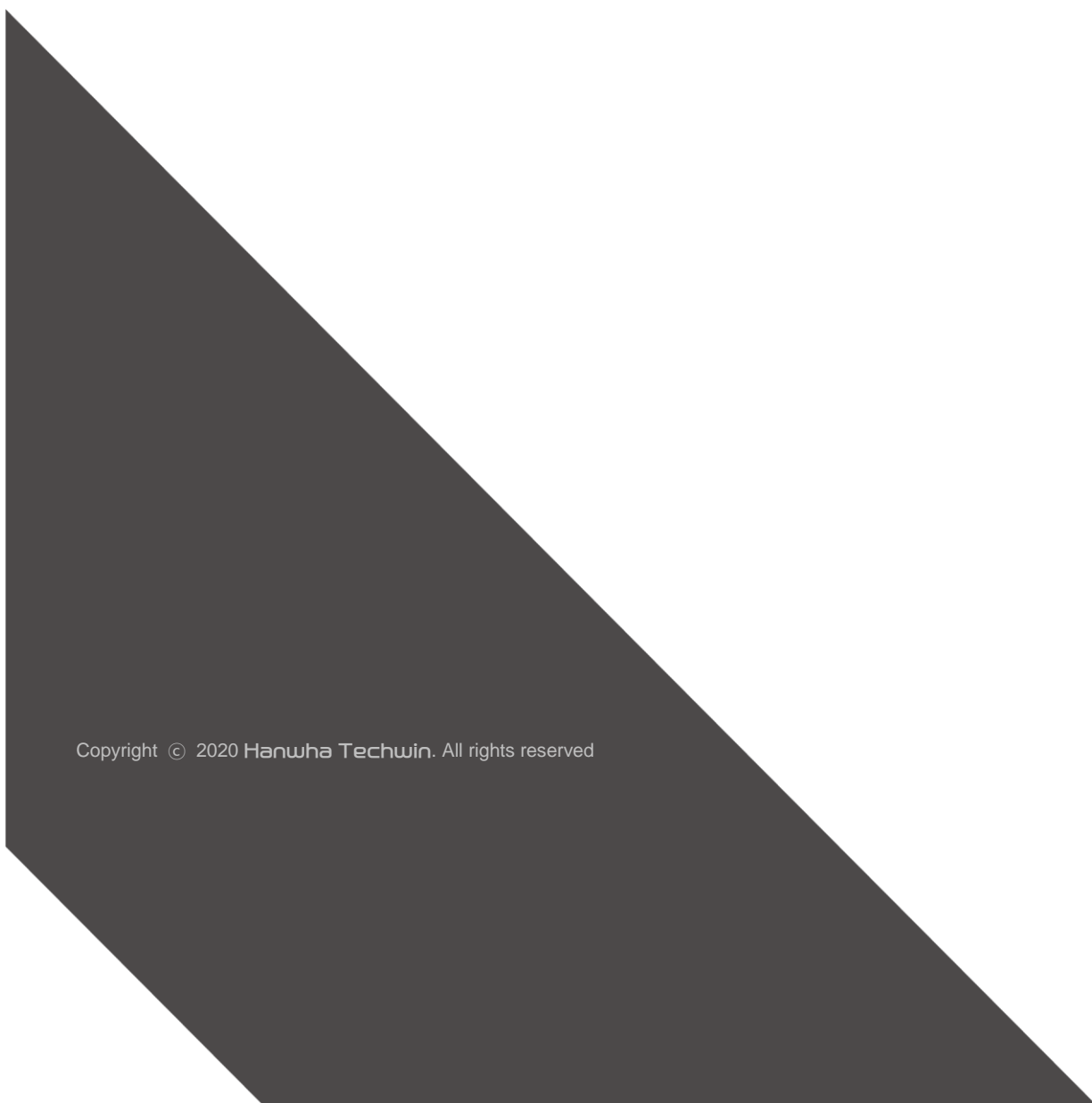




White Paper

# WDR: Wide Dynamic Range

29<sup>th</sup> 06, 2020



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Video processing and sensor technology has been rapidly advancing to make video capture look as natural as possible compared to human vision.

In particular, video surveillance cameras have been developed to provide the best image quality under difficult and changing lighting environments. One of the most important aspects is the Wide Dynamic Range (WDR) or backlight correction technology, which reacts to the change of light.

WDR is a technology for obtaining an excellent image by resolving the difference in brightness when the background is brighter than the main object or glare is generated by strong lighting.

Generally, WDR is required in the following situations:

- During daytime, where it is relatively dark inside a building and bright outside.
- A bright light shines towards the camera, such as with a car approaching the camera with its' headlights turned on.



Image 1. WDR is applied when the main object is dark due to the bright background.

These are common examples in video surveillance; therefore, many video surveillance cameras have the WDR function included. Hanwha Techwin has been working continuously to strengthen its WDR function to provide optimized and vivid images in the strong backlit scenes. And in 2020, Hanwha Techwin introduced the Wisenet7 implemented with the extreme WDR technology which can produce high resolution images suitable for forensic search application in the environment with strong backlit.

The WDR technology applied to Hanwha Techwin cameras provide excellent image quality while minimizing side effects to deliver videos suitable for all applications.

In many video surveillance environments, part of the image may be hard to discern because the dynamic range (which is the ratio between the brightness of the brightest and darkest areas of an image) is too large. To resolve this problem, various WDR methods are used including variable exposure control, adjustment of charging capacity, measurement of cell saturation time, and dual-size sensor cell type.

Nowadays, the most common method is variable exposure control, which captures images with differing brightness and integrates them to achieve the proper brightness. In order to adjust the amount of light entering the camera using the exposure time, an object in a brighter area requires a short exposure time, whereas an object in a darker area requires a long exposure time. Thus, one image is generated using the information from multiple images taken with short and long exposures.

Note, however, that the multiple exposure method has some side effects. The most common one involves moving objects. When capturing a moving object, artifacts may occur if the object is moving too fast and the exposure time is too long.

Dynamic Range is the ratio between the brightness of the brightest and darkest areas of an image.

Methods of increasing the dynamic range of an image has been researched in many fields. Although a way to improve the performance of the image sensor's photo diode has been researched, it has limitations in price and performance. As such, variable exposure control composition has been actively researched due to increases in camera processing power.

# 4. Wisenet7 extreme WDR

The WDR technology applied to Hanwha Techwin’s Wisenet7 chipset uses variable exposure WDR type and it gathers a number of images with various exposure and blends them into one composite WDR video. To achieve extreme WDR following process is executed.

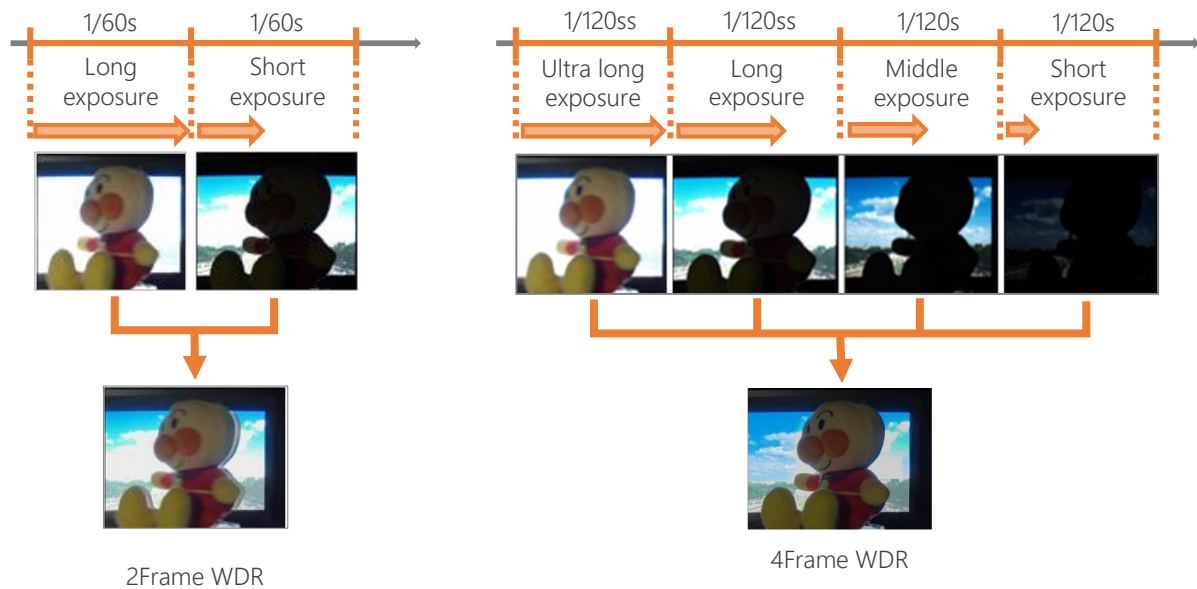


Image 2. Wisenet7 extreme WDR integration

## 4. 1. Scene Based Adaptive Tone Mapping

Hanwha Techwin’s WDR technology uses SBATM (Scene Based Adaptive Tone Mapping), a technology that analyses and reacts to the surrounding images in order to obtain a natural looking image. This technology can generate natural images without the loss of information.

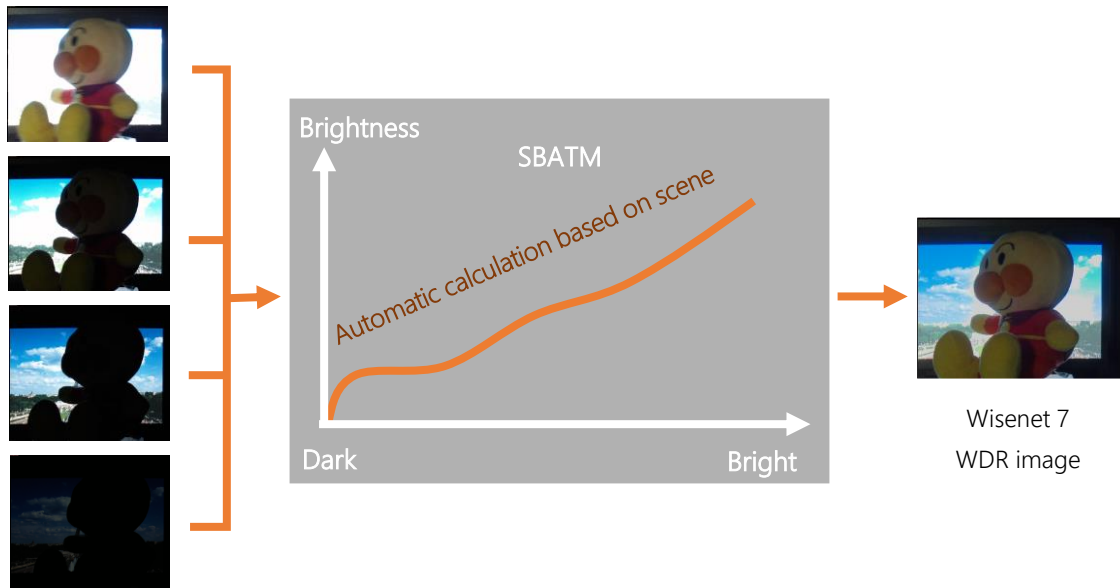


Image 3. Process of generating an image in wide dynamic range environment

## 4. 2. Local Contrast Enhancement

While trying to acquire the Wide Dynamic Range, the issue of decreased gradation can happen in some areas. In this case, a video with a good Dynamic Range but poor contrast can be the result. The Wisenet7 chipset supports a Local Contrast Enhancement feature to deal with this issue. As shown in Image 4, you can still achieve a video with Wide Dynamic Range and high contrast on the whole scene, providing a nature image and full visibility.

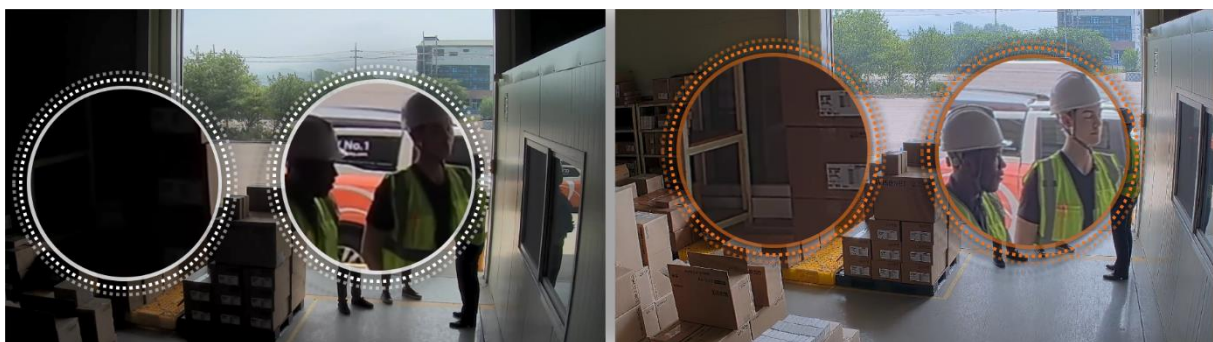


Image 4. Conventional model WDR (left) and Wisenet7 extreme WDR (right) comparison

For video surveillance cameras used in varying and changing lighting conditions, WDR has become an essential technology to capture accurate and reliable video. Therefore, all prominent video surveillance companies are investing R&D effort to further develop WDR video processing technologies.

Hanwha Techwin's WDR technology has been developed based on 30 years of video surveillance experience, resulting in its' 5<sup>th</sup> generation Wisenet7 System on Chip (SoC). The SoC is the core of any camera and dictates how it will perform, its' cybersecurity resilience, encoding performance, and more. Thus, even in the worst case scenarios, such as when the background is more highly lit than the subject causing them to appear dark or when the source of light is too intense that the disparity between the highly lit area and dark area is too big, you can still achieve a natural video without any loss of information and high contrast, even in these challenging WDR environments.



# WISENET

Hanwha Techwin Co.,Ltd.  
Techwin R&D Center, 6, Pangyo-ro 319beon-gil,  
Bundang-gu, Seongnam-si, Gyeonggi-do, 13488, Korea  
TEL 82.70.7147.8771-8  
FAX 82.31.8018.3715  
<http://www.hanwha-security.com/>

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