

# Proposal to observe half-bare electrons on a 45-MeV linac

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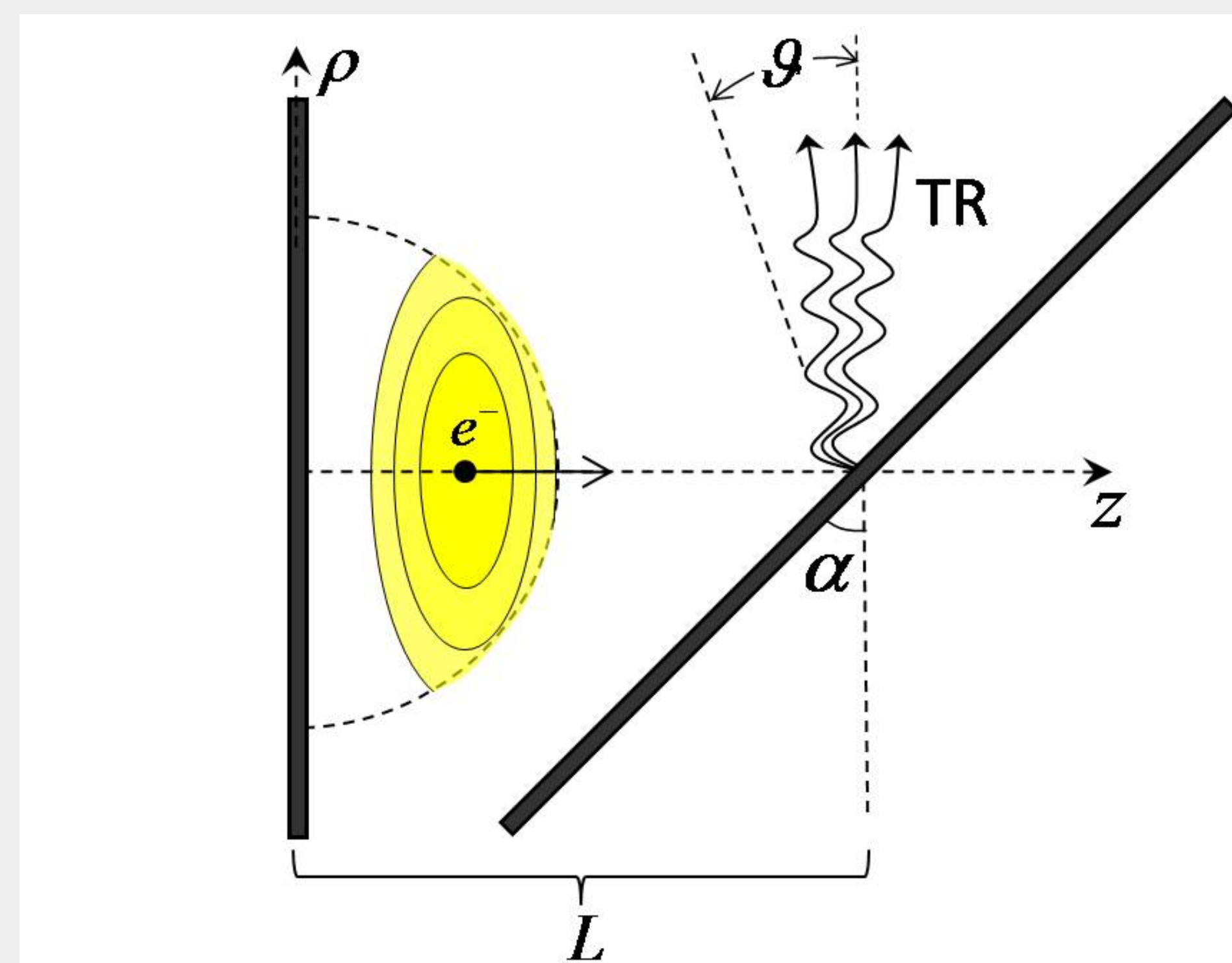
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## Introduction

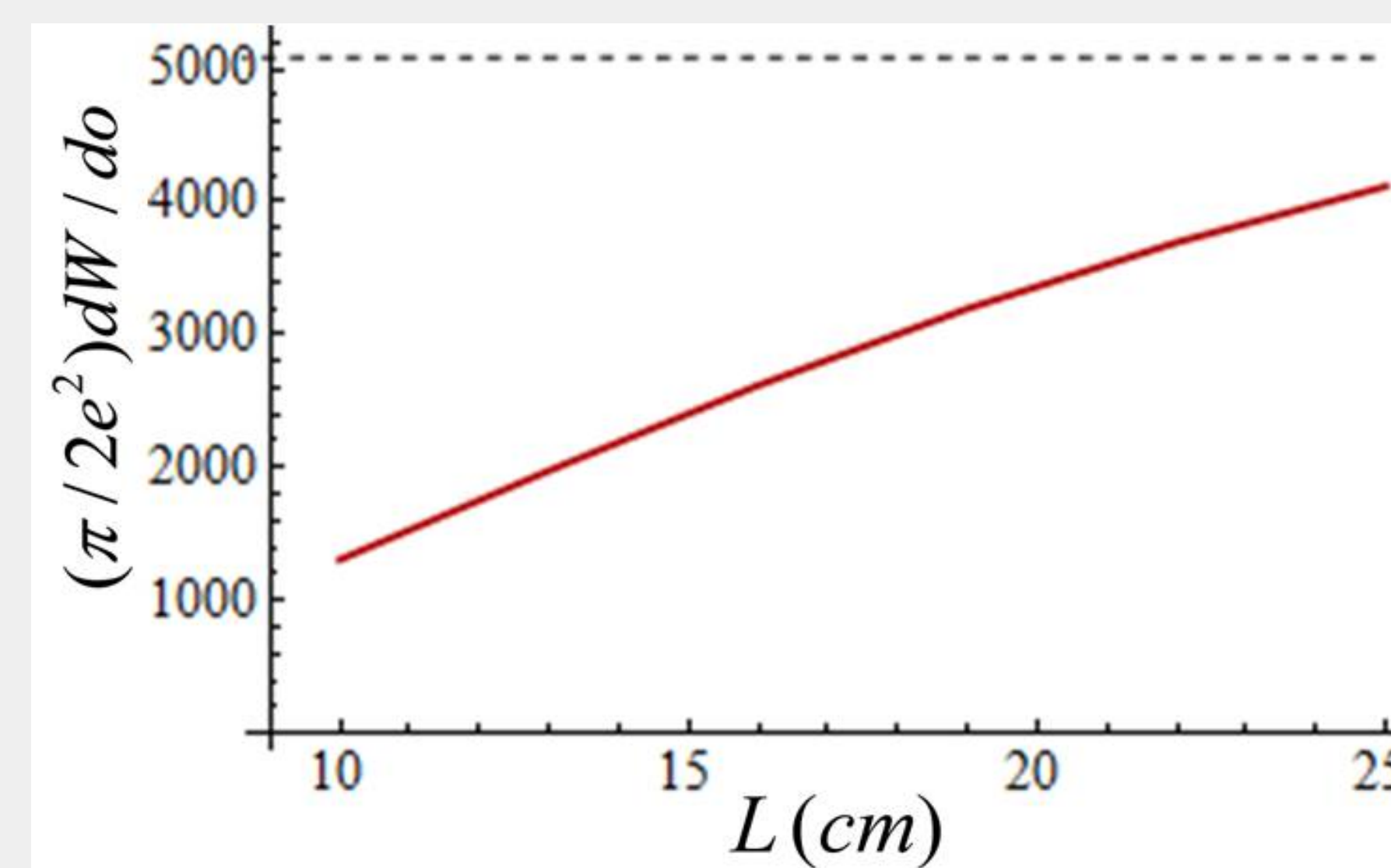
In normal conditions electrons are surrounded by a Coulomb field. When a relativistic electron interacts with matter or external fields it can lose part of its electric field and become "half-bare". In such state the characteristics of its electromagnetic field are significantly modified and this can be observed when the particle interacts with matter again: the properties of the emitted radiation will be different. For example, in the case of relativistic electron multiple scattering in amorphous medium such modification results in partial suppression of the electron bremsstrahlung.



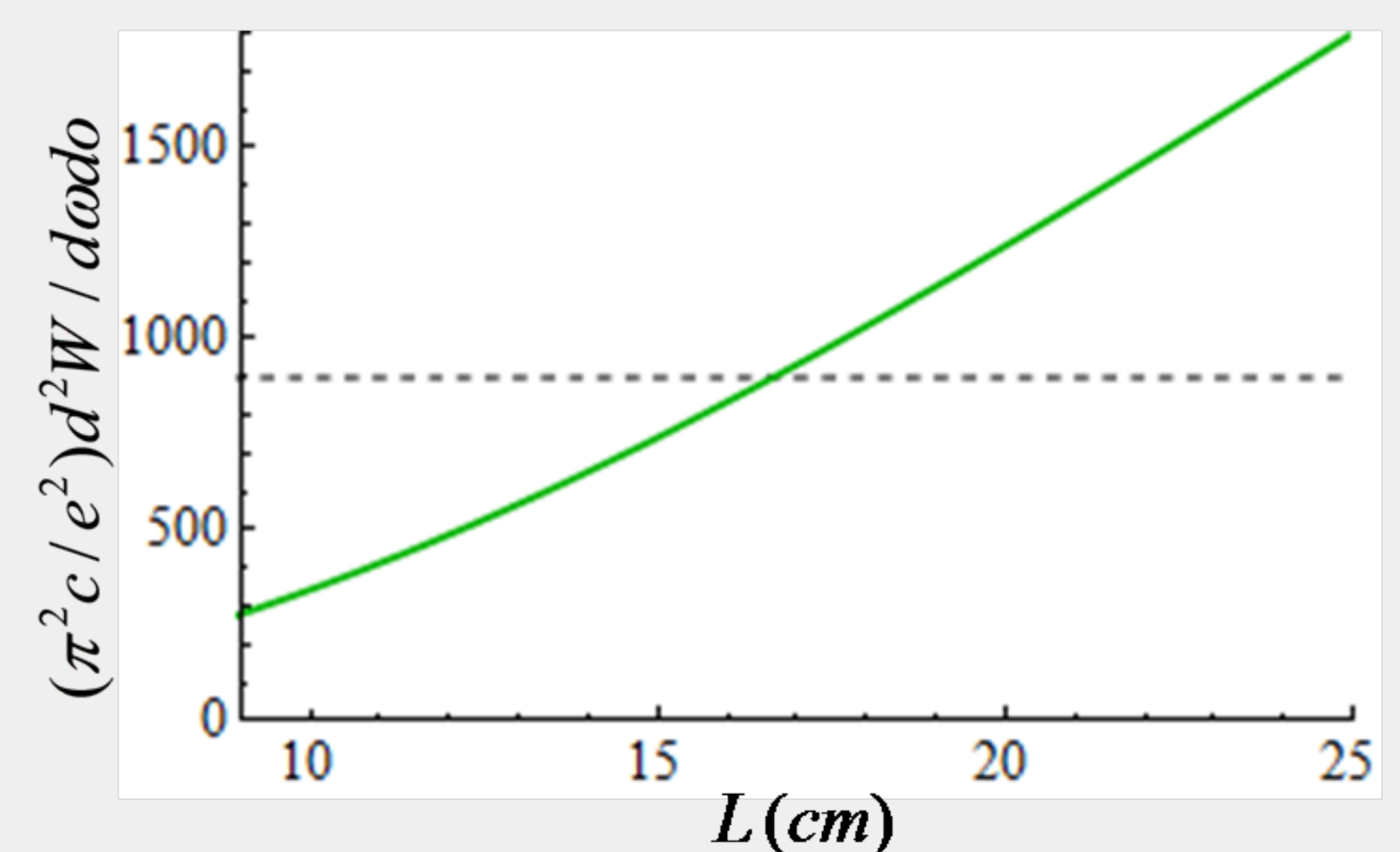
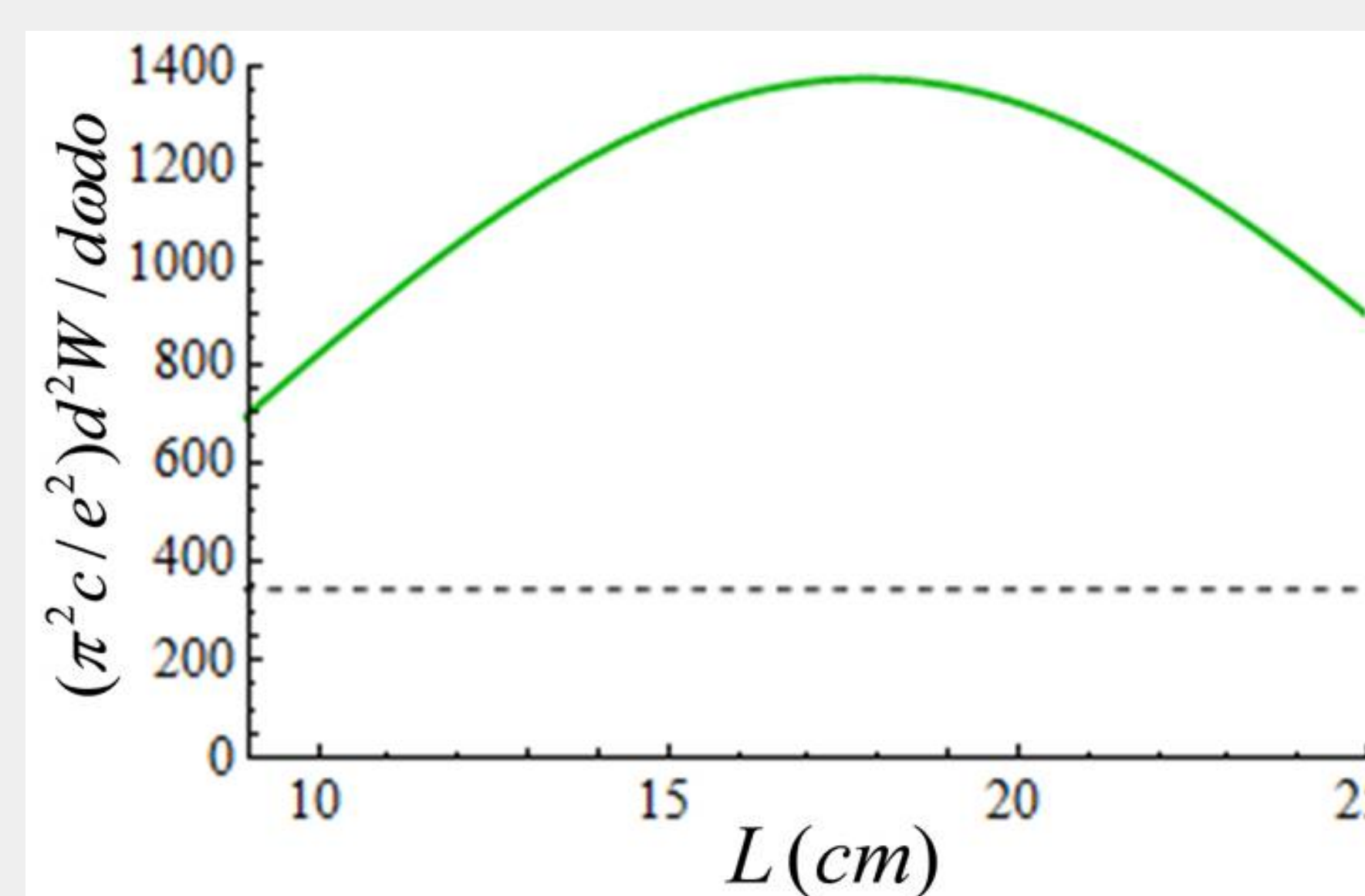
Incidence of the half-bare electron upon the downstream screen.

## Predictions

After interacting with the screen the electron will gradually recover its Coulomb field. At some point (dependent on the wavelength) the radiation emission will become higher than for an electron with a normal field.



Half-bare electron TR yield (solid line) integrated over the wavelength region  $1 \text{ mm} < \lambda < 5 \text{ mm}$ . Dashed line – corresponding signal from the electron with Coulomb field.

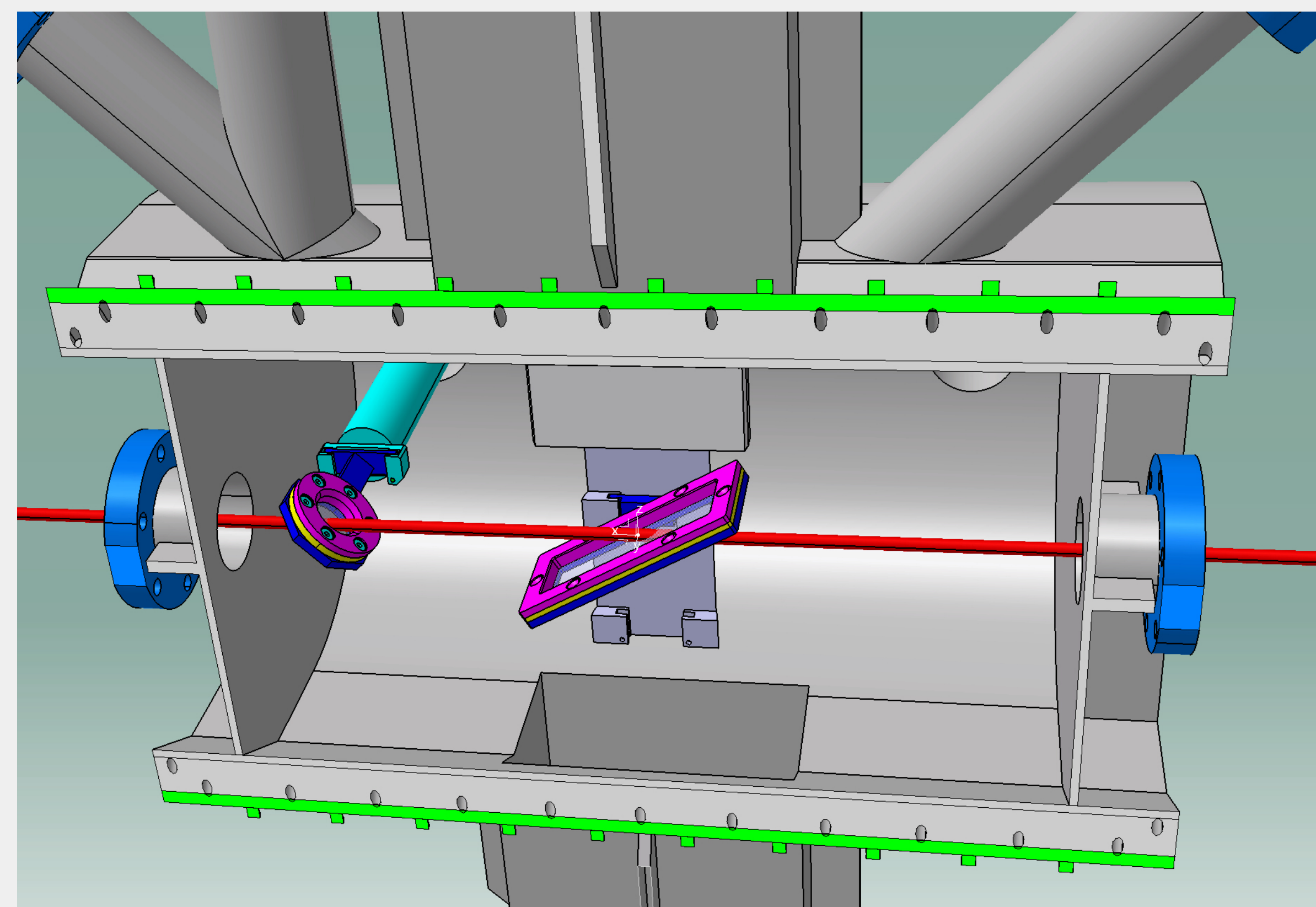


Half-bare electron TR yield for  $\lambda = 0.5 \pm 0.1 \text{ mm}$  and parabolic mirror inclination of  $3^\circ$  (left) or  $1.7^\circ$  (right). Dashed line – corresponding signal from the electron with Coulomb field.

## References

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- N. F. Shul'ga, S.V.Trofymenko, and V.V.Syshchenko. "On the transition radiation and bremsstrahlung from a relativistic electron with a nonequilibrium field." In: JETP Letters 93 (2011), pp. 3- 7.
- N.F. Shul'ga, S.V. Trofymenko, and V.V. Syshchenko. "On transition radiation by relativistic electron." In: Il Nuovo Cimento C 34 (2011), p. 327.
- IPAC'16 MOPMB005

## Proposed experiment



Conceptual view of the screens layout in the chamber for the half-bare electrons experiment. The beam comes from the right. The white screen is used to strip the electrons from their Coulomb field and the pink screen is used to measure the TR. The pink screen will move back and forth and the white screen up and down (actuators are not shown).