

ERTMS 2024 Conference Workshop (WS) #10b:

„How can ETCS braking curves be adapted to a more realistic behaviour of the rolling stock?“

WS Leads:

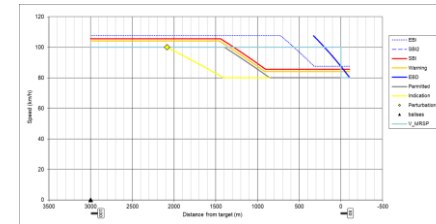
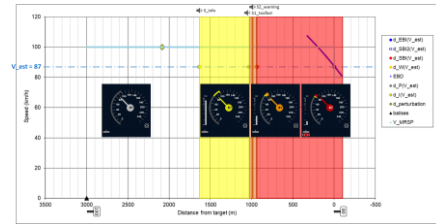


Jakub Marek (AŽD, UNISIG) &



Maarten Bartholomeus (ProRail, EUG)

WS description/aim:



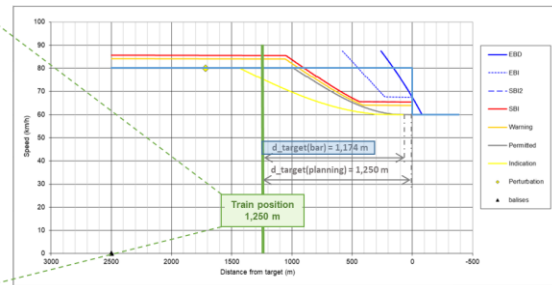
The aim of this workshop is to inform about **generic changes** on the adaptation of **ETCS Braking curves (BC)** to better reflect **real train behaviour**. We will look at the **changes** already **performed** and finalised for **Baseline 4 Release 1 (SV 3.0) in the CCS TSI 2023** as well as the ones already **identified and logged** into the ERTMS Change Requests' database, with the aim to **possibly** further **improve** the **performance** of the overall system (including the possibility to remove/minimise the need for usage of Release Speed when approaching the End of Movement Authority) **or** the **ergonomics** of the associated display towards the driver.

High-level description of such changes, including **videos/simulations** of possible solutions, **will be provided, followed by** a short **discussion**. However, experience is also demonstrating that some of the **issues** are **related to the configuration of vehicles** in order to meet the model parameters. Therefore, the discussion part will also focus on sharing experience about the setting-up of vehicles. It will be an excellent opportunity for participants to share further concerns or verified known issues.

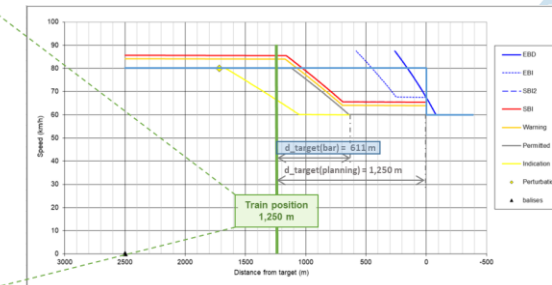
WS Topic #1 What has been done in Baseline 4 Release 1 (System Version 3.0 according to CCS TSI 2023)?



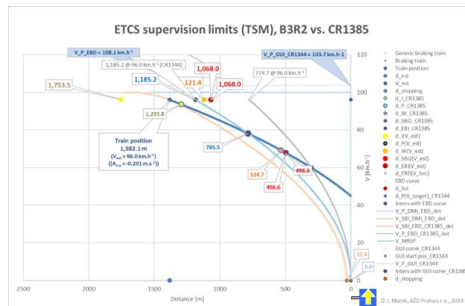
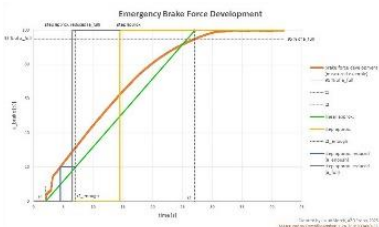
Freight train, 673 m, braked in P mode, 87 BWP; SB in TSM allowed



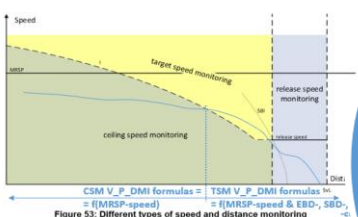
Freight train, 673 m, braked in P mode, 87 BWP; SB in TSM allowed



WS Objectives:



Locations of the ETCS supervision limits acc. to [B3R2 SUBSET-026] vs. [CR1385]	Corresponding display on the DMI – calculations according to	
	ETCS B3R2 SUBSET-026 & DMI	CR1385, orig. Marek, Myslivec, Bubenik, and Drápal (S+D (112) 3 and 6/2020)
i) The train is braking to a stand with 37 % of its full SB application, $d_{est} = 201$ m, $V_{est} = 34$ km.h ⁻¹ , $A_{est} = -0.266$ m.s ⁻²		

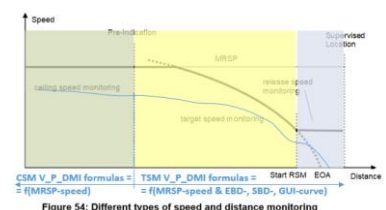


Improving performance

More relaxed braking to a target

Improving drivability

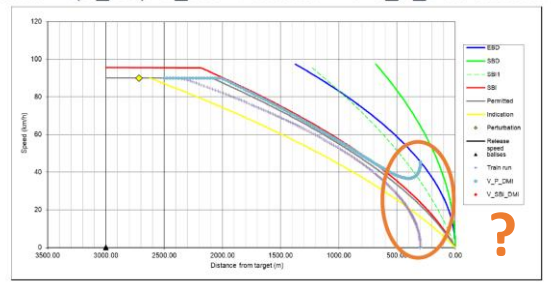
Removing some ergonomic issues



ETCS supervision limits	Corresponding display on the DMI
a) $A_{est} = 0.0$ m.s ⁻² $\Rightarrow V_{P_DMI} = 38$ km.h ⁻¹ ($\Delta V = 0$ km.h ⁻¹ comp. to $A_{est} = 0$ m.s ⁻²)	

ETCS supervision limits	Corresponding display on the DMI
a) $A_{est} = 0.5$ m.s ⁻² $\Rightarrow V_{P_DMI} = 25$ km.h ⁻¹ ($\Delta V = 13$ km.h ⁻¹ comp. to $A_{est} = 0$ m.s ⁻²)	

Fluctuation = $f(V_{est})$: $V_{est} \rightarrow 0$ km.h⁻¹ $\Rightarrow V_{P_DMI}$ increases



WS Topic #2 What can still be done in the future?

- How can the actual deceleration be taken into account during braking?

	JaM	Video 1 (B3R2)	Video 2 (CR1385)

- Can the presented permitted speed displayed to the driver be improved?

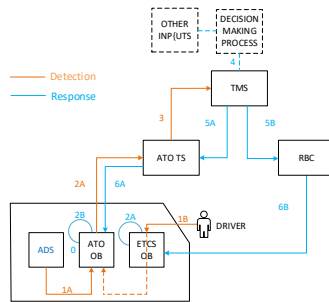
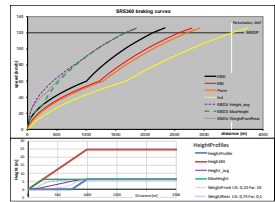
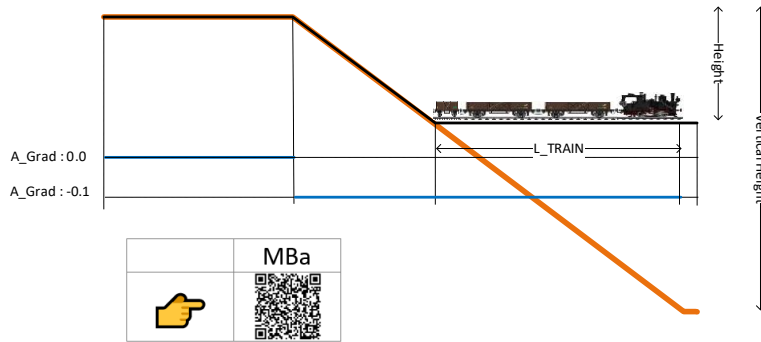
Issue 1 „falling hook effect of permitted speed“

	JaM	Video 1 (train run)	Video 2 (test lab)

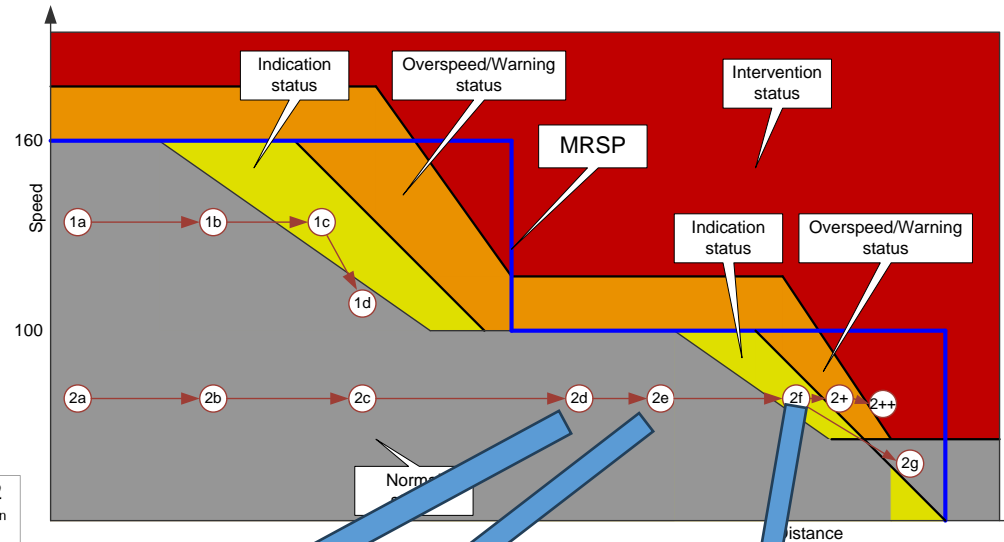
Issue 2 „fluctuating permitted speed“

	JaM	MBa	Video 1 (issue-jump of V_P down)	Video 2 (one solution proposal)

- How can the worst-case gradient under the train be avoided?

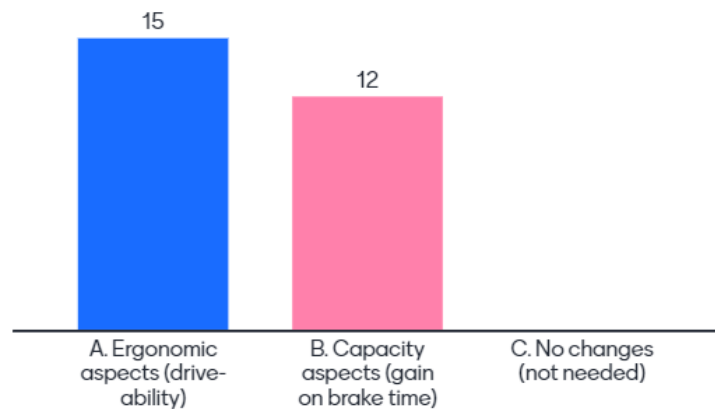


- Can adhesion handling be improved?

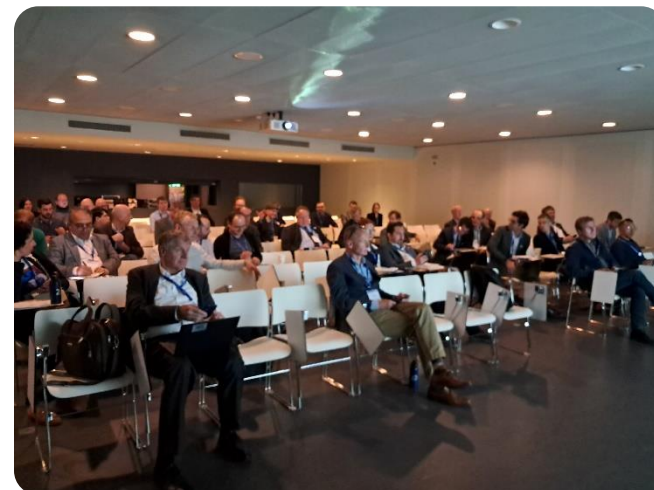


WS Conclusions

- What is the most relevant for the ETCS braking curves improvement?



- Which improvement do you think is most needed?



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