

**EUE/Screen Gems, Ltd.
and division Daytime Programming Temps, Inc.**

Dynamic Spectrum Access Test Bed

Description For FCC Experimental License Application

10 June 2009

1. Introduction

This document provides the narrative information requested by the FCC for grant of an experimental license. Form 442 asks three questions.

- a. The complete program of research and experimentation proposed including description of equipment and theory of operation
- b. The specific objectives sought to be accomplished
- c. How the program of experimentation has a reasonable promise of contribution to the development, extension, expansion or utilization of the radio art, or is along line not already investigated

2. Proposed program of research and experimentation

EUE/Screen Gems (“EUE”) will use its Wilmington, North Carolina studios (the “facility”) to support testing of experimental TV Band Devices (“TVBDs”) by device manufacturers.

TVBDs are unlicensed devices intended to operate on a secondary, noninterfering basis in the television broadcast spectrum. Currently these devices are being developed pursuant to Second Report and Order and Memorandum Opinion and Order (Second R&O/MO&O), FCC 08-260, November 14, 2008 (ET Docket Nos. 04-186 and 02-380) as corrected January 9, 2009. Modifications to this ruling may occur due to currently outstanding petitions for reconsideration and lawsuits. Devices tested at the facility will be compliant to either the current rule or future versions of the regulation.

EUE is not a TVBD manufacturer. The facility offers infrastructure to support testing by other companies and research institutions. The infrastructure provided includes:

1. Well-characterized path loss between marked locations in and around the facility.
2. A micro-power ATSC test signal that can be transmitted or disabled on request
3. Multiple digital TV receivers
4. Multiple wireless microphone systems
5. Engineering support including staff and measurement equipment

This experimental license is requested to support transmission by multiple manufacturers, researchers, and experimental devices at the facility. Prior to transmission by any experimental device at the facility, EUE will file an attachment to the experimental license describing the ELS required information regarding the device under test.

EUE accepts responsibility for compliance with the experimental license and will manage users of the facility to assure compliance. EUE will also establish a single point-of-contact well-known to the surrounding community for reporting and resolution of any concerns that arise.

3. Description of equipment

There are two categories of equipment to be operated in the test facility: representatives of incumbent users of the television broadcast spectrum, and TVBDs under test.

To represent incumbent users, the facility intends to intermittently broadcast a micro-power ATSC test signal. A number of DTV receivers from different manufacturers will be placed around the facility. These are receive-only so are not listed in the application. The facility will also operate wireless microphone systems to test TVBD sensing and potential interference. These are already used extensively on-site for television production operations so no additional license is needed.

The TVBDs under test will come from a range of manufacturers and use a range of different emissions designators and necessary bandwidths. However their potential interference impact is limited by the FCC TVWS rules. This experimental license application describes a transmit power and emissions designator that corresponds to the proposed micro-power ATSC test signal. The test signal power is higher than the power permitted to any TVBD (10 watts proposed for the ATSC test signal vs. 4 watts for a TVBD). The maximum TVBD antenna height will be restricted to less than the antenna transmitting the ATSC test signal, which is mounted on top of a 45 foot building. The maximum emissions bandwidth of any TVBD transmitted carrier will be 6 MHz, channel aligned, the same as the ATSC test signal.

4. Theory of operation

The facility is intended for controlled field trials of TVBDs that have already finished initial laboratory tests. Testing focuses on safety – non-interference to primary users whose use of the spectrum is protected by FCC rules – and capability – whether the device/system achieves its target performance.

The facility supports two types of test setups. In private testing, one manufacturer uses the site's infrastructure to evaluate the safety and capabilities of its experimental TVBD. In group testing, a number of manufacturers come on-site at the same time to evaluate potential interactions among their TVBDs that impair either safety or capabilities.

In both types of testing, initial tests are low-power and indoors. Successful completion of indoor safety tests, as verified by facility staff, allows subsequent outdoor and full-power testing. Depending on the intended use of the device, outdoor testing may utilize the high-multipath high-fading regions between the facility's structures or a low multipath outdoor channel through heavy foliage to a nearby site (still on property owned by the facility). To support transmissions by TVBDs from various locations in and around the facility, the experimental license application request is of type "base and mobile."

This experimental license application requests authorization only for indoor and short range outdoor testing. Eventually the facility intends to support testing using long-range channels to antenna sites located between 1 and 10 miles away. An amendment or further experimental

application will be filed for authorization to move experimental TVBDs offsite for testing long-range channels, providing the necessary data about those devices and intended transmission sites. Tests may use either facility-provided or manufacturer-provided antennas.

5. Justification for frequency request

This license application requests access to six contiguous 6 MHz UHF television channels.

The frequencies granted should be in the range of UHF channels 21-51 since that is where most TVBDs are expected to operate. A review of FCC databases for the Wilmington, NC area shows no active television broadcasts between channels 10 and 29, making the low 20s a desirable operating region to maximize protection for licensed users in the surrounding community.

The bare minimum number of channels needed for a single TVBD test is three. Fixed TVBDs are required to avoid both a television broadcast channel and the adjacent channel, so the test setup would be the micro-power ATSC test signal on channel N, guard channel N+1, TVBD available channel N+2 (or guard N-1 and available N-2).

When testing multiple TVBD networks at the same time in order to find potential interactions among them, and adding wireless microphones that come and go, more than three channels are required. A critical component of the TVBD is the logic that selects a channel among available channels and changes channels under changing load conditions. To model the complexity of real-world situations and evaluate the correctness of this complex logic, three or four available channels are required (being competed for by four or five TVBD networks).

For the scope of testing envisioned at the facility, six channels appears appropriate. A typical test setup may be as follows.

Channel	Contents
21	Available to fixed Test for N-2 interference to DTV receivers in channel 23
22	Available to personal/portable Test for ability to detect mic when adjacent to DTV signal Test for N-1 interference to DTV receivers in channel 23
23	Micro-power ATSC test signal
24	Available to personal/portable Test throughput when adjacent to DTV signal Test for interference to channel 23 DTV receivers when both N-1 and N+1 TVBDs are operating
25	Available to personal/portable and fixed TVBDs Test for ability to sense mics when both PP and fixed are operating in the channel Test for N-1 interference to wireless mic function

26	Run test mic signals to evaluate interference Or run personal/portable to evaluate throughput when in an adjacent channel to other nearby personal/portable or fixed TVBDs
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The micro-power ATSC test signal may be moved to different channels depending on the test setup. At some times the available channels will be dedicated to independent tests, e.g. one manufacturer testing in channels 21-22 and another in channels 25-26, with the ATSC test signal being moved to different channels as required.

6. Description of the facility

EUE/Screen Gems Studios Wilmington, NC contains a number of structures of different sizes. Most are all-metal construction on concrete pads with large open spaces inside.



These structures are arranged in close proximity creating streets between them with urban-style propagation and fading characteristics.



At the rear of the facility is a forested area, owned by EUE, with road access.



7. Specific objectives

TV Band Devices create new testing and verification challenges. The non-interference property of the devices depends on correct operation of a complex hardware-software subsystem (sensors, algorithms, processing) and on interactions with the environment such as other TVBDs. Their capabilities depend on correctly identifying available channels and on effectively sharing channels with other TVBDs despite the long range propagation of TV band spectrum.

It would be expensive and challenging for each manufacturer to set up a test facility capable of fully exercising these devices. The EUE test facility will offer shared infrastructure to amortize costs and enable development of common test approaches. Moreover, it will support group

testing that will discover unforeseen interactions among TVBDs of different manufacturers or standards before they are fielded. This will promote safety and market success.

The objectives include research on TVBD design, technical demonstrations of TVBD equipment and techniques, demonstrations of TVBDs to prospective purchasers, and testing of TVBDs in connection with production and regulatory approval.

8. Contribution to the radio art

TVBDs are one of the earliest examples of a new class of Dynamic Spectrum Access devices. DSA is a promising regulatory tool for increasing the efficiency of utilization of the spectrum by going beyond the static, exclusive allocations that have historically been used for most spectrum bands. The safety and potential utility of TVBDs are currently quite controversial. By contributing to the safety and market success of TVBDs, the EUE test bed will assist in validating DSA and helping to promote its potential use to increase overall spectral efficiency. Higher spectral efficiency in turn permits an increase in radio communications with consequent economic and social benefits.

In addition to its primary function of supporting manufacturer testing, EUE intends to grant periods of low-cost (or free if possible) access to the facility to schools, researchers from universities and non-profit or government laboratories, in support of improving TVBD technology.