

Title (en)
Method for optimizing the spacing between receiving antennas of an array usable for counteracting both interference and fading in cellular systems

Title (de)
Verfahren zur Optimierung des Abstandes zwischen Empfangsantennen eines Arrays als Gegenmassnahme gegen Interferenz und Fading in zellularen Systemen

Title (fr)
Méthode pour l'optimisation de l'espacement entre des antennes de réception d' un réseau pour neutraliser l' interférence et le fading dans les systèmes cellulaires

Publication
EP 1826872 A1 20070829 (EN)

Application
EP 06425093 A 20060216

Priority
EP 06425093 A 20060216

Abstract (en)
The spacing between adjacent receiving antennas of an ULA located in a base station of a cellular communication system is optimized to both the channel and the interference space-time multipath. The spacing is larger than the canonical $\lambda/2$ for introducing a certain degree of angular equivocation aimed to see the interferers (all or a certain number depending on the degree of freedom of the directivity function) as they were grouped together along an unique direction. In an ideal case of fixed interferers with null angular power spread, a given cellular planning and known aperture of the array, the optimal spacing $\#_{opt}$ between adjacent antennas is directly calculable in closed mathematical form in function of the equal angular separation $\#_{\theta}$ between the DOAs of the interferers. When the restrictive hypotheses are neglected, the optimal spacing $\#_{opt}$ is calculable as the spacing that minimizes the spread between the N_I wave numbers associated to the barycentric DOAs of the N_I interfering cells. Moreover closed form solution can be dealt with on condition that N_I interfering cells (with one broadside interfering cell) are considered; said angular separation between the interferers is assumed as being the average $\#_{\theta}$ among adjacent angular separations between barycentric DOAs weighted by the respective barycentric received power. Assuming a multipath channel with an arbitrary number of paths N_p , the i th barycentric DOA is calculated by executing a weighted average extended to the $N_p \times S$ directions of arrival of the N_p paths by the S points of a grid indicative of the positions spanned by the i th interfering station inside its cell, weighting each DOA by the power received on that path. In a SIMO scenario with square cell planning according to the fixed or mobile WiMAX IEEE 802.16d802.16-2004/e, the value $\#_{opt} = 1.8\lambda$ is found as an optimum trade-off between beamforming and diversity (fig.5).

IPC 8 full level
H01Q 21/08 (2006.01); **H01Q 21/22** (2006.01)

CPC (source: EP)
H01Q 1/246 (2013.01); **H01Q 21/08** (2013.01); **H01Q 21/22** (2013.01)

Citation (applicant)
S. SAVAZZI; O. SIMEONE; U. SPAGNOLINI: "Optimal design of linear arrays in a TDMA cellular system with Gaussian interference", IEEE PROC. SPAWC, 2005

Citation (search report)

- [A] US 6056780 A 20000502 - AUBRY CLAUDE [FR], et al
- [A] EP 0755090 A1 19970122 - NORTHERN TELECOM LTD [CA]
- [A] US 2005001765 A1 20050106 - RYU KIL-HYEN [KR], et al
- [DA] "Optimal design of linear arrays in a TDMA cellular system with Gaussian interference", SIGNAL PROCESSING ADVANCES IN WIRELESS COMMUNICATIONS, 2005 IEEE 6TH WORKSHOP ON NEW YORK, NY, USA JUNE 2-8, 2005, PISCATAWAY, NJ, USA, IEEE, 2 June 2005 (2005-06-02), pages 485 - 489, XP010834466, ISBN: 0-7803-8867-4

Designated contracting state (EPC)
AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HU IE IS IT LI LT LU LV MC NL PL PT RO SE SI SK TR

Designated extension state (EPC)
AL BA HR MK YU

DOCDB simple family (publication)
EP 1826872 A1 20070829; CN 101083498 A 20071205; WO 2007093384 A1 20070823

DOCDB simple family (application)
EP 06425093 A 20060216; CN 200710137997 A 20070216; EP 2007001238 W 20070213