



Introduction to VECTO

4th China-EU Workshop on Emissions Standards and Regulations
第四届中欧排放标准与法规研讨会

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5 March 2021

2021年3月5日

Outline

概览

- Principle | 原则
- Component testing | 组件测试
- Mission profiles | 任务档案
- Operating modes | 运行模式
- Validation | 验证
- Air drag tool | 验证
- Engine tool | 发动机工具
- Hashing | 哈希算法
- Verification Testing Procedure | 验证测试程序
- More information | 更多信息

Heavy-duty ≠ light-duty vehicles 重型车辆 ≠ 轻型车辆



Source: ACEA



Simulation tool to calculate the energy demand, fuel consumption and CO₂ emissions
重型车辆 ≠ 轻型车辆



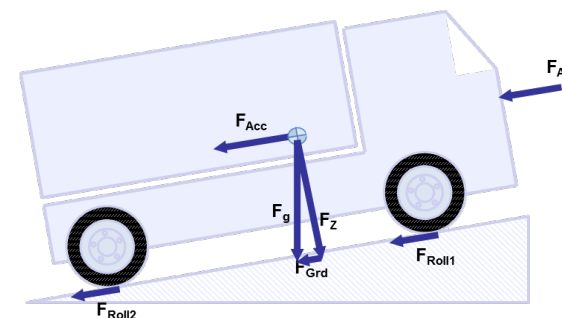
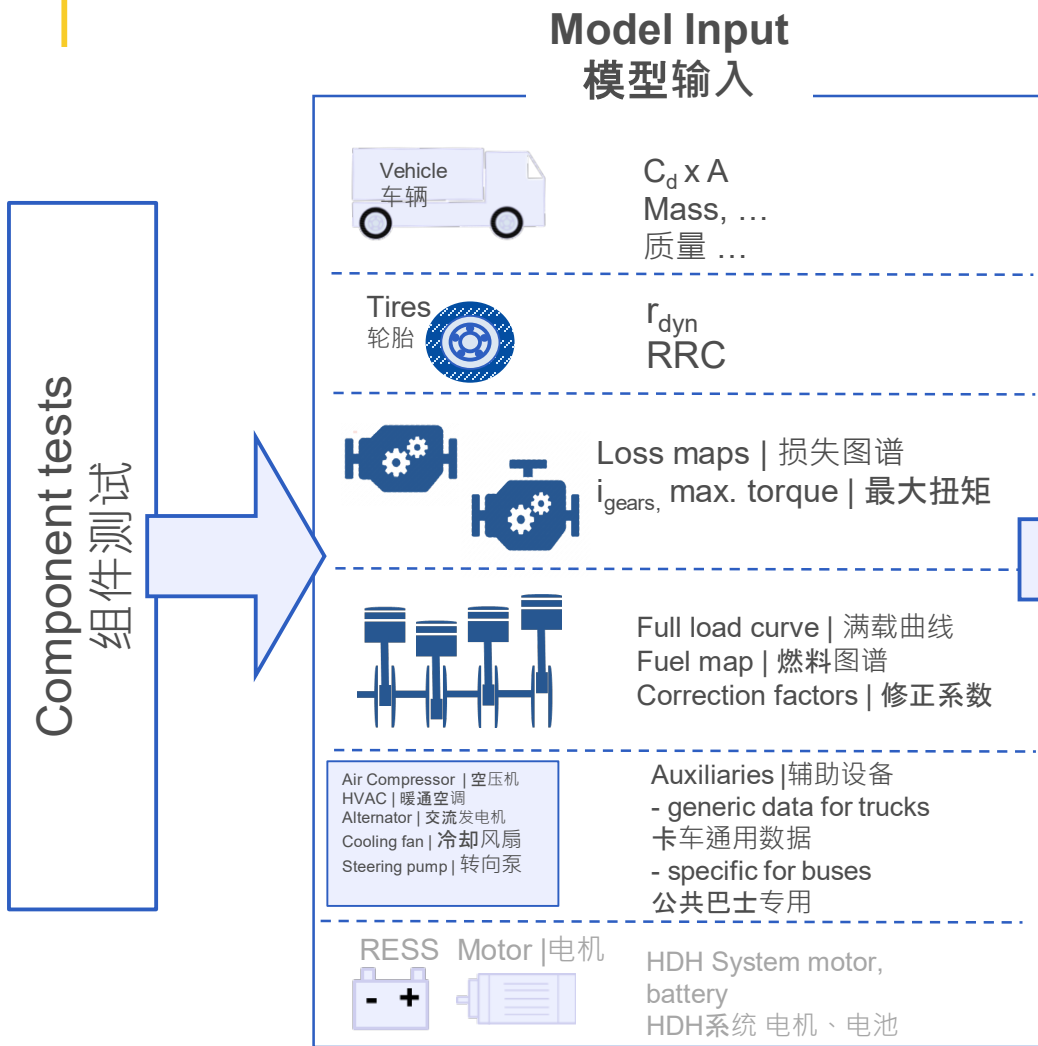
Entire vehicle
整车
Cost effective
成本效益
Reproducible
可复制
Flexible
灵活性



Regular updates
定期更新

VECTO method

VECTO方法



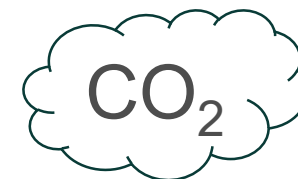
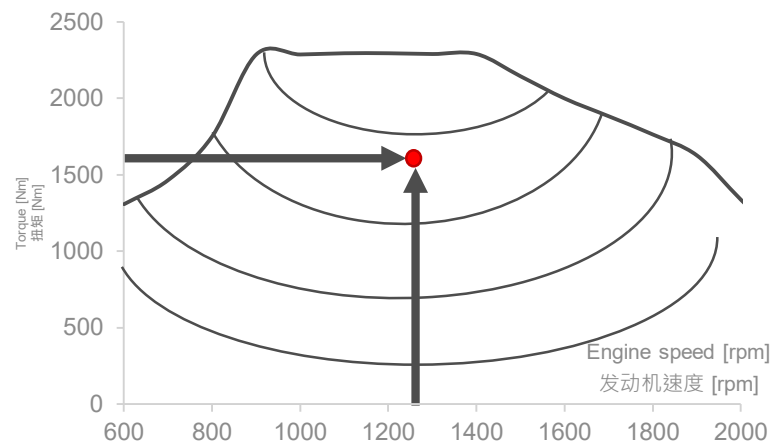
Engine power | 发动机马力：

$$P_{Eng} = P_{Air} + P_{Roll} + P_{Grd} + P_{Acc} + P_{Losses} + P_{Aux}$$

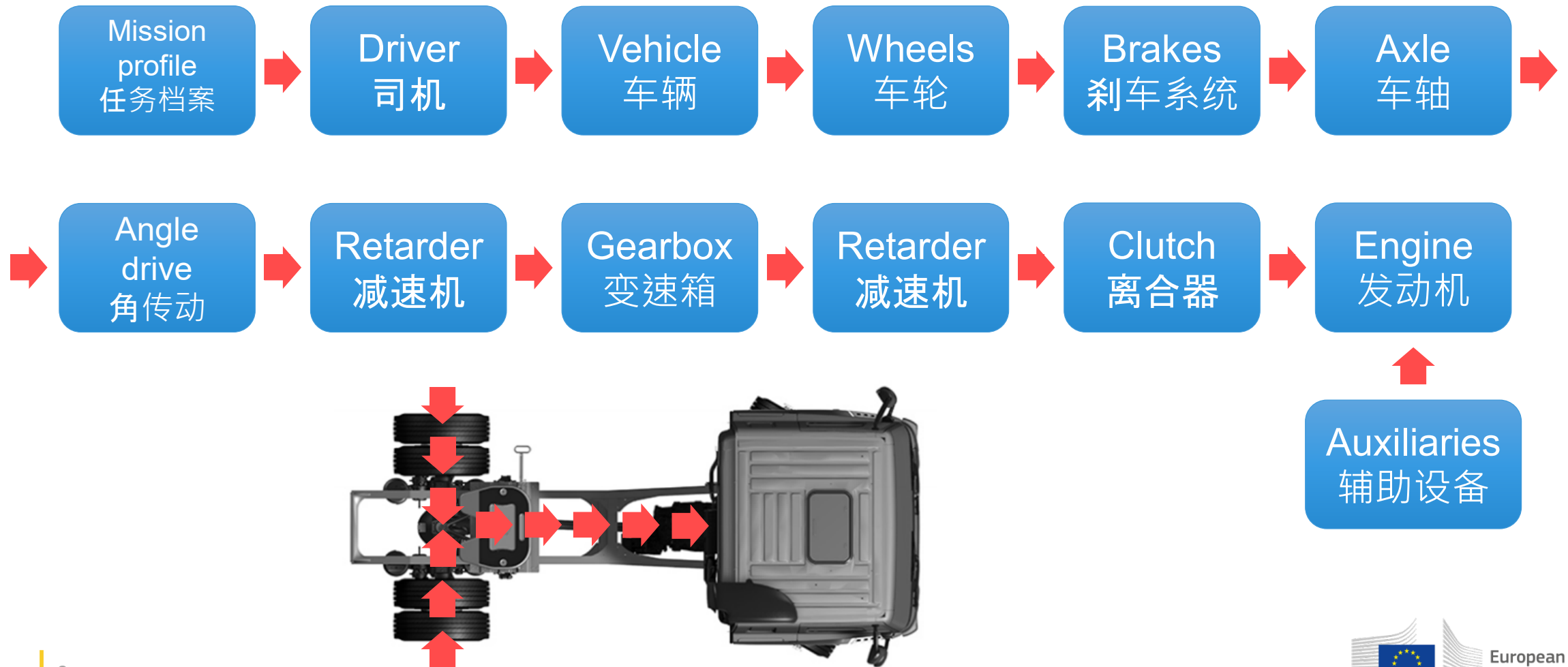
Engine speed | 发动机速度：

$$n_{Eng} = v \cdot i_{Axle} \cdot i_{Gear} \cdot \frac{60}{\pi \cdot D_{Wheel}}$$

Fuel consumption | 燃料消耗量：



Backwards calculation 反向计算



Process 工艺流程

Input 输入

Component data
组件数据

Hashing for integrity
完整性哈希算法

Results 结果

Each vehicle
每辆车

g/km, g/m³.km,

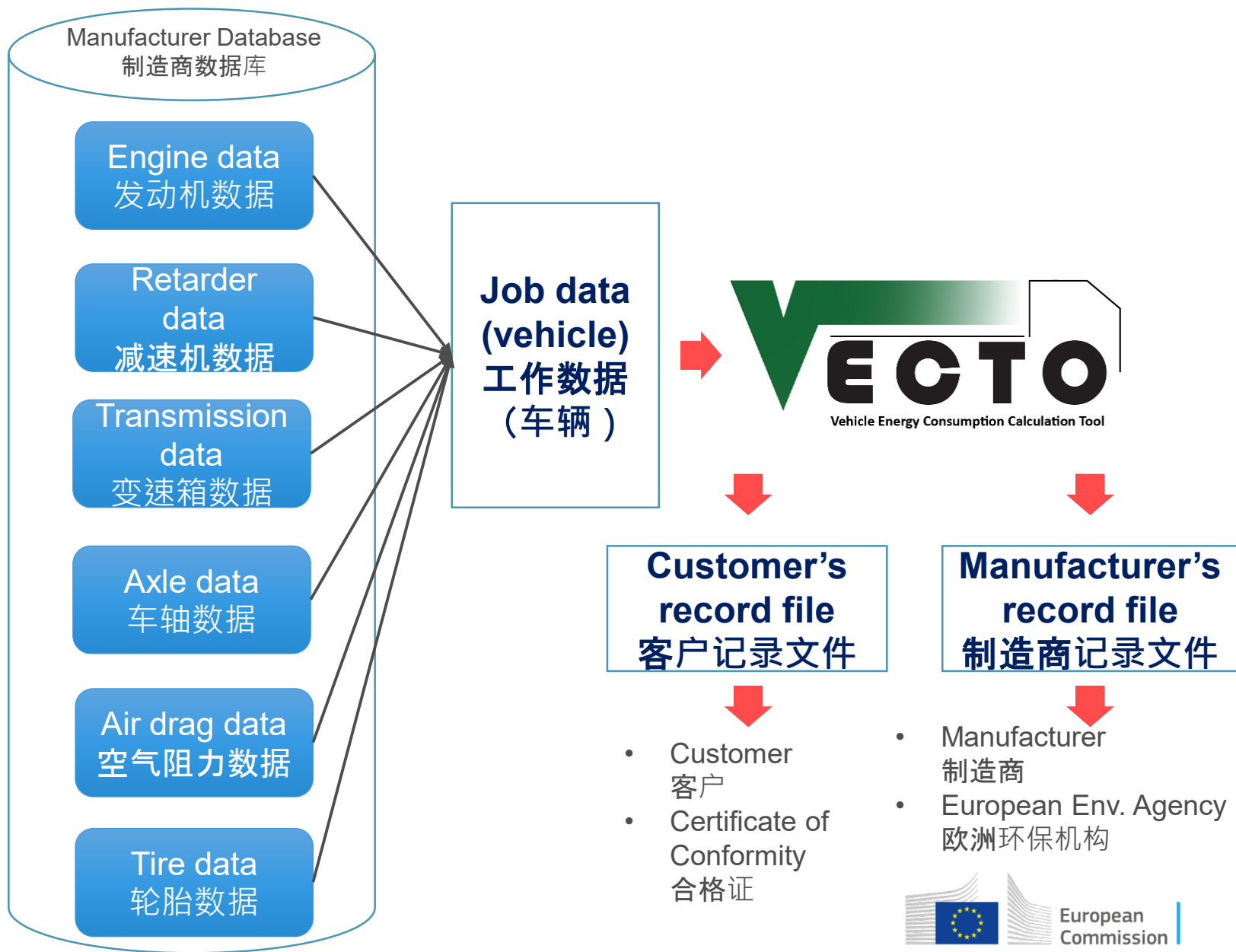
g/ton.km or g/pass.km

Use 使用

Certification
认证

Monitoring
监测

CO₂ Standards
CO₂标准



Component testing

组件测试

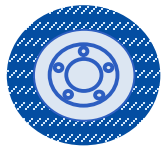
Air drag
空气阻力



- Constant speed test
恒速测试
- Standard body/trailer
标准车身/拖车

→ $C_d \times A$

Tires
轮胎



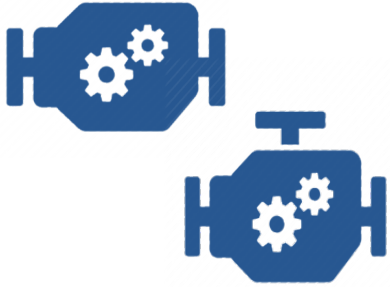
- Drum test (EC1222/2009)
转鼓试验 (EC1222/2009)
- Tire label
轮胎标签

→ RRC

Component testing

组件测试

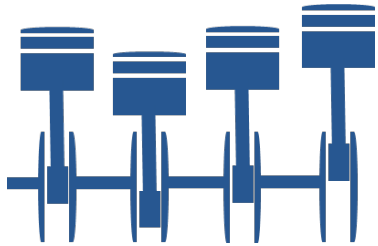
Drivetrain 动力传动系统



- Torque loss
转矩损失
- Full map measurement
全图谱测量
- Or idle measurement + calculation
或怠速测量 + 计算

→ torque loss map
转矩损失图谱

Engine 发动机



- Engine dyno
发动机功率计
- UN/ECE R49
- Steady-state & WHTC
稳态 & WHTC

→ fuel map
燃料图谱

→ full load & motoring
满载 & 监测

→ WHTC correction
WHTC 修正

Component testing

组件测试

Auxiliaries 辅助设备

Air Compressor
空压机
HVAC
暖通空调
Alternator
交流发电机
Cooling fan
冷却风扇
Steering pump
转向泵

Reduced testing burden 减少测试负担

- Component families
部件系列
- Standard values
标准数值

- Standard values
标准数值
- Technology dependent
科技依赖型
- Driving cycle depended
驾驶循环依赖型

→ power demand
功率需求

Mission profiles

任务档案

Lorries

载重卡车

- Long haul
长途运输
- Regional delivery
区域配送
- Urban delivery
城区配送
- Municipal utility
市政公共设施
- Construction
建筑施工

Busses & coaches

公共巴士与长途巴士

- Coach
长途巴士
- Interurban bus
城际公共巴士
- City-bus suburban
郊区城市公共巴士
- City-bus urban
市区城市公共巴士
- City-bus heavy urban
市区城市公共巴士（重型）

Vehicle segmentation 车辆细分

Vehicle groups 车辆分组

- Axle configuration
车轴配置

- Chassis type
底盘类型

- TPMLM



- Mission profiles
任务档案

- Payload
有效载荷

- Body/trailer
车身/拖车

- Auxiliary power
辅助动力

Vehicle groups for vehicles of category N

Description of elements relevant to the classification in vehicle groups			Vehicle group	Allocation of mission profile and vehicle configuration						
Axle configuration	Chassis configuration	Technically permissible maximum laden mass (tons)		Long haul	Long haul (EMS)	Regional delivery	Regional delivery (EMS)	Urban delivery	Municipal utility	Construction
4 × 2	Rigid lorry	> 3,5 – 7,5	(0)							
	Rigid lorry (or tractor) (**)	> 7,5 – 10	1			R		R		
	Rigid lorry (or tractor) (**)	> 10 – 12	2	R+T1		R		R		
	Rigid lorry (or tractor) (**)	> 12 – 16	3			R		R		
	Rigid lorry	> 16	4	R+T2		R		R	R	
	Tractor	> 16	5	T+ST	T+ST+T2	T+ST	T+ST+T2	T+ST		
	Rigid lorry	> 16	4v (***)						R	R
	Tractor	> 16	5v (***)							T+ST
4 × 4	Rigid lorry	> 7,5 – 16	(6)							
	Rigid lorry	> 16	(7)							
	Tractor	> 16	(8)							
6 × 2	Rigid lorry	all weights	9	R+T2	R+D+ST	R	R+D+ST		R	
	Tractor	all weights	10	T+ST	T+ST+T2	T+ST	T+ST+T2			
	Rigid lorry	all weights	9v (***)						R	R
	Tractor	all weights	10v (***)							T+ST
6 × 4	Rigid lorry	all weights	11	R+T2	R+D+ST	R	R+D+ST		R	R
	Tractor	all weights	12	T+ST	T+ST+T2	T+ST	T+ST+T2			T+ST
6 × 6	Rigid lorry	all weights	(13)							
	Tractor	all weights	(14)							
8 × 2	Rigid lorry	all weights	(15)							
8 × 4	Rigid lorry	all weights	16							R
8 × 6 8 × 8	Rigid lorry	all weights	(17)							

(*) EMS — European Modular System

(**) In these vehicle classes tractors are treated as rigid lorries but with specific curb weight of tractor

(***) Sub-group "v" of vehicle groups 4, 5, 9 and 10: these mission profiles are exclusively applicable to vocational vehicles

T = Tractor
R = Rigid lorry & standard body
T1, T2 = Standard trailers
ST = Standard semitrailer
D = Standard dolly

Mission profiles

任务档案

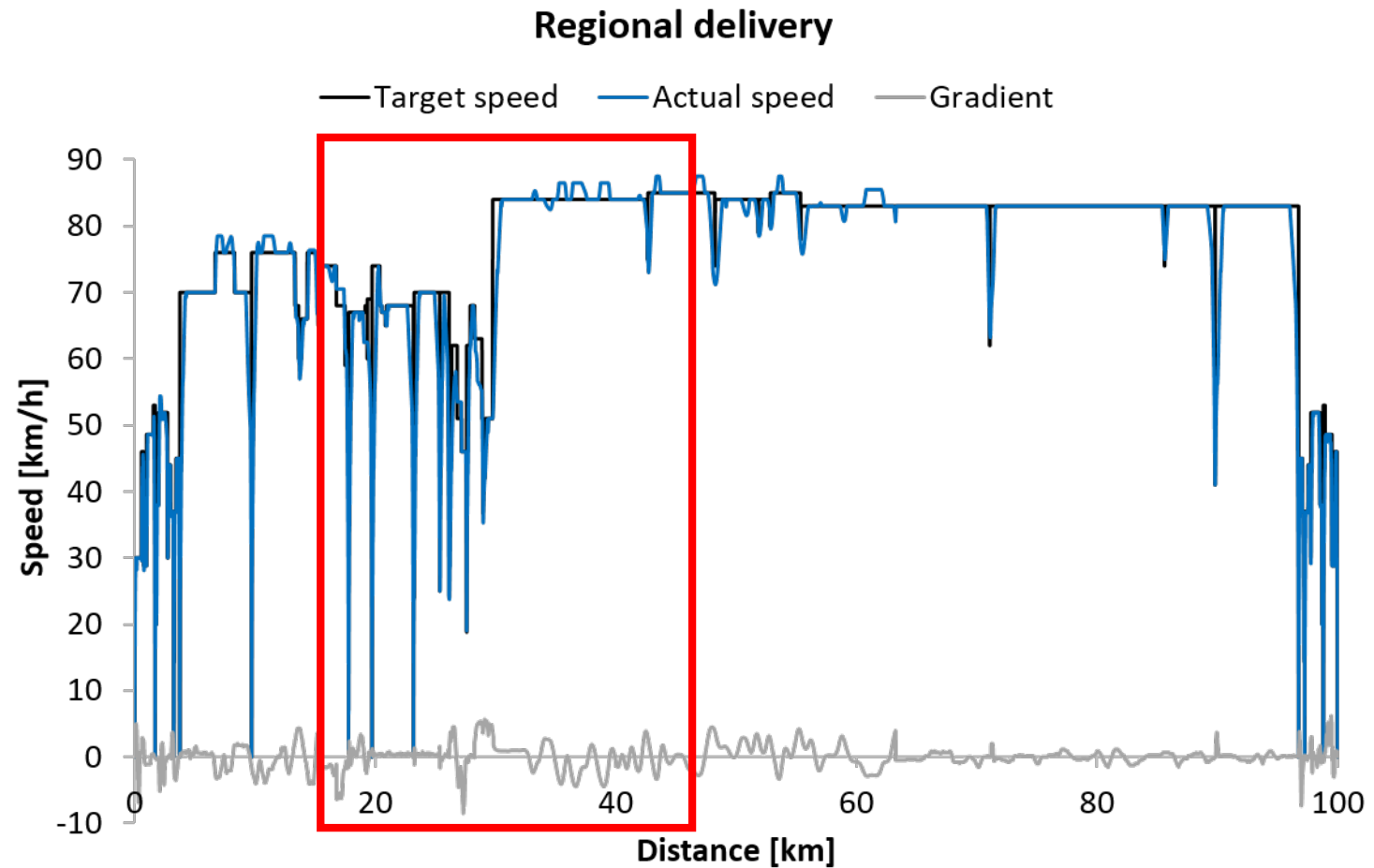
Target speed over distance
超距离目标速度

Road gradient
路面坡度

Stop time
停止时间

Driver model:
驱动模型

- Look ahead
展望未来
- Overspeeding
超速转动
- Gear shifting
变速调档
- ADAS



Mission profiles

任务档案

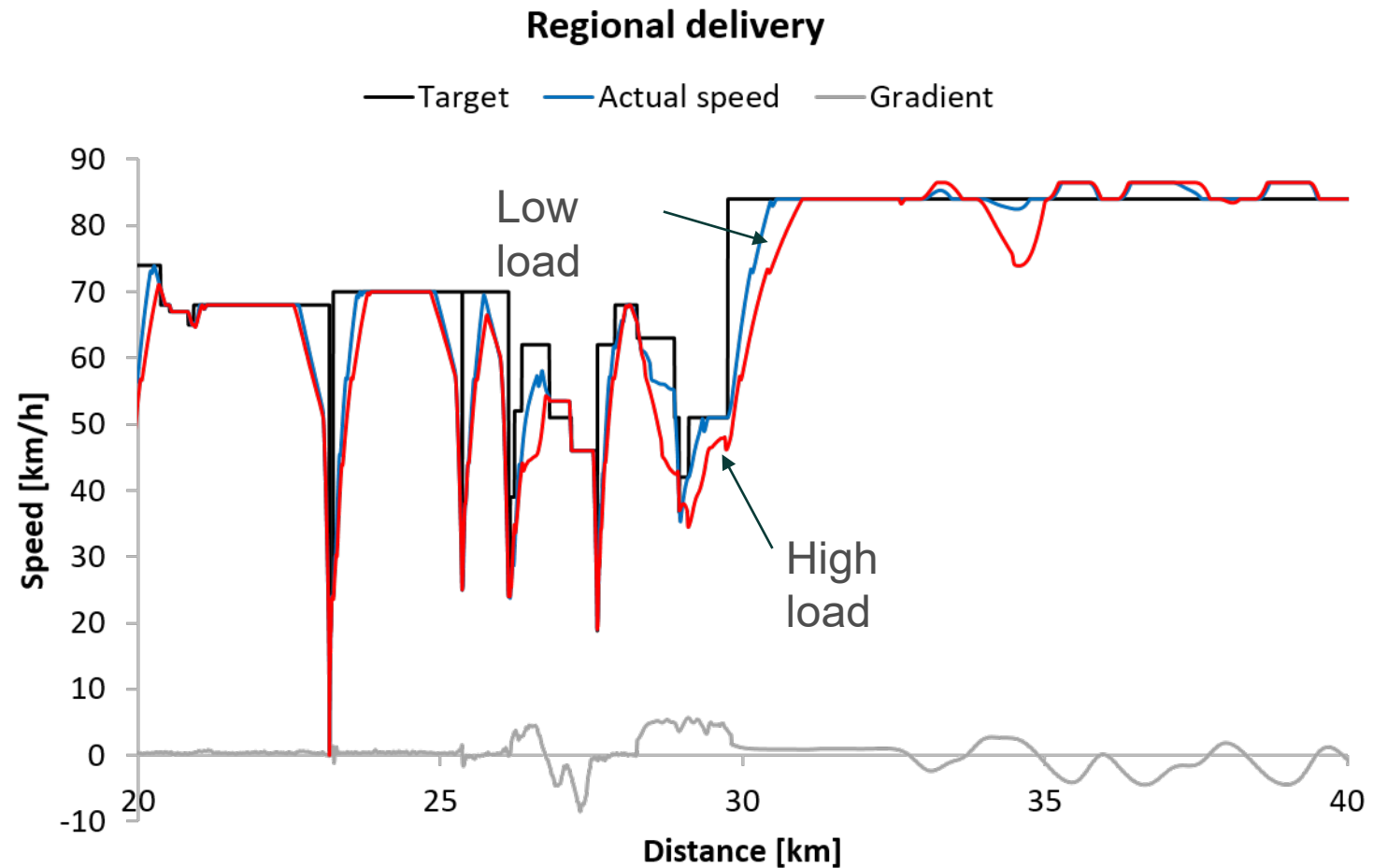
Target speed over distance
超距离目标速度

Road gradient
路面坡度

Stop time
停止时间

Driver model:
驱动模型

- Look ahead
展望未来
- Overspeeding
超速转动
- Gear shifting
变速调档
- ADAS



Operating modes

运行模式

Declaration mode 声明模式

- Parameters set according to regulation
参数按法规设置
- Predefined driving cycles
预定义的行驶工况

Engineering mode 工程模式

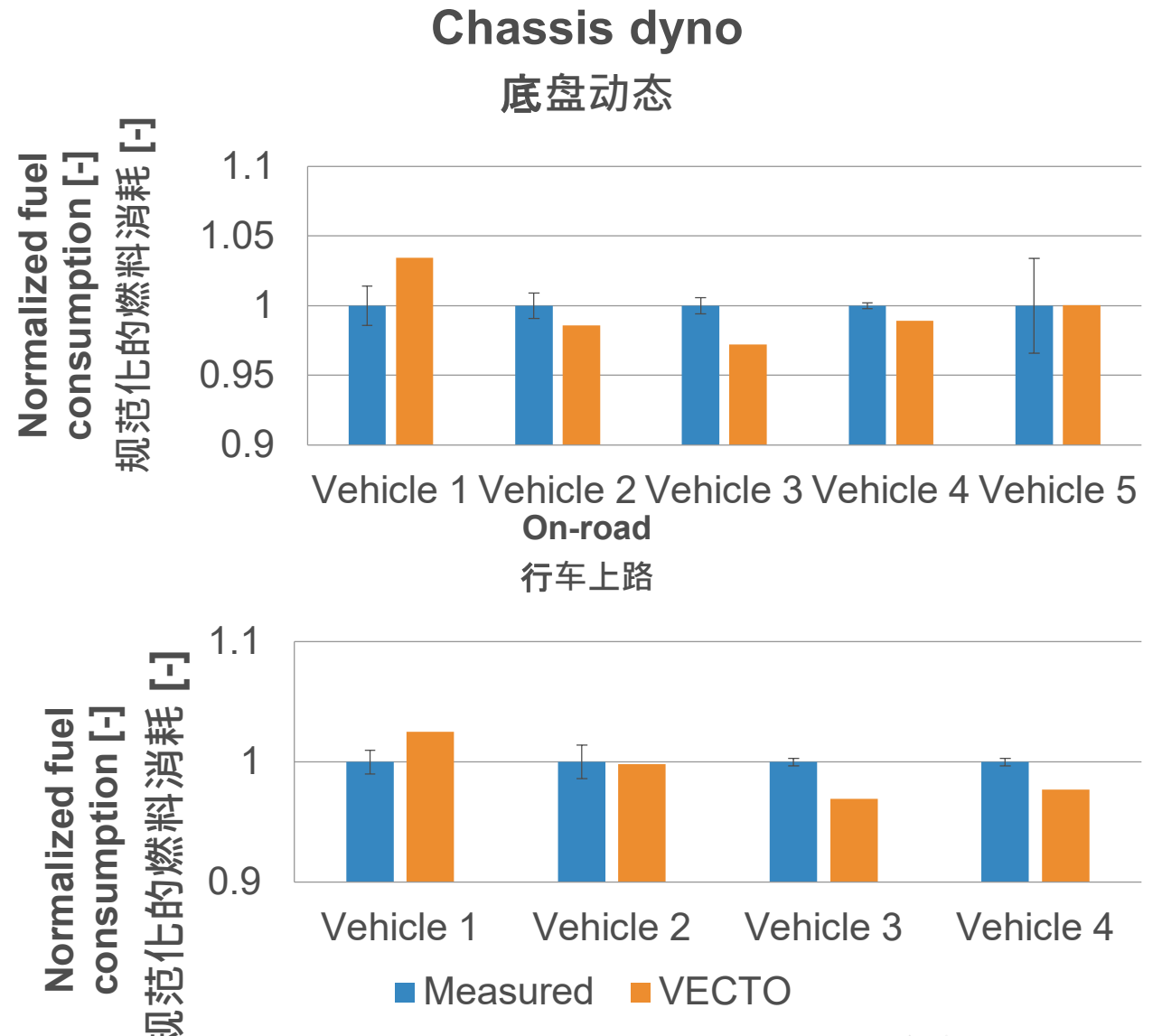
- Most parameters are tunable
大多数参数都可调
- Custom driving cycles
自定义的行驶工况
 - Target speed
目标速度
 - Wheel-power mode
轮上功率模式

Validation 验证

Test campaigns 测试活动

- JRC & industry measurements
JRC与行业测量
- Lorries, busses and coaches
载重卡车
- Chassis dyno and on-road
底盘动态和行车上路
- PEMS + wheel torque meas.
PEMS + 轮上扭矩测量

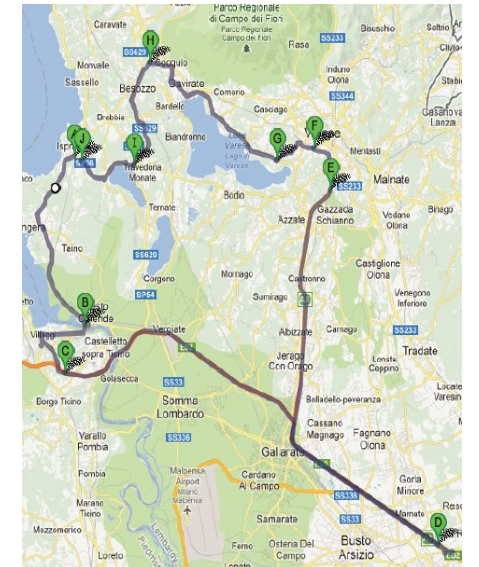
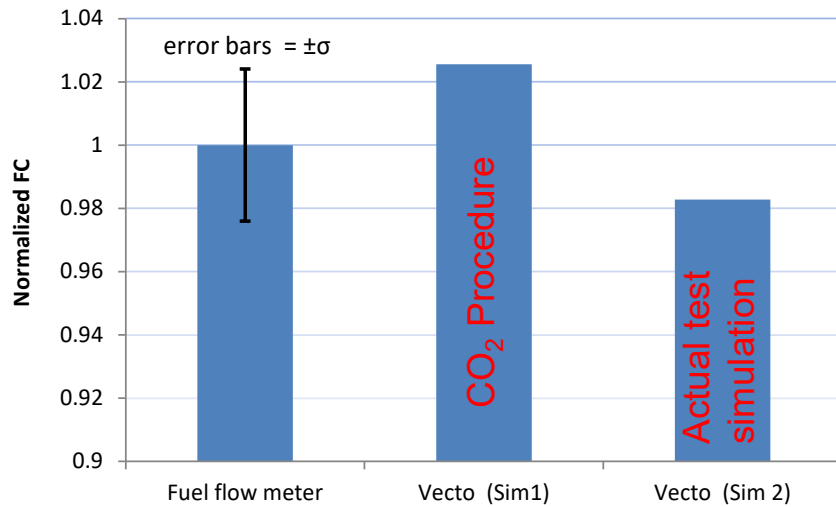
→ Results $\pm 5\%$
结果 $\pm 5\%$



Validation 验证

Proof of Concept 概念证明

- 18t rigid & 40t tractor
18t 整体式车架载重卡车 & 40t 拖拉机
- Dyno, on-road & track
动态、行车上路和轨迹



Development of a CO2 certification and monitoring methodology for Heavy Duty Vehicles – Proof of Concept report, 2014
 重型车辆CO₂认证和监测方法的制定——《概念证明报告》·2014

Validation 验证

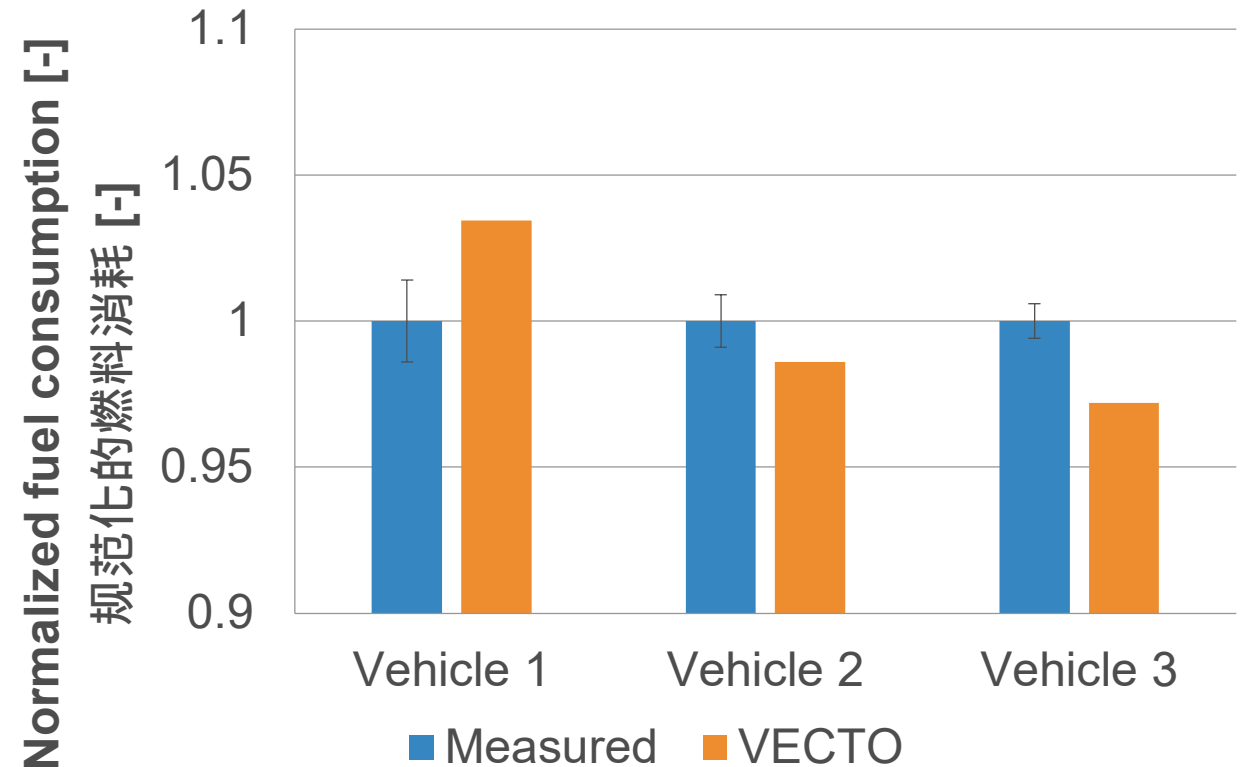
Lorries 载重卡车

- 4 lorries: 24 – 40t
4种载重卡车：24 – 40t
- Dyno: steady-state & cycles
动态：稳态与工况



Assessment of the monitoring methodology for CO₂ emissions from heavy duty vehicles:
Pilot phase test-campaign report and analysis of the ex-post verification options, 2017
重型车辆CO₂排放监测方法的评估：试点阶段的测试活动报告和验证后选项的分析·2017年

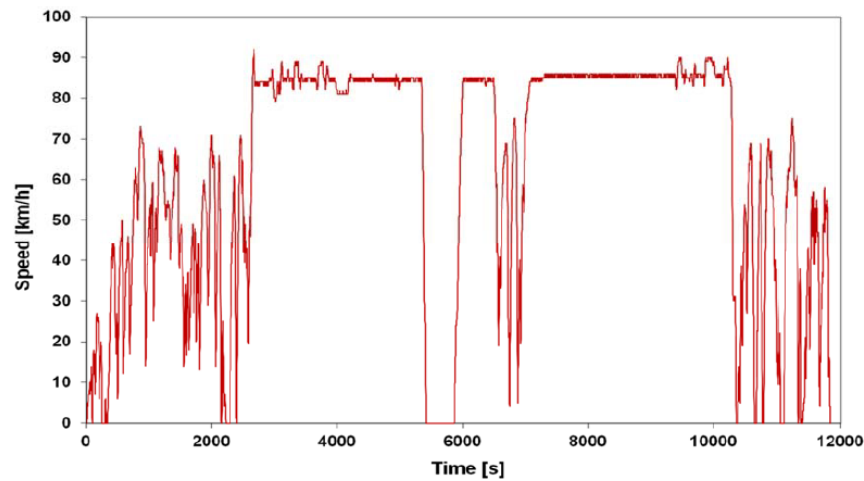
Chassis dyno 底盘动态



Validation 验证

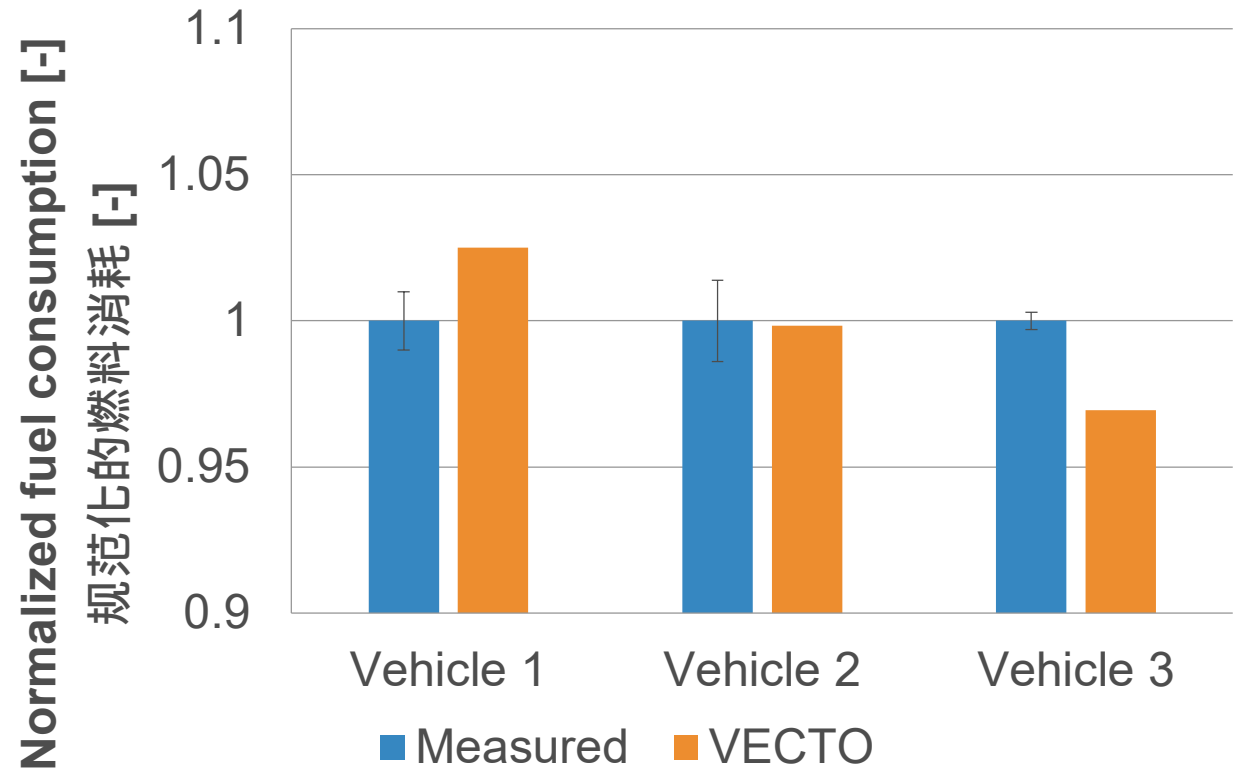
Lorries 载重卡车

- 4 lorries: 24 – 40t
4种载重卡车：24 – 40t
- Dyno: steady-state & cycles
动态：稳态与工况
- On-road
行车上路



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On-road 行车上路



Validation 验证

Busses and coaches

公共巴士与长途巴士

Dyno:

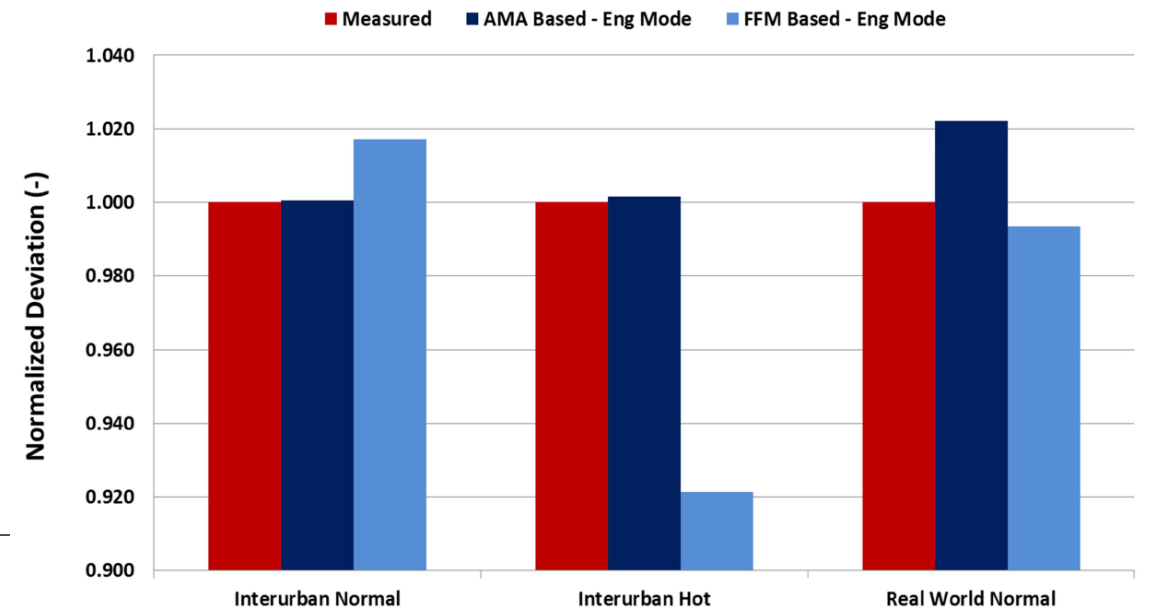
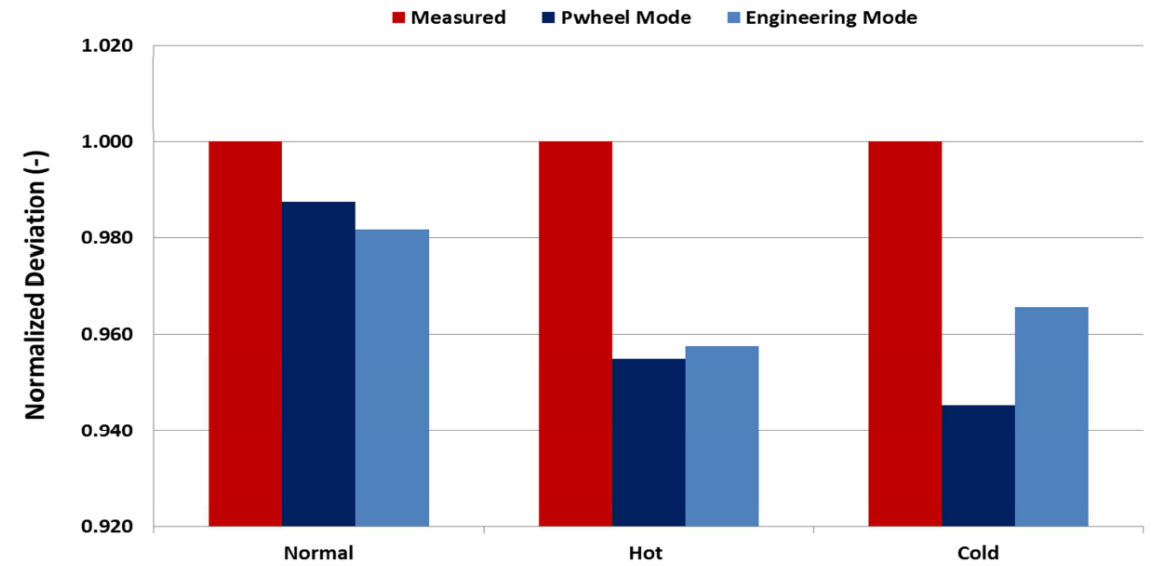
动态:

- Cycles & real world
工况与真实条件
- Multiple ambient conditions
多种环境条件



Assessment of the Measurement Methodology for CO₂ Emissions from Heavy Duty Buses and Coaches, 2018

公共巴士与长途巴士CO₂排放监测方法的评估·2018

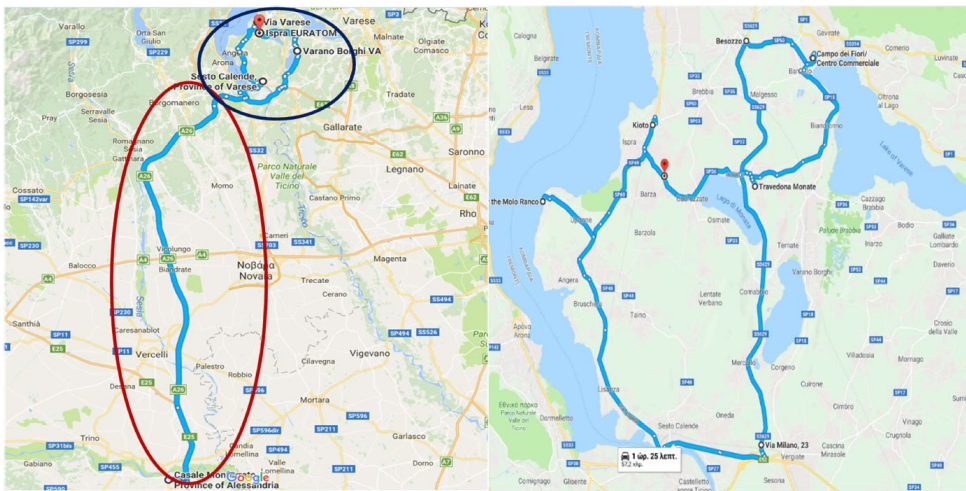


Validation 验证

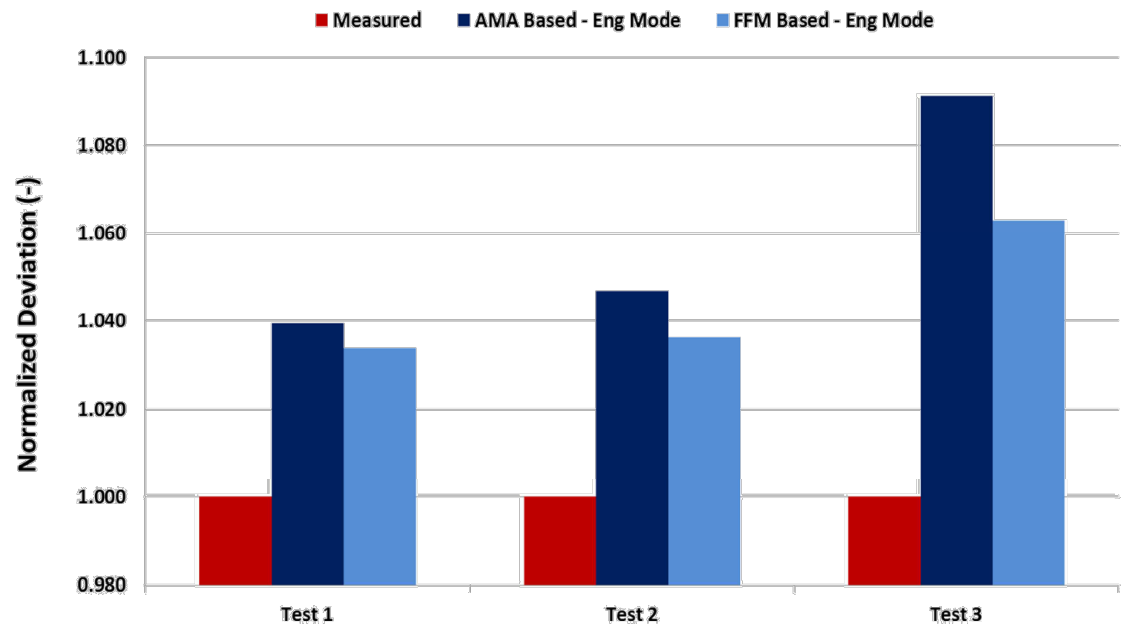
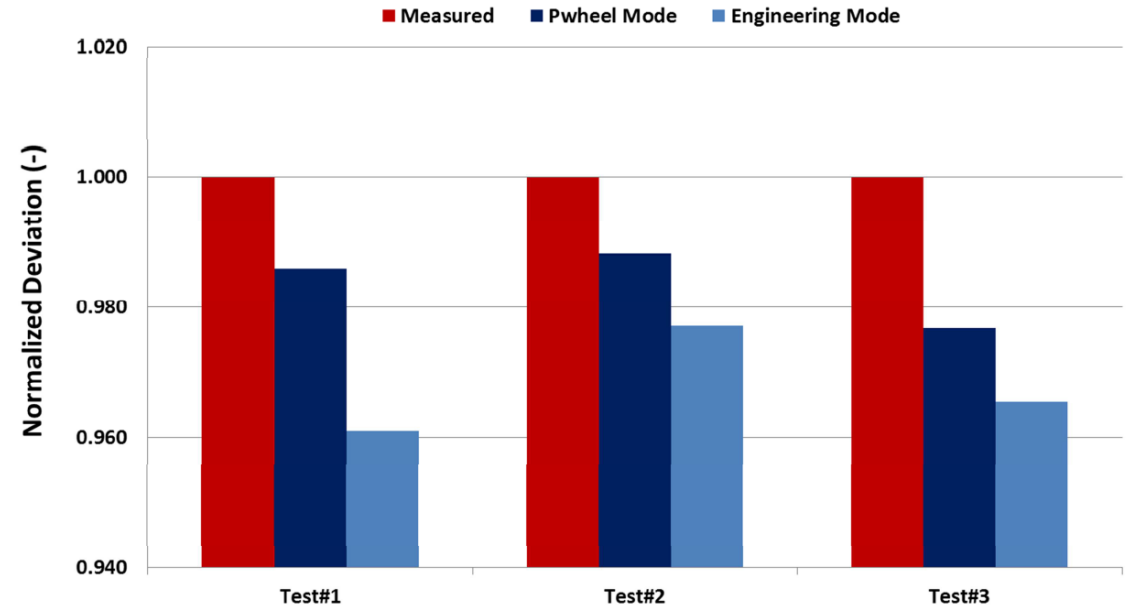
Busses and coaches
公共巴士与长途巴士

On-road
行车上路

- Coach
长途巴士
- Interurban bus
城际公共巴士



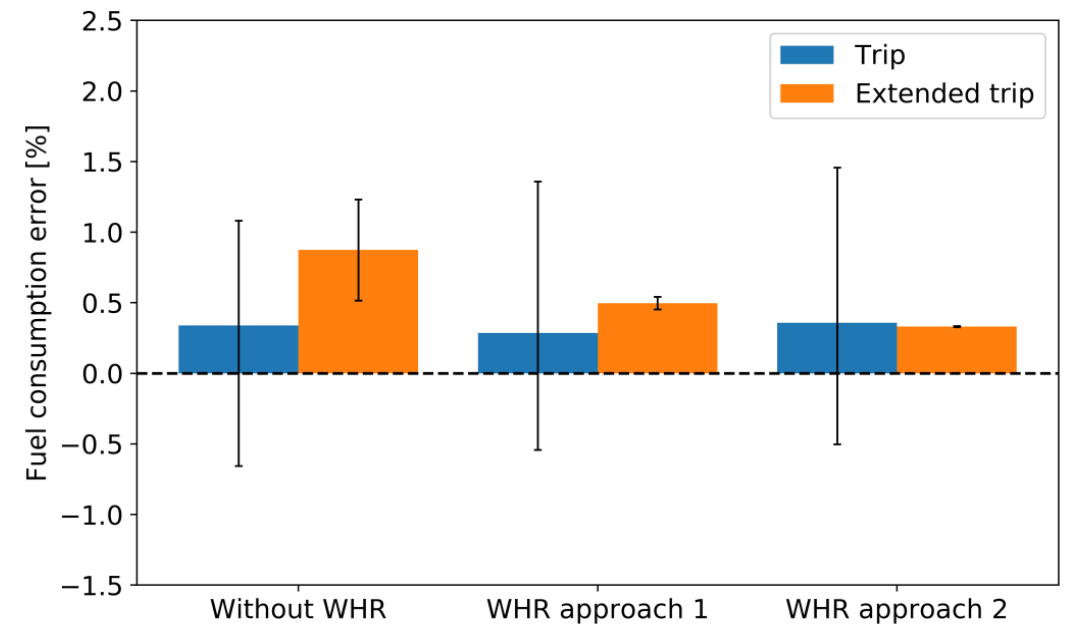
Assessment of the Measurement Methodology for CO₂ Emissions from Heavy Duty Buses and Coaches, 2018
公共巴士与长途巴士CO₂排放监测方法的评估·2018



Validation 验证

Waste Heat Recovery 废热回收

- Lorry + WHR
载重卡车 + WHR
- Chassis dyno:
底盘动态：
- On-road
行车上路



Experimental Evaluation and Modelling of Waste Heat Recovery in VECTO,
SAE technical paper 2020-01-1287, 2020
VECTO余热回收的实验评价与建模 · SAE技术论文2020-01-1287, 2020

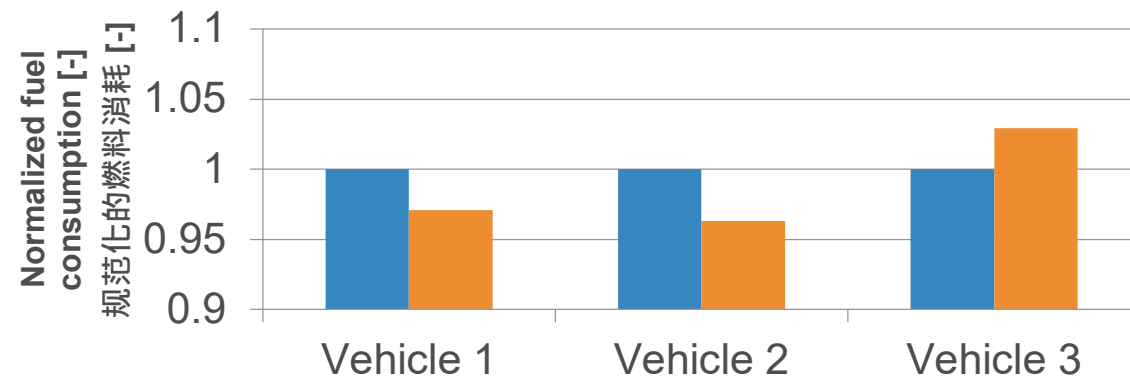
Validation 验证

VTP

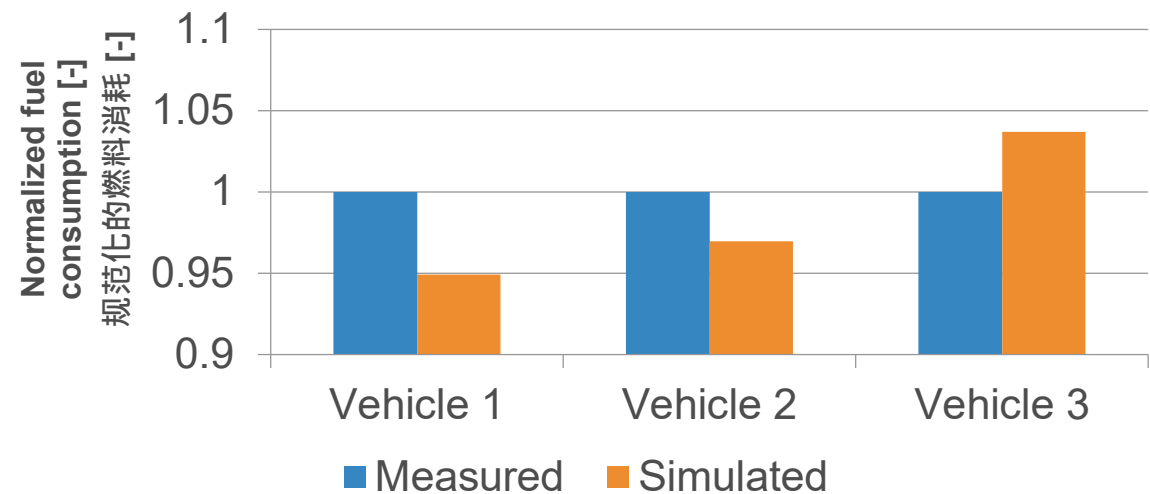
- Heavy buses and medium lorries
重型巴士与中型卡车
- On-road
行车上路



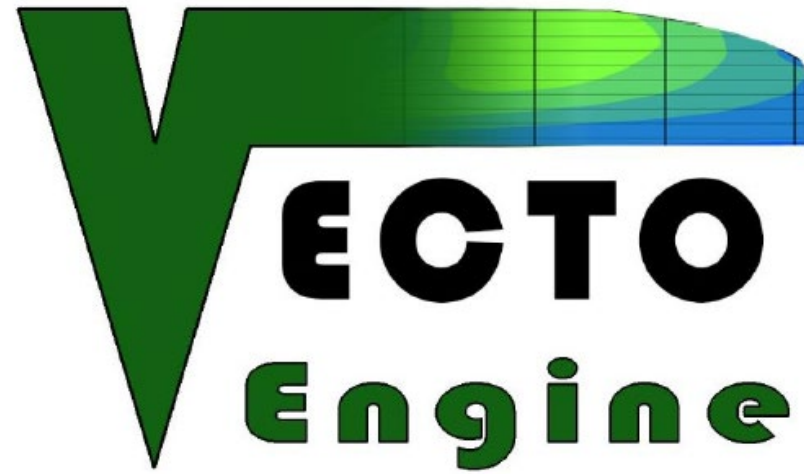
Motorway route
高速公路路线



Urban route
城区路线



Development of Heavy Duty Vehicles CO2 certification for Heavy Buses and Medium Lorries, 2020
重型巴士和中型卡车的重型车辆CO2认证开发 · 2020



Engine 发动机

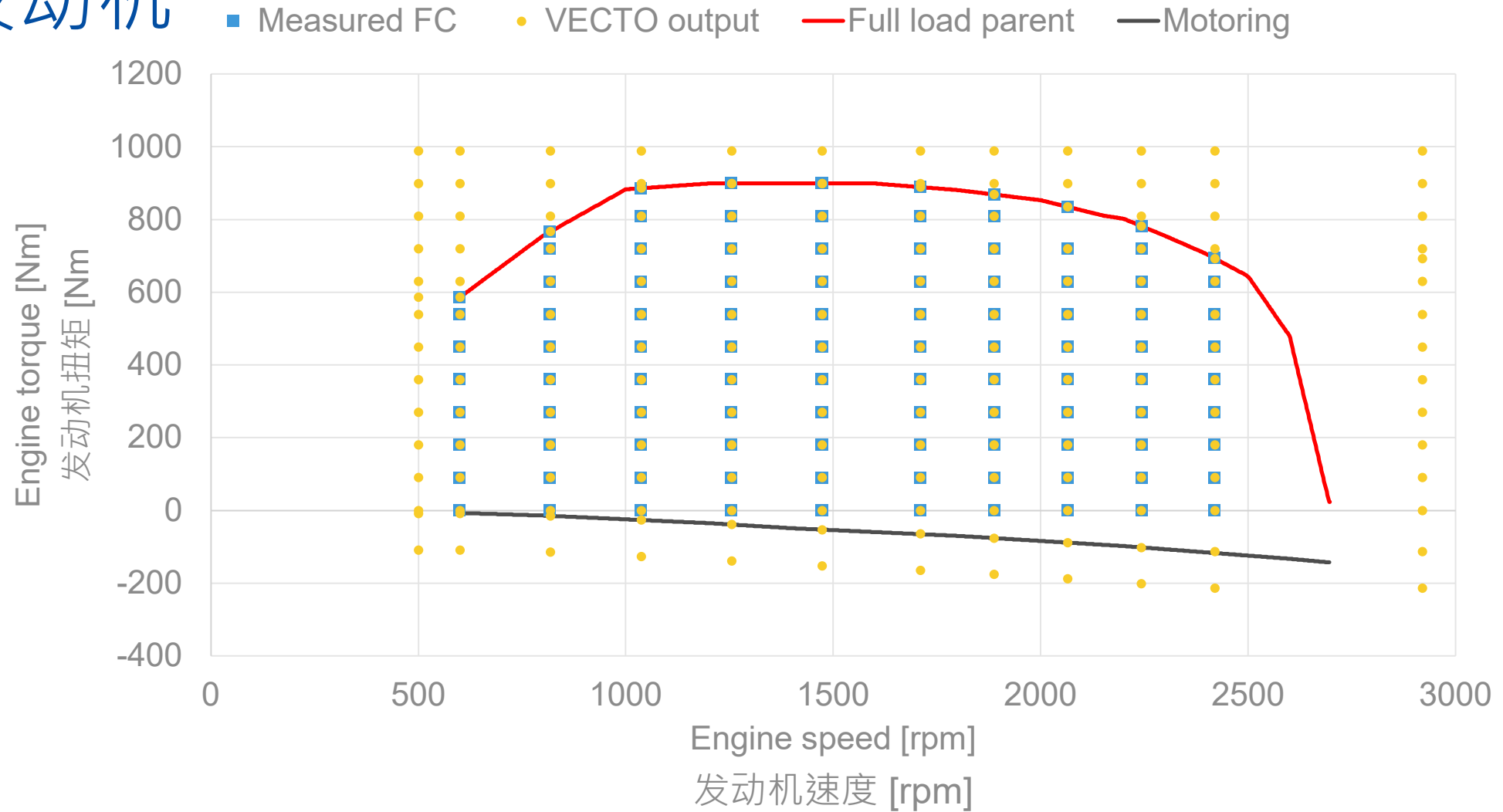
Engine test 发动机测试

Related to pollutant emissions test (EURO VI & UN/ECE R49)
与污染物排放测试相关 (EURO VI & UN/ECE R49)

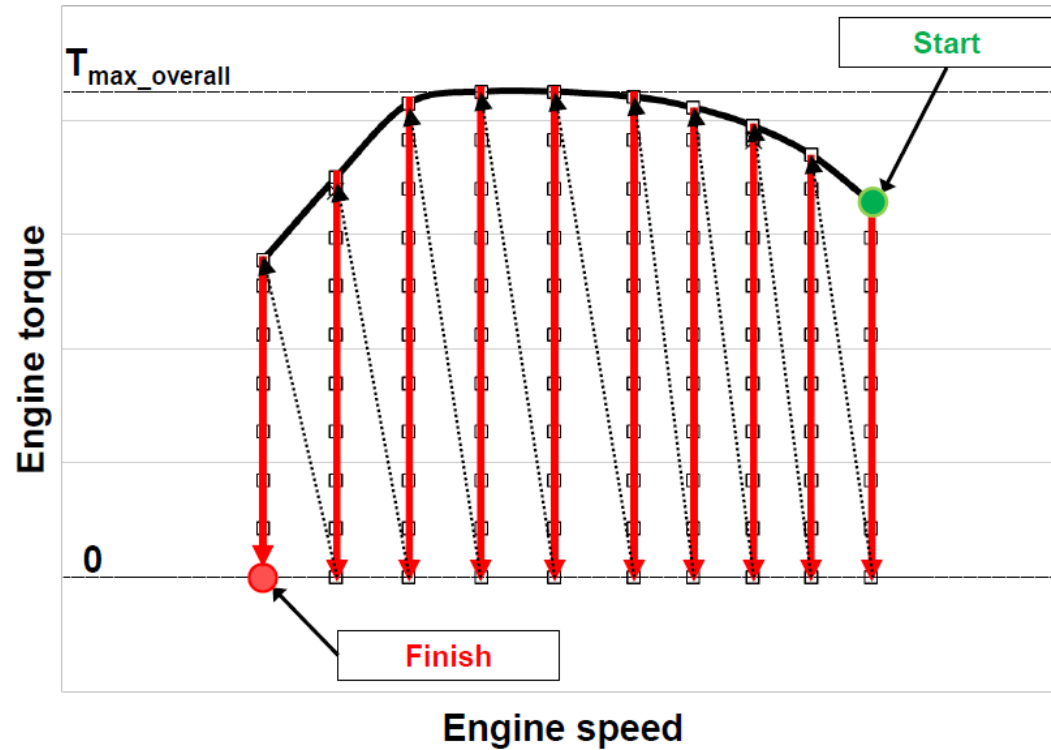
More stringent measurement requirements
更严格的测量要求

Test 测试	Parent engine 母型发动机	Each engine 各个发动机
Full load curve 满载曲线	✓	✓
Motoring 监测	✓	x
WHTC	✓	✓
WHSC	✓	✓
Fuel mapping 燃料图谱	✓	x

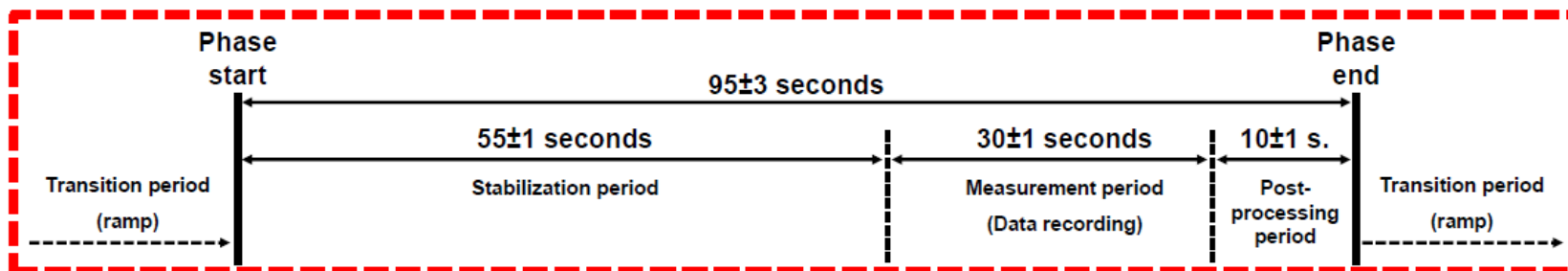
Engine 发动机



Engine 发动机



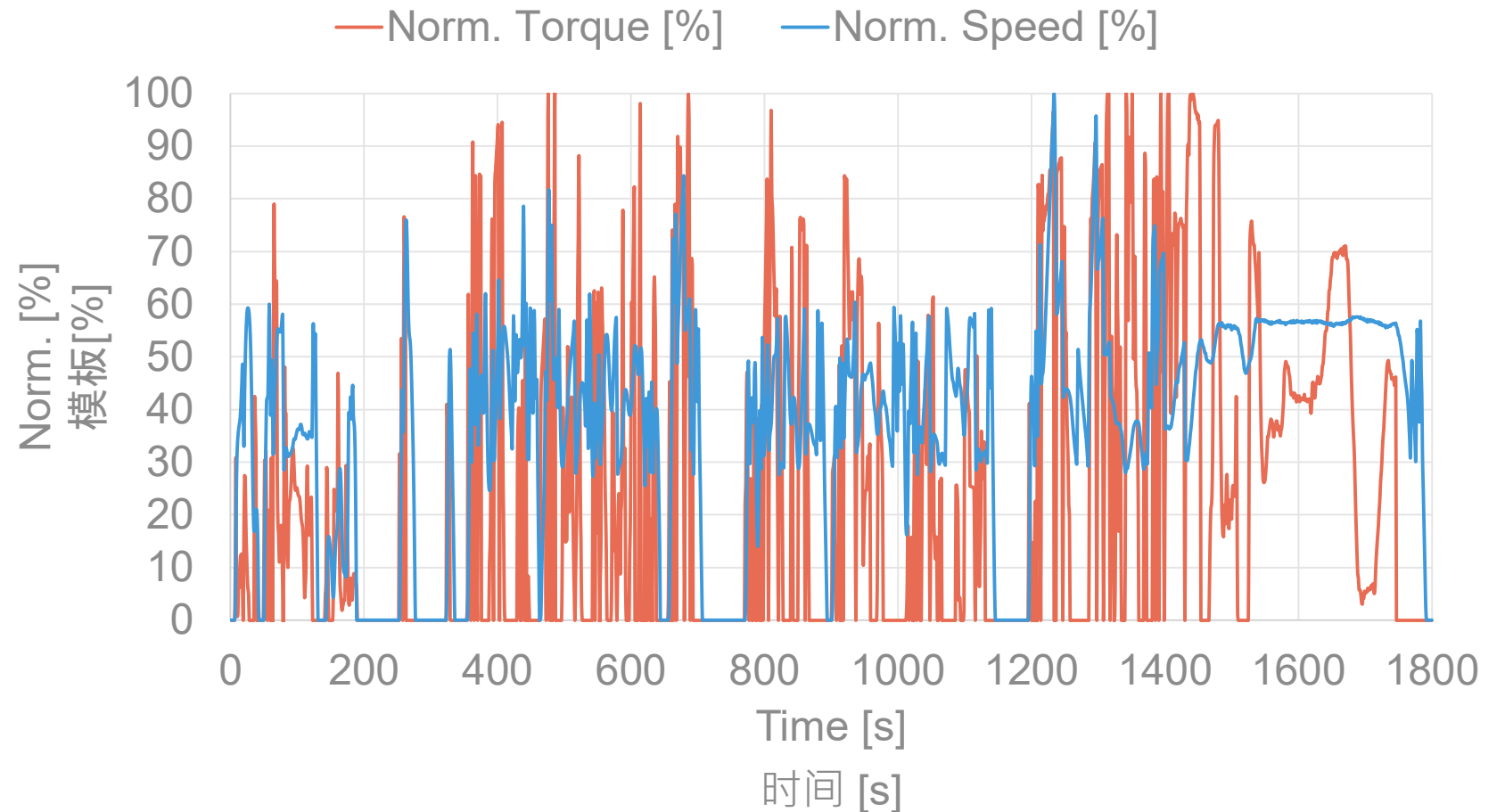
- preconditioning of 20 min at WHSC preconditioning mode 9
- ramp time of 20 sec for load change at constant speed (20-46 sec at speed and load changes)
- 55 sec stabilization time at each point
- 30 sec averaging (measuring) time at each point



Engine 发动机

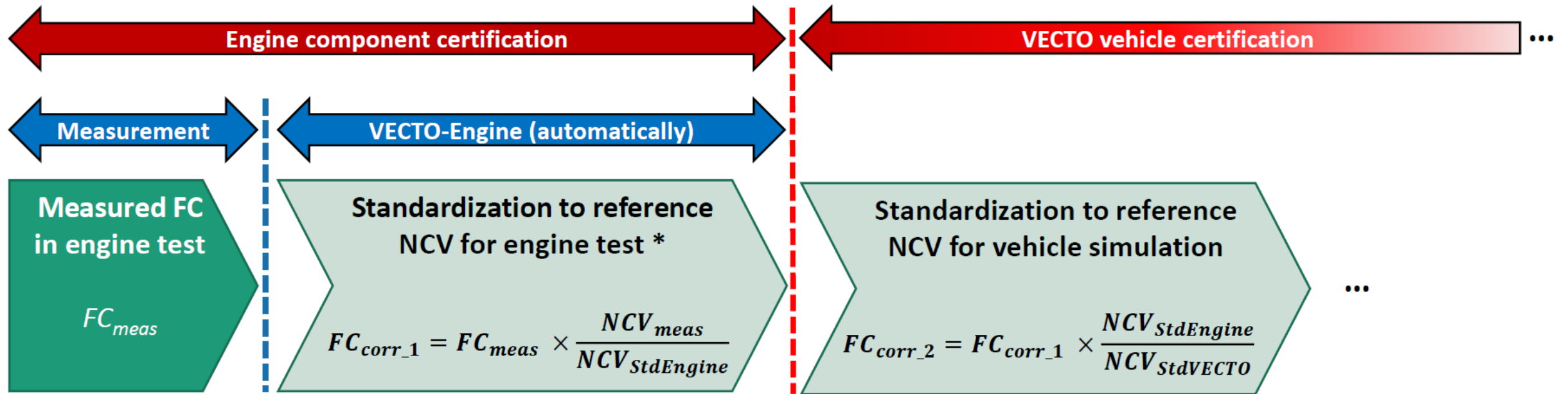
WHTC

- UN/ECE R49
- Transient test
瞬态测试
- Engine dyno
发动机功率计



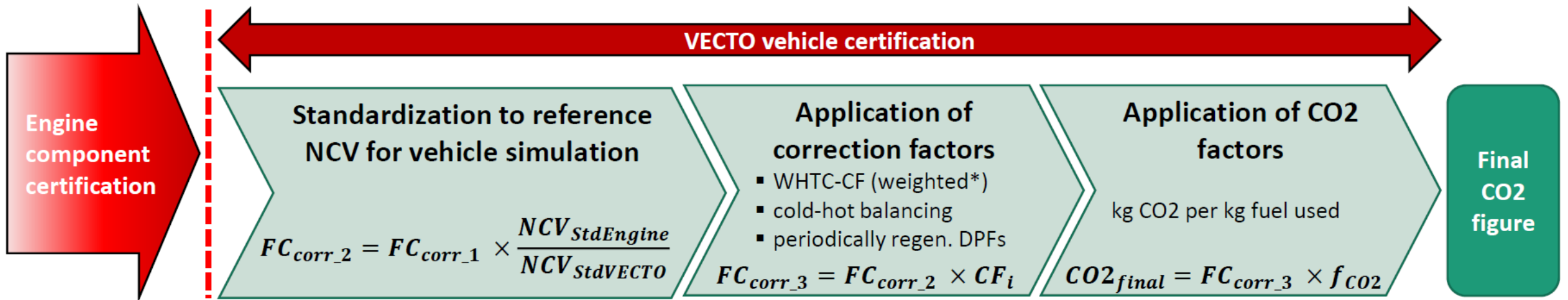
Engine 发动机

Correction factors 修正系数



Engine 发动机

Correction factors 修正系数



Engine 发动机

WHTC correction factor WHTC修正系数

- Transient effects
瞬态效应
- Avoid optimization pollutant – fuel consumption
避免优化污染物 - 燃料消耗
- Correction factor for urban, rural and motorway
城市、农村和高速公路的修正系数

$$CF_{WHTC} = \frac{FC_{meas} [g/kWh]}{FC_{map} [g/kWh]}$$

Engine 发动机

Cold-hot balancing factor 冷热平衡系数

- Avoid optimization pollutant – fuel consumption
避免优化污染物 - 燃料消耗
- WHTC hot & cold
WHTC (热态&冷态)

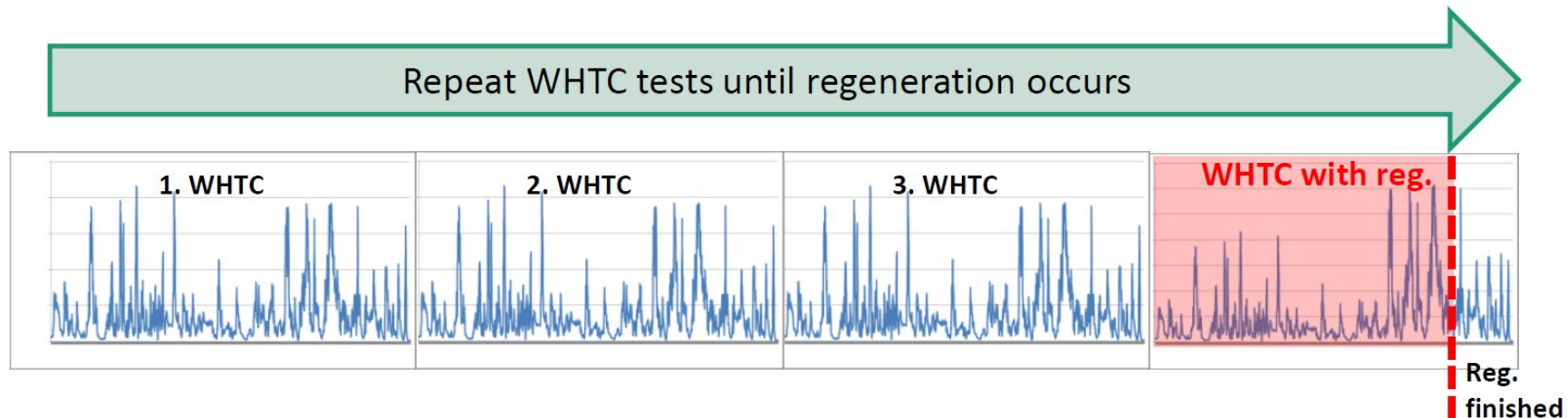
$$BF_{cold-hot} = 1 + 0.1 \cdot \frac{FC_{meas,cold} [g/kWh] - FC_{meas,hot} [g/kWh]}{FC_{meas,hot} [g/kWh]}$$

Engine 发动机

Periodic regeneration factor 周期性再生系数

- Effect periodically regenerated DPF
影响周期性再生的DPF

$$CF_{per\ reg} = \frac{n_{without} + n_{with} \cdot \frac{FC_{with} [g/kWh]}{FC_{without} [g/kWh]}}{n_{without} + n_{with}}$$



Input fields for component data

Input fields for component files

Input fields for specific FC figures and CF_{RegPer}

Input field for output directory

Message window

The screenshot shows the VECTO-Engine software interface with the following sections and highlighted areas:

- Component data:** A red dashed box highlights input fields for Manufacturer, Model, Certification Number, Idle speed of CO2-parent engine, Engine idle speed, Engine displacement, Engine rated power, Engine rated speed, Type of test fuel, and NCV of test fuel.
- Data files:** A purple dashed box highlights input fields for Fuel consumption map of CO2-parent engine, Full-load curve of CO2-parent engine, Full-load curve, and Motoring curve of CO2-parent engine.
- Specific fuel consumption measured:** An orange dashed box highlights input fields for WHTC coldstart total, WHTC hotstart total, WHTC-Urban, WHTC-Rural, WHTC-Motorway, and Correction factors (CF-RegPer).
- Control buttons:** A red dashed box highlights the "START FULL DATA EVALUATION" button and the "Precalculate characteristic engine speeds and grid for fuel map" button.
- Output:** A green dashed box highlights the "Output Directory" input field.
- Message window:** A blue dashed box highlights the message display area.

Control buttons

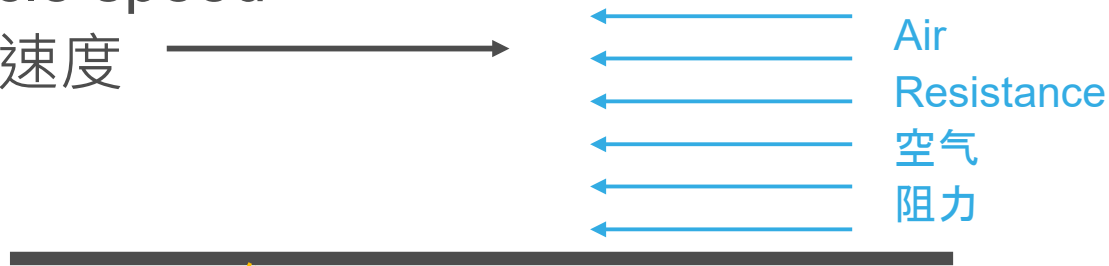


Air drag 空气阻力

Constant speed test | 恒速测试

Vehicle speed

车辆速度



Torque meter | 扭矩计

High speed test → aerodynamic losses

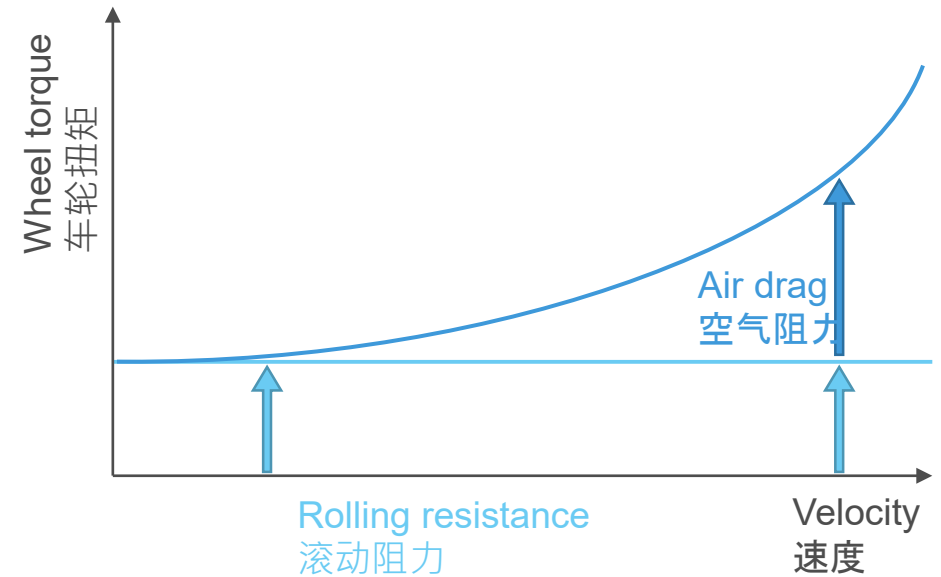
高速测试 → 气动损失

Low speed test → rolling resistance losses

低速测试 → 滚动阻力损失

Traction force from wheel torque meter

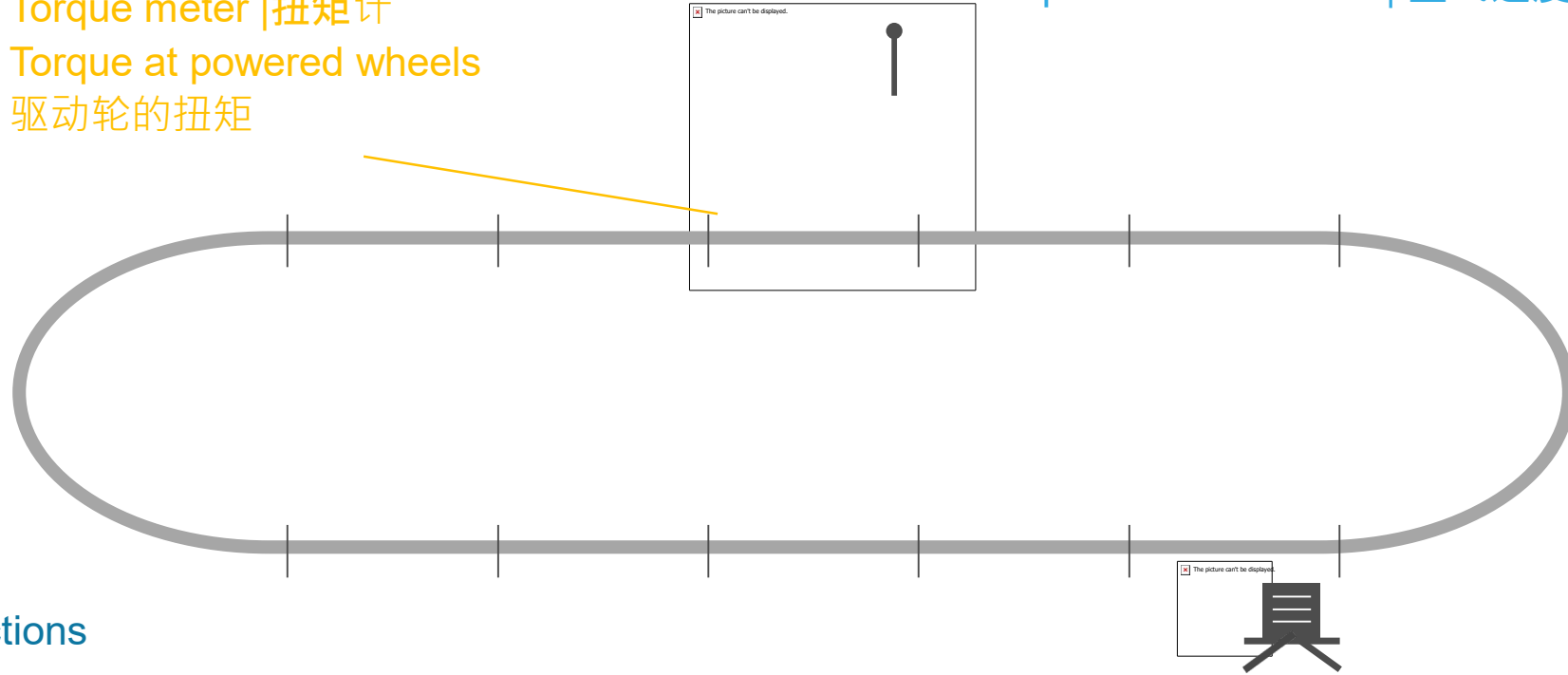
车轮扭矩计的牵引力



Air drag 空气阻力

Torque meter | 扭矩计
Torque at powered wheels
驱动轮的扭矩

On-board anemometer | 车载风速计
Air speed and direction | 空气速度和方向



Measurement sections

测量部分

- Optoelectronic barriers
光电障碍
OR | 或者
- Differential GPS
差分GPS

Weather station

气象站

- Ambient temperature
环境温度
- Air pressure
气压
- Humidity
湿度

VECTO air drag

VECTO空气阻力

Main tab
主要选项卡

Validation criteria tab
验证标准选项卡

The screenshot displays the VECTO software interface for Air Drag. The window title is "Job configurations C:\Utils\2019_01_31_VECTO-AirDrag_3.1.9\DemoData\Niki_demo.csjob.json". The interface features a toolbar with options like Exit, New Job, Load Job, Save As, Reload Job, Save Job, Tools, and Help. The main area is divided into tabs: "Main" and "Criteria". The "Criteria" tab is active, showing a "General" section with a "Vehicle file" field. Below this is the "Misalignment test" section with fields for "Meas. sec. config" and "Misalignment data", and a "Calibrate" button. The "Calibration results" section shows values for "beta misalign" (-0.43 [°]), "fv_veh (vehicle speed)" (0.969 [°]), and "fv_pe (air speed position error)" (1.12 [°]). The "Constant speed test" section includes fields for "Ambient cond.", "Meas. sec. config", "Low-speed 1 data", "High-speed data", and "Low-speed 2 data", along with an "Evaluate" button. At the bottom, a message log displays the following text:

```
Writing the summarized output file...
* writing result-file (*.csv)
* writing result-file (*.csv)
Results from the calculation
- average absolute beta HS test: 0.8048
- delta CdxA correction: -0.0246
- CdxA(0): 5.23
Background operation ended OK.
~ Writing JSON-file(C:\Utils\2019_01_31_VECTO-AirDrag_3.1.9\DemoData\EvaluationDemo.csjob.json)...
```

Toolbar
工具栏

File inputs
文件输入

Message log
消息日志



VECTO air drag

VECTO空气阻力

Validity criteria
inputs
有效性标准输入

Input info section
输入信息部分

Mode selection
模式选择

VECTO air drag

VECTO空气阻力

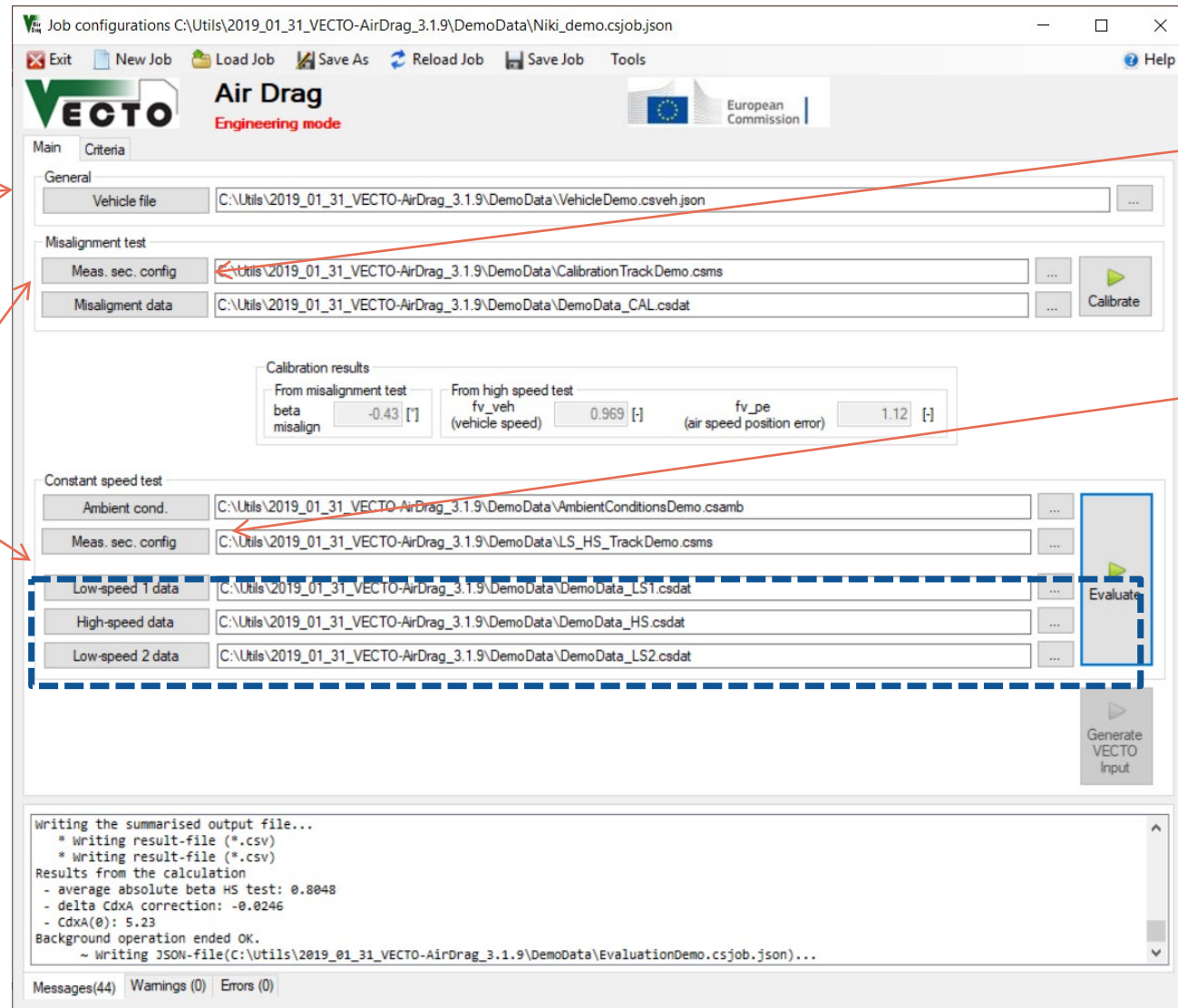
Vehicle technical data file
车辆技术数据文件

Configuration of measurement section
测量部分的结构

Misalignment test
偏差测试

Ambient conditions
环境条件

High and low speed test measurements
高速和低速测试测量





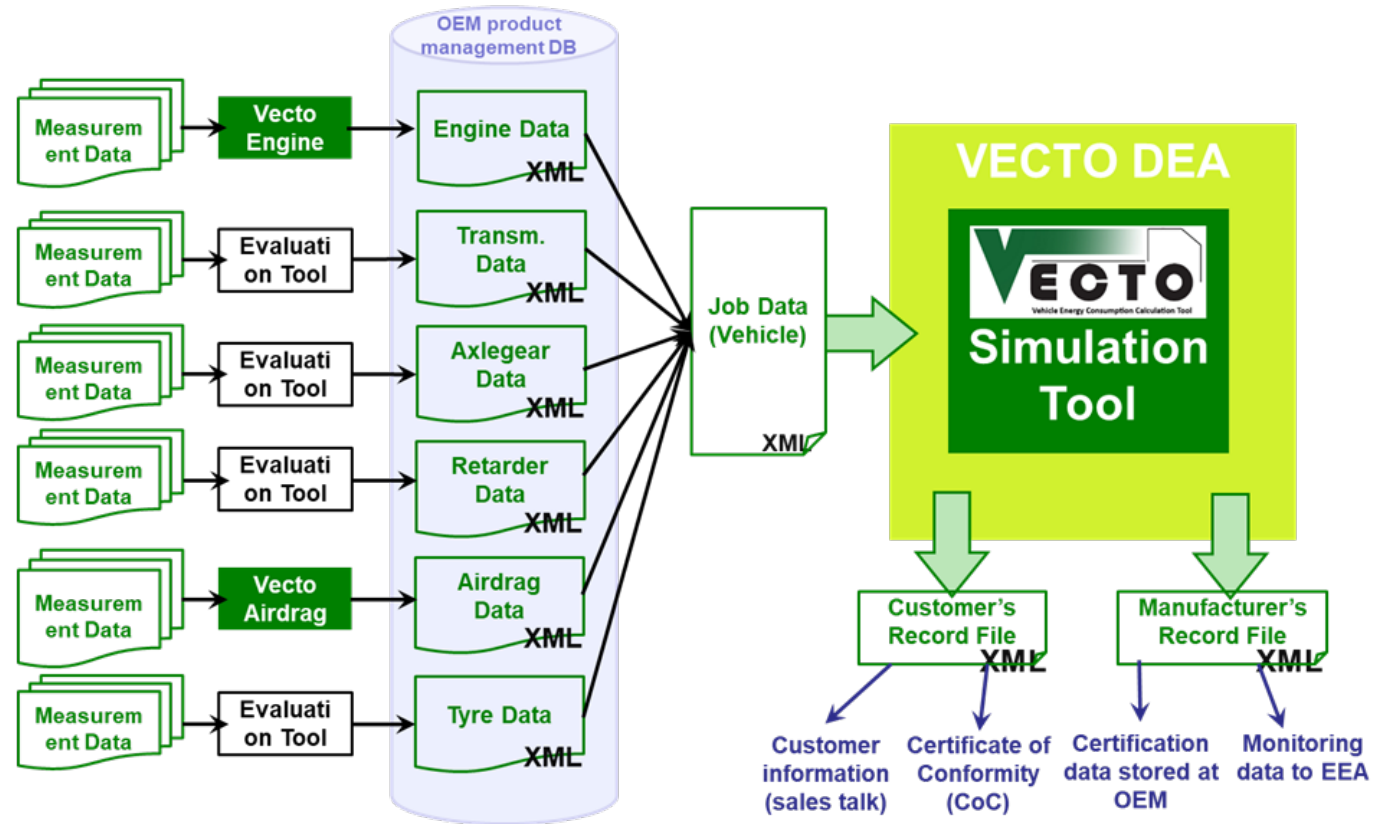
VECTO Hashing Tool

VECTO哈希算法工具

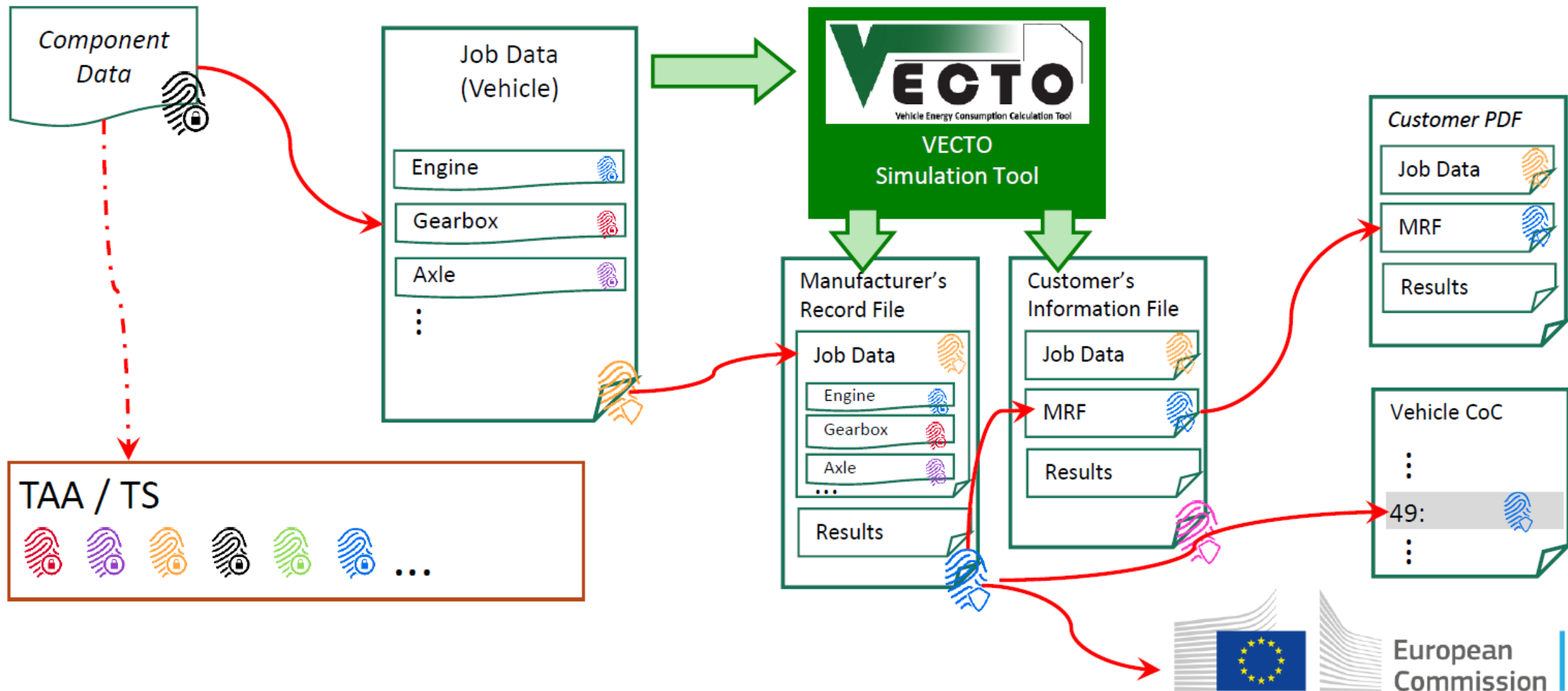
Hashing 哈希算法

Data integrity 数据完整性

- Traceability
可追溯性
 - Detect modifications
检测修改
 - Without actual data
没有实际数据
- ➔ Cryptographic hashing
密码哈希算法
- ➔ Digest value
摘要数值



Hashing 哈希算法

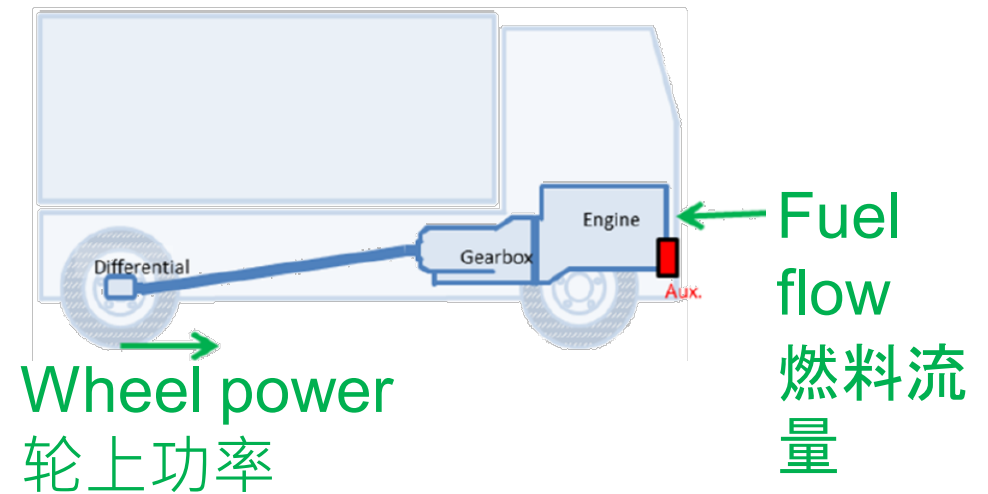
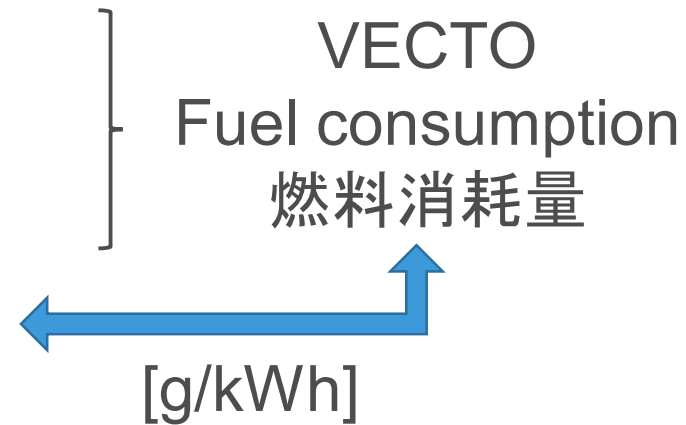


Verification Testing Procedure

验证测试程序

VTP

- On-road verification of declared fuel consumption
对所声明的燃料消耗量进行道路验证
- Test new vehicle
测试新车辆
- Measure:
测量：
 - Wheel torque & speed
车轮扭矩和速度
 - Engine speed
发动机速度
 - Gear
变速箱
 - Fuel consumption
燃料消耗量



Heavy buses

重型巴士

Heavy buses - UNDER DEVELOPMENT

重型巴士 - 正在开发

- Dedicated auxiliary model
专门的辅助模型
- Dedicated mission profiles
专门的任务档案
- Factor method for multistage certification:
多级认证因式分解法：

$$\text{CO}_2 \text{ [g/km]} = \text{VECTO complete(d)} \cdot \text{VECTO primary} \cdot \frac{\text{CO}_2^{\text{SpecPT, GenEff, SpecBody}}}{\text{CO}_2^{\text{SpecPT, GenEff, GenBody}}}$$

Where:

PT Powertrain (ICE fullload curve, transmission type and ratios ...)

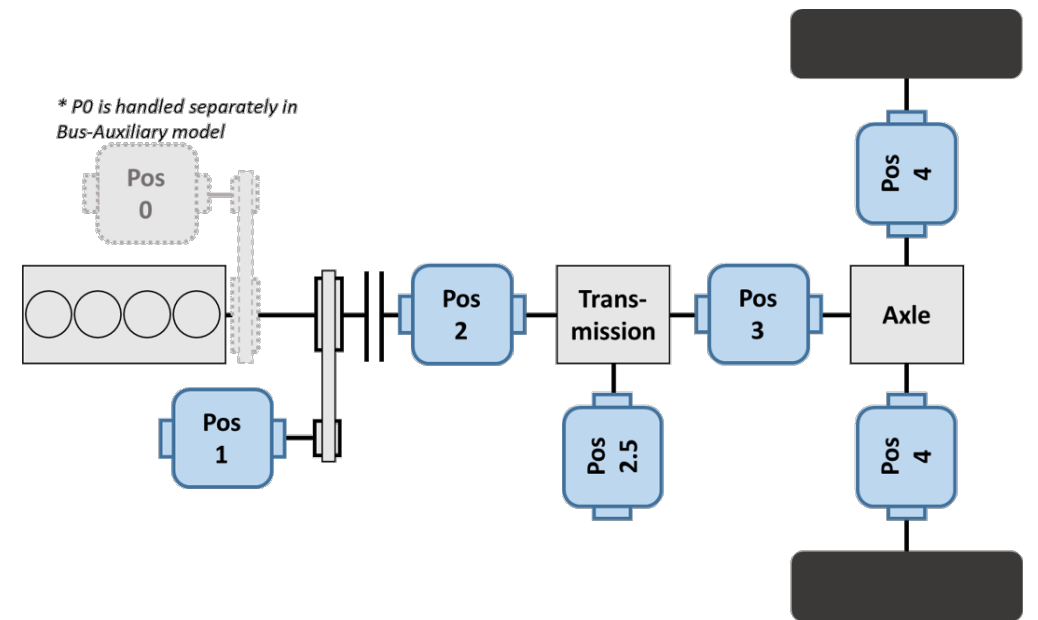
Eff Component efficiency data (ICE map, ICE correction factors, Drivetrain efficiencies), CONFIDENTIAL DATA

Body .. Total vehicle mass, air drag, parts of auxiliaries (HVAC, Pneumatic System, Electric System)

Hybrid and Battery electric vehicles 混合动力和电池电动汽车

Hybrids - UNDER DEVELOPMENT 混合动力汽车 - 正在开发

- Battery electric and hybrid powertrains
电池电力和混合动力系统
 - Parallel, serial and powersplit
平联、串联和动力分配
 - Battery and supercapacitor
电池与超级电容
 - Electric motor
电动机
- Controller
控制器
 - Equivalent Consumption Minimization Strategy
等效消耗最小化策略



More information 更多信息

Confluence

→ Latest Releases
最新发布

Bitbucket

→ Version control
版本控制



JIRA

→ Bug tracking
漏洞跟踪

VECTO VECTO

- Pages
- Blog
- Canvas
- Calendars

SPACE SHORTCUTS

- Stakeholders
- JIRA
- Installation instructions
- Releases
- File lists

PAGE TREE

- Admin How-to
- Docs
- File lists
- Installation instructions
- IT Expert Group
- JIRA Overview
- Releases** ①
 - Releases VECTO-Air Drag ②
 - VECTO Engine Releases ③
- Stakeholders** ④

Pages   Edit Save for later Watch Share ...

VECTO Home

Created by Unknown User (toolsconfluence), last modified by ANAGNOSTOPOULOS Kostis on Dec 03, 2015

VECTO: Vehicle Energy Consumption Calculation Tool

VECTO is a vehicle simulation software created to support CO2 emissions monitoring from Heavy Duty Vehicles (HDV) in Europe and serve as the official CO2 calculation tool in a possible future certification scheme. It is written for .Net (VBasic & C#).

The purpose of this web site is to facilitate the communication between VECTO's development team with the users and streamline VECTO support related issues between the Commission and other organizations (OEMs, member states and type approval authorities) contributing to the development, review, and dissemination of VECTO.

Stay Up-to-date with VECTO
You can receive notifications on specific JIRA-issues or on the whole project.

- You can choose to *watch* an issue by clicking the "*Start watching this issue*" respective link a its right sidebar, as shown in the image:

- You can watch the project as a whole by clicking the "*Watches*" at the left navigation-bar and then clicking "*Watch project*", as shown in the image:


Navigate space

Search

- JIRA: VECTO: Bug-tracking
- SVN: File-repository, accessed by developers
- Admin How-to
- Docs
- File lists
- Installation instructions
- IT Expert Group
- JIRA Overview
- Releases
- Stakeholders

Favourite Pages

There are currently no pages on your favourites list

VECTO
version 3.3.9.2175,
released on December 15 2020.
版本3.3.9.2175,
发布日期: 2020年12月15日。

VECTO AirDrag
version 3.1.9,
released on January 31 2019.
VECTO空气阻力
版本3.1.9,
发布日期: 2019年1月31日。

VECTO Engine
version 1.4.4.1492,
released on February 1 2019.
VECTO发动机
版本1.4.4.1492,
发布日期: 2019年2月1日。

Stakeholders Table

Includes a private page for every Stakeholder.
利益相关者表格
包括每个利益相关者的私人页面。

VECTO: Vehicle Energy Calculation Tool
Create board

Issues

- Reports
- Releases
- Components
- Test sessions
- Timesheets
- Tests
- Risks
- Add-ons

PROJECT SHORTCUTS

- VECTO wiki
- Add link

Project settings ⚙️

Open issues Switch filter ▾

Order by Priority ▾

- VECTO-990**
XLRAEL1700L487912: Gear 5 LossMa...
- VECTO-991
XLRAEM3700G278230: Gear 4 LossMa...
- VECTO-952
Gear: 1 | Object reference not set to an i...
- VECTO-1011
WMA06SZZ2KP133058
- VECTO-997
VF640J567KB012991
- VECTO-996
VF640J563KB012972
- VECTO-1008
AT error in VECTO version 3.3.3.1609
- VECTO-999
VF640J86XKB010356
- VECTO-998
VF640J864KB010370
- VECTO-994
VF640J863KB010389
- VECTO-993
VF640J861KB010388
- VECTO-992
VF640J865KB010412
- VECTO-995
VF620M96XKB000322

+ Create issue

VECTO: Vehicle Energy Calculation Tool / VECTO-990

1 of 31

Description

Details

Type: Use Case
Status: **IN DEPLOYMENT** (View Workflow)
Priority: **Blocker**
Resolution: Unresolved
Affects Version/s: 3.3.2.1548, 3.3.3.1609-RC
Fix Version/s: None
Component/s:
Security Level: Public
Labels: None

Attachments

Drop files to attach, or browse.

Sub-Tasks

- 1 Error Loss-Man extrapolation in **RESOLVED** QUARITSCH M...

People

Assignee:
[Assign to me](#)

Reporter:

Participant:

Votes: [Vote for this issue](#)

Watchers: [Start watching this issue](#)

Dates

Created: 6/Jun/19 16:04
Updated: 13/Jun/19 9:06

Time Tracking

Estimated: Not Specified
Remaining: 0m

[Edit](#) [Comment](#) [Assign](#) [More ▾](#) [Add changes to new ver...](#) [Email](#) [Export](#)

Create Issue

Project: VECTO: Vehicle Energy Cal...
Issue Type: Bug

Summary:

Description:

Acceptance criteria:

Attachment: Drop files to attach, or browse.

Reporter:

Assignee: Automatic [Assign to me](#)

Create another **Create** Cancel

Bitbucket

What is there in Bitbucket?
Bitbucket有什么？

VECTO / vecto-sim

Source

develop

Filter tags

Compare

Copy branch name

Checkout in Sourcetree

Create branch from here

Download

VECTOAux

VectoCommon

VectoConsole

VectoCore

File	Description	Last Modified
.gitattributes	forcing calf line endings	16 Mar 2015
.gitignore	update license header in source files	03 Jan 2019
CHANGES.md	- Fixed path to JIRA guide - Updated changes.md - Updated Release Notes	20 Jul 2015
LICENSE.txt	License under EUPL (latest) * Add LICENSE.txt file. * Add lic-header in all .vb files. * Add p	08 Jan 2014
README.md	updated global readme	14 Jun 2016
README.txt	new VECTO release	30 Oct 2018
VECTO.sln	adding furter projects to vecto solution: VectoGIT, VectoGit-Test	05 Jun 2019
VECTO.sln.DotSettings	renaming ETPT to VTP, refactoring: new cycle format, aux handling (speed dependent), co	15 Nov 2017

- **Version control** tool for code. 代码的版本控制工具。
- **All VECTO code** is hosted here. **All VECTO**代码托管于此。
- Uses **Git** (in a *similar* way to Github). 使用**Git**（与Github类似）。

Link to VECTO repositories in Bitbucket:
Bitbucket中VECTO资源库的链接：

[://httpswebgate.ec.europa.eu/CITnet/stash/projects/VECTO](https://httpswebgate.ec.europa.eu/CITnet/stash/projects/VECTO)

Collaboration

协作

Software 软件

- Access to CITnet
CITnet使用权限
- Software support
软件支持
- Access to source code
源代码使用权限

Validation 验证

- Setting-up experimental campaigns
设置实验活动
- Setting-up VECTO
设置VECTO
- Analyzing simulation and experimental results
分析仿真模拟和实验结果

More information

更多信息

- Official VECTO website:

官方VECTO网站：

https://ec.europa.eu/clima/policies/transport/vehicles/vecto_en

- Video material

视频材料

- Or contact:

或联系方式：

jrc-vecto@ec.europa.eu

Keep in touch

联系我们



EU Science Hub | 欧盟科技中心: ec.europa.eu/jrc



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EU Science Hub – Joint Research Centre
欧盟科技中心 – 联合研究中心



EU Science, Research and Innovation
欧盟科技、研究和创新



EU Science Hub
欧盟科技中心

Thank you 谢谢！

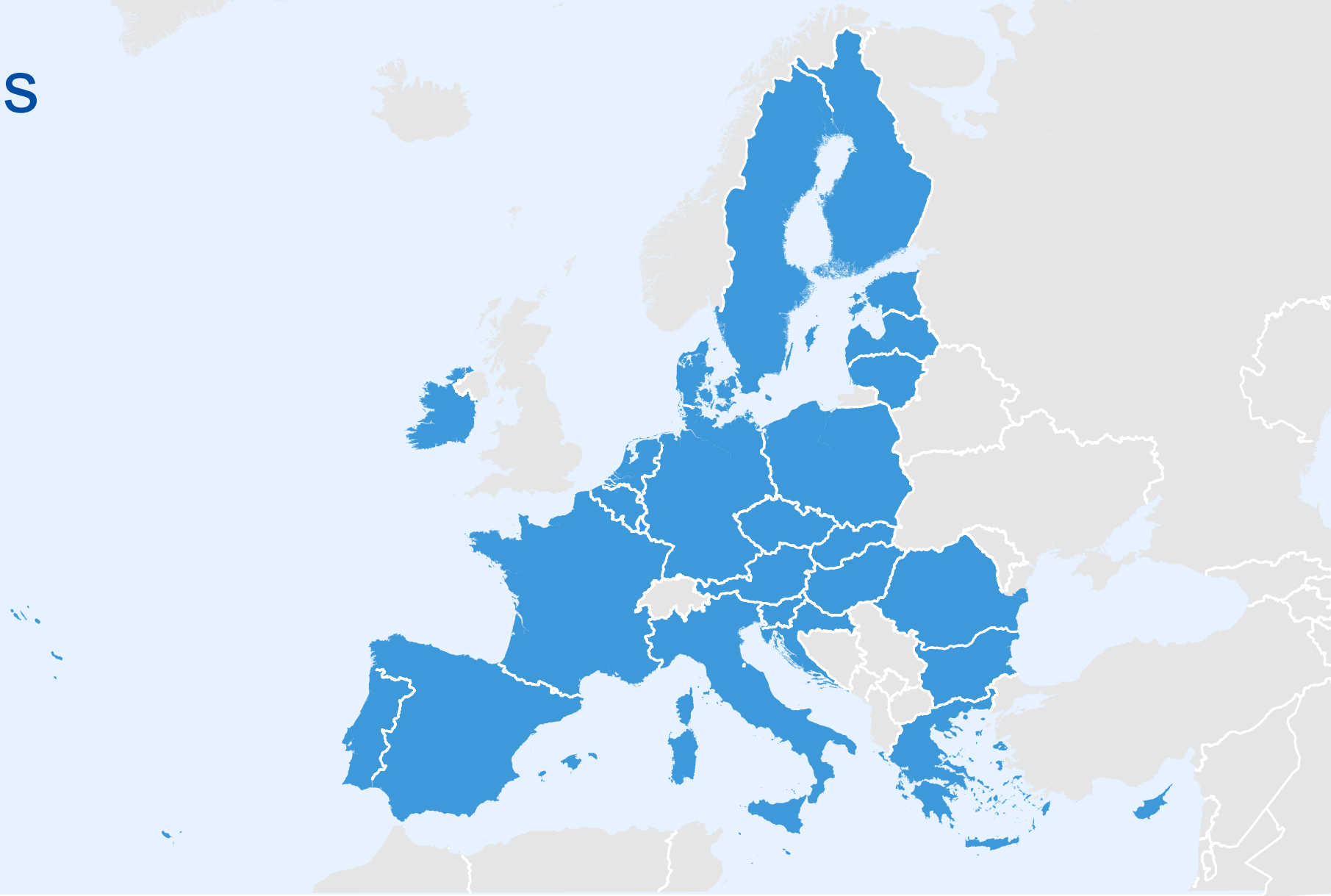


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EU countries 欧盟国家



0 250 500 1,000 Km

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