

# Anti-Roll Bar Modeling for NVH and Vehicle Dynamics Analyses

Jakub Tobolář<sup>1</sup> Martin Leitner<sup>1</sup> Andreas Heckmann<sup>1</sup>

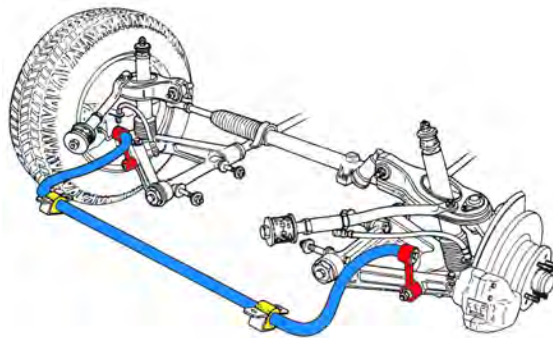
<sup>1</sup>German Aerospace Center (DLR), Institute of System Dynamics and Control, Wessling,  
Jakub.Tobolar@DLR.de

## Abstract

In the automotive field of application, the anti-roll bar is a suspension component tailored to influence the dynamical roll motion characteristics of the vehicle independently from the layout of the vertical suspension. It is designed in a way to connect suspensions on the right and the left side of the vehicle's axle by a cranked bar that acts as a torsional spring, see Figure 1. Since it is additionally attached to the vehicle body and due to the available space at the underfloor, its design often results in a geometrical complex structural element that is prone for dynamical vibrations.

The given background motivates the introduction of a new modeling capability called *AntiRollBar* into the *DLR FlexibleBodies* Library. In the present paper, a principle of the flexible body modeling and of the beam theory behind the *AntiRollBar* model is given. Additionally, its application for particular automotive-related purposes of NVH and vehicle dynamics as well as a simple simulation experiment are presented.

*Keywords: anti-roll bar, vehicle chassis, flexible body, beam model, finite element*



**Figure 1.** Vehicle axle with an anti-roll bar (color emphasized, courtesy of Wikimedia Commons).