

RF & Microwave Industry Trends: Design Skills You Need To Stay Relevant

How-Siang Yap

RF MW Industry Trends

What's driving Keysight EDA development for RF/MW Design



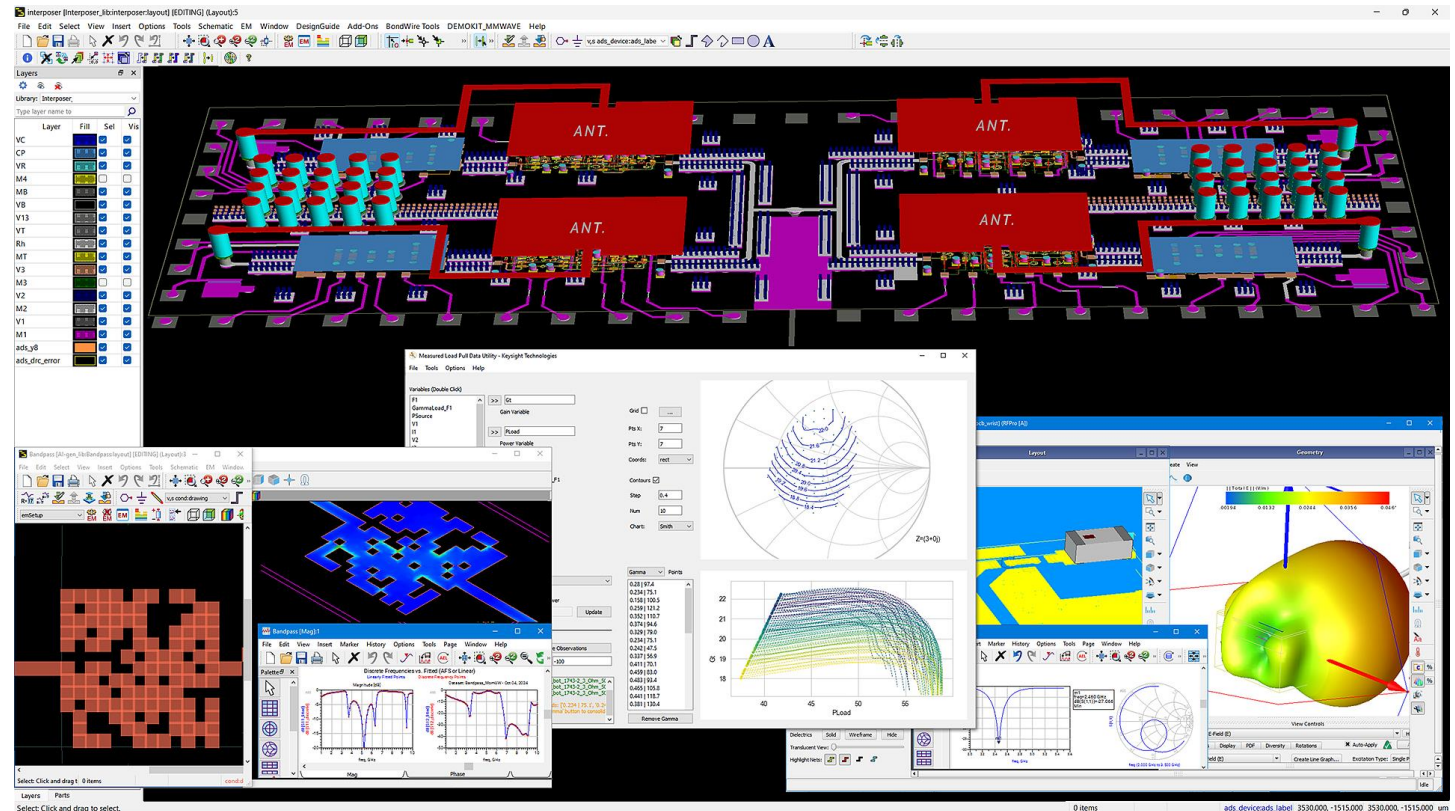
1. 6G Sub-THz 250 GHz Design

- Sub mm wavelength in substrate



2. Ai Machine Learning (ML)

- Automated data management
- Ai training
- Ai assisted design



ADS 2025 Screenshot

RF MW Industry Trends

What's driving Keysight EDA development for RF/MW Design



6G Sub-THz 250 GHz Design

- Sub mm wavelength in substrate
- 3DHI RF Chiplet Integration
- Wide BW digital RF modulation
- Multi-Domain Simulation/Optimization



6G sub mm wavelengths impacts physical design and simulation of RF/MW components for high throughput, low latency wireless data transport

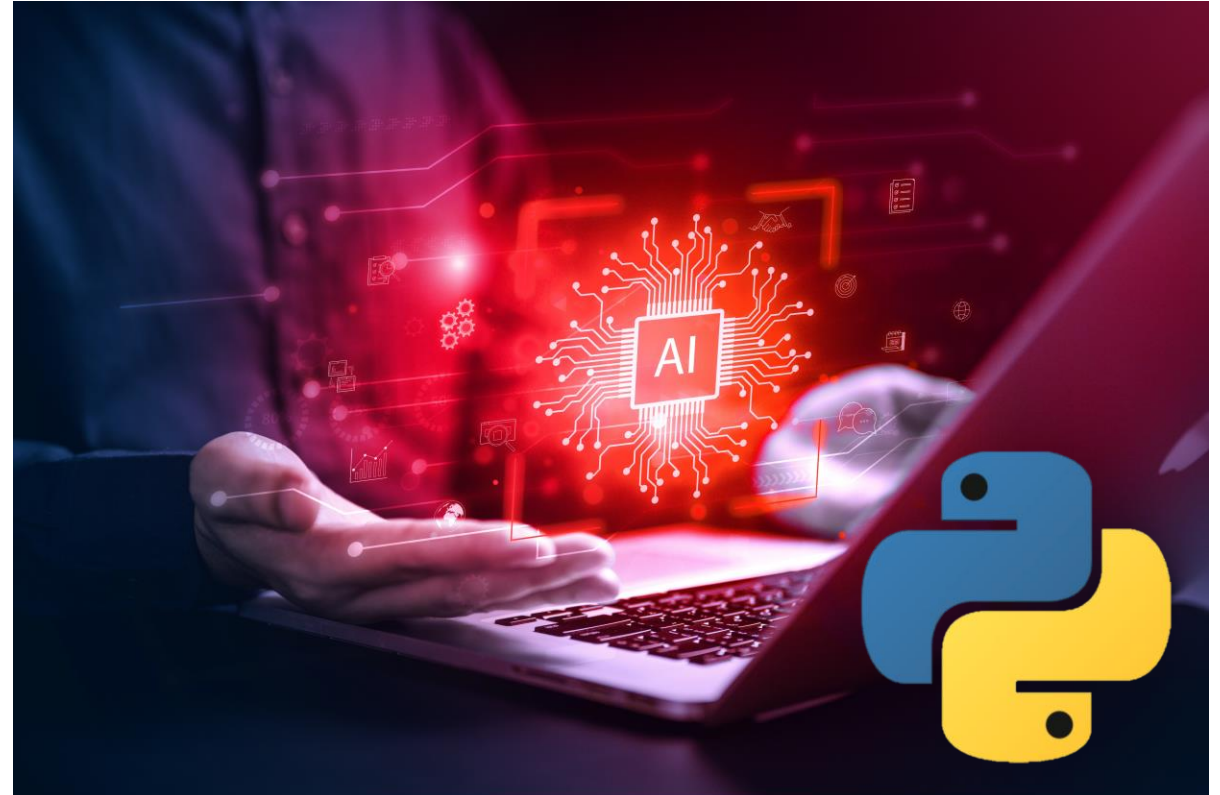
RF MW Industry Trends

What's driving Keysight EDA development for RF/MW Design

Ai

AI & Machine Learning

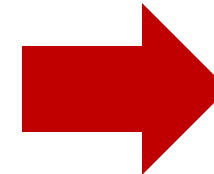
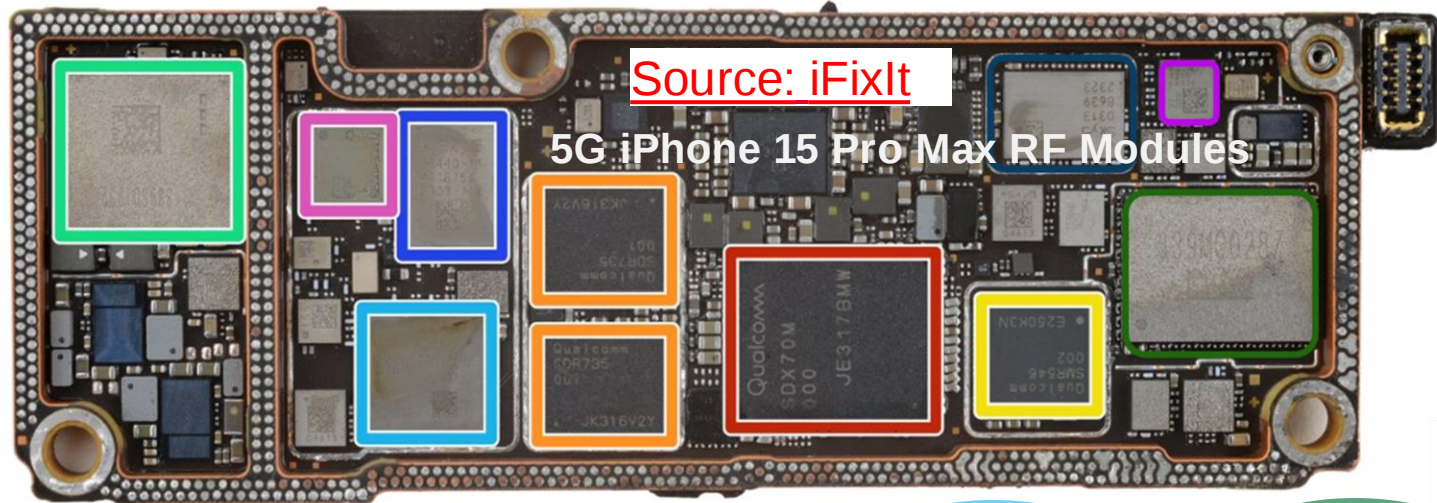
- Python Automation API
- Chatbot Assistant
- AI Training Data Generation
- Neural Network Model Training
- Advanced Optimization & Productivity
- AI Assisted RF/MW Design
- AI assisted IP Retrieval & Reuse



Python automation API enables AI to be incorporated into RF/MW design, modeling, simulation and optimization

6G sub THz 250 GHz frequencies require 3DHI RF Chiplet Integration

Intertwined Si, III-V and Module design flow with multi-domain simulation and optimization



Silicon world

- Qualcomm SDX70M Snapdragon X70 modem
- Qualcomm SDR735 RF transceiver
- Qualcomm SMR546 RF transceiver
- Possibly Apple 339S01232 WiFi & Bluetooth module

III-V RFMW
(ADS)

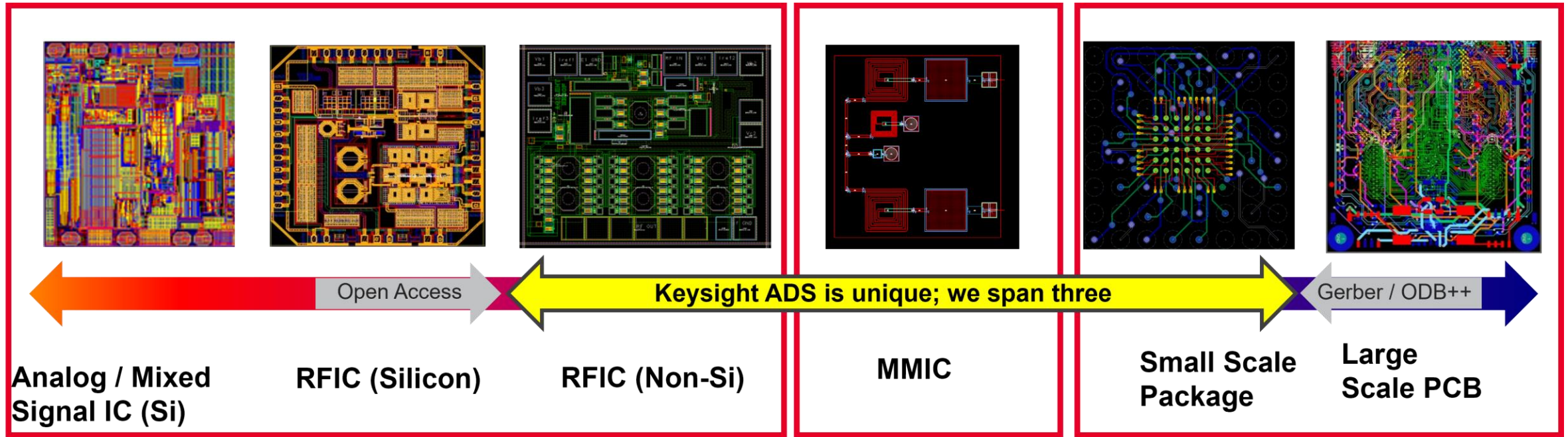
Silicon RFIC
(Cadence/
Synopsys)

Modules
(ADS)

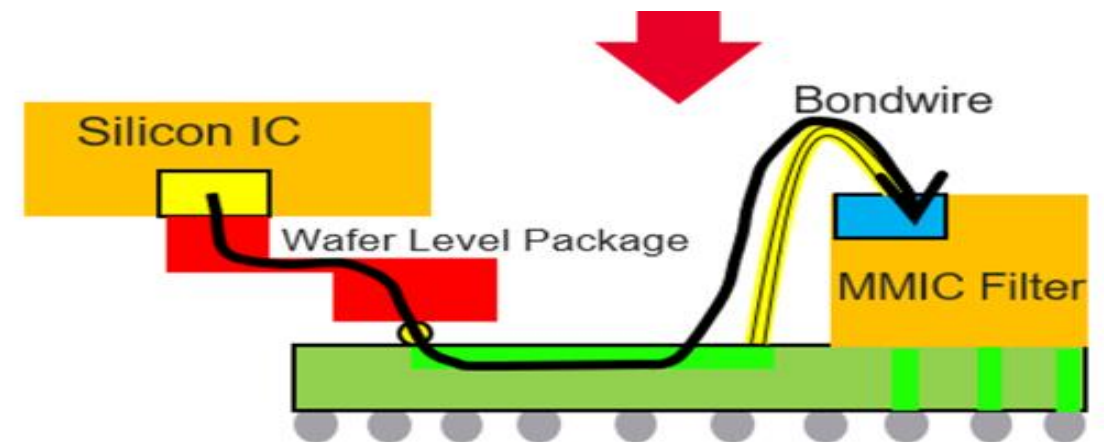
III-V world

- Broadcom AFEM-8234 front-end module
- Skyworks SKY58440-11 front-end module
- Qorvo QM76305 front-end module
- Likely Skyworks SKY50313 front-end module
- Possibly Apple 339M00287 front-end module
- Broadcom AFEM-8245 front-end module

6G/5G RF Chiplet 3DHI Module Assembly & Simulation Platform



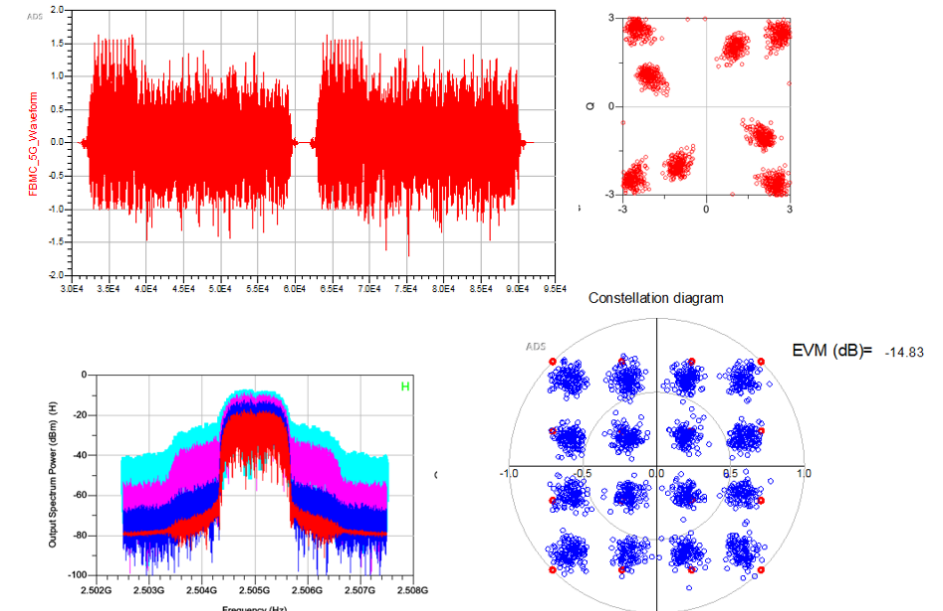
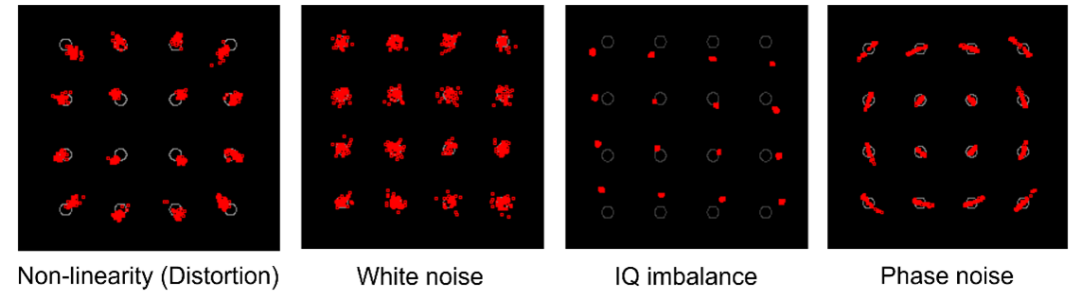
- Keysight ADS streamlines 3DHI assembly by replacing 4 separate flows for RFIC, MMIC, packaging & PCB within a single platform
- RFPro simulates RF paths across different technology boundaries with automated EM-Circuit analysis. No “cookie cutting” after assembly



6G Wide BW Digital RF Modulation

Error Vector Magnitude (EVM) is the new RF/MW circuit performance spec

- EVM measures the distortion of the RF digital modulation
- EVM is degraded across the modulation BW by
 - Amplitude-Phase nonlinearity
 - IQ modulator imbalance
 - White noise & phase noise
- Keysight fast EVM simulation
 - Proven in instrumentation compact signal generation and EVM analysis
 - ADS enables breakthrough fast circuit level EVM simulation & optimization
 - Unique in the industry to enable designing circuits to meet EVM specs directly



Next Gen Multi-Domain RF Simulator (Nexus)

Workflow automated RF simulation across multiple domains (System, Circuit, EM, ETH, Measurement, Statistics)

- **Solve tough RF Design challenges faster**

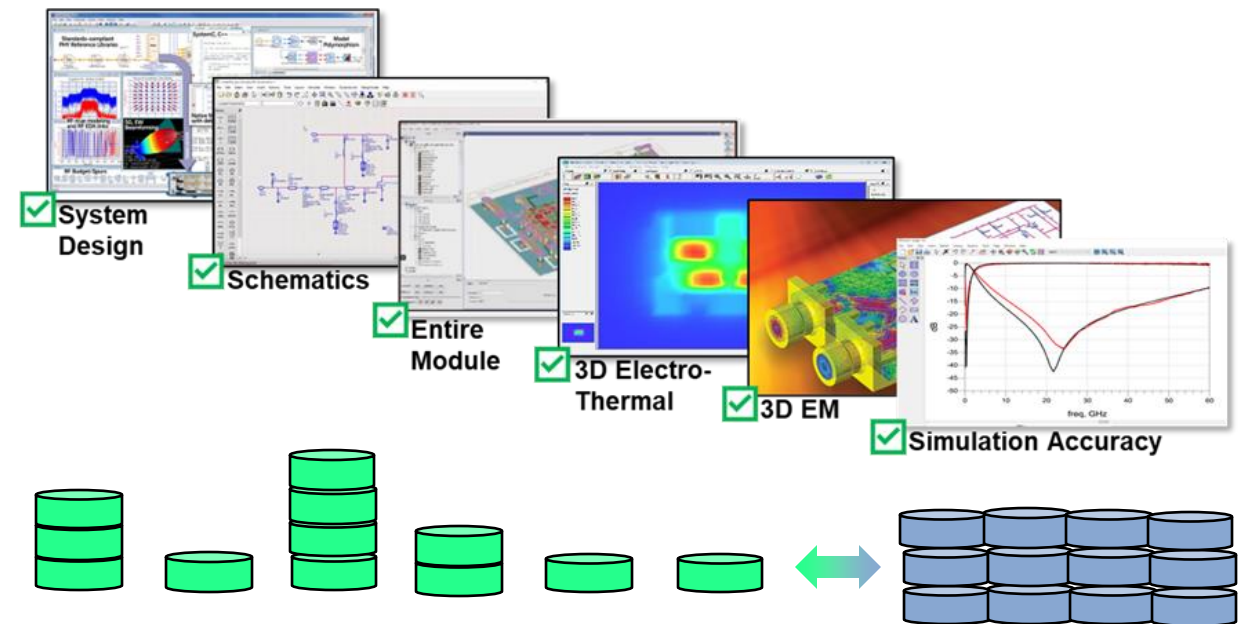
- Multi-domain integrated insights from multi-domain simulation workflow control
- Replaces serial task insights from individual access to specialized simulation tools for System, Circuit, EM, Electrothermal, Measurements & Statistics

- **Streamline a whole workflow, not just a task**

- Using low-code, graphical, or LLM interfaces for **human RF users** to script familiar applications and workflows
- Using Python, HPC, and Data Mgmt. to integrate highly automated AI/ML and digital transformation for the **Enterprise**

- **Directly interoperable between platforms**

- Avoid wasting design time on translators, setups, and specialized domain knowledge
- Interoperable in Keysight ADS, Cadence, & Synopsys platforms

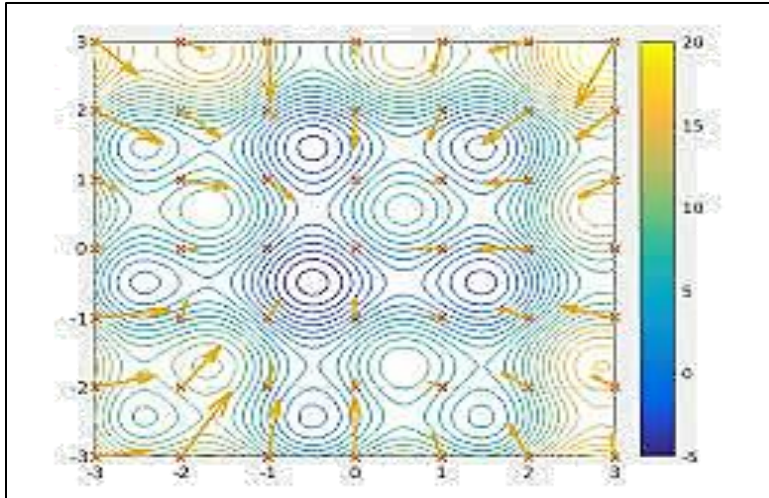


- **Scalable, cost-effective token pool licensing**

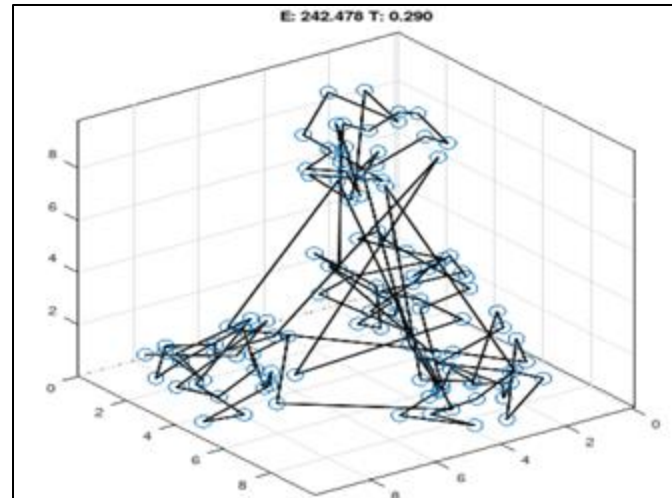
- Enables instant access to all combinations of multi-domain simulation and optimization (Envelope, HB, Transient-Convolution, Electrothermal, Stability, EVM, Linear)

Next Gen Multi-Domain RF Simulator & Optimizer (Nexus)

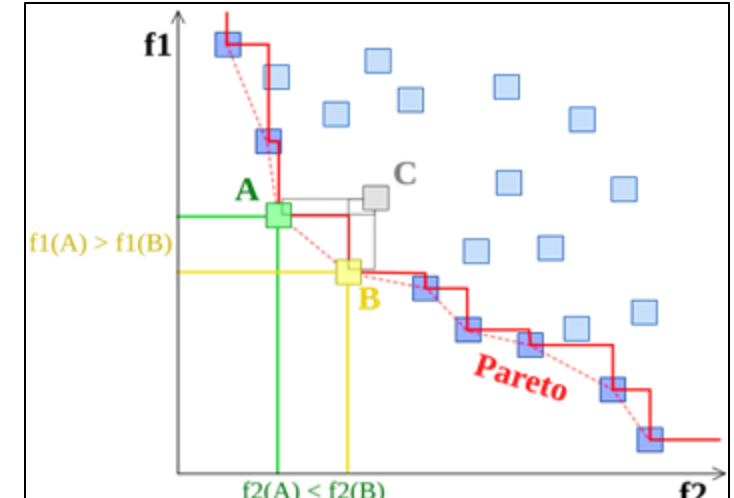
Optimize RF designs across domains and hierarchy with high dimensional multi-objective goals



Particle Swarm



Corana Simulated Annealing



Non Dominated Sorted Genetic Algorithm II (NSGA-II)

New generation optimizers and flexible flow control

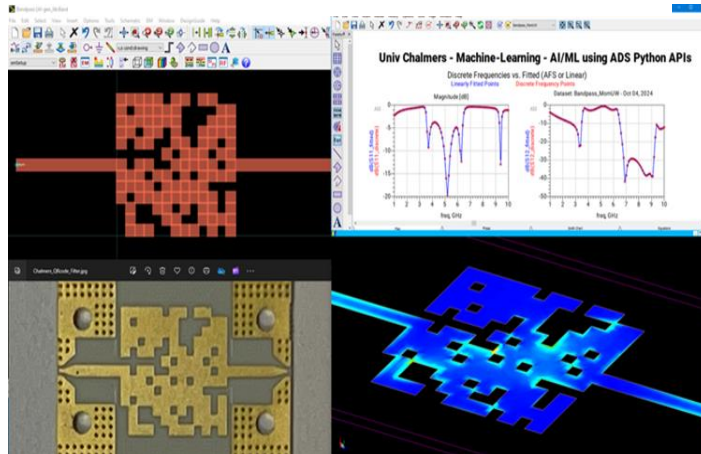
- Multi-objective optimization with large number of variables
- Optimize complex designs across simulation domains and hierarchy
- Intuitive and flexible optimization setup and control

AI- Machine Learning enabled by Python Automation API

ADS Python API enables programmatic control of simulation, schematic, layout, data processing and display

- Automate data processing, formatting and management
 - Harness measured, simulated and graphical data
 - Artificial Neural Network ANN model training and creation
 - AI training data generation
- ADS Python API
 - Enables external capabilities (AI models, Optimizers, Synthesis, etc.) to be added
 - Create innovative designs
 - Automate workflow for personal productivity
 - Enterprise level workflow optimization with AI to win against competitors

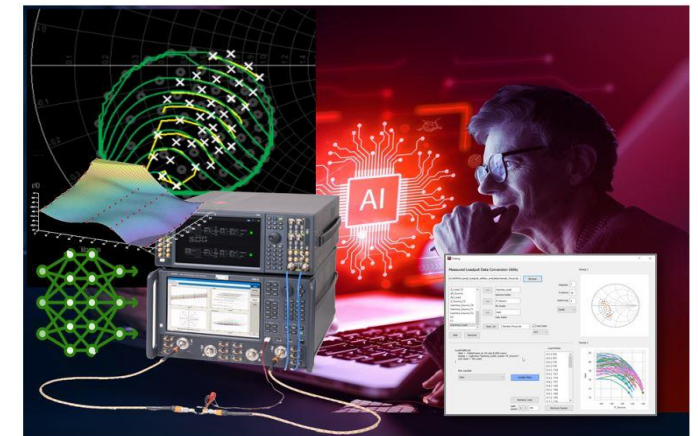
Research & Innovation



Automation / AI/ML



PA Loadpull ANN



Summary

Keysight EDA Solutions

6G sub-THz 250 GHz Design



3DHI RF Chiplets Integration

- ADS SmartMount 3DHI assembly
- RFPro automated EM-Circuit cosimulation

Wide BW digital RF modulation

- Keysight instrument compact test signals
- ADS circuit level fast EVM analysis

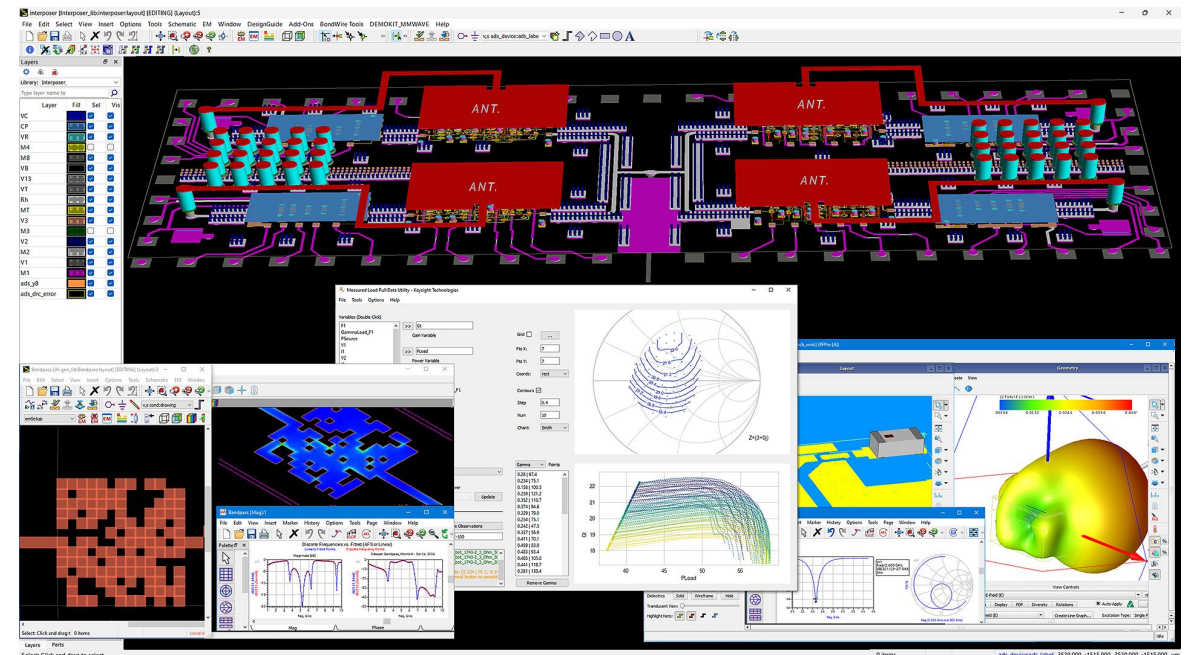
Multi-Domain Simulation/Optimization

- RF Circuit Professional (NEXUS)
- Scalable cost-effective token-pool licensing
- Envelope, EVM, HB, Transient-Convolution, Electrothermal, Stability, Linear



AI & Machine Learning

- ADS Python API
- Python Data
- AI Training Data Generation
- Neural Network Model Training
- AI Assisted RF/MW Design
- Automation Productivity
- AI assisted IP Retrieval & Reuse
- Chatbot Assistant



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