P-CHI2 Research project title:
CHI-2 medium nonlinear response plugin for the UPPEcore simulator

TASK:
Add a capability to UPPEcore to simulate CHI-2 media. This will require to:

1. Run the simulator with two polarization components (it already has this option)

2. Assign two suitable susceptibility tables to each polarization component in the input file. You will need to create suitable tabulated representations for the *susceptibility vs omega* for the pump and second harmonic polarization. You may choose to set up "artificial" tables just to demonstrate the principle, or choose a concrete material such as e.g. BBO. In the later case you will probably want to create a Matlab scrip to create susceptibility tables for a given propagation angle w.r.t. optic axis from the Sellmeier equations for n_o and n_e.

3. Take the files in *wrk_x20...* and modify them for CHI-2 medium plugin. This template already contains a hint how this may be done. You will need to add a few lines of code that will closely resemble the standard envelope equations for second harmonic, but keep in mind that UPPEcore simulator works with analytic signal of the field and not with the envelope. This means that the "additional" phase factors that appear in the envelope formulation need not be included. Naturally, you will also need to add/replace appropriate input parameters.

DELIVERABLE:
Brief report in pdf format, plus input and program files with the chi-2 plugin implementation.

OPTIONAL EXTENSION A:
Set up an exercise package (e.g. suitable for use in opti-583) which demonstrates second-harmonic generation and to it related phase-matching issues.

START-FROM-MATERIAL:
Simulation template with a complete example of my-Kerr-medium, *wrkx20User-Defined_Extensions_Medium_Response*, can be modified in a simple way, requiring only modest programming. However, it is best to look first at a simpler yet case of the user-defined initial condition in the package *wrk_x10_....*