Branes and cosmological models

I: Basics of KK compactification, strings and branes [1, 2, 3, 4, 5]

- Motivation, KK reductions, field spectrum, moduli
- Preserved supersymmetries in toroidal reduction of supergravity
- Open and closed superstring, SUSY in two dimensions
- Boundary conditions for the fermionic and bosonic fields, D-branes
- Oscillator expansion,

II: Quantisation of string on D-brane, interaction with closed strings [1, 2, 3, 4]

- Light-cone quantisation, mass spectrum of open string between D-branes,
- GSO projection of the open string spectrum, Chan-Paton factors, tachyon bound, brane-antibrane annihilation
- Spectrum of the closed R-NS string
- GSO projection, bosonic fields in string excitations
- RR gauge potentials, sources of gauge fields

III: Non-perturbative description of D-branes (Section 12.2-12.4 of [6],[7, 8, 9, 10, 11]

- Black p-brane solutions of supergravity, near-horizon geometry
- Gauge invariant potentials in supergravity
- Sigma model with boundaries, DBI action, world-volume theory
- Gauge invariant Wess-Zumino terms

IV: D-brane phenomenology (Sec. 21 of [2], Sec. 10.2 of [4], [12, 13, 14, 15, 16])

- Branes intersecting at angles, open string on intersecting D6 branes
- Supersymmetry breaking, masses and tachyons in the D6 model
- Intersection of multiple branes on tori, particle generations
- Building spectrum of the standard model from D6-branes

V: Cosmological models [17, 18, 19, 20, 21, 22, 23]

- Brane-antibrane inflation
- Compactifications with fluxes, moduli stabilization
- branes on conifolds, models with wrapped branes, η-problem

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