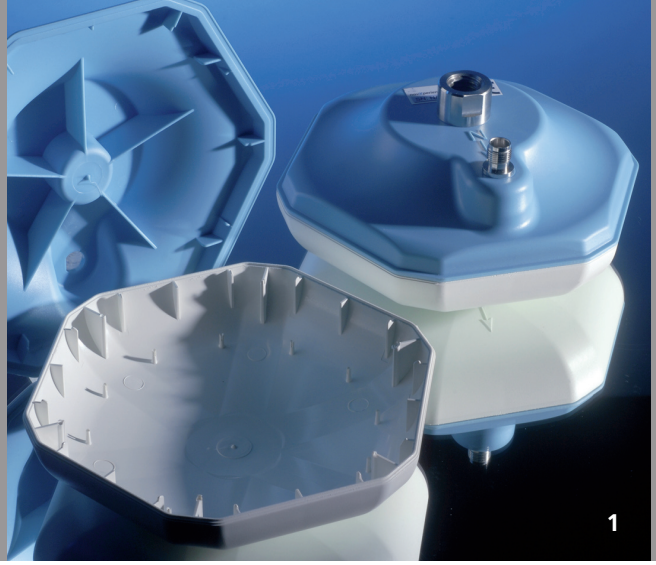

WELDING ASA POLYMER ANTENNA HOUSING WITH 1.5 µm FIBER LASER RADIATION

Task

3G-C antennas are active high-precision electronic systems developed for signal reception from satellite-based navigation systems currently in use. To ensure these systems operate reliably, a tight sealing of the housing is necessary, since it is exposed to harsh environmental conditions.

Method

A large number of polymers possess high absorptivity in the near-infrared wavelength range above 1.5 µm and do not need to be provided with absorbing additives to enable laser welding. Within the frame of the current EU project POLYBRIGHT fiber lasers are being developed with wavelengths 1567 nm (Erbium doping) and 1940 nm (Thulium doping) and maximum output powers of 120 W. These emission wavelengths coincide with local absorption maxima of different non-pigmented polymers, making the laser source particularly suitable for polymer welding. For the described 3G C antenna housing, the lower white joining partner has, in particular, sufficient absorptivity in this wavelength range, which in turn means that high quality weld seams can be achieved even when using colored polymers with high reflectivity in the visible spectral range.

1 G3-C antenna housing (navXperience, ASA polymer), welded with 1.5 µm fiber laser radiation in combined REMOTE / TWIST®-configuration.

Result

In a welding station assembled at Fraunhofer ILT, the antenna's top and bottom shell are positioned relative to each other, clamped together, and the focused laser beam is guided along the weld contour using a galvanometer scanner head. To prevent spots from forming with high radiation intensity, the focused laser beam is moved along the weld seam with a superimposed circular oscillation (TWIST® method).

Applications

This demonstrator welding unit can be used to meet increasing industry demands for the joining of colored (Figure 1) and even transparent components, instead of standard transparent/black combination. Applications are expected in the field of consumer goods and medical components where manufacturers have to forgo carbon black pigmentation for different requirements.

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