

# Index

## A

aberrations, 24, 27, 29, 33  
aerosol scattering, 135  
aliasing, 44, 90  
angular spatial frequency, 6, 24  
astigmatism, 30  
atmospheric turbulence, 132  
autocorrelation, 21, 25, 99  
auxiliary optics, 118

## B

bar target, 126  
bar-target-to-MTF conversion, 92  
birefringent filters, 48  
boost filter, 62

## C

charge-carrier diffusion, 61  
charge-transfer inefficiency, 60  
coherence effects, 120  
coma, 30  
contrast transfer function (CTF), 86  
convolution theorem, 7, 41  
critical spatial frequencies, 18  
crosstalk MTF, 59  
cutoff frequency, 24, 47, 105

## D

defocus, 12, 29  
detection, recognition, and  
    identification, 18  
detector arrays, 39  
detector footprint, 41  
diffraction, 18

diffraction-limited MTF, 22  
diffraction MTF, 25, 117  
division by zero, 79

## E

edge-spread function (ESF), 70,  
    74, 123  
electro-optical systems, 39  
electronic networks, 61  
electronics noise, 64, 79

## F

fiber bundles, 58  
finite source size, 78  
flat field, 8, 121  
focal-plane array (FPA), 39, 51  
four-bar target, 89  
frame grabbers, 61

## G

geometrical MTF, 28, 117  
ground glass, 113–114  
ground-glass diffuser, 100, 116, 120

## I

image modulation depth (IMD), 88  
impulse response, 1  
instantaneous field of  
    view (IFOV), 55  
integrating spheres, 99–100, 104  
interlacing, 53

## J

Johnson criteria, 18

**L**

laser speckle, 98  
line-spread function (LSF), 68,  
74, 123  
linearity, 4, 39

**M**

microdither, 51  
microscanning, 51  
minimum modulation curve  
(MMC), 31  
modulation depth, 9, 42, 89  
modulation transfer (MT), 11  
modulation transfer function, 11  
motion blur, 129  
MTF area (MTFA), 17, 63  
multiplication of transfer  
function, 8, 115

**N**

noise-equivalent modulation  
(NEM), 16, 63  
noise targets, 97  
normalization, 8, 10, 87, 121  
Nyquist frequency, 44,  
51, 100–101, 105

**O**

obscured-aperture systems, 25  
optical transfer function (OTF), 9  
oversampled knife-edge test, 81

**P**

phase reversal, 12, 29  
phase transfer function (PTF),  
9, 12

point-spread function (PSF),  
1, 67, 113  
power spectral density (PSD), 64,  
79, 97

**R**

random-transparency target, 104  
resolution, 16

**S**

sampling, 43  
sampling MTF, 50  
scan velocity, 55, 62  
separability, 43  
separable function, 6  
shift invariance, 4, 39, 49,  
97, 108  
signal-averaging techniques, 77  
signal-processing-in-the-element  
(SPRITE) detectors, 61  
spatial frequency, 5  
spherical aberration, 30  
square wave, 124  
square-wave targets, 86  
Strehl ratio, 28

**T**

through-focus MTF, 34  
time-delay-and-integration (TDI), 57

**V**

vibration, 129

**W**

wavefront error, 30  
white noise, 106





**Glenn D. Boreman** is Professor and Chairman of the Department of Physics & Optical Science and Director of the Center for Optoelectronics & Optical Communications at the University of North Carolina at Charlotte. He is co-founder and Board Chairman of Plasmonics, Inc. (Orlando). From 1984 to 2011 he was on the faculty of the University of Central Florida, where he is now Professor Emeritus. He has supervised to completion 35 MS and 27 PhD students. He has held visiting research positions at IT&T (Roanoke), Texas Instruments (Dallas), US Army Night Vision Lab (Ft. Belvoir), McDonnell Douglas Astronautics (Titusville), US Army Redstone Arsenal (Huntsville), Imperial College (London), Universidad Complutense (Madrid), Swiss Federal Institute of Technology (Zürich), Swedish Defense Research Agency (Linköping), and University of New Mexico (Albuquerque). He received the BS in Optics from the University of Rochester, and the PhD in Optics from the University of Arizona. Prof. Boreman served as Editor-in-Chief of *Applied Optics* from 2000 to 2005, and Deputy Editor of *Optics Express* from 2014 to 2019. He is coauthor of the graduate textbooks *Infrared Detectors and Systems* and *Infrared Antennas and Resonant Structures* (SPIE Press), and author of *Modulation Transfer Function in Optical & Electro-Optical Systems* (SPIE Press) and *Basic Electro-Optics for Electrical Engineers* (SPIE Press). He has published more than 200 refereed journal articles in the areas of infrared sensors and materials, optics of random media, and image-quality assessment. He is a fellow of SPIE, IEEE, OSA, and the Military Sensing Symposium. He is a Professional Engineer registered in Florida. Prof. Boreman served as the 2017 President of SPIE.