The electromagnetic spectrum has been around for as long as the universe, but from all the attention heaped on it recently, you’d think it had just surfaced yesterday. New digital and wireless technologies—from cell phones to satellites to high-definition television—are dramatically changing how we use the airwaves and presenting enormous new business opportunities. The U.S. government and the Federal Communications Commission have responded by reallocating huge swaths of spectrum for new uses and auctioning slices to the highest bidders for prices expected to reach well into the billions.

The future of many giant communications companies rests on the outcome of those auctions. It’s tricky business and complex science. Here’s a primer.

### Major Commercial Wireless Services*

**Broadcast TV**
- Channels 2-4 (VHF) 54 to 72 MHz
- Channels 5-6 (VHF) 76 to 88 MHz
- Channels 7-13 (VHF) 174 to 216 MHz
- Channels 14-20 (UHF) 470 to 512 MHz
- Channels 21-36 (UHF) 512 to 608 MHz
- Channels 38-69 (UHF) 614 to 806 MHz
- See also 3G Broadband Wireless below

**3G Broadband Wireless**
- 746 to 764 MHz; 776 to 794 MHz

**Digital TV**
- 54 to 88 MHz
- 174 to 216 MHz
- 470 to 806 MHz

**Cellular Phone Service**
- 806 to 902 MHz

**Personal Communications Service (PCS)**
- 1,850 to 1,990 MHz

**Satellite-Delivered Digital Radio**
- 2,320 to 2,325 MHz

**Multichannel Multipoint Distribution Service (MMDS)**
- 2,150 to 2,680 MHz

**3G Broadband Wireless (proposed)**
- 1,710 to 1,855 MHz
- 2,500 to 2,690 MHz

The Clinton administration has proposed auctioning this spectrum for 3G broadband wireless services.

**Wireless Communications Service (WCS)**
- 2,305 to 2,320 MHz; 2,345 to 2,360 MHz

**Direct Broadcast Satellite (DBS)**
- 12.2 to 12.7 GHz

EchoStar and DirecTV now dominate this fast-growing business, offering hundreds of TV channels via satellite. They have become major competitors to cable TV companies. Both DBS firms are adding interactivity using wire-line and satellite back channels.

**Digital Electronic Message Service (DEMS)**
- 24.25 to 24.45 GHz; 25.05 to 25.25 GHz

This high-capacity allocation carries a lot of data but the signal can’t travel far. T eligent owns most of the licenses and offers broadband data services to businesses in dense, urban areas.

**Local Multipoint Distribution Service (LMDS)**
- 27.5 to 29.5 GHz; 30.1 to 31.3 GHz

XO Communications (the merger of NextLink and Concentric), a venture founded by Craig McCaw, dominates this band, with 95 percent coverage in the top 30 markets. Winstar also holds some licenses here. Both are building fixed wireless systems.

**Teledesic**
- 18.8 to 19.3 GHz
- 28.6 to 29.1 GHz

Teledesic, the two-way digital satellite service scheduled for full deployment by 2005, plans to use the 18-GHz band for downstream transmissions and the 28-GHz band for upstream. Teledesic’s investors include wireless pioneer Craig McCaw, Bill Gates, and Saudi prince Al-Waleed bin Talal.

**3G Fixed Wireless Service**
- 38.6 GHz to 40 GHz

Winstar was the top bidder at the May auction of this spectrum, paying $161 million for 931 licenses. It plans to offer fixed wireless services in combination with its LMDS capacity at 28 GHz.

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*This diagram shows only a select number of U.S. commercial services. Not represented are hundreds of more minor commercial and noncommercial services. The government is the single largest user of U.S. airwaves. It runs services ranging from law enforcement radio to satellite space research and top-secret military communications.