Queen Mary
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Industry Links

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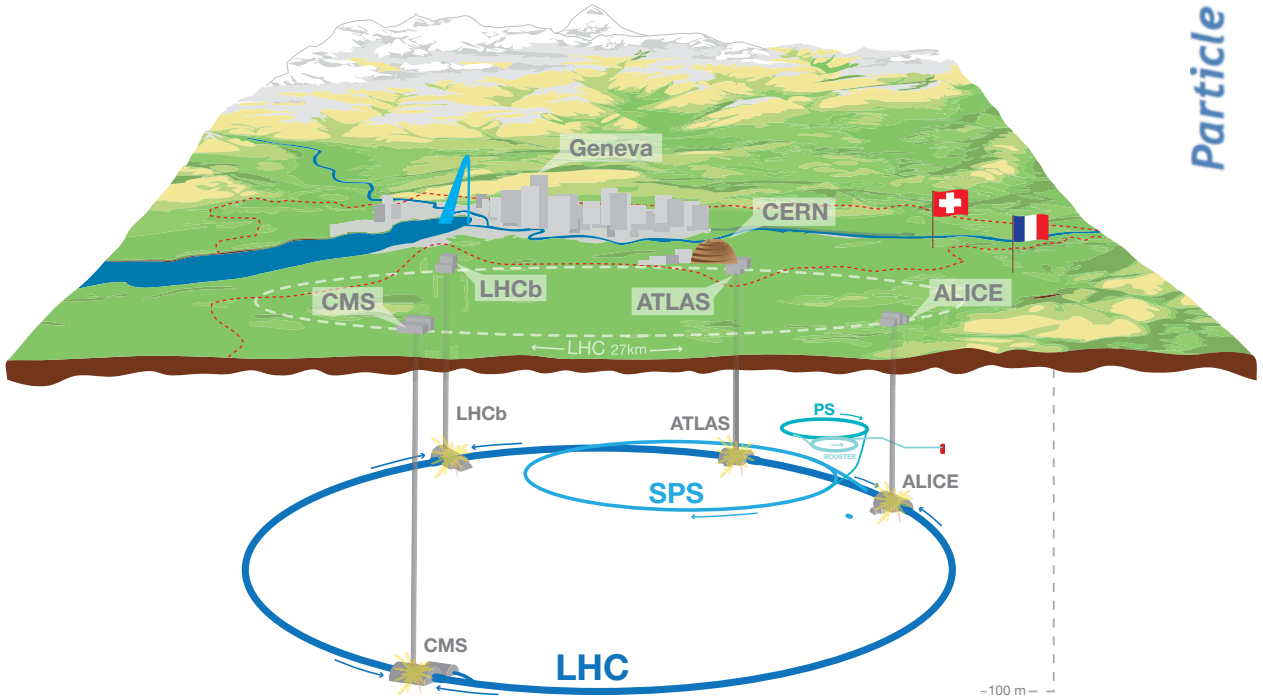
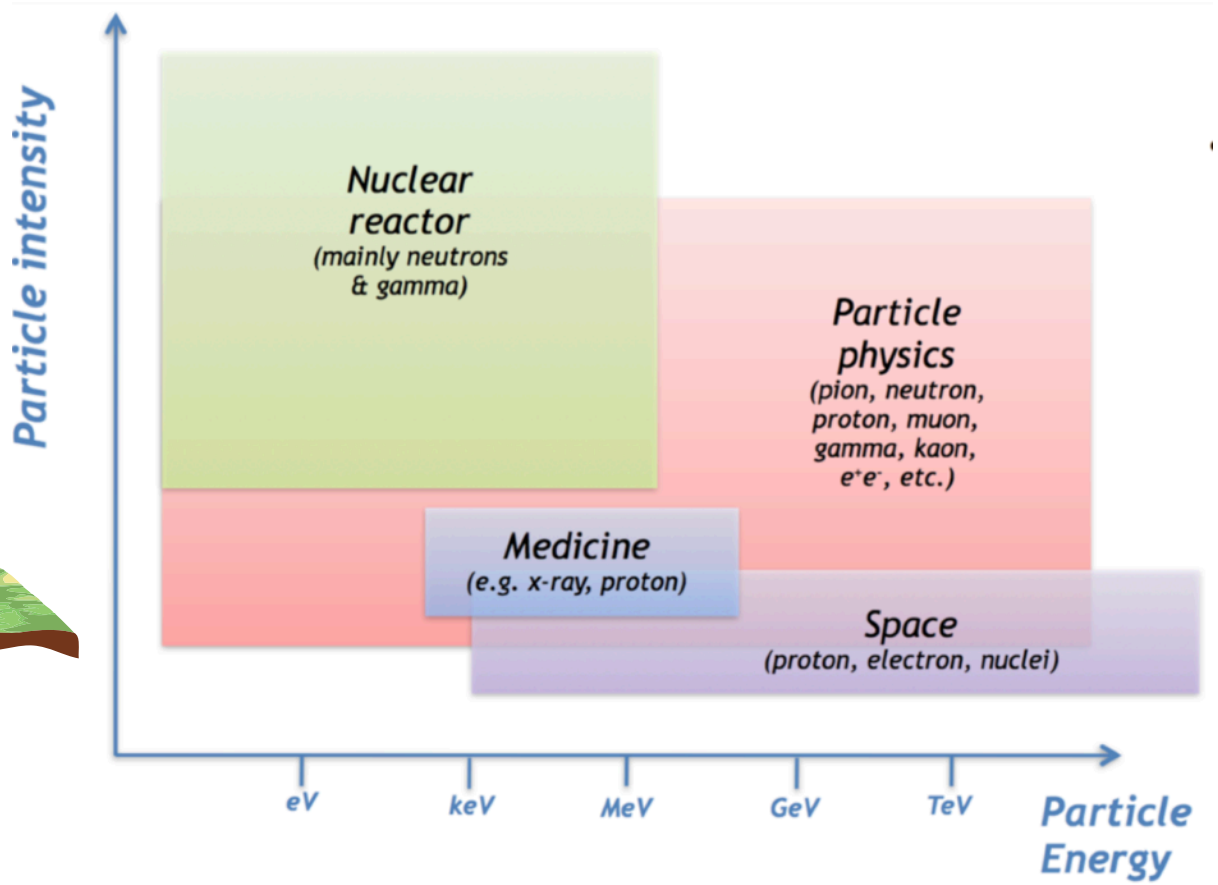
LHC Particle physics environment



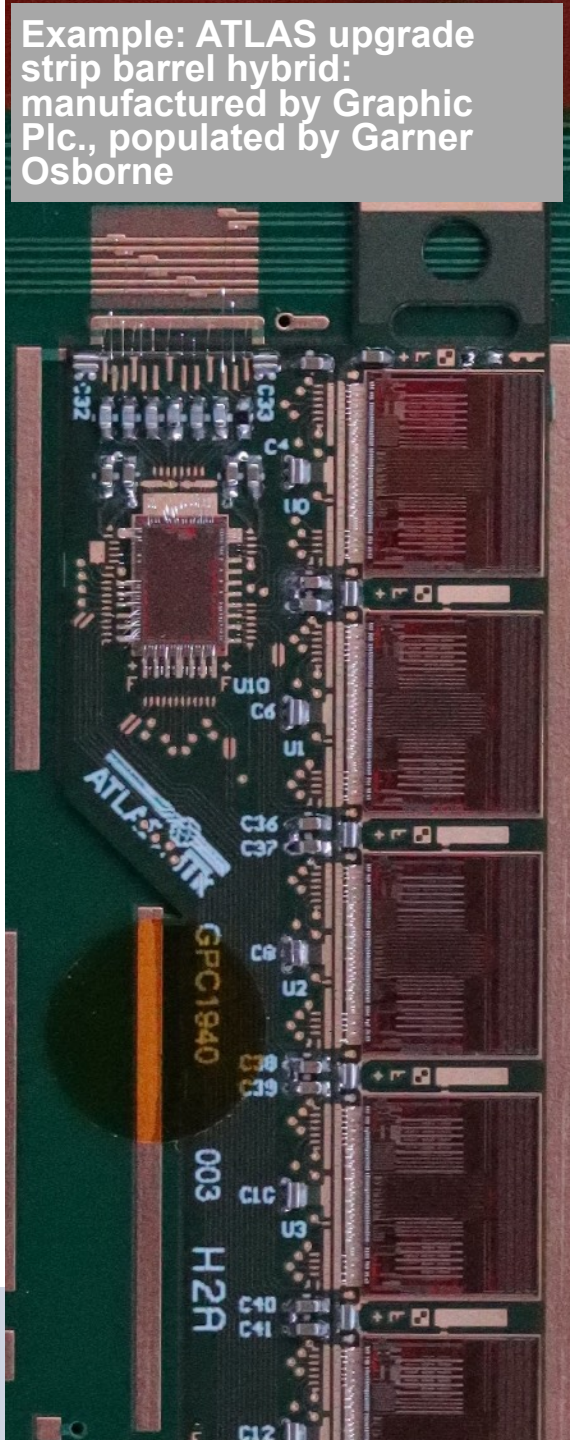


Industry Links

- The Large Hadron Collider (LHC) requires novel solutions to unique problems
- Many off the shelf components will work well
- For some parts need to study radiation damage effects to qualify proposed solutions
- Some problems needed a lot of academic research to understand, but often required industry to ramp up for “production” of bespoke instruments
- We learn from and rely on industry experts to co-create solutions new where necessary
- Industry is an unsung hero of the LHC story

Industry Links: supply chain

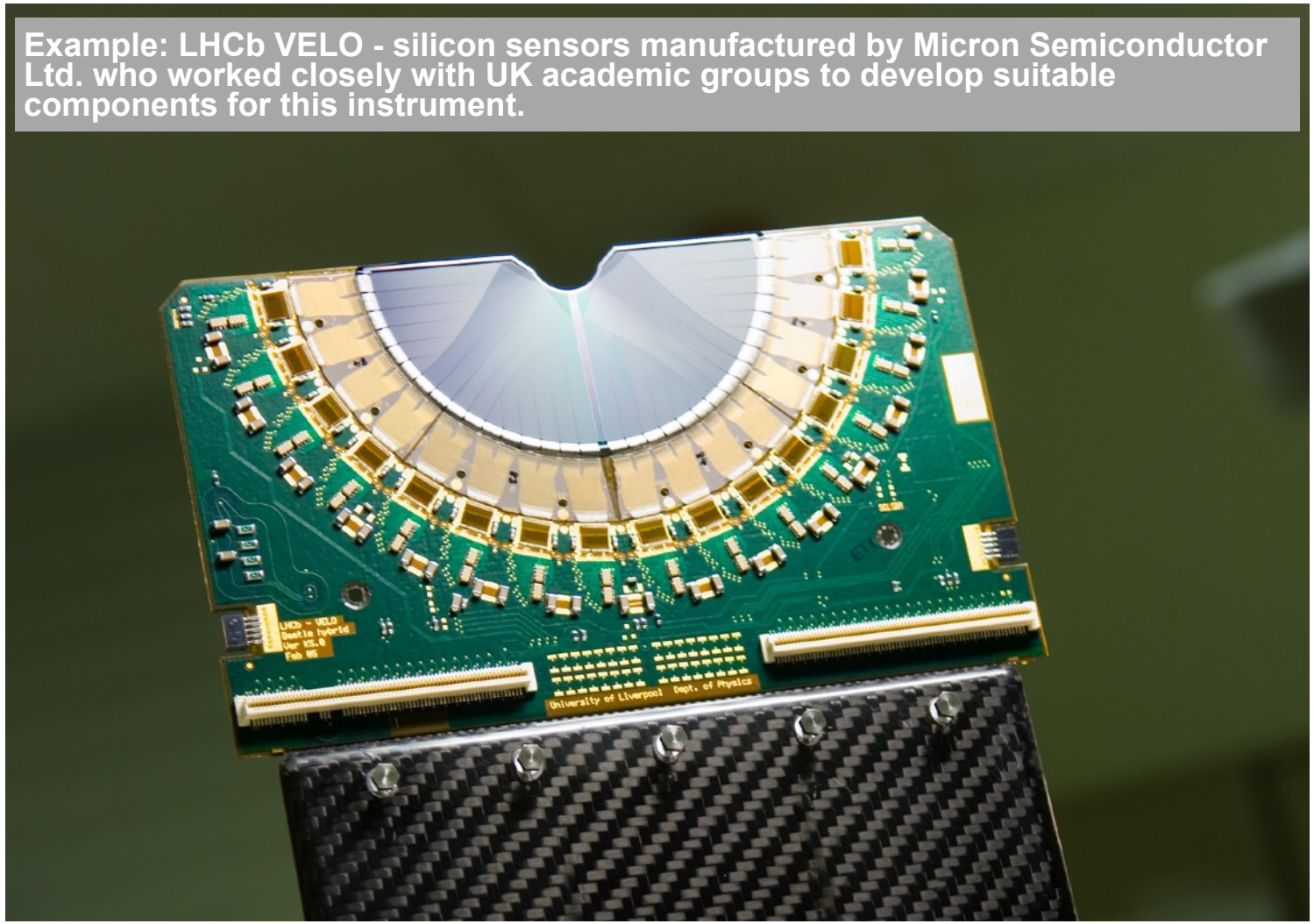
- The UK has an excellent manufacturing base covering heavy industry and high-tech components
- Examples include: Ability to source components and materials from around the world and
  - Assemble key parts, such as ceramic electrical brakes in cooling systems for detectors
  - Manufacture PCBs to required specifications, addressing global supply issues of ‘qualified’ parts
  - Manufacture tooling required for system builds
- Retail sector giants like RS and Farnell are also key to manage just in time assembly



Industry Links: Co-creation of solutions

- SME's are a vital part of the LHC team
- Knowledge of cost-effective fabrication methods
- Ability to scale up production
- Flexibility to try something different
- Essential for success

Example: LHCb VELO - silicon sensors manufactured by Micron Semiconductor Ltd. who worked closely with UK academic groups to develop suitable components for this instrument.



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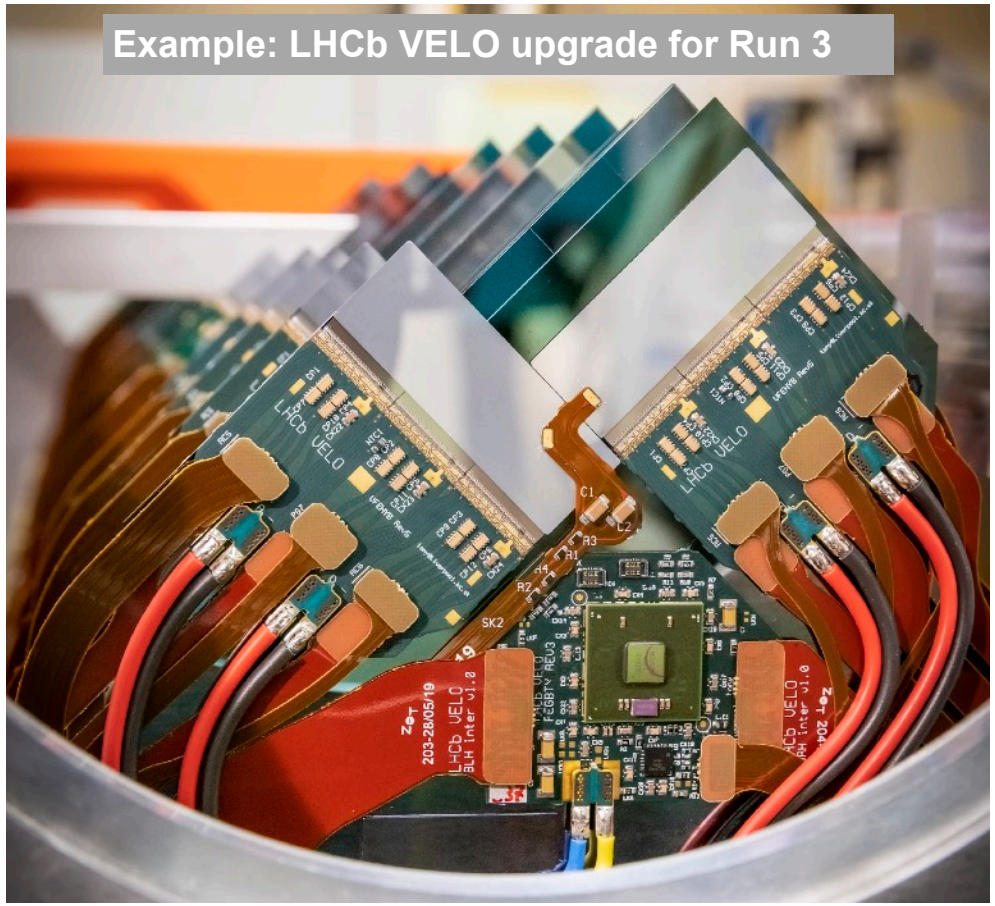

Industry Links: Co-creation of solutions

- SME's are a vital part of the LHC team
- Knowledge of cost-effective fabrication methods
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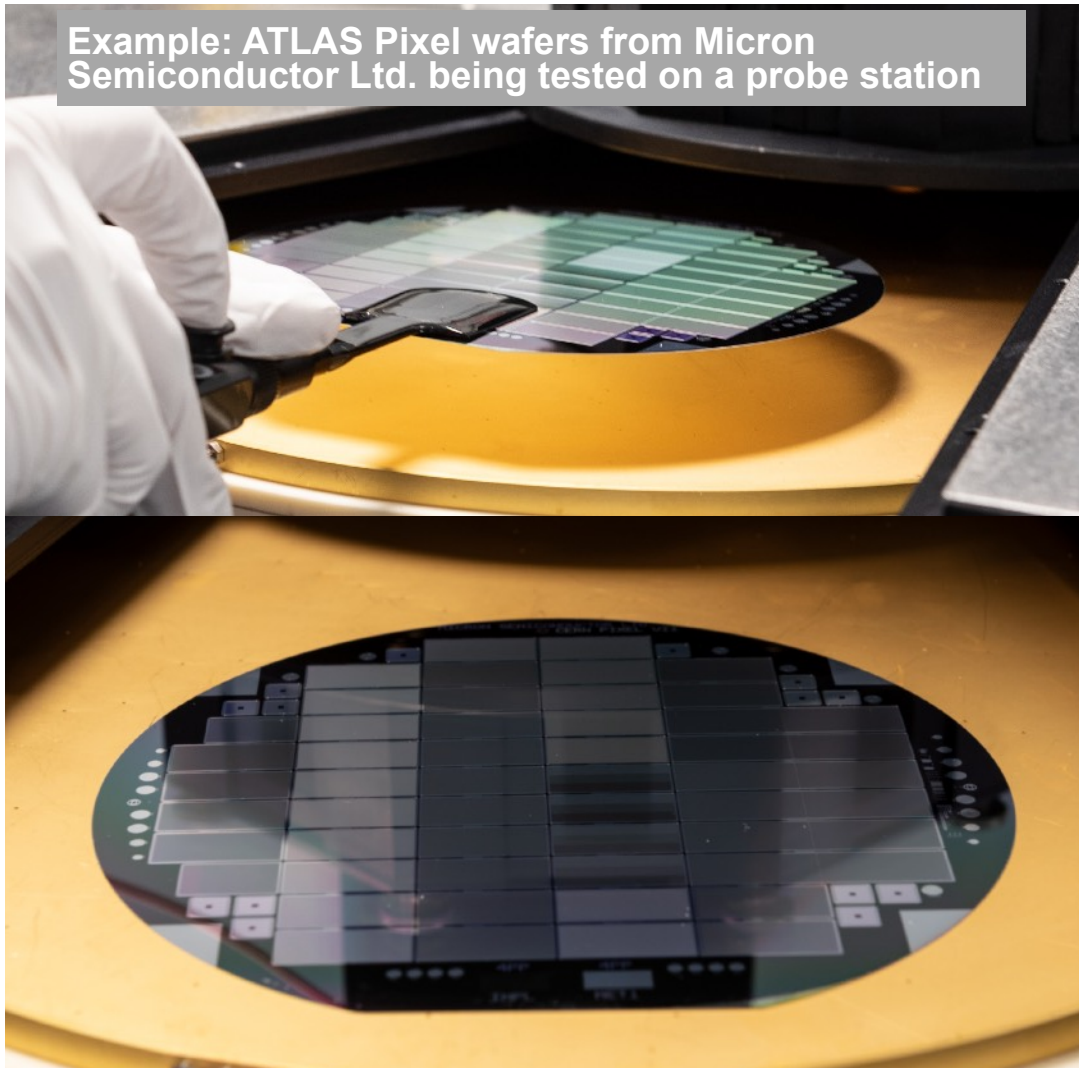
- Other LHC experiments have similar examples



Industry Links: Long standing partnerships

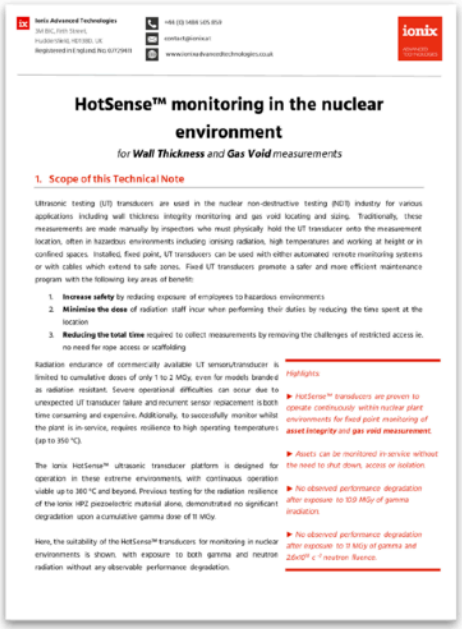
- The UK's GRIDPP benefits from competitive pricing from industry leaders such as Dell and Viglen
- These are vital for our scientific results and design of detector upgrades
- Other tech companies such as NVIDIA have played significant roles with LHC academics holding industry fellowships
- An army of companies provide equipment, training, and maintenance for universities and laboratories.
- These are all essential components of the UK's LHC academic community

Example: Lord Sugar opening an upgraded PC farm at QMUL

Example:Clean room used for sensor testing for the ATLAS upgrade programme

Industry Links: … once the LHC is built

- Big science enhances technical capabilities of academia and industry
- Can lead developing new solutions for real world problems and industry-academia networks fuel the next generation of instrument construction
- The community is working with Micron and EEV to developing LGAD technology for future accelerators



Summary

- Industry is vital to support our big science goals:
  - An essential part of the research ecosystem
  - Augment the expertise of university and national laboratory facilities
  - Expert in cost effective fabrication - valuable knowledge feeding in from their customer base to the scientific community
  - Ability to create something “new” and translate tech from R&D to production line

Also see the Technopolis report “Evaluation of the Benefits that the UK has derived from CERN”