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Integrated RF Design Flow Part 5 - Release for Manufacturing

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Agenda:

1.   **Top level system design using ADS New Budget analysis**

2.   **Modeling "off the shelf components" In terms of data based models or parametric models.**

3.   *Creating Layout libraries for off the shelf components*

4.   **Creating an EM based RF board model.**

5.   **Release for manufacturing.**

Topics for this Module

- Overview of ADS Graphics Export Options

- Detailed look at Gerber artwork export

- Overview of Intermediate File Format (IFF) Export Options to Mentor and Cadence board-level tools

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Available Graphics Export Options

DXF	Import/Export
EGS Archive	Import/Export
GDSII Stream	Import/Export
Gerber	Export only
IGES	Import/Export

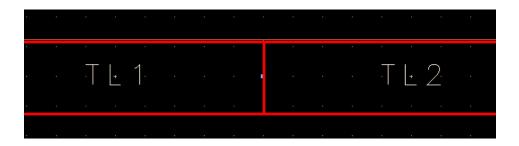# *Detailed Look at Gerber Export*

- **Gerber Artwork Translator**
  - Export selected layers from ADS layout to Gerber photo plotter
  - Supports Gerber RS274D, Gerber RS274X, and MDA Autoplot formats
- **Gerber Viewer**
  - Used to visually inspect Gerber output before committing to fabrication
  - also used for generating drill file and tooling reports from drill layer artwork

Preparing a layout for Gerber Export

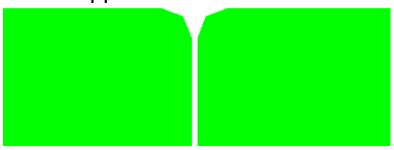Many ADS layout elements meet with no overlap:

Gerber plotter will fill each object individually, creating two potential problems:

1) Aperture radius divot at boundary of filled area

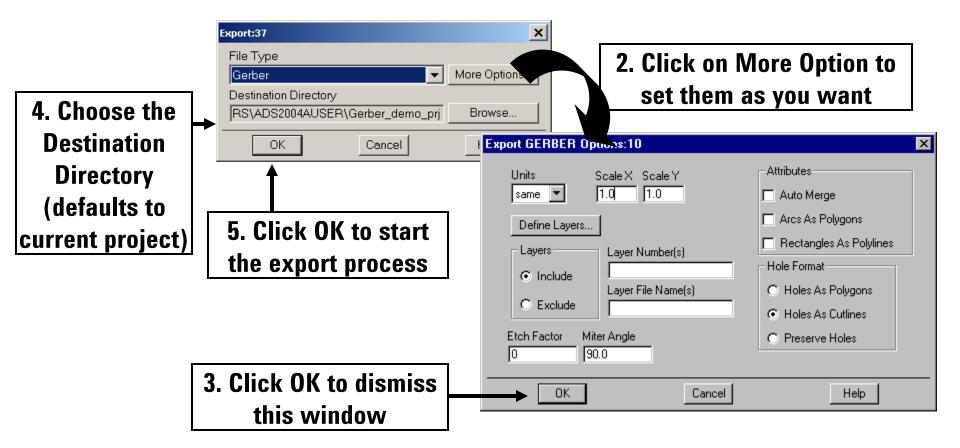2) If film is slightly underexposed, microscopic gap between objects could appear

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Generate Artwork/Edit>Merge>Or

These two steps will avoid gaps or divots in board artwork:

1)   Use File>Generate Artwork – copies an ADS layout, then removes all hierarchy – results in a flat layout with only primitive elements: circles, rectangles, polygons, text

2)   Select All, then Edit>Merge>Or – joins primitive objects which touch into complex polygons

No "seams" ensures no divots, no gaps

Exporting Gerber Files
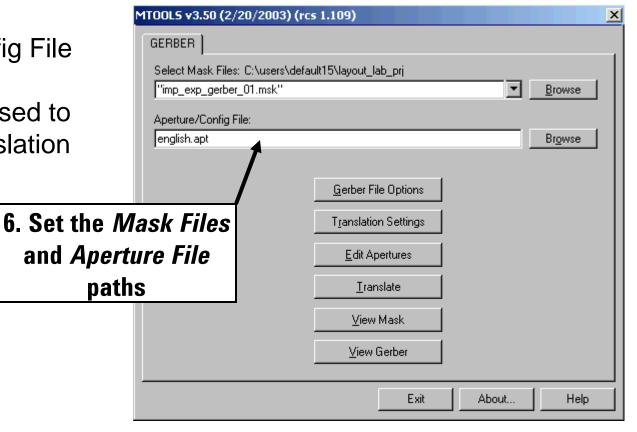
1. In the layout window, click File > Export to open the Export dialog box and select Gerber

4. Choose the Destination Directory (defaults to current project)

2. Click on More Option to set them as you want

5. Click OK to start the export process

3. Click OK to dismiss this window

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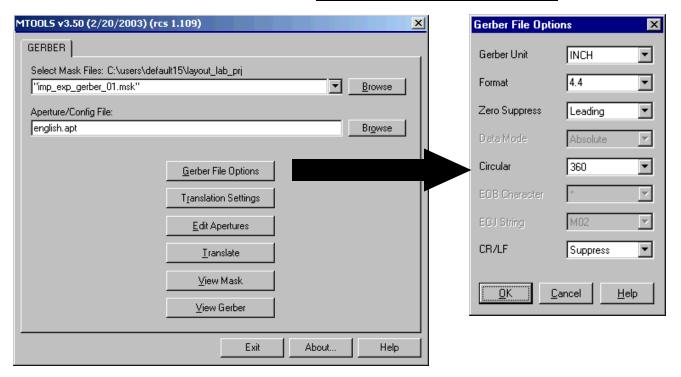
Exporting Gerber Files

- The Mask Files field displays the mask file created in the Export dialog box. This is the file that the Gerber translator converts into Gerber format.

- The Aperture/Config File field displays the configuration file used to hold all of the translation parameters and Gerber apertures
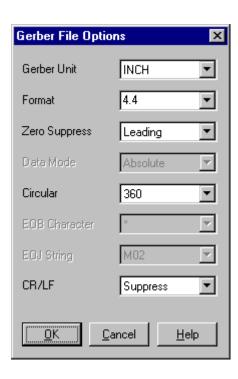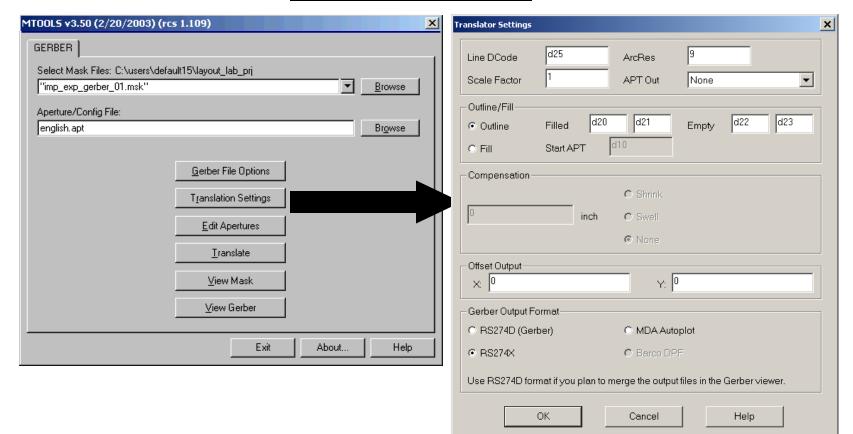

6. Set the *Mask Files* and *Aperture File* paths

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Exporting Gerber Files

7. Set the
Gerber File Options

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7. Gerber File options

- ***Gerber Unit.*** Available units are INCH or MM
- ***Format.*** The number of integers before and after the implied decimal point. Resolution should be sufficient to avoid round-off errors
- ***Circular*** – Options are 360 or Off. Use 360 if Gerber plotter supports arc interpolation.
- ***Zero Suppress.*** Available settings are Leading and None
- ***Data Mode.*** The program always writes out absolute coordinates.
- ***CR/LF*** – only enable if Gerber file is to be viewed in a text editor

Gerber File Options

Gerber Unit	INCH
Format	4.4
Zero Suppress	Leading
Data Mode	Absolute
Circular	360
EOB Character	*
EOJ String	M02
CR/LF	Suppress

OK   Cancel   Help

Exporting Gerber Files

8. Set the
Translation Settings
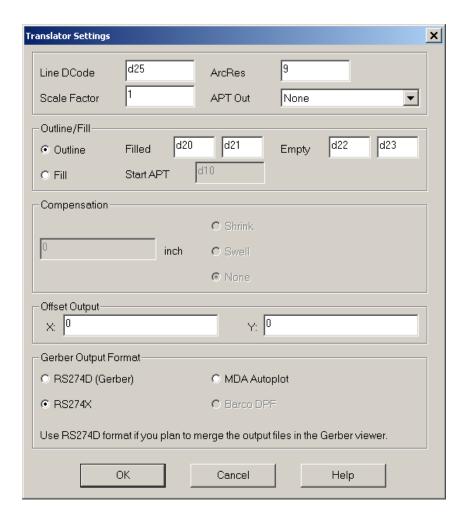
8. Translation Settings

Outline/Fill

Choose "Outline" if plotter supports automatic filling of polygons

"Fill" will explicitly paint interior of polygons
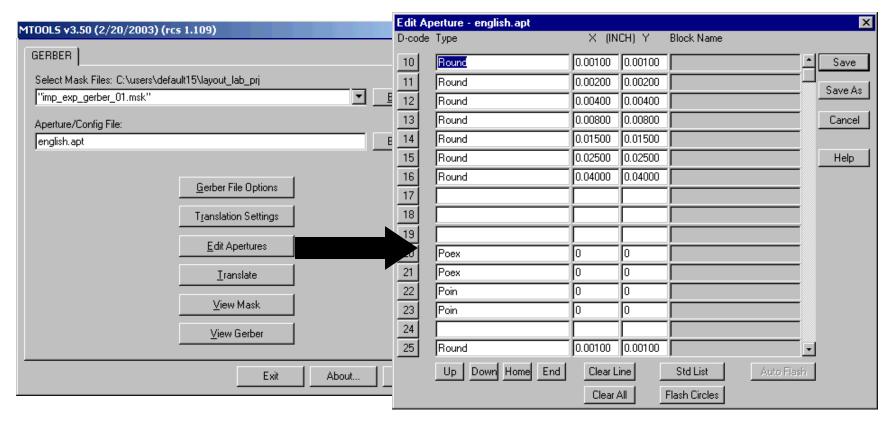
Gerber Output Format:

RS274X is recommended, contains aperture information within the plot file itself

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Exporting Gerber Files:
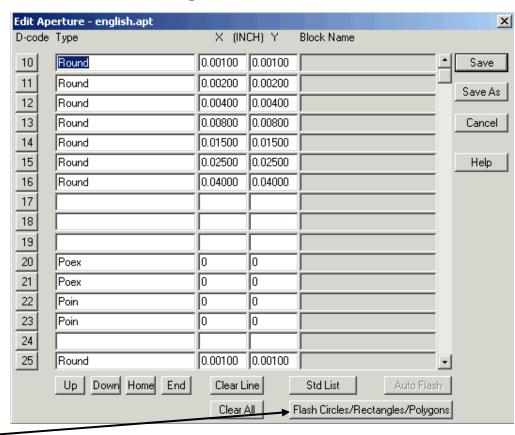
**9. Specify apertures
setting with
*Edit Apertures***

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9. Edit Apertures
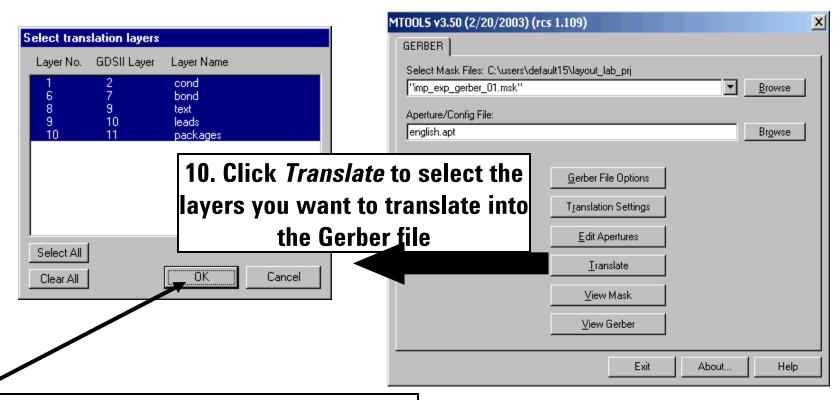
Apertures are the basic images the Gerber plotter will use to paint the artwork objects on film

"Flashing" Circles, Rectangles, Regular-shaped Polygons is more efficient,
This button adds the necessary aperture listings
NOTE: This step is *necessary* to enable generation of drill output

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Exporting Gerber Files

10. Click *Translate* to select the layers you want to translate into the Gerber file
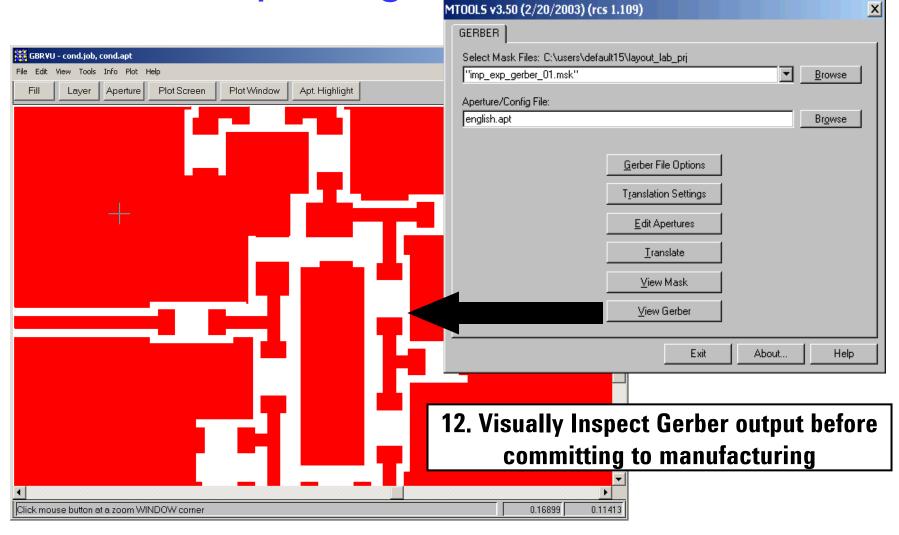
11. After selecting the layers, click OK to complete the translation. A window appears briefly, indicating that the layers are being converted to Gerber format

Output files will be <layer name>.gbr, in the destination directory

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Exporting Gerber Files

12. **Visually Inspect Gerber output before committing to manufacturing**

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12. Visually Inspect Gerber Output

User "Layer" control to set layer visibility, color, layer order

Check individual layers, and layer combinations

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Drill Output Considerations

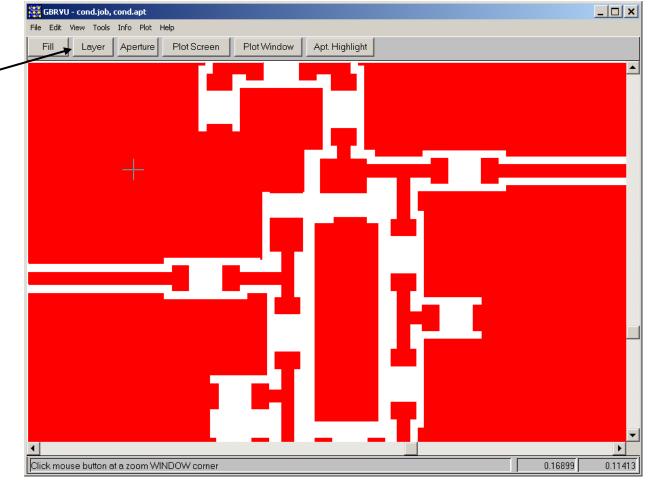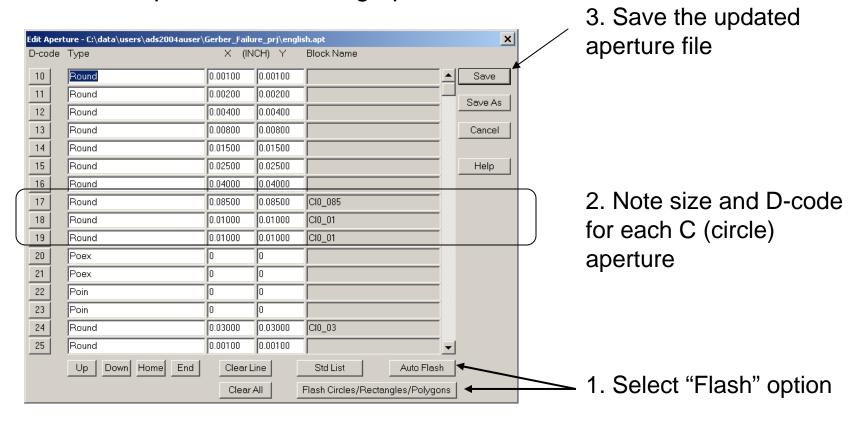- In ADS, a Drill File is derived from a Gerber file of a "hole" layer or layers

- Requires that you "flash" circles on hole layer

- Associate circle apertures with drill tool numbers, drill sizes

Drill Output Considerations
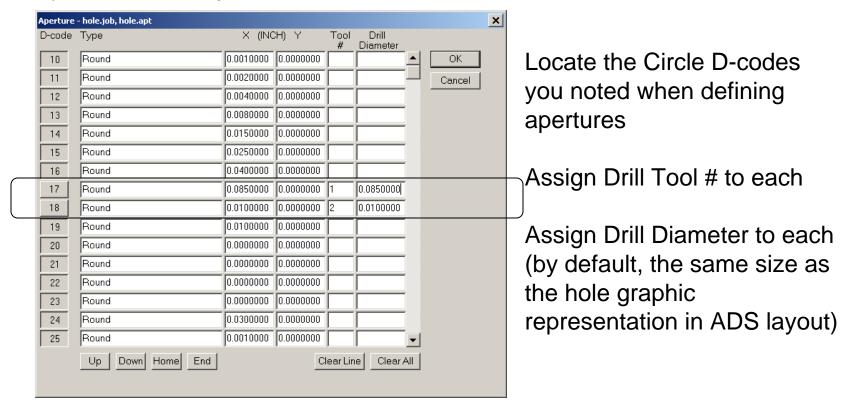
Back at Step 9, when defining apertures:

3. Save the updated aperture file

2. Note size and D-code for each C (circle) aperture

1. Select "Flash" option

Drill Output Considerations
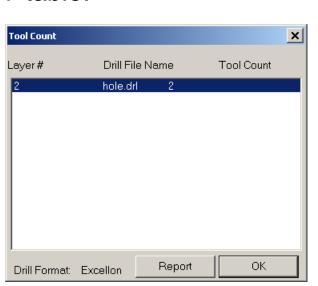
After generating Gerber files for artwork and drill layers:
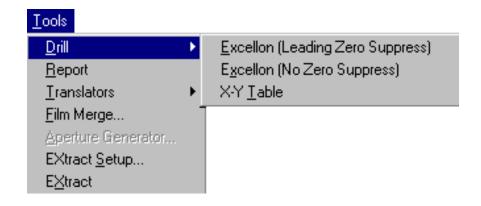
1) View JUST the hole layer in the Gerber viewer
2) Select the Aperture button

Locate the Circle D-codes you noted when defining apertures

Assign Drill Tool # to each

Assign Drill Diameter to each (by default, the same size as the hole graphic representation in ADS layout)

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Exporting the Drill File

- With just the hole laver visible, select Tools > Drill

- 2 main formats:
  - Excellon to create a drill file.
  - Table to create an X-Y table.

- Choose the format you want to generate, then this box appears:

Only the "hole" layer should be identified,

Tool Count=# of unique drill sizes

Tools menu:
- Drill ▶
  - Excellon (Leading Zero Suppress)
  - Excellon (No Zero Suppress)
  - X-Y Table
- Report
- Translators ▶
- Film Merge...
- Aperture Generator...
- EXtract Setup...
- EXtract

Tool Count dialog:

Layer #	Drill File Name	Tool Count
2	hole.drl	2

Drill Format: Excellon   Report   OK

Exporting the Drill File

Click on Report to display the Drill Report file:

```
+-------------------------------------------------------------------------+
|                  D R I L L    T O O L S    T A B L E                     |
+----------+----------+-----------+------------------------------------------+
|  Drill   |  Drill   |  Drill    |                                          |
|  Tool    |  Size    |  Count    |  Remark                                  |
+----------+----------+-----------+------------------------------------------+
|  T01     |  .0850   |  000001   |  D17                                     |
|  T02     |  .0100   |  000576   |  D18                                     |
+----------+----------+-----------+------------------------------------------+
```

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Overview of Intermediate File Format (IFF) Export Options

- Mentor DesignArchitect/BoardStation

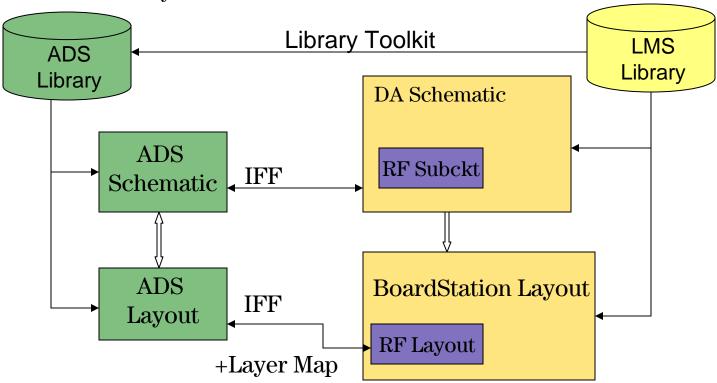- Mentor Expedition

- Cadence Concept/Allegro

Each interfaces assumes a specific use model, we'll review specific requirements for each design flow

ADS ->Mentor DesignArchitect/BoardStation

Appropriate for integrating RF Sub-circuit with larger mixed-signal design

Assumes synchronized packaged parts libraries, strict synchronization between ADS schematic and layout

Requirements: Schematic and Layout IFF interfaces for ADS,
RF Architect and RF Layout interfaces for DA/BoardStation
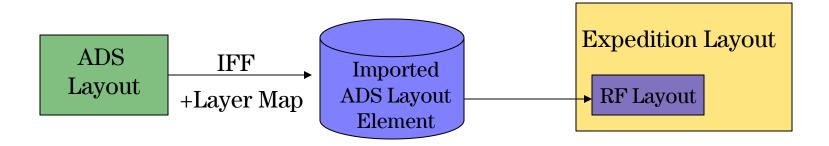ADS Packaged Parts Library derived from Mentor LMS library

ADS ->Mentor Expedition

Appropriate for precise RF copper structures (spirals, couplers, splitters) which would be hard to produce in Expedition

No intelligent transfer of packaged parts, entire ADS layout becomes a single "geometry" in Expedition library

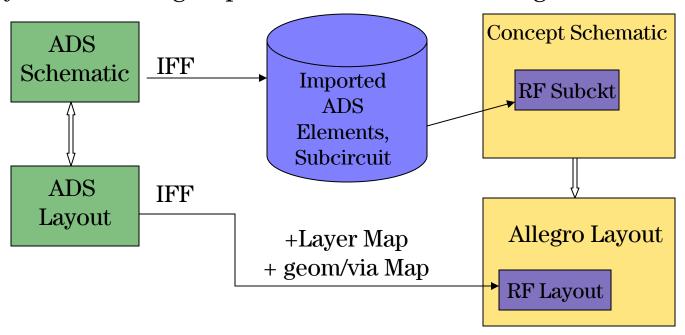Craft & validate Copper-only object with Momentum, Momentum optimization

Requirements: Layout IFF interface for ADS, Layout IFF importers for Expedition

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ADS ->Cadence Concept/Allegro
RF Circuit with packaged parts and transmission lines

ADS Schematic becomes Concept sub-circuit,
ADS layout becomes grouped set of elements in Allegro

Requirements: Schematic and Layout IFF interfaces for ADS, Schematic and Layout
IFF importers for Concept/Allegro,
ADS packaged parts should be enhanced with Concept properties,
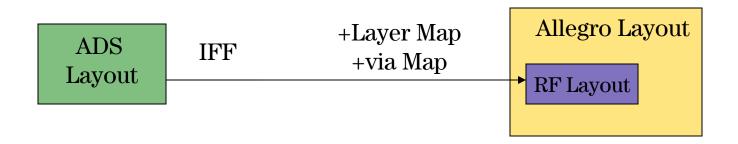ADS geometries should (approximately) match Allegro geometries

ADS ->Cadence Allegro
Copper-only RF Elements, no packaged parts

Appropriate for precise RF copper structures (spirals, couplers, splitters) which would be hard to produce in Allegro

Craft & validate Copper-only object with Momentum, Momentum optimization

ADS layout becomes grouped set of elements in Allegro

Requirements: Layout IFF interface for ADS, Layout IFF importer for Concept/Allegro

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