Retroreflectivity

NZRF RMSA meeting 2013

Presented by
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Contents

- Standards for Retro reflectivity
- What is retro reflection R_L
- What is Day light visibility Qd?
- How retroreflectivity works
- Tools for measuring Retroreflectivity
- Mobile retro reflection units

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Standard for Retroreflectivity

- International best practice is using the 30m geometry for measuring night time retro reflectivity
- Common standards used are:

  EN 1436 R_L and Q_d

  ASTM E 1710

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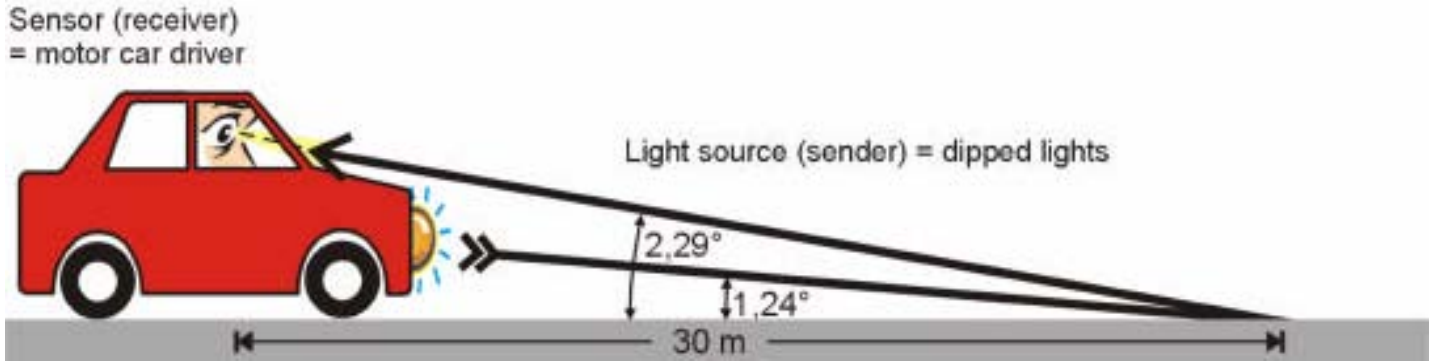
Retroreflection R_L

- EN 1436 R_L

R_L
Measures, true to scale, the retroreflection (night visibility) of a road marking.
The observation angle of 2,29° corresponds to the viewing distance of a motor car driver of 30 m under normal conditions. The illumination angle is 1,24°.



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Retroreflection R_L

- At night on open roads with no street lights
- Especially on windy stretches of roads
- Extremely important in the rain and darkness
- On roads frequented by older drivers
- In unlit tunnels

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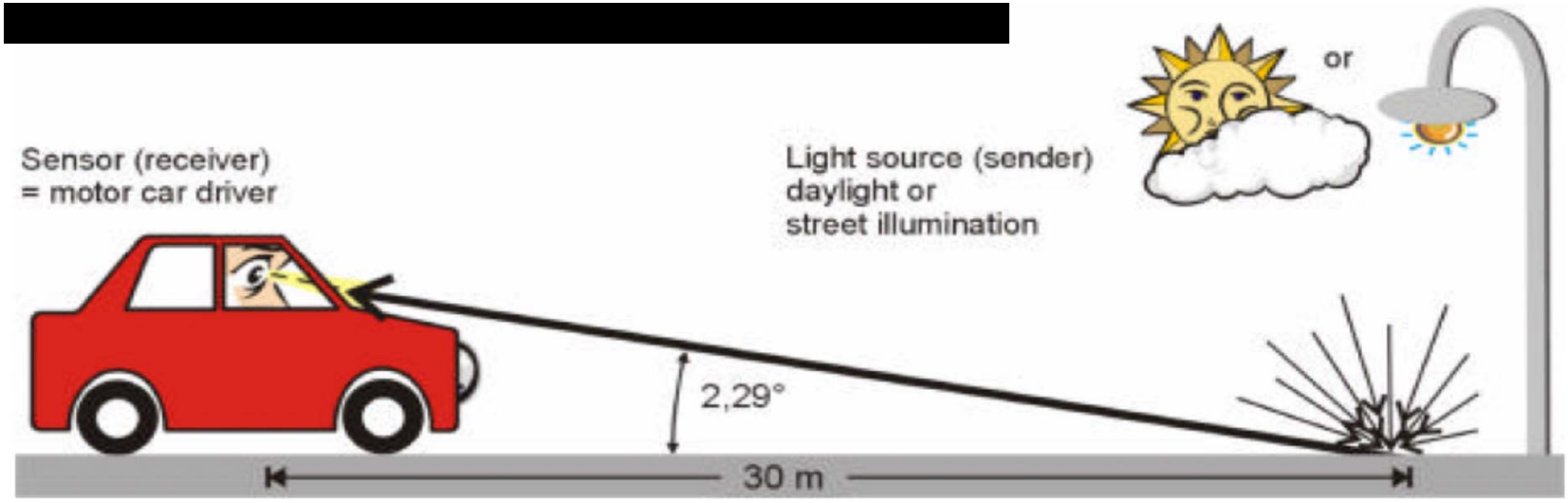
Daylight Visibility Q_d

- Measures, true to scale, the luminance (day visibility) of a road marking
- The observation angle of 2.29° corresponds to the viewing distance of a motor car driver of 30m under normal conditions
- The illumination is diffused light from day or street light



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Daylight Visibility Q_d

- On any road marking during daylight or under streetlights
- The higher the Q_d the bigger the contrast will be between road and markings
- Extremely important on damp roads

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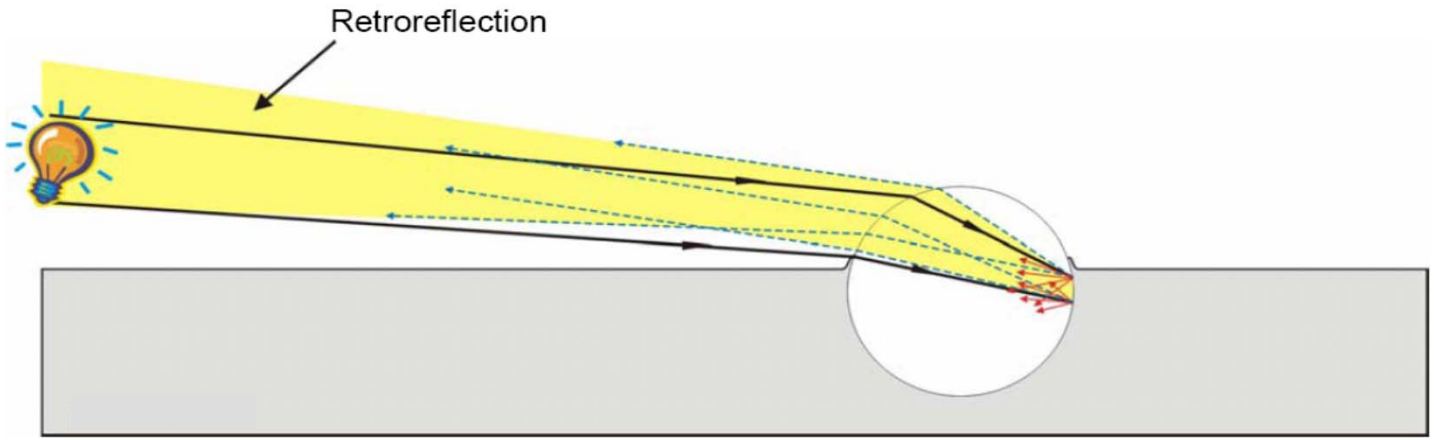
How Retroreflectivity works

- For flat Lines Approximately 50-60% embedded into material for best retro reflectivity



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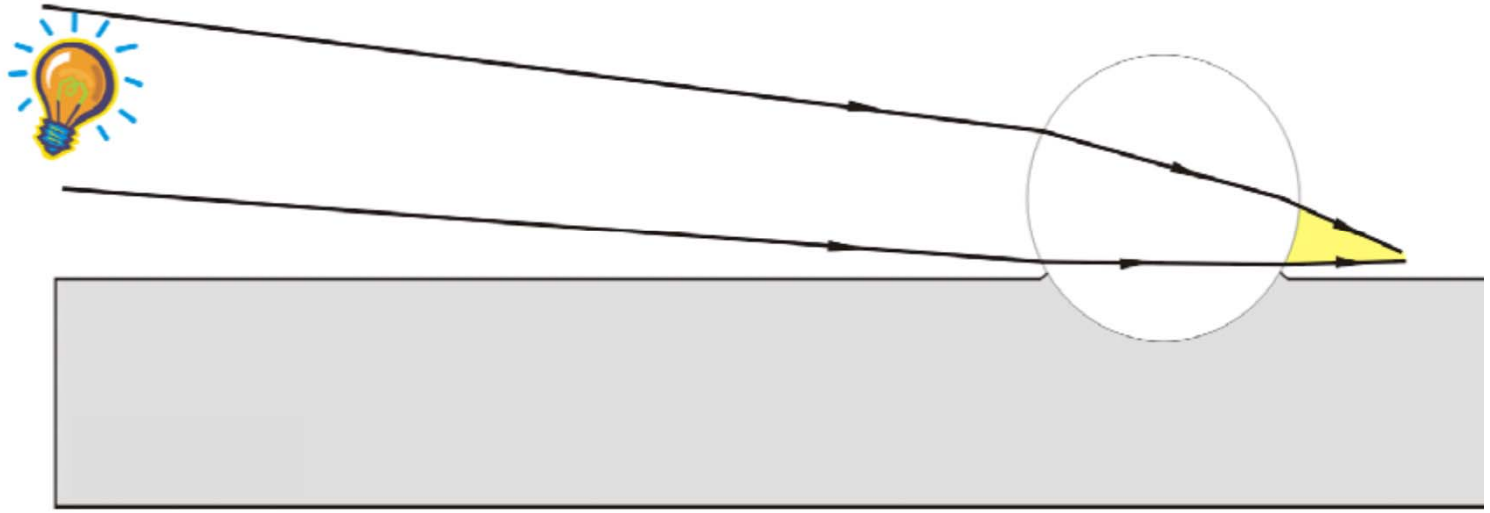
How Retroreflectivity works

- Not deep enough
- → no retro reflection



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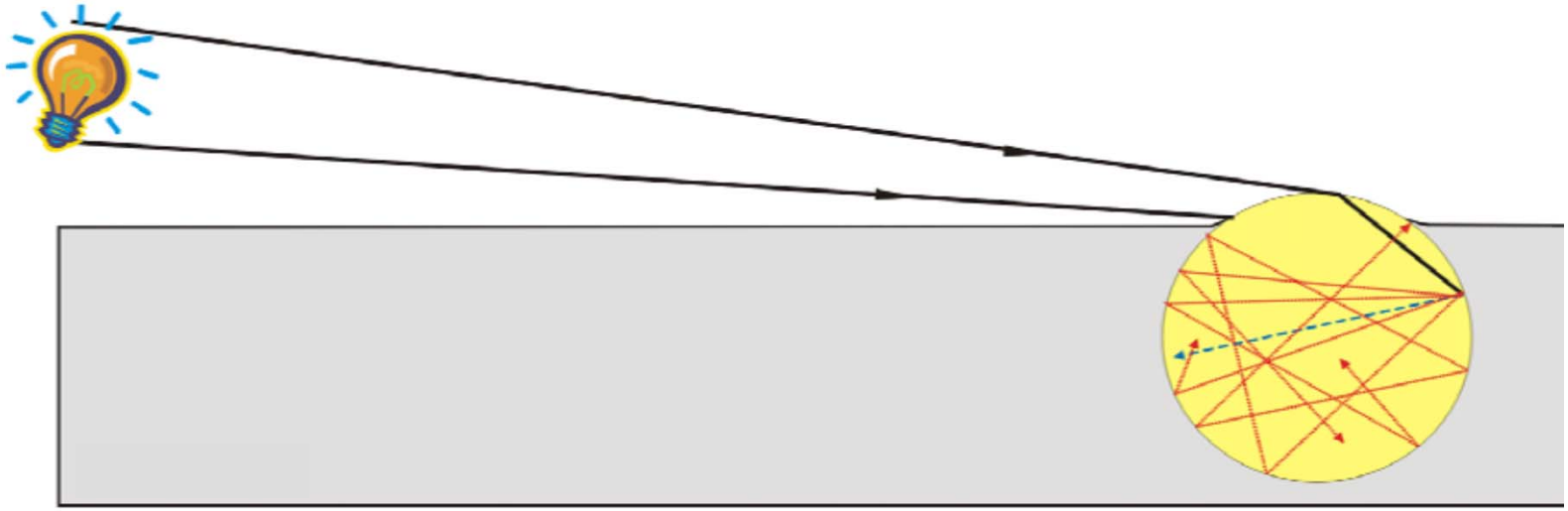
How Retroreflectivity works

–To deep → retro reflection gets lost inside of the glass bead produces low retro readings



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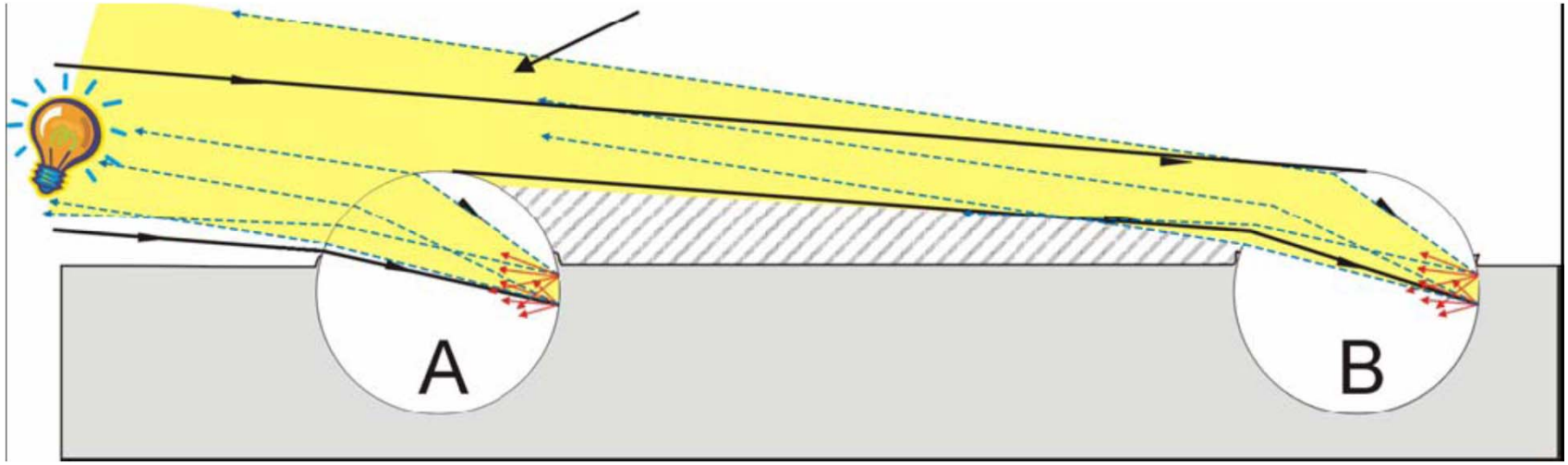
How Retroreflectivity works

- ... the right amount of glass beads



Distance A to B 6mm for 300 micron beads
Distance A to B 21mm for 1200 micron beads

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How Retroreflectivity works

the right amount of glass beads

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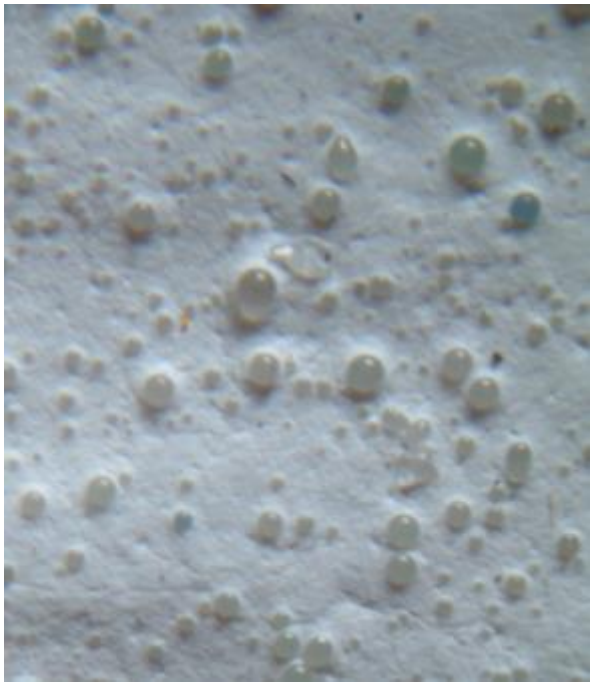
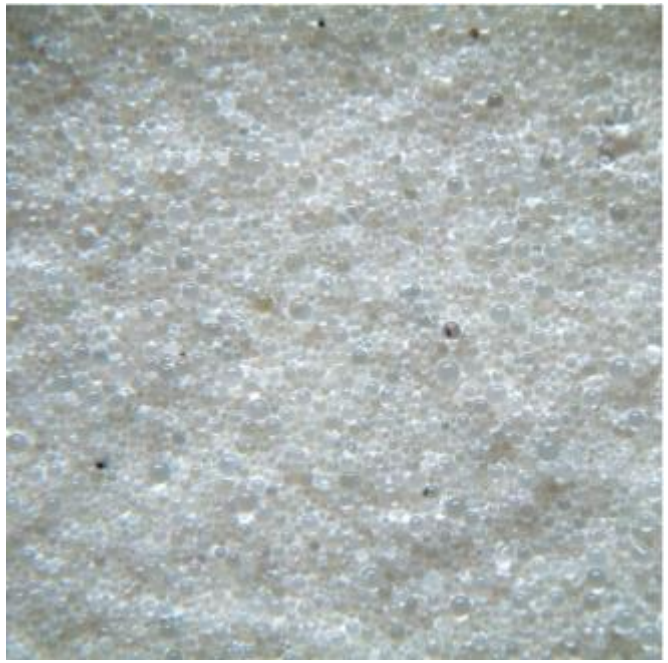
How Retroreflectivity works

the right amount of glass beads



R_L 307 Q_d 229



R_L 59 Q_d 207

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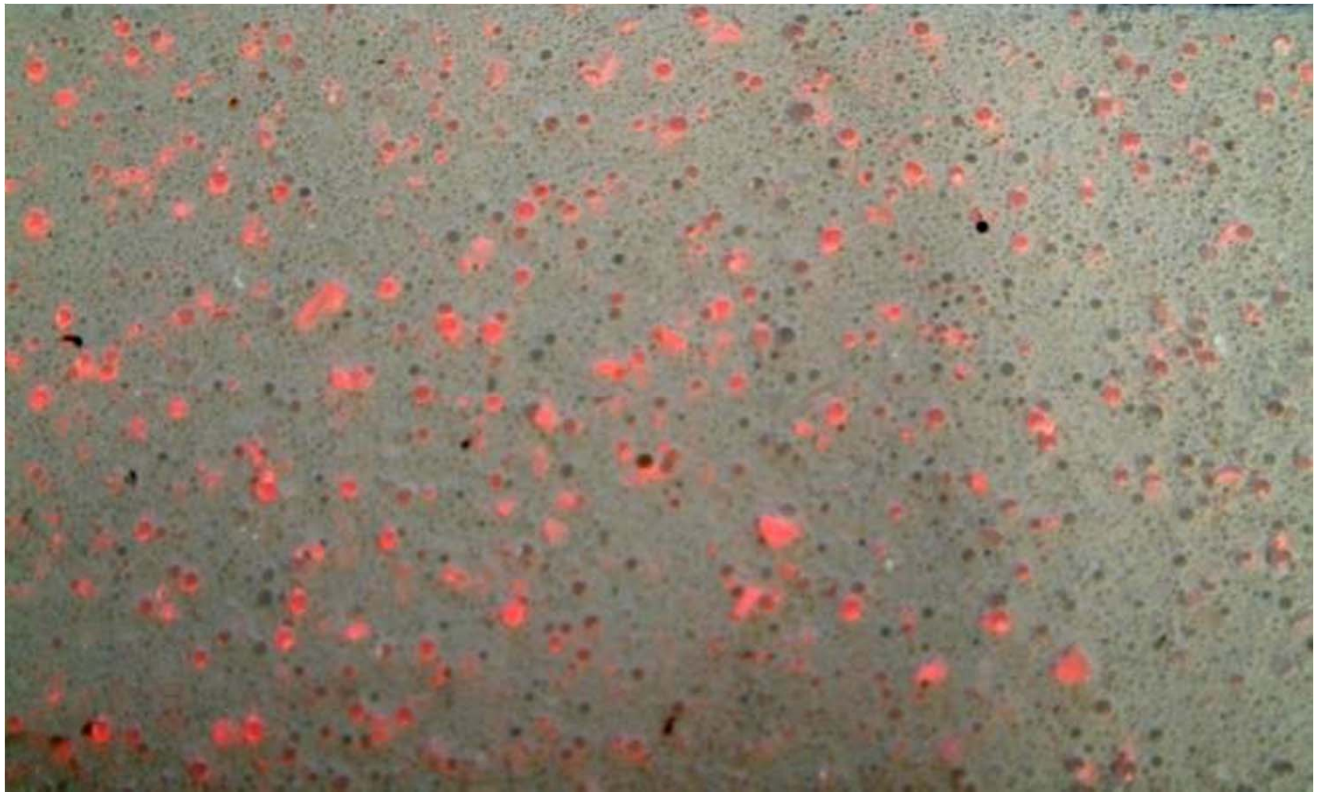
How Illumination works

- Small beads are shadowed by large one's.



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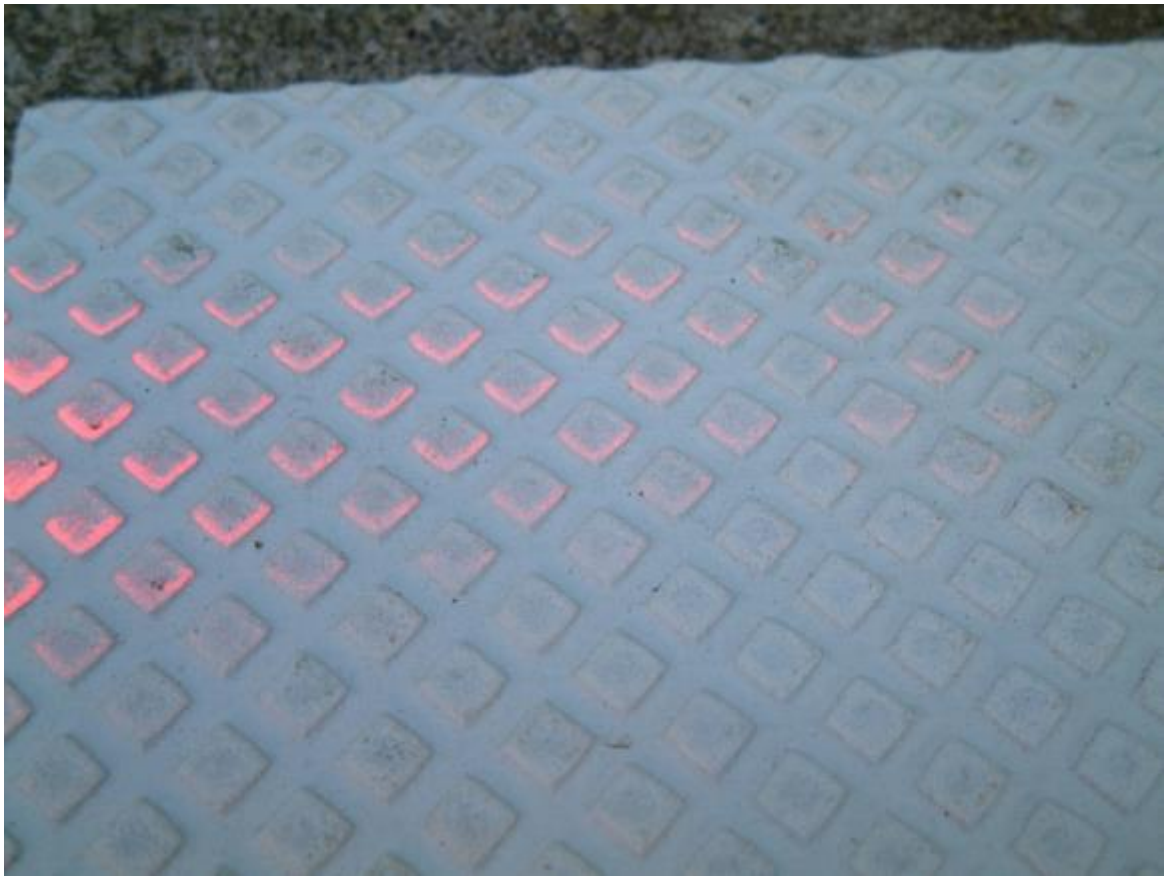
How Illumination works



Road marking tape

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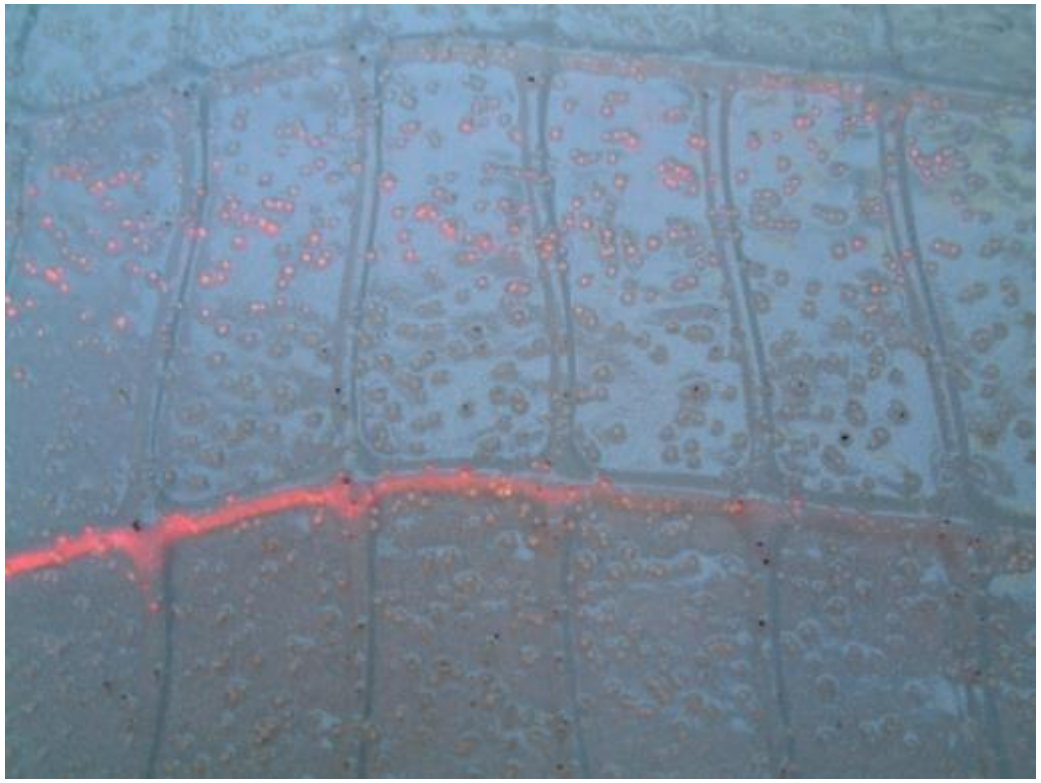
How Illumination works



High retro road marking tape

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How Illumination works

Structure road marking

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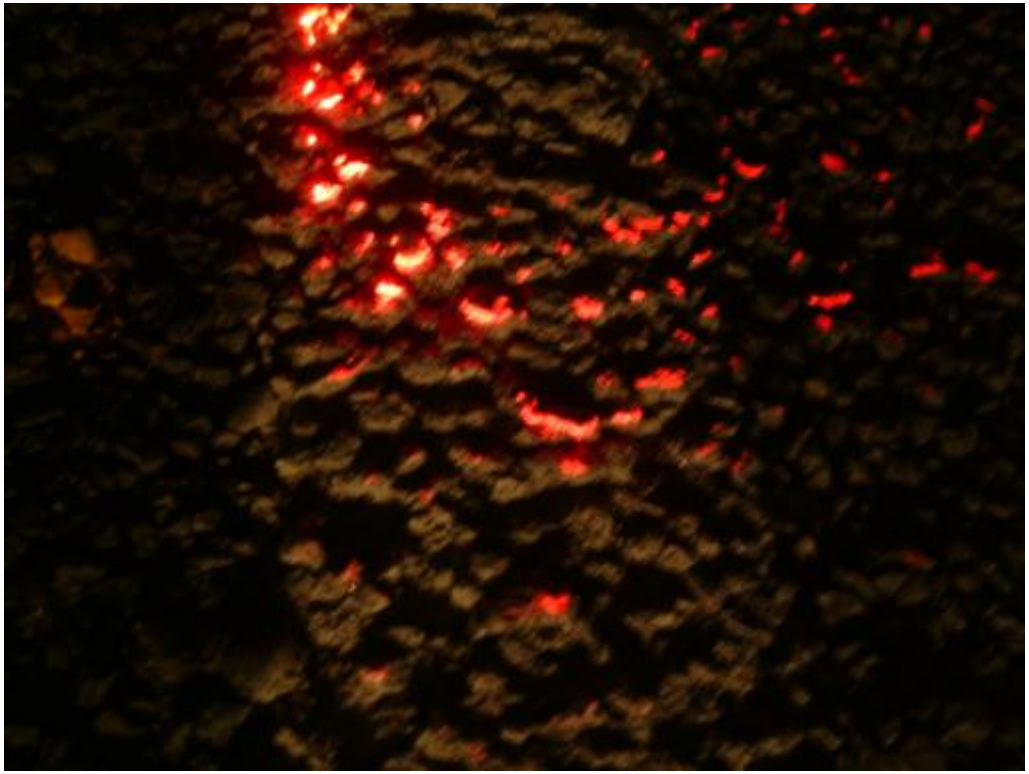
How Illumination works



Chip-seal R_L 80 Q_d 112

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Visual perception

84

153

330

- The retro reflectivity is less obvious in daylight as we can only see the brightness of the marking in the day

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Visual perception

70 150 340

The brighter the lines are the longer the warning time for the driver

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Visual perception

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Tools for measuring retroreflectivity

R_L only instrument

R_L & Q_d capable instruments

Q_d only instrument

R_L mobile measuring unit

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Roaddata equipment

ASTM E1710 or EN 1436 compliant instrument

3rd party certified instruments

Instrument working on colored road marking

Equipment has 6 m measuring distance

Can eliminate most of RRPM Effect

information supplied in excel files

Map display

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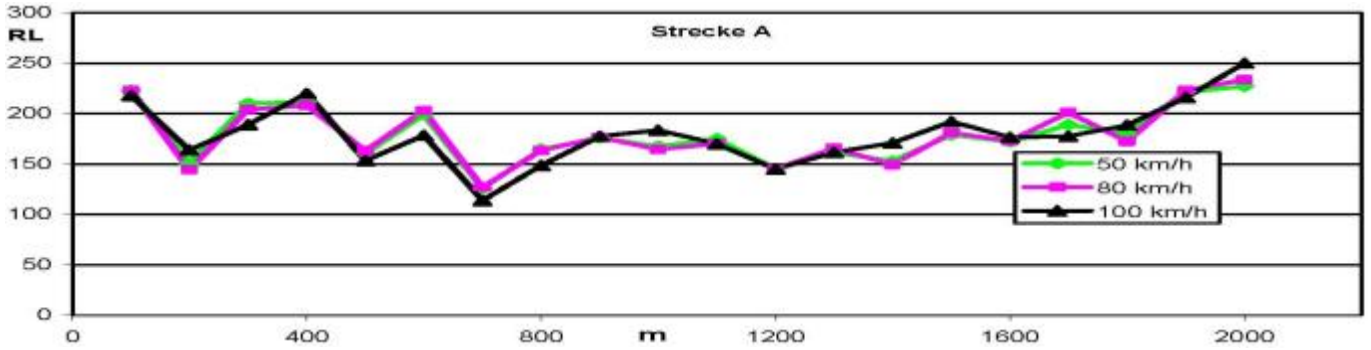
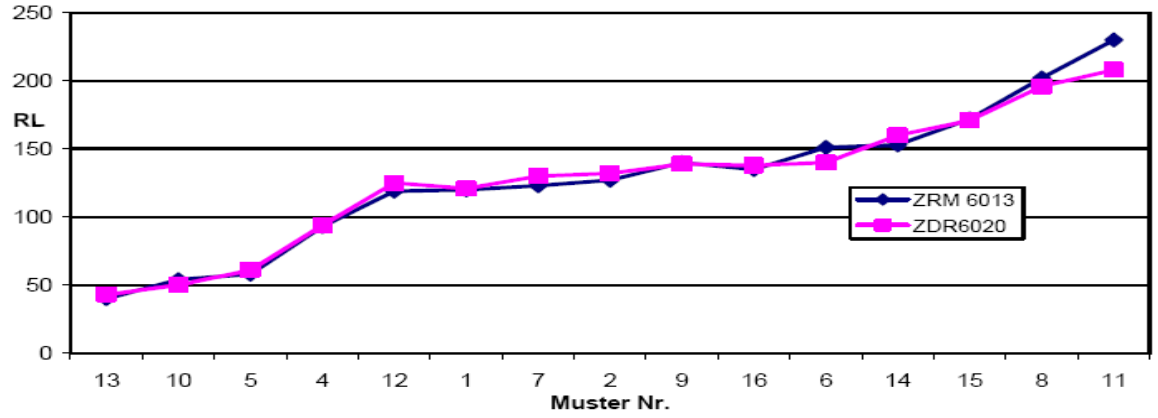
Third party certification

- Are the measurements repeatable a different measuring speed
- Have the results been verified independently



Different speed
Comparison test



Comparison measurements
Handheld and mobile on 15 different road markings

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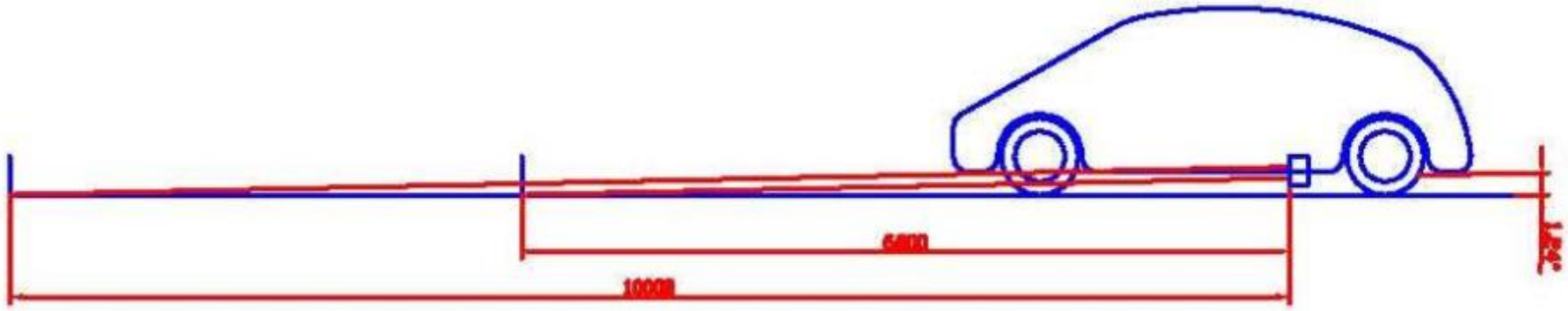
Measuring distance

- 6m measuring distance



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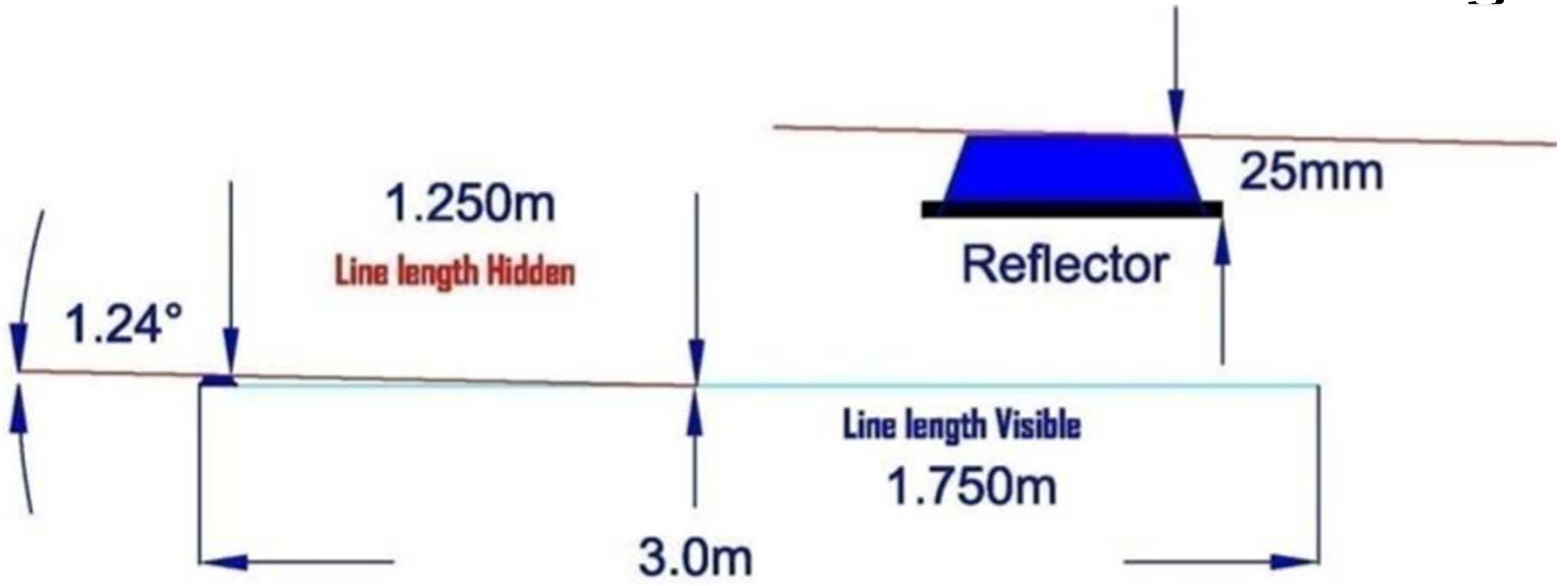
RRPM effect

- RRPM can influence the measurement of road-marking
- Is software removing RRPM measurements
- 1 RRPM can simulate a line of 1.25 m length



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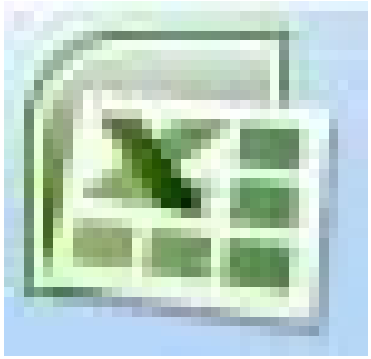
Information supply

- The excel files can be used to produce graphs and other statistical analysis
- Links in excel file give access to photographs



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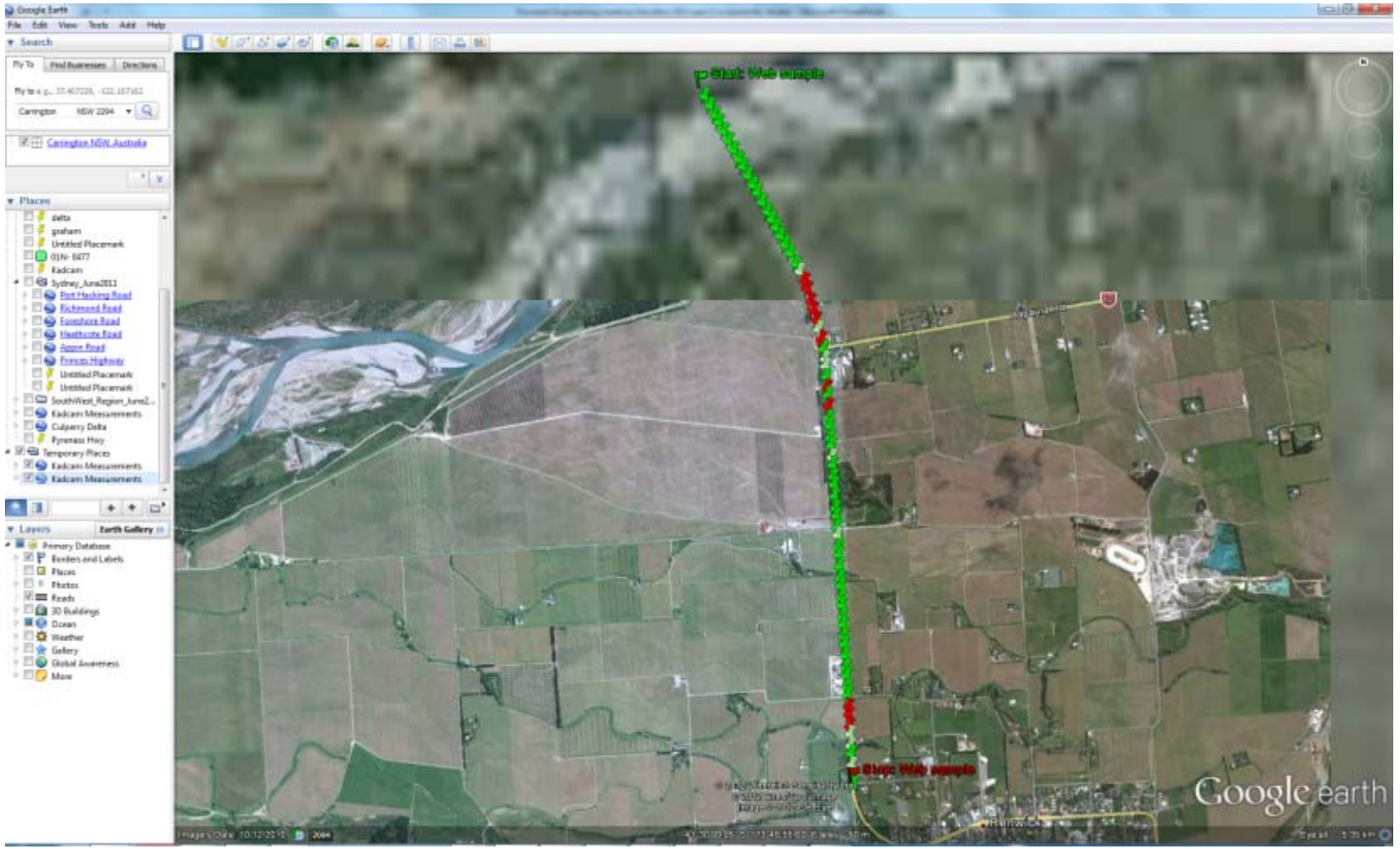
7 Map display



•Sample only measuring average 50 m

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•ZDR 6020

•ZRM 6014

•Mapping Tools

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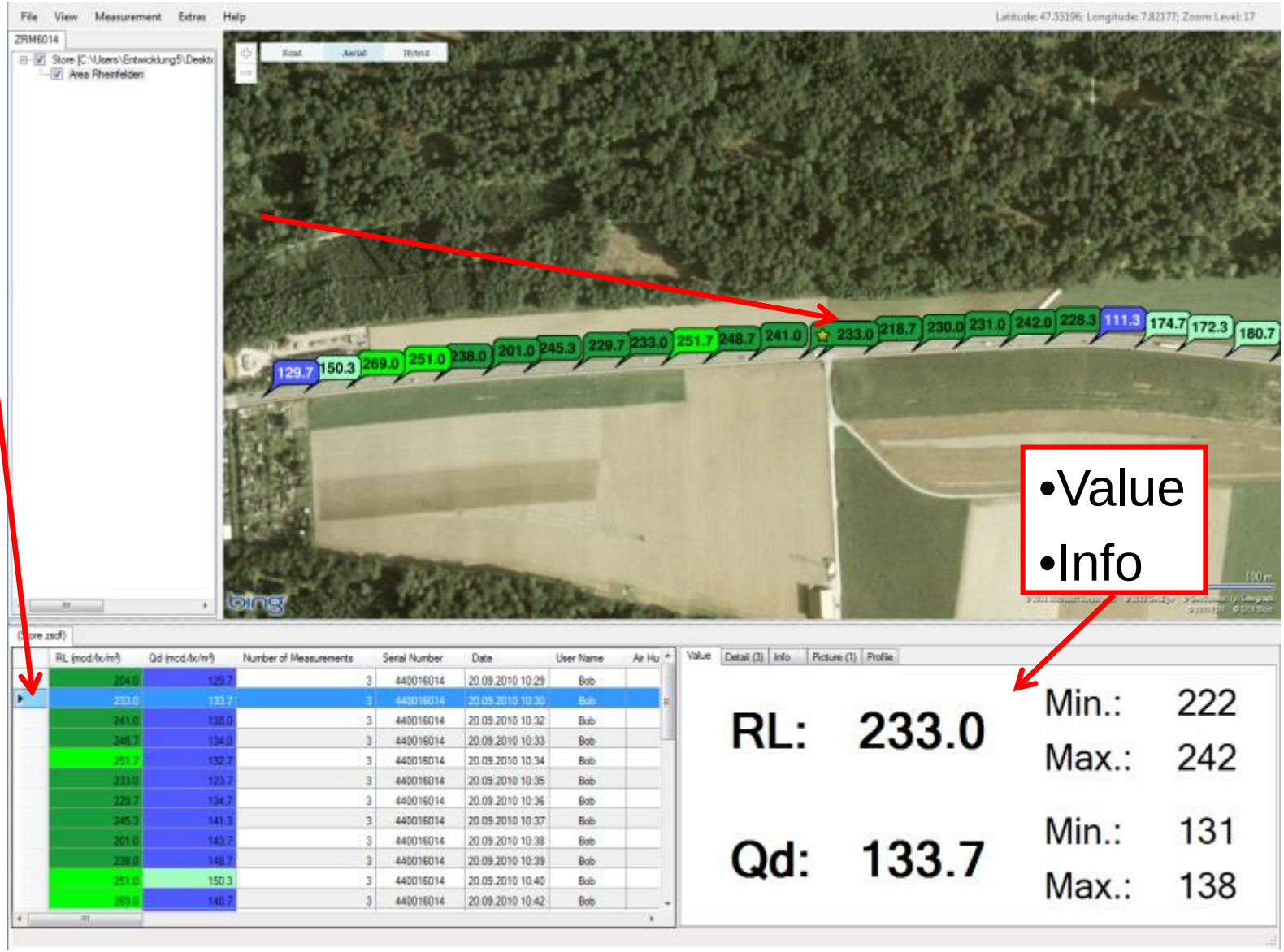

- Handheld measurement

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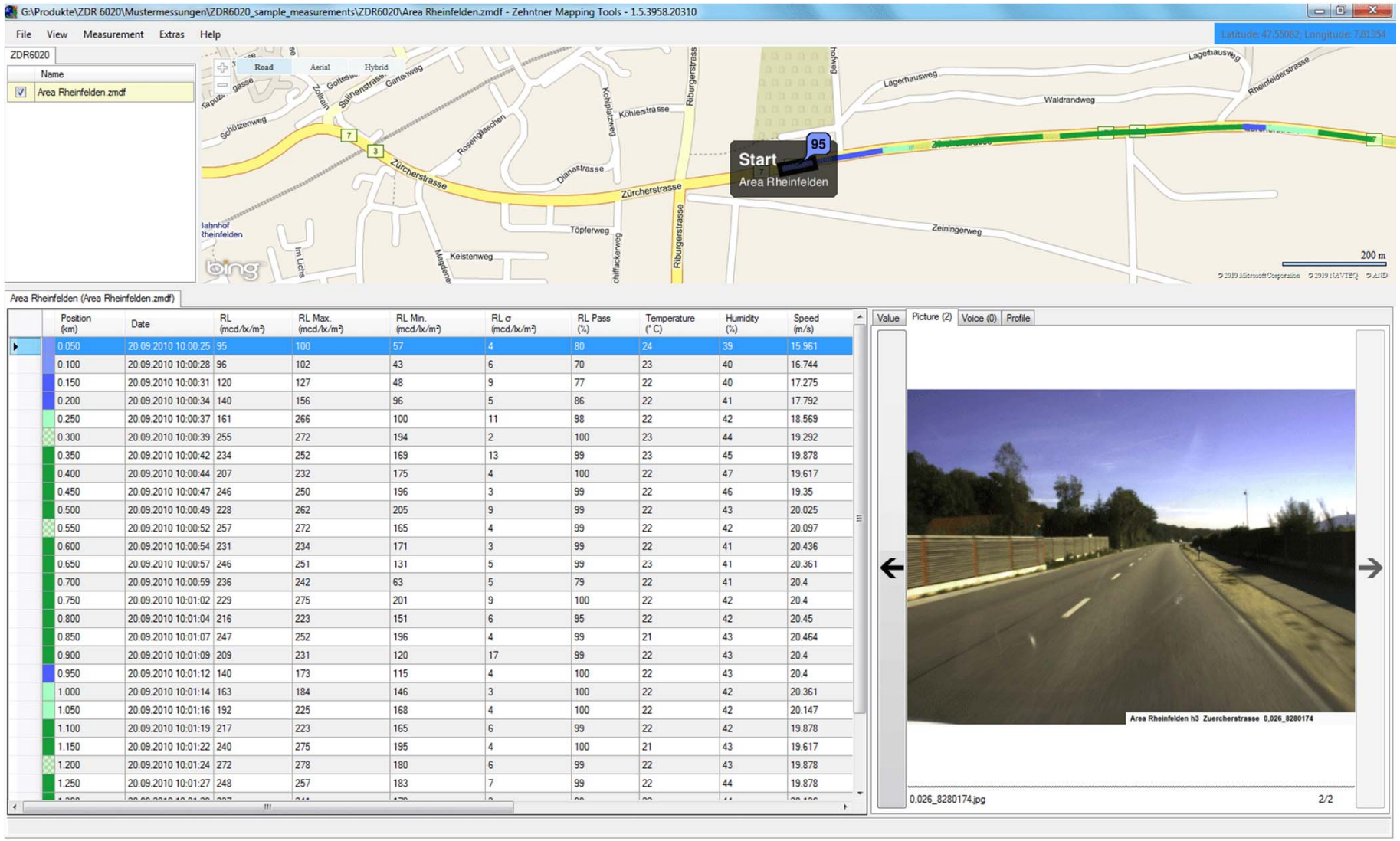

Position (km)	Date	RL (mcd/lx/m²)	RL Max. (mcd/lx/m²)	RL Min. (mcd/lx/m²)	RL σ (mcd/lx/m²)	RL Pass (%)	Temperature (° C)	Humidity (%)	Speed (m/s)
0.050	20.09.2010 10:00:25	95	100	57	4	80	24	39	15.961
0.100	20.09.2010 10:00:28	96	102	43	6	70	23	40	16.744
0.150	20.09.2010 10:00:31	120	127	48	9	77	22	40	17.275
0.200	20.09.2010 10:00:34	140	156	96	5	86	22	41	17.792
0.250	20.09.2010 10:00:37	161	266	100	11	98	22	42	18.569
0.300	20.09.2010 10:00:39	255	272	194	2	100	23	44	19.292
0.350	20.09.2010 10:00:42	234	252	169	13	99	23	45	19.878
0.400	20.09.2010 10:00:44	207	232	175	4	100	22	47	19.617
0.450	20.09.2010 10:00:47	246	250	196	3	99	22	46	19.35
0.500	20.09.2010 10:00:49	228	262	205	9	99	22	43	20.025
0.550	20.09.2010 10:00:52	257	272	165	4	99	22	42	20.097
0.600	20.09.2010 10:00:54	231	234	171	3	99	22	41	20.436
0.650	20.09.2010 10:00:57	246	251	131	5	99	23	41	20.361
0.700	20.09.2010 10:00:59	236	242	63	5	79	22	41	20.4
0.750	20.09.2010 10:01:02	229	275	201	9	100	22	42	20.4
0.800	20.09.2010 10:01:04	216	223	151	6	95	22	42	20.45
0.850	20.09.2010 10:01:07	247	252	196	4	99	21	43	20.464
0.900	20.09.2010 10:01:09	209	231	120	17	99	22	43	20.4
0.950	20.09.2010 10:01:12	140	173	115	4	100	22	43	20.4
1.000	20.09.2010 10:01:14	163	184	146	3	100	22	42	20.361
1.050	20.09.2010 10:01:16	192	225	168	4	100	22	42	20.147
1.100	20.09.2010 10:01:19	217	223	165	6	99	22	42	19.878
1.150	20.09.2010 10:01:22	240	275	195	4	100	21	43	19.617
1.200	20.09.2010 10:01:24	272	278	180	6	99	22	43	19.878
1.250	20.09.2010 10:01:27	248	257	183	7	99	22	44	19.878

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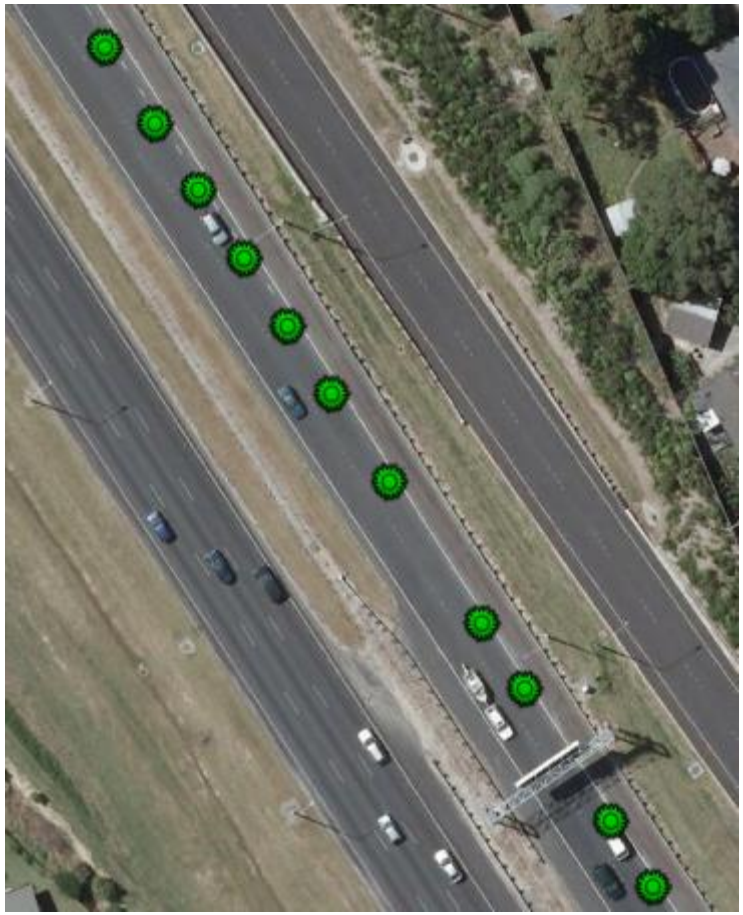
Future options



Thank you

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