Dept PHYS

1. Introduction : what we do at LPP-ERM/KMS
2. W7-X (Greifswald, DE)
3. WEST (Cadarache, FR)
4. ITER (Cadarache, FR)
5. Q&A

More info ? Find us this afternoon on the PHYS stand !
»» more than welcome ««

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Royal Military Academy

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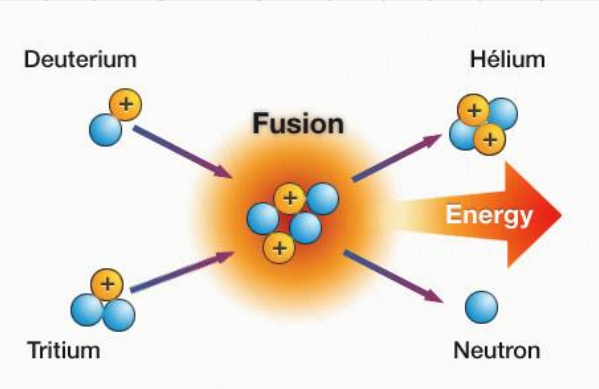
Introduction: what we do at L



LPP-ERM/KMS

- Experimental Research
  - Tokamaks
  - Stellarator
- Design & development
- Theory & Modelling

BCarn (DFR)

H2 (MSP)

1. **Experimental and Theoretical research on plasma physics and fusion energy, notably on Ion Cyclotron Resonance Frequency (ICRF) applications (heating, start-up, wall conditioning, ….)**
2. **LPP-ERM/KMS' design of antennas (e.g. 10 MW ICRF for ITER) + matching system**
3. **Member of EUROfusion (BE beneficiary, head of BE association on fusion activities)**
   Partner in Tri-lateral Euregio Cluster (TEC = BE – NL - DE)

EUROfusion

LPP-ERM/KMS
SCK-CEN
UGent
KULeuven
UC Louvain LN
ULB

RMA Royal Military Academy Brussels

LPP ERM - KMS

sck cen

DIFFER Dutch Institute for Fundamental Energy Research

IFN-1 @

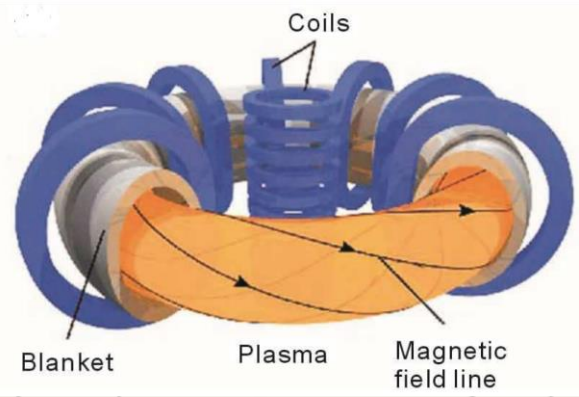
JÜLICH Forschungszentrum

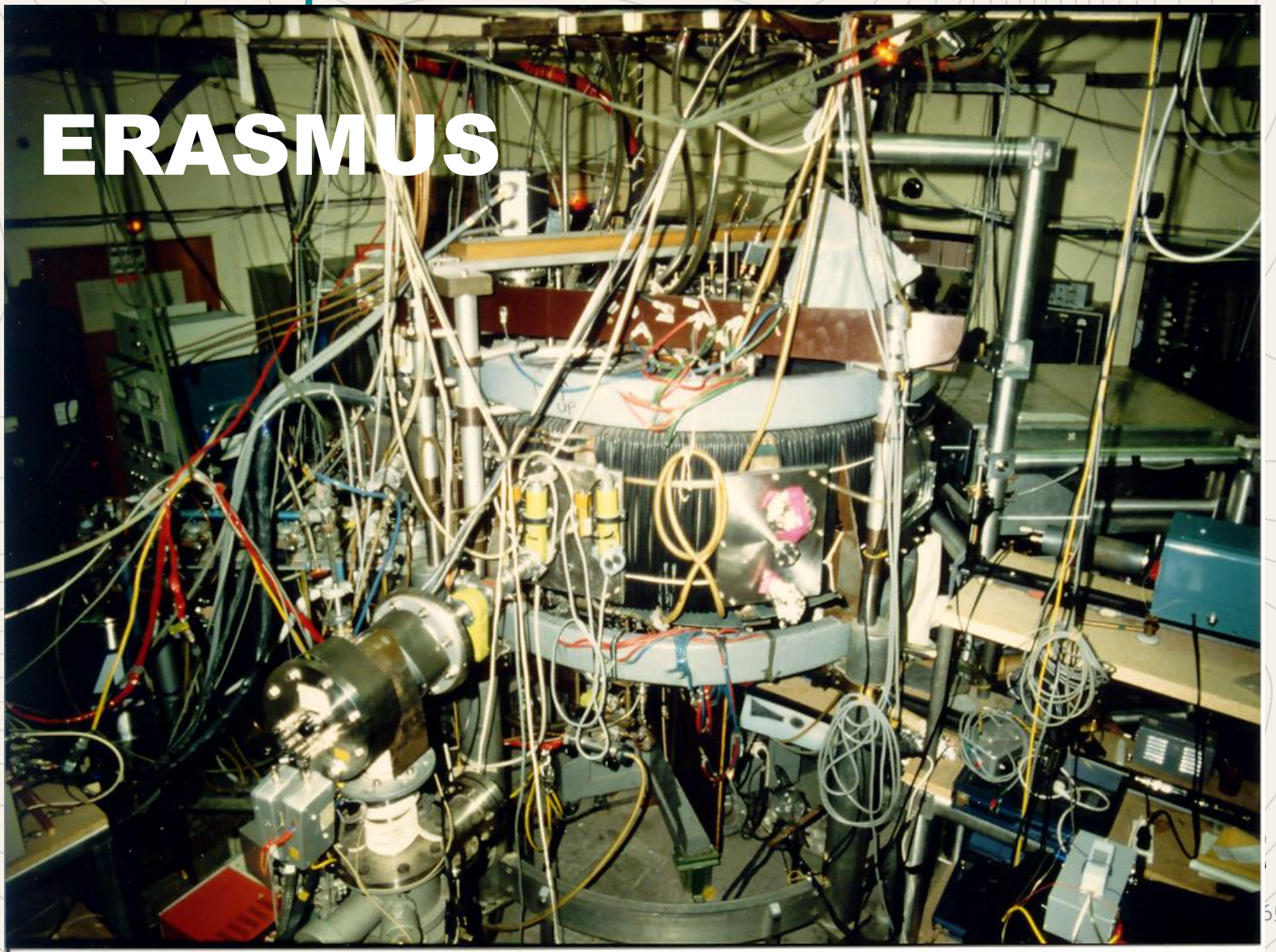
Inside **LPP-ERM/KMS** - Experimental Research

1975

First university tokamak in EU

Tokamaks





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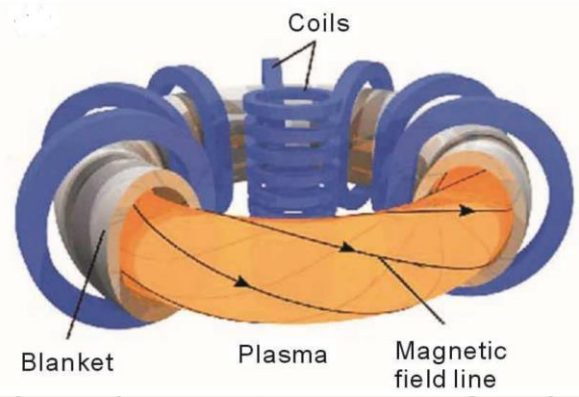
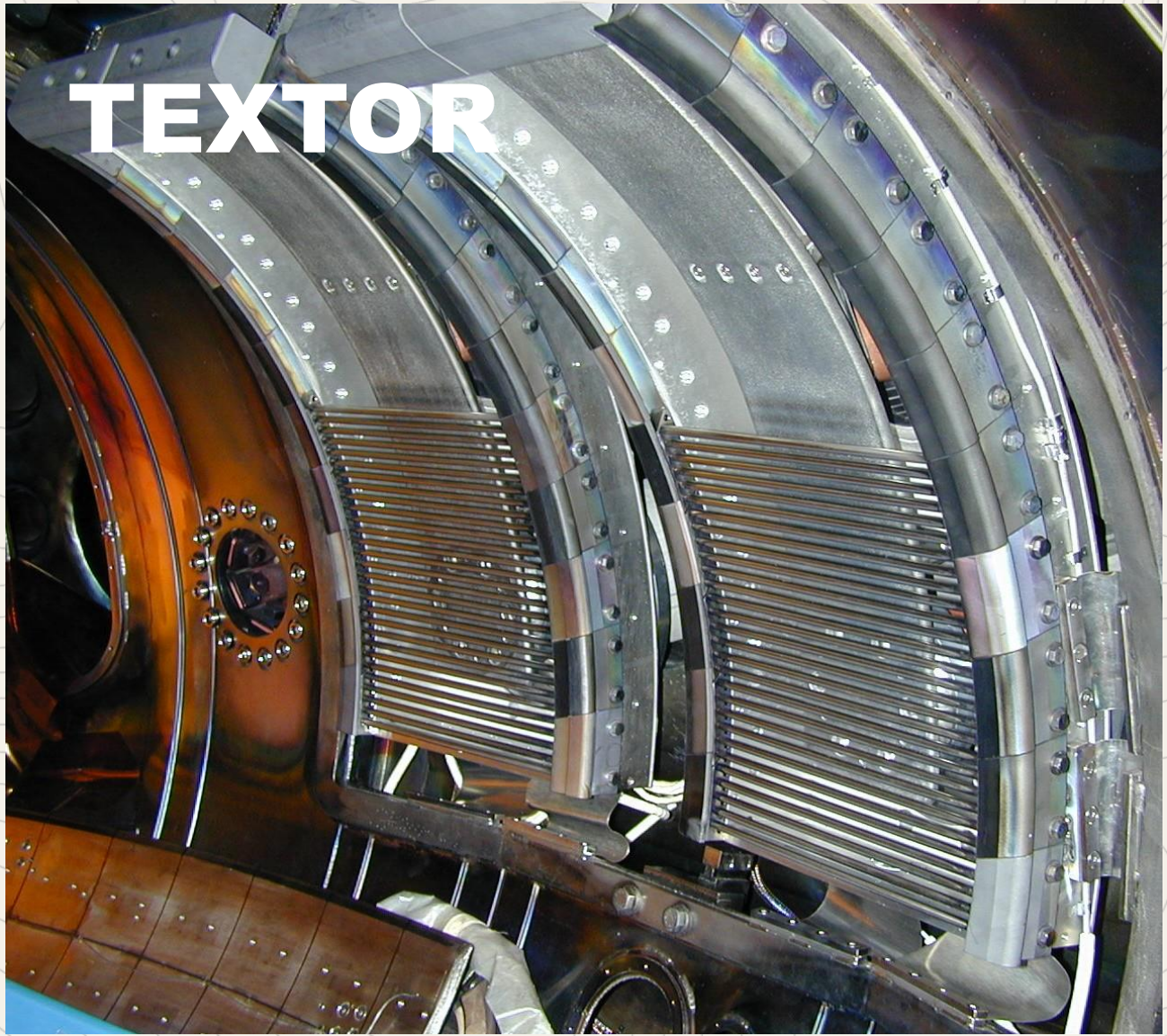
Inside **LPP-ERM/KMS** - Experimental Research

1983-2013

@ FzJ Jülich, DE

Tokamaks





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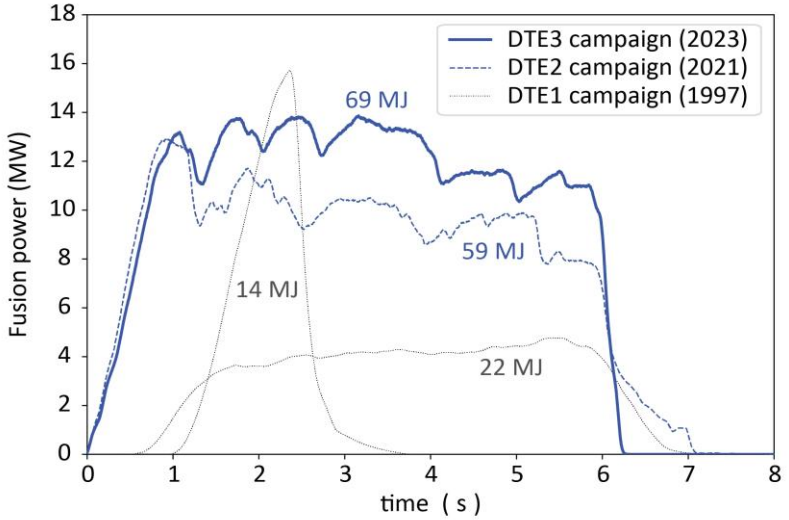
Inside **LPP-ERM/KMS -** Experimental Research

Visit HRH Princess Astrid, 11 May 2022



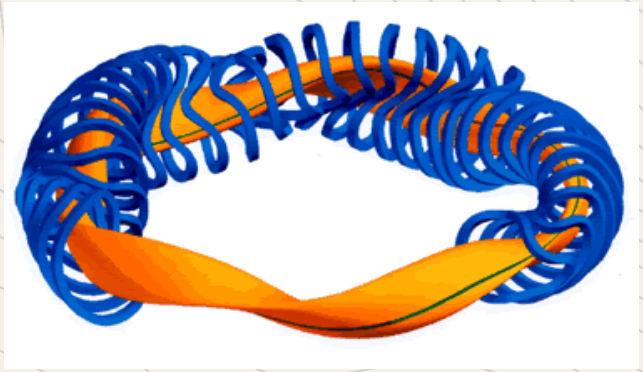
Royal

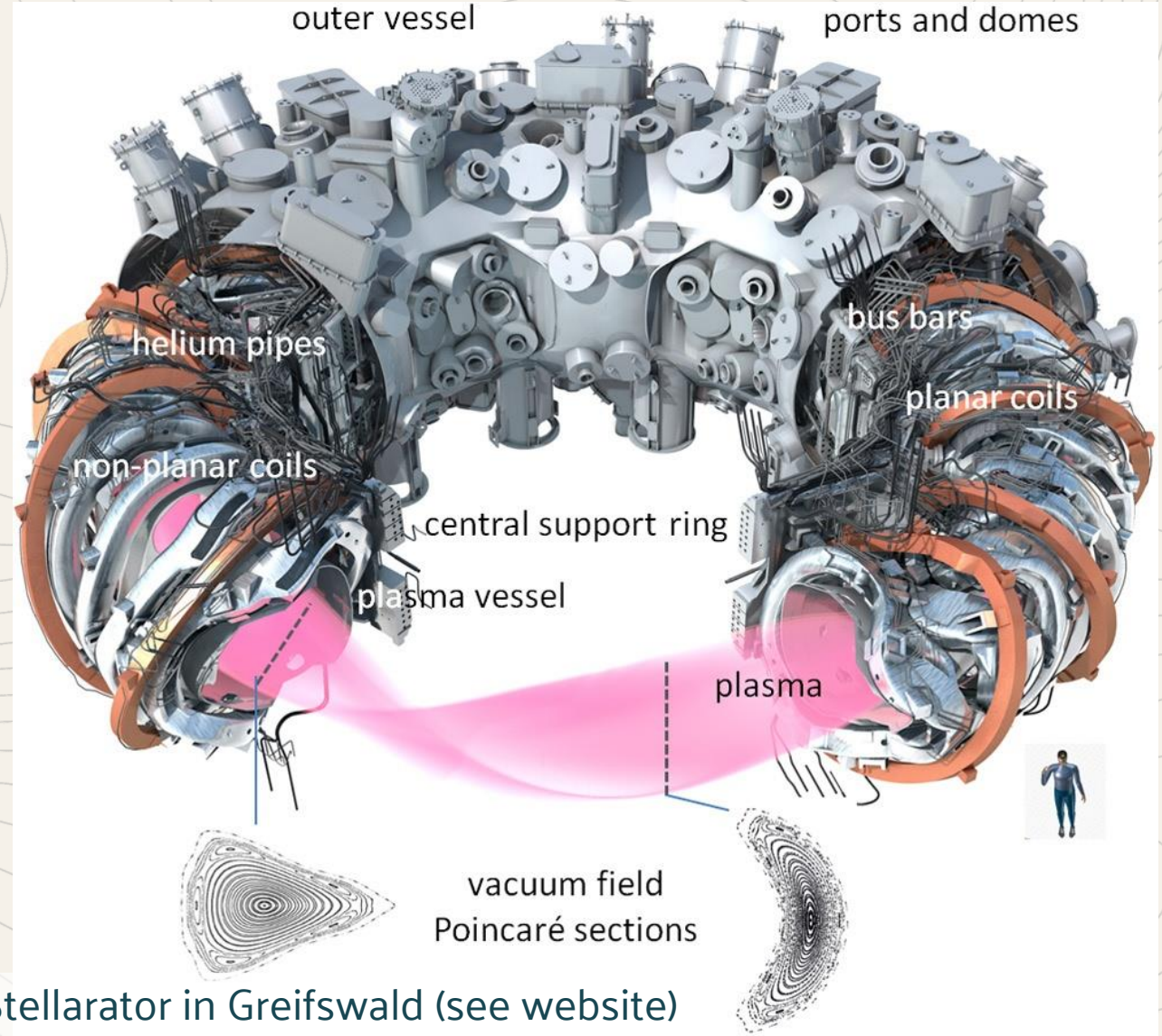
Inside **LPP-ERM/KMS** - Experimental Research

2016 - ...

@ IPP Greifswald, DE

Stellarator





W7-X

RMA Royal Military Academy Brussels

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Sep 2025 : Visit of the RMA to the W7-X Stellarator in Greifswald (see website)

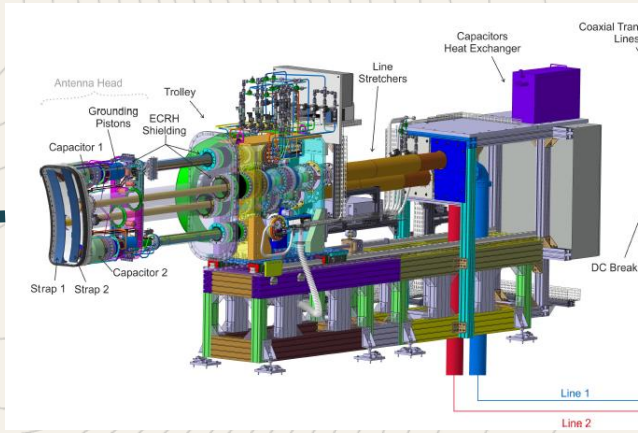
W7-X, IPP (Greifswald, DE)

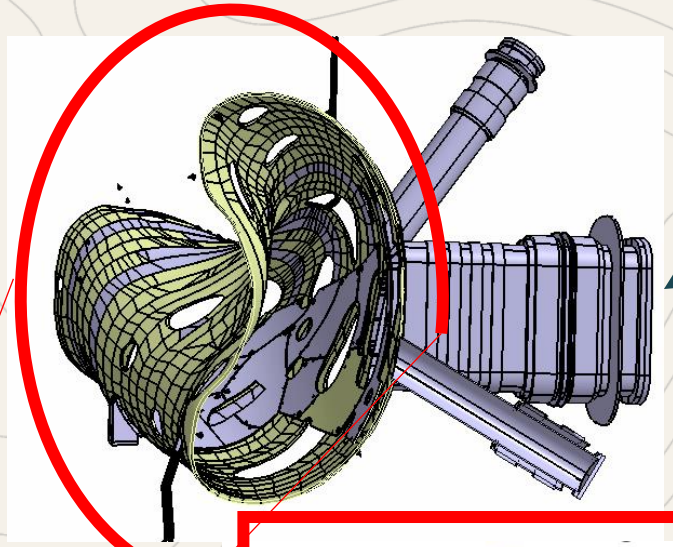
ICRF antenna installed in 2022 on **stellarator W7-X**

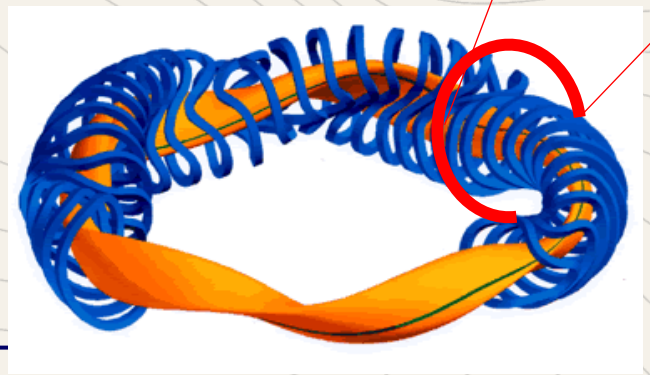
- IC **1,5 MW** (1 antenna, 2 generators)
- f = **25 - 38 MHz**
- **TWO-strap antenna array** : control of
  - Fully **3D shape** adapted to **LCFS** (Magn. Config. m/n = 5/5)
  - Any adjustable phase difference between straps
- **Matching system** + control software:

Functional requirements

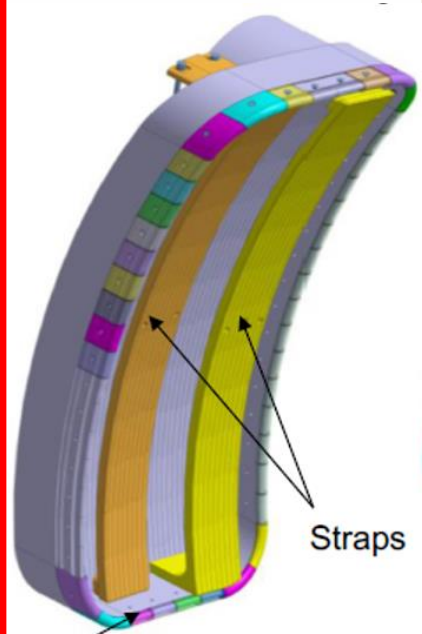
- **Source of fast particles** for confinement investigation.
- **Plasma Heating** – various ICRF heating scenarios.
- Assist in **Wall Conditioning & Plasma Startup**
  especially at low magnetic field (1.7 T).

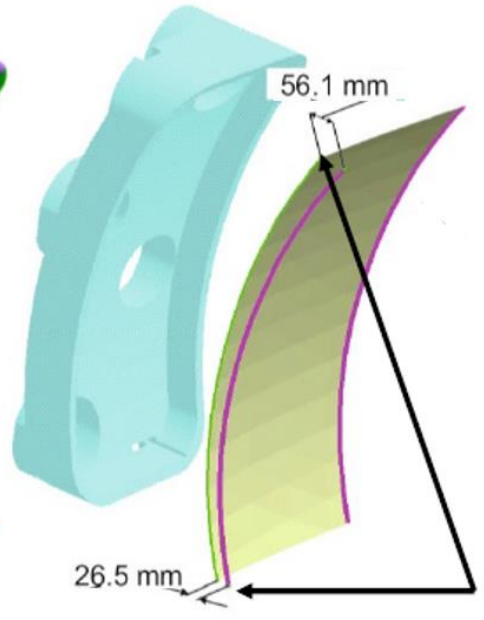






2 straps oper. since sept 2024





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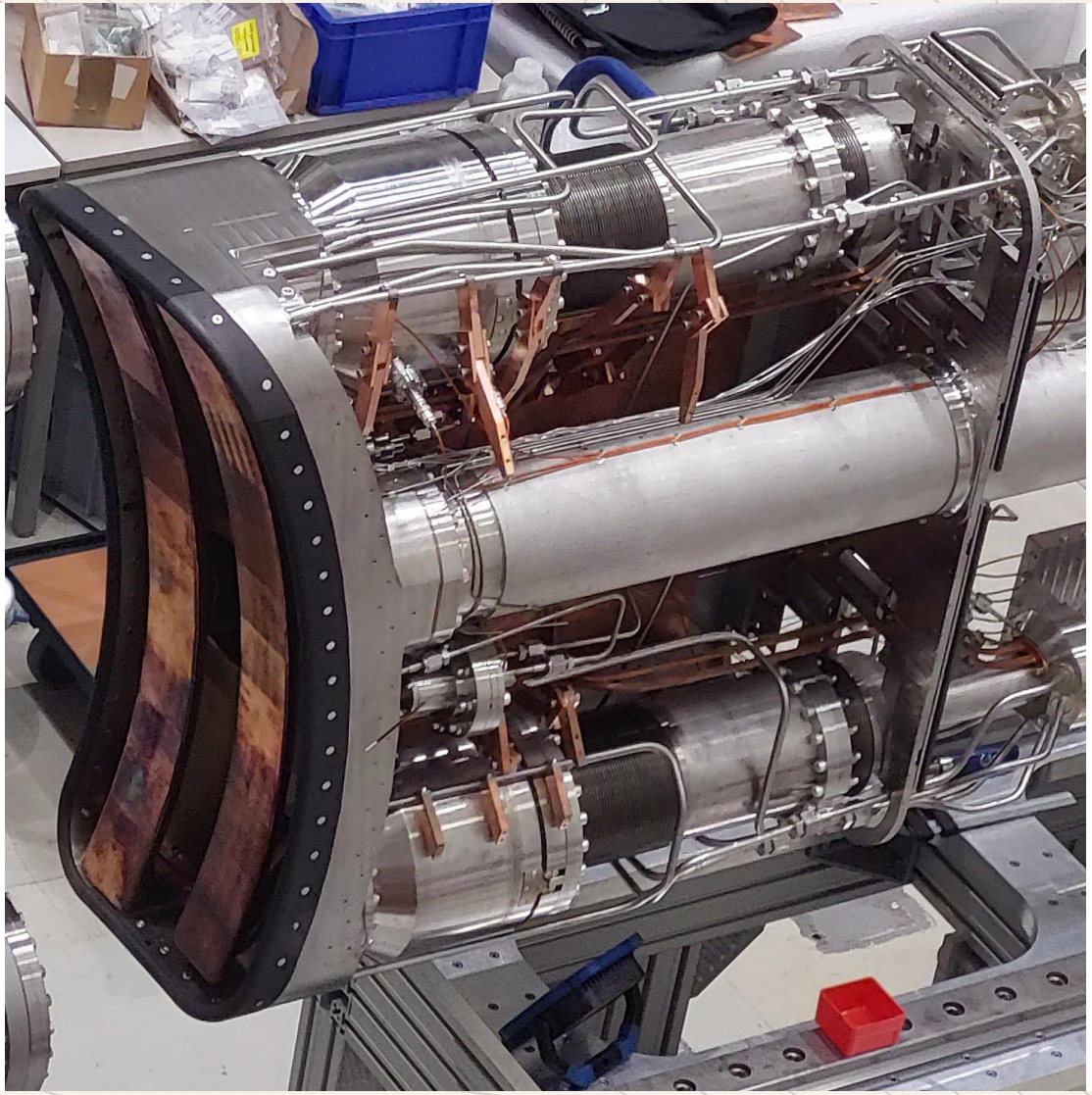
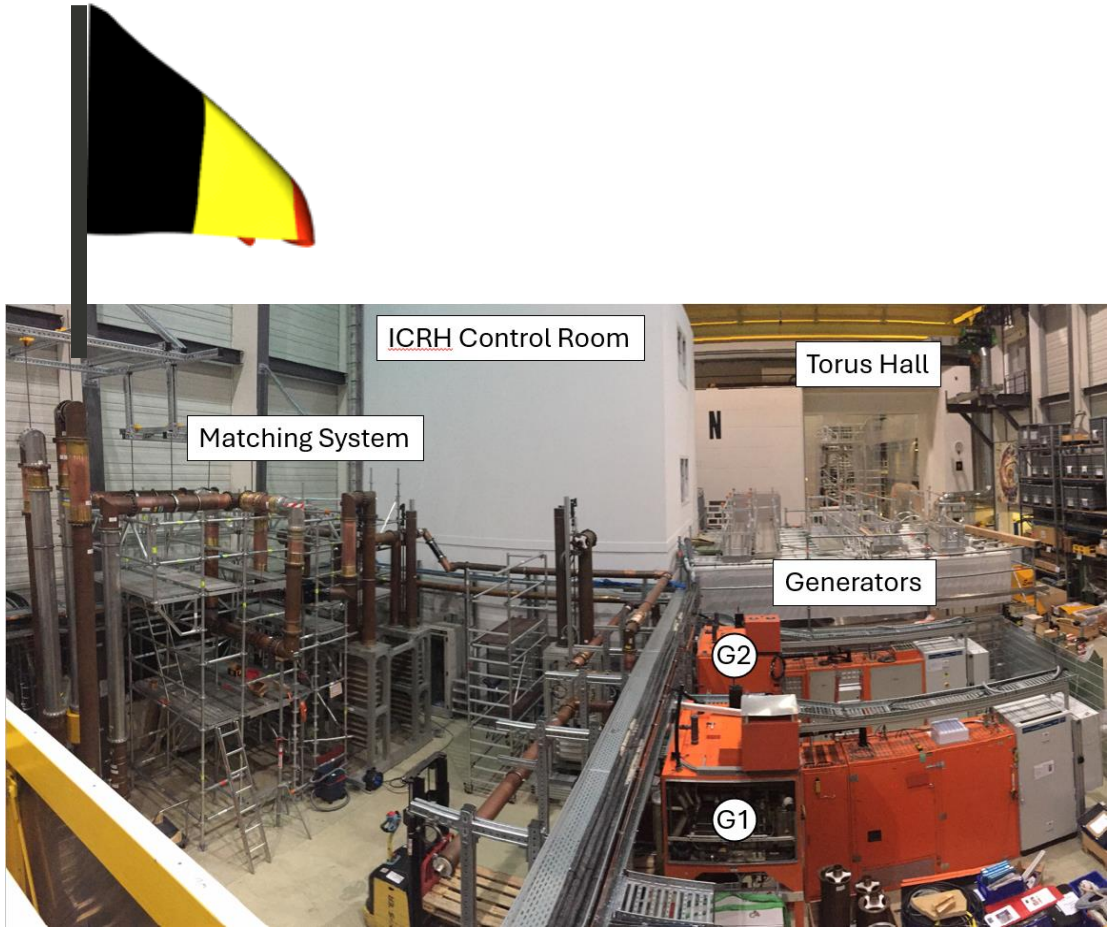
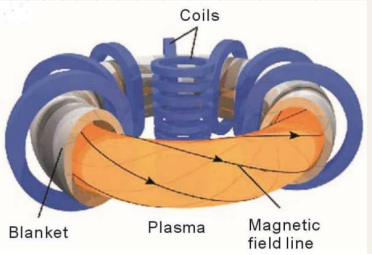
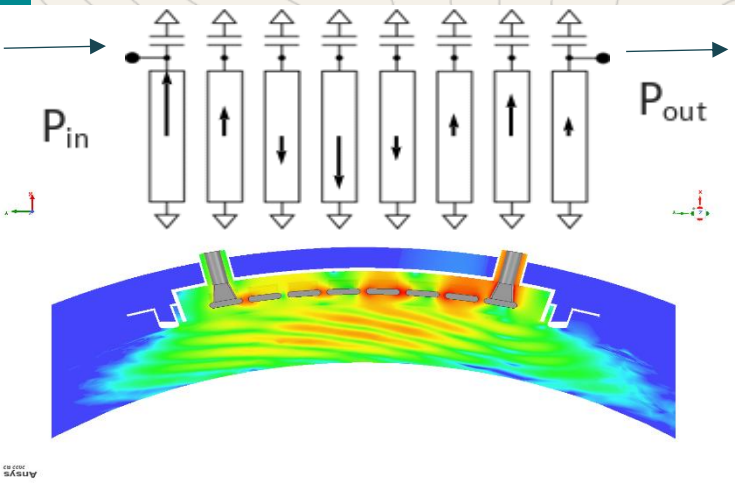
W7-X, IPP (Greifswald, DE)





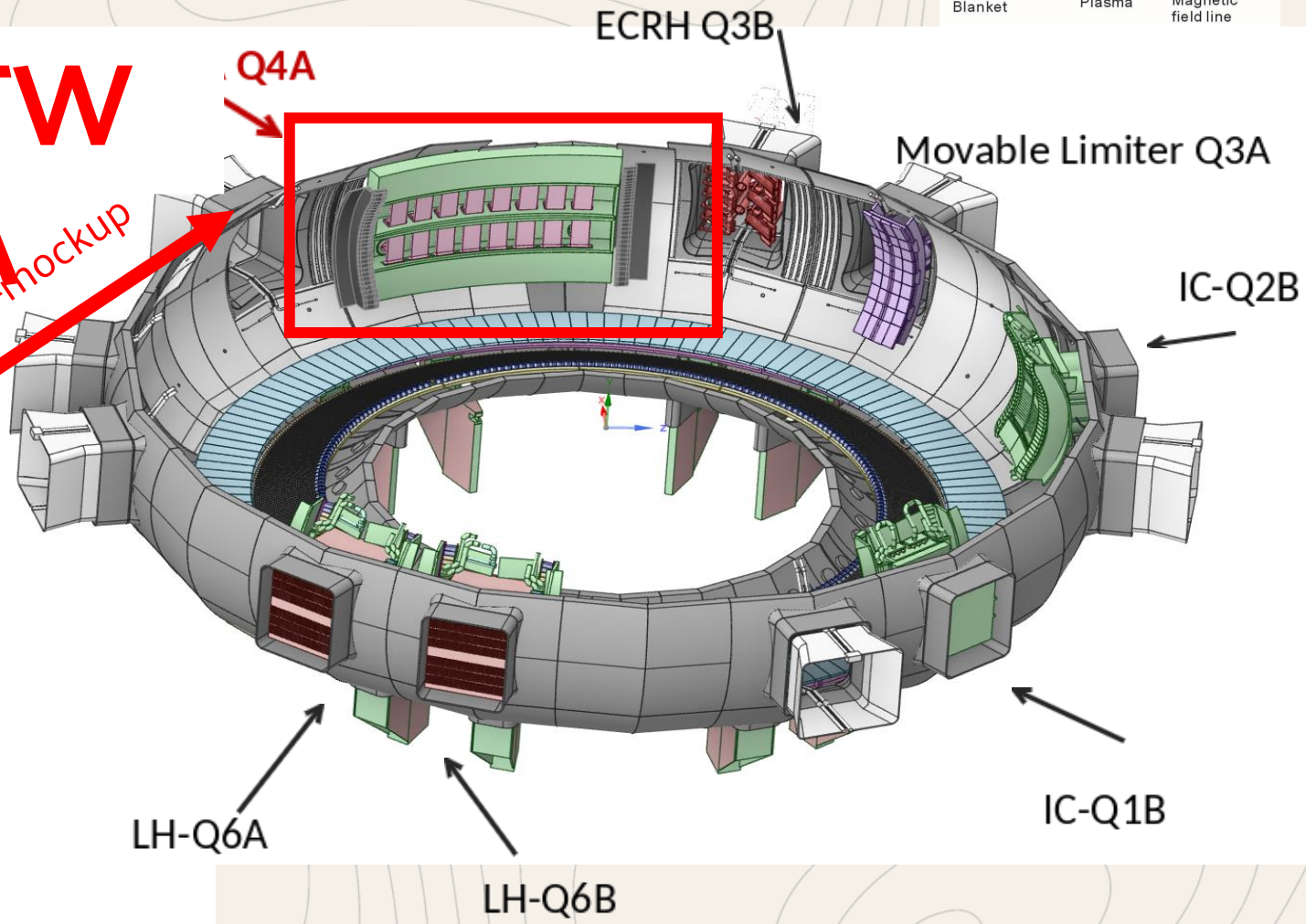
In near future: WEST (Cadarache, FR)





TWA

Successful test of TWA-mockup



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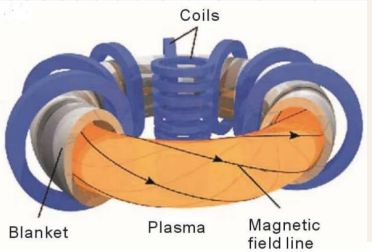
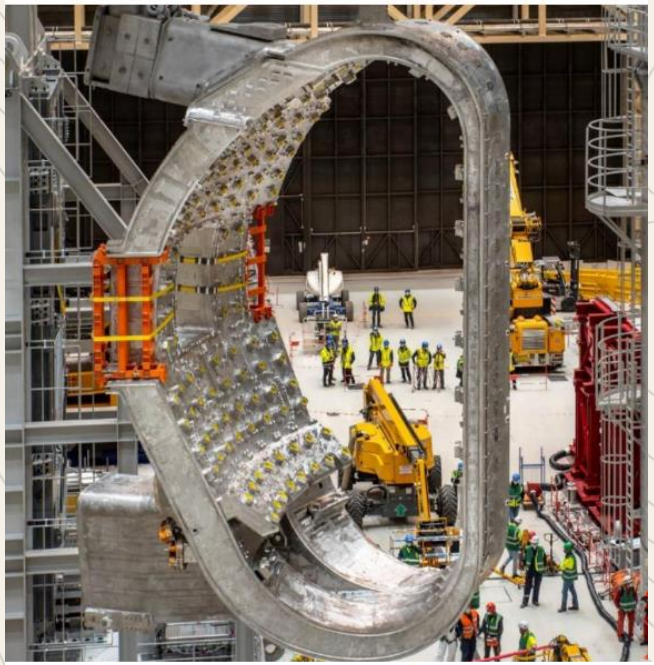
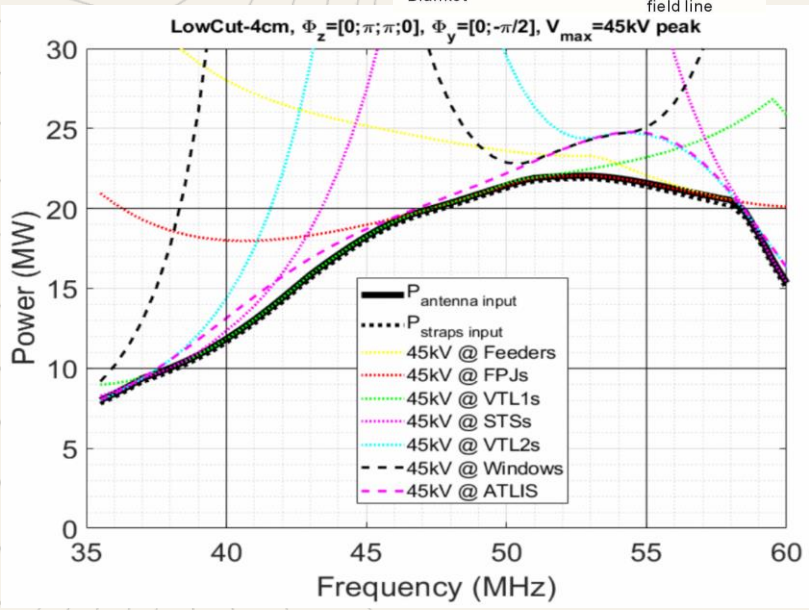
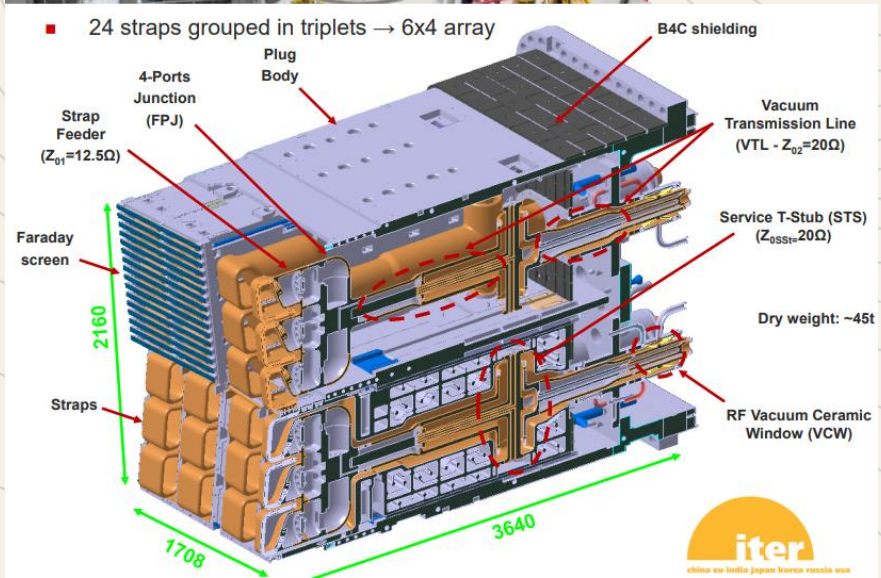
In future: ITER (Cadarache, FR)









Re-baselining ITER as from 2024

heating system includes ICRH

IC **10 MW** (by 1 antenna)

f = **40 - 55 MHz**

Phased antenna array : control

- toroidal phase differences
- current ratio between strap-columns

Functional requirements

Provide **bulk RF heating** - Assist access H mode

Provide **steady state current drive** (CD) capability

Assist in **ICWC** (IC Wall Conditioning)

Contribute to achieve **plasma breakdown, burn-through** and assisted **current rise**

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Questions

No-Time or you want more info ? Find us this afternoon on the PHYS stand !
Or on https://fusion.rma.ac.be !

>>> **More than welcome** <<<

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Royal Military Academy

Department of Mathematics

ALICE

Applied Cryptography Expertise

SMAC

Simulation, Modelling, and Analysis of Complex Systems

4DPL

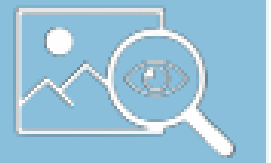
4D Perception Lab

ALICE

Applied Cryptography Expertise

Fundamental and applied cryptography research

Steganalysis



MISSION: PROVIDE EXPERTISE AND SUPPORT TO BELGIAN CYBER COMMUNITY

SMAC

Simulation, Modelling, and Analysis of Complex Systems

- **Mine Counter-Measure Operations**
- **Predictive Maintenance**
- **Open Source Intelligence Analysis**
- **Threat Evaluation and Weapons Assignment**
- **Medical Disaster Management**
- **Fundamental Research**
- **Space Situational Awareness**
- **Quantum Computing**

MISSION: HELP NAVIGATE COMPLEXITY WITH CLARITY

4DPL

4D Perception Lab

- Simultaneous location and mapping
- Landmine detection
- Augmented reality
- Bio/Chemical Weapon Detection
- Hyperspectral Sensors

MISSION: MAKE THE INVISIBLE VISIBLE

ROYAL HIGHER INSTITUTE FOR DEFENCE
LTCOL GENOUW JOHN (GS), DIR STRD

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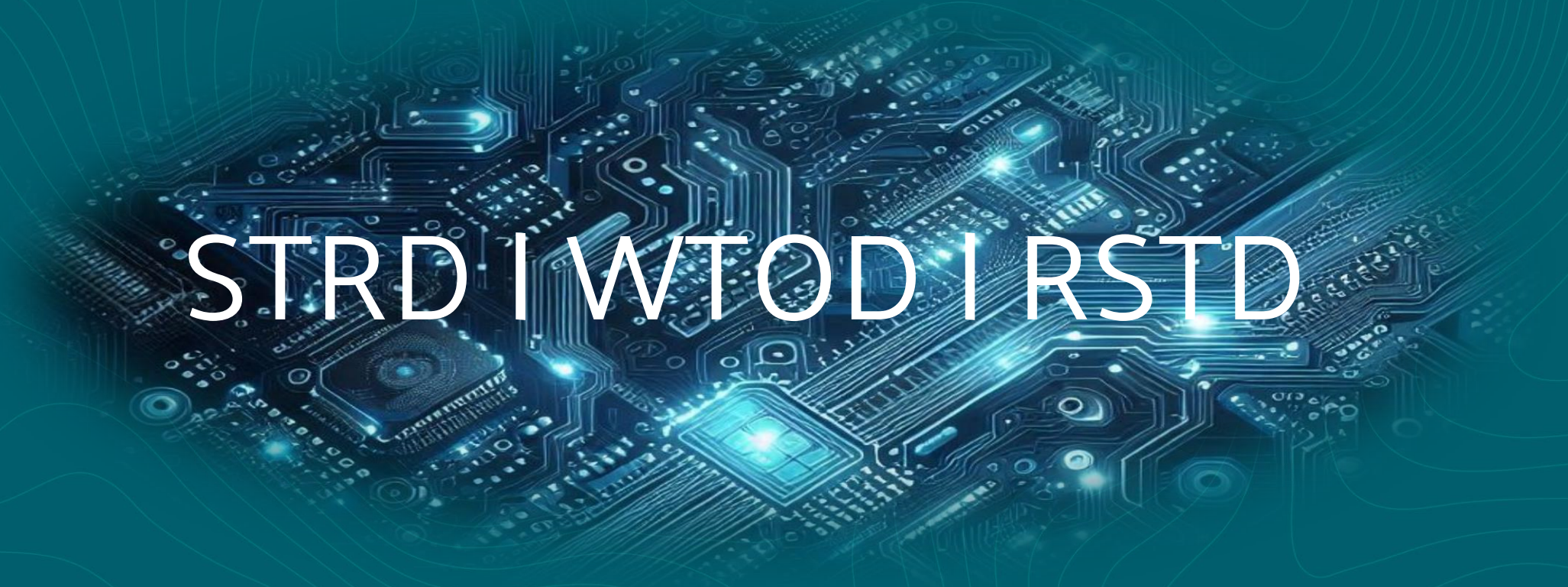
12 Sep 2025



STRD I WTOD I RSTD

SCIENTIFIC & **T**ECHNOLOGICAL **R**ESEARCH FOR **D**EFENCE

Belgian Policy

2016 — 2020 - 2022 — 2025

Strategic vision for Defence

- Gradual increase of the R&T contribution for security and defence up to 2% of defence spending in 2030
- Strengthening the Scientific, Technological and Industrial Potential
- Essential security interest to have a national DTIB

Policy Statement MOD (STAR plan)

- Development of a defense, industry, and research strategy (DIRS)
- ICCW the communities & regions
- R&T budget grows, specific DIRS Bg, Major development programs

Government agreement

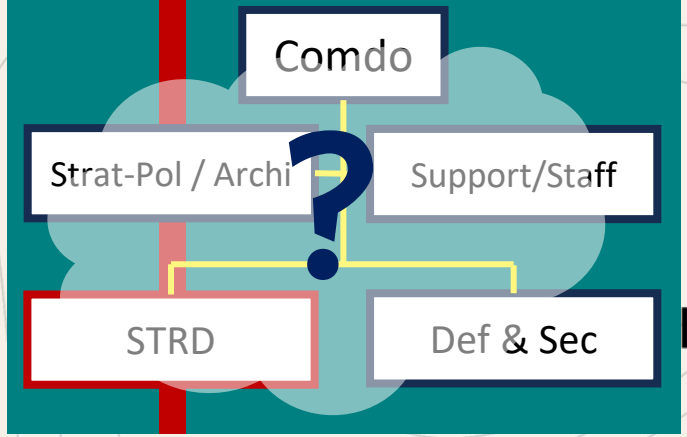
- RHID = Innovation Hub
- "DIRS is here to stay"
- Continued policy : Increased awareness, effort, resources

Belgian Defence 'Research, Technology & Innovation Vision 2030"

- The RHID wishes to be one of the driving forces for the development and the strengthening of the Belgian defence technological and industrial base (DTIB), in a European and NATO-framework, in order to develop a larger and better knowledge base, more effective military and industrial capabilities and a larger strategic autonomy in the security and defence domain.

⇨

- 5 vectors for Defence Research, Technology and Innovation
- RSTD Structure base (end 2024)



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The department for

Scientific and Technological Research of Defence

Supports the policy and strategy through 5 RTI vectors

From an internal scientific and technological research programme
to a research, technology and innovation policy
within a national and European context.

Structurally **reinforce the Belgian Defence**

R&T-capabilities
(Royal Military Academy, Defence laboratories,
Military Hospital Queen Astrid)

Develop a broader national knowledge and technological base

DEFRA
DEFENCE-RELATED RESEARCH ACTION

Science S4Policy

Stimulate and support **collaborative research and development**
(EDA, EDF, ESA, NATO)

EUROPEAN DEFENCE AGENCY

European Commission

NATO OTAN
Science & Technology Organization

Facilitate short-cyclic **innovation projects for Defence**

INNOVATION FOR DEFENCE
DIANA
HEDI
EUDIS Business Accelerator

Create **ecosystems** for research, development and innovation

WORK IN PROGRESS

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Royal Military Academy

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12 Research Areas

DAP	Data Acquisition and Processing
MSP	Mobility, Systems, and Protection
HFM	Human Factors and Medicine

From an internal scientific and technological research programme to a research, technology and innovation policy within a national and European context.

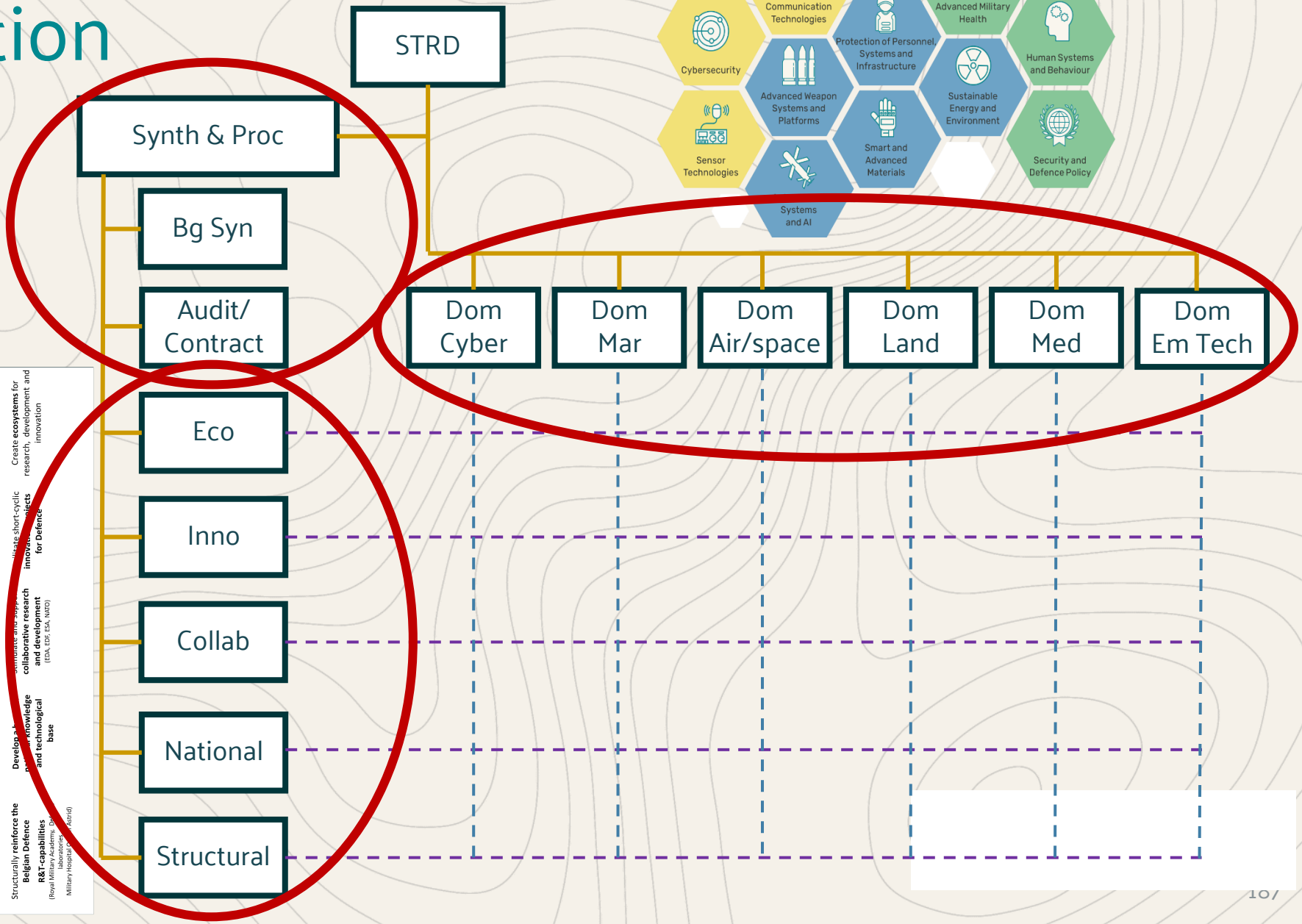
- Structurally **reinforce the Belgian Defence R&T-capabilities** (Royal Military Academy, Defence laboratories, Military Hospital Queen Astrid)
- **Develop a broader national knowledge and technological base**
- Stimulate and support **collaborative research and development** (EDA, EDF, ESA, NATO)
- Facilitate short-cyclic **innovation projects for Defence**
- Create **ecosystems** for research, development and innovation

ROYAL HIGHER INSTITUTE for DEFENCE

RSTD organisation

Current head count

- Bg follow up : 1 (=> 4)
- Coord : 6 (=> 8)
- Res Mgt : 8 (=> 11)



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Thank you

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Lunch Break

&

Networking Session

Sports Hall

RMA.be Brussels
Royal Military Academy

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LA DÉFENSE