CoLAA Leaflet

- *A Licensed Assisted Access Flexible Radio Solution*

- *Cognitive Innovations Private Company*

- *The proposed experiment aims to provide experimental results of the LAA concept in a wireless network deployment, where the spectrum channel condition can be leveraged. In such a case, different setup scenarios can provide useful insights for advanced cognitive communication networks.*

- *The biggest challenge was to implement the LAA into the GNU radio USRP platform and to make it work at the UPI layer of WishFul. In this way, the LAA is considered as a control application on top of the overall control architecture. The second challenge to provide an experimental setup, which provides a useful feedback while a multi-channel use case is considered.*

In order to conduct our experiments in a controlled environment, we allocated 6 WishFul USRP nodes each of them employed with a particular task as follows:

- One USRP (Controller) is charged with the execution of the main code and acts as a controller for the rest of the nodes. Specifically, it utilizes the input from eNB for the QL algorithm and the LBT mechanism while also controls the frequency in which the other USRPs are tuned. Moreover, it triggers the SpSe function at the eNB side, when it is necessary and uses the WishFul functions described above (Table 2). As long as the Controller is employed for code execution and control functionalities only, a baseband is not deployed on it.

- USRP (eNB) is installed with the GNU radio baseband processing available from WishFul. It is also enabled with the SpSe mechanism and the frame transmission using DTX.

- The third USRP plays the role of the UE. We have installed the UE baseband on it receiving the frames transmitted by the eNB. Moreover, it monitors the throughput of the experiment and is able to detect the RSSI of the received signal. The controller node according to the transmitting channel selected by the QL algorithm tunes its frequency.

- There are also 3 USRP WiFi traffic generators, which are used for WIFI traffic simulation on the three channels the experiment is conducted. Each of them has installed with the transmitter baseband processing that is tuned in one of the three transmission channels. The controlled node controls its behaviour and their transmission patterns are modified according to the needs of the current experiment.
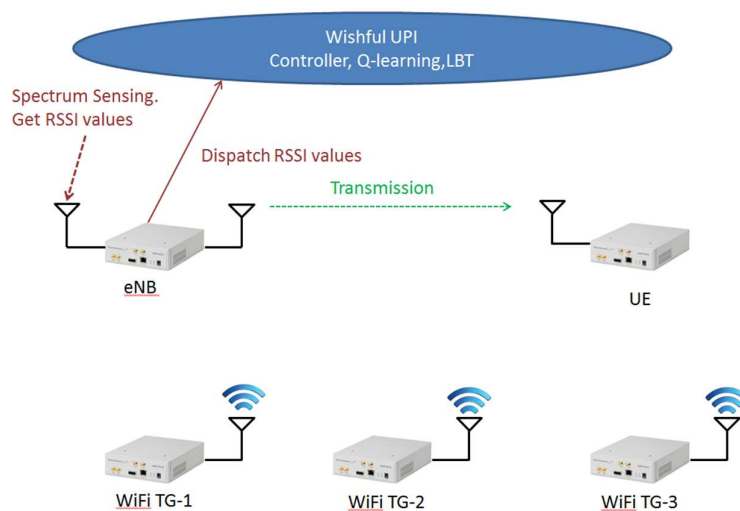

Figure-1D: CoLAA experiment network deployment

Fig.2D below depicts the experimental results obtained by having high WiFi traffic for dBFS values equal to -62 and -72. Low WiFi traffic was also considered and the corresponding results are depicted in the second line of the figure. The general comment is that the QL works always better than the COT and FDC, where COT works better than FDC in all use cases. While the dBFS threshold is high, i.e. -62, the LAA system achieves better performance exploiting all spectrum opportunities easier. In case of lower dBFS threshold such as equl to -72, LAA looses some of its own performance, that the WiFi earns on the other hand. Under high WiFi traffic conditions and low dBFS detection threshold, the FDC do not have any benefit of the spectrum opportunities comparing to the QL one. It gives though a more comprehensive picture of our experiment and the expected results for higher RSSI values, i.e. more tight energy detection for the CS technique, where our experiment relies on.
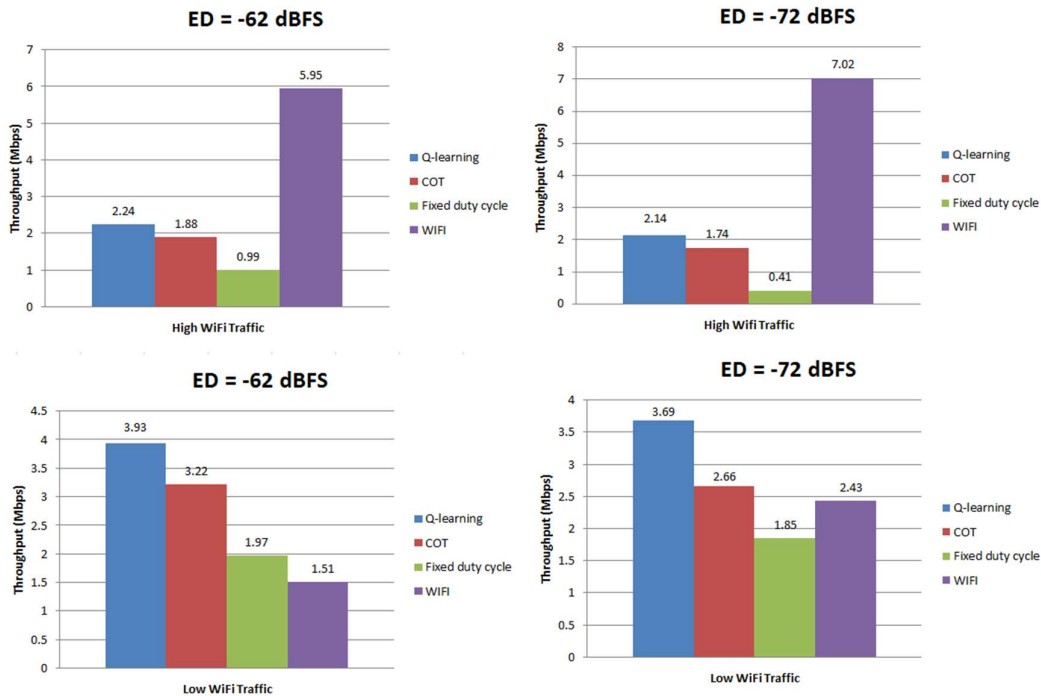

Figure-2D: Experimental results with low and high WiFi traffic for dBFS thresholds equal to -62 and -72

Conclusions: Our experiment proved the LAA concept for efficient selecting component carrier from the unlicensed band while the existing systems such as WiFi keeps operating to the unlicensed band. The results obtained from high and low traffic conditions as well as the different energy detection thresholds corroborated the functionality implemented using the WishFul UPI on GNU SDR platform.

Feedback: CoLAA provides a cognitive carrier selection technique for the efficient coexistence among two different wireless communication systems at the unlicensed band. The CoLAA concept relies on the LAA concept of 3GPP. Thanks to the software tools and hardware provided to me by WiSHFUL, we were able to make large-scale cognitive communication network experiment possible.