ASCの現状報告

我妻一博

2011/2/16

概要

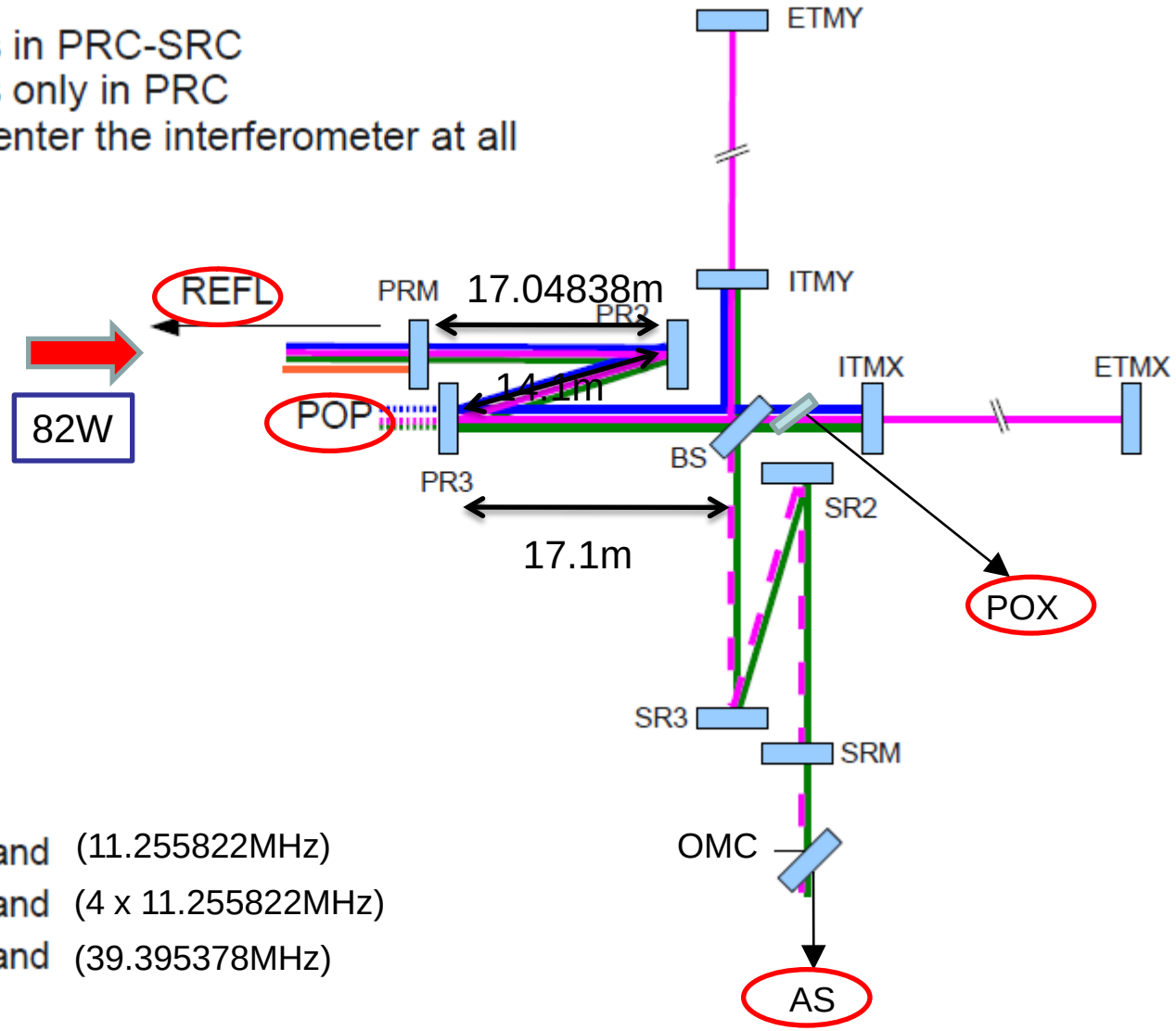
- Parameterを直してbLCGTで計算
  ⇒ 使えそうなポートの目星を付けた
- 我妻・道村で会議@天文台
- iLCGTでの計算

bLCGTの設定

- f1 sideband resonates in PRC-SRC
- f2 sideband resonates only in PRC
- f3 sideband does not enter the interferometer at all

Rprm: 344.518m
Rpr2: -3.919m
Rpr3: 31.970m

Rsrm: 344.518m
Rsr2: -3.919m
Rsr3: 31.970m



Carrier
f1 sideband (11.255822MHz)
f2 sideband (4 x 11.255822MHz)
f3 sideband (39.395378MHz)

パラメータは以下を参照
http://gw.icrr.u-tokyo.ac.jp/JGWwiki/LCGT/subgroup/ifo/MIF/OptParam

- 制御に用いる信号ポートを決める

⇒ tickle01を用いて角度方向の伝達関数を計算し、それを最大にするgouy phaseとdemo.phaseを計算。

Best demodulation and gouy phase

LIGO-T0900511-v4
の4.1に相当

bLCGT parameter

代表でMax A_I
Amp. [W/mrad]

	A_I	A_Q	B_I	B_Q
Demo:	0	90	0	90
Gouy:	90	90	180	180

REFL f1 Angle Sensing Matrix [W/mrad]

	CS	CH	DS	DH	PRM	PR2	PR3	SRM	SR2	SR3	BS
g.ph	8.61	26.3	−66	−66.1	−62.3	−1.19	−0.399	−5.17	−5.17	−5.17	−0.734
d.ph	10.8	9.01	−78	−79.5	6.3	−10.6	−10.6	−10.4	−10.4	−10.4	−7.37
Amp.	129	10.4	−1.9	1.95	26.2	19	143	1.41	2.77	22.7	41.5

REFL f2 Angle Sensing Matrix [W/mrad]

	CS	CH	DS	DH	PRM	PR2	PR3	SRM	SR2	SR3	BS
g.ph	8.75	18.6	71.2	−20.4	65	1.19	−0.203	−5.27	−5.27	−5.27	−0.155
d.ph	−11.8	−11.9	−11.5	−12	−11.7	−11.8	−11.8	−10.8	−10.8	−10.8	−11.9
Amp.	−217	−28.6	0.128	0.251	−46.9	−27.4	−202	−0.18	−0.354	−2.89	−68.2

REFL f3 Angle Sensing Matrix [W/mrad]

	CS	CH	DS	DH	PRM	PR2	PR3	SRM	SR2	SR3	BS
g.ph	−80.7	−78	−1.67	43.1	−15	−75.2	−38.8	13.1	13.1	13.1	−23.8
d.ph	29.6	29.8	32.4	31.7	29.6	27.7	27.6	34.3	34.3	34.3	28.1
Amp.	−302	−81.9	0.481	−0.605	−62.6	−7.07	−27.9	0.0295	0.0579	0.474	−7.58

AS f1 Angle Sensing Matrix [W/mrad]

	CS	CH	DS	DH	PRM	PR2	PR3	SRM	SR2	SR3	BS
g.ph	53.1	54.9	52.5	55.9	88.6	87.7	87.6	47.3	20.2	20.8	30.5
d.ph	86.5	86.9	87.1	87.3	−87.1	−87.5	−87.6	75.6	83.6	83.6	85.6
Amp.	−9.45	8.87	−5.8e+003	−1.59e+003	3.04	6.21	50.8	1.9	5.98	49.6	230

F3(AM)を使わない場合

Best demodulation and gouy phase

bLCGT parameter

代表でMax A_I Amp. [W/mrad]

	A_I	A_Q	B_I	B_Q
Demo:	0	90	0	90
Gouy:	90	90	180	180

POX f1 Angle Sensing Matrix [W/mrad]

	CS	CH	DS	DH	PRM	PR2	PR3	SRM	SR2	SR3	BS
g.ph	-26.9	-85.8	41.6	-53.5	-15.9	-17.3	-17.4	-28.1	-28.1	-28.1	3.58
d.ph	16.7	-75.2	20.3	40	-18.1	-17.1	-17	2.38	2.38	2.38	-25.3
Amp.	8.68	-3.43	27.7	-11.7	4.73	9.61	78.6	0.834	1.64	13.4	25.8

POX f2 Angle Sensing Matrix [W/mrad]

	CS	CH	DS	DH	PRM	PR2	PR3	SRM	SR2	SR3	BS
g.ph	-32.9	25.2	43.5	-46	-24.1	-25.1	-25.2	43.6	43.6	43.6	-2.86
d.ph	-46.6	-45.9	-46.6	-45.9	-46.5	-46.5	-46.5	-46.4	-46.4	-46.4	-46.3
Amp.	-10.9	-3.42	-33.5	11.9	-6.86	-13.9	-114	0.0126	0.0248	0.203	-40.5

POP f1 Angle Sensing Matrix [W/mrad]

	CS	CH	DS	DH	PRM	PR2	PR3	SRM	SR2	SR3	BS
g.ph	-22.9	-26.6	78.5	78.5	-6.83	-7.28	-7.31	-6.44	-6.44	-6.44	-21.4
d.ph	-50.3	-50.3	39.3	39.3	52.8	53.2	53.2	52.7	52.7	52.7	55.6
Amp.	-19.4	9.06	1.78	-1.82	-4.27	-8.65	-70.7	-0.767	-1.51	-12.3	-21.7

POP f2 Angle Sensing Matrix [W/mrad]

	CS	CH	DS	DH	PRM	PR2	PR3	SRM	SR2	SR3	BS
g.ph	-22.7	-26.3	68.2	-44.2	-23.8	-24.9	-24.9	-22.3	-22.3	-22.3	-24.9
d.ph	-75.8	-75.8	-76.1	-75.7	-75.8	-75.8	-75.8	76.5	76.5	76.5	-75.8
Amp.	-24.4	11.3	0.00609	0.0168	6.9	14	114	-0.00375	-0.00737	-0.0603	40.1

Sensing Port

AM(f3)を用いる場合		AM(f3)を用いない場合
CS:REFL_f2,		
CH:REFL_f3_A,	⇒	POP_f1
DS:POX_f2,		
DH:AS_f1,		
PRM:REFL_f3_B,	⇒	REFL_f2
SRM:REFL_f1		

- 最大のものだけを選ぶわけではないので、おそらく対角化Matrixが必要
- PR3の信号が大きい

各ポートでのDC光量

約1mWになるように調整
REFL A and B power is 0.000696828 and 0.000696828
（PRMのAR面反射率を1000e-6, 他は50e-6）
POP A and B power is 0.00101498 and 0.00101498
POX A and B power is 0.00101063 and 0.00101063
AS A and B power is 0.00131755 and 0.00131755
（REFLとASはPDの前にアッテネータ無し）

OMCtr A and B power is 0.00073171 and 0.00073171 (未調整)
OMCref A and B power is 0.129702 and 0.129702 (未調整)
TRX power is 22.7004
TRY power is 22.7006

Cavity内パワー
Intracavity power of arms is 412706 and 412714
PRC power is 811.385
SRC power is 1.71616

気になること

- PR3の信号が大きい
- Cavity powerを400kwにするには鏡のロスが20 x 10^-6 である必要がある（OKか？）
- 制御の自由度の確認（BSやPR2などは角度制御が必要か？）

会議報告

- ★pickleの全体説明(我妻)
- ★パラメータの共有

→Wiki(http://gw.icrr.u-tokyo.ac.jp/JGWwiki/LCGT/subgroup/ifo/MIF/OptParam)
の値を使う

TortoiseSVNをインストール(我妻、道村、ちんたん)

pickleのLCGT版はSVNに置いた(我妻)

自由度はsoft/hard modeで統一

To Do:

o iLCGTのangle sensing matrixを作り、互いに合うかチェック(→我妻、道村)

PMのf1とf2両方使う、ASにpick off mirrorなど設定を合わせる

ポートはAS, REFL, POX, POYを設置

o pickleそのまま走らせてLIGO-T080186の値が出てくるか確認(→道村)

o ~~PRCなどfoldingの角度確認~~(→陳タン) ⇒Foldingの角度情報をもらった

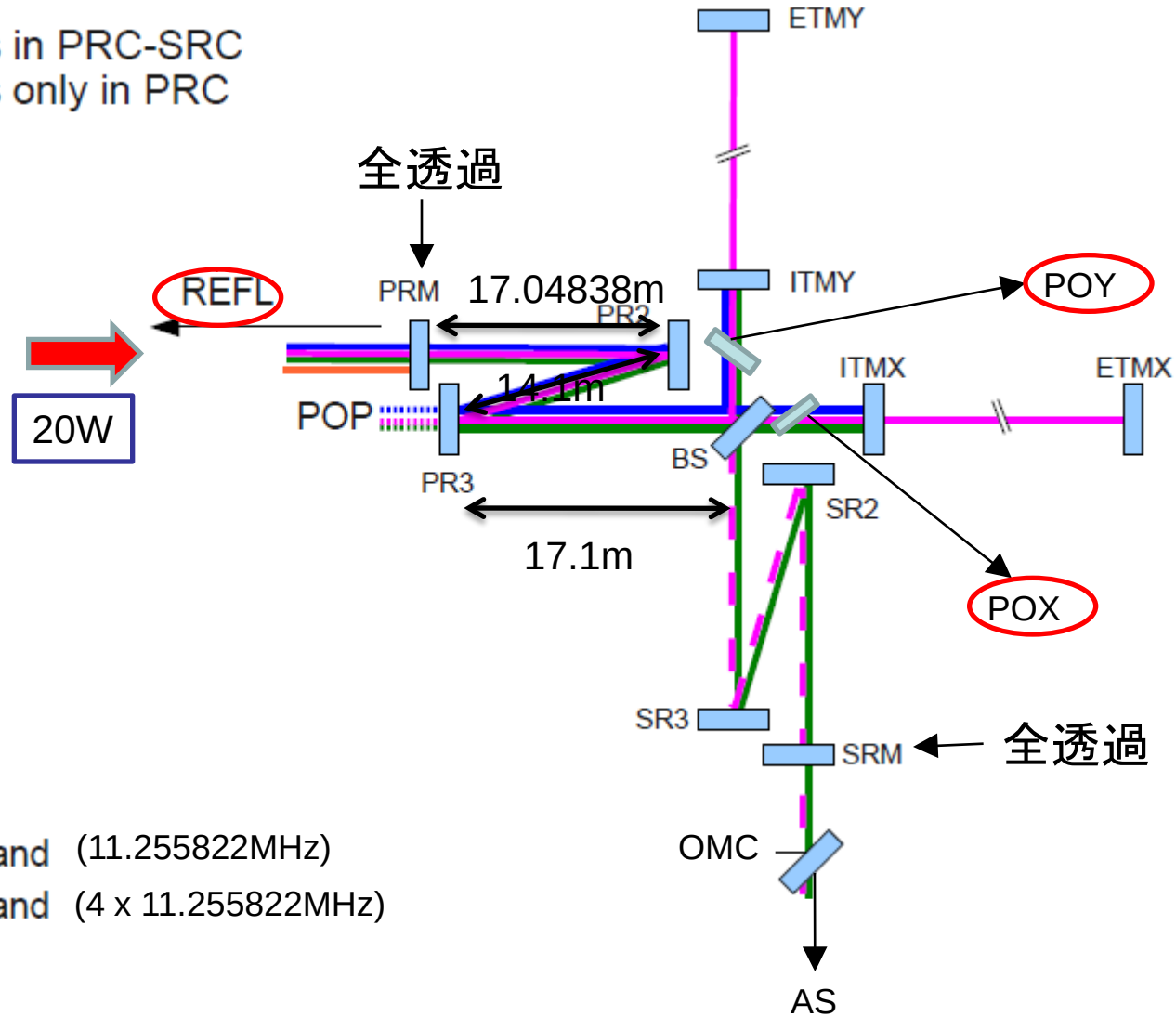
Future: 制御ループの設定(←サスペンションのTFは関口くんらから貰う)

iLCGTの設定

- f1 sideband resonates in PRC-SRC
- f2 sideband resonates only in PRC

Rprm: inf.
Rpr2: -3.919m
Rpr3: 31.970m

Rsrm: inf.
Rsr2: -3.919m
Rsr3: 31.970m



Carrier
f1 sideband (11.255822MHz)
f2 sideband (4 x 11.255822MHz)

パラメータは以下を参照
http://gw.icrr.u-tokyo.ac.jp/JGWwiki/LCGT/subgroup/ifo/MIF/OptParam

Best demodulation and gouy phase

LIGO-T0900511-v4
の4.1に相当

iLCGT parameter

代表でMax A_I
Amp. [W/mrad]

	A_I	A_Q	B_I	B_Q
Demo:	0	90	0	90
Gouy:	90	90	180	180

REFL f1 Angle Sensing Matrix [W/mrad]

	CS	CH	DS	DH	PRM	PR2	PR3	SRM	SR2	SR3	BS
g.ph	31.7	68	34.1	35.3	NaN	56.3	58.2	NaN	NaN	NaN	70.1
d.ph	24.4	−79.7	−52	−55	NaN	−4.1	−4.74	NaN	NaN	NaN	−22.5
Amp.	9.43	2.73	−1.03	1	NaN	3.43	28.4	NaN	NaN	NaN	12.5

REFL f2 Angle Sensing Matrix [W/mrad]

	CS	CH	DS	DH	PRM	PR2	PR3	SRM	SR2	SR3	BS
g.ph	27.1	−62.9	−26.1	49.4	NaN	55.3	57.1	NaN	NaN	NaN	57.5
d.ph	−11.5	−11.5	−11.7	−11.8	NaN	−11.5	−11.5	NaN	NaN	NaN	−11.5
Amp.	−12.4	1.13	−0.00784	0.0194	NaN	−4.92	−40.7	NaN	NaN	NaN	−14.3

Commonで信号分離がきれい

AS f1 Angle Sensing Matrix [W/mrad]

	CS	CH	DS	DH	PRM	PR2	PR3	SRM	SR2	SR3	BS
g.ph	−28.9	9.91	−10.3	−6.05	NaN	26	24.3	NaN	11.8	10	−87.2
d.ph	72.8	73.9	73.5	73.9	NaN	74.4	74.4	NaN	73.5	73.5	76.7
Amp.	3.63	−9.43	3.49e+003	916	NaN	−3.97	−32.8	NaN	−5.01	−41.5	−163

Best demodulation and gouy phase

iLCGT parameter

代表でMax A_I Amp. [W/mrad]

	A_I	A_Q	B_I	B_Q
Demo:	0	90	0	90
Gouy:	90	90	180	180

POX f1 Angle Sensing Matrix [W/mrad]

	CS	CH	DS	DH	PRM	PR3	SRM	SR2	SR3	BS
g.ph	-27	63.2	-27	63.2	NaN	-89	-89.7	NaN	NaN	NaN	89.4
d.ph	33.7	33.7	33.7	33.7	NaN	33.7	33.7	NaN	NaN	NaN	33.7
Amp.	-2.77	-1.41	-2.77	-1.41	NaN	-1.22	-10.1	NaN	NaN	NaN	-4.3e-008

POX f2 Angle Sensing Matrix [W/mrad]

	CS	CH	DS	DH	PRM	PR3	SRM	SR2	SR3	BS
g.ph	-27	63.2	-27	63.2	NaN	87.3	89	NaN	NaN	NaN	88.2
d.ph	79.6	79.6	79.6	79.6	NaN	79.6	79.6	NaN	NaN	NaN	79.6
Amp.	-2.78	-1.39	-2.78	-1.39	NaN	1.23	10.1	NaN	NaN	NaN	-4.31e-008

POY f1 Angle Sensing Matrix [W/mrad]

	CS	CH	DS	DH	PRM	PR3	SRM	SR2	SR3	BS
g.ph	-27.4	58.7	-27.4	58.7	NaN	87.8	89.4	NaN	NaN	NaN	89.6
d.ph	-4.76	-18.4	-4.76	-18.4	NaN	-11.2	-11.3	NaN	NaN	NaN	-11.3
Amp.	-2.72	-1.45	2.72	1.45	NaN	1.23	10.2	NaN	NaN	NaN	7.16

← 何か変?

POY f2 Angle Sensing Matrix [W/mrad]

	CS	CH	DS	DH	PRM	PR3	SRM	SR2	SR3	BS
g.ph	-63.1	26.7	-63.1	26.7	NaN	87.5	89.2	NaN	NaN	NaN	89.4
d.ph	79.6	79.6	79.6	79.6	NaN	79.6	79.6	NaN	NaN	NaN	79.6
Amp.	1.42	2.76	-1.42	-2.76	NaN	-1.23	-10.2	NaN	NaN	NaN	-7.16

道村氏の結果

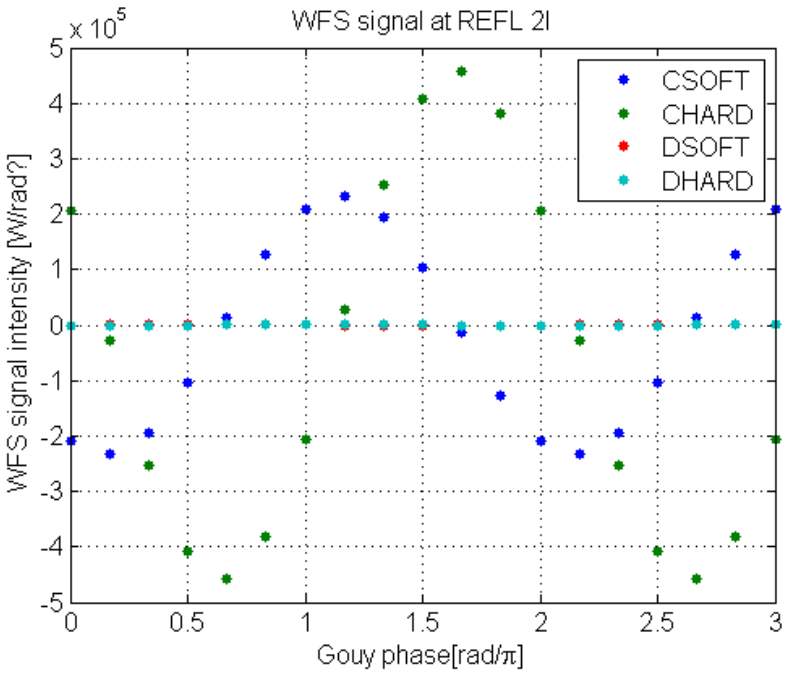
Angle Sensing Matrix [W/mrad?]

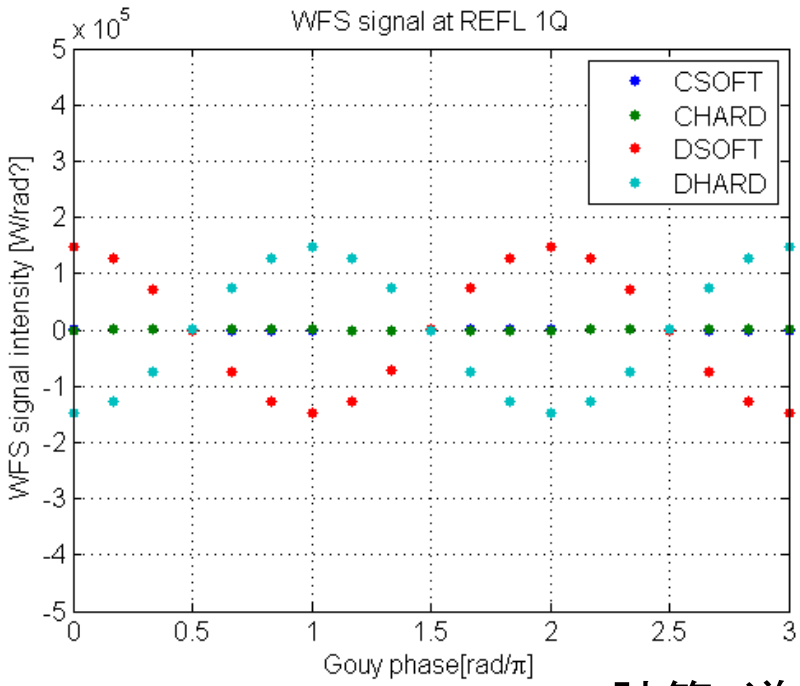
	CSOFT	CHARD	DSOFT	DHARD
AS_1Qb	-5.5e-004	-7.6e-004	7.5e+001	2.9e+002
AS_1Ib	-9.6e-007	-1.3e-006	1.3e-001	5.0e-001
AS_1Qa	3.3e-002	1.3e-001	7.3e-001	2.8e+000
AS_1Ia	5.8e-005	2.2e-004	1.3e-003	4.9e-003
REFL_2Qb	-4.8e-002	1.4e+000	-7.4e-004	3.9e-004
REFL_2Ib	1.6e+001	-4.6e+002	1.0e-001	1.4e-002
REFL_2Qa	7.0e-001	9.5e-002	7.0e-004	-1.1e-004
REFL_2Ia	-2.3e+002	-3.2e+001	7.2e-003	-2.0e-001
REFL_1Qb	-1.3e-001	1.7e+000	-7.5e+001	7.6e+001
REFL_1Ib	-1.1e+001	3.2e+002	-1.5e-001	-2.1e+000
REFL_1Qa	8.1e-001	2.0e-001	1.3e+002	-1.3e+002
REFL_1Ia	1.6e+002	2.1e+001	-9.1e-001	-2.6e-001

線形結合で
DSOFTと
DHARD分離

(※)PRM、SRM部分のFolding無し、BSの直前にEOM

Gouy phaseによる信号の変化





計算:道村氏

Sensing port

REFL_f2_IのA,B(g.ph 90度差)でCommonの二つを取り、
REFL_f1_Q(A, Bのうちg.ph が1piに近い方)でDiffの一つを取り、
ASの一つでDiffのもう一つを取る

⇒ p.12の結論に一致

気になること　その2

- 各々の腕を各自のWFS（POX, POY）で制御しないのか？
- PR3の信号が大きい（制御に用いないからOK？）

今後

- パラメータを合わせて、二人の計算結果のすり合わせ（iLCGT）
- bLCGTのノイズ混入計算を我妻、iLCGTを道村が担当
- プログラムが正しいことの確認（道村？）