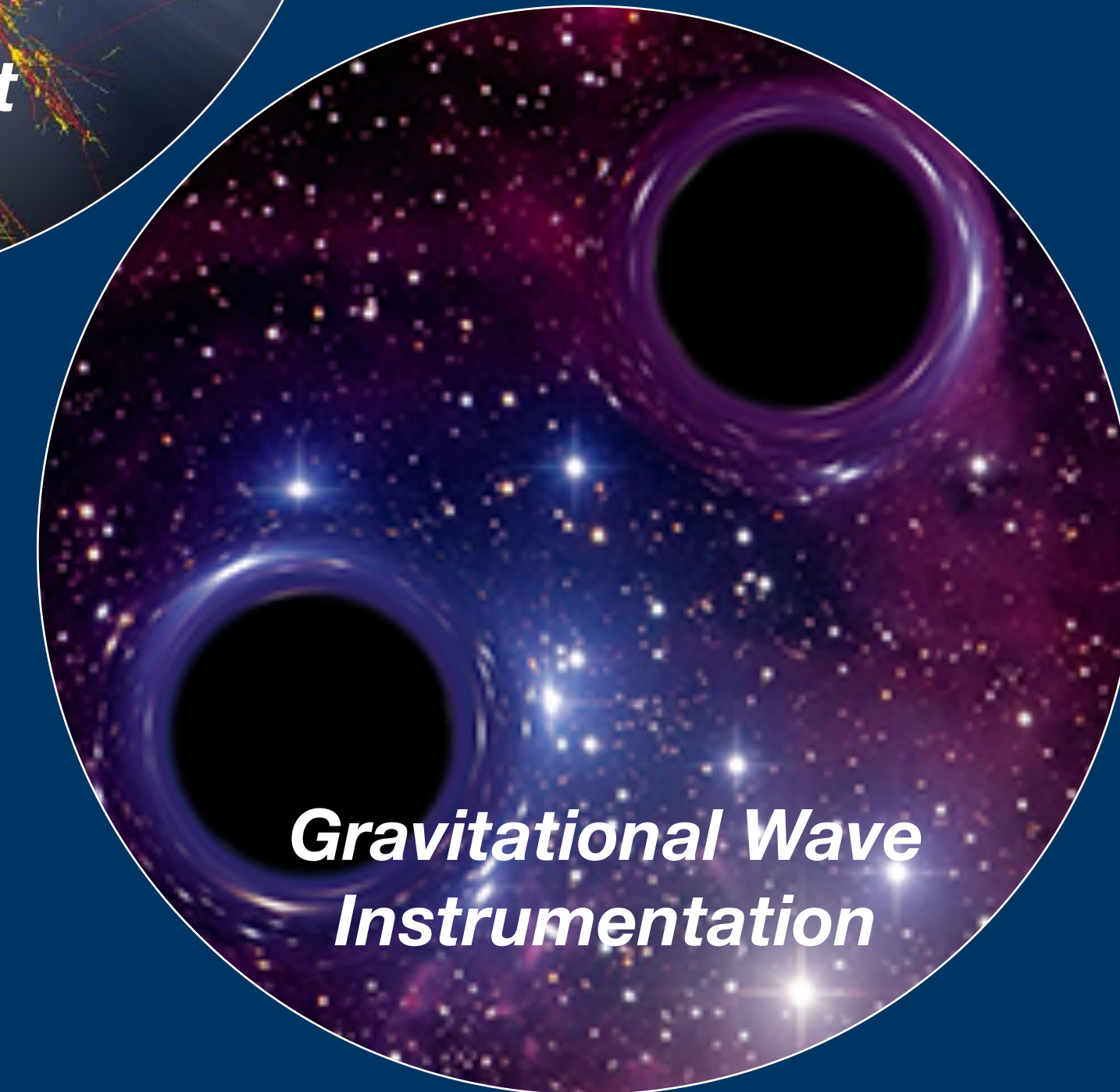
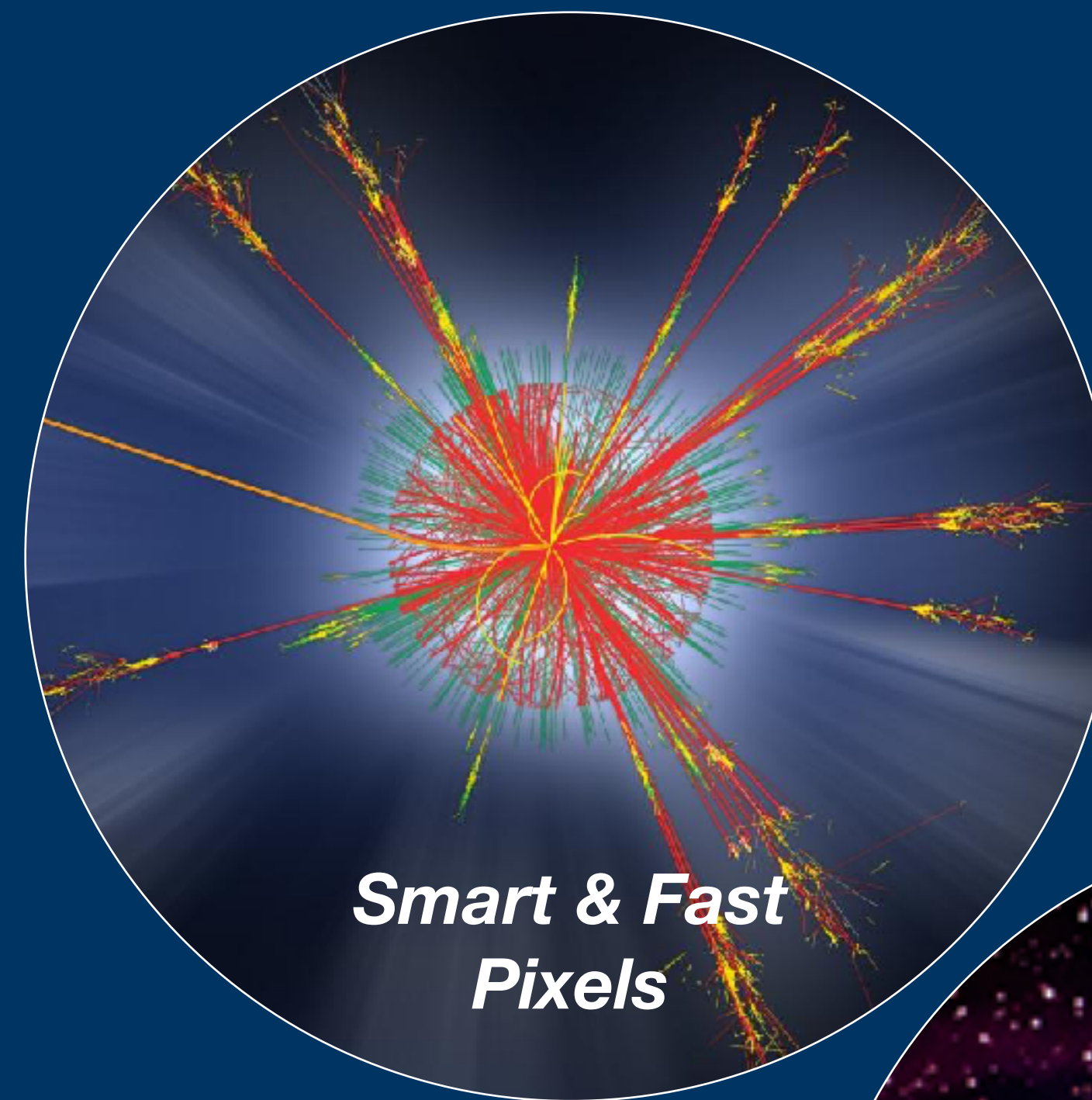


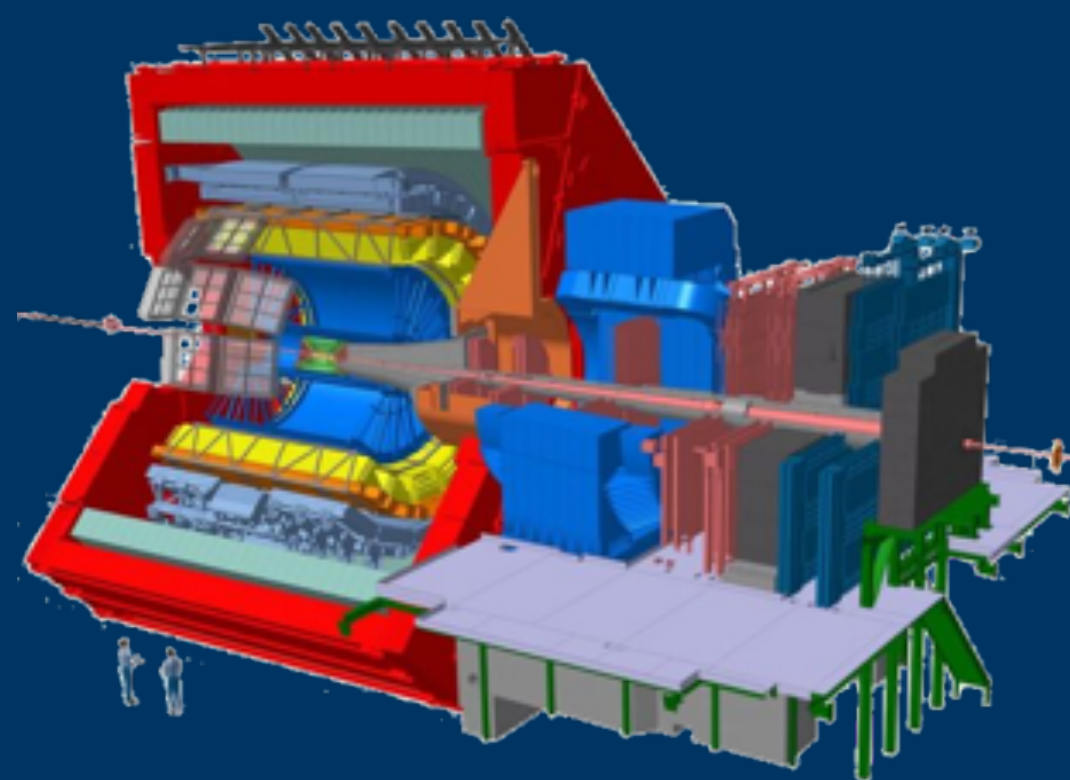
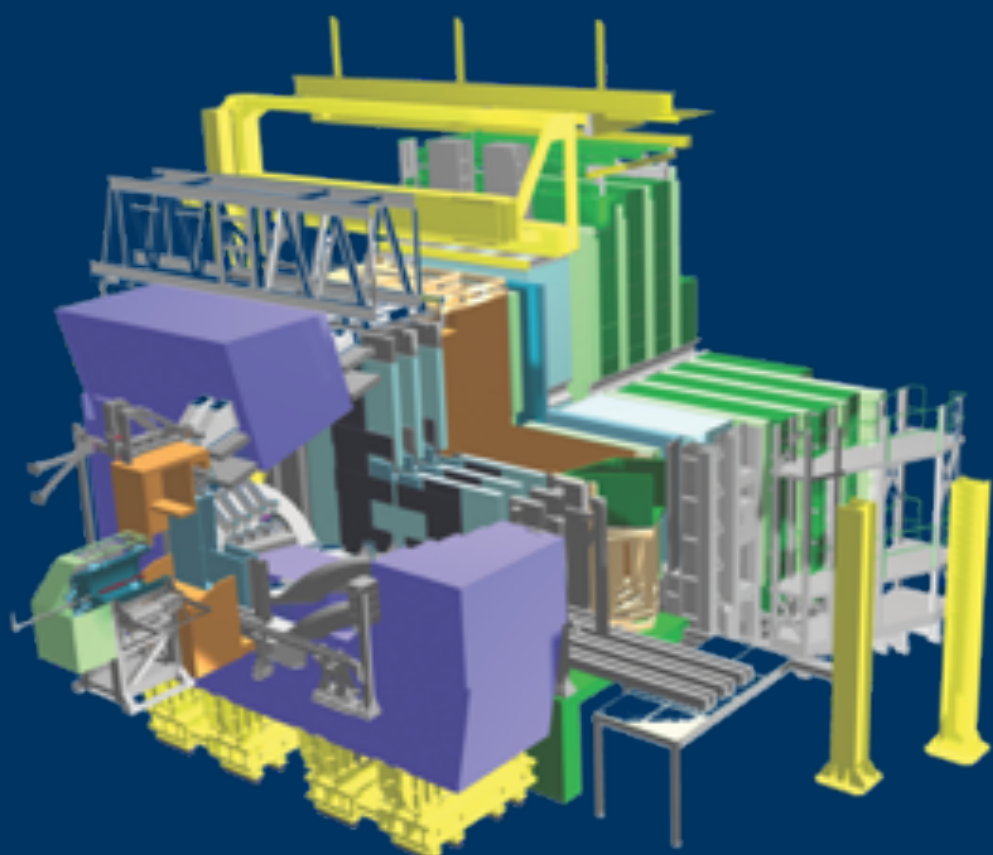
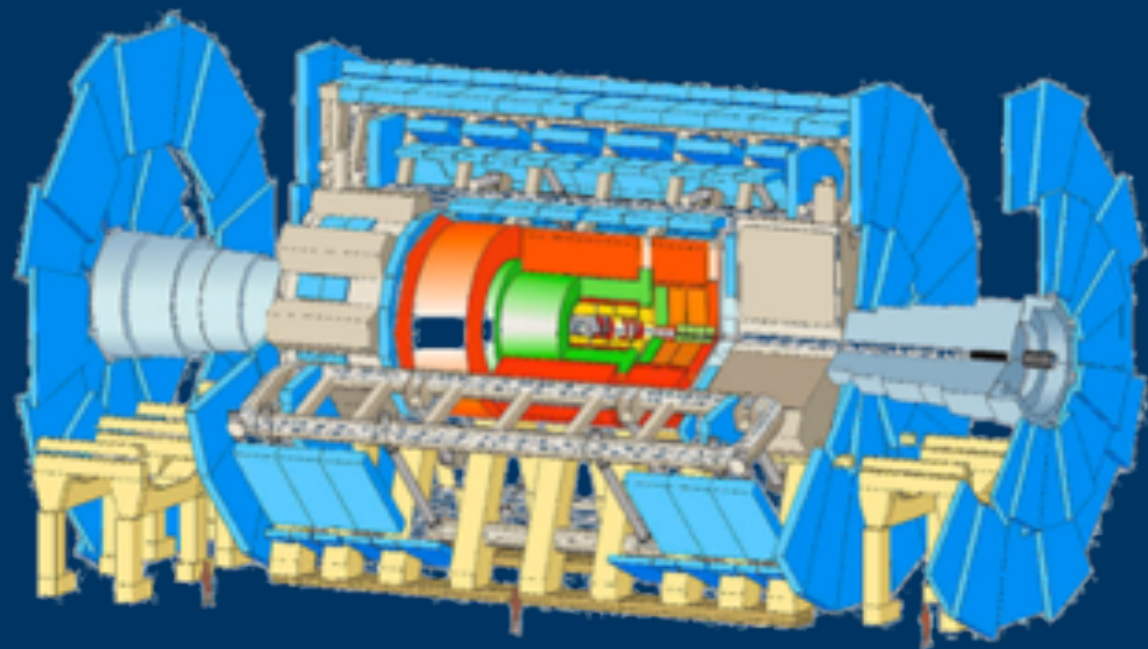
# Detector R&D

In search of ....



# Keep up with the LHC potential

## Fast Timing & Detector Upgrades



Full Application - NWO Open Competition Domain Science - XL, 2021-2022

### NWO Open Competition Domain Science - XL Round 2021-2022

Grant application form

**PART A: Scientific proposal**

**A.1 General information**

**A.1.1 Grant application title**  
Fast sensors and Algorithms for Space-time Tracking and Event Reconstruction (FASTER)

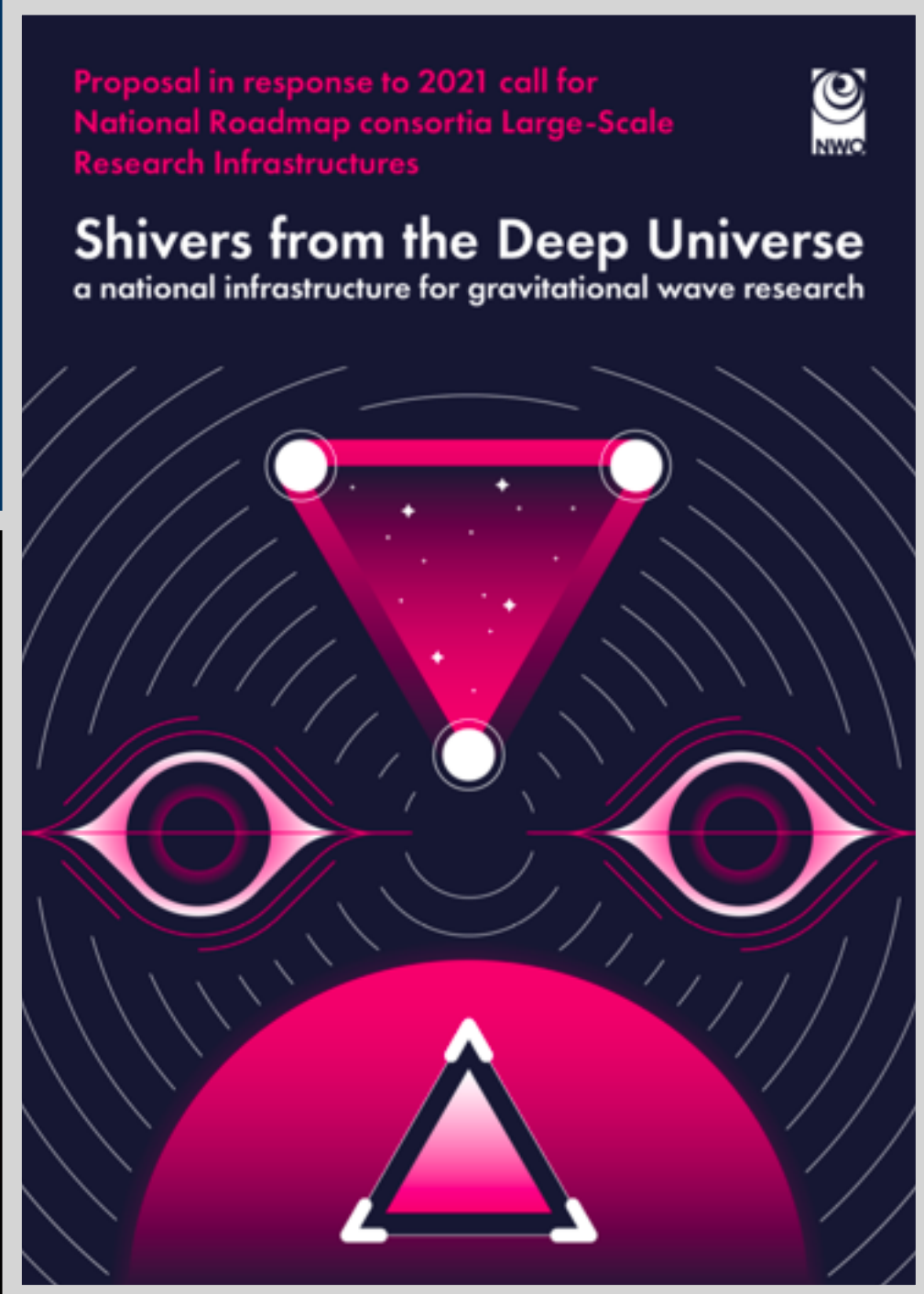
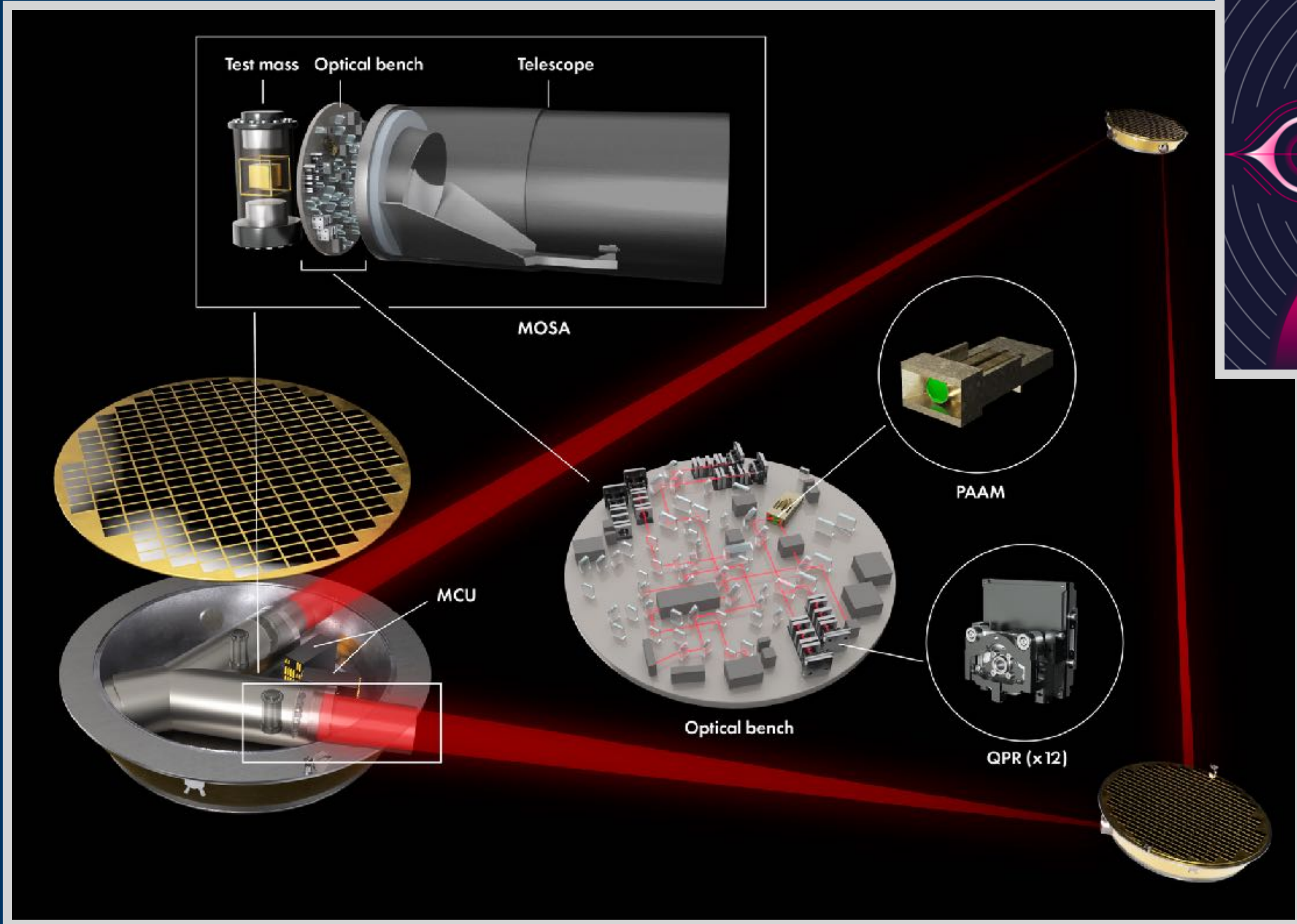
**A.1.2 Abstract**  
The goal of the FASTER project is to develop new sensor technology and computing algorithms for particle physics experiments requiring both high precision space and time information. In particular, new particle physics phenomena are extremely rare and hence require billions of collisions per second to be analyzed in real-time. The High Luminosity phase of the Large Hadron Collider (HL-LHC) at CERN, starting in 2026, will increase the collision rates as to a factor 50 (depending on the experiment), allowing access to incredibly rare physics processes. The higher collision rates increase the number of the recorded physics events in space and time. Currently, the experiments rely solely on the detected spatial information to reconstruct individual events. Moreover, the real-time processing power increases exponentially with the number of collisions. The addition of time information to the three spatial dimensions measured, adds a solution to this challenge. The 4D event reconstruction requires both the development of new silicon and silicon pixel detectors and novel 4D-based pattern recognition algorithms. We will develop novel pixel sensors and electronics that provide greater than 200000 and spatial 0-100  $\mu\text{m}$  resolutions. Recent technological advances in silicon sensors show promising timing capabilities but need extensive R&D to achieve their segmentation and improve radiation resistance. In addition, smart custom mixed-signal devices need to be developed to measure their low-noise signals with high precision. At the same time, more efficient and fast scaling algorithms including data reduction based on the timing information are required. Efficient 4D reconstruction algorithms will be designed exploiting heterogeneous architectures to maximize performance at lower costs. Finally, quantum algorithms will be explored as a potential solution to reduce the exponential computing times of the pattern recognition algorithms for the high-dimensional data.

Fast sensors and Algorithms for Space-time Tracking and Event Reconstruction (FASTER)



# Sensors for GW

*In Space and on Ground*



# Cast

THE OLD MAN FROM SCENE 24  
BARON VON ZUMA KINETOSCOPE  
ROGER THE SHRUBBER  
SIR BEDEVERE THE WISE  
THE LADY OF THE LAKE

SIR LANCELOT THE BRAVE  
SIR ROBIN THE NOT-QUITE-SO-BRAVE-AS-SIR-LANCELOT  
SWAMP CASTLE PRINCE

SIR GALAHAD THE PURE  
THE KNIGHT WHO SAYS NI  
PATSY  
ZOOT  
SIR NOT-APPEARING-IN-THIS-FILM-YET

THE CONSTITUTIONAL PEASANT  
THE FRENCH TAUNTER  
MRS. CONCLUSION

NIELS VAN BAKEL  
MARTIN VAN BEUZEKOM  
MARTIN FRANSEN  
MATTEO TACCA  
JORY SONNEVELD

TIMESH MISTRY - N  
UWE KRAEMER - N  
KEVIN HEIJHOFF - RN

ROBERTO RUSSO  
ROBBERT GEERTSEMA  
ENZO TAPIA  
MARIIA SELINA - N  
TJIP BISCHOFF - N

FRISO HOOGENBERG- N  
DOUWE NOBELS - N  
ANDREA BILBAO-GOYOAGE - N