CBRS Field Experience

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CBRS Field Experience Examples

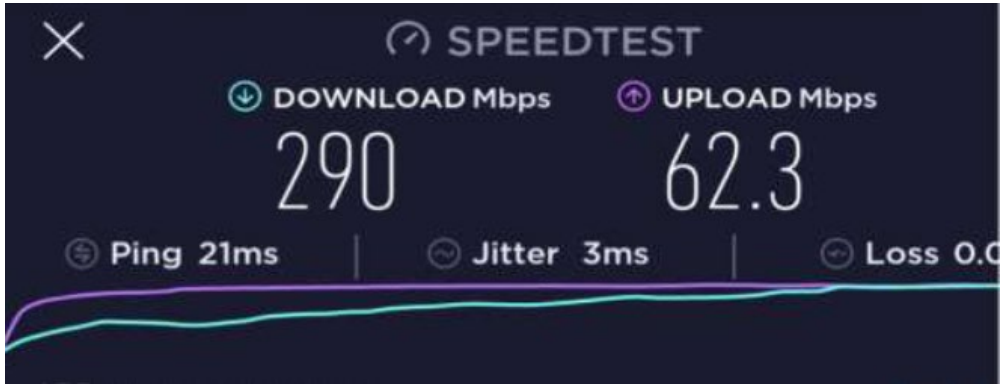
Use Case Example	Customer	Deployment Configuration	Coverage	Performance
Mobile Broadband *Capacity boost*	Operator owning licensed spectrum	2x2 MIMO or 4x4 MIMO TDD Config 2 Carrier Aggregation, Scell in CBRS	~ 1100 m (12 m height antenna)	Average user DL boost: 30 Mbps
Mobile Broadband *MVNO offload*	Operator without licensed spectrum	2x2 MIMO or 4x4 MIMO 20 MHz CBRS spectrum TDD Config 2 Pcell in CBRS	Between 680 m and 1200 m (for cell edge user DL of 5 Mbps and antenna height between 6 to 22 m)	User Tput for 2x2 MIMO DL: ~80 Mbps UL: ~8 Mbps (lightly loaded cells)
Mobile Broadband *Indoor office deployment*	Operator / Enterprise without licensed spectrum	2x2 MIMO or 4x4 MIMO 20 MHz CBRS spectrum TDD Config 2 Pcell in CBRS	Entire building	User Tput for 2x2 MIMO DL: ~125 Mbps UL: ~11 Mbps (lightly loaded cells)
Fixed Wireless Access	Operator using exclusively CBRS for Rural Broadband	AAS 64T/64R Multi-user MIMO 20 MHz to 60 MHz CBRS spectrum TDD Config 2 Good RF conditions CPE with directional antenna	6 to 8 km	Average sector DL Tput: 250 to 410 Mbps

CBRS Field Experience – Speed Test Example

One 20 MHz CBRS LTE PCell
TDD Config 2
EUD in Good RF conditions

CBSD 4x4 MIMO
EUD 2x2 MIMO

CBSD 4x4 MIMO
EUD 4x4 MIMO



CBRS Field Experience – FWA Performance Example

One 20 MHz CBRS LTE Pcell
CBSD with AAS 64T/64R
TDD Config 2

	CPE Average / Median SINR (dB)	CPE min DL Tput (Mbps)	CPE max DL Tput (Mbps)	Average DL Sector Capacity (Mbps)	CPE location
8 Layer MU-MIMO, 64 QAM	16.5 / 16.5	10.1	42.8	200	8 CPEs, 6-8 km from site
8 Layer MU-MIMO, 256 QAM	17.8 / 18.0	15.8	51.3	274	8 CPEs, 6-8 km from site
10 Layer MU-MIMO, 64 QAM	20.9 / 21.0	19.1	40.4	303	10 CPEs, 6-8 km from site
13 Layer MU-MIMO, 256 QAM	18.9 / 18.0	15.8	54.8	400	10 CPEs, 6-8 km from site 3 CPEs, 400-500 m from site

CBRS Field Experience - The Good

- **Significant amount of spectrum (100 to 150 MHz) available in some markets in the early phases after FCD**
- **Significant capacity boost opportunities for operators**
  - B48 has higher power than B46 LAA and does not require LBT, allowing larger cell coverage
  - B48 and B46 can be used together to boost licensed carrier capacity
- **Strong ecosystem for the 3GPP B48 compliant devices (both CBSDs and EUDs)**
- **Strong interest from customers for trials in various type of deployments**
- **Significant deployments done by some customers as soon as FCD (Full Commercial Deployment) was enabled**

CBRS Field Experience - The Bad

- **Several customers experienced issues regarding the EIRP limitations due to DPA and ESC sensor protection**
  - Issue mainly observed in cities near the EAST coast
  - SAS Administrators are working with DoD and FCC to improve the situation
- **EIRP PSD limitation significantly reducing the coverage capabilities of AAS radios**
  - However, the range is acceptable when using CPEs with directional antenna
- **Passive DAS is not supported yet in CBRS**
  - WInnForum will add support for Passive DAS in Rel 2
- **Automatic GAA coexistence is not supported yet by SAS Administrators**
  - Currently, user intervention is required when coexistence becomes an issue
  - SAS administrators in collaboration with CBSD vendors are working on GAA coexistence features

CBRS Field Experience - The Ugly

- **CPI process for registering CBDSs required a lot of attention in early phases of deployment, but has stabilized over time**
- **Single step registration (using WinnForum defined SAS-CBSD protocol) versus Dual step registration (using proprietary SAS web interface) caused confusion for customers in early phases of the deployment**
- **Lengthy 3-way debugging sessions (Operator, CBDS/DP vendor, SAS Administrator) required to get to the bottom of some field issues**
- **Settled differences between SAS implementation making things difficult for CBSD vendors**
  - For example the choice for *heartbeatInterval* parameter value

Other thoughts on CBRS

- **SAS interface management, on the CBSD/DP side, requires sizeable development, testing and certification extra effort as compared with development done for traditional licensed or unlicensed bands**

- **Network planning and RF design for CBRS band becomes complicated**
  - Working with spectrum that could change at any time due to incumbent activity
  - It is difficult to predict the network reduction/loss of coverage
  - Also difficult to predict if the intra-freq handover today is going to be an inter-freq handover tomorrow

- **Strong request from customers for 5G NR introduction in CBRS band**

Although CBRS band is different than traditional licensed or unlicensed bands, it can provide good end-user experience