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Test ideals via a single alteration and discreteness and rationality of F-jumping numbers

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Suppose (X, Δ) is a log-$\bQ$-Gorenstein pair. Recent work of M. Blickle and the first two authors gives a uniform description of the multiplier ideal $\mJ(X;\Delta)$ (in characteristic zero) and the test ideal $\tau(X;\Delta)$ (in characteristic $p > 0$) via regular alterations. While in general the alteration required depends heavily on Δ, for a fixed Cartier divisor D on X it is straightforward to find a single alteration (e.g. a log resolution) computing $\mJ(X; \Delta + \lambda D)$ for all $\lambda \geq 0$. In this paper, we show the analogous statement in positive characteristic: there exists a single regular alteration computing $\tau(X; \Delta + \lambda D)$ for all $\lambda \geq 0$. Along the way, we also prove the discreteness and rationality for the F-jumping numbers of $\tau(X; \Delta+ \lambda D)$ for $\lambda \geq 0$ where the index of $K_X + \Delta$ is arbitrary (and may be divisible by the characteristic).

Comments:	6 pages, added Remark 3.4 (explaining a further generalization of the discreteness results) and several other minor improvements. To appear in Mathematical Research Letters
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