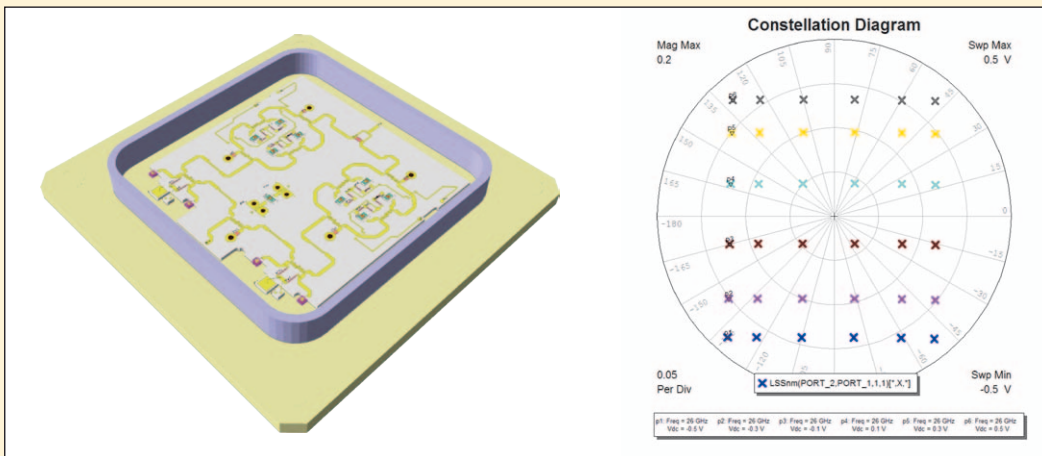


## Research & Development

### Thales Alenia Space Dramatically Cuts Design to Production Time with NI AWR Design Environment



3D layout of hybrid coupler within Microwave Office and constellation pattern at 26 GHz

Thales Alenia Space (TAS) develops cutting-edge satellites and payloads that set the global standard for space systems, providing communications and navigation services. TAS is a leading supplier to the International Space Station and a pivotal player in space systems designed to explore the Universe.

#### The Design Challenge

TAS has more than 40 years of experience in the design, inte-

gration, testing, operation, and commissioning of innovative space systems.

Because TAS Italy's microwave circuit design process includes input from a number of different sources and must provide outputs to other processes, the team wanted to develop a complete RF/microwave flow that would seamlessly link its process-design kits (PDKs) and component libraries to a high-frequency design environment

in order to save design time and increase design reuse.

#### The Solution

TAS designers chose NI AWR Design Environment for this ambitious MIDA (Microwave Integrated Design and Analysis) project because it offers a wide variety of integrated simulation technologies, as well as connections to third-party simulators. TAS successfully developed a complete RF/microwave design flow based on NI AWR software by writing a custom piece of software that links Microwave Office via its comprehensive application programming interface (API) to TAS PDKs and component libraries. This complete design flow enables designers to integrate real components from their predefined libraries into the actual designs. The design time savings and project reuse has enabled TAS to achieve a dramatic reduction in design-to-production times.

As a result, TAS engineers have developed a comprehensive component library (Figure 1),

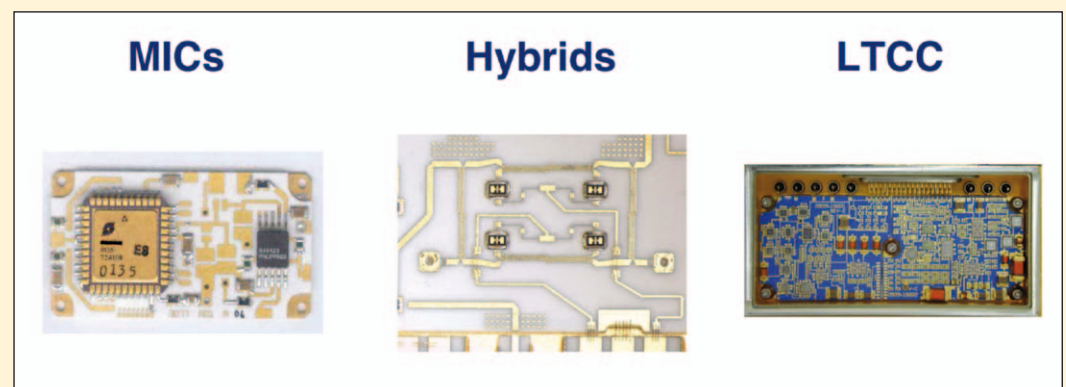


Figure 1: Common TAS circuit types designed with NI AWR Design Environment software.

Thales Alenia Space  
Application:  
Satellite Systems  
Software:  
NI AWR Design Environment  
Microwave Office  
AXIEM  
www.thalesaleniaspace.com  
www.ni.com

covering different part and mounting technologies like chip-and-wire and SMD on MICs, as well as hybrid and low-temperature co-fired ceramic (LTCC) circuits.

The resulting TAS component library is directly linked to the company parts database. Each component that is available for design within NI AWR Design Environments exists in the company database, carrying all the significant information contained therein, including part number, maximum ratings, availability, cost, and more. This information is complemented with electrical models by design engineers and with an artwork cell drawn by technology engineers according to the official specifications. Electrical model and artwork cell data are merged with company component specifications through a controlled interactive flow. As Figure 2 shows, the TAS RF/microwave design flow is based on the customization of NI AWR Design Environment and its integration into the TAS electrical components database and process design rules through the API developed in house.



Furthermore, the company's available circuit manufacturing technologies are translated into Microwave Office PDKs, including physical information and design rules. Circuits can now

be designed in Microwave Office with real components and actual process models. The circuit's electrical schematics are always in sync with circuit layouts. The production documentation is automatically generated by TAS's custom-written software tools as well. Electrical schematics are formatted according to company rules, layouts are formatted and exported into DXF files, and a bill of materials is automatically generated. The files contained in the production data package are always consistently regenerated from the Microwave Office source project and synchronized. Additional custom analysis routines are also available to support part stress analysis and worst-case analysis that are directly linked with simulation results from Microwave Office, further improving the timing and the fidelity of the results.

### Why NI AWR Design Environment ?

Without a doubt, the key feature offered by NI AWR Design Environment that enabled TAS to create this design flow was the software's well-developed API, which allowed designers to easily extend its functionalities to connect Microwave Office to different company data sources and to interact with other applications. Furthermore, tight inte-

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Microwave Office enabled us to customize NI AWR Design Environment through its comprehensive API to connect with our existing industrial production design flows. Moreover, Microwave

Office offers a wide variety of simulation technologies and natively interacts with other available simulators, allowing us to achieve complex designs without ever leaving the same environment. This custom design flow has helped us to achieve a dramatic reduction in design-to-production times and significant increase in project reuse.

gration between Microwave Office and the TAS environment was made possible thanks to the ability to inject database information into the XML libraries through custom properties. While the API was certainly key, there are several motivating factors that positively impacted our decision to choose NI AWR Design Environment:

1. The ability to extend and integrate capabilities through an API.

2. The ability to mix electrical models/sub-circuits with EM documents within a single circuit, while keeping a synchronized layout view.

3. The EM extraction capability, which allowed seamless EM simulation of critical components/parts of the circuits.

4. The ability to use EM simulators from other vendors, if needed, directly from within NI AWR Design Environment software. ◀

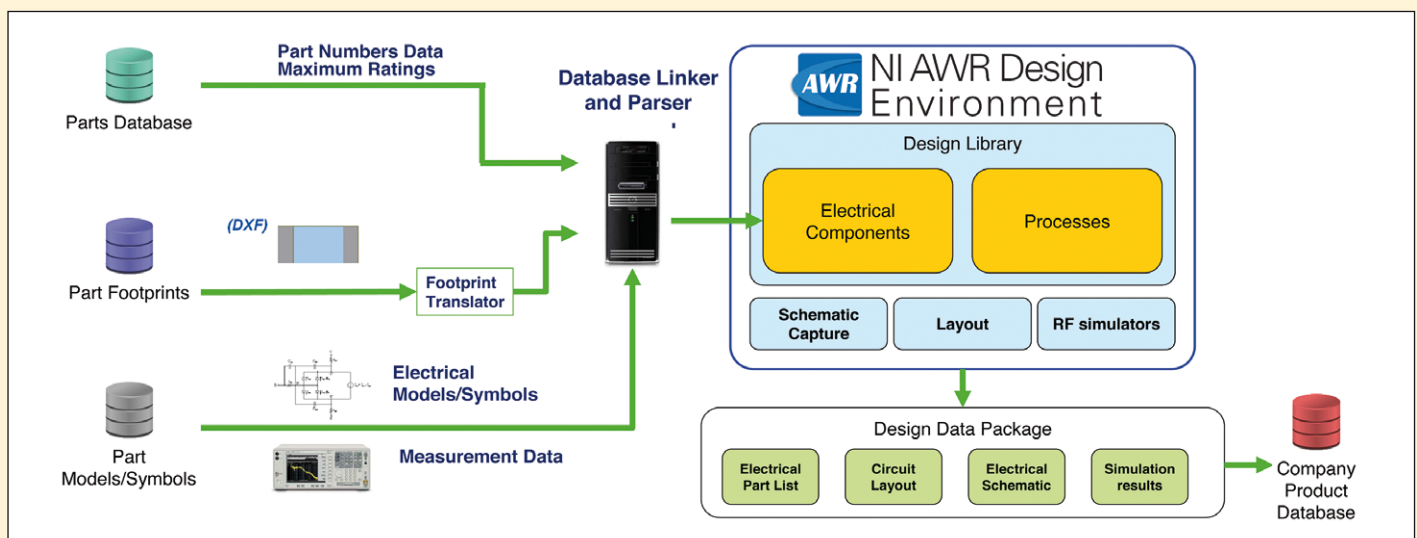


Figure 2: RF and microwave design flow diagram.