Part III

Reference Material

Appendix A
Frequently Used Symbols

Symbols	**Meaning**	**Units**
$\mathcal{B}$	magnetic induction	Vs/cm^2
c_n, c_p	$c = \nu_{\mathrm{th}}\sigma$, electron and hole capture coefficients	cm^3/s
C_{G}	gate capacitance	F
C_{ox}	oxide capacitance per unit area	F/cm^2
d_{ox}	oxide thickness	cm
d_{s}	depletion layer depth	cm
D_n,D_p	diffusion constants of electrons and holes	cm^2/s
$\mathcal{E}$	electric field	V/cm
E_{F}	Fermi level	eV
E_{F}^n, E_{F}^p	Quasi-Fermi levels of electrons and holes	eV
E_{d}	defect energy level	eV
E_{i}	intrinsic energy level	eV
E_{C}	lower edge of conduction band	eV
E_{V}	upper edge of valence band	eV
E_{G}	band gap	eV
$\mathcal{E}_{\mathrm{s}}$	electric field at semiconductor surface	V/cm
E_{t}	defect energy level	eV
f	frequency	s^{-1}
f	fraction of charge induced in the channel	1
$\mathcal{F}$	force	eV/cm
$F(E)$	Fermi–Dirac occupation probability for electrons	1
$F(E)$	Fermi–Dirac distribution function	1
$F_n(E)$	occupation probability for electrons in the conduction band	1
$F_p(E)$	occupation probability for holes in the valence band	1
F_n	flux density of electrons	cm^{-2}s^{-1}
F_p	flux density of holes	cm^{-2}s^{-1}
g	$= \partial I_{\mathrm{D}}/\partial V_{\mathrm{D}}$ transistor conductance	A/V
g_{m}	$= \partial I_{\mathrm{D}}/\partial V_{\mathrm{G}}$ transistor transconductance	A/V
g_{q}	$= \partial I_{\mathrm{D}}/\partial Q_{\mathrm{sig}}$ DEPFET charge steilheit	s^{-1}
$g_{\mathrm{m,\,sat}}$	$= \partial I_{\mathrm{D,\,sat}}/\partial V_{\mathrm{G}}$ transconductance in the saturation region	A/V
g_l	defect charge state degeneration factor	1

h	Planck's constant	Js
h	depletion depth	cm
h	potential change in iterative solution of Poisson equation	V
I_{D}	drain current	A
$I_{\mathrm{D,\,sat}}$	drain current at saturation	A
J_n, J_p	electron and hole current densities	A/cm^2
G	generation rate	cm^{-3}s^{-1}
G_n, G_p	electron and hole generation rates	cm^{-3}s^{-1}
k	Boltzmann's constant	J/K, eV/K
k_τ	radiation damage constant (lifetime)	cm^2/s
K_{F}	$1/f$ noise parameter	C^2/cm^2
L	transistor channel length	µm
L_n, L_p	diffusion length of electrons and holes	cm, µm
m_n	effective electron mass	kg
m_p	effective hole mass	kg
n	free electron concentration	cm^{-3}
n_{i}	intrinsic carrier concentration	cm^{-3}
n_n, n_p	electron concentration in n- and p-regions	cm^{-3}
N_{A}	acceptor concentration	cm^{-3}
N_{d}	defect concentration	cm^{-3}
N_{D}	donor concentration	cm^{-3}
N_{eff}	effective doping concentration	cm^{-3}
N_{t}	defect density	cm^{-3}
N_{C}	effective density of states in the conduction band	cm^{-3}
N_{V}	effective density of states in the valence band	cm^{-3}
$N(E_{\mathrm{kin}})$	density of states	1
p	readout pitch	µm
p	free hole concentration	cm^{-3}
p_n,p_p	hole concentration in n- and p-region	cm^{-3}
$P_{t,l}$	probability of defect being in charge state l	1
q	elementary charge	As
Q_{c}	channel surface charge density	C/cm^2
Q_{inv}	inversion layer surface charge density	C/cm^2
Q_{sig}	signal charge	C
Q_{s}	space–charge density (in units of e)	cm^{-3}
Q_{t}	defect charge density (in units of e)	cm^{-3}
R	recombination rate	cm^{-3}s^{-1}
R_n, R_p	electron and hole capture rates	cm^{-3}s^{-1}
T	absolute temperature	K
U	excess recombination rate	cm^{-3}s^{-1}
v_n	noise voltage	V
V_{bi}	built-in voltage	V
V_{c}	channel potential	V
V_{D}	drain potential	V
$V_{\mathrm{D,\,sat}}$	drain–source saturation voltage	V

V_{F}	flat-band voltage	V
V_{G}	gate potential	V
$V_{\mathrm{G,\,eff}}$	effective gate voltage	V
V_{p}	pinch-off voltage	V
V_{sub}	substrate potential	V
V_{S}	source potential	V
V_{T}	threshold voltage	V
V_{T}	$= \frac{kT}{q}$ thermal voltage	V
W	transistor channel width	µm
$x(E)$	$=\exp(\frac{E-E_{\mathrm{i}}}{kT})$	1
α	radiation-damage constant (current)	A/cm
α_{l}	ratio of probabilities of neighboring defect charge states	1
α_{T}	transistor base-transport factor	1
α_{0}	transistor common-base current gain	1
β	generation constant	$\mathrm{cm}^{-3}\mathrm{s}^{-1}$
β	transistor current gain	1
γ	transistor emitter efficiency	1
ϵ	dielectric constant	1
ϵ_{0}	permittivity in a vacuum	F/cm
Θ_{n}, Θ_{p}	Hall angle of electrons and holes	1
μ_{n}, μ_{p}	mobility of electrons and holes	$\mathrm{cm}^{2}/\mathrm{Vs}$
μ_{n}^{H}, μ_{p}^{H}	Hall mobility of electrons and holes	$\mathrm{cm}^{2}/\mathrm{Vs}$
$\boldsymbol{\nu}_{n}$, $\boldsymbol{\nu}_{p}$	drift velocity of electrons and holes	cm/s
$\nu_{\mathrm{th},n}$, $\nu_{\mathrm{th},p}$	thermal velocity of electrons and holes	cm/s
ρ	charge density	$\mathrm{C/cm}^{3}$
σ	root-mean-square deviation	µm
σ_{n}, σ_{p}	electron and hole capture cross-sections	cm^{2}
τ_{c}	mean free time between collisions	s
τ_{r}	recombination life-time of minority carriers	s
τ_{g}	generation life-time of minority carriers	s
Φ	potential	V
Φ	radiation fluence	cm^{-2}
$q\Phi_{\mathrm{m}}$	work function of metal	eV
$q\Phi_{\mathrm{s}}$	work function of semiconductor	eV
$q\Phi_{\mathrm{B}_n}$, $q\Phi_{\mathrm{B}_p}$	barrier height of metal–semiconductor contact	eV
Ψ_{B}	$\frac{1}{q}\lvert E_{\mathrm{i}} - E_{\mathrm{F}}\rvert$, distance intrinsic level to Fermi level	V
Ψ_{c}	channel potential	V
Ψ_{s}	potential at the semiconductor surface	V
$q\,\chi$	electron affinity	eV

Appendix B
Physical Constants

Quantity	**Symbol**	**Value** (in one or two units)
Ångström unit	Å	1 Å = 10^{-8} cm = 10^{-10} m
Electron volt	eV	1.6022×10^{-19} J
Speed of light	c	2.99792×10^{10} cm/s
Permittivity of free space	ϵ_0	8.85418×10^{-14} F/cm
Permeability of free space	μ_0	1.25663×10^{-8} H/cm
Planck's constant	h	6.62617×10^{-34} J s
Reduced Planck constant	$\hbar$	1.05458×10^{-34} J s
Elementary charge	q	1.60218×10^{-19} C
Electron rest mass	m	0.91095×10^{-27} g
Proton rest mass	M_p	1.67264×10^{-27} kg
Ideal gas constant	R	1.98719 cal/mole K = 8.3145 J/mole K
Boltzmann's constant	$k = R/N_{\mathrm{A}}$	1.3087×10^{-23} J/K
Avogadro's number	N_{A}	6.0221×10^{23} mole^{-1}
Thermal voltage at 300 K	$V_T = kT/q$	0.0259 V
Wavelength of 1-eV quantum	λ	1.23977 µm

References

Books and Reviews

Beadle, W.E., Tsai, J.C.C. and Plummer, R.D. (1984): "Quick Reference Manual for Silicon Integrated Circuit Technology" John Wiley and Sons, New York, Chichester, Brisbane, Toronto, Singapore, 1984

Gatti, E. and Manfredi, P.F. (1986): "Processing the signals from solid state detectors in elementary particle physics" Rivista di Nuovo Cimento 9, Ser. 3 (1986) 1-145

Gray, P.R. and Meyer, R.G. (1993): "Analysis and design of analog integrated circuits" 3rd ed., Wiley, New York 1993

Grove, A.S. (1967): "Physics and technology of semiconductor devices" Wiley, New York 1967

Henke, B.L. (1982) et al.: Atomic Data Tables, Vol. 27 (1982) 1

Kittel, C. (1976): "Introduction to solid state physics" Wiley, New York 1976

Knoll, Glenn F. (1989): "Radiation detection and measurement" 2nd ed., Wiley and Sons, New York 1989

Landolt–Börnstein vol. III/17a (1982): "Semiconductors, Physics of Group IV Elements and III-V Compounds" Springer, Berlin Heidelberg New York, 1982

Landolt–Börnstein vol. III/17c (1984): "Semiconductors, Technology of Si, Ge and SiC" Springer, Berlin Heidelberg New York, 1984

Landolt–Börnstein vol. III/22a (1987): "Semiconductors, Intrinsic Properties of Group IV Elements and III-V, II-VI and I-VII Compounds" Springer, Berlin Heidelberg New York, 1987

Leo, W.R. (1994): "Techniques for Nuclear and Particle Physics Experiments" Springer, Berlin Heidelberg New York

Muller–Kamins (1986): "Device electronics for integrated circuits" 2nd ed., John Wiley & Sons, New York

Nicollian, E.H. and J.R. Brews (1982): "MOS Physics and Technology" John Wiley & Sons, New York

Palik, E.D. (1985): "Handbook of optical constants of solids" Academic Press, New York

Shockley, W. (1950): "Electrons and holes in semiconductors" D. van Nostrand Company Inc., New York

Smith, R.A. (1979): "Semiconductors" 2nd ed., Cambridge University Press, London 1979

Spenke, E. (1965): "Elektronische Halbleiter" 2nd ed., Springer Verlag, Berlin, Heidelberg, New York 1965

Sze, S.M. (1981): “Physics of semiconductor devices” 2nd ed. Wiley, New York 1981

Sze, S.M. (1983): “VLSI Technology” McGraw-Hill, New York 1983

Sze, S.M. (1985): “Semiconductor devices, physics and technology” Wiley, New York 1985

Sze, S.M. (1994): “Semiconductor sensors” Wiley, New York 1994

Van Lint, V.A.J., Flanagan, T.M., Leadon, R.E., Naber, J.A., and Rogers, V.C. (1980): “Mechanisms of radiation effects in electronic materials, volume 1” John Wiley and Sons, 1980

Veigele, W.J. (1973): Atomic Data Tables, Vol. 5 No.1 (1973) 51

Wang, S. (1989): “Fundamentals of Semiconductor Theory and Device Physics” Prentice Hall, Englewood Cliffs, New Jersey

Articles

Abe, K., Arodzero,A. (1997) et al: “Design and performance of the SLD vertex detector: a 307 Mpixel tracking system” Nucl. Instr. and Meth. A400 (1997) 287-343

Alig, R.C., Bloom, S. and Struck, C.W. (1980): “Scattering by ionization and phonon emission in semiconductors” Phys. Rev. B, Vol 22, no.12 (1980) 5565-5582; “Scattering by ionization and phonon emission in semiconductors II. Monte Carlo calculations” Phys. Rev. B, Vol 27, no. 2 (1983) 968-977

Anghinolfi, F., Dabrowski, W. (1997) et al.: “SCTA – a rad-hard BiCMOS analogue readout ASIC for the ATLAS semiconductor tracker” IEEE Trans. Nucl. Sci. 44 (1997) 298-302

Bailey, R., Damerell, C.J.S. (1983) et al.: “First Measurements of Efficiency and Precision of CCD Detectors for High Energy Physics” Nucl. Instr. and Meth. 213 (1983) 201-215

Bak, J.F., Burenkov, A. (1987) et al.: “Large departures from Landau distributions for high-energy particles traversing thin Si and Ge targets” Nucl. Phys. B288 (1987) 681-716

Belau, E., Klanner, R. (1983a) et al.: “Charge collection in silicon strip detectors” Nucl. Instr. and Meth. 214 (1983) 253-260

Belau, E., Kemmer, J. (1983b) et al.: “Silicon detectors with 5 μm spatial resolution for high energy particles” Nucl. Instr. and Meth. 217 (1983) 224-228

Bethe, H.A. (1930): “Zur Theorie des Durchgangs schneller Korpuskularstrahlen durch Materie” Ann. d. Phys. 5 (1930) 325

Beutenmüller, R.H., Kraner, H.W. (1987) et al.: “Silicon position sensitive detectors for the Helios (NA34) experiment” Nucl. Instr. and Meth. A253 (1987) 500-510

Beuville, E., Borer, K. (1990) et al.: “AMPLEX, a low-noise low-power analog CMOS signal processor for multielement silicon particle detectors” Nucl. Instr. and Meth. A288 (1990) 157-167

Bichsel, H. (1988): “Straggling in thin Silicon detectors” Rev. Mod. Phys. 60 (1988) 663-699

Bloch, F. (1933): "Bremsvermögen von Atomen mit mehreren Elektronen" Z. Phys. 81 (1933) 363

Buskulic, D., Casper, D. (1995) et al.: "Performance of the ALEPH detector at LEP" Nucl. Instr. and Meth. A360 (1995) 481-506

Buttler, W., Lutz, G. (1988) et al.: "Low-noise, low power monolithic multiplexing readout electronics for silicon strip detectors" Nucl. Instr. and Meth. A273 (1988) 778-783

Caccia, M., Evensen, L. (1987) et al.: "A Si Strip Detector with Integrated Coupling Capacitors" Nucl. Instr. & Meth. A260 (1987) 124-131

Castoldi, A., Rehak, P. (1996) et al.: "A new drift detector with reduced lateral diffusion" Nucl. Instr. and Meth A377 (1996) 375-380

Cesura, G., Findeis, N. (1996) et al.: "New pixel detector concepts based on junction field effect transistors on high resistivity silicon" Nucl. Instr. and Meth A377, 521-528 (1996)

Chen, W., Kraner, H. (1992) et al.: "Large area cylindrical silicon drift detector" IEEE Trans.Nucl.Sci. 39 (1992) 619-628

Cottini, C., Gatti, E., Gianelli, G. and Rozzi, G. (1956): "Minimum noise preamplifiers for fast ionization chamber" Nuovo Cimento (1956) 473-483;

Damerell, C.J.S., English, R.L. (1987) et al.: "CCDs for Vertex Detection in High Energy Physics" Nucl. Instr. and Meth. A253 (1987) 478-481;

Damerell, C.J.S., English, R.L. (1990) et al.: "A CCD based vertex detector for SLD" Nucl. Instrum. Methods A288 (1990) 236-239

Decamp, D., Deschizeaux, B. (1990) et al.: "A detector for electron-positron annihilations at LEP" Nucl. Instrum. Methods A294 (1990) 121-178

Dentan, M., Abbon, P. (1996) et al.: "DMILL, a mixed analog-digital radiation-hard BICMOS technology for High Energy Physics electronics" IEEE Trans. Nucl. Sci. 43 (1996) 1763-1767

Di Maria, D.J., Arnold, D. and Cartier, E. (1993): "Impact ionization and degradation in silicon dioxide films on silicon", in: C.R. Helms and B.E. Deal (eds.), The Physics and Chemistry of SiO_2 and the Si–SiO_2 Interface 2 (Plenum Press, New York, 1993)

Fano, U. (1947): "Ionization yield of radiations II: The fluctuations of the number of ions" Phys. Rev. 72 (1947) 26-29

Farell, R., Vanderpuye, K. (1994) et al.: "Radiation detection performance of very high gain avalanche photodiodes" Nucl. Instr. and Meth. A353(1994) 176-179

Feick, H., Fretwurst, E. (1996) et al.: "Long term damage studies using silicon detectors fabricated from different starting materials and irradiated with neutrons, protons and pions" Nucl. Instr. and Meth. A377 (1996) 217-223

Fraser, G.W., Abbey, A.F. (1974) et al.: "The X-ray energy response of silicon" Nucl. Instr. and Meth. A350 (1994) 368-378

Fretwurst, E., Herdan, H. (1990) et al.: "Silicon detector developments for calorimetry: technology and radiation damage" Nucl. Instr. & Meth. A288, (1990) 1-12

Fretwurst, E., Feick, H. (1994) et al.: "Reverse annealing of the effective impurity concentration and long term operational scenario for silicon detectors

detectors in future collider experiments" Nucl. Instr. & Meth. A342, (1994) 119-125

Gadomski, S., Hall, G. (1992) et al.: "The deconvolution method of fast pulse shaping at hadron colliders" Nucl. Instr. & Meth. A320, (1992) 217-227

Gajewski, H., Heinemann, B., Langmach, H., Telschow, G., and Zacharias, K. (1992): "TOSCA – Two dimensional Semiconductor Analysis Package", Handbuch, Karl-Weierstraß Institut, Berlin 1992

Gatti, E. and Rehak, P. (1984a): "Semiconductor Drift Chamber - An Application of a Novel Charge Transport Scheme" Nucl. Instr. and Meth. 225 (1984) 608-614;

Gatti, E., Rehak, P. (1984b) et al.: "Silicon Drift Chambers - First results and optimum processing of signals" Nucl. Instr. and Meth. 226 (1984) 129-141;

Gatti, E., Rehak, P. (1985) et al.: "Semiconductor Drift Chambers" IEEE Trans.Nucl.Sci. 32 (1985) 1204-1208;

Hall, R.N. (1952): "Electron-hole recombination in germanium" Phys. Rev. 87 (1952) 387

Hartmann, R., Strüder, L. (1997) et al.: "Ultrathin entrance windows for silicon drift detectors" Nucl. Instr. and Meth. A387 (1997) 250-254

Heijne, E.H.M., Hubbeling, L. (1980) et al.: "A silicon surface barrier microstrip detector designed for high energy physics" Nucl. Instr. and Meth. 178 (1980) 331-341

Heijne, E.H.M., Antinori, F. (1994) et al.: "First operation of a 72 k element hybrid silicon micropattern pixel detektor array" Nucl. Instr. and Meth. A349 (1994) 138-155

Heijne, E.H.M., Antinori, F. (1996) et al.: "LHC1: a semiconductor pixel detector readout chip with internal, tunable delay providing a binary pattern of selected events" Nucl. Instr. and Meth. A383 (1996) 55-63

Hofmann R., Lutz, G. (1984) et al.: "Development of readout electronics for monolithic integration with diode strip detectors" Nucl. Instr. and Meth. 226 (1984) 196-199

Kandiah, K., Deighton, M.O. and Whiting, F.B. (1981): "Low frequency noise mechanisms in field effect transistors" Proc. 6th Conf. on noise in physical systems, NBS Publication 614, U.S. Department of Commerce,1981

Kandiah, K. (1983): "Energy levels of bulk defects responsible for L.F. noise in Si JFETs" Noise in Physical Systems and $1/f$ Noise, pg 287-290, Elsevier Science Publishers B.V., 1983

Kandiah, K. (1986): "Low frequency noise mechanisms in field effect transistors" Noise in Physical Systems and $1/f$ Noise, pg 19-25, Elsevier Science Publishers B.V., 1986

Kandiah, K., Deighton, M.O. (1989) et al.: "A physical model for random telegraph signal currents in semiconductor devices" J. Appl. Phys. 66, (1989) 937-948

Kemmer, J. (1980): "Fabrication of low noise silicon radiation detectors by the planar process" Nucl. Instr. & Meth. A169 (1980) 499-502

Kemmer, J. and Lutz, G. (1987): "New semiconductor detector concepts" Nucl. Instr. & Meth. A253 (1987) 356-377

Kemmer, J., Lutz, G. (1987) et al.: "Low capacitive drift diode" Nucl. Instr. & Meth. A253 (1987) 378-381

Kemmer, J. and Lutz, G. (1988): "New structures for position sensitive semiconductor detectors" Nucl. Instr. & Meth. A273 (1988) 588-598

Kemmer, J., Lutz, G. (1990) et al.: "Experimental confirmation of a new semiconductor detector principle" Nucl. Instr. & Meth. A288 (1990) 92-98

Kemmer J. and Lutz, G. (1993): "Concepts for simplification of strip detector design and production" Nucl. Instr. and Meth. A326 (1993) 209-213

Kleinfelder, S.A., Carithers, W.C. jr. (1988) et al.: "A flexible 128 channel silicon strip detector instrumentation integrated circuit with sparse readout" IEEE Trans. Nucl. Sci. 35 (1988) 171-175

Landau, L. (1944): J. Phys. (USSR) 8 (1944) 201

Lechner, P., Hartmann, R., Soltau, H. and Strüder, L. (1996): "Pair creation energy and Fano factor of silicon in the energy range of soft x-rays" Nucl. Instr. and Meth. A377 (1996) 206-208

Li, Z. (1994): "Modelling and simulation of neutron induced changes and temperature annealing of N_{eff} and changes in resistivity in high resistivity silicon detectors" Nucl. Instr. and Meth. A342 (1994) 105-118

Longoni, A., Gatti, E. and Sacco, R. (1995): "Trapping noise in semiconductor devices: a method for determining the noise spectrum as a function of the trap position" Journal of Applied Physics 78 (1995) 6283-6297

Longoni, A. (1990), Sampietro, M. and Strüder, L.: "Instability of the breakdown of high resistivity silicon detectors due to the presence of oxide charges" Nucl. Instr. and Meth. A288 (1990) 35-43

Lumb, D. (1997) et al: "X-ray Multi-Mirror Mission – an overview" SPIE 2808 (1997) 326

Lutz, G. (1986): "Present and Future Semiconductor Tracking Detectors" Vertex Detectors, Plenum Press, New York, 1988, pp. 195-224

Lutz, G. (1991): "Correlated noise in silicon strip detector readout" Nucl. Instr. and Meth. A309 (1991) 545-551

Lutz, G. (1994): "A simplistic model for reverse annealing in irradiated silicon" Nucl. Instr. and Meth. B95 (1995) 41-49

Lutz, G. (1996): "Effects of deep level defects in semiconductor detectors" Nucl. Instr. and Meth. A377 (1996) 234-243

Matheson, J. (1996), M. Robbins and S. Watts: "The effect of radiation induced defects on the performance of high resistivity silicon diodes", Nucl. Instr. and Meth. A377 (1996) 224-227

Mours, B., Boudreau, J. (1996) et al.: "The design, construction and performance of the ALEPH silicon vertex detector" Nucl. Instr. and Meth. A379 (1996) 101-115

Nyquist, H. (1928): "Thermal agitation of electrical charge in conductors" Phys. Rev. 32 (1928) 110-113

Parker, S.I., Kenney, C.J. (1994) et al.: "A prototype monolithic pixel detector"

Pinotti, E., Bräuninger, H. (1993) et al: "The pn-CCD on-chip electronics" Nucl. Instr. and Meth. A326 (1993) 85-91

Pitzl, D., Cartiglia, N. (1992) et al: “Type inversion in silicon detectors” Nucl. Instr. and Meth. A311 (1992) 98-104

Radeka, V., Rehak, P. (1989) et al.: “Implanted silicon JFET on completely depleted high resistivity devices” IEEE Electron device letters 10 (1989) 91-95

Rehak, P., Gatti, E. (1985) et al.: “Semiconductor drift chambers for position and energy measurements” Nucl. Instr. & Meth. A235 (1985) 224-234

Rehak, P., Walton, J. (1986) et al.: “Progress in semiconductor drift detectors” Nucl. Instr. & Meth. A248 (1986) 367-378

Rehak, P., Gatti, E. (1989) et al.: “Spiral silicon drift detectors” IEE Trans. Nucl. Sci. 36 (1989) 203-209

Rehak, P., Rescia, S. (1990) et al.: “Feedback charge amplifier integrated on detector wafer” Nucl. Instr. and Meth. A288 (1990) 168-175

Richter, G. (1996) et al.: “ABRIXAS, A Broadband Imaging X-ray All-sky Survej”; L. Bassani, G.di Cocco (eds.): Imaging in High Energy Astronomy. Experim. Astron., (1996) 159

Richter, R.H., Andricek, L. (1996) et al.: “Strip detector design for ATLAS and HERA-B using two dimensional device simulation” Nucl. Instr. and Meth. A377 (1996) 412-421

Sansen, W. (1987): “Integrated low noise amplifiers in CMOS technology” Nucl. Instr. and Meth. A253 (1987) 427-433

Scharfetter, D.L. and Gummel, H.K. (1969): “Large-signal analysis of a silicon Read diode oscillator”, IEEE Trans. ED-16 (1969) 64-77

Shapiro, S.L., Dunwoodie, W.M. (1989) et al.: “Silicon PIN diode array hybrids for charged particle detection” Nucl. Instr. and Meth. A275 (1989) 580-586

Sedlmeir, J. (1985): “Untersuchung über einseitig und zweiseitig auslesbare Siliziumstreifendetektoren” Diplomarbeit, Technische Universität München, 15. August 1985

Shockley, W. and Read, W.T. (1952): “Statistics of the recombination of holes and electrons” Phys. Rev. 87 (1952) 835-842

Soltau, H., Holl, P. (1996) et al.: “Performance of the pn-CCD detector system designed for the XMM satellite mission” Nucl. Instr. and Meth. A377 (1996) 340-345

Strüder, L., Bräuninger, H. (1990) et al: “The MPI/AIT x-ray imager (MAXI) - high speed pn-CCDs for x-ray detection” Nucl. Instr. and Meth. A288 (1990) 227-235

Strüder, L., Bräuninger, H. (1993) et al: “First results with the pn-CCD detector system for the XMM satellite mission” Nucl. Instr. and Meth. A326 (1993) 129-135

Strüder, L., Bräuninger, H. (1997) et al: “A 36 cm^2 large monolythic pn-charge coupled device x-ray detector for the European XMM satellite mission” Rev.Sci.Instrum. 68 (1997) 4271-4274

Tapan, I., Duell, A.R. (1997) et al.: “Avalanche photodiodes as proportional particle detectors” Nucl. Instr. and Meth. A388 (1997) 79-90

Toker, O., Masciocchi, S. (1994) et al.: “VIKING, a CMOS low noise monolithic 128 channel frontend for Si-strip detector readout” Nucl. Instr. and Meth. A340 (1994) 572-579

Vasilescu, A. (1998) et al.: “Fluence normalisation based on the NIEL scaling hypothesis”, 3rd ROSE Workshop, DESY Hamburg, 12-14 February 1998, DESY-Proc. 1998-2

Walker, J.T., Parker, S. (1984) et al.: “Development of high density readout for silicon strip detectors” Nucl. Instr. and Meth. 226 (1984) 200-203

Wunstorf, R. (1992a): “Systematische Untersuchungen zur Strahlenresistenz von Silizium-Detektoren für die Verwendung in Hochenergiephysik-Experimenten” Ph.D. thesis, Universität Hamburg, 1992

Wunstorf, R., Benkert, M. (1992b) et al.: “Results on radiation hardness of silicon detectors up to neutron fluences of $10^{15}\,\mathrm{n/cm^2}$” Nucl. Instr. and Meth. A315 (1992) 149-155

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