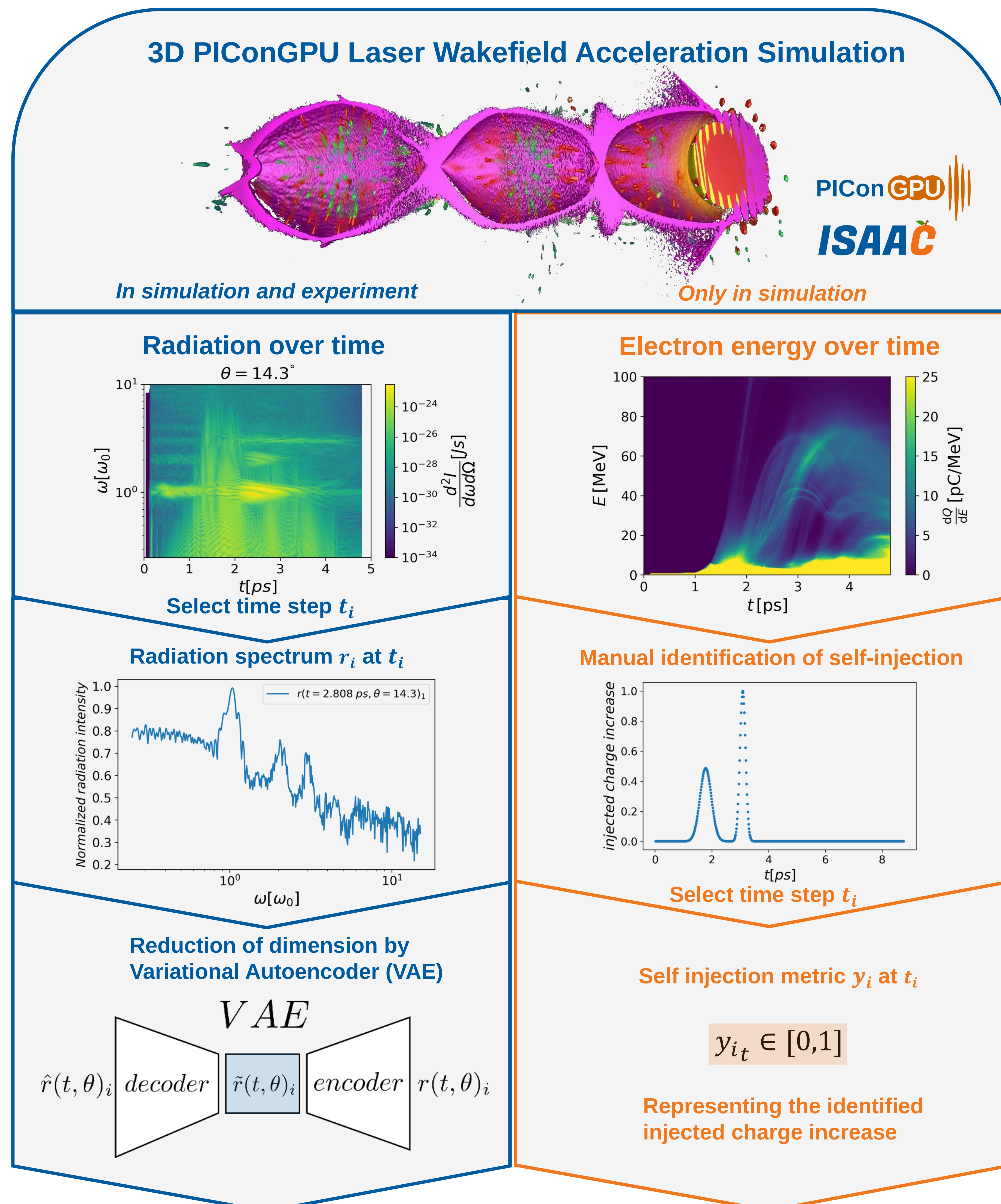


ML-based radiation diagnostics for recognition of self-injection radiation

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Identification of self-injection from simulated radiation spectra



Motivation

- Reconstruct plasma dynamics during laser wakefield acceleration
- Cannot be measured in an experiment

Method

Self-Injection metric

- Self-Injections detectable only in higher energies
- Each represented with a Gaussian distribution
- Projected back using the acceleration gradient

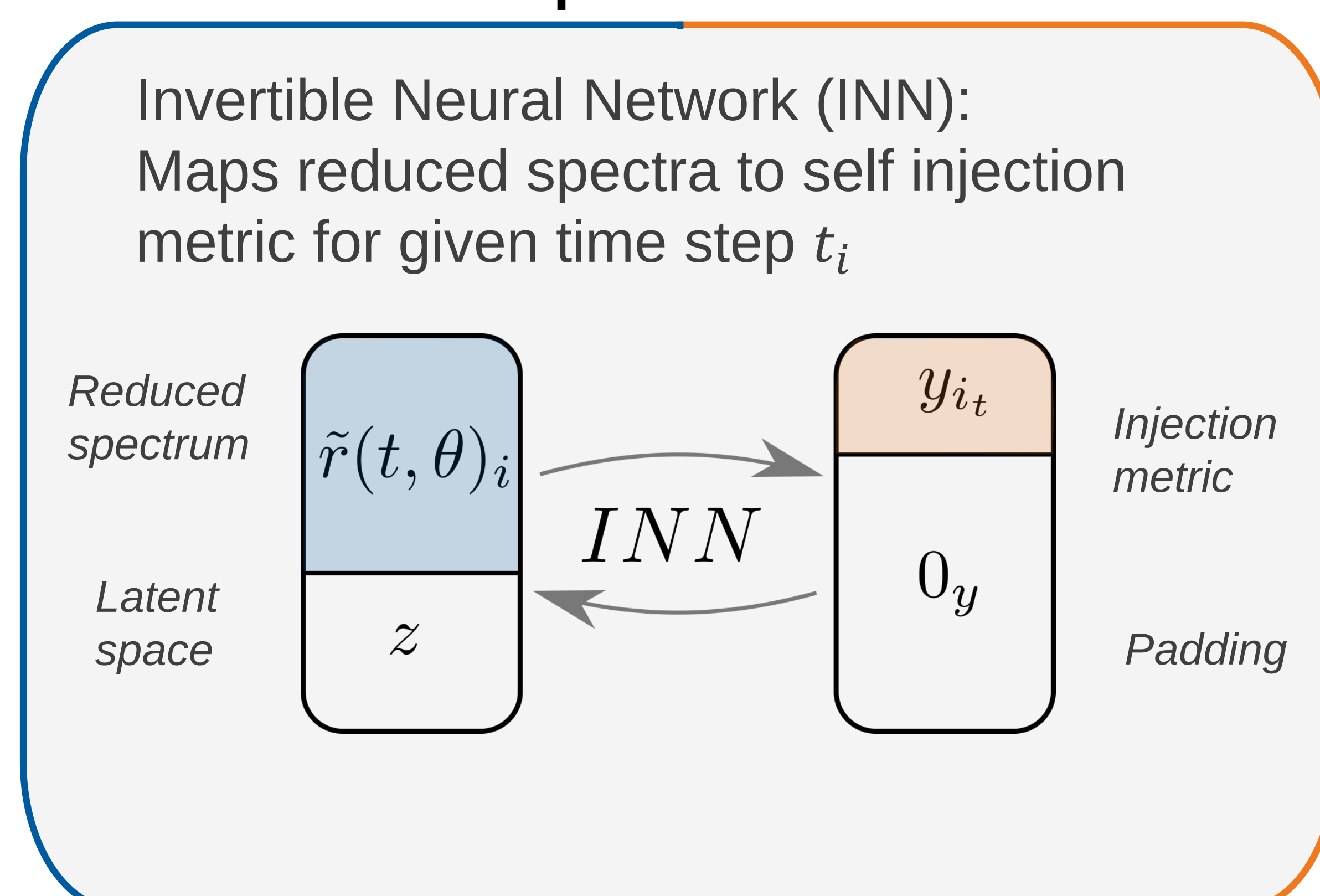
Neural networks

- Variational Autoencoder to reduce dimension of spectra
- Invertible neural network with uncertainty quantification for each prediction

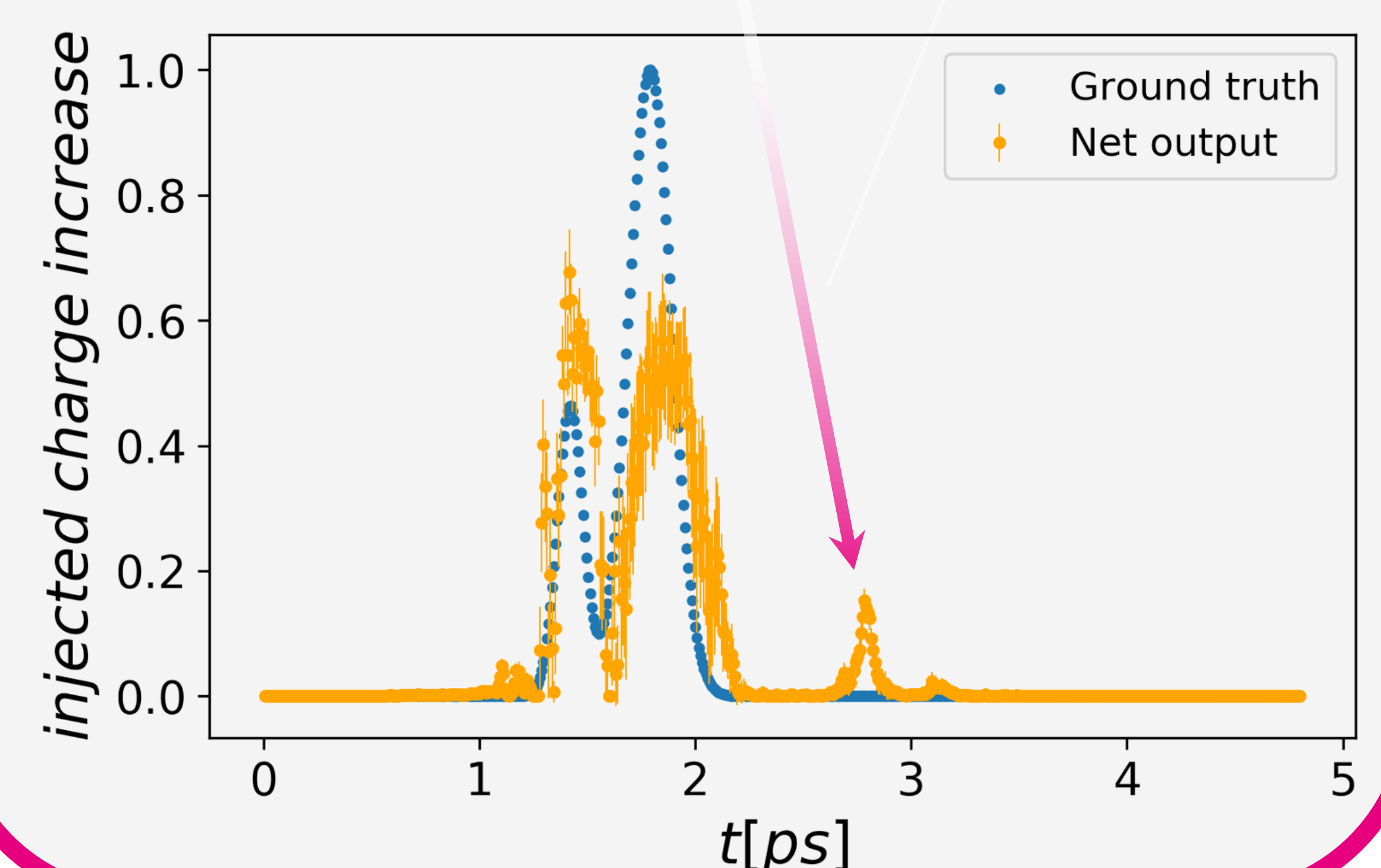
Results

- 3D and 2D simulations created with PConGPU
- **Correct identification** of injections, based on spectra
- **Correct discovery** of new low energy injections

Proposed model



Validation on **unseen simulation**:
Correct identification of undiscovered injections



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