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Title:Observation of 200th harmonic with fractional linewidth of  $10^{-10}$  in a microwave frequency comb generated in a tunneling junction

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Abstract:A microwave frequency comb with up to 200th harmonic of a laser repetition rate is generated by nonlinear intermodal mixing of 15 fs laser pulses in the junction of a scanning tunneling microscope. The highest harmonic has an output power of -146 dBm at 14.85GHz with a signal/noise ratio of 20dB and a measured linewidth of 1.2Hz, which is still larger than the actual linewidth due to phase noise of the spectrum analyzer. Theory suggests that the harmonics have comparable magnitude up to terahertz frequencies, while the observed roll-off is caused by a shunting capacitance in detection circuitry. © 2012 American Institute of Physics.

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Main heading:Harmonic analysis

Controlled terms:Linewidth - Microwave frequencies - Spectrum analyzers

Uncontrolled terms:Fs laser pulse - Laser repetition rate - Output power - Scanning tunneling microscopes - Signal/noise ratio - Terahertz frequencies - Tunneling junctions

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