

TMS polarization monitor plan

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Motivations and References

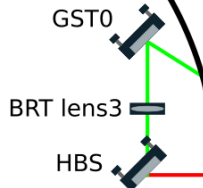
- We need polarization monitor for TMS for
 - Monitoring polarization content inside the arm cavity
 - Measuring arm cavity round-trip loss correctly
(see [JGW-T2011633](#))
 - Searching for axion dark matter
(see [PRL 123, 111301 \(2019\)](#), [arXiv:2106.06800](#))
- References:
 - K. Nagano's GPT modification plan
https://www.dropbox.com/s/w708wi3oc3el3gu/190421_GPT_kaizou.pdf?dl=0
 - TMS in-air part (GPT part) optical layout [JGW-T1808962](#)

Plan

Add 1 inch, 50:50 non-polarizing beam splitter here

HWP

Gran Laser polarizer

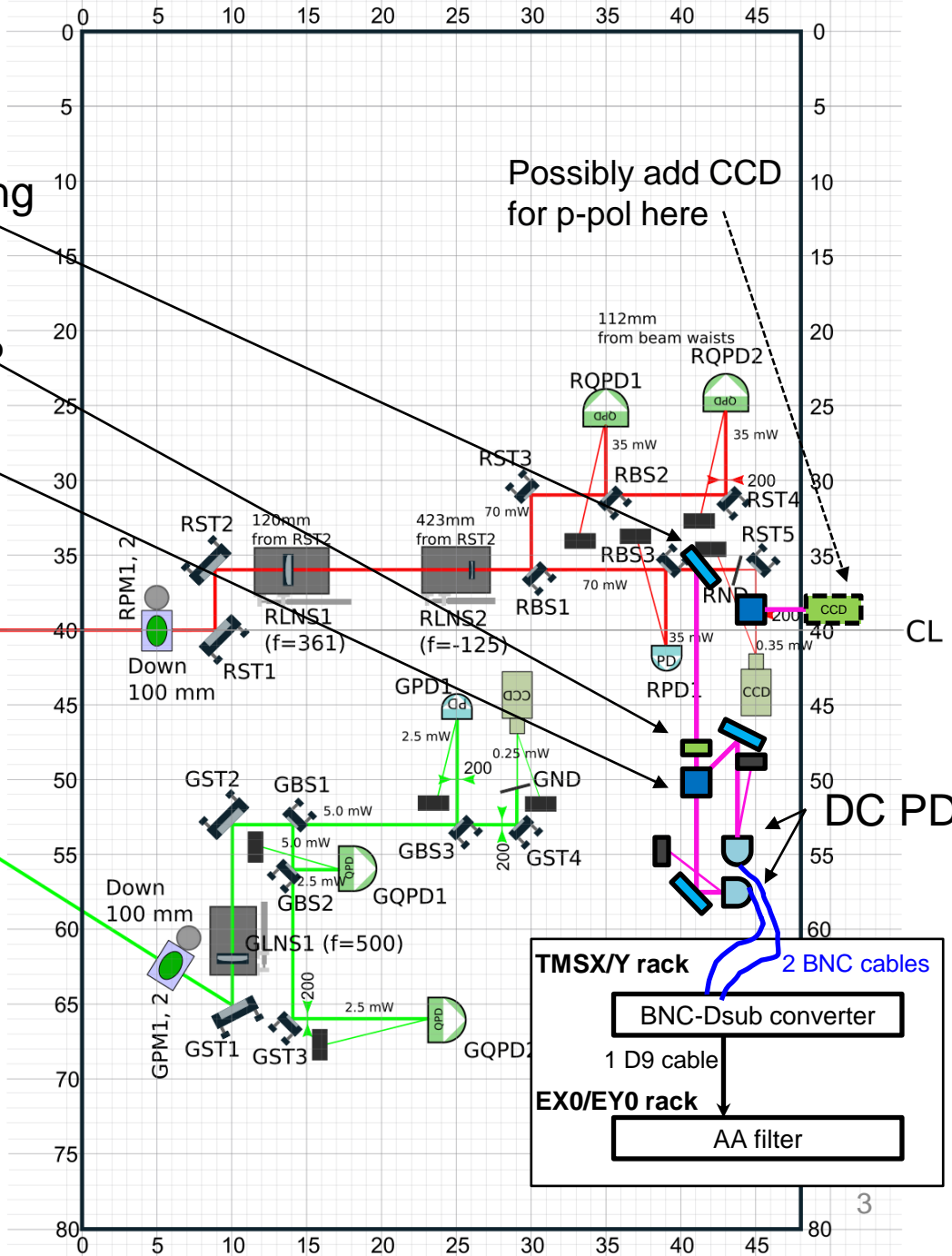


140 mW (2.8 W)
S Pol.

10 mW [err: 50%]
S Pol.

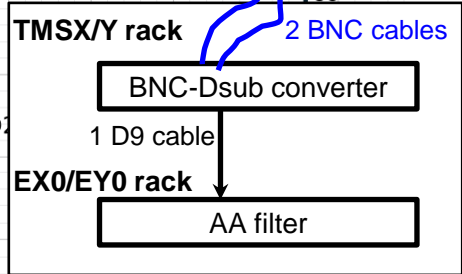
2 additional ADC channels for each table

We can also make RPD1 path in front of polarization monitor path



CL

DC PD



Considerations for the Plan

- Use Glan Laser polarizers which has a high extinction ratio
- Two DC PDs for s-pol and p-pol to differentiate power fluctuation and polarization fluctuation
- Steering mirrors in front of PDs for alignment. Incident angle to polarizer also needs to be adjusted.
- Modification as small as possible, no effect on main PDs and QPDs, consider space available at the TRX/TRY table
- Filter to cut 532 nm and ND filters might be necessary
- Motorized HWP rotation mount might be necessary
- Whitening filters might be necessary
- Check availability of ADC channels and BNC-Dsub converter

Items to Purchase (Optics)

- Qty for TRX and TRY

Description	Company	Part number	Qty.	Comment
HWP	Newport	10RP32-1064	2	1inch
HWP mount	Newport	RM25A	2	
Polarizer	Sigma-Koki	GLPB2-10-25.9SN-7/30	2	High extinction ratio
Non-polarizing beam splitter	Sigma-Koki	NPPH(+/-5%)Q-25.4C06-20-W0.5D-1064 JGW-D2112956	2	1 inch, already delivered
1inch steering mirror		PYD-10 ?	4	Should be some there
1inch mirror mount	Newport	SN100C-F2K	8	For polarizer and NBS
1inch mirror mount & HWP mount pole	ISAS/JAXA	JGW-D1808429 66.2 mm	10	Should be some spares there
Base plate	Thorlabs	BA2T2/M	6	
PD	Thorlabs	PDA100A2	4	For s-pol and p-pol
PD post	Thorlabs	TR75/M-JP	4	
Beam dump	Thorlabs	LB1/M	4	For PD reflection
PD/beam bump post holder	Thorlabs	UPH50/M	8	Swiveling magnetic base post holder 5

Items to Purchase (Others)

- Qty for TRX and TRY

Description	Company	Part number	Qty.	Comment
BNC cable	Misumi	BNC50-PP-C-30	4	30 m (also bought 10 m and 20 m ones)