Commissioning Procedure for bKAGRA Phase 1
(2017.9-2018.3)

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see, also, JGW-T1605595
for interferometer design and commissioning schedule

Major Updates

- v20170612
    - X and Y CRYp installation almost at the same time
      (much earlier X installation)
    - MICH lock at room temp. before cooling down
      (instead of cooling ETMY first)
    - AS cannot be used when room temp. lock since SR3 is not ready
    - SR2 won't be ready by Phase 1 deadline

Vacuum Layout

- Legend

  ⭘ chamber (IFI)

  ☐ duct

  ⫙ bellows

  ⧓ gate valve

  POP optical table

3

8.31
9.7

EYT BRT installation
(7.11-10.2)

Expected Situation

- PSL & IMC ready, beam reached PRM (by 8.31 9.7)
- BS (by 4.13 9.11) soon ready and PRs (by 7.6 7.14) ready
- SR2 (by 7.31 4.13) and SR3 (by 12.19 12.13) not ready
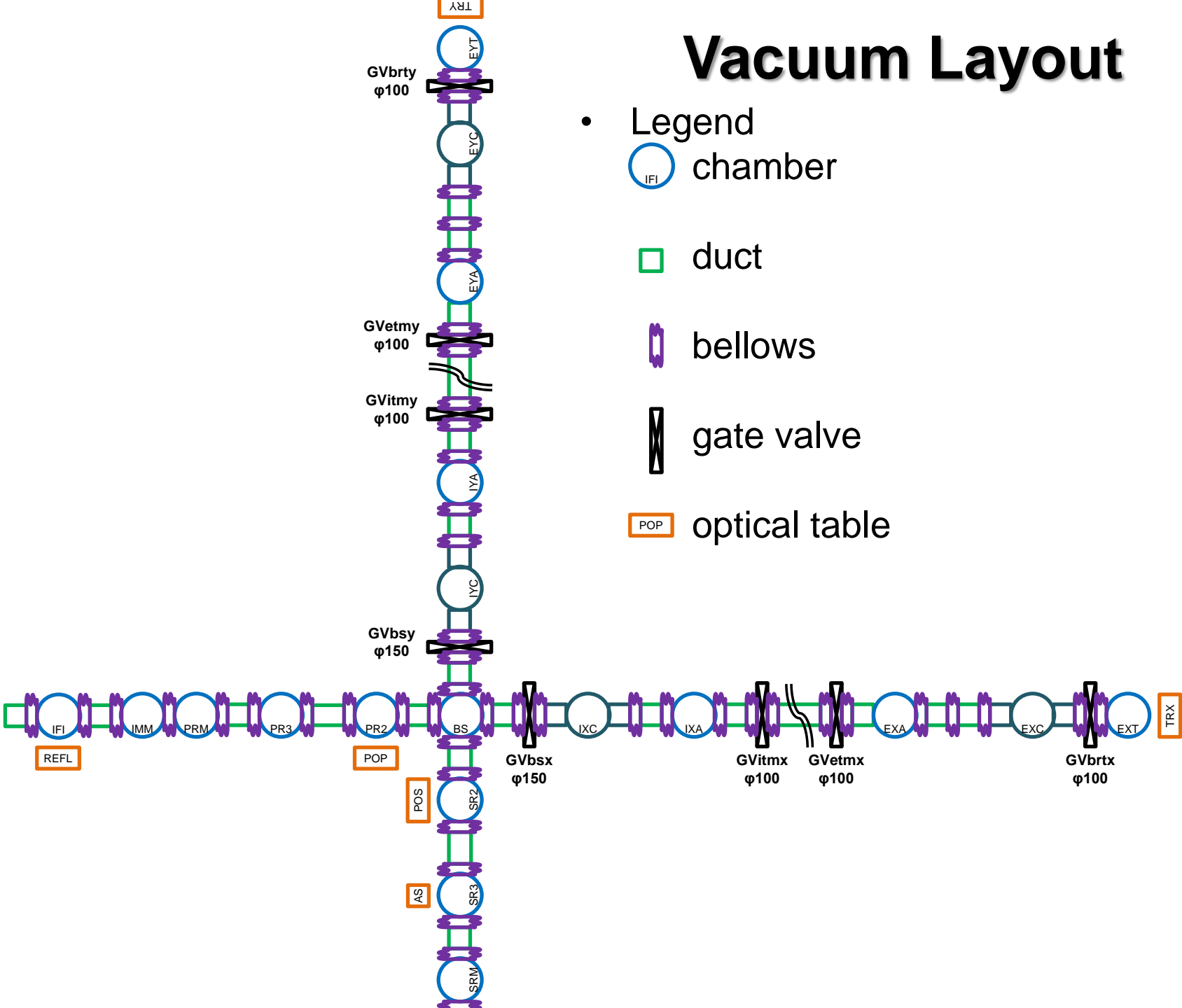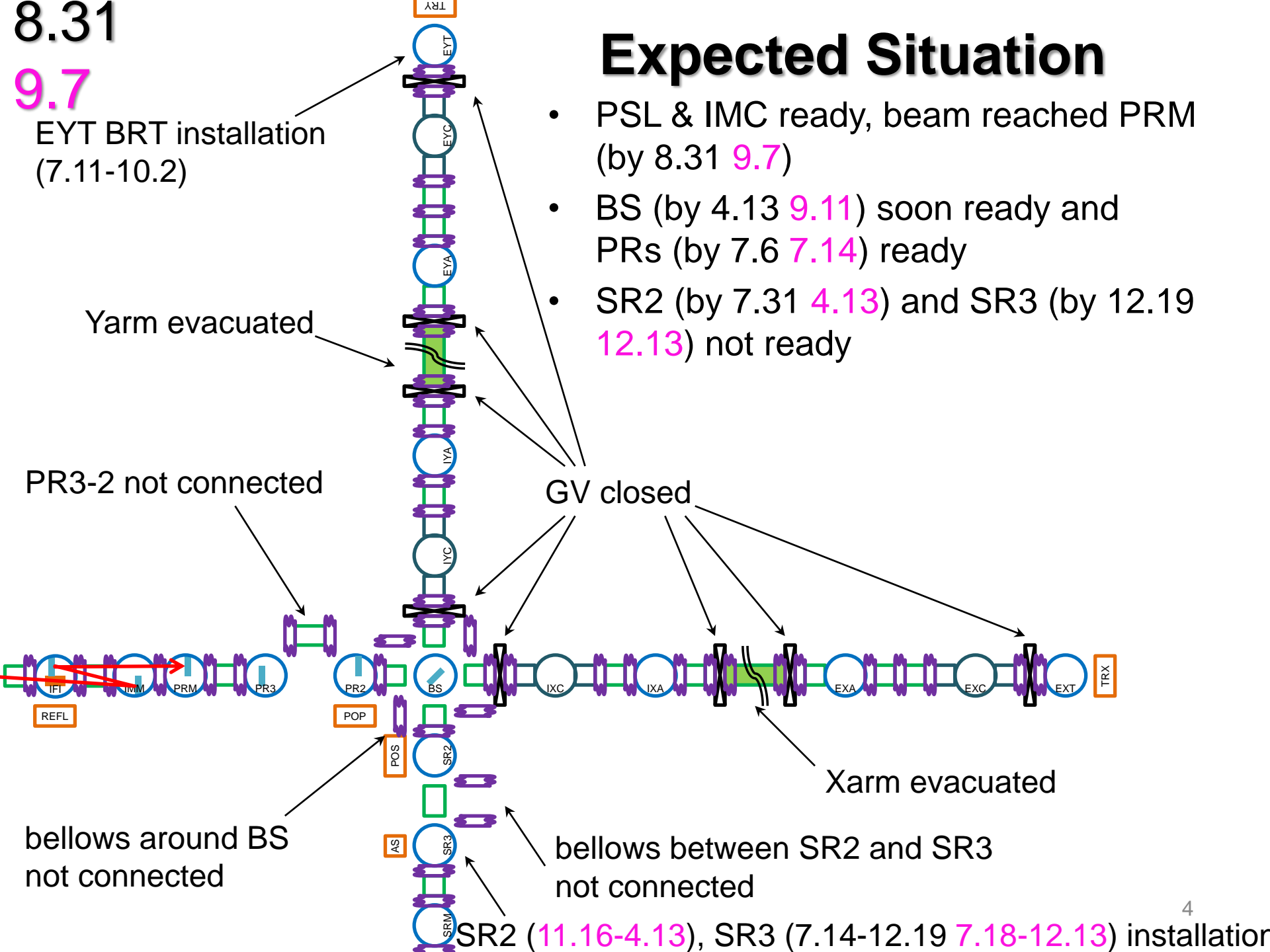
Yarm evacuated

PR3-2 not connected

GV closed

Xarm evacuated

bellows around BS
not connected

bellows between SR2 and SR3
not connected

SR2 (11.16-4.13), SR3 (7.14-12.19 7.18-12.13) installation

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Connect PR3-2 Duct
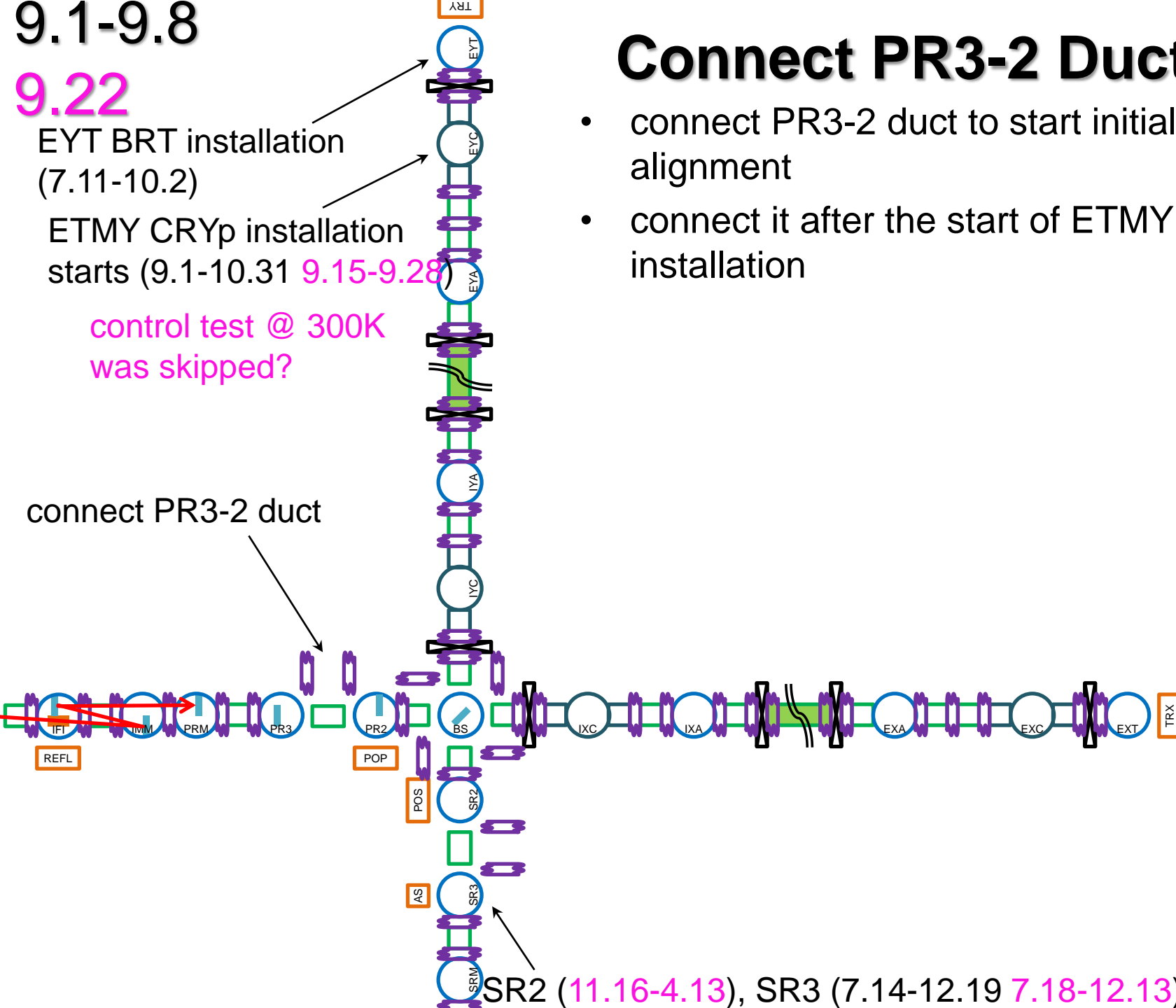
9.1-9.8
9.22

EYT BRT installation (7.11-10.2)

ETMY CRYp installation starts (9.1-10.31 9.15-9.28)

control test @ 300K was skipped?

connect PR3-2 duct

- connect PR3-2 duct to start initial alignment
- connect it after the start of ETMY CRYp installation

SR2 (11.16-4.13), SR3 (7.14-12.19 7.18-12.13) installation

Alignment from IMMT to PR3

9.11-9.15
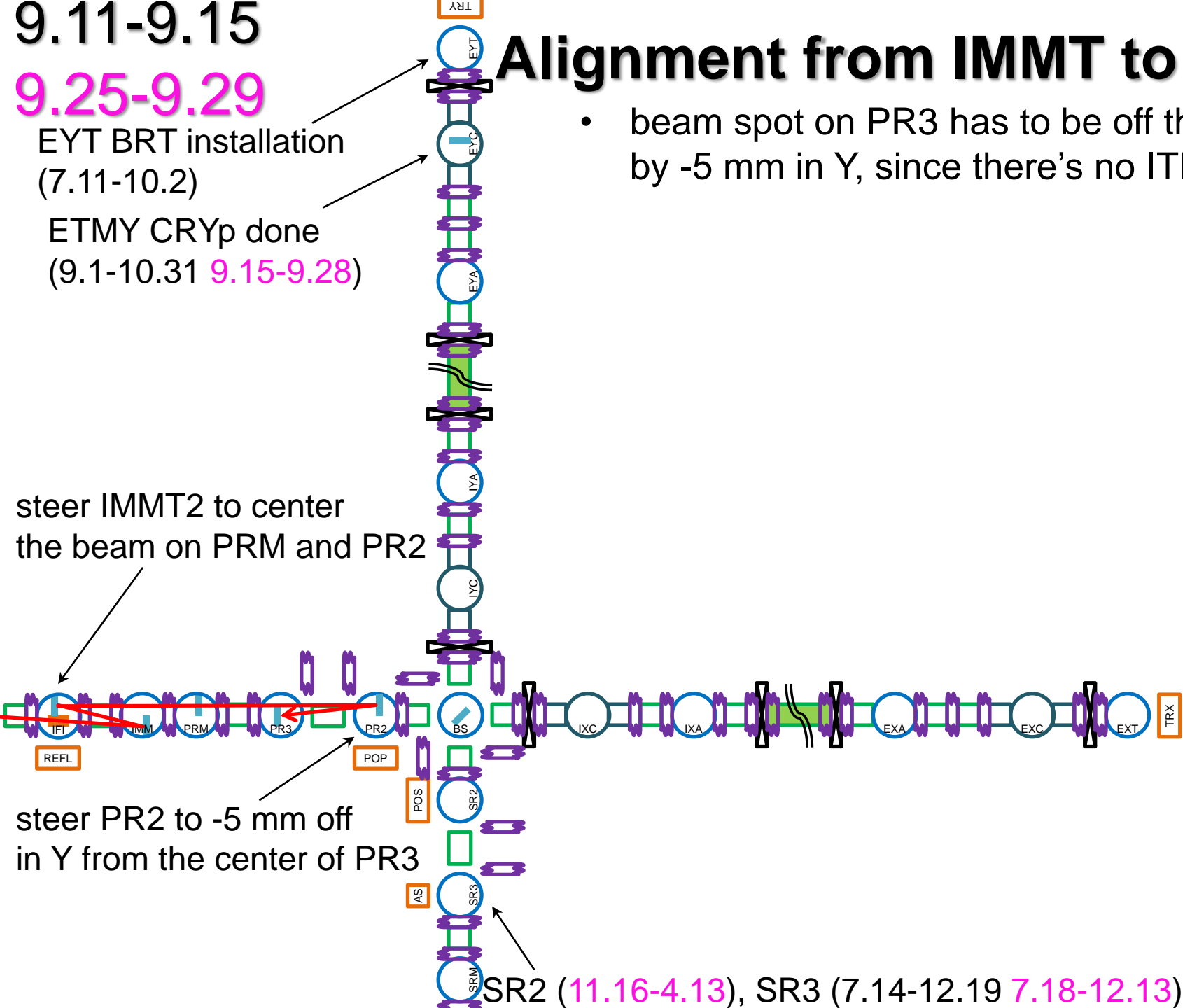9.25-9.29

EYT BRT installation
(7.11-10.2)

ETMY CRYp done
(9.1-10.31 9.15-9.28)

- beam spot on PR3 has to be off the center by -5 mm in Y, since there's no ITM wedge

steer IMMT2 to center
the beam on PRM and PR2

steer PR2 to -5 mm off
in Y from the center of PR3

SR2 (11.16-4.13), SR3 (7.14-12.19 7.18-12.13) installation

9.18-9.22
10.2-10.6
EYT BRT installation done

Alignment from PR3 to Xend

• need to calculate the beam position on GV windows

EYA NAB installation starts (10.3-11.27)

Thorlabs PDA100A (DC PD)

?? mm of the center of GVitmx window
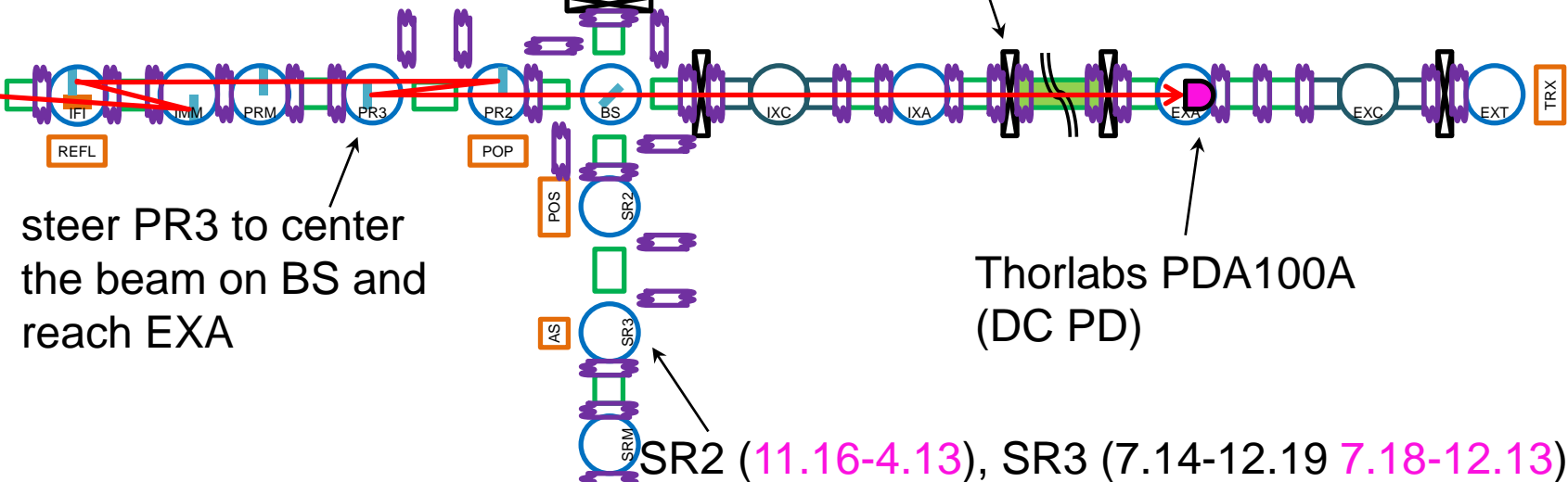
steer PR3 to center the beam on BS and reach EXA

Thorlabs PDA100A (DC PD)

SR2 (11.16-4.13), SR3 (7.14-12.19 7.18-12.13) installation

7

9.25-9.29
10.9-10.13

Alignment from BS to Yend

- need to calculate the beam position on GV windows
- Beam should be blocked for Type-A installation above IXC/IYC

EYA NAB installation
(10.3-11.27)

Thorlabs PDA100A
(DC PD)

?? mm of the center of GVitmy window

steer BS to reach EYA

+5.6 mm off the center in Y of EXT BRT
(although the beam reach EXT, BRT is not ready
yet at this point)

SR2 (11.16-4.13), SR3 (7.14-12.19 7.18-12.13) installation

8
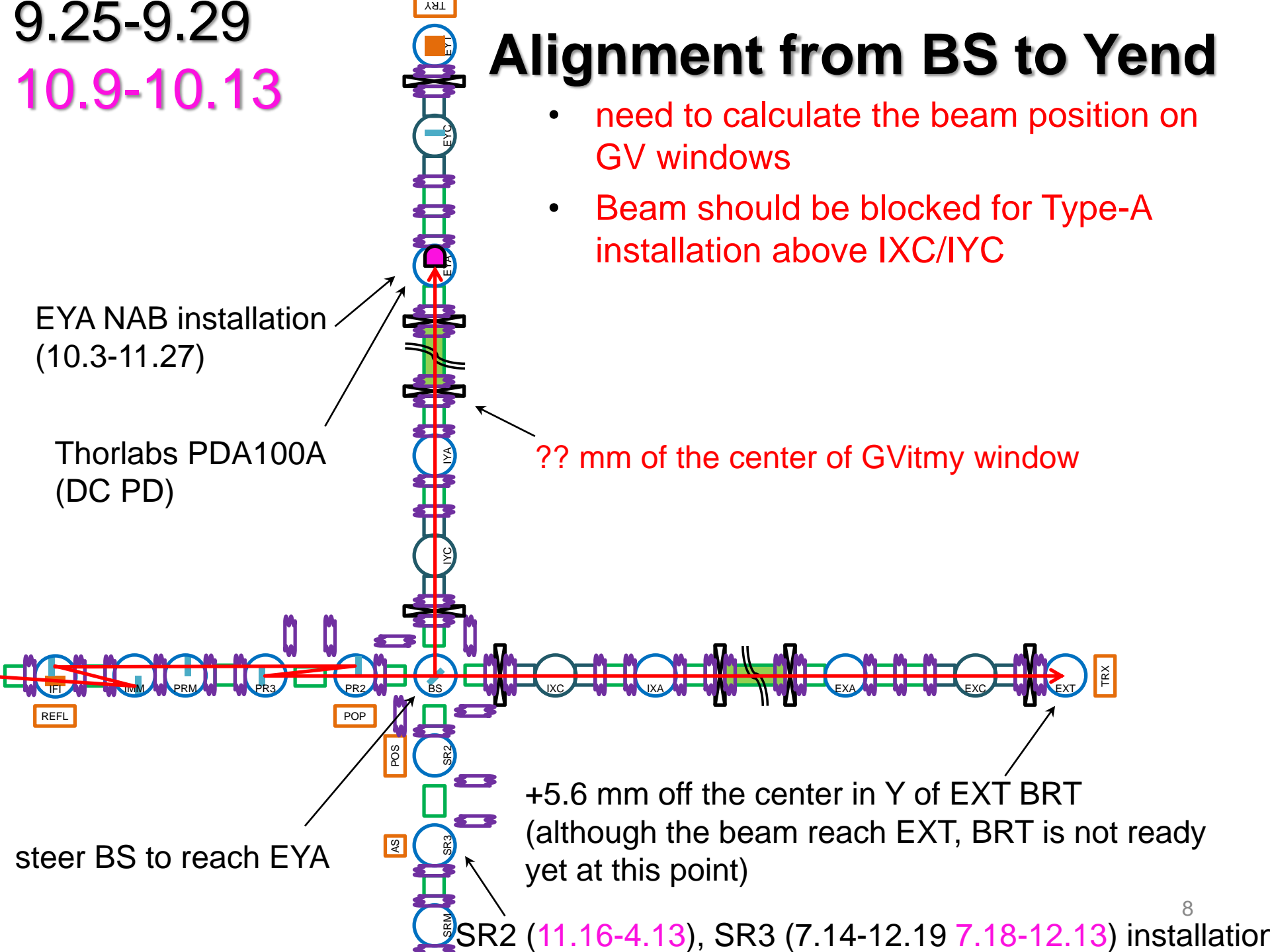
Beam Collimation

10.2-10.27
10.16-11.10

alignment of TMSY BRT
And TRY table optics
(maybe too dim)
(10.16-10.27)

EYA NAB installation
(10.3-11.27)

- measure the beam profile at PR3, PR2 and IXA (or IYA)
- adjust PR2-PR3 lengths if beam looks bad (we won't try PRMI at first, so we don't have to move PR2/3 if the beam is not terrible)

ETMX CRYp
installation starts
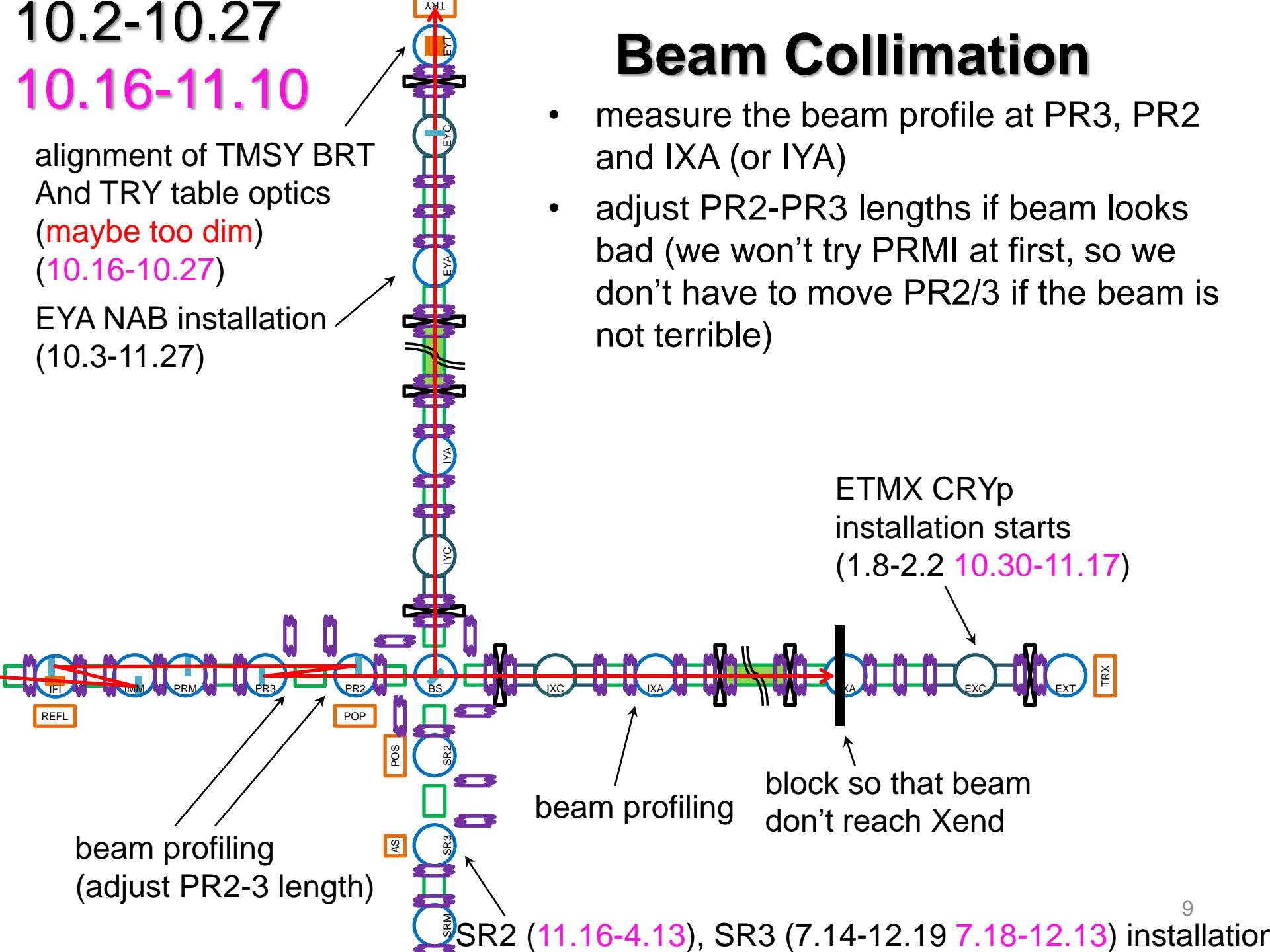(1.8-2.2 10.30-11.17)

block so that beam
don't reach Xend

beam profiling

beam profiling
(adjust PR2-3 length)

SR2 (11.16-4.13), SR3 (7.14-12.19 7.18-12.13) installation

9

11.1-11.7
11.13-11.17

Align ETMY

- align ETMY ~1.5 month after ETMY CRYp installation completion
- also align TMSY

align ETMY so that the beam reach REFL

EYA NAB installation (10.3-11.27)
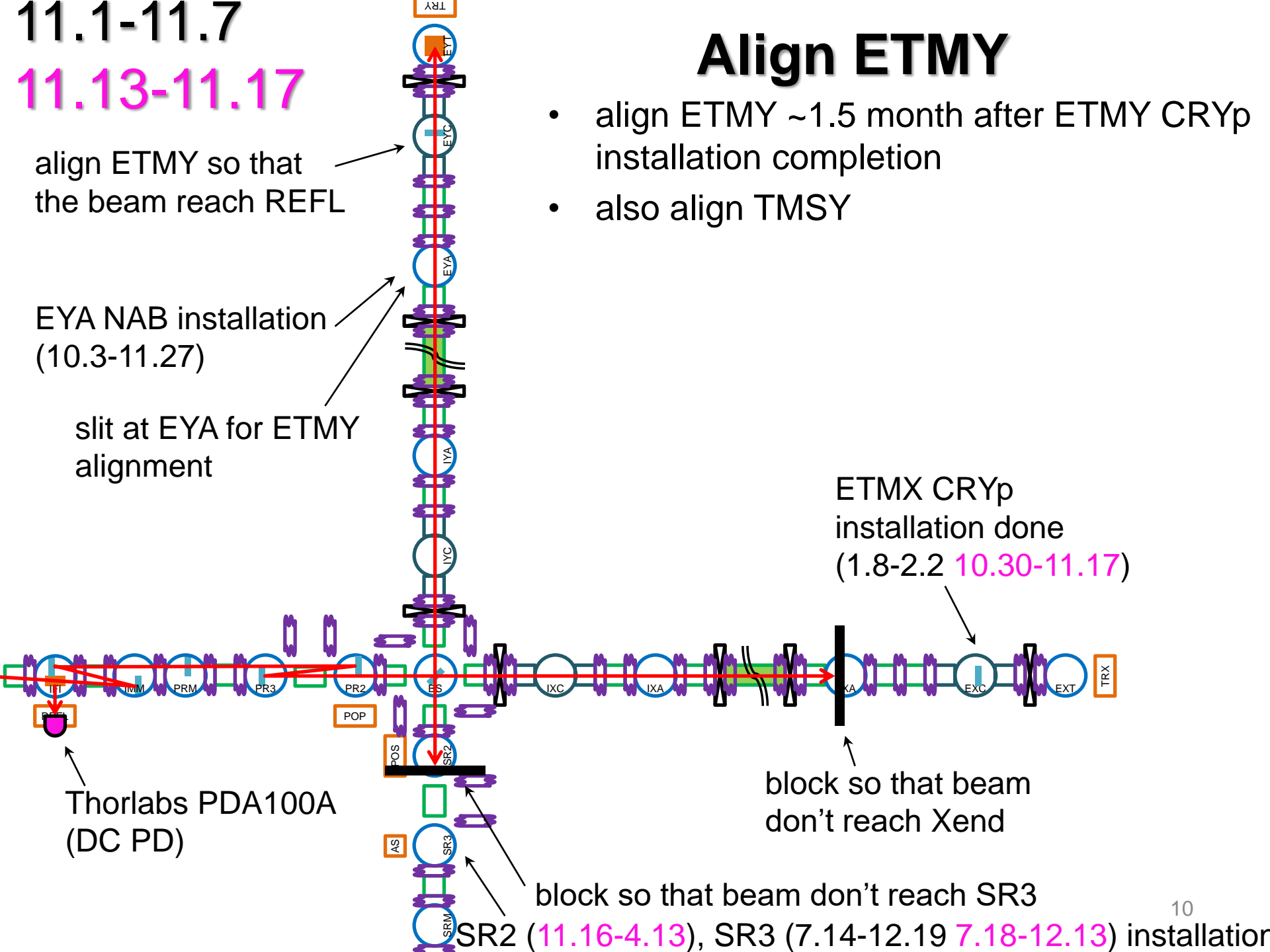
slit at EYA for ETMY alignment

ETMX CRYp installation done (1.8-2.2 10.30-11.17)

Thorlabs PDA100A (DC PD)

block so that beam don't reach Xend

block so that beam don't reach SR3
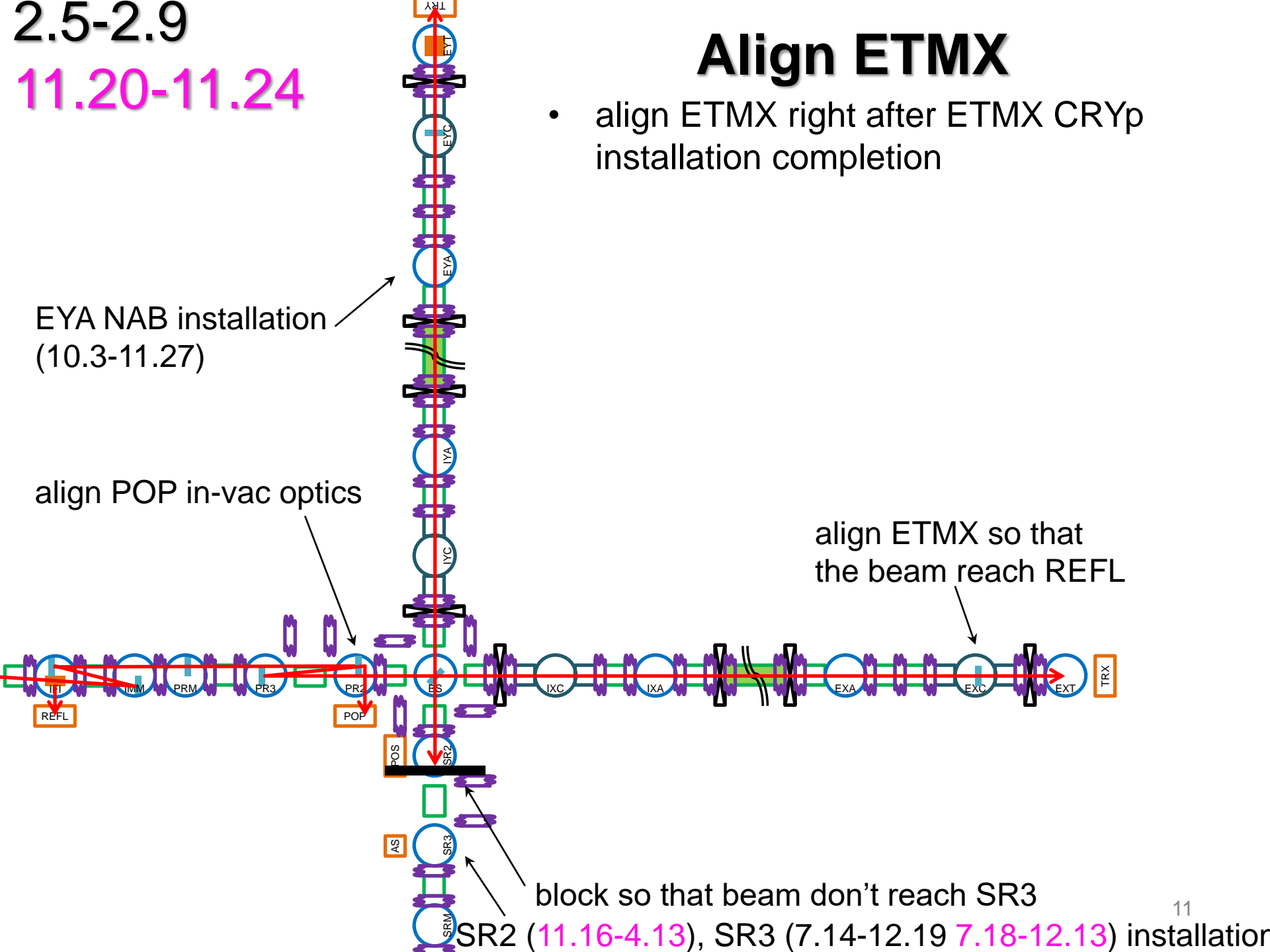SR2 (11.16-4.13), SR3 (7.14-12.19 7.18-12.13) installation

2.5-2.9
11.20-11.24

Align ETMX

- align ETMX right after ETMX CRYp installation completion

EYA NAB installation
(10.3-11.27)

align POP in-vac optics

align ETMX so that
the beam reach REFL

block so that beam don't reach SR3

SR2 (11.16-4.13), SR3 (7.14-12.19 7.18-12.13) installation

11.8-11.14
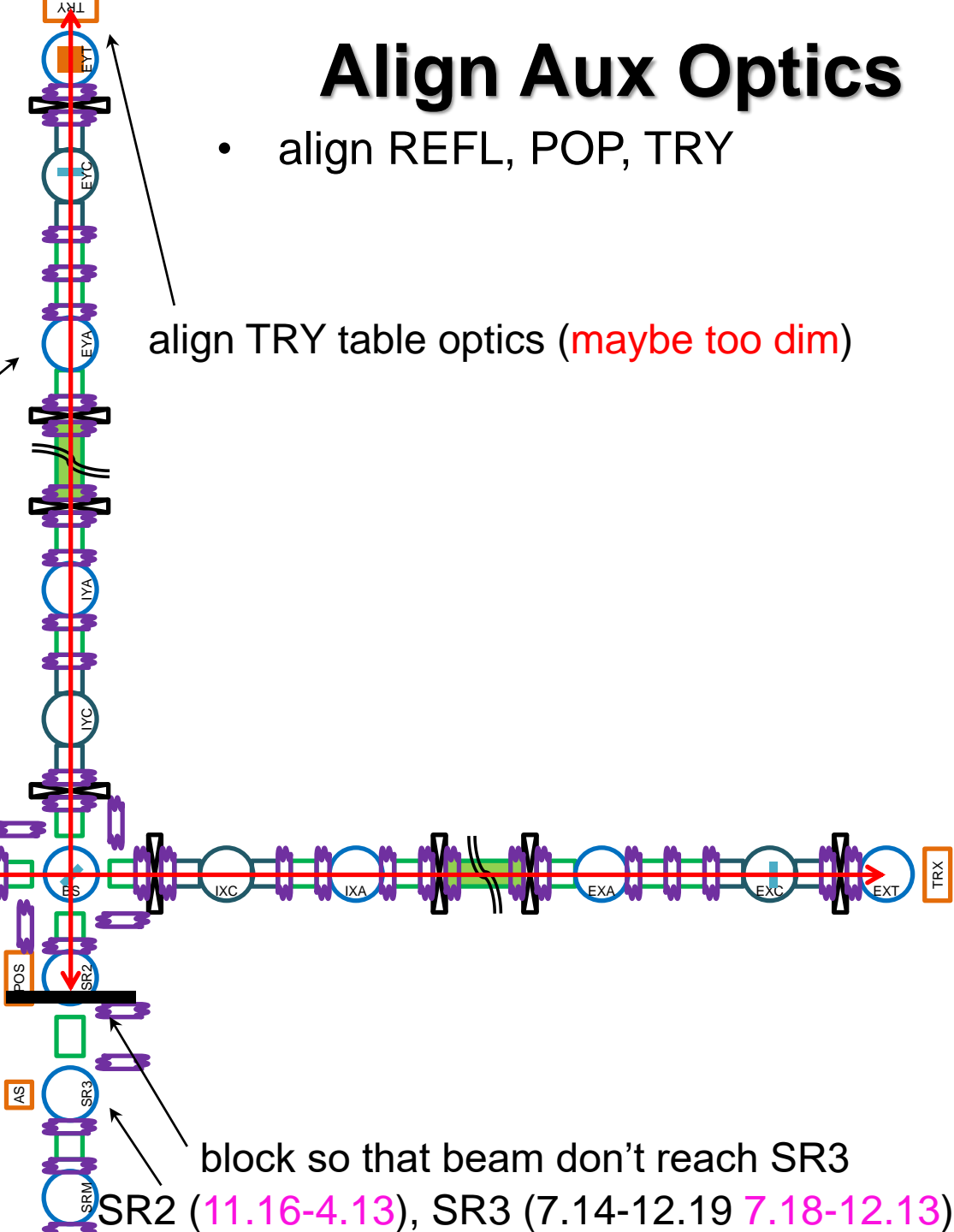11.20-11.24

Align Aux Optics

- align REFL, POP, TRY

align TRY table optics (maybe too dim)

EYA NAB installation
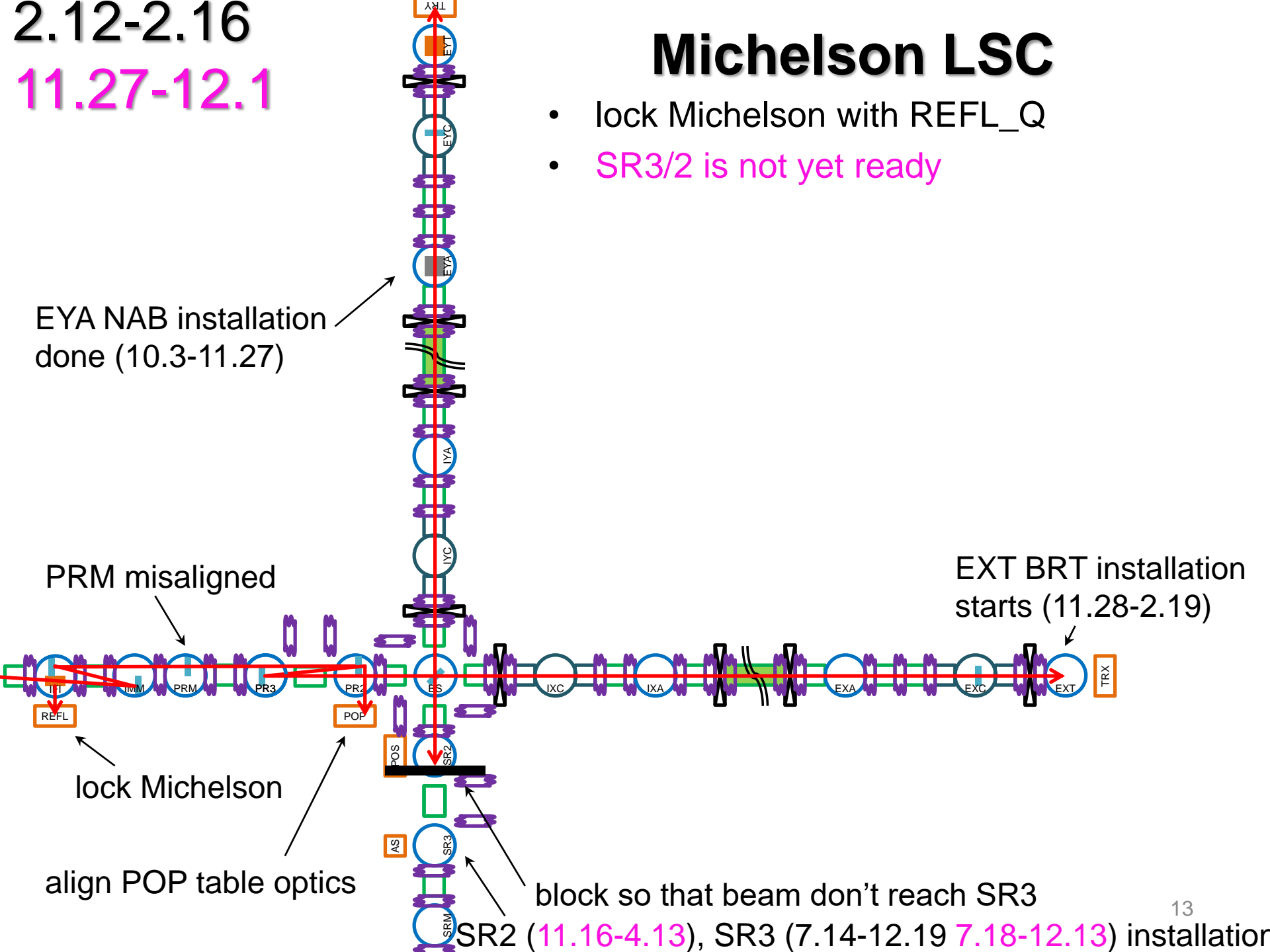(10.3-11.27)

align POP in-vac optics

align REFL table optics

block so that beam don't reach SR3

SR2 (11.16-4.13), SR3 (7.14-12.19 7.18-12.13) installation

12

Michelson LSC

- lock Michelson with REFL_Q
- SR3/2 is not yet ready

2.12-2.16
11.27-12.1

EYA NAB installation done (10.3-11.27)

PRM misaligned

EXT BRT installation starts (11.28-2.19)

REFL

lock Michelson

align POP table optics

block so that beam don't reach SR3

SR2 (11.16-4.13), SR3 (7.14-12.19 7.18-12.13) installation

13

Prepare for EY Evacuation

11.15-11.21
12.4-12.8

- preparation works before evacuation
- EYA NAB won't be suspended if no time; EY evacuation is first priority
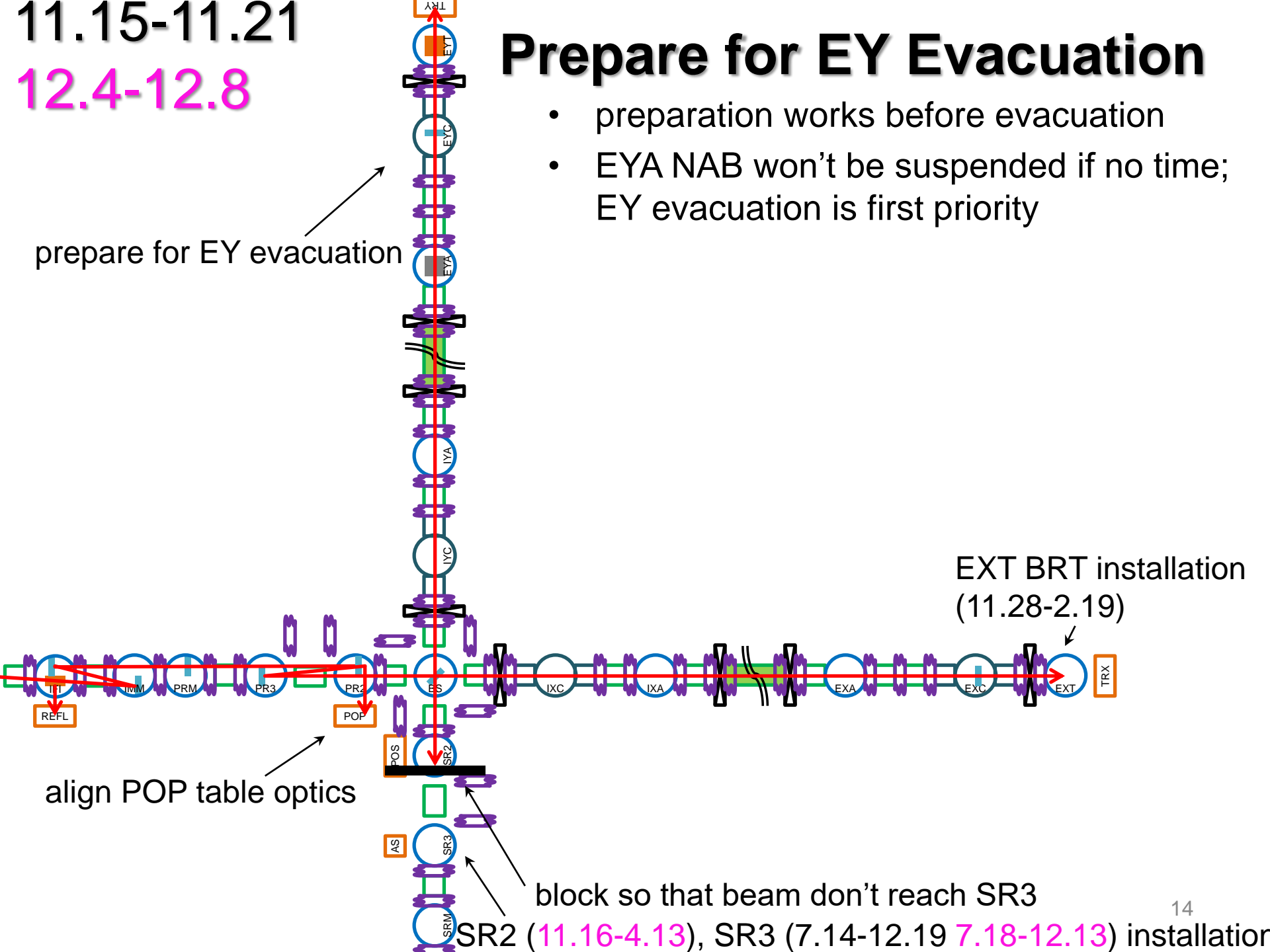
prepare for EY evacuation

EXT BRT installation (11.28-2.19)

align POP table optics

block so that beam don't reach SR3

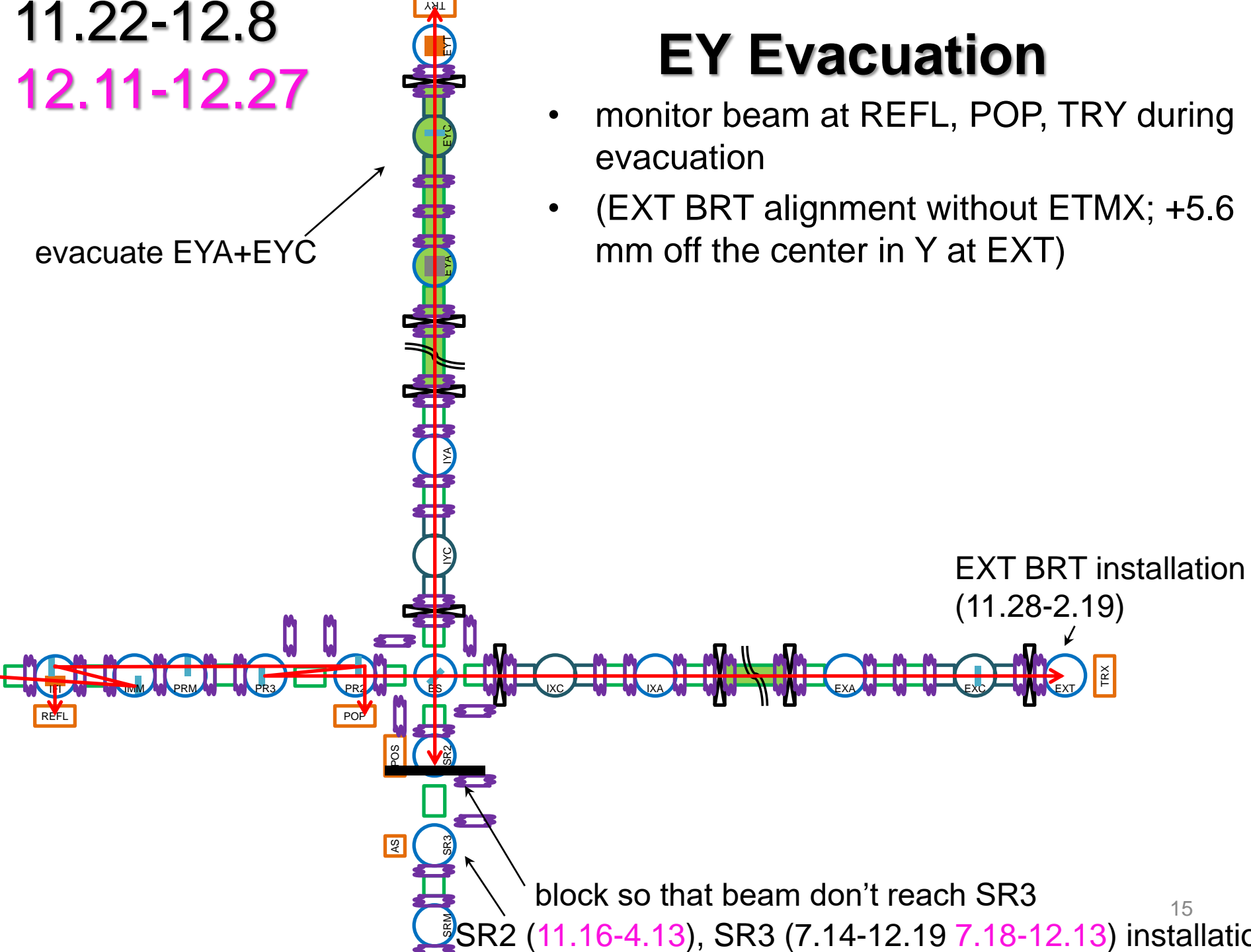SR2 (11.16-4.13), SR3 (7.14-12.19 7.18-12.13) installation

11.22-12.8
12.11-12.27

EY Evacuation

- monitor beam at REFL, POP, TRY during evacuation
- (EXT BRT alignment without ETMX; +5.6 mm off the center in Y at EXT)

evacuate EYA+EYC

EXT BRT installation (11.28-2.19)

block so that beam don't reach SR3

SR2 (11.16-4.13), SR3 (7.14-12.19 7.18-12.13) installation

Prepare for EX Evacuation

2.19-2.23
12.11-12.14

- preparation works before evacuation
- EXA NAB installation is currently scheduled 2.20-2.22; it won't be suspended if no time; EX evacuation is first priority
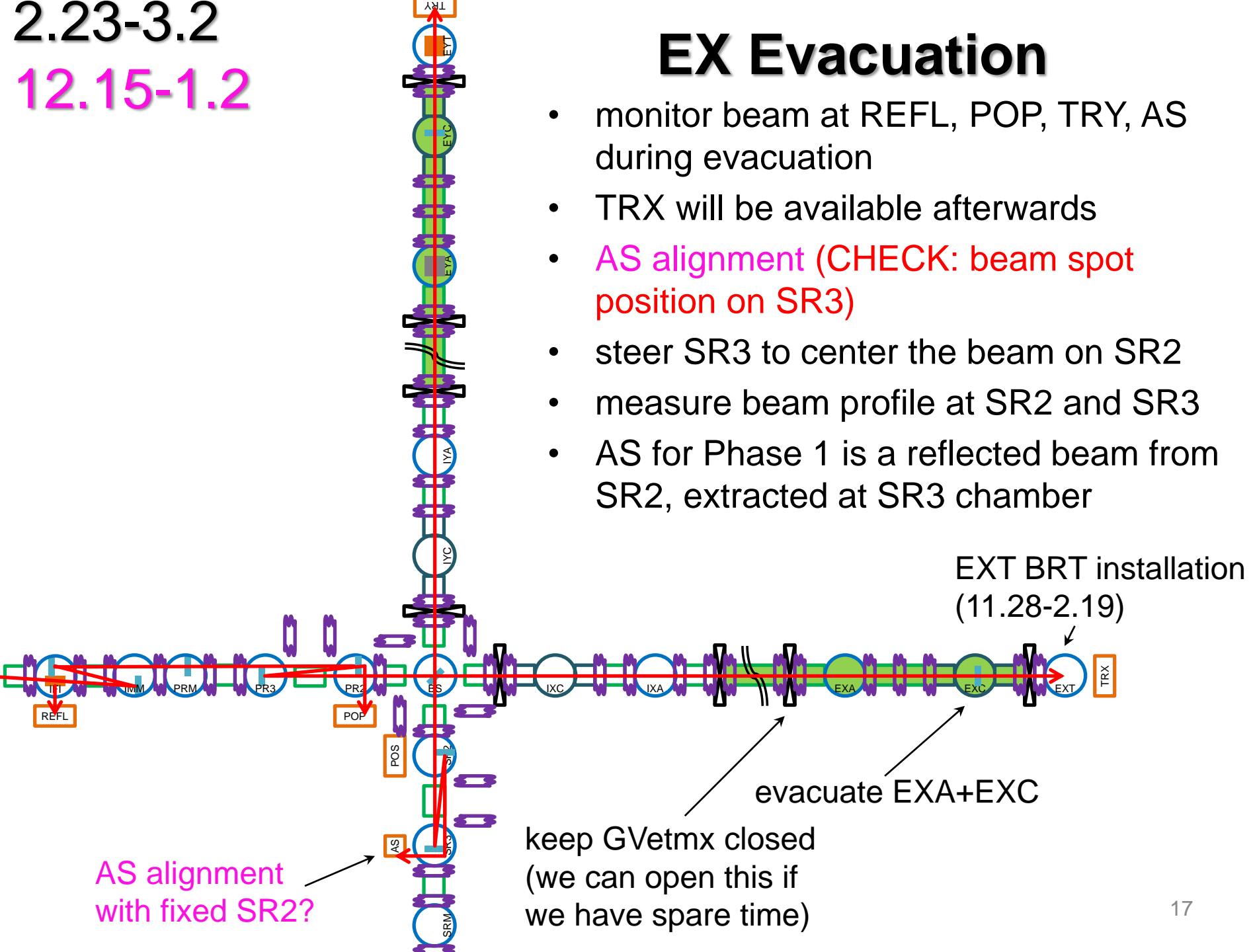
EXT BRT installation (11.28-2.19)

prepare for EX evacuation

install fixed SR2?

SR2 (11.16-4.13), SR3 (7.14-12.19 7.18-12.13) done
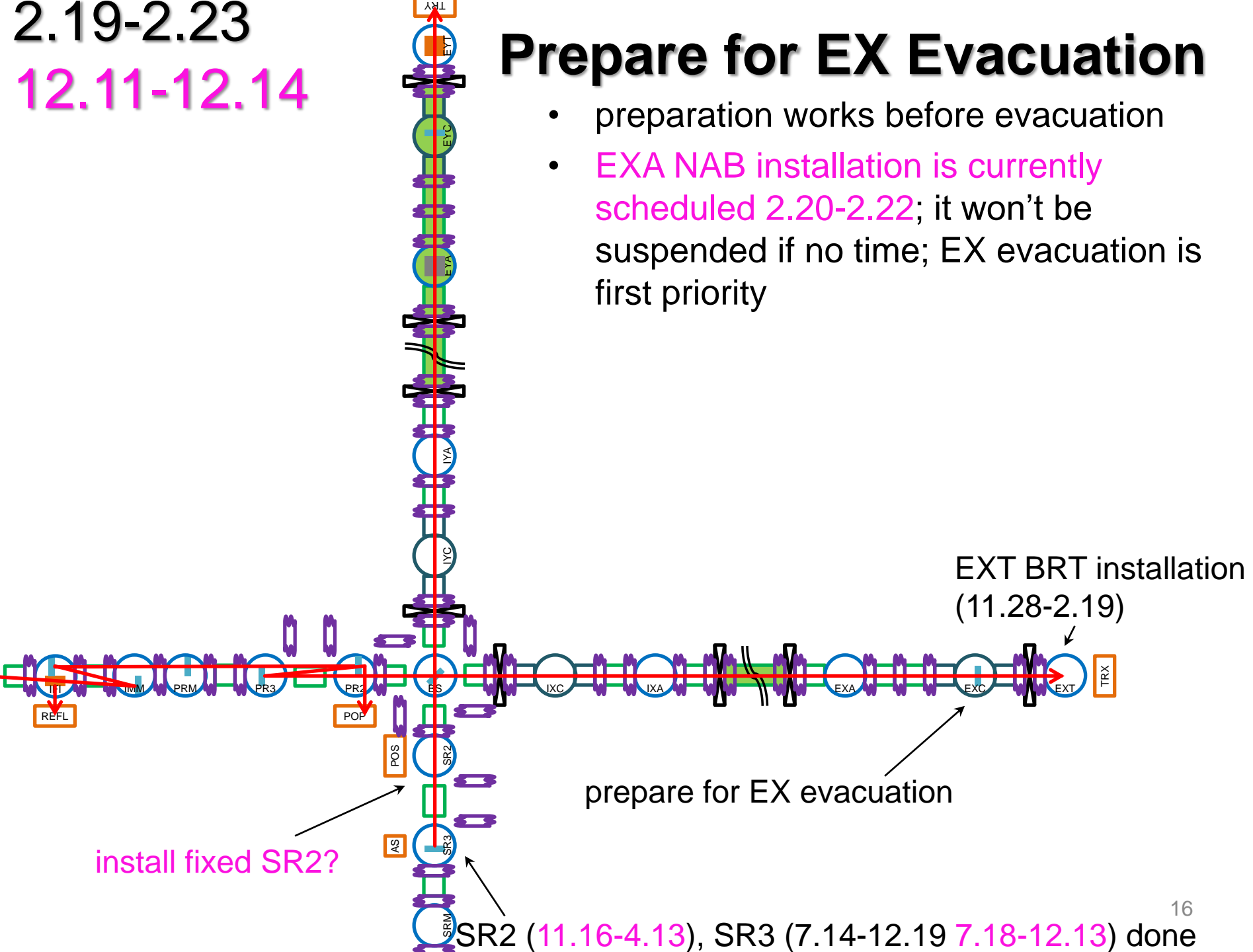
EX Evacuation

- monitor beam at REFL, POP, TRY, AS during evacuation

- TRX will be available afterwards

- AS alignment (CHECK: beam spot position on SR3)

- steer SR3 to center the beam on SR2

- measure beam profile at SR2 and SR3

- AS for Phase 1 is a reflected beam from SR2, extracted at SR3 chamber

2.23-3.2
12.15-1.2

EXT BRT installation
(11.28-2.19)

evacuate EXA+EXC

AS alignment
with fixed SR2?

keep GVetmx closed
(we can open this if
we have spare time)

12.8
12.27

EY Cooling Starts

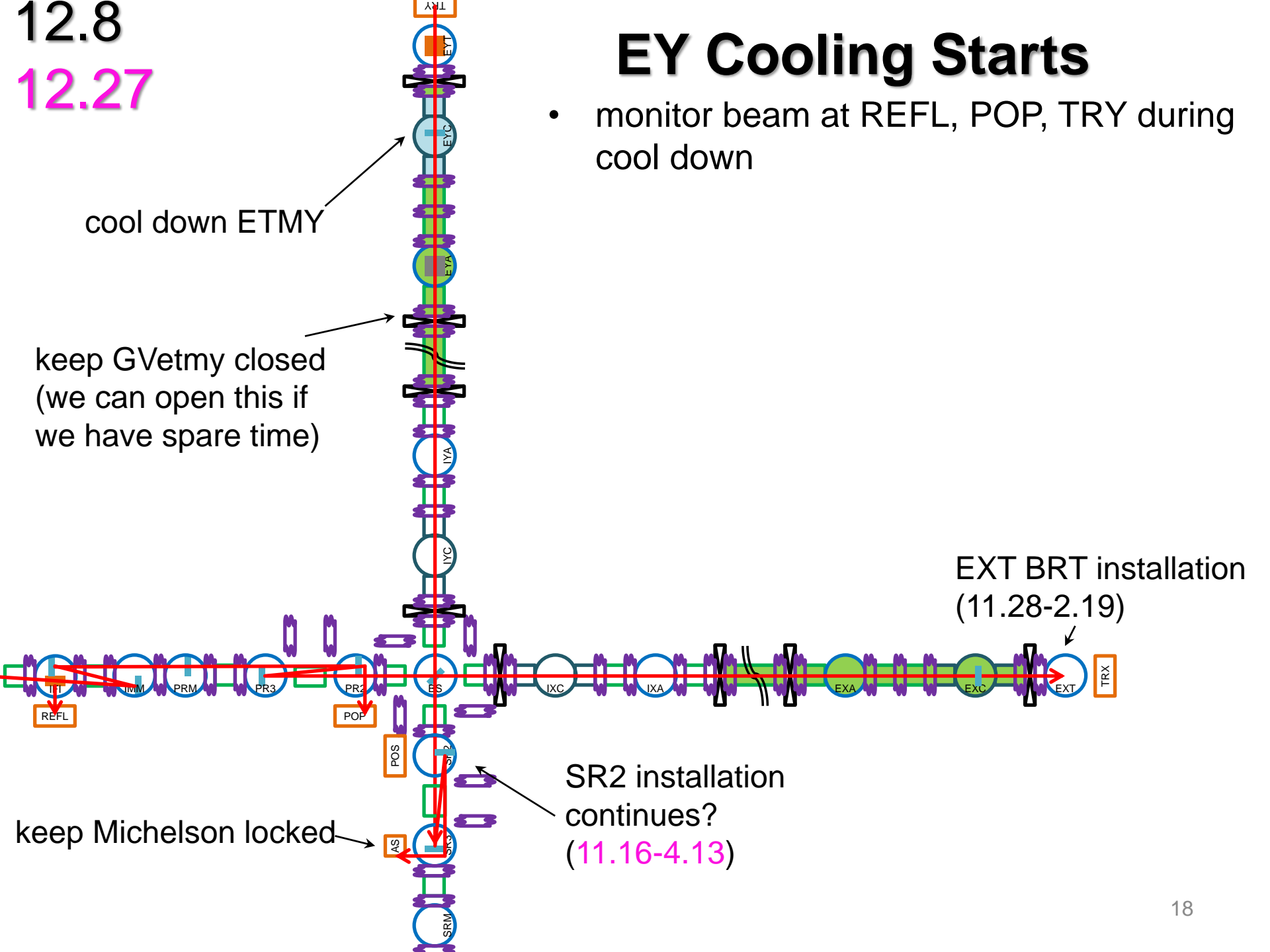- monitor beam at REFL, POP, TRY during cool down

cool down ETMY

keep GVetmy closed
(we can open this if
we have spare time)

EXT BRT installation
(11.28-2.19)

SR2 installation
continues?
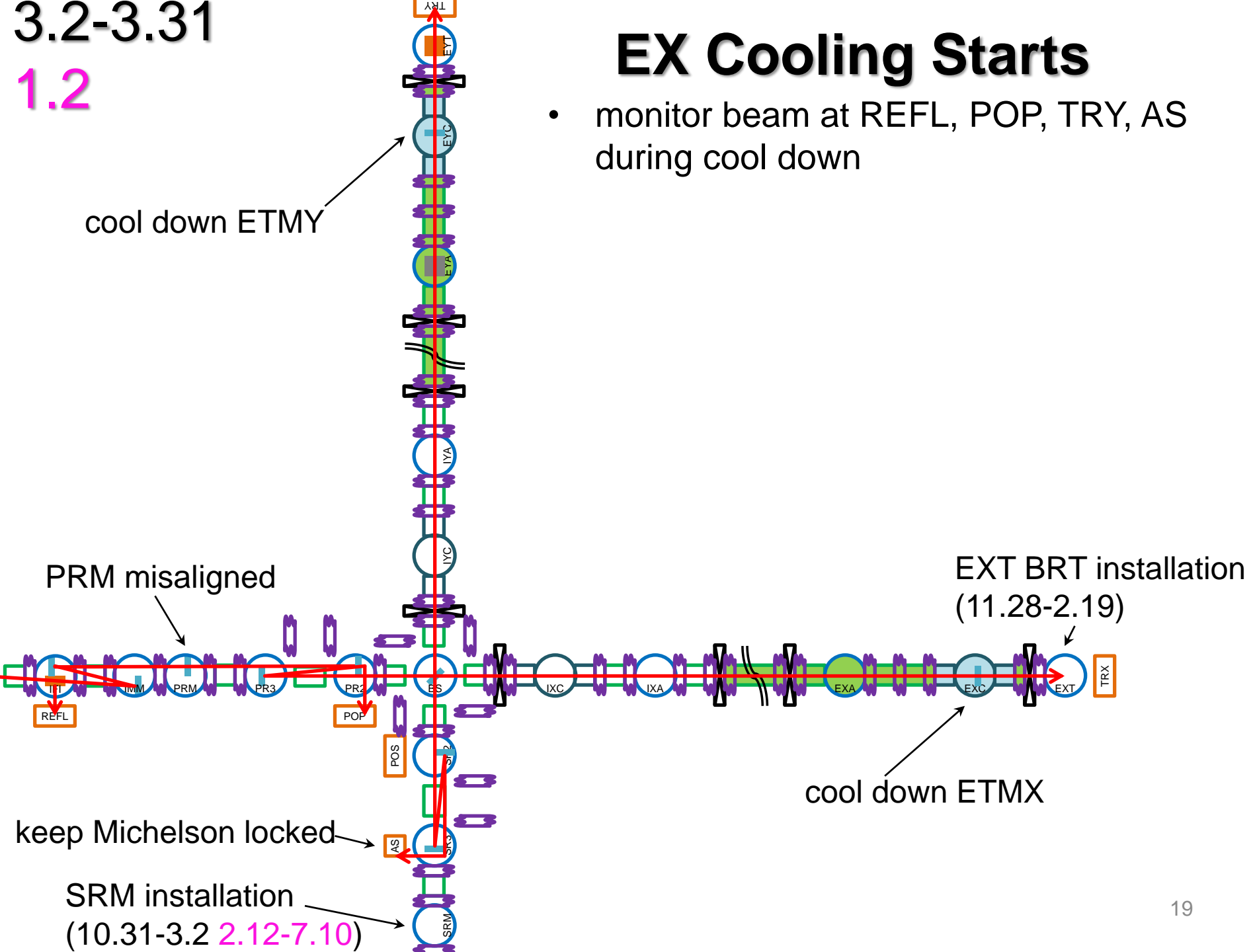(11.16-4.13)

keep Michelson locked
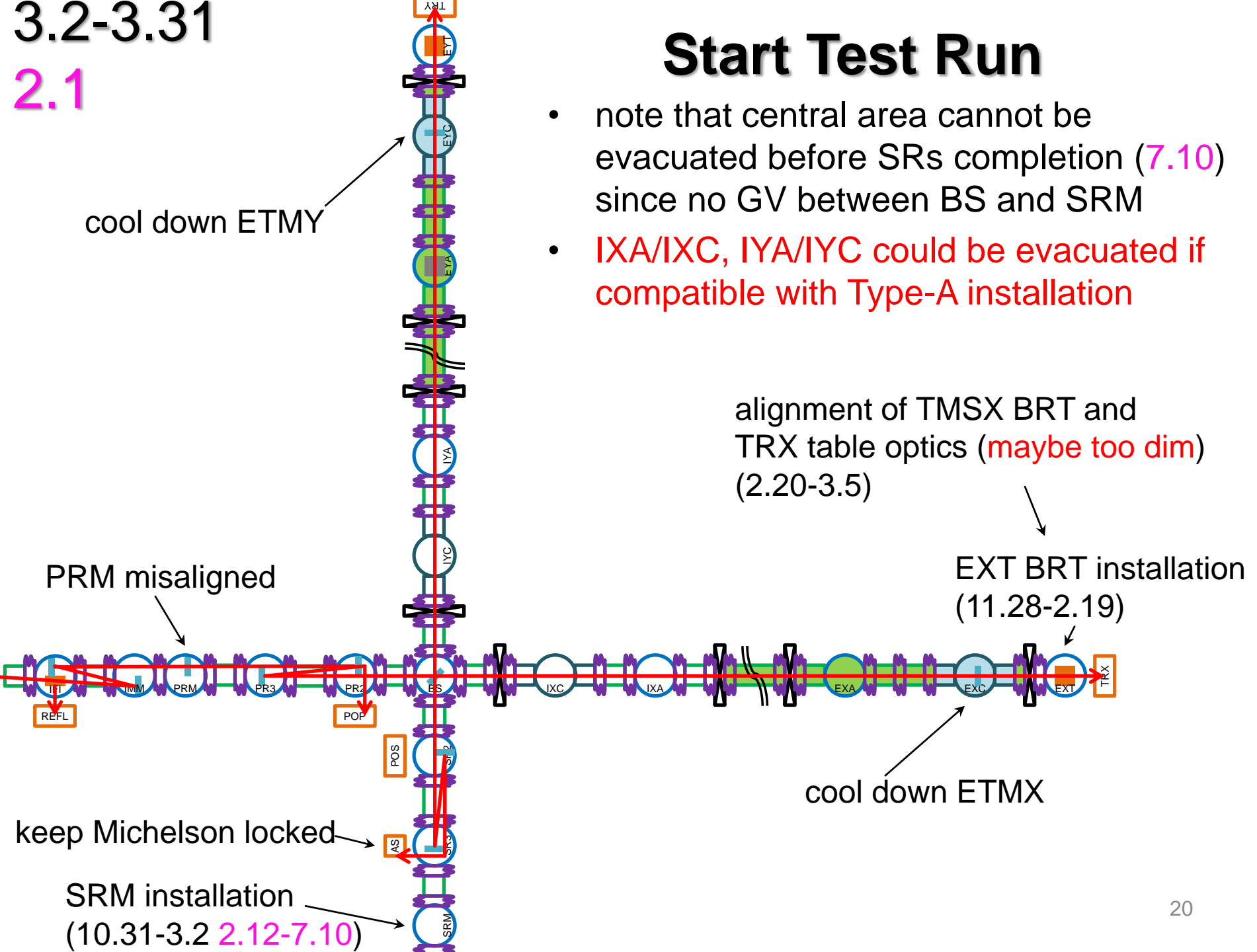
18

3.2-3.31
1.2

EX Cooling Starts

- monitor beam at REFL, POP, TRY, AS during cool down

cool down ETMY

PRM misaligned

EXT BRT installation
(11.28-2.19)

cool down ETMX

keep Michelson locked

SRM installation
(10.31-3.2 2.12-7.10)

3.2-3.31
2.1

Start Test Run

- note that central area cannot be evacuated before SRs completion (7.10) since no GV between BS and SRM

- IXA/IXC, IYA/IYC could be evacuated if compatible with Type-A installation

cool down ETMY

alignment of TMSX BRT and TRX table optics (maybe too dim) (2.20-3.5)

PRM misaligned

EXT BRT installation (11.28-2.19)

cool down ETMX

keep Michelson locked

SRM installation (10.31-3.2 2.12-7.10)

Apr-Jun

PRMI???

- OPTION; DO THIS IF IT DOESN'T DELAY FINAL bKAGRA (JGW-T1605595)
- PR2-PR3 length adjust
- PRMI alignment, locking
- connect remaining bellows/ducts
- evacuate central area?
- open GVs (GVsrm should be closed)
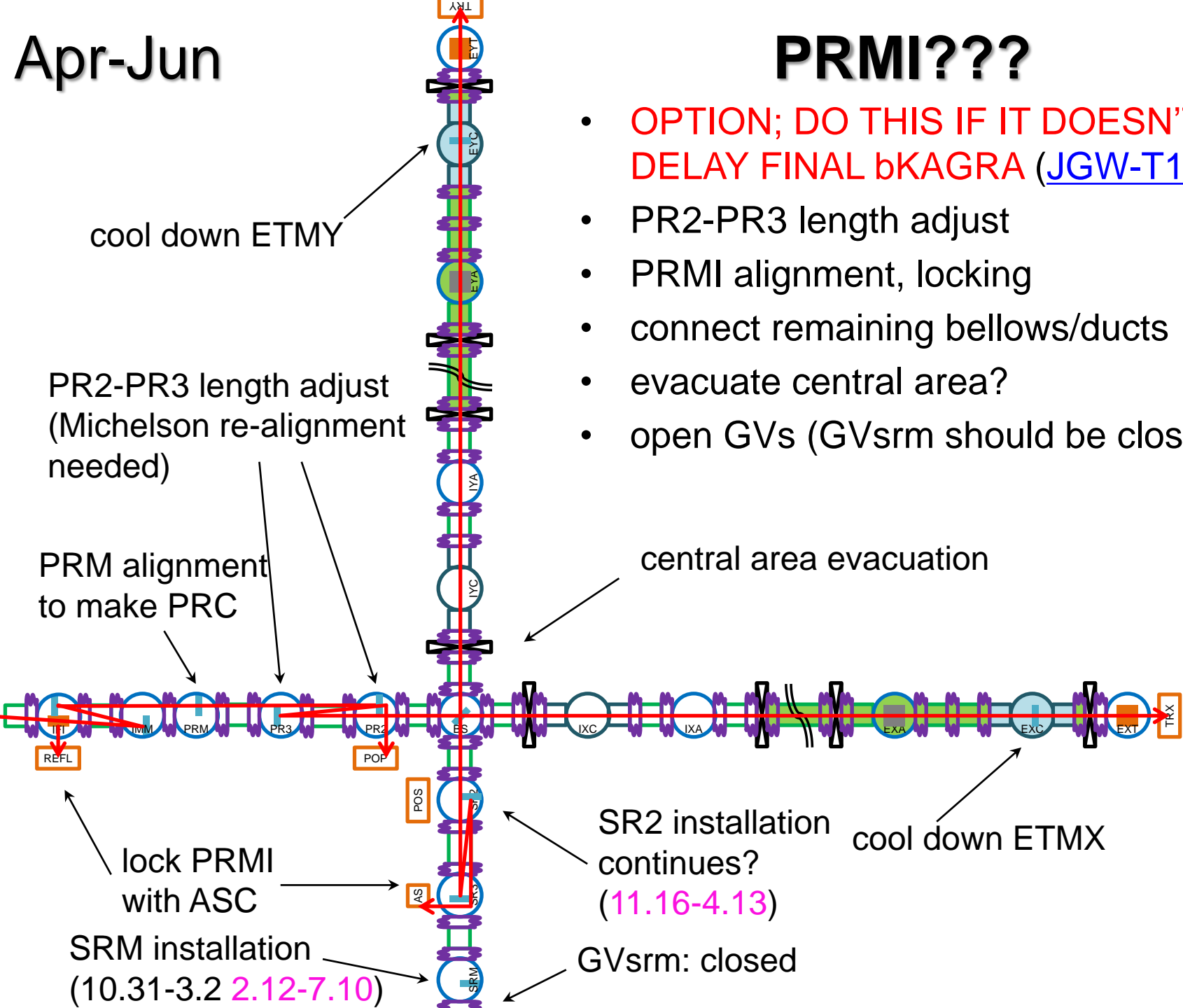
cool down ETMY

PR2-PR3 length adjust
(Michelson re-alignment needed)

PRM alignment to make PRC

central area evacuation

lock PRMI with ASC

SR2 installation continues? (11.16-4.13)

cool down ETMX

SRM installation (10.31-3.2 2.12-7.10)

GVsrm: closed

Some Notes

- Update NAB installation schedule?
- Confirm beam spot positions at GVs