MATTO: updates from the Multi-conjugate Adaptive Techniques Test Optics design

Simone Di Filippo[a,b], D. Greggio[a,b], V. Viotto[a,b], L. Marafatto[a,b], C. Arcidiacono[a,b], A. Ballone[a,b],
A. Baruffolo[a,b], F. Battaini[a,b,c], M. Bergomi[a,b], E. Carolo[a,b], P. Cerpelloni[a,b], S. Chinellato[a,b], M. Dima[a,b],
J. Farinato[a,b], T. S. Gomes Machado[a,b,c], D. Magrin[a,b], K. Radhakrishnan[a,b], O. Rebrysh[a,b,c],
G. Umbriaco[a,b,d], D. Vassallo[a,b], R.Ragazzoni[a,b,c]

[a]INAF – Osservatorio Astronomico di Padova, [b]ADONI -Laboratorio Nazionale Ottica Adattiva, [c]Università di Padova – Dipartimento di Fisica e Astronomia, [d]Università degli Studi di Bologna

THE MATTO TEST- BENCH

➤ A wide-field AO facility designed to serve as a test bench for study and development of MCAO techniques under a wide range of conditions

➤ The test bench is intended to be used in the future to validate new concepts and techniques

➤ It is designed to be flexible and adaptable!

➤ It is composed of 4 independent and configurable modules (+ a SCIENCE CHANNEL with a high-res camera):
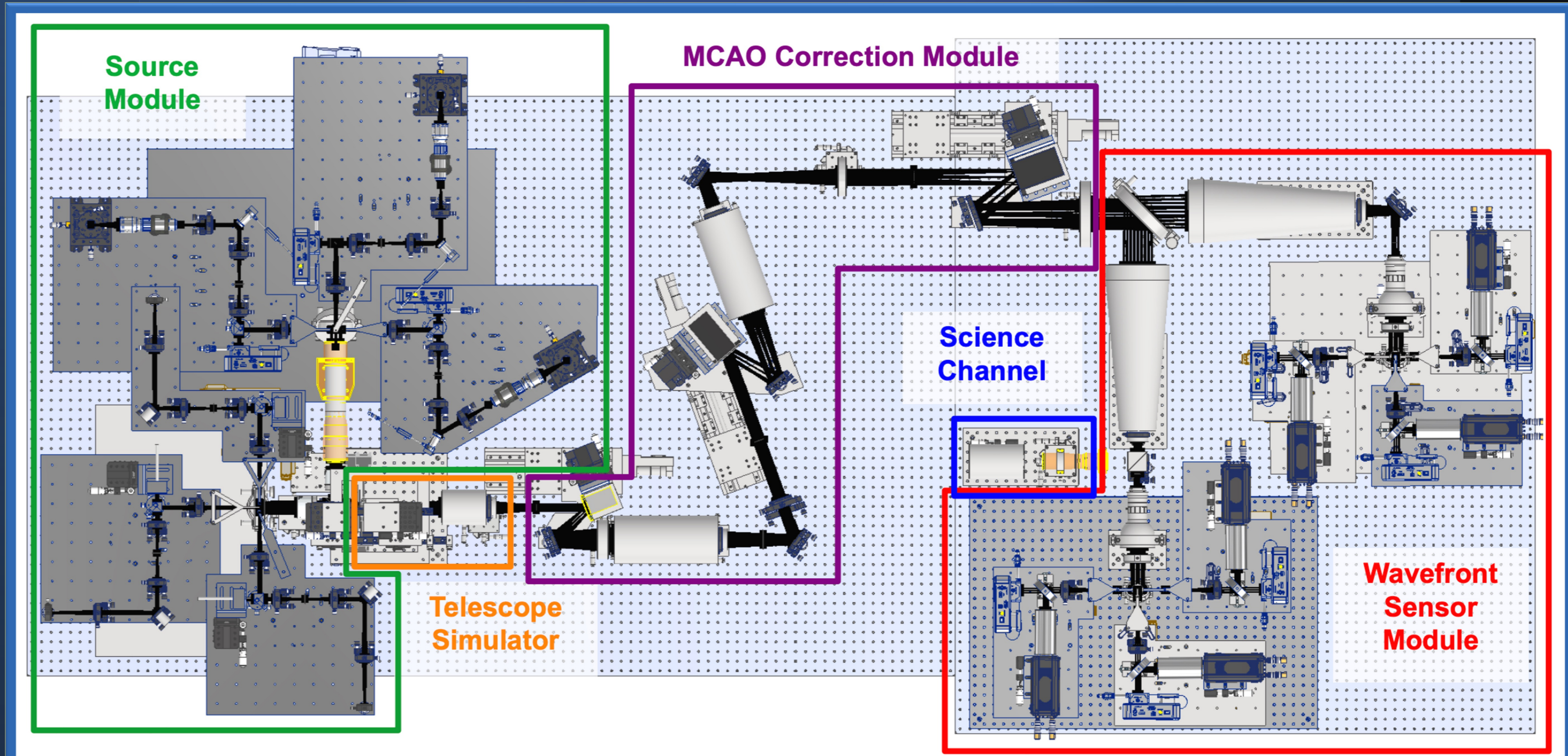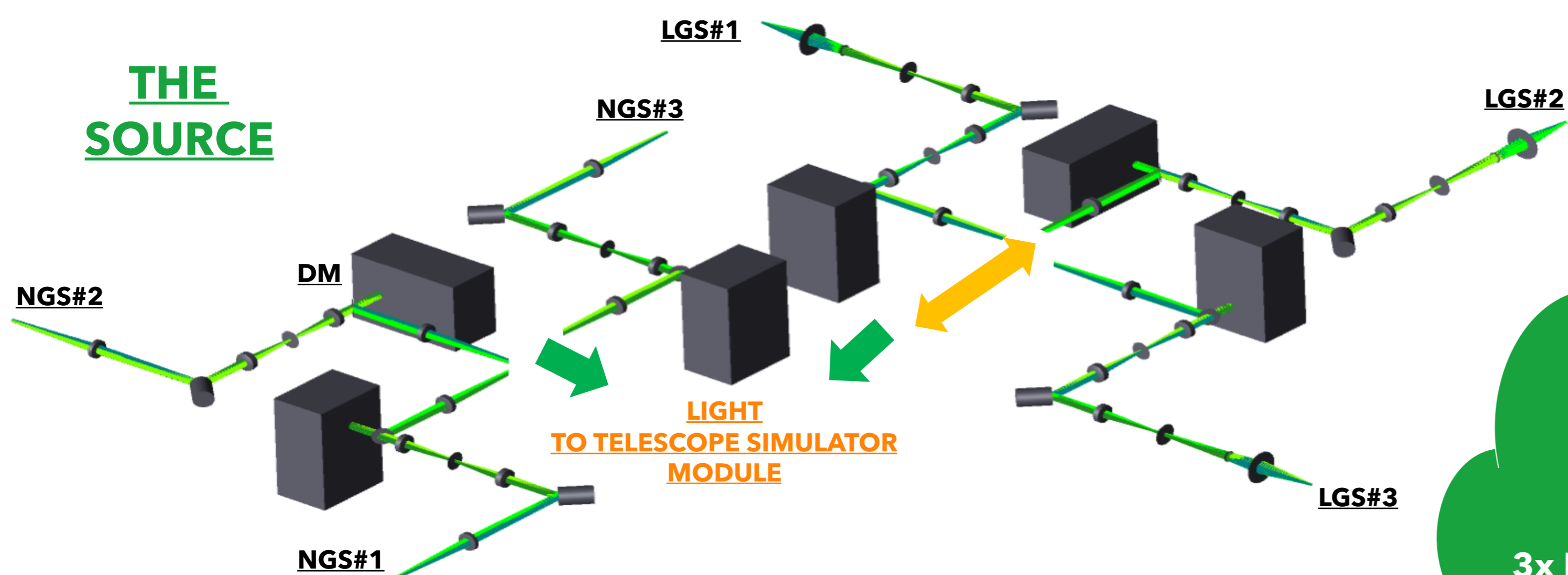
1. THE SOURCE
3. THE MCAO CORRECTION
2. THE TELESCOPE SIMULATOR
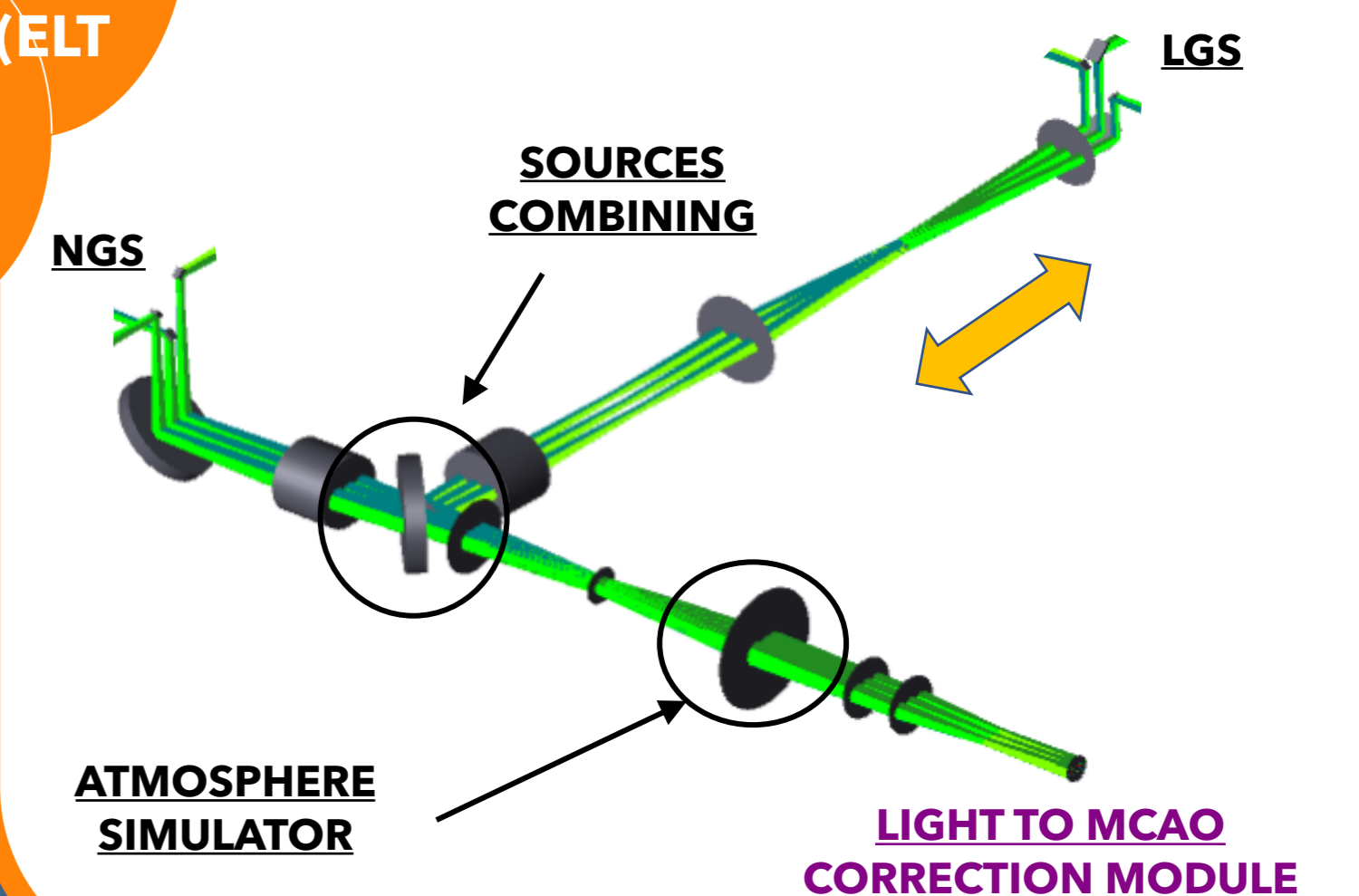4. THE WAVEFRONT SENSOR

THE SOURCE

✓ Combines light from different sources
✓ Mimics the geometry of the beams in the lower atmosphere
✓ Includes phase screes (ELT like & LBT like)

3x NGS sub-modules:
✓ Unresolved source
✓ Located at infinite distance
✓ Able to mimic atmospheric aberrations (DM)

3x LGS sub-modules:
✓ Elongated source
✓ Located at finite distance
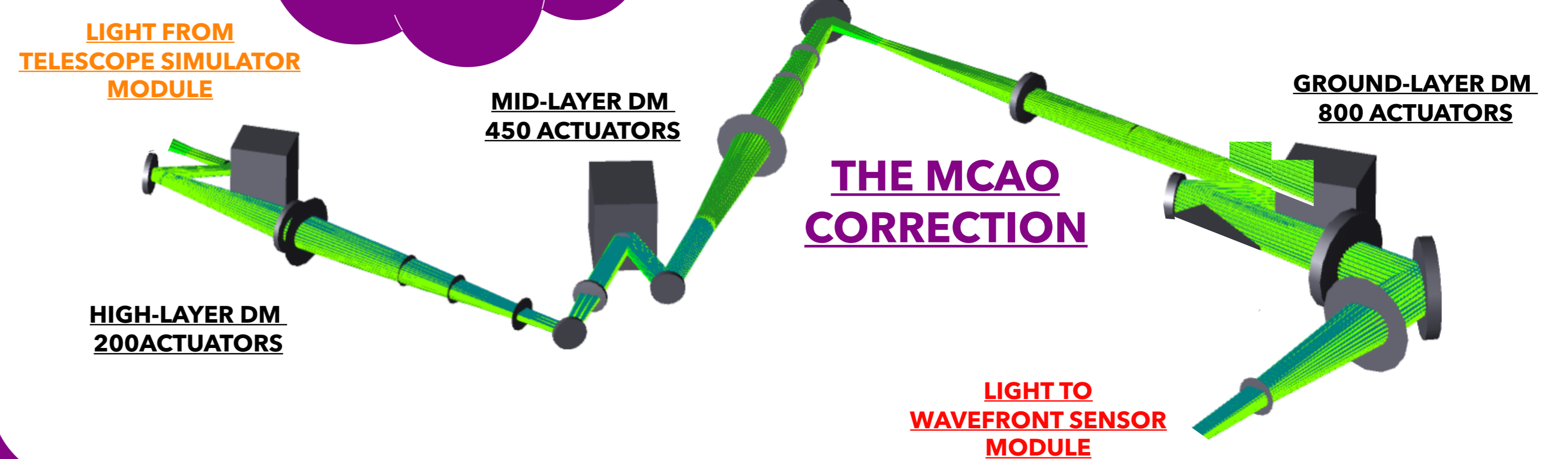✓ Able to mimic atmospheric aberrations (SLM+TTM)

THE TELESCOPE SIMULATOR

✓ Simulates a variety of wavefront sensors
✓ It includes means to locally change focal plane phase
✓ It includes means to sense both in the pupil or in the focal plane

THE WAVEFRONT SENSOR
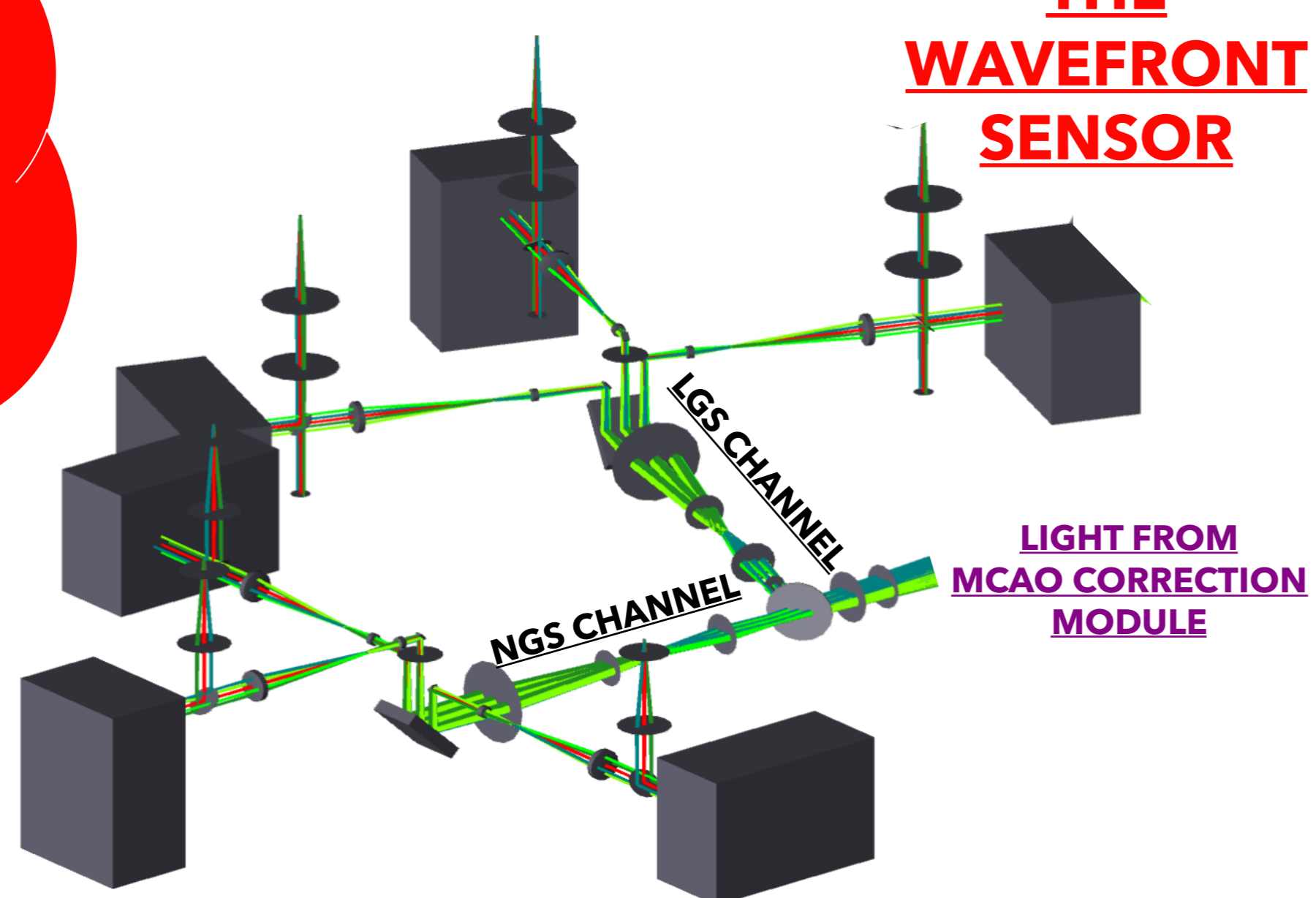
✓ Simulates a variety of compensation schemes
✓ 3DMs with varying conjugation distance

THE MCAO CORRECTION

DAO4MATTO: THE CONTROL

DAO4MATTO will be the hard and soft real-time control (RTC) implementation for MATTO.

The software is based on the highly modular DAO framework, developed at CfAI (Durham University)

The must be able to control a significant number of devices as listed below:
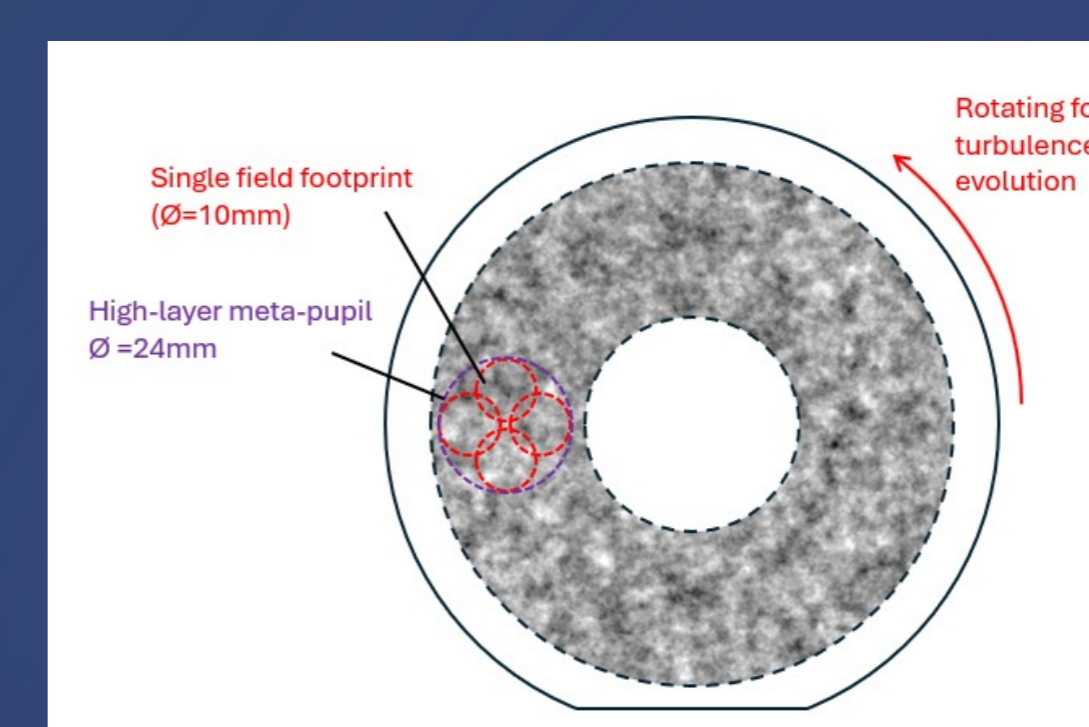
➤ 3 Deformable Mirrors (100 actuators) + 3 Tip-Tilt Mirrors + 3 fast Spatial Light Modulators, for the turbulence injection
➤ 4 rotating phase screens, for turbulence simulation
➤ 3 Deformable Mirrors (200, 450, 800 actuators) for the correction at different atmospheric layers
➤ 6 GigE technical cameras + 6 slow Spatial Light Modulators acting as phase masks generator for the simulation of different WFSs
➤ 1GigE scientific camera + a few additional motors to adapt the setup to different observing conditions
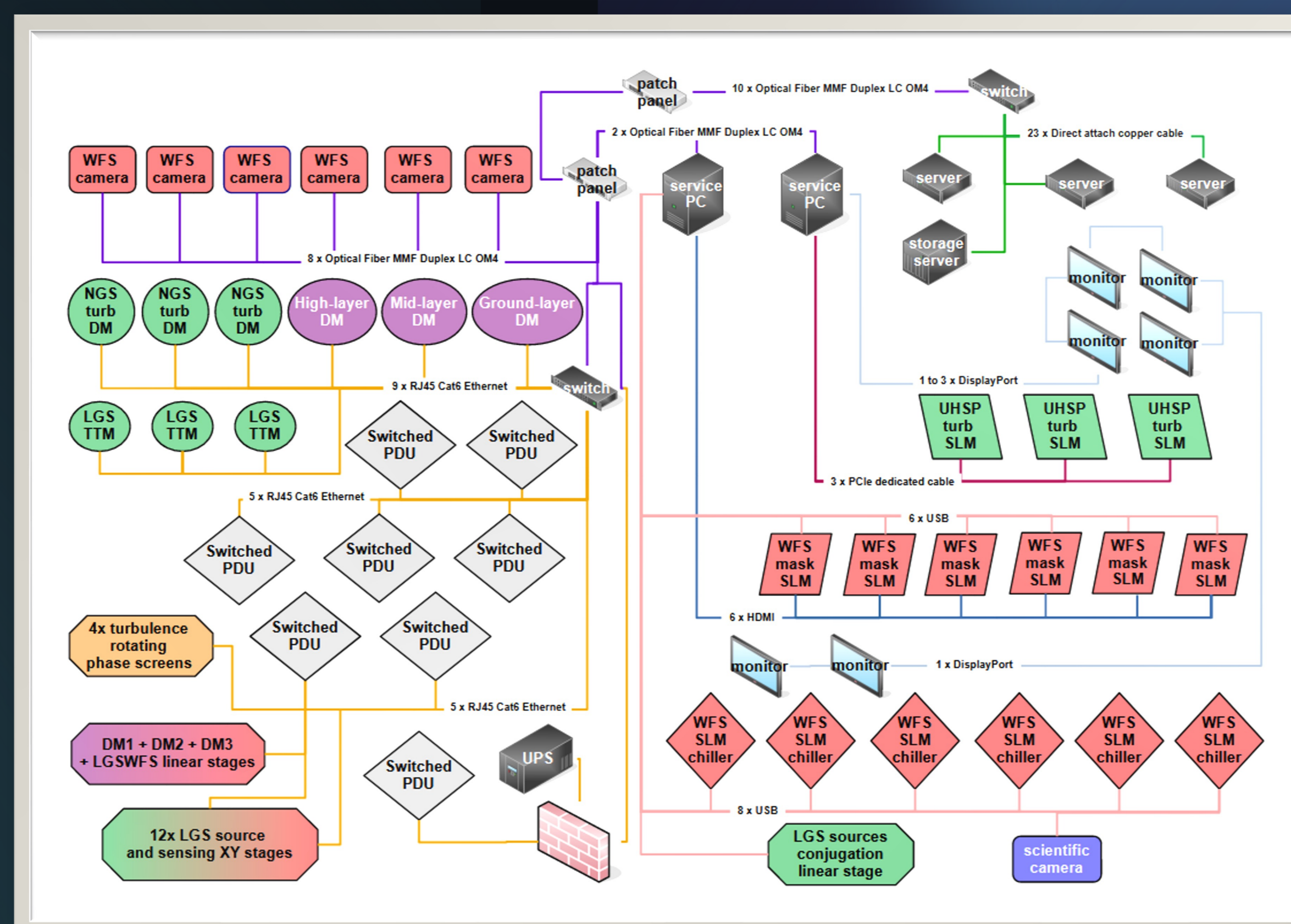
To simulate the turbulence for a 8m class telescope (LBT) and a 40m class telescope (ELT), rotating phase screens will be used

The turbulence profiles are based on actual measurements taken at the LBT and ELT observing sites.

The profiles are compressed in a total of 4-layers for each telescope using the method of optimal grouping

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