***Luminosity Calculation -- River Huang, Vasiliy Morozov***

Define the following parameters:

• is the angle between the projection of the beam1 trajectory on the (*x*, *s*) plane and the s-axis.

• is the angle between the projection of the trajectory on the (*y*, *s*) plane and the s-axis.

• offset and offset .

and also define , ,

**1) Analytic solution 1**

**Condition**: , , , ,

let ,

the luminosity is

where  is the modified Bessel function.

**2) Analytic solution 2**

**Condition:** or, , , ,

Let , , ,

the luminosity is

**3) Analytic solution 3**

**Condition:** , or , , , ,

Let , , ,

the luminosity is

If is small enough, the luminosity is