

Guide to creating Maths Channel

This should assist you in creating the calculated front and rear load split channels

MCR Data

MR fl	Front Left Motion Ratio	0.810
MR fr	Front Right Motion Ratio	0.810
MR rl	Rear Left Motion Ratio	0.688
MR rr	Rear Right Motion	0.688
M fl	Front Left total measured static corner mass [kg]	126
M fr	Front Right measured static corner mass [kg]	138
M rl	Rear Left total measured static corner mass [kg]	201
M rr	Rear Right total measured static corner mass [kg]	227
Mus fl	Front Left unsprung mass [kg]	22.5
Mus fr	Front Right total unsprung mass [kg]	22.5
Mus rl	Rear Left unsprung mass [kg]	24
Mus rr	Rear Right unsprung mass [kg]	24
Ks fl	Front Left Spring rate [lb/in]	408
Ks fr	Front Right Spring rate [lb/in]	412
Ks rl	Rear Left Spring rate [lb/in]	458
Ks rr	Rear Right Spring rate [lb/in]	459
Tf	Front Track [m]	1.505
Tr	Rear track [m]	1.447
L	Wheel base [m]	2.588
Rrf	Rolling Radius front [m]	0.258
Rrr	Rolling Radius rear [m]	0.277
Htot	Height of CG of total mass above ground [m]	0.368
hf	Height of Front roll centre above ground	0.0133
hr	Height of Rear roll centre above ground	0.0840

Adding effect of anti-roll bars

Make relevant calculations with the MCR data on paper so that a combined value can be used in the channel with just {G Force Lat} as a constituent channel.

Remember, when arb is used then add arb wheel rate to wheel rate due to spring

$$K_w = K_{sw} + K_{arbw}$$

Roll stiffness at each end

Front

$$K_{\phi f} = \frac{(T_f^2 \times K_{wf})}{2}$$

Rear

$$K_{\phi r} = \frac{(T_r^2 \times K_{wr})}{2}$$

Basic equations to find roll angle

$$\varphi = \frac{M_{ot}}{K_{\phi t}} \quad [\text{Rad}]$$

Where:

$$M_{ot} = M_s a_y H_{SRA} \quad [\text{Nm}]$$

$$K_{\phi t} = K_{\phi f} + K_{\phi r} \quad [\text{Nm/Rad}]$$

Replace all variables with values apart from [Lat Acc] to give $[\varphi]$

$$\text{Channel } \{\varphi\} = \frac{M_{ot}}{K_{\phi t}} \quad [\text{Rad}]$$

Where:

$$M_{ot} = M_s \times \{\mathbf{G \ Force \ Lat}\} \times 9.81 \times H_{SRA} \quad [\text{Nm}]$$

$$K_{\phi t} = K_{\phi f} + K_{\phi r} \quad [\text{Nm/Rad}]$$

(NB x 9.81 as Lat Acc channel is in G)

Elastic weight transfer WTs due to sprung mass at each end of the car

Create front and rear WT channels keeping **[G Force Lat]** in roll angle channel

$$\text{Channel } \{WT_{sf}\} = \frac{\{\varphi\} T_f K_{wf}}{2}$$

$$\text{Channel } \{WT_{sr}\} = \frac{\{\varphi\} T_r K_{wr}}{2}$$

Create {Load Split Channel}

For each end then:

{Calc Front Load Split}

= Static front load split + 2 {WTsf}

{Calc Rear Load Split}

= Static rear load split + 2 {WTsr}