Channel Ad-Hoc Task 3: Input /Output Parameters and Data Exchange Formats

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Outline

- The purpose of Task 3
- Example of data standardization
  - Matlab database from Cambridge Fiber Model
  - Usage examples
- Discussion….

Purpose of Task 3

- To support efficient evaluation of system performance at multiple levels of implementation detail,
  - as required by the task force,
  - by aiding the efficient exchange of data and parameters between various subtasks.

- To permit efficient cross-checking of results obtained from different measurements, tools and methodologies.

Why is this important?

- Our task force produces and consumes measurement and simulation data from a wide range of sources:
  - Simulators and software
    - Spreadsheets (Excel, OpenOffice, ….)
    - Commercial software applications (Matlab, Rsoft, Spice, …)
    - Proprietary software applications (Electromagnetic mode solvers, others)
  - Measurements
    - Oscilloscope files
    - Jitter analyzer output
    - ....
- In many cases, the output from one simulation or measurement forms the input to another piece of software.
- The task of aggregating and converting the data should ideally only be done ONCE!

And…

- It is also important that any relevant underlying assumptions and conditions of a measurement or simulation gets communicated effectively between producer and consumer.

- Example:
  - The back-to-back (B2B) pulse response of a particular fiber measurement.
  - The set of tx and rx filter responses being used.
  - Fiber lengths, attenuator settings, other relevant parameters.

Goal

- Two main objectives:

- To define the minimum set of data and parameters that are needed for a particular system performance evaluation.

- To aid in the conversion of data into needed formats, saving time and effort on the behalf of the other members of the task force.
  - Assist in making all the great data contributed by the task force members maximally useful for everyone.

Example: Database of Cambridge Data

- The 81 fiber model is a wonderful example of critical data which will be used by a large number of task force members.
- Much of such evaluation will take place in Matlab.
- The data consist of ~390 data files with fiber numbers and launch parameters encoded into the file names.
- Transform this dataset into a native Matlab database that can be loaded into Matlab in a single operation.
- Use a structure that permits the type of selection/access operations that benefits the simulation.

Example: Database of Cambridge Data

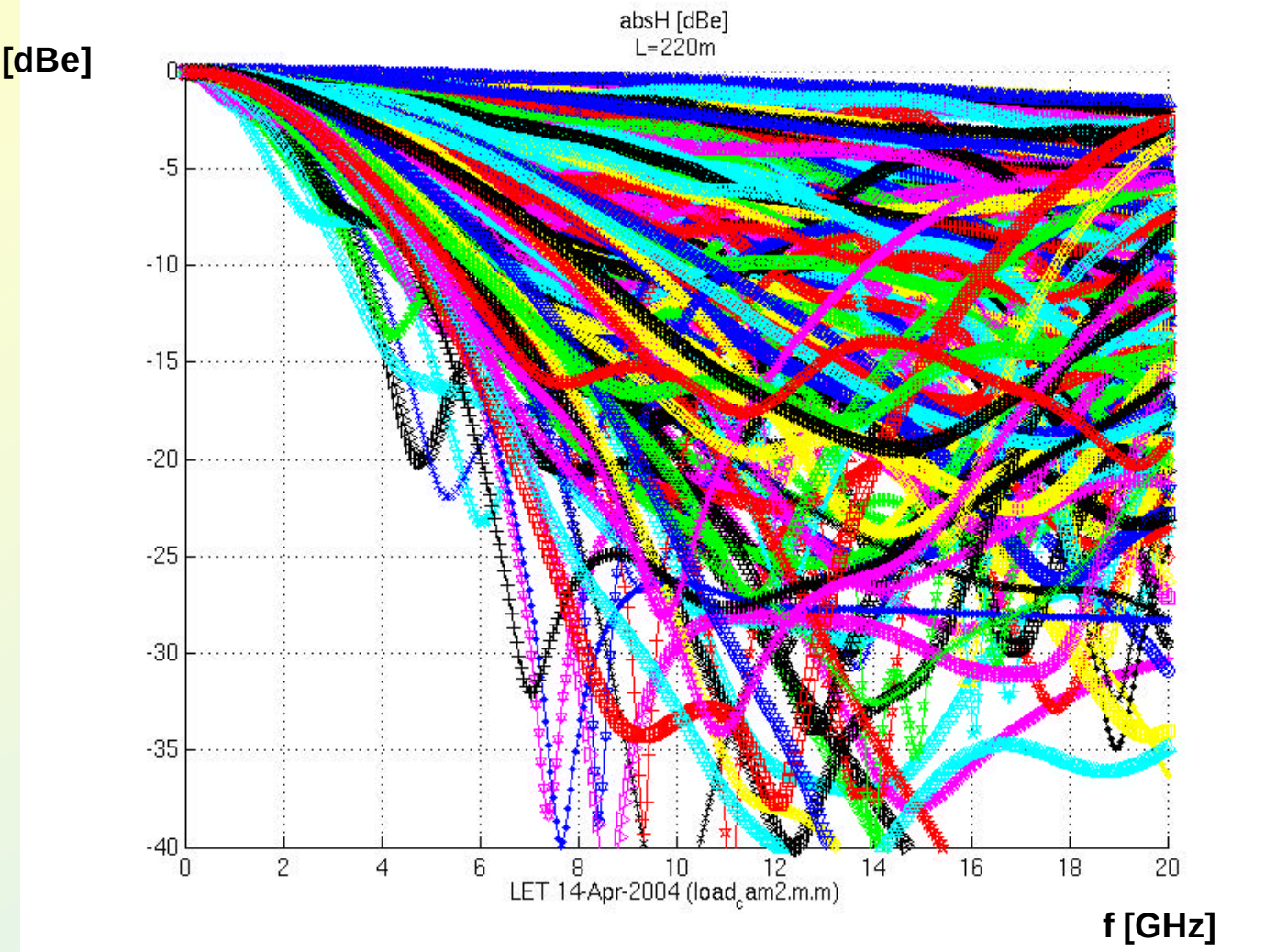
For each structure the following fields exist:

```
s{k}.fname         %original filename (if applicable)
s{k}.delayunit     %unit of the mode delays
s{k}.fibernumber   %original fiber number
s{k}.launchoffset %radial offset of the launch
s{k}.hmode         %rows of mode{number, delay, power}
s{k}.Hmode         %rows of freq/mag/phase
s{k}.length        %length used for Hmode calculation
```

Cambridge Database: Usage example

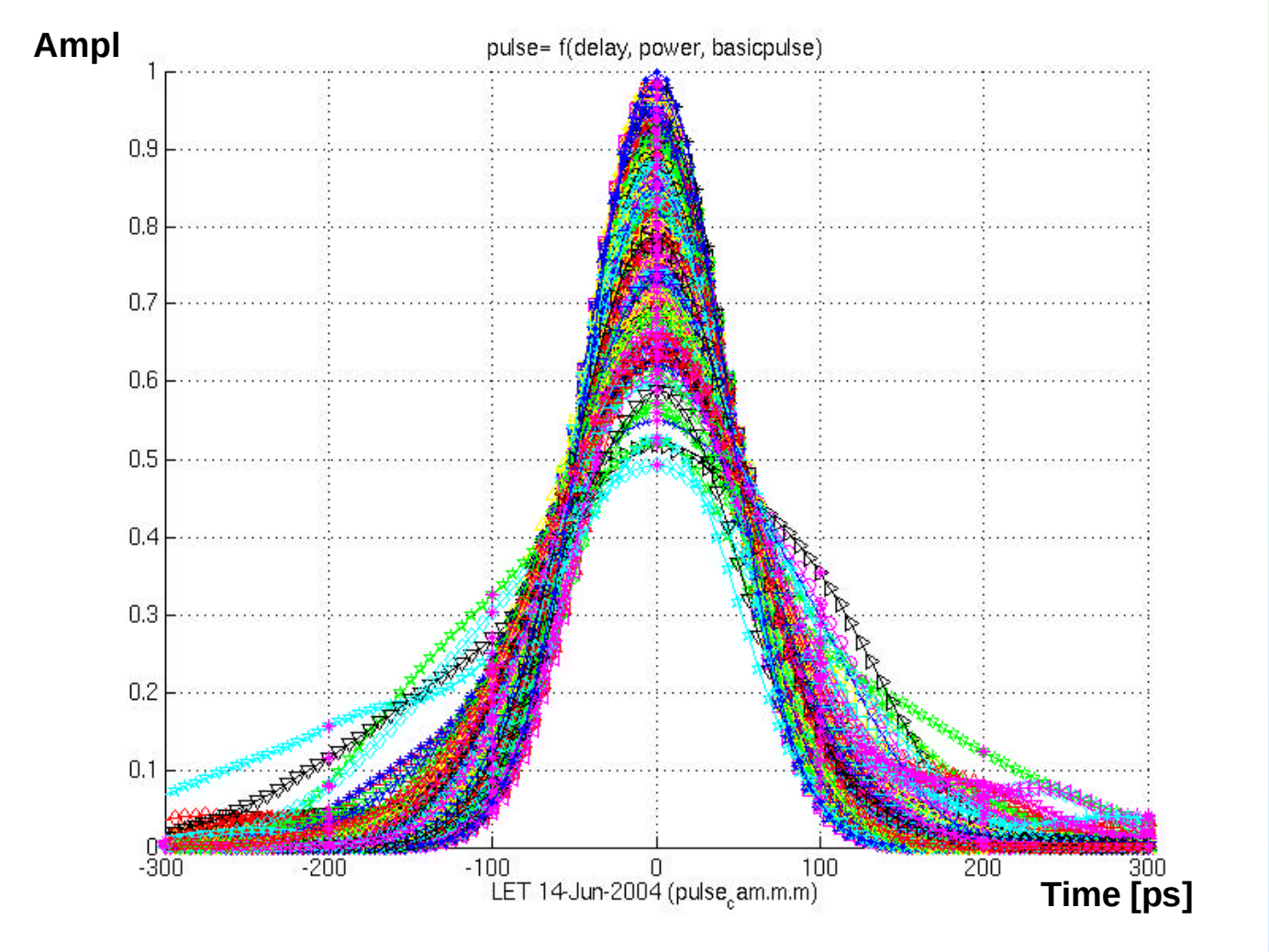
```
s= load('./data/CamMMF.all.1p0.mat'); % contains 195 fiber/launch records
>>s
s =
          s: {1x195 cell}
   …
   …
s= s.s;
>> display(s{162})
          fname: 'CamMMF1p0f54o23i.txt'
     delayunit: 'ps/m==ns/km, scaled down from ns/300m!!'
    fibernumber: 54
   launchoffset: 2.3000e-05
         length: 220
          hmode: [3x18 single]
          Hmode: [3x401 single]
for k= 1:length(s)
    hmode= s{k}.hmode;
    %do some per-fiber/launch calculations
    %etc
    %etc
end
```

Cambridge Model: Frequency Responses



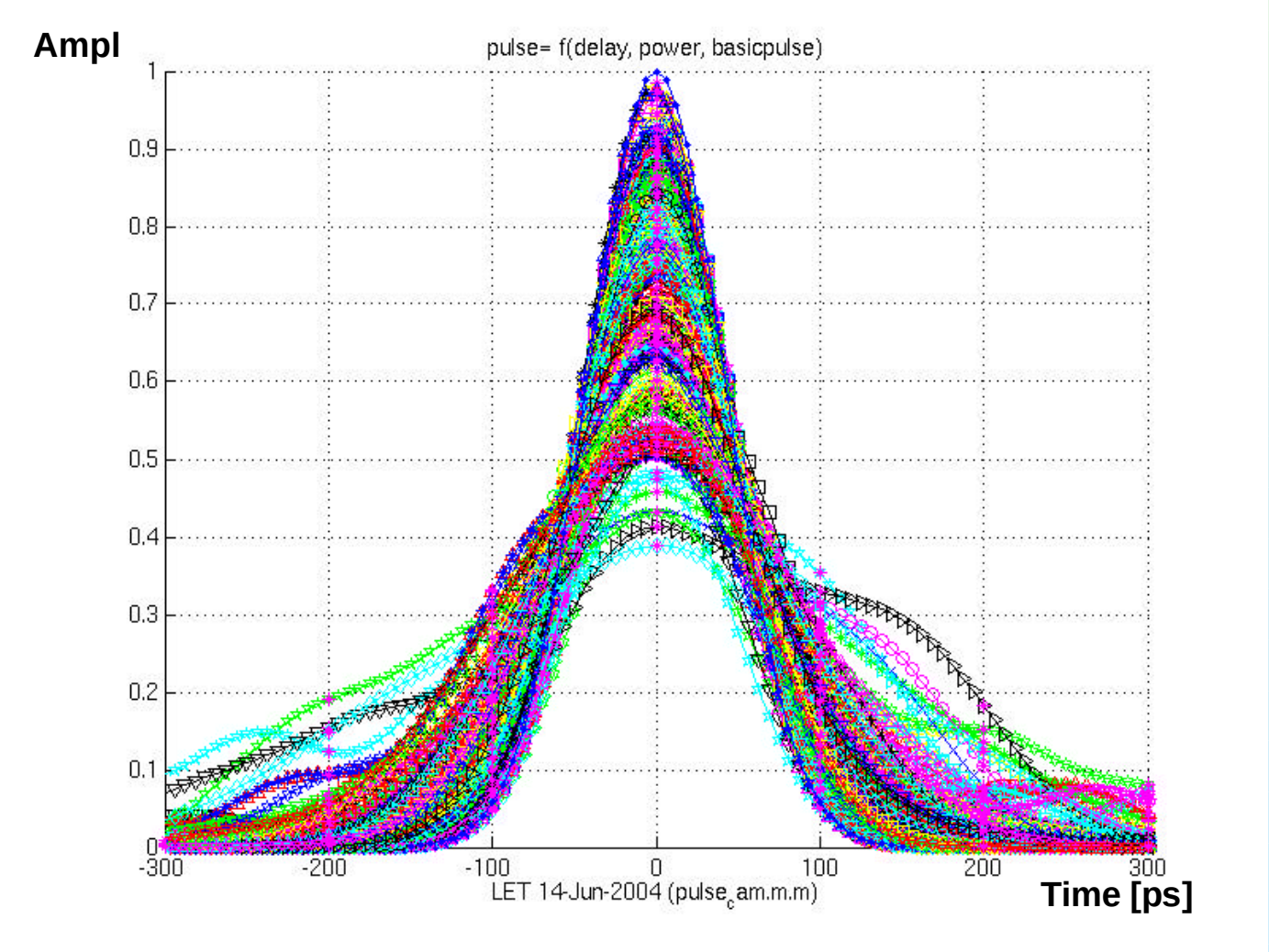
- Collection of Cambridge pulses, L=220m

Cambridge Fiber Model : Pulse responses



- Cambridge fibers, L=220m, Gaussian, pw50=100ps

Cambridge Fiber Model : Pulse responses



- Cambridge fibers, L=300m, Gaussian, pw50=100ps

Availability and Timeline

- Cambridge/Matlab database available from Jonathan Ingham, and presumably later from a non-IEEE website (due to copyrighted material).
  - CamMMF.all.1p0.mat, 912kB (matlab 7 only).
  - CamMMF.all.1p0.matlab6.mat, 1767kB.
- Additional activity is an ongoing effort driven by demand, contributions of data, and volunteer activity of the Task 3 members.
- Assistance is always welcome.

Discussion

- What additional parameters does the TF need?
  - Index profiles n(r)?
  - Mode fields E(r), E(r, phi)?
  - Not just Matlab, what else may be needed?
- The goal is completeness and simplification for all, within a reasonable amount of effort.
- Contributions are voluntary but very welcome
  - The intent is not to coerce anyone into parting with data they rather not submit, for whatever reasons.
  - E.g. mode fields data may not be included unless they are volunteered.