1107-14-68 **James F. McEnerney*** (mcenerney1@llnl.gov). *A real nullstellensatz with multiplicity.* Preliminary report.

Let A be a ring containing the rationals. Let S be a multiplicatively closed subset such that $1 \in S$ and $0 \notin S$, T a cone in A such that $S \subset T$ and I an ideal in A. Then

$$\rho_{S,T} I = \{a \mid sa^{2m} + t \in I^{2m} \text{ for some } m \in \mathbb{N}, s \in S \text{ and } t \in T\}$$

is an ideal. For a commutative ring the collection of non-reduced orders (total cones) is a fibration of the real spectrum. Both of these concepts carry information regarding multiple solutions in the constructible set associated with I, T and S. A non-reduced nullstellensatz that extends the real nullstellensatz and relates these concepts when the ring is a Cohen-Macaulay domain is presented.

Keywords: Multiplicity, Nullstellensatz, semi-algebraic closure, graded ring.

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