

The fibre mapper

The challenge

Performing forensic fibre examination requires finding single textile fibres, tubes often less than half a millimetre long, and less than 1/50th of a millimetre thick on garments surfaces. Garments surfaces consist of millions of fibres and depending on the circumstances these could look very similar to those of interest to the forensic scientist. Recovery of fibres from garments takes place using tapings, our tapings are 170mm long x 50 mm wide and we may have to search in excess of 20 of these tapings from a garment for our fibres of interest.

It is down to our great skill, knowledge and experience that we are able to find them, but we can only do this painstakingly manually using the stereomicroscope. Searching tapings is very resource intensive. Finding the fibres takes up valuable time, that could be better spent analysing the fibres, interpreting their significance and getting that information to the justice system as quickly as possible. We need an instrument to be able to do this for us.

A person is a masterpiece of engineering, their eye takes in so much information, their brain processes it so quickly and decisively, and with memory its capacity to draw on knowledge and use it to constantly improve is unrivalled. We do not expect an instrument to be able to replicate this level of brilliance, we do not expect an instrument to completely replace scientists in the entire process.

We expect instruments to be fast, robust, consistent and undemanding. We expect an instrument to deliver at least equivalent, if not better, levels of discrimination to the human, and we expect them to be capable of working 24/7.

In theory, the technology exists that can deliver an instrument to automatically search tapings for fibres. But it appears that putting it together in a way that can deliver on the criteria is remarkably elusive.

The following is a list of tasks which the ideal instrument would be able to perform:

- The instrument should search a tape 170mm long and 50mm wide as quickly as possible, preferably in less than 30 minutes
- It should collect data in electronic form by measuring an area of the tape in a way(s) that can discriminate between target fibres and the background
- It should be able to process this data so that target fibres can be located on the tapings
- It should allow for marking the area on the tape of the fibre of interest so to facilitate its removal for further examination
- It should be able to process entire data sets taken from tapings and compare them, one to another, highlighting locations of fibres that match each other based on a set of criteria.

- It should be able to feed data from tape searches into a database

Pointers from experience

Think AUTOMATION, this must be the goal from the start– nothing less will do

Think BIG – try and avoid moving parts such as stages, or the one objective/camera approach

Think ARRAYS – why do we need to settle for single illumination devices or detectors?

Think MEMORY – the scanning will acquire a lot of data, most of it will either be empty space or irrelevant information (like background fibres)

Think CONTRAST – not just discrimination, the background material will determine the success rates, not your ability to discriminate based on any single technique

Think COMBINATION – it is doubtful that one technique will provide the best chance of success

Think SPECTROSCOPY – fluorescence and in the visible range (400–700nm). Spectra are likely to be noisy as integration time is short and the tapings are unlikely to reflect well – we recommend transmission Vis techniques for s/n ratio purposes. Look to blue and/ or green excitation wavelengths for fluorescence.

Think IMAGING – fibres can be readily discriminated by morphology, but the image needs to be clear, resolved and measurable

Think INTELLIGENT DATA PROCESSING – smoothing, derivative searching and databases.

Think RESOLUTION – potentially we only need one good hit on the fibre to tell us where it is.

Think SPEED – over a 24hour period, it needs to be faster than manual searching

Think QUALITY – it needs to discriminate as least as well as a human being can

Are you up for the challenge? If so please contact us at www.ContactTraces.com