

Before the

**FEDERAL COMMUNICATIONS COMMISSION**  
Washington, D. C. 20554

and

**THE NATIONAL TELECOMMUNICATIONS AND  
INFORMATION ADMINISTRATION**  
Washington, D. C. 20230

In the Matter of	)	
	)	
Federal Communications Commission Seeks)	)	
Public Comment on Creation of a Spectrum )		ET Docket No. 06-89
Sharing Test-Bed	)	
National Telecommunications and	)	
Information Administration	)	NTIA Docket No. 060602142-6142-01
Notice of Inquiry	)	
	)	
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**COMMENTS OF ADAPT4, LLC**

Adapt4 applauds the FCC and NTIA on their desire to encourage innovation to improve spectrum usage efficiency. Adapt4 develops, manufactures, and sells cognitive radios to address this issue. The first product is the XG1 cognitive radio. This radio can ‘harvest’ unused bandwidth from bands currently approved for secondary use. Adapt4 expects that by participating in the Test-Bed, it can demonstrate that cognitive radio technology can be used to significantly improve spectrum usage efficiency.

Adapt4 is proposing a Test-Bed using the XG1 radio, which meets all of the goals mentioned in the FCC and NTIA initiatives. The existing XG1 radio includes features such as:

- Dynamic spectrum access
- Support for higher priority users such as Public Safety
- Streamlined spectrum coordination process

The proposed Test-Bed would involve the deployment of an XG1 radio network in an urban area at a frequency band that is currently used by federal and/or non-federal users. The technology developed by Adapt4 is frequency-agnostic. Adapt4 proposes the following bands as candidates for the Test-Bed:

222 – 242 MHz

420 – 450 MHz

150 – 216 MHz

Each of these bands has a collection of existing users including business/industrial, public safety and federal government agencies. They are also under-utilized from an efficiency point of view.

The Test-Bed would be used to measure the following metrics:

Percentage of time channels (6.25 kHz resolution) are used by the primary users

Percentage of time channels are used by the XG1 (cognitive) radio network

Throughput of the XG1 network

Noise floor level vs. time

Interference with any primary user

The XG1 Network Management System (NMS) already makes these measurements at 1-minute intervals as part of normal operation. This data is archived at the end of each day and plots are automatically created. This data could be used to evaluate the effectiveness of cognitive radio technology as a means to spectrum sharing.

Adapt4 proposes to establish this Test-Bed in an urban area in central Florida and operate it over a period of 30-60 days. New radio traffic would be created by transmitting periodic video surveillance camera images from remote sites to a central site. This new radio traffic would compete with existing primary user traffic on a non-interfering basis. The capacity to transmit periodic video surveillance images is currently not available without the cognitive radio technology. The use of XG1 radios in a busy urban setting would demonstrate quantitatively the performance of the Test-Bed against its goals.

The XG1 NMS provides the ability to ‘notch-out’ specific channels as each XG1 radio operates on non-contiguous channels using multiple, low-power carriers which frequency hop at high rates. This design reduces the impact of any incidental collisions that may occur with primary users. Many collisions will go unnoticed. If however any interference is caused, specified channels can be notched out through the NMS and never

used again. Any complaints by primary users will be logged, and the affected channels permanently notched out for the rest of the test period. This feature will allow Adapt4 to test in a busy urban area, but will allow rapid correction of observed adverse affects on existing users.

Each day that the Test-Bed is operated, logs will be collected, from every site, archived, and plotted. These logs will contain the metrics described below. A report will be compiled to summarize overall performance.

This test would require an experimental license from the FCC for at least one of the bands listed above for use in a designated geographical area. If the tests in that band are successful in demonstrating spectrum usage improvements without interference to the existing users, Adapt4 would seek the FCC's and NTIA's support in a rule change that would allow the technology to be used on a permanent basis. Adapt4's motivation to support the Test-Bed is that it will lead to the access of more spectrum.

Figure 1 shows the typical data that is collected for every site in the network. Figure 2 shows a spectral plot of the entire view taken when the XG1 network is idle. This idle period is intentionally created multiple times each second to measure the instantaneous use of the band by all other users. A new map of the available spectrum is recomputed after each view. These spectral plots would also be stored and included in a final report. These are useful in determining the noise power density at various times of the day.

Adapt4 would welcome Commission and NTIA personnel to witness the testing, and assist in selecting the metrics to be collected.

Adapt4's cognitive radio technology is band independent, and therefore, an ideal platform for implementing a spectrum-sharing Test-Bed. Upon approval of an experimental license, Adapt4 can provide its standard product equipment to implement a Test-Bed.

Because other vendors are not as far along in their understanding and development of cognitive radios, Adapt4 recommends that multiple non-overlapping test beds be deployed. Adapt4 can use one test-bed to demonstrate and evaluate the operation of its XG1 cognitive radio, while other test-beds are used to evaluate other approaches to cognitive radios.

### **Conclusion:**

Adapt4, the leader in cognitive radio technology, strongly supports the pursuit of Spectrum Sharing Innovation Test-Beds. The company confirms that it is ready and willing to be a participant in a Test-Bed. In this response, we have recommended specific spectrum bands and specific metrics for the Test-Beds. Our interest in the Test-Beds is driven by our desire for the FCC's support in a rule change that would allow the demonstrated technology to be used on a permanent basis in the demonstrated spectrum bands.

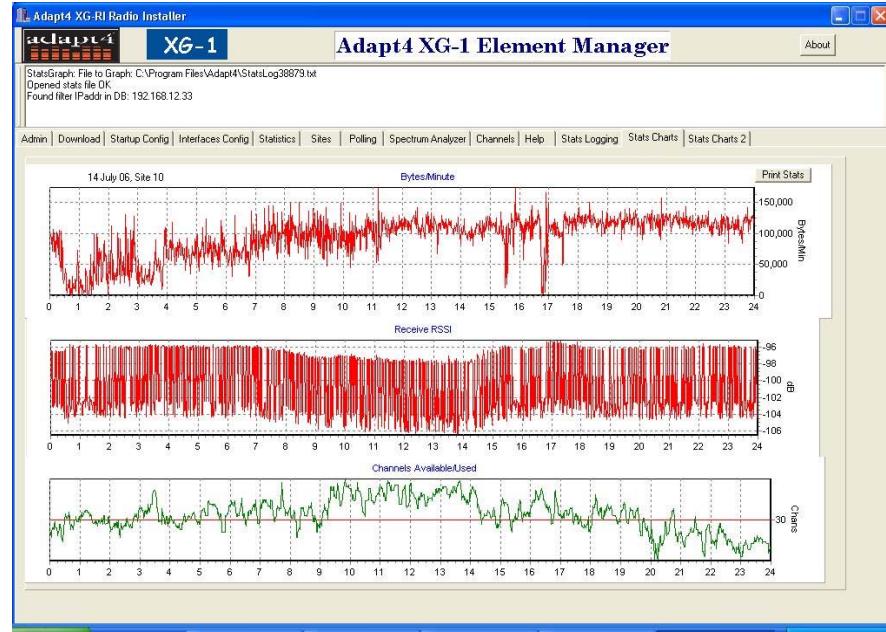
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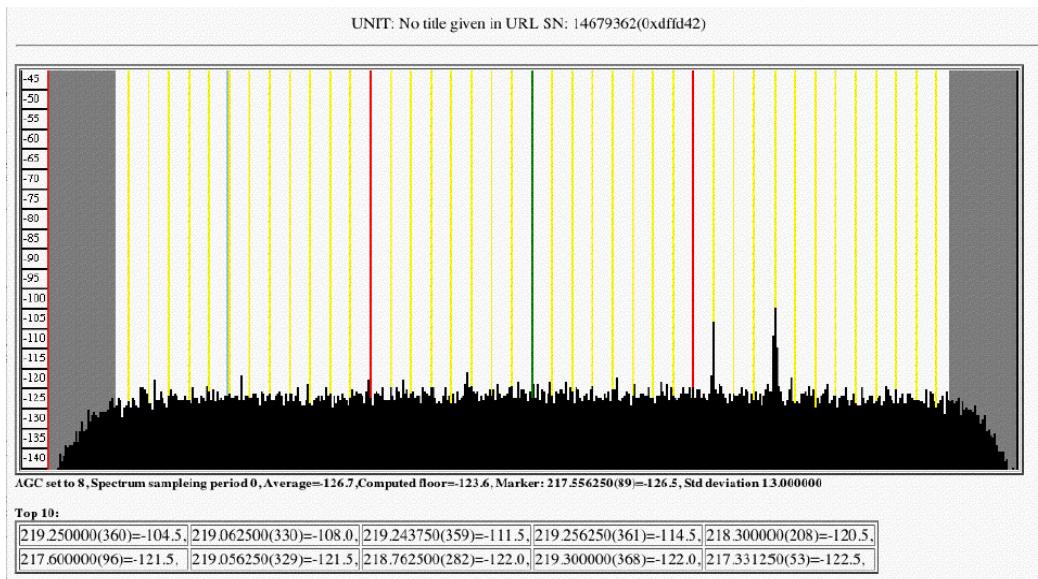
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Dated: July 10, 2006



**Figure 1:** Sample Statistics provided by the XG1



**Figure 2:** Sample Spectral Plots provided by the XG1