COMPARISON: ADLIGO UNSTABLE VS STABLE RECYCLING CAVITY OPTICAL LAYOUT

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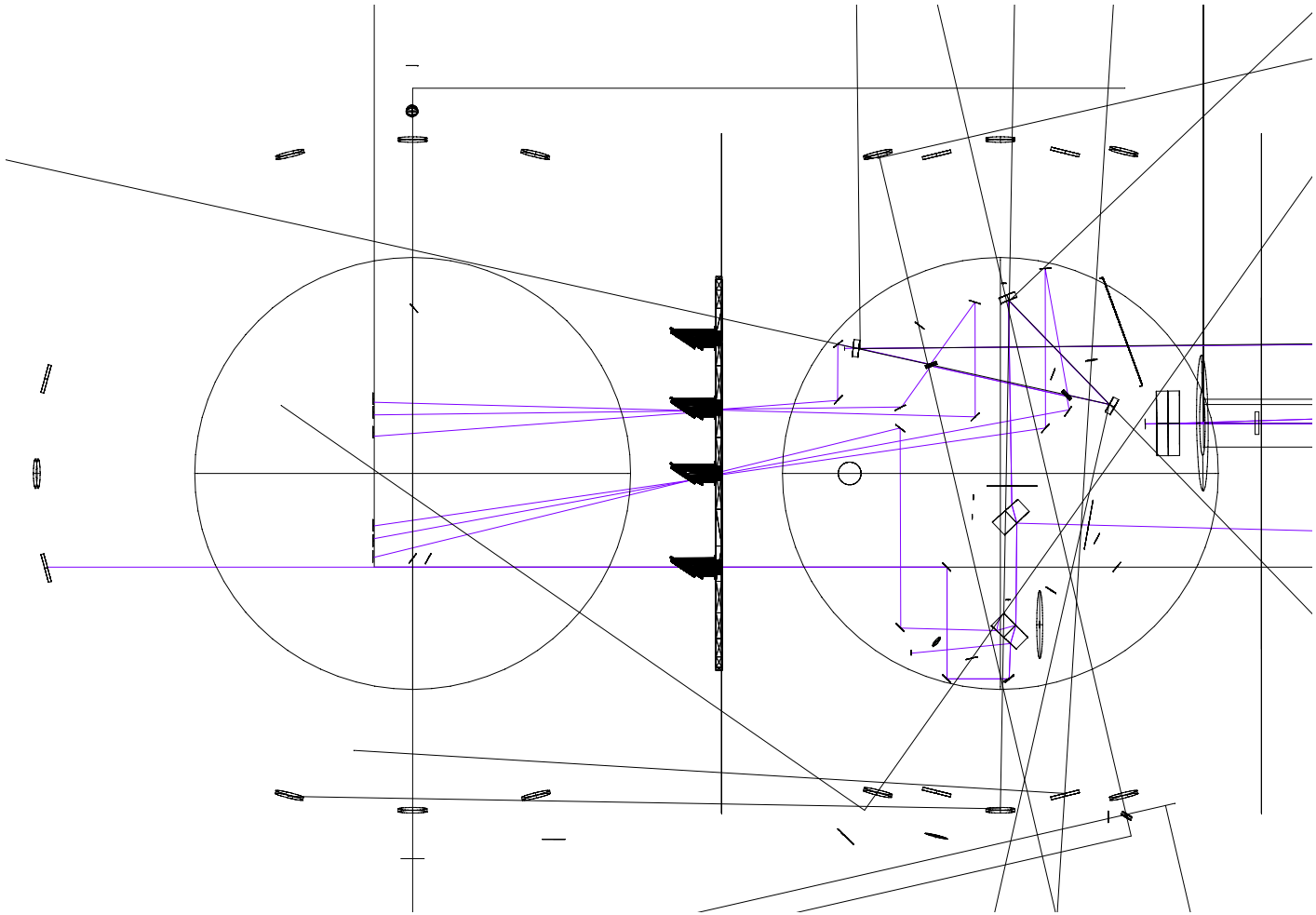
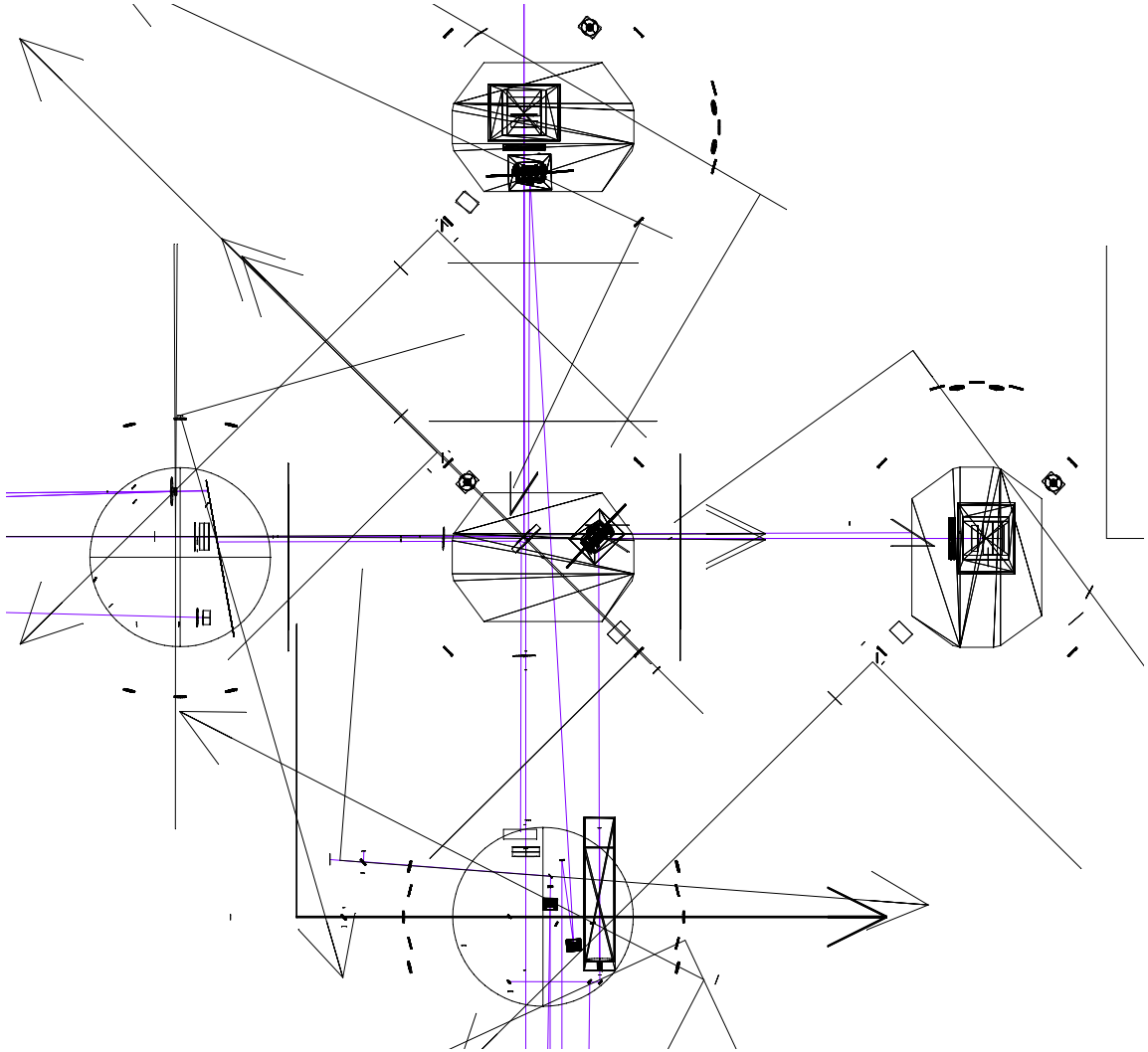
LIGO-G070025-00-D

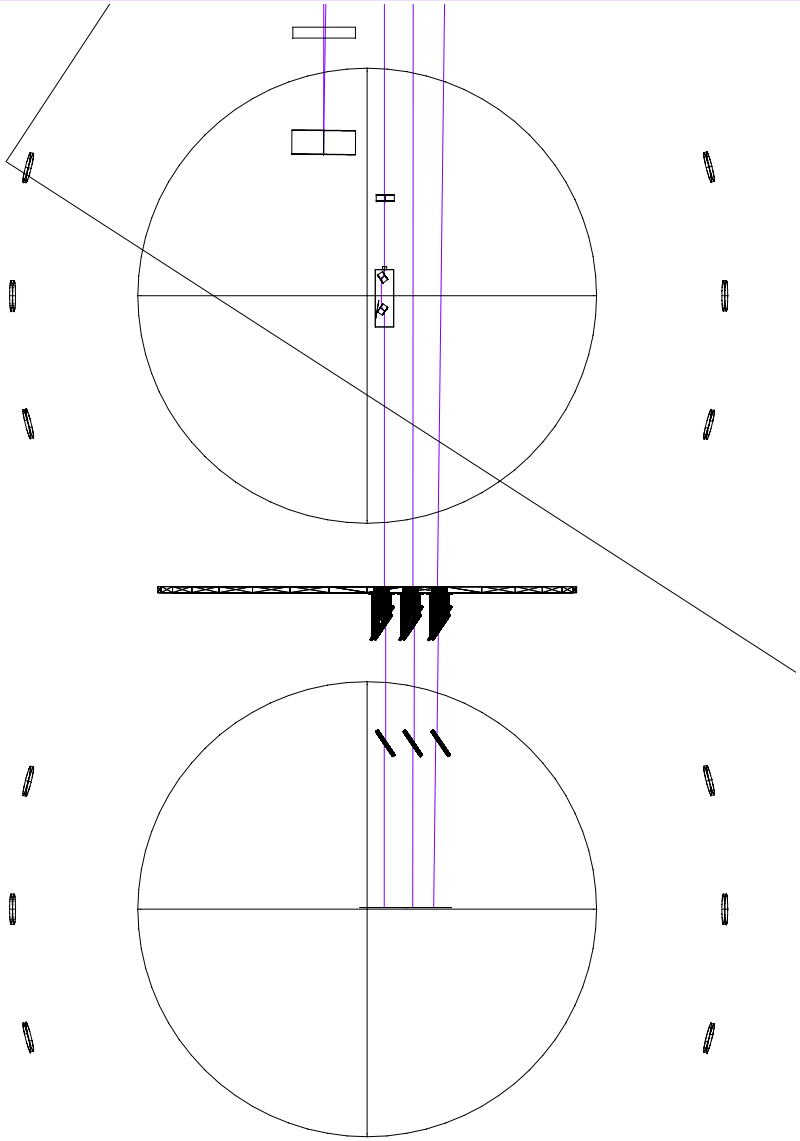
Unstable RC, Optical Layout
Input Optics



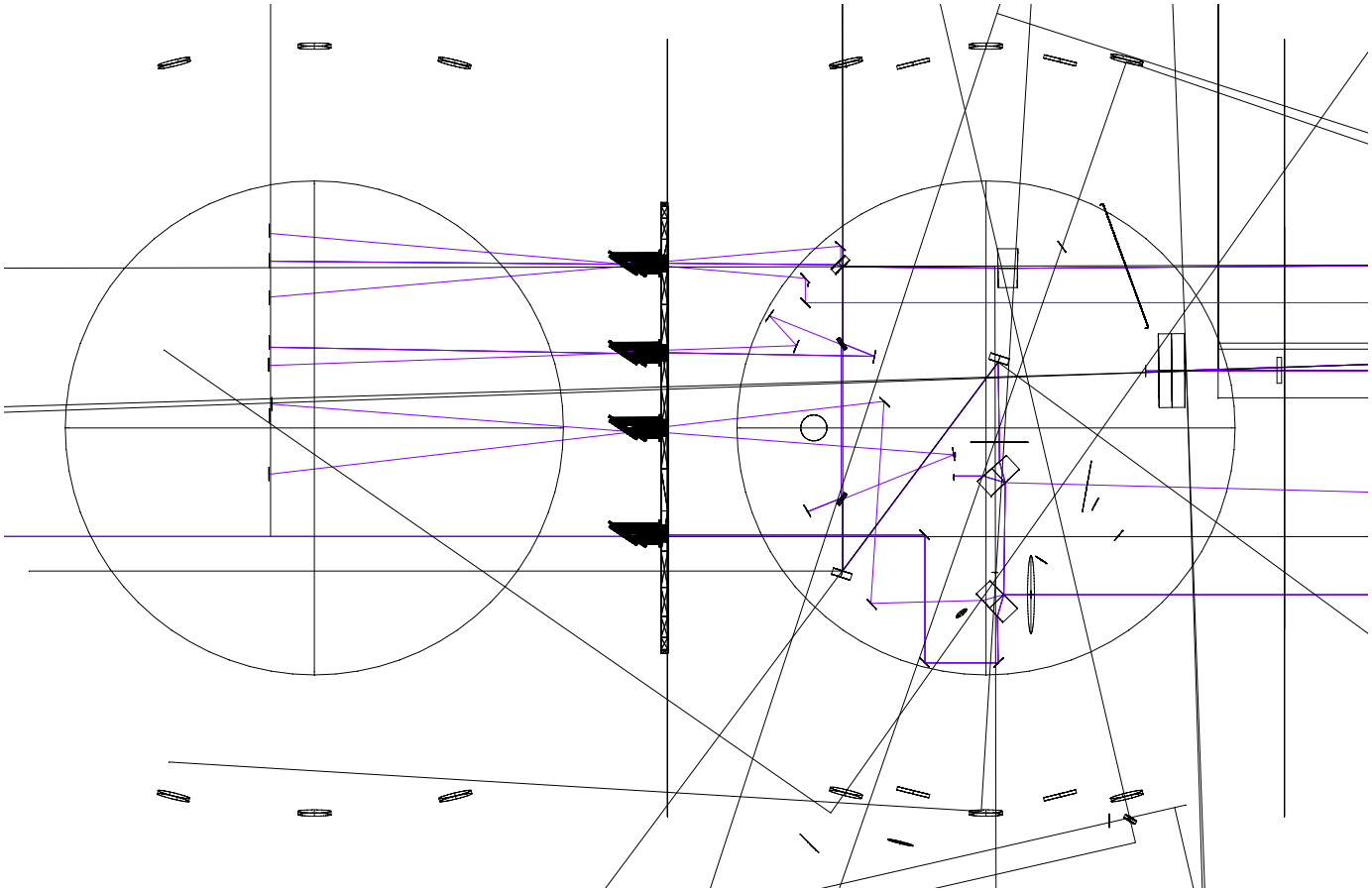
Unstable RC, Optical Layout Vertex



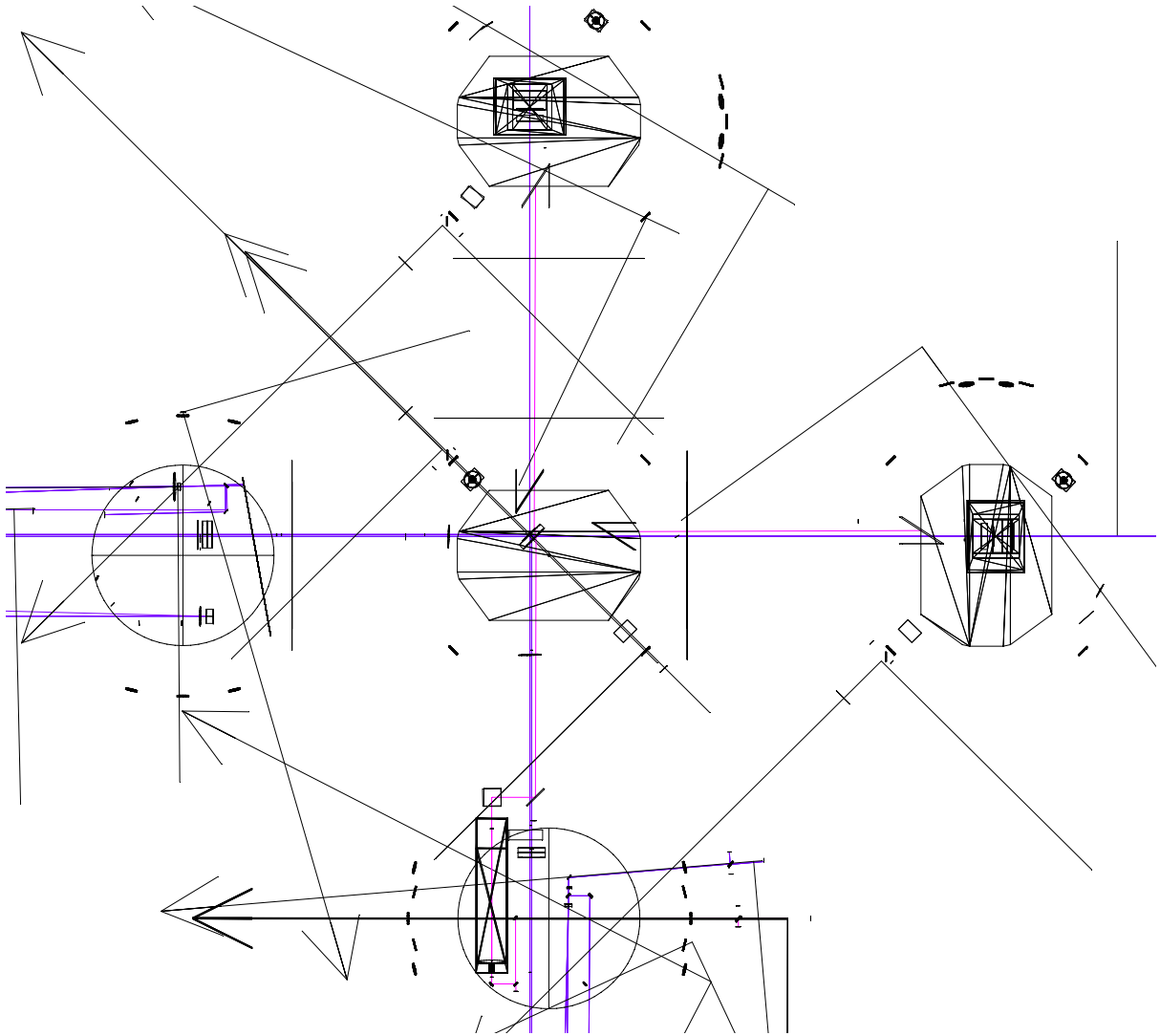
Unstable RC Optical Layout
Output Optics



Stable RC, Optical Layout
Input Optics

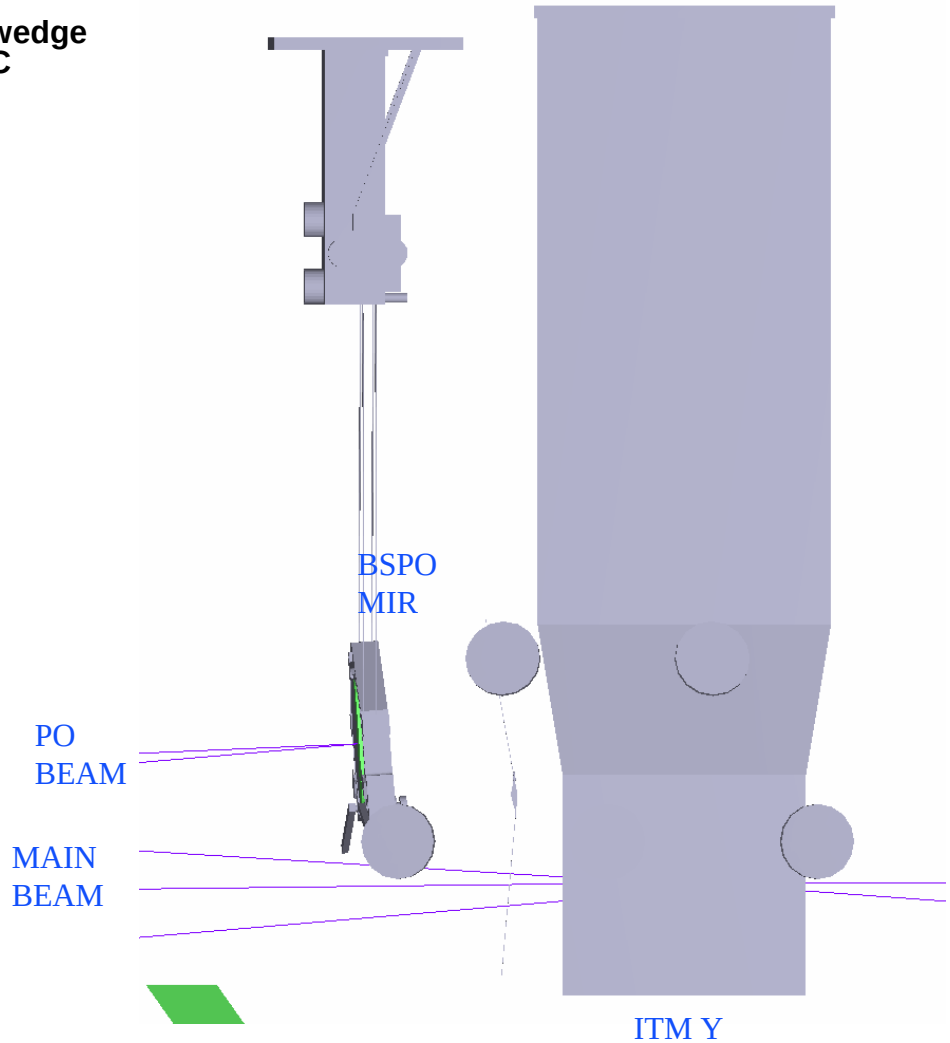


Stable RC, Optical Layout Vertex



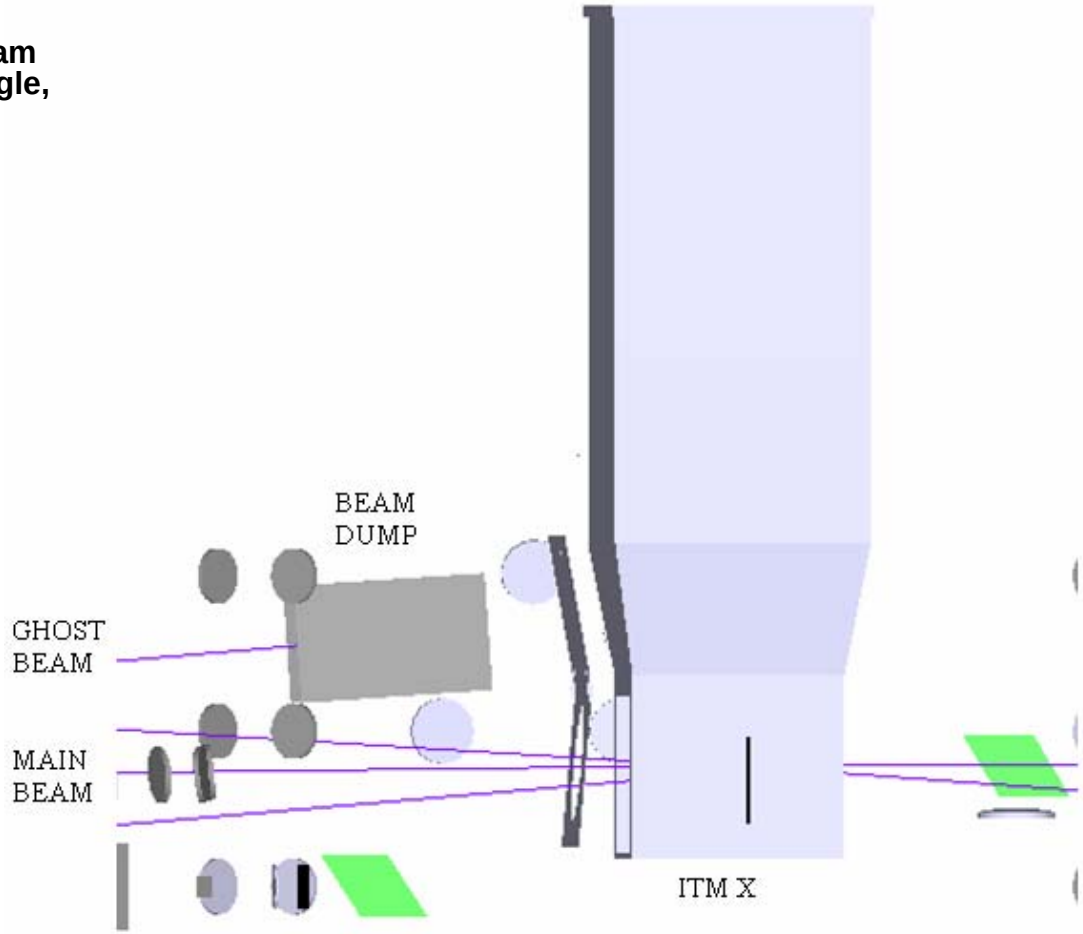
BS PO Beam Clearance

- **BS PO mirror determines BS wedge angle, 1.7 deg, for unstable RC**



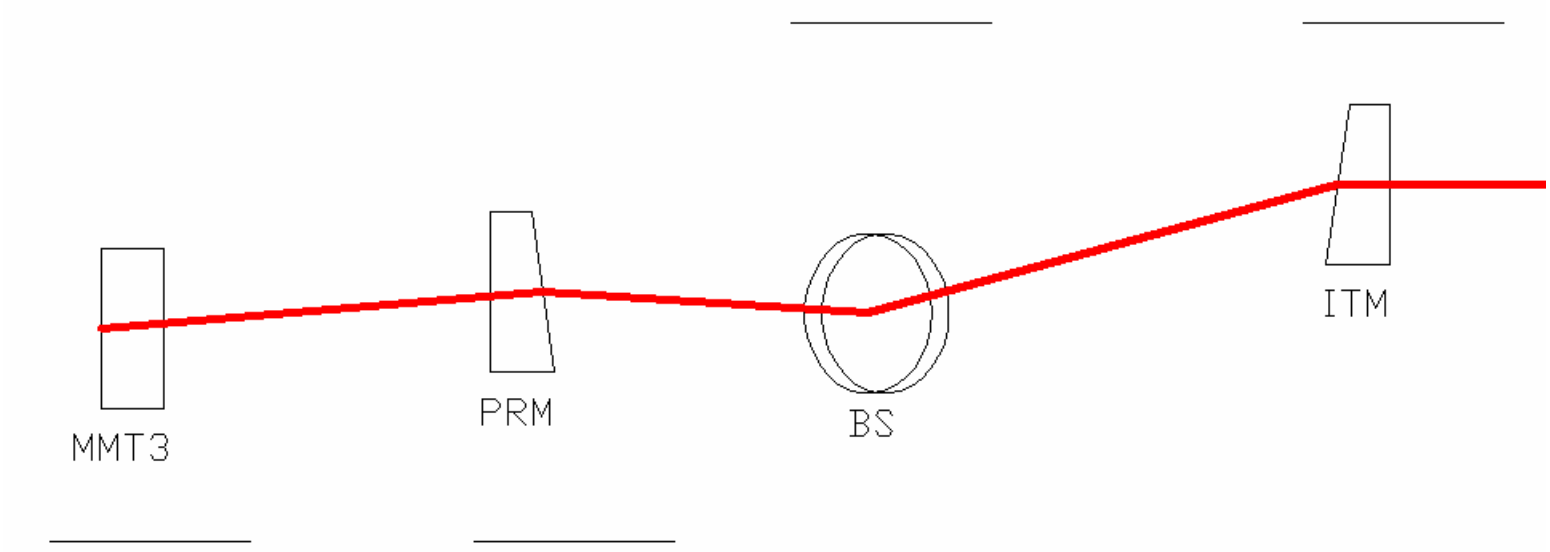
Beam Dump Clearance

- **ITMX PO mirror or ITM ghost Beam Dump determines ITM wedge angle, 1.5 deg**



Typical suspended beam dump

Recycling Cavity Beam Path



Unstable RC Cavity Optic Heights

	HEIGHT ABOVE/BELOW OPTICS TABLE	PREVIOUS DESIGN HEIGHT	GLOBAL POSITION			CLEARANCE @ 100ppm	MATERIAL	WEDGE			
OPTIC			X	Y	Z			deg	orientation	side	comment
MMT1	215.0		-2.07E+04	5.51E+02	-1.00E+02		BK7	2.00E+00	vertical	symmetric	thin side up
MMT2	225.0		-3.89E+03	7.00E+02	-9.00E+01		BK7	2.00E+00	vertical	symmetric	thin side up
MMT3 HR	158.4	-156.4	-1.94E+04	2.19E+02	-156.6		BK7	5.00E-01	horizontal	AR side	thin side -y
PRM HR	193.1	-156.9	-3.58E+03	2.19E+02	-121.9		SUPRASIL	8.10E-01	vertical	symmetric	thin side up
BS	-1,798	-163.9	-2.00E+02	2.18E+02	-135.9		SUPRASIL	1.66E+00	vertical	symmetric	thin side down
ITMX-CP	-1,742		4.53E+03	2.00E+02	-8.03E+01		SUPRASIL	8.33E-02	vertical	either side	
ITMX HR	-1,742	-80.0	4.75E+03	2.00E+02	-79.6		SUPRASIL	1.45E+00	vertical	AR side	thin side up
ITMY-CP	-1,745		-2.00E+02	4.58E+03	-8.34E+01		SUPRASIL	8.33E-02	vertical	either side	
ITMY HR	-1,745	-84.8	-2.00E+02	4.90E+03	-82.7		SUPRASIL	1.45E+00	vertical	AR side	thin side up
SRM HR	191.7	-157.8	-1.81E+02	-3.09E+03	-123.3		SUPRASIL	8.10E-01	vertical	symmetric	thin side up
OMMT M1	156.1		-1.80E+02	-1.94E+04	-1.59E+02		BK7	2.00E+00	vertical	symmetric	thin side up
OMMT M2	214.5		7.54E+01	-3.71E+03	-1.01E+02		BK7	2.00E+00	vertical	symmetric	thin side up
ETMX	-1,742		4.00E+06	2.00E+02	-8.00E+01		SUPRASIL	1.67E-01	vertical	AR side	thin side down
ETMX RM	-1,742		2.00E+02	2.00E+02	-8.00E+01		BK7	1.67E-01	vertical	either side	thin side up
ETMY	-1,745		-2.00E+02	4.00E+06	-8.26E+01		SUPRASIL	1.67E-01	vertical	AR side	thin side down
ETMY RM	-1,742		2.00E+02	2.00E+02	-8.00E+01		BK7	1.67E-01	vertical	either side	thin side up
BS PO M1	-1,467		-1.39E+02	4.08E+03	1.95E+02	2	BK7				
ITMX PO M	-1,493		5.88E+02	2.00E+02	1.69E+02	14	BK7				
BD BSAR3	-1,449		3.90E+03	2.61E+02	2.13E+02	23					
BD ITMXAR3	-2,107		6.80E+02	2.00E+02	-4.45E+02	21					
BD ITMXHR3	-2,034		8.68E+03	2.00E+02	-3.72E+02	13					
BD ITMYAR1	-1,502		-2.00E+02	6.80E+02	1.60E+02	14					
BD ITMYAR3	-2,113		-2.00E+02	6.73E+02	-4.51E+02	37					
BD ITMYHR3	-2,033		-2.00E+02	8.69E+03	-3.71E+02	12					

Cost Difference, Preliminary Estimate

	UNSTABLE		STABLE	
	COMMENT	COST	COMMENT	COST
SM3 optic	N/A	0	SOS	29527
SM3 SUS	N/A	0	SOS	9000
MMT1/PRM1 SUS	SOS	9000	MC triple	114109
MMT2/PRM2 SUS	SOS	9000	MC triple	114109
MMT3/PRM3 SUS	LOS triple	114109	LOS triple	114109
PRM optics		71184		71184
PRM SUS	LOS triple	114109	HAM mount	5000
PRM controls	CDS	36772		0
SRM optics	LOS modified	71184		71184
SRM SUS	LOS triple	114109	HAM mount	5000
SRM controls	CDS	36772		0
OMMT1/SRM1 optics		71184		71184
OMMT1/SRM1 SUS	LOS triple	114109	LOS triple	114109
OMMT1/SRM1 controls	CDS	36772	CDS	36772
OMMT2/SRM2 optics		29527		29527
OMMT2/SRM2 SUS	SOS	9000	MC triple	114109
OMMT2/SRM2 controls	CDS	36772	CDS	36772
BS PO M1 optic		5480		340
BS PO M1 SUS	PO mirror SUS	36000	DLC mount	580
BS PO M1 controls	CDS	24000	2-axis picomotor steering	5000
BS PO M2 optic		29527		340
BS PO M2 SUS	SOS on HAM	9000	DLC mount	580
BS PO M2 controls	CDS	36772	2-axis picomotor steering	5000
ITMX PO M1 optic		5480	none	0
ITMX PO M1 SUS	PO mirror SUS	36000	none	0
ITMX PO M1 controls	CDS	24000	none	0
ITMX Hartmann M1	N/A	0	HAM mount	3000
ITMX Hartmann M2	N/A	0	HAM mount	3000
ITMX Hartmann M3	N/A	0	HAM mount	3000
ITMX Hartmann M3 controls	N/A	0	2-axis picomotor steering	5000
ITMX PO TELESCOPE	off-axis parabola (new)	20880	off-axis parabola (initial LIGO)	0
ITMX Hartmann TELESCOPE	shares ITMX PO TEL	0	N/A	0
total cost		**$1,100,742.00**		**$ 961,535.00**
cost saving with stable RC				**$ 139,207.00**