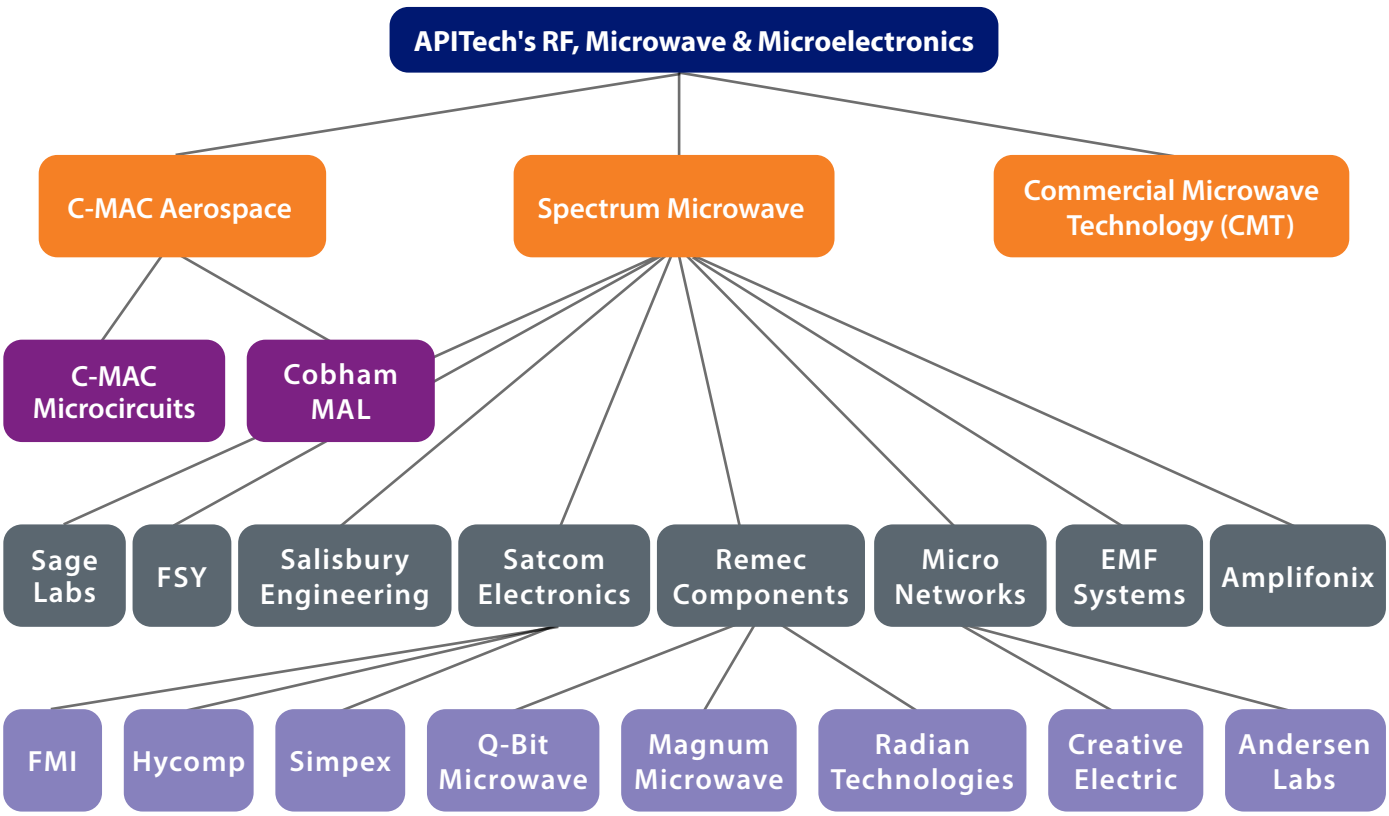
MICROWAVE FILTERS
PRODUCTS & CAPABILITIES

apitech

APITech is a top provider of precision-engineered, high performance RF & microwave and microelectronic solutions for high reliability and mission critical applications in the global defense, commercial and space markets.

APITech'S RF, Microwave & Microelectronics

- 13 locations worldwide dedicated to the design, development and manufacture of one of the **world's largest selections** of RF/ microwave components and subsystems
- 70+ years of extensive and diverse **program experience**
- **Preferred Supplier** status at many major primes
- **Engineering** accounts for **14%** of the team's overall composition
- Dedication to quality; **AS9100** and **ISO 9001** certified



Filter Products

IMAs

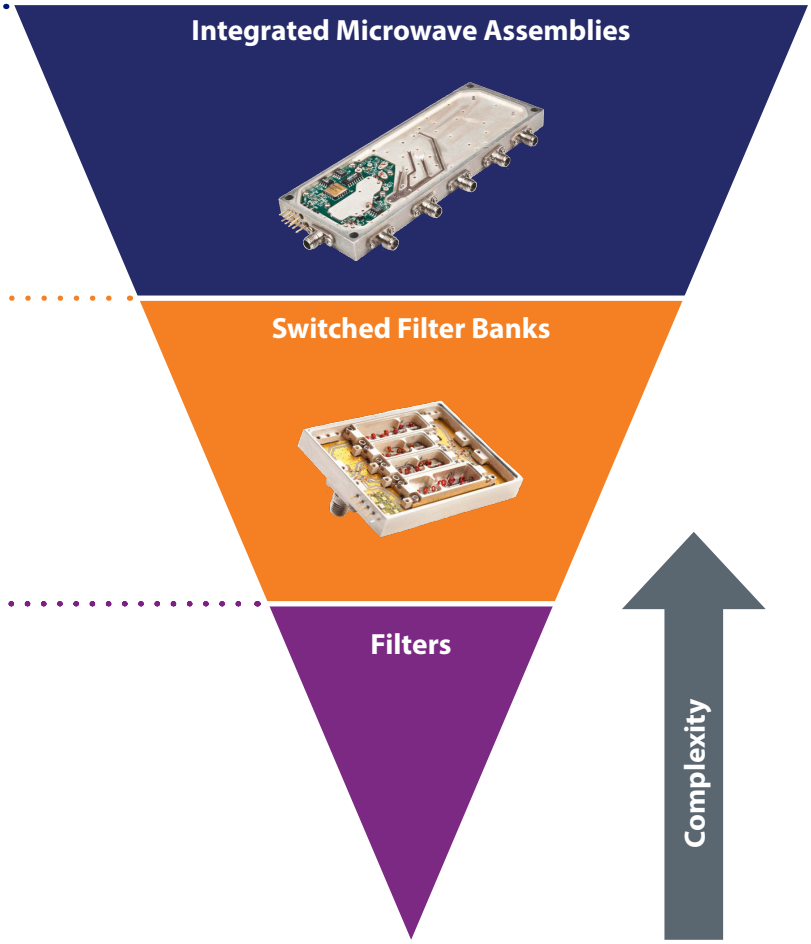
- Digital Frequency Discriminators
- Upconverters/Downconverters
- Amplified Preselectors
- Frequency Activity Detectors
- Frequency Multipliers

Switched Filter Banks

- High Isolation (>80 dB)
- Fast Switching Speeds (<25 ns)
- High Power (100 watts +)
- In-house Filter & Switch Design
- Multiple Control Interfaces (LVTTL, RS-232, USB)

Filter Optimization

- Cavity
- Lumped Element
- Ceramic
- SAW
- Suspended Substrate



High Performance, Fully Customizable Multi-Channel Filter Assemblies

- Bandpass, Lowpass, Highpass, Bandreject
- Duplexers/Diplexers, Triplexers, Multiplexers
- Dielectrically Loaded Cavity Filters, Duplexers & Multiplexers
- Low Cost Ceramic
- Cavity / Combline, TEM
- Lumped Element
- Suspended Substrate
- SAW
- Waveguide

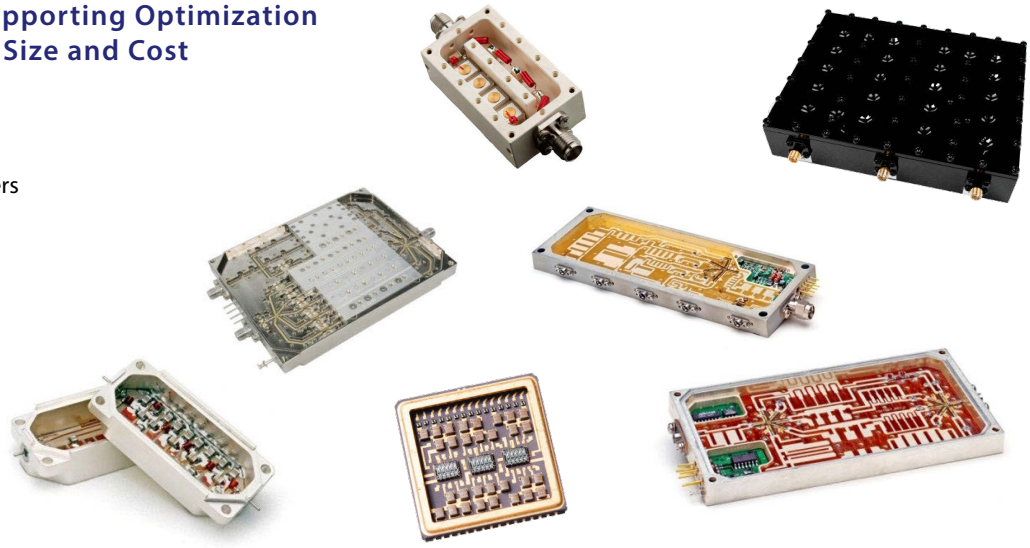
Wireless Assemblies & Sub-Systems

- Multiplexers
- PIN Diode Switch Filters
- Filtered GPS LNAs
- Integrated Switch Filter Banks
- High Power Amplifier + Filter Assemblies

Co-Site Interference Mitigation Filters

Broad Filter Capability Supporting Optimization of Program Performance, Size and Cost Requirements

- Lumped Element Filters
- Cavity /Combline/Interdigital Filters
- Tubular Filters
- Waveguide Filters
- Ceramic
- Suspended Substrate Stripline
- Surface Acoustic Wave (SAW)
- Diplexers & Multiplexers

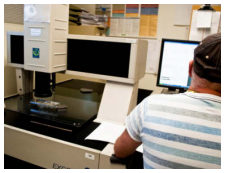


Filter Manufacturing Capabilities

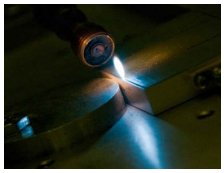
Prototype/ Production Centers

Prototype Machine

CMM (Coordinate Measurement Machine)

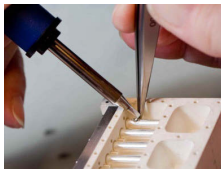


Laser Welding



Fabrication & Assembly

J-STD-001, Class 3 Soldering



SMT/Pick n Place

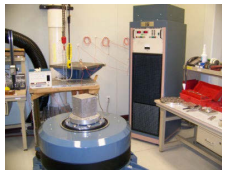
Miniature Assembly

Electrical & Environmental Testing

Automated Test & Data Recording

Extensive Burn-in and Thermal Cycling Capabilities

Shock & Vibration Testing



The Filter Specialists

Our customers are able to weigh the benefits of…

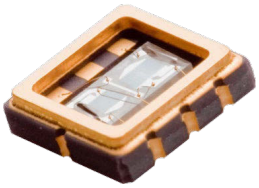
- Size vs. Loss
- Rejection vs. Size
- Selectivity vs. Group Delay

…and select the perfect filter to optimize system performance and value.

Bandpass Filters

APITech's bandpass filters are available with nearly every topology including:

- SAW
- Cavity
- Lumped Element
- Tubular
- Suspended Substrate
- Ceramic
- Waveguide



Lowpass Filters

APITech's lowpass are available with the following topologies:

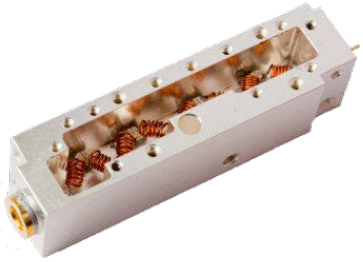
- Lumped Element
- Tubular
- Suspended Substrate

Our expert engineers can utilize multiple topologies in a single design!

Highpass Filters

APITech's highpass filters are available with the following topologies:

- Lumped Element
- Suspended Substrate



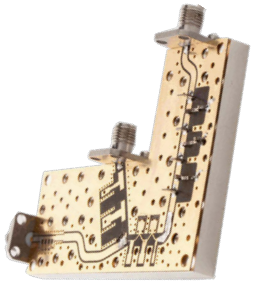
Band Reject/Notch

API's notch filters are available with the following topologies:

- Cavity
- Lumped Element
- Suspended Substrate
- Ceramic
- Waveguide

Diplexers, Triplexers, Multiplexers

Suspended Substrate is the ideal topology for broadband contiguous multiplexers. We also provide multiplexers utilizing lumped component and cavity based structures.



Filter Topologies

Lumped Element

Features

- 300 kHz to 10 GHz
- Smallest and lightest
- Versatile topologies and transfer functions
- Ideal for moderate to very wide bandwidths
- Connectorized or surface mount
- Easily multiplexed
- Temperature stable options
- RoHS Compliance

Our custom package concepts provide additional shielding for better ultimate rejection.

We use creative layouts which offer reduced package sizes when needed.

Cavity

Features

- 400 MHz to 40 GHz
- Low insertion loss
- High selectivity Chebyshev and pole-placed
- Temperature stable options
- High power handling capability
- 0.1 to +60% bandwidth
- Low profile designs available
- Drop-in designs to 20 GHz
- Low intermodulation products

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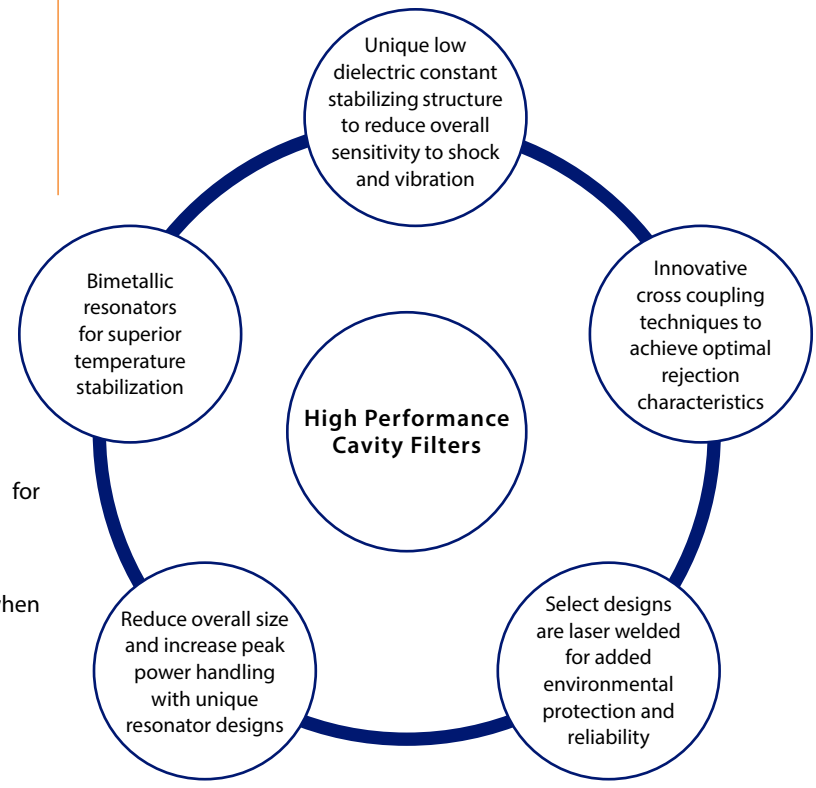
We use creative layouts which offer reduced package sizes when needed.

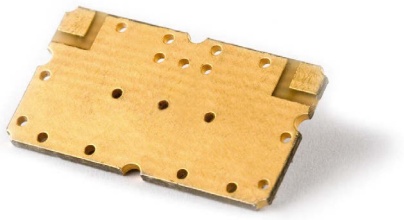


Ceramic

Features

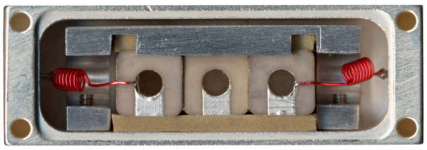
- Frequency range - 400 MHz to 6 GHz
- Bandwidths - 1 to 10%
- 2 to 6+ sections, custom packages available
- Low cost, small size
- Good insertion loss relative to size
- Surface mount
- Open frame or sealed for hi-rel
- Typical applications are:
  - GPS
  - ISM
  - WLAN
  - IFF
  - ManPack

Gold plating on surface mount packages offers better solderability & corrosion resistance



Temperature Stabilizing Elastomers for:

- Harsh Temperature Environments
- Demanding Shock & Vibration Specifications



Capacitive coupling arrays offer:

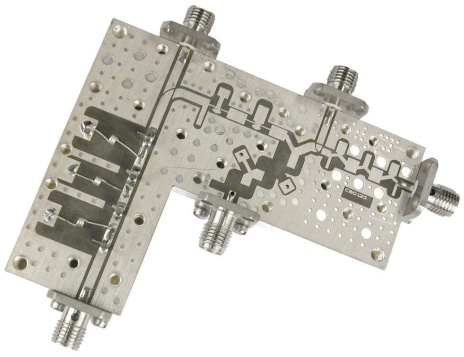
- Design Flexibility
- Superior Performance
- Enhanced Reliability
- Enhanced Repeatability

Suspended Substrate

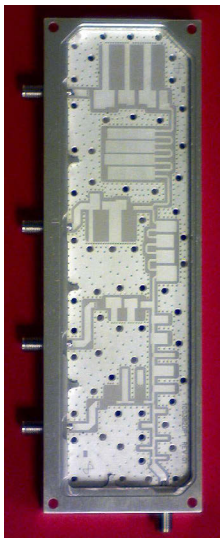
Features

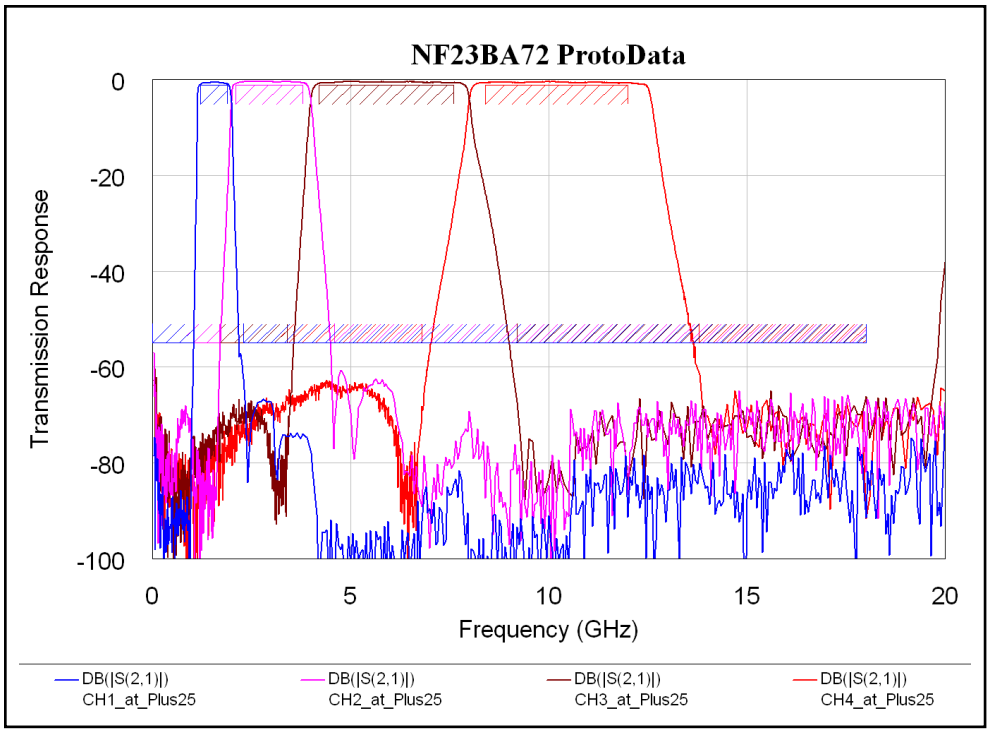
- 2 to 40 GHz
- Ideal for broadband multiplexing
- Chebyshev and elliptic response
- Well suited for high shock and vibration applications
- Highly repeatable (ideal for matched filters)
- Broadband receivers
- Easily integrated with other components

We also offer immersion silver plating for very low loss designs



Suspended Substrate Quadraplexer





Surface Acoustic Wave (SAW)

Features

- Frequencies from 20 MHz to 2600 MHz
- Fractional Bandwidths 0.04 to 60%
- Hermetically Sealed

Available Options

- Available Options
- Low Loss Performance (< 2 dB)
- Shape Factors Below 1.10:1
- Customized Designs for Specific Applications

Tubular/Coaxial

Features

- 30 MHz to 5 GHz
- Broad Stopbands
- Ideal for Harmonic Rejection
- Moderate Bandwidths (2 to 50%)
- Chebyshev Transfer Functions
- High Power Handling Capability
- High Power Tubular Designs to 5000 watts
- Low Loss and High Ultimate Rejection
- Consistent Unit to Unit Performance
- Utilizing Precision Centerless Ground Stock
- Lowpass or Bandpass Configuration
- High Shock Rugged Mounting Configurations Available

Waveguide

Features

- 2 to 40 GHz
- Bandwidths 0.1 to 10%
- Extremely Low Insertion Loss
- High Power Handling
- RX/TX Waveguide Diplexers in Custom Configurations
- Waveguide Flanges are Standard
- SMA, TNC, or Type-N Connectors Available
- Integral Heat Sink

Rapid Filter Centers

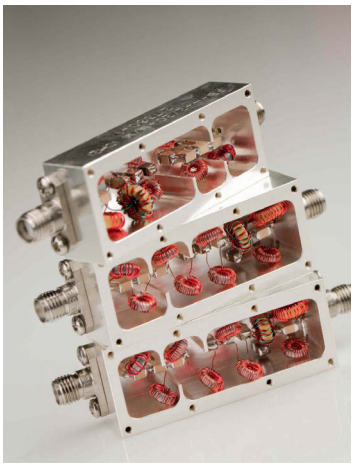
APITech offers Lumped Element rapid cell filters with the following options:

- Bandpass, Lowpass, Highpass or Band Reject (Notch)
- SMA Connectors, Surface Mount or PC Pin Options
- 1 MHz to 3 GHz

Rapid filter solutions are for moderate complexity, standard design options only.

Filters within these restraints (for selected applications) can be delivered in as little as 2-4 weeks.

Please contact the factory for details and to find out if your requirements fall within these guidelines.



APITech offers Cavity rapid cell filters with the following options:

- Bandpass
- SMA Connectors
- 800 MHz to 20 GHz

Rapid filter solutions are for moderate complexity, standard design options only.

Filters within these restraints (for selected applications) can be delivered in as little as 2-4 weeks.

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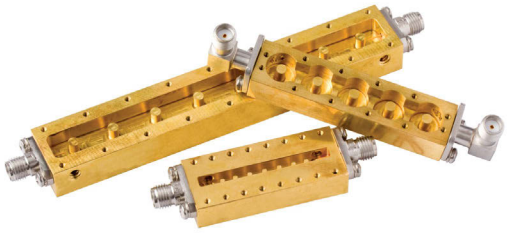

APITech offers Ceramic rapid cell filters with the following options:

- Bandpass
- Surface Mount
- 400 MHz – 2,500 MHz

Rapid filter solutions are for moderate complexity, standard design options only.

Filters within these restraints (for selected applications) can be delivered in as little as 2-4 weeks.

Please contact the factory for details and to find out if your requirements fall within these guidelines.

Quality And Reliability

Superior Quality

Our employees:

- Are encouraged to suggest product improvements
- Have the skills and tools to identify the slightest imperfections
- Continually strive to exceed the goals placed before them
- Know that our success is directly related to the satisfaction of our customers

Rapid filter solutions are for moderate complexity, standard design options only.

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All Manufacturing Facilities Certified to ISO 9001:2008

Six Certified AS9100 Facilities (more facilities to be certified soon!)

During the design & development process, our engineers incorporate preventative design best practices such as:

- Spring-loaded, self-locking tuning bushings and rotors reducing the risk of metallic slivers which can lead to premature failure in cavity designs.
- Annealing of all inductors to remove any metal stress memory for consistent and reliable inductor performance.
- Designs incorporating smooth angles and edges for superior plating adhesion and higher operating power.

Quality Planning

As part of our Quality Management System (QMS) planning we utilize state of the art quality tools including APQP (Advanced Product Quality Planning), Control Plans and FMEA (failure modes effects analysis) that result in robust product realization strategies with the result of proactively engineering out potential quality problems.

Process Monitoring

We monitor established control points of product realization with proprietary data logging technology which allows for regular and critical assessment of performance against QMS objectives and product capability expectations.

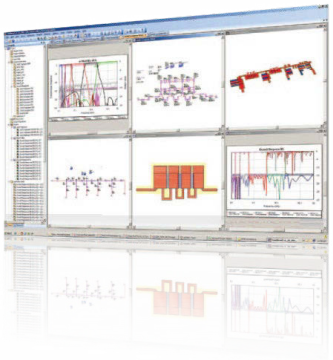
Engineering Capabilities

State-of-the-Art Engineering

Using state-of-the-art software and simulation tools, our experienced engineering team is able to quickly take a requirement from concept to production.

Tools and software our Engineers routinely use:

- Ansoft HFSS
- Microwave Office
- Agilent ADS Design Suite
- SolidWorks
- Labview
- Agilent Genesys
- AutoCAD
- Cadence Allegro
- Ansoft Designer
- Sonnet EM Simulator



3D modeling is used to ensure component compatibility and asses tolerance stack-ups.

Partnering with our Customer

Using Genesys and CAD models allows us to integrate the Filter into our customer's system level assembly to ensure proper fit and overall integrity.

Points of contact

John Yania
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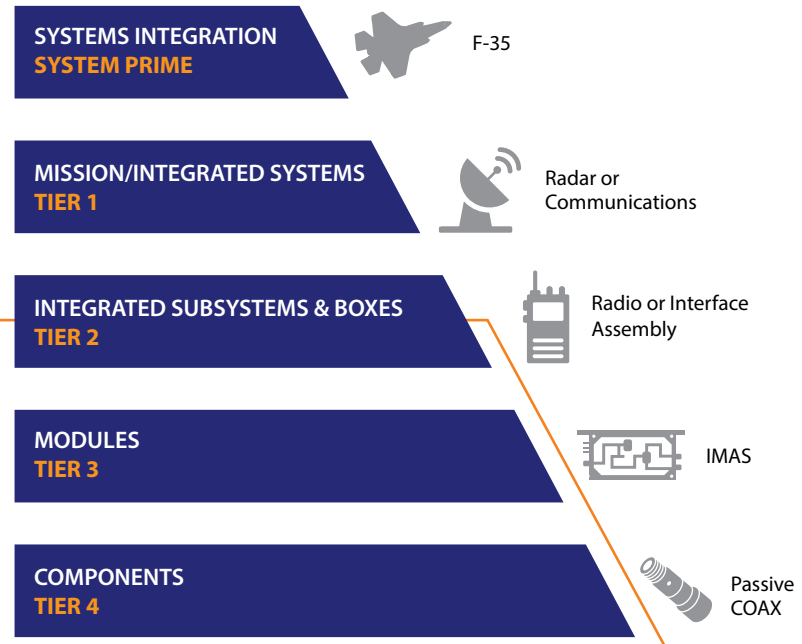
John.Yania@apitech.com

Chris Baumann
Product Specialist
Chris.Baumann@apitech.com

Who We Are

Value-added Integration from Components to Subsystem Solutions

APITech provides rugged, reliable, and efficient subsystems, assemblies, and components for use in the most mission critical defense and military applications, supporting government programs throughout the world. With diverse program experience and preferred supplier status with some of the industry's top premier contractors, our precision-engineered MIL-grade products are ideal for applications where uncompromised reliability and uninterrupted performance is required. APITech is the Electromagnetic Spectrum Innovator at Tier 2.5-4 in the supply chain.



The Electromagnetic Spectrum Innovator

APITech is an innovative designer and manufacturer of high performance systems, subsystems, assemblies and components for technically demanding RF, microwave, millimeterwave, electromagnetic, power, and security applications. A high reliability technology pioneer with over 70 over 70 years of heritage, APITech's products are used by global defense, industrial, and commercial customers in applications spanning radar, electronic warfare, unmanned systems, missile defense, harsh environments, space, communications, medical, test and instrumentation, and more.

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