Navigating Outer Space

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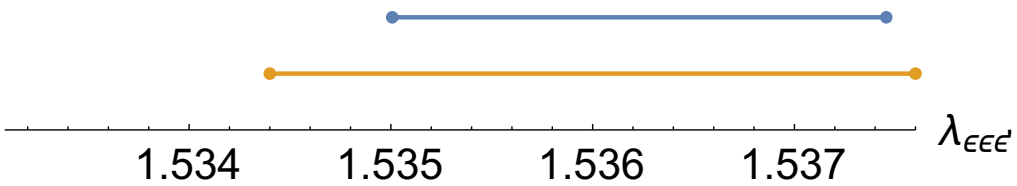
About:
2104.09518 by MR, Slava Rychkov, David Simmons-Duffin, Benoit Sirois, Ning Su and Balt van Rees ; 2021
and
2111.12093 by MR ; 2021

Rigorous bounds

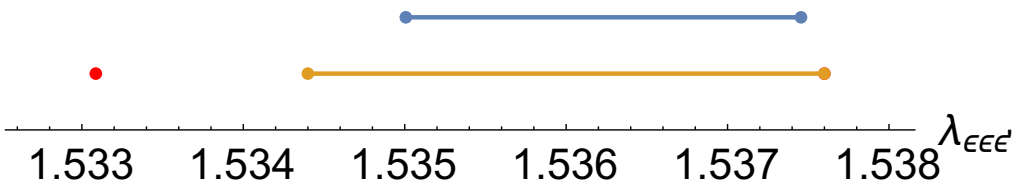
Δ_σ	$0.518157(35)$	$\Lambda = 19$
Δ_ϵ	$1.41265(36)$	$\Lambda = 19$
$\lambda_{\sigma\sigma\epsilon}$	$1.05185(12)$	$\Lambda = 19$
$\lambda_{\epsilon\epsilon\epsilon}$	$1.53240(58)$	$\Lambda = 19$
$\Delta_{\epsilon'}$	$3.82951(61)$	$\Lambda = 31$
$\lambda_{\sigma\sigma\epsilon'}$	$0.05304(16)$	$\Lambda = 19$
$\lambda_{\epsilon\epsilon\epsilon'}$	$1.5362(12)$	$\Lambda = 19$
$\Delta_{\sigma'}$	$5.262(89)$	$\Lambda = 19$
$\lambda_{\sigma\epsilon\sigma'}$	$0.0565(15)$	$\Lambda = 19$
$\frac{c_T}{c_T^{\text{free}}}$	$0.946543(42)$	$\Lambda = 19$
$\Delta_{T'}$	$5.499(17)$	$\Lambda = 19$
$\lambda_{\sigma\sigma T'}$	$0.02107(20)$	$\Lambda = 19$
$\lambda_{\epsilon\epsilon T'}$	$1.355(30)$	$\Lambda = 19$

Rigorous bound excludes OPE found by EFM



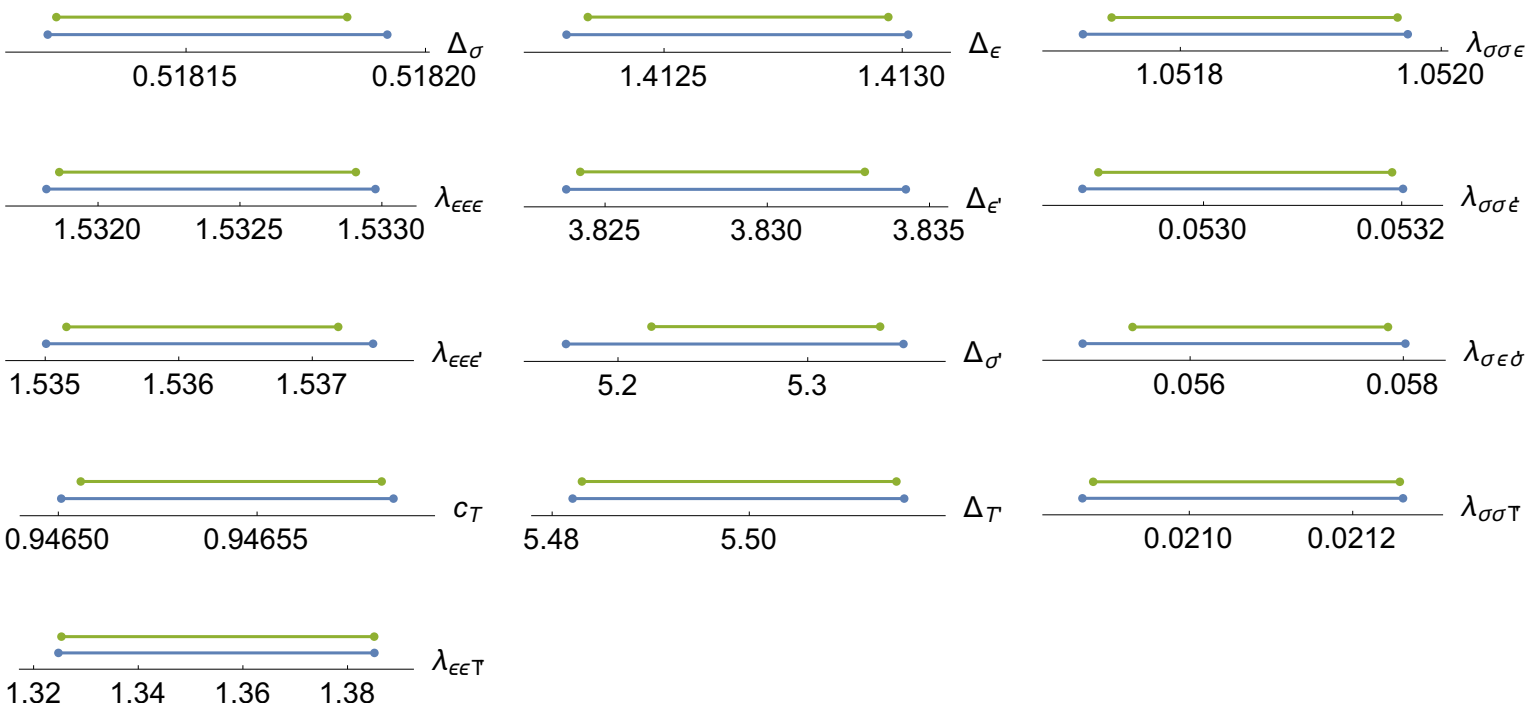
In blue: Rigorous bounds found at $\Lambda = 19$. In orange: The interval corresponding to one standard deviations of the values found for $\lambda_{\epsilon\epsilon\epsilon'}$ using the EFM at $\Lambda = 43$.

Rigorous bound excludes OPE found by EFM



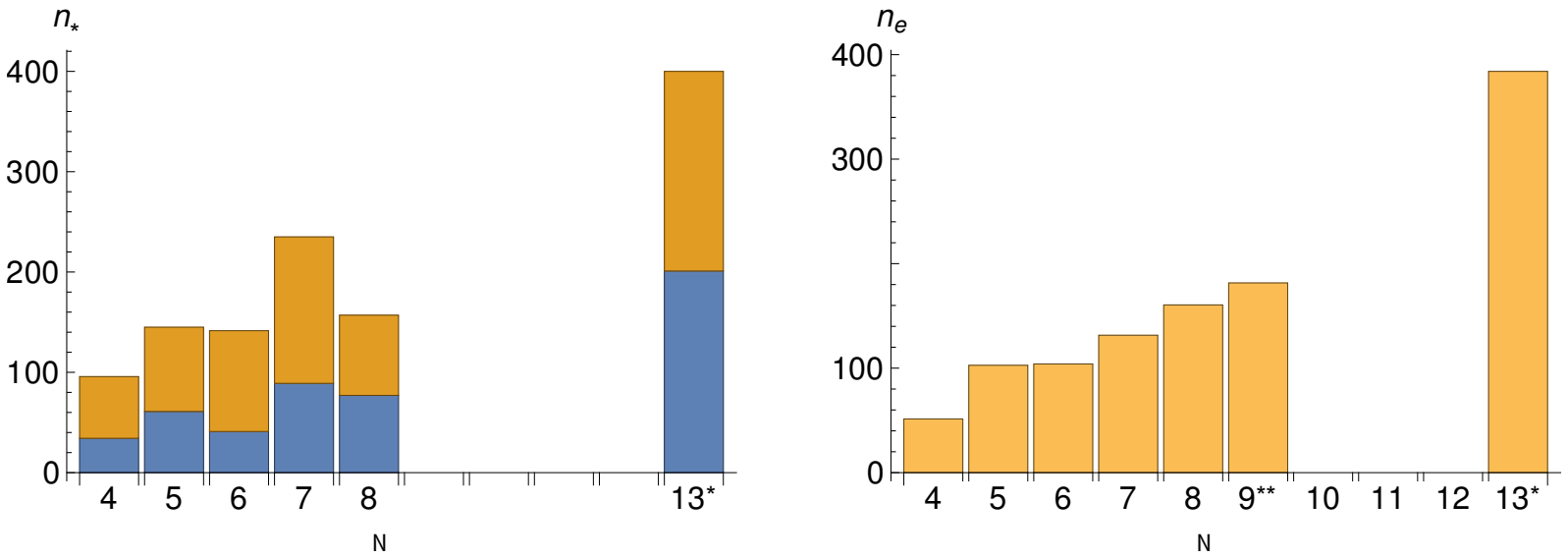
In blue: Rigorous bounds found at $\Lambda = 19$. In orange: The interval corresponding to one standard deviation of the values found for $\lambda_{\epsilon\epsilon\epsilon'}$ using the EFM at $\Lambda = 43$.

Sparseness in all sectors



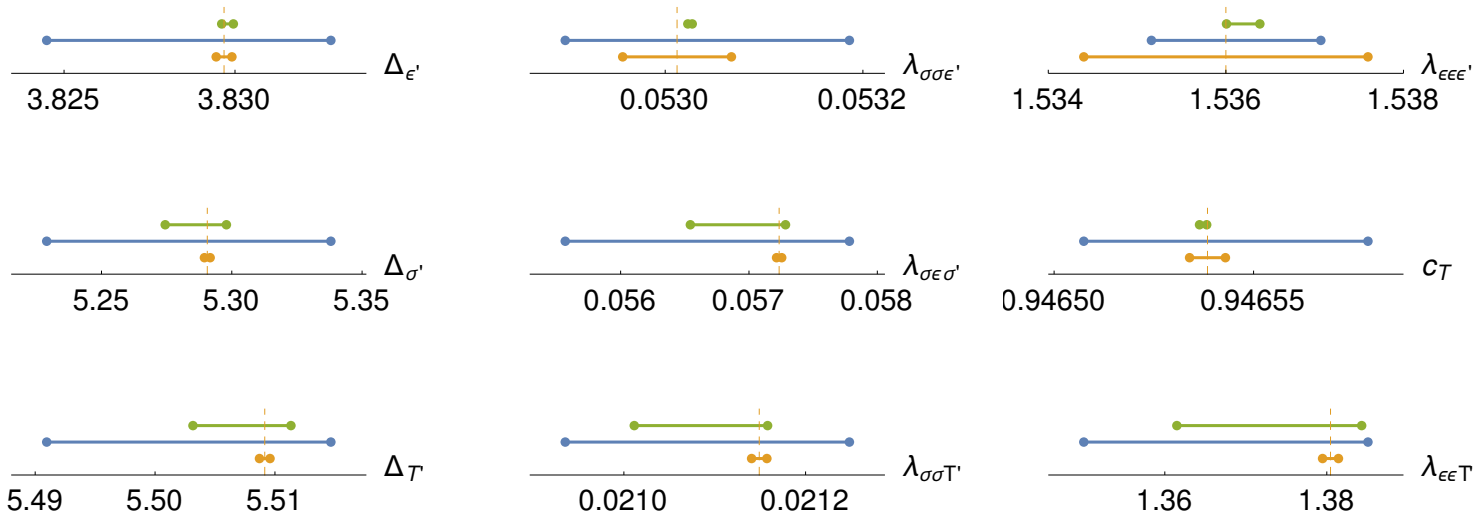
In blue: Rigorous bounds found at $\Lambda = 19$ by demanding a sparseness assumption of the form $\Delta_{\mathcal{O}''} > 6$ in one sector at a time.
In green: The same assuming $\Delta_{\mathcal{O}''} > 6$ in all sectors at once (found using the 13 parameter navigator function).

Scaling of Navigator searches



On the left: A bar chart showing the mean required number of function calls to find (in blue) an allowed point and (in orange) the minimum of the navigator function for parameter spaces of various dimensions N. On the right: The mean number of function calls required to find the minimal or maximal allowed value for one of the navigator function parameters in a search space of dimension N.

Danger of fixing some parameters



In green: the allowed interval after fixing the first 4 parameters $(\Delta_\sigma, \Delta_\epsilon, \lambda_{\sigma\sigma\epsilon}, \lambda_{\epsilon\epsilon\epsilon})$ to a fixed value. All allowed intervals shrink significantly when we do not allow movement in the first 4 parameters. In blue: Rigorous bounds. In orange: EFM one-standard-deviation interval found using the EFM method at $\Lambda = 43$. The median EFM value is indicated by an orange dashed line.