

Kachru, Shamit; Vafa, Cumrun

Exact results for $N = 2$ compactifications of heterotic strings. (English) Zbl 0957.14509
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Summary: We search for $N = 2$, $d = 4$ theories which can be realized both as heterotic string compactifications on $K3 \times T^2$ and as type II string compactifications on Calabi-Yau threefolds. In such cases, the exact non-perturbative superpotential of one string theory is given in terms of tree level computations in the other string theory. In particular we find concrete examples which provide the stringy realization of the results of Seiberg and Witten on $N = 2$ Yang-Mills theory, corrected by gravitational/stringy effects. We also discuss some examples which shed light on how the moduli spaces of different $N = 2$ heterotic vacua are connected.

MSC:

14J32 Calabi-Yau manifolds (algebraic-geometric aspects)

81T30 String and superstring theories; other extended objects (e.g., branes) in quantum field theory

32G81 Applications of deformations of analytic structures to the sciences

Cited in **1** Review
Cited in **98** Documents

Keywords:

Calabi Yau threefolds; tree level computations; non perturbative superpotential; $N=2$ Yang Mills theory

Full Text: [DOI](#) [arXiv](#)

References:

- [1] Seiberg, N.; Witten, E., Electric-magnetic duality, monopole condensation, and confinement in $\text{N} = 2$ supersymmetric Yang-Mills theory, Nucl. phys. B, 426, 19, (1994), hep-th/9407087 · [Zbl 0996.81510](#)
- [2] Seiberg, N.; Witten, E., Monopoles, duality, and chiral symmetry breaking in $\text{N} = 2$ supersymmetric QCD, Nucl. phys. B, 431, 484, (1994), hep-th/9408099 · [Zbl 1020.81911](#)
- [3] Klemm, A.; Lerche, W.; Yankielowicz, S.; Theisen, S., Simple singularities and $\text{N} = 2$ supersymmetric Yang-Mills theory, Phys. lett. B, 344, 169, (1995), hep-th/9411048
- [4] P. Argyres and A. Faraggi, The vacuum structure and spectrum of $\text{N} = 2$ supersymmetric $SU(N)$ gauge theory, hep-th/9411057.
- [5] M. Douglas and S. Shenker, Dynamics of $SU(N)$ supersymmetric gauge theory, hep-th/9503163. · [Zbl 1009.81571](#)
- [6] P. Argyres and M. Douglas, New phenomena in $SU(3)$ supersymmetric gauge theory, hep-th/9505062. · [Zbl 1009.81572](#)
- [7] A. Strominger, Massless black holes and conifolds in string theory, hep-th/9504090. · [Zbl 0925.83071](#)
- [8] B. Greene, D. Morrison and A. Strominger, Black hole condensation and the unification of string vacua, hep-th/9504145. · [Zbl 0908.53041](#)
- [9] C. Vafa, A stringy test of the fate of the conifold, hep-th/9505023. · [Zbl 1009.81542](#)
- [10] J. Schwarz, Does string theory have a duality symmetry relating weak and strong coupling, hep-th/9307121, and references therein.
- [11] Sen, A., Strong-weak coupling duality in four-dimensional string theory, Int. J. mod. phys. A, 9, 3707, (1994), hep-th/9402002 · [Zbl 0985.81635](#)
- [12] C. Hull and P. Townsend, Unity of superstring dualities, hep-th/9410167. · [Zbl 1156.83324](#)
- [13] E. Witten, String theory dynamics in various dimensions, hep-th/9503124. · [Zbl 1054.81526](#)
- [14] A. Sen, String-string duality conjecture in six dimensions and charged solitonic strings, hep-th/9504027. · [Zbl 0982.81520](#)
- [15] J. Harvey and A. Strominger, The heterotic string is a soliton, hep-th/9504047. · [Zbl 1076.81555](#)
- [16] C. Vafa and E. Witten, A one loop test of string duality, hep-th/9505053. · [Zbl 1009.81541](#)
- [17] Candelas, P.; Dale, A.M.; Lütken, C.A.; Schimmrigk, R.; Green, P.S.; Hubsch, T.; Green, P.S.; Hubsch, T.; Candelas, P.; Green, P.S.; Hübsch, T.; Candelas, P.; Green, P.S.; Hubsch, T.; Candelas, P.; de la Ossa, X.C., Comments on conifolds, Nucl. phys. B, Phys. rev. lett., Commun. math. phys., Phys. rev. lett., Nucl. phys. B, Nucl. phys. B, 342, 246-102, (1990)
- [18] Ceresole, A.; D'Auria, R.; Ferrara, S., On the geometry of the moduli space of vacua in $\text{N} = 2$ supersymmetric Yang-Mills theory, Phys. lett. B, 339, 71, (1994), hep-th/9408036

- [19] A. Ceresole, R. D'Auria, S. Ferrara and A. Van Proeyen, On electromagnetic duality in locally supersymmetric $\text{N} = 2$ Yang-Mills theory, hep-th/9412200.
- [20] S. Ferrara, J. Harvey, A. Strominger and C. Vafa, to appear.
- [21] Green, M.; Schwarz, J.; West, P., Anomaly-free chiral theories in six dimensions, Nucl. phys. B, 254, 327, (1985)
- [22] Narain, K.; Sarmadi, M.; Vafa, C., Asymmetric orbifolds, Nucl. phys. B, 288, 551, (1987)
- [23] Witten, E., New issues in manifolds of $SU(3)$ holonomy, Nucl. phys. B, 268, 79, (1986)
- [24] Strominger, A., Superstrings with torsion, Nucl. phys. B, 274, 253, (1986)
- [25] Green, R.; Hubsch, T.; Lutken, C., All the Hodge numbers for all Calabi-Yau complete intersections, Class. quant. grav., 6, 105, (1989) · [Zbl 0657.53063](#)
- [26] Narain, K., New heterotic string theories in uncompactified dimensions < 10 , Phys. lett. B, 169, 41, (1986)
- [27] Walton, M., The heterotic string on the simplest Calabi-Yau manifold and its orbifold limits, Phys. rev. D, 37, 377, (1987)
- [28] Distler, J.; Kachru, S., Duality of $(0,2)$ string vacua, Nucl. phys. B, 442, 64, (1995), hep-th/9501111 · [Zbl 0990.81659](#)
- [29] Gepner, D., Exactly solvable string compactifications on manifolds of $SU(N)$ holonomy, Phys. lett. B, 199, 380, (1987)
- [30] Schimmrigk, R., Heterotic RG flow fixed points with nondiagonal affine invariants, Phys. lett. B, 229, 227, (1989)
- [31] Hosono, S.; Klemm, A.; Theisen, S.; Yau, S.T., Mirror symmetry, mirror map and applications to Calabi-Yau hypersurfaces, Comm. math. phys., 167, 301, (1995), hep-th/9308122 · [Zbl 0814.53056](#)
- [32] Candelas, P.; De la Ossa, X.; Font, A.; Katz, S.; Morrison, D., Mirror symmetry for two parameter models - I, Nucl. phys. B, 416, 481, (1994), hep-th/9308083 · [Zbl 0899.14017](#)
- [33] I. Antoniadis, S. Ferrara, E. Gava, K.S. Narain and T.R. Taylor, Perturbative prepotential and monodromies in $\text{N} = 2$ heterotic string, hep-th/9504034. · [Zbl 1009.81538](#)
- [34] B. de Wit, V. Kaplunovsky, J. Louis and D. Lust, Perturbative couplings of vector multiplets in $\text{N} = 2$ heterotic string vacua, hep-th/9504006. · [Zbl 0925.81145](#)
- [35] V. Kaplunovsky and J. Louis, On gauge couplings in string theory, hep-th/9502077. · [Zbl 0990.81667](#)
- [36] S. Hosono, S. Kachru and C. Vafa, work in progress.
- [37] D. Morrison, Picard-Fuchs equations and mirror maps for hypersurfaces, in Essays on mirror manifolds, ed. S.T. Yau (International Press, 1992) alg-geom/9202026
- [38] Hosono, S.; Klemm, A.; Theisen, S.; Yau, S.T., Mirror symmetry, mirror map, and applications to complete intersection Calabi-Yau spaces, Nucl. phys. B, 433, 501, (1995), hep-th/9406055 · [Zbl 0908.32008](#)
- [39] Vafa, C.; Athanasiu, G.; Atick, J.; Dine, M.; Fischler, W., Remarks on Wilson lines, modular invariance, and possible string relics in Calabi-Yau compactifications, Nucl. phys. B, Phys. lett. B, 214, 55, (1988)
- [40] Candelas, P.; Lynker, M.; Schimmrigk, R.; Klemm, A.; Schimmrigk, R.; Kreuzer, M.; Skarke, H., No mirror symmetry in Landau-Ginzburg spectral, Nucl. phys. B, Nucl. phys. B, Nucl. phys. B, 388, 113, (1992), hep-th/9205004
- [41] Candelas, P.; Font, A.; Katz, S.; Morrison, D., Mirror symmetry for two parameters models, II, Nucl. phys. B, 429, 626, (1994), hep-th/9403187 · [Zbl 1020.32506](#)
- [42] A. Klemm, W. Lerche and P. Mayr, K3-Fibrations and heterotic type 11 string duality, hep-th/9506112.
- [43] C. Vafa and E. Witten, Dual string pairs with $\text{N} = 1$ and $\text{N} = 2$ supersymmetry in four dimensions, hep-th/9507050. · [Zbl 0957.81590](#)

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