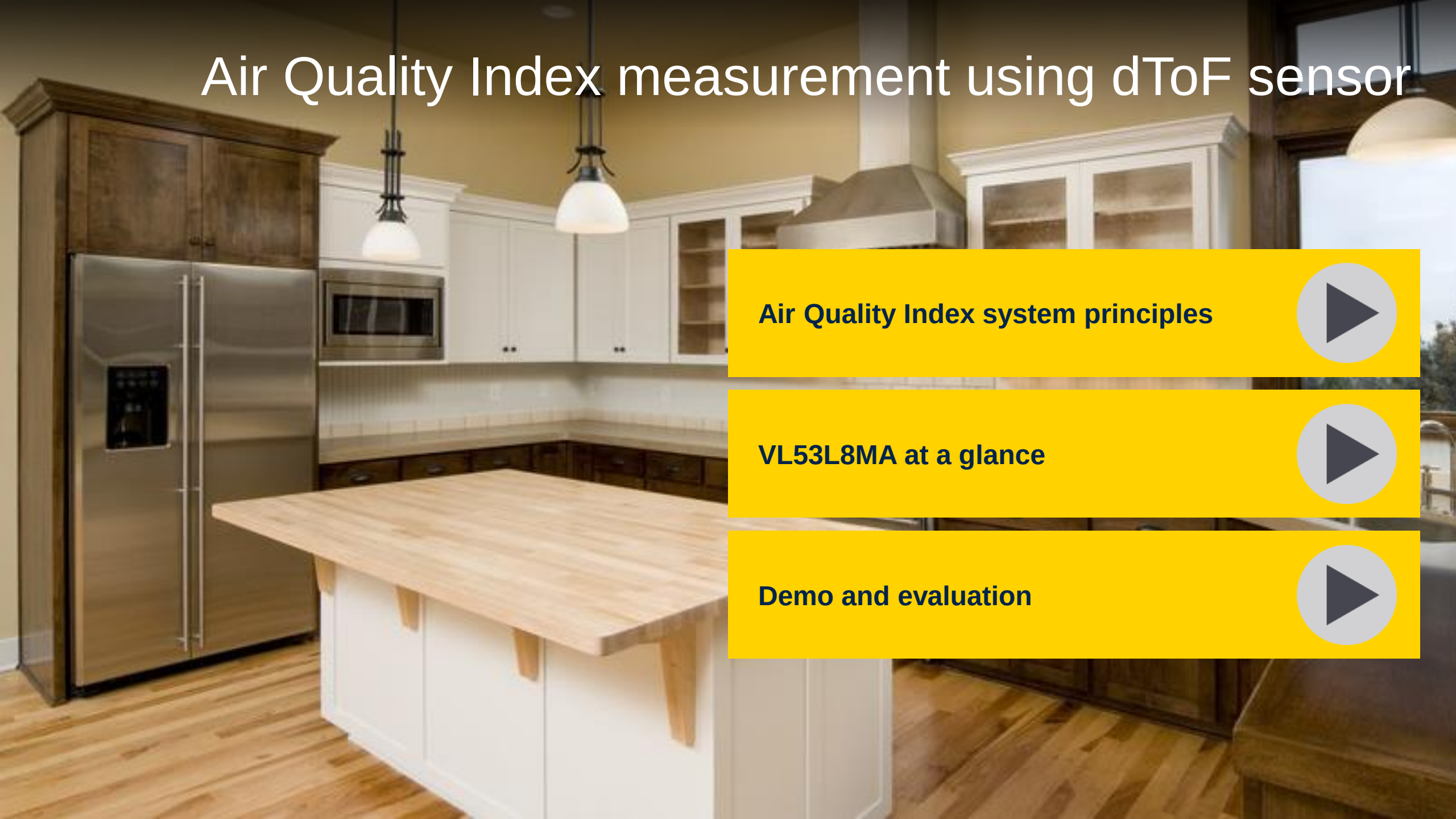
Air Quality Index measurement using dToF sensor

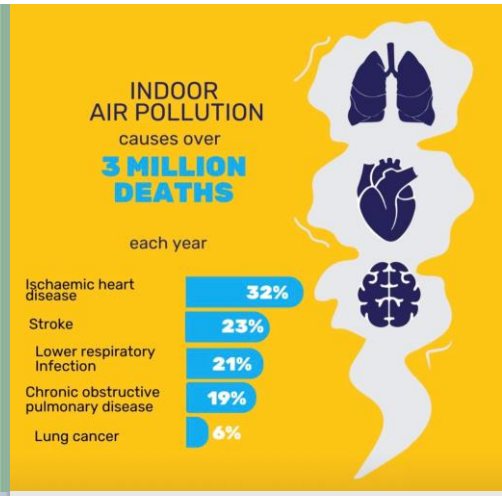


- Air Quality Index system principles
- VL53L8MA at a glance
- Demo and evaluation

The air that we breathe

Why measuring air quality matters

- Measuring air quality has become crucial due to its direct impact on **human health** and the environment
- Poor air quality can lead to respiratory and cardiovascular **diseases**, exacerbate existing **health conditions**, and lead to **poor sleep quality**
- Monitoring air quality helps to understand pollution levels, **identify sources**, and takes steps to **improve** both **public health** and the **environment** both **indoor** and **outdoor**



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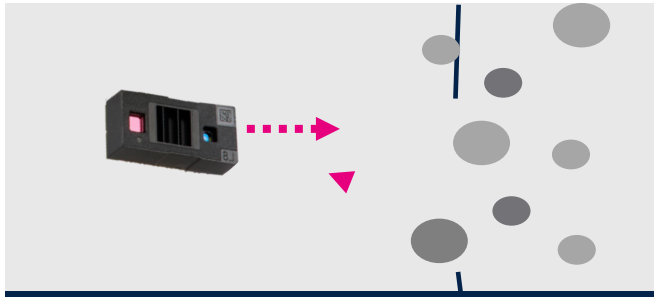
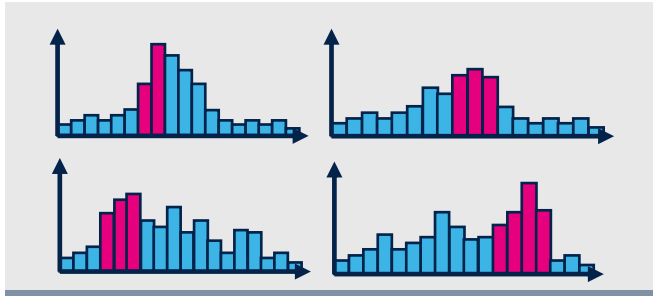
Air quality measurement flow

How is it possible to measure AQI with a ToF sensor?

Particles from polluted environment



ToF backscattering measurements



Specific particles signature on histogram data (CNH)

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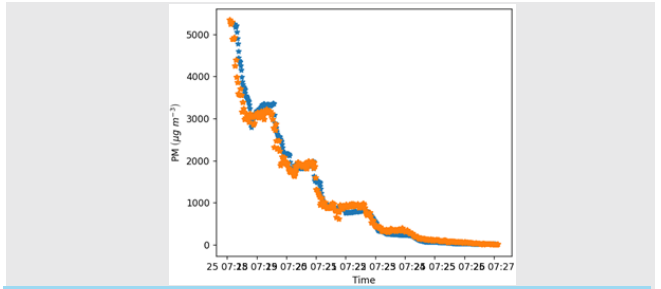
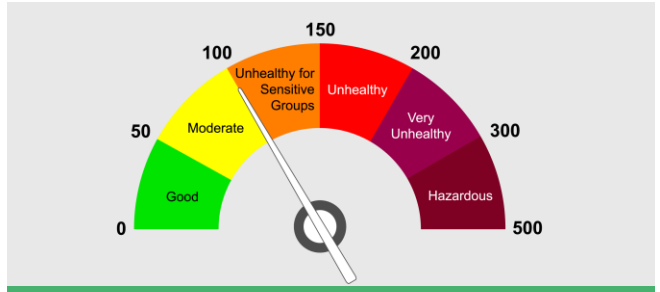
Mobile Physics processing



PM2.5 concentration



AQI and smoke status

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Embedded algorithms by Mobile Physics

Various outputs are available using Mobile Physics algorithm

Mobile Physics processing

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PM2.5 concentration

- Gives the PM2.5 concentration in µg/m3
- Used for product evaluation
- Accuracy ±10µg/m3 or ±10%

Air Quality Index (AQI)

- Converted PM2.5 concentration to AQI using US EPA standards
- Typical use cases: air quality monitoring, environmental surveillance, home health management

Smoke status

- Evaluates the probability of smoke using PM2.5 temporal & spatial behavior
- Typical use cases: personal fire alarm, portable smoke detector

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New product code: VL53L8MA

VL53L8MA: Enhanced version of VL53L8 for air quality measurements

- **World’s first personal mobile environmental monitor**
- **Real time air quality integrated in consumer products**
- **Formal agreement between Mobile Physics and ST**
- **Support legacy Time-of-Flight use-cases**

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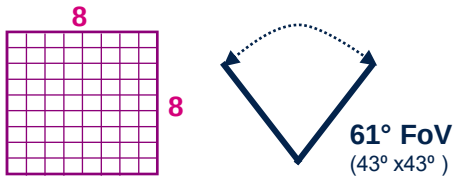
VL53L8MA product
2nd gen multi-zone dToF module with on-chip processing

Half power consumption | **Twice as robust** to sun light
Half host memory usage | **ST in-house lenses** | **1V2 I/O** support

Mass production

6.4 x 3.0 x 1.75mm



Light Emitter

- 940nm VCSEL
- High peak for better performances
- Advanced ST in-house DOE
- Class1 laser [IEC 608825-1, 2014]
- Lens detach detection built in

ToF Receiver

- 61° diagonal square FoV covering 80% of RGB Cam FoV
- 16 & 64 zones + Simultaneous 4 x single zones output
  - ✓ 4x4 + 4 zones @ 60 fps
  - ✓ 8x8 + 4 zones @ 15 fps

Specification & key Features

- Uniform & robust 4m ranging across the whole FoV
- Excellent close distance linearity from 4cm
- Automated crosstalk compensation
- ToF processing embedded (32bit MCU)
- I^2C & SPI interface: 1v2 & 1v8 I/O
- AVDD: 3v3 | DVDD: 1v8

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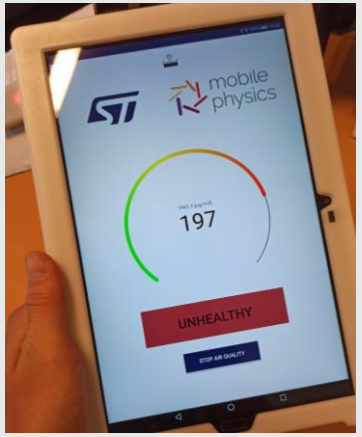
Evaluating Mobile Physics use-case

From demo to evaluation - step by step process

DEMO

- Demo presented to customer using tablet and/or EVK
- Used by marketing to explain the use case
- Simple ‘Traffic light’ system to monitor AQI when spray is used
- Can be run in demo or production mode
- No accuracy guaranteed, very simple demo



SIMPLE EVALUATION

- Initial customer exploration of use case. To understand how PM2.5 concentration evolves with pollutant concentration
- Operating guidelines to respect
- Any indoor space suitable for this evaluation
- EVK placed on flat surface or mounted on

FULL EVALUATION

- 3rd party laboratory confirm objective performance
- Formal comparison with competing solutions
- 2 m x 2 m x 2 m chamber recommended
- Smoke generation scheme
- Exhaust system to ‘remove’ pollution

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