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A Final Evaluation of dust's remains on dust cover surface

by
Eric Kong

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Motive:

Dust cover (Black polyethylene, 4 mil thick) is a possible candidate to be used for covering the PMT panel in the cavity. Before we decide to use it, we want to assure that no dust fall off the dust cover when we pull the cover down from the panel, so that no dust will contaminate the detection system in the cavity. To ensure the above statement is true, we therefore conduct several experiments to check its validity. We have completed our first set experiments using photomicrography and would like to further our investigation for the second set experiments.

Brief description of the experiments:

The 4 mil thick black polyethylene sheet manufactured by (TRM) Weyerhaeuser Paper Company, Anaheim, CA. has passed our 6" long wipe test and is a strong candidate used as dust cover. A piece of this black polyethylene sheet was cut to 6"x8" size from its cardboard package. It was hung in the glove-box ceiling. Mine dust was then blown to the glove-box for 15 minutes. Twenty-five hours later, this black polyethylene sheet was cut to a 1"x2" size and placed on the microscope platform for optical inspection and photography. Circular agitation on the black sheet were done to simulate the anticipated motion in the cavity.

Contents of this binder:

This first half of this binder contains 4 sets of photos on dust cover with dust, and the second half contains eight sets of photos. This report only emphasize the first half and the overall findings because the second half has already been discussed in the preliminary evaluation report. Again, an entire view under microscope, portion of it is not covered in the photo, is sketched with colors to aid recognition of the photo, especially for black & white photos. The percent humidity is lower than the preliminary evaluation and only 60x magification is used here.

Summary of the result:

1. The particles seen in the photos and sketches are mine dust (not plastic dust).
2. A range of 70 to 90% of dust particles remains on the black sheet after one minute circulation agitation.
3. The amount of dust blown to the black sheet through the glove box is over 10μg/cm.
4. The amount of dust hand-blown to the black sheet after wipe clean is over 50μg/cm.
5. The humidity of the test days is around 50%.
6. Some particles move and disappearred and their size is over 70μm.

Conclusion:

The percentage of dust remained on dust cover depends upon the amount of dust put on it, its material, and the humidity of the environment. The anticipated environment would probably be different than this experiment environment. Dust will settle a long time and only let small particles remain on the dust cover surface. These particles are small enough not to fall off the dust cover surfaces. Therefore, we feel that using dust cover will not contribute dust in the cavity when dust cover is pulled off from the panels.