

# References

- [1-1] CMS Collaboration, The Magnet Project, Technical Design Report CERN/LHCC 97-10.
- [1-2] CMS Collaboration, The Electromagnetic Calorimeter Project, Technical Design Report CERN/LHCC 97-33.
- [1-3] CMS Collaboration, The Hadron Calorimeter Project, Technical Design Report CERN/LHCC 97-31.
- [1-4] CMS Collaboration, The Muon Project, Technical Design Report CERN/LHCC 97-32.
- [1-5] CMS Collaboration, Technical Proposal, CERN/LHCC 94-38.
- [2-1] R. Horisberger, Pixel detectors at LHC, Proceedings of the 4<sup>th</sup> Int. Workshop on B-Physics at Hadron Machines, Rome, (1996), Nucl. Instr. & Meth. A 384 (1996) 185.
- [2-2] W.J. Xiao et al., High Fluence Proton Irradiation of GaAs Detectors at Room Temperature and at -8 °C, Nucl. Phys. B (Proc. Suppl.) 61B (1998) 427.  
W.J. Xiao, Investigation of radiation hardness of SI GaAs detectors for their application in the tracking system at the LHC experiments, PhD Thesis, RWTH Aachen, (1998).  
K. Lübelsmeyer et al., Investigation of the radiation damage of GaAs detectors by protons, pions and neutrons, Nucl. Instr. & Meth. A 390 (1997) 33.  
W. Braunschweig et al., Investigation of the radiation damage of GaAs detectors by neutrons and photons, Nucl. Instr. & Meth. A 372 (1996) 111.
- [2-3] C. Bauer et al., Recent results from the RD42 Diamond Detector Collaboration, Nucl. Instr. & Meth. A 383 (1996) 64.  
W. Adam et al. (RD42-Collaboration), Development of Diamond Tracking Detectors for High Luminosity Experiments at the LHC, Status Report RD42, CERN, LHCC 97-3 (Jan. 1997).  
W. Adam et al., Diamond Particle Detectors, Preprint Inst. f. Hochenergiephysik, Vienna, HEPHY-PUB 674-97 (to be published in Nucl. Instr. & Meth.).
- [2-4] B. Henrich, W. Bertl, K. Gabathuler and R. Horisberger, Depth Profile of Signal Charge Collected in Heavily Irradiated Silicon Pixels, CMS Note 1997/021.
- [2-5] D. Pitzl et al., Evaluation of double sided, AC-coupled, double metal silicon strip detectors for H1 at HERA, Nucl. Instr. & Meth. A 348 (1994) 454.
- [2-6] We are indebted to G. Lutz for drawing our attention to this problem.
- [2-7] Fabricated at CSEM, Neuchatel, Switzerland.
- [2-8] John Hopkins University in collaboration with the instrumentation group at BNL (led by Zheng Li).

- 
- [2-9] ROSE collaboration, CERN RD48.
- [2-10] H. Bichsel, Straggling in Thin Silicon Detectors, *Rev. Mod. Phys.* 60 (1988) 663.
- [2-11] *DMILL* process (Durci Mixte sur Isolant Logico-Lineaire):  
M. Dentan et al., A Mixed Analog-Digital Radiation Hard Technology for High Energy Physics Electronics, R&D Proposal (RD29), CERN, DRDC 92-32, May 1992, p42.  
M. Dentan et al., DMILL, A Mixed Analog-Digital Radiation-Hard BiCMOS Technology for High Energy Physics Electronics, *IEEE Trans. Nucl. Sci.* 43 (June 1996) 1763.  
*RICMOS IV (Honeywell)* process:  
S. T. Liu et al., Total dose hard 0.8  $\mu\text{m}$  SOI CMOS Devices, Proceedings of the First Workshop on Electronics for LHC Experiments, (1995) 33.  
S. T. Liu et al., Radiation hard SOI and CHFET Technologies for LHC Applications, Proceedings of the Second Workshop on Electronics for LHC Experiments, (1996) 407.  
S. T. Liu et al., Further Radiation Hardened SOI CMOS Technology, Proceedings of the Third Workshop on Electronics for LHC Experiments, (1997) 130.
- [2-12] S. Kavadias, K. Misiakos and D. Loukas, Calculation of Pixel Detector Capacitances through Three Dimensional Numerical Solution of the Laplace Equation, *IEEE Trans. Nucl. Sci.* 41 (1994) 397.  
L. Bosisio, F. Forti and E. Tomacruz, Measurement and Tridimensional Simulation of Silicon Pixel Detector Capacitance, Proceedings of the 1993 IEEE Nuclear Science Symposium, San Francisco, (1993) 338.
- [2-13] M. Lechner, PhD. Thesis, ETH Zürich (1998) in preparation.
- [2-14] Measurements done by W. Karpinski from RWTH Aachen (1997).
- [2-15] Circuit designs implemented by RWTH Aachen, U.C. Davis and PSI.
- [2-16] R. Horisberger, K. Gabathuler and D. Kotlinski, Readout Architecture for CMS Pixel Vertex Detector, CMS TN/96-046.
- [2-17] Design and simulation done by R.Schnyder, R. Kramert and R. Horisberger, PSI, Feb. 1997.
- [2-18] B.Meier, Diploma-Thesis, Institut für Teilchenphysik, ETH Zürich, April 1998.
- [2-19] S. Cittolin, J.F. Gillot, A. Racz, R. Halsall and B. Haynes, Front End Driver in CMS DAQ, CMS TN/95-020.
- [2-20] LN Industries SA in Grandson, Switzerland.
- [3-1] B. Mours et al., The design, construction and performance of the ALEPH silicon vertex detector., *Nuclear Instruments and Methods in Phys. Res.* A379 (1996) 101.  
G. Anzivino et al., The DELPHI silicon strip microvertex detector., *Nuclear Instruments and Methods in Phys. Res.* A263 (1988) 215.  
M. Acciarri et al., The L3 silicon microvertex detector., *Nuclear Instruments and Methods in Phys. Res.* A351 (1994) 300.  
S. Anderson et al., The extended OPAL silicon strip microvertex detector., submitted to *Nuclear Instruments and Methods in Phys. Res. A*.
- [3-2] J. Sharka et al., Construction of the CDF silicon vertex detector., *IEEE Transactions on Nuclear Science* 39 (1992).
-

- 
- [3-3] The CMS Collaboration The Compact Muon Solenoid Technical Proposal., CERN/LHCC 94-38, LHCC/P1 (1994).
- [3-4] G. Batignani et al., Operational experience with a large detector system using silicon strip detectors with double sided readout., Nuclear Instruments and Methods in Phys. Res. A326 (1993) 183.  
P. Collins et al., Experience with silicon detectors at the DELPHI experiment at LEP., Nuclear Instruments and Methods in Phys. Res. A383 (1996) 1.  
M. Acciarri et al., 1994 running experience with the L3 Silicon Microvertex Detector., Nuclear Physics B, Proc. Suppl. 44 (1995) 296.
- [3-5] G. Tonelli et al., Double-sided radiation resistant microstrip detectors: technology and results., Nuclear Instruments and Methods in Phys. Res. A377 (1996) 422.
- [3-6] R. Dell'Orso et al., Tests of the CMS milestone silicon detectors., submitted to Il Nuovo Cimento.  
RD20 Collaboration RD20 Status Report 1995, CERN/LHCC/96-2 (1996).
- [3-7] S. Sotthibandhu Radiation Damage Studies of Silicon Detectors., PhD thesis, Imperial College, Rutherford Appleton Laboratory RALT-025 (1994) and references therein.
- [3-8] K. Gill et al., Radiation damage by neutrons and photons to silicon detectors., Nuclear Instruments and Methods in Phys. Res. A322 (1992) 177.
- [3-9] E. Barberis et al., Temperature effects on radiation damage to silicon detectors., Nuclear Instruments and Methods in Phys. Res. A326 (1993) 373.
- [3-10] T. Ohsugi et al., Radiation damage in silicon microstrip detectors., Nuclear Instruments and Methods in Phys. Res. A265 (1988) 105.
- [3-11] A. Chilingarov et al., Radiation studies and operational projections for silicon in the ATLAS inner detector., Nuclear Instruments and Methods in Phys. Res. A360 (1995) 432.
- [3-12] The RD2 Collaboration RD2 Status Report, CERN/DRDC 94-34 (1994).
- [3-13] The RD48 Collaboration RD48 Status Report, CERN/LHCC 97-39 (1997).
- [3-14] F. Lemeilleur et al., Study of characteristics of silicon detectors irradiated with 24 GeV/c protons between -20 °C and +20 °C., Nuclear Instruments and Methods in Phys. Res. A360 (1995) 438-444.
- [3-15] S. J. Bates et al., Proton irradiation of silicon detectors with different resistivities., CERN/ECP 95-18 (1995).
- [3-16] S. J. Bates et al., Proton irradiation of silicon detectors with different resistivities., IEEE Transactions on Nuclear Science 43 (1996) 199.
- [3-17] E. Fretwurst et al., Reverse annealing of the effective impurity concentration and long term operational scenario for silicon detectors in future collider experiments., Nuclear Instruments and Methods in Phys. Res. A342 (1994) 119-125.
- [3-18] H. Feick et al., Refinement of the Hamburg Group Damage Models., Presented at the 3rd ROSE Workshop on Radiation Hardening of Silicon Detectors, DESY, Hamburg, 12-14 February 1998. To be published.
-

- 
- [3-19] M. Da Rold et al., Radiation effects on breakdown characteristics of multiguarded devices, *IEEE Transactions on Nuclear Science* 44 (1997) 721-130.
- [3-20] A. Bischoff et al., Breakdown protection and long-term stabilisation for Si-detectors, *Nuclear Instrument and Methods in Phys. Res. A326* (1993) 27-34.
- [3-21] A. Messineo et al., Study of breakdown effects in silicon multi-guard structures, submitted to *IEEE Transactions on Nuclear Science*.
- [3-22] N. Bacchetta et al., High Voltage operation of silicon devices for LHC experiments, presented at the 7th Pisa Meeting, to be published on *Nuclear Instruments and Methods in Phys. Res. A*.
- [3-23] O. Adriani et al., Beam Test results for single and double-sided silicon detector prototypes of the CMS Central Detector., *Nuclear Instruments and Methods in Phys. Res. A396* (1997) 76.
- [3-24] E. Babucci et al., Temperature dependence of the behaviour of a single-sided irradiated silicon detector., *CMS Note 98-011* (1998).
- [3-25] C. Bozzi et al., Characterization and simulation of LHC-type silicon microstrip detectors., submitted to *Il Nuovo Cimento*.
- [3-26] S. Baccaro, A. Festinesi, B. Borgia Gamma and neutron irradiation facilities at ENEA - Casaccia Center (Roma), *CMS TN/95 - 192* (1995).
- [3-27] G. Baccharani, P. Ciampolini and A. Pierantoni Three-dimensional simulation of semiconductor devices: state of the art and prospects., *Nuclear Instruments and Methods in Phys. Res. A326* (1993).
- [3-28] D. Passeri et al., TCAD-Based Analysis of Radiation-Hardness in Silicon Detectors., *IEEE Transactions on Nuclear Science* 45 (1998).
- [3-29] G. Hall, talk given at the CMS MSGC Meeting, CERN, October 1996.
- [3-30] C. Bozzi, Signal-to-Noise Evaluations for the CMS Silicon Microstrip Detectors., *CMS Note 97-026* (1997).
- [3-31] L. Feld et al., Thermal Properties of the Silicon Microstrip Endcap Detector., *CMS Note 98-018* (1998).
- [4-1] R.Bouclier et al., *IEEE Trans. Nucl. Sci.*, NS-41 (1994) 821
- [4-2] F.Angelini et al., *NIM*, A336, (1993) 106
- [4-3] S.Schmidt et al., *NIM*, A344, (1994) 558
- [4-4] F.Angelini et al., *NIM*, A360, (1995) 22
- [4-5] J.E.Bateman et al., *RAL-TR-95-032* (1995)
- [4-6] F. Van Der Berg, *Proc. of the Int. Workshop on MSGC*, Lyon, France (1995)
- [4-7] T.Nagae et al., *NIM*, A323, (1992), 236
- [4-8] R.Bellazzini et al., Substrate-less, spark-free micro-strip gas counters, *Proceedings of the VII Pisa Meeting on Advance Detectors 'Frontier Detectors for Frontier Physics'*, Isola d'Elba, Italy 1997
-

- 
- [4-9] O. Bouhali et al., Operation of Micro Strip Gas Counters with DME based gas mixtures, submitted to NIMA
- [4-10] D.Abbaneo et al. Test of a CMS MSGC Tracker Prototype in a High Intensity Hadron Beam, Proceedings of the VII Pisa Meeting on Advance Detectors 'Frontier Detectors for Frontier Physics', Isola d'Elba, Italy 1997 and CMS internal note CMS 98 002
- [4-11] M. Millard, Techniques and Applications of Plasma Chemistry, eds. J.R. Hollahan and A.T. Bell (Wiley, New York) 1974
- [4-12] L.L.Jones, PreMux128 Specification, RAL note December 1994
- [4-13] P.Lorrain, D.P.Corson, F.Lorrain, Electromagnetic fields and waves, W.H.Freeman & Co., Third Edition
- [4-14] R.Bellazzini and M.A.Spezziga, La Rivista del Nuovo Cimento, vol.17, n.12 (1994)
- [4-15] W.G.Gong et al., NIM, A374, 1996 144
- [4-16] F.Angelini et al, NIM, A382 (1996) 461
- [4-17] R.Bouclier et al., NIM, A336 (1994) 106
- [4-18] J.A.Kadyk, NIM, A300, 1991 436
- [4-19] V. Peskov et al., Feedback and Breakdowns in Microstrip Gas Counters , Preprint NASA/MSFC 1996, submitted to NIMA
- [4-20] M.Bozzo, A. Cattai and A. Tsirou, Tests on MSGCs with advanced passivation, B1 internal note 97.4, <http://cmsdoc.cern.ch/user/c/cattai/alpha/alpha.html>
- [4-21] B. Boimska et al., Investigation of discharge limits in diamond coated microstrip gas chambers, CMS note 96-016
- [4-22] The analysis results can be found in <http://edms.cern.ch/cms-tk>
- [4-23] K. Bernier et al., MSGC test with fast neutrons, CMS note 98-014.
- [4-24] R. Metri, Diplomarbeit 1998, University Karlsruhe.
- [4-25] R. Metri et al., CMS note 97-071.
- [4-26] V. Mack et al., Effects of slow neutrons on MSGCs, submitted to NIM.
- [4-27] E.Albert et al. Performance of a prototype of the Microstrip Gas Chambers for the CMS experiment at LHC , Proceedings of the VII Pisa Meeting on Advance Detectors 'Frontier Detectors for Frontier Physics', Isola d'Elba, Italy 1997
- [4-28] F. Angelini et al., Development of a very large are Microstrip Gas Chamber for the CMS central tracking system, Nucl. Instr. and Meth. A 360 (1995) 22.
- [4-29] F. Angelini et al., NIM A343 (1994) 441
- [4-30] CMS The Compact Muon Solenoid, Technical Proposal, CERN/LHCC 94-38 (1994)
- [4-31] The Forward-Backward MSGC Milestone Status Report, CMS note (pending)
- [4-32] B1 team, Definition of B1 modules, B1 internal note 96.1
-

- 
- [4-33] A. Mugnai, Finite Element Analysis and experimental tests of a Barrel MSGC Detector Module, B1 internal note 96.7, CMS note 96-004
- [4-34] B1 team, Conceptual design of MSGC Rod, B1 internal note 96.20 - in preparation -
- [4-35] A. Caner and A. Cattai, Detailed simulation of the MSGC barrel, B1 internal note 96.23
- [4-36] R. MacKenzie, Heat exchanger calculation for MSGCs, B1 internal note 96.8, TA1/96-12
- [4-37] A. Onnela and T. Nyman Points of support and the C-profile design of the final MSGC barrel Rods., B1 internal note june.97.7
- [4-38] N. Eiden, A study investigating a mechanical disk support, B1 internal note 97.3
- [4-39] N. Eiden, Narrow members of a quasiisotropic laminate, B1 internal note 97.5
- [4-40] N. Eiden, Sensitivity study on the height of the rings in the MSGC barrel support disks, 28 Oct 97, B1 internal note 97.15
- [4-41] N. Eiden, Preliminary Design of a Radiation Penetrating Support Structure, master thesis at the Helsinki University of Technology, 1997
- [4-42] T. Nyman, FEA for the CMS barrel two ring prototype, B1 internal note 98.3
- [4-43] E. Löytynoja and M. Kotamäki, Experimental studies on cooling of a MSGC chamber assembly, B1 internal note 96.9
- [4-44] S. Bachmann et al., Beam Test Performance of a Closed Microstrip Gas Chamber Module for the CMS Forward Tracker, CMS note 97-063
- [4-45] S. Bachmann et al., Spatial Resolution of a Wedge Shaped MSGC Module, CMS note 97-077
- [4-46] B1 team, Status report of MSGC B1 mechanics and module engineering, B1 internal note 97.10
- [4-47] F.S. Guarino, C. Hauviller and J. Kenny, Development and Characterisation of Radiation Resistant Structural Adhesives Cured at Room Temperature, technical note CERN-PPE-TA1/97-12
- [4-48] J.C.Gayde, C. Lasseur, CMS - Central tracker - Prototype B1 - test cible. Mesure par photogrammetrie numerique, Internal note EST/SU/EXP - B1 internal note 97.11-draft-
- [4-49] P.K. Mallick, Fiber-reinforced composites Materials, manufacturing and design 2nd ed., Marcel Dekker, Inc., New York 1993
- [4-50] O. Bouhali et al., A possible approach for the construction of the CMS Forward-Backward MSGC Tracker, CMS-Note/1997-081 (1997)
- [4-51] S. Bachmann et al., The Closed MSGC design : Detectors and mechanical structures, MF1 report (1997)
- [4-52] O. Pooth, Report on the CMS Forward-Backward MSGC milestone (presented at the Vienna Wire Chamber Conference 1998), CMS-CR/1998-006
- [4-53] B1 team, Status report of MSGC B1 prototype, B1 internal note 97.14
-

- 
- [4-54] AMS Technical Proposal; S.C.C. Ting in: Spacestation Utilisation Symposium, ESA SP-385
- [4-55] V. Chorowicz et al., NIM A401 (1997) 238
- [4-56] F. Angelini et al., NIM, A, A335 (1993) 69
- [5-1] CMS Technical Proposal CERN/LHCC 94-38 (1994);  
RD20 status report. CERN DRDC/94-39 (1994)
- [5-2] S. Gadomski et al., The deconvolution method of fast pulse shaping at hadron colliders, Nucl. Instr. Methods A320 (1992) 217
- [5-3] N. Bingefors et al. A novel technique for fast pulse shaping using a slow amplifier at LHC, Nucl. Instr. Methods A326 (1993) 112
- [5-4] M. French, APV6-RH Requirements. Rev 3.0, Rutherford Appleton Laboratory Project Specification, February 1995;  
M. French, APV6 User Manual, Rutherford Appleton Laboratory internal document, April 1997;  
M. French et al., APV6RH: a 128 channel radiation hard pipeline chip for the silicon tracker in CMS, Procs 2nd Workshop on Electronics for LHC Experiments. CERN/LHCC/96-39 (1996) 463.
- [5-5] Harris Semiconductor Inc., Melbourne, Florida USA 32902-0883.
- [5-6] S. Gardien et al., APVD: a CMOS mixed analogue-digital circuit for the Silicon Tracker in CMS Procs 3rd Workshop on Electronics for LHC Experiments. CERN/LHCC/97-60 (1997) 163.
- [5-7] TEMIC Semiconductors, Matra MHS, CP3008, F-44087 Nantes Cedex France.
- [5-8] M. Dentan, Results of industrial transfer of DMILL, Procs 3rd Workshop on Electronics for LHC Experiments. CERN/LHCC/97-60 (1997) 134.
- [5-9] I2C Bus Specification, Application Note, Philips-Signetics, January 1992
- [5-10] M. Millmore, APV6 pipeline emulation, CMS note 1997/045
- [5-11] M. Raymond et al., Measurements of transistors and silicon microstrip detector read-out circuits in the Harris AVLSIRA rad-hard CMOS process , Nucl. Instr. Methods A351(1994) 449;  
M. Raymond et al., Radiation hard electronics for LHC , Nucl. Instr. Methods A360(1995) 162;  
M. Millmore et al., Measurements of radiation hardened transistors from Harris and DMILL technologies, Procs 2nd Workshop on Electronics for LHC Experiments. CERN/LHCC/96-39 (1996) 415;  
M. Millmore et al., Radiation hardened transistor characteristics for applications at LHC and beyond, Nucl. Instr. Methods A399 (1997) 129.
- [5-12] J. Matheson et al., Radiation damage studies of the APV6 chip , Procs. 3rd Workshop on Electronics for LHC Experiments. CERN/LHCC/97-60 (1997) 168.
- [5-13] M. Dentan et al., DMILL - A Mixed Analog-Digital Radiation Hard technology for High Energy Physics Electronics, RD29 Status report. CERN/LERB/97-15 (1997).
-

- 
- [5-14] M. Millmore et al., Measurements of radiation hardened transistors from Harris and DMILL technologies, Procs 2nd Workshop on Electronics for LHC Experiments. CERN/LHCC/96-39 (1996) 415.
- [5-15] L. Jones, PreMUX128 Specification Vsn 2.3 Rutherford Appleton Laboratory internal document (1995).
- [5-16] R. Sachdeva, Signal Processing Algorithms and Radiation Hard Electronics for the CMS Tracking Detector, Ph. D thesis, Imperial College (1995);  
F. Angelini et al., Study of the bunch crossing identification at LHC using Microstrip Gas Chambers, Nucl. Instr. Methods A368 (1996) 345–352;  
J.F. Clergeau et al., Proposal for the Read-out Electronics of Gas Micro-Strip Detectors in the CMS Tracker, CMS Note/1997-013 (1997);  
F.G. Sciacca, Impact of Fast Shaping at the Front-end on Signals from Micro Strip Gas Chambers, CMS Note/1997-105(1997).
- [5-17] F.G. Sciacca, Definition of the Front-end Signal Processing Algorithm for MSGCs in CMS, CMS IN/1997 - 021 (1997).
- [5-18] A. Gandi, CERN. Private communication.
- [5-19] G. Hall et al., Fibre optic link technology for the CMS tracker, Technical note CMS Note 1996/012, Dec. 1996.
- [5-20] F. Vasey et al., Laser based optical links for the CMS tracker: options and choices, Technical note CMS Note 1997/053, Jul. 1997.
- [5-21] F. Vasey, CMS tracker optical readout link specification, preliminary version 1.1, 1997.
- [5-22] K. Kloukinas et al., A system for timing distribution and control of front-end electronics for the CMS tracker, Procs. 3rd Workshop on Electronics for LHC experiments, CERN/LHCC/97-60 (1997) 208-12.
- [5-23] A. Marchioro et al., An integrated Laser Driver Array for Analogue Data Transmission in the LHC Experiments, Procs. 3rd Workshop on Electronics for LHC experiments, CERN/LHCC/97-60 (1997) 282-286.
- [5-24] S. Nagasawa et al., A high-performance single-mode multifibre connector using oblique and direct endface contact between multiple fibres arranged in a plastic ferrule, IEEE Photonics Technology Letters, Vol. 3, No. 10, pp. 937-9, 1991.
- [5-25] V. Arbet-Engels et al., Characterization of optical links for the CMS experiment, Procs. 3rd Workshop on Electronics for LHC experiments, CERN/LHCC/97-60 (1997) 287-92.
- [5-26] K. Gill et al., Neutron damage studies of semiconductor lasers for the CMS tracker optical data links, Procs. 2nd Workshop on Electronics for LHC experiments, Balatonfured, September 23-27, 1996, pp 387-91.
- [5-27] J. Troska et al., Neutron, proton and gamma radiation effects in candidate InGaAs pin photodiodes for the CMS tracker optical links, Technical note CMS Note 1997/102.
- [5-28] K. Gill et al., Gamma and neutron radiation damage studies of optical fibres, Journal of Non-Crystalline Solids 216, 1997, pp 129-34.
-



- 
- [5-29] K. Gill et al., Radiation damage studies of Optoelectronic components for the CMS tracker optical links, Procs. 4th European Conference on radiations and their effects on devices and systems, RADECS, Cannes, 1997.
- [5-30] J. Batten et al., Resistance of MT multi-way single mode connectors to gamma and neutron irradiation, Procs. 4th European Conference on radiations and their effects on devices and systems, RADECS, Cannes, 1997.
- [5-31] CMS FED Prototype User manual, V2.0, System Design Group, Rutherford Appleton Laboratory (1996),  
< ftp://ftp.te.rl.ac.uk/cms/fed/FED\_UM\_18\_12\_96.pdf >,  
< ftp://ftp.te.rl.ac.uk/cms/fed/FED\_UM\_18\_12\_96.pdf.hqx >.
- [5-32] R. Halsall, W. Haynes, The Front End Driver of the CMS Tracker , Procs. 1st Workshop on Electronics for LHC Experiments, CERN/LHCC/95-96 (1995) 119;  
M. de Fez-Laso et al., Status report on the Front End Driver for the CMS tracker, Procs. 2nd Workshop on Electronics for LHC Experiments, CERN/LHCC/96-39 (1996) 499;  
R. Halsall et al., Front End Readout Developments in the CMS Data Acquisition System , Procs. 3rd Workshop on Electronics for LHC Experiments, CERN/LHCC/97-60 (1997) 427.
- [5-33] Signal Processing Technologies SPT7861 data sheet, <http://www.spt.com/>.
- [5-34] See Chapter 7.
- [5-35] S. Cittolin et al., Dual Port Memories in LHC Experiments , CMS Technical Note CMS-TN 95/004 (1995).
- [5-36] A. Racz, CMS Front End Model and VME64 Sequencer, Procs. 3rd Workshop on Electronics for LHC Experiments, CERN/LHCC/97-60 (1997) 441,  
<http://cmsdoc.cern.ch/~cittolin/tridas.html>.
- [5-37] PCI Local Bus Specification, Revision 2.1, PCI Special Interest Group Draft Standard for Common Mezzanine Card Family CMC, IEEE P1386, Draft Standard for Physical/Environmental Layers for PCI Mezzanine Cards, IEEE P1386.1.
- [5-38] B. G. Taylor, Timing Trigger and Control distribution for LHC detectors, Procs 1st Workshop on Electronics for LHC Experiments, CERN/LHCC/95-56 (1995) 180,  
<http://www.cern.ch/TTC/intro.html>;  
P. Moreira et al., TTCrx User's Reference Manual,  
<http://pcvlsi5.cern.ch/MicDig/ttc/MANUAL22.PDF>
- [5-39] M. Bedjidian, Talk given at CMS Electronics Meeting, Jan 1997.
- [5-40] CMS FED PMC specification Rev 1.2, System Design Group, Rutherford Appleton Laboratory (1997), <ftp://ftp.te.rl.ac.uk/cms/pmc/adc\_spec\_v1.2.ps>.
- [5-41] A. Marchioro, A System for Timing Distribution and Control of Front End Electronics for the CMS Tracker, Procs 3rd Workshop on Electronics for LHC Experiments. CERN/LHCC/97-60 (1997) 208.
- [5-42] CMS Electromagnetic Calorimeter Technical Design Report CERN/LHCC/97-33 (1997).
- [5-43] P. Moreira, CMS Tracker LVDS specification (1998),  
<http://trackercontrol.cern.ch/CMSTControl/manuals.htm>
-

- 
- [5-44] IBM Corporation Token Ring Network-Introduction and Planning Guide, Reference manual GA27-3677-05, December 1992.
- [5-45] RD49 status report, CERN/LHCC/97-63 (1997).
- [5-46] G. Stefanini, HV switches for MSGCs, CMS Technical Note, in preparation.
- [5-47] LabView: Graphical Programming for Instrumentation. National Instruments (1995).
- [5-48] J. Varela et al., Trigger Synchronisation circuits in CMS, CMS CR/1997-017 (1997).
- [5-49] C. Bozzi, Signal-to-Noise Evaluations for the CMS Silicon Microstrip Detectors, CMS Note/1997 - 026 (1997).
- [6-1] C. Hauviller, Advanced Materials for High precision Detectors, Proceedings of the International Workshop on Advanced Materials for High Precision Detectors, Ed. B Nisquevert, C. Hauviller, CERN, Geneva, 3-7, 1994
- [6-2] H. Schonbacher, M. Tavlet, Radiation Effects on Structural Materials for High Energy Particle Accelerators, in [6-1]
- [6-3] N. Levoy, K. Raftery, R. White, High Specific Stiffness Beryllium and Beryllium Alloys, in [6-1]
- [6-4] P.K. Mallick, Fibre-Reinforced Composites: Materials, Manufacturing and Design, Marcel Dekker Inc, second edition 1993
- [6-5] Bhagwan D. Argarwal, Lawrence J. Broutman, Analyses and Performance of Fibre Composites, John Wiley & Sons Inc., second edition, 1990
- [6-6] D. Eaton, A. Pradier, The Use of High Stiffness Material and Dimensionally Stable Materials in Spacecraft Applications, in [6-1]
- [6-7] H. Breuker et al., Trade-off between different CMS Tracker Support and Installation Schemes, CMS IN 1998/001, January 5th, 1998
- [6-8] A. Frediani et al., A Conceptual Design of the CMS Tracker, CMS IN 1998/002, January 5th, 1998
- [6-9] R. Bouclier et al., Results on Wire Chamber Ageing, Nucl. Instr. and Meth., A346 (1994) 114-119,  
J. Wise, Chemistry of Radiation Damage to Wire Chambers, PhD Thesis, Lawrence Berkley Laboratory, USA, LBL-32500 (1992)
- [6-10] S. Ilie, MSGC's polymeric materials: tests in liquid DME, CERN-CMS TK-B1, Status Report, Jan. 1997  
M. Capens, Study of the Ageing of Gaseous Detectors and Solutions for the use of MSGCs in High Rate Experiments, PhD Thesis, University of Santiago de Compostela, Spain
- [6-11] CERN Flamable Gas Safety Manual 1996, Ed. Technical Inspection and Safety Commission (1996)
- [6-12] M. Bosteels, S. Ilie, Neon recovery from Microstrip Gas Chambers (MSGC) Neon-DME gaseous mixture with a view to its re-use. CMS IN 1996/010
-

- 
- [6-13] A.Carraro, Studio dei problemi termici relativi alla realizzazione del rivelatori CMS al CERN, Diploma Thesis, Universita Degli Studi di Genova, 1995-1996
- [6-14] G.S.Hickey, Thermal insulation for Mars surface exploration, SAE 27<sup>th</sup> Int. Conf. on Environmental Systems, Lake Tahoe, Ca, July 1997
- [6-15] C.Lasseur, C.Humbertclaude, J-C.Gayde, CERN/EST/SU Report.
- [6-16] C.Lasseur, CERN/EST/SU, private communication
- [6-17] See for example Bertsen, B., Price, M.J, Accurate remote distance measurement using a CCD camera, Nucl. Inst. and Meth., A364, pp. 103-107, (1995), [6-18], [6-20] and references therein.
- [6-18] B.Berntsen, Investigation of a principle for the alignment system of the inner tracker of CMS, Diploma Thesis, University of Trondheim, Norway, May 1994
- [6-19] CIDTEC MegaRAD1 devices, product catalog 1997
- [6-20] F.Klumb, Nouvelles techniques de videometry: Application au controle micrometrique tridimensionnel de objects volumineux, PhD Thesis, University Louis Pasteur, Strasbourg, 1997
- [6-21] CMS Muon TDR, CERN-LHCC/97-12
- [6-22] S.Mota da Silva, R.Ribeiro, Eng. Studies on the Tracker alignment wheel, CMS-IN, in preparation
- [6-23] M. Libkind, Summary of Work on CMS Central Tracker Global Support Structures, LLNL-CMS-96-007, CMS Document 1996-202
- [6-24] S.Mota da Silva, Tracker alignment progress reports on Optimization of the alignment wheel, Report 1 to 13, CERN 1997/98
- [6-25] M.J.Price, Technical Note, CERN-TA1/95-14
- [6-26] SIT Inc. - SITe Fibre Optic CCD Imagers, product catalog 1997
- [6-27] Atlas Inner Tracker TDR, CERN-LHCC/97-16
- [6-28] W.Blum et al., Nucl. Instr. and Meth., A367 (1995) 413,  
W.Blum et al., Nucl. Instr. and Meth.,A377 (1996) 404,  
Max Plank Institute for Physics report MPI-PhE/95-13
- [6-29] Coosemans,W., Mainaud,H., CLIC Note 316, CERN, 1996
- [6-30] Fogale Nanotech, product catalog, 1997
- [6-31] Ruotsalainen,S. Development of straightness measurement system based on stretched wire and capacitive pick-up Master's Thesis, Helsinki University of Technology, Espoo, Finland. 1997
- [6-32] P.A.Aarnio and M.Huhtinen, CERN-CMS IN/97-025 (1997)
- [6-33] R.Veness, presentation at the LHC Experimental Beampipes Meeting, CERN, 25 Sept., (1997)
-

- 
- [6-34] M.Huhtinen and P.A.Aarnio, HU-SEFT R 1994-07 (1994)
- [6-35] J. Ranft and K. Goebel, Estimation of induced radioactivity around high energy accelerators from hadronic cascade star densities obtained from Monte Carlo calculations, CERN HP-70-92 (1970).
- [6-36] A. Sullivan and T. Overton, Health Physics 11 (1965) 1101.
- [6-37] CMS Collaboration, The ECAL Project Technical Design Report, CERN/LHCC 97-33 (1997).
- [6-38] A. S. Iljinov et al., Production of Radionuclides at Intermediate Energies, Landolt-Börnstein, New Series Vols 13a-e, ed. H. Schopper, Springer (1991-1993).
- [6-39] A. B. Chilton, J. K. Shultis and R. E. Faw, Principles of Radiation Protection, Prentice-Hall, 1984.
- [6-40] P. A. Aarnio et al., FLUKA86 user's guide, CERN TIS-RP/168 (1986)  
P. A. Aarnio et al., Enhancements to the FLUKA86 program (FLUKA87) CERN TIS-RP/190 (1987)  
A. Fassò et al, FLUKA: present status and future developments, Proc IV Int. Conf. on Calorimetry in High Energy Physics, La Biodola, Sept 20-25, 1993, Ed. A. Menzione and A. Scribano, World Scientific, p. 493 (1993).  
A. Fassò et al., FLUKA: performances and applications in the intermediate energy range, Specialists' Meeting on Shielding Aspects of Accelerators, Targets and Irradiation Facilities, Arlington, Texas, April 28-29, 1994
- [7-1] CMSIM User's Manual and Reference Guide.
- [7-2] GEANT3 – Detector Description and Simulation Tool, CERN Program Library entry W5013, CERN Geneva, Ed. March 1995.  
R. Brun et al., GEANT3, CERN DD//EE/84-1, revised 1987.
- [7-3] T. Sjöstrand, Computer Physics Commun. 82 (1994) 74.
- [7-4] F.E. Page and S.D. Protopopescu, Isajet - A Monte Carlo event generator for  $pp$  and  $\bar{p}p$  reaction.
- [7-5] G. Marchesini et al., Computer Physics Communications 67 (1992) 465.
- [7-6] Lynn Garren, Monte Carlo Standardization at FNAL, StdHep 3.01, PM0091.
- [7-7] HBOOK - Statistical Analysis and Histogramming, CERN program library, Y250.
- [7-8] T. Pitkänen and V. Karimäki, Hadron  $p_T$  generation for single particle simulation, CMS TN/96-131.
- [7-9] R. Loveless and F. Feyzi, Magnetic and structural analysis of the CMS endcaps, CMS TN 94-277, 1994.
- [7-10] H.Bichsel, Rev. of Mod. Phys., 60(1988)663.
- [7-11] R.Kaufmann, Ph.D. thesis, Zuerich University (1997).
- [7-12] V. Karimäki, Hit covariance formalism for stereo detectors, Nucl. Instr. and Meth. A374 (1996) 367 and CMS TN/95-170.
-

- 
- [7-13] F. Sauli, Principle of operation of multiwire proportional chambers, CERN 77-09, 1977.
- [7-14] V. Palladino and B. Sadoulet, Application of classical theory of electrons in gases to drift proportional chambers, Nucl. Instr. and Meth. 128 (1975) 323.
- [7-15] G.D. Alkhazov, Statistics of electron avalanches and ultimate resolution of proportional counters, Nucl. Instr. and Meth. 89 (1970) 155.
- [7-16] G.D. Alkhazov, Mean value and variance of gas amplification in proportional counters, Nucl. Instr. and Meth. 75 (1969) 161.
- [7-17] F. Lapique and F. Piuz, Simulation of the measurements by primary cluster counting of the energy lost by a relativistic ionising particle in Argon, Nucl. Instr. and Meth. 175 (1989) 297.
- [7-18] F. Fulda-Quenzer et al., Measurement of longitudinal and transverse diffusion of single electrons drifting in gases, Nucl. Instr. and Meth. A235 (1985) 517.
- [7-19] M. Geijsbert et al., Test of the performance of different gas mixtures in MSGC, Nucl. Instr. and Meth. A313 (1992) 377.
- [7-20] J. Schmitz, Results on Monte Carlo simulation of MSGC, Nucl. Instr. and Meth. A323 (1992) 638.
- [7-21] H. Fischle et al., Experimental determination of ionisation cluster size distribution in counting gases, Nucl. Instr. and Meth. A301 (1991) 202.
- [8-1] R. Frühwirth, NIM A262 (1987) 444
- [8-2] N. Stepanov and A. Khanov, Local Track Finder, CMS NOTE/1995-200.
- [8-3] V. Karimäki, Effective vertex fitting, CMS NOTE/1997-051.
- [8-4] N. Stepanov and A. Khanov, NIM A389 (1997) 177
- [8-5] M. Ohlsson et al., Comput. Phys. Commun. 71 (1992) 77
- [8-6] Dempster A.P., Laird N.M. and Rubin D.B, J. Royal Stat. Soc. B39 (1977) 1
- [8-7] S. Kirkpatrick, C.D. Gelatt and M.P. Vecchi, Science 220 (1983) 671.
- [8-8] A. Bondar et. al, Influence of misalignment on CMS Tracker performance, CMS IN/1997-016.
- [8-9] V. Karimäki, Explicit covariance matrix for particle measurement precision, CMS NOTE/1997-064, to be published in NIM A.
- [9-1] M. Konecki and A. Starodoumov,  $b\bar{b}$  Events Simulation Package, Users Manual, available at <http://cmsdoc.cern.ch/user/b/bphys/BPHYS/TNCMS/manual.ps>
- [9-2] G. Wrochna, Muon trigger for heavy ion physics, CMS note 1997/89.
- [9-3] See for example, E.V. Shurayak, Quark Matter 90, Nucl. Phys. A525 (1991) 3.
- [9-4] CMS - The Muon Project, Technical Design Repor, CERN/LHCC 97-32.
- [9-5] M. Bedjidian, Heavy ion beams in CMS and dimuons detection, CMS TN/95-188.
-

- 
- [9-6] K. Eggert and A. Morsch, AT Group Report 95-01 (DI).
- [9-7] F. Antinori, Internal Note, ALICE/MC 93-09.
- [9-8] O. Kodolova and M. Bedjidian, Pattern recognition and track reconstruction in heavy ion collisions, CMS TN/95-124.
- [9-9] O. Kodolova and M. Bedjidian, Dimuon reconstruction in heavy ion collisions, CMS NOTE 1997/095.
- [A-1] P. A. Aarnio and M. Huhtinen, Hadron fluxes in inner parts of LHC detectors, Nucl. Instr. and Meth. A336 (1993) 98.
- [A-2] M. Huhtinen and C. Seez, Uncertainties in fluences and doses at the CMS inner tracker, CERN CMS TN/95-133 (1995).
- [A-3] M. Huhtinen, Radiation Environment simulations for the CMS detector, Proc. of SARE2 workshop, CERN/TIS-RP/97-05 (1997) also CERN CMS TN/95-198 (1995).
- [A-4] M. Huhtinen, Studies of neutron moderator configurations around the CMS inner tracker and ECAL, CERN CMS TN/96-057 (1996).
- [A-5] M. Huhtinen and P. Aarnio, Pion induced displacement damage in silicon devices, Nucl. Instr. and Meth. A335 (1993) 580.
- [A-6] P. Aarnio et al., Damage observed in silicon diodes after low energy pion irradiation, Nucl. Instr. and Meth. A360 (1995) 521.  
S. Bates et al., Pion induced damage in silicon detectors, Nucl. Instr. and Meth. A379 (1996) 116.
- [A-7] ASTM Annual book of standards, vol 10.02 (1985) 323.
- [A-8] K. Potter and G. R. Stevenson, Average interaction rates for shielding specification in high-luminosity LHC experiments, CERN LHC Note 310 (1995).
- [A-9] M. Hoefert, K. Potter and G. R. Stevenson, Summary of design values, dose limits, interaction rates etc for use in estimating radiological quantities associated with LHC operation, CERN TIS-RP/IR/95-19.1 (1995).
- [A-10] M. Huhtinen, Method for Estimating Dose rates from Induced Radioactivity in Complicated Hadron Accelerator Geometries, to be published.
- [A-11] R. Thomas and G. Stevenson, Radiological Safety Aspects of the Operation of Proton Accelerators, IAEA Technical Report Series 283 (1988).
- [A-12] J. Ranft, DPMJET-II, a Dual Parton Model event generator for hadron-hadron, hadron-nucleus and nucleus-nucleus collisions, Presented at SARE2 workshop, CERN, 9-11 October, 1995, Proceedings: CERN/TIS-RP/97-05 (1997)
- [A-13] P. Aurenche et al., DTUJET-93: sampling inelastic proton-proton and antiproton-proton collisions according to the two-component Dual Parton Model, Computer Physics Commun. 83 (1994) 107.
- [A-14] T. Sjöstrand, High energy physics event generation with PYTHIA 5.7 and JETSET 7.4, Computer Physics Commun. 82 (1994) 74.
-

- 
- [A-15] P. A. Aarnio et al., FLUKA86 user's guide, CERN TIS-RP/168 (1986)  
P. A. Aarnio et al., Enhancements to the FLUKA86 program (FLUKA87) CERN TIS-RP/190 (1987)  
A. Fassò et al, FLUKA: present status and future developments, Proc IV Int. Conf. on Calorimetry in High Energy Physics, La Biodola, Sept 20-25, 1993, Ed. A. Menzione and A. Scribano, World Scientific, p. 493 (1993).  
A. Fassò et al., FLUKA: performances and applications in the intermediate energy range, Specialists' Meeting on Shielding Aspects of Accelerators, Targets and Irradiation Facilities, Arlington, Texas, April 28-29, 1994
- [A-16] W. Nelson, H. Hirayama, D. Rogers, The EGS4 code system, Report SLAC-265 (1985).
- [A-17] P. Aarnio et al., Electron-Photon transport: always so good as we think? Experience with FLUKA, CERN TIS-RP/93-10 (1993).
- [A-18] A. Fassò et al, A comparison of FLUKA simulations with Measurements of fluence and dose in calorimeter structures, Nucl. Instr. and Meth. A332 (1993) 459.  
C. Birattari et al, Measurement and characterization of high energy neutron fields, Nucl. Instr. and Meth. A338 (1994) 534.
- [A-19] A. S. Iljinov et al., Production of Radionuclides at Intermediate Energies, Landolt-Börnstein, New Series Vols 13a-e, ed. H. Schopper, Springer (1991-1993).
- [A-20] P. A. Aarnio, CERN CMS NOTE in preparation.
- [A-21] P. A. Aarnio and M. Huhtinen, CERN CMS NOTE in preparation.
- [A-22] T. F. Luera, et al, Neutron damage equivalence for silicon, silicon dioxide and gallium arsenide, IEEE Trans. Nucl. Sci., Vol. NS-34, No. 6 (1987) 1557.
- [A-23] M. Huhtinen, Factors to scale highly ionizing particle rates in MSGC irradiation tests to the LHC radiation environment, CERN CMS NOTE 1997/073 (1997).
-

