



APPROVAL OF TERMINALS TELECOMMUNICATIONS: PROCEDURES, TESTS AND MEASUREMENTS

December 2015



Know all procedures and administrative and technical mechanisms related to the activity of approval of telecommunications terminal in CERT.



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



- 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 includes a telecommunications network with all these components, and has a national frequency plan must have a recess approval of telecommunications terminal .
- The approval process ensures conformity of telecommunications terminals involved requirements of the country's network ,national and international standards and to plan local frequency



Approval definition

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



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 installation : Any telecommunications system that uses radio frequencies for wave propagation in free space



Definition of compliance

Representing 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 own requirements).



Definition of Technical Control

Approval is always followed by a process of technical import control (border) , on the basis of a certificate of approval, which ensures the compliance of imported products relative to the equipment sample approved by CERT.



Objective

Approval is to:

- Verify compliance of terminal equipment or radio equipment with the essential requirements that apply
- User safety
- Security personnel operating public telecommunications networks



Objective

- Protecting networks and information exchange control and management associated.
- Proper use of the radio spectrum.
- The ability to operate the terminal equipment on the one hand, with the network and, on the other, with the other terminal equipment to access the same service.



- The customer presents the product to be approved in G.U
- The G.U examine the administrative record of the customer, then it transmits the project for laboratory tests and measurements of CERT



Another preliminary engineering study is made on the project by the lab technicians that includes:

- Verification of technical specifications with the material presented
- Verification of certificates of compliance and report tests of the manufacturer
- Verifying the proper operation of the equipment presented
- The definition of the tests to be performed



- Tests and measurements
- Development of Approval report
- Elaboration of the approval certificate positive or negative based on the recommendations in the report written approval
- Closing project



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

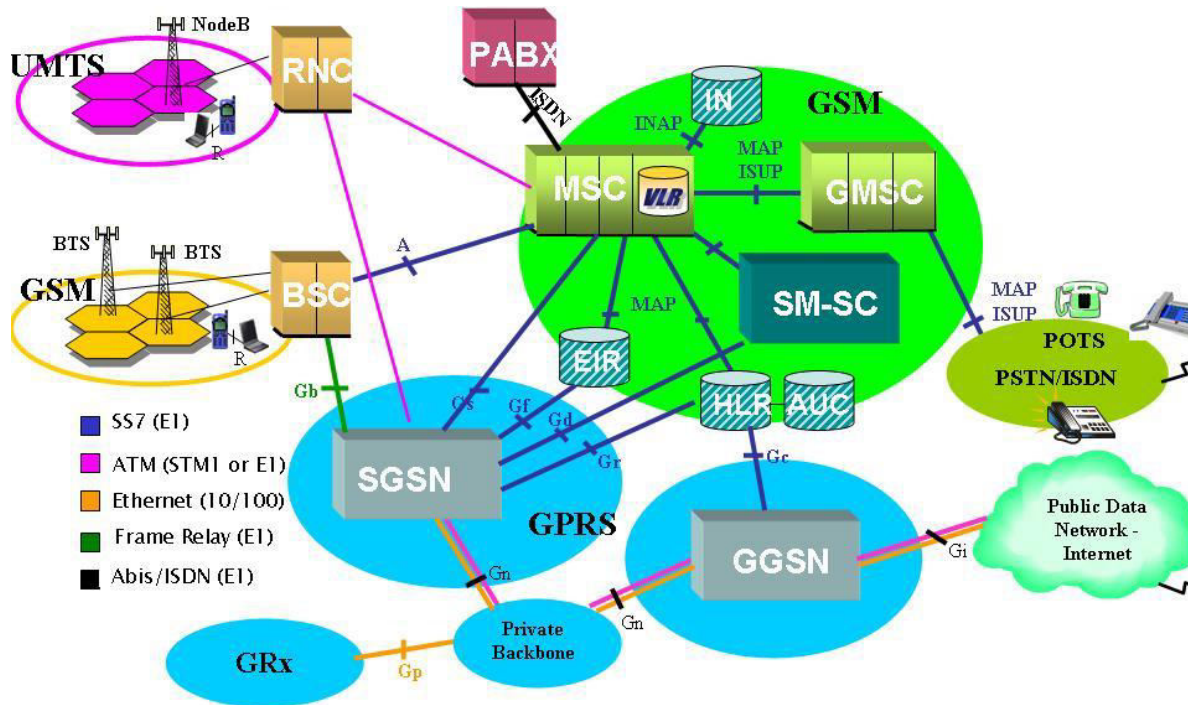
- Components Radio
- Transmission components
- Switching components
- Computer components



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

- 2G: 3GPP TS 51.010
- 3G: 3GPP TS 34.121
- BT: EN 300 328
- WLAN: EN 300 328, EN 301 893
- SRD: EN 300 440, EN 400 440



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 work for approval of a telecommunication terminal is quoted:

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



Functional test

During the work of approval all telecommunication terminals are subjected to functional tests in terms of commissioning and testing of the product and its proper functioning



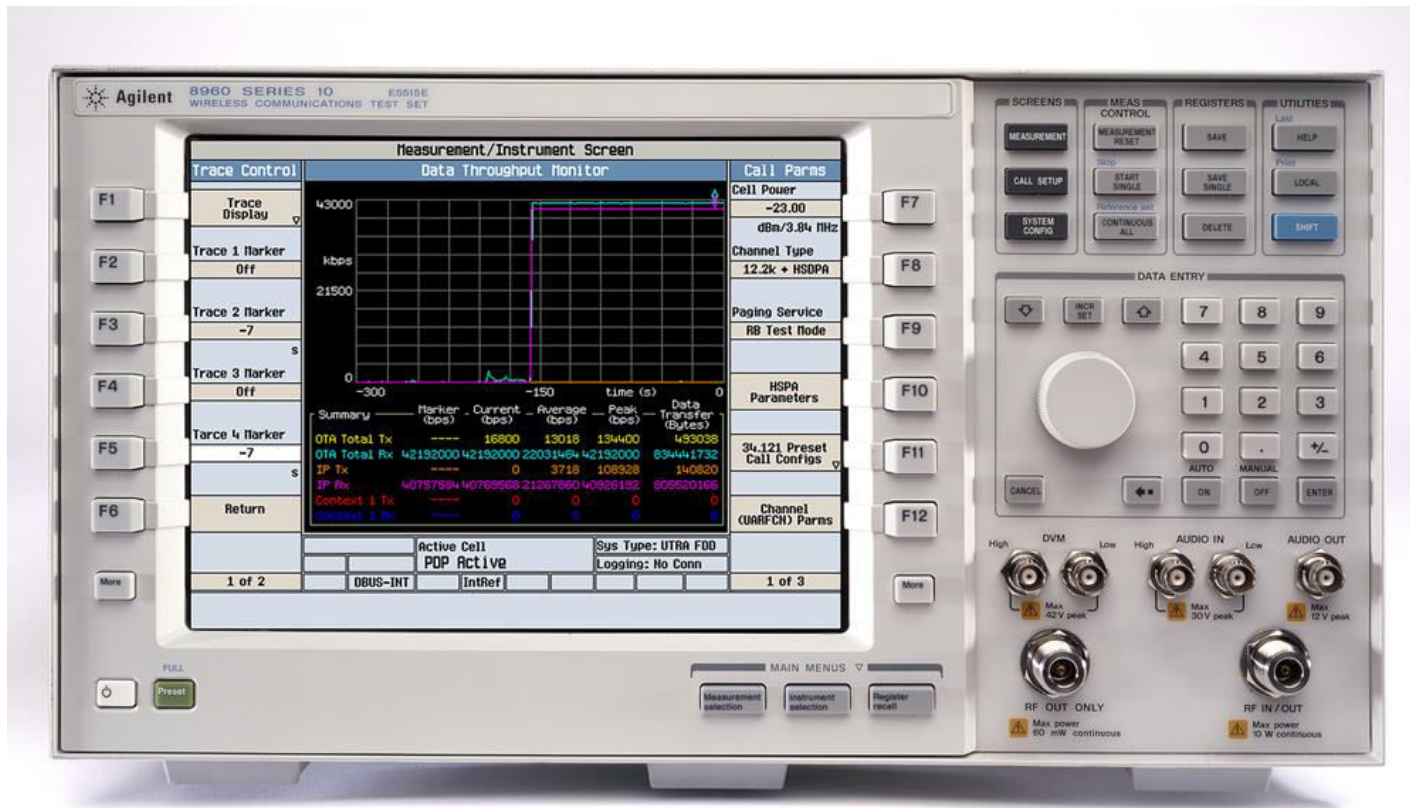
Agilent Technologies 8960 Series 10

The meter for approval testing of a GSM terminal consists of three essential components:

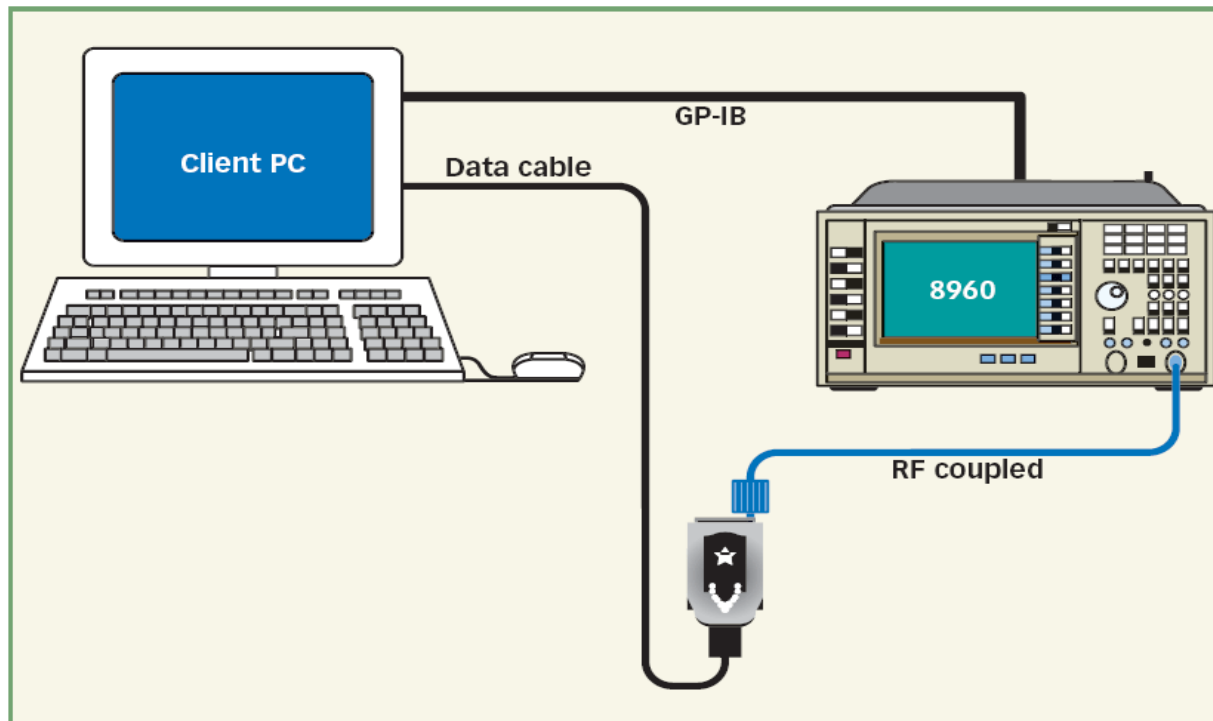
- A radio test simulator (eg Agilent 8960)
- A computer
- A test application installed on the computer (eg WTM)

A link between these components is necessary
USB / GPIB

Agilent Technologies 8960 Series 10

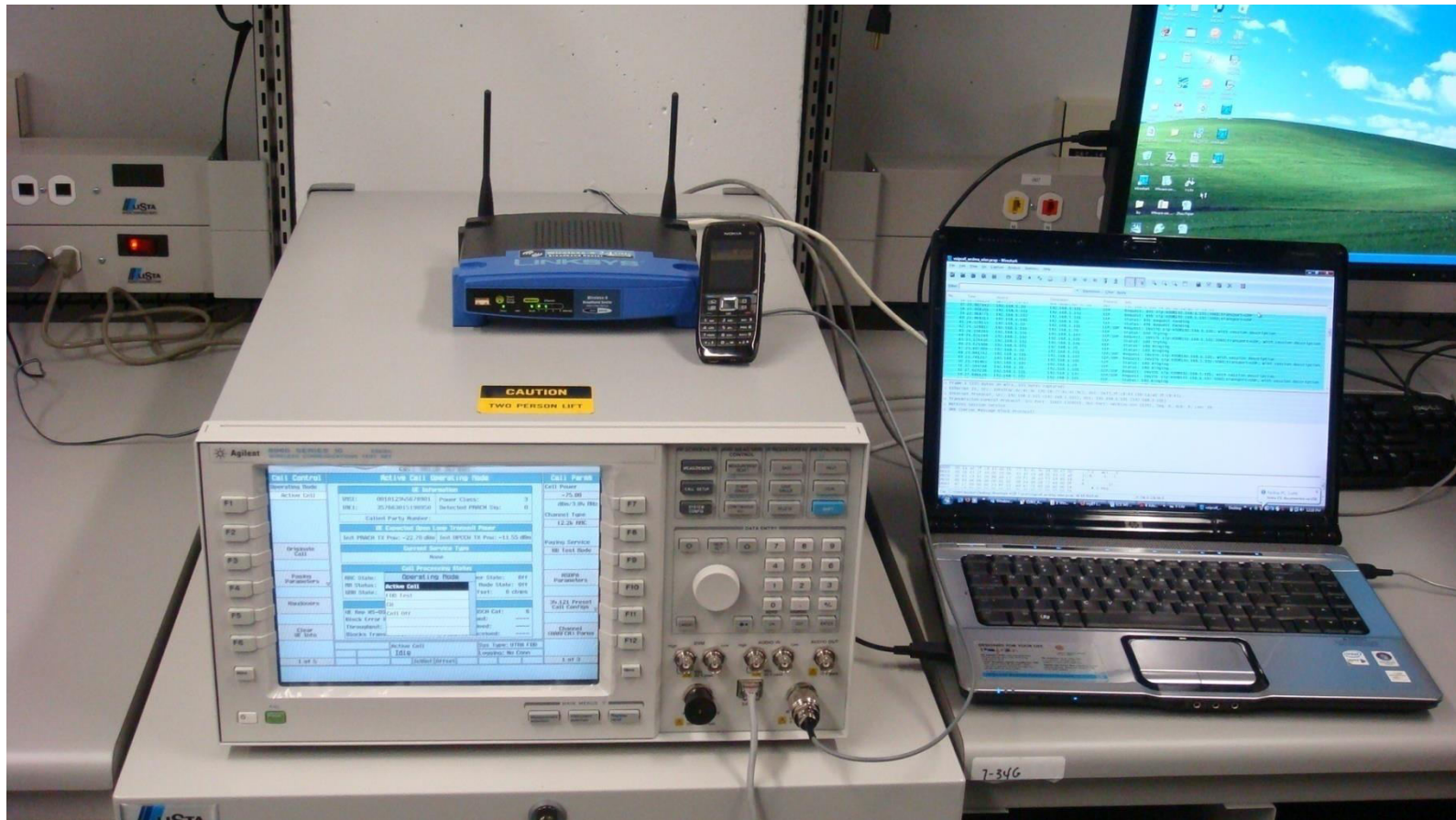


Agilent Technologies 8960 Series 10



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 can be done to a terminal (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 a measurement curve of a spectrum analyzer are:

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

Spectrum Analyzer





Spectrum Analyzer



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



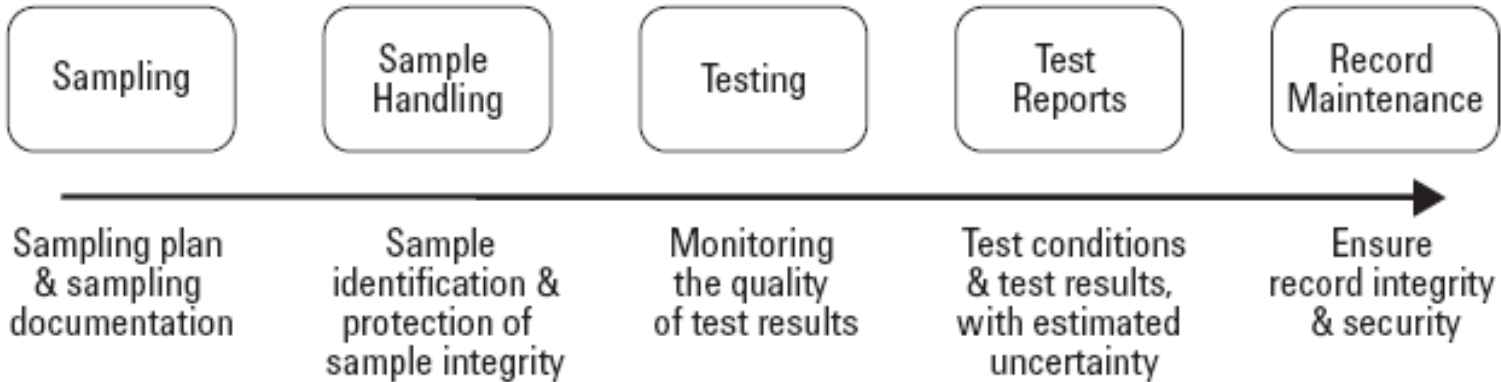


- ISO / IEC 17025 is the global standard for calibration and testing laboratories. This is the reference document for accreditation by a notified version valid organization was published in 2005



- There are two main clauses in ISO / IEC 17025 management requirements and technical requirements. Management requirements are related to the operation and effectiveness of the system of quality management within the laboratory and the requirements of this clause are similar to those of the ISO 9001 standard. The technical requirements cover the skills of the team, the testing methodology, equipment and quality reports on the results of tests and calibrations.

ISO/IEC 17025 Requirements for Testing Laboratories



Compliance across all workflow steps

- Validation of analytical methods & procedures
- Equipment calibration testing & maintenance
- Qualification of material
- Traceability
- Control of nonconforming testing
- Qualification of personnel
- Controlled environmental conditions
- Written procedures

Compliance across the laboratory

Documentation control, corrective & preventive actions, complaint handling, supplier & subcontractor management, non-conflicting organizational structure, internal audits



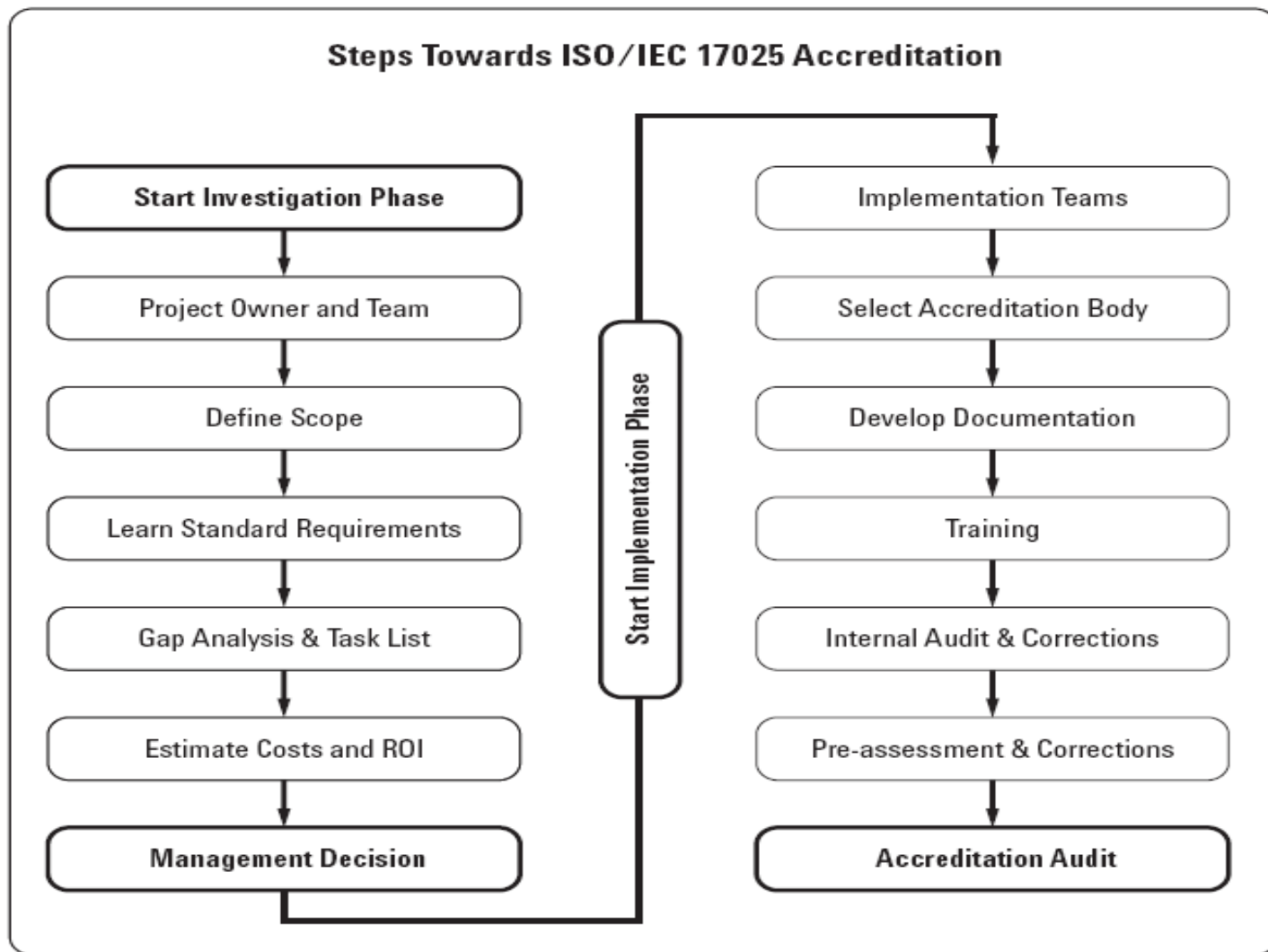
Management requirements

1. Organization
2. Management system
3. Documentary checks
4. Review of requests, tenders and contracts
5. Subcontracting of tests and calibrations
6. Purchasing services and supplies
7. Customer Service
8. Claims
9. Control calibrations and / or non-compliant testing.
10. Improvements
11. Corrective actions
12. Preventive actions
13. Control recordings
14. Internal audits



Technical requirements

1. Staff
2. Housing conditions and environmental
3. Testing and calibration methods
4. Validation
5. Equipment
6. Measurement Traceability
7. Sampling
8. Handling of calibration and testing elements
9. Quality assurance of test results and calibration
10. Reporting of results





In the study phase , information is collected to determine if accreditation is economically reasonable and generally follows the following steps:

- 1 . Management allocates funds and resources to the study.
- 2 . Management refers to a project manager. Ideally, this person should have experience of laboratory operations , business sense , a good understanding of quality systems and excellent communication skills.
- 3 . The project manager must recruit a project team with the assistance of management. The team members must come from the laboratory management , quality assurance of financial services , human resources, training and documentation.
- 4 . The project team determines the scope of accreditation considered. This may include all the calibrations and / or in laboratory tests or only part of them .



5. The project team studied in detail the requirements for accreditation. The main source is the ISO / IEC 17025, with the advice of external experts.
6. The project team is developing a list of requirements. This list should include all the necessary documents for the standard
7. The project team prepared a gap analysis comparing the requirements to what is already available and implemented. A gap exists where the policies, processes and existing procedures are not fully compliant with the requirements.



8. Using the results of the gap analysis, the project team developed the list.
9. The project manager with the help of an external consultant performs a global cost estimate for implementation of the ISO / IEC standard. Costs are compared to the estimated tangible benefits resulting directly from obtaining accreditation
10. The team made a rough estimate of the return on investment in both the short and long term.
11. Management decides to accept or reject these proposals and whether to proceed with the accreditation process.



Once the decision to apply for accreditation to ISO / IEC 17025 plug, laboratory studies, designs and realizes the preparatory documentation for the accreditation assessment. A typical implementation proceeds according to the following steps:

1. The project manager as team implementation in different areas. It is very important that all services involved are represented in the teams at all levels of management.
2. The project manager looking for a notified body and chooses the one that best fits the needs of the laboratory.
3. Teams develop documentation such as procedures under the supervision of the project manager.



4. The project manager sets up the training of the team.
5. The quality assurance department conducts an internal audit and, if necessary, initiates corrective actions.
6. The notified body chosen performs a pre-assessment.
7. The project manager initiates Corrective actions.
8. The notified body carries out an accreditation audit.



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



The approval process in a country is a very necessary step and that 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 via investors and traders.

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



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