

BornAgain - Refactoring #2462

Polarized: Split beam propagation calculations into a computation and measurement step

03 Jun 2020 11:50 - rbeerwerth

Status:	New	Start date:	03 Jun 2020
Priority:	Normal	Due date:	
Assignee:	rbeerwerth	% Done:	0%
Category:		Estimated time:	0.00 hour
Target version:			
Description			
<p>For polarized reflectometry the computation can conceptionally be split into two successive parts. The first step is to calculate the transmitted and reflected amplitudes in every layer of the sample with the usual back-propagation. In the second step then the density matrices for the incoming beam and the analyzing polarized are constructed and applied to the result in order to compute the intensity seen in the experiment.</p> <p>The first step is the one that is potentially expensive (for large numbers of layers). In the implementation, the intensity (second step) is computed in <code>SpecularMatrixTerm::intensity</code>, while the polarization and analyzer properties are not needed at all in the computation of the amplitudes.</p> <p>Also this step is very cheap. For this reason one computation of the amplitudes could be reused to compute intensities for an arbitrary amount of different combinations of polarization and analyzer, providing a potentially significant gain in performance.</p> <p>For example, in the <code>BasicPolarizedReflectometry</code> example, this refactoring would cut the computational cost by half:</p> <pre>results_pp = run_simulation(ba.kvector_t(0.0, 1.0, 0.0), ba.kvector_t(0.0, 1.0, 0.0)) results_mm = run_simulation(ba.kvector_t(0.0, -1.0, 0.0), ba.kvector_t(0.0, -1.0, 0.0))</pre> <p>These lines run two subsequent computations that are virtually identical, except the evaluation of the density matrix for the computation of the intensity.</p> <p>This step is for most real-world examples probably less than 1% of the total cost.</p> <p>This will probably apply similarly also to polarized GISAS, and requires rather involved refactoring possibly taking more hurdles into account.</p>			

History

#1 - 18 Sep 2020 19:32 - wuttke

- Subject changed from *Split calculations into a computation and measurement step* to *Core: polarized propagation: Split calculations into a computation and measurement step*

#2 - 19 Sep 2020 09:11 - wuttke

- Subject changed from *Core: polarized propagation: Split calculations into a computation and measurement step* to *Polarized: Split beam propagation calculations into a computation and measurement step*

- Assignee set to *rbeerwerth*

Is this still on our agenda? Or has it been superseded by recent developments?

#3 - 19 Sep 2020 09:40 - wuttke

- Parent task deleted (#2419)