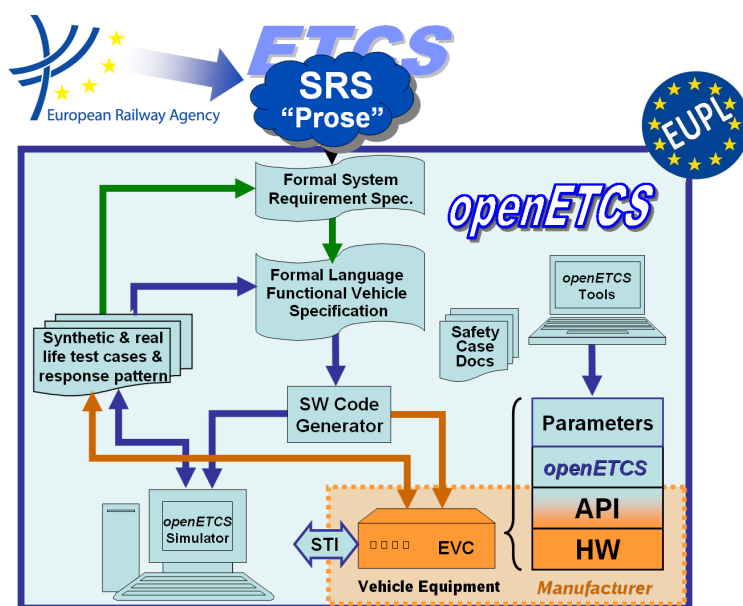


## Reduced Set of Parameters for Calculating Braking Curves within 1st Level Verification and Validation

Alexander Nitsch, Benjamin Beichler, Frank Golasowski

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**Work-Package 4: “Verification and Validation”**

**OETCS/WP4/Backlog  
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# Reduced Set of Parameters for Calculating Braking Curves within 1st Level Verification and Validation

**Version 0.1**

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Description of work

Prepared for openETCS@ITEA2 Project

**Abstract:** Work in progress.

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# Figures and Tables

**Figures**

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## 1 Reduced Parameter Set of Chapter 3.12 Speed and Distance Monitoring

University of Rostock proposes only a subset of functions of the SRS, which are part of the current validation model. This is based on the suggestion for model-language evaluation of WP2.

Basically in the 1st lvl VnV the emergency brake of a Gamma Train Brake Model is used. This implies that only  $A_{brake\_emergency}$  and  $T_{brake\_emergency}$  are used as input from train data to calculate  $A_{safe}$  and  $T_{be}$ . Finally these values are used to calculate the *Emergency Deceleration Curve* (EBD) and the Supervision Limits EBI, Warning and Indication.

Further simplifications of the SystemC Model of University of Rostock are currently assumed at the determination of MRSP, since only *Static Speed Profile* and *Axle Load Profile* are used.

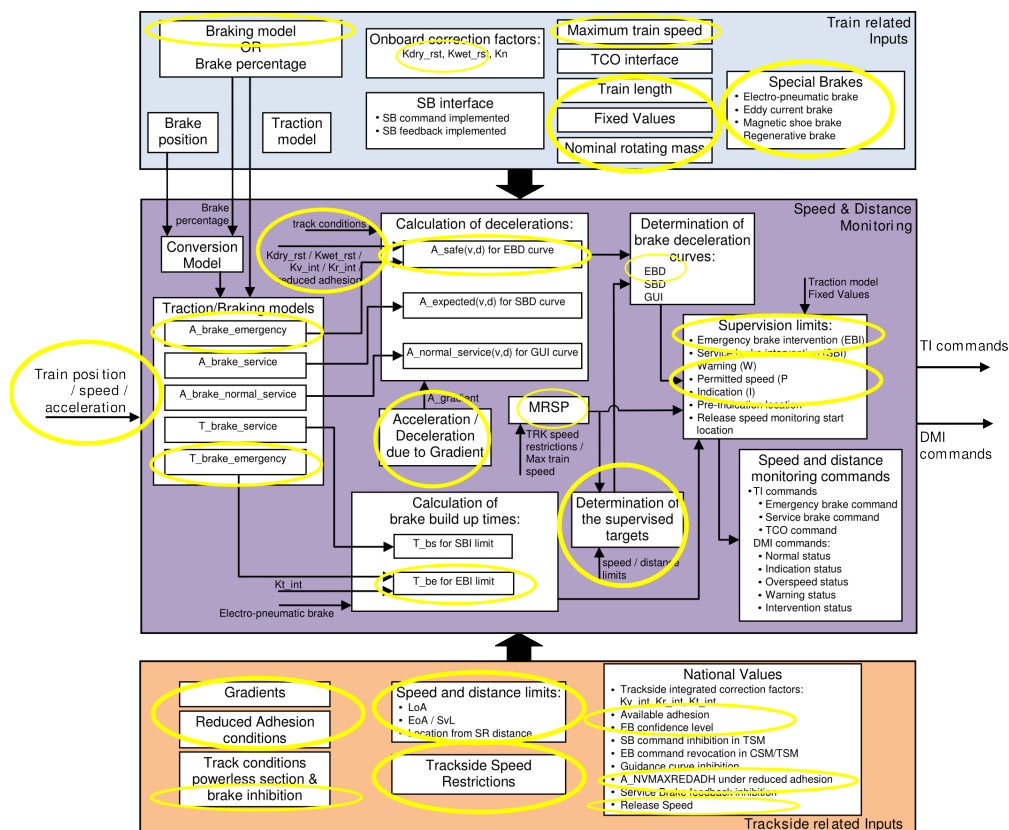


Figure 1. Reduced Module SRS

## 2 Required Input Data from Trackside for Calculating Braking Curves

(extracted from System Requirements Specification Chapter 7 ERTMS/ETCS language)

The Information of following packets are needed for several operations. Caused by the position measurement system and rules of Chapter 3.6 every packet could have a different reference position, because every packet is related to the *Last Relevant Balise Group* (LRBG) of the corresponding message (see chapter 3.8).

Therefore the Distance Information of all following packets implicitly need to use the same internal reference position system, maybe based on geographical positioning (see chapter 3.6.6) or some other kind of absolute positioning.

Nevertheless in our understanding the problem of different reference locations is out of scope of the Speed and Distance Monitoring.

**Table 1. Relevant Packets and inherent Variables - part 1**

Packet Number	Packet Name	Variable Name	Page Number
3	National Values	A_NVMAXREDADH1	11
		A_NVMAXREDADH2	
		A_NVMAXREDADH3	
		M_NVAVADH	
		M_NVEBCL	
		Q_NVDRIVER_ADHES	
		Q_NVINHSMICPERM	
		Q_NVKINT	
		Q_NVKVINTSET	
		V_NVREL	
11	Validated train data	L_TRAIN	39
		M_AXLELOADCAT	
		NC_CDTRAIN	
		NC_TRAIN	
12	Level 1 Movement Authority	Q_OVERLAP	15
		V_LOA	
		V_RELEASEDP	
		V_RELEASEOL	
15	Level 2/3 Movement Authority	D_DP	17
		D_OL	
		L_ENDSECTION	
		Q_DANGERPOINT	
21	Gradient Profile	D_GRADIENT	18
		G_A	
		Q_GDIR	
27	International Static Speed Profile	D_STATIC	19
		NC_CDDIFF	
		NC_DIFF	
		Q_DIFF	



**Table 2. Relevant Packets and inherent Variables - part 2**

Packet Number	Packet Name	Variable Name	Page Number
27	International Static Speed Profile	Q_FRONT	19
		V_DIFF	
		V_STATIC	
51	Axle load Speed Profile	D_AXLELOAD	22
		L_AXLELOAD	
		V_AXLELOAD	
67	Track Condition	D_TRACKCOND	26
		L_TRACKCOND	
		M_TRACKCOND	
71	Adhesion Factor	D_ADHESION	28
		L_ADHESION	
		M_ADHESION	
141	Default Gradient for Temporary Speed Restriction	G_TSR	35

### 3 Train Data and other local Train Variables

These Variables are part of Train Data and local parts of the EVC (e.g. odometry).

#### 3.1 Train Data

- A\_break\_emergency (for all combinations of special brakes)
- Kdry\_rst
- Kwet\_rst
- L\_TRAIN
- V\_MAXTRAIN
- M\_rotating\_nom (rotational mass as fraction of total mass)
- Binary Status Variables of all Brakes
- Brake Position (P or G for Person or Freight Trains)

#### 3.2 Odometry and other Sensor Data

- $d_{est front}$  (estimated front position)
- $d_{max safe front}$
- $V_{est}$  (estimated speed)

- $V_{ura}$  (Error in speed measurement)
- $A_{est1}$  (measured positive Acceleration of Train)