

Index

BCS

- (coherent) state, 27–29, 223, 266
- (generalized) quantality parameter, 159
- condensation (phase coherence), 31, 158, 198
- mean field solution, 24, 25, 27
- number and gap equations, 28
- occupation amplitudes (complex quantities), 29, 222
- order parameter (number of Cooper pairs), 25, 29, 62, 126, 207, 211, 247, 249, 410
- projected state (gauge invariance restoration), 32, 33, 224
- pair transfer amplitudes, 34, 62, 150, 151, 398, 399, 411, 414
- pairing condensation (correlation energy), 141, 241, 255
- self-consistency between mean field and pairing gap renormalization, 241

condensation energy (confinement and correlation), 256

Cooper pair

- absolute transfer cross sections (σ_{2n}), 146, 152, 212, 213, 405, 410, 412, 414, 417
- angular correlation, 200, 214, 260
- confinement (and moments of inertia), 198
- confinement (by an external field), 55, 192, 198, 203, 264, 401
- mean square radius (correlation length), 55, 193, 209, 246, 250, 416, 427
- model, density of levels at the Fermi energy, 116
- radial dependence, 243
- stability (bosonic) requirements, 141, 160
- state, 29, 268
- BCS projected-many pair state, 158
- comparison between σ_{2n} with σ_{1n} , 149, 417
- deconfinement (and binding energy), 141
- entanglement of fermion partners, 416
- generalized quantality parameter, 141, 159, 199, 428

- number of, 27, 63, 126, 147, 247, 249
- quasi-bosonic character (conditions), 141, 160
- transfer probability (Josephson effect), 197
- van der Waals, 181, 204, 259, 433

density of levels, 301, 304

dynamical binding, 259, 260

effective degeneracy (small parameter), 101

effective mass, 66, 300

ω -mass, 65, 300

k -mass, 64, 111, 300

mass enhancement factor (single-particle content), 65

elementary modes of excitation

independent particle motion, 5, 6

pairing vibrations, 17

surface vibrations, 7

fluctuations (symmetry restoration), 25, 32, 33, 143

four-point vertices, 11, 13, 45, 102

gauge

- angle (conjugate variable to particle number), 29, 33
- invariance, 222
- invariance restoration, 32, 33
- operator, 29
- space deformed system, 30
- transformation, 30

generalized quantality parameter, 141, 157

parallel between $\beta = 0, \pm 2$ modes, 250–252

giant dipole resonance, 35

giant pairing vibrations, 36

ground state correlations

density corrections, 39

mean field corrections, 59

halo (single Cooper pair) nucleus ^{11}Li

- k -mass, 111
- binding through deconfinement, 141, 205
- correlation length, 176, 203, 205, 233, 247
- generalized quantality parameter, 176, 428
- isotropic radial deformation, 174, 204, 258, 260
- overlap, 111
- soft $E1$ -mode (pygmy dipole resonance), 116, 174, 178, 259
- symbiotic (bootstrap) mechanism to break gauge invariance, 113, 117, 175, 203, 259, 430
- tunneling halo Cooper pair (unified structure and reactions (NFT_(s+r))), 117, 118, 121–123, 403, 405
- Hartree-Fock field, 10, 59, 64, 111
- induced pairing interaction, 109, 225, 229, 230, 240
 - parallel with pairing in superconductors, 239, 240
- Josephson effect
 - critical current, 218
 - entanglement between Cooper pair partners, 141
 - entanglement between Cooper pair tunneling partners, 159
 - equivalent potential, 218
 - junction resistance, 218
 - parallel with tunneling among members of pairing
 - rotational bands, 148, 149, 249
 - reduced pairing gap, 217, 218, 220
 - successive tunneling, 193, 196, 197
 - transfer (tunneling) probability, 149, 159, 197, 218, 254
 - weakly coupled superconductors, 214
- knock-out reactions, 313
- linear response, 49, 248, 418
- mass enhancement factor, 40, 65
 - and single-particle content, 154
- nuclear field theory (NFT)
 - and reactions, 118, 121–124, 128
 - basis states (elementary modes of excitation), 82, 86
 - rules, 88, 89
 - spurious states, 93
- off-diagonal-long-range-order (ODLRO), 126, 160, 197, 198, 254, 429
 - pair breaking, 31
 - pair dissociation, 31
- one-particle transfer
 - a) DWBA, 271–279
 - b) absolute differential cross sections (unifying structure and reactions)
 - $^{10}\text{Be}(d, p)^{11}\text{Be}$, 287
 - $^{116}\text{Sn}+^{60}\text{Ni} \rightarrow ^{115}\text{Sn}+^{61}\text{Ni}$, 417
 - $^9\text{Li}(d, p)^{10}\text{Li}$, 291, 292
 - Sn-isotopes (light ions), 279–282
 - c) computer code ONE, 423
- pairing rotational bands, 33, 145, 146, 152
 - two-nucleon transfer spectroscopic amplitudes, 151, 411
- pairing vibrations
 - monopole, 6, 19
 - multipole, 429
 - RPA relations, 17, 18, 162
 - transition between superfluid and normal phases, 143, 144
 - two-nucleon transfer spectroscopic amplitudes, 152, 164–169
 - zero-point fluctuations, 81, 150
- particle hole vibrations
 - RPA relations, 7, 12, 15
- particle–vibration coupling, 8
 - single-particle renormalization, 64, 153
 - three-point vertices, 13, 102
- phase coherence and damping, 307
- quantality parameter, 140, 154
- renormalized NFT
 - empirical renormalization, 85, 294
 - halo nucleus: ^{11}Be , 285–288
 - open shell nuclei: $^{118-122}\text{Sn}$, 74–77, 125
 - parallel with QED renormalization, 298
 - renormalization of vibrational states, 15, 85
 - single-particle renormalization, 14
 - unbound nucleus: ^{10}Li , 289–292
- self-energy
 - collective vibrations (vertex corrections), 15
 - single-particle motion, 14
 - real and imaginary contributions, 65
- spontaneous symmetry breaking
 - deformation in 3D-space, 20
 - deformation in gauge space, 24
- strength separable interaction, 13
- sum rules, 37, 58, 60, 413
- surface vibrations
 - self-consistent condition, 11
 - zero-point fluctuations, 7, 14, 110, 372
- transfer quantum number, 6
- two-nucleon transfer
 - absolute differential cross sections (unifying structure+reactions)
 - $^1\text{H}(^{11}\text{Li}, ^9\text{Li})^3\text{H}$, 405
 - $^7\text{Li}(t, p)^9\text{Li}$, 410
 - $^{10}\text{Be}(t, p)^{12}\text{Be}$, 410
 - $^{112-124}\text{Sn}(p, t)$, 412, 414, 415

$^{116}\text{Sn}+^{60}\text{Ni}\rightarrow^{114}\text{Sn}+^{62}\text{Ni}$, 417	spectroscopic amplitudes (successive versus simultaneous), 211
$^{206}\text{Pb}(t,p)^{208}\text{Pb}$, 213	successive, 191, 335
$^{208}\text{Pb}(^{16}\text{O},^{18}\text{O})^{206}\text{Pb}$, 410	
$^{48}\text{Ca}(t,p)^{50}\text{Ca}$, 410	
computer code COOPER, 423	
non-orthogonality correction, 191, 335	vacuum polarization, 80, 81, 138, 372, 373
one- and two-particle transfer probabilities, 196, 207	
operator, 62	weak link between superconductors, 214
physical sum rule, 413	tunneling Hamiltonian, 215
second order DWBA, 334, 335, 342–347, 349–370	tunneling interaction (second order), 217
simultaneous, 190, 334	
specific probe, 62, 247	zero-point fluctuations, 79–81, 110