

Title (en)

Time modulated antenna array with optical switches

Title (de)

Zeitmodulierte Gruppenantenne mit optischen Schaltern

Title (fr)

Réseau d'antenne modulé en temps avec des interrupteurs optiques

Publication

EP 2744042 A1 20140618 (EN)

Application

EP 12275200 A 20121211

Priority

EP 12275200 A 20121211

Abstract (en)

A method and system for driving a time modulated antenna array; comprising performing time switching of signals for one or more different elements (48, 50,...52) of the antenna array (14) by optically switching the one or more signals. The signals may be time switched to perform pattern shaping and/or harmonic beam steering. Optical signals of different wavelengths may be optically switched, each wavelength being for a respective different antenna element, and in this event the optical signals may be wavelength division multiplexed and transmitted over an optical link (8) to the antenna elements (48, 50,...52), and the optical switching may be performed remotely from the vicinity of the antenna array (14). The antenna array may comprise a two-dimensional array of antenna elements, for example a cylindrical array (214), with rows or other groupings of the antenna elements being for time modulated switching using the time switched signals.

IPC 8 full level

H01Q 3/24 (2006.01); **H01Q 3/26** (2006.01)

CPC (source: EP)

H01Q 3/24 (2013.01); **H01Q 3/2676** (2013.01)

Citation (applicant)

- H. E. SHANKS; R. W. BICKMORE: "Four-dimensional electromagnetic radiators", CANADIAN JOURNAL OF PHYSICS., vol. 37, 1959, pages 263 - 275
- W. H. KUMMER; A. T. VILLENEUVE; T. S. FONG; F. G. TERRIO: "Ultra-low sidelobes from time-modulated arrays", IEEE TRANSACTIONS ON ANTENNA AND PROPAGATION, vol. 11, November 1963 (1963-11-01), pages 633 - 639
- J. C. BREGAINS; J. FONDEVILA; G. FRANCESCHETTI; F. ARES: "Signal radiation and power losses of time-modulated arrays", IEEE TRANSACTIONS ON ANTENNA AND PROPAGATION, vol. 56, no. 6, June 2008 (2008-06-01), pages 1799 - 1804, XP011216006
- S. YANG; Y. B. GAN; A. QING; P. K. TAN: "Design of uniform amplitude time modulated linear array with optimized time sequences", IEEE TRANSACTIONS ON ANTENNA AND PROPAGATION, vol. 53, no. 7, July 2005 (2005-07-01), pages 2337 - 2339, XP011135830, DOI: doi:10.1109/TAP.2005.850765
- G. LI; S. YANG; M. HUANG; Z. NIE: "Sidelobe Suppression in Time Modulated Linear Arrays with Unequal Element Spacing", JOURNAL OF ELECTROMAGNETIC WAVES AND APPLICATIONS, vol. 24, no. 5-6, 2010, pages 775 - 783
- J. FONDEVILA; J. C. BREGAINS; F. ARES; E. MORENO: "Optimising uniformly excited linear arrays through time modulation", IEEE ANTENNAS WIRELESS PROPAGATION LETTERS, vol. 3, 2004, pages 298 - 300
- L. MANICA; P. ROCCA; L. POLI; A. MASSA: "Almost time-independent performance in time-modulated linear arrays", IEEE ANTENNAS WIRELESS PROPAGATION LETTER, vol. 8, August 2009 (2009-08-01), pages 843 - 846, XP011331059, DOI: doi:10.1109/LAWP.2009.2027452
- L. POLI; P. ROCCA; L. MANICA; A. MASSA: "Handling sideband radiations in time-modulated arrays through particle swarm optimization", IEEE TRANSACTIONS ON ANTENNAS AND PROPAGATION, vol. 58, no. 4, April 2010 (2010-04-01), pages 1408 - 1411, XP011300585
- P. ROCCA; L. POLI; G. OLIVERI; A. MASSA: "Synthesis of time-modulated planar arrays with controlled harmonic radiations", JOURNAL OF ELECTROMAGNETIC WAVES AND APPLICATIONS, vol. 24, no. 5-6, 2010, pages 827 - 838
- P. ROCCA; L. MANICA; L. POLI; A. MASSA: "Synthesis of compromise sum-difference arrays through time-modulation", IET RADAR SONAR NAVIGATION, vol. 3, November 2009 (2009-11-01), pages 630 - 637, XP006034081, DOI: doi:10.1049/IET-RSN:20090058
- L. POLI; P. ROCCA; L. MANICA; A. MASSA: "Pattern synthesis in time-modulated linear arrays through pulse shifting", IET MICROWAVES, ANTENNAS & PROPAGATION, vol. 4, no. 9, September 2010 (2010-09-01), pages 1157 - 1164, XP006036279, DOI: doi:10.1049/IET-MAP:20090042
- L. POLI; P. ROCCA; L. MANICA; A. MASSA: "Time modulated planar arrays - Analysis and optimisation of the sideband radiations", IET MICROWAVES, ANTENNAS & PROPAGATION, vol. 4, no. 9, September 2010 (2010-09-01), pages 1165 - 1171, XP006036294, DOI: doi:10.1049/IET-MAP:20090379
- E. AKSOY; E. AFACAN: "Thinned Nonuniform Amplitude Time-Modulated Linear Arrays", IEEE ANTENNAS WIRELESS PROPAGATION LETTER, vol. 9, May 2010 (2010-05-01), pages 514 - 517, XP011331337, DOI: doi:10.1109/LAWP.2010.2051312
- A. BASAK; S. PAL; S. DAS; A. ABRAHAM; V. SNADEL: "A modified Invasive Weed Optimization algorithm for time-modulated linear antenna array synthesis", IEEE CONGRESS ON EVOLUTIONARY COMPUTATION, July 2010 (2010-07-01), pages 1 - 8, XP031763761
- H. E. SHANKS: "A new technique for electronic scanning", IEEE TRANSACTIONS ON ANTENNAS AND PROPAGATION, vol. 9, no. 2, March 1961 (1961-03-01), pages 162 - 166, XP011220926
- Y. TONG; A. TENNANT: "Simultaneous control of sidelobe level and harmonic beam steering in time-modulated linear arrays", IET ELECTRONICS LETTERS, vol. 46, no. 3, 2010, pages 200 - 202, XP006034743, DOI: doi:10.1049/EL:20102629
- A. TENNANT; B. CHAMBERS: "A two-element time-modulated array with direction-finding properties", IEEE ANTENNAS WIRELESS PROPAGATION LETTER, vol. 6, 2007, pages 64 - 65, XP011184208, DOI: doi:10.1109/LAWP.2007.891953
- A. TENNANT: "Experimental two-element time-modulated direction finding array", IEEE TRANSACTIONS ON ANTENNAS AND PROPAGATION, vol. 58, no. 3, March 2010 (2010-03-01), pages 986 - 988
- G. LI; S. YANG; Z. NIE: "A study on the application of time modulated antenna arrays to airborne pulsed Doppler radar", IEEE TRANSACTIONS ON ANTENNAS AND PROPAGATION, vol. 57, no. 5, May 2009 (2009-05-01), pages 1578 - 1582, XP011257144
- G. LI; S. YANG; Z. NIE: "Direction of arrival estimation in time modulated linear arrays with unidirectional phase center motion", IEEE TRANSACTIONS ON ANTENNAS AND PROPAGATION, vol. 58, no. 4, April 2010 (2010-04-01), pages 1105 - 1111, XP011300631
- A. TENNANT; B. CHAMBERS: "Time-switched array analysis of phase switched screens", IEEE TRANSACTIONS ON ANTENNAS AND PROPAGATION., vol. 57, no. 3, March 2009 (2009-03-01), pages 808 - 812, XP011254672

Citation (search report)

- [X1] JP 2010216885 A 20100930 - MITSUBISHI ELECTRIC CORP
- [X1] US 4929956 A 19900529 - LEE JAR J [US], et al
- [A] JP 2001177328 A 20010629 - MITSUBISHI ELECTRIC CORP

- [A] US 5640678 A 19970617 - ISHIKAWA HIROYASU [JP], et al
- [A] US 6426721 B1 20020730 - OBARA NORIAKI [JP]
- [A] EP 0843380 A2 19980520 - SUMITOMO ELECTRIC INDUSTRIES [JP], et al

Cited by

CN104466412A; CN110377872A; CN110210111A; CN115695129A; CN104466430A; JP2017528997A; WO2016038336A1

Designated contracting state (EPC)

AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR

Designated extension state (EPC)

BA ME

DOCDB simple family (publication)

EP 2744042 A1 20140618

DOCDB simple family (application)

EP 12275200 A 20121211