

Experiences of Mobile Road Condition Monitoring

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ID 14

Road Condition Monitor RCM411

- measurements
 - road **surface condition**
 - dry,
 - moist,
 - wet,
 - icy,
 - snowy,
 - slushy
 - water/ice layer **thickness**
 - modeled **friction**
 - add-on measurements
 - surface temperature
 - ...



Road Condition Monitor RCM411

- installed on a vehicle
 - user interface on cell phones
 - BlueTooth link to cell phone
 - power from the trailer connector
 - data communicated to selected servers
 - results on a map interface as color coded lines

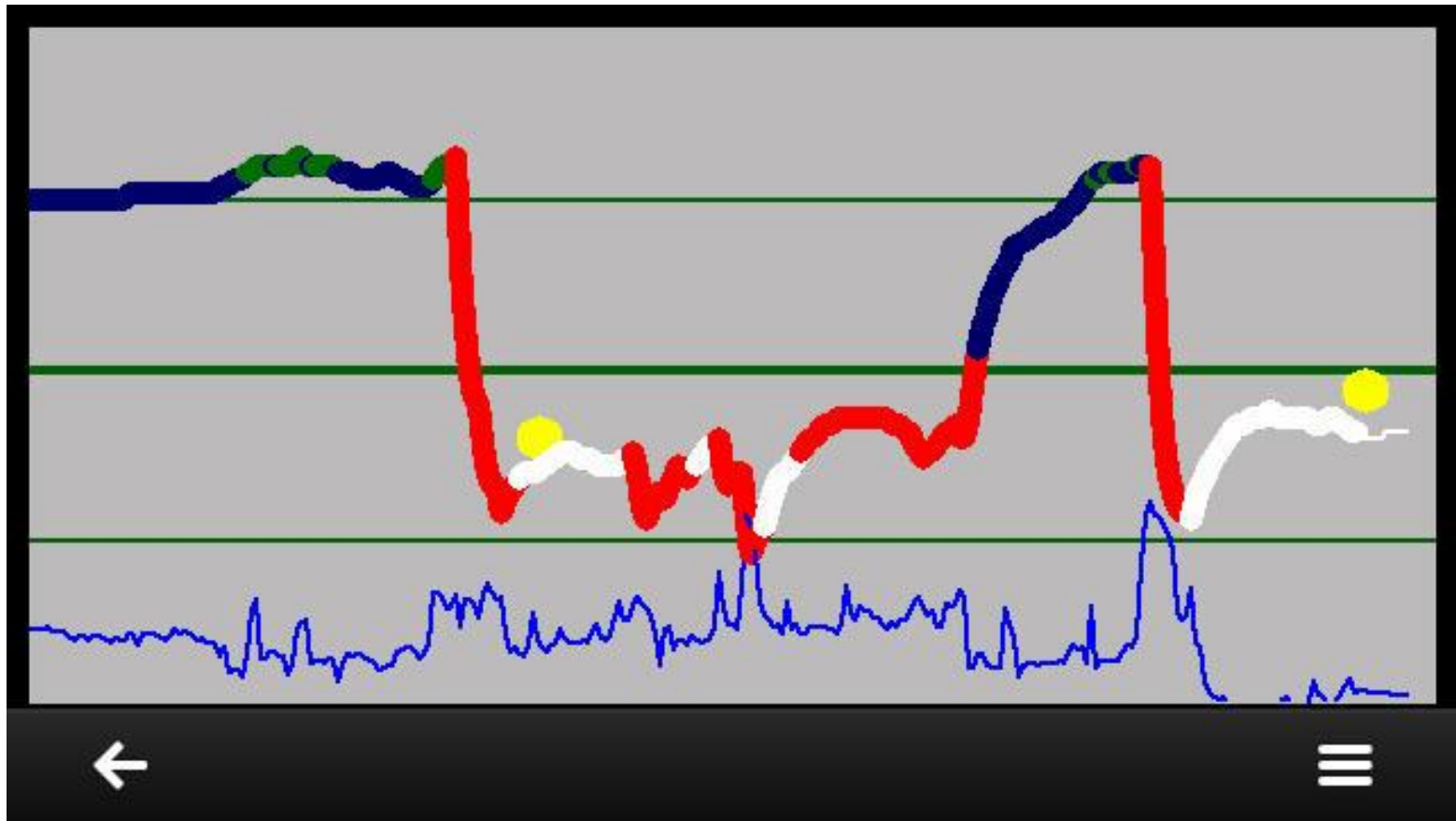


μ TEC Friction Meter

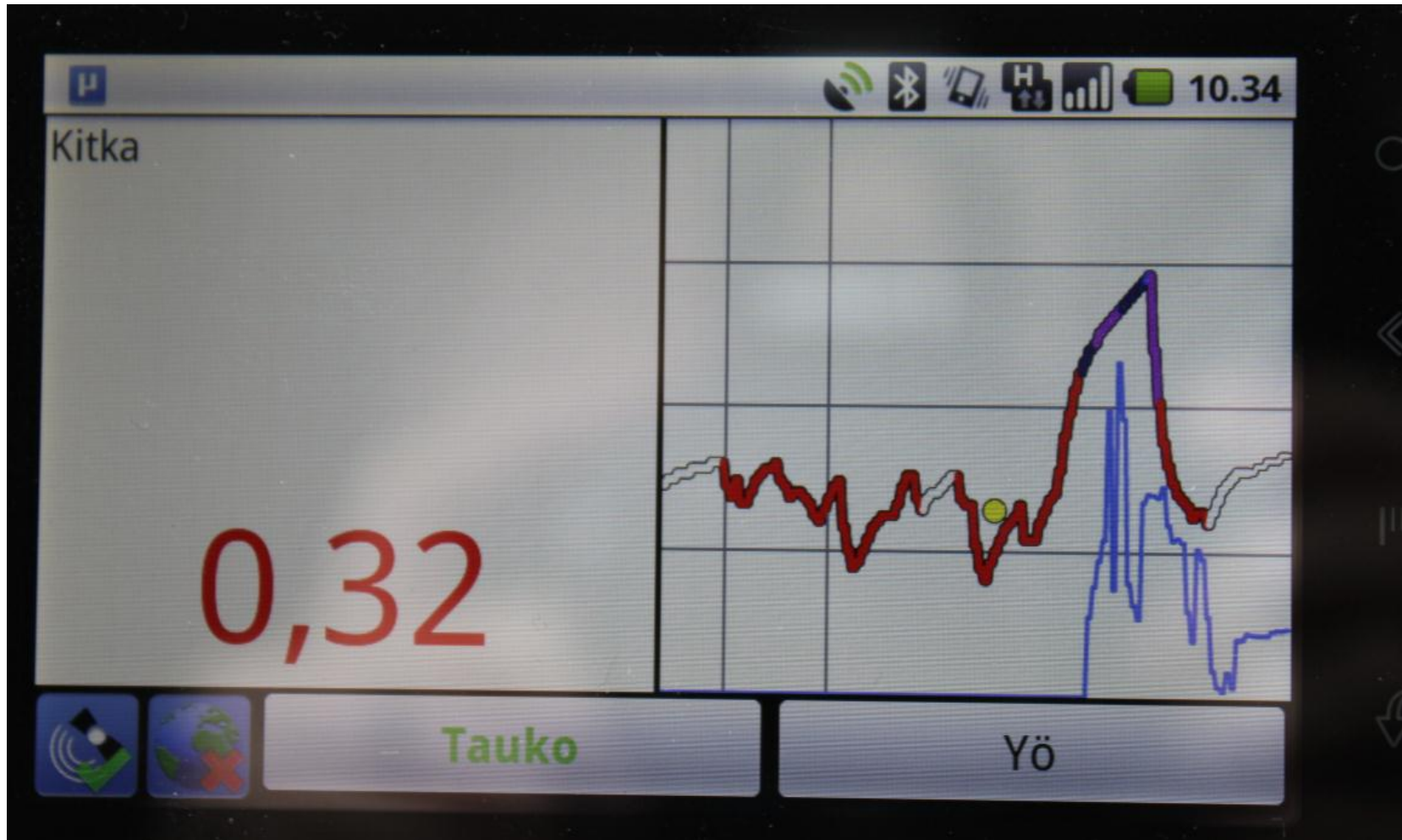
- μ TEC
 - cell phone application
 - accelerometer based absolute friction meter
- used for friction reference
 - development of RCM411 friction model
- μ TEC and RCM data shown on the M μ MS Service at <http://liukasta.info>



Screenshot of a Symbian User Interface



An Android User Interface



Friction
Test Run
6.12.2011 on
M μ MS service
at
<http://liukasta.info>

The screenshot shows the LIUKASTA.INFO website interface. The main content area features a map of a city with a route highlighted in various colors (green, yellow, orange, red) representing different friction levels. To the right of the map is a table of the 10 latest and 10 slipperiest measurements.

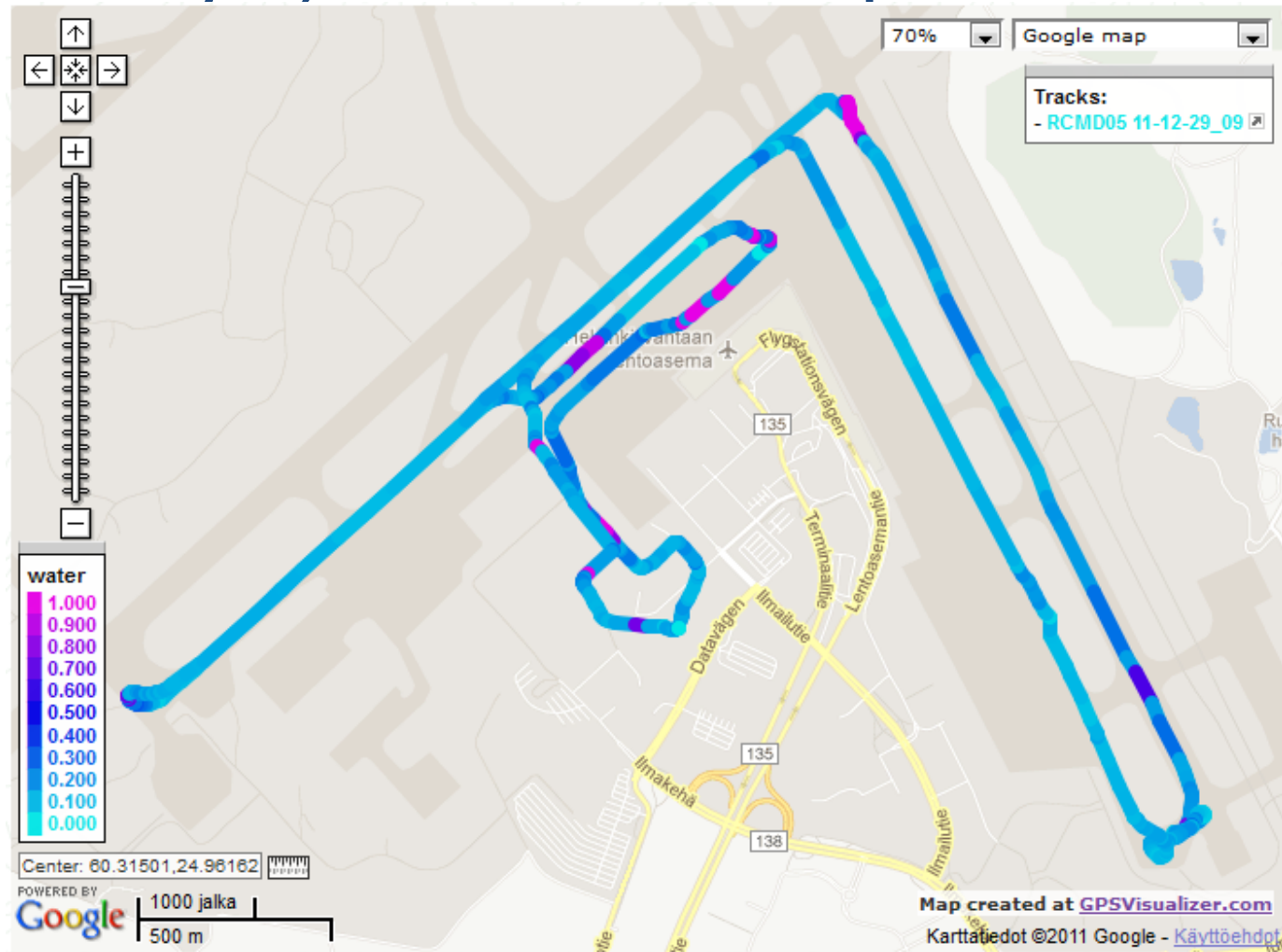
Friction	Timestamp
0.42	04-01-2012 17:23:35
0.4	04-01-2012 17:23:20
0.36	04-01-2012 17:23:14
0.33	04-01-2012 17:23:09
0.33	04-01-2012 17:23:03
0.43	04-01-2012 17:22:54
0.33	04-01-2012 17:22:43
0.4	04-01-2012 17:22:38
0.43	04-01-2012 17:22:09
0.31	04-01-2012 17:21:48

Below the table, there is a section titled "Using the service" which explains that the service requires a mobile solution and a data subscription. It also mentions that measurement data is automatically transferred to the M μ MS-service.

At the bottom of the page, there is a legend for the map colors: Good friction (green), Adequate friction (yellow), Low friction (red), Recent (green circle), Expiring (yellow circle), Old (red circle), and Weather station (blue circle).

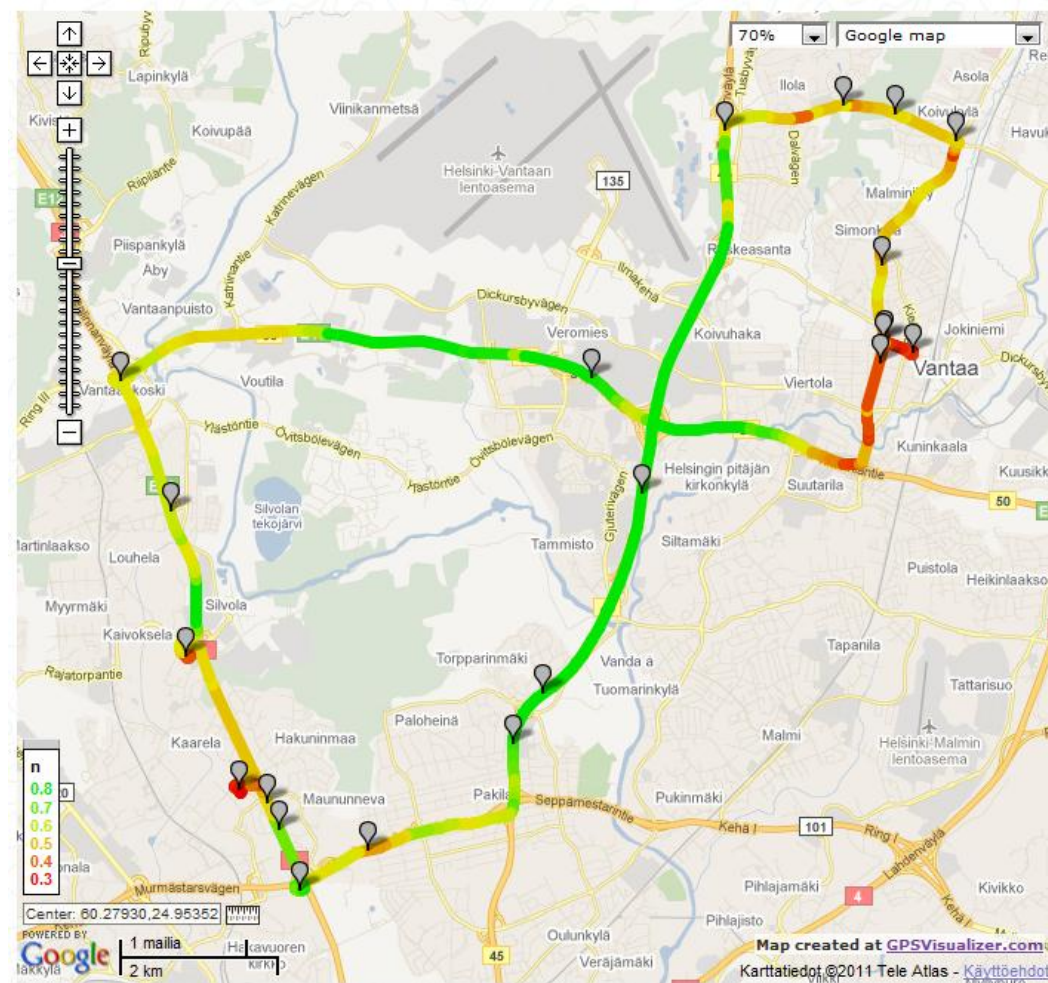
The footer contains contact information for iriba: Homepage: www.iriba.fi, Phone 0207 411 560, Cell phone 040 521 0600, Email: info@iriba.fi. It also includes navigation links for Map, μ Tec & M μ MS, Contact, Download, and language options: Suomi, In english, PÅ Svenska. The copyright notice is © 2010 Iriba Oy.

Water layer, Hki-Vantaa Airport 29.12.2011



Friction Test Run 27.01.2011

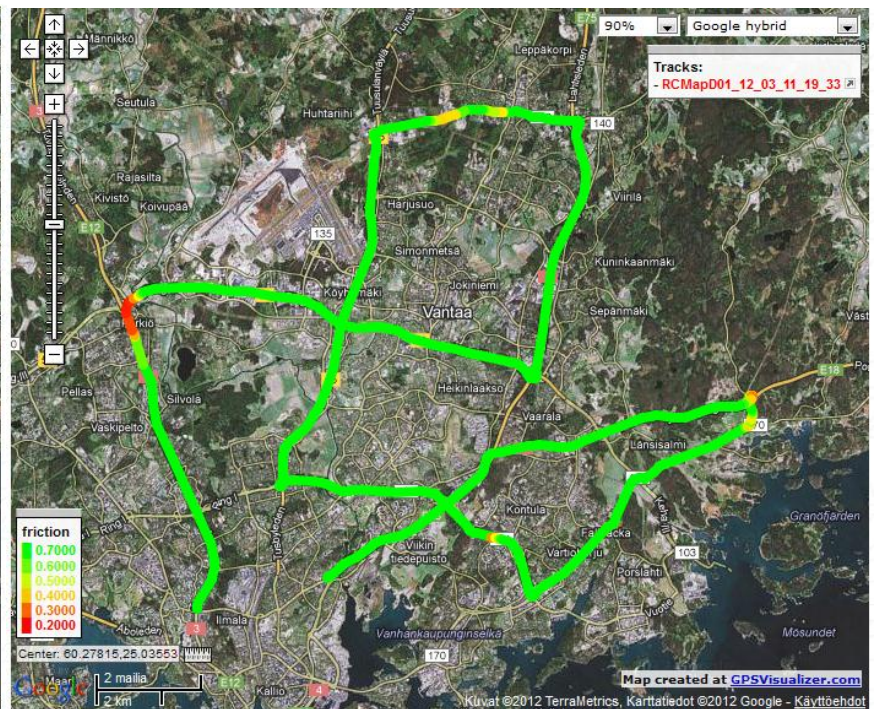
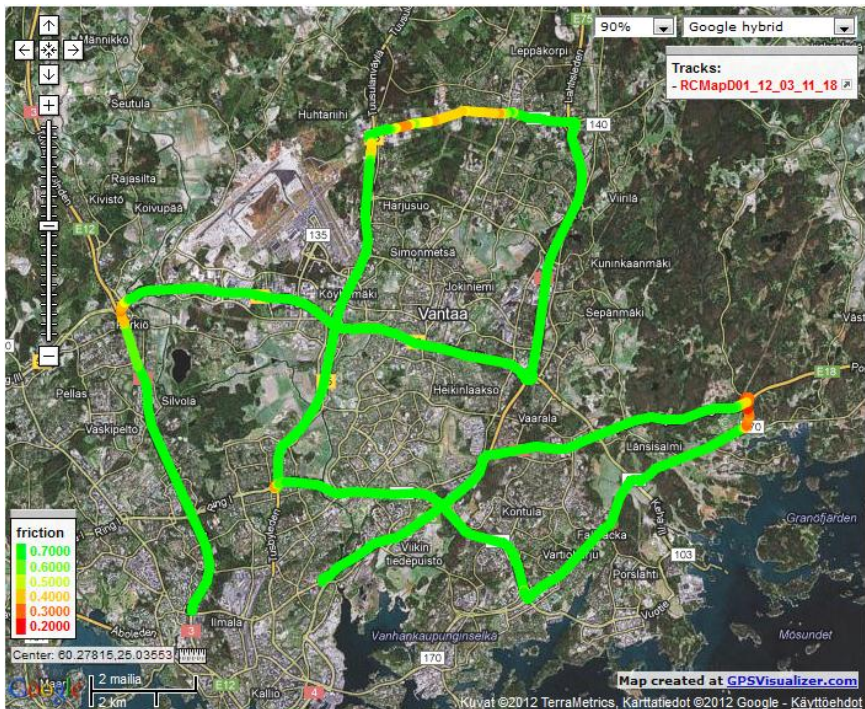
- Conditions:
 - air temperature $-7\text{ }^{\circ}\text{C}$
 - surface icy, dry or snowy
- RCM411 results:
 - friction values as color codes in the table "n"
 - μTEC comparison friction at locations of droplets
- standard deviation
 - 0.10 as difference of μTEC and RCM friction values



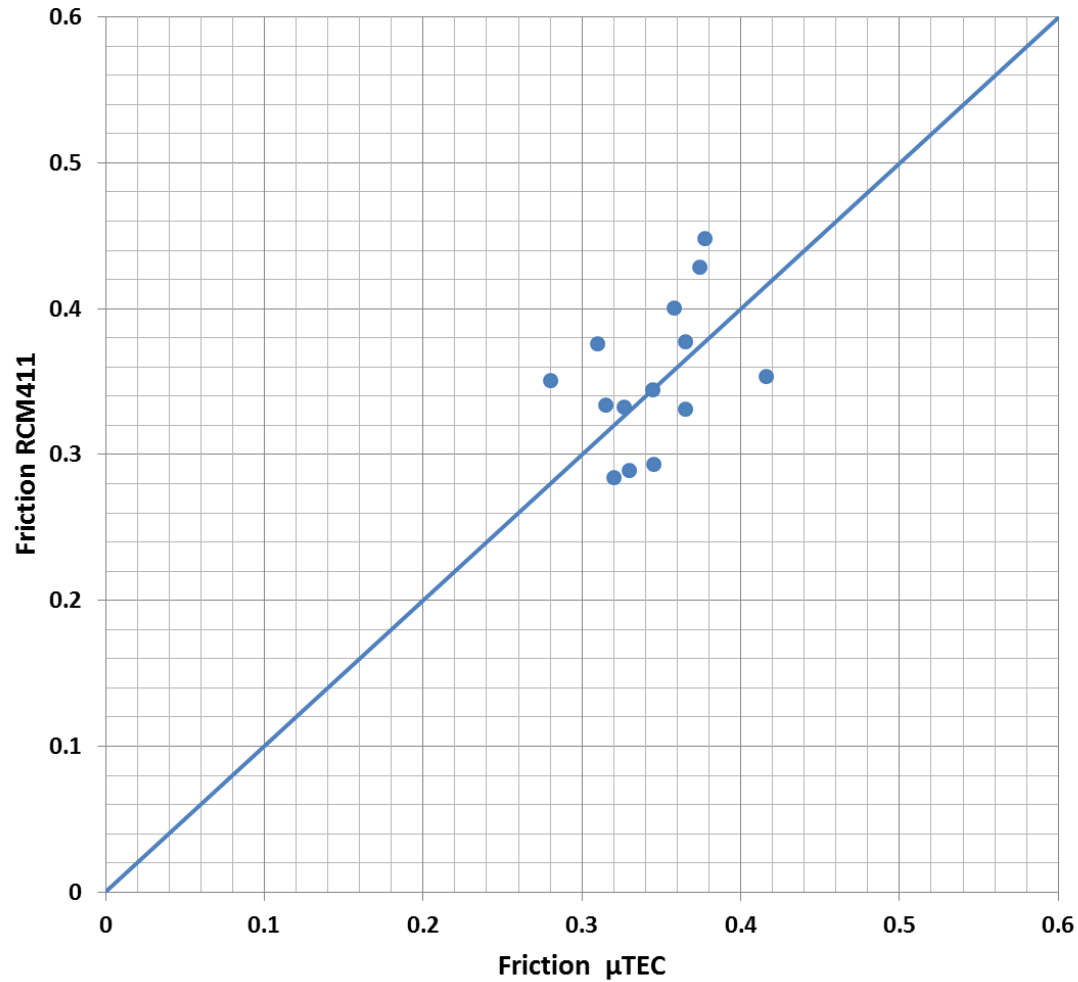
Friction Test Run 30.01.2011



Friction Test Run 11.3.2012 Road Laboratory of Aalto University



Aalto University Friction Test



Conclusion

- Mobile Road Condition Monitor RCM411
 - surface state, amount and friction
 - standard deviation is on the order of 0.10
 - various user interfaces available
 - cell phone, tablet or PC
 - real time map interface in the internet
 - add on sensors
 - surface temperature

Conclusion

- RCM applications
 - a tool for winter maintenance
 - a tool for quality control
 - active spreading of deicers
 - friction mapping
 - thermal mapping
 - information to drivers
 - warning for aquaplaning, ...
- look at the [demo video](#)!

