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Controlling Spin Dynamics of Magnetic Spin Chains at the Atomic Scale SHICHAO YAN, DEUNG-JANG CHOI, JACOB BURGESS, STEFFEN ROLF-PISSARCZYK, SEBASTIAN LOTH, Max Planck Institute for the Structure and Dynamics of Matter, Hamburg, Germany — By combining radio-frequency circuitry with sub-Kelvin Scanning Tunneling Microscopy (STM), fast electric pump-probe pulses of nanosecond duration can be introduced into the tunneling junction with high fidelity. We apply this technique to study dynamics of Fe trimers which can be assembled with the tip of the STM by placing Fe atoms in a regular pattern on copper nitride surface on Cu(100). The spin relaxation time of Fe trimers is found to be extremely sensitive to variations in their environment. This sensitivity can be used to sense the presence of another spin. By attaching a transition metal atom to the STM tip and approaching it to the nanostructure on the surface we deduce the coupling strength between the magnetic atoms. Furthermore, the magnetic state of long-lived spin chains can be sensed even at several nanometers distance by minute changes of the Fe trimer's spin relaxation time. This work paves the way to study and control spin dynamics of nanostructures with precisely tunable spin environments.

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