

COMMERCIAL MOBILE RADIO SERVICES: A PRIMER FOR
RADIO ASTRONOMY SPECTRUM MANAGERS

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The 21st century will see unprecedented growth in demand for data and information services, with much (or perhaps most) of this growth occurring in the Commercial Mobile Radio Service (CMRS) market. This presentation aims to provide a better understanding of the wireless technologies that have been or will be used to facilitate that growth, and how those technologies will impact spectrum management for radio astronomy.

The presentation will include a primer on cellular and Personal Communications Service (PCS) technologies ("1G" and "2G" systems), concentrating on aspects of the technologies that are relevant to radio astronomy spectrum management. Circuit-switched analog (AMPS) and digital (iDEN, ANSI-136, GSM, and CDMA) technologies will be covered. Physical properties of the air interfaces will be presented, including: frequency bands currently employed for cellular and PCS services; service rules including transmit power limitations and out-of-band emission masks; network topology and cell site characteristics, including antenna characteristics and applications of advanced concepts such as MIMO and smart antenna technologies; temporal signal characteristics, including frame structures for TDMA-based technologies such as ANSI-136 and GSM and spreading methods for CDMA; and spectral signal characteristics including modulation methods, power spectral densities, and "real-world" out-of-band emissions.

Beyond 2G systems, next-generation CMRS services ("2.5G," "3G," "4G," etc.) will play increasingly important roles in spectrum management in the 21st century. Generally, these services are lumped together under the Federal Communications Commission's designation of "Advanced Wireless Services" (AWS), and new spectrum allocations are being developed to accommodate the deployment and predicted growth in demand for AWS. As with 1G and 2G services, a primer on AWS (as embodied by EDGE, WCDMA, and OFDM air interfaces) and characteristics of AWS relevant to radio astronomy spectrum management will be provided.

Because of the ubiquity of CMRS applications, "cellular telephones" (in the general sense) are often perceived by radio astronomers as a major interference threat to passive services. In reality, such technology is providing enormous benefit to all segments of society through the provision of economical, convenient, mobile, and spectrally-efficient communications services, while its impact on radio astronomy is relatively low.

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