
Spectral Assessment of Government Systems

Outputs

- Land mobile radio usage measurements in Denver and New York City.
- Maritime radar emission spectrum measurements.

The US Government operates a large number of radio systems, and advances in technology continue to drive the development of new radio systems. In recent years, alternatives to conventional analog FM land mobile radio (LMR) systems have become available. But planning for upgraded networks cannot be accomplished until requirements can be set for the traffic capacity that must be built into the new systems. In FY 2002, ITS performed measurements of traffic levels and message length statistics on existing LMR networks in selected bands in Denver, CO and New York City.

The measurements were designed to show overall usage levels on a channel-by-channel basis in these cities. Since the goal was to establish overall usage across the metropolitan areas, multiple measurement locations were required in each city. The measurement systems were suitcase versions of the NTIA/ITS Radio Spectrum Measurement System, running ITS-developed software.

The measurements were technically challenging for several reasons. One problem was to identify locations in the heart of each city with large radio horizons (Figures 1a and 1b) that were free of local transmitters that would overload the measurement systems. Another problem was to establish measurement rates that were high enough to revisit each channel every second, but not so high as to cause uncalibrated measurements. A test series of measurements was performed in Denver, and a full series of measurements was performed in New York.



Figure 1a. View of downtown Manhattan from one of the New York City LMR measurement sites (photograph by F.H. Sanders).



Figure 1b. View of midtown Manhattan from one of the New York City LMR measurement sites (photograph by F.H. Sanders).

Measurements were performed at three sites in each city for a period of two weeks, running 24 hours per day. The resulting data volumes approached 100 GB for each city. ITS developed new analysis techniques to cope with the volume and provide channel usage and message length statistics. Figure 2 shows an example data output from this measurement series.

In FY 2002 ITS began a detailed study of the behavior of spurious emission spectra produced by radar transmitters. Those emission levels are regulated by the NTIA Radar Spectrum Engineering Criteria (RSEC), but the measured power level of these emissions depends upon the bandwidth

in which they are measured. Until recently, measurement bandwidths have been specified to be set equal to the inverse of the radar pulse widths ($1/t$), but some radar pulse widths are so narrow that no measurement equipment is available with sufficiently wide bandwidth. Thus it is important to understand the exact dependence of radar spurious levels as a function of measurement bandwidth. To begin the study, ITS bought a commercial radar and installed it north of Boulder. The measurement series began in late FY 2002. Results of the measurements will be used in FY 2003 for an NTIA Report and at least one US Contribution for the International Telecommunication Union — Radiocommunication Sector, Working Party 8B (ITU-R WP 8B). The data are needed so that NTIA can provide guidance to domestic and international personnel who are tasked with measuring radar emissions and comparing them to emission masks such as the RSEC.

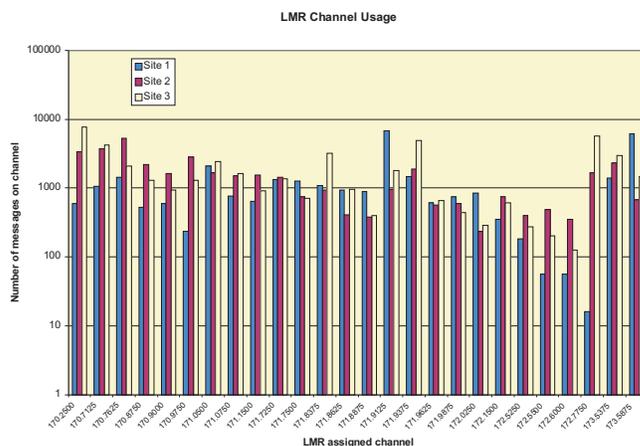


Figure 2. Data output showing land mobile radio channel usage at three selected sites in New York City.

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