

b1. >>>> Straw man from Colin Iteration 1

Intention is to justify the proposal based on the wider LhARA project goals and eventual capability.

I think we need to offer deliverables beyond working Gabor lenses. Could we hope to do 'in-vitro' in last 6 months – we would need to take the cells to the laser.

First pass costing using Strathclyde tool

2FTE for 5 years – combination of mostly RA (experimental), plus some RA (modelling) and some technician.

300k consumables, travel and equipment

Total 1.6M€ - admittedly this used experienced, expensive staff

Indicates that we can look to fund approx. **3.5 to 4 FTE per year for 2.5M€** with a bit of squeezing.

Overview of Project

- Gabor lens test stand – integrated support, Magnets, DC cooling, stray field management – transportable. Applicable to all lens versions and suitable for Laser – clean environment. 1st year.
- Gabor lens – DC. Test with sealed source. Develop instrumentation
- Gabor Lens with electron source. Pulsed. Test with sealed source.
- Integration to Laser as source. Requires beam diagnostics and probably cash for Laser team. Test Gabor lens with Laser
- Momentum selection system. This needs to be either derived from earlier work – ie Gabor lens based or an alternative of the 'quick and cheap/dirty/borrowed?' style.
- In-vitro sample test – laser source. As simple as possible but with valid demonstration of desired parameters.

Task Breakdown

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|--|-----------------------------|
| 1. Gabor Lens and stand design and build | Strathclyde (Lead)/Imperial |
| 2. Gabor lens #1 build | Strathclyde |
| 3. Electron source design and build | Strathclyde |
| 4. Gabor lens #2 (w electron source) build | Strathclyde |
| 5. Plasma stability simulation | Imperial/Strathclyde |
| 6. Beam production simulation | Imperial. |
| 7. Beam Transport/Tracking | Imperial/Strathclyde |
| 8. Alpha particle/strathclyde test diagnostics | Imperial (L) /Strathclyde |
| 9. Gabor lens #1 Alpha particle tests | Strathclyde (L) /Imperial |
| 10. Gabor lens #2 Alpha particle tests | Strathclyde (L) /Imperial |
| 11. Laser beam diagnostic development | Strathclyde/Imperial |
| 12. Laser integration design. | Strathclyde/Imperial |
| 13. Laser integration build/test | Strathclyde/Imperial |
| 14. Momentum selection design | Imperial (L) /Strathclyde |
| 15. Momentum selection build | Strathclyde (L) /Imperial |
| 16. In-vitro-test | Strathclyde /Imperial |

Y1

- Build Gabor lens and test stand.
- Design electron sources – design review and selection
- VSim simulation of plasma stability for differing transverse electron distributions.
- Simulation of beam production – Smilei
- Design Gabor lens diagnostics (review and select month 6) - Build
- Design and implement operational data capture system

Y2

- VSim simulation of plasma stability for differing transverse electron distributions.
- Simulation of beam production – Smilei
- Simulation of beam transport - Momentum selection
- Build electron source(s)
- Build diagnostics, Gabor lens
- Beam diagnostics, Laser.
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Y3

- Design laser/lens interface with laser system team – rep rated system?
- Implement laser/lens interface
- Build electron source(s)
- Build and test diagnostics Gabor Lens
- Beam diagnostics, Laser.
- Momentum selection design finalised

Y4

- Beam diagnostics, Laser.
- First test gabor lens with laser source.
- Momentum selection build

Y5

- Momentum selection build
- Gabor lens laser system test ‘in vitro’ – requires 3 gabor lenses plus momentum selection???