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*Characterization of  $F$ -rationality when  $R$  is Cohen Macaulay via its canonical module.*

Let  $R$  be a  $F$ -finite Cohen Macaulay ring (not necessarily local) of prime characteristic with canonical module  $\omega$ . We try to characterize  $F$ -rationality of  $R$  by studying the module structure via the Frobenius homomorphism of  ${}^e M$  and homomorphisms from  ${}^e M$  to  $\omega$ , in which  $M$  is a finitely generated faithful module. We obtained some conditions involving  ${}^e M$  and  $\omega$  that are equivalent to  $R$  being  $F$ -rational. For example, one of such equivalent conditions is that  $R$  is normal and for every  $P \in \text{Spec}(R)$  with height at least 2, there exists  $e > 0$  such that  $\omega_P$  is a homomorphic image of a direct sum of  ${}^e(P\omega)_P$ . (Received September 07, 2017)