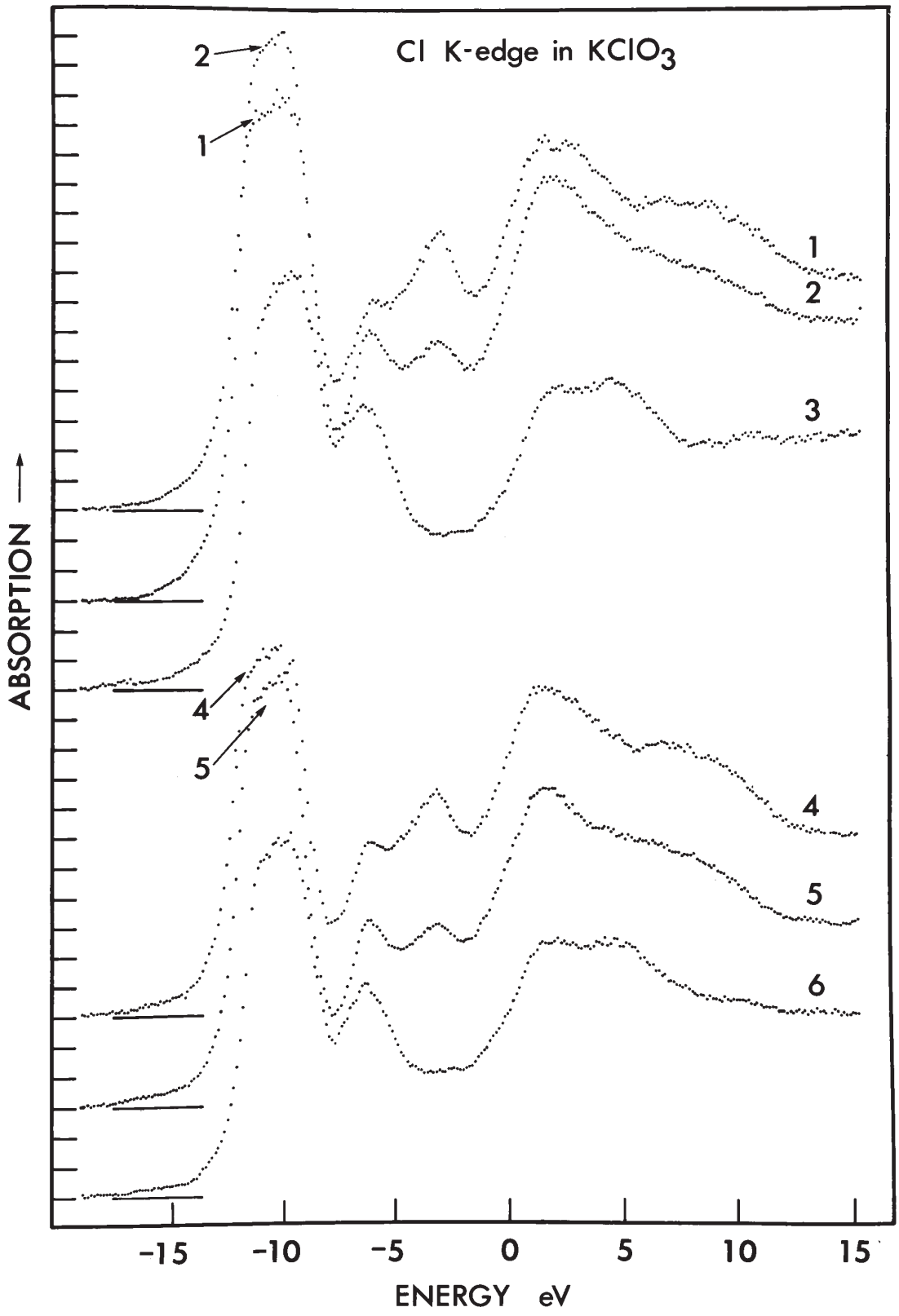
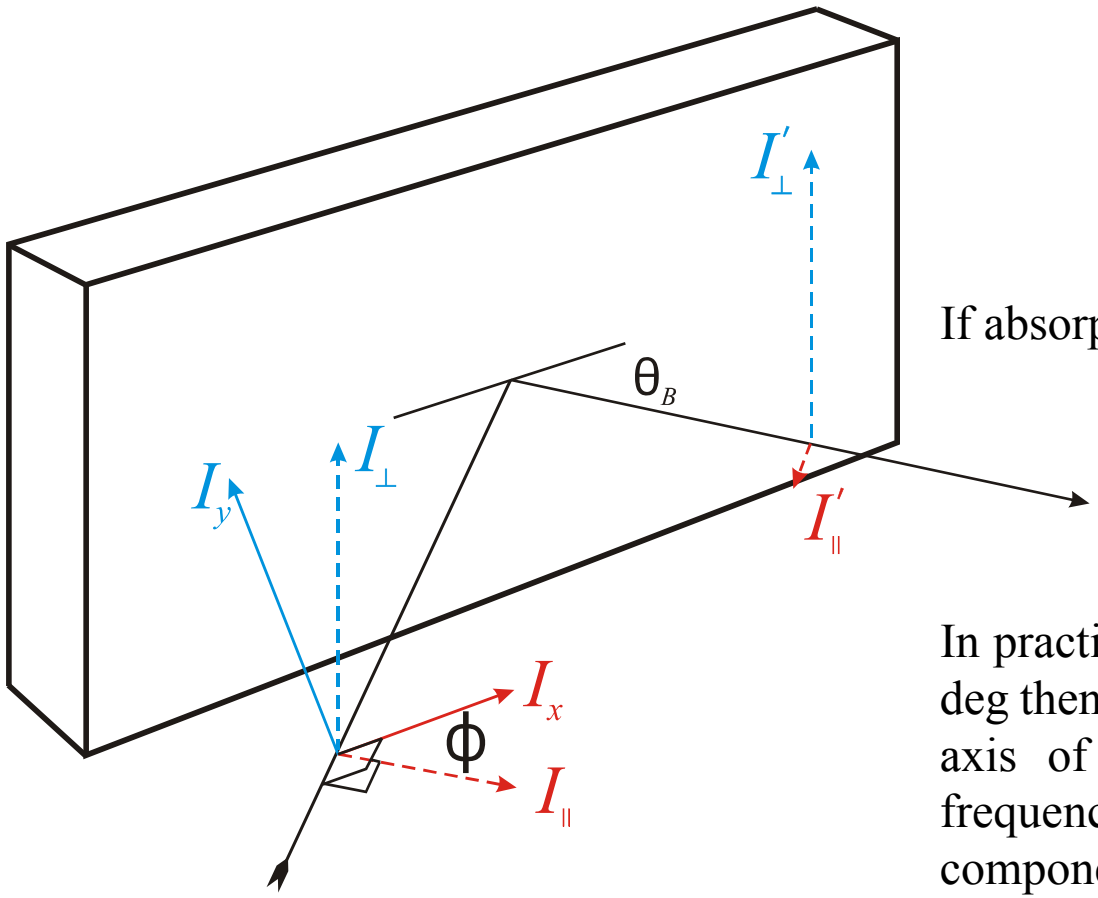


H. W. Schnopper, Chlorine K Absorption Edge in Single Crystal $KClO_3$
in Röntgenspektren und Chemische Bindung
Physikalisch-Chemisches Institut der Karl-Marx-Universität Leipzig, 1966, pp 303 - 313

POLARIZATION BY BRAGG REFLECTION



$$I_y = I_x + \ )I_x$$

$$Ix = I_x + 2P_xI_x\sin^2 N$$

$$I_z = I_x + 2P_xI_x\cos^2 N$$

$$P_x = (I_y - I_x)/(I_y + I_x)$$

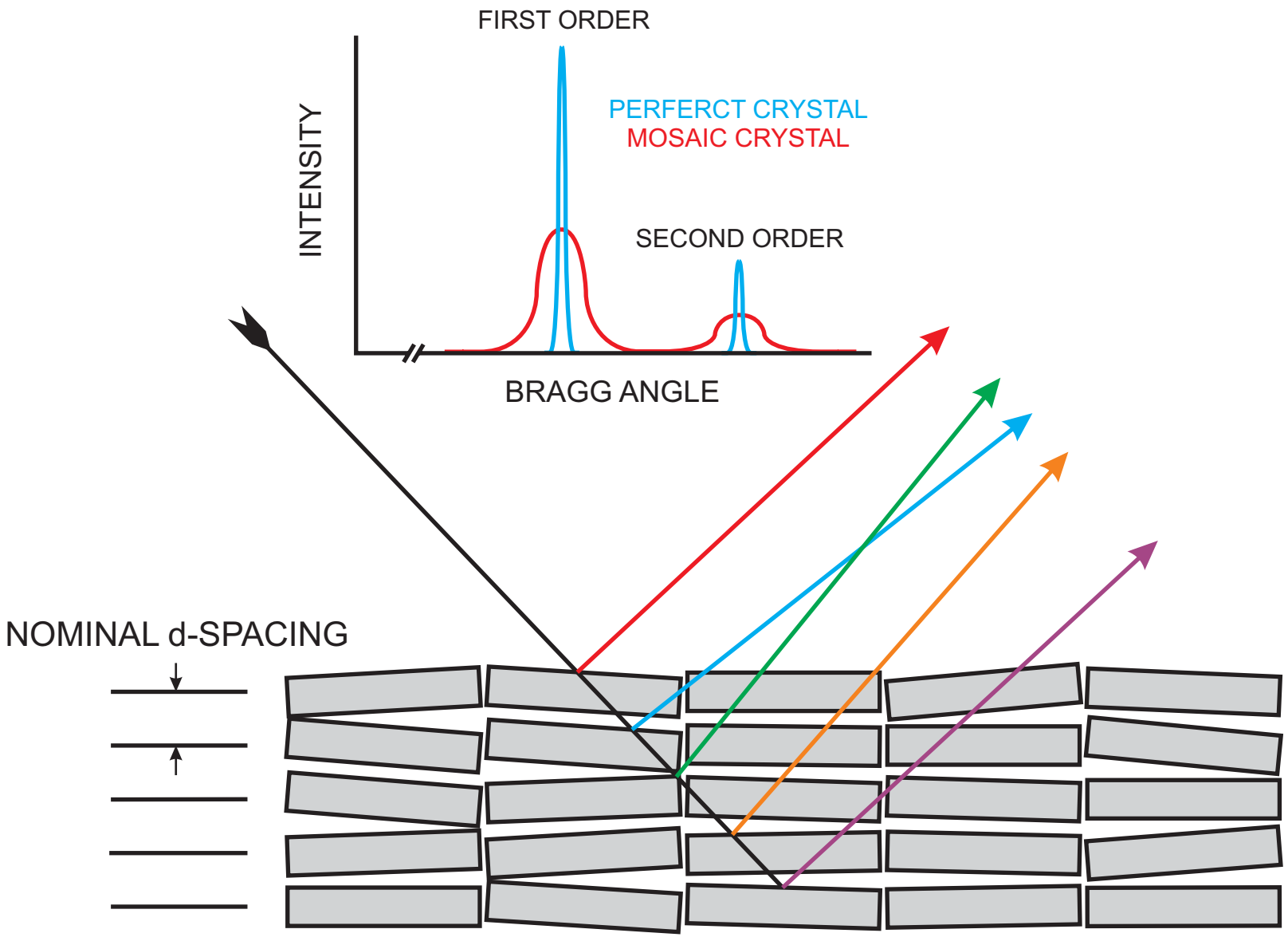
If absorption is neglected,

$$IxN = Ix\cos^2 22_B$$

$$I_zN = I_z$$

In practice, N and I_x are unknown, but if 2_B . 45 deg then IxN . 0. If the crystal is rotated about the axis of the incoming beam with an angular frequency T, then the I_zN signal will have a component that has a modulation frequency $2T$ and an amplitude $2P_xI_x$.

BRAGG REFLECTIONS IN A MOSAIC CRYSTAL

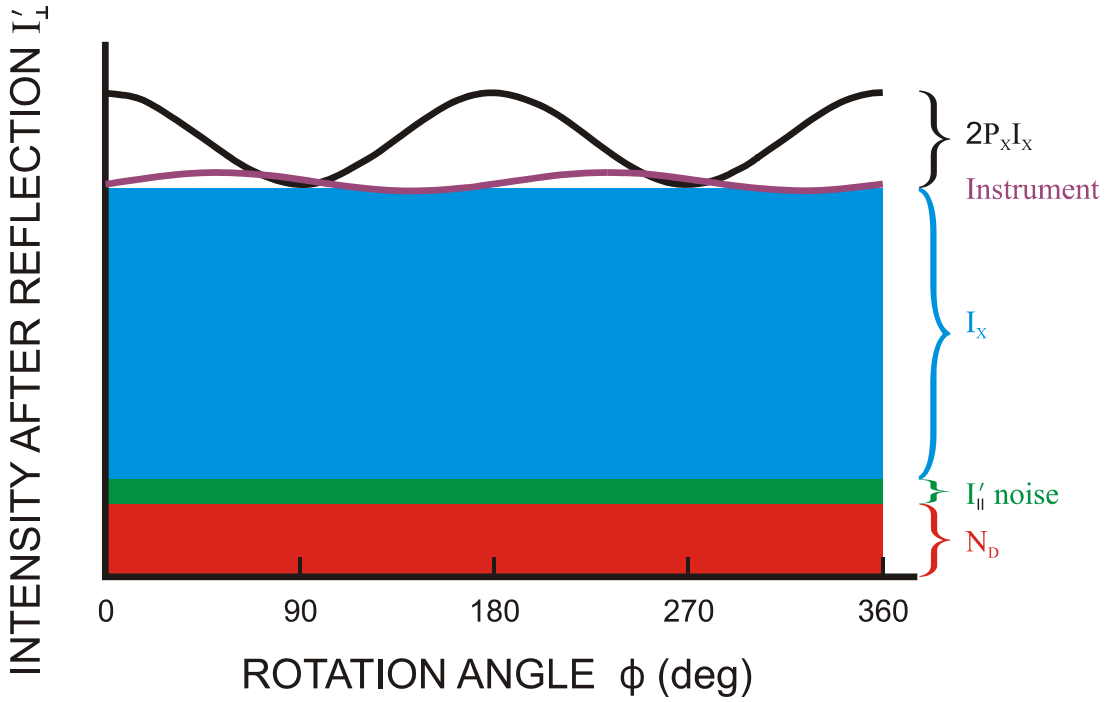


MINIMUM DETECTABLE POLARIZATION: $(P_x)_{min}$

EFFECTIVE AREA:	*A cm^2 (including efficiencies)*
ENERGY RANGE:	*)E keV @ E_0*
SOURCE FLUX:	*F(E) kev cm^{-2} sec^{-1} keV^{-1}*
INCIDENT COUNT RATE:	*$I_2 + I_z = F(E)(\,)E/E_0)$ $cm^{-2}s^{-1}$*

If)I_x is small then I_2 . I_z and the integrated signal recorded after an observing time t is the sum of the following terms:

Unmodulated signal:	*$0.5(I_2 + I_z)At = 0.5I_TAt$*
Modulated signal:	*$0.5P_x(I_2 + I_z)At = 0.5P_xI_TAt$*
Detector noise:	*I_DA_Dt*
I''_2 leakage (2_B¥45 deg):	*$I_2 cos^2 2 2_BAt$*
Instrument modulation:	



MINIMUM DETECTABLE POLARIZATION: $(P_x)_{min}$

The raw data is divided into N bins, the k^{th} bin containing A(k) events. The total number of events detected is

$$N_T = \sum_{k=1}^{N} A(k)$$

The A(k) are distributed randomly with a mean value M(k) which is composed of 2 parts:

$$M(k) = M + m(k),$$

where M is the unmodulated part of the signal (source and background) and m(k) is the polarization modulation. In most observations M o m(k).

For a random variable distributed according to Gaussian statistics, a minimum acceptable test is that the result of a measurement exceeds the one expected from chance alone by 3F, i. E., the probability of a chance result giving the measured result is only 0.26%. Thus,

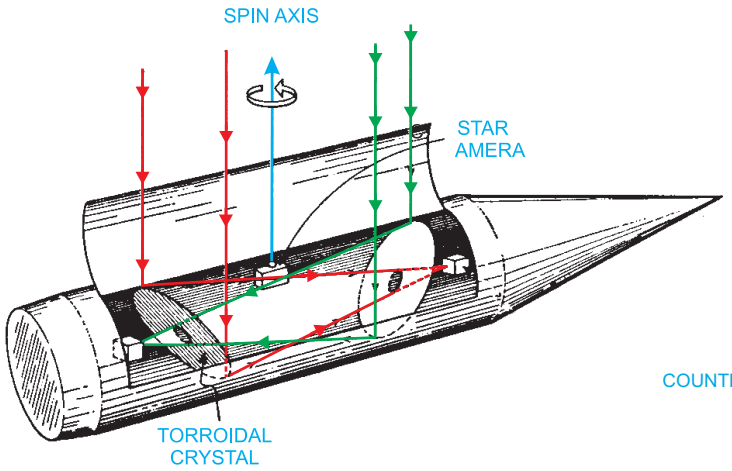
$$0.0026 = \exp\left[-(A_{min})^2/2F^2\right] \quad \text{and,}$$
$$A_{min} = 3.45(NM/2)^{1/2}$$

In terms of the parameters of the experiment,

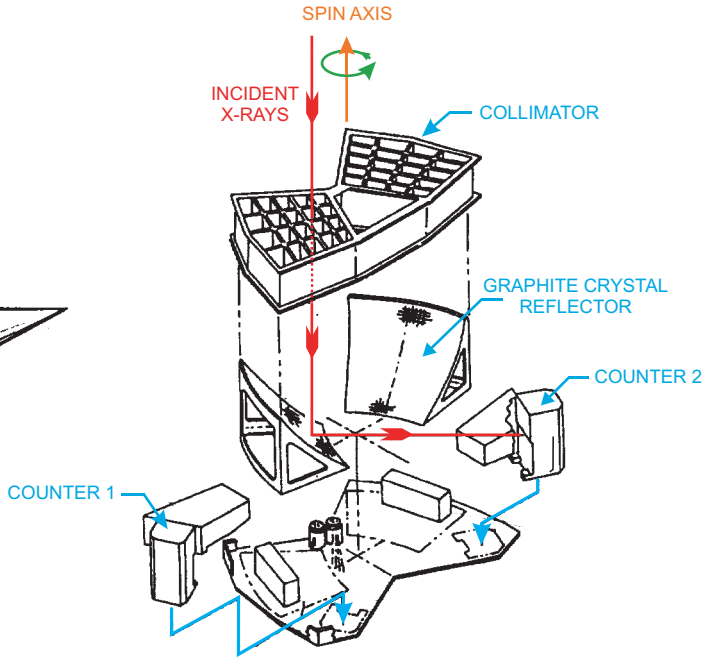
$$NM = I_T A_n t/2 + I_D A_D t \quad \text{and,}$$
$$2A_{min} = (P_x)_{min} I_T A t \quad \text{which results in}$$

$$(P_x)_{min} = 6.9(I_T A t + 2 I_D A_D t)^{1/2} / I_T A t$$
$$\approx 6.9(I_T A t)^{-1/2} \text{ (for small detector noise)}$$

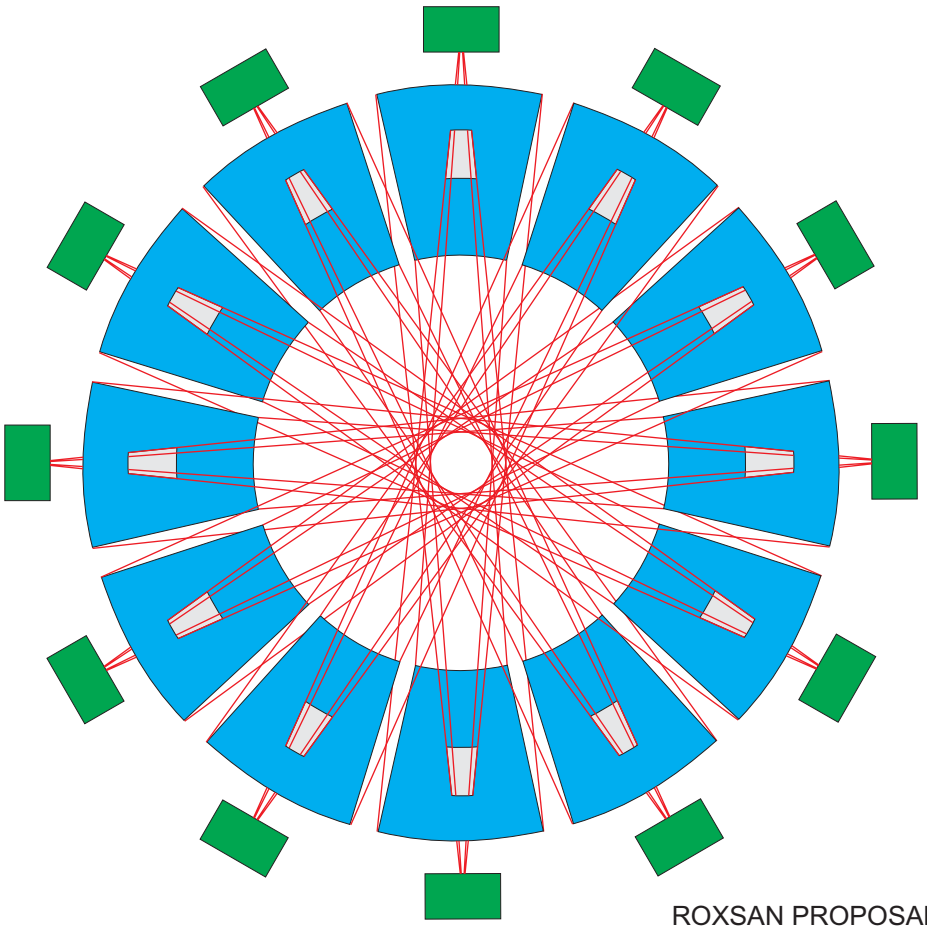
BRAGG CRYSTAL
X-RAY POLARIZATION PAYLOADS



H. W. SCHNOPPER AND K. KALATA
ASTROPHYSICAL JOURNAL **74**, 854 - 858, 1969



M. C. WEISSKOPF, *et al*,
ASTROPHYSICAL JOURNAL, **208**, L125 - L128, 1976



ROXSAN PROPOSAL TO ESA 1984