

Color 1280 x 1024 Micro-Display Manufacturing sTechnology

Develop a manufacturing process to provide affordable, high resolution, full-color micro-displays (0.97" format) for insertion into Soldier borne head mounted image fusion and weapon sight systems.

OBJECTIVE / SOLUTION

Future Army imaging programs, such as the Enhanced Night Vision Goggle-Digital (ENVG-D), will rely on image fused, high resolution (1280 x 1024) sensors and displays to replace the current capabilities (such as standard night vision goggles). These systems will require an affordable, high performance, artifact free, low power, full color micro-display (0.97" diagonal) to meet the desired Key Performance Parameters (KPPs) of system weight, power, situational awareness, and target acquisition. The current manufacturability of such a display is low. PEO-Soldier has deemed this an essential program for the fielding of several FY08-FY13 production programs.

Objective Performance and Manufacturing Goals:

- Increase Contrast Ratio to 100:1
- Increase transmission rate to $\geq 5\%$
- Increase viewing angle to $\pm 20^\circ$
- Decrease display response time to $< 16\text{ms}$
- Increase yield to $\geq 20\%$
- Reduce display unit Cost by 5X

ACHIEVEMENTS

Displays developed on early lots of the program have been inserted into ENVG-D prototypes and were successfully demonstrated in the Phase II ENVG-D limited user evaluations which took place in September 2008 and May 2009. In the early development lots, great effort was placed on increasing the performance of the displays by increasing the cell gap uniformity (better contrast across the display and better viewing angle) and reducing cosmetic artifacts (ghosting, vertical lines, and inoperative pixels). Also the power of the display (with backlight and electronics) has been greatly reduced ($< 0.75\text{W}$) with plans to further reduce the power to less than 0.5W .

BENEFITS

An affordable/high performance micro-display will enable the presentation of digital image fusion to provide the Warfighter with multispectral imagery from two to three sensors. This will increase the Soldier's mobility (better



Color 1280 x 1024
Micro Display



Handheld Talon
Target Locator

vision), situational awareness, and target detection and acquisition. The reduction in cost will allow for a larger procurement of imager systems. The program will also develop lower power displays than the current display (current display: approximately 1W ; projected display: $< 0.6\text{W}$), this will reduce the system power, reduce the number of batteries required to complete the mission, and thus reduce the logistical burden.

STATUS

- Program is in its second year of funding
- Contract package was awarded to Kopin Corporation (December 2007)
- Production of three lots of displays (25 wafers) is complete
- Re-Design to evaluate a $12\mu\text{m}$ pixel vs. $15\mu\text{m}$ pixel under way and will be integrated into the fifth lot of displays
- Displays from this program have been provided to transition partners for insertion into prototype systems
- Displays have been evaluated by limited users

WEAPON SYSTEMS / SECONDARY ITEMS IMPACTED

- Enhanced Night Vision Goggle-Digital (ENVG-D)
- Fused Weapon Sight (FWS)
- Night Sight-Semi Automatic Sniper System (NS-SASS)
- Handheld Target Locator, Talon+

POTENTIAL COST AVOIDANCE

- Return on Investment of 29.7:1 with a cost benefit of $\$136\text{M}$