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1. Introduction

The aim of this document is to describe the protocol to follow for measurements on logistics sites. The output of the measurements must give a clear and detailed view of the radio network coverage from “Gate-In” to “Gate-Out’.

A complete file must be submitted separately for each of the logistics sites of the logistics provider.

The assessment of the coverage will be based on the measurements made in the field, verifying the possibility for a SIM card to be located on site and check accessibility for each tested Mobile Network Operator (MNO).

The goal of these measurements is to check if all vehicles have adequate coverage when stored and also during transfers, and if a data connection can be maintained when car is moving from one area to other.

2. Devices & Technology

a. Device

For accuracy purposes, 2 types of devices must be used simultaneously:

- Mobile Phone
  - 2G/3G/4G capable
  - VoLTE capable
  - LTE 2x2 MIMO capable
- InCar measurements using Car Rooftop antennae (~Voiture Hérisson)

The goal is to measure the signal strength received by the antenna as placed in the connected cars to be tracked.

For each chosen mobile phone, the frequency band compatibility must be provided for potential further investigation.

The auditor must provide the brand as well as the model of the measurement vehicle.

b. Quantity, technology & location

A minimum of 4 mobile phones must be used for InCar measurements:

- 1 Mobile phone locked on 2G technology
- 1 Mobile phone locked on 3G technology
- 1 Mobile phone locked on 4G technology
- 1 Mobile phone unlocked for Handover testing
- In the future, additional mobile phone for any new technology available (5G…)

A minimum of 4 mobile phones connected to the Car RoofTop antennae must be used for InCar measurements:

- 1 Mobile phone locked on 2G technology
- 1 Mobile phone locked on 3G technology
- 1 Mobile phone locked on 4G technology
- 1 Mobile phone unlocked for Handover testing

- In the future, additional mobile phone for any new technology available (5G…)

The purpose is to have at least 8 mobile phones measuring radio signal at the same time for the same MNO.

A graphical view must be provided with the position of each antenna/mobile phone on the car.

Figure 1 – Example of Outside view of the measurement car with antennae positions

Figure 2 – Example of Inside view of the measurement car with antennae positions

c. Tools

Measurements must be carried out using a tool capable of collecting the mobiles radio traces based on GPS information for post treatment on a computer. Preferred tools would be:

- Keysight's Nemo Handy/Outdoor
- Ascom's Symphony
- Rohde & Schwarz' SwissQual
- Accuver's XCAL

3. Measurement Itinerary

Measurements must be done while meeting safety obligations, obeying traffic rules, speed limitations, signals and respecting the safety of pedestrians. On-Site contact will provide traffic and intervention rules inside the site.

a. Dynamic itinerary

The measurement itinerary will be based on the logistic site location. Measures must be done according to the same itinerary as the one taken by the vehicles from "Gate-In" until "Gate-Out".

This includes:

- Loading and unloading areas for trucks, vessels, trains and barges from the access ramp.
- Regular and occasional parking areas.
- Access roads.
- Building used in the compound.

An itinerary can be suggested by the auditor but must be validated by the logistics site operator.

b. Measurements in storage areas

Measurements in storage areas and regular and occasional parking areas of connected vehicles can be static or dynamic. The exact list of these areas will be provided by the on-site contact.

Measurements must be done on various locations inside the zones, depending on the size.

In any case, a map must be delivered summarizing the mobile radio coverage inside each area, and the exact spots where the measurements took place.

4. Measurement Protocol

To achieve the required accuracy, several passes over each measurement area can be considered. The auditor must provide the number of passes necessary to obtain good data quality.

a. Dynamic Accessibility measurements

To analyse accessibility on site, voice calls must start simultaneously on the 8 mobiles at the beginning of the itinerary on the same MNO. Calls must be to fixed landline numbers.

During the whole procedure the following data must be collected:

- Duration of each call (x calls depending on number of call drops)
- Date /Time
- GPS Longitude
- GPS Latitude
- MNO Name
- Techno
- LAC/RAC/TAC
- CID
- Signal Level (dBm) (RSRP/RSCP/RxLev)
- Signal Quality (dB) (RSRQ/ECNO/RxQual)
- Best Server
- Call Drop Cause
- Indoor or Outdoor
- Specific comments about the call

Measurement accuracy: The spacing between two measuring points must be of the order of 1 metre and must not exceed 10 metres.

Call Drop on unlocked mobile phone

If a call drop occurs on one of the 2 unlocked mobile phones, calls on all other trace mobile phones must be stopped and restarted. The call drop must be analysed, and root cause identified.

As long as no disconnection occurs on the 2 unblocked trace mobiles, calls on the other mobiles must be continued or restarted in the event of loss of coverage of a technology.

b. Dynamic Data availability measurements

Data availability means that a vehicle can open and maintain a data session at low throughput. Any drop in the data connexion shall be reported. As an option, a data throughput measurement can be done.

Areas with ~0kbps up/down throughput (no download or upload possible) must be reported and logs analysed for further investigations of these areas.

During the whole procedure the following data must be collected:

- Duration of download/upload
- Date /Time
- GPS Longitude
- GPS Latitude
- MNO Name
- Techno
- LAC/RAC/TAC
- CID
- Signal Level (dBm) (RSRP/RSCP/RxLev)
- Throughput
- RTT
- Packet Loss %

c. Static Accessibility measurements

Static measurements concern areas where vehicles will be parked. Depending on the surface of the area, one or many measurement points must be performed, and a graphical view must be provided showing the exact positions of each measurement. Some specific points of measurements may be directly provided by the On-Site contact for specific purposes. In any case, the mapping of the measurement points must be validated with the site operator.

To perform accessibility measurements, calls must start simultaneously on the 8 mobiles at the beginning of the tests on the same MNO. Calls must be to fixed landline numbers.

During the whole procedures the following data must be collected from the trace mobiles:

- Duration of each call (x calls depending on number of call drops)
- Date /Time
- GPS Longitude
- GPS Latitude
- MNO Name
- Techno
- LAC/RAC/TAC
- CID
- Signal Level (dBm) (RSRP/RSCP/RxLev)
- Signal Quality (dB) (RSRQ/ECNO/RxQual)
- Best Server
- Call Drop
- Indoor or Outdoor
- Specific comments about the call

d. Static Data availability measurements

Data availability means that a vehicle can open and maintain a data session at low throughput. Any drop in the data connexion shall be reported. As an option, a data throughput measurement can be done.

Areas with ~0kbps up/down throughput (no download or upload possible) must be reported and logs analysed for further investigations of these areas.

During the whole procedures the following data must be collected:

- Duration of download/upload
- Date /Time
- GPS Longitude
- GPS Latitude
- MNO Name
- Techno
- LAC/RAC/TAC
- CID
- Signal Level (dBm) (RSRP/RSCP/RxLev)
- Throughput
- RTT
- Packet Loss %

e. Static SMS Efficiency & Latency measurements

For SMS latency and efficiency measurements, the tests must be static on vehicle parking areas. A specific protocol can be suggested by the auditor. However, the following points must be respected:

SMS-MT:

- Calculate efficiency on a minimum of 50 SMS in a fixed period
- Calculate latency on a minimum of 50 SMS in a fixed period

SMS-MO:

- Calculate efficiency on a minimum of 50 SMS in a fixed period
- Calculate efficiency on received RP-ACK
- Calculate latency on received RP-ACK
- Calculate latency on a minimum of 50 SMS in a fixed period

For tests to be considered as “Passed”, the following conditions must be respected:

90% of SMS shall be delivered in:

- < 10s in 2G // < 5s in 3G // < 2s in 4G

95% of SMS shall be delivered in:

- < 20s in 2G // < 10s in 3G // < 5s in 4G

99% of SMS shall be delivered in:

- < 30s in 2G // < 20s in 3G // < 10s in 4G

5. Measurements Input

The on-site contact will provide the following documents:

- On-site detailed map
- Access instructions, safety and traffic rules On-site
- On-site itinerary of the tracked vehicles
- On-site location of storage/parking areas for connected vehicles from "Gate-In" to "Gate-Out"

6. Measurements Output

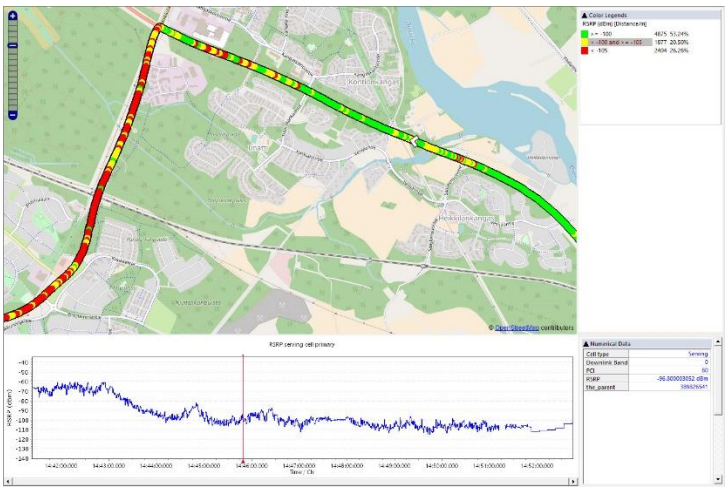
Mandatory deliverables are listed below. Deliverables must be specific to the logistics site and not to the logistics operator. An example of mentioned charts is available in the Excel file *Requirements deliverables summary.xlsx* sent with this file.

1. **The data must be returned in the form of:**
    a. **Image:** One or many .jpg files with minimum resolution of 600dpi/ppp, with maps of the measured site that shows average signal level (in dBm), data availability per technology (2G,3G,4G) per MNO (MNO1, MNO2, etc..) and Call Drops locations.
    b. **Cartography in GIS format:** the map must be based on the chosen itinerary which must be also delivered.
    The degree of accuracy of the measurements must be to at least 10 metres, and preferably 1 metre, which explains the high-resolution requirement.

There shall be 8 maps/MNO:

- 2G coverage map
- 3G coverage map
- 4G coverage map
- Multi-technology coverage map
- 2G itinerary map
- 3G itinerary map
- 4G itinerary map
- Multi-technology itinerary map

Example of coverage maps:

Specific itinerary coverage map example	Area coverage map example
	

Quality of resolution/zoom example

Figure 3 – Example of types of coverage maps and quality of zoom mandatory in deliverables

A basic key coverage must be joined to the map, making it possible for any reader to understand the coverage. Suggested key map:

2G & 3G Signal Strength Equivalency

-50dBm to -65 dBm – Excellent Signal (good voice and data)

-66dBm to -75 dBm – Good Signal (good voice and data)

-76dBm to -85 dBm – Average Signal (good voice data, marginal data with drop-outs)

-86dBm to -109 dBm – Weak Signal (Voice can be OK, no data)

-110dBm to -113 dBm – No signal

4G Signal Strength Equivalency

-70dBm to -90dBm – Excellent Signal (good voice and data)
-91dBm to -105dBm – Good Signal (good voice and data)
-106dBm to -125dBm – Average Signal (good voice data, marginal data with drop-outs)
-126dBm to -136dBm – Weak Signal (Voice can be OK, no data)
-136dBm to -140dBm – No signal

If cars are parked in an indoor area, an indoor map of this area must be provided as well.

2. A pdf/Word file with a global summary of the measured site, and action plan suggestion to be delivered to the MNO for application.

3. A comparison analysis between what is observed on the 4 mobile phones inside the vehicle and what is observed on the mobile phones connected to the antennae on top of the vehicle.

4. A chart for each MNO with detailed measurements. All accessibility measurements must be summarized as per the following chart example:

Date /Time	*Device Reference*	*Longitude*	*Latitude*	*MNO Name*	*Techno*	*LAC RAC TAC*	*CID*	*Signal Level (dBm) (RSRP/RSCP/RxLev)*	*Signal Quality (dB) (RSRQ/ECNO/RxQual)*	*Best Server*	*Call Drop*	*Indoor or Outdoor*	*Comments*

5. A chart for each MNO's "Blind Spot". If "Blind Spot" is confirmed, environment must be studied. Suggestion of chart:

	Date /Time	*Device Reference*	*GPS Coordinates of the Blind Spot on site*	*Vehicles parked in buildings without connectivity access (Y/N)*	*If Yes, Number of Vehicles*	*Multi storage building for vehicle storage (Y/N)*	*If Yes, Number levels in the building*	*Action plan suggestion*
Blind Spot #1								
Blind Spot #2								
…								

6. A chart for each MNO's call drops. If a call drop occurs, signal strength and quality must be analysed. Suggestion of chart:

	Date /Time	*Device Reference*	*GPS Coordinate of the Call Drop on site*	*Technology when call drops*	*Call drop cause*	*Action plan suggestion*	*LAC/RAC/TAC*	*CID*	*Signal Level (dBm) (RSRP/RSCP/RxLev)*	*Signal Quality (dB) (RSRQ/ECNO/RxQual)*	*Best Server*
Call Drop #1											
Call Drop #2											
…											

7. A chart for each MNO's Data measurements.

Date /Time	*Device Reference*	*Longitude*	*Latitude*	*MNO Name*	*Techno*	*LAC/ RAC/ TAC*	*CID*	*Signal Level (dBm) (RSRP/RSCP/RxLev)*	*Signal Quality (dB) (RSRQ/ECNO/RxQual)*	*Throughput*	*RTT*	*Packet Loss (%)*

8. A chart for each MNO's SMS measurements.

										SMS-MT		*SMS-MO*			
Date /Time	*Device Reference*	*Longitude*	*Latitude*	*MNO Name*	*Techno*	*LAC/ RAC/ TAC*	*CID*	*Signal Level (dBm) (RSRP/RSCP/RxLev)*	*Signal Quality (dB) (RSRQ/ECNO/RxQual)*	*Efficiency*	*Latency*	*Efficiency*	*Latency*	*RP-ACK Efficiency*	*RP-ACK Latency*

7. Measurement Availability

Source files of raw measurement must be made available on an FTP server or USB key for possible future investigations.

8. Requirements Checklist

Auditor must fill the following checklist regarding the requirements of this document.

COMPANY NAME	
NAME OF PORT/ STORAGE/TRANSIT SITE	
COMPANY CONTACT	
Name	
Phone Number	
e-mail address	
DATE OF ANSWER	

Requirement Reference	Requirement Description	Checked
Req-01	2 types of measuring devices: Mobile phones & InCar integrated antennae	
Req-02	Number of mobile phones/antennae with specific configuration on each device	
Req-03	Position of antennae & phones	
Req-04	Measurement tool choice	
Req-05	Itinerary map for dynamic measurements	
Req-06	Itinerary map for warehouses measurements	
Req-07	Observance of traffic rules on-site	
Req-08	Dynamic Accessibility measurements attributes	
Req-09	Dynamic Data measurements attributes	
Req-10	Static Accessibility measurements attributes	
Req-11	Static Data measurements attributes	
Req-12	Static SMS measurements attributes	
Req-13	SMS-MT: Calculate efficiency on a minimum of 50 SMS in a fixed period of time Calculate latency on a minimum of 50 SMS in a fixed period of time	
Req-14	SMS-MO: Calculate efficiency on a minimum of 50 SMS in a fixed period of time Calculate efficiency on received RP-ACK Calculate latency on received RP-ACK Calculate latency on a minimum of 50 SMS in a fixed period of time	
Req-15	90% of SMS shall be delivered in: - < 10s in 2G - < 5s in 3G - < 2s in 4G	
Req-16	95% of SMS shall be delivered in: - < 20s in 2G - < 10s in 3G - < 5s in 4G	
Req-17	99% of SMS shall be delivered in: - < 30s in 2G - < 20s in 3G - < 10s in 4G	
Req-18	Measurement Accuracy between 1 and 10 meters	
Req-19	Deliverable 1: Coverage maps with basic key in specific format	
Req-20	Deliverable 1: Coverage maps images with a minimum of 600 dpi/ppp	
Req-21	Deliverable 1: 8 maps/MNO	
Req-22	Deliverable 1: Location of all call drops displayed on each map	
Req-23	Deliverable 2: Analysis summary and advised action plan	
Req-24	Deliverable 3: Analysis of inside/outside antennas mobile phones	
Req-25	Deliverable 4: Measurements chart with specific attributes	
Req-26	Deliverable 5: Detailed analysis of Blind Spots with advised action plan	
Req-27	Deliverable 6: Detailed analysis for call drop on the unlocked mobile phones	
Req-28	Deliverable 7: Detailed analysis for Data measurements	
Req-29	Deliverable 8: Detailed analysis for SMS measurements	
Req-30	Source files availability on USB Key or FTP Server	

Figure 4 - Requirements Checklist

Glossary

Best Server: Best signal received by the UE

Blind Spot: Area with no radio network coverage

CID: Cell Identifier

LAC: Location Area Code

MCC: Mobile Country Code (ex: 208 for France)

MNC: Mobile Network Code (ex: 01 for Orange in France)

MNO: Mobile Network Operator - Telecom operator (ex: Orange, AT&T…)

RAC: Routing Area Code

RSCP: Received Signal Code Power - power measured by a receiver on a particular physical communication channel in 3G cell network

RSRP: Reference signal Receive Power - measurement of the received power level in an LTE cell network

RSRQ: Reference Signal Received Quality - measurement of the received quality level in LTE cell network

RxLev: Received Level

RxQual: Received Quality

TAC: Tracking Area Code

UE: User equipment (ex: mobile phone, tablet…)

Annex

Directique
Customer Quality Perspectives

NANTES SAINT-NAZAIRE PORT

CONNECTIVITY MEASUREMENTS ON VEHICLES LOGISTICS SITES

Nantes Saint-Nazaire Harbour

May 2019

Version	Date	Author	Changelog
1	03/06/2019	Edouard CLISSON	création

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1. MEASUREMENTS SPECIFICATIONS

1.1. FRAMEWORK AND OBJECTIVES

The objective of the audit was to give a detailed view of the mobile radio coverage in the Saint-Nazaire Harbor logistic site, from "Gate-In" to "Gate-Out", by evaluating the accessibility to the mobile network of each measured MNO.

The main purpose was to ensure that all connected vehicles on site are under a good mobile radio coverage, whether they are moving or parked in one of the dedicated areas.

The audit took place from May 20th to May 23rd 2019.

1.2. MEASUREMENTS DESCRIPTION

Measurements have been made with 2 sets of mobiles, each representing a different situation:

- "Incar" situation: devices are set inside the vehicle, on the dashboard (Fig. 1)

- "Outdoor" situation: devices are set inside a roof box fixed on the vehicle (Fig. 2)

Figure 1 : devices set-up inside the vehicle

Figure 2 : roofbox "outdoor" set-up

Each set of handset contains 4 mobiles, blocked on their respective technology:

1. mobile blocked in 2G
2. mobile blocked in 3G
3. mobile blocked in 4G
4. mobile in "auto connect" mode (2G/3G/4G)

Figure 3 : measurement set

The full set-up includes 8 mobiles, which simultaneously measure radio coverage for an MNO. Each operator's coverage has been measured separately, with 1 day dedicated to each :

- **Day 1** – 20/05/2019 – SFR
- **Day 2** – 21/05/2019 – Orange France (ORA)
- **Day 3** – 22/05/2019 – Bouygues Telecom (BYT)
- **Day 4** – 23/05/2019 – Free Mobile (FRE)

1.3. METHODOLOGY

Network accessibility has been assessed:

- For DATA service: PING requests continuously sent to an HTTP server were

- For SMS service: send / receive SMS on the same terminal (1 SMS every 10 pings)

- Signal level acquisition every second

Measurements Drive:

Dynamic measurements based on the route taken by connected vehicles from "Gate-In" to "Gate-Out", including loading and unloading spaces for trucks, boats, trains and barges from the access ramp, and areas of regular and occasional parking.

Figure 4 : measurements drive overview

Vehicle speed:

In order to guarantee a sufficient sample, the vehicle speed was limited to 15km/h. The distance between each test, which were done every second, was then around 5 meters.

1.4. NEMO OUTDOOR

The selected Tool is **Nemo Outdoor.**

Nemo Outdoor de Keysight Technologies is currently one of the market leaders in the drive testing market and benchmarking systems for mobile networks. Nemo is one of the most used tools among French operators, so they have extensive experience of its measurement capabilities and already have tools to process and analyze produced datas.

Figure 5 : NEMO Outdoor

Nemo Outdoor complies with ETSI specifications 102-250-2 v2.2.1 for voice telephony QoS measurement services.

Nemo Outdoor uses Nemo Media Router (NMR) which is the interface and communication application developed for Android and iOS smartphones. NMR allows terminals to communicate with PC-based applications, such as Nemo Outdoor and Nemo INVEX.

Because NMR services are run on mobile devices, all data collected enables the provision of reliable measurements of the quality of the customer experience.

2. RESULTS

2.1. GLOBAL ANALYSIS

- **Network coverage**: there is no specific problem of network coverage for all operators tested, regardless of the technology measured.
- **Accessibility to DATA**: accessibility to DATA service is excellent throughout the site, across all operators and measured technologies. Indeed, only an insignificant amount (<0.1%) of failed measurements is reported for SFR in 2G, under specific conditions (INCAR).
- **Accessibility to SMS service**: some SMS send failures (about 4%) on the operator SFR in UMTS (in blocked or automatic mode), mainly concentrated on the storage area "Park 13" in the west of the zone.

2.2. DATA ACCESSIBILITY MEASUREMENTS

DATA measurements success rate of is the proportion of successful HTTP ping measurements on all attempts.

DATA success rate per operator:

	Mobiles en situation "Incar"				Mobiles en situation "Outdoor"				
	GSM	UMTS	LTE	Auto	GSM	UMTS	LTE	Auto	GLOBAL
SFR	100%	100%	100%	100%	99.9%	100%	100%	100%	**99.99%**
ORA	100%	100%	100%	100%	100%	100%	100%	100%	**100%**
BYT	100%	100%	100%	100%	100%	100%	100%	100%	**100%**
FRE	100%	100%	100%	100%	100%	100%	100%	100%	**100%**

- accessibility to DATA service is excellent throughout the site, across all operators and measured technologies

2.3. SMS SERVICE ACCESSIBILITY MEASUREMENTS

SMS success rate is the proportion of messages sent and received within 10 seconds on all sending attempts.

SMS success rate per operator:

	Mobiles en situation "Incar"				Mobiles en situation "Outdoor"				
	GSM	UMTS	LTE	Auto	GSM	UMTS	LTE	Auto	GLOBAL
SFR	99.2%	96.4%	100%	96.1%	99.5%	99.7%	100%	100%	**98.87%**
ORA	100%	99.7%	100%	99.9%	100%	100%	100%	100%	**99.95%**
BYT	100%	99.6%	100%	99.1%	99.9%	100%	99.7%	100%	**99.78%**
FRE	100%	99.6%	100%	100%	100%	100%	99.6%	100%	**99.91%**

- Accessibility to SMS service is excellent for all operators, except a slightly lower performance on SFR, when the terminal is in UMTS and incar, with a rate approaching 96%, either on the mobile blocked in UMTS or in automatic mode

2.4. FOCUS ON FAILURES

1.1.1. SFR – DATA

Only 4 DATA failures, for a total sample of 59 850 tests, in 2G only and INCAR, without any impact on the overall quality level :

Figure 6 : SFR 2G INCAR –DATA NOK

1.1.2. SFR – SMS

A total of 68 SMS failures, among more than 6 000 attempts, including 56 of them incar (3G or automatic mode, located in several spots of the drive:

Figure 7 : SFR 3G INCAR –SMS tests NOK


SFR
SFR 2G - Outdoor
Mesures SMS
Parcours
Mesures SMS OK
Mesures SMS en échec


SFR
SFR 2G - Incar
Mesures SMS
Parcours
Mesures SMS OK
Mesures SMS en échec


SFR
SFR 3G - Outdoor
Mesures SMS
Parcours
Mesures SMS OK
Mesures SMS en échec


SFR
SFR 3G - Incar
Mesures SMS
Parcours
Mesures SMS OK
Mesures SMS en échec

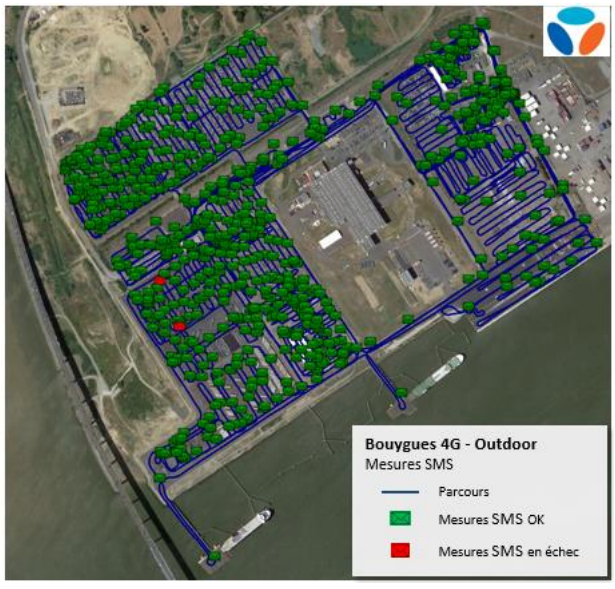

SFR
SFR AUTO - Incar
Mesures SMS
Parcours
Mesures SMS OK
Mesures SMS en échec

1.1.3. ORA – SMS

3 SMS failures over 6 100 attempts located in several spots of the drive:

1.1.1. BYT – SMS

12 SMS failures over 5 400 attempts located in several spots of the drive:



1.1.2. FRE – SMS

2 SMS failures over 2 100 attempts located in several spots of the drive

3. NETWORK COVERAGE MAPS

3.1. COVERAGE 2G (RXLEV)- INCAR

1.1. COVERAGE (RXLEV)- OUTDOOR

Puissance du signal 2G:

- -50 à -65 dBm - Signal excellent
- -66 à -75 dBm - Signal bon
- -76 à -85 dBm - Signal moyen
- -86 à -109 dBm - Signal faible
- -110 à -113 dBm - Pas de signal

Fond cartographique © Google 2019

1.2. COVERAGE 3G (RSCP)- INCAR

Puissance du signal 3G:

- -50 à -65 dBm - Signal excellent
- -66 à -75 dBm - Signal bon
- -76 à -85 dBm - Signal moyen
- -86 à -109 dBm - Signal faible
- -110 à -113 dBm - Pas de signal

1.3. COVERAGE (RSCP)- OUTDOOR

Puissance du signal 3G:

- -50 à -65 dBm - Signal excellent
- -66 à -75 dBm - Signal bon
- -76 à -85 dBm - Signal moyen
- -86 à -109 dBm - Signal faible
- -110 à -113 dBm - Pas de signal

Fond cartographique © Google 2019

1.4. COVERAGE (RSRP)- INCAR

Puissance du signal 4G:

- -70 à -90dBm - Signal excellent
- -91 à -105dBm - Signal bon
- -106 à -125dBm - Signal moyen
- -126 à -135dBm - Signal faible
- -136 à -140dBm - Pas de signal

Fond cartographique © Google 2019

1.5. COVERAGE (RSRP)- OUTDOOR

Puissance du signal 4G:

- -70 à -90dBm - Signal excellent
- -91 à -105dBm - Signal bon
- -106 à -125dBm - Signal moyen
- -126 à -135dBm - Signal faible
- -136 à -140dBm - Pas de signal

(End of the document)