

ACB

Module Assessment and Integration

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ACB

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Your Certification Resource

American Certification Body, Inc.

Introduction

- American Certification Body (ACB)
 - Notified Body to the RE Directive
 - Notified Body to the EMC Directive
 - TCB (Certification Body) for FCC (USA)
 - FCB (Certification Body) for ISED (Canada)
 - RCB (Certification Body) for MIC (Japan)
 - CB (Certification Body) for OFCA (Hong Kong)



Introduction

- American Certification Body (ACB)
 - Compliance Management and Support
 - Product Compliance management
 - Identification of testing or regulatory requirements
 - Test planning, writing and checking
 - Compliance update gap analysis
 - International Approvals (GMA)
 - Training courses



Introduction

- American Certification Body (ACB)
 - Worldwide offices
 - England
 - Netherlands
 - Finland
 - USA
 - China
 - Taiwan



Introduction

- Michael Derby
 - Background
 - Manufacturer – Product Test and Development
 - Including EMC Testing
 - Test Lab – Testing and Consultancy
 - EMC, Radio, RF Exposure
 - Europe and USA
 - Industry participation
 - ETSI standards writer / contributor



Introduction

- Michael Derby
 - Now: ACB
 - Senior Regulatory Engineer
 - Director of ACB Europe
 - Certifying Engineer
 - EU, USA, Canada, Hong Kong
 - Research and training



Introduction

- Michael Derby
 - Other Industry Organisations
 - TCB Council USA – Board of Directors
 - Active member of the REDCA and EUANB
 - TCB Council and REDCA Liaison
 - Secretary of the EMC Test Lab Association
 - Member of many Industry Compliance Groups



Introduction

- Modules
 - Why do I always talk about modules?
 - Who cares about modules?
 - Everyone, it seems
 - Modular Approvals (assessing the module)
 - Including Limited Modular Approvals
 - Using approved modules (Integrating modules)



Why modules?

- A change in Industry
 - It's a wireless world
 - Entrepreneurs and marketing people
 - Laptops with WWAN, WLAN and Bluetooth
 - M2M is growing as an idea and requirement
 - IoT is a desired lifestyle but manufacturers of 'things' are not radio experts
 - Buy a pre-approved module
 - Integrate modules into hosts
 - A challenge for our industry



USA



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USA (and Canada)

- Modular Approvals
 - FCC and ISED have Modular Approvals
 - To “reduce certification” at the host level
 - The EU does not have certification of course; so our need for it is less
 - Over the years it has lead to an assumed “reduction in testing” at the host level
 - This assumption has been incorrect and was recently corrected by the FCC



Modular Approval Types

- What is “Full Modular Approval”?
 - A radio module approved for use in any host
 - The radio transmitter module is fully assessed to the FCC rules and modular approvals requirements
 - The module is intended for any environment
 - Within the scope of the certification parameters
 - In certification terms, this is known as Single Modular Approval



Modular Approval Types

- What is “Limited Modular Approval”?
 - A radio module approved for a specific host or environment and used under control of the module manufacturer
 - The radio transmitter module is fully assessed to the FCC rules but only partially assessed to the list of modular approvals requirements
 - For use in a specific host or environment
 - In certification terms, this is known as:
Limited Modular Approval



FCC Modular Approval

- Full and Limited – Modular Approval
 - The Module will have the FCC ID
 - The module must be labelled with the FCC ID
 - Any host incorporating the module will show that the module is contained within it
 - Contains FCC ID: XXXYYYYY
 - FCC ID will relate to module, not host
 - Modular Approval is defined in Part 15.212
 - Part 15 C, which is unlicensed intentional radiators
 - Licensed devices do also get certified as modules



FCC Modular Approval

- Technical, administrative, testing and certification requirements for Modular Approval
 - A set of criteria exist for full Modular Approval certification, which allows the module to be used in any permitted host
 - If you do not meet all criteria, then you cannot achieve full Modular Approval

Modular Approval criteria shown on the next page:



FCC Modular Approval

- Eight criteria for Modular Approval (15.212)
 1. Transmitter must have its own shield
 2. Must have buffered modulation/data inputs
 3. Must have power supply regulation
 4. Must meet Part 15 antenna requirements
 5. Must be tested in stand-alone configuration
 6. Must be labelled with the FCC ID
 7. Must meet its own FCC rule part
 8. Must meet RF Exposure requirements



FCC Modular Approval

- Eight criteria for Modular Approval (15.212)
 - During the certification application, the module manufacturer will provide a cover letter to explain compliance with all eight requirements in 15.212
 - Cannot exclude one of the 8 and hope it's ok
 - “But we pass the tests, even without a shield!”
 - “But it only operates when it's inside the host!”
 - “Most hosts use that power supply anyway!”



FCC Modular Approval

- Eight criteria for Modular Approval (15.212)
 - I could think like an engineer, or like a lawyer
 - Either way, I meet the same answer
 - It's a clear certification process
 - All 8 are needed for Single Modular Approval
 - Otherwise; it may be Limited Modular Approval
 - Module manufacturers must make instructions to the installer very clear; and they are under increasing pressure to do so (correctly)



FCC Integrating Modules

- Using (integrating) a compliant module
 - Applicable to manufacturers of host equipment which have radio modules installed in them
 - You can rely on the certification of the module
 - No need to get certification of the host
 - In fact; you cannot certify the host based on module certification; unless you do some re-testing
 - This is quite a common mistake
 - The host must state that it contains the module and the host must show the module's FCC ID



FCC Integrating Modules

- Using (integrating) a compliant module
 - You must follow the module's Grant limitations, if any limitations exist
 - Mobile or Portable and safe distance for RF Exposure
 - Permitted antenna types and antenna gains
 - Requirement to consider co-location
 - “Co-location” in FCC terms includes simultaneous transmission
 - “No co-location” Grant note for modules is misleading, IMO
 - Being a module certified for ‘mobile only’ RF Exposure conditions would not make it a Limited Module



FCC Integrating Modules

- Using (integrating) a compliant module
 - Host must comply with its own requirements
 - For example, Part 15B sDoC
 - The person / company selling the host is responsible for the whole product they provide
 - As with the EU RED, the whole final product must comply and re-testing can be necessary
 - All spurious emissions of the whole final system
 - Checking the transmitter spurious emissions has only recently been clarified by the FCC (October 2016)
 - New guidance document in progress



FCC Integrating Modules

- Using (integrating) a compliant module
 - Host must comply with the FCC requirements, including any modules contained within it
 - Part 15.31 states that all transmitters must be active during transmitter emissions tests
 - Test emissions when co-locating modules
 - This is in addition to the host's own testing
 - Device must meet the output power limits per band
 - For example, co-locating multiple 2.4 GHz devices means that the total sum power must not exceed the limit
 - When they simultaneously transmit



FCC Integrating Modules

- Using (integrating) a compliant module
 - May need to work with module manufacturer
 - If co-location or SAR is a problem on module's Grant, module Grantee may need to be involved
 - Responsibility for compliance also remains with the module Grantee after installation
 - This is why the module's installation instructions are so very important
 - FCC gets calls "I bought a module, what do I do?"
 - This should not happen!



FCC Limited Modular Approval

- If it doesn't meet all eight criteria, it could get "Limited Modular Approval" for a specific host
 - If the host or end environment is known, Limited Modular Approval may be possible
 - Limited to application
 - Limited to host
 - Limited to installer (typically Grantee or partner)
 - There are differences in test method
 - There are differences in certification process



FCC Limited Modular Approval

- You can't just sell an LMA module to anyone, as if it had full Modular Approval
 - That's the whole point of modular approvals!
 - You cannot miss one of the eight, so call it LMA and sell it as if it was a fully certified module
- The Grantee remains responsible for compliance in any host
 - Module manufacturer should not assume that the installer knows to re-test the host with LMA



FCC Limited Modular Approval

- The LMA module will be certified for a host or series of hosts, similar in construction
 - The LMA module will be certified for use in that host or series of hosts only
 - Compliance with that range of hosts will have been demonstrated and no other hosts are covered
 - Additional host series can be added to the module's certification through a change in the module's certification



FCC Limited Modular Approval

- Installing an LMA module
 - Check that your host is a permitted host
 - This should be clear in the installation instructions
 - The FCC Grant may list host(s) permitted
 - Re-testing of some test cases and change to the certification of the module may be necessary if the host has not been authorised already at the time of module certification, for LMA



FCC Limited Modular Approval

- LMA module should be tested in a host
 - The LMA does not meet all eight criteria, so it must show that it can comply when in the host
 - Cross-coupling if no shield
 - Voltage input if no regulator
 - The LMA should not be tested stand-alone
 - Although often they are, and it's possible, but that does mean re-testing in hosts
 - Dissimilar hosts may require separate testing



FCC Limited Modular Approval

- Full or Limited Modular Approval?
 - The module's FCC Grant will show if it is Single Modular Approval (Full) or Limited Modular Approval (LMA)
 - The module's certification filing should list all hosts and/or conditions permitted for that module
 - The installation guide should clearly state the limitations and any further actions required



Useful Module KDB

- If you are in the module business
 - Most important one is: **KDB 996369**
 - KDB 784748 contains labelling requirements
 - KDB 447498 contains RF Exposure, MPE and SAR test guidance
 - KDB 616217 contains SAR host guidance



RF Exposure

- Host not known for Full Modular Approvals
 - Most modules are certified Mobile ($>20\text{cm}$ use) unless the transmitter power is low enough to allow any distance of use in any host
 - Module manufacturer calculates safe user distance
 - Provide instructions to the installer for antenna location, distance and co-location
 - Recommended to explain FCC multi-transmitter procedures



RF Exposure

- Mobile Module into a Portable Host
 - Module certified as Mobile at >20 cm
 - Installer wishes to put into a Portable Host (<20 cm)
 - Is the output power above the threshold?
 - If so, then SAR testing is most likely required
 - Perform SAR test on host and module combination
 - Module manufacturer may need to amend their certification



Final Host Assessment

- Re-Certify or Re-Test?
 - FCC is taking a more 'holistic' approach
 - FCC emphasis on assessment of final product; in cases where a certified module is used
 - Modular Discussion Group working with the FCC to determine some clear guidance for the industry
 - We may amend the modular KDB to clarify that testing on final system is necessary
 - Including guidance on how to test each transmitter mode



Final Host Assessment

- Re-Certify or Re-Test?
 - Module discussions for FCC and a more ‘holistic’ approach to compliance
 - It’s a reminder that “modular approval” was intended as a solution to save the installer from the requirement to **certify** the final end product; but it was not intended to avoid any future **testing**
 - Save time and money on the authorisation process, but the installer still has responsibility for final the product compliance



Final Host Assessment

- Re-Test the final system/product
 - Should only be necessary to do simple checks
 - Check the transmitter power is ok
 - Check the transmitter spurious emissions in the worst case mode
 - Module's test report is available online
 - If you find it is failing, it must be fixed!



EU



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EU RED Modules

- Modular Approval in the EU?
 - There is no such thing
 - If a radio module meets the definition of radio equipment in the RED, it must be assessed and must comply with the RED
 - Even if only sold business to business in the EU for installation into other devices, it is considered 'placing on the market'
 - The module is then CE Marked to the RED



EU RED Modules

- Modular Approval in the EU?
 - Module manufacturer is responsible for the compliance of that module, as a radio device
 - No unique rules to assess a radio module
 - Module manufacturer is expected to assess the module for its intended environment
 - This means different things to different people
 - Not all CE Marks are equal
 - Instructions to the installer should be very clear



EU RED Modules

- Modular Approval in the EU?
 - Radio assessment should be easy
 - It will most likely have an antenna and/or an antenna port from which to make measurements
 - EMC is more complicated
 - Consider ESD (VCP/HCP) and Radiated Immunity
 - Or maybe add cables and do more
 - Safety is important but may be minimal
 - Includes RF exposure



EU RED Modules

- Installer of a CE Marked radio module
 - If the module is later plugged into a host by the user and removable, like a USB dongle; then the radio module assessment remains separate from the assessment of the host
 - If the host is a vehicle or a fixed installation, the radio module assessment remains separate from the assessment of the host



EU RED Modules

- Installer of a CE Marked radio module
 - In all other cases (the other 99.9% of cases), the module is 'lost' and a new product is made
 - The manufacturer of the new product (typically the manufacturer of the host) is responsible
 - They are now a 'radio equipment manufacturer'
 - They apply the RED to their device, even if they applied other Directives before they had a module
 - They must fully 'assess' their final product to the requirements of the RED



EU RED Modules

- Installer of a CE Marked radio module
 - Article 3.1a; Product Safety
 - Product Safety must be assessed at the final product level
 - RF Exposure would be considered at the level of the final product
 - MPE calculations may be trusted from the module
 - SAR testing would be performed on the host



EU RED Modules

- Installer of a CE Marked radio module
 - Article 3.1b; EMC
 - EMC must be assessed at the final product level
 - If the module's assessment was relevant to the final installation then that test may not need to be repeated, but that is a very rare and unlikely situation
 - In most cases, full EN 301 489-x testing is performed on the final combination of host and module



EU RED Modules

- Installer of a CE Marked radio module
 - Article 3.2; Radio
 - Radio performance must be assessed at the final product level
 - Often the conducted antenna port measurements are not repeated at the final host level; such as output power, bandwidth, transmitter timing, etc.
 - Radiated tests should be repeated at the host level
 - Also consider tests which were 'conducted' but could be affected if the module's antenna is inside the host product; such as output power and receiver performance



EU RED Modules

- Compliance with the RED
 - The installer's Technical Documentation
 - To have 'presumption of conformity', the installer must have test results to show compliance of their product to the harmonized test standards
 - If they do not have all those test results, they do not have 'presumption of conformity'
 - It may be hard to obtain the module test reports
 - Module test results do not always relate to end product compliance



EU RED Modules

- Compliance with the RED
 - The installer's Technical Documentation
 - A lack of full test data on the end device will mean the manufacturer of the host product needs to consider this as part of their risk assessment
 - The manufacturer's risk assessment will include decisions of which tests are repeated, or not
 - Technical Guidance Notes and ETSI standards exist as guidance to help the module installer



EU RED Modules

- Compliance with the RED
 - The installer's Technical Documentation
 - For Article 3.2 (radio performance), a lack of full test results to the harmonized standard does require the involvement of a Notified Body
 - For Article 3.1 (safety and EMC), a lack of full test results to the harmonized standard does not mandate the involvement of a Notified Body
 - In all cases, Notified Bodies can be useful for assessing the data of the final product and issuing an EU Type Examination Certificate to the RED



Questions?

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