KDB Guidance Document:
Certification and Test Procedures for Citizens Broadband Radio Service Devices Authorized Under Part 96 of the Rules

940660 D01 Part 96 CBSD v01

Comments of Nokia

June 14, 2017

Nokia hereby provides Comments to the above-captioned draft guidance document. We also consider how some of the procedures match to the relevant Wireless Innovation Forum (WInnForum) SAS-CBSD protocol and SAS-SAS protocol specifications.[1] (In addition to this submission, Nokia has provided inputs to the WInnForum for incorporation into its submission in response to this guidance document.)

Page	Text of concern	Comments
2	CBSDs are required to demonstrate the capability to access at least one Spectrum Access System (SAS), which authorizes and manages CBRS spectrum use.	This seems to suggest that for passing certification, the CBSD UUT needs to pass test cases with the SAS test harness **and** provide proof of working with at least one certified SAS. Suggestion: Add a statement such as: "Successful testing of a CBSD with an FCC approved test suite involving a SAS test harness will satisfy this requirement."
2	It also specifies verification tests and recommended procedures for demonstrating compliance with the rules governing the connection and interaction between the CBSD and one or more SASs.	The CBSD can connect to a single SAS at a time. If it attempts to connect to another SAS, this constitutes a new and separate registration. Suggestion: Add a statement such as: "A CBSD that is designed to connect to multiple SASs but only serially can demonstrate compliance by successful testing with an FCC approved test suite involving a SAS test harness."

[1] These WInnForum specifications can be found at: https://workspace.winnforum.org/higherlogic/ws/public/documents?view.

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3	a) The ability to compel the device-under-test (DUT) to operate on a channel selectable by test personnel.	Suggestion: Add a statement such as: "This operation can be tested by having the SAS provide a grant in the chosen channel and verifying externally that the CBSD under test is transmitting in that channel."
3	b) The ability to vary the output power from the minimum to the maximum realizable levels and set it to a desired level.	Suggestion: Add a statement such as: "This operation can be tested by having a SAS test harness cycle the CBSD through a series of spectrum allocations with varying power and measuring the output power."
3	c) As needed, the ability to continuously transmit a modulated signal (i.e., with no time bursting or signal gating applied).	Since many CBSDs are likely to support TD-LTE where transmission DL alternates with receiving UL, this would require a special mode for the radio. Please be specific about what needs may be found that would require this continuous transmission, what power levels would be used, what frequency range(s) might be tested, etc.
3	d) The ability to enter all required SAS registration information.	CBSDs may be designed such that a significant amount of registration information is entered directly into the SAS by the CBSD vendor or by the CBSD User/Owner. Examples include the User/Owner name and contact information, antenna characteristics that apply to all units of a particular model from the CBSD vendor, EIRP capability, measurement capability, etc. There may be no provision in the CBSD software to hold or transmit all SAS registration information.
3	e) The ability to view all information provided to the radio by the SAS.	This function can most easily and reliably be provided by an external protocol analyzer. If a SAS test harness is used, it can output a log file of all messages sent to/received from the CBSD under test. It would be burdensome to require that the CBSD under test or Domain Proxy under test be able to provide such a log capability.

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4	1. Geo-location Must determine its location to an accuracy of ±50 meters horizontal and ±30 meters of elevation. For non-professional installed devices it must report any location changes within 60 seconds.	The R&O specifies a vertical accuracy of ±3 meters. Maybe a clarification is needed. Suggestion: The last sentence should also indicate that a location change greater than these accuracies must be reported for all CBSDs within 60 seconds. This would assume that it would only apply to CBSDs that continue to transmit during the period of the location change. Perhaps: "Locations changes greater than these accuracies must be reported within 60 seconds."
4	2. Operability (Two-way communication) Devices should be able to transmit and receive any communication on any channel assigned by the SAS and respond accordingly.	The expression "any communication" includes transmissions of a different radio technology that may not be known or understood by a CBSD configured to operate with a given radio technology. Suggestion: Reword as such: "Devices should be able to transmit and receive on any channel assigned by the SAS."
4	The management software must be able to collect the data listed below.	It is understood that "management software" here refers to the SAS/SAS test harness communicating with the CBSD under test, since it is in the particular position of verifying that all data required for registration is available.

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4	iv. Requested authorization status (PAL or GAA)	The CBSD that uses the WInnForum protocol does not request a PAL/GAA authorization. PALs and PPAs are already known to the SAS. A request for a given spectrum range to the SAS will result in the SAS determining if the CBSD is entitled to PAL protection for that range. If so, the SAS response will indicate "PAL." If not, the SAS response will indicate "GAA." This avoids much complexity of having to program into the CBSD what PAL ranges it has, and having to reprogram them when PAL auction results change. It is also possible to build a CBSD that can transmit on multiple frequency ranges from the same antenna, and that while one of these ranges may be for a PAL for that CBSD, another range may be GAA for that CBSD. Thus, a CBSD is not a "PAL CBSD" or a "GAA CBSD." It is a CBSD that has a spectrum grant that is either PAL or GAA with respect to that CBSD. In the case of presence of an incumbent, the SAS may need to move that CBSD from a PAL frequency range to another frequency range that would not be PAL for that CBSD. <u>Suggestion</u>: Remove this item from the list.

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4	vi. Call sign (PALs only)	A CBSD may have a spectrum grant at one point in time that would be a PAL grant with respect to that CBSD, and a GAA grant at another time. The CBSD could be already installed and operating only with GAA grants. When its Owner/User obtains a PAL at an auction, the CBSD could begin operating with a PAL grant. - Would the CBSD be required to be reprogrammed to add a Call Sign? - If a CBSD was switched from a PAL grant to a GAA grant due to incumbent presence, would it need to delete its Call Sign (i.e., "PALs **only**")? - And would the Call Sign need to be reinstalled when the SAS moved the CBSD back to the PAL grant after the incumbent was no longer present? <u>Suggestion</u>: If a Call Sign is significant, perhaps it should always be required for a CBSD, but could be entered by the CBSD Owner/User into the SAS directly, rather than requiring any modification of the CBSD.

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5	4. Signal level reporting A CBSD must report to a SAS received signal strength in its occupied and adjacent frequencies, received packet error rates, and other common standard metrics of interference for itself and its associated end user devices as directed by SAS.	The WInnForum measurement reporting requires that a CBSD with measurement capability "RECEIVED_POWER_WITHOUT_GRANT" must measure Received Power in the entire CBRS band in 10 MHz segments and report that at least at the time of the first Grant Request. A CBSD with measurement capability "RECEIVED_POWER_WITH_GRANT" performs and reports Received Power measurements over one or more frequency ranges that do not exceed 10 MHz per measurement report. The measurement report(s) are sent to the SAS in the subsequent Heartbeat Request message. This method is deemed sufficient for compliance with Part 96, since measurements are obtained and delivered to the SAS. There is no provision in the WInnForum protocol for packet error rates at this time, since packet error rates can be controlled by at least the EUTRA radio interface, thereby making them less useful.
5	5. Frequency reporting If directed by the SAS, a CBSD that receives a range of available frequencies or channels from an SAS must promptly report to the SAS which of the available channels or frequencies it will utilize.	The WInnForum protocol uses a different procedure. The CBSD requests a single specific frequency range in a Grant Request that is either accepted or rejected by the SAS. In this way, there is synchronization on spectrum allocation between SAS and CBSD without further messaging or uncertainty on the part of the SAS. <u>Suggestion</u>: It should be stated that a protocol that allows a CBSD to ask for a single frequency range grant and allows the SAS to accept or reject that specific grant request meets this requirement.

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5	1. Power limits and power management All CBSDs must meet both, the maximum EIRP limit and maximum PSD limit.	This text implies that all CBSDs must be capable of transmission at the maximum EIRP of their category (A/B). This text would disallow CBSDs that are designed to operate at less than the maximum EIRP of their category. Suggestion: "All CBSDs must meet both the maximum EIRP limit and maximum PSD limit capabilities declared by the manufacturer."
7	c) Will the device change its operating power and/or channel in response to a command from an SAS?	The WInnForum CBSD concept is that the CBSD (after successful registration) requests a grant that includes both the allowed frequency range and the maximum EIRP to be used. The SAS does not command the CBSD to change power level or frequency range. The SAS may revoke a grant with a suggestion for a new grant. The CBSD may choose to ask for a new grant using the suggestion frequency range and power level.
7	a), c), d), e), f), g), h)	These sub-items are asking questions. They should be changed to reflect a test case result, e.g. "a) The DUT will only transmit after receiving authorization from a SAS."
7	1. Will the device correctly configure based on the different license classes?	The CBSD does not change configuration. It is either registered as Category A or B. PAL and GAA grants operate exactly the same at the CBSD, with the SAS being responsible for PAL and incumbent protection.
7	2. Will the device change power levels on commands from the device?	The SAS does not command the CBSD to change power levels. It can revoke the Grant and suggest a new grant with a different power level.
7	4. Will the device send measurements in response to the command from the SAS?	The SAS is restricted from requesting measurements that are outside the capabilities reported by the CBSD.

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7	e) Is the device capable of signal level and frequency reporting to SAS?	The frequency in use by the CBSD is known to the SAS as a result of the Grant procedure. Signal level reporting is interpreted here as "measurement reporting" as covered on page 5. Suggestion: "The device shall report measurements to the SAS per the measurement capabilities it has registered."
7	f) For a device that operates as a Category A and then as a Category B (or vice versa), will it notify the SAS of the change and report the necessary information?	The WInnForum procedures require that a CBSD must re-register if it wants to operate as a different category CBSD. Such notification would then be handled as a Registration Request.
7	g) How compliance with all requirements is met when CBSDs communicate through a management system.	"management system" is interpreted here as "Domain Proxy." If this is not correct, then clarification is required. Compliance would be demonstrated via testing of the Domain Proxy + CBSD together.
7	1. How would CBSD react if the communications between the device and the SAS is lost? CBSD should stop transmitting once it loses the link to the SAS.	The WInnForum *transmitExpireTime* timer is used to guarantee that a CBSD that loses communication with the SAS will cease transmission in no more than the 5 minutes specified in Part 96. However, transmission is not necessarily stopped as soon as communication is lost, since communication may be re-established before the *transmitExpireTime* timer expires.
7	3. Review power-on restart process for registration (re-registration) process.	The WInnForum has implemented the "registration" of the R&O in two parts. The first part is a generally static registration of the CBSD with the SAS where all installation parameters are given to the SAS. This registration can remain over multiple power-offs, etc. The second part is the CBSD obtaining a Grant from the SAS to operate in a given frequency range with up to a maximum EIRP level. Thus, power-on of a CBSD may or may not require registration. If the CBSD has stored in non-volatile memory the CBSD ID it received when it registered, it could use that CBSD ID to immediately request a new Grant upon restart.

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7	IV. The device operating procedures if communicating directly to a SAS, or to a domain proxy if that manages multiple devices, must include documentation with detailed explanations for the following for each SAS the device is expected to work	It seems that the required documentation should be required of every device, CBSD or Domain Proxy, that communicates with the SAS. Suggestion: "The device operating procedures of a CBSD that communicates directly with the SAS or of a Domain Proxy that communicates directly with the SAS must include documentation with detailed explanations for the following for each SAS or class of SASs that the CBSD/Domain Proxy is expected to work with, where a class of SASs would be those that implement the same protocol for communication with a CBSD/Domain Proxy.
7	IV. e) How does the SAS validate messages from a CBSD?	This item should be deleted, since it deals with how the SAS receiving the communication from the CBSD/Domain Proxy operates. That declaration should come from the SAS manufacturer.