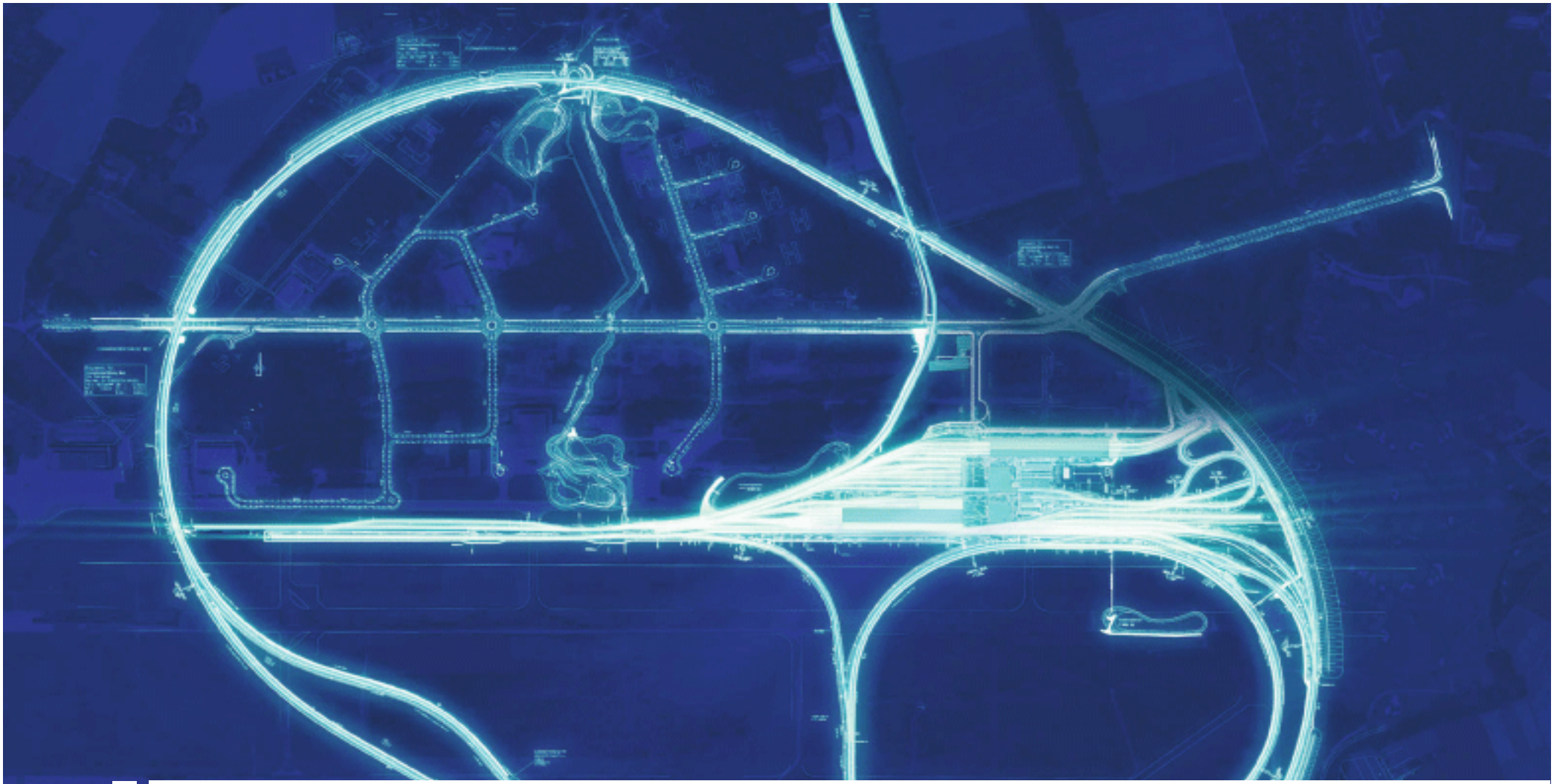
Welcome at Wegberg-Wildenrath
Siemens Test- and Validationcenter

IRSE



Test- and Validationcenter

Siemens Rail Services – We keep rail systems running

Infrastructure and Cities

SIEMENS

Your visit at the Test- and Validationcenter – Letting you know what is planned today

Time	Topic	Speaker
09:00 – 09:15	welcome	Fred Dissel
09:15 – 10:00	welcome and introduction of test center	Robert Grootings
10:00 – 10:45	presentation Siemens ETCS	H.-J. Sieberichs
10:45 – 11:00	coffee break	
11:00 – 12:00	visit of test site	
12:00 – 13:00	ride on test train Velaro D	projectmanager
13:00 – 14:30	lunch	
14:30	departure	

Tradition with obligation – Showing commitment for more than 130 years

The first electric locomotive: Invented by Werner von Siemens in 1879

The Test- and Validationcenter

- New solutions ensure higher security of rail systems
- Every vehicle, every system, every technology – for Rolling Stock & Infrastructure
- Ensures that only tested quality leaves the testing grounds

The new Sector: Infrastructure & Cities

Rail Systems	Mobility and Logistics	Low and Medium Voltage	Smart Grid	Building Technologies
				
High Speed and Commuter Rail **Metro, Coaches and Light Rail** **Locomotives and Components** **Customer Service and Transportation Solutions**	**Rail Automation** **Complete Transportation and e-Vehicle Infrastructure** **Infrastructure Logistics**	**Low Voltage** **Medium Voltage**	**Energy Automation** **Rail Electrification** **Services**	**Building Automation** **Fire Safety and Security** **Control Products and Systems**

Rail Systems –
An aligned portfolio for reliable railway systems

SIEMENS

Rail Systems

High Speed and Commuter Rail


- High speed and intercity trains
- Commuter and regional trains
- Components
- Refurbishment

Metro, Coaches and Light Rail


- Metro rail cars
- Passenger coaches
- Tramcars and light rail cars
- AGT rail cars
- Components
- Refurbishment

Locomotives and Components


- Electric and diesel-electric locomotives
- Propulsion and control components
- Bogies for metros, tramcars, high speed trains and locomotives
- Electrical equipment and traction systems for rail cars
- Refurbishment

Customer Services and Transportation Solutions


- Maintenance of rolling stock and infrastructure
- Spare parts service
- Test- and Validationcenter
- Repair center
- Consulting and system design
- System engineering, project and interface management

Siemens Rail Services –
An aligned portfolio for reliable railway systems

SIEMENS

Interurban Transport

Locomotives

Rail Automation Mainline

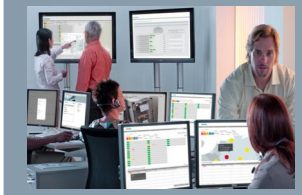
Urban Transport

Rail Automation Mass Transit

Electrification

Transport Solutions

Siemens Rail Services

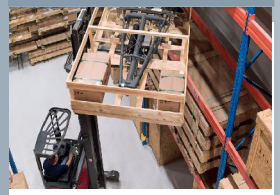


For Rolling Stock and Infrastructure

Maintenance Services

- Consulting
- Performance Package
- Charter Rail
- Full Service
- Railcover
- Rail Remote Services

Spare Part Services



- Express Logistics
- Rail Mall
- Obsolescence Mmt.
- Spare Parts & Packages
- Repairs & Returns

Workshop Services

- Refurbishment
- After Sales Product Support
- Crash & Accident Repair

Test- and Validationcenter

- Test Infrastructure
- Validation & Certification
- Customized Services

Pool of Experts

Training

- Training

Service requirements keep on changing – We offer individual and customized Maintenance Solutions

SIEMENS

Consulting

Offers you the opportunity to expand your knowledge in maintenance, be it in Rolling Stock or Infrastructure.

Performance Package

Offers support in selected fields of maintenance. This enables us to improve the availability of your rail systems together.

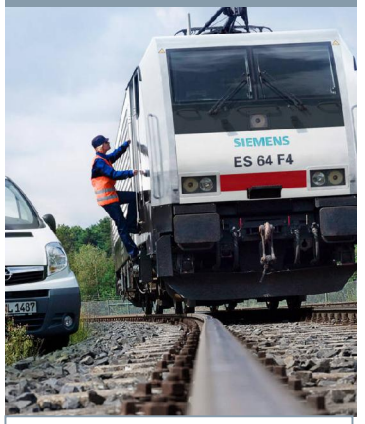
Charter Rail

Enables you to benefit from an increased availability of your rail systems – by using your established staff.

Full Service

Offers an all-round no worry package for maintenance of your rail systems to ensure a full peace of mind.

Railcover

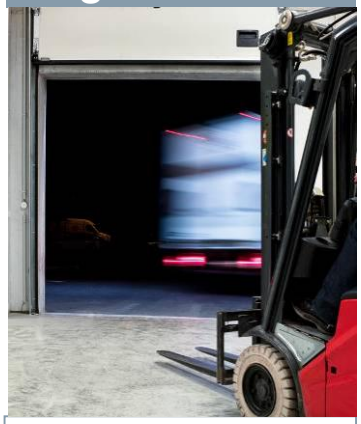


The flexible service concepts increase the availability and optimize the maintenance of locomotives.

To keep rail operation efficient – With our tailor-made Spare Part Solutions for rolling stock and infrastructure

SIEMENS

Express Logistics



More than just overnight delivery of urgently needed spare parts. Express logistics helps reduce your assets

Rail Mall

Single supply whatever, whenever and wherever needed. More than 20.000 parts for rail systems are available.

Obsolescence Management

Solutions before the components are not deliverable any more

Parts & Packages

Repair packages as a convenient alternative for new parts. If desired in customized packages

Repairs & Returns

Just in time with all necessary parts in the correct quantity. Flat-rate solutions for a consistent delivery with necessary parts

Well-trained personnel is a key factor for our customers' success

SIEMENS

Individual training concepts

Personnel should obtain the correct level of qualification, necessary for operation and maintenance of new vehicles

- Management
- Technical/ Maintenance employees
- Drivers

Maintenance and operation tasks require a high degree of technical knowledge of systems installed as well as practical skills

- Ensure better availability of vehicles
- Fast diagnosis and reaction in case of an incident
- Safe and efficient rail service

A location of railway technology – …in the middle of a natural scenery

Wegberg-Wildenrath, Deutschland

One test center for everyone‘s needs – Workshop and testing services close together

SIEMENS

Test- and Validationcenter

- Infrastructure
- Testing
- Solutions from a single source
- Transport

Refurbishment & Accident repair

- Refurbishment
- Rail Life Support
- Crash & Accident Repair

The Test- and Validationcenter – Infrastructure and facilities for railway testing

SIEMENS

Our profile

- Opening in January 1997
- Total area of 35 ha, thereof 21.300 m² testing area
- Connecting track according to BOA of provincial railway regulations since 1997
- Public railway company for cargo transport since 1999
- Unique state-of-the-art test center for railway systems run by a privately-held company
- Offer of transportation and testing services outside the test center

The infrastructure is available –
But also proven competences are important

SIEMENS


DET NORSKE VERITAS
MANAGEMENT SYSTEM CERTIFICATE
Certificate No.: 7897CC1-2010-HSO-GER-DNV
This is to certify that
Siemens AG
Industry Sector, Mobility Division (I MO)
Testcenter
Friedrich-List-Allee 1
41844 Wegberg-Wildenrath - Germany
has been found to conform to the Management System Standard
ISO 9001:2008
ISO 14001:2004
OHSAS 18001:2007
This certificate is valid for the following product or service ranges:
Development, Sales, Creation and Provision of Testing Infrastructure for Rail-based Transportation Systems

Development, Sales, Creation and Provision of Testing Infrastructure for Rail-based Transportation Systems


DET NORSKE VERITAS
MANAGEMENT SYSTEM CERTIFICATE
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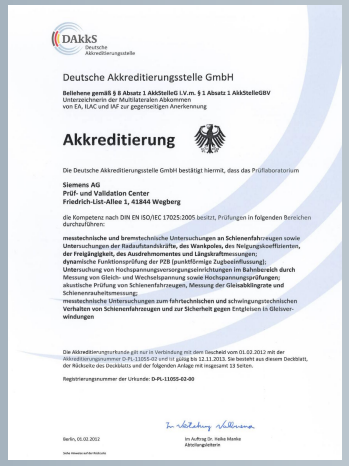
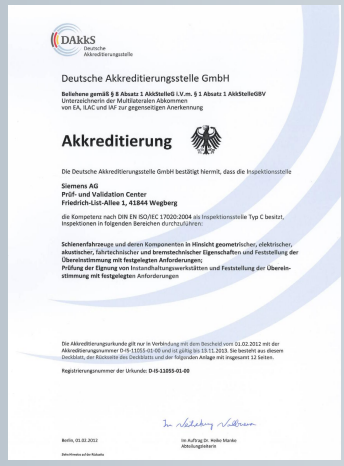
Development, Sales, Creation and Provision of Testing Equipment and Testing and Inspection Service for Rail-based Transportation Systems

Development, Sales, Creation and Provision of Testing Equipment and Testing and Inspection Service for Rail-based Transportation Systems


DAkkS
Deutsche Akkreditierungsstelle GmbH
Akkreditierung
Die Deutsche Akkreditierungsstelle GmbH bestätigt hiermit, dass das Prüflaboratorium
Siemens AG
Prüf- und Validation Center
Friedrich-List-Allee 1, 41844 Wegberg
Registrierungsnummer der Urkunde: D-PL-11055-02-00

Certified facility for testing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Siemens AG
Prüf- und Validation Center
Friedrich-List-Allee 1, 41844 Wegberg
Registrierungsnummer der Urkunde: D-IS-11055-01-00

Certified facility for inspection

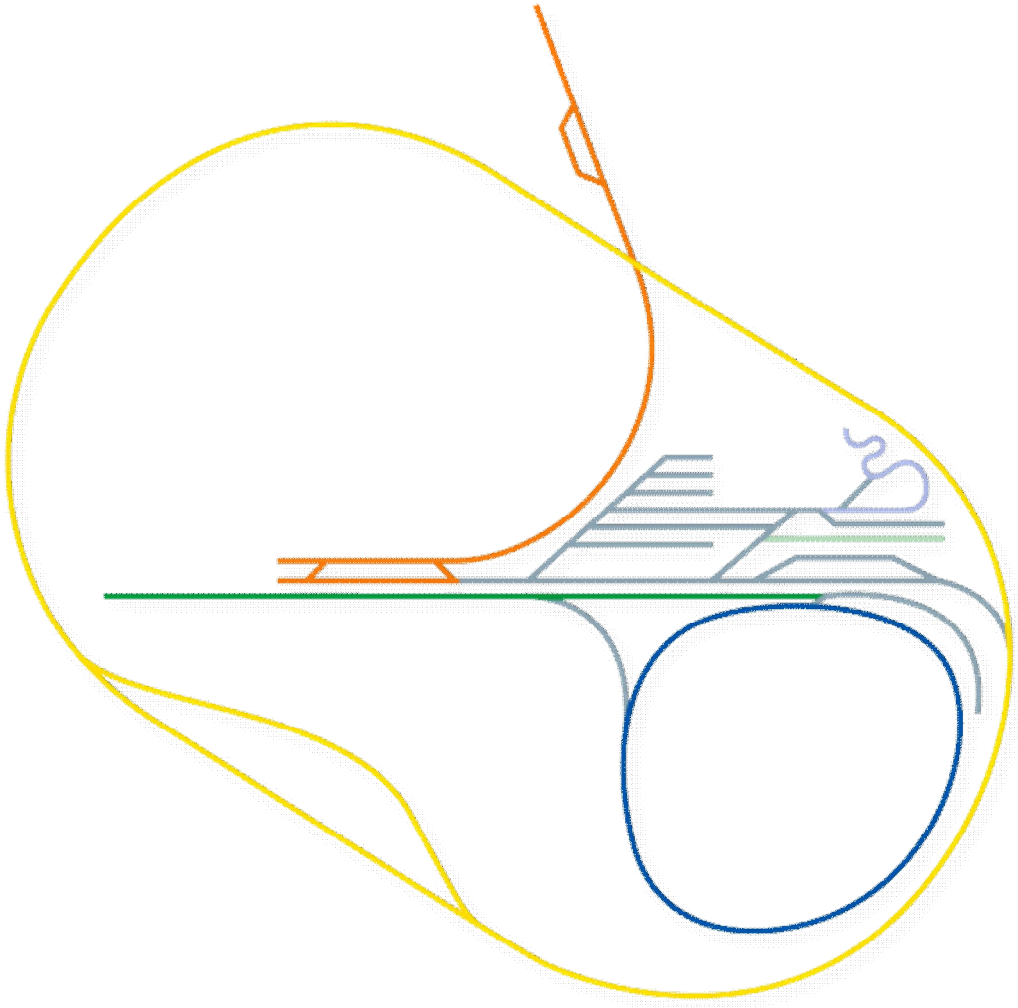

Anerkennung

Associated partner of Eisenbahn-CERT

The whole rail-world on 35 hectares – Infrastructure for global railway systems

Siemens Rail Services – We keep the rail world running

All of Europe on 28 km of track



Test oval T1

Length	6 082 m
V_{max}	160 kph

Test oval T2

Length	2 485 m
V_{max}	100 kph

Test track T3

Length	1 400 m
V_{max}	80 kph

Test track T4

Length	553 m
Radii	50/25/15 m

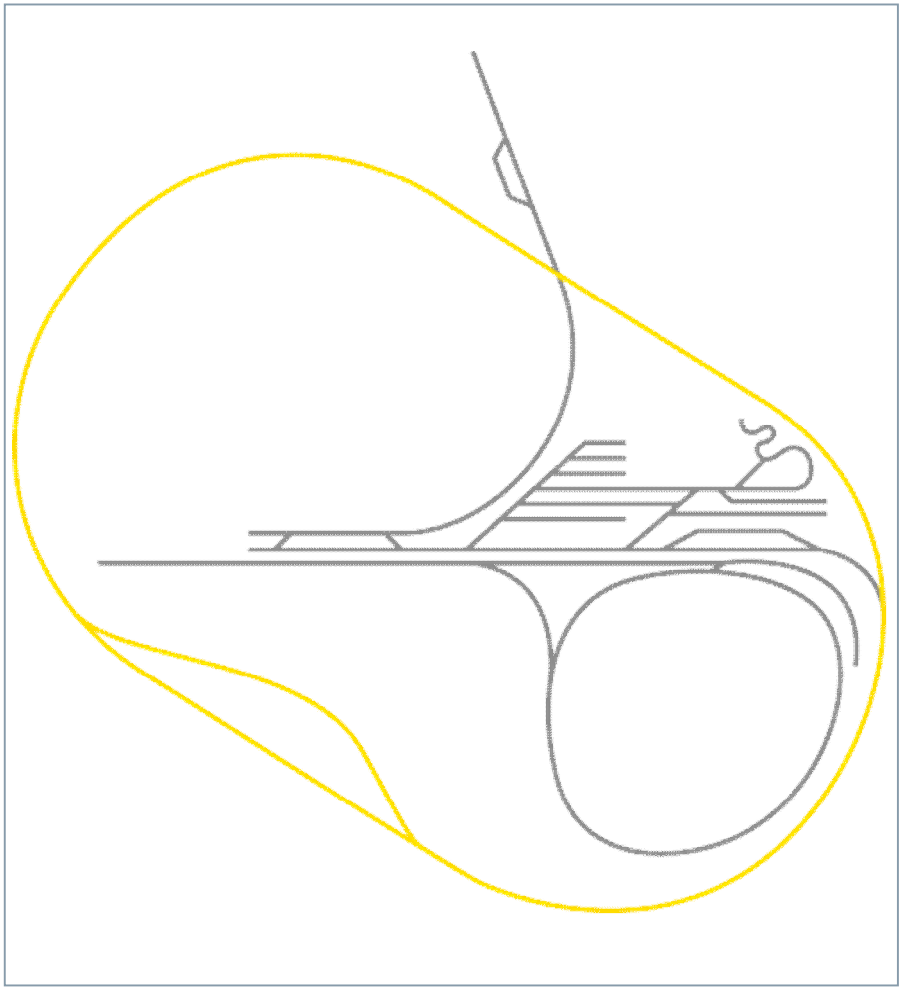
Test track T5

Length	410 m
Gradients	40/70 ‰

Connecting track leading to the railway network of DB AG

All of Europe on 28 km of track
Testing for regional- and long-distance traffic: Test oval 1

SIEMENS

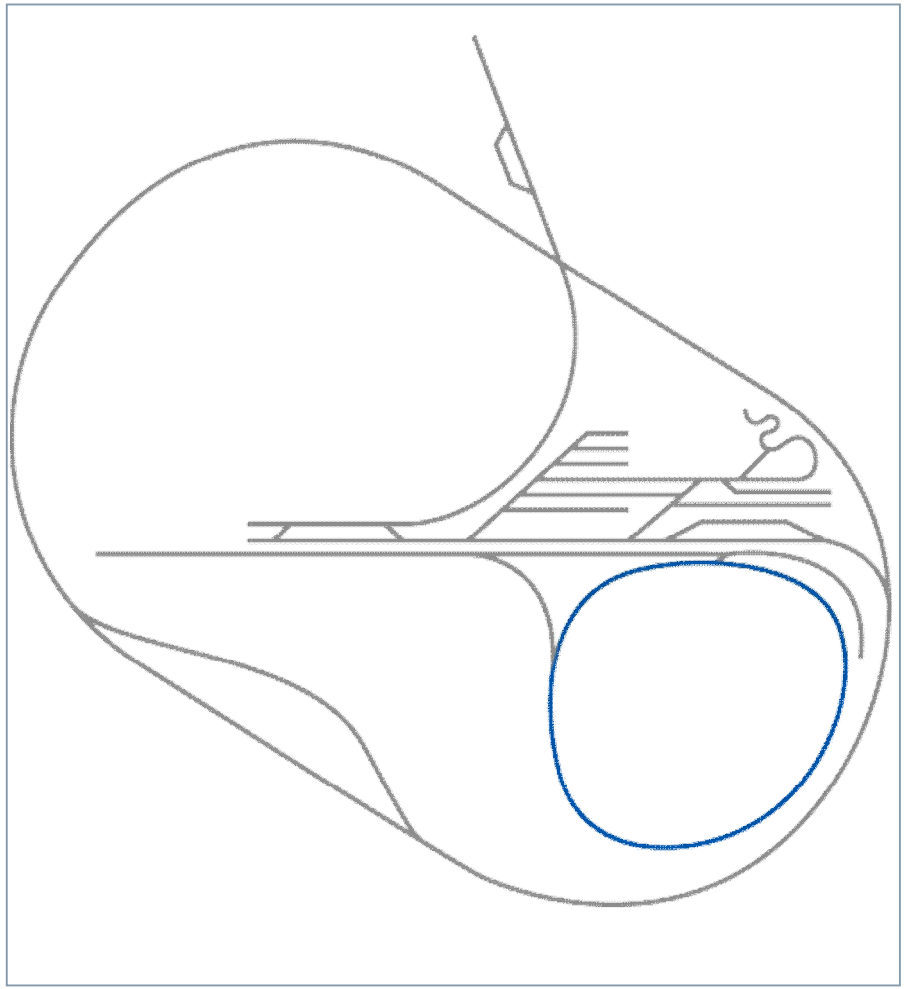


Test oval T1

Test oval 1 of 6 082 m is equipped with a power rail (English type) and various train protection and automation systems such as ATB-EG, ETCS Level 1 and 2 as well as PZB (intermittent ATC) / Indusi. Tests at speeds up to 160 kph are possible here.

All of Europe on 28 km of track
Testing for local and regional traffic: Test oval 2

SIEMENS

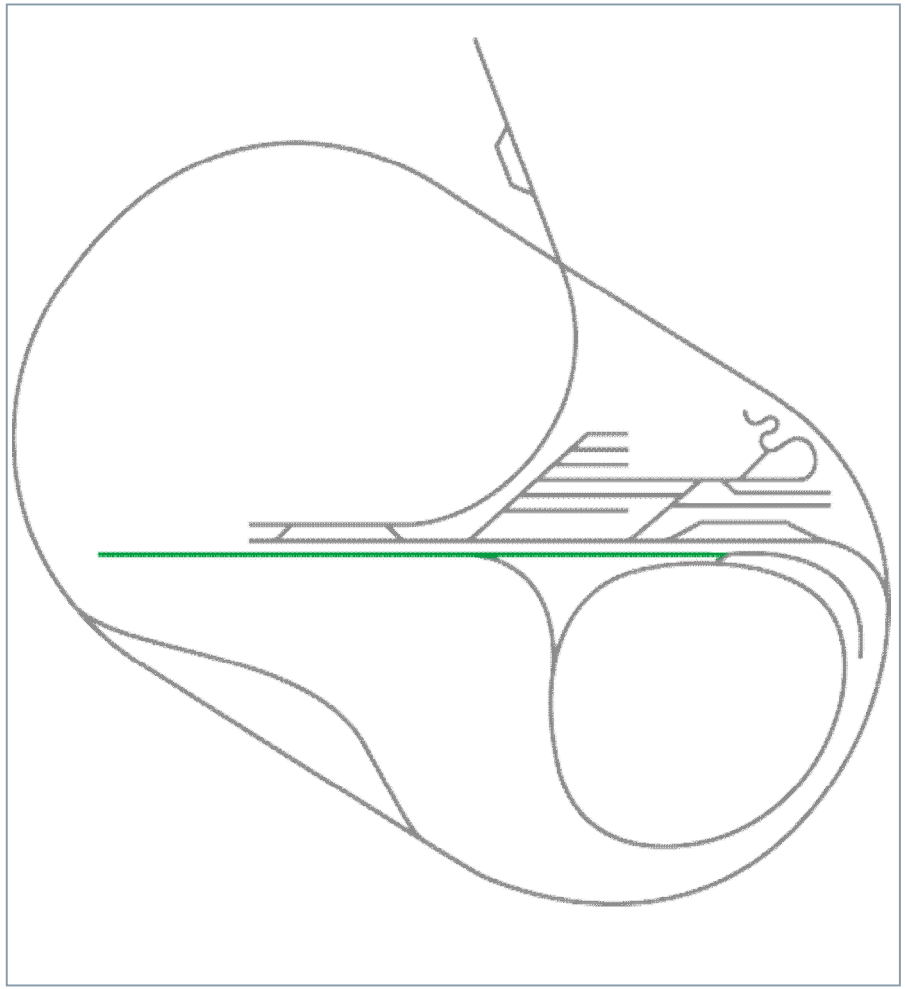


Test oval T2

With a curve radius of 300 m, test oval 2 (2 485 m) is suitable for maximum speed of 100 kph on standard-gauge and meter-gauge track including a power rail.

All of Europe on 28 km of track
Testing for braking distances: Test track 3

SIEMENS

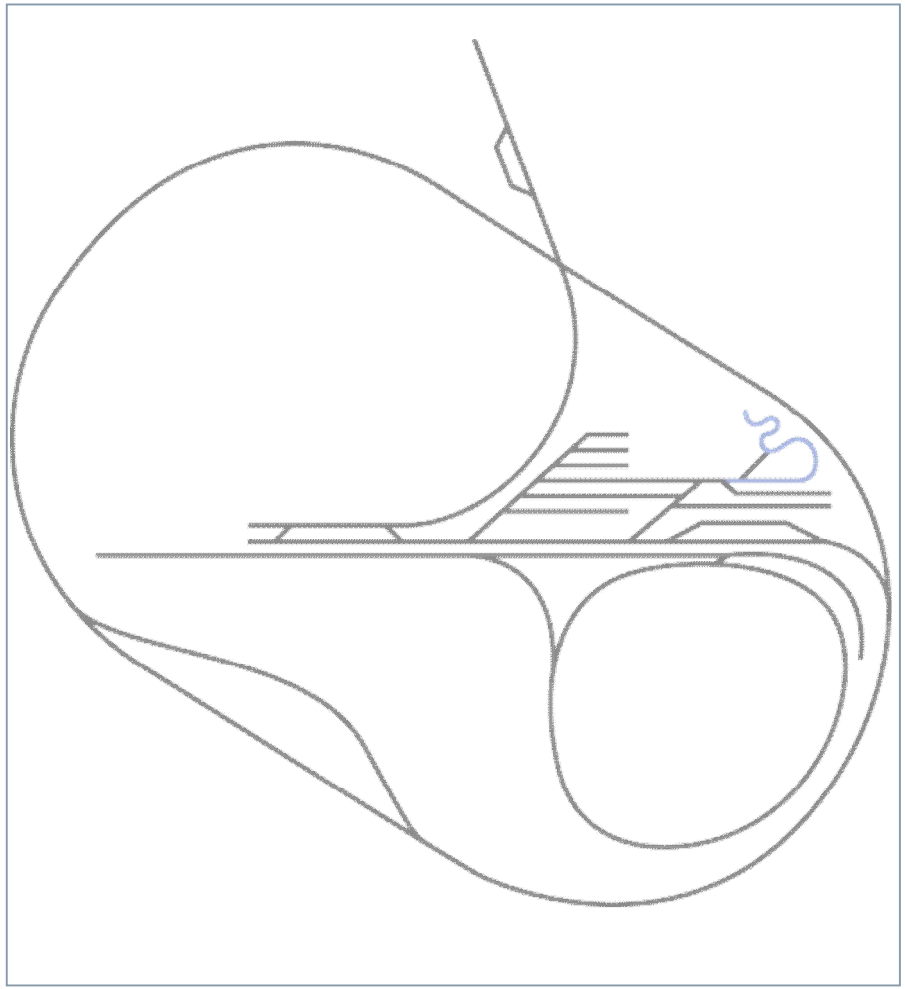


Test track T3

The straight and level track is especially suitable for braking distance measurements. Over a distance of 1 400 m, standard-gauge and meter gauge vehicles reach speeds up to 80 kph. Furthermore a power rail is provided.

All of Europe on 28 km of track
Testing for cornering: Test track 4

SIEMENS

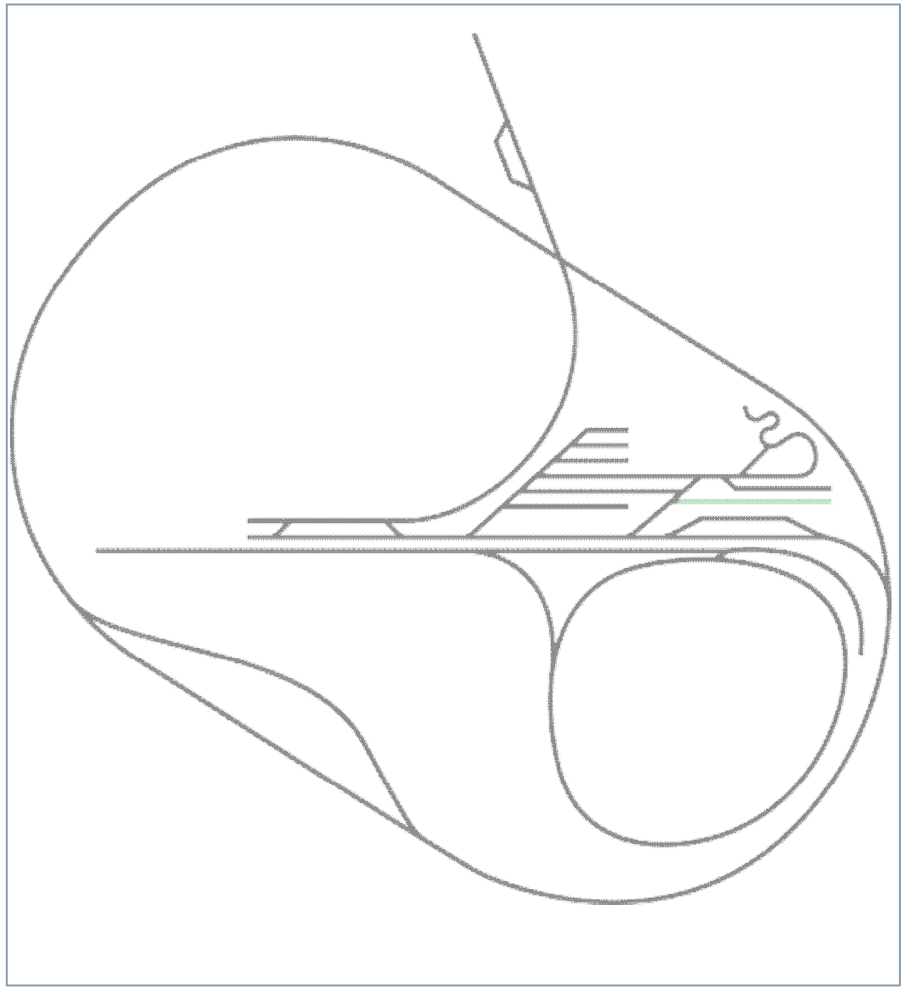


Test track T4

On a track length of 553 m, the curving performance of vehicles can be tested in different radii (50/25/15 m) – both on standard-gauge and meter-gauge track.

All of Europe on 28 km of track
Testing for hills, crests and drops: Test track 5

SIEMENS



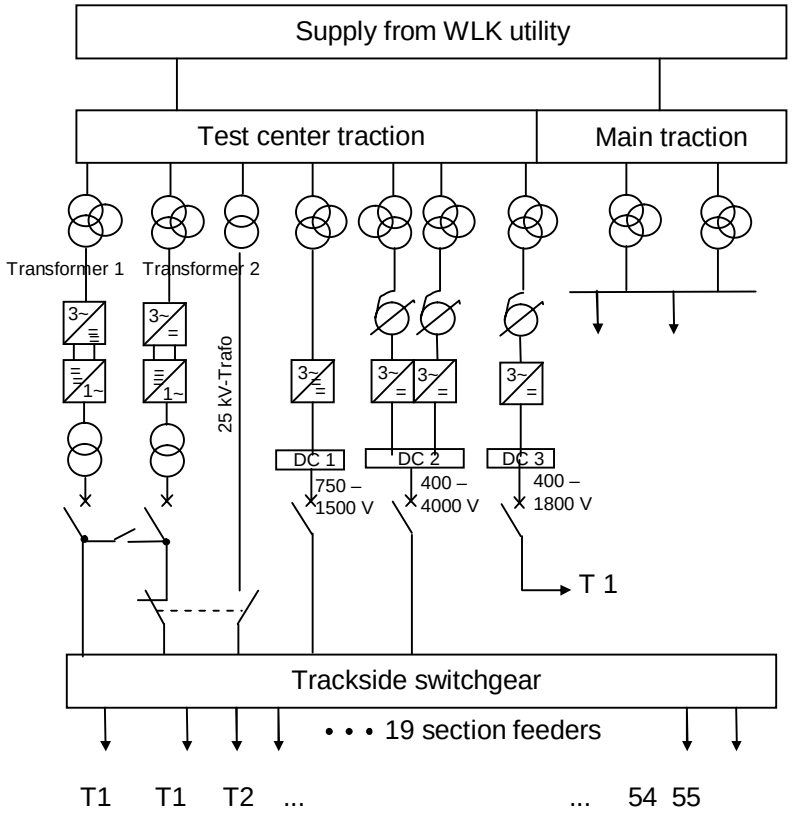
Test track T5

The shortest test track is 410 m long and is gradient track for standard-gauge and meter-gauge vehicles. The track shows a gradient of 40 ‰ as well as 70 ‰.

Getting the power –
Power supply for all standard rail systems worldwide

SIEMENS

Schematic diagram



Power supply from the national grid	
U	20 kV / 50 Hz
S	15 MVA
2 static converters for AC systems	
P	2 x 7,5 MW
U	15 kV / 16,7 Hz 25 kV / 50 Hz 25 kV / 60 Hz 12 kV / 25 Hz
1 traction-supply transformer	
U	25 kV / 50 Hz

3 rectifiers for DC systems	
I	4.000 A
U	± 750 V ± 400 – 4.000 V ± 400 – 1.800 V
Regenerative capacity (stationary resistors)	
AC	6 MW
DC	4.500 A
Test- and Validationcenters own power supply	
U	400 / 230 V / 50 Hz
S	1,2 MVA

Optimal service range for optimal results

Test area / Parameters	Test oval T1	Test oval T2	Test track T3	Test track T4	Test track T5	Train formation buildings 1	Train formation buildings 2
Clearance gauge	1 SM/DR						
Track gauge 1 435 mm	■	■	■	■	■	■	■
Track gauge 1 000 mm		■	■	■	■	■	
Wheelset load 22,5 t		■	■	■	■		
Wheelset load 26,0 t	■					■	■
Trolley system	■	■	■	■	■	■	■
Power rail	■ *)	■	■				
Rail power supplies available							
15 kV/16,7 Hz	■	■	■		■	■	■
25 kV/50 Hz	■	■	■		■	■	■
12 kV/25 Hz	■	■	■		■	■	■
25 kV/60 Hz	■	■	■		■	■	■
= 750 V		■	■	■	■	■	
= 400–2000 V	■	■	■	■	■	■	■
= 2 000–4000 V	■	■	■		■	■	■

> References

*) Power rail english type

SIEMENS

Reliable railway systems from day one – Testing tailored to customers‘ needs

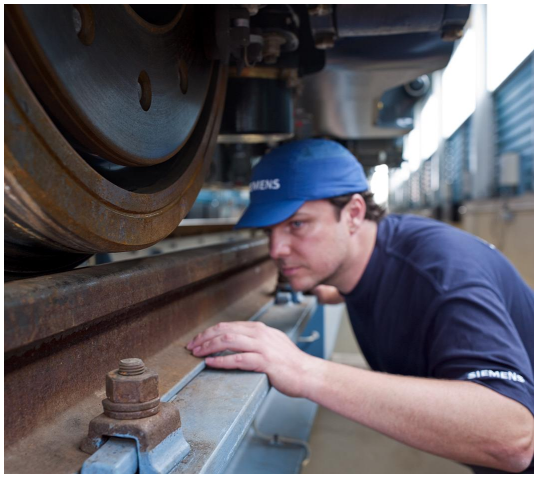
Siemens Rail Services – We keep the rail world running

Individual testing's for our customers – Electrical testing

SIEMENS

Static testing

- Insulation test
- EMC measurement
- Measurements of on-board power systems
- Safety and information systems
- Diagnostic systems
- Heating, ventilation and
- Air-conditioning systems
- Grounding and protective measures
- Auxiliaries



Dynamic testing

- Traction and electric brake
- Interference (system perturbations, track circuit, psophometry, measurement of radio interference)
- Transitions and system changes (voltage gaps and jumps)
- On-board/traction supply or on-board/control and safety systems
- Thermal tests

Individual testing's for our customers – Mechanical testing

SIEMENS

Static testing

- Geometrical test
- Bogie tests
- Discharge tests
- Tilting coefficient and axis of rolling
- Air brake, stationary tests
- Loading and load-status tests
- Sound radiation
- Air-borne noise
- Noise
- Thermal measurements
- Air and lighting systems
- Leakage test

Dynamic testing

- Braking according UIC 544
- Testing of rolling resistance characteristics and safety
- Continuous thermal tests of electrical and mechanical components
- Dynamic traction trials
- Noise levels for vehicle interior and passage
- Reference track in accordance with technical specifications for interoperability (TSI)

Staying on track – The measuring track curve

SIEMENS

Further tests

- Testing of rolling resistance characteristics and safety
- Measurements of mechanical stress

Facts & Figures

- Safety of vehicles against derailment in accordance with DIN EN 14363:2005
- Measuring track curve of 50m
- Radius of curvature of 150m
- Two measurement fields for determining wheel support and guidance forces

Simulating extreme journeys at a standstill – The Turn-tilt-table

SIEMENS

Facts & Figures

- Traveling through curves, over hills, and across dips can be simulated at standstill
- Testing standard and meter gauge vehicles
- Length: 6.600 mm

Further tests

- Stationary bogie tests (ease of movement, rotation torques)
- Discharge tests

The final test for rolling stock– The tilting device

SIEMENS

Further tests

- Geometrical vehicle test
- Tilting coefficient and axis of rolling

Facts & Figures

- Measuring the tilting behavior of the vehicle at a standstill
- Inclined position of the vehicle
- Measuring the effect of lateral acceleration caused by factors such as centrifugal force or side wind

Getting the weight right– The weighing system

SIEMENS

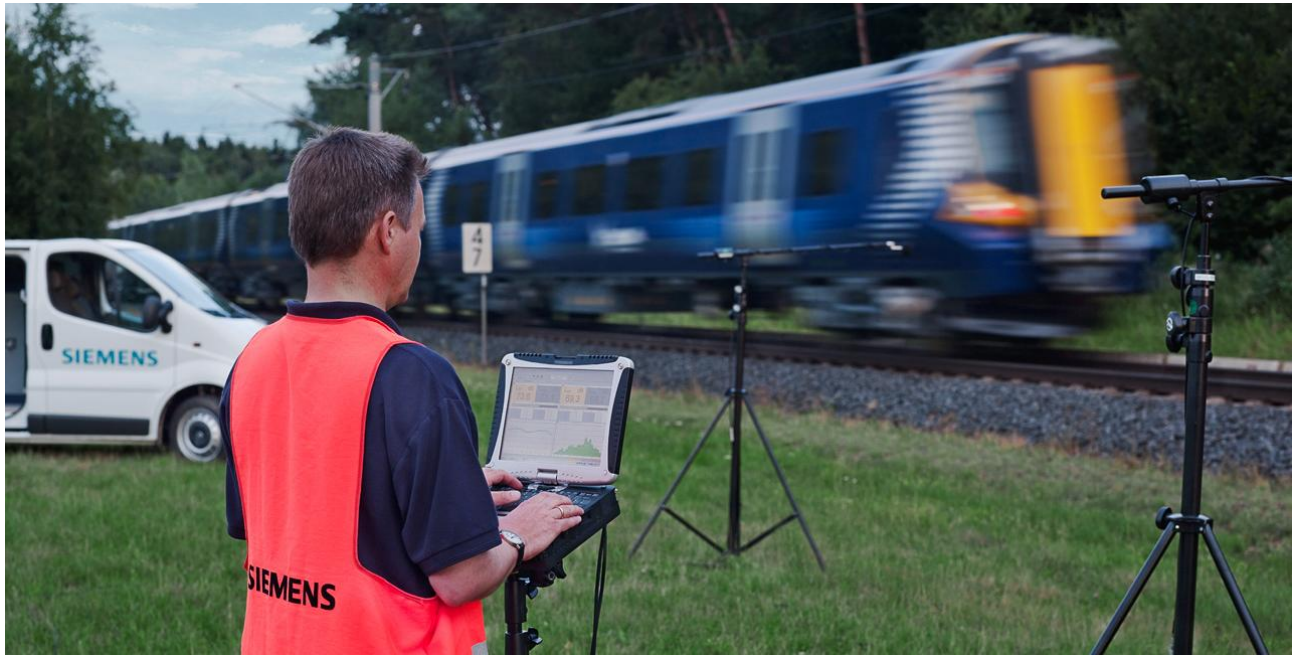
Further tests

- Loading and load-status tests

Facts & Figures

- Measurement of wheel-and-axle rail forces; z measurement tests
- 8 variable weighing elements are provided on 52 m leveled standard-gauge
- Lifting power of each axle (wheel pair) is 30 t

Limiting noise–
The acoustic measuring rig



Facts & Figures

- Reference track according to technical specifications for interoperability (TSI)
- Certification according to TSI Noise and DIN EN ISO 3095:2005
- Measuring possible while vehicles passing at speeds of up to 160 kph

Further tests

- Measurement of air-borne and structure-borne noise

No more delays – The high voltage test facility

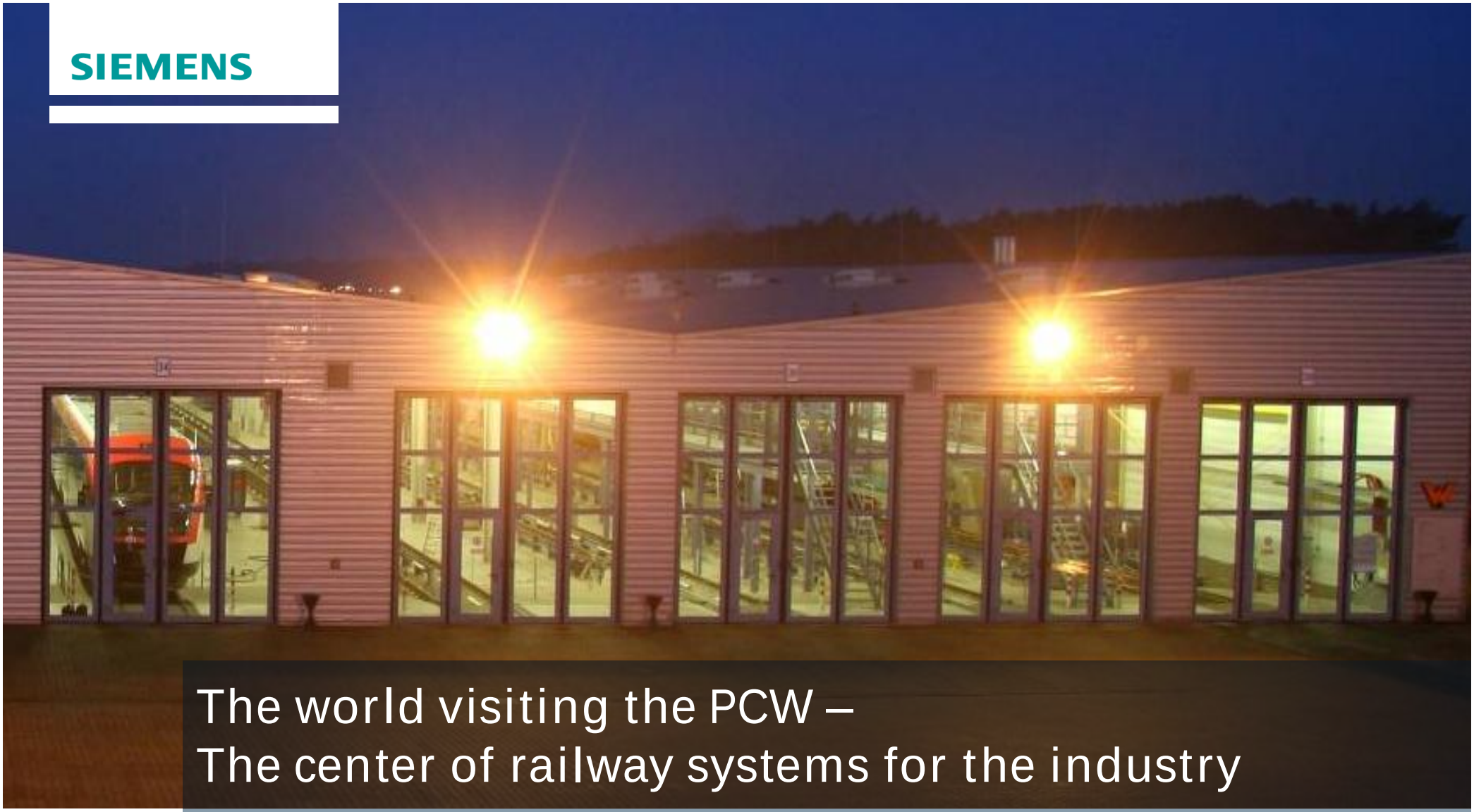
SIEMENS

Facts & Figures

- Carrying out lightning and switching impulse test voltage tests
- Testing of direct and alternating voltage (AC / DC) according to DIN EN60060-2

Further tests

- Testing of rolling resistance characteristics and safety
- Measurement of mechanical stress



The world visiting the PCW – The center of railway systems for the industry

Siemens Rail Services – We keep the rail world running

A worldwide reckoned supplier –
The users of the Test- and Validationcenter

SIEMENS

Manufacturer

ALSTOM · BOMBARDIER TRANSPORTATION · VOITH · vossloh · abrf · Hegenscheidt MFD · GATX · SIEMENS · CAF · ABB · ŠKODA · Faiveley S.A. · Metal Studénka, a.s. · MAX BÖGL

Operator

DB BAHN · VRN · MRCE dispolok · SNCF · Augsburger Verkehrsverbund

Others

AnsaldoSTS · ICS · DLR · TÜV NORD · FH Aachen · DIE BAHNINDUSTRIE. · VBV · Lloyd's Register · invensys Rail · TÜV SÜD Rail · IGT · brunel · Landgericht Stuttgart · THALES · RCAS · aic · RWTH AACHEN · EBC · GATE

Testing and approval from a single source – Various benefits for our customers

SIEMENS

Reasons for testing in the PCW…

- Reducing customers‘ time for setting into operation
- Operational failures can be detected and prevented beforehand
- Ensuring safety and reliability for railway systems from the very beginning

Benefits at a glance

- Flexible type and part testing on closed testing tracks
- Independence of operating plan of public tracks
- Shortened innovation cycles through short-term unlimited testing possibilities

Operational safety for the Metro Taipeh – Endurance test of the door signals

SIEMENS

What do door signals do under full loading?

- Endurance tests of the door signals for Metro Taipei
- Simulation of a short track with final station
- Three weeks of: Arrival, Opening/Closing doors, Departure
- Simulated peak hour: result:signals are still fully functional even after 15,000 km

Deformation properties by an accident of a Velaro RUS – Special test as proprietary development

SIEMENS

Will the Velaro withstand an impact at max. 7 kph without deformation?

- Measurement of the strength of the automatic coupling
- Specially prepared body shell of the high-speed train
- Freight wagon as crash element rolled down gradient of track (T5)
- Test center employees and customer RZD working side by side

The Desiro Classic is tested on behalf of BDZ to ascertain its ability to withstand climatic conditions

SIEMENS

How hot does it get inside the vehicle?

- Endurance test of the air conditioning (for week)
- Test team erects a special tent in train formation hall 1
- Unit is exposed to a temperature of 40°C (for an entire week)
- Test results verified that the air conditioning system is capable of keeping the interior of the vehicle at a constant temperature of 25°C

Acceleration and braking characteristics of the Desiro UK Class 185 are tested through the PCW in the Eifel

SIEMENS

How does the vehicle react on challenging line sections?

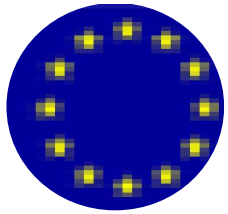
- Intensive tests on acceleration and braking characteristics
- Full four weeks of testing on a specially chosen hilly line in the Eifel region
- Since the vehicles are not yet certified at the time, the Test- and Validation center also handles the formalities for obtaining a special license

Testing the future railway systems today – The every day business at Wegberg-Wildenrath

Siemens Rail Services – We keep the rail world running

Innovations for the future – Rail traffic in the 21st century

SIEMENS



Crossing borders the easy way

European Train Control System (ETCS)

Standards for

Technical Specifications for Interoperability (TSI)

Monitoring from space

Galileo application railGATE

Crossing borders the easy way
European Train Control System (ETCS)

SIEMENS

Illustrating a realistic rail traffic from Rotterdam to Genoa

- ETCS corridor with all existing systems of automatic train control
- National operational programs with remote connectivity to initial control centers
- Testing of rolling stock equipment possible for every type of rail system, every OEM and in all equipment versions
- Detectable freedom from feedback of national systems as well as ETCS

Description	Simulation	Live-Testing	Objective
Corridors in a requirement database (Laboratory and field testing…)	In the laboratory by an independent testing authority	Within the flexible Test- and Validationcenter: PCW	ETCS - 3.0

Crossing Europe on different train control systems – All at one place

SIEMENS

ETCS Level 1

Equipment:

- 2 Groups of balises for fixed data
- 6 pairs of transparent balises
- Provision of customer balises possible

Testing possibilities:

- Basic testing in both directions
- Transitions from ETCS L0 to ETCS L1 and STM PZB, ATB-EG
- Complex procedures feasible through dynamically configurable LEU‘s

ETCS Level 2

Equipment:

- GSM-R (CS 6.0 SR 14)
- Data remote transmission
- Radio Block Center (RBC) either connected or via computer simulation

Testing possibilities:

- Basic testing of ETCS Level 2
- GSM-R with “handover“ functionality

One transition every three minutes –
No problem within our big testing oval

SIEMENS

TSI –
Technical specifications for interoperability

SIEMENS

The Test- and Validationcenter is…

- Member of the EBCERT advising board
- Accredited associated partner for TSI testing and approval of rolling stock vehicles

Alignment to the TSI requirements

- Noise
- Module KD, components of interoperability
- Module SD, quality management system
- Running characteristics
- Certification of maintenance workshops
- ETCS
- Management of railway system accreditation

Galileo *above* –
Implementation centre for ground traffic

SIEMENS

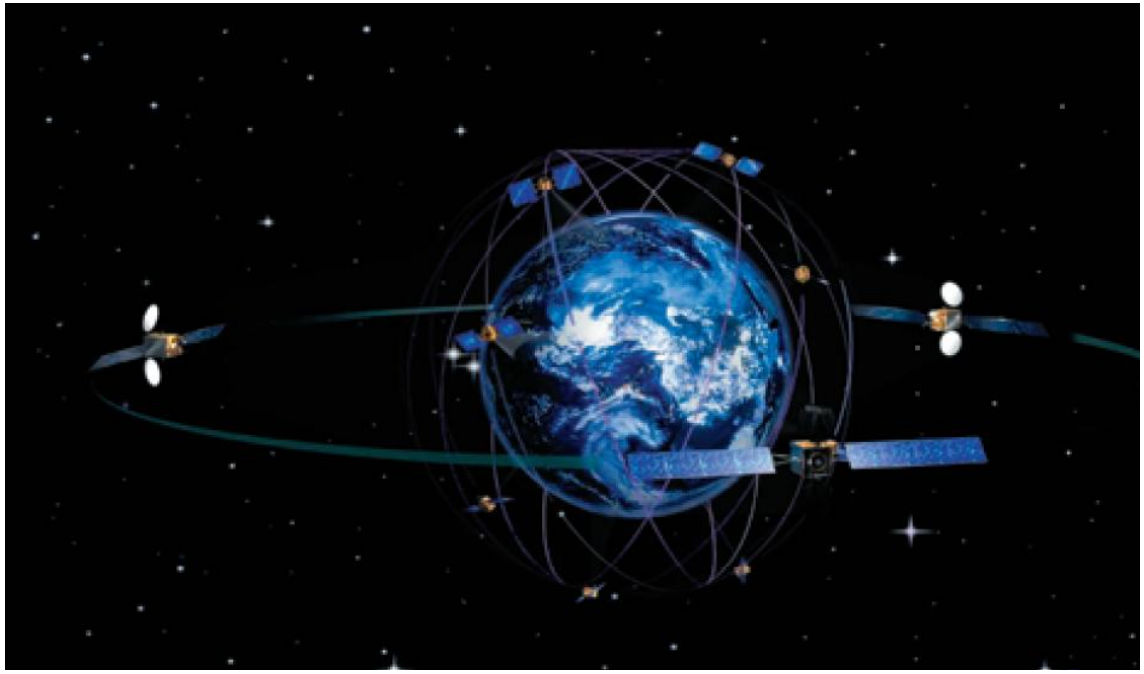
In cooperation with…

aic automotive innovation center aachen

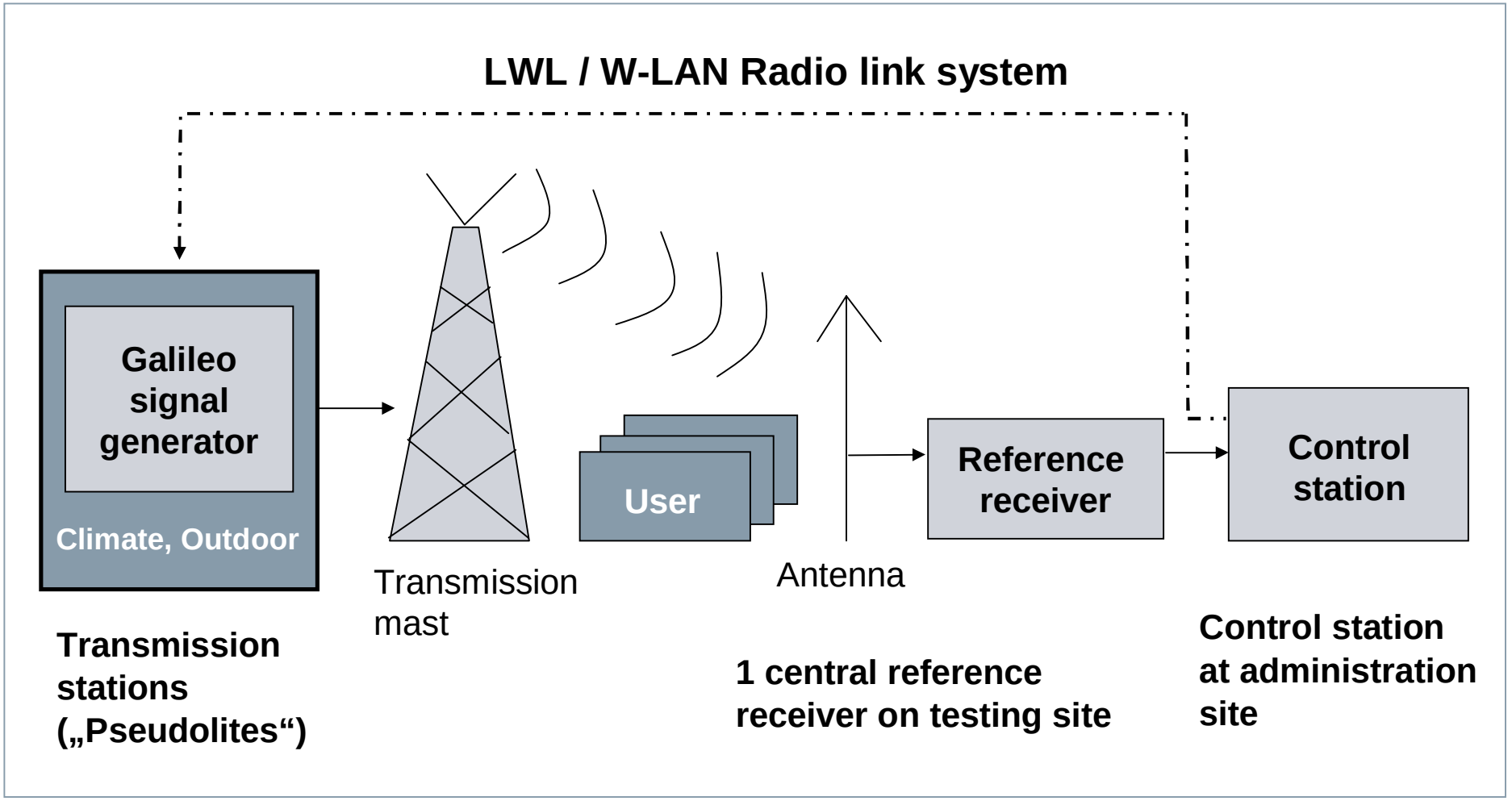
AGIT Gründen. Ansiedeln. Fördern.

IRTT

RWTH AACHEN UNIVERSITY MOBILITY & TRANSPORT



How does the system work – Schematic diagram of the Galileo testing environment

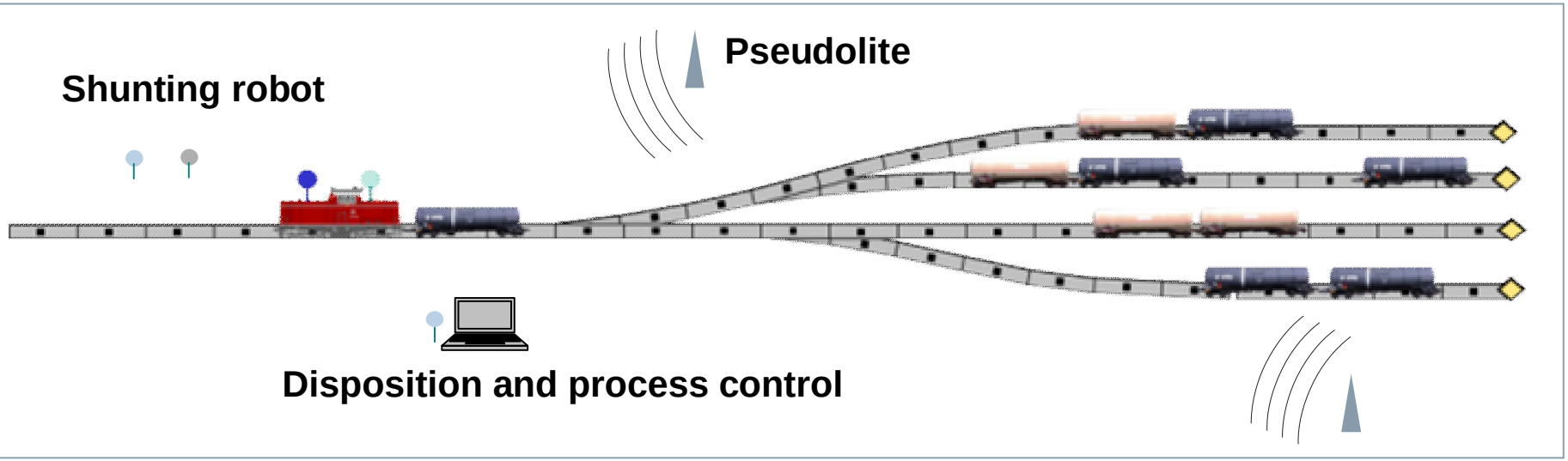


Permanently installed pseudolites at the PCW – To ensure a precise location of rail systems

SIEMENS

Automatic and precise positioning of rolling stock

- Exact positioning of locomotives
- Exact determination of speed
- Determination of slip for dynamic acceleration and braking maneuvers
- Precise target braking and identification of clashes



Taking the universe to the earth–
The Galileo testing facilities at the PCW

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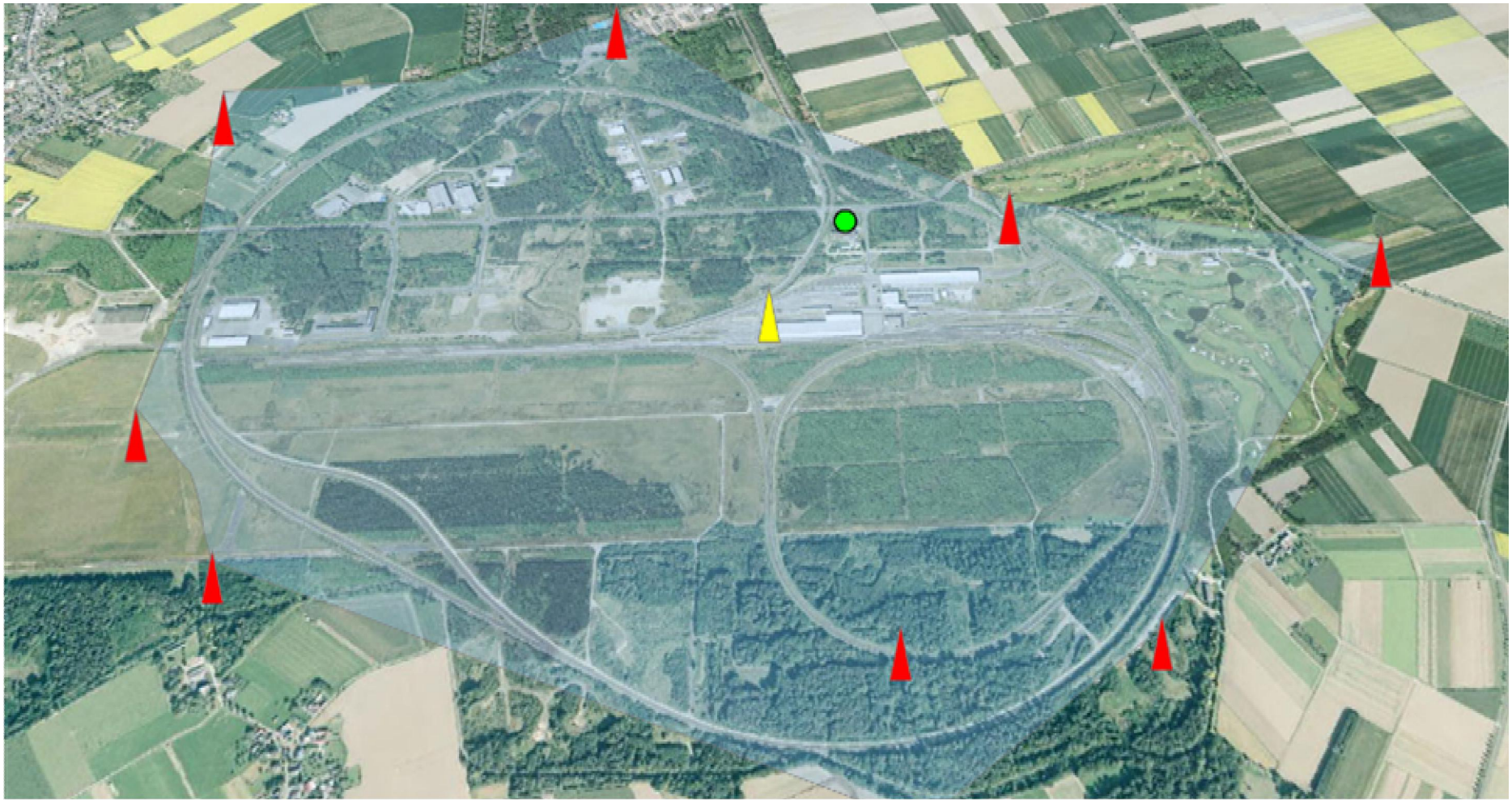


One test center for everyone‘s needs – Workshop and testing services close together

SIEMENS

Test- and Validationcenter

- Infrastructure
- Testing
- Solutions from a single source
- Transport

Refurbishment & Accident repair

- Refurbishment
- Rail Life Support
- Crash & Accident Repair

Rail Systems need to be fit for daily operations – Today, tomorrow and in the future

SIEMENS

Refurbishment

How can you make your vehicles fit for the future?

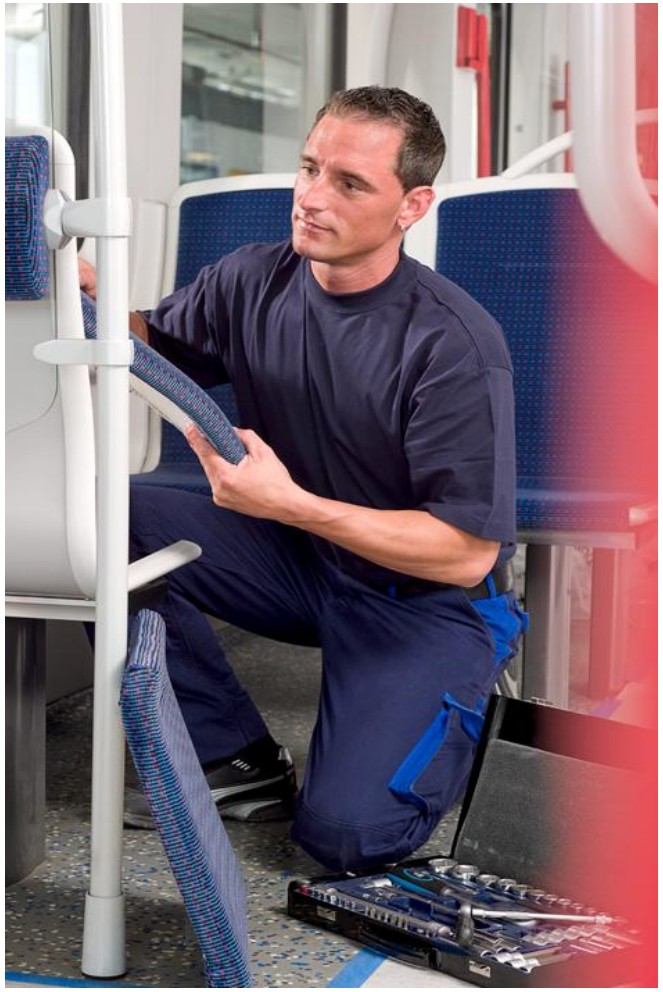
Rail Life Support

Who takes care of rail systems through out the whole life-cycle?

Crash & Accident Repair

Just in case something happens - who can support me?

We make rail systems fit for the future



Refurbishment

Our Answer:

Our refurbishment solutions ensure that your rail systems get back to the state of the art again.

Our Offering:

- Complete overhaul, single component upgrade, interior redesign etc.
- Refurbishment activities according to your specifications
- Tailored solutions for your requirements
- Engineering, Project management, execution, certification, documentation – as a complete package or only partial

Your Benefit:

- Optimization of your rail systems
- Reducing the costs of operation and maintenance
- Saving resources, yours and those of the environment

We take care of rail systems throughout the whole life-cycle

Rail Life Support

Our Answer:

Our After Sales Product Support offers excellent support also after the end of warranty. From technical consultation all the way to changing the design – we provide the solution.

Our Offering:

- Technical consultation, exchange of experience
- Corrections and fault analysis/Adaptations & design changes
- Operation and maintenance optimization/ Obsolescence management

Your Benefit:

- Everything from one source with predefined reaction times
- Direct access to experts and workshops
- Experts in system specific obsolescence management
- Innovations and technology updates from latest developments

We support you in case something happens

Crash & Accident Repair

Our Answer:

Of course we can support you in case of an accident – competent and reliable.

Our Offering:

- Execution of the complete technical, commercial and logistical process - including insurance settlement
- Consulting, management and/or execution of the required actions
- Innovative repair concepts and tools

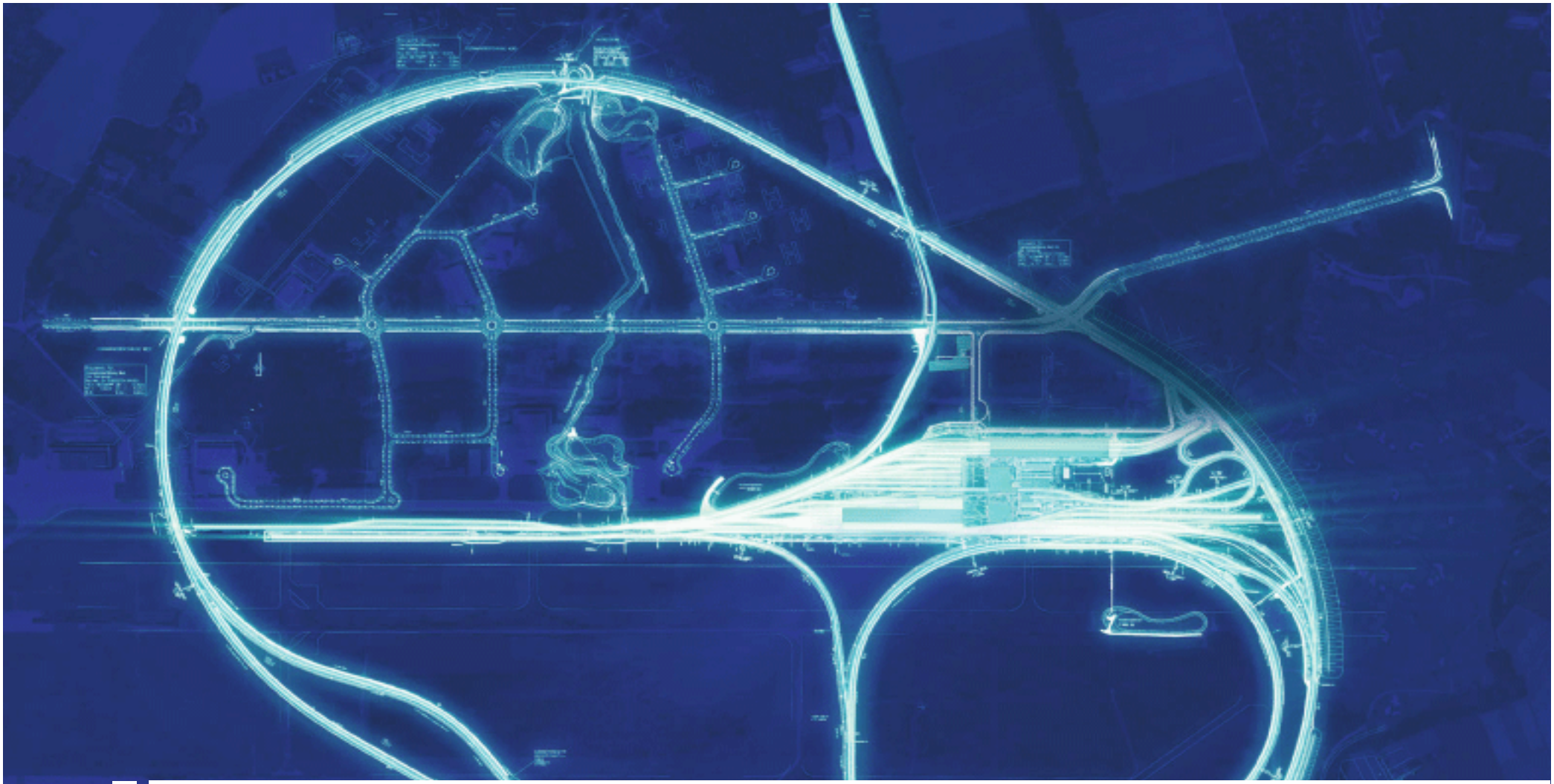
Your Benefit:

- Reduction of your time and effort in case of an accident
- Your vehicles can be in operation again very fast
- Service available worldwide

Railway systems in action – Please always keep in mind…

Siemens Rail Services – We keep the rail world running

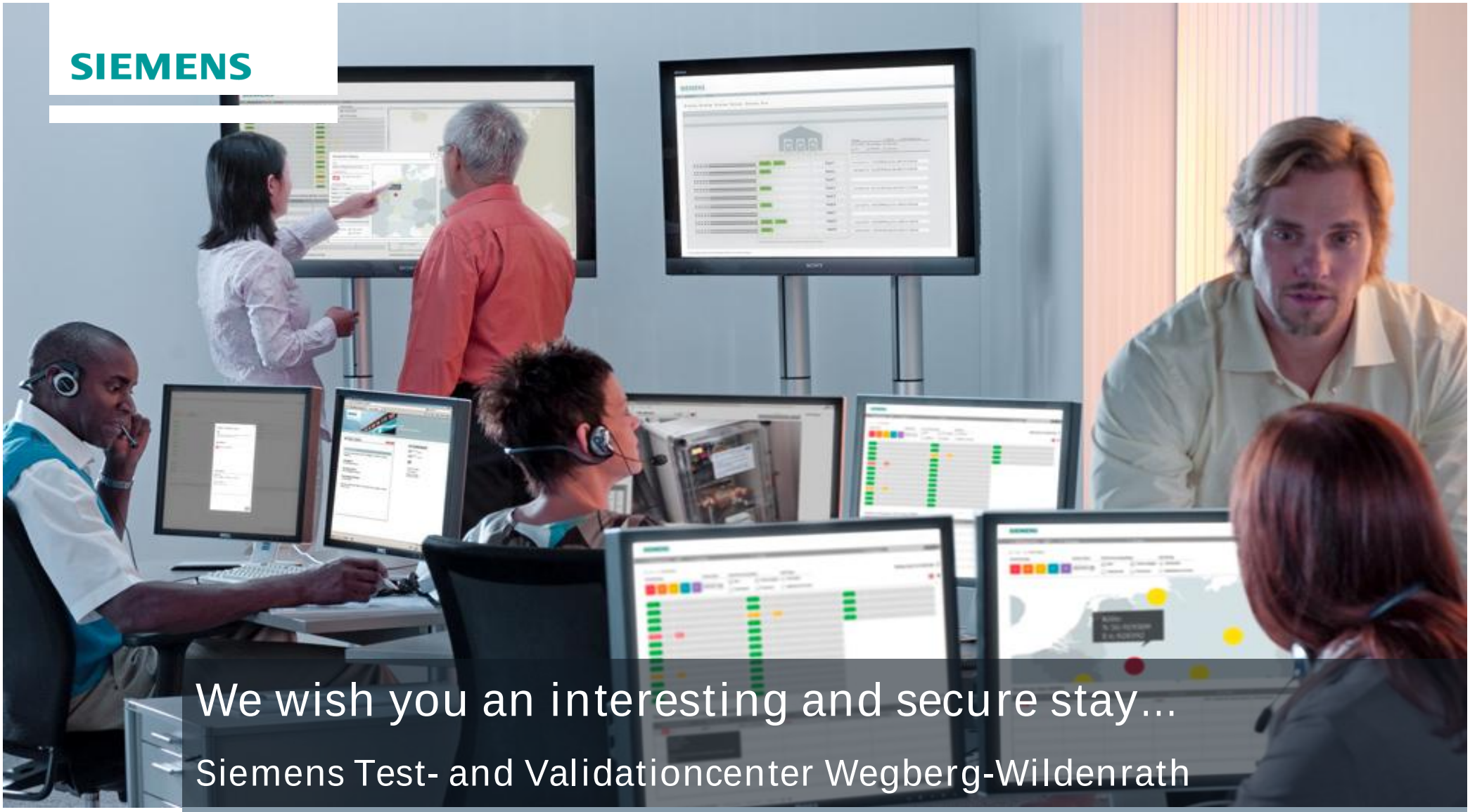
- Stay in your group during the visit
- Do not smoke in any of the workshops and facilities
- Make sure to never enter restricted areas
- Keep a safety distance of at least 1,5 m to all rolling stock vehicles (high voltage and shunting operations)
- Entering track area is strictly prohibited
- Watch out for shunting operations on-site (must have absolute priority at any time)



Let‘s go for a walk and a Ride

Infrastructure and Cities

SIEMENS



We wish you an interesting and secure stay…

Siemens Test- and Validationcenter Wegberg-Wildenrath

IRSE