DRAFT

The Outline of Solar-B Mission Operation & Data Analysis

Version: 0.965

A proposal from

The Solar-B MO/DA Working Group

2002-07-14~~08~~

Change Records

Issue	Date	Authors	Comments
Version 0.1	2001-11-29	M. Shimojo	Written by Japanese
Version 0.7	2002-01-18	M. Shimojo T. Shimizu	Written by English
Version 0.8	2002-02-11	M. Shimojo	Added the discussions of 3rd Solar-B science meeting at Hawaii 2002/01/25-26..
Version 0.9	2002-02-26	M. Shimojo T. Tarbell	Added the discussion of 1st Solar-B MO/DA meeting at LMSAL 2002/02/20-21.
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Version 0.96	2002-07-08	T. Shimizu M. Shimojo	Editing for clarity and change a figure in the section 4.5.
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About the Document

The purpose of the document is to describe the latest plan on the mission operation and data analysis of Solar-B that is now under discussion in the Solar-B MO & DA working group. This document is still a draft ~~plan~~ and unintended for approval of ~~has not yet been authorized by~~ the Solar-B project managers in ISAS, NASA, and PPARC, as well as the principle investigators of the on board scientific instruments~~telescopes~~.

Contents

1. Introduction

The purpose of this document is to provide the outline of Mission Operation and Data Analysis for Solar-B. –The document is based on the following documents and presentations.

- The Outline of Solar-B Mission Operation & Data Analysis (Ver. 0.8:J-MO/DA team)
- Mission Operations and Data Analysis (@FPP-CDR [Tarbell])
- Science Implementation
  (XRT: SAO Solar-B Homepage "http://hea-www.harvard.edu/solarb/")
- Data Products of the XRT (@3rd Solar-B science meeting [DeLuca])
- EIS Ground Based Software Requirements (MSSL/SLB-EIS/SP/022.01)
- EIS Science Data Products (@3rd Solar-B science meeting [Harra])
- EIS Operation Planning (16/7/01)
  (EIS: MSSL Homepage "http://www/mssl/ucl/ac.uk/Solar-B/eis_planning.htm)
- Methods for Visualizing Solar Data (@3rd Solar-B science meeting [Berger])
- Minutes/resumé of tThe 1st Solar-B MO/DA Meeting @ Lockheed 2002/02/20-21

The following three topics are described in the document.

- Operations of the Solar-B satellite and its on board instruments
- Scheduling and submission of observation plans and data policy
- Archiving, distribution and analysis of Solar-B data

2. Operations of the Solar-B Satellite and its Onboard Instruments

2.1. Principles of Solar-B operations

Basic principles of the operation~~Fundamental policies for the operation~~ of the Solar-B satellite and its on board instruments are summarized as follows:

A) The Solar-B team shall coordinate observation plans among the three instruments aboard Solar-B for~~,~~ maximizing the scientific results from Solar-B observations. The items to be coordinated are
   - Target of the observation~~s~~
   - Usage of the data recorder (DR)

B) In order to obtain ~~many more~~ scientific results as much as possible, the Solar-B team, when appropriate, shall cooperate ~~when appropriate~~ with ~~coordinated observations proposed by~~ other satellites and ground-based observatories.

C) ~~Each instrument can run its observation plan independently.~~ The "observation plan" (i.e., observation tables and commands) of each instrument should~~can~~ be prepared independently, once~~after~~ the coordination is agreed~~has been negotiated~~.

Along with the basic principles~~fundamental policies~~, the following schemes of the Solar-B operation are ~~system is~~ proposed as ~~a~~ baseline~~s guideline~~ for further discussion~~s~~:

.

A) Dut~~y~~ies and contributions to the Solar-B operation~~s~~ are ~~as~~ equally shared among~~as possible from~~ Japan, US~~A~~, and UK scientists in~~of~~ the Solar-B team

B) Chief observers (SOT_CO, XRT_CO, EIS_CO) are assigned for scientific operation~~s~~ planning and health check of the~~each~~ instrument~~s~~. The chief observers reside in~~stay at~~ the ISAS/SAGAMIHARA campus, Japan.

C) Persons dedicated only to satellite operation~~s~~ planning ("SSOC TOHBAN" in Yohkoh case) are not assigned. ~~-~~Instead, one of the chief observers should take~~s~~ responsibility ~~care~~ for~~of~~ satellite operation~~s~~ planning~~,~~ after the sufficient training ~~has taken place in the initial observing~~ period of the~~of~~ initial 3-month obervations or more.

D) Scientists are involved in the~~need to join~~ daily real-time operations of Solar-B. (Since the real-time operation team (engineers off~~from~~ the contractors~~companies~~) at KSC cannot speak English,) Japanese speaking scientists~~scientists who speak~~

~~Japanese well~~ are assigned for the persons in charge of the real-time operation. ~~(~~With the "equal" contribution policy,~~)~~ ~~I~~it is considered~~best~~ that at least one of the chief observers is a Japanese speaking scientist.

コメント [TW1]: やっぱり削除かな。

2.2. The operation system of Solar-B

2.2.1. The personnel of the Solar-B daily operation

The following 6 or 7 persons are assigned for the daily Solar-B operation.

□ Chief Observers (3) SOT Chief Observer [SOT_CO]
XRT Chief Observer [XRT_CO]
EIS Chief Observer [EIS_CO]

- Will be nominated o~~O~~ne person for each~~one~~ instrument in shifts of two weeks (TBD).
  - ➪ The length of shift~~period~~ (two ~~-~~weeks) will be changed according to ~~is flexible depending on~~ the nature of observing~~the~~ schedules. Each instrument team should setup their staffing ~~coordinates the~~ schedule ~~of its COs~~.
- Are resident of~~Resident for the shift at~~ ISAS-SAGAMIHARA/Japan.
- Plan the observations, including preparing of the observation tables and command plans for the instrument.
- Check the instrument status at least daily.
- Contribute to collecting and analyzing calibration data.
- Japan, US and UK scientists and/or graduate students (who have experience as the chief observer or the supporter) serve as chief observers. ~~It is best that~~ O~~o~~ne of the three chief observers speaks~~is~~ Japanese~~, as mentioned before~~.

□ Solar-B Chief Planner [CP]

- Is ~~The instrument teams will provide~~ a scientist provided(?) by the instrument teams ~~to serve as "Solar-B Chief Planner"~~ in shifts of TBD duration. Initially, this person will be different from the chief observer of the ~~for that~~ instrument.
- Coordinates the observing plans among the telescopes.
- Works on making satellite pointing parameters and satellite commands.
- Calculates the parameters of the pointing of the satellite and makes the pointing commands.

- Compiles the OP/OG and the command plan requested by~~after~~ the three chief observers, and input the observation tables and commands to ISAC-PLN (The OP/OG. ~~and~~ The command plan is automatically generated~~made~~ by "ISAC-PLN"). He/She also transfers~~sends~~ the OP/OG and the command~~s~~ plan to KSC for ~~the~~ approval.

□ Persons responsible for the real-time operation [KSC TOHBAN] (2)

- Are t~~T~~he conductors of the real-time operation.
- Stay at Kagoshima Space Center (TBD).
- Perform real-time health checks of the Solar-B satellite.
- Consist of t~~T~~wo persons (one operation~~s~~ expert, and one operation~~s~~ trainee) in shifts of two weeks.
- Need a Japanese speaking skill.

□ A supporter of the Solar-B chief planner [Supporter] (1)

- Is a~~One~~ person in shifts of one week, if necessary (at maximum?).
- Supports the Solar-B chief planner and learns the Solar-B satellite and telescope operations.
- Is a Trainees for Solar-B satellite and telescope operations. ~~are assigned.~~
- And his/her staffing schedule is arranged by t~~T~~he science schedule coordinators. ~~plan the staffing schedule of supporter.~~

In addition to the persons allocated for the daily operations, the following persons will support the daily operations and execute the following tasks. Since these ~~following~~ tasks need continuity, a specific~~one~~ person will be asigned~~allocated~~ for a long period of time.

□ The Ground-Base Contacts Coordinator [GCC] (1)

- Is a~~A~~n ISAS staff member or an engineer from a company.
- Schedules the ground-based contacts (KSC and other ground-~~base~~ stations)
- Checks the data transfer among~~from~~ the ground-~~base~~ stations
- Calibrates the attitude data and makes the S/C attitude database.

□ Scientific Schedule Coordinator [SSC] (3 [TBD])

- Consist of t~~T~~hree senior scientists (each from~~in~~ Japan, USA and UK, respectively) per~~by~~ instrument. ~~and/or by continent~~ (TBD).
- Coordinate~~Manage~~ the observation schedule and the proposals.

- Will be c~~C~~ontact persons for proposal submission~~s~~. If necessary, they will be also consultants for proposal preparation, and~~.~~
- Will~~Science Schedule Coordinators can~~ assign a member of the instrument teams ~~to~~ consulted on the proposal~~, if they need help about the instrument~~.
- ~~The coordinator in Japan~~ M~~m~~anage~~s~~ personnel scheduling of the chief planners and KSC TOHBANs.

□ Solar-B Database Coordinator [SDC] (1)

- Is A software engineer.
- Stays at ISAS-SAGAMIHARA.
- Create~~Make~~s and maintains the Solar-B database system
- Maintains the ISAS data analysis computer system of Solar-B.

During the initial phase of the Solar-B operation (about 3 months after the Solar-B launch), a special setup of~~daily~~ operation ~~setup~~ could be requested~~is necessary~~. In addition to the daily operation setup as described above, additional persons (satellite and instrument experts) might have to participate in~~are required for~~ the daily operations. One of the persons should be dedicated to "Solar-B chief planner" in addition to the three~~3~~ chief observers during the initial phase daily operation.

□ SOT, XRT, EIS Engineering Advisors (1)

- Will be assigned a~~A~~t minimum~~least~~ one person for each instrument, and
- will be Staying at ISAS-SAGAMIHARA/Japan during the initial phase.
- Will be r~~R~~esponsible for power-up and functional checkout of the instrument, as well as:
  - ✧ Preparing the command plans for power up and functional checking
  - ✧ Monitoring the instrument status during real-time operations
  - ✧ Functional checkout and calibration of the instrument, and
  - ✧ Establishing standard procedures for instrument calibrations

□ SOT, XRT, EIS Software coordinators (1)

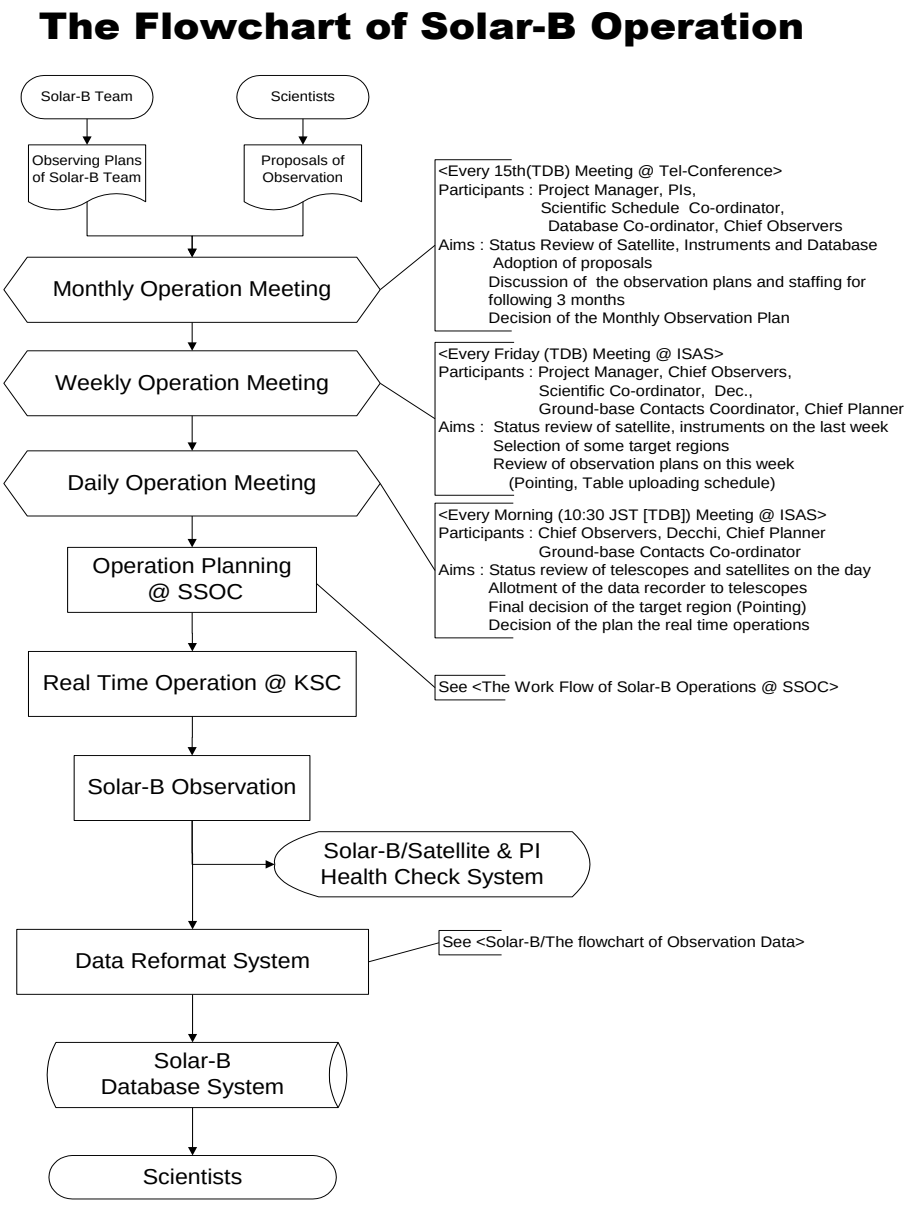
~~➢~~Will s~~S~~et~~ting~~ up the system and environment for data archives and data analysis:

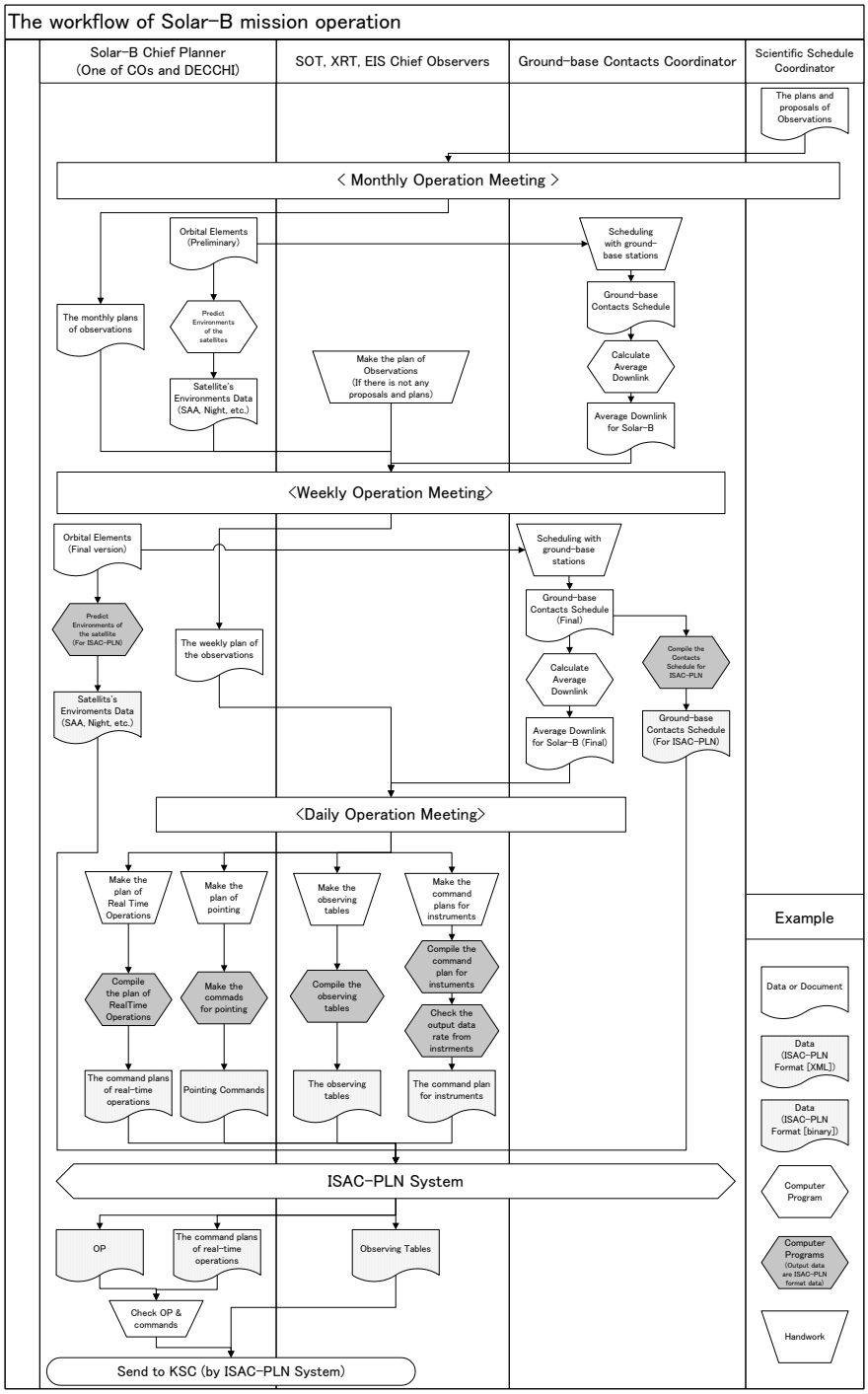
書式変更 ： 箇条書きと段落番号

  - ✧ Installing and checking the database software
  - ✧ Making and installing the data analysis software

- ✧ Setting the data analysis environments

2.2.2. The flowchart of the Solar-B operation




The workflow of Solar-B mission operation
Solar-B Chief Planner (One of COs and DECCHI)
SOT, XRT, EIS Chief Observers
Ground-base Contacts Coordinator
Scientific Schedule Coordinator
The plans and proposals of Observations
< Monthly Operation Meeting >
Orbital Elements (Preliminary)
Scheduling with ground-base stations
The monthly plans of observations
Predict Environments of the satellites
Ground-base Contacts Schedule
Make the plan of Observations (If there is not any proposals and plans)
Calculate Average Downlink
Satellite's Environments Data (SAA, Night, etc.)
Average Downlink for Solar-B
<Weekly Operation Meeting>
Orbital Elements (Final version)
Scheduling with ground-base stations
Predict Environments of the satellite (For ISAC-PLN)
Ground-base Contacts Schedule (Final)
The weekly plan of the observations
Compile the Contacts Schedule for ISAC-PLN
Calculate Average Downlink
Satellite's Environments Data (SAA, Night, etc.)
Average Downlink for Solar-B (Final)
Ground-base Contacts Schedule (For ISAC-PLN)
<Daily Operation Meeting>
Make the plan of Real Time Operations
Make the plan of pointing
Make the observing tables
Make the command plans for instruments
Compile the command plan for instuments
Compile the plan of RealTime Operations
Make the commads for pointing
Compile the observing tables
Check the output data rate from instrments
The command plans of real-time operations
Pointing Commands
The observing tables
The command plan for instruments
ISAC-PLN System
OP
The command plans of real-time operations
Observing Tables
Check OP & commands
Send to KSC (by ISAC-PLN System)
Example
Data or Document
Data (ISAC-PLN Format [XML])
Data (ISAC-PLN Format [binary])
Computer Program
Computer Programs (Output data are ISAC-PLN format data)
Handwork

- Monthly Meeting [Tele-conference]
  - Participants: Project Manager, Principal Investigators, Science Scheduling Coordinators, Chief Observers, Database Coordinator
  - Review of the satellite and instruments status
  - Review of the proposals that have been received during the month
  - Adoption of proposals
  - Discussion of the observation plans and staffing for the following 3 months
  - Coordinate staffing for the following (2nd) month
  - Decisions on the next monthly plan.
  - Prioritize thecach observations offor the next month, and make the priority list of the observations.

- Weekly Meeting [@ISAS every Friday]
  - Participants: Project Manager, Chief Observers, Chief Planner, Supporter, Ground-base Contacts Coordinator, Science Scheduling Coordinator (Japan)
  - Review of the satellite and instruments status in the week
  - Review of the schedule of ground-base contacts for the next week
  - Review of the observation plans for the next week
  - Selection of some target regions and decisions on the pointing maneuver schedule of next week (nearly final)
  - Decisions on the schedule of observation plans for next week (nearly final)
  - Allocation of the data recorder (DR) for each instrument (nearly final)

- Daily Meeting [@ISAS every weekday (TBD) morning]
  - Participants: Chief Planner, Supporter, Chief Observers, Ground-base Contacts Coordinator
  - Confirm the target regions
  - Confirm the allocation of the DR
  - Confirm the pointing and the schedule of pointing maneuvers.
  - Confirm the operation plans of the next-day real-time operations in next day.
  - If there are some changes in the schedule of the ground-base contacts, reallocate the data recorder for each instrument.

- The deadline for input to the next day's operation plan inputs (commands, observation tables, etc.) to the Solar-B Chief Planner is 15:00 JST each day.

- The entire Solar-B operation plan for the next day, including the command plans during KSC real-time operations, the OP/OG, and the observation tables, is completed and sent to KSC for approval by the evening. The KSC TOHBANs make the final check of the operation plan in the evening.

- As a general guide line, the operation plans are approved daily bases. However, iIn case an urgent operation plan changes isare requested as the result of checking the data downlinked foundduring in the morning passes real-time operations, the planners should make the revised plan for the evening real-time operations as soon as possible. However, the general policy is that they do not change the operation plans during the day.

2.3. Responses to solar activity and coordination with ground-based observatories

See "3. Scheduling and submission of observation plans, and data policy"

2.4. Scientists resident at ISAS from US and UK

We (the Japanese team of Solar-B) would like to ask the UK and US teams forabout several scientists resident at ISAS.

- At least two scientists staying at ISAS from each instrument team:
  Theyir aims are
  - Chief Observer of theeach instrument
  - A scientist for jJoint data analysis and scientific discussions among US, UK, and Japan.
- In the initial phase of the solar-B operation, additionalsome scientists and/or engineers fromof each instrumenttelescope team need to stay at ISAS.

We should note that Japan side does not have the manpower for the management of the Solar-B database, and Wwe, the Japanese team, expect major contributions offrom the US and UK teams for the management of the Solar-B database.

2.5. Software required for daily operations

In order to reduce the burden of operations and increase the time for the scientific planning, all software for the operation is expected to be of the highest quality and very user friendly. In the following sections, we describe the software for the operation of the satellite and instruments.

コメント [TW2]: 「ソフトウエアの質が高い」というのは具体的にはどういう意味ですか？

2.5.1. Software for the fundamental operation of Solar-B

Responsible parties for software development are indicated in the parentheses.

- Prediction of the satellite environments (Japan)

  This software predicts the timing of ground ~~-~~station~~base~~ contacts, South Atlantic Anomaly, Pole anomaly and night periods of the satellite, calculating from the orbital elements. The software produces the graphical time chart and the list of events. These are very useful not only for planning of observations but also for troubleshooting of the spacecraft. In ISAS, the software is called “AOSLOS”.

- Estimating the downlink data size (Japan)

  After ~~the~~ coordina~~negotia~~ting with the ground~~-base~~ stations, the schedule of the station~~ground-base~~ contacts of Solar-B is made from AOSLOS data and the schedule of the ground-base stations. The software estimates the volume~~capacity~~ of downlink data using the contacts schedule. The estimated data size~~capacity~~ is used for coordinating the usage of the data recorder (DR).

コメント [TW3]: この文章意味不明で、修正できず: 「局受信のスケジュールを局受信のスケジュールから作る」？

- Support Software for Creating OP, OG and the real-time commanding plans (Japan)

  In the Solar-B project, the ISAC-PLN software package is available ~~used~~ for the management of the command plans, OP, OG, and the observing tables. The package can also create OP and the real-time operation plans based on the list of events, such as ~~(examples of events are ground-base~~ station contacts, SAA and satellite nights~~)~~. ~~Hence, t~~The support software creates the event lists from the AOSLOS data and the plan of observations, and therefore, it~~. The software~~ has an interface to ISAC-PLN.

- Supporting software for checking OP and the real-time commanding plans

(Japan)

ISAC-PLN creates OP and the real-time command plans ~~based on the~~ input~~s~~ from Chief Planner and Chief Observers. The software makes the graphical time-line charts, ~~based on~~ taking OP, the real-time operation plans and the prediction of the data output rate from each instrument into account. The time-line also indicates the storaged data volume~~usage~~ of the data recorder.

□ Making commands required for the satellite pointing (Japan)

The chief planners for all 3 instruments can request the~~to~~ change of ~~the~~ spacecraft pointing~~field of view by a maneuver of the satellite~~. T~~Hence t~~he satellite, therefore, may be able to change the pointing several times a~~during one~~ day. Since the parameters for commanding spacecraft~~s~~ maneuver are complicated, and miscommanding~~takes in making them~~ may lead to ~~have~~ serious consequences, the software should calculate the parameters for s/c maneuver~~s~~ from the solar coordinates of the target regions as inputs. The software will be developed by the company that develops the attitude control system of Solar-B.

□ Health check reformat software (CCSDS > IDL) (Japan)

For the health check and monitoring system, the raw-telemetry data must be reformatted from CCSDS format to the IDL-readable format. The prototype of this reformatter software was already used in the proto-model system test held last year.

□ Health check and monitoring system for the Satellite (Japan)

During the real-time operations at KSC, the KSC TOHBANs check~~s~~ the health of Solar-B using the health check and monitoring systems. The system is used for checking the fundamental status of Solar-B, for example, battery voltages, temperatures, ~~and~~ etc.. The company that develops the telemetry system provides the software.

2.5.2. Software for the operation of the instruments

It must be possible for users to design their own observational studies to address a particular scientific question. Software must be available ~~to all users~~ to choose~~explore~~ instrument~~s~~ setup parameters and to simulate~~view~~ the observation~~expected data return~~.

コメント [TW4]: この文章も私には何を言おうとしているのか、理解ができませんしたので、無修正です。

□ The database system of Solar-B operation and observation

(Instrument teams and Japan)

All previous observational studies must be archived ~~so that they can be recalled~~ by name, identification number or scientific objective, for ease of rerunning and/or modifying. When new studies are designed, they should~~can~~ be cross-checked with~~against~~ these~~is~~ archives for close or exact matches so that the user can examine the ~~real~~ data ~~that was~~ obtained ~~from a~~ in the previous similar observations. Cross-checking by introducing~~and assigning~~ an intelligent identification scheme will limit the size of the archive and the capability of~~aid new users in~~ designing the studyies. The exact ~~form of the identification~~ scheme is yet ~~to be~~ decided. A~~There shall be a~~ validation process will be introduced to ensure that studies cannot harm the instrument.

コメント [TW5]: 「observational study」の定義がこのパラグラフの前に必要。

コメント [TW6]: 直した本人もどうもしっくり意味がわかっていない。

□ Software for creating the observing tables (Instrument teams)

Chief Observers make the observing tables for each instrument based on the observation plans. This software creates the command sequence of the observing tables based on the observing plan of the chief observer. The software has interfaces with ISAC-PLN, and refers the database of Solar-B operation and observation, as well as with instrument-specific databases and/or software. The software also has an interface with the Solar-B database for collecting the ID, name and comments of the observing tables. The comment items of observing tables will follow the~~are based on~~ SOHO IAP (TBD).

□ Support software for command plans for the instruments

(Instrument teams)

When an instrument needs to ~~some~~ command~~s~~ to~~from the~~ MDP (e.g., to stop the observation when the satellite changes the pointing), ~~Chief Observers make command plans for the instruments. T~~the command plans may include many real-time commands and the sequences and timings of the delayed commands for various instruments via MDP. Hence, this software needs to refer~~creates~~ the command~~s~~ plans, ~~based on~~ the event lists and each~~the~~ Chief Observer's plan. The software also has an interface with ISAC-PLN.

□ Estimating the output data rate and size of~~from~~ the prepared observing table

(Instrument teams)

This software generate ~~make~~s the time-line of the observation~~ing sequence~~ from

the observing tables and estimates the output data size between the ground-stationbase contacts. The Chief Observer checks that the estimated data size from observing table does not exceed the allocated size of DR for the instrument.

□ Health check and monitoring system for the instruments (Instrument teams)

During the real-time operations at KSC, the KSC TOHBANs checks the health of the instruments using this system. The system displays the status of the instruments and real-time images. The data distribution system at KSC is asthe same as that at ISAS/SAGAMIHARA, which wasis used duringfor the Proto-Model test, and will be during the Flight-Model test, as well. Hence Wwe will use the same software developed infor the PM- and FM tests, and in the real-time operations at KSC with minorsome revisions.

2.5.3. Special software for the instruments

□ Making MDP/SOT Doppler parameters. (Japan + SOT team)

Since the wavelength setups of the spectropolarimeter and the narrowband tunable filter of SOT are affectinfluenced by the orbital motionvelocity of the satellite, MDP accomodateshas an on board software to calculate the Doppler velocity of the orbit based on the Doppler parameters. The software calculates the Doppler parameters from based on the spacecraft orbital elements uplinked in a regular time interval.

□ Communication with the Deferred Command Store (DCS) (EIS team)

Software will be developed in the EIS team to send the observing plans must be sent to the DCS for communication with the spacecraft. Software must be available to do this and Tthe EIS planning tool has an interface to the softwarewith it.

3. Scheduling and Submission of Observation Plans and Data Policy

3.1. Principles of observation plans and data policy

書式変更 ： 箇条書きと段落番号

i. Solar-B data should be open to the public as quicklyearly as possible. (The J-side proposal baseline for discussions regarding the data policy is as follows:) The Solar-B team and their collaborators take priority for using the data for TBD period (for example, 6 months) after logged in IAS collection. After the elapse of this period, all the data are open to the public.

i.ii. Solar-B operations will be operated planned according to the pre-determined "initial 3-month observation plan" during the firstinitial 3 (TBD) months. Each of the initial phase observation plans shoulddurng the initial phase will be reviewed and prioritized by the Solar-B team. For finalizing making the "initial observation plan", the Solar-B team should receive have comments from outside the Solar-B team.

ii.iii. The "baseline" observations starting after the initial phase will come out of from the successful observation plans tested during prepared for the initial phase3-month plan. "Proposal" observations will be allocated among the scheduled in "baseline" observations.

iii.iv. Proposals for "proposal" observations from inside and outside the Solar-B team will beare submitted to the scientific scheduling coordinators (see 2.2.1).

iv.v. A "gentlemen's agreement" (what is a better term? Consensus inside and outside the Solar-B team?) is required necessary to ensure data-use priority offor graduate students to pursuinge -their PhD researches and to avoid unnecessary copetitions or duplications withwithout competition or duplication by other scientists. Members of the instrument teams, and especially the scientific scheduling coordinators should be aware of the PhD research projects in progress and should urgestrongly discourage any other scientists to avoid overlapping of their research topicsfrom work

~~which overlaps closely with a PhD topic~~.

It is not easy to predict the lifetime of the Solar-B. Hence, we should carefully review the science priority and observation plans before the launch of Solar-B, and crystallize(?) ~~define~~ the initial observations into~~as~~ the initial 3-month observation plan. (The Solar-B team should start to discuss science priorities.~~y~~ Creating ~~and~~ the initial 3-months observation plan is~~should be~~ one of the most~~an~~ important tasks of the Solar-B team before the launch.)~~topic at future Solar-B science meetings.~~

3.2. "Baseline" observations and "proposal" observations

Observations after the initial 3 (TBD) months will consist of "baseline" observations and "proposal" observations. The "baseline" observations will be~~are~~ standard observations ~~that are~~ performed by the Solar-B team continuously through~~for~~ its~~the~~ mission life. "Baseline" observations will emerge from ~~come from~~ the observation plans conducted during ~~prepared for~~ the initial 3 (TBD) ~~-~~month~~es~~ ~~observation plan~~. The "proposal" observations will be executed~~are~~ based on the proposals ~~that are~~ submitted to the scientific scheduling coordinators. ~~The Solar-B team welcomes~~ Jjoint observations with other satellites and ground-based observatories will be promoted.

3.2.1. Proposal submissions

- All proposals shall be in English.
- In order to receive proposals from scientists and students inside and outside the Solar-B team, the scientific schedule coordinators will be~~are~~ assigned as contact points and also as consultants for the proposals.
- Proposals will be~~are~~ discussed at monthly operation meetings. Hence, a standard~~the baseline~~ deadline for~~of the~~ submission will be set~~is~~ before the monthly operation meeting in which the particular operation~~s~~ will ~~first~~ be discussed for the first time, typically 3 months before the observations will ~~be~~ take~~n~~ place.
- The Solar-B team will provides the guidelines for proposal submission.
- The Solar-B team will provide documents and software helpful~~necessary~~ for ~~proposal~~ preparing proposals ~~ation~~ (for example, those of predicting the photon counts and of simulating observations).

3.2.2. Scientific schedule coordinators

- The scientific schedule coordinators are the contact points and consultants for (preparation or evaluation of ?) observation proposals. Using the received proposals, they prepare a draft monthly schedule of observations ~~schedule~~ presented in ~~for~~ the Solar-B monthly operation meeting.
- Each instrument team shall have ~~There is~~ a science schedule coordinator, to whom ~~for each instrument. P~~ proposals should be sent. ~~to science schedule coordinators.~~
- They will be ~~are~~ authorized to select ~~some from incoming observation~~ proposal~~s~~ observations, and to draft ~~for defining a draft of~~ the monthly observation schedules. They will be ~~are~~ also authorized to reject proposals, if the proposals are inadequetly ~~not properly~~ submitted ~~prepared~~, the same observation plans are already proposed, or the essential parts of the proposed ~~scientific~~ plans overlap ~~too much~~ with a PhD thesis in progress, etc.

3.2.3. Data policy

- See. “3.1 Principles of observation plans and data policy”

3.2.4. Responses to solar activity and coordination with ground-based observatories

- Target of Opportunity campaigns will ~~can~~ be inserted ~~entered~~ in the ~~s~~ monthly planning. ~~s~~
- Proposals for these campaigns should be sent to Science Schedule Coordinators.
- Chief Observers and the Chief Planner decide the target in the daily meeting based on the priority list of observations [see 2.2.2]. They have the discretion to choose targets of opportunity, in case they are included in ~~when~~ the monthly plan ~~allows them~~.

3.3. Coordination of data analysis

To protect the ~~ensure data~~ priority of ~~for~~ graduate students ~~to~~ pursuing ~~e~~ their PhD researches, ~~without competition or duplication by other scientists,~~ the Solar-B team should provide ~~makes~~ the list of PhD research themes of graduate students in the Solar-B team. The list will be ~~is~~ accessible from the homepage of Solar-B. Members of the

instrument teams and especially the scientific scheduling coordinators should be aware of the PhD research projects in progress and should ~~strongly~~ make strong efforts to avoid overlapping of their research topics with others. ~~discourage any other scientists from work which overlaps closely with a PhD topic.~~

Open Items

- Need to define who are ~~is involved~~ in the Solar-B team.
- Need to define who are collaborators of the Solar-B team.
- Need to find ~~What is~~ the best way to encourage scientists ~~from~~ outside the Solar-B team to make~~with~~ "proposal" observations.~~?~~ They should have the same priority for using the data, as the Solar-B team members do (?).
- Need to specify the length of~~How long do we need for~~ the initial phase? (is 3 month OK?)
- Need to specify the length for privileged data use: Is it ~~the~~ proper ~~solution~~ to give ~~data priority to the Solar-B team and their collaborators for~~ 6 months (TBD) after logging in ISAS~~collection~~?
- How to protect the data during the above 6 months (TBD)?
  Option 1: Using software (ex. Password? Closed website?)
  Option 2: Gentlemen's agreement?
- Need to specify the level for acceptance of proposals: In w~~W~~hat quality and how much in detail ~~proposals~~ do we accept the proposals?

4. Archiving, Distribution and Analysis of Solar-B Data

4.1. Fundamental views on Solar-B Data processing system

A) The Solar-B telemetry data processing system uses the ISAS satellite database system: the SIRIUS database for raw telemetry and the SDTP protocol for obtaining raw telemetry data.

B) Existing aAnalysis tools, such as ~~that already exist (~~for example, the SSW or SolarSoft package.~~)~~ will be~~are~~ also usable~~ed~~ for Solar-B data analysis, if ~~when~~ appropriate.

C) For health checks of the instruments, we will revise~~use~~ the health check system used in ~~developed for~~ the proto-model system test~~, with some revisions~~.

D) To ensure~~make~~ efficient data accessibility ~~possible~~ not only among~~for~~ the Solar-B science teams but also in~~for~~ the wider solar community, the Solar-B data providing system shall~~will~~ be designed to be compatible, if possible, with the Virtual Solar Observatory (VSO) and the European Grid for Solar Observations (EGSO), or their successors.

4.2. Classification of Solar-B processed data

The Solar-B data are classified into the following categories based on the processing levels.

- Raw telemetry data
- Health check data
- Level-0 data
- Calibration data
- Level-1 data
- Level-2 data
- Level-Q data

In addition to these levels of data, we will need

- Observing logs and data catalogues ~~used~~ for archiving~~searching~~

In thise section, we explain these data levels.

コメント [TW7]: 何を捜すの？

□ **Raw telemetry data**

- They are the data received at KSC and the other ground-based stations. The format ~~of the data~~ is "CCSDS packet" format.
- All raw telemetry data of Solar-B are archived on the "SIRIUS" database. ~~This is~~ the ISAS satellites database at the ISAS/SAGAMIHARA campus., ~~and~~ ISAS maintain all the data of the ISAS satellites ~~are~~ via this database on line ~~in the database~~.
- The "SDTP" protocol (ISAS original protocol) is used to retrieve~~get~~ the data from the SIRIUS database.

□ **Health check data**

- The data will be~~is~~ reformatted from raw telemetry ~~data~~ to IDL-readable ~~data~~. The data include not only observational~~ing~~ data but also status data of the instruments.
- These data are mainly used for the health check and monitoring systems of the instruments. They are also used for planning the next day's observations.
- ~~Raw telemetry data are compressed by MDP using JPEG or DPCM. Since the images are displayed on the health check and monitoring systems, t~~The data are~~is~~ decompressed, ~~in case necessary, during~~ the reformatting process.
- One file per instrument or data species (real-time, playback???) is created for each downlink (real-time passes only?)
- The health check data will be~~are~~ created~~only used~~ temporarily and not stored in an archive.

コメント [TW8]: RL PB の「種別」のことでしょうか？

□ **Level-0 data**

- Reformatted raw telemetry data file.
- The data format of Level-0 is FITS with binary table extension (TBD).
- The ~~data include a~~ header ~~that~~ is constructed~~made~~ from the telemetry data (ex. observing time, exposure time, pixel size, coordinates on the CCD, etc.) and the Solar-B operation database (Table ID, Table name, Comments from Chief Observer, etc.).
- ~~Although the data are compressed by MDP using JPEG and DPCM,~~ T~~t~~he Level-0 data are yet ~~still non-~~decompressed ~~data~~ to save the data storage volume and to save the network bandwidth.
- One file per instrument, per downlink, or hourly (TBD); or one file per one map or one raster (TBD).

- Level-0 data are not calibrated.
- RLevel-0 data include the raw data used for calibration (e.g., dark images), will be included in Level-0 data, when appropriate.
- Level-0 data are provided by the Solar-B data-providing system.

□ **Calibration data**

- Calibration data are made from Level-0 data, pointing data of Solar-B, pre-launch test data, appropriatesome spectrum synthesis models, etc.
- The data are used to derivefor calibration of photon intensity, spectral line wavelength, etc., and for attitude determinationderivation of accurate pointing information..
- The format of calibration data is the same as that of Level-0.
- Calibration data are also provided by the Solar-B data-providing system.
- When calibration data are revised, the instrument team should announce the revision using the homepage of Solar-B, e-mail, etc.

□ **Level-1 data**

- Level-1 data are made from Level-0 and Calibration data using software of the SSW/SOLAR-B package.
- Level-1 data areis fully calibrated and haveincludes the headers. The header of Level-1 includes the contents of Level-0 header, the coordinates on the sun, information of the calibration data, etc.
- The format of level-1 data is standard FITS (TBD).
- The data are not provided by the Solar-B data providing system.

コメント [TW9]: 肯定文にしたいのですが…

□ **Level-2 Data**

- Level-2 data are made from Level-1 data.
- Level-2 data are in physical unitsquantities, and consist of files such as longitudinal magnetogram, Dopplergram, vector magnetogram, filling factor, B vector, etc.
- The format of Level-2 is the same as the Level-1.
- The level-2 data haveinclude the headers that includes the Level-1 headers and additional information about the derivation.
- Level-2 data areis compressed by loss-less compression methods.
- Level-2 data which are standard data products made by the instrument teams They are also provided by the Solar-B data-providing system. AdditionalSome

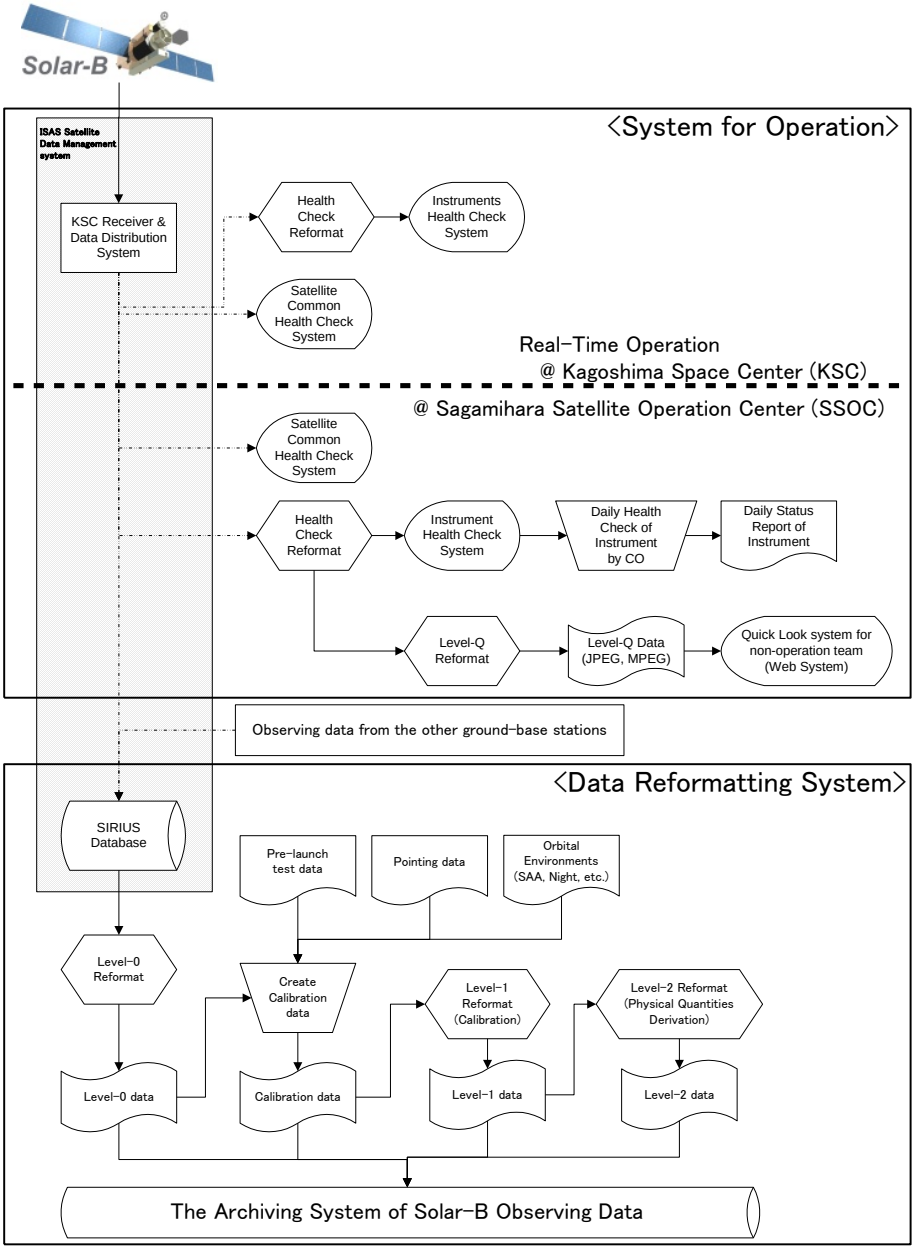
~~other~~ Level-2 data volunteered~~made~~ by the team members and submitted to the archive may also be provided in the same~~this~~ way.

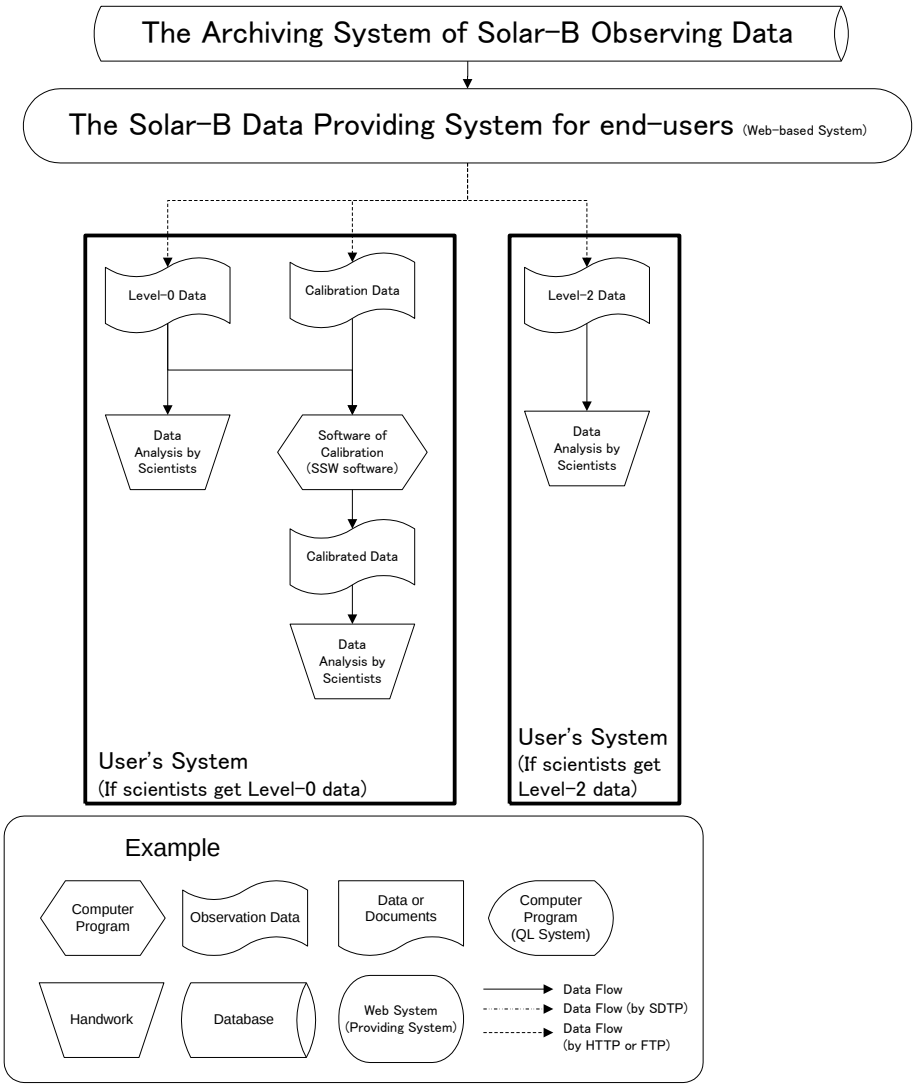
The suggestion from XRT team.

Level – 2 meta data: Combinations of Solar B level - 1 data sets, mission objectives and external (e.g. GOES) data in a variety of formats (data bases linked to data archive, html ...).

- **Level-Q data**
  - Level-Q data are made from Health check data or Level-0 data.
  - Level-Q data are made for monitoring the health and status of the instruments and for reporting the status of Solar-B observations to other satellites and ground-based observatories.
  - The data are accessible via the Solar-B homepage after every KSC contact, immediately and automatically.
  - Examples of Level-Q data are
    - ✓ Status data of S/C and the instruments (text and plots)
    - ✓ Snapshot images (and movies) observed with SOT filtergraph.
    - ✓ Magnetograms are made from the SOT filtergrams
    - ✓ Snapshot images (and movies) observed with XRT
    - ✓ Images observed with EIS (using several main lines)
    - ✓ Atlases of spectra observed with EIS.
  - The format of the data is PNG, JPEG or MPEG.
  - On~~In~~ the Solar-B homepage, the future schedule of ~~the~~ observations (target region, observing table descriptions, etc.) is also given.

4.3. The flowchart of the Solar-B data processing





Open Item

- Is there enough bandwidth between SIRIUS-ISAS and the ground stations to transfer the Solar-B data efficiently? SIRIUS – KSC is OK.

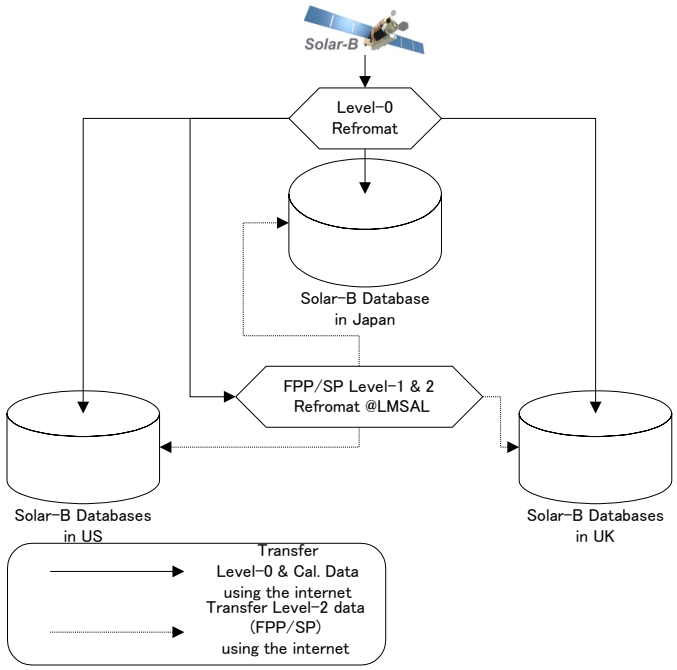
4.4. The Archiving System of Solar-B data

- The master database, containing (Level-0, 2, Q and Calibration data) are constructed in made at ISAS.
- The Solar-B data archiving system use the resources of the ISAS-DARTS system (http://www.darts.isas.ac.jp/). The purpose of the DARTS system is to archive data and distribute ISAS space science data obtained via ISAS spacecrafts. The DARTS system is accessible from everywhere by using through web browsers.
- The DARTS system provides only hardware (e.g., HD, Server) and some software (e.g., Oracle) for the archiving and providing systems. The mission specific system needs to be provided by the Solar-B team.

4.5. The Solar-B data-providing system for the main Solar-B sites at UK and US

We will make the copies of the Solar-B database at several institutes, for example, NAO in Japan, LMSAL, SAO, NRL, GSFC in US and MSSL in UK. However, we will be not able to copy the full database (include Level-0, 1, 2, Q, cal. data) using the Internet. The origin of the problem is the bandwidth of the inter-country network (Japan-US, Japan-UK, US-UK). In the current status, the bandwidth of the network is not enough to transfer Level-1 data. And the bandwidth of the inter-country networks does not grow like the Moore's law. If we use the DVD-ROM or CD-ROM for the data transferring of Level-1 data, the delay between Japan – US, UK could be several months from the observation (in YOHKOH case), which is too long.

In the Solar-B project, level-1 data will be not archived and provided using Solar-B providing system since the calibration data could will be revised during initial phases. Hence, we transfer only level-0, Q data and Calibration data using the Internet from Japan to US and UK. However, the vector magnetograms and associated Level-2 data have to be provided by the Solar-B team since the calibration and Stokes parameter inversions are complicated. These Level-2 data will be provided from LMSAL (the manufacturdeveloper of FPP) to Japan, UK and other US sites using the Internet since the size is less than 1/10 of that of original Level-0 spectropolarimeter data.



4.6. The Solar-B data-providing and searching system for end-users

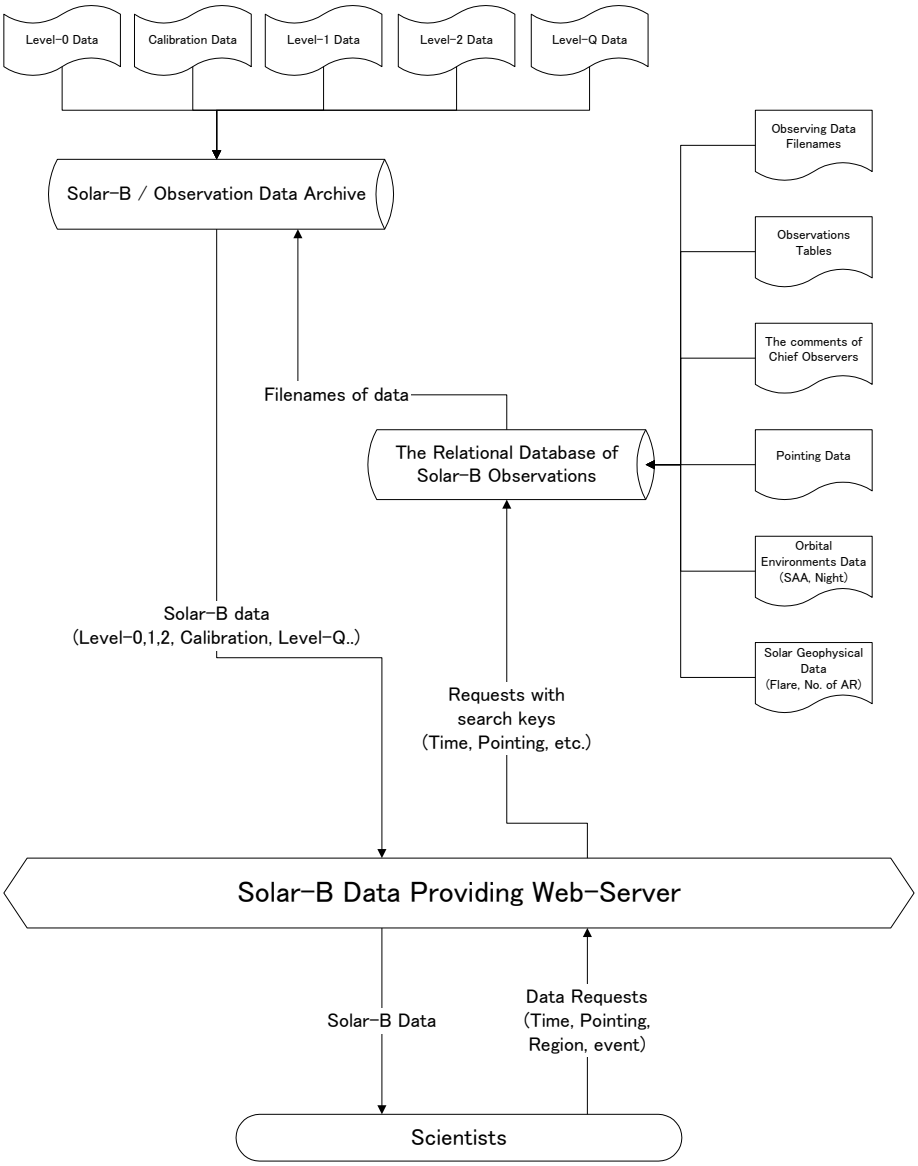
- A data-searching system is required for efficient data analysis. The system uses relational database software (ex. Oracle, PostgresSQL). The following figure is a plan of the Solar-B data-searching and providing system based on the relational database and the web system

  Open Item

  If we use the Oracle system, we need a full-time Oracle system administrator at least 1st year or two and a trained Oracle programmer.

- The software must support a GUI interface to the database for end-users. Users must be able to design queries to the database with the results viewable on screen and optionally printable. The user interface should access Level-Q data. [EIS team suggestion: The software support IDL GUI interfaces.]

Solar-B Data Searching and Providing System for end-users (Scientists)



- The data distribution and searching systems of Solar-B are located at several sites including ISAS, USA and UK. The data of the relational database are mirrored using the Internet every day (the observing data are not mirrored using Internet).

4.7. Software required for Solar-B data processing

- Level-0 reformat software (IDL > TBD format)
  - The Solar-B software developing team makes the software
  - The file format and header contents (not only Leve-0 but also Level-1 and 2) are designed and managed by the Solar-B team.
- Level-1 reformat software (calibration)
  - Each instrument team provides the software for calibration.
- Level-2 software (derivation of physical quantities)
  - Each instrument team provides the software for derivations.
- Level-Q reformat software (Images and movies for Quick Look)
  - The Solar-B software developing team makes the software
  - The experiences of Yohkoh/SXT, SOHO and TRACE are very useful for the Level-Q reformat and web system.
- Data-providing and searching system
  - The system is ~~made based~~ on the web server system and a~~the~~ relational database system.
  - S~~There is a s~~oftware packages for management of the relational database are available (e.g., Oracle, mySQL, PostgresSQL, IDL-DB [UIT]).
  - The web interfaces (User-DB) are important.
  - The search keys are based on the contents of FITS headers.
  - The system will be compatible if possible with the Virtual Solar Observatory and European Grid for Solar Observations, or their successors
- Data analysis software
  - Common parts of the data analysis software (ex. I/O of Level-0, 1 and -2) are made by the Solar-B software developing team.
  - The SSW package is used for the development of the Solar-B data analysis software.
  - Software that is closely related to the instruments (calibration, inversion, line fitting, etc.) is provided by the instruments teams.
  - Solar-B data analysis software will become part of the SSW package, open to

コメント [TW10]: 何に？

the public.

- ✧ The Solar-B team prepares the guidebook for Solar-B data analysis, which is similar to YAG (Yohkoh Analysis Guide).
- ✧ Who are the software developing team of Solar-B?