Xpeedic RF Solution From IC, Filter, to SiP

What is In Booth

Xpeedic RF Solution

from IC, Filter to SiP

EDA - IC
- IRIS for on-chip passive modeling
- iModeler for PDK model

EDA - PKG
- Metis for IC-pkg co-simulation
- Metis for RF SiP extraction

EDA - Filter
- XDS for filter design with multiple technologies: IPD/SAW/BAW

IP - IPD
- IPD (Integrated passive devices) for 5G RF front end, from sample to volume

Xpeedic RF solution from IC, filter to SiP is designed to accommodate the increased 5G requirements on RF front end for more bands, higher frequencies, diversified filter performance while maintaining small size.

MicroApps Presentation

TUMA8 : Fully Integrated IC-Package Co-Simulation Flow for RF IC Designs

Feng Ling
Xpeedic Technology, Inc.

Joshua Wan
Xpeedic Technology, Inc.

11:25 AM - 11:40 AM PDT on Tuesday, 4 August

Industry Workshop Presentation

IW13AB : Integrated Passive Devices (IPD) for 5G RF Front-end Designs

Feng Ling
Xpeedic Technology, Inc.

Lijun Chen
Xpeedic Technology, Inc.

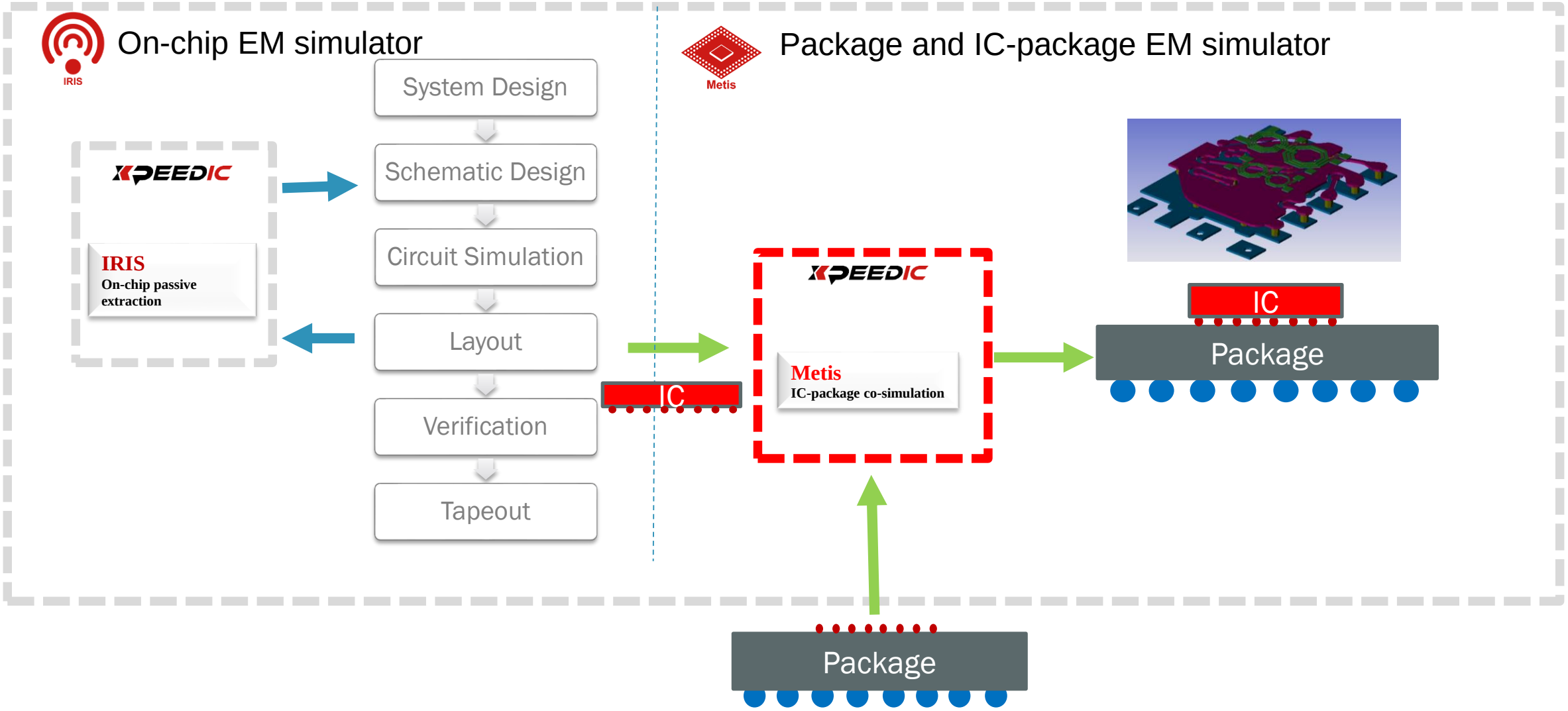
3:50 PM - 5:30 PM PDT on Tuesday, 4 August

Xpeedic RF Solution

EDA-IC

EDA-PACKAGE

Integrated Flow for IC/Package Simulation



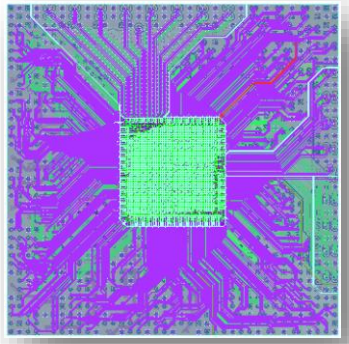
IRIS Tool Support Mainstream Foundry Processes

- IRIS has been certified in multiple foundry process nodes.

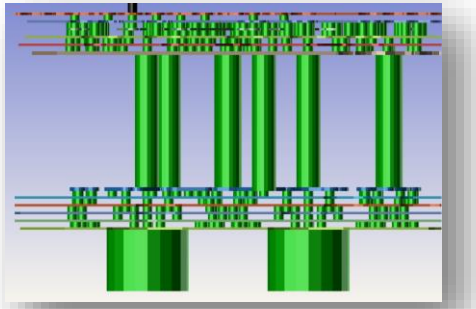
Bulk	FinFET	FD-SOI	RF-SOI	SiGe BiCMOS	GaAs	IPD
tsmc 40nm 28nm 22nm	GLOBAL FOUNDRIES 12LP	GLOBAL FOUNDRIES 22FDX	GLOBAL FOUNDRIES 8SW	GLOBAL FOUNDRIE 8HP 9HP	win SEMICONDUCTORS	SMIC tsmc
UMC 28nm 40nm	SAMSUNG SEMICONDUCTORS 14LPP	SAMSUNG SEMICONDUCTORS 28FDS	TPSCo TPS9	TOWERJAZZ SBC1		ST ON Semiconductor
SMIC 55nm 40nm 28nm			HHGrace	ST B55		HR Silicon
CSMC						CORNING TGV

Metis: Fast Package Extraction Tool

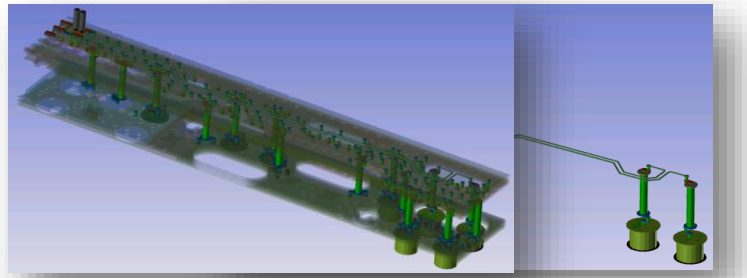
- Import package (.sip or .mcm)



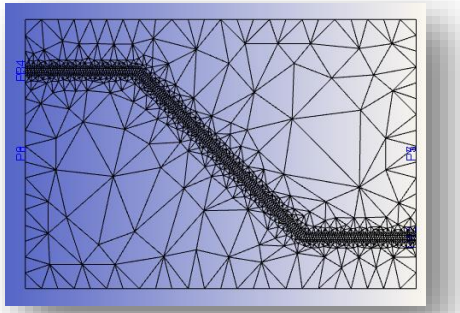
- Add bumps and BGA balls



- Select nets and cut area
- Create 3D model
- Add ports



- Intelligent Mesh



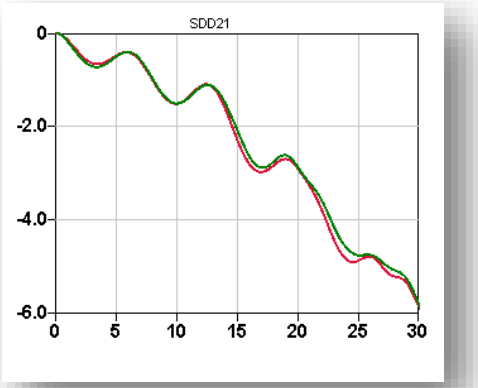
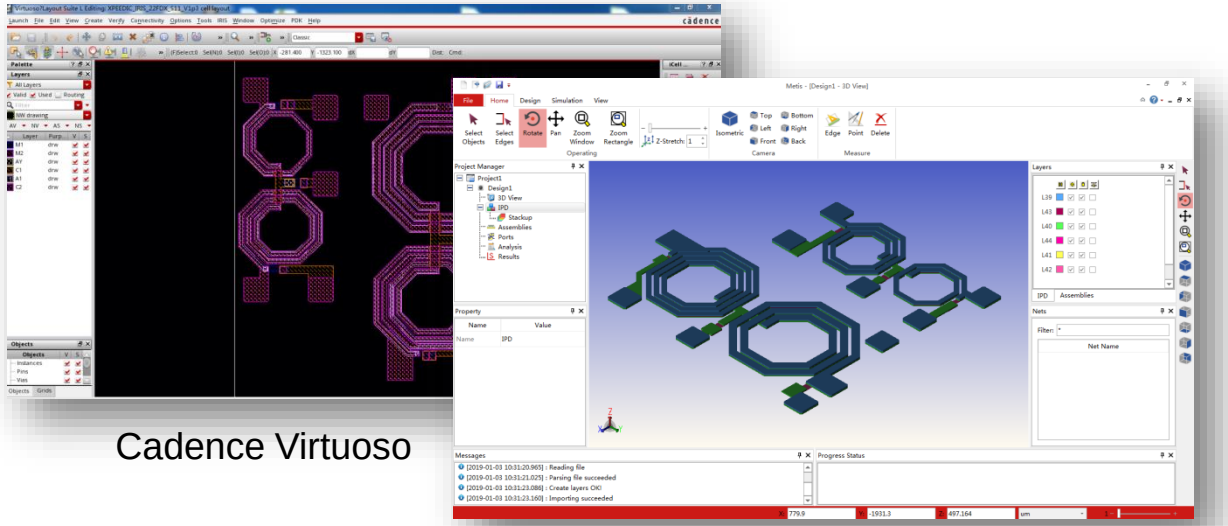
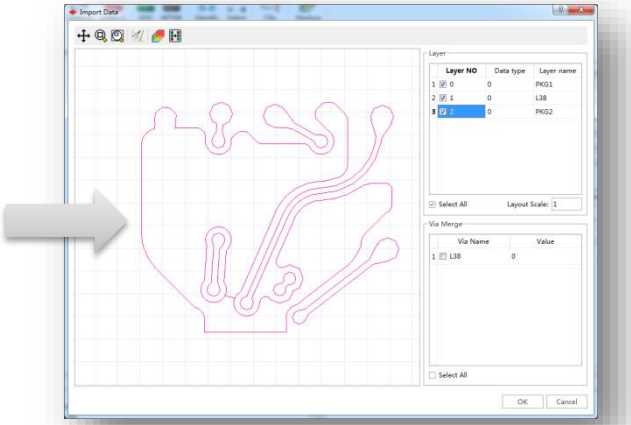


Illustration of Quick IC-Package Merge

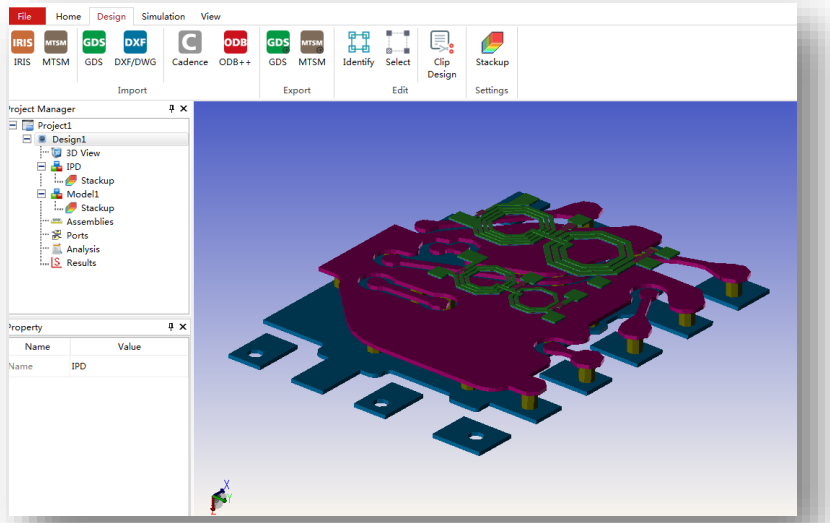
Cadence Virtuoso



Cadence Allegro



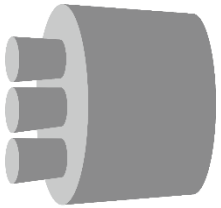
IC + Package Assembly

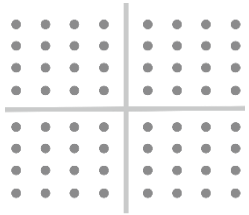


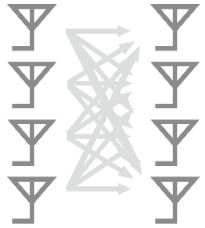
Xpeedic RF Solution

EDA-Filter

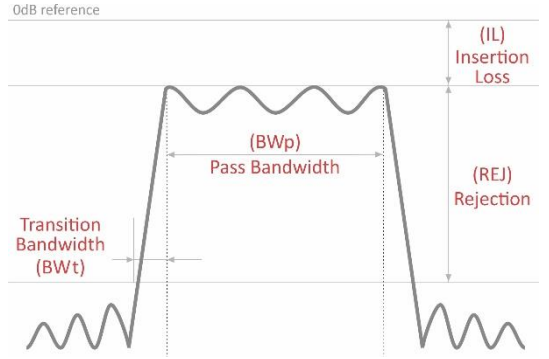
Filter Trend in 5G RF Front End

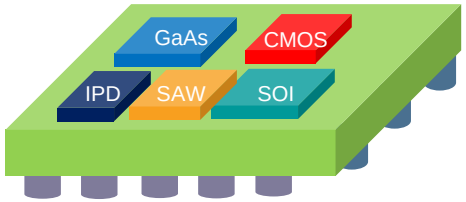

CA


Modulation


MIMO

More filters



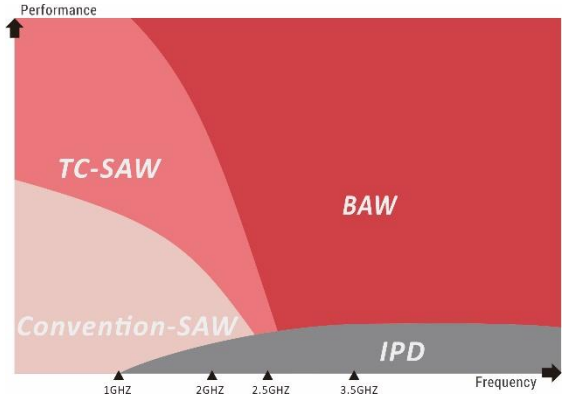


SiP for RF FEM

More bands, CA, modulation, MIMO

More integrated, less discrete

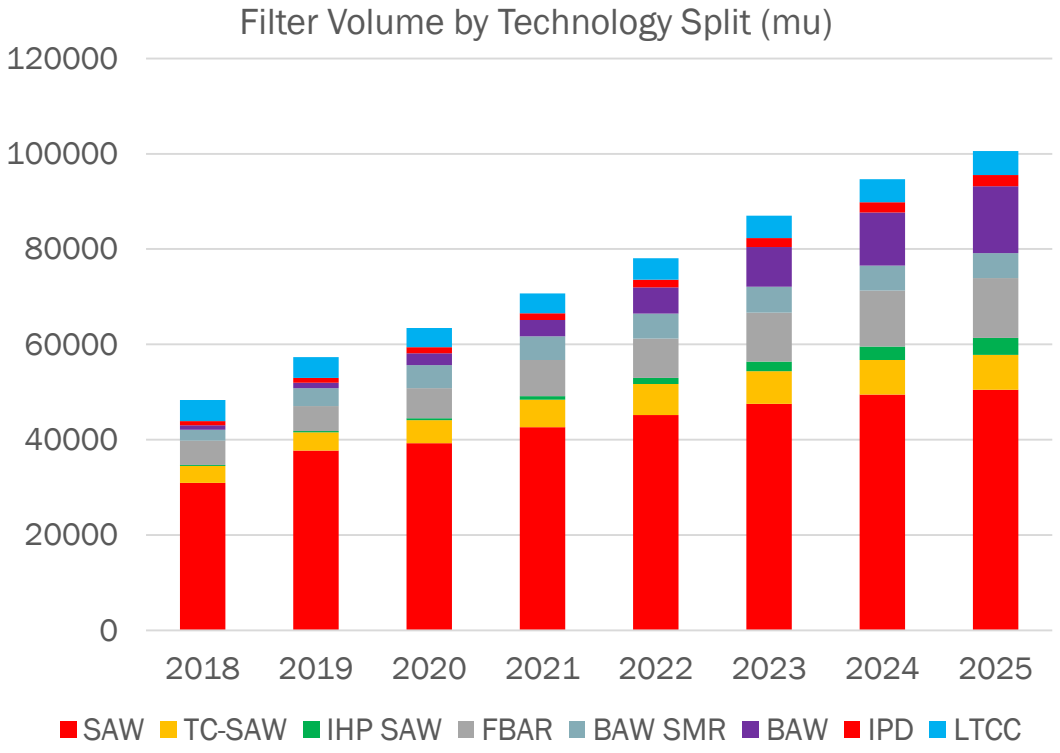
Diversified filter requirement



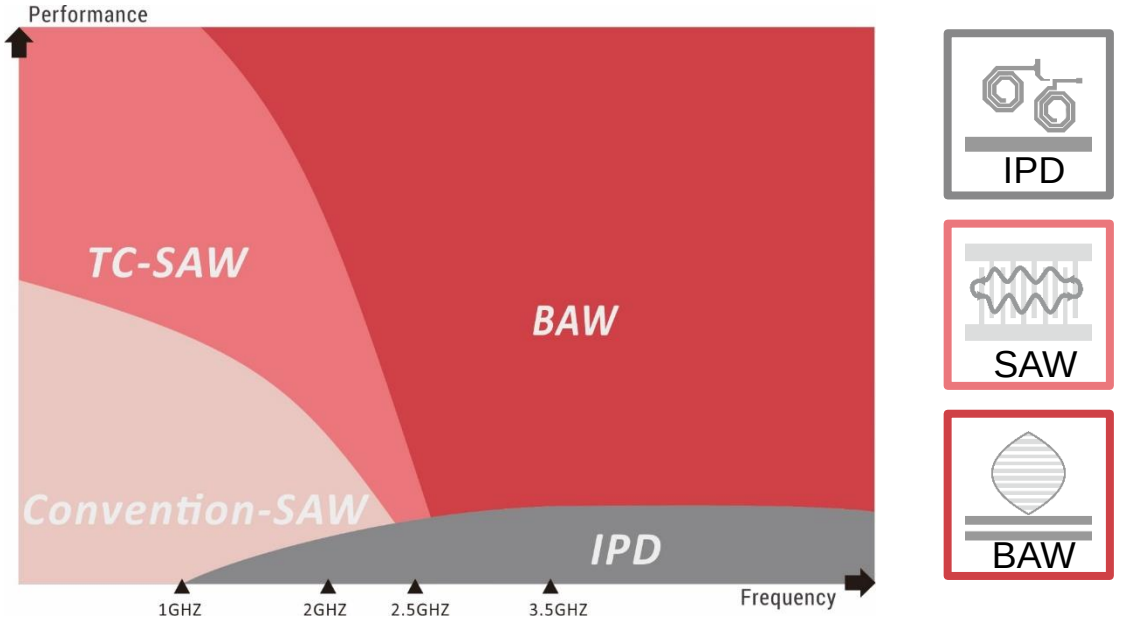
Different filter technologies

5G's Impact on Filters

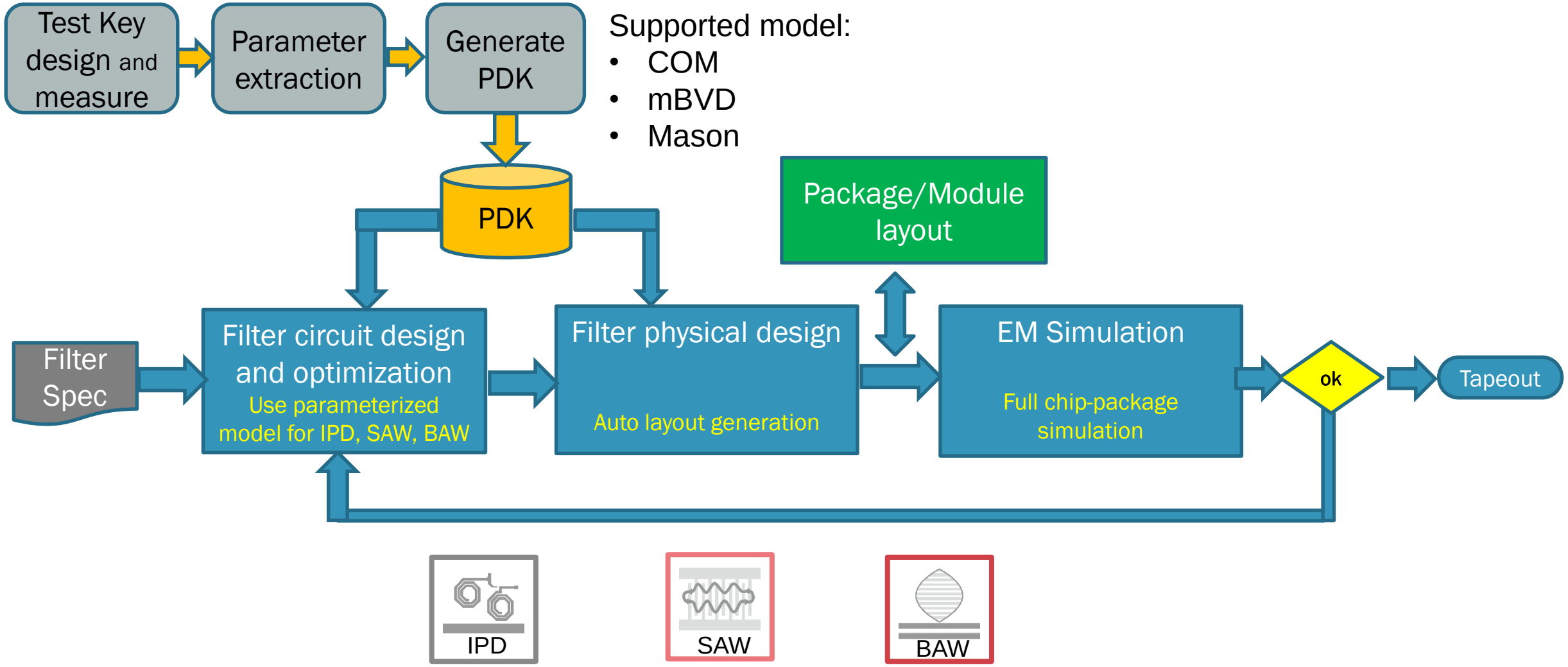
- Filter landscape is reshaping with 5G coming
- Various filter technologies such as LTCC, IPD, SAW and BAW and their combination are needed for 5G



Source: Yole

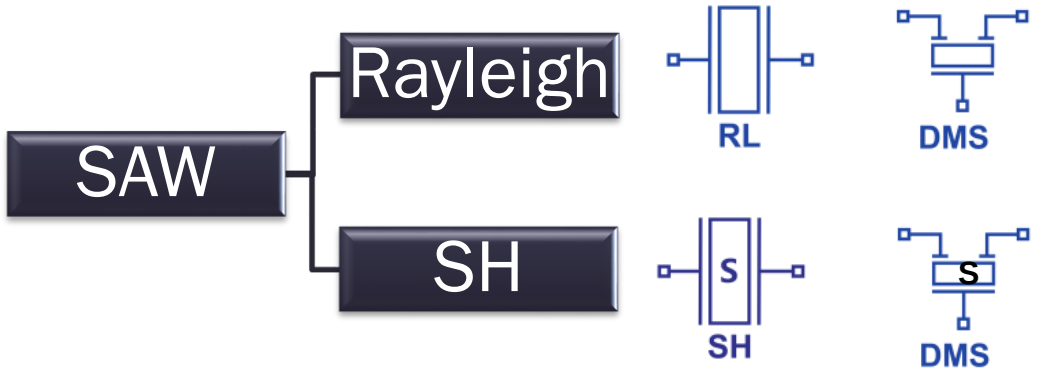


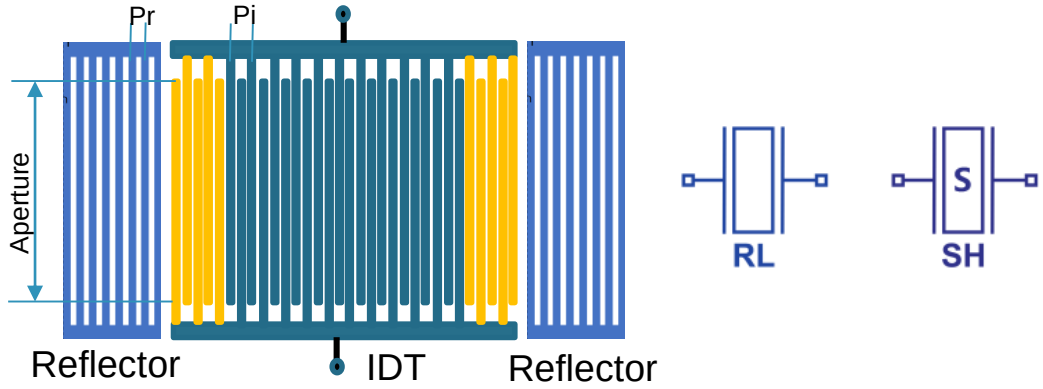
Filter-Centric Xpeedic Design System



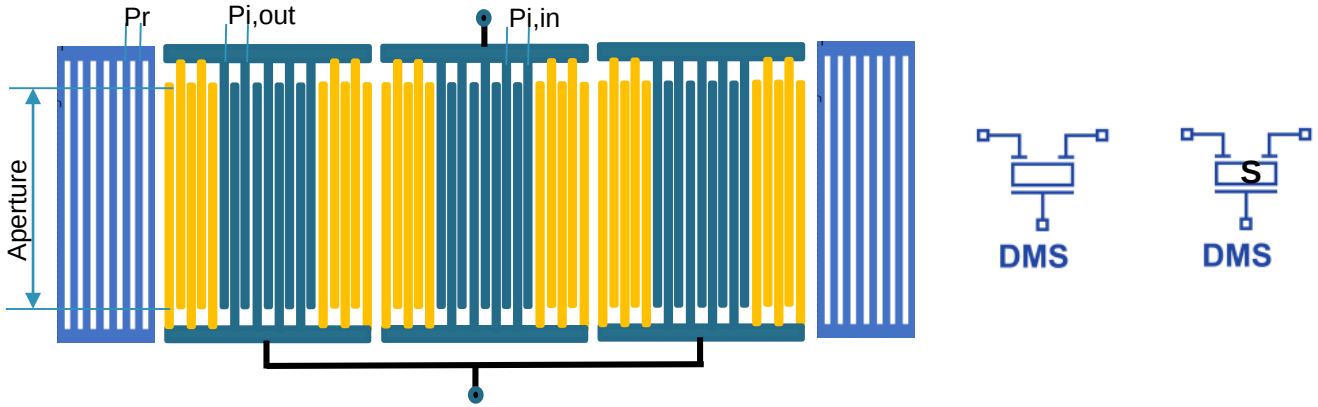
SAW Filter Elements

- Parameterized SAW elements
  - Single SAW resonator
  - Double Mode SAW (DMS)
- Support two wave types
  - Rayleigh waves
  - SH waves





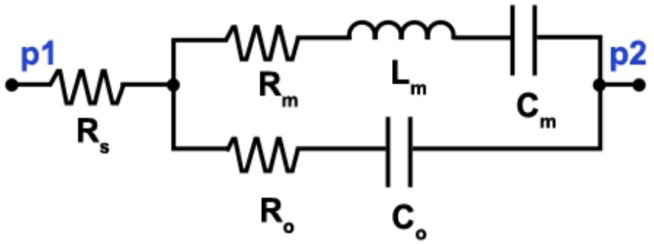
Single SAW Resonator

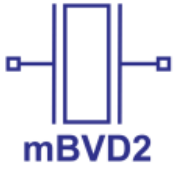


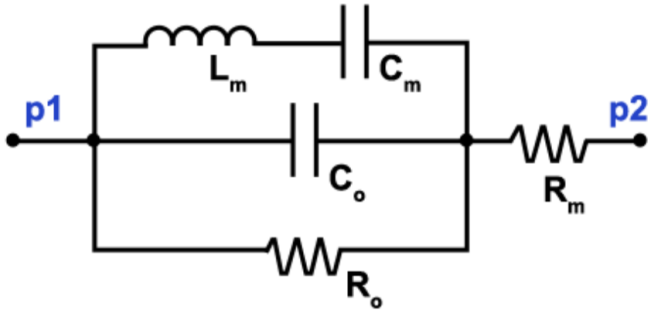
DMS

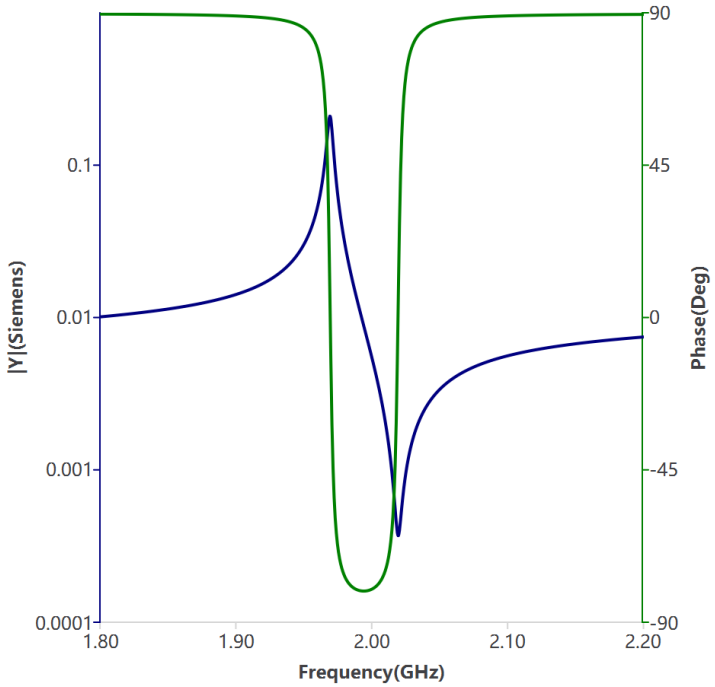
BAW Filter Element

- Support mBVD and Mason model





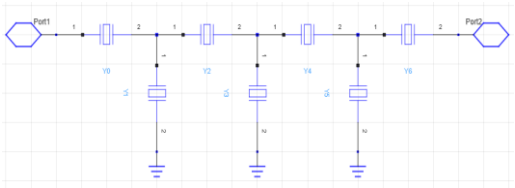




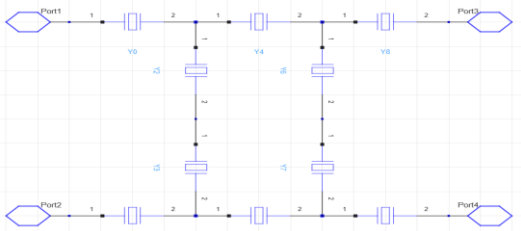
Built-in Topology for SAW/BAW Filters

- Support multiple filter topologies
  - Ladder
  - Lattice
  - Mixed ladder-lattice
- Built-in templates enable quick filter creation

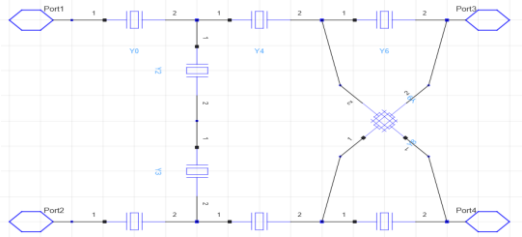
Ladder



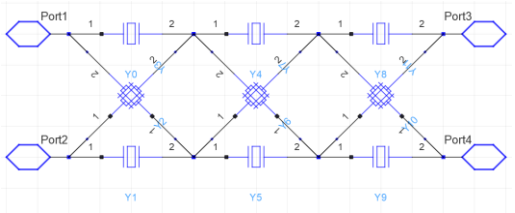
Diff Ladder



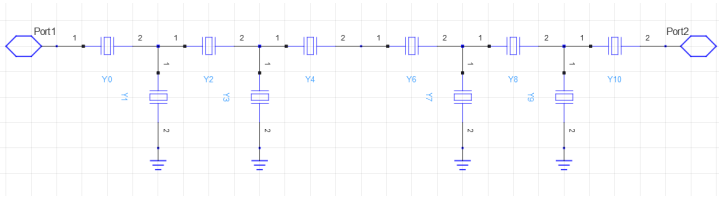
Mixed



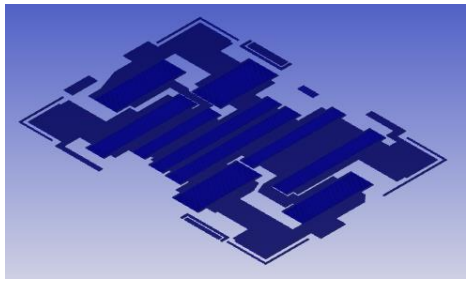
Lattice



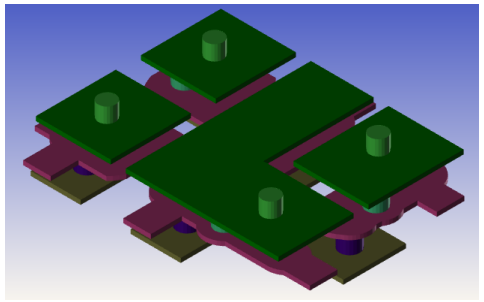
Die-Package Co-simulation



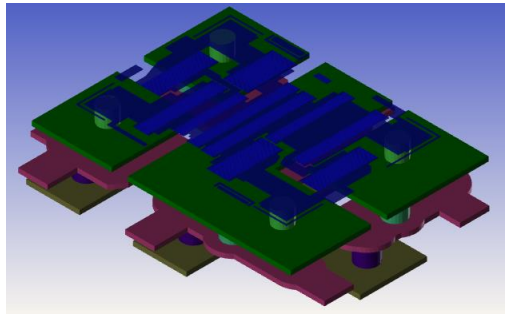
Original schematic



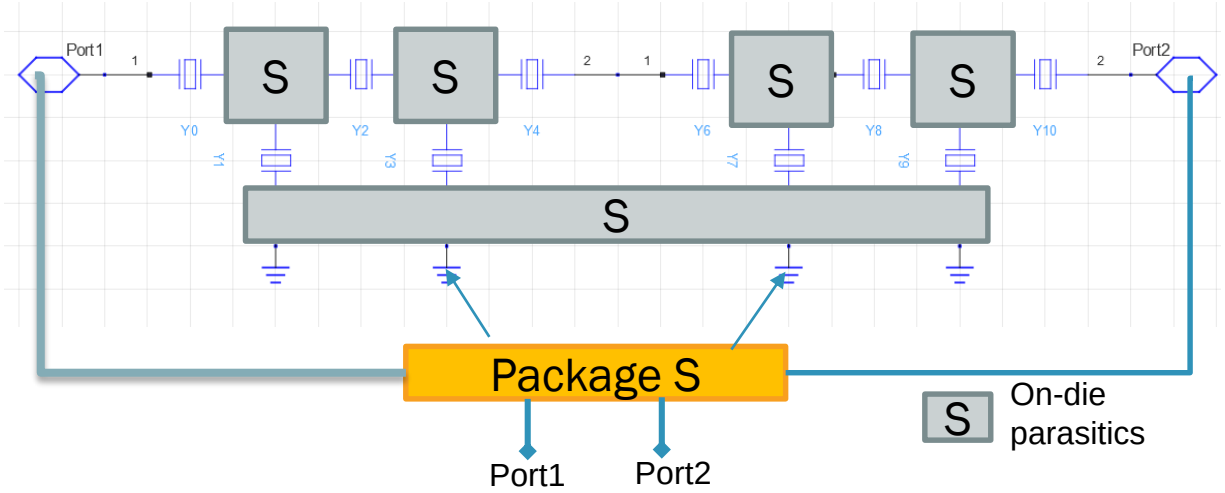
Filter Die



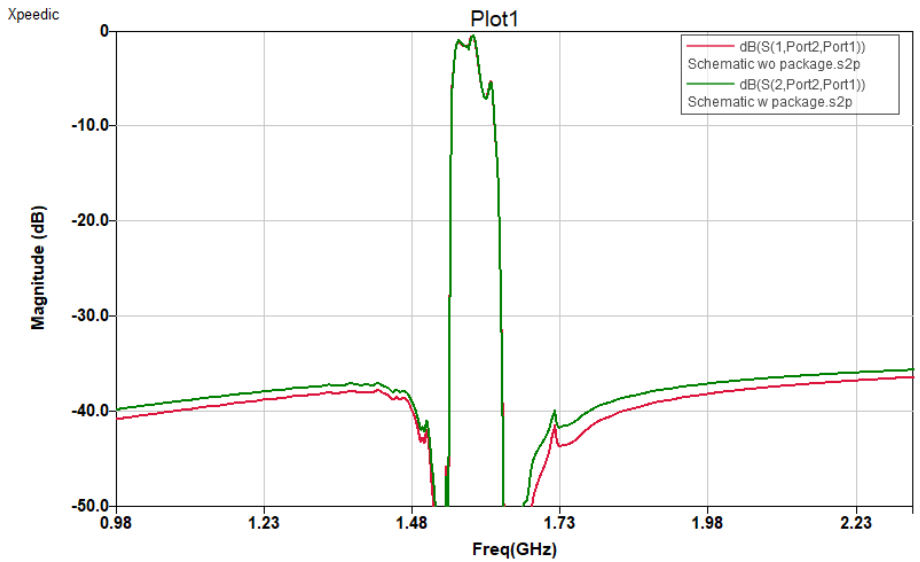
Package



Die+Package



Schematic with on-die and package parasitic

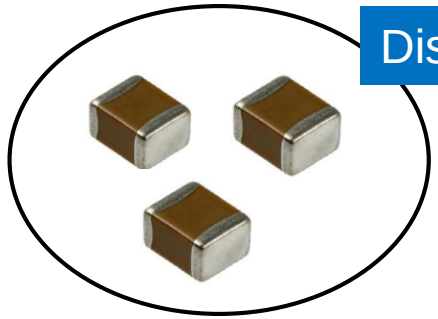


Xpeedic RF Solution

IP-IPD

IPD for RF Front End

- Integrated Passive Device (IPD) advantages over discrete
  - –Miniaturization, high consistency, low cost, high integration,

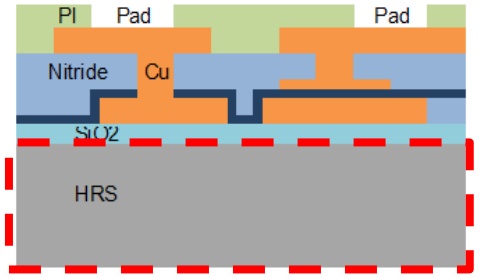


- Discrete R, L,C
- Bulky
- Poor tolerance control

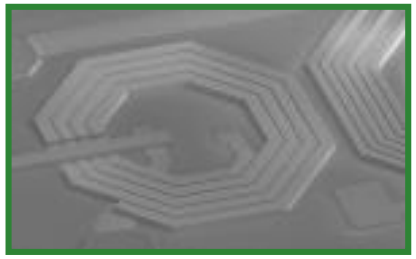
- Multiple R, L, C
- Small size, low profile
- High performance
- Consistency
- High integration

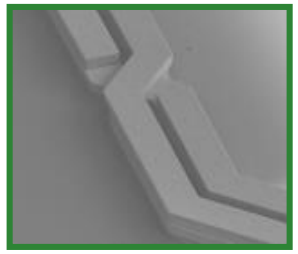
Xpeedic IPD Evolution

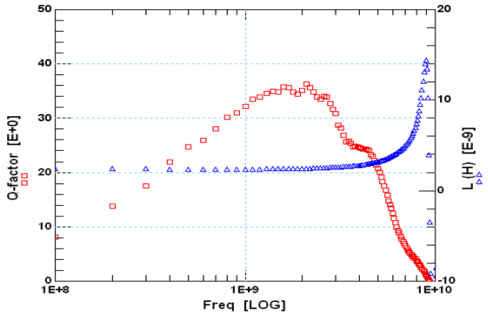
- High resistivity silicon (HRSi) based IPD



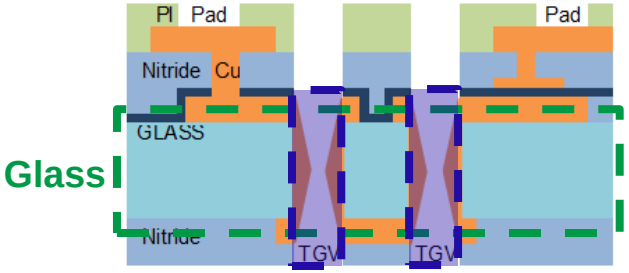
High Resistivity Silicon (HRSi)



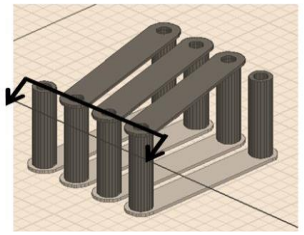


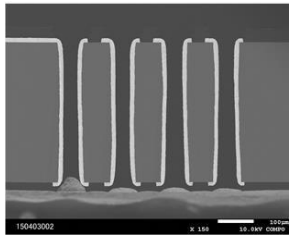


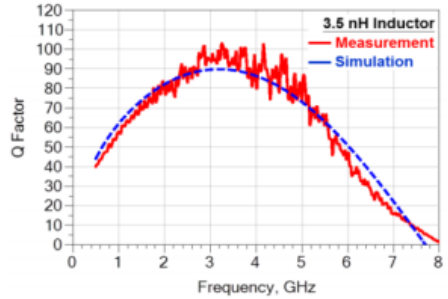
- Through-glass-via (TGV) based IPD



Through Glass Via (TGV)

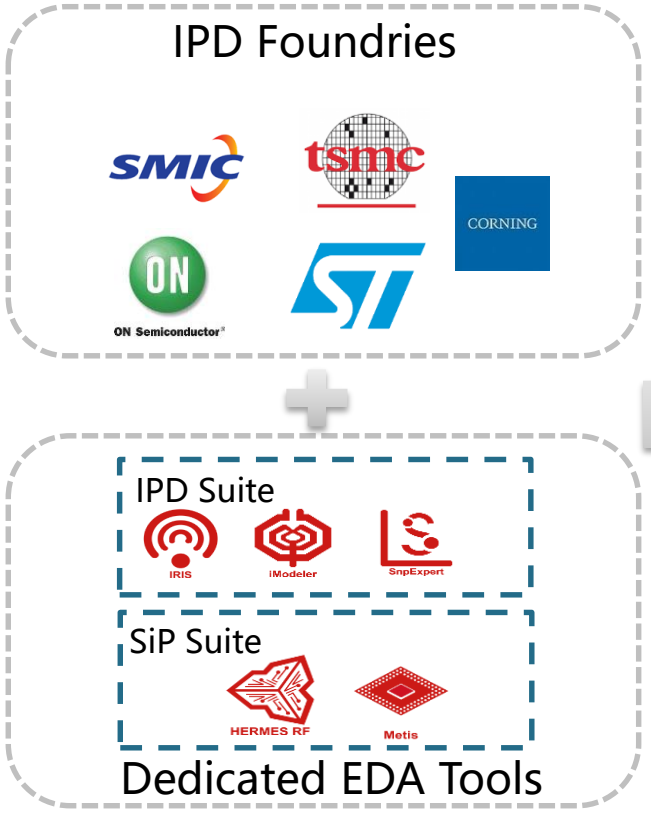


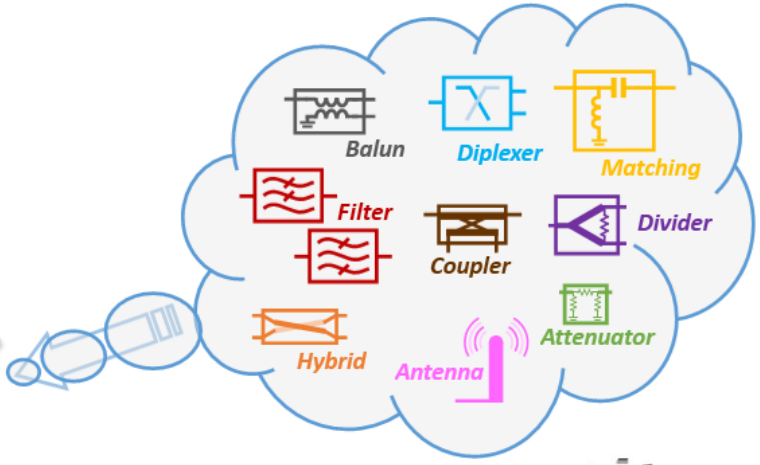


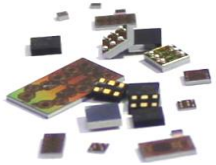


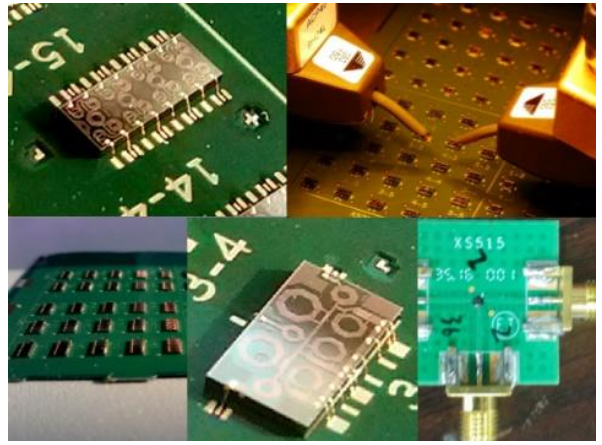
Xpeedic Dedicated IPD Service

- One-stop IPD service provides fast way from spec to volume production
  - Foundry eco-system and in-house dedicated EDA tools



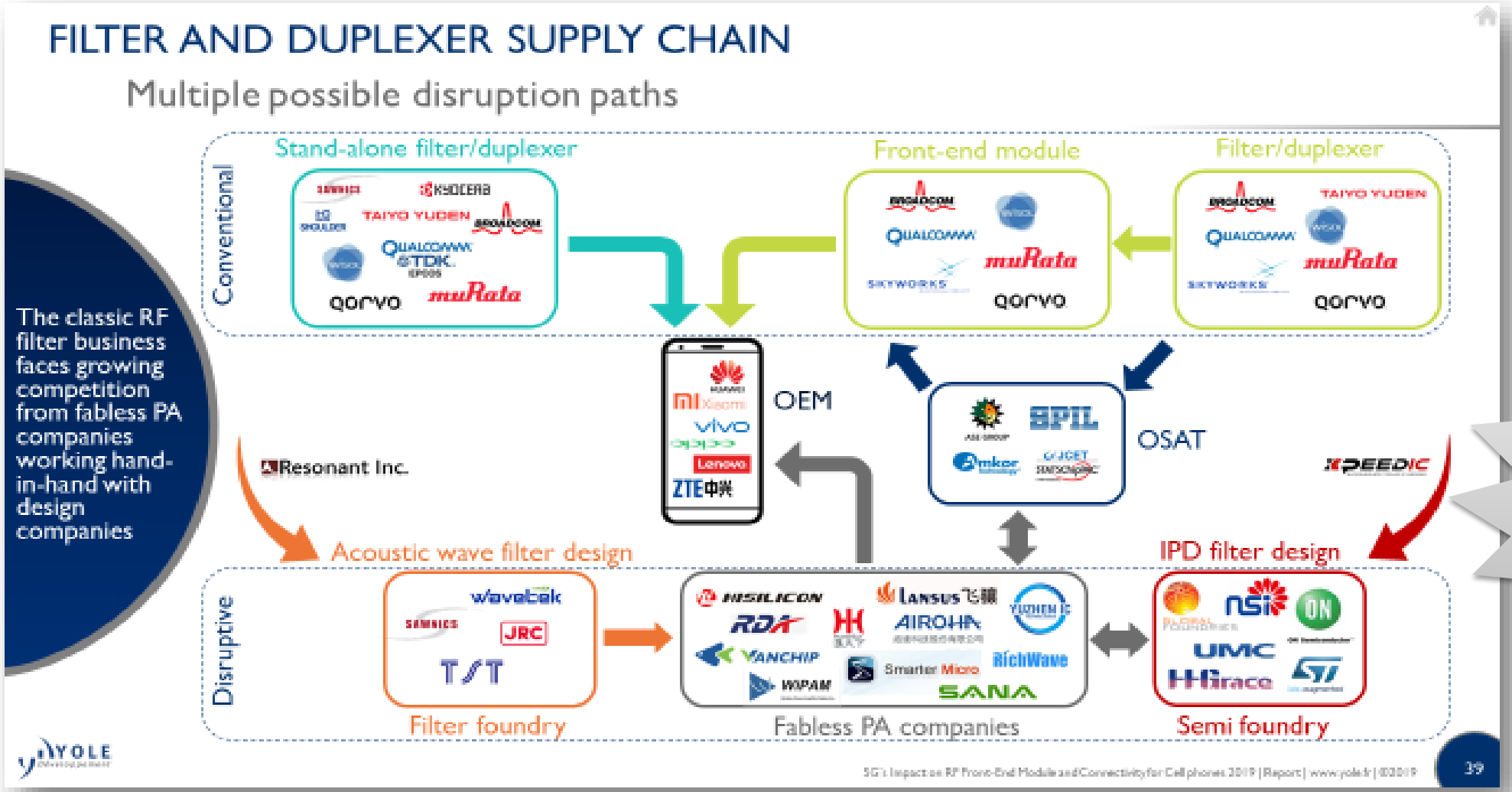






Yole Report:

5G's Impact on RFFE Module and Connectivity for Cell Phones, Aug 2019



Contact Information for Further Questions

- Please contact the email address provided below for any follow-up questions:

support@xpeedic.com