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Final

P19_0356_02_Denali_100MB_Test_Report_00
Date of Approval: 2020-11-19

Test Report

Device Under Test

Device Name	BCM89881
Manufacturer	Broadcom
Type / Version	BCM989881_CS
Sample marking	BROADCOM BCM89881B1BFBG TN2004 A907-01P3 W

Customer

Order No.	P19_0356
Name	Broadcom
Address	5300 California Avenue Irvine CA, 92617 USA

Number of Pages	36
Test Period	from 2020-Jun-26 until 2020-Aug-21
Test Method / Test Requirement	100BASE-T1 Interoperability Test Suite
Performed Tests and References	1 100BASE-T1 Interoperability Test Suite v1.0 (Nov 10, 2017)
Conformance Test Results	The Test Results refer to the delivered device
1 100BASE-T1 Interoperability Test Suite	**PHY IOP Chapter: PASS** **PHY Feature Set tests: PASS**

	Link Partners			
Chapter	**TJA1100**	**88Q1010**	**BCM89811**	**RTL9000AA**
Group 1: Link Status	**PASS**	**PASS**	**PASS**	**PASS**
Group 2: Link-Up	**PASS**	**PASS**	**PASS**	**PASS**
Group 3: Signal Quality	NOT APPLICABLE[1]	NOT APPLICABLE[1]	**PASS**	NOT APPLICABLE[1]
Group 4: Cable Diagnostics	NOT APPLICABLE[1]	NOT APPLICABLE[1]	**PASS**	NOT APPLICABLE[1]

For detailed information see chapters Test List and Observations at the following pages.

Approved by

Christoph Wosnitza, Project Manager

Test performed by

Norwin Trautmann, Project Engineer

[1] Due to results not being link partner dependant, only one link partner is considered for 100BASE-T1 PHY Feature Set tests.

Table of Content

Revision History

Old revision	New revision	Amendment Description	Editor
–	00	Initial version	NT

1 Device Under Test (detailed)

General	
Date of Sample Arrival	2020-04-20
Manufacturer	Broadcom
Sample Marking	BROADCOM BCM89881B1BFBG TN2004 A907-01P3 W
Test performed with DUT no.	see "Test setup"

Device Specification	
Device Name	BCM89881
Type / Version	BCM989881_CS
SW-Version*	C&S Driver - IOP (0520fab6) C&S Driver - Cable Diagnostics (e82e1020) C&S Driver - Signal Quality (09cced2)

Documentation	
User manual / datasheet	89881-DS107.pdf, BCM989881_AUTOBR_0020_100818.pdf

1.1 MDI interface schematics

The following figure indicates components and circuitry used for the MDI interface.

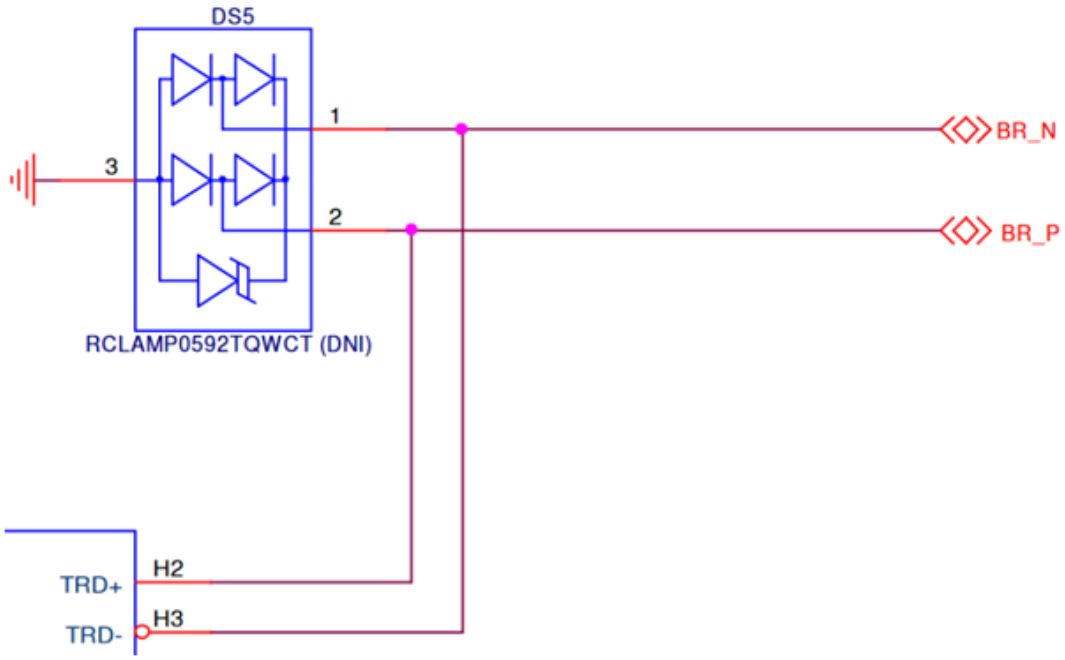

Figure 1: MDI circuit schematic part 1

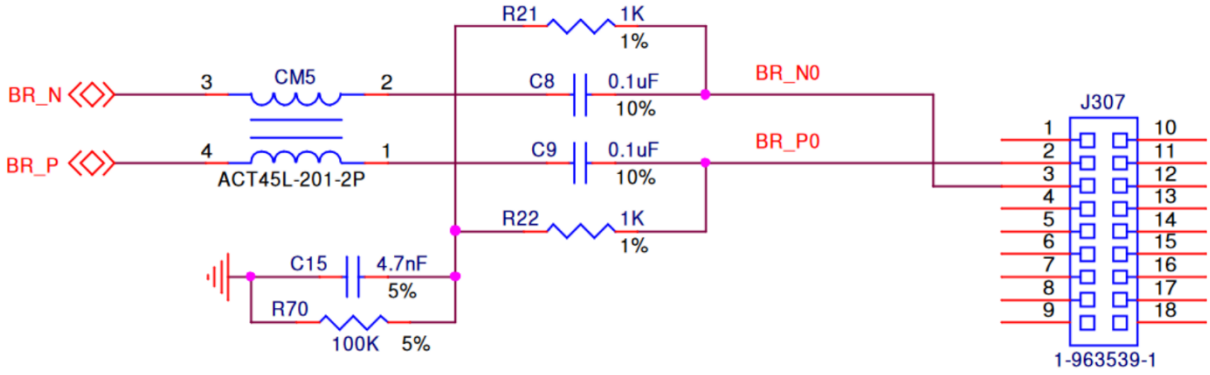

Figure 2: MDI circuit schematic part 2

2 Setup for Device under Test

2.1 PHY Board description

The PHYs to be tested shall be supplied to the test house according to the minimum requirement detailed in this document.

The PHY board consists of three parts that work together:

- PHY host section where the PHY and all its required circuitry are allocated.
- Control section as a link between the Test System and the PHY.
- Power supply section.

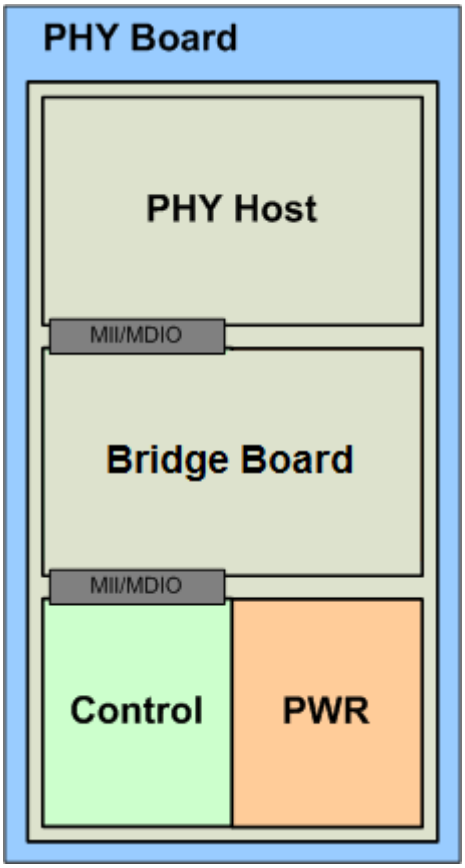

Figure 3: PHY board concept

The PHY host board shall be provided to the test house to execute the tests. In the following sections the required connectors and their pin-out are described.

2.2 PHY host board and Power Supply

In Figure 4 the PHY Host Board is depicted. This configuration is required to be implemented as shown in order to ensure the compatibility with the control board which is directly connected through the MDIO Connector.

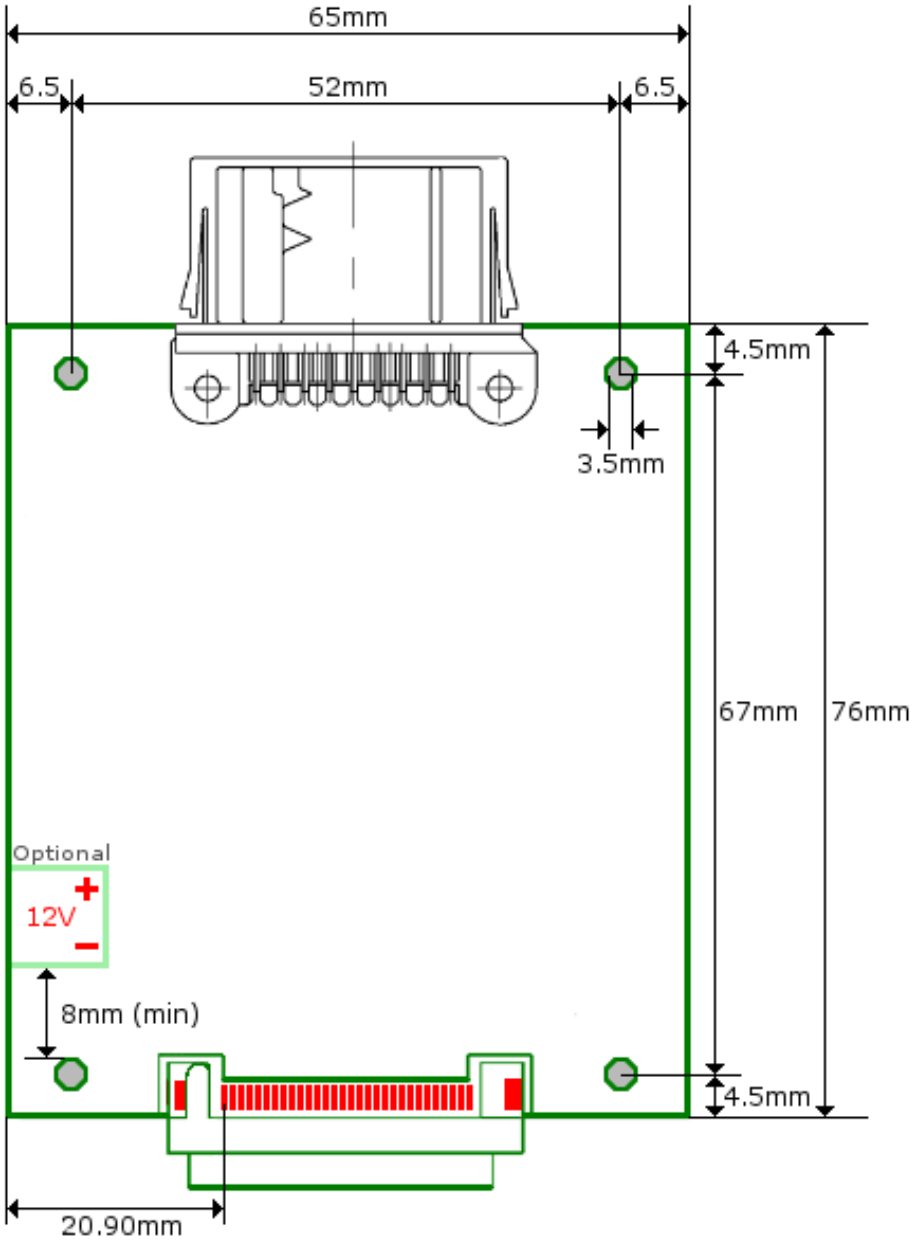

Figure 4: PHY Host board

2.3 Power Supply Requirements

The power supply shall be designed to provide a stable output when working under different temperature conditions between -40°C and +125°C.

The input voltage to the power supply module will be 12V (VBAT).

The required voltages and current outputs are listed in Table 1.

Voltage [V]	Max Current [mA]	Name
3.3	1500	3V3
5	200	5V0

Table 1: Voltages and current outputs requirements

In Figure 5 a brief description of the power distribution within the PHY board is shown.

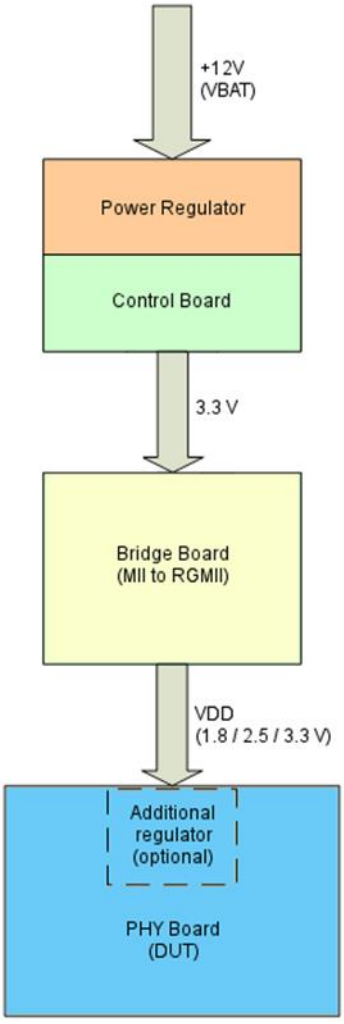

Figure 5: Power Supply Distribution

2.4 Required signals and connectors

2.4.1 MDI Connector

Connector	Pin	Name	Description
MDI Connector	1	NC	-
	2	TRX_P	P Line
	3	TRX_N	N Line
	4	NC	-
	5	NC	-
	6	NC	-
	7	NC	-
	8	NC	-
	9	NC	-
	10	NC	-
	11	NC	-
	12	NC	-
	13	NC	-
	14	NC	-
	15	NC	-
	16	NC	-
	17	NC	-
	18	NC	-

Table 2: MDI Connector

2.4.1.1 Connector description

Manufacturer: Tyco
Description: MQS 18 Pol
Manufacturer Part number: 1-963539-1

2.4.2 MII / MDIO Interface

Pin	Signal	Signal	Pin
1	GND	VCC (3.3V)	2
3	GND	VCC (3.3V)	4
5	GND	GND	6
7	GND	MDC	8
9	GND	MDIO	10
11	GND	GND	12
13	GND	CRS / SPI_CS2	14
15	GND	COL / SPI_CS3	16
17	GND	GND	18
19	GND	RXD3	20
21	GND	RXD2	22
23	GND	RXD1	24
25	GND	RXD0	26
27	GND	GND	28
29	GND	RX_CLK	30
31	GND	RX_DV	32
33	GND	GND	34
35	GND	TX_CLK	36
37	GND	GND	38
39	GND	TXD3	40
41	GND	TXD2	42
43	GND	TXD1	44
45	GND	TXD0	46
47	GND	GND	48
49	GND	TX_EN	50
51	GND	GND	52
53	SPI_MOSI	TX_ER	54
55	SPI_MISO	RX_ER	56
57	SPI_CS1	GND	58
59	SPI_CLK	RESET	60
BOTTOM		**TOP**	

Table 3: MII / MDIO Interface

2.4.2.1 Connector description

Manufacturer: Samtec
Description: Conn Edge Rate Socket Strip SKT 60 POS 0.8mm Solder ST Edge Mount T/R
Manufacturer Part number: ERF8-030-01-L-D-EM2

3 Test Equipment

The following test equipment and test system have been used.

No.	Component	Manufacturer	Version / Type	ID
C&S Equipement				
1	Test Coordinator	C&S	Rev 1.4	-
2	Waveform Generator	Keysight	33600A	CS140416
3	Heating oven with mechanical convection	Binder	Binder FD 23	500 044
4	B 35 Cold box	Fryka	B35-50	500 065
5	Temperature Logger (heat chamber)	PCE	T390	CS140632
6	Temperature Logger (cold chamber)	PCE	T390	CS140656
Power Supplies				
3	Power Supply	Agilent	E3634A	CS140290
Test channel				
Worst Case Channel				
4	Part No.: 6499656795 Typ FLKCuMgU9Y- 9Y2x0,13 - A/T105 (C2:15 meter length) with filters	Kroschu	-	-
Best Case Channel				
5	Part No.: 64996567 Typ FLR9Y 2x0,35 mm²-SN/T105 (SL=13mm) (C1: 1,5 meter length)	Kroschu	-	-

4 Technical Correspondence

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5 Test Setup

The devices were grouped together as shown below. Each link partner was associated with one DUT, forming sixteen groups in total.

	DUT			Link Partner		
Group	Host Board	Bridge Board	DUT ID	Host Board	LP ID	LP Type
G00	CS140540	R1.1 #19	14	CS140235	NXP 73	**NXP TJA1100-MRA4**
G01	CS140319	R1.1 #99	64	CS140593	NXP 84	
G02	CS140597	R1.1 #94	66	CS140182	NXP 78	
G03	CS140249	R1.1 #74	21	CS140338	NXP 90	
G04	CS140604	R1.1 #28	55	CS140337	MVL 33	**Marvell 88Q1010-B0**
G05	CS140538	R1.1 #33	16	CS140239	MVL 32	
G06	CS140192	R1.1 #04	17	CS140237	MVL 20	
G07	CS140188	R1.1 #68	12	CS140448	MVL 23	
G08	CS140583	R1.1 #06	52	CS140477	BCM2049027	**Broadcom BCM89811**
G09	CS140584	R1.1 #39	54	CS140590	BCM2049000	
G10	CS140449	R1.1 #77	13	CS140605	BCM2048998	
G11	CS140476	R1.1 #78	72	CS140589	BCM2049001	
G12	CS140442	R1.1 #72	23	CS140327	RTK 3	**Realtek RTL9000AA**
G13	CS140878	R1.1 #49	22	CS140452	RTK 15	
G14	CS140537	R1.1 #35	20	CS140454	RTK 9	
G15	CS140608	R1.1 #21	15	CS140331	RTK 8	

Table 4: Description of groups used for IOPT

	DUT			Link Partner		
Group	Host Board	Bridge Board	DUT ID	Host Board	LP ID	LP Type
G02	CS140597	R1.1 #94	66	CS140182	NXP 78	**NXP TJA1100-MRA4**
G03	CS140249	R1.1 #74	21	CS140338	NXP 90	
G06	CS140192	R1.1 #04	17	CS140237	MVL 20	**Marvell 88Q1010-B0**
G07	CS140188	R1.1 #68	12	CS140448	MVL 23	
G10	CS140449	R1.1 #77	13	CS140605	BCM2048998	**Broadcom BCM89811**
G11	CS140476	R1.1 #78	72	CS140589	BCM2049001	
G14	CS140537	R1.1 #35	20	CS140454	RTK 9	**Realtek RTL9000AA**
G15	CS140608	R1.1 #21	15	CS140331	RTK 8	

Table 5: Description of groups used for Link Status and Link Up at -40°C and +105°C Temperature

	DUT			Link Partner		
Group	Host Board	Bridge Board	DUT ID	Host Board	LP ID	LP Type
G11	CS140608	R1.1 #21	15	CS140589	BCM2049001	**Broadcom BCM89811**

Table 6: Description of groups used for SQI measurement

	DUT			Link Partner		
Group	Host Board	Bridge Board	DUT ID	Host Board	LP ID	LP Type
G03	CS140249	R1.1 #74	21	CS140338	NXP 90	**NXP TJA1100-MRA4**
G07	CS140188	R1.1 #68	12	CS140448	MVL 23	**Marvell 88Q1010-B0**
G11	CS140476	R1.1 #78	72	CS140589	BCM2049001	**Broadcom BCM89811**
G15	CS140608	R1.1 #21	15	CS140331	RTK 8	**Realtek RTL9000AA**

Table 7: Description of groups used for cable diagnostics

Note:

Regarding cable diagnostics testing, the IOP_31 tests were performed with all groups listed in the table above. During the IOP_32 and IOP_33 tests, group G11 was participating exclusively.

6 Test List

6.1 Nomenclature

The following parameters describe the test environment and if applicable the kind of stress and its location.

Reference name	Description
100BASET1_IOP_XX	Test reference
SR	Soft Reset
HR	Hard Reset
O1	Open is on ETH_N or ETH_P
O2	Open on both ETH_N and ETH_P
NEAR	Open/Short near to DUT
FAR	Open/Short near to LP
M	MASTER
S	SLAVE
P	Swapped Polarity
C1	Best-case Channel
C2	Worst-case Channel
T1	Room Temperature
T2	-40°C
T3	+125°C

Table 8: Nomenclature of test environment variables

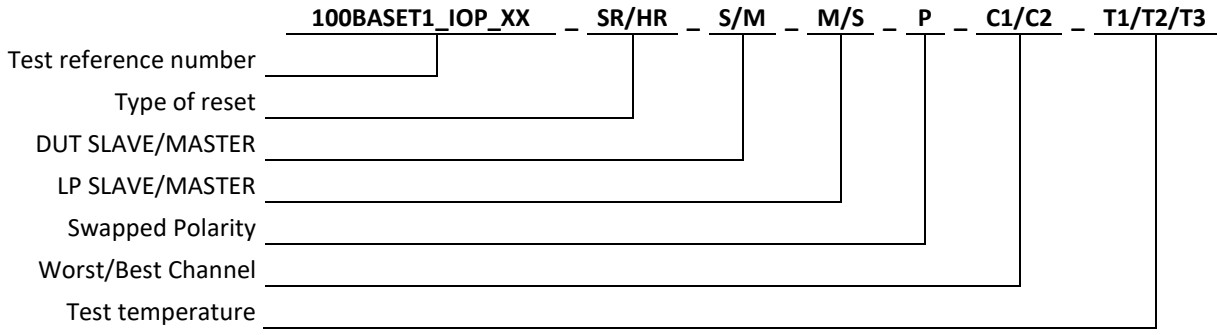

Figure 6: Test groups 1 to 3 nomenclature

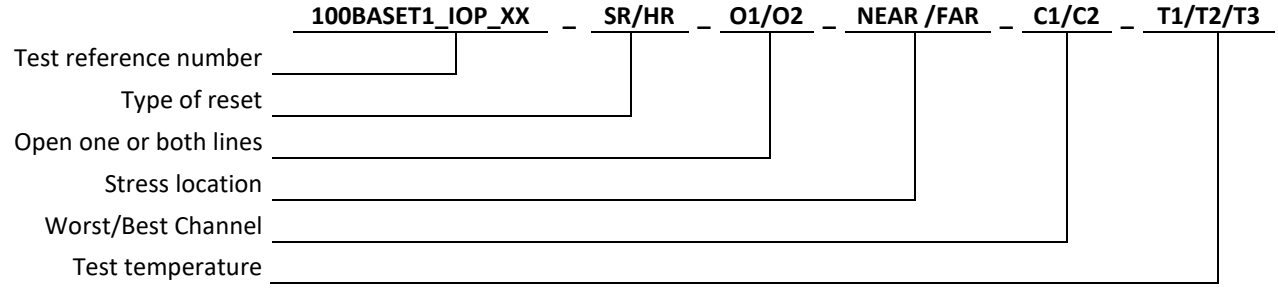

Figure 7: Test group 4 nomenclature

6.2 Test Cases

Group	Test Case	TJA1100-MRA4	88Q1010-B0	BCM89811	RTL9000AA
Link Status	IOP_16_SR_M_S_C1_T1	PASS	PASS	PASS	PASS
	IOP_16_SR_M_S_C1_T2	PASS	PASS	PASS	PASS
	IOP_16_SR_M_S_C1_T3	PASS	PASS	PASS	PASS
	IOP_16_SR_M_S_C2_T1	PASS	PASS	PASS	PASS
	IOP_16_SR_M_S_C2_T2	PASS	PASS	PASS	PASS
	IOP_16_SR_M_S_C2_T3	PASS	PASS	PASS	PASS
	IOP_16_SR_S_M_C1_T1	PASS	PASS	PASS	PASS
	IOP_16_SR_S_M_C1_T2	PASS	PASS	PASS	PASS
	IOP_16_SR_S_M_C1_T3	PASS	PASS	PASS	PASS
	IOP_16_SR_S_M_C2_T1	PASS	PASS	PASS	PASS
	IOP_16_SR_S_M_C2_T2	PASS	PASS	PASS	PASS
	IOP_16_SR_S_M_C2_T3	PASS	PASS	PASS	PASS
	IOP_17_SR_M_M_C2_T1	PASS	PASS	PASS	PASS
	IOP_17_SR_S_S_C2_T1	PASS	PASS	PASS	PASS
	IOP_18_SR_S_M_P_C2_T1	PASS	PASS	PASS	PASS
	IOP_19_SR_M_S_C2_T1	PASS	PASS	PASS	PASS
	IOP_19_SR_S_M_C2_T1	PASS	PASS	PASS	PASS

Group	Test Case	TJA1100-MRA4	88Q1010-B0	BCM89811	RTL9000AA
Link-Up	IOP_21_HR_M_S_C1_T1	PASS	PASS	PASS	PASS
	IOP_21_HR_M_S_C1_T2	PASS	PASS	PASS	PASS
	IOP_21_HR_M_S_C1_T3	PASS	PASS	PASS	PASS
	IOP_21_HR_M_S_C2_T1	PASS	PASS	PASS	PASS
	IOP_21_HR_M_S_C2_T2	PASS	PASS	PASS	PASS
	IOP_21_HR_M_S_C2_T3	PASS	PASS	PASS	PASS
	IOP_21_HR_S_M_C1_T1	PASS	PASS	PASS	PASS
	IOP_21_HR_S_M_C1_T2	PASS	PASS	PASS	PASS
	IOP_21_HR_S_M_C1_T3	PASS	PASS	PASS	PASS
	IOP_21_HR_S_M_C2_T1	PASS	PASS	PASS	PASS
	IOP_21_HR_S_M_C2_T2	PASS	PASS	PASS	PASS
	IOP_21_HR_S_M_C2_T3	PASS	PASS	PASS	PASS
	IOP_21_SR_M_S_C1_T1	PASS	PASS	PASS	PASS
	IOP_21_SR_M_S_C1_T2	PASS	PASS	PASS	PASS
	IOP_21_SR_M_S_C1_T3	PASS	PASS	PASS	PASS
	IOP_21_SR_M_S_C2_T1	PASS	PASS	PASS	PASS
	IOP_21_SR_M_S_C2_T2	PASS	PASS	PASS	PASS
	IOP_21_SR_M_S_C2_T3	PASS	PASS	PASS	PASS
	IOP_21_SR_S_M_C1_T1	PASS	PASS	PASS	PASS
	IOP_21_SR_S_M_C1_T2	PASS	PASS	PASS	PASS
	IOP_21_SR_S_M_C1_T3	PASS	PASS	PASS	PASS
	IOP_21_SR_S_M_C2_T1	PASS	PASS	PASS	PASS
	IOP_21_SR_S_M_C2_T2	PASS	PASS	PASS	PASS
	IOP_21_SR_S_M_C2_T3	PASS	PASS	PASS	PASS

Group	Test Case	TJA1100-MRA4	88Q1010-B0	BCM89811	RTL9000AA
	IOP_22_HR_M_S_C1_T1	PASS	PASS	PASS	PASS
	IOP_22_HR_M_S_C1_T2	PASS	PASS	PASS	PASS
	IOP_22_HR_M_S_C1_T3	PASS	PASS	PASS	PASS
	IOP_22_HR_M_S_C2_T1	PASS	PASS	PASS	PASS
	IOP_22_HR_M_S_C2_T2	PASS	PASS	PASS	PASS
	IOP_22_HR_M_S_C2_T3	PASS	PASS	PASS	PASS
	IOP_22_HR_S_M_C1_T1	PASS	PASS	PASS	PASS
	IOP_22_HR_S_M_C1_T2	PASS	PASS	PASS	PASS
	IOP_22_HR_S_M_C1_T3	PASS	PASS	PASS	PASS
	IOP_22_HR_S_M_C2_T1	PASS	PASS	PASS	PASS
	IOP_22_HR_S_M_C2_T2	PASS	PASS	PASS	PASS
	IOP_22_HR_S_M_C2_T3	PASS	PASS	PASS	PASS
	IOP_22_SR_M_S_C1_T1	PASS	PASS	PASS	PASS
	IOP_22_SR_M_S_C1_T2	PASS	PASS	PASS	PASS
	IOP_22_SR_M_S_C1_T3	PASS	PASS	PASS	PASS
	IOP_22_SR_M_S_C2_T1	PASS	PASS	PASS	PASS
	IOP_22_SR_M_S_C2_T2	PASS	PASS	PASS	PASS
	IOP_22_SR_M_S_C2_T3	PASS	PASS	PASS	PASS
	IOP_22_SR_S_M_C1_T1	PASS	PASS	PASS	PASS
	IOP_22_SR_S_M_C1_T2	PASS	PASS	PASS	PASS
	IOP_22_SR_S_M_C1_T3	PASS	PASS	PASS	PASS
	IOP_22_SR_S_M_C2_T1	PASS	PASS	PASS	PASS
	IOP_22_SR_S_M_C2_T2	PASS	PASS	PASS	PASS
	IOP_22_SR_S_M_C2_T3	PASS	PASS	PASS	PASS

Group	Test Case	TJA1100-MRA4	MVL 88Q1010-B0	BCM89811	RTL9000AA
Signal Quality	IOP_24a_SR_M_S_C1_T1	NOT APPLICABLE	NOT APPLICABLE	PASS	NOT APPLICABLE
	IOP_24a_SR_S_M_C1_T1	NOT APPLICABLE	NOT APPLICABLE	PASS	NOT APPLICABLE
	IOP_24b_SR_M_S_C1_T1	NOT APPLICABLE	NOT APPLICABLE	PASS	NOT APPLICABLE
	IOP_24b_SR_S_M_C1_T1	NOT APPLICABLE	NOT APPLICABLE	PASS	NOT APPLICABLE
Cable Diagnostics	IOP_31_SR_C1_T1	PASS	PASS	PASS	PASS
	IOP_31_SR_C2_T1	PASS	PASS	PASS	PASS
	IOP_32_SR_O1_FAR_C2_T1	NOT APPLICABLE	NOT APPLICABLE	PASS	NOT APPLICABLE
	IOP_32_SR_O1_NEAR_C2_T1	NOT APPLICABLE	NOT APPLICABLE	PASS	NOT APPLICABLE
	IOP_32_SR_O2_FAR_C2_T1	NOT APPLICABLE	NOT APPLICABLE	PASS	NOT APPLICABLE
	IOP_32_SR_O2_NEAR_C2_T1	NOT APPLICABLE	NOT APPLICABLE	PASS	NOT APPLICABLE
	IOP_33_SR_FAR_BUS_M_S	NOT APPLICABLE	NOT APPLICABLE	PASS	NOT APPLICABLE
	IOP_33_SR_FAR_BUS_S_M	NOT APPLICABLE	NOT APPLICABLE	PASS	NOT APPLICABLE
	IOP_33_SR_FAR_GND_M_S	NOT APPLICABLE	NOT APPLICABLE	PASS	NOT APPLICABLE
	IOP_33_SR_FAR_GND_S_M	NOT APPLICABLE	NOT APPLICABLE	PASS	NOT APPLICABLE
	IOP_33_SR_FAR_VBAT_M_S	NOT APPLICABLE	NOT APPLICABLE	PASS	NOT APPLICABLE
	IOP_33_SR_FAR_VBAT_S_M	NOT APPLICABLE	NOT APPLICABLE	PASS	NOT APPLICABLE
	IOP_33_SR_NEAR_BUS_M_S	NOT APPLICABLE	NOT APPLICABLE	PASS	NOT APPLICABLE
	IOP_33_SR_NEAR_BUS_S_M	NOT APPLICABLE	NOT APPLICABLE	PASS	NOT APPLICABLE
	IOP_33_SR_NEAR_GND_M_S	NOT APPLICABLE	NOT APPLICABLE	PASS	NOT APPLICABLE
	IOP_33_SR_NEAR_GND_S_M	NOT APPLICABLE	NOT APPLICABLE	PASS	NOT APPLICABLE
	IOP_33_SR_NEAR_VBAT_M_S	NOT APPLICABLE	NOT APPLICABLE	PASS	NOT APPLICABLE
	IOP_33_SR_NEAR_VBAT_S_M	NOT APPLICABLE	NOT APPLICABLE	PASS	NOT APPLICABLE

Table 9: Test list

7 Observations

7.1 IOP_21 Link-up after PHY-reset

Test Case Description

This test case shall ensure that the PHY is able to establish a link after being reset and reconfigured within a given time limit.

1. DUT shall soft-/hard-reset and reconfigure its PHY.
2. The DUT's PHY configuration must be finished within 20ms after reset.
3. After finished configuration, the DUT shall start timer t0.
4. DUT shall wait until the PHY indicates an active link and stop timer t0.
5. DUT shall monitor whether the link status remains active for at least 750ms after initial link-up.

Each test iteration shall be classified as passed, if all of the following condition(s) are fulfilled.

- DUT's PHY achieved link-up within 100ms after finished configuration (t0 <= 100ms).
- Link did not go down after test step 4.

7.1.1 Observation: Link-up times

The next figures show the link-up times distribution for every test case 21 and against each link partner:

- NXP PHY (TJA1100-MRA4)
- Marvell PHY (MVL88Q1010-B0)
- Realtek PHY (RTL9000AA)
- Broadcom PHY (BCM89811)

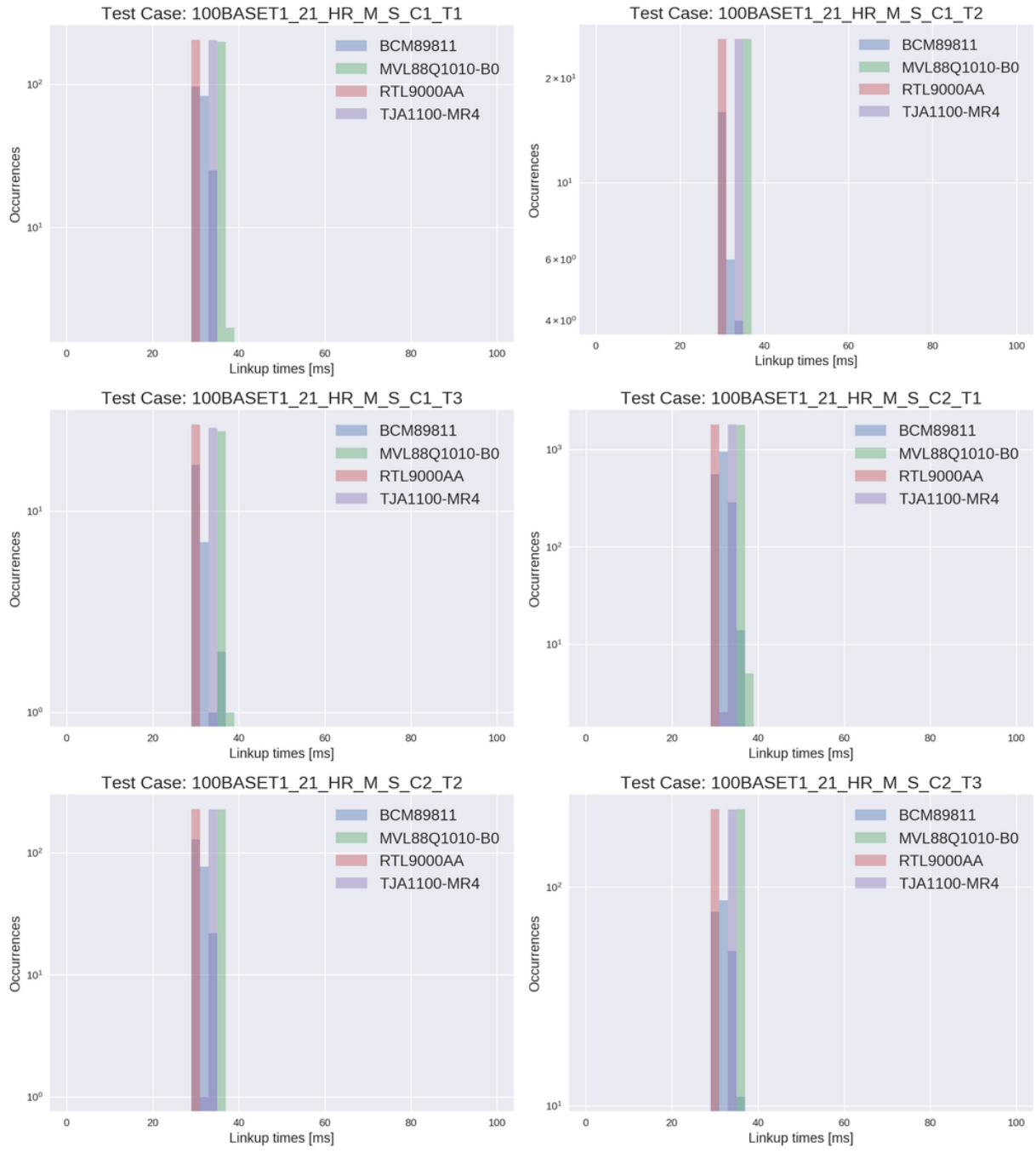

Figure 8: Link time distributions for IOP_21 with DUT as master and hard reset

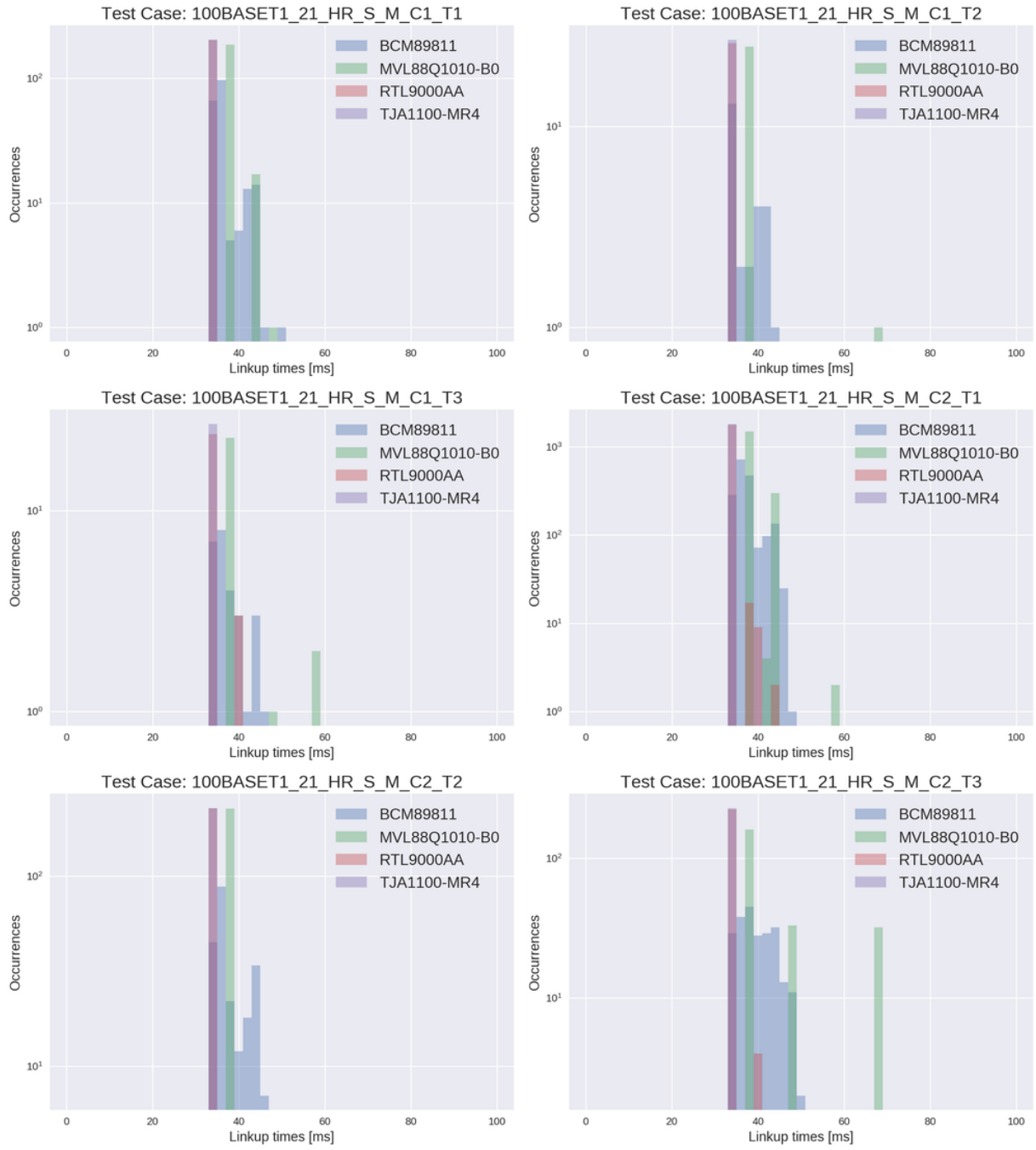

Figure 9: Link time distributions for IOP_21 with DUT as slave and hard reset

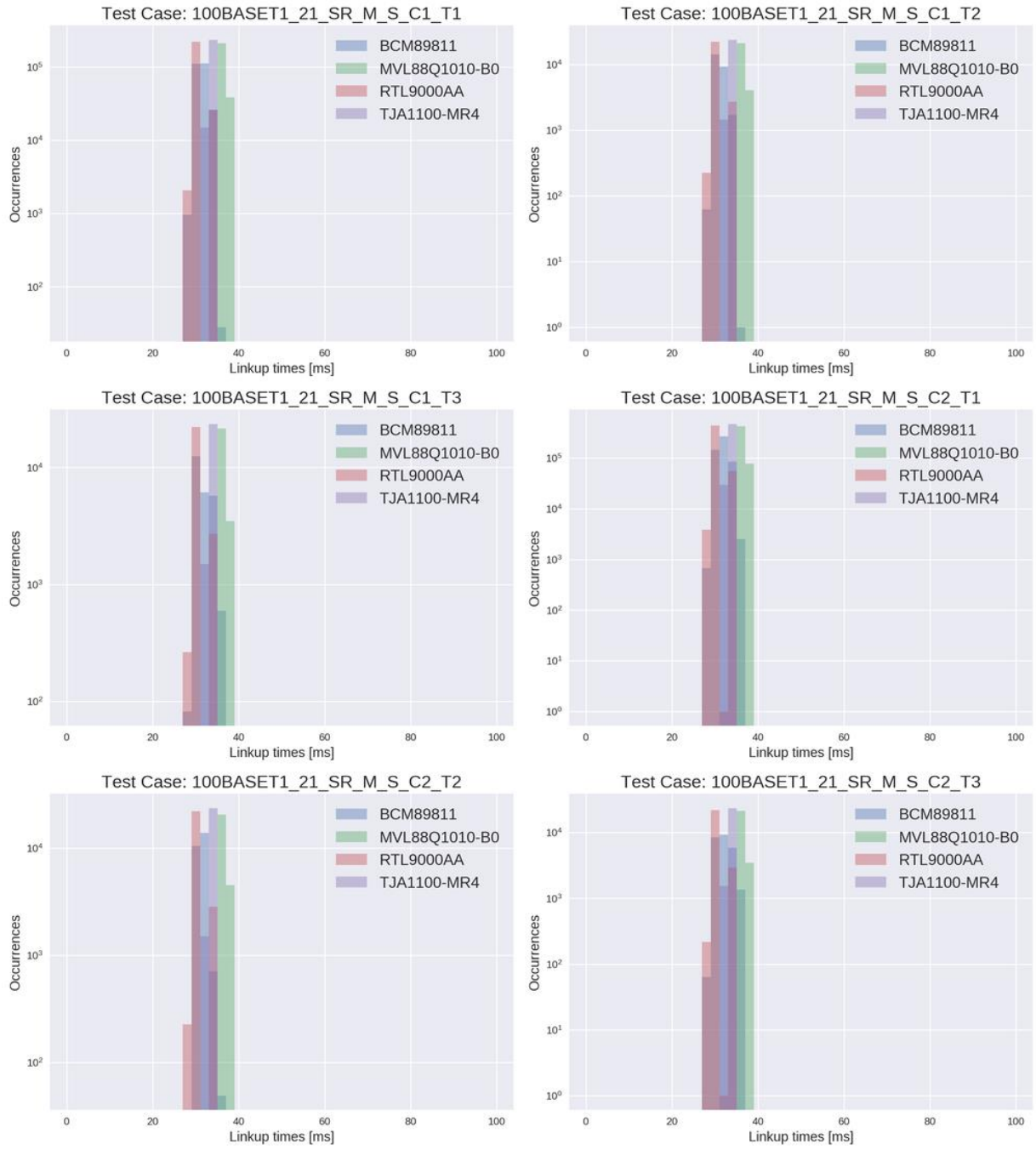

Figure 10: Link time distributions for IOP_21 with DUT as master and soft reset

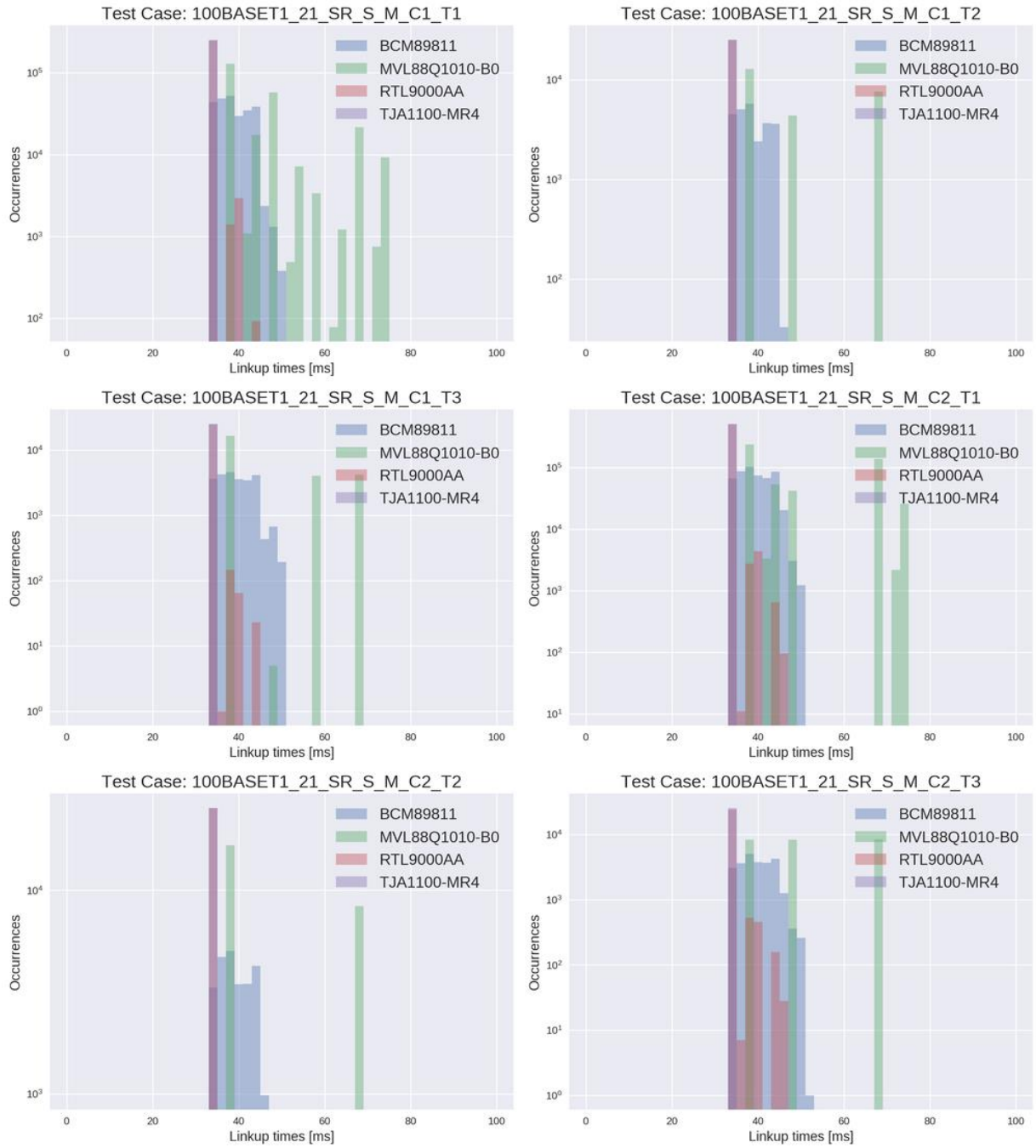

Figure 11: Link time distributions for IOP_21 with DUT as slave and soft reset

7.2 IOP_22 Link-up after reset of link-partner

Test Case Description

This test case shall ensure that the PHY is able to establish a link after the link partner's PHY has been reset and reconfigured within a given time limit.

1. DUT shall soft-/hard-reset and reconfigure its PHY.
2. DUT shall trigger a soft-/hard-reset of the link partner's PHY or wait until the link partner has reset its PHY.
3. DUT shall start timer t0 directly after the reset of the LP's PHY.
4. The link partner must configure its PHY within 20ms after the reset.
5. DUT must ignore any indicated active links within 25ms after the reset.
6. 25ms after LP's reset: DUT shall wait until the PHY indicates an active link and stop timer t0.
7. DUT shall monitor whether the link status remains active for at least 750ms after initial link-up.

Each test iteration shall be classified as passed, if all of the following condition(s) are fulfilled:

- DUT's PHY reported link-up within 120ms after reset of the LP's PHY (t0 <= 120ms).
- Link did not go down after test step 5.

7.2.1 Observation: Link-up times

The next figures show the link-up times distribution for every test case 22 and against each link partner:

- NXP PHY (TJA1100-MRA4)
- Marvell PHY (MVL88Q1010-B0)
- Realtek PHY (RTL9000AA)
- Broadcom PHY (BCM89811)

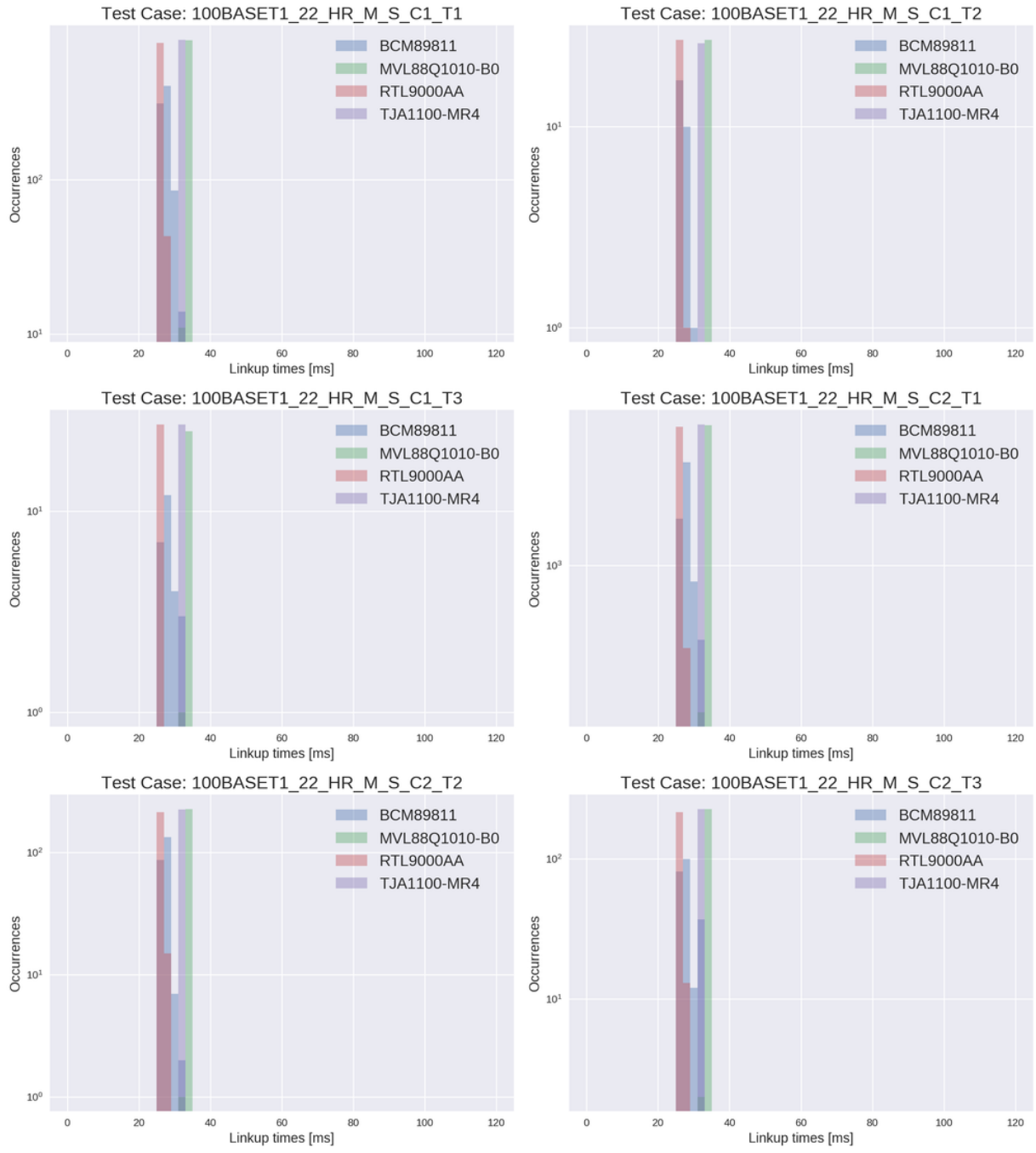

Figure 12: Link time distributions for IOP_22 with DUT as master and hard reset

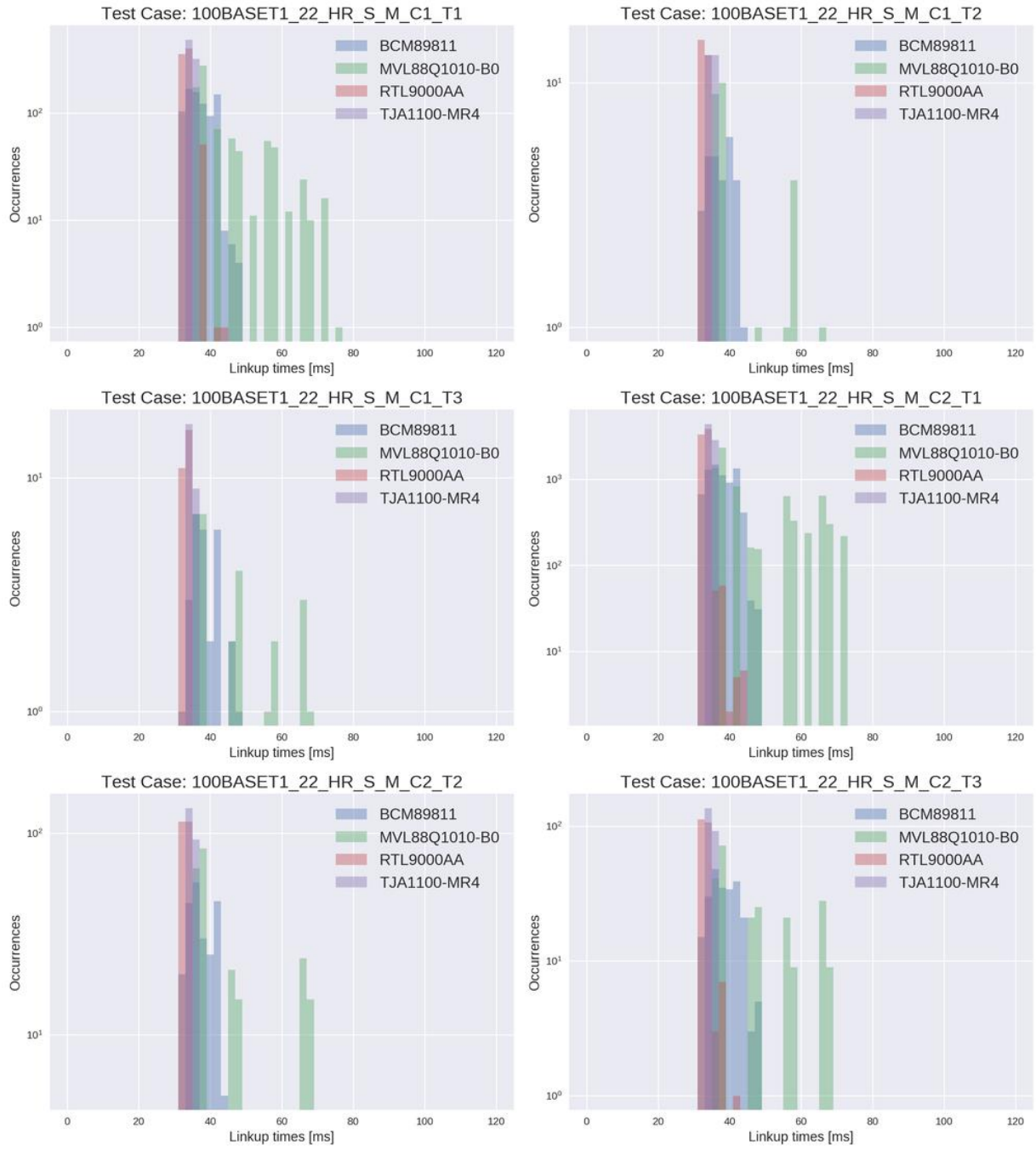

Figure 13: Link time distributions for IOP_22 with DUT as slave and hard reset

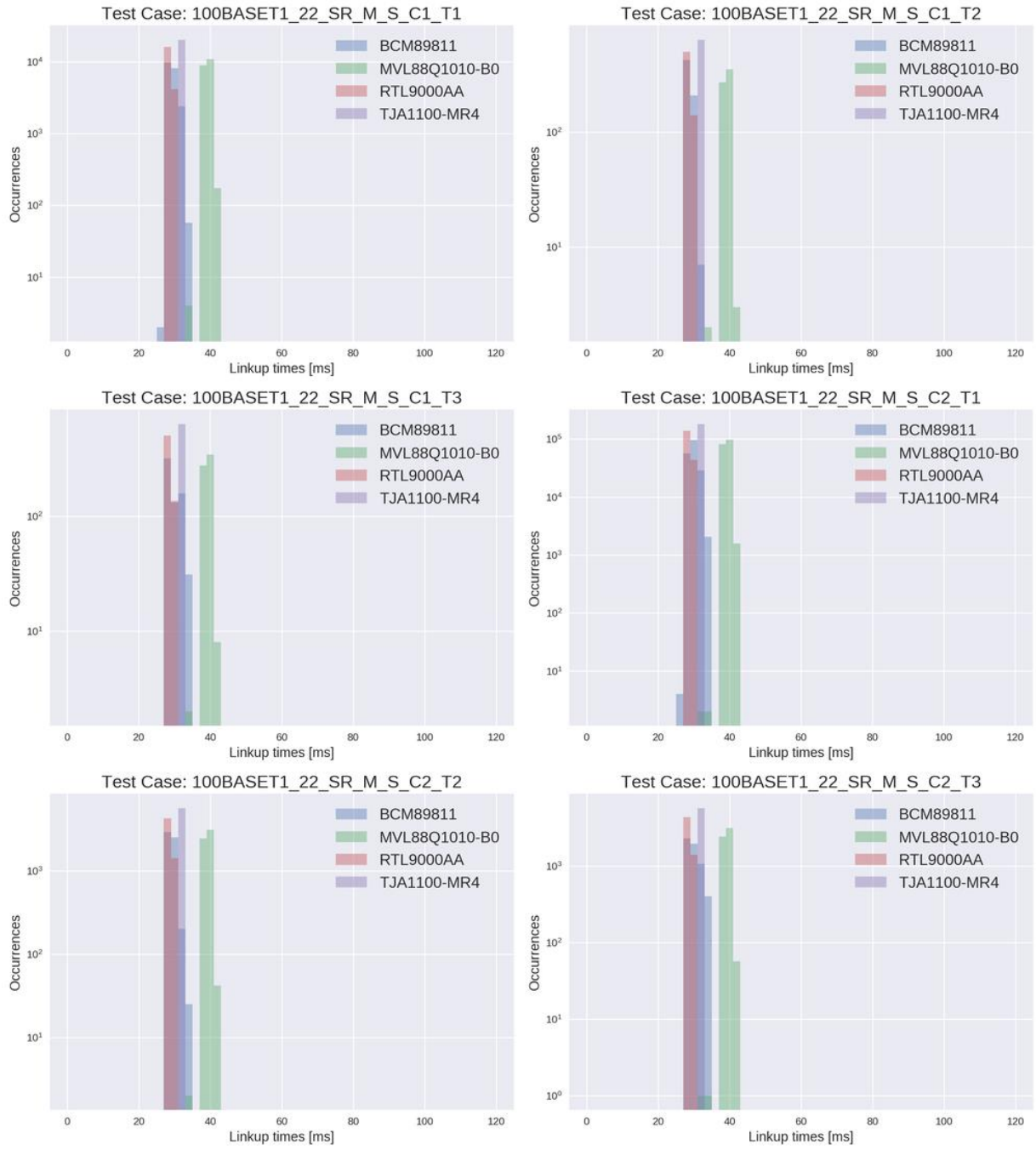

Figure 14: Link time distributions for IOP_22 with DUT as master and soft reset

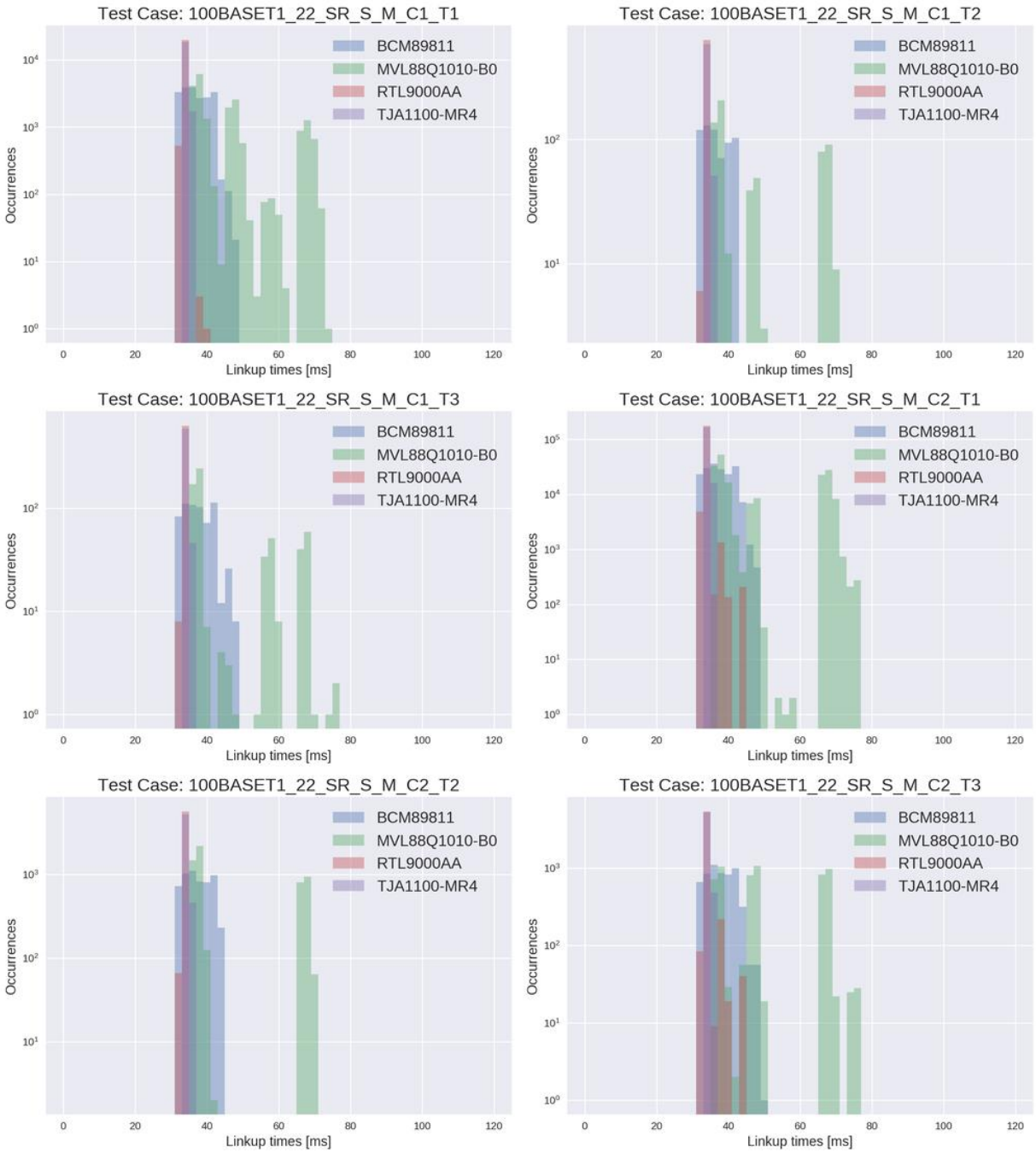

Figure 15: Link time distributions for IOP_22 with DUT as slave and soft reset

7.3 IOP_24a Indicated signal quality for channel with decreasing quality

Test Case Description

This test case shall ensure that the PHY's indicated signal quality decreases for a channel with decreasing channel quality.

1. Remove any artificial channel degradation, to ensure that the highest possible signal quality is reached on both the DUT and LP.
2. DUT shall soft reset and reconfigure its PHY.
3. Measure the PHY's SQI value for at least 100 times. Determine and store the minimum and maximum read values.
4. Increase artificial noise level by one step, i.e. by 100mV Gaussian noise generator amplitude.
5. Repeat steps 3 and 4 for ten additional noise levels after the PHY can no longer establish a link.
6. Draw minimum and maximum curves with the values obtained in each artificial noise step

Each test iteration shall be classified as passed, if all of the following condition(s) are fulfilled.

- SQI value:
  - Steadily and monotonically decreased by one step each
  - SQI values are only valid if link-up condition is present
- Link status
  - Link-up status remains for SQI values higher than 0
  - No link instabilities with intermittently link drops should be observed between SQI values higher than 0.

7.3.1 Observation: Signal quality for channel with decreasing quality

For the test cases with decreasing quality on the channel, the SQI value was steadily and monotonically decreased by one step each, leading to an overall PASS verdict.

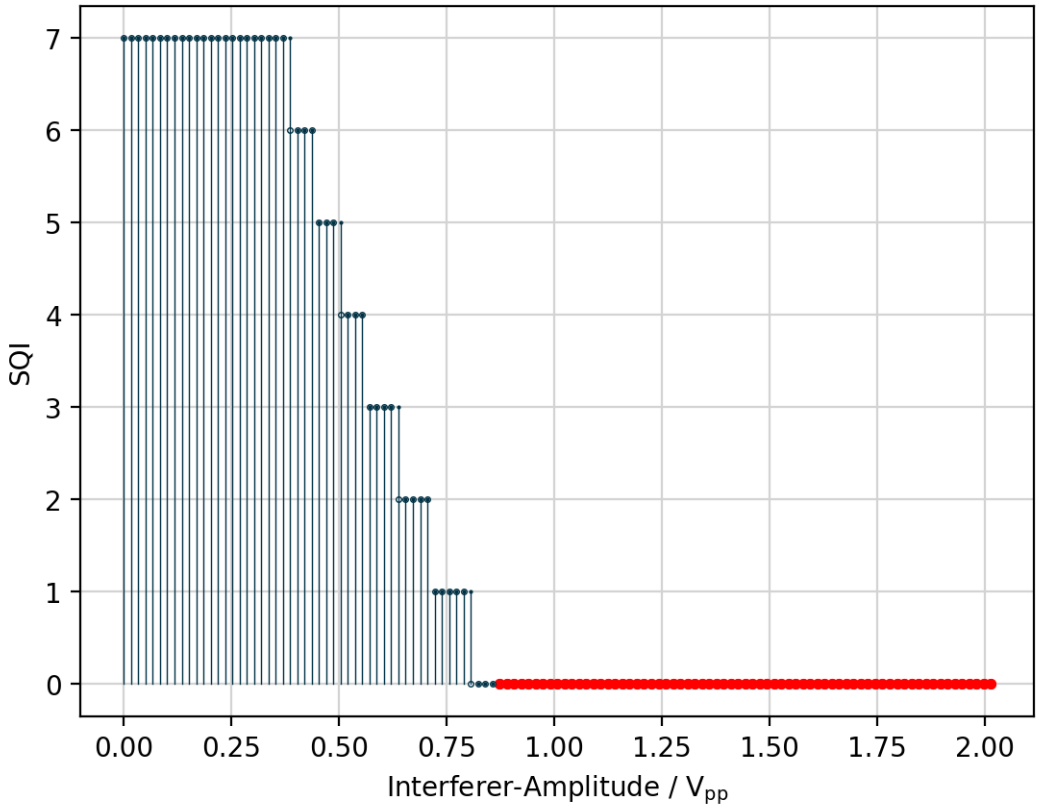

Figure 16: 100BASET1_IOP_24a_SR_M_S_C1_T1

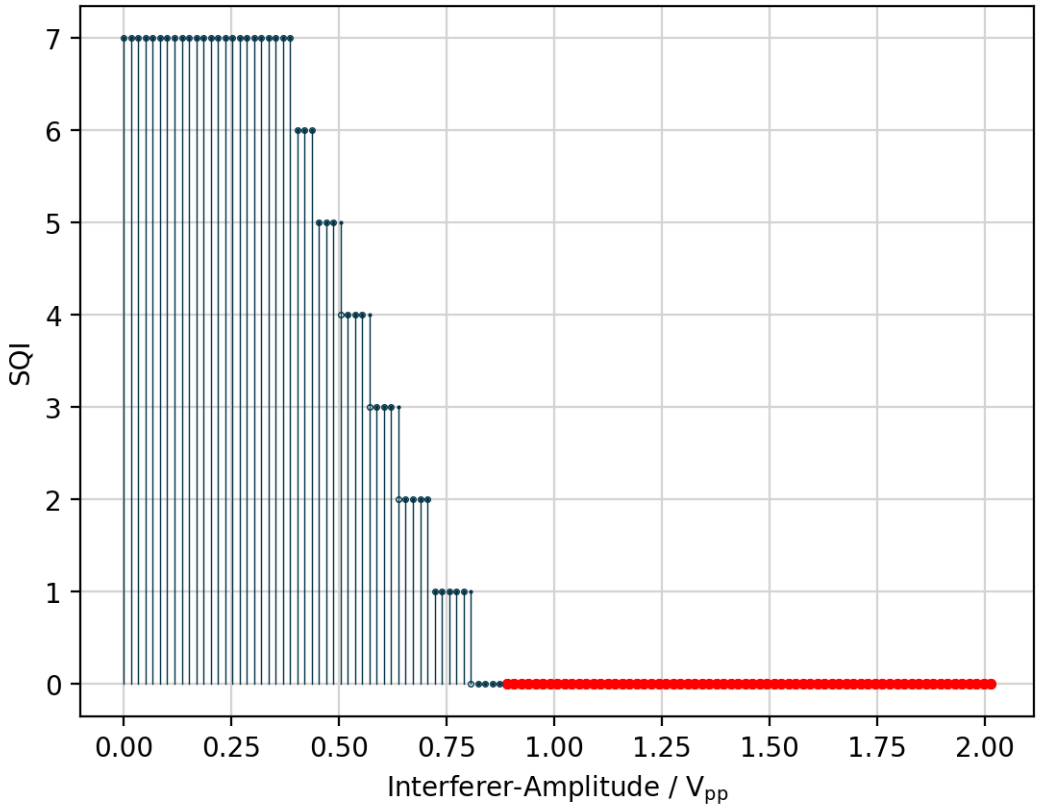

Figure 17: 100BASET1_IOP_24a_SR_S_M_C1_T1

7.4 IOP_24b Indicated signal quality for channel with increasing quality

Test Case Description

This test case shall ensure that the PHY's indicated signal quality increases for a channel with increasing channel quality.

1. Start with the highest artificial noise channel degradation the DUT's PHY can no longer establish a link.
2. DUT shall soft reset and reconfigure its PHY.
3. Decrease artificial noise level until link can be established.
4. Measure the PHY's SQI value for at least 100 times. Determine and store the minimum and maximum read values.
5. Decrease artificial noise by one step, i.e. by 100mV Gaussian noise generator amplitude.
6. Repeat steps 4 and 5 until no artificial noise is applied.
7. Draw minimum and maximum curves with the values obtained in each artificial noise step.

Each test iteration shall be classified as passed, if all of the following condition(s) are fulfilled.

- SQI value:
  - Steadily and monotonically increased by on step each
  - SQI values are only valid if link-up condition is present
- Link status
  - Link-up status remains for SQI values higher than 0
  - No link instabilities with intermittently link drops should be observed between SQI values higher than 0.

7.4.1 Observation: Signal quality for channel with increasing quality

For the test cases with increasing quality on the channel, the SQI value was steadily and monotonically increased by one step each, leading to an overall PASS verdict.

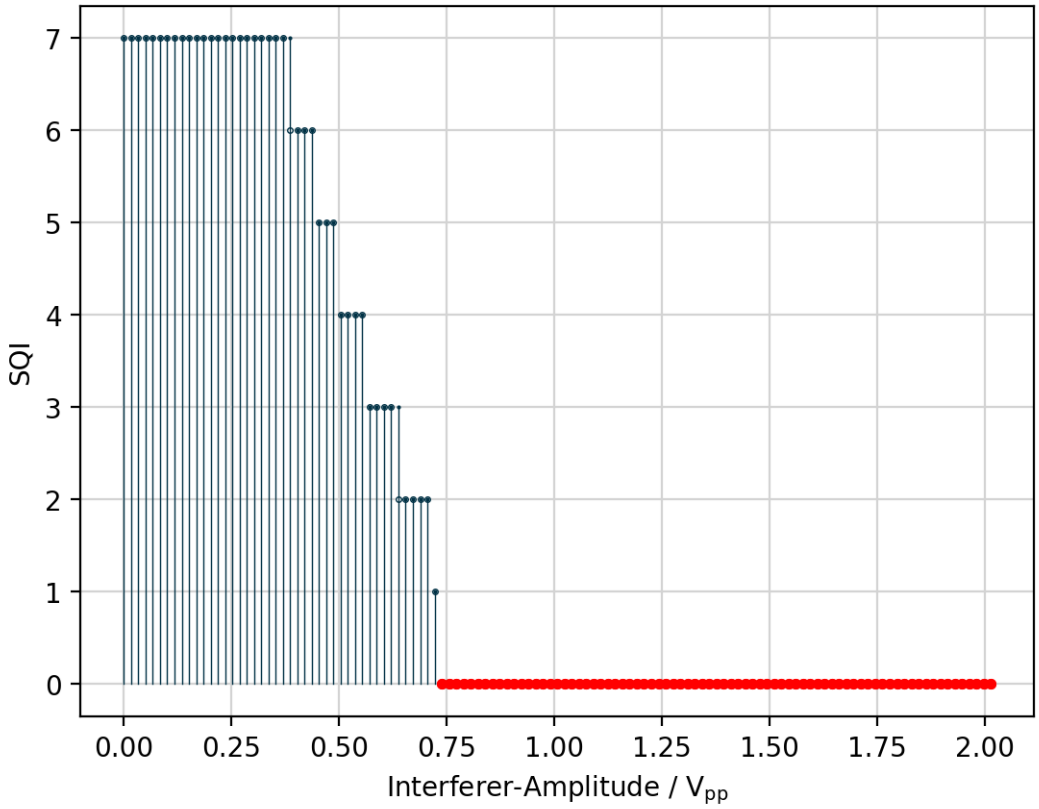

Figure 18: 100BASE_T1_IOP_24b_SR_M_S_C1_T1

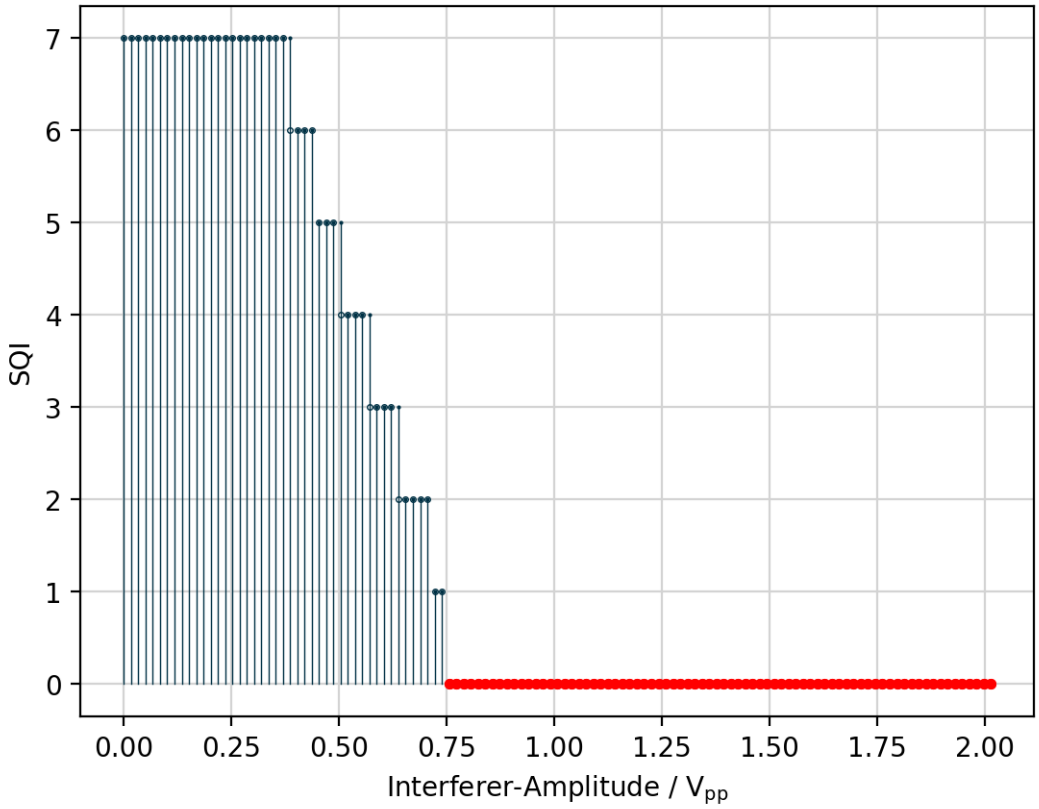

Figure 19: 100BASE_T1_IOP_24b_SR_S_M_C1_T1

8 Annex

8.1 Result description

Result/Status	Meaning/Description
PASS	the expected results from the test specification are fulfilled
FAIL	• the expected results from the test specification are not fulfilled or **or** • the device lacks the functionality to execute the test case
PASS with remark	the expected results from the test specification are fulfilled, but observations were also made during test execution
INCONCLUSIVE	one or more results are not within the test specification with complete measurement uncertainty
IN PROGRESS	the test case has not yet been completed (*only in preliminary test reports*)
NOT APPLICABLE	this (optional) test case is not applicable to the device
NOT SUPPORTED	the optional functionality shown in this test case is not supported by the device
NOT TESTED	• not included in the order *or* • not feasible by C&S
INFO	the test case is performed in addition to the scope of the order and for informational purposes only