

AT4 wireless

Federal Communications Commission (FCC) LTE Test & Certification Overview – GCF/PTCRB



*SPAIN: Málaga - Sevilla - Madrid
USA: Herndon (Virginia)
TAIWAN: Taipei*



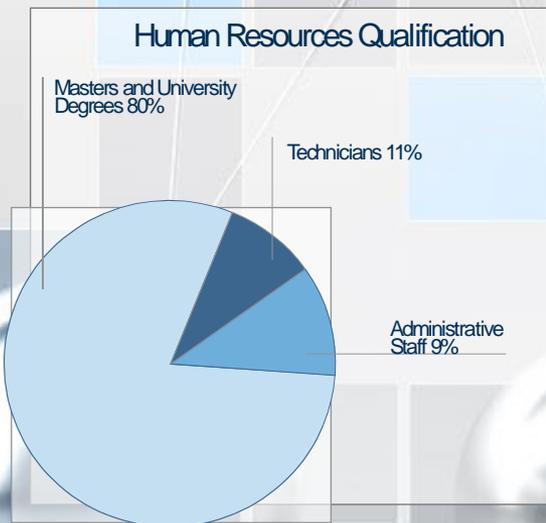
- GCF Overview
- PTCRB Overview
- Certification Program Evolution
- LTE Certification
- LTE Test Cases
- Network Operators



AT4 wireless is a global supplier of Test Services and Solutions for wireless communications industries. Our vision is a global and stable growth, promoting alliances, customers relationships, quality, talent, innovation and technology development.

Human Resources

- *Over 350 people worldwide*



- *Strong cooperation with universities*
- *AT4 wireless is an equal opportunity employer*

Core Activities:

- **Testing Services:** *worldwide network of wireless Testing & Certification Laboratories*
- **Test Systems:** *leading manufacturer of test & measurement equipment for wireless technologies*

Locations



AT4 wireless has currently **3 enabled laboratories in Europe, USA East coast & Taiwan** to offer Testing, Certification, Training and Consulting services

These locations have developed **state of the art test facilities** and strong relationship with Network Operators, other labs and consultants to provide the best support to its clients.

Telecommunications Testing

- GSM/GPRS/EDGE
- WCDMA/HSPA
- LTE™
- Wi-Fi®
- RFID (UHF, HF)
- NFC
- WiMAX™
- Bluetooth®
- R&TTE/FCC
- PTCRB/GCF
- Bluetooth SIG Qualification
- WiFi Alliance
- Continua Health Alliance
- Field Test
- Network Operators Acceptance

Regulatory Testing

- Radiofrequency
- EMC
- Electrical Safety
- SAR
- OTA
- Environmental
- On site testing

Projects

- Training
- Market inspection
- Turn-key Lab Development
- Consultancy
- Product Benchmarking

Worldwide Compliance Services

- Worldwide Approvals Handling Services in over 150 countries
- CE, FCC & IC Certifications
- Research Services
- Other Services

Renewable Energy

- Photovoltaic Modules Testing
- PV system supervision/inspection
- Components Testing (inverters, tracker, etc)

Game and Slot Machines

Calibration



List of
Accreditations



LTE™ Test Systems

- E2010 (Broadband Wireless Test Set)
- T4110 (LTE Protocol Tester)
- T4010 (LTE RF Tester)
- T4020 (RRM Tester)
- S3110B (LTE Mobile Test Application)

MiNT Test Systems

MiNT Cellular

- T1140 (2G/2.5G RF Test System)
- T1150 (3G RF Test System)
- T1152 (HSPA RF Test System)
- T1153 (RRM Test System)

MiNT WiMAX

- E1130 (WiMAX Signaling Unit)
- T223x (Protocol Tester)
- T2110 (Radio Conformance Tester)
- T2100 (pre-RCT)

BITE - Bluetooth Test Systems

- T1111 (RF Tester)
- T1212 (Protocol Tester)

RIDER – RFID & NFC Test Systems

- T3110 (UHF Conformance Tester)
- T3111 (HF Conformance Tester)
- T3121 (HF R&D Tester)
- NFC Forum test suites



- Drawing together leading players from across the mobile industry, the **Global Certification Forum (GCF)** maintains an independent certification scheme for mobile phones and wireless devices that are based on **3GPP (3rd Generation Partnership Project)** and **OMA (Open Mobile Alliance)** standards
 - www.3gpp.org
 - <http://www.openmobilealliance.com/>
 - www.globalcertificationforum.org
- **GCF Certification helps ensure that a mobile device works effectively on mobile networks anywhere in the world.**
 - GCF's guiding maxim is "***test once, use anywhere.***"
- By subjecting new mobile devices to a common set of agreed tests, certification significantly **reduces acceptance testing overheads for individual operators** and makes it easier for manufacturers to offer their devices in multiple markets simultaneously.
- Through its focus on the interoperability of mobile devices and networks, the voluntary GCF Certification scheme complements regulatory type-approval regimes.
- **GCF Certification** is supported by the world's leading **network operators, device manufacturers and other stakeholders such as test system suppliers and test houses**



GCF Drivers

- **Network Operators**
 - Vodafone, Telefonica-O2, Orange, T-Mobile, NTT DoCoMo, VZW, others...
- **Manufacturers (Mobile Devices)**
 - Nokia, LG, Samsung, Motorola, RIM, Apple, Ericsson, Qualcomm, others...
- **Test Industry** - Test Systems & Test Labs
 - AT4 wireless, R&S, Anritsu, CETECOM, others...

GCF Certification scheme:

- Manufacturers **Self Certification Scheme** – (Based on a signed Declaration of Compliance)
 - **Manufacturers are responsible for the certification** by providing the signed Declaration of Compliance confirming, to the GCF, they have successfully passed all the GCF applicable test cases for a device, so that it can be listed in the GCF certified list of devices
 - Manufacturers need to become **GCF Qualified Manufacturer** before being able to certify their devices
 - Testing is required to be performed at **ISO17025 accredited labs** using **GCF validated test platforms**
 - Validated HW/SW configurations for each test case are listed for every Test platform at the GCF website
 - GCF has in place a **rigorous 3rd party validation process for the Test platforms**

Frequency bands of interest for the 3GPP technologies

- GSM/GPRS/EDGE : 900/1800
- UMTS : FDD I (2100 MHz), FDD VIII (900 MHz), FDD III (1800)
- LTE : FDD 1, 7, 13, 20
 - More bands to be added as requested by operators members
- LTE TDD Bands
 - China, India & some US Operators are the main drivers



Test Scope for Certification

- **Conformance Testing**

- To verify **3GPP & OMA conformance specs compliance**
 - Radio / Protocols GERAN-UTRAN-E-UTRAN
 - RF, RRM, Protocol
 - Including Inter-RAT – GERAN/UTRAN/E-UTRAN
 - Applications Enablers
 - MMS, OMA Browsing & Download, LBS SUPL, GAN, VT, etc
- Testing performed in **GCF validated test platforms** (Network Systems Simulators)
 - 3rd party validation process for each test case to be used for certification, for each test platform
 - Validation is maintained up to date – Revalidation process
 - To keep up to date with 3GPP specs revision – 4 times/year



- **IOT – Field trials**

- Following **GSMA test spec DG.11**
 - Static and Mobility testing (drive testing)
- GCF specifies the **requirements with regards to the numbers of combinations of RAN/Core and additional network elements**, as SMS Service Center, MMS, SUPL, OMA Servers, etc that are required to certify a device.
 - Generally, testing of a combination of up to 5 different vendors on the network side is required
 - This usually requires testing in 3 different networks across Europe. Sometimes testing in US or Japan is required to meet all the requirements

- **Performance**

- Only Radiated Performance testing (OTA) so far... (see evolution slide)

PTCRB Certification Program Overview

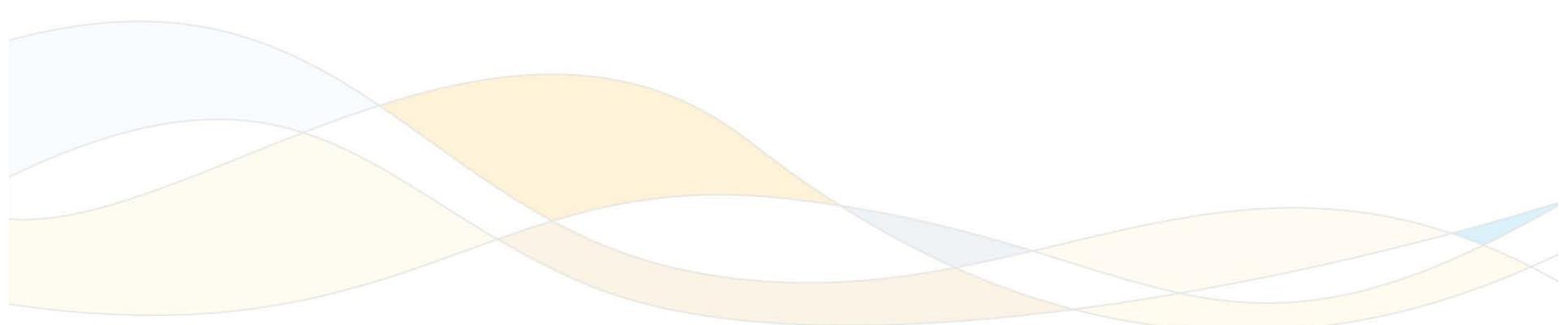
- Lead by North American main GSM operators as **AT&T, T-Mobile, Rogers, Telus, Bell**
 - www.ptcrb.com
 - Frequency bands of focus is 850/1900 for 2G/3G - FDD IV added (T-Mobile)
 - LTE Bands : FDD 12,17, 4, 14, 13
 - PTCRB trying to expand globally as well (Mostly to LATAM and Australia, where common frequency bands allocations exist)



- **CTIA** is the administrator of the PTCRB certification program,
 - CTIA also works on development of test plans used by PTCRB
 - CTIA OTA RF
- **Similar requirements to GCF**
 - **Conformance** : 95% same test scope based on the same 3GPP/OMA specs
 - PTCRB focus on different bands (North American bands 850/1900), but still requires GCF results for certification of the devices (To cover Roaming)
 - Same procedures with regards to 3rd party validation of test systems
 - **Main Differences:**
 - **No Field Trials** requirements in PTCRB
 - **No Self Certification**
 - Apart from ISO17025, **PTCRB requires additional PTCRB** accreditation to the certification labs.
 - **Accredited PTCRB Labs are responsible for device certification**, not the manufacturer as in GCF.



- Certification trending towards **adoption of performance test criteria**
- Possible performance areas of interest :
 - **Battery Life**
 - **Acoustic performance**
 - **Data Performance (Throughput, Roundtrip)**
 - **Heating**
 - **OTA Antenna Performance (single and multiple antennas)**
 - **Service Setup Times, Service Interruption Times during RAT change**
 - **Service Accessibility/Retainability**
 - **User Plane Performance / Signalling Performance**
 - **Video Quality**
- **This would be a fundamental shift within the certification program, expanding conformance/IOT & heading further into performance test criteria.**



GCF and PTCRB were originally established as a certification scheme based on the GSM standard. Both certification programs has subsequently been extended to embrace more advanced 3GPP technologies including WCDMA and HSPA.

LTE - Long Term Evolution – is the next step in the ongoing technological evolution of 3GPP mobile phones and services.

Designed to **deliver further bandwidth and performance improvements compared with current mobile technologies**, LTE has attracted interest from operators with GSM, CDMA and 3G legacy networks.

A **global certification scheme** will be a key milestone along the road to mass market LTE. Establishing an effective certification scheme depends on:

- Stable core specifications
- Readiness of test specifications
- Availability of mature LTE reference terminals for test validation
- Timely investment in test platforms from the test industry.

GCF has been formally **developing LTE Certification since March 2008** and has played a major role in focusing the efforts of manufacturers, operators, standards organizations and the test industry to bring the key building blocks together in a timely fashion.

GCF is currently working towards **introducing LTE certification by the end of 2010**. This will coincide with an expected wave of LTE service and device launches.

LTE is specified for 2 modes of operation : **FDD and TDD**. FDD will be the predominant mode globally, but TDD may have key deployments in China, India and USA

PTCRB joined the same line of activities introducing LTE on their certification program during late 2009 by adopting previous efforts of the GCF & are currently in sync regarding conformance requirements. They differ in the bands of interest and IOT testing (Field testing) approach.

PTCRB validated LTE conformance test cases are currently available for certification. First devices to be **PTCRB certified are expected for ~2011 Q1**.

GCF/PTCRB LTE Conformance testing

- Series 36
 - 3GPP TS 36.521-1 – RF test requirements and procedures
 - 3GPP TS 36.521-3 – RRM test requirements and procedures
 - 3GPP TS 36.523-1 – Protocol test requirements and procedures

GCF			Number of test cases
WI-080 (RF)	FDD 1/3/7/13/20	Prio1	~52
TS 36.521-1			
WI-080 (RRM)	FDD 1/3/7/13/20	Prio1	~25
TS 36.521-3			
WI-081/ WI-082 (Protocol)	FDD 1/3/7/13/20	Prio1	~89
		Prio2	~114
TS 36.523-1			

PTCRB		Number of test cases
RFT 75	FDD 4/12/13/17/14	~50
TS 36.521-1 (RF)		
RFT 75	FDD 4/12/13/17/14	~43
TS 36.521-3 (RRM)		
RFT 75	FDD 4/12/13/17/14	~315
TS36.523-1 (Protocol)		

- **GCF is planning to activate the LTE Certification by Dec 2010**
 - Decision may be made at next GCF meeting – Oct 26-27th 2010 hosted by AT4 wireless in Spain
 - Certification Launch Requirement - 80 % of formally validated Priority 1 test cases are available on each test area (RF, Protocol, RRM)
 - 1 single TP on each WI needs to reach the 80% validation criteria
 - RRM may delay the certification activation by Dec 2010

GCF LTE Field testing

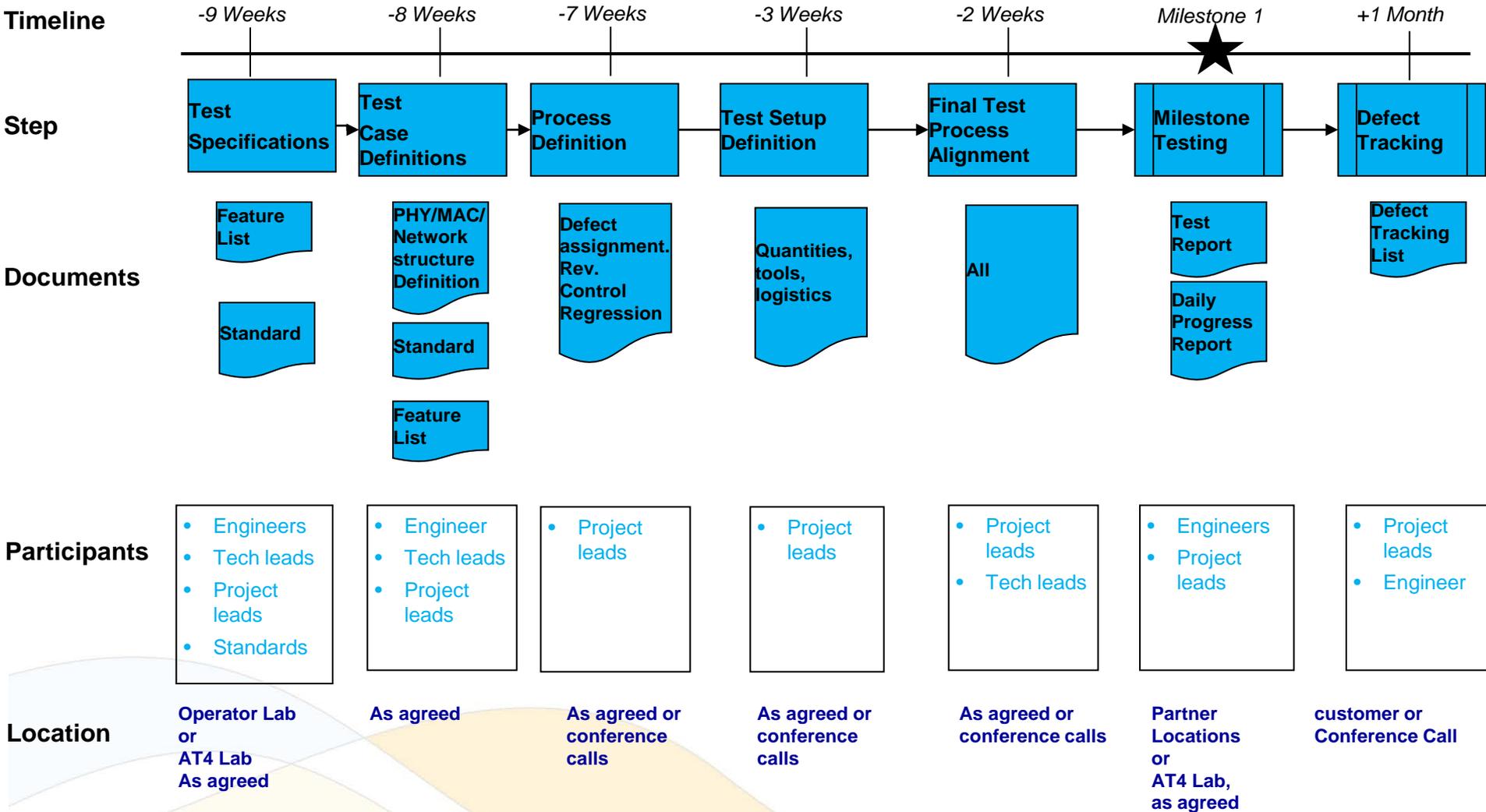
- Extension of **GSMA DG.11** to cover LTE requirements

PTCRB/GCF LTE Performance Testing

- Extension of OTA RF for MIMO – CTIA and 3GPP test plans under development

- **Plausible Carrier Acceptance Test Criteria**
 - **Regulatory**
 - FCC for all the wireless interfaces in the device
 - **Industry certifications**
 - PTCRB, BT SiG, Wi-Fi Alliance, NFC Forum, Continua Health Alliance, CTIA BT IOT, CTIA IEEE 1725 Battery safety, CTIA OTA RF.
 - **Additional requirements** defined by each operators
 - **Lab Network IOT**
 - May be based on **GSMA DG.11** spec (Lab testing) + Operator may own requirements
 - Supplementary IOT + Performance
 - May be performed on the Network Vendor IOT labs
 - E.g: Ericsson, Alcatel-Lucent, Nokia/Siemens, Motorola, ZTE, etc
 - **Possible additional testing** for carrier specific requirements
 - Network Selection, USIM-ME IOT, Data Performance, Radio Performance, AGPS Performance, Audio performance, UI Performance, TTY, MWI, Battery Life, Applications (MMS, Browsing, Email, etc), etc
 - May use simulated environment, with operator developed test cases.
 - IOT and Production/Test Network environments may also be used
 - **Field Testing**
 - May be performed on 5 or 6 different markets across the country
 - Should consider all combinations of operator's RAN/Core/Servers.
 - Should employ a rigorous **Device Program Management Process** and control of SW/HW versions through the acceptance cycle, including comprehensive regression/retesting policies

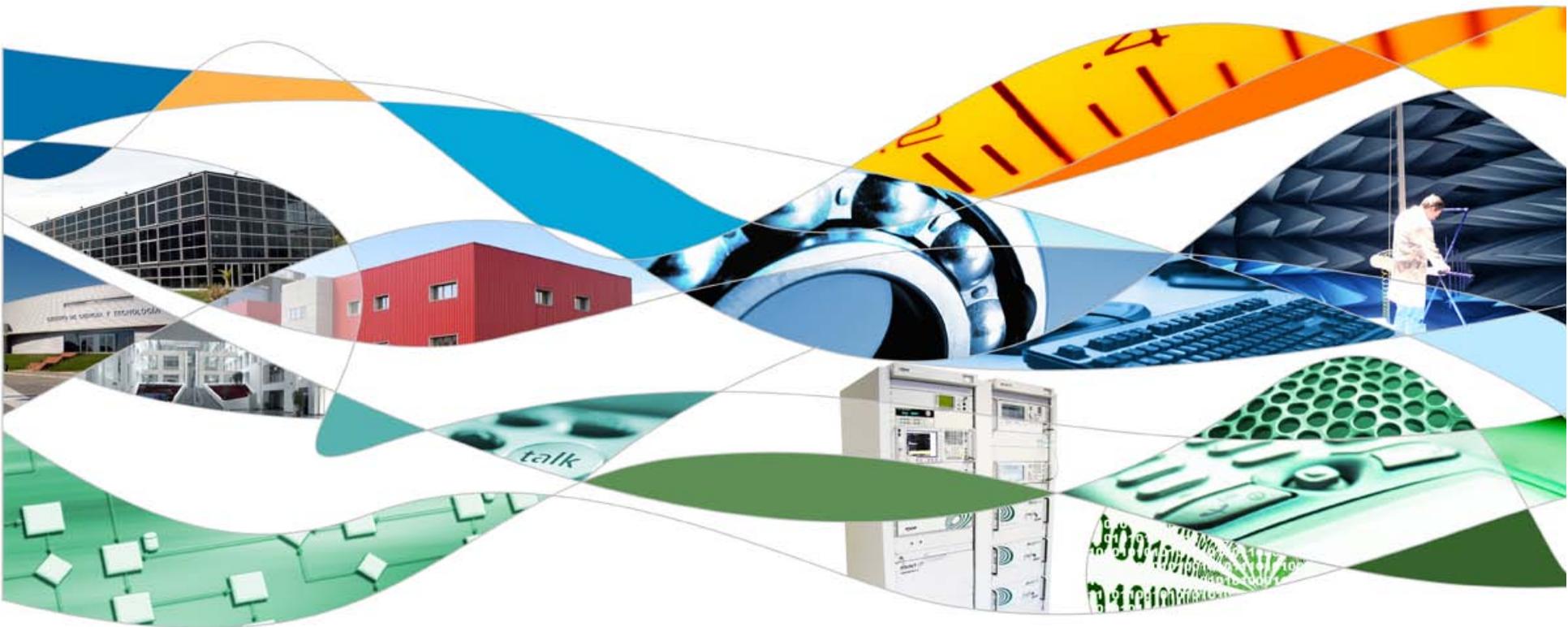
Example Creation of the MNO LTE IOT Program



Once the overall LTE IOT program is detailed, the process for a typical milestone involves significant pre-work.



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CRECIMIENTO EN COOPERACIÓN

COOPERATION IN GROWTH