

KAGRA MIF Status Report

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(Almost) Done

- Main interferometer design
 - mirror specs (RoC, reflectivity, etc)
 - lengths, layout
 - signal extraction scheme, length/alignment control
- Noise requirements for IFO components
 - mirror displacement noise [VIS]
 - laser intensity/frequency noise [IOO, LAS]
 - modulation phase/amplitude noise [IOO]
 - scattered light [AOS]
 - beam jitter [IOO]
- MIF Design Document [JGW-T1200913](#)
- Y. Aso, Y. Michimura, K. Somiya *et al.*,
[PRD 88, 043007 \(2013\)](#)

Needs to be Done

- Initial alignment procedure
 - how do we put mirrors and point the beam
- Commissioning procedure
 - intermediate steps
 - lock acquisition (also for intermediate steps)
- Suspensions, laser, input optics, analog electronics, etc, which meet MIF requirements
 - we *always* have to check the requirement before production!! (ask me if MIF requirements are unclear)
 - don't forget about the range requirements also
- Output optics
- Calibration of GW signal

On Going

- Suspension controls design [Sekiguchi, Ono]
 - actuator noise: [JGW-T1503453](#), magnetic noise: [JGW-T1503469](#)
 - local damping (requirements?)
- PMC design [Nakano, UToyama]
 - plan: [JGW-G1503515](#)
 - check RF intensity noise, beam jitter
- RF modulation [Uehara, NiigataU, Somiya]
 - plan: [JGW-D1503189](#)
- Laser frequency stabilization servo design [Aso]
 - plan: [JGW-T1503330](#), [JGW-D1402908](#)
 - reference cavity: [JGW-T1503493](#)
- Laser intensity stabilization servo design [UToyama]
 - reference cavity: [JGW-D1503389](#)
- Output optics [Shiga, Akutsu]
 - around IMC: [JGW-D1503412](#)
- Arm length stabilization [Tatsumi, Arai]

Status Chart

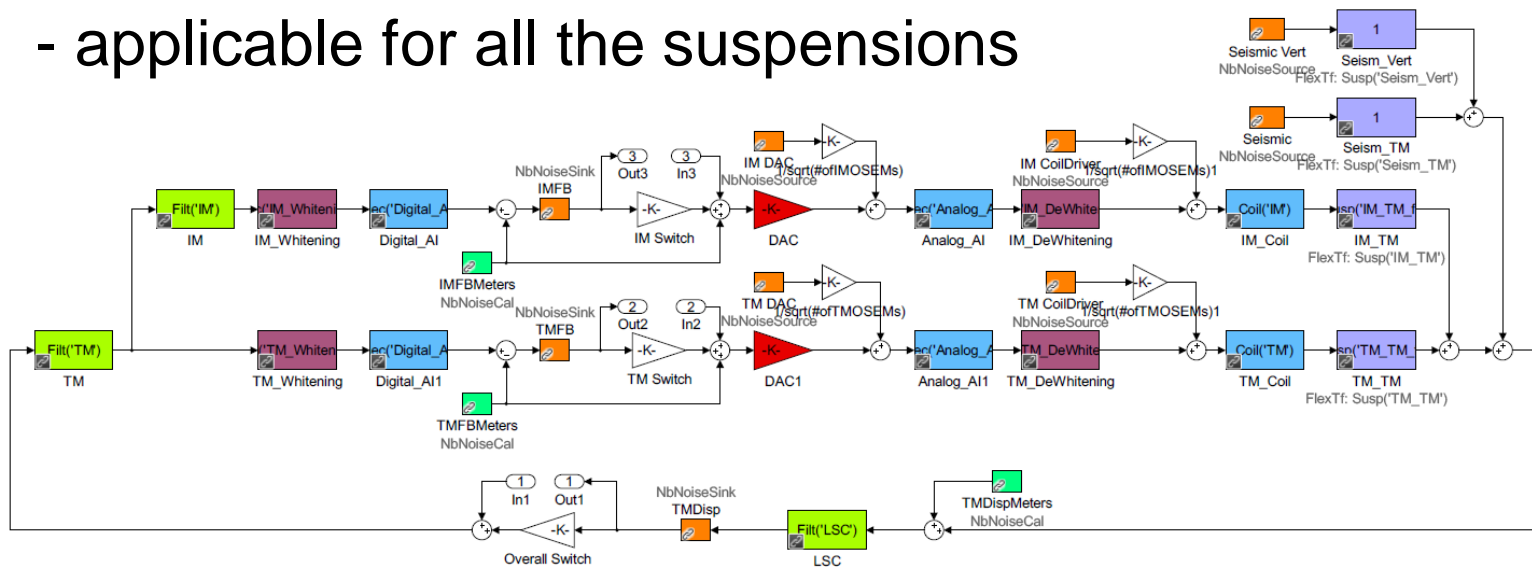
	iK	bK	comments
Laser			NPRO 2W for iK, 200W for bK. Developing 200W one.
PMC			Have to check if current design meet the requirement.
RefCav			FRC for iK, ULE for bK. Already made, but have to check the req.
EOM			High power EOM study on going. Testing start this year.
Periscopes			Newport 45. Have to check the requirement.
IFI			At Kamioka. High power testing is not fully done.
FSS			Servo model exists. Some circuits are in fabrication.
ISS	-		No ISS for iK. Design study just started.
TMS-BRT	-		TMS optical design study is almost done, ordered some optics
Outputs			MCF/MCE tables are designed, but others are not.
OMC	-		No OMC for iK. Designing and testing on going.
PDs			Boards are in fabrication. In-vac enclosures are not designed.
Circuits			Some are in fabrication, but many bK circuits are not designed.
Digital			RT models in development.
IMC sus			Placed, but mirrors are not suspended yet.
PR sus			Assembly on going. Mirrors are not delivered yet.
BS sus			No drawings for IM/TM stages. Mirror is not delivered yet.
SR sus	-		No SRC for iK. Testing on going.
TM sus			In fabrication for iK. Designing cryogenic payload and mirror for bK.

Red: (almost) no design
Orange: conceptual design
Yellow: development without detailed design / design and development at the same time
Green: in fabrication
Blue: almost ready
White: ready

iK: iKAGRA
 bK: bKAGRA

Highlights of Recent Activities

- Sapphire mirror inhomogeneity discussion with MIR
 - see [JGW-G1403015](#)
- List of analog electronics needed is made
 - see [wiki/KAGRA/Subgroups/MIF/AEL](#)
 - cables and electronics for IMC servo will be ready by June
- NoiseBudget model for suspension controls is made
 - see [JGW-T1503453](#)
 - applicable for all the suspensions



Results of Suspension Noise Model

	Seismic	Magnetic	Actuator	Range	Comment
IMC	OK	no calc (should be OK)	OK (?)	BAD (?)	maybe actuator efficiency measurement was wrong by ~2 orders of magnitude (so, maybe the range is OK)
BS	OK	OK	OK	OK	
PRC	OK	OK	OK	OK	
SRC	OK	OK probably	BAD	OK	we should reduce the actuation efficiency
ITM ETM	OK	TBD	TBD	TBD	magnet selection on going

- Note that magnetic noise from IM is not calculated yet