INTER SAISON

WEC 2020/2021

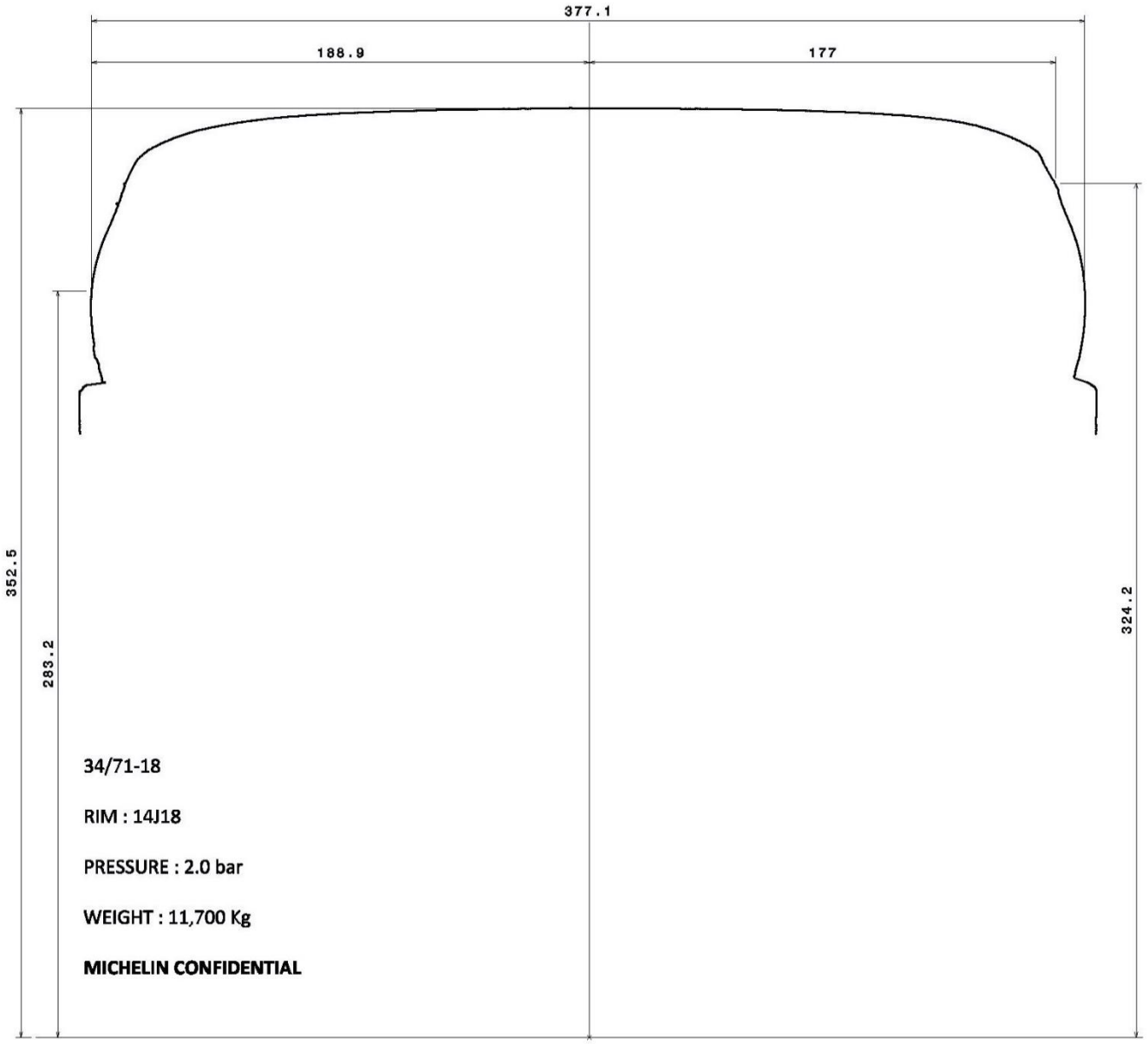
LMH – Rr 348R

34/71–18 – TL RFID COMPETITION MI

05 March 2021

1 INDEX

1.1 2D Profile



1.2 Masses

	Masse (kg)
348R	11.40

1.3 Loaded Radius & Rolling Circumference

1.3.1 Calculation Boundaries

These parameters are extracted from a complete rig test based on:

- Speed scan
- Vertical load scan
- Camber angle scan
- Slip angle scan
- Pressure scan

1.3.2 NEW Loaded Radius Equation

$$Re(P,V,\gamma,F_Y) = Re_0 + Re_P.P + Re_V.V^2 + Re_{\gamma 1}.\gamma^2 + Re_{\gamma 2}.|\gamma| + Re_Y(F_Y - F_0)^2 - \frac{F_Z}{K_{ZZ}}$$

$$K_{ZZ}(P,V,\gamma,F_Y,F_X) = \left(K_{ZZ_0} + K_{ZZ_P}.P + K_{ZZ_{V1}}.V^2 + K_{ZZ_{V2}}.V + K_{ZZ_\gamma}.\gamma^2\right)$$

$$R_{libre} = Re_0 + Re_P.P + Re_V.V^2 + Re_{\gamma 1}.\gamma^2 + Re_{\gamma 2}.|\gamma| + Re_Y(F_Y - F_0)^2$$

With:
Re : Loaded radius [m]
K_{ZZ} : Vertical Stiffness [N/m]
R_{libre} : Free geometrical radius [m]
F_Y : Lateral force [N]
F_Z : Vertical load [N]
V : Velocity [m/s]
γ : Camber [°]
P : Pressure [bar]

1.3.3 Loaded Radius coefficients

Note 1 : The critical difference is roughly ±0.6% on KZZ at 2b. Vref is 150km/h
Note 2 : (Speeds must be used in m/s in the calculation).

	Rr Casing
	348R
KzzP	1.67E+05
Kzz0	3.57E+04
ReP	4.54E-04
KzzV1	-0.3176
KzzV2	798.5039
ReV	2.40E-07
KzzGamma	-5.12E+03
ReGamma1	2.76E-04
ReGamma2	-8.41E-05
Fy0	109.2906
ReY	-2.30E-11
Re0	0.3507

Vertical Stiffness - Kzz [N/m]	**387649**

Loaded Radius - Re [m]	**0.33487**

Pressure [bar]	2.0
Fz [N]	8000.0
|IA| [deg] (absolute value)	3.0
Fy [N]	0.0
V [m/s]	83.3333

Please find in the file “20210305_Kzz_LR_297R_348R.xlsx” an excel sheet to calculate tyre loaded radius with the coefficients above.

1.3.4 NEW Rolling Radius Equation

$$R_{roul} = R_{Nappes} + \left(Re_0 + Re_P . P - R_{Nappes} \right) * \exp(-\alpha * fleche) + R_{roul_{D2}} * \delta^2 + R_{roul_{D1}} * \delta + R_{roul_{V2}} * V^2 + R_{roul_{V1}} * V + R_{roul_{G2}} * \gamma^2 + R_{roul_{G1}} * \gamma$$

where :

$$fleche = f = \frac{F_z}{K_{zz}}$$

And :

$$K_{ZZ}(P, V, \gamma, F_Y, F_X) = \left(K_{ZZ_0} + K_{ZZ_P} . P + K_{ZZ_{V1}} . V^2 + K_{ZZ_{V2}} . V + K_{ZZ_\gamma} . \gamma^2 \right)$$

NB : Kzz is calculated with loaded radius coefficients.

With:

- Rroul : Rolling radius [m]
- K_{ZZ} : Vertical Stiffness [N/m]
- F_Z : Vertical load [N]
- V : Velocity [m/s]
- γ : Camber [°]
- P : Pressure [bar]
- δ : Slip Angle [°]

For calculation of Rolling Circumference (C_{Roll}), use $C_{Roll} = R_{Roll}$ x (2π)

1.3.5 Rolling Radius Coefficients

	Rr Casing
	348R
RroulNappes	0.3473
RroulAlpha : exponential coefficient	87.7024
RroulDelta1 : slip angle dependancy	3.45E-05
RroulDelta2 : square slip angle dependancy	-7.77E-06
RroulV1 : speed dependency	-1.78E-05
RroulV2 : square speed dependency	3.85E-07
RroulGamma1 : camber dependency	-2.73E-05
RroulGamma2 : square camber dependency	-6.22E-05
Re0	0.3507
ReP	4.54E-04

Pressure [bar]	2.0
Fz [N]	8000.0
Camber gamma [deg]	-3.0
SlipAngle [deg]	0.0000
V [m/s]	83.3

Kzz (N/m)	387649
fleche (m) = Fz / Kzz (droop)	0.0206
Rolling radius - Rroul [m]	**0.3487**

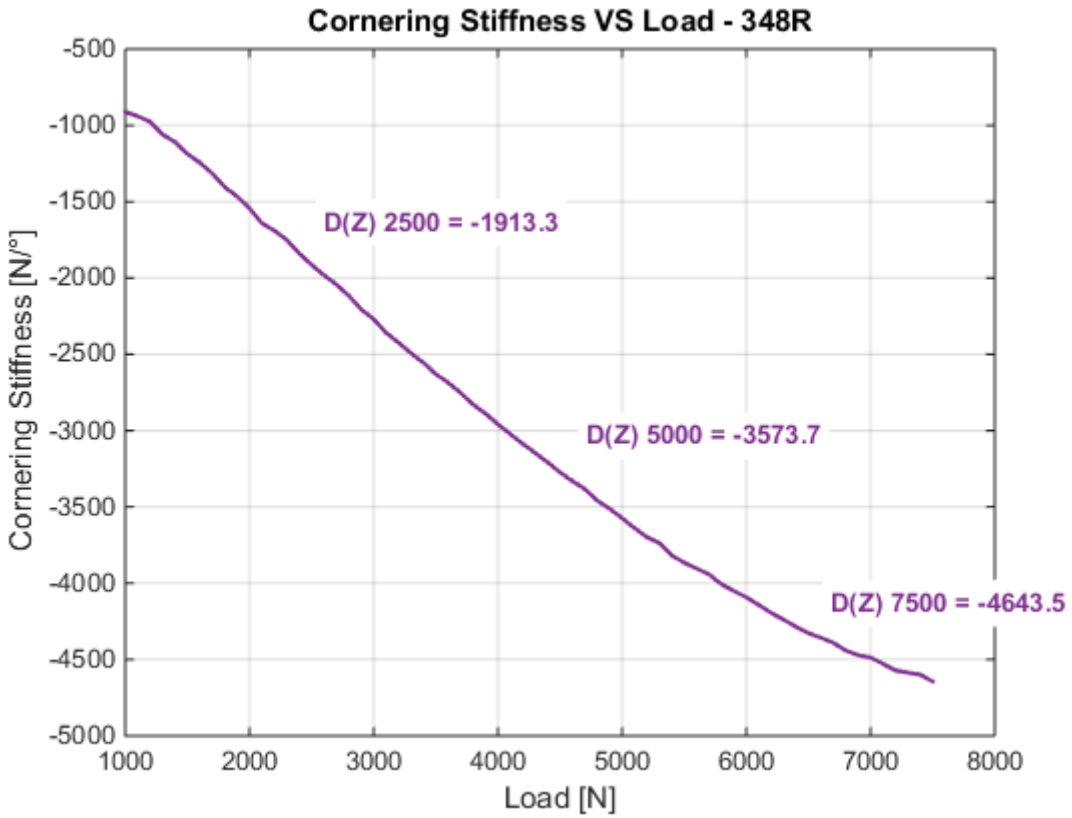
Please find in the file “20210305_RollingRadius_297R_348R.xlsx” an excel sheet to calculate tyre rolling radius with the coefficients above.

1.4 Cornering Stiffness

The critical difference is about ±1.5% on Cornering Stiffness at 5000N.
The results shown are based on flattrack machine testing.

	Cornering Stiffness [N/°]
Vertical Load [N]	**348R**
2500	-1913.3
5000	-3573.7
7500	-4643.5

348R :



1.5 Lateral Rigidity

The results shown below are based on flattrack machine testing.

Lateral Rigidity [N/mm]	
Fz=5000N / carro / pression	**348R**
Fz=5000N / 0° / 1b7	298.3
Fz=5000N / 0° / 1b9	314.8
Fz=5000N / -3° / 1b7	241.7
Fz=5000N / -3° / 1b9	271

348R :