

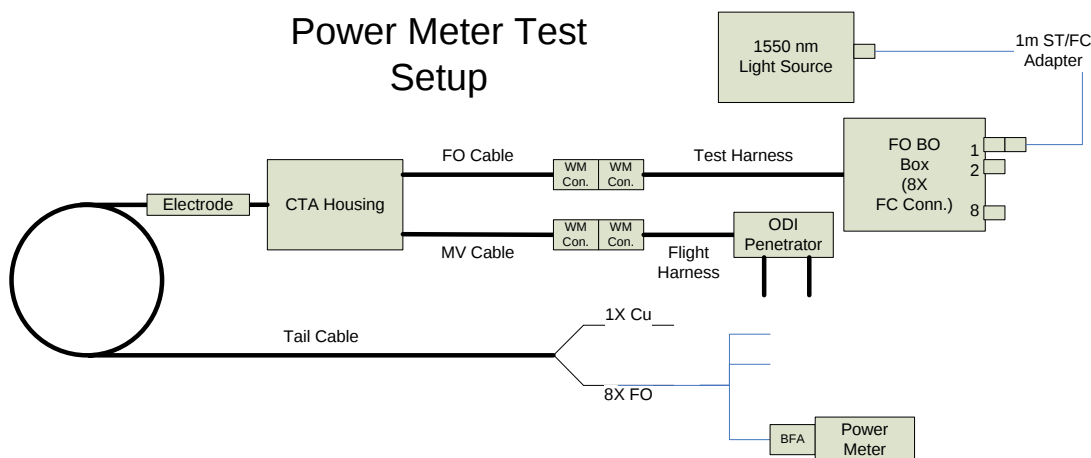
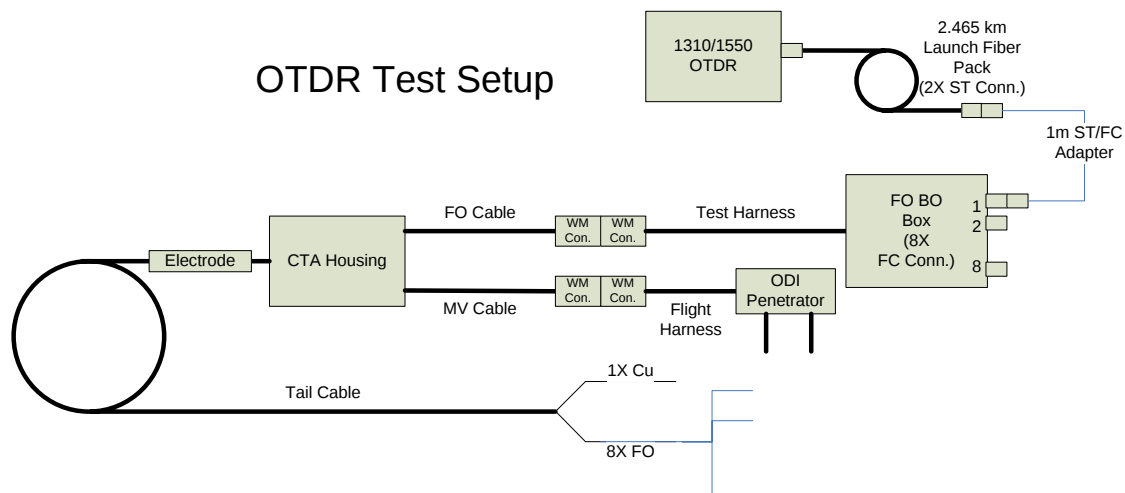
MARS CTA Pre-deployment Function Test

Ver.	Date	Description
1	10/26/06	Initial release for review
2	11/02/06	Modified to reflect additional tests performed to address observed high attenuation in the tail cable
3	11/07/06	Add HP DVM model and serial number
4	11/08/06	Add add'l test on spare CTA with tail cable uncoiled
5	11/09/06	Add test with fusion splice to tail cable
6	11/14/06	Add CTA serial numbers

1. Purpose

This test is intended to ensure proper functionality of the CTA sub-assembly before shipment from MBARI to the deployment ship. A more thorough test shall be performed on board the deployment vessel by the deployment contractor.

2. Test Setup



3. Test Equipment

	Equipment	S/N	Last Cal Date
A	HP 3457A Multimeter	2703A08915	
B	EXFO FTB400 Mainframe	134804-3D	
	FTB7323B-B OTDR Module	135094-3D	
	FTB1402-23BL-EI Power Meter/source	200827	
	BFA-222 Bare Fiber Adapter		
C	Noyes OPM1-2C Power meter	1T14FL041	

4. Units under test

Deployable CTA S/N: MARS/CTA/02

Spare CTA S/N: MARS/CTA/01

5. Test Engineer: Gene Massion

Date: Oct31/06, Nov1/06, Nov 8/06

6. Test Procedures

6.1. Fiber Optic (FO) Connectivity Pass/Fail - Fail

Use the OTDR to measure each fiber in the tail cable's attenuation, distance and loss across the Wet Mate (WM) connector and CTA Splice(s). Measure from FO breakout (BO) box end on all 8 fibers.

A 2.465 km long fiber was used as a "launch" fiber for the test. The fiber path was OTDR – launch fiber (ST connectors both sides) – ST to FC 1 meter adapter fiber – FO Breakout box.

An additional test was made from the tail cable end. The fiber path was OTDR – ST to FC 1 meter adapter fiber – EXFO BFA222 bare fiber adapter – stripped and cleaved tail cable fiber

6.2. Optical Loss Pass/Fail - Fail

Connect the FTB400 light source to each fiber. Measure power at tail cable end using bare fiber adapter at 1550nm. Strip and cleave each fiber. Measure light source directly with power meter before and after each test.

Pretest: FTB400 – ST to FC 1 meter adapter fiber – Noyes power meter
Light source power: -1.4 dBm

Posttest: FTB400 – ST to FC 1 meter adapter fiber – Noyes power meter
Light source power: -1.4 dBm

Unit under test:		Deployable CTA in shipping frame				
Fiber Color	Atten. (dB/km)	Dist. (m)	WM Conn. Loss	CTA Loss	Power Meter (dBm @ 1550nm) reading	Optical Loss (PM reading – pre/post test value)
1 Black					-6.5	-5.1
2 Yellow					-6.0	-4.6
3 Red					-5.7	-4.3
4 Red/ring					-6.0	-4.6
5 Blue/ring					-6.8	-5.4
6 Orange/ring					-5.7	-4.3
7 Turquoise					-5.6	-4.2
8 Pink					-11.1	-9.7
Comments: The results were not as straight forward as expected. See 9 OTDR files for all values. The problem is the attenuation in the tail cable fibers appears to be far outside spec.						

6.3. Electrical resistance

Pass/Fail - Pass

Use the DVM to measure resistance from Copper (Cu) BO on test harness to Cu tape on sea cable. Measure test lead resistance without CTA first. Repeat for both CTA assemblies

Deployable CTA

Lead resistance	0.24 ohms
Lead + Harness res.	0.36 0.35 ohms (2 leads on penetrator)
End to End resistance	0.70 ohms
CTA resistance	0.1 ohms

Spare CTA

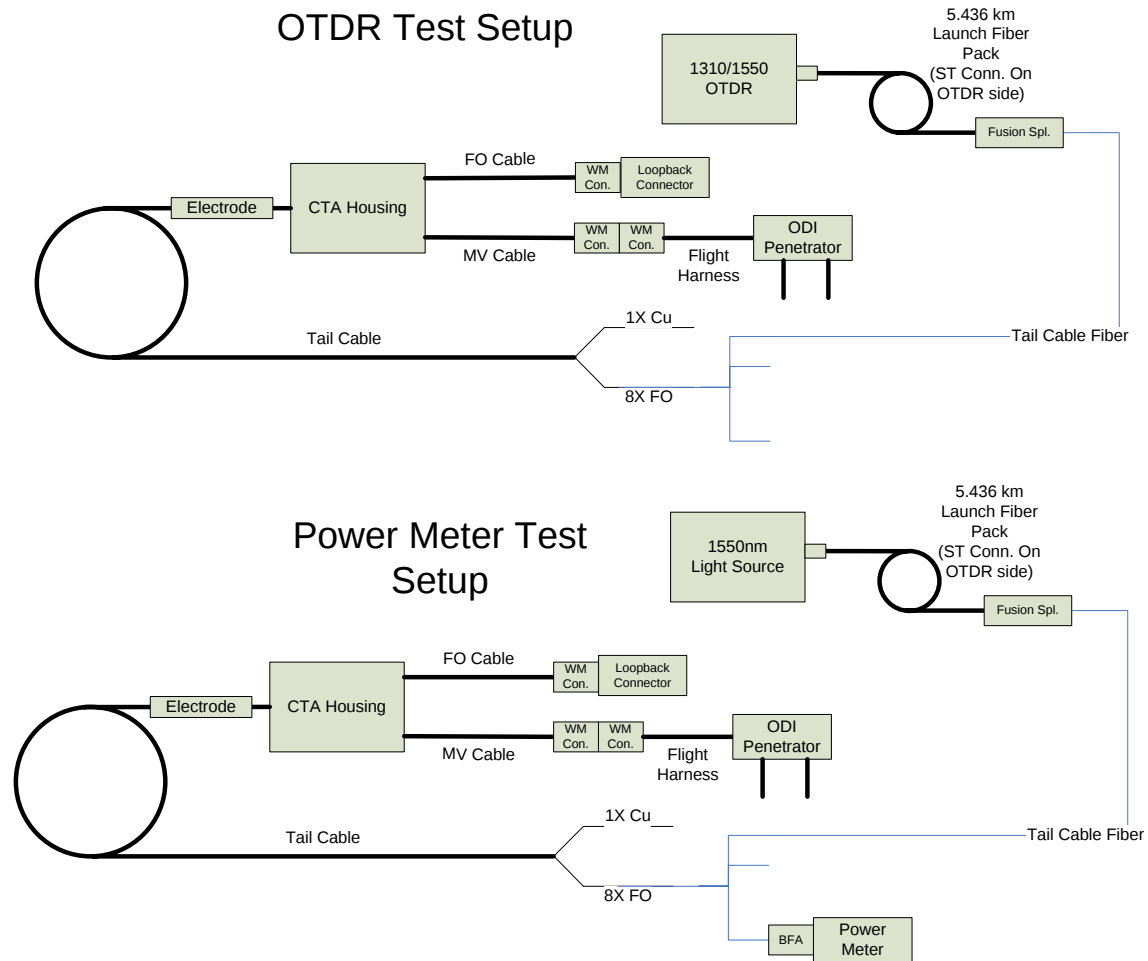
Lead resistance	0.22 ohms
Lead + Harness res.	0.32 0.32 ohms (2 leads on penetrator)
End to End resistance	0.80 ohms
CTA resistance	0.26 ohms

6.4. Uncoiled optical loss

Repeat FO connectivity and optical loss tests 5.1 and 5.2 on spare CTA with tail cable coiled on pallet (3.6m coil diameter). Uncoil tail cable maintaining at least a 6m bend diameter. Wait 1 hour. Repeat FO connectivity and optical loss tests in uncoiled condition.

6.5. OTDR and power meter tests fusion spliced to tail cable

This test is intended to get around the large Fresnel reflection at the ODI test box. Please note we are using a different launch fiber pack (5436 meters of SMF28E).



Measuring the launch power into the CTA at the fusion splice end of the fiber pack gives the following values:

Pretest: FTB400 – 5.436 km launch fiber – Noyes power meter

Light source power: -5.3 dBm

Posttest: FTB400 – 5.436 km launch fiber – Noyes power meter

Light source power: -5.1 dBm

Average power into CTA: -5.2 dBm

The FO loop back connector pairs the fibers as in the Calais test.

Fiber 1 (black) to Fiber 2 (yellow)
 Fiber 3 (red) to Fiber 4 (red-ring)
 Fiber 5 (blue-ring) to Fiber 6 (orange-ring)
 Fiber 7 (turquoise) to Fiber 8 (pink)

Unit under test:		Deployable CTA in shipping frame				
Fiber Color	Atten. (dB/km)	Dist. (m)	WM Conn. Loss	CTA Loss	Power Meter (dBm @ 1550nm) reading	Optical Loss (PM reading – pre/post test value)
1 Black					-6.8	-1.6
2 Yellow					-6.8	-1.6
3 Red					-6.5	-1.3
4 Red/ring					-6.6	-1.4
5 Blue/ring					-6.9	-1.7
6 Orange/ring					-6.8	-1.6
7 Turquoise					-6.4	-1.2
8 Pink					-6.4	-1.2
Comments:						

7. Comments

Electrically, both CTAs measured functionally correct. Optically there appears to be unacceptable attenuation in the tail cable. The Alcatel test documentation indicates that the fibers in the tail cable have total attenuation of less than 0.20 dB and we are seeing of order 4 dB total loss. Although the results are not presented here, we made similar OTDR measurements on 2 fibers in the spare CTA with similar results.

The Alcatel documentation indicates the fibers in the tail cable have LEA, LS-RS and LS fibre types. I believe LEA stands for large effective area but do not know what LS-RS and LS stand for. Of the 8 active fibers out of the 16 fibers in the tail cable, 2 are identified as LEA, 4 are identified as RS and 2 are identified as LS. It may be possible that our measurement techniques, which work for SMF28 and similar fibers, are not appropriate for these fibers.

Both CTAs were stored in their shipping frame in the MBARI parking lot covered with a tarp since arrival at MBARI. No incoming optical or electrical inspection was done on either CTA. The spare CTA was removed the week of XXXX for a test fit with the TRF before the TRF was shipped to the Maersk Defender. It has been stored on temporary carts since then.

The coiled and uncoiled tests gave similar and still unacceptable results.

The fusion spliced tests (6.5 above) seem to give acceptable results.

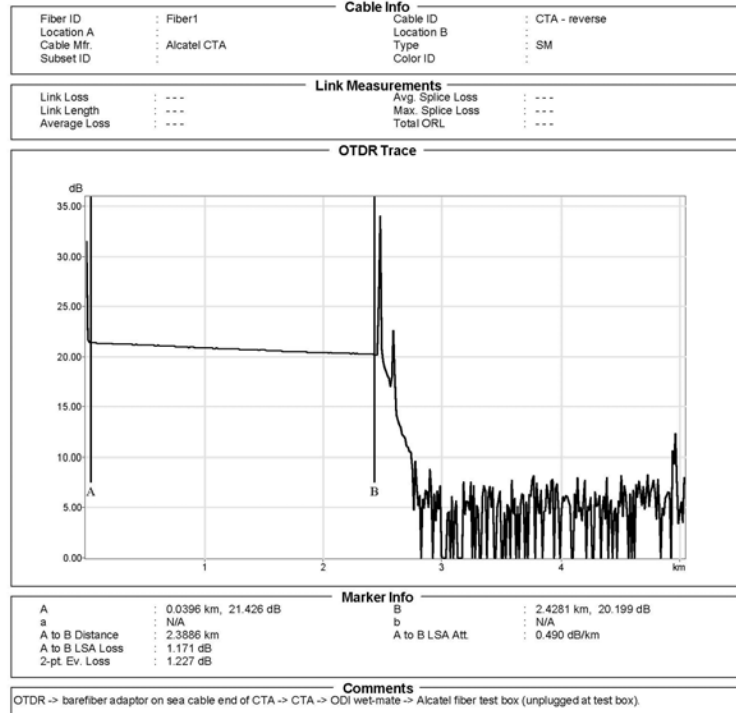
8. OTDR Traces

We have traces for all 8 fibers looking from the ODI test box side and an additional trace for fiber 1 looking from the tail cable side. The traces for fiber 1 are presented here and are very representative of all the other traces.

Fiber 8 seems to have particularly high loss and a OTDR trace from the spare CTA uncoiled is also presented.

8.1. Deployable CTA OTDR Traces (CTA in shipping frame)

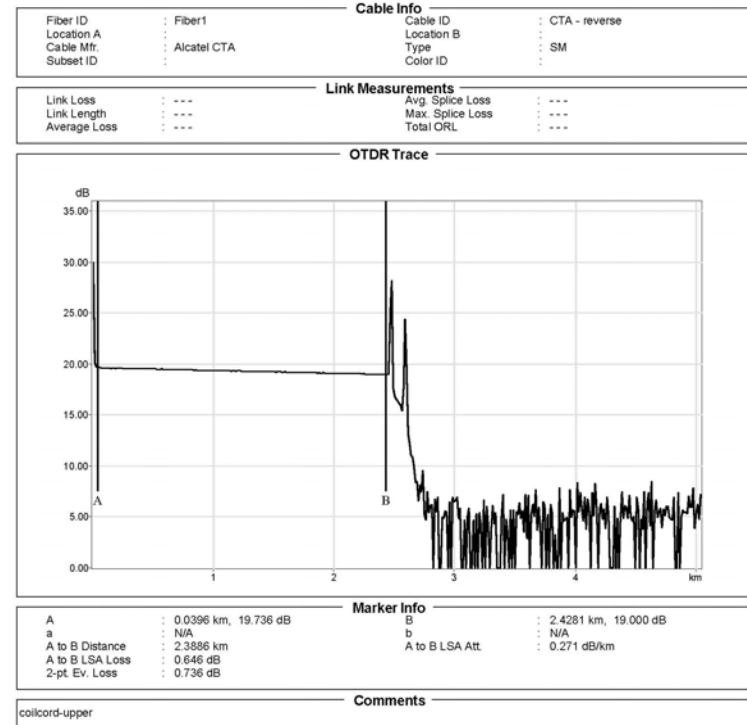
Fiber1 - OTDR Report 1310 nm



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Fiber1 - OTDR Report 1550 nm



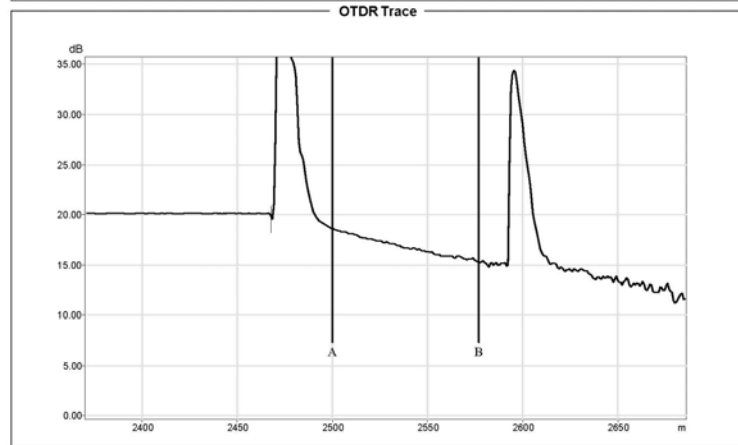
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Fiber 1 - OTDR Report 1310 nm

Cable Info			
Fiber ID	: Fiber 1	Cable ID	: CTA
Location A		Location B	
Cable Mfr.	: Alcatel CTA	Type	: SM
Subset ID		Color ID	

Link Measurements			
Link Loss	: 0.529 dB	Avg. Splice Loss	: ---
Link Length	: 0.9998 km	Max. Splice Loss	: ---
Average Loss	: 0.529 dB/km	Total ORL	: 30.61 dB



Marker Info			
A	: 2.5001 km, 18.594 dB	B	: 2.5773 km, 15.214 dB
a	: N/A	b	: N/A
A to B Distance	: 0.0772 km	A to B LSA Att.	: 41.410 dB/km
A to B LSA Loss	: 3.198 dB		
2-pt. Ev. Loss	: 3.380 dB		

Comments
 OTDR -> 2.6km launch cable -> Alcatel fiber test box -> ODI wet-mate -> CTA.
 Bare fiber at sea cable end of CTA left unterminated.

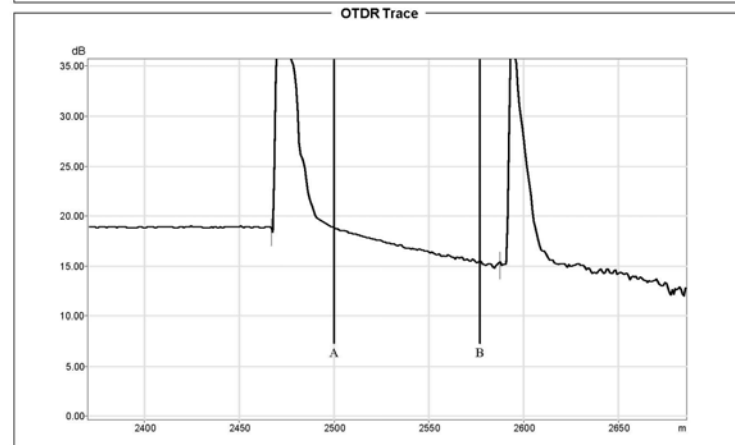
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Fiber 1 - OTDR Report 1550 nm

Cable Info			
Fiber ID	: Fiber 1	Cable ID	: CTA
Location A		Location B	
Cable Mfr.	: Alcatel CTA	Type	: SM
Subset ID		Color ID	

Link Measurements			
Link Loss	: 0.305 dB	Avg. Splice Loss	: ---
Link Length	: 0.9999 km	Max. Splice Loss	: ---
Average Loss	: 0.305 dB/km	Total ORL	: <20.30 dB



Marker Info			
A	: 2.5001 km, 18.792 dB	B	: 2.5773 km, 15.446 dB
a	: N/A	b	: N/A
A to B Distance	: 0.0772 km	A to B LSA Att.	: 43.715 dB/km
A to B LSA Loss	: 3.375 dB		
2-pt. Ev. Loss	: 3.346 dB		

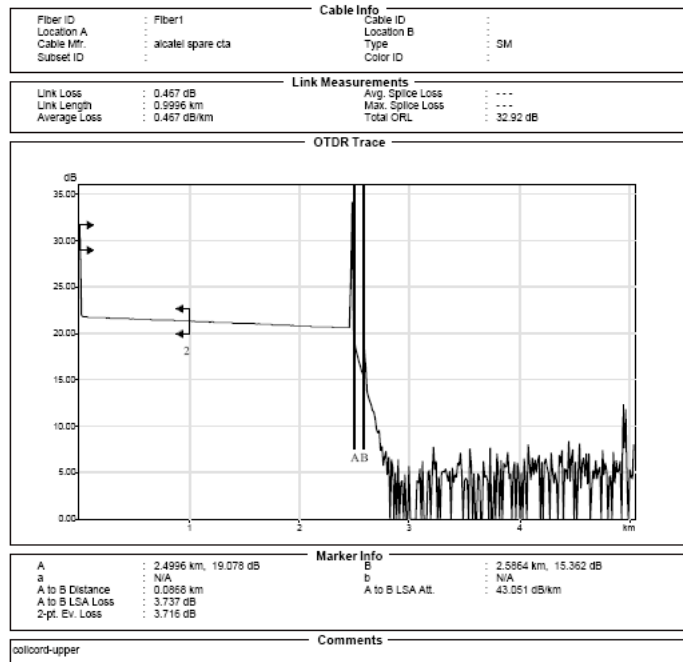
Comments
 coilcord-upper

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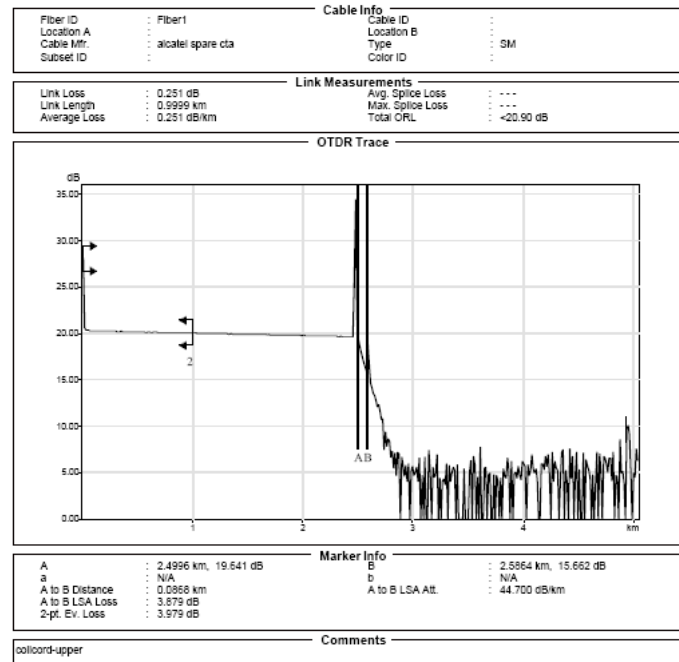
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8.2. Test 6.4 Spare CTA OTDR Traces (CTA coiled on pallet ~3.6m diameter).

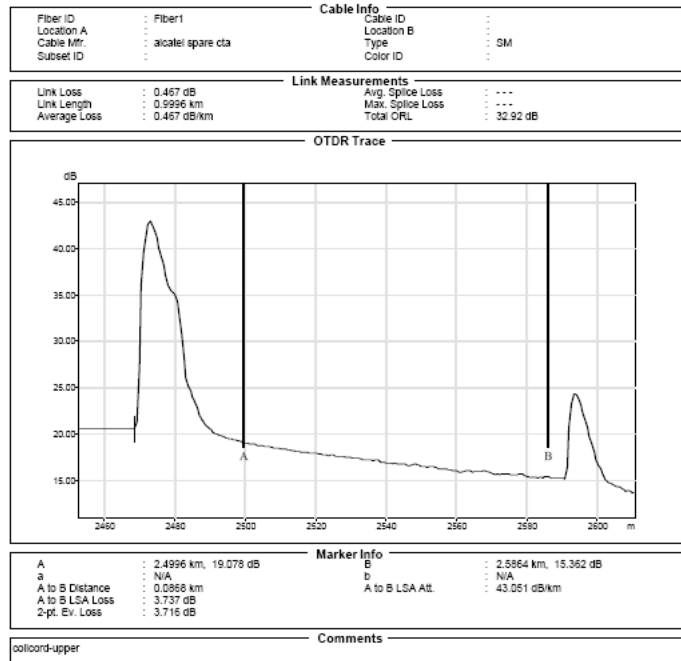
Fiber1 - OTDR Report 1310 nm



Fiber1 - OTDR Report 1550 nm



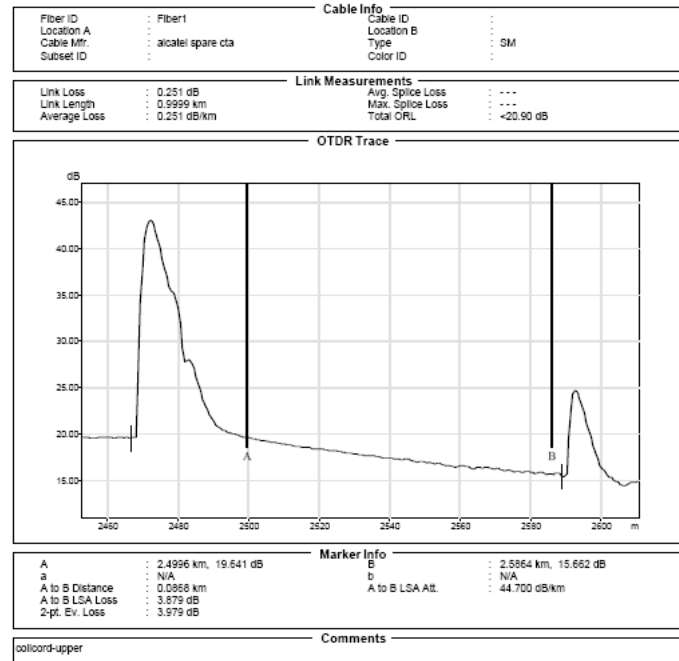
Fiber1 - OTDR Report 1310 nm



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Fiber1 - OTDR Report 1550 nm

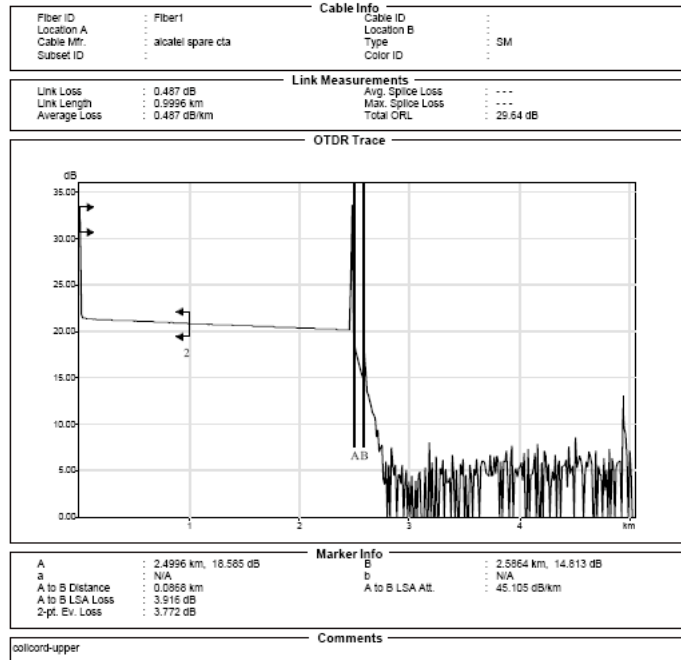


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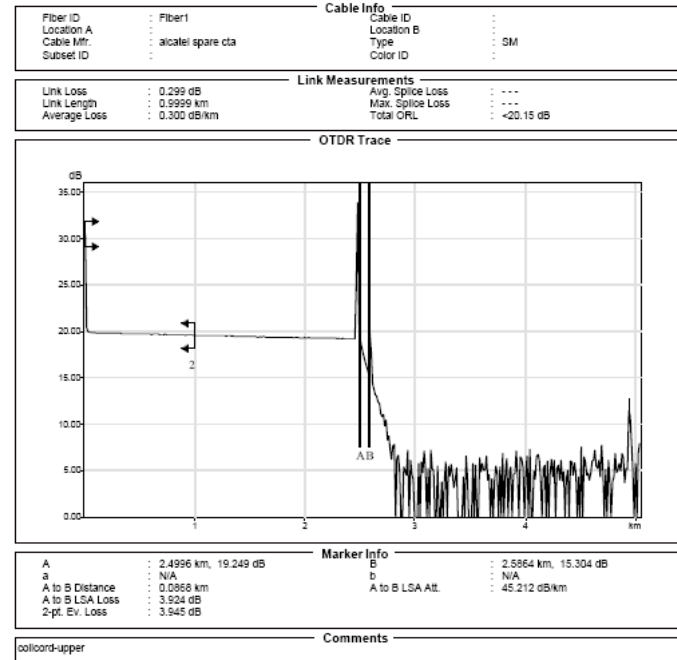
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8.3. Test 6.4 Spare CTA OTDR Traces (CTA uncoiled in parking lot >6m diameter).

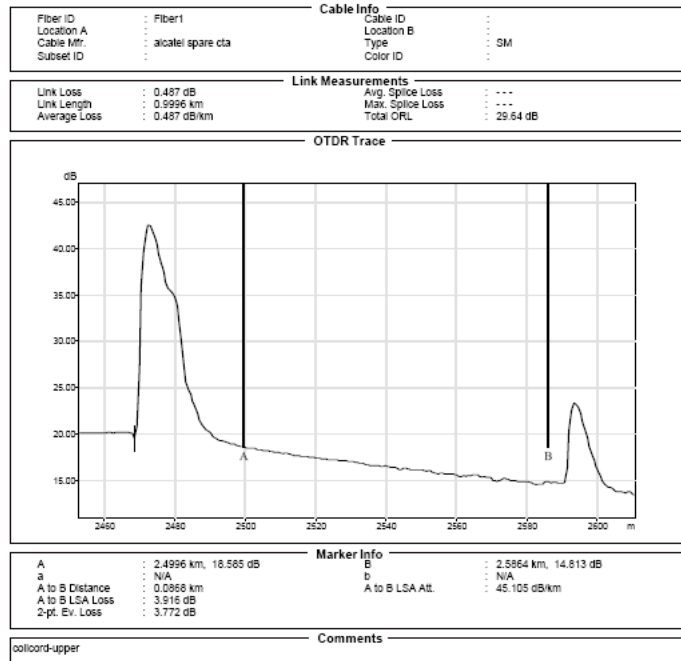
Fiber1 - OTDR Report 1310 nm



Fiber1 - OTDR Report 1550 nm



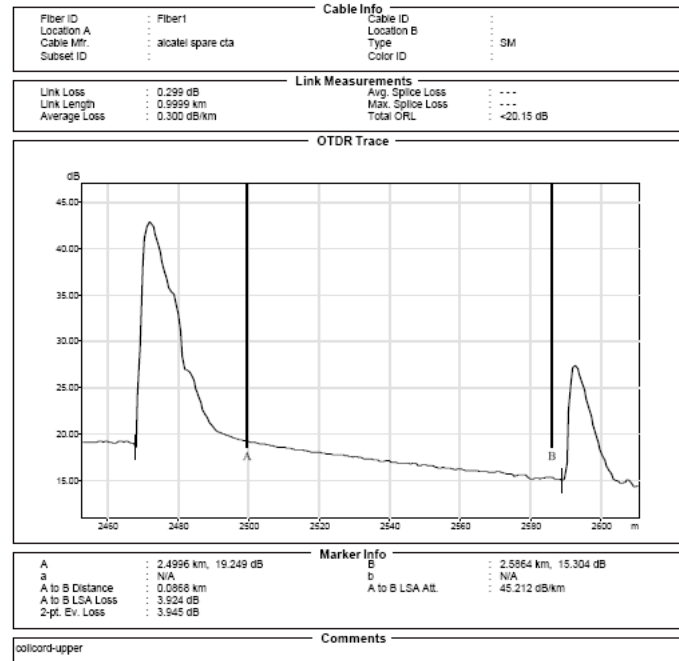
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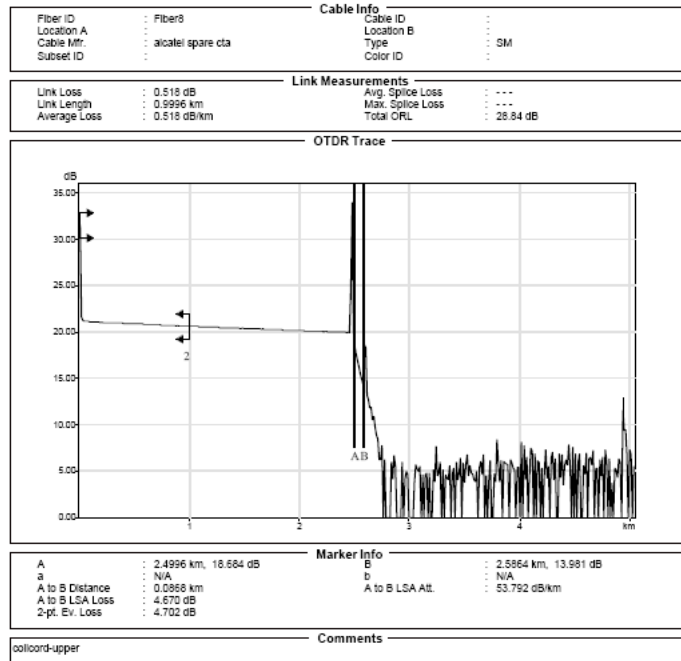
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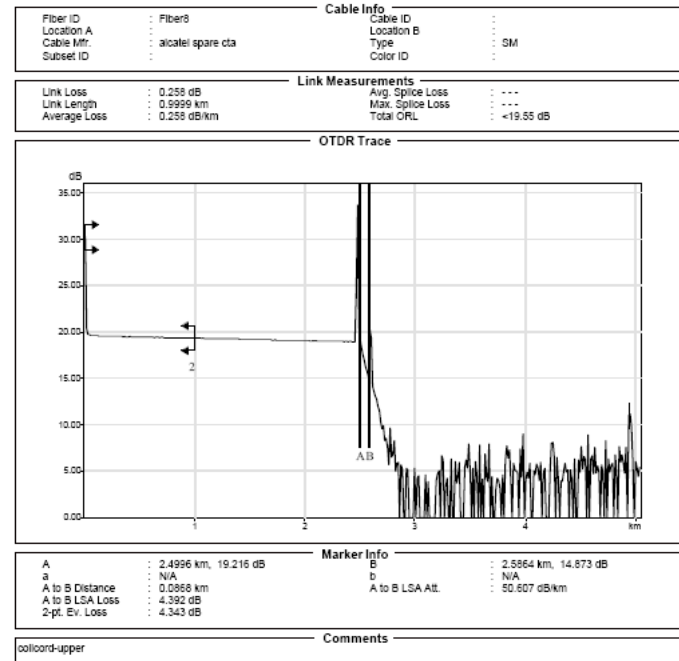
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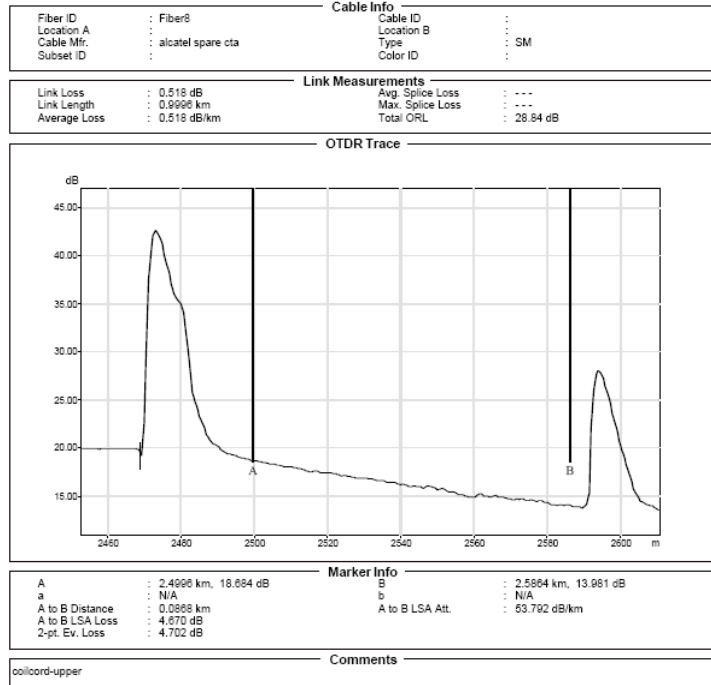
Fiber8 - OTDR Report 1310 nm



Fiber8 - OTDR Report 1550 nm



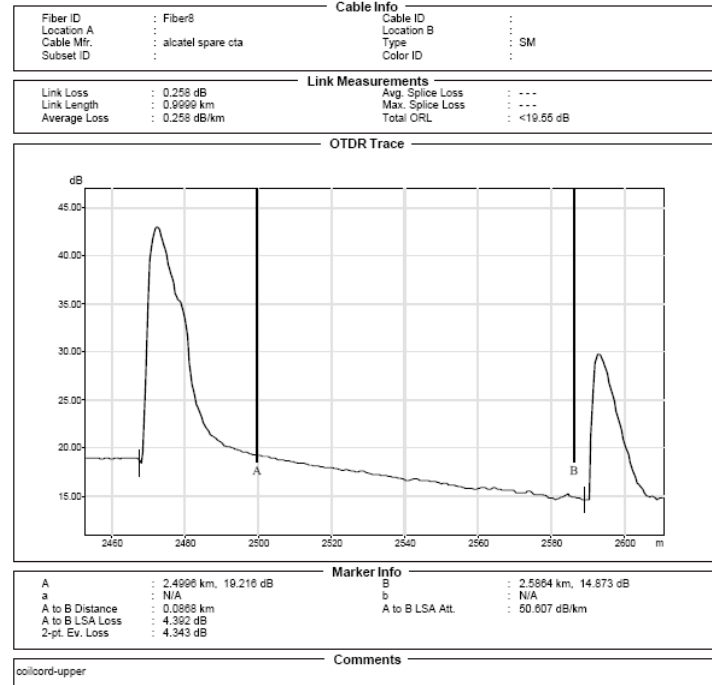
Fiber8 - OTDR Report 1310 nm



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Fiber8 - OTDR Report 1550 nm

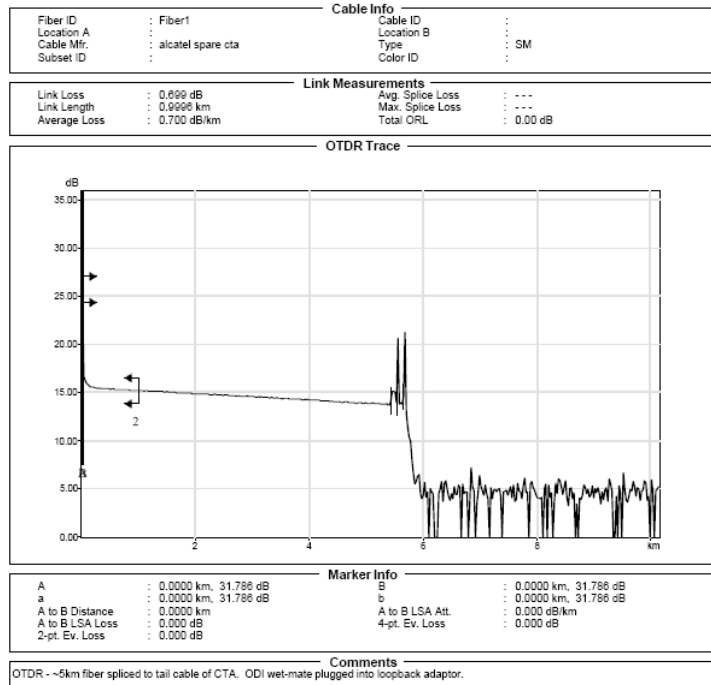


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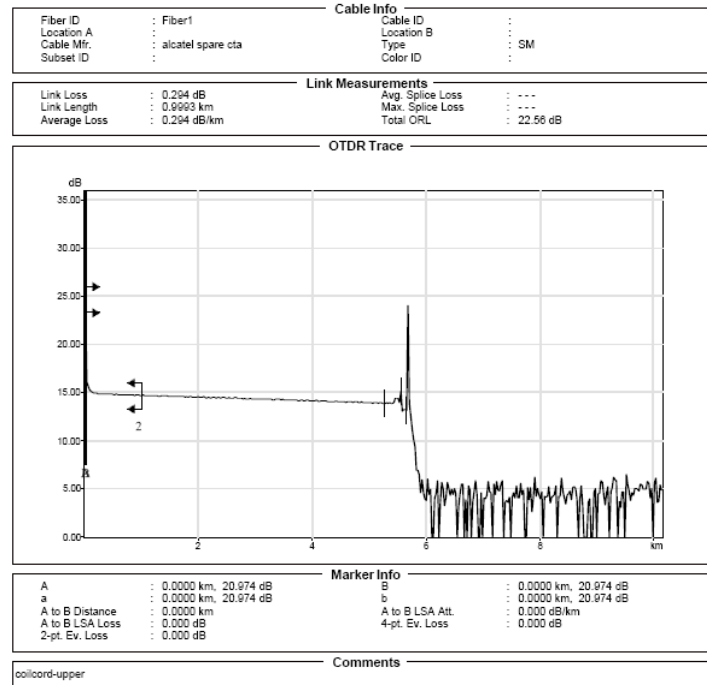
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8.4. Test 6.5 Deployable CTA OTDR Traces (OTDR fusion spliced to tail cable).

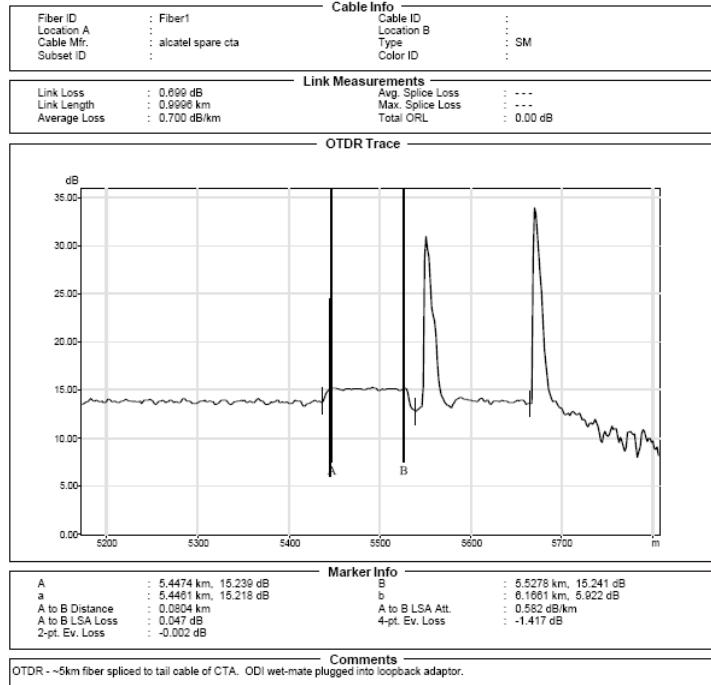
Fiber1 - OTDR Report 1310 nm



Fiber1 - OTDR Report 1550 nm



Fiber1 - OTDR Report 1310 nm



Fiber1 - OTDR Report 1550 nm

