

# Essential criteria for handling measurement of a ground



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The frequency weighted mean square value of the vertical acceleration is a well-known criterion for ride comfort. For handling, several criteria have been put forward, which are to a more or lesser extent dependent on driver input and each car company selects some of these criteria as major criteria for their design, with attention to car application, consumption, environment and road condition. Off-road test is one of the best choices for handling quality evaluation of a vehicle, in which some properties of vehicle are measured by diverse sensors that are fixed on vehicle.

Resultant of these sensor's data and professional driver's opinion is a good criterion in handling evaluation. In this work we performed some objective steady state tests (CRC) and objective transient tests (impulse steering input) on five most common vehicles in Iran and recorded different sensor's outputs and obtained some quantities. Also we performed some subjective test with professional drivers and their opinions about handling quality were recorded with scores between 1 and 20.

Then we will introduce 3 criteria, side slip angle and roll angle and time lag between steering input and lateral acceleration as most essential criteria in handling measurement, and then we will show a good agreement between categorizing these five vehicles according to each of these 3 criteria and categorizing them according to drivers' scores. Keywords: Handling Criteria, Roll Angle, Slip Angle, Steady State Test, Transient Test Introduction The root mean square value of the vertical acceleration is known to be a good criterion of comfort, and levels of acceptance in terms of comfort and safety have been determined [1].

A single, unambiguous objective criterion for handling has however eluded the vehicle science community despite numerous studies pertaining to the topic. As Vlcek [2] notes with respect to truck-trailer devices, “ It is most desirable to define evaluation criteria for the handling performance of vehicle combinations, both for steady state and transient driving behavior”. The aim of this paper is to summarize suggestions and conclusions of research on handling criteria, and to present and discuss the results of tests performed and professional drivers’ opinions evaluation and can be used by vehicle companies to enhance their products quality.

Literature survey Yaw rate and lateral acceleration: Horiuchi et al. [3] determined that drivers focus attention on yaw angle rather than on lateral position error,  $Y_e$ , for steering a two wheel steering system car. For a four wheel steering system car  $Y_e$  becomes more important. Handling (steer response) is measured in terms of yaw rate and lateral acceleration for handling characteristics of four wheel active steering vehicles over a wide maneuvering range of lateral and longitudinal accelerations [4].

Sharp and Pan [5] comment that a vehicle with no body roll in general has better steering behavior than one that rolls. Handling performance could thus be improved if the vehicle is made stiffer in roll by stiffening of anti-roll bars. Roll angle: Metrics used in subjective/objective driver-handling correlations for J-turns (step steer input) by Crolla et al. [6] include: peak lateral acceleration response time, peak road wheel steer angle and response time, peak yaw and roll rate and response time and peak value of torque applied to steering wheel and response time.