

## Minutes "Bruker discussion June 17, 2021"

### Summary of the discussion following the Bruker talk:

**M. Palm:** Is an upgrade from M15 to M16 electronics still possible and how long will M16 be supported

**Answer:** M16 electronics will be supported for 10+ years.

### Solar tracker:

- Is Bruker developing a more robust solar tracker, e.g. for high humidity environments? (mirrors, belt degradation, ..)

**Czurlok:** We know the problems, especially for tropical conditions, he will address them. He fears that other things are more important to be developed. Answer is: No

### Laser

- Lots of SIOS laser failures within 2-4 years. Would it make sense to speak to SIOS or switch to a different company? (better experience with REO within the network).

- Long delivery times for laser

- On one hand turning off the laser when not in use will extend its lifetime, on the other hand turning it on/off too often is also not good. Is there a recommendation for which time periods (hours, days, ...) it makes sense to turn it off? Is there a way to turn it OFF/On remotely via the Bruker Web Interface?

**Czurlok:** He spoke to SIOS, some measures were taken. Seems to be solved. **Gregor:** They were in touch with SIOS. Laser beam became scattered. User realizes that intensity dropped. Scatter was due to dust inside cavity. Meanwhile production process has been corrected. All lasers between 2018 and March 2020 might be affected, about 30% had this problem. Therefore, not enough lasers were available. SIOS came up with a modification of the laser. Since then the optical path is protected. Since March 2020 this effect was not observed anymore. Its solved. Bruker offers only the SIOS laser. REO and SIOS are comparable. REO disadvantage is that status is only shown on the LED, but not on the electronics of OPUS electronics. Bruker has no intention to change from SIOS to REO.

**Warneke:** Similar as before: SIOS were first okay, then bad.

**Gregor:** Lifetime dropped, because SIOS moved production to Asia, and then improved again. Afterwards a new problem, with scatter, started. If you place a piece of paper in the Laser beam behind the interferometer and see scatter on paper, that's not okay, and will most likely get worse. It should only be a clearly visible 4mm spot. Since March 2020 the problem seems to be solved. He hopes, lifetime is 4-5 years. If laser is not older than 2 years, it can be repaired. Take out the dust, and close the cavity. Repair is in the range 500-1000 €. Gregor will forward pictures of good and bad lasers. The long lifetime is related to the problems. Bruker is not looking for a new laser company.

**Warneke:** Does it make sense to switch off the laser? **Gregor:** You should not turn it on/off too often. But you gain lifetime if the break is more than one weekend. But very old lasers should not be turned off, this holds after 4 years. There is an option to switch on/off laser via EWS. Direct command: LSR

### Beamsplitter

- Broadband beamsplitter (status, experience, lifetime, ....)
- Stronger wedge (see slide). Could this become part of the Bruker specs and the final tests for new spectrometers.

**Blumenstock:** Advertise  $0.8^\circ$ , it's better. For old instruments the switch from  $0.5^\circ$  to  $0.8^\circ$  is fine, but for new instruments use larger wedge.  $2^\circ$  is much better. **Czurlok:** Larger wedge would be possible, but Bruker does not want to make this as standard, because then compatibility is not given. Therefore,  $2^\circ$  is not standard. First an optimal configuration should be found. Maybe Blumenstock could help with input.

**Gregor:** If we make  $2^\circ$  standard, we lose the far infrared. A new alignment is necessary. In the future special set of beamsplitters for atmospheric purposes makes sense. Is the visible becoming of interest?

**Blumenstock:** No.

**Czurlok:** For extended KBr, in principle  $2^\circ$  is possible, but  $0.8^\circ$  is standard.

### Spare parts

- Would be nice if Bruker would keep spares of consumables (laser, tracker, encoder/motor assembly) on hand
- Swap out with refurbished/new parts by having Bruker "buy back" broken equipment?

**Czurlok:** Lasers are a different problem, but for tracker etc. it's the policy of Bruker. **Gregor:** Bruker has no complete tracker available. Parts should be available in small quantities, but never a complete tracker. For buying parts back, for lasers it works, but what else? Bruker will not buy back old parts (5 years old).

**Wunch:** Problem is to repair parts.

**Gregor:** Bruker tries to help to repair something, but not buy back old parts.

### Various

- Last year issues with the Bruker response time were raised (e.g., suntracker repair, laser replacement, etc.). Due to the special situation with COVID-19 it cannot be said if this has been resolved.
- Bruker electronic and power supplies: Do they contain electrolytic capacitors that can dry out? Could the lifetime of the electronics be enhanced if they are exchanged on a regular basis?

**Gregor:** Power supply should not be repaired by changing capacitors, when they dry out. Better replace the complete power supply. For capacitors working in 24 V, replacements are not necessary. A kit can be delivered, but you could make mistakes. Check the main electronics, is it powered up by 24 V, you will not have a problem. If you have a line power input, you might get problems. DC/DC power supplies have not shown problems in 10+years. Bad powersupplies can lead to a number of difficult to diagnose problems. If instrument is very old, better to switch to a DC/DC powersupply unit.

- Firmware FWD/REV ZPD timing issue (Lauder/Harwell) **Gregor:** Firmware problem is solved. Lauder Firmware was quite old. After new firmware installation problem is solved. You should have Version 2.485.

**Doniki:** With Version 2.485 we still have problems.

**Gregor:** Instrument must have a different problem

**Brownsword:** Bias between forward and backward for different detectors, related to 2.485.

**Czurlok:** First identify the error, then we will have a look.

**Gregor:** We need more information. 2.485 is quite stable, free of errors.

- Source compartment selection motors and belts have been an ongoing issue

**Gregor:** too much friction in belts. Not all parts have been replaced. Motor failed to find exact position. Work around is to make the stepper motor slower but more powerful. No other solution is available. Motors with linear movement are more affected, e.g. change of detectors, change of source. We had these problems, but not many issues.

- It would be very useful for the next 125 firmware upgrade to incorporate some more useful fault diagnostics info in the event of a non-recoverable software crash (i.e. we can't communicate with the instrument - it needs a power reset. Then the log buffer/full report would contain more detail on what exactly went wrong. Often the instrument will crash sometime after an error, and the log doesn't have enough storage to record the real error. More descriptive error codes would be useful.

**Gregor:** with latest firmware, two sets of log buffer are saved, even after restart. Therefore its possible to look before the restart.

**Czurlok:** Messages are useful, Gregor knows to read the error messages.

**Gregor:** I suggest to save the full report, then we can look at the last half hour.

- When is it planned to employ a successor of Gregor? The long experiences by Gregor cannot be transferred in a short period of time.

**Gregor:** Sep 2023. Somebody should be trained, but that's delayed due to Covid 19. But now there is some pressure. But Gregor was asked to prolong his working time by 6-12 months. Gregor has 30 years experience. Bruker has to decide whether one person is enough or not.

- One person is probably not enough to service all the HR, EM27 and solar trackers.

**Gregor:** Bruker has to decide whether one person is enough or not. Bruker knows it.

**Buschmann:** In our Vertex 80 some Interferograms seem to be missing steps, were shorter. Is there a possibility of the M16 electronics not recognizing a laser problem?

**Gregor:** We should get in touch separately. If laser error is shorter than 3 ms, then we can miss data points, because electronics does not see the error.