The University Defence Research Collaboration in Signal Processing: Phase 3

Signal processing in the information age

[dstl]

23 January 2019

DSTL/PUB111524

Ministry of Defence

The UDRC

Collaborative Centre of Excellence for Signal Processing

Aims

- World-class research
- Long-term sustainable skills
- Community of practice

Approach

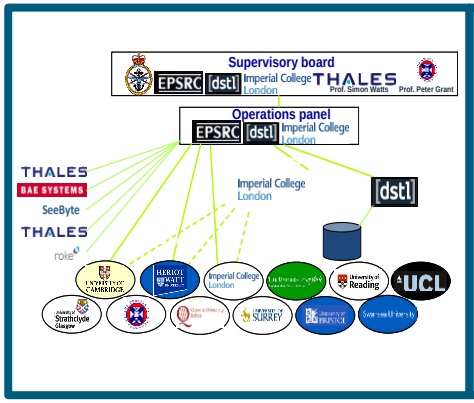
- Joint funding with EPSRC
- Dstl technical leadership
- Close, early engagement with industry

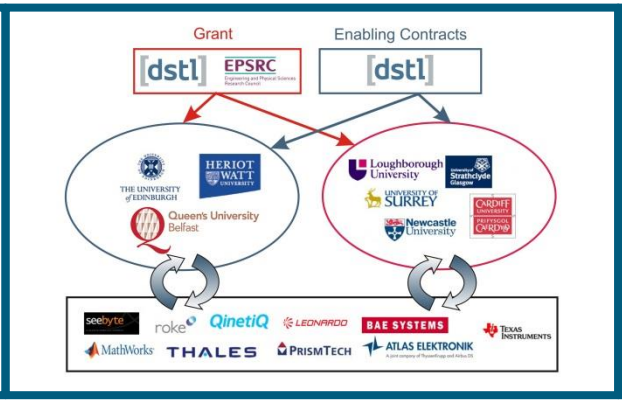
UDRC Timeline

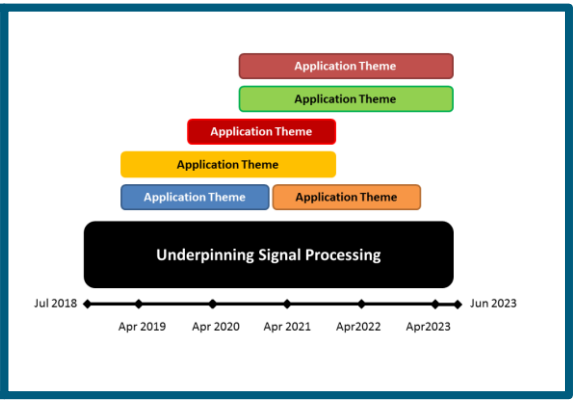
Phase 1: University Defence Research Centre on signal processing

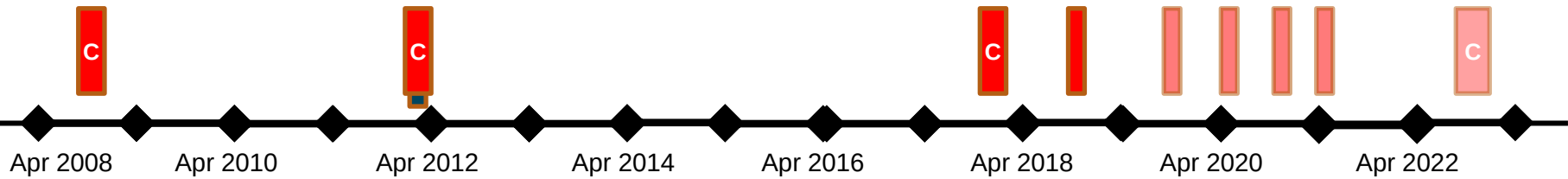
Phase 2: Signal processing in the networked battlespace

Phase 3: Signal processing in the information age



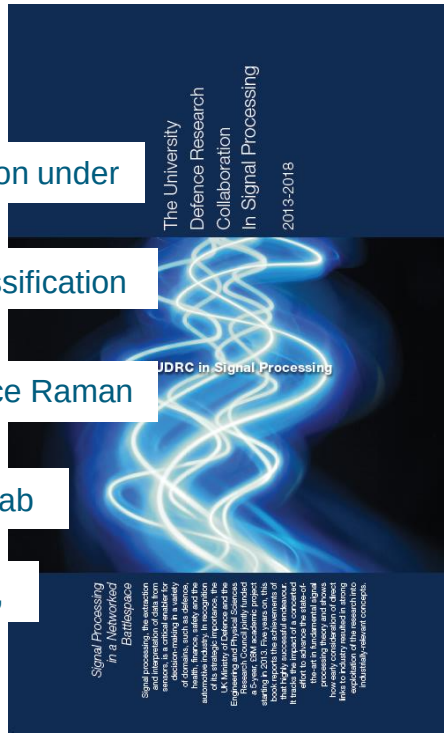




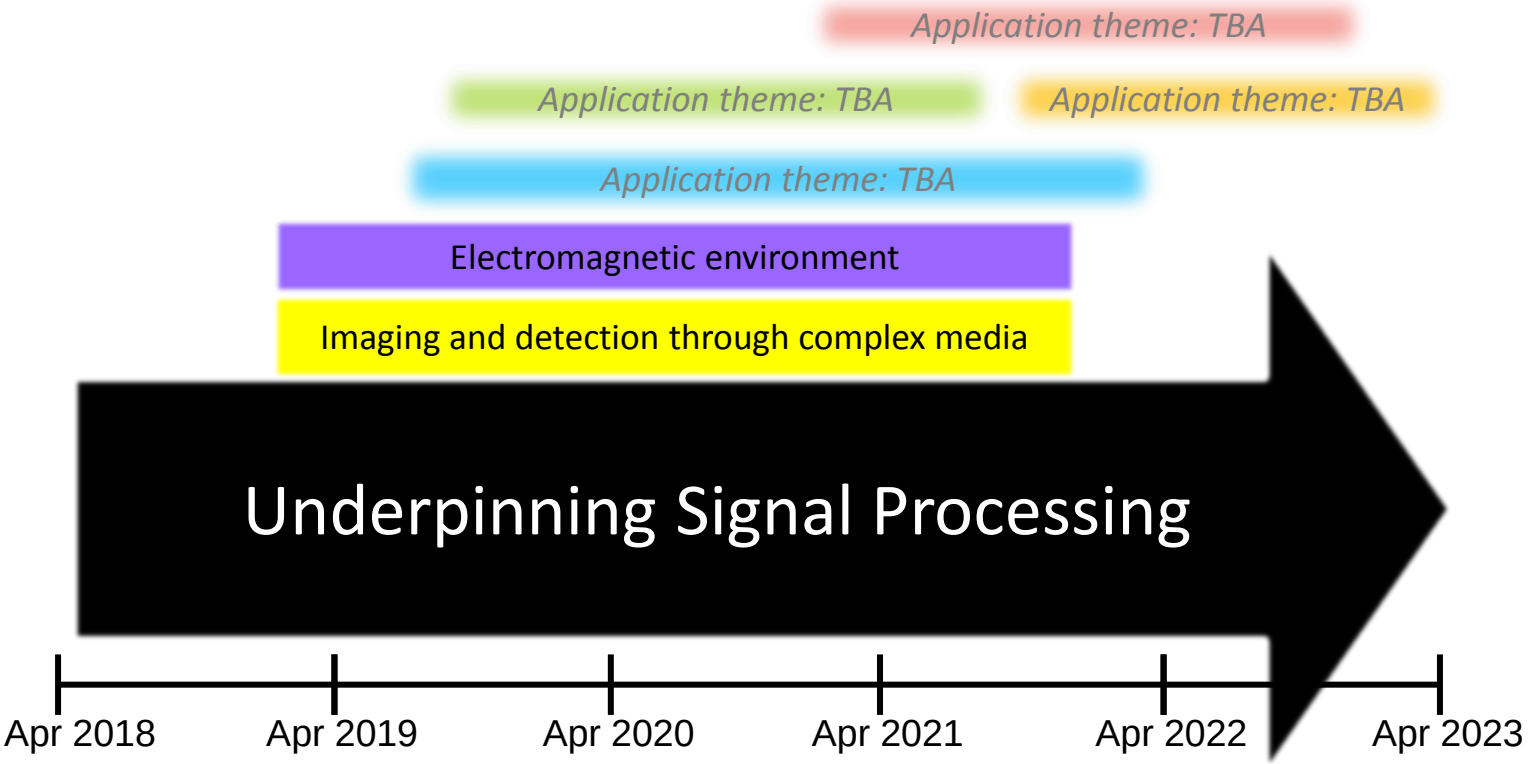


UDRC phase 2 summary

- Huge academic impact: over 300 peer-reviewed publications
- High rate of exploitation of algorithms for a large variety of defence signal processing applications, including:
  - Compressed sensing algorithms for Low Frequency SAR
  - Incorporation of algorithms into a project on assured underwater mine detection under the Maritime Collaborative Enterprise (MarCE) programme
  - Work at Strathclyde University on radar micro-Doppler has been used for classification for ballistic missile defence
  - Sparsity-based spectral decomposition algorithms adapted for use in in-service Raman spectrometer
  - The release of the Polynomial Matrix Eigenvalue Decomposition (PEVD) Matlab toolbox. This has application in large-array processing
- Non defence applications, including healthcare technologies, autonomous systems, communications technology
- Data release to industry/academia on short timescales



UDRC phase 3 model

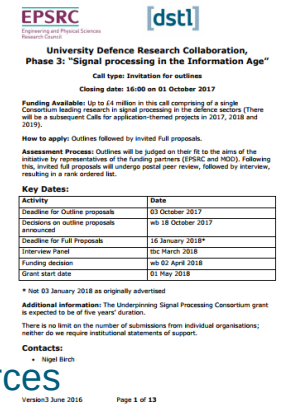


USP Grant:
£4M over 5 years
= £800k per year
= £400k MOD + £400k EPSRC per year

AT Grants:
1st tranche: £1M over 2-3 years 50:50 MOD/EPSRC
Future tranches: will vary

Underpinning Signal Processing

- **Signal processing on large, multidimensional data**
  - Needles in multidimensional haystacks (and needlestacks)
  - Data with high and asymmetric uncertainty
  - Non-traditional correlation (e.g. physics-based sensors with human-sourced information)
  - Assessing the information content of complex data (i.e. what is the method-agnostic upper-bound on the value of processing any given dataset or future collect?)
- **High-volume Signal Processing**
  - Anomaly, outlier and correlation discovery; coping with the incompleteness of any model of normality
  - Fleeting and highly non-stationary signals
  - Non-centralised and pipeline processing
  - Verification of machine-learned models in other domains/scenarios
- **Challenges of the 'Information Age'**
  - Management of very different types of uncertainty
  - "Hyper-fusion" – Data fusion writ large
  - Automated structure discovery
  - Resource constrained sensor management across wide information sources
  - Performance metrics for sensor management
  - Trust and provenance of information sources



EPSRC Engineering and Physical Sciences Research Council [dstl]

University Defence Research Collaboration, Phase 3: "Signal processing in the Information Age"

Call type: Invitation for outlines

Closing date: 16:00 on 01 October 2017

Funding Available: Up to £4 million in this call comprising of a single Consortium leading research in signal processing in the defence sectors (There will be a subsequent Calls for application-themed projects in 2017, 2018 and 2019).

How to apply: Outlines followed by invited Full proposals.

Assessment Process: Outlines will be judged on their fit to the aims of the initiative by representatives of the funding partners (EPSRC and MOD). Following this, invited full proposals will undergo postal peer review, followed by interview, resulting in a rank ordered list.

Key Dates:

Activity	Date
Deadline for Outline proposals	03 October 2017
Decisions on outline proposals announced	wb 18 October 2017
Deadline for Full Proposals	16 January 2018*
Interview Panel	tbc March 2018
Funding decision	wb 02 April 2018
Grant start date	01 May 2018

* Not 03 January 2018 as originally advertised

Additional information: The Underpinning Signal Processing Consortium grant is expected to be of five years' duration.

There is no limit on the number of submissions from individual organisations; neither do we require institutional statements of support.

Contacts:

- Nigel Birch

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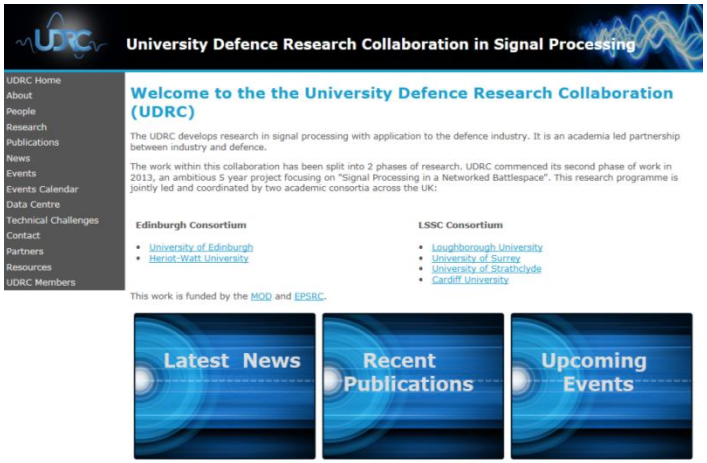
Fostering the signal processing community

Annual Conference

Educating the next generation

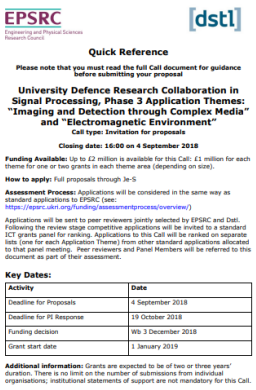
Website



Special journal editions, books, articles, theme meetings

Exploitation, impact, community

- Data exchange
- Industrial links
- Secondments to/from industry/government
- Enabling contracts with MOD/Dstl
- Application themes
- SSPD a flagship international conference in signal processing for defence
- Widen the participation of the UK signal processing community
- Government/industry knowledge transfer meetings to generate a forum for defence signal processing requirements.
- Websites, LinkedIn and newsletter updates



EPSRC Engineering and Physical Sciences Research Council

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Quick Reference

Please note that you must read the full Call document for guidance before submitting your proposal

University Defence Research Collaboration in Signal Processing, Phase 3 Application Themes: "Imaging and Detection through Complex Media" and "Electromagnetic Environment"

Call type: Invitation for proposals

Closing date: 16:00 on 4 September 2018

Funding Available: Up to £2 million is available for this Call: £1 million for each theme for one or two grants in each theme area (depending on size).

How to apply: Full proposals through Je-S

Assessment Process: Applications will be considered in the same way as standard applications to EPSRC (see: https://epsrc.ukri.org/funding/assessmentprocess/overview/)

Applications will be sent to peer reviewers jointly selected by EPSRC and Dstl. Following the review stage competitive applications will be invited to a standard ICT grants panel for ranking. Applications to this Call will be ranked on separate lists (one for each Application Theme) from other standard applications allocated to that panel meeting. Peer reviewers and Panel Members will be referred to this document as part of their assessment.

Key Dates:

Activity	Date
Deadline for Proposals	4 September 2018
Deadline for PI Response	19 October 2018
Funding decision	Wb 3 December 2018
Grant start date	1 January 2019

Additional information: Grants are expected to be of two or three years' duration. There is no limit on the number of submissions from individual organisations; institutional statements of support are not mandatory for this Call.

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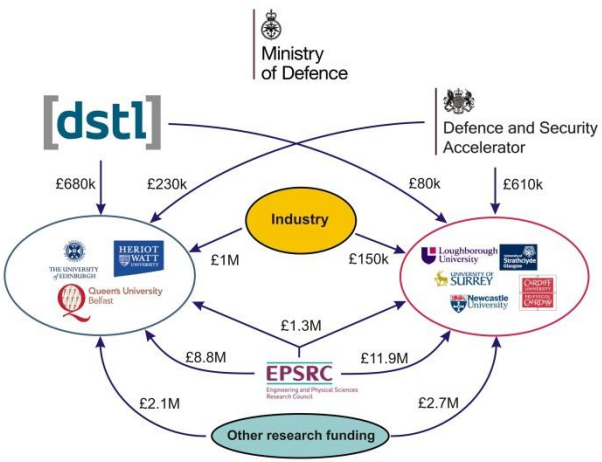

Summary

- UDRC phase 2 had a huge academic impact with over 300 peer-reviewed publications, a high rate of exploitation of algorithms for a large variety of defence signal processing applications, and excellent community-building activities
- UDRC phase 3 aims to continue these activities, while broadening the community and addressing the move from signal processing to information processing
- UDRC3 runs under a underpinning + applications model
- UDRC3 application themes in *imaging and detection through complex media* and *electromagnetic environment* begin in 2019
- Further UDRC3 application theme calls will follow in 2019-2021