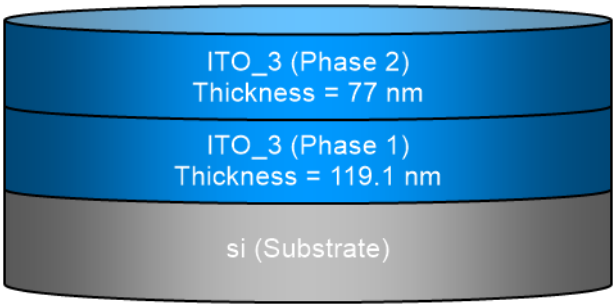
SEA regression report summary

Sample ID
001f-int-ii 70° 1
001f-int-ii 65° 2
001f-int-ii 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 14:33
Comments	

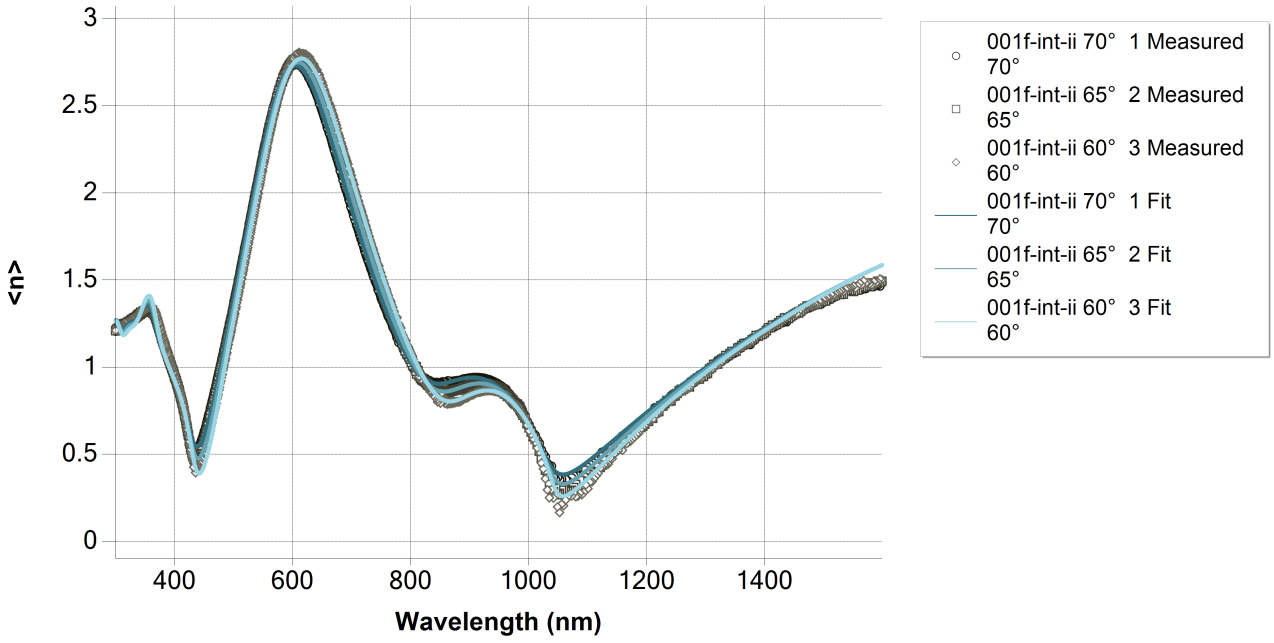
Layer structure	
Overview	
	
Optical model	
Phase 2	ITO_3
Dispersion law	Lorentz
	Drude
	Lorentz
Phase 1	ITO_3
Dispersion law	Lorentz
	Drude
	Lorentz

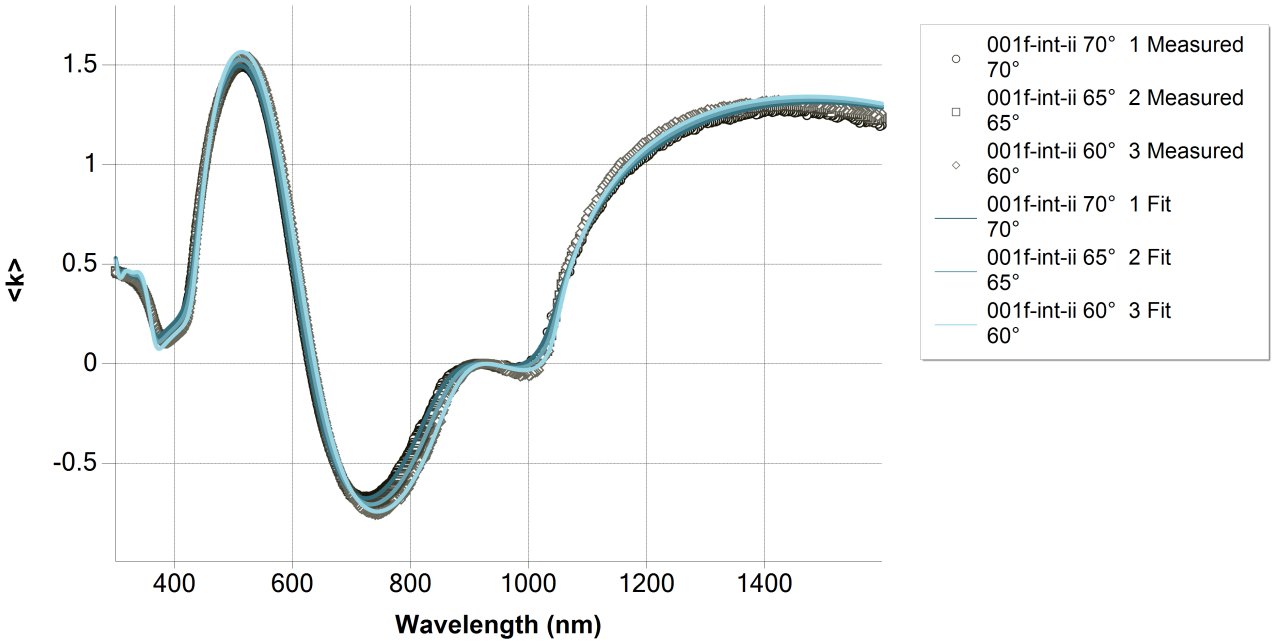
Regression results

Measurement information				
Measurement 1				
Measurement file path	C:\Users\emmabat\ito-si\001f-int-ii.smdx			
Angle of Incidence	70°			
Measurement 2				
Measurement file path	C:\Users\emmabat\ito-si\001f-int-ii.smdx			
Angle of Incidence	65°			
Measurement 3				
Measurement file path	C:\Users\emmabat\ito-si\001f-int-ii.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	76.973	X	0.10238	nm
f	0.35575	X	0.0050912	
E0 (eV)	3.20853	X	0.007508	eV
Γ (eV)	1.41021	X	0.011963	eV
E_p (eV)	0.69904	X	0.0041649	eV
E_Γ (eV)	0.40201	X	0.007732	eV
f	0.2113	X	0.008378	
E0 (eV)	4.24705	X	0.0094898	eV
Γ (eV)	0.63128	X	0.026026	eV
Eps_inf	1.43618	X	0.0098438	
Phase 1 (ITO_3)				
Thickness	119.074	X	0.10712	nm
f	0.16357			
E0 (eV)	3.74618			eV

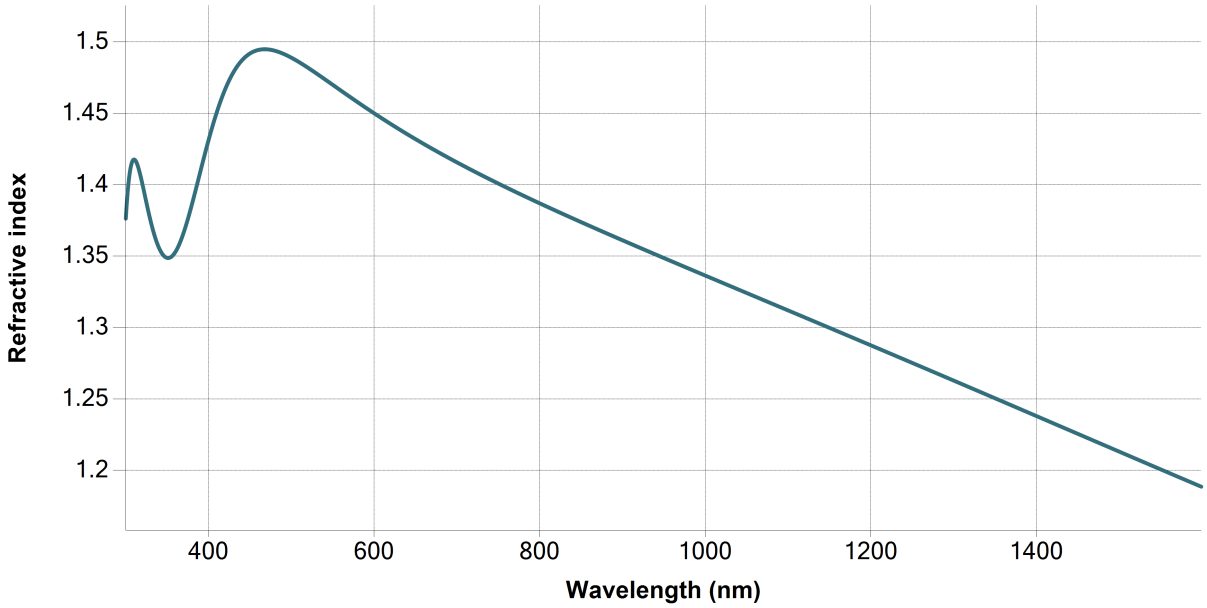
Γ (eV)	0.62015			eV
E_p (eV)	1.09856			eV
E_Γ (eV)	0.22823			eV
f	0.43808			
E0 (eV)	4.29829			eV
Γ (eV)	0.24163			eV
Eps_inf	3.4998			
Derived parameters	Value			
Phase 2 (ITO_3)				
n @ 632.8 nm	1.4379			
k @ 632.8 nm	0.0881			
Phase 1 (ITO_3)				
n @ 632.8 nm	1.9911			
k @ 632.8 nm	0.0202			
Substrate (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)	1.6351E+04 ± 509.3351			S/m
Resistivity (mΩ.cm)	6.1157 ± 0.1905			mΩ.cm
Resistance (Ω/sq)	794.5257 ± 25.8059			Ω/sq
N type dopant concentration (at/cm3)	8.86E+19 ± 1.0558E+18			at/cm3
P type dopant concentration (at/cm3)	1.3113E+20 ± 1.5625E+18			at/cm3
N type dopant mobility (cm2/Vs)	11.5188 ± 0.3842			cm2/Vs
P type dopant mobility (cm2/Vs)	7.783 ± 0.2596			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)	118.0657 ± 0.1062			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	0.99875			
RMSE	0.02426			

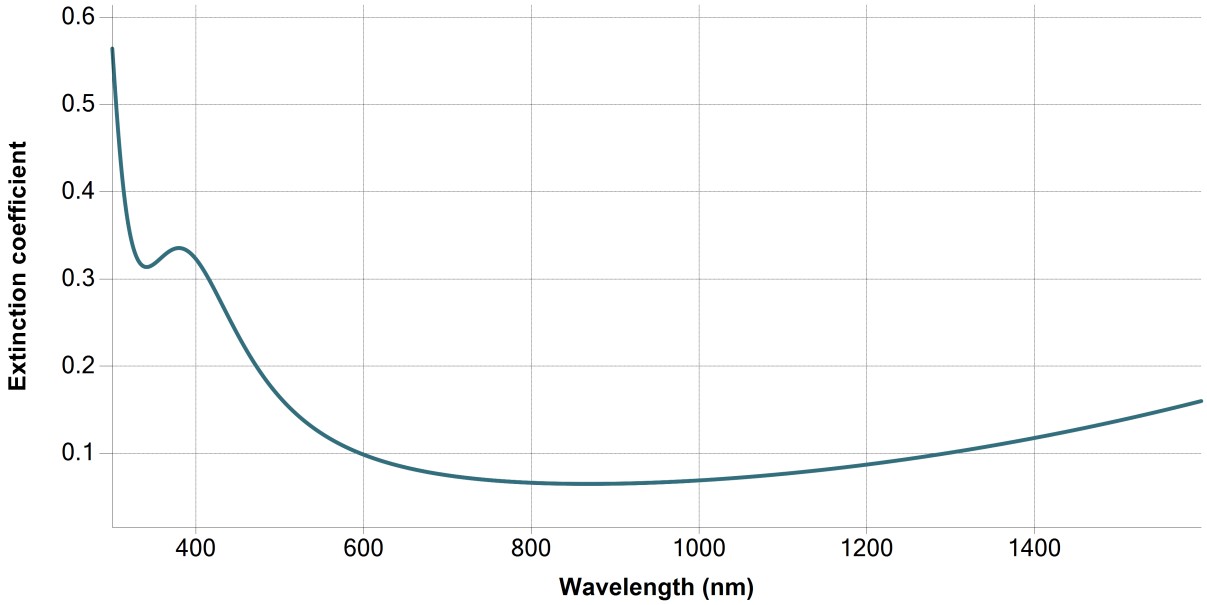
Regression graphs



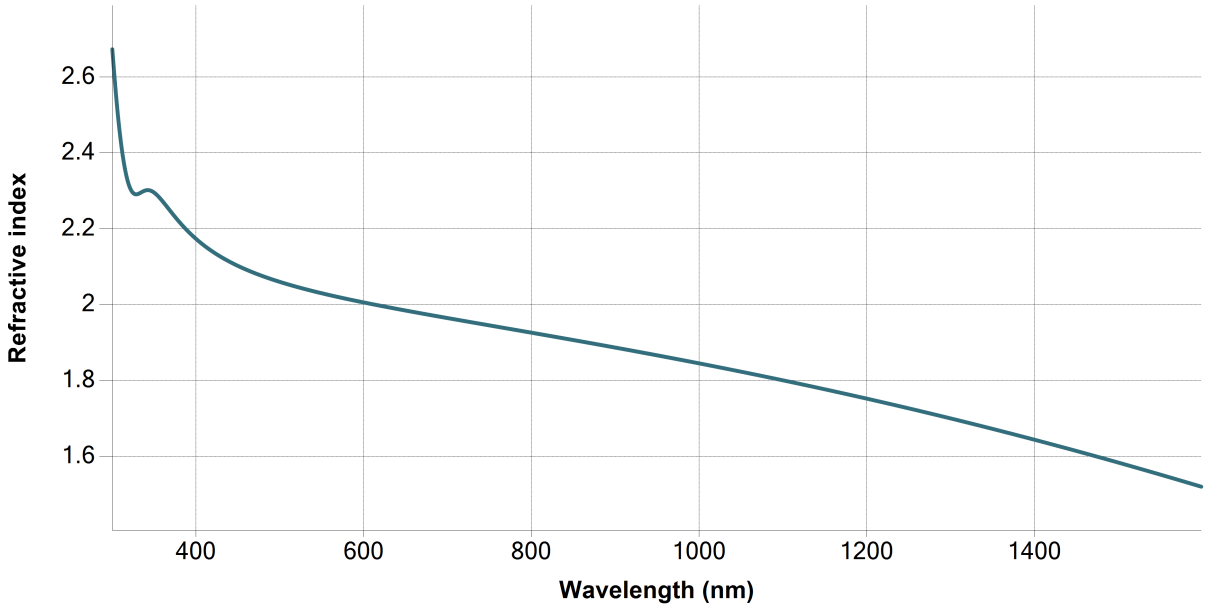


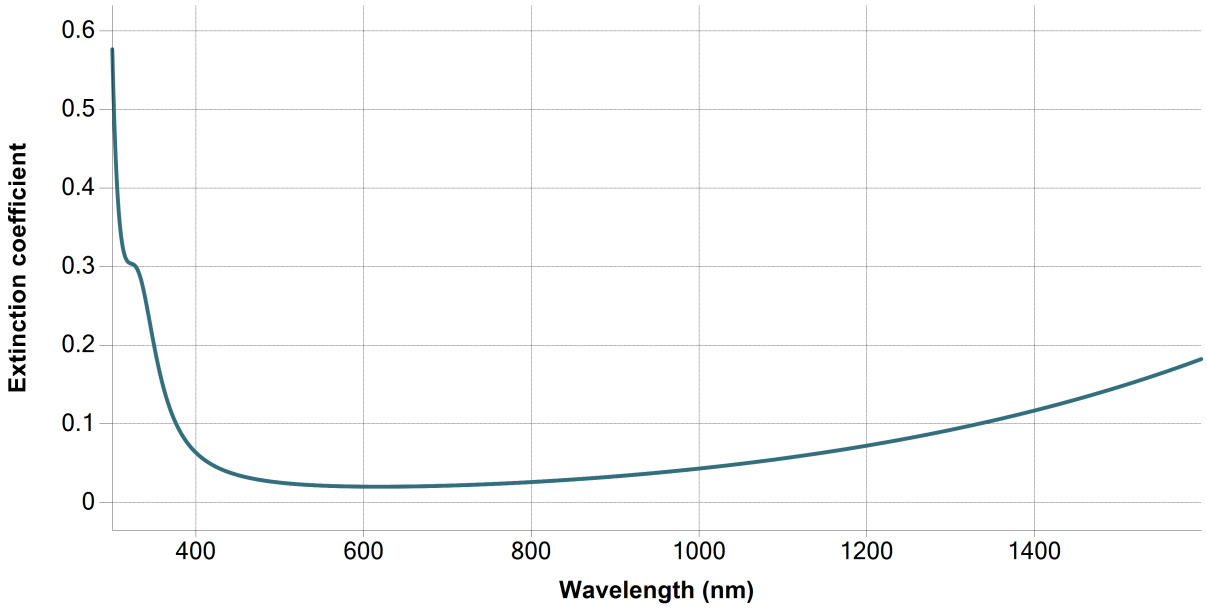
Phase 2 (ITO_3) - Dispersion graphs



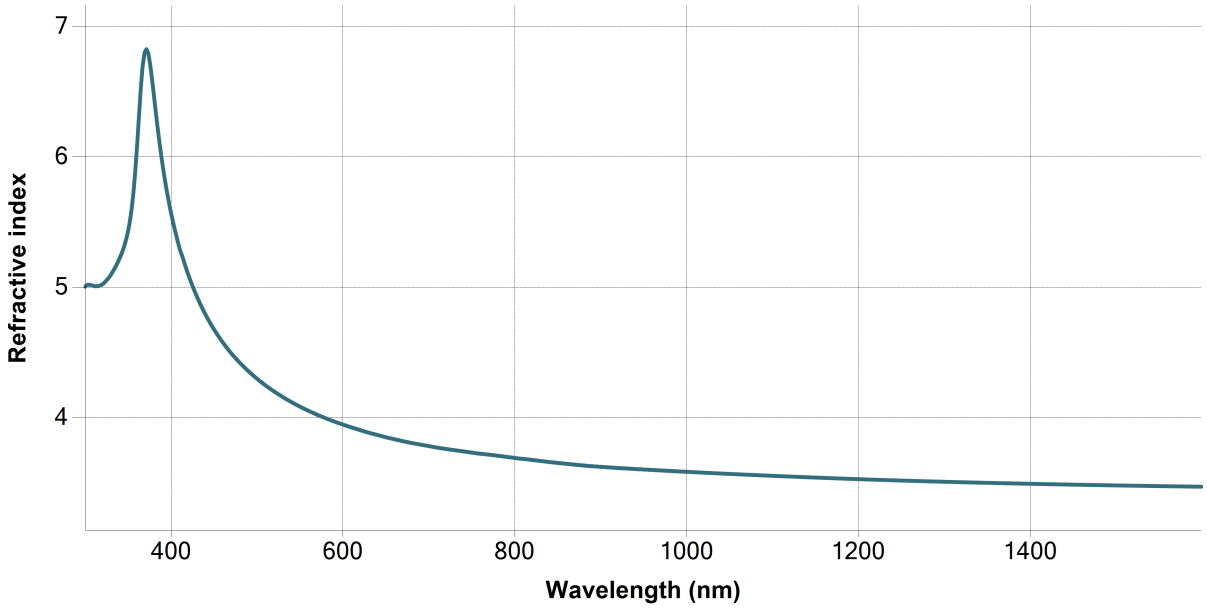


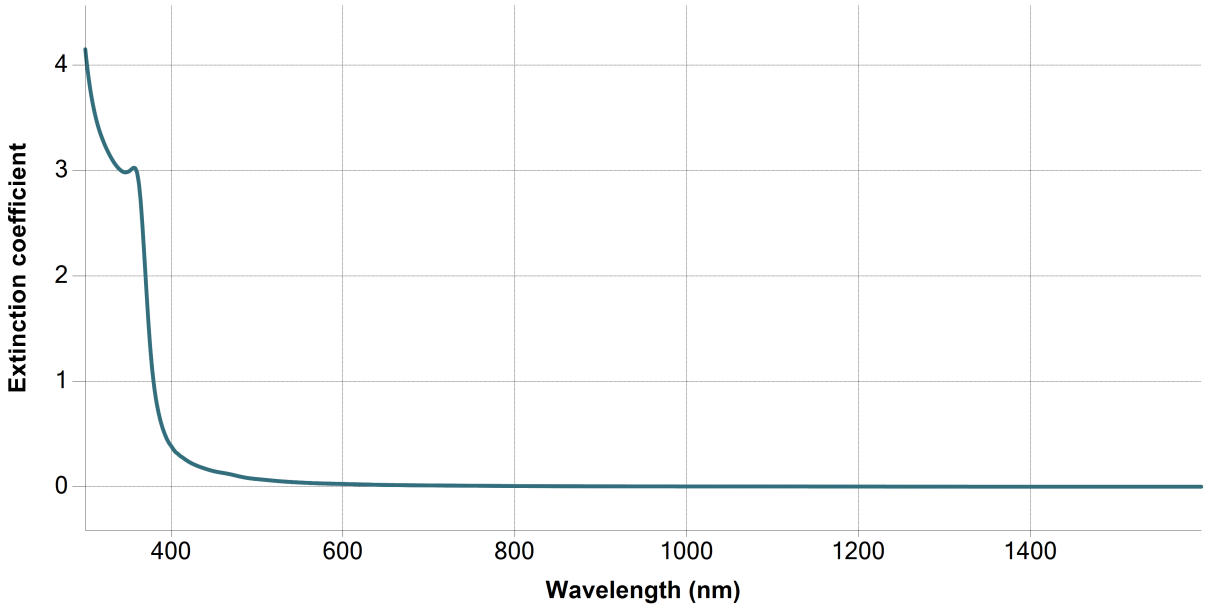
Phase 1 (ITO_3) - Dispersion graphs





Substrate (si) - Dispersion graphs





Correlation coefficients	
Ph2 - ITO_3 - Thickness --- Ph2 - Lorentz[1] - f	0.0162
Ph2 - ITO_3 - Thickness --- Ph2 - Lorentz[1] - E0 (eV)	0.006
Ph2 - ITO_3 - Thickness --- Ph2 - Lorentz[1] - Γ (eV)	0.0839
Ph2 - ITO_3 - Thickness --- Ph2 - Drude[2] - E_p (eV)	-0.1847
Ph2 - ITO_3 - Thickness --- Ph2 - Drude[2] - E_Γ (eV)	0.0988
Ph2 - ITO_3 - Thickness --- Ph2 - Lorentz[3] - f	-0.0829
Ph2 - ITO_3 - Thickness --- Ph2 - Lorentz[3] - E0 (eV)	-0.123
Ph2 - ITO_3 - Thickness --- Ph2 - Lorentz[3] - Γ (eV)	-0.0047
Ph2 - ITO_3 - Thickness --- Ph2 - Eps_inf	-0.0131
Ph2 - Lorentz[1] - f --- Ph2 - Lorentz[1] - E0 (eV)	0.9423
Ph2 - Lorentz[1] - f --- Ph2 - Lorentz[1] - Γ (eV)	0.8459
Ph2 - Lorentz[1] - f --- Ph2 - Drude[2] - E_p (eV)	0.4481
Ph2 - Lorentz[1] - f --- Ph2 - Drude[2] - E_Γ (eV)	-0.4532
Ph2 - Lorentz[1] - f --- Ph2 - Lorentz[3] - f	-0.8729
Ph2 - Lorentz[1] - f --- Ph2 - Lorentz[3] - E0 (eV)	-0.6116
Ph2 - Lorentz[1] - f --- Ph2 - Lorentz[3] - Γ (eV)	-0.8629
Ph2 - Lorentz[1] - f --- Ph2 - Eps_inf	0.6414
Ph2 - Lorentz[1] - E0 (eV) --- Ph2 - Lorentz[1] - Γ (eV)	0.8585
Ph2 - Lorentz[1] - E0 (eV) --- Ph2 - Drude[2] - E_p (eV)	0.3517
Ph2 - Lorentz[1] - E0 (eV) --- Ph2 - Drude[2] - E_Γ (eV)	-0.3934
Ph2 - Lorentz[1] - E0 (eV) --- Ph2 - Lorentz[3] - f	-0.7904
Ph2 - Lorentz[1] - E0 (eV) --- Ph2 - Lorentz[3] - E0 (eV)	-0.4975
Ph2 - Lorentz[1] - E0 (eV) --- Ph2 - Lorentz[3] - Γ (eV)	-0.7642
Ph2 - Lorentz[1] - E0 (eV) --- Ph2 - Eps_inf	0.5353
Ph2 - Lorentz[1] - Γ (eV) --- Ph2 - Drude[2] - E_p (eV)	0.3295
Ph2 - Lorentz[1] - Γ (eV) --- Ph2 - Drude[2] - E_Γ (eV)	-0.5341
Ph2 - Lorentz[1] - Γ (eV) --- Ph2 - Lorentz[3] - f	-0.6165
Ph2 - Lorentz[1] - Γ (eV) --- Ph2 - Lorentz[3] - E0 (eV)	-0.3699
Ph2 - Lorentz[1] - Γ (eV) --- Ph2 - Lorentz[3] - Γ (eV)	-0.5745
Ph2 - Lorentz[1] - Γ (eV) --- Ph2 - Eps_inf	0.4316
Ph2 - Drude[2] - E_p (eV) --- Ph2 - Drude[2] - E_Γ (eV)	-0.258
Ph2 - Drude[2] - E_p (eV) --- Ph2 - Lorentz[3] - f	-0.5589
Ph2 - Drude[2] - E_p (eV) --- Ph2 - Lorentz[3] - E0 (eV)	-0.467
Ph2 - Drude[2] - E_p (eV) --- Ph2 - Lorentz[3] - Γ (eV)	-0.4047
Ph2 - Drude[2] - E_p (eV) --- Ph2 - Eps_inf	0.8113
Ph2 - Drude[2] - E_Γ (eV) --- Ph2 - Lorentz[3] - f	0.3224
Ph2 - Drude[2] - E_Γ (eV) --- Ph2 - Lorentz[3] - E0 (eV)	0.19
Ph2 - Drude[2] - E_Γ (eV) --- Ph2 - Lorentz[3] - Γ (eV)	0.2667
Ph2 - Drude[2] - E_Γ (eV) --- Ph2 - Eps_inf	-0.318
Ph2 - Lorentz[3] - f --- Ph2 - Lorentz[3] - E0 (eV)	0.8481
Ph2 - Lorentz[3] - f --- Ph2 - Lorentz[3] - Γ (eV)	0.9125
Ph2 - Lorentz[3] - f --- Ph2 - Eps_inf	-0.8432
Ph2 - Lorentz[3] - E0 (eV) --- Ph2 - Lorentz[3] - Γ (eV)	0.7797
Ph2 - Lorentz[3] - E0 (eV) --- Ph2 - Eps_inf	-0.749
Ph2 - Lorentz[3] - Γ (eV) --- Ph2 - Eps_inf	-0.6497