A vertical strip on the left side of the slide shows various microwave electronic components, including connectors and filters, with labels such as 'JQL', 'J100869T0', 'D1', '41011', 'JQL', 'M', '950-1725', 'N', '9017449', 'JQL', 'J10010960', 'SSV-1-M3', and '41011799'.

JQL ELECTRONICS INC.

MICROWAVE GROUP

Technology On The Move



- Established in 1996
- 385 Employees Worldwide
- 16 Millions USD Revenue in 2014

Company Overview



JQL Electronics Inc (Headquarter)
Rolling Meadows , IL, USA
RF Component /MMIC Design &
Manufacturing



JQL Electronics (Shanghai) Ltd
Shanghai China
100% Ownership

RF Component Design,
Manufacturing
RF Isolator/Circulator
RF Filter/ Coupler/Divider/
Bias Tee/Antenna etc.
PCBA Assembly



Ferrotech Advanced Materials
Ltd. 65% Ownership
Cixi Zhejiang, China

Garnet/Ferrite/Advanced
Semiconductor Materials



Wodetech Technology Ltd
30% Ownership
Changzhou Jiangsu China

Casting Machining



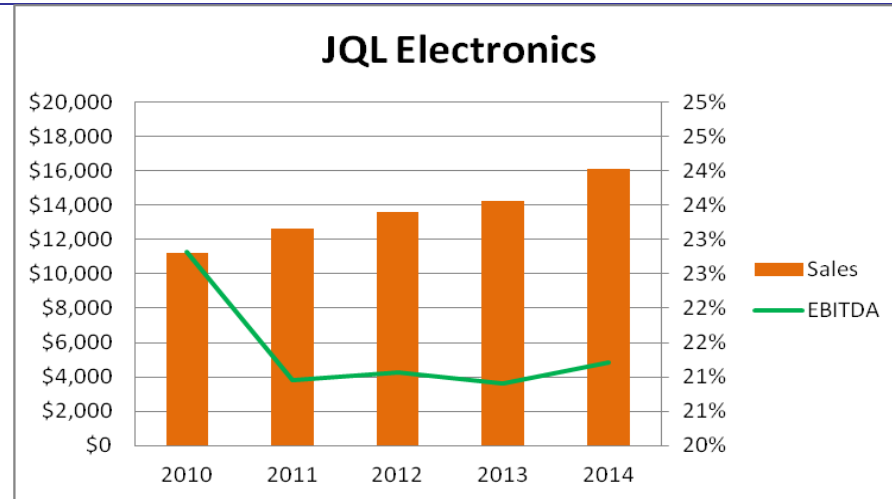
JingQuanLi Electronics Ltd
Shenzhen Guangdong China
30% Ownership

Appliance Power Transformer/
Telecom Power Module/ Design,
Manufacturing





Strong Financials since 1996



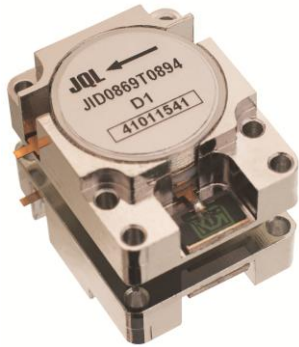
- JQL's 20th Year
- JQL has been profitable since 1996
- JQL revenue 2015 - \$16.5M
- JQL is a debt free company
- New Shanghai Facility, now totaling 86,000sq ft

ISO9001, 14001



JQL Product Profile

RF Isolators & Circulators



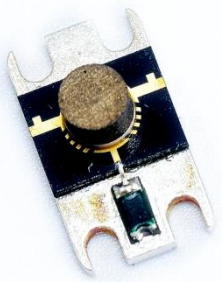
DROP-IN



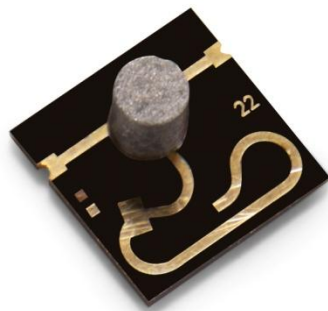
WAVEGUIDE



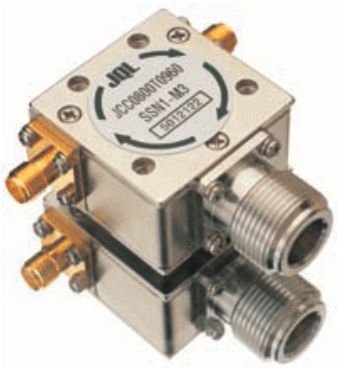
SURFACE MOUNT



MICROSTRIP



SURFACE MOUNT MICROSTRIP



COAXIAL



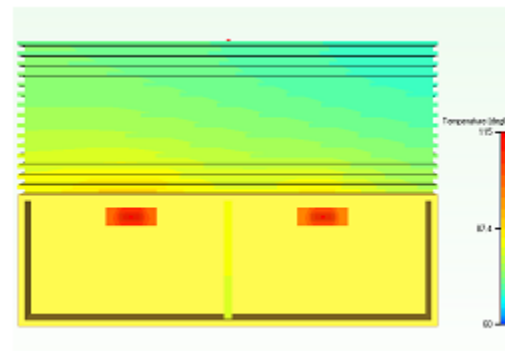
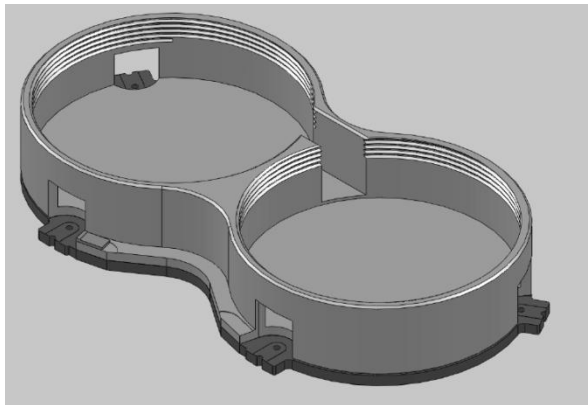
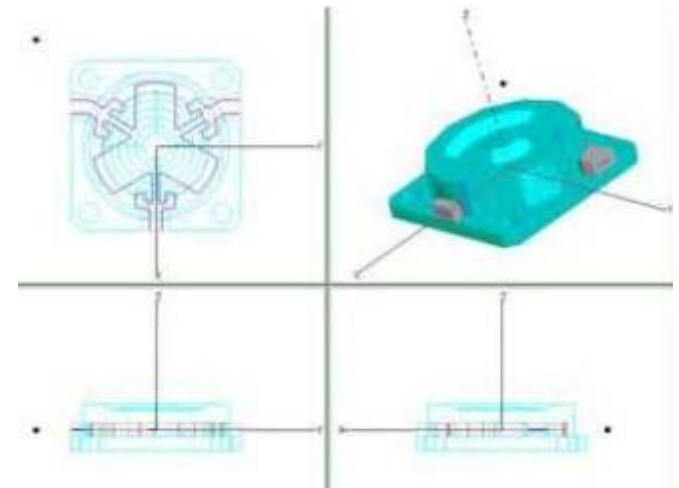
ISO-ADAPTER



JQL Engineering Capability

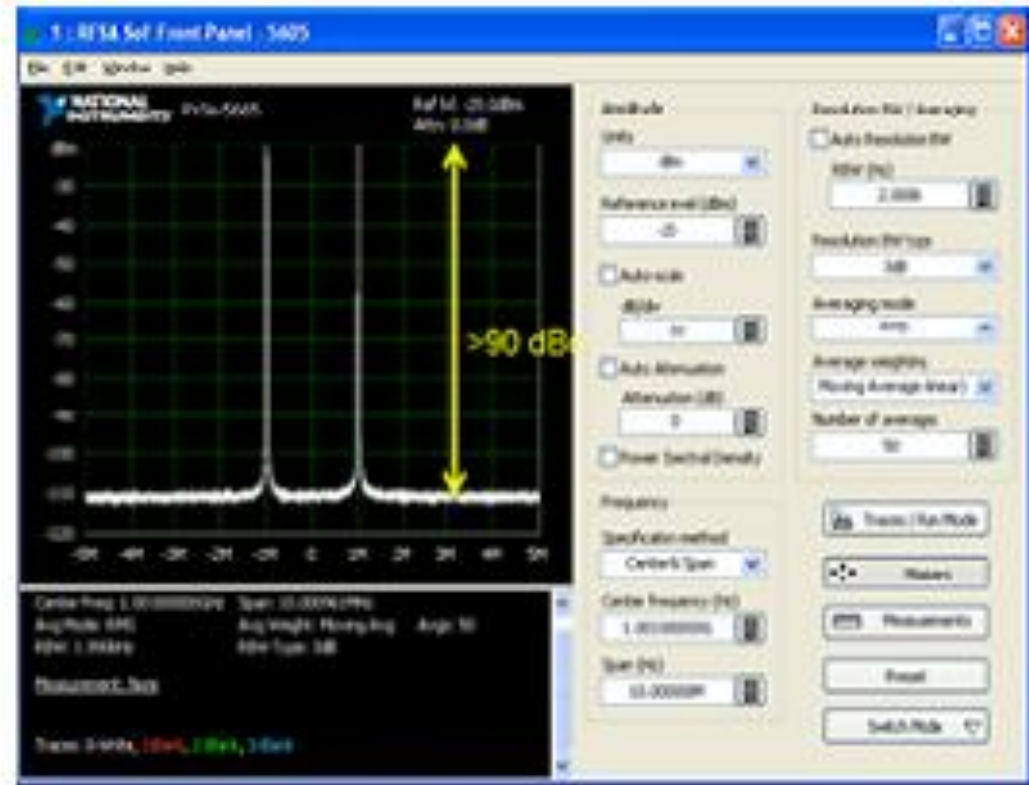
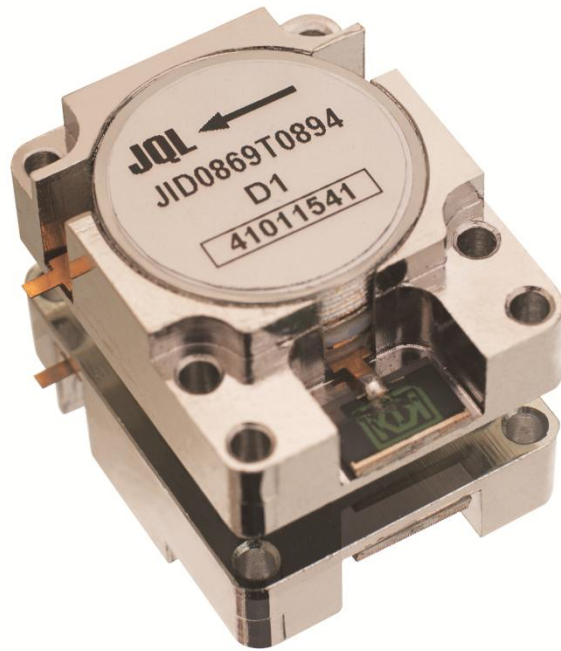
Engineering Capability-Isolator/Circulator Design

1. Heritage of JQL & Dorado Ferrite Designs, more than 1500 designs from 100MHz to 75GHz
2. Well trained engineering Group a combination of computer simulation & rich engineering experience in USA & China
3. Modern Design Capabilities
 - HFSS, Microwave Office
 - 3D Modeling
 - Thermal Analysis



JQL Engineering Capability

Engineering Capability-Drop-in Isolator/Circulator Design



- High Performance Drop-in Isolator/Circulator
- **Ultra Low Intermodulation Performance -90dBc @ 2x45dBm**
- Ultra Low Insertion Loss 0.12dB for UMTS Band
- 100MHz~20GHz

JQL Engineering Capability

Engineering Capability-SMT Isolator/Circulator Patented Design

- **Smallest** - 8.9mm smallest surface mount circulator/isolators in the industry.
- Patented Design - S band, C band, X band PCS,DCS,CDMA, UMTS wireless bands, RFID, WiMax
- Super Flatness
- Solid Structure - Wire bonding Technology
- Low IMD Design - $< -85\text{dBc}$
 $>30\text{dB}$ @ 2nd & 3rd Harmonic Bands
- High Peak Power Handling for C bands



**Patented Design
1st Generation**

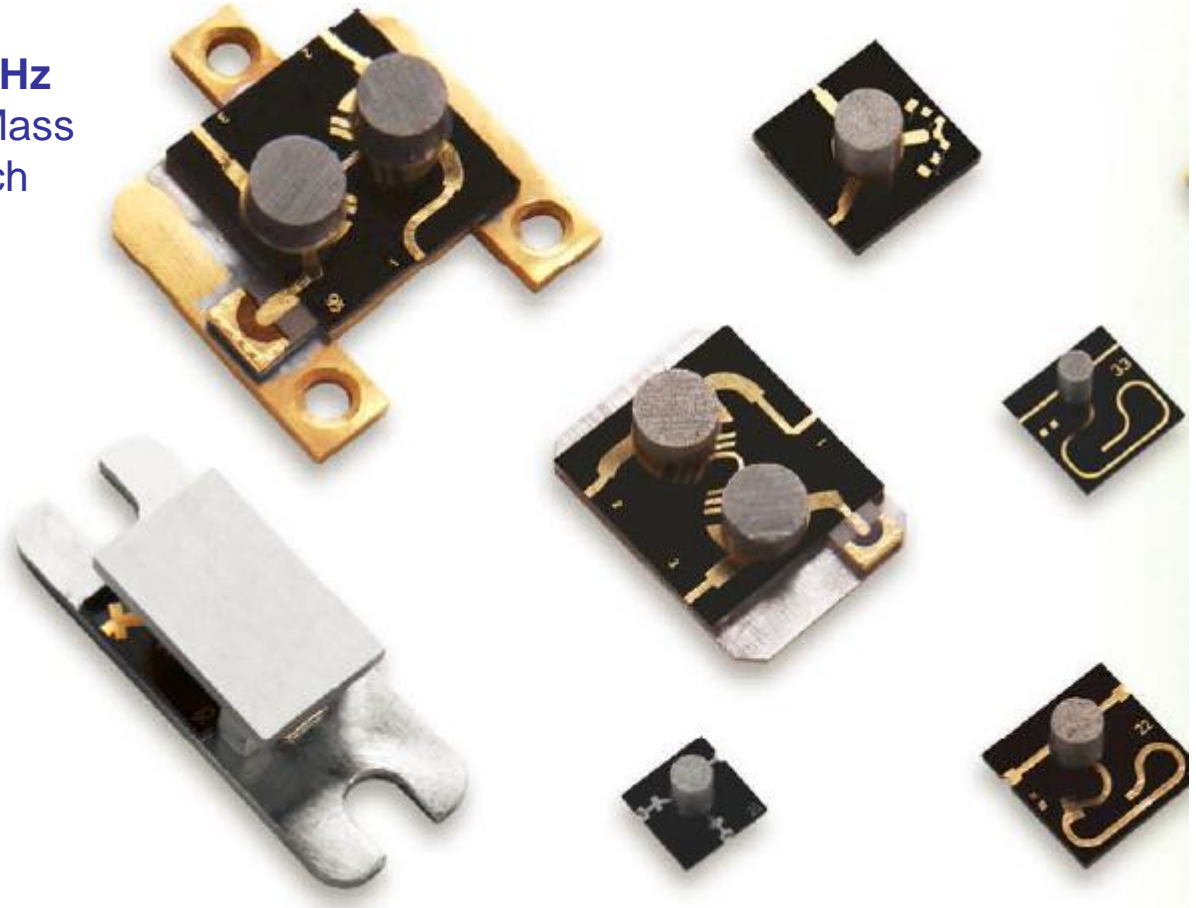


**Patented Design 4th
Generation**

JQL Engineering Capability

Microstrip Isolator/Circulator High Frequency

- High Performance
- **Frequency up to 65GHz**
- Small Package/ Low Mass
- Flexible technology, rich design portfolio
- Thin Film technology
- Lead free & ROHS



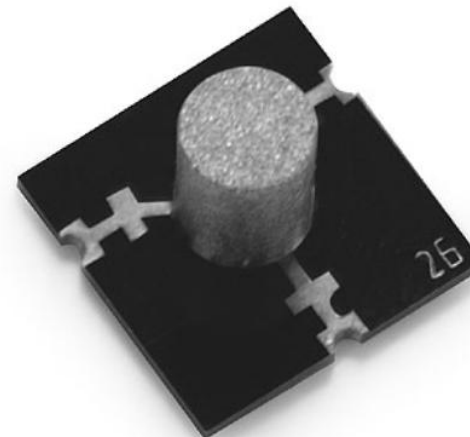
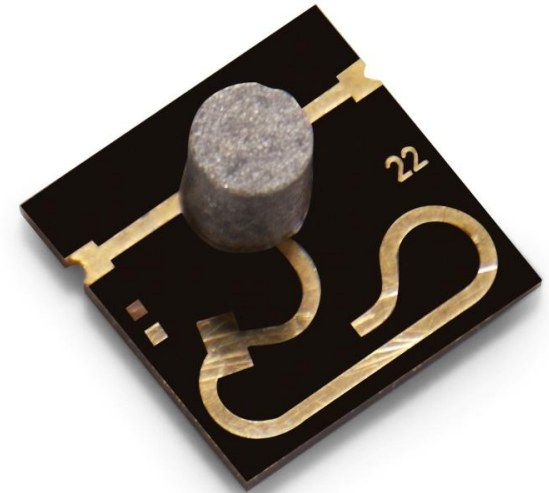
JQL Engineering Capability

SMT Isolator/Circulator High Frequency

- Microstrip - True Surface Mount.
- Frequencies up to 43GHz in mass Production
- Frequencies up to 65GHz in Development
- Small Size, e.g. 26GHz: 4 x 4 x 3.5mm
- Low Loss Nickel Ferrites
- Lead Free & ROHS Compliant
- Thin Film Technology
- Laser Trimming
- Designed for standard reflow process Pick & Place automation
- Typical Specification (26GHz):
 - Insertion Loss: 1.1dB
 - VSWR: 1.3:1
 - Isolation: 18dB

•Manufacture:

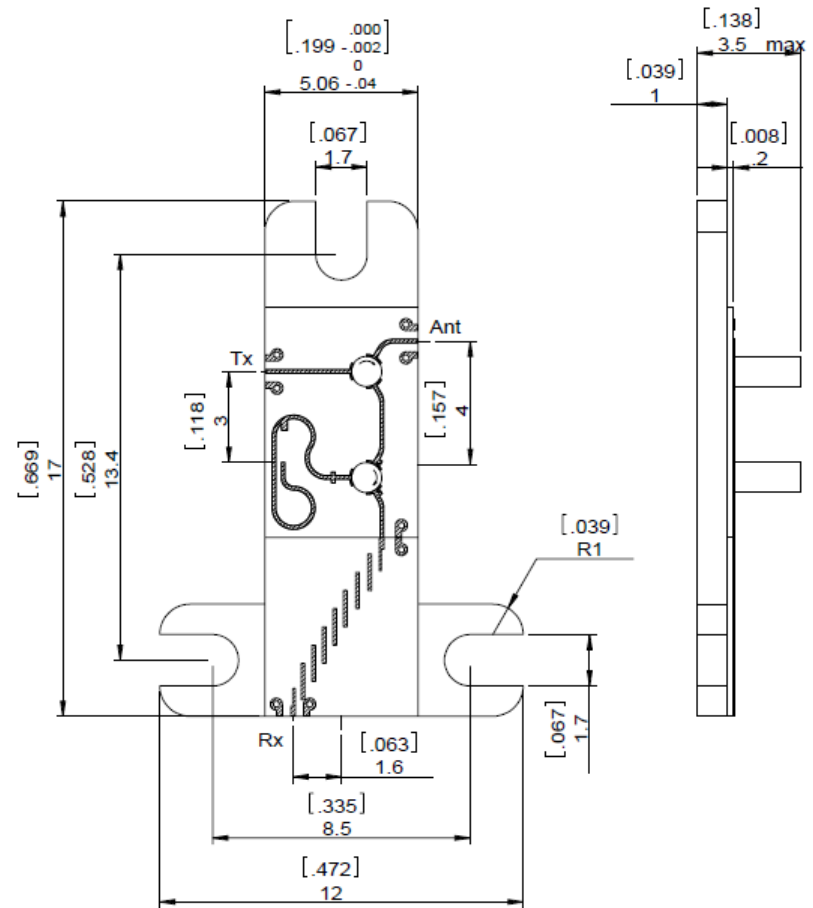
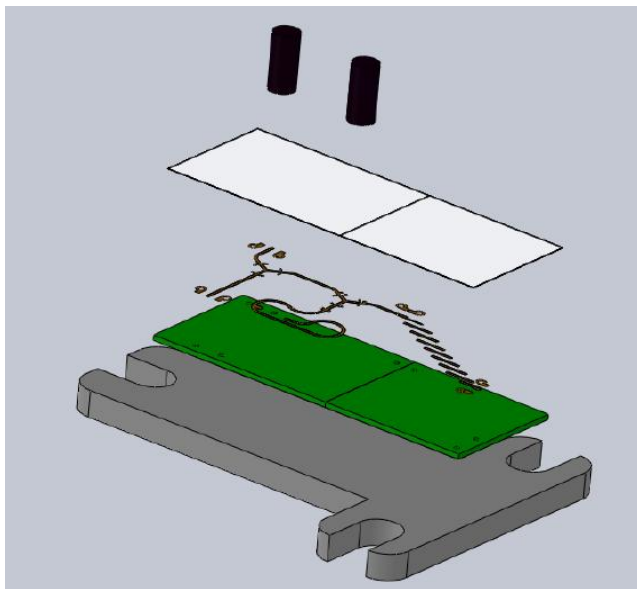
- 20 yrs Mass production
- No1 Supplier in World for Microstrip
- Automated Assembly For V High Volume
- Currently China & Russia
- USA Q2 2017



JQL Engineering Capability

New product in Development: Dual Isolator with integrated filter

- True Surface Mount.
- Frequency up 38-40GHz
- Lead Free & ROHS Compliant
- Designed for standard reflow process & Pick & place automation
- Typical Specification (26GHz):
 - Insertion Loss: 0.9dB TX-ANT, 5.5dB ANT-RX
 - Return Loss: 18dB
 - Isolation: 33dB (ANT-TX), 18dB (TX-RX, RX-ANT)
 - Rejection $F_c \pm 2\text{GHz}$ – 35dB



JQL Engineering Capability

Engineering Capability-Waveguide Isolator/Circulator Design



- JQL Offers 5.9GHz~80GHz
- WR137~WR12 Isolator/Circulators
- Machine/ Cast/ Extruded housings

• Slim Design Waveguide Isolator

- Low Cost
- 12.7mm -----WR90
- 12.7mm -----WR75
- 12.7mm -----WR62
- 9.5mm -----WR42
- 8mm -----WR28
- 10mm -----WR22

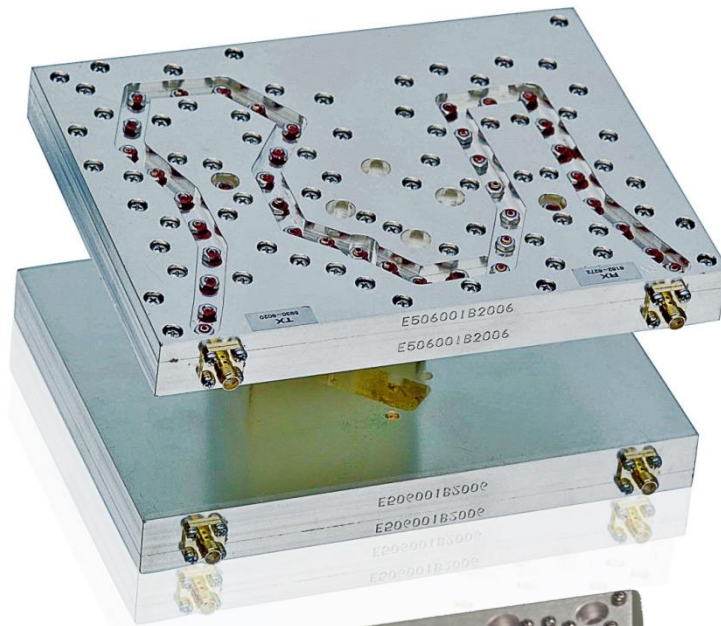
• High Performance Waveguide Circulator

- 500W
- Ultra High Isolation

JQL Engineering Capability

Engineering Capability- Radio Link Isolator & Diplexer Design

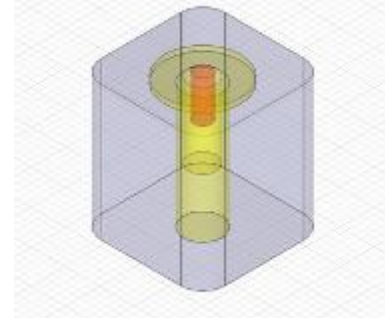
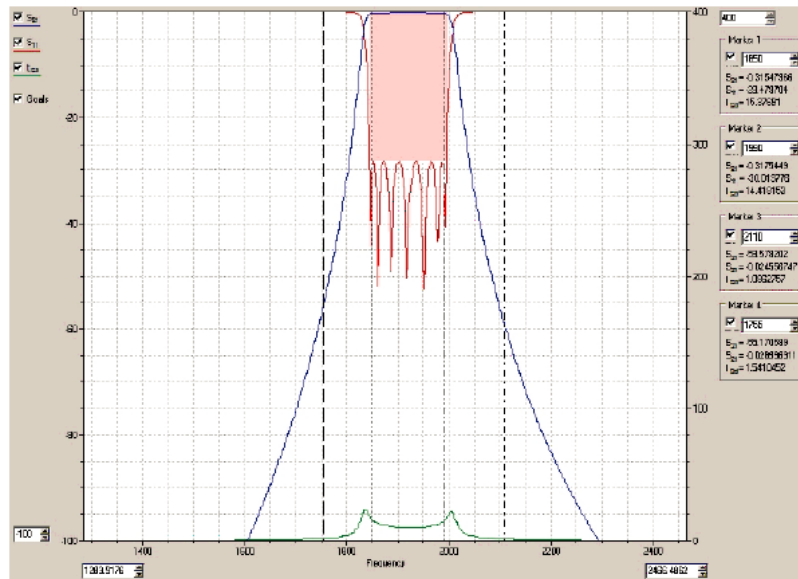
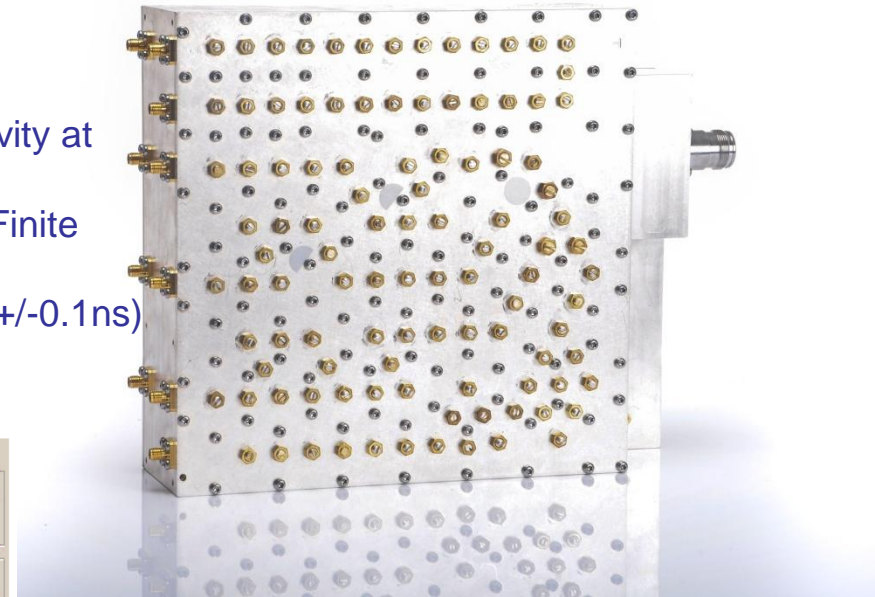
- Waveguide Filter Technology with Waveguide or Coaxial ports
- Waveguide Isolators
- Waveguide Diplexers
- Integrated Isolators & diplexers
- 6GHz~44GHz
- Design for single bands or multiple bands
- Application knowledge: design for short lead-time band configuration in manufacturing



JQL Engineering Capability

Engineering Capability - Filter Design

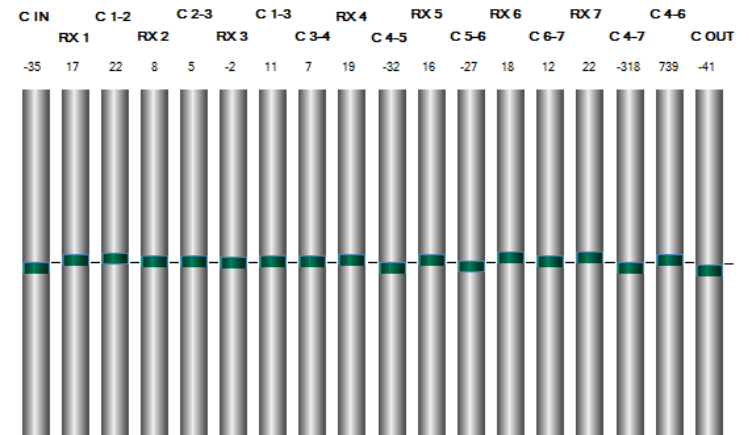
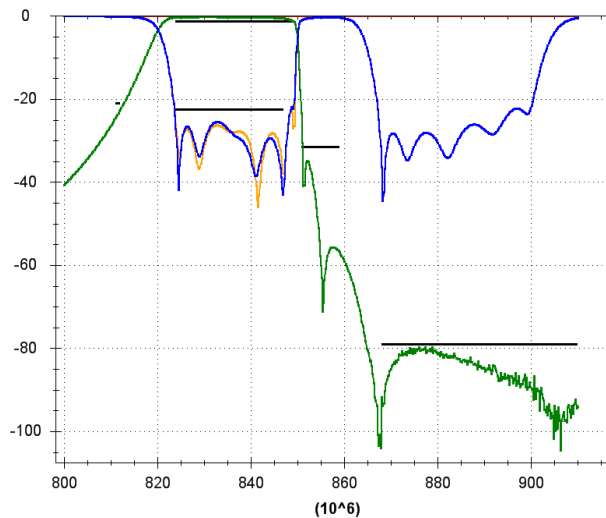
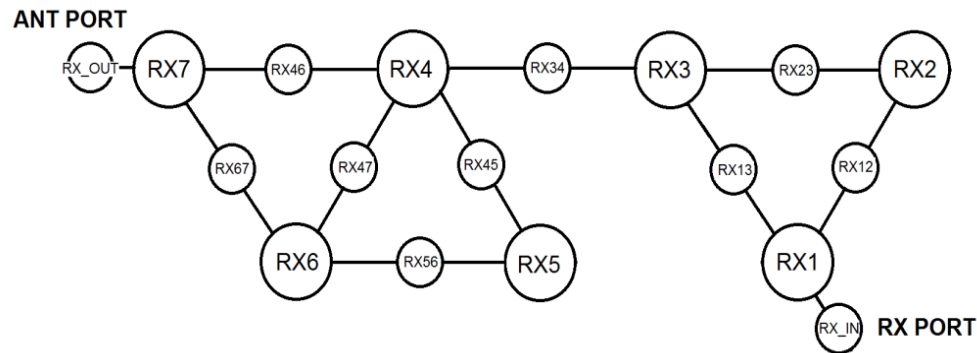
- Air Cavity and Dielectric Loaded Cavity Filters
- HFSS and Microwave Office Simulation
- Rapid Prototyping
- Q factor up to 8,000 (Air Cavity at 900MHz)
- Q Factor up to 20,000 (Dielectric Loaded Cavity at 900MHz)
- Group Delay Equalisation techniques using Finite Transmission Zeros
- Group Delay Equalisation achieves flat GD (+/-0.1ns) over ~ 60% of the BW



JQL Manufacturing Capability

Manufacturing Capability-Computer Aided Filter Tuning

- Proprietary In-House Computer Aided Tuning
- Reduces Training Time
- Reduces dependency on 'highly skilled' tuners

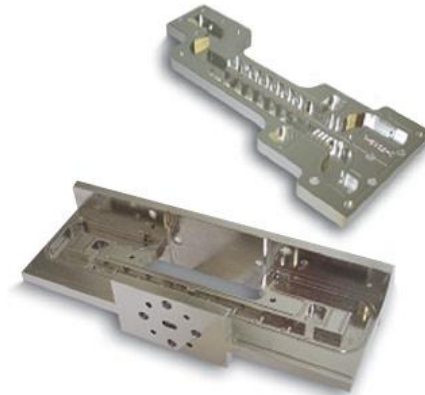


JQL Product Profile

RF Microwave Filters



- High Performance Bandpass, Band Reject, Low Pass, High Pass, Duplexer, Triplexer, Quadplexer Multiplexer



- Radio Link Duplexer
• Point to Point & Point to Multi-point Radio Duplexer



- Helix Diplexer, Mobile Diplexer
- Public Safety, Tetra

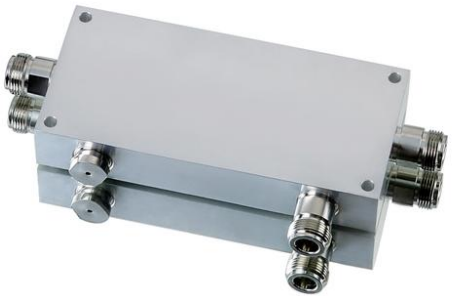


- Ceramic Filter 0.4-6GHz,
• Bandpass, Duplexer,
• Triplexer, Quadplexer,
• Multiplexer,



JQL Product Profile

Engineering Capability: Low PIM RF Components



Low PIM Directional Coupler (-165dBc)



FCC Approved Low PIM Smart Bias Tee (-160dBc)



Low PIM Hybrid Combiner



Low PIM Power Splitter/Divider



Low PIM DC Blocker



Low PIM Tapper



JQL Engineering Capability

Engineering Capability-Material Knowledge



Joint Venture- Ferrotech Advanced Material

Ferrite Ceramic Semiconductor Factory

- Led by the top engineers of the ferrite industry in USA
- Partnered with the major Chinese rare earth material supplier
- Phase 1 production of Yttrium Garnets
- Phase 2 production of High Electric Garnets
- Phase 3 production of Nickel Spinels



JQL Manufacturing Capability

Manufacturing Capability- Environmental Testing

- **Power Testing:** In house power testing capability, up to 200W from 100MHz to 3.5GHz
- **Shock:** In house temperature shock testing, less than 60 seconds from -55C to +120C
- **Vibration:** In house vibration tester
- **RoHS:** X Ray RoHS Detector
- **Electronic Plating Thickness:** X Ray Electric Plating Tester
- **PIM Testing:** Summitek PIM Testers 700, 790, 800, 900, 1800, 1900, 2100MHz
- **In House PIM Testers** 150~2600MHz for inband forward testing (RF Isolator/Circulator)
- **Antenna Testing Room**



JQL Manufacturing Capability

Manufacturing Capability- SMT Assembly, Mechanical Assembly & Tuning



SMT Assembly Line Capability

- Yamaha YV 100X, 100 II Pick & Place
- VTA Precise Screen Printer
- VTA Lead Free Reflow Oven With 8 Temperature Zones
- Experienced Production Engineer Team



• Circulators, Isolators & Filter products:

- Experienced Assemblers & Tuners
- Each Unit Final Tested by QA
- PIM test on EVERY unit with a PIM Specification
- Temperature tests on Ferrite batches

JQL Operation Core

INFOR ERP



- JQL invested and adapted INFOR ERP system.
- SOP is expanding to every operation & function through the JQL.

JQL Quality Control Capability

Quality is JQL's Business Foundation

- <500PPM return of filter production, over 50kpcs/135 models of filters since 2010
- <500PPM return of isolator circulator product line 500k pcs manufactured annually
- SOP - Standard operation procedure is fully enforced at the production line monitoring by IPQC
- Dedicated technicians perform the calibration to achieve the better tuning quality vs. the tuners calibrate by themselves.
- MES – Manufacturing Execution System traces all the procedures to ensure the integrity of manufacturing. No production procedure can be skipped to the next step.
- Traceability of the materials - MES application software, all traceability is based on Barcode
- Traceability of product performance - MES database for all JQL products
- Accessibility of QA database - JQL offers FTP access to JQL QA database for all key customers to check the original testing data with 5 yr minimum from the date of manufacturing 24/7
- ISO 9001 & 14001 registered.



JQL Supply Chain Capability

JQL Supply Chain Integration Machining & Casting

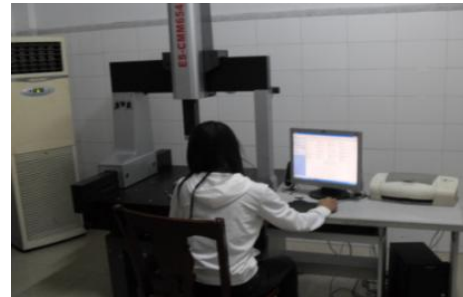
- **JQL Shanghai (Machining)**

- 1st Floor of JQL Shanghai Building
- Precise machining for RF Component manufacture



- **JQL Precision Machining (Tongling) Co Ltd.**

- Tongling Anhui Province
- JV: JQL Majority Shareholder
- CNC for cavity filters



- **SuoAo Mechanical Manufacturing Co. Ltd.**

- Changzhou, Jiangsu Province
- JV: JQL Minority Shareholder
- Castings



JQL Value

