



Representativity of PIARC test tyres for friction coefficients measurement

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- 1) **Historic**
- 2) **Test tyres characteristics**
- 3) **Devices used**
- 4) **Comparative tests done**
- 5) **Conclusions**



1) Historic

In the early seventies, PIARC Committee C1 initiated the manufacture of a special tyre for use on devices to measure friction coefficients.


Although the tyre is not the only important factor in this measurement, the use of this special tyre by many countries has allowed – and still allows – easier exchange of results of measurements.



These special tyres allow also to ensure several parameters:

- highlighting of the surface characteristics,**
- result independence according to the tyre wear,**
- result independence with outdoors temperature,**
- production stability within time.**



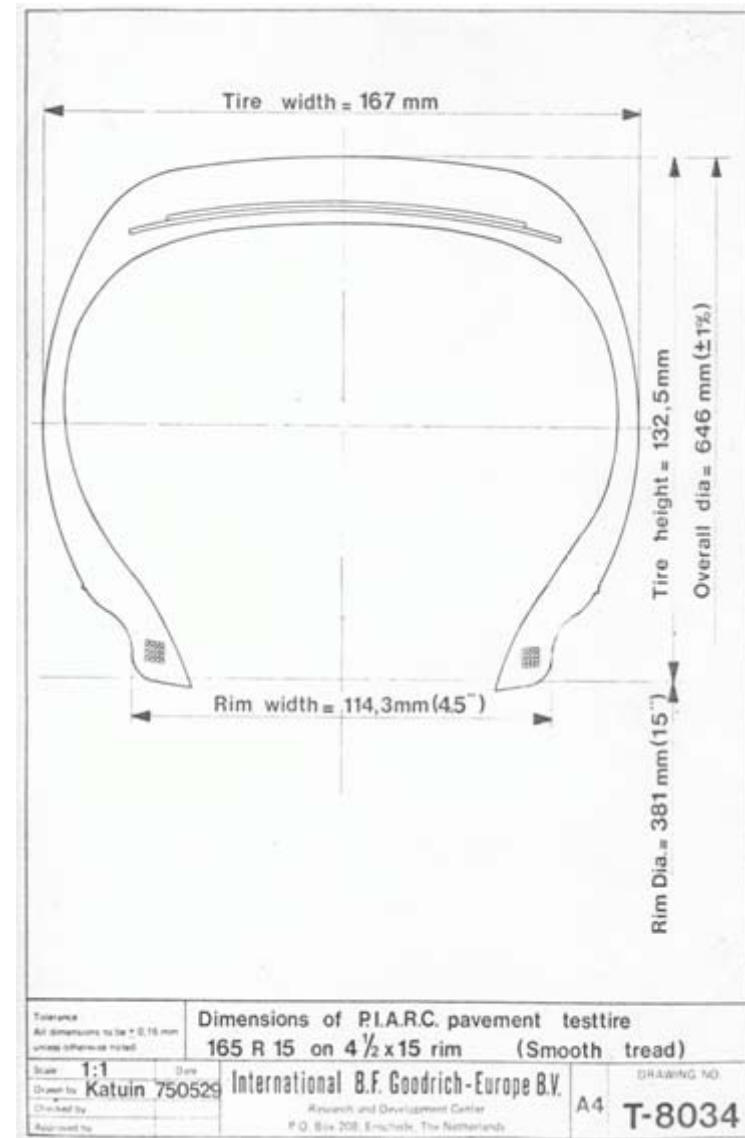


At the time, the size and structure tyre kept were: radial tyre of 165x380xR15 corresponding to a used size in the seventies on tourism vehicle.

In order to improve the measurement sensitivity to surface characteristics, a smooth tyre was kept.

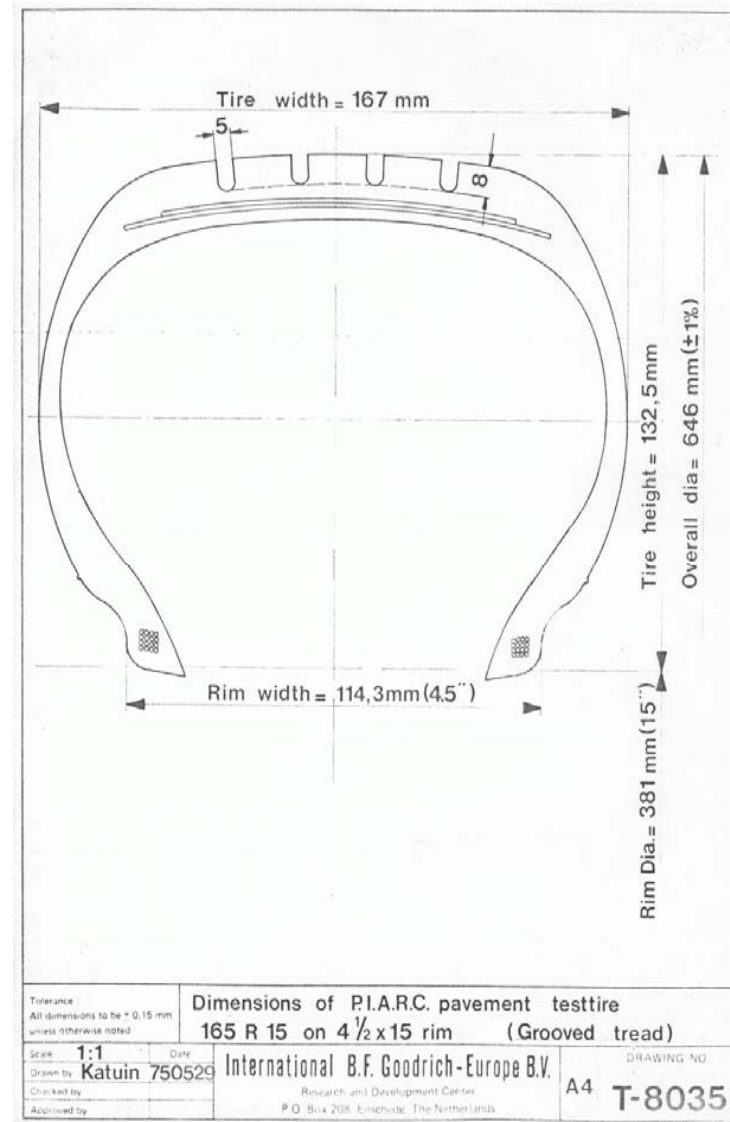
In order to assess the skidding resistance level mobilized by users with their tyre treads, a grooved tyre was also kept.

The PIARC smooth test tyre




**165 R 15 Radial; External diameter: 646 mm;
actual manufacturer: Specialty Tires**

The PIARC ribbed test tyre



**165 R 15 Radial; External diameter: 646 mm;
actual manufacturer: Specialty Tires**



From 1970 to 2005, several societies took in turn to make these tyres: these are KLEBER, GOODRICH, MALOYA and VREDESTEIN. More than 3000 tyres were so made and used for more than thirty years for friction measurements, mainly in Europe.

The used gum characteristics were taken back from those specified by standard ASTM E 501 (E 501-73) describing the elements to respect for a test tyre used in USA in order to carry out surface skidding resistance measurement.

A new producer was chosen in 2006:
"SPECIALTY TIRES OF AMERICA"
A new series was launched on March 2007.



**1600 Washington Street Indiana
Pennsylvania 15701-2844
Phone: 724-349-9010
Fax: 724-349-8192**



The reference test tyres proposed by PIARC

Specifications of these test tyres can be found on:

<http://www.piarc.org/en/publications/tech-report/>

Some European skid resistance measurement devices using a
PIARC test tyre

IMAG (F)



PIARC test tyre

ADHERA (F)



**ODOLIOGRAPHE
(B)**



**SKIDOMETRE
(NL)**



ROADSTAR (A)

Relationship skid resistance/slip ratio

IMAG
15%



ROADstar
18%

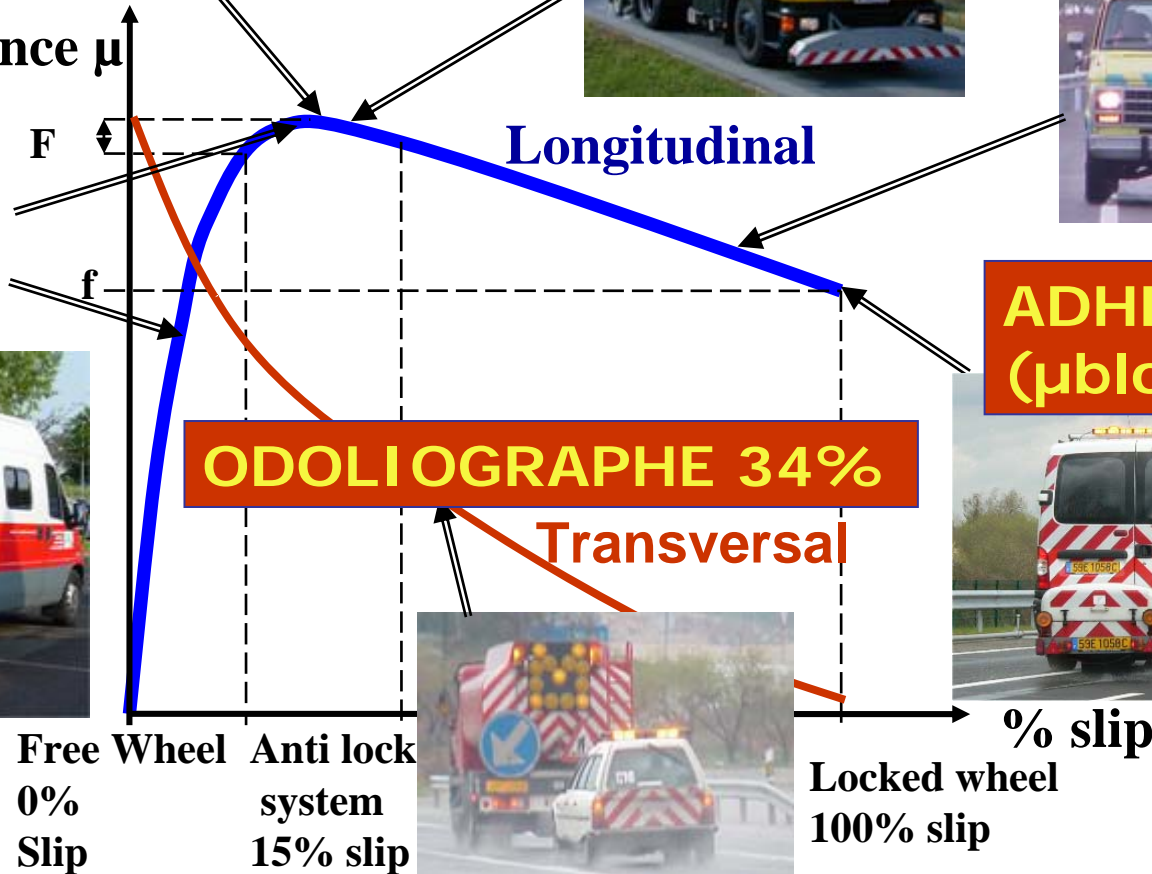


DWW trailer
86%



Skid resistance μ

ADHERA
research
(μ_{max})





ADHERA (F)



The PIARC smooth test tyre on ADHERA (F)



ROADSTAR (A)





The ribbed PIARC test tyre on ROADStar (Austria)

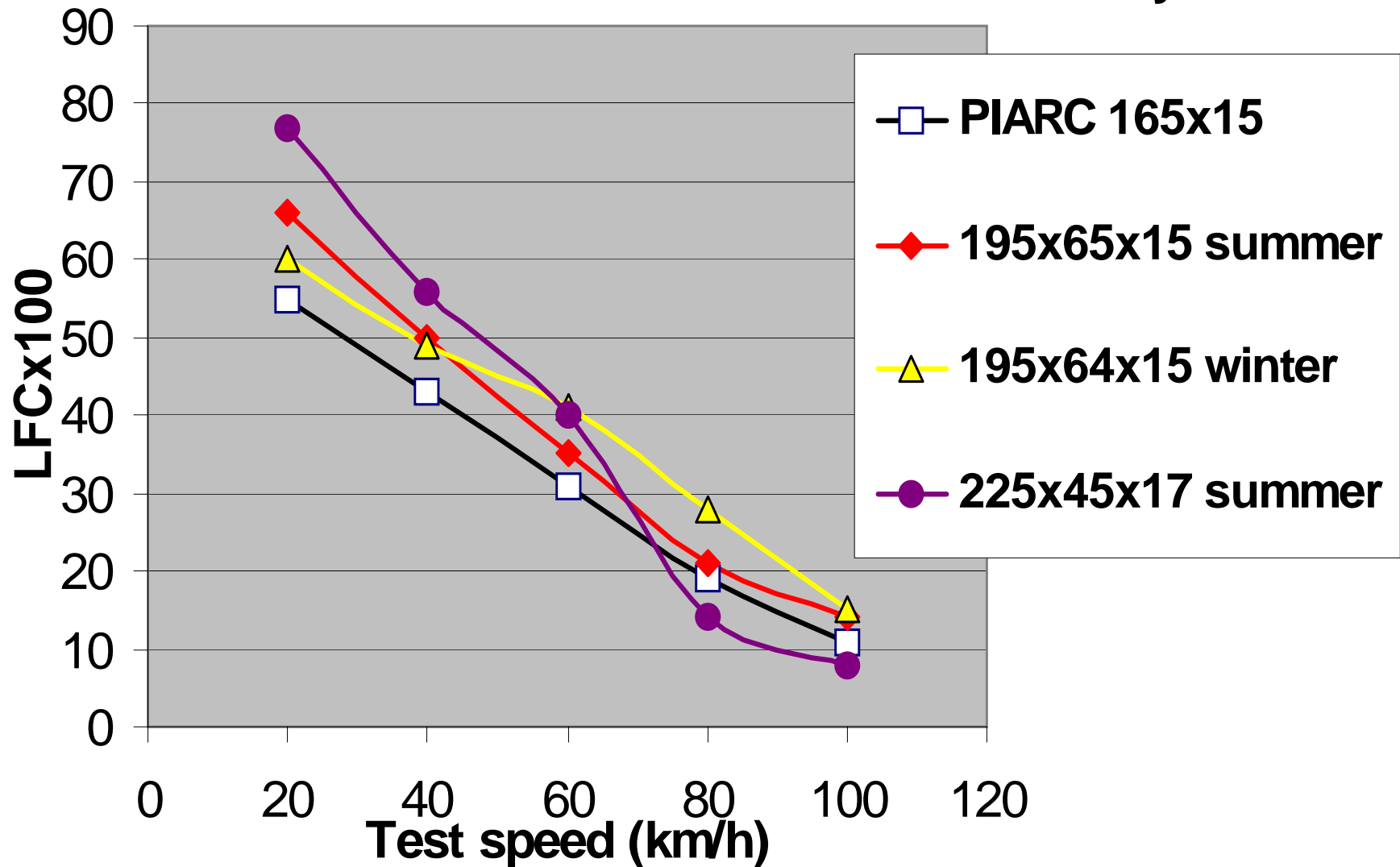
**Comparison between PIARC (smooth)
and
worn (2 mm tread depth) commercial
tyres
with a locked wheel**



10 cm full scale

AC 0/10 MTD = 0.70 mm

AC 0/10 - 1 mm water - locked wheel - worn tyres



**Comparison between PIARC
(smooth and ribbed)
and commercial tyres:
LFC at a fixed slip ratio of 18 %
on motorway trafficked surfaces**

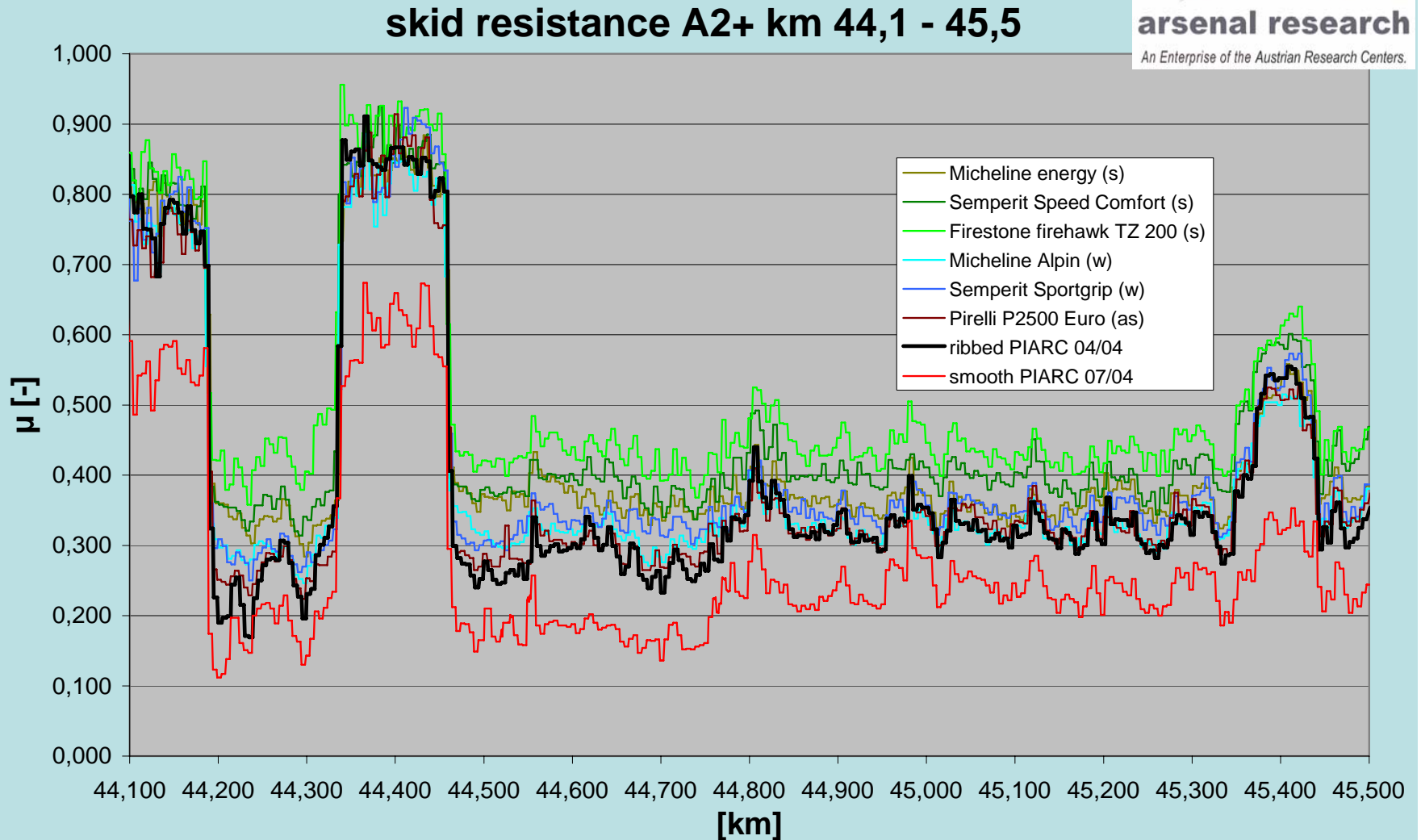


Comparison with different tyres

**chosen tyres (new) - slip ratio of 18 %
(60 km/h)**

- **ribbed PIARC-tyre**
- **smooth PIARC-tyre**
- „Micheline Energy“ (summer)
- „Semperit Speed Comfort“ (summer)
- „Firestone Firehawk TZ 200“ (summer)
- „Micheline Alpin“ (winter)
- „Semperit Sport Grip“ (winter)
- „Pirelli P 2500 Euro“ (all season)

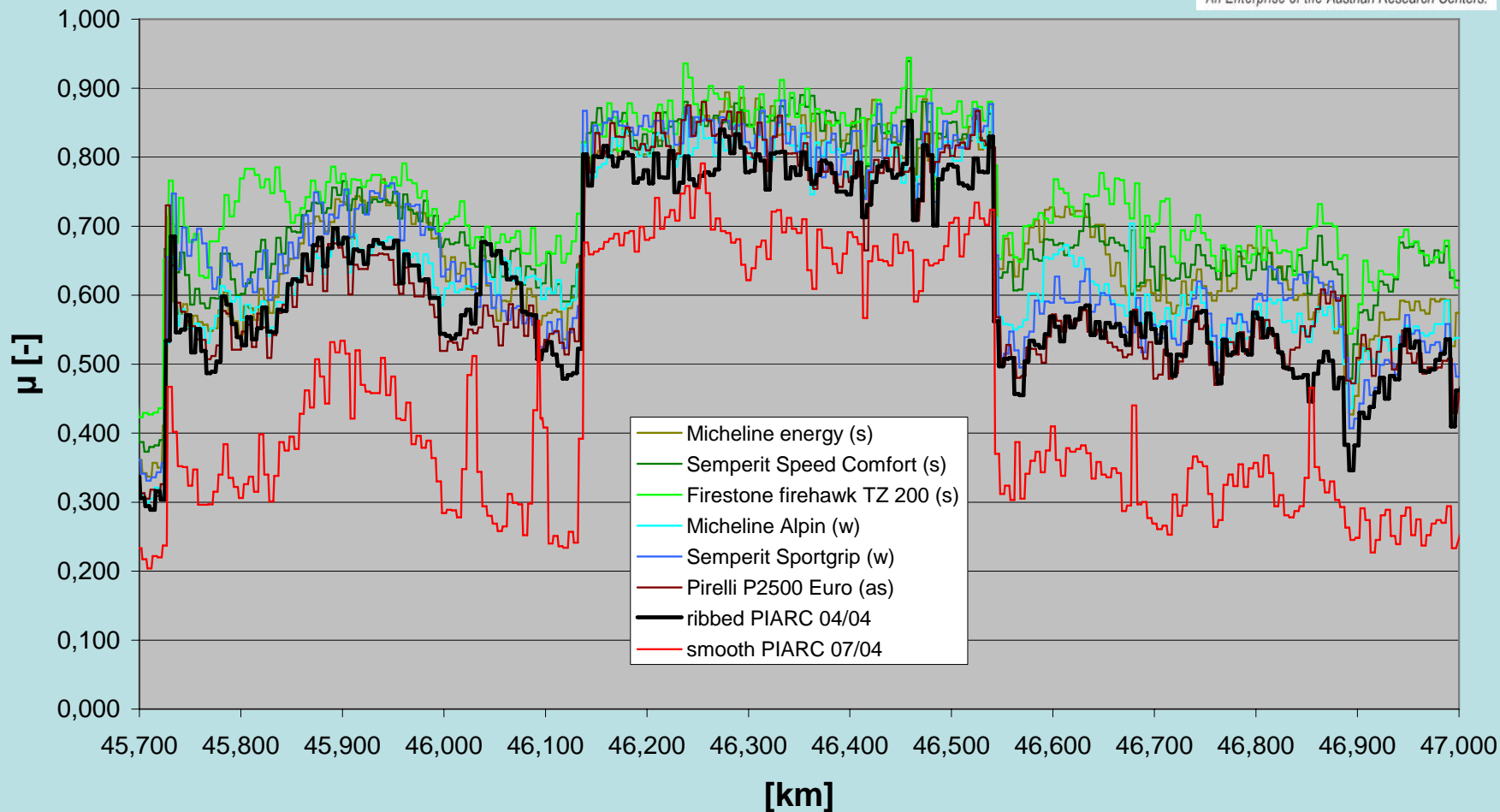
summer-winter-all seasons-ribbed-smooth



summer-winter-all seasons-ribbed-smooth

skid resistance A2+ km 45,7 - 47,0

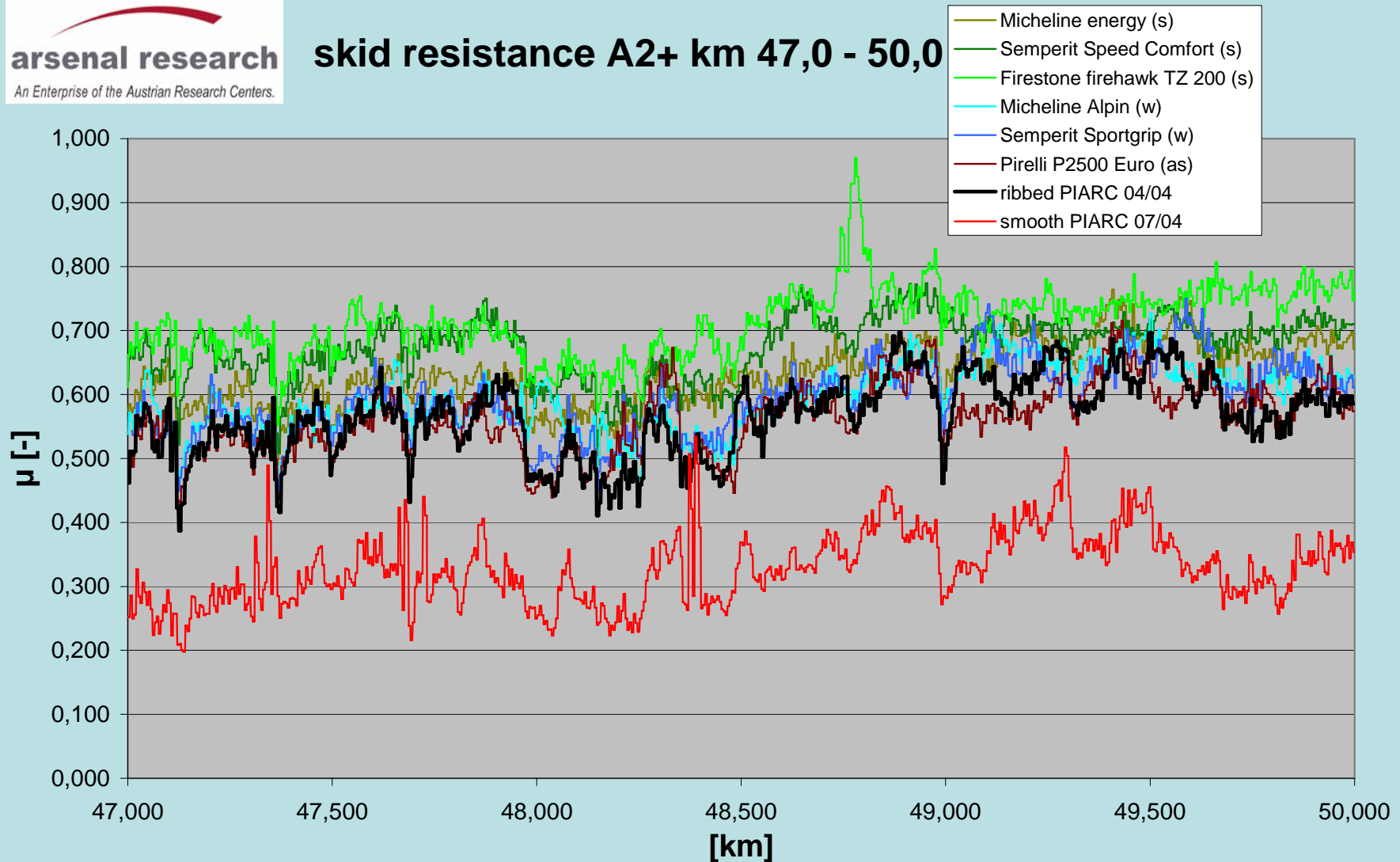
arsenal research
An Enterprise of the Austrian Research Centers.



summer-winter-all seasons-ribbed-smooth

arsenal research
An Enterprise of the Austrian Research Centers.

skid resistance A2+ km 47,0 - 50,0



**Comparison between PIARC (smooth)
and worn (2 mm tread depth)
commercial tyres
with a variable slip ratio on two
different surfaces**



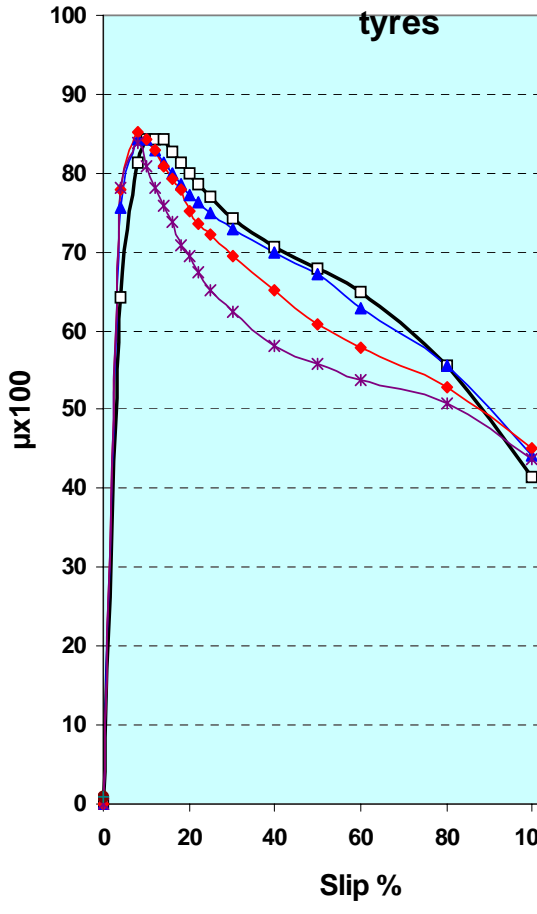
10 cm full scale

**AC 0/10
MTD = 0.70 mm**

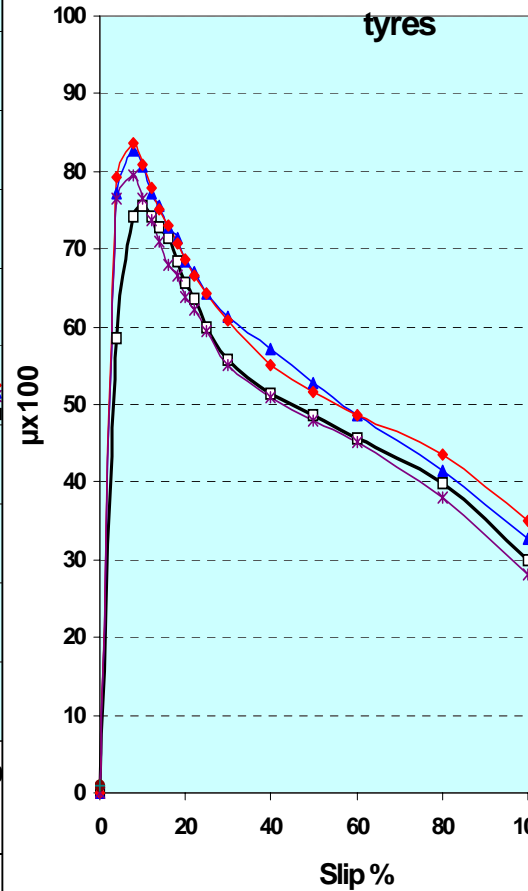
**VTAC 0/6
MTD = 1.30 mm**

Friction comparison on a rough surface: PMT = 1.3 mm

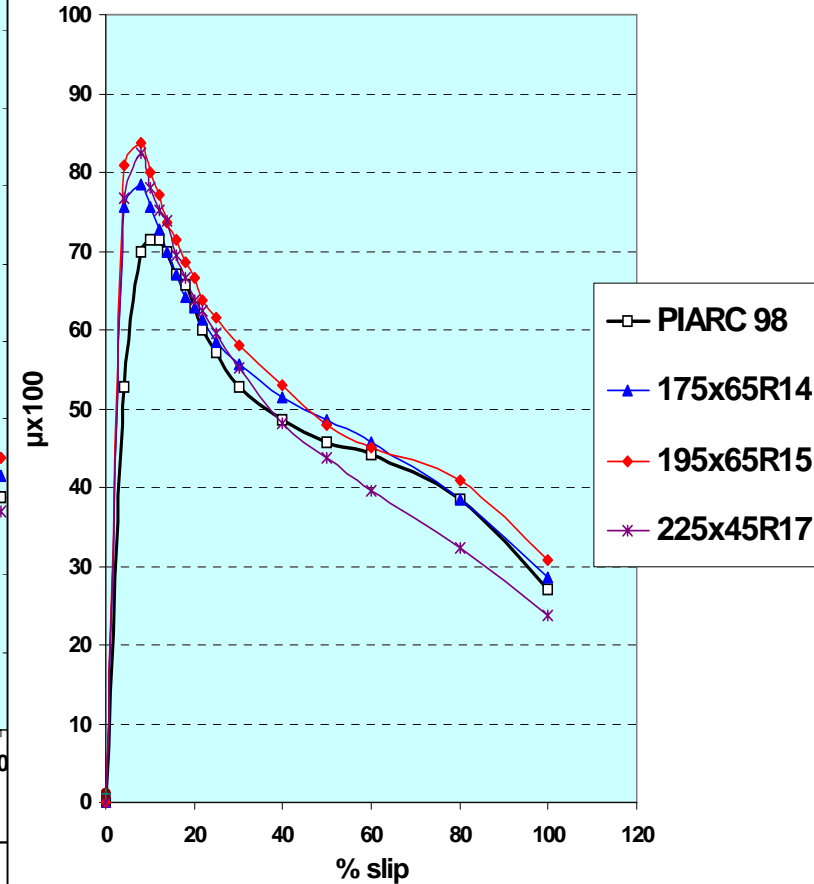
VTAC 0/6 - 1 mm water - 40 km/h - worn
tyres



VTAC 0/6 - 1 mm water - 60 km/h - worn
tyres



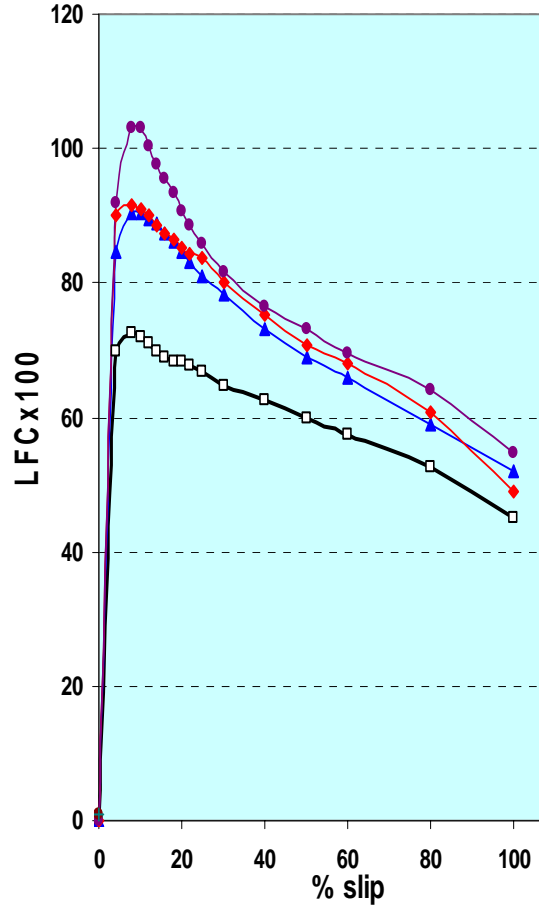
VTAC 0/6 - 1 mm water - 90 km/h - worn tyres



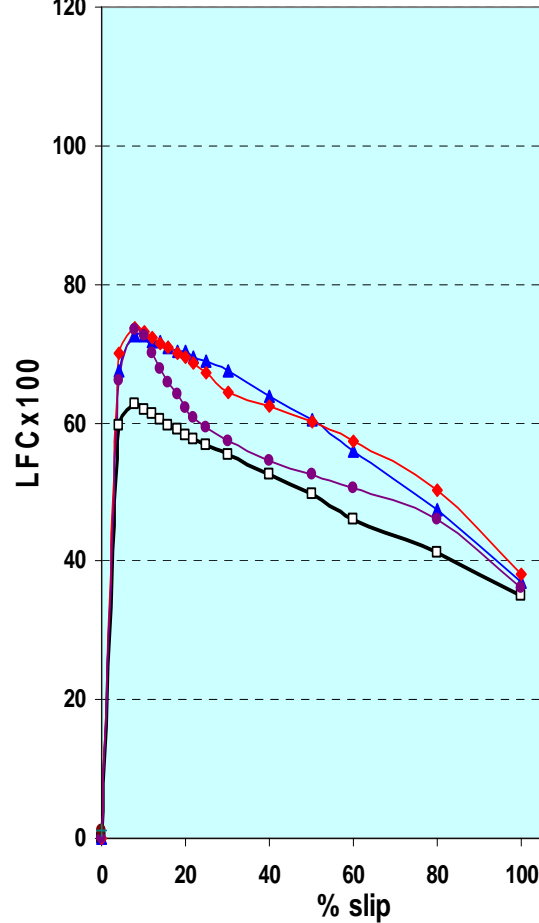
- PIARC 98
- ▲ 175x65R14
- ◆ 195x65R15
- * 225x45R17

Friction comparison on a medium surface: PMT = 0.7 mm

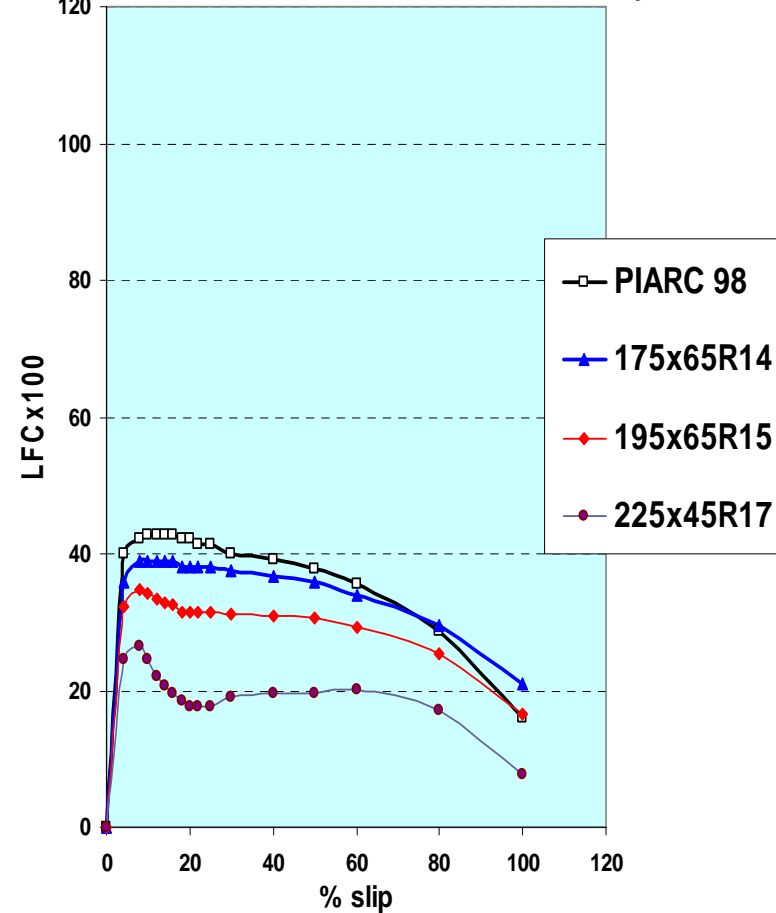
AC 0/10 - 1 mm water - 40 km/h - worn tyres



AC 0/10 - 1 mm water - 60 km/h - worn tyres



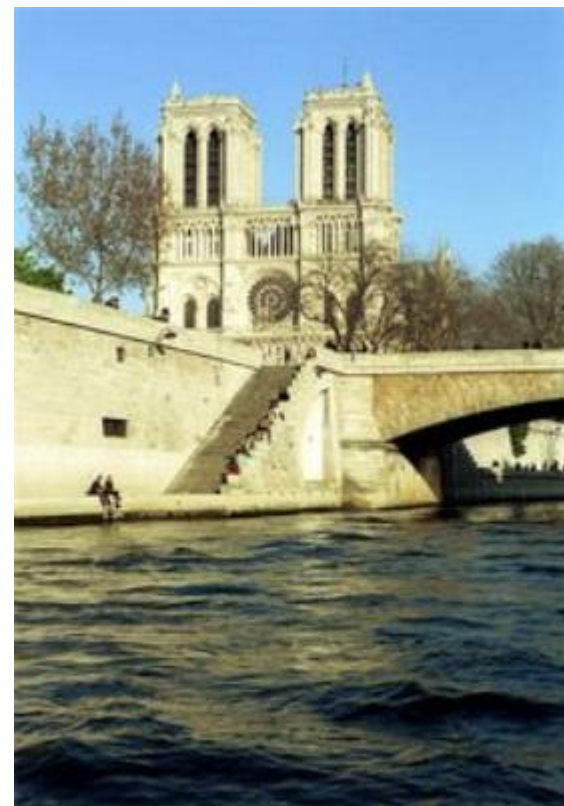
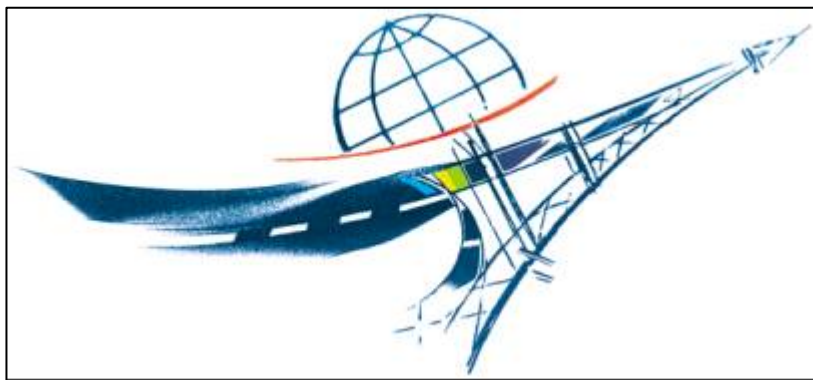
AC 0/10 - 1 mm water - 90 km/h worn tyres





Conclusions

- The PIARC test tyres are good sensors to characterise road surfaces properties
- They are more stable with the wear effect than commercial tyres
- The smooth one give very often the minimum level of longitudinal friction used by the passenger car tyres
- The ribbed one is very well representative for longitudinal friction measurements of the lower part of the present commercial tyres envelope



**Thank you
for your attention**

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