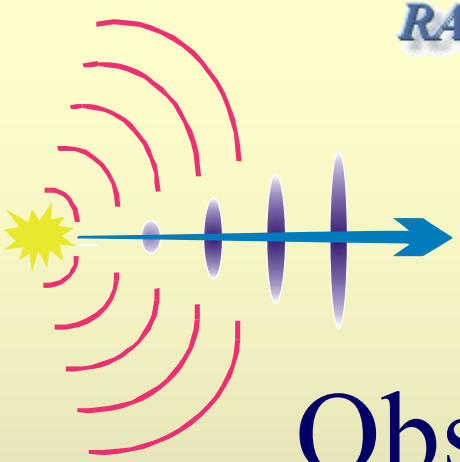

RADIATION from RELATIVISTIC ELECTRONS in PERIODIC STRUCTURES

Observation of Relativistic Electrons Deflection by a Bunch Coulomb Field

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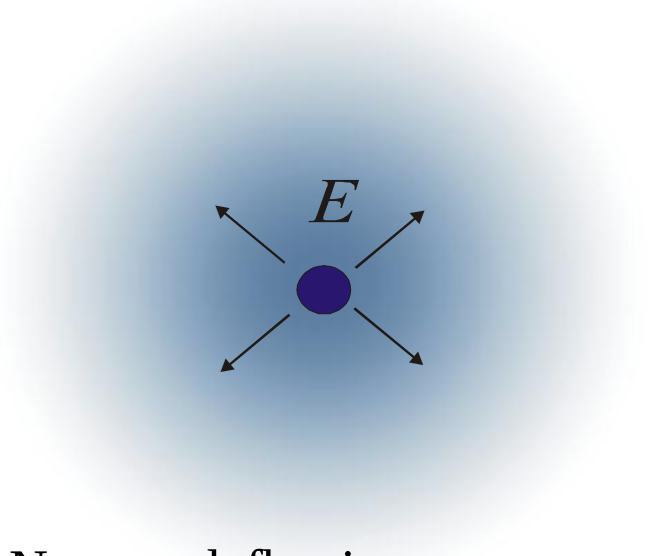
From the cycle of semi-bare electron investigations

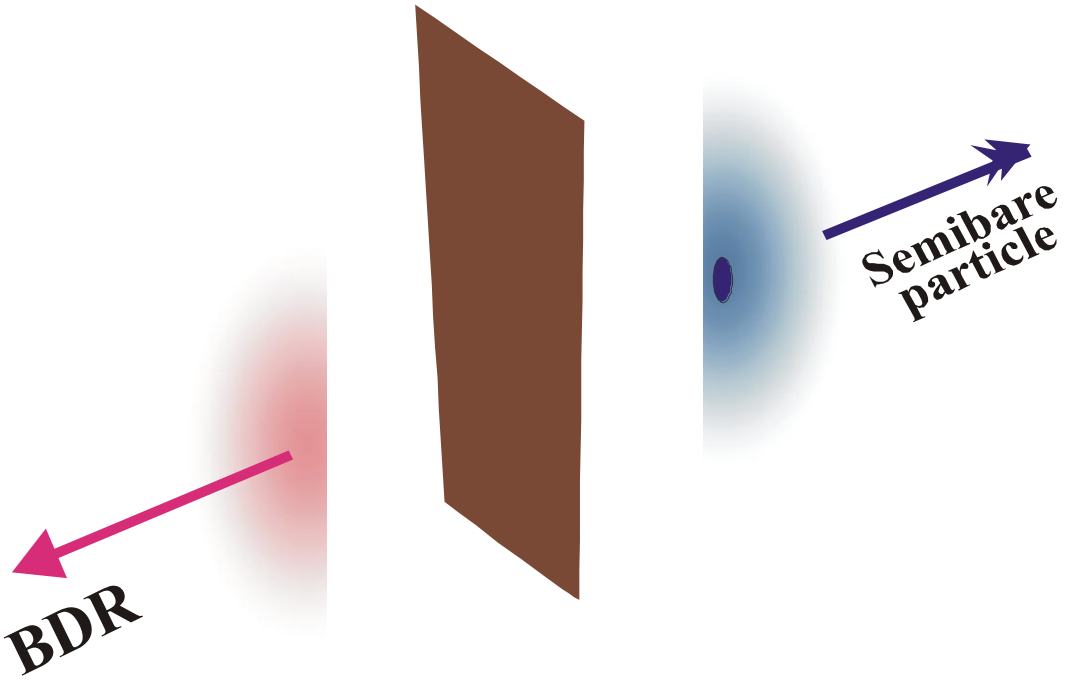
Relativistic particle field in interaction with conductive screen

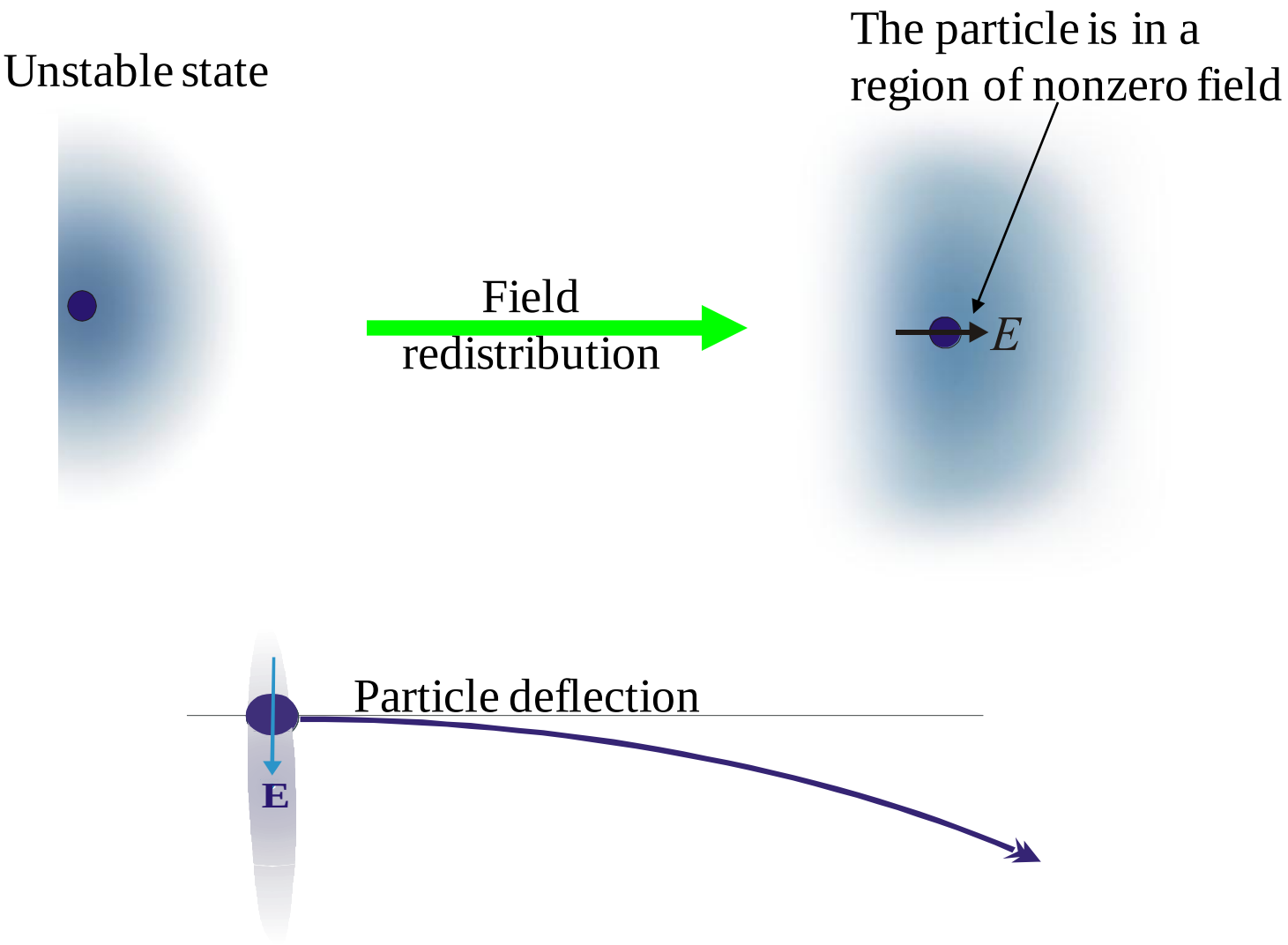
Axial symmetry

$\gamma \gg 1$ → *Pseudo-photon viewpoint is applicable*



Not any deflection

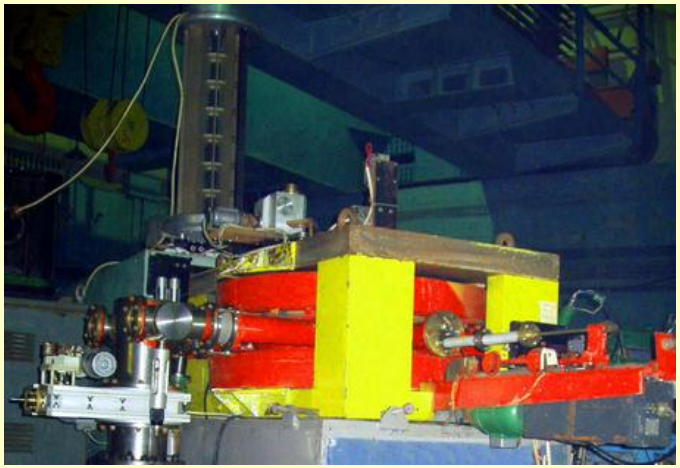




For single electron the deflection is negligible, but for bunch with population 10^8 this effect is estimated to be observable.

Experiment

Tomsk microtron

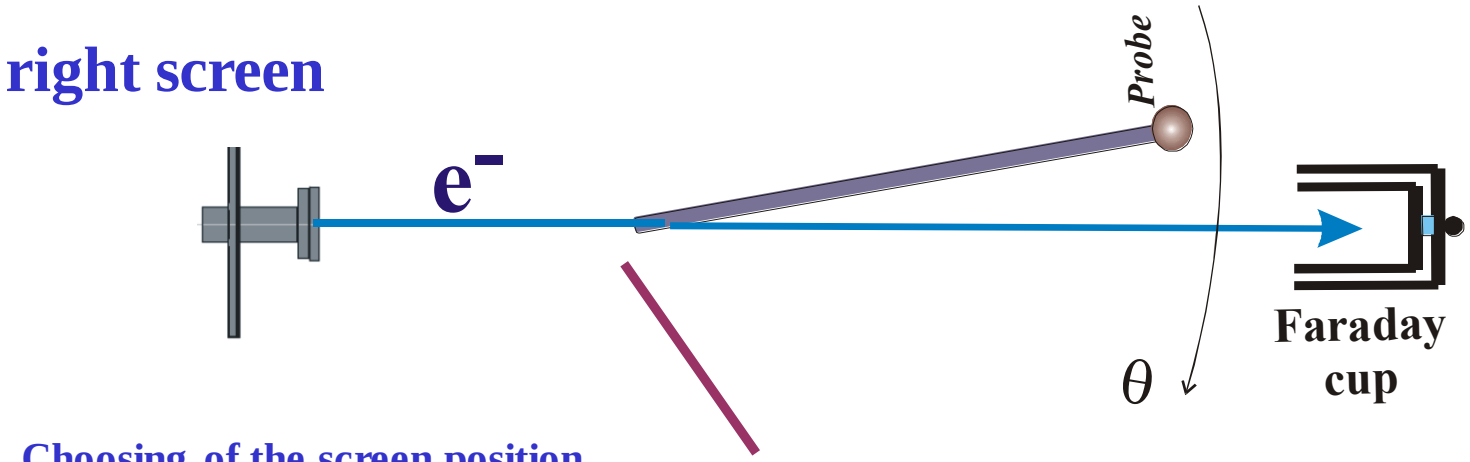


Beam parameters

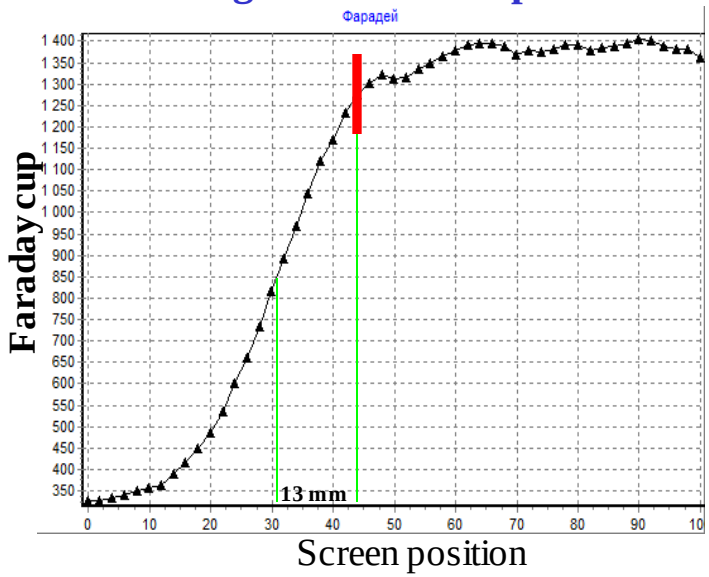
Electron energy 6.1 MeV
Macro-pulse duration 4~5 ms
Pulse repetition rate 1~8 Hz
Micro-pulse length $\sigma \approx 2.3$mm
Electrons number per micro-pulse $\approx 10^8$
Micro-pulses number per macro-pulse $\approx 10^4$
Beam size at the output $\sigma \approx 4 \times 3$ mm^2
Emittance of extracted beam:
horizontal $3.2 \cdot 10^{-2}$ mm×rad
vertical $2.8 \cdot 10^{-2}$ mm×rad

Experimental setup and methodic

Angular beam profile measurements

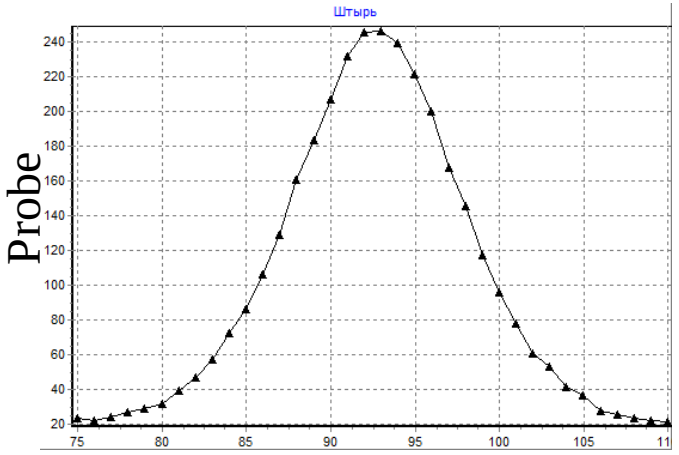


Choosing of the screen position

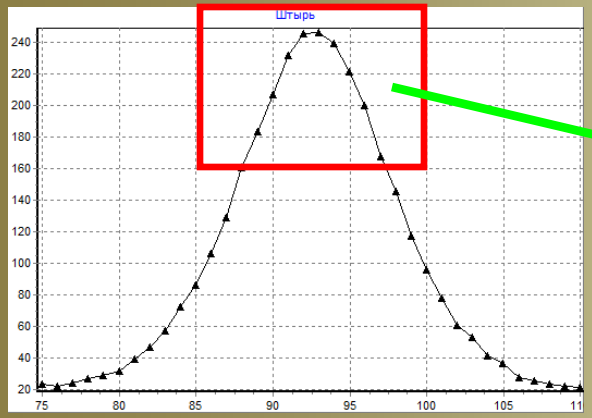


Screens are inclined to exclude an influence of the BDR on the electron beam

Sample of an angular beam profile



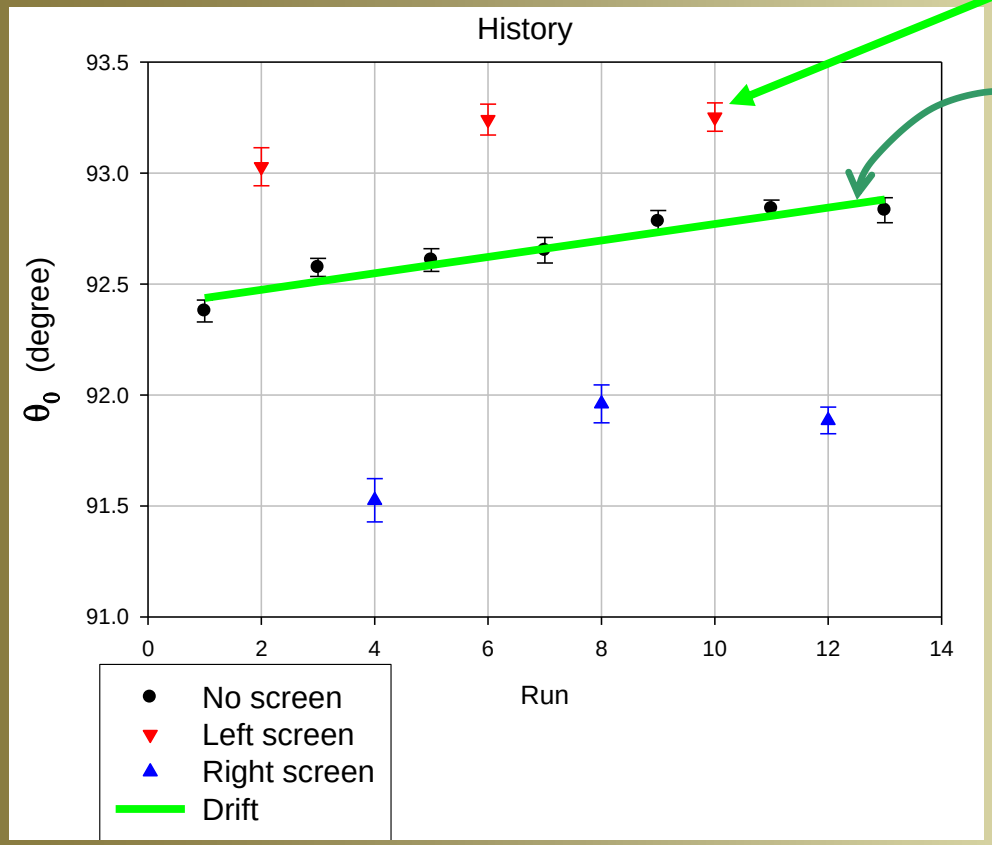
Beam deflection measurement



$$a \cdot e^{-\frac{(\theta-\theta_0)^2}{2c^2}}$$

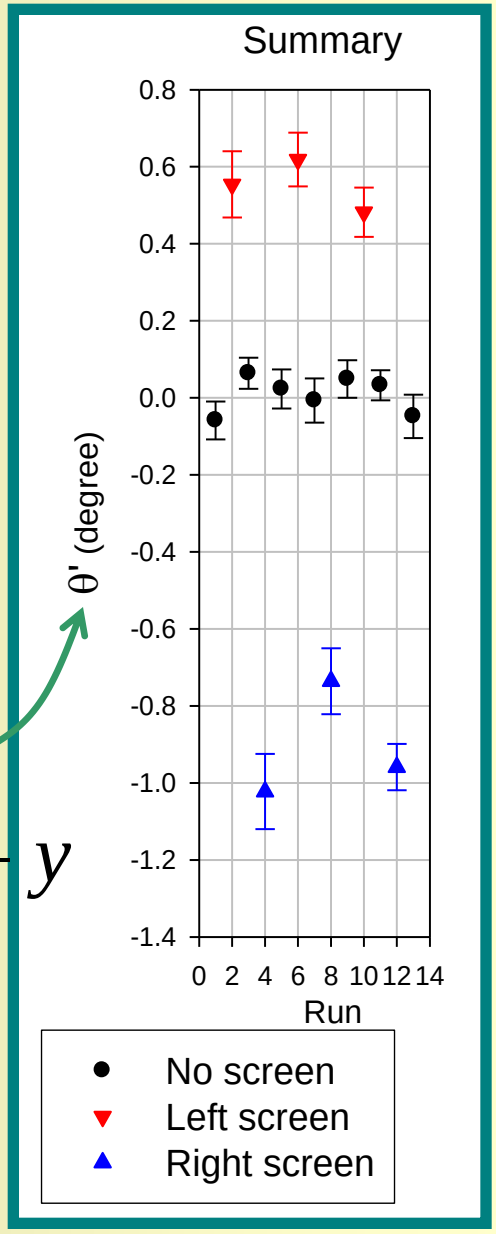
confidence probability

P=95%



$$y = A + B \cdot n$$

$$\theta' = \theta_0 - y$$



About recoil effect

The expressions for recoil effect are built using the energy and pulse conservation low without any information about a mechanism of phenomenon.

In [Dao Xiang. Phys. Rev. ST - AB **11**, 024001 (2008)] is said that a recoil effect is quantum, but not a classical effect, while in our presentation it is purely classical one.

In addition: when in our experiment the conductive screen was replaced by absorber for millimeter wavelength region, the **obtained result was the same**

Resume

The bunch deflection at the angle $\approx 0.7 \pm 0.06^0$ by its own Coulomb field was registered for the relativistic electron with energy 6.2 MeV at Tomsk microtron.


Thank you
for attention