

Contents

1	Introduction	1
2	The Higgs Boson Production Cross Section	7
2.1	Ultra-Violet Renormalisation	10
2.2	Infrared Counterterms	14
2.3	Partonic Cross Section	16
2.4	Structure of the Renormalised Cross Section	20
3	Feynman Integral Techniques	23
3.1	Feynman Parametrisation	23
3.2	Mellin-Barnes Integrals	28
3.3	Integral Relations	30
3.3.1	Partial Fraction Identities	30
3.3.2	Lorentz Invariance Identities	33
3.3.3	Integration-By-Part Identities	34
3.3.4	Laporta Algorithm	34
3.4	Invariant Parametrisation	38
3.5	Dimensional Shift Identities	43
3.5.1	Dimensional Shifts via Explicit Integral Parametrisation	43
3.5.2	Dimensional Shifts via Parametric Integrals	45
4	Phase-Space Integrals and Threshold Expansion	48
4.1	Explicit Phase-Space Parametrisations	48
4.1.1	0 Parton Phase-Space	49
4.1.2	1 Parton Phase-Space	49
4.1.3	2 Parton Phase-Space	50
4.1.4	The Higgs+n-Parton Phase-Space Volume	52
4.2	Reverse Unitarity	54
4.3	Threshold Expansion	56
4.3.1	Threshold Expansion for Real Radiation	56
4.3.2	Validation of the Method for Threshold Expansions of Phase-Space Integrals	58
4.3.3	Threshold Expansion for Loop and Phase-Space Integrals	62
5	Computing Master Integrals via Differential Equations	70
5.1	Differential Equations	70
5.2	Iterated Integrals	79
5.2.1	Multiple Polylogarithms	80

