Applications of LASERs

- ## Non – Linear Optics
  - ### Frequency Conversion

1064 nm →	BBO Crystal

BBO Crystal outputs:
- 1064 nm
- 532 nm
- 355 nm
- 266 nm
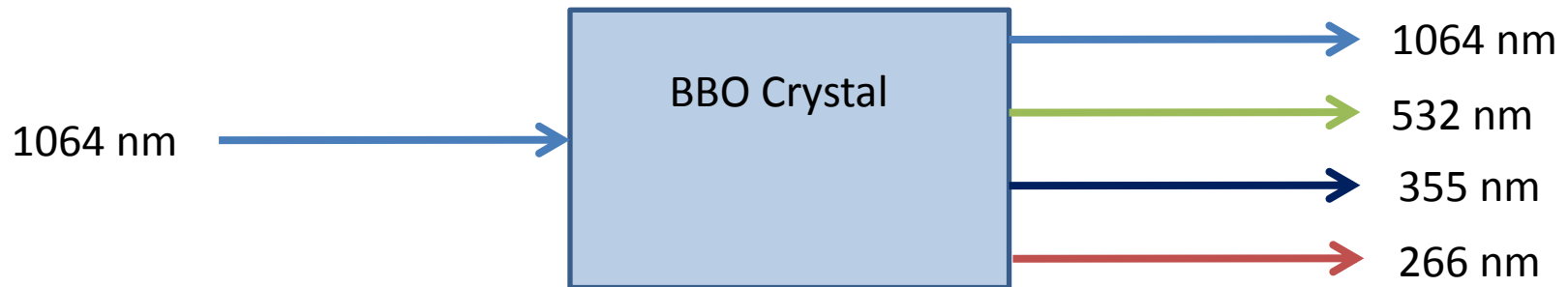
First it was observed in Ruby LASER where, 694.3 nm was converted to 347.15

- Advantage of NLO -

LASER properties remain intact during the frequency conversion viz. intense, coherent and directional.

Conventional light source

Interaction

Material

Reflection   Refraction   Absorption   Scattering
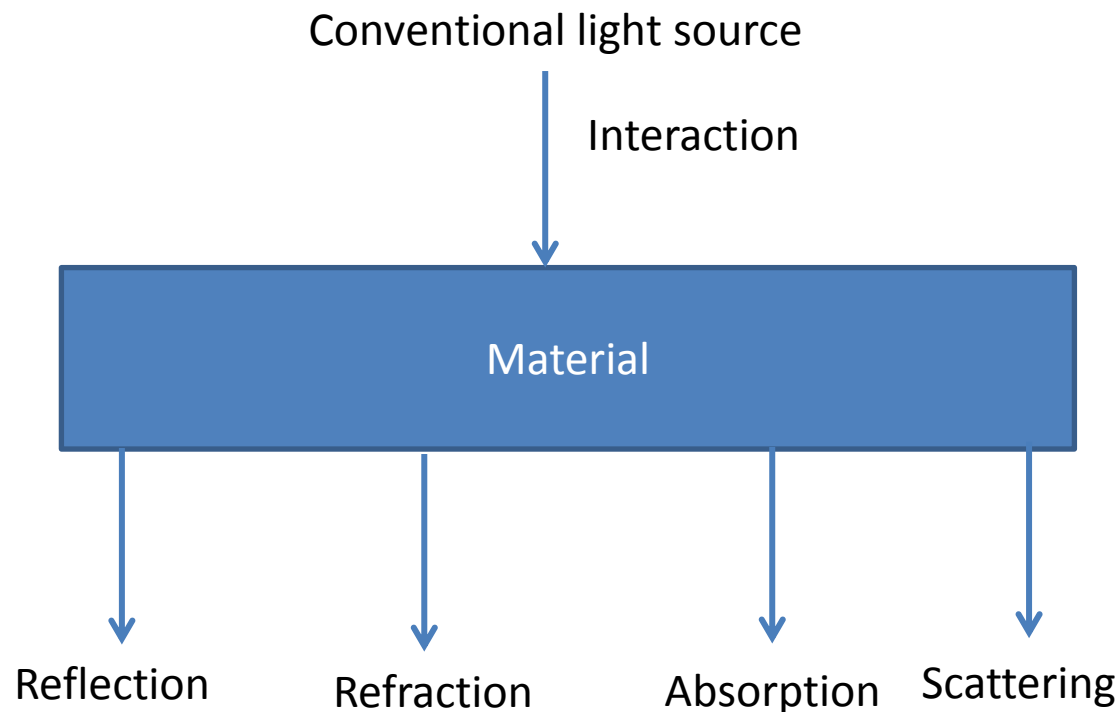
- These interactions cannot significantly change macro/microscopic properties of material as the intensity of electric field of conventional light sources (10 – 1000 V/cm) is very small as compared to electric field within the material (~10^9 V/cm)

- Comparable electric field (10^6 to 10^9 V/cm) can be provided by a pulsed LASER.

- Electric induction (**D**) is given by

$$\mathbf{D} = \mathbf{E} + 4\pi\mathbf{P}$$

P = polarization

For small **E**,

$$\mathbf{P} \; \alpha \; \mathbf{E}$$

$$\mathbf{P} = \chi^{(1)} \, \mathbf{E}$$

$\chi^{(1)}$ = Linear electrical susceptibility (It is a Tensor)