CLAIMS

1. A spectrometer for detecting multiple spectra, the spectrometer configured to be handheld, such that carrying the handheld spectrometer causes unsteadiness, movement, shaking and vibrations therein;
the spectrometer comprising:
a light source;
a sample tray containing a sample to be analysed;
a detector adapted to detect Raman spectra and at least one of absorbance spectra or reflectance spectra;
an incident light path extending from the light source to the sample tray; and
a sample light path extending from the sample tray to the detector, the sample light path comprising:
a scanning interferometry array, the scanning interferometry array comprising:
a beam splitter;
a stationary reflector; and
a scanning reflector;
the scanning interferometry array is configured to induce an interference pattern in sample light passing therethrough, the interference pattern being dependent upon the characteristic signal of the sample light and a position of the scanning reflector,
the detector is further configured to detect the interference pattern,
changing the scanning reflector position adjusts the interference pattern;
wherein in use, the unsteadiness, movement, shaking and vibrations induce unintentional change in the scanning reflector position, thereby inducing unintentional adjustment of the interference pattern; and the scanning reflector is connected to a position detection means configured to determine the position of the scanning reflector, thereby enabling the unintentional change in the scanning reflector position to be detected; and

wherein in use, the incident light path directs incident light from the light source to the sample to be analysed in the sample tray, whereupon incident light interacts with the sample to form a characteristic signal;

the sample light path directs sample light comprising the characteristic signal from the sample to the detector; and

the characteristic signal comprises at least one of a Raman spectrum, an absorbance spectrum and a reflectance spectrum that is characteristic of the sample in the sample tray.

2. The spectrometer, configured to be handheld, of claim 1 wherein the unintentional change in the scanning reflector position causes an interference pattern produced by the sample light passing through the scanning interferometry array.

3. The spectrometer, configured to be handheld, of claim 1 wherein the position detection means is a linear variable differential transformer (LVDT).

4. The spectrometer, configured to be handheld, of claim 1 wherein the sample light path is a single, shared sample light path that is configured to direct sample light carrying a Raman spectrum characteristic signal, and at least one of sample light carrying an Absorbance spectrum characteristic signal and sample light carrying a Reflectance spectrum characteristic signal, to the detector.

5. The spectrometer, configured to be handheld, of claim 4 wherein in use, the single shared sample light path directs at least two of sample light carrying a Raman spectrum characteristic signal, sample light carrying an Absorbance spectrum characteristic signal and sample light carrying a Reflectance spectrum characteristic signal, to the detector, at the same time.

6. The spectrometer, configured to be handheld, of claim 1 wherein in use, the single shared sample light path directs sample light carrying a single type of characteristic signal selected from Raman Spectrum, Absorbance Spectrum and Reflectance spectrum at a time.

7. The spectrometer, configured to be handheld, of any one of claims 1 to 6, further comprising a further beam splitter;

wherein a portion of the incident light path and a portion of the sample light path overlap, thereby forming a common light path extending between the further beam splitter and the sample tray;

incident light and sample light traverse the common light path in substantially opposing directions; and

the further beam splitter selectively directs sample light along the sample light path towards the detector and substantially prevents incident light from being directed along the sample light path.

8. The spectrometer, configured to be handheld, of claim 7, further comprising a quarter-wave plate positioned on the common light path configured to induce 45^{o} of polarisation on all light passing therethrough along the common light path;

wherein the beam splitter is a polarising beam splitter having a refraction polarity axis, in that light that is polarised 90^{o} relative to the refraction polarity axis is substantially entirely reflected by the further beam splitter and other light is able to refract therethrough;

light reflected by the further beam splitter is directed along the sample light path towards the detector; and

light from the light source is polarised 45^{o} upon traversing the quarter-wave plate as incident light, and a further 45^{o} upon traversing the quarter-wave plate as sample light, such that substantially all of the sample light is reflected by the beam splitter.

9. The spectrometer, configured to be handheld, of claim 1, wherein:

at least a portion of the incident light path and at least a portion of the sample light path are comprised of optic fibres arranged to inhibit loss or degradation of the characteristic signal otherwise induced by the spectrometer being held in a user's hand.

10. The spectrometer, configured to be handheld, of claim 1, wherein the light source comprises a narrow-spectrum light source and a separate broad-spectrum light source.

11. The spectrometer, configured to be handheld, of claim 0, wherein the incident light path extends only between the narrow-spectrum light source and the sample tray; and

the spectrometer comprises a separate broad-spectrum incident light path extending from the broad-spectrum incident light source to the sample tray.

12. The spectrometer, configured to be handheld, of claim 0 wherein the broad-spectrum light source comprises at least a first broad-spectrum light source and a second broad-spectrum light source;

the first broad-spectrum light source being positioned to direct light onto a sample in the sample tray to produce sample light comprising the absorbance spectrum characteristic signal; and

the second broad-spectrum light source being positioned to direct light onto the sample to produce sample light comprising the reflectance spectrum characteristic signal.

13. The spectrometer, configured to be handheld, of any one of claims 0 to 0 wherein the broad spectrum light source emits light having a particular incident wavelength band; and

the narrow-spectrum light source emits light having a wavelength that is within the particular incident wavelength band.

14. The spectrometer, configured to be handheld, of claim 0 wherein the incident wavelength band comprises a near-infrared wavelength band.

15. The spectrometer, configured to be handheld, of claim 0 wherein the incident wavelength band comprises an ultraviolet wavelength band.

16. The spectrometer, configured to be handheld, of any one of claims 1 to 0, wherein a wavelength band of the Raman spectrum is entirely within a further wavelength band of the absorbance spectrum or the reflectance spectrum.