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Title: System for transmission terahertz signals in spectroscopy e.g. Raman spectroscopy, includes terahertz device, terahertz waveguide, mode-matching taper, and cap layer, where terahertz device is used to produce terahertz electrical signal

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Abstract: NOVELTY - The system comprises a terahertz (THz) device such as a photomixer (110) or a photoconductor, a terahertz waveguide such as a two wire waveguide, a mode-matching taper, and a cap layer. The terahertz device is configured produce a terahertz electrical signal in response to a received optical signal, and is partially defined in a substrate such as a one-dimensional photonic crystal the mode-matching taper. The terahertz waveguide operable at terahertz frequencies is configured to transport the terahertz electrical signal.

USE - The system is useful for transmission terahertz signals in spectroscopy such as Raman spectroscopy, diagnostics, biomedical analysis, analysis substances and materials including measurement gas-phase samples, liquids and solids, breath analysis, an security analysis including explosive detection explosives such as dinitro, cyclonite and hexogen (RDX), octogen (HMX), trinitrotoluene and pentaerythritol tetranitrate, environmental analysis and scientific analysis including studying absorption and dispersion compounds, dynamics laser induced plasmas and real-time trace gas detection and communications.

ADVANTAGE - The efficient and compact system is capable easily and economically transmitting the terahertz signals with less loss, and exhibits improved versatility, high performance and mechanical stability thus providing informations a composition and conformal state.

DETAILED DESCRIPTION - The system comprises a terahertz (THz) device such as a photomixer (110) or a photoconductor, a terahertz waveguide such as a two wire waveguide, a mode-matching taper, and a cap layer. The terahertz device is configured produce a terahertz electrical signal in response to a received optical signal, and is partially defined in a substrate such as a one-dimensional photonic crystal the mode-matching taper. The terahertz waveguide operable at terahertz frequencies is configured to transport the terahertz electrical signal. The mode-matching taper is situated to couple the terahertz device to the terahertz waveguide to direct the terahertz electrical signal from the terahertz device to the terahertz waveguide, and comprises first and second tapered waveguide sections corresponding to a tapered slotline, a tapered coplanar stripline or a tapered coplanar waveguide. The first tapered waveguide section: is situated on a planar surface the substrate to match a component a propagating electrical mode associated with the terahertz electrical signal produced by the terahertz device; is defined by a conductor situated on the planar surface the substrate; includes an in-plane taper placed at the planar surface so that the first waveguide section is associated with a waveguide mode that matches an in-plane component the electrical mode associated with the terahertz electrical signal; and is defined by a tapered slotline having a taper in a first direction and a second section defined by tapered wires. The second tapered waveguide section: is situated on the planar surface the substrate to match a component a mode supported by the terahertz device to a mode associated with the terahertz waveguide; and includes a taper normal to the plane the surface to match the

component the electrical signal produced by the terahertz device normal to the planar substrate and a mode associated with the terahertz waveguide. The cap layer is situated on the planar surface. The substrate includes a thinned portion situated along a portion the mode-matching taper. Each the wires is tapered in a second direction that is perpendicular to the first direction.
INDEPENDENT CLAIMS are included for:
(1) a mode-matching taper; and
(2) a method generating and detecting electromagnetic radiation at terahertz frequencies.
DESCRIPTION DRAWING(S) - The diagram shows a schematic view a terahertz generation-analysis-detection module.
Photomixers (110)
Silicon lens (120)
Diverging THz beam (130)
TEFLON polytetrafluoroethylene lens (140)
Collimated THz beam. (150)
Drawing:
Derwent Class Code(s): P81 (Optics); S03 (Scientific Instrumentation, photometry, calorimetry); V07 (Fibre-optics and Light Control)
Derwent Manual Code(s): S03-C06; S03-E14P; V07-K10C
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