

# Automatized Detector Positioning by using Parameter Coupling

#### Abstract



In this example, the focus (PSF) of an Ftheta objective is investigated for certain angles of incidence. In order to avoid the superfluous computational effort introduced by the shift of the resulting foci with off-axis illumination, the detector position is shifted according to the main propagation direction of the light. VirtualLab's Parameter Coupling tool is applied to automatically handle this adjustment of the detector position.

# Modeling Task



# **Automatic Detector Positioning via Parameter Coupling**

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Parameter Coupling allows the user to define the variation of the desired system parameters through a small script "snippet".

As a result, any change of the value of the independent input parameter will simultaneously result in a change of the dependent (coupled) parameter.

In this example, we couple the lateral position of the desired detector to coincide with the position of chief ray.

### **Parameter Coupling Procedure**

In order to find the appropriate lateral position of the detector, an additional ray tracing step is performed by the applied Parameter Coupling snippet. This particular snippet can be imported:

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27 □ #region Additional using directives	Name Date modified Type Size
28 29 #endregion	Curck access     2021-01-27 Detector Position via PC.snp     11/03/2021 11:39     SNP File     5 KB
30 31 E public class VI Module : ISpinpetStringDoubleDictionary S	
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33 ⊡ public Dictionary <string, double=""> GetOutputParameter 34</string,>	
35 😑 #region Main method 36 Dictionary(string_double) returnValue = new Dic	Data (D:)
37 38 □ /***********************************	
44 // Access the current value of any parameter in	
45     double inputvalue = parameters[ variable1 ];       46	File name: 2021-01-27 Detector Position via PC.snp v Snippet Files (*.snp)
47 // Add a coupled parameter to the return value. 48 returnValue.Add("Variable2". 2 * inputValue):	Select Snippet Parts to Import - Cancel
Check Consistency Validity: 1 TOK Cancel Help	<ul> <li>✓ Import Source Code</li> <li>✓ Import Global Parameters</li> <li>✓ Import Snippet Help</li> <li>✓ Import External References</li> <li>Selection Tools</li> <li>OK</li> <li>Cancel</li> </ul>

import snippet

# **Detector Index Selection**



The unique index of the detector has to be specified in the specification tab of the snippet.

# **Oblique Incidence**



Now, if the direction of propagation of the plane-wave source is modified, the position of the detector is automatically adapted. In this example, an angle of 15° will lead to a shift of 26.3 mm in x direction.

### **Performance Evaluation – Oblique Incidence**



# **On- & Off-Axis Illumination**

11: Optical Setup View #10 (D:\20 Filter byX      Uight Sources     Components     Ideal Components     Detectors     Analyzers     Coordinate Break     Camera Detector     Bectromagnetic Field Detector	Plane Wave USP 4436383 Back Focal Plane	5: Optical Setup View #4 (D:\202'         Filter byX         Image: Second	JSP 4436383 Back Focal Plane ↓ 1 2 100 µm 13 mm Z 123 mm	r_OffAxis.os)* Off axis			
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		Axes Selection       Axes Selection       Structure       Translation Values       Delta X       Delta Y       Delta Z	100 µm 0 mm				

In the case of off-axis illumination, the position of the detector is also automatically adapted. In this example, a shift of  $100 \,\mu$ m is automatically considered by the Parameter Coupling.

# **Performance Evaluation – Off-Axis Illumination**



### **VirtualLab Fusion Technologies**





title	Automatized Detector Positioning by using Parameter Coupling
document code	SWF.0003
version	1.0
toolbox(es)	VirtualLab Fusion Basic
VLF version used for simulations	2020.2 (Build 2.22)
category	Feature Use Case
further reading	<ul> <li><u>Performance Analysis of Laser Scanning System</u></li> <li><u>Coupling of Parameters in VirtualLab Fusion</u></li> </ul>