

STA Auxiliary Documentation

Measures taken to prevent interference

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1 Background

As part of the NSF SII-NRDZ program, the University of Utah (UofU) in Salt Lake City, Utah, is using the POWDER platform to prototype an end-to-end radio dynamic zone (RDZ), i.e., the POWDER-RDZ. In addition to implementing a prototype Zone Management System (ZMS), called OpenZMS, POWDER-RDZ is exploring a number of practically realizable spectrum sharing use cases that would illustrate technical aspects of an RDZ, as well as explore regulatory aspects of spectrum sharing.

In this context, one of the use cases the University of Utah is exploring is the feasibility of an RDZ safely sharing spectrum with radar systems operating in the 2.7-2.9 GHz range. Concretely, in the case of POWDER-RDZ, a spectrum sharing field trial would involve “testing RF equipment” in the POWDER platform sharing the spectrum range with the federal radar systems in our vicinity. To obtain feedback on the feasibility of the approach and the steps required in realizing it, the University and NTIA undertook a collaborative effort to perform a sensitivity analysis of the radar systems in the context of test equipment at the POWDER facility, and based on that analysis propose an approach towards a possible spectrum sharing field trial.

The three closest radar systems to the POWDER-RDZ are: An ASR-9 airport surveillance radar at the Salt Lake City International Airport, a NEXRAD weather radar (KMTX WSR-88D) located north-west of Salt Lake City, and an ASR-9 system at Bovine Mountain, also located north-west of Salt Lake City. (The airport ASR-9 system is approximately 11 kilometers and line-of-sight from the University of Utah campus. The KMTX system is approximately 75 kilometers away and non-line-of-sight. The Bovine Mountain ASR-9 system is 175 kilometers away and non-line-of-sight.)

In summary the University proposes a multi-step process whereby we will completely avoid the spectrum range associated with the ASR-9 system at the Salt Lake City airport and progress through a carefully controlled series of experiments to make use of the bottom part of the band (2.7-2.8 GHz). (In essence starting with a few low power transmitters and ending with several nodes transmitting at modest power levels.)

As part of NTIA’s ongoing effort to accommodate spectrum sharing, NTIA is working with the Federal Aviation Administration (FAA) and the National Oceanic and Atmospheric Administration (NOAA) to protect the federal systems from harmful interference.

2 Sensitivity Analysis

The University and NTIA have performed a detailed sensitivity analysis to simulate the effect of proposed experiments on all Federal radar systems near the northern Utah region (see Figure 1).

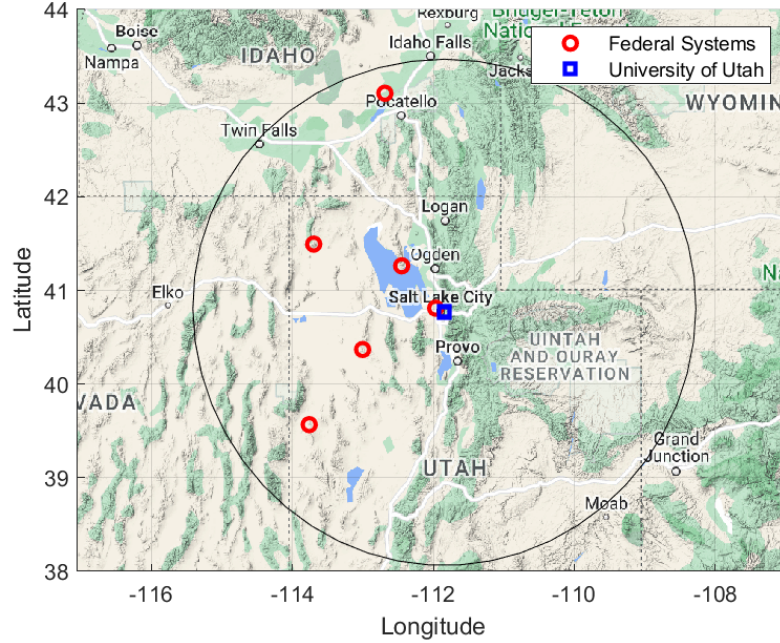


Figure 1: All federal systems included in sensitivity analysis

The analysis (given in summary here, full details are available on request) uses the ITS Irregular Terrain Model (with terrain database provided by NTIA) to predict path loss between a simulated reference transmitter at the proposed location, and each Federal radar system investigated. Each transmitter is modeled by its measured power spectral density output; each receiver under each of its possible operating channels and with the appropriate ASR-9/NEXRAD FDR (frequency dependent response), according to Recommendation ITU-R SM.337-4; and the predicted receive power is compared to thermal noise levels as described in Recommendation ITU-R M.1464-2. (Our prior analysis was performed on an earlier prototype of our intended deployment when operating at +7 dBm under laboratory conditions; we will continue to measure and simulate the actual system under proposed parameters before commencing operation.)

The results are shown in Figure 2. Our conclusion is that operation above 2800 MHz is impossible, because harmful interference to the Salt Lake City Air-

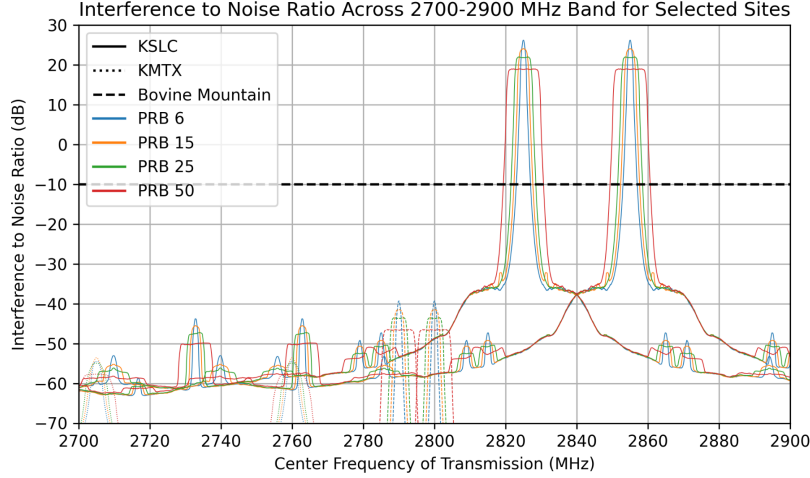


Figure 2: Reference transmitter interference simulation

port ASR-9 would be unavoidable, but careful transmissions between 2700–2800 appear feasible at appropriate power levels to both permit useful experimental communication within POWDER-RDZ while avoiding harmful interference to all existing Federal systems.

3 Measures to Prevent Interference

To prevent interference, the University will:

1. Comply with all 47 CFR §5 regulations, including non-interference and spurious emission criteria, and also Recommendation ITU-R M 1464-2 to protect Federal systems from harmful interference.
2. Perform experiments in consultation with NTIA (and, indirectly via NTIA, relevant Federal agencies such as FAA, NOAA, etc.) and only within any bounds specified by those parties.
3. Ensure all transmissions are performed at power levels not to exceed the lower of:
 - (a) +48 dBm average EIRP;
 - (b) a level where according to our characterisations we expect the radiated power to reach -10 dB I:N ratio at any Federal system; or
 - (c) any limit determined in consultation with NTIA to prevent harmful interference to any Federal system.