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Unit 6 - Week 4

Week 4 Assignment

The due date for submitting this assignment has passed.
As per our records you have not submitted this assignment. **Due on 2018-09-05, 23:59 IST.**

1) ***2 points***

A certain crystal has an index of refraction of approximately 1.2 and $\chi^{(2)}$ is equal to $6\ pm/V$.A different material is discovered to have refractive index of 1.8.Use Miller's rule to estimate $\chi^{(2)}$ in the new material

(a) $0.79\ nm/V$ (b) $0.79\ pm/V$ (c) $0.50\ nm/V$ (d) $0.50\ pm/V$

- (a)
- (b)
- (c)
- (d)

No, the answer is incorrect.
Score: 0

Accepted Answers:
(a)

2) ***2 points***

$\chi^{(2)}$ is measured for frequency doubling 1.064 to 0.532 μm to be $1.2pm/V$. The index of refraction changes from 1.654 to 1.672. Use Miller's rule to estimate $\chi^{(2)}$ for SHG of 1.6 to 0.8 μm. The index of refraction for this interaction is 1.646 for both the wavelengths.

(a) $1.5\ pm/V$ (b) $0.7\ pm/V$ (c) $1.07\ pm/V$ (d)$1.7\ pm/V$

- (a)
- (b)

Week 6
Week 7
Week 8
Week 9
Week 10
Week 11
Week 12
Download Videos
Assignment Solution

(c)

3) **2 points**

$\chi^{(2)}$ is measured for frequency doubling 1.064 to 0.532 μm to be $1.2 pm/V$. The index of refraction changes from 1.654 to 1.672. Use Miller's rule to estimate $\chi^{(2)}$ for SHG of 1.6 to 0.8 μm. The index of refraction for this interaction changes from 1.646 to 1.681

(a) 1.5 pm/V (b) 0.7 pm/V (c) 1.07 pm/V (d) 1.14 pm/V

- (a)
- (b)
- (c)
- (d)

No, the answer is incorrect.
Score: 0

Accepted Answers:
(d)

4) **2 points**

A certain crystal has an index of refraction of approximately 1.6 and $\chi^{(2)}$ is equal to 4.4 pm/V. What will be the effective refractive index of the material if a DC electric field of $5 \times 10^{11} V/m$ is applied.

(a) 1.52 (b) 2.63 (c) 1.77 (d) 1.65

- (a)
- (b)
- (c)
- (d)

No, the answer is incorrect.
Score: 0

Accepted Answers:
(b)

5) **2 points**

What will be the percentage change in the refractive index for Q4?

(a) 39 % (b) 50 % (c) 64 % (d) 75 %

- (a)
- (b)
- (c)
- (d)

No, the answer is incorrect.
Score: 0

Accepted Answers:
(c)

6) **2 points**

A phase-matching configuration is possible in beta-barium borate (BBO) in which two separate non-collinear beams at λ_1 generate a second harmonic beam at λ_2. If the effective refractive indices at the two wavelengths are n_1 and n_2, respectively, the angle between the two fundamental beams is

(a) $\cos^{-1}\left\{\frac{1}{2}\left(\frac{n_2\lambda_1}{n_1\lambda_2}\right)^2+1\right\}$ (b) $\cos^{-1}\left\{\frac{1}{2}\left(\frac{n_2\lambda_1}{n_1\lambda_2}\right)^2-1\right\}$

(c) $\cos^{-1}\left\{\frac{1}{2}\left(\frac{n_1\lambda_1}{n_2\lambda_2}\right)^2-1\right\}$ (d) $\cos^{-1}\left\{\frac{1}{2}\left(\frac{n_1\lambda_1}{n_2\lambda_2}\right)^2+1\right\}$

- (a)
- (b)
- (c)
- (d)

No, the answer is incorrect.
Score: 0

Accepted Answers:
(b)

7) ***2 points***

A phase-matching configuration is possible in beta-barium borate (BBO) in which two separate non-collinear beams at 1.064 μm generate a second harmonic beam at 0.532 μm. If the effective refractive indices at the two wavelengths are 1.65500 and 1.55490, respectively, the angle between the two fundamental beams is

(a) 20.03° (b) 40.06° (c) 30.1° (d) 0°

- (a)
- (b)
- (c)
- (d)

No, the answer is incorrect.
Score: 0

Accepted Answers:
(b)

8) ***2 points***

For Q7, find the angle between the fundamental beam and the SHG beam.

(a) 20.03° (b) 40.06° (c) 30.1° (d) 0°

- (a)
- (b)
- (c)
- (d)

No, the answer is incorrect.
Score: 0

Accepted Answers:
(a)

9) ***2 points***

Consider second harmonic generation in lithium niobate for a fundamental field whose (vacuum) wavelength is 1.064 μm. If the effective refractive indices are 2.2339 and 2.2294 for the fundamental and second harmonic fields, respectively, find the coherence length.

(a) 29.55 μm (b) 108.22 μm (c) 20.51 μm (d) 59.11 μm

- (a)
- (b)
- (c)
- (d)

No, the answer is incorrect.
Score: 0

Accepted Answers:
(d)

10) ***2 points***

The refractive index change $\sqrt{1+\chi^{(1)}}$ to $\sqrt{1+\chi^{(1)}+2\chi^{(2)}E_{DC}}$ is $\Delta n \cong$

(a) $\chi^{(1)}E_{DC}/n$ (b) $\chi^{(1)}E_{DC}$ (c) $\chi^{(2)}E_{DC}/n$ (d) $\chi^{(2)}E_{DC}$

- (a)
- (b)
- (c)
- (d)

No, the answer is incorrect.
Score: 0

Accepted Answers:
(c)

Previous Page End