



# Eurotunnel: Staying 100% connected underground

For its 20th anniversary on 6 May 2014, Eurotunnel Group pushed the button to launch a new mobile telephony service for passengers travelling in the North Tunnel of the Channel Tunnel rail link between the UK and France. **Michel Boudoussier**, Managing Director at Eurotunnel Group, explains that the technology has already been operational in the South Tunnel (direction France–UK) since July 2012, and so now the whole infrastructure is covered, allowing passengers to use their mobile phones and tablets during their journey below sea level.

## The tunnel and its operations

The Channel Tunnel is 50km-long, of which 37.8km are dug under the seabed, between the Sangatte and Shakespeare Cliff shafts, which makes it the longest underwater tunnel in service in the world<sup>1</sup>. Another railroad tunnel, the Seikan in Japan, is longer at 53.8km, but the section underwater connecting the islands of Honshu and Hokkaido is shorter at 23.3km<sup>1</sup>.

More than 300 trains (passenger shuttles, truck shuttles, freight trains and Eurostar trains) go through the Channel Tunnel every day. The record stands at 453 trains in 24 hours<sup>1</sup>. At peak times, such intense use

means one train every 3 minutes. By comparison, the Paris RER system can run one train every 2 minutes, but they are just 225m-long and weigh only 200 tonnes and travel at a maximum speed of just 100km/h<sup>1</sup>. Eurotunnel Shuttles are 800m-long and travel at 140km/h. The tracks in the Channel Tunnel are estimated to carry a load of 110 to 120 million tonnes per year of operation<sup>1</sup>.

## Connecting passengers: South Tunnel

Eurotunnel decided to invest in the development of the rail radio infrastructure (GSM-R) to meet the standards in that domain and part of

the project included the delivery of mobile communications for train users – or GSM-P. The contractual agreement with the selected supplier (Alcatel-Lucent) took place in December 2009 for GSM-R. The contract also enabled the development of GSM-P infrastructure which offers the British and French mobile phone operators the possibility of extending their national network into the tunnels and thus providing a mobile phone service to passengers travelling on trains (2G/GSM and 3G/UMTS services).

Eurotunnel Group and the French mobile network operators (Orange, SFR and Bouygues Telecom) successfully launched mobile telephone and internet services in the Channel Tunnel (South Tunnel) before the London 2012 Olympic Games, and ever since, the French operators have been amazed by the high quality of voice communications and data rates.

The continuation of this project to equip the North Tunnel demonstrates the Eurotunnel Group's strong commitment to improving and offering more services for its customers.

**How does it work?**

Offering 3G mobile data services, on-board information and voice enable customers to remain connected all through their journey. Eurotunnel Group's management wants the Channel Tunnel to be at the competitive edge when it comes to technology. The 30 minute journey is short but it is always good to know you are not going to be interrupted.

The 2G<sup>+</sup> and 3G<sup>+</sup> GSM-P telephone system comprises active elements in the form of optical repeaters every 750 metres, together with radiating and optical fibre cables as the passive elements. The technical challenges have been to accommodate the different radio frequencies in the tunnels while ensuring no interference and enabling the transmission of radio signals via optical fibres.

The initial idea, in-line with the French and UK national radio regulations, was to have French telecom companies covering half of the tunnels up to mid-point and the British telecom companies covering the other half. But after discussions with the French and UK operators it was then judged preferable to have one tunnel per country to avoid cutting communications in the middle of the tunnels. The 'one tunnel per country' solution consists in dedicating the coverage of the South Tunnel to the French operators and the coverage of the North Tunnel to the British operators.

This specific set-up was made possible by authorisation of telecoms regulators in UK (Ofcom) and France (ARCEP/ANFR).

The solution of broadcasting (re-transmitting) the mobile frequencies in the Channel Tunnel is based on the radio coverage of the railway tunnels by radiating cable, shared by GSM-P and GSM-R and fed by optical repeaters/fibres (Radio over Fibre technology) relaying the signals from the Operators' Radio equipment (BTS), which are



**Passengers using the Channel Tunnel can now use their mobile phones whilst travelling under the sea in both directions between the UK and France**

housed at the Sangatte (France) and Shakespeare Cliff (UK) respective tunnel construction shafts, in two dedicated buildings.

The project was a real challenge because the Eurotunnel Group had to bring together all telecom players around a common project and get special authorisations from UK and French telecoms regulators.

Such a project has been also a real breakthrough at a technological level. Very few rail tunnels are covered by 2G and 3G and they are not even 50km-long. Even the Paris subway network is not as well covered as the Channel Tunnel.

**Connecting passengers: North Tunnel**

The Eurotunnel Group is now very proud to have installed British mobile telephone services inside the North Tunnel with the help of UK operators (Vodafone, EE and O2) and also the equipment supplier, Alcatel-Lucent. With the goal of improving services for customers, the fibre optic GSM-P re-transmission system will enable passengers on-board Le Shuttle and high-speed trains to use their mobile devices to use the internet and make calls inside the Channel Tunnel at a quality equivalent to a wireless connection made above-ground. Beyond the initial 2G and 3G services, Vodafone and EE envisage offering 4G in the future.

**Reference**

1. [www.eurotunnelgroup.com](http://www.eurotunnelgroup.com)
2. GSM 900, DCS 1800
3. UMTS 2100



**Michel Boudoussier** studied at the Ecole Normale Supérieure and subsequently became an Engineer at the Corps des Mines. He joined the Eurotunnel Group on 3 May 2010 as Chief Operating Officer in charge of the Channel Tunnel Operations. Following several appointments in the French Ministry for Industry in 1995, Michel joined the French Ministry for Town and Country Planning. Michel spent a large part of his career with SNCF – starting as Freight Manager in the Lorraine region. In 2003, he became SNCF Regional Director for Normandy and then in 2006 became the Regional Director for the Nord-Pas-de-Calais region. Then, in September 2008, Michel was Human Resources Director for the infrastructure arm of SNCF.