SOCOM25D-001: Active Index Matching for Micro-optics (AIMM)

ADDITIONAL INFORMATION
N/A

TECHNOLOGY AREAS:
Human Systems

MODERNIZATION PRIORITIES:
Advanced Materials | Human-Machine Interfaces

KEYWORDS:
optical materials; displays; heads up display

OBJECTIVE:
SOF ground forces require an improved capability for displaying information which is both effective and unobtrusive in the normal flow of a mission. Current technology can either not perform in sunlight environments or must permanently (while wearing it) darken the world (i.e. sunglasses) in an obtrusive way. An improved capability must be effective during bright sunlight and while wearing night vision goggles. The objective of this topic is to develop applied research toward an innovative capability to display information to a human wearer without compromising their natural view of the world.

DESCRIPTION:
As a part of this feasibility study, the proposers shall address all viable overall system design options with respective specifications to innovatively design a transparent near-eye display incorporating optical elements which can selectively affect incident light. Liquid crystal technology can activate and deactivate three-dimensional geometrical features within a transmissive material in order to affect, or not, the path of light through the material. The resultant technology could have applications across common optical elements such as lenses, gratings, and apertures allowing a user to activate or deactivate the optical element. The capability for AIMM applies this technology to transparent near-eye displays. The feasibility study should consider optical abnormalities perceived by a human viewer in close proximity. The feasibility study should consider stray light, either generated by the transparent near-eye displays or caused by interaction of light from the world, as perceived by the wearer. The feasibility study should consider stray light which can be perceived by a non-wearer. The feasibility study should consider technologies to achieve transmission greater than 80% while also displaying information bright enough to be seen in bright daylight. The feasibility study should consider switching speeds of the material as well as general function across temperatures from -20 Celsius to +50 Celsius. The feasibility study should consider degradation from prolonged exposure to solar radiation on Earth. The feasibility study should consider the vergence / accommodation conflict.

PHASE I:
Conduct a feasibility study to assess what is in the art of the possible that satisfies the requirements specified in the above paragraphs entitled “Objective” and “Description.”
The objective of this USSOCOM Phase I STTR effort is to conduct and document the results of a thorough feasibility study (“Technology Readiness Level 3”) to investigate what is in the art of the possible within the given trade space that will satisfy a needed technology. The feasibility study should investigate all options that meet or exceed the minimum performance parameters specified in this write up. It should also address the risks and potential payoffs of the innovative technology options that are investigated and recommend the option that best achieves the objective of this technology pursuit. The funds obligated on the resulting Phase I STTR contracts are to be used for the sole purpose of conducting a thorough feasibility study using scientific experiments and laboratory studies as necessary. Operational prototypes will not be developed with USSOCOM STTR funds during Phase I feasibility studies. Operational prototypes developed with other than STTR funds that are provided at the end of Phase I feasibility studies will not be considered in deciding what firm(s) will be selected for Phase II.

PHASE II:

Develop, install, and demonstrate a prototype system determined to be the most feasible solution during the Phase I feasibility study on a transparent near-eye display.

PHASE III DUAL USE APPLICATIONS:

This system would be used by SOF ground forces who require a capability for displaying information which is both effective and unobtrusive in the normal flow of a mission. This system could also be used in a broad range of military applications where the wearer needs to maintain situational awareness of their environment while receiving information from connected, digital systems.

REFERENCES:

1. Vergence-accommodation conflict in optical see-through display: review and prospect. https://www.sciencedirect.com/science/article/pii/S2666950121001061

TOPIC POINT OF CONTACT (TPOC):

None