Eurailspeed

Parallel Session E.1

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Technology Challenges for 350 km/h

EurailSpeed 7-9 November 2005 Session E1

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I&R Technical Director

boosting rail with new ideas

SNCF

Why is SNCF investigating the options for a commercial speed of 350 km/h ?

✓A real business need (journey time determines market share)

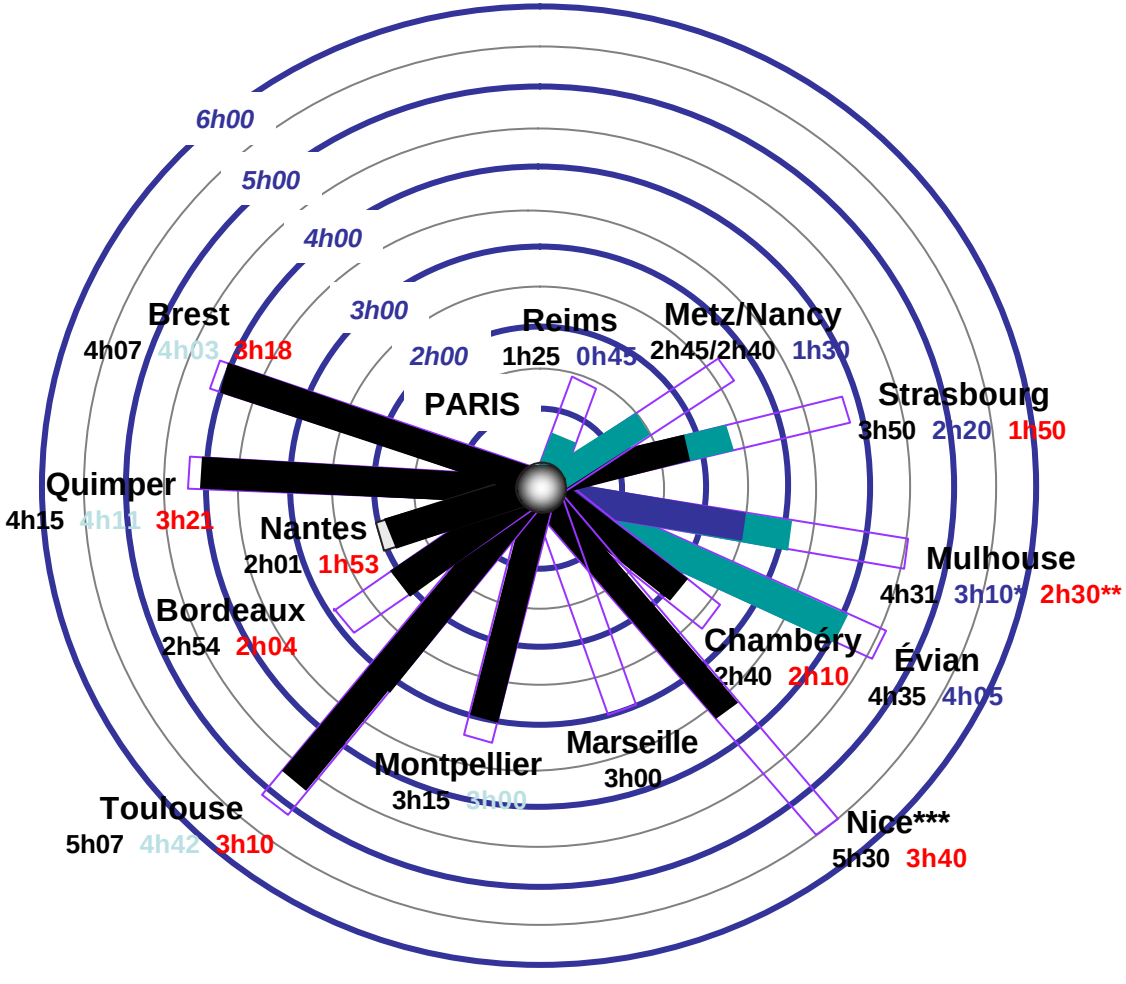
- Market for greater distances by rail

✓ The wheel-rail contact has not reached its limits (2000 km run at V > 400 km/h, record of 515 km/h)

✓ Without distoring the model of the articulated TGV, there is an opportunity for technological leaps (the original concept, TGV 1, is 30 years old) in choosing the technology for future TGVs

✓ Important to start early (time necessary to specify a new product)

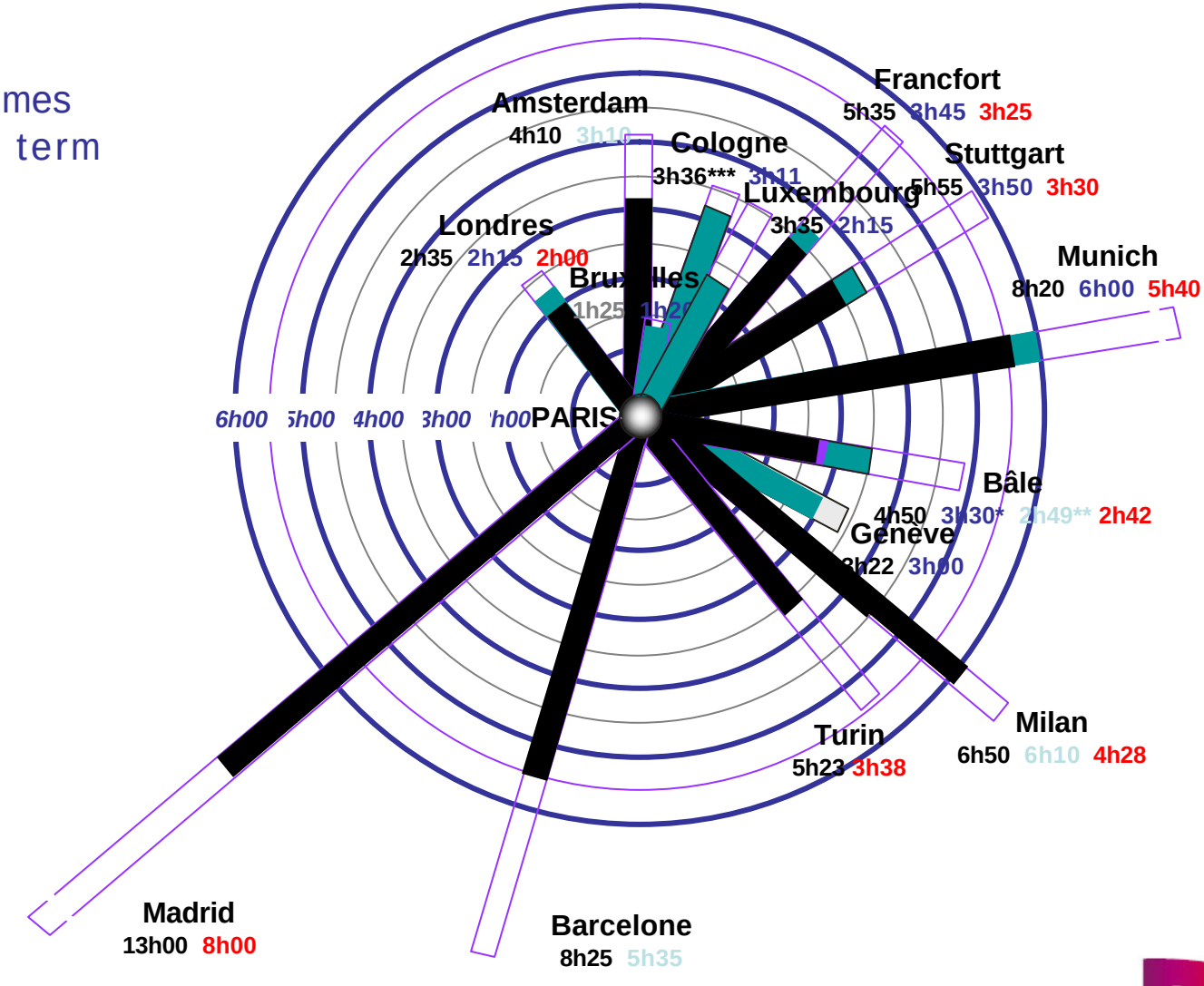
Journey times in the long term



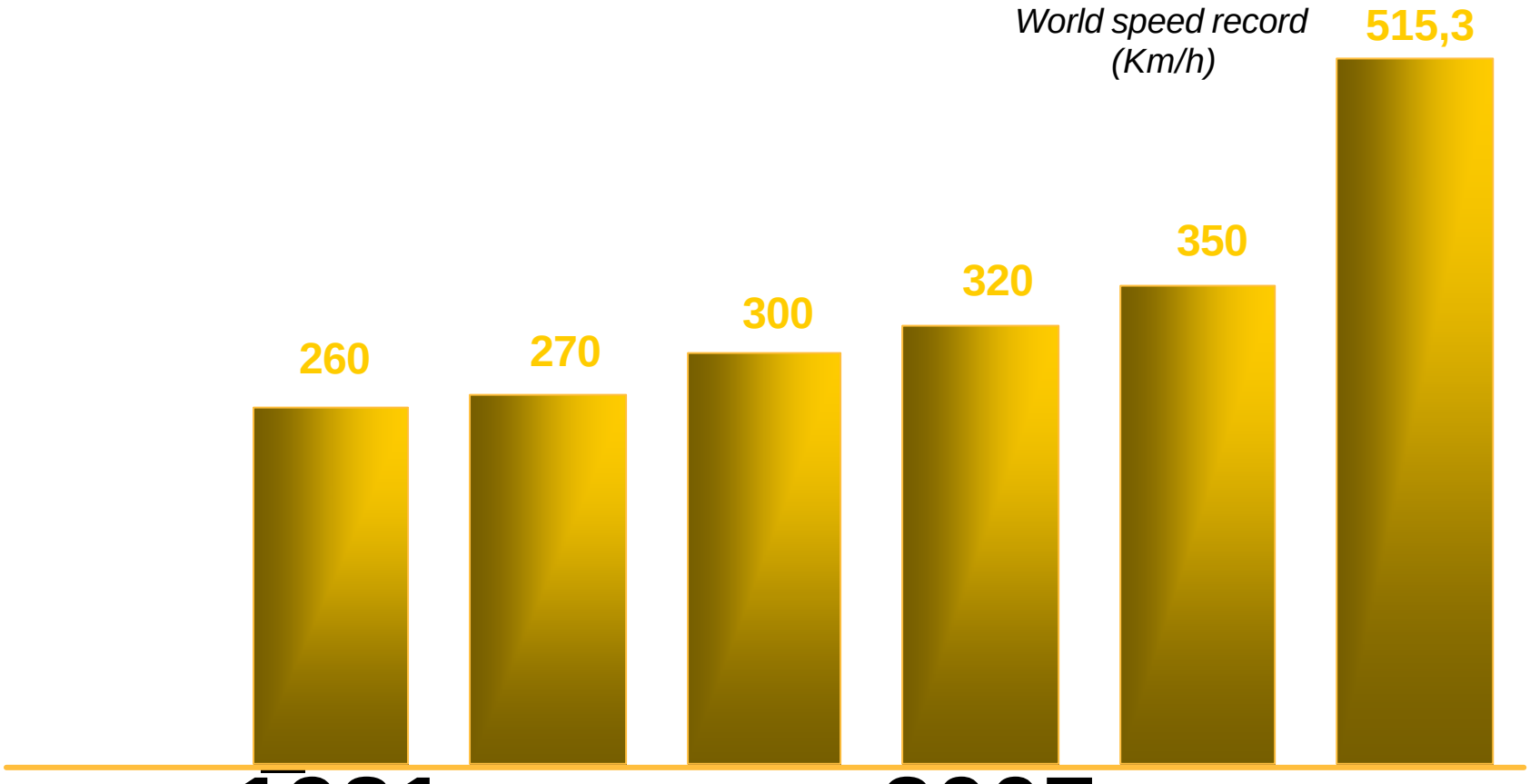
2003 2007 2010 Long term

* via TGV Est HSL (phase 1)
** via TGV Rhin-Rhône (phase 1)
*** next public enquiry/debate

Journey times in the long term



Maximum commercial speed (Km/h)



1981

2007

ideas SNCF

How SNCF proceeded with the analysis

Identification of the technical challenges involved in providing a commercial TGV service at 350 km/h by making an exhaustive analysis of the parameters affected by the speed increase

- Power supply & electric traction
- Braking
- Aerodynamics
- Dynamics
- Signalling
- Comfort (ride)
- Environment
- Rolling stock maintenance
- Infrastructure
- Operation

Elements of the analysis

① Some major elements taken into account in all the current plans for 350 or 360 km/h high-speed running:

✓ **Braking system design considerations:** adhesion, discs, possible use of eddy current brakes, with their constraints in several areas (axleload, track overheating, electrodynamic braking …).

✓ **Ballasted track:** design, behaviour over time, maintenance of ballasted track carrying commercial traffic at V350, flying ballast. Slab track an option?

✓ **Noise**

- in the environment, increase of 3 to 4 dB between V300 and V350
- in passenger saloon, vestibule and driving cab, increase of 4 to 5 dB especially at lower frequencies, to be abated by more efficient materials, active or passive filtering (suspended, decoupled floor).

② Other items to be optimised:

✓ **In the aerodynamics field, in combination with infrastructure design,**

research on alternative shapes for the front end, body streamlining, bogies, inter-vehicle spaces, the underbody, in respect of:

- aerodynamic drag
- entering tunnels
- slipstream effect on persons at the lineside when trains pass or cross
- aeroacoustic noise (leading bogies and inter-vehicle spaces)
- flying ballast

✓ **Axleload**

Upholding 17t axleload at 350 km/h (eddy current brake, more powerful drive, distributed power)

✓ **Current collection**

Development of controlled pantograph to improve collection, reduce overhead wire wear and be able to run in multiple.

✓ **Lateral comfort**

③ Impacts on maintenance and availability

- ✓ **Shortening the life of some equipment**
- ✓ **Increased reprofiling (comfort)**
- ✓ **Increased consumption of wear parts**
- ✓ **Parts service behaviour and fatigue**
- ✓ **Monitoring systems (bearings temperature, comfort,…)**

In conclusion

Some real technical challenges, but also

our experience of thousands of km at 300 km/h

the speed record of 515 km/h

the 2000 km run at V > 400 km/h

the endurance record of 1067 km in 3h 29mn

show that **- the solutions can be found**

- **the wheel-rail contact has not reached its limits**
- **and it remains technically and economically the most relevant for the foreseeable future.**