

MICROELECTRONICS

- State of the art design expertise in μW solid-state hybrids: multi-assemblies and front-ends
- State of the art facilities for hybrids manufacturing including fully automated manufacturing line and RF test capabilities up to 40GHz.
- State of the art design expertise for Active Electronically Scanning Antenna Components.

ACTIVE PHASED ARRAY ANTENNA TECHNOLOGY

Active Components

- Compact Receivers
- Multifunction Hybrids (HPA, TTD, Switch matrix, etc...)
- Antenna Microwave Subsystem (Planks, Panels & Manifolds)

Passive Components

- Plank/tile RF boards
- Compact hi rel beam forming network for power (40W) application

X BAND RADAR COMPONENT & SUBSYSTEM

Front end and pedestal component

- High power active SPNT
- High dynamic very low noise amplifier
- Multichannel front-ends

Receiver, Exciter, Processor component

- Down converter (up to 2 conversion)
- Up converter (up to 2conversion)
- Stretch module for de-ramp-on-receive SAR mode
- Very low phase noise, fast switching Synthesiser
- Exciter and LO distributor
- Compact Receiver/Exciter

Power component

- Up to 10W RF TWT Driver for Radar transmitter

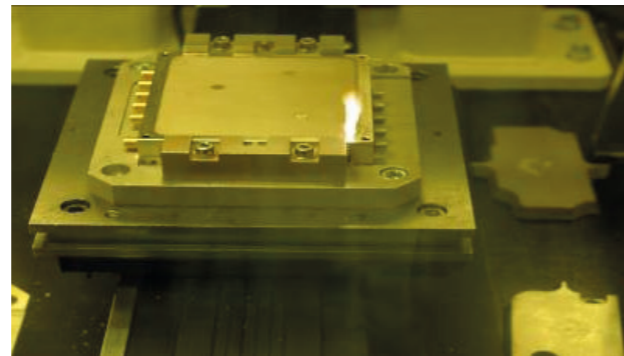
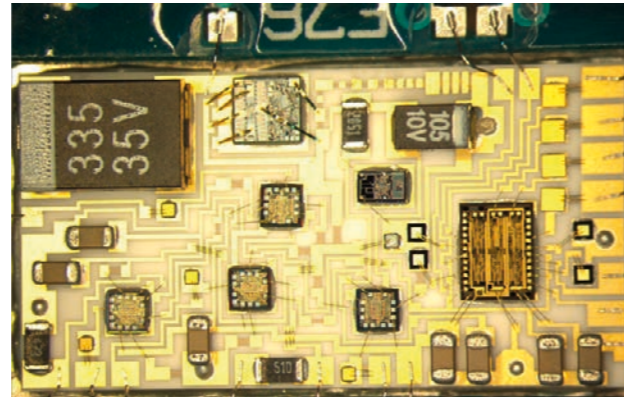
EW/ECM/ESM COMPONENT & SUBSYSTEM

Seeker, AOA/RW Receiver

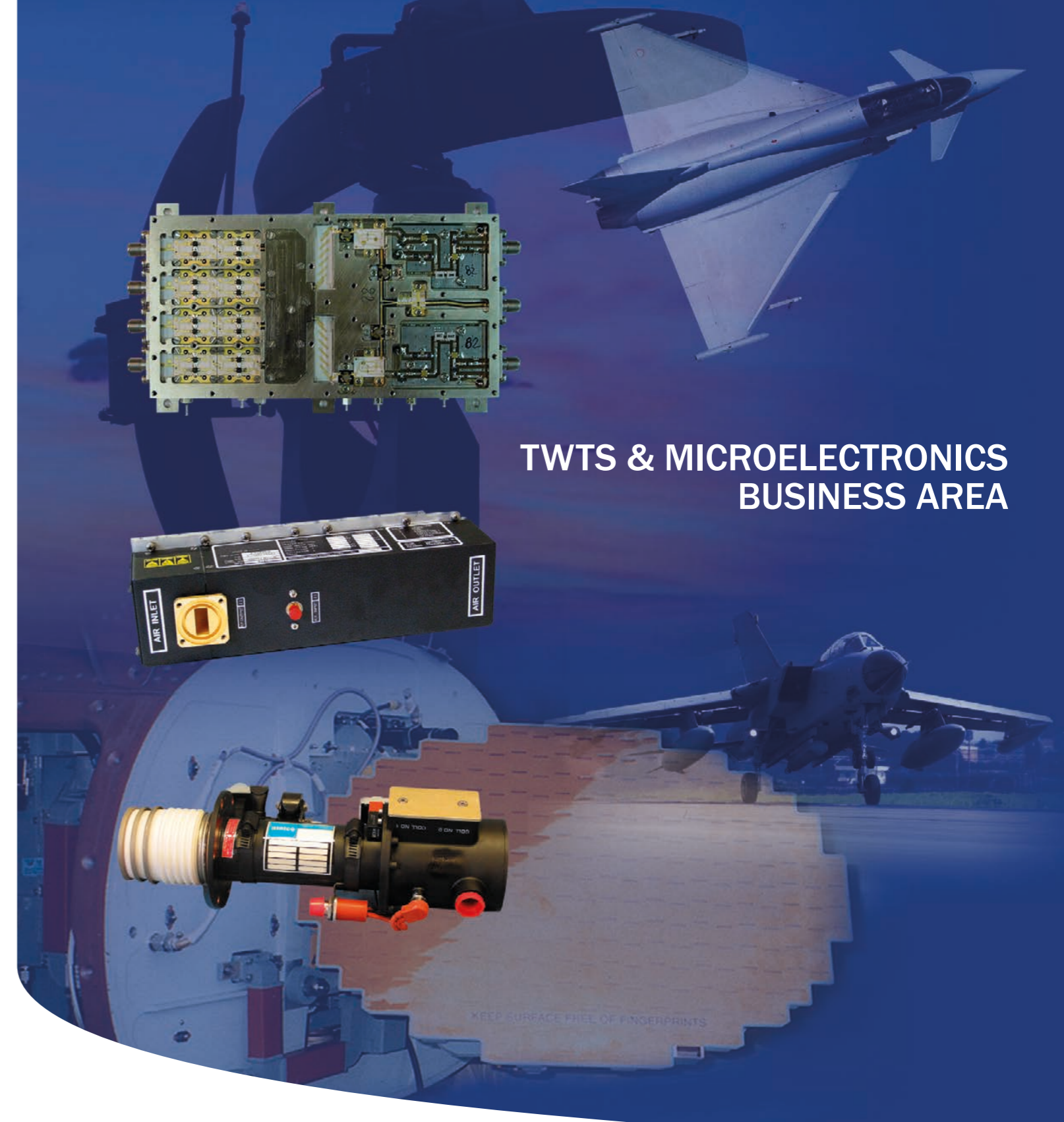
- Multifunction Hybrids
- BROAD BAND FRONT END AND RECEIVER

Very wide band assy

- Front end amplifier and receiver
- Fast switching synthesiser
- Transceiver



Type	Frequency Range	Description		Application
Front End	8+10 GHz	Up to 4 channels 2 o 3 conversion Rx protection	NF 1.8dB High dynamic Variable gain	Radar System - Receiver
Down Converter	8+10 GHz	Compact outline for single channel Double conversion High spurious suppression and image rejection	Variable gain AtoD integrated	Radar System - Receiver
Up Converter and Stretch Module	8+10 GHz	Compact outline for single channel Double conversion	High spurious suppression Wideband option for de-ramp-on receive SAR technique	Radar System - Receiver
Very low noise amplifier	8+10 GHz	High dynamics NF 1.6dB High gain	Limiter protection Output SWR < 1.25	Radar System - Receiver
High Power Amplifier	9+10 GHz	Up to 80W peak Gating option	Output SWR < 1.5	Radar System- Transmitter/exciter
Low phase noise synthesizer	9+10 GHz	Up to 50 channels 1 μs switching time -120dBc/Hz @ 3kHz	Compact outline DDS based + PLL	Radar System - Exciter
Broadband Front End	0,8+40 GHz	Single channel Switched filter bank 8 channels Integrated Gain control	Double conversion Selectable IF bandwidth LO integrated option	Passive missile seeker, RWR; AOA or DF Receiver; EW/ESM
Wideband Synthesizer	6+18 GHz	Up to 600 channels Low phase noise	1 μs switching time DDS based + PLL	Passive missile seeker, RWR; AOF or DF Receiver; EW/ESM
Power combiner/divider	8+10 GHz	Multi port Resistor buried	Stripline or microstrip Metal clad option	Active antenna radar system



TWTS & MICROELECTRONICS BUSINESS AREA

For more information please email infomarketing@selex-es.com

Selex ES S.p.A. - A Finmeccanica Company

Via Villagrazia, 79 - 90125 Palermo (PA) - Italy - Tel: +39 091 6482911, Fax: +39 091 6472979

This publication is issued to provide outline information only and is supplied without liability for errors or omissions. No part of it may be reproduced or used unless authorized in writing.

We reserve the right to modify or revise all or part of this document without notice.

2013 © Copyright Selex ES S.p.A.

www.selex-es.com

SELEX\IT\Brc-22\1212\FM

Selex ES's Palermo Plant was established in 1956 by ELSI for the production of vacuum electronic devices. The company has a strong heritage of design, development and production of High Power Coupled Cavity TWTs. In the 90s the product range was expanded with the introduction of the Helix TWT and chip and wire technology for microwave microelectronics hybrid integrated circuits, components and sub-assemblies.

Today Selex ES has extensive expertise in the development and production of state-of-the-art TWTs, mini TWTs, Microwave Power Module (MPM), High Power Amplifier (HPA) and top-class Microelectronics solid state Components and Subsystems for Airborne, Naval, Ground, Missile and Space applications for the Defense and Aerospace Market.

This experience, coupled with the Palermo site's long history of TWT production, means that it is the ideal partner of choice for Microwave Power, Integrated Receiver and Exciter Solutions for Radar, Security, EW & ESM and Communication Systems.

TECHNOLOGIES AND CAPABILITIES

Key high power vacuum device technology includes: vacuum expertise including brazing, RF induced and resistance welding; etching and plating; manual and automated microwave high power CW and pulsed testing; facilities for inspection, including CNC contactless equipment and SEM electronic microscope. Key Microelectronic technology includes: fully automated epoxy (and other adhesive) dispensing; automatic eutectic attach; die placement and wire bonding; advanced microwave module assembling; automatic testing.

These technologies are supported by a manufacture engineering team. Palermo's expertise includes configuration management and the provision of build-to-print manufacturing and test services.

The Engineering department incorporates a Design Center with a broad range of software CAD/CAE for the design of RF & Microwave Tubes, Components and Systems.

MAGNETRONS



Missile Seeker

- X – Band Magnetron

Ground/Shipboard Radar

- L – Band Magnetron
- S – Band Klystron
- X – Band Klystron

Type	Frequency Range	Peak Output Power	Peak Anode Voltage	Peak Anode Current	Duty Cycle
ET 126	9000 to 9300 MHz	4 Kw	5 kV	2.5A	0.0005
ET 127	9100 to 9300 MHz	4 Kw	5 kV	2.5A	0.0005
ET 128A	1305 to 1365 MHz	2 MW	39 kV	140 A	0.00125
ET 128B	1250 to 1310 MHz	2 MW	39 kV	140 A	0.00125
ET 130	8500 to 9600 MHz	220 kW	21.5 kV	27.5 A	0.001
ET 132	9250 to 9500 MHz	220 kW	21.5 kV	27.5 A	0.001
ET 134	Tunable 8.75 to 9.53 MHz	220 kW	21.5 kV	27.5 A	0.001
ET 135	8500 to 9600 MHz	220 kW	21.5 kV	27.5 A	0.001
ET 141	Tunable 15.5 to 17.5 GHz	125 kW	18 kV	19 A	0.0001

KLYSTRONS



Missile Seeker

- X – Band Magnetron

Ground/Shipboard Radar

- L – Band Magnetron
- S – Band Klystron
- X – Band Klystron

Type	Frequency Range	Peak Output Power	Beam Voltage	Beam Current	Duty Cycle
ET 2820	2.7 to 2.9 GHz	1.4 MW	74 kV	40 A	0.0011
ET 2828	9.9 to 10.3 GHz	180 W	13 kV	140 mA	CW
ET 2860	9.7 to 10.0 GHz	2 W	4.4 kV	35 mA	CW
ET 2870	10 to 11 GHz	500 W	5.4 kV	350 mA	CW

World-class design expertise Coupled Cavity and Helix Travelling Wave Tubes (TWT's). State of the art TWT's manufacturing facilities including semi automated mounting processes and fully automated test capabilities for the manufacturing of:

- Coupled Cavity TWT up to 140kW in S band and 14kW in Ku band
- Helix TWT up to 10kW in S band and 2kW in Ku band
- Mini TWT, MPM and TWT-Amplifier for EW, ESM, Communication and Airborne Radar application

TRAVELLING WAVE TUBE - COUPLED CAVITY TWT



Airborne Radar

- X – Band CC TWT
- Ku – Band CC TWT

Ground/Shipboard Radar

- C – Band CC TWT
- X – Band CC TWT
- S – Band CC TWT

Type	Frequency Range	Peak Output Power	Cathode voltage	Cathode current	Duty Cycle
ET920	3.1 to 3.5 GHz	120 kW	-41 kV	16 A	3% max
ET948	5.3 to 5.8 GHz	120 kW	-46 kV	14.5 A	8% max
ET960	8.5 to 9.5 GHz	12 kW	-22 kV	4 A	2.7% max
ET961	8.6 to 9.5 GHz	20 kW	-26 kV	6.5 A	1.5% max
ET964	10.8 to 11.8 GHz	10 kW	-23.5 kV	3.9A	2.7% max
ET965A	9.5 to 9.9 GHz	12 kW	-25 kV	3.4 A	10.5% max
ET2980	16.5 to 17 GHz	13.5 kW	-29 kV	2.1 A	2.7% max

TRAVELLING WAVE TUBE - HELIX TWT - MINI TWT & TWT-AMPLIFIER



Airborne Radar

- C – Band HX TWT
- X – Band HX TWT
- K – Band HX TWT
- Ku – Band HX TWT

Missile Seeker

- Ku – Band HX TWT

Electronic Counter Measure

- C – Band HX TWT
- L – Band HX TWT
- S – Band HX TWT
- X – Band HX TWT
- K – Band HX TWT
- Ku – Band HX TWT

Type	Frequency Range	Power Output	Cathode voltage	Cathode current	Duty Cycle
ET3201	1 to 2 GHz	280 W	- 3.6 kV	475 mA	CW
ET3301	2 to 4 GHz	250 W	- 4.2 kV	450 mA	CW
ET3407	4 to 8 GHz	280 W	- 8 kV	320 mA	CW
ET3412	2.5 to 8.0 GHz	150 W	- 4.6 kV	280 mA	Up to 100 %
ET3514	7.5 to 12.0 GHz	250 W	- 8.8 kV	300 mA	CW
ET3515	12 to 18 GHz	120 W	- 9 kV	220 mA	CW
ET3519	7.5 to 18.0 GHz	160 W	- 8.7 kV	250 mA	CW
ET3527	7.5 to 17.0 GHz	225 W	- 10.2 kV	280 mA	CW
ET3539	6.5 to 18.0 GHz	200 W	- 9.8 kV	200 mA	Up to 100 %
ET3547	14 to 14.5 GHz	80 W	- 4.9 kV	160 mA	CW
ET3553	6 to 18 GHz	100 W	- 5.1 kV	180 mA	Up to 100 %
ET3602	27.5 to 29.5 GHz	100 W	- 12 kV	115 mA	CW
ET5515	13.5 to 14.0 GHz	370 Wpk	-8.9 kV	250 mA	25% max
ET6306	3.1 to 3.5 GHz	8 kWpk	-14.6 kV	3.2A	2.5% max
ET6404	5.5 to 9.5 GHz	2 kWpk	-9.2 kV	1.6A	10% max
ET6510	8 to 16 GHz	2 kWpk	- 10.7 kV	1.7A	2 % max
ET6512	8.5 to 10.5 GHz	2 kWpk	- 10.9 kV	1.5A	6 % max
ET6519	7.5 to 16 GHz	1.5 kWpk	-10.6 kV	1.6A	4 % max
ET6528	10.8 to 11.8 GHz	2 kWpk	-11 kV	1.7A	2 % max
ET6529	9.5 to 10.0 GHz	4 kWpk	-12 kV	1.5A	6 % max
ET6531	9.0 to 9.5 GHz	2.5 kWpk	-10.8 kV	1.5A	2.5 % max
Mini TWT					
ET3413	2 to 8 GHz	200W	-4.5 kV	200	up to CW
ET3534	6 to 18 GHz	200W	-4.5 kV	200 mA	up to CW
ET6532	9.0 to 10 GHz	1kW pk	-9 kV	600 mA	11%

MICROWAVE POWER MODULE (MPM)

The Microwave Power Module is a microwave amplifier which includes: the mini TWT, the solid state amplifier, the RF input and output network and the Electronic Power Conditioner. All the parts are packaged into a single compact, lightweight housing. With respect to traditional TWT-Amplifiers, the MPM is much smaller, lighter, more efficient, with significant noise reduction.

Type	Frequency Range	Power Output	Dimensions & Weight	PRF	Input voltage
MPM3401	2 to 8 GHz	200W	220x200x65 mm 3,5 kg	up to CW	270V DC
MPM3501	6 to 18 GHz	200W	220x200x65 mm 3,5 kg	up to CW	270V DC
MPM6501	9.0 to 10 GHz	1kW pk	280x150x65 mm 4,5 kg	11%	