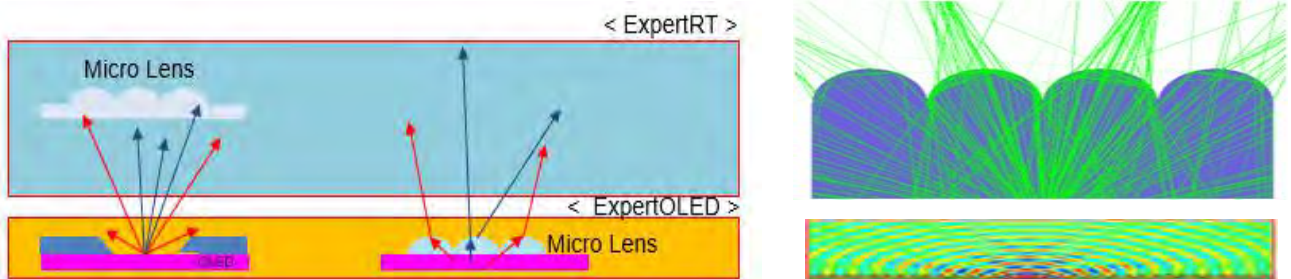


# MULTI-DIMENSION SIMULATOR for OLED with Real Manufacturing Process Implemented

## Hybrid Optic Simulation

For panel simulation, the micro and macro optic are necessary in OLED simulation together. To cover the macro optic instead of FDTD, the ray tracing function is added. With mixing Ray Tracing to FDTD, the panel style simulation is possible.



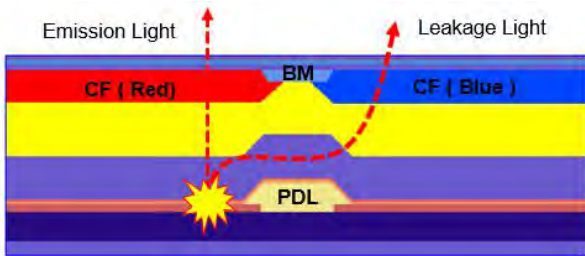
FDTD + Ray tracing Simulation

## Light Leakage Prediction & Analysis Solution

In WOLED, the light leakage between pixels is serious problem. ExpertOLED shows light propagation path internally and calculates the amount of power of light leakage. With these information, user can find the optimized design for solving this failure.

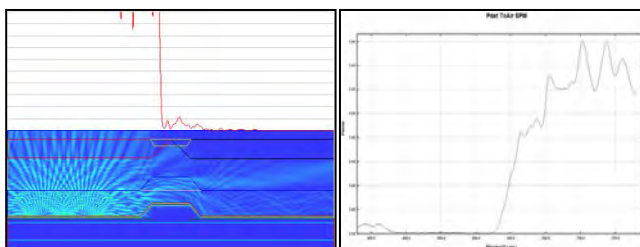
## Easy Structure generation based on an actual manufacturing process.

An easy structure generation with the user-friendly interface emulating a real process. Structure is generated easily using real GDS II mask.



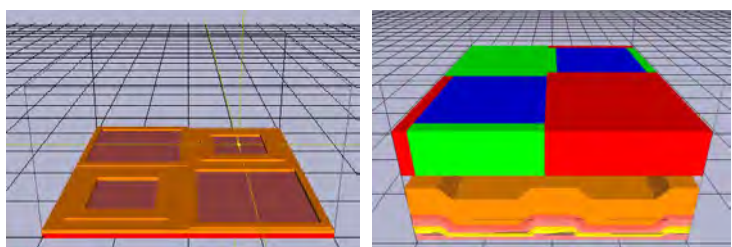
Real Structure in EOLED

#	!	Material	EMType	Thick	Type	Flat	Mask	Taper	Angle	Step	Lenz(R, K)
11	O	GLASS	None	500 nm	Depo	Off					
10	O	CF_B	None	2000 nm	DepoEtch	On	CF_B	Plane	0	° 200 nm	
9	O	CF_G	None	2000 nm	DepoEtch	On	CF_G	Plane	0	° 200 nm	
8	O	CF_R	None	2000 nm	DepoEtch	Off	CF_R	Plane	0	° 200 nm	
7	O	SIN	None	500 nm	Depo	On					
6	O	ITO	None	20 nm	Depo	Off					
5	O	ETL	PType	100 nm	Depo	Off					
4	O	HTL	NType	80 nm	Depo	Off					
3	O	SiO2	None	90 nm	DepoEtch	Off	s	Plane	0	° 200 nm	
2	O	Ag	None	100 nm	DepoEtch	Off	ANODE	Plane	0	° 200 nm	
1	D	GLASS	None	mm	Depo	Off		Curve	0	° 302 mm	0.0



Light Profile

Wavelength Spectrum



Generated Structure in EOLED from GDS II

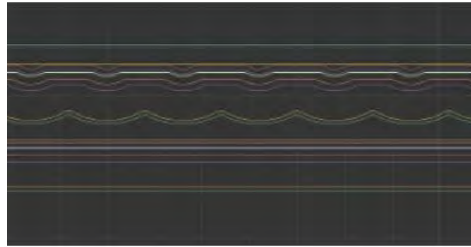
# WORK PROCESS

## STRUCTURE



### Flexible structure generation

Intuitive drawing of various patterns such as lens, grating or diffusion film



Structure Editor

### Easy structure generation

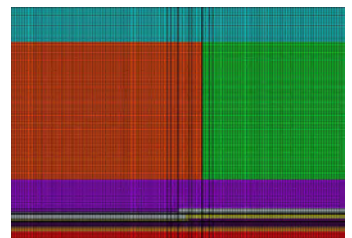
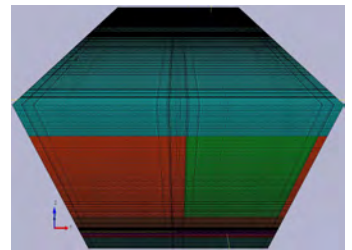
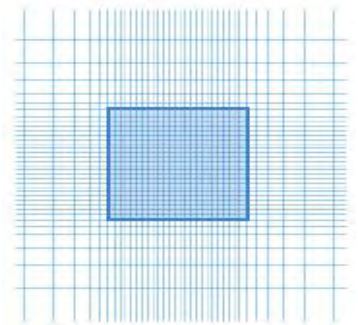
User can generate real structure without complex process from GDS II Mask file

## Mesh



### Adaptive grid generator

The adaptive grid in specific region with the big physical parameter reduces run time and memory.



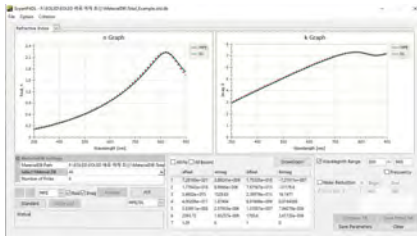
Mesh

## MATERIAL

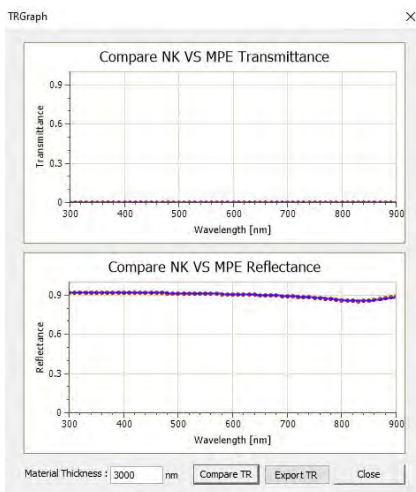


### Fitting

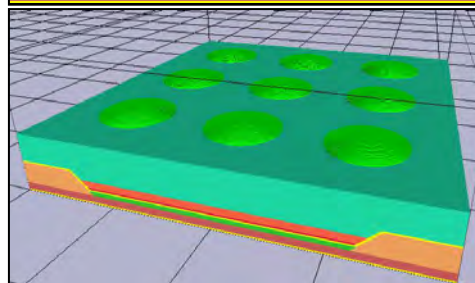
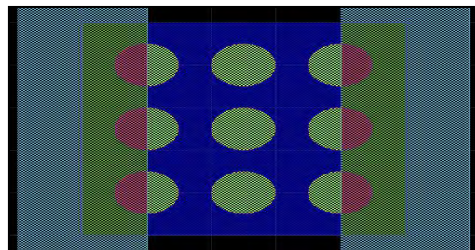
For reducing run time and increase accuracy, a Drude-Lorentz Model in Engine is applied. Users can get accurate result fast.



Material fitting window



Compare NK vs MPE Transmittance & Reflectance



2, 3D Structure generation from GDS II



OPTIC SOLVER



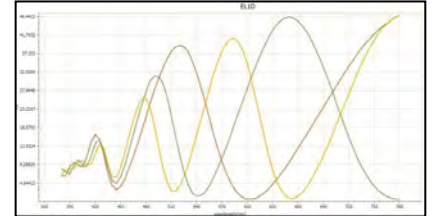
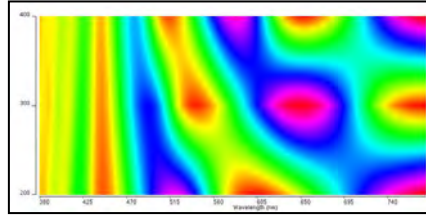
VIEWER



## Various outputs and analysis tools are available in Viewer

### Realization of White OLED simulation

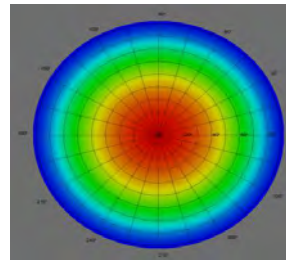
User can design WOLED with tandem structure and color Filter. With these functions, user can do color analysis easily about WOLED.



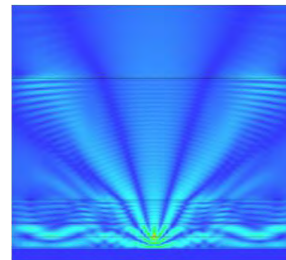
Analysis of Light efficiency by layer thickness split

### Electro Luminescence

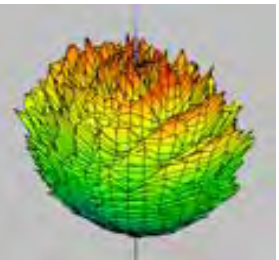
Estimating the emitting power, current profile, electron and hole concentration, and band bending according to applying current or voltage to OLED device



Polar plot view

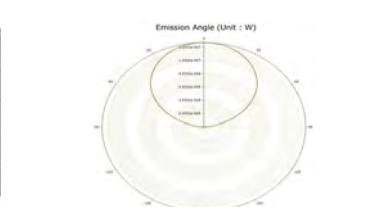
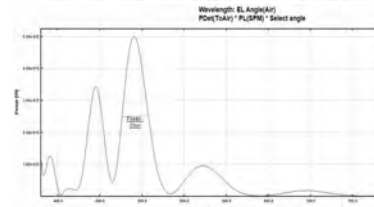
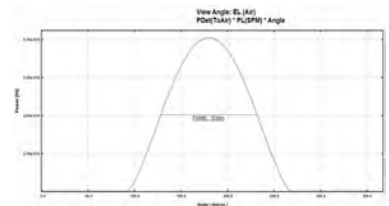
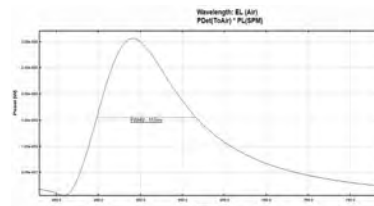


Field view at specific wavelength



### Absorption

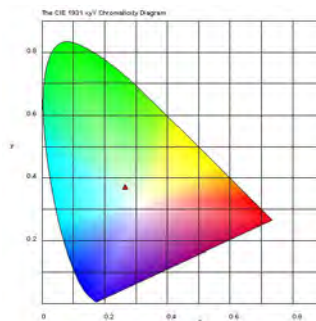
The power that is absorbed or confined in each layer is estimated.



Variou result view by wavelength & angle

### Several Boundary condition

For matching simulation to real situation, the more effective boundary condition is provided such as PML, PBC, and SBC.



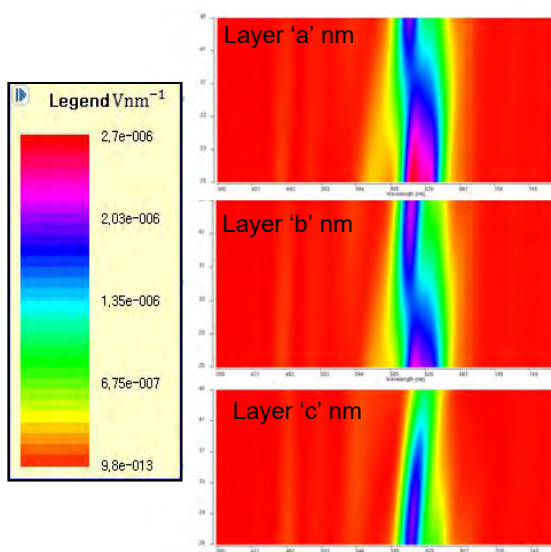
EL	All Angle	0	1	2	3	4	5
X	0.0001395	7.10732e-014	0.192254e-014	4.16615e-014	3.46754e-014	4.8965e-014	6.66789e-014
Y	0.000187749	8.8372e-014	8.11747e-014	6.42215e-014	5.58872e-014	6.58894e-014	8.48007e-014
Z	0.000183367	2.10718e-013	1.86586e-013	7.94798e-014	6.18037e-014	1.45655e-013	2.31383e-013
x	0.262502	0.192095	0.198679	0.224758	0.222379	0.187568	0.174159
y	0.371717	0.238798	0.260467	0.346405	0.366795	0.325222	0.321482
u	0.15307	0.140127	0.138745	0.134022	0.131049	0.13286	0.131204
v	0.482735	0.392028	0.409215	0.464841	0.475234	0.402235	0.375439
vw_x	0.117946	0.117931	0.117931	0.117931	0.117931	0.117931	0.117931
vw_y	0.00169582	7.99361e-012	7.35412e-012	5.78902e-012	5.04465e-012	5.98635e-012	7.67386e-012
380	2.44705e-010	1.51147e-018	8.92763e-019	1.02975e-019	1.14887e-019	3.01526e-018	3.03416e-018
381	2.88655e-010	1.45626e-018	8.00079e-019	6.52367e-020	1.49952e-019	3.83122e-018	3.87423e-018
382	3.2971e-010	1.40352e-018	7.58447e-019	4.01614e-020	1.30202e-018	4.54081e-018	4.81352e-018
383	3.68252e-010	1.50054e-018	7.61617e-019	4.4586e-020	2.01846e-018	5.05907e-018	5.16305e-018
384	4.04709e-010	1.72472e-018	8.18062e-019	9.0799e-020	2.11681e-018	5.32273e-018	5.4361e-018
385	4.39724e-010	2.11983e-018	1.22202e-018	1.8419e-019	2.05524e-018	5.30462e-018	5.46781e-018
386	4.7386e-010	2.6718e-018	1.66208e-018	2.22058e-019	1.93094e-018	5.01544e-018	5.20059e-018
387	5.07489e-010	3.34442e-018	2.20128e-018	4.84026e-019	1.87781e-018	4.50209e-018	4.70217e-018
388	5.40759e-010	4.04397e-018	2.78667e-018	6.24715e-019	1.36068e-018	3.83772e-018	4.04383e-018
389	5.73519e-010	4.72700e-018	3.35802e-018	8.75935e-019	1.01801e-018	3.01666e-018	3.30888e-018
390	6.05958e-010	5.31423e-018	3.05753e-018	1.0497e-018	8.89772e-019	2.37638e-018	2.58119e-018
391	7.36547e-010	6.86115e-018	4.91077e-018	1.37975e-018	4.96779e-019	3.00443e-018	2.23899e-018

CIE xyY Diagram & Table

Our solution analyzes the optic and electric characteristics of OLED. Competitive speed, high accuracy, and controlling big memory are possible in desktop environment.

## Electro Luminescence by layer split

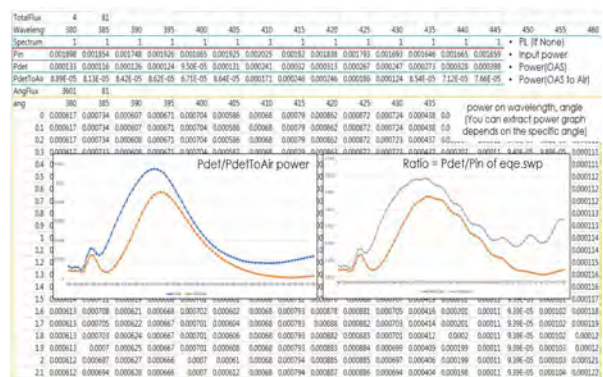
Optimization of thickness of layers and micro-cavity effect are very important to get high luminous efficiency in OLED device. ExpertOLED shows changed power of light by layer thickness split & cavity effect.



Light Efficiency by HIL thickness split

## Easy Data Processing

Besides checking result in Viewer, all result from simulation can be opened in Excel program for user convenience. User can make various results as user wants through Excel.



Simulation Result Data in Excel

## Parallel Processing

Parallel Process increases the speed of a simulation. In this mode, user can control the number of CPU.

## Batch Processing

Computerized batch processing provides running of jobs that can run without end user interaction. It can be used very effectively in user's plan.

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