Design and Manufacturing of RF and Electronic Equipment

Rantelon Ltd.
Company presentation

September 2012
Agenda

- History
- Competence
- Tools and Instruments
- Staff
- Research activities
- Products and Services
History

- In 1993 was founded Microwave Engineering Chair at Tallinn University of Technology thanks to great support from Miteq.
- Rantelon Ltd. was founded by two RF engineers in 1995 as a spin-off company of Microwave Engineering Chair at Tallinn University of Technology with Aim of designing and producing RF equipment, devices and components.
- Our objectives today:
  - to respond quickly on growing market demands
  - to use innovative technical solutions
  - to use efficient tools of design and prototyping work
  - to utilize a fast prototype assembly process
Competence

- RF System and Schematic Design
- Analog and Digital Electronic Design
- Embedded Control Design
- PCB Design
- Mechanical Design
- Project Management: Design from scratch to ready product into the market
- Quality management standard ISO 9001:2000
- Environment management standard ISO 14001:2004
Tools and Instruments

- RF Simulation Software
- 3-D Modelling Software
- PCB Schematic and Layout Software
- Vector Network Analyzers up to 62GHz
- Spectrum Analyzers up to 26.5GHz
- RF Signal Generators up to 20GHz
- Noise figure meter 20GHz
- Arbitrary Waveform Generator up to 6GHz
- Logic Analyzer
- Quick Circuit Prototyper
- High Precision Screen Printer for Solder Paste Application
- Highly Flexible Pick-and Place Machine
- Reflow Soldering System
Instruments: Simulations

1. Enter balanced load as Zload = R + jX
2. Enter generator Rg and Frequency
3. Optional: Enter circuit parasitic capacitance, Cp

<table>
<thead>
<tr>
<th>Stage Data</th>
<th>Units</th>
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<tbody>
<tr>
<td>Stage Name</td>
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<tr>
<td>Noise Figure</td>
<td>dB</td>
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<tr>
<td>Gain</td>
<td>dB</td>
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<tr>
<td>Output IP3</td>
<td>dBm</td>
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<tr>
<td>dNF/dT Temp</td>
<td>dB/°C</td>
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<tr>
<td>dIP3/dT IP3</td>
<td>dBm/°C</td>
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<tr>
<td>Stage Analysis:</td>
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<tr>
<td>NF (Temp cor.)</td>
<td>dB</td>
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<tr>
<td>Gain (Temp cor.)</td>
<td>dB</td>
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<tr>
<td>Input Power</td>
<td>dBm</td>
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<tr>
<td>Output Power</td>
<td>dBm</td>
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<tr>
<td>dNF/dc NF</td>
<td>dB/dB</td>
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<tr>
<td>dNF/dc Gain</td>
<td>dB/dB</td>
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<tr>
<td>dIP3/dc IP3</td>
<td>dBm/dB</td>
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Enter System Parameters:
- Input Power: -50 dBm
- Analysis Temperature: 25 °C
- Noise BW: 1 MHz
- Rel Temperature: 25°C
- S/N (for sensitivity): 10 dB
- Noise Source (Ref): 290 K

System Analysis:
- Gain: 82.50 dB
- Noise Figure: 5.11 dB
- Noise Temp: 651.32 °K
- MDS: -100.86 dBm
- Sensitivity: -98.86 dBm
- Noise Floor: -168.96 dBm/Hz
- Input IP3: 70.50 dBm
- Output IP3: 12.00 dBm
- Input M level: 5.00 dBm
- Output M level: 72.50 dBm
- Output M level: 41.00 dBm

Calculate Z0: [R4]
Instruments: Circuit
Instruments: Control System

- algorithm
- code
- debugging
Instruments: PCB Design
Instruments: Mechanics
Instruments: Manufacturing 1

Automated line:
- pasta printer
- pick and place
- oven
Instruments: Manufacturing 2

Hand assembly:
- THT
- SMT
- connectors
- special
Test and Measurements

- S-parameters
- power consumption
- spectrum
- phase noise
- wave forms
- EVM
- standards
Staff

- Engineering department
  - 6 RF and electronic design engineers
  - 2 Embedded system design engineers
  - 3 CAD and 3-D mechanical design engineers

- Production department
  - 2 Prototype assemblers
  - 5 Productions assemblers
  - 2 Automated assembly line operators
  - 2 Storehouse employees
  - 2 Final tuning and Testing technicians
  - 3 Mechanical processing employees
Contribution in Research projects

- SDR technology based applications:
  - Cognitive Radar (pulse compression)
  - RF Spectrum Surveillance
  - Directional finder

- Jammer for portative and vehical use
- Digital RF Filtering
Telecom Products

TETRA, GSM 900, 1800 and UMTS Repeaters
- Customer specified frequency band, selectable IF bandwidth
- Integrated or external indoor antenna
- Dualband selective E-GSM 900 repeater
Telecom Products

RF Amplifiers

- Outdoor and Indoor Wide Band Low Noise Amplifiers up to 6GHz
- Indoor Wide Band High Power Amplifiers up to 6GHz
- Band selective low noise amplifiers up to 12GHz
- Power amplifier modules up to 200W, 2.2GHz
Telecom Products

RF Frequency conversion
- Up converters
- Down converters
- Transverter and Synthesizer modules
Telecom Products

RF Passive components

- Wilkinson and Hybrid Power Dividers
- Directional Couplers (Tapper)
- Diplexers
- Indoor GSM and 3G Antennas, 880-2200MHz
- Indoor and Outdoor, directional and omnidirectional WiFi antennas
- 75<->50 ohm Transformer, Surge protector, Bias-Tee, DC Block, up to 3GHz
Measuring Instruments

Field test Instruments
- Test Signal Generator, 880...2170MHz, 0dBm
- Power Meter, 10...2500MHz, -60..0dBm
- Harmonics generator for testing return path in CATV
CATV Products

Active and passive components

- Antenna Distribution Amplifiers
- Fixed and Adjustable Gain Amplifiers
- Low Noise Amplifiers
- Lowpass and Highpass Filters
- Bandpass and Bandstop Filters
- Duplex and Diplex filters
Military Products

Jammers, very high power amplifiers, measuring instruments

- 1kW Amplifiers
- Field Strength Meters
- SWR and power meters
- Transport and Portable UHF/VHF Jammers
- RF Spectrum Monitoring
Services

- Electronic devices designing according to custom specification
- Low and Medium volume PCB Assembly
  - Mounting of SMT components onto PCB using automatic production line
  - Mounting of through hole components
  - Final assembling
- Tuning and final testing of RF devices
- Repairment of RF devices