AN113

Bidirectional MultiFiber Insertion and Return Loss Testing Using OP725-OP940 and Two OP720s

Software and cable configurations that will yield high quality return loss measurements

Overview

With 100G Ethernet and beyond quickly becoming the standard for the fiber optics communication industry, many cable manufacturers want to be able to test multifiber cables with relative speed and ease. Using an OP725-OP940 and two 1xN OP720 switches with OPL-MAX, an operator can test bidirectional insertion loss and return loss on high-fiber-count cables.

The test setup should be as follows:

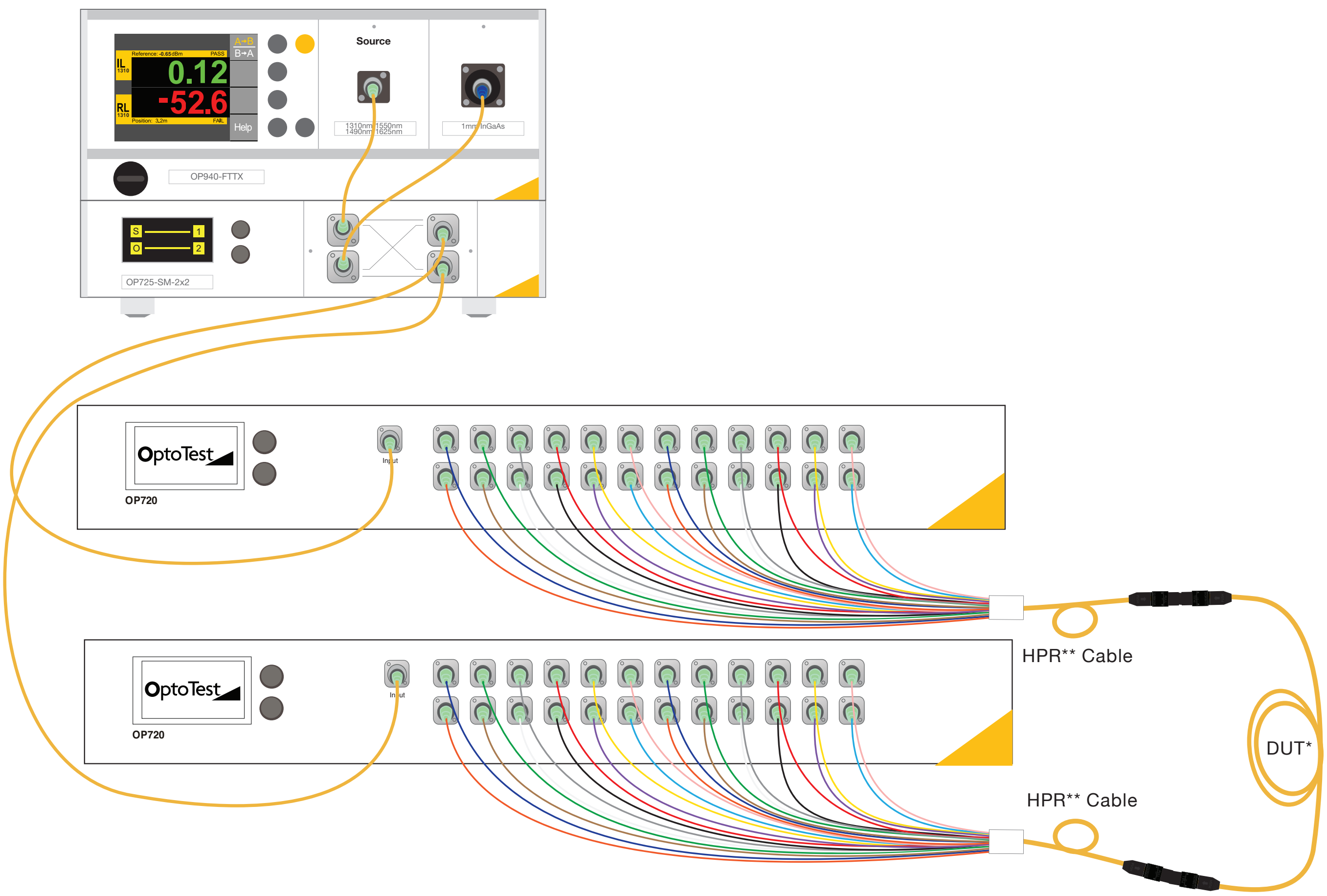

Figure 1: Test setup for measuring IL/RL bidirectionally for multiple channels

The OP725-OP940, Bidirectional Insertion Loss and Return Loss Test System, connects to the inputs of each OP720. HPR cables are then connected to the output of the OP720 (up to 144 channels) which then connect to fanouts with the DUT residing between these fanouts; an MPO ribbon fiber DUT is used in this illustration.

*DUT: Device Under Test

SANTEC CORPORATION
5823 Ohkusa-Nenjozaka, Komaki,
Aichi 485-0802, Japan
+81-568-79-3536

santec
www.santec.com
The Photonics Pioneer

SANTEC USA CORPORATION
USA Toll Free +1-800-726-8321

SANTEC EUROPE LIMITED
Tel. +44-20-3176-1550

santec
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OPL-MAX Test Sequence

Configuring OPL-Max to run correctly with this configuration is similar to configuring a multi-channel OP725-OP940. For a 12-fiber MPO cable, the sequence file should be as follows:

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U
10																					
11		Description	Source Instrument				OPM						Return Loss		Alternate Reference						
12	Seq	Sequence Label	Source Instrument	Source Channel	WavelengthA	WavelengthB	OPM Rack	OPM Channel	Termination for Pass/Fail	Measurement Type	Delay	Comment	Reflection Number	Reference Channel	Reference Module	Reference Channel	14dB offset? 0=No, 1=Yes		Direction 1: A-B , 2: B-A	Assigned Source Channel	Assigned Power Meter
13	<num>	<string>	<num>	<num>	<num>	<num>	<num>	<num>													
14	1	Ch1 A-B	RL1	1	1310	1550	OPMRL1	1	2	1	0		1	1	OPMRL1	1	0		1	1	2
15	2	Ch2 A-B	RL1	2	1310	1550	OPMRL1	2	2	1	0		1	2	OPMRL1	2	0		1	1	2
16	3	Ch3 A-B	RL1	3	1310	1550	OPMRL1	3	2	1	0		1	3	OPMRL1	3	0		1	1	2
17	4	Ch4 A-B	RL1	4	1310	1550	OPMRL1	4	2	1	0		1	4	OPMRL1	4	0		1	1	2
18	5	Ch5 A-B	RL1	5	1310	1550	OPMRL1	5	2	1	0		1	5	OPMRL1	5	0		1	1	2
19	6	Ch6 A-B	RL1	6	1310	1550	OPMRL1	6	2	1	0		1	6	OPMRL1	6	0		1	1	2
20	7	Ch7 A-B	RL1	7	1310	1550	OPMRL1	7	2	1	0		1	7	OPMRL1	7	0		1	1	2
21	8	Ch8 A-B	RL1	8	1310	1550	OPMRL1	8	2	1	0		1	8	OPMRL1	8	0		1	1	2
22	9	Ch9 A-B	RL1	9	1310	1550	OPMRL1	9	2	1	0		1	9	OPMRL1	9	0		1	1	2
23	10	Ch10 A-B	RL1	10	1310	1550	OPMRL1	10	2	1	0		1	10	OPMRL1	10	0		1	1	2
24	11	Ch11 A-B	RL1	11	1310	1550	OPMRL1	11	2	1	0		1	11	OPMRL1	11	0		1	1	2
25	12	Ch12 A-B	RL1	12	1310	1550	OPMRL1	12	2	1	0		1	12	OPMRL1	12	0		1	1	2
26	13	Ch1 B-A	RL1	1	1310	1550	OPMRL1	1	2	1	0		1	1	OPMRL1	1	0		2	1	2
27	14	Ch2 B-A	RL1	2	1310	1550	OPMRL1	2	2	1	0		1	2	OPMRL1	2	0		2	1	2
28	15	Ch3 B-A	RL1	3	1310	1550	OPMRL1	3	2	1	0		1	3	OPMRL1	3	0		2	1	2
29	16	Ch4 B-A	RL1	4	1310	1550	OPMRL1	4	2	1	0		1	4	OPMRL1	4	0		2	1	2
30	17	Ch5 B-A	RL1	5	1310	1550	OPMRL1	5	2	1	0		1	5	OPMRL1	5	0		2	1	2
31	18	Ch6 B-A	RL1	6	1310	1550	OPMRL1	6	2	1	0		1	6	OPMRL1	6	0		2	1	2
32	19	Ch7 B-A	RL1	7	1310	1550	OPMRL1	7	2	1	0		1	7	OPMRL1	7	0		2	1	2
33	20	Ch8 B-A	RL1	8	1310	1550	OPMRL1	8	2	1	0		1	8	OPMRL1	8	0		2	1	2
34	21	Ch9 B-A	RL1	9	1310	1550	OPMRL1	9	2	1	0		1	9	OPMRL1	9	0		2	1	2
35	22	Ch10 B-A	RL1	10	1310	1550	OPMRL1	10	2	1	0		1	10	OPMRL1	10	0		2	1	2
36	23	Ch11 B-A	RL1	11	1310	1550	OPMRL1	11	2	1	0		1	11	OPMRL1	11	0		2	1	2
37	24	Ch12 B-A	RL1	12	1310	1550	OPMRL1	12	2	1	0		1	12	OPMRL1	12	0		2	1	2
38																					

Figure 2: Sequence file for 12-fiber MPO cable

As with all sequence files, Column D will specify which fiber in the cable will be tested, Columns E and F will specify wavelength(s) and Columns G and H specify the power meter and channel used for testing. In the case of the bidirectional test with an OP725-OP940, these Columns G and H, as above, should read "OPMRL1" and "1-12", respectively.

Since the distance from the front panel to the RL reference is not guaranteed to be the same for both directions, it is advised that Column N appears as shown above. The "1" in the first channel in the forward direction (coming from the A-B port) and a "-1" for the remaining channels in that direction will allow the RL Reference to be copied from the first channel to all forward direction channels. Likewise, a "2" and "-2" for the reverse direction (coming from the B-A port) channels will have the same effect, but allow for these channels to be referenced separately from the forward channels.

Columns S,T, and U are the only fundamental departure from a standard sequence file since it is not necessary to include on unidirectional sequence files. For all forward direction channels, columns should read "1" and for all reverse direction channels, this column should read "2".

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Referencing Instructions

Bidirectional Insertion Loss Reference

To properly reference insertion loss bidirectionally, connect the launch leads from the A-B/B-A source connectors to the input ports of the two switches. Do not use the external power meter port for reference. Connect the reference fanout from the A-B switch to the reference fanout on the B-A switch via a mating adapter and perform an insertion loss reference in the software. This will perform two separate reference cycles—one for the A-B direction and one for the B-A direction.

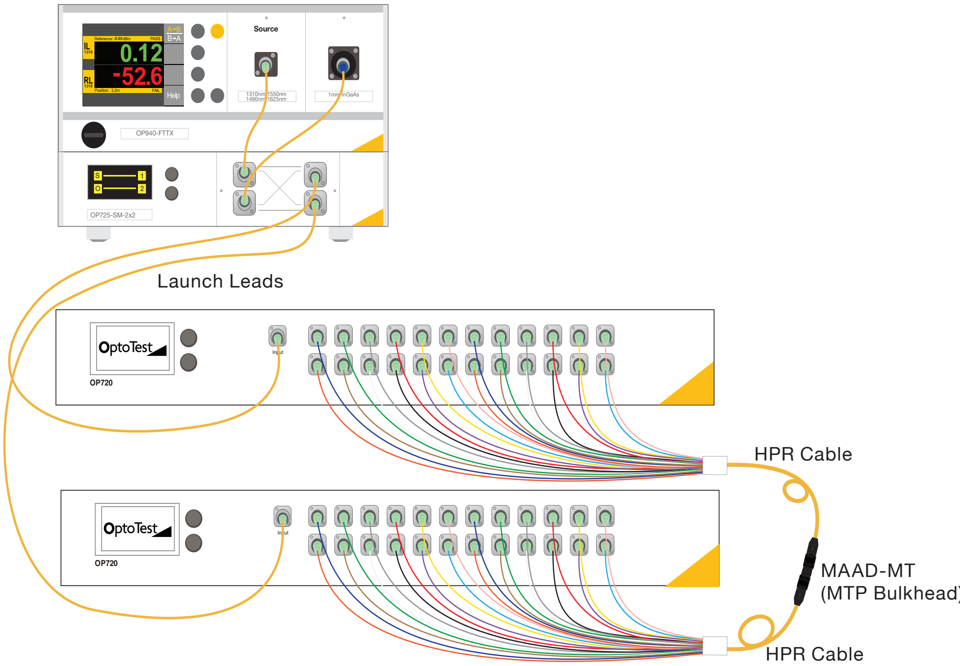

Figure 3: Test setup for measuring bidirectional insertion loss

Bidirectional Return Loss Reference

To reference return loss for a bidirectional test system, connect the system as above leaving end faces open between the two HPR cables to create the Fresnal reflection *(if either fanout is terminated in an APC connector, an APC-to-PC stub will need to be utilized to produce an adequate reference reflection)*. Once the reflection is established, perform a return loss reference cycle in the software. During the reference cycle, the unit will reference both in the A-B direction and the B-A direction and retain these distances separately for their respective measurement cycles.

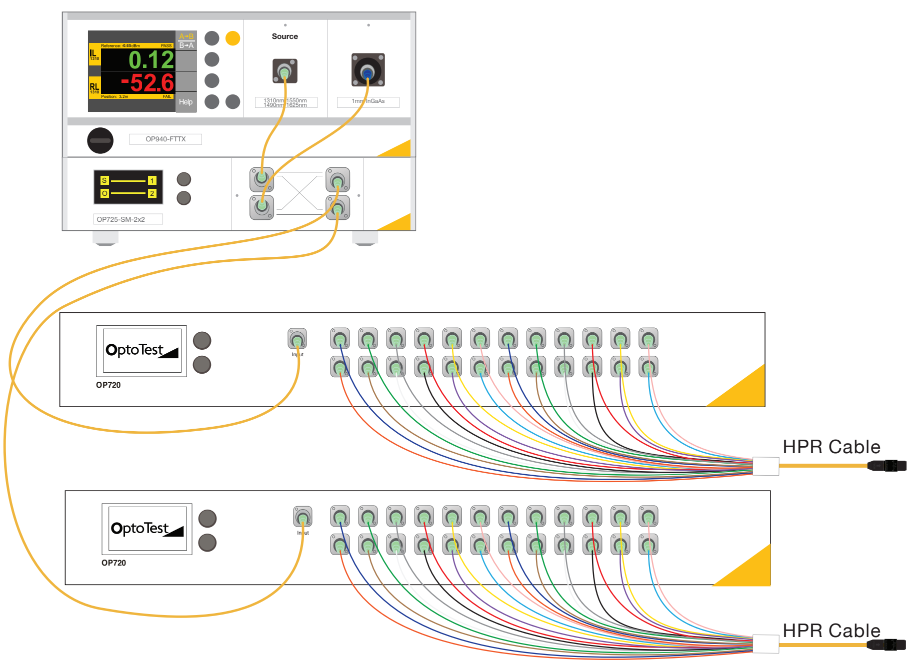

Figure 4: Test setup for measuring bidirectional return loss

SANTEC CORPORATION
5823 Ohkusa-Nenjozaka, Komaki,
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USA Toll Free +1-800-726-8321

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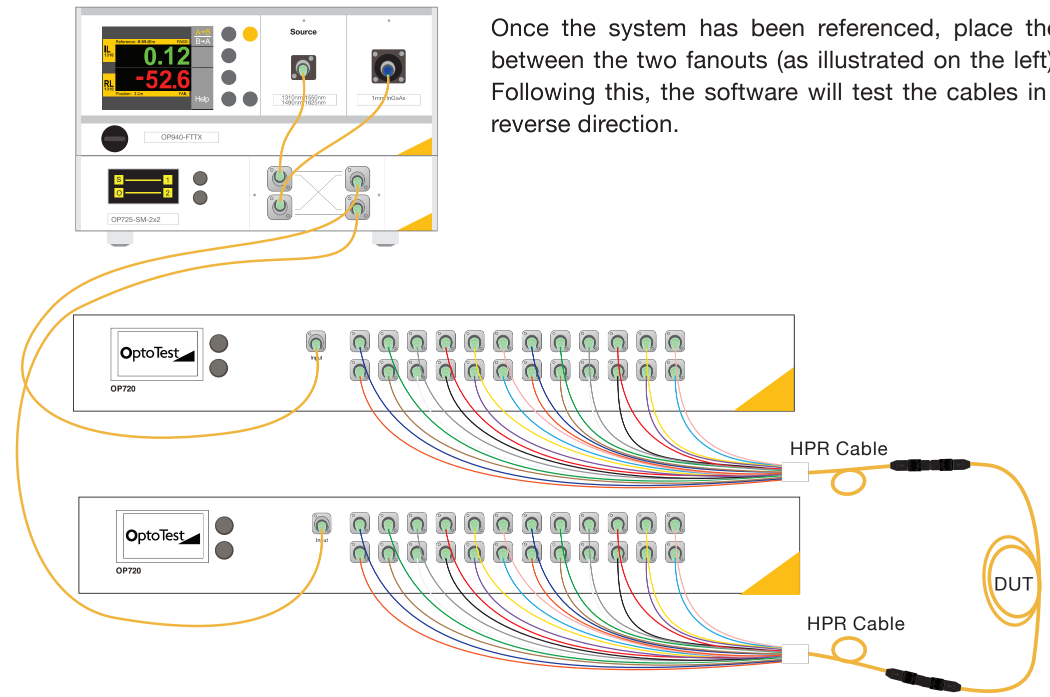
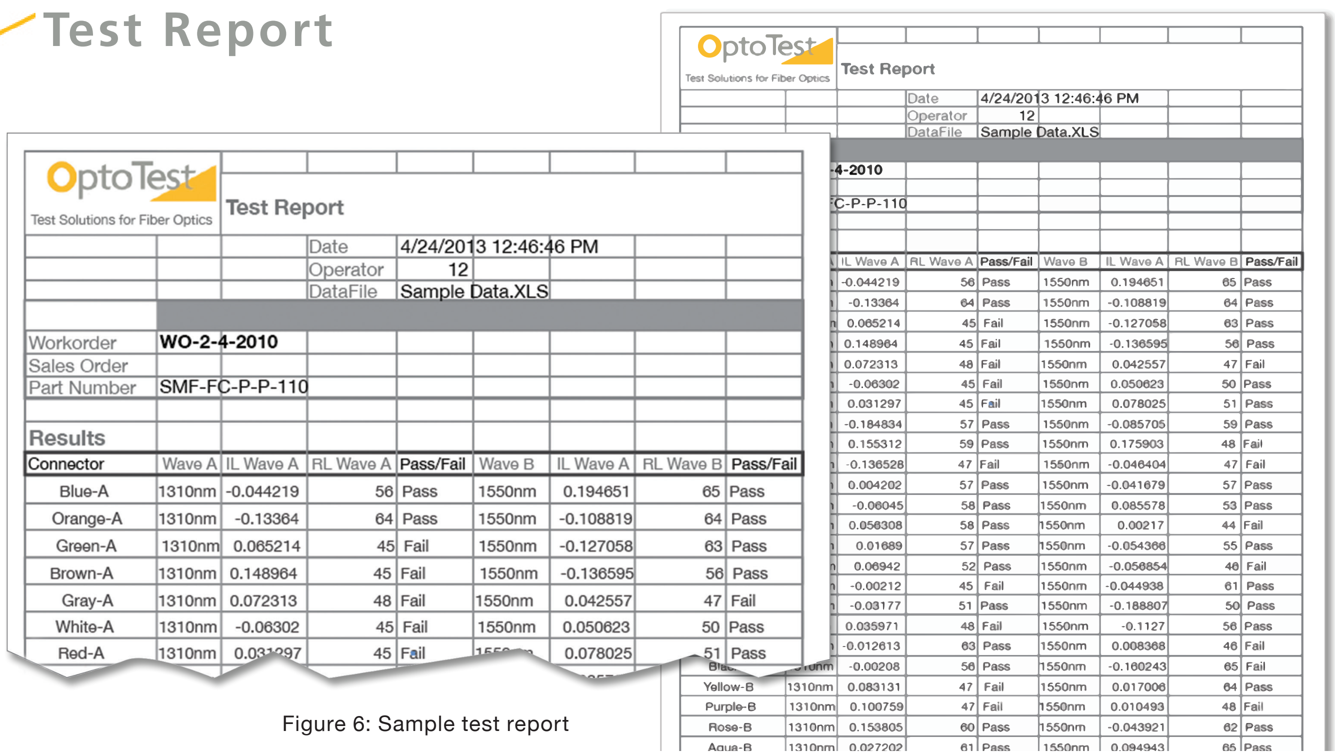
Measurement Instructions



Once the system has been referenced, place the device-under-test into the setup between the two fanouts (as illustrated on the left) and simply select the Test option. Following this, the software will test the cables in the forward direction and then the reverse direction.

Figure 5: Test setup after system has been referenced

Test Report



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Test Solutions for Fiber Optics

Test Report

Date	4/24/2013 12:46:46 PM
Operator	12
DataFile	Sample Data.XLS

Workorder	WO-2-4-2010
Sales Order	
Part Number	SMF-FC-P-P-110

Results

Connector	Wave A	IL Wave A	RL Wave A	Pass/Fail	Wave B	IL Wave A	RL Wave B	Pass/Fail
Blue-A	1310nm	-0.044219	56	Pass	1550nm	0.194651	65	Pass
Orange-A	1310nm	-0.13364	64	Pass	1550nm	-0.108819	64	Pass
Green-A	1310nm	0.065214	45	Fail	1550nm	-0.127058	63	Pass
Brown-A	1310nm	0.148964	45	Fail	1550nm	-0.136595	56	Pass
Gray-A	1310nm	0.072313	48	Fail	1550nm	0.042557	47	Fail
White-A	1310nm	-0.06302	45	Fail	1550nm	0.050623	50	Pass
Red-A	1310nm	0.031297	45	Fail	1550nm	0.078025	51	Pass

Connector	Wave A	IL Wave A	RL Wave A	Pass/Fail	Wave B	IL Wave A	RL Wave B	Pass/Fail
		-0.044219	56	Pass	1550nm	0.194651	65	Pass
		-0.13364	64	Pass	1550nm	-0.108819	64	Pass
		0.065214	45	Fail	1550nm	-0.127058	63	Pass
		0.148964	45	Fail	1550nm	-0.136595	56	Pass
		0.072313	48	Fail	1550nm	0.042557	47	Fail
		-0.06302	45	Fail	1550nm	0.050623	50	Pass
		0.031297	45	Fail	1550nm	0.078025	51	Pass
		-0.184834	57	Pass	1550nm	-0.085705	59	Pass
		0.155312	59	Pass	1550nm	0.175903	48	Fail
		-0.136528	47	Fail	1550nm	-0.046404	47	Fail
		0.004202	57	Pass	1550nm	-0.041679	57	Pass
		-0.06045	58	Pass	1550nm	0.085578	53	Pass
		0.056308	58	Pass	1550nm	0.00217	44	Fail
		0.01689	57	Pass	1550nm	-0.054366	55	Pass
		0.06942	52	Pass	1550nm	-0.056854	46	Fail
		-0.00212	45	Fail	1550nm	-0.044938	61	Pass
		-0.03177	51	Pass	1550nm	-0.188807	50	Pass
		0.035971	48	Fail	1550nm	-0.1127	56	Pass
		-0.012613	63	Pass	1550nm	0.008368	46	Fail
Blac	1310nm	-0.00208	56	Pass	1550nm	-0.160243	65	Fail
Yellow-B	1310nm	0.083131	47	Fail	1550nm	0.017006	64	Pass
Purple-B	1310nm	0.100759	47	Fail	1550nm	0.010493	48	Fail
Rose-B	1310nm	0.153805	60	Pass	1550nm	-0.043921	62	Pass
Aqua-B	1310nm	0.027202	61	Pass	1550nm	0.094943	65	Pass

Figure 6: Sample test report

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