ERPUG

ViaTech

PRAGUE,
CZECH REPUBLIC
2016

Homogeneity and raveling reporting by use of ViaPPS

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ViaTech facts

- ViaTech is a Norwegian Company with a comprehensive range of tailor-made products to measure different characteristics of the pavement surface and nearby area.

- Our products are:
  - ViaPPS (Pavement Profiling System)
  - ViaIRI+ (Texture Measuring System)
  - ViaPhoto (Photographic Systems)
  - ViaFriction (Friction Measuring Systems)
  - Software for the above

- Engineering for high tech companies
- New Products to be launched soon

ViaTech Product range ViaFriction®

Over 80 sold

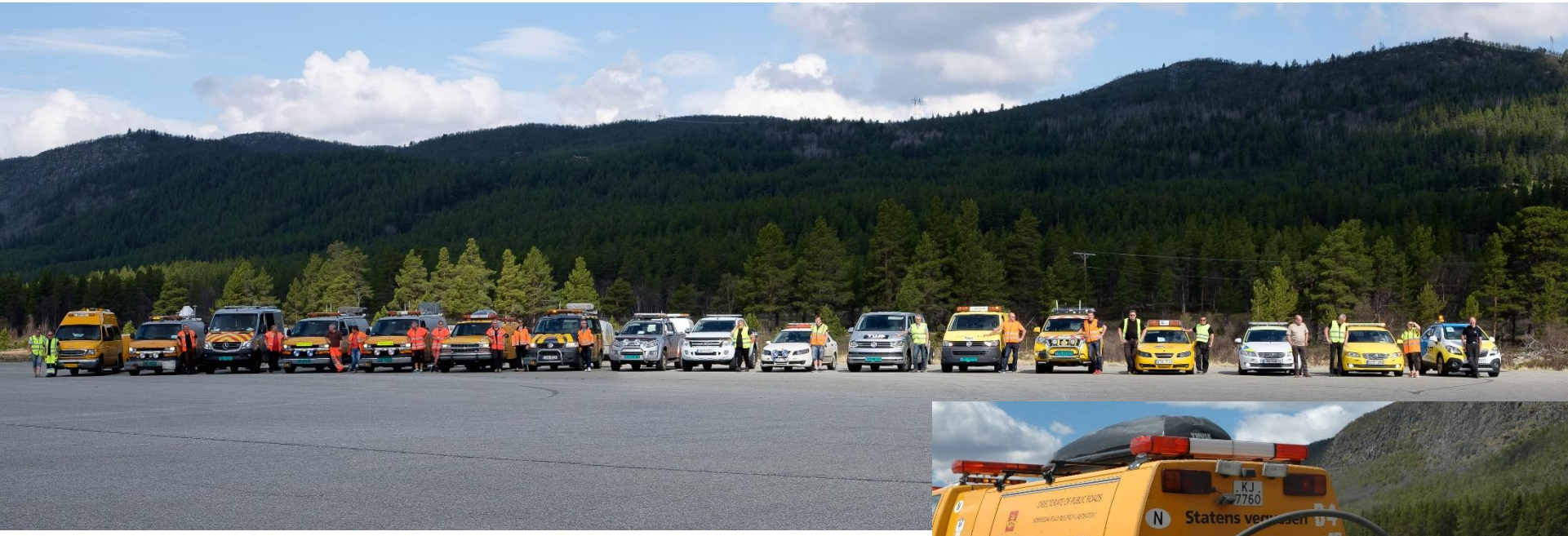
CEN/TS 15901-14

Fixed slip 1-75%

ViaFriction® Extended-split friction

Take-over session and filling the “water” tank!

Harmonisation in Norway-2016



Devices from Denmark, Estonia, Norway and Sweden

Pavement Profile Scanner (ViaPPS)

New Generation ViaPPS with LiDAR (as from 2015):

Range 119 meters-3D
Eye-safe due to laser class 1

POS LV from Applanix

Delivery to the Norwegian Road Authority-May 2015

Pavement Profile Scanner (ViaPPS)

Features:

- Longitudinal and transversal profile
- Rut depth, rut area and rut area volume
- Crossfall & Crossfall vs. Requirement
- Curve radius
- Longitudinal deflection/Bumps
- *IRI*
- *MPD*
- Width of the lane (input to calculations also)
- Bad joints of the asphalt
- Crack parameters
- Accident investigation
- Tunnel/Bridge
- 3D data to external standard format such as xyzi, las/laz
- WEB interface
- 360 Photo integration

2006

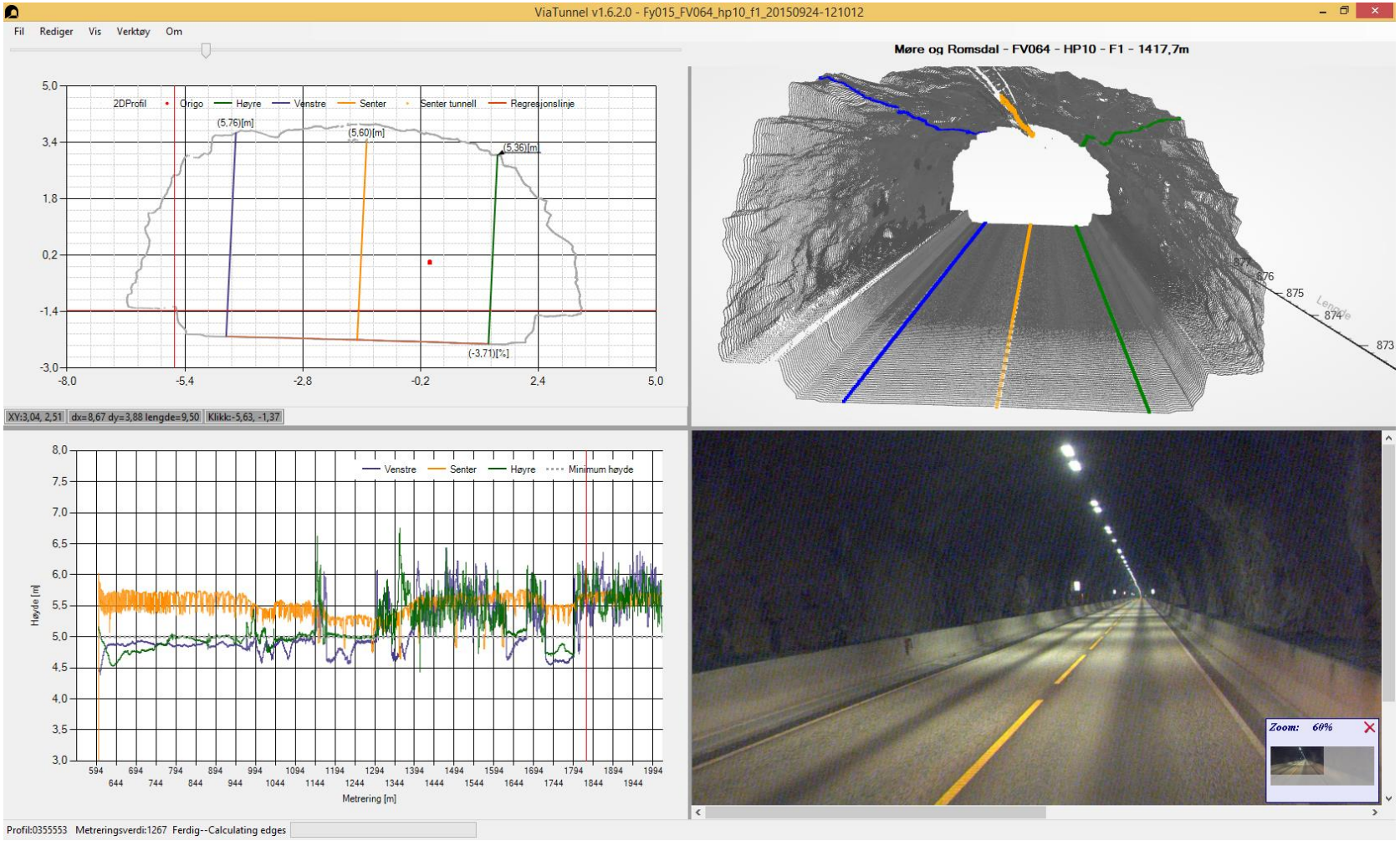
2016

10 Year!

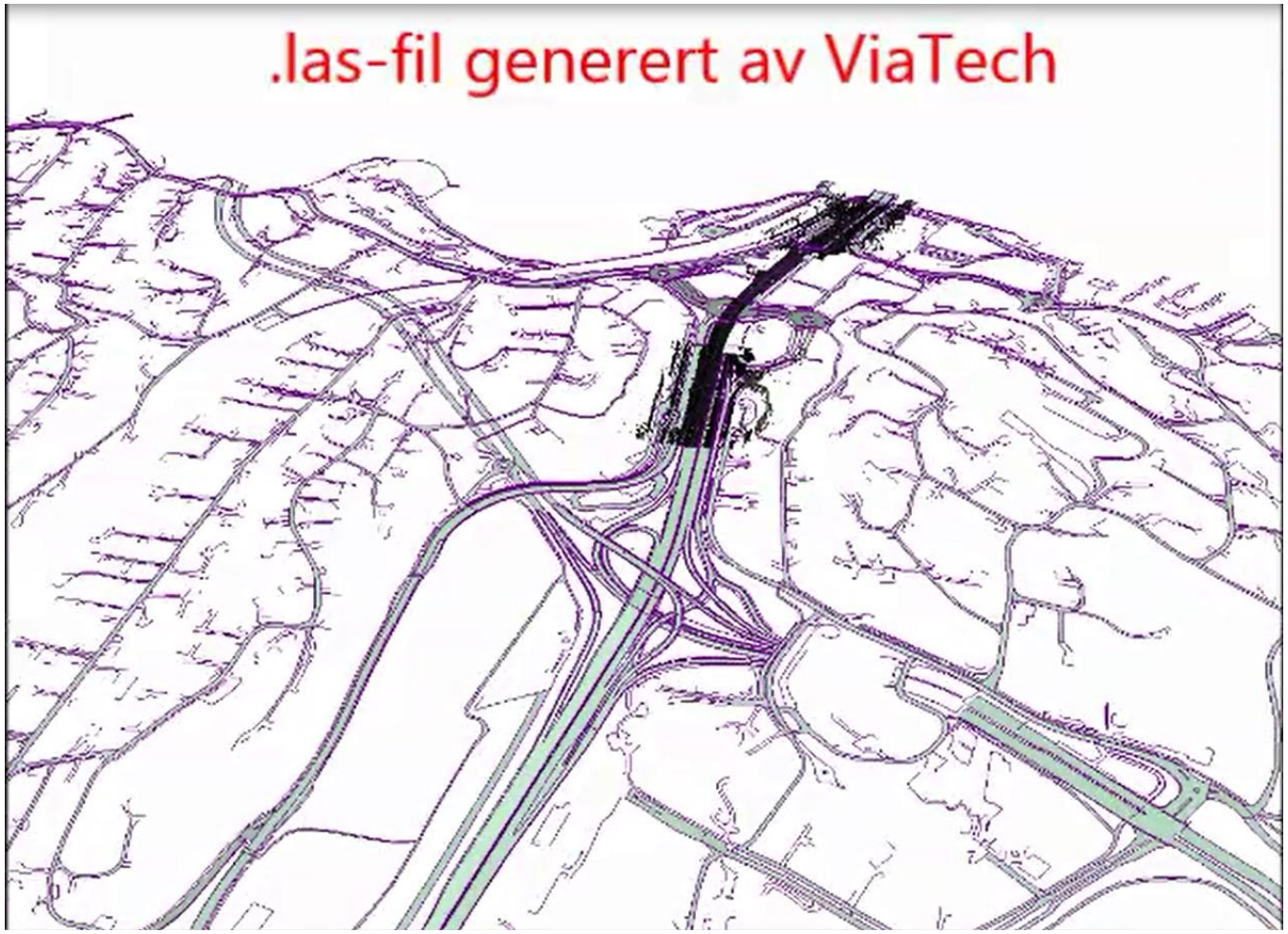
- Homogeneity →
- Side area (Objects etc.)
- ++New parameters (like Sightlines, Raveling, Asphalt mass estimation etc.)

→ All in the same run and with automatic reporting!

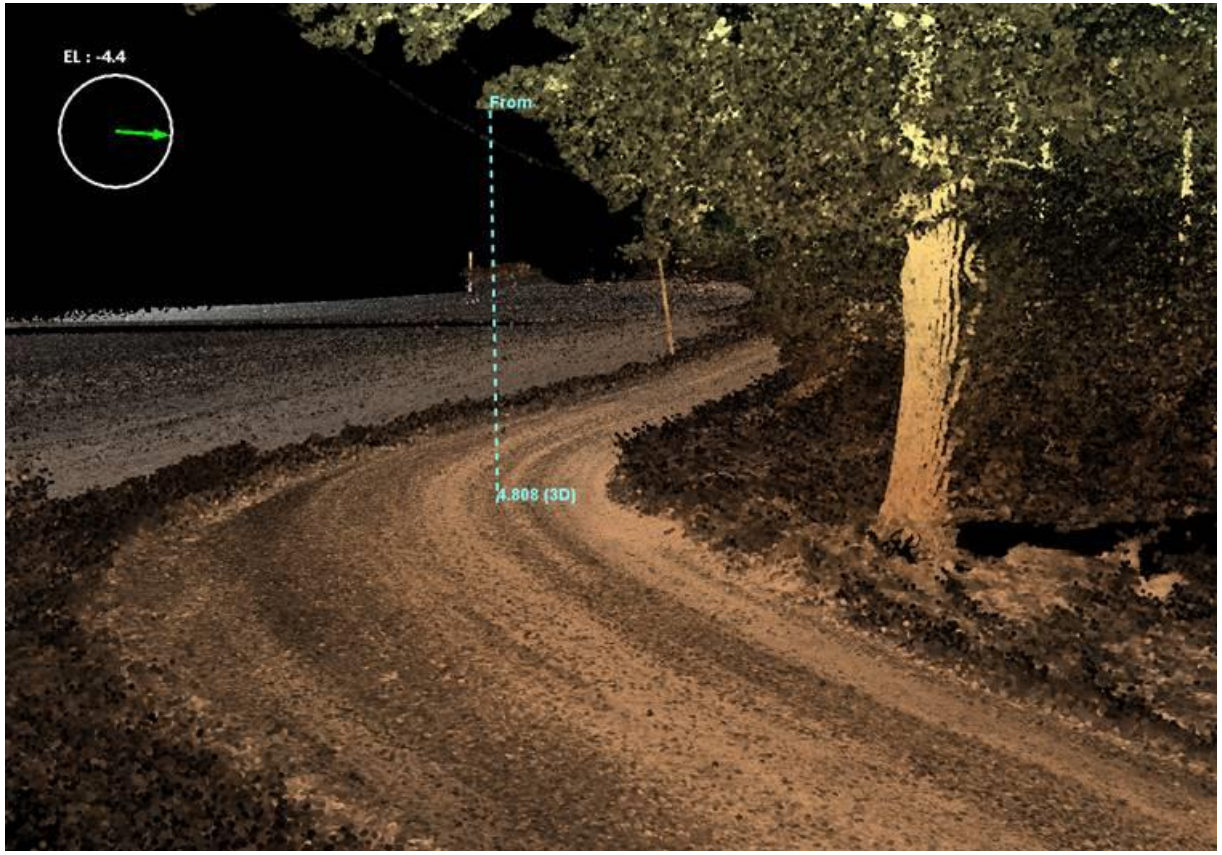
ViaTunnel – Main Window



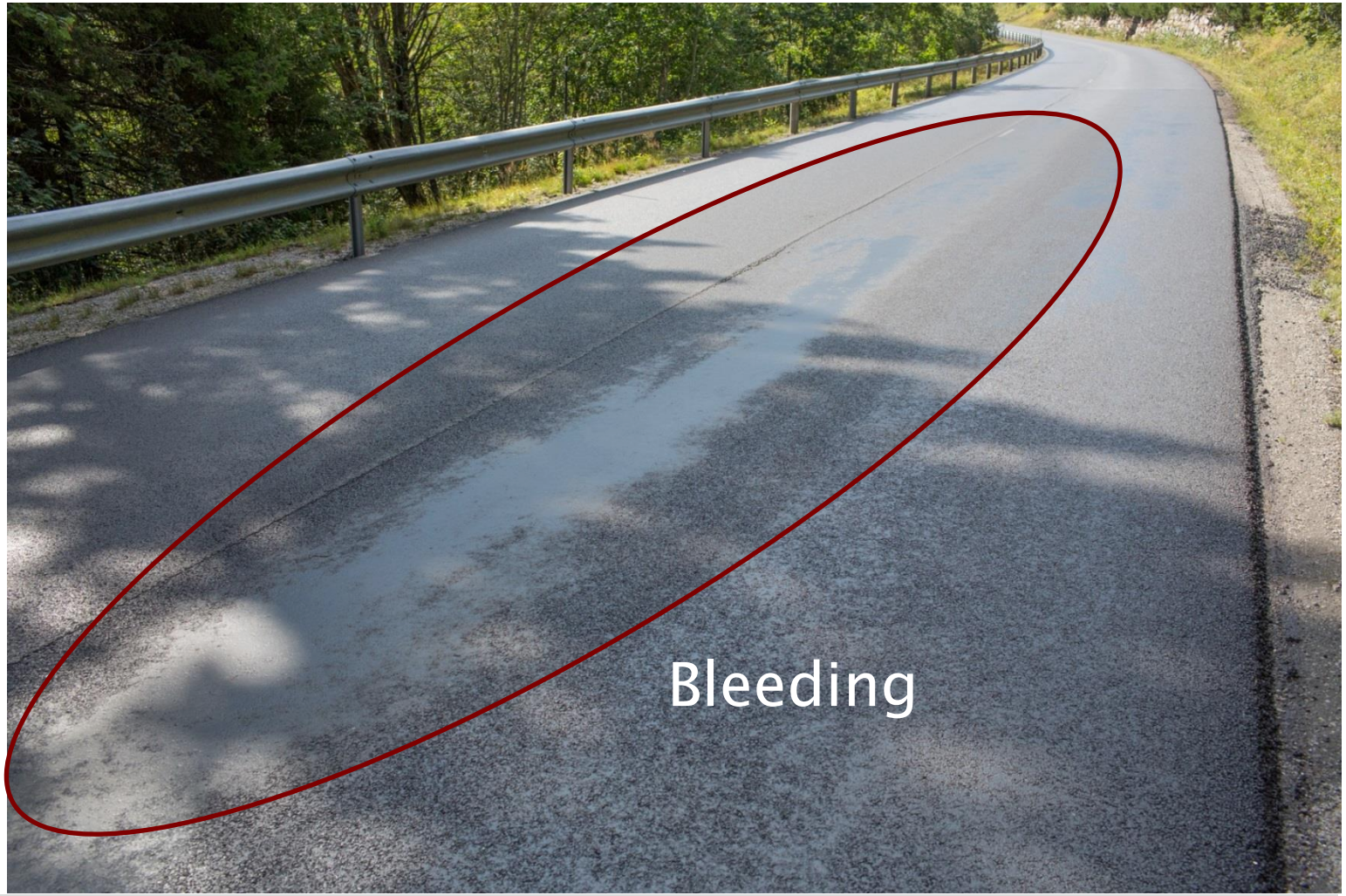
.las integration



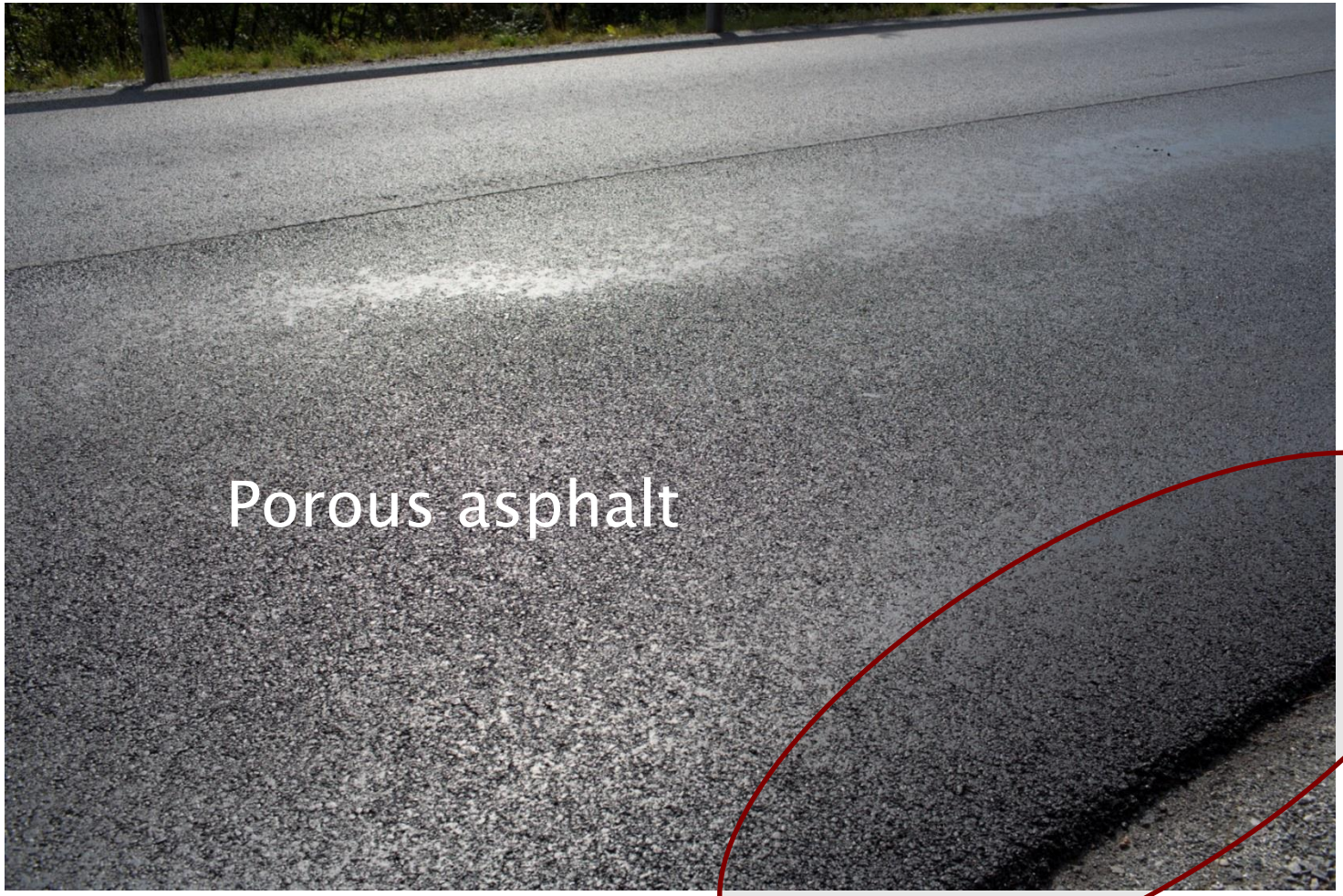
3D measurement



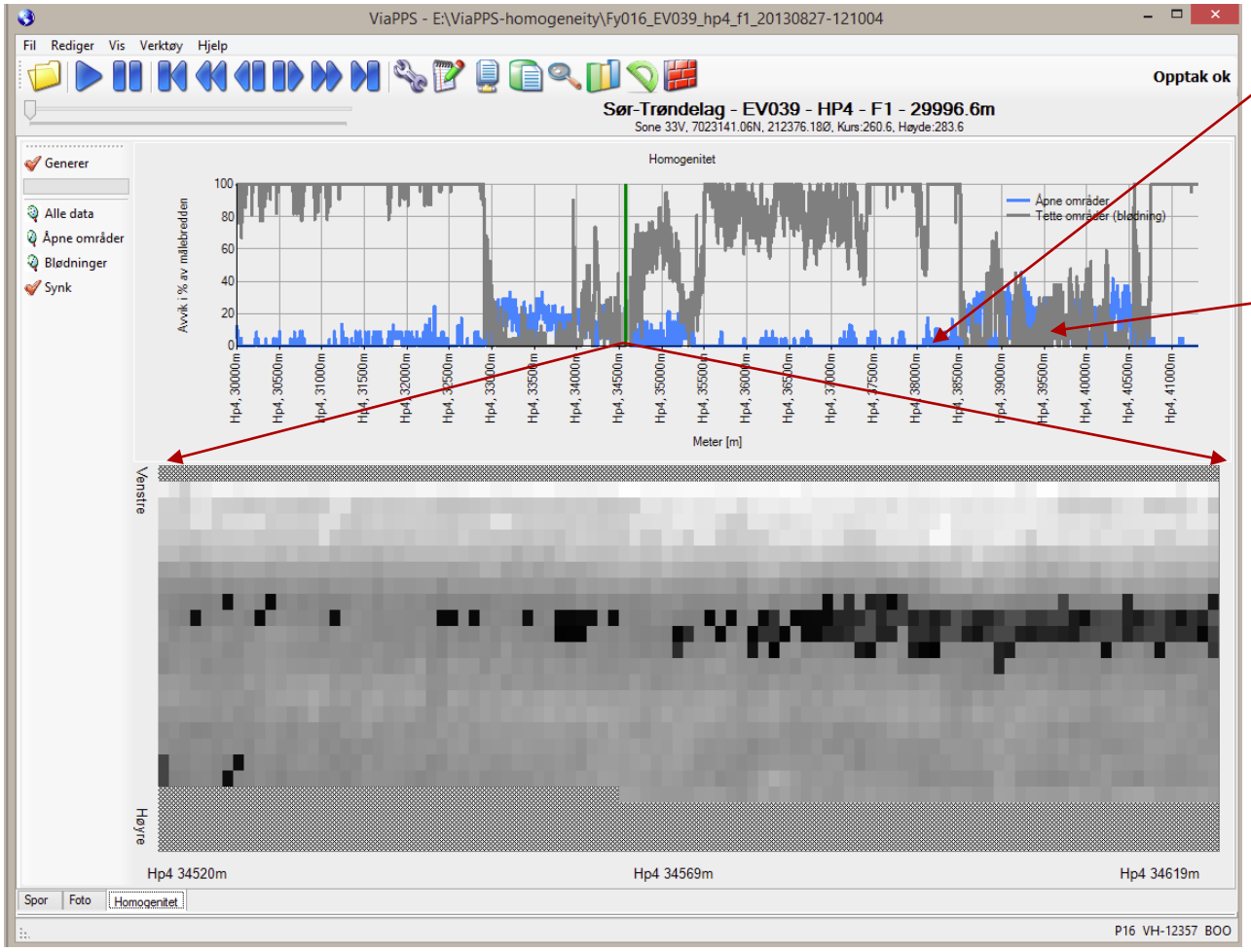
Statistical homogeneity analysis



Statistical homogeneity analysis



ViaPPS Desktop–Homogenity

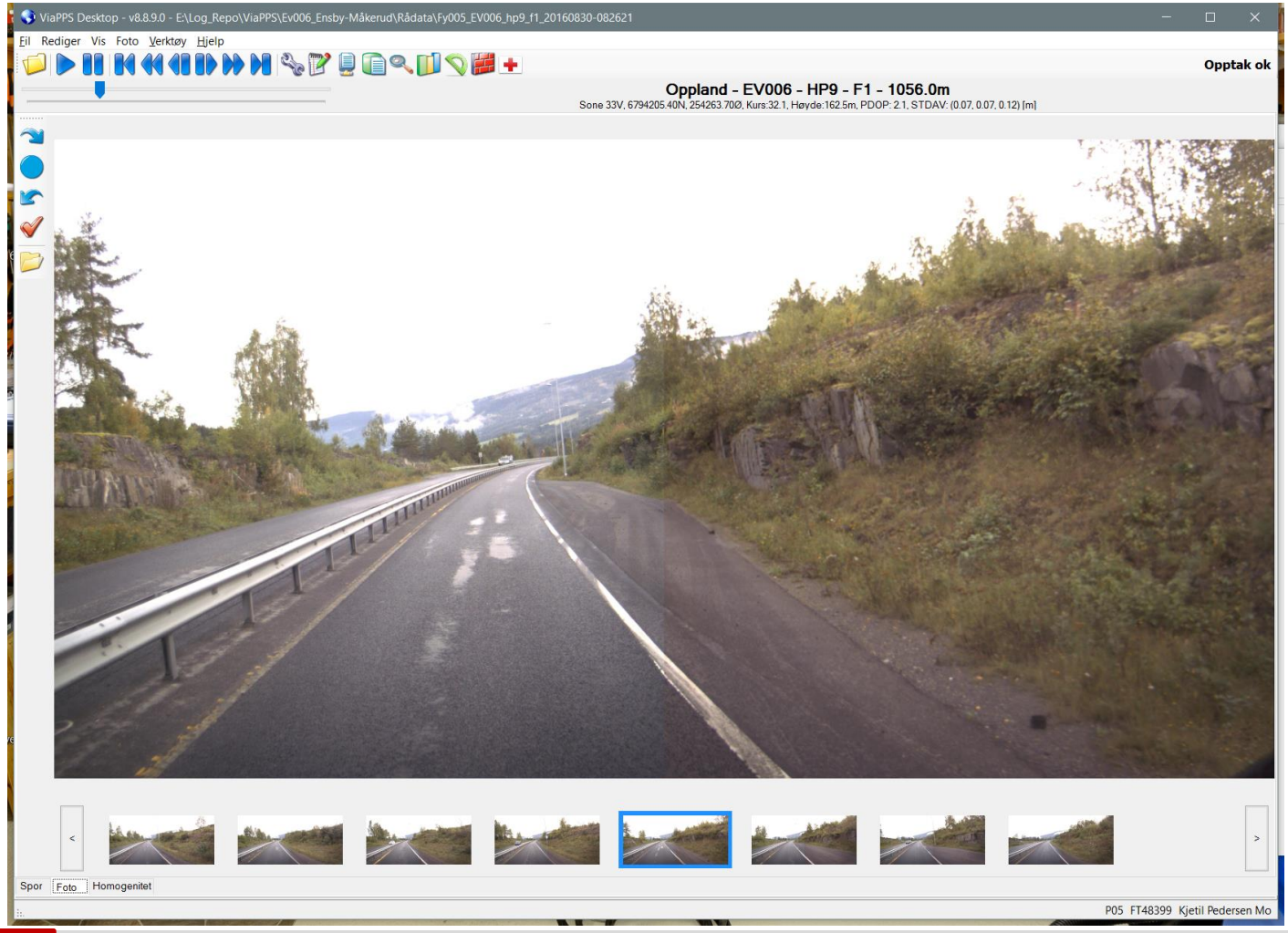


Blue = Level of porosity

Black = Level of bleeding

Automatic reporting

ViaPPS Desktop–Homogenity



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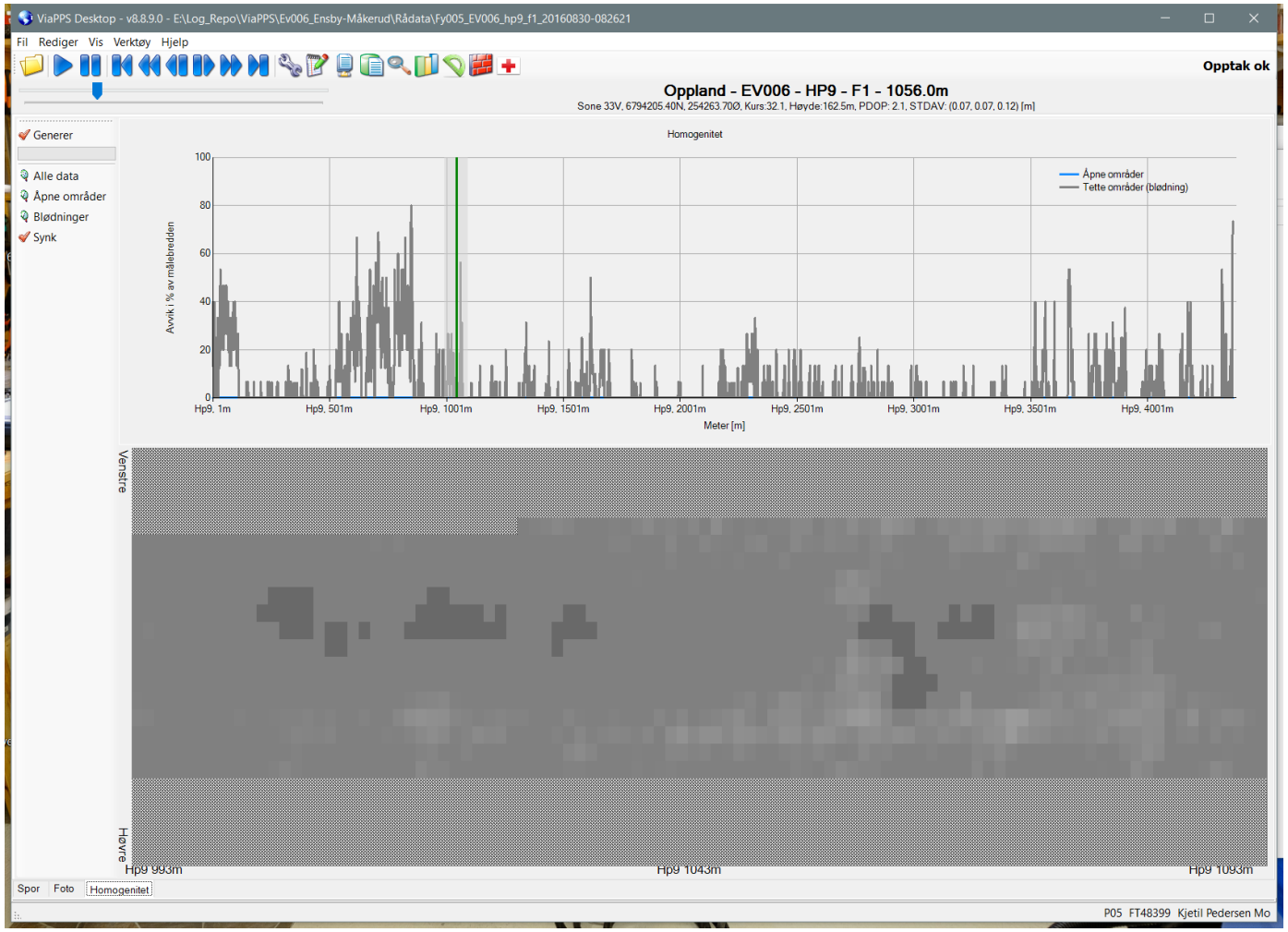


(Homogenity→) Raveling

Raveling

EXISTING RWS PAVEMENT CHARACTERISTICS

- Quantity
  - about 15.000 lane kilometers
  - 85% porous asphalt,
    - 66% ZOAB 0/16, 17% ZOABTW / DGD
  - 15% dense asphalt
    - 9% DAB, 3% SMA, 3% others

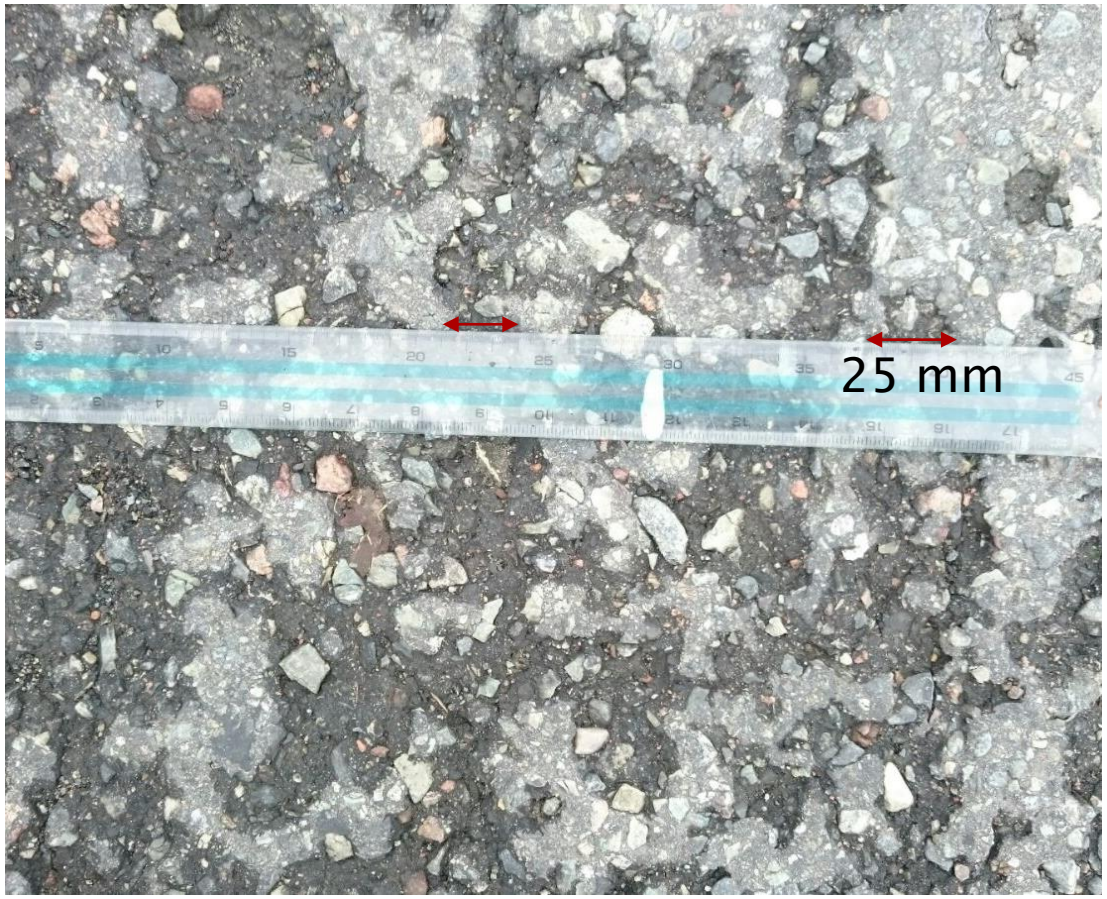
- Road surface distress on porous asphalt is mainly causes by raveling and cracks
  - ZOAB 0/16:
    - 80% maintenance due to raveling
    - 10% maintenance due to surface cracks (increasing the last years)
  - ZOABTW / DGD
    - 60% raveling
    - 30% cracks (increasing since 2001)

Road texture and Raveling

Road texture can be divided into three main classes: micro-, macro- and mega-texture.

- **Microtexture** is related to the surface of the mineral aggregate,which can be rough or polished, whose wavelengths vary between 0 and 0.5 mm and amplitude between 0 and 0.2 mm.
- **Macrotexture** can be characterized as the road surface roughness caused by the aggregate protuberances, with wave-length between 0.5 and 50 mm and amplitude between 0.2 and 10 mm
- Megatexture presents wavelength varying between 5 and 50 cm and amplitude between 1 and 50 cm.

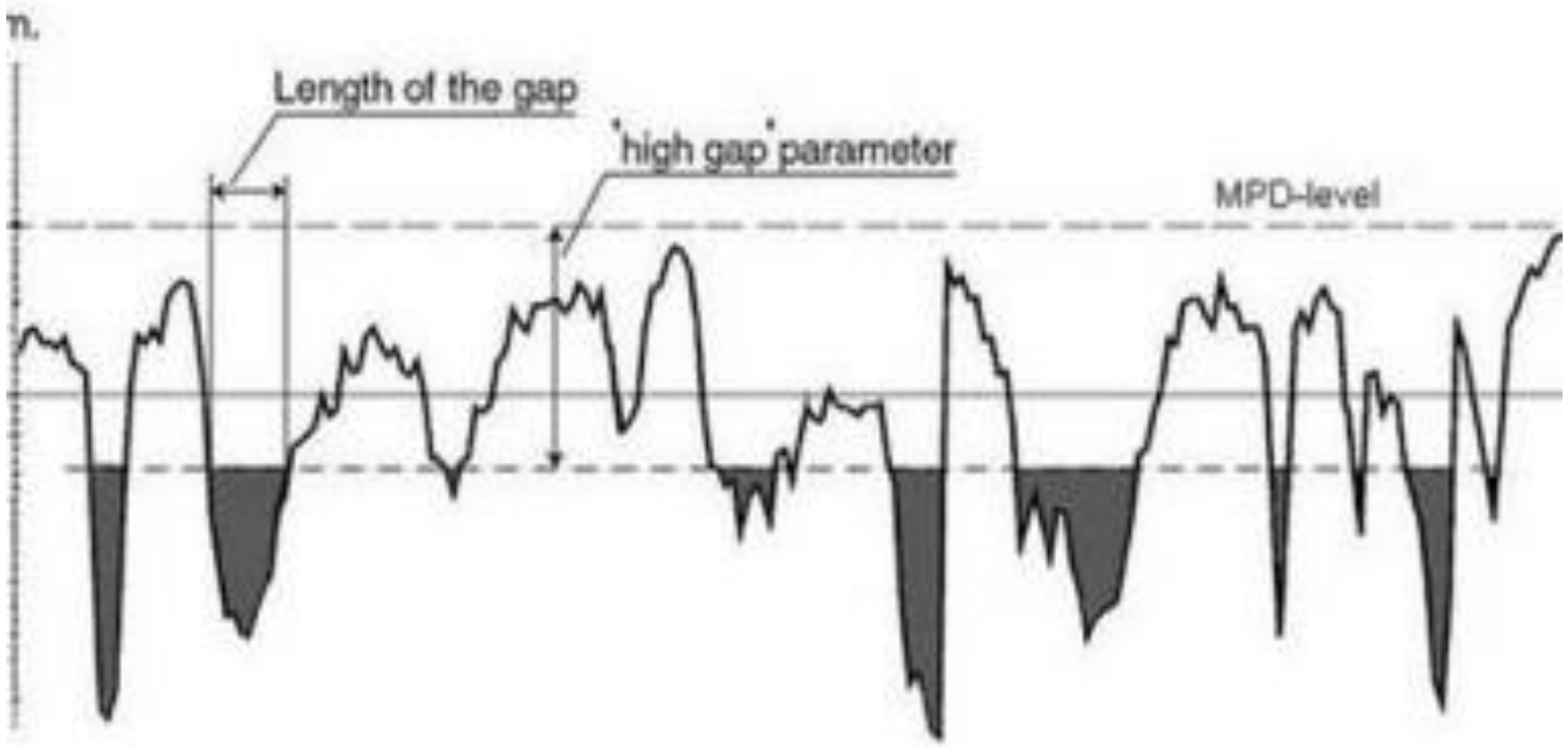
Raveling parameters of interest



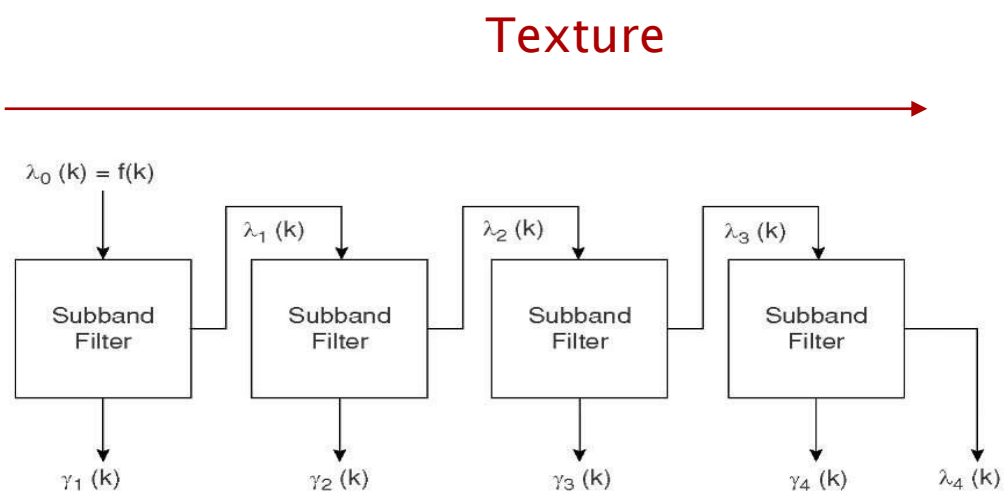
- Height and length of a gap(i.e. the imprint of lost stone)—«highgap» and «greatgap»
- Raveling regions are defined as gaps in longitudinal sampling data that are large and deep enough.

In this case study
the dominant patch size
varies from 20 to 40 mm

Raveling, «Stoneway» algorithms



TEXTURE filtering process



Several filters are used in sequence to test witch one works well

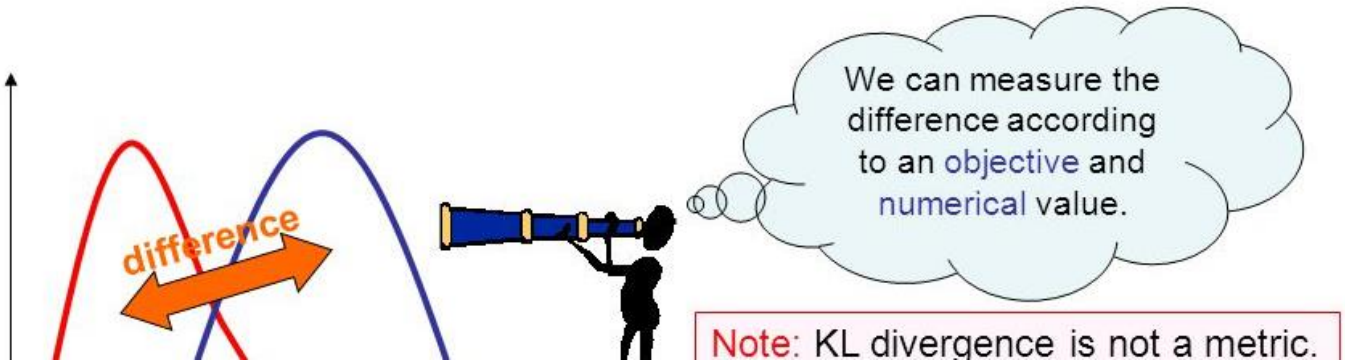
Texture comparison

KL statistical 'metric'

- A measure of the difference between two probability distributions: $a(x)$ and $b(x)$

$$D(a||b) \equiv \int dx a(x) \log\left(\frac{a(x)}{b(x)}\right)$$

a(x) =unraveled
b(x)=raveled

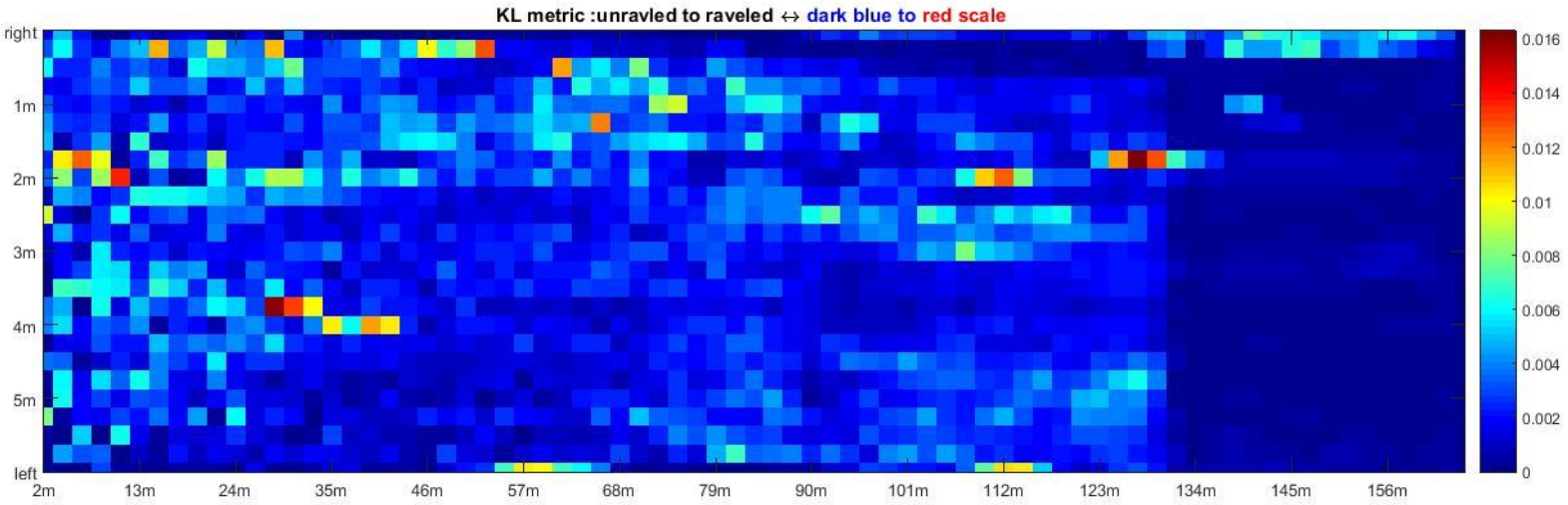


Right raveled road

Test example

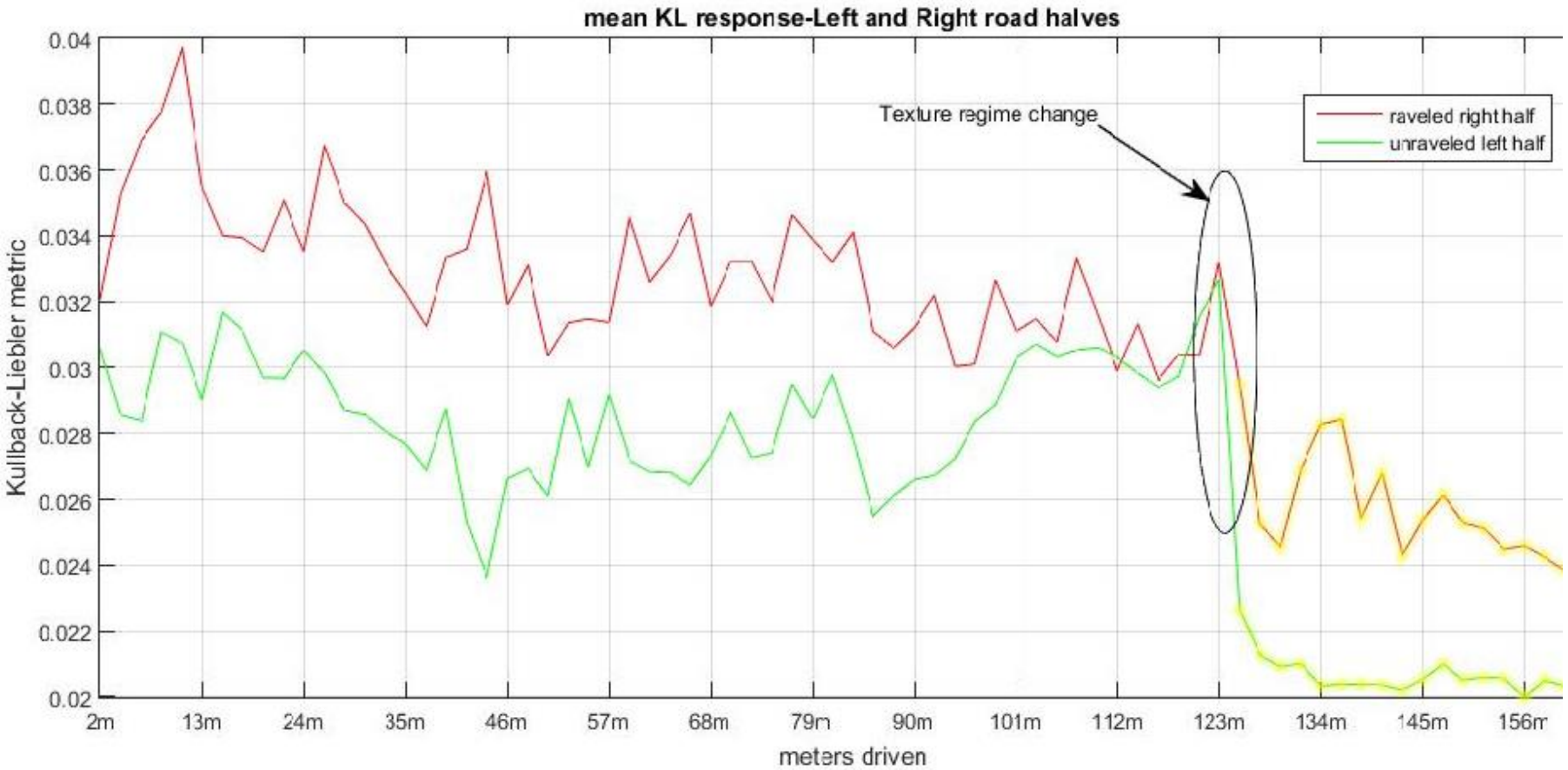
Notice that the KL metric replicates raveled road surface. Right half of road is more raveled. Also at around 130 meters the road surface becomes fine again.

KL metric over raveled road

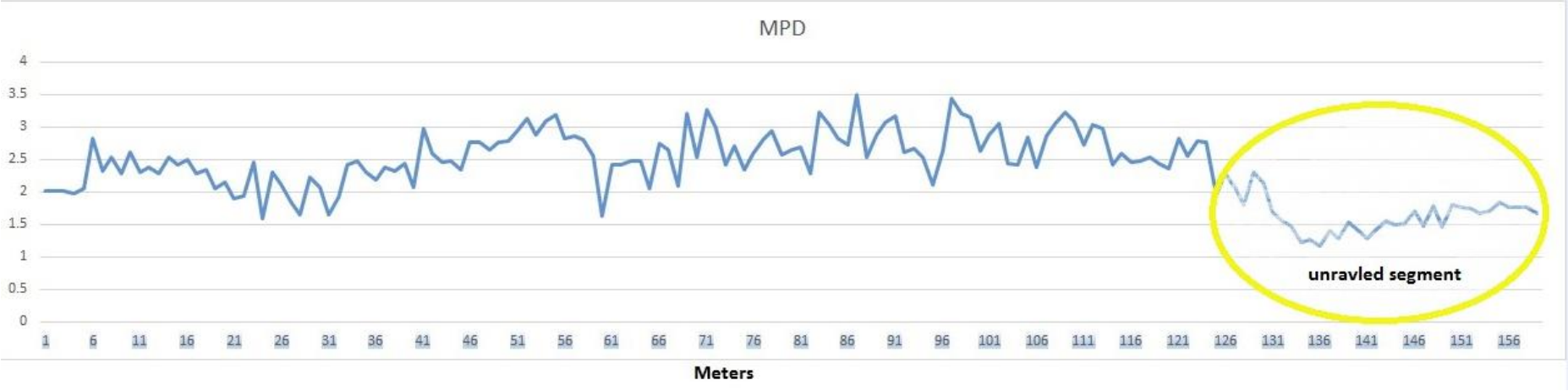


The KL metric replicates raveled road surface. Right half of road is more raveled.
Also at around 130 meters the road surface becomes fine again.

Average KL distance between left and right road halves



MPD



MPD at much higher sampling confirms the texture variations caught otherwise with LIDAR data processed with our new algorithm

Summary–achievements

- Proof of concept on example road segments shows that raveled road surfaces can be detected and localized

Work to do

- Texture customized filters need to be constructed to maximize raveling detection.
- Filters needs to be calibrated to highlight raveling and suppress background irrelevant texture details.
- Information from high frequency filters to be combined to possibly overlay crack information on top of raveling.

→Reporting format: Percentage of lost stones per meter on the 'stoneway'.

→ >15 mm possible during 2017 with ONE scanner
→ >10 mm is theoretic possible with ONE scanner
→ >7 mm is theoretic possible with TWO scanners
→ Valid for all different pavements

Any Questions?