The combination of the $BVP_{in\ situ}$ and the spherocylindrical over-refraction with this lens (OR) will be equal to the patient's ocular refraction (Oc Rx).

$$BVP_{in\ situ} + OR = Oc\ Rx \qquad \text{alternatively} \qquad BVP_{in\ situ} = Oc\ Rx - OR$$

Given the over-refraction with the lens and the patient's ocular refraction, we can resolve these obliquely crossed cylinders and calculate $BVP_{in\ situ}$ using matrix optics and the following method:

1. Express both the spherocylindrical ocular refraction and the spherocylindrical over-refraction in dioptric power matrix form.

$$F = \begin{vmatrix} S + C\sin^2\theta & -C\sin\theta\cos\theta \\ -C\sin\theta\cos\theta & S + C\cos^2\theta \end{vmatrix}$$

   where S is the sphere power, C is the cylinder power and θ is the axis (in radians) of the cylinder.

2. Subtract the dioptric power matrix for the over-refraction from the dioptric power matrix for the ocular refraction, to obtain the dioptric power matrix, F_r, for the $BVP_{in\ situ}$.

$$F_r = \begin{vmatrix} S_r + C_r\sin^2\theta_r & -C_r\sin\theta_r\cos\theta_r \\ -C_r\sin\theta_r\cos\theta_r & S_r + C_r\cos^2\theta_r \end{vmatrix}$$

3. Convert the matrix form of the $BVP_{in\ situ}$ back to spherocylindrical notation using the following formulae:

   If the lens power matrix is $\begin{vmatrix} a_{11} & a_{12} \\ a_{21} & a_{22} \end{vmatrix}$

   trace (t) = $a_{11} + a_{22}$ and determinant (d) = $(a_{11}a_{22}) - (a_{12}a_{21})$

   To convert the matrix form of the $BVP_{in\ situ}$ back to spherocylindrical notation, S_r, C_r and θ_r (the sphere power, cylinder power and cylinder axis respectively of the $BVP_{in\ situ}$) can be determined as follows:

$$S_r = \frac{(t - C_r)}{2}$$

$$\theta_r = \text{atan}\ \frac{(S_r - a_{11})}{a_{12}} \times \frac{180}{\pi} \quad \text{(where } \theta_r \text{ is in degrees)}$$

$$C_r = -\sqrt{t^2 - 4d}$$

   (the minus sign prior to the radical symbol simply means that the final solution will be in minus cylinder form)

	A	B	C	D	E
1		**SPHERE**	**CYLINDER**	**AXIS**	
2					
3	**Oc Rx**	-3	-2	180	=D3/57.2958
4	MATRIX	=B3+C3*(SIN(E3)^2)	=-C3*SIN(E3)*COS(E3)		
5		=-C3*SIN(E3)*COS(E3)	=B3+C3*(COS(E3)^2)		
6	**OR**	0.5	-1	37.5	=D6/57.2958
7	MATRIX	=B6+C6*(SIN(E6)^2)	=-C6*SIN(E6)*COS(E6)		
8		=-C6*SIN(E6)*COS(E6)	=B6+C6*(COS(E6)^2)		
9	SUM	=B4-B7	=C4-C7		
10		=B5-B8	=C5-C8		
11	TRACE	=B9+C10			
12	DET	=(B9*C10)-(B10*C9)			
13	**BVPin situ**	=(B11-C13)/2	=-SQRT((B11^2)-4*B12)	=IF(57.2958*ATAN((B13-B9)/C9)>0, 57.2958*ATAN((B13-B9)/C9), 180+57.2958*ATAN((B13-B9)/C9))	
14					