Optics of planar layered structure

Last revised: 2013-06-06

Helper functions

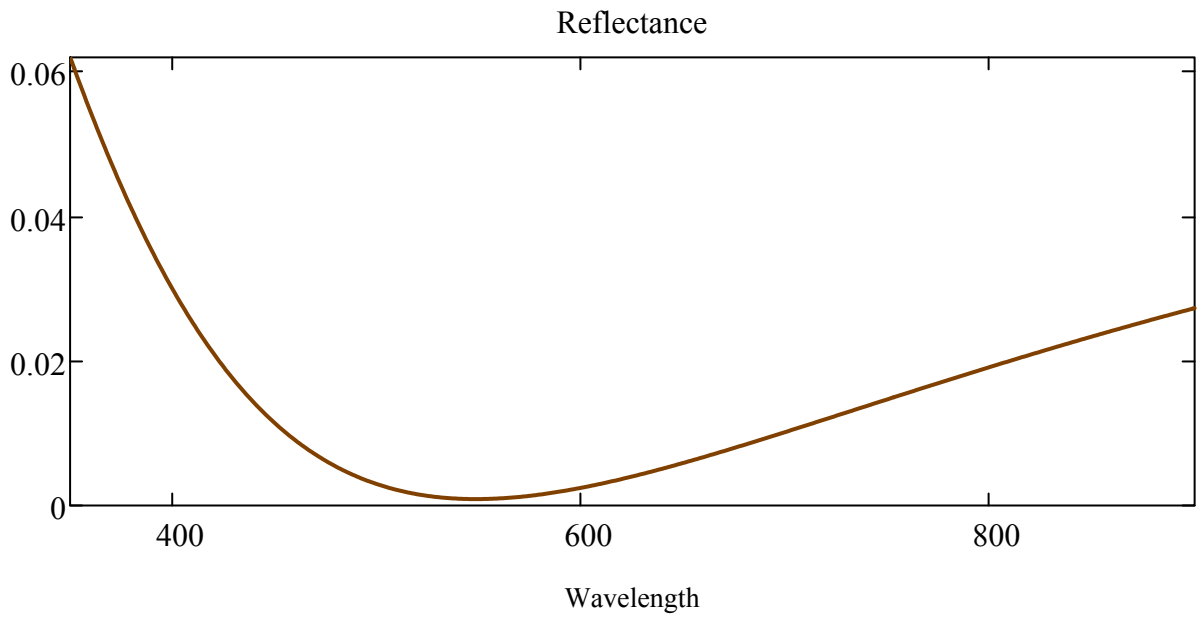
Materials library

Physics

Click here for info about setting up calculations

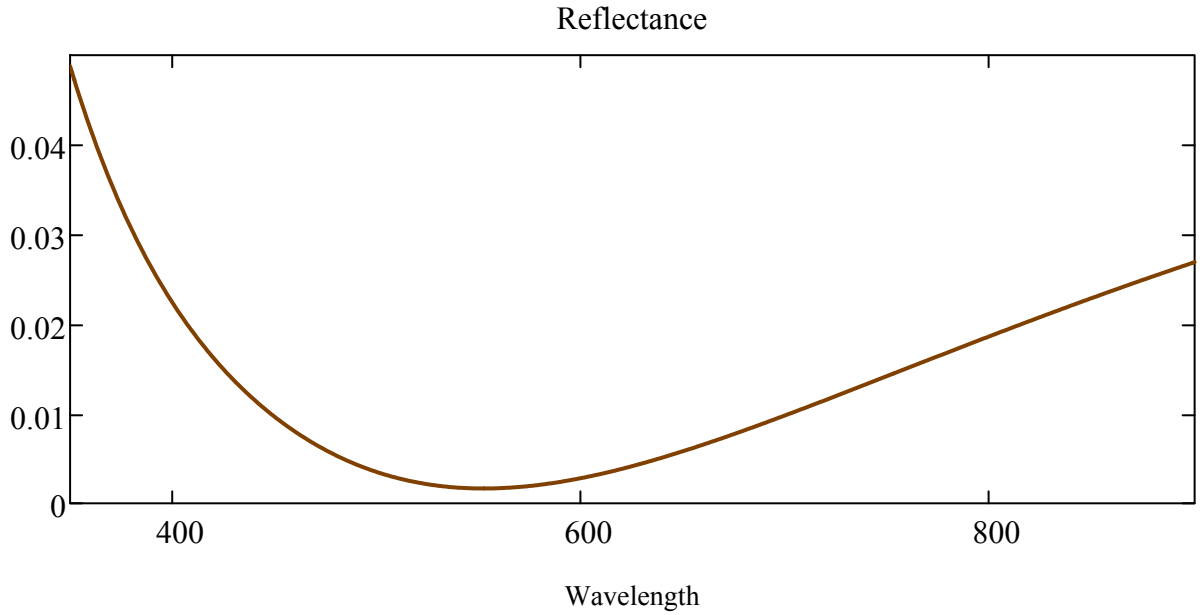
Single-layer quarter-wave antireflection coating

$$\begin{pmatrix} \Lambda \\ R \end{pmatrix} := \text{Reflectance}\left(\begin{pmatrix} \text{LAYERS} & \text{QWL}(\text{MgF2}, 550) \\ \text{SUBS} & \text{SF11} \\ \text{WAVE} & \text{LinearS}(350, 900, 1) \end{pmatrix}\right)$$



Double-layer quarter-wave antireflection coating

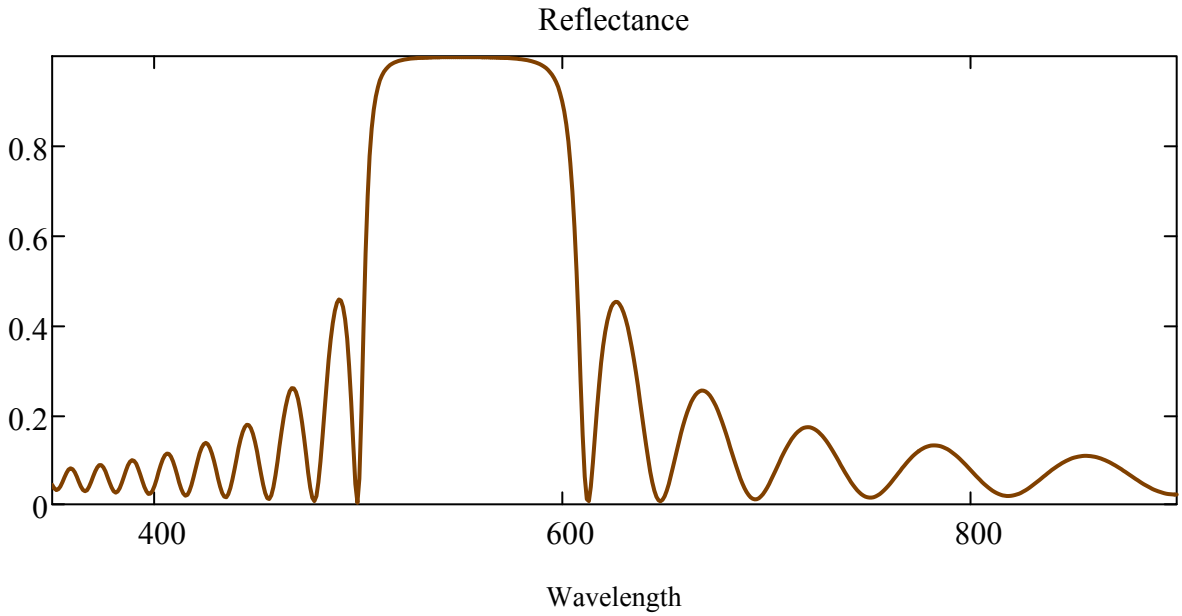
$$\begin{pmatrix} \Lambda \\ R \end{pmatrix} := \text{Reflectance}\left[\begin{matrix} \text{LAYERS} & \text{QWL}\left[\begin{pmatrix} \text{MgF2} \\ \text{Al2O3} \end{pmatrix}, 550\right] \\ \text{SUBS} & \text{SF11} \\ \text{WAVE} & \text{LinearS}(350, 900, 1) \end{matrix}\right]$$



High-reflective quarter-wave stack

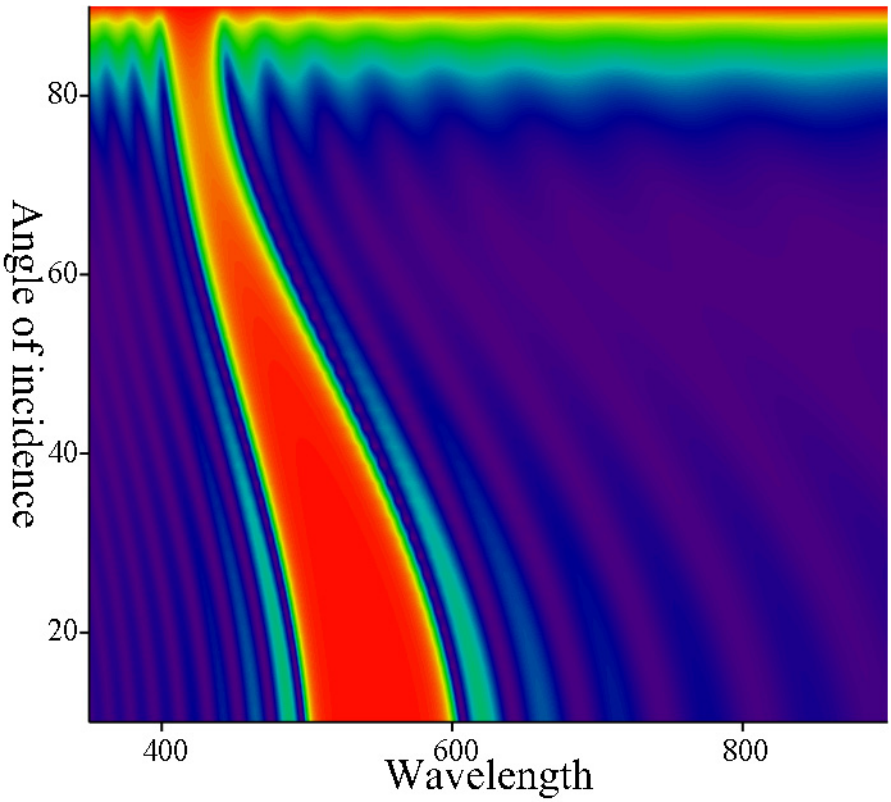
Normal incidence, dependence on wavelength

$$\begin{pmatrix} \Lambda \\ R \end{pmatrix} := \text{Reflectance}\left[\begin{matrix} \text{LAYERS} & \text{QWS}\left[\begin{pmatrix} \text{MgF2} \\ \text{Al2O3} \end{pmatrix}, 550, 16\right] \\ \text{SUBS} & \text{BK7} \\ \text{WAVE} & \text{LinearS}(350, 900, 1) \end{matrix}\right]$$



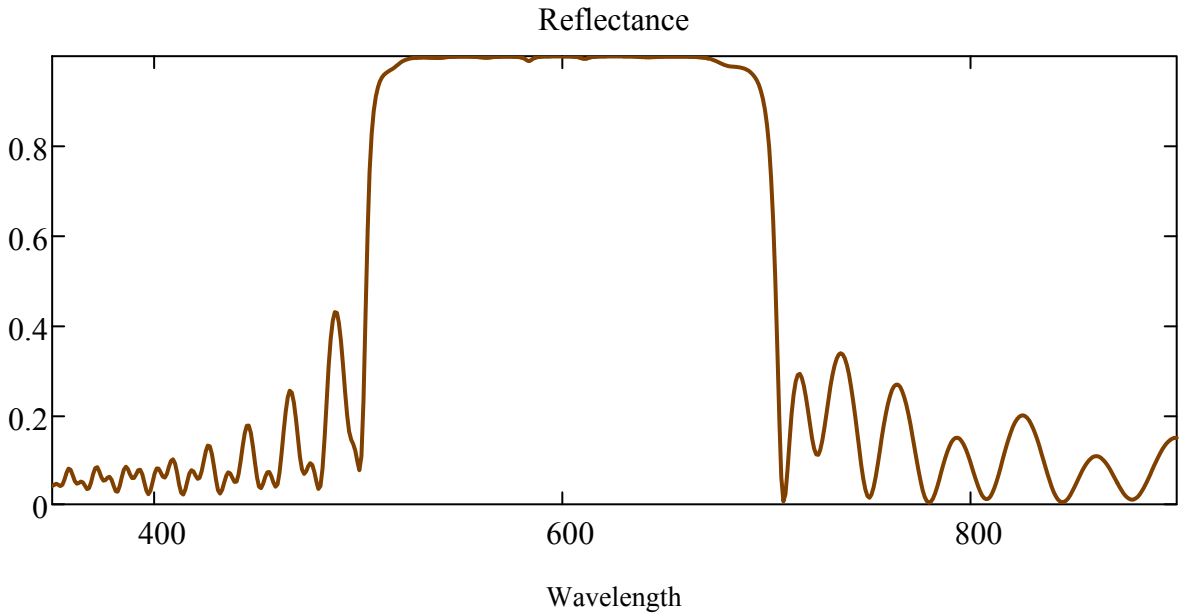
Dependence on wavelength and angle of incidence

$$\begin{pmatrix} \Lambda \\ \Theta \\ R \end{pmatrix} := \text{Reflectance}\left[\begin{array}{ll} \text{LAYERS} & \text{QWS}\left[\begin{pmatrix} \text{MgF2} \\ \text{Al2O3} \end{pmatrix}, 550, 16\right] \\ \text{SUBS} & \text{BK7} \\ \text{WAVE} & \text{LinearS}(350, 900, 1) \\ \text{THETA} & \text{LinearS}(10\cdot\text{deg}, 90\cdot\text{deg}, 2\cdot\text{deg}) \\ \text{POLAR} & \text{"p"} \end{array}\right]$$



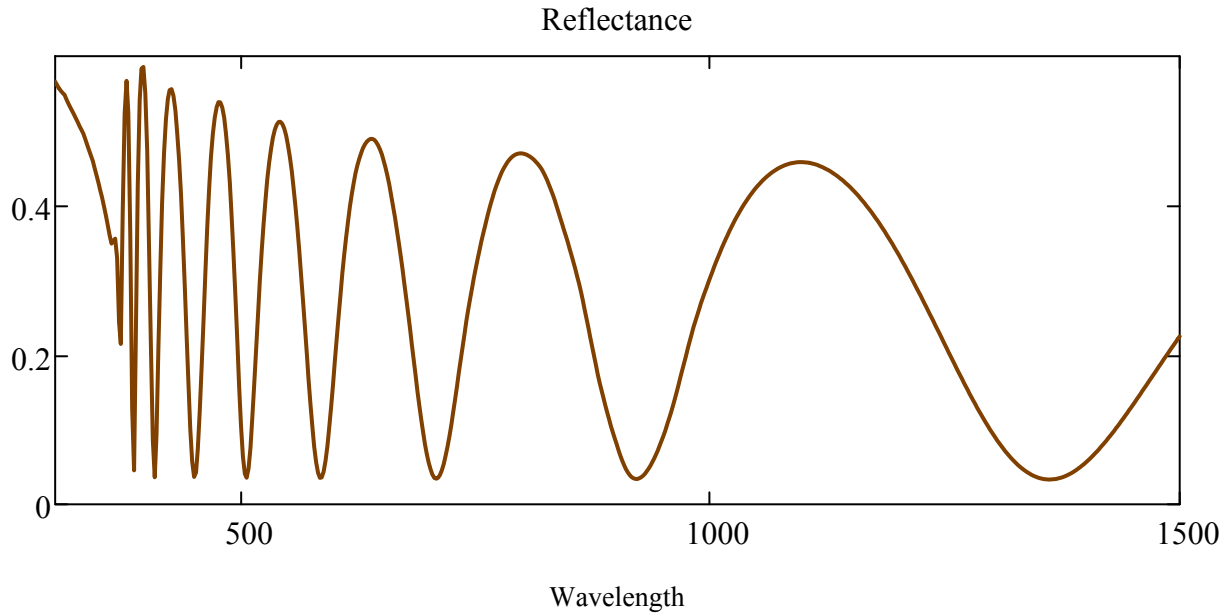
Broadband high-reflective coating

$$\begin{pmatrix} \Lambda \\ R \end{pmatrix} := \text{Reflectance}\left[\begin{matrix} \text{LAYERS} & \text{stack}\left[\text{QWS}\left[\begin{pmatrix} \text{MgF2} \\ \text{Al2O3} \end{pmatrix}, 550, 16\right], \text{QWS}\left[\begin{pmatrix} \text{MgF2} \\ \text{Al2O3} \end{pmatrix}, 640, 16\right]\right] \\ \text{SUBS} & \text{BK7} \\ \text{WAVE} & \text{LinearS}(350, 900, 1) \end{matrix}\right]$$



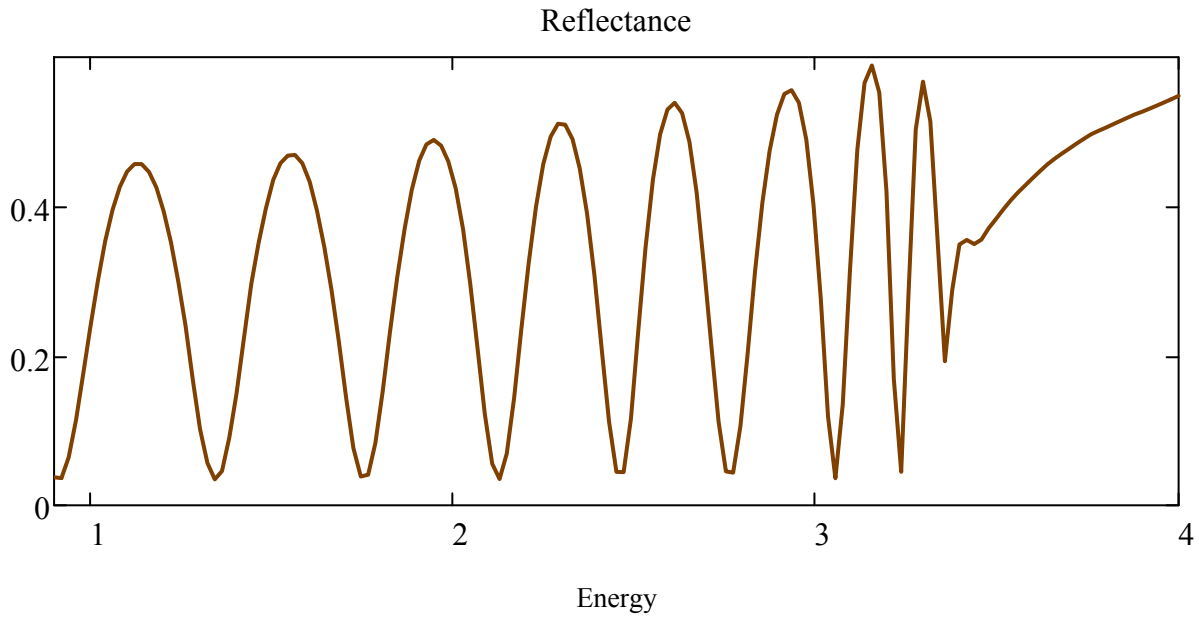
Reflectance of dielectric film on transparent substrate (wavelength scale)

$$\begin{pmatrix} \Lambda \\ R \end{pmatrix} := \text{Reflectance}\begin{bmatrix} \text{LAYERS} & (\text{TiO2} \quad 500) \\ \text{SUBS} & \text{SiO2} \\ \text{WAVE} & \text{LinearS}(300, 1500, 2) \end{bmatrix}$$



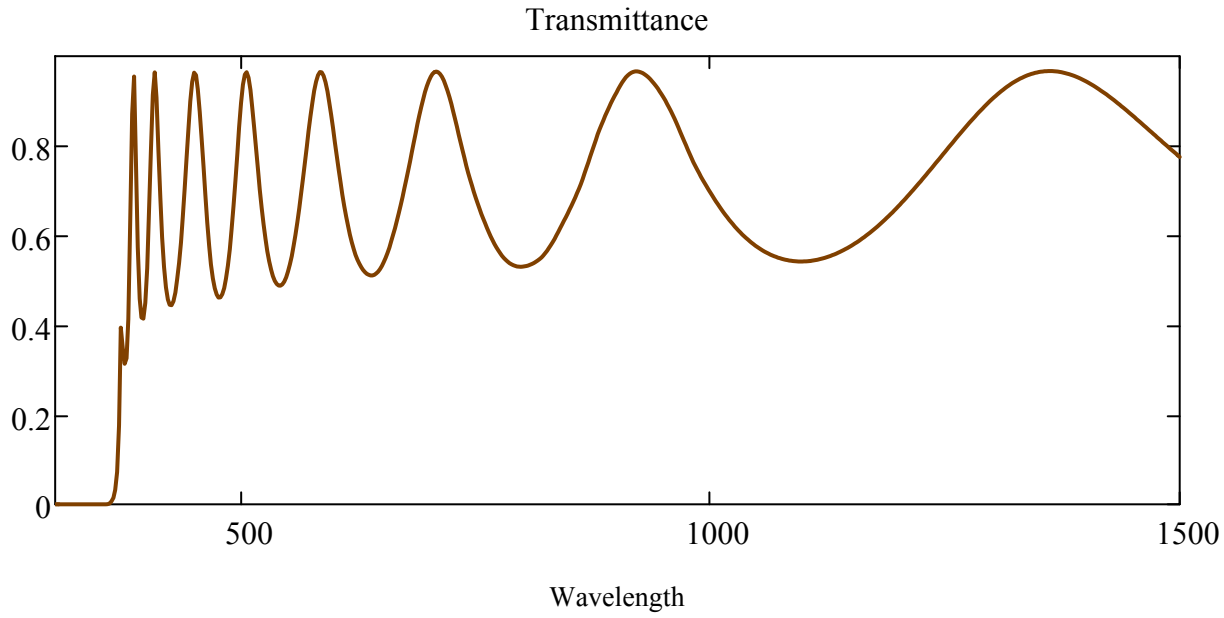
Reflectance of dielectric film on transparent substrate (energy scale)

$$\begin{pmatrix} E \\ R \end{pmatrix} := \text{Reflectance}\begin{bmatrix} \text{LAYERS} & (\text{TiO2} \quad 500) \\ \text{SUBS} & \text{SiO2} \\ \text{ENERGY} & \text{LinearS}(0.9, 4, 0.02) \end{bmatrix}$$



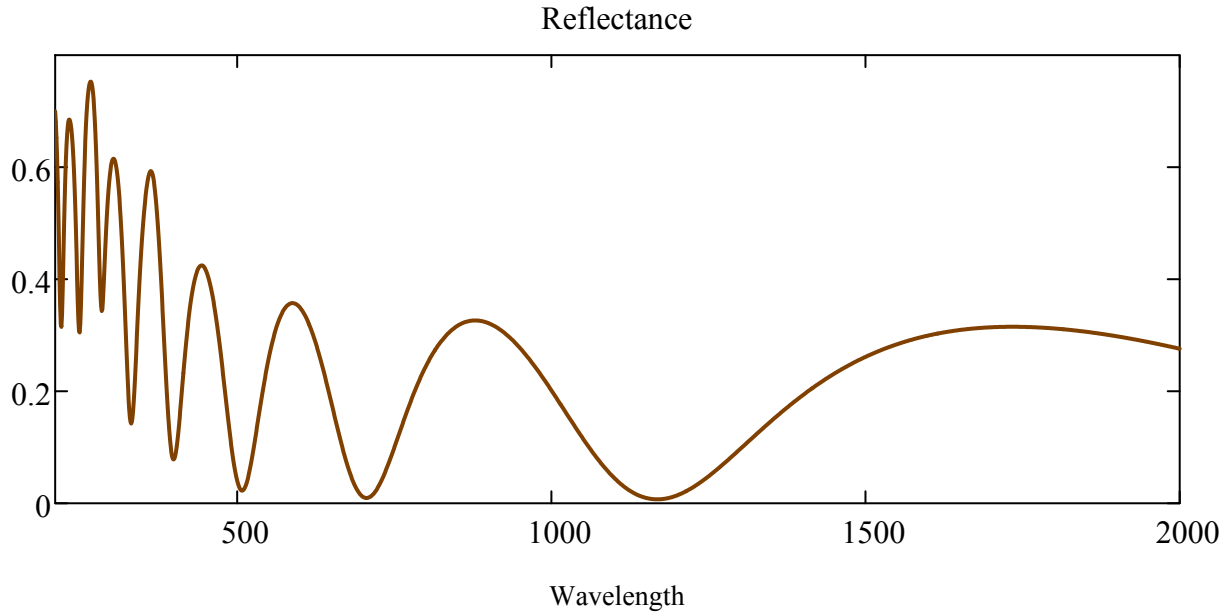
Transmittance of dielectric film on transparent substrate (wavelength scale)

$$\begin{pmatrix} \Lambda \\ R \end{pmatrix} := \text{Transmittance}\begin{bmatrix} \text{LAYERS} & (\text{TiO2} \quad 500) \\ \text{SUBS} & \text{SiO2} \\ \text{WAVE} & \text{LinearS}(300, 1500, 2) \end{bmatrix}$$



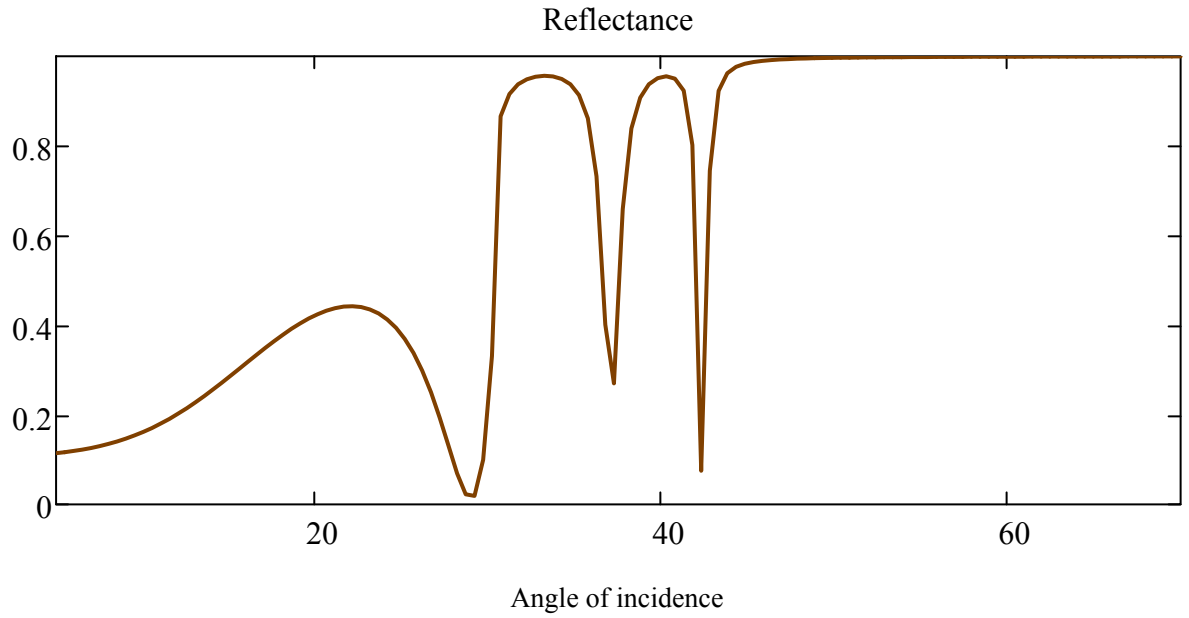
Dielectric film on absorbing substrate

$$\begin{pmatrix} \Lambda \\ R \end{pmatrix} := \text{Reflectance}\begin{bmatrix} \text{LAYERS} & (\text{Al2O3} \quad 500) \\ \text{SUBS} & \text{silicon} \\ \text{WAVE} & \text{LinearS}(210, 2000, 1) \end{bmatrix}$$



M-line spectroscopy

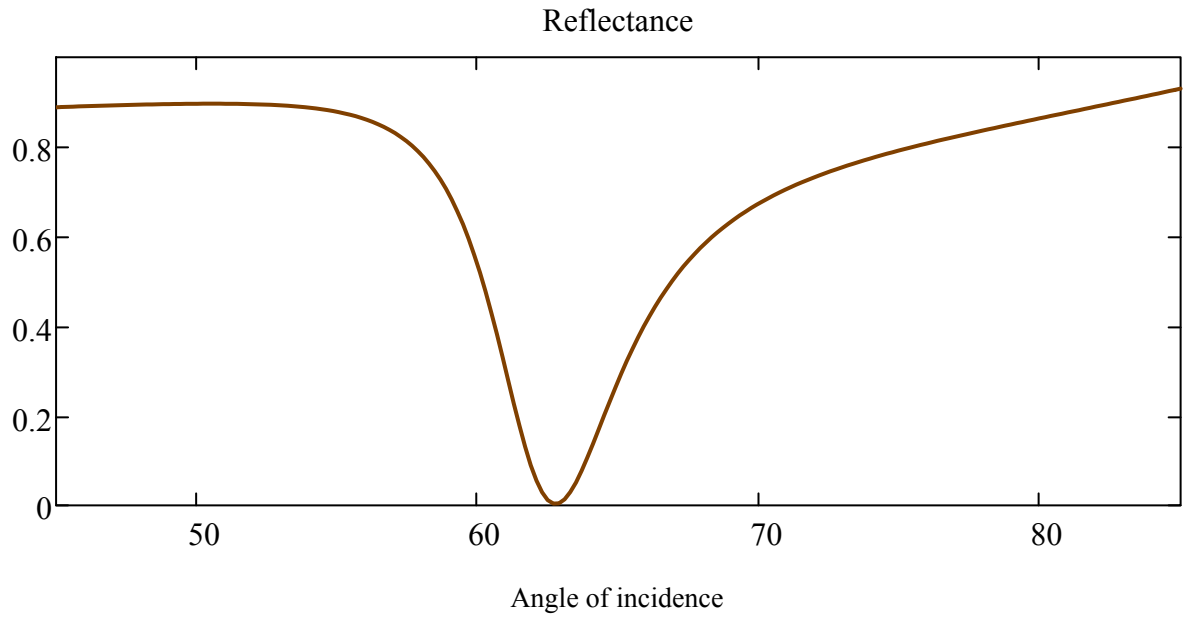
$$\begin{pmatrix} \Theta \\ R \end{pmatrix} := \text{Reflectance}\left[\begin{array}{cc} \text{INDEX} & \begin{pmatrix} 1 \\ 2.0 + 0.006 \cdot i \end{pmatrix} \\ \text{THICKN} & \begin{pmatrix} 50 \\ 500 \end{pmatrix} \\ \text{SUBS} & \text{SiO2} \\ \text{WAVE} & 632.8 \\ \text{INCIDENT} & \text{rutile} \\ \text{THETA} & \text{LinearS}(5 \cdot \text{deg}, 70 \cdot \text{deg}, 0.5 \cdot \text{deg}) \\ \text{POLAR} & \text{TE} \end{array}\right]$$



Surface plasmon resonance

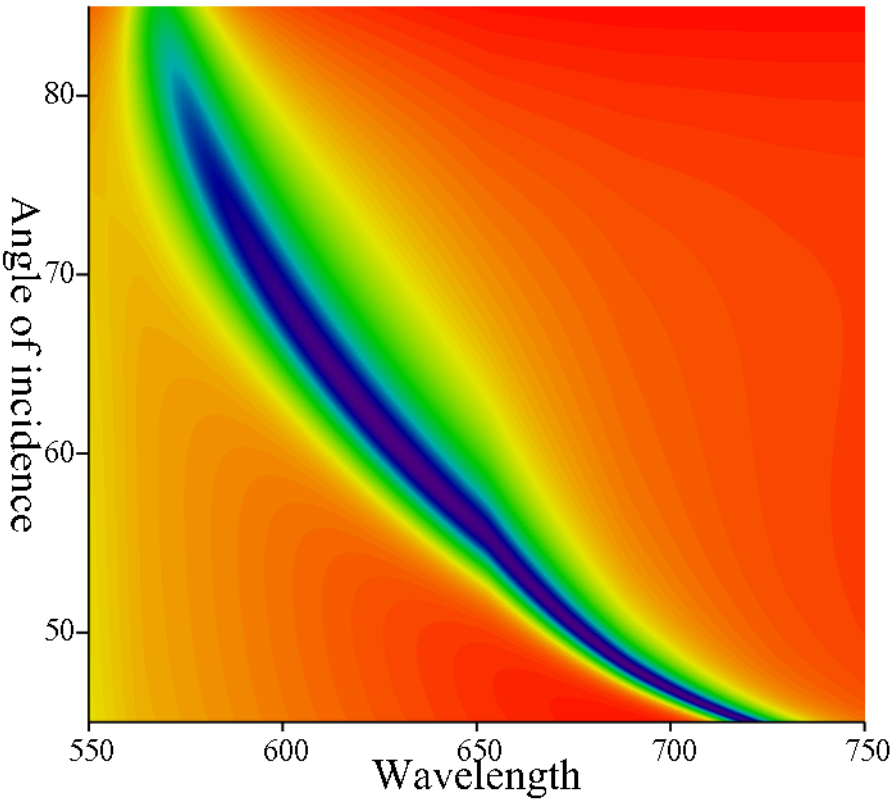
Fixed wavelength, dependence on angle of incidence

$$\begin{pmatrix} \Theta \\ R \end{pmatrix} := \text{Reflectance}\left[\begin{array}{ll} \text{LAYERS} & \begin{pmatrix} \text{gold} & 50 \\ \text{ZrO2} & 200 \end{pmatrix} \\ \text{SUBS} & \text{air} \\ \text{INCIDENT} & \text{BK7} \\ \text{WAVE} & 620 \\ \text{THETA} & \text{LinearS}(45\cdot\text{deg}, 85\cdot\text{deg}, 0.2\cdot\text{deg}) \\ \text{POLAR} & \text{"p"} \end{array}\right]$$



Dependence on wavelength and angle of incidence

$$\begin{pmatrix} \Lambda \\ \Theta \\ R \end{pmatrix} := \text{Reflectance}\left[\begin{array}{ll} \text{LAYERS} & \begin{pmatrix} \text{gold} & 50 \\ \text{ZrO2} & 200 \end{pmatrix} \\ \text{SUBS} & \text{air} \\ \text{INCIDENT} & \text{BK7} \\ \text{WAVE} & \text{LinearS}(550, 750, 2) \\ \text{THETA} & \text{LinearS}(45\cdot\text{deg}, 85\cdot\text{deg}, 0.2\cdot\text{deg}) \\ \text{POLAR} & \text{"p"} \end{array}\right]$$



========== End of Program ==========