GDS Import Wizard V5.6 Manual

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About GDS Import Wizard

Return

A smart tool to translate GDSII to 3DLayout EDB quickly:

- Extract nets from GDS and import to EDB
- Extract accurate material property from IRCX
- Extract accurate layer thickness and stackup from IRCX
- Automatic generate control xml for AEDT GDSII Importing
- Automatic create Via Group and SnapViaGroups
- Automatic generate components on top and bottom layer for easier port setup
- Automatic generate TSV Insulation coating
- Synchronous import to AEDT when EDB prepared
- Automatic detect and fix of small gaps between layers to avoid mesh Issue (New in V4.0)
- Support sheet layers to simplify thinner metal layer mesh e.g. 0.001um （New in V4.0）
- support to generate temperature dependent material （New in V5.0）
- Add CSV input template to provide more flexible input for other Technology File（New in V5.0）
- Support New TSV Layer feature in 3D Layout 2022R1 (New in V5.0)
- Support ConvertPolygonToCircle Feature to reduce mesh(New in V5.0)
- More flexible setting options and enhanced command line(No-GUI) support(windows and Linux)

ANSYS workflow for 2.5D/3D SI Interpower Simulation

Integrated with ANSYS AEDT

Option1:
- ✓ TSMC IRCX
- ✓ GDS File

Option2:
- ✓ Customized Tech file (CSV)
- ✓ GDS File

GDSImportWizard
- ✓ Net name extract
- ✓ Stackup
- ✓ Layer thickness
- ✓ Material properties
- ✓ Via Groups
- ✓ Snap Primitives
- ✓ More…

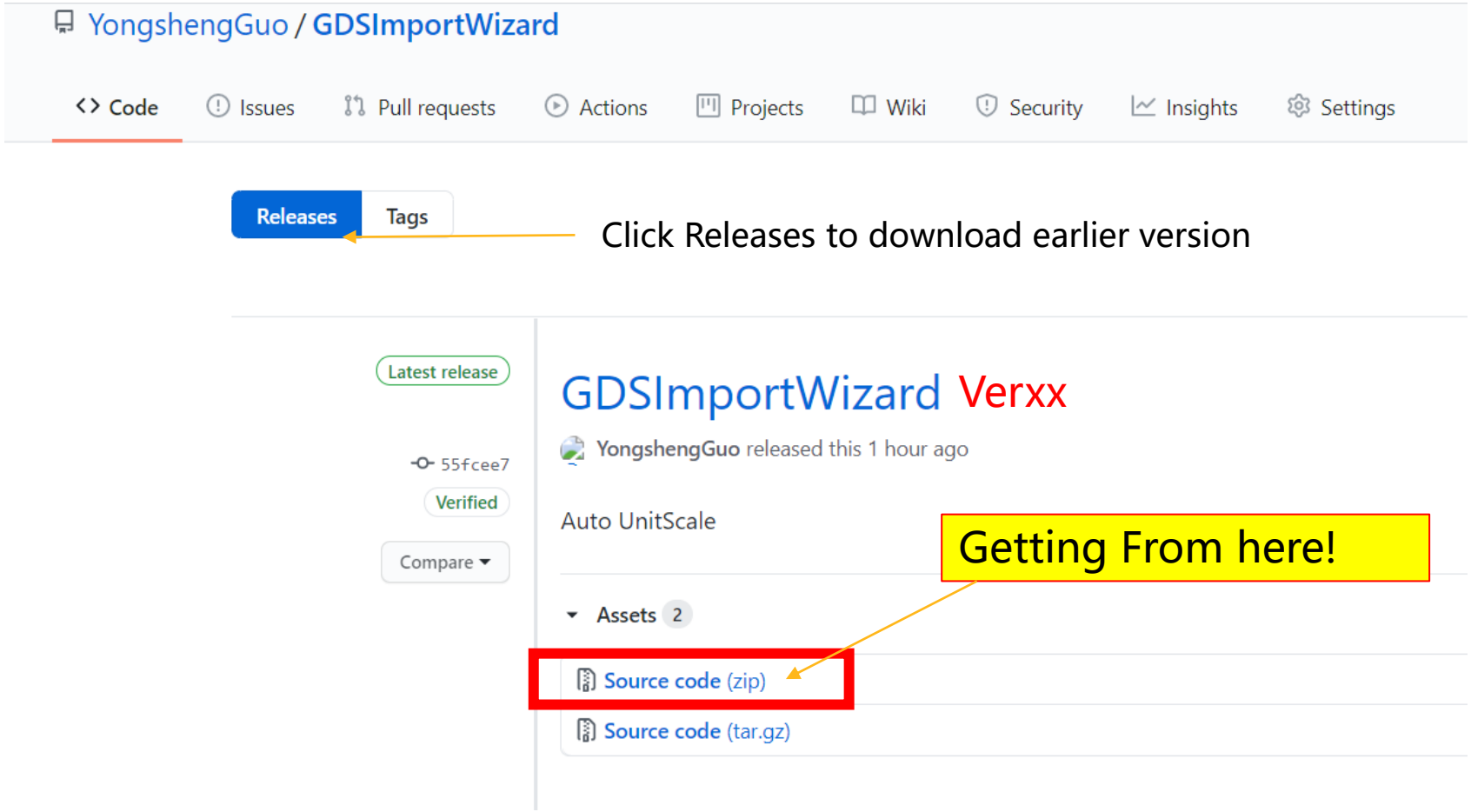
HFSS 3D Layout
- ✓ S-parameter Extraction
- ✓ Crosstalk
- ✓ SSN
- ✓ Eye opening
- ✓ PDN
- ✓ Thermal-EM Co-simulation

Step 1 **Step 2** **Step 3**

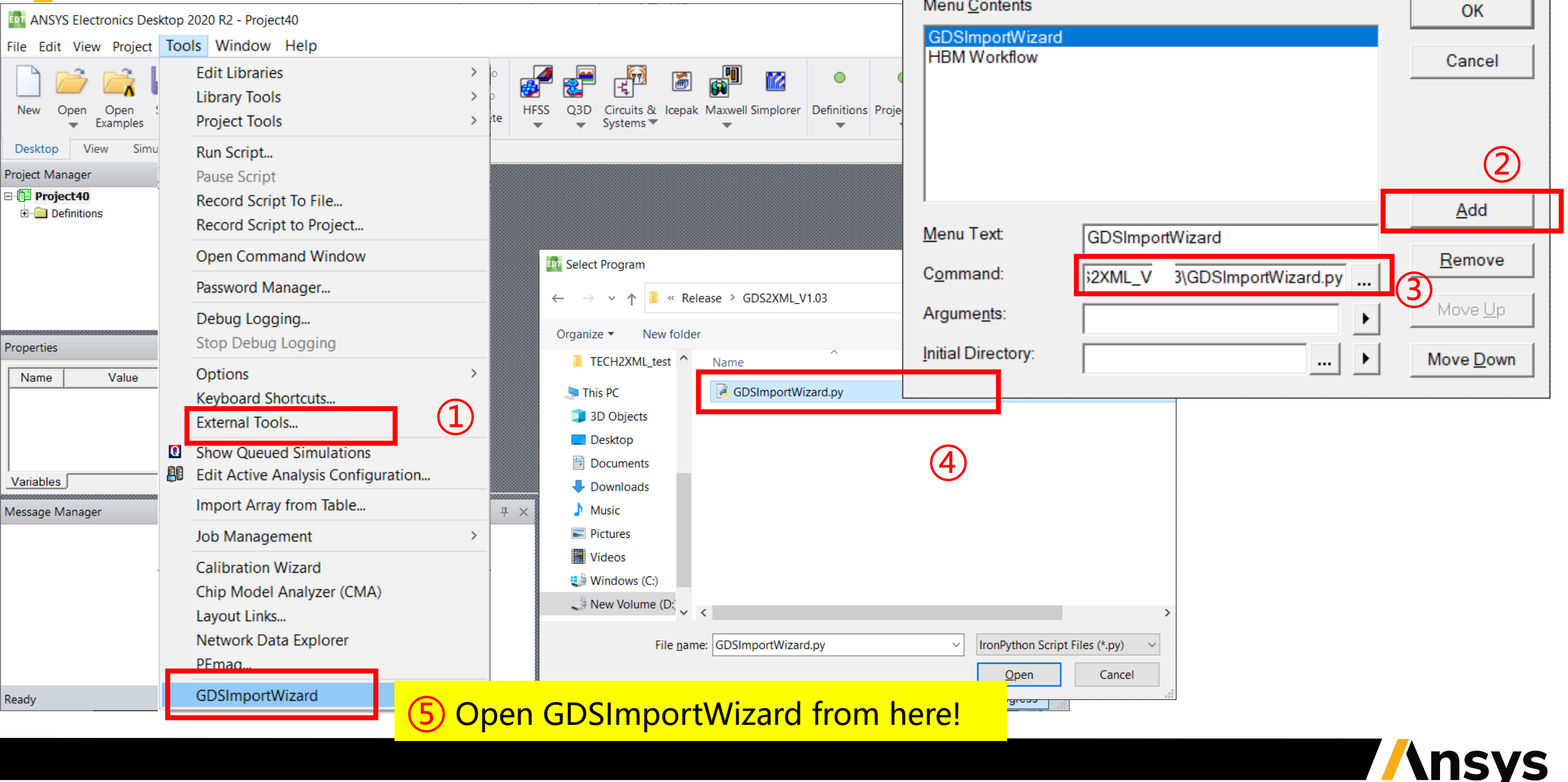
Get the latest GDSImportWizard Tool

Return

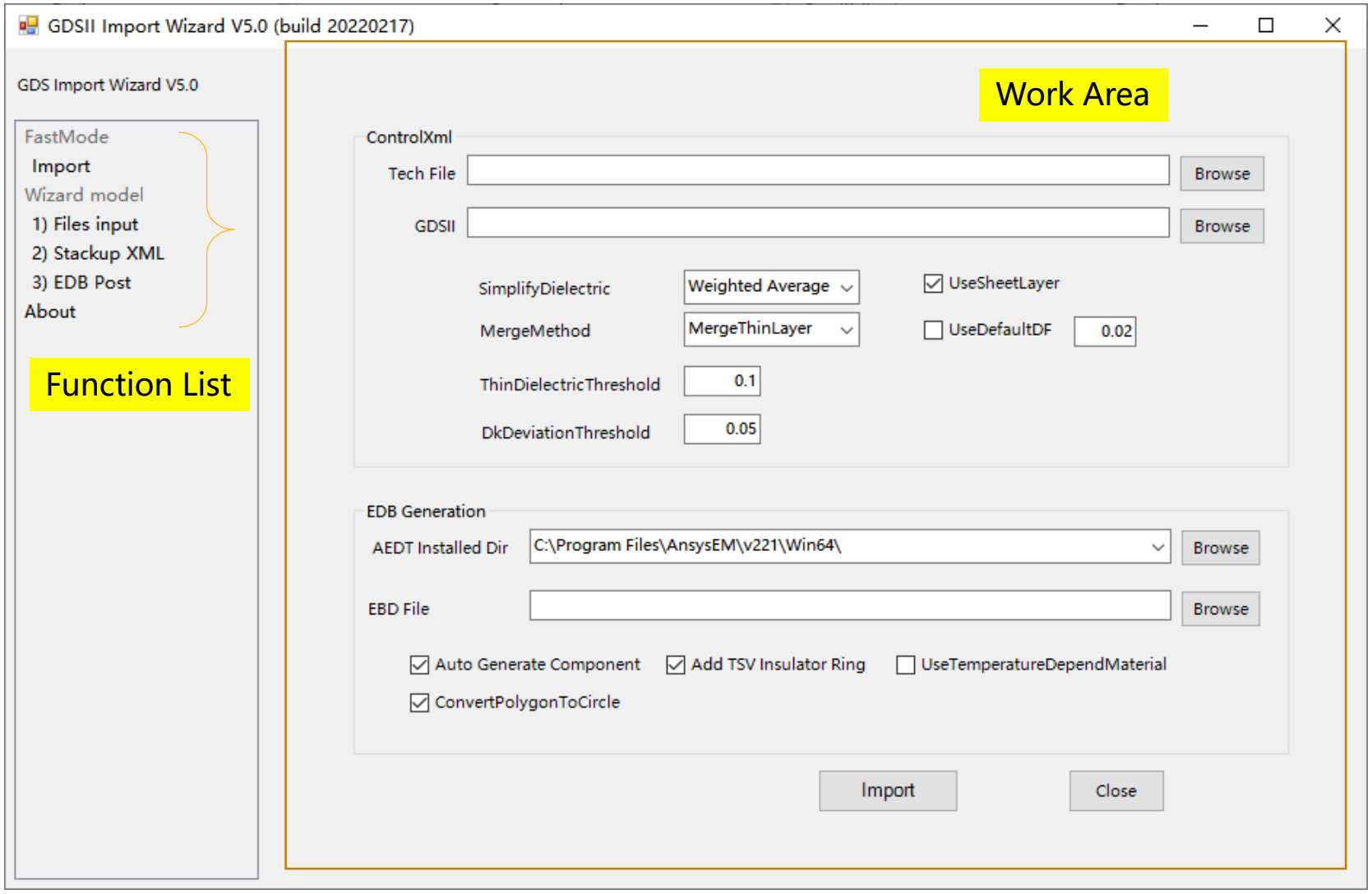
https://github.com/YongshengGuo/GDSImportWizard/releases/latest



Add GDS Import Wizard to AEDT



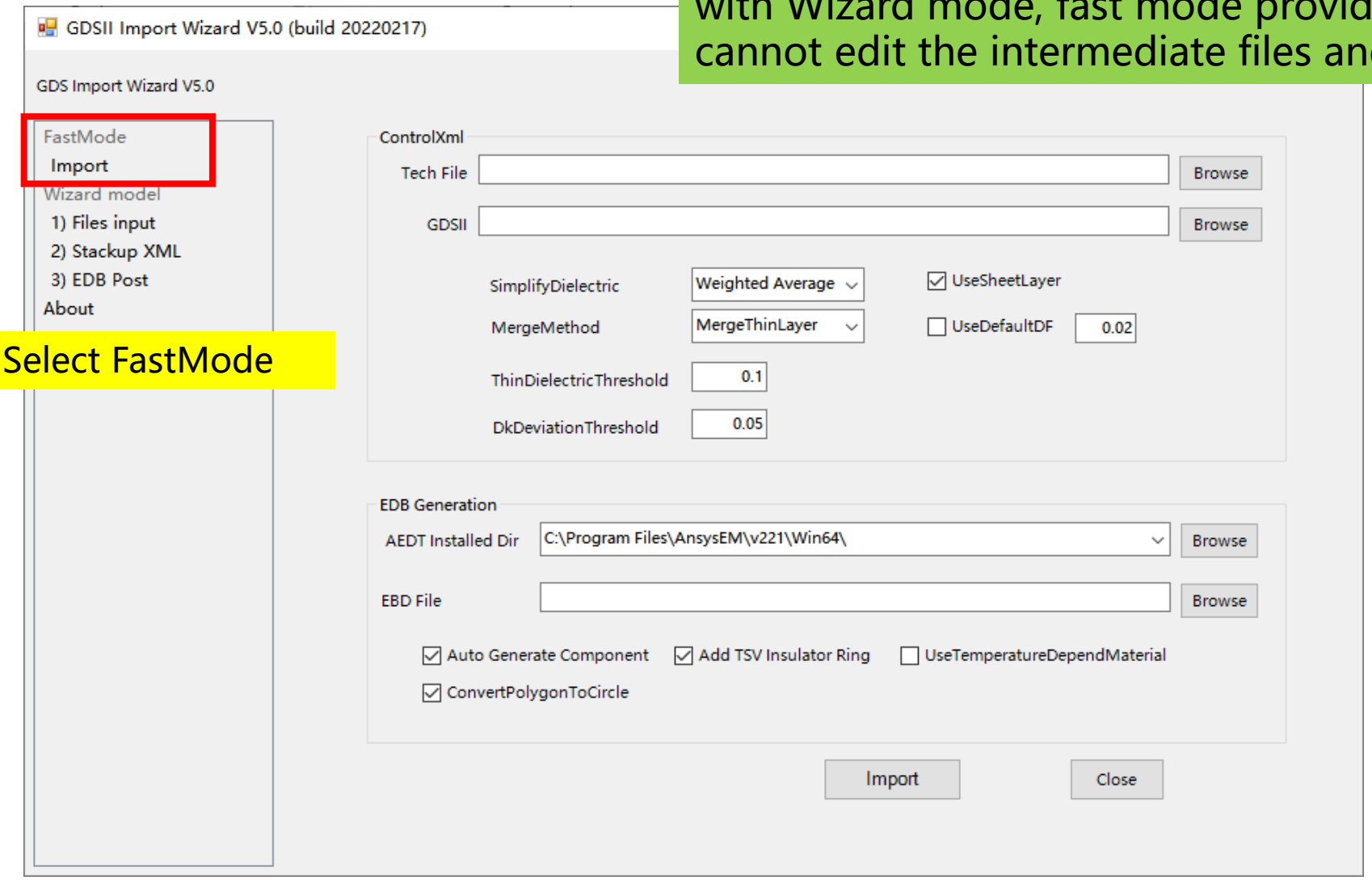
GDS Import Wizard V5.0



Running in Fast Mode

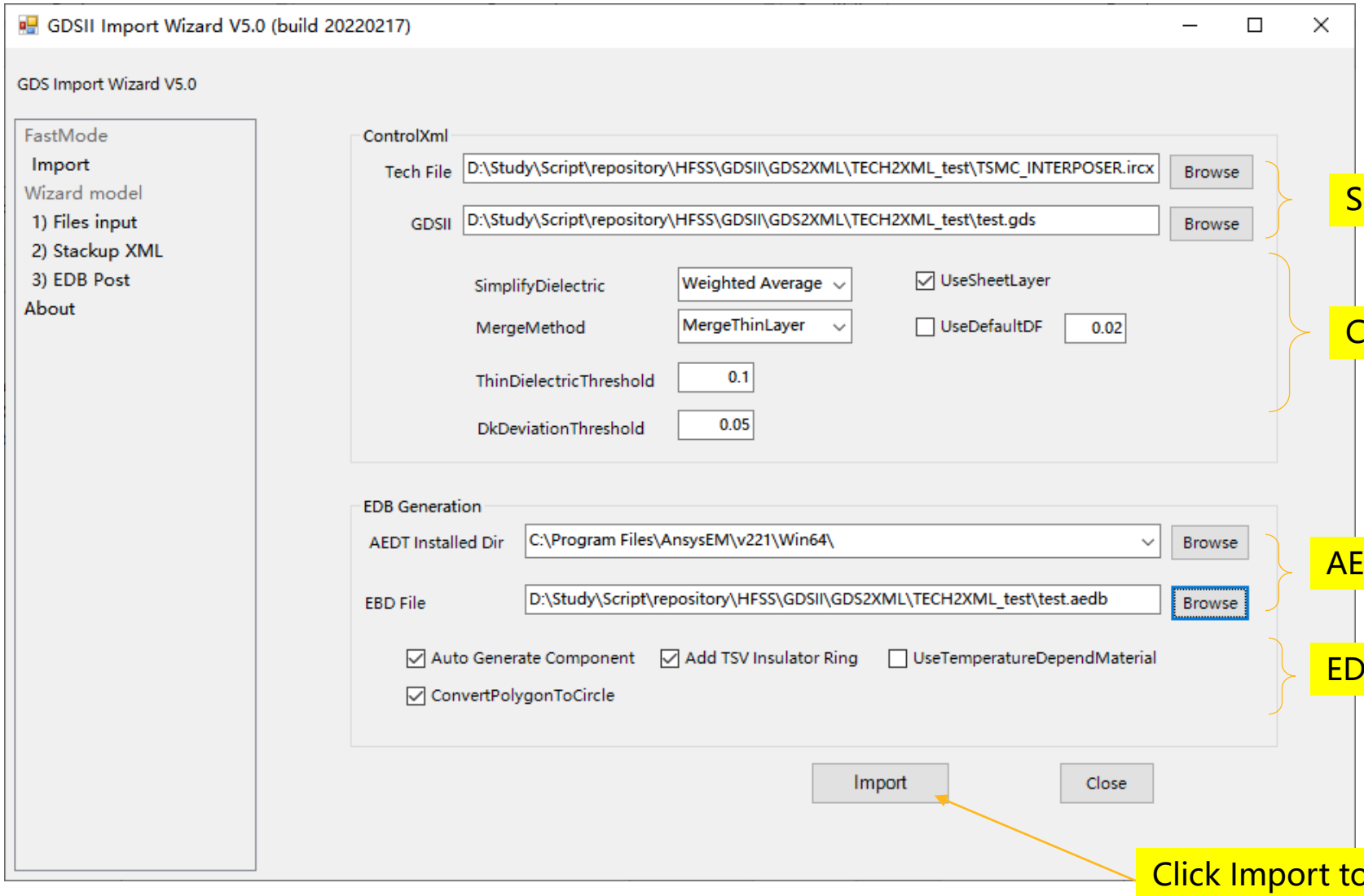
Fast Mode

Fast mode provides a way of one click to Import all. Compared with Wizard mode, fast mode provides faster setting, but it cannot edit the intermediate files and fewer options .



Select FastMode

Fast Mode



Set IRCX and GDS files

Control XML Option

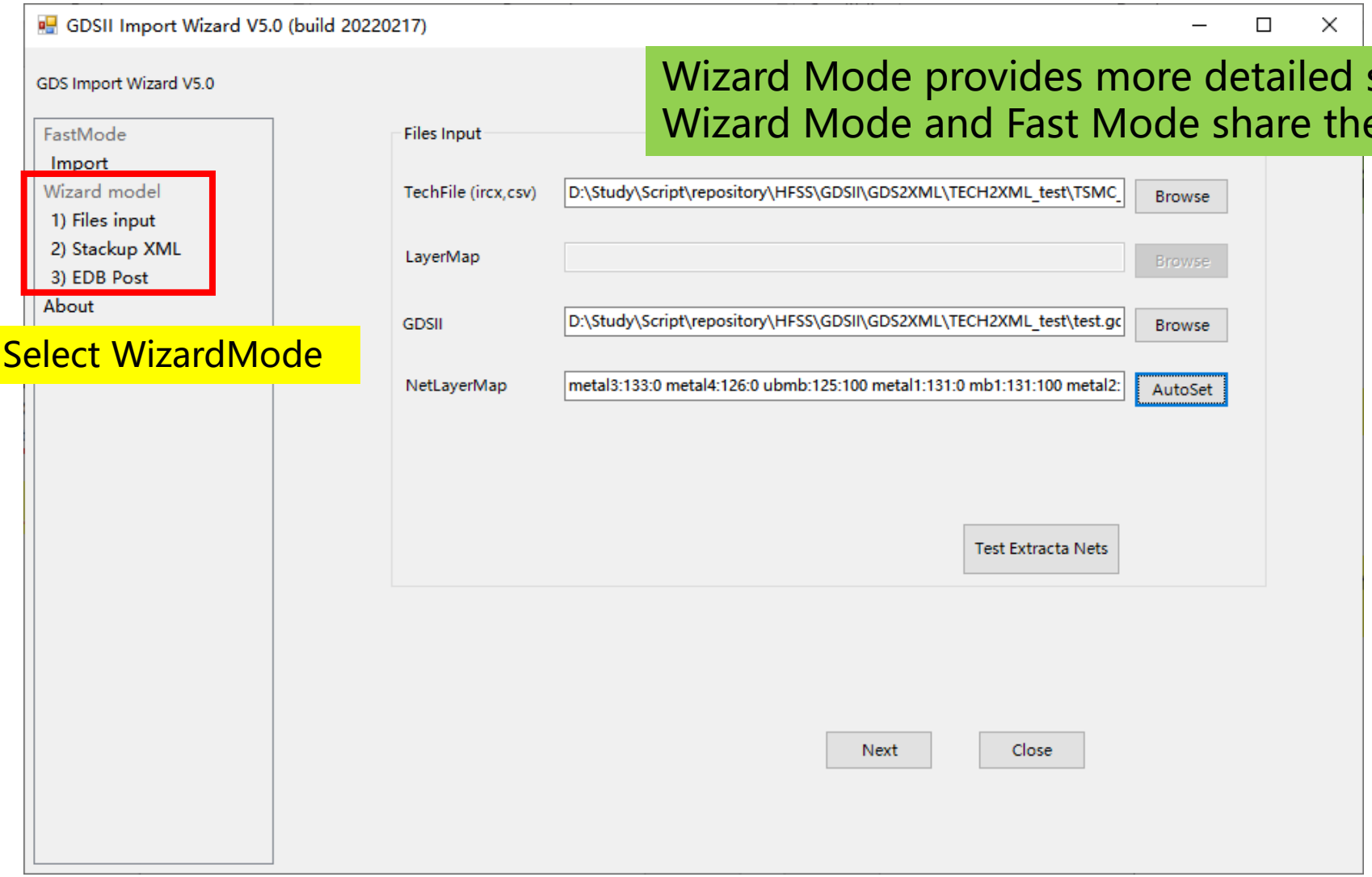
AEDT Version and Project path

EDB post-processing

Click Import to import GDS to 3DL at once

Running in Wizard Mode

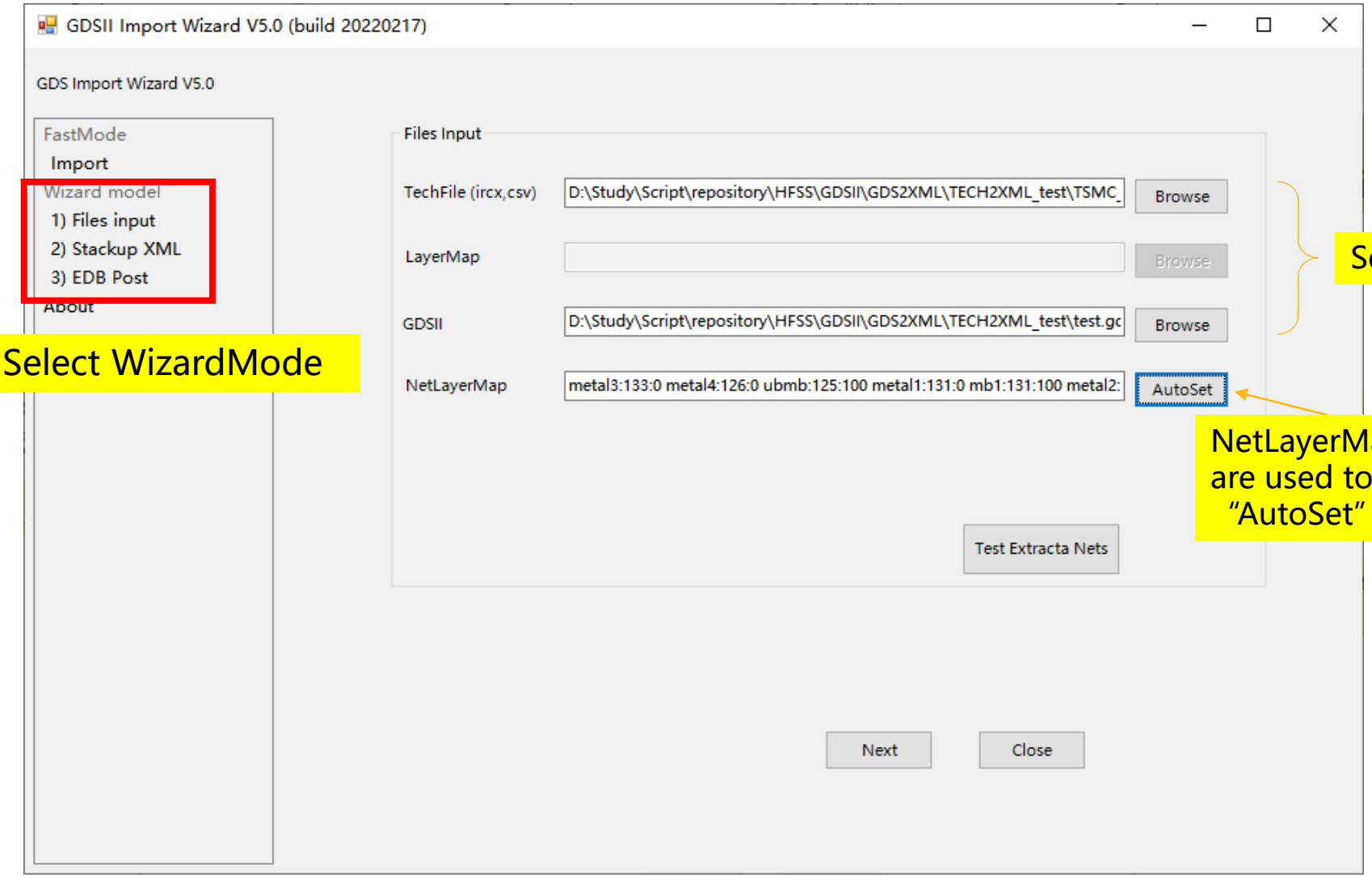
Wizard Mode



Wizard Mode provides more detailed setting and control.
Wizard Mode and Fast Mode share the same setting and options.

Select WizardMode

Wizard Mode – 1) Files input

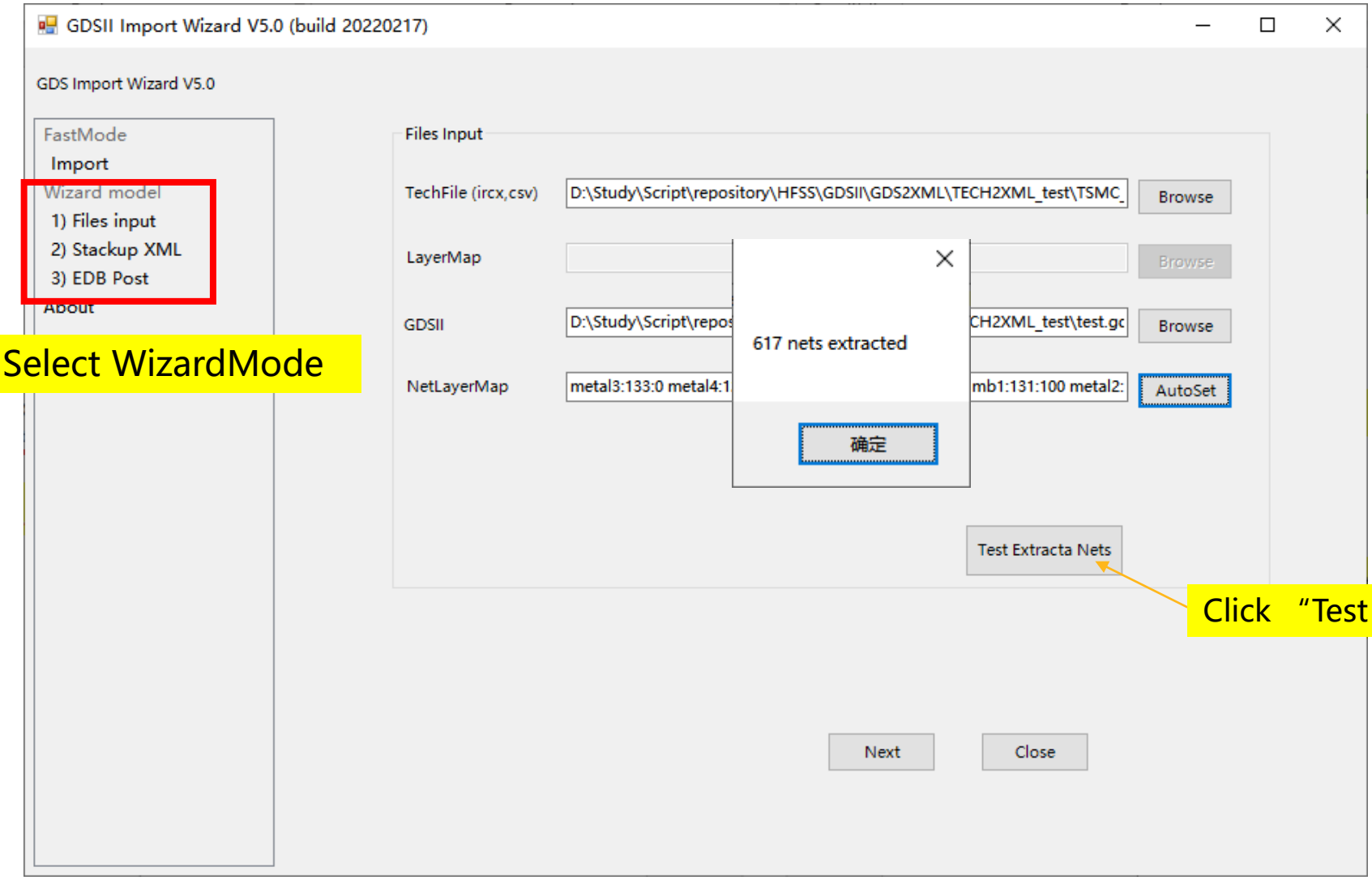


Select WizardMode

Set IRCX and GDS files

NetLayerMap: Indicates which layers of GDS are used to extract Nets information. Click "AutoSet" to extract all net layer map in IRCX.

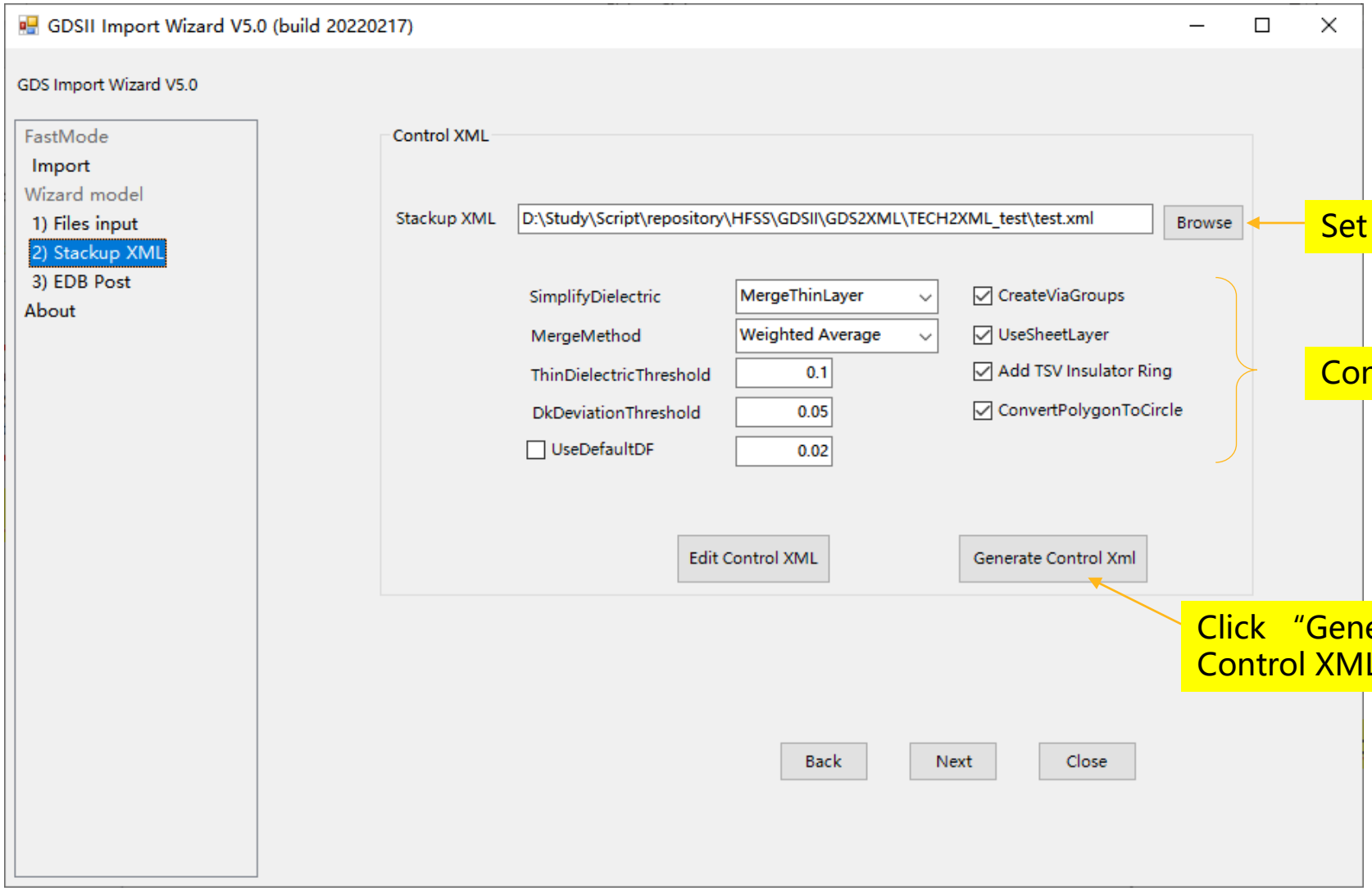
Wizard Mode – 1) Files input



Select WizardMode

Click “Test Extracta Nets” for nets test.

Wizard Mode – 2) Stackup XML

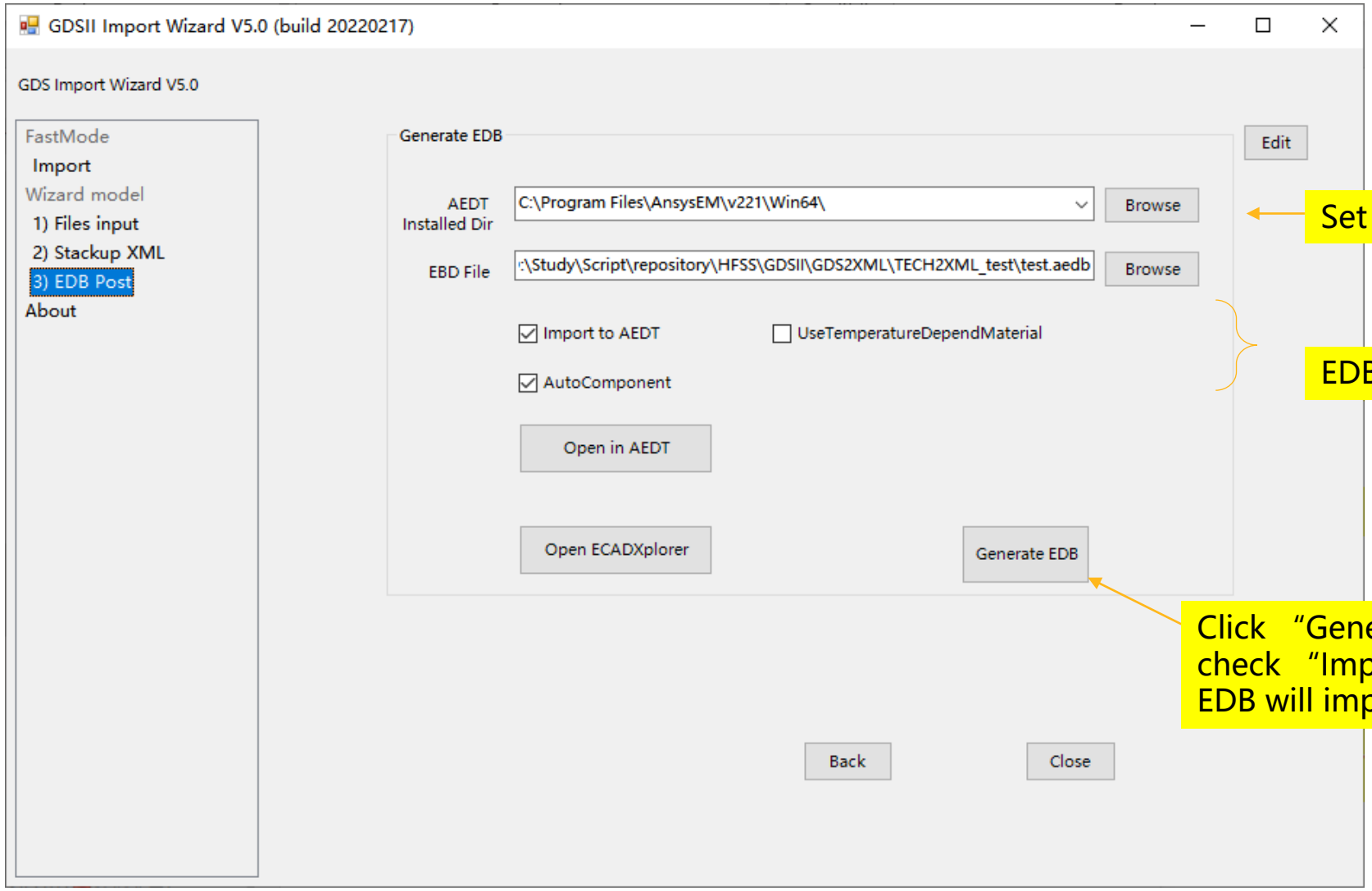


Set Stackup XML Save path

Control XML Option

Click "Generate Control XML" to generate Control XML

Wizard Mode – 3) EDB Post



Set AEDT Path (Version)

EDB post Option

Click "Generate EDB" to generate EDB, if check "Import to AEDT", the generated EDB will import to 3DL.

Running in windows command line

Running in batch mode - Windows

Eg1. Configure from system environment:

- set AedtInstallDir=C:\Program Files\AnsysEM\AnsysEM21.1\Win64
- set GdsFile=D:\HFSS\GDSII\GDS2XML\TECH2XML_test\test.gds
- set TechFile=D:\HFSS\GDSII\GDS2XML\TECH2XML_test\TSMC_INTERPOSER.ircx
- set path=% AedtInstallDir %\common\IronPython;%path%
- ipy64 GDSImportWizard.py -batch

Eg2. Configure from command arguments:

- set AedtInstallDir=C:\Program Files\AnsysEM\AnsysEM21.1\Win64
- set path=% AedtInstallDir %\common\IronPython;%path%
- ipy64 GDSImportWizard.py –GdsFile “D:\HFSS\GDSII\GDS2XML\TECH2XML_test\test.gds” – TechFile “D:\HFSS\GDSII\GDS2XML\TECH2XML_test\TSMC_INTERPOSER.ircx”

Note: system environment and command arguments could be mixed.

Running in batch mode - Windows

- A short command is supported:
  - ipy64 GDSImportWizard.py gdspath
  - ipy64 GDSImportWizard.py gdspath edbpath

- Eg3. short command
  - ipy64 GDSImportWizard.py “D:\HFSS\GDSII\GDS2XML\TECH2XML_test\test.gds” –TechFile “D:\HFSS\GDSII\GDS2XML\TECH2XML_test\TSMC_INTERPOSER.ircx”

Running in Linux terminal command

Running in batch mode - Linux

Eg1. Configure from system environment:

- export AedtInstallDir='/home/ansys/app/AnsysEM20.1/Linux64'
- export GdsFile=/home/ansys/yguo/test/test.gds
- export TechFile=/home/ansys/yguo/test/TSMC_INTERPOSER.ircx
- export ipy64="$AedtInstallDir /common/mono/Linux64/bin/mono $AedtInstallDir /common/IronPython/ipy64.exe"
- $ipy64 GDSImportWizard.py

Eg2. Configure from command arguments:

- export AedtInstallDir='/home/ansys/app/AnsysEM20.1/Linux64'
- export ipy64="$AedtInstallDir /common/mono/Linux64/bin/mono $AedtInstallDir /common/IronPython/ipy64.exe"
- $ipy64 GDSImportWizard.py –GdsFile “D:\HFSS\GDSII\GDS2XML\TECH2XML_test\test.gds” – TechFile “D:\HFSS\GDSII\GDS2XML\TECH2XML_test\TSMC_INTERPOSER.ircx”

Note: system environment and command arguments could be mixed.

Running in batch mode - Linux

- A short command is supported:
  - ipy64 GDSImportWizard.py gdspath
  - ipy64 GDSImportWizard.py gdspath edbpath

- Eg3. short command
  - export AedtInstallDir='/home/ansys/app/AnsysEM20.1/Linux64'
  - export ipy64="$aedtInstallPath/common/mono/Linux64/bin/mono $aedtInstallPath/common/IronPython/ipy64.exe"
  - $ipy64 GDSImportWizard.py "D:\HFSS\GDSII\GDS2XML\TECH2XML_test\test.gds" –TechFile "D:\HFSS\GDSII\GDS2XML\TECH2XML_test\TSMC_INTERPOSER.ircx"

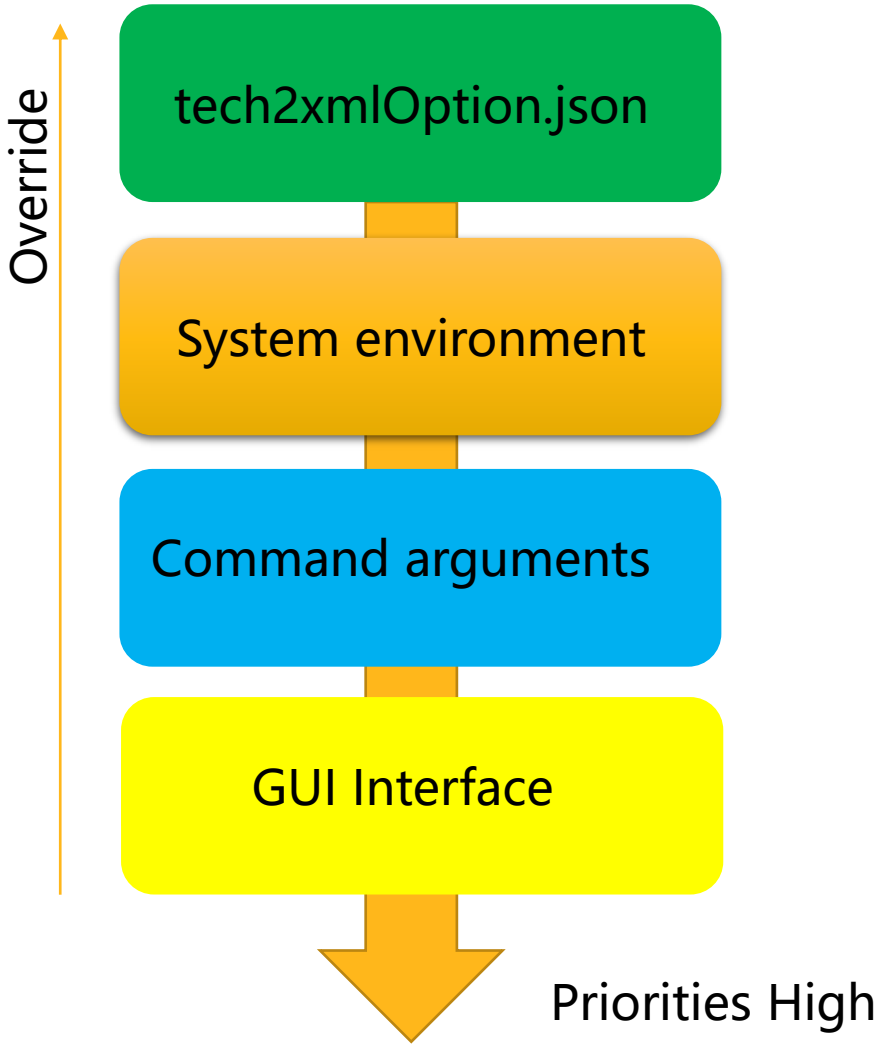
Options Setting

Options Parameters in GDS Import Wizard

- There are Four ways to set the options for GDS Import Wizard
  1) By configure file: tech2xmlOption.json （in same directory with toolkit)
  2) By system environment variables
  3) Set the parameters in command arguments.
  4) Set in GUI.

These three methods will achieve the same effect, but with different priorities.

Options Priorities



If the same parameter given in multiple places, the higher priority parameter will take precedence.

As one example, if one parameter is given in System environment and tech2xmlOption.json at the same time, System environment value will have high priorities and take precedence.

GUI Interface have the highest priority, Command arguments System environment and tech2xmlOption.json setting will be used as initial values of GUI input elements.

Options

Options	Defalut Value	Description
Stackup XML Parameters		
InputType	0	0: Ircx, others: not define
UseShortMergeLayerName	True	changing is not recommended
SimplifyDieletricMethod	1,	0: NoSimplify, No Merge on Dielectric, exact layers in IRCX 1 : MergeThinLayer, Merge layer thinner than a specific value 2:BlockMerge, use average DK on all layers except substrate
MergeDielectricMethod	0	0: Weighted Average , 1: Weighted Average , 2: Kraszewski equation, 3: Landau equation, 4: Lichtenecker equation
ThinDielectricThreshold	0.1	0.1: Merge layer when layer thickness<0.1um, default unit um
DkDeviationThreshold	0.05 or 5%	0.05: Merge layers when dk difference less then 10%
FixedSmallLayerGap	0.005	0.005: Fix small air gap between layers less then 0.005um, default unit um
UseDefaultDF	True	True: If not hav df value in technology, a default df value will be used false: If not hav df value in technology, will set df =0
DefaultDF	0.02	set for default df value
NotUseDfonSubstrate	True	True: default df value will never used on Substrate layer(Silicon material), it is recommended to set as True.
UseSheetLayer	True	True: set the layers as 0um when it small then "SheetLayerThreshold", which will avoid to generatelarge number of tiny meshes
SheetLayerThreshold	0.0015	0.0015: if "UseSheetLayer" is True, layers which < 0.0015um will set to zero thickness(treat as 2D sheet object)
CreatViaGroups	True	True: ViaGroups will be implemented on via layers
CreatViaGroupsOption	Default	Default: "Method:proximity,Tolerance:5um,CheckContainment:true“ , Option: "Method:range,Persistent:false,Tolerance:1um"
NotUseViaGroupsOnLayers	".*tsv.*,pmb"	Regular expressions are used, don’t create ViaGruops if layer name match anyone of list.
IgnoreLayersReg	"air,ctm.*,cbm.*"dtce.*"	layers will not import into 3D Layout. Regular expressions are used, and ignoreLayerNames are seprate with comma or space
TextLayermap	None	Text layers indicate for net extraction, None will use all text layer in technoloyg files. User could set it accrond the rule: "ubmb:125:100, "ubump:125:0"
ConvertPolygonToCircle	True	True: will convert all polygons on a layer to circles, only support from AEDT 2022R1
ConvertPolygonToCircleRatio	0.9	polygons with Circle Ratio 0.9 will convert to circles, valid when ConvertPolygonToCircle as True

Options

Path Parameters		
TechFile	None	input: techFile path (Absolute), must set
LayerMapFile	None	input: layerMapFile path (Absolute), not used
GdsFile	None	input: gdsFile path (Absolute), must set
AedtInstallDir	None	input: AEDT installtion path (Absolute), must set to do edb post
ControlXmlPath	None	output: controlXmlPath (Absolute), optional
edbPath	None	output: edbPath (Absolute), optional
Gds post Parameters		
OpenInAedt	True	true: will open EDB when the conversion is completed
AutoComps	True	true: will automatic generation device, easy port creation
CompLayerList	1,-1	index for which layers will generate components, 1 indicate top layer, -1 indicate bottom layer, and so on.
ComponentPinsTolerance	10	Pins spacing less than 10 times pad diameter with each other will be considered as a component
AutoTSVCoat	True	true: will automatic generation tsv insulator
DissolveViaGroup	False	true: dussikve all groups or component before doing edb post processing
UseTemperatureDependMaterial	True	true: will generate temperature dependance material if TC1/TC2 given in material defintion

Customized Technology File- CSVTech_overlapping_template

CSV Tech overlapping template

- The CSV format template provide an easy way to define Customized Technology File.
- You could find a demo file in the folder of the toolkit as CSVTech_overlapping_template.csv
- overlapping template is suited for any stackup, the dielectrics and metals are defined separately.
- The follow pages will give the details the overlapping template.

CSVTech_overlapping_template.csv

NO	LayerName	Type	LayerMap	TextLayerMap	Thickness	Height	LowerLayer	UpperLayer	DK	DF	Cond	TC1	TC2	Tref	
1	UF1	D			35	107.64			3.7						
19	IMD1a	D			0.05	100.75			8.1						
20	ILD	D			0.75	100			4						
21	substrate	D			100	0			11.9		10				
22	PASSB1	D			0.8	-0.8			6.7						
23	PASSB2b	D			2	-2.8			6.7						
24	PASSB2a	D			0.4	-3.2			6.7						
25	underFill_C	D			0.001	-3.201			6.7						
26	ubump	C	170;0 74;0	125;0	0.001	142.639					5.80E+07	0.00E+00	0.00E+00	25.00	
27	metal4	C	74;0		1.45	105.19					5.80E+07	3.89E-03	-1.50E-07	25.00	
28	metal3	C	33;40		0.85	103.565					5.80E+07	3.63E-03	-1.39E-06	25.00	
29	metal2	C	32;40		0.85	102.12					5.80E+07	3.63E-03	-1.39E-06	25.00	
30	ctm	C			0.08	101.793					5.80E+07	0.00E+00	0.00E+00	25.00	
31	cbm	C			0.2	101.575					5.80E+07	0.00E+00	0.00E+00	25.00	
32	metal1	C	31;40		0.85	100.675					5.80E+07	3.63E-03	-1.39E-06	25.00	
33	mb1	C	31;100		0.001	-0.801					5.80E+07	0.00E+00	0.00E+00	25.00	
34	ubmb	C	170;100	125;100	0.001	-3.201					5.80E+07	0.00E+00	0.00E+00	25.00	
36	via4	V	86;0				metal4	ubump			5.80E+07				
37	via3	V	85;0				metal3	metal4			5.80E+07				
38	via2	V	52;40				metal2	metal3			5.80E+07	3.63E-03	-1.39E-06		
39	ctm_via	V					ctm	metal2			5.80E+07	0.00E+00	0.00E+00		
40	cbm_via	V					cbm	metal2			5.80E+07	0.00E+00	0.00E+00		
41	via1	V	51;40				metal1	metal2			5.80E+07				
42	tsv	V	251;0 86;0				mb1	metal1			5.80E+07				
43	pmb	V	5;100				ubmb	mb1			5.80E+07				
44	tsv	I			0.15				4						

CSVTech_overlapping_template.csv is in the folder of the toolkit.

Column Definition - CSV Tech overlapping template

1. **LayerName** is the names will be uesd in 3D Layout stackup, should be present.
2. **Type**, C : Conductor/Metal layer, V : Via layer, D : Dielectric layer, I : Insulating layer
   - Via Group and SnapViaGroups will be implemented on all Via layers.
   - Insulating layer is designed to define TSV insulation thickness, it must have a LayerName that have defined in Via Layers, or will be ignore
3. **LayerMap** indicates the layer mapping in GDS file.
   - Conductor/Metal and Via layer must have LayerMap value or will be ignore.
   - Multiple layermap Mapping could set to one layer separated with space, e.g. 86;0 85;0
4. **TextLayerMap** indicates which layer used to extract net list in GDS,
   - the layermap in GDS should have net information.
5. **Thickness** is set for Dielectrics/ Metals/Vias layer thickness, the default unit is um.
6. **Height** indicates position of the layer in stackup
   - All Height define in the lower of the layer, dielectrics Layers or Metal/Vias layers will be reordered by Height value, respectively.
   - If dielectrics Height not give, the height will be obtained by accumulating the thickness of dielectrics layer (invert order)
   - If Metal and Vias Height not give, the height will be obtained by accumulating the thickness of Metal and Vias layer (invert order)
   - The last dielectric layer is the origin, all height (D/C/V) value refer to this value, negative value is accepted.

Column Definition - CSV Tech overlapping template

7. **LowerLayer**, **UpperLayer** defined the start and end layer of via layer
   - If LowerLayer, UpperLayer not give, the adjacent layers will set to LowerLayer, UpperLayer
   - LowerLayer, UpperLayer determines the thickness of the via layer, which have higher priority the via Thickness property
8. **DK, DF, Cond** is used to set Material properties of the layers
9. **TC1, TC2, Tref** is the temperature coefficient of conductivity, use for corner analysis
   - temperature-dependent material (conductivity) will be used if check UseTemperatureDependMaterial option in GUI
   - The formular is Cond/(1+(TC1*($Temp-Tref))+(TC2*($Temp-Tref)**2))
   - Tref is the base temperature, which defines the current conductivity

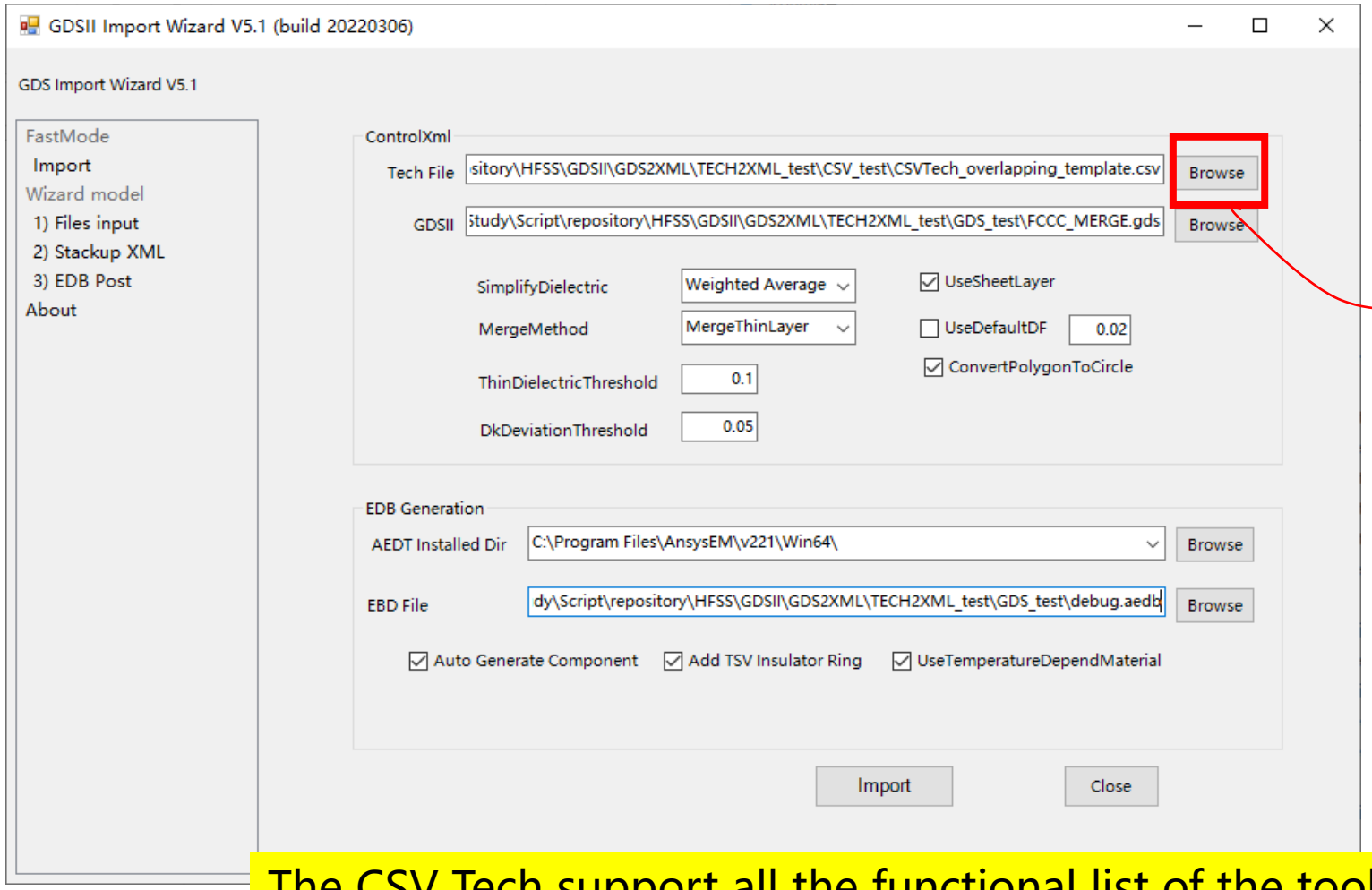
Options in CSV Tech (from V5.6)

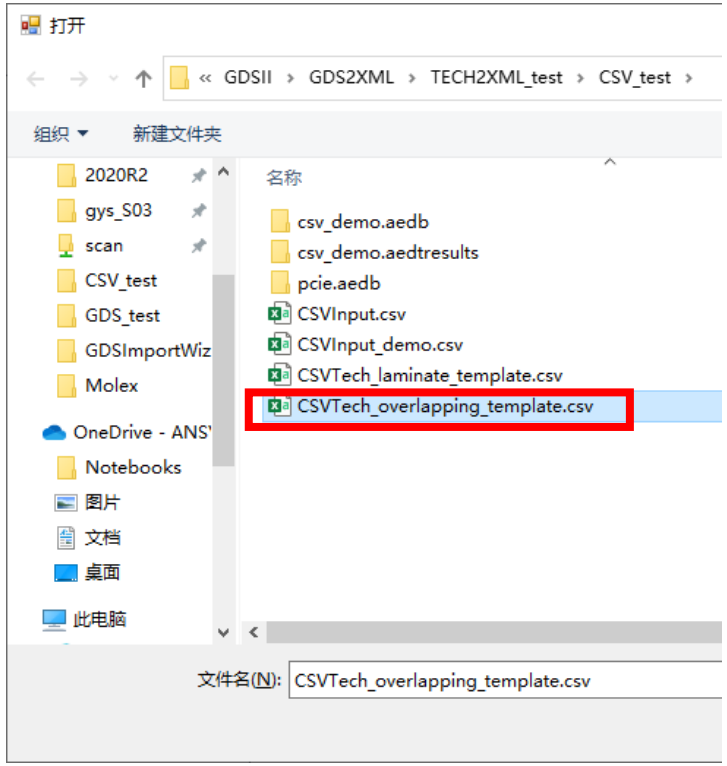
	A	B	C	D	E	F	G	H	I
1	NO	LayerName	Type	LayerMap	TextLayerI	Thickness	Height	LowerLayer	UpperLayer
2	13	fill_in	D			0.001			
3	14	M4	C	31;0		0.001	0.002		
4	15	CTM2	C	67;3		0.0003	0.0006		
5	17	M3	C	28;0		0.0005	0		
6	21	via34	V	29;0				None	M4
7									
8		UseSheetLayer	O	FALSE					
9		FixedSmallLayerGap	O	0					
10		CreatViaGroups	O	FALSE					
11		AutoComps	O	FALSE					
12	#Note:								

Options in CSV Tech with Type as O or (Option).

Options in CSV Tech have highest priority then GUI and any other ways, it should be used with caution, which may cause mismatch between GUI and finally effective.

Use CSV Tech as input





The CSV Tech support all the functional list of the toolkit.

Customized Technology File-CSVTech_laminate_template

CSV Tech laminate template

- The CSV format template provide an easy way to define Customized Technology File.
- You could find a demo file in the folder of the toolkit as CSVTech_laminate_template.csv
- **Laminate template** provides a simplified then input the overlapping template, the dielectrics and metals are defined in laminate mode, more like PCB/Package application.
- Laminated CSV assume all the dielectrics is filled in Metal/Via layers and align with these layers.
- The follow pages will give the details the overlapping template.

CSVTech_ laminate_template.csv

NO	LayerName	Type	LayerMap	TextLayerMap	Thickness	Height	DK	DF	Cond	TC1	TC2	Tref	
1	TOP_UBM	C	214;0	214;0	44.5		4	0.02	5.80E+07				
2	PI1	V	11;0		3		4	0.02	5.80E+07				
3	RDL1	C	1;0		4		4	0.02	5.80E+07				
4	PI2	V	12;0		3		4	0.02	5.80E+07				
5	RDL2	C	2;0		4		4	0.02	5.80E+07				
6	PI3	V	13;0		3		4	0.02	5.80E+07				
7	RDL3	C	3;0		4		4	0.02	5.80E+07				
8	tsv	V	14;0		3		4	0.02	5.80E+07				
9	RDL4	C	4;0		4		4	0.02	5.80E+07				
10	PI5	V	15;0		3		4	0.02	5.80E+07				
11	BOT_UBM	C	215;0		58		4	0.02	5.80E+07				
12	tsv	I			0.15		4						

Laminated CSV assume all the dielectrics is filled in Metal/Via layers and align with these layers.
CSVTech_ laminate_template.csv is in the folder of the toolkit.

Column Definition - CSV Tech laminate template

1. **LayerName** is the names will be uesd in 3D Layout stackup, should be present.
2. **Type**, C : Conductor/Metal layer, V : Via layer, ~~D : Dielectric layer,~~ I : Insulating layer
   - **Dielectric layer (type D) should be never present in this laminate template.**
   - The start and end layer is considered as the adjacent layers
   - Via Group and SnapViaGroups will be implemented on all Via layers.
   - Insulating layer is designed to define TSV insulation thickness, it must have a LayerName that have defined in Via Layers, or will be ignore
3. **LayerMap** indicates the layer mapping in GDS file.
   - Conductor/Metal and Via layer must have LayerMap value or will be ignore.
   - Multiple layermap Mapping could set to one layer separated with space, e.g. 86;0 85;0
4. **TextLayerMap** indicates which layer used to extract net list in GDS,
   - the layermap in GDS should have net information.
5. **Thickness** must set for Metals/Vias layer thickness, the default unit is um.
6. **Height** indicates position of the layer in stackup
   - All the height will be obtained by accumulating the thickness of Metal and Vias layer (invert order)
   - Manually set the height value is not suggested.

Column Definition - CSV Tech laminate template

7. **DK, DF, Cond** is used to set Material properties of the layers
   - DK, DF is used for the filled material
   - Cond is used for the metal/via material
8. **TC1, TC2, Tref** is the temperature coefficient of conductivity, use for corner analysis
   - temperature-dependent material (conductivity) will be used if check UseTemperatureDependMaterial option in GUI
   - The formular is Cond/(1+(TC1*($Temp-Tref))+(TC2*($Temp-Tref)**2))
   - Tref is the base temperature, which defines the current conductivity

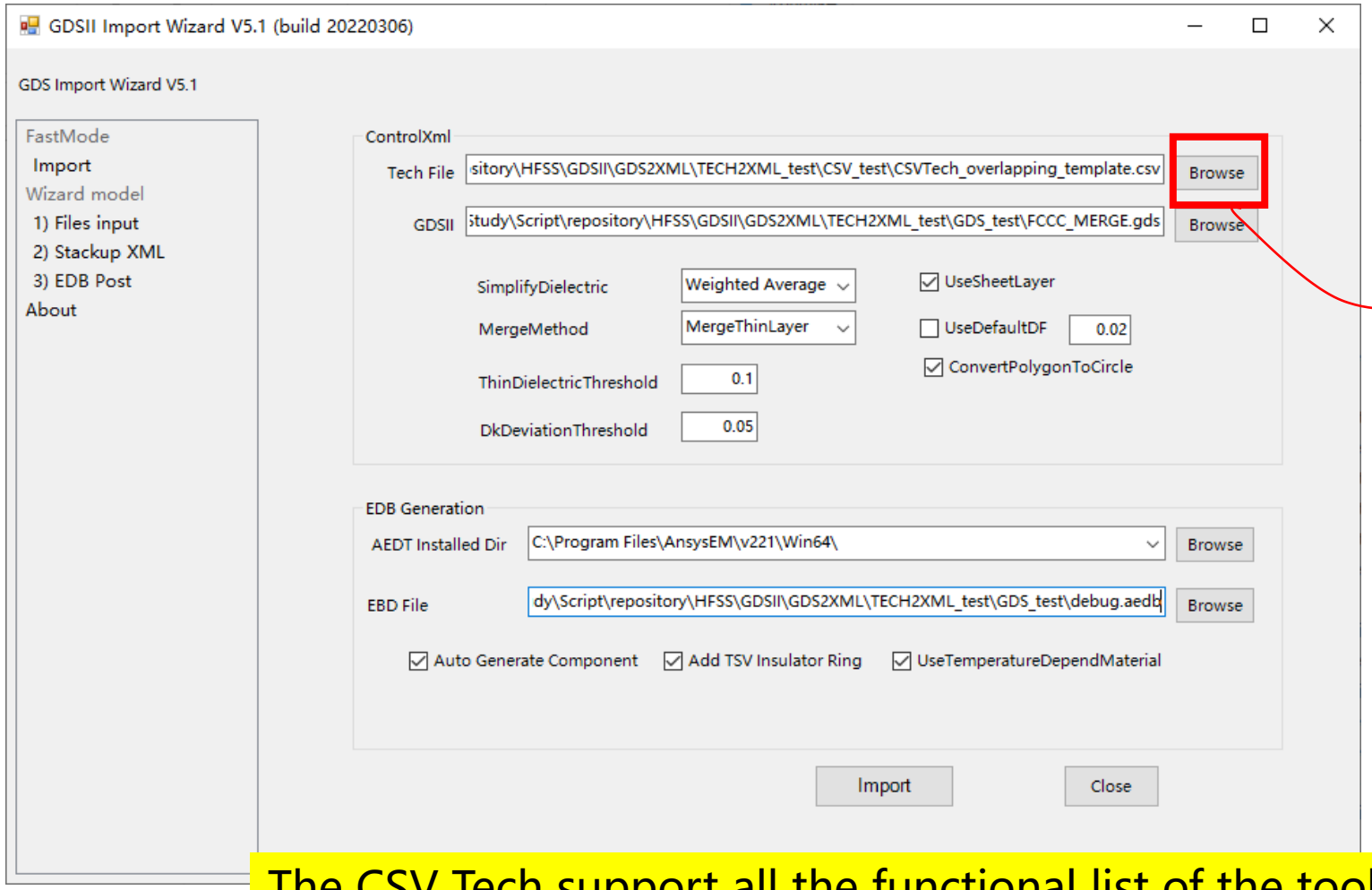
Options in CSV Tech (from V5.6)

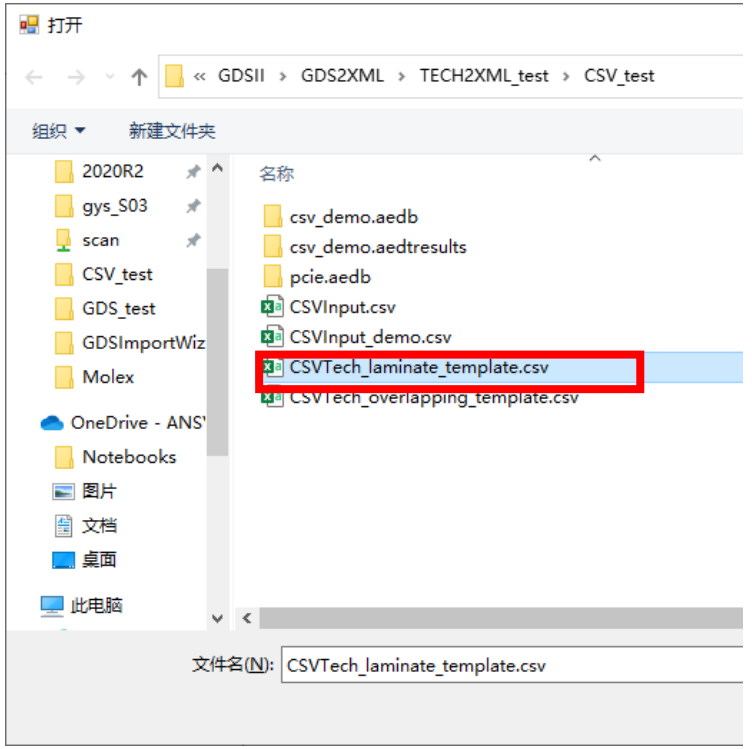
	A	B	C	D	E	F	G	H	I
1	NO	LayerName	Type	LayerMap	TextLayerI	Thickness	Height	LowerLayer	UpperLayer
2	13	fill_in	D			0.001			
3	14	M4	C	31;0		0.001	0.002		
4	15	CTM2	C	67;3		0.0003	0.0006		
5	17	M3	C	28;0		0.0005	0		
6	21	via34	V	29;0				None	M4
7									
8		UseSheetLayer	O	FALSE					
9		FixedSmallLayerGap	O	0					
10		CreatViaGroups	O	FALSE					
11		AutoComps	O	FALSE					
12	#Note:								

Options in CSV Tech with Type as O or (Option).

Options in CSV Tech have highest priority then GUI and any other ways, it should be used with caution, which may cause mismatch between GUI and finally effective.

Use CSV Tech as input





The CSV Tech support all the functional list of the toolkit.

ITF Technology File Support

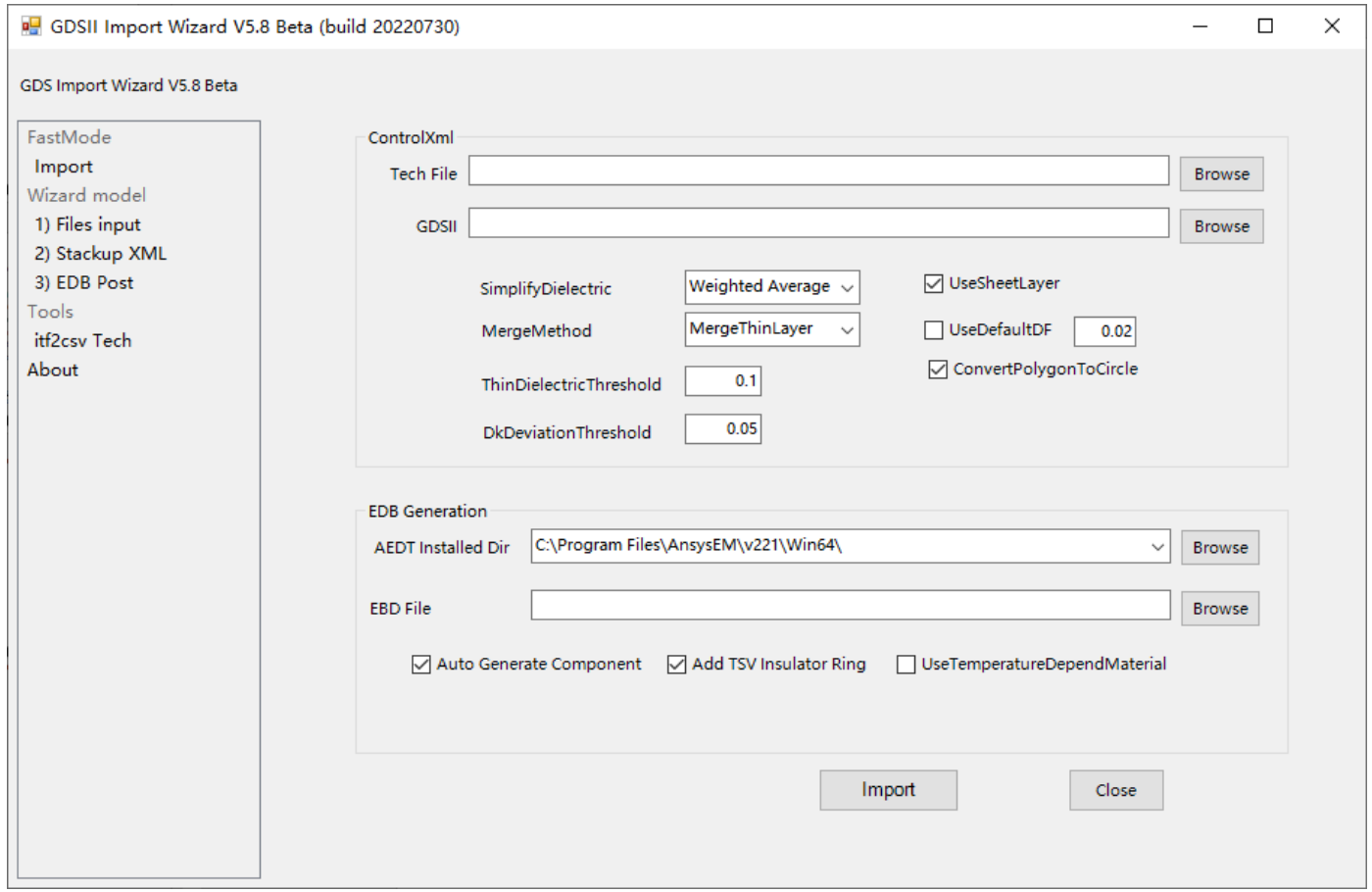
2022-08-01

About ITF

- Synopsys' Interconnect Technology Format (ITF) provides detailed modeling of interconnect parasitic effects that enables designers to perform accurate parasitic extraction for timing, signal integrity, power and reliability signoff analysis. ITF offers a flexible and innovative format to accurately model the effects of increased process variation at advanced process technologies. ITF has been evolving for more than 10 years and is the semiconductor industry’s most widely used interconnect modeling format. It is supported by leading semiconductor foundries and integrated device manufacturers and is proven on thousands of production designs.

https://news.synopsys.com/2016-09-06-Synopsys-Announces-Standards-Board-Ratification-of-Its-New-Parasitic-Models-for-Latest-FinFET-Process-Nodes

About GDS Import Wizard

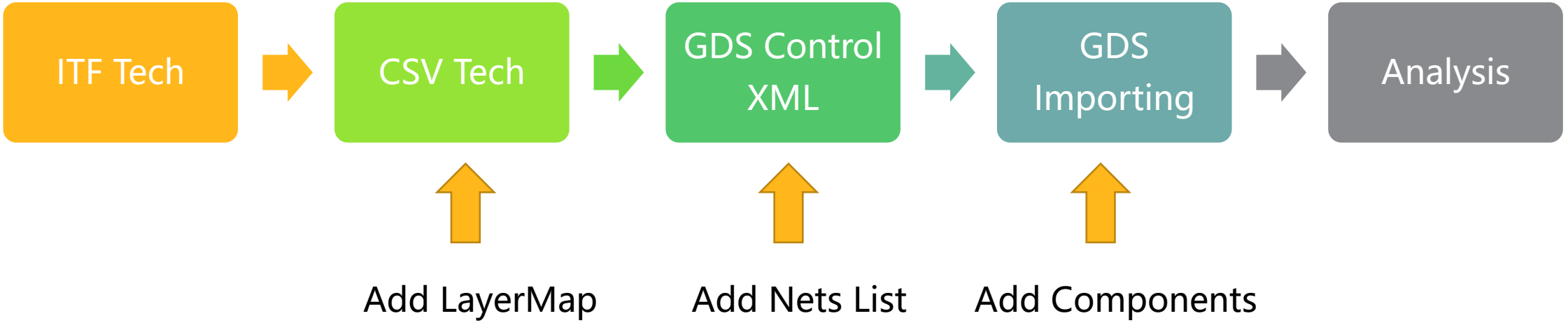


GDS Import Wizard is a free tool, which is used to easily import GDS into ANSYS HFSS 3D layout for high-precision full wave analysis.

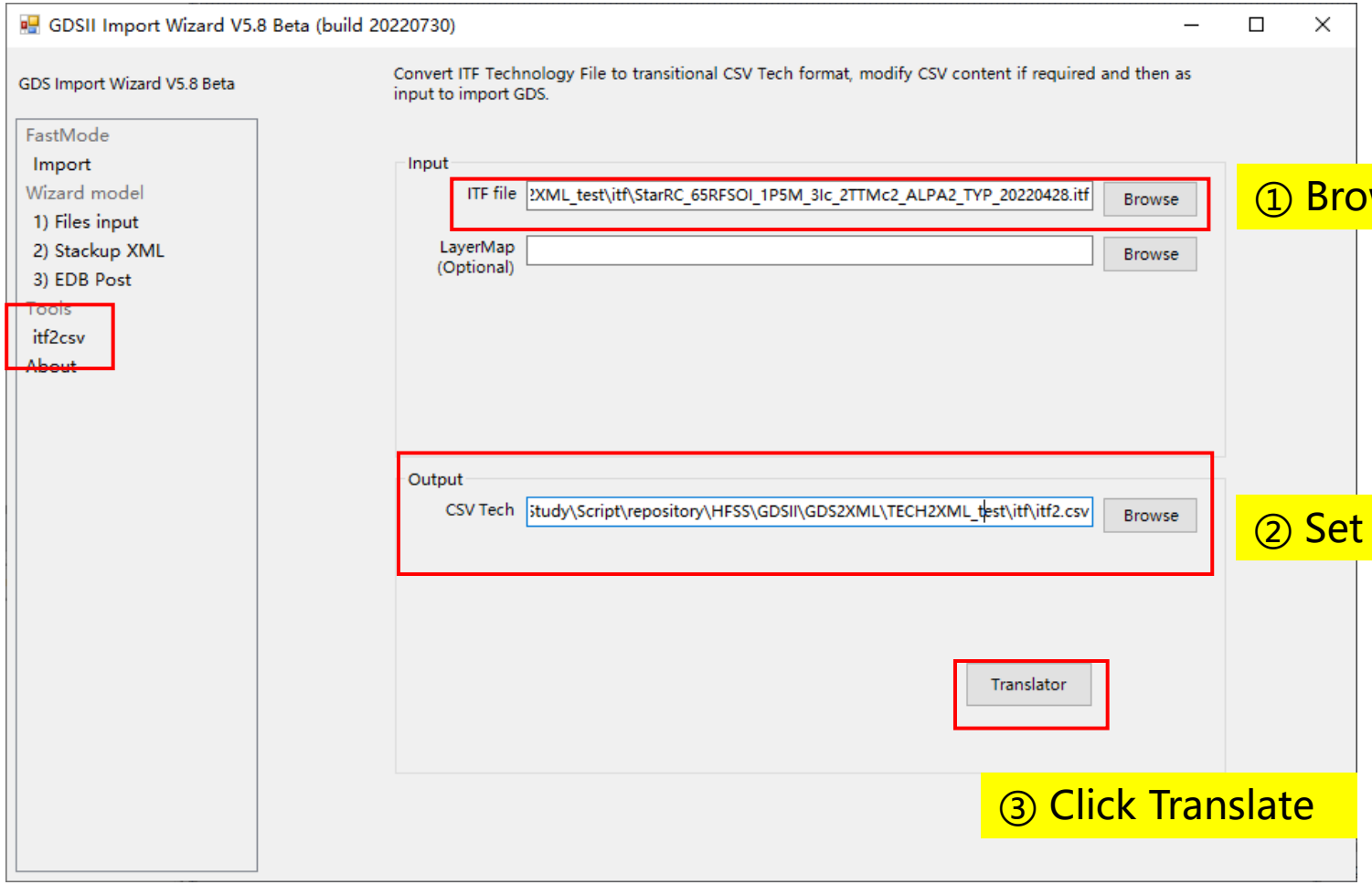
The latest tools is released at GitHub.

https://github.com/YongshengGuo/GDSImportWizard/releases/latest

GDS Import Workflow for ITF Technology File



Step1. Translate ITF to CSV Tech



① Browse ITF file

② Set CSV output Path

③ Click Translate

About CSVTech

NO	LayerName	Type	LayerMap	TextLayerMap	Thickness	Height	LowerLayer	UpperLayer	DK	DF	Cond	TC1	TC2	Tref	
1	UF1	D			35	107.64			3.7						
19	IMD1a	D			0.05	100.75			8.1						
20	ILD	D			0.75	100			4						
21	substrate	D			100	0			11.9		10				
22	PASSB1	D			0.8	-0.8			6.7						
23	PASSB2b	D			2	-2.8			6.7						
24	PASSB2a	D			0.4	-3.2			6.7						
25	underFill_C	D			0.001	-3.201			6.7						
26	ubump	C	170;0 74;0	125;0	0.001	142.639					5.80E+07	0.00E+00	0.00E+00	25.00	
27	metal4	C	74;0		1.45	105.19					5.80E+07	3.89E-03	-1.50E-07	25.00	
28	metal3	C	33;40		0.85	103.565					5.80E+07	3.63E-03	-1.39E-06	25.00	
29	metal2	C	32;40		0.85	102.12					5.80E+07	3.63E-03	-1.39E-06	25.00	
30	ctm	C			0.08	101.793					5.80E+07	0.00E+00	0.00E+00	25.00	
31	cbm	C			0.2	101.575					5.80E+07	0.00E+00	0.00E+00	25.00	
32	metal1	C	31;40		0.85	100.675					5.80E+07	3.63E-03	-1.39E-06	25.00	
33	mb1	C	31;100		0.001	-0.801					5.80E+07	0.00E+00	0.00E+00	25.00	
34	ubmb	C	170;100	125;100	0.001	-3.201					5.80E+07	0.00E+00	0.00E+00	25.00	
36	via4	V	86;0				metal4	ubump			5.80E+07				
37	via3	V	85;0				metal3	metal4			5.80E+07				
38	via2	V	52;40				metal2	metal3			5.80E+07	3.63E-03	-1.39E-06		
39	ctm_via	V					ctm	metal2			5.80E+07	0.00E+00	0.00E+00		
40	cbm_via	V					cbm	metal2			5.80E+07	0.00E+00	0.00E+00		
41	via1	V	51;40				metal1	metal2			5.80E+07				
42	tsv	V	251;0 86;0				mb1	metal1			5.80E+07				
43	pmb	V	5;100				ubmb	mb1			5.80E+07				
44	tsv	I			0.15				4						

CSVTech_overlapping_template.csv is in the folder of the toolkit.

Column Definition - CSV Tech overlapping template

1. **LayerName** is the names will be uesd in 3D Layout stackup, should be present.
2. **Type**, C : Conductor/Metal layer, V : Via layer, D : Dielectric layer, I : Insulating layer
   - Via Group and SnapViaGroups will be implemented on all Via layers.
   - Insulating layer is designed to define TSV insulation thickness, it must have a LayerName that have defined in Via Layers, or will be ignore
3. **LayerMap** indicates the layer mapping in GDS file.
   - Conductor/Metal and Via layer must have LayerMap value or will be ignore.
   - Multiple layermap Mapping could set to one layer separated with space, e.g. 86;0 85;0
4. **TextLayerMap** indicates which layer used to extract net list in GDS,
   - the layermap in GDS should have net information.
5. **Thickness** is set for Dielectrics/ Metals/Vias layer thickness, the default unit is um.
6. **Height** indicates position of the layer in stackup
   - All Height define in the lower of the layer, dielectrics Layers or Metal/Vias layers will be reordered by Height value, respectively.
   - If dielectrics Height not give, the height will be obtained by accumulating the thickness of dielectrics layer (invert order)
   - If Metal and Vias Height not give, the height will be obtained by accumulating the thickness of Metal and Vias layer (invert order)
   - The last dielectric layer is the origin, all height (D/C/V) value refer to this value, negative value is accepted.

Column Definition - CSV Tech overlapping template

7. **LowerLayer**, **UpperLayer** defined the start and end layer of via layer
   - If LowerLayer, UpperLayer not give, the adjacent layers will set to LowerLayer, UpperLayer
   - LowerLayer, UpperLayer determines the thickness of the via layer, which have higher priority the via Thickness property
8. **DK, DF, Cond** is used to set Material properties of the layers
9. **TC1, TC2, Tref** is the temperature coefficient of conductivity, use for corner analysis
   - temperature-dependent material (conductivity) will be used if check UseTemperatureDependMaterial option in GUI
   - The formular is Cond/(1+(TC1*($Temp-Tref))+(TC2*($Temp-Tref)**2))
   - Tref is the base temperature, which defines the current conductivity

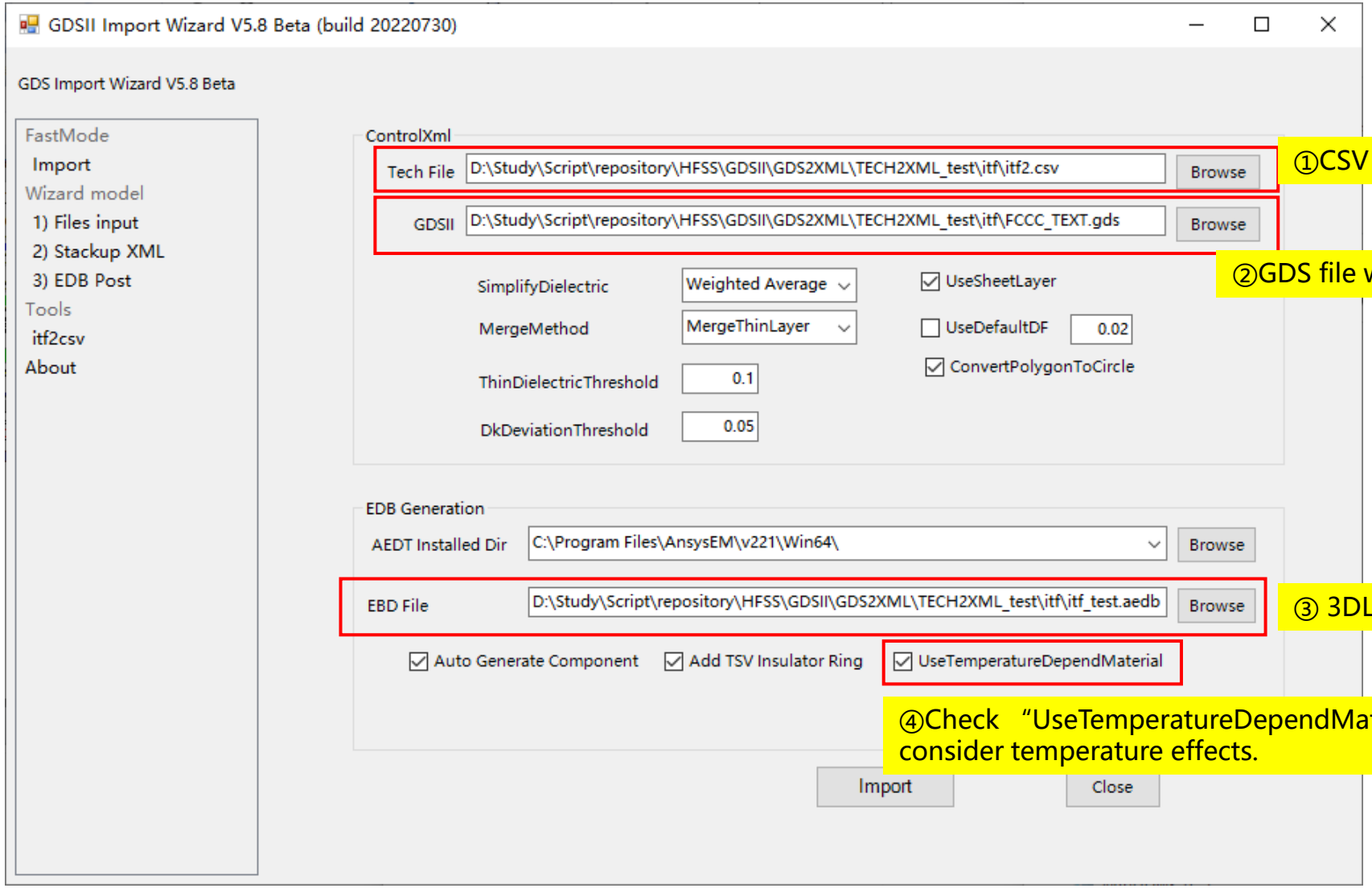
Step2: Add LayerMap

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
1	NO	LayerNam	Type	LayerMap	TextLayerMa	Thickness	Height	LowerLaye	UpperLaye	DK	DF	Cond	TC1	TC2	Tref
29	28	ILDb	D			4.02E-01	0.34			4					
30	29	ILDa	D			7.00E-02	0.27			7					
31	30	tox	D			2.48E-03	0.267525			4.2					
32	31	FOXB	D			6.75E-02	0.2			4					
33	32	FOXA	D			2.00E-01	0			4					
34	33	alpa	C			2.80E+00	12.67253					22841063	3.78E-03	-1.33E-07	25
35	34	metal5	C	170;0	125;0	3.30E+00	8.572525					49143768	3.85E-03	8.58E-07	25
36	35	metal4	C	74;0											
37	36	MIM	C												
38	37	MIM_P2	C												
39	38	metal3	C	33;40											
40	39	metal2	C	32;40											
41	40	metal1	C												
42	41	npoly	C												
43	42	ppoly	C			1.20E-01	0.27					1192606	2.47E-03	-9.28E-08	25
44	43	ndiff	C			7.50E-02	0.2					136962.8	2.00E-03	-3.43E-08	25
45	44	pdiff	C			7.50E-02	0.2					136892.5	3.49E-03	-7.60E-08	25
46	45	viapa	V					metal5	alpa			3703704			
47	46	via4	V	86;0				metal4	metal5			8585165			
48	47	via3b	V					MIM_P2	metal4			8585165			
49	48	via3a	V					MIM	metal4			8585165			
50	49	via3	V	85;0				metal3	metal4			8585165			
51	50	via2	V	52;40				metal2	metal3			68854875			
52	51	via1	V					metal1	metal2			71362306			
53	52	psubCont	V					SUBSTRAT	pdiff						
54	53	nsubCont	V					SUBSTRAT	ndiff						
55	54	pdfCont	V					pdiff	metal1			5611672			
56	55	ndfCont	V					ndiff	metal1			5367687			
57	56	ppolyCont	V					npoly	metal1			6497726			
58	57	npolyCont	V												
59															

Add Layermap for Layers you want import.
1) Layermap only added for Conductor and Via Layer.
2) Layers Without layermap will not import to 3D Layout
3) TextLayermap used to extract net information.
4) Make sure imported via layer lower/upper layer have valid layermap

Refer to GDS Import Wizard manual for more detail. (attached with the toolkit in Github.)

Step2: Import GDS



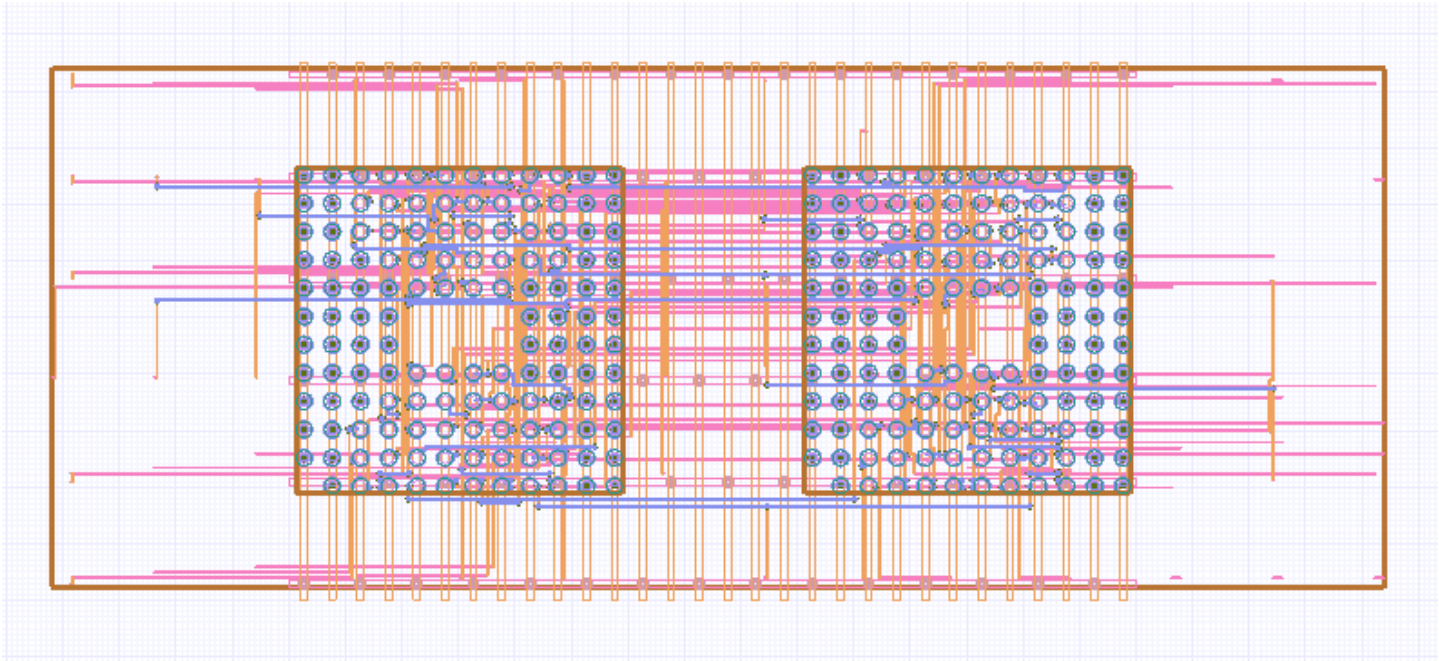
①CSV Tech which got from itf2csv with layermap

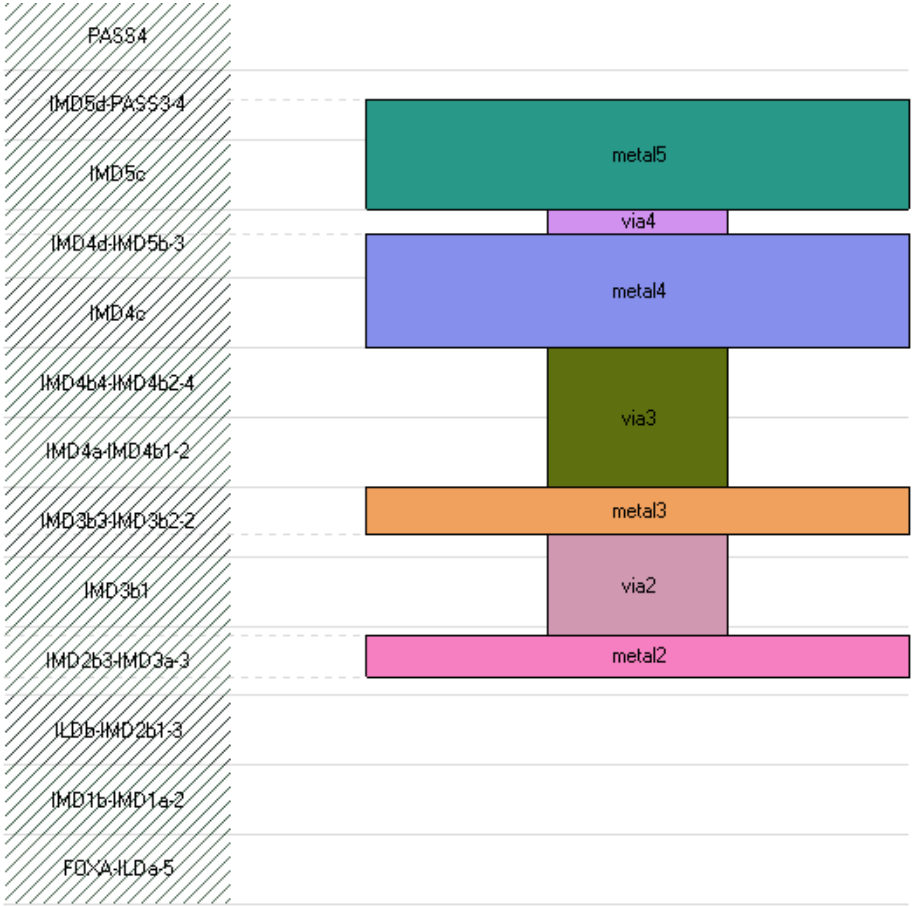
②GDS file will be imported to 3DL

③ 3DL save path

④Check “UseTemperatureDependMaterial” if you want consider temperature effects.

Next: please enjoy to setting solver option and analysis

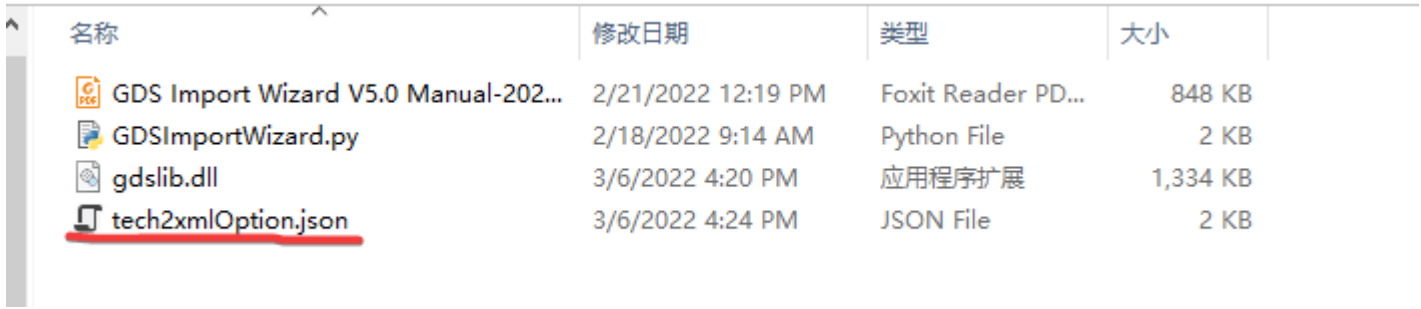




Additional remarks

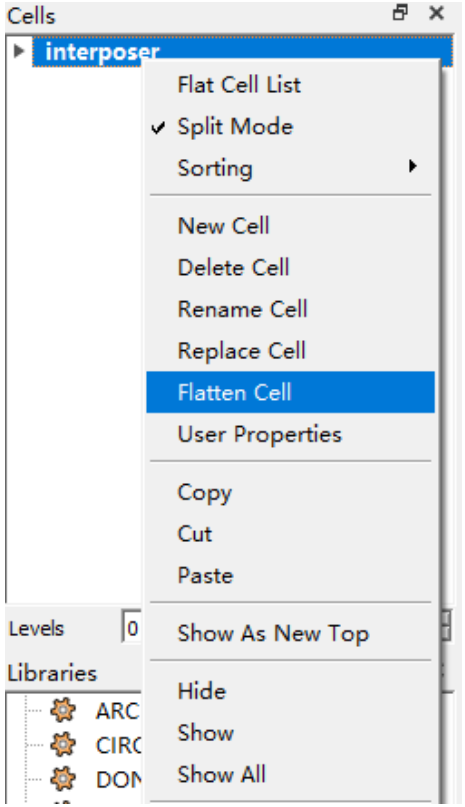
Restore default settings

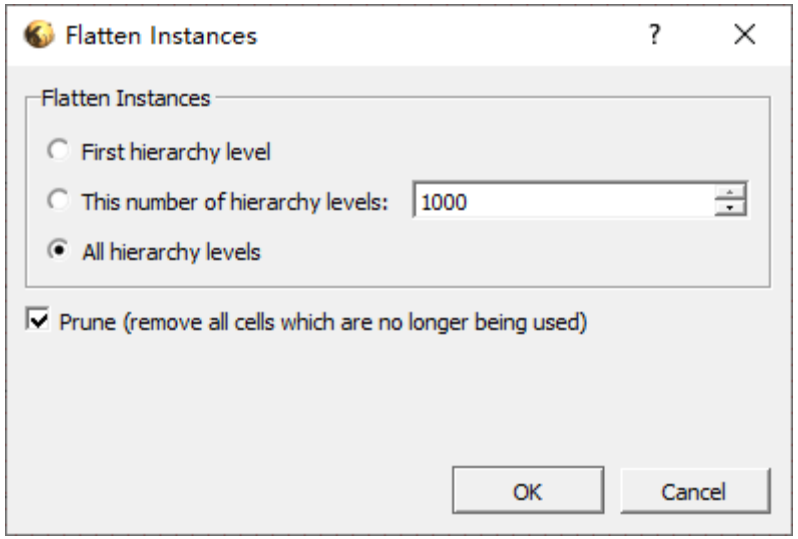
- If you have modified the configuration in tech2xmlOption.json and then want to restore to the default options. Just delete the file and run the toolkit again, tech2xmlOption.json will be made with default options.
- Don't forget that environment variables have higher priority. You need to check the settings in environment variables to make sure it is in purposeful.



About nets loss or error

- A known issue, hierarchy cells may bring wrong net coordinates and cause net lost or wrong (short or not right) . Flatten Cells and then import will solve this issue.
- Below is a demo, how to use KLayout to flatten the cells.

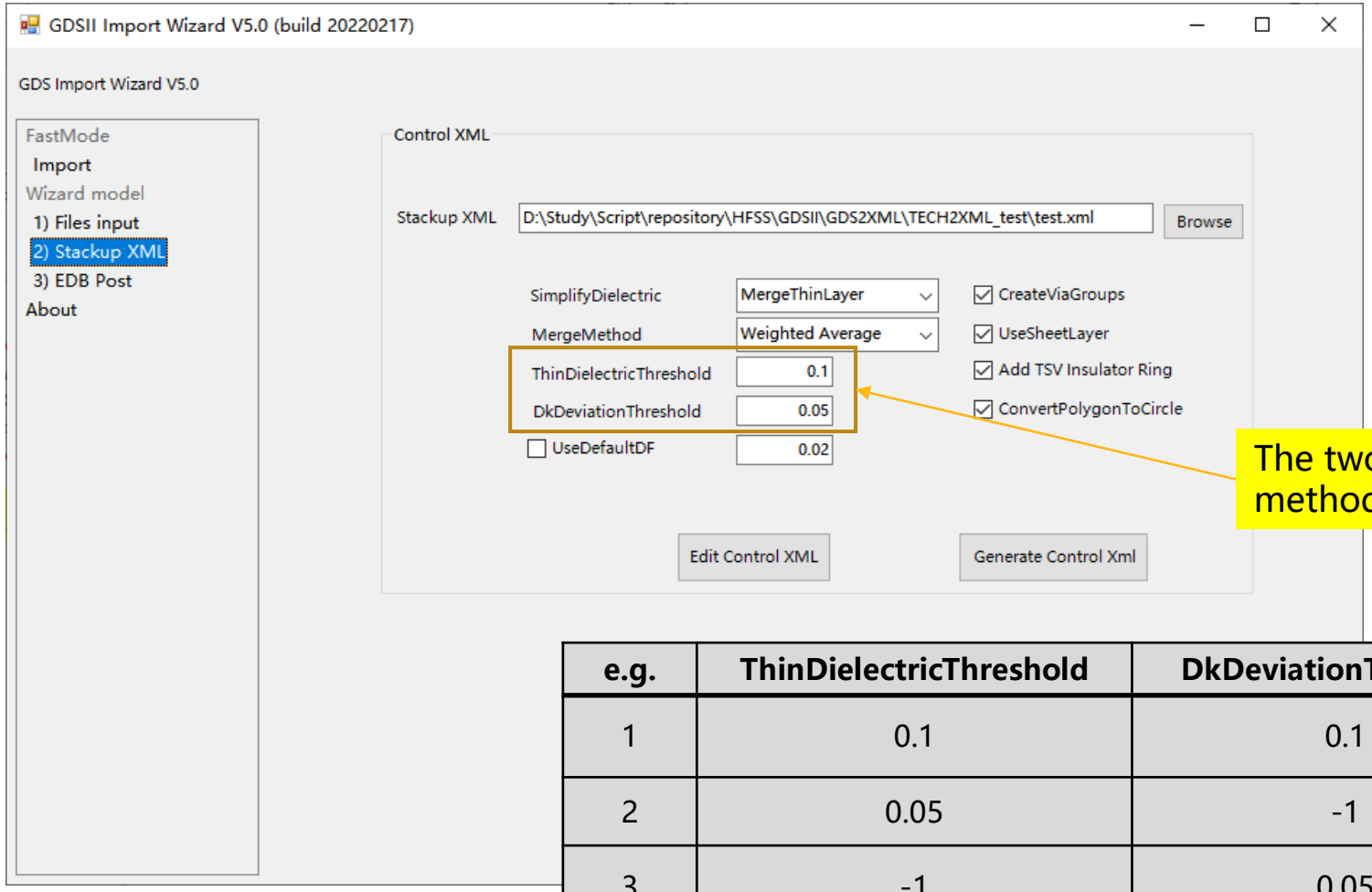




About Stackup simplification

Return

Stack simplification can effectively reduce the complexity of the model and improve efficiency



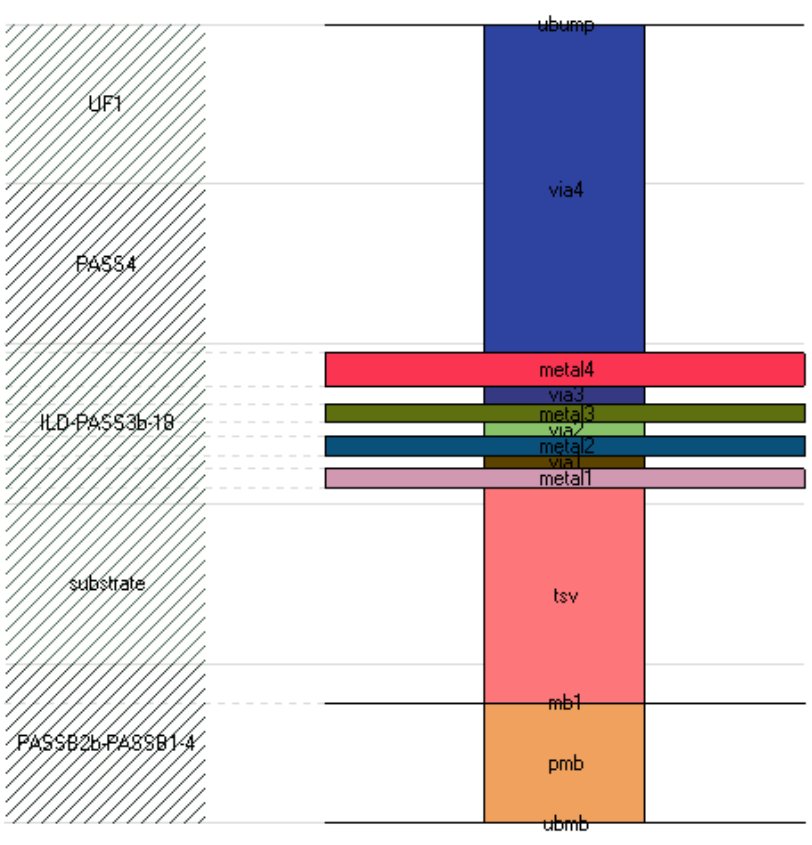
The two options only available on MergeThinLayer method, they control how the thin layers be merged.

e.g.	ThinDielectricThreshold	DkDeviationThreshold	Note
1	0.1	0.1	Merge when layer thickness<0.1um, or 2 layers dk difference less than 10%
2	0.05	-1	Only merge when layer thickness<0.05um
3	-1	0.05	Only merge when 2 layers dk difference less than 5%

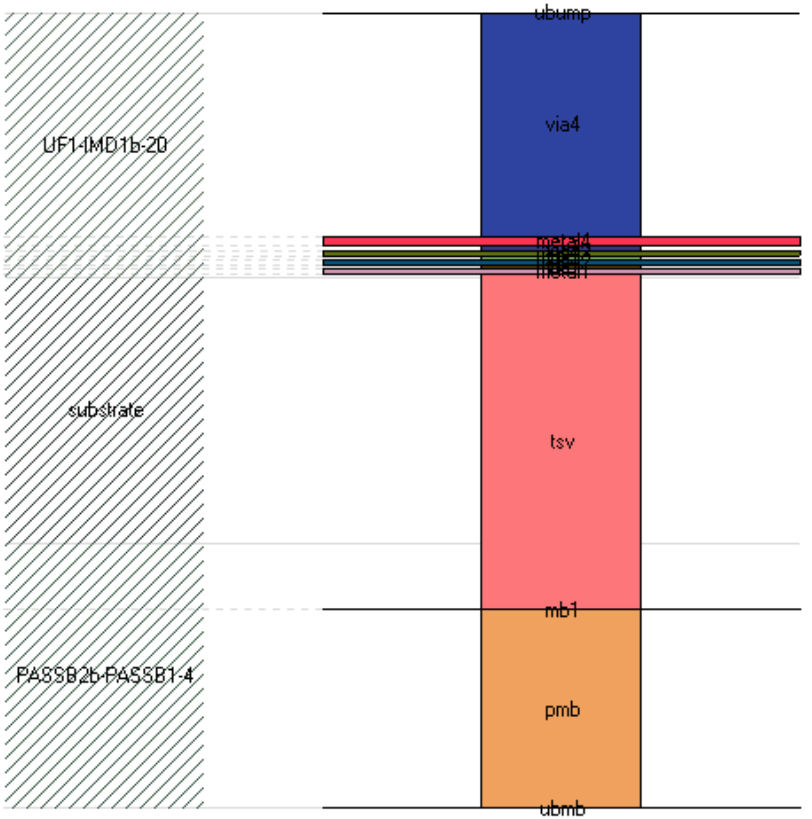
About Stack simplification

- Merge Method Compare

NoSimplify



MergeThinLayer



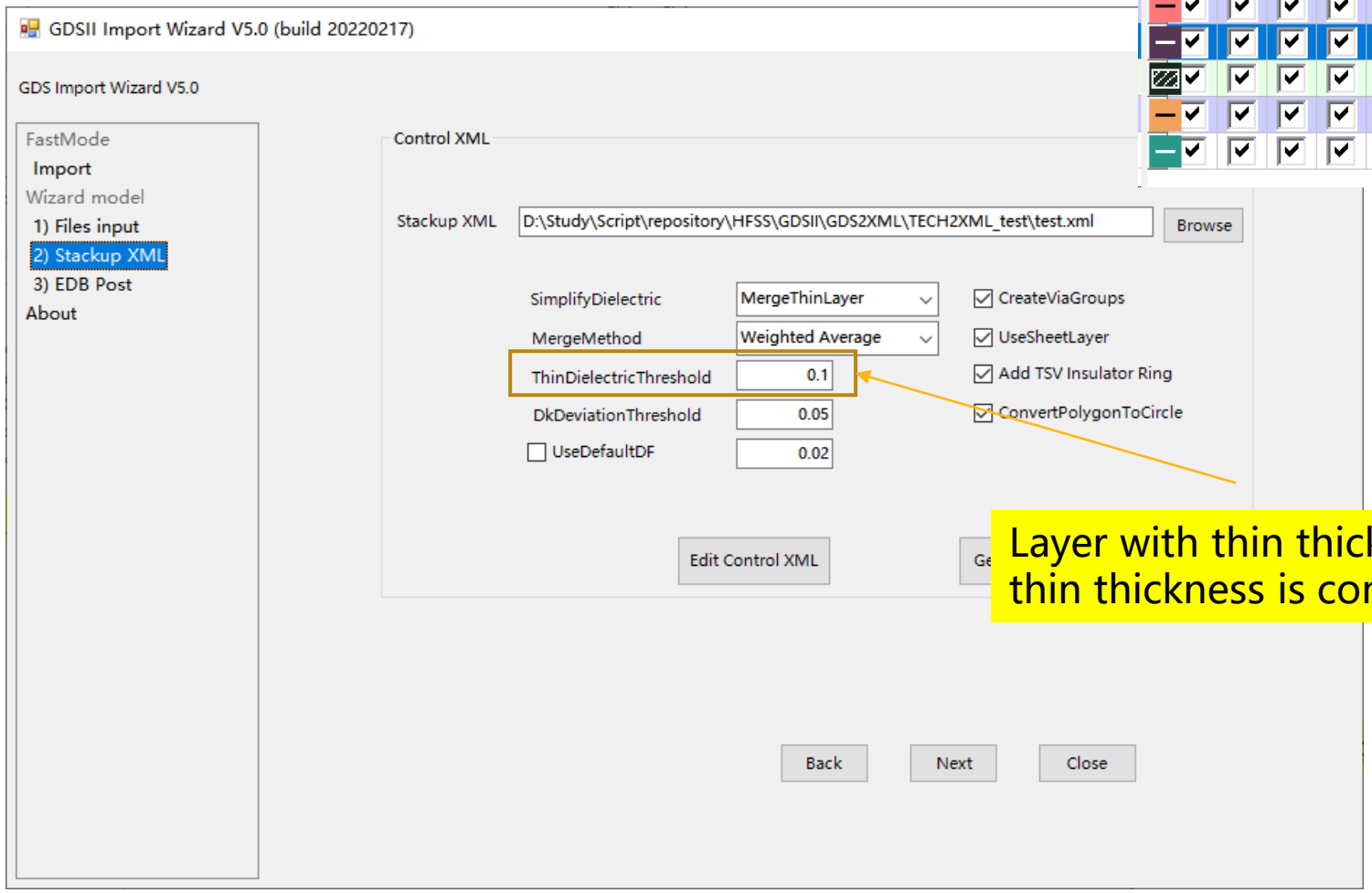
BlockMerge

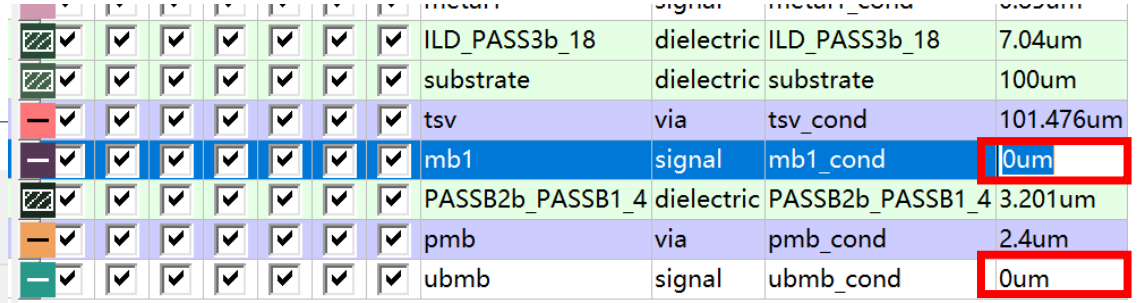
Ansys

Use Sheet Layer

Return

Sheet layer will reduce the number of meshes



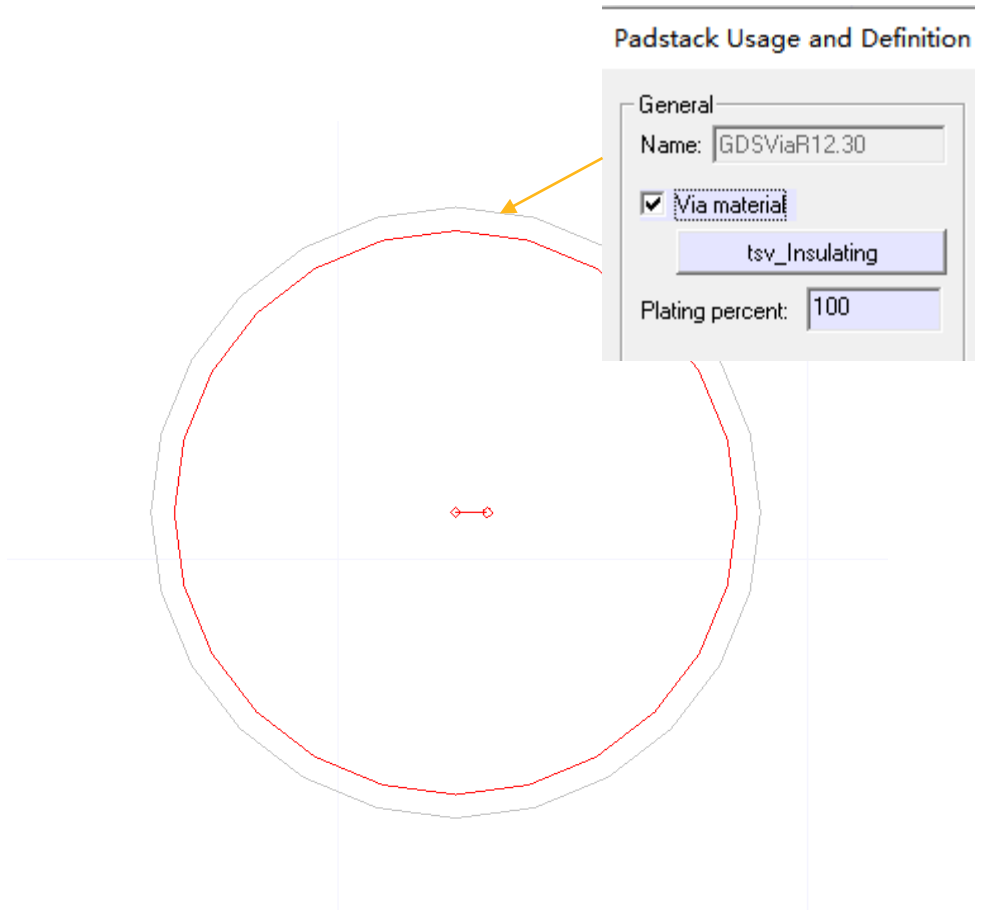


ILD_PASS3b_18	dielectric	ILD_PASS3b_18	7.04um
substrate	dielectric	substrate	100um
tsv	via	tsv_cond	101.476um
mb1	signal	mb1_cond	0um
PASSB2b_PASSB1_4	dielectric	PASSB2b_PASSB1_4	3.201um
pmb	via	pmb_cond	2.4um
ubmb	signal	ubmb_cond	0um

Layer with thin thickness tool will convert to sheet (0um).
thin thickness is controlled by option SheetLayerThreshold

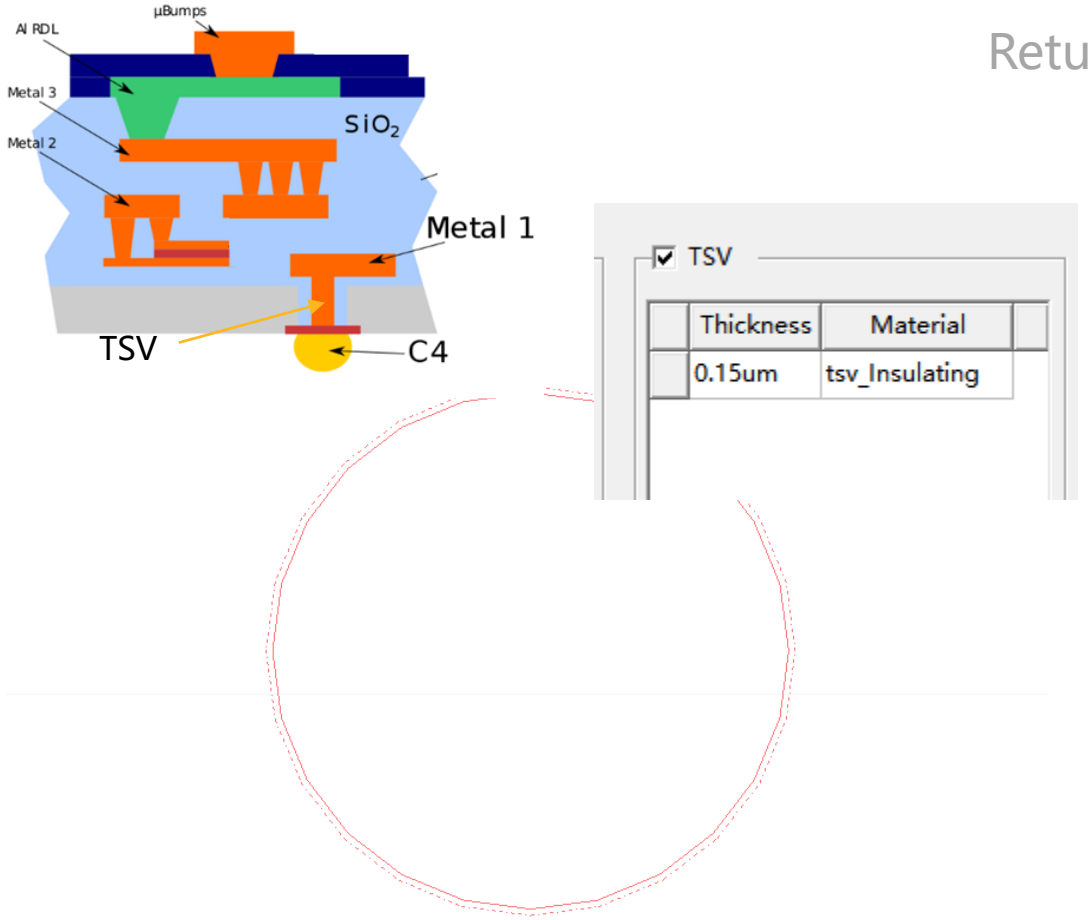
TSV

Return



Before 2021R2

TSV insulation is realized using 2 overlapping vias



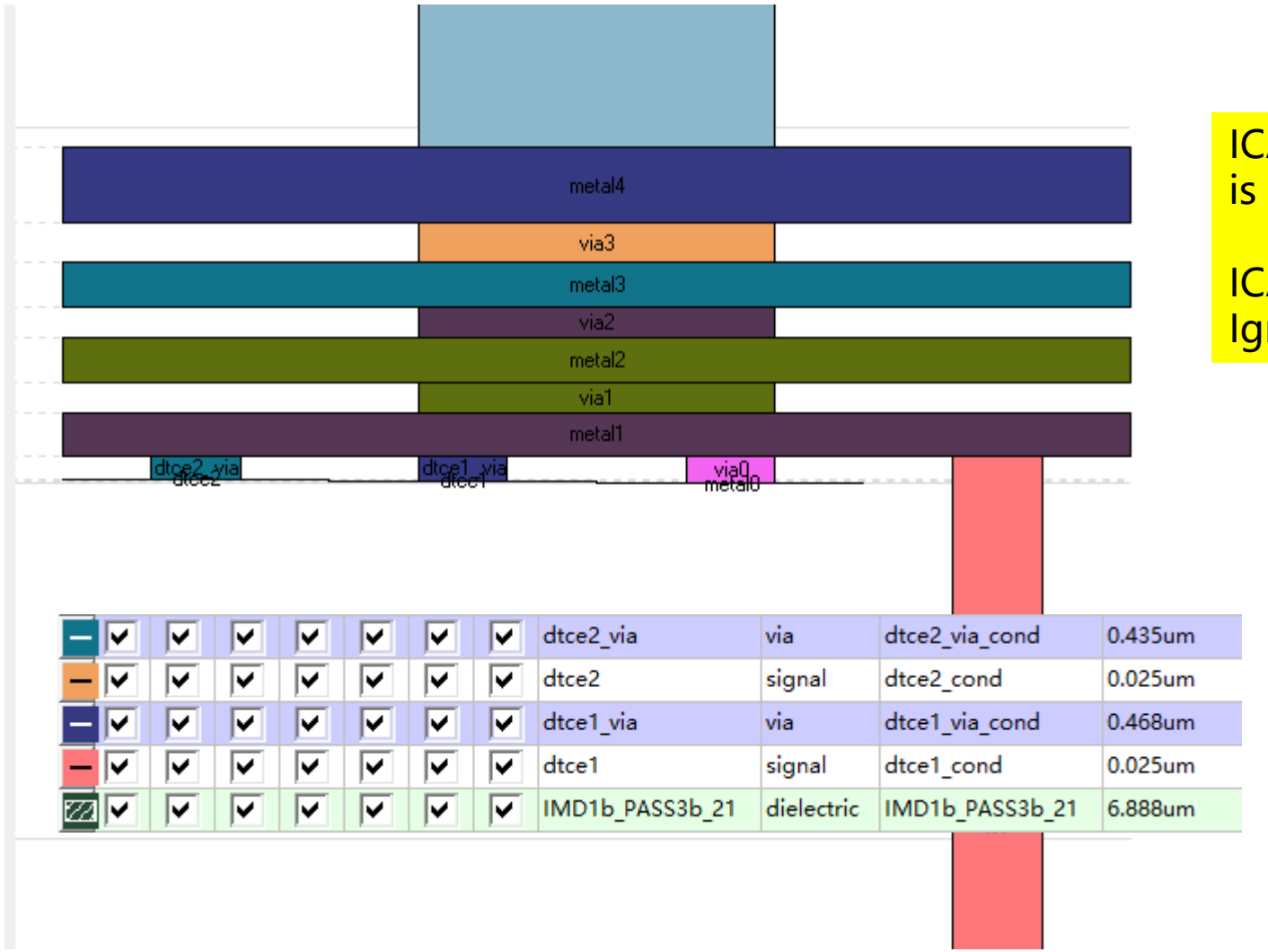
New in 2022R1

TSV insulation is realized using layer TSV new property

GDS Import Wizard V5.0 will automatically choose the best way according to which AEDT version you run it.

ICap (integrated capacitors)

Return



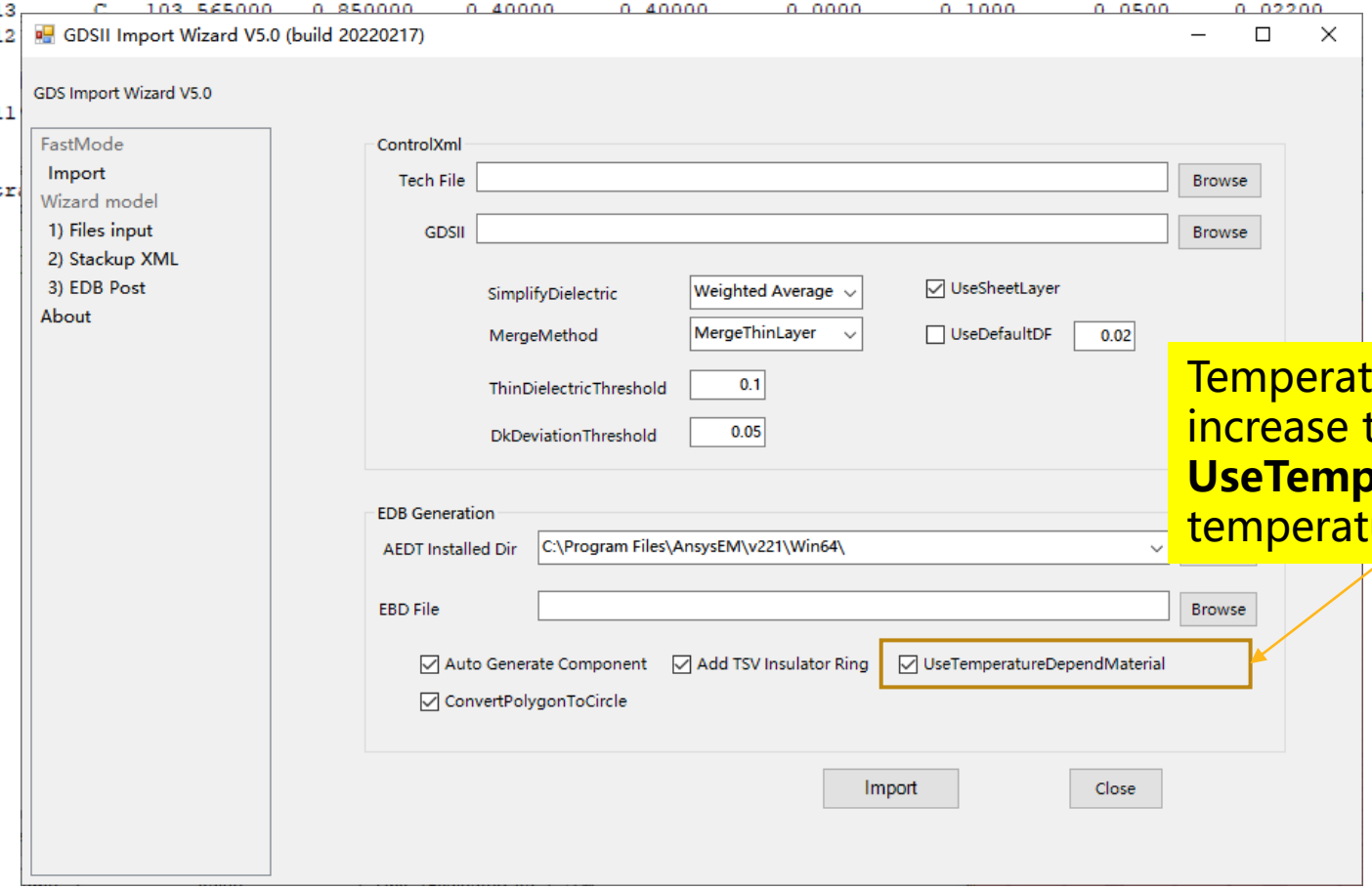
☑	☑	☑	☑	☑	☑	☑	☑	dtce2_via	via	dtce2_via_cond	0.435um
☑	☑	☑	☑	☑	☑	☑	☑	dtce2	signal	dtce2_cond	0.025um
☑	☑	☑	☑	☑	☑	☑	☑	dtce1_via	via	dtce1_via_cond	0.468um
☑	☑	☑	☑	☑	☑	☑	☑	dtce1	signal	dtce1_cond	0.025um
☑	☑	☑	☑	☑	☑	☑	☑	IMD1b_PASS3b_21	dielectric	IMD1b_PASS3b_21	6.888um

ICAP layers are ignored by default because it is thin and not have effect most of the time.

ICAP layers could be imported by setting IgnoreLayersReg to “air”

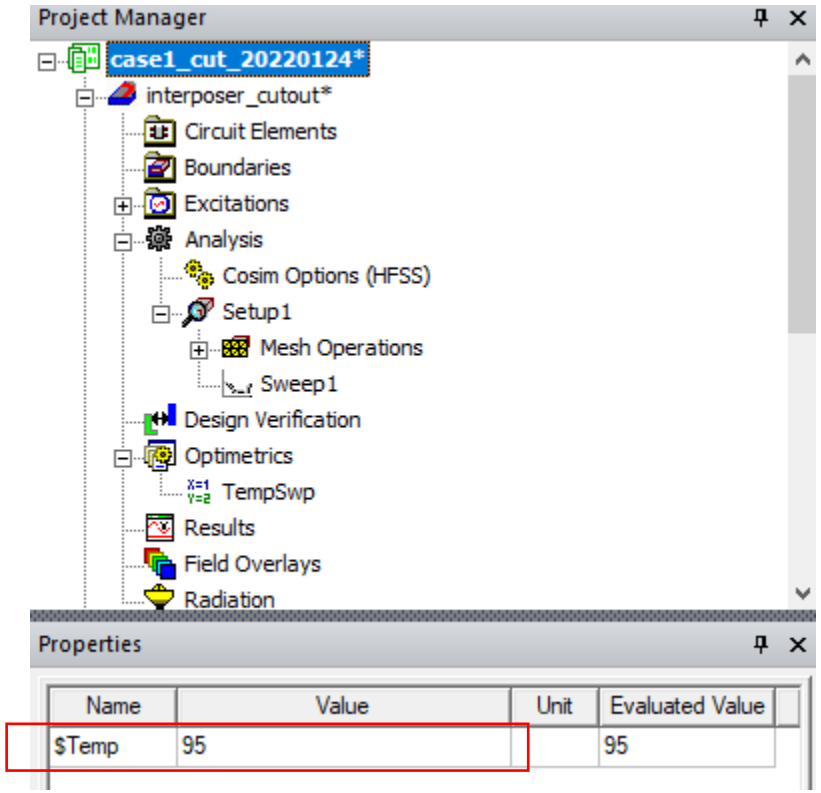
Temperature dependent material

```
* CONDUCTOR 10 15 (NAME:V, TYPE:V, HEIGHT:V, THICKNESS:V, WIDTH:V, SPACE:V, B_BIAS:V, T_BIAS:V, BIAS:V, RESIST:V, ABOVE_IMD:V, ABOVE_IMD_DIFF:V, TC1:V, TC2:V, INDIE_TABLE:P)
FIELD       TYPE    HEIGHT          THICKNESS      WIDTH       SPACE      B_BIAS      T_BIAS        BIAS      RESIST    ABOVE_IMD   ABOVE_IMD_DIFF  TC1         TC2         INDIE_TABLE
NAME
ubump       C   142.639000   0.001000   22.00000    18.00000      0.0000      0.0000      0.0000     0.00010    UF1                -0.0010  0.00000e+00 0.00000e+00 N/A
metal4      C   105.190000   1.450000    3.00000     2.00000      0.3890     -0.0340      0.1775     0.02100    PASS2               0.0000  3.89000e-03 -1.50000e-07    INDIE_TABLE[metal4]
metal3      C   103.565000   0.850000    0.40000     0.40000      0.0000      0.1000      0.0500     0.02200    IMD3a              -0.0750  3.63100e-03 -1.39200e-06    INDIE_TABLE[metal3]
metal2                                                                                                          IMD2d              -0.0750  3.63100e-03 -1.39200e-06    INDIE_TABLE[metal2]
ctm                                                                                                             IMD2b               0.0000  0.00000e+00 0.00000e+00 INDIE_TABLE[ctm]
cbm                                                                                                             IMD1c               0.0000  0.00000e+00 0.00000e+00 INDIE_TABLE[cbm]
metal1                                                                                                          ILD                -0.0750  3.63100e-03 -1.39200e-06    INDIE_TABLE[metal1]
mb1                                                                                                             PASSB2b            -0.0010  0.00000e+00 0.00000e+00 N/A
ubmb                                                                                                            N/A                 0.0000  0.00000e+00 0.00000e+00 N/A
substr                                                                                                          PASSB1                 N/A        N/A         N/A   N/A
```

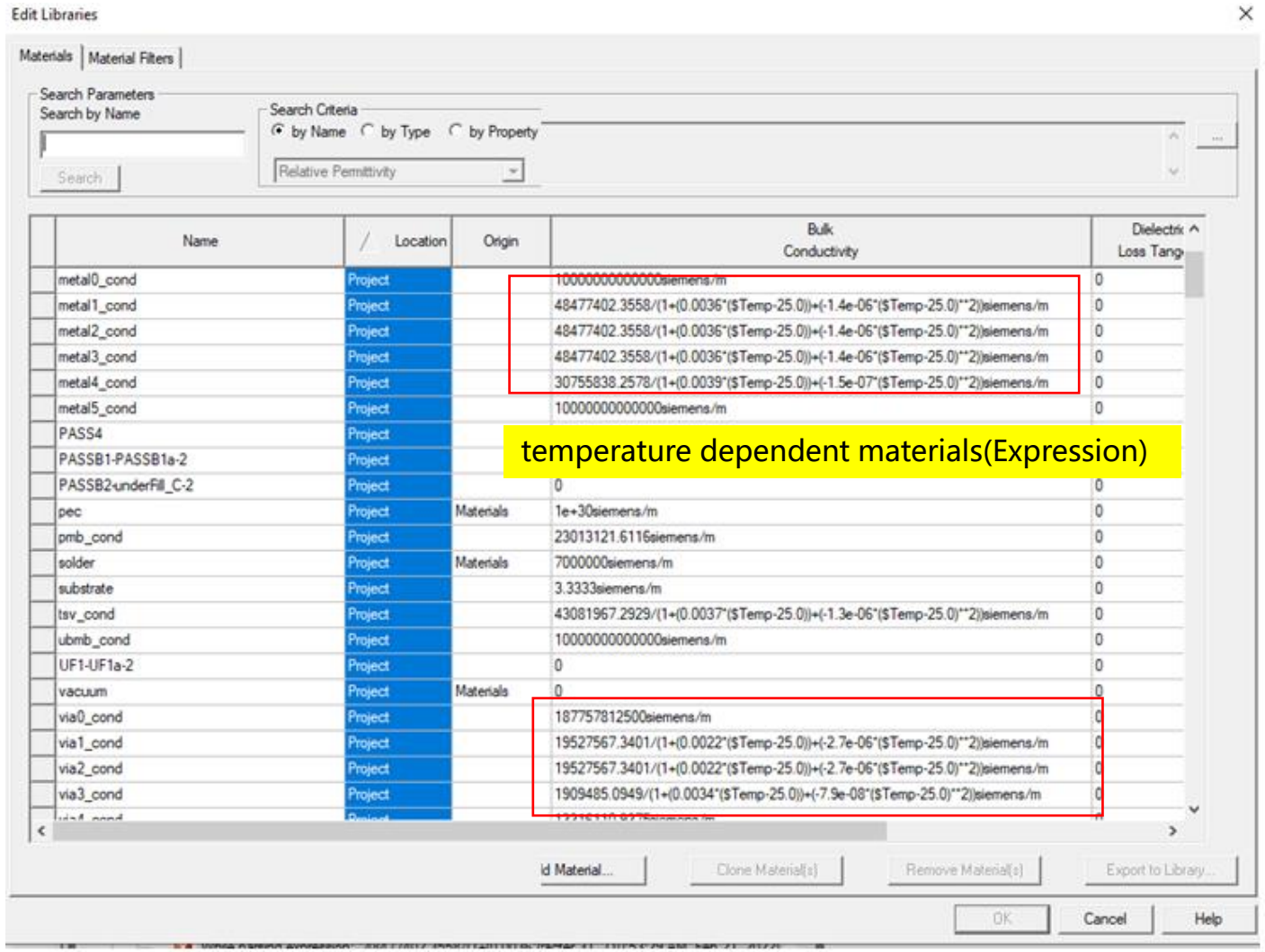


Temperature will affect the conductivity of metal and increase the resistance. If Tc1 and TC2 are given and **UseTemperatureDependMaterial** is checked, temperature dependent materials will be generated

Temperature dependent material



Sweep the $Temp variable will get the corner results at different temperatures



Multiple layermaps support in IRCX

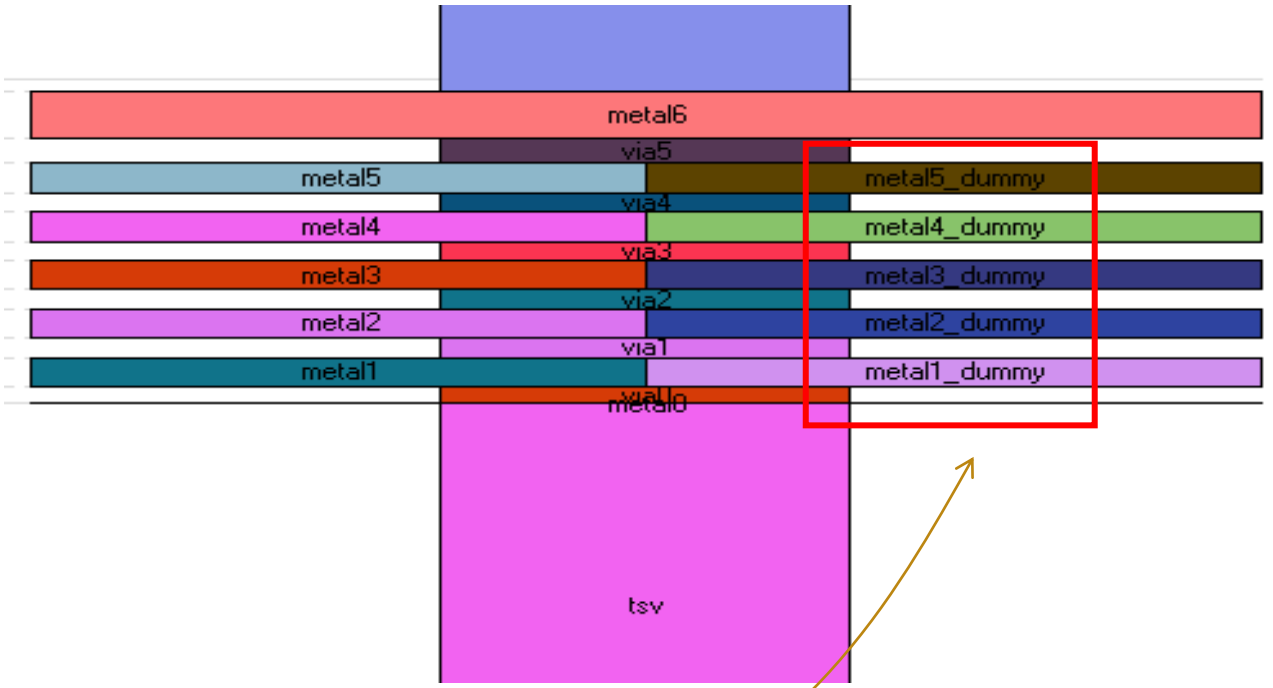
```
1441  [LAYER_MAPPING]
1442  #substate is reversed-tone NWELL
1443  #via4 is (ubump AND metal4)
1444  #ubump_top_pin is ubump_pin
1445  #ubmb_top_pin is ubmb_pin
1446  #RC      GDS LVS      DFII
1447  ubump         170;0    ubump         UBM;drawing
1448  metal4            74;0     metal4            AP;drawing
1449  DUM4              74;1     DUM4              AP;dummy
1450  metal3            33;40    metal3            M3;drawing
1451  DUM3              33;41    DUM3              M3;dummy
1452  metal2            32;40:32;41   metal2            M2;drawing
1453  DUM2              32;41    DUM2              M2;dummy
1454  metal1            31;40    metal1            M1;drawing
1455  DUM1              31;41    DUM1              M1;dummy
1456  mb1      31;100   MB1      M1;BSL
1457  ubmb          170;100 UBMB          UBM;BSL
1458  via4          86;0     via4          CB2;drawing
1459  via3          85;0     via3              RV;drawing
1460  via2              52;40    via2              VIA2;drawing
1461  via1              51;40    via1              VIA1;drawing
1462  tsv      251;0    tsv      TSV;drawing
1463  tsv_3t       251;3    tsv_3t       TSV;dummy1
1464  pmb      5;100    PMB      PM;dummy
1465  ubump_pin         125;0    ubm_top_pin       UBM;pin
1466  metal4_pin        126;0    metal4_pin        AP;pin
1467  metal3_pin        133;0    metal3_pin        M3;pin
1468  metal2_pin        132;0    metal2_pin        M2;pin
1469  metal1_pin        131;0    metal1_pin        M1;pin
1470  mb1_pin           131;100  MB1_pin           M1;BSP
1471  ubmb_pin          125;100  UBMB_pin          UBM;test0
1472  ctm      77;0     ctm      CTM;drawing
1473  cbm      88;0     cbm      CBM;drawing
1474  ctm_via       51;40    ctm_via           VIA1;drawing
1475  cbm_via       51;40    cbm_via           VIA1;drawing
1476
```

Multiple layermaps are supported from V5.4, it only need add the new layermap to the corresponding metal layer and separated with ":" .

Just append the dummy layermap to metal layer if you want consider the dummy metal.

Dummy Layer support in IRCX

```
34      "AedtInstallDir": null,
35      "MergeDielectricMethod": 0,
36      "SheetLayerThreshold": 0.0015,
37      "ConvertPolygonToCircleRatio": 0.90000000000000002,
38      "DefaultDF": 0.02,
39      "Precision": 6,
40      "ControlXmlPath": null,
41      "Materials": [],
42      "InputType": 0,
43      "TextLayermap": {},
44      "DummyLayerReg": [
45          "metal\\d+"
46      ],
47      "ThinDielectricThreshold": 0.10000000000000001,
48      "UnionPrimitivesOnLayer": [
49          "ubmb",
50          "ubump"
51      ],
52      "RemoveDuplicatePins": false,
53      "UseTemperatureDependMaterial": false,
54      "ImportDummyNet": true,
55      "OpenInAedt": true,
56      "GdsFile": null,
57      "InsulatorThickness": 1,
58      "SimplifyDieletricMethod": 1,
59      "IgnoreLayersReg": [
60          "air",
61          "ctm.*",
62          "cbm.*",
63          "dtce.*"
64      ],
65      "ImportDummyLayer": true
66  }
```



Additional layers will be generated when “ImportDummyLayer” is set

CreatVia Groups Method

```
{
    "ConvertPolygonToCircle": true,
    "Default": null,
    "CreatViaGroupsOption": "Method:proximity,Tolerance:5um,CheckContainment:true",
    "NotUseViaGroupsOnLayers": [
        ".*tsv.*",
        "pmb"
    ],
```

"Method:proximity,Tolerance:5um,CheckContainment:true"

```
<Layer Name="52" Material="via2_cond" GDSDataType="40" TargetLayer="via2"  StartLayer="meta
 <CreateViaGroups Method="proximity" Tolerance="5um" CheckContainment="true" />
 <SnapViaGroups Method="areaFactor" Tolerance="3" RemoveUnconnected="true" />
</Layer>
<Layer Name="51" Material="via1_cond" GDSDataType="40" TargetLayer="via1"  StartLayer="meta
 <CreateViaGroups Method="proximity" Tolerance="5um" CheckContainment="true" />
 <SnapViaGroups Method="areaFactor" Tolerance="3" RemoveUnconnected="true" />
</Layer>
<Layer Name="251" Material="tsv_cond" GDSDataType="0" TargetLayer="tsv"  StartLayer="metal1
 <TSVProperties Thickness="0.15" Material="tsv_Insulating" />
</Layer>
<Layer Name="5" Material="pmb_cond" GDSDataType="100" TargetLayer="pmb"  StartLayer="mb1" S
</Layer>
</Vias>
```

```
{
    "ConvertPolygonToCircle": true,
    "Default": null,
    "CreatViaGroupsOption":"Method:range,Persistent:false,Tolerance:1um",
    "NotUseViaGroupsOnLayers": [
        ".*tsv.*",
        "pmb"
    ],
    "OpenInAedt": true,
```

"Method:range,Persistent:false,Tolerance:1um“

```
<Layer Name="52" Material="via2_cond" GDSDataType="40" TargetLayer="via2"  S
 <CreateViaGroups Method="range" Persistent="false" Tolerance="1um" />
 <SnapViaGroups Method="areaFactor" Tolerance="3" RemoveUnconnected="true" />
</Layer>
<Layer Name="51" Material="via1_cond" GDSDataType="40" TargetLayer="via1"  S
 <CreateViaGroups Method="range" Persistent="false" Tolerance="1um" />
 <SnapViaGroups Method="areaFactor" Tolerance="3" RemoveUnconnected="true" />
</Layer>
<Layer Name="251" Material="tsv_cond" GDSDataType="0" TargetLayer="tsv"  Sta
 <TSVProperties Thickness="0.15" Material="tsv_Insulating" />
```

Note: Environment variables and command-line arguments could be set for this option.

Ansys