University of Calgary
Fall semester 2010

PHYS 673: Quantum and Nonlinear Optics

~~Midterm examination~~ Quiz 1

October 6, 2010

Open books except Handbook of nonlinear optical crystals. Attempt all problems. Full credit = 100 points. Partial and extra credit will be given. 20 minutes.

Potassium Dihydrogen Phosphate (KDP) is a uniaxial crystal with

λ, μm	n_O	n_E
1.064	1.49378	1.45987
0.532	1.51242	1.47047
0.353	1.53153	1.48612

Problem 1. You need to implement SHG of 1.064μm in the Type I configuration.

a) (10 pts) $o + o \to e$ or $e + e \to o$?

b) (30 pts) Write the expression for the phase-matching angles θ, ϕ in the symbolic form.

c) (10 pts) Find the numerical values for these angles.

Problem 2. You need to implement SFG 1.064μm+0.532μm$\to$ 0.353μm in a collinear Type II $e + o \to e$ configuration.

a) (30 pts) Write the equation for the phase matching angle θ in the symbolic form. You need not solve it.

b) (20 pts) Show that this equation has a solution. **Hint:** use continuity of the refraction indices as a function of θ.