Technical Note
AWS Relocation for 1.7 and 2.1 GHz

Applicable Products: EX-2.4i

Introduction

The FCC has set aside and awarded licenses in the 1.7 GHz and 2.1 GHz bands for use by service providers to deliver Advanced Wireless Services (AWS). Incumbents in these bands must relocate to other bands if requested to do so by AWS licensees. Under these cricumstances, incumbents have the option to move to other FCC Part 101 bands or to license-exempt bands.

Relocating to the 2.4 GHz License-exempt Band

The proximity of the 2.4 GHz license-exempt band to the licensed 1.7 and 2.1 GHz bands makes it possible to reuse the existing infrastructure in those bands, making the relocation to 2.4 GHz the least expensive of all potential relocation options. Additionally, the absence of licensing in 2.4 GHz band enables a rapid transition to the new band.

The existing infrastructure available for reuse includes antennas, transmission lines and ancillary components.

Pre-Upgrade Process

There are certain criteria which should be considered prior to performing an upgrade of a 1.7 or 2.1 GHz radio system to the EX-2.4i. This section lists the most important items to consider. This document also includes a detailed checklist (see Appendix A) that can be completed on-site.

- **Existing System integrity:** It is important to understand the condition of the existing system. Any identified issues should be verified to determine if the radio or transmission system (cables, antenna, connectors, etc.) are the source of such issues.
- **Physical system integrity:** In most cases, the cleaner a system looks the better it works. Therefore, the equipment should be inspected visually. The infrastructure that will remain should be free of cable bend-radius violations, loose connectors, nicks or dents in the cabling (coaxial, power, ground, telco and/or data).
- **Inventory:** The final step in the pre-upgrade process is to determine the reliability of the system, available signal levels (RSL) and other miscellaneous parameters. This data collection process can be performed during the physical inspection.

Existing System Integrity and Parameter Checklist

- *Power supply:* Record voltage, amps and make/model. It is recommended that the expected voltage specifications are checked with a multi-meter to ensure that the ratings are correct and that no fluctuations are seen during the test.
- *Ground:* Check the system ground connections. All connections should be free of dirt or other imperfections, tightened, absent of visible damage such as rust or noticeable damage from lightning or surges. The ground cable should be as short as possible and traverse to the nearest grounding connection. The cable should not have any sharp bends or loops. Check local electrical code for compliance.
- *Rack mount:* Make sure all screws are available and that the location of the future EX-2.4i radio allows for proper ventilation. The EX-2.4i radios have three fans on one side and ventilation holes on the other. Each side should have as much distance from obstructions as possible in order to ensure proper ventilation.
- *Coaxial cable:* Record the size, type, make and length. These numbers will be inserted into the

calculation for availability. The cable should also be as short as possible while providing sufficient length for maintenance of the EX-2.4i and other equipment nearby.

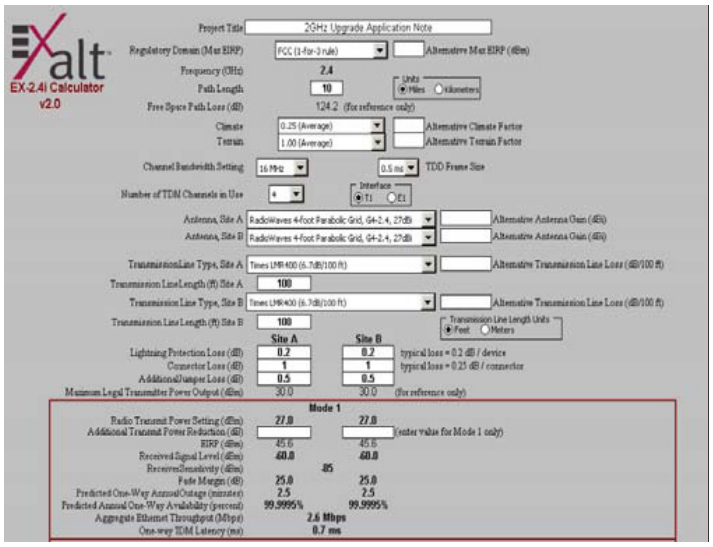
- *Connectors:* Record amount, location and make/model. Ensure that the cable which will be connected to the EX-2.4i is properly terminated and clean. This connector should be an N-Male (N-M) and free of any excess adapters. If their integrity is in question, replace the connector or jumper cable altogether as this is the most common source of problems.
- *Lightning protection devices:* Record the type, make, frequency range and proper connection to ground.
- *Cable egress location:* The location where the coaxial cable exits the building or shelter should be large enough that the cable is not strained. Prior to any egress or connection outdoors a 'drip-loop' should be in place to prevent ice build-up or other methods for water to rest or enter the building.
- *Horizontal coax runs:* Typically in tower installations there will be a length of cable running parallel to the ground before it meets the tower. If aerial, this run should be supported by a messenger-cable or ice-bridge. Both methods relieve the coaxial cable of the stress induced by gravity. These methods also protect the cable from falling ice or other potential materials which may damage the cable if released from above.
- *Vertical cable runs:* As the cable meets the tower and begins its path to the antenna, all bend radius and proper attachment methods should be followed. The entire cable run should be securely attached to the tower and the verified to be in good condition.
- *Antenna to cable mating:* Perhaps the most critical connection, the cable to antenna connection should appear perfect. The cable should have no creases where it meets its connector. Proper water sealant methods should be used. The connection should not move when handled and any sign of water damage should be attended to immediately.
- *Antenna:* Record the make, model and gain. All hardware should look and feel solid, be free of rust and be fully intact.

Site Availability Check

Step 1: Visit each site and inspect the system from radio to antenna.

Step 2: Perform a path calculation using the latest version of the Exalt Path Calculator. The purpose is to determine the expected performance of the EX-2.4i for the distance of the link. Record the results for future use assuming ≥99.995% availability with proper fade margin (>15 dB).

Step 3: If the existing equipment and path calculation results are acceptable, proceed with a final tally of items to replace based on the results of the inspection. Any 'weak points' such as bent or damaged coaxial cables or rusted antenna hardware should be replaced.



Conclusions

Incumbent operators with expiring 1.7 and 2.1 GHz licenses and new AWS licensees now have a cost-effective alternative for relocation. By leveraging existing transmission equipment, neighboring 2.4 GHz license-exempt spectrum and a high capacity, carrier-class TDM and Ethernet radio system, operators can minimize capital expense, minimize system downtime and ensure continued carrier-class performance when transitioning to a new band.

In the event the existing transmission infrastructure is in disrepair, the EX-2.4i remains a good option due to the distance capability and ability to make use of comparatively inexpensive grid dishes. Alternatively, Exalt offers both 5 GHz license-exempt radio systems and 6 GHz licensed radio systems.

About the EX-2.4i

The EX-2.4i makes the 2.4 GHz band usable in the most challenging collocation and interference environments by providing unprecedented frequency agility, interference rejection and carrier-class availability and reliability. The system's 1 MHz tuning resolution, variable channel bandwidth, and security features allows the EX-2.4i to operate where other systems cannot, optimizing the utilization of available spectrum to the fullest.

A minor upgrade to the EX-2.4i system will provide substantial T1 (TDM) and Ethernet capacity improvements over previous equipment. And with the simple addition of a 2 GHz combiner, both legacy and new operators can instantly add T1 and Ethernet capacity to their 1.7 and 2.1 GHz links without a fork-lift upgrade.

Visit www.exaltcom.com for more information on microwave radio systems from Exalt Communications.

Appendix A: Site Checklist Form

Site Checklist		
ITEM	**SITE 1**	**SITE 2**
Antenna Make/ Model	-	-
Antenna Gain	- dBi	- dBi
Cable Type	-	-
Cable Length	- ft	- ft
Lightning Protection (LP)	Y_____/N_____	Y_____/N_____
LP Make/Model	-	-
Equipment Rack (1U required)	Y_____/N_____	Y_____/N_____
UPS (optional)	Y_____/N_____	Y_____/N_____
Overall Condition (1-10)		
Login into bridges & view logs (screenshots are helpful)		

Notes:

Digital pictures should be taken during initial inspection. If available, a Praxsym (http://www.praxsym.com/) meter should be used to inspect cable integrity. Any reflectometer covering 2.4 - 2.5 GHz may be used.