

At a Glance

What it is

- The affordable modular panoramic photonics mast (AMPPM) is a new submarine sensor mast with 360 degree panoramic search capability in both visible and infrared (IR) wavelengths. It is designed to significantly increase system reliability and drastically reduce total life-cycle cost.

How it works

- The photonics mast uses multiple cameras to create an instantaneous 360 degree panoramic image with a 65 degree vertical field-of-view.
- A non-rotating mast structure is used to increase system reliability.
- New window materials will be used to increase transparency at wavelengths from 0.35 microns to 5 microns while increasing hardness and durability.
- A high definition (HD) format short wave IR (SWIR) sensor will be used for low-light-level conditions and to penetrate marine haze.
- A near-IR/SWIR hyper-spectral sensor will be used to augment the detection of targets with spectrally unique signatures.

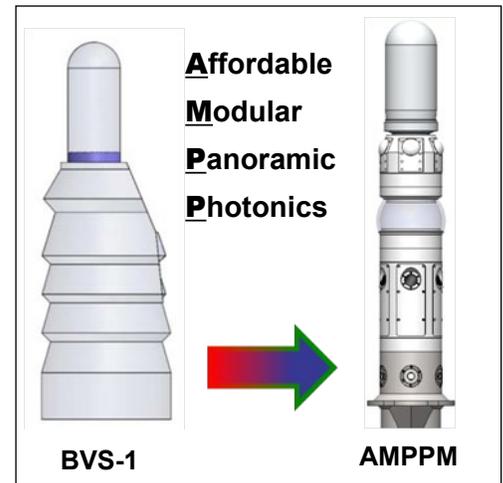
What it will achieve

- A 50% reduction in total life-cycle cost for the system/platform as a result of significantly reduced periscope mast fabrication and maintenance costs.
- Open architecture design that provides for rapid component upgrades.
- Increased systems availability and safety with modular component design.
- Reduced target search time at visible and IR wavelengths leading to decreased mast exposure.
- Better performance in cluttered/littoral operations with autonomous target detection.

Points of Contact

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The affordable modular panoramic photonics mast will become the future standard mast on Virginia and SSGN class submarines. It is designed to provide the highest quality sensors for a panoramic search capability in the visible and infrared (IR), as well as long range detection and identification capabilities with short-wave IR (SWIR) and hyper-spectral sensors. The panoramic photonics mast is designed to drastically reduce fabrication and maintenance costs by its modular design and non-rotational structure. In addition, it will significantly increase operational availability compared with current photonic masts.



The AMPPM will utilize multiple visible and IR sensors arranged around the mast structure to provide a full, simultaneous 360 degree search capability. The non-rotational structure will be much more reliable than the current rotating mast, leading to lower fabrication costs, reduced wear, and much lower maintenance costs. The new mast structure will rapidly provide situational awareness and target detection, greatly reducing mast exposure time.

The modular and open architecture design of the AMPPM will also help to facilitate reduced fabrication and maintenance costs. The modular design will allow much more maintenance to be accomplished at the intermediate-level (vs. the depot level) than the current photonics mast, resulting in a large increase in system availability. In addition, the modular design will allow easy replacement of the current sensors with higher performance sensors, as they are developed.

The use of a sensitive SWIR sensor in the mast will allow unprecedented capability to see and identify targets under low-light-level conditions and through marine haze, greatly increasing detection ranges. The use of a high-performance hyper-spectral sensor will allow targets to be identified uniquely by their spectral signature and will allow autonomous target detection and tracking. Finally, the use of new, Spinel-based window materials will increase transparency, reduce weight, and increase the durability of all visible and IR windows used on the new photonics mast.

Research Challenges and Opportunities

- Modular sensor components for 360 degree imaging
- Sensitive SWIR camera technology for marine environments
- New, harder transparent window materials for visible and IR wavelengths
- Automatic target detection capability using hyper-spectral imaging
- Reduced sensor footprint to fit within mast volume