

Software workshop (TaskA-WP03)

Potsdam (Germany), 9-11 Jan. 2002

Started with the welcome and practical information by F. Scherbaum.

P-Y. Bard made a short introduction and a summary of the up to date status of the whole project and he reminded to all partners this year's deliverables.

K. Atakan presented the agenda of the meeting (agenda attached App. 1).

Although this meeting was devoted to WP03- H/V software, array processing software discussions were included due to common issues involved. However, the detailed discussions were done in two separate groups. The minutes of the Array measurement software discussions will be sent in a separate e-mail by M. Ohrnberger.

We identified the Users and the Developers in the group. Out of 22 participants only four were identified as users and the rest as developers.

I Partners attending the meeting

Pierre-Yves Bard, Sylvette Bonnefoy, Bertrand Guillier,	UJF - Grenoble
Anne-Marie Duval,	CETE - Nice
Kuvvet Atakan, Jens Havskov,	UiB - Bergen
Paula Tevez-Costa,	ICTE - Lisbon
Nikos Theodulidis, Alekos Salvvaiddis,	ITSAK – Thessaloniki
Alberto Tento	CNR - Milano
Donat Faeh, Fortunat Kind,	ETHZ - Zürich
Giovanna Cultrera, Antonio Rovelli, Guiseppa di Giulio	INGV – Roma
Denis Jongmans, Marc Wathelet	Ulg - Liège
Peter Moczo, Lucia Fojtikova	GPISAS - Bratislava
Frank Scherbaum, Matthias Ohrnberger, Gerd Haertel	UP - Postdam

II Scientific matters

II.1 Presentations of the existing processing Software

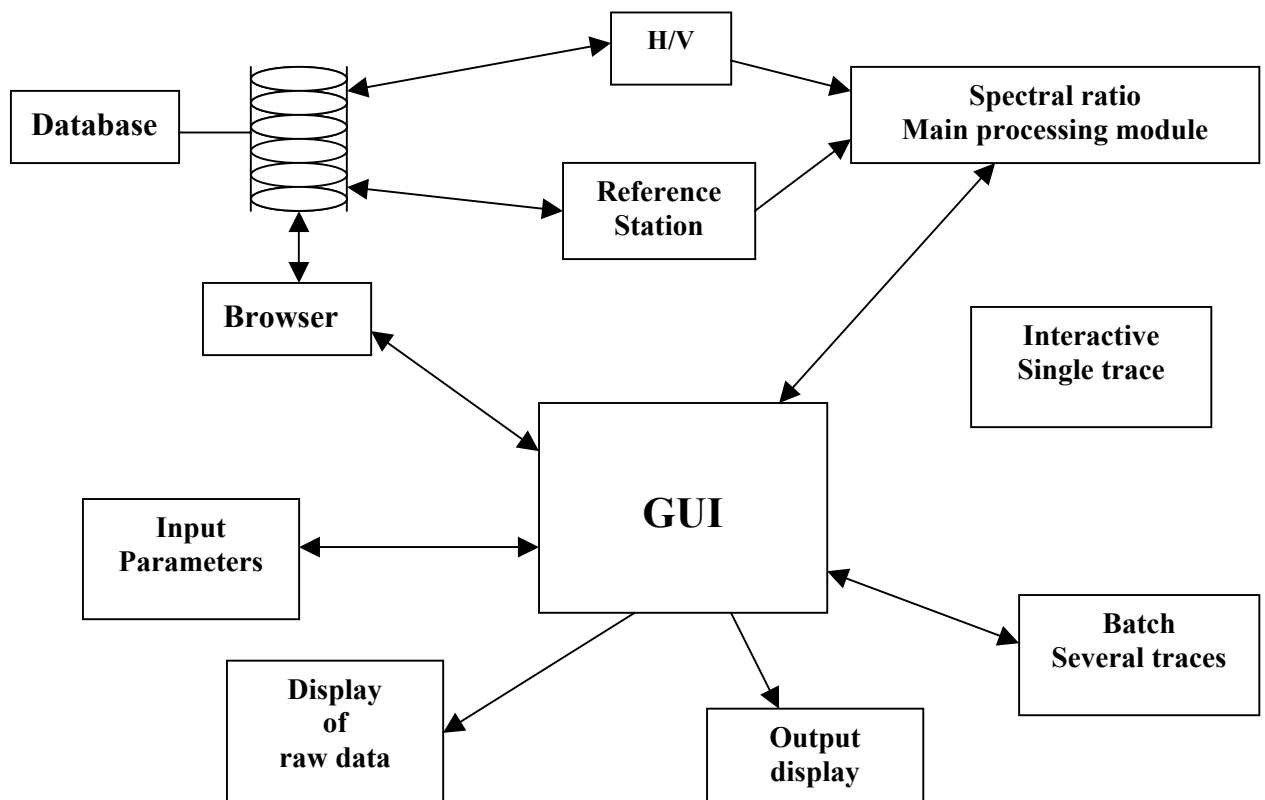
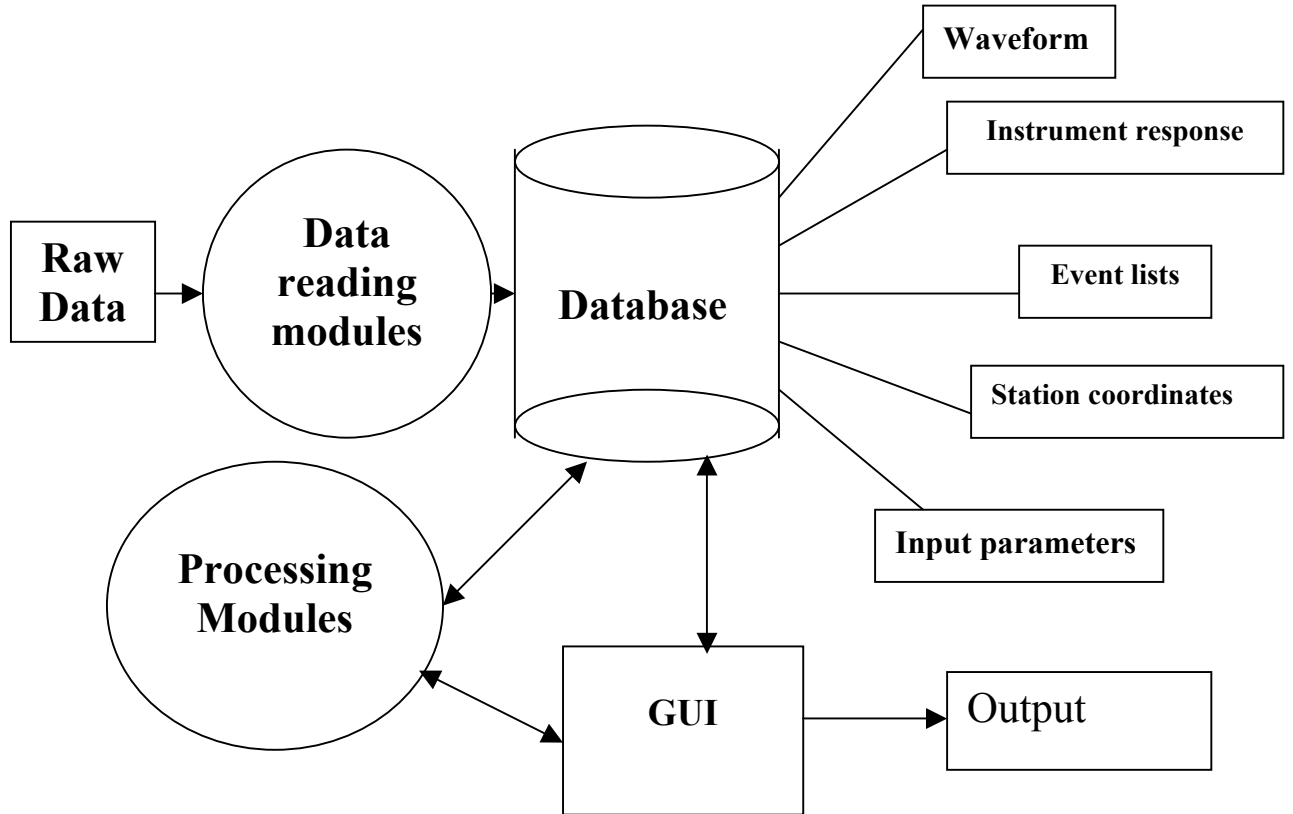
Ten groups have presented their (H/V) processing software and results from a common data set that was sent earlier by N. Theodulidis. In a separate e-mail the summary of each of these presentations as well as the synthesis of the results will be sent. The presentations were done in the following order:

1. Matthias Ohrnberger (UP - Potsdam) Array Technique presentation
2. Jens Havskov (UiB - Bergen) H/V ratio presentation
3. Nikos Theodulidis (ITSAK – Thessaloniki) Common data set sent & H/V ratio presentation
4. Pierre-Yves Bard (UJF & LCPC – Grenoble) H/V ratio presentation
5. Donat Fah and Fortunat Kind (ETH – Zurich) H/V ratio presentation & Array Technique presentation
6. Anne-Marie Duval (CETE – Nice) H/V ratio presentation
7. Paula Tevez-Costa (ICTE/UL – Lisbon) H/V ratio presentation
8. Giovanna Cultrera (INGV –Rome) H/V ratio presentation
9. Alberto Tento (CNR – Milano) H/V ratio presentation
10. Bertrand Guillier (IRD – Grenoble) H/V ratio presentation

II.2 Discussion and Preliminary Decisions

In order to facilitate the discussion Kuvvet Atakan presented the following diagram as a basis:

Basic structure of the SESAME Software



Separate / Common Software: First point of discussion was whether the Consortium preferred a common software tool for both (H/V) and Array Technique. We decided that there is no need to merge these two software tools and therefore the development will be separately done. In addition, we discussed the possibility of including a reference station processing technique but based on the project objectives the software development will be dedicated only to H/V and Array Technique.

Platform: We started the discussion for Platforms. Platform independence was found to be important and therefore we decided to develop the new software with a language which is Platform independent.

Database: Database structure will be based on individual files and therefore a simple directory structure is sufficient. A more complex relational database structure was considered to be unnecessary for this application and too complicated to implement.

The database will include the following type of files:

- The waveforms
- Instrument response
- List of Events
- Station/Site coordinates
- Input parameters
- Experimental Conditions

The format of all these files will be based on simple ASCII format to be defined by the developers except for the waveform format. The latter is discussed below under the data reading modules.

Data Reading Modules: The data entry to the database requires a common format(s) and therefore a discussion of different possible formats for waveforms started. Main points to be taken into account were flexibility and ability of being able to incorporate data from a variety of recording instruments available. A number of formats were suggested, among them, GSE(ASCII), SAC, SEISAN and a simple ASCII.

After long discussion GSE(ASCII) format was accepted as the main common format for the waveforms. It was also decided that a simple SESAME(ASCII) format will be created for this purpose. This implies that the end-user is responsible of converting the waveforms from its own instrument to anyone of the two aforementioned formats. In fact, two alternative solutions for data reading were proposed: (a) keeping the original data in its recording format and reading directly (this implies that all the reading routines for a large variety of recording formats have to be included in the new software) and (b) providing a large number of conversion codes - to a common format - within the software tool. Both alternatives were not considered feasible due to the complexity of reading/converting all existing variety of formats coming from different recordings (as well as the new ones manufactured in the future?).

Therefore it has been decided to not include conversion routines into the software package.

Window Selection Module (is not included in the original diagram above): From a number of selected files the processing will be conducted on some selected windows. For this purpose this new module is introduced between the main processing modules and the database.

Output from this module is individual sets of windows following optional selection criteria. The options are:

Manual selection

Automatic selection

- Anti-trigger algorithm
- Frequency-Time analysis
- High-pass filtering

Main Processing Modules: Main processing modules decided to be developed in FORTRAN90.

1. FFT (including tapering)
2. Instrument response
3. Smoothing with the following options
 - Konno & Ochmachi
 - Moving average
 - Linear
 - Triangle window
4. Merging two horizontal components with the following options

- No merging
 - Arithmetic mean
 - Geometric mean
 - Quadratic mean
 - Complex merging
5. Spectral ratio
 6. Average of several (H/V) ratios
 7. Error estimates on spectral ratios

Graphical User Interface (GUI) functionalities. We discussed the functionalities and possibilities of different languages for this module. The following were proposed: JAVA, QT, DELPHI & KYLIX, MATLAB.

JAVA was finally selected (this decision was taken on the next day).

Output

There are the following two types of output:

A. Numerical Output

1. Logg files
2. Used parameters
3. Individual spectra
4. (H/V) ratios
 - individual (per window)
 - component N-S
 - component E-W
 - merged comp.
 - average of several windows (with plus/minus deviation)
 - component N-S
 - component E-W
 - merged comp.
5. Spectral amplitude (mean with plus/minus deviation)
6. Selected peak/frequency/amplification values
7. Simple "end-user" file
8. Error file

B. Graphical Output

1. Used parameters
2. Waveforms (with chosen windows)
3. Individual spectra
4. (H/V) ratios
 - individual (per window)
 - component N-S
 - component E-W
 - merged comp.
 - average of several windows (with plus/minus deviation)
 - component N-S
 - component E-W
 - merged comp.

II.3 Distribution of responsibilities of the various modules

It was decided that all graphics will be done by JAVA and all the rest in FORTRAN90.

1. GUI →UiB
2. Window Selection →LGIT (in cooperation with INGV, GPISAS & ETH (F-T analysis))
3. Main processing Modules → CNR
 - FFT→UiB
 - Instrument response →UiB

- Smoothing
- Merging
- Spectral ratio
- Average spectral ratio
- Error Estimates
- 4. Output → ICTE/UL (in cooperation with UiB)
- 5. Browser → UiB

→ ETH

The performance of the preliminary version of the software will be tested → INGV (in cooperation with LGIT, Resonance, CETE/Nice).

The input parameter file will be prepared by → CETE/Nice and should include the following:

- frequency range of interest
- min. window length (automatically determined)
- window length for manual picking
- smoothing options/ parameters
 - Konno & Ohmachi
 - Moving average
 - Linear
 - Triangle window
- type of window selection
 - manual
 - automatic (additional parameters required here)
- merging options/parameters for merging
 - arithmetic
 - geometric
 - quadratic
 - no merge
- window tapering
- instrument response parameters (if used)
 - displacement
 - velocity
 - acceleration
- spectral ratio parameters
- averaging of several traces
- error estimates on spectral ratios
- output graphical options
- automatic picking
- F-T analysis (yes/no/both)

A preliminary list of input parameters is already prepared as follows:

File # 1:

Not yet specified

File # 2

comes from: output of the window definition- input for process)

filename start time end time id NS id EW idV

each line = one window

File # 3 (Input parameter file for Main processing Module)

parameter file (input parameter for processing) comes from the browser of the parameter definition interface.

This parameter file should be saved and called when choosing parameter for a new analysis.

one line for each parameter keyword : value

: means comments

average files section

type= all, individual

file_average : type

window selection section

type= manual, automatic(antitrigger), automatic (Donat Faeh), polarization (Frank Scherbaum)

```

selection_type : type
..... ##parameters of each window selection

## smoothing section
# linear : width(Hz) : shape
# konno-Ohmachi : value1 : value2
# logarithmic : percentage : shape
# moving average : value
smooth : type : values

## taper section
taper : shape : percentage

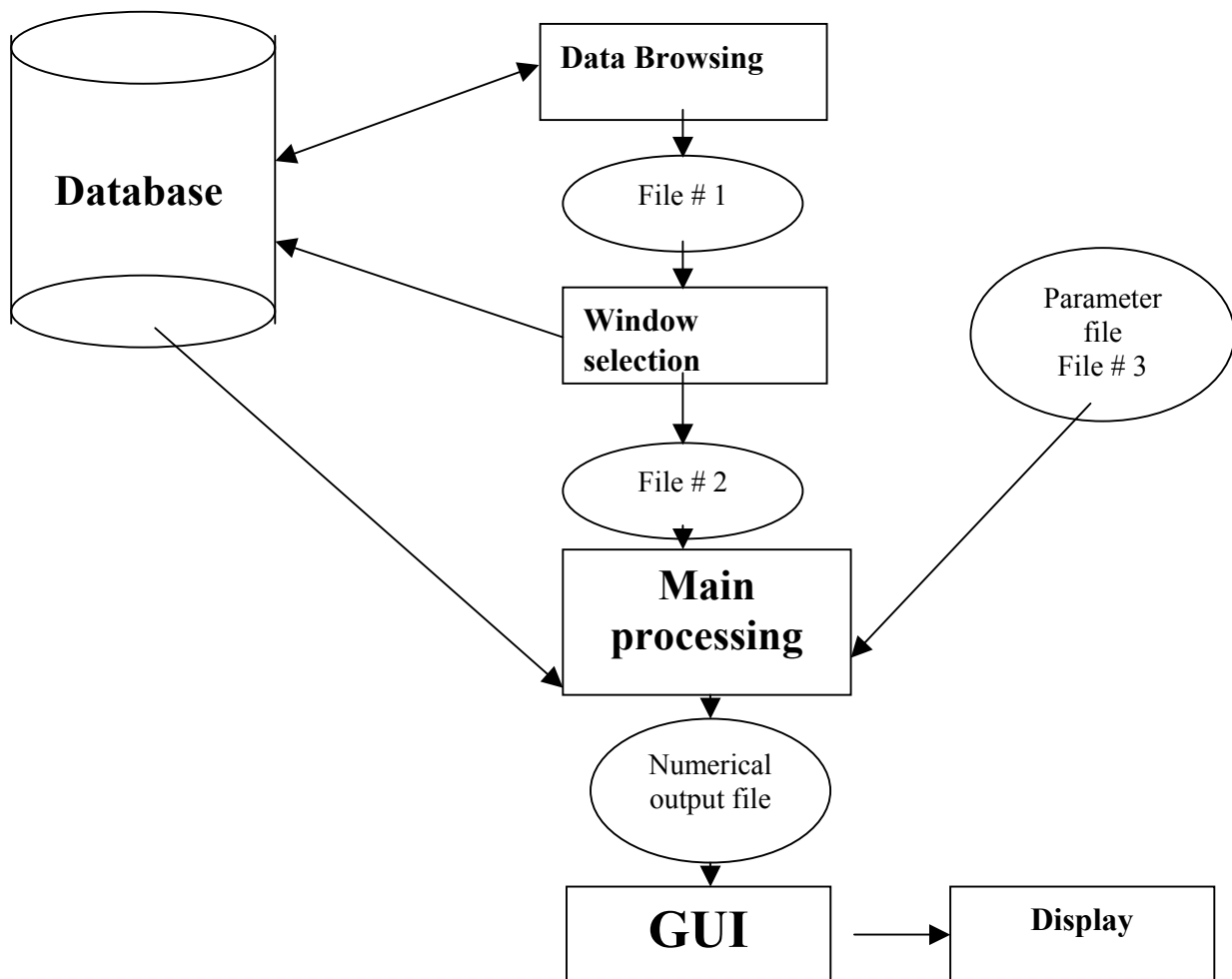
## merging section
# type= no_merging, arithmetic, geometric, quadratic
merge_type : type

## average section
# type= linear_mean, linear_median, logarithmic
average_type : type

## instrumental correction
# type = yes, no
instrument_resp : type

## output graphical options
    
```

Procedure to be followed for processing:



File # 1:

-filename list

File # 2:

filename	Time window
# 1	Wind #1
#2	Wind #2
...

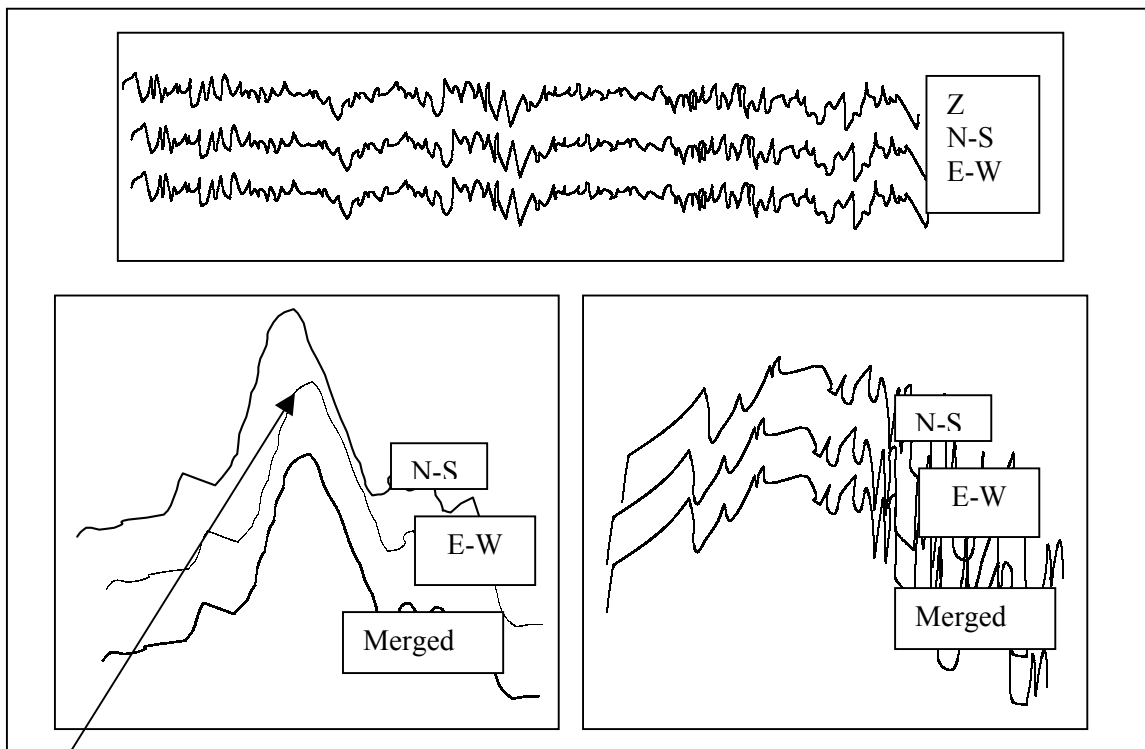
Numerical output files:

- logg file
 - copy of the parameter file
 - windows filename
- spectra
 - individual window
 - average spectra for overall window
- H/V ratio
 - Each horizontal
 - Merged comp.
- H/V average
- Waveform with selected windows (from window selection module)

Graphical display:

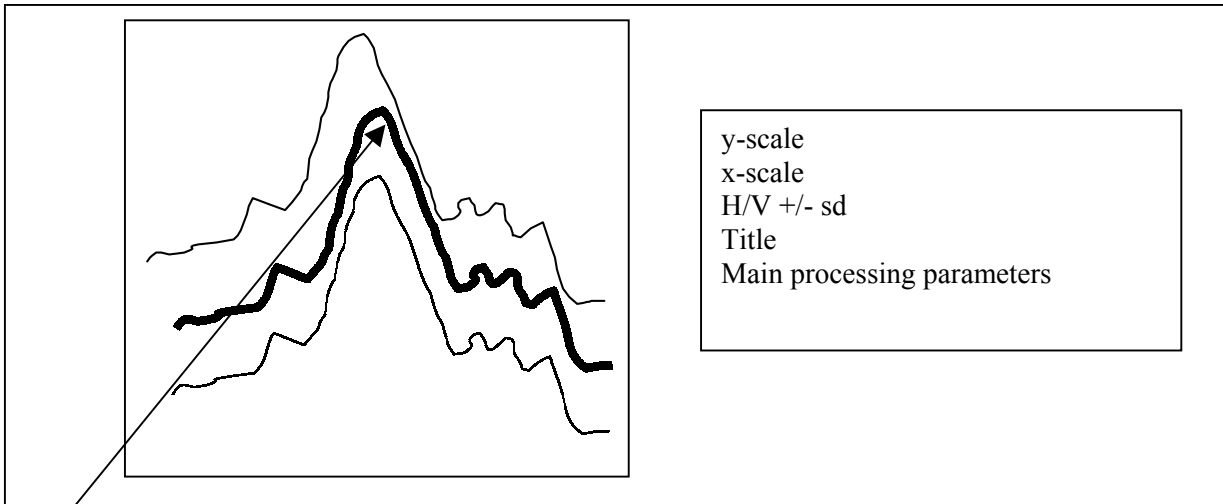
- Logg trace file
- Input files
- Output files
- Waveform files

Example of a display with single H/V ratios and spectra:



Interactive picking of peaks on the above diagram

Example of a display window for average H/V ratio:



Interactive picking of peaks on the above diagram

In addition three more topics of discussion were:

- Parameter reading module (to be developed by ?)
- On-line help functions (each group who is responsible on the different modules will provide the necessary text description of the module and these will be integrated to the software in some way)
- Software copyrights (disclaimer; gnu-gpl public licence, public-domain both executable and the code)

Presentation by F.Scherbaum (Friday 11 Friday, 11th January 2002) of the Java application for his tutorial. Many of the display modules in this package can be used for the new software as well. This will be utilized.

III Others

- ➡ **Next meeting - in Nice (April 2002):** (during EGS):

21-22	Instrument workshop final report
23-24	WP02 Experimental conditions
25	WP04 Data compilation
26-27	WP03 Software development
- | | | |
|--------------------------------|-------|---------------------------|
| in Rome (October 2002): | 23 | WP04 Empirical evaluation |
| | 24 | WP03 Software development |
| | 25-26 | General SESAME meeting |

➡ **Important note !!!** Bratislava workshop date is shifted to 22-24 Sept.2003

➡ The address of the preliminary web site for the SESAME project is:
http://www-lgit.obs.ujf-grenoble.fr/users/pgueg/SESAME/SeS_Main.html

➡ The logo of the project was voted among the three alternatives prepared by A-M.Duval and the following is chosen.

