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<http://www.anacom.pt/template12.jsp?categoryId=163202>

GSM Mobile Networks Quality of Service Survey

Rail Axels

November 2005

I EXECUTIVE SUMMARY

I.I FRAMEWORK

In the framework of the activities planned for 2005, ANACOM carried out a survey on the quality of the GSM mobile services provided by the Portuguese operators on rail axels, by analyzing technical parameters that translate the quality perception from the Consumer's standpoint.

The survey analyzed the main Portuguese rail axels: *Braga-Lisbon*, *Lisbon-Faro* and *Lisbon-Coimbra-Guarda*.

The measurements took place on working days, from 15 to 21 November 2005. 3,038 test calls were made, corresponding to 46 hours and 30 minutes of measurements along 2,185 kilometres.

Global results by operator have maximum precision errors below 3.03%, for a 95% confidence level

Three mobile network indicators of capital importance were analyzed, considering the quality perspective from the user/consumer's standpoint:

- a. **Coverage;**
- b. **Accessibility;**
- c. **Audio Quality.**

This survey's methodology is based on automatic end-to-end tests, in order to identify the quality of service on the field and providing the most realistic perspective on the networks' performance, from the user's standpoint.

In view of these services' penetration rate, of the diversity of the terminal equipment that is used, and given the users' subjective views themselves, it is impossible to rigorously reproduce each consumer's conditions of interaction with the networks. The results of this study must thus be understood as an indicator of the networks' behaviour. Their transposition/extrapolation to specific situations requires some prudence, at the risk that biased conclusions might be taken.

Technical and methodological options of this study directly influenced its results and must be taken into account when analyzing the results, namely the following:

- It used **EFR Dual-Band terminal equipment**;
- Tests were exclusively based on a **technical solution** (equipment + software) and performed in a totally **automatic** way, thereby setting homogenous conditions for the monitoring of the 3 operators and eliminating the subjectivity inherent to the human user;
- Tests were carried out in **moving vehicles** and with **outdoor antennas**;
- A compromise **conversation time** of **110 seconds** was used to simultaneously analyze accessibility and audio quality in conversations. That time is close to the average conversation time of communications using the networks under analysis, in the third quarter of 2005, a criterion used to select the conversation time for the tests;
- The results of the study only reflect the behaviour of the networks on the places and moments of the measurements;
- On the other hand, operators are permanently improving their networks. The technical interventions necessary for these improvements can cause momentary degradations of the service in the geographic area of intervention.

I.II MAIN CONCLUSIONS

This survey's results show that the GSM mobile networks have a not satisfactory performance on rail axels.

Only 61.8% of test calls were successfully made and adequately kept, and ended normally (by disconnection) at the end of the pre-established time (110 seconds).

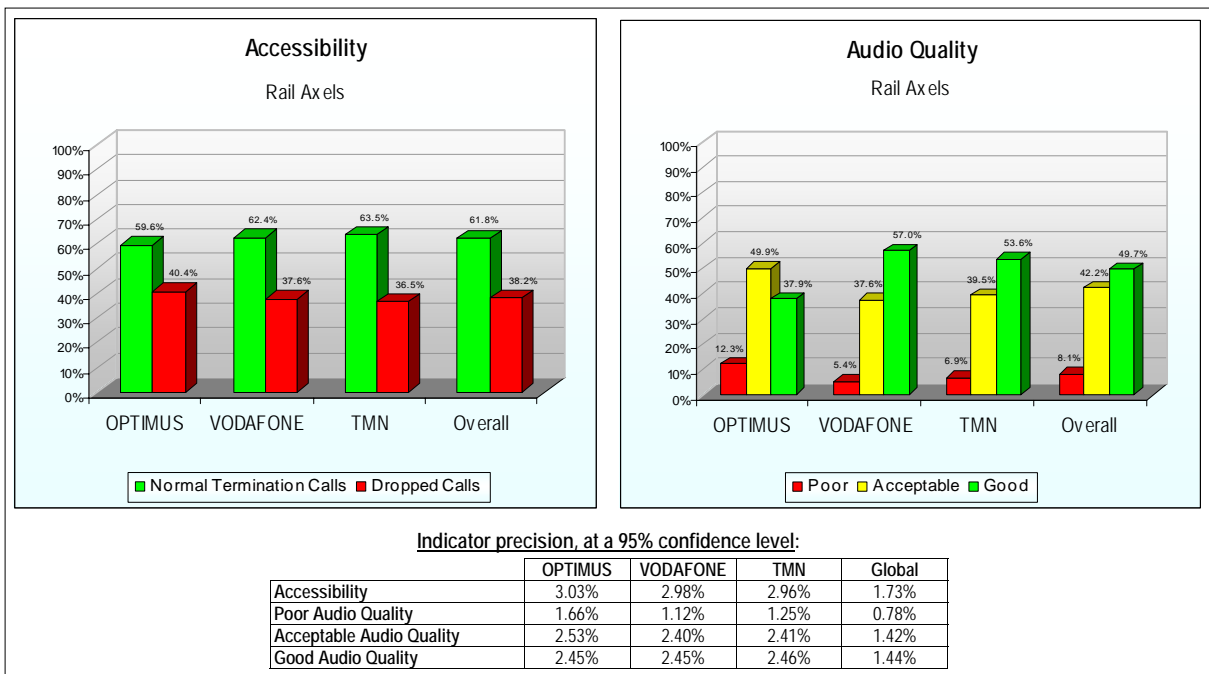


Figure 1 - Performance of GSM Mobile Networks, on Rail Axels

Regarding the perceptiveness of voice communications in these networks, about 92% of test calls had good or acceptable *Audio Quality* average values. However, the number of calls with poor or bad average values (around 8%) is substantial.

The analysis of results by operator does not show important differences regarding the *Accessibility* indicator. Concerning *Audio Quality*, VODAFONE and TMN have similar results. OPTIMUS stands out negatively, with 12.3% of test calls made through this network with poor or bad average *Audio Quality* values.

The poor results registered on rail axels are mainly due to serious coverage deficiencies and to some

situations of total absence of radio signal, especially in the Lisbon-Faro route (see Figure 2 and coverage maps on Section 2).

On this rail axel, only 57.6% of the attempted calls were successfully established and only 33.6% of calls were adequately kept during the pre-established time (110 seconds) and ended normally.

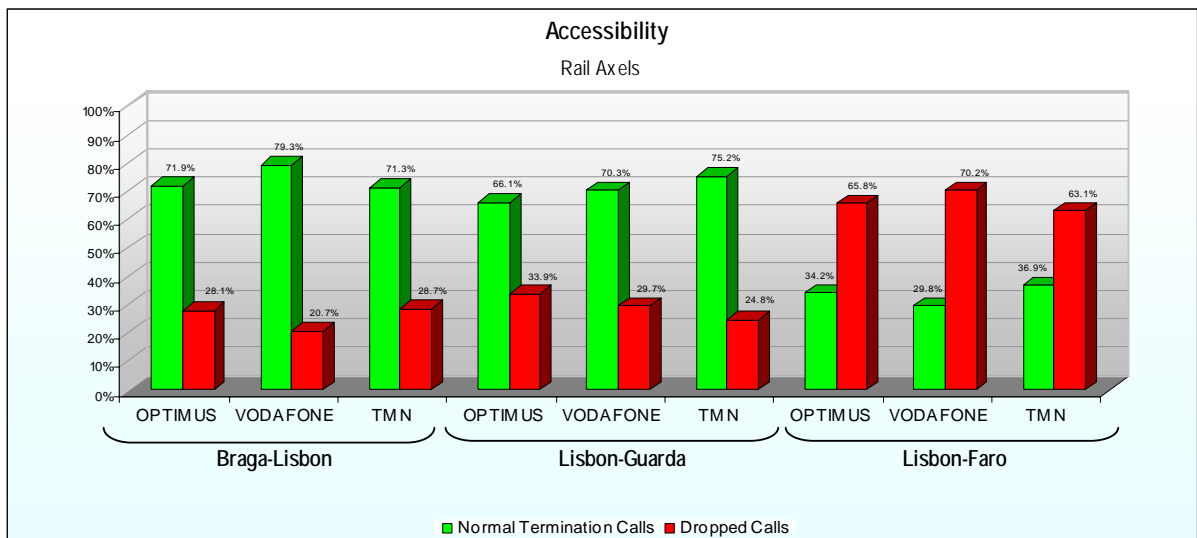


Figure 2 – Accessibility on each analyzed Rail Axel.

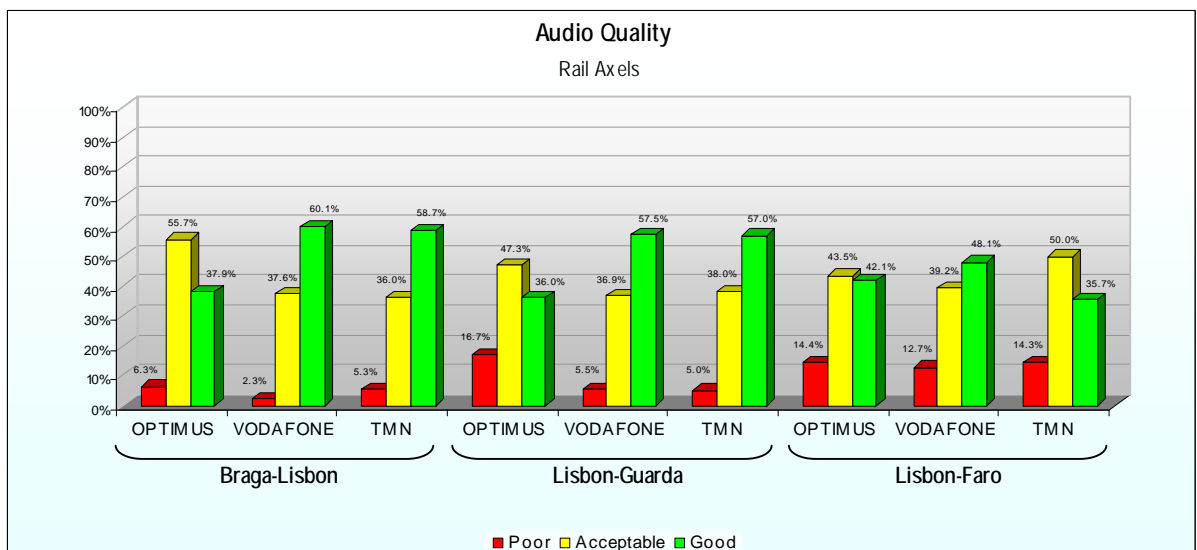


Figure 3 – Audio Quality on each analyzed Rail Axel.