Informal Joint Working Group of GRB and GRRF – 26/27 May 2010

Comments on doc of ISO/TC31/WG6(?) STD-03-06

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As preface

The title of document STD-03-06 informs that it enclosed comments on doc GRB-50-07. But in fact doc analyzed below initiated to the attempts of discredit tyre rolling resistance deceleration method ISO/FDIS 18164 Amd 1 on the finish of its voting in ISO/TC31/WG6.

It is relevant to note that including this method into Regulation 117 in doc RF GRB-50-07 and now GRB 51-09 is not proposed. RF documents only recall that in measurements of deceleration "j" in parallel with approximation $j = \Delta\omega/\Delta t$ exact relation exists: $j = d\omega/dt$ (ω – angular velocity, t – time).
Applicability of this relation is not result of RF experts investigations. Theory of limits and differential calculus belong to I.Newton and G.Leibnitz

None the less an arguments against use of one of achievements admitted in natural science arouse interest, especially if such arguments were distributed*) between official persons.

 * As soon as the person which formed and distributed doc STD-03-06 is identified, hereinafter he named *Author*.

Peculiarities of doc STD-03-06 structure.

Part	Contents	Vol. in pages
A	Referative description of the methods of tyre rolling resistance (RR) determination and of the time-distance variant of deceleration way	12 (1-12)
B	Something about only one tyre-roadwheel deceleration test and partly about *Author's* unsuccessful attempt to solve simultaneous equations for data processing allegedly using time-distance method from ISO/DIS 18164 Amd 1	4 (13-16)
C	Information about the event that *Author* of doc STD 03-06 had accomplished tyre rolling resistance measurements by his own method of second derivation of time-distance function use and had insufficient accuracy of the result	2 (17-19)
D	*Author*'s conclusion: "The experts of ISO/TC31/WG6 recommend that the proposals made in Informal Document GRB-50-07 part D are not adopted in UN/ECE R117."	1 (20)
Notability of analyzed structure: negative conclusion in part "D" is based on one measurement partly described in part "B" only. That requires attention and consideration which gave below		

Peculiarity of doc STD-03-06 part "A".

On pages 1-12 some states principally being not news for most of rolling resistance problem experts are posed.

On page 5 one can find contradictory affirmation: "The experts of ISO/TC31/WG6 on tyre rolling resistance do not share the opinion that the methods set in Regulation No.117 are not equivalent."

This assertion is disproved by presence part 10 in new standard ISO 28580 devoted to the necessity of compensation the difference between results obtained by different methods and machines. It is good foresight that A and B coefficients in correlation equation (15) in clause 10.5.4 of standard are not limited.

Reasoning in part "A" not touches directly the time-distance deceleration method.

Strange features of doc STD-03-06 part "B".

Main attempt to discredit "time-distance" method is undertaken on pages 13-16.

Probably for that on page 13 initial times t_1, t_2, t_3, t_4 chosen from mistaken matrix is presented. Instead of drum revolutions z_1, z_2, z_3, z_4 related as 1:2:3:4 in accordance with method requirements the row 1:2.012:3.012:4.012 is taken: 86; 173; 259; 345 rev.

One can not suppose that there is deliberate garbling.
More probably that it is carelessness, but in both causes that single careless test may not be an argument against "time-distance" method.

# Peculiarity of Doc STD-03-06 page 14.

This page contains an affirmation that "time-distance" method gives periodical multivalued results.

As it well known correct solution of equation with periodic functions requires **to specify initial conditions or constraints** for finding realistic roots.

"Commonly accessible tool Microsoft Excel solver" used by *Author* does not execute this procedure instead of investigator. This caused "multiple solutions".

Correct solution of simultaneous equation cited from ISO/FDIS 18164 Amd1 is based on the property of realistic roots $Bt_{\Sigma} < \pi/2$ and never been multivalued (see for example visualization of simultaneous equations solution by iterations on next page).

Example of visualization of iteration*) (tyre 195/65 R15).
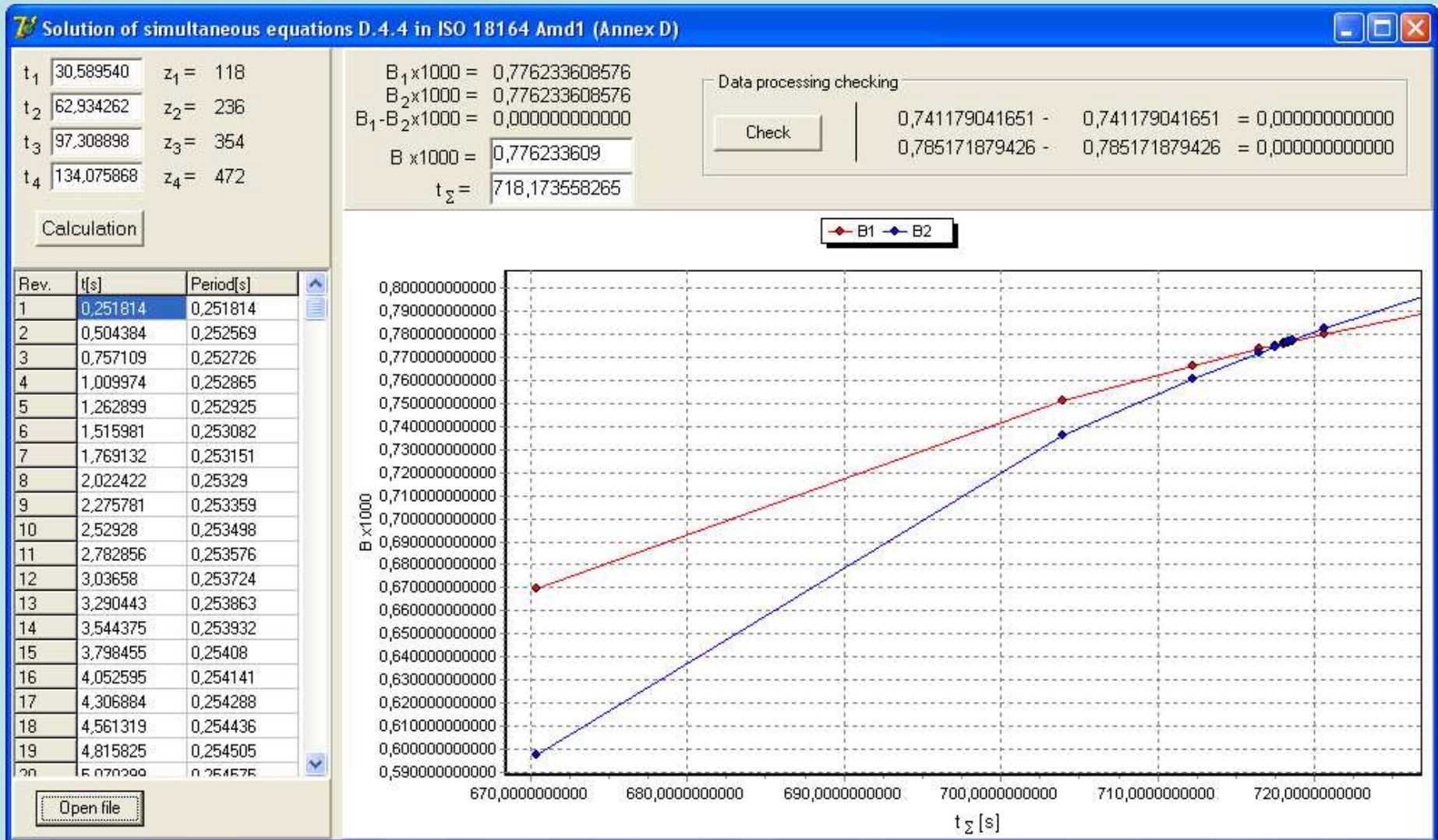
*) Special program for all WG6 members disposal sent to WG6 Convenor by project leader letter from 23/03/2010

Doc STD-03-06 page 15.

On this page the *Author* developing his previous consideration calculates nonrealistic RR forces caused by erroneous roots of equations.

Nonrealistic RR forces are the result of mistaken efforts of the *Author*.
Therefore the reasonings on pages 14-15 of doc STD-03-06 characterize not "time-distance" method, but *Author's* working style.

Note: Simple in use computer program mentioned on slide 7 is prepared with the aim to give interested persons an ability of forming their own opinion relatively correct way of solving equations D.4.4 ISO/FDIS 18164 Amd1.

Doc STD-03-06 page 16.

On this page the *Author* informs about his "second attempt" of processing previously obtained data "using the equations from SAE 2009-01-0072".So equation system "B" from SAE Paper is understudied by *Author* as different relatively "A" cited from ISO/FDIS 18164 Amd1. This mistaken understanding is reinforced by different roots of "A" and "B" systems.

$$
(A) \quad
\begin{cases}
\cos^2 B(t_\Sigma - t_1) = \cos Bt_\Sigma \cos B(t_\Sigma - t_2) \\
\cos^2 B(t_\Sigma - t_3) = \cos B(t_\Sigma - t_2)\cos B(t_\Sigma - t_4)
\end{cases}
$$

$$
(B) \quad
\begin{cases}
\dfrac{\cos^2 B(t_\Sigma - t_1)}{\cos Bt_\Sigma \cdot \cos B(t_\Sigma - t_2)} = 1 \\[2ex]
\dfrac{\cos^2 B(t_\Sigma - t_3)}{\cos B(t_\Sigma - t_2)\cos B(t_\Sigma - t_4)} = 1
\end{cases}
$$

Meanwhile it is not so difficult to see that system "B" is identical transformation of system "A" and owing to that different roots from it are additionally testify of mistaken algorithm of *Author's* data processing using in doc STD-03-06.

Doc STD-03-06 pages 17-19.

These pages contain an information about attempts to apply "a classic numerical method" of tyre RR determination using second derivation of "time-distance" experimental function. The results of not sufficient accuracy were obtained by *Author*.

In accordance with high mathematic law there are direct and absolutely exact relation between "time-distance" function and its second derivation, i.e. deceleration. If so it means that low accuracy obtained by *Author* depends from the way of mathematic approximation of time-distance measurement curve. Unfortunately the *Author* does not describe his algorithm of data processing for show to him the source of not sufficient accuracy.

Nevertheless abortive attempt must not grieve the *Author* because second derivation approach is very perspective and most promising. Also it is clear that source of failure is not the method described in ISO/DIS 18164 Amd 1 because last was not applied. When last was applied results are of high accuracy (see ISO/TC31/WG6 doc N111-113)

Discrediting technology applied by *Author* of doc STD-03-06 to "time-distance" method.

Summarizing of analysis the contents of pages 13-16 of doc STD-03-06 it became clear following logic operation sequence:

- Partial changing of described properties of the method stated in ISO/FDIS 18164 Amd 1.
- Presentation of the object with appended features as discredit arguments.
- Hiding the description of the method, equipment and test conditions used for discredit.
- Defense of personal reputation using formula "the experts from ISO/TC31/WG6 found (recommend) etc".
- Distribution of discredit personal conclusion hastily made on behalf of ISO/TC31/WG6 without awaiting official group conclusion.

This list will help to understand true aim of *Author* at nearest future.

About conclusion of doc STD-03-06

First argument of conclusion: "multiple and non realistic values for tyre rolling resistance were obtained with the proposed data interpretation process and commonly accessible resolution tools".

As it analyzed above on slides 4-7 this *Author's* conclusion relates to mistaken results obtained by private *Author's* efforts.

Second argument of conclusion is "very low sampling rate (1 time measurement per drum/tyre revolution) lead to an important decrease of measurement accuracy" of time-distance method. "Several thousands measurements in usual decelerations technique" are juxtaposed on page 7.

What is usual deceleration technique? If ISO 28580 then stated time measurement instrumentation accuracy is ±0.01 s (see table A.1). For reaching speed measurement accuracy of 0.1% required time increment must be not less than 10 s. In time-distance method increment period of revolution of drum with diameter 1.7 m and speed 80 km/h is equal 0.2403 s i.e. 40 times less.

(see next page)

About conclusion of doc STD-03-06 (continue)

"Several thousands measurements in usual decelerations technique" seems as fantastic: more probably unusual measurement system (for example in Michelin lab) provides several hundreds one. And why "several"? Whether manufacturer of such unusual system is not requested about exact quantity of samples per one rev?
If 1 rev. to divide on hundreds, for example 360 parts, then time increment will be equal 0.2403:360=0,67 ms and for reaching time measurement accuracy of 1% instrumentation one should be 6.7 µs!
It is became clear that "usual" measurement system about *Author* heard uses the principle not provided by ISO 28580. One of known variant of such principle is based on counting pulses of sensor per time segment.

So presentation *Author's* reasonings on this matter as argument against "time-distance" deceleration method is not proved.

Summary

Document STD-03-06 corresponds imitation of deep scientific investigation directed against RR determination method ISO/FDIS 18164 Amd1.Detailed analysis shows that in fact only one measurement test underlie in negative conclusion of doc STD-03-06. This test contains garbling of initial conditions and also data processing failure to comply with elementary rules of equation systems solution. Therefore the conclusion of doc under consideration are unproved.

Summary (continue)

RF proposal to add Reg.117 in context seems as follows:

Annex 6 TEST PROCEDURE FOR MEASURING ROLLING RESISTANCE

1. TEST METHODS

   The alternative measurement methods listed below are given in this Regulation The choice of an individual method is left to the tester. For each method, the test measurements shall be converted to a force acting at the tyre/drum interface. The measured parameters are:

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c) in the deceleration method: the determination of deceleration of the test drum and tyre assembly in approximate form $\Delta\omega/\Delta t$ or in exact form $d\omega/dt = d^2\varphi/dt^2$ (ω - angular velocity, φ – angle of rotation). If deceleration is obtained as second derivation of measured time-angle/distance function such way deceleration obtaining shall be detailed.

   This text only lifts a ban to use differential form $d\omega/dt$ alternatively to $\Delta\omega/\Delta t$. The risk of appearance in the future Reg.117 of new inaccurate test methods is excluded by the filter which is Annex 6 items 7.3.3 and 7.5.3.

Thank you for your attention!