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Road vehicles — Multimedia data exchange format for impact tests

Véhicules routiers — Format d'échange de données multimédia pour les essais de choc

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Active Safety Recommendation

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1 Hints

For active safety tests a set of specific environments can be described in a general way. Recommendation for the usage of the MME format in the exchange of data between the test laboratories and the customers are summarized in the following pages.

1.1 MME Descriptors

1.1.1 Test object

In active safety tests the interaction between 2 or more test objects are described. In all scenarios the vehicle under test is engaged. The test object code is 1.

The other objects could be vehicles, vulnerable road users like pedestrians or two wheelers and/or parts of the test rig like lines. The test object code is 2.

1.1.2 Type of the test

Value	Scenario
BSD	Blind Spot Detection
C2C	Car to Car
LSS	Lane Support Systems
SAS	Speed Assist Systems
VRU	Vulnerable Road User
…	…

1.1.3 Subtype of the test

The values for ‘Subtype of the test’ can be expanded by the exchanging partners. The table contains recommendation for a subset of the types of test listed in 1.1.2.

Value	Remark
CCRb_AEB	Subtype of C2C (Car to Car Rear breaking)
CCRb_CIB	Subtype of C2C (Car to Car Rear breaking)
CCRb_DBS	Subtype of C2C (Car to Car Rear breaking)
CCRb_FCW	Subtype of C2C (Car to Car Rear breaking)
CCRm_AEB	Subtype of C2C (Car to Car Rear moving)
CCRm_CIB	Subtype of C2C (Car to Car Rear moving)
CCRm_DBS	Subtype of C2C (Car to Car Rear moving)
CCRm_ESS	Subtype of C2C (Car to Car Rear moving)
CCRm_FCW	Subtype of C2C (Car to Car Rear moving)
CCRs_AEB	Subtype of C2C (Car to Car Rear stationary)
CCRs_CIB	Subtype of C2C (Car to Car Rear stationary)
CCRs_DBS	Subtype of C2C (Car to Car Rear stationary)
CCRs_ESS	Subtype of C2C (Car to Car Rear stationary)
CCRs_FCW	Subtype of C2C (Car to Car Rear stationary)
CCFtab_AEB	Subtype of C2C (Car to Car Front turn across path)

FP-STP_CIB	Subtype of C2C (False Positive - Steel Trench Plate)
FP-STP_AEB	Subtype of C2C (False Positive - Steel Trench Plate)
FP-STP_DBS	Subtype of C2C (False Positive - Steel Trench Plate)
FP-CCRb_AEB	Subtype of C2C (False Positive – Car to Car Rear breaking)
FP-CCRb_FCW	Subtype of C2C (False Positive – Car to Car Rear breaking)
CBFA_AEB	Subtype of VRU (Car to Bicyclist Farside Adult)
CBLA_AEB	Subtype of VRU (Car to Bicyclist Longitudinal Adult)
CBLA_ESS	Subtype of VRU (Car to Bicyclist Longitudinal Adult)
CBLA_FCW	Subtype of VRU (Car to Bicyclist Longitudinal Adult)
CBNA_AEB	Subtype of VRU (Car to Bicyclist Nearside Adult)
CBNAO_AEB	Subtype of VRU (Car to Bicyclist Longitudinal Adult Obstructed)
CPFA_AEB	Subtype of VRU (Car to Pedestrian Farside Adult)
CPLA_AEB	Subtype of VRU (Car to Pedestrian Longitudinal Adult)
CPLA_ESS	Subtype of VRU (Car to Pedestrian Longitudinal Adult)
CPLA_FCW	Subtype of VRU (Car to Pedestrian Longitudinal Adult)
CPNA_AEB	Subtype of VRU (Car to Pedestrian Nearside Adult)
CPNA_FCW	Subtype of VRU (Car to Pedestrian Nearside Adult)
CPNAO_AEB	Subtype of VRU (Car to Pedestrian Nearside Adult Obstructed)
CPNC_AEB	Subtype of VRU (Car to Pedestrian Nearside Child)
CPNCO_AEB	Subtype of VRU (Car to Pedestrian Nearside Child Obstructed)
CPRA_AEB	Subtype of VRU (Car to Pedestrian Reverse Adult)
CPRNC_AEB	Subtype of VRU (Car to Pedestrian Reverse Nearside Child)
CPRSC_AEB	Subtype of VRU (Car to Pedestrian Reverse Stationary Child)
CPTA_AEB	Subtype of VRU (Car to Pedestrian Turning Adult)
CSFA_AEB	Subtype of VRU (Car-to-Scooter Farside Adult)
CVFA_AEB	Subtype of VRU (Car-to-VRU Farside Adult)
CVNA_AEB	Subtype of VRU (Car-to-VRU Nearside Adult)
BN_LDW	Subtype of LSS (Bot dots None)
DC_LDW	Subtype of LSS (Dashed Curve)
DDR_ELK	Subtype of LSS (Dashed Dashed Right)
DN_LDW	Subtype of LSS (Dashed None)
DN_LKA	Subtype of LSS (Dashed None)
DS_LKA	Subtype of LSS (Dashed Solid)
NDR_ELK	Subtype of LSS (None Dashed Right)
NDR_LKA	Subtype of LSS (None Dashed Right)
NNR_ELK	Subtype of LSS (None None Right)
SD_LKA	Subtype of LSS (Solid Dashed)
SDR_ELK	Subtype of LSS (Solid Dashed Right)
SN_ELK	Subtype of LSS (Solid None)
SN_LDW	Subtype of LSS (Solid None)
SN_LKA	Subtype of LSS (Solid None)
…	…

1.1.4 Regulation

The value of the descriptor regulation in the MME file is a comma separated list of keys each composed by 3 parts separated by '_' (ASCII 95).

The first part describes the *Family* which represents a group of regulations or procedures like UN-R, GTR, EuroNCAP.

The second is the subpart which could be the number of the regulation or an abbreviation of the procedure like 127, VRU, LSS.

The third part gives a specification of the version number or year of publication like 8.7, IV, 2022.

A list of examples gives the following table.

Value	Remark
EuroNCAP_VRU_3.0.2	Version 3.0.2 of the EuroNCAP test protocol for AEB VRU systems
CNCAP_C2C_2021	Version from 2021 of the China NCAP test protocol for car to car scenarios
USNCAP_DBS_2015	Version from 2015 of the NHTSA test protocol for dynamic brake support
CIASI_C2C_2017	Version from 2017 of the CIASI test protocol for car to car scenarios
ANCAP_LSS_3.0.2	Version 3.0.2 of the ANCAP test protocol for lane support systems
IIHS_VRU_II	Version II of the pedestrian AEB test protocol of the IIHS - or alternatively:
IIHS_VRU_2019	Version II from 2019 of the pedestrian AEB test protocol of the IIHS
…	…

1.2 Reference Coordinate Systems

All channels are measured or calculated in specific reference coordinate systems. For MME 2.x the coordinate system Id is part of the extended channel code. For MME 1.x the related reference system has to be agreed between the exchanging partners. The reference systems used in active safety tests can be reduced to the following table.

Id	Characteristic	Directions	Description	Remark
1DY	VUT dynamic	X Y Z	Dynamic Coordinate System moving like the VUT	According ISO 8855 Moving direction is X
2DY	Target dynamic	X Y Z	Dynamic Coordinate System moving like the Target	According ISO 8855 Moving direction is X
LOC	Steering Wheel	1 2 3	Local Coordinate System of the Steering Wheel (1 = Longitudinal)	Only the rotation around the longitudinal axis of the steering system is used
LOC	Path System	X Y Z	Local Coordinate System of the Path	Only the lateral deviation from the path is used
NED	NorthEastDown	1 2 3	Stationary Earth fixed Coordinate System (1 = North, 2 = East, 3 = Down)	Typically from GPS based systems with units [m]
TST	Testground Static	X Y Z	Coordinate System with Stationary Origin and Directions at the Test Ground	Derived from NED system by moving the origin to a point at the test ground and rotating to the main driving direction

1.3 Channel Codes

The channel code consists of 16 characters, composed of a sequence of codes with a fixed length and specific order, defining test object, position, main location, fine locations, physical dimension, direction and filter class

EXAMPLE	**1 0 VEHC 00 DI 00 VE X P**		
Meaning:	Test object	= 1	Vehicle under test
	Position	= 0	Undefined
	Main location	= VEHC	The whole vehicle
	Fine location 1	= 00	Undefined
	Fine location 2	= DI	Difference (relative)
	Fine location 3	= 00	Undefined
	Dimension	= VE	Velocity
	Direction	= X	X-direction
	Filter class	= P	Prefiltered

No filter classes are defined for active safety signals. Therefore all channels which could be filtered should have the filter class **P** (Prefiltered). Data sets which not could be filtered like Event or Time channels should have the filter class **0**.

1.3.1 Naming of Bus Signals

Bus signals can be named with the Main location 2BUS. To distinguish between different signals the Fine locations can be used. When bus signals are equivalent to named channels the code of the named channel with the Fine location **RD** (redundant) is recommended.

1.3.2 Codes for test type C2C

A list of examples gives the following table.

Channel Code	Unit	RefSys	Description
10PEAC000000DS0P	m	LOC	Accelerator Pedal Position
10PEAC000000000P	1	LOC	Accelerator Pedal Command
10PEBR000000DS0P	m	LOC	Brake Pedal Position
10PEBR000000FO0P	N	LOC	Brake Pedal Force
10PEBR000000000P	1	LOC	Brake Pedal Command
10STWL000000AV1P	rad/s	LOC	VUT Steering Wheel Angle Velocity
10TFCW000000EV00	1	-	FCW acoustical
10TTTC000000TI00	s	-	TTC
10TTTC010000TI00	s	-	TTC with Acceleration
10VEHC000000ACXP	m/s2	1DY	VUT Longitudinal Acceleration
10VEHC000000AVZP	rad/s	1DY	VUT Yaw Rate
10VEHC000000DSXP	m	TST	VUT Position X
10VEHC000000DSYP	m	TST	VUT Position Y

10VEHC000000VEXP	m/s	1DY	VUT Longitudinal Velocity
10VEHC00DI00DCYP	m	LOC	VUT Lateral Path Error
10VEHC00DI00DSXP	m	1DY	Headway Distance VUT - Target
10VEHC00DI00DSYP	m	1DY	Lateral Distance VUT - Target
20VEHC000000ACXP	m/s2	2DY	Target Longitudinal Acceleration
20VEHC000000AVZP	rad/s	2DY	Target Yaw Rate
20VEHC000000DSXP	m	TST	Target Position X
20VEHC000000DSYP	m	TST	Target Position Y
20VEHC000000VEXP	m/s	2DY	Target Longitudinal Velocity
20VEHC000000VEYP	m/s	2DY	Target Lateral Velocity
20VEHC00DI00DCYP	m	LOC	Target Lateral Path Error
…			
Examples for the usage of bus signals:			
10TTTCRD0000TI00	s	-	Bus Signal TTC
10VEHCRD0000ACXP	m/s2	1DY	Bus Signal VUT Requested Acceleration
102BUS010000000P	1	-	Bus Signal 1 Raw
102BUS010000EV00	1	-	Bus Signal 1
102BUS020000EV00	1	-	Bus Signal 2
102BUS030000000P	1	-	Bus Signal 3 Raw
102BUS030000EV00	1	-	Bus Signal 3
…			

1.3.3 Codes for test type VRU

A list of examples gives the following table.

Channel Code	Unit	RefSys	Description
10PEAC000000DS0P	m	LOC	Accelerator Pedal Position
10PEAC000000000P	1	LOC	Accelerator Pedal Command
10PEBR000000DS0P	m	LOC	Brake Pedal Position
10PEBR000000FO0P	N	LOC	Brake Pedal Force
10STWL000000AV1P	rad/s	LOC	VUT Steering Wheel Angle Velocity
10TFCW000000EV00	1	-	FCW acoustical
10VEHC000000ACXP	m/s2	1DY	VUT Longitudinal Acceleration
10VEHC000000AVZP	rad/s	1DY	VUT Yaw Rate
10VEHC000000DSXP	m	TST	VUT Position X
10VEHC000000DSYP	m	TST	VUT Position Y
10VEHC000000VEXP	m/s	1DY	VUT Longitudinal Velocity
10VEHC00DI00DCYP	m	LOC	VUT Lateral Path Error
10VEHC00DI00DSXP	m	1DY	Headway Distance VUT - Target
10VEHC00DI00DSYP	m	1DY	Lateral Distance VUT - Target
20CYCL000000DSXP	m	TST	Cyclist Position X
20CYCL000000DSYP	m	TST	Cyclist Position Y

20CYCL000000VEXP	m/s	2DY	Cyclist Longitudinal Velocity
20CYCL000000VEYP	m/s	2DY	Cyclist Lateral Velocity
20CYCL00DI00DCYP	m	LOC	Cyclist Lateral Path Error
20PEDA000000DSXP	m	TST	Pedestrian (adult) Position X
20PEDA000000DSYP	m	TST	Pedestrian (adult) Position Y
20PEDA000000VEXP	m/s	2DY	Pedestrian (adult) Longitudinal Velocity
20PEDA000000VEYP	m/s	2DY	Pedestrian (adult) Lateral Velocity
20PEDA00DI00DCYP	m	LOC	Pedestrian (adult) Lateral Path Error
20PEDC000000DSXP	m	TST	Pedestrian (child) Position X
20PEDC000000DSYP	m	TST	Pedestrian (child) Position Y
20PEDC000000VEXP	m/s	2DY	Pedestrian (child) Longitudinal Velocity
20PEDC000000VEYP	m/s	2DY	Pedestrian (child) Lateral Velocity
20PEDC00DI00DCYP	m	LOC	Pedestrian (child) Lateral Path Error
…			
Examples for the usage of bus signals:			
10TTTCRD0000TI00	s	-	Bus Signal TTC
10VEHCRD0000ACXP	m/s2	1DY	Bus Signal VUT Requested Acceleration
102BUS010000000P	1	-	Bus Signal 1 Raw
102BUS010000EV00	1	-	Bus Signal 1
102BUS020000EV00	1	-	Bus Signal 2
102BUS030000000P	1	-	Bus Signal 3 Raw
102BUS030000EV00	1	-	Bus Signal 3
…			

1.3.4 Codes for test type LSS

A list of examples gives the following table.

Channel Code	Unit	RefSys	Description
10TLCR000000TI00	s	-	TLC
10TLCRFRLE00EV00	1	-	Line Crossing Time LHS
10TLCRFRRI00EV00	1	-	Line Crossing Time RHS
10TLDW000000EV00	1	-	LDW Activation Time
10TLDW010000EV00	1	-	LDW Vibration
10TLKA000000EV00	1	-	LKA Activation Time
10VEHC000000ACXP	m/s2	1DY	VUT Longitudinal Acceleration
10VEHC000000ACYP	m/s2	1DY	VUT Lateral Acceleration
10VEHC000000AVZP	rad/s	1DY	VUT Yaw Rate
10VEHC000000DSXP	m	TST	VUT Position X
10VEHC000000DSYP	m	TST	VUT Position Y
10VEHC000000VEXP	m/s	1DY	VUT Longitudinal Velocity
10VEHC000000VEYP	m/s	1DY	VUT Lateral Velocity
10VEHC00DI00DCYP	m	LOC	Lateral Path Error VUT

10VEHC00DI00DSYP	m	1DY	Lateral Displacement
11WHEL000000DSXP	m	TST	VUT Front Left Wheel Position X - needed?
11WHEL000000DSYP	m	TST	VUT Front Left Wheel Position Y - needed?
13WHEL000000DSXP	m	TST	VUT Front Right Wheel Position X - needed?
13WHEL000000DSYP	m	TST	VUT Front Right Wheel Position Y - needed?
20VEHC000000ACXP	m/s2	2DY	Target Longitudinal Acceleration
20VEHC000000AVZP	rad/s	2DY	Target Yaw Rate
20VEHC000000DSXP	m	TST	Target Position X
20VEHC000000DSYP	m	TST	Target Position Y
20VEHC000000VEXP	m/s	2DY	Target Longitudinal Velocity
…			
Examples for the usage of bus signals:			
10TLKARD0000000P	1	-	Bus Signal LKA Requested
10TLKARD0000EV00	1	-	Bus Signal LKA Approval
10VEHCRDDI00DSYP	m	1DY	Bus Signal Lateral Displacement
…			

2 Examples

2.1 Example of a test information file MME 1.6

```
Data format edition number  :1.6
Laboratory name             :NOVALUE
Laboratory contact name     :NOVALUE
Laboratory contact phone    :NOVALUE
Laboratory contact fax      :NOVALUE
Laboratory contact email    :NOVALUE
Laboratory test ref. number :21C2C-012M_CARID_20191016_145239
Customer name               :NOVALUE
Customer test ref. number   :NOVALUE
Customer project ref. number:NOVALUE
Customer order number       :NOVALUE
Customer cost unit          :NOVALUE
Customer test engineer name :NOVALUE
Customer test engineer phone:NOVALUE
Customer test engineer fax  :NOVALUE
Customer test engineer email:NOVALUE
Title                       :NOVALUE
Medium No./number of media  :1/1
Timestamp                   :2021-04-14 08:41:35
Type of the test            :C2C
Subtype of the test         :CCRs_AEB
Regulation                  :EuroNCAP_C2C_2018
Reference temperature       :NOVALUE
Relative air humidity       :NOVALUE
Date of the test            :12.04.2021
Number of test objects      :2
Name of test object 1       :VUT
Velocity test object 1      :4.17
Mass test object 1          :NOVALUE
Driver position object 1    :NOVALUE
Impact side test object 1   :FR
Type of test object 1       :1
Class of test object 1      :NOVALUE
Code of test object 1       :NOVALUE
Ref. number of test object 1:NOVALUE
Name of test object 2       :GVT
Velocity test object 2      :0
Mass test object 2          :NOVALUE
Driver position object 2    :NOVALUE
Impact side test object 2   :NOVALUE
Type of test object 2       :2
Class of test object 2      :NOVALUE
Code of test object 2       :NOVALUE
Ref. number of test object 2:NOVALUE
```

2.2 Example of a channel information file MME 1.6

```
Instrumentation standard    :NOVALUE
Number of channels          :16
Name of channel 001         :10VEHC000000ACXP / VUT Longitudinal Acceleration
Name of channel 002         :10VEHC000000VEXP / VUT Longitudinal Velocity
Name of channel 003         :10VEHC000000VEYP / VUT Lateral Velocity
Name of channel 004         :10VEHC000000AVZP / VUT Yaw Rate
Name of channel 005         :10VEHC00DI00DCYP / Lateral path error VUT
```

```
Name of channel 006         :10STWL000000MO1P / VUT Steering Wheel Torque
Name of channel 007         :10TLDW000000EV00 / LDW Activation Time
Name of channel 008         :10TLKA000000EV00 / LKA Activation Time
Name of channel 009         :10VEHC00DI00DSYP / Distance Line - VUT Lateral
Name of channel 010         :11WHEL000000DSXP / VUT Front Left Wheel Position X
Name of channel 011         :11WHEL000000DSYP / VUT Front Left Wheel Position Y
Name of channel 012         :13WHEL000000DSXP / VUT Front Right Wheel Position X
Name of channel 013         :13WHEL000000DSYP / VUT Front Right Wheel Position Y
Name of channel 014         :20VEHC000000ACXP / GVT Longitudinal Acceleration
Name of channel 015         :20VEHC000000VEXP / GVT Longitudinal Velocity
Name of channel 016         :20VEHC000000AVZP / GVT Yaw Rate
…
```

2.3 Example of a channel data file MME 1.6

```
Test object number          :1
Data source                 :transducer
Data status                 :ok
Name of the channel         :X-Position of the VUT
Laboratory channel code     :10VEHC000000DSXP
Customer channel code       :VUT Position X
Reference channel           :implicit
Reference channel name      :NOVALUE
Channel code                :10VEHC000000DSXP
Channel frequency class     :NOVALUE
Unit                        :m
Reference system            :TST
Transducer type             :NOVALUE
Pre-filter type             :NOVALUE
Cut off frequency           :NOVALUE
Channel amplitude class     :NOVALUE
Sampling interval           :0.01
Bit resolution              :NOVALUE
Time of first sample        :0.01
Number of samples           :2406
Start offset interval       :NOVALUE
End offset interval         :NOVALUE
Offset post test            :NOVALUE
Transducer id               :NOVALUE
Transducer natural frequency:NOVALUE
Transducer damping ratio    :NOVALUE
0.01
0.02
0.03
…
```

2.4 Example of a test information file MME 2.x

…

2.5 Example of a channel information file MME 2.x

…

2.6 Example of a channel data file MME 2.x

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