About TTE

TTE, a subsidiary of TACTRON Elektronik GmbH & Co KG, a new Industry Leader for High Technology Test Systems in frequency ranges up to 110GHz. We are located in Planegg near Munich, Germany. Our expertise are State of the Art products for the microwave and millimeter wave industry.

TTE is committed to provide the best RF products, systems and related services – Made in Germany!

Active & Passive Target Simulators and Components
Active Target Simulator (ATS)

Our Range of Products for Radar and Radar Signal Testing

<table>
<thead>
<tr>
<th>dynRTS and staRTS</th>
<th>minRTS</th>
<th>Frequency Converter</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frequency range</td>
<td>77/79 GHz band</td>
<td>77/79 GHz band</td>
</tr>
<tr>
<td>Instantaneous bandwidth</td>
<td>5000 MHz (std)</td>
<td>5000 MHz (std)</td>
</tr>
<tr>
<td>Number of targets</td>
<td>1 dynamic or up to 6 static in parallel</td>
<td>1 static</td>
</tr>
<tr>
<td>Target distance</td>
<td>up to 1000 m (in 4096 steps)</td>
<td>5 m internal (more with additional optical fiber extensions)</td>
</tr>
<tr>
<td>Target Gain Flatness</td>
<td>±2 dB, typ</td>
<td>±2 dB, typ</td>
</tr>
<tr>
<td>Target velocity</td>
<td>up to ±400 km/h</td>
<td>-</td>
</tr>
<tr>
<td>Target size</td>
<td>80 dB dynamic range</td>
<td>30 dB dynamic range</td>
</tr>
<tr>
<td>Exceptional spurious suppression in Doppler spectrum</td>
<td>40 dB, typ</td>
<td>40 dB, typ</td>
</tr>
<tr>
<td>Phase Noise at 77GHz</td>
<td>@10 kHz: 90 dBc</td>
<td>@10 kHz: 90 dBc</td>
</tr>
<tr>
<td>Dimensions [mm]</td>
<td>482.6(W) x 450(L) x 177(H)</td>
<td>178.9(W) x 216.4(L) x 100(H)</td>
</tr>
</tbody>
</table>

Notes:
All specifications are subject to change without prior notice.

3 in 1

RTS Radar Target Simulator

Calibrated Down-Converter (for Signal Analysis)

Calibrated Up-Converter (for Signal Generation)

Simulate Radar Targets
Simulate a single dynamic or multiple static radar targets in the 77/79 GHz or 24 GHz band with our simulator family - customized on your request.

- Instantaneous BW: up to 10 GHz (200 MHz at 24 GHz)
- Target Distance: up to 1000 m
- Target Velocity: up to ±400 km/h
- Exceptional spurious suppression in Doppler spectrum: >40 dB
- Phase Noise at 77 GHz / 10 kHz: 90 dBc

Characterize Radar Signals
Use calibrated RTS output ports (IF or base-band) for characterizing radar signals by:

- Power measurement
- Spectrum analysis
- Ramp analysis

Generate (Interference) Signals
Interferer signals like:
- sine signal
- noise signals
- FMCW ramps
can be injected at low IF frequencies of RTS using cost-effective signal generators (up to 6 GHz for 76-81 GHz coverage)

3 in 1

SAVE COST using IF Measurement Capability of RTS

Notes:
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Passive Target Simulator (PTS)

With this new PTS series TTE introduce the new test system for RF- and Microwave-Applications. This Target Simulator will be offered with different options and can easily customize for simple implementation in existing systems. The body of each system consists of robust aluminum housing, there are no moving parts insight, so it is impassible against shock and vibration. High precision machining cause to very low insertion loss and low interdependence between frequency and delay time. Due to the low attenuation the usage of large antennas with a high gain is unnecessary. The result is the reduction of undesired reflection insight the test chamber.

Features:
• Low Failure Rate, because there is no Operation Necessary
• Long Term Stability
• Low Insertion Loss
• Suitable for Broadband Applications
• 24 GHz, 76 GHz, 79 GHz and 81 GHz
• Customized Outline and Delay Time (ns) or Distance (m) on Request
• Special Lens Corrected High-Gain Horns Available
• TEM Transmission Mode

Application:
• Radar Module Testing in Assembly Lines
• Radar Testing and Development
• Test and Measurement

Specifications

<table>
<thead>
<tr>
<th>Material</th>
<th>Copper</th>
<th>Aluminum</th>
<th>Dielectric</th>
</tr>
</thead>
<tbody>
<tr>
<td>Polished</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chromated</td>
<td></td>
<td></td>
<td></td>
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</table>

Waveguide Form

<table>
<thead>
<tr>
<th>WR-15</th>
<th>WR-12</th>
<th>WR-10</th>
</tr>
</thead>
</table>

Frequency

<table>
<thead>
<tr>
<th>50-75 GHz</th>
<th>60-90 GHz</th>
<th>75-110 GHz</th>
<th>60-90 GHz</th>
<th>75-110 GHz</th>
</tr>
</thead>
</table>

Target

<table>
<thead>
<tr>
<th>Short Circuit</th>
</tr>
</thead>
</table>

Delay Distance

<table>
<thead>
<tr>
<th>0.2-10 m (7.9-393.7 in)</th>
</tr>
</thead>
</table>

Flanges

<table>
<thead>
<tr>
<th>UG387/U</th>
</tr>
</thead>
</table>

Polarization

<table>
<thead>
<tr>
<th>Horizontal or Vertical</th>
</tr>
</thead>
</table>

Mounting

<table>
<thead>
<tr>
<th>Outside the chamber (with 4 holes Ø5.0 mm (0.197 in))</th>
</tr>
</thead>
</table>

Mechanical Dimension

| 118.3x118.3x5.18 in |

Antennas

| 10-24 dBi Rectangular Gain Horns | 34 dB Lens Corrected Gain Horns available |

Testplots

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Part Number

<table>
<thead>
<tr>
<th>DL-WR15-Proto</th>
</tr>
</thead>
</table>

Notes:

All specifications are subject to change without prior notice.

Delay Line

Notes:

All specifications are subject to change without prior notice.
Specifications

RF Band: 68 - 82 GHz
VSWR: 1.3:1 nominal
Gain nom.: 32 dB

Model Number
LCA-76-82-32

Notes:
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Flexible Dielectric Waveguides (FDW)

With this new FDW Series, TTE introduce the new signal transmission lines for RF- and Microwave-Applications. This Dielectric Waveguides will be used, where low attenuation and high flexibility is required. The integrated transitions make the Dielectric Waveguide 100% compatible to your existing, rectangular waveguide equipment. The outer electrical shielding gives an additional mechanical protection to the waveguide section.

Features:
- Flexible Waveguide (bend- and twistable)
- Frequency up to 110 GHz (V, E and W Band)
- Full Waveguide Bandwidth
- Ultra-Low Attenuation, compared to Metal Waveguide
- Transition from Dielectric to metallic rectangular Waveguide included
- Mechanical and Electrical Shielding
- Customized Length

Application:
- S-Parameter Measurement
- Test and Measurement
- On-Wafer Probing

Specifications

<table>
<thead>
<tr>
<th>Waveguide Format</th>
<th>WR-15</th>
<th>WR-12</th>
<th>WR-10</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frequency</td>
<td>50-75 GHz</td>
<td>60-90 GHz</td>
<td>75-110 GHz</td>
</tr>
<tr>
<td>Length</td>
<td>2-4.2 m (7.2-13.8 ft)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Technology</td>
<td>Rectangular dielectric Material</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Flanges</td>
<td>UG387/U</td>
<td>UG387/U</td>
<td>UG387/U-M</td>
</tr>
<tr>
<td>Outside Protection</td>
<td>Metal Shielding</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Performance Graph</td>
<td>-/-</td>
<td>-/-</td>
<td>page 12/13</td>
</tr>
<tr>
<td>Part Number</td>
<td>FDW-15-XXm</td>
<td>FDW-12-XXm</td>
<td>FDW-10-XXm</td>
</tr>
<tr>
<td></td>
<td>XX= length in m</td>
<td>XX= length in m</td>
<td>XX= length in m</td>
</tr>
</tbody>
</table>
Performance Graph
FDW-10-1m

Test Setup:
Extender-Mode Changer-Dielectric Waveguide-Mode Changer-Extender

Frequency: 75-110GHz (W-Band)
Length: 1m

Notes:
All specifications are subject to change without prior notice.
**Corner Reflector (CRF)**

The Trihedral is a high precise machined component. The clutter on measurements that are caused by cars and other models will be nearly reduced. According customers required RCS and frequency we offer different sizes.

**Features:**
- Different Sizes available
- High Precise
- High Radar Cross Section

**Application:**
- RCS Reference
- Radar Test and Measurement

Theoretical max. RCS \( \sigma = \frac{4 m^4}{\lambda^2} \).

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**Radarbook**

Innovative Evaluation Platform for Microwave Radar Sensors

**Radarbook**

Start Your First Microwave Radar Measurements Within 5 Minutes

The **Radarbook** is a novel microwave radar evaluation platform for R&D laboratories, educational institutions, and for rapid prototyping. With out of the box software examples, startup of 24- or 77-GHz radar sensors from Doppler-radar to multi-channel MIMO-sensors is done within minutes.

A high performance analog processing chain and the FPGA based raw data processing allow radar experiments on a state-of-the-art level in a very short time.

Full software support of 24- and 77-GHz radar ICs with a Python or Matlab based GUI for a fully configurable processing chain.

**Modular RF-Frontend**

**High-Performance FPGA Processing**

**LINUX based OS or USB 3.0 to Host**

**Supported MIMO Frontends**
- Infineon 77-GHz
- Infineon 24-GHz
- Analog Devices 24-GHz

**Analog Input Chain**
- 12 analog channels
- Programmable signal-conditioning

**Signal-Processing**
- Rate reduction
- FFT, chirp-z
- Zoom-FFT
- Re-configurable

**Available Frameworks**
- Sampling
- Range-Doppler
- Beamforming
- MIMO

**Architecture/Interfaces**
- Linux OS on ARM with LAN, WLAN
- Optional USB 3.0 interface to host PC
- Flexible configuration
- Standardized command interface

**Single Power Supply**
- 12 – 36 V

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ADF-24G-TX2RX8 Frontend  MIMO-77-TX8RX8 Frontend

**Bottom view of the Radarbook with ARM module and FPGA.**
RF- and Microwave Components • Coaxial DC to 110GHz • Terminations • Adapters • Antennas • Bias Tees • Attenuators • DC-Blocks • Detectors • Equalizers • Filters • Cables and Cable Assemblies • Dividers • Combiners • Mixers • Multipliers • Noise Sources • Phase Shifters • Couplers • Hybrid Couplers • Switches • Connectors • Amplifiers • Circulators • Isolators • RF- and Microwave Components • Waveguides DC to 500GHz • Terminations • Adapters • Antennas • Attenuators • Detectors • Filters • Flexible Waveguides • Flexible dielectric Waveguides • Multipliers • Waveguide Structures • Couplers • Noise Sources • Mixers • Oscillators • Phase Shifters • Switches • Amplifiers • Circulators • Isolators • SMDs DC to 110 GHz • Terminations • Attenuators • Diodes • Filters • Inductors • Capacitors • Dividers • Transistors • Resistors • Chips / MMICs to 125 GHz • Modules • ASICs and Lcs • Up / Downconverters • Frequency Standards • Frequency Extenders • Filters • customized Modules • Synthesizers • Amplifiers • Systems • Radar Evaluation Boards • Radar Target Simulators (active/passive) • System Development • Satellite Hardware • Quasi-Optical Network Analyzers • Material • Software • CAD / CAE • Test & Measurement • Measurement Technology • Spectrum & Network Analyzing • Frequency Extenders • Handheld Synthesizers • Power Sensors • Test and Measurement Equipment • Cable/Antenna Testers • Power Monitoring • Delay Lines • Radar Target Simulators • Security • Radar Test Simulators • Signal Logging and Analyzing • Cellular Radio Jammers • SatCom • LNBs • Block Converters • 70/140 IF Converters • Transmitters / Receivers • Oscillators • Frequency Sources • Redundant Switching Systems • Amplifier Systems • Low Noise Amplifiers • Test Translators • Amplitude / Slope Equalizers • Power Supply Systems • Waveguides • Rotary Joints