SigFit

Release Notes
Version 2008-R1.1

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Warning: Use of this program is subject to the terms of the Demo Software Agreement or the Software Agreement agreed upon in writing with the User's authorized representative(s). Installation of this software indicates acceptance of the Software Agreement.

Technical Support

IMPORTANT: When contacting technical support please provide the following:

1. Your .sig file defining your SigFit analysis.
2. All files referenced by the .sig file. This includes FEA model files, FEA results files, OLOAD files, VECTOR files, etc.
3. The nature of the problem and the error you are seeing, if any.

Licensing Issues

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For more information about Sigmadyne visit our website at: www.sigmadyne.com.

The background theory used in SigFit is discussed in the following book & short courses:

Doyle, K., Genberg, V., Michels, G., **Integrated Optomechanical Analysis**, TT58, SPIE Press, October, 2002.

Integrated Optomechanical Analysis short course available from Sigmadyne, Inc.

SigFit short course available from Sigmadyne, Inc.

1 Summary

Version 2008-r1.1 includes the following new features: (see section 3)

1) x86_64 build
2) FLEXnet license manager
3) Nodes may be defined on multiple surfaces
4) Automatic generation of surface elements for solid element meshes
5) Thermo-optic analysis allows temperature dependent dn/dT
6) Parameters module added to user interface
7) Frequency step-size filter now user adjustable in harmonic/random analysis
8) MPC equations generated for LoS & Zernikes use SID instead of Optic ID
9) DMAP alter provided to output damping matrix diagonal for MSC.Nastran 2007
10) VSigFit may be iconified during a run

2 Installation and Upgrading:

Instructions for installing may be found in the Install-Instructions-v2008R1.pdf found at http://www.sigmadyne.com/sigweb/sigfit_download.htm. The installation and upgrade process is different than in the past as the installation of the licensing system is a now a separate step from installation of the SigFit application.

3 New Features

3.1 x86_64 build

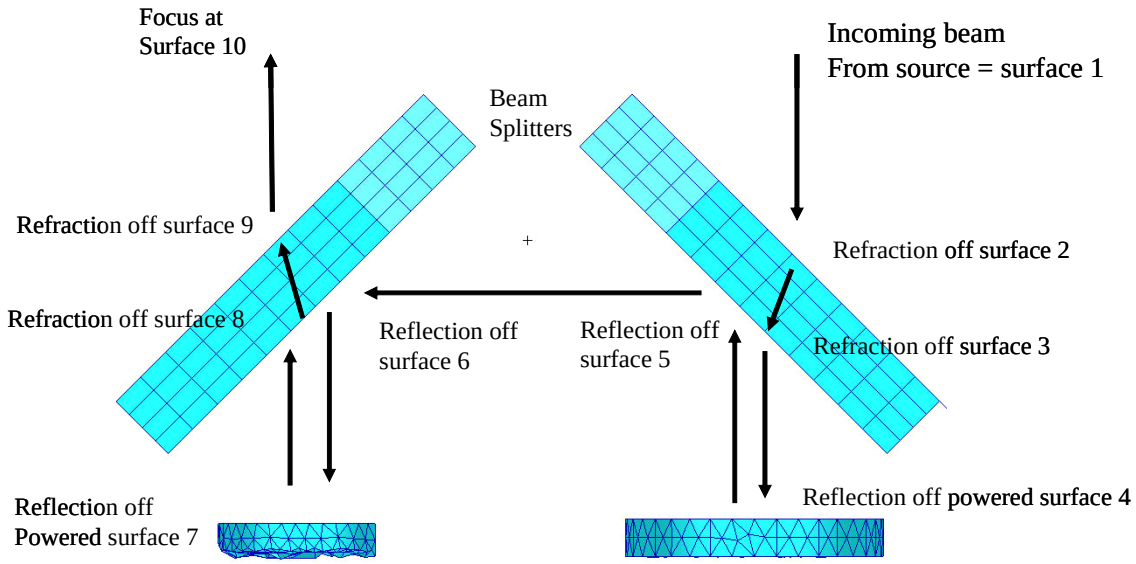
SigFit is now available for both x86_32 and x86_64 Windows platforms. Be sure to choose the appropriate install file when you download the software. The 64-bit version of SigFit may be required for very memory intensive analyses which may be encountered in adaptive control, dynamics, thermo-optic, stress-optic, or stress-induced birefringence analyses.

3.2 FLEXnet license manager

FLEXnet is now offered as a license manager as a replacement for the dongle system. In v2008R1 both the original dongle based licensing system and the newly offered FLEXnet licensing system are operational, however, Sigmadyne plans to phase out the current dongle licensing system in favor of the FLEXnet system. Use of either licensing system is chosen at the time of install. Customers wishing to migrate to the FLEXnet licensing system before their next lease renewal should contact Sigmadyne to make arrangements to exchange their existing dongles for FLEXnet certificate files.

3.3 Nodes may be defined on multiple surfaces

This feature allows for multiple bounces off surfaces in the LoS equation and multiple apertures or multiple polynomial types to be fit on a single surface within a single execution of SigFit. For example, in the optical system below, on surfaces 3 & 5 and surfaces 6 & 8, the same nodes are used to represent the surface.



The optical beam changes size (diameter) as it passes through the system. Different apertures, coordinate systems, polynomial types may be used for surface 3 than surface 5. Within SigFit, nodes are stored for each surface, thus nodes on multiple surfaces will be stored (and counted) for each surface on which they are specified.

3.4 Automatic generation of surface elements for solid element meshes

Whenever possible, it is recommended that SURDEF and SURDEF1 entries reference surface elements that coat optical surfaces of optical component models meshed of solid elements. Referencing these dummy surface elements is the most robust method to direct SigFit which nodes to associate with a surface. However, as a more convenient alternative SigFit can now internally generate these surface elements by determining which faces of the solid elements make up an optical surface in SigFit by using the location of the nodes associated with the solid elements and the geometric definition of the surface. The accuracy of this technique depends on the model generation of the solid, the accuracy of the model compared to the optical prescription, and the specification of PRETOL. If the solid element mesh is generated to geometry that does not match that used in defining the SigFit surface geometry, then nodes may be incorrectly selected and wrong answers will result.

To use this feature, the user specifies the association of SigFit surfaces to the finite element model by referencing the solid elements of the mesh representing the optical component. These solid elements are referenced in the same manner as surface elements would be referenced. SigFit will compare all of the faces of the solid elements referenced to the optical prescription of the surface. If the all of the nodes of a solid element face are within a tolerance of the optical prescription, then a 2D surface element is created on that face and is associated with that surface. These surface elements are then used for area weighting and interpolation if requested.

The tolerance used to compare nodal locations to the optical prescription may be adjusted with PARAM, PRETOL and is interpreted to be expressed in FE units. The default value of PRETOL is 0.001.

As a data check, the user should view contours of nodal results, and verify that all nodes on the surface were found as intended and no nodes interior to the lens were associated with the surface. If PRETOL is too large, then thin solid elements near the surface can have overlapping faces on the surface. If PRETOL is too small, then differences in node geometry from the optical prescription will cause missing faces. If DIAGPRT PLEVEL is set MED or HIGH, a listing of solid faces used will be printed in the fit file.

3.5 Thermo-optic analysis allows temperature dependent dn/dT

Temperature dependent dn/dT is now supported in thermo-optic OPD analysis. Both tabular and Sellmeier equation descriptions of the temperature dependence are allowed. Refractive and thermo-optic data may be specified as relative or absolute data. A medium material may be specified to be used in interpretation of relative data. The thermo-optic OPD may

be generated using changes in absolute or constant reference relative index of refraction. For more detailed information refer to the thermo-optic analysis documentation in the SigFit Reference Manual. Also refer to the relevant entries in the SigFit Dictionary.

New and modified data entries are MATMED, MATN1, MATN2, MATTO1 in the Materials module, SELLM in the Data module, and PARAM, TODN in the Parameters module.

3.6 Parameters module added to user interface

A new module containing single valued parameters has been added. The entries have the form

PARAM,*{parameter name},{parameter value}*

Further documentation on the parameters can be found in the Parameters section of the SigFit Dictionary.

3.7 Frequency step-size filter now user adjustable in harmonic/random analysis

Forcing frequencies in harmonic and random response analysis are considered to be duplicate frequencies if the values are within DFREQ of each other. In other words if f1-f2 < DFREQ then f1 will be used in the list of forcing frequencies and f2 will be dropped. The default value of DFREQ was and still is 0.001 Hz. The user may now override the default by specifying DFREQ on its PARAM entry.

PARAM, DFREQ, *value*

3.8 MPC equations generated for LoS & Zernikes use SID instead of Optic ID

When SigFit writes MPC equations for line-of-sight error (LoS) or Zernike polynomial coeffficients, the surface ID (SID) is now used to create an SPOINT ID. In prior versions, the Optic-ID was used. The numbering scheme used in v2008 is:

GRID ID for surface RBE3 = 9sss000 (where sss = SID)
GRID ID for LoS = 9999000
SPOINT ID for Zernikes = 9ssszzz (where zzz = zernike polynomial term)

The default for the Optic Id has always been SID. If previous runs did not specify Optic-ID or had it equal to SID there will be no difference in output.

3.9 DMAP alter provided to output damping matrix diagonal for MSC.Nastran 2007

In MSC.Nastran v2007 the following DMAP Alter may be used in SOL 111 to write the diagonal of the viscous damping matrix BHH and the diagonal of the structural damping matrix K4HH to the punch file. SigFit can then read this file to use as damping for harmonic/random analyses within SigFit. The diagonal of the damping matrices are used to keep the solution uncoupled. This is an approximation that can be tested by comparing the resulting analysis in SigFit to an analysis in MSC.Nastran using the full damping matrix. A file containing this DMAP can be found in the MSCNASTRAN_Support folder in the installation directory.

```
$----------------------------------
$ DMAP Alter for v2007
COMPILE GMAX
ALTER 'CALL GMAM'
$ output diagonal of viscous damping
DIAGONAL BHH/VDAMP/$
MATPCH VDAMP/ $
$ output diagonal of structual damping
DIAGONAL K4HH/GDAMP/$
MATPCH GDAMP//$
EXIT
```

```
$ exit optional to STOP after output
$---------------------------------
```

3.10 VSigFit may be iconified during a run

The VSigFit application and SigFit Job Manager windows may be iconified during a run by picking the  icon on the VSigFit application during a run.

4 Bug Fixes

4.1 Eight character limit for ANSYS component names in V2008R1

In V2008R1 the variable used to store ANSYS components names used with the SURDEF1 entry was inadvertently set to a length of 8. The error results in no nodes or elements found for a properly defined surface.

This error was not present in version 2007R2 in which this feature was first released.

4.2 Zero order or odd asphere terms not allowed in optical prescription

The inclusion of zero order or odd asphere terms in a surface of type STYP=ASPH would cause a fatal error message. Entry of zero order or odd asphere terms is now allowed.

In association with this change the combination of the following conditions will result in a warning message in the .fit file and supression of optical file output:

1. definition of a surface of type STYP=ASPH with odd asphere terms in its geometry and
2. selection of the use of sag surface deformation with ASAG=SAG and
3. selection of either linear or non-linear radial correction options with ARCORR=LIN or NL and
4. selection of optical file output with either standard or Fringe Zernike polynomials.

The combination of these conditions results in the definition of a Zernike sag surface in the optical analysis file which is unable to exactly represent the odd asphere terms of the original prescription. If optical file output is desired for these conditions then the user should use ARCORR=NLTP. In the case of output to ZEMAX a grid sag surface is available.