ETRTO
The European Tyre and Rim Technical Organisation

Tyre Abrasion
2021 Tests Preliminary Report

TATF WG

Contents

2021 ETRTO Abrasion Tests Overview

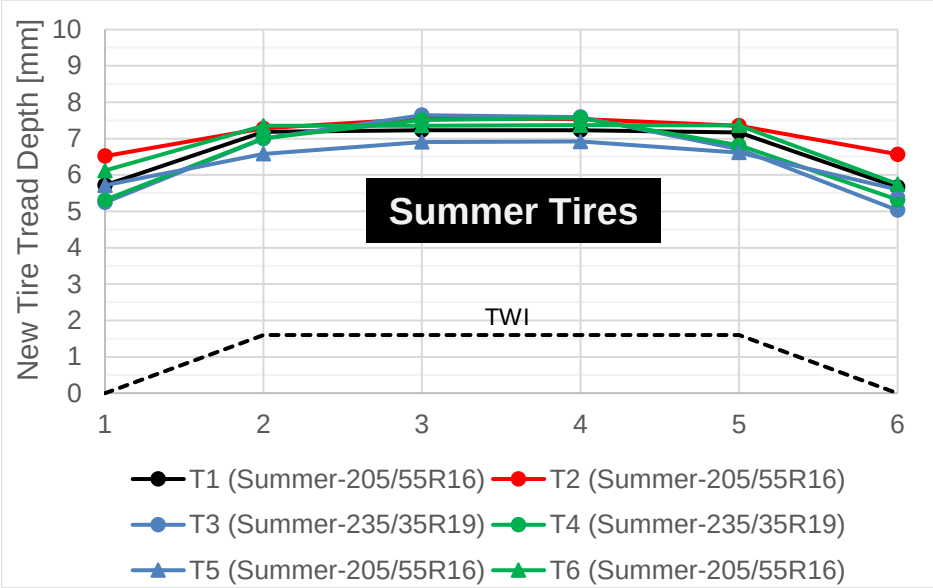
Tests

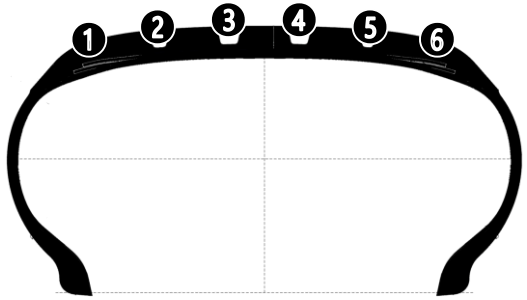
Provider Test Location	Test ID	Test Purpose	Test Condition	Mileage/Tire	Vehicle	Tires	Tires ID
Dekra France	D1	Temperature Sensitivity	High Temp	10000	VW Golf 8 TDI 110kW Aut. (FWD)	Summer	T1, T2, T3, T4
	D2	Test Duration Summer Tires	Summer Test Temp	24000	VW Golf 8 TDI 110kW Aut. (FWD)	Summer	T1, T2, T5, T6
	D3	Temperature Sensitivity	Low Temp	10000	VW Golf 8 TDI 110kW Aut. (FWD)	Summer	T1, T2, T3, T4
IFV Germany	I1	Load Sensitivity	Variable loads	10000	VW Golf 7 TDI 110kW Aut. (FWD)	Summer	T2
	I2	Test Duration Winter Tires	Winter Test Temp	20000	VW Golf 7 TDI 110kW Aut. (FWD)	Winter	T7, T8, T9, T10
	I3	Temperature Sensitivity	High Temp	10000	VW Golf 7 TDI 110kW Aut. (FWD)	Winter	T7, T8, T11, T12
	I4	Temperature Sensitivity	Low Temp	10000	VW Golf 7 TDI 110kW Aut. (FWD)	Winter	T7, T8, T11, T12

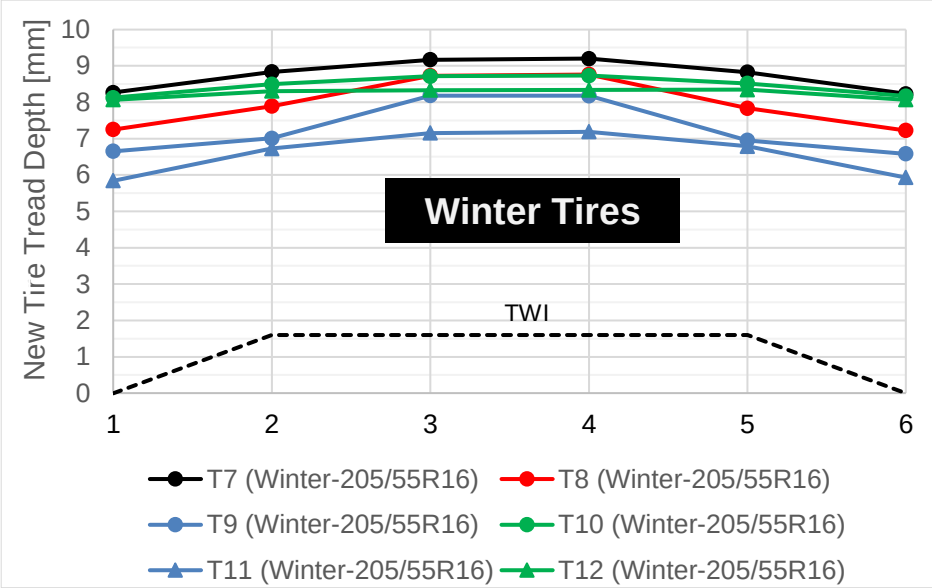
Tires

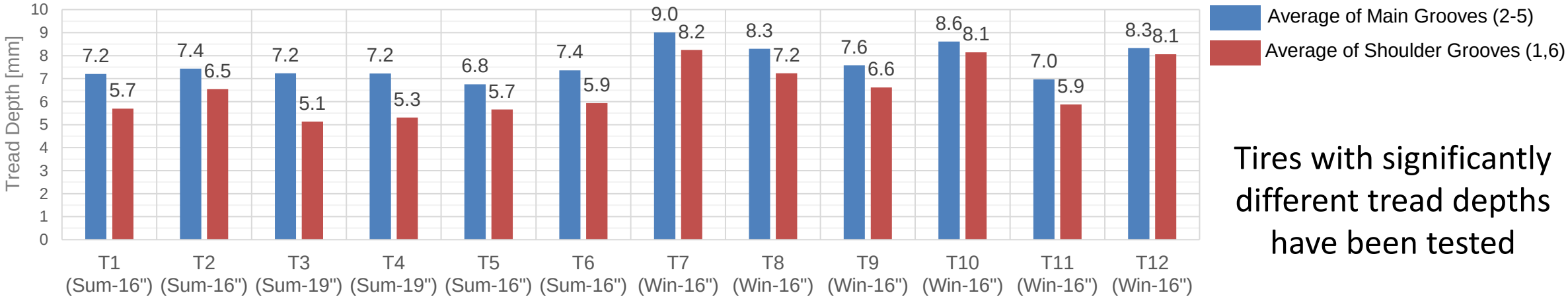
Cat	ID	Size	LISS
Summer	T1	205/55R16	91V
	T2	205/55R16	91V
	T3	235/35R19	91Y
	T4	235/35R19	91Y
	T5	205/55R16	91V
	T6	205/55R16	91V
Winter (3PMSF)	T7	205/55R16	91H
	T8	205/55R16	91H
	T9	205/55R16	91H
	T10	205/55R16	91H
	T11	205/55R16	94V
	T12 (ICE)	205/55R16	94R

Tested Tires Original Tread Depths





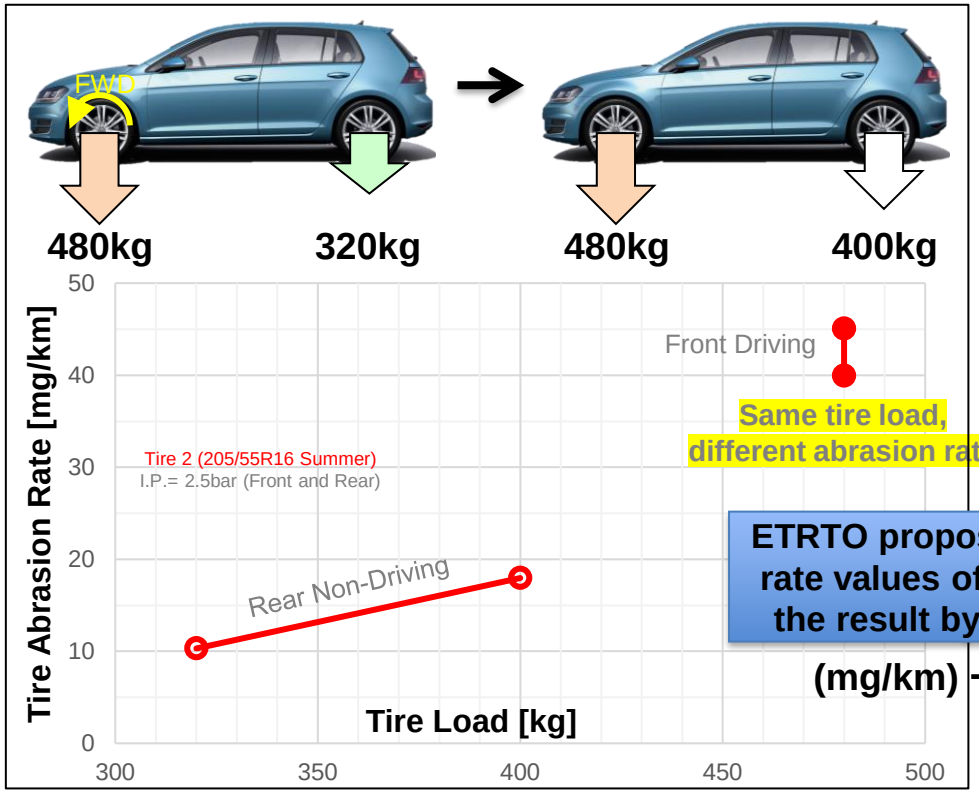




Tires with significantly different tread depths have been tested

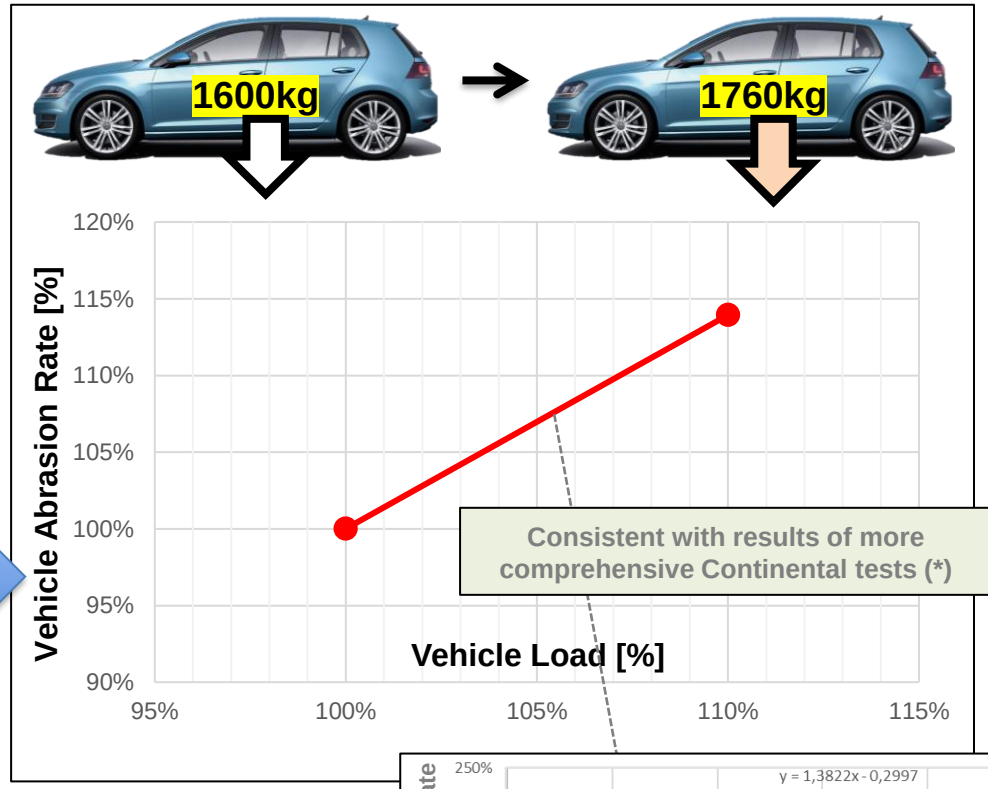
Per Vehicle Normalized Tire Abrasion Rate

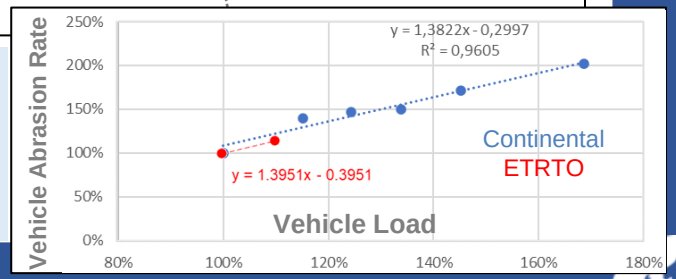
Tire abrasion proving dependent on total vehicle load (not on tire load only)



ETRTO proposal: sum the abrasion rate values of all 4 tires and divide the result by total vehicle weight

(mg/km) → (mg/km) / ton





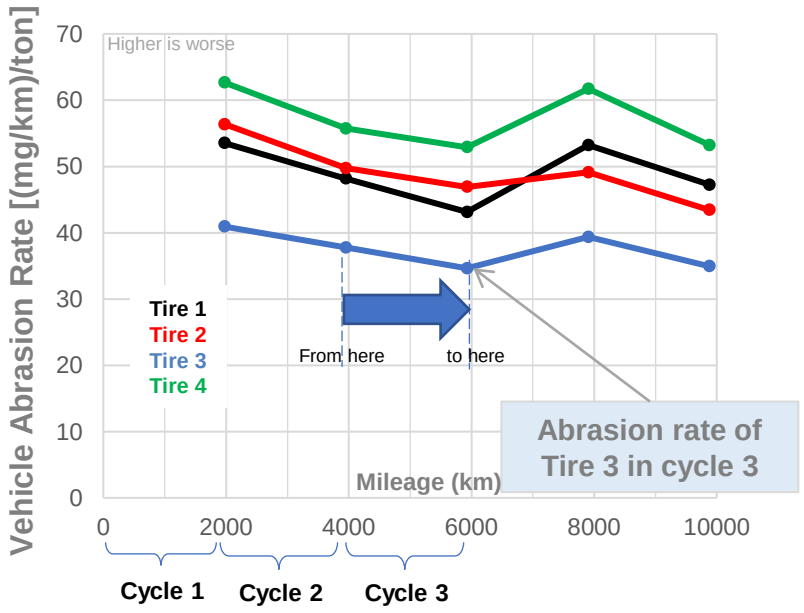
Per Vehicle Normalized Tire Abrasion Rate in (mg/km)/ton, simply called Vehicle Abrasion Rate later in this presentation, will in future allow to better compare the abrasion levels of tires with very different load capacity (then different test loads)

Abrasion Rate and Tire Ranking Evolution

For each test the following charts are reported:

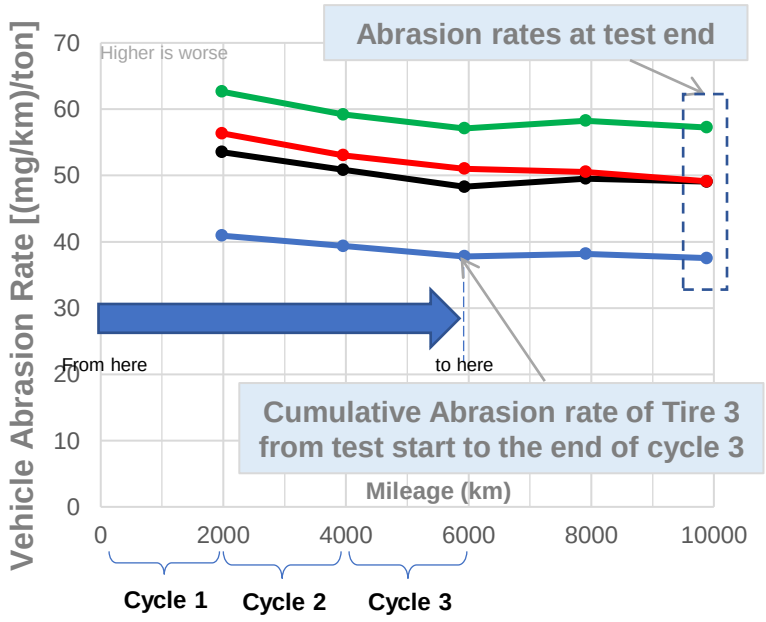
Vehicle Abrasion Rate by Cycle

Purpose: confirm the evolution of tire abrasion rate and check the possible effects of external factors (changes in temperature, driving style...)



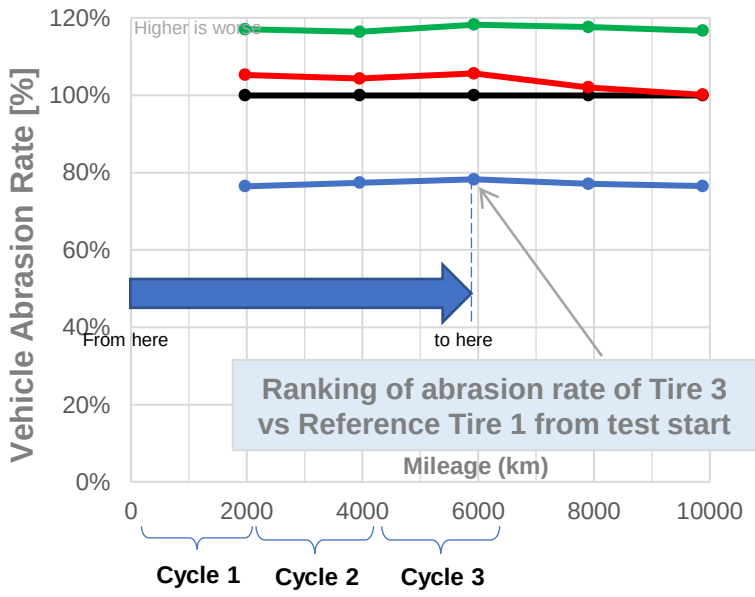
Cumulative Vehicle Abrasion Rate

Purpose: confirm whether a minimum test mileage is needed to get stable abrasion results.



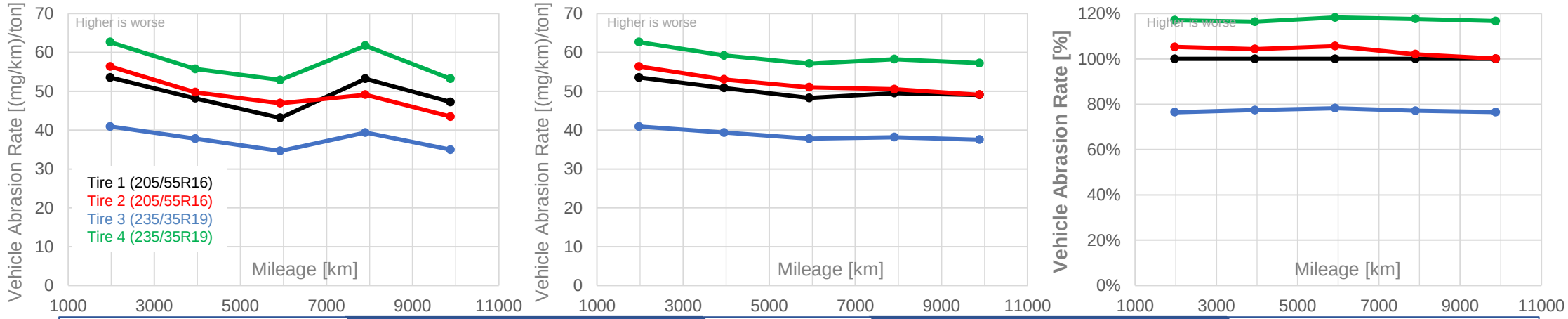
Ranking based on Cumulative Vehicle Abrasion Rate
(using the first tire of the test as reference)

Purpose: confirm ranking reversal occurrences



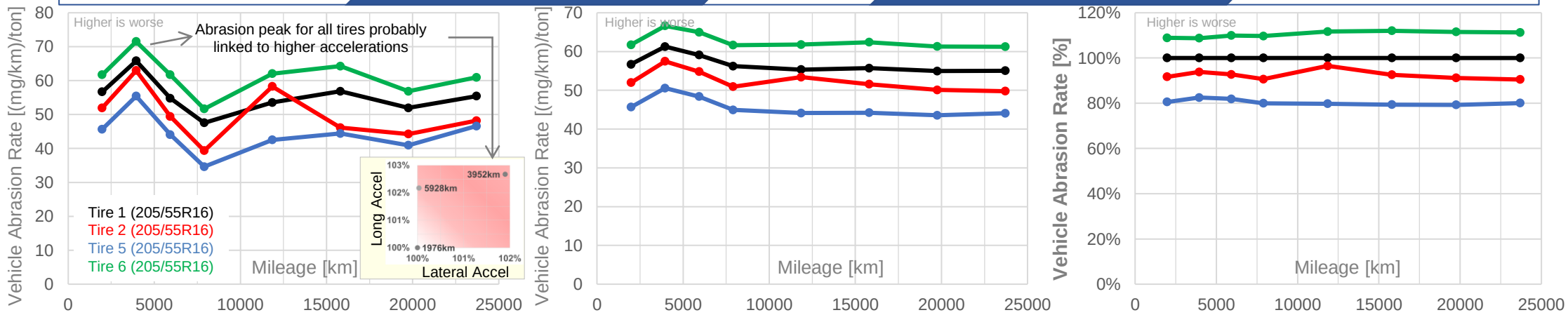
Abrasion Rate and Tire Ranking Evolution

Dekra 1 (Summer)



By test cycle → **Cumulative** → **Cumulative (Ranking)**

Dekra 2 (Summer)

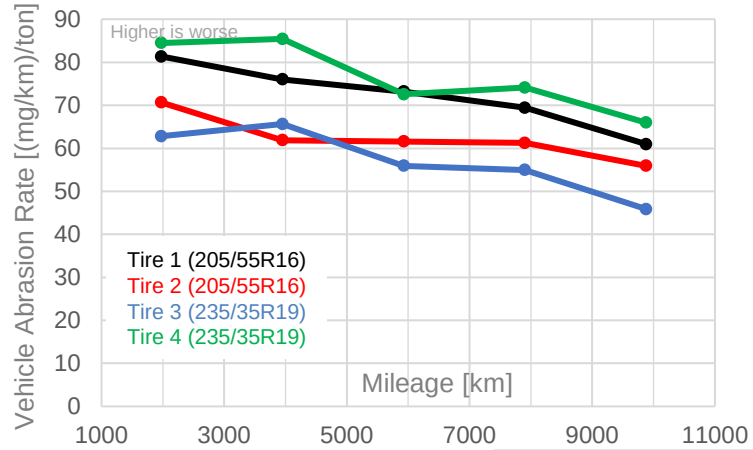


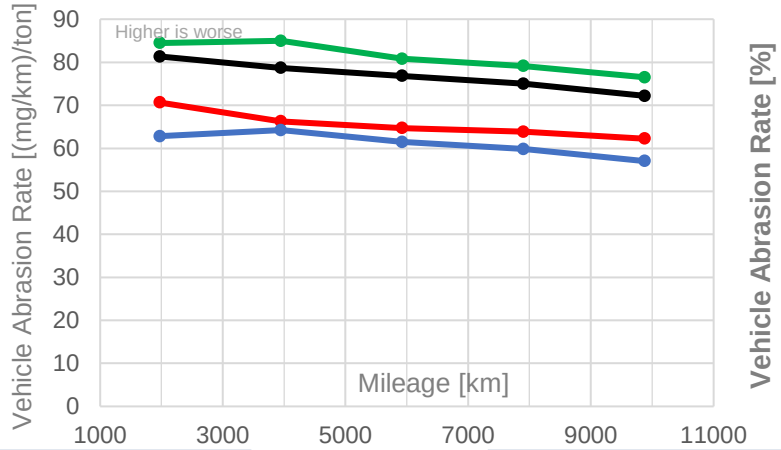
Longer test expressely intended for test duration assessment

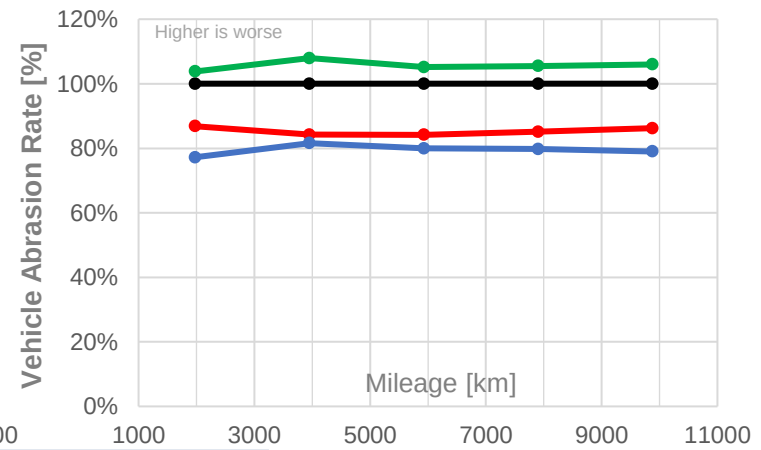
Despite local variations of tire abrasion levels among test cycles, quite stable tire ranking along the tests

Abrasion Rate and Tire Ranking Evolution

Dekra 3 (Summer)

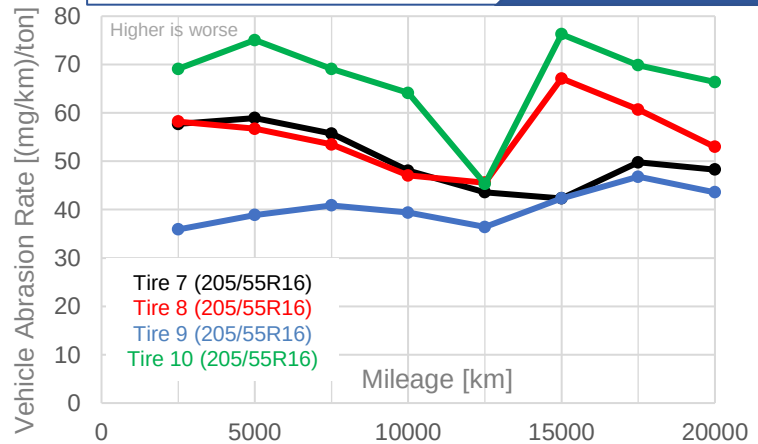


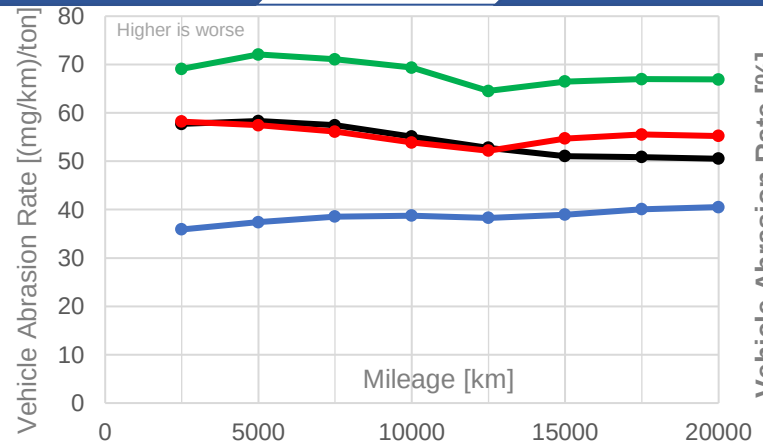


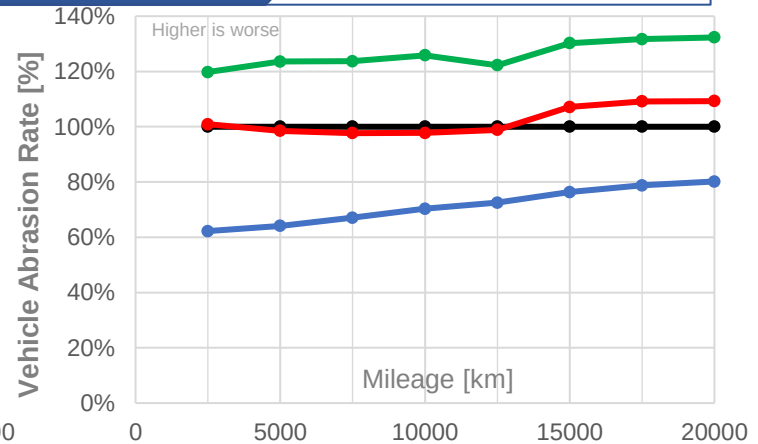


By test cycle → **Cumulative** → **Cumulative (Ranking)**

IFV 2 (Winter)





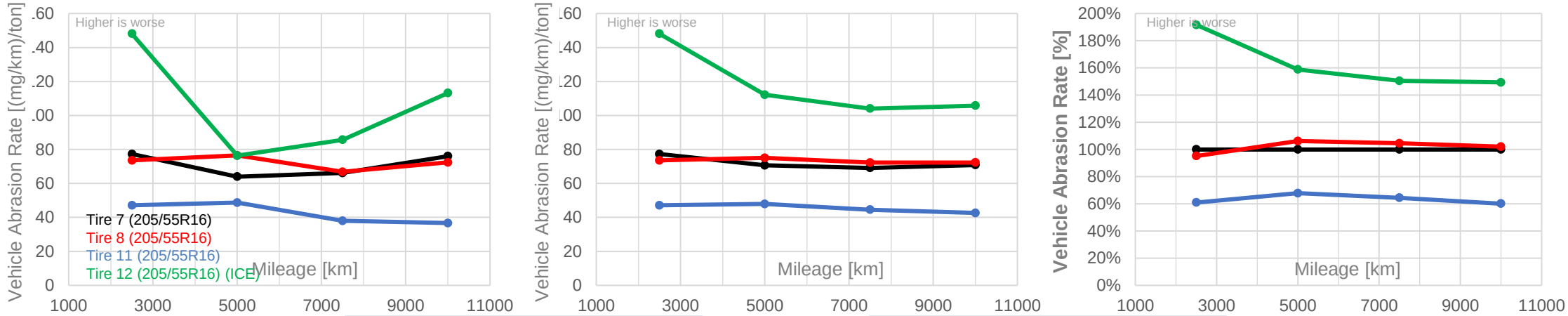


Longer test expressely intended for test duration assessment

Ranking inversions confirmed to be possible even after a long mileage

Abrasion Rate and Tire Ranking Evolution

IFV 3 (Winter)



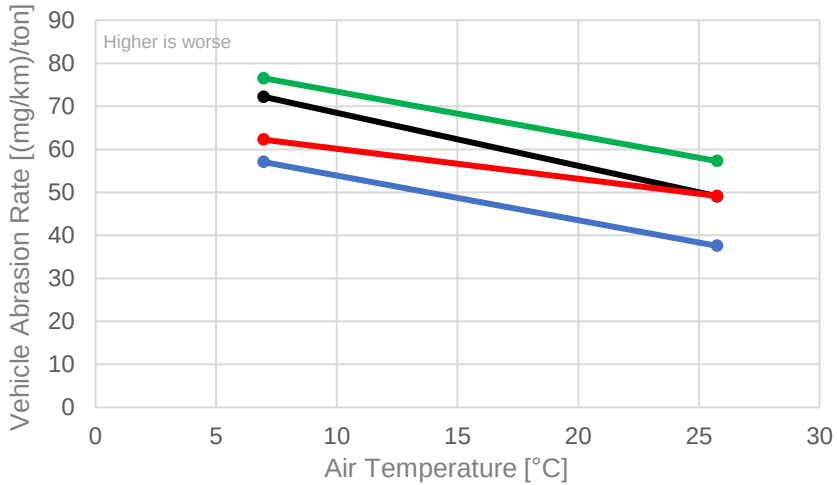
IFV 4 (Winter)

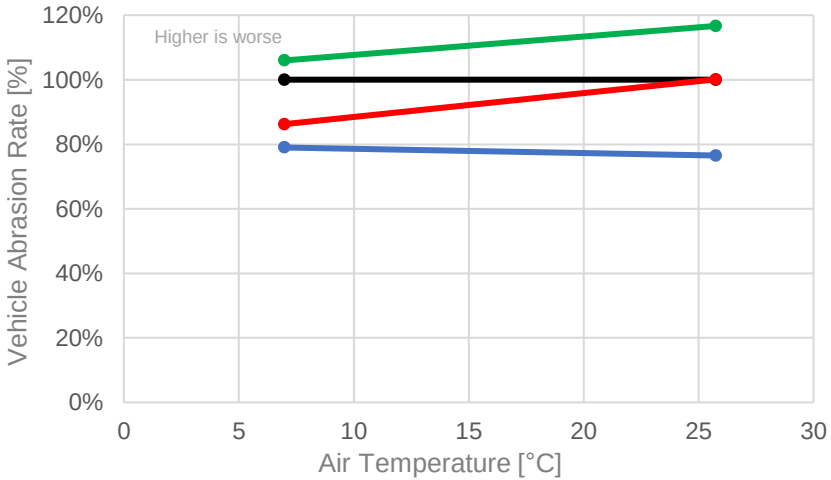
Despite local variations of tire abrasion levels among test cycles, quite stable tire ranking from ≈ 8000km

Abrasion Rate Sensitivity to Air Temperature

Dekra 1&3 (Summer)

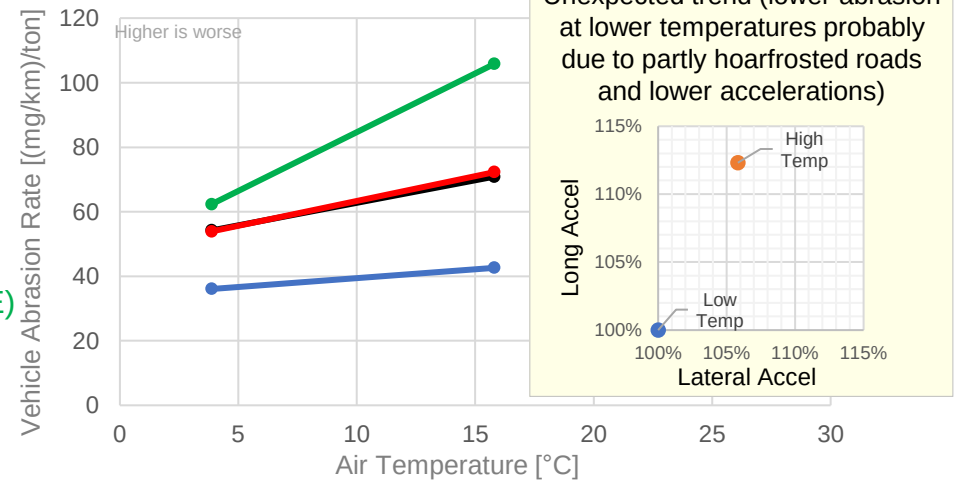
Tire 1 (205/55R16)
Tire 2 (205/55R16)
Tire 3 (235/35R19)
Tire 4 (235/35R19)

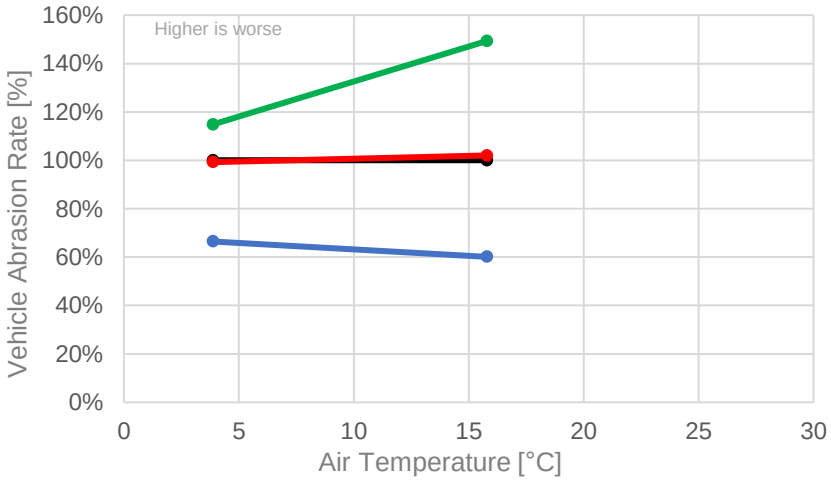




IFV 3&4 (Winter)

Tire 7 (205/55R16)
Tire 8 (205/55R16)
Tire 11 (205/55R16)
Tire 12 (205/55R16) (ICE)

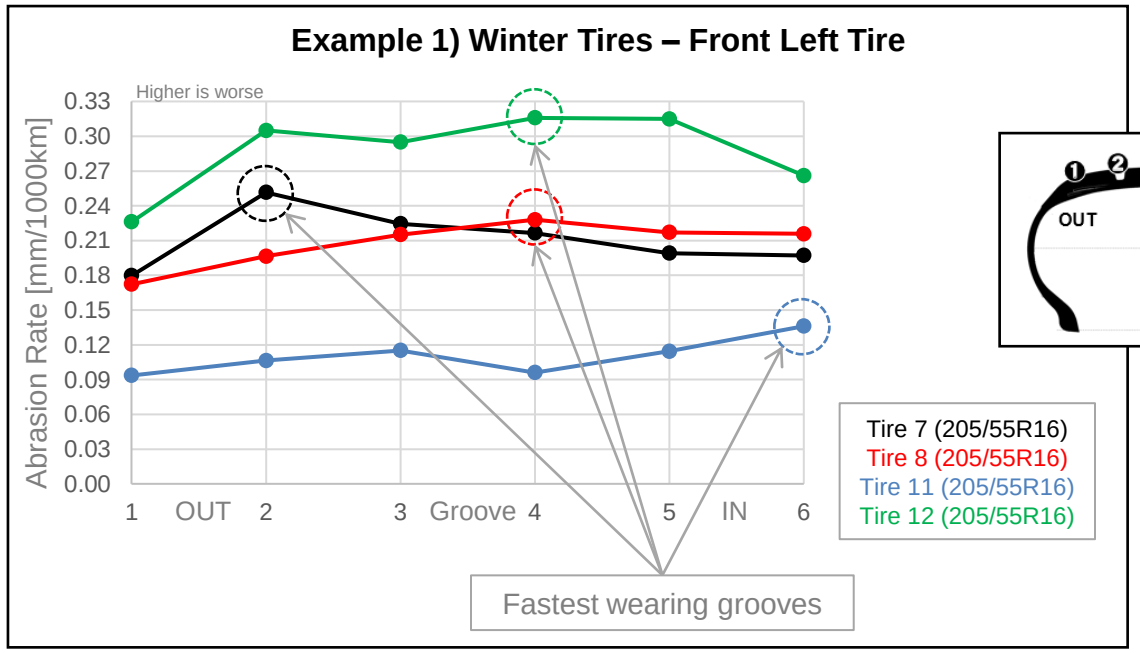


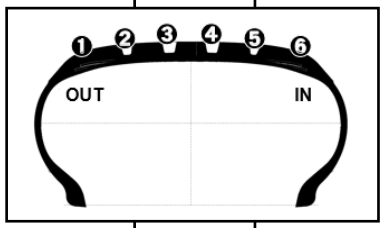


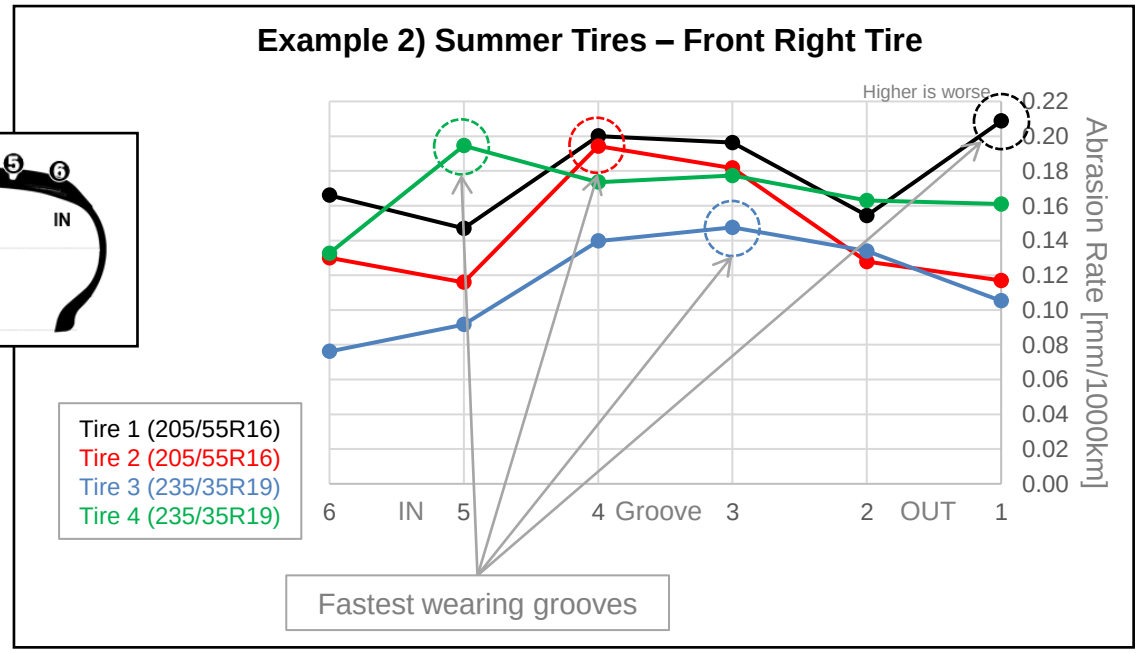
Air temperature confirming to have a significant impact on tire abrasion (sensitivity depending on tire)

Abrasion Rate by Tread Groove

Though not the primary scope of abrasion tests, tire residual tread depths have been measured in all tests to confirm tire wear profiles







Different positions of fastest wearing grooves for the tested tires

→ No evidence of a same uneven abrasion due to test course

Detailed results in the Appendix

Conclusion

A preliminary analysis of ETRTO 2021 Abrasion Tests allows to make some tentative conclusions

- Tire load is confirmed to have a detrimental effect on abrasion rate. To better compare the abrasion levels of tires with very different load capacity (then different test loads) ETRTO suggest to use a **Vehicle Abrasion Rate** in **(mg/km)/ton** summing the abrasion rate of all tires and normalizing the result by total vehicle weight
- No significant changes of abrasion ranking have been observed in ETRTO 2021 tests where tires abrasion rate proved to be quite stable after a relatively short mileage (even <10000km). Nonetheless:
  - The evolution of tire abrasion during its life changes from tire to tire
  - Tire abrasion rate usually decreases when tire gets worn but opposite cases can occur
  - As a consequence of the above the abrasion rate ranking between two tires can change in a test
- The sensitivity of abrasion rate to temperature depends on the tire. To reduce (not eliminate) the effect of temperature on tires ranking, the usage of appropriately selected reference tires is needed

ETRTO
The European Tyre and Rim Technical Organisation

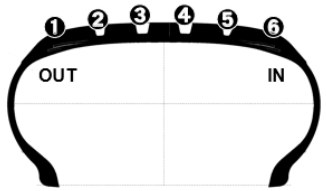
Thanks for your attention

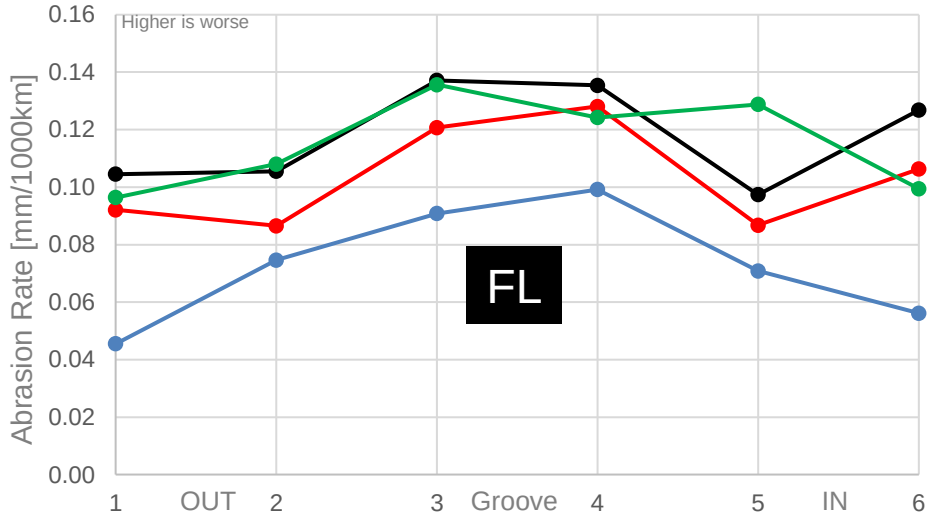
APPENDIX

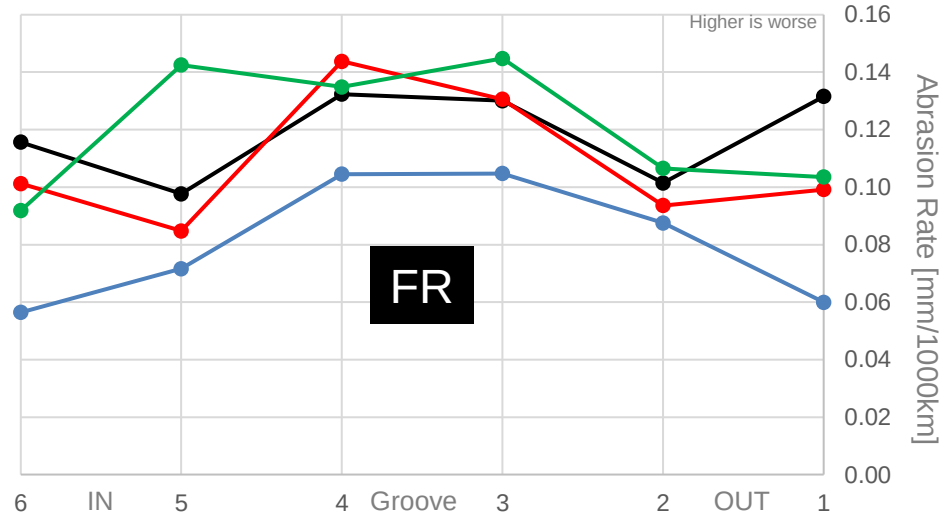
Abrasion Rate by Tread Groove

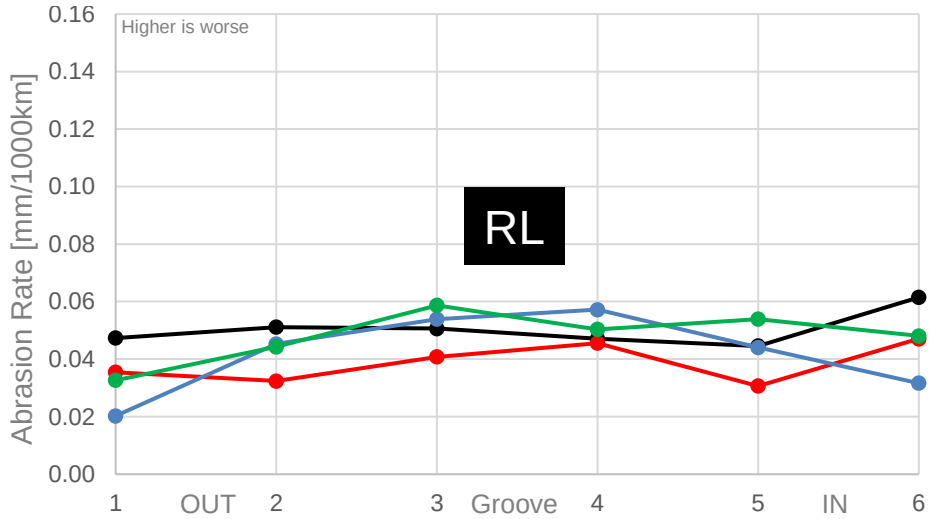
Dekra 1 (Summer)

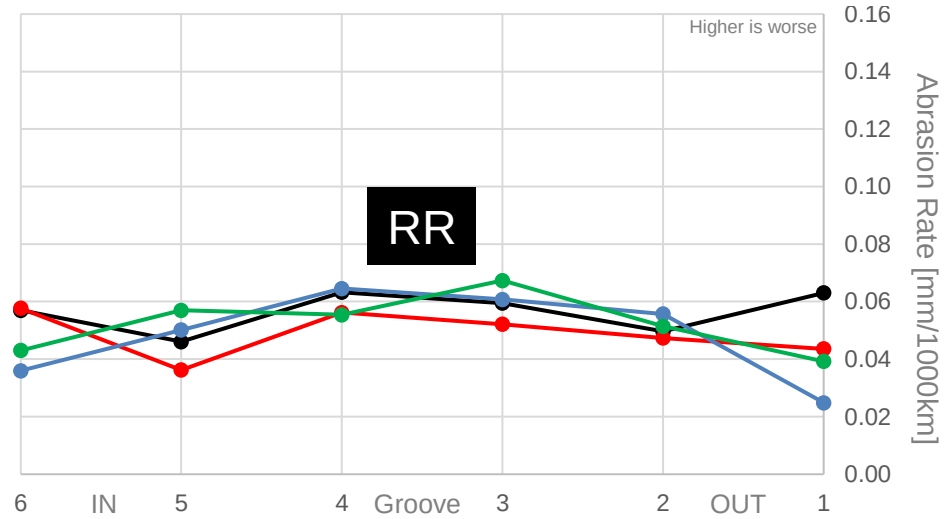
Tire 1 (205/55R16)
Tire 2 (205/55R16)
Tire 3 (235/35R19)
Tire 4 (235/35R19)







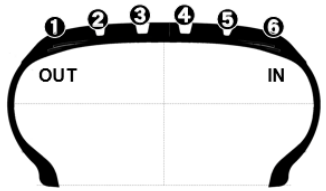


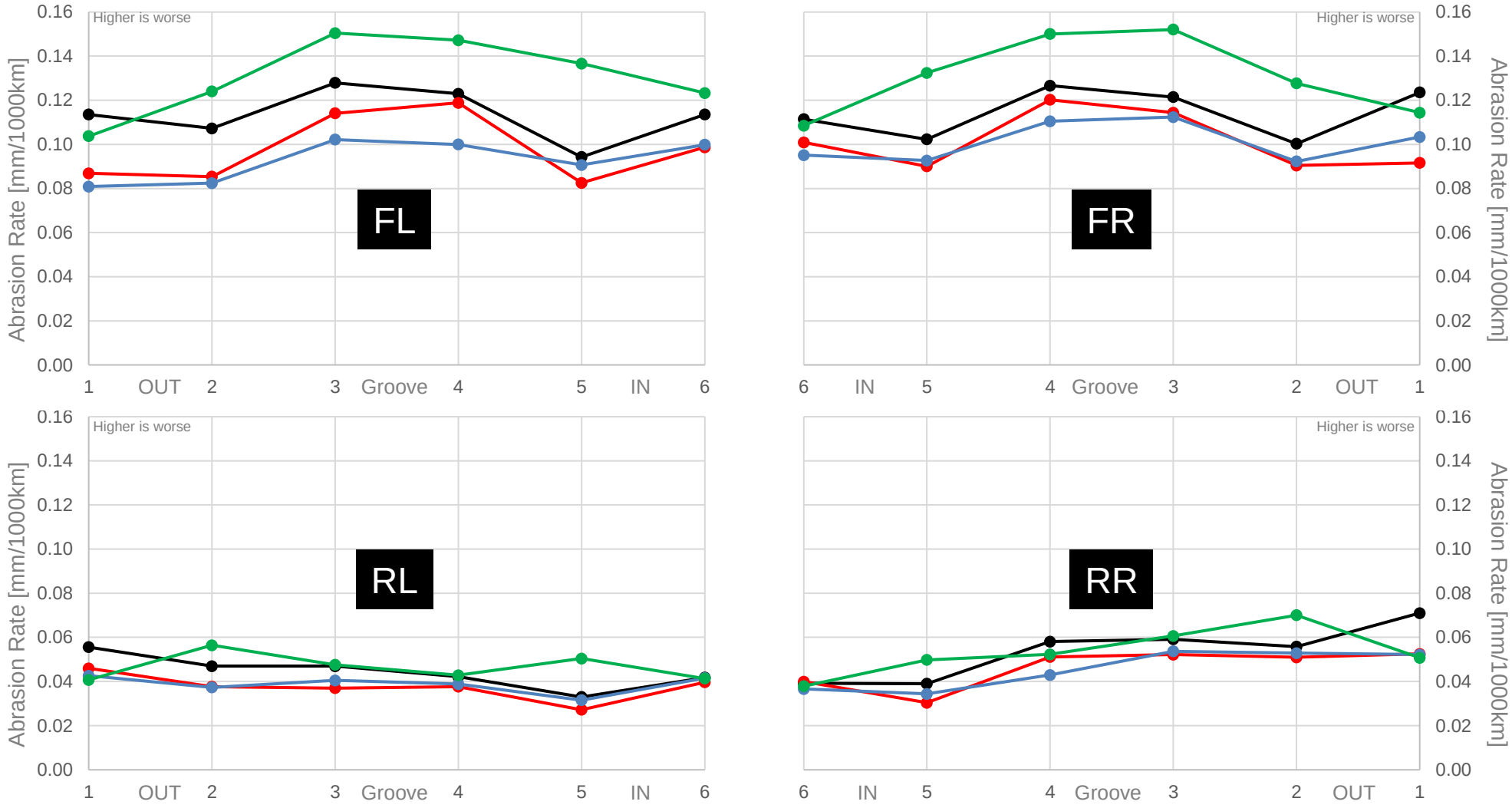


Abrasion Rate by Tread Groove

Dekra 2 (Summer)

Tire 1 (205/55R16)
Tire 2 (205/55R16)
Tire 5 (205/55R16)
Tire 6 (205/55R16)

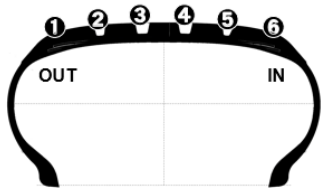


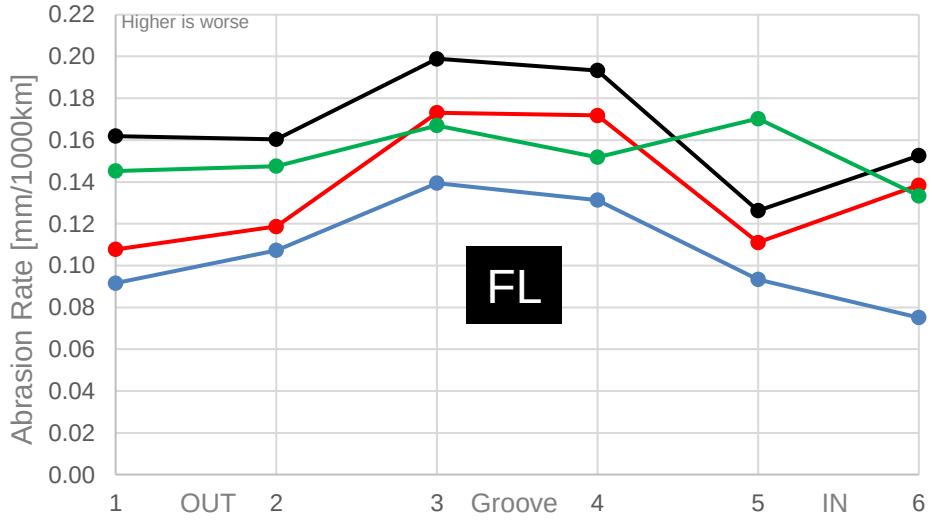


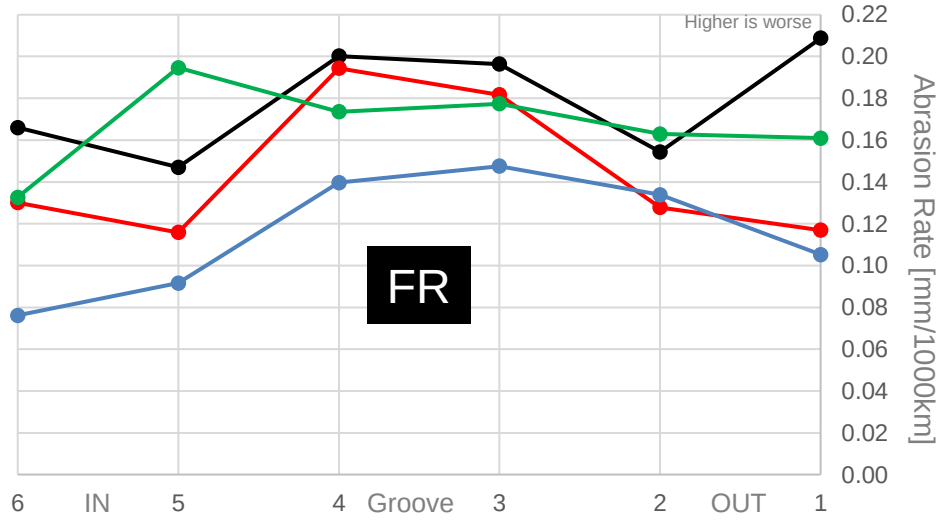
Abrasion Rate by Tread Groove

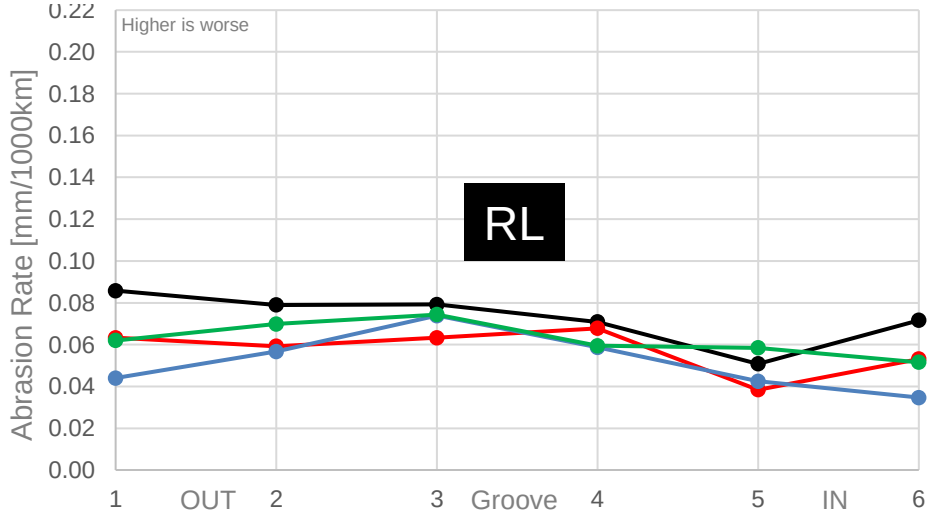
Dekra 3 (Summer)

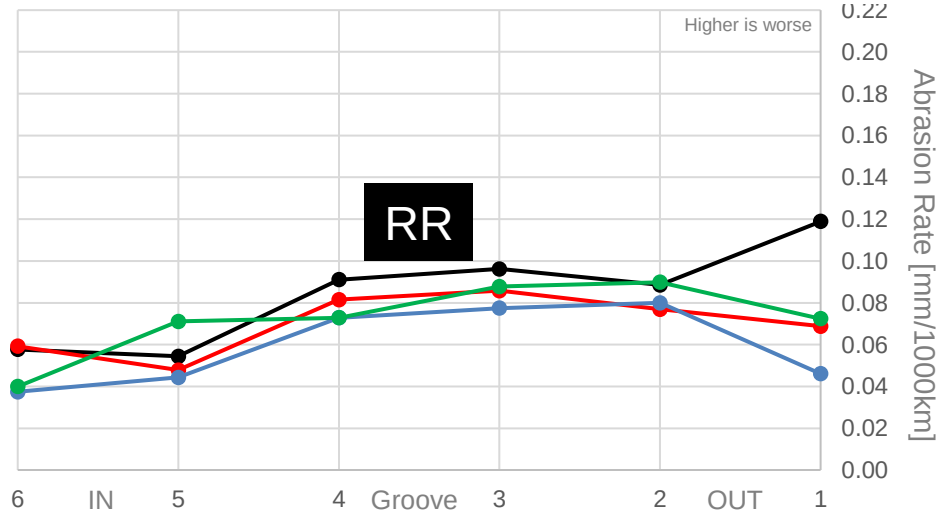
Tire 1 (205/55R16)
Tire 2 (205/55R16)
Tire 3 (235/35R19)
Tire 4 (235/35R19)







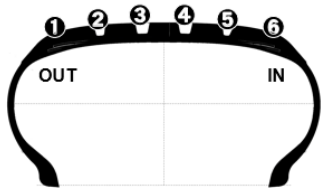


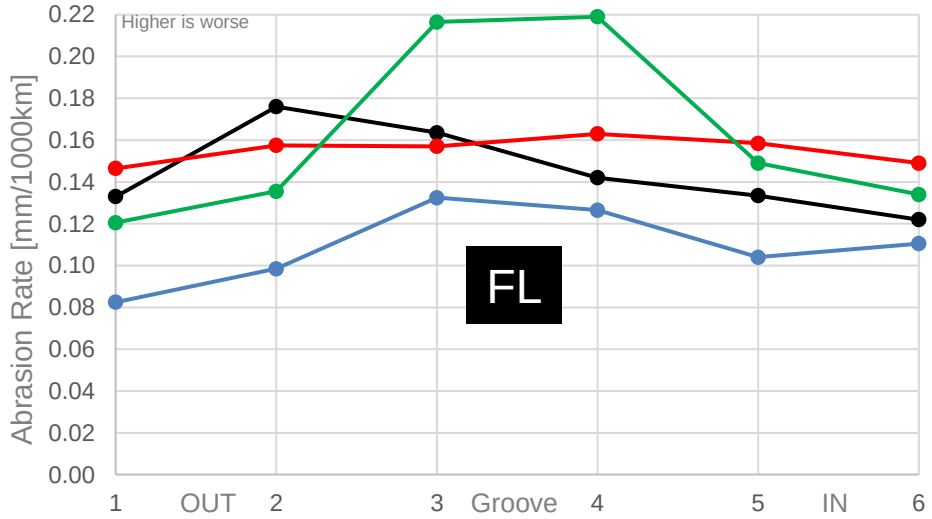


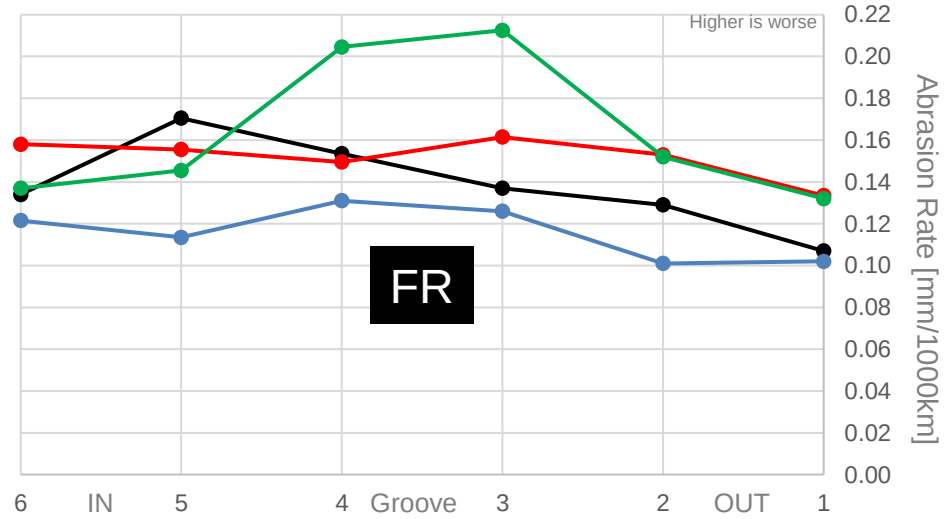
Abrasion Rate by Tread Groove

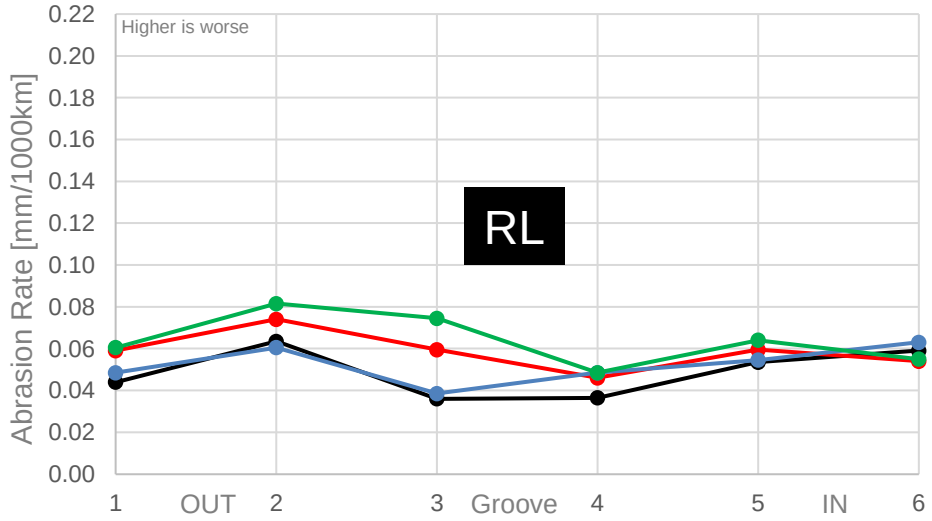
IFV 2 (Winter)

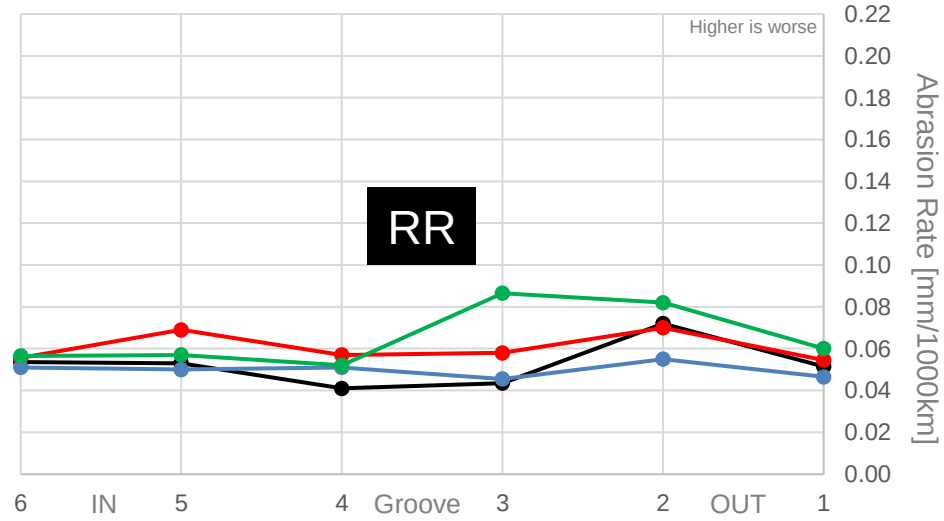
Tire 7 (205/55R16)
Tire 8 (205/55R16)
Tire 9 (205/55R16)
Tire 10 (205/55R16)







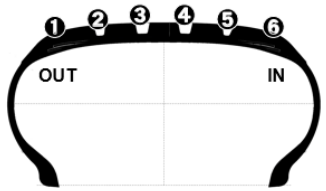


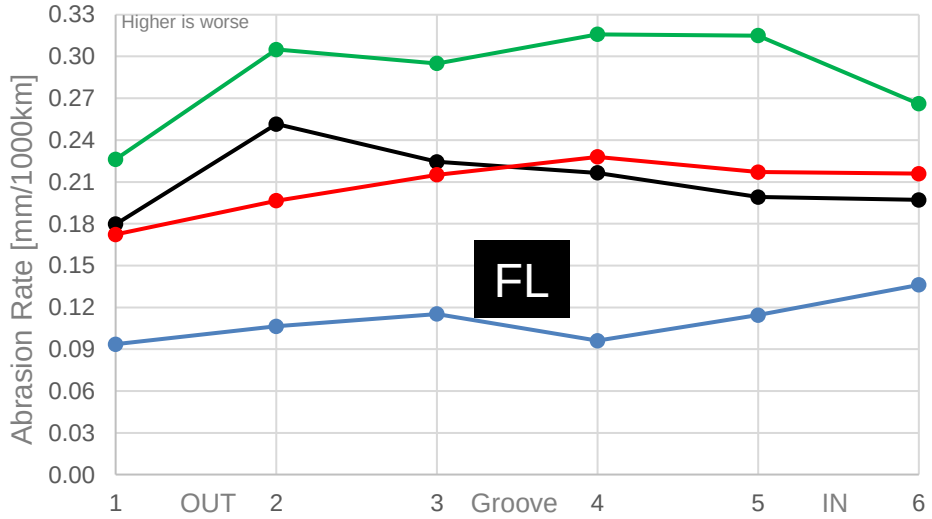


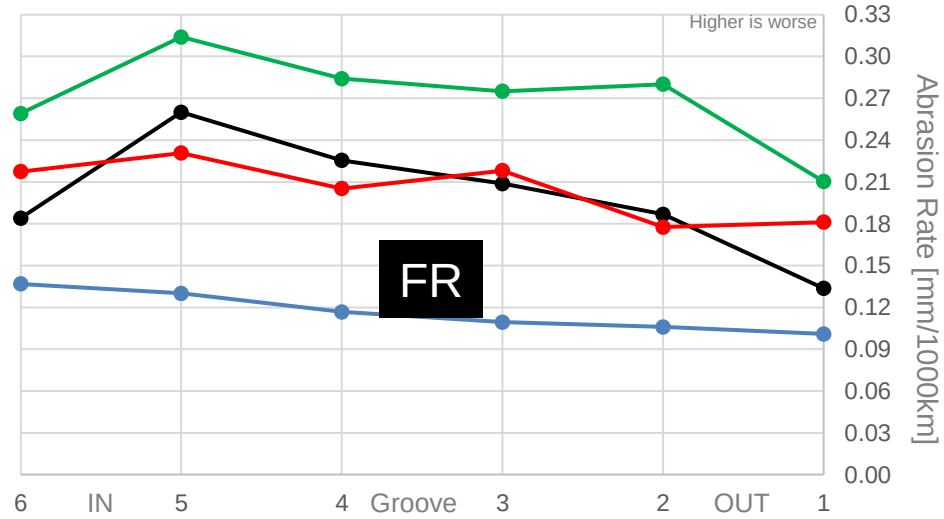
Abrasion Rate by Tread Groove

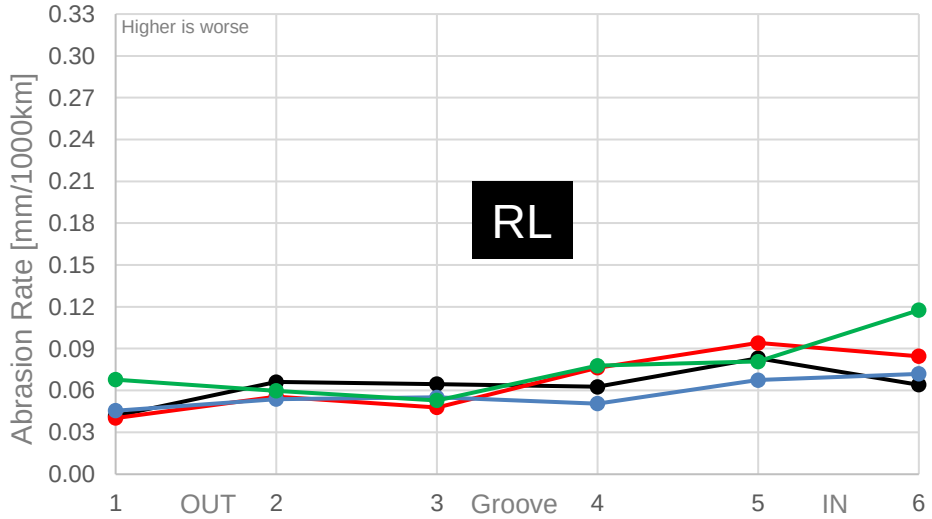
IFV 3 (Winter)

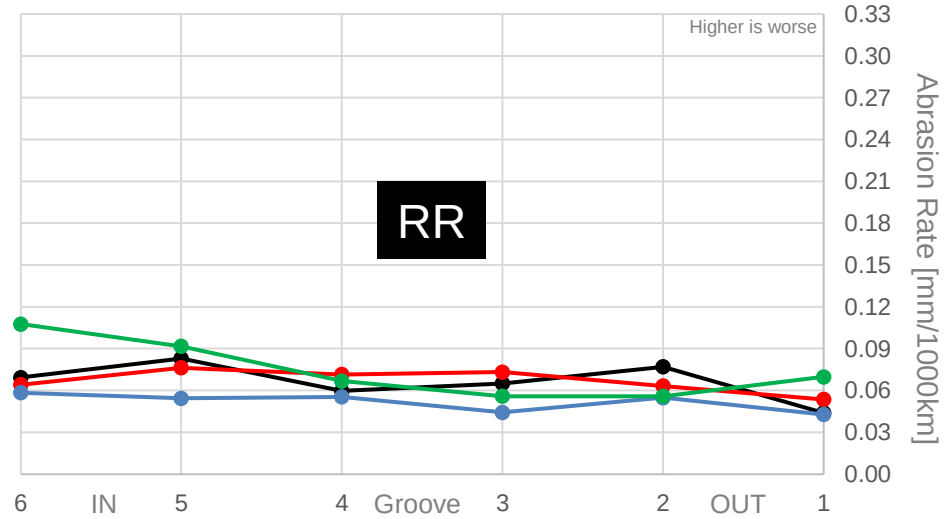
Tire 7 (205/55R16)
Tire 8 (205/55R16)
Tire 11 (205/55R16)
Tire 12 (205/55R16)











Abrasion Rate by Tread Groove

IFV 4 (Winter)

Tire 7 (205/55R16)
Tire 8 (205/55R16)
Tire 11 (205/55R16)
Tire 12 (205/55R16)