still being analyzed and modeled in order to be included in present simulation model.

Having the performance of power-rate functions, we calculated required SNR for achieving particular BER for each modulation scheme that is required for implementation of discreet waterfilling. The performance is for RA scenario when total transmitted power (amplitude) constraint is varied (thus received SNR is increased) and rate is maximized is shown in Fig. 16. Those results are averaged over 10 measurements. As it was expected, given the BER performance in Fig. 15, simulated achieved data rate is higher compared to the case of RF transmission. It can be noticed that in both cases of non-ideal receiver in simulated channel and RF transmission, BER constraint is exceeded due to additional noise introduced by estimation stages and hardware impairments. Therefore, those impairments should be appropriately modeled and included in optimization procedure.

3.2 DSA scenario

The TIGR framework is also used to demonstrate the DSA scenario that allows several standards or users to opportunistically share the available spectrum resources without introducing mutual interference. Specifically, the given scenario assumes interference-free coexistence of two OFDM-based systems within a common frequency band as shown in Fig. 18. The first system is primary user (PU) transmitter-receiver pair which operates in narrowband randomly changing the portion of occupied spectrum, and in certain way emulates the frequency hopping of GSM signal. Accordingly, SU pair operating within the whole available band, continuously monitors and detects parts of non-used spectrum by measuring SINR over subcarriers based on the method given in [11] and performs capacity achieving OFDM transmission with optimal rate and power allocation over subchannels for given system constraints. The receiver's GUI for the case when PU is detected is shown in Fig. 17, while appropriate bit/power loading is given in Fig. 19. The actual bit and power loading is determined by estimated SINR values. The DSA scenario is successfully demonstrated at DySPAN 2010 technical conference [12].

4. CONCLUSION AND FUTURE WORK

In this paper we have described the design issues and performance results for TIGR framework, a reconfigurable testbed for adaptive OFDM transmission based on GNU Radio platform and CORBA communication model which enables additional adaptivity and reconfigurability features within the system. The TIGR supports for continuous capacity achieving OFDM transmission with optimal rate and power allocation over subchannels for given system constraints. Proposed system extends PHY layer functionalities of current wireless standards and offers control and feedback mechanisms for easy reconfiguration of transmission parameters allowing evaluation of different strategies in either simulation or real-time scenarios. Basic insight into interaction between CORBA and GNU Radio software components is introduced and basic adaptivity is presented. Two experimental scenarios are described bringing general conclusion that estimation noise and hardware impairments should be appropriately modeled and included into resource allocation procedures, which is usually neglected in algorithms design.

However, additional experimental evaluation with USRP2 and different indoor conditions is to be performed in order to get larger insight into the TIGR capability. Current efforts are put on the profiling of the transmitter/receiver execution in order to optimize signal processing code, thus allowing for higher bandwidths. Additionally, TIGR is close to support an additional feature of adaptive Coded OFDM (COFDM), where the rate and coding adaptation is jointly performed, thus bringing the framework closer to support current wireless standards (WiMAX, LTE). Also MIMO implementation is considered to be added while some initial work is already done in this direction. Available flexibility also allows for inserting some advanced features as cyclostationary signatures in order to support additional cognitive radio scenarios.

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