OptiLayer
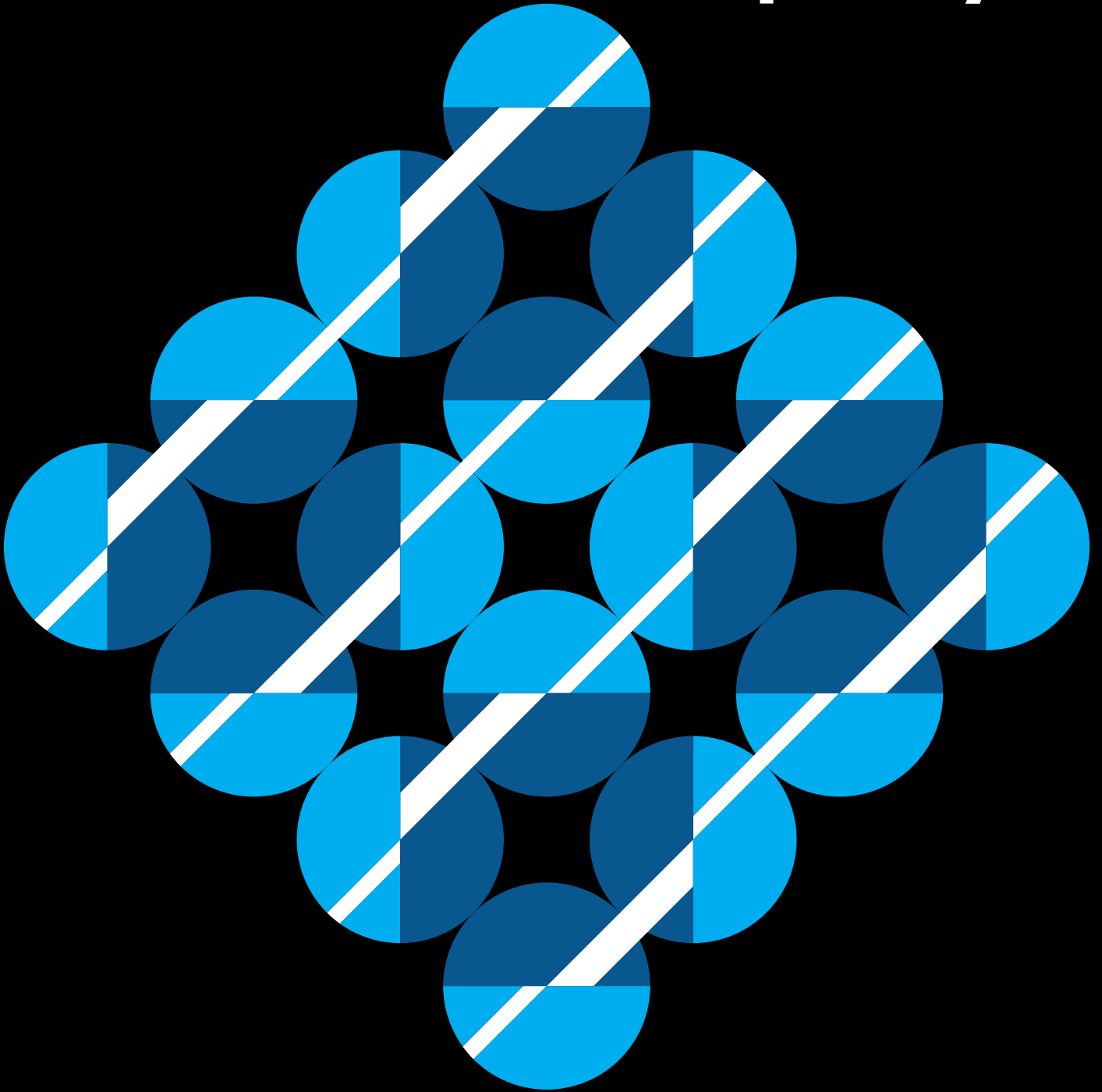
**OptiLayer
thin film
software**

**OptiLayer supports all stages
of the design, characterization
and production cycle**

OptiLayer GmbH

OptiLayer.com

Features of OptiLayer thin film software

OptiLayer GmbH

OptiLayer software consists of three modules which use the same databases and can easily exchange data:

- **OptiLayer:** design, evaluation, pre-production error analysis, monitoring, computational manufacturing,
- **OptiChar:** optical characterization of single layers based on spectral photometric and ellipsometric data,
- **OptiRE:** post-production characterization (reverse engineering) of multilayer coatings on the basis of spectral photometric and ellipsometric data.

OptiReOpt library is aimed at a real-time characterization and reoptimization of optical coatings being produced in deposition plants equipped with on-line spectral photometric and ellipsometric monitoring.

OptiLayer utilizes the most up-to-date software solutions and has a unique mathematical kernel designed on the highest professional level.

- **OptiLayer** achieves very good performance at ANY computer running Windows XP SP3, Windows Vista, Windows 7, Windows 8 and 8.1.
- **OptiLayer** software has a user-friendly interface which makes work pleasant and convenient.
- Installation process takes only a few minutes.
- **OptiLayer** has context-sensitive help system and advanced manuals.
- Installation package includes a number of tutorial examples which allow to be involved in the **OptiLayer** philosophy in a very fast way.
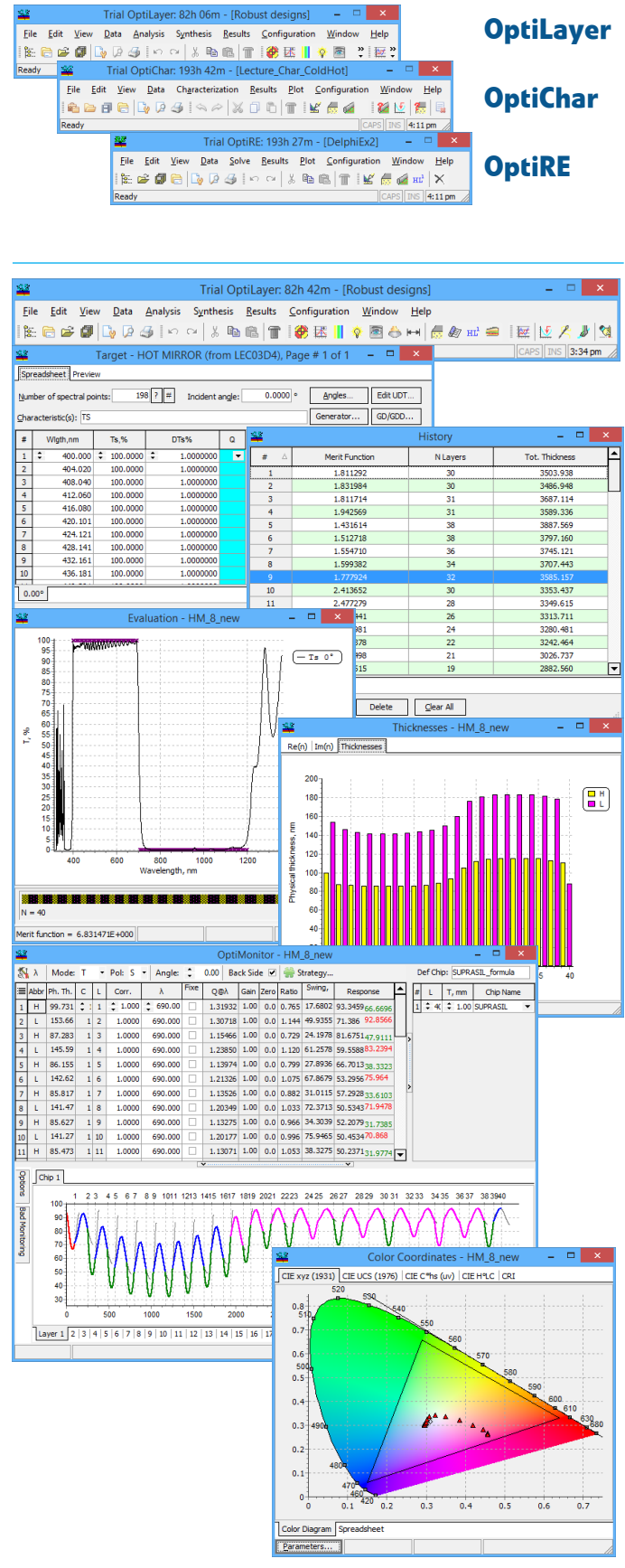- The package includes a Catalog of materials and substrates.

General

OptiLayer software operates in any spectral range and angular range. The number of grid points in spectral and angular ranges are practically unlimited. For convenience there are two main modes of the software: spectral mode and angular mode. In both modes, targets and measurement data can be

specified over both spectral parameter and angular domains.

Spectral parameters can be specified in micrometers, nanometers, angstroms, inverse centimeters, electron volts, terahertz or gigahertz. Angular parameters are to be specified either in degrees or in radians. For X- ray applications it is possible to set grazing incidence angles instead of standard incidence angles.

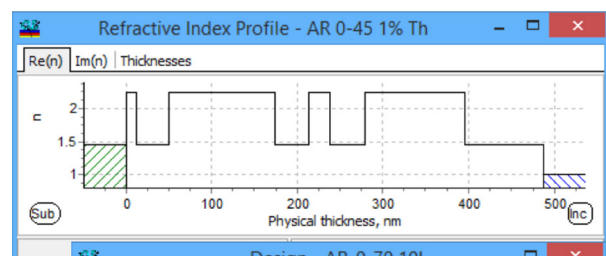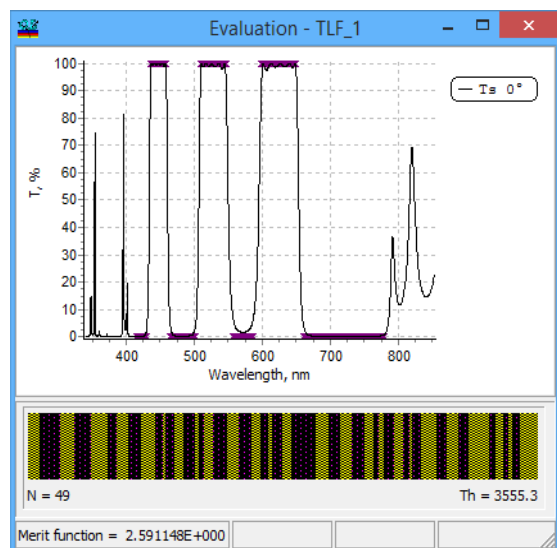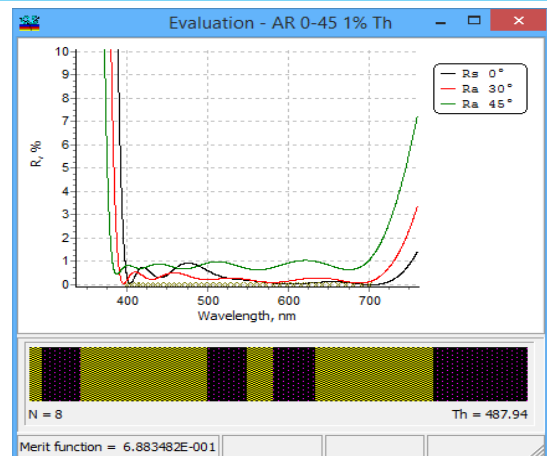OptiLayer allows designing absolutely all types of optical coatings:
- Anti-reflection coatings: narrow band, broad band, single or multiple band, omnidirectional,
- High reflectors,
- Mirrors: cold and hot mirrors, dichroic mirrors, chirp and dispersive mirrors, ultrafast mirrors,
- Filters of all types: edge filters, band pass filters, narrow band pass filters, minus filters, notch filters, WDM filters, gain flattening filters,
- Beamsplitters with any split ratio,
- Polarizers,
- Color coatings, dichroic color filters,
- Rugate and quasi-rugate coatings,

and all other types of multilayers in accordance with desired spectral characteristics.

All modules of OptiLayer software store the data for specific problems in separately identified directories without mixing them up. At the same time, there are convenient options that allow the transferring of data files between various directories. OptiLayer provides a Catalog that contains optical constants of optical glasses and thin film materials as well as standard light sources and detectors. Catalog data is accompanied by comments pointing out data sources.

Input options

All modules of OptiLayer software have a set of original editing options which enable convenient and fast input of numerical and symbolic data. These options include

- linear and nonlinear grid generators,
- column editor allowing fast generating of data in columns,
- copying, inserting and deleting options,
- pages editor allowing generating of large arrays

of data specified over spectral and angular domains,

- universal import options allowing easy input of numerical data from two-column data files and from any external ASCII file,
- copy-paste data sets using Windows clipboard.

OptiLayer software supports data acquisition from the data files of different formats used in well-known spectrophotometers and ellipsometers. There are also special options for the data exchange with many commercial thin film software and with the main lens design programs. It is required pushing only one button to import data from:

- Perkin Elmer,
- JCAMP-DX,
- Woollam,
- Agilent Cary,
- Sopra,
- Horiba,
- Sentech,
- SPEKTRUM,
- Leybold monitoring spreadsheets,
- TFCalc,
- Essential Macleod,
- FilmStar,
- ZEMAX

A wide choice of import options makes OptiLayer compatible with all commercial and home made software packages.

Graphical options

Graphical options of OptiLayer software meet all modern demands. It is possible to:

- control the display and appearance of all chart elements,
- label area, line, and data point elements,
- control the scale and appearance of various types of axis,
- control the positioning and appearance of various titles, footnotes, and legends,
- compare spectral characteristics related to different designs and much more.

Output options

Results obtained by OptiLayer are presented in a
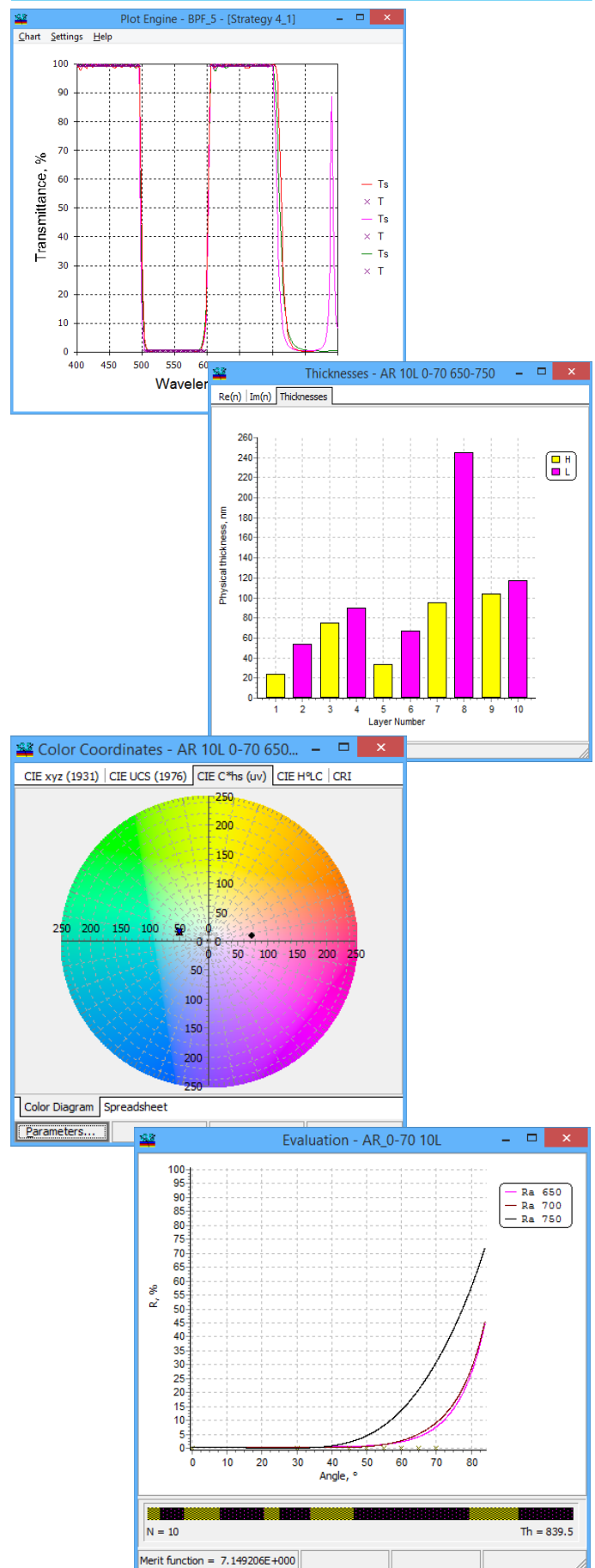
graphical form and in the form of various reports containing numerical data and detailed text comments related to these data. It is possible to print and save all chart windows and reports. Chart windows can be saved as

- *.VTC2 files (this format is used by the powerful OptiLayer graphical add-on Plot Engine).
- Various graphics formats including BMP, JPG, WMF, PCX, GIF, TIFF, PNG, EPS, SVG, VML and PDF.

Chart data can be saved in Text, XML, HTML, and Microsoft Excel formats. Reports can be saved as ASCII files or exported directly to Microsoft Excel.

OptiLayer can directly export any obtained results to main lens design and other widely used software packages such as ZEMAX, CODE V, FRED, OPTIS SPEOS, OpTaLiX.

OLE (Object Linking and Embedding) is supported by the powerful stand-alone OptiLayer utility Plot Engine.

Analysis options of OptiLayer

OptiLayer can evaluate a large variety of optical coating characteristics:
- reflectance, transmittance, absorptance for s-polarized, p-polarized and non-polarized light,
- phase shifts on reflection and transmission for s- and p- polarizations,
- differential phase shifts on reflection and transmission,
- group delay (GD) and group delay dispersion (GDD) for the transmitted and reflected light,
- user-defined characteristics, for example, difference between s- and p-polarized reflectance/transmittance,
- ellipsometric angles psi and delta,
- electric field distribution inside of the coating,
- admittance diagrams.

All characteristics can be evaluated from front and back sides of the substrate.

It is possible to calculate color coordinates and all other color characteristics of a coating with an arbitrary light source and detector in the reflected or
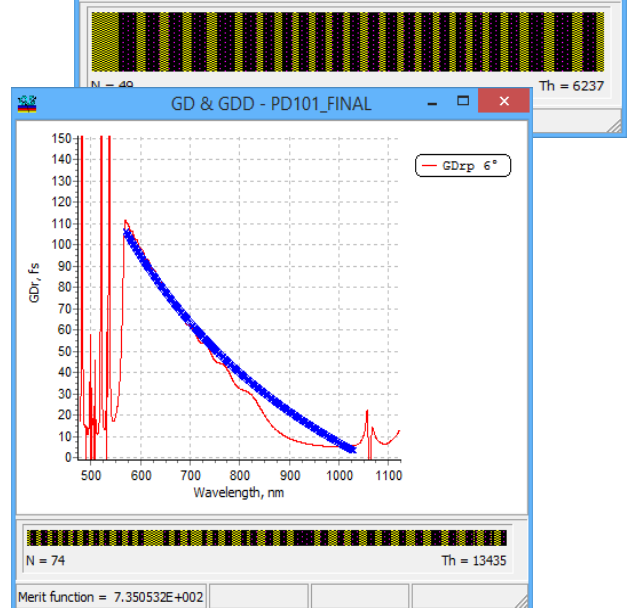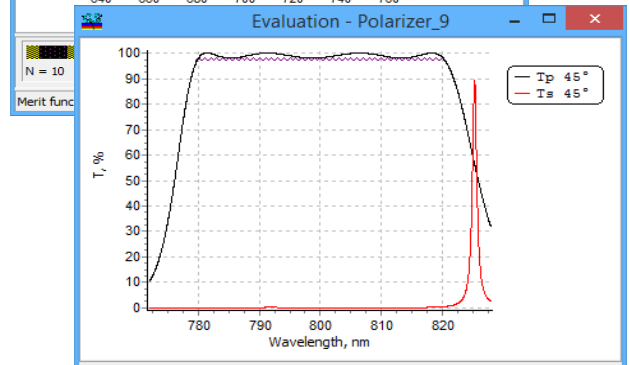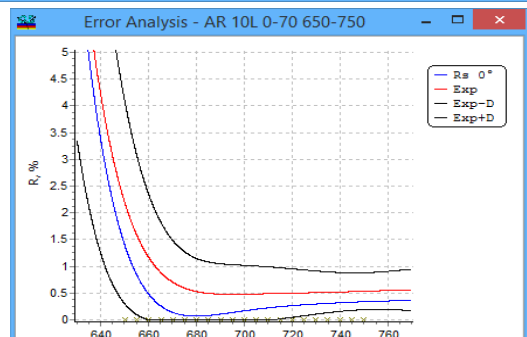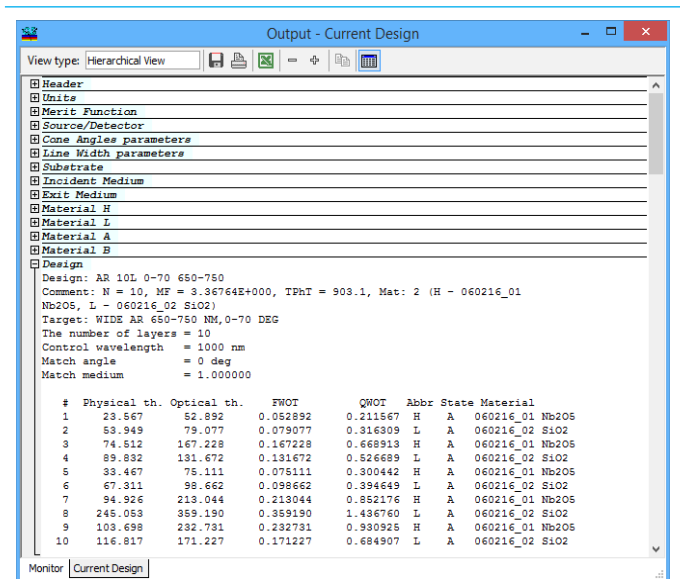
transmitted light of arbitrary polarization using almost all existing color coordinate systems: CIE XYZ 1931, CIE YUV (UCS 1960), CIE YU'V' (UCS 1976), CIE LUV, CIE LAB, Hunter Lab, Dominant/Complimentary wavelengths and Excitation purity.

OptiLayer provides color diagrams corresponding to various color coordinate systems: CIE xyz (1931), CIE UCS (1976), CIE C*hs(uv) and CIE H⁰LC diagrams. A flexible interface allows switching between color diagrams and spreadsheets containing numerical values of corresponding color coordinates. It is possible to depict trajectories of color coordinates on the diagrams for a specified angular range.

OptiLayer can calculate Correlated Color Temperature (CCT) and Color Rendering Index (CRI). It is possible to specify up to 14 test samples for CRI evaluation. Color analysis with CIEDE2000 color difference formula can be also performed.

Due to the implementation of sophisticated mathematical algorithms OptiLayer is the only thin film software that can accurately evaluate and design coatings with group delay and group delay dispersion characteristics. It makes OptiLayer to be an extremely powerful tool in the area of ultrafast coatings (dispersive mirrors, output couplers, etc). These options also provide powerful capabilities for thin film WDM technologies connected with 40 Gb/s and Tb/s applications.

Together with the outstanding design capabilities, unique WDM analysis options make OptiLayer the most superior tool for new developments in WDM technologies.

OptiLayer allows evaluation of spectral characteristics of a sequence of substrates/medium with optional coatings at each boundary between them. Each substrate/medium can be parallel (all reflections are taken into account) or wedged (reflected light is going away from the optical path of the system and is not taken into account).

Evaluation modes of the program are accompanied with a set of other convenient options. There are opportunities:
- to average coating characteristics over arbitrary spectral or/and angular ranges,
- to find minimum and maximum values of various
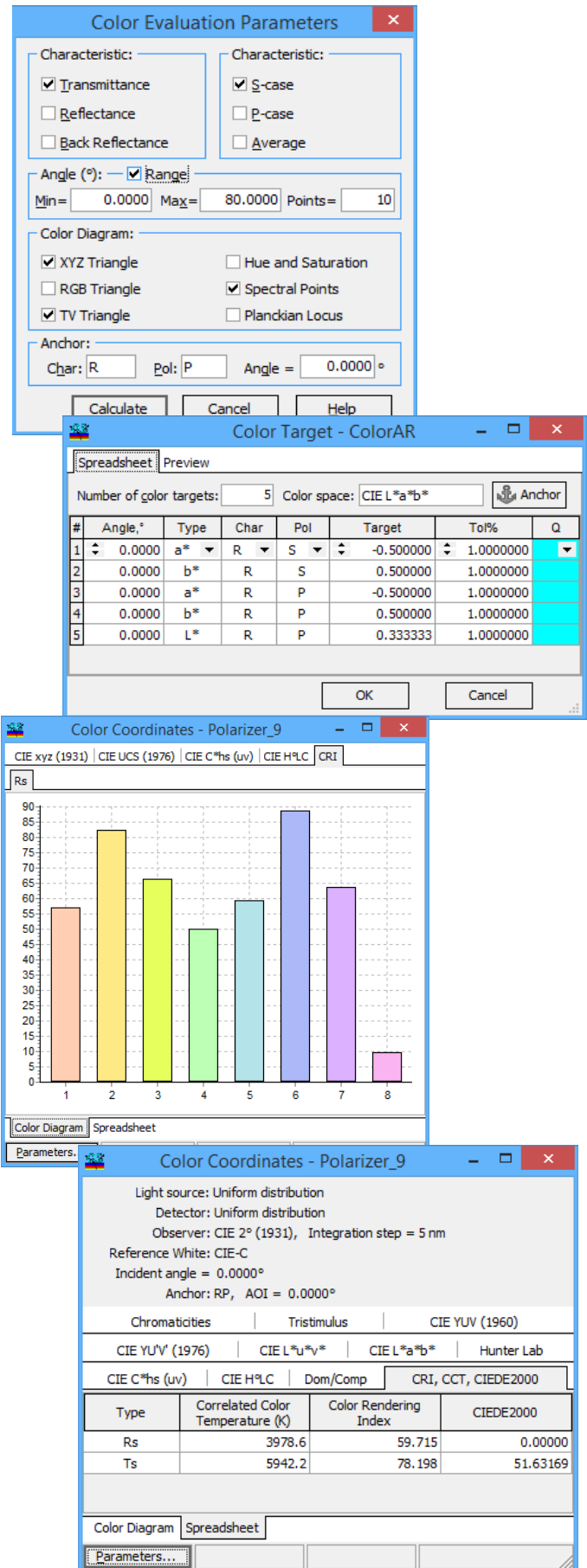
characteristics in a specified spectral or/and angular ranges,

- to calculate weighted integral values of spectral characteristics for a set of widely used spectral weight functions or for user-defined weight functions,
- to pick out exact numerical values from the evaluation plots at arbitrary points,
- to change the number of evaluation plots and their chart appearance in the most convenient way,
- to open several independent evaluation windows for plotting coating characteristics in various scales and various ranges.

OptiLayer presents:
- admittance diagrams,
- plots of the electrical field inside a coating,
- plots of refractive index and extinction coefficient on physical/optical thickness,
- refractive index profile in bar diagram form.

Pre-production error analysis options

OptiLayer has a set of powerful options for the pre-production error analysis of optical coatings. It is possible to evaluate effects connected with:
- errors in layer thicknesses,
- errors in layer refractive indices,
- inhomogeneity of coating layers,
- interface roughness,
- systematic parameters deviations connected with the inaccuracy of monitoring calibration.

OptiLayer can evaluate a sensitivity of each coating layer to errors in parameters of this layer and rank coating layers according to their sensitivity to errors. OptiLayer makes it possible to perform pre-production estimations of expected errors in thicknesses of layers of optical coatings when direct broadband or monochromatic optical monitoring is used for their production.

OptiLayer is the only thin film software that has special options for estimating expected production yields of a given design. Special range targets are used for yield estimations. These targets specify acceptable tolerances of spectral characteristics when various types of production errors are considered.
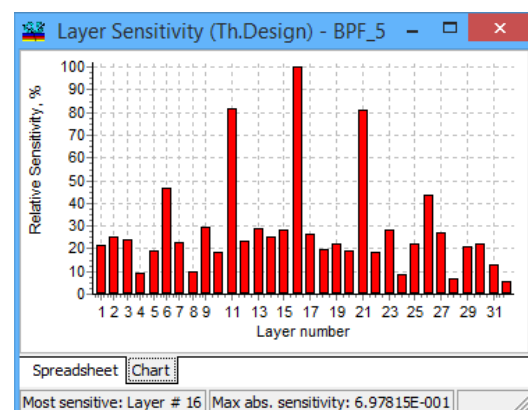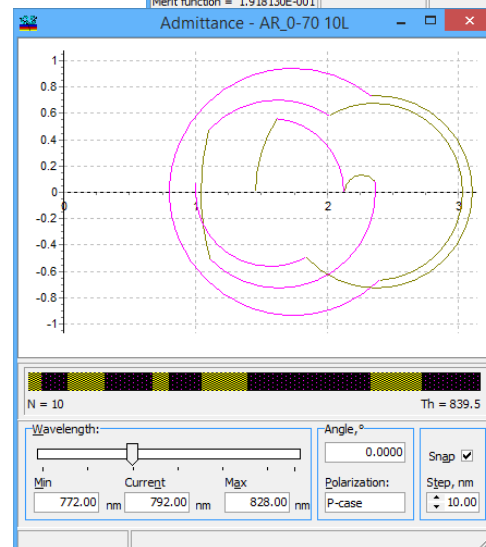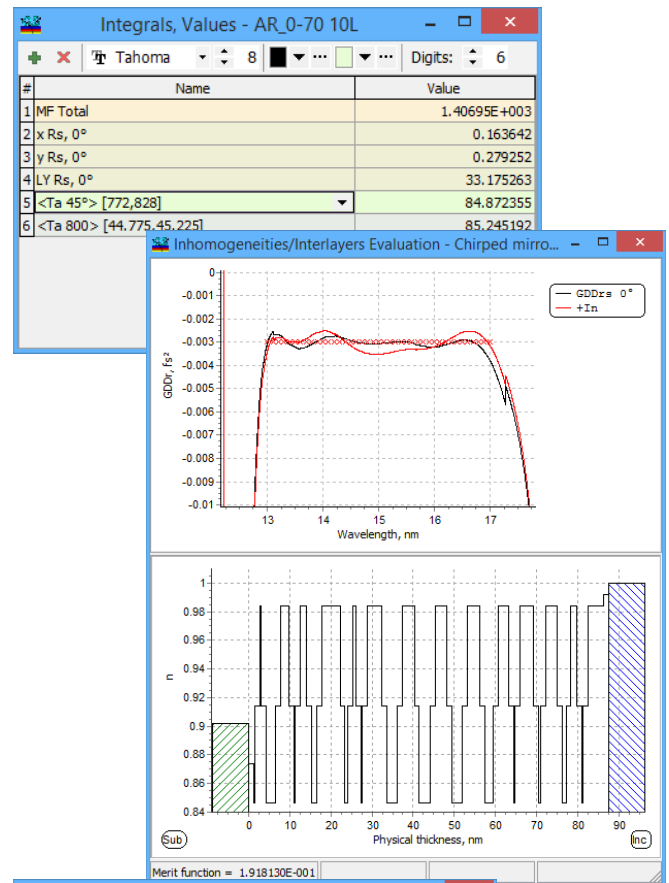
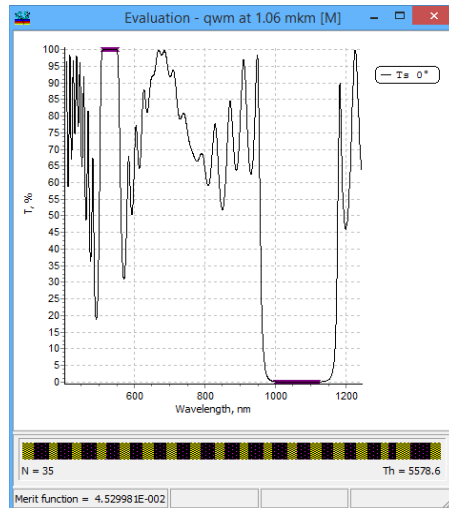## Design options of OptiLayer

Outstanding design capabilities of OptiLayer are provided by a flexible combination of various design approaches with the needle optimization technique. OptiLayer incorporates the unique know-how that is inaccessible to other thin film programs.
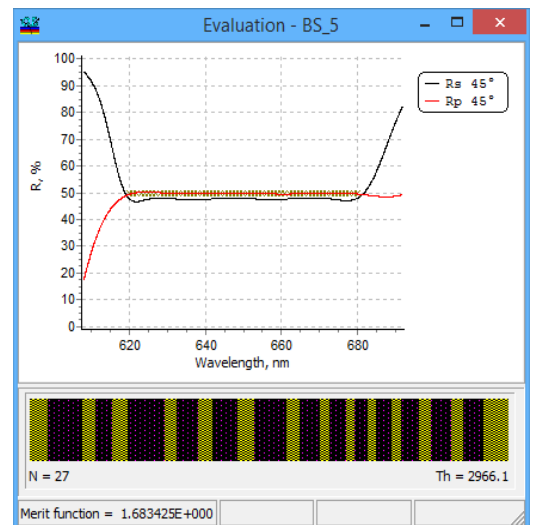
Design modes of OptiLayer can explore targets of four different types. These are Conventional targets, Integral targets, Color targets, and EFI (Electric Field Intensity) targets. Conventional targets include all possible spectral characteristics, such as reflectance, transmittance, various phase characteristics, etc. They also include almost arbitrary user-defined targets that can be composed using various combinations of coating spectral characteristics. Integral targets allow specifying a large number of additional target demands expressed as integral values of coating spectral characteristics, for example, as weighted average characteristic values over specified spectral regions. Color targets provide almost unlimited opportunities for specifying demands to coating color characteristics. EFI targets allow designing coatings with additional demands to the electric field intensity inside coating layers.

Refinement modes of OptiLayer use the most powerful first, second, and higher order optimization routines. OptiLayer is the only one thin film software where all optimization routines are based on analytic algorithms for computations of gradients and Hesse matrices of merit functions. These algorithms belong to the unique know-how of OptiLayer developers. They provide the eminent convergence rate and accuracy of the OptiLayer refinement algorithms.

The Needle Optimization AUTO algorithm provides solutions of the most complicated design problems even if an optical coating designer has very small experience. The manual Needle Optimization mode meets the requirements of the most sophisticated designer and enables an effective application of design expertise. The choice of a starting design is not critical for the needle optimization design procedure. It is possible to start the procedure with an arbitrary starting design, for example, a single layer. An important parameter is the overall optical thick-

ness of a starting design. By increasing this thickness it is possible to obtain a set of designs having increasing numbers of layers and decreasing merit function values. This allows optical coating designer to select practical designs and to find a balance between the number of design layers and the merit function value.

The Gradual Evolution algorithm of OptiLayer automatically generates a sequence of design solutions even without using any starting design at all. These solutions have various combinations of merit function value MF, number of design layers N, and design total optical thickness TOT. These parameters are reflected in a special History window. Optical coating designers can select designs with the best combination of MF, N, and TOT values according to their specific demands.

OptiLayer combines unprecedented design capabilities with wide opportunities for selecting the most practical design. These opportunities are provided by additional specialized design algorithms and a set of auxiliary options for improving design feasibility properties. The Random Optimization algorithm allows obtaining multiple designs with close combinations of MF, N and TOT. The best designs generated by the Random Optimization mode are stored in a special Collection database and can be easily extracted from it.

Thin Layer Removal and Design Cleaner procedures allow eliminating thin layers from the designs and reducing the number of layers.

A special design feature Trapping is also aimed at improving design feasibility by implying limits to layer thicknesses. If this feature is active, then thickness of any design layer once getting inside specified thickness limits will stay inside these limits forever. This allows preventing the growth of some layers above a reasonable limit as well as preventing an increase of the number of thin layers during coating designing.

Inhomogeneity/Interlayers Refinement option enables designing of coatings with taking into account the refractive index dependence on layer thickness and the interface roughness of coating layers. This
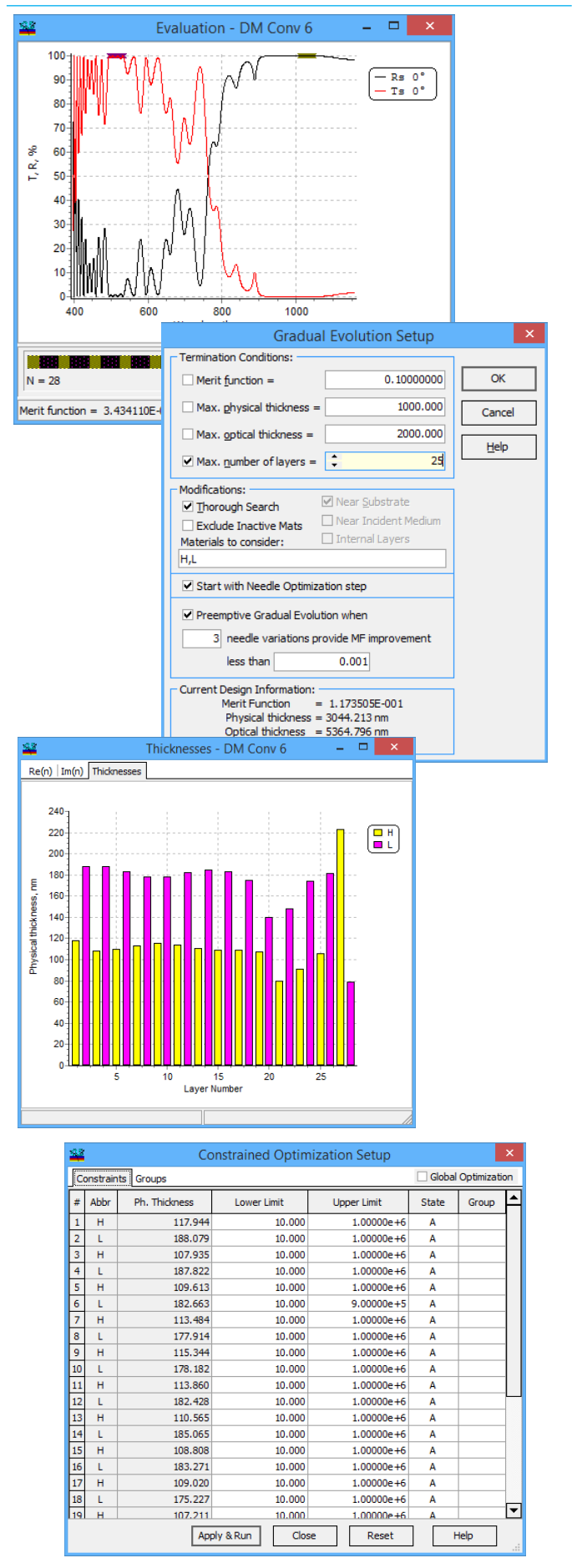
option provides new opportunities for the designing of super quality optical coatings for UV-Visible-Near IR spectral regions and coatings for EUV and X-ray applications.

The Inhomogeneous Refinement algorithm is useful for solving specific optimization problems, for example, for the design of gain flattening filters or complicated multiple lines filters for medical applications.
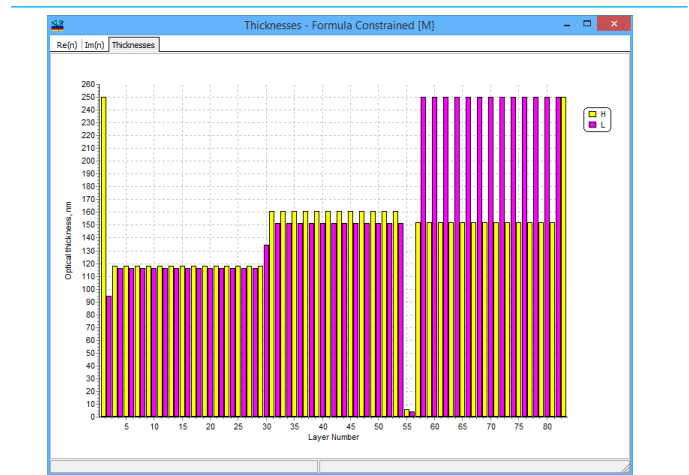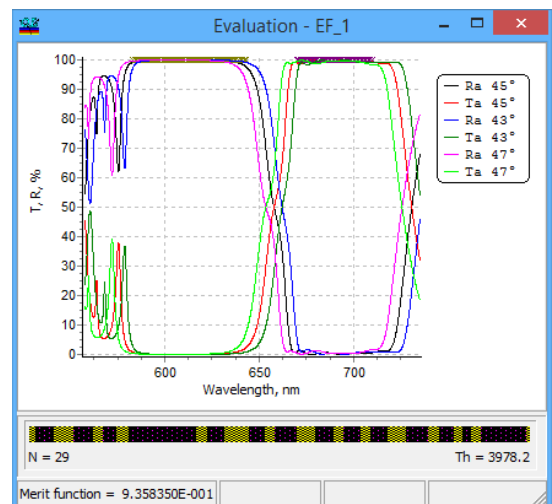
A new Sensitivity-Directed Refinement algorithm gives possibilities to synthesize filters consisting of quarter-wave stacks and near quarter-wave stacks in the case of edge and blocking filters design problems.

Specialized Rugate and Constrained optimization algorithms are powerful tools for designing coatings with very special spectral properties, for example, high reflectors with extended transmission zone and reduced sidelobe reflectance ripples.

Formula Constrained Optimization algorithm enables designing of coatings specified in a design formula format. This option is aimed at providing design opportunities that were traditionally connected with the design approaches based on the equivalent layers theory.

OptiLayer allows designing coatings with specified color target properties. The target color coordinates may be specified in all existing color coordinate systems. In the course of the design process light source and detector are taken into account. Color diagrams track color coordinates of the current design. OptiLayer suggests a choice of reference white points and provides an opportunity to create own reference white points. It is possible to specify requirements for minimal relative change of color between some color calculated at a given angle and other parameters and the current color. For this purpose the Anchor Color concept is used.

There is a special OptiLayer option aimed at designing WDM filters. The basic ideas of this option belong to the unique know-how of OptiLayer developers and are not accessible for other thin film software. This option combines the most powerful classical design ideas with the specific integer pro-

gramming optimization approach. Available theoretical knowledge is utilized in the form of a simple interactive dialog which enables creating a filter prototype according to the desired filter specifications. The final design with excellent transmittance properties in the high transmission zone is obtained by an effective OptiLayer optimization routine. The WDM filter option can be also successfully used for designing conventional narrow band pass filters.

OptiLayer allows designing stacks – combinations of substrates/media with optional coatings – at each boundary between them. For this purpose all design techniques can be used.
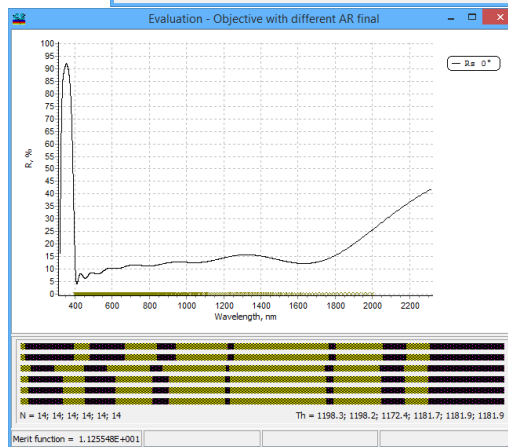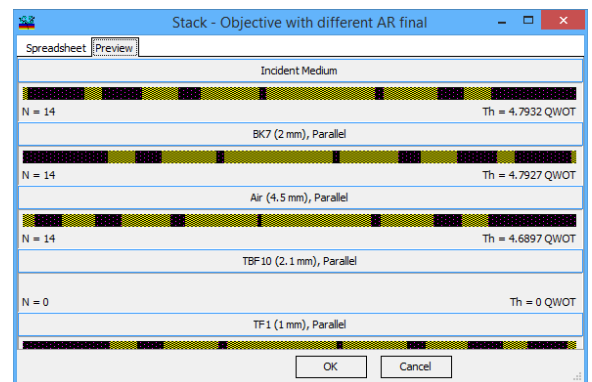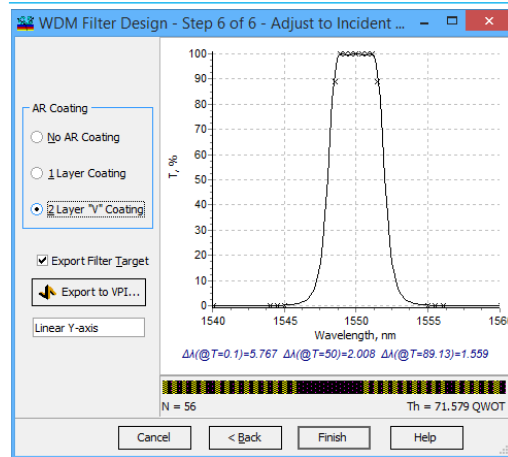
Trough flexible Environment Manager, OptiLayer gives an opportunity to design a coating for several environments simultaneously. For each environment, it is possible to define different targets, materials, light sources, detectors, incident media, substrates, the state of back side, substrate thickness, and the presence of a back side coating.

A new feature of OptiLayer - Taper - allows taking into account thickness non-uniformity in the course of the design process. It is possible to specify up to 32 coefficients which enable to control distribution of thicknesses in the deposition chamber. The option is effective in the case of large area deposition.

OptiLayer provides robust versions of all algorithms (refinement, needle optimization, gradual evolution, etc). Robust versions of the algorithms allow finding solutions stable with respect to errors in optical parameters of layers. It is possible to specify levels of thickness errors as well as systematic and random errors in refractive indices.

OptiLayer records results obtained at different steps of the design procedure in a special database. This feature adds flexibility to the design process because it allows one to easily return to the previous steps of the design process and to apply other design approaches.

Computational power of OptiLayer design algorithms and a set of design tools are permanently growing and it is far superior as compared to the performance of other programs. What OptiLayer can

do in a few seconds will require days of computations with other thin film software or will be never achieved at all when using other programs.
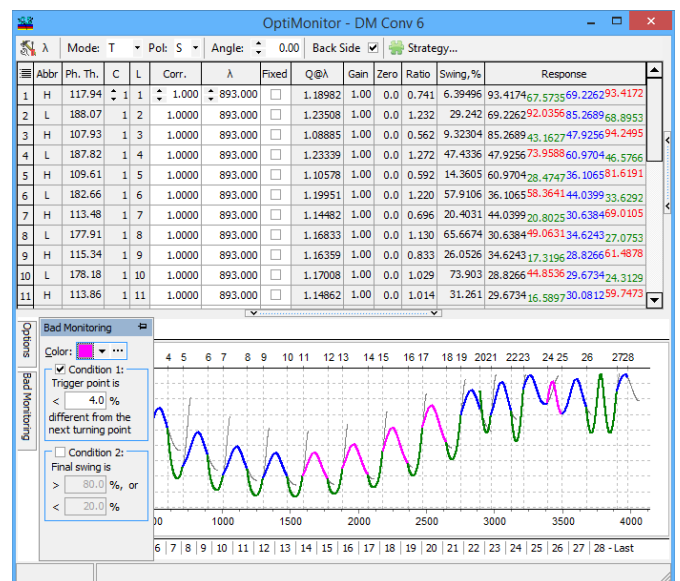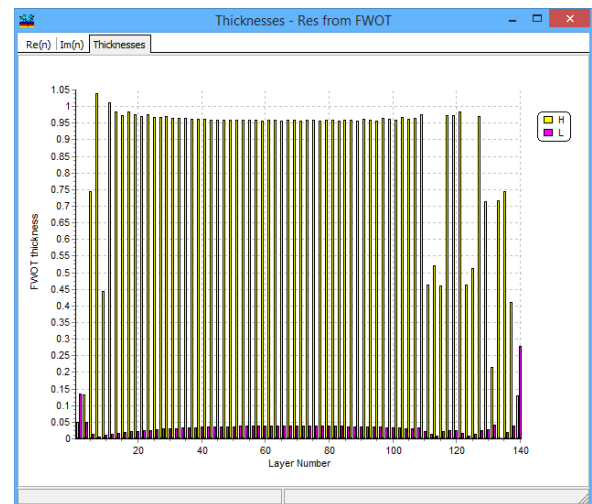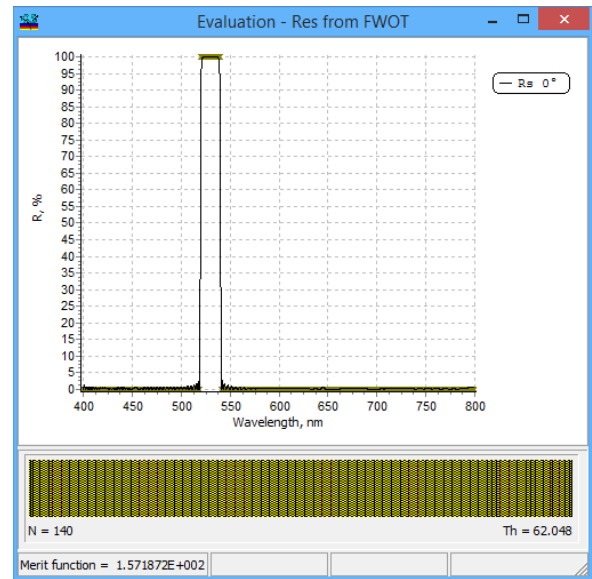
Optical monitoring options

OptiLayer has a flexible option for generating monitoring spreadsheets corresponding to all types of direct and indirect monochromatic optical monitoring. Convenient graphical interface and a set of auxiliary options help an optical coating engineer to choose monitoring wavelengths for various coating layers. As soon as a monitoring wavelength for a layer is chosen, respective starting monitoring level, monitoring signal extrema, swing and termination level are immediately updated in the monitoring spreadsheet.

Generating of monitoring spreadsheets for optical coating designs is a sophisticated task requiring a lot of practical experience. In order to minimize the number of monitoring wavelengths as well as to take into account many years of experience related to monochromatic monitoring, a really breakthrough innovative automatic option for generating monitoring spreadsheets is introduced. The new option provides monitoring spreadsheets that :

- Take into account demands for the smallest number of switches between monitoring wavelengths in the course of the deposition process;
- Satisfy specified input and output signal swing values;
- Satisfy conditions on specified signal amplitudes (differences between signal maxima and minima);·
- Satisfy conditions on the distance from the trigger point to the next turning point.

The automatic generator of monitoring spreadsheet is supplemented by the option that allows revealing layers with bad monitoring conditions when spreadsheet generation is over.

OptiLayer proposes also other options aimed at an automatic generation of monitoring spreadsheets, for example, a monitoring strategy based on the choice of the most sensitive monitoring wavelengths or a monitoring strategy aimed at minimiz-

ing a cumulative effect of thickness errors.

## Computational manufacturing options

Computational manufacturing is the most powerful tool for a pre-production study of design feasibility. Computational manufacturing experiments simulate production runs in the cases when broadband and monochromatic optical monitoring techniques are employed. Due to the extremely efficient mathematical algorithms these experiments can be performed hundreds and thousands times faster than real deposition runs. This opens a way for minimizing test deposition runs required for starting production of new types of optical coatings or for selecting the most stable design solutions. All computational manufacturing settings have convenient and flexible dialogs.

Computational manufacturing options of OptiLayer enable estimating expected production yields and revealing design layers where accurate monitoring is especially critical for successful production.

In the course of computational manufacturing experiments typical error factors responsible for the inaccuracies of deposition process can be simulated. These factors include:
- instabilities of deposition rates,
- random and systematic errors in terminating layer depositions (shutter delays),
- deviations of layer refractive indices inside a deposition chamber from their theoretical values,
- inaccuracies of refractive index wavelength dependencies,
- inhomogeneities of deposited layers,
- noise in measurement on-line data,
- fluctuations of monitoring signals in time,
- calibration drifts of monitoring devices.

OptiLayer has a set of options specifically aimed at the pre-production analysis of WDM filters and narrow band pass filters with quarter-wave and multiple quarter-wave layer optical thicknesses. Respective computational manufacturing experiments simulate optical coating production with turning point optical monitoring. It is possible to estimate and compare production yields of various WDM designs.
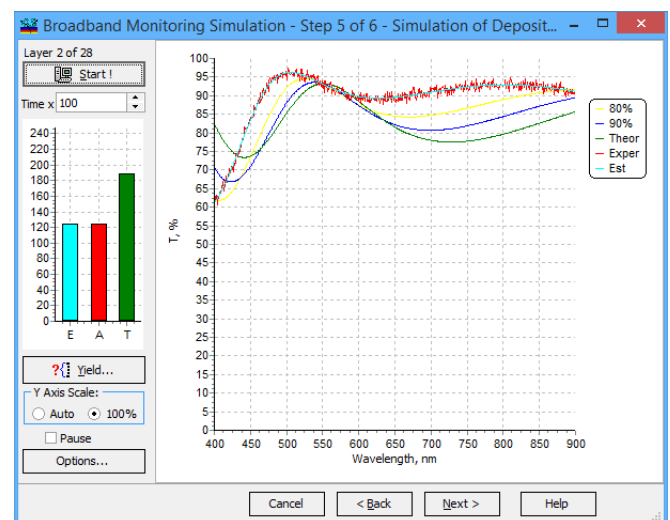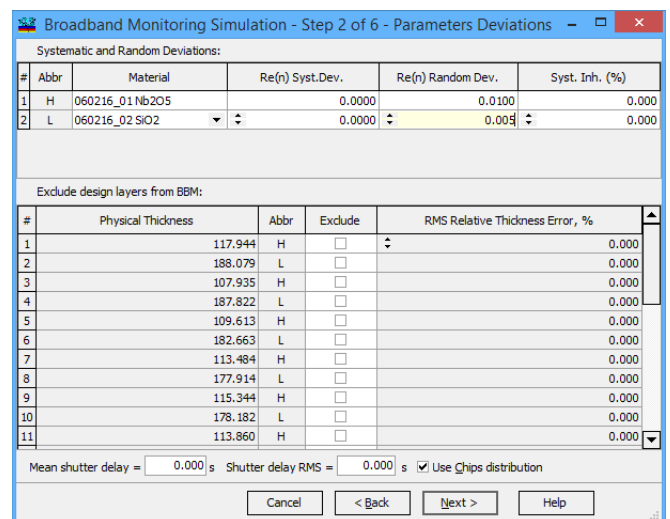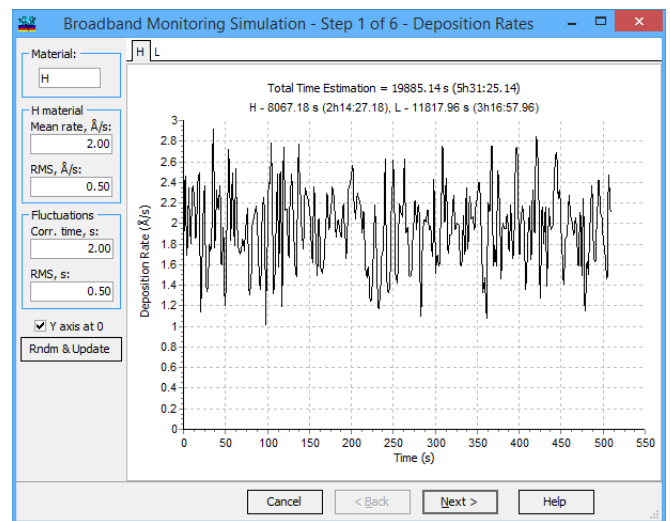
Characterization options of OptiChar

The OptiChar module of OptiLayer software is elaborated for the optical characterization of single thin films on the basis of spectral photometric and/or spectral ellipsometric data. Measurement data from all widely used spectrophotometers and ellipsometers (Agilent Cary, Perkin Elmer, Woollam, etc.) as well as from two-column data files and from any ASCII file can be easily imported to OptiChar.
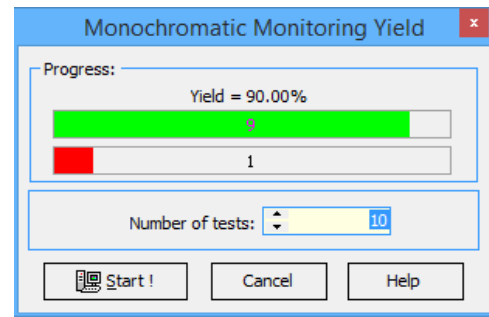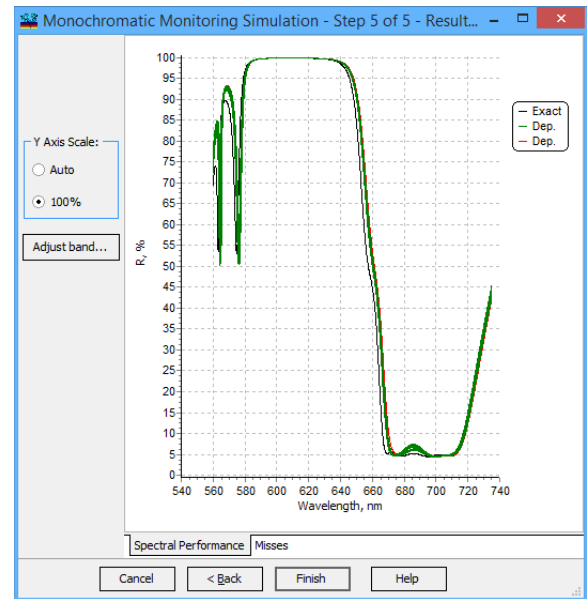
OptiChar provides diverse and flexible characterization options based on special mathematical methods. Convenient and user-friendly interface allows even beginners to be easily involved in the characterization process and obtain detailed and reliable information about the investigated thin film.

Using OptiChar it is possible to characterize:
- dielectric films,
- metal films,
- metal-dielectric composites,
- ITO, TCO films,
- mixture films.

OptiChar provides a set of models for thin films. The set includes models of absorbing and non-absorbing films, various well-known wavelength dependencies of the refractive index and extinction coefficient. It is possible to specify the limits for thin film parameters according to *a priori* information about optical parameters of the investigated film. The Layer Refinement option allows refining the results of the characterization procedure when the input measurement data are slightly changed or when a good approximation to the film parameters is already available.
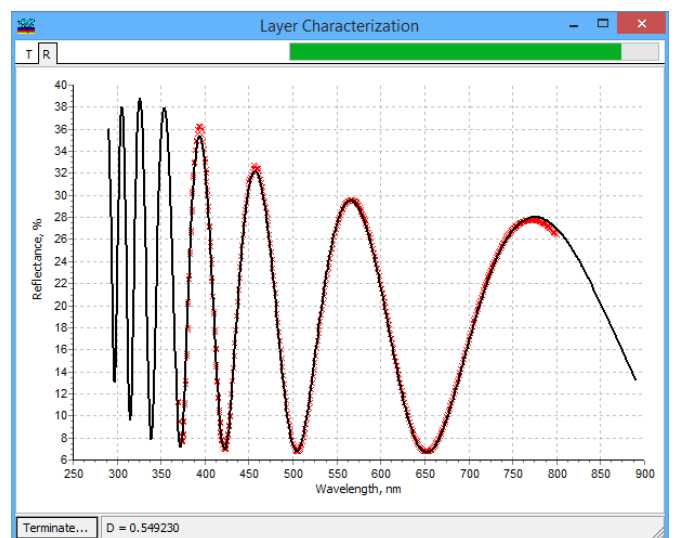
OptiChar is the only characterization software that provides a unique non-parametric model for wavelength dependencies of refractive indices and extinction coefficients. This non-parametric model of OptiChar is especially useful for complicated characterization problems, when optical constants wavelength dependencies cannot be described by simple models. The model can be applied for the characterization of thin metal films, metal-dielectric composites, ITO films etc. This model should be applied in

the cases when characterization is performed in the broad band spectral ranges.

Two options of the program, Bulk Inhomogeneity and Surface Inhomogeneity, allow studying dependencies of layer refractive indices on film thickness. In the simplest cases, it is possible to find a degree of bulk inhomogeneity and thickness of surface overlayer. Studying more accurate thickness dependencies of optical constants is also possible.

Porosity option and Mixture option allow considering the investigated thin film in the frame of effective medium theories. Porosity option allows determination of film packing density. Mixture option helps to find ratios of the materials forming the thin film.

In the case of ellipsometric characterization, depolarization factors may be taken into account. This provides an opportunity to use measurements taken without special preliminary preparation of thin films samples.

OptiChar allows characterizing not only thin layers but also substrates. Substrate Characterization option provides a choice of the same set of models as for thin films.

Total losses plot presenting 100%-R-T data helps to make conclusions about the presence of absorption in the film as well as to estimate the accuracy of measurement data.

It is possible to compare on the same plot optical constants obtained in the course of the characterization process with optical constants taken from the Catalog or from any problem directory. Of course, it is possible to save the obtained optical constants in the layer materials database for further use.

Partial Discrepancies plot shows the deviations between experimental and model data. These plots are especially useful in the case of ellipsometric characterization because the Delta angle typically varies in the wide angular ranges.

OptiChar allows flexible operating with measurement data sets. The Modify Measurements and Add
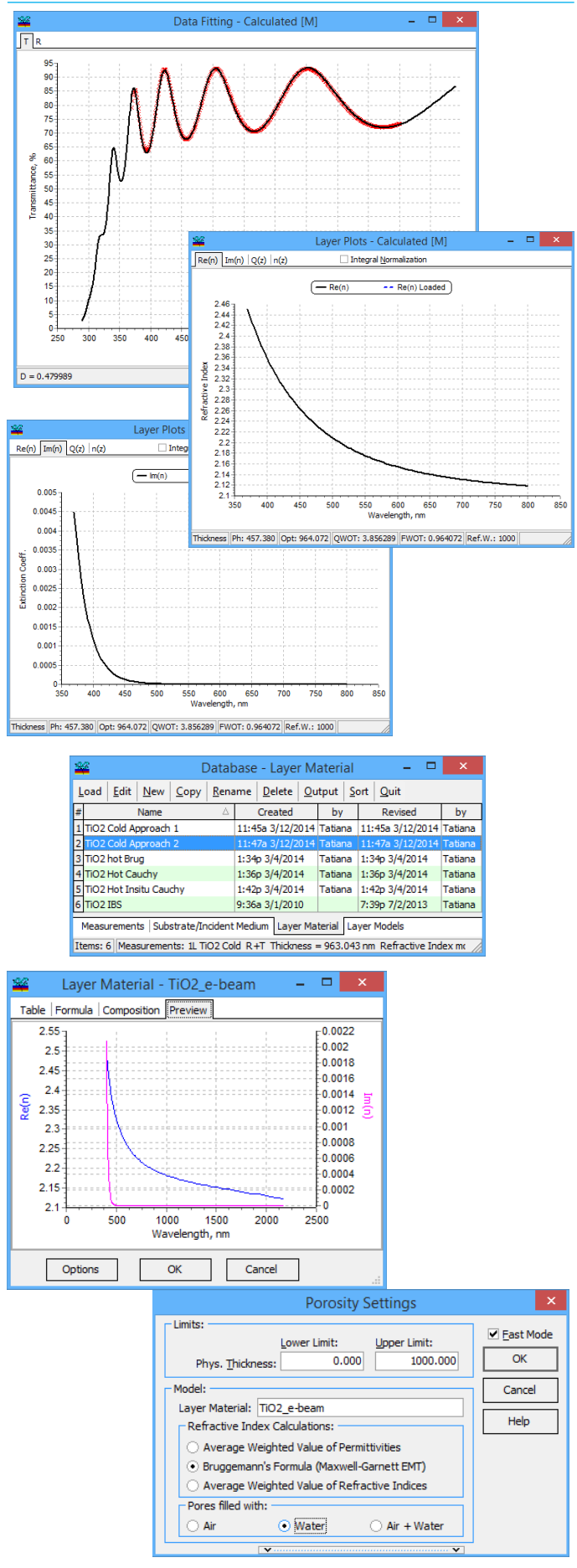
to loaded options allow combining different data files. Preprocess Measurements Data option allows transformations of the measurement data loaded to the memory. It is possible to cut data from questionable spectral ranges, to decrease the number of spectral points, to set tolerances and to normalize data with respect to the substrate.

Characterization and reverse engineering options of OptiRE

OptiRE is intended for the reverse engineering of optical coatings based on spectral photometric and/ or ellipsometric data. Post-production measurement data from all widely used spectrophotometers and ellipsometers (Agilent Cary, Perkin Elmer, Woollam, Horiba etc.) can be easily imported to OptiRE. It is also possible to analyze on-line broadband and monochromatic measurement data recorded in the course of optical coating production by respective monitoring devices. Special OptiRE options provide input of on-line broadband measurement data recorded after depositions of subsequent coating layers (Multi-Scan Measurements option) and on-line monochromatic measurement data (Response Data option).

Reverse engineering of produced optical coatings is an important element of modern design-production chains because it provides a feedback for the deposition process. The main purpose of OptiRE is to discover systematic and random errors in layer parameters of deposited coatings and thus to raise the quality of optical coating production.

Systematic Errors option of OptiRE performs a search for systematic errors in layer thicknesses. Results obtained with this option are presented in the form of "correction factors" to the theoretical thicknesses of layers of each particular material. This option is especially convenient for the calibration of time monitoring, quartz crystal monitoring or indirect optical monitoring.

Indices Correction option is intended for the correction of nominal layer refractive indices specified in a theoretical coating design. For various reasons layer refractive indices in a multilayer stack may deviate from respective indices determined on the basis of
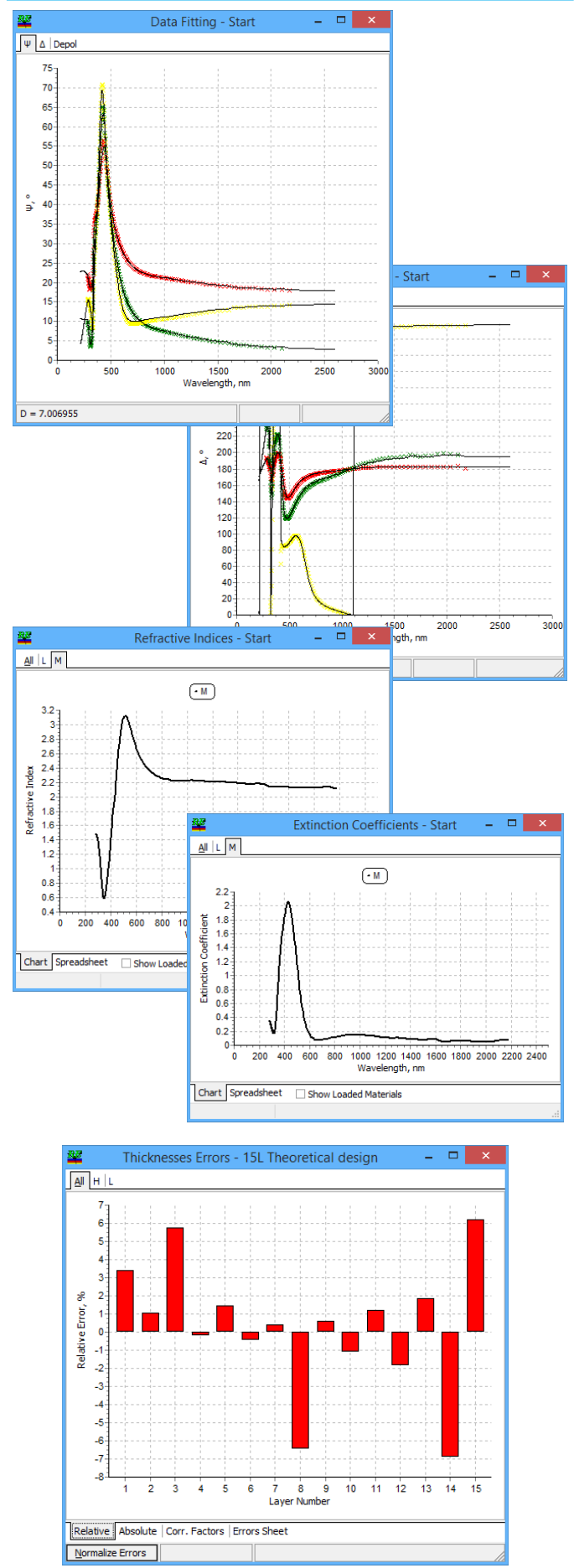
characterization of single layer samples and then used in optical coating designs. The Indices Correction option allows finding deviations of actual refractive indices from nominal ones as constant drifts (offsets) as well as linear and exponential drifts with respect to coating thickness. In the cases when there are doubts in the correctness of the refractive indices dispersion behavior, models describing layer refractive indices are to be specified and its parameters are to be found in the course of the reverse engineering procedure.

Random Errors option performs a search for random errors in layer thicknesses. This search is a multi-parametric inverse problem whose solution may be unstable and non-unique. Special mathematical algorithms of OptiRE presented in the convenient user-interface form allow obtaining reliable results.

Quasi-Random Errors option of the program combines the features of Systematic Errors and Random Errors options. These algorithms take into account possible correlations between errors in thicknesses of layers of each particular material.

OptiRE allows investigating inhomogeneity of layers of any particular or all used materials. In some situations it is absolutely necessary to take into account layers inhomogeneity because neglecting of the related effects essentially decreases an accuracy of the reverse engineering procedure.

Advanced OptiRE options allow simultaneous search for errors in layer thicknesses as well as layer refractive indices and degrees of inhomogeneity. This option can be applied in the most complicated reverse engineering problems.

All spectrophotometric devices feature some instability, and measurement data can drift after performing a measurement calibration. To correct for possible errors associated with this effect, OptiRE can apply a special autocorrection procedure.

The results obtained by OptiRE algorithms are presented in the graphical form and in the corresponding spreadsheets. All obtained reverse engineering results are also presented in reports and can be saved or easily exported to Microsoft Excel. These
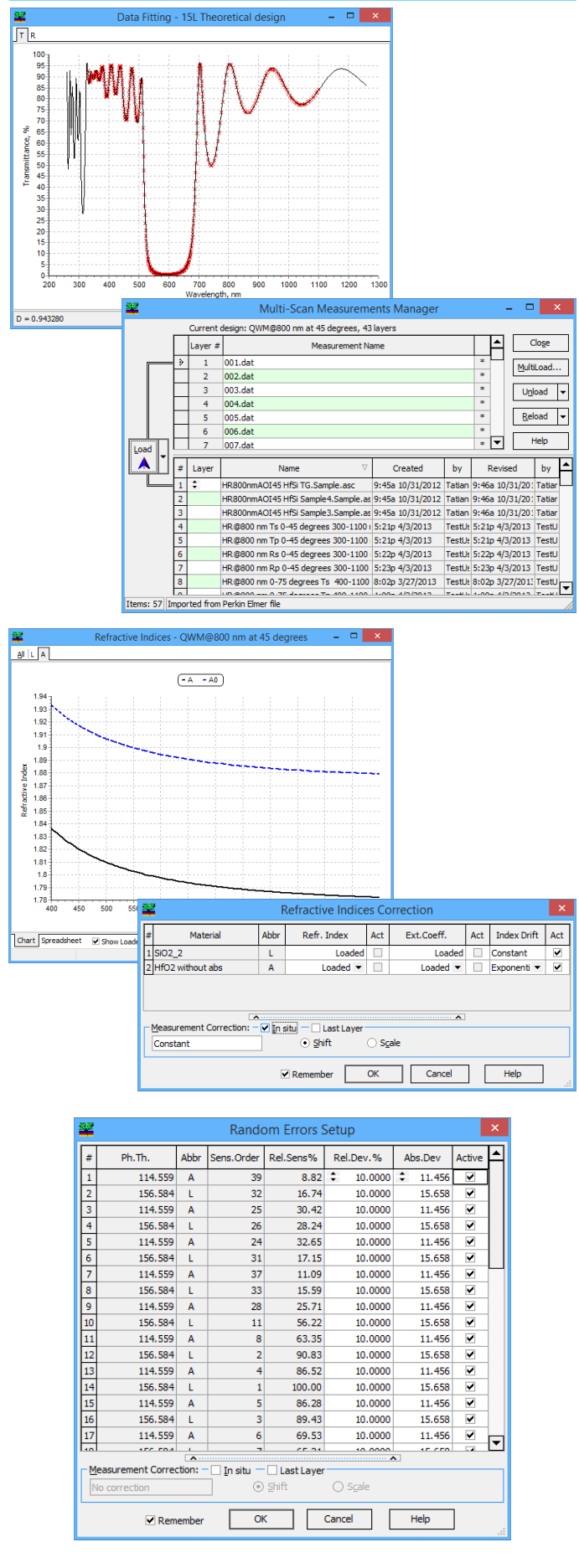
results may include errors in layer thicknesses, corrected refractive indices and extinction coefficients, degrees of inhomogeneity, achieved fittings of experimental data by model data.

OptiRE allows flexible operating with measurement data sets. Modify Measurements, Add to loaded and Preprocess Measurements Data options allows combining different measurement data, transforming the measurement data, cutting the data from undesired spectral ranges, decreasing the number of spectral points, setting tolerances and normalizing data with respect to the substrate.

OptiRE supports the modern software technology called Automation. This enables incorporating OptiRE in any production control software. Due to this technology OptiRE can be involved into the on-line control of manufacturing process.

It is possible to call OptiRE functions and get results back from any other program. The only requirement is to use a tool supporting COMautomation technology. It is possible to use Visual Basic, Visual Basic for Applications, Visual C++, C#, Embarcadero C++, Delphi, LabVIEW and many others.

The OptiLayer package is supported by corresponding examples in Visual Basic, Delphi and LabView which help optical coating engineers to start implementation of OptiRE to their design-production chains.

OptiReOpt library

OptiReOpt is specifically elaborated for a real-time support of optical coatings production in deposition plants equipped with on-line monitoring devices. OptiReOpt can be used for control of the layer thicknesses in the course of the deposition process. It can be also used for the on-line compensation of manufacturing errors.

OptiReOpt is arranged as a DLL (Dynamic Link Library) and therefore is able to be embedded into any environment supporting DLL calls. Among these environments are:

• Microsoft Visual Studio version 6.0 (C++, Visual
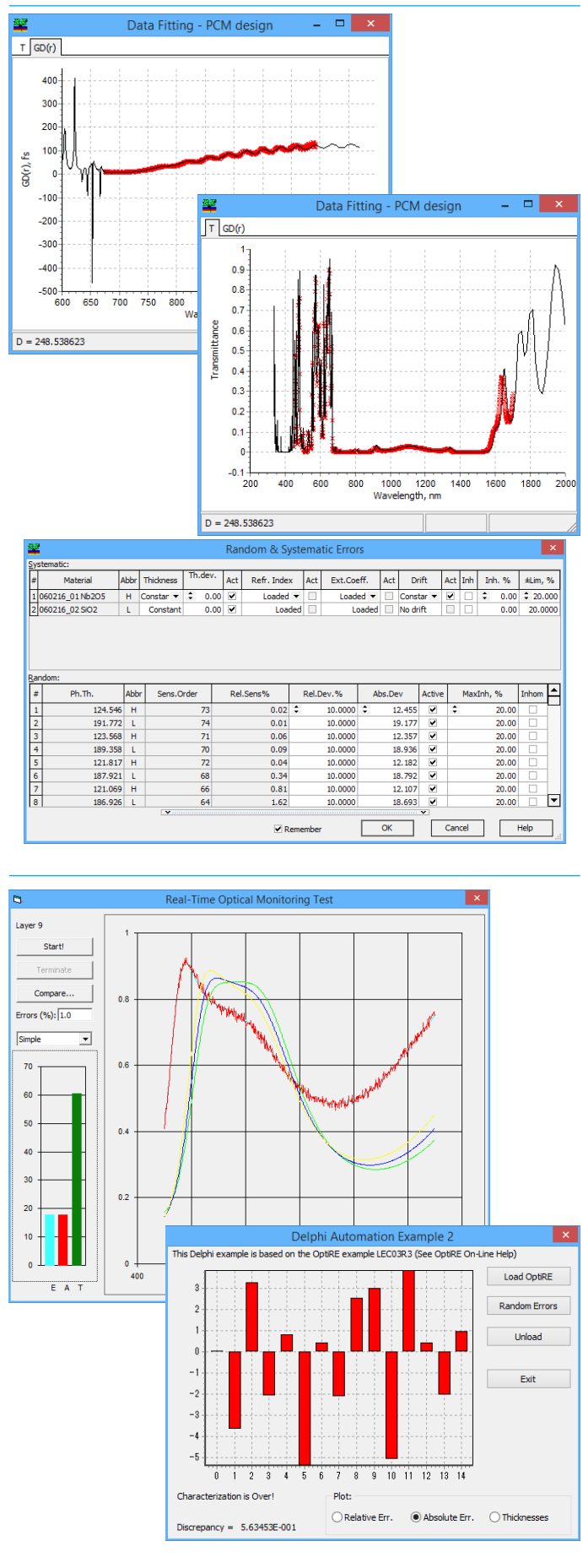
Basic)

- Microsoft Visual Studio .NET 2003, 2005, 2008, 2010, 2012, 2013 (C++, C#, Visual Basic)
- Borland, Embarcadero C++ Builder (any version)
- Borland Delphi (version 5.0 and higher), Embarcadero Delphi 2007, 2009, 2010, XE, XE2-XE6.
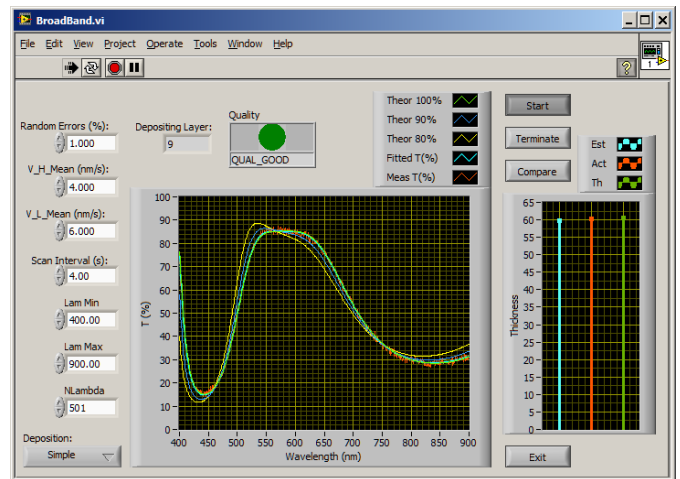- LabVIEW versions 5.xx - 8.xx and later.

Additional flexibility is achieved by COM interfaces that can be used for calling functions of the OptiReOpt module. COM interfaces add parameters checking which simplifies the development of a deposition process controlling software.

OptiReOpt can be used by any customer's control software supporting DLL calls at practically all deposition plants with any type of on-line spectral photometric and spectral ellipsometric devices. Special attention was paid to providing convenient OptiReOpt use in the LabView environment, because this software tool is often used for the implementation of deposition control software.

OptiReOpt DLL functions provide access to unique OptiLayer mathematical routines and due to this fact OptiReOpt exhibits an outstanding computational efficiency. Even in the case of coatings with dozens of layers computations are so fast that reliable determination of parameters of deposited layers and reoptimization of parameters of remaining layers does not require interrupting a deposition process.

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