DOF: 01/17/2018

Agreement whereby the Plenary of the Federal Institute of Telecommunications approves and issues the guidelines that set out indexes and quality parameters for the mobile service providers and abrogates the Fundamental Technical Quality Plan for the Local Mobile Service published on the thirtieth day of August, two thousand and eleven, as well as the measurement methodology of the Fundamental Technical Quality Plan for the Local Mobile Service published on the twenty-seventh day of June, two thousand and twelve.

On the margin a logo, which says: Instituto Federal de Telecomunicaciones

AGREEMENT WHEREBY THE PLENARY OF THE FEDERAL INSTITUTE OF TELECOMMUNICATIONS APPROVES AND ISSUES THE GUIDELINES THAT SET OUT INDEXES AND QUALITY PARAMETERS FOR THE MOBILE SERVICE PROVIDERS AND ABROGATES THE FUNDAMENTAL TECHNICAL QUALITY PLAN FOR THE LOCAL MOBILE SERVICE PUBLISHED IN THE OFFICIAL GAZETTE OF THE FEDERATION ON THE THIRTIETH DAY OF AUGUST, TWO THOUSAND AND ELEVEN, AS WELL AS THE MEASUREMENT METHODOLOGY OF THE FUNDAMENTAL TECHNICAL QUALITY PLAN FOR THE LOCAL MOBILE SERVICE PUBLISHED IN THE OFFICIAL GAZETTE OF THE FEDERATION ON THE TWENTY-SEVENTH DAY OF JUNE, TWO THOUSAND AND TWELVE.

BACKGROUND

1. On August 30, 2011, was published in the Official Gazette of the Federation (hereafter, the "DOF" after its Spanish initials) the "Resolution by which the Plenary of the Federal Telecommunications Commission issued the Basic Technical Quality Plan of the Local Mobile Service "(hereafter, the "Plan"), with the aim of establishing the bases for the local mobile service to be provided in better quality conditions in the national territory, for the benefit of the users.

2. On June 27, 2012, the DOF published the "Resolution whereby the Plenary of the Federal Telecommunications Commission issues the measurement methodology of the Fundamental Technical Quality Plan of the Local Mobile Service" (hereafter, the "Methodology of Measurements of the Plan") with the objective of establishing the measurement methodology of the quality indicators determined in the Plan that contributes to the local mobile service being provided in better quality conditions in the national territory, for the benefit of the users.

3. On June 11, 2013, the DOF published the "Decree by which various provisions in articles 6, 7, 27, 28, 73, 78, 94 and 105 of the Political Constitution of the United Mexican States are amended and added, in matters of telecommunications" (hereafter, the "Constitutional Reform Decree"), by means of which the Federal Institute of Telecommunications (hereafter, the "Institute") was created as an autonomous body with legal personality and endowed with its own assets, whose purpose is to regulate, promote and supervise the use, leverage and exploitation of the radioelectric spectrum, networks and the provision of broadcasting and telecommunications services, as well as being the authority in matters of economic competition in the service sectors previously alluded to.

4. On July 14, 2014, the DOF published the "Decree by which the Federal Law on Telecommunications and Broadcasting and the Law of the Public Broadcasting System of the Mexican State are issued, and various provisions are amended, added and repealed on telecommunications and broadcasting matter " (hereafter, the "LFTR Decree", after its Spanish initials), which entered into force thirty calendar days following its publication, that is to say, on August 13, 2014.

5. On September 4, 2014, the Organic Statute of the Federal Institute of Telecommunications (hereafter, the "Statute") was published in the DOF, which entered into force on September 26, 2014; On July 20, 2017, its latest modification was published in the mentioned official media.

6. On June 12, 2015, the Plenary of the Institute issued the Agreement to launch for public consultation the *"PRELIMINARY DRAFT AGREEMENT THROUGH WHICH THE GUIDELINES ESTABLISHING THE INDEXES AND QUALITY PARAMETERS TO BE USED BY THE PROVIDERS OF THE MOBILE SERVICE IN THE PROVISION OF THE SERVICES TO THE FINAL USERS AND THE FUNDAMENTAL TECHNICAL PLAN OF QUALITY OF THE LOCAL MOBILE SERVICE PUBLISHED IN THE OFFICIAL GAZETTE OF THE FEDERATION ON AUGUST 30, 2011"*, which was published in the Internet portal of the Institute.

7. The public consultation was held for twenty working days, that is, from June 16 to July 13, 2015. During this period various comments, opinions or proposals related to the object of the consultation were received and some others expressing specific concerns but not directly related to the Preliminary Draft.

8. By means of document IFT/221/UPR/DG-RTE/063/2015 dated on September 10, 2015, the Regulatory Policy Unit submitted for consideration the Regulatory Impact Analysis to the General Regulatory Improvement Coordination, so it could express its non-binding opinion, which was issued through official letter IFT/211/CGMR/046/2016, dated on April 5, 2016.

CONSIDERING

FIRST.- Competence of the Institute.- In accordance with the provisions of the fifteenth and twentieth paragraphs, section IV, of article 28 of the Political Constitution of the United Mexican States, the Institute aims at the efficient development of radio broadcasting and telecommunications, in accordance with the provisions of the Constitution and in the terms established by the laws.

For this purpose, in terms of the Constitutional provision invoked as well as in terms of the 1st and 7th articles of the Federal Law on Telecommunications and Broadcasting (hereafter, "LFTR", after its Spanish initials), the Institute is responsible for the regulation, promotion and supervision of the use, leverage and exploitation of the radioelectric spectrum, orbital resources, satellite services, public telecommunications networks as well as for the provision of broadcasting and telecommunications services, and for the access to active and passive infrastructure and other essential inputs, ensuring compliance with articles 6th and 7th of the Constitution.

On the other hand, 6th Constitutional article, in section B, fraction II, states that telecommunications are public services of general interest, so the State will guarantee that they are provided in conditions of competition, quality, plurality, universal coverage, interconnection, convergence, continuity, free access and without arbitrary interference. The Institute is also the authority in the field of economic competition in the broadcasting and telecommunications sectors, so it will exercise exclusively the faculties of article 28 of the Constitution, the LFTR and the Federal Law of Economic Competition.

The Institute, through its Governing Body, is also competent to issue general administrative provisions, fundamental technical plans, guidelines, cost models, conformity assessment procedures, homologation and certification procedures, and technical regulations in the field of telecommunications and broadcasting; as well as other provisions for the fulfillment of its regulatory function in the sectors of its competence.

Moreover, the LFTR in article 3 fraction VII defines quality as the totality of the characteristics of a telecommunications and broadcasting service that determine its capacity to satisfy the user´s explicit and implicit needs, which parameters are defined and updated regularly by the Institute and in article 15 section XLVII sets that the service Quality Indexes to which the providers of telecommunications and broadcasting services must submit, which is established as one of the attributions of the Institute, as well as to publish every three months the results of the verifications relative to those indexes; In this regard, it is also important to emphasize that one of the rights of

users is that they are provided with telecommunications services in accordance with the quality parameters established by the Institute.

Therefore, based on the provisions of articles 6th, section B, fraction II, and 28th, fifteenth and twentieth paragraphs, section IV, of the Political Constitution of the United Mexican States, as well as in articles 1st, 2nd, 7th, 15th, fractions I and XLVII, 118th, fraction VII, 145th, fractions V and VI, 146th, 191st, fraction VII, and 293rd of the Federal Telecommunications and Broadcasting Law; 1st, 4th, section I and 6th, sections I and XXI, of the Organic Statute of the Federal Institute of Telecommunications, issues the "GUIDELINES THAT SET THE QUALITY INDEXES AND PARAMETERS TO BE USED BY THE MOBILE SERVICE PROVIDERS" (hereafter, the “Guidelines”).

SECOND.- Motivation for the issuance of Guidelines. In accordance with the provisions of article 15, section XLVII, of the LFTR, the Institute has the power to set the Quality Indexes to which the telecommunication service providers must subscribe, among them, the concessionaires, the Mobile Wholesale Concessionaires and the Mobile Virtual Operators, who provide the mobile service.

In Mexico, mobile service coverage has reached penetration rates of around ninety percent of the population by 2017. However, the quality of the service offered can vary drastically among geographical areas due to different factors, including the fact that the infrastructure deployed, for example in rural areas, does not use the most recent access technology, the difference in user density with respect to urban areas, the demand for services from different geographical areas, etc. It is considered that there is also a need to increase the capacity of current mobile networks to meet the demands of current and future users and applications. As a result, the mobile service has been one of the services receiving most complaints both on the platform “Soy usuario” (I am a User)[1] of the Institute, as well as through the Federal Consumer Protection Agency (hereafter, the "PROFECO" for its initials in Spanish) due to the lack of optimum quality that users perceive.[2]

It is clear that the constant growth of the number of users can impact on the quality of the service received, several studies[3] predict a growth of the mobile service in Mexico from 103 million unique subscriptions (84% of the population) in 2013 to 116 million for 2020 (88% of the population, considering an estimated population of 132 million inhabitants). It is also estimated that mobile broadband will experience a strong growth in Mexico, reaching 100 million connections by 2020[4] (of 50 million connections in the first quarter of 2015).

For Mexico, it is estimated that mobile data traffic will grow seven times from 2016 to 2021 at a compound annual growth rate of 48%. [5] The International Telecommunications Union (ITU) had predicted that in 2015 the proportion of data traffic would exceed voice traffic, however, it was since 2009 that the proportion of data traffic exceeded voice traffic, maintaining exponential growth, while voice traffic has remained at the same level. Currently, data service traffic has grown by 70% compared to the first four months of 2016 and 2017.[6]

Due to the growing demand for high rates of data transmission and quality of service, emerging networks such as LTE lead to a reduction in costs, low complexity in their implementation, with Access Technologies of high spectral efficiency, with high average peak transmission rates, low latency and flexibility in the use of frequencies and bandwidth. This kind of networks are mainly focused on the transfer of data with a convergent architecture based entirely on the IP Internet

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1 http://www.ift.org.mx/usuarios-y-audiencias/informe-estadistico-soy-usuario-2017-abril-junio#overlay-context=usuarios-y-audiencias/contratos-de-otros-servicios

2 https://www.gob.mx/profeco/prensa/boletin-de-prensa-041-profeco-recibio-7-373-quejas-por-servicios-de-telecomunicaciones-durante-the-first-trimestre-del- 2017

3 http://www.ovum.com/telecoms-research/

4 https://www.gsma.com/latinamerica/es/mexico-100-millones-connexiones-banda-ancha-movil-2020

5 https://www.cisco.com/c/m/en_us/solutions/service-provider/vni-forecast-highlights.html#

6 https://www.ericsson.com/assets/local/mobility-report/documents/2017/ericsson-mobility-report-june-2017.pdf

protocol; There is a continuous deployment of these LTE networks, accounting for 451 LTE networks in 151 countries.[7]

Considering the current state of the networks in Mexico and the evolution of the telecommunications sector described, with these Guidelines, quality parameters are established according to the technologies and the needs of the users. Therefore, the proposed Guidelines promote a better service, thus guaranteeing the right of users to have quality telecommunications services.

In this context, Resolution 95 (2016) of the World Telecommunication Standardization Assembly resolves that the ITU Telecommunication Standardization Sector provides references that help developing and underdeveloped countries in the establishment of an adequate national measurement framework to measure the quality of the service and the quality of experience. In addition, it instructs the Study Groups of the ITU Telecommunication Standardization Sector, among others, to develop recommendations that provide guidance to regulators with regard to the definition of test strategies and methodologies for monitoring and measuring service and experience quality and, to study scenarios, measurement strategies and test tools to be adopted by regulators and operators.

Due to the above, the Guidelines establish the parameters to evaluate the mobile services offered in Mexico (voice, short message service -SMS and data transfer), as well as a methodology to measure the proposed parameters. For this methodology, a two-step statistical model is established using stratified random sampling in the first step to select the geographic locations where it will be measured and a simple random sample in the second step to determine the sample size for each service to be evaluated.

THIRD.- Quality in the field of telecommunications. The quality parameters defined in the Guidelines are established based on the following international references, providing information to the user with an adequate and prospective approach to the current environment:

a) With regard to voice, short message and data transfer services, the Guidelines establish the quality parameters in accordance with the ETSI TS 102 250-2 technical specification: "Speech and multimedia Transmission Quality (STQ); QoS aspects for popular services in mobile networks, Part 2: Definition of Quality of Service parameters and their computation" issued by the European Telecommunications Standards Institute (ETSI) V2.3.1 (2014-08);

b) The parameter of packet loss is established based on the recommendation ITU-T Y.1540 (2016-07) " Internet protocol data communication service IP packet transfer and availability performance parameters";

c) Regarding the algorithm used for the measurement of speech quality, the Guidelines are based on the recommendation ITU-T P.863 (2014/09) " Perceptual objective listening quality assessment", and

d) Lastly, the levels of power received that define the coverage ranges established in these Guidelines are defined based on the technical specifications:

- **a.** 3GPP TS 43.022, "Technical Specification Group GSM / EDGE Radio Access Network; Functions related to Mobile Station (MS) in idle mode and group receive mode (Release 12)";
- **b.** 3GPP TS 25.304, "Technical Specification Group Radio Access Network; User Equipment (UE) procedures in idle mode and procedures for cell reselection in connected mode (Release 12)", and
- **c.** 3GPP TS 36.304, "Technical Specification Group Radio Access Network; Evolved Universal Terrestrial Radio Access (E-UTRA); User Equipment (UE) procedures in idle mode (Release 12)".

FOURTH.- Indexes and quality parameters of the mobile service. Quality parameters are established for each of the mobile services offered such as voice, text messages and data transfer,

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7 https://www.gsma.com/mobileeconomy/archive/GSMA_ME_2016.pdf

also Quality Indexes or mandatory values are established considering the best practices at the international level and the current state of mobile networks in Mexico.

It should be noted that for some of the defined quality parameters, the corresponding Quality Indexes are not established due to the lack of a consensus of values at the international level and/or the non-existence of a historical database resulting from Measurement Exercises, which may serve as a support or basis for its establishment; the quality parameters for which indexes are not defined, are established as informative. With the above, it is expected to promote and encourage competition as a result of the maximum publicity that the Institute will give to the results of the verification of the defined quality parameters.

About the voice service, the parameters of speech quality and average Call set-up time are set as informative. The speech quality parameter is significantly impacted by the Mobile Terminal Equipment used in the measurement. Whereas, the average Call set-up time parameter considers only Calls that are successful, that is, those that do not exceed the maximum Call set-up time used in the calculation of the percentage of failed Calls (failed Calls are those that cannot be established into the maximum Call set-up time).

However, in the case of the punishable parameters of the voice service, in the case of the dropped Call proportion parameter, an average value of 2% is defined, which reflects the best international practice as well as the Institute's historical measurements.

Concerning the Unsuccessful Call Ratio, at the international level, an index value of 5% predominates considering a Call set-up time to determine this proportion of around 2 seconds in the case of local Calls and 7 seconds in the case of international Calls. In the present Guidelines, the index of the parameter of the Unsuccessful Call Ratio has the value of 3% is kept as is established in the Plan, considering a lower Call set-up maximum time (than the established in the Plan), with gradual decrements of 2 seconds per year until reaching 8 seconds in 2021. These maximum Call set-up time values higher than those found internationally, justify the referred 3% index.

In relation to the text message service, given that this keeps on generating traffic at the national level, mainly in rural areas, it is considered essential to continue evaluating it and establishing punishable indexes. Therefore, for the evaluation of the punishable parameter of the proportion of unsuccessful text messages, those text messages that are not delivered completely in the maximum time of delivery are considered as failed, that is, for a text message to be considered as successful not only must it be delivered in a maximum time of 20 seconds, but also all sent characters must be received correctly.

In the case of the parameters of the average delivery time of the short message, and of the integrity of the short message, they are established as informative. The aim is not to punish twice the non-compliance of the conditions that qualify a text message as failed. As in the voice service, the average delivery time of the short message is determined solely from the text messages delivered successfully.

Regarding the data transfer service, the most relevant parameters are established based on international best practices: latency, packet loss and the uploading and downloading data rate. Accessibility, in particular, is measured from the parameter of the unsuccessful FTP session attempts ratio.

It should be noted that for the data transfer service, quality indexes of a punishable nature are not established since, as a result of the investigation of the international framework, it was observed that several countries do not establish compliance values for the data transfer service and when they are established, these values do not show homogeneity. It was also considered that to date, there is no historical database of measurements that could serve as a basis for a possible index value. This being the case and in order to gather information about the state of the networks regarding data transfer, it was considered to establish that the results of the measurements of the data transfer parameters are of an informative nature.

Recapitulating, parameters are established and, where appropriate, Quality Indexes that result in a better service quality for users, according to the recommendations of the ITU, the best international practices and the deployment and technological evolution of the networks of the

mobile service in the country. In addition, a broad dissemination of the results of service quality measurements is considered to encourage competition and empower the user by reducing asymmetries in the information.

The parameters and indexes established are the following:

SERVICE	QUALITY PARAMETERS	QUALITY INDEXES	SANCTIONABLE/ INFORMATIVE
VOICE	Unsuccessful Call Ratio	<= 3%	SANCTIONABLE
	Dropped Call Ratio	<= 2%	SANCTIONABLE
	Speech Quality (MOS*)	---	INFORMATIVE
	Average Call set-up time	---	INFORMATIVE
SHORT MESSAGES	Failed Short Message Ratio	<= 2%	SANCTIONABLE
	Short Message Average Delivery Time	---	INFORMATIVE
	Integrity of the Short Message	---	INFORMATIVE
DATA TRANSFER	Unsuccessful FTP Session Attempts Ratio	---	INFORMATIVE
	Average Download Data Transmission Rate	---	INFORMATIVE
	Average Upload Data Transmission Rate	---	INFORMATIVE
	Latency	---	INFORMATIVE
	Packet Loss Ratio	---	INFORMATIVE

Table 1 Quality indexes and parameters

Finally, during a period of one year the quality indexes will be informative so that, on the one hand, the Institute gets the necessary equipment to perform the measurements in the field and, on the other hand, the Institute will be able to apply the statistical methodology which establishes that the measurements must be carried throughout a year to obtain a weighted average of the performance of the network at national level and have a sample size that is representative of the different networks. In addition, the sampling methodology considers the values of trend measures and dispersion measures such as the mean and the standard deviation, which will be obtained from the results of previous measurements; These statistical measures will be used to calibrate the stratified sampling model that allows obtaining an adequate sample size at the level of expected representativeness.

FIFTH.- Measurements Methodology. The verification of the quality indexes will be carried out according to the measurement methodology established in Annex I of these Guidelines. It is planned to make measurements that reflect the actual conditions under which users have access to the mobile service, including quality measurements for the moving data transfer service. As of January 1, 2019, the determination of non-compliance with punishable quality indexes should be carried out based on a hypothesis test considering the weighted annual average of the

measurements obtained for each quality parameter, and a critical value calculated for each index based on statistical criteria, considering a confidence level of 95%.

In addition to the verification of compliance with the quality indexes established through field Measurement Exercises, an analysis of the quality of the networks at the national level will be carried out from the delivery of a quarterly report based on the performance counters extracted from the network management systems of the concessionaires and, where applicable, Mobile Virtual Operators. From this delivered report, it will be able to generate other informative reports that serve as a complement to the field Measurement Exercises given the limitation to obtain an overview of the quality of the network at the national level. This information will be used to provide data to the user in a friendly language, eliminating information asymmetries.

On the other hand, both ETSI and ITU have issued international standards and recommendations such as ETSI TR 102 643 V1.0.2 (2010-01) and P.10 / G.100 that define the quality of experience as *"overall acceptability of an application or service, as perceived subjectively by the end-user"*, that is, all the factors of the system are included, both objective and subjective, from end to end, such as the customer, the terminal equipment, the network, the infrastructure, among others. Therefore, the present Guidelines also establish measurements that reflect the quality of the users' experience of an informative nature, since the analyzes generated from the information to be delivered by the mobile service providers will show the quality of the network, not reflecting the experience or perception of the end user. These measurements may consider scenarios of real use of services not only outside but also inside buildings, public spaces, moving, among others.

Regarding measurements to verify compliance with the established quality indexes, it is expected to sanction those acts or omissions that are intended to alter, limit, hinder and/or prevent the Institute from carrying out the verification of the quality parameters of the Institute so that these reflect the real and/or usual conditions of the performance of mobile networks. In case of detecting alterations in the user profiles in relation to the quality of service, it is foreseen to request information from the service providers in order to get the necessary data to analyze in a complete and correct way the results of the verification.

SIXTH.- Considerations and statistical basis. It was designed a methodology based on a statistical sampling to carry out the measurements and evaluate compliance with the quality indexes established in the Guidelines, aiming a representative sample that allows inferring the behavior of the networks at the national level.

The measurement methodology establishes a statistical model composed of two stages. In the first stage, a stratified random sampling is used, by which the federal entities are divided and then the number of geographic locations where the measurements will be carried out is defined. The second stage makes use of a simple random sampling to determine the size of the sample of events to be carried out in each federal entity for each of the parameters of the three services to be evaluated.

In this way, the stratification allows the distribution of the federal entities of the country in different groups, in such a way that groups are internally homogeneous but different from each other. The above, given that each stratum shares characteristics that affect the values of the quality parameters such as density of radio base stations, access technology, traffic demand, among others.

In this scheme, each stratum is defined by a range of percentage of the population (regarding the total population of the country), in such a way that all the federal entities are associated to a stratum. The four strata correspond to the following population percentages:

Stratum 1: Percentage of the population of the federal entity greater than 0% and less than or equal to 2%.

Stratum 2: Percentage of the population of the federal entity greater than 2% and less than or equal to 4%.

Stratum 3: Percentage of the population of the federal entity greater than 4% and less or equal to 6%.

Stratum 4: Percentage of the population of the federal entity greater than 6%.

Within each stratum, a sample size is determined that guarantees an estimation error of less than one (1) percent in accordance with a simple random sampling.

Finally, based on the results of the measurements obtained in the field, corresponding to the number of samples obtained, the compliance with the quality parameters is determined.

SEVENTH.- Information for the end user. To mitigate information asymmetries, the publication and wide dissemination of the results of the measurements of quality of the mobile service is contemplated, as well as the information contained in the reports delivered by the mobile service providers on a quarterly basis with information of quality at the national level generated from performance counters. The above, so that users have more elements that allow them to make informed decisions when selecting their mobile service provider. In order to carry it out, publishing the results of mobile service quality measurements on a quarterly basis as established by the LFTR, as an element of value for the decision making of the mobile end user, is required, even though the determination of the compliance is made annually. In this way, mobile end users will have the most up-to-date and effective information that will allow them to know the quality of the mobile service in the market and therefore will empower them to make decisions.

In the same tenor, article 191, second paragraph, section VII, of the LFTR, provides that it is a user's right to get telecommunications services in accordance with the quality parameters contracted or established by the Institute; likewise, in terms of article 293 of the same legal code, concessionaires and authorized persons are obligated to provide the public with complete and truthful information about the telecommunications services they provide, so that in these Guidelines it is provided that the concessionaires, the wholesale concessionaires and Mobile Virtual Operators may advertise, through any media, only when they expressly indicate the zone(s) or place(s) where the quality indexes determined in these Guidelines are met/breached.

For purposes of the foregoing, the Institute will verify that Mobile Virtual Operators and Concessionaires provide the public with complete and accurate information about the telecommunications services they provide and verify compliance with this obligation, being able, if necessary, to order the suspension of publicity of the information.

In relation to the support to the end user by the mobile service provider, the obligation to implement a complaint tracking system is established, since to the extent that the user's needs and expectations are met, their satisfaction will be increased, which is not only determined by technical factors.

EIGHT.- Failures reports in the mobile service. In case of failures in the mobile service that are imputable to the mobile service providers, an obligation to provide information related to it is stablished. This information will be shared with PROFECO, in order to let it act within the scope of its competence, notwithstanding that the end users exercise their rights.

In the event of Failures in the mobile service attributable to the networks of mobile service providers operating their own management systems that generate files of performance counters, only those Failures that meet the criteria of affecting more than 10 000 users will be reported, for a period of time greater than or equal to 30 minutes in order to record the Failures that have the greatest impact on the quality of service for users.

NINTH.- Public Consultation. In compliance with article 51st of the LFTR, under the principles of transparency and citizen participation, the Institute carried out the public consultation of merit from June 16 to July 13, 2015. There were received 32 entries, 7 from natural persons and 25 from juridical persons, which were valued and strengthened these Guidelines, where appropriate.

TENTH.- Regulatory Impact Analysis. In accordance with the provisions of the second paragraph of article 51st of the LFTR that establishes that prior to the issuance of rules, guidelines or administrative provisions of a general nature in question, the Institute must conduct and make public a regulatory impact analysis.

In this regard, in accordance with the provisions of article 51st of the LFTR; 4 section VIII, subsection IV) and 75 section II of the Statute, the General Coordination for Regulatory

Improvement by means of document number IFT/211/CGMR/046/2016 dated on April 5, 2016, issued the non-binding opinion regarding the "PROJECT DRAFT OF GUIDELINES THAT SET INDEXES AND QUALITY PARAMETERS TO WHICH MOBILE SERVICE PROVIDERS SHOULD SUBMIT". In this document, the General Coordination for Regulatory Improvement, states that the analysis carried out by the Regulatory Policy Unit provides sufficient elements that allow any interested party to know the general objectives of the Draft Bill, the problems that will be addressed, the alternatives that were valued and the potential impacts regarding procedures and regulatory actions, costs and benefits as a result of the provisions and mechanisms for implementation, monitoring and evaluation thereof with the aim of achieving a substantial improvement in the quality of mobile telecommunications services.

For the reasons set forth above, based on the provisions of articles 6th, section B, section II, and 28th paragraphs fifteen and twenty, section IV, of the Political Constitution of the United Mexican States, as well as in articles 1st, 2nd, 7th, 15th, fractions I and XLVII, 118, fraction VII, 145, fractions V and VI, 146, 191, fraction VII, and 293 of the Federal Telecommunications and Broadcasting Law; 1, 4, fraction I and 6, fractions I and XXI, of the Organic Statute of the Federal Institute of Telecommunications, the Plenary of the Institute issues the following:

AGREEMENT

FIRST.- The "GUIDELINES THAT SET THE QUALITY INDEXES AND PARAMETERS TO WHICH MOBILE SERVICE PROVIDERS SHOULD SUBMIT" are approved and issued together with their Annexes I and II, which are attached and are part of this agreement.

SECOND.- Publish this Agreement with its Annexes in the Official Gazette of the Federation, as well as in the Internet portal of the Institute.

The President Commissioner, **Gabriel Oswaldo Contreras Saldívar**.- Rubric.- The Commissioners: **Adriana Sofía Labardini Inzunza**, **Mario Germán Fromow Rangel**, **Javier Juárez Mojica**, **María Elena Estavillo Flores**, **Adolfo Cuevas Teja**, **Arturo Robles Rovalo**.- Rubrics.

This Agreement was approved by the Plenary of the Federal Institute of Telecommunications in its XLVII Ordinary Session held on November 16, 2017, unanimously by the Commissioners Gabriel Oswaldo Contreras Saldivar, Adriana Sofia Labardini Inzunza, Maria Elena Estavillo Flores, Mario Germán Fromow Rangel, Adolfo Cuevas Teja, Javier Juárez Mojica and Arturo Robles Rovalo; based on the paragraphs twentieth, sections I and III; and twenty-first, of article 28 of the Political Constitution of the United Mexican States; articles 7th, 16th and 45th of the Federal Telecommunications and Broadcasting Law; as well as in articles 1st, 7th, 8th and 12th of the Organic Statute of the Federal Institute of Telecommunications, through Agreement P/IFT/161117/715.

SINGLE ANNEX

GUIDELINES THAT SET THE INDEXES AND QUALITY PARAMETERS TO WHICH THE MOBILE SERVICE PROVIDERS SHOULD SUBMIT

CHAPTER I

GENERAL DISPOSITION

FIRST.- The purpose of these guidelines is to set the quality and service parameters of the mobile service and the mobile telecommunications wholesale service, as well as to establish the terms for these services to be provided under quality conditions in the national territory for the benefit of the end users in accordance with the provisions of the Federal Telecommunications and Broadcasting Law.

SECOND.- The provisions set forth in these guidelines are mandatory for the Concessionaires that provide the mobile service, Mobile Wholesale Concessionaires and, as applicable, for the Mobile Virtual Operators that provide such service, all of them are responsible for the quality of the service offered to the final user.

THIRD.- The Mobile Virtual Operators must have the necessary means, owned or provided by the Concessionaires that operate wholesale shared networks licensees, to comply with these

guidelines. Concessionaires that operate wholesale shared networks must provide such means under conditions of non-discrimination in terms of quality, offering them, where appropriate, the same quality of service and under the same conditions as their own end users so that they, in turn, comply with the present guidelines.

CHAPTER II

DEFINITIONS

FOURTH.- For the purpose of these guidelines, in addition to the definitions laid down in the Federal Telecommunications and Broadcasting Law and other applicable legal and administrative provisions, the following definitions shall apply:

I. **Test Log:** Set of devices and functionalities capable of recording by day, hour and georeferenced position, those events and situations during the Measurement Exercise defined by the Federal Institute of Telecommunications;

II. **Non-Guaranteed Coverage:** An area that reflects the geographical zone in which the mobile service providers offer mobile service, corresponding to certain access technology, without indicating that they comply with the quality indexes established in these guidelines. In case of advertising through any media that area, it must expressly inform the public, in general, the zone(s) or place(s) where they indicate that the quality indexes are not being met;

III. **Guaranteed Coverage:** An area that reflects the geographical zone in which the mobile service providers offer the services subject of these guidelines, corresponding to certain access technology, being obligated to comply with all the quality indexes established in these guidelines, which may advertise to the public;

IV. **Concessionaire:** Individual or entity that provides public telecommunications services and holds a concession to use, leverage and exploit radio frequency spectrum bands for the provision of the mobile service;

V. **Mobile Wholesale Concessionaire:** Holder of a concession of those provided for in the Federal Telecommunications and Broadcasting Law and offering mobile telecommunications wholesale services;

VI. **Performance Counters:** Basic elements for measuring the performance of a telecommunications network, where applicable, at the level of the network controller and dis-aggregated by radio base sector;

VII. **Network Controller:** Network device in charge of controlling the use and integrity of radio frequency logical resources for a set of radio bases, mobility and security processes;

VIII. **Measurement Exercise:** Program determined by the Federal Institute of Telecommunications to carry out measurements, post-processing, and analysis of information in order to verify compliance with the indexes and quality parameters;

IX. **Measurement Equipment:** Automated instrument capable of carrying out field tests for the measurement of the indexes and quality parameters foreseen in these guidelines that must comply with the applicable regulations and have a Testing Log;

X. **Mobile Terminal Equipment:** Equipment that the end user uses to connect beyond the terminal connection point of a public network for accessing and/or receiving one or more telecommunications services;

XI. **ETSI:** *European Telecommunications Standard Institute*;

XII. **Failure:** Inability of an element of the network of providers of the mobile service to perform the function that is required. A failure of the service can come from faults in the elements and/or functionalities of the network causing the absence of the service;

XIII. **FTP:** *File Transfer Protocol*;

XIV. **Busy Hour:** Interval of one hour during which a network entity, within the mobile network, experiences the maximum traffic of voice or data, and that is determined based on traffic statistics;

XV. **ICMP:** *Internet Control Message Protocol*;

XVI. **Quality Index:** Mandatory compliance value with respect to the quality parameters established in these Guidelines;

XVII. **Institute:** Federal Institute of Telecommunications;

XVIII. **IP:** Internet Protocol;

XIX. **Law:** Federal Telecommunications and Broadcasting Law;

XX. **LFPC:** Federal Consumer Protection Law (for its initials in Spanish);

XXI. **Guidelines:** Guidelines that set the indexes and quality parameters to which mobile service providers should submit;

XXII. **Call:** Voice connection established between two Mobile Terminal Equipment of end users, which allows carrying out bidirectional communication;

XXIII. **Differentiated Coverage Map:** Geographic representation of the area that corresponds to the coverage that jointly includes the Not Guaranteed Coverage and the Guaranteed Coverage where it is clearly shown, for each access technology, the difference between the geographical zones where the providers of the mobile service comply with all the Quality Indexes and those where they do not necessarily comply with said indexes;

XXIV. **Guaranteed Coverage Maps:** Geographic representation of the area in which mobile service providers offer the services covered by these Guidelines, corresponding to certain access technology, where they indicate that they comply with all the Quality Indexes established in these Guidelines;

XXV. **Measurement:** Function that includes the registration, collection, storage and processing of information regarding the quality parameters established in these Guidelines;

XXVI. **Short Message:** Block of alphanumeric text with information transferred in an integral way through the short message service;

XXVII. **MOS:** *Mean Opinion Score*;

XXVIII. **Mobile Virtual Operators:** Concessionaire or authorized operator that lends, commercializes or resells mobile services or capacities previously contracted with a Mobile Wholesale Concessionaire;

XXIX. **Data Package:** Information block with a basic structure which is identified by headers that allow its transfer through a telecommunications network;

XXX. **Quality Parameter:** Objective and comparable measure of the quality of the service delivered to end users, which is mainly related to services and their characteristics regardless of access technology;

XXXI. **Mobile Service Providers:** All the Concessionaires and Mobile Virtual Operators that provide the mobile service as well as the Mobile Wholesale Concessionaires;

XXXII. **RSCP:** *Received Signal Code Power*;

XXXIII. **RSRP:** *Reference Signal Received Power*;

XXXIV. **RxLev:** Level of reception of the broadcast control channel (*Receiving level*);

XXXV. **Radio base Sector:** Partition of the capacity of a cellular site, according to the planning of radio frequency resources that generates a geographic coverage area in which the mobile service or wholesale telecommunications services are provided. The resulting area is identified by one or more antennas or radio base station that use the same cell identifier or Sector Identity;

XXXVI. **Mobile Telecommunications Wholesale Service:** Telecommunications service that consists of providing access to individual elements, technical, economic, operational and commercial capabilities of a network or services, including interconnection services, that are used by Mobile Virtual Operators to provide the mobile service;

XXXVII. **Short Message Service (SMS):** A telecommunications service that involves the transport of a Short Message of 160 alphanumeric characters through a public telecommunications network which allows the exchange of messages between two end users;

XXXVIII. **Data Transfer Service:** Telecommunications service that enables the exchange of information within a public telecommunications network through the IP protocol;

XXXIX. **Voice Service:** Telecommunication service that allows bidirectional voice communication through a public telecommunications network, so that at least two end users connected to network access points can communicate in real time;

XL. **Mobile Service:** Telecommunications service given to end users, which is provided through Mobile Terminal Equipment that does not have a specific geographical location;

XLI. **Management System:** System that can perform functions, such as inventory, engineering, administration, billing, planning and/or repair functions of the Concessionaires' networks, Mobile Wholesale Concessionaires or an element of the infrastructure of Mobile Virtual Operators;

XLII. **Data Transmission Rate:** Parameter that describes the number of bits effectively transmitted in an address between specific points of a public telecommunications network per unit of time, also called transfer rate or throughput;

XLIII. **Access Technology:** A type of technology used in mobile service networks to provide access for the end user to the mobile services;

XLIV. **ITU:** International Telecommunication Union; and

XLV. **Advertised Speed of Data Transfer:** Rate of Data Transmission which providers of the mobile service announce to the public, in their service centers, Internet portal, or any other media they provide services subject of the present Guidelines and that comply with the Quality Indexes established in them.

These definitions may be used in singular or plural, in masculine or feminine, in an indistinct way.

CHAPTER III

OF THE QUALITY PARAMETERS OF THE VOICE SERVICE

FIFTH.- The Quality Parameters of the Voice Service are established and will be evaluated according to the following:

I. **Unsuccessful Call Ratio:** Estimation of the degree of lack of accessibility to the service, based on the determination of the percentage of failed Call Attempts between two specific Mobile Terminal Equipment. Call Attempts that exceed a maximum Call setup time of 8 seconds will be considered failed.

$$Unsuccessful\ Call\ Ratio = \frac{N_F}{N_T} \times 100\%$$

Where

NF is the total number of Unsuccessful Call attempts, and;

NT is the total number of Voice Service attempts.

II. **Average Call set-up time:** Average amount of time needed to establish the connection. This time interval is measured from the difference between the time the command Call attempt runs at the origin Mobile Terminal Equipment and the time the Call connects.

$$Average\ Call\ set-up\ time = \frac{\sum\left(A_i - B_i\right)}{N_T - N_F}\left[seconds\right]$$

Where

A_i is the connection time for the successful attempt *i*, that is, when Call *i* is connected, and;

B_i is the time in which the call attempt command is executed in order to establish the Call on the origin Mobile Terminal Equipment for the successful attempt *i*.

III. **Dropped Call Ratio:** Estimation of the degree of retention of the Calls, based on calculating the percentage of Calls that are interrupted by causes other than the intentional termination of the end user.

$$Dropped\ Call\ Ratio = \frac{C}{N_T - N_F} \times 100\%$$

Where

C is the total of Dropped Calls by causes beyond the intentional termination of the end user.

IV. **Speech Quality:** Evaluation of the quality of end-to-end voice transmission in a successful Call, which is established according to the following scale defined by the MOS and established in recommendation ITU-T P.863 "Perceptual objective listening quality assessment" or, in its case, the evolution of it:

Speech Quality

Evaluated Value	Perception of the voice
5	Excellent
4	Good
3	Regular
2	Mediocre
1	Bad

CHAPTER IV

OF THE SMS QUALITY PARAMETERS

SIXTH.- The Quality Parameters of the SMS are established and will be evaluated according to the following:

I. **Failed Short Message Ratio:** Estimation of the degree of lack of accessibility of the service, based on the determination of the percentage of sent attempts of failed Short Messages. Short Messages that exceed a maximum time of delivery of the Short Message of 20 seconds or those that are not complete will be considered as failed.

$$Failed\ Short\ Message\ Ratio = \frac{D}{M_T} \times 100\%$$

Where

D is the number of failed Short Messages, and;

M_T is the total number of sent attempts of Short Messages.

II. **Successful Short Messages Average Delivery Time:** Estimation of the delay in the delivery of a Short Message, based on the determination of the average amount of time for the delivery of a Short Message. Said time interval is measured from the difference between the time in which the Short Message is sent by the origin Mobile Terminal Equipment and the time it is received in the destination Mobile Terminal Equipment. It is considered a successful attempt when the Short Message is delivered to the destination Mobile Terminal Equipment in a time less than or equal to 20 seconds that corresponds to the maximum delivery time of the Short Message.

$$Successful\ Short\ Messages\ Average\ Delivery\ Time = \frac{\sum (E_i - F_i)}{M_T - M_F}[seconds]$$

Where

E_i is the time of receipt of the Short Message in the destination Mobile Terminal Equipment for the successful attempt *i*;

F_i is the sending time of the Short Message in the origin Mobile Terminal Equipment for the successful attempt *i*, and;

M_F is the total number of attempts in which the maximum delivery time of the Short Message is exceeded.

III. **Integrity of the Short Message:** Proportion of Short Messages correctly received in relation with the total of Short Messages received. It will be considered a Short Message correctly received when it contains 160 correct characters and it is received in a time less than or equal to the maximum delivery time established for the Short Message. A character is correct when the sent character is equal to the received one.

$$Integrity\ of\ the\ Short\ Message = \frac{G}{M_T - M_F} \times 100\%$$

Where

G is the total of Short Messages integrally received.

CHAPTER V

OF THE QUALITY PARAMETERS OF THE DATA TRANSFER SERVICE

SEVENTH.- The Quality Parameters of the Data Transfer Service are established and will be evaluated according to the following:

I. **Unsuccessful FTP Session Attempts Ratio**: Estimation of the degree of lack of accessibility of the service, based on the determination of the percentage of unsuccessful session attempts under the FTP protocol. Unsuccessful session attempts are those that failed to open a data session in the Mobile Terminal Equipment to the FTP protocol.

$$Unsuccessful\ FTP\ Session\ Attempts\ Ratio = \frac{O_{Fd}}{N_{Td}} \times 100\%$$

Where

O_{Fd} is the number of unsuccessful FTP session attempts to download, and;

O_{Td} is the total number of FTP session attempts to download.

II. **Average Download Data Transmission Rate** (*throughput*): Average amount of data downloaded per second from the test server to the Mobile Terminal Equipment with respect to the duration of the established FTP session.

$$Average\ download\ Data\ Transfer\ Rate = \frac{\sum_{i=1}^{O_{Td}} \left(\frac{H_i}{n} \right)}{O_{Td} - O_{Fd}} \left[\frac{Mbits}{second} \right]$$

Where

H_i is the amount of data or payload downloaded in Megabits (Mbits) of the FTP session attempt successfully established *i*, and;

n is the duration in seconds of the established FTP session

III. **Average Upload Data Transmission Rate** (*throughput*)**:** Average amount of data loaded per second from the Mobile Terminal Equipment to the test server with respect to the duration of the established FTP session.

$$Average\ upload\ DataTransmition\ Rate = \frac{\sum_{i=1}^{O_{Tc}} \left(\frac{H_i'}{n'} \right)}{O_{Tc} - O_{Fc}} \left[\frac{Mbits}{second} \right]$$

Where

H'_i is the amount of data or payload uploaded in Mbits of the successfully established FTP session attempt *i*;

n' is the duration in seconds of the established FTP session;

O_{Fc} is the number of unsuccessful FTP upload attempts, and;

O_{tc} is the total number of attempts to upload FTP sessions.

IV. **Latency:** Estimation of the average response time of a service between two specific points (origin and destination) of a network evaluated by the difference of the time of sending to the destination point and the time of reception at the origin point of a Data Packet through ICMP.

$$AverageLatency = \frac{\sum_{i=1}^{O_{Td}} \left(I_i - J_i \right)}{O_{Td} - O_{Fd}} [milisecond]$$

Where

I_i is the time when the Data Packet is received in the successfully established FTP download session attempt *i*, and;

J_i is the time when the Data Packet is sent in the successfully established FTP download session attempt *i*.

V. **Packet Loss ratio:** Estimation of the degree of reliability of the Data Transfer Service, based on the determination of the proportion of lost Data Packets with respect to the total of Data Packets sent during the download. It is considered a lost Data Packet when it does not reach its destination in the time determined for the said test in Annex I of these Guidelines.

$$Packet\ Loss\ Ratio = \frac{K}{L} \times 100\%$$

Where

K is the number of lost Data Packets, and;

L is the total number of Data Packets sent.

CHAPTER VI

OF QUALITY INDEXES AND INFORMATION OF VOICE SERVICE QUALITY PARAMETERS

EIGHTH.- For the evaluation of the Quality Parameters defined in Chapter III of these Guidelines, the Mobile Service Providers that provide the Voice Service must comply with the following Quality Indexes:

I. **Average Call set-up Time:** This Quality Parameter will be informative.

II. **Unsuccessful Call Ratio:** The compliance value for the proportion of failed Call attempts must be less than or equal to 3%.

III. **Dropped Call Ratio:** The compliance value for the Dropped Call Ratio must be less than or equal to 2%.

IV. **Speech Quality:** This Quality Parameter will be informative. Speech Quality measurements will be based on the MOS scale. Its evaluation will be carried out through the application of an objective comparison algorithm, which does not imply human appreciation between transmitted and received signal. For this purpose, the Measurement Equipment must use the algorithm defined in recommendation ITU-T P.863 "Perceptual objective listening quality assessment" or, where appropriate, the one that replaces it.

CHAPTER VII

OF THE QUALITY INDEXES AND INFORMATION OF THE PARAMETERS OF THE SHORT MESSAGES SERVICE

NINTH.- For the evaluation of the Quality Parameters defined in Chapter IV of these Guidelines, the Mobile Service Providers that provide the SMS must comply with the following Quality Indexes:

I. **Successful Short Messages Average Delivery Time:** This Quality Parameter will be informative.

II. **Failed Short Messages Ratio:** The compliance value for the proportion of failed Short Messages must be less than or equal to 2%.

III. **Integrity of the Short Message:** This Quality Parameter will be informative.

CHAPTER VIII

OF THE INFORMATION OF THE PARAMETERS OF THE DATA TRANSFER SERVICE

TENTH.- For the evaluation of the Quality Parameters defined in Chapter V of these Guidelines, the following is established:

I. **Unsuccessful FTP Session Attempts Ratio:** This Quality Parameter will be informative. The failed session attempt proportion values will be published for each Access Technology.

II. **Average Download Data Transmission Rate:** This Quality Parameter will be informative. Average Download Data rates will be published for each Access Technology.

III. **Average Upload Data Transmission Rate:** This Quality Parameter will be informative. The values of average Upload Data Transmission Rate will be published for each Access Technology.

IV. **Latency:** This Quality Parameter will be informative. The Latency values will be published for each Access Technology.

V. **Packet Loss Ratio:** This Quality Parameter will be informative. The Packet Loss Ratio values will be published by Access Technology.

CHAPTER IX

OF METHODOLOGY AND MEASUREMENT PROGRAM

ELEVENTH.- To measure the Quality Indexes and Parameters established in these Guidelines, the Institute will conduct the Measurement Exercise in accordance with the applicable provisions and based on the Measurement methodology in the field defined in Annex I, established for that purpose.

In order to promote an improvement in the quality of the Mobile Service and competition, when at least one Mobile Service Provider does not reach the Quality Indexes established in these Guidelines according to the results of the Measurements in a certain location, the Institute could return to said location in the same calendar year in which the first Measurement was made.

TWELFTH.- The Institute may do measurements that reflect the end user's quality of experience by Access Technology and by service. Results and information corresponding to the methodology used shall be informative.

CHAPTER X

OF THE PUBLICATION OF THE RESULTS OF THE MEASUREMENTS

THIRTEENTH.- The publication of the results of the Measurements of Quality Parameters, referred to in Chapter IX, will be made on the Institute's Internet portal within 30 business days after each calendar quarter.

Likewise, the Institute will inform, within the following 10 business days counted from the conclusion of each Measurement, the results of said Measurement to the Mobile Service Providers, who will be able to express what suits their rights within 10 business days, counted from the reception of notification.

The Institute will inform PROFECO about the results of the Mobile Service Quality Measurements, referred to in Chapter IX.

CHAPTER XI

OF THE INFORMATION TO THE END USER

FOURTEENTH.- The Mobile Service Providers must make available to the end user information about the Guaranteed Coverage Maps, as well as the Differentiated Coverage Maps for each Access Technology in a disaggregated manner that contain, at least, the information of the Guaranteed Coverage and the Non-Guaranteed Coverage at the level of federal entity, cellular region and national level, that has enough street-level detail, when the end user hires its services or acquires a Mobile Terminal Equipment. The Guaranteed Coverage must be published in green color and the Non-Guaranteed Coverage in yellow color.

In order for the Mobile Service Providers to inform the public about the Guaranteed Coverage and the Non-Guaranteed Coverage, where applicable, the Mobile Wholesale Concessionaires must deliver the Guaranteed Coverage Maps and Differentiated Coverage Maps to the Mobile Virtual Operators for Access Technologies that correspond to the services contracted by them, on a quarterly basis. Likewise, the Concessionaires that provide the service of visiting users must deliver to the Concessionaires, with whom they have signed a contract in this regard the Guaranteed Coverage Maps and the Differentiated Coverage Maps for the Access Technologies that correspond to the services contracted by them, on a quarterly basis. These maps must comply with the characteristics I, II and III described in Twentieth Guideline.

The Institute will verify that the Mobile Service Providers provide the public with information on the Guaranteed Coverage and the Non-Guaranteed Coverage that is complete and truthful with respect to the telecommunications services they provide and will verify compliance with this obligation, being able, if applicable, to order the suspension of information publicity.

FIFTEENTH.- In this case, the Advertised Speed of Data Transfer shall correspond to the Average Data Rate of Download of the Busy Hour, expressed in Mbps, for each Access Technology correspondent to the calendar month immediately prior to publication and shall not refer to a maximum speed "up to *X* Mbps". For the effect of the Advertised Speed of Data Transfer, the Mobile Service Providers shall refer to "*Y* Mbps in Busy Hour", where *Y* shall be calculated based on the following formula:

$$Y = \frac{\sum_{i=1}^{N_R} Th_i}{N} \left[\frac{Mbits}{second} \right]$$

Where

N_R is the total number of radio base stations in the Mobile Service Provider's network, and;

Th_i is the monthly Average Data Rate of download of the Busy Hour of radio base *i*.

The Mobile Service Providers may only publicize, advertise or offer their services as broadband if they comply with the parameters established by the Institute for such purposes.

SIXTEENTH.- The Mobile Service Providers must inform their end users about the way to consult in their service centers and/or on their Internet portal, the Guaranteed Coverage Maps for each Access Technology, as well as the Differentiated Coverage Maps. Such notice must be made available to the general public on its Internet portal, in a comprehensive, affordable, free and easily identifiable manner in addition to being sent via email or free text message.

SEVENTEENTH.- When the end user requests it, the Mobile Service Providers must send by e-mail or text message and without additional charge to the end user, in a clear manner, the information necessary for the applicant to consult the Guaranteed Coverage Maps and the Differentiated Coverage Maps in its Internet portal and/or in its service centers.

CHAPTER XII

OF THE FINAL USER SUPPORT SYSTEMS

EIGHTEENTH.- The Mobile Service Providers must have systems of support to end users in their service centers, as well as by telephone and/or electronic media (online chat or email) to attend consultations and complaints regarding the Mobile Service and its follow-up for free. The support system must comply with the guidelines issued by the Institute in terms of accessibility and with at least the following characteristics:

I. They should be an efficient media to receive, follow up and address inquiries and complaints of end users and provide the necessary information to follow up indicating the status of the same until its solution, including the maximum time of solution based on the provisions established by the Institute;

II. The systems of support to end users for the reception of queries and complaints must be available 24 hours a day, every day of the year via telephone or electronically;

III. They must be available for access from the Mobile Terminal Equipment, by dialing the codes assigned for this purpose in the Fundamental Numbering Plan, or from the network of any Concessionaire by dialing a non-geographic number with collect call (reverse charge, "01 800").

IV. When end users have accessed the system of support via telephone and choose to speak with an authorized representative, the waiting time to be served should not be longer than 30 seconds in more than 5 percent of total calls and in no case longer than 60 seconds.

V. When the end user files a complaint, the Mobile Service Providers must issue an acknowledgment containing a folio or registration number. The respective acknowledgment must be delivered in printed form or through the sending of a Short Message or email, when the end user submits his complaint in the customer service centers, or electronically when it is made through this medium, by chat, or by telephone. The mentioned information must be stored, at least, during the twelve months after it has been generated, and;

VI. The Mobile Service Providers must enable, at least in their Internet portal, a complaint management system through which the end user can check the status of the same by entering the folio number or registration that was assigned at the time of file the complaint. Likewise, when the complaint has been resolved, the Mobile Service Providers must send to the end user a Short Message or notify via telephone.

NINETEENTH.- The Mobile Service Providers must make available to the general public, in an easily identifiable form, a notice through which they communicate the possibility of consulting their information centers in their service centers and/or on their Internet portal, information about the systems of support to end users referred to in the Eighteenth Guideline of these Guidelines, information that must also be provided when contracting the service and acquiring a Mobile Terminal Equipment.

CHAPTER XIII

OF THE DELIVERY OF INFORMATION

TWENTIETH.- The Mobile Service Providers must deliver the Guaranteed Coverage Maps to the Institute, as well as separately the Differentiated Coverage Maps within ten calendar days after the conclusion of each calendar quarter.

The Guaranteed and Differentiated Coverage Maps must have, at least, the following characteristics:

I. Have a resolution of at least 50 meters;

II. For each Access Technology a map for each cellular region;

III. They must use the format of Arcview (.shp) or Mapinfo (.tab);

IV. For each Access Technology, in a single propagation prediction of the received power level in dBm, define the following coverage ranges according to the following parameters:

	GSM	UMTS	LTE
Range 1 [dBm]	RxLev> -75	RSCP> -85	RSRP> -100
Range 2 [dBm]	-86 <RxLev -75	-96 <RSCP -85	-111 <RSRP -100
Range 3 [dBm]	-111 <RxLev -86	-116 <RSCP -96	-121 <RSRP -111

The coverage maps to be delivered to the Institute should be graphed in colors that clearly distinguish each of the established ranges.

The Institute may process and publish in an available and comparable manner for end users the information related to the coverage maps referred to in this guideline.

TWENTY FIRST.- The Mobile Service Providers that operate their own Management Systems that generate files of Performance Counters shall keep the files of Performance Counters for each calendar quarter, extracted from their Management Systems, without having been manipulated and stored for the following thirty natural days, counted from the last day of the said quarter.

The files must contain the information of the Performance Counters generated during the Busy Hour, in its case, at the Network Controller level, both voice and data traffic. In its case, such files must be available to the Institute through the means that it determines.

Based on the information provided, the Institute will be able to perform an analysis of the performance of the networks related to the Quality of the Mobile Service, which results will be informative and public.

TWENTY SECOND.- The Mobile Service Providers that operate their own Management Systems that generate files of Performance Counters must submit electronically and within the first 5 business days after each calendar quarter a report duly audited by a third party accredited under the applicable regulations. Such quarterly report shall contain the quality information of the Mobile Service, generated from the said files of Performance Counters. The foregoing based on the requirements and format established by the Institute for such purposes.

This quarterly quality report shall contain the monthly disaggregated data.

CHAPTER XIV

OF SERVICE FAILURES REPORTS

TWENTY THIRD.- The Concessionaires, Mobile Wholesale Concessionaires and the Mobile Virtual Operators that operate their own Management Systems that generate Performance Counters files shall report to the Institute those Failures results in part or in the entire network that make it impossible to provide the service offered, in a geographical area for a period of thirty (30) minutes or more, to an estimated number of more than ten thousand (10 000) end users present in the said zone at the beginning of the Failure. The report must be sent to the Institute within the next thirty minutes counted from the moment in which said Failure was initiated. The report will be sent electronically through the format established in Annex II of these Guidelines, which will be available

on the Institute's Internet portal. The Institute will issue the corresponding electronic acknowledgment during the following twenty-four hours, counted from the reception of the report.

The Failures report must be delivered by the Concessionaires, Mobile Wholesale Concessionaires and the Mobile Virtual Operators that operate their own Management Systems that generate Performance Counters files without prejudice to the obligations derived from the LFPC including bonuses, compensations and other privileges of PROFECO.

If the Failure persists at the time of the presentation of the report, the Concessionaire, Mobile Wholesale Concessionaire or the Mobile Virtual Operator shall continue to present a report following the format established in Annex II of these Guidelines, every twenty-four hours starting from of the delivery of the first report and until the Failure has been corrected.

The Failures report should contain the estimate of the initial number of affected end users. Such estimate will be made based on the *Call Detail Record* or CDR as well as the *Event Detail Record o*r EDR taking into account the registered end users thirty minutes before that the Failure occurred in the geographical area of affectation. In the case of Mobile Wholesale Concessionaires, such estimate must take into account the totality of registered end users in their network regardless of whether they have contracted the Mobile Service with the Concessionaires or the Mobile Virtual Operators.

TWENTY FOURTH.- When a Failure with the characteristics mentioned in the Twenty-third Guideline is presented, the Institute will inform about it to the PROFECO within the next two business days counted from the reception of the Failures report, in order to let it act within the scope of its competence, notwithstanding that the mobile end users exercise their rights.

CHAPTER XV

OF THE VERIFICATION

TWENTY-FIFTH.- The verification of the compliance with the provisions of these Guidelines will be carried out in accordance with the provisions of Chapter Fourteenth of the Law.

CHAPTER XVI

OF THE SANCTIONS

TWENTY-SIXTH.- The infractions of the provisions of these Guidelines will be sanctioned in accordance with the provisions of Chapter Fifteen of the Law. To determine the non-compliance with the sanctionable Quality Indexes in accordance with the provisions of the Eighth and Ninth guidelines of these Guidelines, a hypothesis test will be carried out, considering the annual weighted average for each Quality Parameter, obtained from the Measurements referred to in the Eleventh Guideline, and a critical value for each Quality Index; the above in accordance with the provisions of Annex I.

TWENTY SEVENTH.- The acts or omissions of the Mobile Service Providers that have the purpose of affecting, limiting, hindering, manipulating and/or preventing the normal development of the events or Measurement Exercises or cause altered or erroneous data to be recorded, or information that does not correspond to the actual and/or usual Quality Parameters is collected, stored and/or processed in the Measurements made by the Institute will be sanctioned, in accordance with the applicable provisions. The acts or omissions of the Providers of the Mobile Service whose purpose is to manipulate or falsify the files of Performance Counters or to affect, limit, hinder and/or impede the analysis of the performance of the networks foreseen in the same Twenty-First Guideline, will be punished in the same terms.

TRANSITORIES

FIRST.- These Guidelines will take effect sixty calendar days after their publication in the Official Gazette of the Federation.

SECOND.- As of the entry into force of these Guidelines, the Fundamental Technical Quality Plan for the Mobile Local Service published in the Official Gazette of the Federation on August 30, 2011, as well as the Measurement Methodology of the Fundamental Technician of Quality of the Local Mobile Service Plan published in the Official Gazette of the Federation on June 27, 2012 and all the provisions that oppose these Guidelines are abrogated.

THIRD.- The maximum Call set-up time used for the calculation of the Quality Index corresponding to the unsuccessful Call Ratio referred to in the Eighth Guideline, section II, in relation to the Fifth Guideline, section I, shall be less than or equal to 14 seconds for 2018 with decrements of 2 seconds for each calendar year until reaching 8 seconds, as shown in the following table:

Year	Average Call set-up time (seconds)
2018	14
2019	12
2020	10
2021	8

FOURTH.- As of the entry into force of these Guidelines, the Measurements referred to in the Eleventh Guideline will be made using the Mobile Service Quality Measurement methodology established in Annex I of these Guidelines.

With respect to said Measurements, the Wholesale Shared Network will be evaluated independently until it reaches a population coverage greater than or equal to fifty percent of the aggregate population at the national level according to its deployment schedule.

FIFTH.- Chapter XVI, regarding the fulfillment of the Quality Indexes, will enter into force on the 1st of January 2019. Meanwhile, the results of the Quality Measurements will be informative.

SIXTH.- As long as the broadband parameters are not issued by the Institute, the Mobile Service Providers will not be subject to the provisions of the last paragraph of the Fifteenth Guideline.

SEVENTH.- The Mobile Service Providers will publish the notice and send the email or the free text message referred to in the Sixteenth Guideline, within ten calendar days following the entry into force of these Guidelines.

EIGHT.- The Mobile Service Providers shall deliver to the Institute for the first time the Guaranteed Coverage Maps and the Differentiated Coverage Maps referred to in the Twentieth Guideline, within ten calendar days following the entry into force of these Guidelines.

Subsequently, the Guaranteed Coverage Maps and the Differentiated Coverage Maps must be delivered within the first 10 calendar days after the conclusion of each calendar quarter.

NINTH.- The Institute shall publish in the Official Gazette of the Federation the set of Performance Counters that shall be included in the files referred to in the Twenty-First and Twenty-Second guidelines within three hundred and sixty-five calendar days following entry into force of these Guidelines.

The Mobile Service Providers that operate their own Management Systems that generate files of Performance Counters shall store the Performance Counters from the calendar month immediately following said publication. Likewise, they must deliver the duly audited quarterly report referred to in the Twenty Second Guideline within five business days following the end of the calendar quarter immediately after the publication of merit.

ANNEX I

QUALITY MEASUREMENTS OF THE MOBILE SERVICE METHODOLOGY

The purpose of this Measurement Methodology is to establish a clear, precise and objective measurement procedure to evaluate the Quality Parameters to which the Mobile Service Providers must adhere.

1. Definitions: For the present methodology, in addition to the definitions provided for in the Law, the following definitions shall apply:

I. **3GPP:** Third Generation Partnership Project;

II. **Event:** Each of the scheduled measurement attempts;

III. **IMSI:** International Mobile Subscriber Identity;

IV. **OSI model:** Model for the standardization of systems and the Open Systems Interconnection, divided in seven functional layers;

V. **Ping:** Tool that uses an echo to detect the presence of another device or network and any delay in the communication that could occur in the connection. This tool allows to evaluate the status, speed and quality of a network;

VI. **Test:** Set of events that evaluate a Quality Parameter in the Measurement Exercise;

VII. **SIM:** Subscriber Identity Module;

VIII. **Guard Time:** Time interval required to synchronize consecutive Events that avoid overlaps with other Tests;

IX. **Primary Route**: The one that due to its width, length, signaling and equipment, allows a large volume of vehicular traffic, and

X. **Secondary Route:** That one that allows the vehicular circulation to the interior of the colonies, neighborhoods and towns.

These definitions may be used in singular or plural, in masculine or feminine, in an indistinct manner.

2. Measurements. The Institute will carry out the Measurement Exercises in order to evaluate the Quality Parameters for each of the services offered by the Mobile Service Providers established in these Guidelines. The evaluation of Voice Services and Short Message Quality Parameters will be carried out within the area resulting from the union of the Guaranteed Coverage Maps of the 2G and 3G Access Technologies service that corresponds, including but not limited to the following: GSM / GPRS / EDGE / EGPRS / UMTS / WCDMA / HSDPA / HSUPA / HSPA+. In the case of the Data Transfer Service, the evaluation of the Quality Parameters will be performed for each Access Technology within the geographic area reported in the Guaranteed Coverage Maps of the service for 3G, LTE and higher Access Technologies.

The foregoing, notwithstanding that the Institute may carry out Events in areas of Non-Guaranteed Coverage or in areas outside the union of the Guaranteed Coverage Maps referred to in the preceding paragraph in terms of the present methodology.

3. General dispositions. Before the Measurement Exercise, the following actions will be carried out:

I. The Institute will carry out the Measurement Exercises within the intersection of the Guaranteed Coverage Maps of all the Concessionaires, Mobile Wholesale Concessionaires and, where applicable, Mobile Virtual Operators.

II. The intersection of Guaranteed Coverage Maps will be obtained considering the Concessionaires, Mobile Wholesale Concessionaires and, where applicable, Mobile Virtual Operators that have a population coverage greater than fifty (50) percent as of the following process:

   a. For the Evaluation of Voice Services and Short Messages, the union of Guaranteed Coverage Maps for each Access Technology will be made, resulting in a single area for each Concessionaire, Mobile Wholesale Concessionaire and, where applicable, Mobile Virtual Operator that covers all Access Technologies. After this, the intersection of the areas obtained by integrating into a single Guaranteed Coverage Map all Access Technologies of all the Concessionaires, Mobile Wholesale Concessionaires and, where applicable, Mobile Virtual Operators.

   b. Regarding the Evaluation of the Data Transfer Service, the intersection will be performed for each Access Technology of the Guaranteed Coverage Maps of all the Concessionaires, Mobile Wholesale Concessionaires and, where applicable,

Mobile Virtual Operators resulting in a single Map of Guaranteed Coverage for each Access Technology.

The Institute will determine the geographic locations where the Measurement Exercises will be carried out based on a sampling by strata in accordance with number 9 of this Methodology and considering a representative sample size.

III. Based on the map resulting from the intersection of the Guaranteed Coverage Maps delivered by the Mobile Service Providers, the Institute will obtain the percentage of population for each federal entity with respect to the total national population.

IV. The information corresponding to the population will be taken from the most recent national population and housing census published by the National Institute of Statistics and Geography (hereafter, "INEGI" for its initials in Spanish).

V. The federal entities will be classified into four strata according to their percentage of population. Each stratum is defined by a range of percentage of population (with respect to the total population of the country), in such a way that all the federal entities are associated to a stratum. The classification by stratum of the federal entities will be published on the Institute's Internet portal within the first twenty calendar days of January of each year. The four strata correspond to the following population percentages:

Stratum 1: Percentage of population of the federal entity greater than 0% and less than or equal to 2%.

Stratum 2: Percentage of population of the federal entity greater than 2% and less than or equal to 4%.

Stratum 3: Percentage of population of the federal entity greater than 4% and less or equal to 6%.

Stratum 4: Percentage of population of the state greater than 6%

VI. A weighting factor will be calculated by stratum, which will be determined based on the population of the federal entity and the total population.

VII. The Institute will carry out at least eight Measurements per year, from which at least one Measurement per defined stratum must be done.

VIII. In each Measurement, a representative sample size will be determined.

IX. Measurements will not be carried out in locations where, 30 calendar days before the Measurement, any harmful interference or service Failure that could affect the results has been reported and has not been resolved.

The fractions referred to in this section will not be applicable to the Events in areas of Non-Guaranteed Coverage or in areas outside the union of Guaranteed Coverage Maps referred to in numeral 2 of this methodology.

4. Evaluation of the Quality Parameters Events. The evaluation of the Quality Parameters Events of the Mobile Service will be carried out in accordance with the provisions of the Guidelines, segmented for the Voice, Short Message and Data Transfer Services, under the following general criteria:

I. The Institute will carry out tests on the Measurement Equipment to verify that it is in optimal operating conditions, prior to the start of each Measurement.

II. All Events of this Annex will be carried out exclusively outdoors and at least 1.5 meters above the surface level.

III. The Events of each of the services to be evaluated will be executed in a random manner, without prior notice, in the corresponding Access Technologies, and simultaneously to the Concessionaires, Mobile Wholesale Concessionaires and, where applicable, Mobile Virtual Operators in equivalent conditions, when it is technically feasible. For each Mobile Wholesale Concessionaire, in each Measurement Exercise, Events will be included for each service using one or more SIMs that correspond to all the Concessionaires; Mobile

Wholesale Concessionaires and, where applicable, two Mobile Virtual Operators for each Mobile Wholesale Concessionaire to which they have previously contracted the service, which will be chosen randomly by means of a random number computational generator. Failure to comply with the Quality Indexes by the Mobile Virtual Operators will be considered a breach by the Mobile Wholesale Concessionaire and will be sanctioned in accordance with the provisions of the present Guidelines, unless it is reliably established that the breach is attributable to infrastructure elements whose responsibility is the Virtual Mobile Operator, in which case the responsibility will lean on this one.

IV. The Events will be carried out trying, as far as possible, to cover the greatest extent of the areas referred to in numeral 2, avoiding repeating routes in each Measurement; in case of partial repetition of routes, it will be sought that the Events are carried out at different times within the schedule foreseen in fraction X of this numeral. In the selection of routes, Primary and Secondary Routes will be used.

V. For Voice Service and Short Message Testing, the Measurement will evaluate the individual quality of each network, leaving the transit scenarios or terminations in a different network.

VI. For the Quality Parameters of the Voice Services and Short Messages, the Events will be carried out in movement, at speeds of up to 80 km/h, considering that the destination Mobile Terminal Equipment will be located at a fixed point and the origin Mobile Terminal Equipment will be in motion. The location of the fixed point may be moved for each day of the Measurement, at least 1 kilometer within the area defined in accordance with numeral 3, fraction II.

VII. For the Quality Parameters of the Data Transfer Service, the Mobile Terminal Equipment will remain, as far as possible, moving at speeds of up to 80 km/h. The Measurement Equipment must have the functionality to discard those Events that are outside the established speed range.

VIII. When the Institute deems it appropriate, specific Events may be carried out by Concessionaire, Mobile Wholesale Concessionaire and/or Mobile Virtual Operator in the localities that are defined for such purposes.

IX. Voice Services, Short Messages and Data Transfer Events will be carried out preferably using Mobile Terminal Equipment that are similar to those commercialized by the Concessionaires and, as the case may be, the Mobile Virtual Operators. For all Events, the access of Mobile Terminal Equipment to the service of foreign networks (international *roaming*) will be blocked.

X. The Events will take place from 9:00 a.m. to 9:00 p.m. (applicable time to the geographical area where the Event takes place), contemplating the seven days of the week.

XI. Through the Measurement Equipment Test Log, the start and end times must be recorded for each day as well as all the pauses resulting during the Measurement (for example, food intake, atypical concentrations of end users, etcetera). These hours must correspond to the timestamp contained in the log files generated by the Measurement Equipment for each of the days of the Measurement. Any Event that was generated during periods of pause recorded in the Test Log should be discarded.

XII. The Events for Voice Services and Short Messages should be evaluated simultaneously.

XIII. The Institute will evaluate simultaneously all the Concessionaires, Mobile Wholesale Concessionaires and, where appropriate, the Mobile Virtual Operators having the possibility to intersperse the Events when it deems appropriate.

XIV. During the Measurement, Events must be executed to verify the profile assigned to the SIM and its respective IMSI with respect to the quality of service at the layer, 3 level, of the OSI model. The profile changes will be expressly reported in the Test Log and the SIM must be changed to continue with the Measurement.

XV. The Measurement Equipment will allow the synchronization of the start of each Test for the evaluation of the parameters of each Concessionaire, Mobile Wholesale Concessionaire and, where applicable, Mobile Virtual Operator.

XVI. In case the personnel in charge of carrying out the Measurements detect Failures attributable to the Measurement Equipment, they will be recorded through the Test Log, so that the corresponding Events are discarded in the post-processing stage.

XVII. The personnel in charge of the Measurements, will register through the Test Log any extraordinary situation that occurs before the start or at the end of the Measurement and during the same, so that it is compared with the result of the post-processing stage.

XVIII. The post-processing of the information must be an automatic process, which manages the files of the records of the Measurement Equipment, considering for the evaluation and the emission of results what is registered through the Testing Log. During post-processing and emission of results, human intervention must be limited to the minimum necessary.

XIX. The post-processing tool must have a configuration that, based on the codes generated for each Event by the Measurement Equipment, allow the automatic exclusion of those Events that are affected by fortuitous events or force majeure outside the network of the Providers of the Mobile Service

XX. The staff of the Institute in charge of the Events must store the generated codes with the algorithm of cryptographic reduction MD5 (*Message-Digest Algorithm 5*) or its equivalent, associated with each log file generated during the day. These codes must be available during the post-processing stage.

XXI. The integrity of the registry files must be verified by means of the codes, generated with the cryptographic reduction algorithm MD5 or its equivalent, which must contain the files, as well as the codes referred to in section XX of this section, as well as the start and end timestamp of the Measurement coming from the Measurement Equipment, which must correspond to the start and end time established for each day within the Measurement and registered in the Test Log.

XXII. During the post-processing stage, it must be verified automatically that the profile assigned to the SIM and its respective IMSI, stored in the log files during each day of the Measurement, always coincides with the profile extracted from the test to the referred to in section XIV of this numeral. The information of said profile must be reported by Access Technology for each Concessionaire, Mobile Wholesale Concessionaire and, where applicable, Mobile Virtual Operator. In the event of detecting any alteration resulting from said verification, said Event shall be discarded and the provisions of the following section shall apply. This test must be performed with each of the SIM cards used in each Measurement.

XXIII. In case of detecting any change or modification of the profile assigned to the SIM, the Institute will require the Concessionaire, Mobile Wholesale Concessionaire and, where applicable, Mobile Virtual Operator, the information that allows it to verify the causes of said modification. The information must include, at least, the SIM profiles managed by the network in terms of quality, subscription status, indicate whether the SIM corresponds to the prepaid or postpaid type service, purchased services, additional services, quality level negotiated with the network (*negotiated QoS*), *precedence/priority class*, maximum data transfer rate for loading and unloading and restrictions on services. The Concessionaires, Mobile Wholesale Concessionaires and, if applicable, Mobile Virtual Operators, must deliver the information within 48 hours after the requirement by the Institute.

XXIV. For all Voice and Short Message Service Events, ten-digit dialing should be used.

5. Measurement Equipment. The characteristics of the Measurement Equipment are established in accordance with the following:

I. The Measurement Equipment will have the capacity to carry out the Events simultaneously to all the Concessionaires, Mobile Wholesale Concessionaires and, where applicable, Mobile Virtual Operators in equivalent conditions, in the different Access Technologies with

which they provide Voice Services. Short Messages and Data Transfer within the Mexican Republic.

II. The Measurement Equipment should be able to simultaneously evaluate the Voice and Short Message Services.

III. The Measurement Equipment will have the possibility of being installed in vehicles and/or fixed structures to carry out the Events in movement, in fixed points or combining both modalities.

IV. The Measurement Equipment will automatically store the information obtained from the Events and will be supported by external devices of greater capacity.

V. The Measurement Equipment will have a Global Positioning System (GPS) that allows to know and record the location and speed of the vehicle for each of the Events.

VI. The Measurement Equipment must be kept in optimal operating conditions by means of maintenance programs and comply with the applicable regulations.

VII. Once the corresponding Measurement has started, the technical characteristics of the *software* and *hardware* of the Measurement Equipment will remain unchanged until the conclusion of the same.

VIII. The Measurement Equipment must have isolation boxes for each Mobile Terminal Equipment in order to mitigate the interference between the Mobile Terminal Equipment (both for the Data Transfer and the Voice Services), in order to compensate and, if necessary, eliminate attenuation losses inside the vehicle, measured in the same conditions as outdoors.

IX. The Measurement Equipment must have the capacity to make measurements of the Access Technologies offered by the Mobile Service Providers using Mobile Terminal Equipment. Likewise, the Measurement Equipment must meet the needs of technological evolution.

X. The Measurement Equipment must allow the flexible creation of the Events, in the same way, it must allow the use of templates for their reuse.

XI. The Measurement Equipment must have the Mobile Terminal Equipment that will be used to carry out the Measurements and must be the same or similar to those marketed by the Concessionaires or, where applicable, Mobile Virtual Operators, and have the corresponding approved certificate;

XII. The Measurement Equipment must comply, as applicable, with the latest versions of the technical specifications and the corresponding international recommendations (for example, ETSI and 3GPP);

XIII. The Measurement Equipment shall support all voice codecs for all Access Technologies, and

XIV. In case of Failure of the Measurement Equipment or the Mobile Terminal Equipment used in the Measurement, it must reproduce a visual and/or audible alarm. Likewise, the tests carried out within the period of Failure of the Measurement Equipment will be discarded.

6. Measurement of the Voice Service. The evaluation characteristics of the Voice Service are established in accordance to the following:

I. The Events of the Quality Parameters of the Voice Service will be made simultaneously to all the Concessionaires, Mobile Wholesale Concessionaires and, where applicable, Mobile Virtual Operators in equivalent conditions for each Access Technology of those established in numeral 2 of this Annex. When the Institute deems it appropriate, specific Events may be carried out by Concessionaires, Mobile Wholesale Concessionaires or Mobile Virtual Operators in the localities, Access Technologies and Services defined for such purposes.

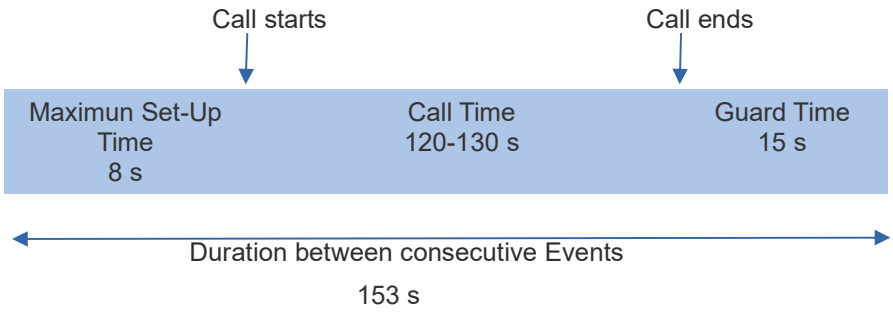
II. The maximum Call Set-up Time will be 8 seconds measured from the time the Call attempt command is executed on the originating Mobile Terminal Equipment until the connection is established.

III. The duration of the Call will be at least 120 and at most 130 seconds measured after the connection is established.

IV. The duration of the consecutive Events will be a maximum of 153 seconds, which implies that the Guard Time must be at least 15 seconds.

V. For this purpose, the Measurement Equipment will use the algorithm defined in recommendation ITU-T P.863 "Perceptual objective listening quality assessment", or in its case, its evolution. The results of the corresponding Events will be reported using figures up to one decimal place. For such purposes, the result of each Event must be rounded to the higher integer in such a way that there is a correspondence with the scale of the *Perception of the Voice* column defined in the fifth guideline, fraction IV.

VI. The following diagram shows the timing sequence for the Evaluation of Voice Service Parameters, where "s" refers to seconds:



7. Evaluation of the Short Message Service. The evaluation characteristics of the Short Message Service are established in accordance with the following:

I. The Events for the Evaluation of the Short Message Service will be carried out simultaneously and in equivalent conditions to all the Concessionaires, Mobile Wholesale Concessionaires and, where applicable, Mobile Virtual Operators, for each Access Technology of the established in the numeral 2 of this Annex. When the Institute deems it appropriate, specific Events may be carried out by Concessionaire, Mobile Wholesale Concessionaire or Mobile Virtual Operator in the localities, Access Technologies and Services that are defined for this purpose.

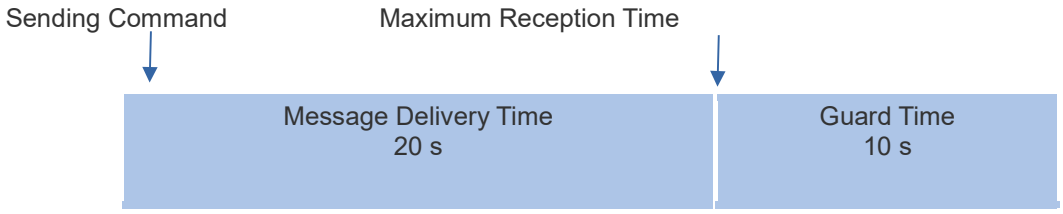
II. That Short Message is considered unsuccessful if, after 20 seconds from the execution of the sending command in the origin Mobile Terminal Equipment, is not received in the destination Mobile Terminal Equipment or it is not complete.

III. The number of characters of the Short Messages will be 160 including the identifier of each. These characters will be encoded based on the ANSI INCITS 4-1986 (R2007) standard, for 7-bit ASCII.

IV. The Events that evaluate the Integrity of the Short Messages will be made by counting 160 correct graphic characters, only of the Short Messages with a delivery time less than or equal to 20 seconds.

V. The duration of the consecutive Events will be a maximum of 30 seconds, which implies that the Guard Time will be 10 seconds.

VI. The following diagram shows the timing sequence for the Evaluation of the Parameters of the Short Message Service, where "s" refers to seconds:



8. Evaluation of the Data Transfer Service. The evaluation characteristics of the Data Transfer Service are established in accordance with the following:

I. The Events of the Quality Parameters of the Data Transfer Service will be carried out simultaneously to all the Concessionaires, Mobile Wholesale Concessionaires and, where applicable, Mobile Virtual Operators in equivalent conditions for each Access Technology of those established in the numeral 2 of this Annex. When the Institute deems it appropriate, specific Events may be carried out by Concessionaire, Mobile Wholesale Concessionaire or Mobile Virtual Operator in the localities, Access Technologies and Services that are defined for such purposes.

II. In the case of the evaluation of the Average Download Data Transmission Rate, the file to be transferred per FTP session will not be compressible and will have a size of 2 Gigabytes, hosted on a test server managed by the Institute with wide ability to support the traffic of large volumes of information. In the same way, said server will generate log files (*logs*) associated with the performance of said server.

III. In the case of the evaluation of the Average Upload Data Transmission Rate, the file will be transferred to a test server with large capacity to support the traffic of large volumes of information, managed by the Institute; per session of FTP can not be compressible and will have a size of 500 Megabytes which must be stored in Mobile Terminal Equipment before each Measurement.

IV. The maximum time for establishing the IP service will be 15 seconds counted from the start of the corresponding Event. If this time is exceeded, it will be considered a failed session.

V. The maximum time for the successful start of an FTP session will be 10 seconds after the IP service has been established.

VI. For the Evaluation of the Average Download Data Transmission Rate and the Average Upload Data Transmission Rate, two independent FTP sessions will be established.

VII. The time to evaluate the Average Download Data Transmission Rate will be 10 seconds, measured from the successful start of each corresponding FTP session. In case the FTP session is interrupted, the amount of data that has been downloaded in said session will be taken into account. The amount of data downloaded, measured in Megabytes, will be averaged over the 30 seconds that the Test lasts to determine the Average Download Data Transmission Rate. The Packet Loss Ratio will be evaluated during the time that each session lasted.

The time to evaluate the Average Upload Data Transmission Rate will be 10 seconds, measured from the successful start of each corresponding FTP session. In case the FTP session is interrupted, the amount of data that has been uploaded in said session will be considered. The amount of data uploaded, measured in Megabytes, will be averaged over the 15 seconds that the Test lasts to determine the Average Upload Data Transmission Rate.

VIII. The guard time between the Evaluation of the Average Download Data Transmission Rate and the Evaluation of the Average Upload Data Transmission Rate will be 10 seconds.

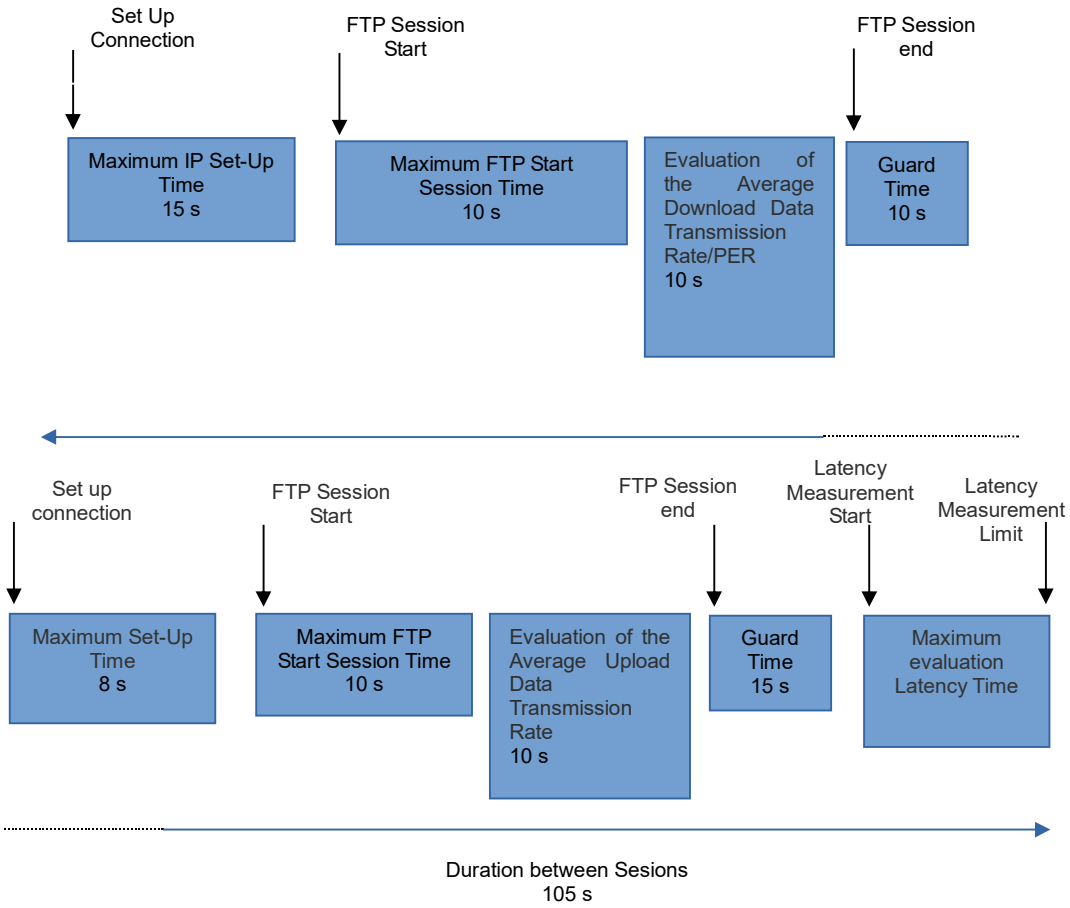
IX. The guard time between the Evaluation of the Average Upload Data Transmission Rate and the Evaluation of the Latency will be 15 seconds. During this time, the automatic verification of the profile referred to in numeral 4, section XIV will be carried out.

X. The maximum time for the Latency Measurement will be 10 seconds. The Evaluation of the Latency will be made through the ICMP protocol, through a Ping to a test server defined by the Institute and that guarantees the equity in the measurements.

XI. The Events for the Data Transfer Service will be made by forcing the Mobile Terminal Equipment to each Access Technology evaluated.

XII. The total duration of the Data Transfer Event will be 105 seconds.

XIII. The following diagram shows the timing sequence for the Evaluation of the Parameters of the Data Transfer Service, where "s" refers to seconds:



9. Determination of the sample size. To determine the size of the sample, a two-stage sampling is considered. The first stage considers a stratified random sampling composed of four strata corresponding to the percentage of population established in numeral 3, fraction V. The second stage considers a simple random sampling to obtain the number of Events to be carried out in each stratum with a level of confidence and a certain estimation error.

First stage of sampling. Considering the four strata, the stratification allows the distribution of the federal entities in different groups, in such a way that groups are obtained internally homogeneous but different among them. The above given that each stratum shares characteristics that affect the values of the Quality Parameters that can be reached such as: density of radio base stations, Access Technology, traffic demand, among others.

The federal entities for each stratum will be chosen in a random manner following the procedure established in numeral 10.

The number of federal entities *n* where the Measurement Exercise will be carried out in each calendar year will be calculated from the following formula:

$$n = \frac{\left(\sum_{i=1}^{L} N_i \sigma_i\right)^2}{N^2 D + \sum_{i=1}^{L} N_i \sigma_i^2}$$

Where:

L = total number of strata into which the federal entities have been divided (*L* = *4*);

σ =expected standard deviation for the corresponding Quality Parameter of stratum *i*.[8]

Ni =number of federal entities for each stratum *i*;

N = total number of federal entities, and

D = *B2/4*, where *B* is the elevation of the estimation error (less than or equal to the percentage of the population average for each stratum established).

The number of federal entities *or* for each stratum will be calculated based on the Neyman assignment, expressed by the following formula:

$$n_1 = n\left(\frac{N_i \sigma_i}{\sum_{i=1}^{L} N_i \sigma_i}\right) i = 1,2,3,4$$

Where:

ni = total number of federal entities of stratum *i*, and

n = total number of federal entities to be considered in the Measurement Exercise in each calendar year.

Second stage of sampling. During the second stage of sampling, to calculate the number of Events to be performed in each of the federal entities selected by the stratified random sampling, the sample size is calculated from a simple random sampling starting from the following expression:

$$P_r(|p - P| \leq d) \geq 1 - \alpha$$

Where:

Pr = probability that the specified condition is met;

P = value of the percentage or actual proportion of interest;

p = value of the percentage or proportion that is estimated;

d = maximum acceptable difference (estimation error) between the real value *P* and its estimate *p,* and

1- α = confidence level required.

$$n \geq \frac{k^2 * P * (1 - P)}{d^2}$$

Where:

n = sample size;

k = confidence limit (limit of the rejection region of the null hypothesis);

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8 For the purposes of the present methodology and, in case of not having previous values of the standard deviation (result of Measurement Exercises), it will be considered as less than or equal to a percentage of the population average for each stratum i. In case of having values of the standard deviation (result of Measurement Exercises), these values will be taken.

P = value of the percentage or real proportion of interest (Quality Parameters established in these Guidelines), and

d = maximum acceptable difference (estimation error) between the real value *P* and its estimated *p*.

For the calculation of the above, a confidence level of 95% is considered as well as an estimation error equal to or less than 1%. The sample size will be selected according to said estimation error, considering that Events could be discarded during the Measurement Exercise.

Finally, to determine compliance or non-compliance of each Quality Index, a hypothesis test will be carried out for each stratum based on the results of the Measurement Exercise of each calendar year. From each of these tests it will be determined if there is enough evidence in the selected sample to infer that the established Quality Indexes are being met.

For the purpose of carrying out each hypothesis test, the proportion for each Quality Parameter in each calendar year is determined, which is calculated from an average of the estimates obtained for each state and stratum.

Also, when considering 4 different strata, each one must have associated a weight or value that weights them in relation to the percentage of population of each of them. The weighting coefficient for the i-th stratum is obtained as follows:

$$W_i = {N_i}/{N}$$

Where:

Ni = stratum population *i*, and

N = the total federal entities. population

Once the weighting coefficient of each stratum is obtained, the annual proportion for each Quality Parameter *pst* is calculated, making a weighted average of the proportions obtained in each stratum for the corresponding Quality Parameter, as indicated by the following formula:

$$Pst = \sum_{i=1}^{L} w_i P_i$$

Where:

pi = estimator of the proportion of the Quality Parameter corresponding to the *i*-th stratum obtained in the Measurement Exercise.

Pst = estimator of the annual proportion of the corresponding Quality Parameter in the Measurement Exercise.

The hypothesis test will be carried out based on the estimated proportion for each Quality Parameter *Pst*, a null hypothesis and an alternative hypothesis.

The null hypothesis (*H0*) considers that the Concessionaire and, if applicable, the Mobile Virtual Operator follows the established Quality Indexes (*p*), while the alternative hypothesis (*Hα*) takes into account that the Concessionaire and, if applicable Mobile Virtual Operator is in breach with the established Quality Indexes (*p*). Also, the test will be carried out with a level of significance ***α = 1%***.

In this way, the hypotheses raised can be expressed as:

$$H_0 : Pst \leq p$$

$$H_\alpha : Pst > p$$

Based on the sample data obtained in the Measurement Exercise, the hypothesis test determines whether the null hypothesis (*H0*) must be accepted or rejected. To make the decision, compare the test statistic (*X*), calculated with the following formula, with the *critical value Z1-α:*

$$X = \frac{Pst - p}{\sqrt{\frac{p(1-p)}{n}}}$$

Where:

p =Quality Index;

Z1-α = value of *z* equal to **2.33** which corresponds to a standard normal distribution with a level of significance of 1%, and

n = total of the number of samples obtained from the Measurement Exercises of the calendar year for each Quality Parameter considering all the strata.

If the test statistic (*X*) is less than or equal to *the critical value Z1*-α then there is no statistically enough information to reject the null hypothesis (*H0*) at a level of significance α; whereas if the test statistic (*X*) is greater than *the critical value Z1*-α then there is statistically enough information to reject the null hypothesis (*H0*) and the alternative hypothesis is accepted.

10. Determination of the random selection. The federal entities where the measurements will be carried out should be selected according to the following procedure:

I. To determine the federal entities where the Measurement Exercise is carried out, a computational random number generator will be used. The random numbers generated must be distributed evenly within the range of keys associated with each federal entity established by the INEGI;

II. The federal entities for each stratum are selected as long as the number generated for said federal entity corresponds to the key assigned by the INEGI and is totally or partially within the Guaranteed Coverage Map;

III. The number of federal entities chosen for each stratum must correspond to the number obtained in the first sampling stage.

ANNEX II

SERVICE FAILURES REPORT

The personal data collected will be protected and treated in terms of the General Law for the Protection of Personal Data in Possession of Obligated Subjects, articles 68, 116 and 120 of the General Law of Transparency and Access to Public Information, as well as 16, 113, fraction I, and 117 of the Federal Law of Transparency and Access to Public Information and other applicable provisions on the protection of personal data.

GENERAL DATA:

This instruction establishes and describes the elements that make up the format determined by the Institute for the delivery of the information indicated in the information sheets contained in said format.

- **Provision applicable to the Information and Metrics Format:**

  In order to carry out the registry of incidents of Network Failures, the Concessionaires, Mobile Wholesale Concessionaires or Mobile Virtual Operators that operate their own Management Systems and that generate Performance Counters Files shall deliver the following information in accordance with the definitions, criteria and indications established in the "**Guidelines that set the Indexes and Quality Parameters to which the Mobile Service Providers should be subject**".

- **Rules to fill the format of the information sheets of this guide:**

  The format will be sent through the electronic system that the Institute establishes for such purposes.

The information will be delivered through a CSV file for each information sheet included in the present application. CSV files are a type of open and simple document to present data in the form of a table, with the following characteristics:

- The columns are separated by the comma (,) character.
- The rows are separated by line breaks (Character CRLF).
- The last row of the file may or may not end with the end of line character.
- Fields that contain a comma, a line break, a double quote, a space, or end-of-line characters (CR, LF, or both at the same time) must be enclosed in double quotes.
- The CSV file can contain as many lines as are necessary for the delivery of the corresponding information. It must not contain empty lines.
- Each row must always contain the same number of fields.
- The first row of the file will contain the fields corresponding to the names of the columns.
- The Institute will make available to the obligated and interested subjects the templates of the CSV files that must be filled out.

The CVS file will be guided by the provisions of *http://tools.ietf.org/html/rfc4180*

- **Contact address**:

  In case of doubts about any of the elements contained in this format please contact the following email:

  fallas.calidad.movil@ift.org.mx

- **General Parameters:**
  - *Deadline to formulate a prevention by the IFT:*

    Within 5 working days from the presentation of the information
  - *Deadline to address the requirement of prevention by the obligated party:*

    10 business days from the request for clarification
  - *Affirmative or Negative resolution regarding prevention:*

    As a rule: Negative resolution
  - *Character of the information:*

    Public at the disaggregated level

DESCRIPTION OF THE INDICATORS:

Name of the Indicator	Description of the Indicator	Measurement Unit
Elaboration Date	Indicate the date on which the Network Failures report was prepared (dd / mm / yyyy)	Does not apply
Name of Concessionaire	Indicate the full name of the Concessionaire, Mobile Wholesale Concessionaire or Mobile Virtual Operator that operates its own Management Systems that generate Performance Counters Records.	Does not apply
Name of the person that elaborates the report	Indicate the full name (name, paternal surname and maternal surname) of the person who prepared the Network Failures report.	Does not apply

Position of the person that elaborate the report	Indicate the position of the person who prepared the Network Failures report.	Does not apply
Technologies of access affected	Indicate the Access Technologies affected by the Failure.	Does not apply
Description of the Failure	Explain precisely what the Failure consisted of and, if possible, what were the causes that originated it.	Does not apply
Geographical area of the Failure	Indicate the geographical location that was affected by the Failure. Specify it starting with the largest geographic level: first the State, followed by the municipality, locality and if possible the colony (s).	Does not apply
Initial number of end users affected	Indicate the estimated number of affected end users at the start of the Failure. The Concessionaires, Mobile Wholesale Concessionaires or Mobile Virtual Operators that operate their own Management Systems and generate Performance Counters Records can perform the calculation they consider appropriate, provided it is well-founded.	Does not apply
Estimated number of end users affected	Indicate the estimated number of end users affected during the whole of the failure. Specify in detail the considerations for the calculations. This data is necessary as long as the Failure has been resolved, otherwise this information shall specify in a second report that Concessionaires, Mobile Wholesale Concessionaires or Mobile Virtual Operators that operate their own Management Systems and generate Performance Counters Records must file once the Failure has been solved.	Does not apply

Statistic information about voice traffic	Indicate the approximate number of Calls and their duration (total minutes) that may have been consumed during the same interval of the affectation. Reports and documentary evidence of where these statistics are derived should be attached. Project the estimated number of total traffic that could have been processed for the Voice Service based on the traffic information of the same day of the week prior to the Failure. For the calculation, the same conditions of space and time must be replicated, same geographical area of affectation and same hour for the duration of the Failure, respectively. Separate the approximate number of Calls and the total duration by semicolons.	Does not apply/Minutes
Statistic Information about data traffic	Indicate the number of Megabytes that could have been consumed during the same interval of the affectation. Attach reports and documentary evidence of where these statistics derive. Project the estimated number of total traffic that could have been processed for the data service based on traffic information on the same day of the week prior to the Failure. For the calculation, the same conditions of space and time must be replicated, same geographical area of affectation and same time for the duration of the Failure, respectively.	Megabytes
Date of Failure	Indicate the date on which the Failure was presented (dd / mm / yyyy)	Does not apply

Start time of the Failure	Indicate the time when the Failure occurred (hh: mm)	Does not apply
Time that remained the Network Failure	Indicate the duration of the affectation. If the Failure has not been solved, it will be necessary to specify the approximate duration it will take to correct it. For this last case, once the Failure is attended, a new report must be submitted, updating this data indicating the actual duration of the Failure.	Hours: minutes
Corrective Actions	Enlist in a brief and precise manner, the most relevant actions that were carried out to solve the Failure. Separate the actions by semicolons.	Does not apply

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