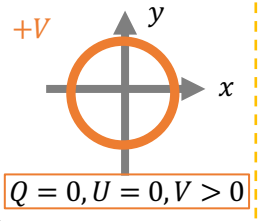
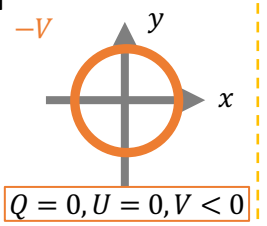
Estimating Upper Limits on CMB Circular Polarization from LiteBIRD (Hiroki Ochi et al.)

- The standard cosmological models do not predict the measurable amount of the circularly polarized component in the CMB. However, the secondary physical processes may produce the circularly polarized component in the CMB at very low level. Therefore, the measurement of the CMB circular polarization is important to either solidify the standard cosmological model or probe beyond the standard model.





- we present the analytical formulas to estimate the error of the power spectrum for the circular polarized component from the time-ordered data when a polarimeter employs achromatic half-wave plate. We derived the time-ordered data and $\langle C_\ell^{VV} \rangle$ considering the V component of the satellite system Mueller Matrix.

$$d = I_{out} = IM_{II,all} + QM_{IQ,all} + UM_{IU,all} + VM_{IV,all}$$

$$M_{IV,all} = \frac{1}{2}(\eta^2 + \delta^2)M_{IV,H} + \frac{1}{2}(\eta^2 - \delta^2)\left[M_{QV,H}\cos(2\theta - 2\xi) - M_{UV,H}\sin(2\theta - 2\xi)\right]$$

$$\langle C_\ell^{VV} \rangle = \frac{1}{4\pi}\left(\frac{4\pi}{N_{pix}}\right)^2 \sum_{i=1}^{N_{pix}} \sum_{S'_i=I_i}^{V_i} \sum_{S''_i=I_i}^{V_i} A'_{V_iS'_i} A'_{V_iS''_i} \sum_{t=t_1}^{t_{obs}} P_{tS'_i} P_{tS''_i} \sigma_t^2$$

Conclusions and Outlooks

- We derived that the value of $M_{IV,H}$, $M_{QV,H}$, $M_{UV,H}$ is effective in estimating V.
- We will estimate upper limits that can be obtained from LiteBIRD detector noise and HWP non-ideality. We also consider calibrating the value of LiteBIRD HWP Mueller Matrix by taking advantage of C_ℓ^{VV} being consistent with zero.