

Gravitational waves detected by LIGOKAGRA











- Host: ICRR Utokyo, Co-host: KEK, NAOJ
- 300+ collaborators from 90+ institutes
- Constructed in Kamioka mine
- Underground and cryogenic





Detection of gravitational wave using laser interferometer



KAGRA How to get More sensitivity with control?





Development of optical configurations



KAGRA Concept of digital system



KAGRA Control network design









KAGRA Source codes by GUI: Libraries for Real time model on Matlab, Simulink



KAGRA Generated C source of Real Time code from GUI

Actual control signals (filter bank, matrix, trigger, linearization etc.) will be generated automatically when building real time modules.



KAGRA Produced channels

- Test Point channel: Anchor point of data stream, not to break control loop. Fast real time data (16kHz), limited number to access up to 24/RTPC at a time. ~10000ch.
- DAQ channel: selected channels from Test Point. To be stored into disks. Decimated from 16Hz to 16kHz.
 Available to see the past data. ~1000ch.
- Epics channel: Automatically produced when RT code built, named with similar name as Test Point. Slow (16Hz), stored all the data, accessible to the past data. ~100000ch.
 - No need to write/edit EPICS channel database manually.

JGW-G1706727

EPICS meeting at KURRI, 2017/5/16, Osamu Miyakawa

KAGRA MEDM --Length sensing and control system



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EPICS meeting at KURRI, 2017/5/16, Osamu Miyakawa

KAGRA EPICS covers realtime signals

Software for real time access:

- Dataviewer: osciloscope,
- DTT: FFT analyzer
- Foton: digital filter composer
- Foton: GUI digital filter composer

Some MEDM screens are produced automatically when built.

- Signal excitation
- 10 filter banks
- 3 monitor point IN1/IN2/OUT







- Guardian is an application covering on EPICS to manage states of interferometer.
- Automatic lock acquisition: down -> locked -> operation by looking EPICS channel info.

ſ		X K1:GRD-MICH_	LOCK.MAIN.qYK	(b4b.adl							
	version:) ezca: 514 GUARDI	AN: MICH_LOCK	archiv	e id: 227837272						
	STATE	DOWN	5	109							
TINC MICH	TARGET	ENGAGE_SERV0			graph						
	REQUEST	OPERATION		1000	edit Drelated						
		OPERATION		all all							
	NOMINAL	OPERATION	1000 +OP+MODE+STATUS=OK								
	USERMSG	EZCA CONNECTION ERROR: Could	channel (ti	meout=2s all							
	OP	EXEC - LOAD LOG	INFO 💻 📑	1AIN 3.	.255 4.012						
	GRDMSG	GRIMSG EPICS CONNECTION ERROR. attempting to reestablish									
	MODE										
backgr	PVs	PVs 44 SET 7 DIFFS 0 SPM DIFFS									
links:	awiki	bugzilla									
L)STA	ATUS_MONITOR										
Rev	iew of	Scientific Ins	truments	87, 09	94502 (2016						



KAGRA EPICS on Web UI using php-epics

* EPICS gateway provides external accesses to channel data from outside network of the laboratory.

*However users need MEDM installation on their local PCs.

The php-epics can call some channel access method. (ca_get, ca_put, etc.)
 We developed Web UI for accessing channels using php-epics, but all the adl files needs to be manually converted.

Web

K1IOPPR2 GDS TP

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			C 11	K1IOPPR2_GDS_TP Tue, 09 May 2017 13:12:33 +0900
Origi	inal UI us	sing ADI		K1PR2 k1ioppr2
SVN # exported FE T	X K1101 K110PPR2 IM ADC DAC DAQ IPC AWG DK	PPR2_GDS_TP.adl _GDS_TP EXC_OVF_CFC	Mon May 8 21:11:39 2017 GPS Time 1178338317	FE TIM ADC DAC DAQ IPC AWG DK EXC OVF CFC
STATE WORD	I/O STATUS	DAQ STATUS 19	Diag Reset CONFIGURATION FILES	TIMING STATUS
Sync Source	overflows	Status CPS SUM DC 0x0 0 62 NET CHN DRATE TRATE FE 2 547 547 368 368 368 568	PASDF TABLE 0 safe Thu Apr 20 20:00:06 2017	Sync SourceTDSCYC/USR1411CPU Max222DT ADC5
CYC/USR 15 1 CPU Max 2 2 DT ADC 5 IRIG-B 12 DT DAC -810> orc	9#0 941 910 911	Test Points 0 AWG 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	COEFF LOAD Thu Apr 20 19:59:59 2017	IRIG-B 12 DT DAC -722
ON OFF			DHQ LUHU Thu Apr 20 19:59:59 2017	OVERFLOWS0 RT NET STAT

KAGRA EPICS on Web UI using HTML5 + javascript

** Automatic conversion of ADL is done using HTML5 + javascript, but without channel access.

* We need a little more time to merge php and HTML5 + javascript for an automatic conversion with channel access.

Or	riginal UI	Ising A	DL 1	file
000	X	emap.adl		
K1 SITEMAP			Mon May	8 21:42:13 2017
	면CDS	면GUARDIAN	4	
	면PSL	면 CAMERA		
	ЪIMC	ዋLSC		
	₽VIS	ЪREM		
	GPIC0	₽JF0_ALIG	N	
	₽_SEISMOMETERS	면/VNC to K1M	10N	



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