Honeywell N56X0 Area Imager with 2DTG's DPM Decoder: Performance Evaluation

Contents

1. Objective

The objective of this study was to evaluate performance of the **Honeywell N56XX Area Imager,** upgraded with **icEveryCode™ DPM Decoder.**

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3 devices were selected for this study:

1.1 **N5680SR-BR0-215 Area Imager by Honeywell Corp.** (SN: 12343B1318), upgraded with the **icEveryCode™ DPM Decoder** (DPM decoding software) by 2DTG.

1.2 **N5680SR-BR0-215 Area Imager by Honeywell Corp.** (SN: 12343B1318) with the original ("system") decoding software.

1.3 **Xenon 1900HD by Honeywell Corp.** (S/N 10266B016E), upgraded with the **icEveryCode™ DPM Decoder** by 2DTG.

Note: Device 1.3 was used for reference purpose only.

2. Test Scope

Three performance parameters were measured on the representative set of DPM marks:

Decode Rate or **Success Rate -** defined as a ratio equal to the percentage of the successful decoding within the given set of samples - (Number of successfully decoded samples) / (Total number of samples).

Operating Range - one of the most challenging performance parameters for any DPM reader along with Decode Rate. Industries require DPM readers to be capable to decode DPM marks at the distance up to 2 inches from the exit window for the small DataMatrix symbols, having module size in the range of 5-7 mils, and up to 8 inches for the 20-40 mils symbols. **Operating Range** was calculated as the difference between the maximum and minimum **Reading Distance.**

Decode time - defined as the full time required for successful decoding: from starting to aim at the symbol until it is decoded.

3. Test Procedure

3.1. Samples

The set of DPM samples was comprised from "typical" materials (steel, duralumin, plastic, etc.), surfaces (cast, polished, etc.) and type of DPM marks (Dot Peen, Laser etching). Some of the samples have been chosen intentionally challenging. Though the spectrum of the samples was broad enough, most of them came from automotive industry.

Set contains 24 Data Matrix DPM samples: laser etched - 8, Dot penned - 16. Module size is ranging from 4.4 to 31 mil; average module size – 19.0 mil. Sample images - as captured by regular camera - are shown in the Exhibit 1.

Dot Peen samples, depicted on the pictures as having "red dots" (and marked with letter "F") - HF13-HF22 - were not considered (decoded) in this analysis.

Sample # H11 was excluded from the analysis since it's out of specs (cell size is < 5 mil) for N56X0SR.

Samples ## H3, H10, HF6, HF9, and HF10 were excluded from analysis since they could not be decoded by either scanner.

Reading technique is described in the "**DPM Multi-Platform Plugin**" User's Guide.

3.2. Definitions

All decode results fall under the 3 categories:

- **"Stable Decoding"** – meaning that decoding was successful from the first try – no lighting or distance adjustment, or aiming angle optimization was required.
- **"Conditional Decoding"** - decoding was successful, but some adjustments had to be made during the image capturing process:

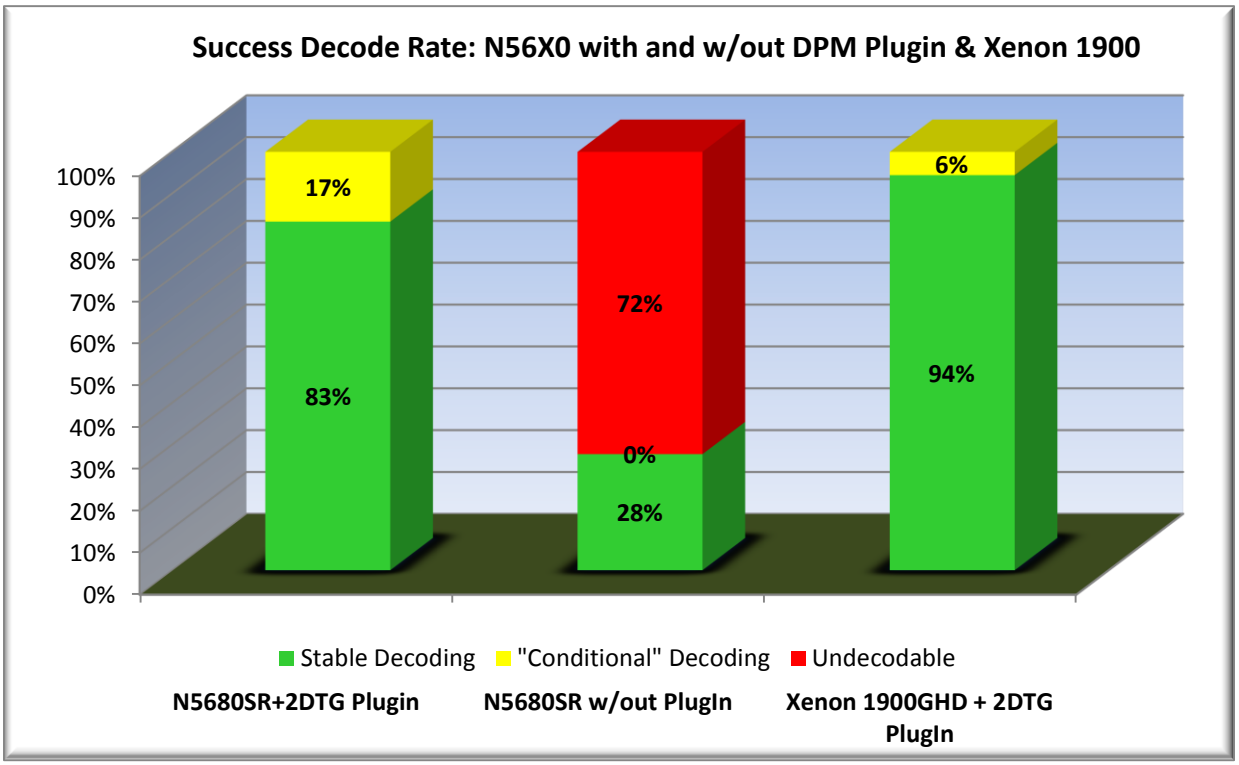
- For most of the scanners studied image capture has to be performed under the certain angle to the surface (from 45 to 65 degrees) to avoid direct light reflection from the substrate. “Optimal” value of this angle as well as distance from the target depends both on surface condition and ambient light. Accordingly, this “optimal” angle and distance has to be worked out by operator experimentally and capture time depends on operator experience.
- For scanners 1.2 and 1.4 “angle adjustment” is less important as they have built-in illumination system providing diffuse-like lighting.

- **“Undecodable”**

The time stamp for the **“Stable Decoding”** we considered to be up to 2 sec; for the **“Conditional Decoding”** – up to 5 sec; and for **“Undecodable”** – more than 10 sec.

4. Test Results

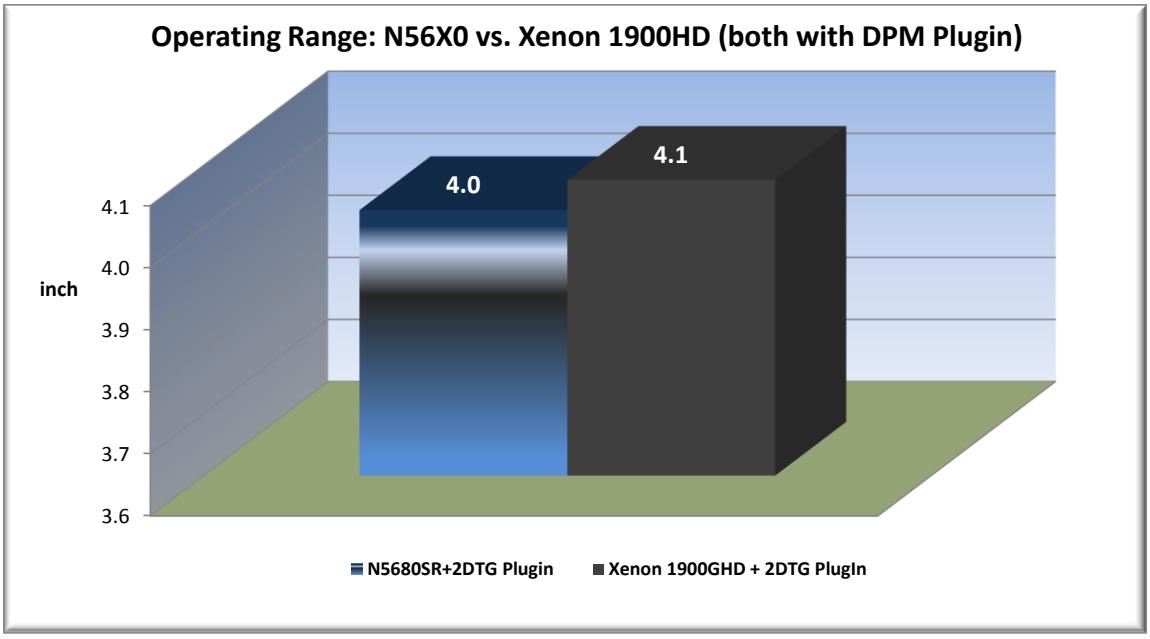
Side-by-side comparison of the Success Decode Rate for N56X0SR with- and without 2DTG’s Plugin is demonstrated by the diagram below (Xenon 1900HD results are shown as a reference):



Comparison of the average operating ranges for the devices 1.1 and 1.2 is not meaningful since only few samples were decoded by N56X0 without Plugin.

Average Operating Range for the N56X0SR and Xenon 1900HD (both with Plugin) is basically the same,

demonstrating that it's more dependant on the samples quality than a type of imager (for DPM samples):



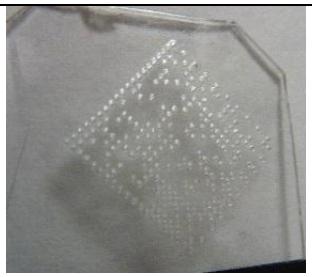
5. Conclusion

As expected, N56X0, upgraded with DPM PlugIn, demonstrates very good DPM performance – **Success Decode Rate** – the same as Xenon 1900 with DPM Plugin, which is in turn on par with the DPM industry leaders: DS3508-DP20185R (Motorola Solutions, Inc.) and DataMan 7500 (Cognex Corp.).

"High Density" type of imager is preferable for DPM applications since it provides higher resolution. Imager's operating range is more dependant on the samples quality than a type of imager.

6. Exhibit 1. DPM Samples

H1 Cast Duralumin 26x26; 24 mil	H2 Cast Duralumin 18x18; 20 mil	H3 Polished Steel 18x18; 10 mil	H4 Chrome-plated Steel 18x18; 11 mil
			
H5 **Painted Al** **26x26; 21 mil**	**H6** **Painted Plastic** **12x12; 23 mil**	**H7** **Polished Al** **12x12; 23 mil**	**H8** **Black Plastic** **12x12; 20 mil**
			
H9 **Polished Al** **26x26; 12 mil**	**H10** **Polished Al** **14x14; 11 mil**	**H11** **AMD chip** **18x18; 4.4 mil**	**H12** **Black Plastic** **12x12; 21 mil**
			

H13 + H13F Milled Steel 20x20; 26 mil	H14 + H14F Milled Brass 20x20; 22 mil	H15 + H15F Milled Cooper 20x20; 16 mil	H16 + H16F Polished Duralumin 20x20; 24 mil
			
H17 + H17F **Organic Glass** **20x20; 30 mil**	**H18 + H18F** **Teflon** **20x20; 30 mil**	**H19 + H19F** **Colored Organic Glass** **20x20; 30 mil**	**H20 + H20F** **Textolite** **20x20; 16 mil**
			
H21 + H21F **Duralumin, distressed** **20x20; 16 mil**	**H22 + H22F** **Curved polished steel** **16x16; 17 mil**	**H23F** **Duralumin** **20x20; 18 mil**	**H24F** **Duralumin** **20x20; 28 mil**