Part V

On-Line Software

Last Updated: 15 June 1995

This software is that software developed for accumulating data during run time. Required is SVT software, including interface software when required (e.g., software to download software to embedded processors), for the following: setting up and configuring the SVT, SVT hardware control, SVT data acquisition modes, run control, quality control, monitor, diagnostics, alarm/safety, calibration/alignment, on-line analysis, on-line event display, and job control.

Chapter 28

Run Control – Setup/Configure

28.1 SVT Electronics (Readout Electronics)

Requirement:
Readout Electronics; include needed interface software;

Justification:
justification of requirement

28.2 L3/SVT Configuration (Trigger)

Requirement:
Trigger – L3 Hardware Logic Software; include needed interface software

Justification:
justification of requirement

28.3 DAQ/SVT Configuration (Data Acquisition)

Requirement:
DAQ – ASICs, I960s, DAQ CPSs, Event Building; include needed interface software;

Justification:
justification of requirement

28.3.1 ASICs Configuration

Requirement:
The On-line SVT software includes software to download pedestals, gain look-up table and zero suppression parameters (thresholds and number of time bins above threshold) to the ASICs. This software should also allow to set the operation mode of the ASICs.

Justification:
The ASICs must be loaded with pedestal and gains externally from the I960 CPUs and require these parameters setting to operate properly.

Requirement:
The ON-line SVT software includes software to read back the values of pedestals, gain lookup table and zero suppression stored in the memory of all ASICs. It should additionally compare the parameter read to those previously down-loaded.

Justification:
It is necessary to be able to read back these data to verify that the ASICs have been set up properly and operate normally.

Requirement:
The ON-line SVT software should raise a red alarm when the parameters (pedestal, gains or zero suppression) read back from the ASICs are non identical to those previously down loaded or if an ASIC fail to respond or return sensible parameters.

Justification:
The value of the parameters should be identical. Any difference signal a hardware or software mal-function that warrants an interuption of the data taking or a closer examination of the failure.

28.3.2 Receiver Card Operation and Configuration

Requirement:
The ON-line SVT software includes the tools to down load the I960 with the event building code and other required codes from a remote computer host.

Justification:

The I960 CPUs run a single code without OS. Their program must be down loaded from a host computer.

Requirement:
The ON-line SVT software includes I960 networking software for the I960 to transmit and receive data from the local network.

Justification:
The I960 are used to build sub-events or transmit data to DAQ or some host computers. Their link to the network is essential and requires the use of some simple networking software.

Requirement:
The ON-line SVT software includes software to operate the I960 CPUs as event builder during the normal running condition.

Justification:
The I960 CPUs act as sub-event builders assembling the SVT data.

Requirement:
The ON-line SVT software includes software to operate the I960 CPUs as pedestal accumulator and pedestal event builder. The I960 pedestal determination software is invoked during special “pedestal runs” and is used to calculate pedestal averages and widths. This software has options to accumulate the pedestals locally on the I960 and or to also ship the pedestal events to tape and or a host computer. The pedestal software calculates the pedestal mean and averages. It passes the averages to ASIC down load software to store the averages in the ASICs memory. It transmits the averages, the widths and the number of entries for each channel to the host computer. The pedestal software if the option is selected builds a pedestal event and sends on the local network (to tape) as a regular event.

Justification:
The calculation of pedestal is best done in a distributed fashion on the receiver cards i.e. within the I960.

Requirement:
The ON-line SVT software includes a fast and crude cluster finder to be run on the I960. The output of the cluster finder consists of a space point list (in local wafer coordinates) to be transmitted to a SVT level 3 trigger processor. The software includes routines to perform the cluster finding, and to build a space point list as part of the sub-event buffer.

Justification:
The zero suppressed data read in normal DAQ mode can be quickly analyzed to extract approximate cluster positions. These positions are used at the level 3 trigger to decide whether or not the event should be sent to tape.

Requirement:
The ON-line SVT software includes code to run diagnostics on the performance of the receiver cards.

Justification:
Justification of the requirement

Requirement:
The ON-line SVT software includes tools to run tests on the receiver cards. These tools permit to verify the good operation of the I960 and DAQ network. Test features include being able to load events into the I960 from the network or the hardware control system and reading them back from the fast network or the hardware control system.

Justification:
Justification of the requirement

Requirement:
The ON-line SVT software includes tools to down load all required I960 software, establish network nodes and addresses, set up the protocols etc etc.

Justification:
Justification of the requirement

28.3.3 Level-3 Trigger Configuration

Requirement:
The ON-line SVT software includes tools to down load the trigger programs to the L3 processors.

Justification:
Justification of the requirement

Requirement:

The ON-line SVT software includes tools to test the L3 trigger programs. These tools include code to send faked or known events to the trigger processors to test their performance.

Justification:
Justification of the requirement

28.3.4 Online Subsystem Control

Requirement:
The ON-line SVT software includes a user interface to allow the SVT operator to establish the configuration of the SVT receiver cards, down load the ASICs, down load the trigger software, start or setup the calibration and monitoring processes, to start and setup the event display as well as the on-line analysis software.

Justification:
It should be possible to establish the configuration of the entire SVT subsystem from a single entry point.

Requirement:
The configuration of the SVT subsystem should be modular, "data driven" and proceed from "configuration lists".

Justification:
It is thus easier to start and recover the system after shut down. The modularity ensures a good capacity for growth in functionality.

Requirement:
The SVT subsystem control system uses a graphical interface.

Justification:
Justification of the requirement

Requirement:
The SVT subsystem control user interface includes a window to display the state and status of the SVT subsystem.

Justification:
Justification of requirement

Requirement:
Justification of the requirement

The SVT subsystem control user interface includes a window to select the ASICs parameters and configuration.

Requirement:
The SVT subsystem control user interface includes a window to setup and select the I960 software and configuration.

Justification:
Justification of the requirement

Requirement:
SVT subsystem control user interface includes a window to setup and select the level 3 trigger software and configuration.

Justification:
Justification of the requirement

Requirement:
The SVT subsystem control user interface includes a window to display help on the various components of the subsystem.

Justification:
Justification of the requirement

Requirement:
The SVT subsystem control user interface includes a log window.

Justification:
Justification of the requirement

Requirement:
The SVT subsystem control user interface includes software for messaging and communication with STAR Experiment and STAR Run control.

Justification:
Justification of the requirement

Chapter 29

Hardware Control, Setup, Monitoring

29.1 Hardware Controls

Last Updated: 1 July 1995

This section addresses the requirements of the software needed for the SVT hardwre control system.

29.1.1 Generic Workstation Software

Requirement:
Details are given for the requirements pertaining to the operation of STAR SVT customized implementation of EPICS on a SUN workstation. It provides requirement for the basic software environment and tools required to run EPICS.

Requirement:
Short statement of requirement

Justification:
Justification of requirement

Status:
Under discussion

Requirement:
Short statement of requirement

Justification:
Justification of requirement

Status:
Under discussion

Requirement:
Short statement of requirement

Justification:
Justification of requirement

Status:
Under discussion

Requirement:
Short statement of requirement

Justification:
Justification of requirement

Status:
Under discussion

Requirement:
Short statement of requirement

Justification:
Justification of requirement

Status:
Under discussion

29.1.2 Security

Requirement:
The task of security is to protect the subsystem against malicious or accidental actions. Excessive security tends to increase the over-head and increases the response time. It is important to build the right amount of security into the system.

One important aspect of the security task is to insure that system parameters are not set to values that could damage the hardware. Another aspect is to avoid that parameters that can affect the quality of the data being changed while data are taken. Yet another aspect is to make sure two users cannot simultaneously change the parameter while setting the same hardware.

Requirement:
The system must have built-in robustness that protects hardware against parameters settings that could cause serious damage.

Justification:
Robutsness of a system reduces need for a tight security system.

Status:
Under discussion

Requirement:
Parameters that affect data recorded by the data acquisition should be well protected against changes by a "lock-out" system that cannot be broken without a major alarm being generated.

Justification:
This provides enough protection against accidental changes.

Status:
Under discussion

Requirement:
The subsystem configuration must be easy to restore.

Justification:
This requirement reduces the need for security.

Status:
Under discussion

Requirement:
The tagging should be granted to any user that wnats to work on the system.

Justification:

Eliminates unconscious interference of two users working on hte same subsystem.

Status:
Under discussion

Requirement:
The system security for the sun workstation should eliminate assaults by hackers.

Justification:
Justification of requirement

Status:
Under discussion

Requirement:
There should be a possibility for further securing selected controlled parameters by the use of passwords.

Justification:
Justification of requirement

Status:
Under discussion

Requirement:
The parameter database and configuration files should be well protected with passwords.

Justification:
Justification of requirement

Status:
Under discussion

Requirement:
Short statement of requirement

Justification:
Justification of requirement

Status: Under discussion

29.1.3 Safety

Requirement:
The Controls System will not be reliable enough to be in charge of safety for the experiment. But since it handles information from all subsystems and is snesitive to subsystem parameter changes, it can provide an early warning of approaching disasters and thus enhances the system and subsystems safety significantly.

Requirement:
All changes in the system parameters that lead to situations that could jeopardie safety of the facility or parts of it should generate alarms.

Justification:
Justifiction of requirement

Status:
Under discussion

Requirement:
Controls System has to monitor constantly the status of all the interlocks in the SVT subsystem.

Justification:
Justifiction of requirement

Status:
Under discussion

Requirement:
Alarms related to safety should be of the highest level.

Justification:
Justifiction of requirement

Status:
Under discussion

29.1.4 Definition of Generic Parameters to be Monitored

Requirement:
Details are given pertaining to the definition of generic monitoring parameters, qualifiers and attributes needed to perform the HV, LV, and other hardware control monitoring.

Requirement:
The experimental apparatus parameters monitored by the SVT EPICS implementation are to be defined formally as specific instantiation of generic parameter definitions.

Justification:
Simplify the design, development and use/operation of the software.

Status:
Under discussion

Requirement:
The generic parameter definitions (GPD) will consist of a collection of elements, qualifiers and attributes.

Justification:
A parameter definition necessitates a number of items, some of which are essential, some of which qualify or supplement the information conveyed by the given parameter.

Status:
Under discussion

Requirement:
The GPD will include a label number or identification number.

Justification:
The label will be used for indexing in the software.

Status:
Under discussion

Requirement:

The GPD will include a name consisting of a short keyword.

Justification:
This is the name the user will use to identify the parameter when interaction with the hardware control system.

Status:
Under discussion

Requirement:
The GPD will include a short description of the parameter consisting of a short sentence.

Justification:
The short description conveys more information than a single keyword and hence reduces the ambiguities as to the nature of the parameter.

Status:
Under discussion

Requirement:
The GPD will include a long description of the parameter and associated hardware. The description should include all relevant informations to indicate the nature, fonction and meaning of the parameter. It should also point to other related parameters and additional documentation on the relevant components of the system.

Justification:
The long description will be used as a HELP page for the operation of the monitor.

Status:
Under discussion

Requirement:
The GPD will include a statement of the location of the hardware.

Justification:
Such statement being singled out from the long description will permit quicker and better identification of the components when trouble shouting.

Status:
Under discussion

Requirement:
The GPD will include an attribute to whether or not the parameter is “seen”, i.e. displayed actively by the user interface. This attribute will have two possible values, YES and NO only.

Justification:
A number of parameter may be defined some of which do not need to be shown to the user.

Status:
Under discussion

Requirement:
The GPD will include an attribute to whether or not the parameter is “set-able” by the user.

Justification:
Some parameters cannot be set e.g. air temperature and are read only. Some parameters can be set but should be set at configuration or initialization time and should not under the control of the user.

Status:
Under discussion

Requirement:
The GPD will include a desired state attribute. The state attribute can take as many as three values : ON, OFF, STANDBY.

Justification:
Some hardware elements need to be before OFF or ON under user control. Some harware elements such a HV power supply also can be put on standby.

Status:
Under discussion

Requirement:
The GPD will include a current state attribute. The state attribute can take as many as three values : ON, OFF, STANDBY.

Justification:
Some hardware elements need to be before OFF or ON under user control. Some harware elements such a HV power supply also can be put on standby. A request to change the state of a specific parameter or hardware component may non be effective for a number of reasons. It is thus good pratice to be able to known both what the desired and actual states are.

Status:
Under discussion

Requirement:
The GPD will include a value of frequency at which a given controler should be accessed to read the parameter value.

Justification:
The diversity of the nature of the parameters need under the control of the hardware control system dictates that each be accessed or read at their own speed as dictated by their hardware interface or by the underlying physics processes.

Status:
Under discussion

Requirement:
The GPD will include a value of the "time out" to be waited by the system while "talking" to a specific interface and waiting for a response.

Justification:
The different hardware controller have different speed. As they may be busy while an access is attempted, it is necessary to define the time interval to be waited.

Status:
Under discussion

Requirement:
The GPD will include a value of the number of retries when a given controler is accessed to read, set, or perform any other action.

Justification:
The different hardware controller have different speed. As they may be busy while an access is attempted, it is necessary to define the number of retries before the apparatus is considered as non responding.

Status:
Under discussion

Requirement:
The GPD will include a variable, possibly user set-able, indicating the desired value of the parameter.

Justification:
Some hardware components need to be set a some selectable value of the parameter.

Status:
Under discussion

Requirement:
The GPD will include a variable containing the current value of the parameter.

Justification:
Some hardware components are used as probes and return some parameter value.

Status:
Under discussion

Requirement:
The GPD will include two variables to specify tolerances on the range of the parameter (low and high values) as read by the hardware.

Justification:
It may be necessary to generate alarms when a parameter is found outside the tolerance range.

Status:
Under discussion

Requirement:
The GPD will include a variable to hold values of associated parameters.

Justification:
This is necessary for instance in the case of the HV supplies which will return a value of current in addition to the high voltage values.

Status:
Under discussion

Requirement:
The GPD will include an attribute used to specify whether the parameter can generate alarms.

Justification:
Some parameters like the voltages can go out of tolerance and should be signaled to the user. Other parameters are used only to characterize the system and need not generate any alarm as they do not have tolerances.

Status:
Under discussion

Requirement:
The GPD will include a qualifier defining the level of alarm generated when the parameter goes out of tolerances.

Justification:
Different parameters going out of tolerance may have different impact on the proper operation of the experiment. It is thus advisable to be able to generate alerts of different levels depending on the severity of the alarm.

Status:
Under discussion

Requirement:
The GPD will include a qualifier or a list of qualifiers defining which actions are to be taken upon the generation of an alarm.

Justification:
Different actions may be possible or advisable. Those of which that can be automated should be initiated automatically by the hardware control. The minimal action to be taken is to log an alert in the log file.

Status:
Under discussion

Requirement:

The GPD will include an alarm in progress attribute used to indicate an alarm has been raised for this parameter.

Justification:
This avoids to generate multiple instances of the same action for the same problem.

Status:
Under discussion

Requirement:
The GPD will include a defer attribute used to indicate the alarm has been defered by the user.

Justification:
Once an alarm condition exists the hardware control will continously report it to the user unless the user declares to be defered.

Status:
Under discussion

Requirement:
The GPD will include a defer delay time. Once deferred, an alarm will be reissued once the delay has elapsed.

Justification:
This is to avoid the user forget an alarm condition once it has been defered.

Status:
Under discussion

Requirement:
The GPD will include a text to describe each error condition that can occur for this parameter

Justification:
The user should be informed clearly of the nature of the apparatus or hardware malfunction.

Status:
Under discussion

Requirement:
The values and ranges of the GPD elements, qualifiers, and attributes can either be defined at configuration time, initialization time, or run time.

Justification:
Justification of requirement

Status:
Under discussion

Requirement:
The GPD will include a password string.

Justification:
The modification of some of the values or attributes should be reserved to specialists and thus should be locked to prevent non-specialists to alter them.

Status:
Under discussion

29.1.5 User Graphical Interface

Requirement:
Details are given for requirements pertaining to the functionality requirements on EPICS user interface. The user interface must be designed so has simplify the interaction with the Control System and to maximize the efficiency of its operation. It should allow maximal control and transparency so the user has quick access to all controls and parameters.

Requirement:
The hardware control system should use a graphical interface based on modal and non-modal windows.

Justification:
Windows with menu selection and buttons are user friendly and minimize the number of commands the operator has to memorize. The user may then focus on the functionality rather than

Status:
Under discussion

Requirement:
The hardware control system should be able to display many different windows.

Justification:
There are many different type of actions or functions to be performed by the system, they should be clearly separted and performed in these different windows in order to avoid the confusion of these different functions.

Status:
Under discussion

Requirement:
There should be a main monitor window or set of windows used to display and control the values of the parameters.

Justification:
That is what monitoring is all about.

Status:
Under discussion

Requirement:
The main window should be able to show different pages of parameters.

Justification:
There are too many parameters to use a single page for display. Also, different kind of parameters require different kinds of displays.

Status:
Under discussion

Requirement:
The main window should have a menu where all possible actions of the Control System are displayed and available to the user.

Justification:

Status:
Under discussion

Requirement:
There should be a window or set of windows used specifically to set the values of the parameters and their attributes.

Justification:
Justification of the requirement

Status:
Under discussion

Requirement:
There should be a window or set of windows used specifically to read the values of the parameters and their attributes.

Justification:

Status:
Under discussion

Requirement:
There should be a set of windows used to display alarm status and their description.

Justification:
The appearance of a new window on the screen will attract the attention of the user much better than if only a line or two are changed on an already displayed screen.

Status:
Under discussion

Requirement:
There should be a HELP window.

Justification:
This window is used to provide information to the user about the meaning of the parameters or the nature of alarms and suggested actions.

Status:
Under discussion

Requirement:
There should be a log window to display the "recent" history of the system. All levels of alarms or messages generated and all actions taken by the user should be displayed in this window.

Justification:
This window allows the user to review the recent history of the system.

Status:
Under discussion

29.1.6 Main Monitor Window

This section details the functionality requirements for the main window.

Requirement:
Show Global System Status as NORMAL, WARNING, ERROR or FATAL ERROR.

Justification:
The global system status is used to quickly inform the user of an error condition.

Status:
Under discussion

Requirement:
Show Date and Time

Justification:
Insure that the user knows can time tag the occurences of error conditions

Status:
Under discussion

Requirement:
Show Page Number

Justification:
There are many pages to be shown.

Status:
Under discussion

Requirement:
This window should be clone-able.

Justification:
Allows the user to look at multiple pages at once.

Status:
Under discussion

Requirement:
Show selected parameters and selected qualifiers and attributes.

Justification:
This is what this window is for.

Status:
Under discussion

Requirement:
The parameter shown are selectable at configuration and run time.

Justification:

Status:
Under discussion

Requirement:
The parameter attributes and qualifiers shown are selected at configuration time.

Justification:
Simplifies the design of the interface.

Status:
Under discussion

29.1.7 Parameter Setting Window

This section details the functionality requirements for the parameter setting window.

Requirement:
The window shows the parameter index and name to be set. It shows fields labelled with the type of attributes or qualifiers to be supplied by the user. It provides empty fields for the user to specify the values to be set.

Justification:
Justification of requirement

Status:
Under discussion

Requirement:
The window shows an OK and a CANCEL buttons to dispose of the window.

Justification:
The OK is used by the use to indicate the information has been supplied. The CANCEL is used to indicate no change of the parameter qualifiers and or attributes is required.

Status:
Under discussion

Requirement:
The window shows a PREVIOUS and NEXT buttons to request the modification of the previous or following parameter in the list.

Justification:
Allows easy travel through the list of parameters.

Status:
Under discussion

Requirement:
The fields shown depend on the specific instantiation of the generic parameter and is defined at configuration time.

Justification:
Different parameters call for different attributes and qualifier specification.

Status:
Under discussion

Requirement:
The parameter index field can be set by the user to select specific parameter index to be read.

Justification:
Allows to travel to distant parameters (in the list) quickly.

Status:
Under discussion

29.1.8 Parameter Reading Window

This section details the functionality requirements for the parameter reading window.

Requirement:
The window shows the parameter index and name to be read. It shows fields labelled with the type of attributes or qualifiers to be read by the system.

Justification:

Status:
Under discussion

Requirement:
The window shows a READ button to instruct the system to perform a READ action for the current parameter.

Justification:
It is thus possible for the user to request the readout of specific parameters explicitely at user defined time.

Status:

Under discussion

Requirement:
The window shows a DONE button to dispose of the window.

Justification:
The DONE is used by the user to indicate the window is no longer needed.

Status:
Under discussion

Requirement:
The window shows a PREVIOUS and NEXT buttons to request the readout of the previous or following parameter in the list.

Justification:
Allows easy travel through the list of parameters.

Status:
Under discussion

Requirement:
The fields shown depend on the specific instantiation of the generic parameter and are defined at configuration time.

Justification:
Different parameters call for different attributes and qualifier specification.

Status:
Under discussion

Requirement:
The parameter index field can be set by the user to select specific parameter index to be read.

Justification:
Allows to travel to distant parameters (in the list) quickly.

Status:
Under discussion

29.1.9 Alarm Window

This sub-section details the functionality requirements for the alarm windows.

Requirement:
The alarm window shows a symbol identifying the error level.

Justification:
An image is worth a thousand words and conveys quick information about the level of the alarm being reported.

Status:
Under discussion

Requirement:
When generated by a parameter specific alarm, the alarm window shows the index number, the name of the parameter, the short description of the parameter and the location of the hardware component for which an alarm is issued. A short text detailed the type or nature of the error is also displayed.

Justification:
Clear Identification of the cause of the alarm is necessary to insure immediate action can be taken by the user to remedy the problem.

Status:
Under discussion

Requirement:
When generated by a non parameter specific alarm, the alarm window shows a short text detailed the type or nature of the error.

Justification:
Clear Identification of the cause of the alarm is necessary to insure immediate action can be taken by the user to remedy the problem.

Status:
Under discussion

Requirement:
The window shows a SEEN button to dispose of the window.

Justification:
The SEEN button is used by the user to indicate he has read the error message.

Status:
Under discussion

Requirement:
The window shows a DEFER button to suspend the generation of further alarm by the same error condition.

Justification:
Allows to put parameters in a defered state.

Status:
Under discussion

29.1.10 Message Log Window

The following details the functionality requirements for the message log windows.

Requirement:
The message log window shows all entries to the log.

Justification:
Justification of requirement

Status:
Under discussion

Requirement:
The window has a Save Log menu item that permits to save the logging buffer to a disk file.

Justification:
Justification of requirement

Status:
Under discussion

Requirement:
The window has a Clear Log menu item to clear the history of the system.

Justification:
Justification of requirement

Status:
Under discussion

29.1.11 HELP Window

The details of the functionality requirements for the HELP window are given below.

Requirement:
Short statement of requirement

Justification:
Justification of requirement

Status:
Under discussion

29.1.12 Actions

Requirements pertaining to the definition of actions are given below.

Requirement: *Read Values*
Short statement of requirement

Justification:
Justification of requirement

Status:
Under discussion

Requirement: *Set Values*
Short statement of requirement

Justification:
Justification of requirement

Status:
Under discussion

Requirement: *Monitor*
Short statement of requirement

Justification:
Justification of requirement

Status:
Under discussion

Requirement: *Help*
Short statement of requirement

Justification:
Justification of requirement

Status:
Under discussion

Requirement: *Logging*
Short statement of requirement

Justification:
Justification of requirement

Status:
Under discussion

Requirement: *Alarm Generation*
Short statement of requirement

Justification:
Justification of requirement

Status:

Under discussion

29.1.13 Documentation

Good documentation will be a key to smooth and efficient operation of the system. For a distributed group, like the STAR Controls containing many sub-group such as the SVT, the organization of a good information system is essential.

Requirement:
The subsystem development has to be well documented.

Justification:
Good documentation of the system developement allows new members to join and continue the work started by others so there is no need to regenrate from scratch parts of the system in case the author leaves the collaboration.

Status:
Under discussion

Requirement:
The hard implementation should be documented in details in connection with the software system.

Justification:
It is essential to know what the hardware is to understand what the software should do.

Status:
Under discussion

29.1.14 Code Documentation

Requirement:
There should be "in-line" documentation of the code.

Justification:
Allows to know what specific parts of code are doing.

Status:

Under discussion

Requirement:
There should be documentation on all routines by specification of a synopsis, a long description, a list of inputs and output variables (implicit and/or explicit), a list of possible return values, and a list of side effects.

Justification:
These information are meant to allow the user to consider the routines as black boxes with well defined inside/outside boundaries.

Status:
Under discussion

Requirement:
Notes that clearly explain the design, describe the algorithms that are used and explain the implementation must be provided.

Justification:
Justification of requirement

Status:
Under discussion

Requirement:
User's guide for the control subsystem will be generated.

Justification:
Justification of requirement

Status:
Under discussion

Requirement:
All the documentation should be generated along with the Control System Software.

Justification:
Justification of requirement

Status:
Under discussion

Requirement:
All the documentation must be readily available so that it can be found when needed. The SVT hardware control documentation will be added to existing hardware control documentation both under the HARDWARE CONTROL heading and under the SVT subsystem heading.

Justification:
Justification of requirement

Status:
Under discussion

Power supplies, air, water; On-detector temperatures, voltages; electronics temperatures, voltages; include needed interface software.

29.2 High Voltage

The high voltage is used to bias the Silicon Drift Detector of the SVT. It is essential that the voltages be set at well defined values and stable over time. The task of the Control System is to set those voltages, to monitor they remain set at the requested value during the running periods and that the current the power supplies provide does not exceed prescribed tolerances beyond which the detector and power supply good operation could be jeopardized.

There will be 36 HV powers supplies (Lecroy 1440) each connected to the 36 detector ladders. The power supplies will have the ability to supply voltage in the range X to Y. The supplies will be connected to a Lecroy 1131 interface and will thus be setable and readable by the Control System. The Control system will be able to set voltages, read the values requested as registered by the controllers, the actual values supplied to the detectors, as well as the output current supplied by the power units. The voltage affects critically the performance of the detector and will thus be under tight tolerance. Likewise, the current will also have tolerance limits to insure the detectors are not destroyed by excessive currents.

Requirement:
The HV Control System Software has to handle 36 power supplies.

Justification:
There are 36 supplies.

Status:
Under discussion

Requirement:
The HV Control System Software has to be able to set High Voltage values of all 36 supplies independently.

Justification:
The different detectors may be operated at slightly different voltages so all supplies should settable and controlled independently.

Status:
Under discussion

Requirement:
The HV Control System Software has to be able to read requested High Voltage values of all 36 supplies independently.

Justification:
The different detectors may be operated at slightly different voltages so all supplies should settable and controlled independently.

Status:
Under discussion

Requirement:
The HV Control System Software has to be able to read actual High Voltage values of all 36 supplies independently.

Justification:
The different detectors may be operated at slightly different voltages so all supplies should settable and controlled independently.

Status:
Under discussion

Requirement:
The HV Control System Software has to be able to read actual current values supplied by all 36 supplies independently.

Justification:
The different detectors may be operated at slightly different voltages so all supplies should settable and controlled independently.

Status:
Under discussion

Requirement:
The HV Control System Software has to be able to set the power supplies individualy or collectively to ON, OFF or STANDBY.

Justification:
Justification of requirement

Status:
Under discussion

Requirement:
The HV Control System Software has to be able to probe the supplies to determine their state i.e. ON, OFF or STANDBY.

Justification:
It is thus possible to compare the deisred state with the actual state.

Status:
Under discussion

Requirement:
The HV Control System Software has to be able to set tolerances (high and low) on the admissible actual voltage returned by the supplies.

Justification:
The performance of the detector depends critically on the stability of the voltages.

Status:
Under discussion

Requirement:
The HV Control System Software has to be able to set tolerances (high and low) on the admissible actual current output by the supplies.

Justification:
The performance and safety of the detector depends might be affected by excessive current output.

Status:
Under discussion

Requirement:
The HV Control System Software issues an alarm if one or many of the actual voltage bias are found to exceed tolerances.

Justification:
Justification of requirement

Status:
Under discussion

Requirement:
The HV Control System Software issues an alarm if one or many of the actual current output are found to exceed tolerances.

Justification:

Status:
Under discussion

Requirement:
The HV Control System Software issues an alarm if one or many of the power supplies are found in a state (ON, OFF, or STANDBY) different than the expected state.

Justification:
This is both a security and safety issue.

Status:
Under discussion

Requirement:
The HV Control System Software issues an alarm if one or many of the power supplies hardware interface fails to respond to request after prescribed number of

retries.

Justification:
It is essential to be able to communicate with the supplies to find their status and the voltages being supplied to the detector.

Status:
Under discussion

Requirement:
The HV Control System Software archives the values of voltage read with a time stamp when these differ from the prescribed value by more than X volts . **Justification:** It is thus possible to map the history of the voltages and correlate this information with data taken by the data acquisition system.

Status:
Under discussion

Requirement:
The HV Control System Software archives the values of currents read with a time stamp when these differ from the last value read by more than X micro-amps.

Justification:
It is thus possible to map the history of the currents and correlate this information with data taken by the data acquisition system.

Status:
Under discussion

Requirement:
The HV Control System Software must be able to perform on individual, a subset or all HV channels READ, SET, and MONITOR operations.

Justification:
The READ operations consist of probing the supplies for state or parameter values. The SET operations consist of requesting the supplies to change state or set parameter to new values. The Monitor operations involve a combination of READ operations at regular time intervals to determine the state and values of the parameters, check that they are within tolerances, and issue alarms in case they are not.

Status:
Under discussion

Requirement:
The frequency of READ requests performed by the MONITOR task is user set-able but should have a default value of 0.1 Hz.

Justification:
Justification of requirement

Status:
Under discussion

Requirement:
The number and identity of HV supplies actively monitored should be user selectable.

Justification:
It is thus possible to de-activate the monitoring of a known faulty channel and continue operation.

Status:
Under discussion
Requirement:
statement of requirement

Justification:
justification of requirement

29.3 Low Voltage

The details are provided for the specific requirements associated with the setting, reading, and monitoring of the low voltage power supplies.

Requirement:
Short statement of requirement.

Justification:
Justification of requirement.

Status:
Under discussion
Requirement:
statement of requirement

Justification:
justification of requirement

29.4 Temperature

Requirement:
statement of requirement

Justification:
justification of requirement

29.5 Air Flow

Requirement:
statement of requirement

Justification:
justification of requirement

29.6 Water Flow/Temperature

Requirement:
statement of requirement

Justification:
justification of requirement

29.7 Position Sensors

Requirement:
statement of requirement

Justification:
justification of requirement

29.8 Generation of Alarms

Requirement:
The SVT Monitoring System generates alarms when monitored data, calibration parameters or system components appear to be at fault.

Justification:
A trivial statement of the goal of the monitoring system: to inform the user something has gone wrong.

Requirement:
There will be four (4) alarm levels or subsystem states: Normal (WHITE) , Warning (YELLOW) , SEVERE ERROR (RED).

Justification:
The levels indicate the gravity of the problem.

Requirement:
The online monitoring system will take no specific action towards the detector hardware. Actions should be determined by the physicist users.

Justification:
One does not want software bugs to interupt data taking. However, the On-line monitoring system will notify the user of system problem by the generation of appropriate alerts.

Requirement:
The On-Line Monitoring system will notify the operator of a yellow alert if no data is transmitted by DAQ after prescribed time out period while beam is ON, and DAQ is ON.

Justification:
No data coming through signals a potential hardware error.

Status:
These conditions to be better and more clearly specified.

Requirement:
The On-Line Monitoring system will notify the operator of a yellow alert if no calibration data are supplied after due request by the data base or by the calibration tasks.

Justification:
This indicates the calibration requested do not exist, are wrongly specified or that the supplying task cannot provide them.

Requirement:
The On-Line Monitoring system will notify the operator of a yellow alert if it cannot spawn sub-monitoring processes.

Justification:
The monitoring system should in principle perform multiple (paralell) tasks as required by its configuration or by the user. The failure to proceed with these tasks must be signaled to the operator.

Requirement:
The On-Line Monitoring system will notify the operator of a red alert if it has lost communication with DAQ.

Justification:
Justification of requirement

Requirement:
The On-Line Monitoring system will notify the operator of a red alert if it has lost communication with RUN control, Experiment control, or SVT hardware control.

Justification:
Communication with these subsystems is essential to know the proper experiment state and status.

Requirement:
The On-Line Monitoring system will notify the operator of a yellow alert when spawn processes fail to return results after prescribed time delay.

Justification:
Justification of requirement

Requirement:
The On-Line Monitoring system will notify the operator of an appropriate alert upon occurence of internal errors. The error message will mention the severity of the error, the software module where the error occured and a short message describing the nature or reason of the error.

Justification:
Fast debugging and trouble shooting.

Requirement:
The On-Line Monitoring system will sound selected alarms on the on-line monitoring workstation.
Justification:
Noise is a good way to attract the operator's attention.

Requirement:
The On-Line Monitoring system will display an alarm window on the on-line workstation.

Justification:
Such a window is a good vehicle to inform the operator of an error condition, the nature, the severity and details or additional informations about the error. attention.

Requirement:
The On-Line Monitoring system will log every errors or alarm conditions generated locally. They will also be transmitted to the logging subsytem process.

Justification:
Justification of requirement

Requirement:
The errors or alarm generated by the various components of the on-line monitoring process will contain the following

1. Error Index
2. Error Name
3. Component Name
4. Severity Level
5. Pointer(s) to Relevant Documentation

Chapter 30

Diagnostics/Tests

Requirement:
Readout Electronics, Trigger, DAQ; include needed interface software

Justification:
justification of requirement

Chapter 31

Calibration/Alignment

The SVT Calibration is the set of computational activities required to prepare parameter data that must be down-loaded into the SVT detector system software for on-line and off-line evaluation of the data. The SVT calibration system gathers all necessary parameters and informations to permit the proper utilization of the acquired data both on- and off-line.
Details are given for the requirements partaining to the functionality and operation of on-line calibration. The output of the calibration is fed to the Monitoring system described in a separate section.

31.1 Generic Requirements

Requirement:
The SVT On-Line calibration subsystem should be built of separate and distinct software modules callable by the main monitoring tasks. The calling sequence and data flow should be determined by the user at configuration time or at run time and based on the current needs of the experiment.

Justification:
A number of tasks functionally distinct will be run by the calibration system. It is best that these tasks belong to separate software modules or packages. It is thus possible and easy to select or de-select and activate them as needed.

Requirement:
The calibration system will not perform any monitoring of the calibration constants obtained on-line. Instead, it will store these data to the data base and they will be passed to the monitoring system.

Justification:
This allows a clear separation and management of the tasks.

Requirement:
Specific calibrations processes will be initiated by the SVT operator. There will not be automatic scheduling of the calibration processes.

Justification:
The operator will have complete control of the operation of the calibration and monitoring systems. One should not rely on the computer system to perform tasks automatically as this would require additional levels of safety and security that would make the development of the calibration and monitoring systems unduly complex.

Requirement:
The calibration system will inform the user/operator when requested (specific) calibration have been completed or if they failed to complete.

Justification:
Justification of requirement

Pedestal determination; gain determination, alignment and position determination; drift velocity determination; drift velocity profile; dead/hot channel determination; dE/dx and PID calibration

31.2 Pedestal

Requirement:
statement of requirement

Justification:
justification of requirement

31.3 Relative/Absolute Gains

Requirement:
statement of requirement

Justification:
justification of requirement

31.4 Drift Speed

Requirement:

statement of requirement

Justification:
justification of requirement

31.5 Detector Position/Alignment

Requirement:
statement of requirement

Justification:
justification of requirement

31.6 System Log

Requirement:
All messages generated by the monitoring systems and all actions generated either by the monitoting system or by the operator will be logged.

Justification:
A complete history of the actions and errors simplifies trouble shooting of the subsystem.

Chapter 32

Detector Performance Monitoring

Pedestals, gains, dead/hot channels, alignment, drift velocity, cluster finding, space point finding, resolution, tracking, physics high level observables

32.1 Online Monitor Software

Last Updated: 7 July 1995

Monitoring is viewed as the set of computational activities required to verify that the SVT subsystem is functioning properly. It requires a timely assessement of the detector performance and quality control of the data acquired.

The task of Monitoring is to insure the subsystem is functioning optimally and has maximal capacity to acquire good quality data. The monitoring of the SVT is splitted between the hardware control system whose task is to insure proper hardware setting and behaviour and the On-Line Monitoring whose task is to verify that the data acquired and the different calibrations performed are of maximal quality.

Details are given for the requirements pertaining to the functionality and operation of On-Line Monitoring of the STAR SVT performance. This section includes definition of the basic functionalty required to monitor the good performance of the SVT. These requirements are paralelled by requirements on the details of software implementation dictated by the hardware implementation.

32.1.1 Generic Requirements

Requirement:

The SVT On-Line monitoring subsystem monitors all types of data acquired by this subsystem, i.e. it monitors data acquired under all trigger types and all configuration settings.

Justification:
Failures of the subsystem may manifest themself is numerous and subtle ways. It is thus best to maximize the redundancies and the number of ways the data flow is monitored.

Requirement:
The SVT On-Line monitoring subsystem monitors all calibration performed On-Line or Off-line concurently to the data taking.

Justification:
Some aspects of the calibration constants such as the pedestals and the gains downloaded to the ASICs or the detector positions and angles determine the quality of the data taken. Wrong pedestals of gains imply poor quality data that become difficult to analyse off-line and bad positions and angles might potentially reduce the tracking efficiency of the level 3 trigger.

Requirement:
The SVT On-Line monitoring subsystem monitors the performance of the SVT level 3 trigger.

Justification:
The SVT level 3 trigger compoent of the trigger is sensitive to many physics observables. It must however be properly calibrated to perform optimally. Variations of the trigger (SVT) rate might signal a modification of the performance of the SVT hardware or and improper calibration. The SVT L3 output and yield is thus a good indicator of the SVT performance.

Requirement:
The SVT On-Line monitoring subsystem monitors all parameters defined or requested by the SVT operator in parallel.

Justification:
There are multiple parameters to be monitored. While the operator looks at specific number of these, the monitoring of the others should not be interupted. The software system should thus have the capacity and flexibility to perform multiple tasks both serially and in parallel.

Requirement:
The SVT On-Line monitoring subsystem monitors should be built of separate and distinct software modules callable by the main monitoring tasks. The calling sequence and data flow should be determined by the user at configuration time or at run time and based on the current needs of the experiment.

Justification:
A number of tasks functionally distinct will be run by the monitoring system. It is best that these tasks belong to separate software modules or packages. It is thus possible and easy to select or de-select them as needed.

Requirement:
There will be a set of core monitoring tasks the user cannot turn off.

Justification:
Some of the monitoring are to be considered essential and should never be interupted by the operator. These should have a special software tag and receive special priority and privilege.

Status:
The nature and number of these priviliged tasks is under discussion.

Requirement:
The monitoring tasks will not perform any calibration activities but receive calibration data from the various separate calibration tasks.

Justification:
The different calibration tasks are to be performed independantly at various time intervals dictated by the nature of the tasks and volatilty of the parameters. The task of the monitoring system is to insure the calibration performed produce good quality parameters.

Requirement:
The monitoring system receives data from the calibration tasks, from the data base and from DAQ subsystem.

Justification:
The monitoring system monitors the size, integrity and quality of the data transmitted from DAQ. It also verify and examines the calibrations performed On-Line by the calibration tasks. The calibration tasks may store their output to the data base or transmit it directly to the monitoring task.

Status:
It is not quite clear at this point what the detailed architecture should or will be. It may be that the calibration tasks only store their output to the data base thus reducing the complexity of the inter process dialog and communication.

32.2 Noise – Pedestals Width/Stability

Requirement:
statement of requirement

Justification:
justification of requirement

32.3 Pedestals Monitoring

This section details the requirements for the monitoring of pedestal averages and widths.

Requirement:
The On-Line SVT Monitoring system must monitor the pedestal averages and width of all SVT equivalent pixels.

Justification:
The Pedestals are an essential part of the SVT calibration chain as they directly affect the quality of data taken under zero suppression mode. Wrongly set pedestals could cause the loss of valuable data or the readout of unnessary segments of the detector thereby increasing the load on the DAQ taping process. In addition, the width of the pedestals is an excellent indicator of the energy resolution of the detector elements, it also provides indications of noisy channels and or dead channels.

Requirement:
The On-Line SVT Monitoring system must provide displays to examine the pedestal averages and widths as well as the number of entries for each channel. There should be multiple ways to view the data

- Channel by Channel Mode
  Pedestal Average, Width and Number of Entries for a selected wafer, anode, time index.

- Multi-channel Mode
  Pedestal Average, Width and Number of Entries for a selected range of wafer, anode, time index.

- Graphical Multi-channel Mode
  Graphs of the Pedestal Average, Width and Number of Entries vs Channel number for a selected range of wafer, anode, time index.

Justification:
It is necessary to examine the value of the averages and the widths. This examination may proceed channel by channel or may require to compare a large range of channels. Alternatively, a graphical display allows a quick examination of the values to check trends across the detector or to verify that the values are within tolerance.

Requirement:
The On-Line SVT Monitoring system can be used to set tolerances on the minimal and maximal values of the pedestal averages, widths, and number of entries.

Excursion beyond these tolerance limits will be the basis for the generation of alarms.

Requirement:
A somewhat "fine" granularity is available for the specification of tolerances. i.e. it is possible to define tolerance for small groups of channels on a wafer basis, and anode basis.

Justification:
Different parts of the detector might behave differently even under optimal conditions.

Requirement:
Alarms (Yellow) are generated when one or more channels become out of tolerance.

Justification:
A non-severe situation that must be reported to the operator.

Requirement:
Alarms (Red) are generated when large groups of channels become out of tolerance.

Justification:
A severe situation possibly indication serious a mal-function of some components of the SVT hardware must be reported to the operator.

Requirement:
The pedestal monitoring process checking that averages and widths are within prescribed tolerances is run every time a new pedestal calibration becomes available.

Justification:
This insures timely examination of the calibration.

Requirement:
The pedestal monitoring process checking that averages and widths are within prescribed tolerances can be run at any time by the monitor operator.

Justification:
The operator can thus set new or different tolerances and verify immediately whether the current calibration satisfies those tolerances.

32.4 Gains – Stability/Variation Across Detector

Requirement:
statement of requirement

Justification:
justification of requirement

32.4.1 Gains Monitoring

This section details the requirements for the monitoring of gain averages and widths.

Requirement:
The On-Line SVT Monitoring system must monitor the gain averages and width of all SVT equivalent pixels.

Justification:
The Gains are an essential part of the SVT calibration chain as they directly affect the quality of data taken under zero suppression mode. Wrongly set gains could cause the loss of valuable data or the readout of unnessary segments of the detector thereby increasing the load on the DAQ taping process. In addition, the width of the gains is an excellent indicator of the energy resolution of the detector elements, it also provides indications of noisy channels and or dead channels.

Requirement:
The On-Line SVT Monitoring system must provide displays to examine the gain averages and widths as well as the number of entries for each channel. There should be multiple ways to view the data

- Channel by Channel Mode
  Gain Average, Width and Number of Entries for a selected wafer, anode, time index.
- Multi-channel Mode
  Gain Average, Width and Number of Entries for a selected range of wafer, anode, time index.
- Graphical Multi-channel Mode
  Graphs of the Gain Average, Width and Number of Entries vs Channel number for a selected range of wafer, anode, time index.

Justification:
It is necessary to examine the value of the averages and the widths. This examination may proceed channel by channel or may require to compare a large range of channels. Alternatively, a graphical display allows a quick examination of the values to check trends across the detector or to verify that the values are within tolerance.

Requirement:
The On-Line SVT Monitoring system can be used to set tolerances on the minimal and maximal values of the gain averages, widths, and number of entries.

Justification:
Excursion beyond these tolerance limits will beThe On-Line SVT Monitoring system the basis for the generation of alarms.

Requirement:

A somewhat "fine" granularity is available for the specification of tolerances. i.e. it is possible to define tolerance for small groups of channels on a wafer basis, and anode basis.

Justification:
Different parts of the detector might behave differently even under optimal conditions.

Requirement:
Alarms (Yellow) are generated when one or more channels become out of tolerance.

Justification:
A non-severe situation that must be reported to the operator.

Requirement:
Alarms (Red) are generated when large groups of channels become out of tolerance.

Justification:
A severe situation possibly indication serious a mal-function of some components of the SVT hardware must be reported to the operator.

Requirement:
The gain monitoring process checking that averages and widths are within prescribed tolerances is run every time a new gain calibration becomes available.

Justification:
This insures timely examination of the calibration.

Requirement:
The gain monitoring process checking that averages and widths are within prescribed tolerances can be run at any time by the monitor operator.

Justification:
The operator can thus set new or different tolerances and verify immediately whether the current calibration satisfies those tolerances.

32.5 Drift Speed – Stability/Variations/Deviations

Requirement:
statement of requirement

Justification:
justification of requirement

32.5.1 Time Offset Monitoring

Requirement:
The On-Line SVT Monitoring system monitors the time offset between the RHIC clock and the SVT SCA stop time.

Justification:
The position resolution of the SVT depends on the accurate knowledge of the STOP time.

32.5.2 Average Drift Speed Monitoring

Requirement:
The On-Line SVT Monitoring system monitors the average drift speed on all SVT detectors.

Justification:
The drift speed should ideally constant with an accuracy of 0.1 %. In practice, variations may arise from temperature fluctuations or biasing perturbations. It is essential to monitor the changes in the drift speed as they arise. Measurements of the average drift speed will be performed periodically using charge injection at the different precisely known locations on all wafers of the SVT. It is the job of the monitor to check that the drift speeds on all wafers are constants or within tolerances.

Requirement:
The On-Line SVT Monitoring system provides displays of the measured drift speed average and width on all wafers. There should be multiple ways to view the data:

- Wafer by Wafer Mode
- Multi-wafer Mode
- Graphical Multi-channel Mode

Justification:
It is necessary the operator can visualize the output of that calibration process.

Requirement:
The operator can set tolerance limits on the minimum and maximum drift speed average and width determined by the calibration process after charge injection measurements.

Justification:
These tolerances will be used as the basis for alarm generation.

Requirement:
Yellow Alarm is generated when the drift speed on one wafer exceeds tolerances.

32.5.3 Differential Nonlinearities Monitoring

Requirement:
The On-Line SVT Monitoring system monitors the calibration for correction due to differential non-linearities.

Justification:
Special runs with zero magnetic field will be acquired to determine the differential non-linearities. The monitor should examine the calibration derived from those runs to ensure that the calibration is OK.

Status:
Need clearer definitions of requirements.

32.6 Positioning

Requirement:
The On-Line SVT Monitoring system monitors the calibration of position and orientations of all wafers.

Justification:
These positions and angles are at the basis of the hit position determination for tracking. Accuraet tracking requires they be known to an accuracy of a few tens of microns.

Requirement:
statement of requirement

Justification:
justification of requirement

32.7 Data – Integrity/Volume

Requirement:
statement of requirement

Justification:
justification of requirement

32.8 Zero Suppression Monitoring

Requirement:
This section details the requirements for the monitoring of zero suppression performance.

Requirement:
The On-Line SVT Monitoring system must monitor the zero suppression performance.

Justification:
The zero suppression is an essential component of the DAQ system in that it allows a sizeable reduction of the data volume to be transfered to tape. Many agents can affect the good performance of the zero suppression and must be monitored.

Requirement:
The On-Line SVT Monitoring system must monitor the data volume on a trigger by trigger basis globally and locally i.e. wafer by wafer.

Justification:
Variations of the data volume might result from variations of pedestals or gain settings, bad or corrupted ASICs thresholds, faulty software etc. For a given trigger, the volume should be constant within certain limits. Exercursion beyond those limits could indicate the mal-function of some components.

Requirement:
The On-Line SVT Monitoring system can be used to set tolerances on the minimum and maximum data volume expected from the SVT globally and wafer by wafer on a trigger by trigger basis.

Justification:
Will be used as the basis for the generation of alarms.

Requirement:
The On-Line SVT Monitoring system generates yellow or red alarms if a few or a large number of channels (respectively) are reported to have data volume outside of tolerance.

Justification:

Justification of requirement

Requirement:
The On-Line SVT Monitoring system allows the operator to examine the values of all thresholds used by the SVT ASICs.

Justification:
Bad thresholds could cause severe disruption of the data taking process.

Requirement:
The On-Line SVT Monitoring system must provide displays to examine the thresholds. There should be multiple ways to view the data

- Channel by Channel Mode
  Threshold value used for a selected wafer, anode, time index.

- Multi-channel Mode
  Threshold values used for a selected range of wafer, anode, time index.

- Graphical Multi-channel Mode
  Graphs of the Threshold values vs Channel number for a selected range of wafer, anode, time index.

Justification:
The examination may proceed channel by channel or may require to compare a large range of channels. Alternatively, a graphical display allows a quick examination of the values to check trends across the detector or to verify that the values are reasonable.

Requirement:
The On-Line SVT Monitoring system is used to display miscellaneous quantities to be used as diagnostics of the behaviour of the zero suppression by the ASICs. The monitoring system should be flexible enough to allow easy generation and display of new parameters to be displayed as well. Among the essential parameters to be displayed are the following:

- Size of Line Clusters
- Size of Clusters
- Number of Line Clusters
- Number of Clusters

Justification:

Justification of requirement

32.9 Dead and Hot Channel Monitoring

Requirement:
The On-Line SVT Monitoring system provides displays of the hot and dead channels. There should be multiple ways to view the data:

- Channel by Channel Mode
  Channel State of a selected wafer, anode, time index.

- Multi-channel Mode
  Channel State of a selected range of wafer, anode, time index.
- Graphical Multi-channel Mode
  Graphical Map of the Channel State of a selected range of wafer, anode, time index.

Justification:
The channels are flagged dead by a calibration process. It is necessary the operator can visualize the output of that calibration process.

Requirement:
The operator can set tolerance limits on the maximum of dead or hot channels. There should be global tolerance and "local" tolerances with various granularites i.e wafer level, ASIC level etc.

Justification:
These tolerances will be used as the basis for alarm generation.

Requirement:
Yellow Alarm is generated when the number of dead or hot channels exceeds the tolerance.

Justification:
Justification of requirement

32.10 Cluster Monitor

Requirement:
statement of requirement

Justification:
justification of requirement

32.11 Tracking Monitor

Requirement:
statement of requirement

Justification:

justification of requirement

32.12 Physics Observable Monitor

Requirement:
statement of requirement

Justification:
justification of requirement

Chapter 33

Job Control

Select/Deselect subprocesses. Monitor subprocess execution/termination. Assign resources; log activities.

33.1 Configuration of Analysis Software

Requirement:
statement of requirement

Justification:
justification of requirement

33.2 Interfaces

Requirement:
statement of requirement

Justification:
justification of requirement

Chapter 34

L3 Trigger – Development/Studies

Requirement:
Vertex finding; track finding; multiplicity; topology, dE/dx; Baryo-chemistry and Strangeness Physics

Justification:
justification of requirement

Chapter 35

Data Acquisition – Development

Requirement:
statement of requirement

Justification:
justification of requirement

Chapter 36

Analysis

36.1 Event Reconstruction

Requirement:
Receive subset of event from DAQ. Select events analyzed. Include data from other Detectors.

Develop trigger, calibration, and monitoring procedures. Develop Cluster Finding techniques. Develop Space Point Extraction techniques. Develop Track Finding techniques. Develop SVT – TPC matching techniques. Develop Particle Identification techniques.

Justification:
justification of requirement

36.2 Event Display

Requirement:
The On-Line SVT Monitoring system includes a graphical display of the SVT for hit visualization. It should be possible to display a full wafer or a selected range of anodes and time bins on a given wafer. The display should have flexibility to allow clear visualization of the hit structures and features. It should include gray or color scales, linear or logarithmic scales. It should provide different display methods such a 2-D histograms, contour plot, lego plot and 3-D surface plots.

Justification:
Visual tools can help a great deal in understanding the response of the detector.

Requirement:
The Hit Display should be linkable with the SVT event display or other STAR event displays.

Justification:
This allows to examine hits in connection with tracks found by the tracking code in the SVT or the TPC or both.

Requirement:
It should be possible to invoke multiple selection criteria on the data when visualizing hits to select or condition the data being looked at.

Justification:
Most of the data is usually reasonable. It is usually the rare pathologies that are hard to understand. Being able to set conditions on the data can help a great deal in selecting the pathological events or hits that require special attention and may reflect hardware or software malfunction.

Requirement:
SVT Monitoring system includes a graphical display of the SVT for track reconstruction. The display should allow a selection of representations: 3-dimensional representation, 2-dimensional projection in the transverse plane, conformal mapping, hough transform etc.

Justification:
At the macroscopic level, tracking is excellent indicator of the performance of both the hardware and software.

Requirement:
The graphical display should include selection of gray or color scales.

Justification:
The software might be used from different terminal types.

Requirement:
The graphical display should include options contolling whether a detailed or coarse SVT geometry is shown. It should also provide options controlling whether hits, track candidates, or accepted tracks only are shown. It should be possible to invoke multiple selection criteria on the data when visualizing tracks to select or condition the data being looked at.

Justification:
Justification of requirement

Requirement:

The Track Display should be linkable with the SVT hit display and other STAR event displays.

Justification:
This allows to examine SVT tracks in connection with tracks found in the TPC or other STAR detectors.

Requirement:
statement of requirement

Justification:
justification of requirement

36.3 Physics Analysis

Requirement:
Particle Spectra, Particle Ratios, Multiplicity, Topological Analysis; HBT, K_0 and Λ reconstruction

Justification:
justification of requirement

36.4 Off-Line Software

This software includes all SVT-related software required for SVT design and simulations. Also included is the software associated with all aspects of SVT-related event reconstruction and physics analysis.