Let $G$ be a connected reductive group defined over a finite field $\mathbb{F}_q$ by Frobenius map $F$, and let $G = G^F$. The Jordan decomposition of characters gives a correspondence, with certain invariance properties with respect to Deligne-Lusztig induction, between irreducible characters of $G$, and pairs $(s, \psi)$, where $(s)$ is a semisimple class in the dual group $G^*$, and $\psi$ is a unipotent character of $C_{G^*}(s)$, the centralizer of $s$ in $G^*$. If $s$ is a real element of $G^*$, suppose $h \in G^*$ such that $hsh^{-1} = s^{-1}$. Then the character $^h\psi$, $\psi$ composed with conjugation by $h$, is also a unipotent character of $G^*$. We conjecture that the irreducible character of $G$ corresponding to the pair $(s, \psi)$ is real-valued if and only if $s$ is a real element, and $^h\psi = \bar{\psi}$, where $hsh^{-1} = s^{-1}$. We give a proof of this in the case that $G$ has connected center, and the centralizer $C_{G^*}(s)$ is a Levi subgroup of $G^*$. (Received September 03, 2012)