Let $G$ be a finite abelian group. The block monoid of $G$ is the set $\mathcal{B}(G)$ of zero-sum sequences $g_1 \cdots g_n$ such that $\sum_{i=1}^{n} g_i = 0$ with the operation given by concatenation. A factorization $z = \alpha_1 \cdots \alpha_n$ of length $|z| = n$ of an element $\alpha \in \mathcal{B}(G)$ is a product of $n$ atoms of $\mathcal{B}(G)$; that is, zero-sum sequences which contain no proper zero-sum subsequences.

The monotone catenary degree $c_{\text{mon}}(G)$ is the smallest $m \in \mathbb{N}_0 \cup \{\infty\}$ such that for each $\alpha \in \mathcal{B}(G)$ and every pair of factorizations $z, z'$ of $\alpha$ where $|z| \leq |z'|$, there is a chain $z = z_0, z_1, \ldots, z_k = z'$ of factorizations of $\alpha$ with $|z_i| \leq |z_{i+1}| \forall i$ where $z_{i+1}$ is constructed from $z_i$ by replacing at most $m$ atoms from $z_i$ with at most $m$ new atoms. In a recent paper Geroldinger and Yuan provide explicit upper and lower bounds for $c_{\text{mon}}(G)$. They leave open exact values for cyclic groups and the following groups:

$$C_2^3, C_2^4, C_3^2, C_3^3, C_3^4, C_4^2, C_6, C_2 \oplus C_4, C_2 \oplus C_6.$$ 

We investigate, using theoretical and computational techniques $c_{\text{mon}}(G)$ where $G$ is one of these exceptional groups. (Received September 16, 2014)