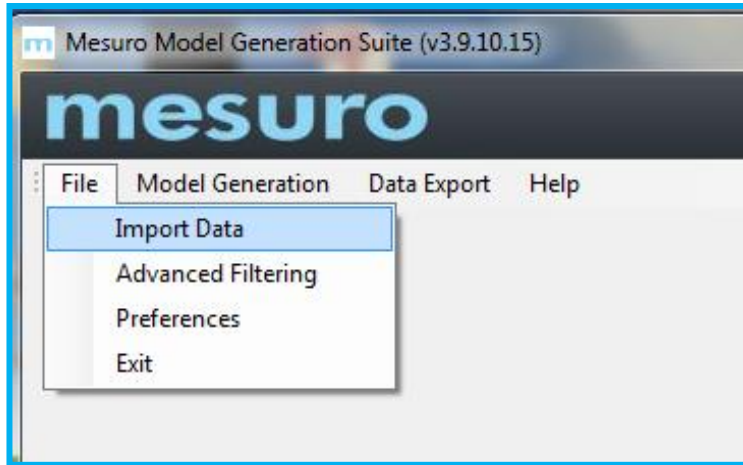


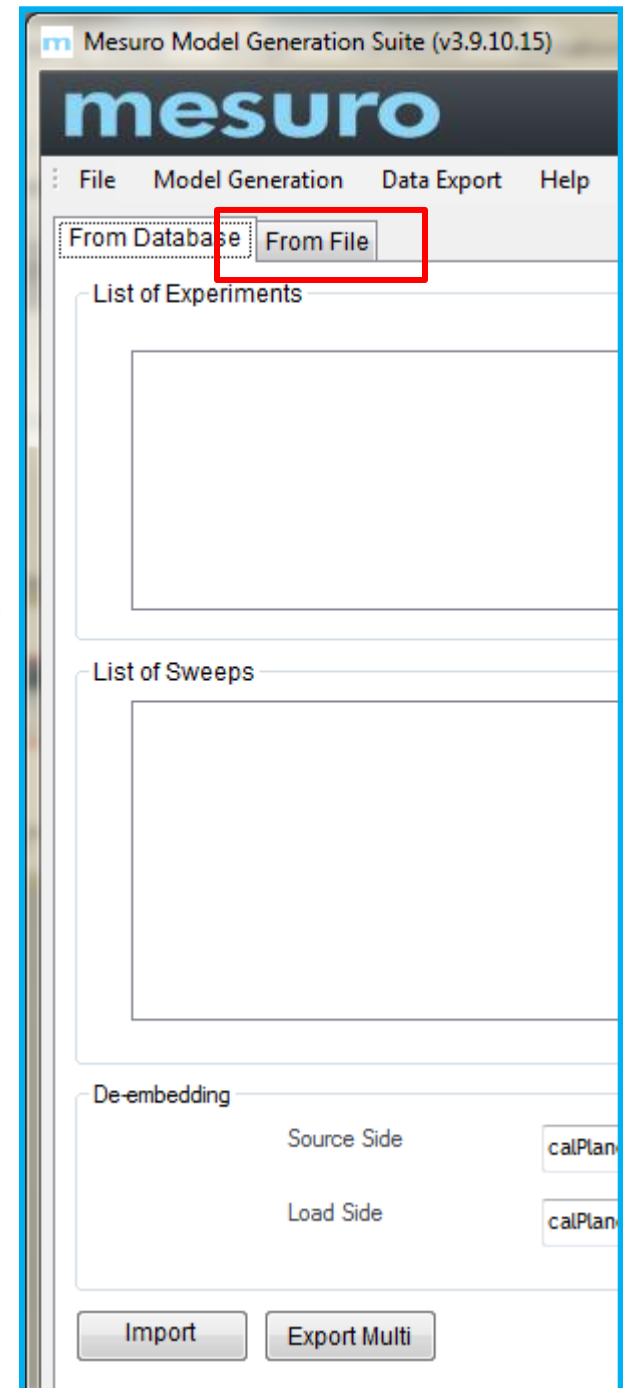
# Import and Generate CM+ Model with Focus LPCWave File

Neo

1

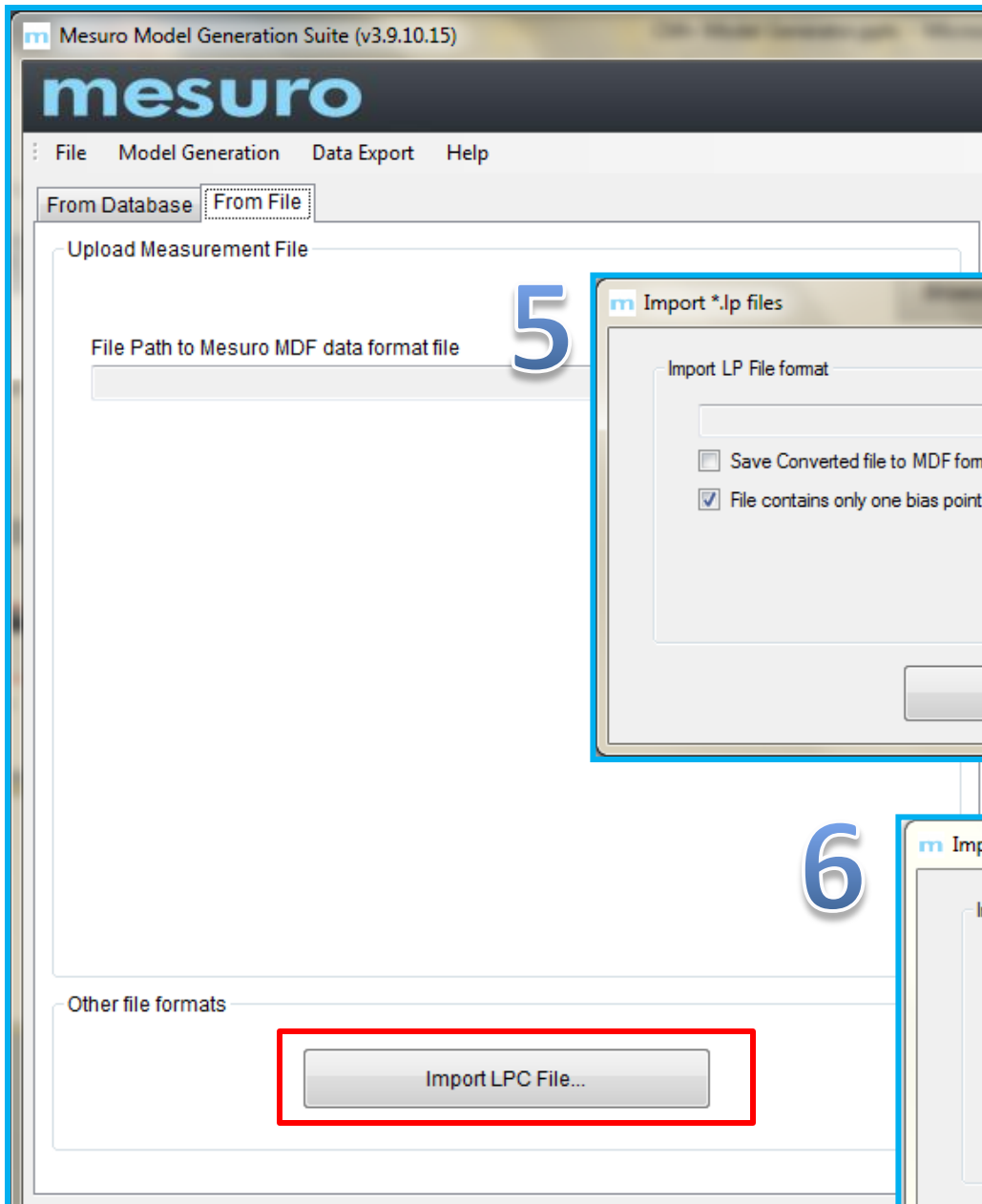


3

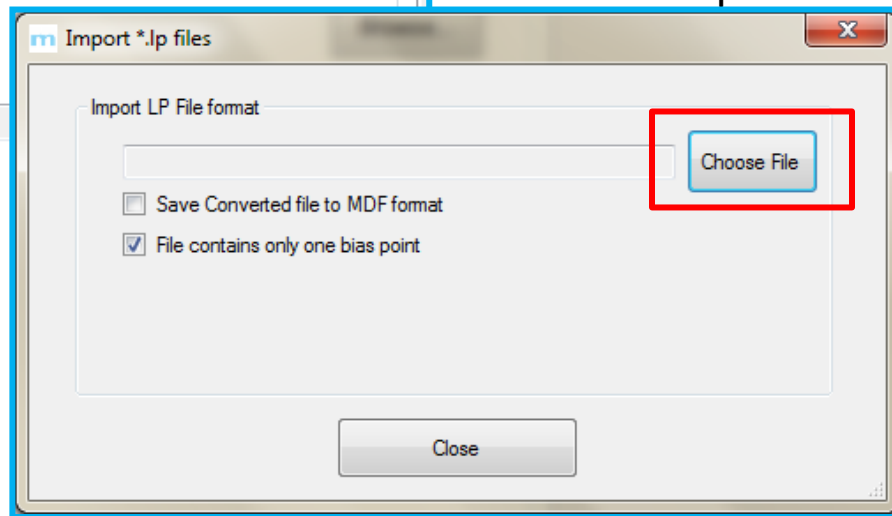


1. Open Mesuro Model Generation Suite.exe
2. Click **File – Import Data**
3. Choose tab **From File**

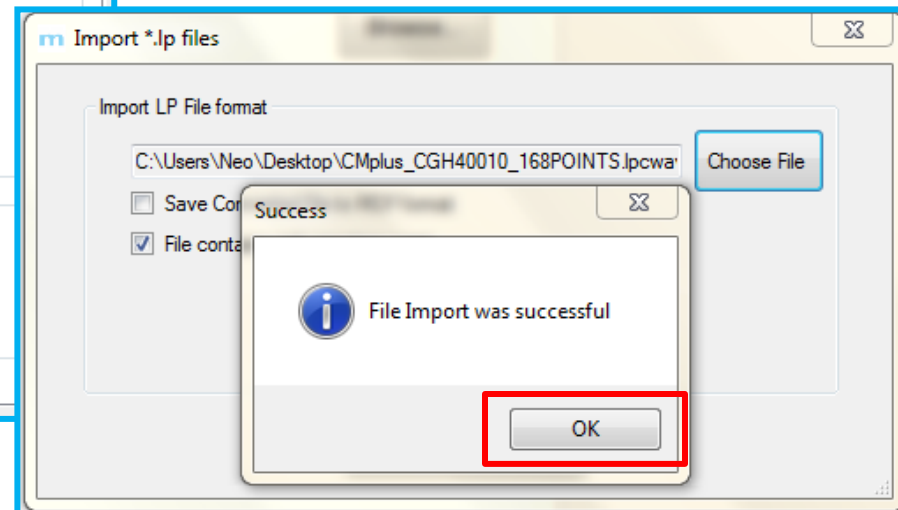
4



5



6



4. Click **Import LPC File**
5. Click **Choose File** and load Focus LPCWave file (In this example, we have only one bias condition)
6. There will be a dialog once the file is imported successfully and

7. In this part, we can check the LPCWave data by clicking **Data Summary**.

\*Check if the data is reasonable:

if Drain/Gate Voltage varies unusually, if efficiency exceeds 100%, etc.

To filter undesired data, click **Advanced Filter Option**.

7

Mesuro Model Generation Suite (v3.9.10.15)

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File Model Generation Data Export Help

Preview **Advanced Filter Options**

Filter Actions

**Model this Data**  Automatically Sort and Order by Input Variables

Measured Gama

LoadF0

Measured Gamma - LoadF0

Dynamic Range Bias **Data Summary**

Input Power  Output Power  Drain Efficiency  PAE

Dynamic Range Bias **Data Summary**

Variable	Min	Max
Fundamental Frequency	2	-
Input Power (dBm)	10.83	29.521
Drain Voltage (V)	28.019	28.032
Gate Voltage (V)	-2.518	-2.516
Output Power (dBm)	20.37	38.943
Drain Efficiency (%)	1.064	60.92
PAE (%)	1.124	60.358

Power (dBm)

Efficie

Dataset Number

8. In this part, we can remove undesired data by setting these filters and clicking **Apply Filtering**. In this example, we recommend to overwrite the bias settings as shown, so that the drain and gate voltage are fixed. When this model is used in the simulator, same bias condition (Vg: -2.5V, Vd: 28V in this case) should be set. Otherwise, the simulator will do extrapolation based on the bias condition.

8

The screenshot shows the Mesuro Model Generation Suite (v3.9) interface. The 'Advanced Filter Options' window is open, showing various filter settings. A red box highlights the 'Data Summary' table, which is shown in two states: before and after filtering. An arrow labeled 'Apply Filtering' points from the first table to the second. The 'Overwrite Bias Settings' section shows 'Gate' set to -2.5000 V and 'Drain' set to 28.0000 V. The 'Apply Filtering' button at the bottom is also highlighted with a red box.

Variable	Min	Max
Fundamental Frequency	2	-
Input Power (dBm)	10.83	29.521
Drain Voltage (V)	28.019	28.032
Gate Voltage (V)	-2.518	-2.516
Output Power (dBm)	20.37	38.943
Drain Efficiency (%)	1.064	60.92
PAE (%)	1.124	60.358

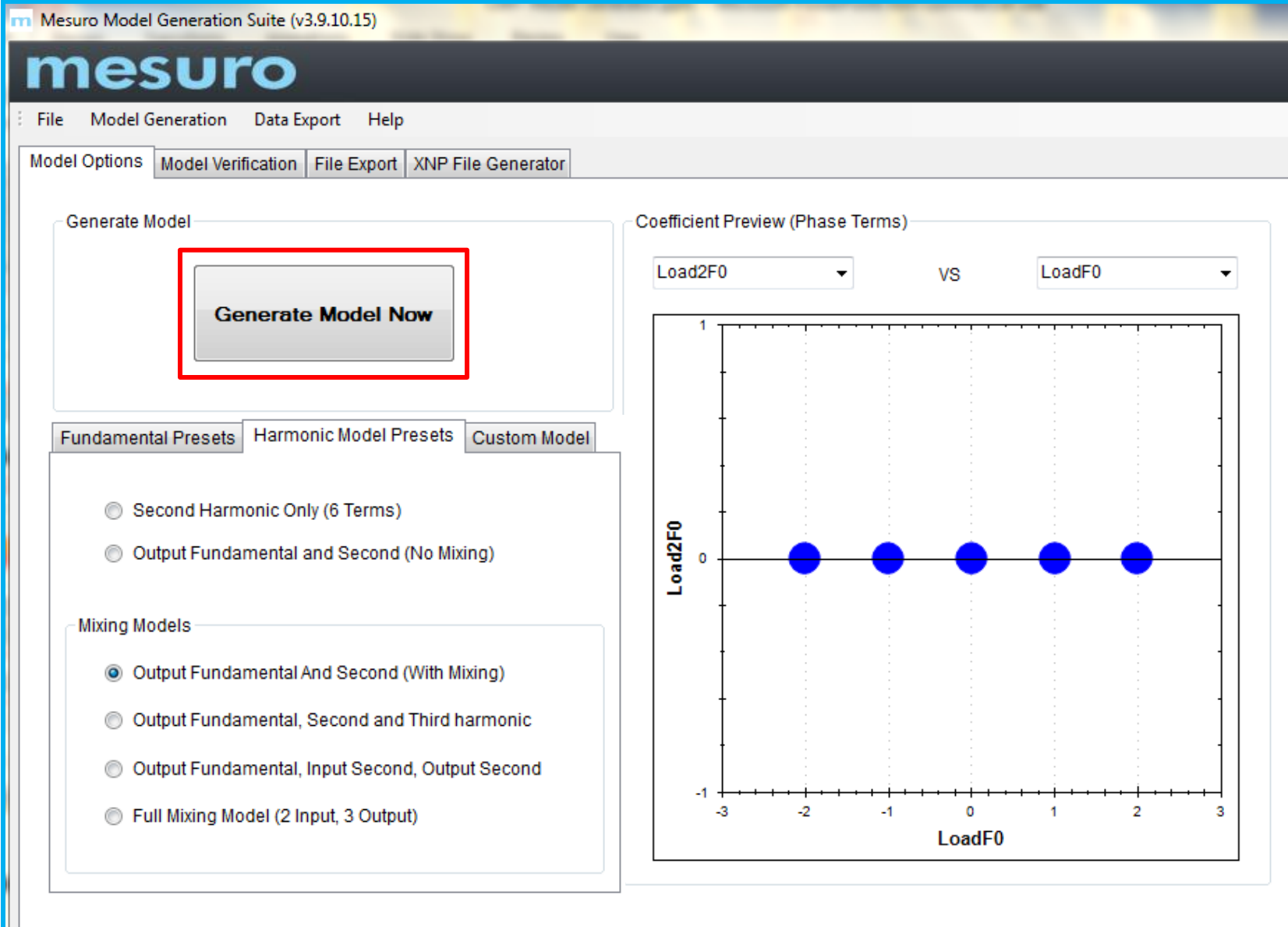
  

Variable	Min	Max
Fundamental Frequency	2	-
Input Power (dBm)	10.83	29.521
Drain Voltage (V)	28	28
Gate Voltage (V)	-2.5	-2.5
Output Power (dBm)	20.37	38.943
Drain Efficiency (%)	1.065	60.974
PAE (%)	1.125	60.412



10. In this step, choose the corresponding option based on the LPWave file and click **Generate Model Now**. In this example, the imported LPWave file contains load F0 and 2F0 nested pattern, so **Output Fundamental And Second (With Mixing)** is chosen. If the file contains only load F0, choose **Fundamental Only (6 Term)**.

10



Mesuro Model Generation Suite (v3.9.10.15)

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File Model Generation Data Export Help

Model Options Model Verification File Export XNP File Generator

Generate Model

**Generate Model Now**

Fundamental Presets Harmonic Model Presets Custom Model

Second Harmonic Only (6 Terms)

Output Fundamental and Second (No Mixing)

Mixing Models

Output Fundamental And Second (With Mixing)

Output Fundamental, Second and Third harmonic

Output Fundamental, Input Second, Output Second

Full Mixing Model (2 Input, 3 Output)

Coefficient Preview (Phase Terms)

Load2F0 VS LoadF0

Load2F0

LoadF0

LoadF0	Load2F0
-2	0
-1	0
0	0
1	0
2	0

11. This part allows you to check the accuracy of the model. Always check the accuracy of only the frequency you wish to model e.g. the average value of B21 should be < 1%

11

Mesuro Model Generation Suite (v3.9.10.15)

# mesuro

File Model Generation Data Export Help

Model Options Model Verification File Export XNP File Generator

Select Verification Type

- Data Summary
- Measured Gamma
- Input Waveforms
- Output Waveforms
- Dynamic Load Line
- Transfer Characteristic
- Comparison of B Waves
- Measured A Waves

Cycle Data Sets

Dataset number 1 of 16

### Data Summary

Variable	Min Error %	Max Error %	Avg Error %
B21	0.0031	24.7876	0.695
B22	0.0108	14.1552	2.1573
B23	0.0621	59.3715	4.4978
B12	0.0069	12.0319	3.0824
B13	0.0833	31.3906	4.7087
110	0	0	0

Legend: B21 (red), B22 (blue), B23 (green), B12 (pink), B13 (purple)

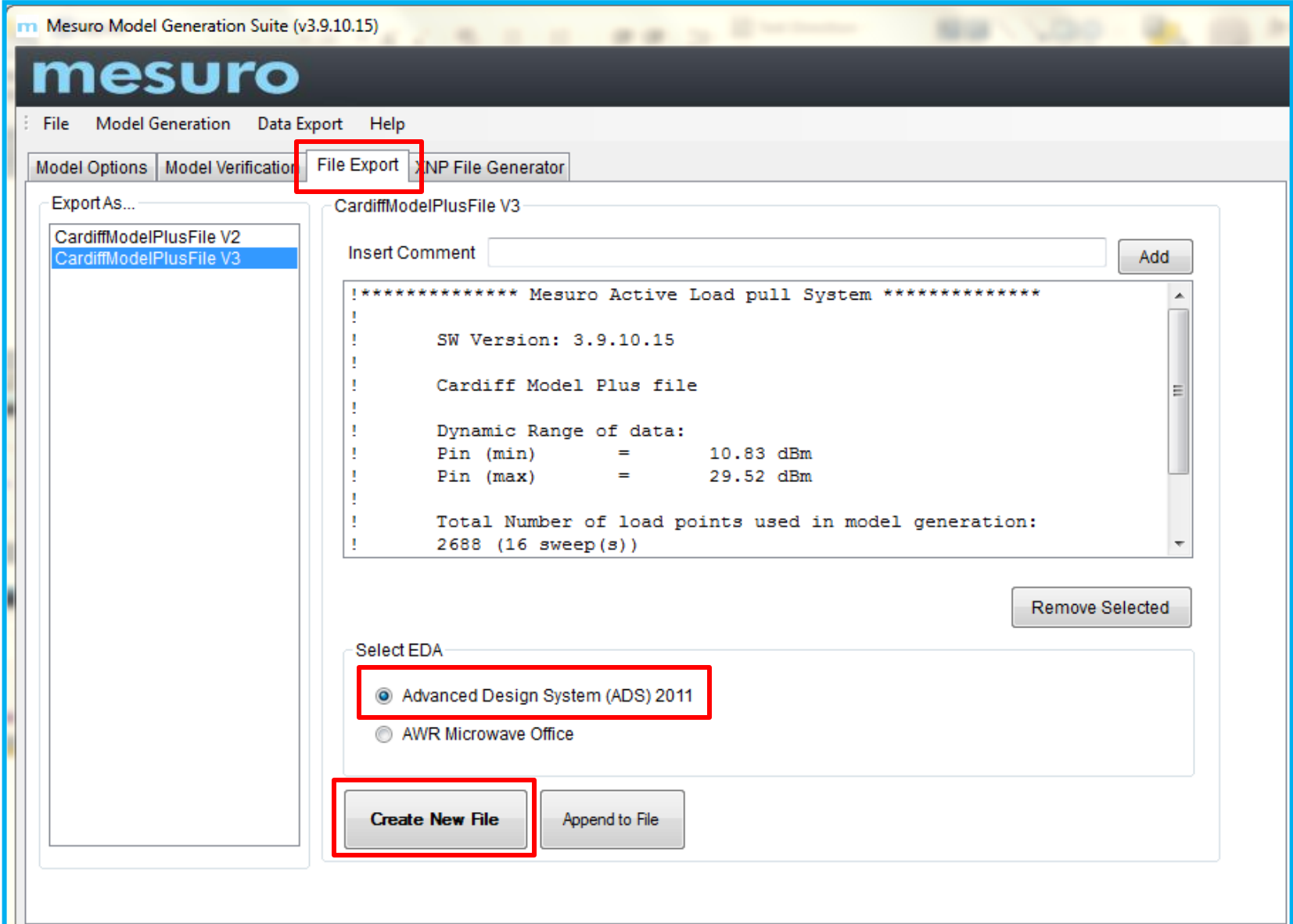
Y-axis: Error % (0 to 60)

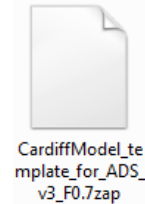
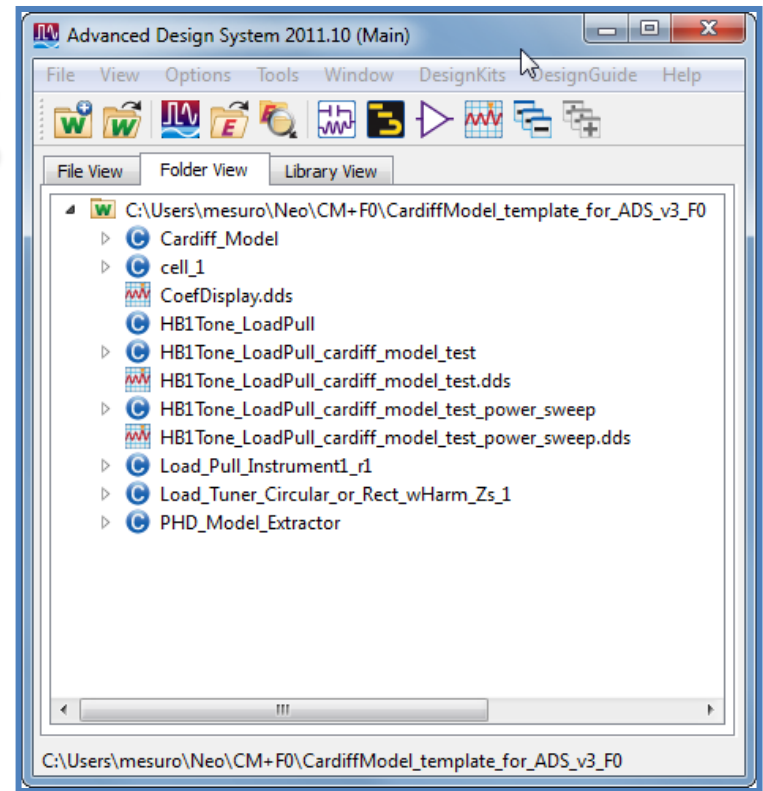
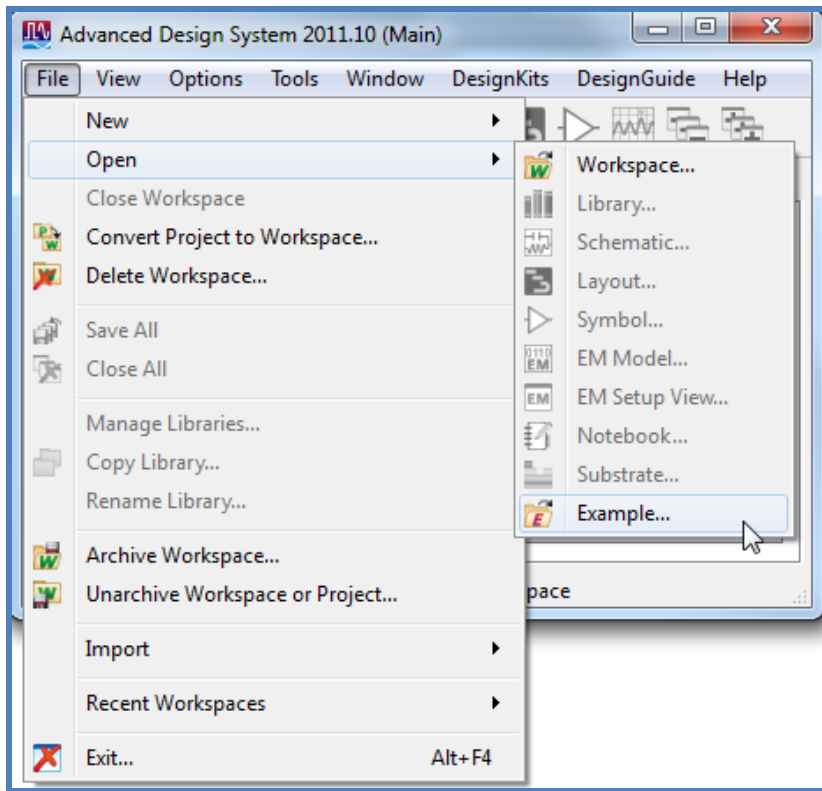
X-axis: Measurement point (0 to 160)



12. Choose **File Export** tab, check **Advanced Design System (ADS) 2011** or **AWR Microwave Office**, and click **Create New File**. Save the .mdf file. This .mdf file is the model file that will be used in ADS or AWR. Use **V3**

12





CardiffModel\_template\_for\_ADS\_v3\_F0.7zap

1. In ADS, click **File – Open - Example**, and load the template file: **CardiffModel\_template\_for\_ADS\_v3\_F0.7zap**  
This file can be found in **...¥MESURO TEMPLATES¥ADS¥F0\_ONLY**
2. There are two simulations template:
  - HB1Tone\_LoadPull\_cardiff\_model\_test:  
Generate Pout and PAE contour in Smith chart
  - HB1Tone\_LoadPull\_cardiff\_model\_test\_power\_sweep:  
Power sweep at one load impedance point

In **HB1Tone\_LoadPull\_cardiff\_model\_test**, check the following parameters before simulation:

- File\_Path of the CM+ model
- Load Pull region
- Rffreq
- Bias condition
- Pavs\_dBm

Load\_Pull\_Instrument1\_r1  
X1  
V\_Bias1=-2.5 V  
V\_Bias2=28 V  
RF\_Freq=Rffreq  
Pavs\_dBm=Pavs\_dBm  
Z0=Z0  
Specify\_Load\_Center\_S=0  
Sweep\_Rectangular\_Region=0  
Swept\_Harmonic\_Num=1  
S\_Load\_Baseband=0\*exp(j\*0\*pi)  
S\_Load\_Center\_Fund=0.8\*exp(j\*-0.75\*pi)  
S\_Load\_Center\_2nd=0\*exp(j\*0\*pi)  
S\_Load\_Center\_3rd=0\*exp(j\*0\*pi)  
S\_Load\_Radius=0.9  
S\_imag\_min=-0.1  
S\_imag\_max=0.5

Note:  
If specifying a complex Z0, for example 5+j\*10, a load impedance of 5-j\*10 corresponds to a reflection coefficient of 0. You can obtain finer resolution near the edge of the Smith Chart by specifying a complex Z0.

VAR  
VAR7  
Z\_Source\_Fund=50  
Z0=50  
Pavs\_dBm=20

S\_imag\_num\_pts=15  
S\_real\_min=-0.5  
S\_real\_max=0.2  
S\_real\_num\_pts=15  
Z\_Source\_Fund=Z\_Source\_Fund  
Z\_Source\_2nd=50

VAR  
VAR6  
Rffreq=2GHz

VAR  
File\_Path  
pathvar="C:\Users\mesuro\Neo\CM+F0\CGH40010\_CMplus\_model.mdf"

Load Pull Instrument 1

HARMONIC BALANCE

HarmonicBalance  
.HB1  
.Freq[1]=Rffreq  
.Order[1]=9

VAR  
For\_passing\_parameters\_to\_dataset

### At load that gives maximum power (and gain):

BiasCurrent_at_MaxPower	Zload_at_MaxPower	MaxPowerRho
0.273	15.609 + j14.595	0.556 / 144.463

PAE_at_MaxPower
26.777

Z In at MaxPower
0.627 - j0.184

Gain at MaxPower
13.115

Pdel_dBm_Max
33.115

### At load that gives maximum PAE:

BiasCurrent_at_MaxPAE	Zload_at_MaxPAE	MaxPAE_Rho
0.187	11.853 + j26.258	-0.370 + j0.582

PAE_max
30.160

DE_max
30.369

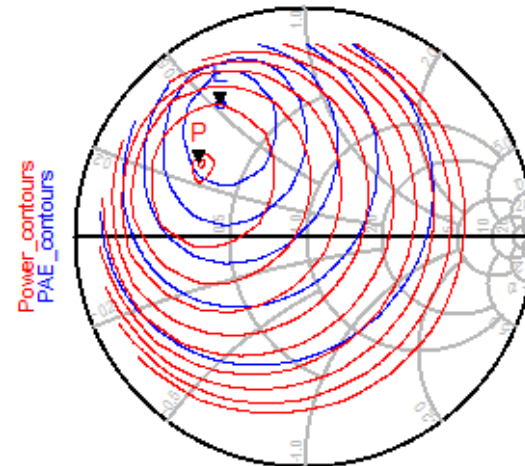
Z In at MaxPAE
0.273 + j1.245

Gain at MaxPAE
11.991

Pdel_dBm_at_MaxPAE
31.991

System Reference Impedance Z0:   
 A Rho of 0 corresponds to a load impedance of conj(Z0).

PAE and Delivered Power Contours



Power contour levels, dBm:

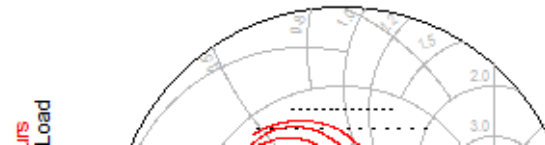
- 33.08
- 33.00
- 32.00
- 31.00
- 30.00
- 29.00
- 28.00

PAE contour levels, %:

- 30.130
- 25.000
- 20.000
- 15.000
- 10.000
- 5.000

(PAE, %) (Power Delivered, dBm)  
 E level=30.129608, number=65 P level=33.081451, number=64

Transducer Power Gain Contours,  
 Simulated Load Reflection Coefficients and  
 Corresponding Input Reflection Coefficients



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Sourc at Fur

In **HB1Tone\_LoadPull\_cardiff\_model\_test\_power\_sweep**, check the following parameters before simulation:

- File\_Path of the CM+ model
- Source & Load impedance @ F0
- RFFreq
- Bias condition
- p\_start, p\_stop & p\_step

**VAR**  
File\_Path  
pathvar="C:\Users\mesuro\Neo\CM+F0\CGH40010\_CMplus\_model.mdf"

**Load Pull Instrument 1**  
X1

V\_Bias1=-2.5 V  
V\_Bias2=28 V

RF\_Freq=RFfreq  
Pavs\_dBm=Pavs\_dBm  
Z0=50+j\*0  
Specify\_Load\_Center\_S=1  
Sweep\_Rectangular\_Region=0  
Swept\_Harmonic\_Num=1  
S\_Load\_Baseband=0\*exp(j\*0\*pi)  
S\_Load\_Center\_Fund=0.6\*exp(j\*16/18\*pi)  
S\_Load\_Center\_2nd=0\*exp(j\*2.5/18\*pi)  
S\_Load\_Center\_3rd=0\*exp(j\*-8.9/18\*pi)  
S\_Load\_Radius=0.0  
S\_imag\_min=0.1  
S\_imag\_max=0.8

**VAR**  
VAR6  
RFFreq=2GHz

**VAR**  
VAR8  
Pavs\_dBm=10

**VAR**  
VAR7  
p\_start=5  
p\_stop=20  
p\_step=0.5

**Note:**  
If specifying a complex Z0, for example 5+j\*10, a load impedance of 5-j\*10 corresponds to a reflection coefficient of 0. You can obtain finer resolution near the edge of the Smith Chart by specifying a complex Z0.

S\_imag\_num\_pts=1  
S\_real\_min=-0.85  
S\_real\_max=-0.55  
S\_real\_num\_pts=10  
Z\_Source\_Fund=5.25-j\*1.45  
Z\_Source\_2nd=50

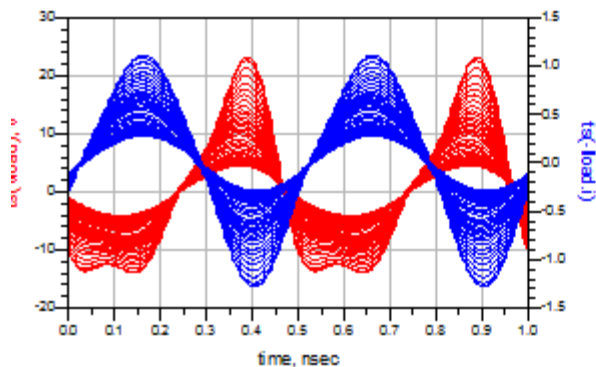
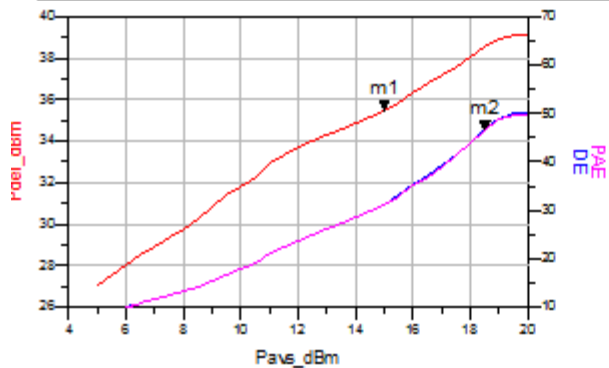
**HARMONIC BALANCE**  
HarmonicBalance  
HB1  
Freq[1]=RFFreq  
Order[1]=9

```

m2
indep(m2)=18.500
plot_vs(DE, Pavs_dBm)=46.617
X1.X1.imag_index 11=0.205212, X1.X1.real_index 11=-0.563816

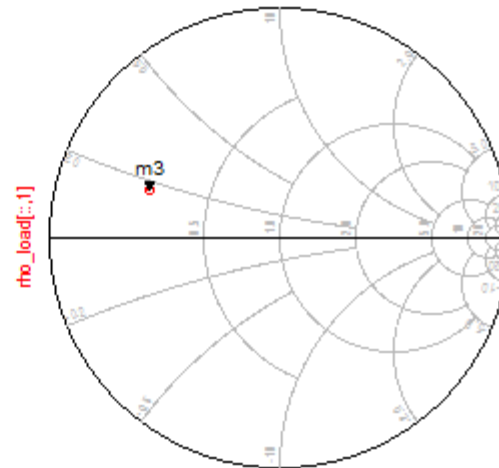
m1
indep(m1)=15.000
plot_vs(Pdel_dBm, Pavs_dBm)=35.484
X1.X1.imag_index 11=0.205212, X1.X1.real_index 11=-0.563816

```



$$\text{Eqn } z_{\text{load}} = V_{\text{load}} / I_{\text{load}} \cdot i$$

$$\text{Eqn } \rho_{\text{load}} = (z_{\text{load}} - 50) / (z_{\text{load}} + 50)$$



Pavs\_dBm (5.000 to 20.000)

```

m3
Pavs_dBm=20.000
rho_load[:,1]=0.600 / 160.000
X1.X1.imag_index 11=0.205212, X1.X1.real_index 11=-0.563816
impedance = Z0 * (0.257 + j0.166)

```