

MAT E 201

Case study 1. Photonic materials

You are asked to design a material that will be used in telecom systems (material and thickness). The expected intensity range at which the material will work is between 1200 and 1600 Watts/m².

We wish that the transmitted intensity will be no less than 700 Watts/m².

Please choose the material from the table below

TABLE 21-1 ■ *Index of refraction of selected materials for photons of wavelength 5890 Å*

Material	Index of Refraction (<i>n</i>)	Material	Index of Refraction (<i>n</i>)
Air	1.00	Polystyrene	1.60
Ice	1.309	TiO ₂	1.74
Water	1.333	Sapphire (Al ₂ O ₃)	1.8
Teflon™	1.35	Leaded glasses (crystal)	2.50
SiO ₂ (glass)	1.46	Rutile (TiO ₂)	2.6
Polymethyl methacrylate	1.49	Diamond	2.417
Typical silicate glasses	~1.50	Silicon	3.49
Polyethylene	1.52	Gallium arsenide	3.35
Sodium chloride (NaCl)	1.54	Indium phosphide	3.21
SiO ₂ (quartz)	1.55	Germanium	4.0
Epoxy	1.58		

What would be the absorbed intensity?

What would happen if the wavelength of the beam doubles?