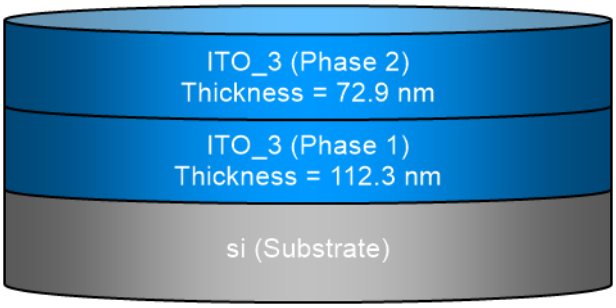
SEA regression report summary

Sample ID
001f-int-i 70° 1
001f-int-i 65° 2
001f-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 14:32
Comments	

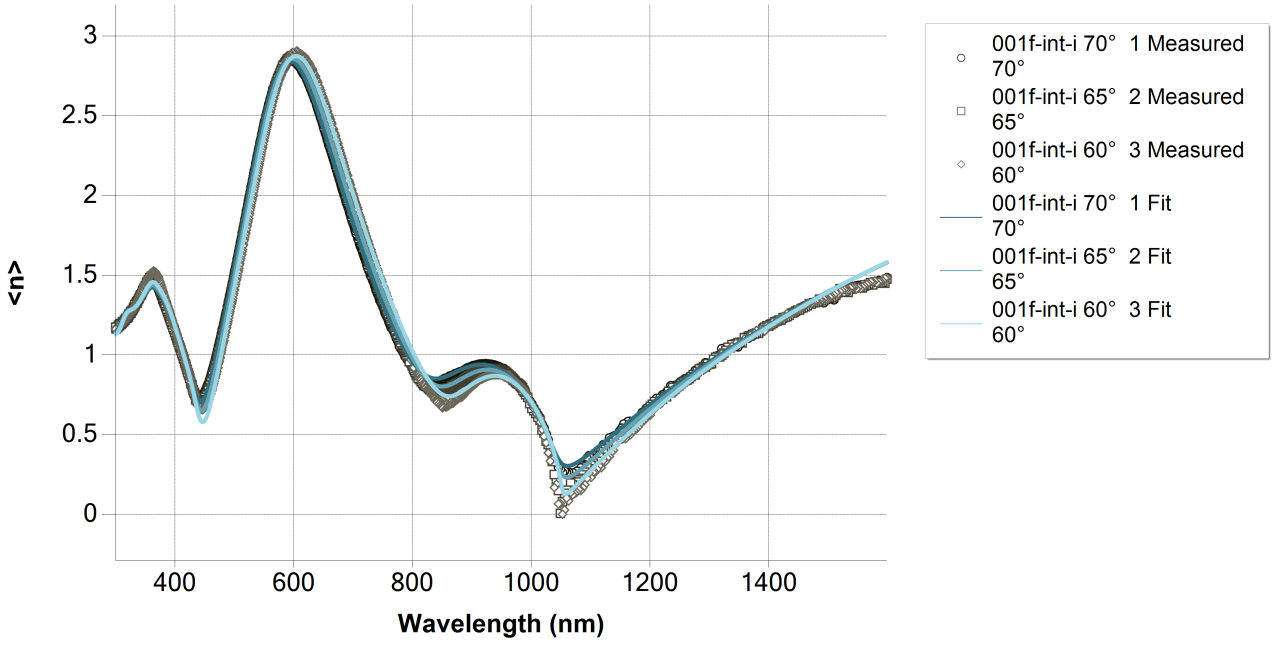
Layer structure	
Overview	
	
Optical model	
Phase 2	ITO_3
Dispersion law	Lorentz
	Drude
	Lorentz
Phase 1	ITO_3
Dispersion law	Lorentz
	Drude
	Lorentz

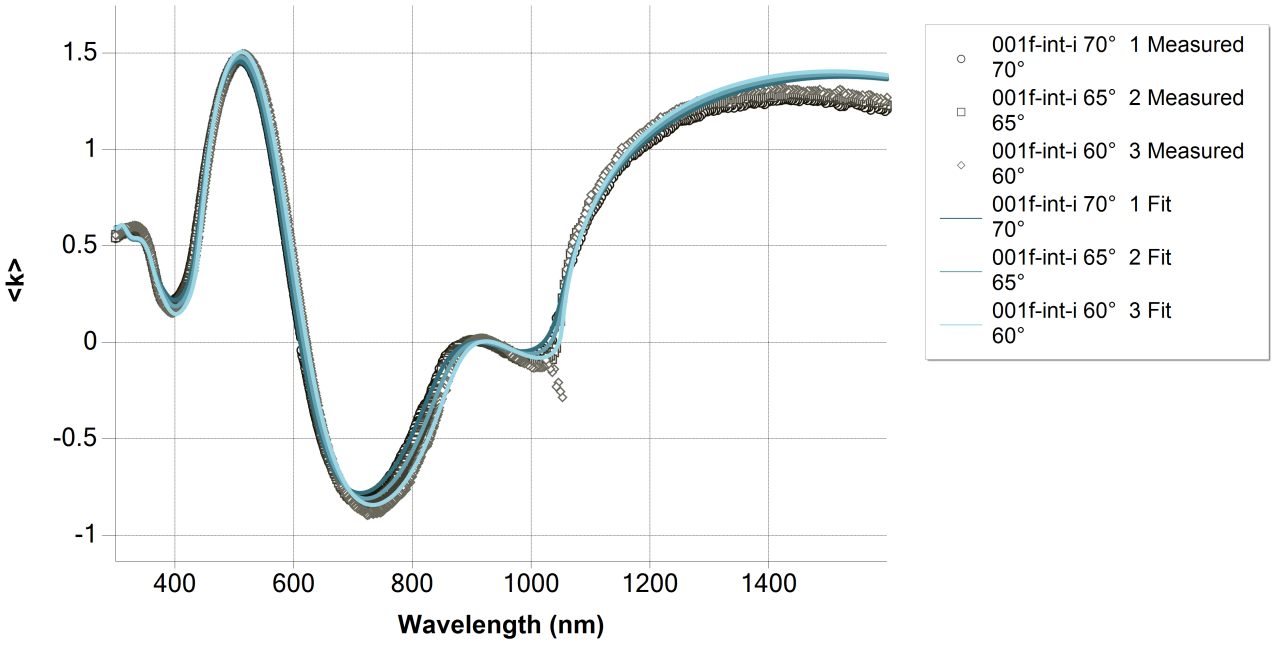
Regression results

Measurement information				
Measurement 1				
Measurement file path	C:\Users\emmabat\ito-si\001f-int-i.smdx			
Angle of Incidence	70°			
Measurement 2				
Measurement file path	C:\Users\emmabat\ito-si\001f-int-i.smdx			
Angle of Incidence	65°			
Measurement 3				
Measurement file path	C:\Users\emmabat\ito-si\001f-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	72.926	X	0.17747	nm
f	0.47313	X	0.013389	
E0 (eV)	3.36139	X	0.0097788	eV
Γ (eV)	1.13727	X	0.014591	eV
E_p (eV)	0.68304	X	0.0065775	eV
E_Γ (eV)	0.32207	X	0.010351	eV
f	0.17232	X	0.020649	
E0 (eV)	4.23062	X	0.025419	eV
Γ (eV)	0.73109	X	0.094856	eV
Eps_inf	1.62856	X	0.01572	
Phase 1 (ITO_3)				
Thickness	112.339	X	0.17076	nm
f	0.16357			
E0 (eV)	3.74618			eV

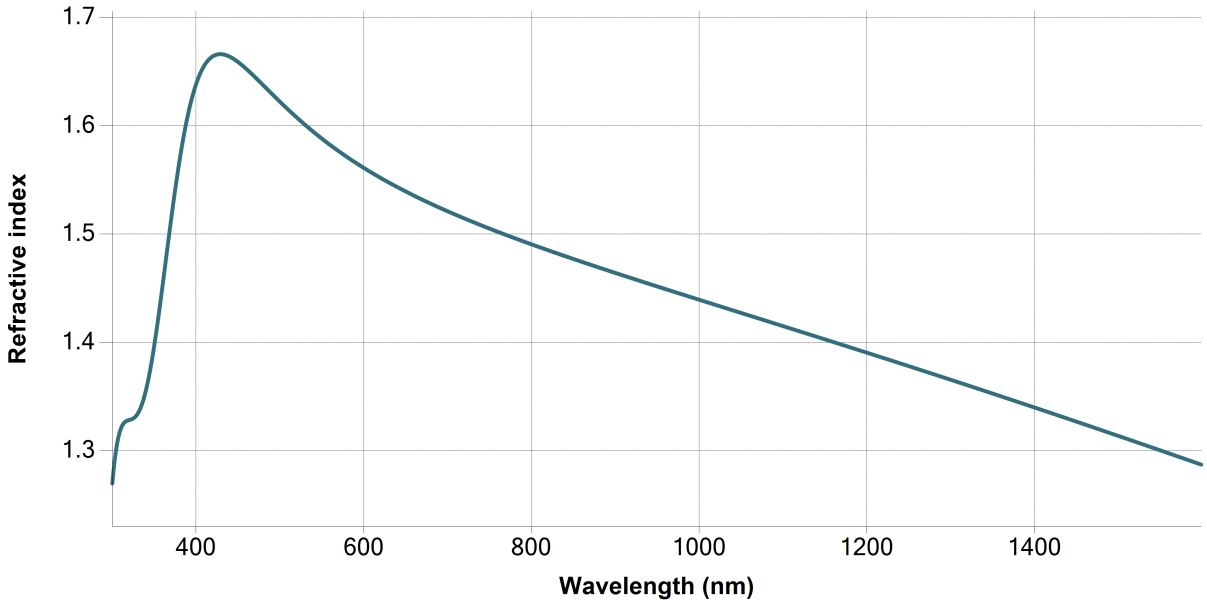
Γ (eV)	0.62015			eV
E_p (eV)	1.09856			eV
E_Γ (eV)	0.22823			eV
f	0.43808			
E0 (eV)	4.29829			eV
Γ (eV)	0.24163			eV
Eps_inf	3.4998			
Derived parameters	Value			
Phase 2 (ITO_3)				
n @ 632.8 nm	1.5463			
k @ 632.8 nm	0.077			
Phase 1 (ITO_3)				
n @ 632.8 nm	1.9911			
k @ 632.8 nm	0.0202			
Substrate (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)	1.9486E+04 ± 1001.5242			S/m
Resistivity (mΩ.cm)	5.132 ± 0.2638			mΩ.cm
Resistance (Ω/sq)	703.7193 ± 37.8822			Ω/sq
N type dopant concentration (at/cm3)	8.4589E+19 ± 1.6291E+18			at/cm3
P type dopant concentration (at/cm3)	1.2519E+20 ± 2.4111E+18			at/cm3
N type dopant mobility (cm2/Vs)	14.3778 ± 0.7892			cm2/Vs
P type dopant mobility (cm2/Vs)	9.7147 ± 0.5332			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)	125.1441 ± 0.1902			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	0.99758			
RMSE	0.03526			

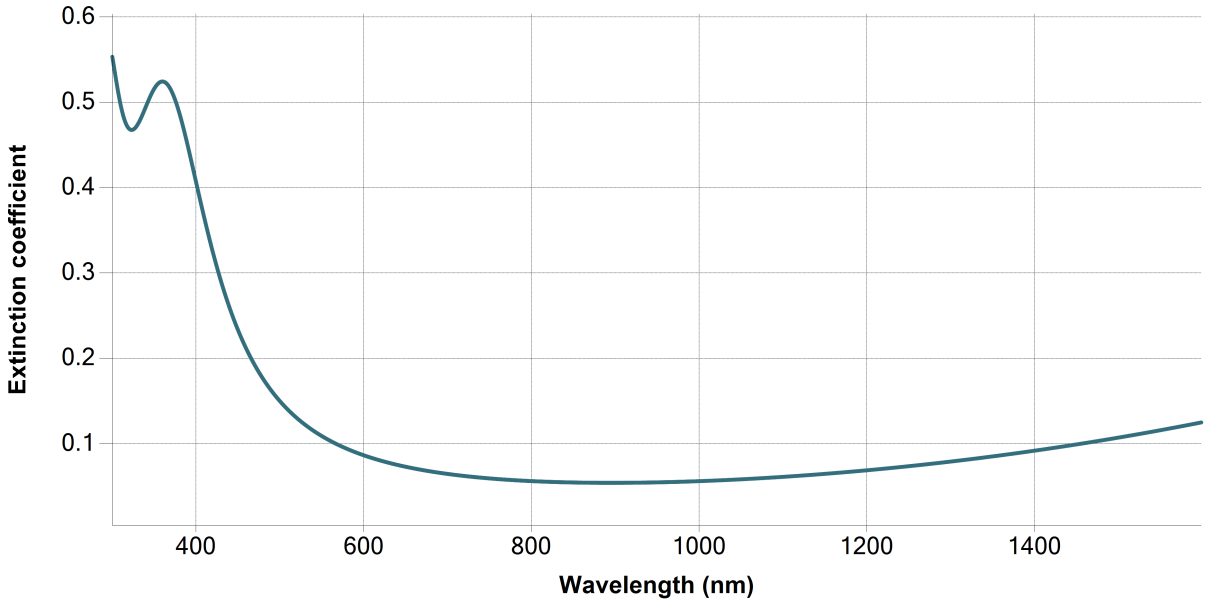
Regression graphs



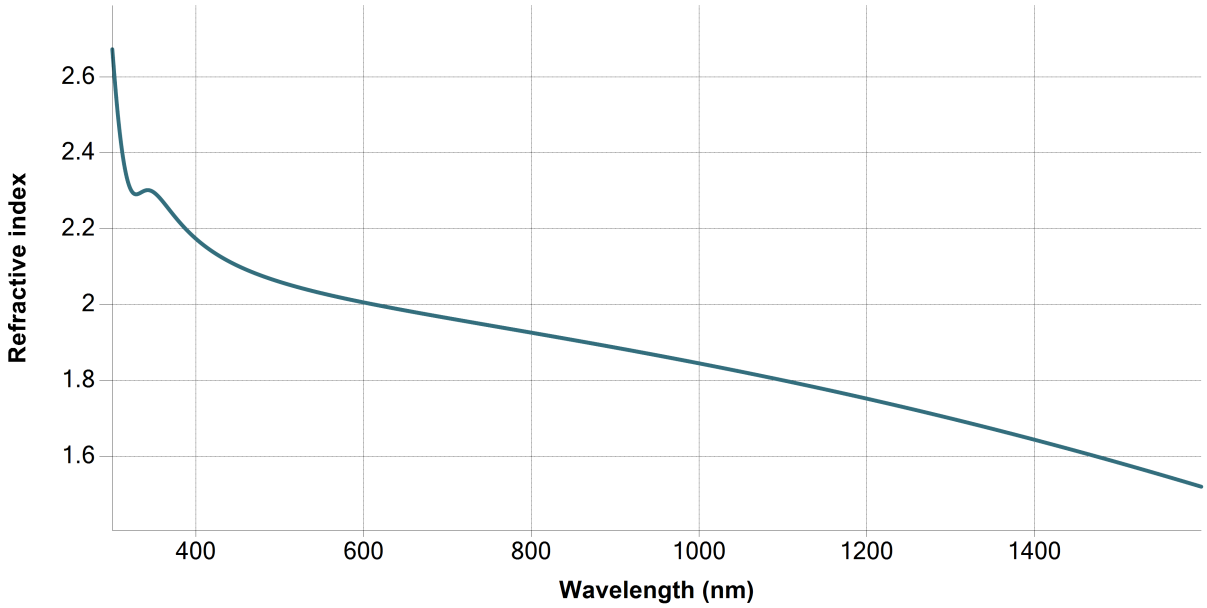


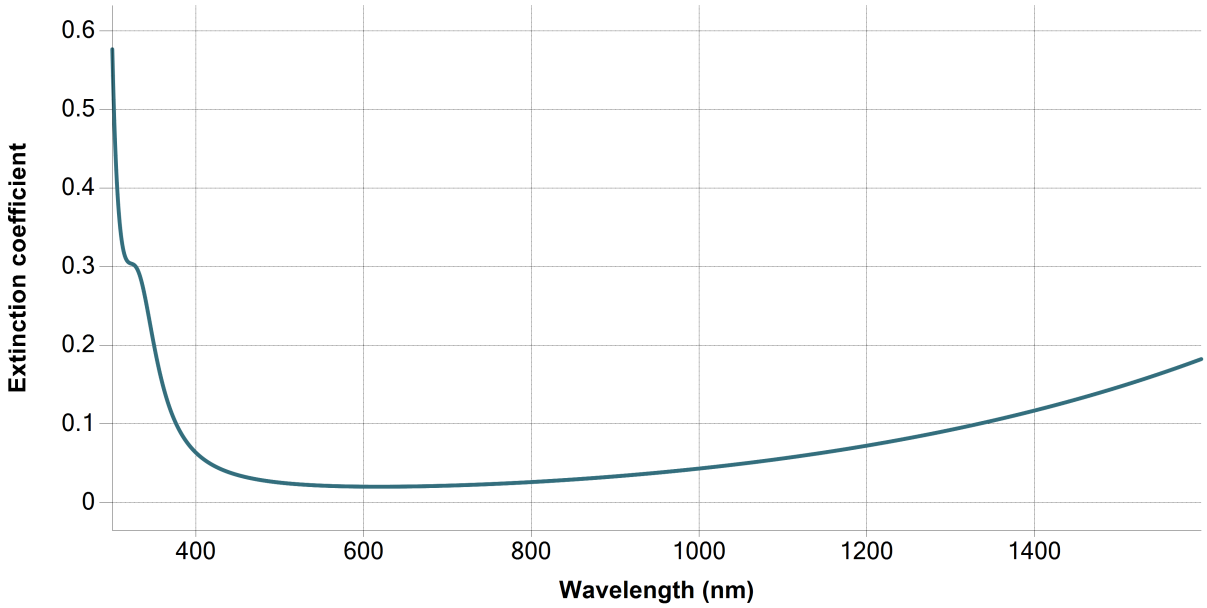
Phase 2 (ITO_3) - Dispersion graphs



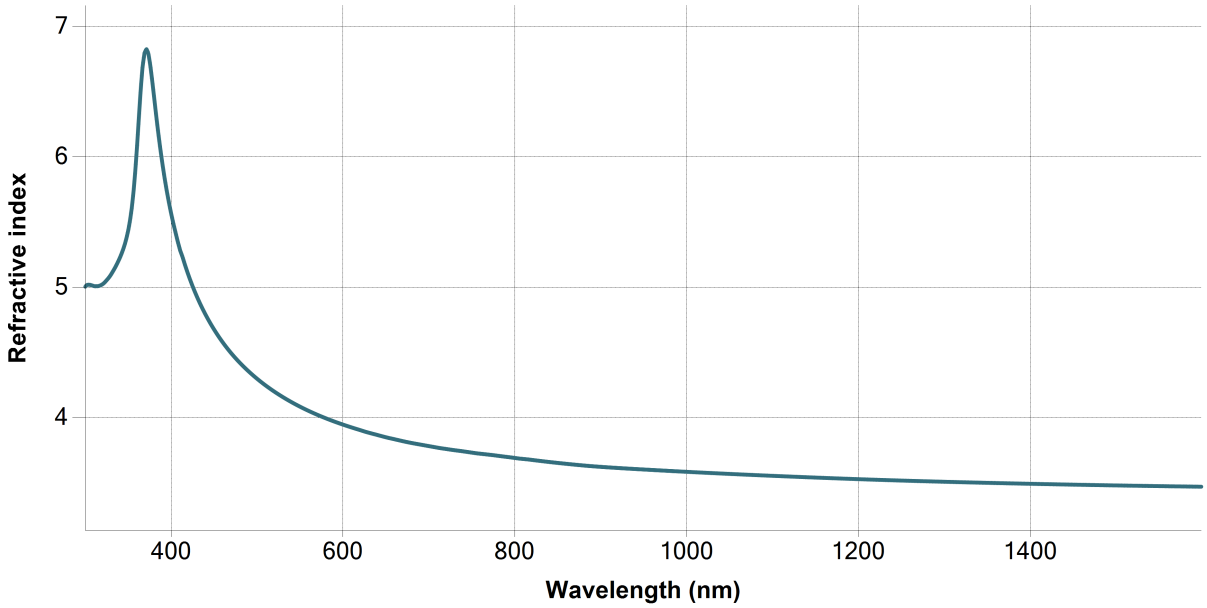


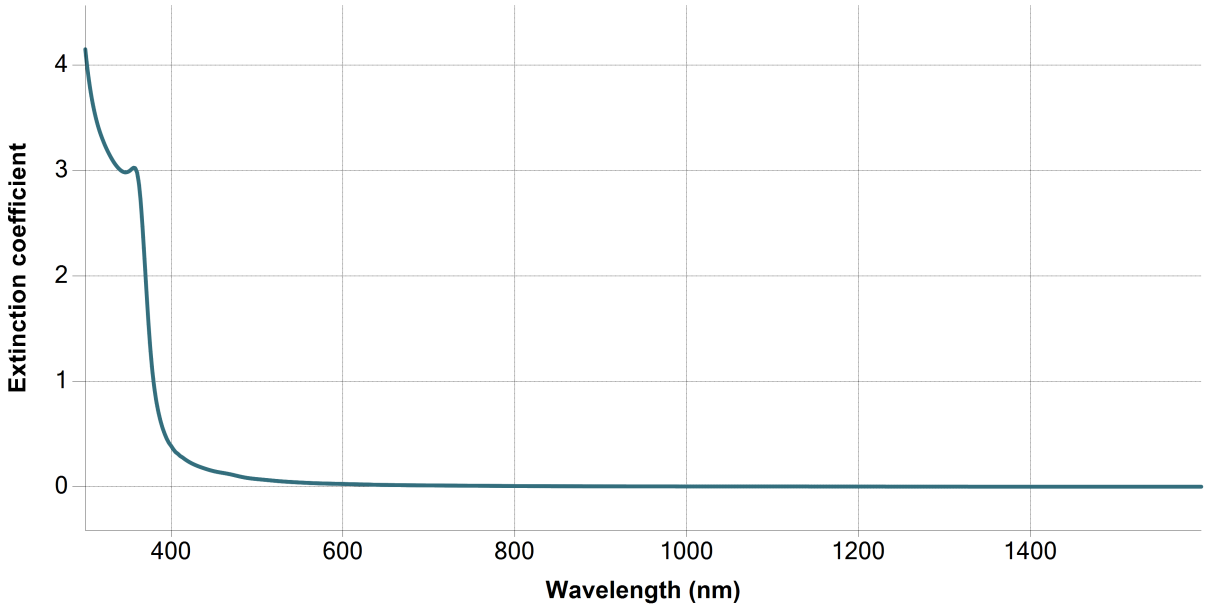
Phase 1 (ITO_3) - Dispersion graphs





Substrate (si) - Dispersion graphs





Correlation coefficients	
Ph2 - ITO_3 - Thickness --- Ph2 - Lorentz[1] - f	0.3031
Ph2 - ITO_3 - Thickness --- Ph2 - Lorentz[1] - E0 (eV)	0.3031
Ph2 - ITO_3 - Thickness --- Ph2 - Lorentz[1] - Γ (eV)	0.3741
Ph2 - ITO_3 - Thickness --- Ph2 - Drude[2] - E_p (eV)	0.2296
Ph2 - ITO_3 - Thickness --- Ph2 - Drude[2] - E_Γ (eV)	0.0474
Ph2 - ITO_3 - Thickness --- Ph2 - Lorentz[3] - f	-0.3639
Ph2 - ITO_3 - Thickness --- Ph2 - Lorentz[3] - E0 (eV)	-0.3689
Ph2 - ITO_3 - Thickness --- Ph2 - Lorentz[3] - Γ (eV)	-0.2477
Ph2 - ITO_3 - Thickness --- Ph2 - Eps_inf	0.422
Ph2 - Lorentz[1] - f --- Ph2 - Lorentz[1] - E0 (eV)	0.9338
Ph2 - Lorentz[1] - f --- Ph2 - Lorentz[1] - Γ (eV)	0.8605
Ph2 - Lorentz[1] - f --- Ph2 - Drude[2] - E_p (eV)	0.3883
Ph2 - Lorentz[1] - f --- Ph2 - Drude[2] - E_Γ (eV)	-0.1984
Ph2 - Lorentz[1] - f --- Ph2 - Lorentz[3] - f	-0.93
Ph2 - Lorentz[1] - f --- Ph2 - Lorentz[3] - E0 (eV)	-0.5606
Ph2 - Lorentz[1] - f --- Ph2 - Lorentz[3] - Γ (eV)	-0.9254
Ph2 - Lorentz[1] - f --- Ph2 - Eps_inf	0.6159
Ph2 - Lorentz[1] - E0 (eV) --- Ph2 - Lorentz[1] - Γ (eV)	0.8838
Ph2 - Lorentz[1] - E0 (eV) --- Ph2 - Drude[2] - E_p (eV)	0.3372
Ph2 - Lorentz[1] - E0 (eV) --- Ph2 - Drude[2] - E_Γ (eV)	-0.2179
Ph2 - Lorentz[1] - E0 (eV) --- Ph2 - Lorentz[3] - f	-0.834
Ph2 - Lorentz[1] - E0 (eV) --- Ph2 - Lorentz[3] - E0 (eV)	-0.4127
Ph2 - Lorentz[1] - E0 (eV) --- Ph2 - Lorentz[3] - Γ (eV)	-0.7907
Ph2 - Lorentz[1] - E0 (eV) --- Ph2 - Eps_inf	0.5279
Ph2 - Lorentz[1] - Γ (eV) --- Ph2 - Drude[2] - E_p (eV)	0.3702
Ph2 - Lorentz[1] - Γ (eV) --- Ph2 - Drude[2] - E_Γ (eV)	-0.3392
Ph2 - Lorentz[1] - Γ (eV) --- Ph2 - Lorentz[3] - f	-0.7474
Ph2 - Lorentz[1] - Γ (eV) --- Ph2 - Lorentz[3] - E0 (eV)	-0.4243
Ph2 - Lorentz[1] - Γ (eV) --- Ph2 - Lorentz[3] - Γ (eV)	-0.7021
Ph2 - Lorentz[1] - Γ (eV) --- Ph2 - Eps_inf	0.5012
Ph2 - Drude[2] - E_p (eV) --- Ph2 - Drude[2] - E_Γ (eV)	-0.1954
Ph2 - Drude[2] - E_p (eV) --- Ph2 - Lorentz[3] - f	-0.4925
Ph2 - Drude[2] - E_p (eV) --- Ph2 - Lorentz[3] - E0 (eV)	-0.4349
Ph2 - Drude[2] - E_p (eV) --- Ph2 - Lorentz[3] - Γ (eV)	-0.348
Ph2 - Drude[2] - E_p (eV) --- Ph2 - Eps_inf	0.7839
Ph2 - Drude[2] - E_Γ (eV) --- Ph2 - Lorentz[3] - f	0.1131
Ph2 - Drude[2] - E_Γ (eV) --- Ph2 - Lorentz[3] - E0 (eV)	-0.0146
Ph2 - Drude[2] - E_Γ (eV) --- Ph2 - Lorentz[3] - Γ (eV)	0.0602
Ph2 - Drude[2] - E_Γ (eV) --- Ph2 - Eps_inf	-0.1327
Ph2 - Lorentz[3] - f --- Ph2 - Lorentz[3] - E0 (eV)	0.7639
Ph2 - Lorentz[3] - f --- Ph2 - Lorentz[3] - Γ (eV)	0.9404
Ph2 - Lorentz[3] - f --- Ph2 - Eps_inf	-0.8098
Ph2 - Lorentz[3] - E0 (eV) --- Ph2 - Lorentz[3] - Γ (eV)	0.7053
Ph2 - Lorentz[3] - E0 (eV) --- Ph2 - Eps_inf	-0.7677
Ph2 - Lorentz[3] - Γ (eV) --- Ph2 - Eps_inf	-0.6406