

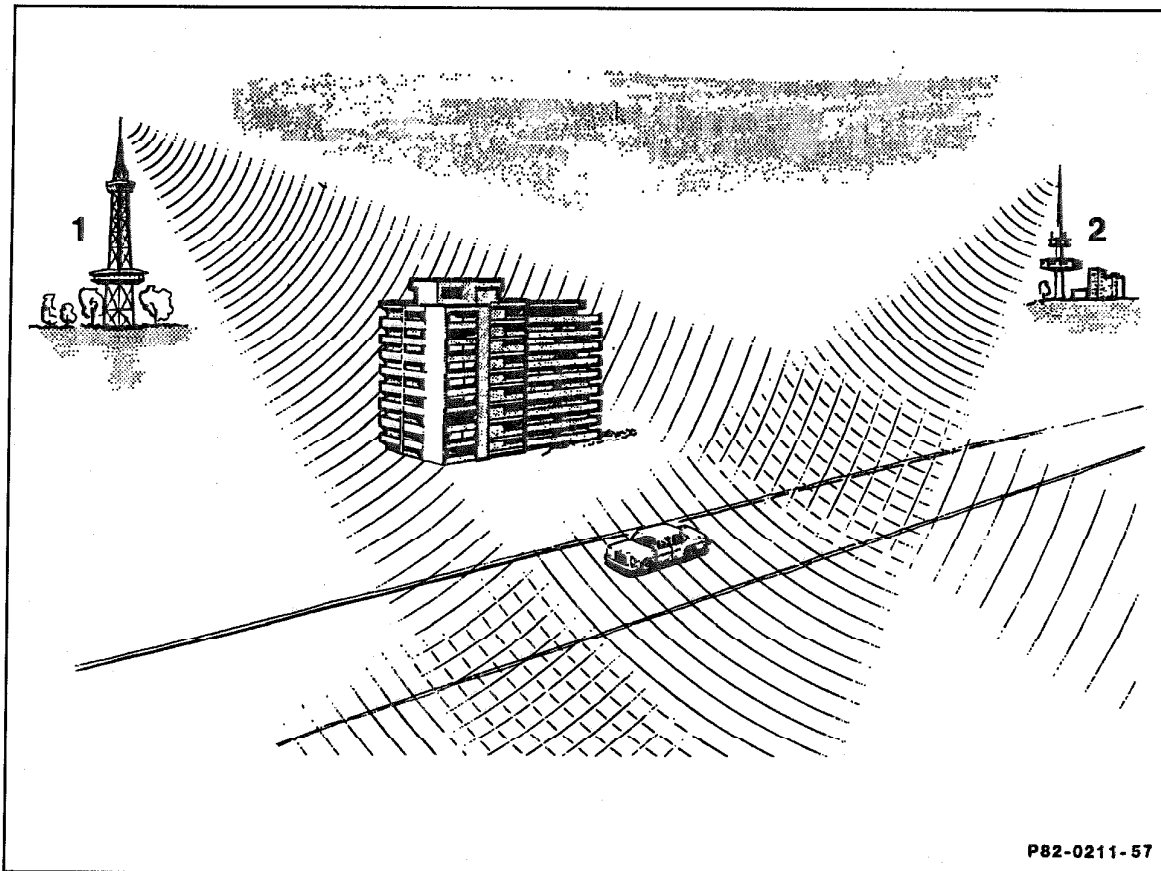
82-0507 FM and FM stereo reception in moving vehicles

Since the introduction of stereo radio systems in passenger cars there have been various complaints about stereo reception interference. However, these interferences are not due - as assumed in almost all cases - to a fault within the vehicle or the radio receiver or the reception system, but are due to the unique characteristics of FM wave reception.

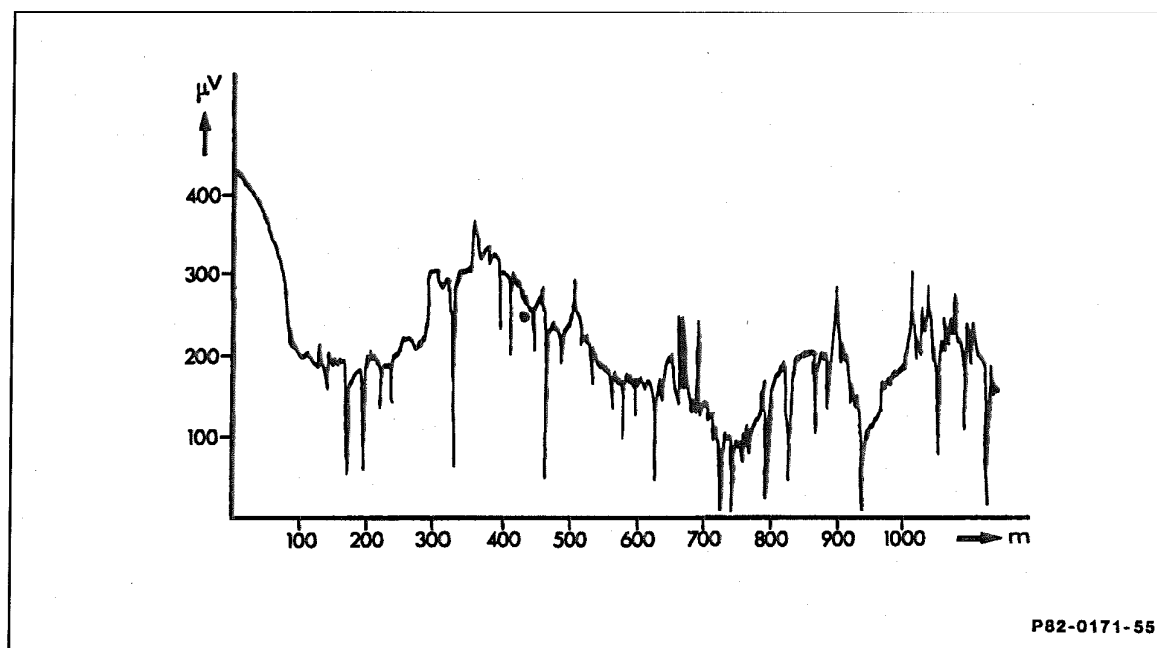
It is for this reason that we provide this information to facilitate evaluating complaints and to avoid unnecessary troubleshooting.

Field strength conditions

Owing to the particular nature of frequencies within the FM broadcast band propagating in a straight line, reception is theoretically possible only in a direct line of sight between transmitter and receiver. In practice however the FM waves also follow the curvature of the earth to some extent, in the course of which they are broken or reflected by buildings, hills and other obstructions. This results in large variations of received signal strength caused by the shadowing effect of these obstructions. While constant field strength conditions can be expected with stationary systems, these fluctuate constantly with varying intensity in a moving vehicle.



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The field strength diagram shows such a variable signal level. In cities, for example, it is possible that signal differences up to a ratio of 1 : 1000 may occur within the space of a few meters.

The differing field strength conditions are of particular importance to stereo reception, as this requires a frequency bandwidth three times greater than that required for mono reception. This means that the frequency band contributing to "background noise" during stereo reception is three times greater than that during mono reception. Therefore, a field strength approx. ten times greater is required in practice for interference-free (noise-free) stereo reception.

In areas with unfavorable field strength conditions, stereo reception can be disturbed much more easily than mono reception. It is also possible that a station just tuned in suddenly disappears. The cause of such interference is not a defect or fault within the receiver but due to reception conditions.

Reflection

Reflection, which is considered the most frequent reception interference, causes noises and reception distortions. These occur when both a direct and a reflecting signal of one station are received at the same time. The signals then mix together, with distortion and phase-cancellation due to slight timing differences resulting in clearly audible noise. This occurs mostly for very short periods of time, as it happens only under certain conditions, but its acoustic perception is very pronounced and can be clearly reproduced when slowly driving through areas of signal reflection. The signals are superimposed and partly cancel each other in this process.

Other interference

The vehicle antenna not only picks up transmitted signals but also interference signals which can be caused by sources outside the vehicle or by the vehicle itself. If the vehicle interference suppression is in order, too weak a useful signal may facilitate interference. If the desired signal voltage on the receiver input is significantly greater than the interference voltage, the interference is completely suppressed. However, if the interference voltage is roughly at the same level as the desired signal voltage or even higher, which may be the case if tuned in to a weak station, interference during reception is particularly evident. No technical remedy is possible for this type of interference except changing over to another station.