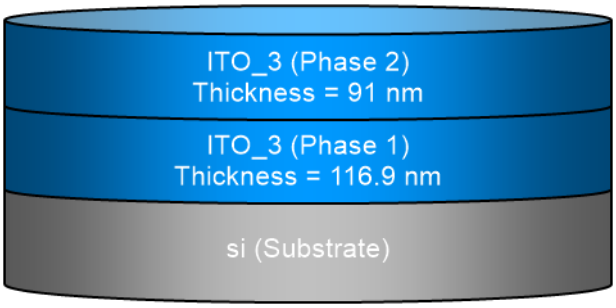
SEA regression report summary

Sample ID
001c-int-ii 70° 1
001c-int-ii 65° 2
001c-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 14:30
Comments	

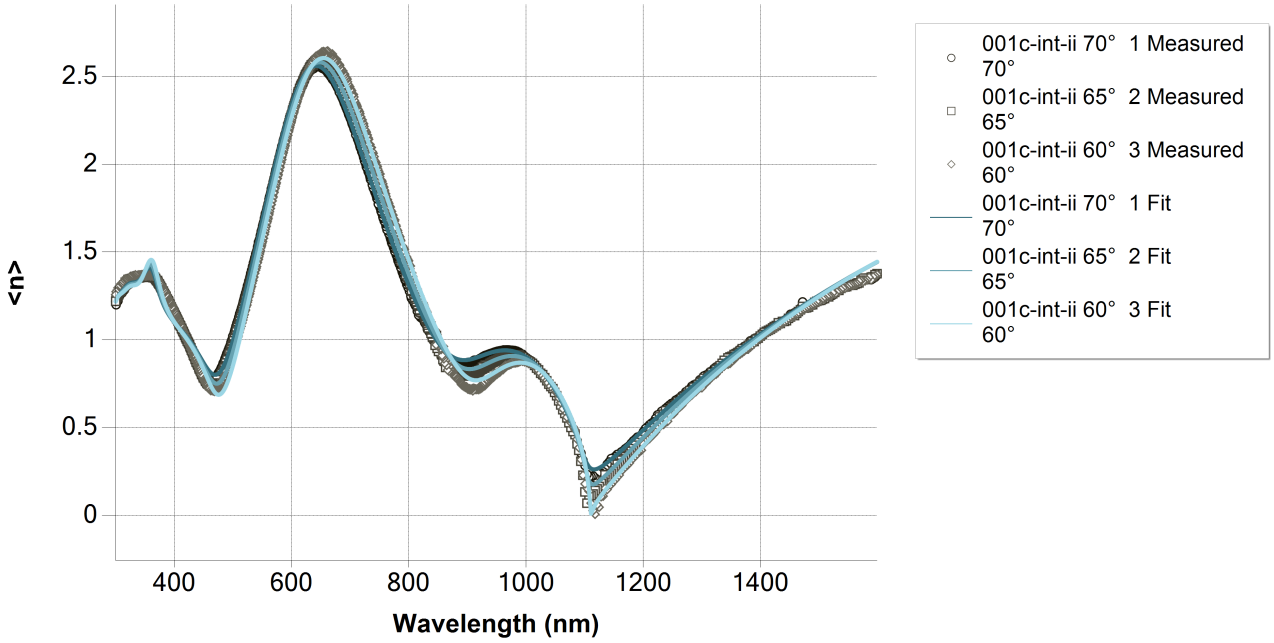
Layer structure	
Overview	
	
Optical model	
Phase 2	ITO_3
Dispersion law	Lorentz
	Drude
	Lorentz
Phase 1	ITO_3
Dispersion law	Lorentz
	Drude
	Lorentz

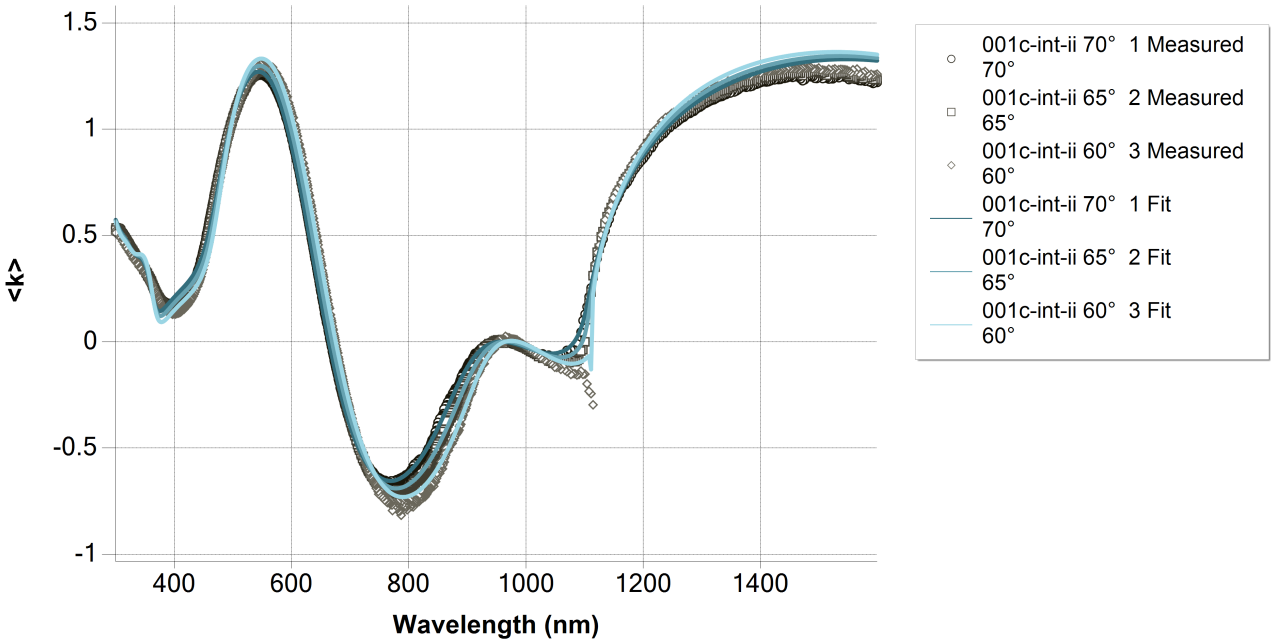
Regression results

Measurement information				
Measurement 1				
Measurement file path	C:\Users\emmabat\ito-si\001c-int-ii.smdx			
Angle of Incidence	70°			
Measurement 2				
Measurement file path	C:\Users\emmabat\ito-si\001c-int-ii.smdx			
Angle of Incidence	65°			
Measurement 3				
Measurement file path	C:\Users\emmabat\ito-si\001c-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	90.959	X	0.16244	nm
f	0.42313	X	0.0074046	
E0 (eV)	2.97784	X	0.0081126	eV
Γ (eV)	1.36934	X	0.01591	eV
E_p (eV)	0.68663	X	0.0045231	eV
E_Γ (eV)	0.35664	X	0.008697	eV
f	0.30259	X	0.011487	
E0 (eV)	4.17598	X	0.011954	eV
Γ (eV)	0.96277	X	0.037999	eV
Eps_inf	1.47292	X	0.010571	
Phase 1 (ITO_3)				
Thickness	116.874	X	0.14768	nm
f	0.16357			
E0 (eV)	3.74618			eV

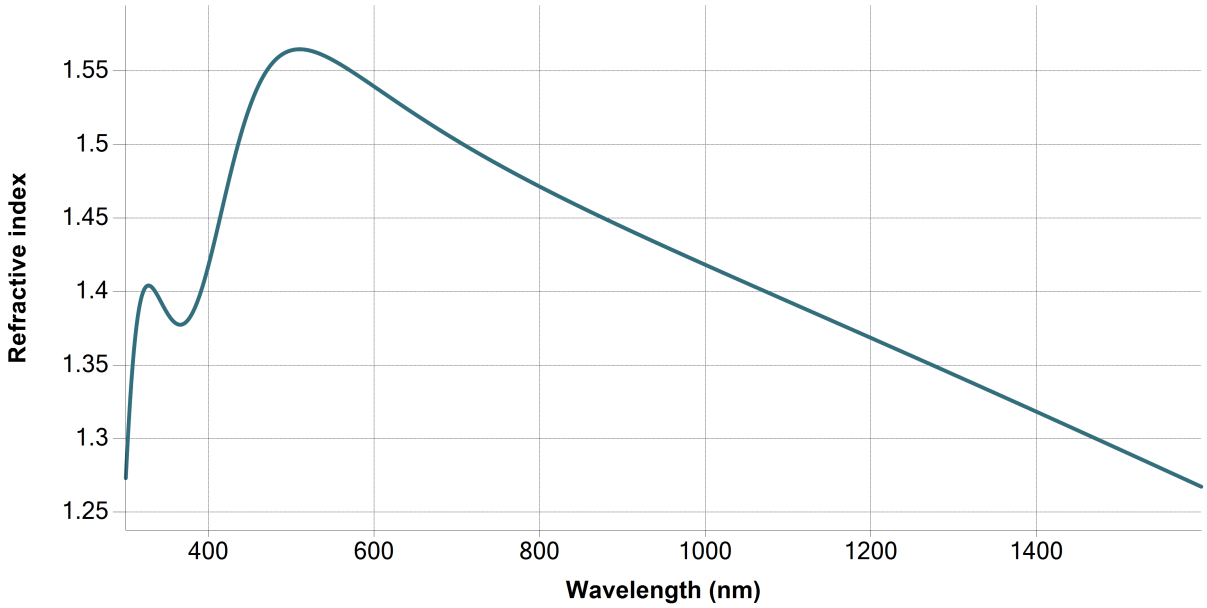
Γ (eV)	0.62015			eV
E_p (eV)	1.09856			eV
E_Γ (eV)	0.22823			eV
f	0.43808			
E0 (eV)	4.29829			eV
Γ (eV)	0.24163			eV
Eps_inf	3.4998			
Derived parameters	Value			
Phase 2 (ITO_3)				
n @ 632.8 nm	1.5269			
k @ 632.8 nm	0.1259			
Phase 1 (ITO_3)				
n @ 632.8 nm	1.9911			
k @ 632.8 nm	0.0202			
Substrate (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)	1.7783E+04 ± 667.9424			S/m
Resistivity (mΩ.cm)	5.6234 ± 0.2112			mΩ.cm
Resistance (Ω/sq)	618.2316 ± 24.3254			Ω/sq
N type dopant concentration (at/cm3)	8.5481E+19 ± 1.1262E+18			at/cm3
P type dopant concentration (at/cm3)	1.2651E+20 ± 1.6668E+18			at/cm3
N type dopant mobility (cm2/Vs)	12.9844 ± 0.5168			cm2/Vs
P type dopant mobility (cm2/Vs)	8.7732 ± 0.3492			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)	120.2875 ± 0.152			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	0.99755			
RMSE	0.03174			

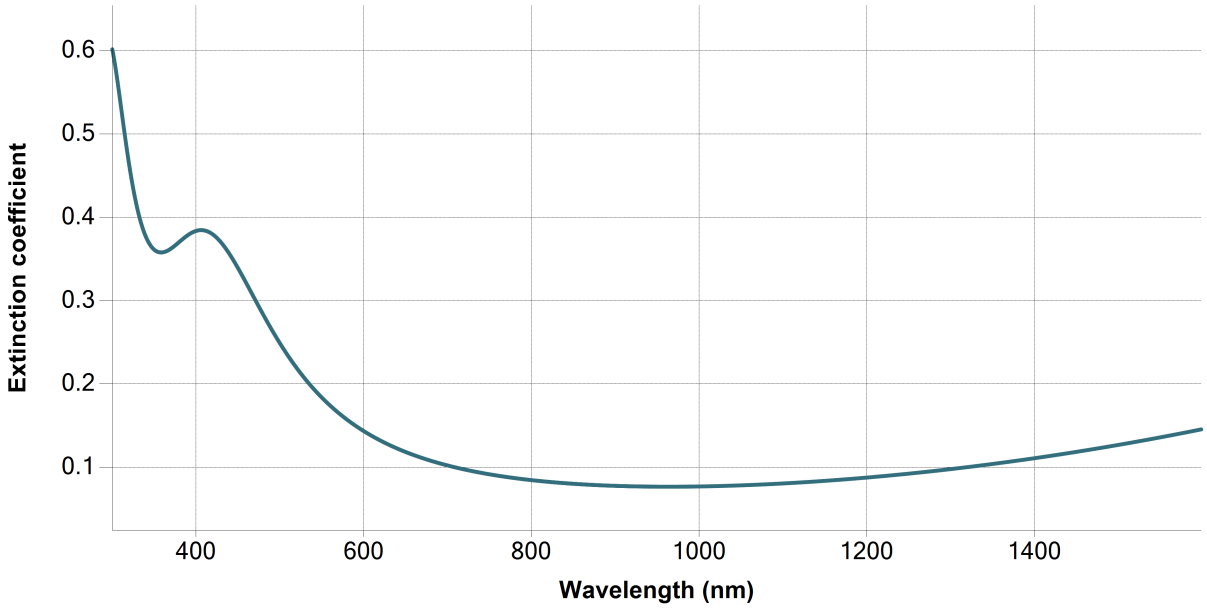
Regression graphs



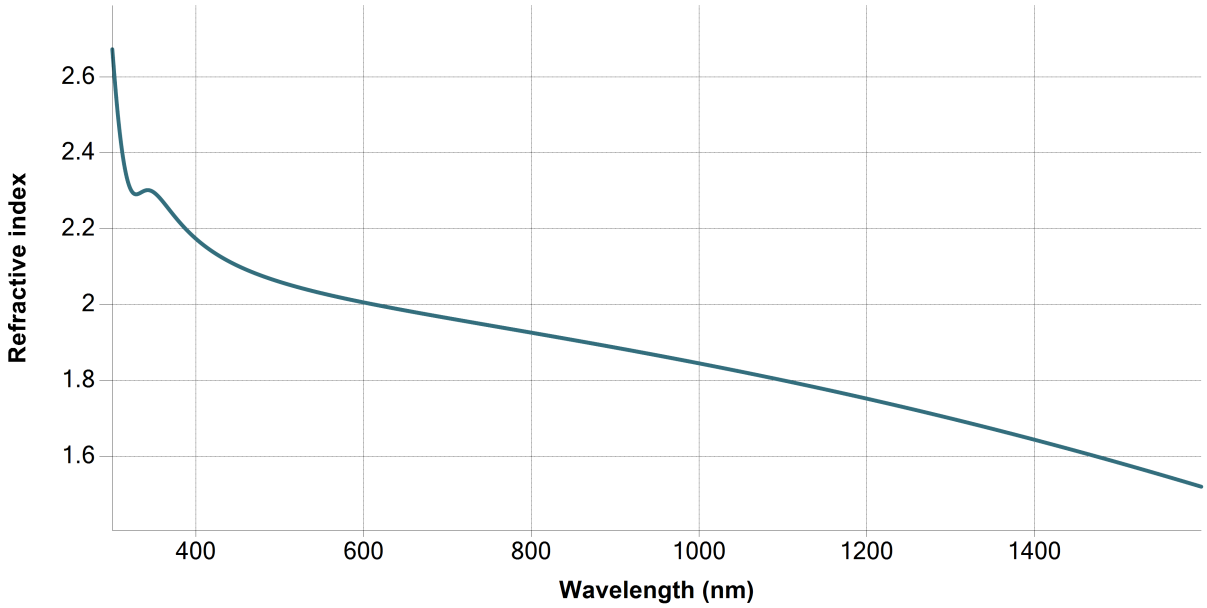


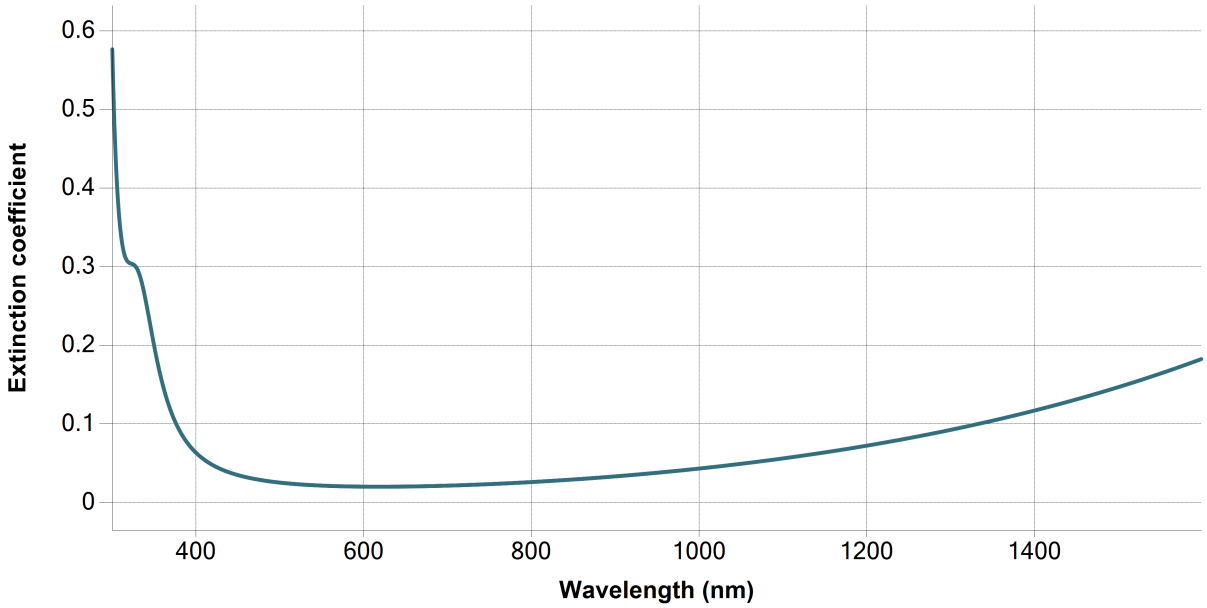
Phase 2 (ITO_3) - Dispersion graphs



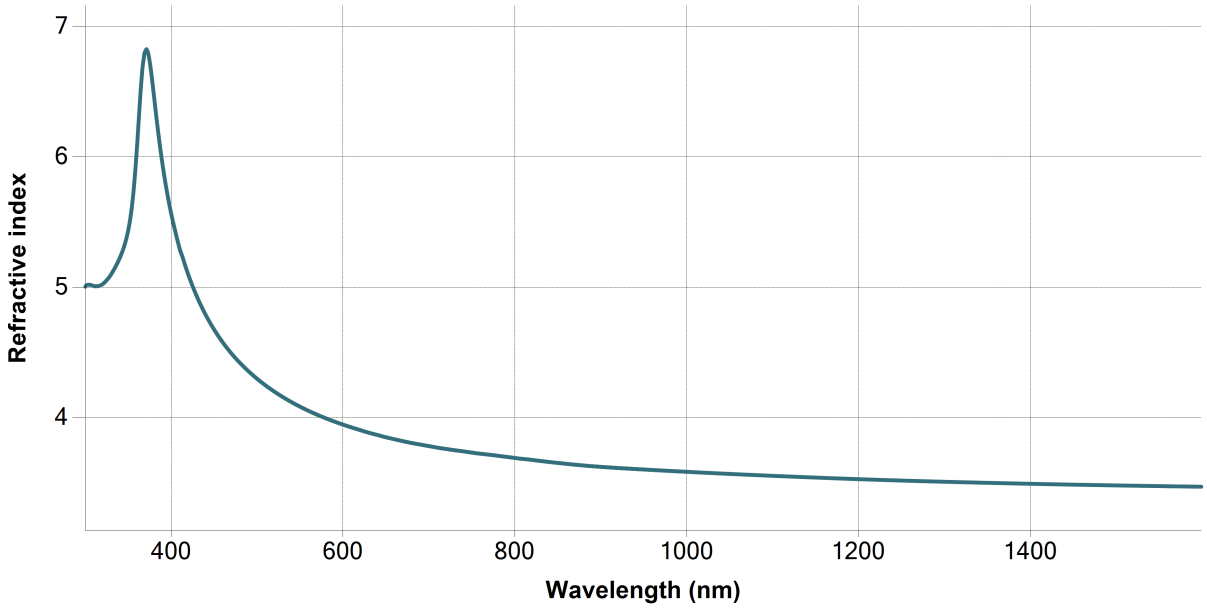


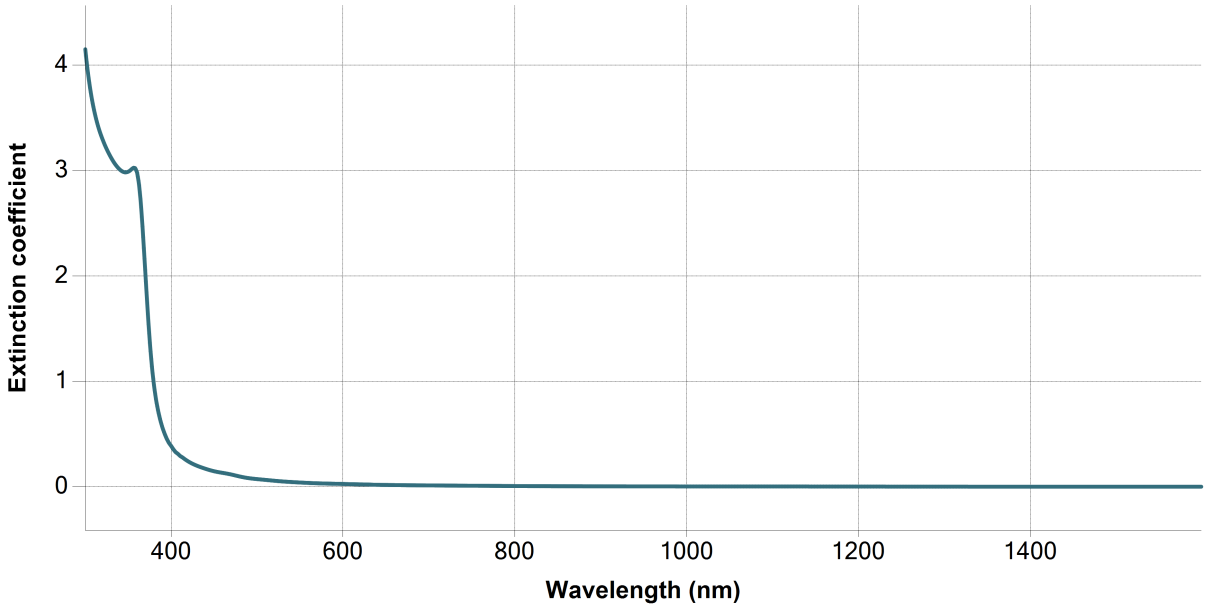
Phase 1 (ITO_3) - Dispersion graphs





Substrate (si) - Dispersion graphs





Correlation coefficients	
Ph2 - ITO_3 - Thickness --- Ph2 - Lorentz[1] - f	0.0655
Ph2 - ITO_3 - Thickness --- Ph2 - Lorentz[1] - E0 (eV)	0.034
Ph2 - ITO_3 - Thickness --- Ph2 - Lorentz[1] - Γ (eV)	0.1402
Ph2 - ITO_3 - Thickness --- Ph2 - Drude[2] - E_p (eV)	0.0342
Ph2 - ITO_3 - Thickness --- Ph2 - Drude[2] - E_Γ (eV)	0.0759
Ph2 - ITO_3 - Thickness --- Ph2 - Lorentz[3] - f	-0.1566
Ph2 - ITO_3 - Thickness --- Ph2 - Lorentz[3] - E0 (eV)	-0.2269
Ph2 - ITO_3 - Thickness --- Ph2 - Lorentz[3] - Γ (eV)	-0.042
Ph2 - ITO_3 - Thickness --- Ph2 - Eps_inf	0.1882
Ph2 - Lorentz[1] - f --- Ph2 - Lorentz[1] - E0 (eV)	0.9097
Ph2 - Lorentz[1] - f --- Ph2 - Lorentz[1] - Γ (eV)	0.8738
Ph2 - Lorentz[1] - f --- Ph2 - Drude[2] - E_p (eV)	0.4053
Ph2 - Lorentz[1] - f --- Ph2 - Drude[2] - E_Γ (eV)	-0.4597
Ph2 - Lorentz[1] - f --- Ph2 - Lorentz[3] - f	-0.8742
Ph2 - Lorentz[1] - f --- Ph2 - Lorentz[3] - E0 (eV)	-0.4758
Ph2 - Lorentz[1] - f --- Ph2 - Lorentz[3] - Γ (eV)	-0.8678
Ph2 - Lorentz[1] - f --- Ph2 - Eps_inf	0.5914
Ph2 - Lorentz[1] - E0 (eV) --- Ph2 - Lorentz[1] - Γ (eV)	0.8676
Ph2 - Lorentz[1] - E0 (eV) --- Ph2 - Drude[2] - E_p (eV)	0.2966
Ph2 - Lorentz[1] - E0 (eV) --- Ph2 - Drude[2] - E_Γ (eV)	-0.3768
Ph2 - Lorentz[1] - E0 (eV) --- Ph2 - Lorentz[3] - f	-0.779
Ph2 - Lorentz[1] - E0 (eV) --- Ph2 - Lorentz[3] - E0 (eV)	-0.3326
Ph2 - Lorentz[1] - E0 (eV) --- Ph2 - Lorentz[3] - Γ (eV)	-0.7404
Ph2 - Lorentz[1] - E0 (eV) --- Ph2 - Eps_inf	0.4878
Ph2 - Lorentz[1] - Γ (eV) --- Ph2 - Drude[2] - E_p (eV)	0.3515
Ph2 - Lorentz[1] - Γ (eV) --- Ph2 - Drude[2] - E_Γ (eV)	-0.5621
Ph2 - Lorentz[1] - Γ (eV) --- Ph2 - Lorentz[3] - f	-0.6988
Ph2 - Lorentz[1] - Γ (eV) --- Ph2 - Lorentz[3] - E0 (eV)	-0.3348
Ph2 - Lorentz[1] - Γ (eV) --- Ph2 - Lorentz[3] - Γ (eV)	-0.6294
Ph2 - Lorentz[1] - Γ (eV) --- Ph2 - Eps_inf	0.489
Ph2 - Drude[2] - E_p (eV) --- Ph2 - Drude[2] - E_Γ (eV)	-0.3492
Ph2 - Drude[2] - E_p (eV) --- Ph2 - Lorentz[3] - f	-0.4796
Ph2 - Drude[2] - E_p (eV) --- Ph2 - Lorentz[3] - E0 (eV)	-0.4162
Ph2 - Drude[2] - E_p (eV) --- Ph2 - Lorentz[3] - Γ (eV)	-0.3115
Ph2 - Drude[2] - E_p (eV) --- Ph2 - Eps_inf	0.7803
Ph2 - Drude[2] - E_Γ (eV) --- Ph2 - Lorentz[3] - f	0.2887
Ph2 - Drude[2] - E_Γ (eV) --- Ph2 - Lorentz[3] - E0 (eV)	0.0999
Ph2 - Drude[2] - E_Γ (eV) --- Ph2 - Lorentz[3] - Γ (eV)	0.2066
Ph2 - Drude[2] - E_Γ (eV) --- Ph2 - Eps_inf	-0.3248
Ph2 - Lorentz[3] - f --- Ph2 - Lorentz[3] - E0 (eV)	0.7581
Ph2 - Lorentz[3] - f --- Ph2 - Lorentz[3] - Γ (eV)	0.9058
Ph2 - Lorentz[3] - f --- Ph2 - Eps_inf	-0.8097
Ph2 - Lorentz[3] - E0 (eV) --- Ph2 - Lorentz[3] - Γ (eV)	0.6571
Ph2 - Lorentz[3] - E0 (eV) --- Ph2 - Eps_inf	-0.7482
Ph2 - Lorentz[3] - Γ (eV) --- Ph2 - Eps_inf	-0.5833