Master Fachseminar on Real Algebraic Geometry

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organized by Dr. Maria Infusino and Prof. Salma Kuhlmann

Hilbert's 17th problem for ordered fields

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Abstract. In 1975 K. McKenna investigates the properties of ordered fields K where the following holds:

For every rational function f in n variables with coefficients from K such that f is non-negative everywhere it is defined on K, f can be written as a sum of squares of rational functions in n variables with coefficients from K.

Artin proved that this holds for Archimedean ordered fields, but in his paper McKenna goes further and gives a characterization of all fields having the desired property. This characterization includes the relation of K to its real closure, an axiomatization of K as well as a property that he calls the *Weak Hilbert Property (WHP)*. In this talk we will give a detailed proof of this characterization. In the end we will introduce both an example and a counterexample of such a field as well as some open related questions.