

Lab (1)

Channel Characterization

1) S-Parameters of the Channel

TB Schematics

Library NameanalogLiboff

Cell Nameportoff

View Namesymboloff

Instance NamePORT1off

AddDeleteModify

User PropertyMaster ValueLocal ValueDisplay

lvsIgnoreTRUEoff

CDF ParameterValueDisplay

Port modeNormalHarmonicPortoff

Resistance50 Ohmsoff

Reactanceoff

Port numberoff

DC voltageoff

Source typesineoff

Library NameanalogLiboff

Cell Namen4portoff

View Namesymboloff

Instance Namemy_channeloff

AddDeleteModify

CDF ParameterValueDisplay

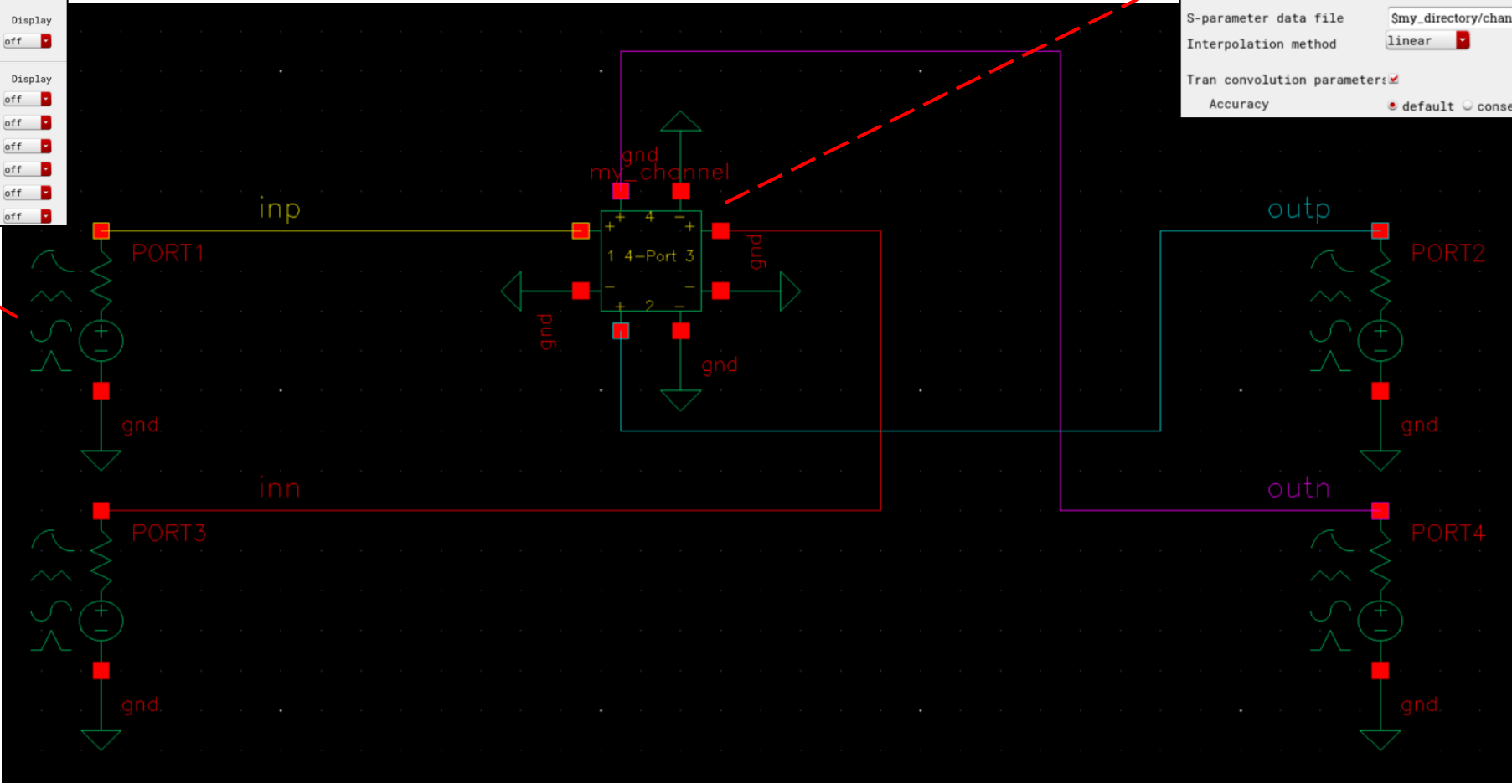
Browse s-parameter file

S-parameter data file\$my_directory/channel_its4poff

Interpolation methodlinearoff

Tran convolution parameters:off

Accuracydefaultconservativeoff



Analysis Setup

Name	Value
Filter	Filter
Tests	
ch	
Simulator	spectre
Analyses	
sp	1 20G 1000 Logarithmic Points P...
Click to add analysis	

Choosing Analyses -- ADT Assembler

Analysis

<input type="radio"/> tran	<input type="radio"/> dc	<input type="radio"/> ac
<input type="radio"/> noise	<input type="radio"/> xf	<input type="radio"/> sens
<input type="radio"/> dcmatch	<input type="radio"/> acmatch	<input type="radio"/> stb
<input type="radio"/> pz	<input type="radio"/> lf	<input checked="" type="radio"/> sp
<input type="radio"/> envlp	<input type="radio"/> pss	<input type="radio"/> pac
<input type="radio"/> pstb	<input type="radio"/> pnoise	<input type="radio"/> pxf
<input type="radio"/> psp	<input type="radio"/> qpss	<input type="radio"/> qpac
<input type="radio"/> qpnoise	<input type="radio"/> qpxf	<input type="radio"/> qpsp
<input type="radio"/> hb	<input type="radio"/> hbac	<input type="radio"/> hbstb
<input type="radio"/> hbnoise	<input type="radio"/> hbsp	<input type="radio"/> hbxf

S-Parameter Analysis

Ports

/PORT1/PORT2/PORT3/PORT4

Sprobes

Port#	Name	Left Port	Right Port

Sweep Variable

☒ Frequency

☐ Design Variable

☐ Temperature

☐ Component Parameter

☐ Model Parameter

☐ None

Sweep Range

☒ Start-Stop Start Stop

☐ Center-Span

Sweep Type

☒ Points Per Decade

☐ Number of Steps

Add Specific Point: ☐

Add Points By File ☐

Do Noise

☐ yes

☒ no

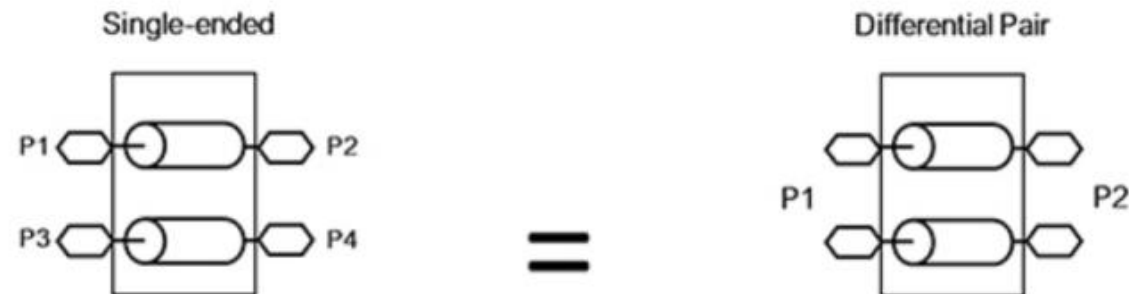
Mode

☒ Single-Ended ☐ Mixed In/Out ☐ Other

Enabled ☒

Test Expressions

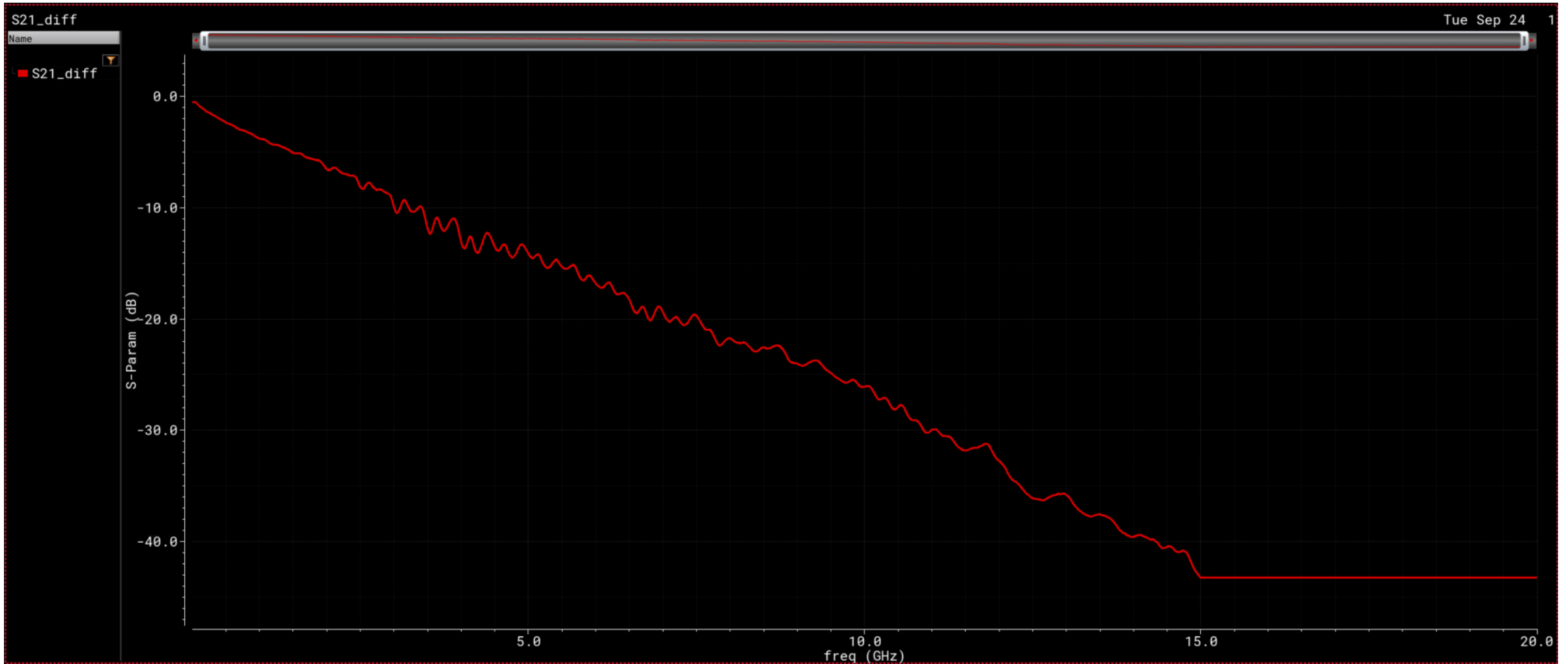
Name	Type	Details
Filter	Filter	Filter
S21	expr	aaSP("/PORT2" "/PORT1")
S43	expr	aaSP("/PORT4" "/PORT3")
S23	expr	aaSP("/PORT2" "/PORT3")
S41	expr	aaSP("/PORT4" "/PORT1")
S21_diff	expr	dB20((0.5 * ((S21 + S43) - S23 - S41)))



$$\text{SDD21} = \underline{0.5[S21 - S23 - S41 + S43]}$$

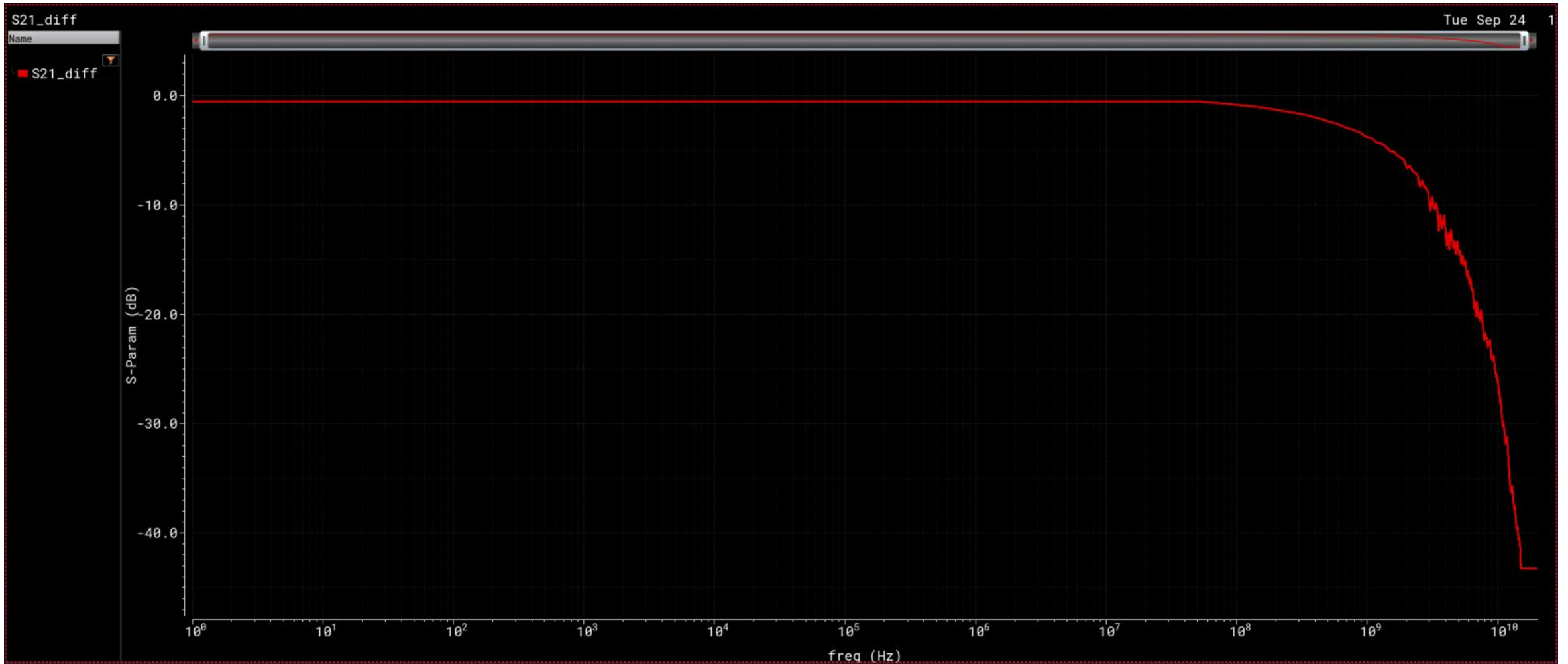
Results

- Freq – linear Scale



Results

- Freq – log Scale



2) Pulse Response of the Channel

(8 Gbps)

TB Schematics

BrowseReset Instance Labels Display

Property	Value	Display
Library Name	analogLib	off
Cell Name	port	off
View Name	symbol	off
Instance Name	PORT1	off

AddDeleteModify

User Property	Master Value	Local Value	Display
lvsIgnore	TRUE		off

CDF Parameter

Property	Value	Display
Port mode	<input checked="" type="radio"/> Normal <input type="radio"/> HarmonicPort	off
Resistance	50 Ohms	off
Reactance		off
Port number		off
DC voltage		off
Source type	pulse	off

Frequency name 1

Delay time5n s

Zero value0 V

One value500.0m V

Period of waveform10us

Rise time6.25ps

Fall time6.25ps

Type of rising & falling edge

Pulse width125ps

Display small signal param

BrowseReset Instance Labels Display

Property	Value	Display
Library Name	analogLib	off
Cell Name	port	off
View Name	symbol	off
Instance Name	PORT3	off

AddDeleteModify

User Property	Master Value	Local Value	Display
lvsIgnore	TRUE		off

CDF Parameter

Property	Value	Display
Port mode	<input checked="" type="radio"/> Normal <input type="radio"/> HarmonicPort	off
Resistance	50 Ohms	off
Reactance		off
Port number		off
DC voltage		off
Source type	pulse	off

Frequency name 1

Delay time5n s

Zero value0 V

One value-500m V

Period of waveform10us

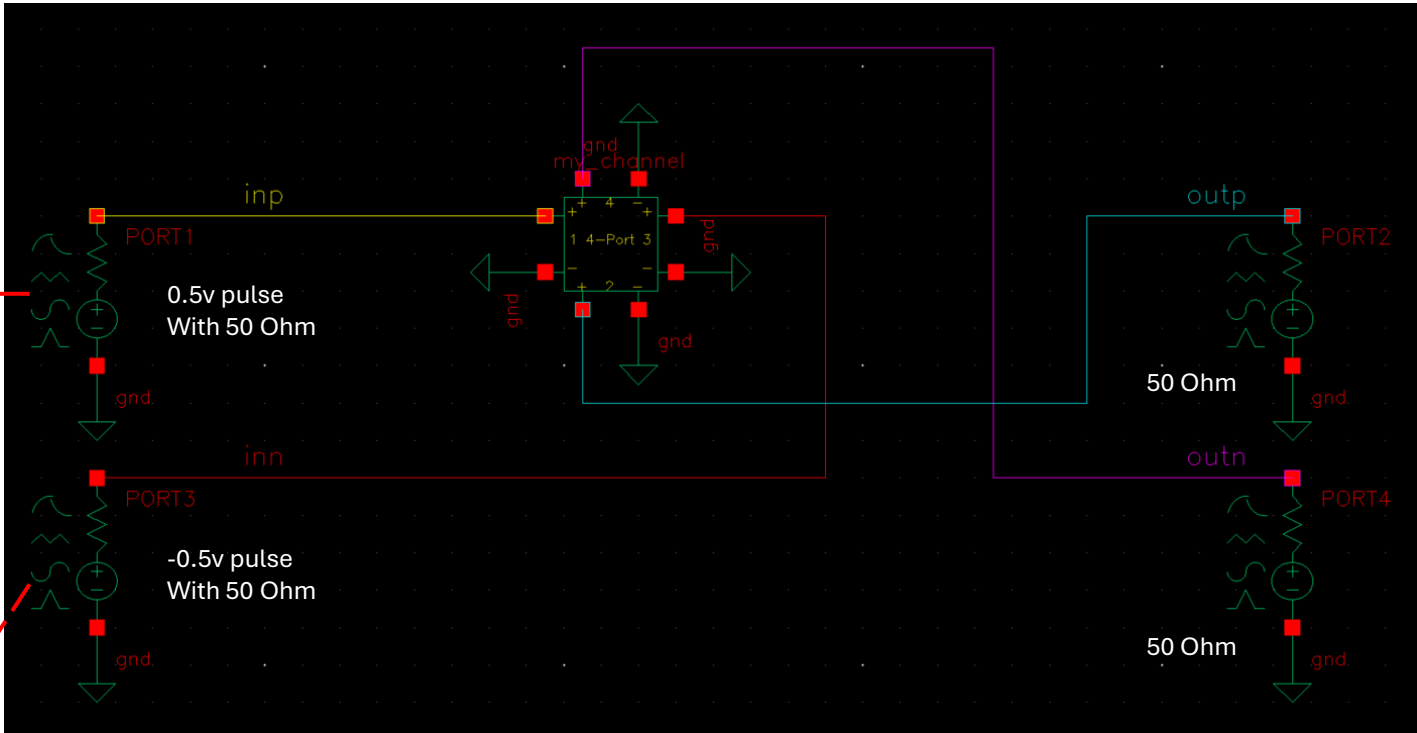
Rise time6.25ps

Fall time6.25ps

Type of rising & falling edge

Pulse width125ps

Display small signal param



Analysis Setup

Name	Value
Filter	Filter
Tests	
ch_tran	
Simulator	spectre
Analyses	
tran	0 15n
Click to add analysis	

Choosing Analyses -- ADI Assembler

Analysis

☒ tran ☐ dc ☐ ac
☐ noise ☐ xf ☐ sens
☐ dcmatch ☐ acmatch ☐ stb
☐ pz ☐ lf ☐ sp
☐ envlp ☐ pss ☐ pac
☐ pstb ☐ pnoise ☐ pxf
☐ psp ☐ qpss ☐ qpac
☐ qpnoise ☐ qpxf ☐ qpsp
☐ hb ☐ hbac ☐ hbstb
☐ hbnoise ☐ hbsp ☐ hbxf

Transient Analysis

Stop Time

Accuracy Defaults (errpreset)

☐ Transient Noise

Dynamic Parameter ☐

☐ HV_solution

Enabled ☒

Options...

OK Cancel Defaults Apply Help

Transient Options

Time Step Algorithm State File Output EM/IR Output Fault Electrothermal Misc

SIMULATION INTERVAL PARAMETERS

start

outputstart

TIME STEP PARAMETERS

step

maxstep

minstep

OK Cancel Defaults Apply Help

Test Expressions

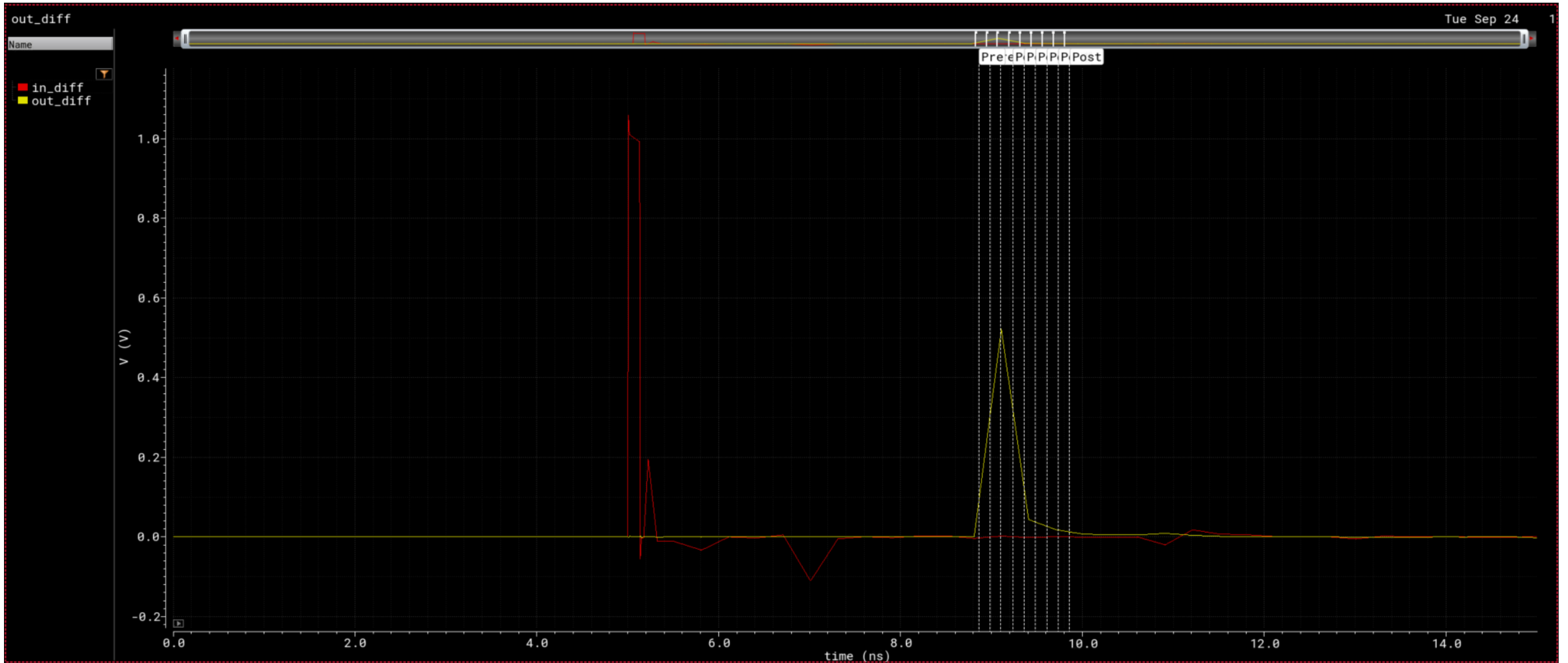
Name	Type	Details
Filter	Filter	Filter
** Waveforms **	expr	
	signal	/inp
	signal	/inn
	signal	/outp
	signal	/outn
in_diff	expr	(VT("/inp") - VT("/inn"))
out_diff	expr	(VT("/outp") - VT("/outn"))
** Expressions **	expr	
Datarate	expr	8e+09
UI	expr	(1 / Datarate)
** Main Cursor **	expr	
cursor_main	expr	ymax(out_diff)
t_cursor_main	expr	xmax(out_diff)
** Post & Pre Cursors **	expr	
t_cursor_pre_2	expr	(t_cursor_main - (2 * UI))
t_cursor_pre_1	expr	(t_cursor_main - UI)
t_cursor_post_1	expr	(t_cursor_main + UI)
t_cursor_post_2	expr	(t_cursor_main + (2 * UI))
t_cursor_post_3	expr	(t_cursor_main + (3 * UI))
t_cursor_post_4	expr	(t_cursor_main + (4 * UI))
t_cursor_post_5	expr	(t_cursor_main + (5 * UI))
t_cursor_post_6	expr	(t_cursor_main + (6 * UI))
cursor_pre_2	expr	value(out_diff t_cursor_pre_2)
cursor_pre_1	expr	value(out_diff t_cursor_pre_1)
cursor_post_1	expr	value(out_diff t_cursor_post_1)
cursor_post_2	expr	value(out_diff t_cursor_post_2)
cursor_post_3	expr	value(out_diff t_cursor_post_3)
cursor_post_4	expr	value(out_diff t_cursor_post_4)
cursor_post_5	expr	value(out_diff t_cursor_post_5)
cursor_post_6	expr	value(out_diff t_cursor_post_6)

$$DataRate = 8 \text{ Gb/s}$$

$$UI = 1/8G = 125ps$$

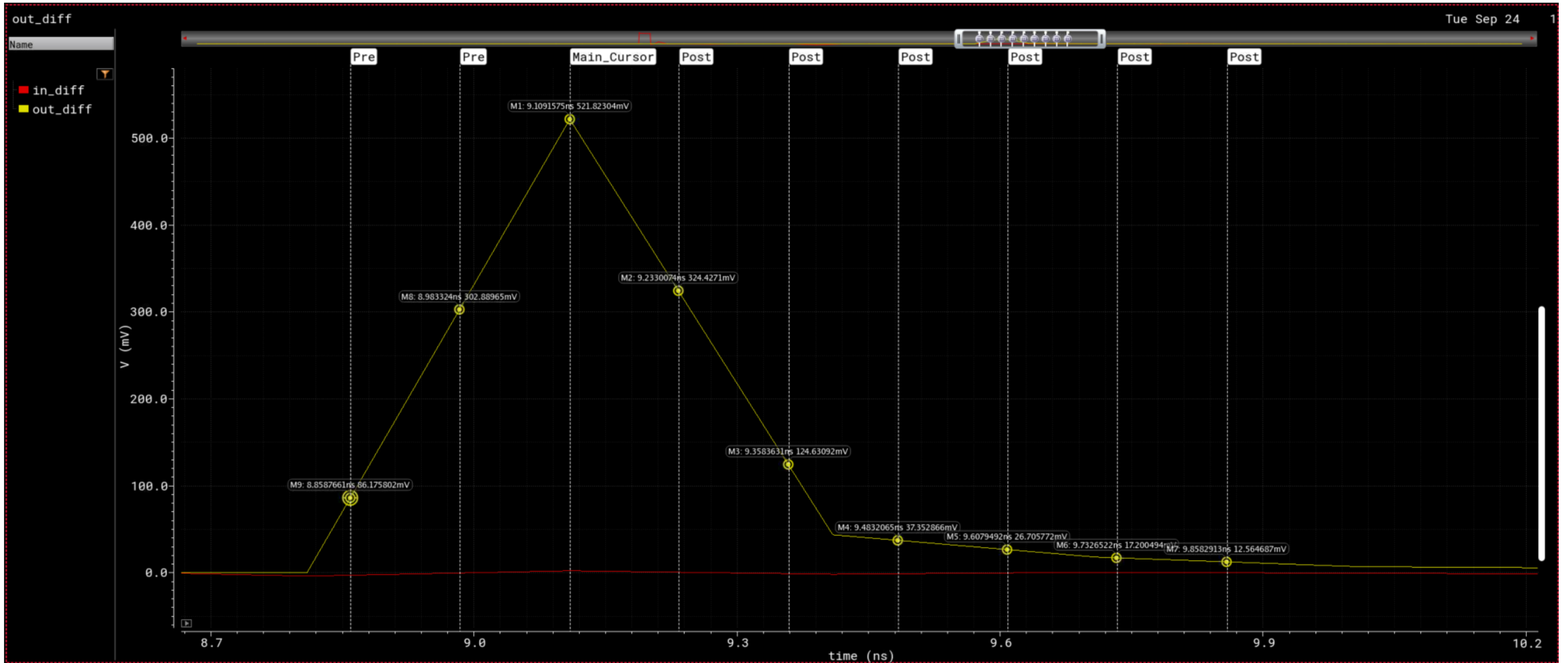
Results

- Waveforms



Results

- Waveforms



Results

- Cursor Values

Cursor Type	UI	Time (ns)	Output Value (mV)
Pre-Cursor	-2	8.859	86.86
Pre-Cursor	-1	8.984	304.3
Main-Cursor	0	9.109	521.8
Post-Cursor	1	9.234	322.6
Post-Cursor	2	9.359	123.4
Post-Cursor	3	9.484	37.27
Post-Cursor	4	9.609	26.6
Post-Cursor	5	9.734	17.14
Post-Cursor	6	9.859	12.53