

DIAS

SMART ADAPTIVE
REMOTE DIAGNOSTIC
ANTITAMPERING
SYSTEMS

DIAS overview

25th October 2022, Brussels



DIAS
Smart Adaptive Remote Diagnostic Antitampering Systems

EUROPEAN COMMISSION
HORIZON 2020
LC-MG-1-4-2018
Grant agreement ID: 814951



This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 814951.

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The DIAS consortium

- Smart Adaptive Remote **D**iagnostics **A**ntitampering **S**ystems
- 11 partners with various competencies
- Part of H2020 European programme (smart, green and integrated transport sector)
- International co-operation
- Budget: €4.99M
- Duration: 38 months (Sept. 2019 – Oct. 2022)

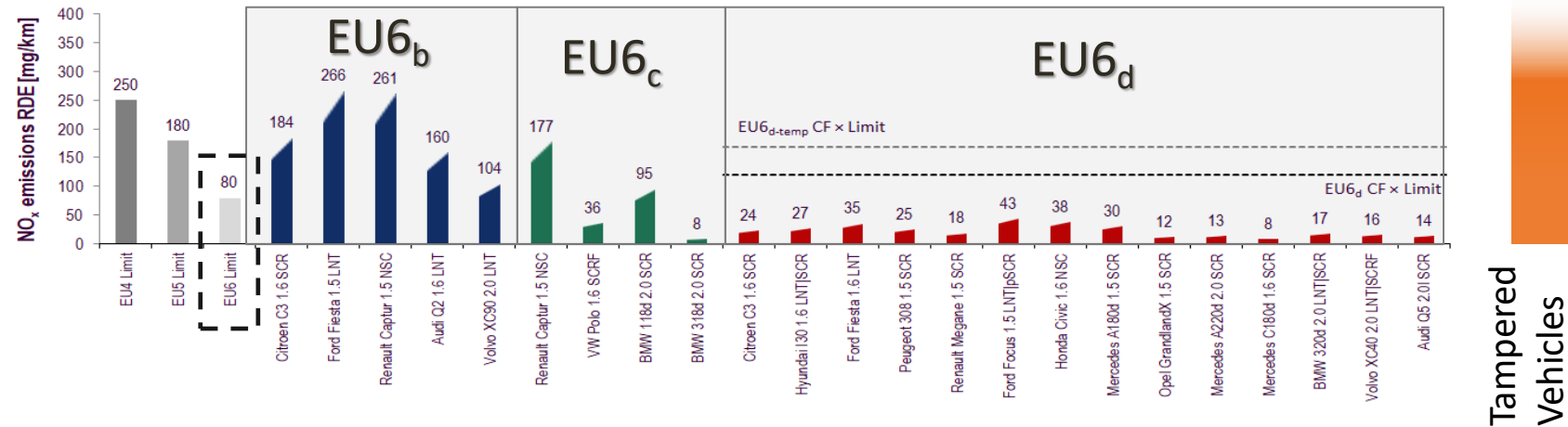


Problem statement

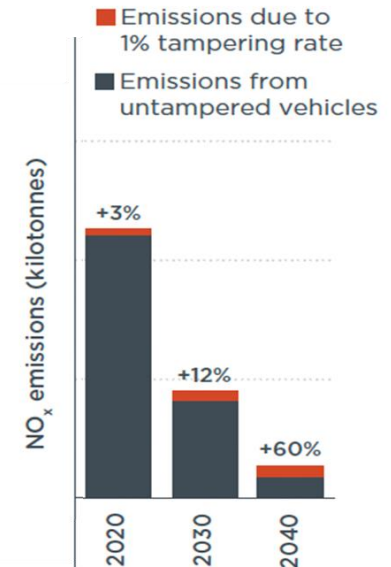
- NO_x emissions (diesel):

- EU6d fleet average: 20-30 mg/km thanks to the development of effective Environmental Protection Systems (EPS)

- Tampered vehicle: More than x10 higher emissions



- Even a small percentage of tampered vehicles (1%) can lead to a huge increase in fleet emissions in the future (+60% for 2040)
- **Up to 10% of EU5/V and EU6/VI vehicles** in the EU are estimated to have been **tampered** with their environmental protection systems



Objectives of DIAS

1. **Detect tampering** using On-Board Diagnostics and Monitoring (OBD/OBM)
2. **Prevent tampering** via hardened in-vehicle communication and component security
3. **Report** tampering events and relevant data to appropriate authorities

Target: Make tampering **economically unattractive and reduce emissions**

Our methodology:



Overview of market and risk analysis

Initial inputs:

Security analysis

Tampering Practices
Tampering Devices/Market Assessment

Testing



Specifications of countermeasures to be developed:

- ☐ Environmental Protection Systems (EPS) to be covered:

DeNOx

DPF

TWC

GPF

- ☐ Components to be covered:

ECU

CAN

Sensors

...

- ☐ Tampering methods to be covered:

ECU reflashing

Emulators

Modifiers

DTC erasers

- ☐ Vulnerabilities to be covered:

Simulated signal

Clear DTCs

Change ECU maps

Hardware access

...

- ☐ Categories of solutions to be covered:

Diagnostic

Security

Reporting

Overview of identified solutions

- **Diagnostic solutions:**

- **Monitoring and plausibilisation of signals**
 - Diagnosis of DPF/GPF-related attacks
 - Diagnosis of deNOx (EGR & SCR)-related attacks
 - Diagnosis of TWC-related attacks
 - Diagnosis of all-EAS-related attacks
- **Estimation of tampering probability**
 - Diagnosis of all-EAT-related attacks

- **Security solutions:**

- **Component Security**
 - Boot Security
 - Firmware Update Security
 - Prevent the exploitation of memory corruption vulnerabilities
- **Communications Security**
 - Key generation, exchange and storage
 - Data exchange authentication, integrity and encryption
- **Intrusion Detection and Firewall**
 - Intrusion Detection System
 - Firewall

- **Reporting solutions:**

- **Reporting scheme**
 - Generic scheme of tampering-related data reporting
 - NOx emissions related data aggregation, preprocessing, storage and transfer rate
- **Reporting infrastructure**
 - In-vehicle data aggregation/preprocessing and transfer to cloud
 - On-cloud data aggregation/preprocessing and transfer to reporting authorities
- **Emissions compliance certification**
 - Final tampering report (certificate)

Overview of conducted demonstrations

- Installation of anti-tampering systems on demonstrators:
 - Demonstrator vehicle provided by partner Ford OTOSAN
 - Stand-alone lab demonstrators
- Evaluation of anti-tampering systems via:
 - **Internal** verification and validation of the system
 - **External** hacking events:
 - Analysis of vehicle hardware and software by IT security experts and hackers
 - Hackathon #1 organized in May 2021
 - Hackathon #2 organized in March 2022



2 days, 5 teams, 1 question:
Can you deactivate the environmental protection system of a truck?

Hack-a-Truck!

19 & 21 May 2021

DIAS

Call: H2020-MG-2018-TwoStages

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The image shows a presentation slide for the 'Hack-a-Truck!' event. It includes a title, a question, a date, and a logo. There are also several smaller images and text blocks on the slide, including a diagram of a truck, a photo of a person, and a list of topics.

→ Received feedback led to adjustments on DIAS solutions and further considerations

Overview of future regulatory framework

Guidelines for various end-users



- **Vehicle manufacturers:** Provide vehicle's anti-tampering solutions for tampering prevention, detection and reporting for and after the Type Approval



- **Type Approval authorities:** Ensure that the anti-tampering provisions addressed to vehicle manufacturers are met



- **Member States:** Transpose into national law and enforce tampering-related EU regulatory framework



- **Other authorities** (i.e. Periodic Technical Inspection, Roadside Inspection): Identify high emitters and tampered vehicles and report tampering



- **Workshops:** Ensure legitimate use of diagnostic tools and report tampering



- **Vehicle owners:** Ensure proper and timely maintenance and proper “reverting” actions if tampering is concluded

Overview of impact assessment results

- Over the 2022-2050 period, the maximum theoretical benefits that can be achieved in an ideal case where 100% of the tampering is eliminated, and based on the most **realistic estimations** for tampering inputs*:
 - **3.7** megatonnes savings on NOx emissions
 - **41** kilotonnes savings on PM emissions
 - **26,000** avoided premature deaths
 - **460,000** avoided years of life lost
- **Half benefit** based on most **optimistic estimations** for tampering inputs
- **Double or triple benefit** based on **worst-case estimations** for tampering inputs (e.g. 81,000 premature deaths can be avoided)

*i.e. The share (in %) of tampered vehicle in the European fleet and the ratio of tampered to non-tampered vehicle emissions

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Thank you





Q & A