Property Measurement Requirements

For simulant related work the following guidance is provided with respect to how we treat disparate measurements of a single property. A specific example is measurement of size distribution. As with all guidance discretion and judgment is needed in applying the following.

1. We will report an integration of all the different measurements the community finds to be trustworthy. This will be done by someone using their professional judgment. This will be the value typically used by people who are not specialists in the specific property being measured.

2. We will also report all separate measurements. It is recognized this will often lead to "all kinds of answers on the same material". This will be useful to specialists and is critical for us to compare technologies. The values reported should include the technique and an independent (key word – independent) expert in the field should comment on the validity of the technique (not the competence of the individual reporting the value). The later is of course at the heart of the prototyping effort.

3. In all cases the techniques used shall be documented to a level sufficient for one skilled in the art to completely replicate the process. We note that this requirement is beyond what is normally employed for reports in the current technical literature.

4. We suggest that results and methods descriptions needed to satisfy 3 above be documented in, for example, a NASA TM, a U.S.G.S. Open File Report, or equivalent. This will allow the work to be published elsewhere in accordance with the journal's current practices.

5. The policy and procedure in 3 and 4 above will remain until a method(s) of measurement is written into the requirements document. At which point reference can be made to the requirements document. To preclude the risk that technological development could be stifled by this approach, the requirements document is explicitly structured to permit use of non-standardized measurements. This is done by requiring a comparison of new techniques to documented techniques.

Rationale:

A significant part of our motivation for 3 & 4 is the situation we have with respect to JSC-1 and the various Apollo simulants. Measurements are easy to find but no one could reproduce them because no one thought to carefully report how the measurements were made. Often the significance and sensitivity of the values are not great enough that this is a problem. But it has already arisen a couple times where it is. Given that we will be doing these type of measurements for ten years or longer, and using the results for a significantly greater period, we had best be careful now.

A significant complication in our situation is the need to invent novel instrumentation to get at some of the properties we want the way we want them (adhesion of a single particle to space suit view window in the activated state and in UHV is a good for

example). Using a commercial system makes it much easier to document procedures. For homemade instrumentation some detail is always inadvertently missing no matter how hard you try otherwise. We recognize this, but it is better to set a goal and try than to ignore an issue!

Finally, we are often going to be at the cutting edge or limits of technology or system performance. This increases the chances of measurements of questionable validity. A standard safe guard against this in science is the fact someone else will attempt to make the same measurement. For engineering situations that is a poor assumption. The only real safeguard in such cases is the demand for thorough documentation about methodology.

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