

List of Publications by Citations

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The third column is the impact factor (IF) of the journal, and the fourth column is the number of citations of the article.

268 papers	4,464 citations	35 h-index	56 g-index
368 ext. papers	5,834 ext. citations	3.2 avg, IF	6.18 L-index

#	Paper	IF	Citations
268	Sideband suppression in time-modulated linear arrays by the differential evolution algorithm. <i>IEEE Antennas and Wireless Propagation Letters</i> , 2002 , 1, 173-175	3.8	262
267	Design of a uniform amplitude time modulated linear array with optimized time sequences. <i>IEEE Transactions on Antennas and Propagation</i> , 2005 , 53, 2337-2339	4.9	177
266	A new technique for power-pattern synthesis in time-modulated linear arrays. <i>IEEE Antennas and Wireless Propagation Letters</i> , 2003 , 2, 285-287	3.8	126
265	4-D Arrays as Enabling Technology for Cognitive Radio Systems. <i>IEEE Transactions on Antennas and Propagation</i> , 2014 , 62, 1102-1116	4.9	113
264	A NOVEL ELECTRONIC BEAM STEERING TECHNIQUE IN TIME MODULATED ANTENNA ARRAY. <i>Progress in Electromagnetics Research</i> , 2009 , 97, 391-405	3.8	112
263	. <i>IEEE Transactions on Antennas and Propagation</i> , 2014 , 62, 4392-4395	4.9	110
262	Directional Modulation Based on 4-D Antenna Arrays. <i>IEEE Transactions on Antennas and Propagation</i> , 2014 , 62, 621-628	4.9	108
261	Direction of Arrival Estimation in Time Modulated Linear Arrays With Unidirectional Phase Center Motion. <i>IEEE Transactions on Antennas and Propagation</i> , 2010 , 58, 1105-1111	4.9	104
260	Design of a Low Sidelobe Time Modulated Linear Array With Uniform Amplitude and Sub-Sectional Optimized Time Steps. <i>IEEE Transactions on Antennas and Propagation</i> , 2012 , 60, 4436-4439	4.9	99
259	A Simple and Accurate TDOA-AOA Localization Method Using Two Stations. <i>IEEE Signal Processing Letters</i> , 2016 , 23, 144-148	3.2	98
258	The Application of a Modified Differential Evolution Strategy to Some Array Pattern Synthesis Problems. <i>IEEE Transactions on Antennas and Propagation</i> , 2008 , 56, 1919-1927	4.9	89
257	Antenna-array pattern nulling using a differential evolution algorithm. <i>International Journal of RF and Microwave Computer-Aided Engineering</i> , 2004 , 14, 57-63	1.5	84
256	Evaluation of directivity and gain for time-modulated linear antenna arrays. <i>Microwave and Optical Technology Letters</i> , 2004 , 42, 167-171	1.2	80
255	Decoupling and Low-Profile Design of Dual-Band Dual-Polarized Base Station Antennas Using Frequency-Selective Surface. <i>IEEE Transactions on Antennas and Propagation</i> , 2019 , 67, 5272-5281	4.9	69
254	. <i>IEEE Transactions on Antennas and Propagation</i> , 2010 , 58, 2442-2447	4.9	64
253	Comparative Study of Low Sidelobe Time Modulated Linear Arrays with Different Time Schemes. <i>Journal of Electromagnetic Waves and Applications</i> , 2004 , 18, 1443-1458	1.3	56
252	Linear antenna arrays with bidirectional phase center motion. <i>IEEE Transactions on Antennas and Propagation</i> , 2005 , 53, 1829-1835	4.9	51

251	. <i>IEEE Transactions on Antennas and Propagation</i> , 2017 , 65, 368-374	4.9	50
250	Wide-Angle Scanning Phased Array Using an Efficient Decoupling Network. <i>IEEE Transactions on Antennas and Propagation</i> , 2015 , 63, 5161-5165	4.9	49
249	A Novel Broadband Printed Dipole Antenna With Low Cross-Polarization. <i>IEEE Transactions on Antennas and Propagation</i> , 2007 , 55, 3091-3093	4.9	49
248	Broadband, Single-Layer Dual Circularly Polarized Reflectarrays With Linearly Polarized Feed. <i>IEEE Transactions on Antennas and Propagation</i> , 2016 , 64, 4235-4241	4.9	48
247	Millimeter-Wave Circularly Polarized Tapered-Elliptical Cavity Antenna With Wide Axial-Ratio Beamwidth. <i>IEEE Transactions on Antennas and Propagation</i> , 2016 , 64, 811-814	4.9	48
246	Accurate Models of Time-Invariant Beampatterns for Frequency Diverse Arrays. <i>IEEE Transactions on Antennas and Propagation</i> , 2019 , 67, 3022-3029	4.9	47
245	A Compact Dual-Polarized Double E-Shaped Patch Antenna With High Isolation. <i>IEEE Transactions on Antennas and Propagation</i> , 2013 , 61, 4349-4353	4.9	46
244	Optimization of novel high-power millimeter-wave TM/sub 01/-TE/sub 11/ mode converters. <i>IEEE Transactions on Microwave Theory and Techniques</i> , 1997 , 45, 552-554	4.1	45
243	A Study on the Application of Time Modulated Antenna Arrays to Airborne Pulsed Doppler Radar. <i>IEEE Transactions on Antennas and Propagation</i> , 2009 , 57, 1579-1583	4.9	42
242	. <i>IEEE Transactions on Antennas and Propagation</i> , 2018 , 66, 476-480	4.9	41
241	A Novel Stacked Antenna Configuration and its Applications in Dual-Band Shared-Aperture Base Station Antenna Array Designs. <i>IEEE Transactions on Antennas and Propagation</i> , 2019 , 67, 7234-7241	4.9	41
240	Octave Bandwidth Transmitarrays With a Flat Gain. <i>IEEE Transactions on Antennas and Propagation</i> , 2018 , 66, 5231-5238	4.9	40
239	Wide-Angle Beam-Scanning Reflectarray With Mechanical Steering. <i>IEEE Transactions on Antennas and Propagation</i> , 2018 , 66, 172-181	4.9	38
238	. <i>IEEE Transactions on Antennas and Propagation</i> , 2016 , 64, 117-125	4.9	38
237	Sidelobe Suppression in Time Modulated Linear Arrays with Unequal Element Spacing. <i>Journal of Electromagnetic Waves and Applications</i> , 2010 , 24, 775-783	1.3	36
236	Gain Improvement in Time-Modulated Linear Arrays Using SPDT Switches. <i>IEEE Antennas and Wireless Propagation Letters</i> , 2012 , 11, 994-997	3.8	36
235	Pattern Synthesis of Unequally Spaced Linear Arrays Including Mutual Coupling Using Iterative FFT via Virtual Active Element Pattern Expansion. <i>IEEE Transactions on Antennas and Propagation</i> , 2017 , 65, 3950-3958	4.9	35
234	Unified Time- and Frequency-Domain Study on Time-Modulated Arrays. <i>IEEE Transactions on Antennas and Propagation</i> , 2013 , 61, 3069-3076	4.9	35

233	Wideband Folded Reflectarray Using Novel Elements With High Orthogonal Polarization Isolation. <i>IEEE Transactions on Antennas and Propagation</i> , 2016 , 64, 3195-3200	4.9	35
232	Mutual coupling compensation in time modulated linear antenna arrays. <i>IEEE Transactions on Antennas and Propagation</i> , 2005 , 53, 4182-4185	4.9	34
231	A 2-D Multibeam Half Maxwell Fish-Eye Lens Antenna Using High Impedance Surfaces. <i>IEEE Antennas and Wireless Propagation Letters</i> , 2014 , 13, 365-368	3.8	32
230	Moving phase center antenna arrays with optimized static excitations. <i>Microwave and Optical Technology Letters</i> , 2003 , 38, 83-85	1.2	32
229	Full-Wave Simulation of Time Modulated Linear Antenna Arrays in Frequency Domain. <i>IEEE Transactions on Antennas and Propagation</i> , 2008 , 56, 1479-1482	4.9	31
228	Ku-Band Transmitarrays With Improved Feed Mechanism. <i>IEEE Transactions on Antennas and Propagation</i> , 2018 , 66, 2883-2891	4.9	30
227	Pattern Synthesis of 4-D Irregular Antenna Arrays Based on Maximum-Entropy Model. <i>IEEE Transactions on Antennas and Propagation</i> , 2019 , 67, 3048-3057	4.9	28
226	SIMULATION OF TIME MODULATED LINEAR ANTENNA ARRAYS USING THE FDTD METHOD. <i>Progress in Electromagnetics Research</i> , 2009 , 98, 175-190	3.8	28
225	Synthesis of Uniform Amplitude Thinned Linear Phased Arrays Using the Differential Evolution Algorithm. <i>Electromagnetics</i> , 2007 , 27, 287-297	0.8	28
224	. <i>IEEE Transactions on Antennas and Propagation</i> , 2019 , 67, 5353-5361	4.9	27
223	Convex Optimization of Pencil Beams Through Large-Scale 4-D Antenna Arrays. <i>IEEE Transactions on Antennas and Propagation</i> , 2018 , 66, 3453-3462	4.9	27
222	Harmonic Beamforming in Antenna Array With Time-Modulated Amplitude-Phase Weighting Technique. <i>IEEE Transactions on Antennas and Propagation</i> , 2019 , 67, 6461-6472	4.9	27
221	Practical Implementation of Wideband and Wide-Scanning Cylindrically Conformal Phased Array. <i>IEEE Transactions on Antennas and Propagation</i> , 2019 , 67, 5729-5733	4.9	26
220	Microstrip Array Antenna With 2-D Steerable Focus in Near-Field Region. <i>IEEE Transactions on Antennas and Propagation</i> , 2017 , 65, 4607-4617	4.9	26
219	Synthesis of satellite footprint patterns from time-modulated planar arrays with very low dynamic range ratios. <i>International Journal of Numerical Modelling: Electronic Networks, Devices and Fields</i> , 2008 , 21, 493-506	1	26
218	Bandwidth Enhancement of a Dual-Polarized Slot Antenna Using Characteristic Modes. <i>IEEE Antennas and Wireless Propagation Letters</i> , 2018 , 17, 988-992	3.8	25
217	Novel Parasitic Micro Strip Arrays for Low-Cost Active Phased Array Applications. <i>IEEE Transactions on Antennas and Propagation</i> , 2014 , 62, 1731-1737	4.9	25
216	Wideband Wide-Scanning Phased Array With Connected Backed Cavities and Parasitic Striplines. <i>IEEE Transactions on Antennas and Propagation</i> , 2018 , 66, 1767-1775	4.9	24

215	. <i>IEEE Transactions on Antennas and Propagation</i> , 2017 , 65, 7063-7072	4.9	24
214	Characteristic Mode Formulation for Dielectric Coated Conducting Bodies. <i>IEEE Transactions on Antennas and Propagation</i> , 2017 , 65, 1248-1258	4.9	23
213	Time-modulated array antennas [theory, techniques, and applications]. <i>Journal of Electromagnetic Waves and Applications</i> , 2019 , 33, 1503-1531	1.3	23
212	. <i>IEEE Transactions on Antennas and Propagation</i> , 2019 , 67, 4257-4262	4.9	23
211	Improving conflicting specifications of time-modulated antenna arrays by using a multiobjective evolutionary algorithm. <i>International Journal of Numerical Modelling: Electronic Networks, Devices and Fields</i> , 2012 , 25, 205-215	1	22
210	. <i>IEEE Transactions on Antennas and Propagation</i> , 2019 , 67, 676-680	4.9	22
209	An Improved Phase Modulation Technique Based on Four-Dimensional Arrays. <i>IEEE Antennas and Wireless Propagation Letters</i> , 2017 , 16, 1175-1178	3.8	21
208	. <i>IEEE Antennas and Wireless Propagation Letters</i> , 2019 , 18, 467-471	3.8	21
207	. <i>IEEE Antennas and Wireless Propagation Letters</i> , 2019 , 18, 378-382	3.8	21
206	Generalized Characteristic-Mode Formulation for Composite Structures With Arbitrarily MetallicDielectric Combinations. <i>IEEE Transactions on Antennas and Propagation</i> , 2018 , 66, 3556-3566	4.9	20
205	Helical Torsion Coaxial Cable for Dual-Band Shared-Aperture Antenna Array Decoupling. <i>IEEE Transactions on Antennas and Propagation</i> , 2020 , 68, 6128-6135	4.9	20
204	Phased Transmitarray Antennas for 1-D Beam Scanning. <i>IEEE Antennas and Wireless Propagation Letters</i> , 2019 , 18, 358-362	3.8	20
203	A Joint Optimization Approach for the Synthesis of Large 4-D Heterogeneous Antenna Arrays. <i>IEEE Transactions on Antennas and Propagation</i> , 2017 , 65, 4585-4594	4.9	19
202	Nonuniform FSS-Backed Reflectarray With Synthesized Phase and Amplitude Distribution. <i>IEEE Transactions on Antennas and Propagation</i> , 2018 , 66, 6883-6892	4.9	19
201	Integration of 5G Rectangular MIMO Antenna Array and GSM Antenna for Dual-Band Base Station Applications. <i>IEEE Access</i> , 2020 , 8, 63175-63187	3.5	18
200	A Study on the Application of Subarrayed Time-Modulated Arrays to MIMO Radar. <i>IEEE Antennas and Wireless Propagation Letters</i> , 2017 , 16, 1171-1174	3.8	18
199	A Study on Linear Frequency Modulation Signal Transmission by 4-D Antenna Arrays. <i>IEEE Transactions on Antennas and Propagation</i> , 2015 , 63, 5409-5416	4.9	18
198	Synthesis of Optimal Sum and Difference Patterns from Time Modulated Hexagonal Planar Arrays. <i>Journal of Infrared, Millimeter and Terahertz Waves</i> , 2008 , 29, 933-945		18

197	Time-Modulated Arrays for Physical Layer Secure Communications: Optimization-Based Synthesis and Experimental Assessment. <i>IEEE Transactions on Antennas and Propagation</i> , 2018 , 66, 6939-6949	4.9	18
196	. <i>IEEE Access</i> , 2020 , 8, 65155-65163	3.5	17
195	Signal-to-noise ratio and time-modulated signal spectrum in four-dimensional antenna arrays. <i>IET Microwaves, Antennas and Propagation</i> , 2015 , 9, 264-270	1.6	17
194	. <i>IEEE Antennas and Propagation Magazine</i> , 2010 , 52, 168-177	1.7	17
193	Time modulated planar arrays with square lattices and circular boundaries. <i>International Journal of Numerical Modelling: Electronic Networks, Devices and Fields</i> , 2005 , 18, 469-480	1	17
192	Dual-Band Shared-Aperture Base Station Antenna Array With Electromagnetic Transparent Antenna Elements. <i>IEEE Transactions on Antennas and Propagation</i> , 2021 , 69, 5596-5606	4.9	17
191	DESIGN AND ANALYSIS OF WIDEBAND PLANAR MONOPOLE ANTENNAS USING THE MULTILEVEL FAST MULTIPOLE ALGORITHM. <i>Progress in Electromagnetics Research B</i> , 2009 , 15, 95-112	0.7	16
190	In-Band Radar Cross-Section Reduction of Slot Antenna Using Characteristic Modes. <i>IEEE Antennas and Wireless Propagation Letters</i> , 2018 , 17, 1166-1170	3.8	16
189	Conformal Phased Array Antenna for Unmanned Aerial Vehicle With $\pm 70^\circ$ Scanning Range. <i>IEEE Transactions on Antennas and Propagation</i> , 2021 , 69, 4580-4587	4.9	16
188	Adaptive Nulling with Time-Modulated Antenna Arrays Using a Hybrid Differential Evolution Strategy. <i>Electromagnetics</i> , 2010 , 30, 574-588	0.8	15
187	Application of Characteristic Mode Theory in HF Band Aircraft-Integrated Multiantenna System Designs. <i>IEEE Transactions on Antennas and Propagation</i> , 2019 , 67, 513-521	4.9	15
186	. <i>IEEE Transactions on Antennas and Propagation</i> , 2018 , 66, 5907-5917	4.9	14
185	A NOVEL WIDEBAND ANTENNA ARRAY WITH TIGHTLY COUPLED OCTAGONAL RING ELEMENTS. <i>Progress in Electromagnetics Research</i> , 2012 , 124, 55-70	3.8	14
184	Numerical modelling of 8mm TM ₀₁ -TE ₁₁ mode converter. <i>Journal of Infrared, Millimeter and Terahertz Waves</i> , 1995 , 16, 1935-1943		14
183	Low-Profile Transmitarray Antenna With Cassegrain Reflectarray Feed. <i>IEEE Transactions on Antennas and Propagation</i> , 2019 , 67, 3079-3088	4.9	14
182	OAM-Generating Transmitarray Antenna With Circular Phased Array Antenna Feed. <i>IEEE Transactions on Antennas and Propagation</i> , 2020 , 68, 4540-4548	4.9	13
181	Low-Cost 1-D Beam-Steering Reflectarray With $\pm 70^\circ$ Scan Coverage. <i>IEEE Transactions on Antennas and Propagation</i> , 2020 , 68, 5009-5014	4.9	12
180	Efficient Pencil Beam Synthesis in 4-D Antenna Arrays Using an Iterative Convex Optimization Algorithm. <i>IEEE Transactions on Antennas and Propagation</i> , 2019 , 67, 6847-6858	4.9	12

179	A Hybrid Analog-Digital Adaptive Beamforming in Time-Modulated Linear Arrays. <i>Electromagnetics</i> , 2010 , 30, 356-364	0.8	12
178	Design of a Tapered Balun for Broadband Arrays With Closely Spaced Elements. <i>IEEE Antennas and Wireless Propagation Letters</i> , 2009 , 8, 1291-1294	3.8	12
177	Design of high-power Millimeter-wave TM/sub 01/-TE/sub 11/Mode converters by the differential evolution algorithm. <i>IEEE Transactions on Plasma Science</i> , 2005 , 33, 1372-1376	1.3	12
176	4-D Retro-Directive Antenna Arrays for Secure Communication Based on Improved Directional Modulation. <i>IEEE Transactions on Antennas and Propagation</i> , 2018 , 66, 5926-5933	4.9	12
175	Direction finding based on TMAs with reconfigurable angle-searching range and bearing accuracy. <i>Electronics Letters</i> , 2017 , 53, 130-132	1.1	11
174	. <i>IEEE Antennas and Wireless Propagation Letters</i> , 2018 , 17, 118-121	3.8	11
173	Direction Finding Using Multiple Sum and Difference Patterns in 4D Antenna Arrays. <i>International Journal of Antennas and Propagation</i> , 2014 , 2014, 1-12	1.2	11
172	A STUDY OF AM AND FM SIGNAL RECEPTION OF TIME MODULATED LINEAR ANTENNA ARRAYS. <i>Progress in Electromagnetics Research Letters</i> , 2009 , 7, 171-181	0.5	11
171	Low Cross-Polarization Ultrawideband Tightly Coupled Balanced Antipodal Dipole Array. <i>IEEE Transactions on Antennas and Propagation</i> , 2020 , 68, 4479-4488	4.9	11
170	Wide-Scanning Conformal Phased Array Antenna for UAV Radar Based on Polyimide Film. <i>IEEE Antennas and Wireless Propagation Letters</i> , 2020 , 19, 1581-1585	3.8	11
169	Wideband Wide-Scanning Phased Array in Triangular Lattice With Electromagnetic Bandgap Structures. <i>IEEE Antennas and Wireless Propagation Letters</i> , 2019 , 18, 422-426	3.8	10
168	. <i>IEEE Transactions on Antennas and Propagation</i> , 2020 , 68, 7927-7936	4.9	10
167	Low-Profile High-Gain and Wide-Angle Beam Scanning Phased Transmitarray Antennas. <i>IEEE Access</i> , 2020 , 8, 34276-34285	3.5	10
166	Wide-Angle Scanning Lens Fed by Small-Scale Antenna Array for 5G in Millimeter-Wave Band. <i>IEEE Transactions on Antennas and Propagation</i> , 2020 , 68, 3635-3643	4.9	10
165	Reducing the Number of Elements in the Synthesis of a Broadband Linear Array With Multiple Simultaneous Frequency-Invariant Beam Patterns. <i>IEEE Transactions on Antennas and Propagation</i> , 2018 , 66, 5838-5848	4.9	10
164	K/Ka Dual-Band Reflectarray Subreflector for Ring-Focus Reflector Antenna. <i>IEEE Antennas and Wireless Propagation Letters</i> , 2019 , 18, 1567-1571	3.8	10
163	Design of a novel monopulse antenna system using the time-modulated antenna arrays. <i>International Journal of RF and Microwave Computer-Aided Engineering</i> , 2010 , 20, 163-169	1.5	10
162	Broadband conical printed quadrifilar helical antenna with integrated feed network. <i>Microwave and Optical Technology Letters</i> , 2002 , 35, 491-493	1.2	10

161	A 3-D-Printed Multibeam Spherical Lens Antenna With Ultrawide-Angle Coverage. <i>IEEE Antennas and Wireless Propagation Letters</i> , 2021 , 20, 411-415	3.8	10
160	Synthesis of large-scale non-uniformly spaced 4D arrays using an IFT method. <i>IET Microwaves, Antennas and Propagation</i> , 2018 , 12, 1973-1977	1.6	10
159	In-Band Scattering Reduction of Wideband Phased Antenna Arrays With Enhanced Coupling Based on Phase-Only Optimization Techniques. <i>IEEE Transactions on Antennas and Propagation</i> , 2020 , 68, 5297-5307	4.9	9
158	Design and discussion of a broadband cross-dipole with high isolation and low cross-polarisation utilising strong mutual coupling. <i>IET Microwaves, Antennas and Propagation</i> , 2014 , 8, 315-322	1.6	9
157	Millimeter-wave Low Sidelobe Time Modulated Linear Arrays with Uniform Amplitude Excitations. <i>Journal of Infrared, Millimeter and Terahertz Waves</i> , 2007 , 28, 531-540		9
156	In-Band Scattering Reduction for a U-Slot Patch Antenna. <i>IEEE Antennas and Wireless Propagation Letters</i> , 2020 , 19, 312-316	3.8	9
155	Complete and Unified Time- and Frequency-Domain Study on 4-D Antenna Arrays Including Mutual Coupling Effect. <i>IEEE Transactions on Antennas and Propagation</i> , 2020 , 68, 824-837	4.9	9
154	LPI Beamforming Based on 4-D Antenna Arrays With Pseudorandom Time Modulation. <i>IEEE Transactions on Antennas and Propagation</i> , 2020 , 68, 2068-2077	4.9	9
153	Defocused Cylindrical Luneburg Lens Antennas With Phased Array Antenna Feed. <i>IEEE Transactions on Antennas and Propagation</i> , 2019 , 67, 6008-6016	4.9	8
152	Transmit Beamforming Based on 4-D Antenna Arrays for Low Probability of Intercept Systems. <i>IEEE Transactions on Antennas and Propagation</i> , 2020 , 68, 3625-3634	4.9	8
151	Ultrawideband Low-Profile Transmitarray With Vivaldi Array Feed. <i>IEEE Transactions on Antennas and Propagation</i> , 2020 , 68, 3265-3270	4.9	8
150	Near-Field Focused Array Antenna With Frequency-Tunable Focal Distance. <i>IEEE Transactions on Antennas and Propagation</i> , 2018 , 66, 3401-3410	4.9	8
149	A low profile dual-band dual-polarized patch antenna array with integrated feeding network for pico-base station applications. <i>Microwave and Optical Technology Letters</i> , 2014 , 56, 1594-1600	1.2	8
148	Pattern Synthesis with Specified Broad Nulls in Time-Modulated Circular Antenna Arrays. <i>Electromagnetics</i> , 2011 , 31, 355-367	0.8	8
147	Synthesis of Low and Equal-Ripple Sidelobe Patterns in Time-Modulated Circular Antenna Arrays. <i>Journal of Infrared, Millimeter, and Terahertz Waves</i> , 2009 , 30, 802-812	2.2	8
146	Multiple Patterns from Time-Modulated Linear Antenna Arrays. <i>Electromagnetics</i> , 2008 , 28, 562-571	0.8	8
145	A novel E-shape radiation pattern reconfigurable microstrip antenna for broadband, wide-beam, high-gain applications. <i>Microwave and Optical Technology Letters</i> , 2008 , 50, 2052-2054	1.2	8
144	Synthesis of Irregular Phased Arrays Subject to Constraint on Directivity via Convex Optimization. <i>IEEE Transactions on Antennas and Propagation</i> , 2021 , 69, 4235-4240	4.9	8

143	Two-Dimensional Imaging Based on Near-Field Focused Array Antenna. <i>IEEE Antennas and Wireless Propagation Letters</i> , 2019 , 18, 274-278	3.8	8
142	A Low Cost, Low in-Band RCS Microstrip Phased-Array Antenna With Integrated 2-bit Phase Shifter. <i>IEEE Transactions on Antennas and Propagation</i> , 2021 , 69, 4517-4526	4.9	8
141	Phased Hemispherical Lens Antenna for 1-D Wide-Angle Beam Scanning. <i>IEEE Transactions on Antennas and Propagation</i> , 2019 , 67, 7617-7621	4.9	7
140	Modified corner-fed dual-polarised stacked patch antenna for micro-base station applications. <i>Electronics Letters</i> , 2015 , 51, 604-606	1.1	7
139	. <i>IEEE Transactions on Antennas and Propagation</i> , 2020 , 68, 6098-6108	4.9	7
138	Reflectarray Antenna Design With Arbitrary Incident and Reflection Beam Angle. <i>IEEE Transactions on Antennas and Propagation</i> , 2018 , 66, 5964-5973	4.9	7
137	Focused Array Antenna Based on Subarrays. <i>IEEE Antennas and Wireless Propagation Letters</i> , 2017 , 16, 888-891	3.8	7
136	A double-layered printed dipole antenna with parasitic strips. <i>Microwave and Optical Technology Letters</i> , 2012 , 54, 1517-1520	1.2	7
135	Study of Low Sidelobe Time Modulated Linear Antenna Arrays at Millimeter-Waves. <i>Journal of Infrared, Millimeter and Terahertz Waves</i> , 2005 , 26, 443-456		7
134	A Hybrid Approach for the Synthesis of Nonuniformly-Spaced Linear Subarrays. <i>IEEE Transactions on Antennas and Propagation</i> , 2021 , 69, 195-205	4.9	7
133	Cross Band Mutual Coupling Reduction in Dual Band Base Station Antennas with a Novel Grid Frequency Selective Surface. <i>IEEE Transactions on Antennas and Propagation</i> , 2021 , 1-1	4.9	7
132	Realization of multiple orbital angular momentum modes simultaneously through four-dimensional antenna arrays. <i>Scientific Reports</i> , 2018 , 8, 149	4.9	6
131	Fast Analysis of Parallel-Plate Cylindrical Luneberg Lens Antennas Through Dyadic Green's Functions. <i>IEEE Transactions on Microwave Theory and Techniques</i> , 2018 , 66, 4327-4337	4.1	6
130	. <i>IEEE Access</i> , 2019 , 7, 118402-118410	3.5	6
129	Band-notched UWB planar antenna with parasitic spiral strips. <i>Microwave and Optical Technology Letters</i> , 2011 , 53, 1532-1535	1.2	6
128	A Pattern Synthesis Approach in Four-Dimensional Antenna Arrays with Practical Element Models. <i>Journal of Electromagnetic Waves and Applications</i> , 2011 , 25, 2274-2286	1.3	6
127	FDTD design of a novel short backfire antenna for millimeter-wave wireless LAN applications 2000 , 24, 348-349		6
126	A Ferrite-Loaded Ultra-Low Profile Ultra-Wideband Tightly Coupled Dipole Array. <i>IEEE Transactions on Antennas and Propagation</i> , 2021 , 1-1	4.9	6

125	Synthesis of Low-Sidelobe 4-D Heterogeneous Antenna Arrays Including Mutual Coupling Using Iterative Convex Optimization. <i>IEEE Transactions on Antennas and Propagation</i> , 2020 , 68, 329-340	4.9	6
124	Mixed-Potential Integral Equation Based Characteristic Mode Analysis of Microstrip Antennas. <i>International Journal of Antennas and Propagation</i> , 2016 , 2016, 1-8	1.2	6
123	Generalized Closed-Form Sidebands Radiation Expressions for 4-D Antenna Arrays. <i>IEEE Transactions on Antennas and Propagation</i> , 2021 , 69, 1193-1197	4.9	6
122	Hybrid Directional Modulation and Beamforming for Physical Layer Security Improvement Through 4-D Antenna Arrays. <i>IEEE Transactions on Antennas and Propagation</i> , 2021 , 69, 5903-5912	4.9	6
121	Metamaterial cavity for the isolation enhancement of closely positioned dual-polarized relay antenna arrays. <i>Microwave and Optical Technology Letters</i> , 2017 , 59, 857-862	1.2	5
120	Extremely low-profile wideband dual-polarized microstrip antenna for micro-base-station applications. <i>International Journal of RF and Microwave Computer-Aided Engineering</i> , 2017 , 27, e21091	1.5	5
119	. <i>IEEE Access</i> , 2020 , 8, 14013-14023	3.5	5
118	A wideband horizontally polarized omnidirectional antenna for LTE indoor base stations. <i>Microwave and Optical Technology Letters</i> , 2015 , 57, 2112-2116	1.2	5
117	Pattern synthesis approach for circularly polarised four-dimensional antenna arrays. <i>IET Microwaves, Antennas and Propagation</i> , 2015 , 9, 1004-1008	1.6	5
116	A Practical Array Pattern Synthesis Approach Including Mutual Coupling Effects. <i>Electromagnetics</i> , 2007 , 27, 53-63	0.8	5
115	DESIGN AND OPTIMIZATION OF SPHERICAL LENS ANTENNAS INCLUDING PRACTICAL FEED MODELS. <i>Progress in Electromagnetics Research</i> , 2011 , 120, 355-370	3.8	5
114	2D flat Luneburg lens antenna for multibeam scanning application. <i>Electronics Letters</i> , 2019 , 55, 1317-1318	1.8	5
113	Dual-Beam Rectenna Based on a Short Series-Coupled Patch Array. <i>IEEE Transactions on Antennas and Propagation</i> , 2021 , 69, 5617-5630	4.9	5
112	Dual-polarized metamaterial cavity-backed antennas for mutual coupling reduction. <i>Journal of Electromagnetic Waves and Applications</i> , 2017 , 31, 957-968	1.3	4
111	Aircraft-Integrated VHF Band Antenna Array Designs Using Characteristic Modes. <i>IEEE Transactions on Antennas and Propagation</i> , 2020 , 68, 7358-7369	4.9	4
110	Dual-Polarized Planar Phased Array Antenna With Cavity-Backed Elements. <i>IEEE Antennas and Wireless Propagation Letters</i> , 2019 , 18, 1736-1740	3.8	4
109	DESIGN OF A LOW SIDELOBE 4D PLANAR ARRAY INCLUDING MUTUAL COUPLING. <i>Progress in Electromagnetics Research M</i> , 2013 , 31, 103-116	0.6	4
108	Adaptive beamforming in time modulated antenna arrays based on beamspace data 2009 ,		4

107	Shaped patterns synthesis in time-modulated antenna arrays with static uniform amplitude and phase excitations. <i>Frontiers of Electrical and Electronic Engineering in China: Selected Publications From Chinese Universities</i> , 2010 , 5, 179-184		4
106	Adaptive nulling in time-modulated antenna arrays 2008 ,		4
105	Short backfire antennas for wireless LAN applications at millimeter-waves		4
104	A rigorous study of the rf fields in complex cavities with gradual transitions. <i>Journal of Infrared, Millimeter and Terahertz Waves</i> , 1996 , 17, 1895-1906		4
103	A Self-Decoupling Method for Antenna Arrays Using High-Order Characteristic Modes. <i>IEEE Transactions on Antennas and Propagation</i> , 2021 , 1-1	4.9	4
102	Phase Modulation Technique for Harmonic Beamforming in Time-Modulated Arrays. <i>IEEE Transactions on Antennas and Propagation</i> , 2021 , 1-1	4.9	4
101	High-Directivity Optimization Technique for Irregular Arrays Combined With Maximum Entropy Model. <i>IEEE Transactions on Antennas and Propagation</i> , 2021 , 69, 3913-3923	4.9	4
100	An effective hybrid approach for the synthesis of pencil beams and shaped beams through 4D linear antenna arrays with constrained DRR. <i>Journal of Electromagnetic Waves and Applications</i> , 2019 , 33, 584-600	1.3	4
99	A lightweight multi-beam cylindrical Luneberg lens antenna loaded with multiple dielectric posts. <i>International Journal of RF and Microwave Computer-Aided Engineering</i> , 2019 , 29, e21511	1.5	4
98	In-Band Scattering and Radiation Tradeoff of Broadband Phased Arrays Based on Scattering-Matrix Approach. <i>IEEE Transactions on Antennas and Propagation</i> , 2021 , 1-1	4.9	4
97	Synthesis of Sparse Antenna Arrays Subject to Constraint on Directivity via Iterative Convex Optimization. <i>IEEE Antennas and Wireless Propagation Letters</i> , 2021 , 20, 1498-1502	3.8	4
96	Radar Cross Section Reduction of Wideband Vivaldi Antenna Arrays with Array-Level Scattering Cancellation. <i>IEEE Transactions on Antennas and Propagation</i> , 2022 , 1-1	4.9	4
95	A compact wideband dual-polarized linear array with hybrid structure and resistive loadings. <i>International Journal of RF and Microwave Computer-Aided Engineering</i> , 2019 , 29, e21736	1.5	3
94	Low-profile dipole array fed transmitarray 2017 ,		3
93	4D antenna arrays for LFM signal transmission 2015 ,		3
92	Experimental Investigation of Wide-Angle Impedance Matching of Phased Array Using Overlapped Feeding Network. <i>IEEE Antennas and Wireless Propagation Letters</i> , 2014 , 13, 1284-1287	3.8	3
91	The role of ground plane plays in wideband phased array antenna 2010 ,		3
90	Mutual-Coupling Compensation in Time-Modulated Antenna Arrays for Flat-Top Pattern Synthesis. <i>Electromagnetics</i> , 2009 , 29, 499-507	0.8	3

89	A novel radiation pattern reconfigurable microstrip antenna for wide-angle scanning application in phased antenna array. <i>Microwave and Optical Technology Letters</i> , 2008 , 50, 1539-1540	1.2	3
88	A novel reconfigurable circular polarization patch antenna. <i>Microwave and Optical Technology Letters</i> , 2008 , 50, 1921-1923	1.2	3
87	A new method for the design of a quasi-optical mode converter with a special reflector. <i>IEEE Transactions on Microwave Theory and Techniques</i> , 2002 , 50, 1849-1852	4.1	3
86	A Novel Method for Maximum Directivity Synthesis of Irregular Phased Arrays. <i>IEEE Transactions on Antennas and Propagation</i> , 2022 , 1-1	4.9	3
85	A Low-Profile Triple-Band Shared-Aperture Antenna Array for 5G Base Station Applications. <i>IEEE Transactions on Antennas and Propagation</i> , 2021 , 1-1	4.9	3
84	Dual-polarized stacked microstrip antenna with trident-shaped baluns for MIMO array development. <i>International Journal of RF and Microwave Computer-Aided Engineering</i> , 2021 , 31, e22736	1.5	3
83	In-Band SCS Reduction of Microstrip Phased Array Based on Impedance Matching Network. <i>IEEE Transactions on Antennas and Propagation</i> , 2021 , 1-1	4.9	3
82	A Novel Printed Dual-Log-Periodic Array Antenna for UHF Near-Field RFID Applications. <i>IEEE Transactions on Antennas and Propagation</i> , 2018 , 66, 7418-7423	4.9	3
81	. <i>IEEE Antennas and Wireless Propagation Letters</i> , 2018 , 17, 2414-2418	3.8	3
80	. <i>IEEE Antennas and Wireless Propagation Letters</i> , 2021 , 20, 1503-1507	3.8	3
79	Efficient synthesis of 4D antenna arrays using a bitwise evolutionary genetic algorithm. <i>International Journal of Numerical Modelling: Electronic Networks, Devices and Fields</i> , 2015 , 28, 310-320	1	2
78	Efficient Synthesis of Irregularly Shaped Radiation Patterns Based on Four-Dimensional Planar Arrays and Post-Processing. <i>Electromagnetics</i> , 2015 , 35, 429-442	0.8	2
77	Pattern Synthesis of a Time-modulated Vivaldi Linear Array with MOEA/D Algorithm 2019 ,		2
76	The Four Dimensional Linear Antenna Arrays 2006 ,		2
75	Analysis of High Power Millimeter Wave Waveguide Mode Converters with Input Mode Mixture. <i>Journal of Infrared, Millimeter and Terahertz Waves</i> , 2000 , 21, 219-230		2
74	Novel low profile ultra-wideband capacitance loaded log-periodic monopole array with reduced transverse dimension. <i>IET Microwaves, Antennas and Propagation</i> , 2019 , 13, 1443-1449	1.6	2
73	DOA Estimation via Sparse Signal Recovery in 4-D Linear Antenna Arrays With Optimized Time Sequences. <i>IEEE Transactions on Vehicular Technology</i> , 2020 , 69, 771-783	6.8	2
72	Dual-Polarized Ultrawideband Eleven Antenna Fed by Modified Passive Balun. <i>IEEE Antennas and Wireless Propagation Letters</i> , 2020 , 19, 1600-1604	3.8	2

71	Low Scattering Patch Array Antenna Based on Grooved Ground. <i>IEEE Antennas and Wireless Propagation Letters</i> , 2021 , 20, 308-312	3.8	2
70	A Cylindrical Lens Antenna With Extremely Flat Beams. <i>IEEE Access</i> , 2019 , 7, 156675-156685	3.5	2
69	Synthesis of large-scale thinned arrays based on a multiagent genetic algorithm. <i>International Journal of RF and Microwave Computer-Aided Engineering</i> , 2021 , 31, e22522	1.5	2
68	Design of A Low-profile and Low Scattering Wideband Planar Phased Antenna Array. <i>IEEE Transactions on Antennas and Propagation</i> , 2021 , 1-1	4.9	2
67	Lightweight, Solderless, Ultra-Wideband Transmitarray Antenna with True Time Delay Line. <i>IEEE Antennas and Wireless Propagation Letters</i> , 2021 , 1-1	3.8	2
66	Efficient Synthesis of Filter-and-Sum Array With Scanned Wideband Frequency-Invariant Beam Pattern and Space-Frequency Notching. <i>IEEE Signal Processing Letters</i> , 2021 , 28, 384-388	3.2	2
65	Integrated Coupler-Antenna Design for Multi-Beam Dual-Polarized Patch-Array Rectenna. <i>IEEE Transactions on Antennas and Propagation</i> , 2021 , 1-1	4.9	2
64	A low-profile wide-scanning fully metallic lens antenna for 5G communication. <i>International Journal of RF and Microwave Computer-Aided Engineering</i> , 2021 , 31, e22584	1.5	2
63	A Cylindrical Luneberg Lens Antenna with Extremely Wide Fan-Beam 2018 ,		2
62	Design and analysis of an amplitude-phase weighting module for harmonic beamforming in time-modulated antenna arrays. <i>AEU - International Journal of Electronics and Communications</i> , 2021 , 138, 153835	2.8	2
61	HF band aircraft integrated multi-antenna system designs using characteristic modes 2017 ,		1
60	2017 ,		1
59	4D-arrays for MIMO radar applications 2014 ,		1
58	A phase-comparison monopulse system based on a 4D antenna array 2014 ,		1
57	A QPSK modulation scheme based on four dimensional antenna arrays 2012 ,		1
56	Design of a dual-band quadrifilar helix antenna 2012 ,		1
55	Power-pattern synthesis in time modulated semicircular arrays. <i>Digest / IEEE Antennas and Propagation Society International Symposium</i> , 2009 ,		1
54	A novel beam scanning technique in time modulated linear arrays. <i>Digest / IEEE Antennas and Propagation Society International Symposium</i> , 2009 ,		1

53	Analysis and design of Luneberg lens antenna with simultaneous Ku/K/Ka-band feed-system 2012 ,		1
52	A Projection-Based Approach for Ultra-Low Side-Lobe Pattern Synthesis in Time-Modulated Spherical Arrays. <i>Electromagnetics</i> , 2012 , 32, 61-76	0.8	1
51	Efficient analysis of wireless communication antennas using an accurate [Z] matrix interpolation technique. <i>International Journal of RF and Microwave Computer-Aided Engineering</i> , 2010 , 20, 382-390	1.5	1
50	Conformal Frequency Reconfigurable Microstrip Antenna on a Thin Substrate for Wide-Band Applications. <i>Electromagnetics</i> , 2008 , 28, 427-432	0.8	1
49	Synthesis of low sidelobe planar antenna arrays with time modulation		1
48	TLM analysis of mutual coupling of microstrip patch antenna array. <i>IET Microwaves Antennas and Propagation</i> , 2000 , 147, 207		1
47	An Electromagnetic-Transparent Cascade Comb Dipole Antenna for Multi-Band Shared-Aperture Base Station Antenna Array. <i>IEEE Transactions on Antennas and Propagation</i> , 2021 , 1-1	4.9	1
46	Design of Phase Modulation Antenna Array With Stable Overall Efficiencies. <i>IEEE Antennas and Wireless Propagation Letters</i> , 2022 , 21, 282-286	3.8	1
45	A Novel In-Band Scattering Cancellation Technique for Vivaldi Antenna Array 2021 ,		1
44	In-Band Scattering Cancellation Techniques for Vivaldi Antenna Array. <i>IEEE Transactions on Antennas and Propagation</i> , 2021 , 1-1	4.9	1
43	A wide-scanning ellipsoid lens antenna fed by phased array antenna. <i>International Journal of RF and Microwave Computer-Aided Engineering</i> , 2020 , 30, e22127	1.5	1
42	2-D Wide-Scanning Flat Luneburg Lens Antenna for 5G Communication 2020 ,		1
41	Improving Physical Layer Security Technique Based on 4-D Antenna Arrays with Pre-Modulation 2020 ,		1
40	A quadrature-hybrid-integrated reconfigurable feeding network for wideband quad-polarization-agile antenna design. <i>International Journal of RF and Microwave Computer-Aided Engineering</i> , 2021 , 31, e22641	1.5	1
39	Linear Phased Array Antenna Fed by the Modified Dielectric Image Line. <i>IEEE Antennas and Wireless Propagation Letters</i> , 2021 , 20, 733-737	3.8	1
38	A Thinned Irregular Array Synthesis Approach Based on Benders Decomposition. <i>IEEE Transactions on Antennas and Propagation</i> , 2021 , 69, 3875-3885	4.9	1
37	Wideband terahertz frequency-scanning reflectarray 2016 ,		1
36	A miniaturized wideband dual-polarized linear array with balanced antipodal Vivaldi antenna 2016 ,		1

35	Space-Time Coding through Time-Modulated Arrays - State-of-the-Art and Recent Trend/Advances 2019 ,		1
34	Time-Modulated Beamforming in Antenna Arrays with Multiple Sub-Branch RF Switches 2019 ,		1
33	2019 ,		1
32	Synthesis of Sparse Array With Sum and Difference Patterns Under Minimum Element Spacing Control by Alternating Linear Programming Optimization. <i>IEEE Antennas and Wireless Propagation Letters</i> , 2021 , 1-1	3.8	1
31	Dual-Polarized Filtering Transmitarray Antennas With Low-Scattering Characteristic. <i>IEEE Transactions on Antennas and Propagation</i> , 2021 , 1-1	4.9	1
30	Black Box Method for The Radiation and Scattering Optimization of TCDA 2018 ,		1
29	AMillimeter-Wave Phased Array Fed Biconvex Lens Antenna 2018 ,		1
28	An active, ultra-wideband dual-polarized tightly coupled dipole subarray for satellite communication. <i>International Journal of RF and Microwave Computer-Aided Engineering</i> , 2021 , 31, e22849	4.5	1
27	Design of a Low-Crosstalk Sub-Wavelength-Pitch Silicon Waveguide Array for Optical Phased Array. <i>IEEE Photonics Journal</i> , 2021 , 13, 1-8	1.8	1
26	Calculation of the Total Radiated Power for 4-D Antenna Arrays with Arbitrary Time Modulated Waveforms. <i>IEEE Transactions on Antennas and Propagation</i> , 2021 , 1-1	4.9	1
25	Directional Modulation in Time-Modulated Array With a Novel Pseudorandom Ascending Phase Time Sequence. <i>IEEE Transactions on Microwave Theory and Techniques</i> , 2022 , 1-1	4.1	1
24	Ultra-Low Scattering Design of Wideband Conformal Arrays Based on Optimally Loaded Resistors. <i>IEEE Transactions on Antennas and Propagation</i> , 2022 , 1-1	4.9	1
23	Conformal Array Antenna for Applications in Wide-Scanning Phased Array Antenna Systems. <i>IEEE Antennas and Wireless Propagation Letters</i> , 2022 , 1-1	3.8	1
22	Teaching Electromagnetics to Next-Generation Engineers—The ELEDIA Recipe: The ELEDIA teaching style. <i>IEEE Antennas and Propagation Magazine</i> , 2020 , 62, 50-61	1.7	0
21	A Variable Step Length Hybrid Approach for Electromagnetic Ray Tracing in Ionosphere. <i>Electromagnetics</i> , 2007 , 27, 331-340	0.8	0
20	FDTD design of bifilar and quadrifilar truncated spherical helical antennas. <i>Microwave and Optical Technology Letters</i> , 2001 , 30, 246-249	1.2	0
19	A Vector Modulation Approach for Secure Communications Based on 4-D Antenna Arrays. <i>IEEE Transactions on Antennas and Propagation</i> , 2021 , 1-1	4.9	0
18	An Irregular Tiled Array Technique for Massive MIMO Systems. <i>IEEE Transactions on Wireless Communications</i> , 2021 , 1-1	9.6	0

17	Integrative Transmitarray with Gain-Filtering and Low-Scattering Characteristics. <i>IEEE Transactions on Antennas and Propagation</i> , 2021 , 1-1	4.9	o
16	Magnetoelectric composite coupled by bonding material in energy trapping vibration for RF/microwave devices. <i>Microwave and Optical Technology Letters</i> , 2020 , 62, 669-674	1.2	o
15	Synthesis of Simultaneous Sum and Difference Patterns in Single-Channel 1-bit Time Modulated Array. <i>IEEE Antennas and Wireless Propagation Letters</i> , 2022 , 1-1	3.8	o
14	Low-Scattering-Cross-Section Thinned Phased Array Antenna Based on Active Cancellation Technique. <i>IEEE Transactions on Antennas and Propagation</i> , 2022 , 1-1	4.9	o
13	A Wideband Frequency and Polarization Reconfigurable Liquid Metal-Based Spiral Antenna. <i>IEEE Antennas and Wireless Propagation Letters</i> , 2022 , 1-1	3.8	o
12	Correction to "Microstrip Array Antenna With 2-D Steerable Focus in Near-Field Region" [Sep 17 4607-4617]. <i>IEEE Transactions on Antennas and Propagation</i> , 2020 , 68, 2475-2475	4.9	
11	Enhancing the Convergence Speed of Space Mapping Technique in Cylinder Conformal Antennas Optimization. <i>Journal of Infrared, Millimeter, and Terahertz Waves</i> , 2009 , 31, 162	2.2	
10	Reply to "Comments on "A Novel Broadband Printed Dipole Antenna With Low Cross-Polarization" <i>IEEE Transactions on Antennas and Propagation</i> , 2008 , 56, 1506-1506	4.9	
9	Design of Modified Short Backfire Antennas for Millimeter-Waves Wireless LAN Applications. <i>Journal of Infrared, Millimeter and Terahertz Waves</i> , 2002 , 23, 755-764		
8	A numerical study on the influence of an input mode mixture in high-power microwave waveguide mode converters 2000 , 24, 129-131		
7	Wideband Receive Beamforming Based on 4-D Antenna Arrays With Post-Modulation. <i>IEEE Antennas and Wireless Propagation Letters</i> , 2022 , 1-1	3.8	
6	One-dimensional conformal ultra-wideband connected slot arrays with reduced scattering. <i>International Journal of RF and Microwave Computer-Aided Engineering</i> , 2021 , 31, e22802	1.5	
5	Fast analysis of scattering from metallic-dielectric composite large antenna arrays using characteristic modes. <i>International Journal of Numerical Modelling: Electronic Networks, Devices and Fields</i> , 2021 , 34, e2862	1	
4	A Novel 3-D-NUFFT Method for the Efficient Calculation of the Array Factor of Conformal Arrays. <i>IEEE Transactions on Antennas and Propagation</i> , 2021 , 1-1	4.9	
3	Ultra-wideband dual-polarized transmitarray antenna with Vivaldi elements. <i>International Journal of RF and Microwave Computer-Aided Engineering</i> , 2021 , 31, e22892	1.5	
2	Efficient Secure Communication in 4-D Antenna Arrays through Joint Space-Time Modulation. <i>IEEE Transactions on Antennas and Propagation</i> , 2022 , 1-1	4.9	
1	Integrated Radar and Communication Design with Low Probability of Intercept Based on 4-D Antenna Arrays. <i>IEEE Transactions on Antennas and Propagation</i> , 2022 , 1-1	4.9	