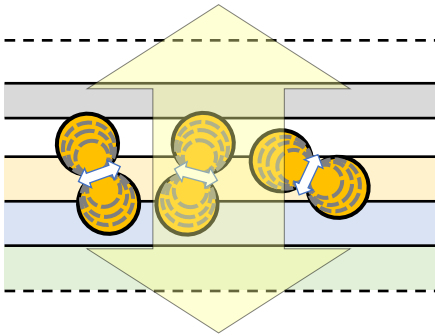
Internal Light Source-Far Field Intensity

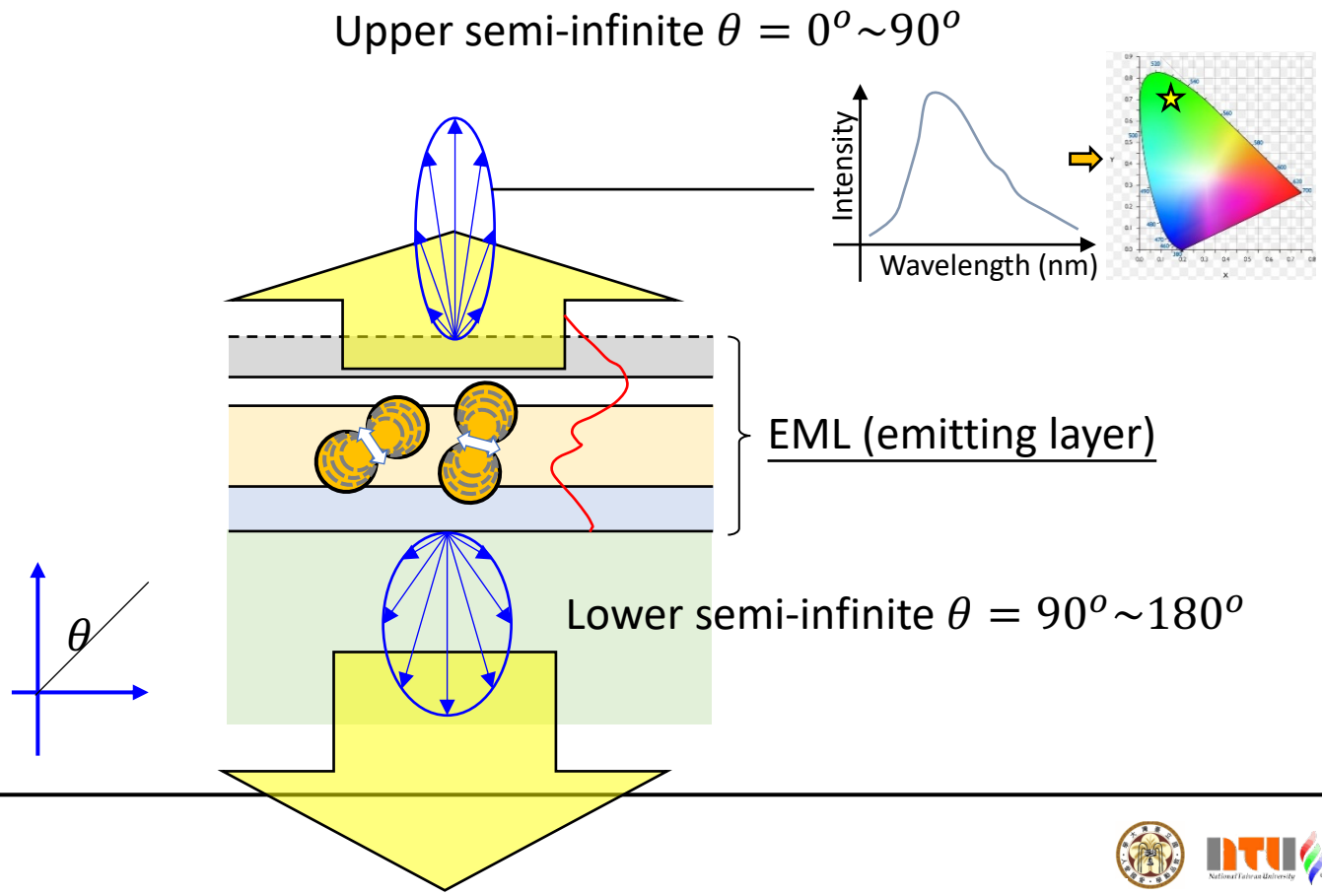
-FarFieldCmd.pyc

Author: Wei-Kai Lee



Objective

- Calculate the angular dependent far field spectrum, CIE coordinate, and far field intensity.



How to execute the calculator

python: windows
python3: mac, linux

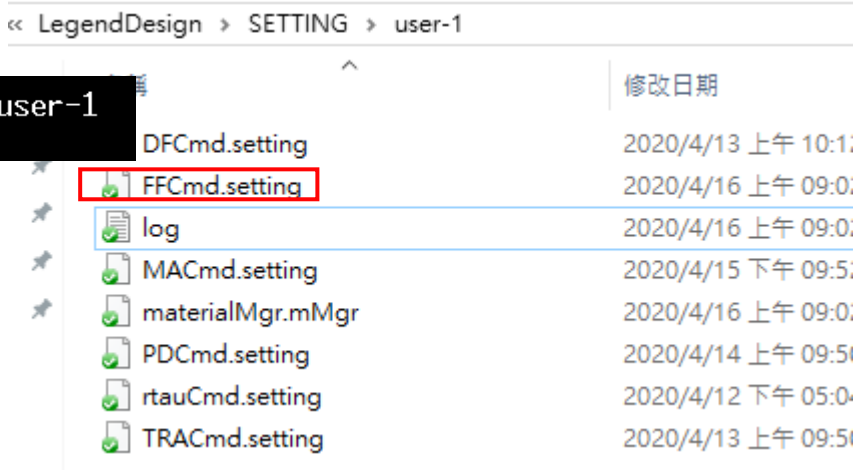
```
>python FarFieldCmd.py
```

Execution file

```
>>> Please insert username : user-1
```

Type user name

```
Far Field Setting is not built in ../../SETTING/user-1
Now saving the default far field setting.
```

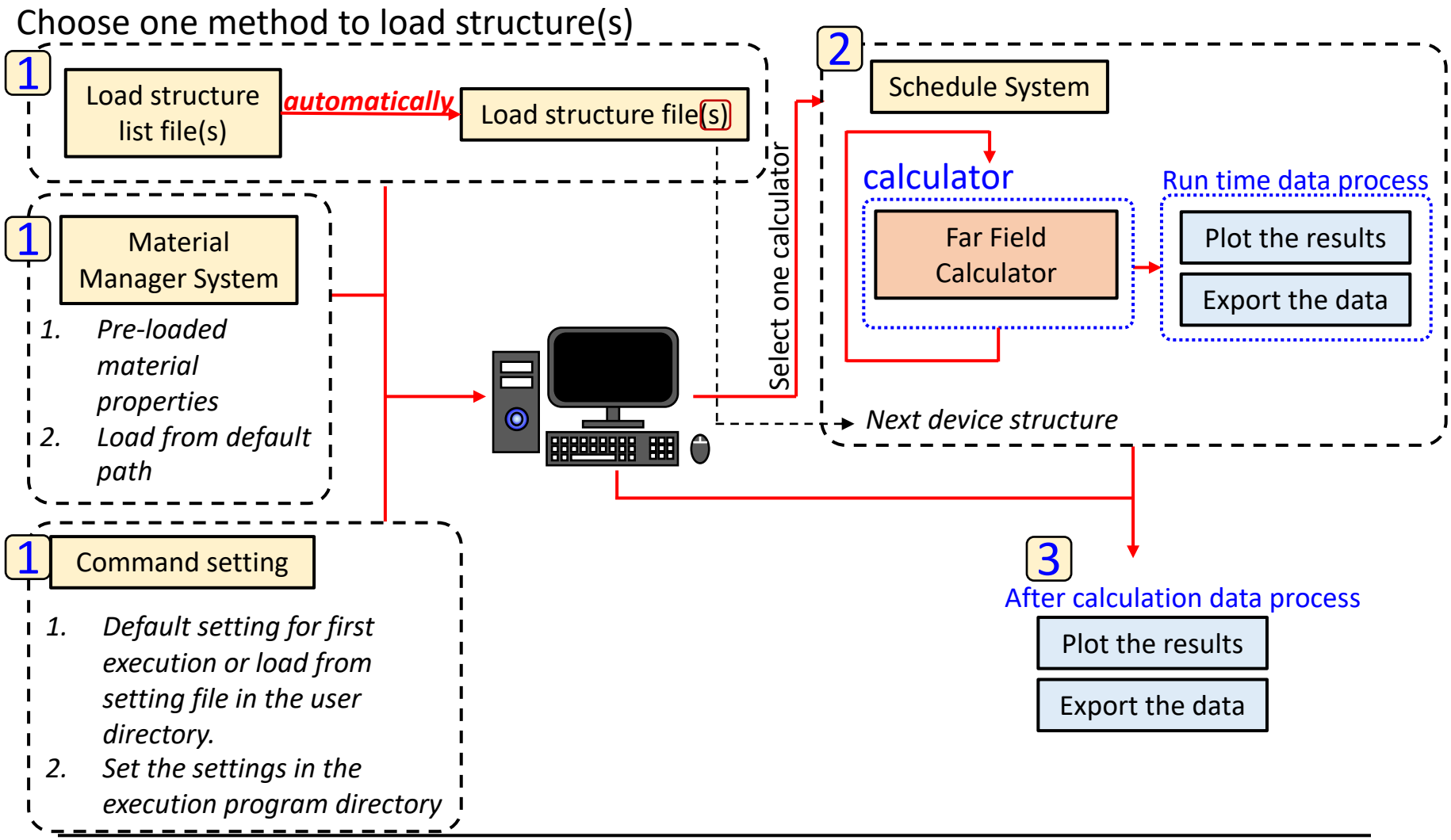


Help

```
User Control Command
=======================================
1. Settting Command:
changeUser              exit

Material Manager Command
=======================================
1. Settting Command:
printMgr                saveMgr

Structure/Structure List Command
=======================================
1. Structure List Command:
ReadStructListPath    ReadStructListName
SaveStructListPath    SaveStructListName
readStructList        saveStructList

2. Structure Command:
ReadStructPath        ReadStructName
SaveFilePath          SaveFileName
readStruct            deleteStruct

3. Print Information Command:
printStructInfo       printStructSettingInfo
printListInfo

4. Result Command:
ResultFilePath        ResultFileName
deleteResult
save_run_time_result_Bool
resetSN
```

```
Far Field Command
=======================================
1. Settting Command:
SettingFilePath       SettingFileName
setDefaultSetting     printFFInfo
loadFFSETTING         saveFFSETTING

2. Reference Purcell Factor Command:
ReferencePurcellFactorFilePath
ReferencePurcellFactorFileName
readRefPurcellFactor

3. Write Bool:
writeSpectrumBool     writePolarBool
writeNormalizedSpectrumBool
writeNormalizedPolarBool
write_TotalPowerBool
write_ForwardPowerBool write_BackwardPowerBool
write_M1M3PowerBool   write_M2M4PowerBool
write_M1PowerBool     write_M2PowerBool
write_M3PowerBool     write_M4PowerBool

4. Plot Bool:
changefigshowBool
plot_TotalPowerBool
plot_ForwardPowerBool plot_BackwardPowerBool
plot_M1M3PowerBool    plot_M2M4PowerBool
plot_M1PowerBool      plot_M2PowerBool
plot_M3PowerBool      plot_M4PowerBool

5. Run Time Bool:
runtime_plot

6. CIE Analyzer Bool:
CIE1931AnalysisBool   CIE1976AnalysisBool

7. Execution Function:
calFarField
```

Calculating Workflow



Default Setting

```
>>> printFFInfo

Setting file path : ../../SETTING/user-1
Setting file name : FFCmd.setting
theta : 0.00000:1.00000:180.00000
phi : 0.0
Reference Purcell factor file path : E:\Dropbox\GoodLabSimulator_aniso\LegendDesign\ori_src\Optics\WaveOptics\SourceOptics\Data
Reference Purcell factor file name : AirPurcellFactor
Write Bool
================================================
     spectrum bool            : True
     polar bool               : True
     normalized spectrum bool : False
     normalized polar bool    : False
Write Mode Bool
================================================
     Total (M1+M2+M3+M4)  : True
     +z    (M1+M2)        : False
     -z    (M3+M4)        : False
     M1                   : False
     M2                   : False
     M3                   : False
     M4                   : False

Plot Bool
================================================
     spectrum bool            : False
     polar bool               : False
     normalized spectrum bool : True
     normalized polar bool    : True
Plot Mode Bool
================================================
     Total (M1+M2+M3+M4)  : True
     +z    (M1+M2)        : False
     -z    (M3+M4)        : False
     M1                   : False
     M2                   : False
     M3                   : False
     M4                   : False

CIE1931 xyz analysis  : True
CIE1976 u*v* analysis : True
Save Run Time Result  : True
Run Time Plot         : False

Figure Show Bool : True
```

Calculate Far Field

Bottom-emitting OLED

FarFieldCmd-Example-1.txt | sfile-2.txt | sfile-2-air.txt

	MATERIAL	THICKNESS(nm)
1	air	X
2	Al	120.000000
3	LiF	1.000000
4	B3PYMPM	50
5	CBP	20.000000
6	TAPC	50
7	cito	80
8	glass	X

Thick metal

Simulate the far field properties into glass.

```
wavelength(nm) : 480.0:1.0:600.0
EML :
    Layerno                 : 5
    Position(nm)            : 10.000000
    ratio                   : 1.000000
    QY                      : 1.000000
    Fluorescence            : cbp_irppy2acac
    DOF                     : cbp_irppy2acac
```

simulation wavelength

Calculate Far Field

Bottom-emitting OLED

FarFieldCmd-Example-1.txt | sfile-2.txt | sfile-2-air.txt

```
1          MATERIAL                    THICKNESS(nm)
2               air                             X
3                Al                    120.000000
4               LiF                     1.000000
5          B3PYMPM                             50
6               CBP                    20.000000
7              TAPC                             50
8              cito                             80
9             glass                             X
10              air                             X
11
12
13
14 wavelength(nm) : 480.0:1.0:600.0
15 EML :
16     Layerno                  : 5
17     Position(nm)             : 10.000000
18     ratio                    : 1.000000
19     QY                       : 1.000000
20     Fluorescence             : cbp_irppy2acac
21     DOF                      : cbp_irppy2acac
```

Thick metal

Simulate the far field properties into air.

simulation wavelength

FarFieldCmd-Example-1.txt | structureList-FarFieldCmd.txt

```
1  Name readfilename                readfilepath          savefilename
2   #s1  sfile-2.txt       ./Example/structure/Convention      sfile-2       ../../Example/FFCmd/Conventi
3  #sa1  sfile-2-air.txt   ./Example/structure/Convention      sfile-2-air   ../../Example/FFCmd/Convention/C
4
```

Calculate Far Field

Transparent/ Double-emitting OLED

FarFieldCmd-Example-1.txt | sfile-2.txt | sfile-2-air.txt

	MATERIAL	THICKNESS(nm)
1	air	X
2	Al	10:5:20
3	LiF	1.000000
4	B3PYMPM	50
5	CBP	20.000000
6	TAPC	20
7	cito	50
8	glass	X

Thin metal

Simulate the far field properties into glass.

simulation wavelength

```
wavelength(nm) : 450:1.0:650.0
EML :
    Layerno                 : 5
    Position(nm)            : 10.000000
    ratio                   : 1.000000
    QY                      : 1.000000
    Fluorescence            : cbp_irppy2acac
    DOF                     : cbp_irppy2acac
```

FarFieldCmd-Example-1.txt | structureList-FarFieldCmd.txt

	Name	readfilename	readfilepath	savefilename	savefil
1	#Ts1	sfile-2.txt	./Example/structure/Transparent	sfile-2	../../Example/FFCmd/Transparent/
2	#Tsa1	sfile-2-air.txt	./Example/structure/Transparent	sfile-2-air	../../Example/FFCmd/Transparent/Tran

Calculate Far Field

Transparent/ Double-emitting OLED

FarFieldCmd-Example-1.txt | sfile-2.txt | sfile-2-air.txt

```
1            MATERIAL                                THICKNESS(nm)
2                 air                                           X
3                  Al                                    10:5:20
4                 LiF                                    1.000000
5             B3PYMPM                                          50
6                 CBP                                   20.000000
7                TAPC                                          20
8                cito                                         50
9               glass                                          X
10               air                                           X
11
12
13  wavelength(nm) : 450:1.0:650.0
14  EML :
15      Layerno                     : 5
16      Position(nm)                : 10.000000
17      ratio                       : 1.000000
18      QY                          : 1.000000
19      Fluorescence                : cbp_irppy2acac
20      DOF                         : cbp_irppy2acac
```

Thin metal

Simulate the far field properties into air.

simulation wavelength

Calculate Far Field

```
>>> changefigshowBool F

*** Unknown syntax: changefigshowBool F
>>> save_run_time_result_Bool F

>>> runtime_plot T
```

```
>>> Theta 0:1:180

>>> Phi   0

>>> CIE1931AnalysisBool   T

>>> CIE1976AnalysisBool   T
```

Calculate Far Field

```
>>> ReadStructListPath  ./Example/structure/Convention

>>> ReadStructListName  structureList-FarFieldCmd.txt

>>> readStructList

Now reading structure list file ./Example/structure/Convention\structureList-FarFieldCmd.txt
  No./Name         filename        savefilename  CommandID  Check                    readfilepath
-------------------------------------------------------------------------------------------------------------------
       #s1      sfile-2.txt             sfile-2        0.0      X  ./Example/structure/Convention      ../../Example/FFCmd/C
      #sa1  sfile-2-air.txt         sfile-2-air        0.0      X  ./Example/structure/Convention  ../../Example/FFCmd/Conve


Structure file reading...
-------------------------------------------------------------------------------------------------------
Now reading structure file ./Example/structure/Convention\sfile-2.txt
Now reading structure file ./Example/structure/Convention\sfile-2-air.txt


>>> ReadStructListPath  ./Example/structure/Transparent

>>> ReadStructListName  structureList-FarFieldCmd.txt

>>> readStructList

Now reading structure list file ./Example/structure/Transparent\structureList-FarFieldCmd.txt
  No./Name         filename        savefilename  CommandID  Check                     readfilepath
-------------------------------------------------------------------------------------------------------------------
      #Ts1      sfile-2.txt             sfile-2        0.0      X  ./Example/structure/Transparent      ../../Example/FFCmd/T
     #Tsa1  sfile-2-air.txt         sfile-2-air        0.0      X  ./Example/structure/Transparent  ../../Example/FFCmd/Trans


Structure file reading...
-------------------------------------------------------------------------------------------------------
Now reading structure file ./Example/structure/Transparent\sfile-2.txt
Now reading structure file ./Example/structure/Transparent\sfile-2-air.txt
```

Calculate Far Field

```
>>> printStructInfo

****************************************
Name: #s1
[#]   Material            Thickness(nm)
----------------------------------------
[1]   air                 X
[2]   Al                  120.0
[3]   LiF                 1.0
[4]   B3PYMPM             50.0
[5]   CBP                 20.0
[6]   TAPC                50.0
[7]   cito                80.0
[8]   glass               X

wavelength(nm) : 480.00000:1.00000:600.00000

EML   Fluorescence    DOF            Position(nm)    PLQY           Ratio
-------------------------------------------------------------------------------
[5]   cbp_irppy2acac  cbp_irppy2acac  10.0            1.0            1.0
Device number : 1


****************************************
Name: #sa1
[#]   Material            Thickness(nm)
----------------------------------------
[1]   air                 X
[2]   Al                  120.0
[3]   LiF                 1.0
[4]   B3PYMPM             50.0
[5]   CBP                 20.0
[6]   TAPC                50.0
[7]   cito                80.0
[8]   glass               X
[9]   air                 X

wavelength(nm) : 480.00000:1.00000:600.00000

EML   Fluorescence    DOF            Position(nm)    PLQY           Ratio
-------------------------------------------------------------------------------
[5]   cbp_irppy2acac  cbp_irppy2acac  10.0            1.0            1.0
Device number : 1
```

Calculate Far Field

```
****************************************
Name: #Ts1
[#]   Material              Thickness(nm)
----------------------------------------
[1]   air                   X
[2]   Al                    10.00000:5.00000:20.00000
[3]   LiF                   1.0
[4]   B3PYMPM               50.0
[5]   CBP                   20.0
[6]   TAPC                  20.0
[7]   cito                  50.0
[8]   glass                 X

wavelength(nm) : 450.00000:1.00000:650.00000

EML   Fluorescence    DOF             Position(nm)    PLQY            Ratio
------------------------------------------------------------------------------
[5]   cbp_irppy2acac  cbp_irppy2acac  10.0            1.0             1.0
Device number : 3


****************************************
Name: #Tsa1
[#]   Material              Thickness(nm)
----------------------------------------
[1]   air                   X
[2]   Al                    10.00000:5.00000:20.00000
[3]   LiF                   1.0
[4]   B3PYMPM               50.0
[5]   CBP                   20.0
[6]   TAPC                  20.0
[7]   cito                  50.0
[8]   glass                 X
[9]   air                   X

wavelength(nm) : 450.00000:1.00000:650.00000

EML   Fluorescence    DOF             Position(nm)    PLQY            Ratio
------------------------------------------------------------------------------
[5]   cbp_irppy2acac  cbp_irppy2acac  10.0            1.0             1.0
Device number : 3
```

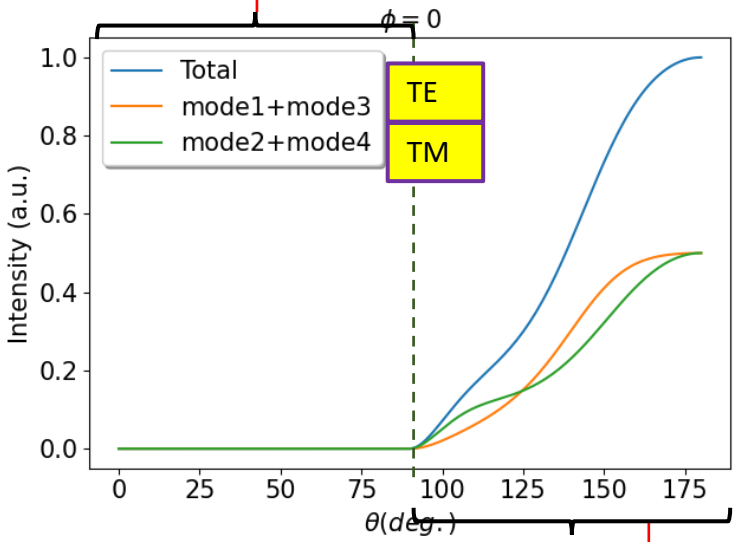
Calculate Far Field

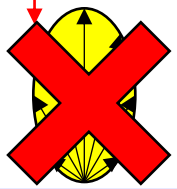
```
>>> printFFInfo

Setting file path : ../../SETTING/user-1
Setting file name : FFCmd.setting
theta : 0.00000:1.00000:180.00000
phi : 0.0
Reference Purcell factor file path : E:\Dropbox\GoodLabSimulator_aniso\LegendDesign\ori_src\Optics\WaveOptics\SourceOptics\Data
Reference Purcell factor file name : AirPurcellFactor
Write Bool
================================================
     spectrum bool            : True
     polar bool               : True
     normalized spectrum bool : False
     normalized polar bool    : False
Write Mode Bool
================================================
     Total (M1+M2+M3+M4)  : True
     +z    (M1+M2)        : False
     -z    (M3+M4)        : False
     M1                   : False
     M2                   : False
     M3                   : False
     M4                   : False

Plot Bool
================================================
     spectrum bool            : False
     polar bool               : False
     normalized spectrum bool : True
     normalized polar bool    : True
Plot Mode Bool
================================================
     Total (M1+M2+M3+M4)  : True
     +z    (M1+M2)        : False
     -z    (M3+M4)        : False
     M1                   : False
     M2                   : False
     M3                   : False
     M4                   : False

CIE1931 xyz analysis  : True
CIE1976 u*v* analysis : True
Save Run Time Result  : False
Run Time Plot         : True

Figure Show Bool : True
```

Calculate Far Field

```
>>> calFarField

Now running structure (#1/#4) #s1 ...
¦Device-#1/#1¦(100%)>>>>>>>>>>>>>>>>>>>>¦Elapsed:0day(s)/0hr(s)/0min(s)/11sec(s)
Now running structure (#2/#4) #sa1 ...
¦Device-#1/#1¦(100%)>>>>>>>>>>>>>>>>>>>>¦Elapsed:0day(s)/0hr(s)/0min(s)/31sec(s)
Now running structure (#3/#4) #Ts1 ...
¦Device-#3/#3¦(100%)>>>>>>>>>>>>>>>>>>>>¦Elapsed:0day(s)/0hr(s)/0min(s)/52sec(s)
Now running structure (#4/#4) #Tsa1 ...
¦Device-#3/#3¦(100%)>>>>>>>>>>>>>>>>>>>>¦Elapsed:0day(s)/0hr(s)/2min(s)/32sec(s)
```

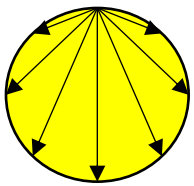
Data

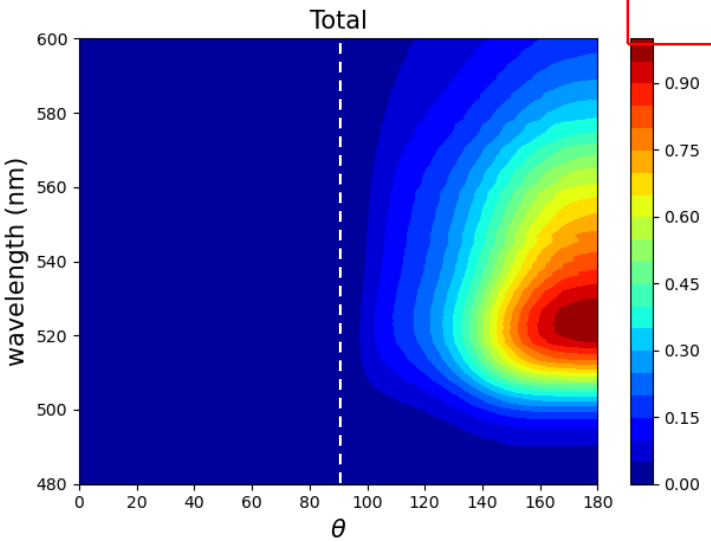




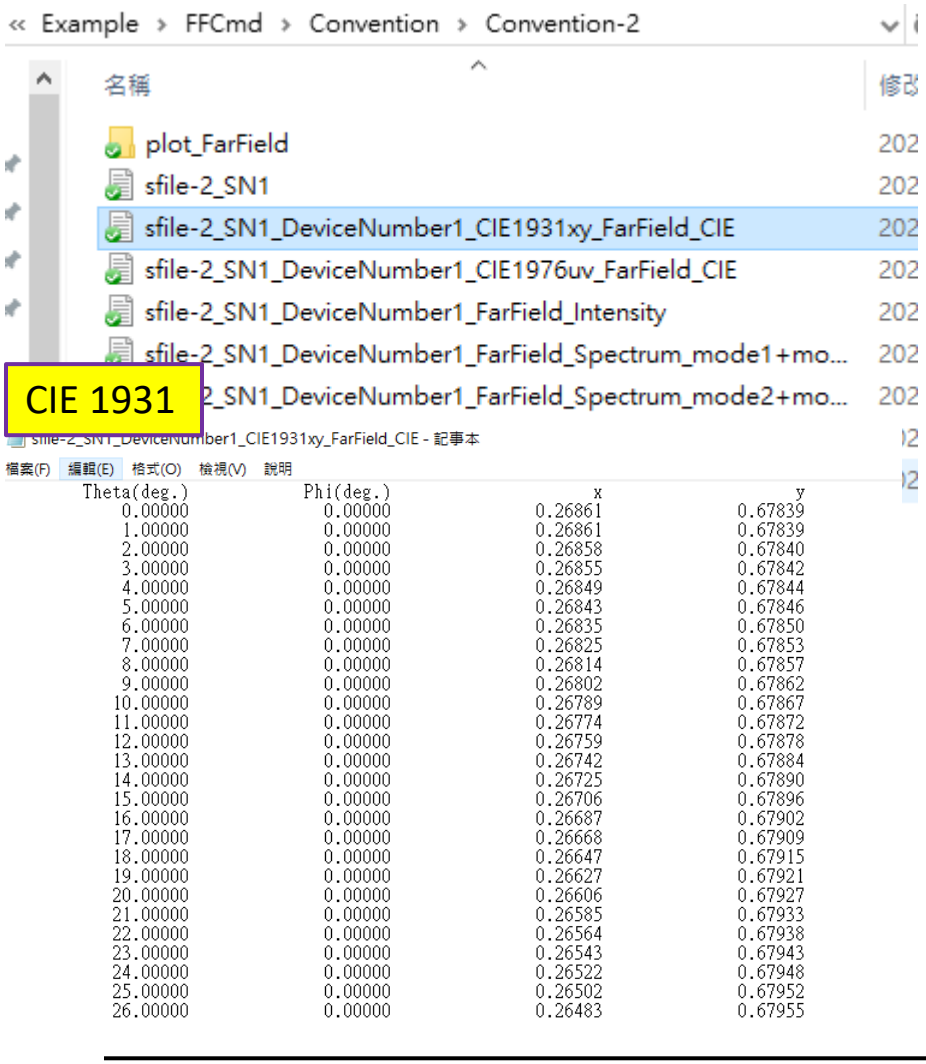
MATERIAL	THICKNESS(nm)
air	X
Al	120.000000
LiF	1.000000
B3PYMPM	50
CBP	20.000000
TAPC	50
cito	80
glass	X

wavelength(nm) : 480.0:1.0:600.0





Data



CIE 1931

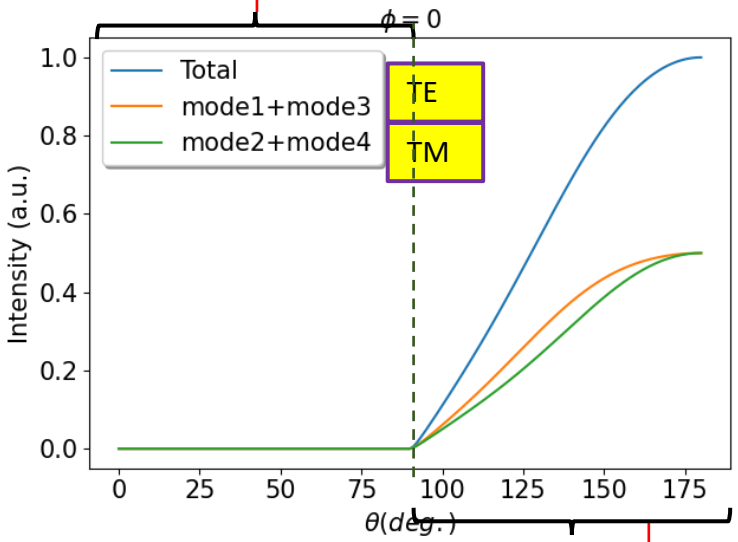
Theta(deg.)	Phi(deg.)	x	y
0.00000	0.00000	0.26861	0.67839
1.00000	0.00000	0.26861	0.67839
2.00000	0.00000	0.26858	0.67840
3.00000	0.00000	0.26855	0.67842
4.00000	0.00000	0.26849	0.67844
5.00000	0.00000	0.26843	0.67846
6.00000	0.00000	0.26835	0.67850
7.00000	0.00000	0.26825	0.67853
8.00000	0.00000	0.26814	0.67857
9.00000	0.00000	0.26802	0.67862
10.00000	0.00000	0.26789	0.67867
11.00000	0.00000	0.26774	0.67872
12.00000	0.00000	0.26759	0.67878
13.00000	0.00000	0.26742	0.67884
14.00000	0.00000	0.26725	0.67890
15.00000	0.00000	0.26706	0.67896
16.00000	0.00000	0.26687	0.67902
17.00000	0.00000	0.26668	0.67909
18.00000	0.00000	0.26647	0.67915
19.00000	0.00000	0.26627	0.67921
20.00000	0.00000	0.26606	0.67927
21.00000	0.00000	0.26585	0.67933
22.00000	0.00000	0.26564	0.67938
23.00000	0.00000	0.26543	0.67943
24.00000	0.00000	0.26522	0.67948
25.00000	0.00000	0.26502	0.67952
26.00000	0.00000	0.26483	0.67955

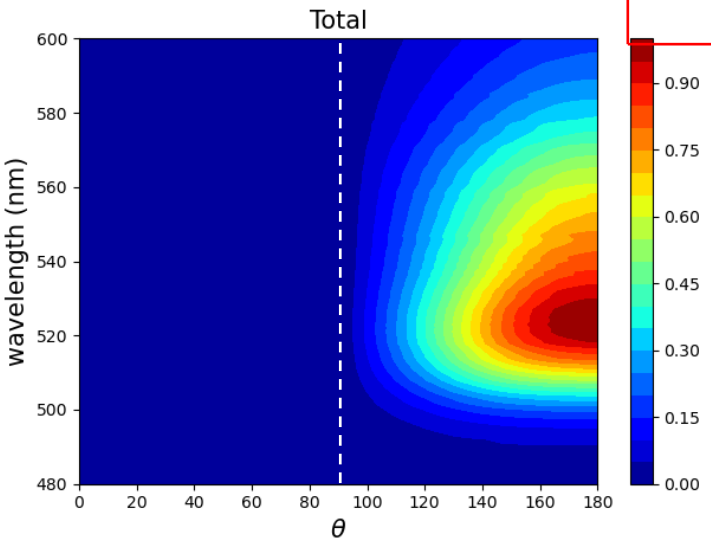
Angular Dependent CIE coordinate

CIE 1976

Theta(deg.)	Phi(deg.)	u*	v*
0.00000	0.00000	0.10133	0.57580
1.00000	0.00000	0.10133	0.57580
2.00000	0.00000	0.10132	0.57580
3.00000	0.00000	0.10130	0.57580
4.00000	0.00000	0.10128	0.57580
5.00000	0.00000	0.10125	0.57580
6.00000	0.00000	0.10121	0.57580
7.00000	0.00000	0.10117	0.57579
8.00000	0.00000	0.10112	0.57579
9.00000	0.00000	0.10107	0.57578
10.00000	0.00000	0.10101	0.57578
11.00000	0.00000	0.10095	0.57577
12.00000	0.00000	0.10088	0.57577
13.00000	0.00000	0.10081	0.57576
14.00000	0.00000	0.10073	0.57576
15.00000	0.00000	0.10065	0.57575
16.00000	0.00000	0.10057	0.57574
17.00000	0.00000	0.10048	0.57573
18.00000	0.00000	0.10040	0.57572
19.00000	0.00000	0.10031	0.57571
20.00000	0.00000	0.10022	0.57570
21.00000	0.00000	0.10013	0.57569
22.00000	0.00000	0.10004	0.57568
23.00000	0.00000	0.09995	0.57566
24.00000	0.00000	0.09986	0.57565
25.00000	0.00000	0.09978	0.57564
26.00000	0.00000	0.09970	0.57562

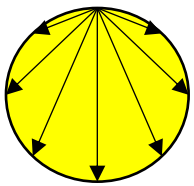
Data



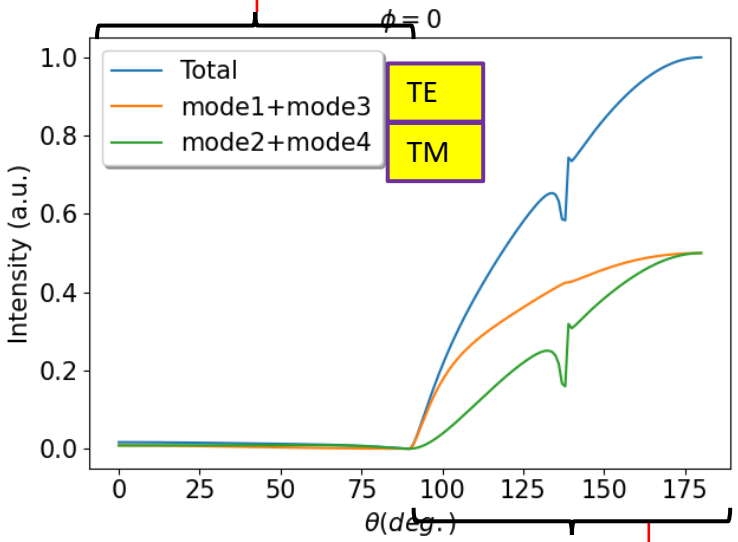


MATERIAL	THICKNESS(nm)
air	X
Al	120.000000
LiF	1.000000
B3PYMPM	50
CBP	20.000000
TAPC	50
cito	80
glass	X
air	X

wavelength(nm) : 480.0:1.0:600.0

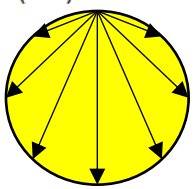


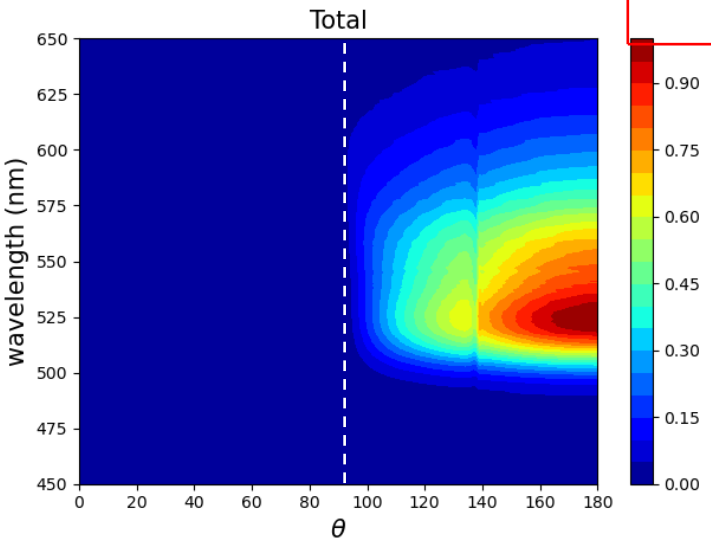
Data



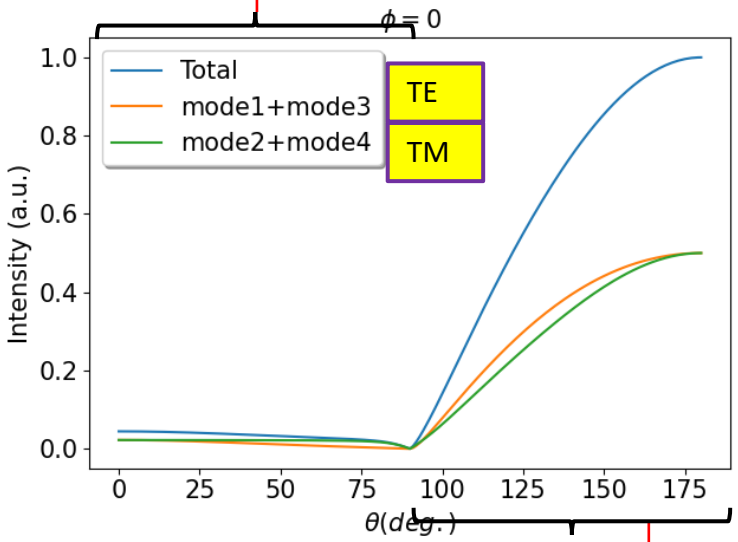
MATERIAL	THICKNESS(nm)
air	X
Al	10:5:20
LiF	1.000000
B3PYMPM	50
CBP	20.000000
TAPC	20
cito	50
glass	X

wavelength(nm) : 450:1.0:650.0



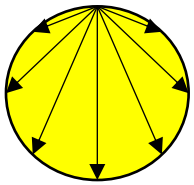


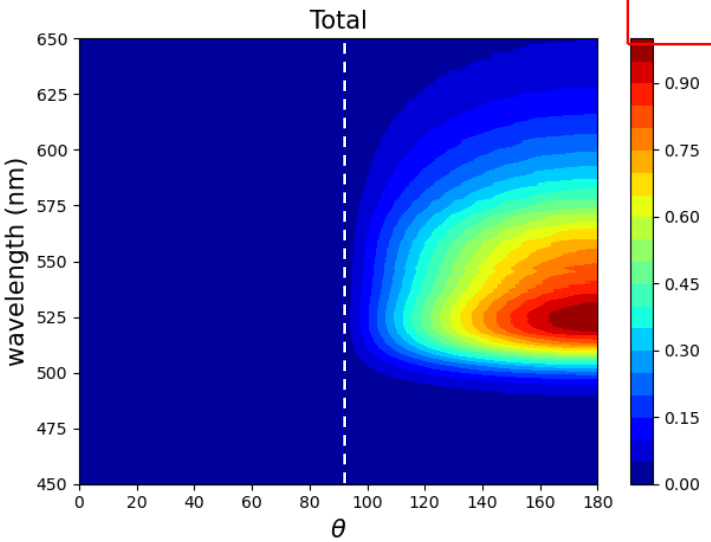
Data



MATERIAL	THICKNESS(nm)
air	X
Al	10:5:20
LiF	1.000000
B3PYMPM	50
CBP	20.000000
TAPC	20
cito	50
glass	X
air	X

wavelength(nm) : 450:1.0:650.0





Exit

Exit the material manager system.
*** The material manager system would be automatically saved into the user's setting directory.

```
>>> exit
------------------------------------------------------------------------------------------------------------
End running GOODLAB anisotropic simulator ver1.0 Thu Apr 16 08:36:37 2020
Elapsed time : 0 day(s)/ 0 hr(s)/ 4 min(s)/ 7.784407615661621 sec(s)
------------------------------------------------------------------------------------------------------------
```