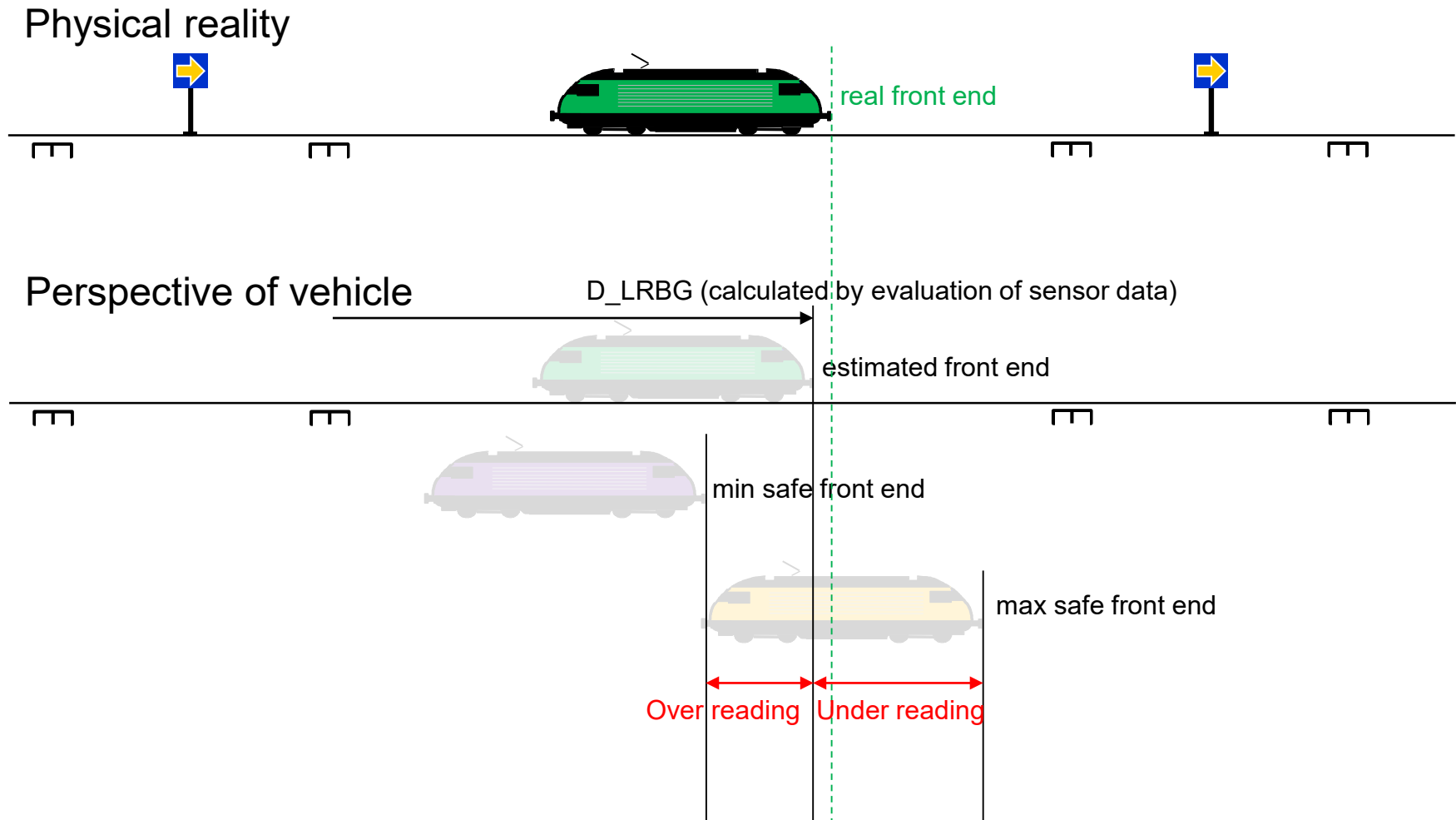
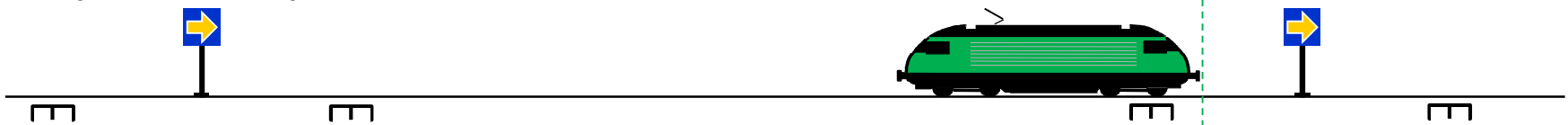


# ETCS Odometry

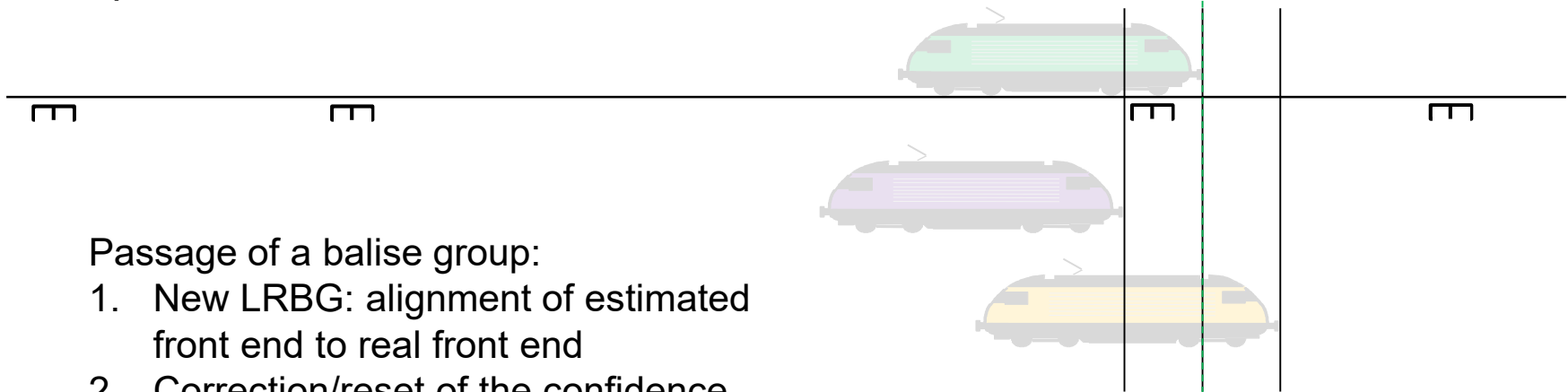


# Passage of a balise group

Physical reality



Perspective of vehicle



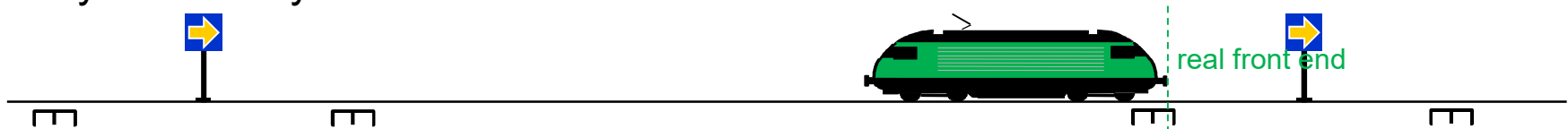
Passage of a balise group:

1. New LRBG: alignment of estimated front end to real front end
2. Correction/reset of the confidence interval (location accuracy of the BG + small tolerances)

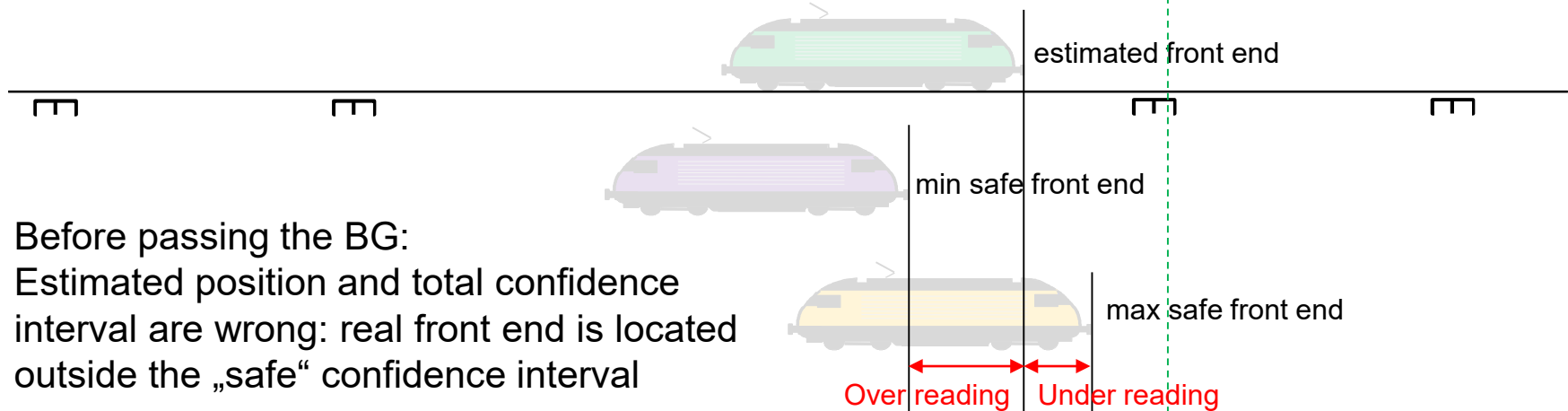
**Accurate DMI and supervision when signal corresponds to an end of authority EoA**

# Odometry fault: Real front end outside conf. interval

Physical reality



Perspective of vehicle



Before passing the BG:  
Estimated position and total confidence interval are wrong: real front end is located outside the „safe“ confidence interval

Tolerable hazard rate for ETCS onboard: ca.  $10^{-9}/h$  (SIL 4); SUBSET-091, V2.5

**Fulfilling the requirement would roughly allow 1 event every 1000 years on L2 lines in CH**

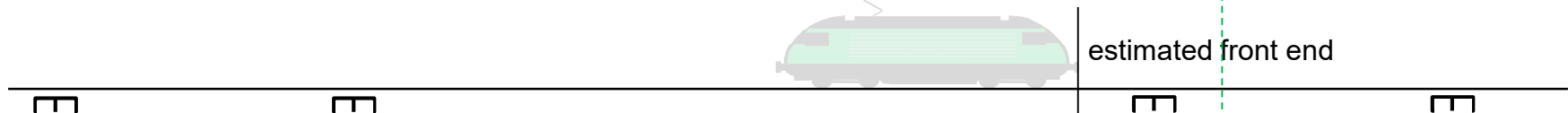
Observations/Monitoring: **100+ events per year**

# Odometry fault: Passage of balise group

Physical reality

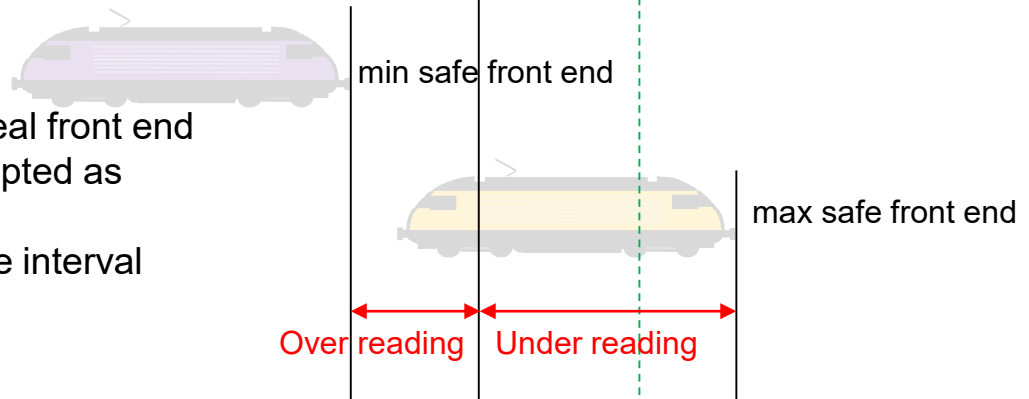


Perspective of vehicle



(1.) passage of a BG in case of a fault:

1. **No** alignment of the estimated to the real front end (linking consistency error, BG not accepted as LRBG)
2. Correction (widening) of the confidence interval (Alstom:  $\text{error} + 2 * Q\_LOCACC$ )
3. **No** reset of the confidence interval



**Supervision and timely issue of EB not possible when driver surpasses EoA in RS  
Danger point behind the signal is reached with high probability unless overlap is large**