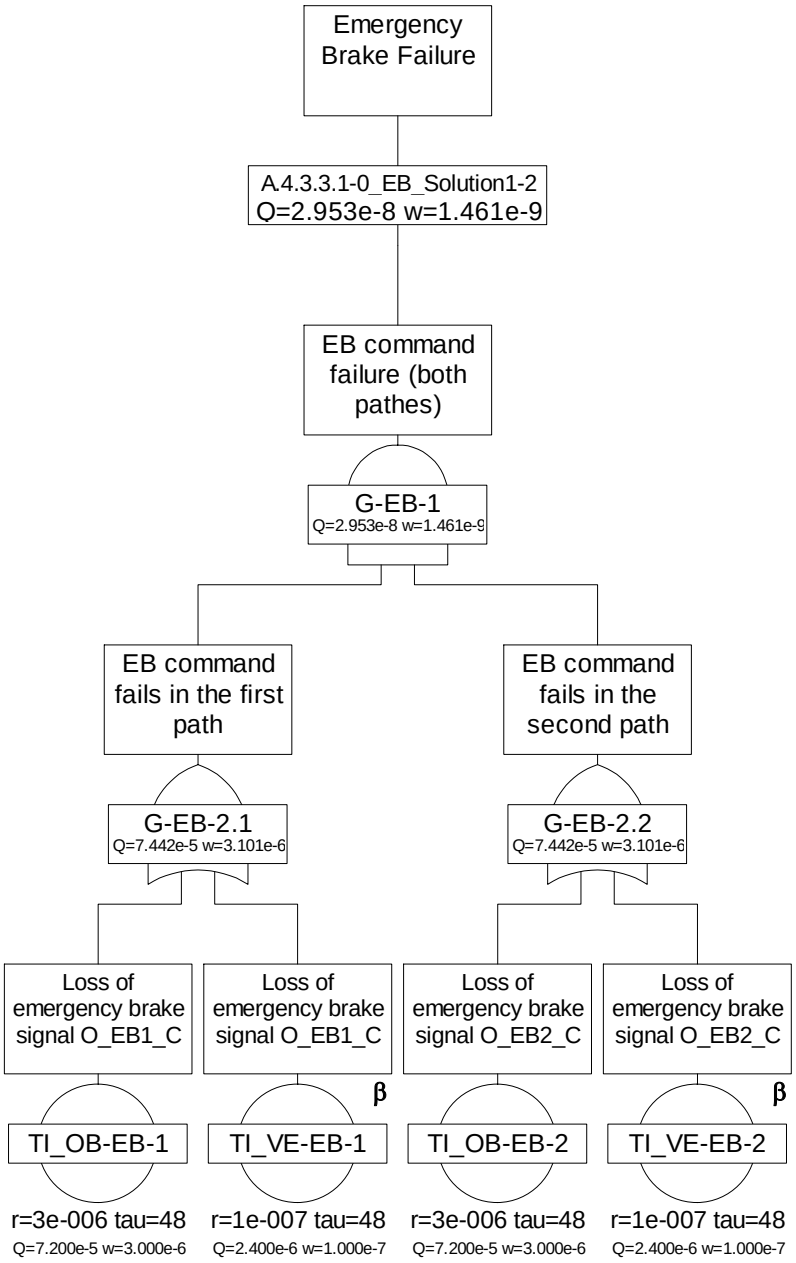
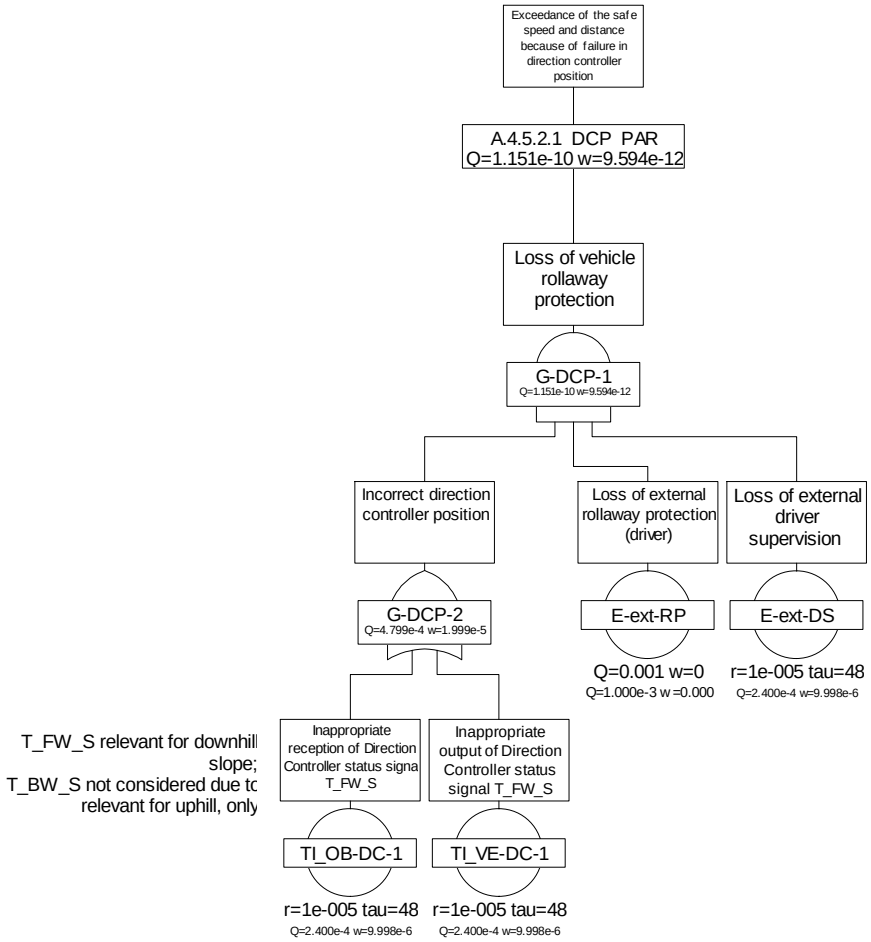
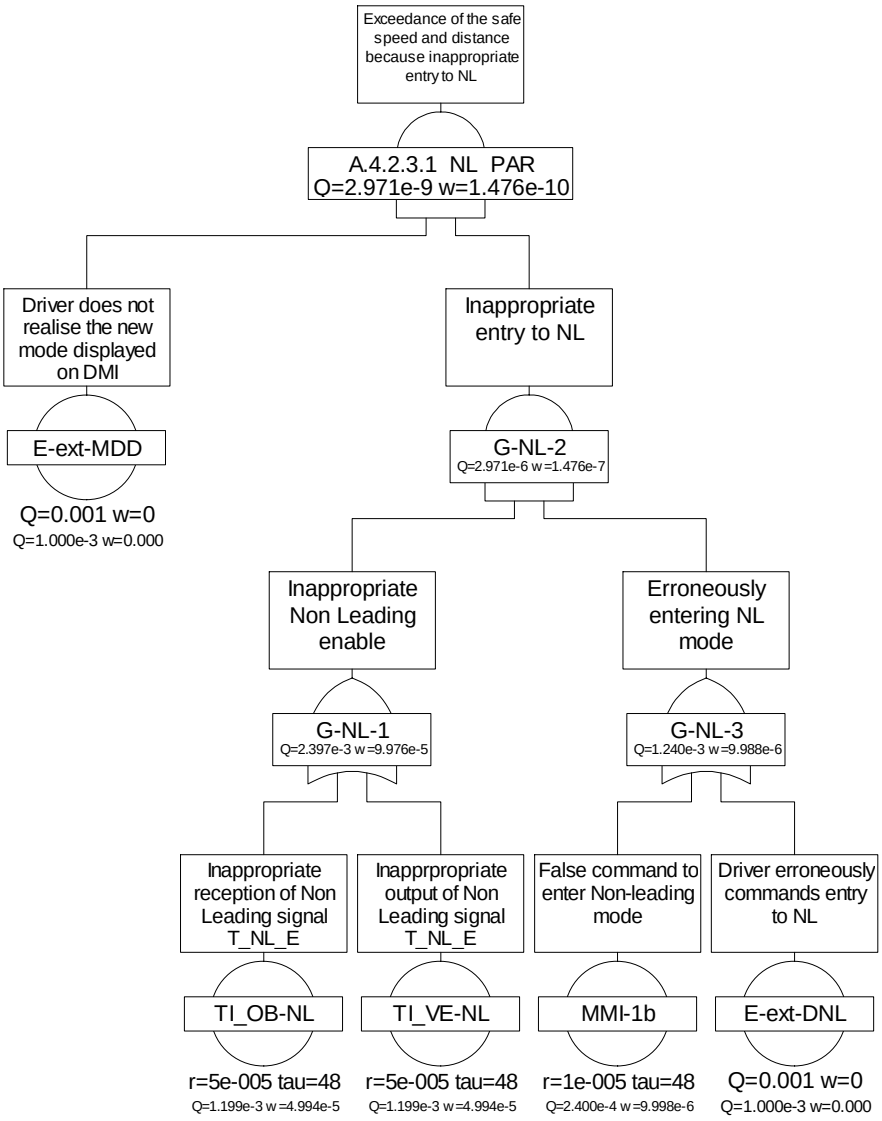
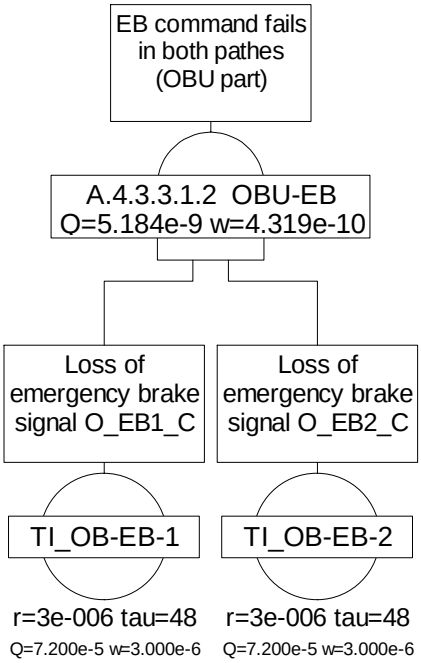
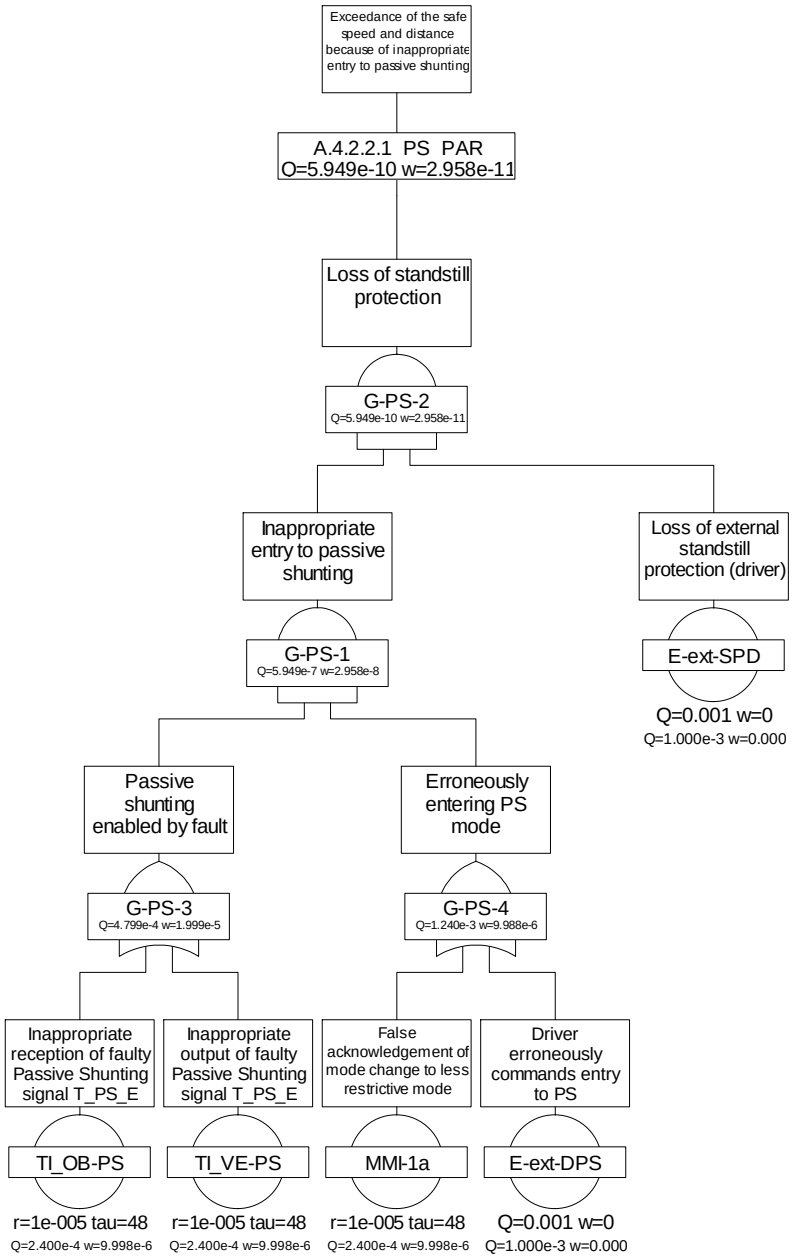
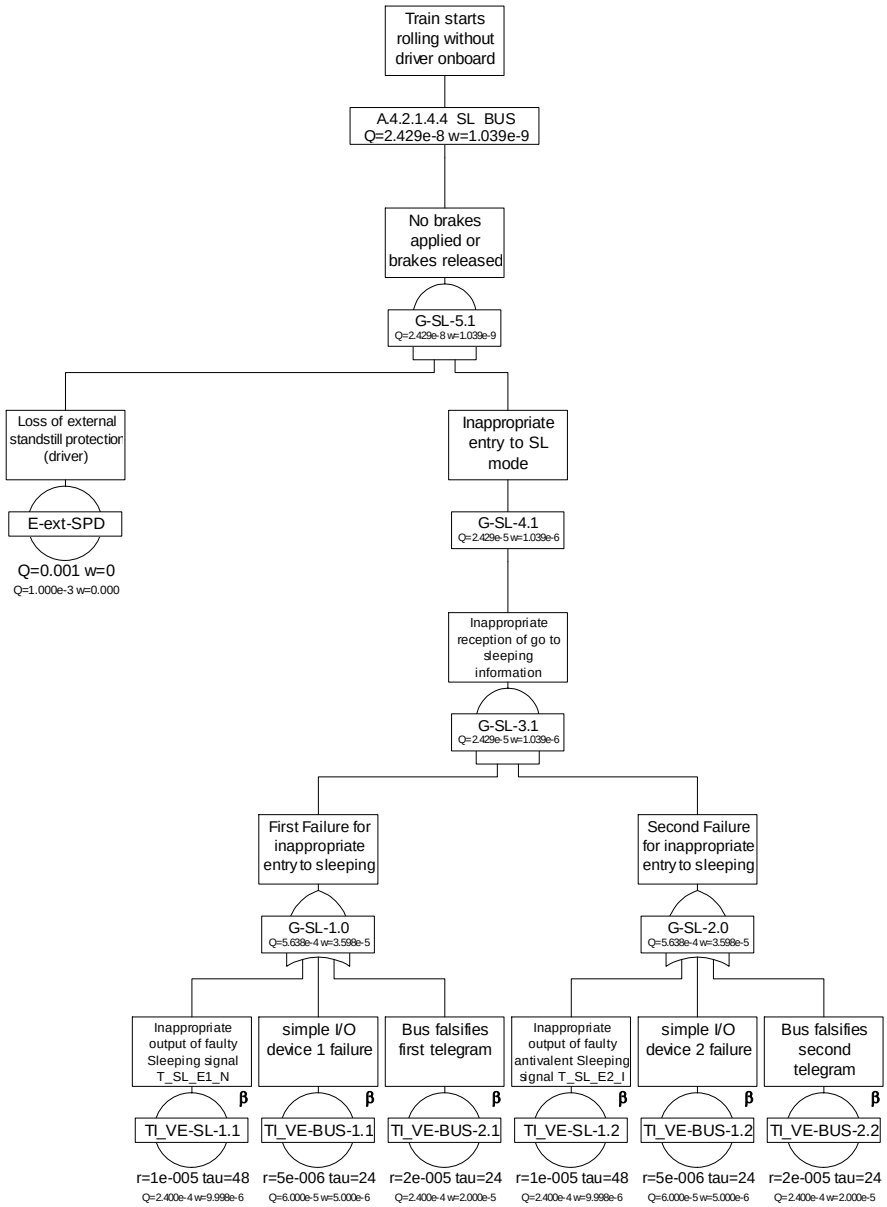

Emergency Brake Failure
A.4.3.3.1-0_EB_Solution1-2
Q=2.953e-8 w=1.461e-9
EB command failure (both pathes)
G-EB-1
Q=2.953e-8 w=1.461e-9
EB command fails in the first path
EB command fails in the second path
G-EB-2.1
Q=7.442e-5 w=3.101e-6
G-EB-2.2
Q=7.442e-5 w=3.101e-6
Loss of emergency brake signal O_EB1_C
Loss of emergency brake signal O_EB1_C
Loss of emergency brake signal O_EB2_C
Loss of emergency brake signal O_EB2_C
β
β
TI_OB-EB-1
TI_VE-EB-1
TI_OB-EB-2
TI_VE-EB-2
r=3e-006 tau=48
Q=7.200e-5 w=3.000e-6
r=1e-007 tau=48
Q=2.400e-6 w=1.000e-7
r=3e-006 tau=48
Q=7.200e-5 w=3.000e-6
r=1e-007 tau=48
Q=2.400e-6 w=1.000e-7

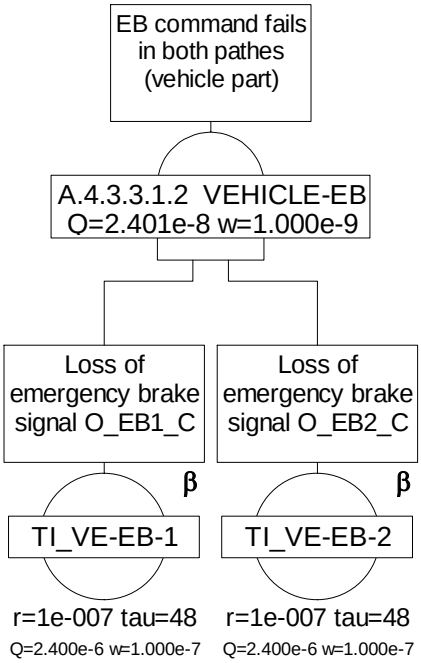

Exceedance of the safe speed and distance because of failure in direction controller position
A.4.5.2.1 DCP PAR
Q=1.151e-10 w=9.594e-12
Loss of vehicle rollaway protection
G-DCP-1
Q=1.151e-10 w=9.594e-12
Incorrect direction controller position
Loss of external rollaway protection (driver)
Loss of external driver supervision
G-DCP-2
Q=4.799e-4 w=1.999e-5
E-ext-RP
Q=0.001 w=0
Q=1.000e-3 w =0.000
E-ext-DS
r=1e-005 tau=48
Q=2.400e-4 w=9.998e-6
T_FW_S relevant for downhill slope;
T_BW_S not considered due to relevant for uphill, only
Inappropriate reception of Direction Controller status signal T_FW_S
Inappropriate output of Direction Controller status signal T_FW_S
TI_OB-DC-1
TI_VE-DC-1
r=1e-005 tau=48
Q=2.400e-4 w=9.998e-6
r=1e-005 tau=48
Q=2.400e-4 w=9.998e-6

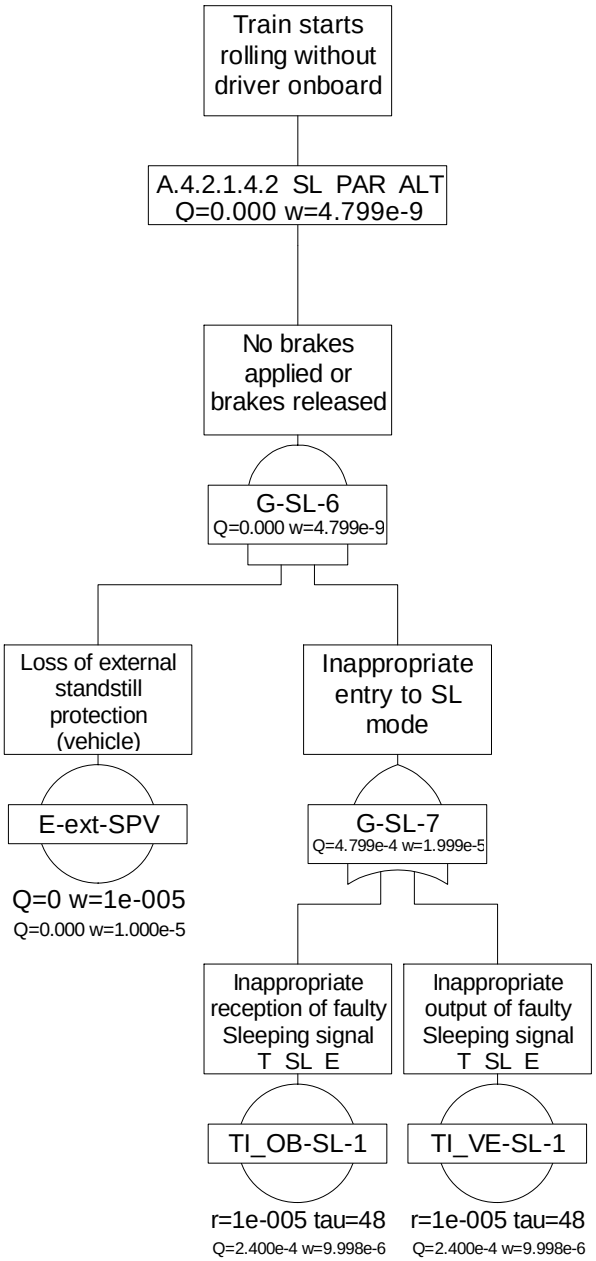

Exceedance of the safe speed and distance because inappropriate entry to NL
A.4.2.3.1 NL PAR
Q=2.971e-9 w=1.476e-10
Driver does not realise the new mode displayed on DMI
Inappropriate entry to NL
E-ext-MDD
Q=0.001 w=0
Q=1.000e-3 w=0.000
G-NL-2
Q=2.971e-6 w=1.476e-7
Inappropriate Non Leading enable
Erroneously entering NL mode
G-NL-1
Q=2.397e-3 w=9.976e-5
G-NL-3
Q=1.240e-3 w=9.988e-6
Inappropriate reception of Non Leading signal T_NL_E
Inapprpropriate output of Non Leading signal T_NL_E
False command to enter Non-leading mode
Driver erroneously commands entry to NL
TI_OB-NL
TI_VE-NL
MMI-1b
E-ext-DNL
r=5e-005 tau=48
Q=1.199e-3 w=4.994e-5
r=5e-005 tau=48
Q=1.199e-3 w=4.994e-5
r=1e-005 tau=48
Q=2.400e-4 w=9.998e-6
Q=0.001 w=0
Q=1.000e-3 w=0.000

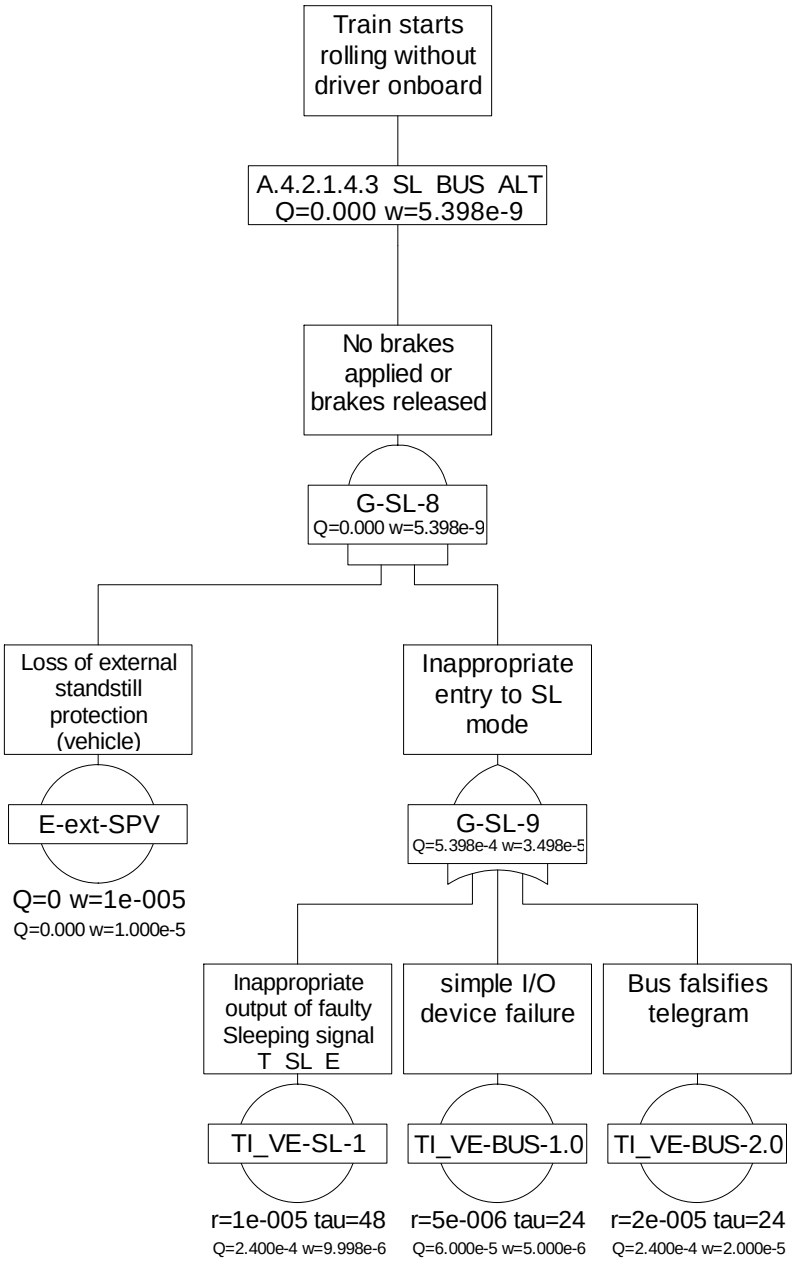

EB command fails in both pathes (OBU part)
A.4.3.3.1.2 OBU-EB
Q=5.184e-9 w=4.319e-10
Loss of emergency brake signal O_EB1_C
Loss of emergency brake signal O_EB2_C
TI_OB-EB-1
TI_OB-EB-2
r=3e-006 tau=48
Q=7.200e-5 w=3.000e-6
r=3e-006 tau=48
Q=7.200e-5 w=3.000e-6

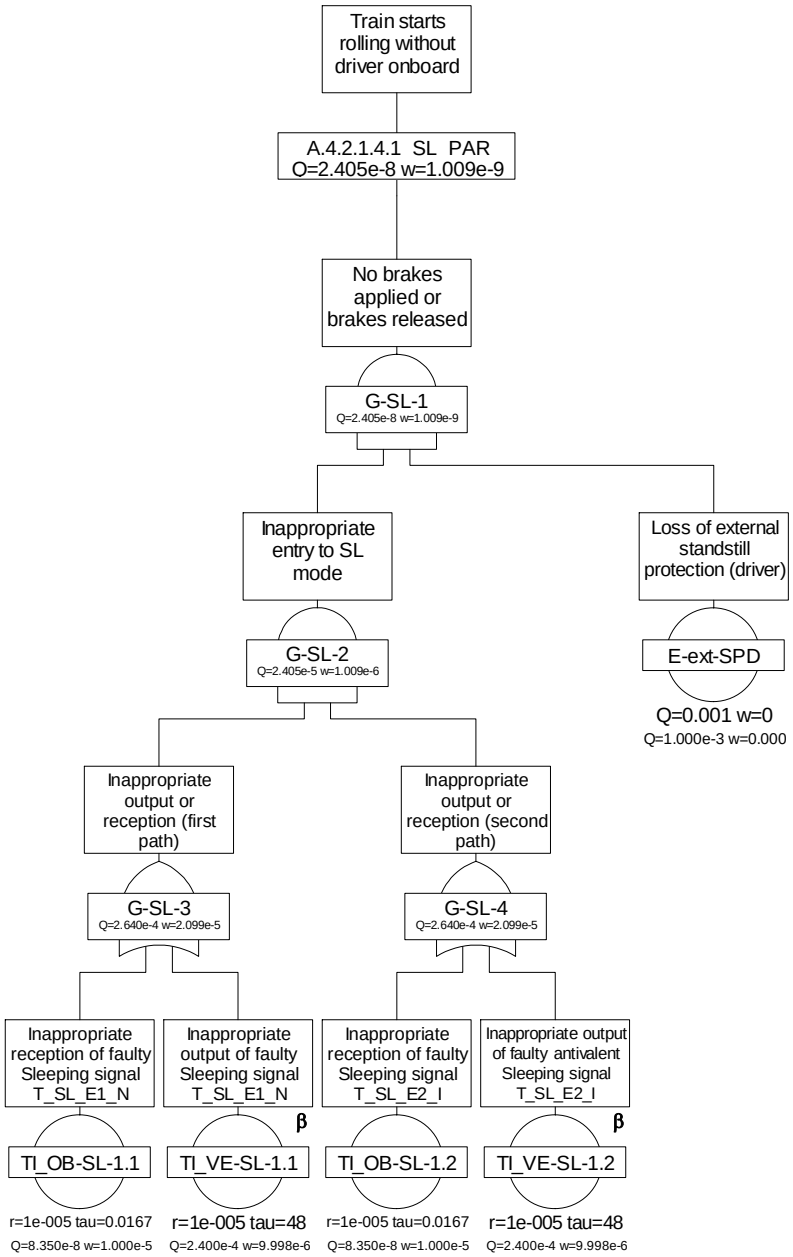

Exceedance of the safe speed and distance because of inappropriate entry to passive shunting
A.4.2.2.1 PS PAR
Q=5.949e-10 w=2.958e-11
Loss of standstill protection
G-PS-2
Q=5.949e-10 w=2.958e-11
Inappropriate entry to passive shunting
Loss of external standstill protection (driver)
G-PS-1
Q=5.949e-7 w=2.958e-8
E-ext-SPD
Q=0.001 w=0
Q=1.000e-3 w=0.000
Passive shunting enabled by fault
Erroneously entering PS mode
G-PS-3
Q=4.799e-4 w=1.999e-5
G-PS-4
Q=1.240e-3 w=9.988e-6
Inappropriate reception of faulty Passive Shunting signal T_PS_E
Inappropriate output of faulty Passive Shunting signal T_PS_E
False acknowledgement of mode change to less restrictive mode
Driver erroneously commands entry to PS
TI_OB-PS
TI_VE-PS
MMI-1a
E-ext-DPS
r=1e-005 tau=48
Q=2.400e-4 w=9.998e-6
r=1e-005 tau=48
Q=2.400e-4 w=9.998e-6
r=1e-005 tau=48
Q=2.400e-4 w=9.998e-6
Q=0.001 w=0
Q=1.000e-3 w=0.000

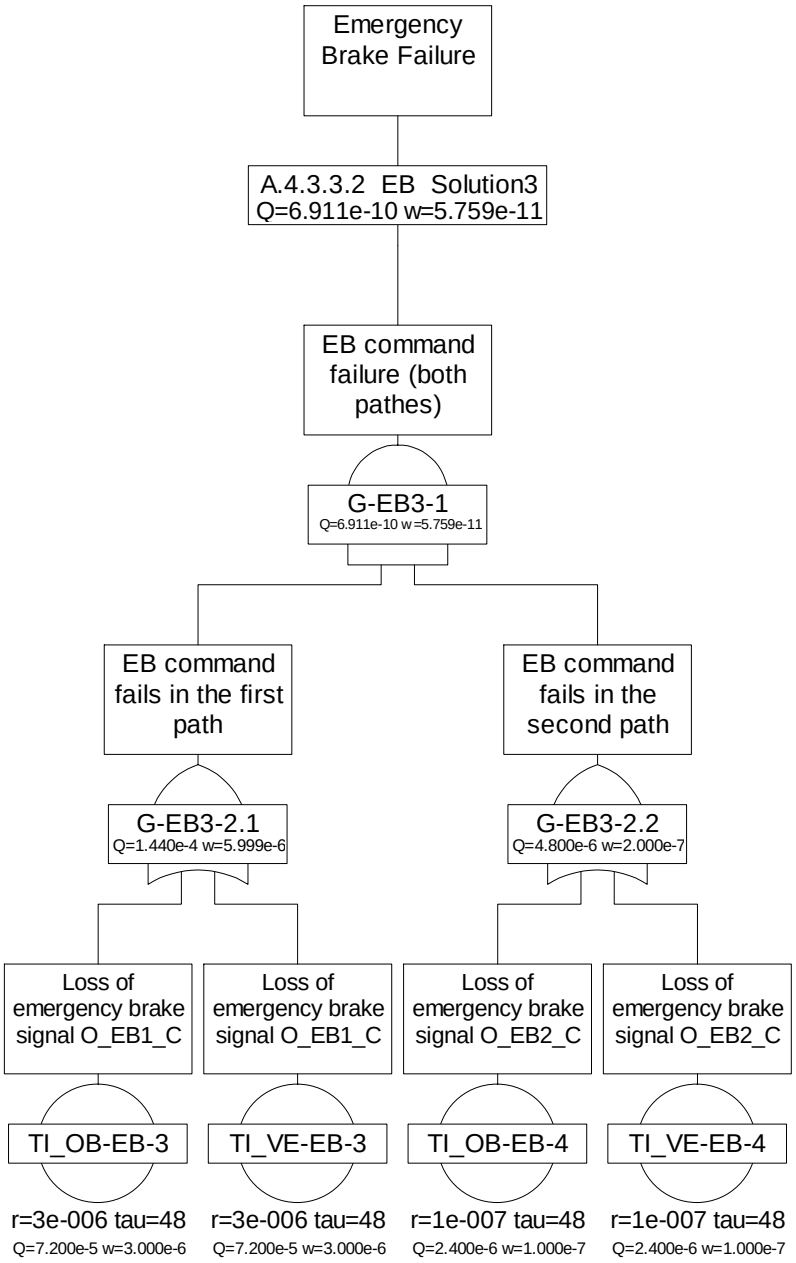

Train starts rolling without driver onboard
A.4.2.1.4.4 SL BUS
Q=2.429e-8 w=1.039e-9
No brakes applied or brakes released
G-SL-5.1
Q=2.429e-8 w=1.039e-9
Loss of external standstill protection (driver)
E-ext-SPD
Q=0.001 w=0
Q=1.000e-3 w=0.000
Inappropriate entry to SL mode
G-SL-4.1
Q=2.429e-5 w=1.039e-6
Inappropriate reception of go to sleeping information
G-SL-3.1
Q=2.429e-5 w=1.039e-6
First Failure for inappropriate entry to sleeping
Second Failure for inappropriate entry to sleeping
G-SL-1.0
Q=5.638e-4 w=3.598e-5
G-SL-2.0
Q=5.638e-4 w=3.598e-5
Inappropriate output of faulty Sleeping signal T_SL_E1_N
simple I/O device 1 failure
Bus falsifies first telegram
Inappropriate output of faulty antivalent Sleeping signal T_SL_E2_I
simple I/O device 2 failure
Bus falsifies second telegram
β
TI_VE-SL-1.1
TI_VE-BUS-1.1
TI_VE-BUS-2.1
TI_VE-SL-1.2
TI_VE-BUS-1.2
TI_VE-BUS-2.2
r=1e-005 tau=48
Q=2.400e-4 w=9.998e-6
r=5e-006 tau=24
Q=6.000e-5 w=5.000e-6
r=2e-005 tau=24
Q=2.400e-4 w=2.000e-5
r=1e-005 tau=48
Q=2.400e-4 w=9.998e-6
r=5e-006 tau=24
Q=6.000e-5 w=5.000e-6
r=2e-005 tau=24
Q=2.400e-4 w=2.000e-5

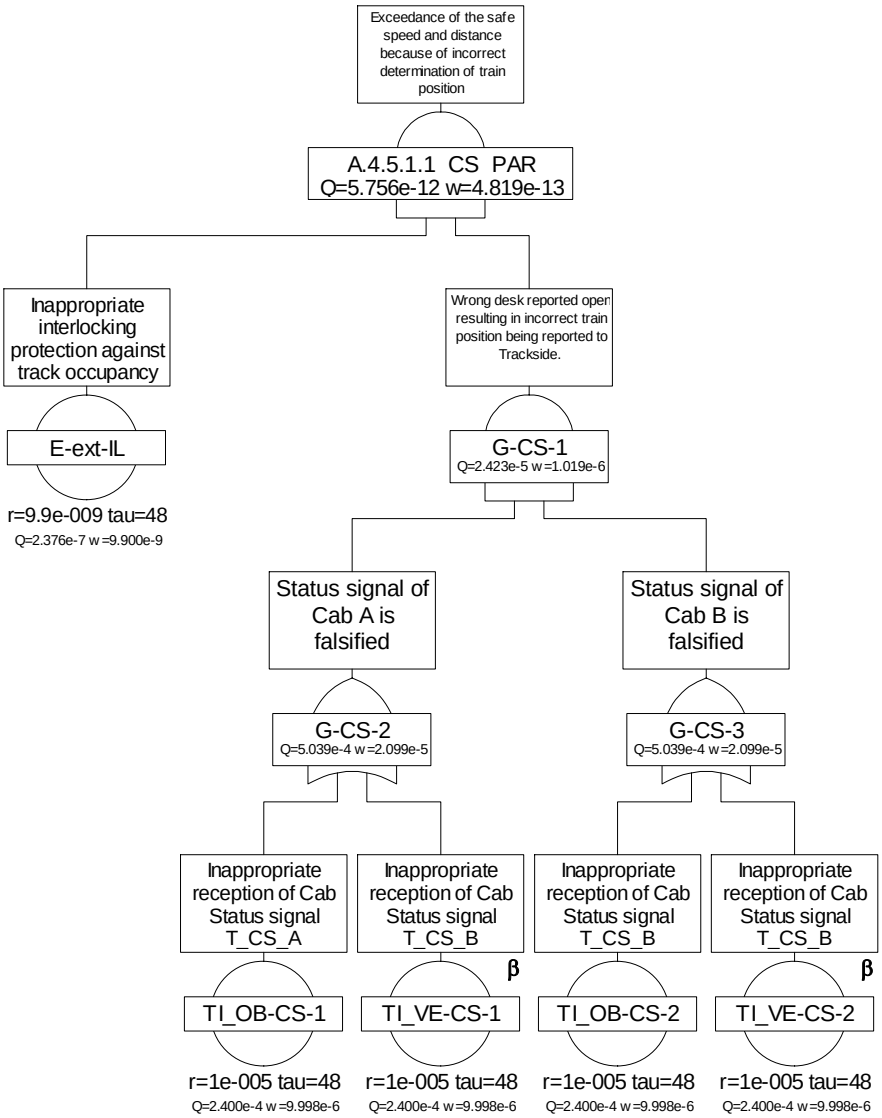

EB command fails in both pathes (vehicle part)
A.4.3.3.1.2 VEHICLE-EB
Q=2.401e-8 w=1.000e-9
Loss of emergency brake signal O_EB1_C
Loss of emergency brake signal O_EB2_C
β
β
TI_VE-EB-1
TI_VE-EB-2
r=1e-007 tau=48
Q=2.400e-6 w=1.000e-7
r=1e-007 tau=48
Q=2.400e-6 w=1.000e-7

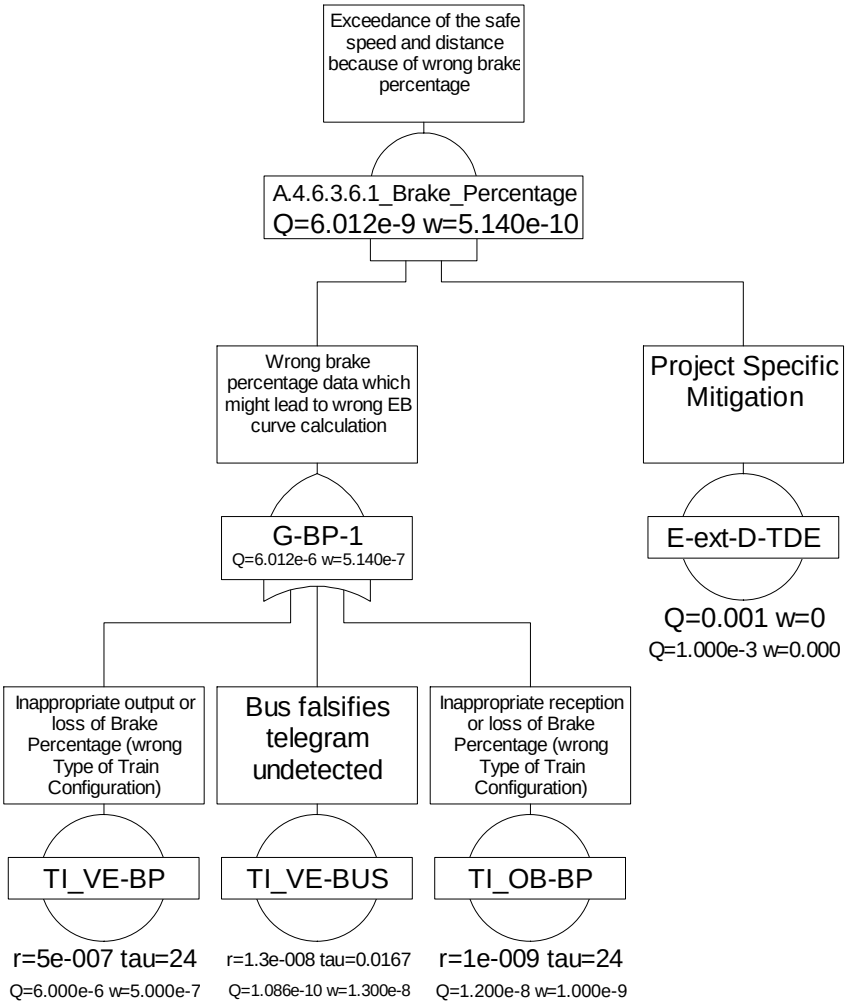

Train starts rolling without driver onboard
A.4.2.1.4.2 SL PAR ALT
Q=0.000 w=4.799e-9
No brakes applied or brakes released
G-SL-6
Q=0.000 w=4.799e-9
Loss of external standstill protection (vehicle)
Inappropriate entry to SL mode
E-ext-SPV
Q=0 w=1e-005
Q=0.000 w=1.000e-5
G-SL-7
Q=4.799e-4 w=1.999e-5
Inappropriate reception of faulty Sleeping signal T SL E
Inappropriate output of faulty Sleeping signal T SL E
TI_OB-SL-1
TI_VE-SL-1
r=1e-005 tau=48
Q=2.400e-4 w=9.998e-6
r=1e-005 tau=48
Q=2.400e-4 w=9.998e-6

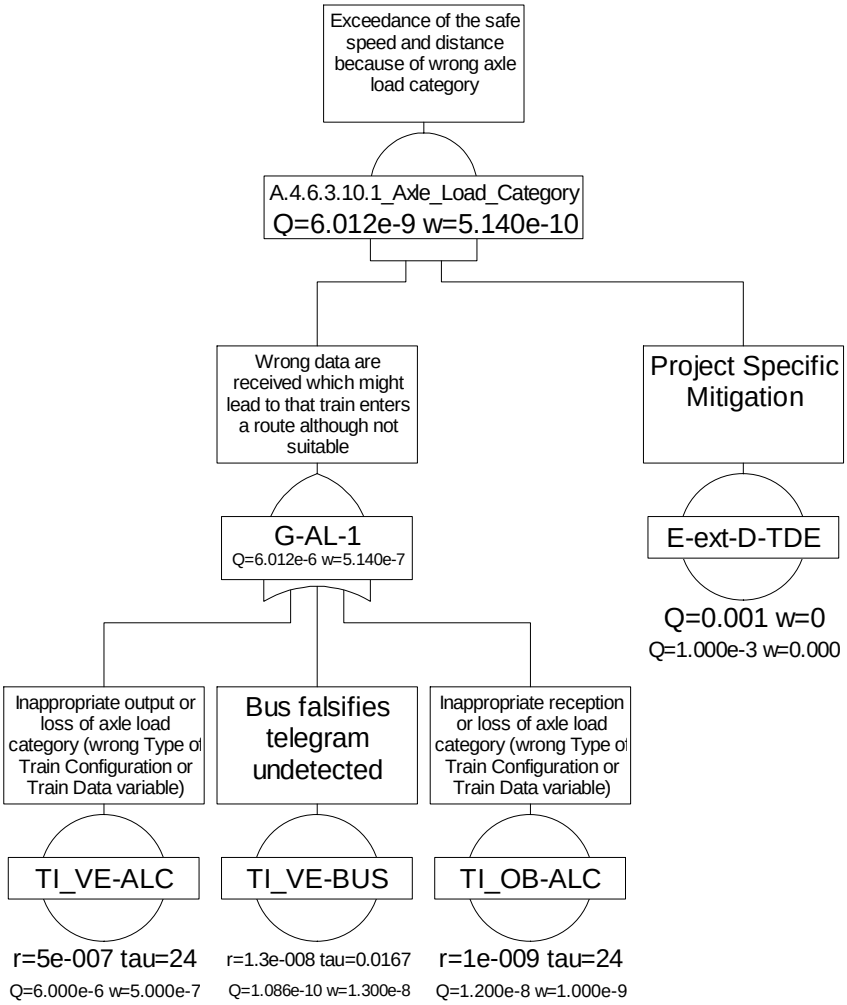

Train starts rolling without driver onboard
A.4.2.1.4.3 SL BUS ALT
Q=0.000 w=5.398e-9
No brakes applied or brakes released
G-SL-8
Q=0.000 w=5.398e-9
Loss of external standstill protection (vehicle)
Inappropriate entry to SL mode
E-ext-SPV
Q=0 w=1e-005
Q=0.000 w=1.000e-5
G-SL-9
Q=5.398e-4 w=3.498e-5
Inappropriate output of faulty Sleeping signal T_SL_E
simple I/O device failure
Bus falsifies telegram
TI_VE-SL-1
TI_VE-BUS-1.0
TI_VE-BUS-2.0
r=1e-005 tau=48
Q=2.400e-4 w=9.998e-6
r=5e-006 tau=24
Q=6.000e-5 w=5.000e-6
r=2e-005 tau=24
Q=2.400e-4 w=2.000e-5

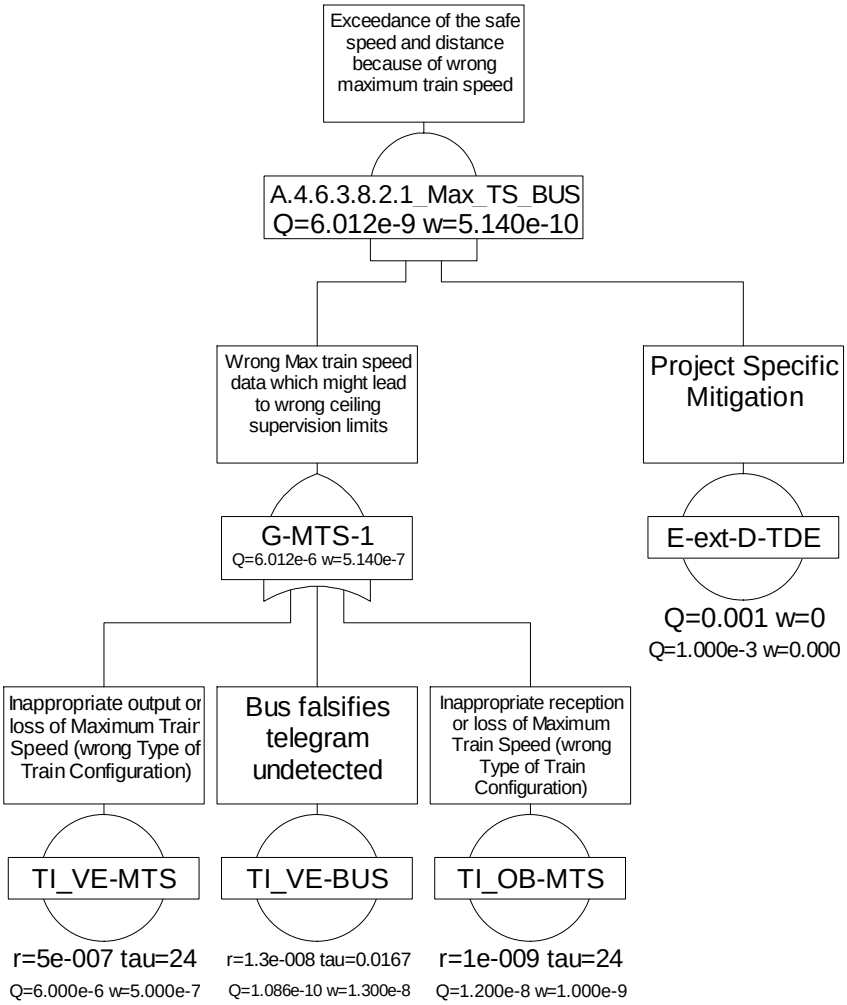

Train starts rolling without driver onboard
A.4.2.1.4.1 SL PAR
Q=2.405e-8 w=1.009e-9
No brakes applied or brakes released
G-SL-1
Q=2.405e-8 w=1.009e-9
Inappropriate entry to SL mode
Loss of external standstill protection (driver)
G-SL-2
Q=2.405e-5 w=1.009e-6
E-ext-SPD
Q=0.001 w=0
Q=1.000e-3 w=0.000
Inappropriate output or reception (first path)
Inappropriate output or reception (second path)
G-SL-3
Q=2.640e-4 w=2.099e-5
G-SL-4
Q=2.640e-4 w=2.099e-5
Inappropriate reception of faulty Sleeping signal T_SL_E1_N
Inappropriate output of faulty Sleeping signal T_SL_E1_N
Inappropriate reception of faulty Sleeping signal T_SL_E2_I
Inappropriate output of faulty antivalent Sleeping signal T_SL_E2_I
β
β
TI_OB-SL-1.1
TI_VE-SL-1.1
TI_OB-SL-1.2
TI_VE-SL-1.2
r=1e-005 tau=0.0167
Q=8.350e-8 w=1.000e-5
r=1e-005 tau=48
Q=2.400e-4 w=9.998e-6
r=1e-005 tau=0.0167
Q=8.350e-8 w=1.000e-5
r=1e-005 tau=48
Q=2.400e-4 w=9.998e-6

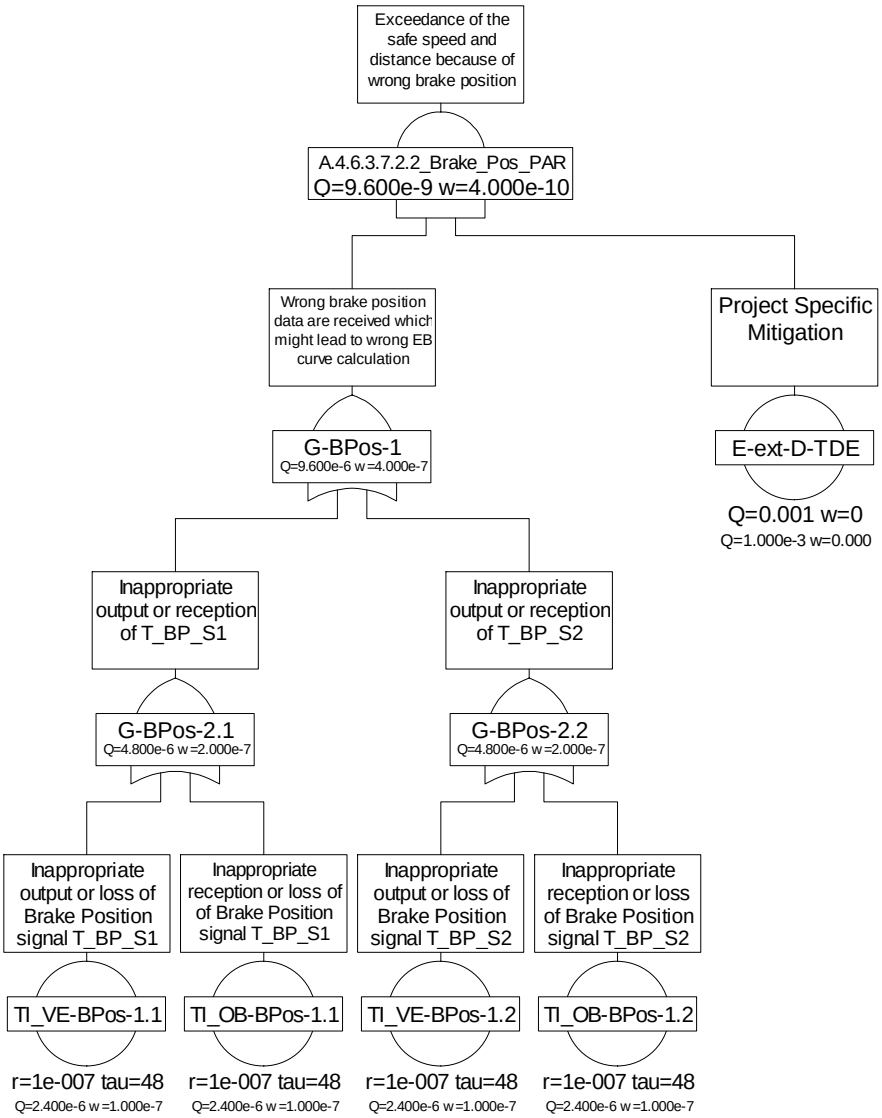

Emergency Brake Failure
A.4.3.3.2 EB Solution3
Q=6.911e-10 w=5.759e-11
EB command failure (both pathes)
G-EB3-1
Q=6.911e-10 w=5.759e-11
EB command fails in the first path
EB command fails in the second path
G-EB3-2.1
Q=1.440e-4 w=5.999e-6
G-EB3-2.2
Q=4.800e-6 w=2.000e-7
Loss of emergency brake signal O_EB1_C
Loss of emergency brake signal O_EB1_C
Loss of emergency brake signal O_EB2_C
Loss of emergency brake signal O_EB2_C
TI_OB-EB-3
TI_VE-EB-3
TI_OB-EB-4
TI_VE-EB-4
r=3e-006 tau=48
Q=7.200e-5 w=3.000e-6
r=3e-006 tau=48
Q=7.200e-5 w=3.000e-6
r=1e-007 tau=48
Q=2.400e-6 w=1.000e-7
r=1e-007 tau=48
Q=2.400e-6 w=1.000e-7

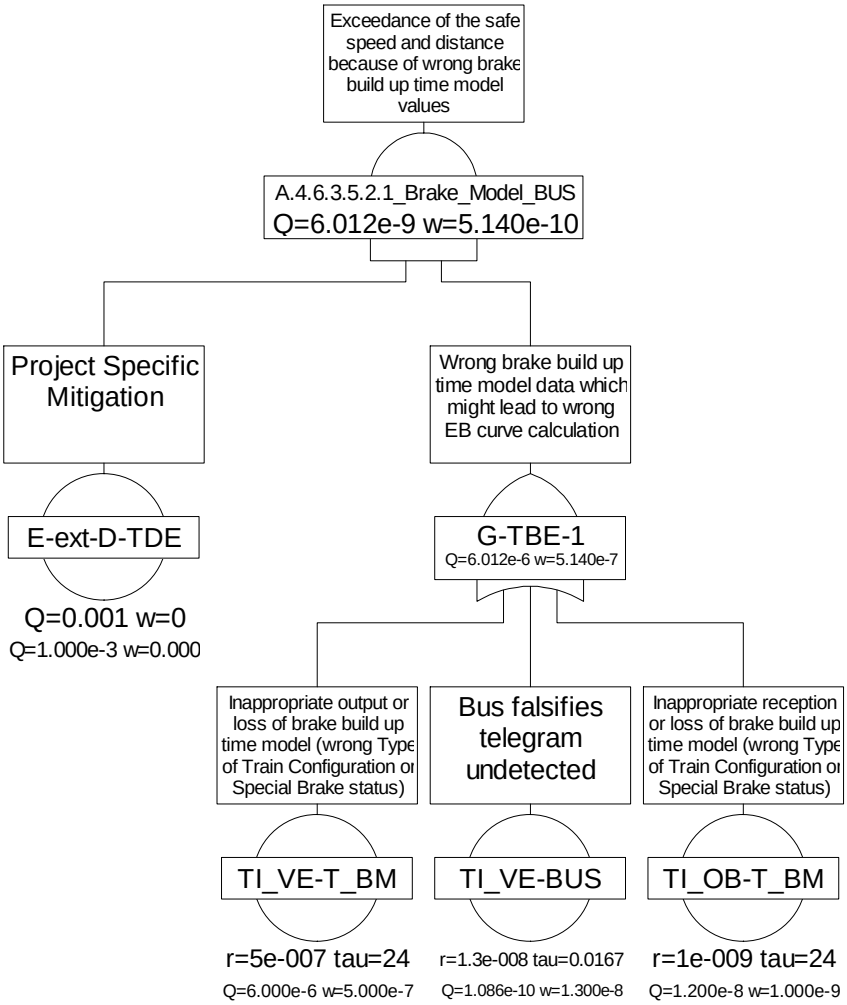

Exceedance of the safe speed and distance because of incorrect determination of train position
A.4.5.1.1 CS PAR
Q=5.756e-12 w=4.819e-13
Inappropriate interlocking protection against track occupancy
Wrong desk reported oper resulting in incorrect train position being reported to Trackside.
E-ext-IL
r=9.9e-009 tau=48
Q=2.376e-7 w=9.900e-9
G-CS-1
Q=2.423e-5 w=1.019e-6
Status signal of Cab A is falsified
Status signal of Cab B is falsified
G-CS-2
Q=5.039e-4 w=2.099e-5
G-CS-3
Q=5.039e-4 w=2.099e-5
Inappropriate reception of Cab Status signal T_CS_A
Inappropriate reception of Cab Status signal T_CS_B
Inappropriate reception of Cab Status signal T_CS_B
Inappropriate reception of Cab Status signal T_CS_B
β
β
TI_OB-CS-1
TI_VE-CS-1
TI_OB-CS-2
TI_VE-CS-2
r=1e-005 tau=48
Q=2.400e-4 w=9.998e-6
r=1e-005 tau=48
Q=2.400e-4 w=9.998e-6
r=1e-005 tau=48
Q=2.400e-4 w=9.998e-6
r=1e-005 tau=48
Q=2.400e-4 w=9.998e-6

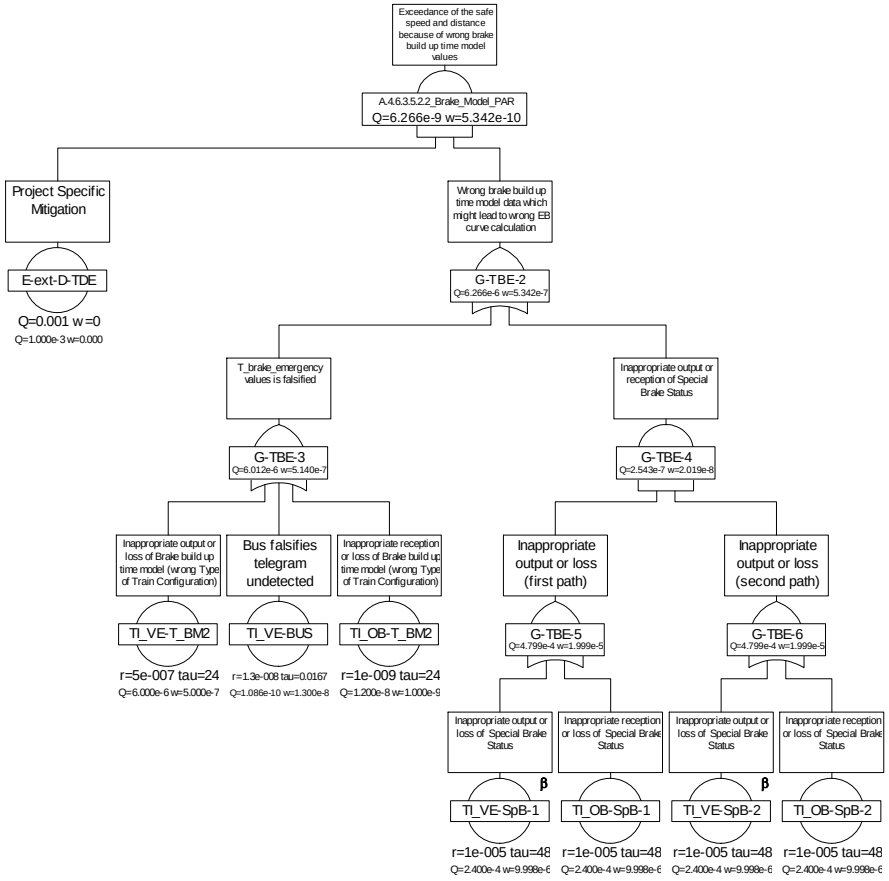

Exceedance of the safe speed and distance because of wrong brake percentage
A.4.6.3.6.1_Brake_Percentage
Q=6.012e-9 w=5.140e-10
Wrong brake percentage data which might lead to wrong EB curve calculation
Project Specific Mitigation
G-BP-1
Q=6.012e-6 w=5.140e-7
E-ext-D-TDE
Q=0.001 w=0
Q=1.000e-3 w=0.000
Inappropriate output or loss of Brake Percentage (wrong Type of Train Configuration)
Bus falsifies telegram undetected
Inappropriate reception or loss of Brake Percentage (wrong Type of Train Configuration)
TI_VE-BP
TI_VE-BUS
TI_OB-BP
r=5e-007 tau=24
Q=6.000e-6 w=5.000e-7
r=1.3e-008 tau=0.0167
Q=1.086e-10 w=1.300e-8
r=1e-009 tau=24
Q=1.200e-8 w=1.000e-9

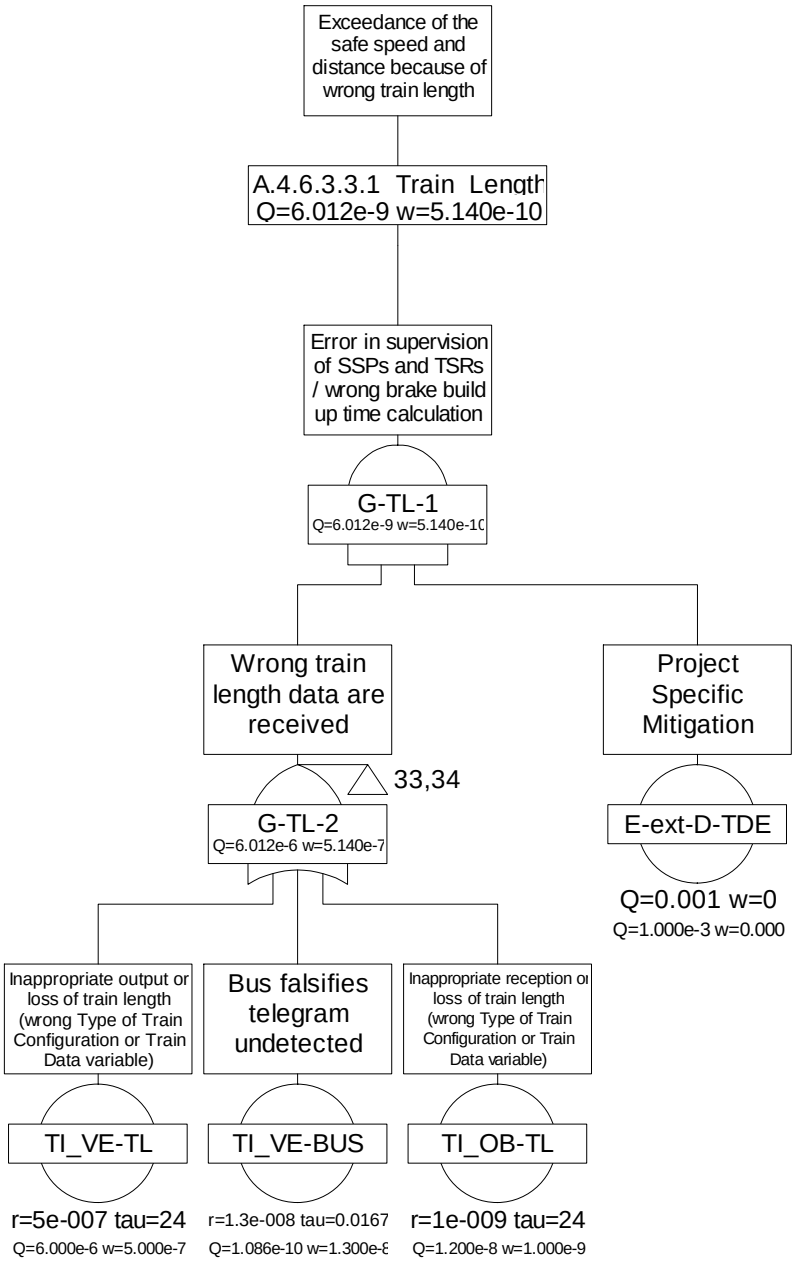

Exceedance of the safe speed and distance because of wrong axle load category
A.4.6.3.10.1_Axle_Load_Category
Q=6.012e-9 w=5.140e-10
Wrong data are received which might lead to that train enters a route although not suitable
Project Specific Mitigation
G-AL-1
Q=6.012e-6 w=5.140e-7
E-ext-D-TDE
Q=0.001 w=0
Q=1.000e-3 w=0.000
Inappropriate output or loss of axle load category (wrong Type of Train Configuration or Train Data variable)
Bus falsifies telegram undetected
Inappropriate reception or loss of axle load category (wrong Type of Train Configuration or Train Data variable)
TI_VE-ALC
TI_VE-BUS
TI_OB-ALC
r=5e-007 tau=24
Q=6.000e-6 w=5.000e-7
r=1.3e-008 tau=0.0167
Q=1.086e-10 w=1.300e-8
r=1e-009 tau=24
Q=1.200e-8 w=1.000e-9

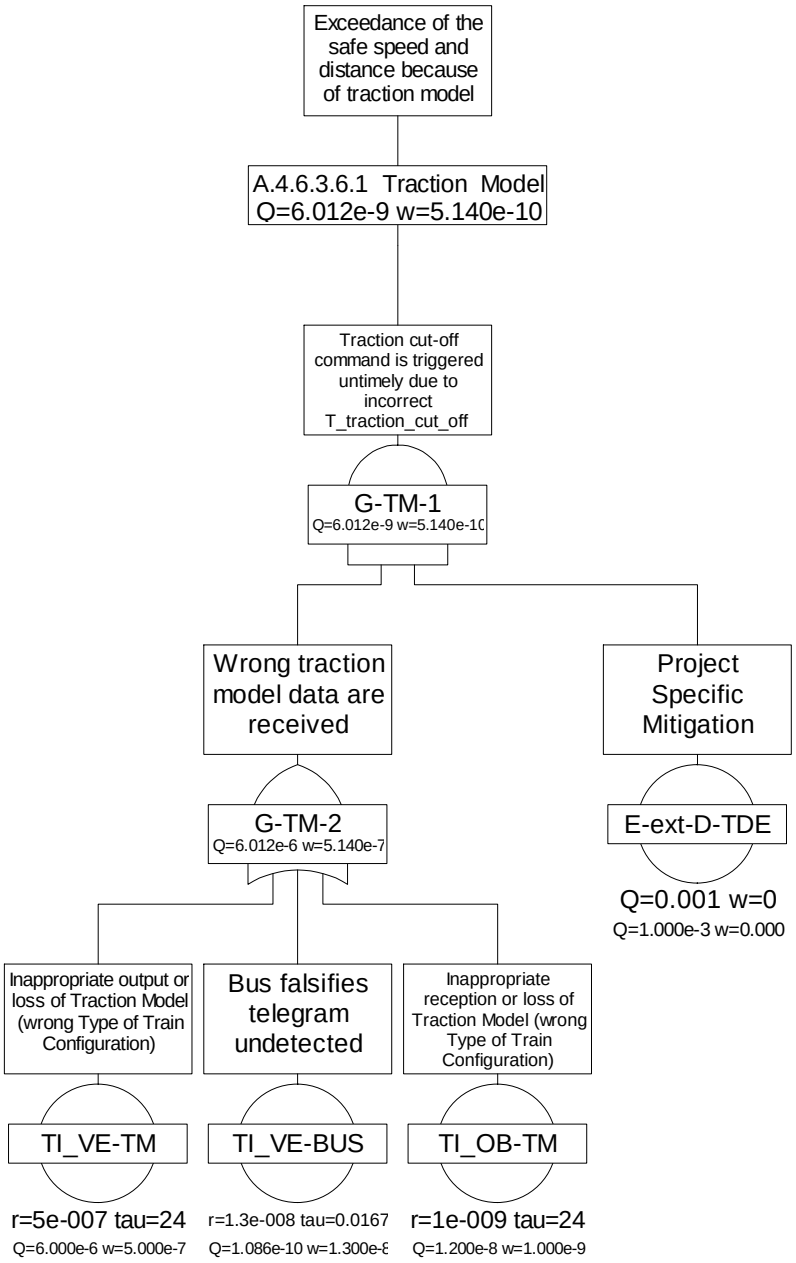

Exceedance of the safe speed and distance because of wrong maximum train speed
A.4.6.3.8.2.1_Max_TS_BUS
Q=6.012e-9 w=5.140e-10
Wrong Max train speed data which might lead to wrong ceiling supervision limits
Project Specific Mitigation
G-MTS-1
Q=6.012e-6 w=5.140e-7
E-ext-D-TDE
Q=0.001 w=0
Q=1.000e-3 w=0.000
Inappropriate output or loss of Maximum Train Speed (wrong Type of Train Configuration)
Bus falsifies telegram undetected
Inappropriate reception or loss of Maximum Train Speed (wrong Type of Train Configuration)
TI_VE-MTS
TI_VE-BUS
TI_OB-MTS
r=5e-007 tau=24
Q=6.000e-6 w=5.000e-7
r=1.3e-008 tau=0.0167
Q=1.086e-10 w=1.300e-8
r=1e-009 tau=24
Q=1.200e-8 w=1.000e-9

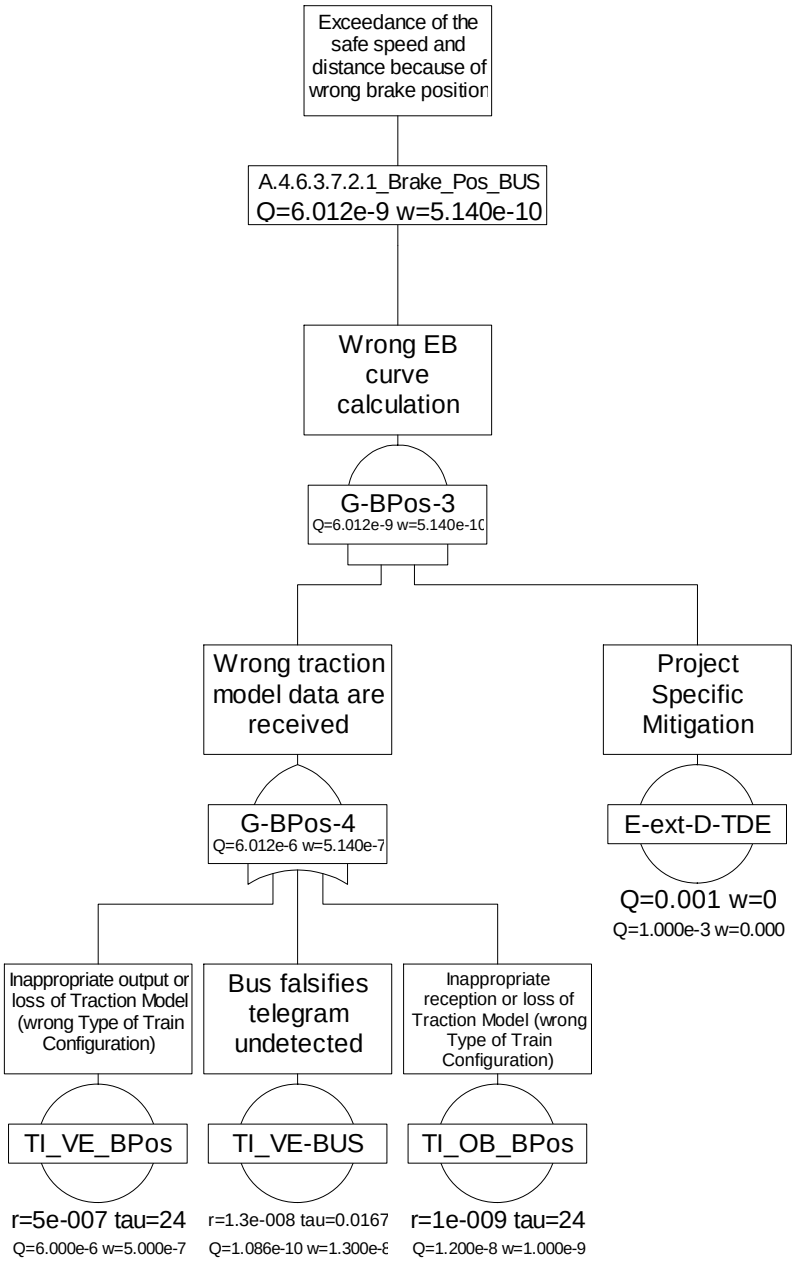

Exceedance of the safe speed and distance because of wrong brake position
A.4.6.3.7.2.2_Brake_Pos_PAR
Q=9.600e-9 w=4.000e-10
Wrong brake position data are received which might lead to wrong EB curve calculation
Project Specific Mitigation
G-BPos-1
Q=9.600e-6 w=4.000e-7
E-ext-D-TDE
Q=0.001 w=0
Q=1.000e-3 w=0.000
Inappropriate output or reception of T_BP_S1
Inappropriate output or reception of T_BP_S2
G-BPos-2.1
Q=4.800e-6 w=2.000e-7
G-BPos-2.2
Q=4.800e-6 w=2.000e-7
Inappropriate output or loss of Brake Position signal T_BP_S1
Inappropriate reception or loss of of Brake Position signal T_BP_S1
Inappropriate output or loss of Brake Position signal T_BP_S2
Inappropriate reception or loss of Brake Position signal T_BP_S2
TI_VE-BPos-1.1
TI_OB-BPos-1.1
TI_VE-BPos-1.2
TI_OB-BPos-1.2
r=1e-007 tau=48
Q=2.400e-6 w=1.000e-7
r=1e-007 tau=48
Q=2.400e-6 w=1.000e-7
r=1e-007 tau=48
Q=2.400e-6 w=1.000e-7
r=1e-007 tau=48
Q=2.400e-6 w=1.000e-7

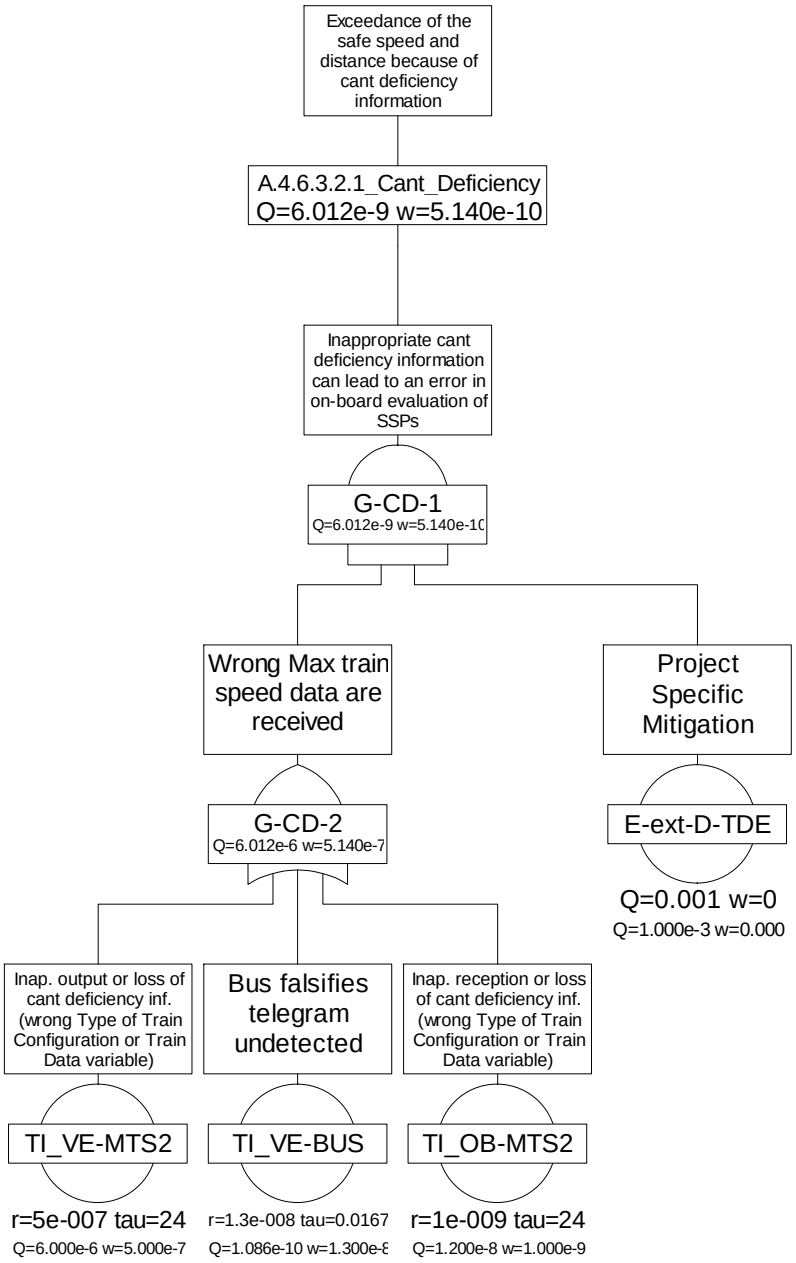

Exceedance of the safe speed and distance because of wrong brake build up time model values
A.4.6.3.5.2.1_Brake_Model_BUS
Q=6.012e-9 w=5.140e-10
Project Specific Mitigation
Wrong brake build up time model data which might lead to wrong EB curve calculation
E-ext-D-TDE
Q=0.001 w=0
Q=1.000e-3 w=0.000
G-TBE-1
Q=6.012e-6 w=5.140e-7
Inappropriate output or loss of brake build up time model (wrong Type of Train Configuration or Special Brake status)
Bus falsifies telegram undetected
Inappropriate reception or loss of brake build up time model (wrong Type of Train Configuration or Special Brake status)
TI_VE-T_BM
TI_VE-BUS
TI_OB-T_BM
r=5e-007 tau=24
Q=6.000e-6 w=5.000e-7
r=1.3e-008 tau=0.0167
Q=1.086e-10 w=1.300e-8
r=1e-009 tau=24
Q=1.200e-8 w=1.000e-9

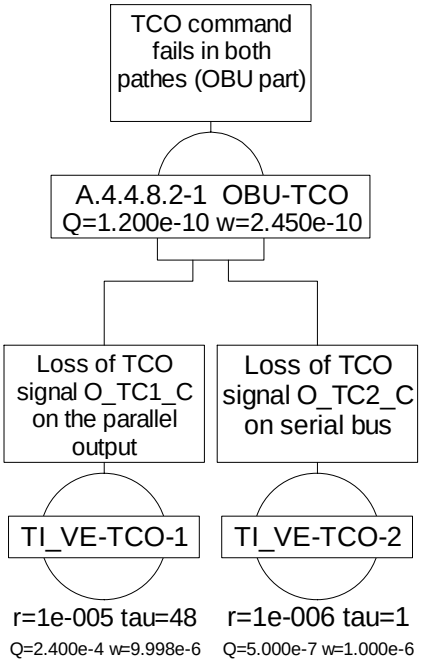

Exceedance of the safe speed and distance because of wrong brake build up time model values
A.4.6.3.5.2.2_Brake_Model_PAR
Q=6.266e-9 w=5.342e-10
Project Specific Mitigation
E-ext-D-TDE
Q=0.001 w=0
Q=1.000e-3 w=0.000
Wrong brake build up time model data which might lead to wrong EB curve calculation
G-TBE-2
Q=6.266e-6 w=5.342e-7
T_brake_emergency values is falsified
G-TBE-3
Q=6.012e-6 w=5.140e-7
Inappropriate output or reception of Special Brake Status
G-TBE-4
Q=2.543e-7 w=2.019e-8
Inappropriate output or loss of Brake build up time model (wrong Type of Train Configuration)
Bus falsifies telegram undetected
Inappropriate reception or loss of Brake build up time model (wrong Type of Train Configuration)
TI_VE-T_BM2
TI_VE-BUS
TI_OB-T_BM2
r=5e-007 tau=24
Q=6.000e-6 w=5.000e-7
r=1.3e-008 tau=0.0167
Q=1.086e-10 w=1.300e-8
r=1e-009 tau=24
Q=1.200e-8 w=1.000e-9
Inappropriate output or loss (first path)
Inappropriate output or loss (second path)
G-TBE-5
Q=4.799e-4 w=1.999e-5
G-TBE-6
Q=4.799e-4 w=1.999e-5
Inappropriate output or loss of Special Brake Status
Inappropriate reception or loss of Special Brake Status
Inappropriate output or loss of Special Brake Status
Inappropriate reception or loss of Special Brake Status
β
β
TI_VE-SpB-1
TI_OB-SpB-1
TI_VE-SpB-2
TI_OB-SpB-2
r=1e-005 tau=48
Q=2.400e-4 w=9.998e-6
r=1e-005 tau=48
Q=2.400e-4 w=9.998e-6
r=1e-005 tau=48
Q=2.400e-4 w=9.998e-6
r=1e-005 tau=48
Q=2.400e-4 w=9.998e-6

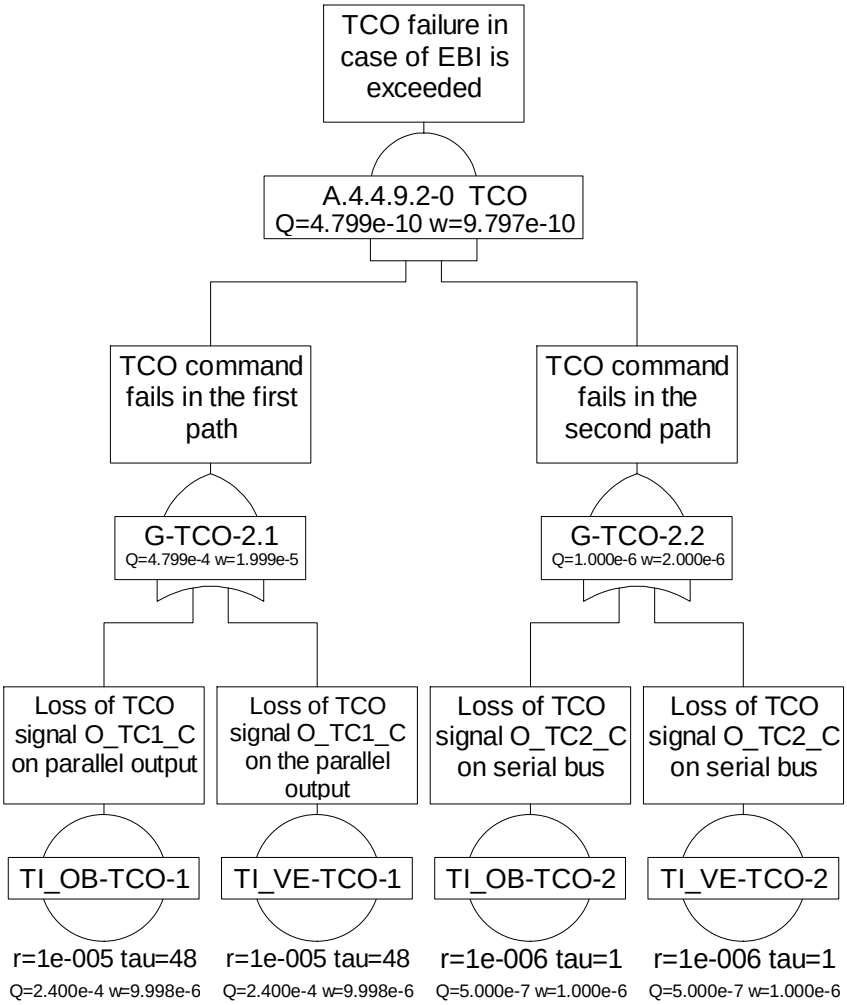

Exceedance of the safe speed and distance because of wrong train length
A.4.6.3.3.1 Train Length
Q=6.012e-9 w=5.140e-10
Error in supervision of SSPs and TSRs / wrong brake build up time calculation
G-TL-1
Q=6.012e-9 w=5.140e-10
Wrong train length data are received
Project Specific Mitigation
33,34
G-TL-2
Q=6.012e-6 w=5.140e-7
E-ext-D-TDE
Q=0.001 w=0
Q=1.000e-3 w=0.000
Inappropriate output or loss of train length (wrong Type of Train Configuration or Train Data variable)
Bus falsifies telegram undetected
Inappropriate reception or loss of train length (wrong Type of Train Configuration or Train Data variable)
TI_VE-TL
TI_VE-BUS
TI_OB-TL
r=5e-007 tau=24
Q=6.000e-6 w=5.000e-7
r=1.3e-008 tau=0.0167
Q=1.086e-10 w=1.300e-8
r=1e-009 tau=24
Q=1.200e-8 w=1.000e-9

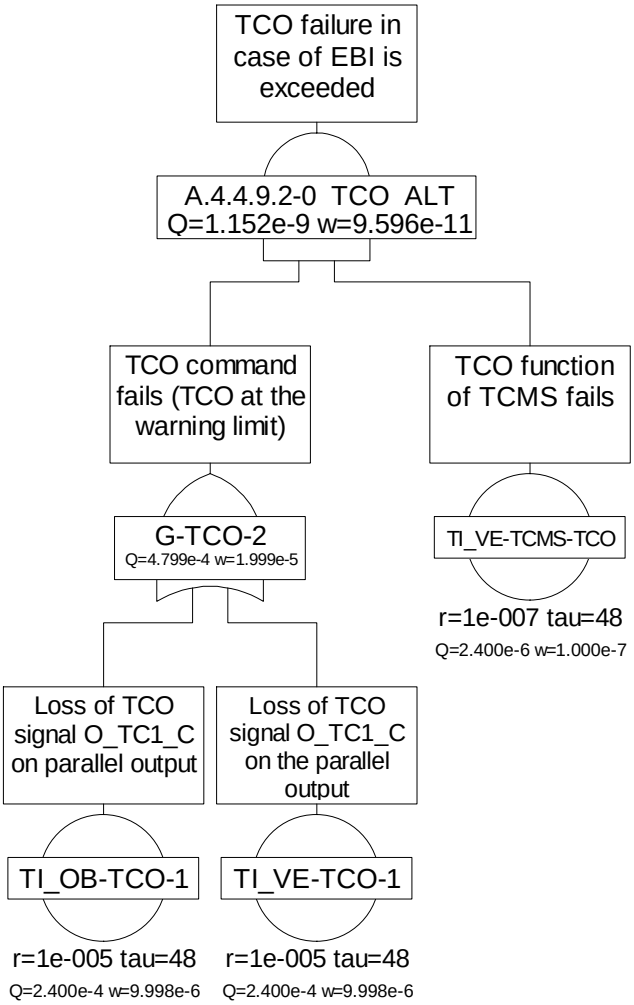

Exceedance of the safe speed and distance because of traction model
A.4.6.3.6.1 Traction Model
Q=6.012e-9 w=5.140e-10
Traction cut-off command is triggered untimely due to incorrect T_traction_cut_off
G-TM-1
Q=6.012e-9 w=5.140e-10
Wrong traction model data are received
Project Specific Mitigation
G-TM-2
Q=6.012e-6 w=5.140e-7
E-ext-D-TDE
Q=0.001 w=0
Q=1.000e-3 w=0.000
Inappropriate output or loss of Traction Model (wrong Type of Train Configuration)
Bus falsifies telegram undetected
Inappropriate reception or loss of Traction Model (wrong Type of Train Configuration)
TI_VE-TM
TI_VE-BUS
TI_OB-TM
r=5e-007 tau=24
Q=6.000e-6 w=5.000e-7
r=1.3e-008 tau=0.0167
Q=1.086e-10 w=1.300e-8
r=1e-009 tau=24
Q=1.200e-8 w=1.000e-9

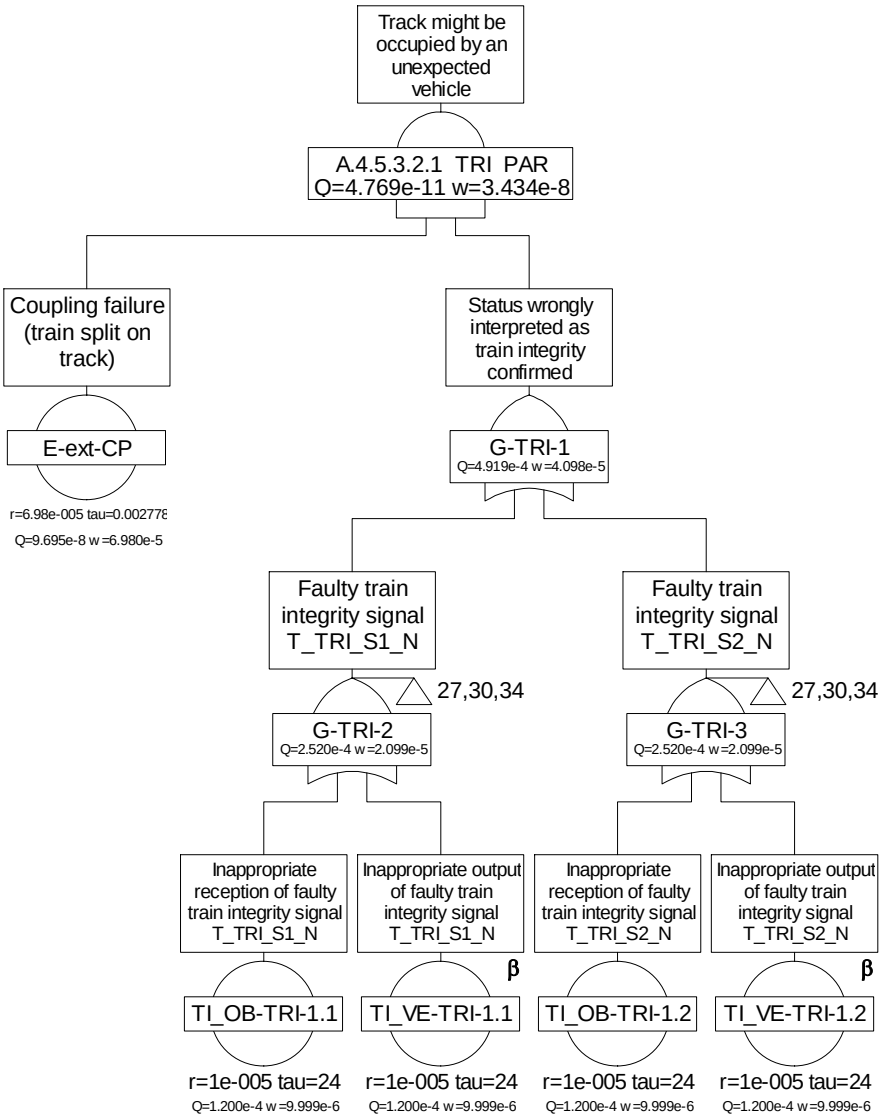

Exceedance of the safe speed and distance because of wrong brake position
A.4.6.3.7.2.1_Brake_Pos_BUS
Q=6.012e-9 w=5.140e-10
Wrong EB curve calculation
G-BPos-3
Q=6.012e-9 w=5.140e-10
Wrong traction model data are received
Project Specific Mitigation
G-BPos-4
Q=6.012e-6 w=5.140e-7
E-ext-D-TDE
Q=0.001 w=0
Q=1.000e-3 w=0.000
Inappropriate output or loss of Traction Model (wrong Type of Train Configuration)
Bus falsifies telegram undetected
Inappropriate reception or loss of Traction Model (wrong Type of Train Configuration)
TI_VE_BPos
TI_VE-BUS
TI_OB_BPos
r=5e-007 tau=24
Q=6.000e-6 w=5.000e-7
r=1.3e-008 tau=0.0167
Q=1.086e-10 w=1.300e-8
r=1e-009 tau=24
Q=1.200e-8 w=1.000e-9

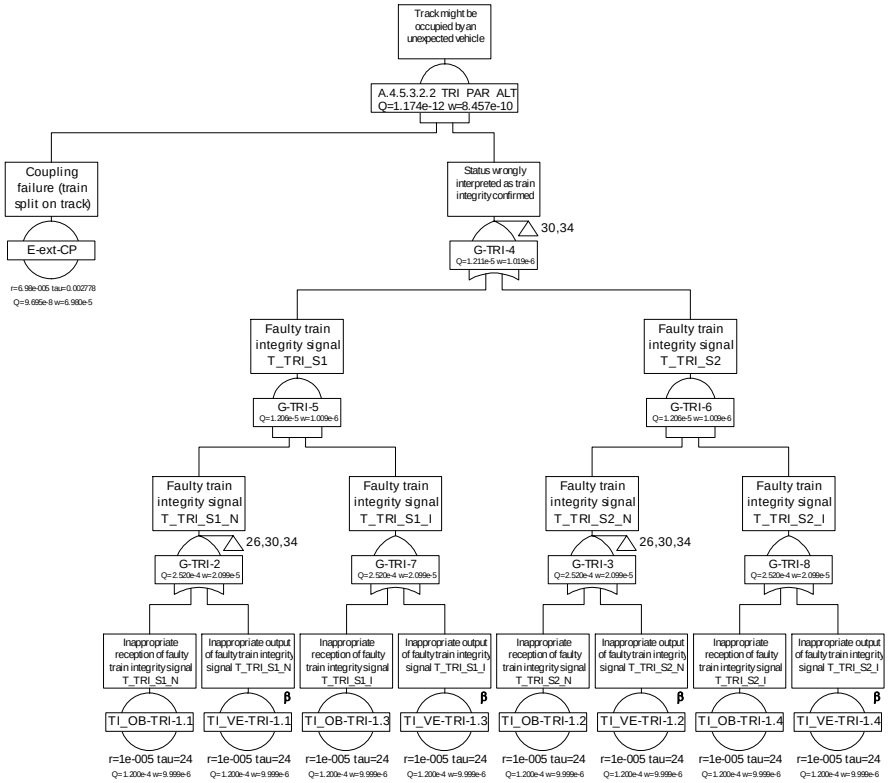

Exceedance of the safe speed and distance because of cant deficiency information
A.4.6.3.2.1_Cant_Deficiency
Q=6.012e-9 w=5.140e-10
Inappropriate cant deficiency information can lead to an error in on-board evaluation of SSPs
G-CD-1
Q=6.012e-9 w=5.140e-10
Wrong Max train speed data are received
Project Specific Mitigation
G-CD-2
Q=6.012e-6 w=5.140e-7
E-ext-D-TDE
Q=0.001 w=0
Q=1.000e-3 w=0.000
Inap. output or loss of cant deficiency inf. (wrong Type of Train Configuration or Train Data variable)
Bus falsifies telegram undetected
Inap. reception or loss of cant deficiency inf. (wrong Type of Train Configuration or Train Data variable)
TI_VE-MTS2
TI_VE-BUS
TI_OB-MTS2
r=5e-007 tau=24
Q=6.000e-6 w=5.000e-7
r=1.3e-008 tau=0.0167
Q=1.086e-10 w=1.300e-8
r=1e-009 tau=24
Q=1.200e-8 w=1.000e-9

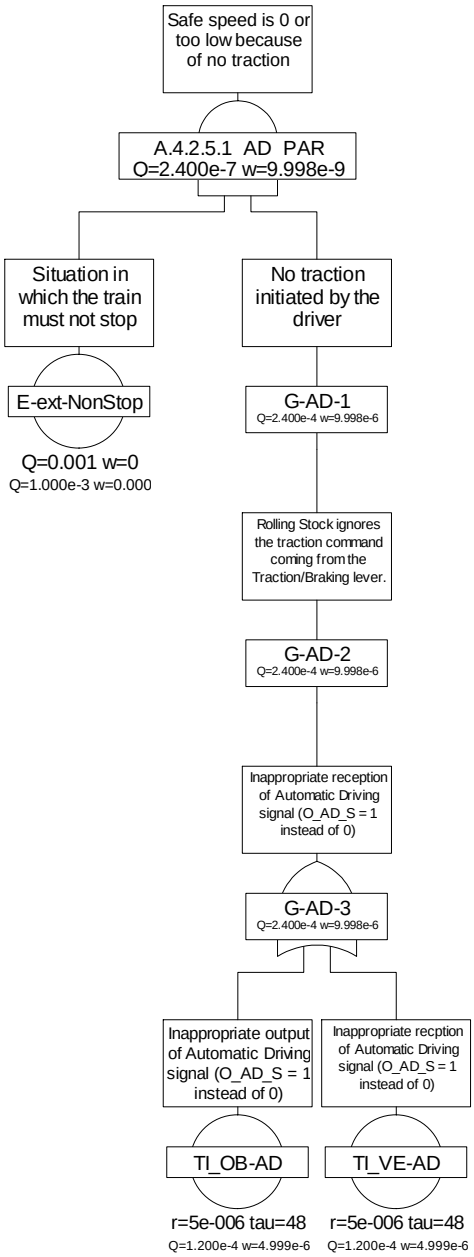

TCO command fails in both pathes (OBU part)
A.4.4.8.2-1 OBU-TCO
Q=1.200e-10 w=2.450e-10
Loss of TCO signal O_TC1_C on the parallel output
Loss of TCO signal O_TC2_C on serial bus
TI_VE-TCO-1
TI_VE-TCO-2
r=1e-005 tau=48
Q=2.400e-4 w=9.998e-6
r=1e-006 tau=1
Q=5.000e-7 w=1.000e-6

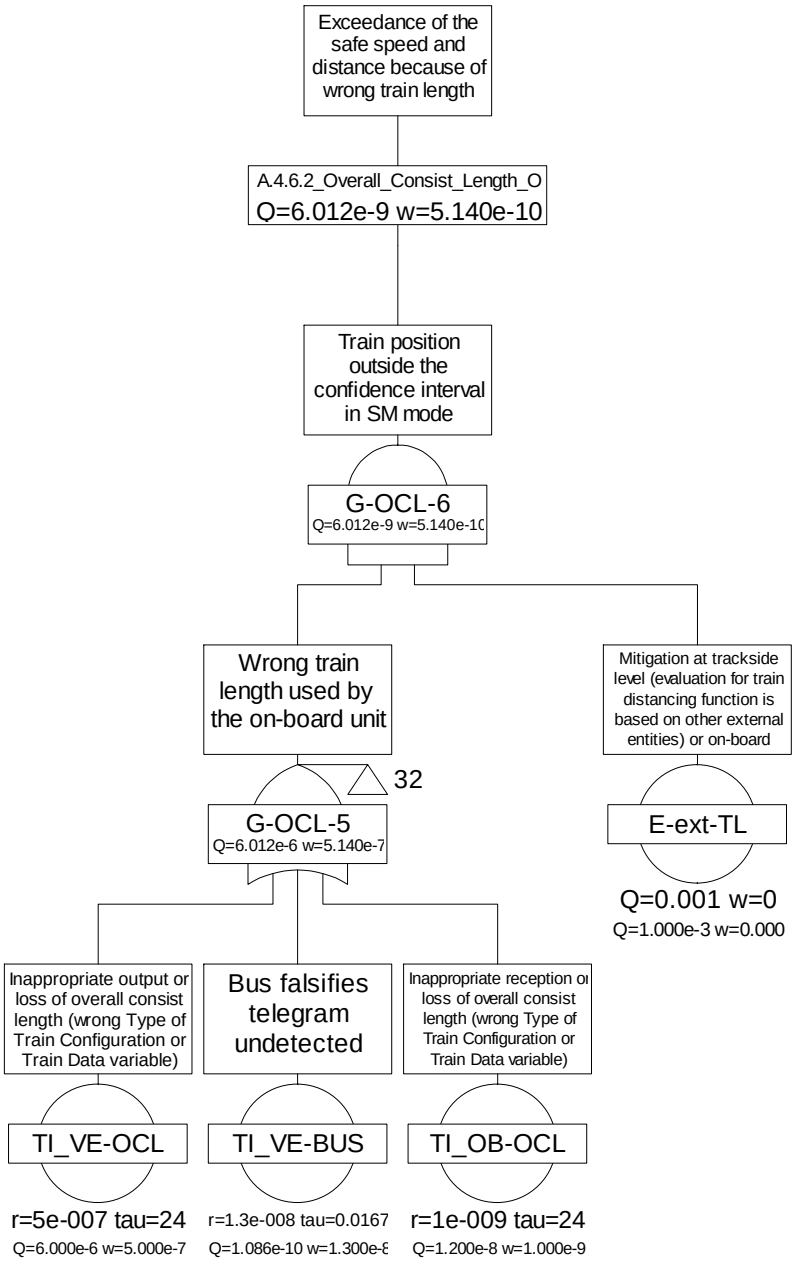

TCO failure in case of EBI is exceeded
A.4.4.9.2-0 TCO
Q=4.799e-10 w=9.797e-10
TCO command fails in the first path
TCO command fails in the second path
G-TCO-2.1
Q=4.799e-4 w=1.999e-5
G-TCO-2.2
Q=1.000e-6 w=2.000e-6
Loss of TCO signal O_TC1_C on parallel output
Loss of TCO signal O_TC1_C on the parallel output
Loss of TCO signal O_TC2_C on serial bus
Loss of TCO signal O_TC2_C on serial bus
TI_OB-TCO-1
TI_VE-TCO-1
TI_OB-TCO-2
TI_VE-TCO-2
r=1e-005 tau=48
Q=2.400e-4 w=9.998e-6
r=1e-005 tau=48
Q=2.400e-4 w=9.998e-6
r=1e-006 tau=1
Q=5.000e-7 w=1.000e-6
r=1e-006 tau=1
Q=5.000e-7 w=1.000e-6

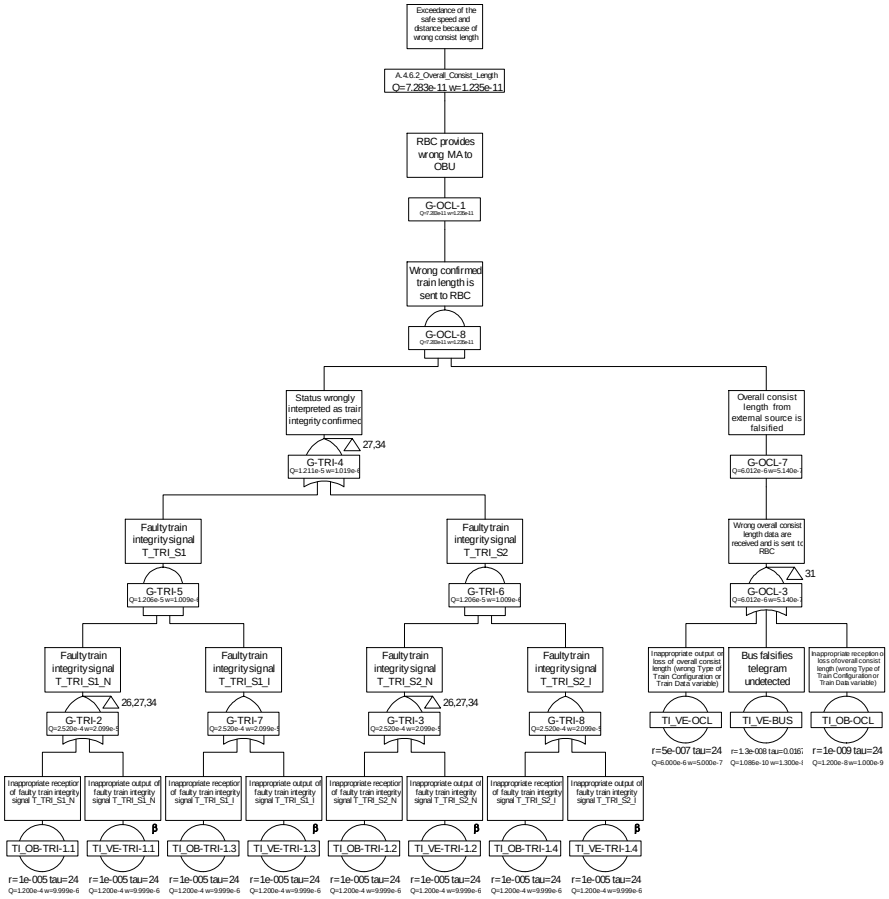

TCO failure in case of EBI is exceeded
A.4.4.9.2-0 TCO ALT
Q=1.152e-9 w=9.596e-11
TCO command fails (TCO at the warning limit)
TCO function of TCMS fails
G-TCO-2
Q=4.799e-4 w=1.999e-5
TI_VE-TCMS-TCO
r=1e-007 tau=48
Q=2.400e-6 w=1.000e-7
Loss of TCO signal O_TC1_C on parallel output
Loss of TCO signal O_TC1_C on the parallel output
TI_OB-TCO-1
TI_VE-TCO-1
r=1e-005 tau=48
Q=2.400e-4 w=9.998e-6
r=1e-005 tau=48
Q=2.400e-4 w=9.998e-6

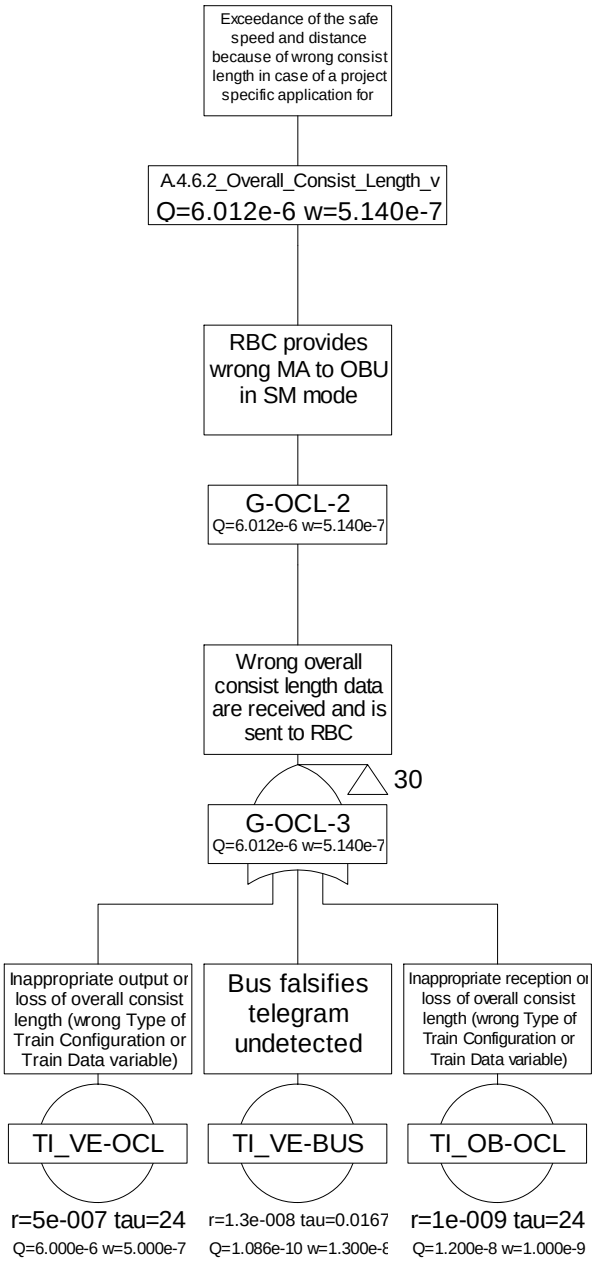

Track might be occupied by an unexpected vehicle
A.4.5.3.2.1 TRI PAR
Q=4.769e-11 w=3.434e-8
Coupling failure (train split on track)
Status wrongly interpreted as train integrity confirmed
E-ext-CP
r=6.98e-005 tau=0.002778
Q=9.695e-8 w =6.980e-5
G-TRI-1
Q=4.919e-4 w =4.098e-5
Faulty train integrity signal T_TRI_S1_N
Faulty train integrity signal T_TRI_S2_N
27,30,34
27,30,34
G-TRI-2
Q=2.520e-4 w =2.099e-5
G-TRI-3
Q=2.520e-4 w =2.099e-5
Inappropriate reception of faulty train integrity signal T_TRI_S1_N
Inappropriate output of faulty train integrity signal T_TRI_S1_N
Inappropriate reception of faulty train integrity signal T_TRI_S2_N
Inappropriate output of faulty train integrity signal T_TRI_S2_N
β
β
TI_OB-TRI-1.1
TI_VE-TRI-1.1
TI_OB-TRI-1.2
TI_VE-TRI-1.2
r=1e-005 tau=24
Q=1.200e-4 w =9.999e-6
r=1e-005 tau=24
Q=1.200e-4 w =9.999e-6
r=1e-005 tau=24
Q=1.200e-4 w =9.999e-6
r=1e-005 tau=24
Q=1.200e-4 w =9.999e-6

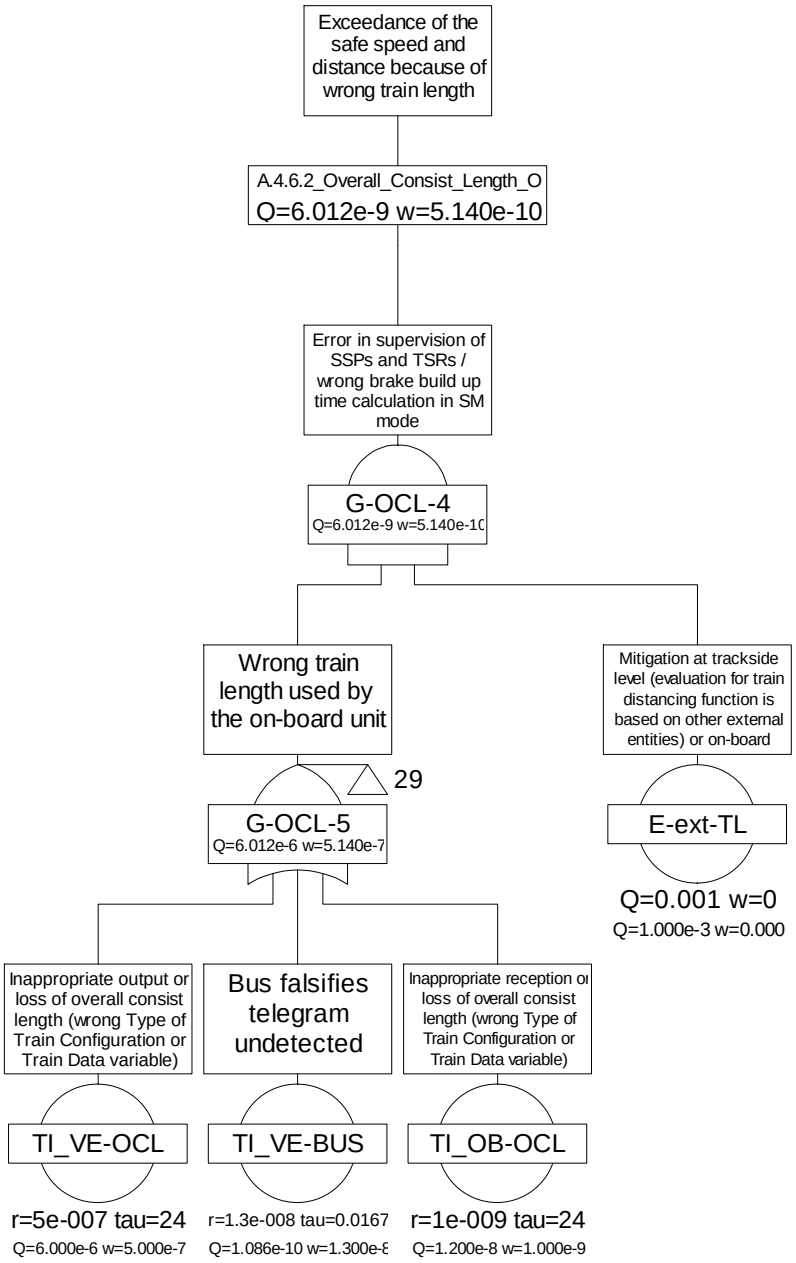

Track might be occupied by an unexpected vehicle
A.4.5.3.2.2 TRI PAR ALT
Q=1.174e-12 w=8.457e-10
Coupling failure (train split on track)
E-ext-CP
r=6.98e-005 tau=0.002778
Q=9.695e-8 w=6.980e-5
Status wrongly interpreted as train integrity confirmed
30,34
G-TRI-4
Q=1.211e-5 w=1.019e-6
Faulty train integrity signal T_TRI_S1
G-TRI-5
Q=1.206e-5 w=1.009e-6
Faulty train integrity signal T_TRI_S2
G-TRI-6
Q=1.206e-5 w=1.009e-6
Faulty train integrity signal T_TRI_S1_N
26,30,34
G-TRI-2
Q=2.520e-4 w=2.099e-5
Faulty train integrity signal T_TRI_S1_I
G-TRI-7
Q=2.520e-4 w=2.099e-5
Faulty train integrity signal T_TRI_S2_N
26,30,34
G-TRI-3
Q=2.520e-4 w=2.099e-5
Faulty train integrity signal T_TRI_S2_I
G-TRI-8
Q=2.520e-4 w=2.099e-5
Inappropriate reception of faulty train integrity signal T_TRI_S1_N
Inappropriate output of faulty train integrity signal T_TRI_S1_N
Inappropriate reception of faulty train integrity signal T_TRI_S1_I
Inappropriate output of faulty train integrity signal T_TRI_S1_I
Inappropriate reception of faulty train integrity signal T_TRI_S2_N
Inappropriate output of faulty train integrity signal T_TRI_S2_N
Inappropriate reception of faulty train integrity signal T_TRI_S2_I
Inappropriate output of faulty train integrity signal T_TRI_S2_I
β
TI_OB-TRI-1.1
TI_VE-TRI-1.1
TI_OB-TRI-1.3
TI_VE-TRI-1.3
TI_OB-TRI-1.2
TI_VE-TRI-1.2
TI_OB-TRI-1.4
TI_VE-TRI-1.4
r=1e-005 tau=24
Q=1.200e-4 w=9.999e-6

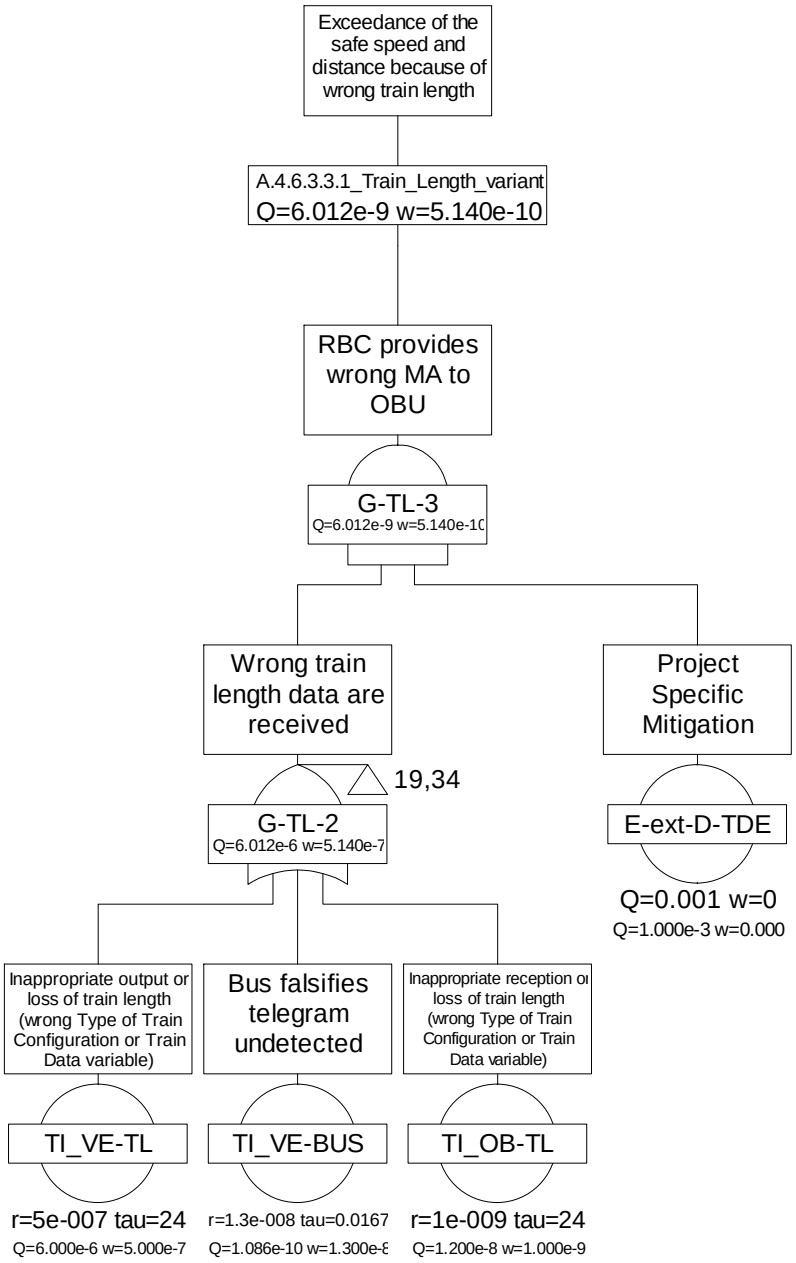

Safe speed is 0 or too low because of no traction
A.4.2.5.1 AD PAR
Q=2.400e-7 w=9.998e-9
Situation in which the train must not stop
No traction initiated by the driver
E-ext-NonStop
Q=0.001 w=0
Q=1.000e-3 w=0.000
G-AD-1
Q=2.400e-4 w=9.998e-6
Rolling Stock ignores the traction command coming from the Traction/Braking lever.
G-AD-2
Q=2.400e-4 w=9.998e-6
Inappropriate reception of Automatic Driving signal (O_AD_S = 1 instead of 0)
G-AD-3
Q=2.400e-4 w=9.998e-6
Inappropriate output of Automatic Driving signal (O_AD_S = 1 instead of 0)
Inappropriate recption of Automatic Driving signal (O_AD_S = 1 instead of 0)
TI_OB-AD
TI_VE-AD
r=5e-006 tau=48
Q=1.200e-4 w=4.999e-6
r=5e-006 tau=48
Q=1.200e-4 w=4.999e-6

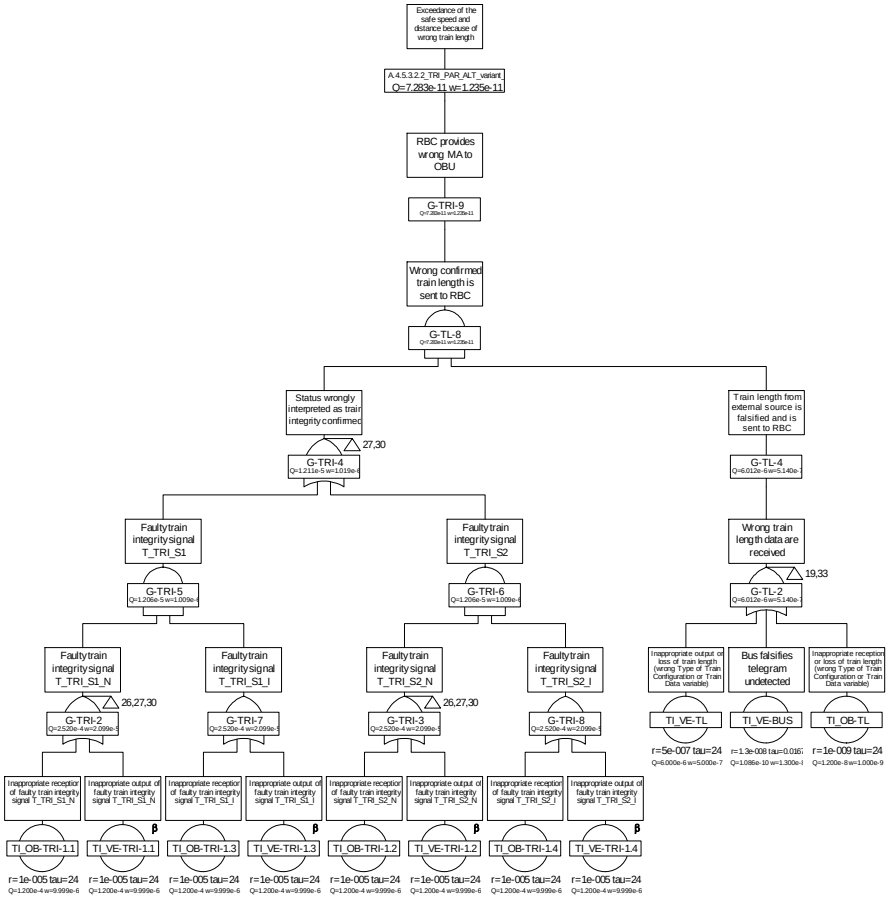

Exceedance of the safe speed and distance because of wrong train length
A.4.6.2_Overall_Consist_Length_O
Q=6.012e-9 w=5.140e-10
Train position outside the confidence interval in SM mode
G-OCL-6
Q=6.012e-9 w=5.140e-10
Wrong train length used by the on-board unit
Mitigation at trackside level (evaluation for train distancing function is based on other external entities) or on-board
32
G-OCL-5
Q=6.012e-6 w=5.140e-7
E-ext-TL
Q=0.001 w=0
Q=1.000e-3 w=0.000
Inappropriate output or loss of overall consist length (wrong Type of Train Configuration or Train Data variable)
Bus falsifies telegram undetected
Inappropriate reception or loss of overall consist length (wrong Type of Train Configuration or Train Data variable)
TI_VE-OCL
TI_VE-BUS
TI_OB-OCL
r=5e-007 tau=24
Q=6.000e-6 w=5.000e-7
r=1.3e-008 tau=0.0167
Q=1.086e-10 w=1.300e-8
r=1e-009 tau=24
Q=1.200e-8 w=1.000e-9

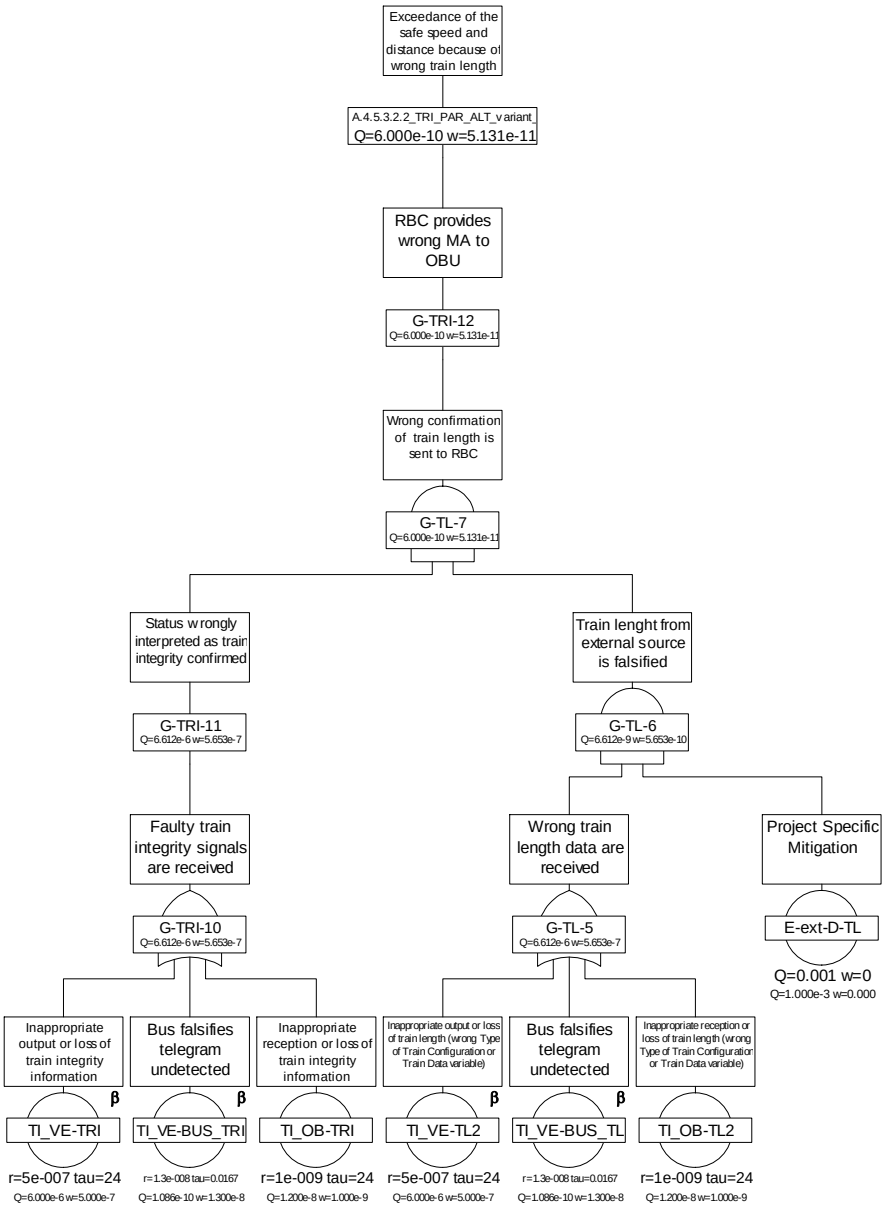

Exceedance of the safe speed and distance because of wrong consist length
A.4.6.2_Overall_Consist_Length
Q=7.283e-11 w=1.235e-11
RBC provides wrong MA to OBU
G-OCL-1
Q=7.283e-11 w=1.235e-11
Wrong confirmed train length is sent to RBC
G-OCL-8
Q=7.283e-11 w=1.235e-11
Status wrongly interpreted as train integrity confirmed
27,34
G-TRI-4
Q=1.211e-5 w=1.019e-6
Overall consist length from external source is falsified
G-OCL-7
Q=6.012e-6 w=5.140e-
Faulty train integrity signal T_TRI_S1
G-TRI-5
Q=1.206e-5 w=1.009e-6
Faulty train integrity signal T_TRI_S2
G-TRI-6
Q=1.206e-5 w=1.009e-6
Wrong overall consist length data are received and is sent to RBC
31
G-OCL-3
Q=6.012e-6 w=5.140e-
Faulty train integrity signal T_TRI_S1_N
26,27,34
G-TRI-2
Q=2.520e-4 w=2.099e-5
Faulty train integrity signal T_TRI_S1_I
G-TRI-7
Q=2.520e-4 w=2.099e-5
Faulty train integrity signal T_TRI_S2_N
26,27,34
G-TRI-3
Q=2.520e-4 w=2.099e-5
Faulty train integrity signal T_TRI_S2_I
G-TRI-8
Q=2.520e-4 w=2.099e-5
Inappropriate output of loss of overall consist length (wrong Type of Train Configuration or Train Data variable)
Bus falsifies telegram undetected
Inappropriate reception of loss of overall consist length (wrong Type of Train Configuration or Train Data variable)
TI_VE-OCL
r=5e-007 tau=24
Q=6.000e-6 w=5.000e-7
TI_VE-BUS
r=1.3e-008 tau=0.0165
Q=1.088e-10 w=1.300e-1
TI_OB-OCL
r=1e-009 tau=24
Q=1.200e-8 w=1.000e-9
Inappropriate reception of faulty train integrity signal T_TRI_S1_N
Inappropriate output of faulty train integrity signal T_TRI_S1_N
Inappropriate reception of faulty train integrity signal T_TRI_S1_I
Inappropriate output of faulty train integrity signal T_TRI_S1_I
Inappropriate reception of faulty train integrity signal T_TRI_S2_N
Inappropriate output of faulty train integrity signal T_TRI_S2_N
Inappropriate reception of faulty train integrity signal T_TRI_S2_I
Inappropriate output of faulty train integrity signal T_TRI_S2_I
β
TI_OB-TRI-1.1
TI_VE-TRI-1.1
TI_OB-TRI-1.3
TI_VE-TRI-1.3
TI_OB-TRI-1.2
TI_VE-TRI-1.2
TI_OB-TRI-1.4
TI_VE-TRI-1.4
r=1e-005 tau=24
Q=1.200e-4 w=9.999e-6


Exceedance of the safe speed and distance because of wrong consist length in case of a project specific application for
A.4.6.2_Overall_Consist_Length_v
Q=6.012e-6 w=5.140e-7
RBC provides wrong MA to OBU in SM mode
G-OCL-2
Q=6.012e-6 w=5.140e-7
Wrong overall consist length data are received and is sent to RBC
30
G-OCL-3
Q=6.012e-6 w=5.140e-7
Inappropriate output or loss of overall consist length (wrong Type of Train Configuration or Train Data variable)
Bus falsifies telegram undetected
Inappropriate reception or loss of overall consist length (wrong Type of Train Configuration or Train Data variable)
TI_VE-OCL
TI_VE-BUS
TI_OB-OCL
r=5e-007 tau=24
Q=6.000e-6 w=5.000e-7
r=1.3e-008 tau=0.0167
Q=1.086e-10 w=1.300e-8
r=1e-009 tau=24
Q=1.200e-8 w=1.000e-9


Exceedance of the safe speed and distance because of wrong train length
A.4.6.2_Overall_Consist_Length_O
Q=6.012e-9 w=5.140e-10
Error in supervision of SSPs and TSRs / wrong brake build up time calculation in SM mode
G-OCL-4
Q=6.012e-9 w=5.140e-1C
Wrong train length used by the on-board unit
Mitigation at trackside level (evaluation for train distancing function is based on other external entities) or on-board
29
G-OCL-5
Q=6.012e-6 w=5.140e-7
E-ext-TL
Q=0.001 w=0
Q=1.000e-3 w=0.000
Inappropriate output or loss of overall consist length (wrong Type of Train Configuration or Train Data variable)
Bus falsifies telegram undetected
Inappropriate reception or loss of overall consist length (wrong Type of Train Configuration or Train Data variable)
TI_VE-OCL
TI_VE-BUS
TI_OB-OCL
r=5e-007 tau=24
Q=6.000e-6 w=5.000e-7
r=1.3e-008 tau=0.0167
Q=1.086e-10 w=1.300e-8
r=1e-009 tau=24
Q=1.200e-8 w=1.000e-9


Exceedance of the safe speed and distance because of wrong train length
A.4.6.3.3.1_Train_Length_variant
Q=6.012e-9 w=5.140e-10
RBC provides wrong MA to OBU
G-TL-3
Q=6.012e-9 w=5.140e-10
Wrong train length data are received
Project Specific Mitigation
19,34
G-TL-2
Q=6.012e-6 w=5.140e-7
E-ext-D-TDE
Q=0.001 w=0
Q=1.000e-3 w=0.000
Inappropriate output or loss of train length (wrong Type of Train Configuration or Train Data variable)
Bus falsifies telegram undetected
Inappropriate reception or loss of train length (wrong Type of Train Configuration or Train Data variable)
TI_VE-TL
TI_VE-BUS
TI_OB-TL
r=5e-007 tau=24
Q=6.000e-6 w=5.000e-7
r=1.3e-008 tau=0.0167
Q=1.086e-10 w=1.300e-8
r=1e-009 tau=24
Q=1.200e-8 w=1.000e-9


Exceedance of the safe speed and distance because of wrong train length
A.4.5.3.2.2_TRI_PAR_ALT_variant
Q=7.283e-11 w=1.235e-11
RBC provides wrong MA to OBU
G-TRI-9
Q=7.28e11 w=1.23e-11
Wrong confirmed train length is sent to RBC
G-TL-8
Q=7.28e11 w=1.23e-11
Status wrongly interpreted as train integrity confirmed
27,30
G-TRI-4
Q=1.211e-5 w=1.019e-6
Train length from external source is falsified and is sent to RBC
G-TL-4
Q=6.012e-6 w=5.140e-
Faulty train integrity signal T_TRI_S1
G-TRI-5
Q=1.206e-5 w=1.009e-6
Faulty train integrity signal T_TRI_S2
G-TRI-6
Q=1.206e-5 w=1.009e-6
Wrong train length data are received
19,33
G-TL-2
Q=6.012e-6 w=5.140e-
Faulty train integrity signal T_TRI_S1_N
26,27,30
G-TRI-2
Q=2.520e-4 w=2.099e-5
Faulty train integrity signal T_TRI_S1_I
G-TRI-7
Q=2.520e-4 w=2.099e-5
Faulty train integrity signal T_TRI_S2_N
26,27,30
G-TRI-3
Q=2.520e-4 w=2.099e-5
Faulty train integrity signal T_TRI_S2_I
G-TRI-8
Q=2.520e-4 w=2.099e-5
Inappropriate output of loss of train length (wrong Type of Train Configuration or Train Data variable)
Bus falsifies telegram undetected
Inappropriate reception or loss of train length (wrong Type of Train Configuration or Train Data variable)
TI_VE-TL
TI_VE-BUS
TI_OB-TL
r=5e-007 tau=24
Q=6.000e-6 w=5.000e-7
r=1.3e-008 tau=0.0165
Q=1.088e-10 w=1.300e-
r=1e-009 tau=24
Q=1.200e-8 w=1.000e-9
Inappropriate reception of faulty train integrity signal T_TRI_S1_N
Inappropriate output of faulty train integrity signal T_TRI_S1_N
Inappropriate reception of faulty train integrity signal T_TRI_S1_I
Inappropriate output of faulty train integrity signal T_TRI_S1_I
Inappropriate reception of faulty train integrity signal T_TRI_S2_N
Inappropriate output of faulty train integrity signal T_TRI_S2_N
Inappropriate reception of faulty train integrity signal T_TRI_S2_I
Inappropriate output of faulty train integrity signal T_TRI_S2_I
β
TI_OB-TRI-1.1
TI_VE-TRI-1.1
TI_OB-TRI-1.3
TI_VE-TRI-1.3
TI_OB-TRI-1.2
TI_VE-TRI-1.2
TI_OB-TRI-1.4
TI_VE-TRI-1.4
r=1e-005 tau=24
Q=1.200e-4 w=9.999e-6


Exceedance of the safe speed and distance because of wrong train length
A.4.5.3.2.2_TRI_PAR_ALT_variant_
Q=6.000e-10 w=5.131e-11
RBC provides wrong MA to OBU
G-TRI-12
Q=6.000e-10 w=5.131e-11
Wrong confirmation of train length is sent to RBC
G-TL-7
Q=6.000e-10 w=5.131e-11
Status wrongly interpreted as train integrity confirmed
Train lenght from external source is falsified
G-TRI-11
Q=6.612e-6 w=5.653e-7
G-TL-6
Q=6.612e-9 w=5.653e-10
Faulty train integrity signals are received
Wrong train length data are received
Project Specific Mitigation
G-TRI-10
Q=6.612e-6 w=5.653e-7
G-TL-5
Q=6.612e-6 w=5.653e-7
E-ext-D-TL
Q=0.001 w=0
Q=1.000e-3 w=0.000
Inappropriate output or loss of train integrity information
Bus falsifies telegram undetected
Inappropriate reception or loss of train integrity information
Inappropriate output or loss of train length (wrong Type of Train Configuration or Train Data variable)
Bus falsifies telegram undetected
Inappropriate reception or loss of train length (wrong Type of Train Configuration or Train Data variable)
β
β
β
β
TI_VE-TRI
TI_VE-BUS_TRI
TI_OB-TRI
TI_VE-TL2
TI_VE-BUS_TL
TI_OB-TL2
r=5e-007 tau=24
Q=6.000e-6 w=5.000e-7
r=1.3e-008 tau=0.0167
Q=1.086e-10 w=1.300e-8
r=1e-009 tau=24
Q=1.200e-8 w=1.000e-9
r=5e-007 tau=24
Q=6.000e-6 w=5.000e-7
r=1.3e-008 tau=0.0167
Q=1.086e-10 w=1.300e-8
r=1e-009 tau=24
Q=1.200e-8 w=1.000e-9