

TABLE OF CONTENT

1	Introduction	1
2	The nuclear many-body problem	4
2.1	The nucleon-nucleon interaction	5
2.2	Green's functions at zero-temperature	8
2.2.1	Green's Functions	8
2.2.2	Lehmann representation and spectral functions	11
2.2.3	Free Green's function	15
2.2.4	Self-energy and Dyson equation	16
2.2.5	Diagrammatic methods	17
2.3	The ladder approximation	21
2.3.1	Ladder approximation for G_2	21
2.3.2	Effective interaction or T -matrix	23
2.3.3	The non-interacting two-particle dressed propagator	27
2.3.4	The ladder self-energy	28
2.4	Brueckner-Hartree-Fock approximation	31
2.5	Energy of the system	33
3	<i>In-medium</i> bound states in nuclear matter	35

3.1	Di-nucleons within BHF	35
3.1.1	Binding energies	38
3.1.2	Eigenfunctions and spatial characterization	39
3.2	Quest for di-nucleons within SCGF	41
4	Neutron matter within SCGF theory	43
4.1	Iterative scheme	43
4.2	Numerical implementation	46
4.3	Neutron matter results	48
4.3.1	Self-energy	48
4.3.2	Spectral function and momentum distribution	53
4.3.3	Energy per nucleon	56
4.3.4	Neutron mean-free path in the medium	58
4.4	<i>In-medium</i> bound states and pairing gap	62
5	Summary and conclusions	68
Bibliography		77
ANNEX	Approximation for the spectral function	78