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The class number one problem for some non-abelian normal CM-fields of degree 24

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Abstract. We determine all the non-abelian normal CM-fields of degree 24 with class number one, provided that the Galois group of their maximal real subfields is isomorphic to $\mathcal{A}_4$, the alternating group of degree 4 and order 12. There are two such fields with Galois group $\mathcal{A}_4 \times \mathcal{C}_2$ (see Theorem 14) and at most one with Galois group $\mathrm{SL}_2(\mathbb{F}_3)$ (see Theorem 18); if the Generalized Riemann Hypothesis is true, then this last field has class number 1.

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