**Lecture-12 Transformation of E&M field**

1. **Let us consider two plates** in the xz-plane in Frame . The surface charge density

图示

描述已自动生成

( )

The two plates move along x-direction at the speed

* , thus ()

We consider another frame , which moves at the speed along the x-axis with respect to S, what the field observed in ?

In , the velocity of the two plates:

here and

In , the charge density (See Lec. 9, Sec. 6)

here and

* here

Thus

* ------

We can derive the rules for other components: is moving at speed of along the x-direction with respect to :

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Or -------CGS

Case 1: To the first order (, i.e. ) 🡪

Case 2: Suppose in the with , then:

🡪

Then

Similarly, in the with , then in :

1. **A conducting rod moving in -field ()**

图示, 示意图

描述已自动生成In frame, the rod is moving along y-direction.

Lorenz force

drives that charge accumulates at ends （right hand rule）.



induced internal field.

图示

描述已自动生成In

图示

描述已自动生成

图示

描述已自动生成Now let us sit the co-moving frame () with . For the moment, we neglect the rod, then we will see in the frame , there exist and :

up to

In , the rod is at rest, induces charge distribution in the rod, which in turn rebalance the field resulting in no electric field inside the rod! Therefore, there is no motion of electric charge!

图示

描述已自动生成Total distribution in