Vehicle Emissions Remote Sensing in the Roadworthiness Package

Synergies with Particle Number Counting

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The Air Quality Challenge

1. **Air pollution** is the **fourth leading cause of death** in the world and road transport is one of the main sources of pollution.
2. **1-3%** of vehicles responsible for up to **40%** of total traffic emissions.
3. **Traditional PTI limited**: infrequent, predictable, vulnerable to circumvention
4. **Need for Real-world emissions data** to complement periodic testing and close enforcement gaps

Roadworthiness Package

Vehicle emissions RS obligations

*The European Commission has released its roadworthiness update package. This proposal reviews the Directives **2014/47/EU** on roadside inspections of vehicles and **2014/45/EU** on periodic roadworthiness tests for motor vehicles*

1. National authorities in **all EU countries are required to equip** themselves with **remote sensing devices**.
2. All EU countries **must measure the real-world emissions of 30%** of their registered fleet each year with RSDs.
3. All EU countries **must detect high emitters** with RSDs. They must report this to the Commission for centralized monitoring and market surveillance.
4. **High-emitters must be enforced**. Verification in roadside inspections or PTIs is optional.
5. If **foreign high-emitters** are detected, they must **inform the responsible Member State**, who must request the owner to present the vehicle at any authorized testing center within a maximum period of 45 days.

EUROPEAN
COMMISSION

Brussels, 24.4.2025
COM(2025) 180 final

2025/0097 (COD)

Roadworthiness package

Proposal for a

DIRECTIVE OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL

amending Directive 2014/45/EU on periodic roadworthiness tests for motor vehicles and their trailers and Directive 2014/47/EU on the technical roadside inspection of the roadworthiness of commercial vehicles circulating in the Union

(Text with EEA relevance)

{SEC(2025) 119 final} - {SWD(2025) 96 final} - {SWD(2025) 97 final} -
{SWD(2025) 98 final} - {SWD(2025) 99 final}

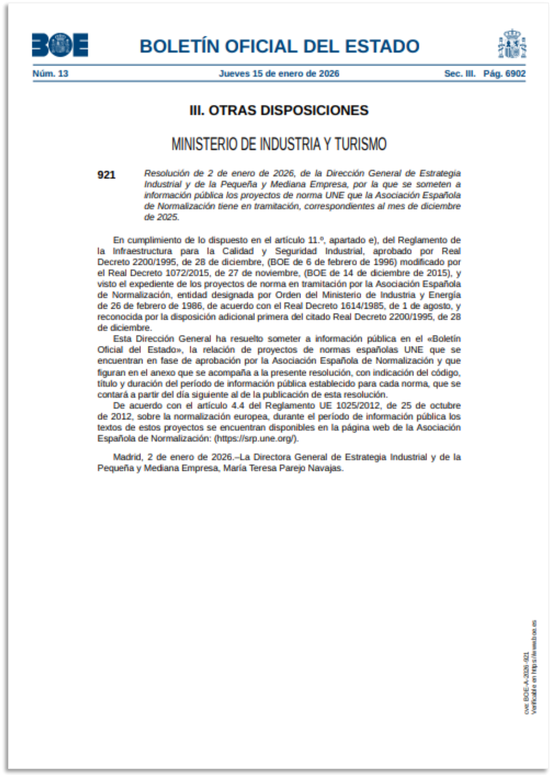
UNE

Vehicle emissions RS standard

- The Spanish Association for Standardization, UNE, and the Spanish Metrology Centre, CEM, have developed a **UNE standard for instruments used for vehicle emission remote sensing**.

- This pioneering standard, published on 15th of January 2016, will harmonize this type of instrument in Spain, and develop a **basis for future regulation.**

- As any UNE standard, once published in Spain, it will be **easily adopted or replicated** by other countries.



BOLETÍN OFICIAL DEL ESTADO
Núm. 13 Jueves 15 de enero de 2026 Sec. III. Pág. 6902

III. OTRAS DISPOSICIONES

MINISTERIO DE INDUSTRIA Y TURISMO

921 *Resolución de 2 de enero de 2026, de la Dirección General de Estrategia Industrial y de la Pequeña y Mediana Empresa, por la que se someten a información pública los proyectos de norma UNE que la Asociación Española de Normalización tiene en tramitación, correspondientes al mes de diciembre de 2025.*

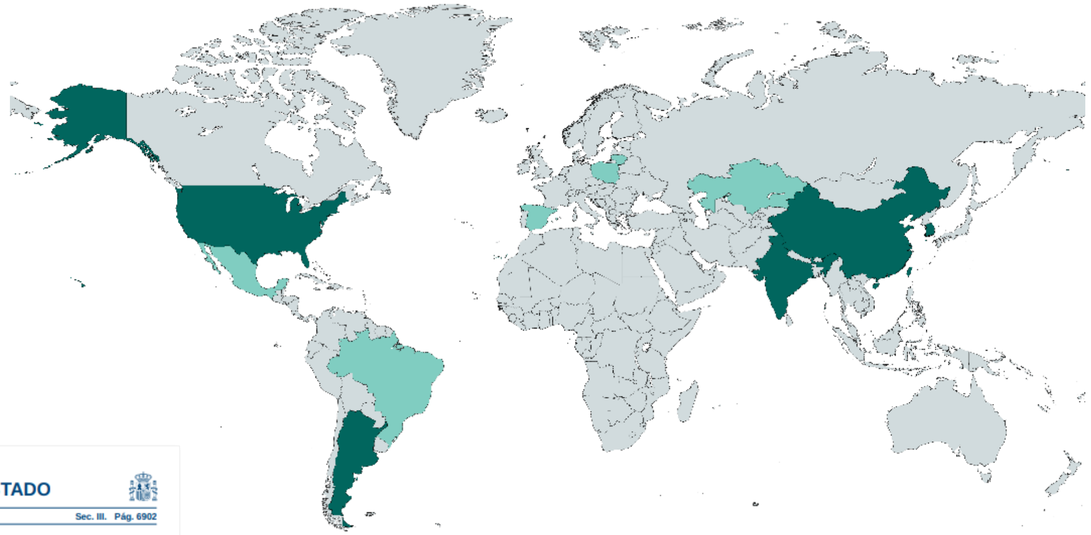
En cumplimiento de lo dispuesto en el artículo 11.º, apartado e), del Reglamento de la Infraestructura para la Calidad y Seguridad Industrial, aprobado por Real Decreto 2200/1995, de 28 de diciembre, (BOE de 6 de febrero de 1996) modificado por el Real Decreto 1072/2015, de 27 de noviembre, (BOE de 14 de diciembre de 2015), y visto el expediente de los proyectos de norma en tramitación por la Asociación Española de Normalización, entidad designada por Orden del Ministerio de Industria y Energía de 26 de febrero de 1986, de acuerdo con el Real Decreto 1614/1985, de 1 de agosto, y reconocida por la disposición adicional primera del citado Real Decreto 2200/1995, de 28 de diciembre.

Esta Dirección General ha resuelto someter a información pública en el «Boletín Oficial del Estado», la relación de proyectos de normas españolas UNE que se encuentran en fase de aprobación por la Asociación Española de Normalización y que figuran en el anexo que se acompaña a la presente resolución, con indicación del código, título y duración del período de información pública establecido para cada norma, que se contará a partir del día siguiente al de la publicación de esta resolución.

De acuerdo con el artículo 4.4 del Reglamento UE 1025/2012, de 25 de octubre de 2012, sobre la normalización europea, durante el período de información pública los textos de estos proyectos se encuentran disponibles en la página web de la Asociación Española de Normalización: (https://srp.une.org/).

Madrid, 2 de enero de 2026.–La Directora General de Estrategia Industrial y de la Pequeña y Mediana Empresa, María Teresa Parejo Navajas.

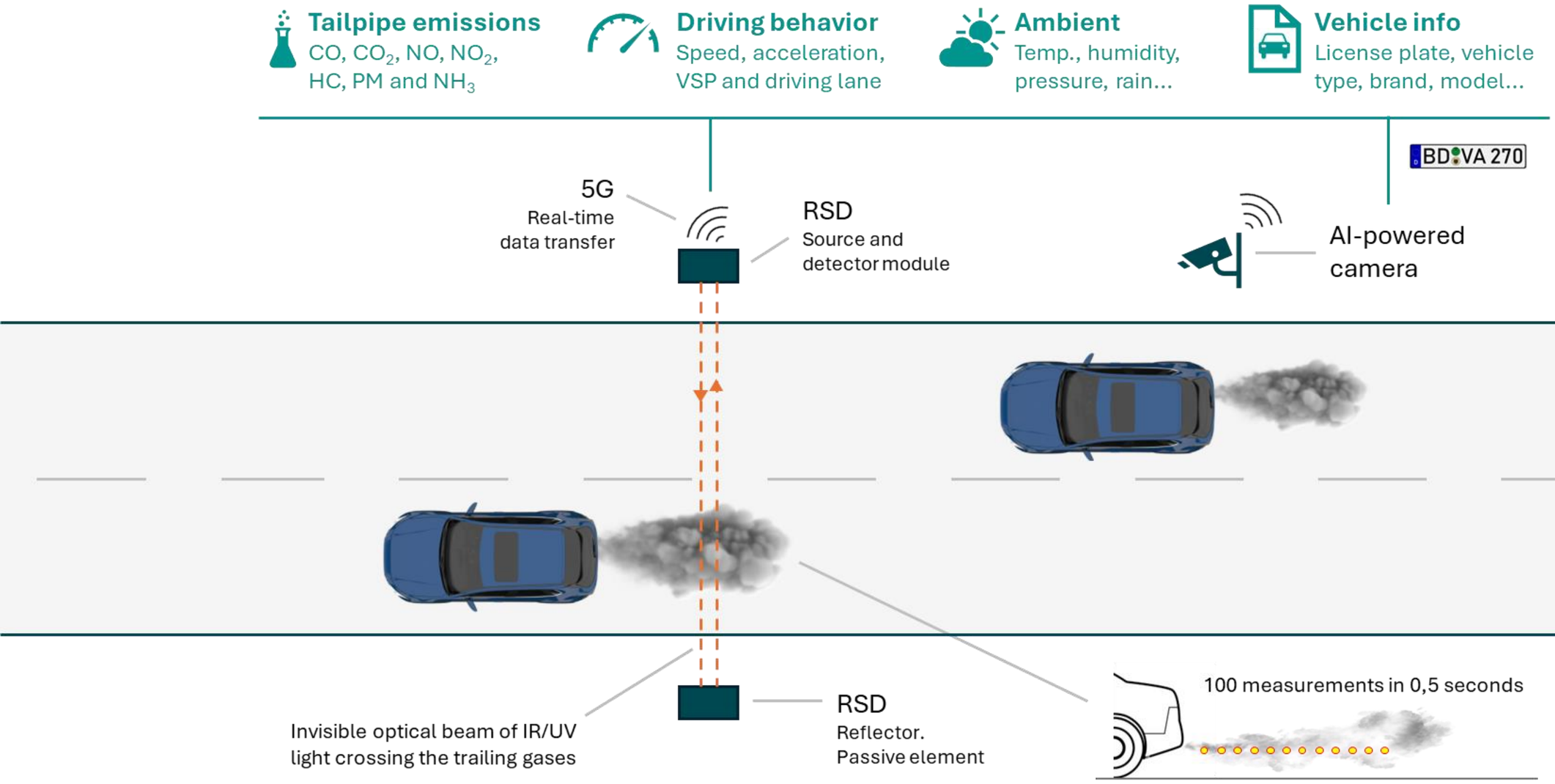
cve: BOE-A-2026-921
Verificable en https://www.boe.es



Vehicle emissions remote sensing regulations

- Regulated
- Draft or under study

RSD - Remote Sensing Device



PM Detection via UV Opacity

OPUS RSE employs UV opacity measurement at 230nm wavelength — a physics-based approach that delivers superior sensitivity compared to conventional visible-light opacity meters used in traditional PTI.

Why UV at 230nm?

UV light at this wavelength is **far more sensitive to fine particles** than traditional green-light opacity measurements. Smaller particles that scatter visible light poorly are captured effectively in the UV spectrum — directly targeting the PM2.5 fraction most harmful to human health.

Output & Application

Results are expressed as **grams of PM per kilogram of fuel burned,** enabling direct comparison across:

- vehicle types
- fuel categories
- measurement campaigns.

This makes UV opacity an effective first-line screen for identifying high-PM emitters across mixed urban and highway fleets.

RSD + PN COUNTING: A POWERFUL SYNERGY

1. Creating a seamless two-stage enforcement pipeline.

Mass RSD Screening at scale

Flagging high-emitters for follow-up. No traffic disruption, no driver intervention required.

PN at PTI / Roadside

Flagged vehicles are directed to a PTI station or roadside check where particle number counting provides an exact, legally defensible count of ultrafine particles.

RSD + PN COUNTING: A POWERFUL SYNERGY

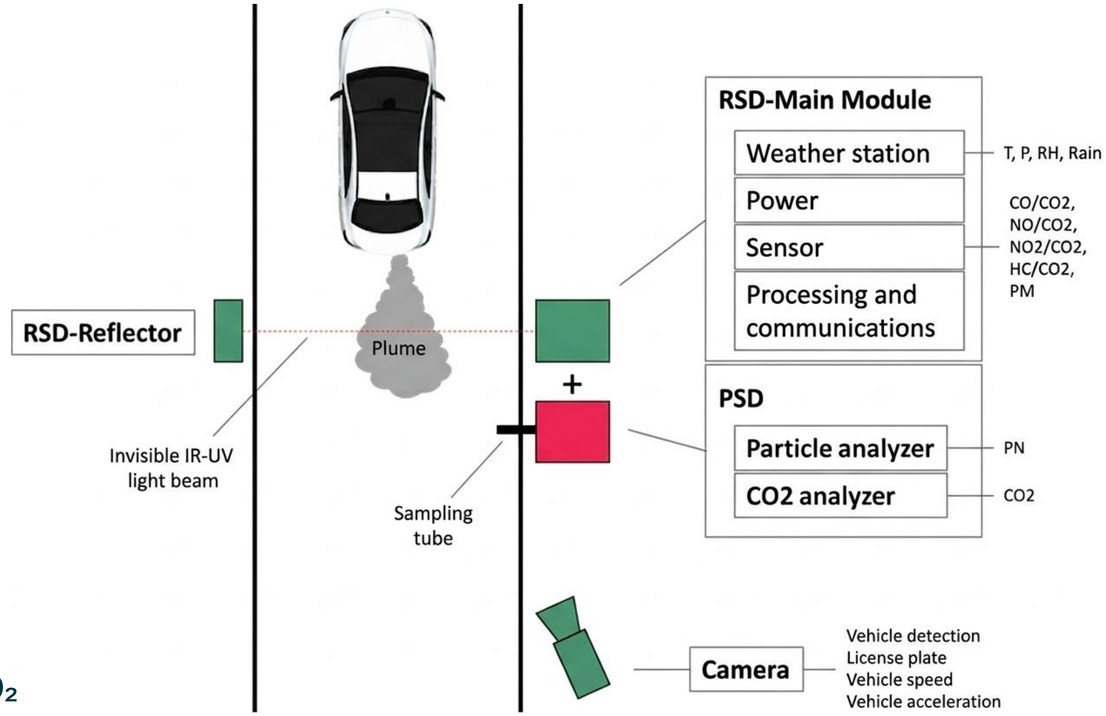
2. Integrated Particle Sampling Device (PSD)

PSD Specifications

Detection Capability: Ultrafine particles down to 10 nm diameter

Measurement Method: Extractive point sampling with continuous monitoring

Synchronized Parameters: PN/CO_2 ratio, vehicle kinematics and ambient conditions



Integrated System Outputs

- **Gaseous Emissions:** CO/CO_2, NO/CO_2, NO_2/CO_2, HC/CO_2, NH_3/CO_2
- **Particulate Mass:** PM via UV opacity at 230nm
- **Particulate Number:** PN count and PN/CO_2 ratio

RSD + PN COUNTING: A POWERFUL SYNERGY

2. Integrated Particle Sampling Device (PSD)

Test Vehicles

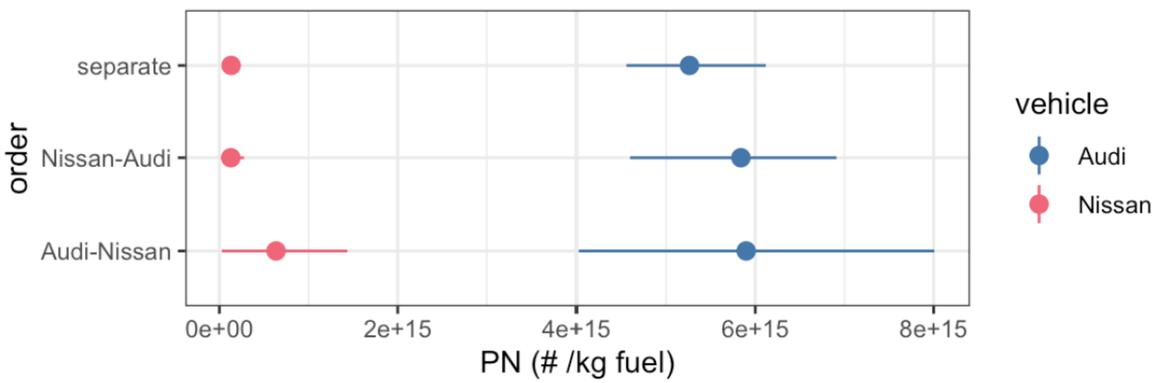
- **Audi A3 (1999):** 1.9 TDI diesel, 108 HP, **without DPF** (pre-Euro 4)
- **Nissan Qashqai (2004):** 2.0 TDI diesel, 150 HP, with DPF (Euro 4+)

Test Scenarios

- **Single passes:** Vehicles measured individually with clear plume separation.
- **Close-following passes:** Vehicles traveling close together (overlapping plumes).

Key Findings

Vehicle	Mean PN EF	Result
Audi A3 (no DPF)	High PN	Consistent with Euro 3 diesel
Nissan Qashqai (DPF)	Very low PN	Consistent with functional DPF performance (Euro 4/5)



RSD + PN COUNTING

Benefits for Stakeholders

For PTI Operators

- Pre-screening flags DPF failures before vehicle enters PTI
- Reduces inspection workload (targeted testing of high-emitters)
- Complete audit trail: RSD + extractive PN verification

For PN Manufacturers

- Proven integration with existing RSD infrastructure (complementarity)
- Compatible methodology with PTI-grade PN counters
- Shared regulatory framework (EU Roadworthiness Package alignment)

For Regulators

- Mass screening (RSD) + precise verification (PTI PN) = comprehensive enforcement
- Detects both gaseous emissions and particulate number violations
- Real-world data complements laboratory measurements

RSD + PN COUNTING

Complete Enforcement

Cost-Effective Mass Screening

RSD monitors entire fleets continuously at minimal per-vehicle cost, maximizing coverage within constrained enforcement budgets

Full Pollutant Coverage

Combined gaseous and particulate emissions monitoring closes every gap in the current enforcement landscape

EU-Ready Deployment

Proven technology, ISO-accredited accuracy, and centralized data integration — ready for immediate rollout under the Roadworthiness Package

The integration of **Remote Sensing** with **Particle Number Counting** delivers the most comprehensive, cost-effective enforcement solution available for EU roadworthiness compliance - addressing both gaseous and particulate emissions within a single operational framework.

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Efficient solutions.

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