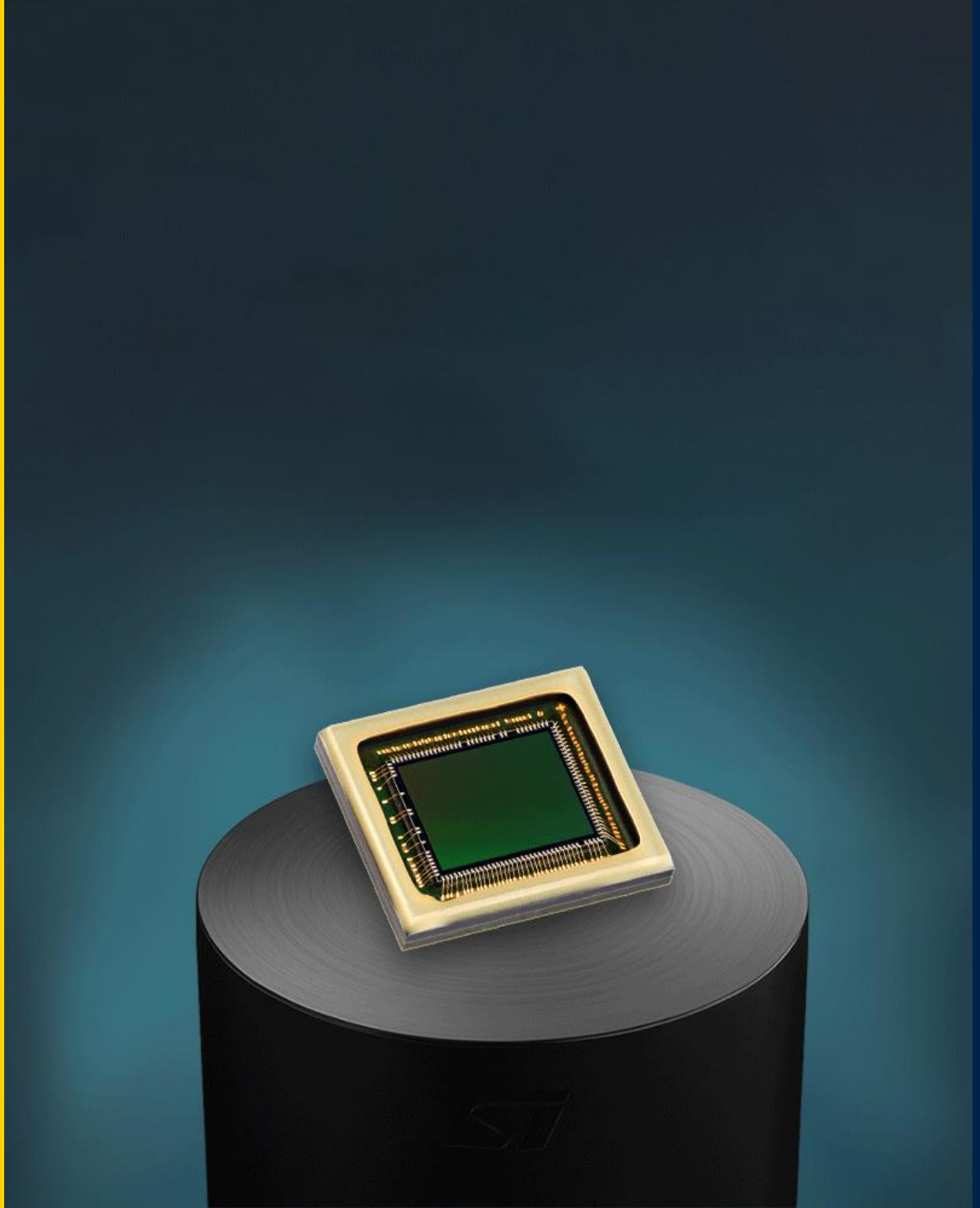


Stay ahead of the curve with ST BrightSense 5MP image sensors

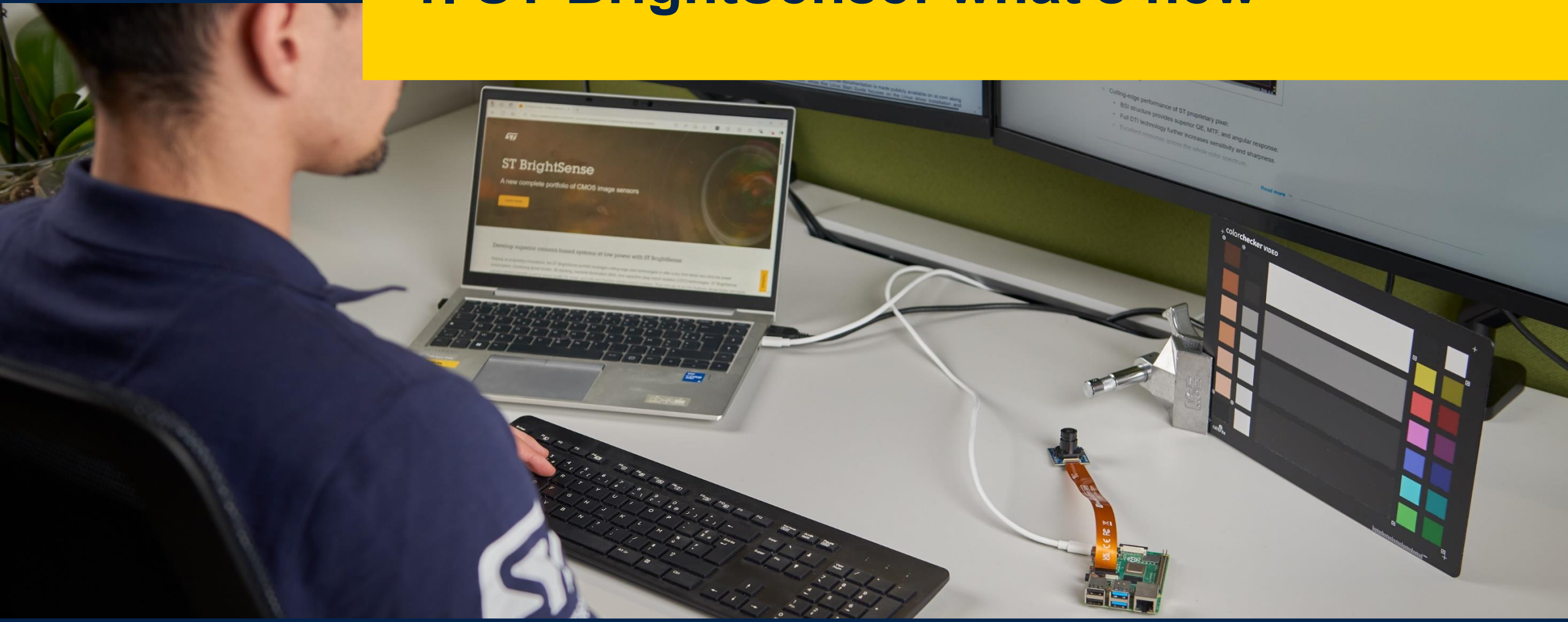
STMicroelectronics

남형돈 차장

Webinar agenda

1. ST BrightSense: what’s new
2. Introducing the next-generation 5MP image sensors
3. Global, rolling, and dual-shutter explained
4. Seeing the world in RGB-IR
5. Sensor die vs. packaged sensor

1. ST BrightSense: what’s new



ST BrightSense portfolio

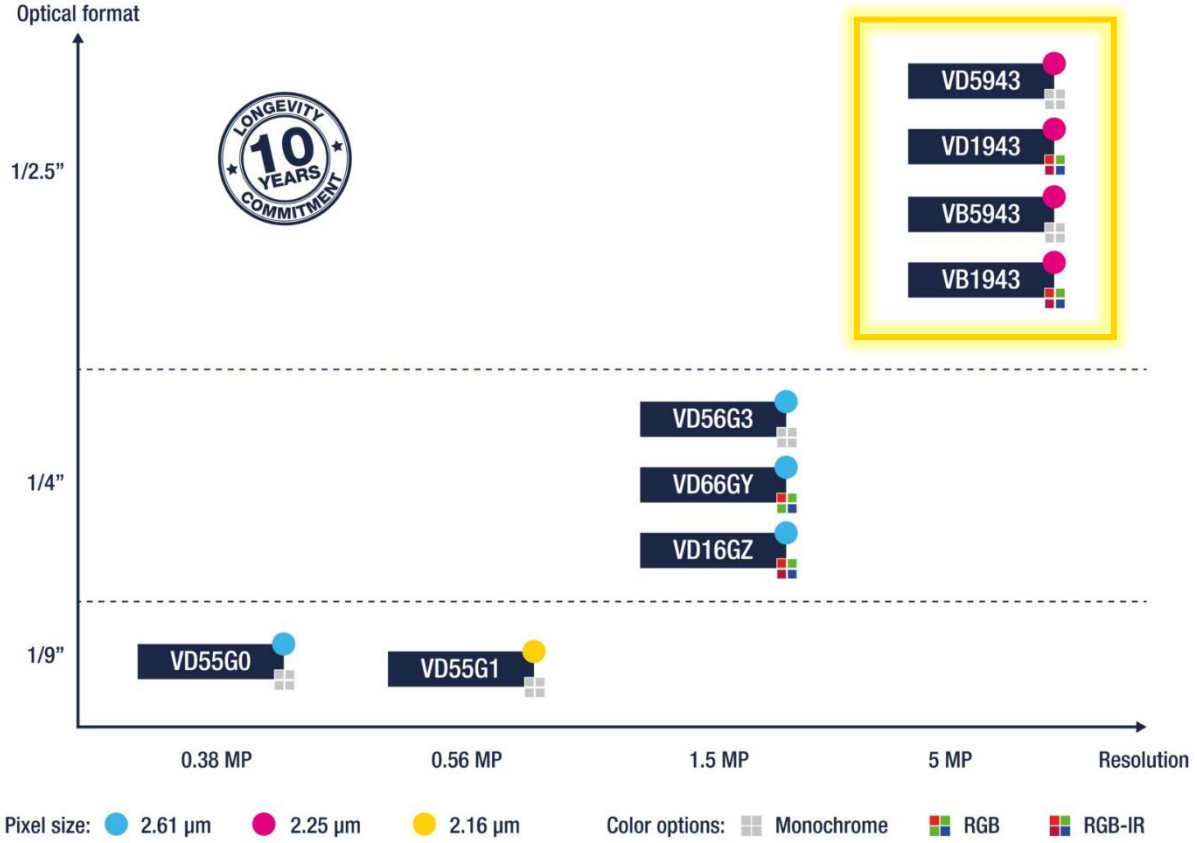
A broad and growing CMOS image sensors offer

Partner with an experienced and reliable industry leader

- Patented technologies awarded by top players
- Proven supply chain with billions of units shipped
- Comprehensive imaging portfolio (CIS, ALS, dTOF, iTOF)

Build smart and power-efficient vision systems

- Extend battery time with low power & auto-wake up
- Optimize processing through smart in-sensor features
- Maximize ergonomics and size with slim sensor designs



A comprehensive development ecosystem

A broad range of complementary deliverables

Open product documentation

Turnkey evaluation tools

Free software tools & drivers

Experienced ST Partners

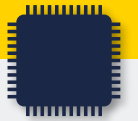
Knowledge base and community

Everything needed to speed up your projects

Product evaluation	Hardware prototyping	Application development	Software integration	Mass production
• Datasheet • Evaluation kit • Evaluation software	• Development kits • Camera modules • Board reference designs	• Comprehensive SDK • Example software • Software partners	• User manual • Software drivers • Getting started tutorials	• Camera module partners • High to low volume support • Longevity program

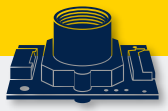
What’s new in the ST BrightSense ecosystem?

Play seamlessly with the latest STM32N6 MCU



Try the **STM32N6-AI** software package: a **free library** of lightweight AI models that seamlessly combine STM32N6 and ST BrightSense sensors.

Easily integrate our sensors with your Raspberry Pi



Benefit from an **easy start** on **Raspberry Pi** with ST BrightSense sensors fully integrated into the latest **libcamera framework**.

Streamline sensor setup in Linux environments

Enjoy effortless **Linux** experience with our **upstreamed** sensors (VD56G3, VD66GY, VD55G1) offering stability, easy integration, and automatic updates.

Test our turnkey robotic evaluation kit

Get your **STEVAL-ROBKIT1** robotic kit with **advanced navigation** powered by the ST BrightSense VD56G3 sensor – **just a few clicks away**!

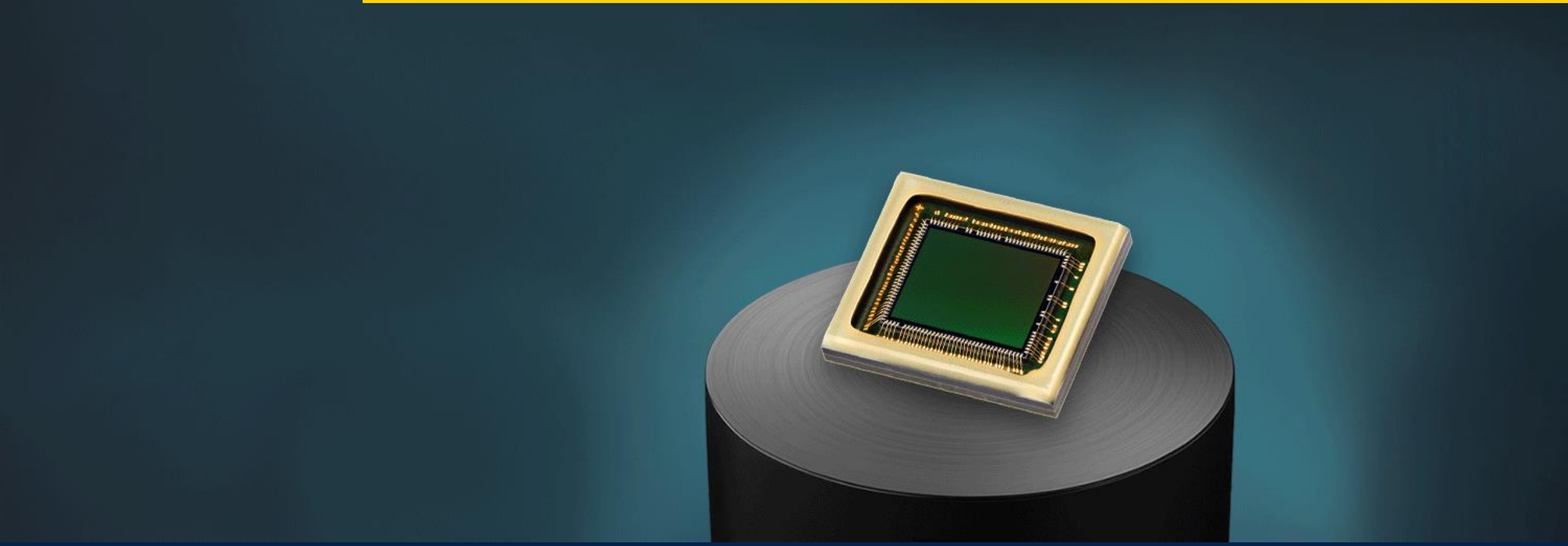
Watch our growing series of tutorial videos

Get a seamless start with the ST BrightSense ecosystem using our **ST Bright Tips step-by-step tutorials**, available on st.com and YouTube.

Meet a new partner camera module maker

Appleye joins **ST Partner Program**, delivering custom camera solutions with expert technical support, low NRE, flexible MOQ and rapid development.

2. Introducing the next-generation 5MP image sensors



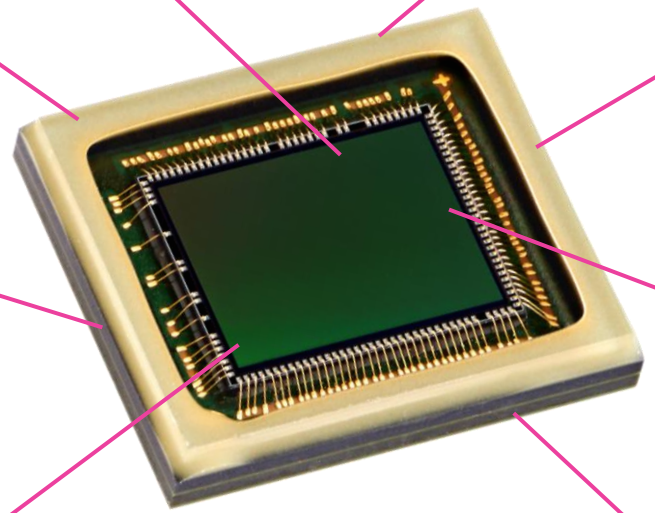
Explore a pioneering 5 MP imaging product

Cutting-edge 2.25 µm pixels with dual global & rolling shutter

On-chip single-frame HDR for enhanced image quality

Low power and MIPI CSI-2 output ideal for edge AI vision systems

Available as bare die and packaged sensor



Superior sensitivity and sharpness for accurate imaging

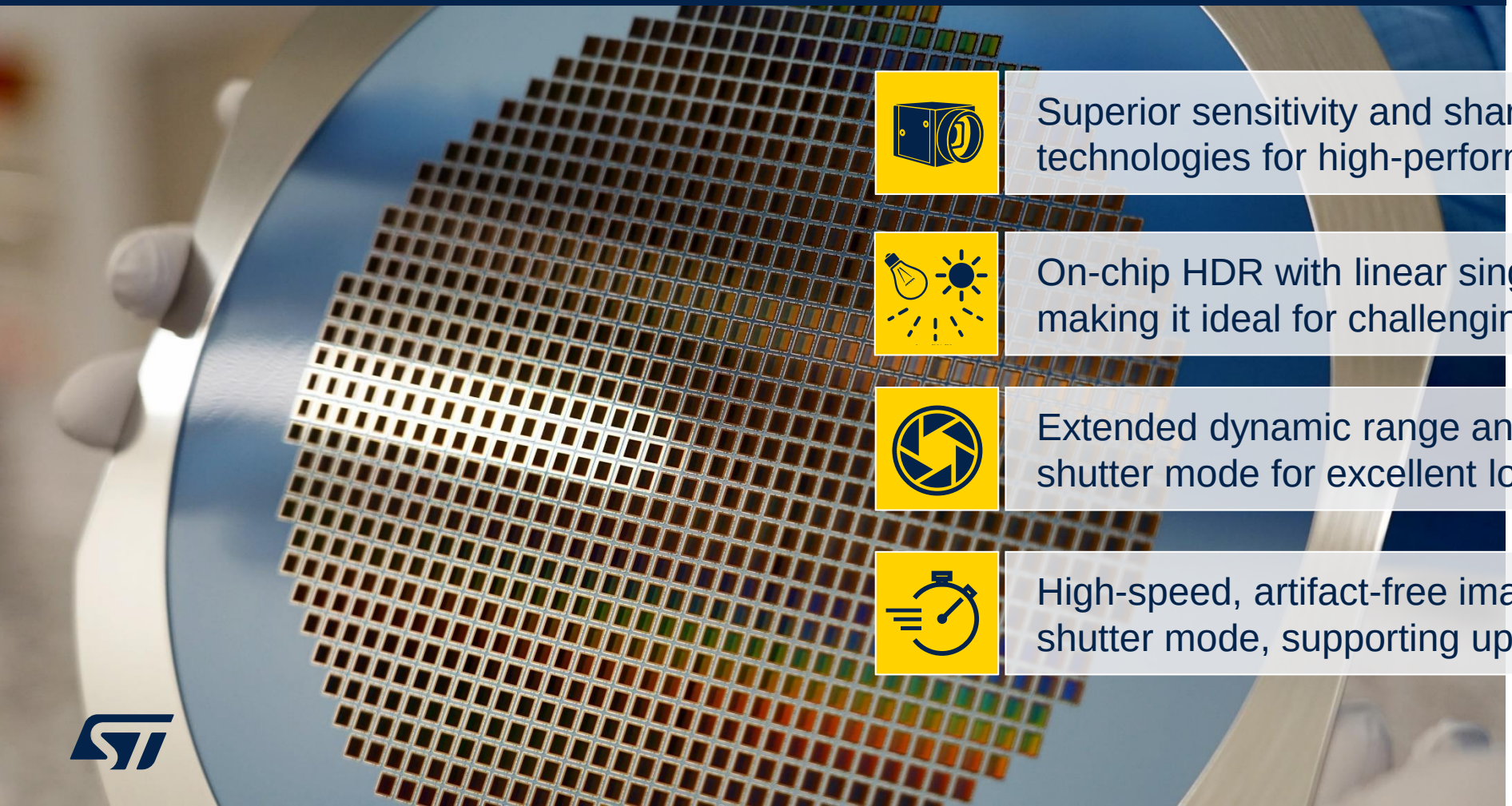
Industry-leading footprint enabled by advanced pixel technologies

Smart built-in features including embedded RGB-IR separation

Available in monochrome and RGB-IR versions

Experience superior 5 MP image quality

Powered by ST's proprietary 2.25 µm pixel technology & advanced wafer fabrication

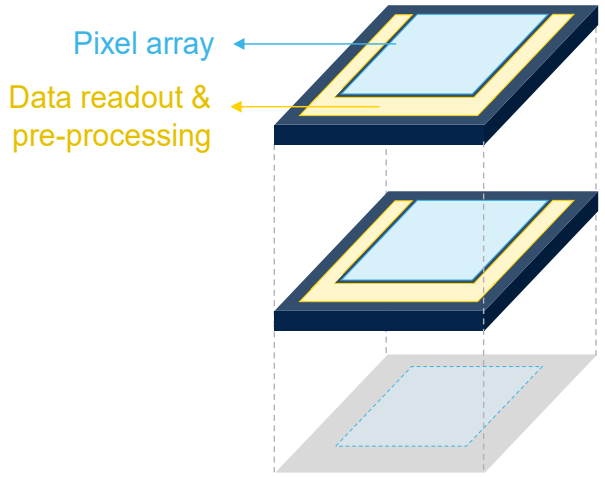


- Superior sensitivity and sharpness with BSI and CDTI technologies for high-performance machine vision
- On-chip HDR with linear single-frame operation, making it ideal for challenging outdoor environments
- Extended dynamic range and low noise in rolling shutter mode for excellent low-light performance
- High-speed, artifact-free image capture in global shutter mode, supporting up to 100fps frame rate

Capture more light. Occupy less space

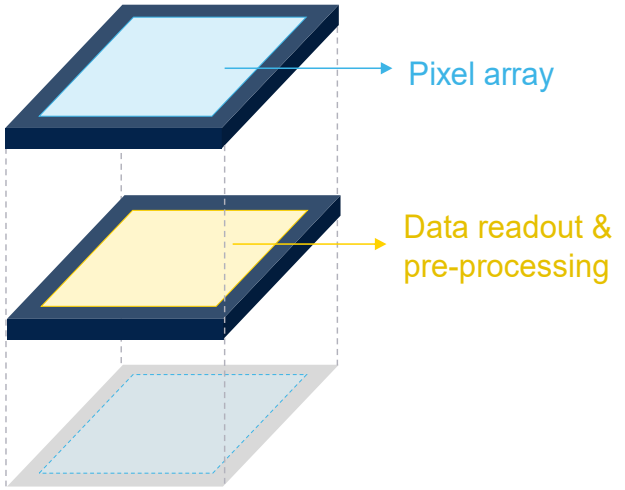
Industry-leading image array-to-die size ratio

Existing solutions with regular 3D stacking

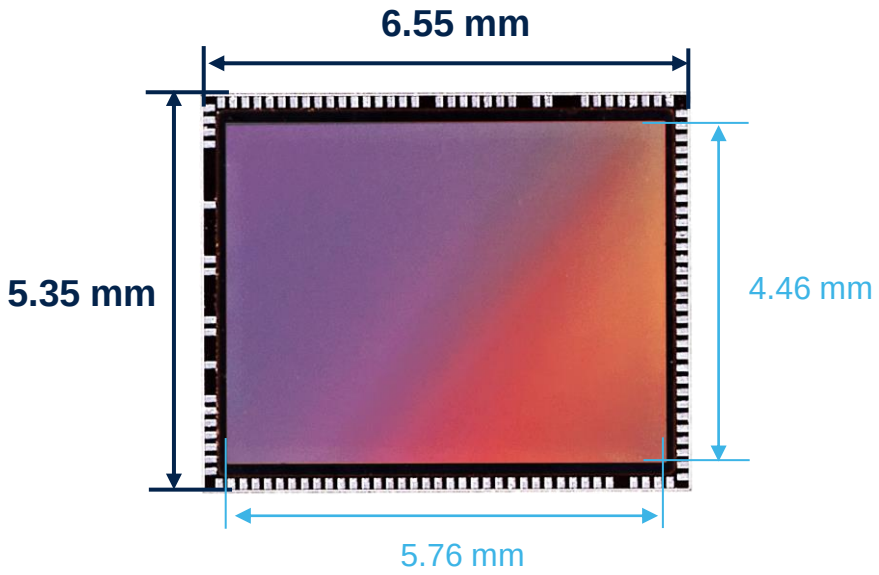


~33% of the die surface is occupied by the pixel array.

ST BrightSense solutions with advanced 3D stacking



73% of the die surface is occupied by the pixel array.

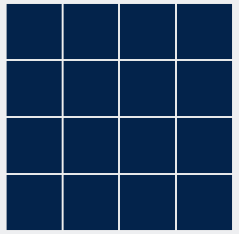


3. Global, rolling, and dual-shutter

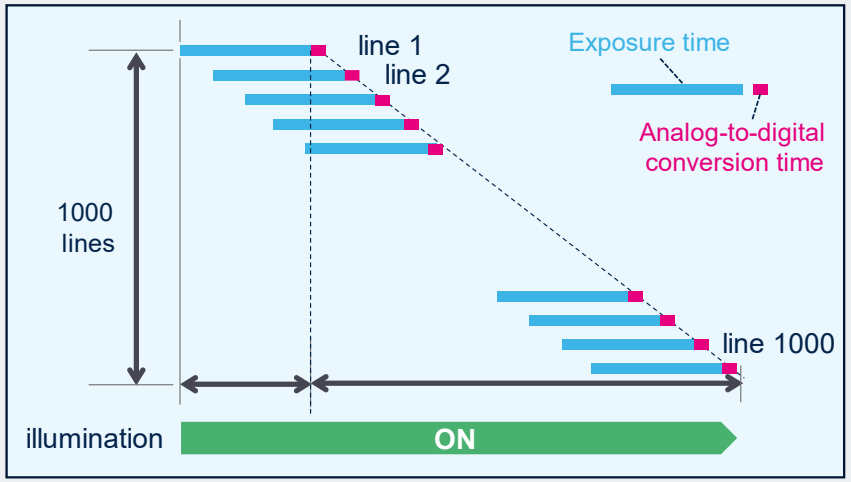
Innovative dual-global/rolling shutter

No more compromises — Harness the best of both worlds

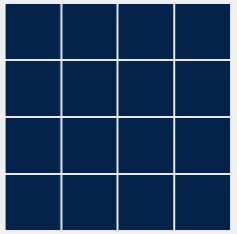
Rolling shutter



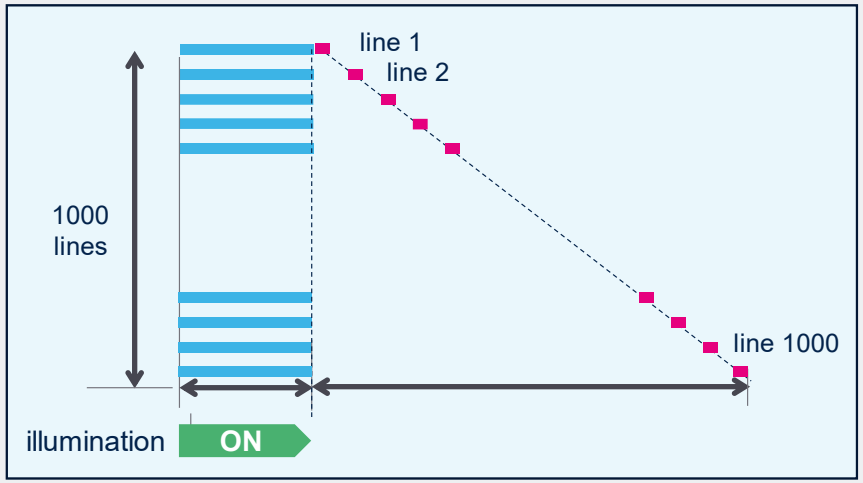
Sequential exposure to light:
Pixel rows are exposed to light one after the other with a delay.



Global shutter



Simultaneous exposure to light:
Pixel rows are all exposed at the same time.



Innovative dual-global/rolling shutter

No more compromises — harness the best of both worlds

Rolling shutter

Enhance image contrast
through extended dynamic range capabilities

Improve signal-to-noise ratio
for superior performance in low-light environments

Global shutter

Eliminate motion blur and lighting artifacts
for high-speed image and video capture

Reduce power consumption and illumination needs
with ultra-short exposure times

Crystal-clear details from shadows to highlights

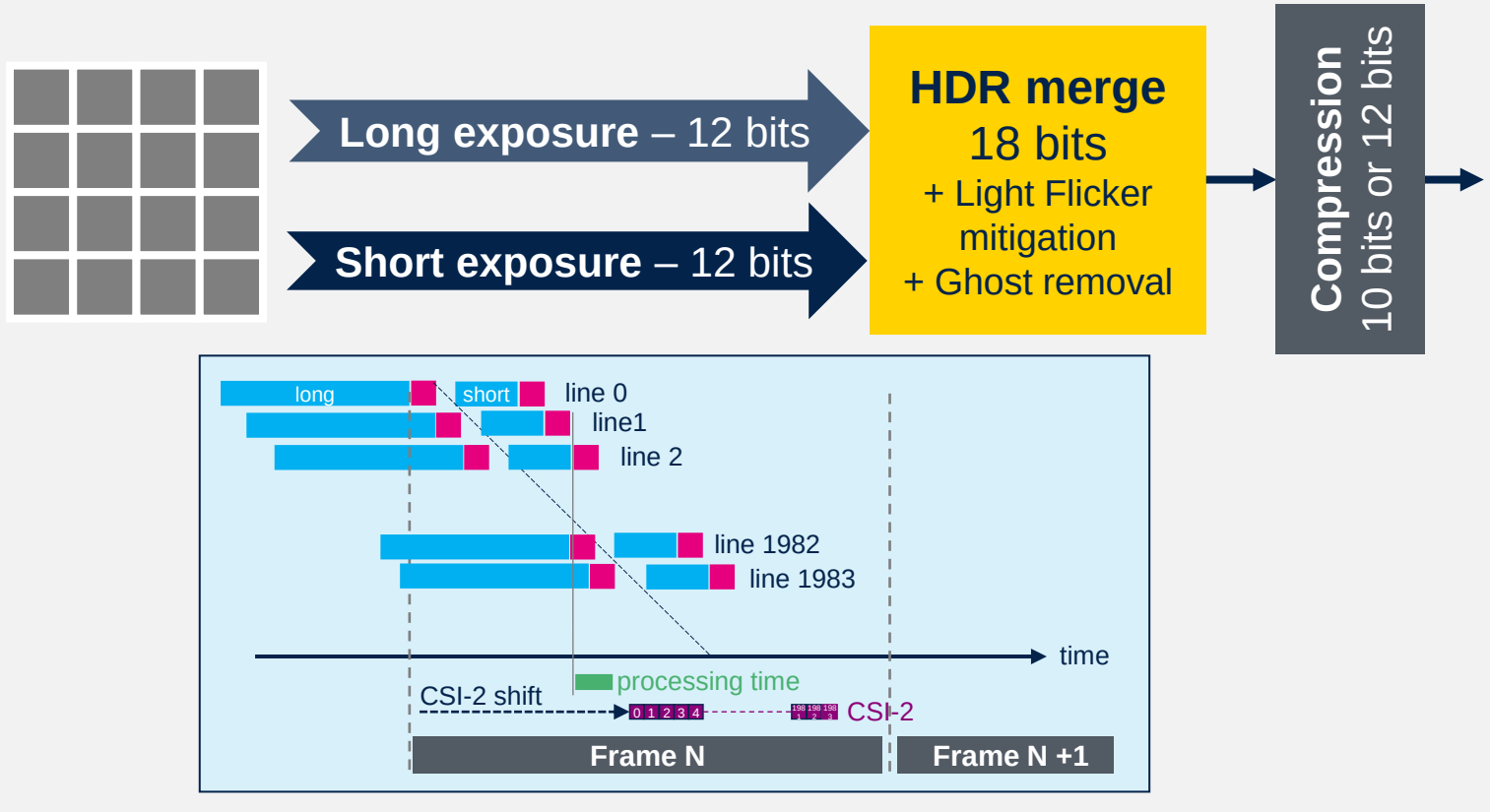
Enjoy vivid, high-contrast imaging in any lighting environment

Monochrome image
Without HDR feature

Monochrome image
With on-chip HDR

Enhanced dynamic range

Behind the scene: on-chip staggered HDR



On-chip HDR saves power and processing by eliminating off-chip HDR needs

Up to 100 dB dynamic range available in monochrome and color

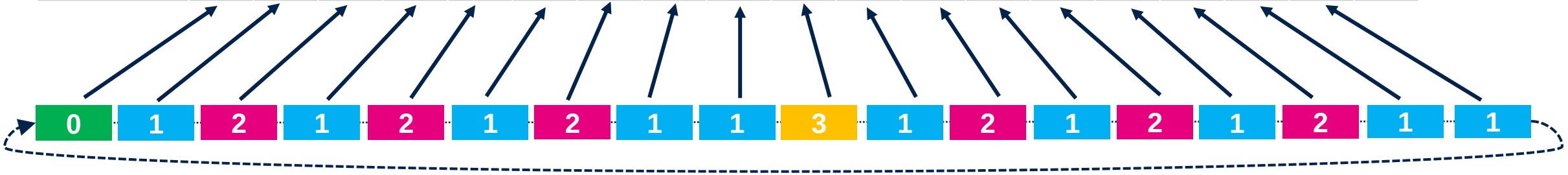
Standard 10/12-bit output providing high-speed data with no frame rate impact

Context management

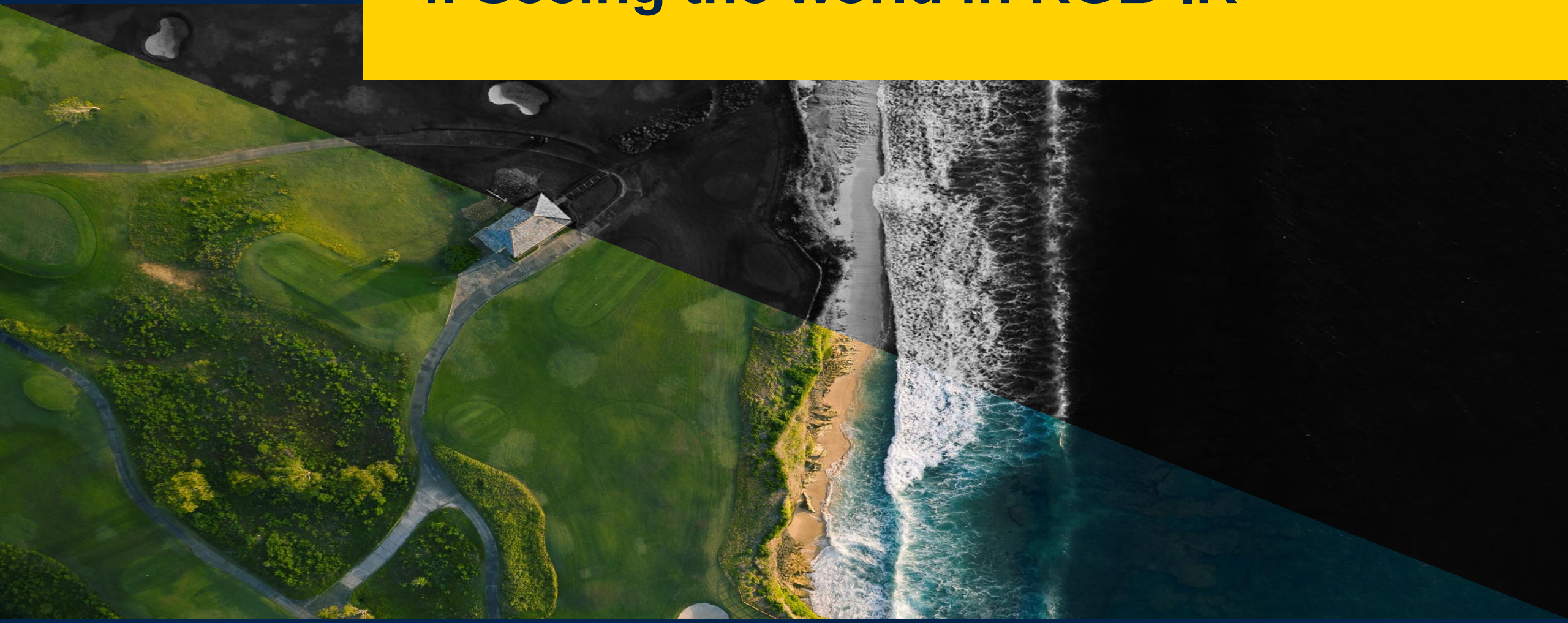
Flexibility, setting, frame-to-frame

- 0 **Context 0**: 5MP, 10 bits, RS, IR Smart Upscale, with STROBE - 10 FPS
- 1 **Context 1**: 5MP, 10 bits, RS, RGB - 10 FPS
- 2 **Context 2**: 2MP, 10 bits, RS, RGBNIR 4x4 - 15 FPS
- 3 **Context 3**: 5MP, 12 bits, RS, HDR RGB - 10 FPS

Element	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
Context	0	1	2	1	2	1	2	1	1	3	1	2	1	2	1	2	1	1	-



4. Seeing the world in RGB-IR



Why using RGB-IR imaging?

RGB imaging

Capture color and visible spectral information

Compatible with standard computer vision algorithms

Best suited for daytime and well-lit conditions

Provides rich texture and color cues for recognition

+

IR imaging

Penetrate surface layers for in-depth imaging

Less affected by shadows, glare, and color changes

Ideal for low-light and nighttime use

Detects thermal signatures and material properties

=

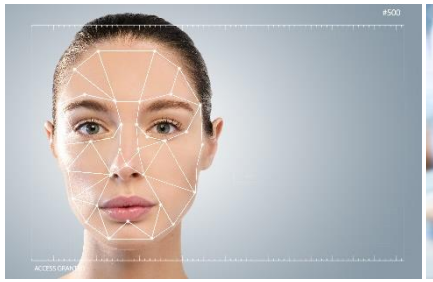
RGB-IR imaging

Operates effectively from daylight to darkness

Enhances biometrics with anti-spoofing

Enable multispectral material analysis

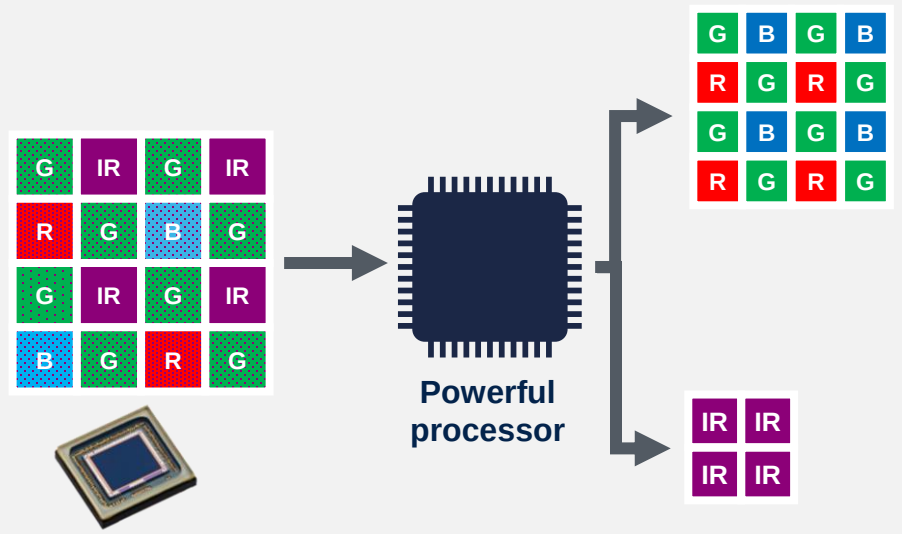
Improve system robustness through data fusion



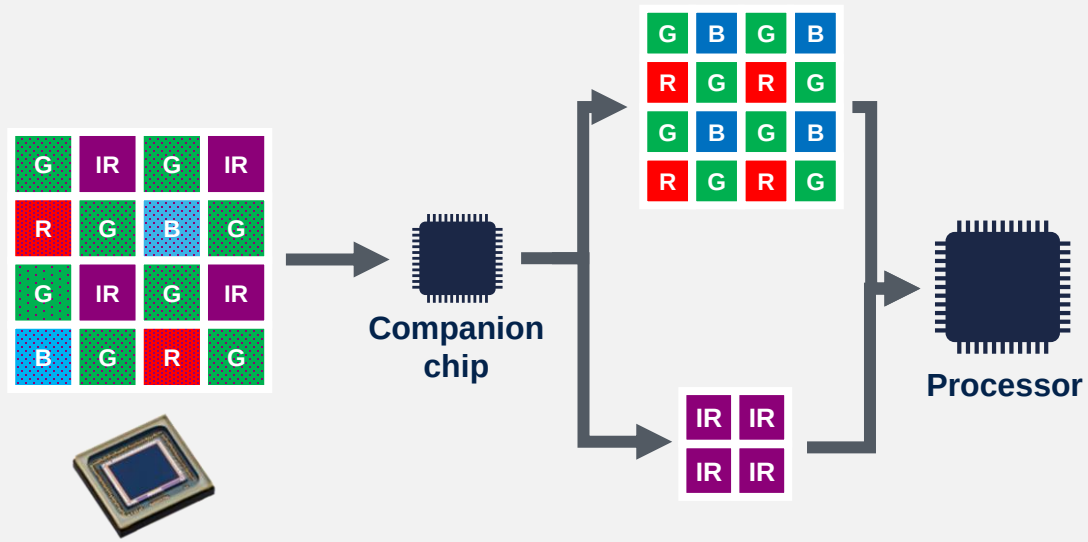
Once upon time with RGB-IR

Option #1



- Costly in processing, power and development time
- Low IR resolution

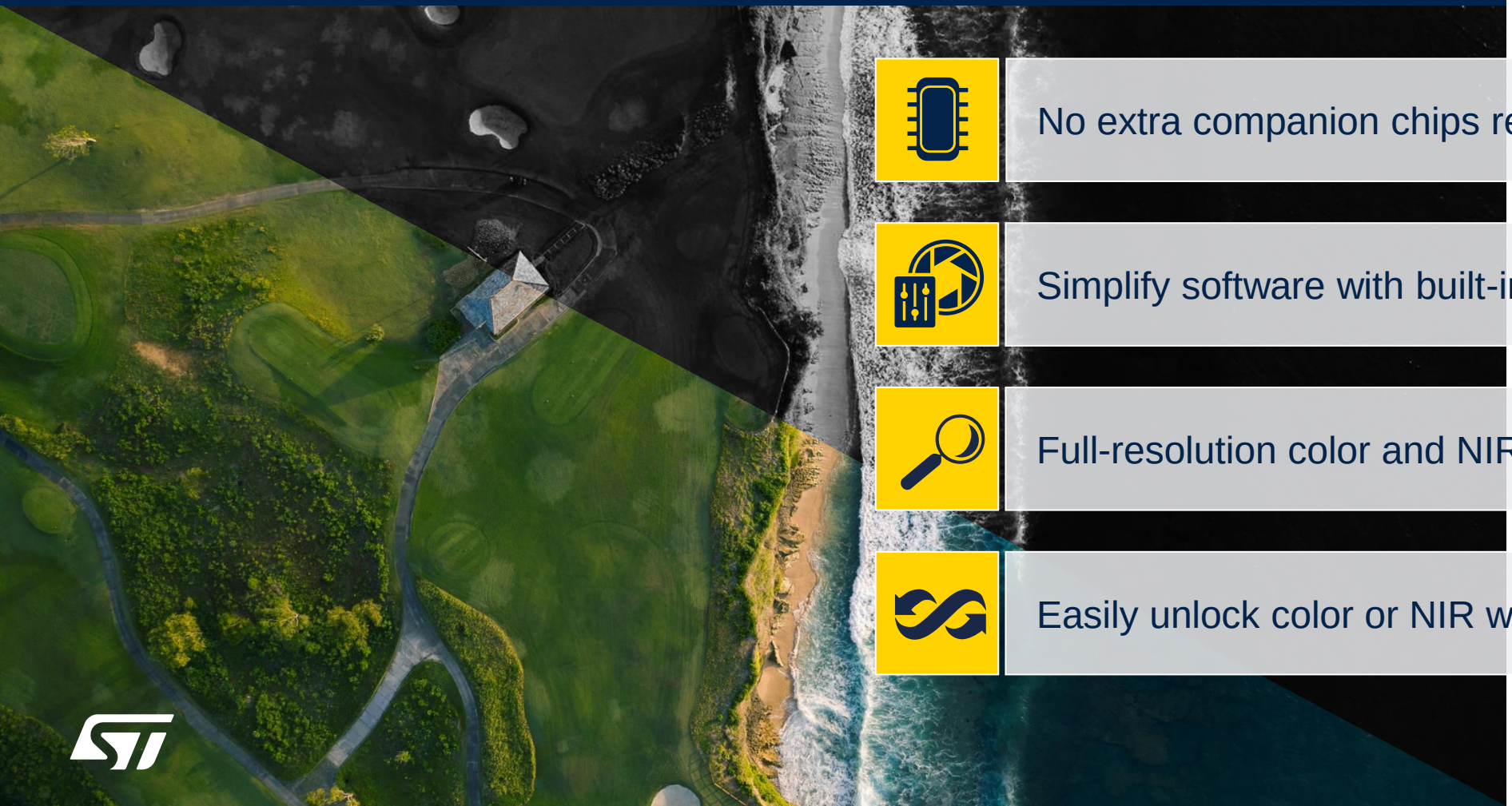
Option #2



- Require adding an extra companion chip
- Low IR resolution

On-chip RGB-IR separation and conversion

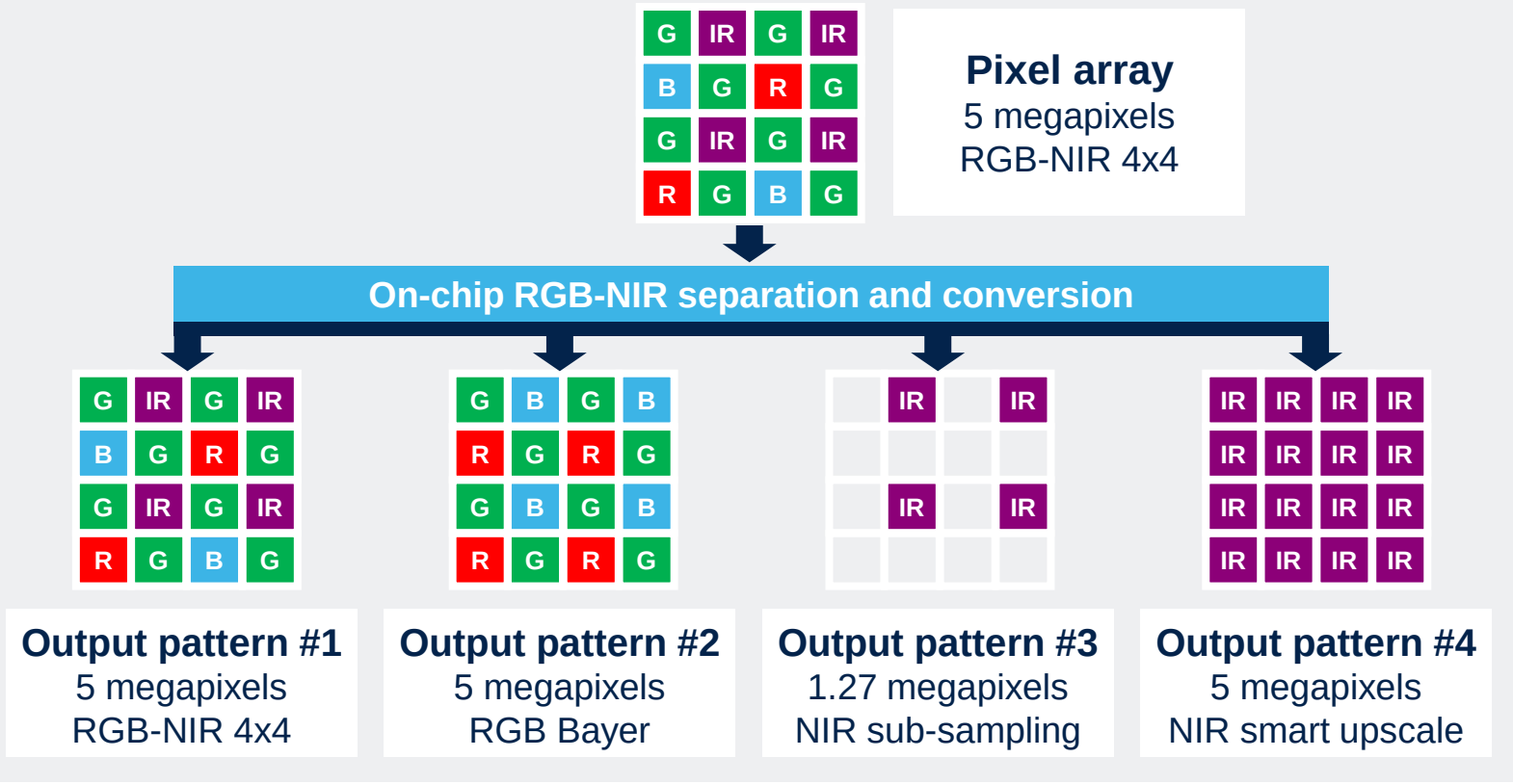
Making RGB & IR streaming simple and affordable



- No extra companion chips required
- Simplify software with built-in demosaicing
- Full-resolution color and NIR with smart upscale
- Easily unlock color or NIR with one register

On-chip RGB-IR separation and conversion

From daylight to nighttime, from color to multispectral



Switch the output pattern instantly at any frame with a single register change

Benefit from balanced imaging through independent RGB & IR exposure times

Achieve full 5MP NIR resolution leveraging proprietary on-chip smart upscale

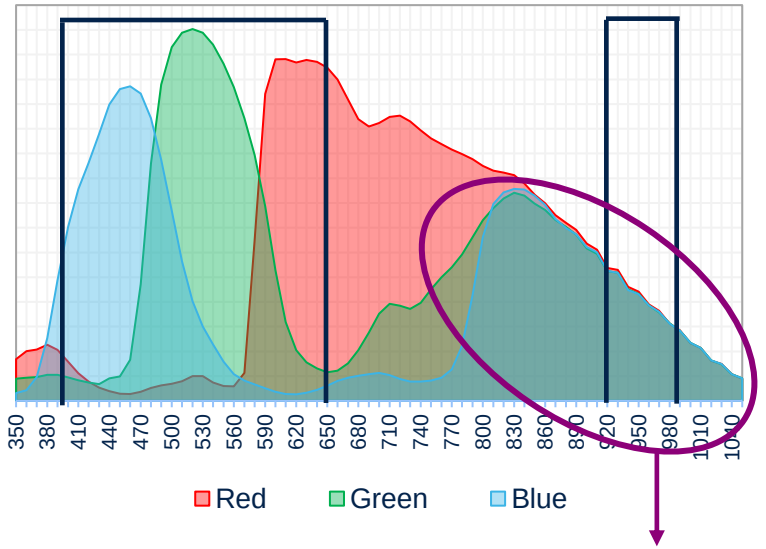
Benefit from crystal-clear 5MP color images

Experience pure imaging, free from infrared pollution

Magnified color image
with native RGB output

Presence of NIR pollution

Quantum Efficiency (QE) curve

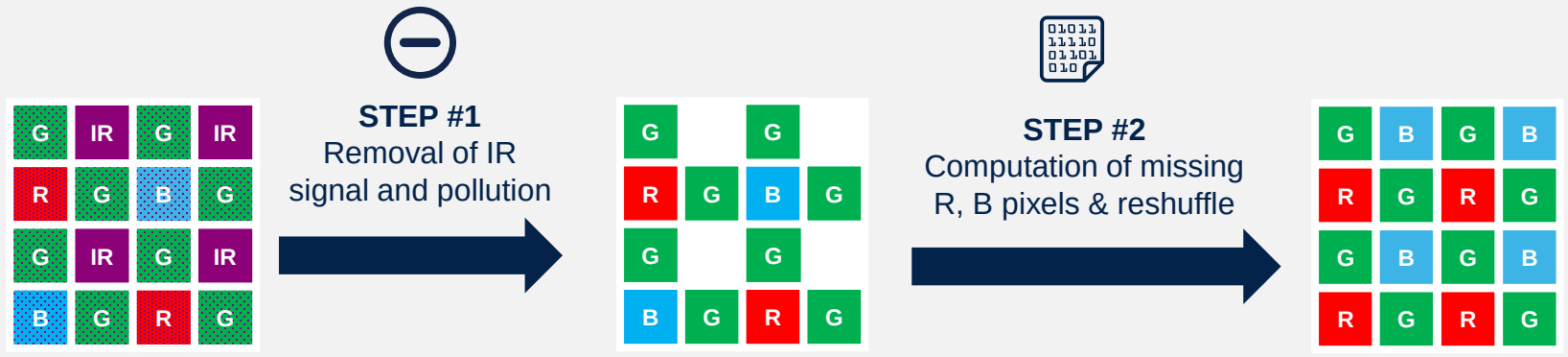


Magnified color image
with cleaned RGB output

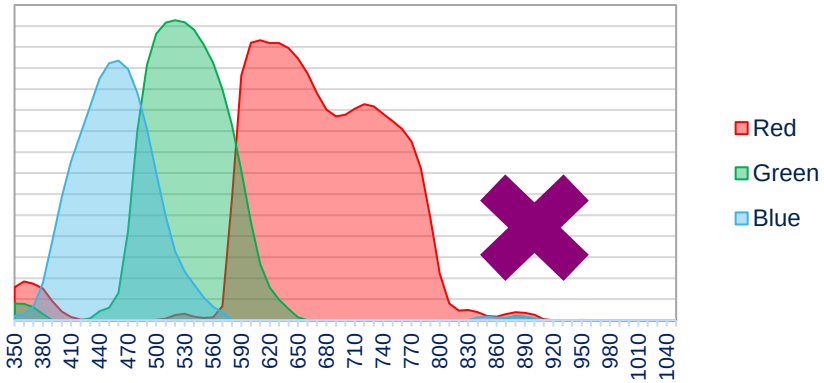
Absence of NIR pollution

Benefit from crystal-clear 5MP color images

Behind the scene: on-chip color interpolation



Equivalent QE curve – Clean RGB



High-clarity images with reduced NIR ambient interference

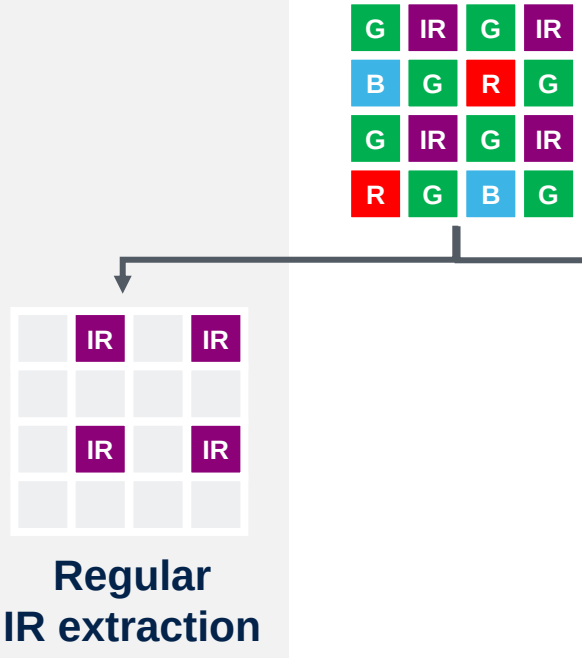
Sharp color details with smart local-aware processing

Built-in processing means no extra hardware or CPU needed

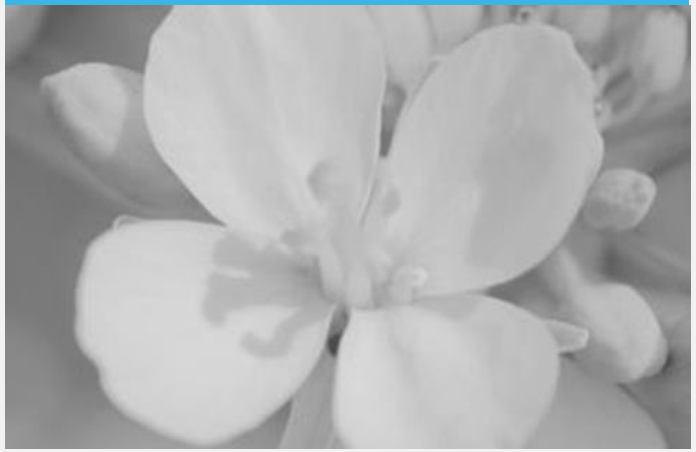
Leverage full 5MP near-infrared images

No compromise on resolution for sharper detail

IR image
from classic RGB-IR output

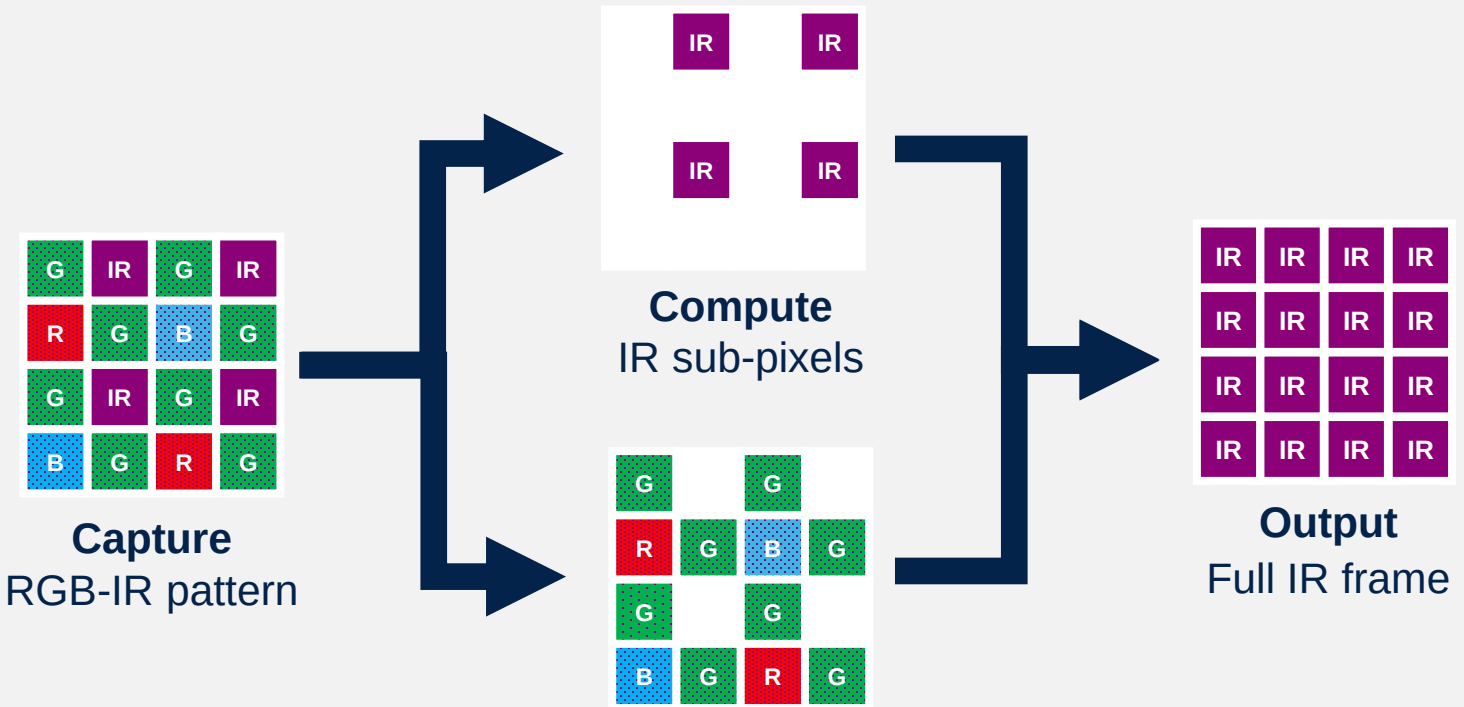


IR image
with smart upscale



Leverage full 5MP near-infrared images

Behind the scene: NIR smart upscale feature



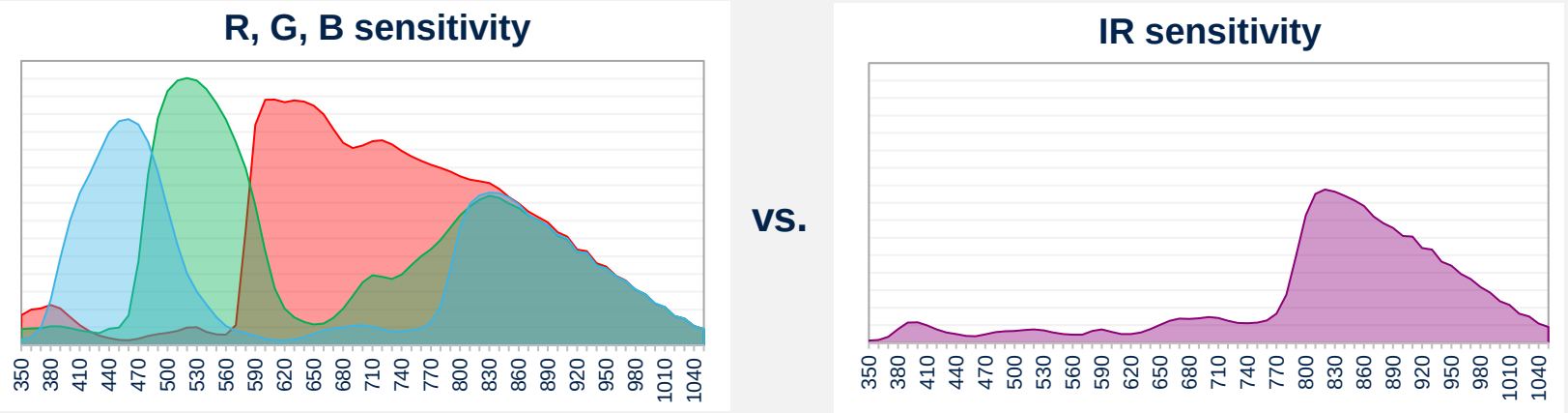
See more detail with full 5MP NIR resolution across a wide field of view

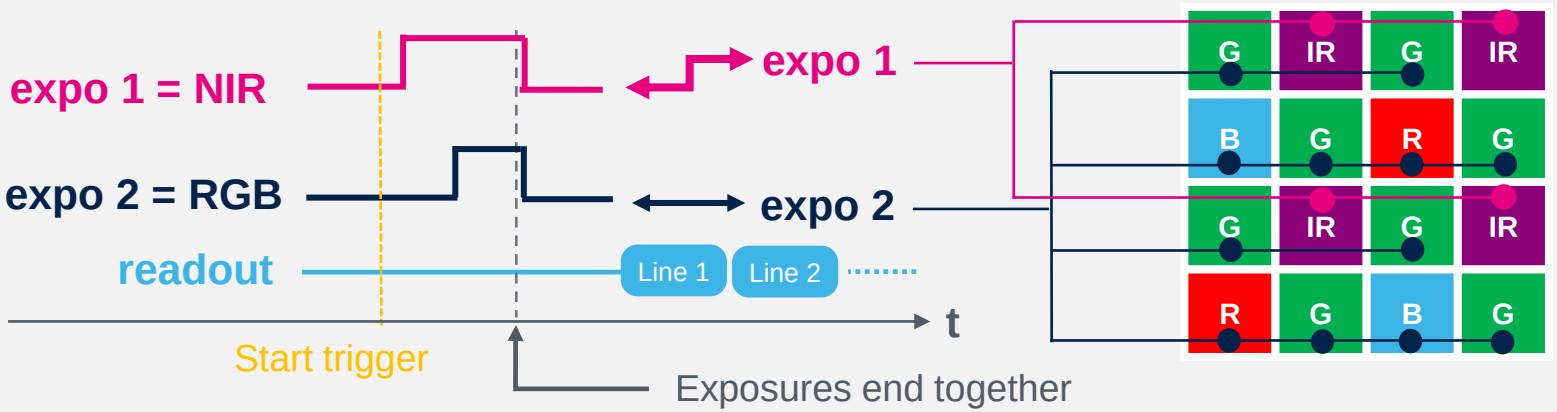
Built-in processing means no extra hardware or CPU needed

Get twice the sharpness with our patented upscale technology

Rely on balanced RGB and IR signal

Leveraging exposure split feature



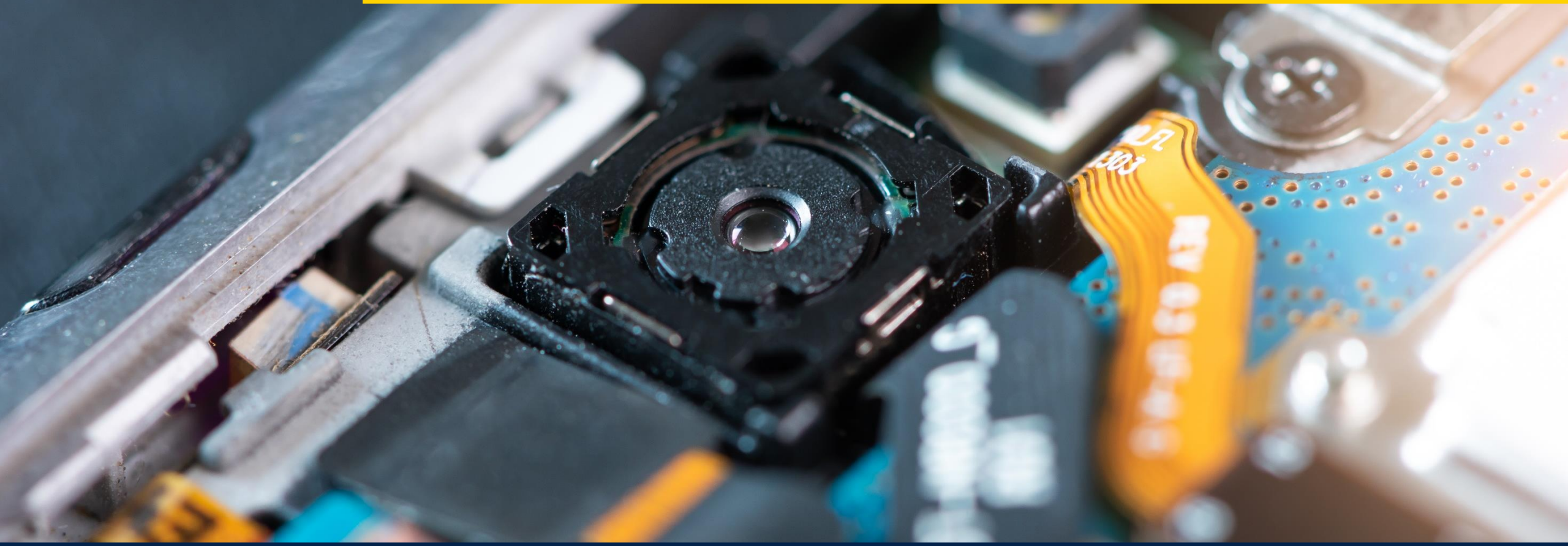


Boost IR sensitivity beyond silicon limits

Enable flexible exposure for varied lighting

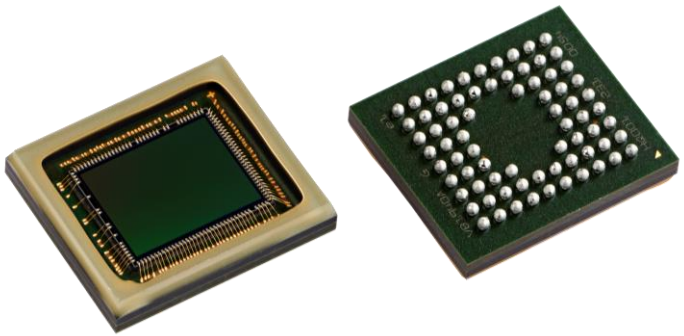
Sync illumination via sensor GPIOs for precise timing

5. Sensor die vs. packaged sensor



Integrating a packaged sensor

Ready to integrate; built for flexible production



Packaged image sensor
By ST

→

PCB build
By supplier or in-house

→

Product build
By OEM or in-house

Direct integration, ready-to-solder
No intermediate steps, ready for fast assembly

Simplified production environment
No need for costly cleanrooms or specialized equipment

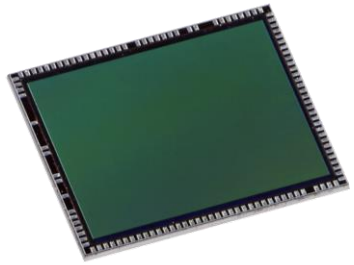
ST quality
Reliable performance meeting ST standards and terms

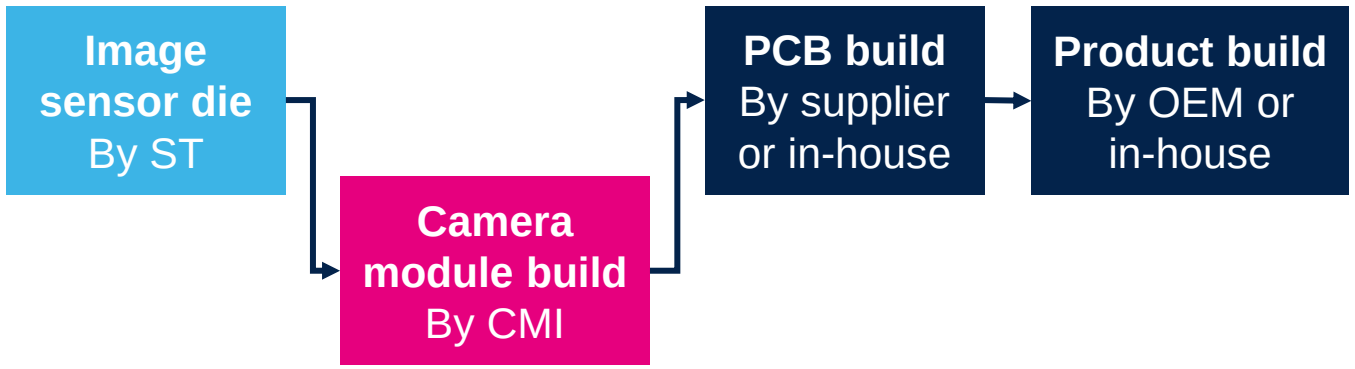
Flexible production and handling
Lower MOQ, optimized packing for easy ordering & shipping

Larger camera module size
Design may increase overall module dimensions

Integrating a sensor die

Ultra-optimized; camera module ready





Optimized for large-scale production
Simplify cost recovery of NRE and MOQ through scale

Maximized camera module optimization
Enables highly customized, space-efficient designs

Extra manufacturing step
Requires specialized CMI for sensor assembly

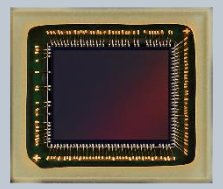
Complex handling
Needs cleanrooms, and special storage and processing

Wide sourcing flexibility
Multiple suppliers, lenses, country of origin worldwide

Ordering codes

The VD1943, VD5943, VB1943, and VB5943 sensors are ready for evaluation and sampling

To learn more and request detailed documentation, evaluation kits, or product samples, reach out to your local ST sales representative or an authorized distributor.

Illustration	Category	Ordering code	Description
	VD5943 Sensor die	VD5943CE/RW	Monochrome. Sensor bare die in reconstructed wafer
	VD1943 Sensor die	VD1943CE/RW	RGB-IR. Sensor bare die in reconstructed wafer
	VB5943 Packaged sensor	VB5943CAJX/1	Monochrome. OBGA packaged sensor
	VB1943 Packaged sensor	VB1943CAJX/1	RGB-IR. OBGA packaged sensor

A comprehensive ecosystem

Available soon – Stay tuned

A broad range of complementary deliverables

- Open product documentation
- Turnkey evaluation tools
- Free software tools & drivers
- Experienced ST Partners
- Knowledge base and community

Everything needed to speed up your projects

Product evaluation	Hardware prototyping	Application development	Software integration	Mass production
• Open datasheet • Evaluation kit • Evaluation software	• Development kits • Camera modules • Board reference designs	• Comprehensive SDK • Example software • Software partners	• Open user manual • Software drivers • Getting started tutorials	• Camera module partners • High to low volume support • Longevity program

Time to wrap up!

1. The **ST BrightSense ecosystem has been expanded** with new STM32 drivers, robotic kits, and partner camera module integrator.
2. The new **dual global/rolling shutter pixel** delivers artifact-free clarity and enhanced dynamic range, all packed into a compact 2.25µm pitch.
3. Full-resolution **RGB and IR streaming is now simple and affordable** thanks to on-chip RGB-IR separation and 5MP IR smart upscale.
4. **Choose** between **packaged sensors** ready-to-solder for flexible production **or sensor dies** optimized for camera module integration.
5. The product will enter **mass production in February 2026**, with a comprehensive **ecosystem gradually rolling out**—stay tuned.

Want to know more?

Check out the post-webinar email, which includes access to useful technical resources and online content.

Contact your local ST sales representative or authorized distributor to **get V**943 evaluation kits and early samples**.

Share inspiring projects, ask questions **online anytime** and get valuable advice from the **ST Imaging Community**.

Join our next ST BrightSense webinar in Spring 2026, to explore new products and reference designs.

Our technology starts with You

Find out more at www.st.com