

# Automation High Speed Cable Testing Solution



# Demands

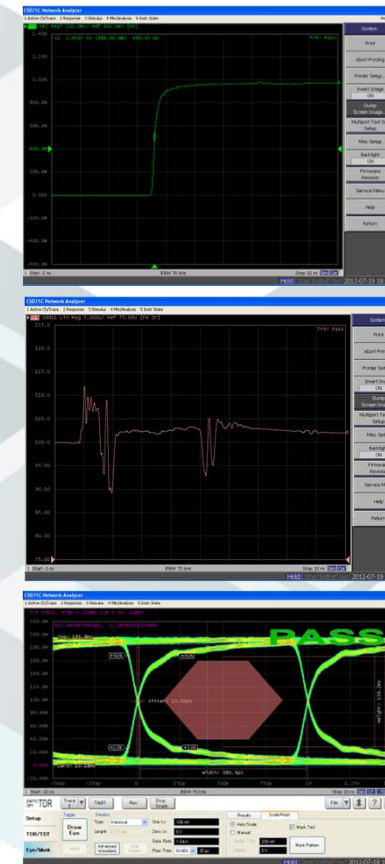
- Most modern high speed cable requires following tests
  - N.P. Check (Negative/Positive wiring correction)
  - Intra-Pair Skew & Inter-Pair Skew
  - Differential & common Mode Impedance
  - Insertion & Return Loss
  - FEXT (Far End Cross Talk)
  - Eye-Diagram (Optional, option TDR required)
- To test all these items, significant amount of time is required. This solution can reduce test time dramatically.

# Features

- Expand ENA ports to increase test throughput
- Flexible configuration to expand VNA ports to 8x ports
- Automation program to control all hardware and provide pass/fail result
- One-time connection to full test all items in Time domain, Frequency domain and Eye Diagram
- Standard calibration, ECal and De-Embedded method to allow operator to perform accurate test
- Report generation
- Barcode function to allow you further enhance report data structure easier

# Features (cont'd)

- Supported Test Items
  - N.P. (Negative/Positive wiring correction)
  - Intra-Pair Skew
  - Inter-Pair Skew
  - Diff. Mode Impedance
    - Mated, Cable
  - Comm. Mode Impedance
    - Mated, Cable
  - Insertion Loss
  - Return Loss
  - Mode Conversion
  - FEXT
  - Eye-Diagram (Optional, option TDR required)



# The Essentials of Solution

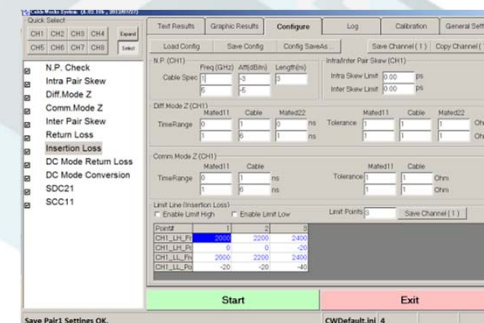
- Keysight E5071C – 4 Ports ENA Network Analyzer
- J2450A – 4 to 32 Ports Test Set
- **CableWorks** Software
- RF cables and jumper wires
- Calibration Kit (Keysight N4431B 4-port ECal)
- Fixture
- PC or NB



**E5071C**

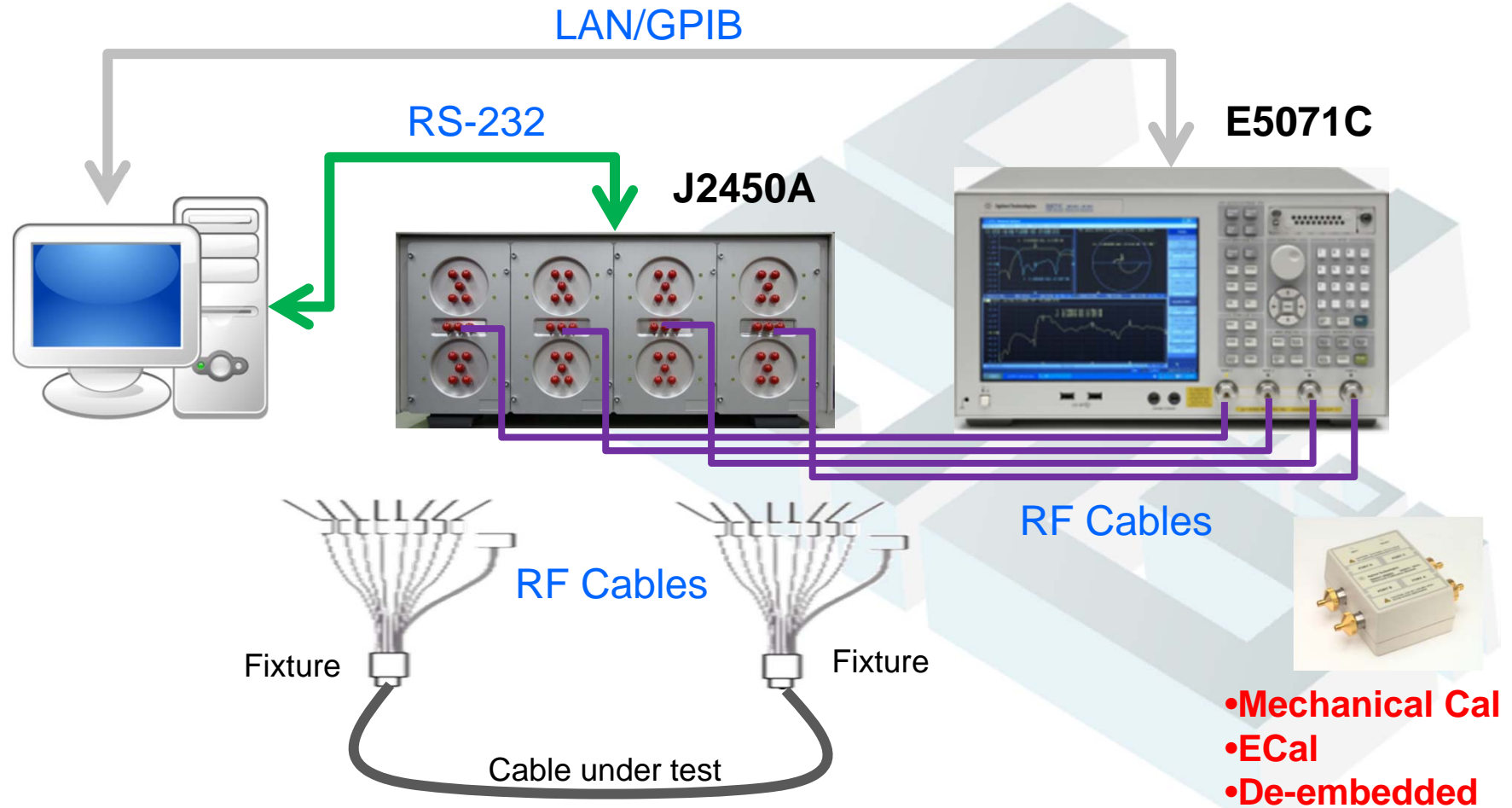


**J2450A**



**CableWorks**

# Configuration



# Test Speed

- Full test for one cable:
  - In 100 seconds
- Factors affect test time are:
  - Number of selected test items
  - Number of sweep points in ENA



# Software Configuration

## Parameter and limit line setting

Cable Works System (A.02.106, 2012/07/27)

Quick Select: CH1 CH2 CH3 CH4 CH5 CH6 CH7 CH8

Expand Select

N.P. Check  
 Intra Pair Skew  
 Diff.Mode Z  
 Comm.Mode Z  
 Inter Pair Skew  
 Return Loss  
 **Insertion Loss**  
 DC Mode Return Loss  
 DC Mode Conversion  
 SDC21  
 SCC11

Text Results | Graphic Results | **Configure** | Log | Calibration | General Setting

Load Config | Save Config | Config SaveAs ... | Save Channel ( 1 ) | Copy Channel ( 1 )

N.P. (CH1)

	Freq.(GHz)	Att(dB/m)	Length(m)
Cable Spec	1	-3	3
	5	-5	

Intra/Inter Pair Skew (CH1)

Intra Skew Limit: 0.00 ps  
Inter Skew Limit: 0.00 ps

Diff.Mode Z (CH1)

	Mated11	Cable	Mated22		Mated11	Cable	Mated22	
TimeRange	0	1	0	ns	1	1	1	Ohm
	1	6	1	ns	1	1	1	Ohm

Comm.Mode Z (CH1)

	Mated11	Cable		Mated11	Cable	
TimeRange	0	1	ns	1	1	Ohm
	1	6	ns	1	1	Ohm

Limit Line (Insertion Loss)

Enable Limit High  Enable Limit Low Limit Points: 3 Save Channel ( 1 )

Point#	1	2	3
CH1_LH_Fr	2000	2200	2400
CH1_LH_Pc	0	0	-20
CH1_LL_Fr	2000	2200	2400
CH1_LL_Pc	-20	-20	-40

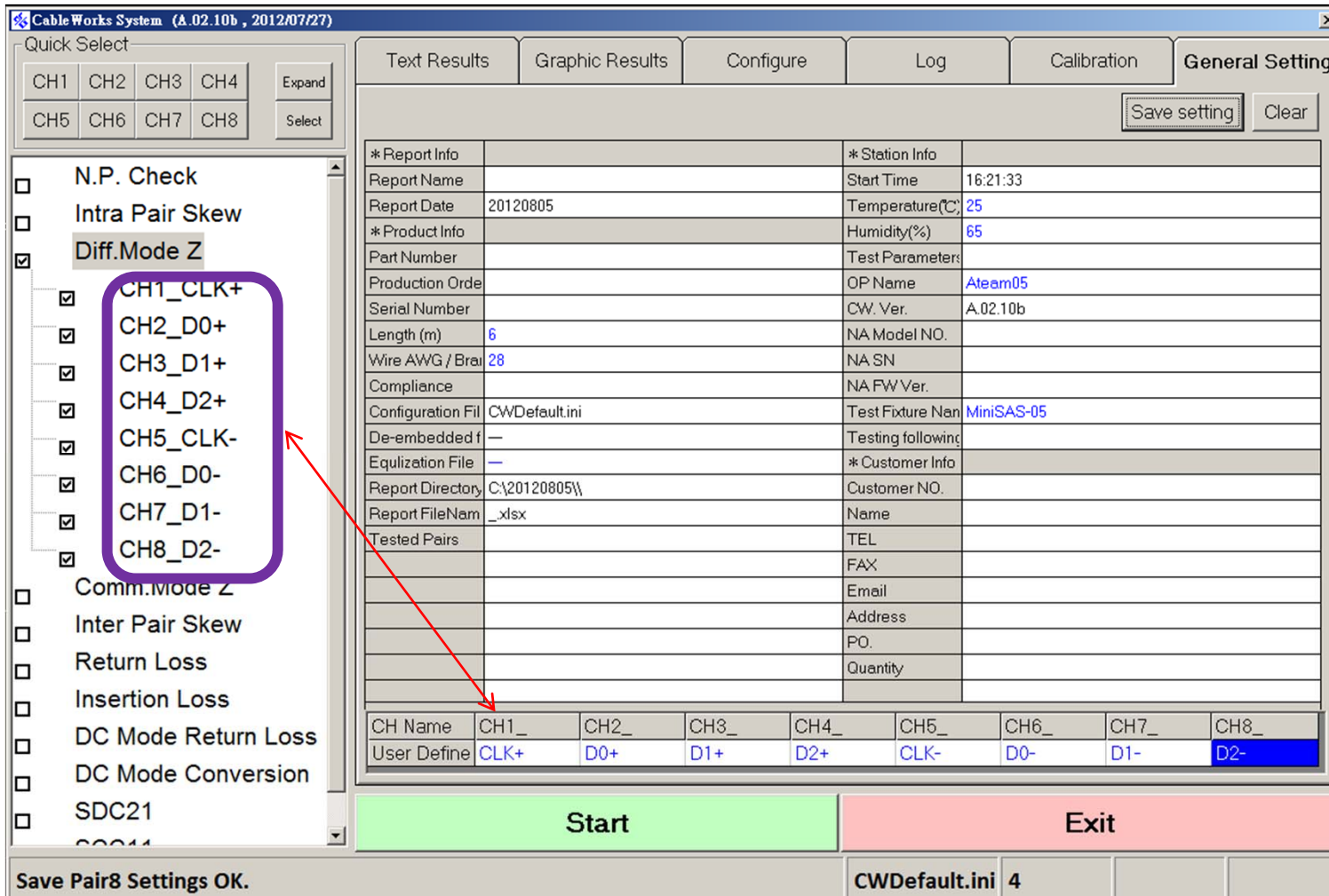
Start Exit

Save Pair1 Settings OK. CWDefault.ini 4



# Software Configuration (cont'd)

## General Information setting



The screenshot shows the 'General Setting' tab of the Cable Works System software. The left sidebar contains a tree view of settings, with 'Diff.Mode Z' expanded to show channel-specific options: CH1\_CLK+, CH2\_D0+, CH3\_D1+, CH4\_D2+, CH5\_CLK-, CH6\_D0-, CH7\_D1-, and CH8\_D2-. A purple box highlights these options, and a red arrow points from this box to the 'User Define' table at the bottom of the main configuration area.

* Report Info				* Station Info			
Report Name		Start Time	16:21:33	Report Date	20120805	Temperature(°C)	25
* Product Info		Humidity(%)	65	Part Number		Test Parameters	
Production Order		OP Name	Ateam05	Serial Number		CW_Ver.	A.02.10b
Length (m)	6	NA Model NO.		Wire AWG / Brai	28	NA SN	
Compliance		NA FW Ver.		Configuration File	CWDefault.ini	Test Fixture Name	MiniSAS-05
De-embedded f	—	Testing following		Equilization File	—	* Customer Info	
Report Directory	C:\20120805\	Customer NO.		Report File Name	_xlsx	Name	
Tested Pairs		TEL				FAX	
		Email				Address	
		PO.				Quantity	

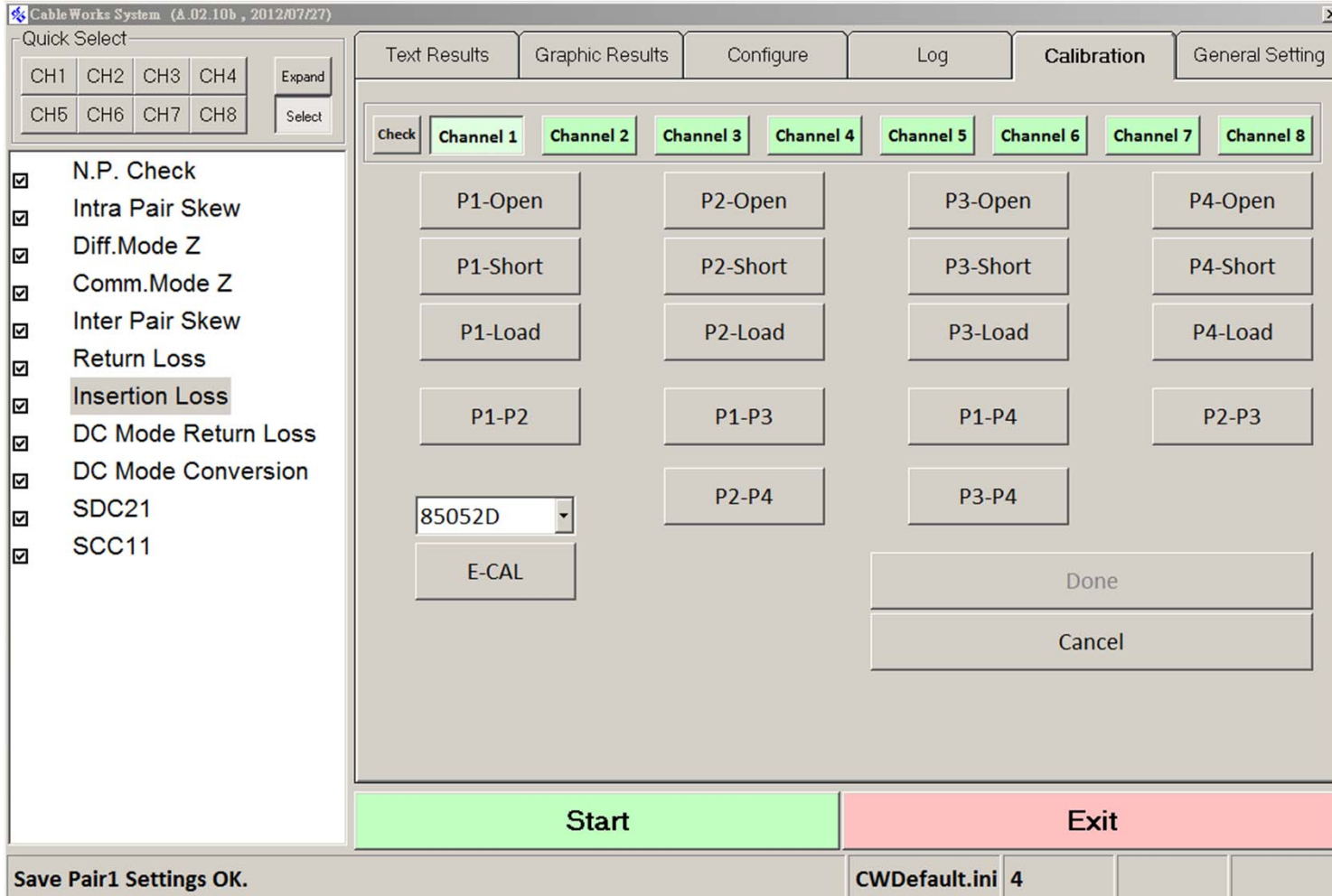
CH Name	CH1_	CH2_	CH3_	CH4_	CH5_	CH6_	CH7_	CH8_
User Define	CLK+	D0+	D1+	D2+	CLK-	D0-	D1-	D2-

Start Exit

Save Pair8 Settings OK. CWDefault.ini 4

# Software Screenshot (cont'd)

## Calibration



The screenshot shows the 'Calibration' window of the CableWorks System software. The window title is 'CableWorks System (A.02.10b, 2012/07/27)'. The interface includes a 'Quick Select' panel on the left with buttons for channels CH1 through CH8 and 'Expand' and 'Select' buttons. Below this is a list of calibration items with checkboxes: N.P. Check, Intra Pair Skew, Diff.Mode Z, Comm.Mode Z, Inter Pair Skew, Return Loss, Insertion Loss (highlighted), DC Mode Return Loss, DC Mode Conversion, SDC21, and SCC11. The main area has tabs for 'Text Results', 'Graphic Results', 'Configure', 'Log', 'Calibration', and 'General Setting'. Under the 'Calibration' tab, there are buttons for 'Channel 1' through 'Channel 8'. Below these are buttons for 'P1-Open', 'P2-Open', 'P3-Open', 'P4-Open', 'P1-Short', 'P2-Short', 'P3-Short', 'P4-Short', 'P1-Load', 'P2-Load', 'P3-Load', 'P4-Load', 'P1-P2', 'P1-P3', 'P1-P4', 'P2-P3', 'P2-P4', 'P3-P4', and 'E-CAL'. A dropdown menu shows '85052D'. At the bottom of the main area are 'Done' and 'Cancel' buttons. At the very bottom of the window are 'Start' and 'Exit' buttons. A status bar at the bottom left says 'Save Pair1 Settings OK.' and the bottom right shows 'CWDefault.ini 4'.

# De-Embedding

- De-embedding moves the measurement plane from the instrument connectors to the switch connectors
- Two steps:
  1. Calibrate the ENA-TDR by using the ECal module
  2. Measure the four paths of DUT and save the de-embedding files.

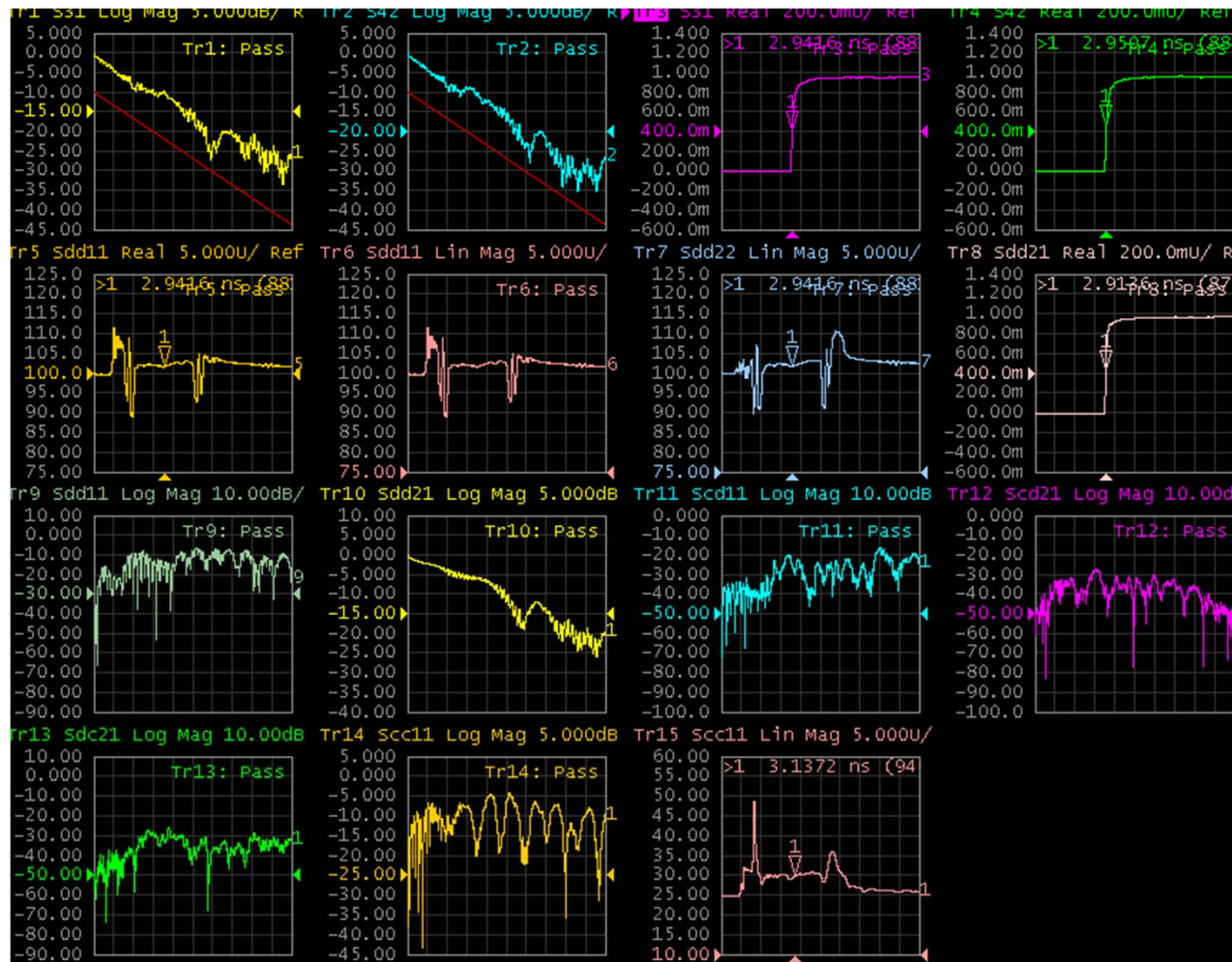
# Test Result Example

N.P. Check	CH1_	CH2_	CH3_	CH4_	CH5_	CH6_	CH7_	CH8_
Result	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS
N.P. Check	CH1_	CH2_	CH3_	CH4_	CH5_	CH6_	CH7_	CH8_
Result	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS

\*

Diff. Mode Z Mated	CH1_	CH2_	CH3_	CH4_	CH5_	CH6_	CH7_	CH8_
Result	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass
Avg	96	96	96	96	96	96	96	96
Max	105	105	105	105	105	105	105	105
Min	93	93	93	93	93	93	93	93
LH								
LL								
Diff. Mode Z Cable	CH1_	CH2_	CH3_	CH4_	CH5_	CH6_	CH7_	CH8_
Result	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass
Avg	96	96	96	96	96	96	96	96
Max	105	105	105	105	105	105	105	105
Min	93	93	93	93	93	93	93	93
LH								
LL								
Diff. Mode Z Mated	CH1_	CH2_	CH3_	CH4_	CH5_	CH6_	CH7_	CH8_
Result	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass
Avg	96	96	96	96	96	96	96	96
Max	105	105	105	105	105	105	105	105
Min	93	93	93	93	93	93	93	93
LH								
LL								

# Test Result Example (cont'd)



# Contact Information

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