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ABSTRACT: *Summary of everything done in phase 1, 2 and 3.* *TITLE:* *Summary*		
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Summary

The main goal of this project is to find COTS fiber optical harness parts which are of interest for European space end-users. Another and equally important objective is to develop new production processes that enhance the harnesses reliability.

At the start of the project, T&G Elektro contacted the end-users Thales Alenia Space, Astrium and VTT. The conclusion of these meetings was that they required a connectors that were multi fiber, compact, light weight and reliable. T&G Elektro found one type of connector that complies with the first three requirements but not the last, at least not before testing the assemblies. The selected connector type are MPO and MTP connectors.
These connectors can have up to 72 fibers in the ferrule and in this project versions of the 12 fiber ferrule are used. As this number meets the customer requirements.

The two assemblies produced and tested are:

1. MPO/APC, GORE High temperature ribbon cable
2. MTP/PC, GORE High temperature ribbon cable

The main difference between these two are the ferrule polishing. The MPO/APC ferrule is polished with 8° angle and shorter protrusion. The MPO/PC ferrule is polished according to IEC geometry standard.

The productions was carried out at T&G Elektro's production facility at Nes in Aadal. The facility comprises of an ISO 6 clean room for fiber optical harness production. During production, thermal preconditioning and epoxy processes are used to minimize the stress between materials, that is a result of temperature changes in space. These two processes plus the polishing process have been developed to achieve high reliability for use in space.

Test specifications are written according to the documentation given before the start of the project by ESA and technical and relevant science articles. Our connector assemblies passed all the tests and the added attenuation was often reversible when the parameters went back to pretest levels or when the test stopped.

As an elongation of the GSTP project, an in orbit demonstration where possible through a vacant test slot in the Proba V satellite. The setup of the demonstration was made to send a specified test signal through 4 channels and to measure the bit error rate for all channels. The mission aim was to demonstrate that fibre optical components can stand typical space conditions, including launch and standard long term operations. After 1.5 years in orbit, still no bit errors have been detected. This indicates a low degradation of the connector as well as good reliability for the complete fibre optical system.

As mentioned earlier, there were four important points for the assembly: multiple fiber count, compact design, light weight and reliable. The first three where fulfilled before this project. The tests in this project indicates that the MPO/MTP connectors also fulfill point four which is reliability and T&G Elektro are confident of being able to deliver these

connectors, with our special internal processes, to space customers.

There are three different types of cables that T&G Elektro are ready to deliver; ribbon cable, bundle of single fiber cable and fiber optical routing board:
In a ribbon cable the fibers are in a row and have a rectangular intersection. All 12 fibers channels have the same start and end point.
A bundle consists of 12 single fibers that can be individually routed to one or several other MPO/MTP connectors. This enables routing between a system of MPO/MTP connectors.
The third type of interconnection is through a fiber optical routing board, this is a routing that is laid between two polyamide plates and the routing is typically made by a machine. This solution can contain hundreds of fibers with corresponding number of MPO/MTP or free single fiber ends to terminate other connectors as well. This solution is the most flexible of the three connection types.

For further information of the alternatives, see the Datasheet.