Main Interferometer Subsystem

What to do with iKAGRA

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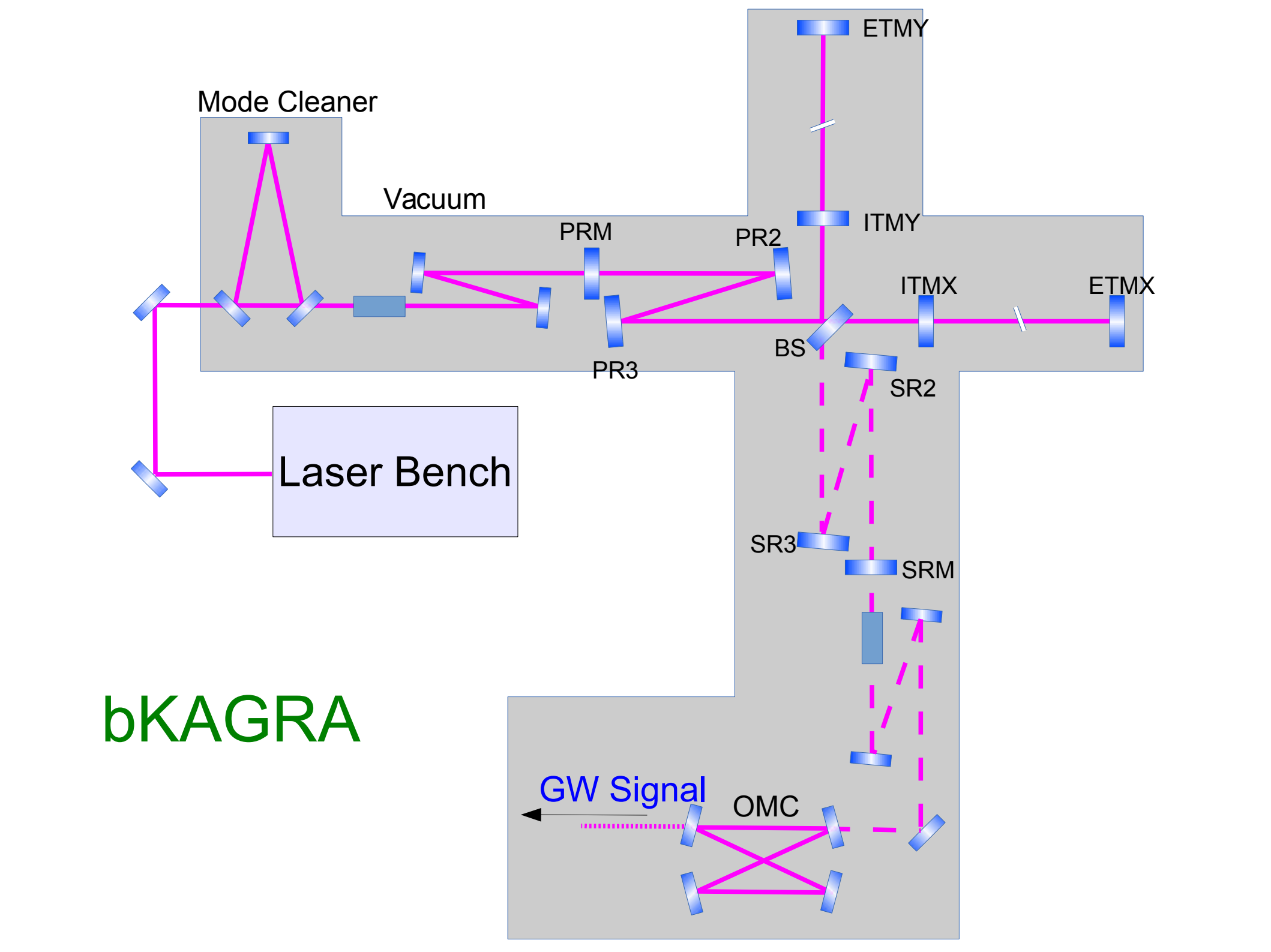
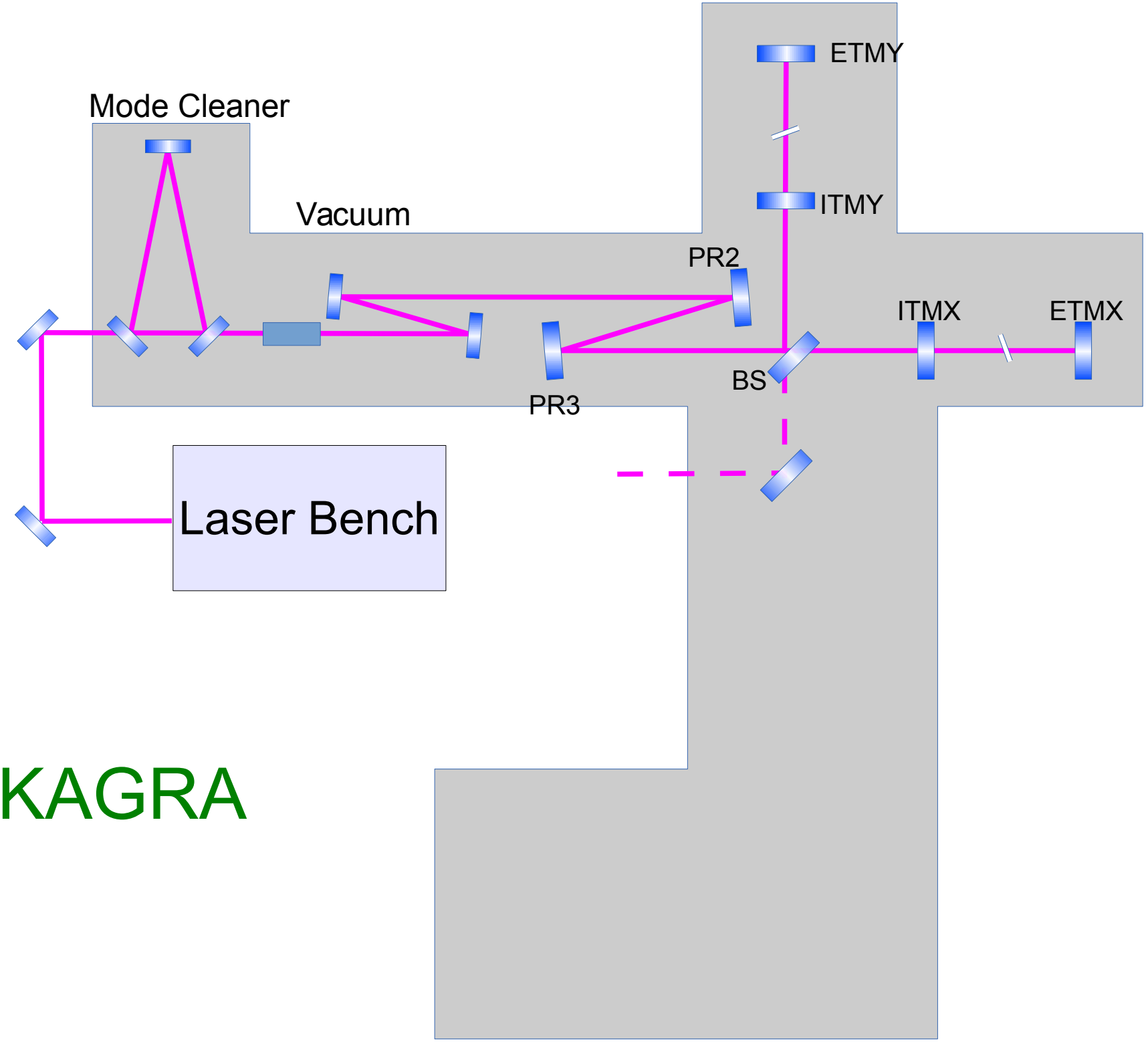
2014/4/16


ETMY
Mode Cleaner
Vacuum
ITMY
PRM
PR2
ITMX
ETMX
BS
PR3
SR2
Laser Bench
SR3
SRM
bKAGRA
GW Signal
OMC


ETMY
Mode Cleaner
ITMY
Vacuum
PR2
ITMX
ETMX
BS
PR3
Laser Bench

iKAGRA

Important differences between iKAGRA and bKAGRA

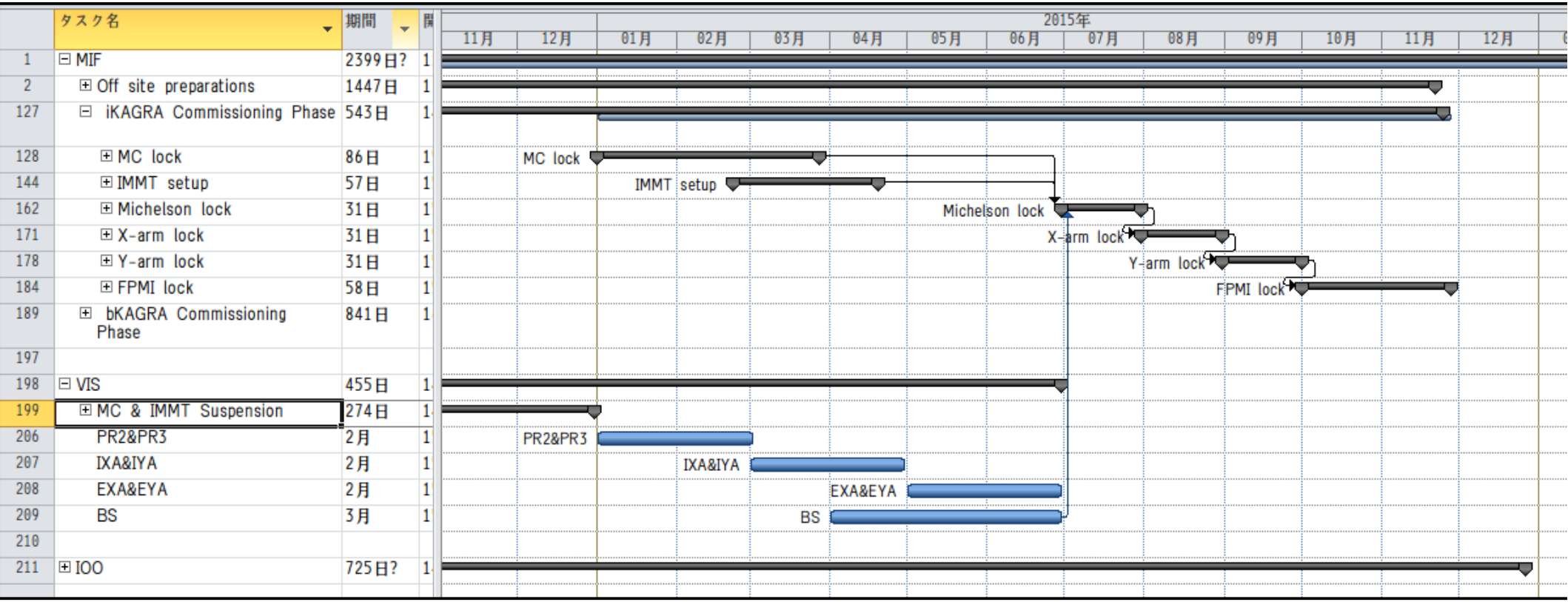
- DRFPMI -> FPMI
- IMMT will not be optimized for iKAGRA (poor mode matching)
- No green lock
- POX is available but POY separation may be difficult
- No WFS for the main interferometer

Commissioning

Interferometer commissioning can start only after the BS installation

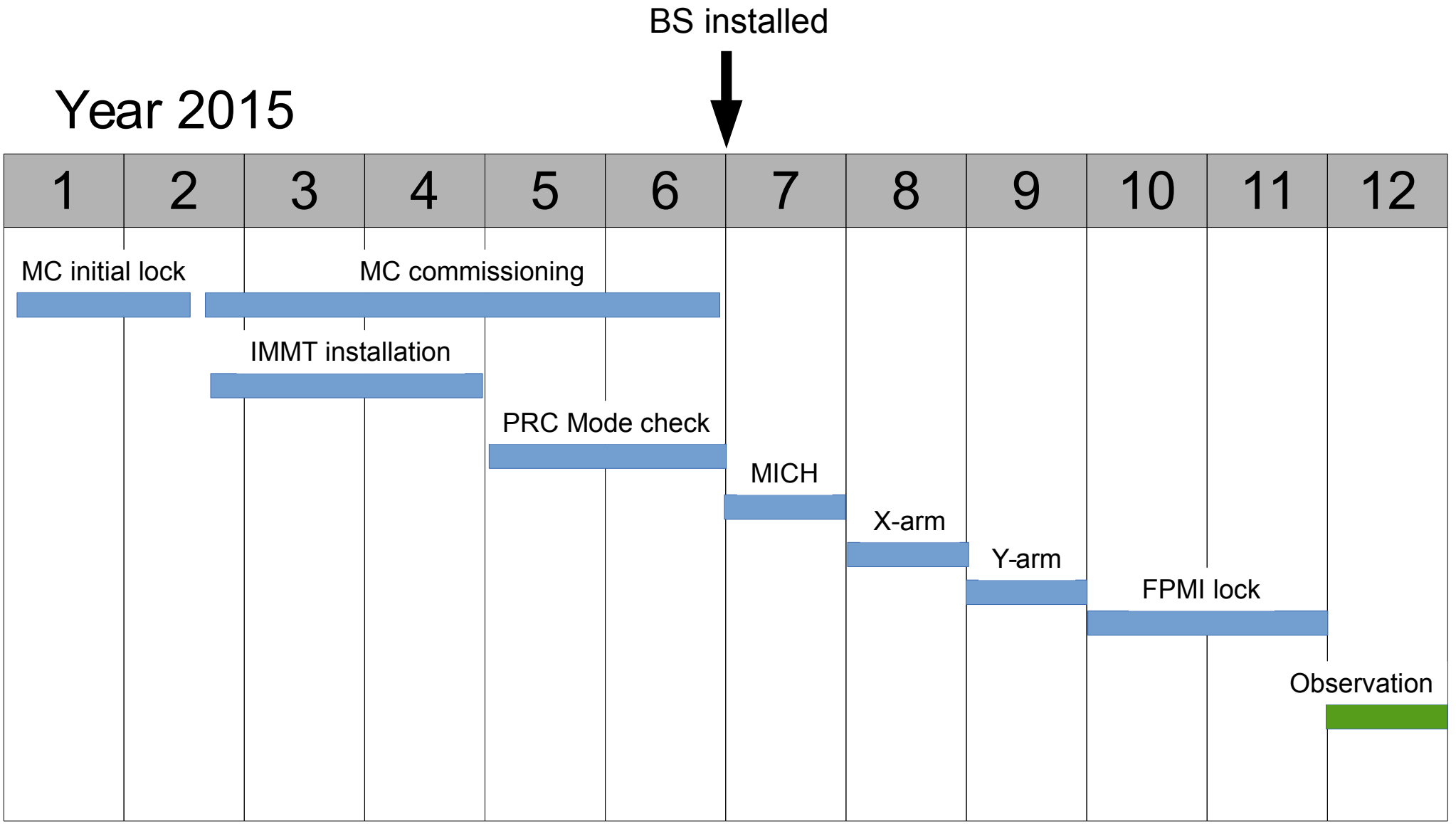
Michelson -> X-arm -> Y-arm -> FPMI

in 5 months !?



- 2 - 3 MIF commissioning people at the site
- At least 1 MIF expert
- At least 1 suspension expert, 1 RTS expert must be present

More detailed schedule

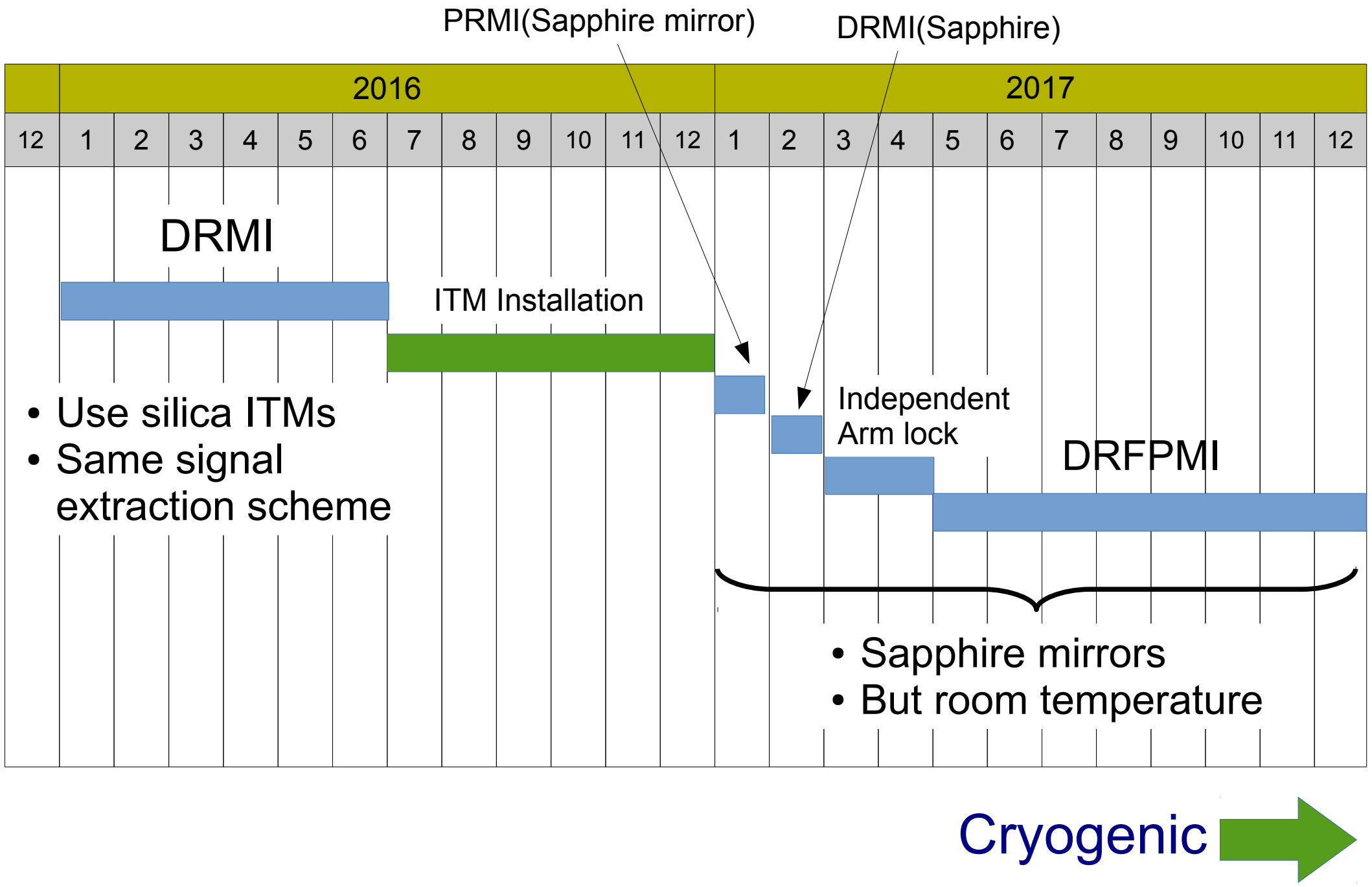


More detailed schedule

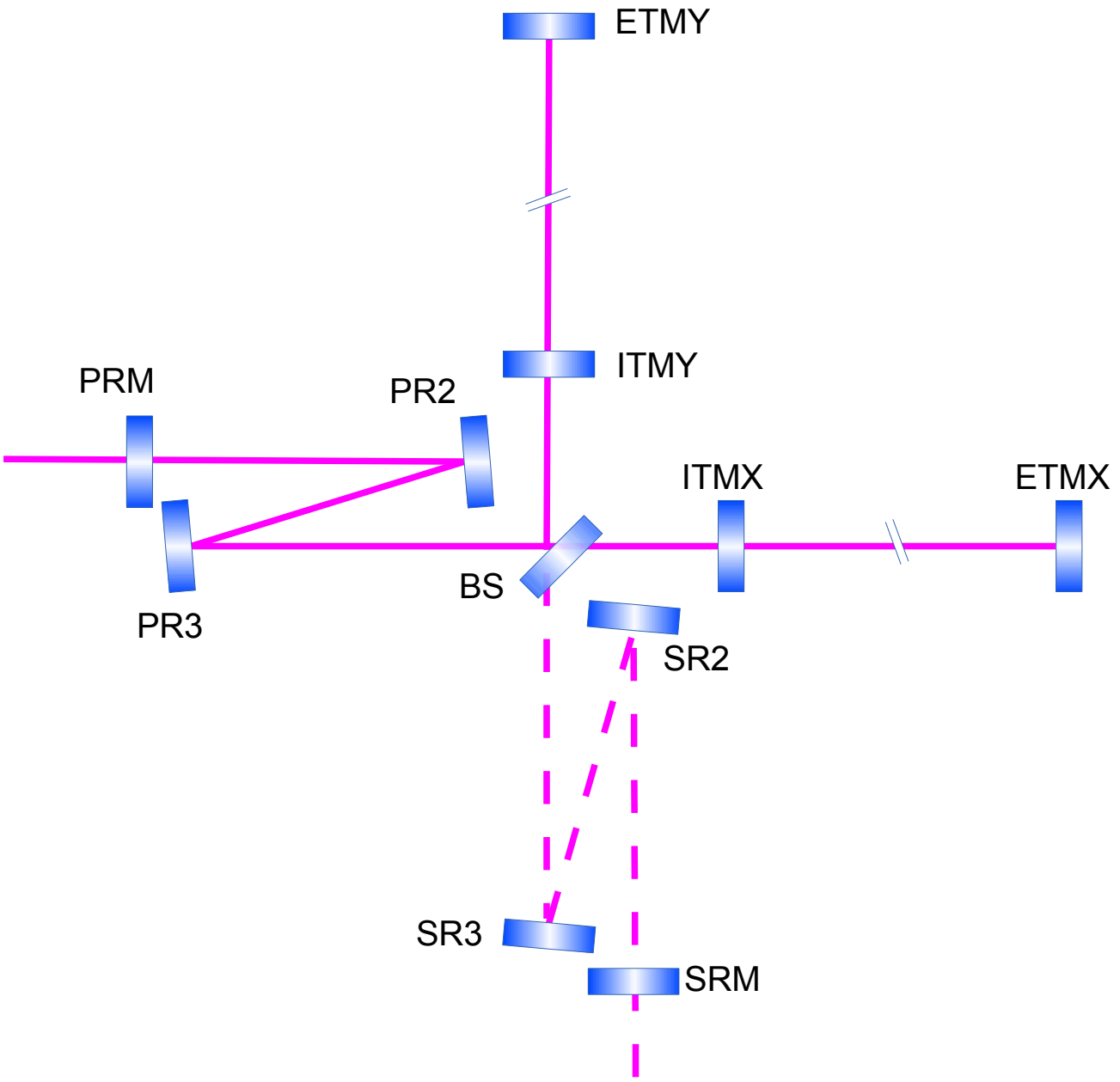
Year 2015

7	8	9	10	11	12
MICH • Initial alignment • Check PDH • Close loop • Optimize servo	X-arm • Initial alignment • Check PDH • Close loop • Optimize servo	Y-arm • Initial alignment • Check PDH • Close loop • Optimize servo	FPMI lock • Align two cavities • Lock two cavities independently at the same time • Lock MICH • Hand off to DARM CARM • Lock CARM with the laser		Observation

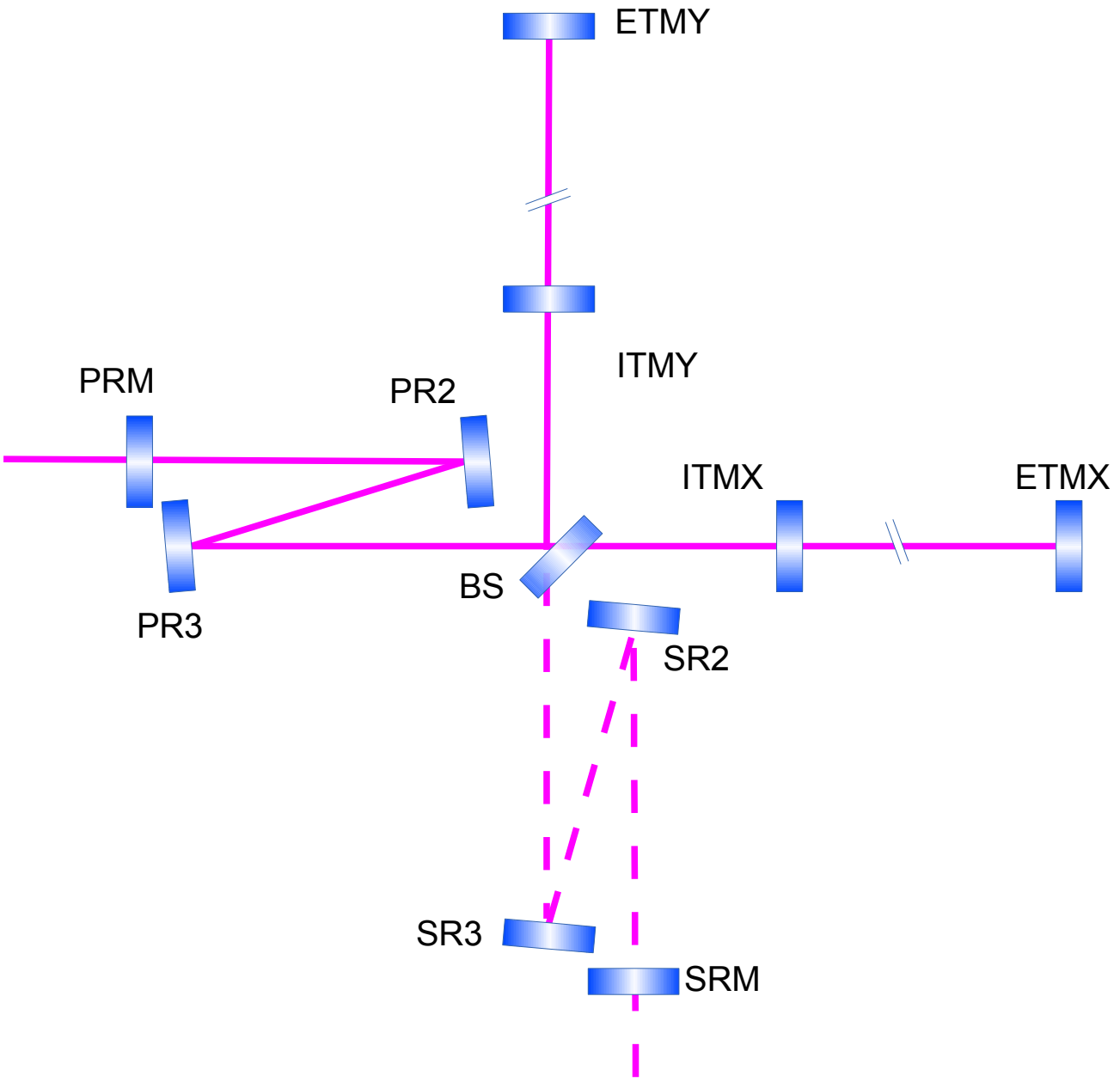
bKAGRA Schedule



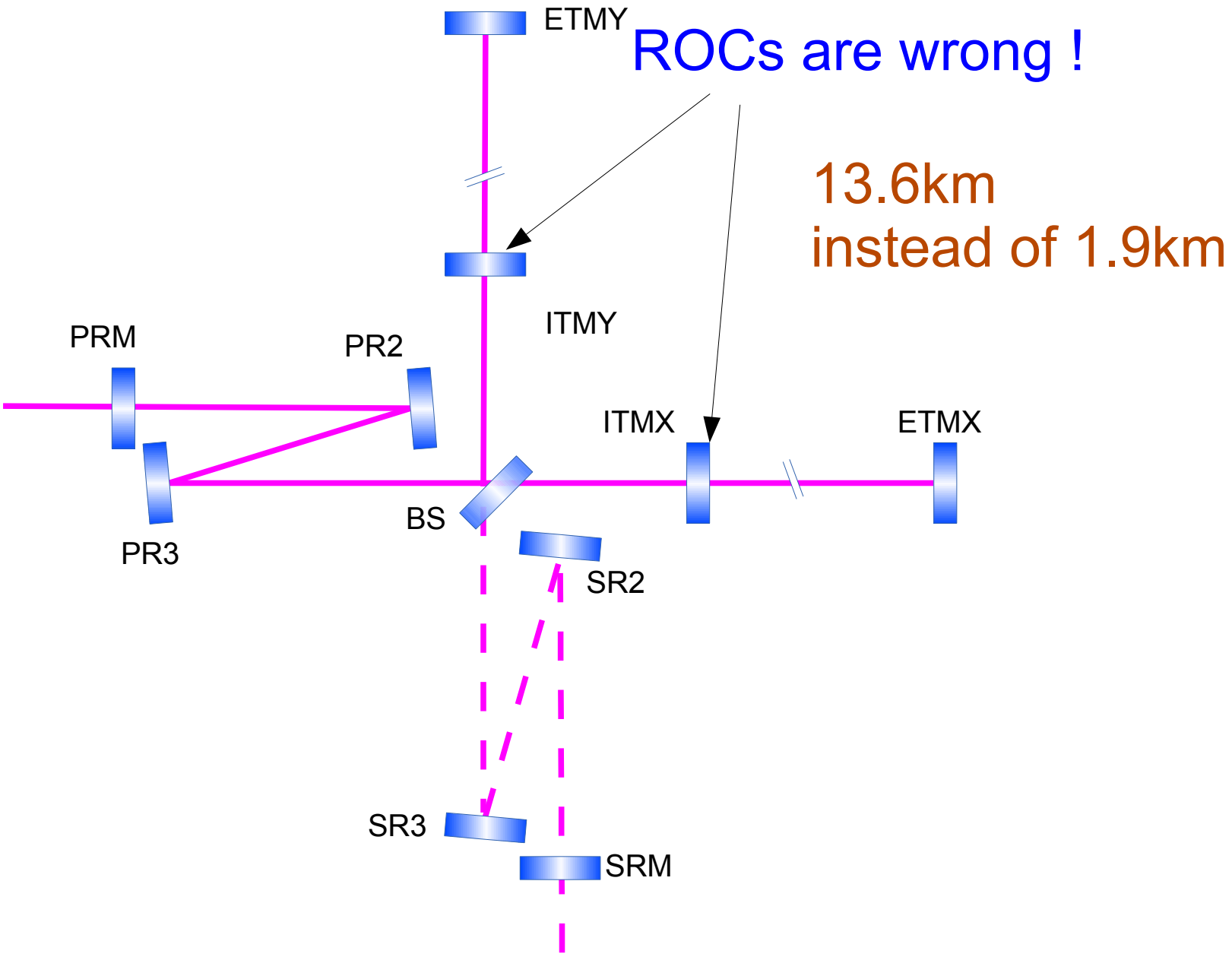
No DRMI



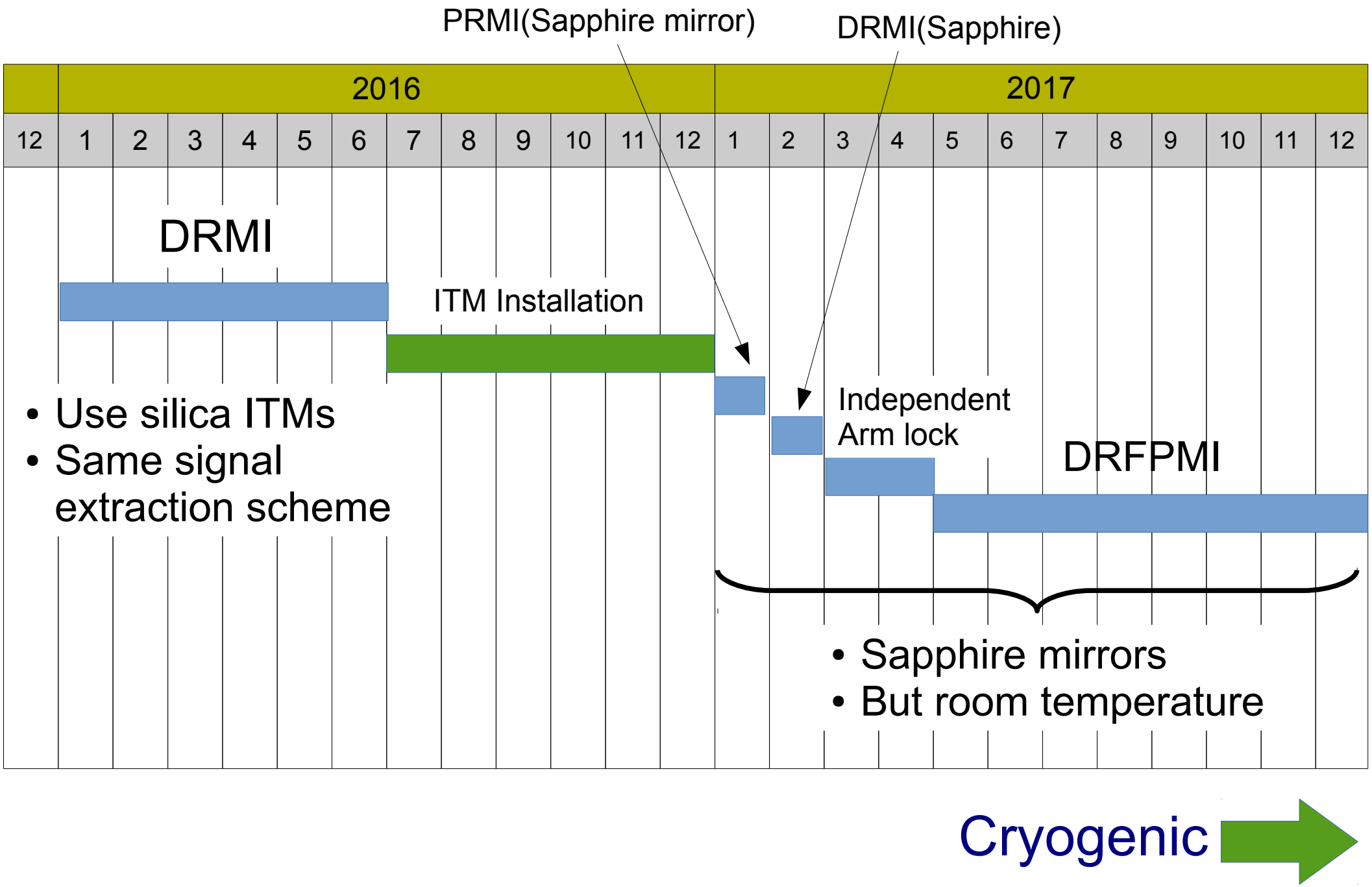
No DRMI



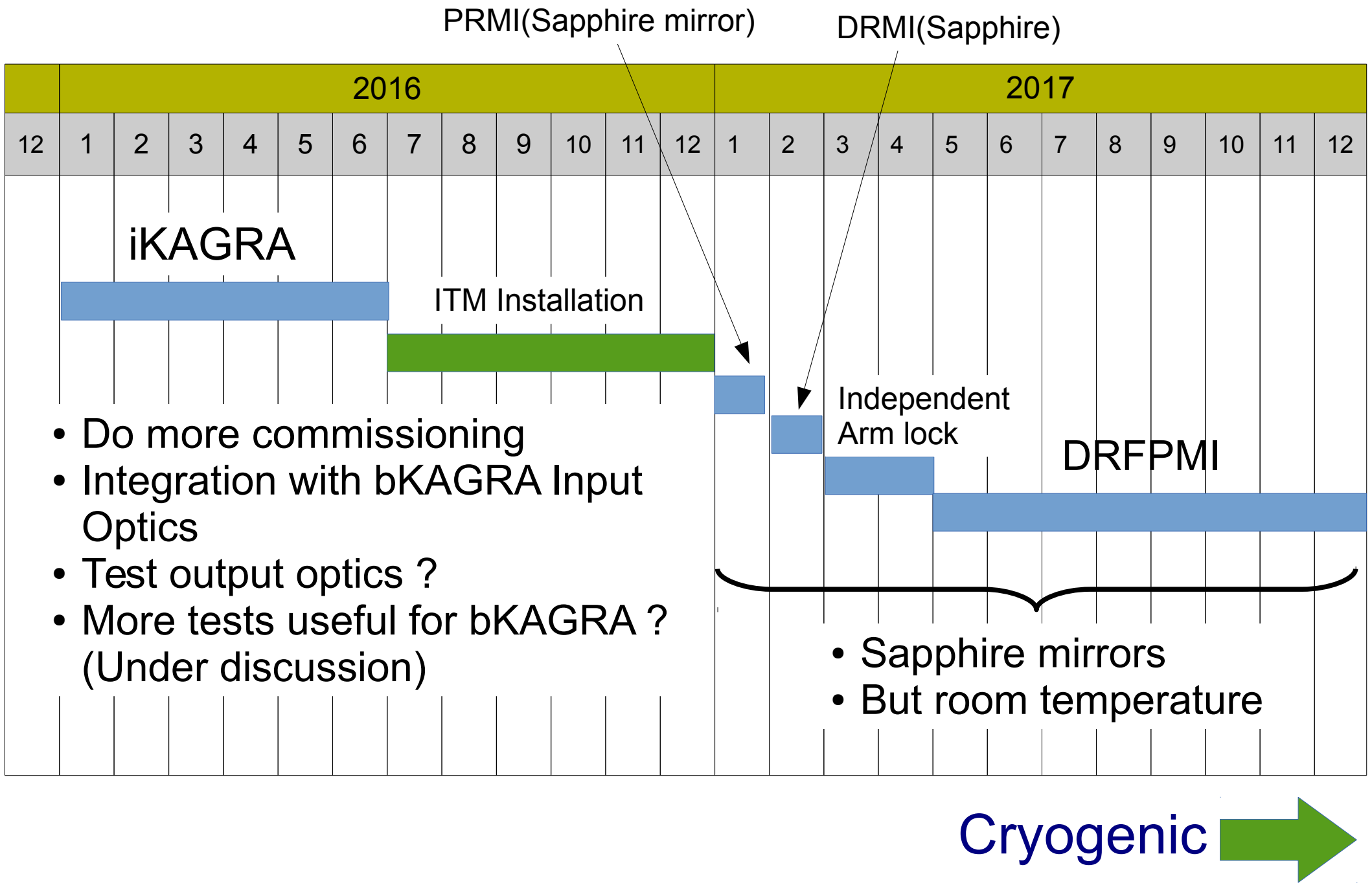
No DRMI


ETMY
ROCs are wrong !
13.6km
instead of 1.9km
ITMY
PRM
PR2
ITMX
ETMX
BS
PR3
SR2
SR3
SRM

bKAGRA Schedule

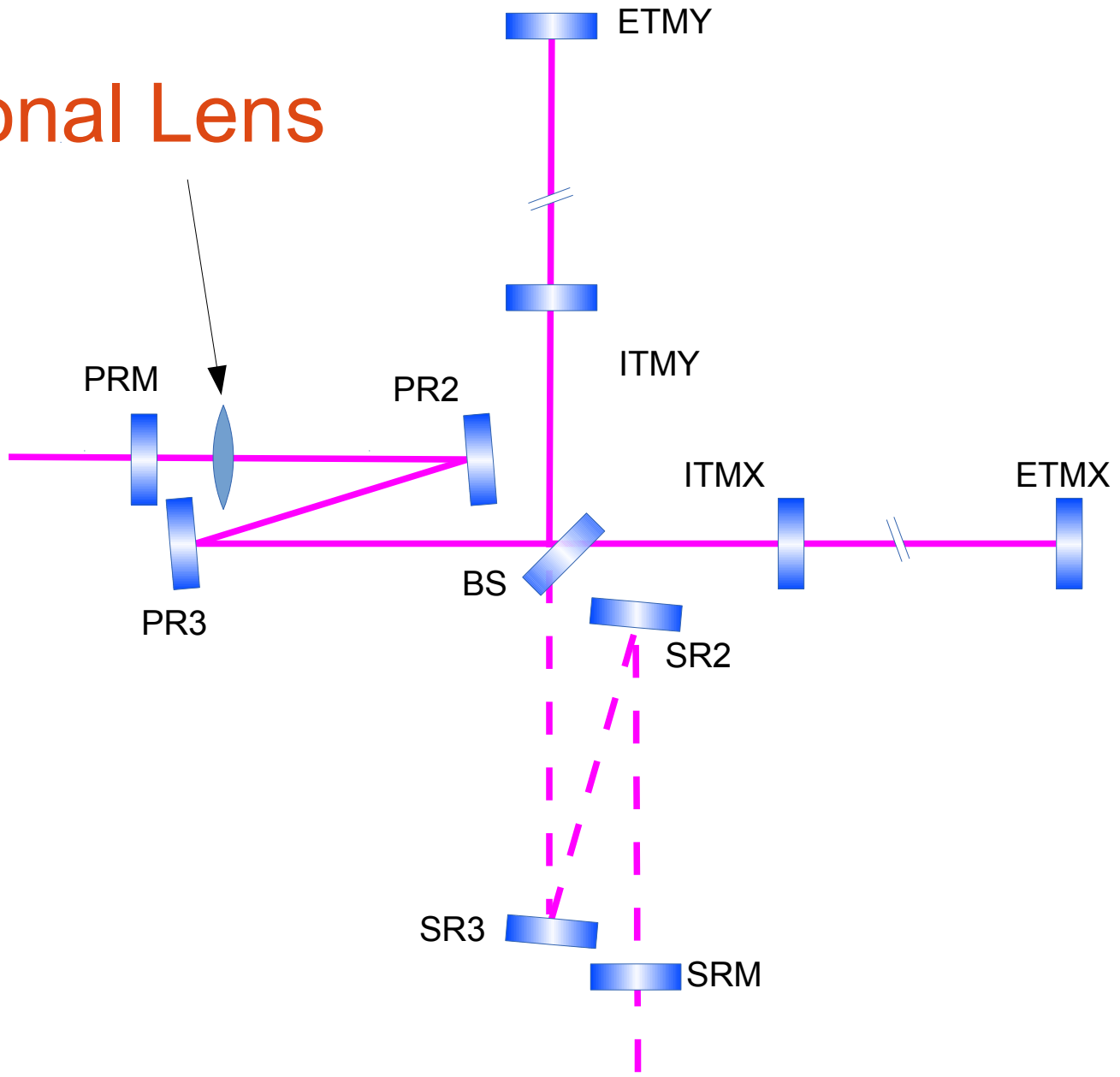


bKAGRA Schedule



Stable PRC ?

Additional Lens



What can we learn from iKAGRA ?

Common elements

- Tunnel, Facilities, Vacuum (?)
- MC, Faraday(?), IMMT(?), PR2, PR3, BS
- Some analog circuits
- Digital System

Possible tests/measurements

- MC commissioning/characterization
  - WFS
  - Beam jitter after MC
  - RF AM (RFSB transmission servo)
- Type-B controllability check
- Scattered light estimation
- Building noise budget system
- Seismic feed forward test

Suggestions from Rana

1) Common mode servo for frequency stabilization.

2) Measurements of loss/scattering in the arms
(not important for bKAGRA, but useful technique to develop)

3) Comparison of ground motion with relative interferometric motions

4) Use MICH as an out-of-loop sensor for the DARM DOF.
Excess sensing noise of the differential arms or individual arm noises.

5) Auto Noise Budget for FPMI.

6) RF chain noise and distortion.

7) Budgeting of low frequency suspension angular motion using optical levers and dither readout.

8) Mode matching diagnostic by slow arm cavity mode scan.

9) Use GIF to do Wiener seismic FF for CARM/DARM.

10) Measure delay and packet CRC for digital loops.
Loopback fidelity tests of RFM. Digital filter noise generation.

11) Schnupp asymmetry measurement as diagnostic of
initial optic placement.

12) Compare FPMI contrast with FFT models.

13) Use simple green laser generation and beat frequency detection for ALS prototyping.