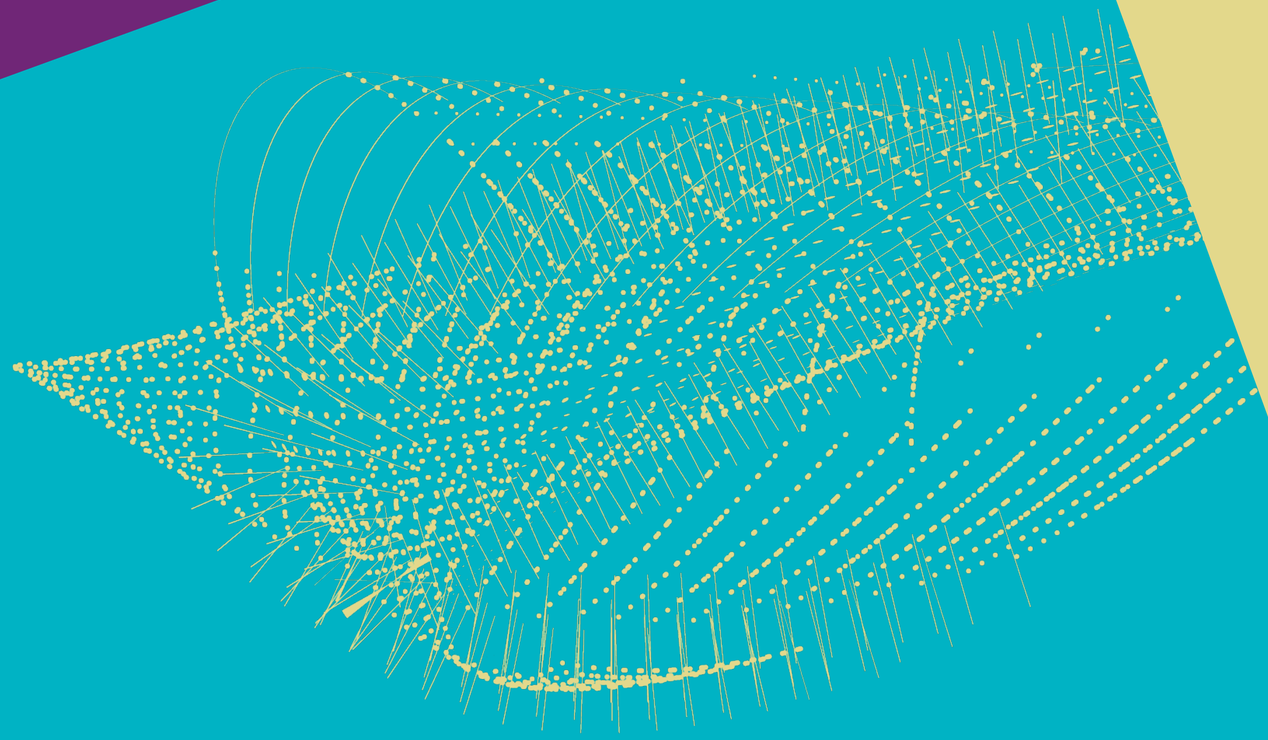
Nikhef



Welcome Nikhef SAC

Jorgen D'Hondt
Nikhef Director

Nikhef – Dutch national institute for particle & astroparticle physics

Nikhef's mission is to study the interactions & structure of
all elementary particles and fields at the smallest distance scale
and the highest attainable energy.

Two complementary approaches:
accelerator-based particle physics
astroparticle physics

Nikhef coordinates & leads
the Dutch experimental activities in these fields.

Nikhef – Dutch national institute for particle & astroparticle physics

NWO institute and 6 university partners

- University partners in key positions
  - leaders of the scientific programs
  - comply to the Nikhef National strategy

Permanent Staff	105
PhD candidates	125
Postdocs	55
Technical/engineer	88
Support	47

Nikhef – Dutch national institute for particle & astroparticle physics

Technology workshops/labs

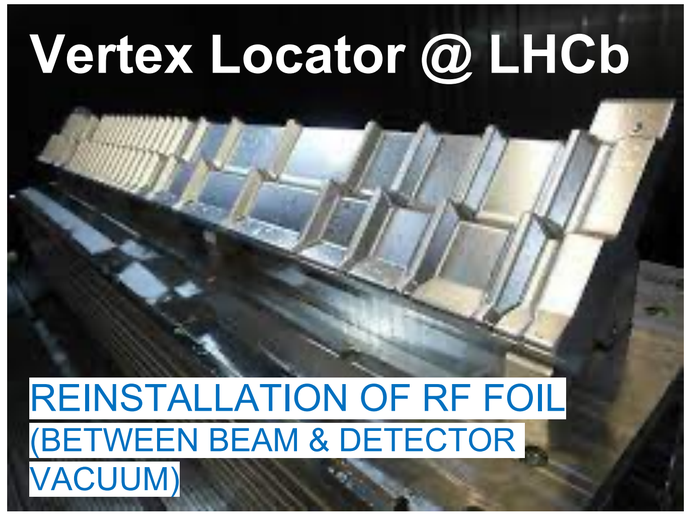
- mechanics, electronics, computing
- Tier-1 computing centre

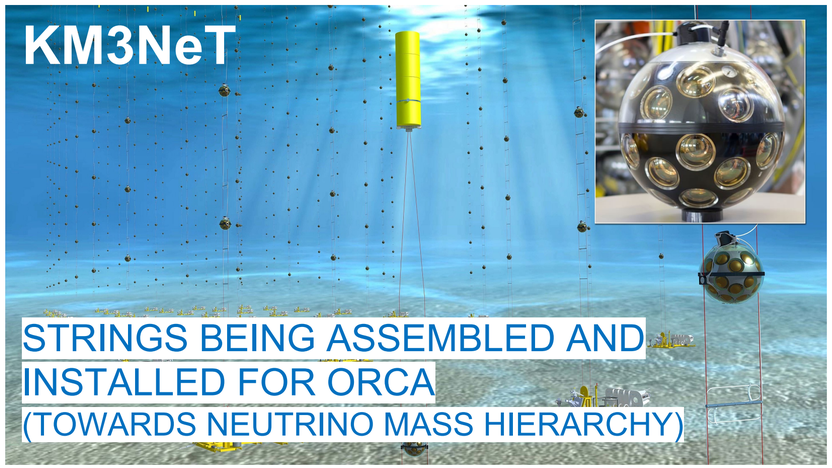
Theory, Data Processing, Detector R&D

Strong participation in

- ATLAS, LHCb, ALICE @ LHC
- KM3NeT, Dark Matter (Xenon), UHECR (Auger)
- eEDM experiment @ Nikhef
- gravitational waves (Virgo, ETPathfinder, ET)

Annual budget ~55M EUR





NIKHEF STRATEGY 2023-2028

1. EXPANDING KNOWLEDGE
2. PROVIDING TECHNOLOGIES
3. PREPARING THE FUTURE
4. FOSTERING HEALTHY PARTNERSHIPS

NIKHEF STRATEGY 2023-2028

Expanding knowledge – Further exploring our understanding of the universe in terms of elementary particles and forces, through the interpretation of data and by confronting the results with theory and vice versa.

- Develop new theoretical models utilising high-precision data of the experimental programmes;
  - Theory & Experiment go hand in hand (several TH+EXP PhD theses)
  - Focus on EFT, QCD (for LHC) and BSM (flavour, neutrinos, cosmology)
  - Continuous exploration to position the group to successfully apply for (major) grants as a group/community, potentially together with experimental groups.

NIKHEF STRATEGY 2023-2028

Expanding knowledge – Further exploring our understanding of the universe in terms of elementary particles and forces, through the interpretation of data and by confronting the results with theory and vice versa.

- Search for new (Beyond the Standard Model) phenomena in data from the LHC experiments ATLAS, LHCb and ALICE, and the eEDM experiment in Groningen;
  - Attracting and fostering new talented researchers at the LHC experiments requires Nikhef to seek innovation in instrumentation, data processing and data analysis.
  - We plan to connect our physics ambitions with innovations in enabling technologies like fast-timing detectors (4D tracking) and AI/ML (e.g. for reconstruction, classification, measurements and searches).

NIKHEF STRATEGY 2023-2028

Expanding knowledge – Further exploring our understanding of the universe in terms of elementary particles and forces, through the interpretation of data and by confronting the results with theory and vice versa.

- Exploit the discovery potential of the ‘multi-messenger’ astroparticle physics experiments KM3NeT, Auger and Virgo, and the XENONnT experiment;
  - Actions initiated to renew the dialogue with the astronomy community in the Netherland to explore a common vision for MMA, and a joint ambition to establish concrete research projects.
  - CTA is not hosted by a national institute in the Netherlands.
  - Demonstrate we can work together successfully and position ourselves for major grant applications to realise a joint MMA ambition.

NIKHEF STRATEGY 2023-2028

Expanding knowledge – Further exploring our understanding of the universe in terms of elementary particles and forces, through the interpretation of data and by confronting the results with theory and vice versa.

- Develop innovative data-reconstruction and -analysis strategies using artificial intelligence, machine learning and quantum-computing technologies throughout Nikhef's scientific portfolio.
  - Established the AI/ML@Nikhef Task Force to develop an integrated plan to embrace AI/ML across all research programs at Nikhef, i.e. linking expert developments outside Nikhef and our research programs
  - Strategic choice to focus two new external grant applications on the personnel and hardware requirements for AI/ML (see document for discussion on Friday June 6)

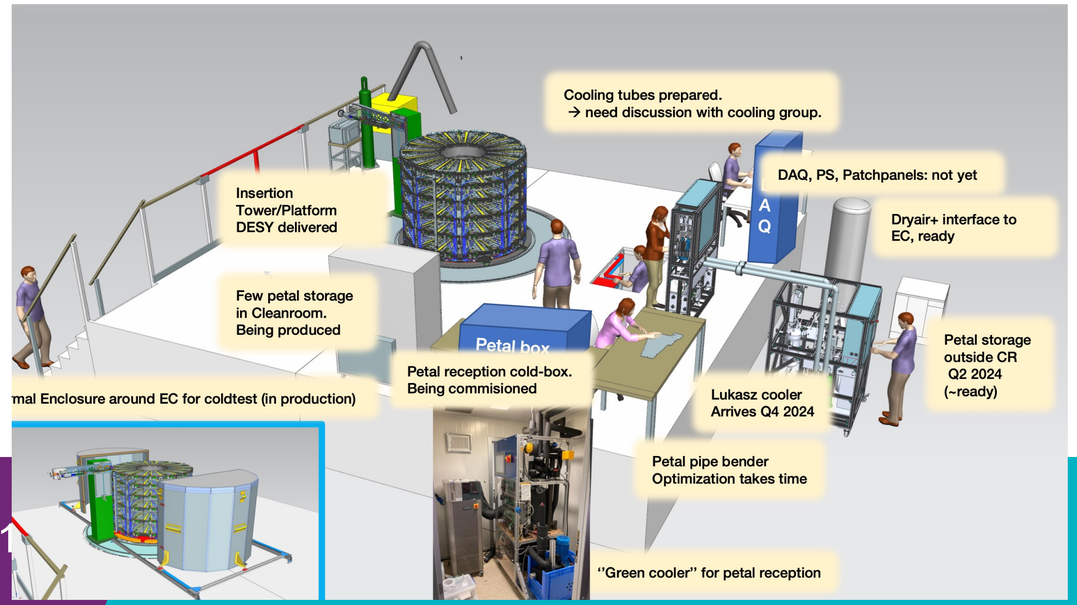
AI/ML@Nikhef TASK FORCE – mandate

- The AI/ML@Nikhef Tasks Force aims to **deliver a strategic roadmap** with options for AI/ML at Nikhef to achieve impact on the short and long term.
- First reflect on the current situation, with an **inventory of current expertise** in AI/ML for fundamental physics at Nikhef. The Task Force will identify key existing collaborations on AI/ML, describe the impact of current efforts, and benchmark Nikhef's current state of the art in AI/ML for fundamental physics with that of other institutes in terms of capabilities and expertise.
- For its **recommendations for future actions**, the Task Force will identify both short-term actions, across programs as stepping stones for future thematic impact, and options for long-term actions. For the latter, it will identify research themes where Nikhef could make an impact with future AI/ML technology on the time scale of 5-10 years, and it will make a first assessment of investments needed to have impact in those area.
- The report will present **recommendations for strengthening and initiating new partnerships** both nationally and internationally in AI/ML for fundamental physics, and recommend options for integration of AI/ML in Nikhef's organisational structures and in its branding.

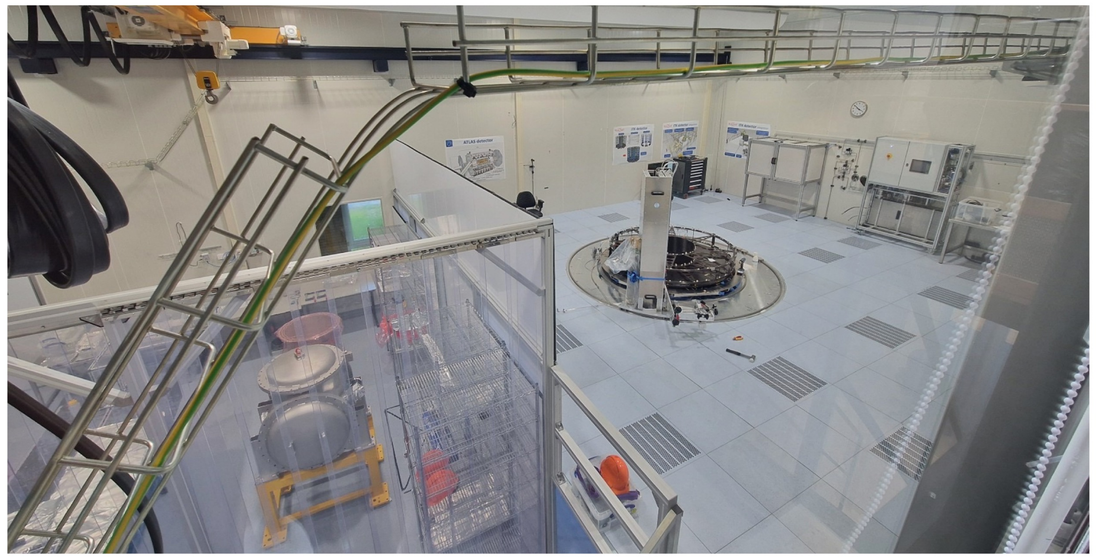
NIKHEF STRATEGY 2023-2028

Providing technologies – Much of Nikhef's effort is put into upgrading and exploiting the current experiments and building upcoming experiments, and the technology departments at Nikhef are essential to make this happen.

- Contribute to the upgrades of the LHC experiments scheduled to be installed during LHC's Long Shutdown 3 (LS3, 2025-2028), in particular the major upgrade for ATLAS;
  - The ITk upgrade for ATLAS is in full swing and Nikhef is ready to deliver



Clean room at Nikhef



NIKHEF STRATEGY 2023-2028

Providing technologies – Much of Nikhef's effort is put into upgrading and exploiting the current experiments and building upcoming experiments, and the technology departments at Nikhef are essential to make this happen.

- Continue the digital optical module (DOM) assembly, integration and deployment for KM3NeT;
  - Fantastic observation of the highest energetic neutrino
  - Towards the future, a major grant has been applied for completing the ambition to realise the full ORCA part of KM3NeT

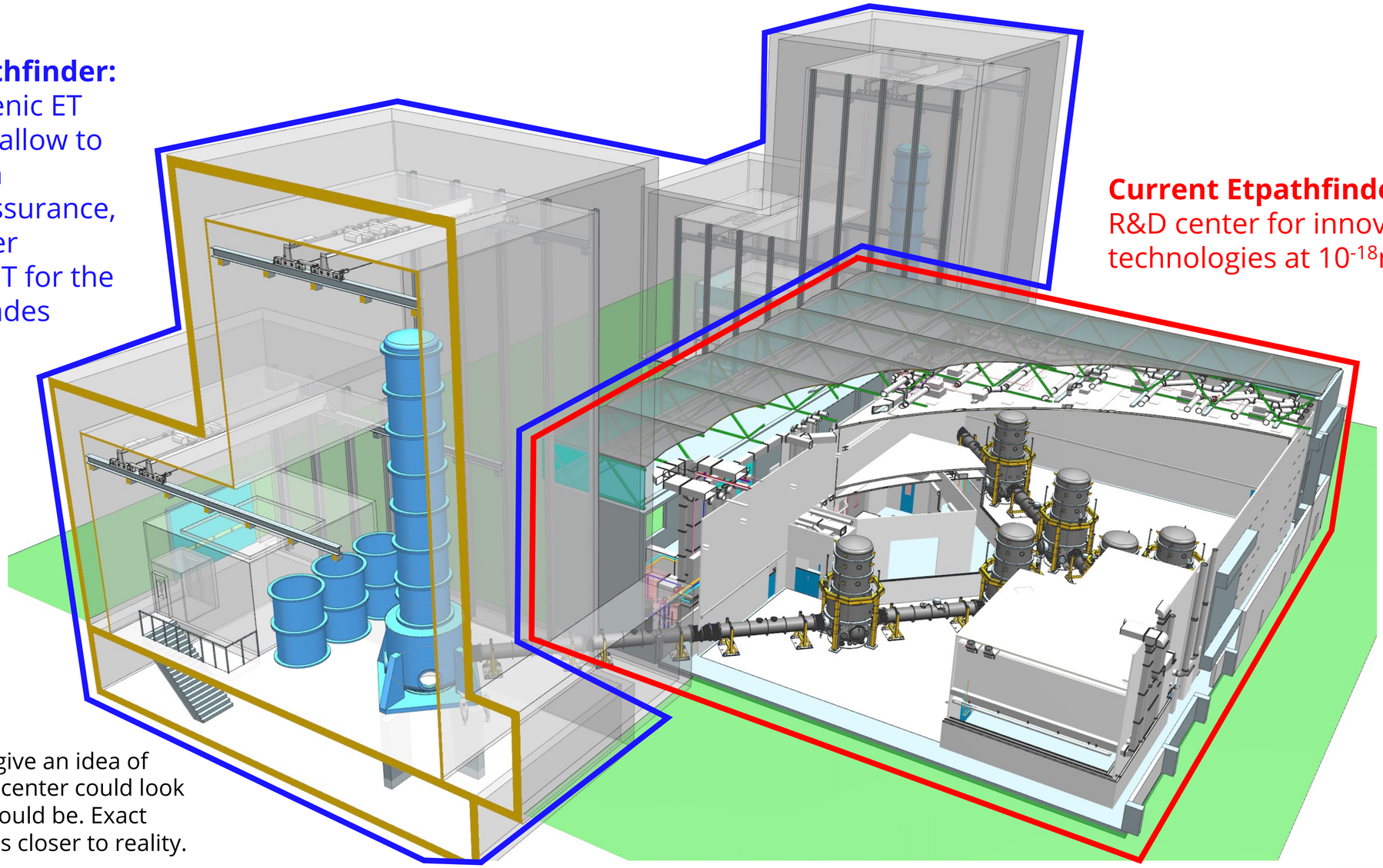
NIKHEF STRATEGY 2023-2028

Providing technologies – Much of Nikhef's effort is put into upgrading and exploiting the current experiments and building upcoming experiments, and the technology departments at Nikhef are essential to make this happen.

- Complete the first phase of the ETpathfinder R&D laboratory in Maastricht and contribute to the crucial interventions/upgrades required to make Virgo competitive with the LIGO facilities in the USA;
  - ETpathfinder is operational, and first thoughts are emerging to extend the R&D laboratory to a validation centre for real-size instruments for the Einstein Telescope
  - The Virgo upgrade TDR is being finalised and Nikhef is preparing to take a leadership role in the implementation of the project (pending funding, risk assessments related to the technical capacity to realise the full upgrade, and global strategic alignment of ambitions)

ET Pathfinder – vision to full scale

Extension of Etpathfinder:
2x Full Scale Cryogenic ET mirror towers. Will allow to develop integration concepts, quality assurance, risk reduction, faster commissioning of ET for the next couple of decades



Current Etpathfinder:
R&D center for innovative ET technologies at 10^{-18}m level

Note: Artistic concept to give an idea of how an ET LF integration center could look like and what the scale would be. Exact plans TBD if dream comes closer to reality.

Nikhef

NIKHEF STRATEGY 2023-2028

Providing technologies – Much of Nikhef's effort is put into upgrading and exploiting the current experiments and building upcoming experiments, and the technology departments at Nikhef are essential to make this happen.

- Perform maintenance of hardware in the (astro)particle physics experiments
  - Technologies and scientists have a drive to innovate and develop new instruments
  - The long-term maintenance of existing instruments is however a key responsibility for the institute, also in the context of international collaborations
  - Finding an adequate balance between the attraction to innovate and the duty to maintain is a continuous point of attention

NIKHEF STRATEGY 2023-2028

Preparing the future – Nikhef is constantly innovating towards new technologies and designs of new facilities and projects to explore new scientific challenges and opportunities in the years to come.

- Continue the R&D on ‘4D fast timing’ to be able to implement this technology for the upgrades of the LHC experiments in the 2030s;
  - Decades of expertise with silicon detector developments at Nikhef
  - A major grant has been submitted to deliver 4D fast-timing detectors for ATLAS, ALICE and LHCb, including innovations in sensors, integrated circuits (ASICs), data transmission, cooling and mechanical support structures, and accelerated tracking algorithms
  - This is Nikhef’s key capital investment to the LHC experiment for the next 10 years and a focal point for our technical and scientific efforts

NIKHEF STRATEGY 2023-2028

Preparing the future – Nikhef is constantly innovating towards new technologies and designs of new facilities and projects to explore new scientific challenges and opportunities in the years to come.

- Prepare the technical design of the Einstein Telescope and investigate if a realistic bid to host the Einstein Telescope in the Euregion Meuse-Rhine can be made;
  - Significant efforts in the Netherlands coordinated by the Ministry but with a major involvement of Nikhef in various ways
  - New leadership has been hired to take over some roles from the Nikhef director (who remains the ET co-Coordinator for the European project)
  - In Nikhef's organisation we have created temporary groups for the national and international developments of the ET preparations; this facilitates the separation of budgets, capacity and planning with our research programs

NIKHEF STRATEGY 2023-2028

Preparing the future – Nikhef is constantly innovating towards new technologies and designs of new facilities and projects to explore new scientific challenges and opportunities in the years to come.

- Intensify participation in XLZD, DUNE and a next-generation UHECR.
  - Nikhef has an extensive expertise with Xenon Dark Matter detectors, and we have expanded our local lab for material characterisation; accordingly, we have an expertise very relevant for the developments of XLZD
  - GRAND in China might have to be reconsidered which jeopardises our main route beyond Auger; alternatives like SWGO are being explored
  - For Nikhef to observe a leading role in DUNE it would have to upscale its investments significantly; currently researchers at Nikhef are only fractionally engaged in DUNE with overlap with KM3NeT and Xenon; do we have sufficient person power in the combined KM3NeT+Xenon/XLZD+DUNE groups to cover all our ambitions?

NIKHEF STRATEGY 2023-2028

Preparing the future – Nikhef is constantly innovating towards new technologies and designs of new facilities and projects to explore new scientific challenges and opportunities in the years to come.

- By the early 2040'ies, several of our current experiments will have provided their legacy results and come to an end.
  - *The high-luminosity runs of the LHC will be completed*
  - *KM3NeT will have had 10 years for full operation*
  - *Our eEDM project we have published it legacy papers*
  - *XENON and XLZD will have reached their best performances*
  - *Auger Prime will have completed its 10-year program*
  - *The 2nd generation Virgo will have made the transition to the 3rd generation Einstein Telescope*
  - *DUNE will have …*
- By the late 2040'ies, we must have made a transition to a new Nikhef portfolio of experiments.

TOWARDS THE FUTURE

- The roadmaps of astroparticle and particle physics will be our main guidelines to engage in new experiments.
- Preparing for the above-mentioned ongoing experiments has been a rollercoaster with a lead-time of 10-20 years.
- Accordingly, the process towards our future in the 2040'ies must start today.

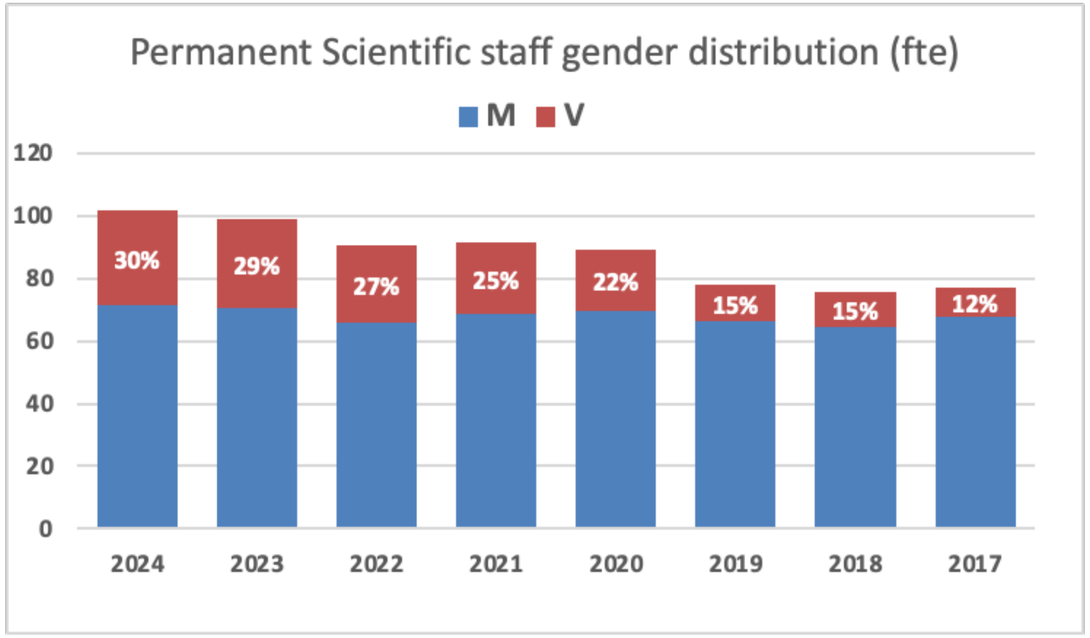
- Developing and defining together the long-term vision for Nikhef, actively promoting this ambition, building adequate technical capacity and expertise, preparing new talented leadership, fostering careers and the Nikhef partnership in this transition, adapting our organization, ensuring the buy-in of everybody at Nikhef, prepare the managerial instruments to inform ourselves, etc … will be a challenging task.

- The task will be led by Rosemarie Aben, and she will be actively assisted by a working group dedicated to (1) developing a strategy for Nikhef, (2) developing an implementation plan and (3) organize the implementation.

NIKHEF STRATEGY 2023-2028

Fostering healthy partnerships – Nikhef strives to be a vibrant, diverse and inclusive community in the (inter)national field of (astro)particle physics, offering a safe work environment and investing in people's talents and expertise.

- Expand on the diversion and inclusion agenda, and pursue (gender) balance in leadership positions;
  - Excellent progress on gender diversity among the junior faculty
    - Nikhef has ± 100 permanent scientific staff members, 30% of whom is female
    - 22 of the 50 most recent hires are female (44%)
  - The first Diversity Day of Nikhef was a success


Permanent Scientific staff gender distribution (fte)
M
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120
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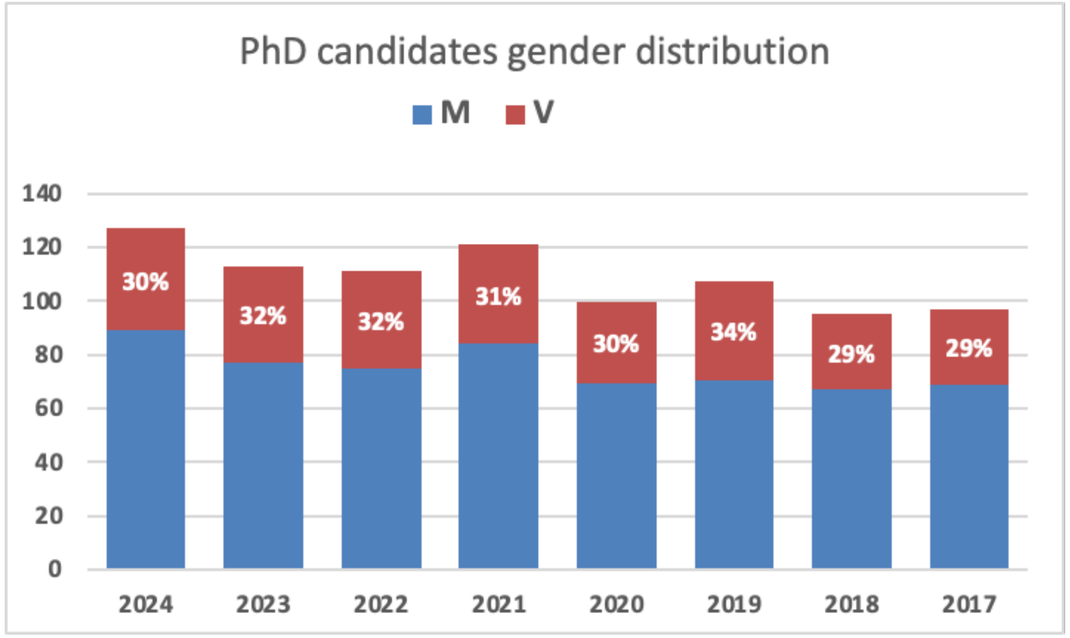
PhD candidates gender distribution
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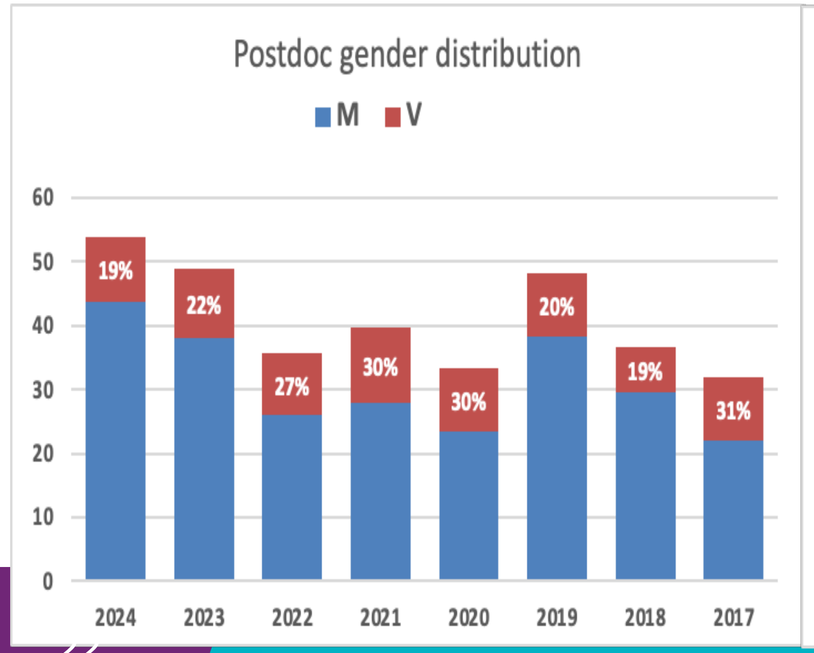
Postdoc gender distribution
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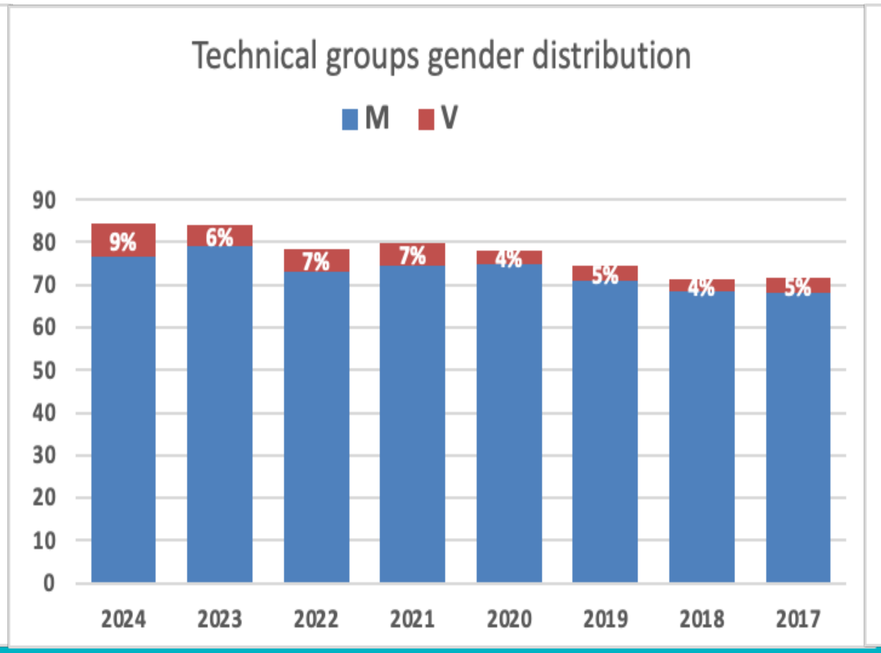
Technical groups gender distribution
M
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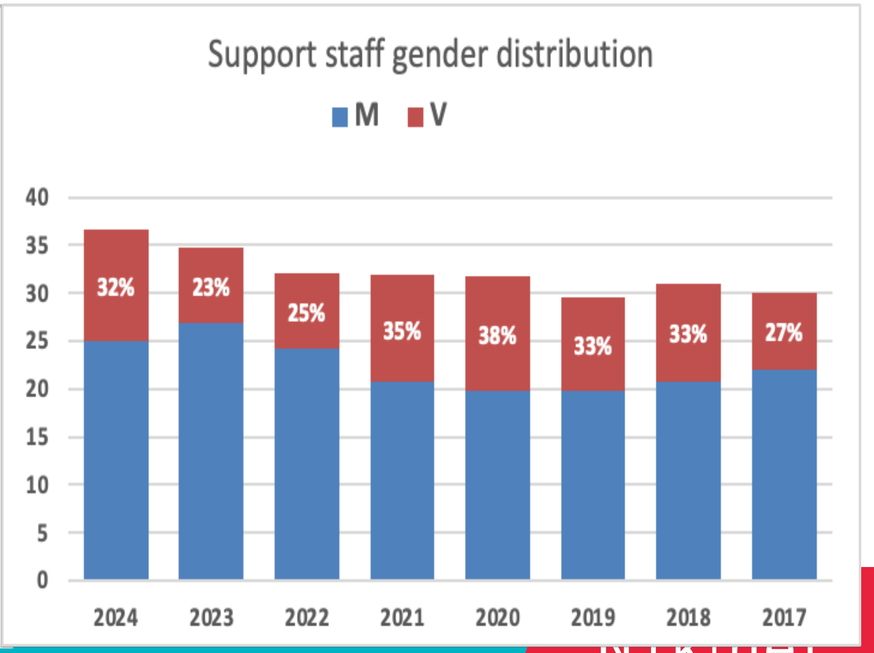
Support staff gender distribution
M
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0
32%
23%
25%
35%
38%
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NIKHEF STRATEGY 2023-2028

Fostering healthy partnerships – Nikhef strives to be a vibrant, diverse and inclusive community in the (inter)national field of (astro)particle physics, offering a safe work environment and investing in people's talents and expertise.

- Work toward climate neutrality in 2030, and pursue our sustainability agenda for travel and the primary process;
  - As originally planned, we had a midterm evaluation of the Nikhef Sustainability Roadmap actions in 2025.
  - Accordingly, we have an updated sustainability ambition and action plan including improving our energy efficiency and reducing our carbon footprint (see document for discussion on Friday June 6), we aim for net-zero carbon footprint by 2034-2035.
  - A Sustainability Officer has been assigned to this task.

NIKHEF STRATEGY 2023-2028

Fostering healthy partnerships – Nikhef strives to be a vibrant, diverse and inclusive community in the (inter)national field of (astro)particle physics, offering a safe work environment and investing in people's talents and expertise.

- Strengthen links to industry and other research institutes;
  - We organise the Big Science Forum in 2026 in Maastricht

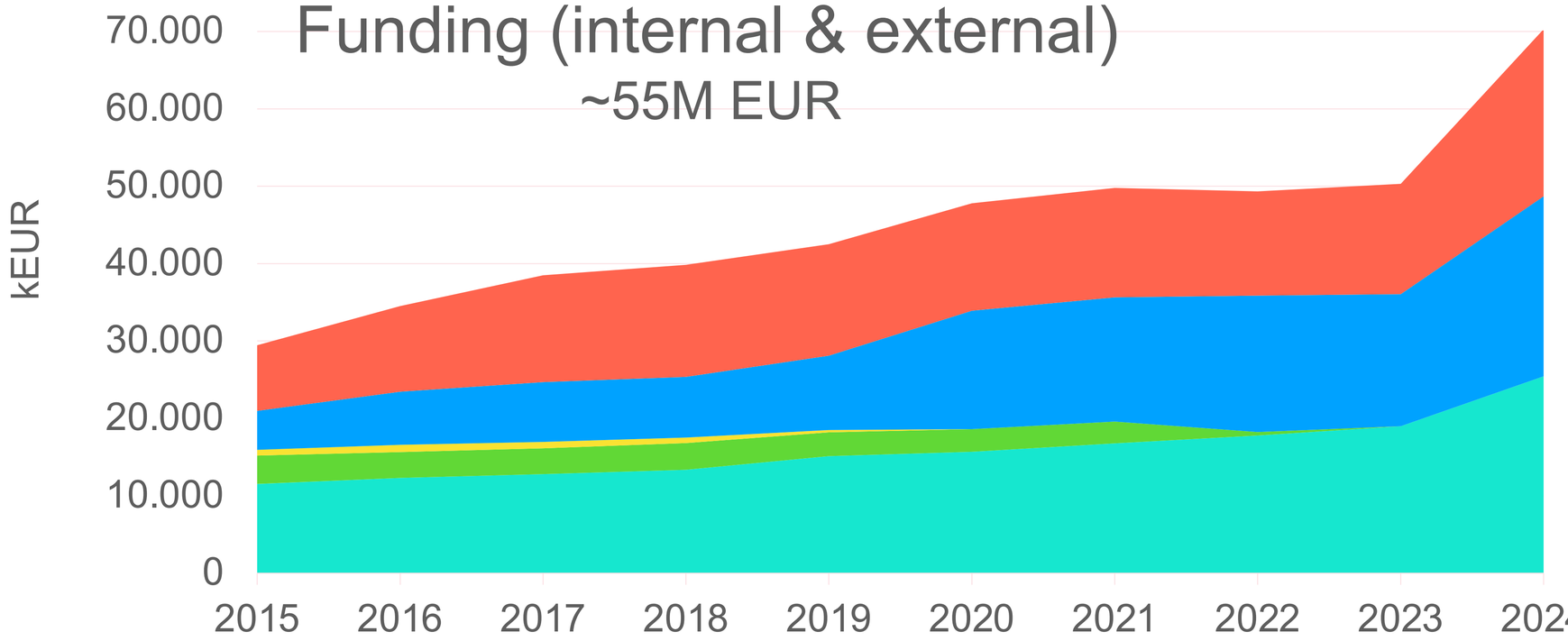
- Exploit the (new) possibilities of the new Nikhef building to foster talent and outreach activities.
  - Clearly a very dynamic environment! Step by step getting the Nikhef family together in the building with various events (e.g. Nikhef-50 on June 17)
  - PhD and postdoc councils are engaged, connected and very active
  - A new leadership training program is being developed with focus on NWO-I research institutes
  - We had our first Nikhef Open Day in the new building, very successful
  - Internal communications and the external website are being revisited

NIKHEF STRATEGY 2023-2028

Fostering healthy partnerships – Nikhef strives to be a vibrant, diverse and inclusive community in the (inter)national field of (astro)particle physics, offering a safe work environment and investing in people's talents and expertise.

- The partnership between the NWO-I institute and our six university partners forms the foundation of Nikhef. We continue to invest in it and are always looking at ways to maximise its potential. Our internal communication plan pays extensive attention to this.
  - e.g. regular meetings between the directorate and the university team leaders

NIKHEF BUDGET (including personnel)

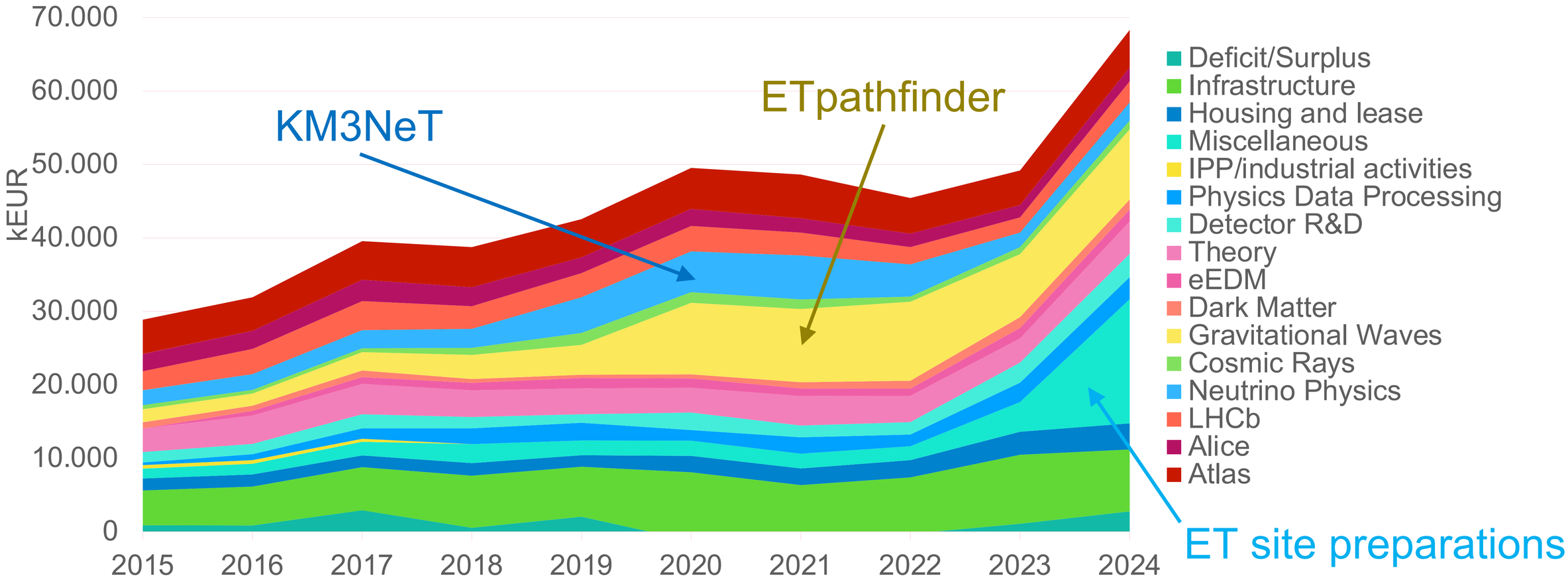


Increase of 14.5M EUR is due to specific grants related to the preparations of the Einstein Telescope

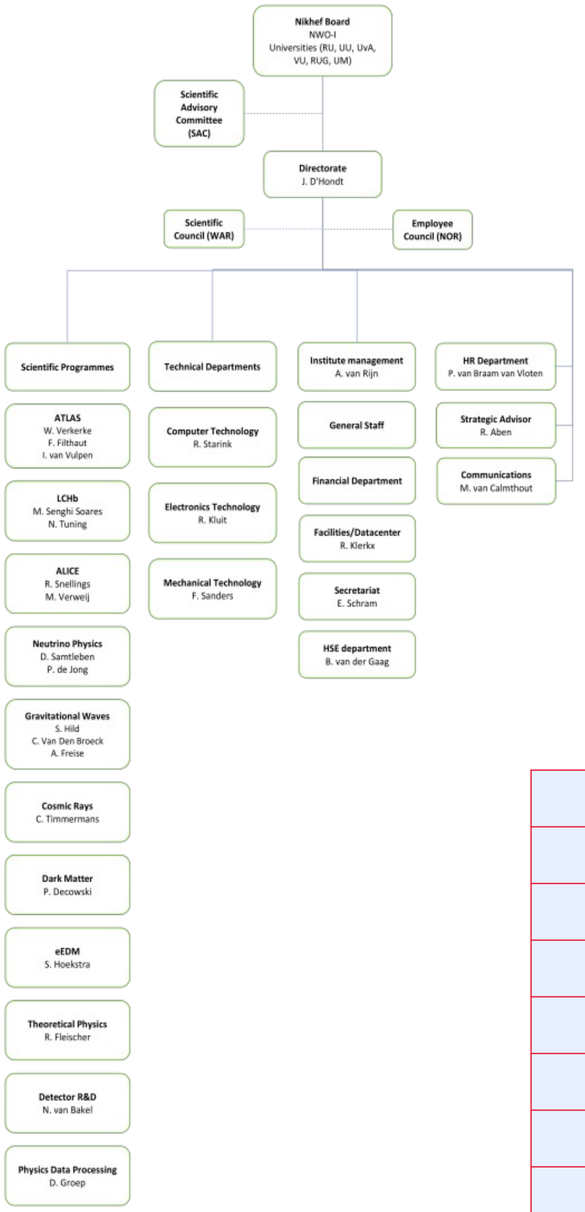
The budget is under stress due to the (geo)political climate, and general costs are increasing. This creates tension between sustaining established research lines and initiating new research directions. We increasingly depend on external grants. Idea to establish an internal program with small grants for proof-of-concept projects as seeds for larger external grants.

Nikhef

NIKHEF EXPENSES



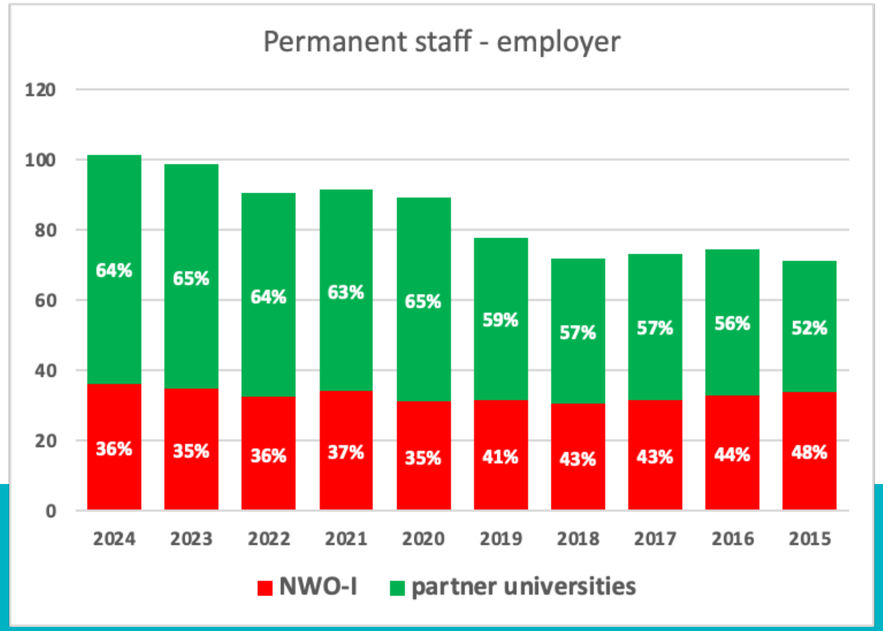
This includes also the allocation of technical personnel over research programs. While we foster talent, we keep 20-25% flexibility in our technical staff (temporary contracts) to potentially adapt our expertise and capacity to fit requirements in emerging research directions.



NIKHEF PERSONNEL

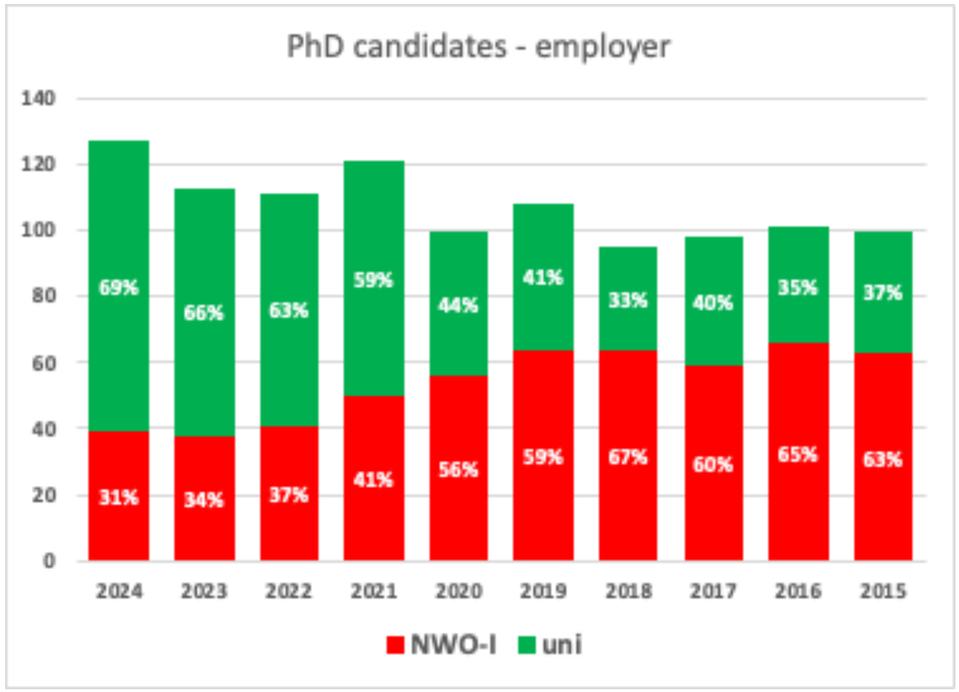
- Over the past 10 years, Nikhef permanent staff increased from 71 to 101 FTE (+42%)
- The growth is mostly caused by:
  - the joining of RUGroningen and UMaastricht
  - increase in university positions (Sectorplan)
- The ratio of NWO-I staff vs university staff was about 50-50 in 2015; today it is about 1/3 - 2/3.

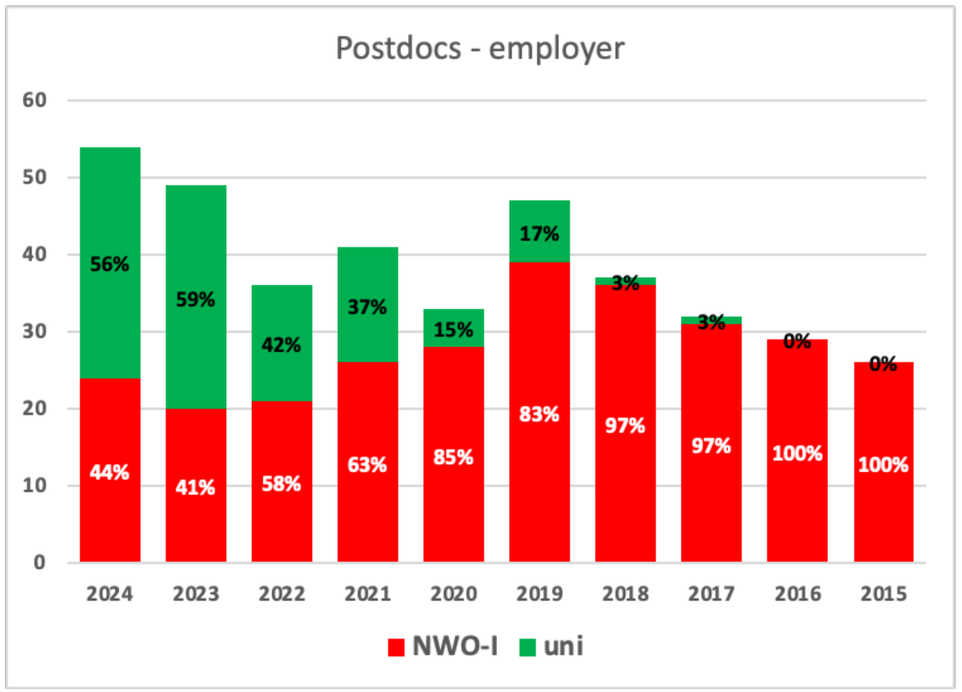
PhDs graduating	
2024	24
2023	18
2022	12
2021	27
2020	21
2019	14
2018	16
2017	15
2016	29
2015	20



NIKHEF EARLY CAREER RESEARCHERS

- A steady (or even slightly increasing) number of PhD candidates
- Clearly more postdoctoral researchers
- Early career researchers increasingly on university budgets/grants
- Nikhef the backbone for technology, universities strengthen the research part





PhDs graduating	
2024	24
2023	18
2022	12
2021	27
2020	21
2019	14
2018	16
2017	15
2016	29
2015	20

Nikhef Jamboree May 19-20, 2025

very large participation

Nikhef
JAMBOREE 2025
17 JUNI NIKHEF 50 JAAR
Charles Timmermans INTRO: great spot, de Vasim! my grandfather used to work here
SPECIAL AWARD CEREMONY - de Jan Kluyver prijs - the Jan Kluyver Award
Ashley Ellen
Mc Dougall
Parallel Topical Session: Knowledge and Tech Transfer
Assignment! Flip Nikhef Technology for Alternative Solutions
Example TU Delft Upside Down Flight Simulator
To stabilize unmanned motion at sea.
Parallel Topical Session: Taskforce Diversity & inclusion:
Hearing vs. listening
Or: Careless whisper Carefully whispering?
Compassion & Respect
At Nikhef: We party on!
AHOY!
Let's continue to create new and better ideas!
we'll have many more breakfast sessions: great opportunities to connect!
Aiming for 4D-tracking!
Welkom Jorgen Have fun!
prof. Jorgen d'Hondt: my lifestory (last six months) started with cookies, kitchen, registration of hours & have fun!
I Looove Future Colliders!
All my knowledge is in my backpack
WEL COME
let's build a future together!
from Silk factory de Vasim Nijmegen to Cultural hub
ET PADVINDER
and... we will reduce the carbon footprints of all our research projects.
Lucas Timmermans: IC Design / Picopix Timing
Smaller + smaller transistors
In all chips you have power supplies & comparators
Freek Sanders: We work for you! we will give you what you need.
Silicon
We can make just about ANYTHING
A centrifugal glue mixer
Can You Make...?
You need it...
We got it!
Instead of spreading it out, we put it in a loop
take care! sometimes they get HOT
I traveled all over the place! and I partied
and I'm looking forward to my new wall!
Frans Schreuder: ATLAS is going through several upgrades & FELIX will get a 10x higher trigger rate transferring lots of data!
STRINGS? Atlas?
ANTARES!
Daniel Geerts + Sil Westerveld: Security Update
What percentage of our mail gets rejected by our spamfilter?
8000/9000 email per day coming in 150.000 spam emails
95% gets rejected
Ronald Starink: We live in interesting times but also... dangerous times! people aim to access our computers & steal the information that's on it: like YOUR THESIS!
AWARENESS is KEY
Parallel Topical Question: WHO (early career researchers) SHOULD HAVE WON THE EUROVISIE SONGFESTIVAL?
ESTONIA!
BBQ!
STOOMBOOT
our office is next to DATA CENTER
Emily Kooistra & Roel Aaij
We need to do better to prevent us getting PHISHED
SO: notify us! (we will not punish you if you don't)
forward phishing mails + send us your screenshot
We also have a coding assistant, it's totally safe, even though AI is involved
OUR TOOLS ARE GETTING BETTER
up to date libraries AVAILABLE!
+ vacuum lab with little & big RGA
you can quickly set up tests here!
what's that gas coming out of the other end??
Big hall: Build stuff, Experiment, ATLAS ITK testing, DMISENS
Cooling lab: lots of parts & coolers here + new materials for cooling substrates
Ice lab: NEW! Dutch Black Hole Consortium
Silicon Alley: with a detector assembly & a clean room
Verspanende werkplaats: Machining workshop, Wood workshop, Reinheids Lab from clean to ULTRA HIGH VACUME CLEAN welding facilities
ASSEMBLY HALL
MEZZANINE BIG HALL with ET junk naturally!
We also have a measuring machine it can measure everything!
DEEP IN THE MEDITERRANIAN SEA WE'RE GOING TO BUILD MORE STRINGS
KM3 Net: 1 km³
I thought I just saw a Neutrino coming by...
Did you know that the heat generated in our institute is re-used to supply student homes with energy?
How to get most out of your proposal & earn that grant??
- choose your audience
- explain why the problem you're adressing is relevant
- innovation innovation innovation
- describe the current situation
- what's already been established + what your goal is
- what is the output?
- what is the result of the output?
- distinguish yourself from your peers
- design your application well
- make it easy to read for non-experts
- grant cv's read the rules!!
- abstract/summary/keywords
- ask for help! (NIKHEF will be delighted to support!)
NOW GO GET THAT GRANT
by Wouter Verkerke
we need: trust in communication, speeddating (instead of breakfast), communication with colleagues at other universities, to participate in communication with each other, to learn something, to think about multiple channels
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THANK YOU FOR YOUR ATTENTION!

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Welcome SAC!