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NL-5656 AA Eindhoven (NL)(54) **Improved transmitter network with a single transmitter frequency.**

(57) A transmitter network comprising a plurality of transmitters having a like transmitter frequency may cause disturbance to occur in an adjacent similar transmitter network. This disturbance is no longer of an echo signal type, so that cancellation thereof will be more difficult.

For eliminating this disturbance as much as possible, a transmitter network is proposed in which auxiliary transmitters are used having an aerial height which becomes smaller according as the edge of the coverage area is approached more.

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The invention relates to a transmitter network comprising at least two transmitters having a like transmitter frequency which transmit a like signal.

Such a transmitter network is known from the journal article entitled "DAB - A new sound broadcasting system, Status of the development - Routes to its introduction" by G. Plenge in EBU Review no. 246, April 1991, Chapter 5.2.2, pp. 87-112.

When a conventional transmitter network is designed, for example, for broadcasting purposes, one is generally confronted with the problem that not enough channels are available for the signals to be transmitted. In that case one resorts to reusing frequencies whilst under normal propagation conditions it is possible to receive in a certain area only one of the transmitters transmitting at a specific frequency, so that no mutual disturbance need be expected under normal propagation conditions. In such a conventional transmitter network, however, disturbances may nevertheless occur under special propagation conditions, such as, for example, tropospheric ducting.

In the transmitter network known from above journal article, a signal is transmitted with a like transmitter frequency *via* a plurality of transmitters, whereas a receiver can receive signals from different transmitters. As a result, a disturbance signal is developed having a characteristic corresponding to an echo signal. This (undesired) echo signal is suppressed in the receiver by means of an echo canceller or by using a what is commonly referred to as guard band in the time domain when the signal to be transmitted is actually transmitted. Consequently, it is possible that this received signal is discarded in the receiver for a specific period of time during which the received signal is disturbed by the echo signals.

A great advantage of transmitter networks, in which no more than a single transmitter frequency is used, is that much fewer channels need to be available than when conventional transmitter networks are used.

However, there may be a problem on the boundaries of coverage areas of a plurality of transmitter networks, because in that case the signal received from the other transmitter network no longer has the features of an echo signal, so that the receiver cannot suppress these disturbing signals in an unqualified manner.

It is an object of the invention to provide a transmitter network as defined in the opening paragraph in which the disturbance caused by this transmitter network outside its coverage area is reduced.

For this purpose, the transmitter network is characterized, in that the transmitter network comprises a main transmitter and an auxiliary transmit-

ter, the auxiliary transmitter having a smaller aerial height than the main transmitter and the auxiliary transmitter being installed on the boundary of the coverage area of the main transmitter.

By adding a plurality of auxiliary transmitters with a smaller aerial height to the main transmitter, it becomes possible to realise a sharply defined coverage area of the transmitter network, which is meant to denote that with a specific size of the coverage area the disturbance caused outside this coverage area is reduced compared with the use of only a single main transmitter. If the auxiliary transmitters are installed on the boundary of the coverage area of the main transmitter, the size of the coverage area of the overall transmitter network is determined by the coverage area of the auxiliary transmitters. The field strength received from an auxiliary transmitter with a smaller aerial height than that of the main transmitter diminishes more rapidly as a function of the distance from the receiver to this auxiliary transmitter than does the field strength received from a main transmitter as a function of the distance from the receiver to the main transmitter. This is caused by the fact that with the auxiliary transmitter having a smaller aerial height the area in which direct-sight transmission occurs, while the field strength diminishes by the squared distance from transmitter to receiver, is smaller than with the main transmitter, so that the area beyond the direct-sight distance, in which the field strength is reduced by the fourth power of the distance, starts earlier. Due to this faster reduction of the received field strength, the coverage area of the overall transmitter network will thus be more sharply defined than the coverage area of a main transmitter alone.

A further embodiment of the invention is characterized, in that the transmitter network comprises further auxiliary transmitters positioned on the boundary of the coverage area of another auxiliary transmitter, the aerial height of the further auxiliary transmitters becoming ever smaller as the boundary of the coverage area of the transmitter network is approached more.

By positioning smaller auxiliary transmitters on the boundary of the coverage area of an auxiliary transmitter, it is possible to supply a high-quality signal to an erratically formed coverage area without causing much disturbance outside this area.

The invention will be further explained with reference to the drawing Figures, in which

Fig. 1 shows the variation of the received signal as a function of the position of the receiver when no more than one main transmitter is used and when a main transmitter and a plurality of auxiliary transmitters according to the invention are used; and

Fig. 2 shows the coverage area of a transmitter network in which auxiliary transmitters are used having an ever smaller aerial height as the boundary of the coverage area is approached more.

The dashed line a in Fig. 1 shows the field strength of the received signal as a function of the position of a receiver whilst assuming that no more than a single main transmitter A is used. There is further assumed that the coverage area is to have the size as denoted by the letter D and that the relative field strength within the coverage area is to be at least -90 dB. This -90 dB value may be determined, for example, by disturbance caused by transmitters from a neighbouring area.

The variation of the field strength as a function of the distance is determined on the basis of formulas for the received field strength as a function of the distance of a transmitter as stated in the title "Microwave Mobile Communications" by W.C. Jakes, Wiley, 1974.

The solid lines show the received signal coming from the main transmitter A and the auxiliary transmitters B₁, B₂ if a plurality of auxiliary transmitters B₁, B₂ are positioned 30 km apart around the main transmitter A. The aerial height of the main transmitter A is assumed to be a 300 metres and the height of the aërials of the auxiliary transmitters B₁ and B₂ is assumed to be 10 metres. Fig. 1 distinctly shows that the size of the coverage area may be maintained with a considerably lower transmitter power of the main transmitter A. This lower power of the main transmitter leads to a smaller field strength of the received signal outside the coverage area, as a result of which the disturbance caused outside the coverage area is reduced proportionally.

In the transmitter network as shown in Fig. 2 there is a main transmitter A supplying a signal to a large part of the coverage area. On the boundary of the coverage area of the main transmitter A four auxiliary transmitters B₁ to B₄ having a smaller aerial height are present increasing the overall coverage area. In addition, further auxiliary transmitters D₃, D₅ and D₆ and D₁, D₂ and D₄ respectively, are present on part of the boundary of the coverage area of the main transmitter A and on the boundary of the coverage area of the auxiliary transmitters B₁ to B₃, the further auxiliary transmitters having an aerial height again smaller than that of the auxiliary transmitters B₁ to B₄. Finally, auxiliary transmitters E having an even smaller aerial height are present for completely covering the desired coverage area.

which transmit a like signal, characterized in that the transmitter network comprises a main transmitter and an auxiliary transmitter, the auxiliary transmitter having a smaller aerial height than the main transmitter and the auxiliary transmitter being installed on the boundary of the coverage area of the main transmitter.

2. Transmitter network as claimed in Claim 1, characterized in that the auxiliary transmitters are positioned around the main transmitter.

3. Transmitter network as claimed in Claim 1 or 2, characterized in that the transmitter network comprises further auxiliary transmitters positioned on the boundary of the coverage area of another auxiliary transmitter, the aerial height of the further auxiliary transmitters becoming ever smaller as the boundary of the coverage area of the transmitter network is approached more.

Claims

1. Transmitter network comprising at least two transmitters having a like transmitter frequency

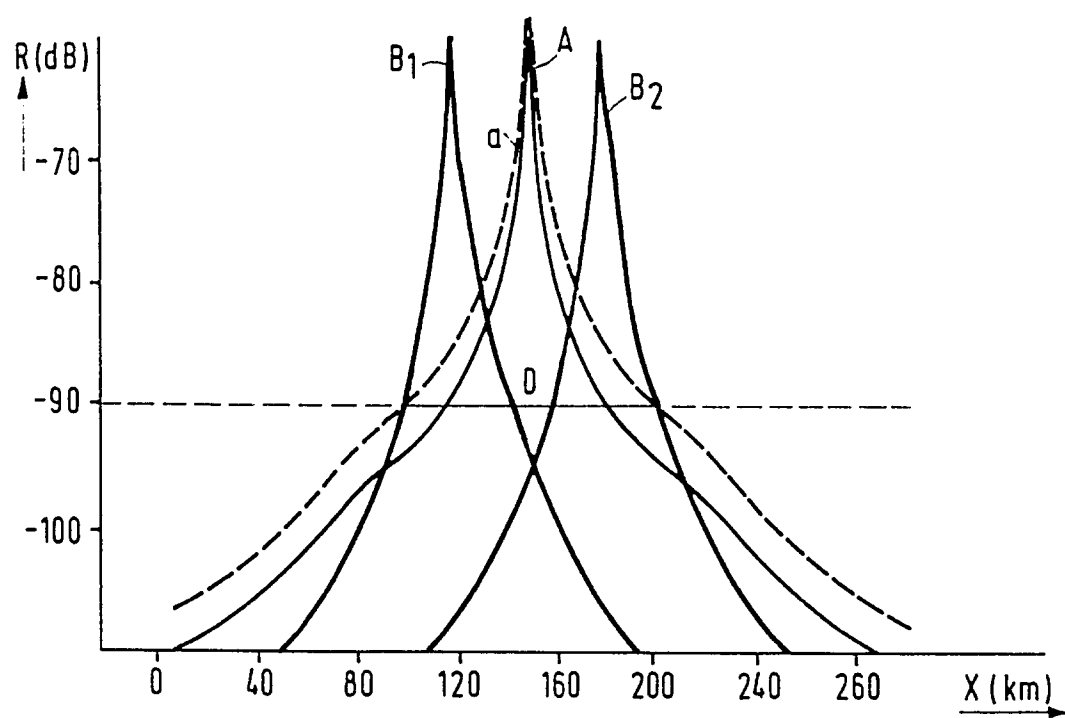


FIG. 1

