



# Signal & Imaging Processing Algorithms

Our product – our offer to you

December 2025

## FIELDS OF APPLICATION

Our services are applied in a variety of sectors – each solution can be tailormade by request

### INFRARED

#### Dynamic range conversion

Enhancing sharpness  
correction of over- and underexposure  
Preserving and highlighting image details



### UNDERWATER IMAGING

#### Morphological de-blurring

Scattered light elimination  
or weakening



### IMAGE QUALITY ASSESSEMENT

No-reference IQA in  $SU^*$  require nether parametrization nor learning database

### AERIAL PHOTOGRAPHY

#### Sharpness enhancement

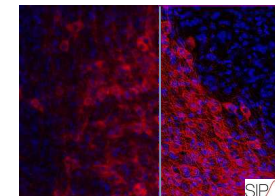
Correction of under- or overexposure  
Restoration of objects in shadow areas



### MICROSCOPY

#### Highlighting of details

Accentuating desired image properties







## AERIAL PHOTOGRAPHY: NIGHT VISION

### Recover the quality: sharpness enhancement and exposure compensation

Correction of under- or overexposure & Improvement of detail representation



*No image enhancement*



*SIPAL image enhancement*



## AERIAL PHOTOGRAPHY: NIGHT VISION

### Recover the quality: sharpness enhancement and image magnification

Correction of under- or overexposure & Improvement of detail representation



No image enhancement

SIPAL image enhancement

*4 x magnification*



No image magnification



SIPAL image magnification

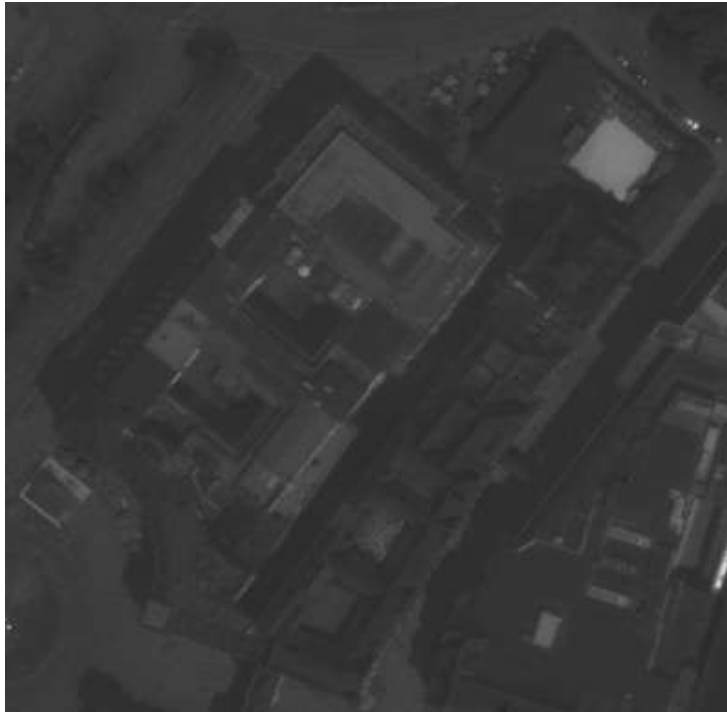




## AERIAL PHOTOGRAPHY: NIGHT VISION

Recover the quality: sharpness enhancement and restoration of objects in shadow areas

Correction of under- or overexposure & Improvement of detail representation



*No image enhancement*



*SIPAL image enhancement*



## IMAGE QUALITY ENHANCEMENT: VISION WITH FOG

### Recover the quality: sharpness enhancement and exposure compensation

Correction of under- or overexposure & Improvement of detail representation



*No image enhancement*



*SIPAL image enhancement*

## Recover the quality: sharpness enhancement and exposure compensation

Correction of under- or overexposure & Improvement of detail representation



*No image enhancement*

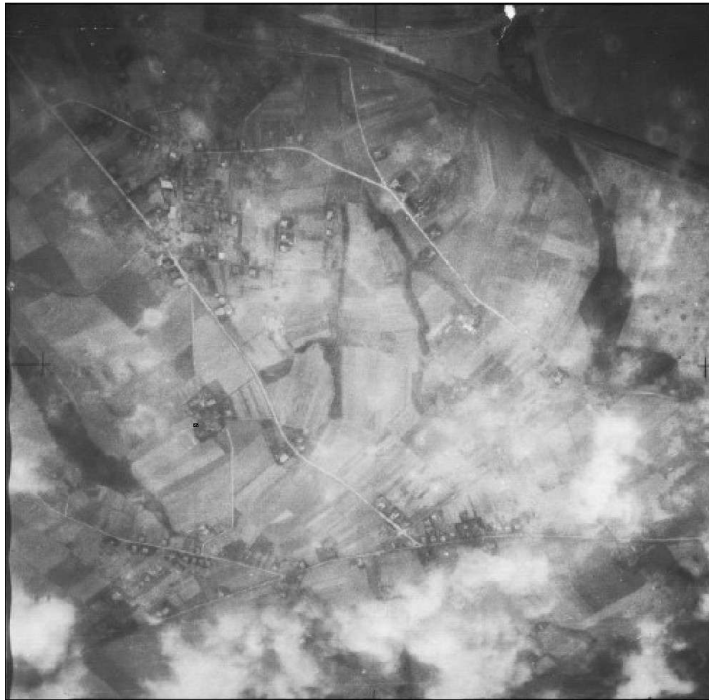


*SIPAL image enhancement*

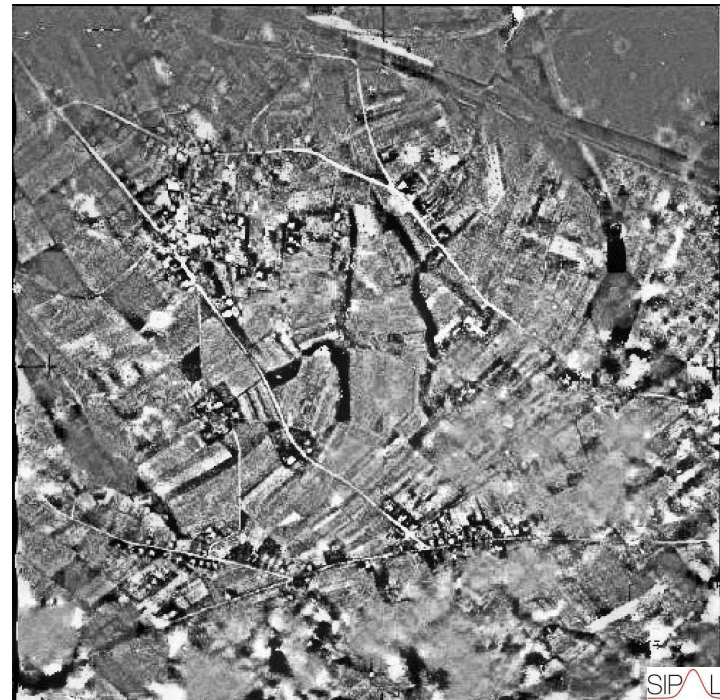
## IMAGE QUALITY ENHANCEMENT: VISION THRU CLOUDS

### Recover the quality: sharpness enhancement and exposure compensation

Correction of under- or overexposure & Improvement of detail representation



*No image enhancement*



*SIPAL image enhancement*



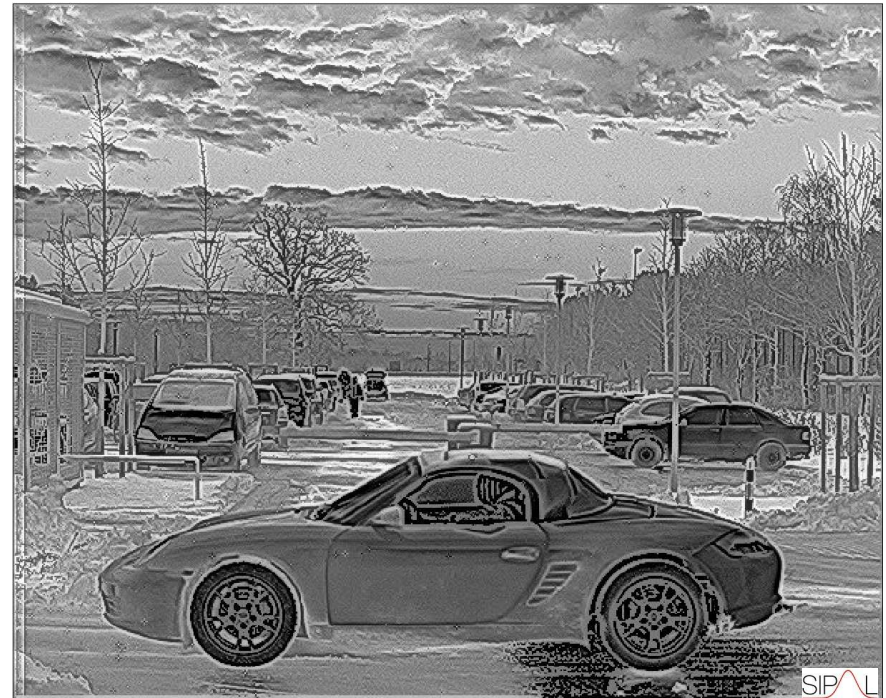
## IMAGE QUALITY ENHANCEMENT: NIGHT VISION DEVICE

### Recover the quality: sharpness enhancement and exposure compensation

Correction of under- or overexposure & Improvement of detail representation



*No image enhancement*



*SIPAL image enhancement*

## IMAGE QUALITY ENHANCEMENT: NIGHT VISION DEVICE

### Recover the quality: sharpness enhancement and exposure compensation

Correction of under- or overexposure & Improvement of detail representation



*No image enhancement*

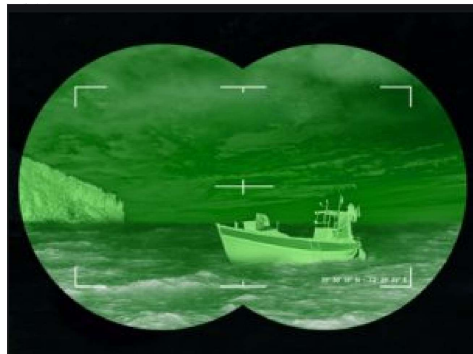


*SIPAL image enhancement*

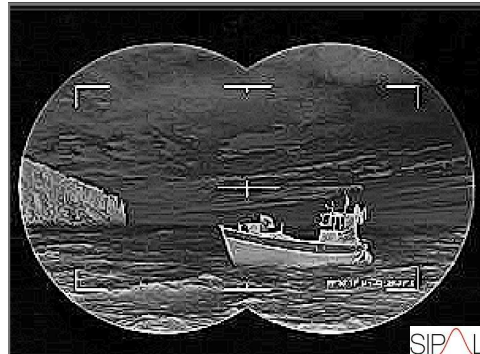
## IMAGE QUALITY ENHANCEMENT: NIGHT VISION DEVICE

### Image or ROI<sup>\*)</sup> magnification with sharpness recovery and exposure compensation

Correction of under- or overexposure & Improvement of detail representation



No image enhancement



SIPAL image enhancement

*4 x magnification*



SIPAL image enhancement

<sup>\*)</sup>ROI: region of interest





## OVERVIEW INFRARED

Compared to conventional image enhancers, SIPAL is able to improve the image's quality regarding a variety of factors

Comparison of images enhanced with SIPAL's algorithm

*automatic  
parameter setting*

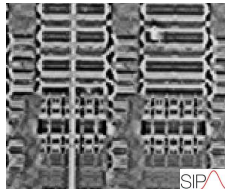
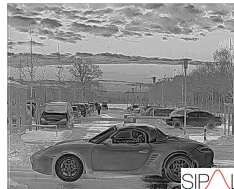
Original,  
no enhancement

Conventional  
enhancement

Morphological  
deblurring

Details  
enhancement

Zero-loss  
magnification



### SIPAL advancements

- Deblur independent of exposure differences within the image
- Multiple enlargement (up to 10x) of the original image or one of its areas w/o loss of image quality or w/ simultaneous quality enhancement
- The information you need is in your image, we have the tools for digging it out

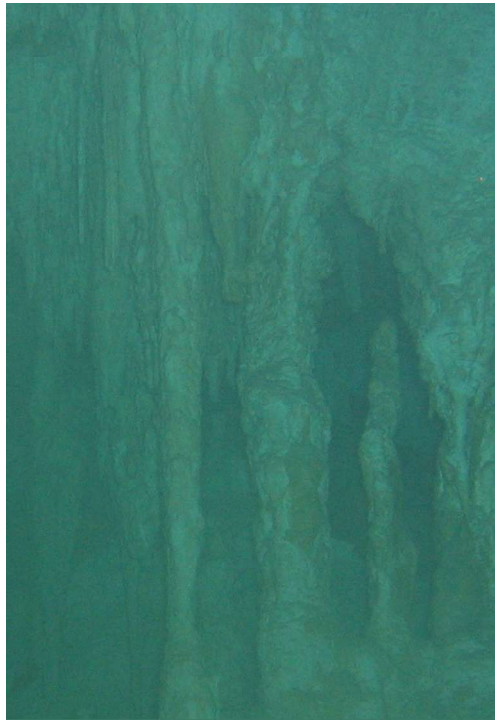




## UNDERWATER IMAGING

Lifting underwater images to another level – without expensive or highly professional equipment

Correction of under- or overexposure & Improvement of detail representation



*No image enhancement*



*SIPAL image enhancement*



*No image enhancement*



*SIPAL image enhancement*

SIPAL





## UNDERWATER IMAGING

Lifting underwater images to another level – without expensive or highly professional equipment

Correction of under- or overexposure & Improvement of detail representation



*No image enhancement*

*SIPAL image enhancement*

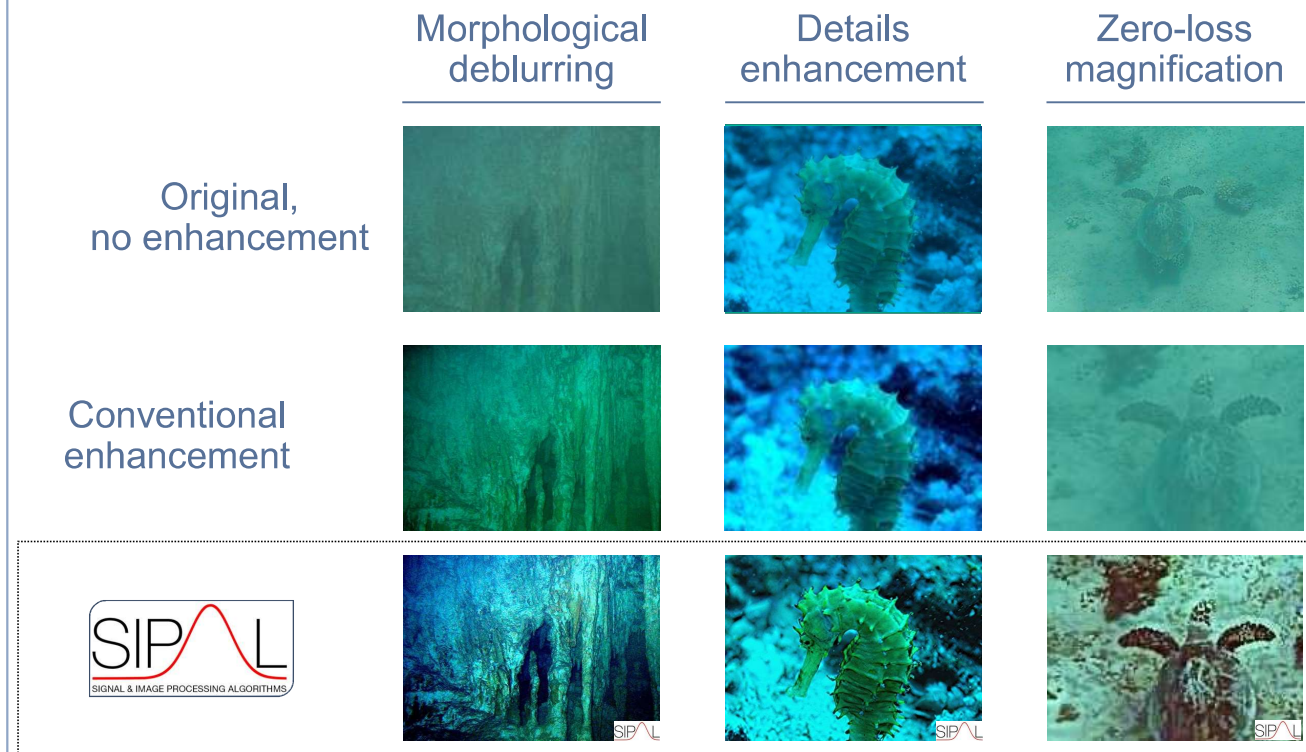




## OVERVIEW UNDERWATER IMAGING

Compared to conventional image enhancers, SIPAL is able to improve the image's quality regarding a variety of factors

Comparison of images enhanced with SIPAL's algorithm



*water magig away*

### SIPAL advancements

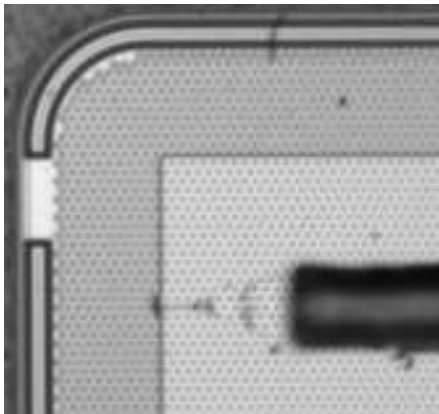
- Image sharpness recovery & diffused light elimination independent from exposure intensity
- Highlighting of hardly perceptible image details
- Multiple enlargement (up to 10x) of the original image or one of its areas w/o loss of image quality or w/ simultaneous quality enhancement



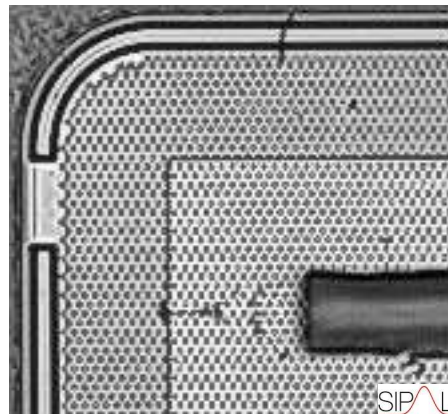
## IMAGE QUALITY ENHANCEMENT: MICROSKOPY

### Image or ROI\*) magnification with sharpness recovery

Correction of under- or overexposure & Improvement of detail representation

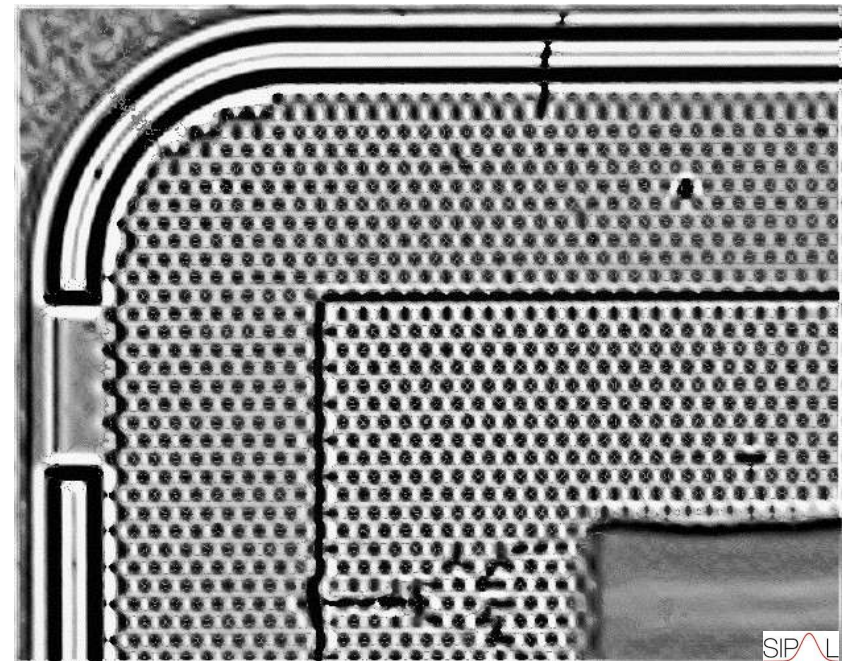


No image enhancement



SIPAL image enhancement

*4 x magnification*



SIPAL image enhancement

\*)ROI: region of interest

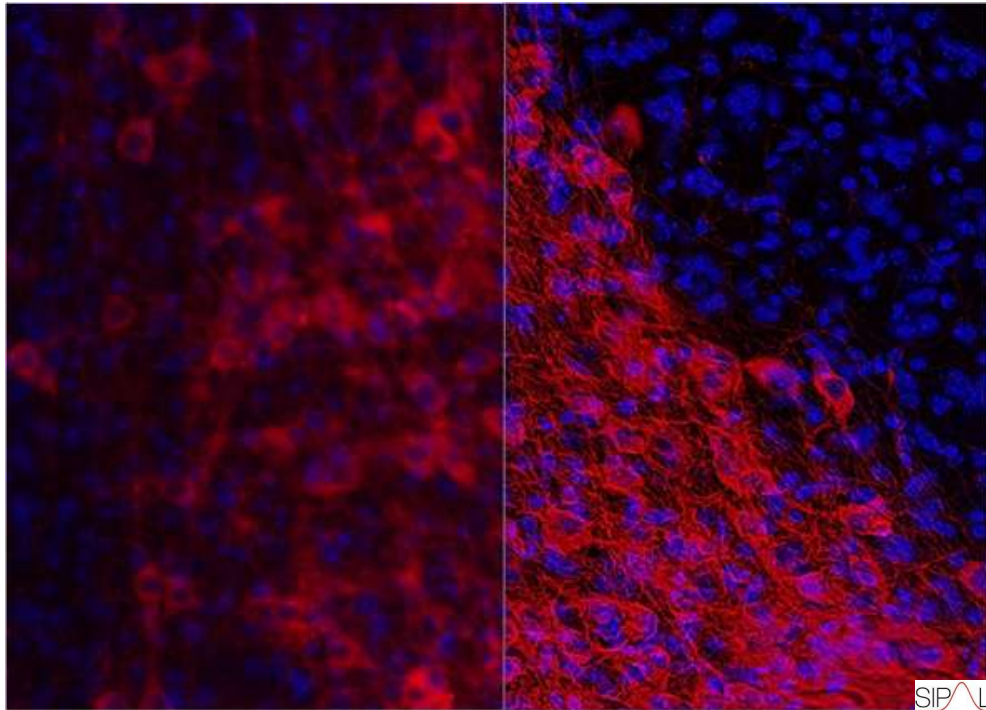




## IMAGE QUALITY ENHANCEMENT: FLUORESCENCE MICROSCOPY

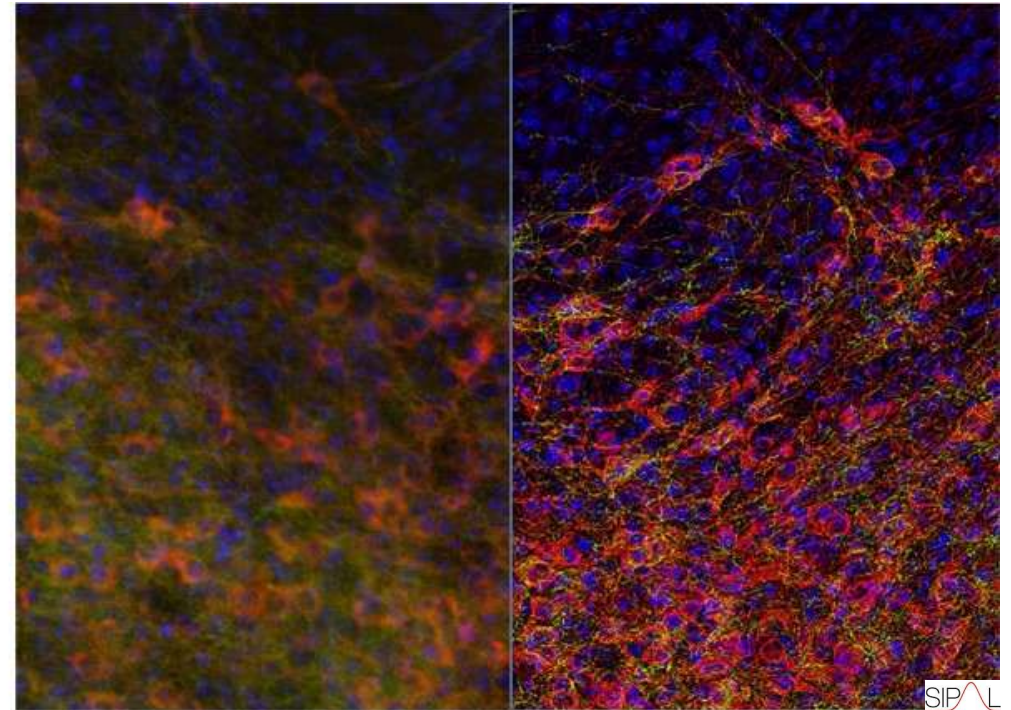
### Recover the quality: sharpness enhancement and noise reduction

Correction of under- or overexposure & Improvement of detail representation



*No image enhancement*

*SIPAL image enhancement*



*No image enhancement*

*SIPAL image enhancement*

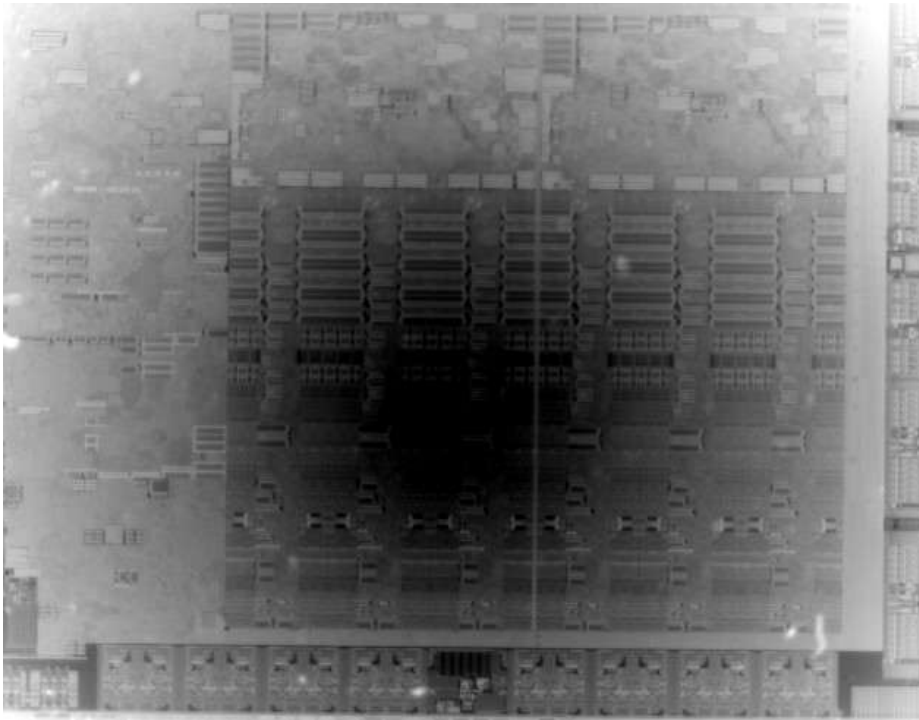
**SIPAL**



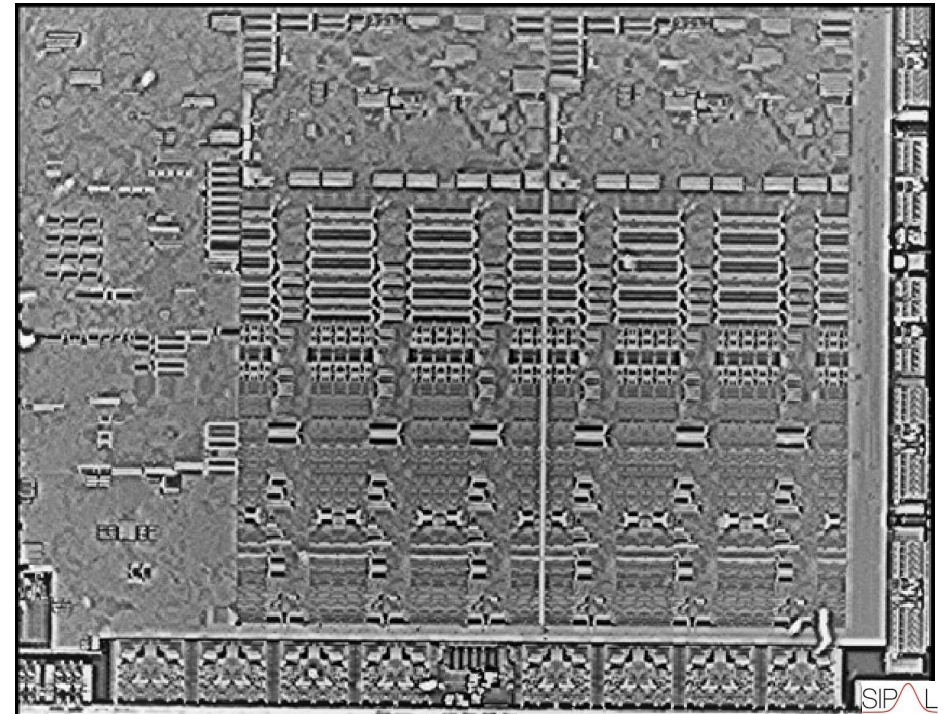
## IMAGE QUALITY ENHANCEMENT: INFRARED MICROSCOPY

Sharpness recovery and sensitivity improvement independent from irradiation sources and imaging methods

Correction of under- or overexposure & Improvement of detail representation



*No image enhancement*

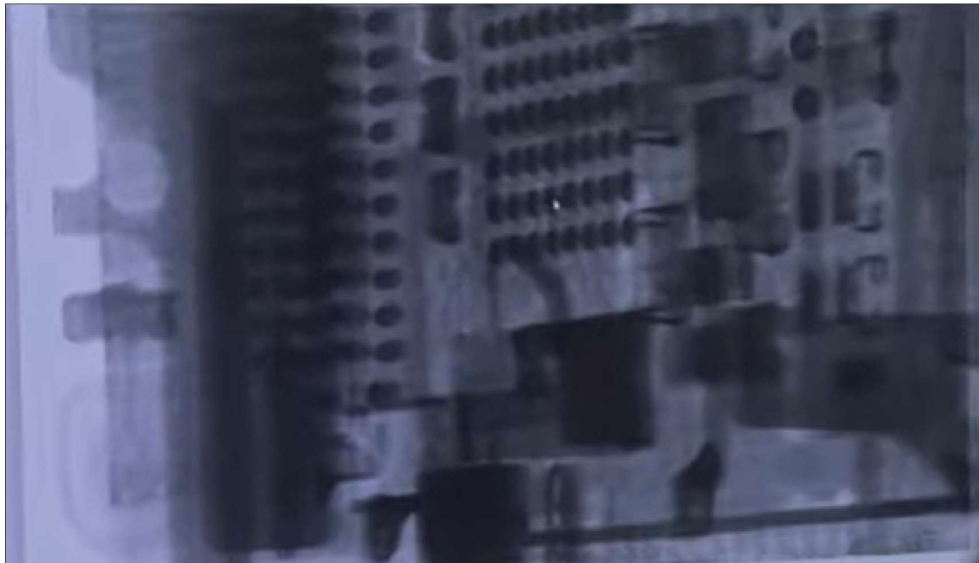


*SIPAL image enhancement*

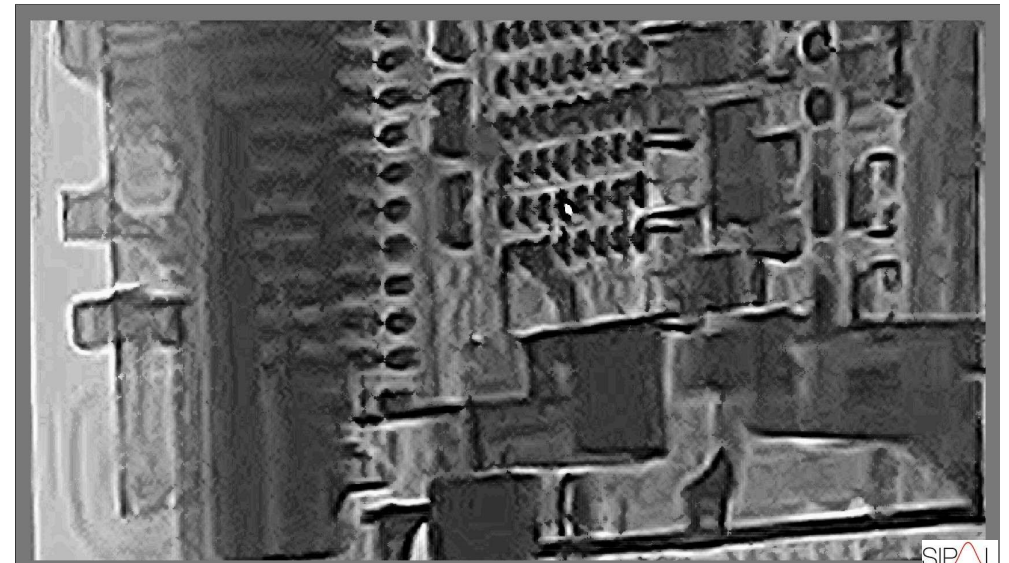
## IMAGE QUALITY ENHANCEMENT: X-Ray MICROSKOPY

### Sharpness recovery and sensitivity improvement independent from irradiation sources and imaging methods

Correction of under- or overexposure & Improvement of detail representation



*No image enhancement*



*SIPAL image enhancement*

## ○ IMAGE QUALITY ASSESEMENT (IQA)

Our objective no-reference IQA in  $SU^*$  require nether parametrization nor learning database

SIPAL IQA is fast & is easy to apply, even on large stacks

BLURRY (negative values)

**IQA value - 269 SU**



SHARP (positive values)

**IQA value: 266 SU**



<sup>\*)</sup> Sharpness Unit



## ○ IMAGE QUALITY ASSESEMENT (IQA)

Our objective no-reference IQA in  $SU^*$  require nether parametrization nor learning database

SIPAL IQA is fast & is easy to apply, even on large stacks

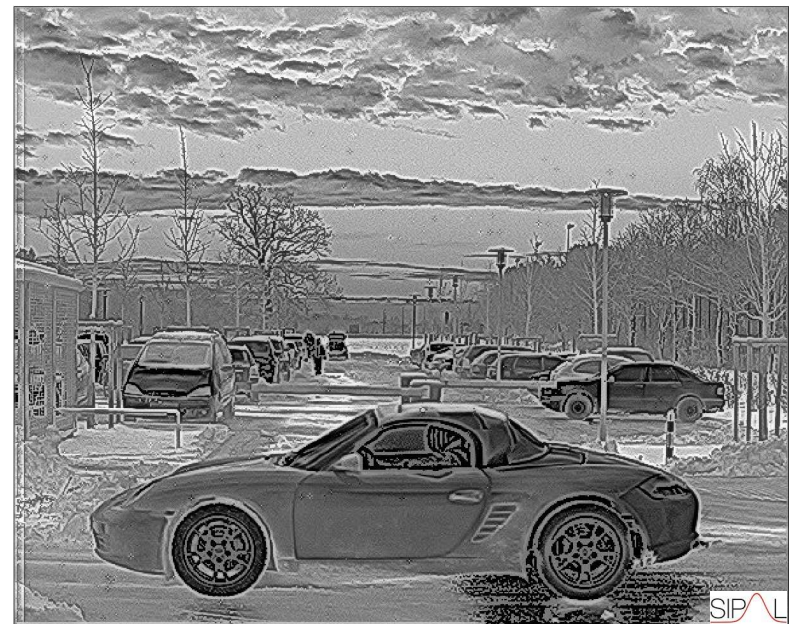
BLURRY (negative values)

**IQA value - 296 SU**



SHARP (positive values)

**IQA value: 344 SU**



<sup>\*)</sup> Sharpness Unit

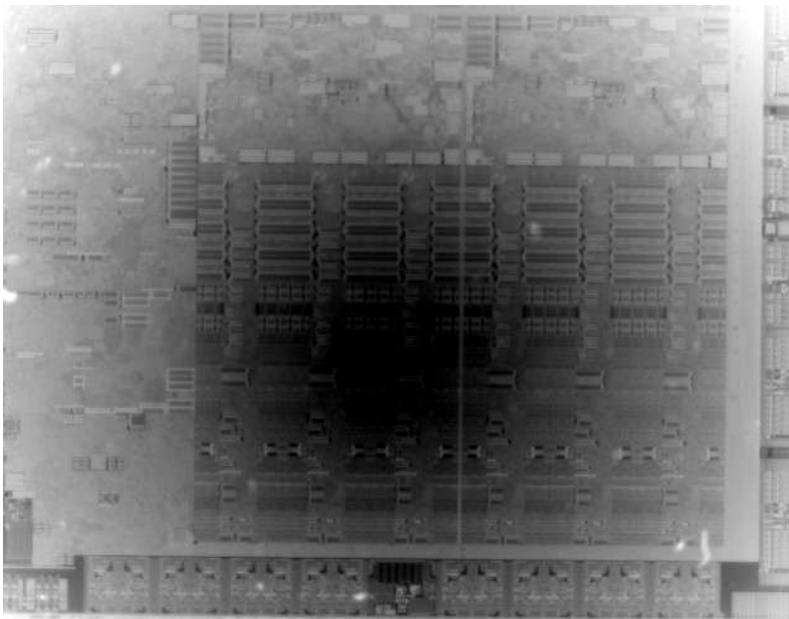
## ○ IMAGE QUALITY ASSESEMENT (IQA)

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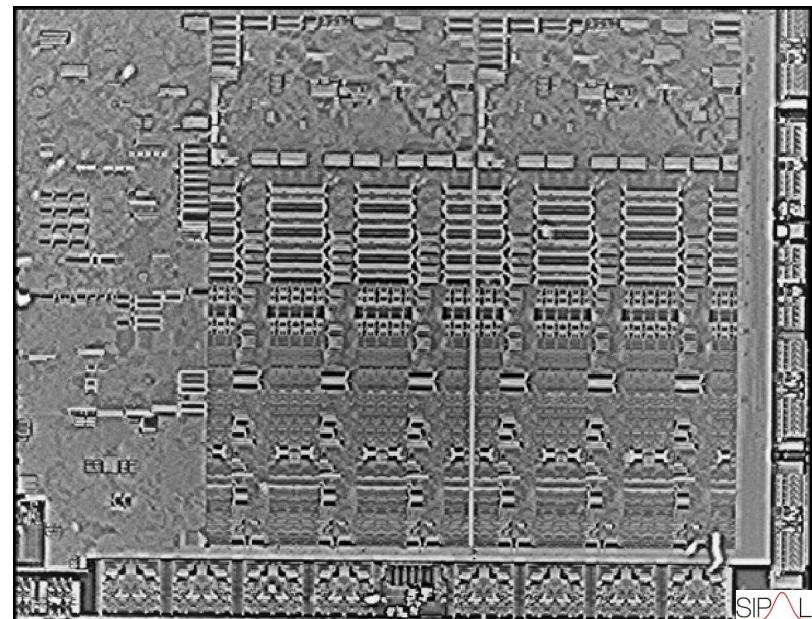
BLURRY (negative values)

**IQA value - 296 SU**



SHARP (positive values)

**IQA value: 346 SU**



<sup>\*)</sup> Sharpness Unit



... and what we don't

## SIPAL approach substantially differs from common methods

### CONVENTIONAL TECHNOLOGY

**Histogram adjustment** as an overall, unspecific contrast enhancement filter decrease image quality and leads to **loss of image details**

**Fourier filtering** and other frequency filter as well as blur subtraction by **deconvolution** favour unpredictable **artefact** generation

Local image disturbances favour generation of **shadows** or bright/dark spots by utilisation of **unsharp masking**

### SIPAL TECHNOLOGY

**No loss of details**

**No artefacts\***

**No shadows**

- **Object-based** algorithms

- **Morphological** filters, based on nonlinear neighbour operators

- **No additional information is added** to an image

**Use of no *AI***

\*) total absence of any kind of artefacts could not be granted



## CONTACT DETAILS

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[www.sipal-online.com](http://www.sipal-online.com)

