



SITE SELECTION

Once the basics have been established (frequency band, simplex vs. duplex, coverage area and transmitter power output, antenna gain and height) the site selection process can commence.

The main options involved in site selection are obtaining land and constructing a tower or renting space on a community tower or rooftop. The latter poses the greatest technical challenge for the system designer. The presence of strong ambient RF from nearby tenants will almost invariably create problems of receiver desensitization and intermodulation products in your receivers and transmitters and theirs. Receiver desensitization occurs when off-channel RF energy enters the front-end of a receiver and overloads the amplifier circuits, causing a reduction in overall receiver gain or sensitivity. This generally points to inadequate selectivity of the receiver, which must be augmented with external filter devices.

#### TRANSMITTER NOISE

Transmitter noise is sideband energy, created by the speech amplifier and modulator of a transmitter, which falls outside the permissible channel bandwidth. Regulatory agencies such as the FCC govern the attenuation of these spurious radiations, but improper transmitter adjustment, (overdeviation), lax maintenance (spurring), and the tendency for certain digital modulation techniques (particularly paging) to "splatter," all contribute to this problem.

Receiver-caused intermodulation refers to the RF energy generated by the mixing (heterodyne) action in the non-linear active device (tube or solid-state) of the receiver front end. These IM products may also desensitize the receiver. Usually the third order IM product predominates.

Transmitter-caused intermodulation is similar to that in receivers, and refers to RF energy generated by the mixing action in the transmitter's final amplifier stage. Unless an isolator or other filter device is provided at the transmitter, the transmitting antenna functions very well as a receiving antenna for importing nearby ambient RF and heterodynes nicely with all available frequencies present, intended or otherwise.



INTERMODULATION

Common sense suggests planning for desense and intermod troubles rather than compensating for them after the system is operational. This is done by obtaining a comprehensive list of all transmit and receive frequencies in use, as well as transmitter power levels, from the site manager.

If your operating frequencies are known, these data can be entered into a computer software package available for intermodulation studies to determine critical frequency combinations in existence, and those potentially created by your equipment. It is very helpful, for example, to know whether a strong intermodulation product exists within your receiver's pass band, for there is virtually nothing that can be done to eliminate it other than choosing a different receive frequency. A fine example of "look before you leap."

Intermodulation products can be created virtually anywhere by a non-linear device, such as a receiver's first stage, a transmitter's power output stage, a loose connector, or even a corroded turnbuckle on a guy wire. First, look for the source of the problem. Good engineering practices and prudent maintenance should take care of corrosion problems, dissimilar metal combinations, and transmitter maladjustments. Sometimes the problem can be eliminated by requesting the transmitter's caretaker to re-tune the unit for better (legal) performance. In other instances it can be cured only by equipping another tenant's "offending" transmitter with a cavity resonator. Such solutions may require considerable diplomacy.

In other cases, intermod and desense problem can be cured by equipping your own system's transmitters or receivers with appropriate filters. It's better to identify these needs at the outset, and thereby for the necessary hardware, than to return to the site and employ the "borrow, cut and try" approach.

#### ANTENNAS AND FEEDLINES

Antennas and feedlines need to be selected with great care in order to perform the task expected of them. Because the antenna is the "business end" of the radio system, and probably requires a significant outlay for installation labor, specifications and quality should not be compromised. The wrong choice of gain or radiation pattern, or an inferior quality product, can sabotage an otherwise sound design.



ANTENNAS AND FEEDLINES