

## 1.85mm/2.4mm/2.92mm/3.5mm Series High Frequency Coaxial Cable Assembly

### 1. INTRODUCTION

#### 1.1 Purpose

Testing was performed on the TE connectivity (TE) 1.85mm/2.4mm/2.92mm/3.5mm Series High Frequency Coaxial Cable Assembly and connectors to determine their conformance to the requirements of Product Specification 108-160049 Revision 1.

#### 1.2 Scope

This report covers the electrical, mechanical, and environmental performance of the 1.85mm/2.4mm/2.92mm/3.5mm Series Radio Frequency Coaxial Cable Assembly and Connectors.

#### 1.3 Conclusion

All of the 1.85mm/2.4mm/2.92mm/3.5mm Series Radio Frequency Coaxial Cable Assembly and Connectors part number listed in paragraph 1.5, conformed to the electrical, mechanical, and environmental performance requirements of Product Specification 108-160049, Revision A

#### 1.4 Product Description

The TE Connectivity 1.85mm/2.4mm/2.92mm/3.5mm interface connectors and Radio Frequency Coaxial Cable Assembly products are designed with innovative features, optimized performance, and full compatibility with all industry standard 1.85mm/2.4mm/2.92mm/3.5mm RF interconnect products. 1.85mm/2.4mm/2.92mm/3.5mm interface connectors series include: screw, hand screw, quick lock install method.

#### 1.5 Test Specimens

Table 1 – Test Specimens

Specimens list of cable assembly for testing				
Test Group	Sample			
	Part Number	Description	Qty	Note
1	1-2016659-0	Cable assembly 1.85mm Female to 1.85mm Female	1	Mechanical: Flexure test
	1-2016661-0	Cable assembly 2.40 plug to 2.40 plug	1	
	1-2016662-0	Cable assembly 2.92 plug to 2.92 plug	1	
	1-2016663-0	Cable assembly 3.50 plug to 3.50 plug	1	
2	1-2016659-0	Cable assembly 1.85mm Female to 1.85mm Female	1	Mechanical: cable crushing test
	1-2016661-0	Cable assembly 2.40 plug to 2.40 plug	1	
	1-2016662-0	Cable assembly 2.92 plug to 2.92 plug	1	
	1-2016663-0	Cable assembly 3.50 plug to 3.50 plug	1	
3	1-2016659-0	Cable assembly 1.85mm Female to 1.85mm Female	1	Mechanical: cable pulling test
	1-2016661-0	Cable assembly 2.40 plug to 2.40 plug	1	
	1-2016662-0	Cable assembly 2.92 plug to 2.92 plug	1	
	1-2016663-0	Cable assembly 3.50 plug to 3.50 plug	1	

**1.6 Test Sequence**

**Table 2 - Test Sequences**

Test or Examination	Test Group (a)		
	1	2	3
	Test Sequences (b)		
Initial Examination of Product	1	1	1
Visual inspection	2	2	2
Interface dimensions	3	3	3,6
VSWR/IL	5,7	5,7	
Mechanical phase stable	8	8	
Mechanical amplitude stable	9	9	
Mechanical Compatibility	4	4	4
Flexure test	6		
Cable crushing test		6	
Cable pulling test			5

**NOTE**

(a) See paragraph 1.5  
 (b) Numbers indicate sequence in which tests were performed

**1.7 Environmental Conditions**

Unless otherwise stated, the following environmental conditions prevailed during testing:

Temperature: 15°C to 35°C  
 Relative Humidity 20% to 80%

**2. SUMMARY OF TESTING**

**2.1 Visual Inspection – All Groups**

A Certificate of Conformance stating that all specimens submitted for testing were representative of normal production lots and met the requirements of the applicable product drawing was provided. Where specified, specimens were visually examined, and no evidence of physical damage detrimental to product performance was observed.

The result is pass.

**2.2 Mechanical Compatibility –All Groups**

The mating face of the specimens shall be compatibility with the gauges which base on the IEC 61169-32 industry specifications.

The result is pass.

**2.3 Impedance –All Groups**

The impedance can meet specification defined 50+/-2ohm

The result is pass.

**2.3 Flexure – Test Groups 1**

After the test, the cable assembly interface dimensions shall be within the specified limits. Electrical test requirement stated in the relevant detail specification shall be complied with.

The result is pass.

1.85mm cable assembly

Item	Inspection	Instrument	Testing Data							Result
			NO	first time	10000times	12000times	/	/	/	
Appearance of bending point	NO damage to the bending part of the wire	visual	/	OK	OK	OK	/	/	/	PASS
VSWR	0-67GHZ <1.30	Network analyzer	S11	1.24	1.25	1.25	/	/	/	PASS
			S22	1.21	1.21	1.22	/	/	/	PASS
IL	0-67GHZ -7.0dB/Min	Network analyzer	S21	-5.95	-5.95	-5.98	/	/	/	PASS
Mechanical phase stability	$\leq \pm 5^\circ$	Network analyzer	S21	1.13°	1.12°	1.17°	/	/	/	PASS
Mechanical amplitude stability	$\leq \pm 0.05\text{dB}$	Network analyzer	S21	-0.01	-0.01	-0.01	/	/	/	PASS

### 2.40mm cable assembly

Item	Inspection	Instrument	Testing Data							Result
			NO	first time	10000times	20000times	/	/	/	
Appearance of bending point	NO damage to the bending part of the wire	visual	/	OK	OK	OK	/	/	/	PASS
VSWR	0-50GHZ <1.30	Network analyzer	S11	1.21	1.21	1.22	/	/	/	PASS
			S22	1.19	1.20	1.21	/	/	/	PASS
IL	0-50GHZ -4.3dB/Min	Network analyzer	S21	-3.74	-3.76	-3.81	/	/	/	PASS
Mechanical phase stability	$\leq \pm 5^\circ$	Network analyzer	S12	374.59m°	-369.81m°	-379.25m°	/	/	/	PASS
Mechanical amplitude stability	$\leq \pm 0.05\text{dB}$	Network analyzer	S21	-0.01	-0.01	-0.03	/	/	/	PASS

### 2.92mm cable assembly

Item	Inspection	Instrument	Testing Data							Result
			NO	first time	10000times	12000times	/	/	/	
Appearance of bending point	NO damage to the bending part of the wire	visual	/	OK	OK	OK	/	/	/	PASS
VSWR	0-40GHZ <1.30	Network analyzer	S11	1.1609	1.1684	1.1824	/	/	/	PASS
			S22	1.1612	1.1635	1.1699	/	/	/	PASS
IL	0-40GHZ -3.9dB/Min	Network analyzer	S21	-3.1117	-3.1296	-3.2547	/	/	/	PASS
Mechanical phase stability	$\leq \pm 5^\circ$	Network analyzer	S12	512.32m°	542.87m°	536.54m°	/	/	/	PASS
Mechanical amplitude stability	$\leq \pm 0.05\text{dB}$	Network analyzer	S21	-0.039	-0.027	-0.041	/	/	/	PASS

### 3.50mm cable assembly

Item	Inspection	Instrument	Testing Data							Result
			NO	first time	10000 times	120000 times	/	/	/	
Appearance of bending point	NO damage to the bending part of the wire	visual	/	OK	OK	OK	/	/	/	OK
VSWR	0-26.5GHZ <1.30	Network analyzer	S11	1.2097	1.2085	1.2241	/	/	/	PASS
			S22	1.2073	1.2109	1.2056	/	/	/	PASS
IL	0-26.5GHZ -3.2dB/Min	Network analyzer	S21	-2.5028	-2.4987	-2.5097	/	/	/	PASS
Mechanical phase stability	$\leq \pm 5^\circ$	Network analyzer	S12	-175.83m°	-181.56m°	-187.36m°	/	/	/	PASS
Mechanical amplitude stability	$\leq \pm 0.05\text{dB}$	Network analyzer	S21	-0.025	-0.019	-0.028	/	/	/	PASS

## 2.4 Cable Assembly Crushing – Test Groups 2

After the test, the cable assembly Electrical test requirement stated in the relevant detail specification shall be complied with.

The result is pass.  
1.85mm cable assembly

Item	Inspection	Instrument	Testing Data							Result
			NO	first time	After the compressive	/	/	/	/	
Appearance	There is no physical damage	visual	/	OK	OK	/	/	/	/	PASS
VSWR	0-67GHZ <1.30	Network analyzer	S11	1.25	1.25	/	/	/	/	PASS
			S22	1.22	1.22	/	/	/	/	PASS
IL	0-67GHZ -7.0dB/Min	Network analyzer	S21	-5.87	-5.92	/	/	/	/	PASS
Mechanical phase stability	$\leq \pm 5^\circ$	Network analyzer	S21	1.13°	1.11°	/	/	/	/	PASS
Mechanical amplitude stability	$\leq \pm 0.05\text{dB}$	Network analyzer	S21	-0.01	-0.01	/	/	/	/	PASS

2.40mm cable assembly

Item	Inspection	Instrument	Testing Data							Result
			NO	first time	After the compressive	/	/	/	/	
Appearance	There is no physical damage	visual	/	OK	OK	/	/	/	/	PASS
VSWR	0-50GHZ <1.30	Network analyzer	S11	1.22	1.22	/	/	/	/	PASS
			S22	1.21	1.22	/	/	/	/	PASS
IL	0-50GHZ -4.3dB/Min	Network analyzer	S21	-3.82	-3.84	/	/	/	/	PASS
Mechanical phase stability	$\leq \pm 5^\circ$	Network analyzer	S21	1.02°	1.04°	/	/	/	/	PASS
Mechanical amplitude stability	$\leq \pm 0.05\text{dB}$	Network analyzer	S21	-0.01	-0.01	/	/	/	/	PASS

2.92mm cable assembly

Item	Inspection	Instrument	Testing Data							Result
			NO	first time	After the compressive	/	/	/	/	
Appearance	There is no physical damage	visual	/	OK	OK	/	/	/	/	PASS
VSWR	0-40GHZ <1.30	Network analyzer	S11	1.22	1.22	/	/	/	/	PASS
			S22	1.18	1.19	/	/	/	/	PASS
IL	0-40GHZ -3.9dB/Min	Network analyzer	S21	-2.95	-2.92	/	/	/	/	PASS
Mechanical phase stability	$\leq \pm 5^\circ$	Network analyzer	S21	1.39°	1.35°	/	/	/	/	PASS
Mechanical amplitude stability	$\leq \pm 0.05\text{dB}$	Network analyzer	S21	-0.01	-0.02	/	/	/	/	PASS

3.50mm cable assembly

Item	Inspection	Instrument	Testing Data							Result
			NO	first time	After the compressive	/	/	/	/	
Appearance	There is no physical damage	visual	/	OK	OK	/	/	/	/	PASS
VSWR	0-26.5GHZ <1.30	Network analyzer	S11	1.15	1.16	/	/	/	/	PASS
			S22	1.15	1.15	/	/	/	/	PASS
IL	0-26.5GHZ -3.2dB/Min	Network analyzer	S21	-2.46	-2.47	/	/	/	/	PASS
Mechanical phase stability	$\leq \pm 5^\circ$	Network analyzer	S21	733.52m°	729.64m°	/	/	/	/	PASS
Mechanical amplitude stability	$\leq \pm 0.05\text{dB}$	Network analyzer	S21	-0.01	-0.01	/	/	/	/	PASS

## 2.5 Cable pulling – Test Groups 3

After the test, neither the dielectric nor the sheath shall have moved in relation to the cable outlet of the connector.

The result is pass.

**1.85mm cable assembly**

Item	Inspection	Instrument	Testing Data: Unit(lbf )				Result
Cable Retention Force	>30 lbs	Tensile testing machine	67.5	71.3	/	/	PASS

**2.40mm cable assembly**

Item	Inspection	Instrument	Testing Data: Unit(lbf )				Result
Cable Retention Force	>30 lbs	Tensile testing machine	61.6	70.2	/	/	PASS

**2.92mm cable assembly**

Item	Inspection	Instrument	Testing Data: Unit(lbf )				Result
Cable Retention Force	>30 lbs	Tensile testing machine	75.1	70.5	/	/	PASS

**3.5mm cable assembly**

Item	Inspection	Instrument	Testing Data: Unit(lbf )				Result
Cable Retention Force	>30 lbs	Tensile testing machine	80.7	89.1	/	/	PASS

**3. TEST METHODS**

**3.1 Visual Examination**

A Certificate of Conformance was issued stating that all specimens have been produced, inspected, and accepted as conforming to product drawing requirements, and made using the same core manufacturing processes and technologies as production parts. Where specified, specimens were visually examined and no evidence of physical damage detrimental to product performance was observed. Testing was performed in accordance with Test Specification EIA-364-18B.

**3.2 Flexure**

The test shall be performed using a fixture as shown in Figure and below requirement.

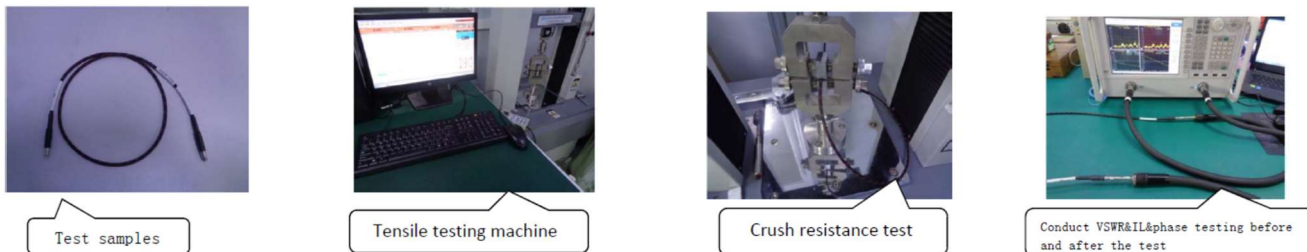
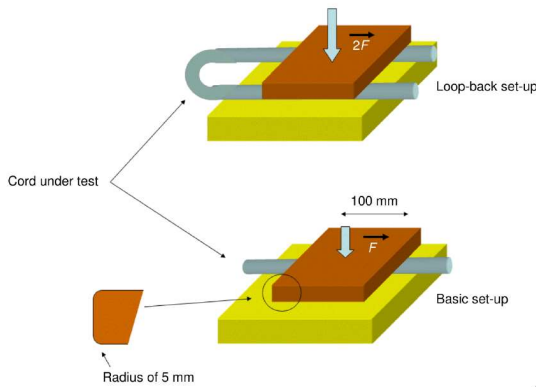
- 1) Apply 300g weight,
- 2) A flexure is a rotation of the fixture of +/-60°
- 3) The rate of flexure shall be 20 per minute
- 4) Number of flexures: 10000 and 12000 times
- 5) Visual inspection and electrical test (VSWR, Insertion Loss, Mechanical phase stability and Amplitude stability)



### 3.3 Flexure

A force  $F$  shall be applied to a test fixture as shown in Figure at the rate of  $0, 2F$  per second maximum. The force shall then be maintained for  $60 \pm 10$ S.

- 1) Value of the force  $F$ , 1000N,
- 2) Distance from the test region to one of the connectors, normally 1m maximum
- 3) Visual inspection and electrical test (VSWR, Insertion Loss, Mechanical phase stability and Amplitude stability)



### 3.4 Pulling

The cable as specified in the relevant specification shall be attached to the connector in accordance with TE specification. A tensile force as specified by the relevant specification shall be applied to the free end of the cable, The force shall then be maintained for  $60 \pm 10$ S.

- 1) Value of the force  $F$ , 133N min,
- 2) Value of force, method of application and its point of application;
- 3) Duration of application of force if other than 60s min

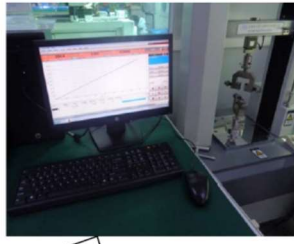


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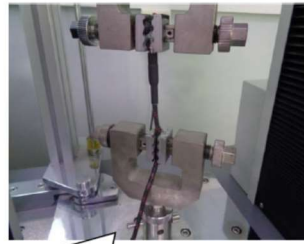




Test samples



Tensile testing machine



Cable retention force is testing



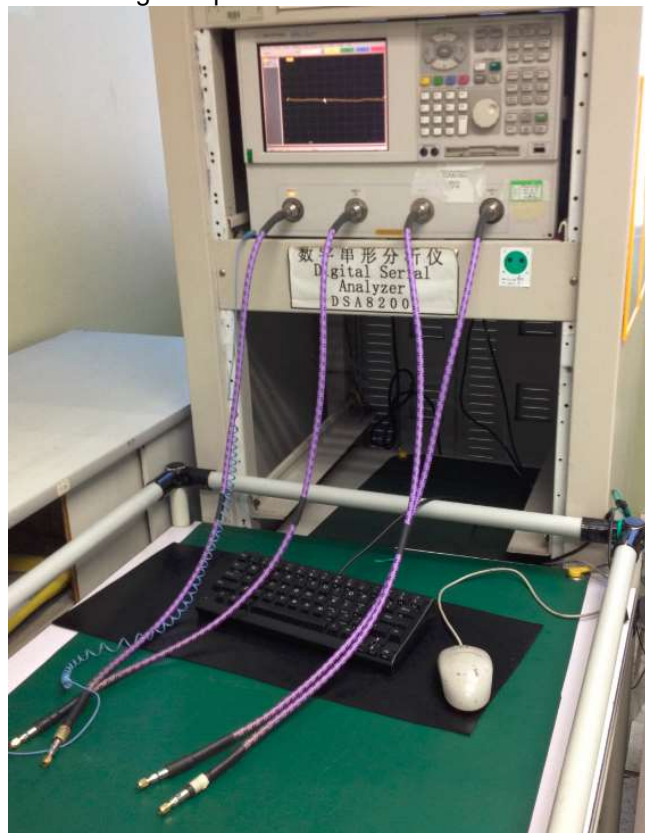
Test Data

### 3.5 Insertion Loss / VSWR / Impedance/mechanical phase and amplitude stability

The return loss and Insertion Loss was performed using an Agilent PNA Network Analyzer. The 1.85mm/2.4mm/2.92mm/3.5mm to 3.5mm (m) adapter was connected to port 1 and port 2 of the network analyzer. The network analyzer was set to collect 501 data points across a frequency range of 50.0 MHz to 67.0 GHz with a bandwidth of 1 kHz in step mode.

A full 2 port calibration was performed employing the precision calibration Kit. After calibration either the 1.85mm/2.4mm/2.92mm/3.5mm to 3.5mm (m) adapter was added to adapt to the DUT and is included in the final return loss and Insertion Loss measurement.

The test specimens on cables were placed between port 1 and port 2 of the network analyzer. A S22, S12 measurement was performed driven. Testing was performed in accordance with Test Specification EIA-364-108.



## Change history:

REV	DATE (DD-MM-YY)	CATEGORY	ADDITIONS, DELETIONS, CHANGES
1	08-July-2020	All	Preliminary version
2	15-July-2020	All	Used the latest template