specifications other than those shown here,

please contact a Litton representative or applications engineer. We would be happy to assist you in selecting a Ring-Loop TWT to match your specific requirements.

Sales Offices

Main Marketing offices and applications engineering services are located at 960 Industrial Road, San Carlos, California 94070. Phone (415) 591-8411 or TWX 910-376-4900. Electron Tube Sales Offices are listed below:

EAST
1770 Walt Whitman Road
Melville, L.I., New York 11746
(516) 694-8300

SOUTH
P. O. Box 00
Warner Robins, Georgia 31093
(912) 923-3397

SOUTHWEST
11333 North Central Expressway
Suite 211
Dallas, Texas 75231
(214) 369-2184

DISTRICT OF COLUMBIA
490 L'Enfant Plaza East, S.W.
Suite 8206
Washington, D.C. 20024
(202) 554-2570

MIDWEST
4130 Linden Avenue
Suite 270
Dayton, Ohio 45432
(513) 258-1243

WEST
960 Industrial Road
San Carlos, California 94070
(415) 591-8411

Sales outside the United States are handled through the following companies:

LITTON PRECISION PRODUCTS INTERNATIONAL

58 Rue Pottier
78150 Le Chesnay, France
955.21.04

Oberföhringerstrasse 8
8 Munich 80, West Germany
(811) 980547
Via Arco 4
I 20121 Milan, Italy
(2) 89.33.62

95 High Street
Slough, Buckinghamshire
SL1 1DH, England
Slough 28267

Fack
S-100 51 Stockholm 28
Sweden
(8) 142345

Steenloperstraat 26
Capelle a/d IJssel
Holland
(010) 50.39.02

Gubelstrasse 28
8050 Zurich, Switzerland
(1) 48.35.44

DENLEN ELECTRONICS CORP., LTD.
23 Guardsman Road
Thornhill, Ontario, Canada
(416) 889-7201

WESTREX COMPANY, ORIENT
Central P. O. Box 760
Tokyo, Japan
211-6791

M. T. I. ENGINEERING, LTD.
182 Ben Yehuda Street
Tel-Aviv, Israel
03-236334



ELECTRON TUBE DIVISION

San Carlos, California