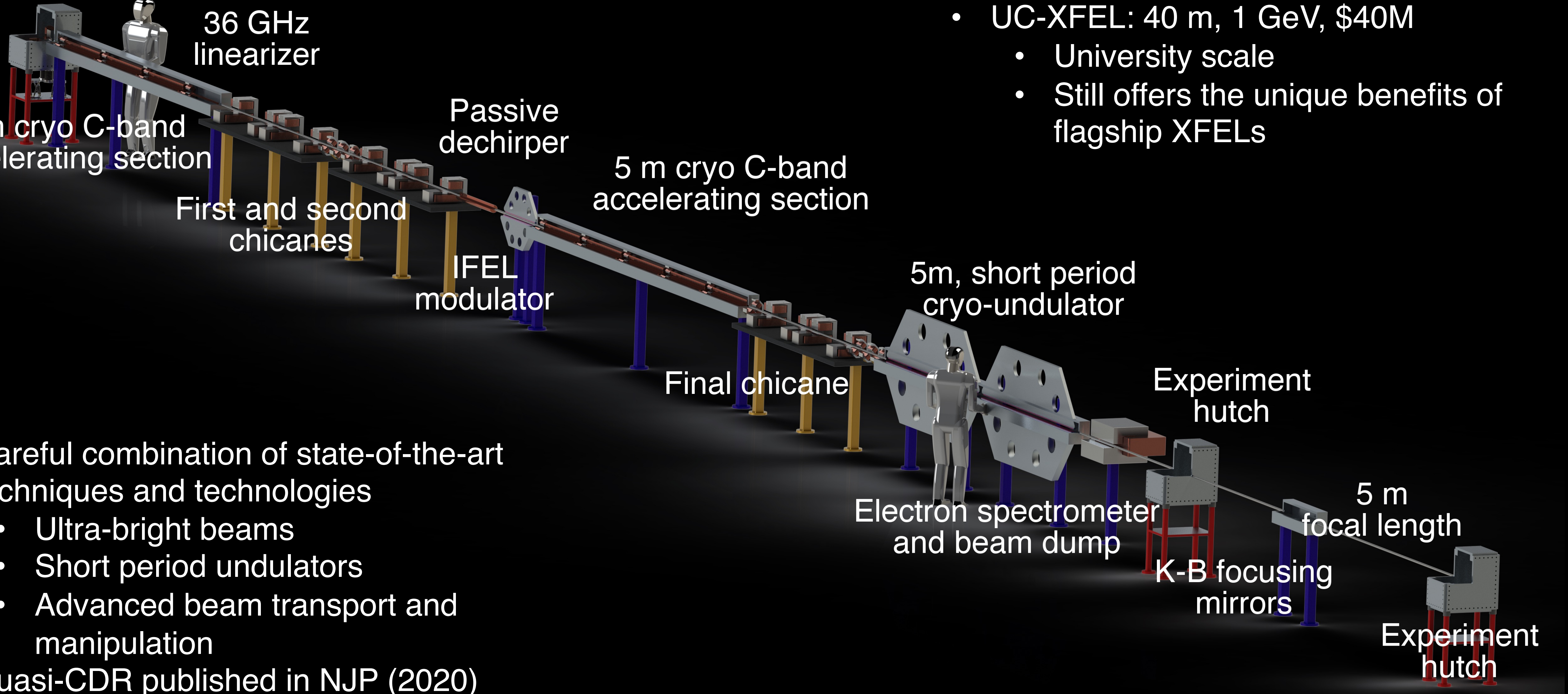
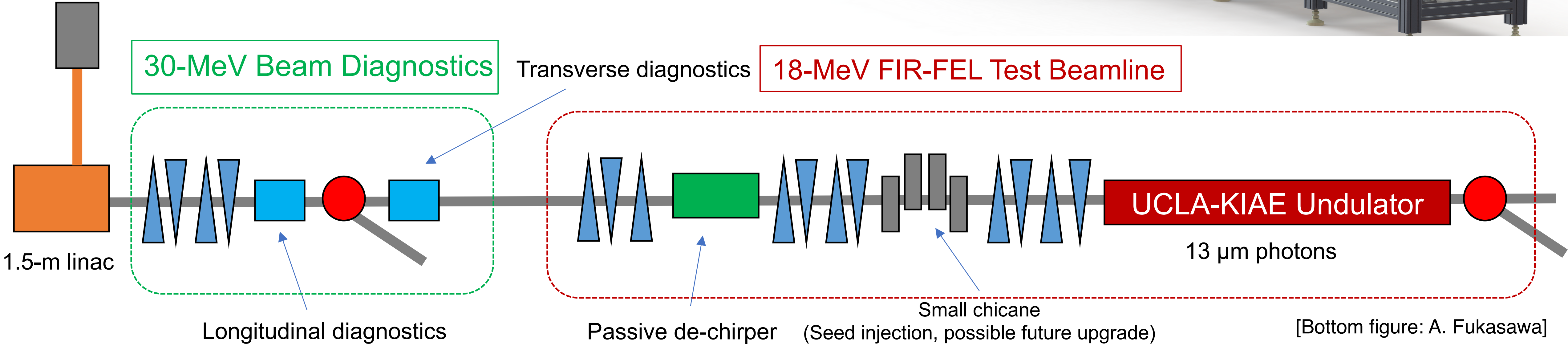
UC-XFEL

- Current XFELs: ~km, ~10 GeV, ~$1B
  - Nation-state scale
  - Scaling previously infeasible
- UC-XFEL: 40 m, 1 GeV, $40M
  - University scale
  - Still offers the unique benefits of flagship XFELs



- Careful combination of state-of-the-art techniques and technologies
  - Ultra-bright beams
  - Short period undulators
  - Advanced beam transport and manipulation
- Quasi-CDR published in NJP (2020)

- UCLA hosted a conference in July 2021
  - ~40 speakers, representing interested parties from the photoinjector all the way through photon end-users
  - Led to the formation of a consortium to advance UC-XFEL development
- Formalized stepping stone FELs for development at UCLA
  - Considered different funding cases and objectives
  - FIR FEL project currently underway
- Continued progress with cryogenic half-cell beamline
  - Developing technologies and expertise required for UC-XFEL



[Bottom figure: A. Fukasawa]

Emittance exchange for advanced PWFA

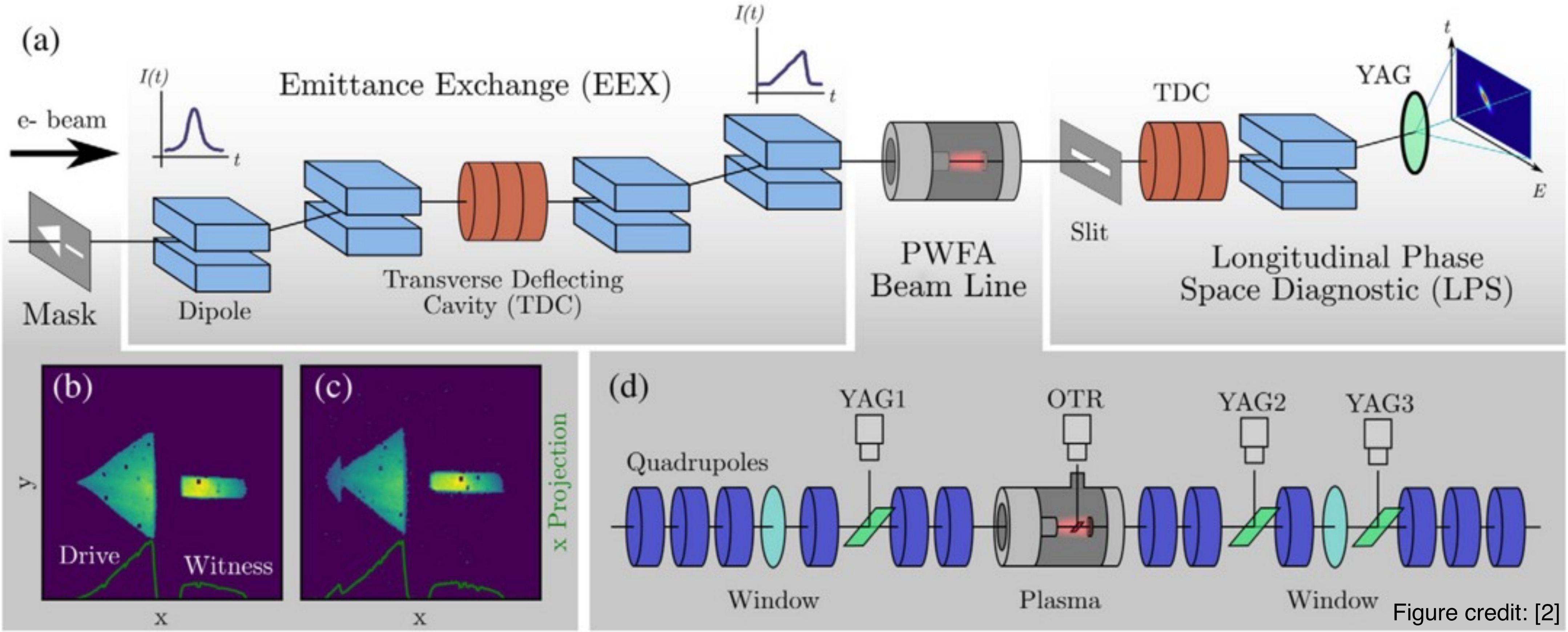


Figure credit: [2]

- By transversely masking the beam before the EEX beamline, the final current profile is controlled
- Shaping drive and witness bunches with this approach has yielded record-breaking transformer ratios [2]

Multileaf collimator masking

- Propose replacing the laser cut tungsten masks in EEX beamline with a multileaf collimator (MLC)
- MLCs are commonly employed to shape radiotherapy beams
- Real-time, nearly arbitrary drive and witness beam shaping
- Highly synergistic with machine learning
- Extension of UCLA/AWA collaboration to study exotic shaped beams for HTR PWFA

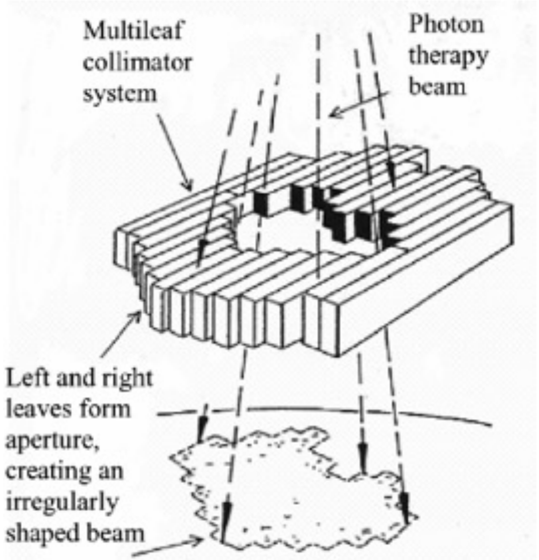


Figure credit: [3]


Figure credit: [3]

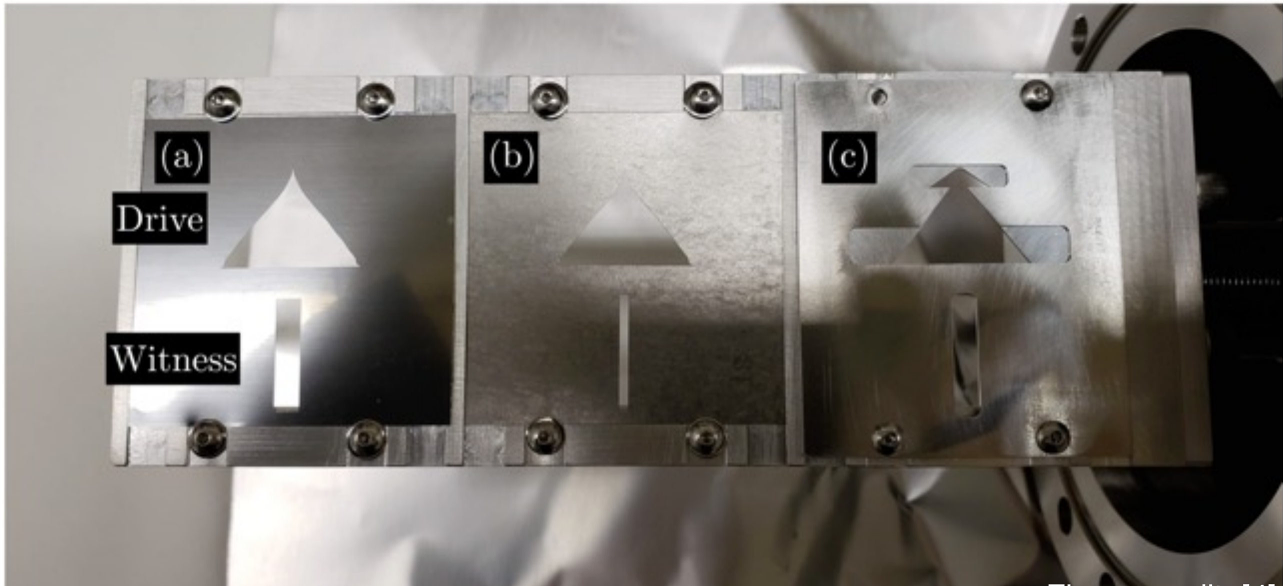
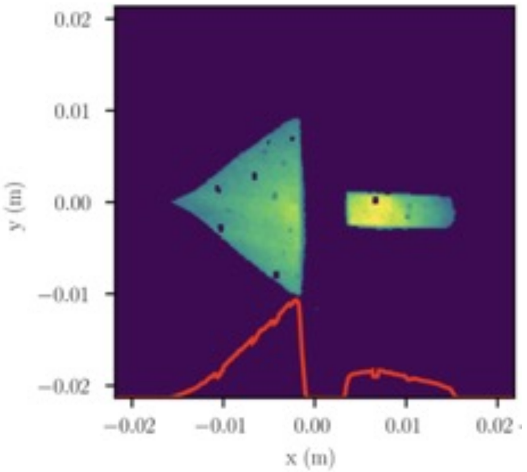
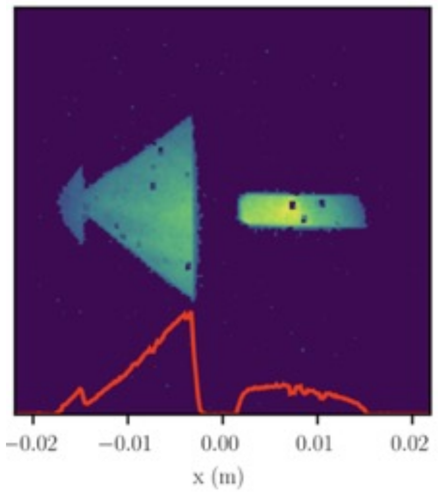


Figure credit: [4]

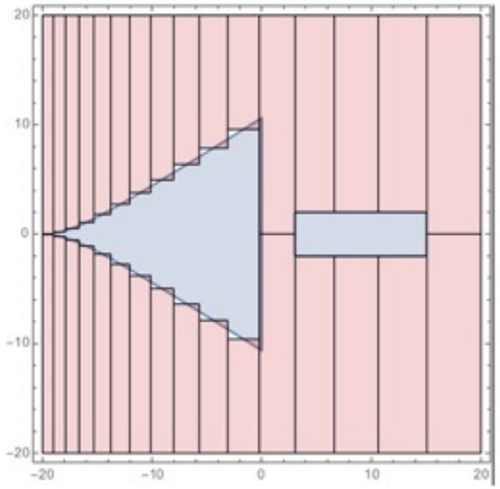
32 leaf, log-spaced MLC

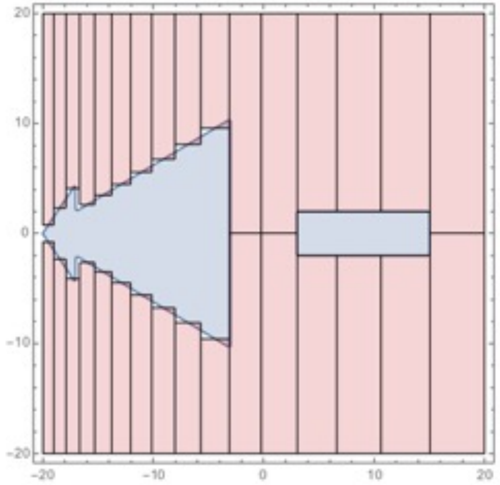
Laser cut mask [1]



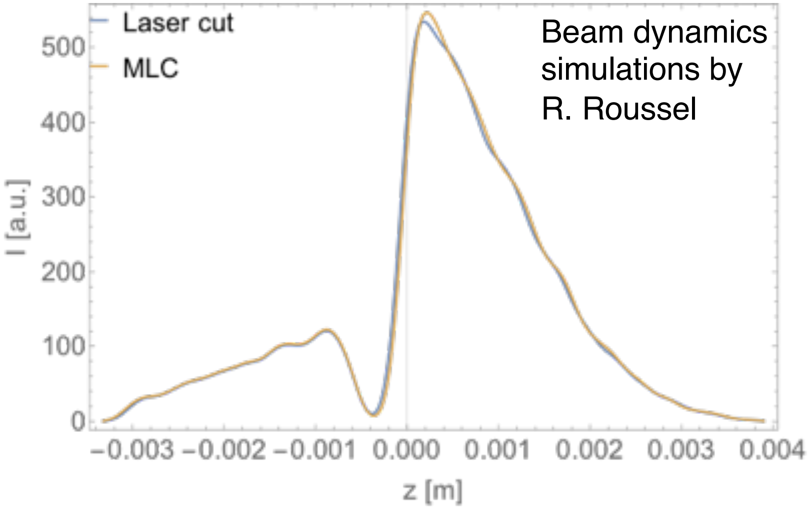


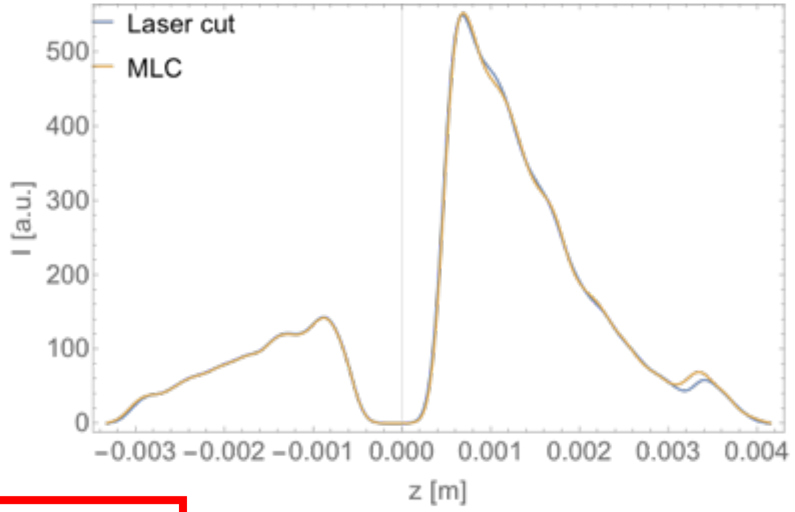
MLC replication





Final current profile





32 leaf MLC functionally equivalent to existing AWA masks