

$$N = 133 = 7 \cdot 19$$

By the Ibukiyama-Kitayama dimension formula,
 $\dim(S_4(K(133))) = 49$

By the Skoruppa-Zagier dimension formula and Jacobi restriction,
the lift dimension of $S_4(K(133))^+$ is 25
the nonlift dimension of $S_4(K(133))^+$ is heuristically 23
 $\dim(S_4(K(133))^+)$ thus is heuristically 48
 $\dim(S_4(K(133))^-)$ is heuristically 1

The heuristic dimensions are correct by the spanning results to follow

$\dim(J_{\{2,133\}}^{\{\text{cusp}\}}) = 4$ (Skoruppa-Zagier), so need to span to within 3 dimensions

$q = 5$ for TraceDown

After TD($\text{Grit}(J_{\{4,665\}}^{\{\text{cusp}\}})$) and $(\text{Grit}(J_{\{2,133\}}^{\{\text{cusp}\}}))^2$,
spanned rank in $S_4(K(133))^+$ is 48
spanned rank in $S_4(K(133))^-$ is 0

After Borcherds products,
spanned rank in $S_4(K(133))^-$ is 1

Final spanned rank in $S_4(K(133))^+$ is 48

Final spanned rank in $S_4(K(133))^-$ is 1

$S_2(K(133))$ is determined by Jacobi restriction and the $H4Ndd(2,+)$ test
($H_4(133,2,2)^+ = 0$)

So $S_2(K(133)) = \text{Grit}(J_{\{2,133\}}^{\{\text{cusp}\}})$ (dimension 4)