# Intelligent Jamming Helps Improve System Coverage

The word 'jamming' is normally associated with things like electronic warfare or undesirable propaganda broadcasts. As such jamming is a rather 'negative' technique as it is designed to spoil, rather than to create.

However, and perhaps, surprisingly, jamming can actually also help to improve the operation of a radio system.

This article describes a technique which helps to better 'tailor' the coverage of a wide area (multi site) MPT1327 system.

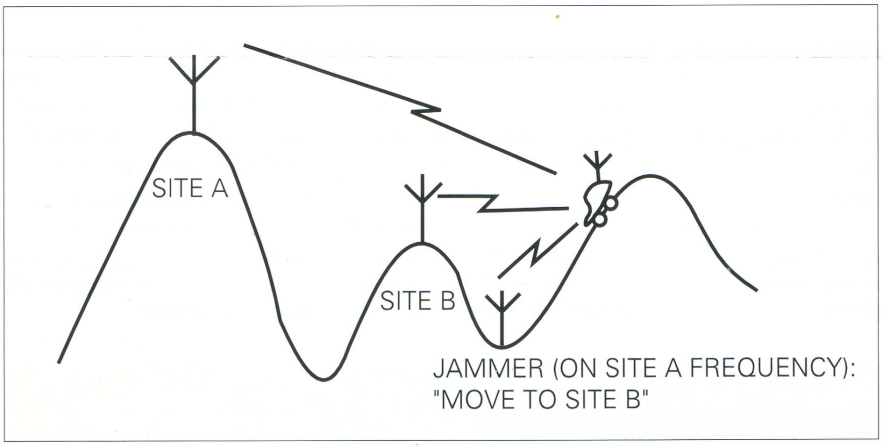


***Figure 1:*** *Without any further measures, an MPT1327 radio at location D could well vote to the site A control channel, and when moving towards site B, 'hang on' to site A for an extended time, while really, it should have locked onto site B.*
*To overcome the problem, the jammer transmits constant 'MOVE' messages in the site B coverage area, forcing mobiles to switch to the 'right' control channel (in this case of site B).*

| | 1 | PFIX | IDENTI | 1 | CAT (000) | TYPE (11) | FUNC (011) | CONT | (M) | RSVD | CRC |
|---|---|---|---|---|---|---|---|---|---|---|---|
| No. of bits | 1 | 7 | 13 | 1 | 3 | 2 | 3 | 10 | 5 | 3 | 16 |

***Figure 2:*** *The MPT1327 'MOVE' message instructs selected radio units (with the same PFIX/IDENT1 address structure) or all radio units of a system (M = 0) to a new control channel (CONT).*


***Figure 3:*** *Photograph of the Jammer Control Module. Its built-in intelligence will ensure that when the prime Control Channel would move (eg, when the system switches to a secondary Control Channel) the Jammer follows that move. And when for instance, the adjacent (referred CONT) site is off the air (for whatever reasons), it should stop jamming altogether.*

## The coverage challenge

While we like to think and plan for radio systems to follow the propagation patterns that we assign to it in our coverage plans, radio signals unfortunately have a will of their own.

Cell coverage is never nicely limited to hexagons or circles.

The field of quality RF coverage system design is complex, embracing technically well disciplined design techniques as used in antenna and antenna system designs but also requiring a certain degree of 'black art' to fine tune a system's actual coverage performance.

We all know those seasoned, well experienced RF engineers that can (it sometimes seems) almost literally 'see' RF propagation problems when evaluating a (potential) site.

Because non-line-of-sight radio propagation is so variable, many conflicts occur in actual practice. If the coverage area is relatively flat it is not too bad, but when we need to cover areas such as those found in and around Sydney for instance, we really start to need these 'black art' engineers to get the system optimised and correctly fine tuned.

## A typical coverage problem

Unfortunately, coverage conflicts can never be fully eliminated. For instance, substantial coverage overlap, basically undesired, is usually inevitable in actual practice.

This problem is especially of significance

in the RF coverage design of MPT1327 systems.

A typical case is that of a mobile that will switch to the 'wrong' control channel after it has passed briefly through an overlap area.

Radios that are locked on the 'wrong' control channel can affect the system's performance greatly, not in the least from the user's point of view where he might have to do with a noisy and scratchy signal while travelling in a prime coverage area.

Or worse, the call may drop out altogether, as MPT1327 systems do not have the 'hand off' functionality that mobile phone systems have.

Techniques developed by Radio Systems Technologies however are now available to also provide fully compatible hand-off in MPT1327 systems.

A range of antenna system design tools is available to the system designer to achieve the best possible coverage — this 'antenna systems' issue is dedicated to the products and techniques that can be applied.

Especially for MPT1327 systems a new tool is available to complement the more 'conventional' antenna system design techniques.

RST's 'intelligent jammer' is a device that will help achieve better 'brick wall' coverage patterns in an MPT1327 system.

The technique is based on one of those many MPT1327 protocol messages that up to now are rarely or not at all used.

Even truly experienced MPT1327 experts usually still find some interesting and new information when flipping through the relevant protocol documents.

The MPT1327 protocol, while launched quite some time ago now, is a 'living' document that still gets extended from time to time to further improve it.

The message is the MPT1327 'MOVE' message. A 'MOVE' message will direct mobiles to a new control channel, regardless of whether or not the mobile 'thinks' that it is currently 'fine' on a particular control channel — the mobile MUST move to that new control channel.

The jammer comprises a control module, and a standard radio (normally a low powered mobile of about 1 W Tx power or less).

It covers that area of a specific cell that really, is supposed to be covered by an adjacent MPT1327 site.

Operating on the same frequency as the original cell control channel, it will constantly transmit 'MOVE' messages to any radios that get in reach of the jammer coverage area.

As such the jammer acts as a kind of RF policeman that will strictly send anyone in its coverage area to the 'right' site (which of course, can be user programmed).

Diagram Figure 1 depicts the basic principle of the jammer.

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