Microwave Power Solution is the business unit of Leonardo, based in Palermo since 1956, for the production of high power vacuum electronic devices. The company has a strong heritage in the design, development and production of Microwave Power Solutions. In the 90s the product range was expanded with the introduction of chip and wire technology for microwave microelectronics hybrid integrated circuits, components and sub-assemblies.

Today the company has an extensive expertise in the development and production of state-of-the-art TWTs, mini TWTs, Microwave Power Modules (MPM) and TWT-A (TWT Amplifiers), Solid State Power Amplifiers (SSPA) for Airborne, Surface, Missile and Space platforms for the Defense and Aerospace Market.

Applications are Radar, Security, Surveillance, EW & ESM, Instruments and Communication systems, platforms and end user in the 4 continents are equipped by Leonardo Microwave Power Solutions.

TECHNOLOGIES AND CAPABILITIES

Key high power vacuum device technology includes:

- Vacuum technology 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.

MAGNETRONS AND KLYSTRONS

World class design expertise of Magnetrons and Klystrons. Leonardo Microwave Power Solution is among the few players worldwide that still design, develop and produce such Tubes, among legacy products worth to mention:

- Klystron from S band up to 1.4M output power peak, 1‰ duty cycle; up to the X band with 500W CW output power;
- Magnetron from L band 2MW output power peak 1.25 % duty cycle; up to the X band with 2kW power peak 1.0 % duty cycle;

These tubes are ideal for several different application such as:

- seekers and threat simulators;
- SAR (synthetic aperture radar) for standoff airborne application or EO (earth observation) space payloads;
- ATM (air traffic management) systems and wheatear forecast ground radar.

TRAVELLING WAVE TUBE - COUPLED CAVITY TWT & TWT-AMPLIFIERS

Microwave Power Solution is among the few players worldwide that still design, develop and produce such Tubes, among legacy products worth to mention:

- Klystron from S band up to 1.4M output power peak, 1‰ duty cycle; up to the X band with 500W CW output power;
- Magnetron from L band 2MW output power peak 1.25 % duty cycle; up to the X band with 2kW power peak 1.0 % duty cycle;

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- seekers and threat simulators;
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- ATM (air traffic management) systems and wheatear forecast ground radar.

<table>
<thead>
<tr>
<th>Type</th>
<th>Frequency Range</th>
<th>Peak Output Power</th>
<th>Cathode voltage</th>
<th>Cathode current</th>
<th>Duty Cycle</th>
<th>Cooling</th>
<th>Focussing</th>
</tr>
</thead>
<tbody>
<tr>
<td>ET948</td>
<td>5.3 to 5.8 GHz</td>
<td>120 kW</td>
<td>-46 kV</td>
<td>14.5 A</td>
<td>8% max</td>
<td>Liquid</td>
<td>solenoid</td>
</tr>
<tr>
<td>ET960</td>
<td>8.5 to 9.5 GHz</td>
<td>12 kW</td>
<td>-22 kV</td>
<td>4 A</td>
<td>2.7% max</td>
<td>Forced air</td>
<td>PPM</td>
</tr>
<tr>
<td>ET961</td>
<td>8.6 to 9.5 GHz</td>
<td>20 kW</td>
<td>-29 kV</td>
<td>6.5 A</td>
<td>1.5% max</td>
<td>Forced air</td>
<td>PPM</td>
</tr>
<tr>
<td>ET964</td>
<td>10.8 to 11.8 GHz</td>
<td>10 kW</td>
<td>-23.5 kV</td>
<td>3.9 A</td>
<td>2.7% max</td>
<td>Forced air</td>
<td>PPM</td>
</tr>
<tr>
<td>ET966</td>
<td>9 to 10 GHz</td>
<td>12 kW</td>
<td>-25 kV</td>
<td>3.4 A</td>
<td>10.5% max</td>
<td>Liquid</td>
<td>PPM</td>
</tr>
<tr>
<td>ET2980</td>
<td>16.5 to 17 GHz</td>
<td>13.5 kW</td>
<td>-29 kV</td>
<td>21.1 A</td>
<td>2.7% max</td>
<td>Liquid</td>
<td>PPM</td>
</tr>
</tbody>
</table>
The Microwave Power Module (MPM) is a microwave amplifier which includes: the mini TWT, the solid state amplifier and gain equalizer, 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.

Based on proprietary novel potting-free concept the HVPS (high voltage power supply) results in high reliable module and very lightweight and an easy concept for life cycle support and maintenance.

Applications for surface, missile or airborne platforms
- EW equipment
- Test and measurement equipment
- Commercial and military radars

Key Features
The amplifiers are designed for:
- 70 dB typical small signal gain
- -40°C to +90°C operating baseplate temperature (TBP)
- Output power flatness 1dB (typ.)
- -35dBm/MHz noise power density (typ.)

Unit is conductively cooled through baseplate and HVPS is hermetically sealed.

All the amplifiers are very compact, light weight 270 VDC Nominal input (other can be arranged) rack mount available.

<table>
<thead>
<tr>
<th>Type</th>
<th>Frequency Range</th>
<th>Power Output</th>
<th>Cathode Voltage</th>
<th>Cathode Current</th>
<th>Duty Cycle</th>
<th>Control Electrode</th>
</tr>
</thead>
<tbody>
<tr>
<td>ET3201</td>
<td>1 to 2 GHz</td>
<td>280 W</td>
<td>-3.6 kV</td>
<td>475 mA</td>
<td>CW</td>
<td></td>
</tr>
<tr>
<td>ET3301</td>
<td>2 to 4 GHz</td>
<td>250 W</td>
<td>-4.2 kV</td>
<td>450 mA</td>
<td>CW</td>
<td></td>
</tr>
<tr>
<td>ET3407</td>
<td>4 to 8 GHz</td>
<td>280 W</td>
<td>-8 kV</td>
<td>320 mA</td>
<td>CW</td>
<td></td>
</tr>
<tr>
<td>ET3602</td>
<td>27.5 to 29.5 GHz</td>
<td>100 W</td>
<td>-12 kV</td>
<td>115 mA</td>
<td>CW</td>
<td></td>
</tr>
<tr>
<td>ET6306</td>
<td>3.1 to 3.5 GHz</td>
<td>8 kWp</td>
<td>-14.6 kV</td>
<td>3.2A</td>
<td>2.5% max</td>
<td></td>
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<tr>
<td>ET6404</td>
<td>5.5 to 9.5 GHz</td>
<td>2 kWp</td>
<td>-9.2 kV</td>
<td>1.6A</td>
<td>10% max</td>
<td></td>
</tr>
<tr>
<td>ET6510</td>
<td>8 to 16 GHz</td>
<td>2 kWp</td>
<td>-10.7 kV</td>
<td>1.7A</td>
<td>2% max</td>
<td></td>
</tr>
<tr>
<td>ET6512</td>
<td>8.5 to 10.5 GHz</td>
<td>2 kWp</td>
<td>-10.9 kV</td>
<td>1.5A</td>
<td>6% max</td>
<td></td>
</tr>
<tr>
<td>ET6529</td>
<td>9.5 to 10.0 GHz</td>
<td>4 kWp</td>
<td>-12 kV</td>
<td>1.5A</td>
<td>6% max</td>
<td></td>
</tr>
</tbody>
</table>

(**) Preliminary data
**SOLID STATE POWER AMPLIFIER (SSPA)**

Leonardo solid state power amplifiers are based on gallium nitride (GaN) monolithic microwave integrated circuit (MMIC) provided in an environmentally sealed compact light weight mechanical housing.

Output power is saturated, in the same enclosure several different output power level are available, the efficiency of these SSPAs is outstanding because the amplifiers are based on a proprietary novel power combining network that enable the compact outline line and light weight.

**Applications for surface, missile or airborne platforms**

- Test and measurement equipment
- Commercial and military radars

**Key Features**

The amplifiers are designed for:

- 70 dB typical small signal gain
- -40°C to +70°C operating baseplate temperat. (TBP)
- Output power flatness 1dB (typ.)
- -30dBm/MHz noise power density (typ.)
- Very long pulse width

Several control bite are available.

- Status and control interface 5V TTL compatible
- Internal thermal regulation
- Over-temperature protection
- Alarm status communicated via Control connector

Unit is conductively cooled through baseplate and Hermetically sealed

All the amplifiers are very compact 177.8mm x 228.6mm x 40.2mm, weight, less than 4kg

28 V DC Nominal input (22-33 V) rack mount available.

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**MICROWAVE POWER SOLUTIONS**

<table>
<thead>
<tr>
<th>Type</th>
<th>Frequency Range</th>
<th>Power Output</th>
<th>Dimensions/Weight</th>
<th>Duty</th>
<th>Input Voltage</th>
</tr>
</thead>
<tbody>
<tr>
<td>MHXA022</td>
<td>X BAND 1GHz INSTANT BW</td>
<td>120 W</td>
<td>228.6mm x 177.8mm x 30.5mm / 1.5 kg</td>
<td>25%</td>
<td>28VDC</td>
</tr>
<tr>
<td>MHXA020</td>
<td>X BAND 1GHz INSTANT BW</td>
<td>500 W</td>
<td>228.6mm x 177.8mm x 40.2mm / 3.5 kg</td>
<td>20%</td>
<td>28VDC</td>
</tr>
<tr>
<td>MHXA017</td>
<td>X BAND 1GHz INSTANT BW</td>
<td>700 W</td>
<td>228.6mm x 177.8mm x 40.2mm / 4kg</td>
<td>25%</td>
<td>28VDC</td>
</tr>
<tr>
<td>MHXA024</td>
<td>X BAND 1GHz INSTANT BW</td>
<td>1000 W</td>
<td>228.6mm x 177.8mm x 40.2mm / 4kg</td>
<td>15%</td>
<td>28VDC</td>
</tr>
<tr>
<td>MHXA026</td>
<td>X BAND 1GHz INSTANT BW</td>
<td>2000 W</td>
<td>350mm x 250mm x 150mm / 8kg</td>
<td>10%</td>
<td>28VDC</td>
</tr>
<tr>
<td>MHXA027</td>
<td>8 to 11GHz</td>
<td>500 W</td>
<td>228.6mm x 177.8mm x 40.2mm / 4kg</td>
<td>CW</td>
<td>28VDC</td>
</tr>
<tr>
<td>MHXA018</td>
<td>8 to 11GHz</td>
<td>150 W</td>
<td>228.6mm x 177.8mm x 40.2mm / 4kg</td>
<td>CW</td>
<td>28VDC</td>
</tr>
</tbody>
</table>