

Sira Electro-Optics Ltd undertook a study on the *Identification and Evaluation of Fibre Optics Components – Phase 2 & 3* (ESTEC under Contract No. 12299/97/NL/SB(SC)). The work follows on from an earlier Phase 1 contract, No AO/1-3170/NL/SB, where consideration was given to the availability of commercial, space quality, components, which employed optical fibre technology.

PHASE 1 - AVAILABILITY OF COMMERCIAL FIBRE-OPTIC, SPACE QUALITY, COMPONENTS

The work performed in Phase 1 undertook a general review of the availability of commercial fibre-based components which were intended specifically for use under space environment conditions and, where these were available, what national or international standards had been applied. The result of this review showed that there were effectively no off-the-shelf components available which did not require the end user to perform extensive evaluation test measurements.

PHASE 2 - IDENTIFICATION AND EVALUATION OF FIBRE OPTICS COMPONENTS

The work undertaken in Phase 2 was directed first towards evaluation and final selection of identified standard single-mode optical fibres of European origin through exposure to ionising radiation. This was followed by environmental test measurements to assess the selected optical fibre when incorporated within commercially available, space-quality cable fitted with space-quality connectors.

The initial requirement was to irradiate standard, commercial, single-mode, bare optical fibres using both gamma ray and proton test sources and, from the resulting information on induced attenuation effects, select one fibre type for inclusion within a space-quality fibre cable structure.

Three commercial, double acrylate-buffered, single mode fibres were earlier identified, being manufactured in Europe by Plasma Optical Fibre, Optical Fibres (Corning) and Pirelli. Fibre construction was in the form of germanium-doped silica core (diameter ~9 µm) and silica cladding (diameter 125 µm); the acrylic outer layer diameter was 250 µm.

For gamma irradiation tests, the Cobalt-60 facility at Cranfield University /RMCS, Shrivenham was employed. The Paul Scherrer Institut in Switzerland provided the proton irradiation source.

PHASE 3 – PREPARATION OF ESA/SCC DOUMENTATION

The work performed in Phase 3 was undertaken to provide a suite of ESA/SCC documents, which detailed the route to qualification and procurement of the above and similar space qualified optical fibre cable.

Draft ESA/SCC documentation was prepared for single mode simplex optical fibre cable assemblies. The documents prepared were: a Basic Specification for Capability Approval, an Evaluation Test Programme, a Generic Specification, a Detail Specification and a document of terms, definitions, abbreviations, symbols and units used in the other documents.