

## Speed Matters

### In-house rapid prototyping at PTB in Berlin

**The Physikalisch-Technische Bundesanstalt (PTB), as the National Metrology Institute of Germany, enjoys an excellent reputation throughout the world. For its scientific and metrological development work, it often needs special electronic devices that are not available on the market. The corresponding solutions are designed by the scientists and development engineers at PTB and then manufactured by the department “Nutzerunterstützung” (user support), an internal service provider, as single-sided or double-sided PCBs. For this, the institute uses in-house prototyping equipment from LPKF.**

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Electronic devices are developed for measuring physical quantities such as pressure, magnetic fields, luminosity, fluid flow, temperature, current, or voltage. They are often combined with application-specific control panels and displays that are based on microcontroller boards or connected to automated measuring stations via different communication modules and protocols such as USB, RS232, RS485, or Ethernet. In some cases, extremely low-noise amplifiers, special power supplies or various other devices are needed as well.

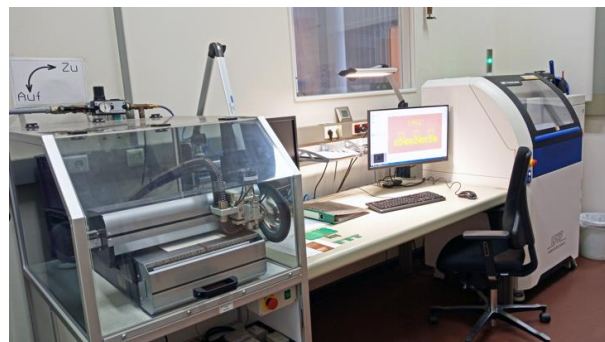
Many projects have to meet a strict timeframe, and the equipment is needed promptly. For rapid manufacturing of the PCB prototypes, the lab has an LPKF ProtoMat H60 circuit board plotter, an LPKF ProtoLaser U4 laser system, and the LPKF Contac S4 through-hole plating system. A process for creating solder masks with LPKF ProMask as well as additional devices such as a programmable oven for drying and curing, a UV exposure unit for polymerization, a measuring device for the PCB copper thickness – including the copper in the vias – and a stereomicroscope are also used in the lab.

Speed is of the essence due to the large number of PCBs produced by the service provider. If drilling and structuring must both be performed by the same machine, the LPKF ProtoLaser U4 is used. This laser system can process a wide variety of materials, even HF materials. That is important because at PTB, many different materials – even new materials – are used. With the lab equipment, employees process, for example, FR4

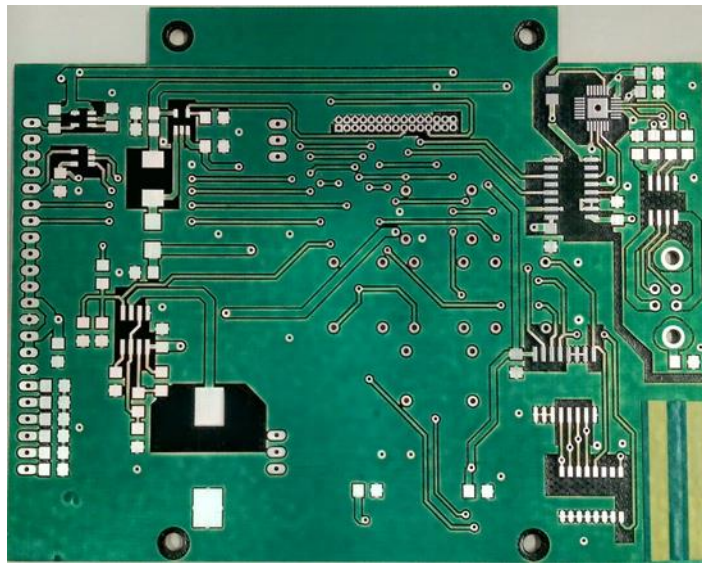
material with a thickness of 1.0 mm or 1.55 mm and a copper layer of thickness 18  $\mu\text{m}$  or 35  $\mu\text{m}$  or Rogers RO4003 or TMM10i. Flex materials and ceramics can be processed reliably with the ProtoLaser. Processing of aluminum oxide of thickness 1.0 mm with 35  $\mu\text{m}$  copper for applications with higher current intensities and accordingly stronger heat generation also works very well. Demands on processing speed have increased dramatically over the last few years – especially for structures smaller than 100  $\mu\text{m}$ . Through its capacity to drill and structure, the ProtoLaser U4, which is considered an “all-around genius” at PTB, makes it possible to implement the high requirements.

In addition, the lab employees use LPKF ProMask to create solder masks. This makes later assembly easier and reduces, for example, tin requirements for the chemical process of immersion tin coating. The PTB service provider uses an LPKF Contac S4 for through-hole plating. With this new system, through-hole plating of holes smaller than 0.4 mm no longer causes problems.

Incidentally, PTB also has an electronics training center in which apprentices and students can learn all about PCB design. Many of the budding engineers need the PCB service for their final projects. For that, it is extremely helpful to be able to perform prototyping directly and quickly with LPKF’s in-house equipment for PCB manufacturing.



**Fig. 1:** Prototyping lab at PTB Berlin with the LPKF ProtoMat H60 and the LPKF ProtoLaser U4



**Fig. 2:** Double-sided printed circuit board produced in the prototyping laboratory of PTB Berlin

#### **About LPKF**

LPKF Laser & Electronics AG is a leading provider of laser-based solutions for the technology industry. Laser systems from LPKF are key elements in the manufacturing of printed circuit boards, microchips, automotive parts, solar modules, and many other components. Founded in 1976, the company is headquartered in Garbsen, near Hannover, Germany, and has subsidiaries and representative offices throughout the world. Around 20 percent of the workforce is engaged in research and development.