

# Data Acquisition System

version 3

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ver.3            8 July 2008  
ver.2           11 November 2004  
ver.1           16 October 2002

# 主な改訂点

- 干渉計 2台 → 1台に伴い、  
原則チャンネル数が半分となる。
- 検討項目としていた構内への  
原子時計設置 (GPS装置のoption)  
は実施したほうが良い。  
(ルビジウム 費用 +200万円)

# 変更点リスト

	Old (ver.2)	New (Ver.3)
HDAQ # of CH	16 /IFO	32
LDAQ bit resolution	12 bits	16 bits
Total Data flow	126.5 GB/h	70 GB/h

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# **Comprehensive Data Acquisition System**

- 1. Main DAQ System**
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- 3. Detector Diagnosis**
- 4. Environmental Monitor**
- 5. Time Keeper and Global Positioning System**
- 6. Raw Data Archive**
- 7. Pre Analysis Server**
- 8. Data Distribution**



# 1. Main DAQ System

Considering data in this system is restricted to use GW signal search.

## ADC Specification

- Sampling Clock **32768 Hz =  $2^{15}$**
- Number of Channels **32 CH**
- Bit Resolution **24 bit = 4 byte integer**
- Anti-alias Filter **Digital Filter  
( Cutoff Freq. > **10kHz** )**
- Data Rate **4 MB / sec**

## Frame Data Specification

- Frame Length **1 second**  
**32768 data sample / frame**
- File **64 frames / file**

## 2. Frame Maker

On each station, both ADC data of diagnosis and environment monitor are recorded as an unified and frame formatted file.

In addition to the above, detector diagnosis by using local data should be running on the machine.

### Hardware Specification

- |                     |  |
|---------------------|--|
| • Operation System  | UNIX                                   |
| • Hard Disk         | <b>1TB</b> = 14.1 GB / hour x 70 hours |
| • Network Interface | <b>Gigabit Ethernet</b> (optical)      |

# 3. Detector Diagnosis

Main purpose is to evaluate operation status of the detector. Light power, mirror or beam orientation and various control system are monitored by this system.

## ADC Specification

- Sampling Clock **16384 Hz =  $2^{14}$**
- Number of Channels **512 CH**  
= 64 CH x 8 station
- Bit Resolution **16 bit = 2 byte integer**
- Anti-alias Filter **Digital Filter**  
(Cutoff Freq. > **5 kHz**)
- Data Rate **2 MB / sec** x 8 stations



## 4. Environmental Monitor

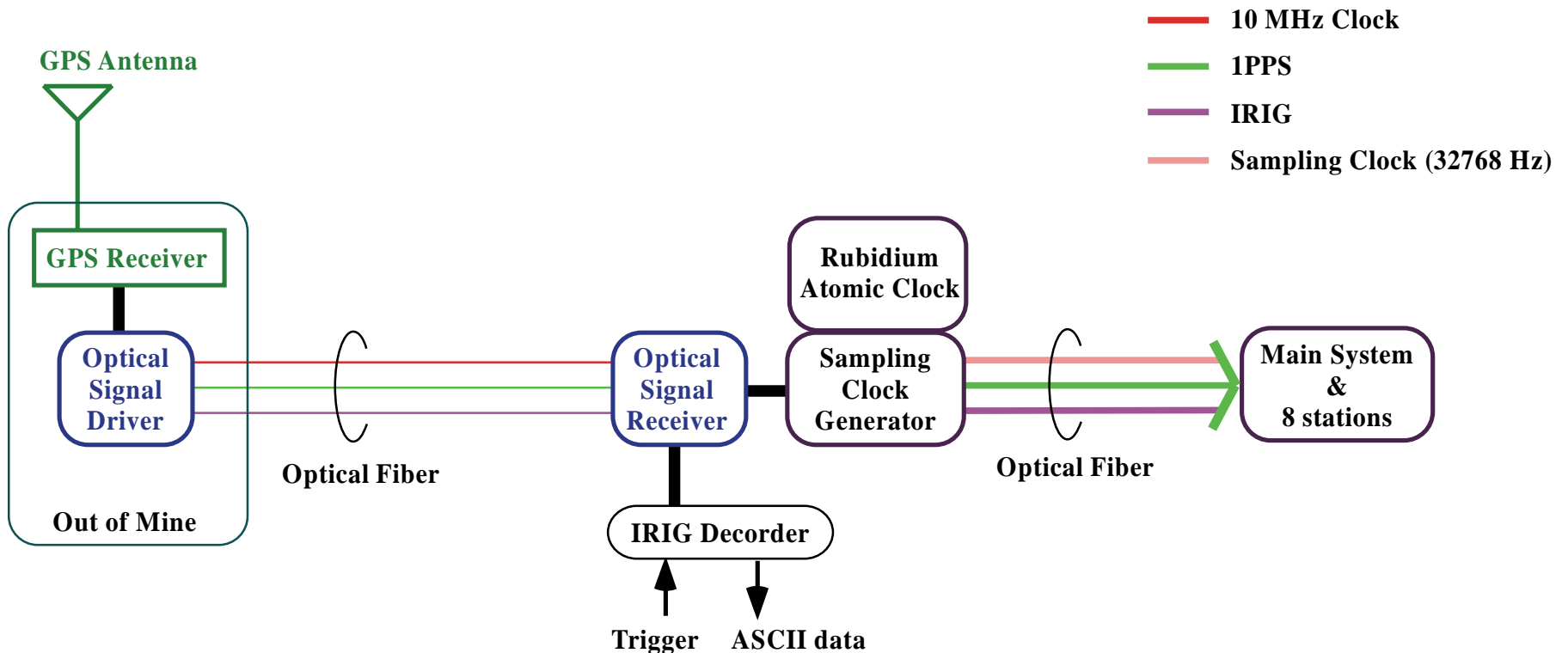
This system monitor temperature, humidity and pressure related on cryogenic and vacuum system.

### ADC Specification

- Sampling Clock **32 Hz = 2<sup>5</sup>**
- Number of Channels **512 CH**  
= 64 CH x 8 station
- Bit Resolution **16 bit**
- Anti-alias Filter Analog Filter  
(Cutoff Freq. = **10Hz**)
- Data Rate **2 kB / sec** x 8 stations

# 5. Time Keeper and Global Positioning System

To obtain precise time information, the following system is needed.



## 6. Raw Data Archive

Total amount of data to be archived is 3 TB per day. To keep last one month data, amount of 100 TB hard disk is needed.

	From Each Station	On Data Archive
<b>Main</b>	<b>4 MB/sec x 1</b>	<b>14.1 GB/hour</b>
<b>Diagnosis</b>	<b>2 MB/sec x 8</b>	<b>56.3 GB/hour</b>
<b>Environment</b>	<b>2 kB/sec x 8</b>	<b>0.05 GB/hour</b>
	<b>20 MB/sec</b>	<b>70.4 GB/hour</b>

# 7. Pre Analysis Server

Before data distribution, raw data should be calibrated. And then, data selection and/or data compression is needed. For example, the following things should be processed in parallel with data acquisition.

- **Detector Calibration**
- **Averaging of Noise Spectrum**
- **Phase space specification for Inspiral Search**
- **Data Compression for Continuous Signal Search**
- **Burst Noise Selection**

## **8. Data Distribution**

**Only pre-processed data is distributed to the collaborators by using high-speed network. Data transfer rate is expected to be 30-100 MB/sec. Gigabit Ethernet Network has a capability to do that.**

# Analog to Digital Converter

	Sampling Clock (Hz)	Number of Channels	Resolution (bit)	Effective Freq. (Hz)
<b>Main</b>	<b>32768</b> <b>(2<sup>15</sup>)</b>	<b>32</b>	<b>24</b>	<b>10 k</b>
<b>Diagnosis</b>	<b>16384</b> <b>(2<sup>14</sup>)</b>	<b>512 = 64 x 8</b>	<b>16</b>	<b>5 k</b>
<b>Environment</b>	<b>32</b> <b>(2<sup>5</sup>)</b>	<b>512 = 64 x 8</b>	<b>16</b>	<b>10</b>