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FTire Support Checklist

1 Things to Observe when Requesting Technical Support for FTire

Before requesting FTire technical support, please check the following trouble-shooting guide.

1. Please send your request only via www.cosin.eu/support/technical-request. This will help us to assign the problem to our respective specialist.

2. Run the troublesome simulation with the **most recent FTire version**. Make sure that this FTire version was actually used. You can see the version string in FTire's first message lines.

   If you are running FTire within an MBS package and do not see any FTire message line, FTire was not yet called at all. This is most likely a case for the MBS package vendor's support.

3. Check whether **de-activation of recent changes and enhancements** of FTire might have caused the issue (open tir-file in cosin/tools → version control → check 'only use features introduced until..'). Report from what date on the issue occurs. This de-activation is only a means to identify the reason of the problem. After problem solution, **don't forget to re-activate** all FTire enhancements.

4. Switch on and read **FTire's extended message output** ('verbosity mode': open tir-file in cosin/tools → output → diagnostics → check 'message output verbose'), to recognize any additional warning or error message.

5. Switch on and watch **FTire's animation** (open tir-file in cosin/tools → animation & sound → kind of animation output → check 'on-line'), to inspect your simulation run visually. Some 3rd-party simulation environments will suppress cosin's animation. In order to prevent this, check cosin/tools → cosimulation → 'do not allow 3rd-party solver to suppress animation'.

6. Make sure that the **integrator's step size** is not larger than about **2 ms** (in the calling MBS solver settings, restrict it either with HMAX or by specifying at least 500 output steps per second simulation).

7. If you are using an accelerated **FTire speed mode**, try if the problem persists with standard speed mode 0. May be, your simulation boundary conditions (like an extremely rough road etc.) require speed mode 0.

8. Verify that the **wheels' moments of inertia** are reasonably large, after subtracting the 'free' tire parts (see below). For a passenger car, it will be in the order of magnitude of 0.1 kgm^2 or more.

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9. Do not try to cure a numerical instability by **strongly decreasing the step-size**. If FTire does not run with a calling step-size of 1 ms (at least) and an internal step-size of 0.1 ms (at least), a modelization level error is very likely.
10. Verify that the correct **fixed mass properties** are added to the rim part. To get these values, open tir-file in cosin/tools → analyze → mass correction data.
11. Inspect the **road surface geometry** with cosin/tools' **road visualization** capabilities, to exclude problems with the road data or road computation, like length unit scaling, misoriented reference frames, etc.

If the problem persists, provide

1. the file **ftire_diagnosis.txt**, located in your working directory, created by the program run during which the issue happened;
2. **all** files that are needed to re-run your simulation outside your own environment. Don't forget the **tire / road / driver / drive-train** data files, if used. In case of Adams/Car, these are the acf, adm, tir, rdf (or rgr, crg), and xml files.

If you have confidential model data, either try to reproduce the issue with uncritical data, or generate and send a **record file**, together with the tire and road data file. To this end, open the tir-file in cosin/tools, then check **'yes'** in output → diagnostics → simulation recording, and save the data file. Together with both your **tire** and **road data file**, the **record file ftire.rec** will allow us to re-run the simulation without having your vehicle data available. ftire.rec will be generated in your cosin private working directory.

Observing these points will definitely speed-up and simplify the problem resolution.

2 Things to Remember when Assessing FTire Validation Results

When assessing FTire validation results, please bear in mind that FTire is a **physics-based** tire model. It observes all relevant physical principles, like energy and impulse conservation, thermodynamics and fluid dynamics relationships, tangential stiffness matrix symmetry, etc. Whenever you compare FTire to physically contradicting test 'results', it will and must show differences. This is in clear contrast to purely mathematical approximations like Magic-Formula-type tire models.

Just to give one example: it was very simple in MF-type tire models to accurately describe a tire with **negative** rolling resistance, but obviously and fortunately this is **impossible** in FTire.

This chapter is not meant to excuse any FTire model deficiencies that might lead to unsatisfactory validation results. But when reading a validation report, one should remember

1. FTire cannot reflect physically impossible behavior
2. FTire cannot reflect contradicting test results (if for example similar characteristics are measured on different test rigs with different unknown friction properties, or if the same characteristics is measured with two different tire samples of the same size and brand)
3. Test results are often falsified or at least affected by unknown test rig imperfections, like compliances, surface friction variations, temperature variations, etc.
4. Test results are often falsified by imperfect sensors and/or data processing, like sensor noise, offset, drift, etc.
5. Test results might be given in coordinate systems, the choice of which is not documented and thus unknown (Tydex W, Tydex C, ISO, contact patch vs. spindle forces, etc.)

6. Wheel force transducers split the inertia properties of the measurement rim into two, and the relationship between these two parts is typically not documented and thus unknown
7. Drum or flat-trac surface geometries are not perfect
8. Though they can be easily modeled in FTire, tire imperfections like non-uniformity, ply steer, conicity, run-out, imbalance etc. are typically unknown
9. Operating conditions, like slip angle sweep speed, quality of wheel load control, exact geometry of cleats, actual inflation pressure, actual tread depth, actual ambient temperature, measurement rim moment of inertia, etc. might not be known sufficiently accurately.