## **2022 IEEE Wireless, Antenna** and Microwave Symposium (WAMS 2022)

Rourkela, India 5 – 8 June 2022



**IEEE Catalog Number: CFP22BP7-POD ISBN:** 

978-1-6654-5847-4

## **Copyright © 2022 by the Institute of Electrical and Electronics Engineers, Inc. All Rights Reserved**

*Copyright and Reprint Permissions*: Abstracting is permitted with credit to the source. Libraries are permitted to photocopy beyond the limit of U.S. copyright law for private use of patrons those articles in this volume that carry a code at the bottom of the first page, provided the per-copy fee indicated in the code is paid through Copyright Clearance Center, 222 Rosewood Drive, Danvers, MA 01923.

For other copying, reprint or republication permission, write to IEEE Copyrights Manager, IEEE Service Center, 445 Hoes Lane, Piscataway, NJ 08854. All rights reserved.

## \*\*\* This is a print representation of what appears in the IEEE Digital Library. Some format issues inherent in the e-media version may also appear in this print version.

IEEE Catalog Number:	CFP22BP7-POD
ISBN (Print-On-Demand):	978-1-6654-5847-4
ISBN (Online):	978-1-6654-5846-7

## Additional Copies of This Publication Are Available From:

Curran Associates, Inc 57 Morehouse Lane Red Hook, NY 12571 USA Phone: (845) 758-0400 Fax: (845) 758-2633 E-mail: curran@proceedings.com Web: www.proceedings.com



Page No.	Paper Id	Authors	Title	eCF Paper Id
1-5	2	Sudhakar Rao, Suzanna LaMar	Deployable Bunker Antenna with $4\pi$ Steradians Coverage for Ground Communications	370165
6-9	9	Mohammad Shukoor	A Simple Wideband Angular Stable Linear-Circular and Linear-Cross Reflective Type Polarizer for Satellite Communication Applications	370170
10-14	13	Kalyanarao B	Realization of FPGA based Burst QPSK Modem for Wireless Communication applications	370171
15-17	16	Mohammad Shukoor	Sensing Object-Human Interaction Through 4-Bit Spiral Resonator Based Passive Chipless WiFi Tags	370173
18-21	17	Paolo Focardi	Wide-band Planar Dipole Antennas for Earth and Planetary Science Applications	370174
22-25	19	Aparna Parameswaran	Design of a Wide-Band Circuit Analog Absorber Using Modified Square Loop Loaded with Lumped Resistors	373408
26-28	22	Nischal Chandur	Exploring the Meta-Surface for Broadband TE1,1-mode in Circular Window	370178
29-31	24	Dhaval Pujara	Design and Simulation of Microstrip Antenna on High- Temperature Super Conductor and Copper	370179
32-35	25	Dipali Bansal	Bilateral Antenna Pattern Selection (BAPS) based Optimal Smart Antenna Selection in 5G system	373474
36-39	28	Priyanka Bajaj	Design of a Narrowband and a Wideband Switchable Absorber/Reflector Using an Active Frequency Selective Surface With Embedded Biasing Network	370181
40-44	31	Krishna Mazumder	A Small Scale Circular Polarized Reader Antenna with Wide Beamwidth for RFID Applications	370183
45-48	33	Deepal Deepak Patil	Additively Manufactured Dual Band Antenna Array for Wi-Fi Application	370185
49-52	34	Ruchi Ruchi	A Rectenna for RF Energy Harvesting for Application in Powering IoT Devices	370186
53-56	35	Mohammed Zaki Salman	Miniaturized Slotted Microstrip Patch Antenna using Artificial Magnetic Conductor	392290
57-60	36	Gopika R	A Series Combiner-Fed Patch Array for Energy Harvesting Applications	370188
61-64	38	Punyatoya Routray	Quadruple Polarization Insensitive Multilayered Metamaterial Absorber	370189
65-69	40	Rashmitha Karre , Anantha Bharathi	COAXIAL LINE FED DUAL BAND CIRCULAR POLARIZATION RECTANGULAR PATCH ANTENNA USING DUAL COUPLED LINES	370190
70-74	42	Sreenivasulu M	Minkowski Fractal Antenna with Circular DGS for Multiband Applications	370102
75-79	43	Manichandana B	L-Slots Fractal Antenna with DGS for Dual band Applications	370103
80-82	46	Ns Vamsi	UWB Monopole Antenna with Triple Band Suppression Characteristics	370106
83-86	47	Sudhakar Rao, Suzanna LaMar	Quad-Band Petal Reflector Antenna For Ground Communications	370107
87-91	50	Priyanka Das	Mutual Coupling and RCS Reduction of MIMO Antenna using a hybrid technique	370108
92-96	51	Sheesh Ram	Effect of Salinity on the Complex Dielectric Permittivity of Water in X Band	370109
97-100	53	Amugothu Ramesh	Metamaterial Superstrate Based High Gain Antenna for Wi-Fi Applications	370210
101-104	55	Kannadhasan S	Miniaturized Dual Band U-Shaped Structure Microstrip Patch Antenna for Wireless Applications	370211

105-109	56	Damera Vakula	Compact Complementary Symmetric Ring Resonator Band Stop Filter for Ku band applications.	383447
110-114	57	Dilrach Donion Dahana	A High-Gain Polarization Reconfigurable Printed Monopole	370213
110-114	57	Bikash Ranjan Behera	A righ-Gain Forarization Reconfigurable Frinted Monopole Antenna for RF Energy Harvesting Application	570215
115-120	60	Akash Mecwan	Feed Forward Correction for Linearity Improvement of LNA	383483
121-124	61	Pallab Kr Gogoi, Mrinal	A Compact Multi-mode Integrated Doppler radar at 2.4 GHz	370215
		Kanti Mandal	for Multipurpose Applications.	
125-128	62	Abhishek Chatterjee	A Wideband Antenna Integrated Power Amplifier For 5G	370216
27/4	(2)		Base Stations	220212
N/A	63	Maxon Okramcha	Coplanar slotted Circular Patch Antenna with Loaded	370217
			Periodic Structure for RFID/WLAN/Wi-MAX/Satellite	
122 127	(5	חי 1 1 י חי	Communication	270210
133-137	65	Priyadarshini Raiguru	Impaired Fractal Based Sub-Array Diagnosis	370219
138-140	66	Pratibha Verma	Design and PIC Simulation of Dual-band RBWO Under Low	370220
1 41 1 46	(0)		Magnetic Field Operation	272470
141-146	68	Dipali Bansal	Adaptive Beamforming Method based Optimal Smart	373479
147 150	(0)		Antenna Selection with RSC Algorithm in 5G system	270222
147-150	69	Pratyancha Prasad	An Optimized and Compact Bandstop FSS for C, X, Ku and	370222
151 154	1	C1 1 D (1	K bands	270222
151-154	71	Shankar Patil	Metamaterial based triple-band Circular Patch antenna for 5G	370223
			Sub 6 GHz Applications	
155-157	72	Vangalla Veerababu	Design and PIC Simulation of a Millimeter Wave Gyro-	370224
			twystron Amplifier	
158-161	73	Satya Prakash, Mrinal	A Modified H-plane Horn Antenna In PCB Technology With	370225
		Kanti Mandal	Improved Efficiency	
162-164	74	Sheeba Varghese	Coupling Enhancement of Waveguide Fed Cylindrical	370226
1 ( 5 1 ( 5			Dielectric Resonator Antenna.	250101
165-167	75	Kalpana Muvvala	Circularly Polarized Split Cylindrical Dielectric Antenna for	370191
1 (0, 1 = 1			Wireless Applications	2 = 2 4 0 0
168-171	77	Prantik Dutta	Non-reciprocal Bandpass Filters: Parametric Simulation	373480
172-173	78	Prantik Dutta	Distributed Cross-Coupled Non-Reciprocal Bandpass Filters	370194
154 150	70	4 11 D 1	for Mobile Communications	202442
174-178	79	Anil Rajput	Wideband Bandstop Filter Design With High Impedance	383443
170 102	0.0	0 11 01	Folded Stubs	202444
179-183	80	Sandhya Sharma	Detection of Skin Abnormalities using a Highly Sensitive	383444
104 100	01		Planar Microstrip Probe	220102
184-188	81	Tarun Kumar Das	Wide Stopband Centrally Corrugated Folded Bandpass Filter	370197
100.100	0.0	A ' TT 1 11'	with Trapezoidal Spurline	270100
189-192	82	Aswin Undavalli	GUI-based Fractal Antenna Designer	370198
193-197	83	Aswin Undavalli	GUI-based Rotman Lens Designer	370199
198-202	84	Awanish Kumar	Multifunction Metasurface Structure for Absorption and	370200
202 207	0.5	A 11D 1	Polarization Conversion Applications	272402
203-207	85	Anil Rajput	Aperture feed wideband Circularly Polarized Rotated	373483
200.212	07	A 11 D1 //	Dielectric Resonator Antenna	270202
208-212	87	Ambika Bhatta	Image-Based Solution for Scattering from a Wedge Satisfying	370203
212 217	0.0		Neumann Boundary Condition	270204
213-217	88	Pasumarthi Suneetha	Design of a Barque-Shaped Two-Port MIMO Antenna with	370204
			Enhanced Isolation Characteristics for WLAN Applications	
218-221	89	Pavan Kumar B	Dual-Band Circularly Polarized Microstrip Planar Array	370205
			Antenna with Inter-leaved Elements for Geo-stationary	
			Satellite TT&C Application	
222-224	90	Yuvaraj Sivasubramanian	Generation of OAM beam by a Uniform Circular Array with	370206

225-229	91	Himaja Makkapati	Design and Analysis of a Dual-Band MIMO Antenna for	370207
			Improved Isolation using the Defected Ground structure	
230-233	92	S Durga Padmaja Bikkuri	Polarization and Angle Insensitive Fractal based Absorber for Multiband Application	383485
234-237	93	Nibash Kumar Sahu	Anisotropic Metasurface Inspired Circularly-polarized Monopole Antenna for OFF Body communications	370209
238-242	95	Aman Raj	Phase Quantized Near-Field Focussing Metasurface for 5.8 GHz Wireless Power Transfer	370230
243-246	96	Karthikeyan S S	Design of Microstrip Based Dual Junction Four-Port	370231
247-250	98	Arup Ray, Manisha	Circulator for 8.2 GHz X-band Dummy Metal Aware Tunable On-chip Slot Antenna with A	370233
		Kahar	Low-cost Proof-of-Concept	250224
251-255	99	Mihika Srivastava	High Q and High EMR Hepta Band Single Layer Metasurface Absorber for EMI and Sensing Applications in C, X, Ku, K and Ka Band	370234
256-259	101	Thokala Latha	Compact and Conformal Ultra-Wideband Archimedian Spiral Antenna	370235
260-262	103	Jagadeesh Babu Kamili	Characteristic Mode Analysis of a Modified Circular Monopole UWB-MIMO Antenna	370236
263-266	104	Sheershendu Bhattacharya	Effects of Cavity Parameters on the Performance of Equilateral Triangular Patch Antenna	370237
267-270	105	Gokul Nath S J	Metallic Object Detection Inside Human Stomach With Antipodal Vivaldi Antenna Utilizing Microwave Imaging Technique	370238
271-273	106	Akhila Gouda	EM Scattered Field Prediction Using Extreme Learning Machine	370239
274-277	107	T Shanmuganantham	Ku-band CSRR Loaded SIW cavity backed slot antenna	373485
278-282	108	Arun Shaji B K	Complementary Metamaterial Superstrate for Wide Band High Gain Antenna	370241
283-285	109	Neema K	Reconfigurable Intelligent Surface for Highly Efficient Electromagnetic Functionality	370242
286-290	110	Harish A. R.	High Gain Dual-Polarized Meta-surface Antenna	383471
291-294	111	Harish A. R.	Wideband High Gain Hybrid LPDA-Yagi Antenna	370244
295-298	112	Krushna Kanth V	EM Design and Performance Analysis of Dualband FSS based on SIW Cavity Technology	383472
299-303	113	Rahul Vashisth	Design and fabrication of broadband microwave absorber using CISR sheets in 2.5 to 8.2 GHz range	370246
304-308	114	Nidhi Madhuri A, Bharathi A	X Band Miniaturized 90° Hybrid Coupler	370247
309-312	115	Mohammad Sarwar Raeen	A THz Tuned Plasmonic Material Absorber in Visible Light Spectrum for Low Power Devices	373488
313-317	116	Girija Shankar Sahoo	Antenna Array Design for Higher Spectral Effeiciency for Hybrid Beamforming 5G MIMO Wireless Communication System	370249
318-320	117	Gaurangi Gupta	All-Metal Patch Dual-Frequency Dual-Circular Polarized Fan- Beam Antenna	383488
321-325	118	Nacer Chahat	Detector Development for the Lunar Crater Radio Telescope	383489
326-330	119	Sarosh Ahmad, Charles Vinoth	Design of a Dual-Band Printed Monopole Antenna for ISM Band Applications	370252
331-334	120	S S Karthikeyan	Design of Compact Shielded QMSIW Based Self-Diplexing Antenna for High-Isolation	370253
335-338	121	Damera Vakula	Design and Simulation of Wilkinson Power Divider for S C X Wideband Applications	370254

339-343	122	Shyam Sundar Pati	2D Double Semi Circular Goblet Shaped Angular Stable Dual	370255
		5	Band Reflection Type Polarization Converter And Its	
			Application in Radar Cross Section Reduction	
344-347	124	Ashutosh Kedar	Realization of Low Sidelobe Level Sparse Array Antennas	370256
			Using Fractal Structures	
348-351	126	Subrahmanyam G V	A Rectangular and Corners notched Square Shaped UWB	370257
		5	Antenna for high gain GPR Applications	
352-356	128	Priyanka Das	Dual-band Absorption using a Phase Transition metal	370258
357-361	129	Tithi Rani	A Planar Monopole Antenna Array with Partial Ground Plane	370259
			and Slots for Sub-6 GHz Wireless Applications	
362-366	130	Kabir Das Ayinala	An SRR-Loaded Compact Triple-band 4-Element MIMO	370227
002000	100		design for WLAN/WiMAX/C-band Applications	0,011,
367-369	131	Avinash Singh and Nisha	Experimental Investigation on Water Based FSS Absorber	370228
507 507	101	Gupta		570220
370-373	132	Jaya Mishra	Digital predistortion implementation for Frequency Hopping	370229
510 515	152	saya wiisina	System	570227
374-378	133	Priyanka Dalal	Uni-planar MIMO Antenna for Sub-6 GHz 5G Mobile Phone	370270
574 570	155	i iiyanka Dalai	Applications	570270
379-382	134	Priyanka Dalal	Phased Array Antenna for Millimeter-Wave 5G Mobile	370271
517-502	137		Phone Applications	570271
383-387	135	Srikanth Deepak	A Compass Shaped Microstrip Patch Antenna with Angular	370272
565-567	155	Bandhakavi	Analytics in the UWB Region	570272
388-391	136	Maxon Okramcha	Super Wideband Conformal Slotted and Asymmetric feed	370273
300-391	150	Maxon Okrainena	Antenna for Microwave Medical Imaging System	570275
202 205	127	Versen due Neth Considi		270274
392-395	137	Veerendra Nath Ganimidi	Design of 4-element Slot Loaded Patch Antenna Array for 5G	370274
206 400	120	A (1 ) D	Devices	270275
396-400	138	Arthi R	Compact CMOS technology-based phase shifter design to	370275
101.107	100		operate in K band	2=2.40.1
401-405	139	Arpitha H S	Digital Transformation of Oil & Gas Fields Architecting	373491
106.100	1.40		Multi-Services Digital Private Network on 5G NR-U Model	2502(1
406-409	140	Kirthika Srinivasan,	Design of S-band Frequency Tunable Substrate Integrated	370261
		Kumar Gaurav Singh	Waveguide Band Pass Filter with EBG Slots	
410-412	141	Aditya S. Thakur	Design Studies of Multi-Beam All-Metallic Metamaterial-	370262
			Based Backward-Wave Oscillator	
413-417	142	Ashutosh Kedar	Dual-Polarized Ultra-Wideband TCDA With Superstrate and	370263
			FSS Networks for Wide-Band and Wide-Scanning	
418-422	143	Raghvenda Kumar Singh	A Dual-mode Miniaturized Rhombus-Shaped Antenna	370264
			Inspired with CRLH-TL Employing Christmas-Tree Shaped	
			Meander Line	
423-426	144	Sheeja Vincent	Planar Double Spiral Sensor for the detection of adulteration	370265
			in Coconut oil	
427-431	145	Praween Kumar Nishad	An Electrical Model of Singly Wound Microstrip Inductors	370266
			for UHF Band Applications	
432-435	146	Rajasekhar Manda	8-Element MIMO Antenna with Connected Ground in	370267
			Swastika-Shaped Substrate for Super-Wideband Applications	
436-439	147	Raghavendra K	Characterisation of RF seeker for misalignments	370268
440-444	149	N.G. Elakiya	Performance Analysis Of Relay Based Cooperative NOMA	370269
			System	
445-447	150	Swapnil Sinha	A Neural Network Model for Effective Dielectric Constant	383498
			Prediction of a Two Layered Microstrip Transmission Line	
448-451	151	Atta Ullah	Gain Enhancement of Diversity Slot Antenna Using FSS with	370291
			Metamaterial Unit Cells for UWB Systems	
452-454	152	Swapnil Sinha	A Machine Learning Model to Predict the Radiation	383478
		1	Resistance of Dipole Antenna	

455-457	153	Atta Ullah	Low-Profile MM-Wave PIFA Array with Omni-Directional and Full-Coverage Radiations	370293
458-461	154	Gokul Nath S J	Double Ridge Conical Horn Antenna with Dielectric Loading	370294
438-401	134	Gokul Nath S J	for Microwave Imaging of Human Breast	570294
462-465	155	Tarush Mehta	Design of Tri-band RF Circulators using Non-Magnetic	370295
402-403	155	I di usii iviciita	Metamaterial Based Structures for Wi-Fi 6E and WiMAX	570295
			Applications	
466-470	156	Ashish K Adiga	Gain Enhancement of 4x4 mm-Wave Patch Array with	370296
400-470	150	Asilisii K Aulga	· · · · · · · · · · · · · · · · · · ·	570290
			Dielectric Shells and Metamaterial Lens: A Comparative Study	
471 475	157	Sanket Nirmal	2	270207
471-475	157	Sanket Nirmal	Analysis of diverse MIMO antennas for fifth generation	370297
176 170	1.50		application: A review	270200
476-479	158	Gandreddi Lakshmi	Inset Fed Slotted Patch Antenna Array for Microwave	370298
100.100	1.50	Prasanna Ashok	Imaging Applications	250200
480-482	159	Abhay Kumar	Low Cost Temperature Controlled Frequency Reconfigurable	370299
			Antenna with High Selectivity	
483-487	161	Gouri Shankar Sharma	Two Port Compact Wideband Dielectric Resonator MIMO	370276
			Antenna for WLAN/WiMAX Applications	
488-491	162	Maharana Pratap Singh	A High Gain Circularly Polarized Microstrip Patch Antenna	370277
			Array for mm-Wave Applications	
492-496	163	Praneet Jain	A Reconfigurable Four-Port MIMO Antenna for Sub-6 GHz	370278
			Applications	
497-500	164	Ritam Gupta	Wide-band Circular Slot Cut Patch Antenna with Broad Beam	370279
			width for X band applications	
501-505	165	Kailas S Vel	Compact Single and Dual Broadband Reflective Type Linear	370280
			Cross Converters at Terahertz Regime	
506-510	166	Ashish Adiga	Hybrid Method to Compute EM-Fields of Multi Gradient Flat	370301
		e	Lens-Array Antenna	
511-515	167	Diptapravo Som	Studies on CMOS down-converter with double-balanced	370302
		1 1	mixer along with Balun at S-band	
516-521	169	Karteek Viswanadha	Design of multiband stub loaded oval ring patch antenna with	370303
010021	107		serpentine shaped EBG for C- and Ku-band communications	0,0000
522-525	170	Shipra Bhadoria	Computationally Stable MIMO Digital Predistortion for	370281
522 525	170	Shipiu Dhudonu	Power Amplifier based on Orthogonal Polynomial	570201
526-530	171	Ashish Kumar	A novel analog predistortion technique for LTE	370282
520-550	1/1	Asilisii Kullai	communication systems	570202
531-533	172	Vaddadi Sree Vamsi	Antenna Elements and Array Design for Wi-Fi 7 and 5G	370304
551-555	1/2		Applications	570504
534-538	174	Soham Ghosh	Slot based Miniaturized Human Body Implantable Antenna	370306
000-100	1/4		Design at 2.45 GHz ISM Band	570500
539-543	176	Bharath Reddy Gudibandi	Miniaturization of Split Ring Resonator and Spiral Resonator	392292
339-343	1/0	Bharain Reddy Gudibandi		392292
			with Interdigitated Ring Edges for small sensor applications	
511 517	177	Dradaan Mars Saulas	Degion of an Invented C. Change State Antonio series Scilicity	270200
544-547	177	Pradeep Mane, Sanjay	Design of an Inverted C-Shape Slot Antenna using Substrate	370309
540 550	170	Bhilegaonkar	Integrated Waveguide	202512
548-552	178	Arpitha H.S	Designing, Dimensioning and Testing SDN-NFV Private	383512
			Cloud Architecture based realisation of 5GC with IIOT,	
			MCS, CV2X & VONR Service	
553-555	179	Saurav Kumar Roy	Comparative Study of Circularly Polarized Mictrostrip	370311
			Antennas	
556-558	181	Vaddadi Sree Vamsi,	Design and Analysis of Slotted circular patch Antenna for Wi-	370313
		Barsa Panda	Fi Applications	
559-562	182	Ansha K	Circularly Polarized Elliptical Microstrip Patch Array	373498
		1	Antenna for THz Applications	

563-566	184	Saravana Sai Rama Kolluri	Design of Broad-Band Coplanar Vivaldi Antenna for Radar Applications	383514
567-571	185	Patinavalasa Megh	Reconfigurable Frequency Selective Surface Switching	370317
		Sainadh	between Absorption and Transmission Band	
572-575	187	Bhanuprasad Eppe	Design Of An Equal Power Divider Using Capacitive Gap End-Coupled Lines	370319
576-580	188	Meenakshi Rawat	Multi Tile Synchronization and Calibration of Xilinx RF SoC ZCU216 for Digital Beamforming	370320
581-585	189	Vipin Kumar H	Autodyne Proximity Sensor with Temperature Compensated Biasing Network	370321
586-588	190	Maharana Pratap Singh	Dual Band Millimeter Wave MIMO Antenna Loaded with SRRs for 5G Applications	370322
589-594	193	Kranti Patil	Design of Hexagonal Ring Shaped Two Port MIMO Antenna for Sub-6 GHz and WLAN Application for Mobile Devices	370324
595-599	194	Donthireddy Priya	A CPW Fed Compact Multiband Antenna For Wireless Applications	370325
600-605	195	K Vaishnavi	Miniaturized Planar Dual Band Monopole UWB antenna using Capacitively Loaded Loop Resonator with Notch Characteristics	370326
606-609	197	Mayank Vishwakarma	A Compact Circularly Polarised Resistive Loaded Wideband Annular Ring Micro strip Antenna for Wireless Communication	370328
610-614	198	Priyanka Choudhary	Offset fed inverted U-shaped slot Penta-Band monopole antenna for UMTS/GSM/WLAN Applications	370329
615-619	199	Kailas S Vel	Miniaturized All Angle Stable Dual Band Frequency Selective Surfaces at Terahertz Regime	370330
620-622	200	Jobin B	Monopulse Comparator For Tracking Application using Rat race Couplers at X-band	
623-626	201	Anbu Mathi R	Aperture Coupled MSA with Low Back lobe for X Band Weather Radar Application	370332
627-630	202	Gaurangi Gupta	All-Metal Dual Band Circular Polarized UHF Patch Antenna	370333
631-635	206	Akila Murugesan	Estimation of reflection phase due to a pair of Jerusalem Cross elements using an equivalent circuit model	370336
636-640	207	Dr. V. Srinivasa Rao	Design and analysis of a substrate Integrated Waveguide Antenna Using Ceramic Vias for Bandwidth Improvement	370283
641-643	208	Madhar Shaik	A Miniaturized LTCC RF front-end Module for SATCOM MSS Handheld Terminals	370284
644-647	209	Amruta Sarvajeet Dixit	Antipodal Vivaldi Antenna for 5G Devices	370285
648-653	210	Amruta Sarvajeet Dixit	A Substrate Integrated Waveguide for Antipodal Vivaldi Antenna's Performance Enhancement: A Comprehensive Review	370286
654-659	212	Kiran Nivrutti Patil	Review on Power Conversion Efficiency Improvement Strategies in RF Energy Harvesting	383476
660-662	224	Ramprabhu Sivasamy	Design and Fabrication of a Miniaturized Microwave Absorber With Wide Band Absorption Characteristics	392274