Fabry-Perot Michelson Model

- Find the optimum demodulation phases
 - Maximize BS DoF at AS Q (both f1, f2)
 - Maximize DARM DoF at AS Q (both f1, f2)
 - Maximize CARM DoF at REFL I (both f1, f2)
- How the optimum phase is determined?

Do they agree with the analytical calculations?

For f1, $\alpha = l_{-} \omega_{\rm m}/c$, $\sin(\alpha)^{\sim}0.92$, $\cos(\alpha)^{\sim}0.38$ $\beta = l_{+} \omega_{\rm m}/c$

	DARM	MI	CARM
V1 (AS Q)	-JoJi El ² Preso Pauzi × Cos & Sind	-JoJ, IE, Presoranti * COSP sind	0
V2 (REFL I)	-JoJi Eil² reso ranti x cospsind	Jo Ji Eil² Vreso Vanti X COSB Sind	-JoJ, [Eil2 rreso Vanti × Sin B COS L
V3 (REFL Q)	Jo Ji Eil Treso Manti X Sin B Sind	- JoJi Fil * Yreso Yanti x sinp sind	-JoJ, E, 2 V'reso Vanti × Cosp Cosd

Table made by Koyama-kun, Analytical calculation by Ando's master thesis

FPMI Sensing Matrix (f1, 16.88MHz)

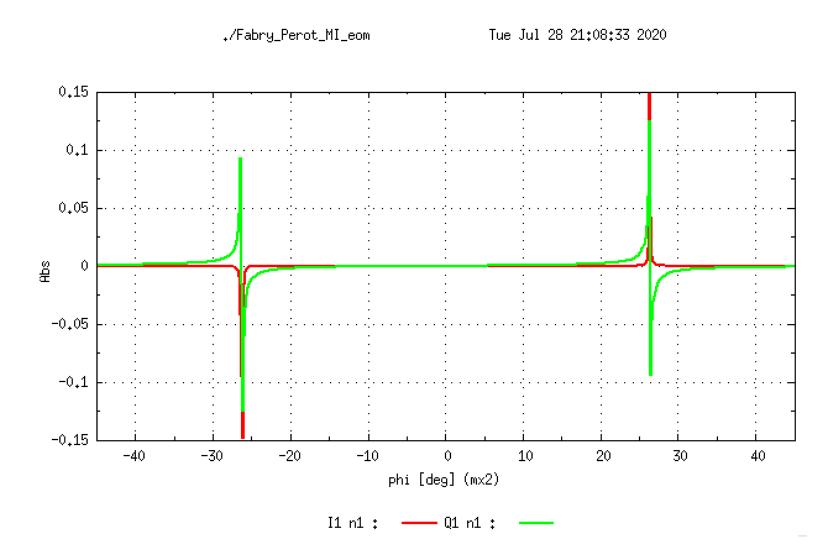
	DARM	MI	CARM
V1 (AS Q1)	4.35	0.0044	0
V2 (REFL I1)	0	0	-3.6
V3 (REFL Q1)	4.5e-5	-0.0045	0

Be careful of fake signal

weak (see, next page)

Demod phases I = 66.2, Q = 156.2Isym*16.881e+6*2*pi/c*180/pi-360*3 = -66.5 This column might be x2 Depending on definitions

DARM error signals REFL I2 and Q1 (v2 and v3)



For f2, $\sin(\alpha)^{\circ}0$, $\cos(\alpha)^{\circ}1$,

	Φ- アーム差動	Φ- マイケルソン	Φ+ アーム同相
V1 (AS Q)	-JoJ, El2 Preso ranzi × CosB sind	-JoJ, IE, Preso Vanti + Cos/s sind	0
V2 (REFL I)	-JoJi Eil² reso ranti x cos & sind	Jo Ji Eil * Vreso Vanti ** Cosp sind	-JoJ, [Eil2 rieso [Vanti × Sin B COS d
V3 (REFL Q)	Jo Ji Eil * Treso Fanti × sin & sin d	- JoJi Fil Preso Panti X Sinp Sind	-JoJ, E, 2 V'reso Vanti

Table by Koyama-kun

For f2, $\sin(\alpha)^{\circ}0$, $\cos(\alpha)^{\circ}1$,

	Φ- アーム差動	Φ- マイケルソン	Φ+ アーム同相
V1 (AS Q)	0	0	0
V2 (REFL I)	0	0	-JoJ, [E, 12 rreso [Vanti x Sin B COS L
V3 (REFL Q)	0	0	-JoJi Eil V'reso Vanti

Table by Koyama-kun

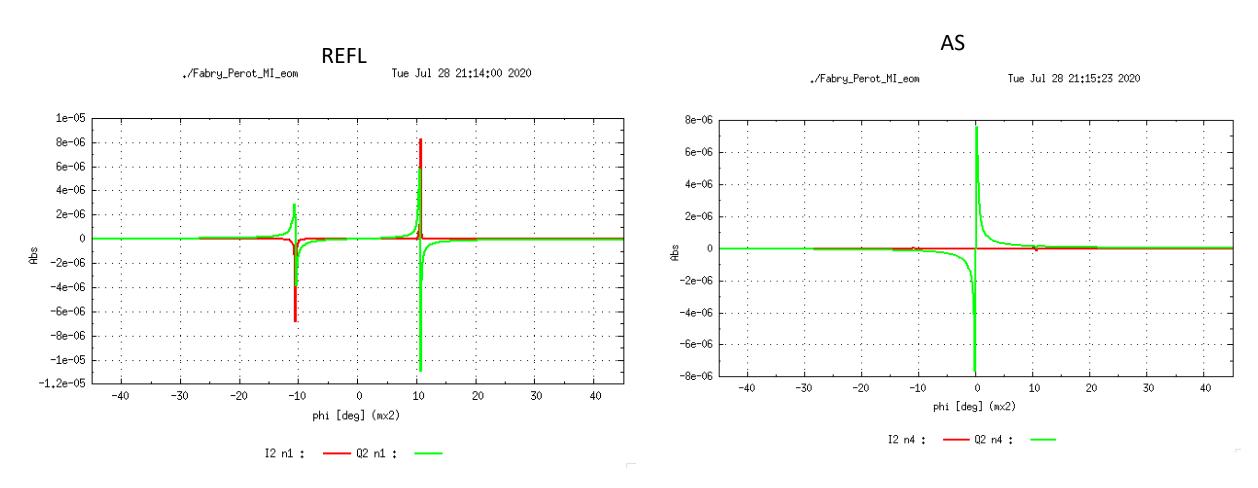
FPMI Sensing Matrix (復調位相最適化後、45MHz 復調)

	Φ- アーム差動 DARM	Φ- マイケルソン MI	Φ+ アーム同相 CARM
V1 (AS Q2)	0	~0	0
V2 (REFL I2)	0	~0	9.4
V3 (REFL Q2)	0	~0	0

Be careful of fake signals

Demodulation phases I = 176.56, Q = 266.56 lsym*45.0159e+6*2*pi/c * 180/pi - 360*8 = -177.18

DARM error signals at AS and REFL



REFL: 0 まわりの傾きほぼなし

AS: 信号がありそうだが絶対値がものすごく小さい

Fabry-Perot Michelson Model

Parameter Summary

Parameter	Design values (lossless case)
Arm finesse	1550
Arm FSR	50 kHz
Arm cutoff frequency	16 Hz
腕共振器の複合反射率 (Carrier 共振)	-0.996
Transmission at MI for f1	0.9239 (amplitude)
Transmission at MI for f2	0.000048 (amplitude)