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LETF Abstract Submittal

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Title: Color Choice is Everything – Impacts Color makes to the Lighting Environment

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When contracts are let out to design multiple systems in a vehicle, it is a challenge to maintain integration between system leads. Designers on niche systems, like lighting and control panel design, often get caught up in the challenge of designing the light source or visual interface and fail to include time in their schedule to work with system architects on how their lighting system will be integrated. Additionally, behavioral scientists, industrial designers, and materials engineers get caught up with the materials and look of the system, but often fail to consider how the selection of their materials could affect the certification or performance of electronic devices like lighting systems. Additionally, computer modeling of the system architecture often assumes a perfect environment without the clutter of actual human use (dirt, stowage, crowding). As a result, lighting systems, and backlit displays run the risk of being overdesigned or under designed.

Engineers making the assumption that because they have no input or there is no requirement on work surface reflectance, make the assumption that they can't count on good material choices and thus may install more lighting than is necessary. While having more lights may seem better, for a vehicle that is trying to conserve power, more lights may not be a good option. On the other hand, designers who made the opposite assumption and designed a lighting system that only produced just enough light, often wind up with a system that did conserve power, but didn't produce enough light. These situations are exasperated when the system starts to be used and the models are not "perfect" anymore.

The lack of coordination and iterative design not only can impact lighting levels within an environment, but also can affect color perception. This is because, if materials do not represent a gradation of white or black, the material unevenly absorbs and reflects light at different wavelengths of the visual spectrum. The lighting designer may have built a light that meets light spectra requirements, but the eventual light reaching the human user may not be the spectra of light architects intended, if materials near the light source change the spectrum just by how much color is absorbed or reflected. With the recent findings concerning Circadian rhythm, where the spectra of light is extremely important for addressing crew sleep and wake cycles, system architects should pay considerable attention on the impact material choices have in changing the light spectrum in an environment.

This presentation will show examples of how material choices impact the resulting illuminance, color spectrum, and power usage of an illuminated space. Its goal is to encourage system designers and planners to use more care in development of requirements and the verification of systems intended for the human visual interface.