Opening Reception

Monday Feb. 2nd 2025

Danish Chips Competence Centre

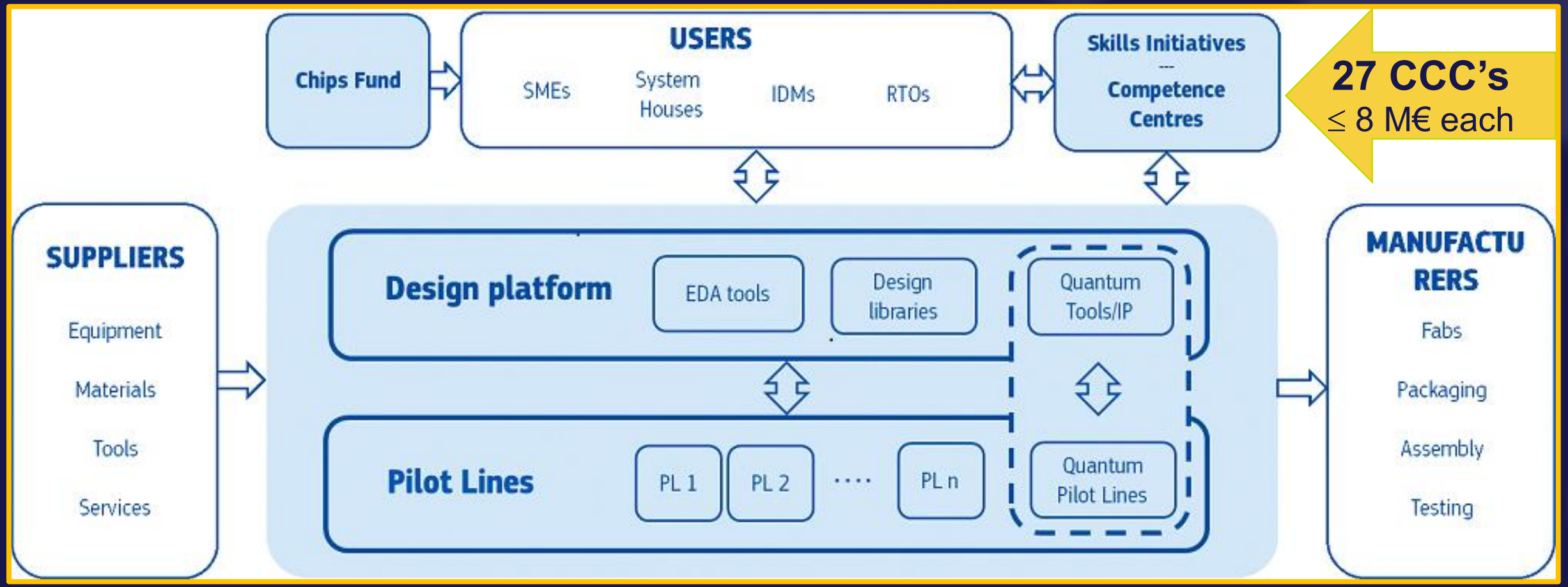
14:30 Introduktion til DKCCC fokusområder og partnere

- Claus Friis Pedersen (DTU Nanolab): DkCCC overblik
- Farshad Moradi (AU): Chip-design
- Michael Kjær (DFM): Chips og avanceret karakterisering
- Peter Krogsgaard (KU): Kvanteforskning og chips

Afrunding

Danish Chips Competence Centre

‘Chips for Europe’ Overview



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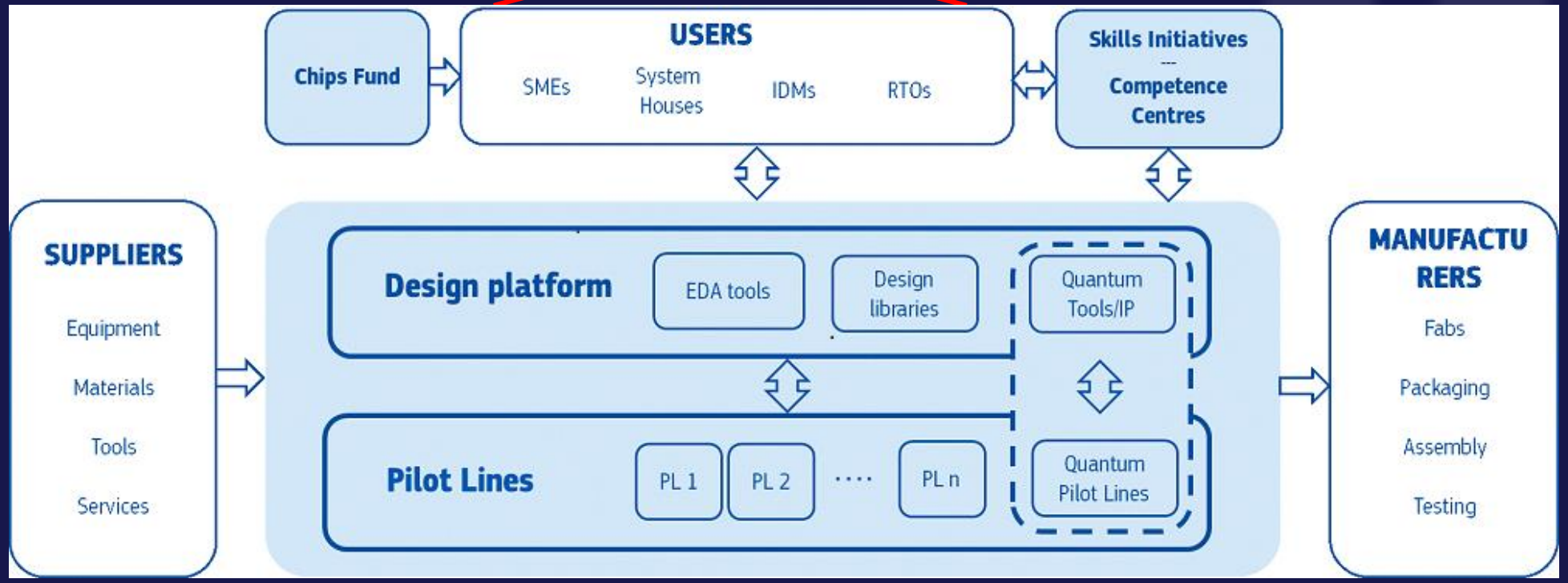
Chips Competence Centres: DkCCC Vision

Increase the number of Danish companies developing, fabricating and marketing successful chip solutions.

DkCCC Vision1



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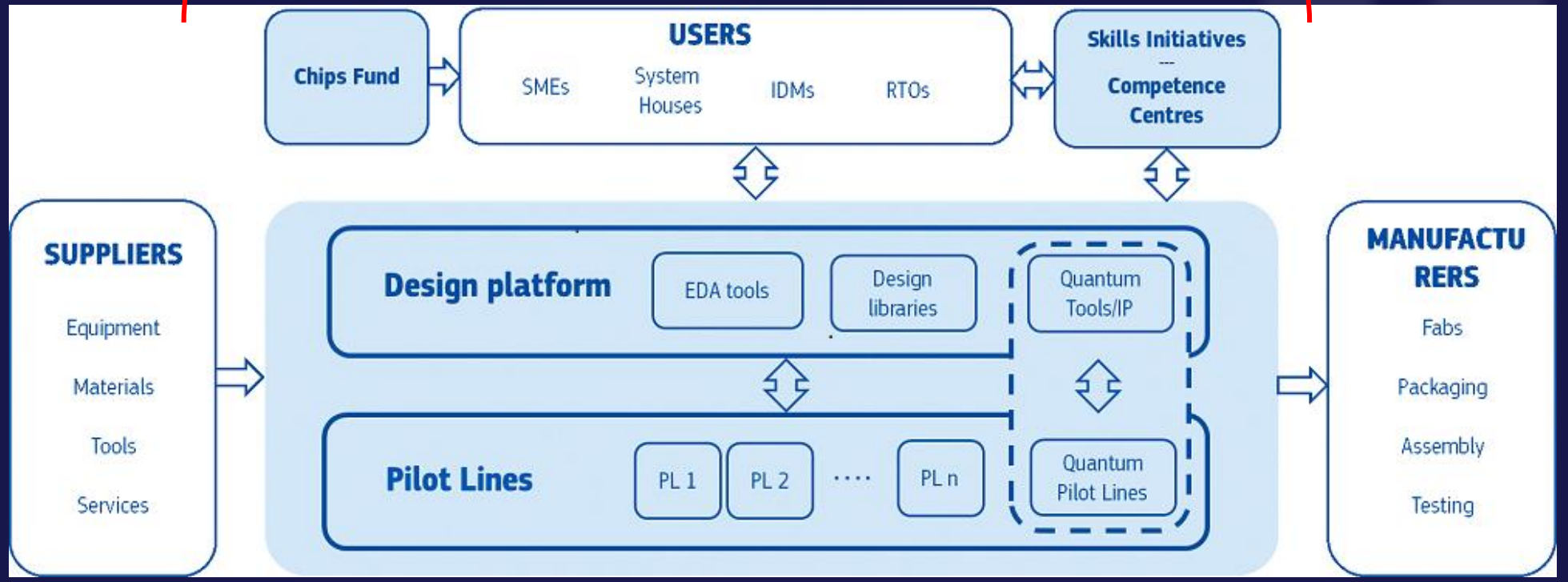
Chips Competence Centres: DkCCC Vision

Establish an integrated chip ecosystem in Denmark, closely connected with EU chip competence centres and the European chip community.

DkCCC Vision2



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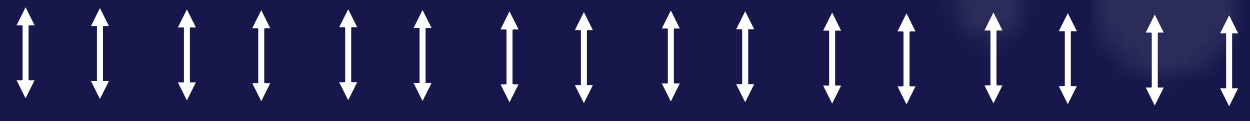
Danish Chip Competence Centre - DkCCC

Users/Companies and Chips eco-system



Design

Fabricat.

Quantum

DkCCC

Services: Networking & Competences
50 services initially proposed
User driven services is next step

AARHUS UNIVERSITET

DTU

KØBENHAVNS UNIVERSITET

ansk Industri

DFM

Danish Chips Competence Centre

DkCCC: Organisation.

Users/Companies and Chips eco-system

WP3:
Skills & Training

WP4:
Business Enablement

WP6:
Outreach & Awareness

WP5
Chips JU
National CCC's

Associated Expert Services

WP1&2 Centre Set-up & Project Management

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DTU
KØBENHAVNS UNIVERSITET
ansk Industri
DFM
Danish Chips Competence Centre

DkCCC: Partner Competences, DTU

Chip Fabrication

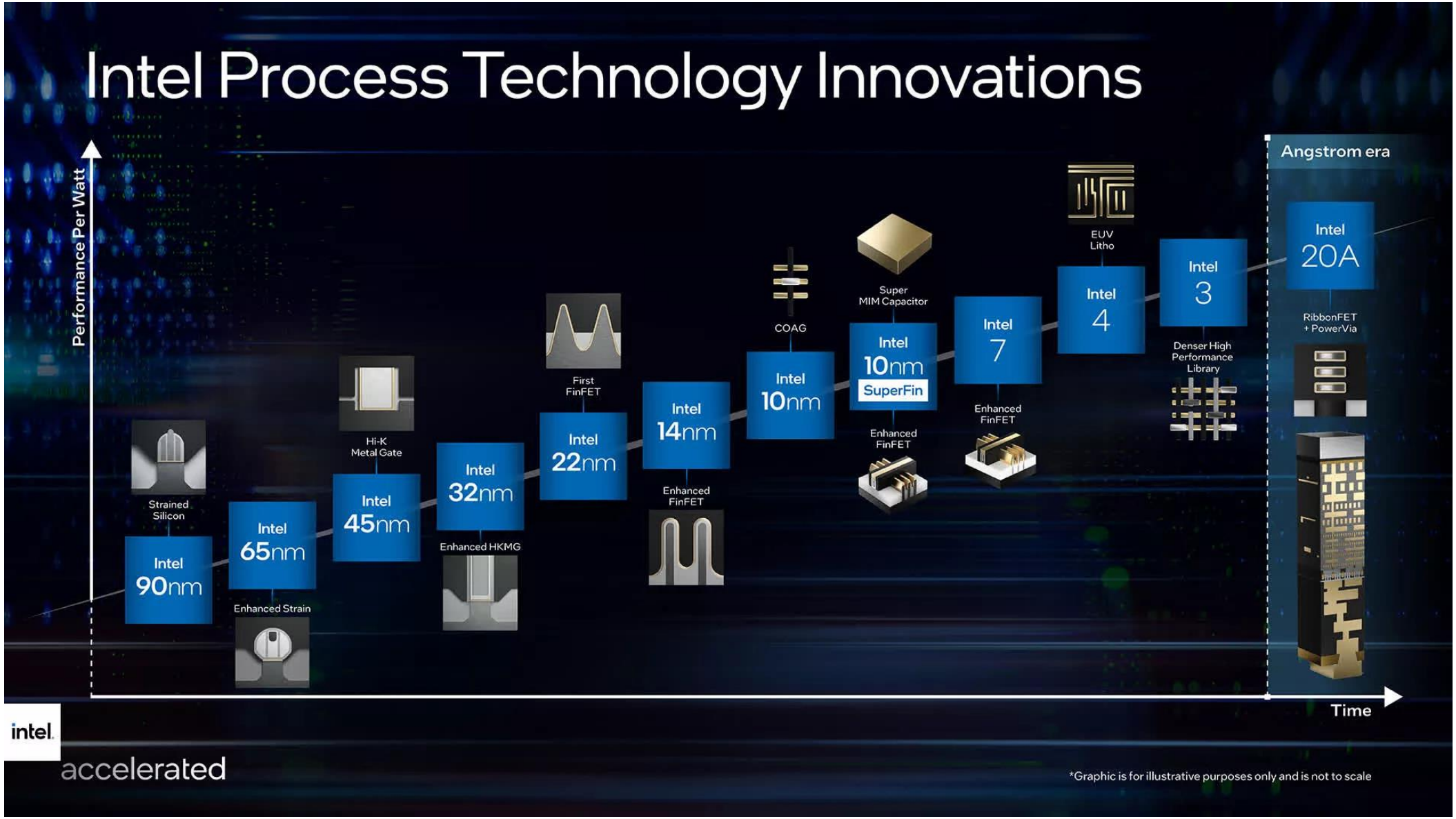
Business Development

DTU Chip Forum

Danish Chips Competence Centre

CHIP DESIGN

Danish Chips Competence Centre


Intel Process Technology Innovations
Performance Per Watt
Time
Angstrom era
Intel 90nm
Strained Silicon
Intel 65nm
Enhanced Strain
Intel 45nm
Hi-K Metal Gate
Intel 32nm
Enhanced HKMG
Intel 22nm
First FinFET
Intel 14nm
Enhanced FinFET
Intel 10nm
COAG
Intel 10nm SuperFin
Super MIM Capacitor
Enhanced FinFET
Intel 7
Enhanced FinFET
Intel 4
EUV Litho
Intel 3
Denser High Performance Library
Intel 20A
RibbonFET + PowerVia
intel
accelerated
*Graphic is for illustrative purposes only and is not to scale

1

Product definition and specification

Product management, system architecture, and customer define initial product requirements

2

Architecture/system design

System architects define block-level architecture for the design and may leverage previous IP

3

Integrated circuit design

Multidisciplinary effort:

- Logic: Initial analog and digital design
- Circuit: Digital synthesis and design for test
- Layout: Routing and mask generation

Verification

Verification engineers verify design functionality and timing through simulation

4

Post-silicon validation

Validation engineers validate physical device functionality across extreme working conditions

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Data Trends That Challenge The Network

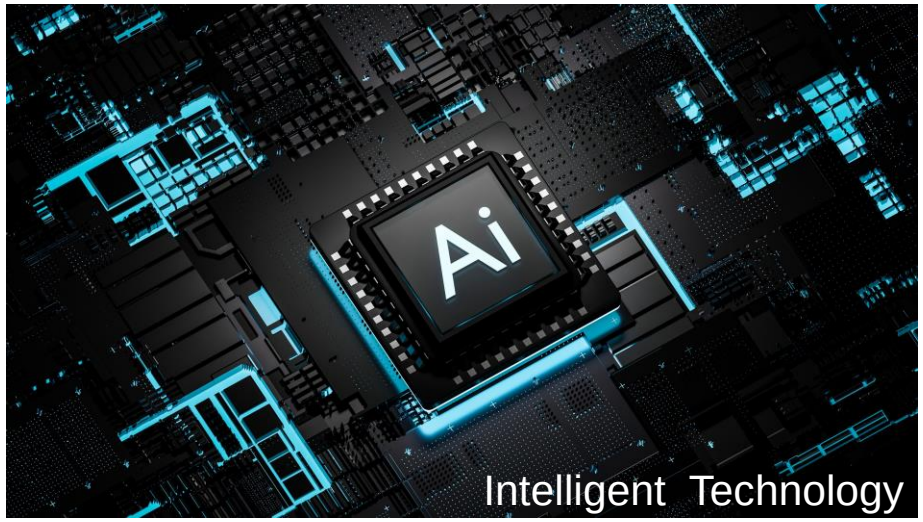
Billions of devices are becoming connected driving the need for network capacity to scale

Video content is exploding, and buffering is a deal breaker for digital natives

Artificial Intelligence infuses experiences and processes with data, but security and privacy are concerns

Machine-to-machine communications opens opportunities, requiring reliability and ultra-low latency

Our Foucs



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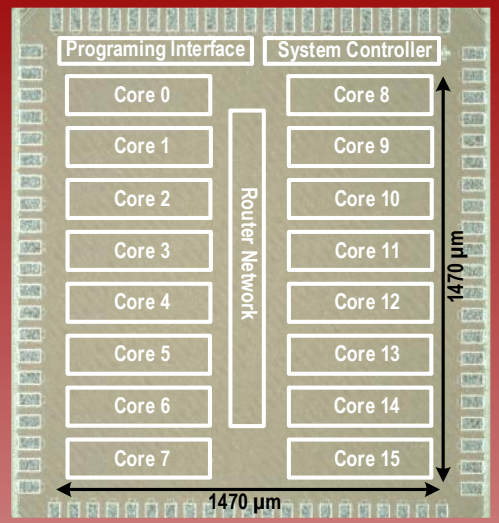
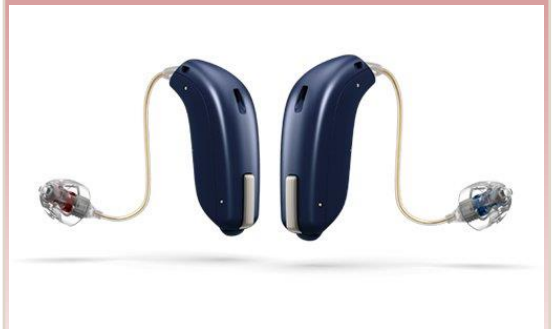
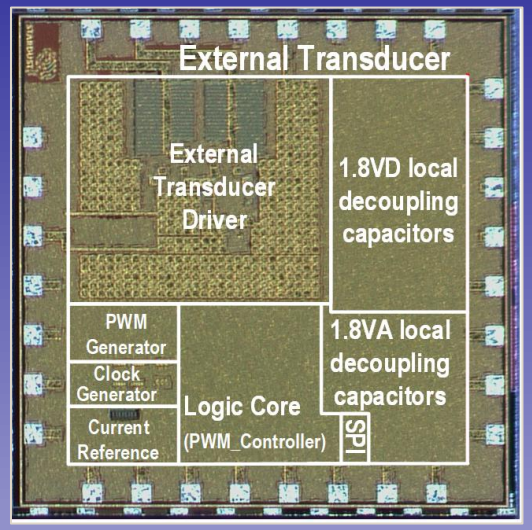
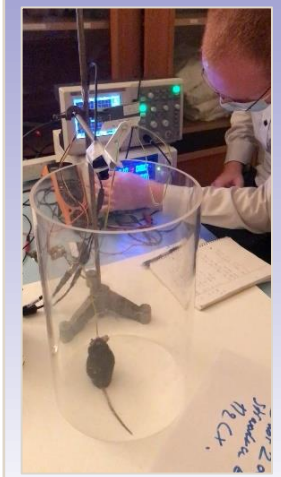


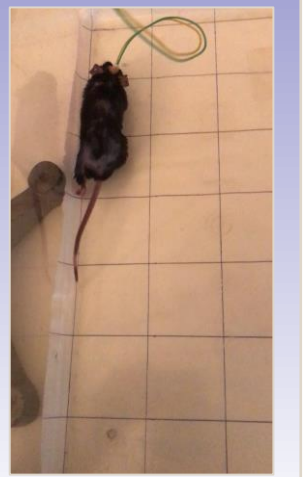
Brain-Inspired AI HW

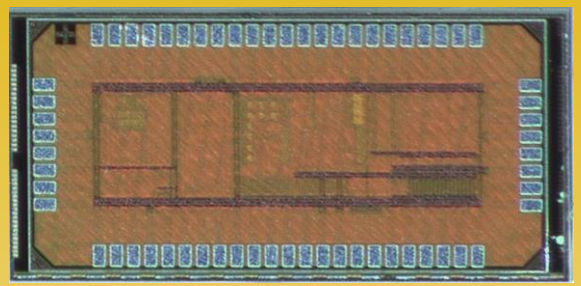




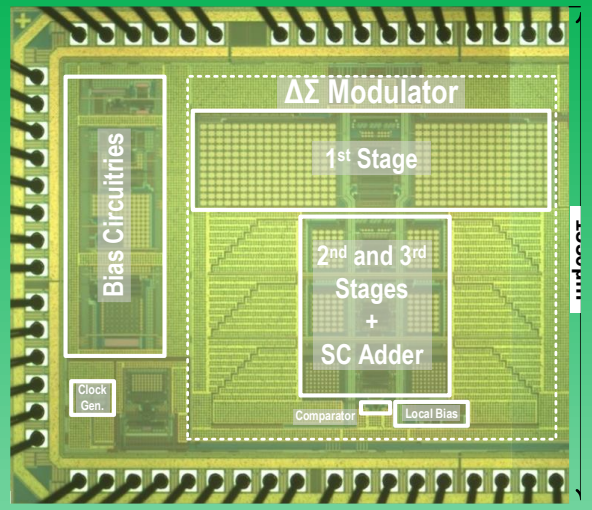
Neural Recording



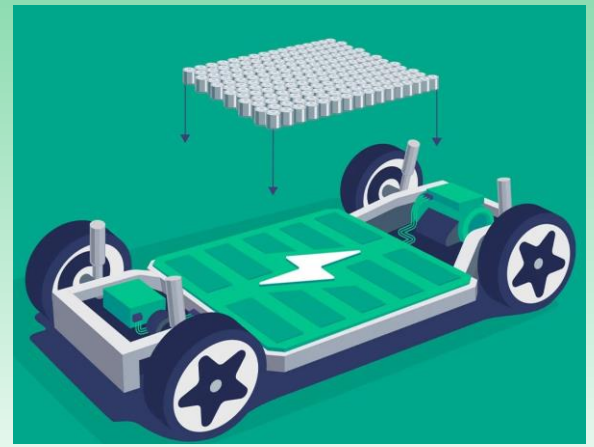




Water Leakage Sensing Chip



Spintronic Magnetic Field Sensor



DKCCC
Inauguration at DTU

Michael Kjær, CEO

2025-02-03

DFM
Danmarks Nationale Metrologiinstitut

Danish Chips Competence Centre

Danish National Metrology Institute

DFM is one of the 7 GTS institutes in Denmark that report to UFS, developing technological infrastructure critical for Danish companies and society.

We possess the highest measurement competence in Denmark within several key measurement areas.

Act as a bridge between academia and industry.

40+

Years of highly specialised metrology knowlege

43

Employees

26

PhDs

11

Specializing in quantum technology

DFM
Danmarks Nationale Metrologiinstitut

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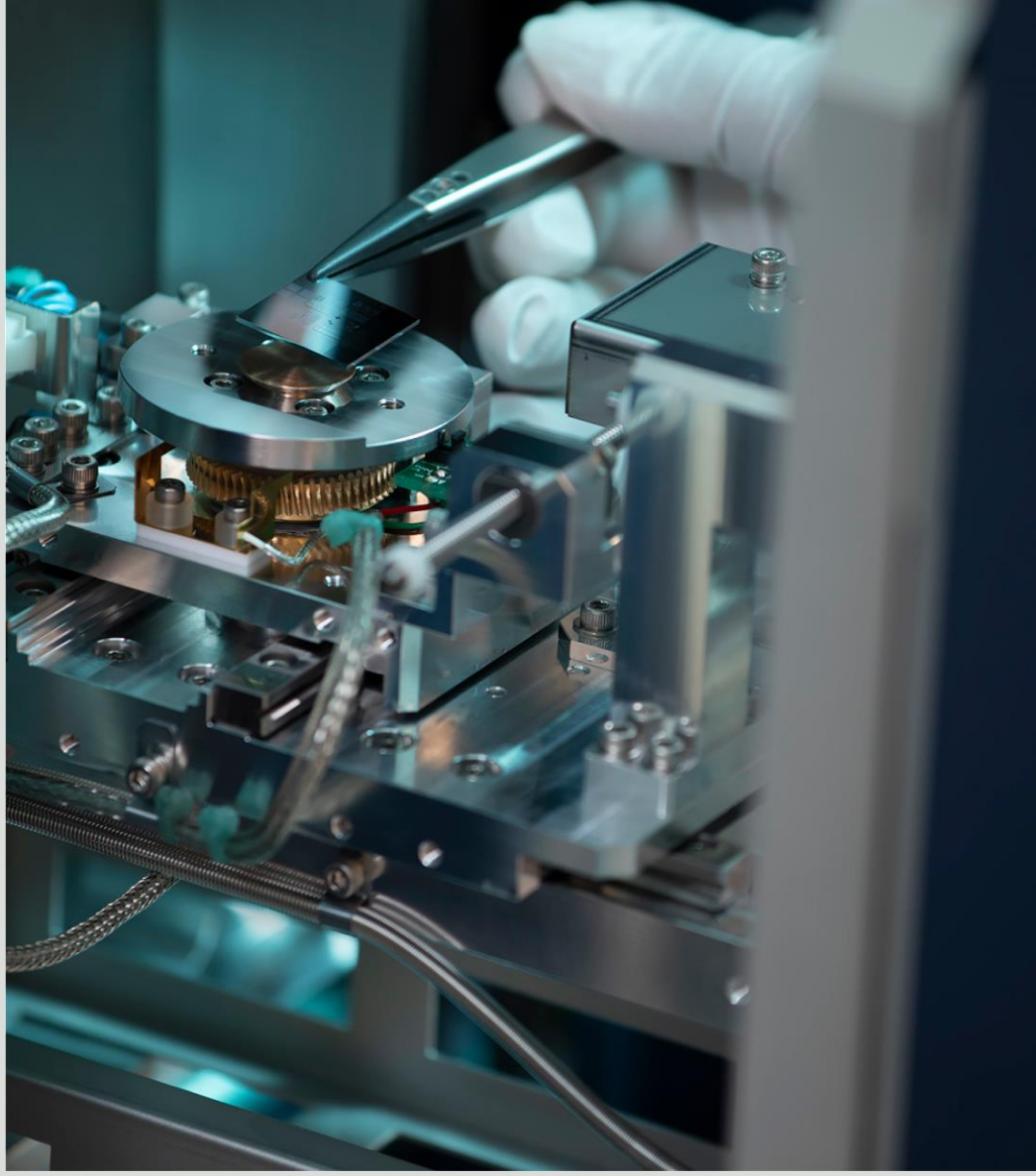
DFM Quantum Activities

- Development of quantum materials & metrology, superconducting circuits, single photon chips, photonic integrated circuits
- Quantum standardization, measurement equipment and measurement protocols



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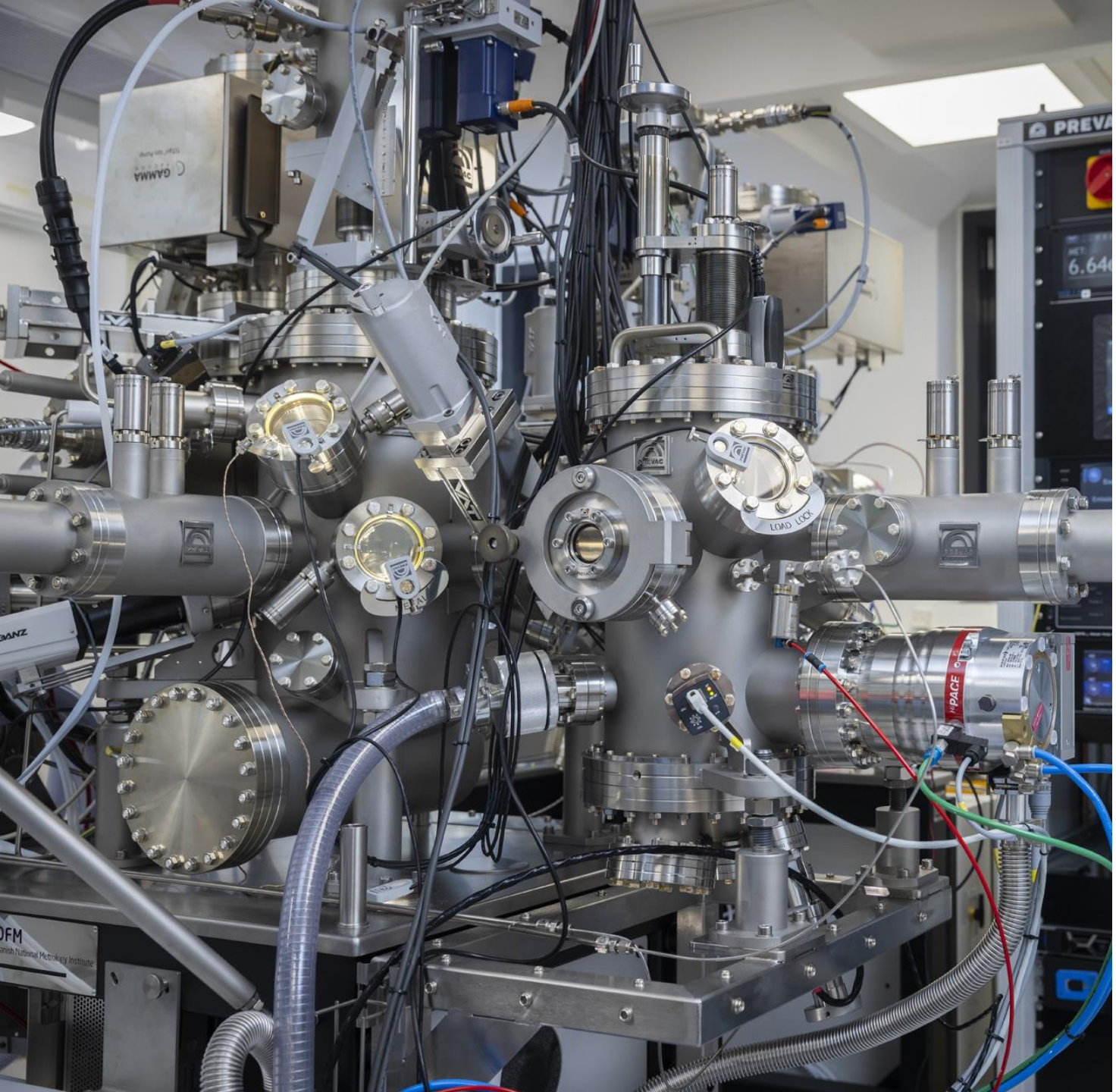

New Quantum Materials Cluster at DFM

Brand-new molecular beam epitaxy (MBE) system

- Small volume
- Ultra-high quality
- Rapid small-scale prototyping
- In-situ lithography & characterization
- Reference samples

Chamber 1: III-V Semiconductors

Chamber 2: Metal & Superconductors

Chamber 3: Processing & Cleaning

Chamber 4: Si/Ge (end of 2025)

Chamber 5: Processing & Loading (end of 2025)

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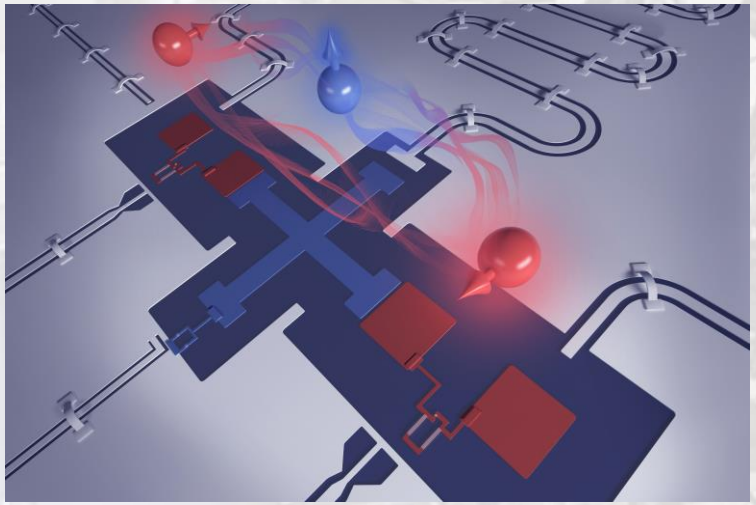
Activities

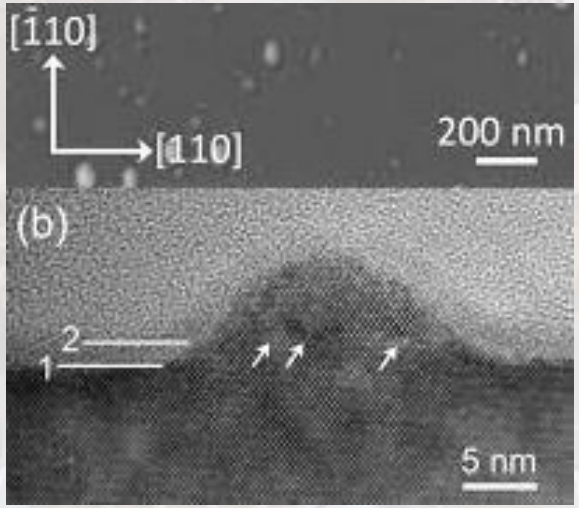
Superconducting circuits

Fabrication and characterization of Al-based superconducting qubits.



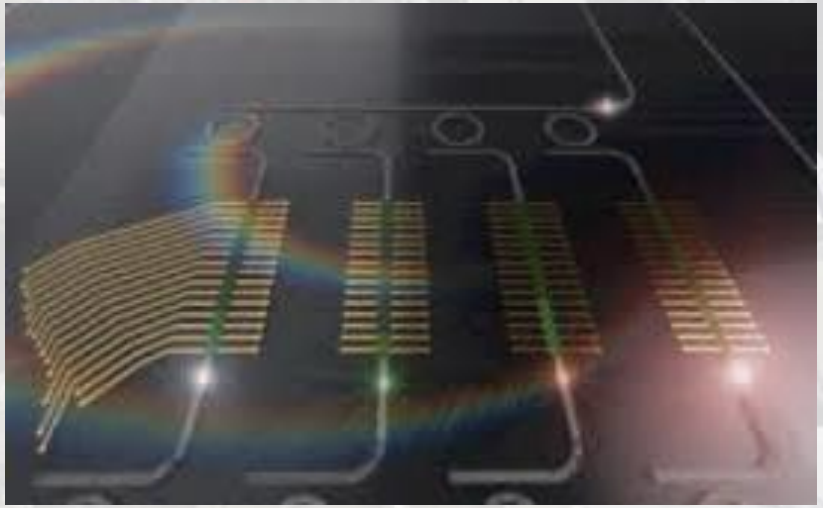
Quantum dots

Fabrication and characterization of InAs-quantum dot & III/V waveguides.



Photonics chips

Establishment of new characterization setups e.g. high-resolution loss reflectometry (fx OFDR).



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Quantum House Denmark & Quantum Test Center Denmark

Facility:

- 2 floors in NBI building w. office space
- Rent to quantum companies, primarily startups
- Expected 10-12 companies, 40 employees
- 4-5 QD employees support
- Common laboratories, but few “private” areas
- Equipment investment ~10 Meuro

Offerings:

- Business development
- Legal assistance (IPR, investment agreements etc.)
- Digital marketing
- Standardization
- Project proposals
- Symposiums, workshops etc.

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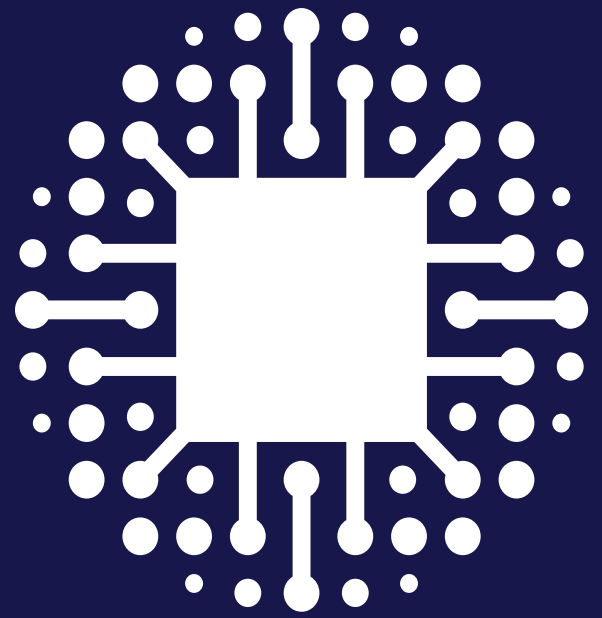

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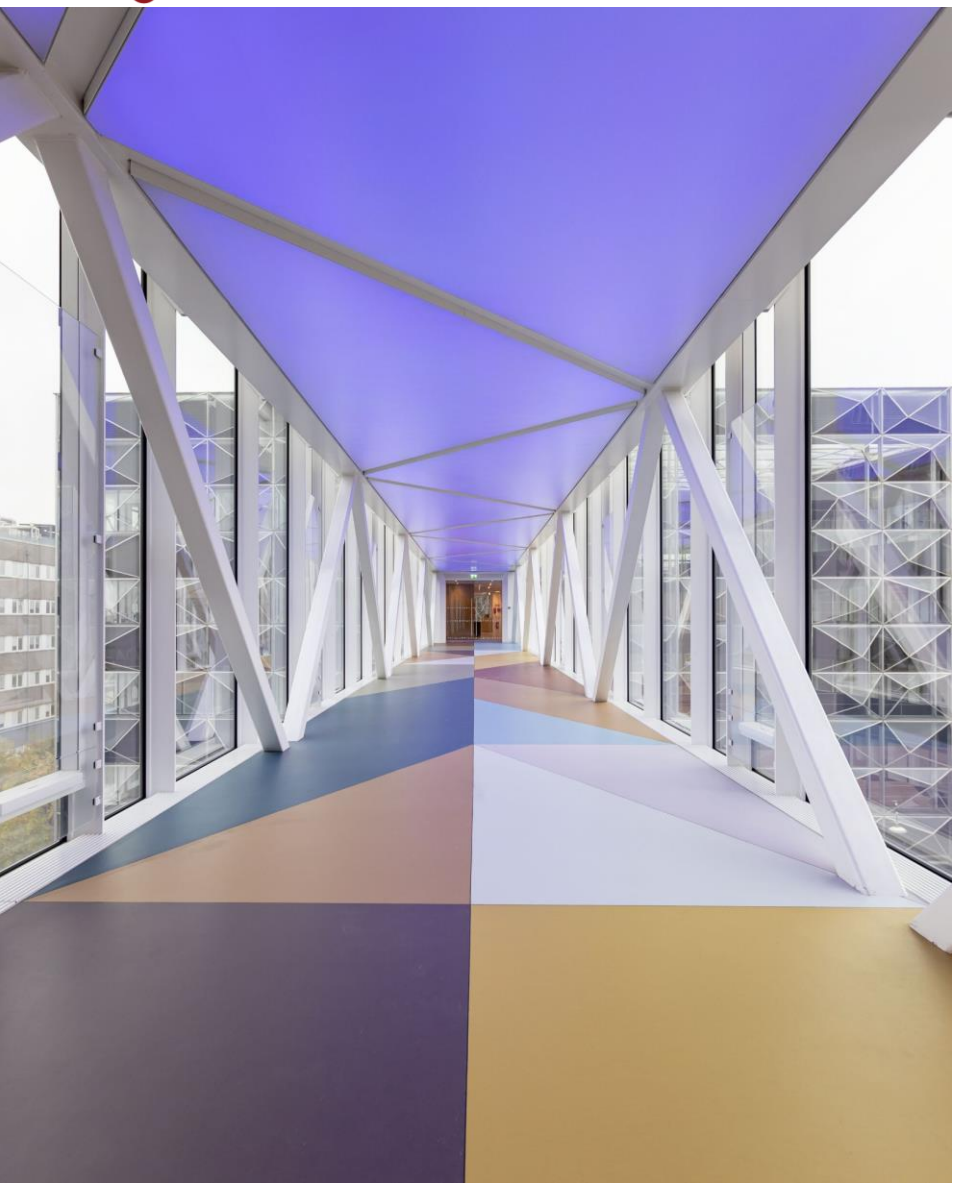
NIELS BOHR INSTITUTE



Peter Krogstrup

- Professor, Niels Bohr Institutet, Copenhagen University
- CEO Novo Nordisk Foundation Quantum Computing Programme (NQCP) & Quantum Foundry Copenhagen

NQCP
NIELS BOHR INSTITUTE

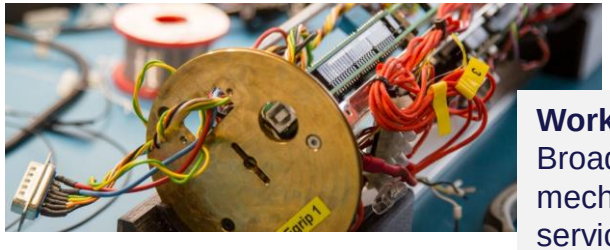
QUANTUM FOUNDRY
COPENHAGEN

Danish Chips Competence Centre

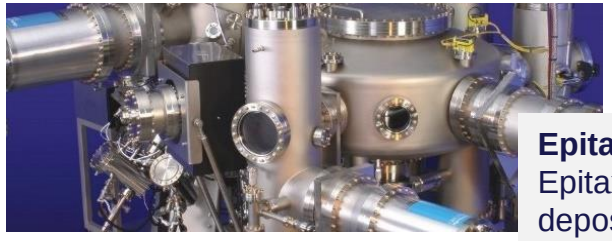
Leveraging **material science** to advance next generation quantum chip technologies

Danish Chips Competence Centre

Relevant services and activities at Copenhagen University



Workshop
Broad electrical and mechanical engineering services, custom made prototypes, and small series of mechanical parts.



Epitaxy
Epitaxial thin-film depositions based on innovative molecular beam epitaxy methods. Focus on heterostructures for High Electron Mobility Layers and Integrated Photonics. Expert consultancy and services.

Nanofab & materials characterization
Expert consultancy on nanofabrication processing and material characterization, as well as specialist-for-hire services.

Teaching & Outreach
Events and Initiatives to advance the quantum-readiness of the workforce. Both open enrollment and bespoke initiatives.

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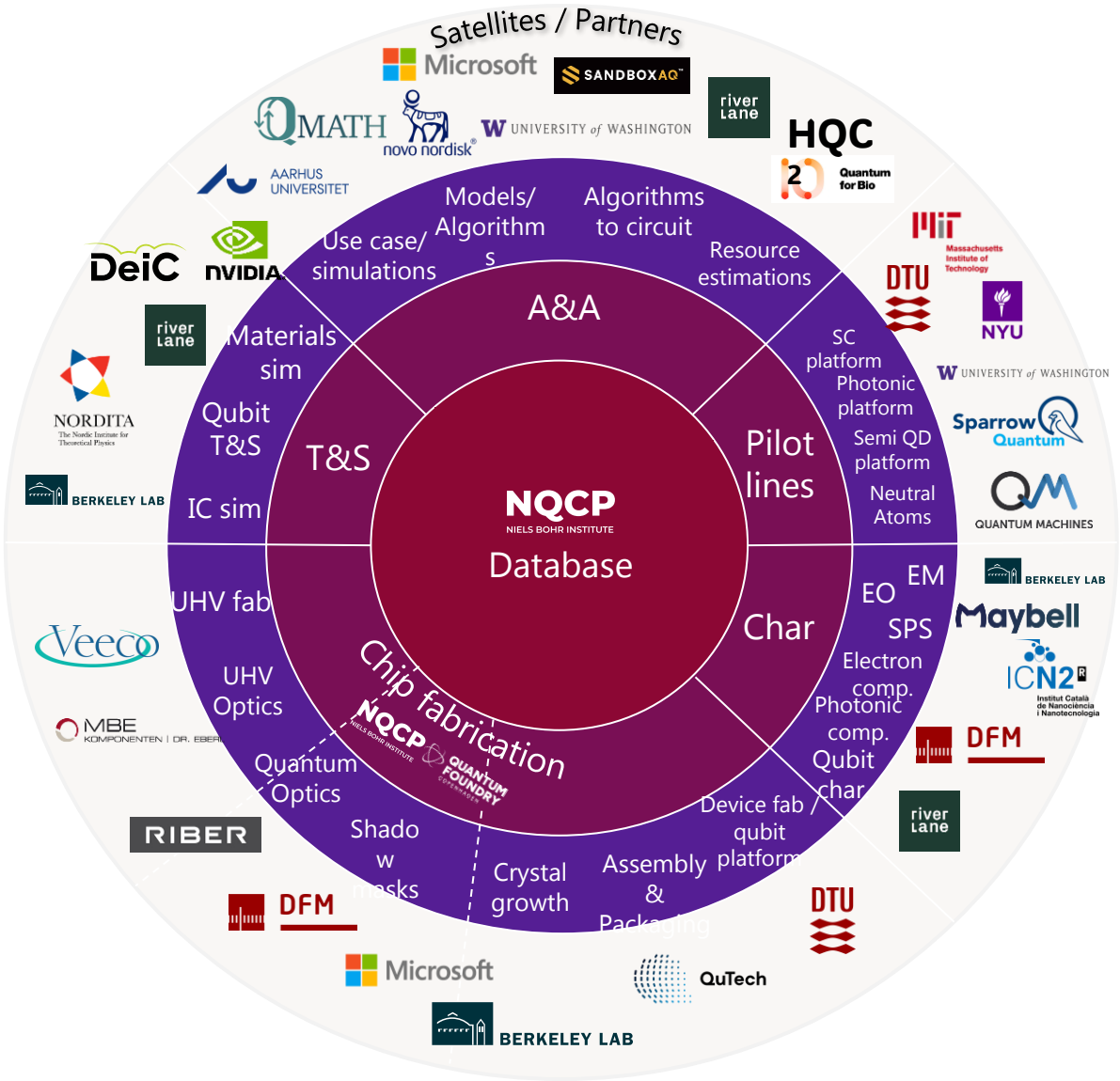
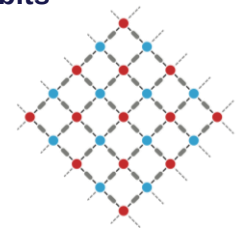
Tap into an international ecosystem with base at the Niels Bohr Institute

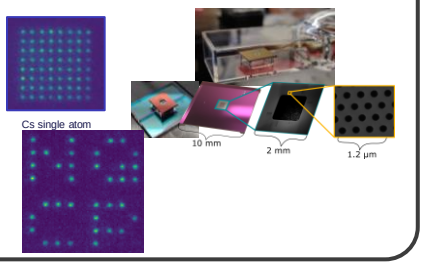


Chip based quantum processor research

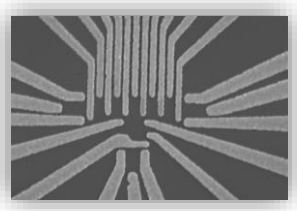
Superconducting qubits



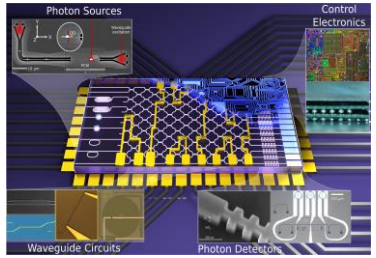
Neutral atoms



Semiconductor spin qubits



Quantum Photonics



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