

PCB Assurance - Clarification Questions and Answers

Question	Answer
The competition talks about imaging PCBs in the range of visible and x-ray light. Would the Authority consider approaches that use longer wavelengths of electromagnetic energy under this challenge?	There is no restriction on the wavelengths to use to image PCBs and the solution can include multispectral imaging, provided it can be done safely. The solution to imaging should include a method to image the internal copper traces of the PCB.
Is the use of ML vision processing in solutions considered mandatory?	The use of ML is not mandatory, all valid approaches to interpreting the images are encouraged and assessed equally.
Do we have access to any data / circuit boards / CT scanners / X ray machines, or do we have to source everything ourselves?	CT radiograph and reconstruction volume data of a small number of PCBs can be provided. Commercial PCBs with open source design data are also available.
Can we build a computer model in unity to show how this would work in practice or do you need a physical PoC?	Could you explain more about what you are thinking with building a computer model in unity? Ideally would like a PoC, though we don't understand enough about the unity approach to give a definitive answer.
Is 80k the limit for this work?	For this phase yes. At the end of the phase the work completed will be reviewed against existing budget allocations. So there is potential for further funding at a later date.
Can we use off the shelf data processing programs like FME, Hadoop, MATLAB or do we have to build it all from scratch?	In the final application, data processing will preferably be done off-line. While there are no limitations to which data processing approach to use, being able to run it off-line will be of benefit.
Is there anything we're not allowed to use?	I would like to leave the solution open to not constrain creative ideas. Please feel free to ask about anything you think might fall into this category of not allowed.
Do we have test data or test items we know are tampered or are not tampered to use as QA for the design process.	A small set of CT data and gerber manufacturing data for tampered/not tampered PCBs can be provided, though other options should be explored first.
What datasets are available for AI modelling? As this is a key limiting factor within the tight delivery timeframes to developing a sophisticated AI. EG, are there datasets of PCB Xray/CT images linked to CAD files? And if so, what's the rough size of the available data (in terms of number of samples)?	We will not be providing large datasets for AI training purposes, however a small set of CT data and gerber manufacturing data for tampered/not tampered PCBs can be provided.
If no datasets are available, this presents an opportunity to deploy a novel imaging technology that we've been developing (redacted). We believe this technology (redacted) has particular relevance for establishing the integrity of copper tracks on a pcb, but the lack of existing datasets poses a concern for success AI development. Nonetheless, we believe we could develop a demonstrator in the timeframes, but this would be on non-populated PCBs (with further work then required to upgrade the solution to work on populated PCBs). Would this be an acceptable end point for the project?	Tracing of copper tracks and their attribution across multi-layered PCBs with a development pathway of how this can be applied to populated PCBs to overcome problems should as 'shadowing' is of interest.
What are the dimensions and thickness of the PCB board?	PCB dimensions could be up to 30cm by 20 cm, more likely smaller 15cm x 10 cm. Thickness up to 2mm but more likely 1mm to 1.5mm.
Which types of X-Ray technology or machines have been attempted?	Micro-focus CT scanning up to 200KeV.
What were the limitations of the existing X-ray technology that was used?	Component's metal artefacts "shadow" images, high barrier to entry on machine cost and user training. Can be difficult to manually interpret volume.

What is the minimum size of the copper traces that can be analysed?	Each copper trace could be less than 35um in height, less than 100um in width and a copper clad layer less than 150um thick.
How many copper layers are typically found in an assembly, and what is the maximum number observed?	A PCB for verification could consist of multiple (potentially 10 or more) layers of copper traces, bonded on to FR4 glass epoxy substrates and laminated together.
What is the closest dielectric separation between copper layers?	Pre-preg thickness between layers minimum would be 50um though likely to be 100um.
Where are the copper traces located within the PCB board?	Traces would be on layers spread through out the PCB stack up. Some layers will be planes of copper for power and ground low impedance distribution, while other layers will be signal layers with mostly copper traces surrounded copper planes of power and ground for signal and power integrity.
While the goal is to focus on an image-based solution can some limited probing take place?	Absolutely, the goal is to determine the tracking layout and if probing benefits the solution understanding then yes.
Would we be able to power the PCB board under test?	Yes
Is there an expected limit to the cost of the final system once production ready?	No cost is currently defined to not constrain potential solutions. It is envisaged the system would be R&D lab equipment scale.