Accuracy of mobile measurements

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Invitation by Anders Nordström:

Den 7-8 Februari är det möte i finsk branschförening och då man använder funktionskontrakt på de flesta ställen i Finland så är mobil mätning väldigt viktig. Där har varit stor tveksamhet kring resultaten av dessa under 2011 och därför vill man höra om teknikutveckling samt vad som händer på standardiseringsområdet för mobil mätning. Jag tror där är 3 Ecodyn och 1 laserlux för mobilmätning i Finland idag.

General about the R_L of road markings





The 30 m geometry of EN 1436



The R_L value does not change much with distance

However, the R_L value depends on the observation height





Low R_L value but large apparent area

However, the R_L value depends on the observation height



Medium R_L value and medium apparent area

But the R_L value depends on the observation height



High R_L value but small apparent area

The $R_{\rm L}$ value depends actually on the vehicle



The shadow factor is the ratio of the two heights



The value is 0,542 for the 30 m geometry

The $R_{\rm L}$ value depends actually on the vehicle

But the visibility is the same

It is only a problem for measurements

Portable instruments since 1982

Sensitivity, linearity and range Daylight (Shade and subtraction The 30 m geometry White and yellow markings **Calibration** (Ceramic blocks) **Distance** (Collimating lens) **Shadow factor (Arrangement of fields)** Location (Placement)

Sampling

UTL BOD-RETROMETER

Blocks with tilted ceramic surfaces



Tilted ceramic surfaces are easy to measure accurately in the laboratory, and they are sturdy and easy to protect

Coloured blocks for final testing

The distance law of illumination is the enemy of reflection measurements in the field



Distance - Collimating lens creates virtual infinite distance



Distance – there is constant signal as long as the fields fully overlap





This is a strong principle, but it cannot be used for mobile instruments

Influence of the shadow factor is avoided by the arrangement of the fields of illumination and measurement



Because the illuminated field is the smaller, the shadow factor is not included in the measurement

This is also a strong principle, and it can be used for mobile instruments

Location and sampling

Measured field

We know where it is



The field is small (4-5 cm wide, 20 cm long) and one has to enter the road and to walk from one location to the next



Mobile instruments

Ecodyn

Laserlux

LTL-M



Some of the items on the list

Sensitivity, linearity and range



Daylight Ecodyn Laserlux



30 m geometry

White and yellow markings



Three different methods: Frequency band Spectral band Time band



The laser light is not absorbed by yellow

Calibration

Blocks are easy to measure accurately in the laboratory, sturdy and easy to protect



Panels are difficult to measure accurately in the laboratory, And they are non-uniform and prone to dirt and wear



Distance – Instrument too high or too low



Distance – Road marking too high or too low



Distance – Tilt of the vehicle



Distance – Curve up/down of the road



Distance – Other factors



Distance - Conclusion



Shadow factor – Lift or camber



Shadow factor – Curve up/down



Shadow factor – Conclusion



Location of the measured field – With few and big areas

1 m



Measured field – Few big areas and 10 cm lines



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Measured field – Few big areas and broken lines



Measured field – Conclusion



Sampling

The stimulus for visibility of a line is the R_L integrated over the width of the line – which equals the average R_L over the width multiplied with the width. Refer to COST 331.

It is therefore best to measure the full width. It is also best to measure the full length

Ecodyn measures only a part of the width with a bias towards the brightest part, but the full lenght **4**

Laserlux measures the full width, but only a part of the lenght

LTL-M measures the full width and the full length (at 90 km/h)

Ecodyn Laserlux



Sensitivity, linearity and range **Daylight Correct 30 m geometry** White and yellow markings Calibration Distance **Shadow factor Location** Sampling

It is an opinion only and may be unfair

It is diffiult to determine the accuracy

0.00

Non-uniformity

Typical: high in the centre and worn at the left hand side



Two measuring fields of 5 cm in the middle and full width







Some difficult cases





Conclusion

Experience and care improves the accuracy

Apart from that it is better to provide more thumbs up

(this is how portable instruments were improved)

Feedback regarding distance and other matters might also help

Do not wait for a new standard on mobile measurements