

WIDE BAND COUPLER TEST REPORT

QUALIFICATION: TELCORDIA GR-1209-CORE

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DATE: November, 2011

1. Purpose:

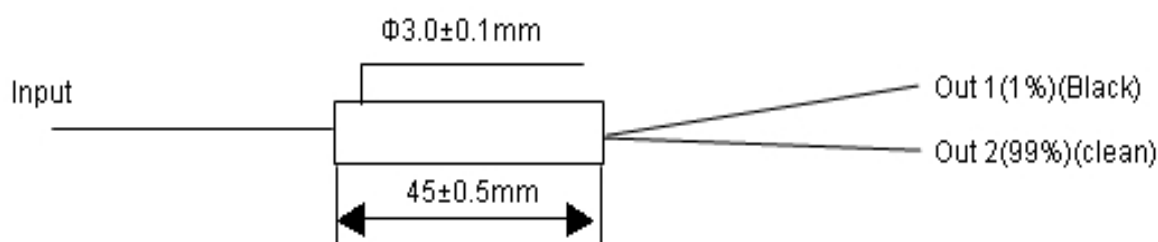
The Purpose of this qualification test is to demonstrate the PuHuiXing technology Co., LTD optical fiber wide band coupler meet the TELCORDIA GR-1209-CORE specifications. And qualify PuHuiXing technology coupler manufacturing processes.

Note: Telcordia Technologies Generic Requirements GR-1209-CORE Issue 4, September 2010

2. Sample description

All the samples used in this qualification test were manufactured at PuHuiXing technology product line in July 2011. The 1550nm wide band coupler (WBC) with coupling ratio of 1/99 were built according to company standard manufacture processes and met the product specifications. Eleven devices in total were randomly picked from the product line.

3. Device Configuration (Unit: mm)



4. Test Equipment

All test and measurement equipment are within the manufacturer suggested calibration period and were certified by the relative calibration centers in China.

- (1) Temperature and humidity chamber (RGDJ-150)
- (2) Optical spectrum analyzer (Ando AQ6317B)
- (3) Optical power meter (Ando Q8221)
- (4) Stable optical light source (PuHuiXing technology Co., LTD 1550 DFB-LD)
- (5) Fusion splicer (Fujikura FSM-60S).

5. Environmental and Mechanical Test Including:

- Temperature-Humidity Aging Test
- Temperature-Humidity Cycling Test
- Water immersion Test
- Vibration Test
- Side Pull Test
- Cable retention Test
- Impact Test

6. Environmental and Mechanical Test Conditions:

6.1 Temperature-Humidity Aging Test

Temperature	$85 \pm 2^{\circ}\text{C}$
Humidity	$85 \pm 2\% \text{ RH}$
Test length	14 days (336 hours)

6.2 Temperature-Humidity Cycling Test

Temperature	$-40 \pm 2^{\circ}\text{C}$ to $75 \pm 2^{\circ}\text{C}$
Humidity	From 2 to 32°C , maintain a constant humidity: $80 \pm 2\% \text{ RH}$; From 32 to 75°C , maintain a constant humidity ratio of 0.024lb. of water per lb. of dry air; (Corresponds to 80 % RH at 32°C and 10 % RH at 75°C) Below $+2^{\circ}\text{C}$, humidity is uncontrolled
Test length	14 days (336 hours)

6.3 Water immersion Test

Water temperature	$43 \pm 2^{\circ}\text{C}$
Water PH value	5.5 ± 0.5
Test length	7 days (168 hours)

6.4 Vibration Test

Amplitude	1.52mm
Frequency	10—55—10 HZ
Test length	2 hours/each plane, total 3 planes

6.5 Side pulling Test

The load applied angle	90°
Load weight	0.5 - 1 lb
Test length	10 seconds/port

6.6 Cable Retention Test

Load weight	1 - 2.2 lb
Test length	1 minute/port

6.7 Impact Test

Drop height	1.8 meters
Withstand number	8 drops per axis, total 3 axes

7. Pass/fail criteria

Parameters	Allowable value after test
Upper stability insertion loss (1% port)	21.60 dB
Lower stability insertion loss (1% port)	18.20 dB
Upper stability insertion loss (99% port)	0.30 dB
Lower stability insertion loss (99% port)	0.03 dB

8. Test Procedures

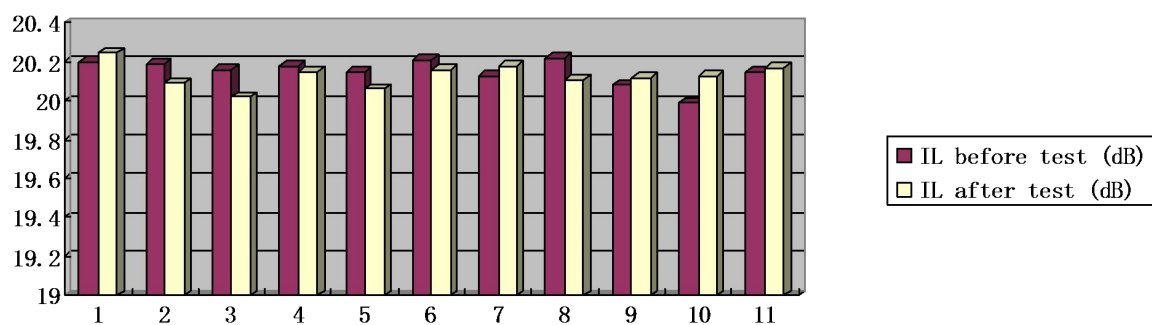
Note: IL is the acronym of Insertion Loss.
USL is acronym of Upper Stability Loss.
LSL is acronym of Lower Stability Loss.

8.1 Temperature-Humidity Aging Test

Table 1 The insertion loss before and after temperature –humidity aging test
(1% port)

No.	IL before test (dB)	IL after test (dB)	USL	LSL
1	20.20	20.25	21.60	18.20
2	20.19	20.09	21.60	18.20
3	20.16	20.02	21.60	18.20
4	20.18	20.15	21.60	18.20
5	20.15	20.06	21.60	18.20
6	20.21	20.16	21.60	18.20
7	20.13	20.18	21.60	18.20
8	20.22	20.11	21.60	18.20
9	20.08	20.12	21.60	18.20
10	19.99	20.13	21.60	18.20
11	20.15	20.17	21.60	18.20

Chart 1

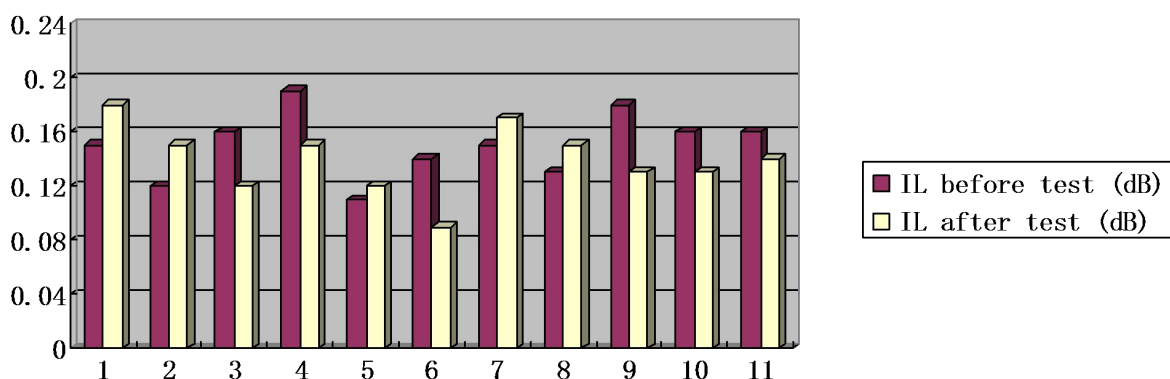


Sample number

Table 2 The insertion loss before and after temperature –humidity aging test
(99% port)

No.	IL before test (dB)	IL after test (dB)	USL	LSL
1	0.15	0.18	0.30	0.03
2	0.12	0.15	0.30	0.03
3	0.16	0.12	0.30	0.03
4	0.19	0.15	0.30	0.03
5	0.11	0.12	0.30	0.03
6	0.14	0.09	0.30	0.03
7	0.15	0.17	0.30	0.03
8	0.13	0.15	0.30	0.03
9	0.18	0.13	0.30	0.03
10	0.16	0.13	0.30	0.03
11	0.16	0.14	0.30	0.03

Chart 2



Sample number

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8.2 Temperature-Humidity Cycling Test

Table 3 The insertion loss before and after Temperature-Humidity Cycling test
(1% port)

No.	IL before test (dB)	IL after test (dB)	USL	LSL
1	20.25	20.22	21.60	18.20
2	20.09	20.12	21.60	18.20
3	20.02	20.11	21.60	18.20
4	20.15	20.22	21.60	18.20
5	20.06	19.95	21.60	18.20
6	20.16	20.20	21.60	18.20
7	20.18	20.12	21.60	18.20
8	20.11	20.13	21.60	18.20
9	20.12	20.21	21.60	18.20
10	20.13	20.10	21.60	18.20
11	20.17	20.13	21.60	18.20

Chart 3

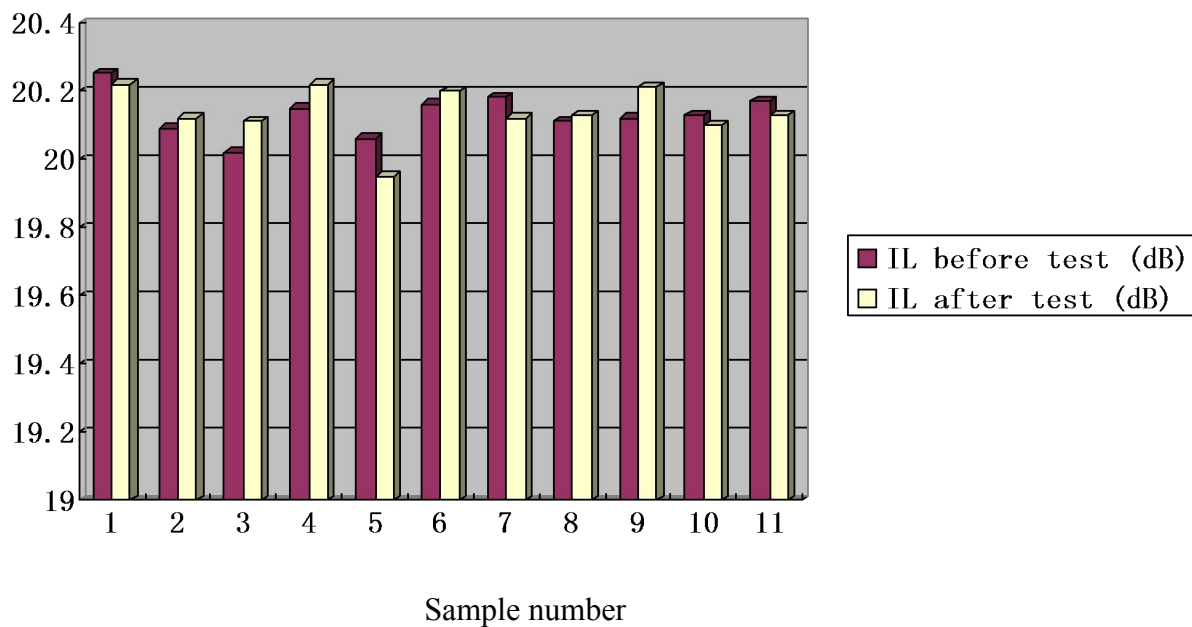
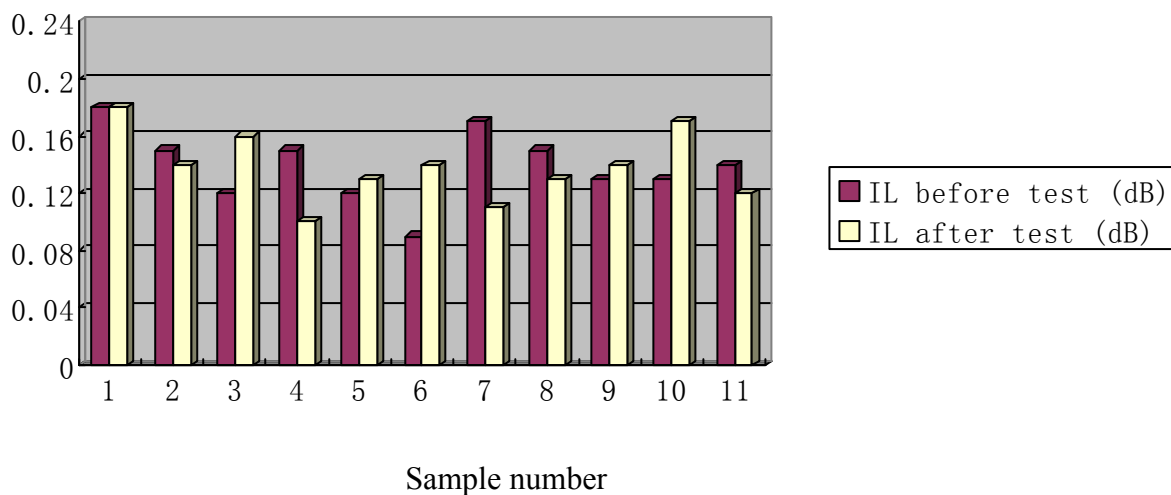


Table 4 The insertion loss before and after Temperature-Humidity Cycling test
(99% port)

No.	IL before test (dB)	IL after test (dB)	USL	LSL
1	0.18	0.18	0.30	0.03
2	0.15	0.14	0.30	0.03
3	0.12	0.16	0.30	0.03
4	0.15	0.10	0.30	0.03
5	0.12	0.13	0.30	0.03
6	0.09	0.14	0.30	0.03
7	0.17	0.11	0.30	0.03
8	0.15	0.13	0.30	0.03
9	0.13	0.14	0.30	0.03
10	0.13	0.17	0.30	0.03
11	0.14	0.12	0.30	0.03

Chart 4



The optical power were measured at temperature, +85 °C , +25 °C , and -40 °C each time, once per day. Only the insertion losses before and after Temperature-Humidity Cycling test were shown at this report.

8.3 Water Immersion Test

Table 5 The insertion loss before and after water immersion test

(1% port)

No.	IL before test (dB)	IL after 156 hours test (dB)	IL after 168 hours test (dB)	USL	LSL
1	20.22	20.10	20.09	21.60	18.20
2	20.12	20.06	20.04	21.60	18.20
3	20.11	20.12	20.12	21.60	18.20
4	20.22	20.25	20.26	21.60	18.20
5	19.95	20.01	20.03	21.60	18.20
6	20.20	20.11	20.10	21.60	18.20
7	20.12	20.13	20.10	21.60	18.20
8	20.13	20.04	20.03	21.60	18.20
9	20.21	20.09	20.07	21.60	18.20
10	20.10	20.08	20.09	21.60	18.20
11	20.13	20.11	20.12	21.60	18.20

Chart 5

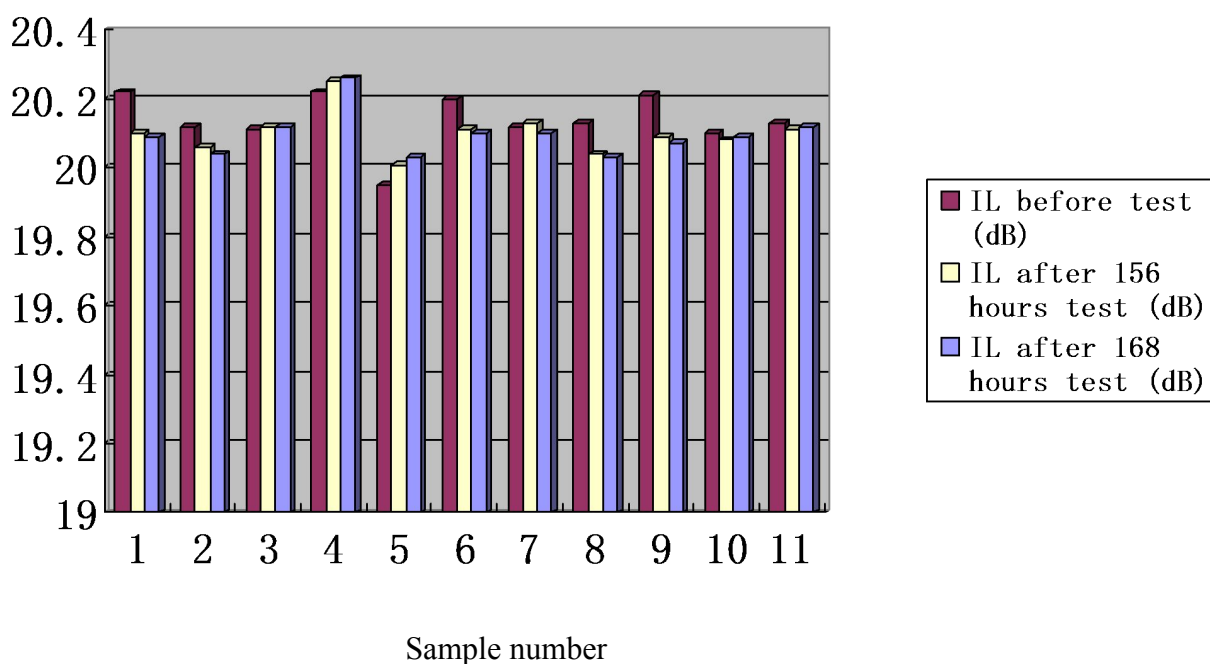
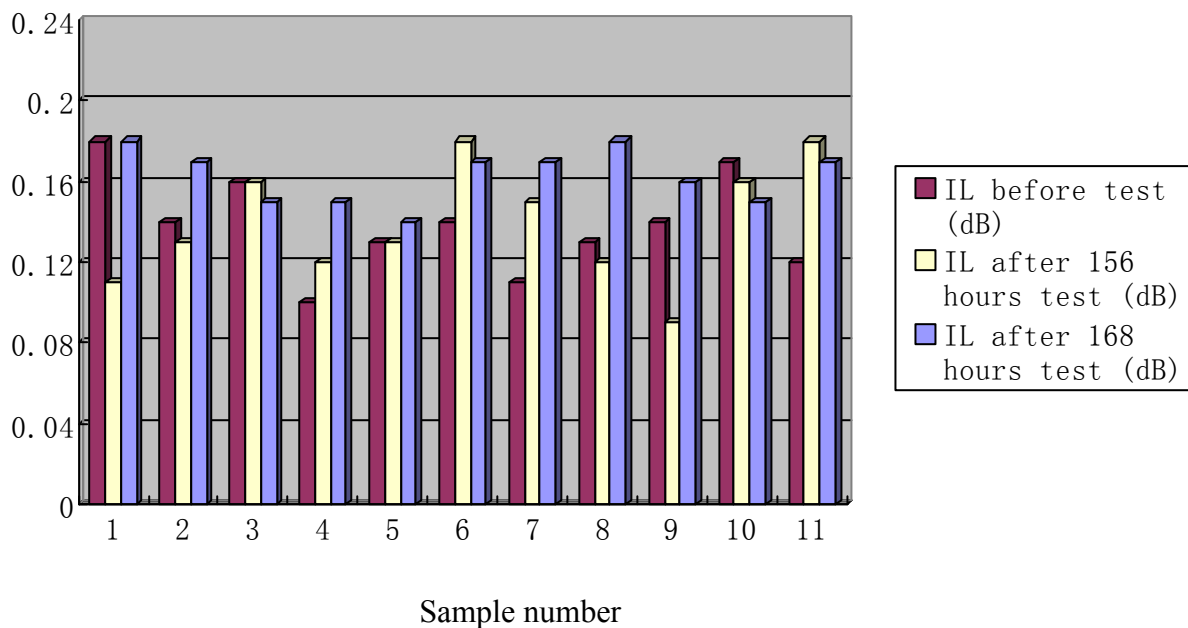


Table 6 The insertion loss before and after water immersion test
(99% port)

No.	IL before test (dB)	IL after 156 hours test (dB)	IL after 168 hours test (dB)	USL	LSL
1	0.18	0.11	0.18	0.30	0.03
2	0.14	0.13	0.17	0.30	0.03
3	0.16	0.16	0.15	0.30	0.03
4	0.10	0.12	0.15	0.30	0.03
5	0.13	0.13	0.14	0.30	0.03
6	0.14	0.18	0.17	0.30	0.03
7	0.11	0.15	0.17	0.30	0.03
8	0.13	0.12	0.18	0.30	0.03
9	0.14	0.09	0.16	0.30	0.03
10	0.17	0.16	0.15	0.30	0.03
11	0.12	0.18	0.17	0.30	0.03

Chart 6



8.3 Vibration Test

Table 7 The insertion loss before and after vibration test
(1% port)

No.	IL before test (dB)	IL after test (dB)	USL	LSL
1	20.09	20.12	21.60	18.20
2	20.04	20.09	21.60	18.20
3	20.12	20.07	21.60	18.20
4	20.26	20.20	21.60	18.20
5	20.03	20.10	21.60	18.20
6	20.10	19.99	21.60	18.20
7	20.10	20.13	21.60	18.20
8	20.03	20.12	21.60	18.20
9	20.07	20.16	21.60	18.20
10	20.09	20.12	21.60	18.20
11	20.12	20.17	21.60	18.20

Chart 7

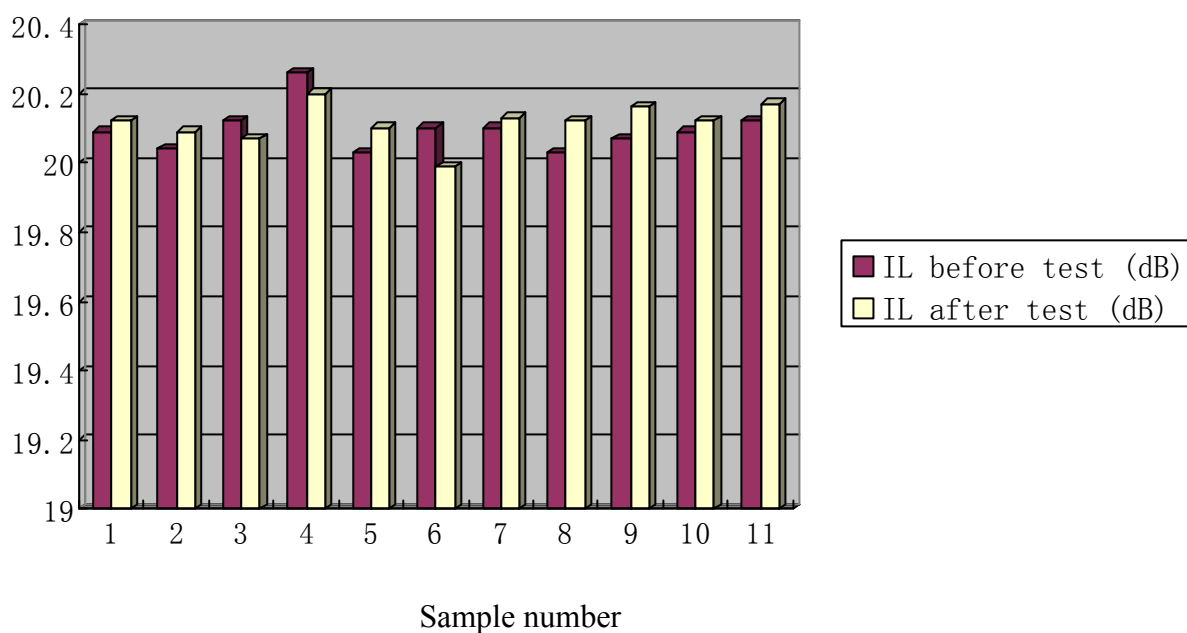
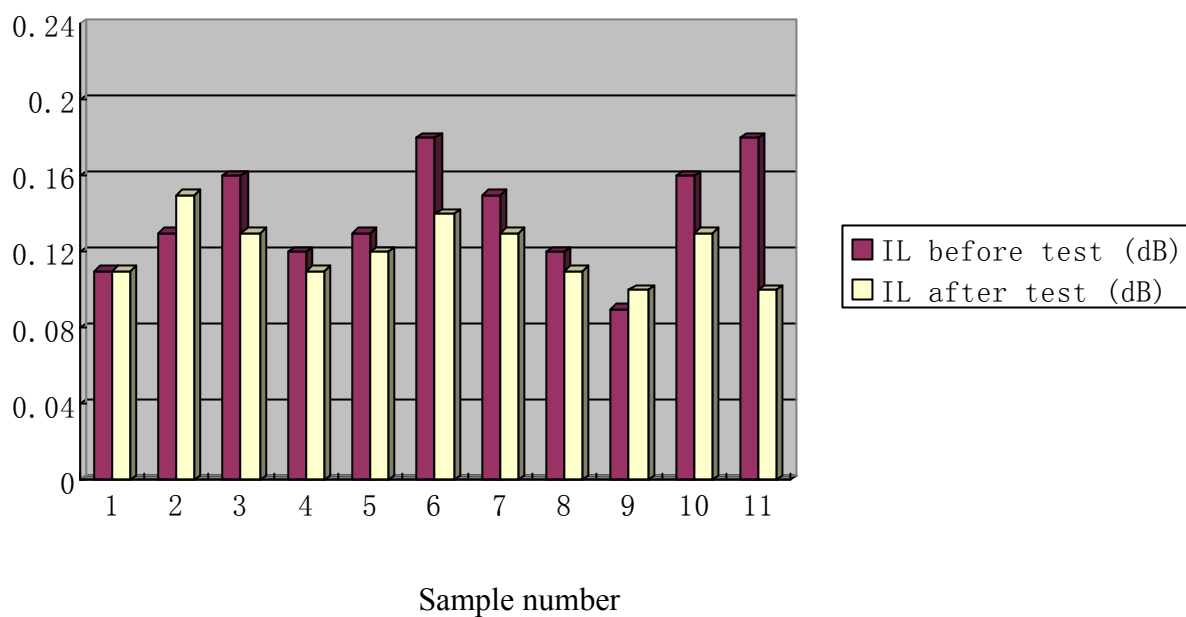


Table 8 The insertion loss before and after vibration test
(99% port)

No.	IL before test (dB)	IL after test (dB)	USL	LSL
1	0.11	0.11	0.30	0.03
2	0.13	0.15	0.30	0.03
3	0.16	0.13	0.30	0.03
4	0.12	0.11	0.30	0.03
5	0.13	0.12	0.30	0.03
6	0.18	0.14	0.30	0.03
7	0.15	0.13	0.30	0.03
8	0.12	0.11	0.30	0.03
9	0.09	0.10	0.30	0.03
10	0.16	0.13	0.30	0.03
11	0.18	0.10	0.30	0.03

Chart 8



8.5 Side Pulling Test

Table 9 The insertion loss before and after side pulling test
(1% port)

No.	IL before test (dB)	IL after test (dB)	USL	LSL
1	20.12	20.11	21.60	18.20
2	20.09	20.07	21.60	18.20
3	20.07	20.09	21.60	18.20
4	20.20	20.10	21.60	18.20
5	20.10	20.07	21.60	18.20
6	19.99	20.05	21.60	18.20
7	20.13	20.04	21.60	18.20
8	20.12	20.15	21.60	18.20
9	20.16	20.22	21.60	18.20
10	20.12	20.18	21.60	18.20
11	20.17	20.15	21.60	18.20

Chart 9

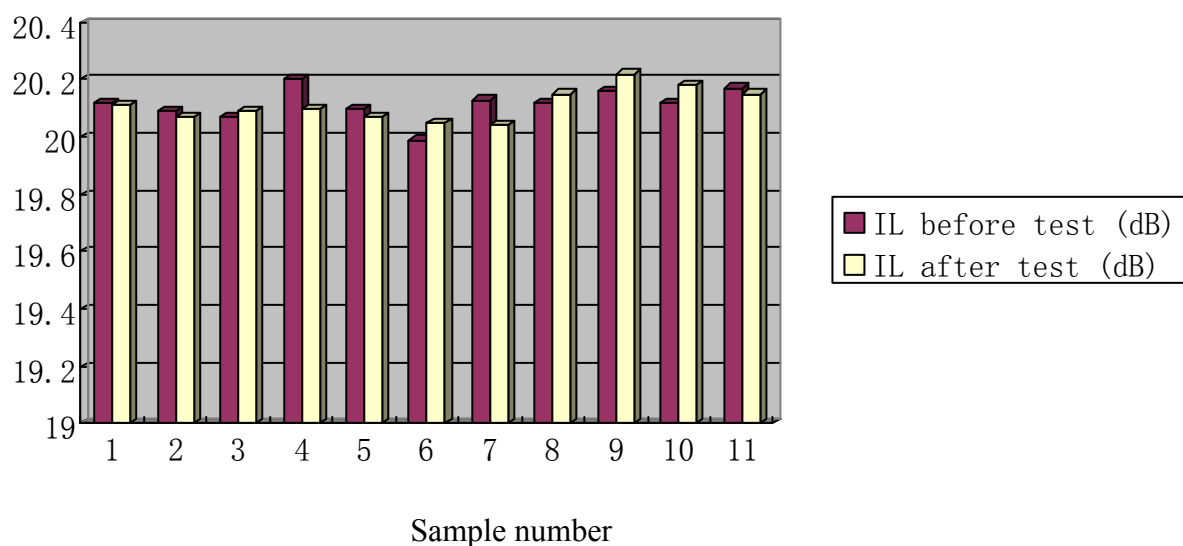
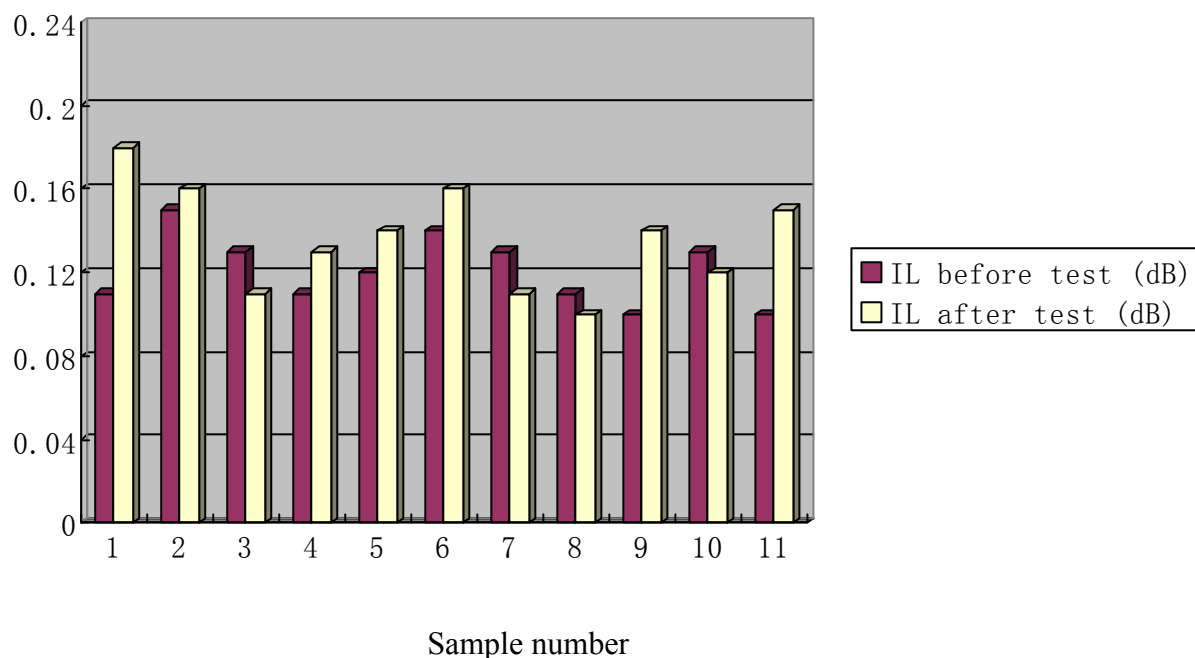


Table 10 The insertion loss before and after side pulling test
(99% port)

No.	IL before test (dB)	IL after test (dB)	USL	LSL
1	0.11	0.18	0.30	0.03
2	0.15	0.16	0.30	0.03
3	0.13	0.11	0.30	0.03
4	0.11	0.13	0.30	0.03
5	0.12	0.14	0.30	0.03
6	0.14	0.16	0.30	0.03
7	0.13	0.11	0.30	0.03
8	0.11	0.10	0.30	0.03
9	0.10	0.14	0.30	0.03
10	0.13	0.12	0.30	0.03
11	0.10	0.15	0.30	0.03

Chart 10



8.6 Cable Retention Test

Table 11 The insertion loss before and after cable retention test

(1% port)

No.	IL before test (dB)	IL after test (dB)	USL	LSL
1	20.11	20.10	21.60	18.20
2	20.07	20.06	21.60	18.20
3	20.09	20.08	21.60	18.20
4	20.10	20.15	21.60	18.20
5	20.07	20.12	21.60	18.20
6	20.05	20.09	21.60	18.20
7	20.04	19.98	21.60	18.20
8	20.15	20.12	21.60	18.20
9	20.22	20.19	21.60	18.20
10	20.18	20.11	21.60	18.20
11	20.15	20.18	21.60	18.20

Chart 11

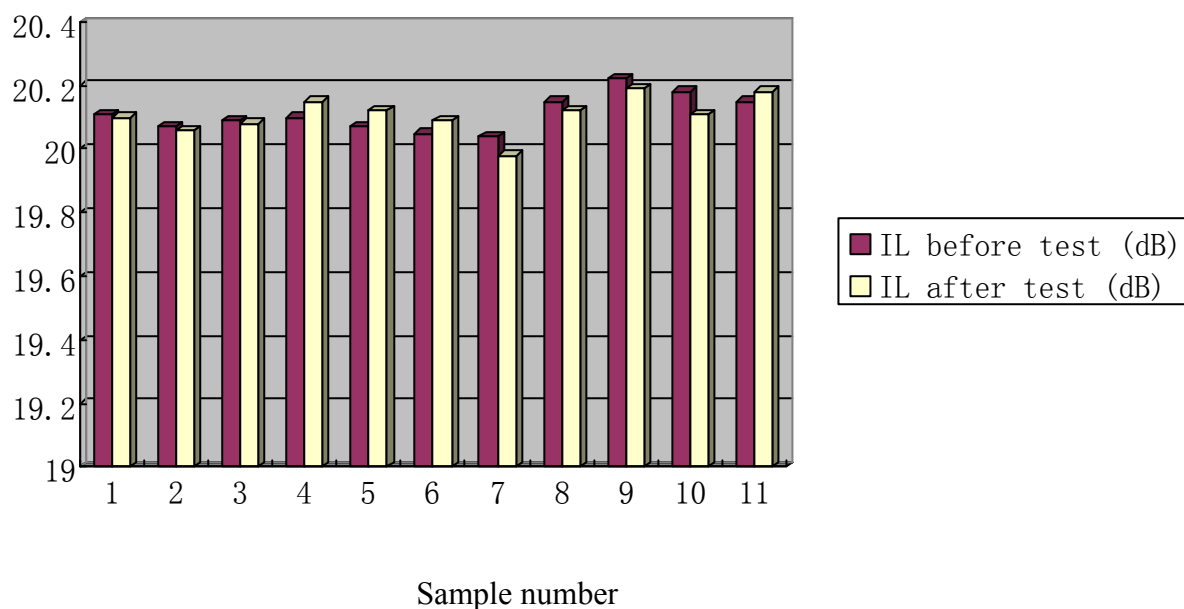
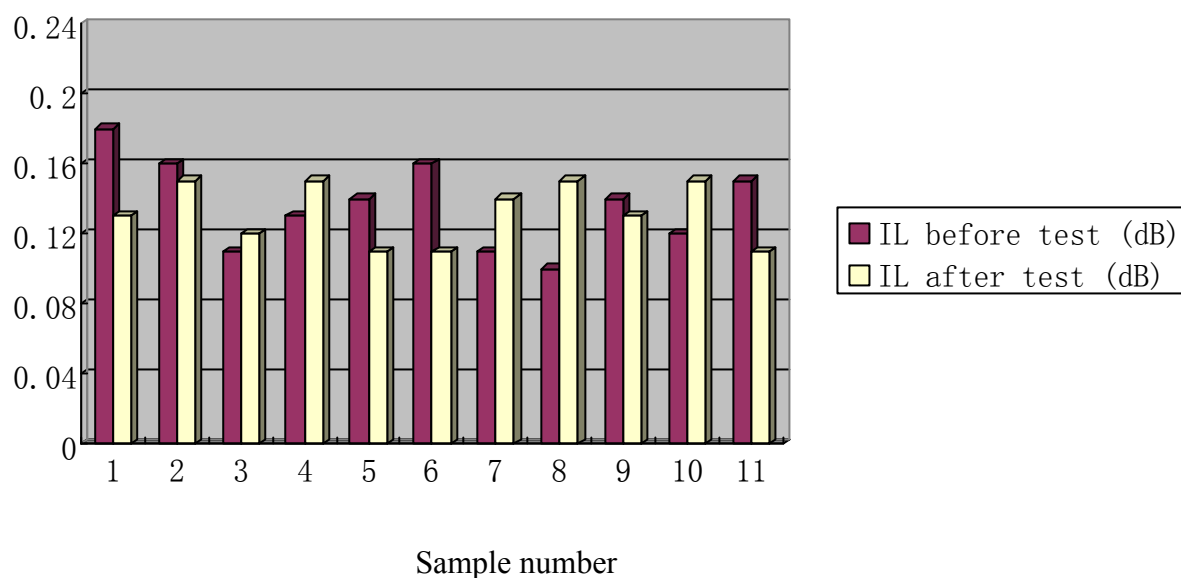


Table 12 The insertion loss before and after cable retention test
(99% port)

No.	IL before test (dB)	IL after test (dB)	USL	LSL
1	0.18	0.13	0.30	0.03
2	0.16	0.15	0.30	0.03
3	0.11	0.12	0.30	0.03
4	0.13	0.15	0.30	0.03
5	0.14	0.11	0.30	0.03
6	0.16	0.11	0.30	0.03
7	0.11	0.14	0.30	0.03
8	0.10	0.15	0.30	0.03
9	0.14	0.13	0.30	0.03
10	0.12	0.15	0.30	0.03
11	0.15	0.11	0.30	0.03

Chart 12



8.7 Impact Test

Table 13 The insertion loss before and after impact test

(1% port)

No.	IL before test (dB)	IL after test (dB)	USL	LSL
1	20.10	20.12	21.60	18.20
2	20.06	20.17	21.60	18.20
3	20.08	20.09	21.60	18.20
4	20.15	20.11	21.60	18.20
5	20.12	20.11	21.60	18.20
6	20.09	20.15	21.60	18.20
7	19.98	20.10	21.60	18.20
8	20.12	20.15	21.60	18.20
9	20.19	20.12	21.60	18.20
10	20.11	20.21	21.60	18.20
11	20.18	20.15	21.60	18.20

Chart 13

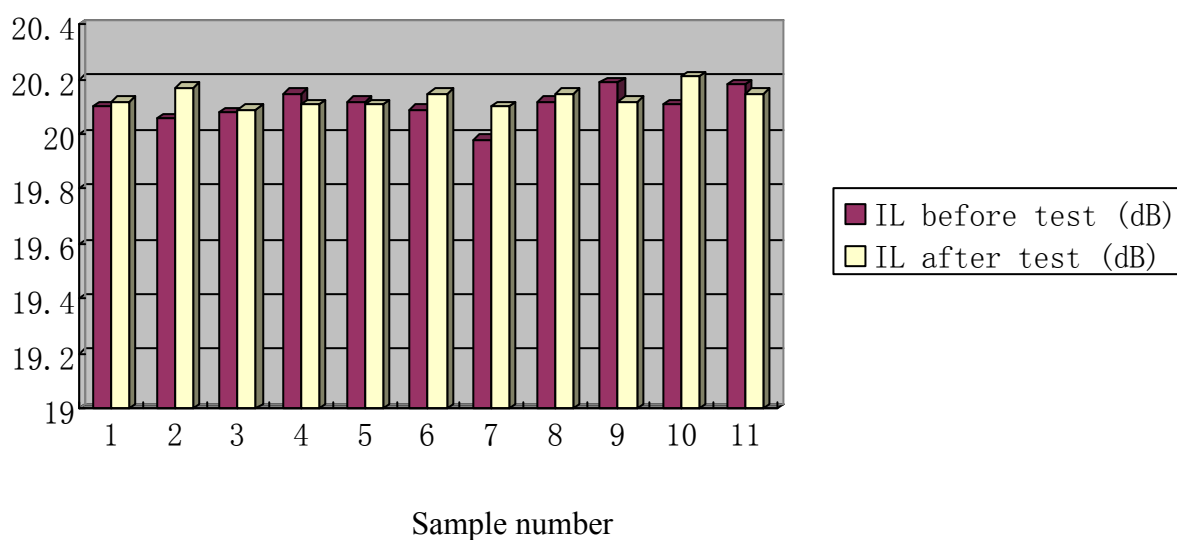
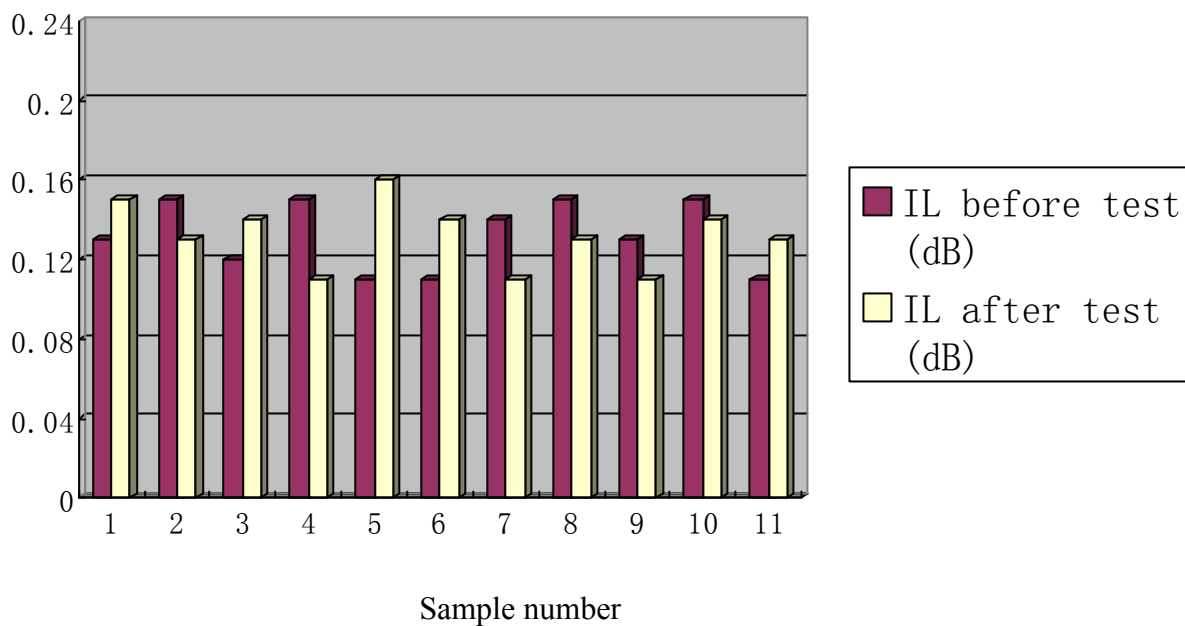


Table 14 The insertion loss before and after impact test
(99% port)

No.	IL before test (dB)	IL after test (dB)	USL	LSL
1	0.13	0.15	0.30	0.03
2	0.15	0.13	0.30	0.03
3	0.12	0.14	0.30	0.03
4	0.15	0.11	0.30	0.03
5	0.11	0.16	0.30	0.03
6	0.11	0.14	0.30	0.03
7	0.14	0.11	0.30	0.03
8	0.15	0.13	0.30	0.03
9	0.13	0.11	0.30	0.03
10	0.15	0.14	0.30	0.03
11	0.11	0.13	0.30	0.03

Chart 14



9. Test Summary

Table 15 The maximum insertion loss and the maximum change of insertion loss at all test (1% port)

No.	Max IL at all test (dB)	Min IL at all test (dB)	USL (dB)	LSL (dB)	Pass or fail
1	20.25	20.03	21.60	18.20	Pass
2	20.19	19.97	21.60	18.20	Pass
3	20.16	19.90	21.60	18.20	Pass
4	20.22	20.05	21.60	18.20	Pass
5	20.15	19.95	21.60	18.20	Pass
6	20.21	19.99	21.60	18.20	Pass
7	20.18	19.96	21.60	18.20	Pass
8	20.22	20.01	21.60	18.20	Pass
9	20.21	20.05	21.60	18.20	Pass
10	20.21	19.99	21.60	18.20	Pass
11	20.18	20.11	21.60	18.20	Pass

Table 16 The maximum insertion loss and the maximum change of insertion loss at all test (99% port)

No.	Max IL at all test (dB)	Min IL at all test (dB)	USL (dB)	LSL (dB)	Pass or fail
1	0.18	0.11	0.30	0.03	Pass
2	0.17	0.12	0.30	0.03	Pass
3	0.16	0.11	0.30	0.03	Pass
4	0.19	0.10	0.30	0.03	Pass
5	0.16	0.11	0.30	0.03	Pass
6	0.18	0.09	0.30	0.03	Pass
7	0.17	0.11	0.30	0.03	Pass
8	0.18	0.10	0.30	0.03	Pass
9	0.18	0.09	0.30	0.03	Pass
10	0.17	0.12	0.30	0.03	Pass
11	0.18	0.10	0.30	0.03	Pass

10. Conclusion

Eleven devices were randomly picked as samples and tested during this qualification test. The test results reported in this document demonstrate that PuHuiXing technology optical fiber splitter couplers meet the reliability assurance requirements specified in TELCORDIA GR-1209-CORE .

PuHuiXing Technology Co., Ltd is committed to ensure that continual process improvements and periodic surveillance qualifications will continue to be performed on this product family.