NSRP | National Shipbuilding Research Program

RSL ADVANCED LIGHTING TECHNOLOGIES

MSTIC
Maritime Sustainment Technology and Innovation Consortium

MSTIC-26-01-3-003

Laser Diode Illuminator for DDG 1000 Remote Source Lighting System

ELECTRICAL TECHNOLOGIES PANEL MEETING
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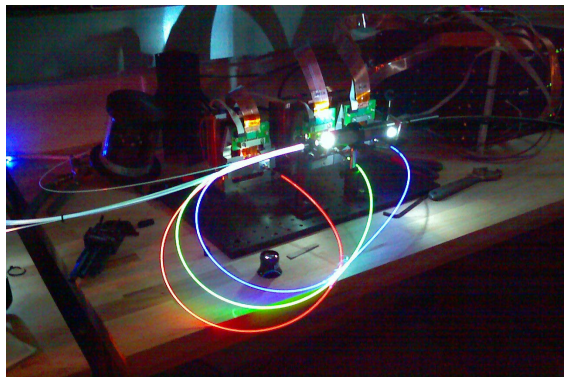
NSRP
NATIONAL SHIPBUILDING RESEARCH PROGRAM™
Taking Shipbuilding and Repair to the Next Level

MSTIC PROJECT

- Duration: 16 months
- Develop illuminators with laser diode modules as light sources for use on DDG 1000 class.
- Laser diode modules used extensively in cinema projectors and industrial machine vision applications.
- Build and test to MIL requirements.
- Test Navigation and Signaling lights to 72 COLREGS.
- At project end, illuminator designs ready for production.



- Leveraging work from previous NSRP Panel Projects 2019-477-002 and 2019-477-005.
- Benefitting NAVSEA's update of DOD-HDBK-289 with MIL-STD-x743.

NSRP 2019-477-002 ADVANCED TOPSIDE LIGHTING SYSTEM (2020)

OBJECTIVE

Identify issues with U.S. Navy lighting, define functional requirements, identify new lighting technologies, and outline optimal system.

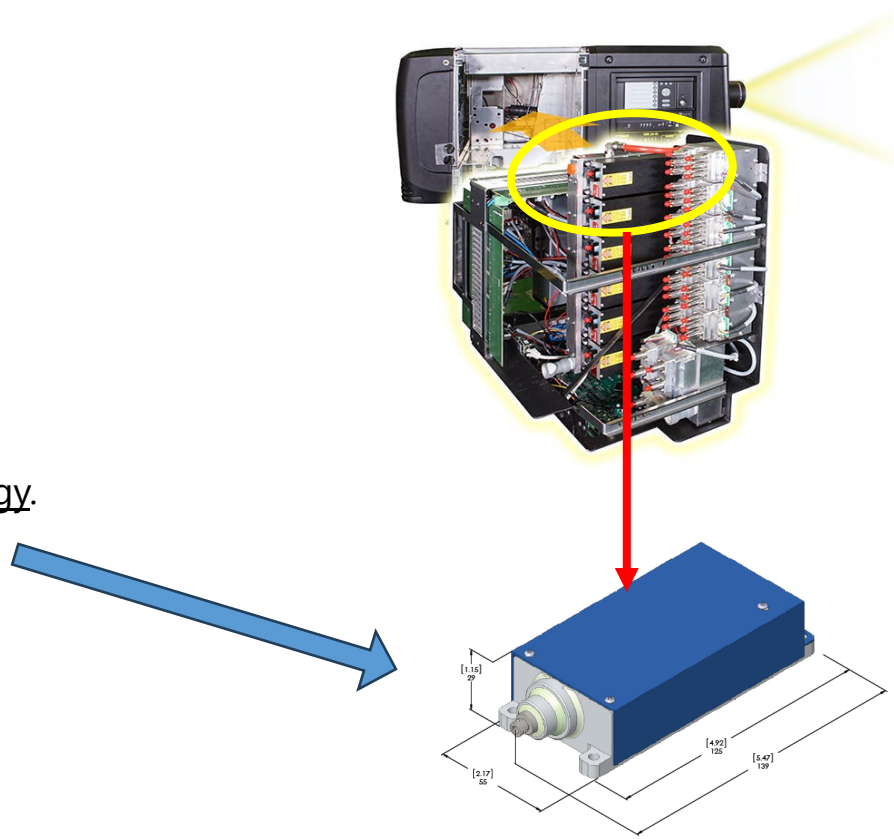
OPTIMAL SYSTEM OUTLINE

1) **Solid state sources – LEDs and RGB Laser Diodes:**
   - High reliability.
   - Long life.
   - Mature technologies with downward cost curves.

2) **RGB Laser-based, controllable, fiber optic remote source lighting:**
   - Eliminate topside metallic parts.
   - Reduce Topside size & weight.
   - Increased system lifetime.
   - Drastically reduce total ownership cost (TOC) of the RSL technology.
   - Design based on laser diode modules used in cinema projection.

3) **LED Luminaires:**
   - Use in accessible locations.
   - Must be self monitoring.

4) **Lights controlled by:**
   - Integrated bridge system for New Constructions.
   - Legacy control panels for In-Service upgrades.



LIGHTING TECHNOLOGY USE BY APPLICATION

NSRP PP 2019-477-002 and 2019-477-005

CONDITION	DEVICE TYPE
Luminaire in inaccessible Location (Mast, yardarms, etc.)	RSL
Luminaire and cable in proximity of ISTAR equipment.	RSL
Luminaire in relatively accessible location.	LED
Luminaire weight of utmost concern.	RSL
Luminaire embedded in ship's structure.	RSL
Light type used infrequently.	LED
Frequent high mechanical stress on luminaire.	RSL
Narrow output beam required.	Xenon / LEP

LIGHTING GROUP	LIGHTING TYPE	RECOMMENDED LIGHTING TECHNOLOGY
Navigation and Signaling	Anchor Light - Aft	LED
	Anchor Light - Fwd	LED
	Clearance/Obstruction Light	RSL
	Masthead - Aft	RSL
	Masthead - Fwd	RSL
	Mine Sweeping	LED
	Task - Not under command	RSL
	Task - Man Overboard	RSL
	Task - Restricted maneuv.	RSL
	Side Lights	LED
	Towing - Masthead	RSL
	Towing - Stern	LED
	Stern	LED
	Aircraft Warning	RSL
	Stern Light (Blue)	LED
	Wake light	LED
	Blinker	RSL
Searchlights	8 - inch searchlight	XENON /LED/LD/LEP
	12 - inch searchlight	XENON /LD/LEP
Other Exterior Lights	RAS / FAS	LED
	Waterline Security	LED/LEP/RSL
Interior Lights	Navigation Bridge	LED/OLED
	Combat Information Center (CIC)	LED/OLED

LASER DIODE RSL SYSTEM BENEFITS

- Reduce the cost of the RSL technology by over 75%.
  - Improved coupling efficiency into optical fibers vs. LED and metal halide (~ 80% vs. ~20% to 25%).
  - Same RGB (or RGB-IR) illuminator configuration for all lights.
- Suitable for use on new constructions and retrofit-able to in-service ships.
- Easily adaptable to multiple ships' classes.
- Full redundancy as required per COLREGS.

QUESTIONS?

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