

### FIRST CONTACT™ DF FOR CLEANING SENSORS AND ESD SENSITIVE SURFACES

Static free films from FIRST CONTACT™ DF polymer solution offer the first practical method to safely and easily clean ESD sensitive surfaces, sensors and nanostructures. FIRST CONTACT™ DF solution follows all surface contours, dissolves organic contaminants and encapsulates particulates. Dust, nano-scale particulates and organic contaminants are all safely and completely removed. Peeling the dried polymer film renders the surface pristinely clean! Multiple independent labs using various techniques found no residues from the polymers in FIRST CONTACT™ DF. Carbon nanotubes that make the film conductive irreversibly bind to the polymers and do not remain after peeling.



The Cleaning & Protection System

#### FIRST CONTACT™ DF POLYMERS:

- ◆ Make a film peels off with no electrostatic buildup (of course - don't peel fast!).
- ◆ Remove fingerprints (skin oils).
- ◆ Leave no residue, Clean off contaminants and nano-particulates.
- ◆ Remove residue from treatments using other products or chemicals.
- ◆ Are safe and easy to use, reducing chance for error.
- ◆ Physically protect from airborne contaminants and accidental contact.

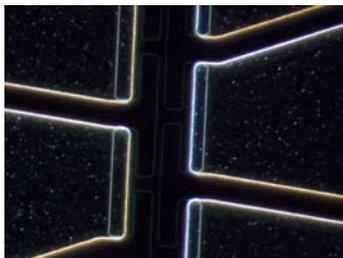
#### PRODUCT

FIRST CONTACT™ polymer systems have undergone iterative testing, innovation and development over recent years and are now available in several tested formulations. The polymer solutions are ready to use right from the bottle - no mixing is required. Try the Colorless, the Red, the Sprays and now ESD safe, anti-static FIRST CONTACT™ DF.

FIRST CONTACT™ DF consists of carbon nanotube enhanced designer polymers in a complex, carefully tailored solvent system. The polymers in FIRST CONTACT™ adhere strongly to themselves, the nanotubes and contaminants, but have minimal adhesion to the substrate surface (about 1/10<sup>th</sup> or less that of scotch tape). The solution dries to a flexible film and peels off easily and without charging, leaving an amazingly clean surface.

The chemically inert, the polymer may remain on the substrate for indefinite periods of time. Not only is the substrate clean, it is protected from recontamination or accidental contact which could damage the polished surface. The system is quite safe, utilizing common solvents like ethanol and acetone.

In addition to cleaning borosilicate glass and Zerodur®, FIRST CONTACT™ cleans fused silica, Si, Ge, ZnSe, NaCl, KBr, KRS-5, first surface mirrors, thin films including AR and reflective coatings, crystals, including non-linear crystals – even diffraction gratings and phase masks! Smooth or rough surfaces, flat or curved surfaces, continuous or non-continuous surfaces may be cleaned safely, easily, and completely as the fluid conforms to any surface while the dried polymer film releases easily; removing all particulate and organic contaminants.



Cleaning and protecting micro and nano structures.

#### NO RESIDUE

The polymers have been tested in many independent labs and shown to leave no residue behind. Testing by JPL, NASA, and others utilizing XPS/ESCA, FTIR, Contact Angle Analysis, and Mil-STD-1246C all attest that FIRST CONTACT™ polymer does not leave residues.

#### OUTGASSING

NASA Goddard SFC tests for outgassing found the polymer film meets their requirements; data may be found on the NASA website at: <http://outgassing.nasa.gov/cgi/uncgi/search/search.html.sh>, search 'First Contact'.

Photonic Cleaning Technologies, LLC

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## CCD AND CMOS SENSOR CLEANING WITH FIRST CONTACT™ DF

"Inspection of the films surface resistivity found it to be  $10^{10} \Omega/\text{sq}$ , which puts it slightly into the static-dissipative category. A sample of the film without the carbon nanotubes was found to have a resistivity of greater than  $10^{12} \Omega/\text{sq}$ , classifying it as an insulator."

– Derylo, G, et al., SPIE Proceedings, Advanced Telescopes and Instrumentation, June 2008.

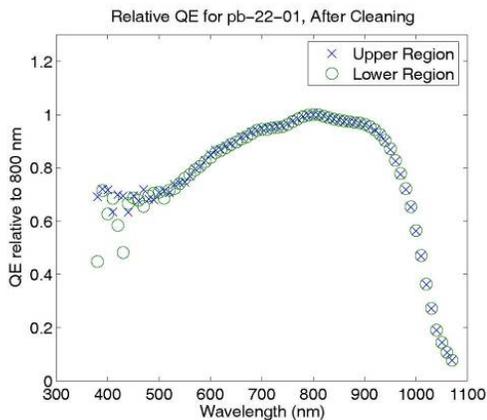
FIRST CONTACT™ DF has changed sensor cleaning forever! Use for vision systems, camera sensors and even CMOS sensors.

### FILM REMOVAL AND APPLICATION: WIRE BONDS AND PLASTICS

Before the liquid polymers dry, embed pull tabs like a piece of unwaxed dental floss or paper tabs to have something to start film peeling from the edge. Peel off slowly, gently and steadily over a few seconds to minimize static buildup. It was found that wrapping the plastic brush handle with conductive tape eliminated concerns about ESD from the brush. Carefully apply the liquid, for example through a magnifier, pushing it from the center center towards the wire bonds or plastic around the edges. DO NOT come near the wire bonds or plastic parts with the liquid polymers!! A steady hand is required to do this, but it is repeatable and safe. The first few times a particular procedure and sensor was tried, an ESD meter was used during the process to monitor ESD.

### PROTECTION

FIRST CONTACT™ polymer film provides excellent protection to the coated surface! The inert polymers form a strong, flexible covering that adheres intimately to the substrate. The polymer film prevents airborne contaminants and accidental contact, e.g. fingerprints, and abrasion damage. FIRST CONTACT™ polymer film is also an excellent barrier to oxygen, water, water vapor, and sulfur compounds. Leave the polymer film in place to protect and prevent re-contamination, then peel it from the substrate just prior to placing it in the coating chamber.



Above: "No change in quantum efficiency" before and after cleaning the new, pristine backlit and thinned CCD's with ESD free First Contact NT™. Lower region was cleaned with acetone and the upper region with First Contact NT™ using standard ESD safe protocols.

First Contact Polymer™ even removed oil from a vacuum accident!

–See G Derylo et al., SPIE Proceedings, ATI 2008, Marseilles

### APPLICATION METHODS

FIRST CONTACT™ is versatile; apply it with a brush, a pipette, by dipping, pouring, or spraying. Nothing touches the substrate except liquid FIRST CONTACT™ Polymer Solution. It is completely safe when properly applied regardless of the contaminants. Please visit our website, [www.PhotonicCleaning.com](http://www.PhotonicCleaning.com), or contact us for more information.

**Useful Note:** Some simple, common surfaces like microscope slides are extremely difficult to clean. Researchers at Wake Forest University compared slides cleaned with an accepted method, Squeaky Clean Slides, to those cleaned with the FIRST CONTACT™ polymers and found use of FIRST CONTACT™ to be the 'best method.'

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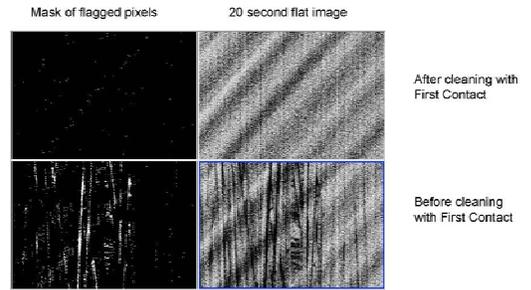
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First contact test  
Flag 3% below background



Above: Before and after images on a brand new, cleanroom fabricated and stored backlit, thinned astronomical CCD. Truly, cleaner than new! From Derylo et al, ref. on left.



Above: Test fixture with a ultra-sensitive CCD with oil contamination on the top photo. Bottom: Polymer cleaned CCD restored to better than new. For intermediate comparison, the polymer was initially applied to half the unit. "In order to achieve very low readout noise, these particular CCD's purposely are designed with all circuit protection features left out and are much more ESD-sensitive than any other CCDs I've worked with."

--CCD Fab Engineer.

The sensors were efficiently and effectively cleaned with FIRST CONTACT™ DF.