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Title:Four-step pulses of fractional-order surface plasmons

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Abstract:The 0-order transmission of a 1D metallic grating, on a high-resistivity silicon wafer in optical contact with a silicon plate, has been characterized by terahertz time-domain spectroscopy with subpicosecond resolution over a 400 ps scan range. Two new long-time-delay, powerful pulses are observed after the second reflected pulse. In the frequency domain, these two strong and fast-ringing structures correspond to the bandwidth ranges between the [0, 1] and [0, 2] surface plasmon modes and the range above [0, 2], respectively. A physical optics ray analysis provides an intuitive understanding of these new four-step (reflection, diffraction, total reflection, and diffraction) pulses, caused by fractional-order surface plasmon type beam coupling. © 2012 Optical Society of America.

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Main heading:Plasmons

Controlled terms:Diffraction - Physical optics - Silicon wafers

Uncontrolled terms:Beam coupling - Frequency domains - High resistivity silicon - Intuitive understanding - Metallic gratings - Optical contact - Reflected pulse - Scan range - Silicon plates - Subpicosecond - Surface plasmon modes - Surface plasmons - Terahertz time domain spectroscopy - Total reflection

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