

FastBike

**A Multibody Software for the Analysis of
Motorcycle Dynamics**



DYNAMOTION

move your engineering

**Type
of problem**

Trim

Stability

Handling



**Type
of simulation**

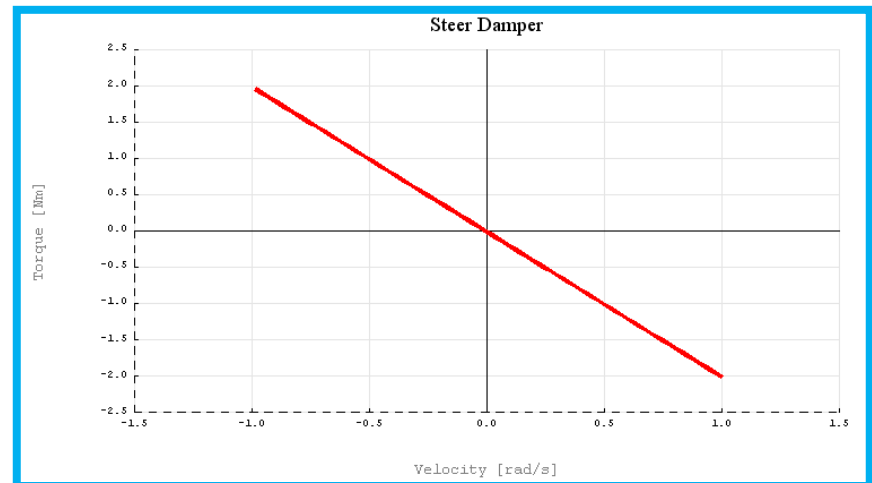
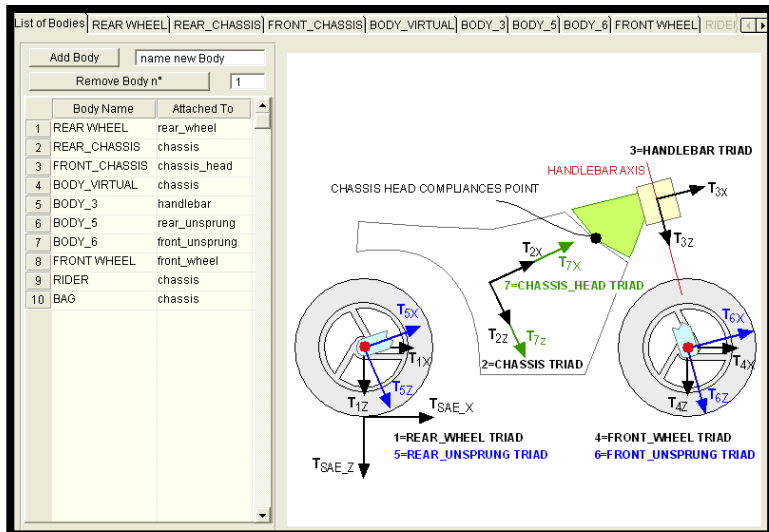
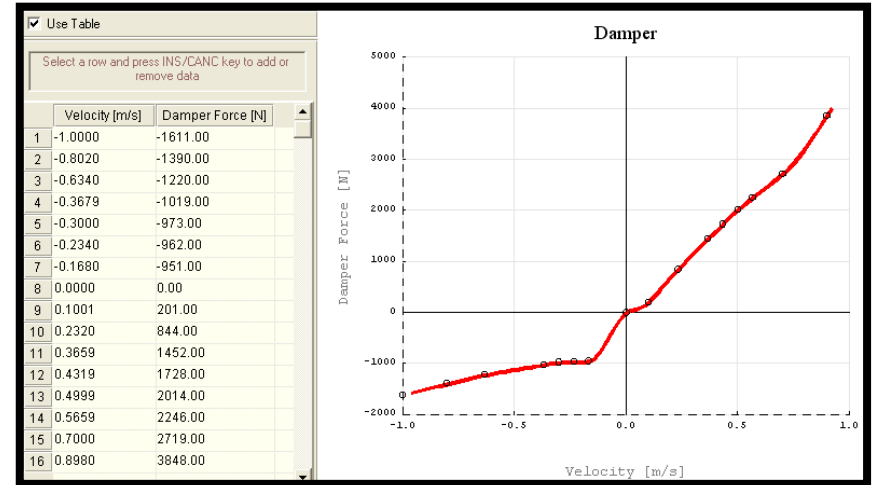
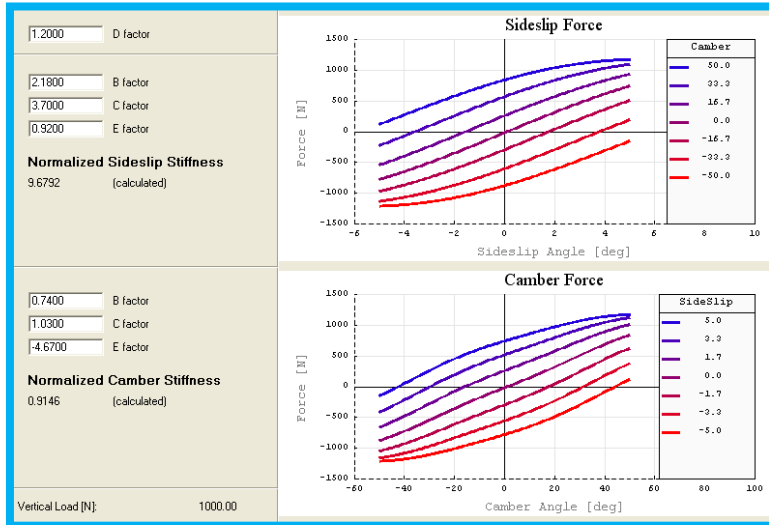
- static
- steady state

- eigenvalues
- time simulation

- time simulation
- FRF
- steady state

- **Standard bodies**
(chassis, front assembly, wheels, etc.)
- **Additional bodies**
(bags elastically suspended, etc.)
- **Several suspension linkages**
(swingarm, fork, paralever, duolever, telelever)
- **Frame and suspensions compliances**
- **Non-linear spring-shock**
- **Deformable tyre**
- **Detailed chain/shaft transmission**
- **Easy to use Graphical User Interface**
- **...and many more**





<FastBike GUI> EXAMPLE_MOTO_swing-fork-chain.lua

EXAMPLE_MOTO swing-fork

FASTBIKE

- Data
 - Sensors and Outvars
 - Sensors
 - Outvars
 - Simulation
 - Nominal Trim
 - Static Trim
 - Single Steady State
 - Multiple Steady State
 - Free Modes
 - Frequency Response
 - Slalom
 - Cornering
 - Lane Change**
 - Braking
 - Acceleration
 - Brake while Cornering

<Lane Change> EXAMPLE_MOTO_swing-fork-chain.lua

Manage Maneuver Parameter

20.00	Speed [m/s]
3.00	Lane Change Width [m]
20.00	Lane Change Transition distance [m]
10.00	Total Duration of the simulation [s]

Engaged_Gear: N

Integration Step: 0.0200

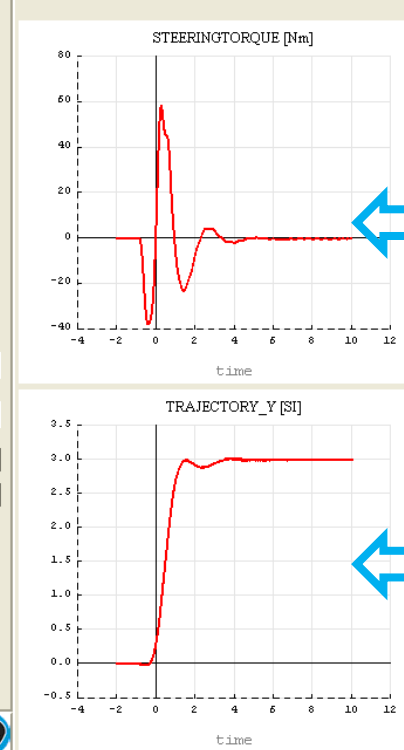
Solver Parameters: MEBDFI, h0: 1.00e-006, rtol: 1.00e-006, atol: 1.00e-003

Control Coefficient Parameters

Actual	
KP_phi	-166.86
KD_phi	-14.77
KI_phi	0.00
KP_sn	-67.62
KD_sn	-61.29
KI_sn	0.00
KP_delta	0.00
KD_psi	0.00
Cut Freq	10.00
Zeta	0.70
Leadtime	0.85

Optimal Control

Buttons: Run Simulation, CLOSE



- STEERING TORQUE**
- BRAKING TORQUE**
- ENGINE TORQUE**
- TYRE FORCES**
- ...
- TRAJECTORY**
- SPEED**
- ROLL**
- YAW**
- ...

FASTBIKE

<Free Modes> EXAMPLE_MOTO_swing-fork-chain.lua

Speed

- single case
- multi case
- Initial value: 10.0000
- Final value: 40.0000
- Number of steps: 30

Lateral Acceleration

- single case
- multi case
- Initial value: 0.0000

Longitudinal Acceleration

- single case
- multi case
- Initial value: 0.0000

Deceleration Optional Parameters

- Braking Ratio (0=only front 1=only rear): 0.0000
- Optimal Braking:
- Engine Ratio (0=no engine brake 1=only engine brake): 0.0000

Engaged_Gear: N Generate WRML file

Run CLOSE View Details

Free modes stability - EXAMPLE_MOTO swing-fork

Frequency [Hz]

Real [rad/s]

wobble

weave

- FREQUENCY
- DAMPING RATIO
- MODAL SHAPE
- ...

<FastBike GUI> EXAMPLE_MOTO_swing-fork-chain.lua

EXAMPLE_MOTO swing-fork

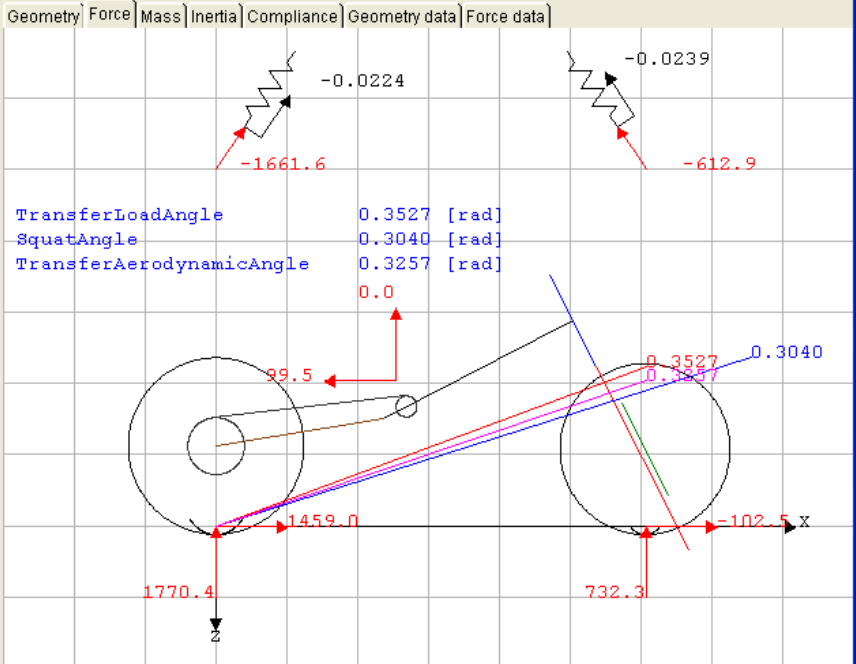
FASTBIKE





Data
 Sensors and Outvars
 Sensors
 Outvars
 Simulation
 Nominal Trim
 Static Trim
 Single Steady State
 Multiple Steady State
 Free Modes
 Frequency Response
 Slalom
 Cornering
 Lane Change
 Braking
 Acceleration
 Brake while Cornering

20.0000	Speed [m/s]
5.0000	Longitudinal acc. [m/s ²]
5.0000	Lateral acc. [m/s ²]

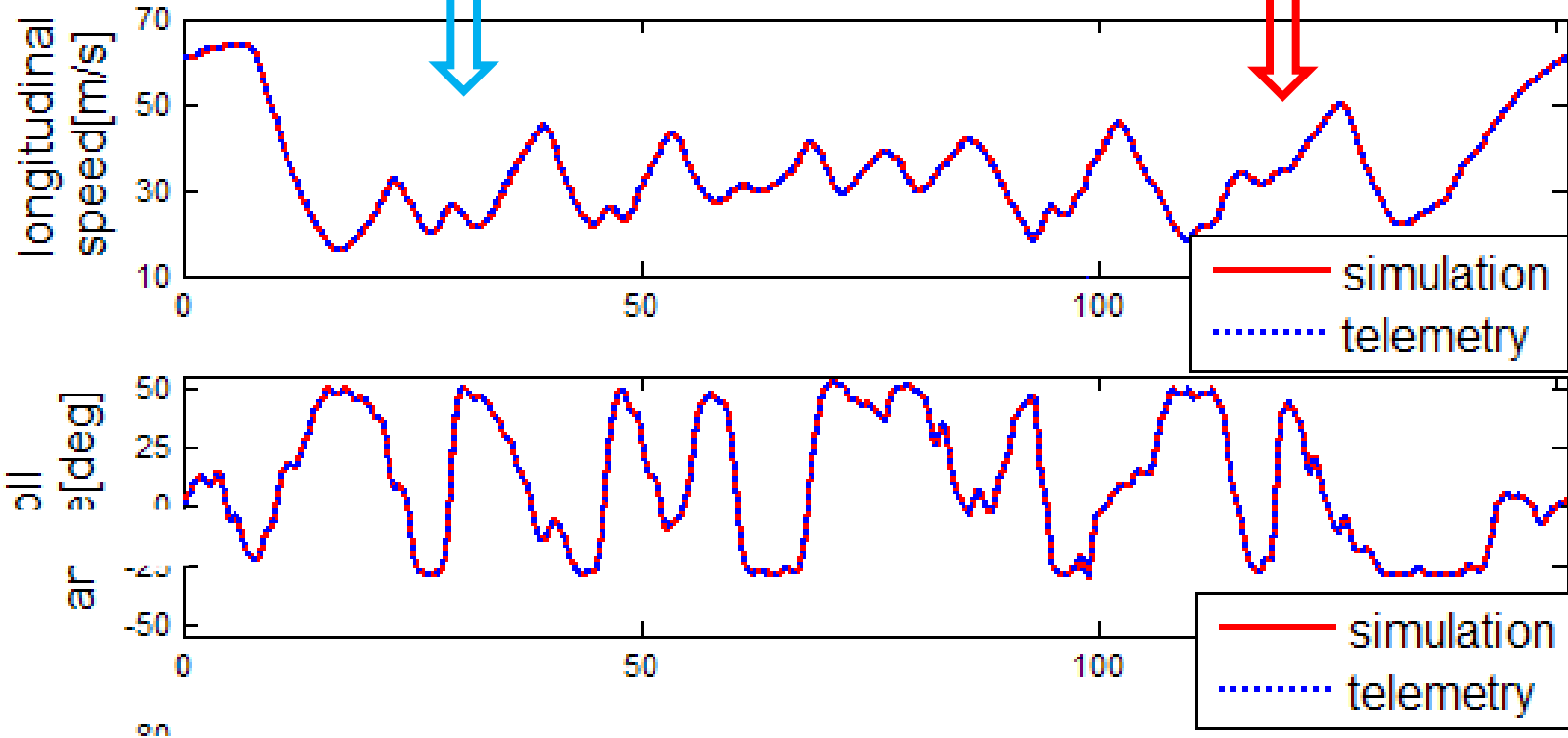
Vertical position of CoG [m]	0.5585
Longitudinal position of CoG [m]	0.7396
Roll angle [°]	32.4007
SteerEffectiveAngle [°]	1.1482
Front Normal Load [N]	732.29
Rear Normal Load [N]	1770.35
Front Lateral Force [N]	360.38
Rear Lateral Force [N]	913.71
Front Longitudinal Force [N]	-102.47
Rear Longitudinal Force [N]	1458.96
Transfer Load angle [°]	20.189
Squat angle [°]	17.399
Front suspension travel [m]	-0.0239
Rear suspension travel [m]	-0.0224

Geometry | Force | Mass | Inertia | Compliance | Geometry data | Force data



-  DIFFERENT SPEED
-  CORNERING
-  ACCELERATING
-  BRAKING

FastBike is consistent with Road Tests



Trim	[STC] . Static Trim Calculation [SSA] . Steady State Analysis
Stability	[FMS] . Free-Motorcycle Stability [FRF] . Frequency Response functions
Handling	[CSLC] . Control Synthesis for Lane Change [CSS] . Control Synthesis for Slalom [CSC] . Control Synthesis for Cornering [SLCM] . Simulation of Lane Change Maneuver [SSM] . Simulation of Slalom Maneuver [SCM] . Simulation of Cornering Maneuver
In-Plane Dynamics	[BFR] . Braking on a Flat Road [AFR] . Acceleration on a Flat Road [FRF] . Frequency Response functions