potential of a point charge: system is

a b

3 2 1

as symmetric around the z axis

in to Fourier space using the Fourier transform

apply boundary conditions as and as

applying the conditions ,

and ,

let a=0 therefore b and are always positive

rearrange 6

8+4

4-8

rearrange 7

11-5

11+5

9+12

rearrange 6

rearrange 7

14+4

4-14

15+5

15-5

sub 21 in to 17

sub 23 in to 19

sub 25 in to 27

LHS

RHS

let

sub 28 in to 21

sub 28 in to 23

sub 29 and 30 in to 2

let

first term

second term

let

test limiting cases:

for assuming is always positive as in region 2

result as expected for a 2 layer system

for

result as expected

let

returns result as expected

let

returns result as expected

giving the integral of 31 as

let

as

then

test cases

for

let

let

calculation for dipole

Chart, diagram

Description automatically generated

b

a

3 2 1

as then

particle 1

particle 2

calculating the dipole using principle of superposition

first term

second term

third term

fourth term

fifth term

sixth term

ignoring and above terms

let

test cases

let

returns expected result

let

returns expected result

let

expected result

calculating the electric field due to the dipole

using and

first term:

second term

third term

fourth term

fifth term

sixth term

first term:

second term

third term

fourth term

lattice sums