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Nicholas R Baeth* (baeth@ucmo.edu) and **Daniel Smertnig**. *A structure theorem for length sets in local quaternion orders.*

If R is a Noetherian ring, every non-zero-divisor can be written as the product of finitely many irreducible elements. However, this representation may not be unique. If r is a non-zero-divisor of a ring R , the length set of r is $L_R(r) = \{n: r = a_1 \cdots a_n \text{ with each } a_i \text{ irreducible}\}$. Length sets and related invariants provide a measure of how non-unique factorization in R can be. In this talk we introduce some of these invariants and show that, like classical orders in number fields, even though factorization can be highly non-unique, length sets of elements in local quaternion orders possess a great deal of structure. In particular we give a structure theorem for unions of sets of lengths in terms of almost arithmetical progressions. (Received August 15, 2017)