Ansys DDR Eye Analyzer

About ADEA

New DDR Solution for

Easy! Simple! and Customizable!

See more details about ADEA!

01

GitHub

All ADEA source codes are

published on the GitHub.

Download and Enjoy ADEA!

02

How to Use

User guide is included in ADEA .

Go to *./Resources/help*

Check the guide video!

03

Questions

Any questions & problems,

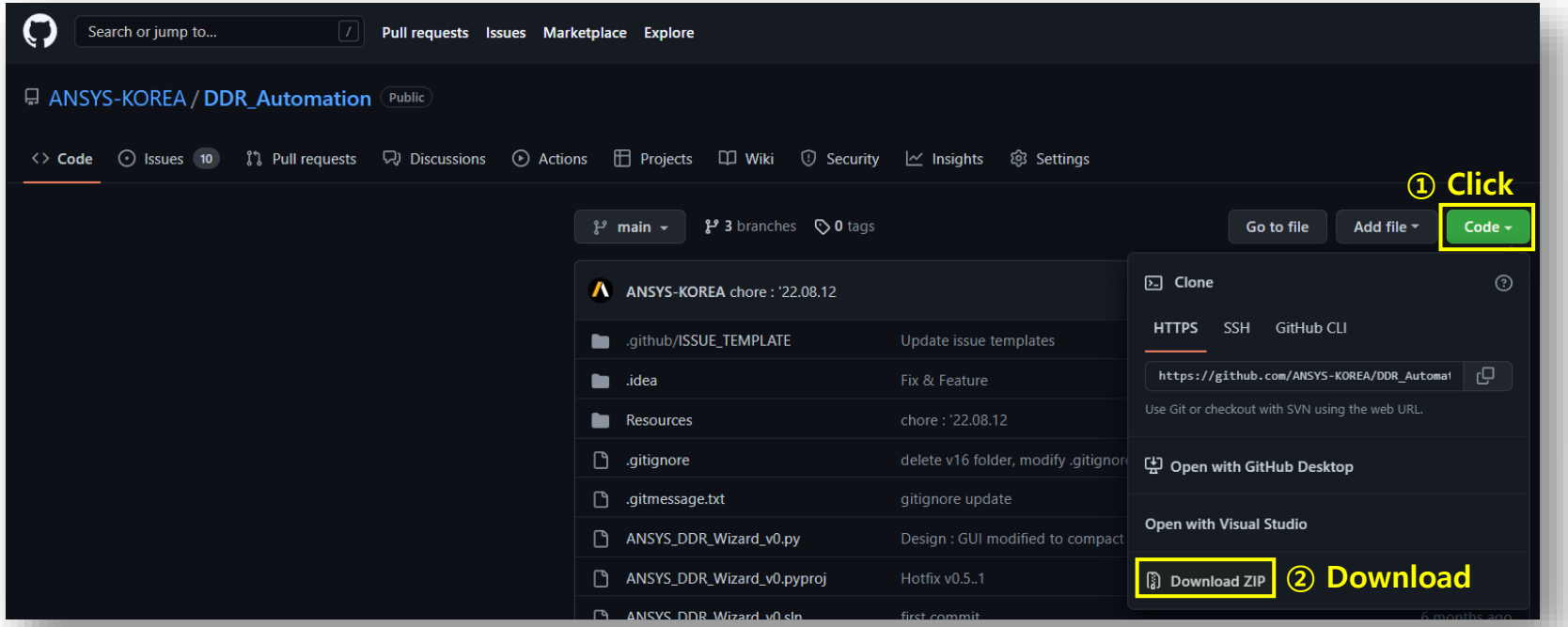
Send an e-mail to developer

04

Getting Started with ADEA

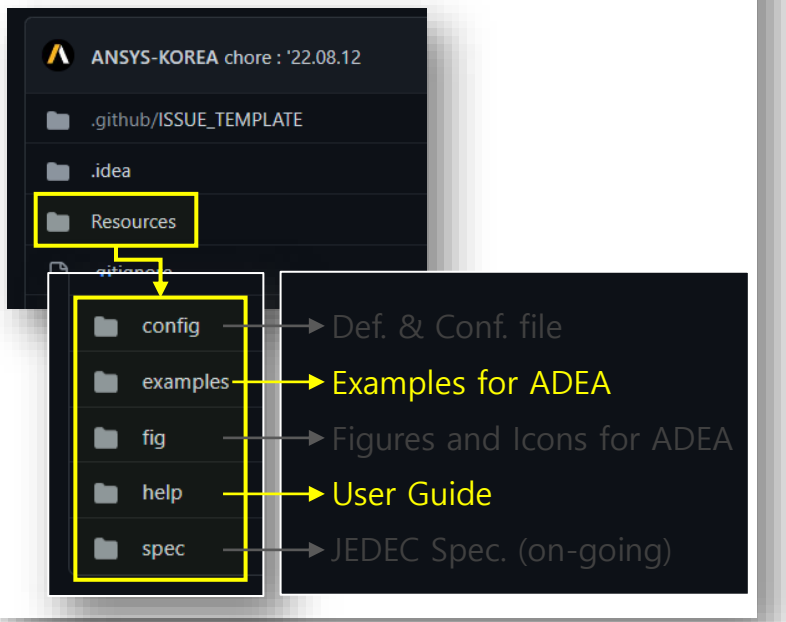
Show Video

- **Source code, example, and user guides of ADEA are available for download from GitHub.**
  - Download ADEA from the Ansys-Korea GitHub Homepage.



Check the **Examples** and **User Guide**

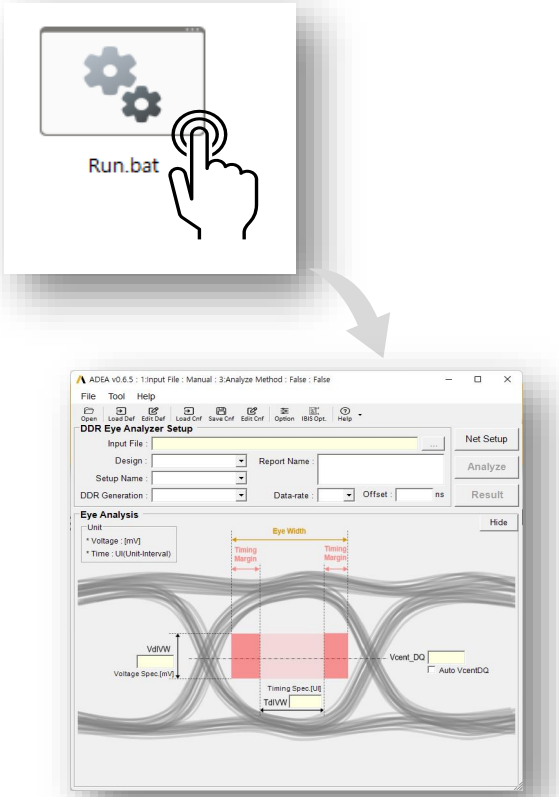
in the **Resources** folder ☺



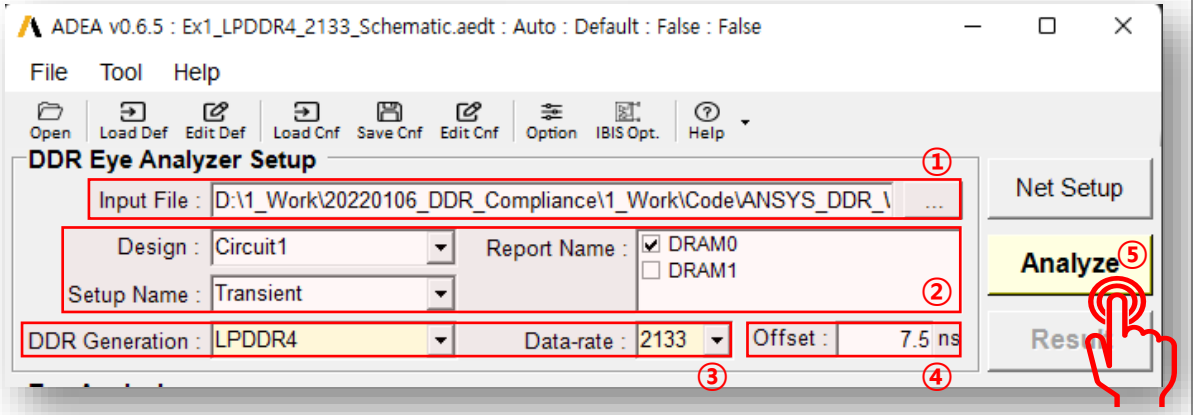
User Guide – Ansys DDR Eye Analyzer : Eye Analyze

Show Video

1. Launch ADEA



2. ADEA Setup



① Load **Input File** (*.aedt).

② Select **Design**, **Setup**, and **Report.**

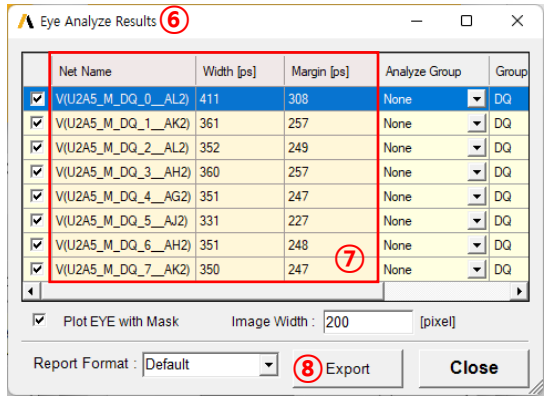
③ Select **DDR Type** and **Data-rate**.

④ Enter **Offset** for eye analyze.

3. Analyze

⑤ Click '**Analyze**'

4. Result



⑥ Result Window Pops up.

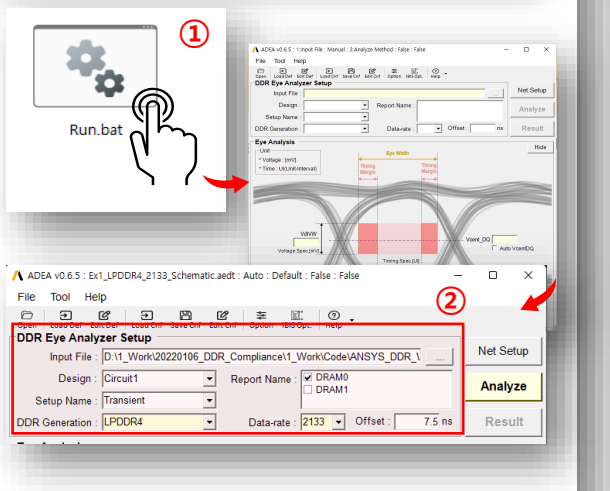
⑦ Check Analysis Results

⑧ Export Report (Optional)

User Guide – Ansys DDR Eye Analyzer : IBIS Opt.

Show Video

1. IBIS Opt. Setup

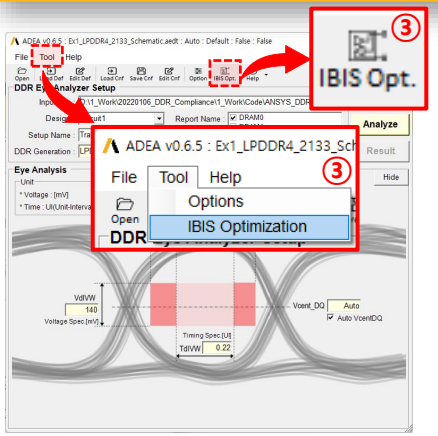


Same way as Eye Analyze

① Launch AEDA

② ADEA Setup

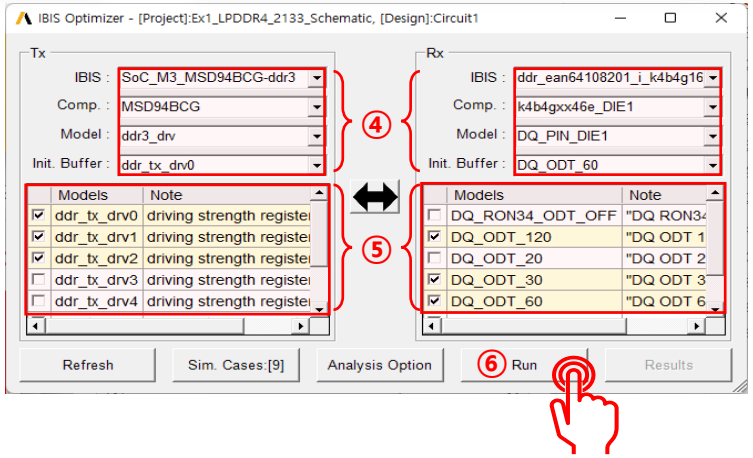
2. Sim. Case Setup



③ Click '**IBIS Opt.**' Icon

or **Tool → IBIS Opt.**

3. Analyze



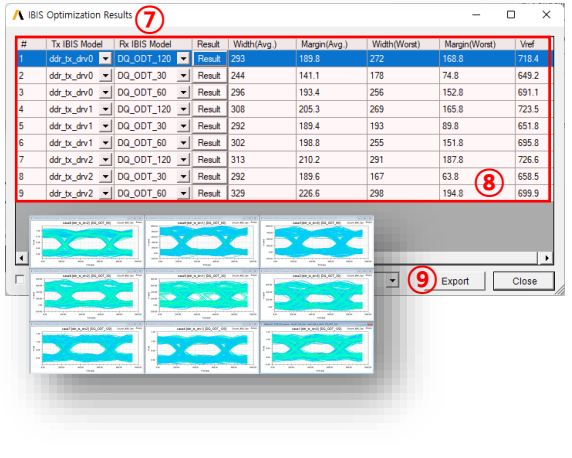
④ Check Tx & Rx IBIS Info.

- ✓ **IBIS file, Comp., Model, Initial Buffer**

⑤ Select **IBIS Models for Tx/Rx**.

⑥ Click '**Run**'

4. Result



⑦ Result Window Pops Up.

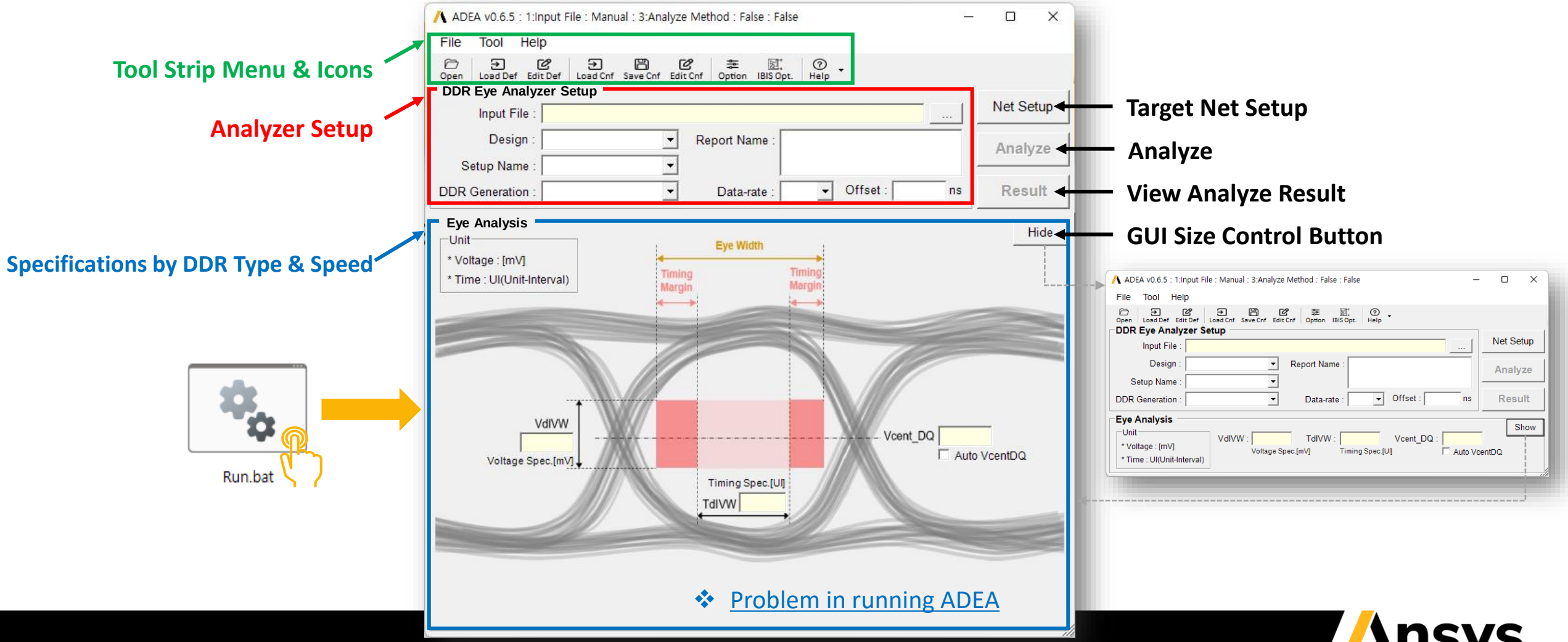
⑧ Check Analysis Results.

⑨ Export Report (TBD)

Eye Analyze

1. Launch ADEA | 2. ADEA Setup | 3. Analyze | 4. Result

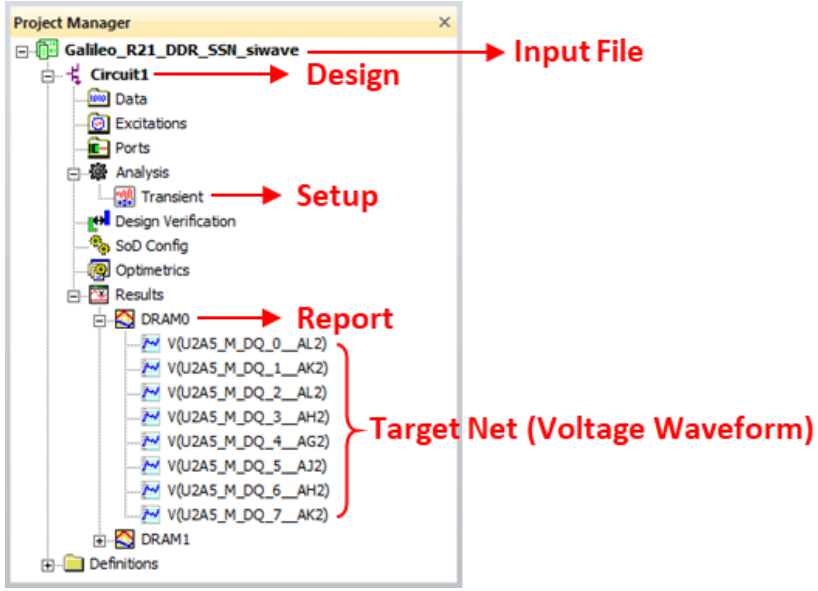
- Launch ADEA using Run.bat file among the files provided.



Eye Analyze

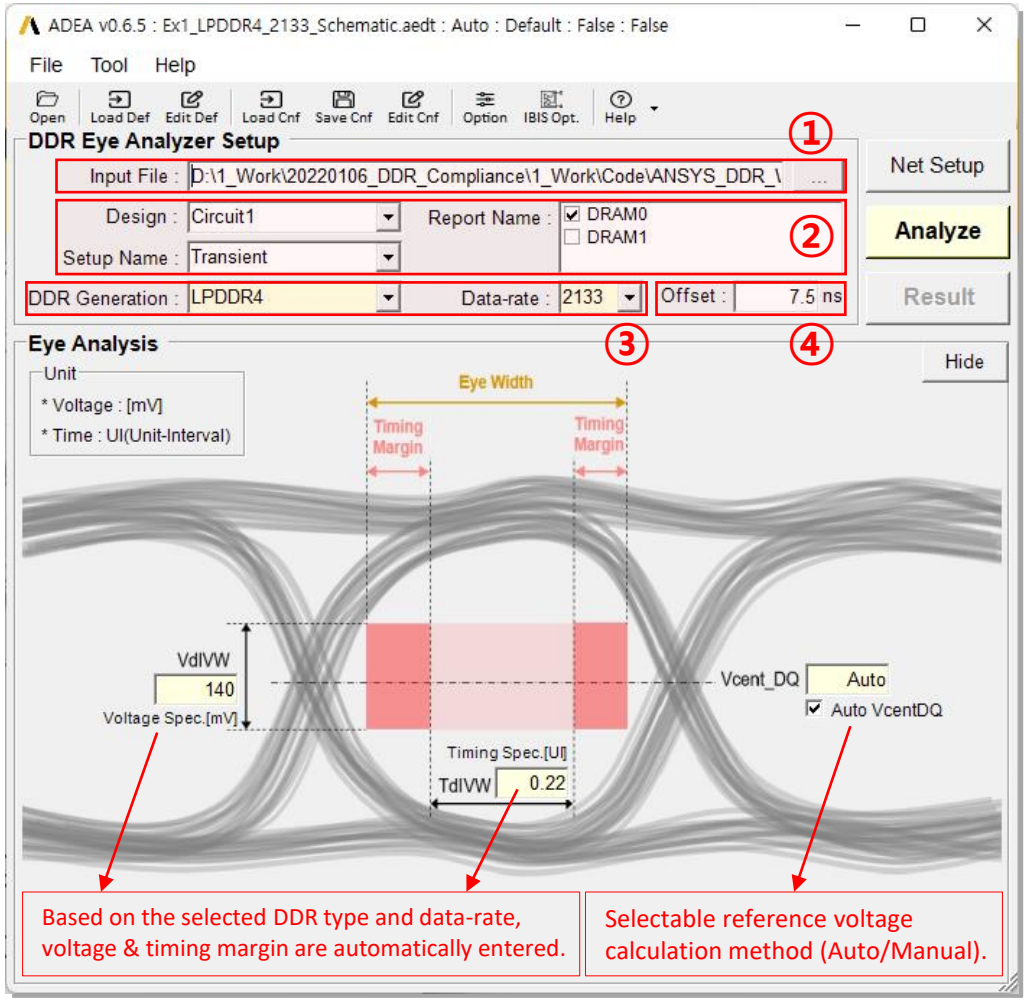
① Click [...] button or Open Icon → Select Input File.

② Select Design, Setup, and Report to analyze.



③ Select DDR Type and Data-rate.

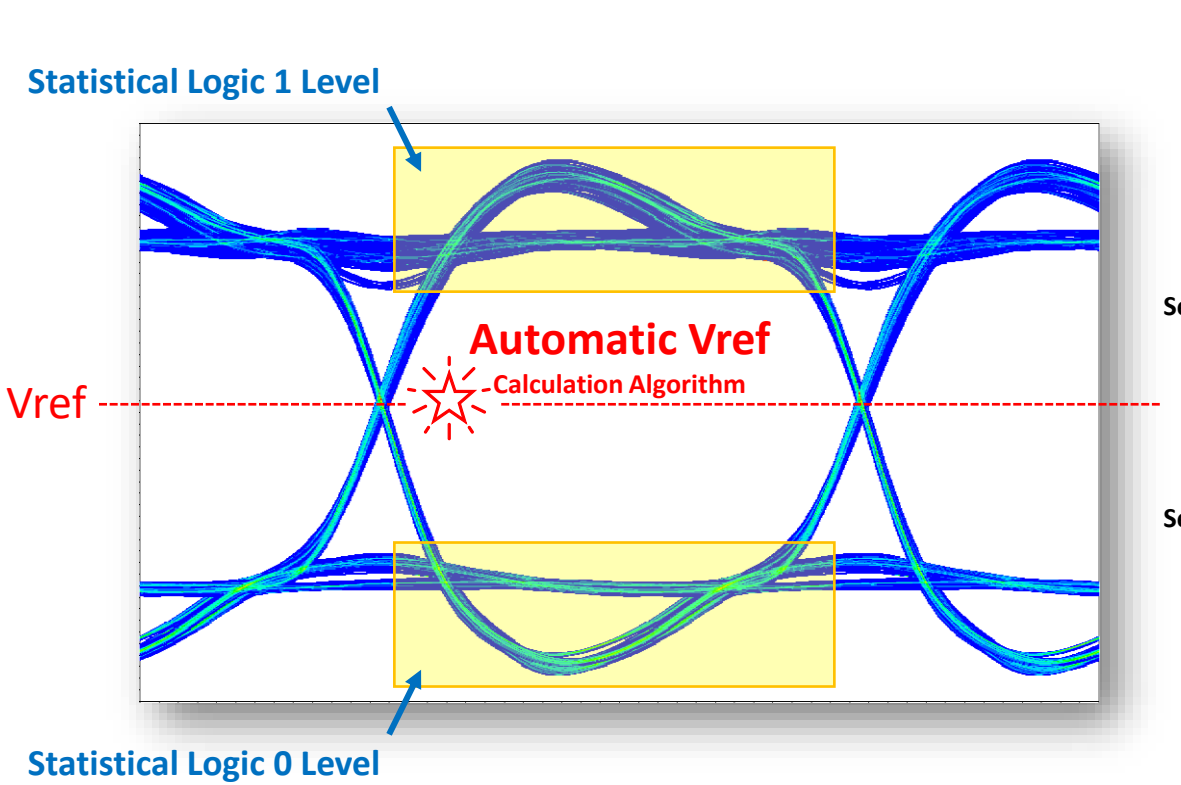
④ Enter Offset.

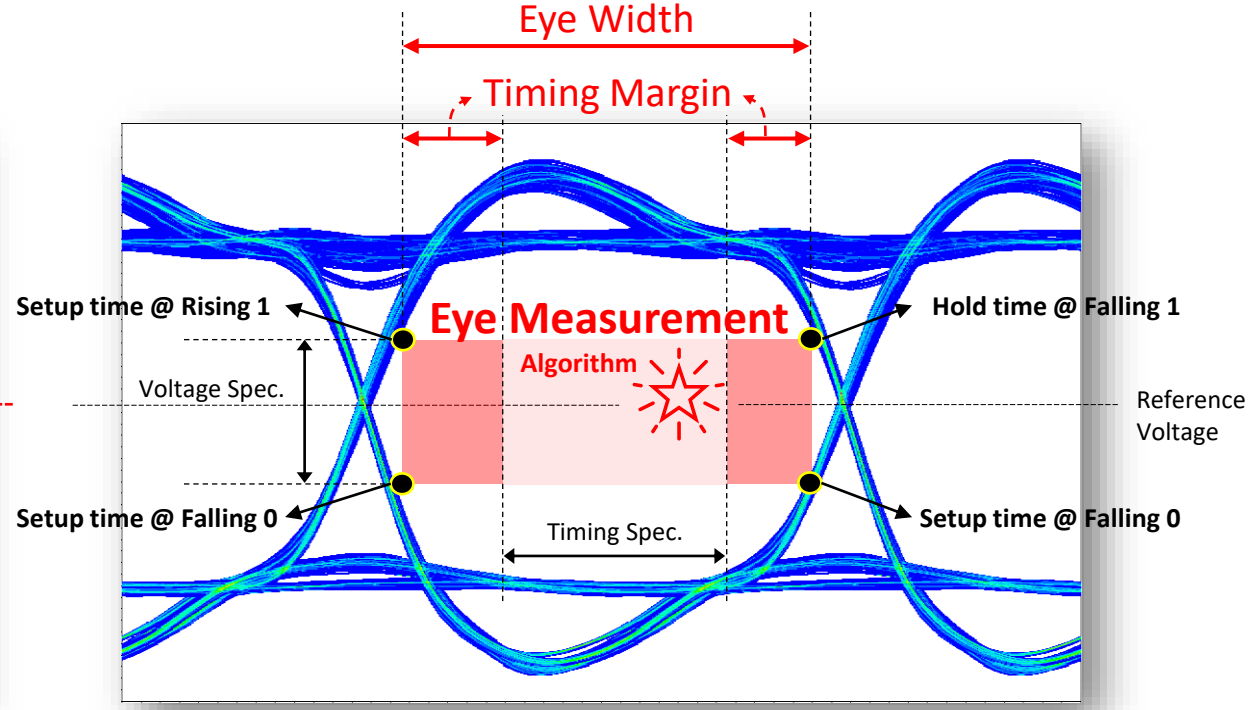


Eye Analyze

- Click the Analyze button to proceed with the analysis

  - ✓ Reference voltage level calculation and eye measurement algorithms are built in.
  - ✓ Customized reference voltage level calculation and/or eye measurement method can be added.

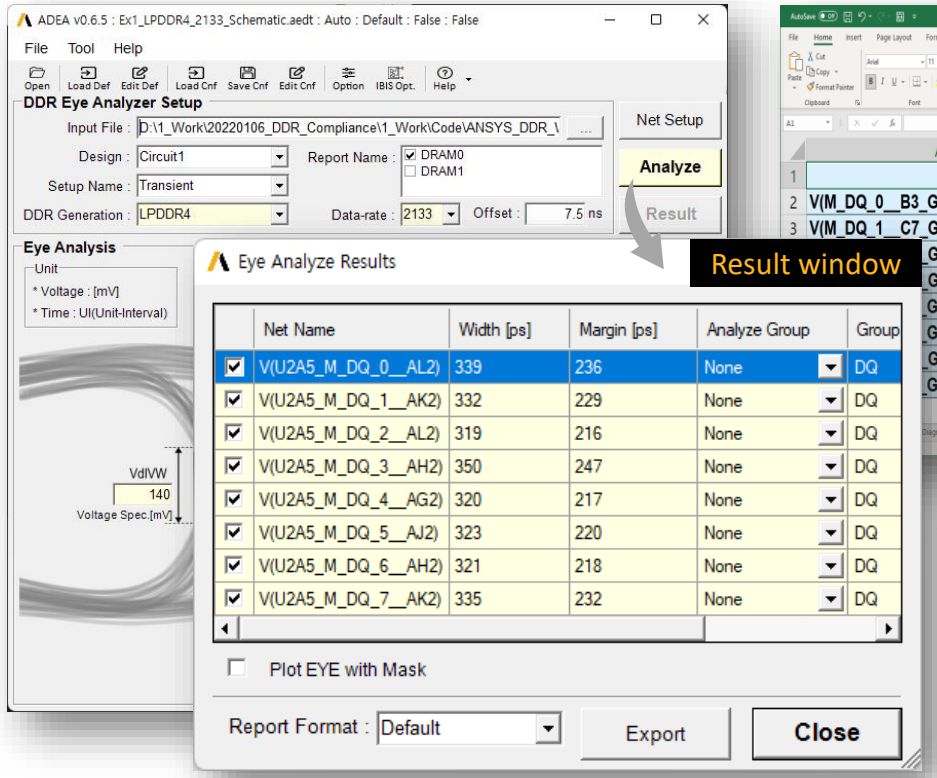




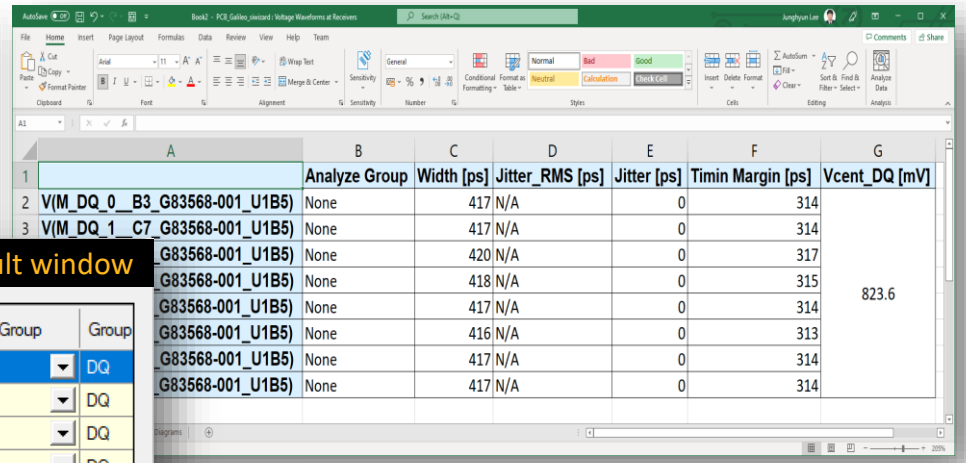
Eye Analyze

- View the analysis result in the Result Window

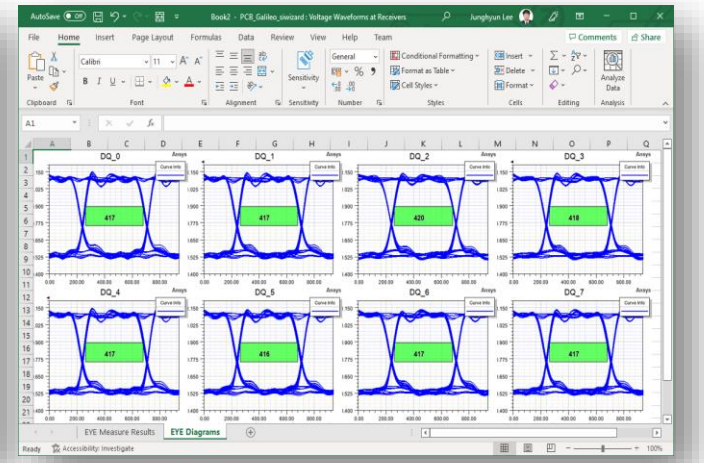
  - ✓ Possible to export built-in Excel report.
  - ✓ HTML report is also available (TBD), and customization is possible easily in the format desired by the user.



Result window



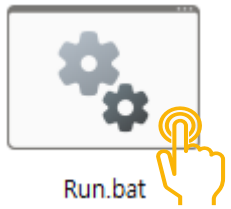
	A	B	C	D	E	F	G
1		Analyze Group	Width [ps]	Jitter_RMS [ps]	Jitter [ps]	Timin Margin [ps]	Vcent_DQ [mV]
2	V(M_DQ_0__B3_G83568-001_U1B5)	None	417	N/A	0	314	
3	V(M_DQ_1__C7_G83568-001_U1B5)	None	417	N/A	0	314	
	_G83568-001_U1B5)	None	420	N/A	0	317	
	G83568-001_U1B5)	None	418	N/A	0	315	
	G83568-001_U1B5)	None	417	N/A	0	314	823.6
	G83568-001_U1B5)	None	416	N/A	0	313	
	G83568-001_U1B5)	None	417	N/A	0	314	
	G83568-001_U1B5)	None	417	N/A	0	314	

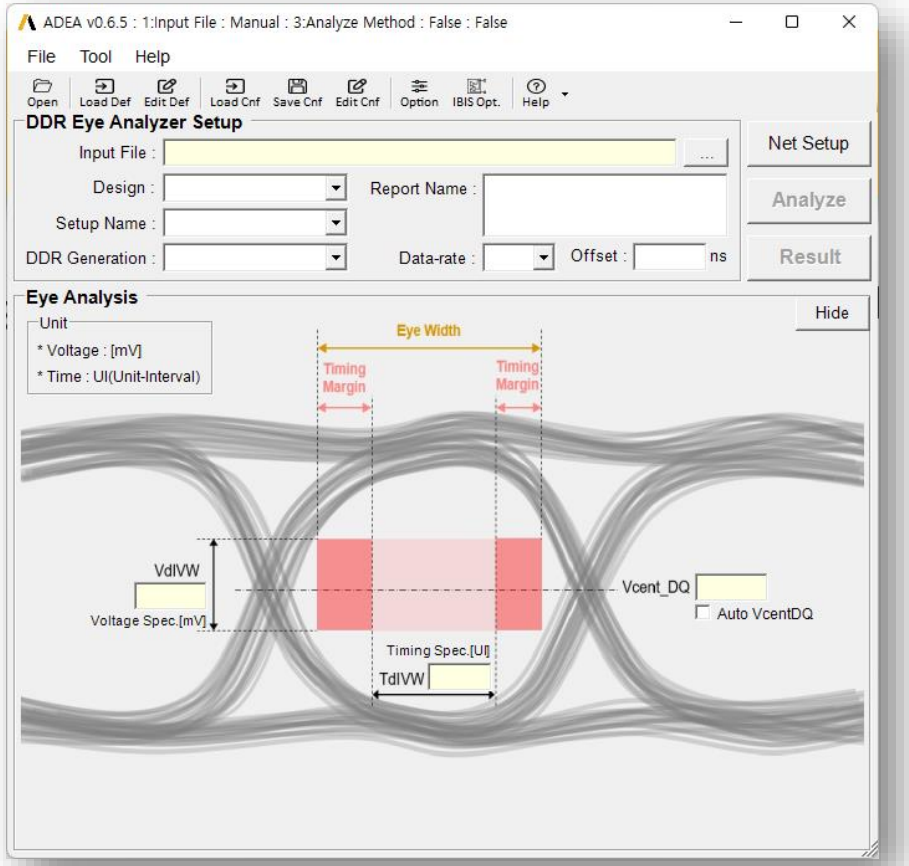


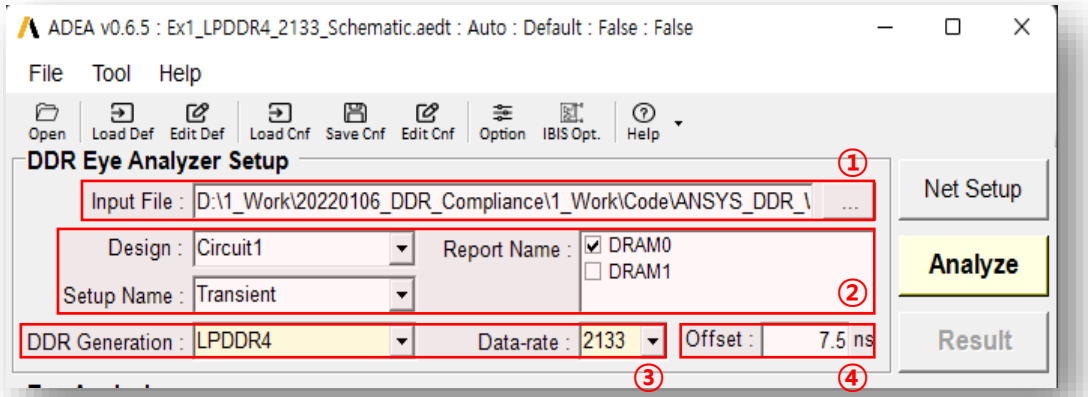
- Automatically pop-up the result window when the analysis is complete.
- Check the result of the timing analysis in the result window.
- Export eye and Excel report as required.

IBIS Opt.

- Run ADEA and complete the ADEA setup in the same way as the Eye Analyze







① Select Input File (*.aedt).

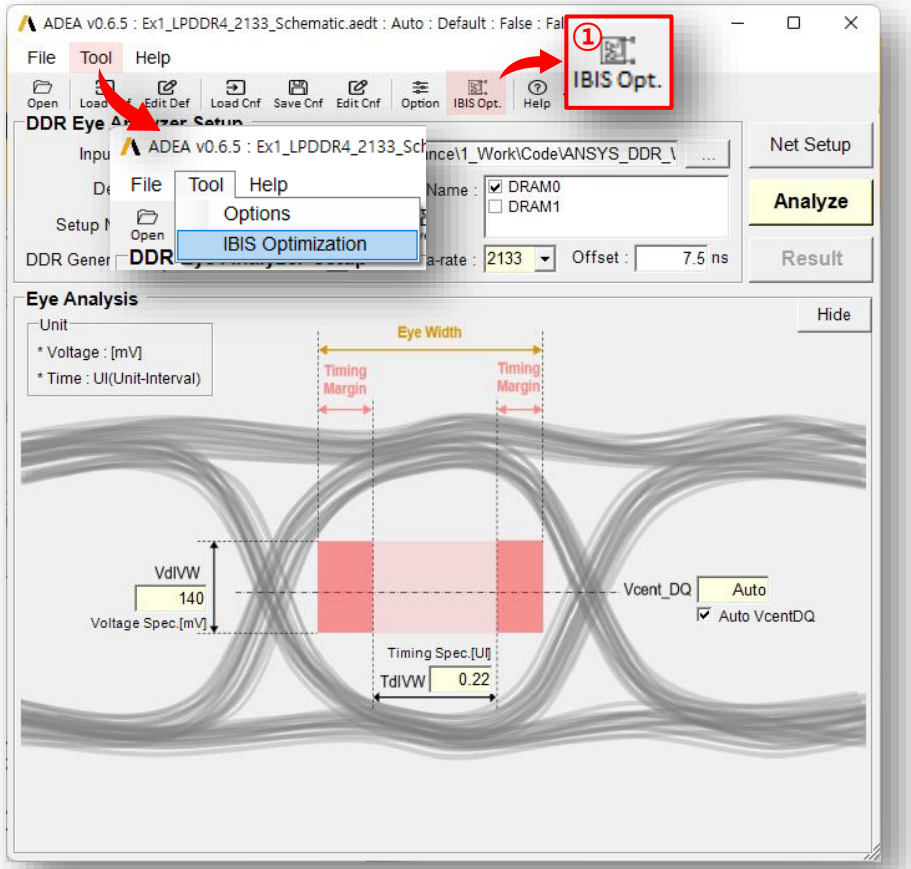
② Select Design, Setup Name, and Report.

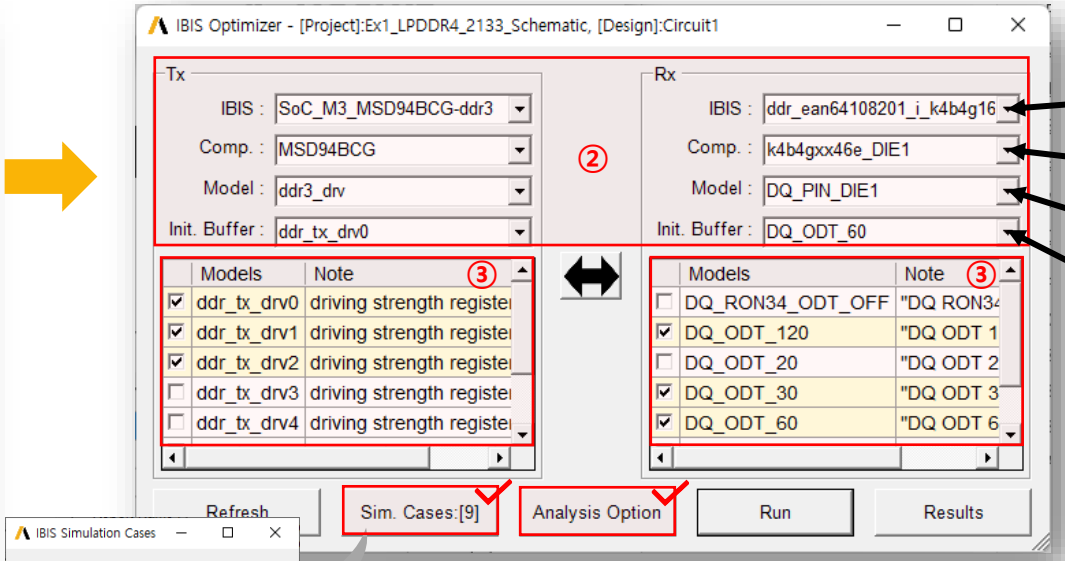
③ Select DDR Type and Data-rate.

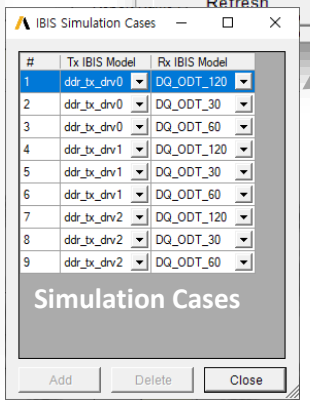
④ Enter Eye Offset.

IBIS Opt.

- Run IBIS Optimizer and select IBIS and simulation case.







IBIS File (*.ibs)

IBIS Component

IBIS Model

Initial Buffer model for input schematic

- *Check the combination of Tx/Rx IBIS models*

① Run IBIS Optimizer.

② Select and/or check

- IBIS file, component, model, and initial buffer model.

③ Select the Tx/Rx buffer models to be analyzed.

✓ Check the Simulation cases.

✓ Check Analysis option.

IBIS Opt.

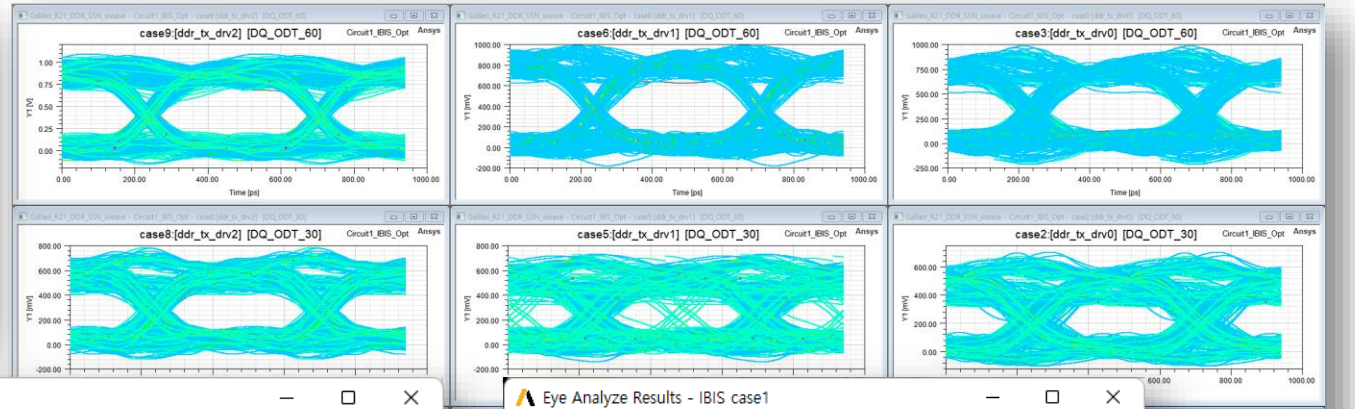
- Click the Run button to proceed with the analysis and check the results.

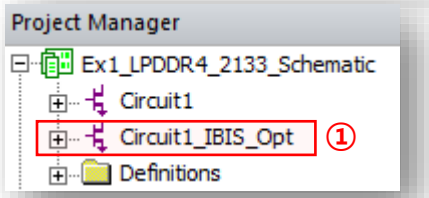
① Schematic for IBIS opt. is automatically created.

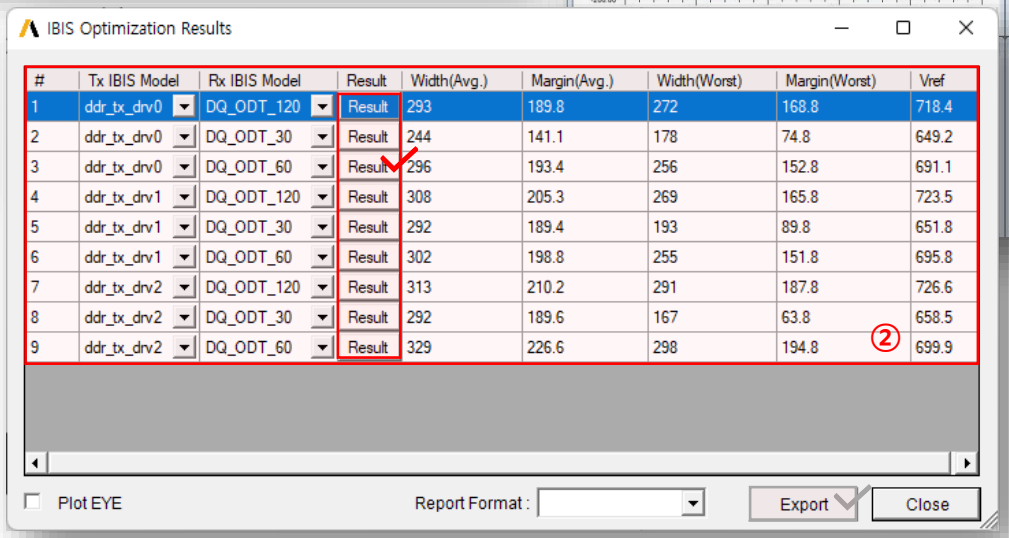
② Automatically pop-up the result window.

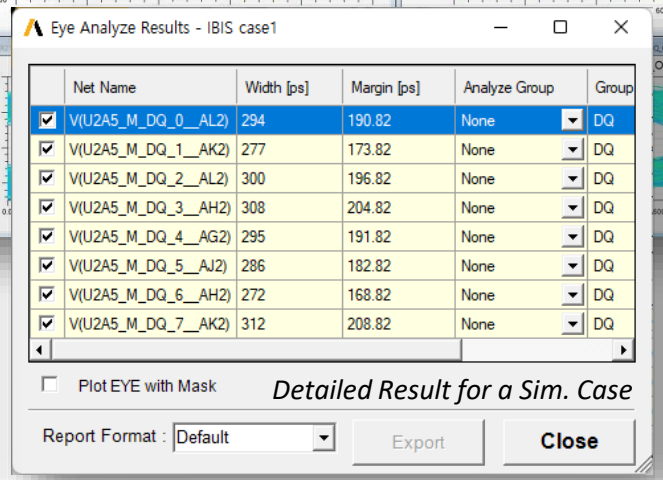
✓ Check the detailed result for each simulation case.

✓ Export eye and Excel report as required (TBD).









Appendix A.1 – Launching ADEA

❑ Launch Ansys DDR Eye Analyzer using Run.bat file.

- If ADEA does not run using the Run.bat file, apply the following sequentially.

Run.bat

```
1  : Launch Option 1 - Specific version of ANSYS EM
2  :   step1. Create an environment variable [ANSYSE
3  :   step2. Set its value to the Specific version
4  :           ex)C:\Program Files\AnsysEM\AnsysEM20
5
6  : Launch Option 2 - Latest version of ANSYS EM Su
7  :   You don't have to do anything because SerDes
8
9  set PATH=%SIWAVE_INSTALL_DIR%\common\IronPython"
10
11 ipyw64 ".\ANSYS_EYE_Analyzer_v0.py"
```

① ②

❖ Setup the Version for Ansys Electronics Desktop

A. Modify the path of ① to the absolute path where AEDT is installed.

ex) Before : `set PATH=%SIWAVE_INSTALL_DIR%\common\IronPython"`

After : `set PATH="C:\Program Files\AnsysEM\AnsysEM21.2\Win64\common\IronPython"`

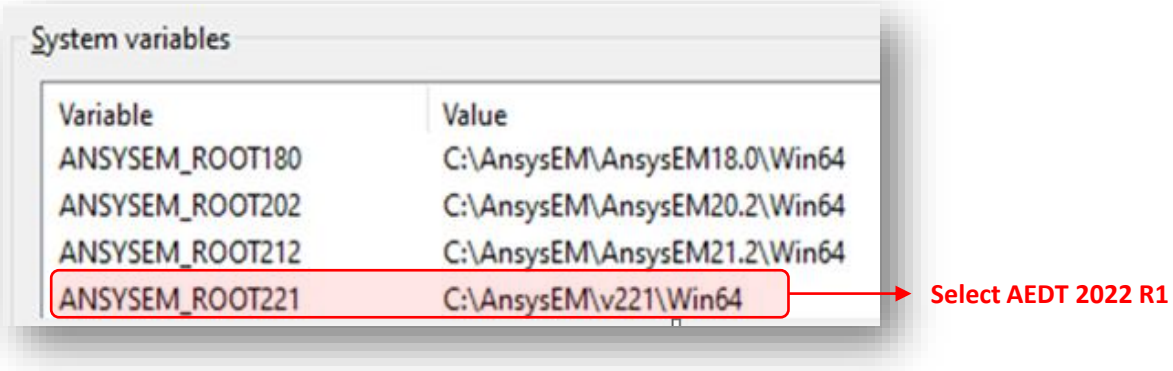
B. Modify ② to the absolute path of the file *"ANSYS_EYE_Analyzer_v0.py"*.

✓ When using relative paths, the Run.bat file and *"ANSYS_EYE_Analyzer_v0.py"* file must be in the same path.

Appendix A.2 – AEDT Version Selection

❑ Version Selection for Ansys Electronics Desktop(AEDT)

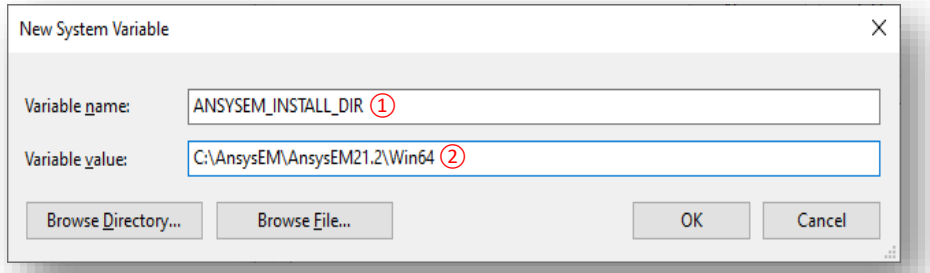
- By default, search for the system variable (ANSYSEM_ROOTxxx) to automatically select the most recent AEDT version.

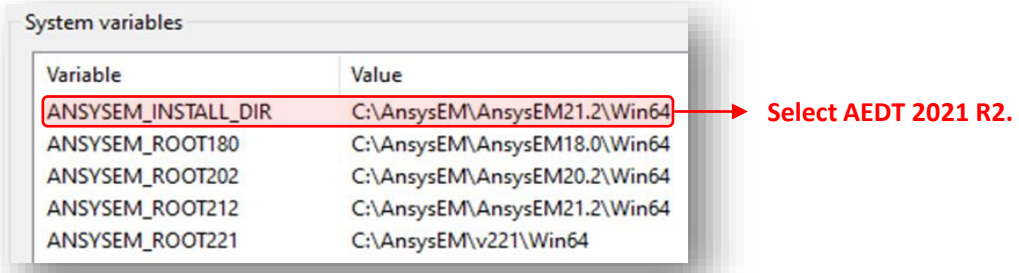


- If you want to use AEDT for a specific version,

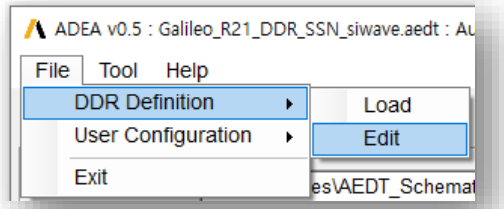
  ① Create the [ANSYSEM_INSTALL_DIR] system variable.

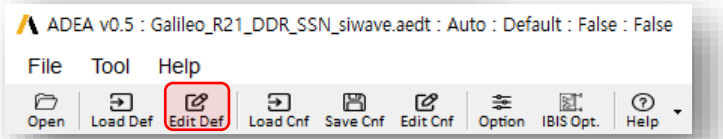
  ② Set the AEDT installation path for the desired version to the value of the above system variable.





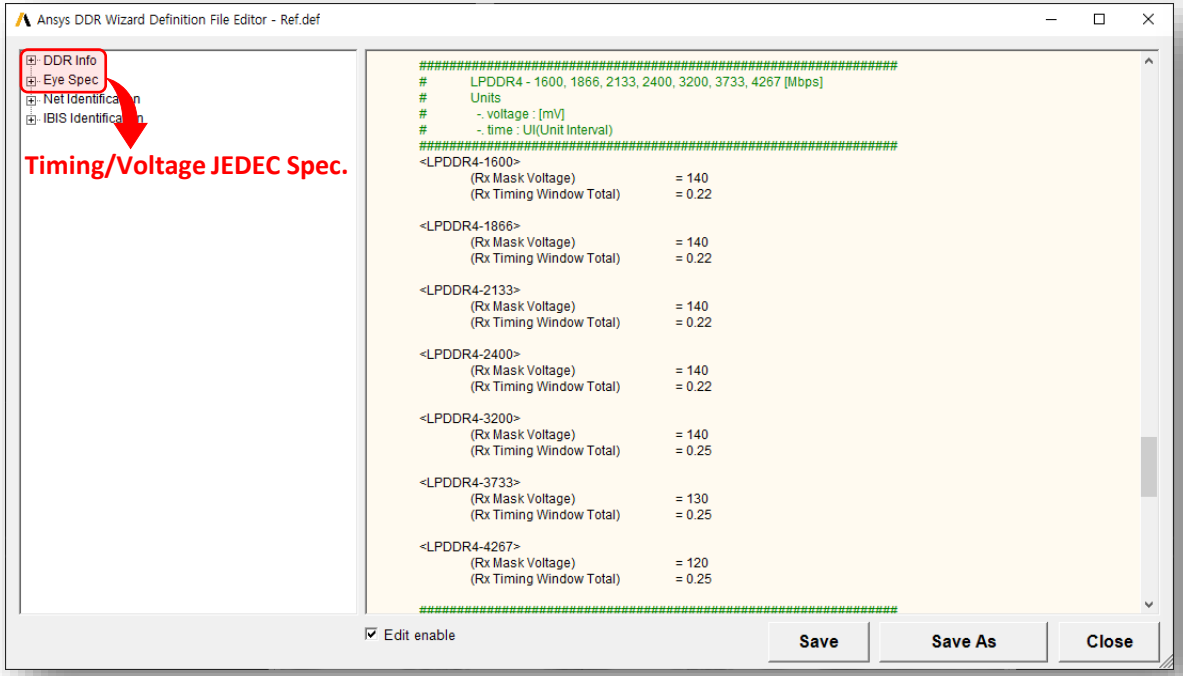
Appendix B.1 – Pre-Configurations

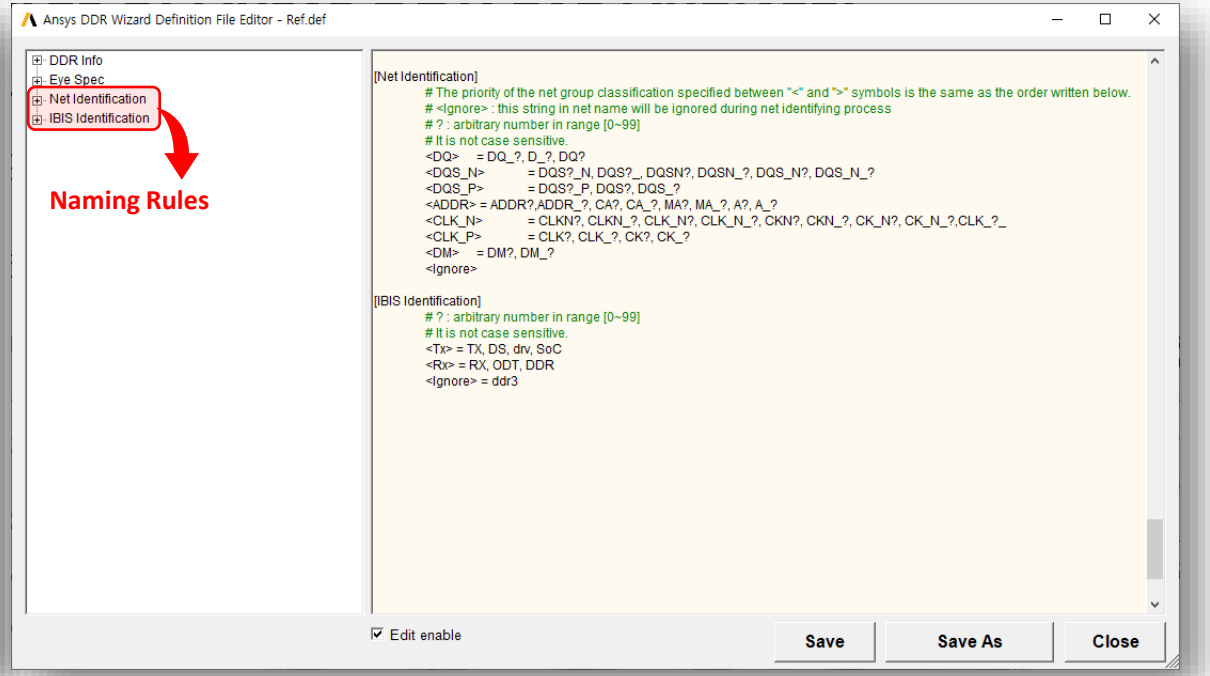




❑ Definition File (*.def)

- Timing/Voltage JEDEC specifications of (LP)DDR2/3/4/5 are defined.
- User can modify and/or add customized specifications.
- Naming rules for target net and IBIS model classification are defined. The rules can be modified and/or added.

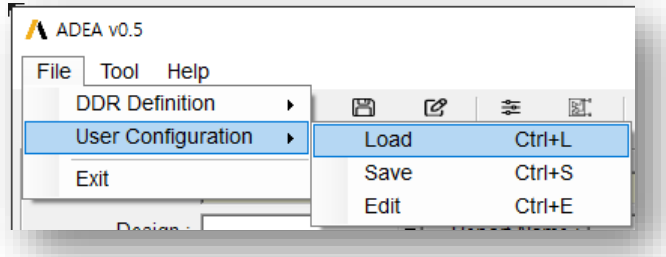


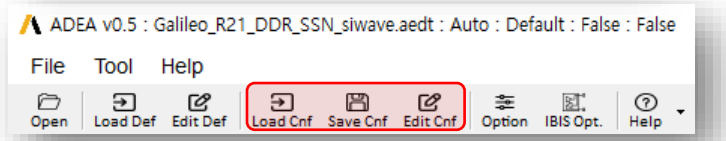


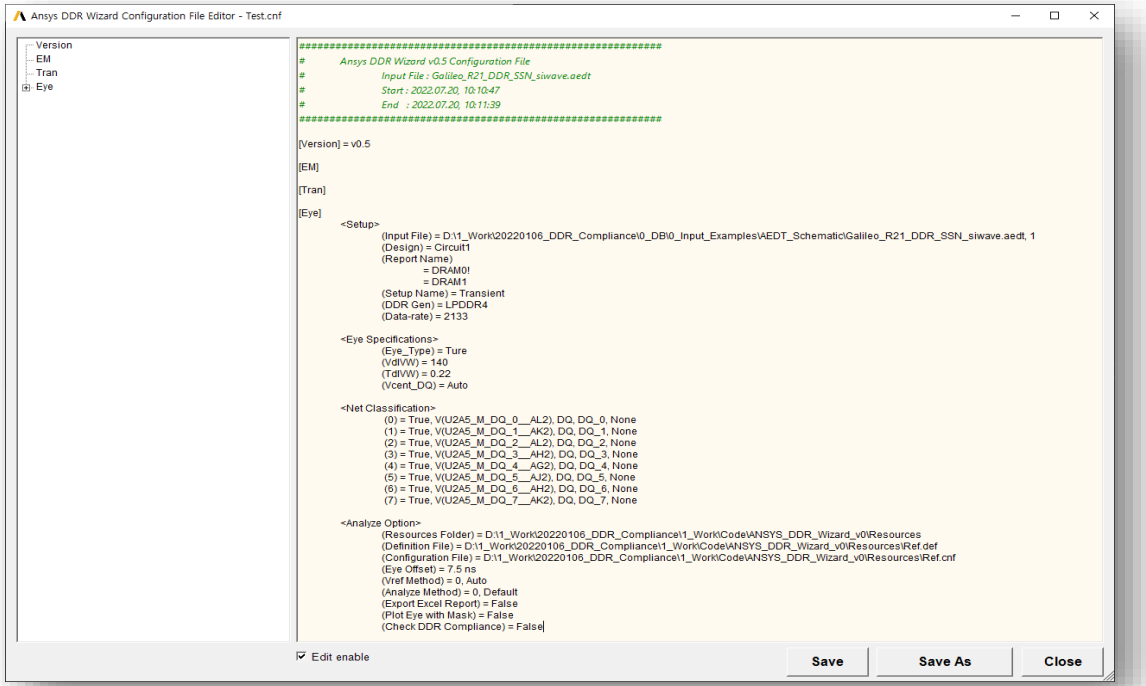
Appendix B.2 – Pre-Configurations

❑ Configuration File (*.cnf)

- All inputs for ADEA can be saved in the configuration file.
- All inputs for ADEA can be automatically filled by importing the configuration file.
- DDR Type and Data-rate are automatically saved and loaded for convenience.








```
##############################################################
#   Ansys DDR Wizard v0.5 Auto Saved Configuration File
#        Input File :
#        Start : 2022.07.17, 23:25:44
#        End   : 2022.07.17, 23:25:51
##############################################################

[Version] = v0.5

[EM]

[Tran]

[Eye]
    <Setup>
        (DDR Gen) = LPDDR4
        (Data-rate) = 3733
```

Appendix B.3 – Automatic Net Classification

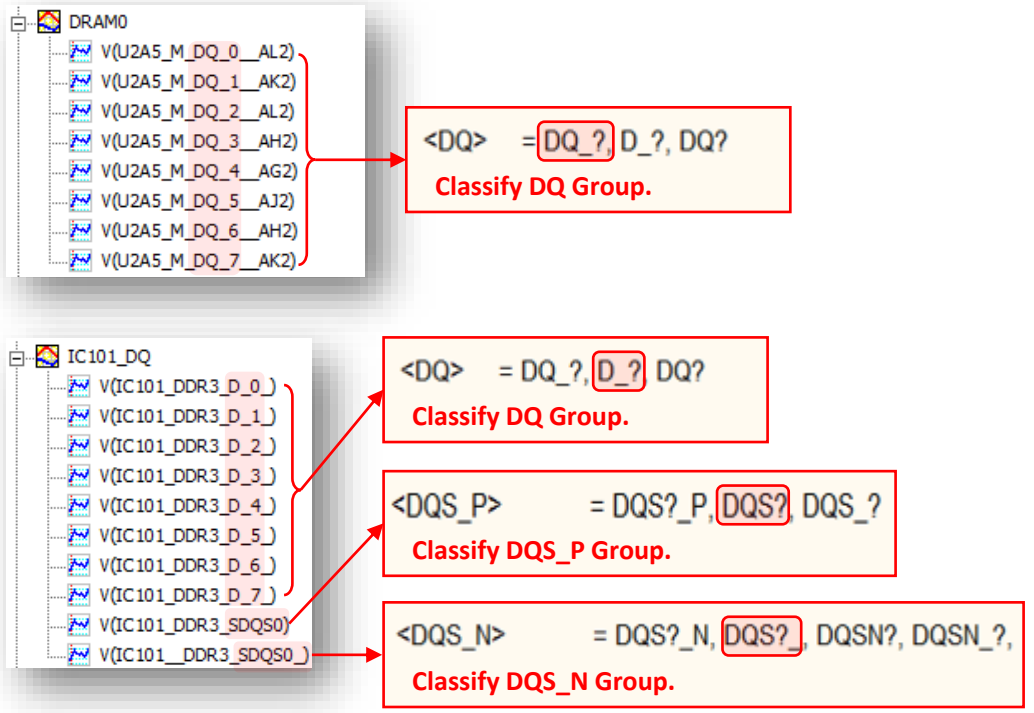
❑ Automatic Net Classification

- ADEA automatically classify the net to be analyzed into the following groups:

  ① DQ ② DQS_N ③ DQS_P ④ ADDR ⑤ CLK_N ⑥ CLK_P ⑦ DM

- It is automatically classified according to the 'Net Identification' rule defined in the definition file.

```
[Net Identification]
        # The priority of the net group classification specified between "<" and ">" symbols is the same as the order written below.
        # <Ignore> : this string in net name will be ignored during net identifying process
        # ? : arbitrary number in range [0~99]
        # It is not case sensitive.
        <DQ>    = DQ_?, D_?, DQ?
        <DQS_N>         = DQS?_N, DQS?_, DQSN?, DQSN_?, DQS_N?, DQS_N_?
        <DQS_P>         = DQS?_P, DQS?, DQS_?
        <ADDR> = ADDR?,ADDR_?, CA?, CA_?, MA?, MA_?, A?, A_?
        <CLK_N>         = CLKN?, CLKN_?, CLK_N?, CLK_N_?, CKN?, CKN_?, CK_N?, CK_N_?,CLK_?_
        <CLK_P>         = CLK?, CLK_?, CK?, CK_?
        <DM>    = DM?, DM_?
        <Ignore>
```

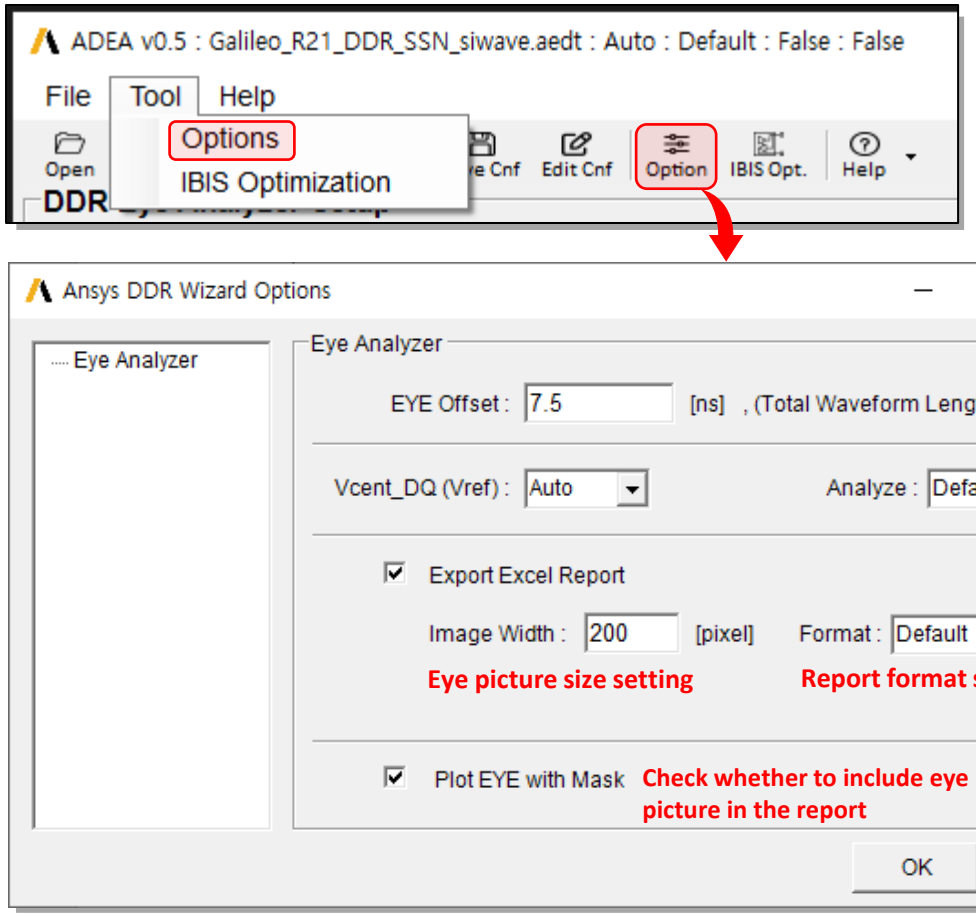


- The 'Net Identification' rule can be modified and/or added.

Appendix C.1 – Analysis Option Setup

❑ Ansys DDR Eye Analyzer – Option setup

- Click Tool → Option Menu or  Icon.



- In the Option Window, enter the settings for eye analysis.
  - ✓ Eye Offset : Enter the offset for voltage waveform.
  - ✓ Vcent_DQ(Vref) : Select voltage reference calculation method.
  - ✓ Analyze : Select eye measurement algorithm
  - ✓ Export Excel : Check whether to export the Excel report or not.

- The reference voltage calculation method, eye measurement method, and report format can be customized by request.

Option Setup process can be skipped when analyze with default option setup.

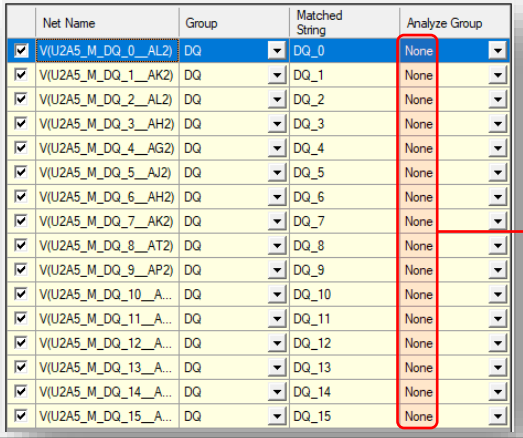
Appendix C.2 – Target Net Setup

❑ Target Net Setup

- DQ groups among auto-classified groups are automatically checked as target net.
- Target nets can also be set and/or un-set by checking or unchecking the net.
- Net groups can also be manually set using the dropdown button.
- Using the Analyze Group, nets can be analyzed as a group.

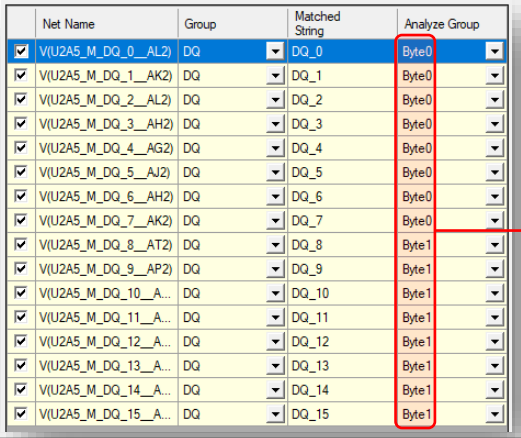
Automatic grouping according to the DQ number

✓ If the Analyze Group is not set up, analyze it as an individual net.



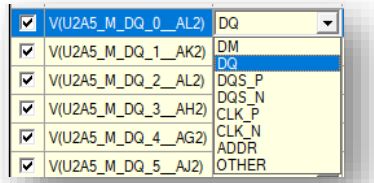
Net Name	Group	Matched String	Analyze Group
V(U2A5_M_DQ_0__AL2)	DQ	DQ_0	None
V(U2A5_M_DQ_1__AK2)	DQ	DQ_1	None
V(U2A5_M_DQ_2__AL2)	DQ	DQ_2	None
V(U2A5_M_DQ_3__AH2)	DQ	DQ_3	None
V(U2A5_M_DQ_4__AG2)	DQ	DQ_4	None
V(U2A5_M_DQ_5__AJ2)	DQ	DQ_5	None
V(U2A5_M_DQ_6__AH2)	DQ	DQ_6	None
V(U2A5_M_DQ_7__AK2)	DQ	DQ_7	None
V(U2A5_M_DQ_8__AT2)	DQ	DQ_8	None
V(U2A5_M_DQ_9__AP2)	DQ	DQ_9	None
V(U2A5_M_DQ_10__A...	DQ	DQ_10	None
V(U2A5_M_DQ_11__A...	DQ	DQ_11	None
V(U2A5_M_DQ_12__A...	DQ	DQ_12	None
V(U2A5_M_DQ_13__A...	DQ	DQ_13	None
V(U2A5_M_DQ_14__A...	DQ	DQ_14	None
V(U2A5_M_DQ_15__A...	DQ	DQ_15	None

Analysis for each Bit line.

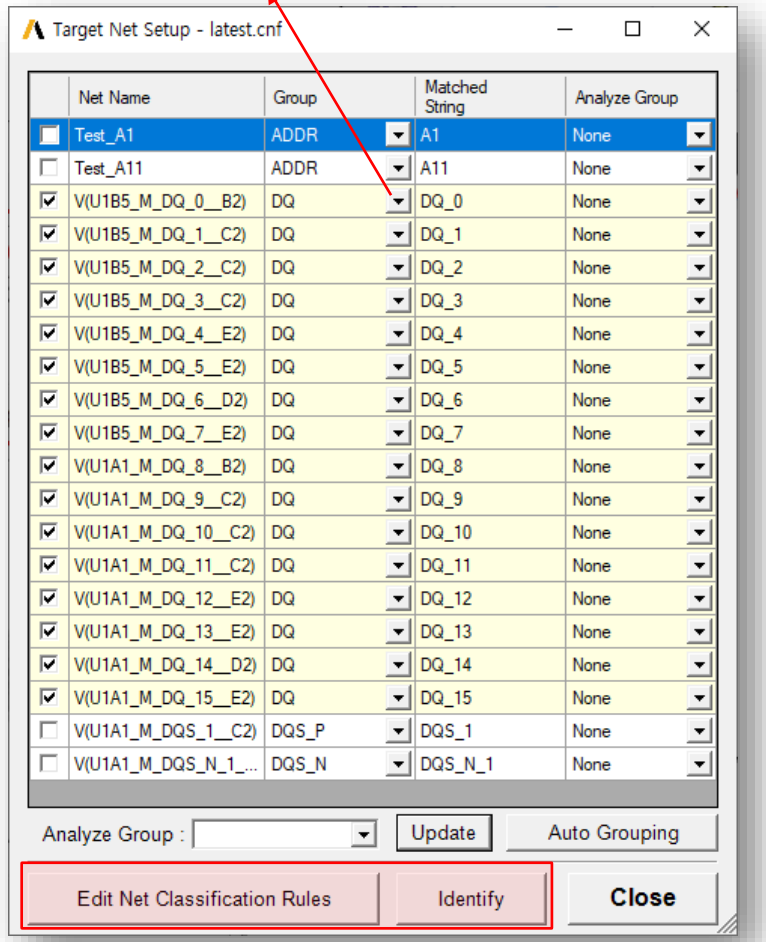


Net Name	Group	Matched String	Analyze Group
V(U2A5_M_DQ_0__AL2)	DQ	DQ_0	Byte0
V(U2A5_M_DQ_1__AK2)	DQ	DQ_1	Byte0
V(U2A5_M_DQ_2__AL2)	DQ	DQ_2	Byte0
V(U2A5_M_DQ_3__AH2)	DQ	DQ_3	Byte0
V(U2A5_M_DQ_4__AG2)	DQ	DQ_4	Byte0
V(U2A5_M_DQ_5__AJ2)	DQ	DQ_5	Byte0
V(U2A5_M_DQ_6__AH2)	DQ	DQ_6	Byte0
V(U2A5_M_DQ_7__AK2)	DQ	DQ_7	Byte0
V(U2A5_M_DQ_8__AT2)	DQ	DQ_8	Byte1
V(U2A5_M_DQ_9__AP2)	DQ	DQ_9	Byte1
V(U2A5_M_DQ_10__A...	DQ	DQ_10	Byte1
V(U2A5_M_DQ_11__A...	DQ	DQ_11	Byte1
V(U2A5_M_DQ_12__A...	DQ	DQ_12	Byte1
V(U2A5_M_DQ_13__A...	DQ	DQ_13	Byte1
V(U2A5_M_DQ_14__A...	DQ	DQ_14	Byte1
V(U2A5_M_DQ_15__A...	DQ	DQ_15	Byte1

Grouping analysis for Byte lane



Dropdown Menu for net group selection



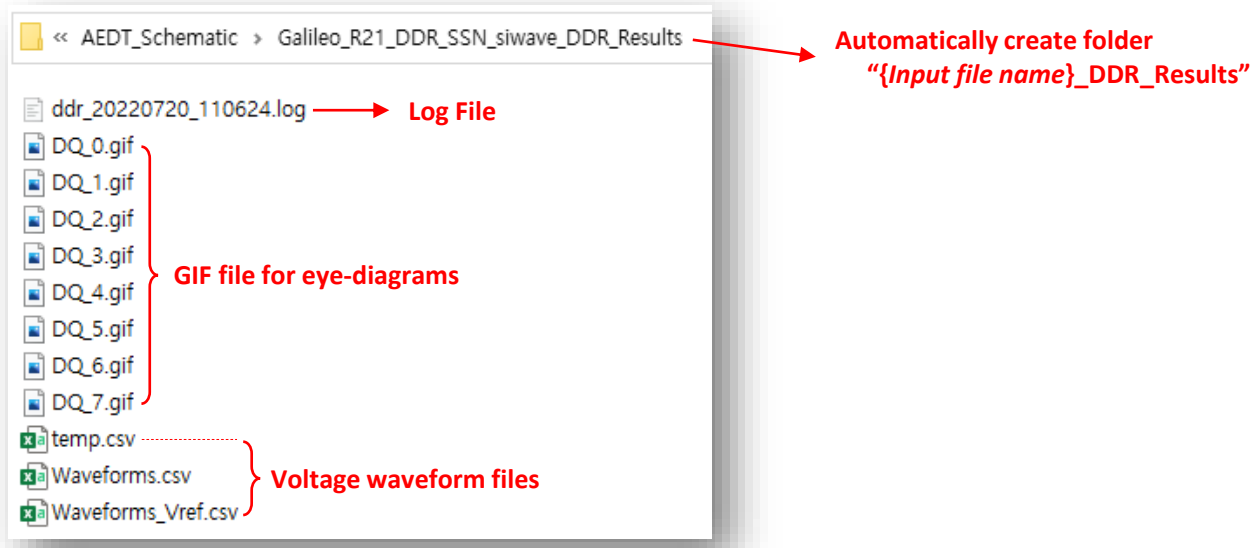
Net Name	Group	Matched String	Analyze Group
Test_A1	ADDR	A1	None
Test_A11	ADDR	A11	None
V(U1B5_M_DQ_0__B2)	DQ	DQ_0	None
V(U1B5_M_DQ_1__C2)	DQ	DQ_1	None
V(U1B5_M_DQ_2__C2)	DQ	DQ_2	None
V(U1B5_M_DQ_3__C2)	DQ	DQ_3	None
V(U1B5_M_DQ_4__E2)	DQ	DQ_4	None
V(U1B5_M_DQ_5__E2)	DQ	DQ_5	None
V(U1B5_M_DQ_6__D2)	DQ	DQ_6	None
V(U1B5_M_DQ_7__E2)	DQ	DQ_7	None
V(U1A1_M_DQ_8__B2)	DQ	DQ_8	None
V(U1A1_M_DQ_9__C2)	DQ	DQ_9	None
V(U1A1_M_DQ_10__C2)	DQ	DQ_10	None
V(U1A1_M_DQ_11__C2)	DQ	DQ_11	None
V(U1A1_M_DQ_12__E2)	DQ	DQ_12	None
V(U1A1_M_DQ_13__E2)	DQ	DQ_13	None
V(U1A1_M_DQ_14__D2)	DQ	DQ_14	None
V(U1A1_M_DQ_15__E2)	DQ	DQ_15	None
V(U1A1_M_DQS_1__C2)	DQS_P	DQS_1	None
V(U1A1_M_DQS_N_1_...	DQS_N	DQS_N_1	None

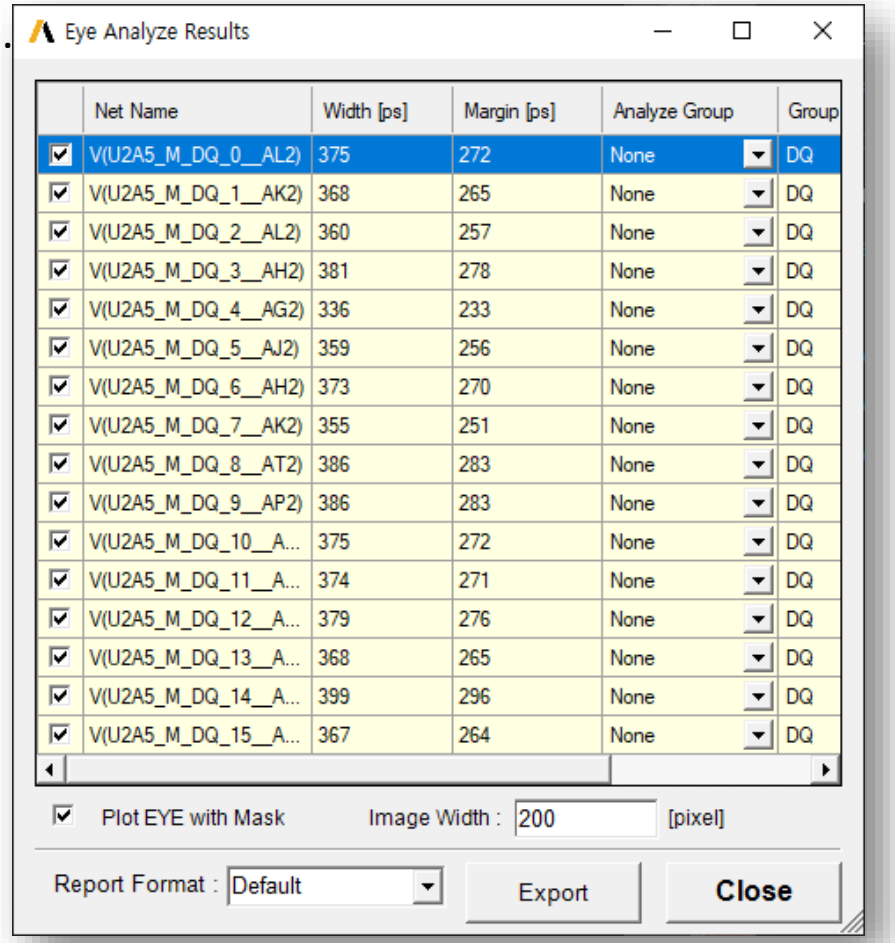
Modify and apply rule

Appendix D – Eye Measurement Results

❑ Eye Measurement Results

- The Result Window is automatically pop-up, after the analysis complete.
- User can check the eye width and timing margin by bit or byte.
- After checking the results, user can export the report.
- Result files such as *.log file and eye diagram GIF file are generated.



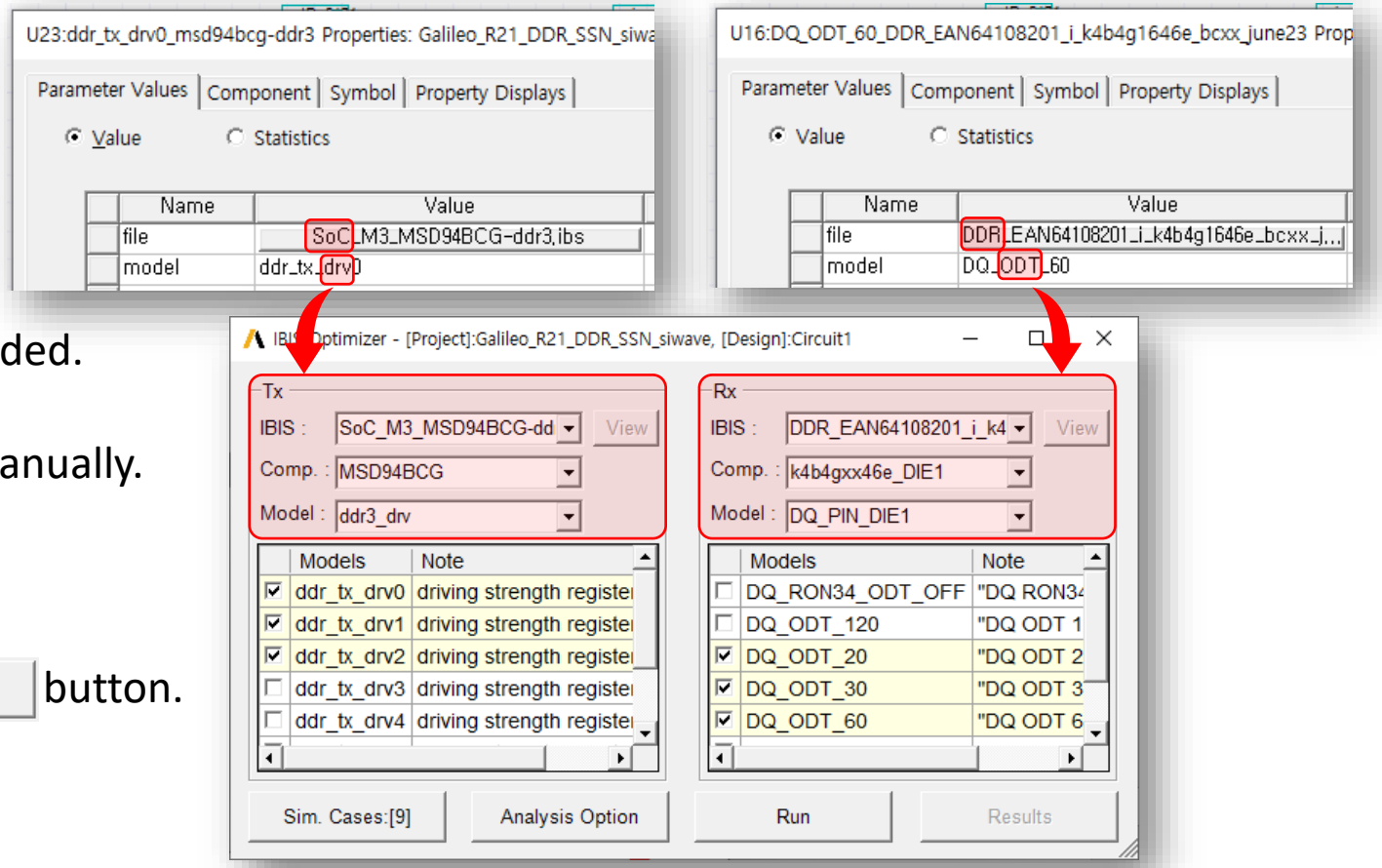


Appendix E – IBIS File and Model Selection

❑ IBIS File and Model Selection

- The IBIS file and model in Tx/Rx are automatically classified according to the IBIS identification rule in Def. file.

```
[IBIS Identification]
        # ? : arbitrary number in range [0~99]
        # It is not case sensitive.
        <Tx> = TX, DS, drv, SoC
        <Rx> = RX, ODT, DDR
        <Ignore> = ddr3
```

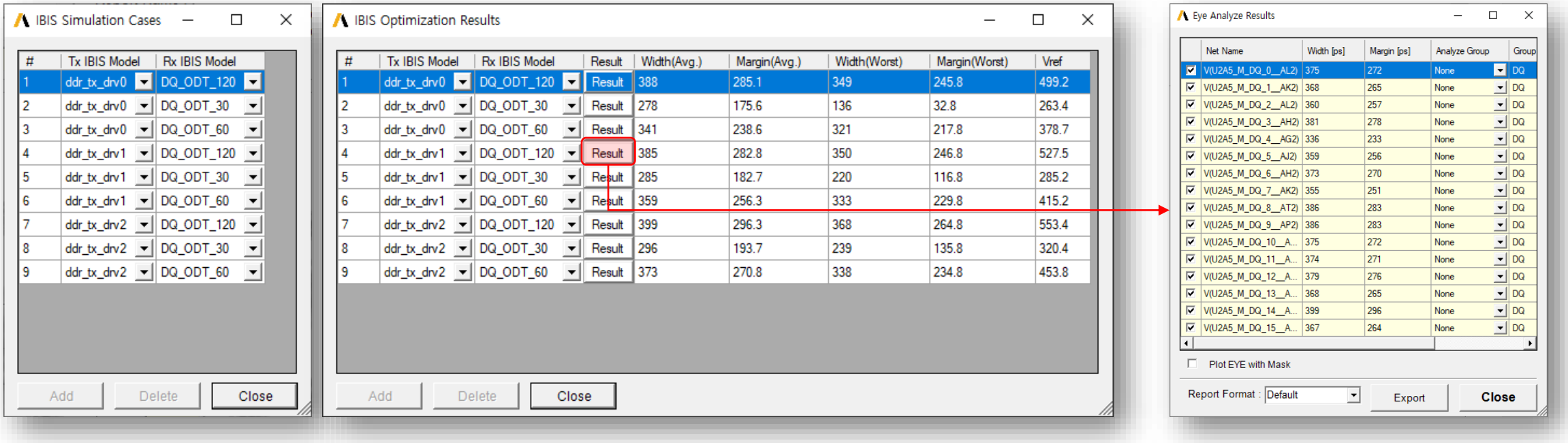


- IBIS identification rule can be modified and added.
- IBIS File, Comp., and Model can be selected manually.
- Select the Tx and Rx models to analyze.
- Simulation cases can be checked by Sim. Cases:[9] button.

Appendix F – IBIS Optimization Results

❑ IBIS Optimization Results

- The eye analyze results for the simulation cases are automatically pop up.



- Eye width and timing margin for each case are represented by the average and worst values of the target net.

- Click the Result button to see the detailed analysis results for each case.