

Physics

Lancaster  
University



# **WP1: Introduction**

**Andy Blake, Lancaster University**

**DUNE-UK Meeting**

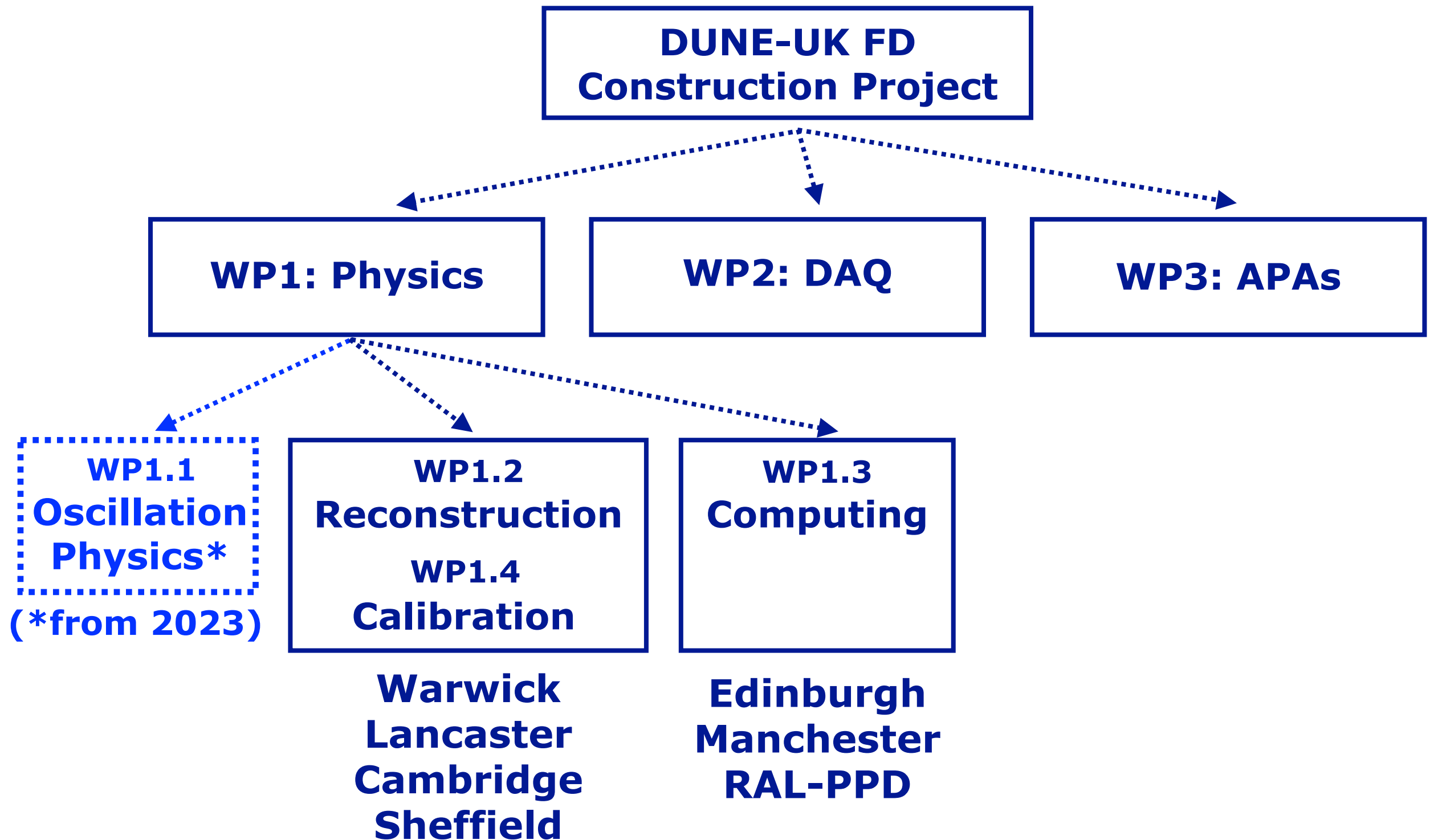
**Tuesday 5<sup>th</sup> July, 2022**



# Overview

- **The goal of WP1 is to develop the essential reconstruction software and offline computing for DUNE-FD data-taking.**
  - The construction of the DUNE software is critical for the successful exploitation of its hardware and delivery of its physics goals!
  - The UK groups have recognised expertise in these areas.
- **WP1 has four sub-packages:**
  - WP1.1: Oscillation Physics (*from 2023*).
  - WP1.2: **Reconstruction Software**.
  - WP1.3: **Offline Computing**.
  - WP1.4: Commissioning (*from 2023*), and **Detector Calibration**.
- **Currently 6.0 FTE PDRAs working across all sub-packages.**
  - Additional contributions from many PhD students across the UK.
  - Lots of impact within the international DUNE collaboration.

# WP1 Organisation



# Reconstruction & Calibration

- **The UK-led Pandora reconstruction software provides a pattern recognition solution for every detector and event type in DUNE.**
  - Recent important work on Vertical Drift detector (Dom & Maria) and ProtoDUNE (Leigh & Steve)
- **The versatility of the Pandora reconstruction is enabled by its multi-algorithm approach.**
  - This is a powerful approach to pattern recognition.
- **Deep Learning tools are harnessed to steer key decisions within algorithm chains. (Andy C)**
- **High-level tools provide a bridge to physics and enable physics-driven algorithm development.**
- **Cosmic-ray calibration algorithms (Rhiannon & Vitaly)**

# WP1.3 Computing

- **The UK groups are playing a pivotal role in the design, development and deployment of critical software to support the production and management of DUNE data.**
- **The UK is firmly integrated in the international Computing Consortium, and UK-led contributions are essential to the success of the DUNE computing project.**
- **Key areas of work:**
  - Management and movement of DUNE data using RUCIO (Edinburgh)
  - Design and development of a workflow system for DUNE (Manchester, RAL-PPD)
  - Critical monitoring responsibilities e.g. ETF (RAL-PPD)
  - Preparation of Computing CDR.

# Significant Progress!

- **WP1 personnel and projects are well-positioned within the DUNE collaboration.**
  - **Reconstruction:**
    - ☐ UK convenorships in DUNE-FD and protoDUNE Reco & Sim group (C. Backhouse, D. Brailsford, L. Whitehead).
  - **Calibration:**
    - ☐ UK convenorship of DUNE-FD calibration group (R. Jones).
  - **Computing:**
    - ☐ UK management roles within DUNE computing consortium (P. Clarke, A. McNab).
    - ☐ Largest Grid computing contributor outside USA.
- **Off project, there are numerous physics studies and analyses!**

# This Meeting

- Lots of progress to report from the past six months!

## 9am: Reconstruction software

9:00 AM → 11:00 AM	<b>DUNE WP1: Physics and Computing</b> <b>Speaker:</b> Andrew Blake (Lancaster University) Introduction <b>Speaker:</b> Andrew Blake (Lancaster University)  Pandora overview <b>Speaker:</b> Andrew Chappell (University of Warwick)  Using calorimetry in shower reconstruction <b>Speaker:</b> Maria Brigida Brunetti (University of Warwick)  Vertex reconstruction using Deep Learning <b>Speaker:</b> Andrew Chappell (University of Warwick)  Vertical Drift status <b>Speaker:</b> Dominic Brailsford (Lancaster University)  ProtoDUNE status <b>Speaker:</b> Leigh Whitehead (University of Cambridge)
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## 11:35am: DUNE Near Detector

11:35 AM → 12:15 PM	<b>DUNE Near Detector</b> <b>Speaker:</b> Abigail Waldron PandoraND overview <b>Speaker:</b> Melissa Uchida (University of Cambridge)  Pandora Near Detector status <b>Speakers:</b> Jingyuan Shi (University of Cambridge), Steve Dennis (University of Cambridge)  ND-GAr beam test and electronics status <b>Speakers:</b> Patrick Dunne, Patrick Dunne (Imperial College London)
12:15 PM → 1:30 PM	Lunch
1:30 PM → 2:10 PM	<b>DUNE WP1: Physics and Computing</b> <b>Speaker:</b> Andrew Blake (Lancaster University) Computing overview <b>Speaker:</b> Andrew McNab (University of Manchester)  Data management development ¶ <b>Speaker:</b> Robert Currie (Edinburgh University)

## 1:30pm: Computing