

Korean Group

KAGRA International Collaboration
Meeting

July 9, 2015

on behalf Korean Gravitational Wave
Group

Members

- Experiment:
 - Tai-Hyun Yoon (Lead, Korea Univ.), Kyuman Cho (Sogang U.), Jaewan Kim (Myungji U.)
- Data Analysis
 - Hyung Won Lee (Lead), Jeongcho Kim (Inje U.), John Oh, Sang Hoon Oh, Edwin Son (NIMS), Chunglee Kim, Gungwon Kang, Heesuk Cho (KISTI), Chang-Hwan Lee, Young-Min Kim (PNU), Hyunkyu Lee, Kyungmin Kim (Hanyang U.)
- Others (Theory, Astrophysics)
 - Hyung Mok Lee (SNU), Sangpyo Kim (Kunsan Nat. U.)

Computing Support

- Korea Institute for Science & Tech. Info. (KISTI) supports KGWG for its activities including KAGRA Collaboration.
- Current hardware includes 636 CPU cores and 155TB
- Current user groups include KAGRA Parameter Estimation Members, for the construction of PE pipeline

<i>Name</i>	<i>Affiliation</i>
Kazuhiro Hayama	Osaka City Univ.
Tatsusya Narikawa	Osaka City Univ.
Hideyuki Tagoshi	Osaka City Univ.
Koh Ueno	Osaka City Univ.
Hiroataka Yuzurihara	Osaka City Univ.

Tilt Sensor for Initial Mirror Alignment of KAGRA

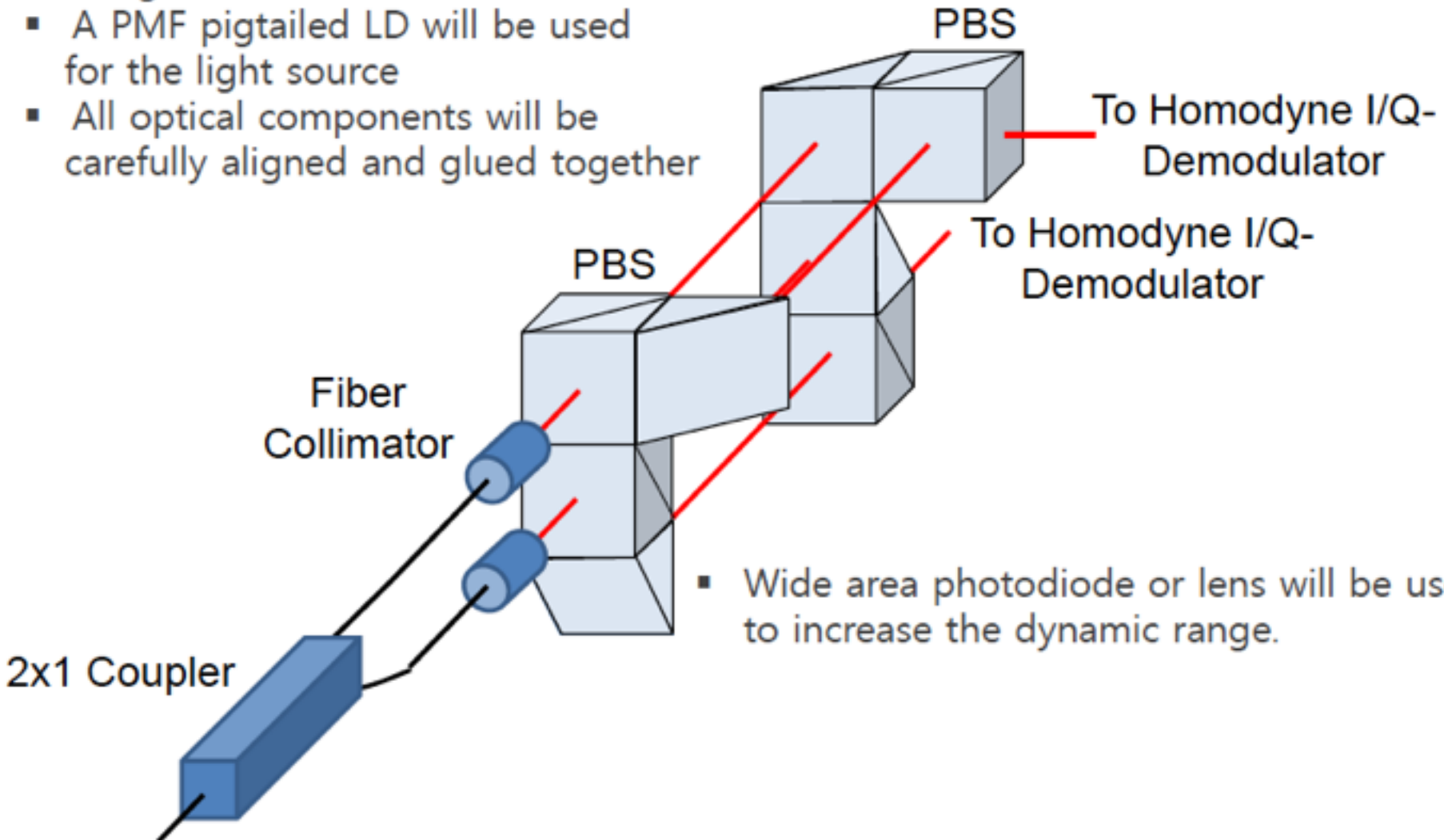
Professor Kyuman Cho, Sogang University

- High sensitivity, wide dynamic, low drift range tilt sensors are very important in initial mirror alignments of KAGRA.
- Optical lever has been used for
 - Local angular alignment of each mirror,
 - Alignment control to lead to lock the interferometer,
 - Monitor drift.
- Prof. Cho proposed new interferometric tilt sensor schemes which, in theory, can provide
 - a better sensitivity,
 - a better stability,
 - a compatible dynamic range to an optical lever.



Proposed Scheme for Tilt Sensor

- Two homodyne tilt sensors for pitch and yaw measurements are integrated
- A PMF pigtailed LD will be used for the light source
- All optical components will be carefully aligned and glued together

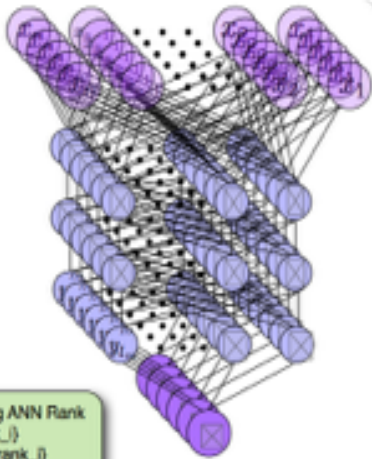


- Wide area photodiode or lens will be used to increase the dynamic range.

Detector's Characterization @ KGWG

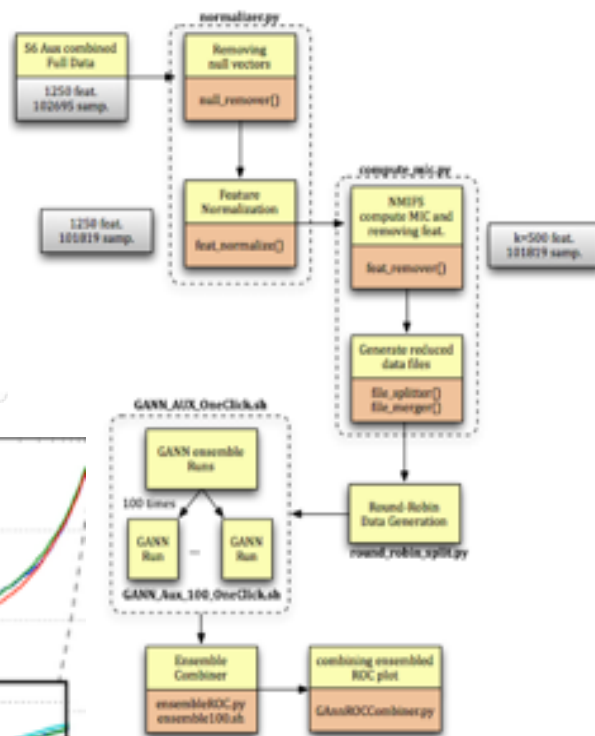
Members:

John Oh, Sang Hoon Oh, Edwin Son, Hwansun Kim, Hyoungeok Chu (NIMS)
 Young-Min Kim, Chang-Hwan Lee (Pusan National Univ.)

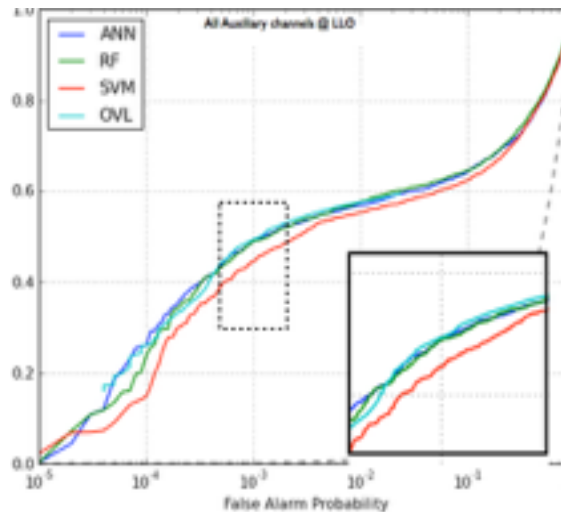


Combining ANN Rank
 - max(rank_*)
 - average(rank_*)
 - max(off_flag_*)
 - likelihood ratio
 - something new ?

MIGANN
 Mutual Information-Genetic Algorithm aided Artificial Neural Network



- **Glitch Classification using Machine Learning Algorithms**
 - Artificial Neural Net based Glitch identification
 - iDQ Pipeline (online classification using BDT, ANN, SVM, OVL) in LIGO
 - testing in KAGRA
 - Improving iDQ pipeline: applying the notion of deep neural network



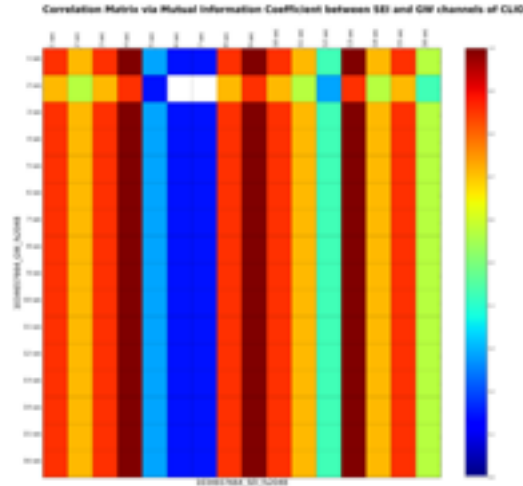
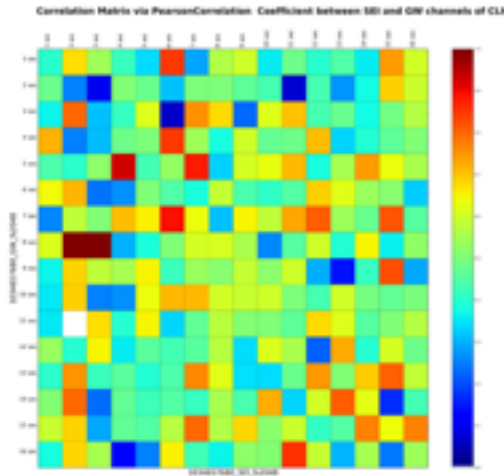
BDT: Bagged Decision Trees of Random Forest

ANN: Artificial Neural Network

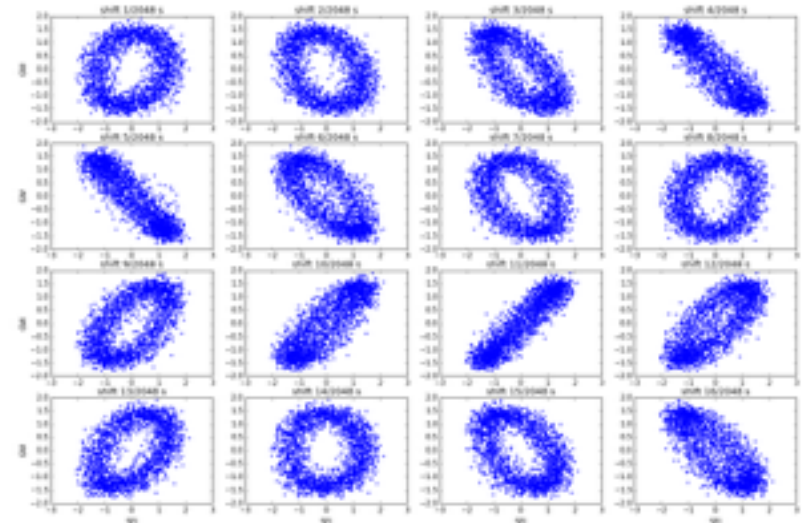
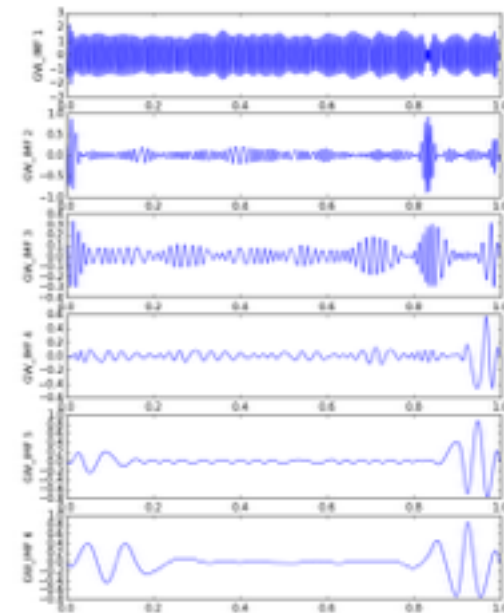
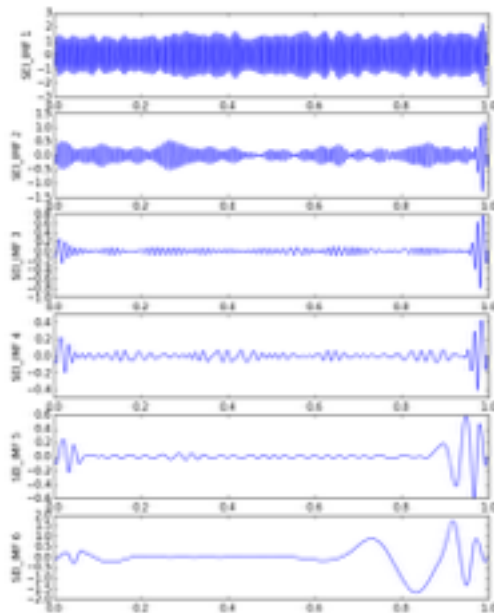
SVM: Support Vector Machine

OVL: Ordered Veto List – Conventional Method of Glitch Determination in LIGO

Detector's Characterization @ KGWG



- **Correlation Analysis of CLIO Data:**
SEI and GW Channel
 - PearsonR & Maximal Info. Coeff.
 - Generating Correlation Matrix
 - : Monitor the correlated aux. channels
- **Event Trigger Generation**
 - Hilbert-Huang Transform based approach



KGWG-KAGRA DAS activities

Members:

Hyung Won Lee (Inje U.), Jeongcho Kim (Inje U.), and Chunglee Kim (Yonsei U.)

MCMC Parameter estimation for CBC inspirals

- Effects of amplitude corrections for NS-BH and BH-BH binary inspirals
- Comparison of MCMC performance with the initial vs early-phase advanced LIGO-Virgo
- MCMC PE with more realistic noise realisations (non-Gaussianity)

Waveform Study

- Reviewing the post-Newtonian formalism: TaylorF2
- Developing non-precessing TaylorF2 approximant including amplitude corrections, eccentricity effects

Joint Meetings

- Semi-Annual Meetings
 - 6th meeting: June 20-21, 2014, Seoul National University
 - 7th meeting: December 19-20, 2014, Toyama University
 - 8th meeting: June 27, 2015, Gwangju
- Future direction of joint meetings
 - Merge into F2F meeting?
 - Merge into International meeting?
 - To be decided later