

To: Helena Armandula 10/17/2005
From: Mark S. Anderson
Subject: LIGO Aluminum Part Processed in New Oven: Molecular Contamination Analysis

Purpose

An aluminum part was sampled using solvent wipes. This was to determine the level and identity of molecular (oily) contamination on the surface after processing in a new oven.

Method

The analytical swabs consisted of extracted fiber-free lens tissue using dichloromethane solvent. The areas sampled were ~300 square centimeters. The low volatility residue was analyzed using Diffuse Reflectance/ Fourier Transform Infrared (DRIFT/FTIR) spectroscopy. FTIR provides chemical functional group information for quantitative analysis and qualitative identification of materials. The analysis followed the ACL-120 procedure that complies with Mil-STD-1246C Notice 3 and is sensitive to the most stringent level (A/100).

Results and Discussion

The hardware surface is very clean. The tap holes could be cleaned further. A common mixture of compounds was removed from the surfaces and tap holes.

Sample Location	Chemical Functional Group	~Amount,
Side 1 Area 1	AHC, Ester, Silicone	0.04 micrograms/cm ²
Side 1 Area 2	AHC, Ester, Silicone	0.03 micrograms/cm ²
Side 2 Area 1	AHC, Ester, Silicone	0.06 micrograms/cm ²
Side 2 Area 2	AHC, Ester, Silicone	0.06 micrograms/cm ²
Side 1 Tap Hole	AHC	12 micrograms total
Side 1 hole untapped	AHC	10 micrograms total
Side 2 Tap Hole	AHC	2 micrograms total
Side 2 hole untapped	AHC	6 micrograms total
Control Swab	-	No oily residue detected <0.1 micrograms

A 1.0 microgram per square centimeter level is a 10-nanometer average film thickness (density of 1.0).

AHC = Aliphatic hydrocarbon, common lubricant

Esters are from plasticizers and are a component of fingerprints

Silicone = polydimethylsiloxane