

5G roll-out in France and abroad: technical and health aspects

Dr. P.Aballéa, F-M.Robineau, L-C.Vioissat (Inspectorate General of Social Affairs /IGAS)
P.Follenfant et J-M. Nataf (General Council for the Environment and Sustainable Development/
CGEDD) P.Distler et B.Legait (General Council for the Economy CGE)
H.Havard (Inspectorate General of Finance IGF) et V.Menuet (Inspectorate of Finance IGF), with
C-A.Calvet (assistant)

Executive Summary

With the upcoming launch of a tender for the allocation of its frequencies, the fifth generation of mobile communications (5G) is about to enter its deployment phase in France. In this context, the Ministers for the Ecological Transition, Solidarity and Health, and the Economy, Finance and the Recovery, as well as the Minister Delegate reporting to the Minister for the Economy, Finance and the Recovery with responsibility for Industry commissioned, in early July 2020, the General Council for the Environment and Sustainable Development (CGEDD), the General Council for the Economy (CGE), the Inspectorate General of Social Affairs (IGAS) and the Inspectorate General of Finance (IGF) to evaluate the technical and health aspects of 5G roll-out in France and abroad. The report is based on the task force's investigations at national and international levels during July and August 2020, including a questionnaire sent to French regional economic departments in 22 countries and shared by the World Health Organization (WHO) with its correspondents. Due to its limited duration and its launch during summer, the task force focused on a limited number of interviews and investigations and narrowed the scope of analysis and recommendations.¹

The report reiterates the main features of 5G, the latest generation of mobile telephony (1), assesses France's position in relation to 5G deployment abroad and evaluates corresponding information and dialogue procedures in a comparative perspective (2), reviews the subject of RF-EMF exposure limits and their evolution as a result of 5G roll-out (3). Lastly, the report provides a comparative analysis of health agencies concerning the health-related effects of 5G (4). In light of these findings, the report makes seven recommendations, regarding information to the population, research and monitoring of exposure to electromagnetic waves (5).

Key features of 5G

5G is part of an ongoing process of technological improvement since 1G in the 1980s. 5G aims to improve performance (flow, responsiveness, density of connected objects) compared to 4G; it will support the growth of data consumption and the emergence of new use cases for individuals and businesses. 5G technology is not fundamentally different from 4G; it improves its parameters, relying

¹ The task force's investigations do not include environmental and energy performance aspects, which are being covered in a separate study run by the French Environment and Energy Management Agency (ADEME) and the French Electronic Communications, Postal and Distribution Regulatory Authority (ARCEP). In addition, it does not cover health consequences that are unrelated to electromagnetic wave exposure.

on a network core that will eventually be heavily transformed, and is accompanied by the use of new types of antennas (active antennas). 5G, which will co-exist with previous generations of mobile communications, in particular 4G, will initially use frequency bands already operated by previous generations as well as frequency bands around 3.5 GHz. In a second phase, 5G will also be rolled out on 26 GHz bands, which are characterised by a reduced range and low penetration into buildings and human tissues. In response to increased throughputs and new uses, 5G will require significant investments by telecommunications operators and a renewal of terminals.

5G international roll-out

The results of 5G roll-out in the developed countries studied show that France is, in comparative terms, lagging behind. The deployment began in June 2018, with South Korea assigning frequencies in the 3.5GHz and 28 GHz bands. And so far, of the 26 countries in the sample, 21 have already begun the commercial launch of their 5G network. Besides France, only Belgium, Brazil, Singapore, Israel and Estonia have not yet reached this stage.

All countries in the sample organised technical consultations. No country arranged a nationwide public consultation specifically dedicated to 5G, although citizens and civil society sometimes participated in technical and town hall consultations planned at local level. These public consultations were run with mixed success.

Levels of exposure to radiofrequencies and 5G

Since 1998, RF-EMF exposure limits have been subject to guidelines drawn up by an international scientific non-governmental organisation called ICNIRP (International Commission on Non-Ionizing Radiation Protection). ICNIRP establishes these exposure limits on the basis of the only deleterious effects that are currently proven: thermal effects on tissues, for both distant (antennas) and near (terminals) exposure. ICNIRP derives exposure limits for the exposure of one unit mass of biological tissue to electromagnetic power by applying reduction factors to ensure a margin of safety, and then sets reference electromagnetic field levels that can be measured in situ.

ICNIRP guidelines, which were recently revised in March 2020, represent a benchmark for the WHO, the European Union and a large majority of countries, including France, which has adopted them in regulatory provisions. In addition, France, like other countries, has introduced a series of additional measures to further limit public exposure beyond the obligation to comply with exposure limits. It has also introduced measures to monitor and control exposure in living areas and emissions from terminals. In France, current exposure measurements are well below the limit values set by regulations and their median value has evolved in a limited manner in recent years. In total, less than 1% of the exposure measurements carried out by the French National Frequency Agency (ANFR) exceed the level determined for so-called atypical points, i.e. those subject to a field strength greater than 6 V/m, a value ten times lower than ICNIRP reference level corresponding to the future 5G bands. It is nevertheless very difficult to measure exposure linked to uses (i.e. contact with terminals) which, however, usually represents the majority of overall exposure; ANFR also checks the compliance of mobile phones available for sale with regard to these limit values.

It is also difficult to estimate changes in exposure levels in France due to the arrival of 5G. Based on the information available to date, it can be estimated that the introduction of 5G in the 3.5 GHz band with active antennas will not generate a surge in exposure in urban areas, where it will be deployed for the most part, compared with the changes observed with existing networks, but may contribute to an increase in the number of atypical points, which will require particular vigilance. The subsequent use of the band around 26 GHz will lead to new effects that have yet to be documented.

Health effects of radiofrequencies and 5G

In view of the large number of studies published since the 1950s, in France and worldwide, on the health effects of radiofrequencies, there are, according to the consensus of national and international health agencies, no proven short-term adverse effects, i.e. deleterious thermal effects on tissues, below the exposure limits recommended by ICNIRP, neither for the general public nor for workers. The possible long-term effects, whether carcinogenic or not, which are difficult to demonstrate, are at this stage, for the most part, not proven according to the same national and international agencies. However, discussions are ongoing within the scientific community, especially as regards these long-term effects. No proven effects have been demonstrated for children, although the possibility of cognitive effects cannot be ruled out. Furthermore, no causal link has been demonstrated between electromagnetic waves and the electromagnetic hypersensitivity of individuals.

The health and control authorities also concur in concluding that there are no specific health effects of 5G below exposure limits. While only five countries, including France, appear to be funding studies dedicated to 5G, national agencies consider either that there are no health issues specific to 5G technology, or that there are indeed specific issues, for which it is possible to extrapolate the results from studies performed on previous generations. Several agencies (Germany, Netherlands, Switzerland, etc.) nevertheless consider that the difference between 5G technology and previous generations is such that it is necessary to go beyond the studies carried out on those generations for frequencies around 26 GHz. In any case, most agencies' conclusions are supplemented by recommendations in terms of research and information.

Given the very limited time available, the task force only made general recommendations in the areas of information and prevention, research and exposure monitoring:

- Bolster messages to the general public, especially young people, on the proper use of terminals and measure their effects
- Harmonise the content of government websites on "radiofrequency exposure and health"
- Publish the documents that contribute to enhancing discussions and the consultation committees of the French Agency for Food, Environmental and Occupational Health & Safety (ANSES) and ANFR
- Organise a formal consultation following the publication of ANSES' work on the health effects associated with the deployment of 5G
- Strengthen ANSES' means of evaluation and research on the health effects of electromagnetic waves, particularly in the frequency bands around 26 GHz and the protocols for measuring exposure
- Carry out electromagnetic field measurements before and after installation of antennas deploying 5G technology on a significant number of representative sites
- Study the interest and methods of developing an individual measuring device capable of identifying overall level of exposure per individual