

TRANSITION: PART 90Z (3.65 GHZ) TO PART 96 (CBRS) MOVING FORWARD



Richard Bernhardt

National Spectrum Adviser, WISPA
WinnForum Spectrum Sharing Committee CBRS Operations
Work Group (WG5) Chair, WinnForum
408-472-0881
rbernhardt@wispa.org

Wednesday, September 23, 2020



Necessary Disclaimer and Disclosures

Absolutely none of the information provided herein should be taken for legal advice or commercial dependence or otherwise.

There may be errors or changes. This is provided as a guideline to seek information for each circumstance. You are advised to seek legal, business, and other professional advice for your needs. This information is provided on an “as is” basis and no guarantee or warranty of its accuracy is herein given.

That’s legal speak for you need to verify your own situation with qualified professionals. This Webinar is just for discussion and to provide a basis for asking questions.



Today's Agenda

Introduction and Disclaimers

1. Overview of Part 90 Subpart z (NN Licenses) 3.65-3.70 GHz
2. Overview of Part 96 Applicable CBRS Rules (GWBL/GWBZ Cat A&B CBSDs in GAA)
3. Transition History and Waiver Request, Recent Order Extending Time
4. What's Needed to Transition from Part 90z to Part 96 CBRS
5. Why this matters? Many fixed wireless deployments in 3.65-3.70 GHz today
6. Equipment Choices including CBSDs Cat A and B, CPE-CBSD (Over the Air)
7. SAS engagement and CPI to Register and Install CBRS Equipment
8. Transition of Old Part 90z Equipment – Some yes...some no
9. New Equipment v. Older Equipment (Can it be Upgraded or Used in CBRS?)
10. Issue of GWBL/GWBZ Protection (Incumbent to GAA)
11. Part 90 Open Issues - ULS Registration
12. What if I need Even More Time - Individual Waivers



Overview of Part 90 Subpart z (NN Licenses) 3.65-3.70 GHz

47 CFR Subpart Z - Wireless Broadband Services in the 3650-3700 MHz Band

§ 90.1307 Licensing.

- (a) The 3650-3700 MHz band is licensed on the basis of non-exclusive nationwide licenses. Non-exclusive nationwide licenses will serve as a prerequisite for registering individual fixed and base stations. A licensee cannot operate a fixed or base station before registering it under its license and licensees must delete registrations for unused fixed and base stations.
- (b) The Commission **shall issue no new licenses or license renewals under this section after April 17, 2015**, except as specified in paragraph (c) of this section.
- (c) If a license issued under this Section expires between April 17, 2015 and April 17, 2020, the licensee may request a **one-time renewal** and the Commission may renew that license for a term ending no later than April 17, 2020. (See info on FCC Extension later in this presentation)
- (d) Licenses that were issued after January 8, 2013 will be afforded protection from harmful interference from Citizens Broadband Radio Service users pursuant to § 90.1338 until April 17, 2020 regardless of their expiration date. (See info on FCC Extension later in this presentation)



Policies governing the use of the 3650-3700 MHz band – Part 90z

§ 90.1319 Policies governing the use of the 3650-3700 MHz band.

- (a) Channels in this band are available on a **shared basis only** and will not be assigned for the exclusive use of any licensee.
- (b) Any base, fixed, or mobile station operating in the band **must employ a contention-based protocol**.
- (c) Equipment incorporating an unrestricted contention-based protocol (i.e. one capable of avoiding co-frequency interference with devices using all other types of contention-based protocols) may **operate throughout the 50 megahertz of this frequency band**. Equipment incorporating a restricted contention-based protocol (i.e. one that does not qualify as unrestricted) may operate in, and shall only tune over, the lower 25 megahertz of this frequency band.
- (d) **All applicants and licensees shall cooperate in the selection and use of frequencies in the 3650-3700 MHz band in order to minimize the potential for interference and make the most effective use of the authorized facilities.** A database identifying the locations of registered stations will be available at <http://wireless.fcc.gov/uls>. Licensees should examine this database before seeking station authorization, and make every effort to ensure that their fixed and base stations operate at a location, and with technical parameters, that will minimize the potential to cause and receive interference. Licensees of stations suffering or causing harmful interference are expected to cooperate and resolve this problem by mutually satisfactory arrangements.

§ 90.1338 Grandfathered operation and transition to Citizens Broadband Radio Service.

§ 90.1338 Grandfathered operation and transition to Citizens Broadband Radio Service.

- (a) Fixed and base station registrations filed in ULS on or before April 17, 2015 that are constructed, in service, and fully compliant with the rules in part 90, subpart Z as of April 17, 2016 will be afforded protection from harmful interference caused by Citizens Broadband Radio Service users until the end of their license term (with one exception that fixed and base stations registered under licenses issued after January 8, 2013 will only be afforded protection until April 17, 2020 – Now October 17, 2020), consistent with § 90.1307. Protection criteria for such registered base stations are described in § 96.21 of this chapter. Registrations originally filed after April 17, 2015 will only be afforded protection from harmful interference under this section within the licensee's Grandfathered Wireless Protection Zone, as defined in §§ 96.3 and 96.21 of this chapter.
- (b) Existing licensees as of April 17, 2015 may add new mobile or portable stations (as defined in § 90.1333) and/or add new subscriber units that operate above the power limit defined in § 90.1333, only if they can positively receive and decode an enabling signal from a base station. Such units will be afforded protection within the licensee's Grandfathered Wireless Protection Zone (as defined in §§ 96.3 and 96.21 of this chapter) until April 17, 2020 – Now October 17, 2020, or until the end of their license term, whichever is later (with one exception that mobile and portable stations associated with licenses issued after January 8, 2013 will only be afforded protection until April 17, 2020 – Now October 17, 2020).

Tier 1: Incumbents

- **Incumbents**



- **Federal government**

- Mainly shipborne radar operated in coastal areas
- Some inland radar sites
- Protected from aggregate interference due to CBRS
- Radar activity is generally detected by Environmental Sensing Capability (ESC) networks; some are informed to SASs by the government through a portal



- **Fixed-satellite service (FSS) receive-only earth stations**

- Approximately 20 extended C-band sites, mostly on east and west coasts
- Most operate down to 3625 MHz, some down to 3610 MHz
- Protected from aggregate interference and blocking interference due to CBRS



- **Grandfathered Wireless Protection Zones (GWPZ)**

- Legacy Part 90 operations in 3650-3700 MHz
- Most GWPZs expire starting in October 17, 2020
- A few will remain as late as January 2023
- Protected from aggregate interference caused by CBRS, until expiration
- Many grandfathered operators are transitioning to CBRS

Overview of Part 96 Applicable CBRS Rules (GWBL/GWBZ Cat A&B CBSDs in GAA)

The Basic Part 96 Rules for Part 90z Operators

Grandfathered Wireless Broadband Licensees - GWBL's get incumbent status in CBRS.

GWBLs shall not cause harmful interference to/with federal incumbents and grandfathered FSS earth stations

GWBL protection only applies in Grandfathered Wireless Protection Zones

Around base or fixed stations that were properly registered in the Uniform Licensing System (ULS) by April 15, 2015

Grandfathered Wireless Protection Zones will not be defined for subscriber units operated by Grandfathered Wireless Broadband Licensees, regardless of whether they have been registered in ULS.

Grandfathered Wireless Protection Zones must be registered in the SAS for these protections to apply.

Grandfathered Wireless Broadband Licensees may operate within their Grandfathered Wireless Protection Zones and operational frequencies consistent with the technical rules in part 90, subpart Z, consistent with the transition period set forth in §§90.1307 and 90.1338 of this chapter.

Grandfathered Wireless Broadband Licensees and Citizens Broadband Radio Service users must protect authorized grandfathered FSS earth stations in the 3650-3700 MHz band, consistent with the existing protection criteria in 47 CFR part 90, subpart Z, until the last Grandfathered Wireless Broadband Licensee's license expires within the protection area defined for a particular grandfathered FSS earth station.



GWBLs in GWPZs – Using Part 90 as an Incumbent

Part 96 GWBLs and Grandfathered Protection Zones (GWPZs)

Each location registered in the ULS before the expiration date mentioned above is protected by a Grandfathered Wireless Protection Zone (GWPZ). Below are a few pertinent rule sections:

§96.21 Protection of existing operators in the 3650-3700 MHz Band.

- (a) Grandfathered Wireless Broadband Licensees shall be granted Incumbent User status consistent with §§90.1307 and 90.1338 of this chapter. Notwithstanding this status, Grandfathered Wireless Broadband Licensees shall not cause harmful interference to federal Incumbent Users and grandfathered FSS earth stations consistent with the rules governing Citizens Broadband Radio Service operators in this part.**
- (1) Incumbent User protections for a Grandfathered Wireless Broadband Licensee shall only apply within its Grandfathered Wireless Protection Zone.**
- (2) Incumbent User protections for a Grandfathered Wireless Broadband Licensee shall only apply to Grandfathered Wireless Protection Zones around base or fixed stations that are registered in ULS on or before April 17, 2015 and constructed, in service, and fully compliant with the rules in part 90, subpart Z of this chapter as of April 17, 2016. Grandfathered Wireless Protection Zones will be reduced in geographic area and/or applicable frequency range if portions of the protected network fail to meet the above criteria after April 17, 2016. Grandfathered Wireless Protection Zones will not be defined for subscriber units operated by Grandfathered Wireless Broadband Licensees, regardless of whether they have been registered in ULS.**
- (3) Grandfathered Wireless Protection Zones must be registered in the SAS for these protections to apply.**
- (b) Grandfathered Wireless Broadband Licensees may operate within their Grandfathered Wireless Protection Zones and operational frequencies consistent with the technical rules in part 90, subpart Z, consistent with the transition period set forth in §§90.1307 and 90.1338 of this chapter.**
- (c) Grandfathered Wireless Broadband Licensees and Citizens Broadband Radio Service users must protect authorized grandfathered FSS earth stations in the 3650-3700 MHz band, consistent with the existing protection criteria in 47 CFR part 90, subpart Z, until the last Grandfathered Wireless Broadband Licensee's license expires within the protection area defined for a particular grandfathered FSS earth station. Thereafter, the protection criteria in §96.17 applicable to FSS earth stations in the 3600-3700 MHz band shall apply.**



47 CFR Part 96, the WinnForum Specifications, References

FCC Title 47 CFR Part 96 Rules: Governing FCC Rules for the 3.5 GHz band, commonly known as CBRS. See the Part 96 rules at the Electronic Code of Federal Regulations:

<https://www.ecfr.gov/cgi-bin/text-idx?SID=c7f0d04cb455d4e41f359a251b4b0435&mc=true&node=pt47.5.96&rqn=div5>

Clarifications and OET Laboratory Knowledge Databases (KDB): These entries at the Office of Engineering and Technology of the FCC provide access to clarifications about the rules, testing and use of CBRS by the FCC. Often in the form of Q&A.

<https://apps.fcc.gov/oetcf/kdb/index.cfm>

Wireless Innovation Forum (WinnForum) Standards and Specifications (Includes: Requirements, Protocols, Best Practices and Operations. See: <http://www.winnforum.org> and CBRS Baseline Standards (Release 1) and Expanded Features and Functions (Release 2):

<https://cbrs.wirelessinnovation.org/cbrs-baseline-specifications>

Private Industry Consortia: CBRS Alliance is a provider of LTE and NR based best practices and private standards supporting the commercialization and support for CBRS. They have created the “OnGo” product which provides for central standards, co-existence, and other grouping benefits of their members. Other group consortia may form. <http://www.cbrsalliance.org>



Transition History and Waiver Request, Recent Order Extending Time

Part 90 Subpart Z NN Licenses were Granted 25 or 50 MHz of spectrum on a non-exclusive basis in 3.65-3.7 GHz nationwide. Ten-year licenses were issued. They were generally renewable.

They required registration of equipment with the FCC Universal Licensing System (ULS)

<https://www.fcc.gov/wireless/systems-utilities/universal-licensing-system>

If licensee followed GN Docket No. 12-354 (FCC 15-47) on/around April 17, 2015 and registered qualified equipment with the ULS, it could qualify as incumbent **Grandfathered Wireless Broadband Licensee** status. This provides current/valid registered holders with protection from interference from CBRS operators (GAA) until the license expired or was terminated.

It was **expected that there would be about a two-year time frame to allow for transition** between the Part 90z NN licensees (especially GWBL) and the advent of the CBRS ecosystem full operation. **This did not happen.**

WISPA and UTC filed for a blanket waiver petition to extend the deadlines for transition and allow an adequate transition period. (Petitioned: October 4, 2018)

With Reduced Transition Time Frame Issues Arose

Full Commercial Operation of CBRS Granted in January 2020. (Not two years before)

Right to Transition Began with ICD and Full Commercial Operation of GAA, but this fell into Winter Season. Transition of equipment difficult in Winter.

Supply Chain Unfilled: At the time transition capable rules and SASs in place, little compatible equipment, especially WISP or fixed access equipment was available.

Cost of the transition was steep without proper equipment and time to gently transition.

Over the Air – CPE-CBSDs had not been tested or validated by the FCC.

CPIs needed to install massive amounts of CBRS equipment to transition.

Some older equipment (such as some WiMAX), once thought to be able to be upgraded were determined unable to be transitioned and must be replaced.

February 2020, advent of Covid-19 virus stops much of the supply chain.

March 2020 Covid-19 virus curtails much of the ability to install new equipment in homes/residences.



FCC Grants Extension to Part 90z Licenses

Given the evolving and unpredictable nature of the pandemic, and its potential for causing delays for even diligent licensees for any transition plans in the near term, we find that it is a reasonable to extend the transition period to enable grandfathered and non-grandfathered licensees alike to continue to operate pursuant to their part 90 licenses while they continue to work on completion of their transition to part 96. During this time, 3650-3700 MHz band licensees will be permitted to continue operating consistent with their current status (i.e., grandfathered or non-grandfathered). In addition, to implement this waiver, we hereby modify the license term of those licensees with part 90 licenses that expire between the adoption date of this order and October 17, 2020, to the end of the extended transition period, October 17, 2020. All 3650-3700 MHz band licensees affected by this waiver are required to complete the transition of their operations to part 96 rules or cease operating at non-transitioned sites by October 17, 2020.

“Granting this temporary extension will enable Part 90 licensees to focus on continuing to provide high-speed broadband and other critical services during this national state of emergency,” said FCC Chairman Ajit Pai. “This is a logical delay of the transition during the pandemic to ensure that current licensees, like WISPs and electric utilities, can keep their eyes on the ball when it comes to helping consumers. We can allow this flexibility while still maintaining a reasonable timeline for this transition. I’m also pleased we could find a way to grant this relief without impacting this summer’s important 5G auction.”

“Consistent with the Commission’s goal of maintaining broadband connectivity and wireless services for all Americans during this national emergency—when it is anticipated that such consumers will need additional capacity to support online education, telework, and other activities—we find good cause to extend the transition period for those licensees whose transition period would otherwise expire between April 17, 2020 and October 17, 2020, for additional time, to October 17, 2020, to ensure that the affected licensees’ customers do not experience any disruption in service. Because we waive the transition period on our own motion, we dismiss as moot, without prejudice, the waiver request filed by the Wireless Internet Service Providers Association (WISPA) and the Utilities Technology Council (UTC) for a blanket waiver, as well as the individual requests for waiver listed in Appendix A.”

Transitioning from FCC Part 90 Subpart Z 3.65 GHz NN License to CBRS in Part 96

FCC Grants Extension of Transition Deadline for Certain 3650-3700 Band Licenses.

Check the date of your Part 90 license against the language in Part 90. Many licenses would have sunseted (expired) as of April 17, 2020 – But...the FCC issued its March 19 Public Notice on its own order and has extended Part 90 operations to **October 17th, 2020.**

Manufacturer Assisted Transition: Verify with your equipment provider whether the equipment you have deployed (CBSD) is software and/or firmware upgradable to meet Part 96 requirements.

Viable CBRS Ecosystem Equipment: All equipment must meet the requirements of Part 96 including the capability to talk/communicate with the SAS (or via Domain Proxy); cover 150 MHz of the band spectrum (with a few exceptions), have frequency and power control by the SAS, and meet spectral, power and out of band limitations.

If you have a current Part 90 Subpart Z 3.65 GHz NN license, and it remain current, and, you are registered for Grandfathered Wireless protection in CBRS, you may not be able to operate in CBRS in the same geography and frequencies.



What if I need Even More Time - Individual Waivers beyond October 2020 Directly from the FCC Extension

Individual licensees **may file new requests for waiver** if they seek further extensions of time beyond the extended transition date of October 17, 2020.⁴¹ All such requests will be evaluated on a case-by-case basis, consistent with the Commission's usual practices.

Licensees seeking a further extension of the transition period beyond October 17, 2020, **“must plead with particularity the facts and circumstances which warrant such action.”**

Licensees should plead with specificity the individual steps taken to comply with the extended transition deadline and provide details regarding any unique or unusual circumstances that could justify a further extension pursuant to the Commission's waiver standards.

We (FCC) would expect such requests to describe: (1) the licensee's **good faith efforts to purchase, install, and test the necessary upgrades or equipment required to operate their networks pursuant to part 96 prior to the transition deadline;** (2) **the unique or unusual circumstances that prevented them from completing the part 96 transition by October 17, 2020;** and (3) **the specific steps—including the time required to complete those steps—that the licensee will take to complete its transition expeditiously.** We (FCC) remind licensees that **“an applicant for waiver faces a high hurdle even at the starting gate.”**

Current Licensees in Part 90z Not Registered in the ULS

While GWBL protection is afforded to those who properly registered equipment with the ULS, there were many who did not register for a myriad of reasons. While they may not have protection as an incumbent from CBRS operators, their licenses (assuming still current) are still valid for operation. – The license does continue but not as GWBL.

But...They are supposed to avoid interference with CBRS operators.

Issue: Operators such as this are most likely not known or seen by the SAS. Put another way, the SAS does not know about these Part 90z operators.

It is important to note that a Part 90 Licensee is not allowed to go back and register their operations in the ULS in hopes of establishing GWBL rights.

What's Needed to Transition from Part 90z to CBRS

1. **Appropriate Equipment** for Part 96 Operation.
2. **Work with Manufacturers to Determine Status and Viability of Current Equipment** (Previously used for Part 90z NN) for Use in the CBRS Ecosystem. Some may work, others may be doorstops.
3. **Create a good network plan** and understanding of CBRS.
4. **Develop a relationship with a Spectrum Access System (SAS) Administrator** (or more).
5. **ID Appropriate FCC ID and Registration Information Requirements** for CBRS.
6. **Use Proper Installation** (most likely with a Certified Professional Installer – CPI).
7. **Have no geographic/known equipment still operating in Part 90z** – where the CBRS GAA deployment is sought.
8. **Obtain a grant.**

Citizens Broadband Radio Service Device (CBSD) Categories

Device	Max EIRP per 10 MHz	Indoor Operation	Outdoor Operation	Professional Installation Required?
Category A CBSD	1 W	Allowed	Allowed at or below 6 m HAAT, otherwise must be operated as Category B	If unable to geolocate to required accuracy (50 m horizontal x 3 m vertical)
Category B CBSD	50 W	Not allowed	Yes. No height limit.	Always
End User Device (EUD)	200 mW	Must be under control of a CBSD. SAS does not manage EUDs nor does it have any knowledge about EUDs.		

New Equipment v. Older Equipment (Can it be Upgraded or Used in CBRS?)

Current equipment utilized for RF transmission and radio functions under Part 90 may or may not qualify for transition into the Part 96. This will primarily on the ability to comply with Part 96 rules; including such things as radio frequency operating range, power limitations, out-of-band emissions and the ability to connect to a SAS or a Domain Proxy among other considerations.

Most important is that any equipment operating under Part 96 must tested and certified for Part 96 operation.

As the 3650-3700 MHz band has been in use while different technologies have been in play, it is possible some equipment may be able to be tested, certified and transitioned, while others cannot. The manufacturer of the equipment should be able to provide guidance on whether the needed aspects for Part 96 operation can be provided by upgrade (such as software defined changes), firmware changes or other changes.

Issue of GWBL/GWBZ Protection (Incumbent to GAA) You are interfering with You

So you are a holder of a Part 90 subpart z, NN 3.65-3.70 GHz NN license and you take the steps to transition from Part 90 to migrate into CBRS.

But, you hold onto your current Part 90 NN license which is still valid and qualified for GWBL.

You ask for a GAA grant in from the SAS in CBRS for spectrum inside 3.65-3.70 GHz.

What happens? You will most likely be told by the SAS your grant request is denied. It is denied because there is a protected 3.65 GWBL in the region and it must protect the incumbent. In effect, the SAS is protecting you (GWBL) from you (GAA spectrum grant seeker)

What should you do?



Equipment Ecosystem

- **CBSDs**

- The FCC has certified a few dozen CBSDs, which are now available for commercial service
- A complete list of certified CBSDs can be found on the FCC's Equipment Authorization System search page
 - Choose "CBD-Citizens Band Category A and B Devices" in the equipment class to get a list of certified CBSDs

- **EUDs**

- Several dozen end user devices and modules have been certified by the FCC
- A complete list of certified CBSDs can be found on the FCC's Equipment Authorization System search page
 - Choose "CBE-Citizens Band End User Devices" in the equipment class to get a list of certified EUDs and modules



More Information & Resources

- **FCC's CBRS Rules**
- **WinnForum CBRS Standards**
 - Release 1 Functional and Operational Requirements
 - Release 2 Functional and Operational Requirements (brand new!)
 - All WinnForum Release 1 CBRS standards
 - All WinnForum Release 2 CBRS standards
- **Incumbent Data**
 - NTIA GIS files describing federal incumbencies
 - FCC Information on FSS incumbents
- **CBRS Alliance**
 - Advocates for 3GPP-based (4G LTE and 5G NR) deployments in CBRS, under the OnGo™ brand
 - List of OnGo-certified devices
- **FCC's Equipment Authorization System search page**
 - Where you can view a (not particularly user-friendly) list of FCC-certified CBRS equipment
 - In the Equipment Class dropdown, choose CBD for CBSDs, or CBE for end user devices



Who Will Want to Use CBRS? – Use Cases Examples

Fixed Wireless Networks (Indoor and Outdoors)

WISP (Wireless Internet Service Providers)

Indoor Networks (e.g. Private LAN)

Extensions of Cable Networks/Operators (MSOs)

Utilities and energy

Internet of Things (IoT) and Industrial Internet of Things (IIoT)

Security and surveillance

Industrial, commercial and residential monitoring

Agricultural (such as moisture sensors) and dairy sensors

Parking and building functions

Private Networks (Single or many locations/geographies)

Industrial or Business

Multiple Unit Dwellings (MDUs) or Multi-Tenant Enterprises (MTEs)

Neutral Host Networks (Networks which can accommodate more than one host)

Venues, Stadiums, Accommodations

Workplace

Mobile Networks and 5G LTE and NR

Mobile Network Operations (MNOs)

Private mobile networks



Example Vertical Markets for CBRS

- **Medical/Dental Office and Hospitals and Centers**
- **Education (K-12 and Higher Ed)**
- **Industry and Commercial**
- **Security and Surveillance**
- **Hospitality and Accommodations**
- **Venues, Stadiums, Public Places**
- **Multi-Family Residential**
- **Multi-Tenant Enterprise**
- **Airports and Campuses**
- **Oil and Gas**
- **Energy**
- **Power and Utilities**
- **Telecommunications**
- **Entertainment And More.**

Using GAA (Licensed by Rule) – Can Anyone Use It? Yes with Conditions

Per FCC Part 96 GAA Spectrum: General Authorized Access (GAA) Users may operate in the 3550-3700 MHz frequency band.

Open and Unused Spectrum: Any unused (and not requiring protection) CBRS frequency may be considered GAA. The statement, “Use it or share it” means that unused PAL or PAL frequencies not assigned may be used as GAA. If not used by PAL and not required to be protected, the spectrum in the entire CBRS band is open to GAA.

Licensed by Rule: No formal license is required, but GAA users must follow all FCC rules.

Open to Anyone: All users of any size or network type may use GAA spectrum and request a grant. Grants are in 10 MHz increments. Not FIFO. All who wish to use may use.

Play Nice in the Sandbox/Cooperate: Part 96 requires users of GAA spectrum to “cooperate”. This means intentional interference is frowned upon. Make sure to cooperate in the band.

How Much Spectrum? How Available is the Spectrum? As much as 150 MHz...and yes, you may request it all. Not First In-First Out. May be crowded in dense areas. May require individual coordination or work with the SAS.



Conclusions and Actions for Transition from Part 90 to Part 96

- **Transition from Part 90z NN licenses** should occur between now and October 17, 2020.
- **Consult with your manufacturer** to see if Part 90 equipment may be used/updated for use in the CBRS ecosystem.
- Consider your **network plan** so you can smoothly transition.
- Consider the **cost of the transition, equipment needed, installation process that must be followed**, using a SAS, CPI, and following WinnForum Standards and FCC rules for CBRS in Part 96.
- **Plan for growth** and varied uses available.
- Watch for new features and functions.

Questions? Comments? Your Use?

**Let us know your burning
CBRS Part 90-96 Transition
questions!**



Today's Presenter: Richard Bernhardt

National Spectrum Advisor

Wireless Internet Service Providers Association (WISPA)

Chair, WinnForum, WG5 Operations Working Group, Spectrum Sharing Committee

408-472-0881

rbernhardt@wispa.org

