Laser-Wire System for ATF2

Engineering and Installation Issues

David Howell

John Adams Institute
University of Oxford

ATF2 Laser-wire

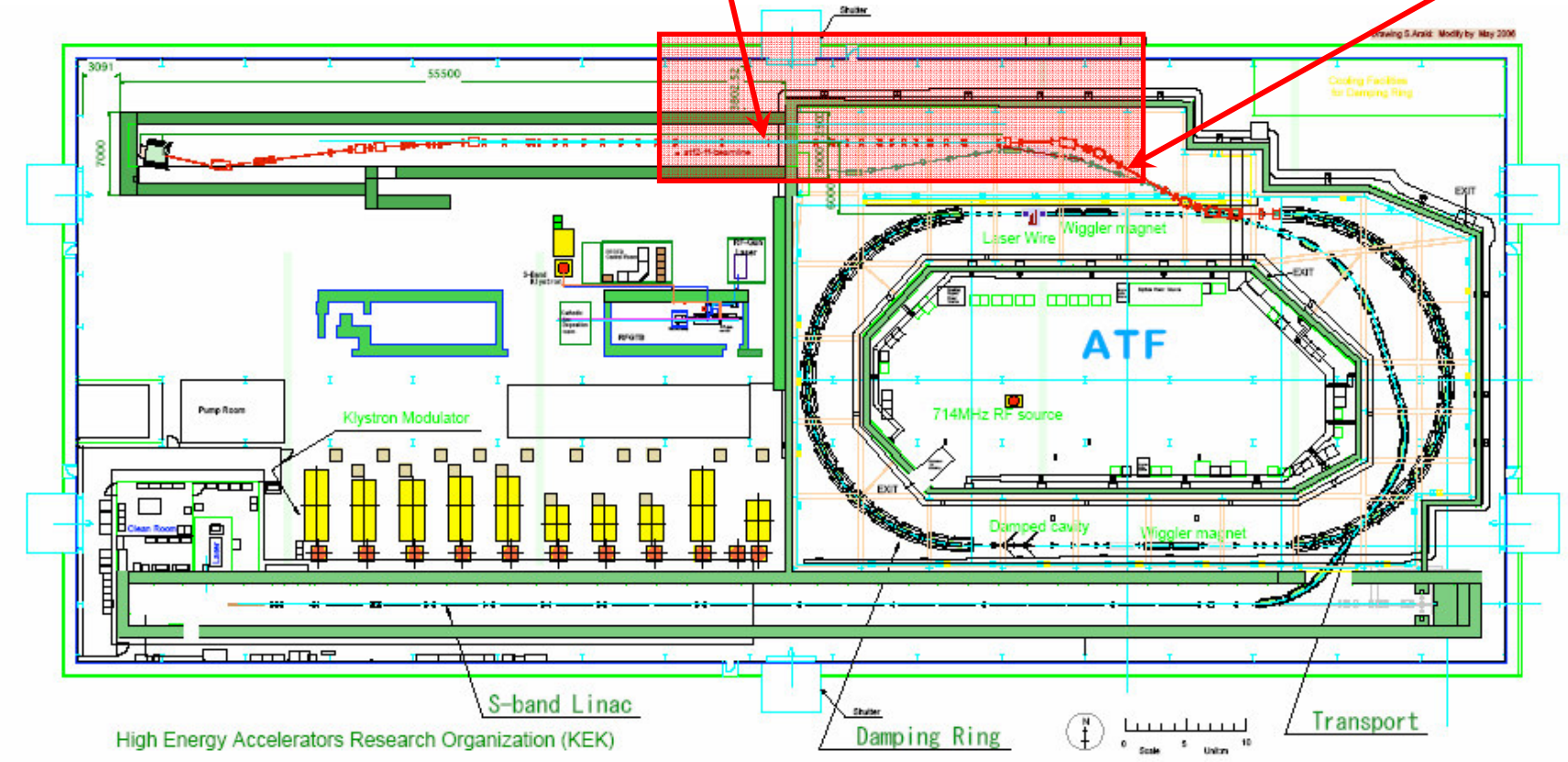
Infra-structure & Installation issues to be resolved

- Laser-wire stations – positions and footprints
- Laser Hut – position and services
- Light transport and service cables
- Laser-wire stations – detailed design
- Detector – position and shielding
- Laser safety

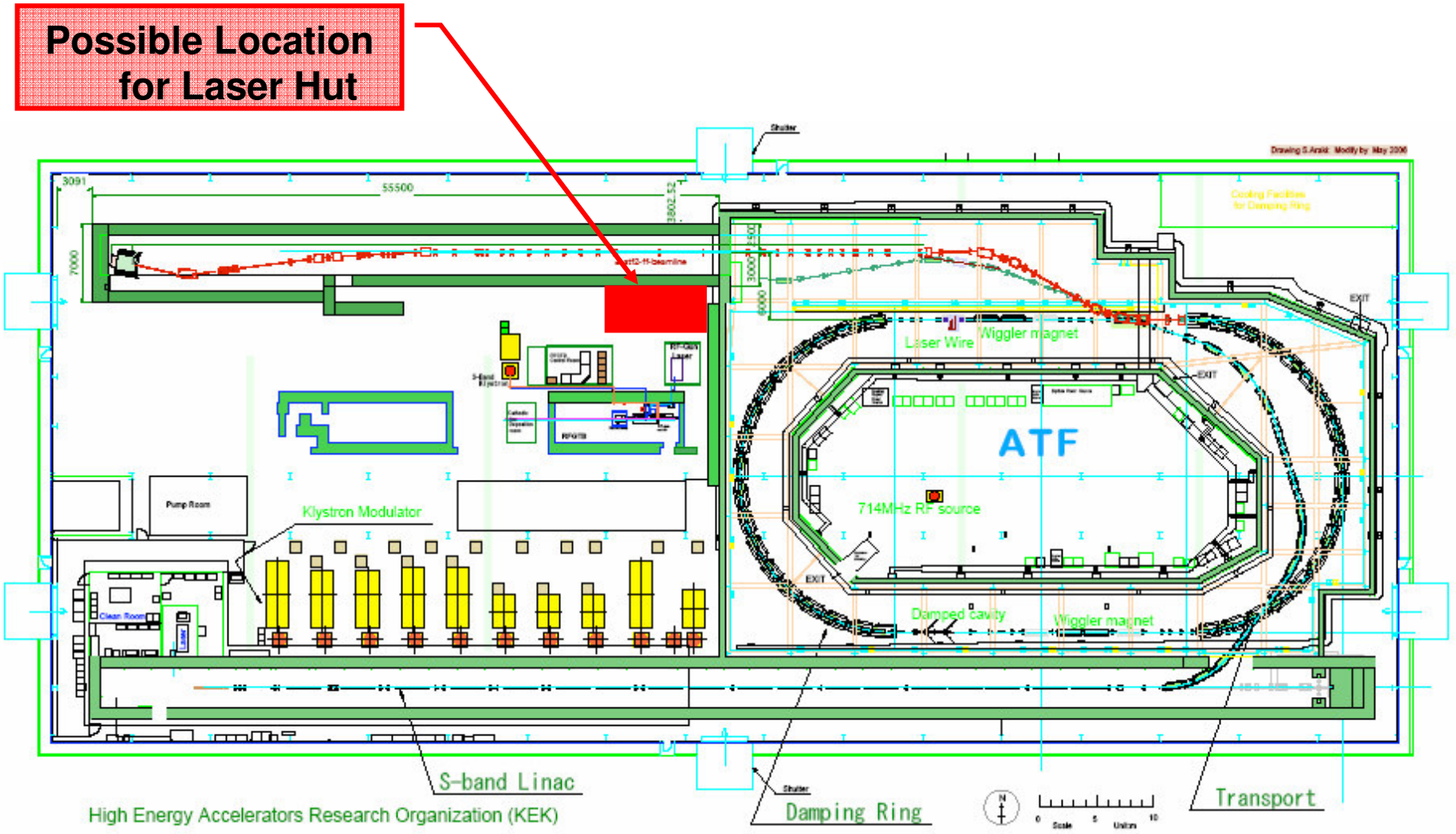
Possible ATF2 Laser-wire locations

Emittance measurement system (4 or 5 locations – both sides of shield wall)

Possible sub-micron scale (low dispersion) R&D location



Laser Hut – suggested location



Laser Hut Specifications

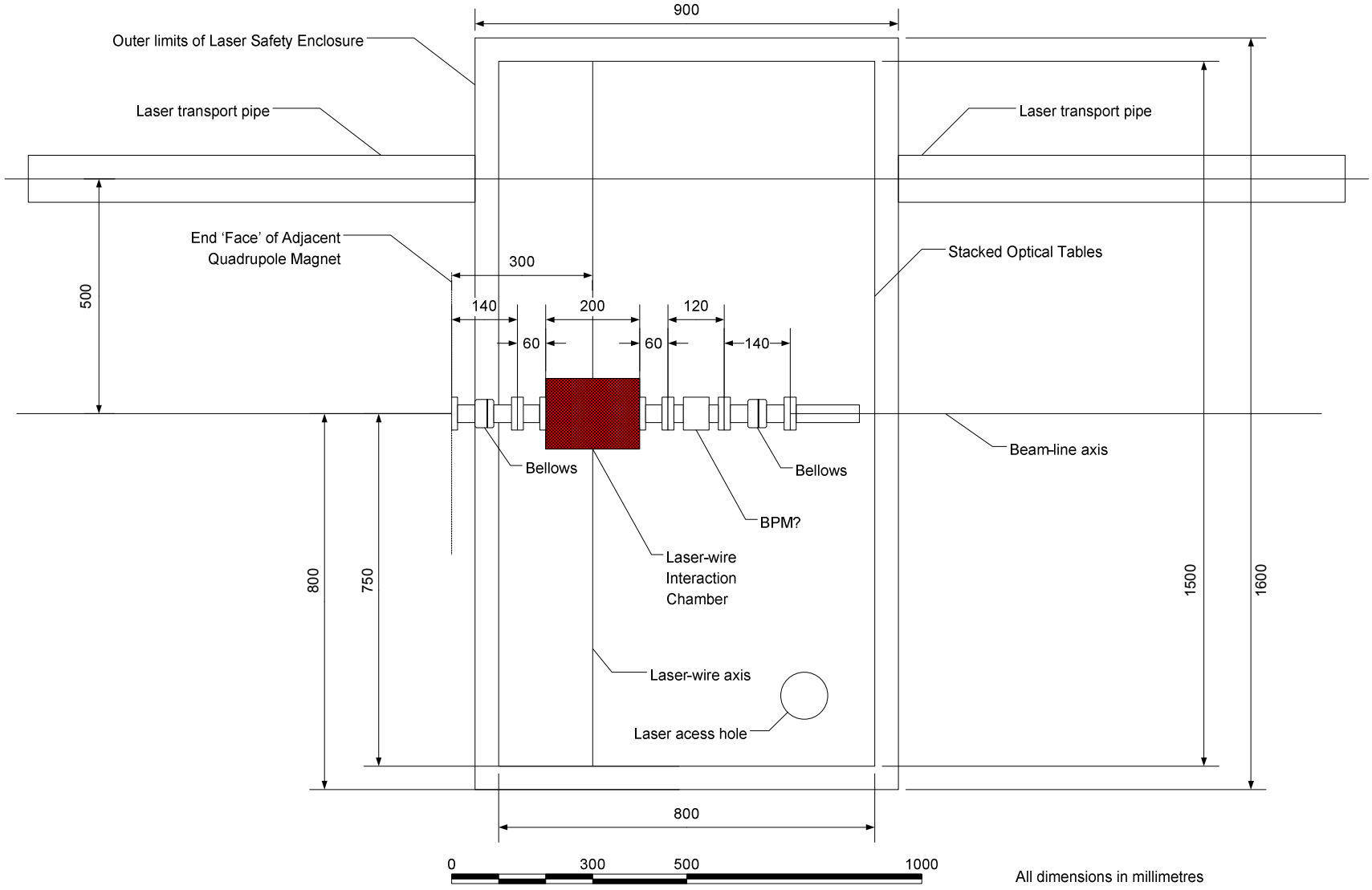
- Dimensions – Approximately 8m x 5m
  - based on existing hut where optical table is too small
- Floor stability – Ideally on the same foundations as the accelerator
- Local power distribution board – load to be defined
- Cooling water system – heat load to be defined
- Environmental controls – to be defined
  - Temperature stability is very important for reliable laser operation!
- Separate clean area for laser table (inside the hut)
- Assembly bench and storage for optics, etc.
- Electronics racks
- Laser safety interlocks and controls

What is the timescale for defining these items?

Light Transport – Proposed Scheme

- Laser light to be distributed inside pipes
- For reasons of laser safety and stability
- Possibly evacuated (to reduce fluctuations in refractive index)
- Approximate diameter 100mm
- Mounted close to the floor, alongside the accelerator
- Support bases for relay lenses at intervals of several metres
- How many access holes required in shield wall?

Initial thoughts on layout of laser-wire measurement station for ATF2



KEK-ATF2 Extraction line Laser-wire; Proposed general layout - plan

D F Howell 31/5/06

Gamma Detector Requirements

- Exit window at end of straight section
- Direct line of sight required – magnets and collimators?
- Space for detector and adequate shielding
- Low background location - collimators?
- Cable access for HV and signal cables to laser hut

Other Issues which affect Laser-wire design

- Alignment – how do we 'connect' to the survey co-ordinate system for the magnets and BPMs?
- Roll angle of e-beam
  - how stable is this?
  - what is maximum possible at Laser-wire locations?
- e-beam position at Laser-wire stations?
  - range of possible positions
  - stability of this position – over long and short timescales?

Schedule

Installation can (will) be phased, for example

1. Bases for Laser-wire stations along beam-line
2. Construct Laser hut
3. Install light transport system
4. Install optical table and services
5. Install and commission laser system
6. Install and commission first laser-wire station
7. Install and commission remaining stations