



ITU Training Course on “Homologation Procedures & Type Approval Testing for Mobile Terminals for AFR Region”

Tunis, Tunisia, 23-27 June 2014



Part 2: APPROVAL OF TELECOMMUNICATIONS TERMINALS : PROCEDURES, TESTS AND MEASUREMENTS

June 2014



- Objective
- Introduction
- Procedure
- *Approval Methodology*
- Different types of devices
- Standards
- Tests and measurements
- Measuring devices
- ISO17025 accreditation
- Recommendations
- Conclusion



Detail procedures, administrative and technical mechanisms related to the activity of Type Approval of telecommunications terminals



- Every modern country organizes the local telecommunications sector via organizations and definite regulations.
- Telecommunications Standards and procedures for local country must be consistent and aligned with the organizations and international standards of regulation in the sector.



- Each country including telecommunications networks with all their components, and having defined a national frequency plan must have, obviously, a telecommunications terminal approval body .
- The approval process ensures conformity of telecommunications terminals connecting to the Access Network with the requirements of the country's network, national and international standards and to national frequency plan



Approval definition

The approval is the set of control operations and necessary tests, by which CERT ascertains and certifies that a representative sample of telecommunications terminal equipment or radio equipment complies with regulations, standards and technical specifications.



Type Approval definition

- Are subject to approval any terminal equipment or radio installation to be connected to a public network.
- Terminal equipment : Any device, any system or group of system, designed to be connected to an endpoint of a network and transmits, receives or processes telecommunications signals.
- Radio Equipment : Any telecommunications system that uses radio frequencies for wave propagation in free space



Definition of compliance

All operations that focus on the verification of the compatibility of the technical characteristics of the equipment with the technical requirements of interworking with public telecommunications networks and rules for use and operating frequency, it is intended for individual people (Equipment imported for public use).



Definition of Technical Control

Approval is always followed by a process of technical control during importation (border), on the basis of a certificate of approval, which ensures the compliance of imported products with the samples approved.



Objective

Approval aims to :

- Verify compliance of terminal equipment or radio equipment with needed requirements
- User safety
- Security of staff operating in public telecommunications networks



Objective

- Protection of networks and information exchanged
- Optimum use of the radio spectrum.
- interoperability of the terminal equipment with the network and with other terminals accessing same service.



- The customer presents the product to be approved to the One Stop Shop (OSS)
- The OSS examines the administrative request of the customer, then it transmits it to Type Approval Lab (CERTLABS)



A second preliminary engineering study is made by CERT Labs experts that includes:

- Verification of technical specifications of the equipment presented
- Verification of certificates of compliance and report tests of the manufacturer
- Verification of the smooth functioning of the equipment presented
- The definition of the tests to be performed



- Tests and measurements
- Generation of Approval report
- Elaboration of the approval certificate (fail or pass) based on the recommendations in the written approval report
- Closing process

- Test report
- Technical Request

- The equipment is defective
- Missing of accessories (power, driver, cables ... etc)
- The equipment interfaces are inaccessible
- Equipment require an internal configuration (eg: access points or Smartphones)

- The objective of sending a technical request to the customer is to invite him to solve the problems encountered during testing. It sent by lab to the OSS and thereafter OSS sends to the customer
- The customer can intervene in the lab to unlock situations (hardware configuration, inaccessibility ..) or to retrieve his equipment and intervene in its locale.
The Approval request closes with a negative decision after sending 6 TR

The Technical request contain:

- Reference OSS
- Reference lab
- The brand, model and product name
- The customer name
- Tests made
- The problems encountered
- The recommendations of the lab
- Date
- The names of the engineers and their signatures

It contains:

- Reference OSS
- Reference lab
- The brand, model and product name
- The customer name
- Standards and references of studies
- Application fields
- Identification and description of the equipment and customer
- Product specifications

- Tests and measurements made and results
 - The final recommendations of the lab (successful or unsuccessful)
 - Measurement reports and tests and picture of equipment
 - Date
 - The names of the engineers and their signatures
- Note: The test report is sent to OSS, and based on the recommendation of the lab, the OSS issues a certificate of positive or negative approval signed by the General Manager of CERT.



Each telecommunication network contains components of different types that include several types of equipment:

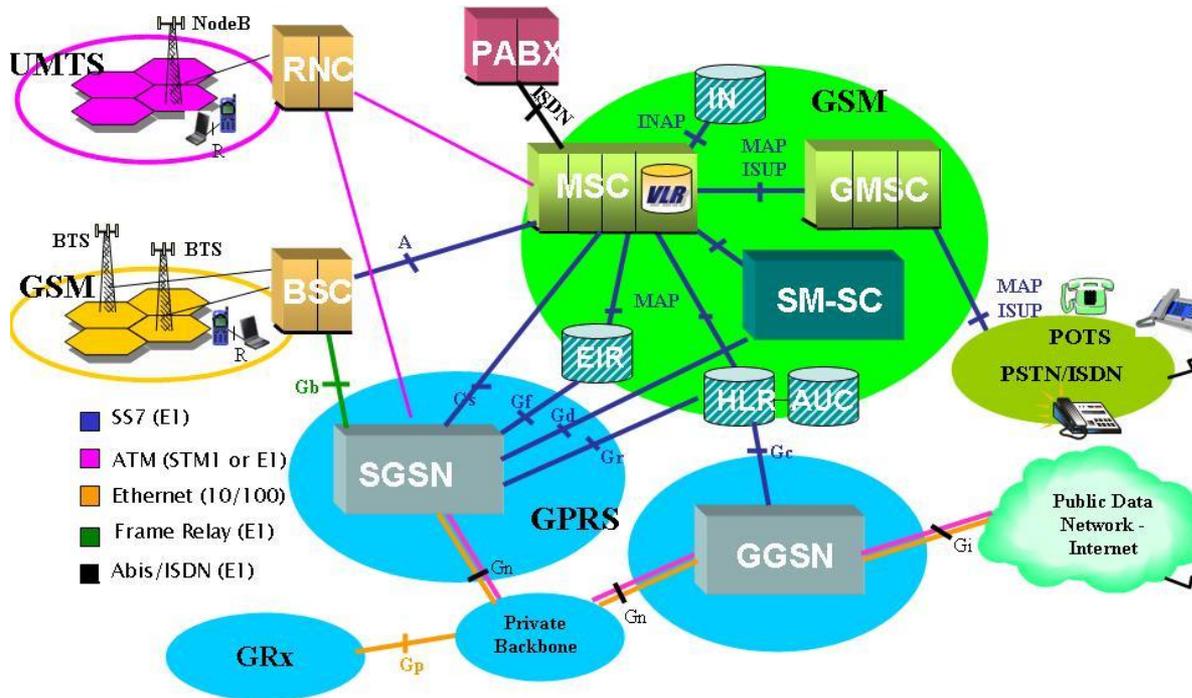
- Radio Components
- Transmission components
- Switching components
- Computer components



Each telecommunication network also contains different types of connections:

- The wired links
- Radio links
- Optical links

A telecommunication terminal may interface with the telecommunications network via one or more connections types





- Fixed terminals:
Fixed terminals of a telecommunication network are wired terminals, IP terminals, ADSL terminals ... (The telephones, routers, modems)



➤ Mobile terminals:

Mobile telecommunications terminals occupy a very wide and extensive range

These terminals can be transmitters / receivers, Bluetooth, WIFI, GSM, HSDPA, UMTS, GPS, geo-location equipment, the signal converter equipment



Define:

- Frequency bands allocated to radio equipment
- The maximum power and fields allowed
- The occupancy rate of the spectral band

Ensuring coexistence between different users of radio waves



Bande de fréquences	Puissance rayonnée max ou champ max/ portée max	Norme Européenne ou norme internationale équivalente	Largeur du canal	Applications
26,312 - 26,474 MHz	40 mW / 100m		12.5 KHz	Postes téléphoniques sans cordon
41,312 - 41,475 MHz	20 mW / 100m		12.5 KHz	
46-49 MHz	50 mW / 100m		--	
1880 - 1900 MHz	10 mW / 100m		2 MHz	
6765 - 6795 kHz	42dB μ A/m à 10m	EN 300 330	--	Equipements non spécifiques : Ils regroupent différents types d'applications sans fil, notamment de télécommande et télécontrôle, télémessure, transmission d'alarmes et de données. Ils ne doivent en aucun cas permettre la transmission de la voix. NB : Les équipements de télécommande n'utilisent pas la bande (40.66 -40.7) MHz.
26,957 - 27,283 kHz	10 mW / 10m		--	
40,66 - 40,7 MHz	10 mW / 100m		--	
433,05 - 434,79 MHz	10mW /20m	EN 300 220	--	



868,6 - 869,4 MHz	10mW / 50m	EN 300220	25 KHz	Alarmes	
869,65 - 869,7 MHz	25 mW / 100m				
9 - 59,750 kHz	72dB μ A/m à 10 m	EN 300 330	--	Matériels à boucle d'induction: Ils regroupent les systèmes d'immobilisation de véhicules, d'identification des animaux, de détection de câbles, de gestion des déchets, d'identification des personnes, de contrôle d'accès, les capteurs de proximité, les systèmes antivol, d'identification automatique d'articles, de commande sans fil et de péage routier automatique.	
59,750 - 60,250 kHz	42 dB μ A/m à 10 m		--		
60,250 - 70 kHz	69dB μ A/m à 10 m		--		
70 - 119 kHz	42dB μ A/m à 10 m		--		
119-135 kHz	66dB μ A/m à 10 m		--		
135 -148,5 kHz	42dB μ A/m à 10 m		--		
3155 - 3400 kHz	13,5 dB μ A/m à 10 m		--		
13 553 - 13 567 kHz	42 dB μ A/m à 10 m		EN 302 291		--
170 - 181,5 MHz	10m W / 50m				--
196,6 - 200,2 MHz	10m W / 50m	EN 300 422	--	Microphones sans fil et aides à l'audition	
470 - 790 MHz	50m W/50m		--		
863 - 865 MHz	10.m W / 50m	EN 300 422 EN 301 357	--		



Bande de fréquences	Puissance rayonnée max ou champ max/ portée max	Norme Européenne ou norme internationale équivalente	Largeur du canal	Applications
0.050 - 0.130 MHz	500m W / 100m	--	--	Traduction simultanée
0.125 - 0.134 MHz	42 dB μ A/m à 10m	--	--	Dispositifs d'identification (RFID)
13.553 - 13.567 MHz	60 dB μ A/m à 10m	EN 300 330	200 KHz	
865 - 868 MHz	2 Wp.a.r. / 10m	EN 302 208		
9-315 kHz	30 dB μ A/m à 10m	EN 302 195	--	Implants médicaux à faible puissance
315 - 600 kHz	- 5 dB μ A/m à 10m	EN 302536	--	
401 - 402 MHz	25 μ W p.a.r.	EN 302 537	25 KHz	
402 - 405 MHz	25 μ W p.a.r.	EN 301 839	25 KHz	
405 - 406 MHz	25 μ W p.a.r.	EN 302537	25 KHz	
2 400 - 2 483,5 MHz	100mW / 100m	EN 300 328 EN 301 893	-- --	Equipements des réseaux locaux radioélectriques de transmission de données à l'intérieur des bâtiments
5150 – 5350 MHz	200m W / 100m			
24.05 - 24.25 GHz	100m W	EN 300 440	--	Système d'information routière et radars à courte portée destinés aux véhicules
76-77 GHz	55 dBm/MHz p.i.r.e	EN 302 372	--	



Definition

By applying the appropriate standard and with a set of measuring instruments and test benches, we ensure the conformity of the equipment under test, submitted for approval, compared to standard that supports them



Measurements

Among the tests and measurements performed during the approval of a telecommunication terminal :

- Verification of the frequency band
- Measuring the frequency error
- Measurement of the emitted power
- Measurement of reception levels
- Measurement of BER (bit error rate)
- Measurement of internal impedance



Functional test

During the approval, all telecommunication terminals are subject to functional tests in terms of commissioning and testing of the product and its smooth functioning



Agilent Technologies 8960 Series 10

- The test bench of a GSM terminal consists of three essential components:
- Simulator test radio (eg Agilent 8960)
- computer
- A test application installed on the computer (eg WTM)

A link between these components is necessary
USB / GPIB

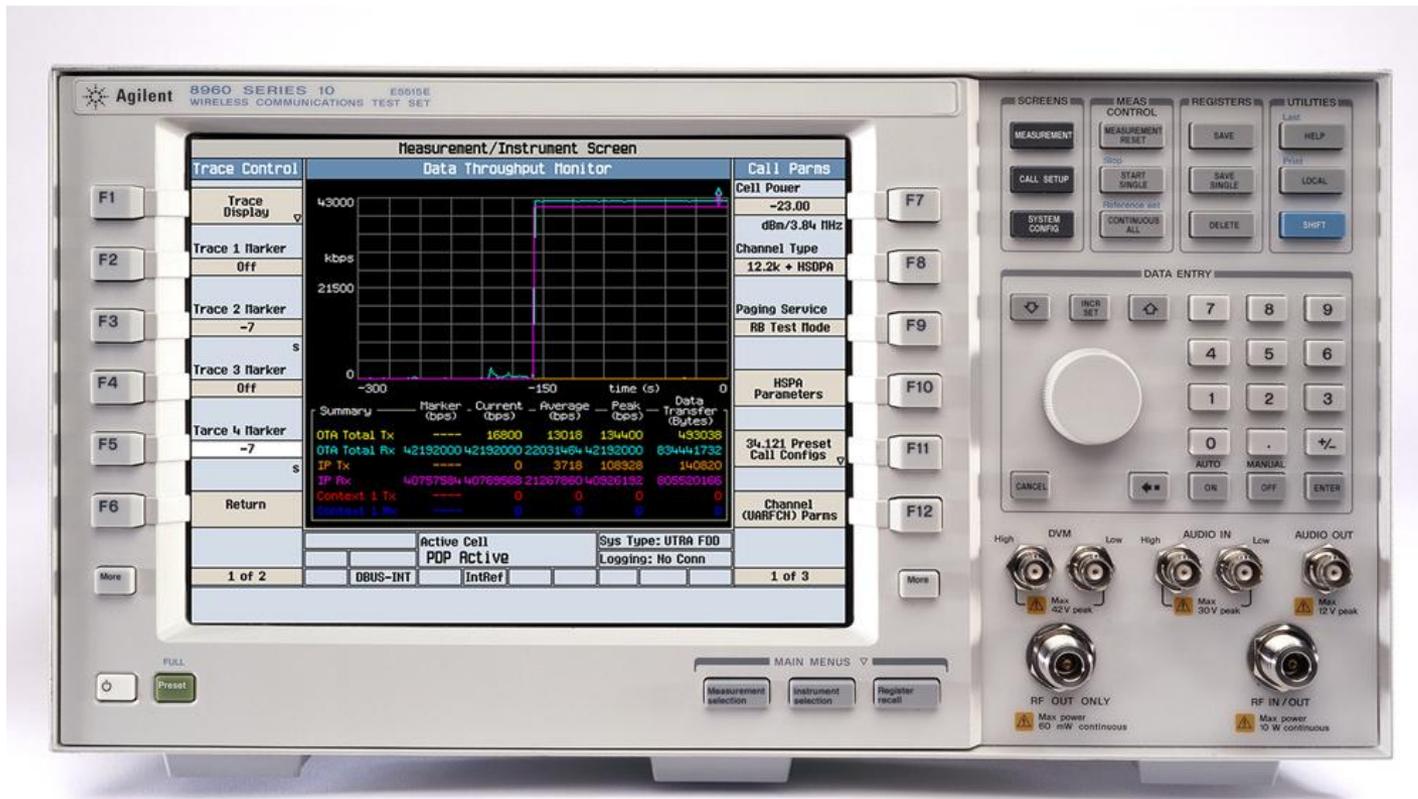


Agilent Technologies 8960 Series 10

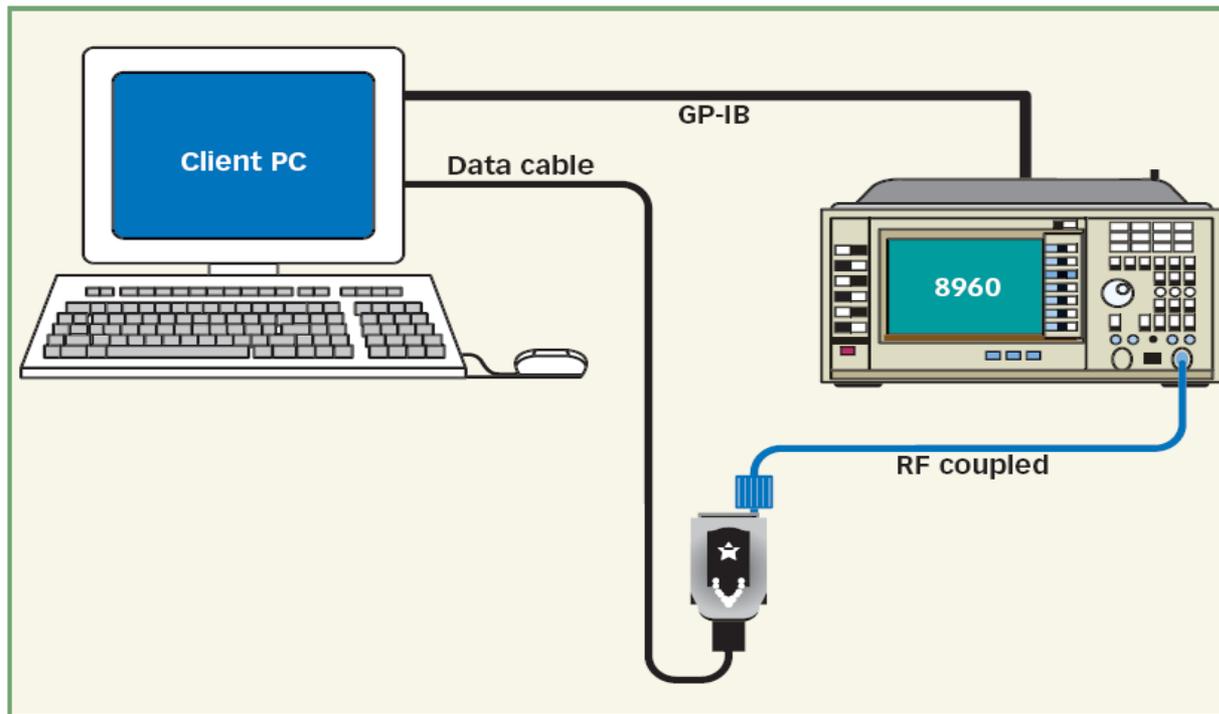
A detailed test report is delivered by this instrument and it contains:

- Date / time
- Name of operator
- The reference measuring device
- IMEI of the EUT
- IMSI of the SIM card test
- All parameters tested with the measured values and test results (pass or failed)

Agilent Technologies 8960 Series 10

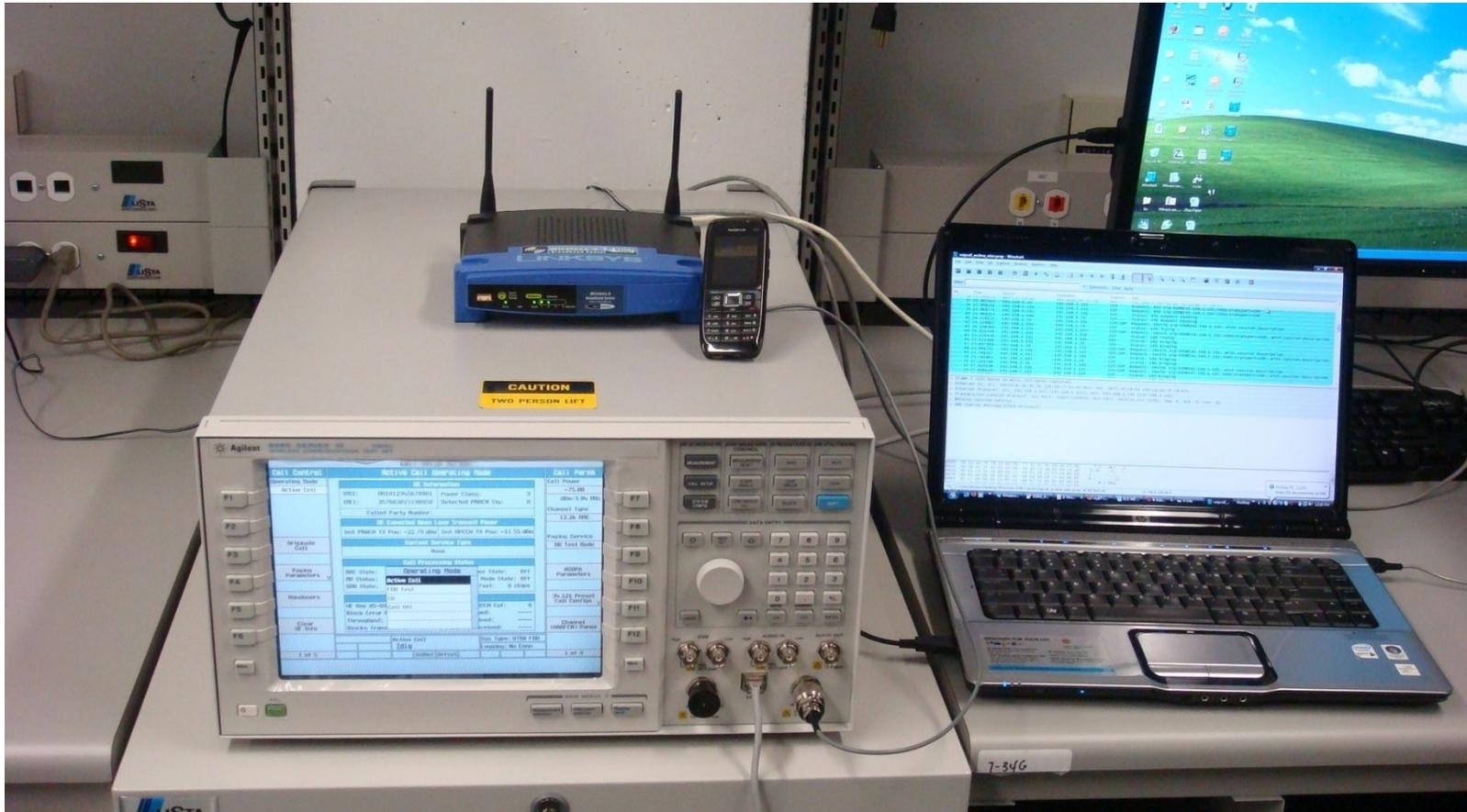


Agilent Technologies 8960 Series 10



6. A practical external PAVT measurement system is based on the Agilent 8960 wireless-communications test set.

Agilent Technologies 8960 Series 10





Wavetek 4107

As for the approval of a GSM terminal, technical control testing requires a radiated radio simulator mode, it's not conducted mode and we take a minimum number of tests (Wavetek 4107)

Wavetek 4107



Wavetek 4107





Spectrum Analyzer

A spectrum analyzer is a measuring instrument for displaying the different frequencies contained in a signal and their respective amplitudes. The signals can be of various types: electrical, optical, acoustic, radio



Spectrum Analyzer

- A digital spectrum analyzer used to measure the voltage of electric signals in the frequency domain. The measurements can range from a few tenths of Hz to several tens of GHz.
- For the approval of telecommunications terminal a spectrum analyzer (0-60GHz) can support all types of products to be approved



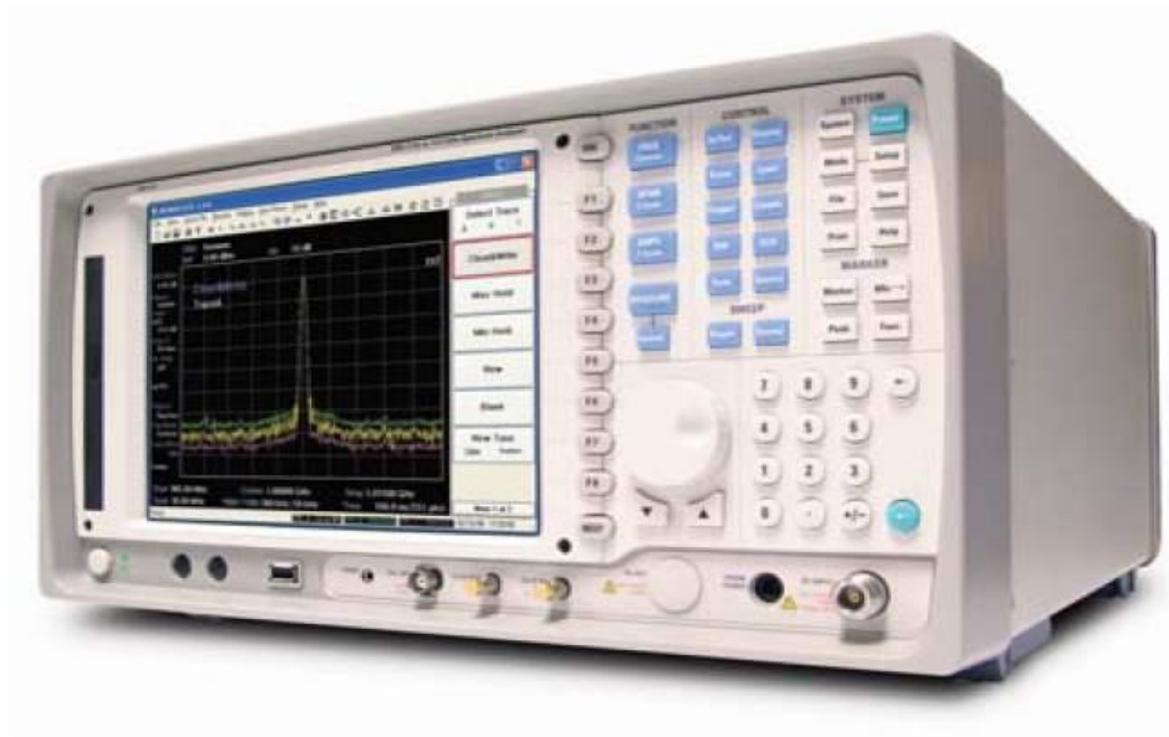
Spectrum Analyzer

Among the things to check :

- The frequency band
- The transmission power
- Channel spacing
- The number of channels



Spectrum Analyzer





Spectrum Analyzer



An check of the parameters of the analyzer is made before each measurement:

- The frequency band (frequency of start and end)
- Spam
- The amplitude of signal

We must choose the values of these parameters for good and reliable results



Power meter

- The power meter is a device that measures the electrical power consumed by a receiver or supplied by an electric generator.
- The power meter is used in Approval activities to measure the minimum and maximum output power for Radio equipment

Power meter





The foundation of a certification service must be overwhelming followed by three other services: standardization, technology monitoring and training, quality

- Service standards: it ensures the development and monitoring of standards and national and international requirements. It develops very specific reports to be followed by laboratory technicians



- The technology monitoring and training service which provides:
 - 1- Monitoring of all new technologies
 - 2- The annual training plan development for laboratory technicians
- Quality Service : it ensures the implementation and updating of approval procedures and preparation of means of accreditation and ISO.



The approval process in a country is a very necessary step for the safety of the state, final consumers and the proper functioning of its telecommunication network.

But it must not be an economic and regulatory obstacles for investors and traders.

So we must put this project in place with flexible and reliable procedures.



THANKS