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INSTRUMENTATION TECHNOLOGIES

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Electronic components market challenges for the Libera instruments

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Berlin, June 2022





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- Order and production process
- Component classification
- Missing components: examples
- Dealing with issues and Costs involved
- Latest delivery examples



Ordering and production process





Internal processes today



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Ordering and production today





Components

Performance – critical

- Order in advance
- Keep large(r) stock
- Replacements possible but we never compromise the performance
- Impact: PCB redesign
- Examples
 - FPGA chips
 - A/D converters
 - Programmable VCXO/XO

Performance – noncritical standard

- Introduce "standard"
 alternative components
- SW/FPGA needs to support the new components
- Impact: SW/FW/FPGA
 effort, testing
- Examples
 - Level translators
 - RAM chips
 - FLASH chips

Performance – noncritical non-standard

- Order in advance
- Keep stock
- Impact: PCB redesign
- Examples
 - Ethernet PHY
 - Connectors
 - Power supplies



Example: FLASH memories

Delivery date: unknown

Switched from "Recommended for new design" to "Not recommended for new designs" without warning

Class: Performance non-critical standard

Potential impact to sales: HIGH (Omni-present component on most instruments).

Actions:

- Alternative components are available from different providers, they were tested and supported in the SW/FW.
- Multiple alternative components confirmed

Effort spent: 3 ED (1 ED estimated for support still pending)

Other: increase of stock negligible





Example: ETHERNET PHY

Delivery date: 2034

Not available

Class: Performance non-critical non-standard

Potential impact to sales: MID-HIGH (Component present on one platform). Actions:

- Sufficient stock was acquired on time.
- Redesign for using alternative component was estimated

Effort spent: 2 ED (>10 ED planned for redesign if needed) Other: increase of stock / influence on cashflow





Example: ADC for Libera Photon

Delivery date: 2024

Not available

Class: Performance critical

Potential impact to sales: MID-HIGH (Critical component for one product).

Actions:

• Purchasing a stock with highly increase price (50x increase) was purchased to cover needs and already signed contracts for 2022/2023.

Effort spent: **5 ED** and profit affected for signed contracts

Other: increase of stock / influence on cashflow



Example: Programmable VCXO

Delivery date: unknown

Delivery date shifts: Q2-2022 --> Q3-2022 --> Q4-2022 --> Q1-2023

Class: Performance critical

Potential impact to sales: HIGH (Omni-present component on most instruments).

Actions:

- Using alternative components (same provider, different SW support). This required investigation in feasibility, performance tests, SW support. The integration is done in a way that the operation of the device and performance do not change (no action or changes needed on the user side, devices are used as the ones with original component)
- Keep the components stock and use them in products where alternatives are harder to implement

Effort spent: 84 ED (still on going, total estimate ~100 ED)



Example: Cost changes





Stock increase and redesigns cost



Impact:

- Ordering components for future non-confirmed purchase orders means taking a lot of risk (not doable for each project or custom products)
- Stock increase negatively impacts cash flow



Handling component obsolescence

Another dimension of the problem:

- The component availability issues might trigger earlier obsolescence
- Or can be considered like a de-facto unavailable component

This triggers needs for boards and instruments redesign and the consideration of a wider picture for new developments: it is important to use as many common components and modules as possible.

Examples of maintenance development projects

- Redesign of the ICB module (for CPU and OS in platform B, Libera Brilliance+, Libera LLRF, etc.)
- Redesign of the event-receiver module for platform B



Dealing with these issues

- I-Tech dedicates much more effort into continuous monitoring of delivery dates and availability in general: meetings 2 times per week
- Many iterations with internal development groups to find solutions
- Supply chain in constant communication with suppliers, Sales group in constant communication with customers.
- Logged R&D effort comparable to a medium-size development project
- Despite the situation, we aim at:
 - keeping full traceability of components in each board produced
 - tracking the software and firmware updates and procedures required for new/replaced components
 - delivering in time
 - providing customers with unchanged user experience and measurement performance

This is how I-Tech manages to deal with this situation, with the luxury of a dedicated supply chain, R&D intelligence, established QC process and risk management.



Delivery examples

Libera Brilliance+ for APS-U

- Contract signature: October 2019
- Delivery period: May 2020 to April 2021
- Quantity: 144 platforms with 576 BPM modules
- Biweekly meetings with APS team: review of production, testing and delivery
- Deliveries in 1+5 batches
- No delays except for batch #3 (due to strike at US carrier)

Libera Spark ERXR for HZB BESSY-2

- Purchase order: 16.7.2021
- Delivery date requested: 27.12.2021
- Quantity: 50 instruments
- Update emails or calls at important milestones
- Testing completed on 6.12.2021, equipment delivered in time



Delivery examples (2)

Libera Spark ERXR and Libera Spark EL for PAL EUV

- Purchase order: 14.10.2021
- Delivery date requested: 1.5.2022 (actual ship-out date: 13.4.2022)
- Quantity: 38 + 22 instruments
- Regular update emails
- Delivery in 1 batch

Libera Photon for IHEP

- Purchase order: 14.12.2021
- Delivery date requested: 14.6.2022 (30 units), 14.8.2022 (8 units)
- Quantity: 38 instruments
- Update emails through the Chinese agent
- Delivery delay: approximately 2-3 months foreseen



Conclusion

- Issues with component availability started in 2020
- I-Tech deliveries were not affected by the components' delivery time so far
- Situation in the components' market requires much more effort in internal processes
- The cost of internal stock has raised drastically so far
- Communication with customers on future purchases is essential to avoid impacts to the timeline

