Layout 会議

2011/6/16

ICRR UT・EVO

Layout 会議の目的

① 干渉計メインビームの軸を決める(I,bLCGT共通)

- MC→(FAI, MTR1, MTR2) →(PRM, PR2, PR3)
  →BS→ITMs →ETMs
- BS →SR3 →SR2 →SRM → MTSs
- 鏡の位置と径（鏡の曲率）とウエッジ角

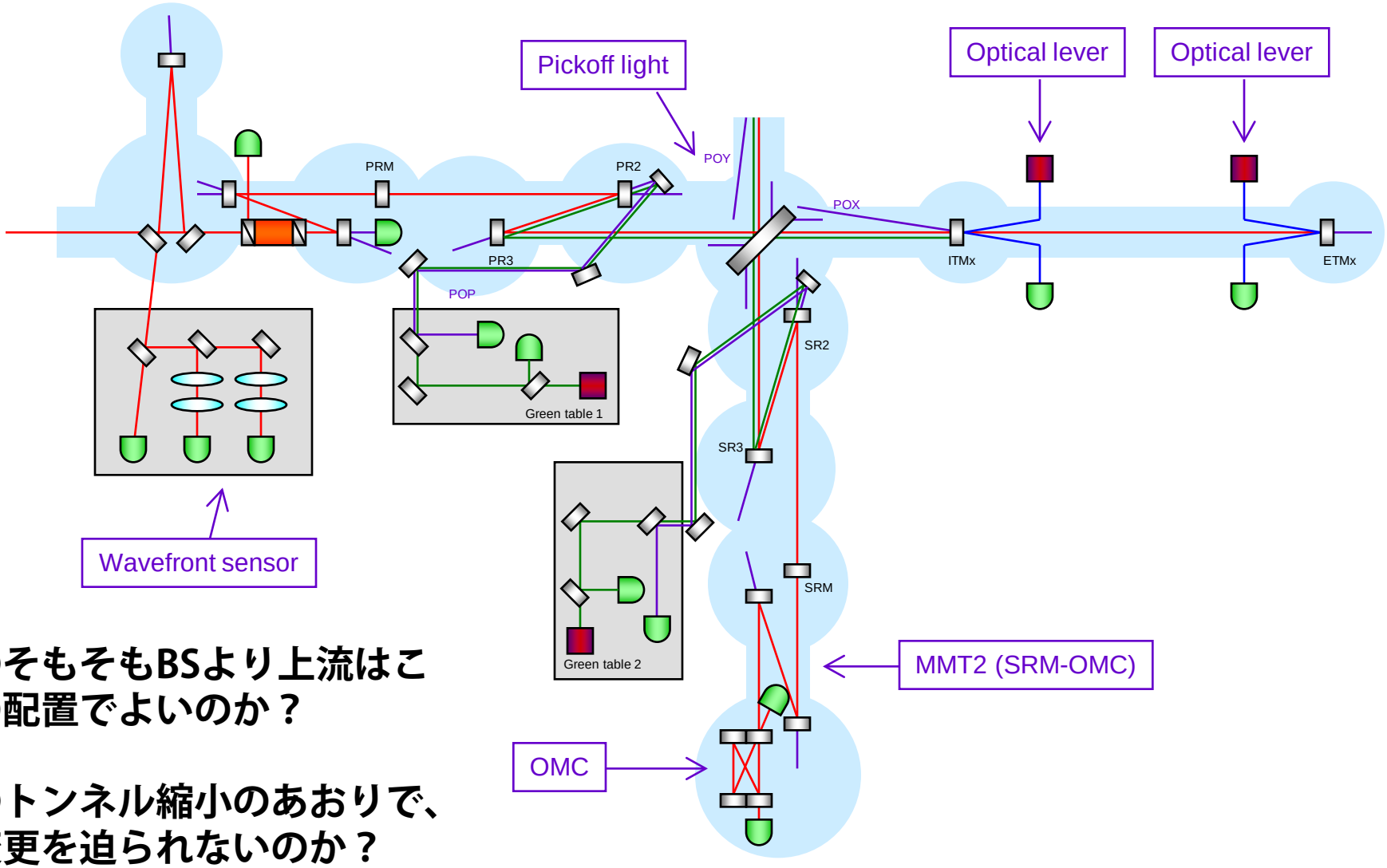
② 決まったら、補助光学系への受け渡し光学系の配置を議論する

- GIMs(Guide), BDPs(Beam Damping

③ そこから先はサブグループ・各補助光学系グループ内で決める

①は、ほとんどもう決まっているように見えるが一部問題もある。
②と、③のAOSから逆に入る光学系のルートや鏡、必要なら追加
真空タンクの位置の確認が必要。

Layout Image by Ohmae



●そもそもBSより上流はこの配置でよいのか？

●トンネル縮小のあおりで、変更を迫られないのか？

MC光軸

① MC

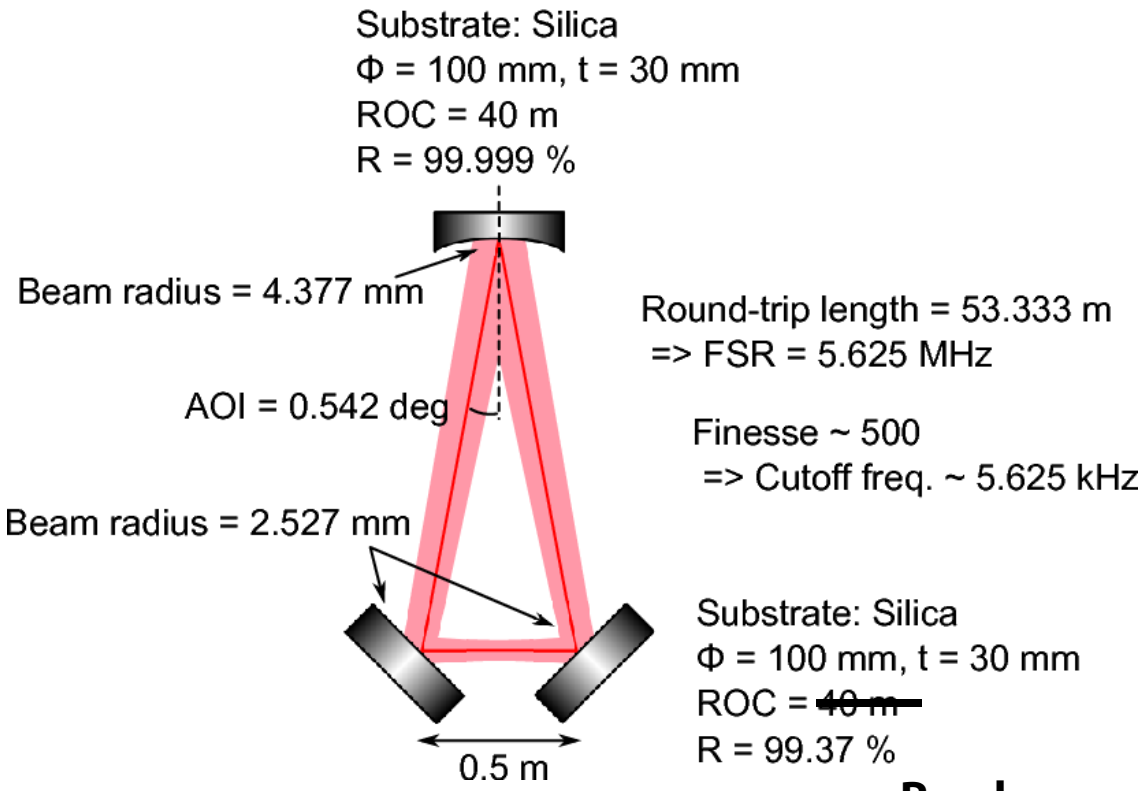
- 共振器長（←要求安定度・MIF RF・DCRO制御透過周波数）
- ビーム径:（←ダメージ閾値）→ 鏡の最低コート面積
- 短軸位置と長さ（→正確なMC End Tankの位置に影響）
- 鏡厚とウェッジ（？）

② AOS for MC

- GIM and DAP

for
MCIn Ref, MCOt Ref,
MCEd Tra, AR, Window

直接外に出すか？
GIMを使うか？
真空外でよいか？

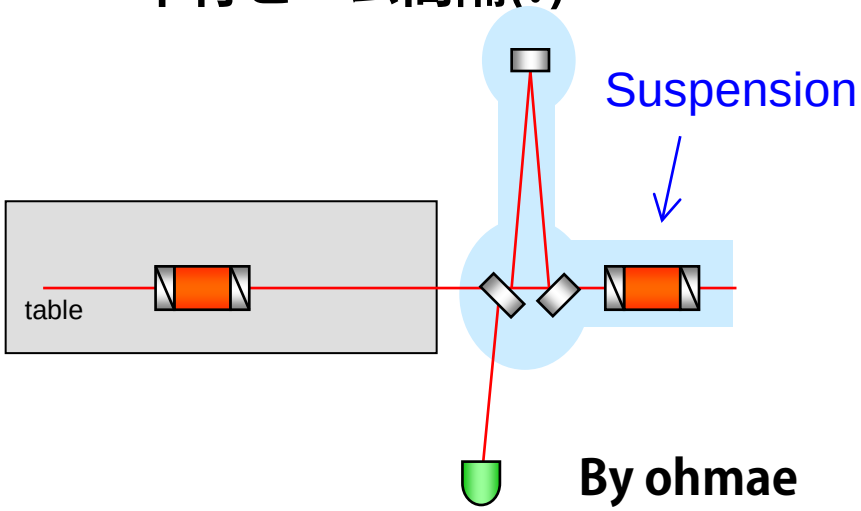


By ohmae

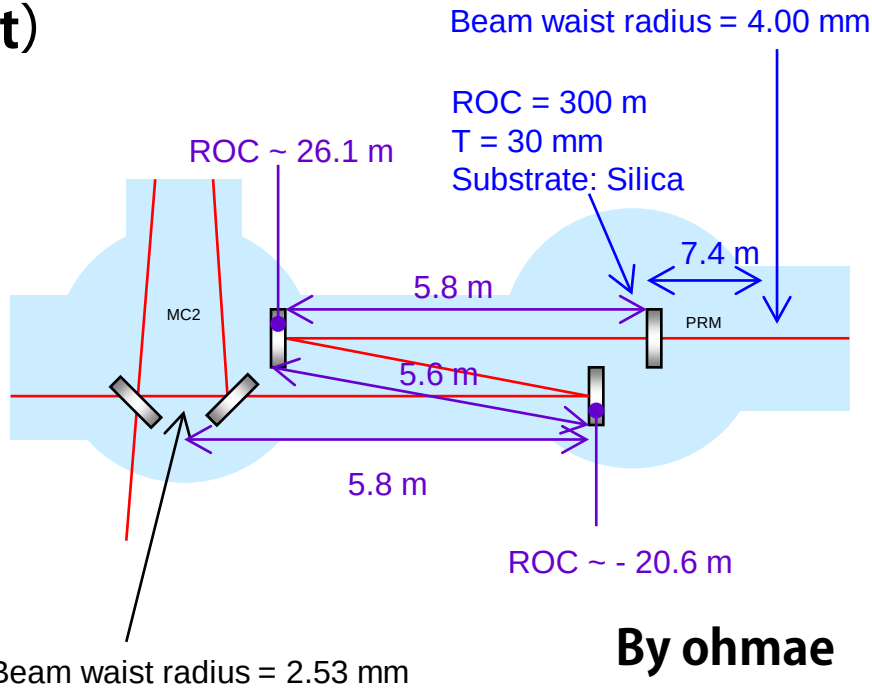
MTR光軸 (1)

① FAI, MTR1, MTR2

- 懸架装置の大きさにもよるが、原案だと無理がある？MCは独立させるべき。
- FAIとMTR2を置く位置の確保→別タンクの用意
- FAIでの熱レンズ効果の考慮や強力な磁石の影響回避が必要
- MTRs間隔と曲率（自由度多いby寺田君）
  （←位置に鈍感な組み合わせがあるか）
  （←ビーム径情報@PRM and MCout）
- MTRs ウェッジ(?)
- 平行ビーム間隔(?)



By ohmae



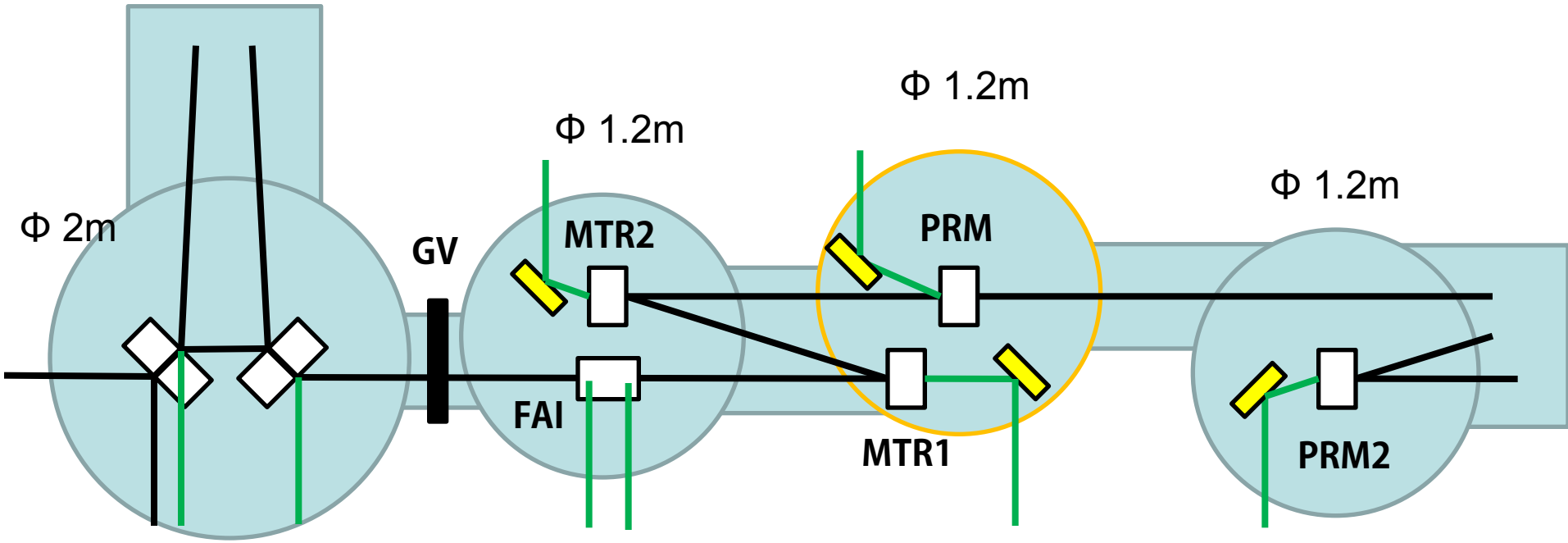
By ohmae

MTR光軸 (2)

② AOS for FAI, MTR1, MTR2

- GIM and BDP for Pick Off of FAI Input-Output PBS
- GIM and BDP for MTR1, MTR2 Trans and AR Ref
- Window Ref

MCを1~2m Laser側に動かす（掘削穴に収まる）

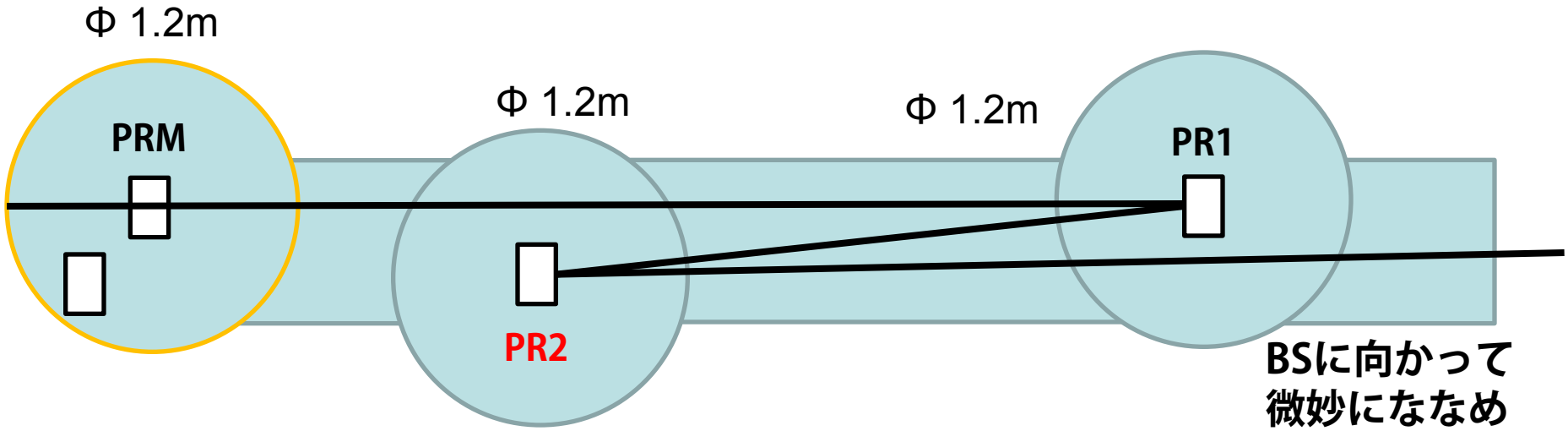


PRC光軸 (1)

① PRM, PR1, PR2, BS

- 共振器長（←FP Cavity, ROC許容誤差, PI Stability, BS-ITM長, ）
- ビーム径（←ダメージ閾値）
- 入射角度（←要求ビーム真円度, 高次モードカップル）
- 平行ビーム間隔（0.629度だとPR1, PR2間隔が~26cm ）
- 位置（← ITMウエッジ角, BSのウエッジ角度, 鏡の厚み）

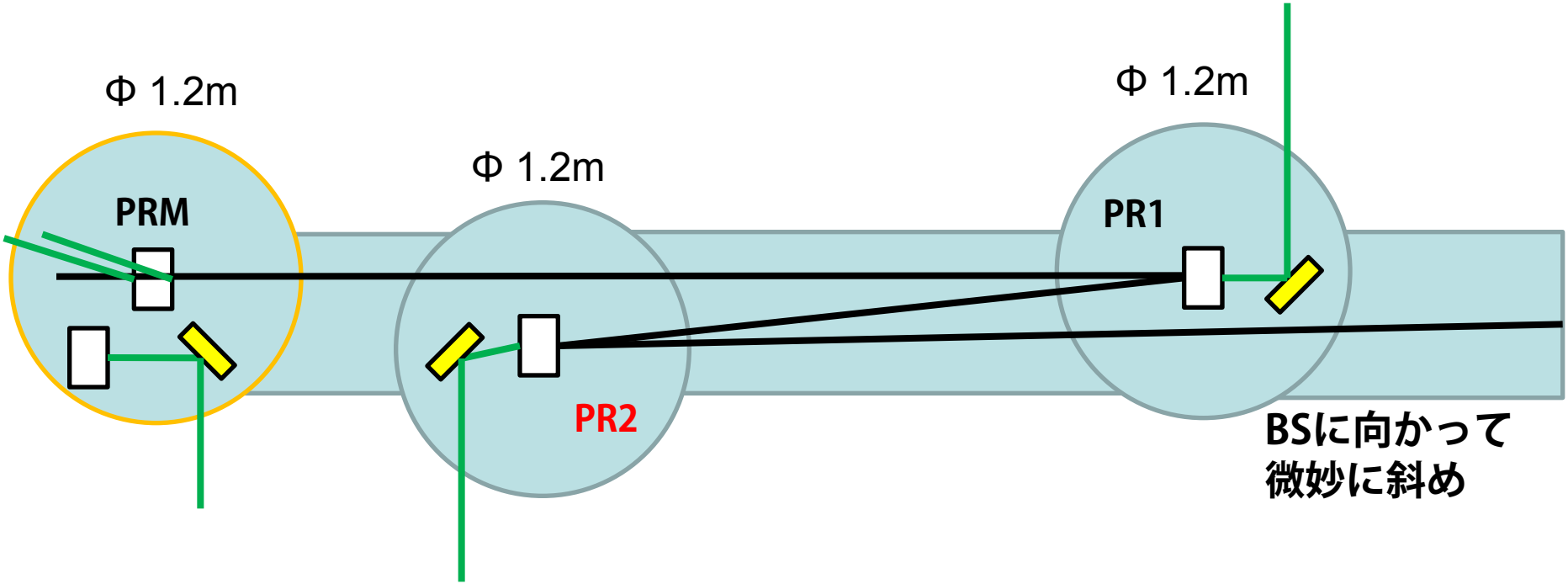
今の配置の若干の不安点：
BSに入射する最後のPR2鏡が、BSから遠い位置にある。つまり、ウエッジによる、シフト量が大きい。



PRC光軸 (2)

① AOS for PRM, PR1, PR2

- GIM and BDP for PRM AR ref, PRM HR ref,
- GIM and BDP for PR1, PR2 Tra, AR Ref,
- Window Ref
- Green Locking Laser Introduction



PRC光軸 Parameters

MIF_Design_Aso20110228

Parameter Name	Value	Comments
HR Reflectivity@1064 nm	90+0/-0.1%	
HR Loss@1064 nm	<100 ppm	
AR Reflectivity@1064 nm	<100 ppm	
HR ROC	300.6±1 m	332.8 by Agatsuma Report
AR ROC	>100 km	As large as possible
AR Wedge Angle	2.0±0.1 deg	

Table 1.4: PRM Requirements

Parameter Name	Value	Comments
HR Reflectivity@1064 nm	99.95±0.01%	
HR Reflectivity@532 nm	<10%	As small as possible
HR Loss@1064 nm	<100 ppm	
HR Loss@532 nm	<1%	
AR Reflectivity@1064 nm	<500 ppm	
AR Reflectivity@532 nm	<10%	
HR ROC	-3.251±0.01 m	
AR ROC	>50 km	As large as possible
AR Wedge Angle	2.0±0.1 deg	

Table 1.6: PR2 Requirements

Parameter Name	Value	Comments
HR Reflectivity@1064 nm	>99.99%	
HR Reflectivity@532 nm	>80%	As large as possible
HR Loss@1064 nm	<100 ppm	
HR Loss@532 nm	<1%	
AR Reflectivity@1064 nm	<1000 ppm	
AR Reflectivity@532 nm	No requirement	
HR ROC	27.36±0.1 m	
AR ROC	>10 km	As large as possible
AR Wedge Angle	2.0±0.1 deg	

Table 1.7: PR3 Requirements

f1	16.880962 MHz	$3 \times f_{MC}$, PM
f2	45.015898 MHz	$8 \times f_{MC}$, PM
f3	39.388910 MHz and 56.269873 MHz	$7 \times f_{MC}$ and $10 \times f_{MC}$, AM
f_{MC}	5.626987 MHz	MC FSR
L_{MC}	26.6388 m	MC Length

Table 1.19: RF Sideband Frequencies

Parameter Name	Value	Comments
Lp1	14.761 m	Distance between PRM and PR2
Lp2	12.067 m	Distance between PR2 and PR3
Lp3	14.764 m	Distance between PR3 and BS
Ls1	14.761 m	Distance between SRM and SR2
Ls2	12.067 m	Distance between SR2 and SR3
Ls3	14.764 m	Distance between SR3 and BS
Folding Angle	0.6293 deg	The incident angle to the folding mirrors.

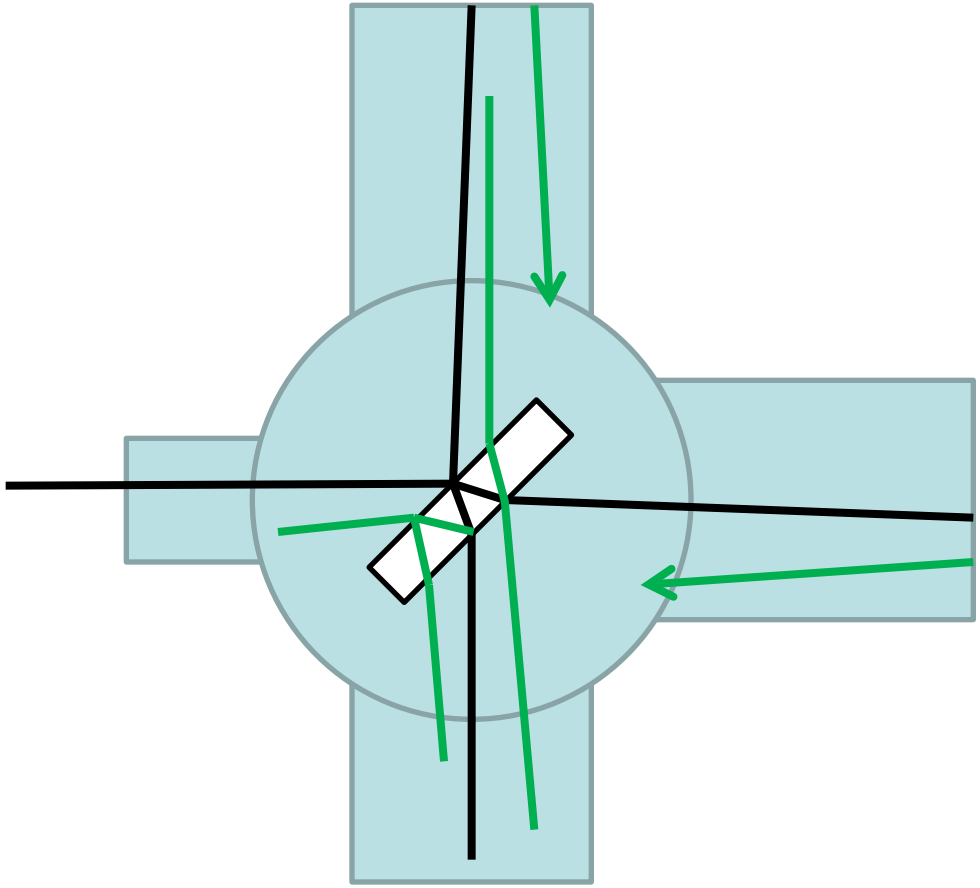
Table 1.18: Folding parameters. See Figure 1.2 for the meaning of the parameters.

BS

① BS
- (BS center or BS Ref Center) = Tank Center ??
- ITMのウエッジを考慮したビーム反射方向（→GVの穴との整合性）
- BSの基材屈折率、ウエッジを考慮したビーム直進方向（→GVの穴との整合性）
- BSの厚み
- ITMのウエッジ方向は、
  対称配置？非対称配置？

② AOS around BS
- GIM for BS AR Refs
- GIM for ITM AR Ref

(どこに戻ってくる？？)
(BS側のRadiation Shield の切れ込みの指示が必要)
- Window Ref

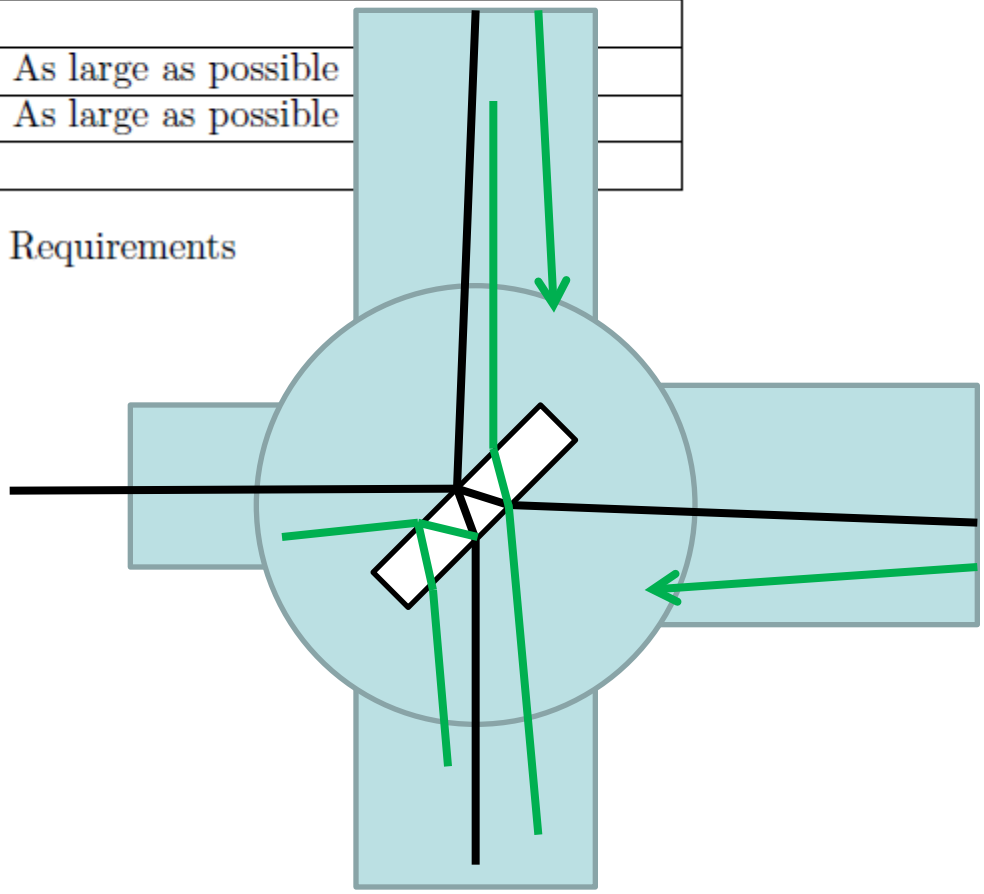


BS Parameters

MIF_Design_Aso20110228

Parameter Name	Value	Comments
HR Reflectivity@1064 nm	50±0.5%	S Polarization
HR Reflectivity@532 nm	<10%	As small as possible
AR Reflectivity@1064 nm	<50 ppm	
AR Reflectivity@532 nm	<10%	
HR ROC	>500 km	As large as possible
AR ROC	>500 km	As large as possible
AR Wedge Angle	0.383±0.002 deg	

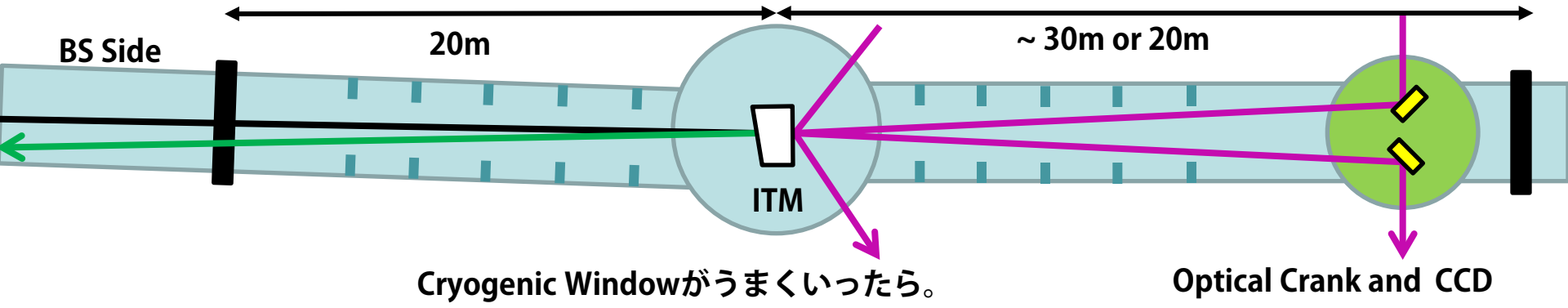
Table 1.3: Beam Splitter Requirements



ITM

① ITM
- 穴の中心軸に対し、250mm L内側に設置（直径3500mm穴の場合）
- ITM center ＝Tank Center ??
- ITMのウエッジを考慮したビーム入射方向
（→ Radiation DuctはITM-BSの横ずれを考慮して斜めにつける。斜めでない場合は、バッフル穴の位置に注意。）
- BS側GVの穴の位置に注意（GVの取り付け方に依存）。

② AOS around ITM
- GIM for ITM AR Refs in BS Tank
（→ BS側のRadiation Shieldの切れ込みの指示が必要?)
- Optical Crank and CCD monitor Tank from Arm Side
- Windows Ref

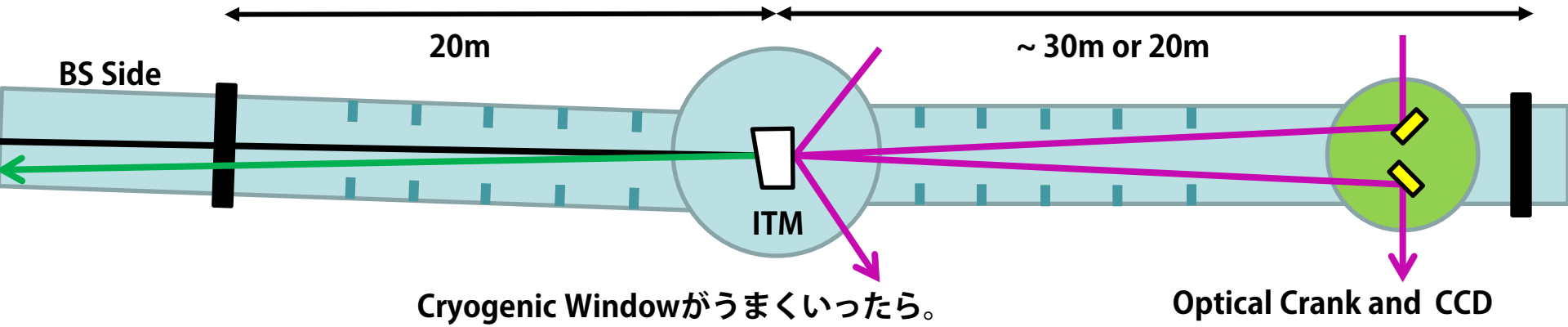


ITM parameters

MIF_Design_Aso20110228

Parameter Name	Value	Comments
HR Reflectivity@1064 nm	99.6±0.01%	Power reflectivity
HR Reflectivity Mismatch @1064 nm	<0.05%	$\lvert R_{\mathrm{ITMX}} - R_{\mathrm{ITMY}} \rvert$
HR Reflectivity@532 nm	80±10%	ITM reflectivity must be smaller than ETM
HR loss@1064 nm	<45 ppm	Including diffraction and absorption
HR loss@532 nm	<1%	Including diffraction and absorption
AR Reflectivity@1064 nm	200(+100/-0) ppm	
AR Reflectivity@532 nm	<5%	
HR ROC	>500 km	As large as possible
HR ROC Mismatch between ITMX and ITMY	<10 km	
AR ROC	>500 km	As large as possible
AR Wedge Angle	0.2±0.002 deg	

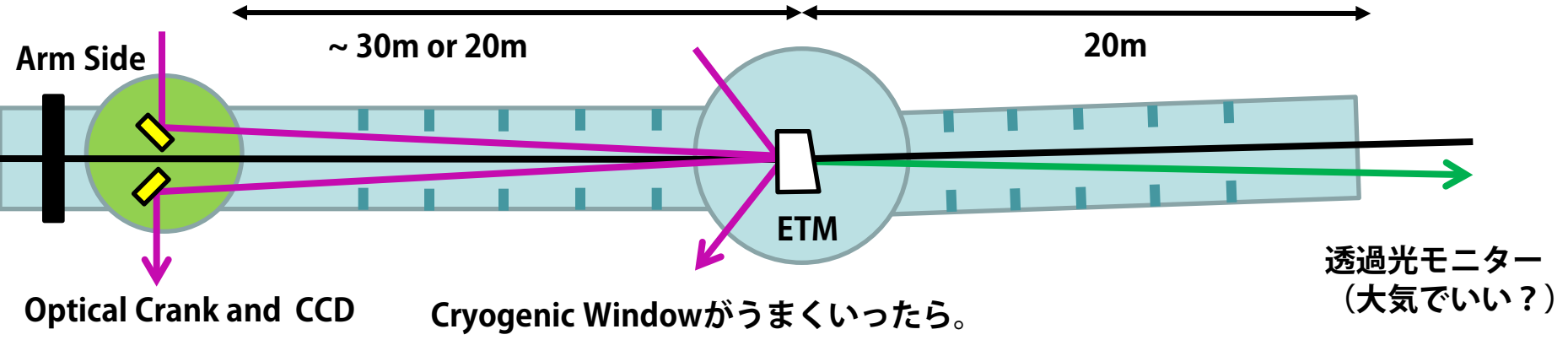
Table 1.1: Input Test Mass Requirements



ETM

① ETM
- (ETM center or ETM HR Center) = Tank Center ??
- ETMにウエッジ必要では？ウェッジを考慮したビーム透過方向
（→ Radiation Shield Ductは斜めにつける。斜めでない場合は、バッフル穴の位置に注意。）

② AOS around ETM
- GIM for ETM AR Refs to Tra Monitor
（→ Tra側のRadiation Shieldの切れ込みの指示が必要 ?)
- Optical Crank and CCD monitor Tank from Arm Side
（iLCGTでのTypeCタンクを流用できるか ?。高さは不要。）
- Windows Ref

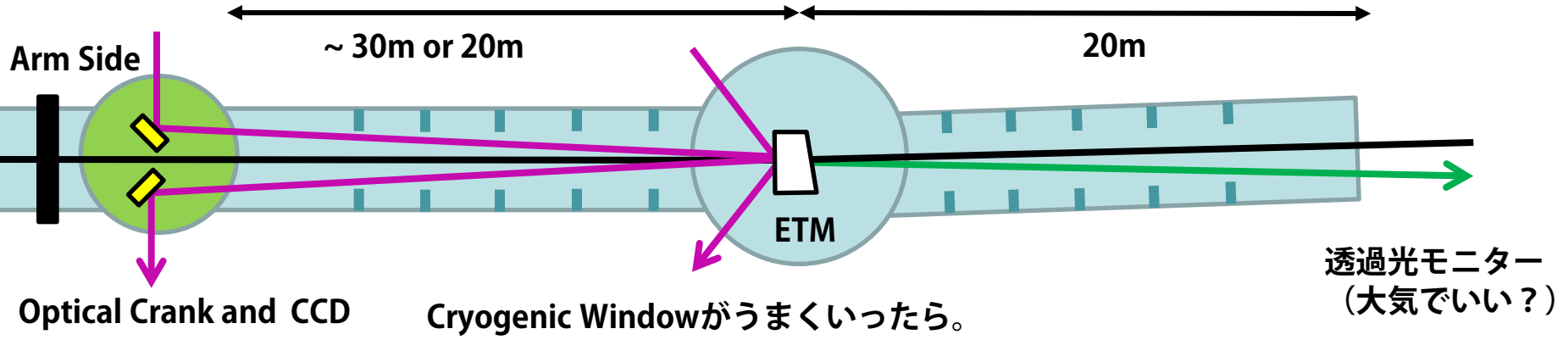


ETM Parameters

MIF_Design_Aso20110228

Parameter Name	Value	Comments
HR Reflectivity@1064 nm	>99.9945%	Power reflectivity
HR Transmissivity@1064 nm	>1 ppm	
HR Reflectivity@532 nm	80±10%	ETM reflectivity must be larger than ITM
HR loss@1064 nm	<45 ppm	Including diffraction and absorption
HR loss@532 nm	<1%	Including diffraction and absorption
AR Reflectivity@1064 nm	<1000 ppm	
AR Reflectivity@532 nm	No requirement	
HR ROC	7000±100 m	
HR ROC Mismatch between ITMX and ITMY	<7 m	
AR ROC	>100 km	As large as possible
AR Wedge Angle	0 deg	

Table 1.2: End Test Mass Requirements



SRC Parameters

Parameter Name	Value	Comments
HR Reflectivity@1064 nm	99.95±0.01%	
HR Reflectivity@532 nm	<10%	As small as possible
HR Loss@1064 nm	<100 ppm	
HR Loss@532 nm	<1%	
AR Reflectivity@1064 nm	<500 ppm	
AR Reflectivity@532 nm	<10%	
HR ROC	-3.251±0.01 m	
AR ROC	>50 km	As large as possible
AR Wedge Angle	2.0±0.1 deg	

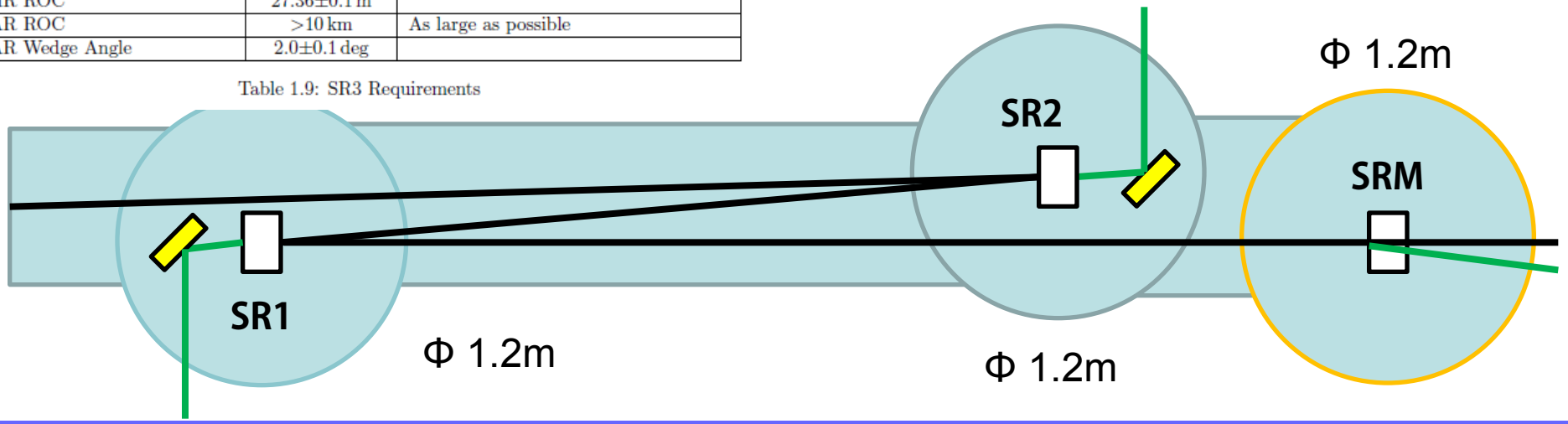
Table 1.8: SR2 Requirements

Parameter Name	Value	Comments
HR Reflectivity@1064 nm	>99.99%	
HR Reflectivity@532 nm	>80%	As large as possible
HR Loss@1064 nm	<100 ppm	
HR Loss@532 nm	<1%	
AR Reflectivity@1064 nm	<1000 ppm	
AR Reflectivity@532 nm	No requirement	
HR ROC	27.36±0.1 m	
AR ROC	>10 km	As large as possible
AR Wedge Angle	2.0±0.1 deg	

Table 1.9: SR3 Requirements

Parameter Name	Value	Comments
HR Reflectivity@1064 nm	85.0±1%	
HR Loss@1064 nm	<100 ppm	
AR Reflectivity@1064 nm	<100 ppm	
HR ROC	300.6±1 m	
AR ROC	>100 km	As large as possible
AR Wedge Angle	2.0±0.1 deg	

Table 1.5: SRM Requirements



SRC 光軸

① SR2, SR1, SRM
- 共振器長（←FP Cavity, ROC許容誤差, BS-ITM長, 変調周波数）
- ビーム径（←ダメージ閾値、一瞬でも全然問題ない？）
- 入射角度（←要求ビーム真円度, 高次モードカップル）
- 位置（← ITMウエッジ角, BSのウエッジ角度, 鏡の厚み）
- 平行ビーム間隔（0.629度だとPR1, PR2間隔が~26cm ）

② AOS around SR Cavity
- GIM for ETM AR Refs from SR2, SR1, SRM
- Windows Ref
- Green Locking Laser Introduction