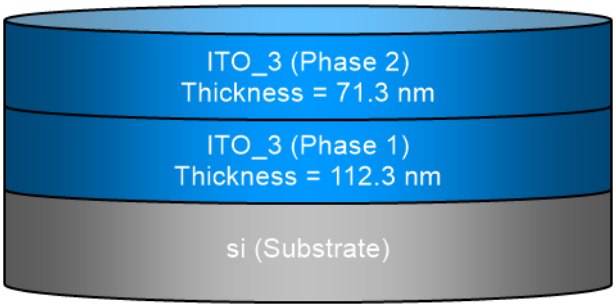
SEA regression report summary

Sample ID
001b-int-i 70° 1
001b-int-i 65° 2
001b-int-i 60° 3

Details	
Software and regression log	
Software about	Semilab - Spectroscopic Ellipsometry Analyzer - SEA
Software version	1.7.1
Officially licensed to	MIT
Operator	operator
Date and time of regression	01-04-2022 14:26
Comments	

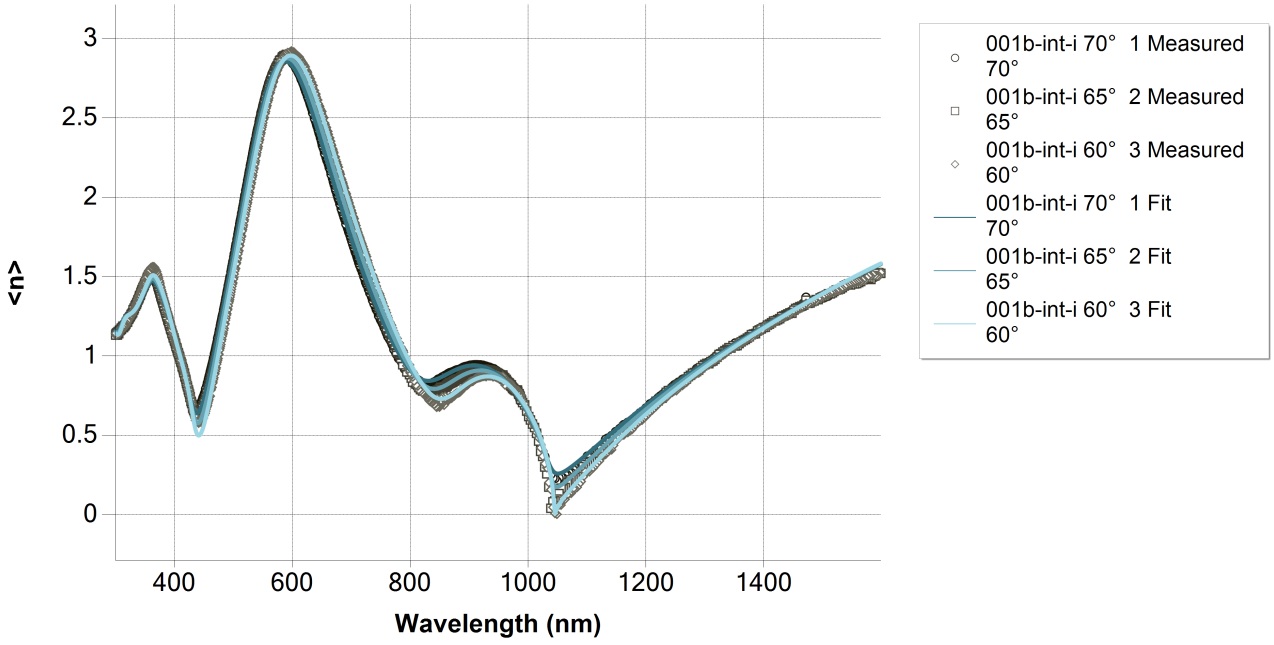
Layer structure	
Overview	
	
Optical model	
Phase 2	ITO_3
Dispersion law	Lorentz
	Drude
	Lorentz
Phase 1	ITO_3
Dispersion law	Lorentz
	Drude
	Lorentz

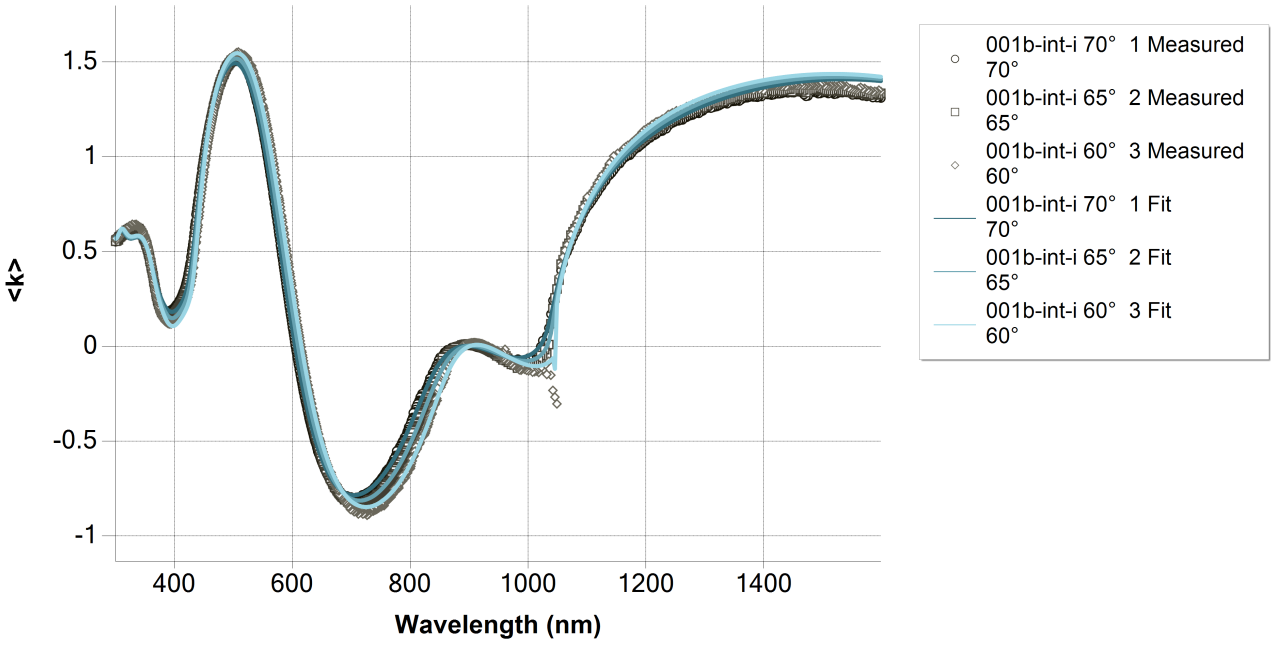
Regression results

Measurement information				
Measurement 1				
Measurement file path	C:\Users\emmabat\ito-si\001b-int-i.smdx			
Angle of Incidence	70°			
Measurement 2				
Measurement file path	C:\Users\emmabat\ito-si\001b-int-i.smdx			
Angle of Incidence	65°			
Measurement 3				
Measurement file path	C:\Users\emmabat\ito-si\001b-int-i.smdx			
Angle of Incidence	60°			
Regression details				
Regression 1 (EllipsoReflectance)				
Wavelength range	300.14 - 1599.16 nm			
Angle of Incidence	70°			
Fit to	<n>, <k>			
Regression 2 (EllipsoReflectance)				
Wavelength range	300.14 - 1599.16 nm			
Angle of Incidence	65°			
Fit to	<n>, <k>			
Regression 3 (EllipsoReflectance)				
Wavelength range	300.14 - 1599.16 nm			
Angle of Incidence	60°			
Fit to	<n>, <k>			
Angular Aperture	0°			
Fit algorithm	LMA			
Results				
Parameters	Value	Fitted	2 σ confidence limit	Unit
Model				
AOI Shift	0			°
Angular Aperture	0			°
Phase 2 (ITO_3)				
Thickness	71.295	X	0.12793	nm
f	0.49418	X	0.0089202	
E0 (eV)	3.4486	X	0.0067734	eV
Γ (eV)	1.13406	X	0.0091907	eV
E_p (eV)	0.60455	X	0.0056868	eV
E_Γ (eV)	0.2807	X	0.008686	eV
f	0.14686	X	0.015587	
E0 (eV)	4.30578	X	0.026742	eV
Γ (eV)	0.58136	X	0.072446	eV
Eps_inf	1.55687	X	0.013431	
Phase 1 (ITO_3)				
Thickness	112.296	X	0.12426	nm
f	0.16357			
E0 (eV)	3.74618			eV

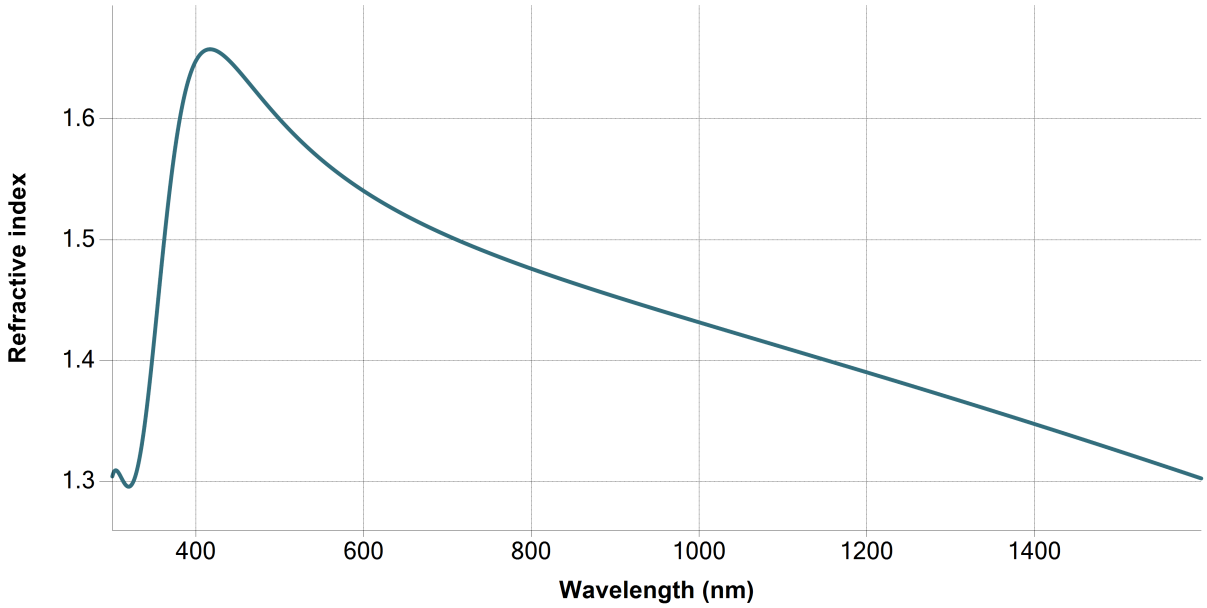
Γ (eV)	0.62015			eV
E_p (eV)	1.09856			eV
E_Γ (eV)	0.22823			eV
f	0.43808			
E0 (eV)	4.29829			eV
Γ (eV)	0.24163			eV
Eps_inf	3.4998			
Derived parameters	Value			
Phase 2 (ITO_3)				
n @ 632.8 nm	1.5267			
k @ 632.8 nm	0.0703			
Phase 1 (ITO_3)				
n @ 632.8 nm	1.9911			
k @ 632.8 nm	0.0202			
Substrate (si)				
n @ 632.8 nm	3.8811			
k @ 632.8 nm	0.0195			
Drude derived parameters	Value			Unit
Phase 2 (ITO_3)				
Conductivity (S/m)	1.7515E+04 ± 871.5103			S/m
Resistivity (mΩ.cm)	5.7094 ± 0.2841			mΩ.cm
Resistance (Ω/sq)	800.807 ± 41.2832			Ω/sq
N type dopant concentration (at/cm3)	6.6266E+19 ± 1.2467E+18			at/cm3
P type dopant concentration (at/cm3)	9.8074E+19 ± 1.8451E+18			at/cm3
N type dopant mobility (cm2/Vs)	16.4972 ± 0.8776			cm2/Vs
P type dopant mobility (cm2/Vs)	11.1468 ± 0.593			cm2/Vs
Phase 1 (ITO_3)				
Conductivity (S/m)	7.1131E+04 ± 0			S/m
Resistivity (mΩ.cm)	1.4058 ± 0			mΩ.cm
Resistance (Ω/sq)	125.1913 ± 0.1385			Ω/sq
N type dopant concentration (at/cm3)	2.1881E+20 ± 0			at/cm3
P type dopant concentration (at/cm3)	3.2384E+20 ± 0			at/cm3
N type dopant mobility (cm2/Vs)	20.2898 ± 0			cm2/Vs
P type dopant mobility (cm2/Vs)	13.7093 ± 0			cm2/Vs
Fit quality				
R^2	0.99874			
RMSE	0.02591			

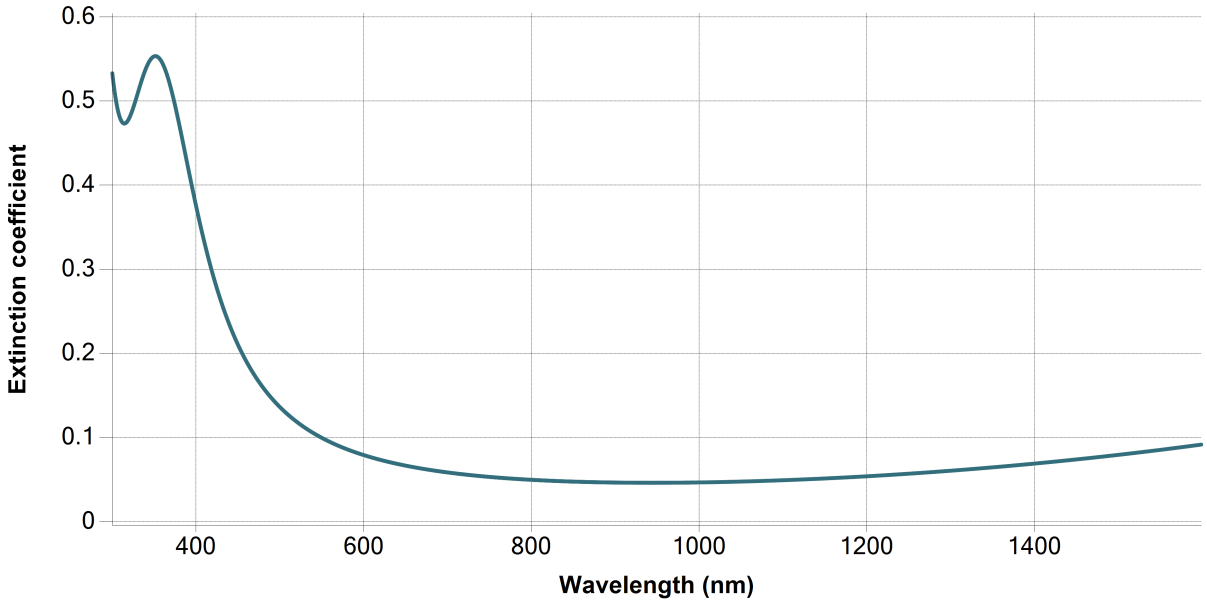
Regression graphs



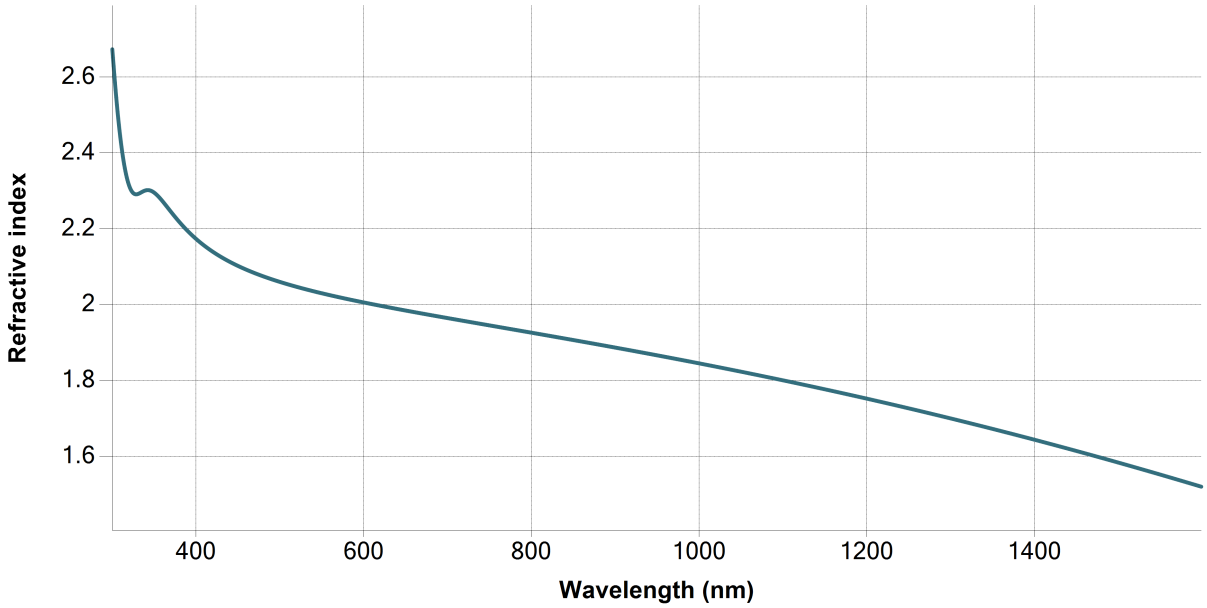


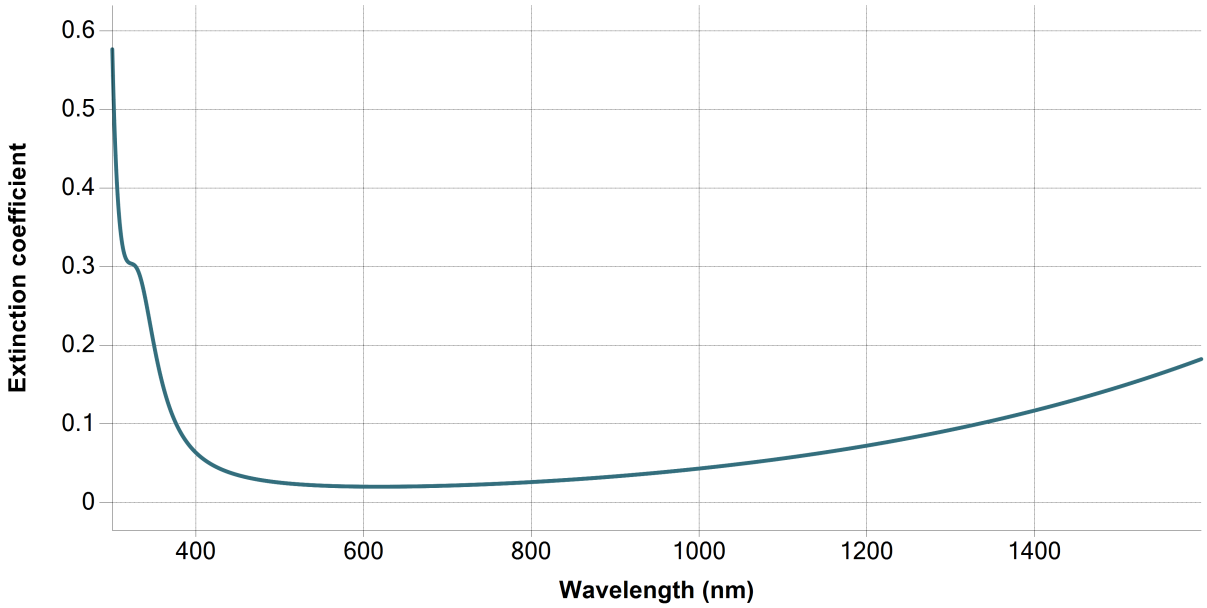
Phase 2 (ITO_3) - Dispersion graphs



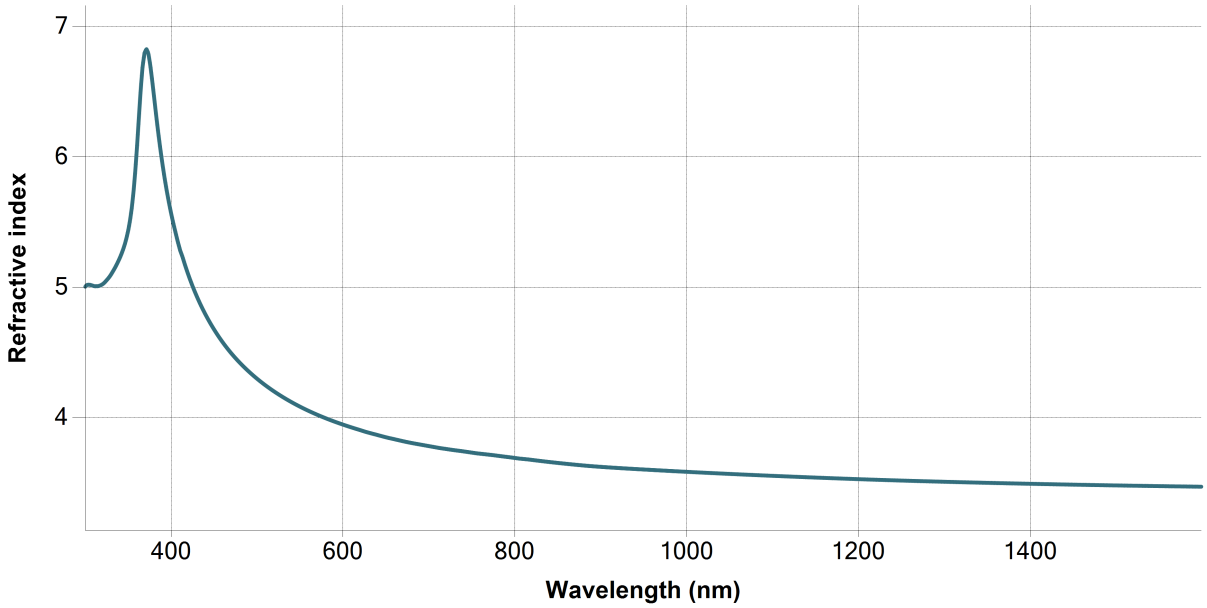


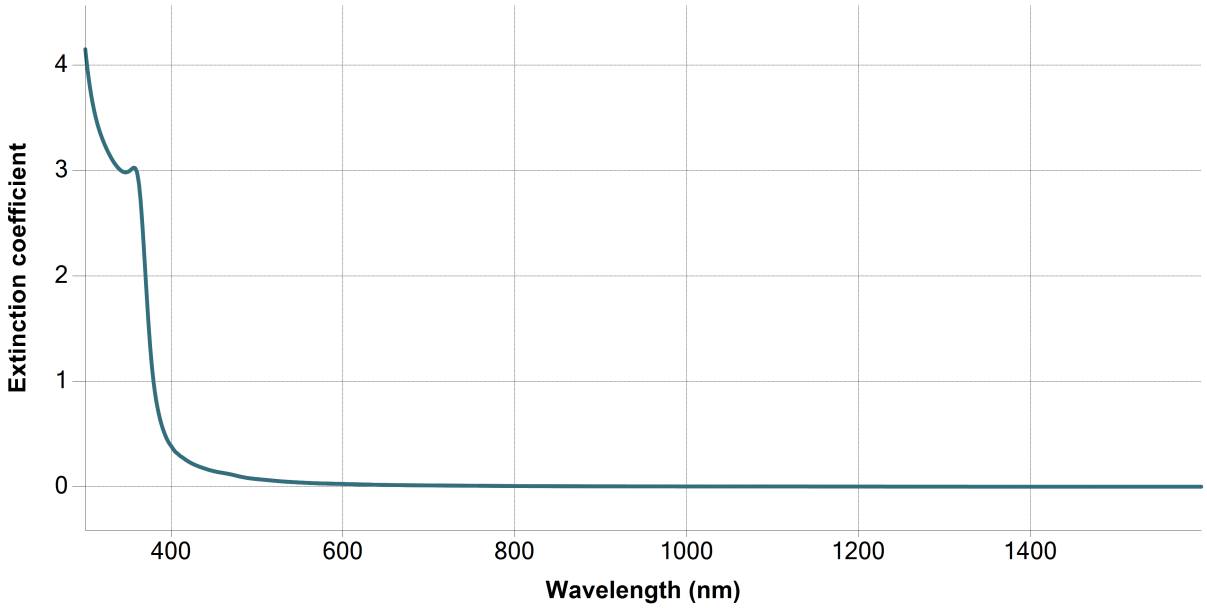
Phase 1 (ITO_3) - Dispersion graphs





Substrate (si) - Dispersion graphs





Correlation coefficients	
Ph2 - ITO_3 - Thickness --- Ph2 - Lorentz[1] - f	0.3595
Ph2 - ITO_3 - Thickness --- Ph2 - Lorentz[1] - E0 (eV)	0.3592
Ph2 - ITO_3 - Thickness --- Ph2 - Lorentz[1] - Γ (eV)	0.3989
Ph2 - ITO_3 - Thickness --- Ph2 - Drude[2] - E_p (eV)	0.2931
Ph2 - ITO_3 - Thickness --- Ph2 - Drude[2] - E_Γ (eV)	0.0832
Ph2 - ITO_3 - Thickness --- Ph2 - Lorentz[3] - f	-0.4365
Ph2 - ITO_3 - Thickness --- Ph2 - Lorentz[3] - E0 (eV)	-0.3952
Ph2 - ITO_3 - Thickness --- Ph2 - Lorentz[3] - Γ (eV)	-0.3037
Ph2 - ITO_3 - Thickness --- Ph2 - Eps_inf	0.4728
Ph2 - Lorentz[1] - f --- Ph2 - Lorentz[1] - E0 (eV)	0.932
Ph2 - Lorentz[1] - f --- Ph2 - Lorentz[1] - Γ (eV)	0.8219
Ph2 - Lorentz[1] - f --- Ph2 - Drude[2] - E_p (eV)	0.4292
Ph2 - Lorentz[1] - f --- Ph2 - Drude[2] - E_Γ (eV)	-0.2003
Ph2 - Lorentz[1] - f --- Ph2 - Lorentz[3] - f	-0.9109
Ph2 - Lorentz[1] - f --- Ph2 - Lorentz[3] - E0 (eV)	-0.6852
Ph2 - Lorentz[1] - f --- Ph2 - Lorentz[3] - Γ (eV)	-0.9238
Ph2 - Lorentz[1] - f --- Ph2 - Eps_inf	0.6376
Ph2 - Lorentz[1] - E0 (eV) --- Ph2 - Lorentz[1] - Γ (eV)	0.8611
Ph2 - Lorentz[1] - E0 (eV) --- Ph2 - Drude[2] - E_p (eV)	0.3726
Ph2 - Lorentz[1] - E0 (eV) --- Ph2 - Drude[2] - E_Γ (eV)	-0.2171
Ph2 - Lorentz[1] - E0 (eV) --- Ph2 - Lorentz[3] - f	-0.8074
Ph2 - Lorentz[1] - E0 (eV) --- Ph2 - Lorentz[3] - E0 (eV)	-0.5356
Ph2 - Lorentz[1] - E0 (eV) --- Ph2 - Lorentz[3] - Γ (eV)	-0.789
Ph2 - Lorentz[1] - E0 (eV) --- Ph2 - Eps_inf	0.5383
Ph2 - Lorentz[1] - Γ (eV) --- Ph2 - Drude[2] - E_p (eV)	0.3817
Ph2 - Lorentz[1] - Γ (eV) --- Ph2 - Drude[2] - E_Γ (eV)	-0.3396
Ph2 - Lorentz[1] - Γ (eV) --- Ph2 - Lorentz[3] - f	-0.6755
Ph2 - Lorentz[1] - Γ (eV) --- Ph2 - Lorentz[3] - E0 (eV)	-0.4678
Ph2 - Lorentz[1] - Γ (eV) --- Ph2 - Lorentz[3] - Γ (eV)	-0.6547
Ph2 - Lorentz[1] - Γ (eV) --- Ph2 - Eps_inf	0.4623
Ph2 - Drude[2] - E_p (eV) --- Ph2 - Drude[2] - E_Γ (eV)	-0.1874
Ph2 - Drude[2] - E_p (eV) --- Ph2 - Lorentz[3] - f	-0.5609
Ph2 - Drude[2] - E_p (eV) --- Ph2 - Lorentz[3] - E0 (eV)	-0.485
Ph2 - Drude[2] - E_p (eV) --- Ph2 - Lorentz[3] - Γ (eV)	-0.4012
Ph2 - Drude[2] - E_p (eV) --- Ph2 - Eps_inf	0.8077
Ph2 - Drude[2] - E_Γ (eV) --- Ph2 - Lorentz[3] - f	0.1079
Ph2 - Drude[2] - E_Γ (eV) --- Ph2 - Lorentz[3] - E0 (eV)	0.0125
Ph2 - Drude[2] - E_Γ (eV) --- Ph2 - Lorentz[3] - Γ (eV)	0.0754
Ph2 - Drude[2] - E_Γ (eV) --- Ph2 - Eps_inf	-0.1131
Ph2 - Lorentz[3] - f --- Ph2 - Lorentz[3] - E0 (eV)	0.8717
Ph2 - Lorentz[3] - f --- Ph2 - Lorentz[3] - Γ (eV)	0.9334
Ph2 - Lorentz[3] - f --- Ph2 - Eps_inf	-0.8551
Ph2 - Lorentz[3] - E0 (eV) --- Ph2 - Lorentz[3] - Γ (eV)	0.8138
Ph2 - Lorentz[3] - E0 (eV) --- Ph2 - Eps_inf	-0.8062
Ph2 - Lorentz[3] - Γ (eV) --- Ph2 - Eps_inf	-0.6792