

HBK Aerospace and Defence

PRESENTATION

Part of Spectris

World-leading precision instrumentation and controls

spectris

Spectris
Dynamics

Spectris
Scientific

Other



Spectris Dynamics is a global leader in advanced virtual and physical testing, and high precision sensing solutions.

Spectris Scientific is an international leader in advanced measurement techniques for materials analysis.

FOUNDED IN

1915

IN EGHAM, UK

2023
SALES
€1,730
MILLION



2023

OP. PROFIT
€313
MILLION

EMPLOYS AROUND

7,500

PEOPLE WORLDWIDE



spectris

IS LISTED
ON THE
LSE-SXS



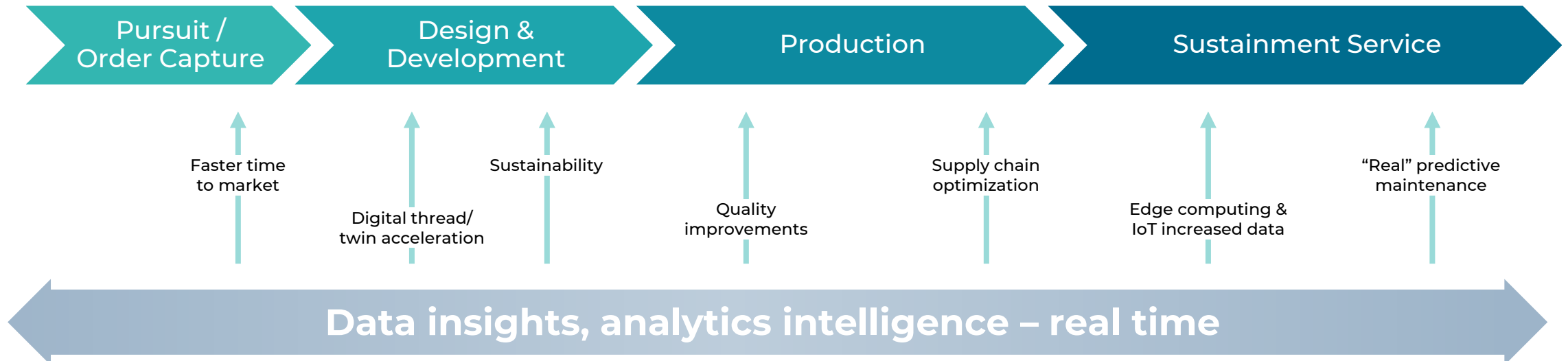


A global powerhouse across test, measurement, simulation and analysis

- 80 years of innovation
- 300+ employees working in R&D
- Over **80 new products** will be launched in 2024 alone across Virtual test, DAQ, Software and Sensors
- 35,000 customers served in more than 50 countries
- **8 acquisitions** in the past 5 years to build a complete solution in Virtual test, DAQ, Software and Sensors

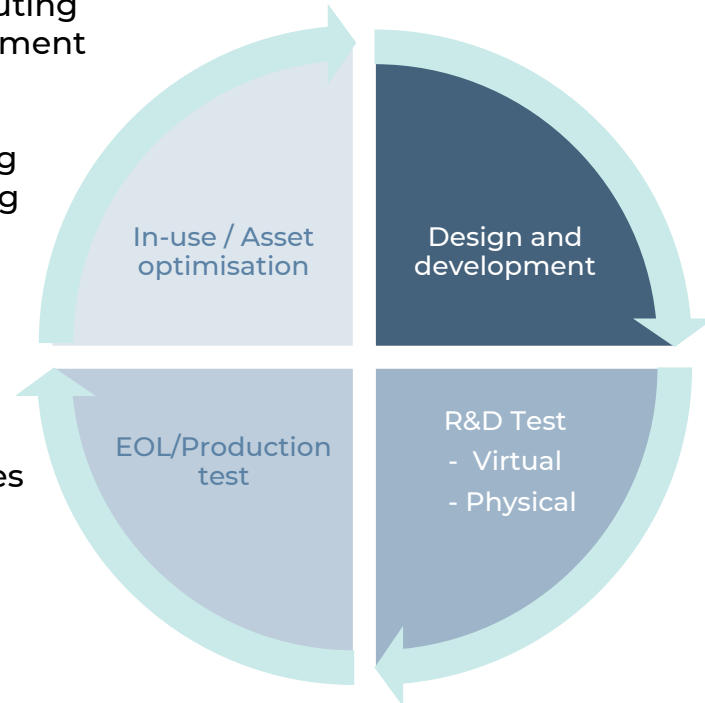
One partner for the entire product life cycle

- Simplify your test and measurement supply chain across R&D and in-use.
- Accelerate product development time through the convergence of Virtual and Physical Testing.
- Enhance processes and assets, improve production quality and deliver reliable health and usage monitoring systems - HUMS.
- Underpinned by deep aerospace expertise and supported by integrated Data Analytics and Data Management Software.



Our end-to-end Aerospace & Defence offering

- ▲ Condition monitoring
- ▲ Embedded real-time computing
- ▲ Acoustic signature management
- ▲ In-Product sensing
- ▲ Aircraft HUMS
- ▲ Structural health monitoring
- ▲ Ground vibration monitoring



- ▲ Reliability analysis
- ▲ Fatigue and durability simulation
- ▲ Condition Digital twins
- ▲ X-in-the-loop (development)

- ▲ Electrical powertrain & drives
- ▲ Environmental vibration
- ▲ Reliability maintenance
- ▲ EOL automation test (embedded sensors)

- ▲ X-in-the-Loop (test)
- ▲ Real time control
- ▲ Electrical & Gaz Turbine powertrain
- ▲ Strain stress and fatigue propagation
- ▲ Structural dynamics
- ▲ Acoustic properties & certification

Data insights, analytics intelligence – real time

Human experience meets intelligent digital capability



Exceptional service delivery from a team of highly experienced engineers, combined with intelligent digital and sensing capabilities



230+ employees acting on service and engineering team globally



4 acquisitions specific to digital in last 5 years



Market-leading SMART sensing capabilities



A sustainable partner for the future



Our commitment to innovation



- Committed to spend 8% of our sales on R&D every year



Our sustainability commitment



- Net zero operations by 2030, net zero value chain by 2040
- Science-based goals and targets aligned with the UN's Sustainable Development Goals



Four strategic avenues for growth



- **Electrification:** capture the mobility and energy transition
- **Automation:** Enable productivity in a highly connected world
- **Digitalisation:** Provide domain insights and data management
- **Virtual Test:** Support the shift towards a virtual innovation environment

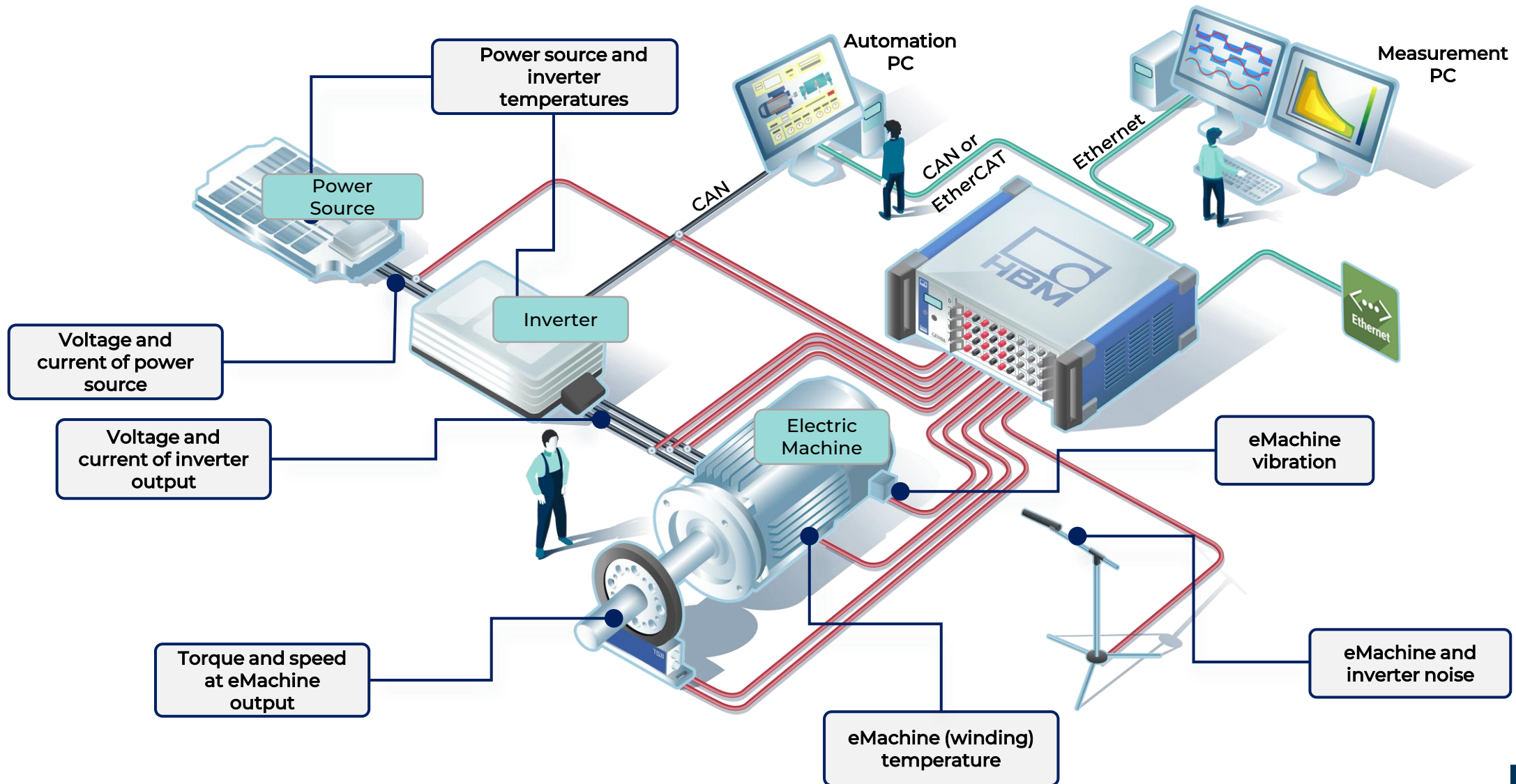
Introduction of a remote probe based data acquisition system for power measurement in EMC critical environments or applications with long distances

Klaus Lang
Business Development Manager
Electric Power Testing
Hottinger, Brüel & Kjær

Agenda

1. The electric power train and power measurements
2. Some specifics on electrical testing in Aerospace
3. The typical approach with conventional power analyzers
 - Wiring
 - Problems
 - Increasing voltages & switching frequencies
4. A new approach
 - Concept and technology
 - Wiring
 - EMC issues
 - Safety
 - Fast
5. Summary and conclusion

Electric Power Train testing



Agenda

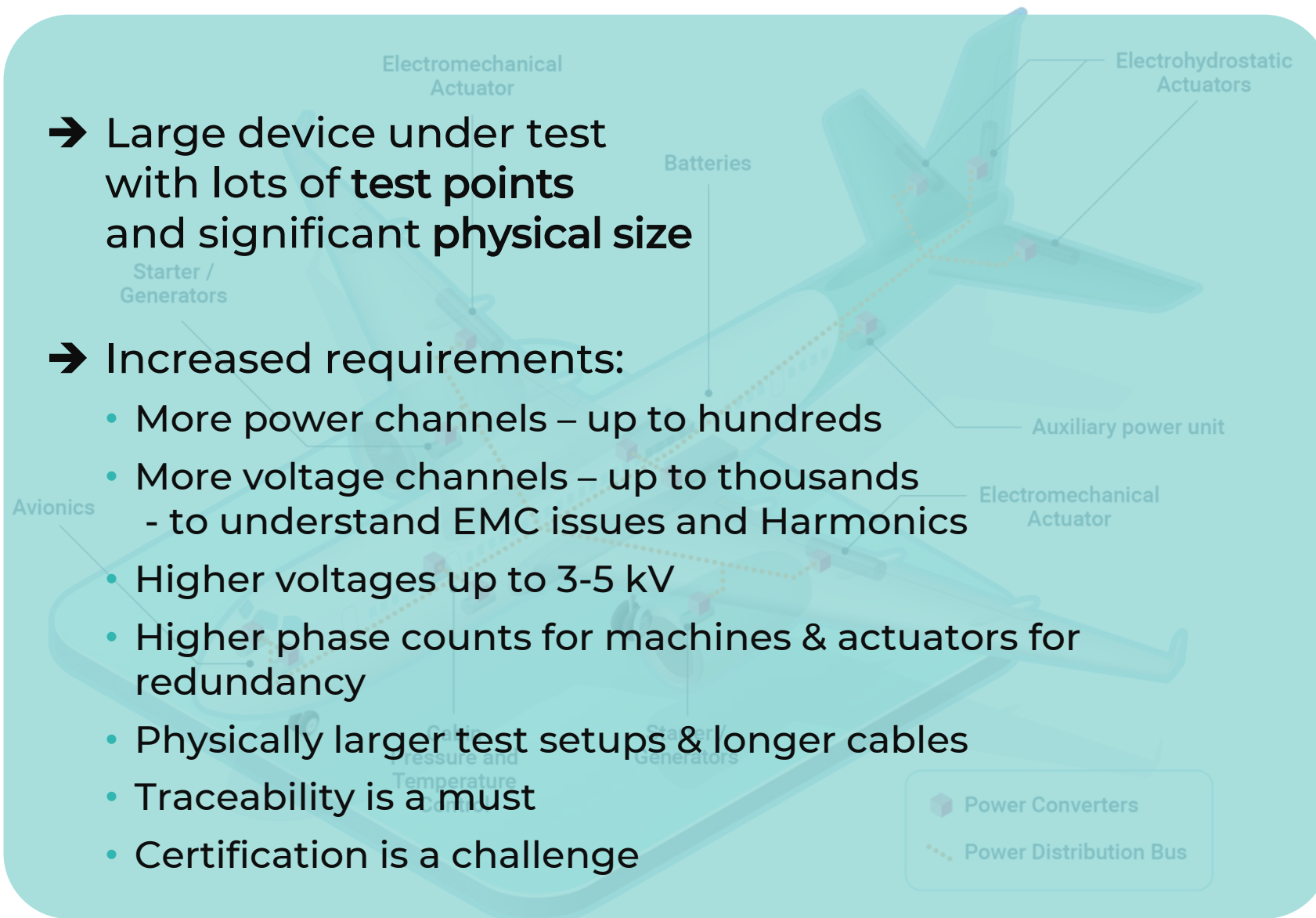
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More electric aircraft testing

→ Large device under test with lots of **test points** and significant **physical size**

→ Increased requirements:

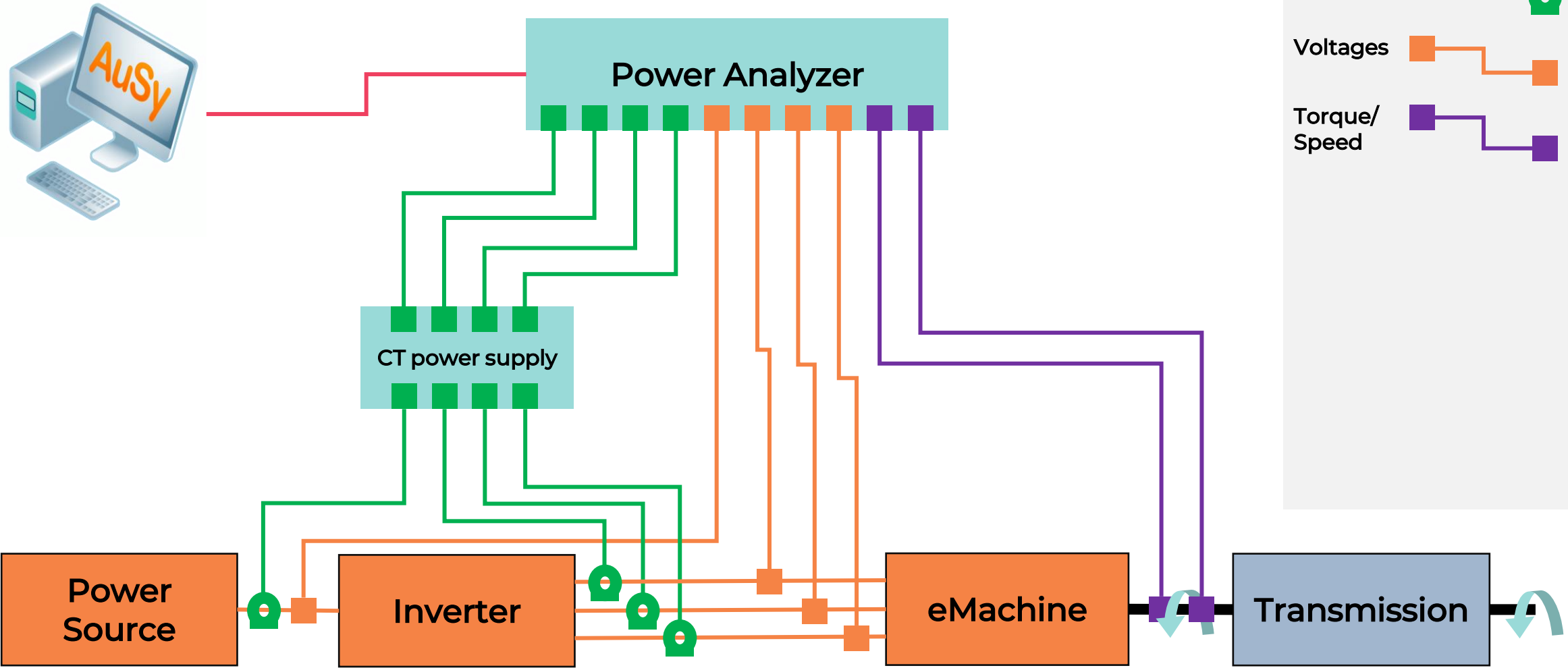
- More power channels – up to hundreds
- More voltage channels – up to thousands - to understand EMC issues and Harmonics
- Higher voltages up to 3-5 kV
- Higher phase counts for machines & actuators for redundancy
- Physically larger test setups & longer cables
- Traceability is a must
- Certification is a challenge



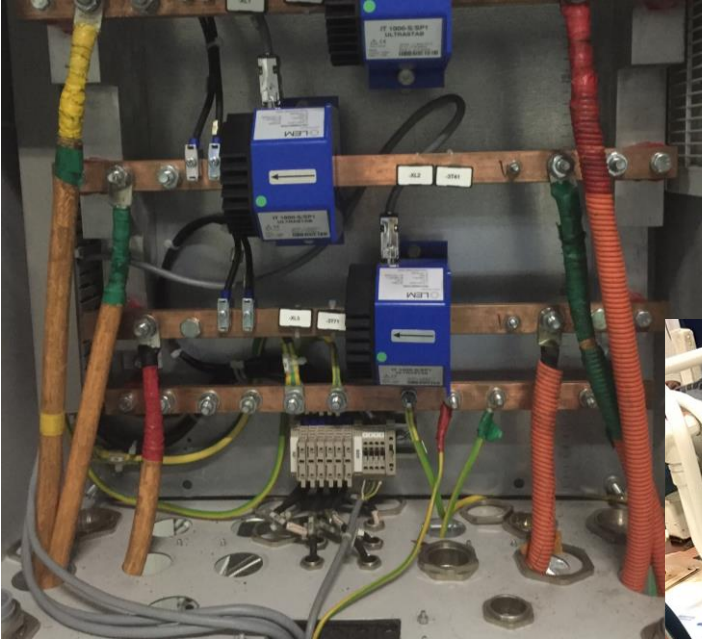
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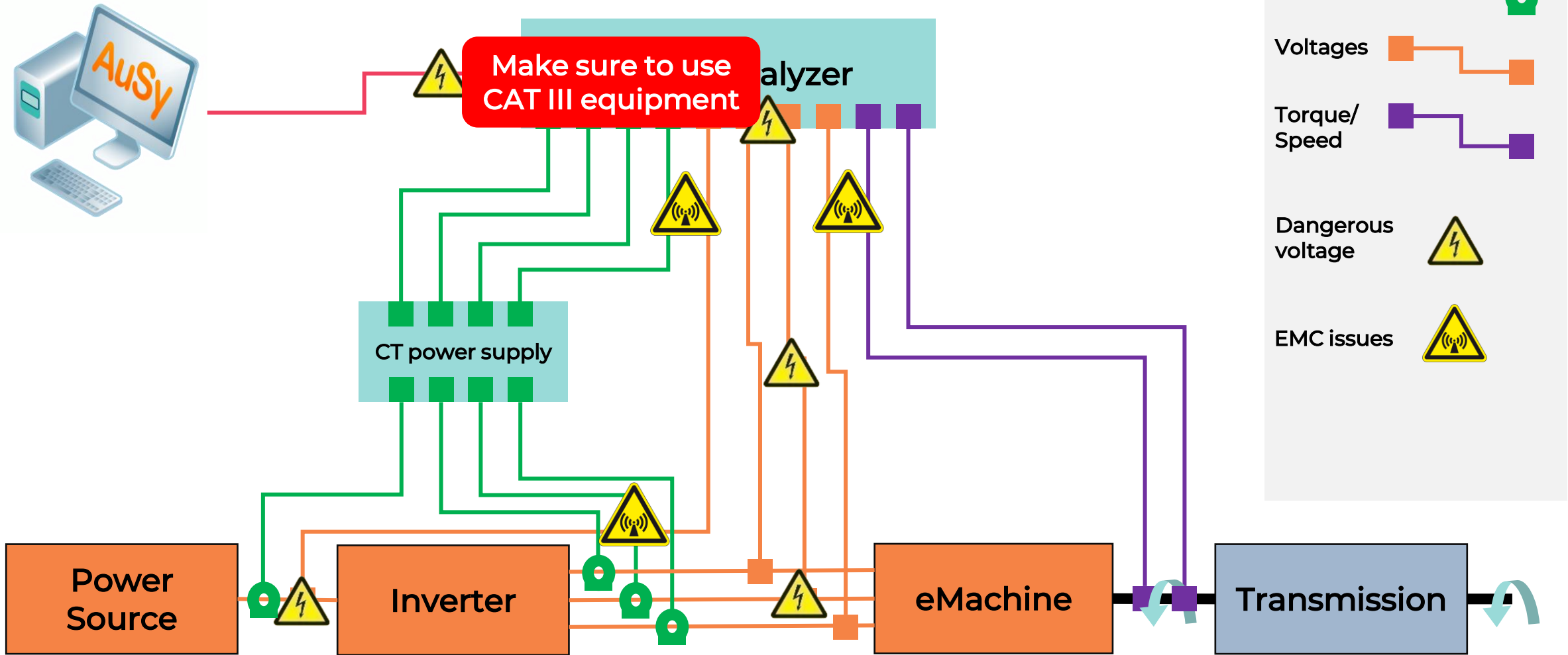
Typical (clean) cabling for power measurements



Electric powertrain testing in reality



Problems with a typical cabling



Increasing voltages & switching frequencies

DC link voltages for electric systems and drives are going up

- ▲ This increases all EMC problems
- ▲ Requires higher safety levels
 - Be sure the Power Amplifier meets the needed Voltage level and Overvoltage Categories
 - Typical test rigs are CAT III installations, make sure your Power Amplifier is certified for this!

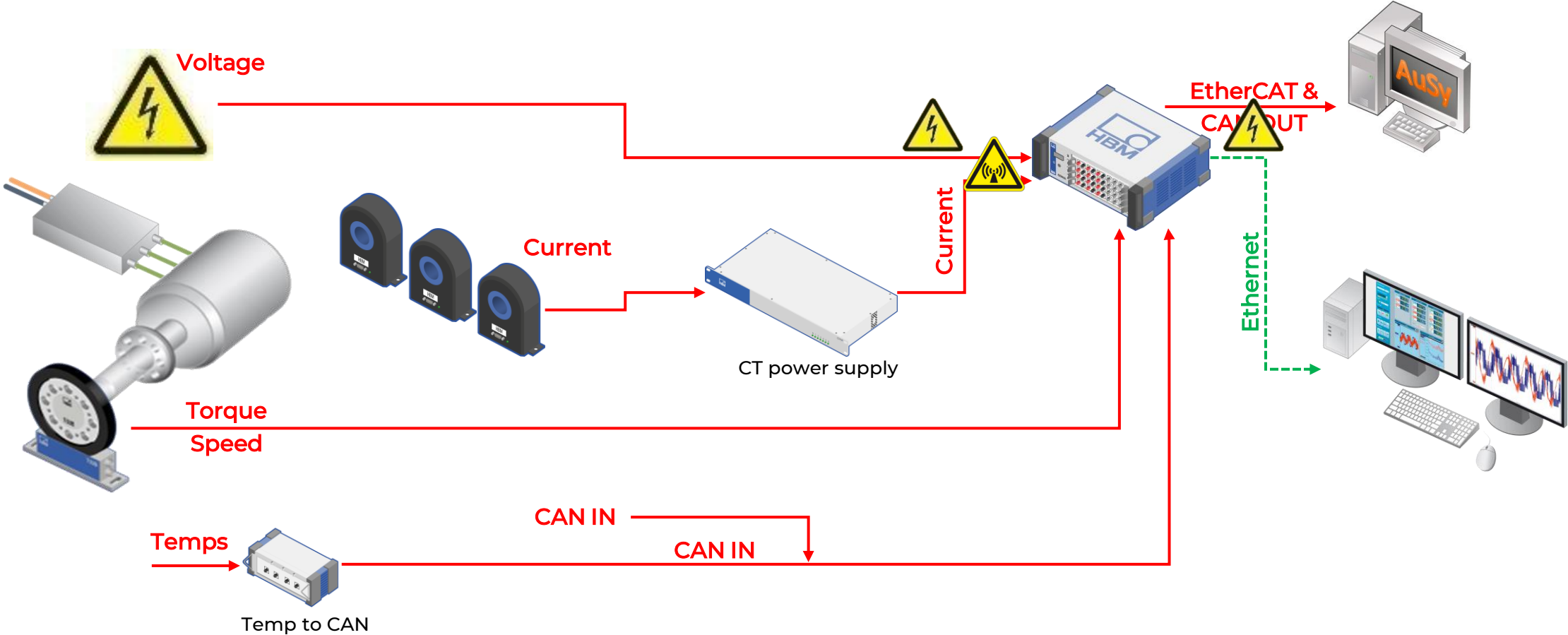
Switching frequencies are going up on inverters

- ▲ Increases EMC problems
- ▲ Long cables and cable capacitance are causing problems:
 - Bandwidth limiting
 - Reflections are causing measurement errors

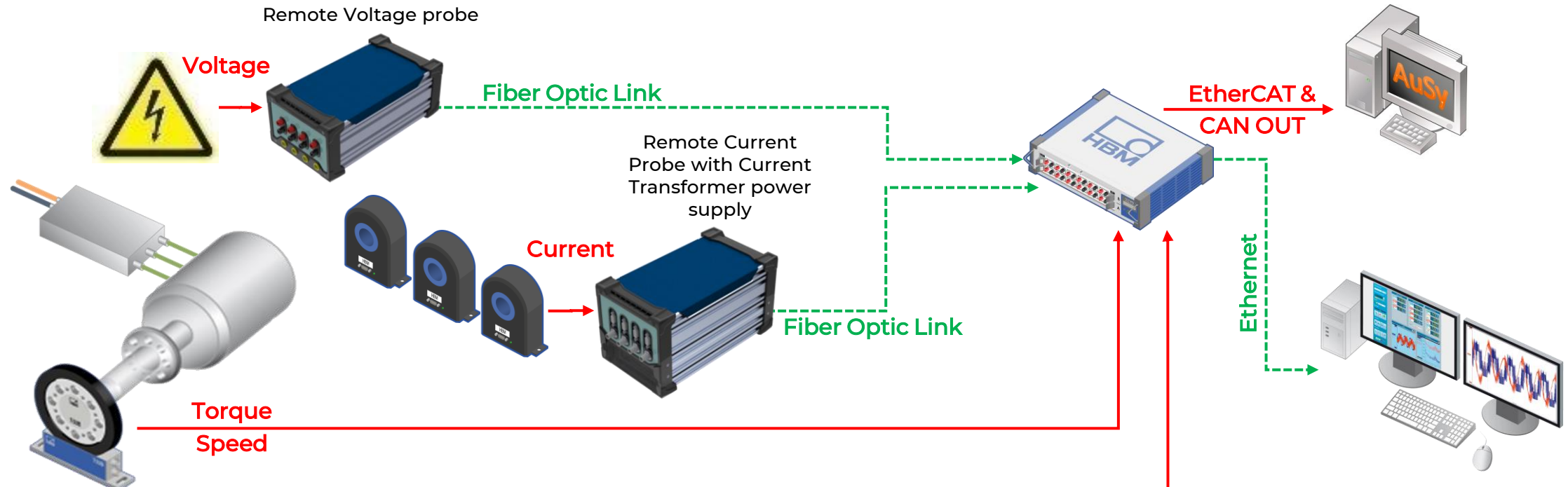
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Current solution

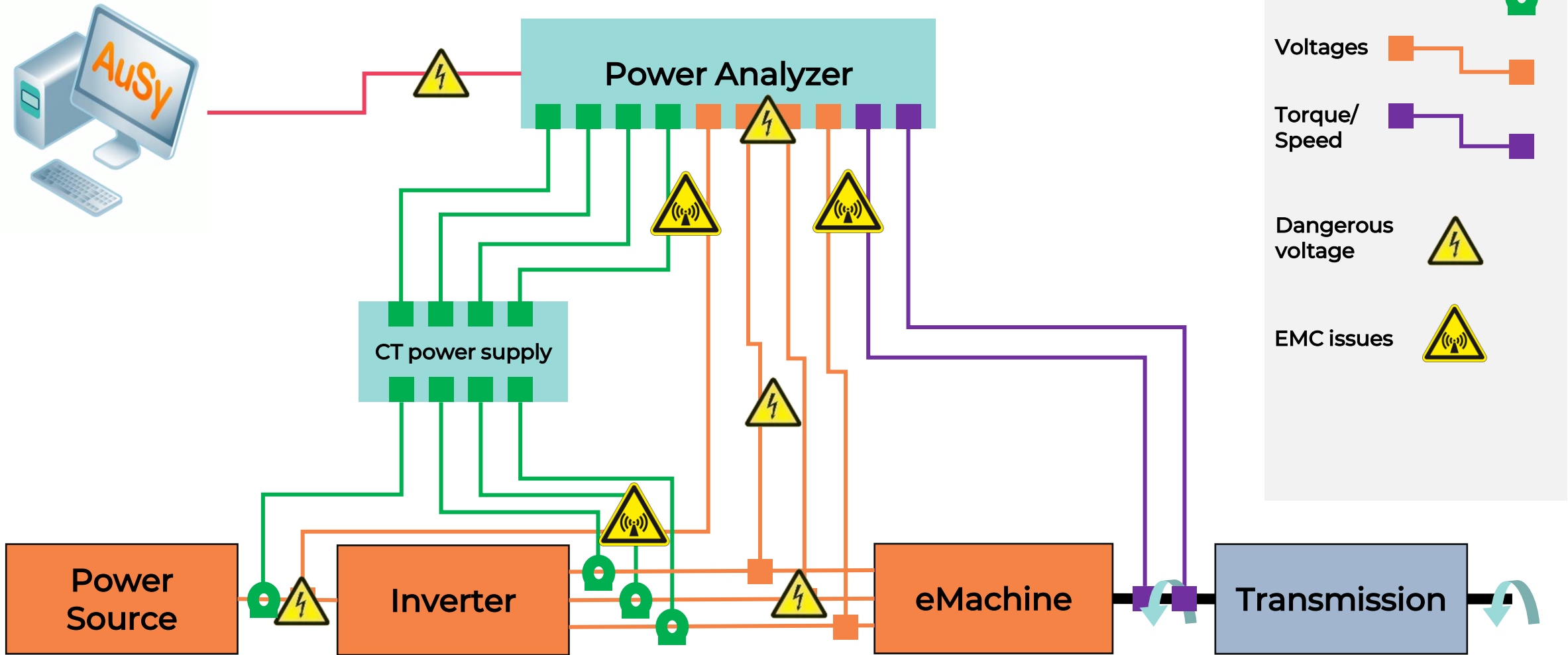


New concept with voltage & current remote probes

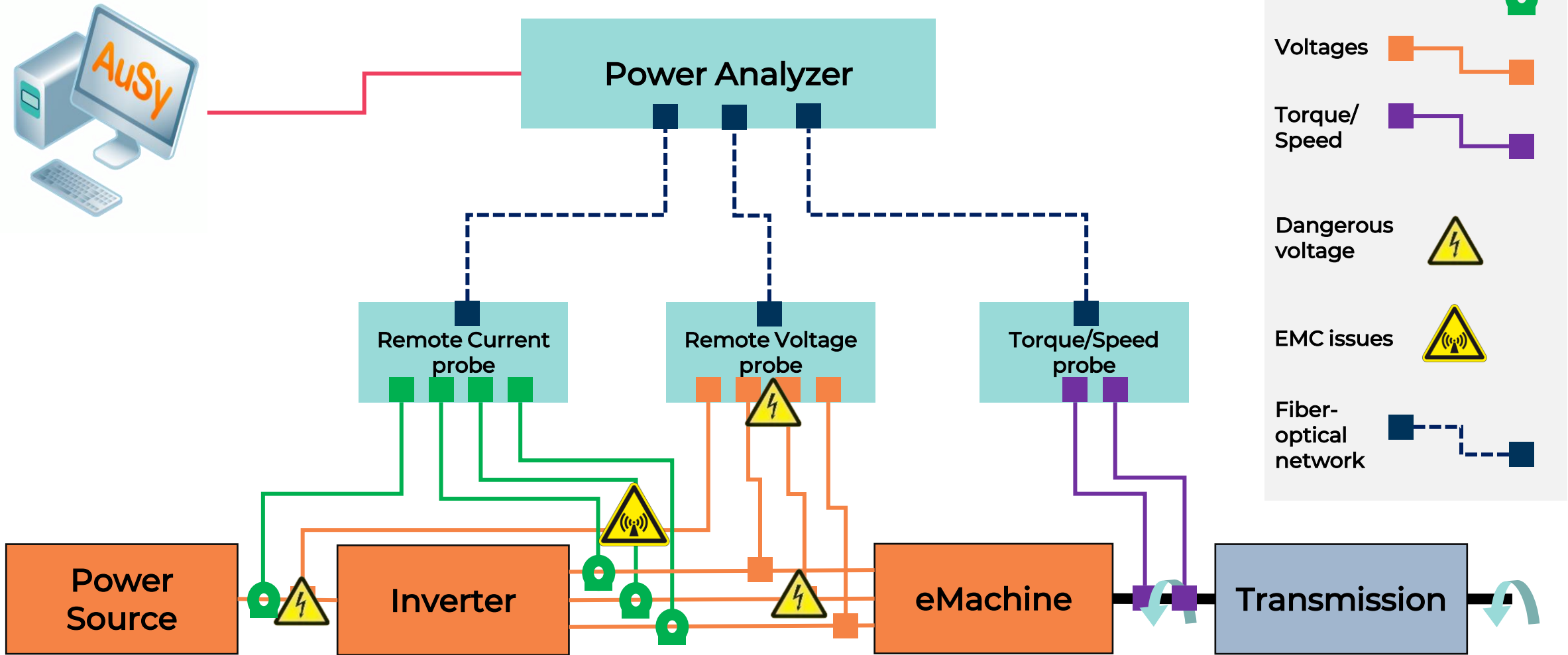


- ▲ Uncompromised safety
- ▲ Minimizes EMC issues
- ▲ Shorter cables prevent reflections
- ▲ Integrated Current Transformer power minimizes cabling
- ▲ Distributed setup with cable length up to 50 m

Problems with a typical cabling



Remote probe based power measurement conce



New remote probes – first variants

Remote Voltage Probe

- 5 voltage ranges up to ± 2000 V DC
- 4 individually replaceable voltage channels
- 2 MS/s or 20 MS/s sample rate

Remote Current Probes

- 6 current ranges up to ± 2 A
- 4 individually replaceable current channels
- Two built-in precision burden resistors
- Additional voltage inputs for current clamp usage
- 2 MS/s or 20 MS/s sample rate
- Variant available with built-in power supply for CT's

Remote Probe receiver / Power Analyzer GN800B

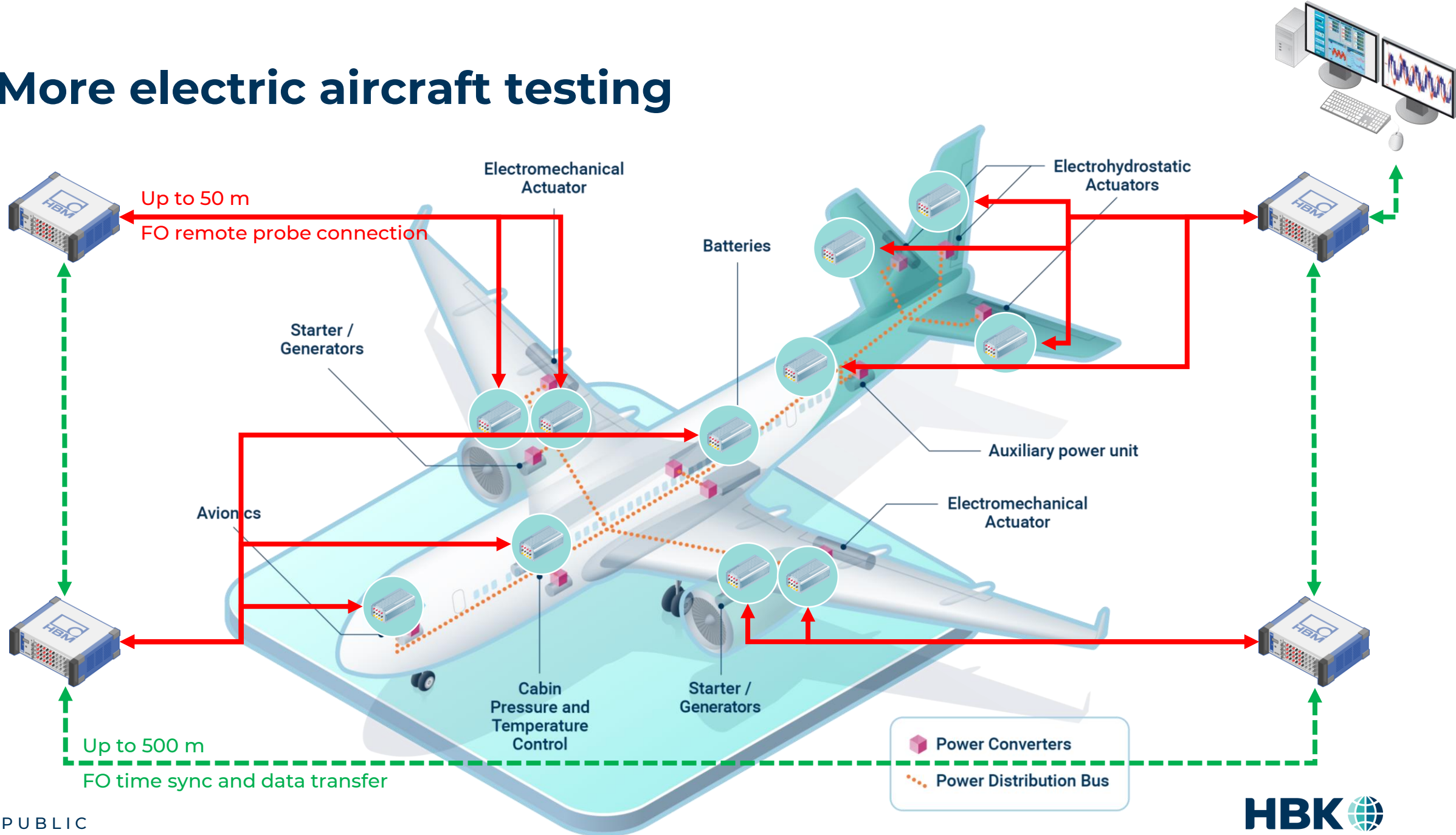
- Serving two remote probes (= 4 power or 8 voltage or 8 current channels in a single slot)
- Predefined and user definable real-time calculations
- Result transfer to automation systems or HiL controllers with < 1 ms latency



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More electric aircraft testing



Summary & Conclusion – Remote Probe based Power Analyzer

▲ The HBK „optical“ Power Analyzer

- Scalable to any channel count
- Multi-Mainframe setups up to 500 m
- Voltage, Current, Power channels
- Other physical inputs channels for Strain, Force, Accelerometers, Temperatures and more
- Real time bus inputs and outputs
- ± 2000 V voltage inputs, up to 5 kV via divider
 - Overvoltage categories 1000 V CAT IV
- Built-in power supply for CTs
- Highest sample rates up to 2 / 20 / 250 MS/s
- Continuous storage with 400 MB/s /mainframe

▲ Features added with the remote probes

- **Increased safety**
- **Increased flexibility**
 - Longer (FO) cables up to 50 m
 - Mix voltage & currents according to requirements
- **Higher accuracy**
 - Less EMC emissions and injections
 - Eliminates noise on current or torque/speed signals
- **Better results by shorter cables**
 - Higher bandwidth & Less reflections
- **Lower operational costs**
 - Less safety efforts & troubleshooting
 - More reliable results
 - Easier calibration: satellites only

How can we help?

Explore our website

www.hbkworld.com

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