a pumped dye laser source adapted to receive a portion of said visible pulse output and for generating a broadband output comprising single high power broadband visible pulses in the picosecond to femtosecond range;

means for orthogonally polarizing, collimating and overlapping said visible pulse output and said broadband output to provide a phasematched broadband infrared output to generate a probing pulse;

a beamsplitter for beamsplitting said probing pulse into a polarized, infrared output and a visible pulsed output;

means for focusing and reflecting said polarized infrared output to a sample to thereby generate a corresponding broadband infrared signal characterized by said sample;

a linear sum frequency generator for converting the characterized signal into a visible broadband spectral signal; and

means for processing said visible spectral signal into spectrographic data characterizing the probed sample signal.

12. A method for obtaining broadband multichannel infrared spectra with resolution in the picosecond to femtosecond range of time resolution, comprising the steps of:

generating a pulse output in the visible spectrum at a predetermined narrowband high-pulse frequency;

receiving a portion of said pulse output and generating a tunable broadband output therefrom;

orthogonally polarizing and collimating said pulse output and said broadband output to generate a focused broadband infrared (BBIR) probing pulse;

downconverting and beamsplitting said probing pulse into a polarized infrared output and a visible pulsed output;

transmitting said polarized broadband infrared output to probe a sample and focusing a resultant corresponding broadband signal characterized by said sample; and

overlapping said characterized infrared signal with said visible pulsed output to generate a visible spectral signal providing data on said probed sample.

13. A method according to claim **12**, comprising the further step of:

amplifying and frequency-modulating said pulse output after said step of generating the same and before said step of generating a tunable broadband output therefrom.

14. A method according to claim **12**, wherein:

said high pulse frequency of said pulse output is selected to be in the picosecond to femtosecond range.

15. A method according to claim **12**, wherein:

said step of transmitting said polarized broadband infrared output to probe a sample includes the step of transmitting said polarized broadband infrared output through said sample for obtaining said resultant corresponding broadband visible signal therefrom.

16. A method according to claim **12**, wherein:

said step of transmitting said polarized infrared output to probe a sample comprises the step of reflecting said polarized infrared output from a selected portion of said sample and utilizing a corresponding reflected infrared output to generate said resultant corresponding broadband visible signal characterized by said sample.

17. A method according to claim **16**, wherein:

the reflected broadband infrared output containing sample information is upconverted to a visible broadband signal by means of a nonlinear mixing crystal.

18. A method according to claim **12**, wherein:

the transmitted broadband infrared output containing sample information is upconverted to a visible broadband signal by means of a nonlinear mixing crystal.

19. A method according to claim **12**, comprising the further step of:

receiving said visible spectral signal providing data on said probe sample at a spectrograph for generating a spectral analysis output thereof.

20. A method according to claim **12**, comprising the further step of:

processing said visible spectral signal containing sample data repeatedly to thereby generate time averaged data indicative of a condition of said sample.

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