



Polarization Preserving, Fiber Optic, Rotary Joint For Fiber Applications Requiring Mobility

Background

In modern optoelectronic systems, there is often a strict requirement on the variability of the system phase or delay. This occurs on high-speed fiber optic links (analog or digital), in radio interferometry, and in phased arrays. When the system incorporates a moving element, such as a steerable antenna, then the motion of the interface itself can make the system phase requirement difficult to meet. Motion can cause physical path length changes, temperature changes, and polarization changes in fiber.

The Polarization Preserving Fiber Optic Rotary Joint (PPFORJ) uses a patented technique to suppress all of these effects by using a single fixed length of fiber across the interface; controlling of polarization fluctuations in the fiber across the interface; smooth control of the fiber motion; and compact and efficient mechanical design. The PPFORJ minimizes the state of polarization change in single mode optical fiber while allowing a +/- 300 degree rotation.

When radio antennas or telescopes feed RFoF signals into an optical fiber, the PPFORJ keeps the state of polarization change to a minimum as the structure moves through azimuth and elevation. The innovation prevents the corruption of data where polarization changes can deteriorate the quality of the data.

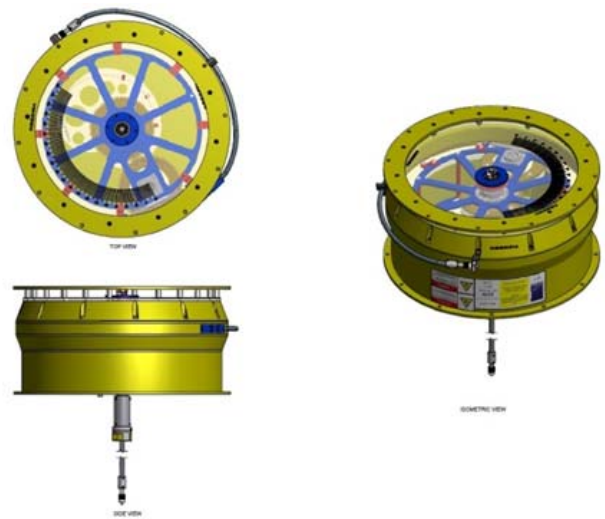


Figure 2. Polarization Preserving Fiber Optic Rotary Joint



Design

The Fiber Optic Rotary Joint is a purely mechanical device contained within a cylindrical housing and utilizing a planetary gear system to guide a single fiber optic cable through a rotating interface. In order to minimize the state of polarization change the fiber must not be twisted. Bending is acceptable.



Performance

4.2. State-of-Polarization Change (SOPC) -PAI [BEND-54.09.00.00-00230-00/T Polarization Requirement of the FOW LRU]

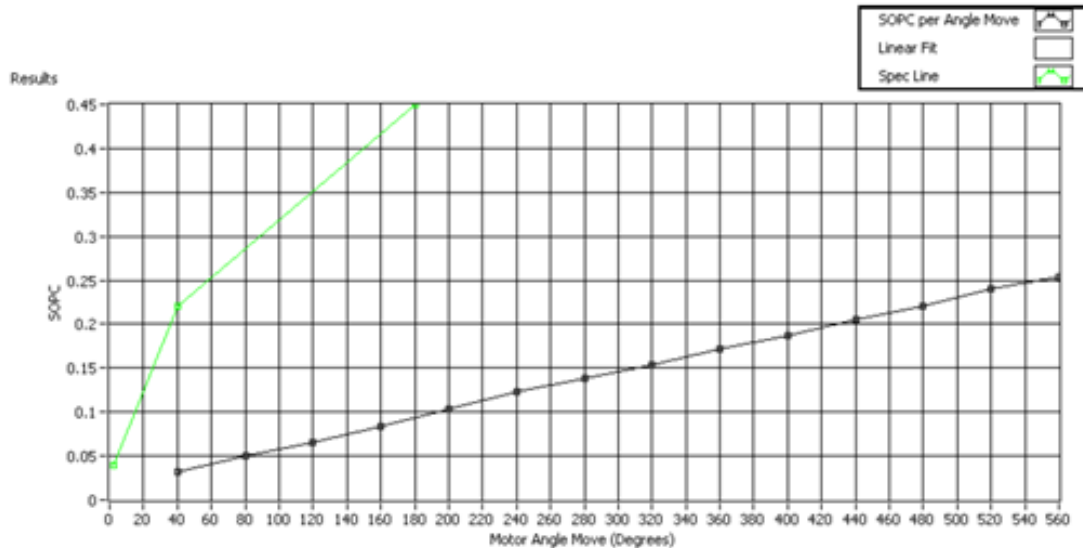
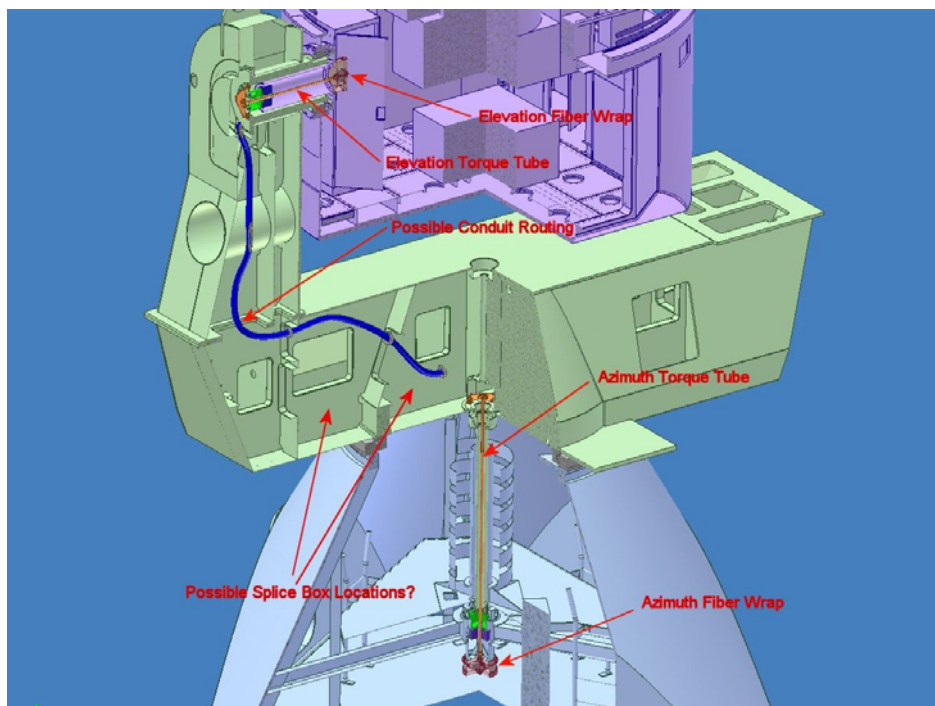


Figure 1 SOPC versus position for the wrap. Data taken from: FOW 132 11-17-10,



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