Index

a
Argon 106
absolute humidity 106
absorption 90
bands 89
coefficient 120
mobile channel 317
active device 63
adaptive
coded modulation 232
coding and modulation 231
delta modulation (ADM) 273
differential PCM 273
FEC 231, 255
ACM see Adaptive, coded modulation
ADM see Adaptive, delta modulation
ADPCM see Adaptive, differential PCM
Advanced Communications Technology
Satellite (ACTS) 211
Aeronautical mobile satellite service
(AMSS) 362
air link 10
all electric satellite 42
alternate mark inversion (AMI) 270
AMI see alternate mark inversion (AMI)
amplitude 91, 114
modulation (AM) 268, 343
am-to-pm conversion 257
AMSS see Aeronautical mobile satellite service (AMSS)
angle-of-arrival 91, 114
ANIK A (ANIK I) 6
annual statistics 83, 84
anomalous propagation 383
antenna
averaging factor 199, 200
beam diversity (see beam diversity)
gain 52, 77
losses 65
multi-beam and frequency reuse 401
noise 65
antennas 47
directional 350
aperture efficiency 52
apogee 18, 18
area mean power 322
argument of perigee 20
array antenna 48
ascending node 20
atmospheric windows
stratification 381
windows 89
attenuation
cloud 107, 155
cross-section 103
fog 107
gaseous 105
rain 101, 162, 174, 209
attenuation coefficient
clouds 107
rain 102
attitude control 39
attitude 39
auroral electrojets 94
average masking angle 340, 353
availability 83
azimuth angle 27, 30

© 2017 John Wiley & Sons Ltd. Published 2017 by John Wiley & Sons Ltd.
balanced modulator 267
band segmentation 370
bandwidth 90
bandwidth reduction 231
barometric pressure 140
baseband
  channel 287
  formatting 262
  processor 46
baseline orientation angle 219
baud rate 271
beam diversity 206
beamwidth 47, 53, 77
beginning of life (BOL) 38
bent pipe repeater see frequency translation transponder (FT)
BER see bit error rate (BER)
binary phase shift keying (BPSK) 278, 287, 307, 312
bipolar waveform see alternate mark inversion (AMI)
bit error probability, for BFSK 251
bit error rate (BER) 225, 231, 423
  approximation 425
  for composite OBP satellite 251
  for wideband channel 350
blockage 317, 340, 346
  average masking angle 340
  handheld terminal 344
  street masking function 340
body stabilization 37
BOL see beginning of life (BOL)
Boltzmann’s constant 60, 120
boresight 54
BPSK see binary phase shift keying (BPSK)
brightness temperature see noise temperature
broadcast satellite service (BSS) 77, 82, 101, 316
BSS see broadcast satellite service (BSS)
bus see satellite, bus
byte 274

c
canting angle 111
capacity 111
CDMA 312
equivalent voice channel 297
PCM/SCPC/PSK/FDMA 292
PCM/TDM/PSK/FDMA 290
TDMA 296
carbon dioxide 106
carrier modulation 262
digital 275
carrier-to-interference ratio 82
carrier-to-intermodulation noise ratio 256
carrier-to-noise density 72, 75, 81
  for BFSK, OBP and FT satellites 254
  composite, for FT satellite 242
  for OBP satellite 250
carrier-to-noise ratio (C/N) 70, 75, 82, 235
  composite, for FT satellite 238, 241, 256, 297
  for OBP satellite 250
Carson’s rule 267
C-band 12
CDF see cumulative distribution function (CDF)
CDMA see code division multiple access (CDMA)
cellular mobile technology development 416
  satellite and 5G 418
central limit theorem 335
channel 11
  narrowband 321
  wideband 348
chip rate 305
circuit 11
circular
  orbit 21
  parabolic reflector 53
Clarke, Arthur C. 3
cloud liquid water (CLW) 153, 154
cloud types 107, 155
code division multiple access (CDMA) 288, 303
capacity 312
direct sequence spread Spectrum (DS-SS) 306
frequency hopping spread spectrum (FH-SS) 309
processing gain 310
coherence bandwidth 100
coherent detection 276
command 44
complex
dielectric permittivity 153
refractive index of water 103
refractivity 140
complimentary error function 423
composite link
on board processing satellite 248
carrier-to-noise ratio (C/N) 238, 257
comparison of FT and OBP performance 252
frequency translation satellite 236
intermodulation noise 255
COMSAT 8
C/N see carrier-to-noise ratio (C/N)
continuously variable slope delta modulation (CVSD) see adaptive, delta modulation (ADM)
CONUS antenna beam 206
coordination 389
area 389
distance 389
for interference mitigation 388
ITU-R procedures for satellite and terrestrial services 394
for Mode (1) propagation 392
for Mode (2) propagation 393
cosmic background noise 127
Crane
global rain model 177
two component rain model 182
cross-correlation coefficient 353
shadowing 353
cross-polarization discrimination (XPD) 110, 188, 193, 208
cross-section
absorption 103
scattering 103
crosstalk 257
cumulative distribution function (CDF)
mixed state mobile propagation 347
multi-satellite networks 351
d
DAH rain attenuation model 163
DAMA see demand assigned multiple access (DAMA)
Debye spectrum 142
decimal (dB) format 51
deep space communications 92, 101
delay spread 349
demand assigned multiple access (DAMA) 288
demod/remod transponder see on-board processing transponder (OBP)
depolarization 108, 187
ice 113
rain 110
depolarized wave 187
descending node 20
despun platform 37
deviation ratio, FM 267
dielectric material 318
permittivity of water 108
differential delay 99
longitude 28
phase shift keying 278
diffraction 90, 317, 382
subpath 381
directional antennas 350
direct wave propagation see line of site propagation
dispersion 90, 99
distribution
log-normal 327
Rayleigh 334, 336
Ricean 337
diversity 350
diversity, site gain 212, 220
Hodge model 218
improvement 214, 222
ITU-R model 220
modeling considerations 225
processing 224
system design and performance 217
D layer see ionospheric layers
domestic satellite 8
double sideband Suppressed carrier (DSB/SC) 263
AM-DSB/SC 267
downconverter 66
downlink 10
for FT satellite 238
for OBP satellite 250
power control 211
downlink limited link 241, 248
drop density 103
drop size distribution 103
dry air continuum 142
DSB/SC see double sideband suppressed carrier (DSB/SC)
DS see T-carrier TDM signaling
DS-SS see spread spectrum, direct sequence (DS-SS)
dynamic real-time frequency assignment 370

e
E layer see ionospheric layers
earth segment see ground segment
east-west station keeping 40
eb/no see energy-per-bit to noise density
eccentricity 20
effective
  aperture 52
  earth radius 152, 179
  path length 173, 198, 200
effective isotropic radiated power (EIRP) 51, 236
electron concentration 93, 94
electronic propulsion satellites 42
elevation angle 27, 29
elliptical orbit see satellite orbits
empirical roadside shadowing model 328
end of life (EOL) 38
energy-per-bit to noise density 72
  composite, for FT satellite 242
  composite, for BFSK 252
  for OBP satellite 250
EOL see end of life (EOL)
EPFD see equivalent power flux density (EPFD)
equalizers 350
equatorial electrojets 94
equatorial orbit see satellite orbits
equivalent heights
  for dry air 150
  for water vapor 150
equivalent noise circuit
  active device 63
  passive device 64
equivalent noise temperature 59, 120
equivalent power flux density (EPFD) 387
equivalent voice channel capacity 296
error
  detection, correction 255
  function, complimentary 423
  functions 328, 423
evolution of satellite broadband 399
exceedance 83
extremely high frequency (EHF) 14, 205

f
FA see fixed access (FA)
F-layer see ionospheric layers
fading 90
  channel performance 303
  correlated 353
  mobile channel 319
  narrowband 319
  selective 348
  shadow 321, 327, 348, 353
  uncorrelated 351
  wideband 319
Faraday effect see polarization, rotation
FDM see frequency division multiplex (FDM)
FDMA see frequency division multiple access (FDMA)
FEC see forward error correction (FEC)
Federal Communications Commission (FCC) 365
feedback shift register 304
FH-SS see spread spectrum, frequency hopping (FH-SS)
Figure of Merit 69
fixed access 288
fixed satellite service (FSS) 78, 82, 101, 316
forward error correction (FEC) 231
forward scattered wave see tropospheric wave
four color multiple beam array 403
free space link 49
free-space path loss 55
frequency 91
agile systems 370
band designations 13
dispersion 90
diversity 230
management 357
modulation (FM) 287
reuse 110, 187, 303, 402
reuse factor 404
separation, 369
translation transponder 45, 236, 254, 286
frequency allocation process 361
in the United States 368
frequency division multiple access (FDMA) 288, 289
bandwidth limited capacity 292
PCM/SCPC/PSK 292
PCM/TDM/PSK 294
power limited capacity 291
system capacity 292
frequency division multiplex (FDM) 287, 289, 364
frequency hopping spread spectrum (FH-SS)
fast frequency hopping 310
hopset 309
processing gain 312
slow frequency hopping 310
frequency modulation (FM) 267
improvement factor 268
frequency shift keying (FSK) 44, 277, 287
binary 251
Fresnel zone 332
front end see receiver front end
FSK see frequency shift keying (FSK)
FSS see fixed satellite service (FSS)
FT see frequency translation transponder (FT)

Gaussian
noise channel 280
random variable 327
Geocentric Gravitational Constant see Kepler’s Constant
g geometric latitude 92
geometry of GSO links
azimuth angle 30
elevation angle 29
range 29
geostationary earth orbit (GEO) see satellite orbits
geosynchronous earth orbit (GSO) see satellite orbits
global model see Crane, global rain model
Greenwich Meridian 28
ground
reflection 318
segment 9, 35
wave propagation 88
group delay 98
G/T see figure of merit (G/T)

h
half-circuit 11
half-power beamwidth 47, 53, 206
hand held terminal blockage 344
heat pumps 42
heaters 42
high earth orbit (HEO) see satellite orbits
high power amplifier (HPA) 255
high throughput satellites (HTS) 398
and 5G 416
EchoStar 17, 400
frequency band options 413
ground system infrastructure 412
Intelsat Epic 401
Ka-Sat 400
ViaSat-1 400
high frequency (HF) 14, 94
highly elliptical orbit see satellite orbits
Hodge site diversity model 218
horizon detectors 39
horn antenna 48
HPA see high power amplifier (HPA)
HTS see high throughput satellite (HTS)
hyrdrometeors 108

galactic noise 65
gaseous attenuation 105
hydrometeor rain scatter 384
hydrosols 152

ice depolarization 113
modeling 190
IF amplifier 67
line of site propagation 136
in-band interference 377
inclination angle 21
inclined orbit 21
index of refraction see refractive index
input power backoff 81
Integrated service digital network (ISDN) 399
INTELSAT 5, 8, 207, 215
TDMA 295
Interdepartmental Radio Advisory Committee (IRAC) 365
interference
between space and terrestrial service systems 377
between space services networks 378
between space services networks with reverse band allocations 379
designations 376
in-band 377
line-of-site interference 381
mitigation in satellite communications 376
noise 257
out-of-band 377
propagation mechanisms 379
RF link 386
intermodulation
distortion 257
noise 255
International Mobile Telecommunications-2020 (IMT-2020) 418
International Telecommunications Union (ITU) 358
Radio communications Sector (ITU-R) 359
Radio Regulations 364
service designations 362
study groups 359

Telecommunications Development Sector (ITU-S) 359
telecommunications service regions 362
Telecommunications Standards Sector (ITU-T) 359
International Telecommunications Union Radio communications Sector (ITU-R)
building blockage model 340
cloud attenuation model 153
depolarization model 188
diversity improvement factor 222
empirical roadside tree shadowing model 328
gaseous attenuation model, approximation method 145
gaseous attenuation model, line-by-line calculation 140
ice depolarization estimation 193
mixed propagation state procedure 346
mountain environment multipath model 338
rain attenuation model 162
roadside building shadowing model 331
scintillation model 197
site diversity gain model 220
intersymbol interference (ISI) 349
inverse square law of radiation 51
ionosphere 87, 92
ionospheric layers 93
ionospheric scintillation 95
ionospheric wave 88
ISI see intersymbol interference (ISI)
iso"
Kepler's Constant 17, 19
Kepler's Laws 18
Kirchhoff's Law 119
knife edge diffraction 318
Ku-band 13, 101, 205

land mobile satellite service (LMSS) 317, 363
L-band 13, 96
Leibe complex refractivity model 139
line loss 67
Line of Apsides 20
line of nodes 20
linear dipole antenna 48
line-of-site
  link impairments 95, 101
  propagation 88, 316, 324, 346
  rain fade mitigation 205
link performance parameters 70
link power budget equation 57, 316
  modified, for mobile channel 321
link system performance 75
downlink 81
  fixed antenna gain, fixed antenna size link 77
  fixed antenna gain link 77
  fixed antenna size link 76
  percent of time performance specifications 82
  uplink 79
liquid water density (cloud) 107
LMSS see land mobile satellite service (LMSS)
LNA see low noise amplifier (LNA)
local mean power 327, 334
log-normal distribution 327
look angles 27
low earth orbit (LEO) see satellite orbits
low-frequency (LF) 14
low noise amplifier (LNA) 67

m
Manchester coding see split phase coding margins
  implementation 280, 283
  uplink and downlink 258
marine mobile satellite service (MMSS) 363
m-ary
  signal 270
  phase shift keying (MSK) 278
maximal length PN code 304
MCPC see multiple channel per carrier (MCPC)
measurements
  amplitude scintillation 116
  BER for diversity operation 226
  brightness temperature 121
  cloud liquid water 156–159
  diversity switching 226
  electron concentration 93
  extraterrestrial noise sources 128
  ionospheric scintillation 97
  isotherm height, 0 degrees 165
  noise factor 121
  orbit diversity 229–230
  power flux density of the sun 133
  radio sky temperature 129–130
  rain and ice depolarization 112, 114
  rain intensity exceedance 167–172
  received signal power, moving mobile receiver 322
  scintillation on satellite link 118
  signal level, mobile satellite link 323
  site diversity 216–218
  total electron concentration 96
  water vapor density 139
medium access control (MAC) see multiple access
medium earth orbit (MEO) see satellite orbits
medium frequency (MF) 14
MESH network 413
methods of radio spectrum sharing 368
metropolitan area spot beams 206
MFK see street masking function (MFK)
MF-TDMA see time division multiple access, multi-frequency (MF-TDMA)
minimum permissible transmission loss 389
minimum shift keying (MSK) 278
mitigation, rain fade 205
mitigation, rain fade (contd.)
  power restoral techniques 205
  signal modification restoral techniques 229
MMSS see maritime mobile satellite service (MMSS)
Mode (1) propagation (clear air) 379
  coordination distance 392
Mode (2) propagation (hydrometeor scatter) 379
  coordination distance 393
modified Bessel function 347
modulation
  higher order phase 283
  index 368
mobile satellite
  channel 316
  mixed propagation conditions 346
  multi-satellite mobile links 351
  narrowband channel 321
  propagation 316
  service (MSS) 77, 101, 316
  wideband channel 348
Molniya orbit see satellite orbits
mountain environment multipath model 338
MSS see mobile satellite service (MSS)
multiple beam antenna
  array design 402
  capacity 404
  four color array 403
  frequency reuse factor 404
  signal to interference ratio (SIR) 407
  total available bandwidth 404
multi-frequency TDMA see time division multiple access, multi-frequency (MF-TDMA)
multipath 90, 317
  fading 321, 333, 348
  fading factor 322, 334
multiple access 262, 286
  code division 303
  frequency division 289
  time division 293
multiple channel per carrier (MCPC) 287
multiplexing
  complex scan 275
  statistical 275
  synchronous 374
multi-satellite network
  GSO 351
  NGSO 352
mutual interference (MI) 377
n
  narrowband channel 321
National Aeronautics and Space Administration (NASA) 3
National Telecommunications and Information Agency (NTIA) 365
National Television System Committee (NTSC) 263
  composite signal 263
nearly instantaneous Companding (NIC) 273
Newton Laws on Mechanics and Gravitation 17
NIC see nearly instantaneous Companding (NIC)
nitrogen 106
noise bandwidth 266
noise, due to
  atmospheric gases 121
  clouds 125
  extra-terrestrial sources 126
  moon 133
  radio stars 134
  rain 124
  sun 131
noise factor 61, 120
noise figure 61
noise power 60
noise power density 60
noise power spectral density see noise power density
noise, quantizing 372
noise temperature 63
non-coherent detection 276
non-geosynchronous (NGSO) see satellite orbits
non-regenerative repeater see frequency translation transponder (FT)
non-return to zero (NRZ)
polar 270, 278, 423
unipolar 270
normal probability density function 423
north-south station keeping 40
NRZ see non return to zero
NTSC see national television system committee (NTSC)

O
oblate spheroids 110
OBP see on-board processing transponder (OBP)
OFDM see orthogonal frequency division multiplexing (OFDM)
on-board processing transponder (OBT) 46, 248, 253
1/2 power beamwidth see Half-power beamwidth
orbit control 39
orbit diversity 227
orbital
  elements 21
  parameters 19
  slots 24
orbits see satellite orbits
orthogonal frequency division multiplexing (OFDM) 350
outage 83
time 84
out-of-band interference 377
output power backoff 81
oxygen 106, 121
OOK see on/off keying (OOK)
on/off keying (OOK) 277

P
PA see pre-assigned access (PA)
PAL see phase alternation line (PAL)
path loss 235
path loss factor
  narrowband channel 322, 323
  two-slope model 324
parabolic reflector antenna 48
passive device 64
payload, satellite 35, 45
  transponder 45
antennas 47
PCM see pulse code modulation (PCM)
percent of time link performance 84
perigee 19
phase 91, 114
phase alternation line 263
phase shift keying 44, 290, 277
  8-phase 283
  binary 287
  differential 278
  m-ary 278
  minimum 278
  quadrature 278, 287
phase state diagram 283
photonic drives 42
physical structure 37
plane wave 102
PN see pseudorandom (PN) sequence
polar orbit see satellite orbits
polarization 91, 114
  frequency reuse 45
  rotation 97
power
  backoff 287
  control 207
  control, downlink 211
  control, uplink 208
density (see power flux density (pfD))
efficiency 286
flux density 51, 55, 80
subsystem 38
power flux density (pfD) 51
power restoral techniques
  beam diversity 206
  power control 207
  site diversity 211
  orbit diversity 227
pre-assigned access (PA) 288
probability
  of correct reception, for OBP satellite 251
  of error (see bit error rate (BER))
prograde orbit see satellite orbits
propagate (radiowave) 49
propagation delay see group delay
propagation effects modeling and prediction
  atmospheric gases 138
  clouds and fog 152
propagation effects modeling and prediction (contd.)
depolarization 187
rain attenuation 162
tropospheric scintillation 194
propagation mechanisms 89
propagation modes
ground wave 88
ionospheric wave 88
tropospheric wave 88
line-of-site 88
pseudorandom (PN) sequence 304
PSK see phase shift keying (PSK)
pulse code modulation (PCM) 271, 274
bandwidth requirements 273

q
QAM see quadrature amplitude modulation (QAM)
Q-band 13
Q-function 424
QPSK see quadrature phase shift keying (QPSK)
quadrature
amplitude modulation (QAM) 232, 278
phase shift keying (QPSK) 278, 280, 287
quantizing noise 272
quantum noise 60

r
radiation mirrors 42
radiation shields 42
radio auroras 94
radio climate zones 390
radio frequency (RF) 49
link performance parameters 70
transmission fundamentals 49
system noise 59
radio frequency interference (RFI) 377
radiometer
measurements 215
radio noise 59, 65, 117, 122–123
radio noise, due to
atmospheric gases 121
clouds 125
extra-terrestrial sources 126
moon 133
radio stars 134
rain 124
sun 131
radio refractive index lapse rate 382
radiosonde 108
radio spectrum management 357
radiowave 49
rain
attenuation coefficient 102
attenuation 101, 102, 162, 209
convective 102
depolarization 101, 110
fade mitigation 205
height 164, 178
intensity plots 167–172
stratiform 101
range 27, 29
Rayleigh
approximation 108, 153, 192
criterion 318
distribution 318, 334
refractive index 115, 142
structure constant 116
receiver antenna noise see antenna noise
receiver front end 59
reflection 317
refraction 90, 317
refractivity 196
regenerative repeater see on-board processing transponder (OBP)
regional
satellite 8
spot beams 206
relative humidity 139
reliability 83
retrograde orbit see satellite orbits
reverse band allocations 377
RF see radio frequency (RF)
RFI see radio frequency interference (RFI)
Rice-Nakagami distribution 199, 337
Ricean K-factor 338
Right Ascension of the Ascending Node 20
roadside trees multipath model 339
roughness 318
Satellite(s)

5G technologies 418
Advanced Communications Technology
Satellite (ACTS) 211
all electric 42
ANIK A (ANIK 1) 6
Applications Technology Satellite-1
(ATS-1) 5
attitude control 39
ATS-3 5
ATS-5 6
ATS-6 6, 117
Boeing 702SP 43
broadband, evolution of 399
bus 36
COMSTAR 113, 117, 216, 228
COURIER 4
CTS 8, 244
EARLYBIRD 5
ECHO 3
EchoStar 17 400
garbageyard 39
HTS and 5G 416
INTELSAT 207, 225
ITALSAT 228
Intelsat Epic 401
Ka-Sat 400
orbital control 39
OLYMPUS 228
payload 45
physical structure 37
power subsystem 38
RELAY 4
SCORE 3
signal processing elements 262
SIRIO 215
SPUTNIK 3
stable points 39
SYNCOM 5
TELESTAR 4
thermal control 41
Tracking and Data Relay Satellites
(TDRS) 36
tracking, telemetry, command and
monitoring 43
ViaSat-1 400

WESTFORD 4

Satellite communications
early history 3
link parameters 10
segments 9
satellite multiple access 286
code division 303
frequency division 289
time division 293
satellite news gathering (SGN)
satellite orbits 11
circular orbit 21
elliptical orbit 21
garbageyard 39
geometry of GSO links 27
gestionary earth orbit (GEO) 23
geosynchronous earth orbit (GSO) 9,
11, 23
high earth orbit, highly elliptical orbit
(HEO) 12, 26
inclined orbit 21
low earth orbit (LEO) 12, 25
medium earth orbit (MEO) 12, 26
Molniya orbit 27
non-geosynchronous (NGSO) 9, 229,
344
polar orbit 21, 27
prograde orbit 21
retrograde orbit 21
satellite switched TDMA see time division
multiple access, satellite switched
(SS/TDMA)
saturated output operating point 80
saturation flux density
multiple carrier 81
single carrier 80
S-band 13
scattering 90, 317, 318
scintillation
fade depth 199
index 95
ionospheric 95
parameters 116
tropospheric 114
SCPC see single channel per carrier (SCPC)
SDMA see space division multiple access
(SDMA)
SECAM 263
selective fading 338
shadow
  fading 321, 327, 348
  fading factor 322
shadowing 317, 346
cross-correlation coefficient 353
  street canyon 353
sidelobes 47, 54
sidereal time 22
signal processing elements
  analog systems 262
  baseband formatting, analog 262
  baseband formatting, digital 270
  carrier modulation, analog 264
  carrier modulation, digital 275
  source combining, analog 264
  source combining, digital 274
signal separation 372
signal-to interference ratio (SIR) 407
signal-to-noise ratio
  weighted 269
single channel per carrier 287
single sideband suppressed carrier (SSB/SC) 263
  AM-SSB/SC 267
split phase (Manchester) coding 270
STAR network 414
site diversity 211
gain 212
  Hodge Model 218
  improvement 214
  ITU-R model 220
  modeling considerations 225
sky noise, due to see also radio noise
  atmospheric gases 121
  clouds 125
  extra-terrestrial sources 126
  moon 133
  radio stars 136
  rain 124
  sun 131
sky wave see ionospheric wave
slant path 164
Slobin
  cloud model 155
  cloud regions 126, 161
cloud types 107, 155
slots (orbital) 24
smart satellite see on-board processing
  transponder (OBP)
solid state power amplifier (SSPA) 47, 79, 81, 209, 255
source combining 262
  analog 264
  digital 274
space division multiple access (SDMA) 288
space segment 9, 35
spatial separation 371
speech baseband 262
specific attenuation
  atmospheric gases 140
  clouds 107, 154
  rain 103, 104, 166, 180, 183
  regression coefficients 166, 173
  water vapor 148
spectral efficiency 286, 303
spectrum
  efficiency metrics 372
  utilization efficiency (SUE) 373
  utilization factor (U) 373
  spectrum management 357
  functions and activities 357
  international 358
  in the United States 365
  spin stabilization 37
spot beam 206
spreading loss 55
spreading ratio see code division multiple access (CDMA), processing gain
spread spectrum see also code division multiple access (CDMA)
  direct sequence 306
  frequency hopping 309
spread spectrum multiple access (SSMA)
  see code division multiple access (CDMA)
SSPA see solid state power amplifier (SSPA)
SSB/SC see single sideband suppressed carrier (SSB/SC)
SS/TDMA see time division multiple access, satellite switched (SS/TDMA)
station keeping see orbit control
street masking function (MKF) 340
subcarrier 362
subsatellite point (SS) 28
sunspot cycle 92
super high frequency (SHF) 14
suppressed carrier AM 267
surface ducting and layer reflection 383
system noise temperature 66

T
Tatarski 116
TDMA see time division multiple access (TDMA)
TDM see time division multiplexing (TDM)
TEC see total electron content (TEC)
telemetrical communications service regions 362
telemetry 44
tessellate 403
thermal
  blankets 42
  control 41
  noise 59
  shields 42
three-axis stabilization 38
3-dB beamwidth see half-power beamwidth
time diversity see time-delayed transmission diversity
time division multiple access (TDMA) 225, 231, 288, 293
burst time plan 294
capacity 296
frame efficiency 295
guard bands 294
multi-frequency 288
PCM/TDM/PSK 294
preamble 294
reference burst 294
reference station 293
satellite switched 288, 299
traffic data 294
unique word 294
time separation 372
time zone (antenna) beams 206
time-delayed transmission diversity 231
T-carrier TDM signaling 275
T-matrix see transformationmatrix (T-matrix)
total
  columnar content (liquid water) 108
electron content 92, 94
Tracking and Data Relay Satellites (TDRS) see satellites
  tracking 44
Tracking, Telemetry, Command (TT&C) see Tracking, Telemetry, Command and Monitoring (TTC&M)
Tracking, Telemetry, Command and Monitoring (TTC&M) 9, 43
transfer characteristic 80
transformationmatrix (T-matrix) 190
transmission
  channel 262
  factor, downlink 256
  impairments 87
  transponder 10, 45, 79
traveling wave tube amplifier (TWTA) 47, 79, 81, 209, 255
troposphere 101
tropospheric
  scatter 383
  scintillation 114, 194
  wave 88
Tsolakis and Stutzman T-matrix Model 190
TWT see traveling wave tube (TWT)
TWTA see traveling wave tube amplifier (TWTA)

U
ultra high frequency (UHF) 14
un-availability 105
uncorrelated fading 351
uplink 10
  for FT satellite 236
  for OBP satellite 250
uplink limited link 241, 246
uplink power control 208
  closed loop 209
  open loop 210

V
VA see voice activation factor (VA)
van de Camp cloud scintillation model 199
variance of log of received power 116
V-band 13, 101, 229
velocity of light 49
very small antenna terminal (VSAT) 8, 10, 58
very high frequency (VHF) 14, 94, 99
video signal to noise ratio (S\N) 82
very low frequency (VLF) 14
voice activation factor (VA) 292
VSAT see very small antenna terminal (VSAT)

w
water vapor 106, 121
density 139
pressure 196, 200
wavelength 49
weighted signal-to-noise ratio 269
weighting factor 269
wet continuum 142
wide area diversity 227
World Radiocommunication Conference (WRC) 361
worst-month statistics 82, 84
Wulfsburg 120

x
X-band 13
XPD see cross-polarization discrimination (XPD)

z
zenith attenuation
for clouds 162
for gaseous attenuation 150
0°C isotherm height 165, 178