Interface Control Document for the digital control subsystem

1. Definition of subsystem

This system provides the functions which digitalize analog sensing signals extracted from interferometers, produce signals in computers for controlling the interferometers and data acquisitions, and re-produce analog signals to actuate the interferometer.

2. Task area

No.	Function	Hardware, software
1	Digital control system	PC, ADC/DAC, AA/AI filter, whitening/dewhitening filter, real time OS, control software, monitor software, data storage
2	Detector tuning system	tuning software
3	Detector diagnosis system	diagnosis software
4	Long term monitor	monitor software, data storage
5	Auto lock / auto alignment sequencer	auto lock scripts
6	Detector operation system for GW observation	operator, operation scheduling
7	GW search data calibration	projector, calibration signals, real time calibration software
8	Real time data analysis	projector, real time data analysis software

3. Required specifications

Item	value	comment
Sampling rate	>16kHz	
Dynamic range of input	>+/-15V	
Dynamic range of output	>+/-10V	
ADC noise	<3uV/rHz	
DAC noise	<3uV/rHz	
time delay	<100usec	To realize 300Hz UGF
Input channel numbers	>1024ch	(16kHz:>128ch, 2kzHz:>256ch, 64Hz>512ch)
Output channel numbers	>256ch	for suspensions, PZTs
Stored channel numbers	16kHz:>64ch, 2kzHz:>256ch, 64Hz>512ch	

4. Interface between systems

Item	Related sub-system	Requirements	Agreed
Sampling rate	Data acquisition, Data analysis, IFO control	16kHz (option:up to 64kHz)	not yet

Number of channels	Data acquisition, Data analysis, IFO control	TBD, 16kHz:64ch, 2kHz:256ch, 64Hz:512ch (see channel list)	not yet
Data bit resolution	Data acquisition	24bit = 4 Byte integer	not yet
Data transfer rate	Data acquisition	4MB/sec for 16kHz, 2MB/sec for 2kHz, 128kB/sec for 64Hz	not yet
Saving Parameters(using conlog)	Data analysis, IFO control	TBD, See parameter list	not yet
ADC dynamic range	IFO control	20Vpp(differential input)	not yet
DAC dynamic range	IFO control	10Vpp(differential output)	not yet
through delay	IFO control	80usec	not yet
ADC noise level	IFO control	2uV/rHz	not yet
DAC noise level	IFO control	1.5uV/rHz	not yet
AA filter noise level	IFO control	TBD uV/rHz	not yet
AI filter noise level	IFO control	TBD uV/rHz	not yet
whitening filter noise level	IFO control	TBD uV/rHz	not yet
dewhitening filter noise level	IFO control	TBD uV/rHz	not yet
whitening filter input impedance	IFO control	TBD	not yet
dewhitening filter output impedance	IFO control	TBD	not yet
Connector shape	IFO control	TBD	not yet
消費電力設計	Infrastructure	TBD	not yet
廃熱設計・冷却能力	Infrastructure	TBD	not yet
Network capability	Infrastructure	10Gbps ethernet	not yet
Optical fiber cable	Infrastructure	TBD	not yet
Location and space	Infrastructure, Data acquisition, IFO control	3 racks at center room, 1 rack at X end room, 1 rack at Y end room	not yet
Remote control switch	Vacuum, Infrasturucture	TTL(0V-5V)	not yet
Wireless LAN	for digital system on laptop PC	IEEE802.11n(300Mbps)	not yet

5. Other related subsystems

CCD monitor	IFO support	
Inter lock	Infrastructure, IFO	
Entrance monitor system	Infrastructure	