



UK NQT Hub in Sensors and Metrology

Kai Bongs, University of Birmingham

UK QT Showcase 2015 - 11.11.2015

EPSRC
Pioneering research
and skills

Innovate UK
Technology Strategy Board

[dstl]

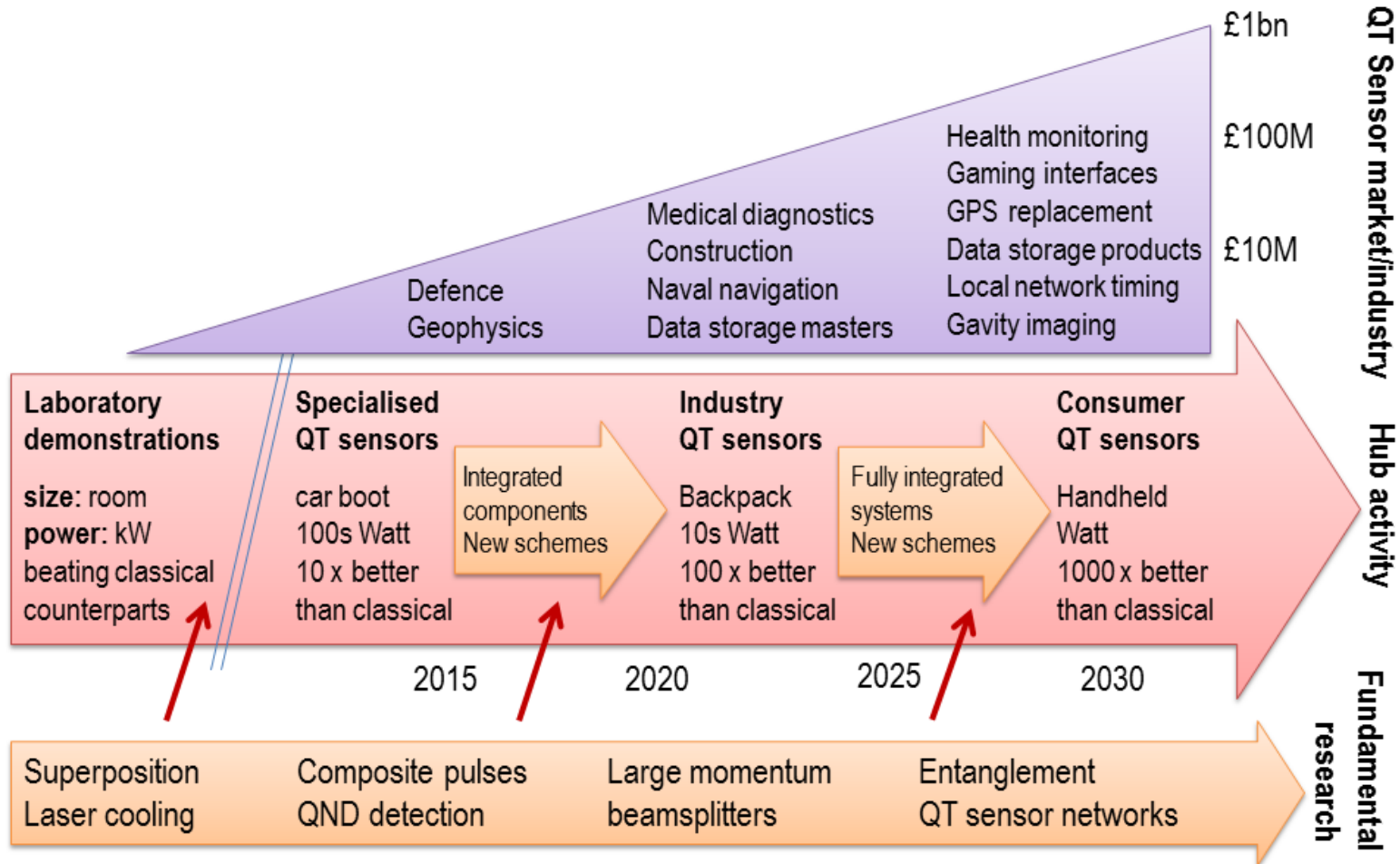


UK NATIONAL
QUANTUM
TECHNOLOGIES
PROGRAMME

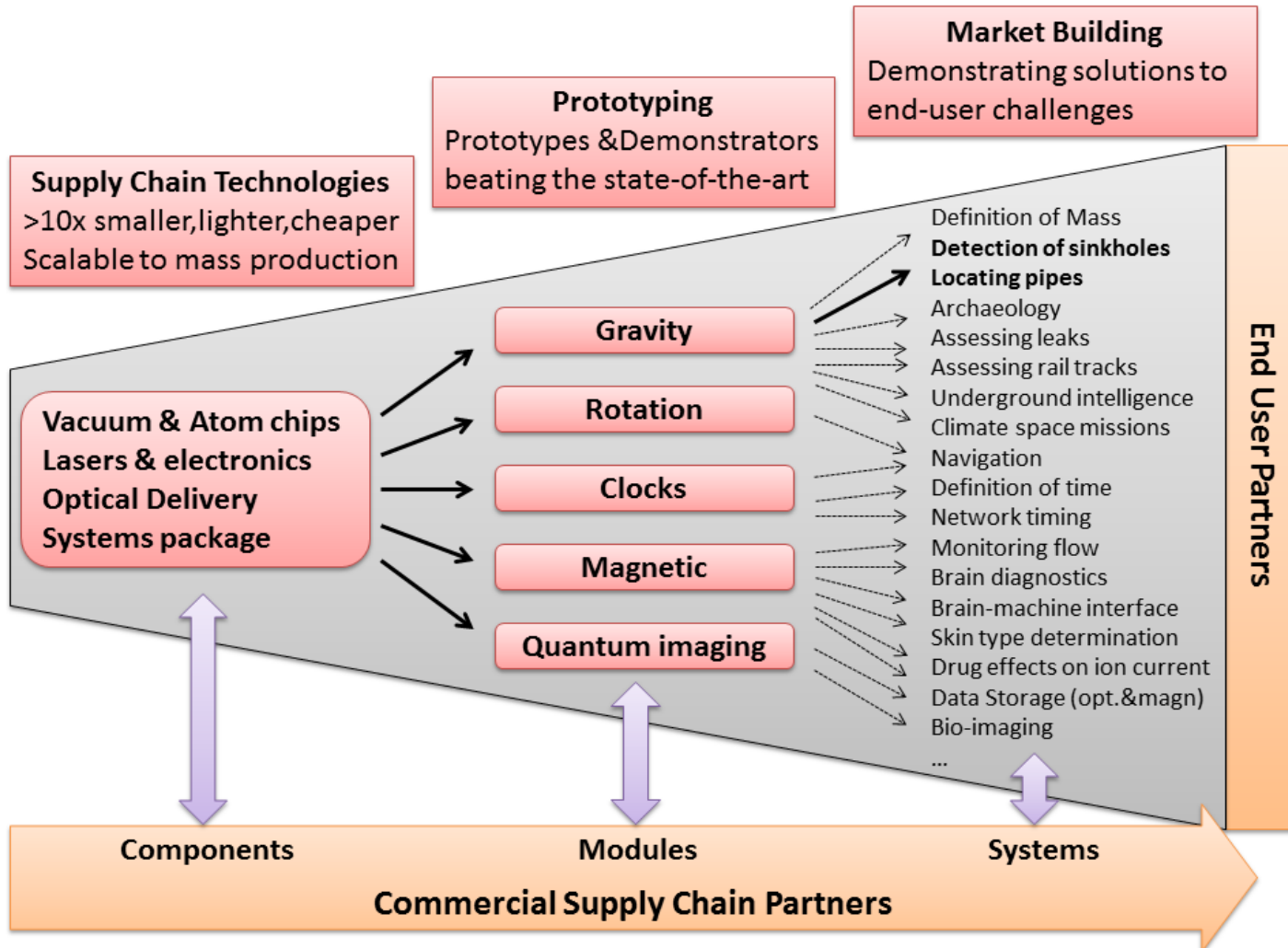
Atom-based QT sensors



Quantum Sensor Roadmap



Activities and Links



Industry Partners



Dstl: gravity imager & optical clock developments, field trials

e2v: vacuum, imaging, systems engineering

MSquared: electronics, lasers, system integration

NPL: clock and magnetometer development and system validation

Kelvin Nanotechnologies: semiconductor laser systems, MOT/atom/ion chips

Chronos: timing signal generation

RAL: space applications

Defence

AWE
BAE systems
GEM Elettronica
MBDA
Sandia
Selex
Thales
TMD
UTC Aerospace

Semicond.

Comp. Semi.
IQE

Exploration

ArkeX
BGS
BP
GeoDynamics
Halliburton
MicrogLacoste
Muquans
Reid Geophysics
Schlumberger

Healthcare

Elekta
NHS Trauma
Vertex

Transport

Network Rail
Texas Transp.Inst.
Transport for London

Laser

Coherent
Coldquanta
ELUXI
Gooch & Housego
HighFinesse
Sacher

Infrastructure

Balfour Beatty
Cardno
Drill Line
ICE
Infotec
JK Guest
Macleod Simmonds
RSK
Severn Trent Water
Stratascan
Subscan
Subsurface Utility Eng.
T2 Utility Engineers
UKSTT
URS Infrastruc. and Env.
UTSI Electronics

Other

Chemring
ESA
IBM
KTN
MTC
Oxford Instruments
Plextek
Procter & Gamble
Quantum Wave Fund
Qrometric
Rolls Royce
Royal Institute of Nav.
Samsung
Texas Instruments
TSB-KTP
Versysns Ventures
Witted

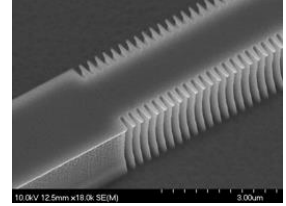
Supply Chain



WP1: Lasers/electronics
Doug Paul, Glasgow
Douglas.Paul@glasgow.ac.uk



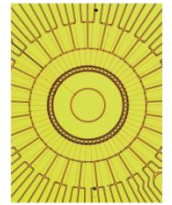
100 kHz diode laser
System on a Chip



WP2: Atomics package
Mark Fromhold, Nottingham
Mark.Fromhold@nottingham.ac.uk



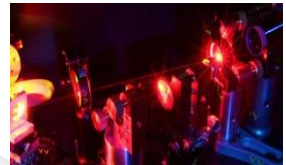
Atom/ion chips
Integrated optics
Vacuum



WP3: Custom lasers
Jennifer Hastie, Strathclyde
jennifer.hastie@strath.ac.uk



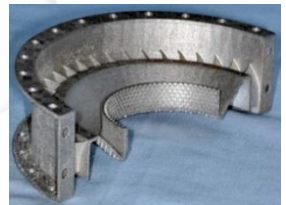
Semiconductor disk
lasers
Femtosecond comb



WP4: Systems package
Moataz Attallah, Birmingham
M.M.Attallah@bham.ac.uk



Inertial stabilisation
Overall package by
add. manufacturing



Demonstrators



WP5: Gravity sensors
Kai Bongs, Birmingham
k.bongs@bham.ac.uk



1 nano-g in 10l volume
Towards gravity imager



WP6: Magnetic field sensors
Peter Krüger, Nottingham
Mark.Fromhold@nottingham.ac.uk



Highest sensitivity
From magnetic microscope
to large scale



WP7: Rotation sensors
Tim Freearde, Southampton
tim.freearde@soton.ac.uk



200 picoradian/s



WP8: Clocks
Erling Riis, Strathclyde
e.riis@strath.ac.uk



1 in 10^{13} in 1l volume
1 in 10^{16} in 10l volume



WP9: Quantum Imaging
Vincent Boyer, Birmingham
v.boyer@bham.ac.uk



Squeezed light source <20l

Market Building



WP10: Market Building

Costas Constantinou, Birmingham
C.Constantinou@bham.ac.uk



Martin Dawson, Fraunhofer UK
m.dawson@strath.ac.uk



WP11: Gravity in Civil Eng.
Nicole Metje, Birmingham
n.metje@bham.ac.uk

UK network

Foster Dialogue

Knowledge Transfer

Demonstration activities



Facilities



- **Nanofabrication**
Glasgow, Nottingham, Southampton
- **Rapid vacuum prototyping**
Nottingham
- **Technology Transfer Centre**
Birmingham

Collaboration

- **We are open to collaboration**
- **Let us know what suits you**
- **Contact**
Jo Smart (j.c.smart@bham.ac.uk)