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Preliminary Trace Analysis of Atlantis 0.681 Fibers

Background

In 2018 it was noticed that the 0.681 fiber optics had high attenuation. Further testing revealed some recovery of attenuation after a series of shallow JASON casts. It was then proposed to a "deep cast" in order to allow for further recovery of the attenuation.

Tests

The "deep cast" took place during the week of April 16th, 2019. The test involved the deployment of 5000 meters of cable using a clump weight of 500 lbf attached to the cable via a swivel. OTDR traces were conducted prior to the cast, at full deployment length, and after the cast. Traces were done using 1310 and 1550 nm wave lengths and various pulse lengths.

Results

The focus of this document will be on the traces using 1550 nm wave length and 300 ns pulse length. This set was chosen due to the relatively low noise in the traces along with the detail provided. Shorter pulses provide smaller dead zones but include more noise, where longer pulse lengths have less noise, but with larger dead zones. 1550 nm wavelength was chose due to showing more pronounced effects of the attenuation issues.

Red Fiber

The red fiber shows loss with in the expected range.

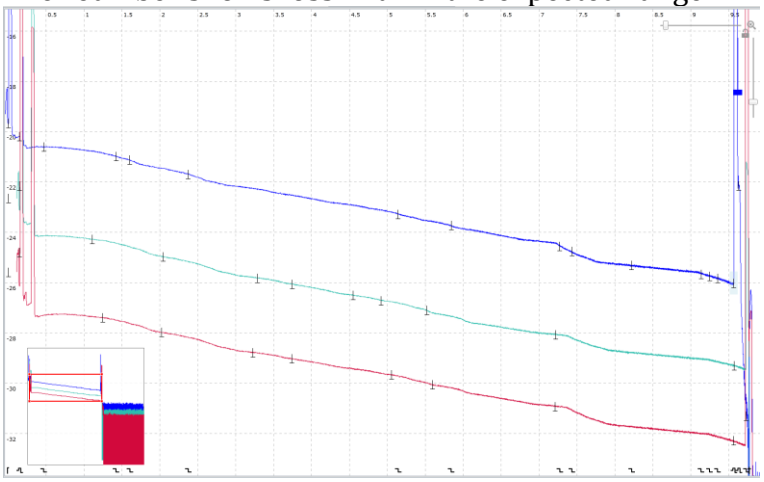

Figure 1 shows the three fiber traces (before, during and after). No statistical change was observed in this fiber. It should be noted that there is an anomaly that was not relieved during the cast. It is located around 2 km from the wet end of the cable.

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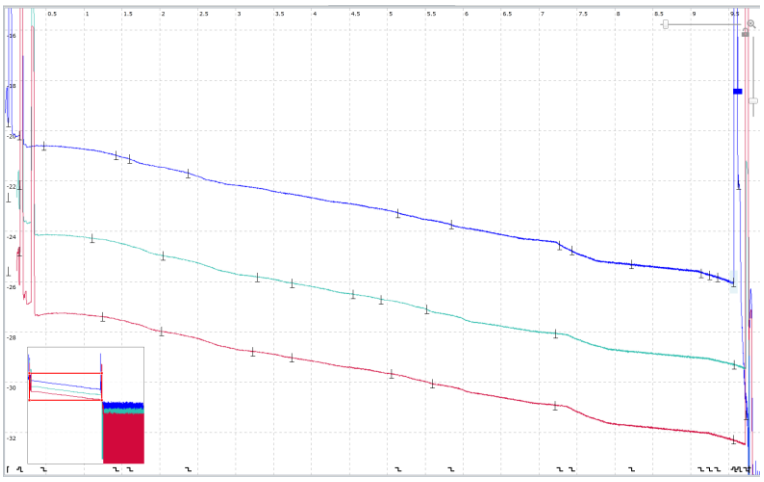
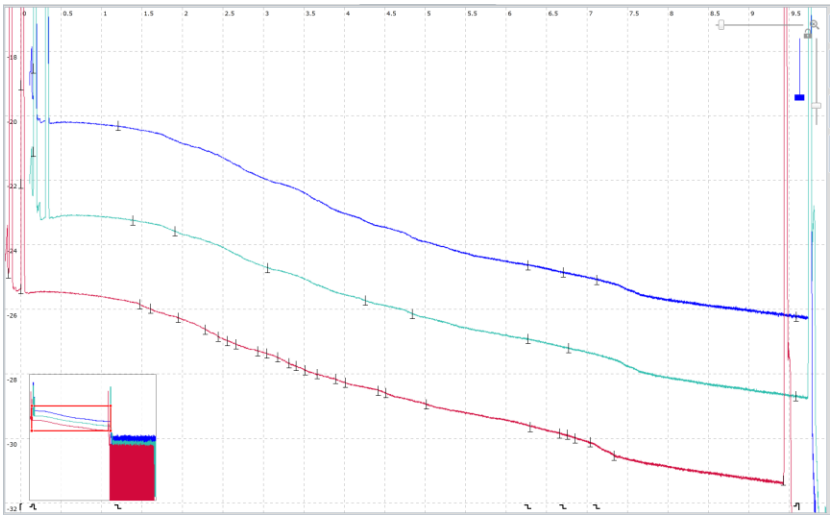


Figure 1: Red Fiber. Blue prior to Cast, Green Cast at 5000 m, Red After Cast

White Fiber

The white fiber shows loss with in the expected range. Figure 2 shows the traces. The loss seen in this



fiber is slightly higher than the red fiber. Similar to the red fiber there is an anomaly around 2 km from the wet end of the cable.

Figure 2: White Fiber. Red prior to cast, Blue during 5000m Cast, Green After Cast

Black Fiber

The black fiber is shown in Figure 3. This fiber is the main focus, as it has the highest loss of the trio. Shown in the figure are pronounced steps in attenuation. Following the 5000m cast a 0.5 dB improvement was shown. This was largest enough to consider, but we below the hoped for value. It should be noted that the highest levels of attenuation are in the section not removed from the drum. It can be further noted that the noise at the end of the trace is significantly more than the other fibers. This appears to start around the 2 km from the end point. Unlike the two other fibers there is no event at the 2 km from the end mark.

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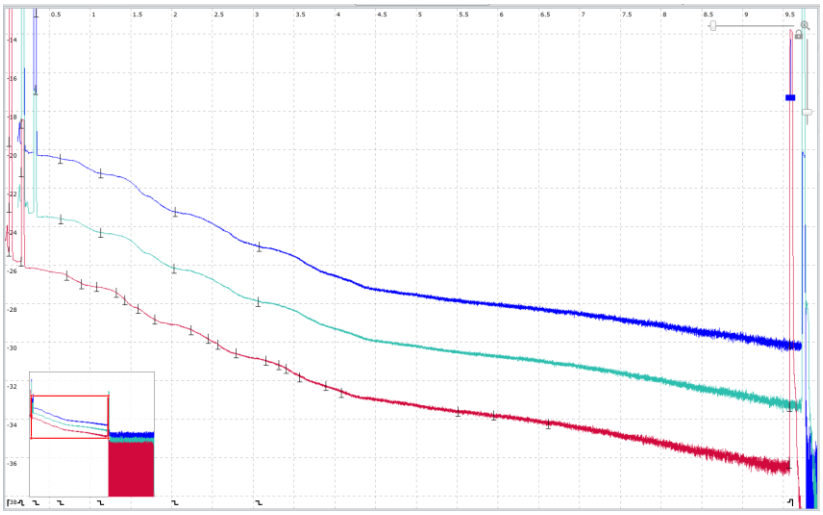

Figure 3: Black Fiber. Red Prior to Cast, Blue During 5000 m Cast, Green After Cast

Overall Comparison

Figure 4 shows a comparison between the three fibers after the cast. The difference between the black fiber and the other is stark. It can be seen that there is significantly higher loss in the first 4.5 km on the drum. The higher noise level is also quite apparent.

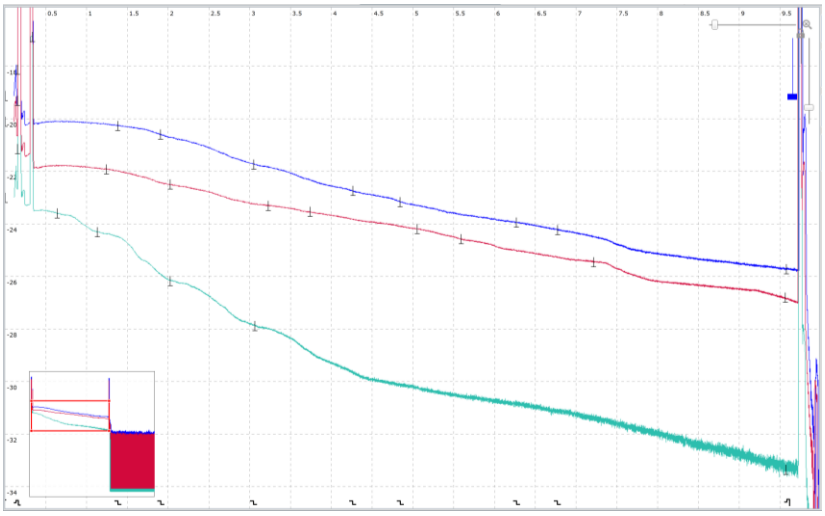

Figure 4: Post 5000m Cast, Green - Black Fiber, Red - Red Fiber, Blue - White Fiber

Conclusions

Unfortunately, this test did not provide concrete evidence of alleviation of attenuation. It is recommended to off completely off spool the cable to remove all residual stresses. At that time a determination can be made on the viability of the cable. Perhaps more troubling is the lack of a cause for the attenuation. The tension testing between the storage drum and the traction head revealed no anomalies during the testing.