

MARKING RUBRIC: PHTN1300 Test #3 (2017F)

1. UNITY EQN (4 MARKS): 2 FOR R_2^2 , 1 FOR TWO-TIMES GAIN & ATTENUATION, 1 FOR TWO TIMES KTP ATTENUATION (ALL PER ROUND TRIP)
RE-ABSORPTION LOSS (5 MARKS): 1 FOR ENERGY CONVERSION, 2 FOR N_D CALCULATIONS (INCL UNITS OF DENSITY), 1 FOR UNITS OF CROSS-SECTION ($1.8E-22 \text{ m}^2$), AND 1 FOR THE CORRECT ANSWER
ALGEBRAIC SOLUTION FOR GTH (2 MARKS)
NUMERICAL SOLUTION (3 MARKS): 1 FOR CONVERSION OF KTP ATTENUATION UNITS TO m^{-1} , 1 FOR ADDING RE-ABSORPTION LOSS, 1 FOR ANSWER
-1 FOR ALL MISC. ERRORS SUCH AS MATHEMATICAL ERRORS
THIS IS ALMOST IDENTICAL TO THE EXAMPLE IN THE MX2 PREVIEW EXCEPT WITH THE ADDITION OF A THIRD MIRROR (HENCE THE R_2^2 TERM).

KTP ATTENUATION = 1 m^{-1} , ENERGY LEVEL = 0.2437 eV , $\gamma_{\text{TH}} = 1.974$
VER A: GTH OPTICAL = 18.01, VER B: GTH OPTICAL = 13.01

2. ADDING TRANSMISSION OF THE WINDOW, SQUARED (OR TO THE FOURTH IF PER SURFACE DIRECTLY) (2 MARKS)
SETTING $G_{\text{TH}} = G_0$ FOR A LOSS SOLUTION (1 MARK)
ADDING THERMAL LOSSES TO THE GTH EQUATION (1 MARK)
NUMERICAL SOLUTION (3 MARKS): INCLUDES $R = 1 - T$ FOR MINIMUM REFLECTION INSTEAD OF TRANSMISSION, AND PER SURFACE / PER PASS LOSS
THIS IS A BASIC "CALCULATE THE MINIMUM TRANSMISSION" PROBLEM AND DOES NOT REQUIRE SNELL/FRESNEL APPLICATION AT ALL!

3. PSAT CALCS (3 MARKS): 2 MARKS FOR BASIC ISAT CALC INCLUDING SUBSTITUTIONS AND UNITS, 1 MARK FOR AREA TO CONVERT TO PSAT
POUT CALCS (2 MARKS): 1 FOR USE OF G_0 , 1 FOR GTH USAGE

PSAT = 0.8152 W ,
VER A: $P @ 1064 \text{ nm} = 0.1582 \text{ W}$, VER B: $P @ 1064 \text{ nm} = 0.2723 \text{ W}$

4. CALCULATING THE POWER OF THE 532NM INPUT BEAM (2 MARKS): 1 FOR THE 8%, 1 FOR 95% TRANSMISSION OF THE OC
CALCULATING R_p (3 MARKS): A MARK FOR SNELL'S, 2 MARKS FOR FRESNEL
CALCULATING OVERALL OUTPUT (1 MARK)
THIS IS A STRAIGHTFORWARD APPLICATION OF THE FRESNEL EQUATION TO CALCULATE REFLECTION AT ANY ARBITRARY ANGLE (LIKE THAT EMPLOYED MANY TIMES IN LAB #4).

VER A: THETA-R = 26.77 DEGREES, $R_p = 0.01177$

5. USING THE FORMULA GIVEN ON THE FORMULA SHEET: 1 MARK FOR USE OF 808NM, 1 MARK FOR SUBSTITUTIONS AND UNITS, 1 MARK FOR VOLUME, AND 1 FOR THE CORRECT ANSWER.
SEE LAB #5 FOR THE SAME APPLICATION OF THE FORMULA (WITH ALMOST IDENTICAL NUMBERS, NONETHELESS)

VER A: 19.3MW, VER B: 16.06MW

6. 1 MARK FOR USING THE GIVEN SLOPE, 1 MARK FOR ADDING THRESHOLD, 1 MARK FOR THE CORRECT ANSWER

VER A: $I = 83.3\text{MA} + I_{TH}$ (ALSO GIVEN) = 143.3MA