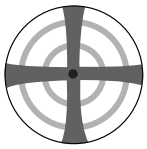
Interference Figures and Optic Sign Determination

Once the interference figure has been obtained and identified as to whether it is uniaxial or biaxial, the optic sign of the mineral can be determined using an accessory plate, either gypsum, quartz or mica.
REMEMBER: The optic sign tells us whether the ordinary ray corresponds to the fast or slow ray.

omega = Fast	Optically Positive	epsilon = Slow
omega = Slow	Optically Negative	epsilon = Fast

To determine optic sign of a uniaxial mineral:
1. Obtain an optic axis interference figure, one that is centred in field of view
2. Insert accessory plate into the light path.
3. Observe the interference colours:
   - in two quadrants the colours increase, move to the right,
   - in other two quadrants the colours decrease, move to the left.
4. Look at the NE quadrant of the interference figure.



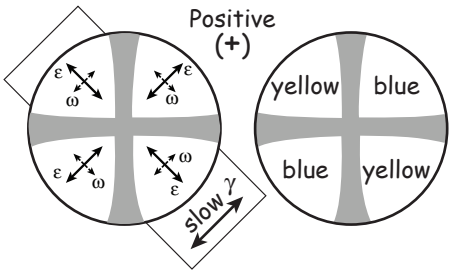
Uniaxial
Optic Axis

INTERPRETATION USING THE GYPSUM PLATE
In the centred uniaxial optic axis interference figure, remember;
- omega vibrates parallel to isochromes
- epsilon vibrates radially from centre

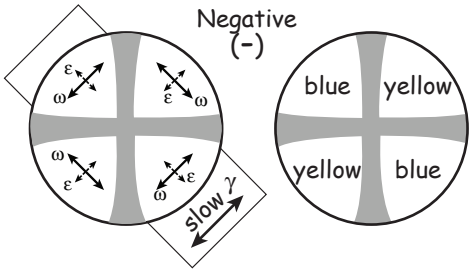
The accessory plate vibration direction is NE - SW, and corresponds to slow direction of plate. It is parallel to extraordinary ray vibration direction in NE Quadrant of the interference figure.
Examining the NE quadrant of the interference figure, two possibilities may occur:

1. The interference colours will increase, move to the right on the colour chart, when the accessory plate is inserted. This tells us that the extraordinary ray, of the mineral, must be the slow ray and therefore the mineral is optically positive.
2. The interference colours will decrease, move to the left on the colour chart, when the accessory palte is inserted. This tells us that the extraordinary ray, of the mineral, must be the fast ray and therefore the mineral is optically negative.

The SW quadrant of the interference figure will exhibit the same colour changes, observed in the NE quadrant because omega and epsilon vibration directions are the same.

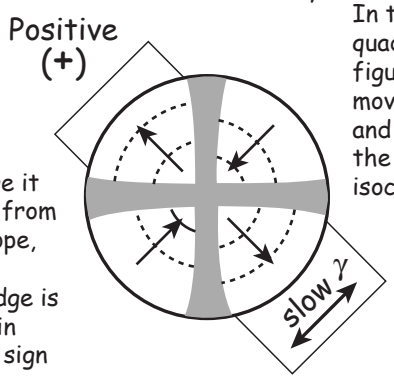


In opposite quadrants of the interference figure the interference colours either increase or decrease.
$Slow_{min}$ + $Slow_{acc}$ = increase
$Fast_{min}$ + $Slow_{acc}$ = decrease
Remember you are determining whether ε is the fast or slow ray.



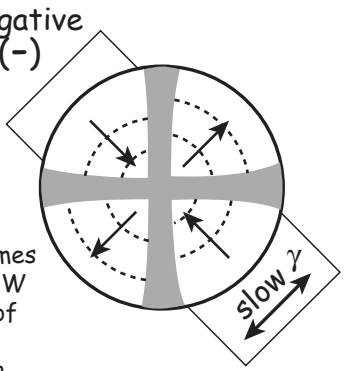
The blue or green colour results from the addition of the slow vibration direction of plate to the slow vibration direction of mineral, i.e. increase to second order blue-green, (550 + 200 =750 nm) giving a total retardation = 750 nm. The yellow colour results from the subtraction of the slow vibration direction of plate from the fast vibration direction of mineral, i.e. Decrease to first order yellow, (550 - 200 = 350 nm) giving a total retardation = 350 nm

OPTIC SIGN USING THE QUARTZ WEDGE
If the interference figure displays numerous isochromes colour changes produced with the gypsum plate become difficult to detect. In this case the quartz wedge is used. Inserting the Qtz wedge results in the movement of the isochromes about the isogyres. In quadrants where the colours subtract, i.e. where the fast ray of the mineral is parallel to slow ray direction of the quartz wedge, the isochromes move outward as lower order colours form near the melatope and displace higher order colours. In quadrants where the colours add, where the slow ray of the mineral is parallel to the slow ray of the quartz wedge, the isochromes move inwards, towards the melatope. The isogyre, on insertion of the accessory adopts the interference colour corresponding to the retardation of the accessory.



With the quartz wedge it is the direction, away from or towards the melatope, of movement of the isochromes as the wedge is inserted that assists in determining the optic sign

In the NE and SW quadrants of the figure the isochromes move in, In the NW and SE quadrants of the figure the isochromes move out.



In the NE and SW quadrants of the figure the isochromes move out, In the NW and SE quadrants of the figure the isochromes move in.