

## Ride Quality – Half Rounds

---

User Tutorial for the Ride Quality – Half Rounds Test Bench

May 2, 2014

## 1.0 Purpose

The purpose of the Ride Quality - Half Rounds Test Benches are to provide the designer with information about the ride quality of the design and how it will impact the occupants of the vehicle.

## 2.0 Procedures

### 2.1 Installation

Initial installations will be provided with the installation of the CyPhy tool suite. The test benches will be part of the dynamics test bench suite.

### 2.2 Tool

The Ride Quality - Half Rounds Test Benches in GME allows the user to interface with Dymola, which is a simulation software application that solves a dynamics system. The CyPhy Interpreter creates a Modelica model from the CyPhy design and calls Dymola to solve the model it creates.

## 3.0 Requirements tested

- **Ride Quality - Half Rounds Test Benches:** The Gs applied to the occupants when traveling over half rounds of various sizes at a given speed.

## 4.0 Required Components

- Full Fidelity Suspension Components

## 5.0 Theory of Operation

The system (design) is assembled into Modelica representation with input parameters of the model consistent with the CyPhy components. The model is executed by Dymola, and the results are post-processed when necessary to provide the metrics for scoring.

## 6.0 Description and Test Bench Structure

The System Under Test is executed during a Suite of Test benches including one CAD test bench to determine the models mass.

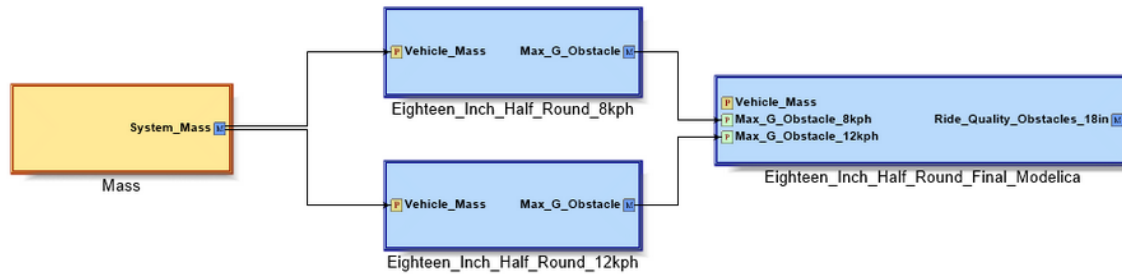


Figure 1: Suite of Tests structure for half rounds test benches

This mass is then propagated to two dynamics test benches which run the System Under Test which use the same ground context based on which the metric being tested at the threshold speed and the objective speed for that metric.

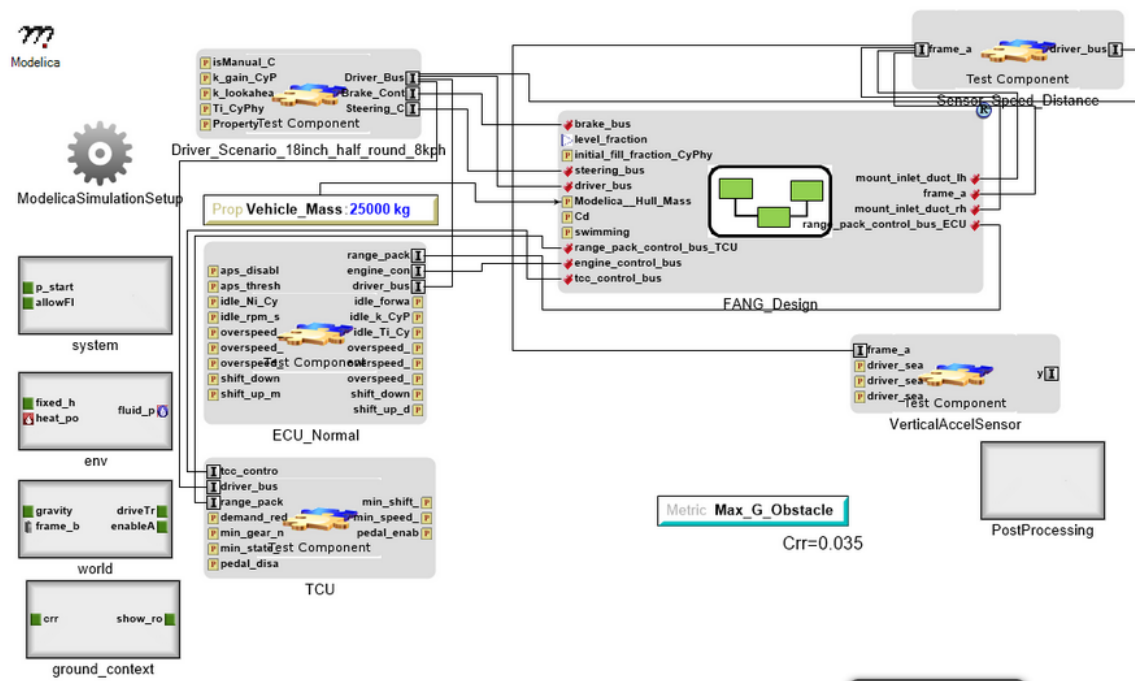


Figure 2: Test bench set up for dynamics simulation of half rounds

These values are compared in a final test bench to determine if the design meets the objective or threshold of the test bench. Table 1 below describes the metrics tested by these test benches as well as the objective and threshold speeds.

Results are returned in the testbench\_manifest.json file in the results folder.

## 7.0 Metrics

Test Bench #	Metric	Threshold (kph)	Objective (kph)	Description
13.1	Ride_Quality_Obstacles_12in	22	24	Speed in kph the vehicle was traveling when if less than 2.5G was experienced by the occupants when going over a 12 inch half round
13.2	Ride_Quality_Obstacles_14in	23	26	Speed in kph the vehicle was traveling when if less than 2.5G was experienced by the occupants when going over a 12 inch half round
13.3	Ride_Quality_Obstacles_16in	10	14	Speed in kph the vehicle was traveling when if less than 2.5G was experienced by the occupants when going over a 12 inch half round
13.4	Ride_Quality_Obstacles_18in	8	12	Speed in kph the vehicle was traveling when if less than 2.5G was experienced by the occupants when going over a 12 inch half round

**Table 1: Ride Quality Half Rounds Metrics**

## 8.0 Required Connection to System Under Test

Figure 2 shows all connections required from the test bench to execute this test.

## 9.0 Known Issues

- Currently the speed is oscillating significantly for the 8 kph test bench.