Considerations of “Soft” Configurations or Configurations of “non-Software Defined Radios”

TCB Workshop April 2013
“Hard” Configurations:
- All frequency determining circuits including power, modulation, tuning etc. fixed in the hardware design without user configuration control (limited control to adjust power for installation and gain)

“Soft” Configurations:
- Some frequency determining parameters configured through non-hardware means; such parameters may include power tables, antenna calibration, frequency options based on location, sensor based control, country of operation based configurations, etc.
“Soft” Configuration – Why?

- Permit design flexibility for a range of products
- Allow same base design to be used in multiple configurations
  - Adjust for variation of different regulatory requirements
  - Permit product evolution
- Adjust for product manufacturing process and component variations
“Soft” Configurations – How?

Many different approaches are possible, for example some combinations of the following may be used:

- ROM based configurations
- EEPROM (with or without field programmability) with or without unique hardware tokens for specific categories
- Sensor based (proximity, location, etc.)
- Boot-load and / or BIOS based configuration
- Software Driver based (authenticated or system controlled)
- Network or system management based (local or through network connection)
- External Database
- Over-the-air software uploads
- Service provider based
- User interface based
Compliance Considerations

- Grantee is required to ensure compliance of the approved device under all operating conditions and modes.
- Many rule parts place special conditions on user access to operating parameters, for example:
  - Part 15 restrictions on user programming and access (§ 15.15)
  - Part 15 restrictions on master and client devices (§ 15.202)
  - Part 90 front panel programming restrictions (§§ 90.203(g) and 90.427 (b))
  - Part 95 restrictions (§§ 95.645 and 95.655)
Compliance Approaches

Grantee maintains complete control of how the parameters are configured and does not allow third party (users, installers, integrators, service centers, etc.) access to set or adjust parameters

- *Operational description must be clear if such configurations are part of the design and how control is maintained* (TCB must ask for this and review it)

- No user controllable or configurable software or network based software is provided

- Alternative is to consider Software defined radio approvals
Modular Certifications

- Grantee must ensure all the configurations that determine compliance are part of the module and the operation description makes it clear in the filing.

- If the grantee (or through licensed third party) uses software or other host based means to configure the module for compliance:
  - This must be clearly described in the operational description.
  - Modules cannot be programmed through country code or other control settings unless approved by FCC (by PBA).
  - Software to control duty cycle for compliance must be clearly described and approved – with very specific OEM instructions and approval; duty cycle range must be fixed in the software to ensure compliance.
  - The Host integrator shares responsibilities in compliance.
  - OEM integration documentation must make the information clear.
  - Host may require its own approval.
“Soft” Configurations - Alternatives

- **Software Defined Radio (SDR) Approach**
  - It may be appropriate to get approval as SDR to demonstrate compliance using different configuration approaches

- **Split-Module with or without Limited conditions**
  - For modules, where functions are shared between modules and host, it may be possible to split certain control functions
  - Appropriate authentication and validation approaches must be approved by FCC
Non-SDR Special Cases

- Under certain circumstances grantee may be permitted to perform “over-the-air” software upgrades or allow approved parties to perform the functions (KDB 178919)
- Other special arrangements may be considered on a case-by-case basis
- TCB must ensure that any special cases are pre-approved by FCC
Certain Part 15 devices may have the ability to operate outside the authorized band:

- This is only permitted for client devices as described in § 15.202.
- Clients must be truly passive and must wait for an “enabling” signal which permits transmission on that frequency.
  - This is not a “country code” setting
- Master must not transmit on non-US frequency
  - Operational description must include how the master is prohibited from transmitting in such frequencies
- For devices that act as “master” in some bands and “client” in other bands the description must explain how this is achieved and managed
Compliance for other modes

In some cases compliance may be achieved under the guidance of authorized master:

- Devices may support Wi-Fi Direct in bands where an authorized master (for example with DFS and radar detection capability in the UNII band) is operating.
  
  - In this case the devices must operate on the same frequency as the master and must move when the master initiates a move.
Compliance for other modes

Indoor operation compliance

- In the bands requiring indoor operation, the device must be programmed to detect indoor operation, or
  - Device must be connected to AC Power(*), or
  - Device must be under the control of a local master that is acting as an access point and is connected to AC Power(*)
    - Normal “hot spot” in portable devices are not acceptable
    - Remote connection over to network service provider are not acceptable
    - (*) AC Power means “mains” and not through portable DC inverters
Device Configurations through Country Code

Device Configurations through Country Code are not permitted for compliance purposes when codes are not directly programmed in the hardware,

Following configurations generally not permitted for non-SDR without prior approval

- Modular transmitters programmed through host interface for country code compliance unless Host is also certified for compliance
- Mobile Country Codes (MCC) or Mobile Network Codes (MNC) are not acceptable for programming host compliance
- Country codes entered through other interfaces provided to users, network, device driver etc must not be used to rely on compliance
Extended Frequency Operation

Devices with “extended frequency” operation approved on grant listing must not rely on user configurations
  - Operation description must clearly show how the control is maintained in US for compliance

Where frequency operation is permitted under multiple rule parts with software configuration
  - Operational description must explain how control is maintained and compliance assured for each rule part
Devices subject to user programming restrictions like front panel programming or frequency programming and using software for configuration:

- Operation description and user manual instructions must be included to show how compliance is assured
- Any software or service center control capabilities must be described
Comments on Proposal

Propose to modify KDB Publication:
- KDB 594280 (Software Configuration Control)
- KDB 996369 (Modular Transmitter Guide)
- Include some of the discussions in this presentation and plan for further guidance

Draft KDB publications will be created to invite comments prior to modification of the current versions. We invite comments on:
- Proposed clarifications
- Areas that need to be further addressed
- Questions or concerns on the proposals
- Other comments
Questions and Answers

Thanks!