

# ROOT I/O IN JAVASCRIPT

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Reading ROOT files in a browser

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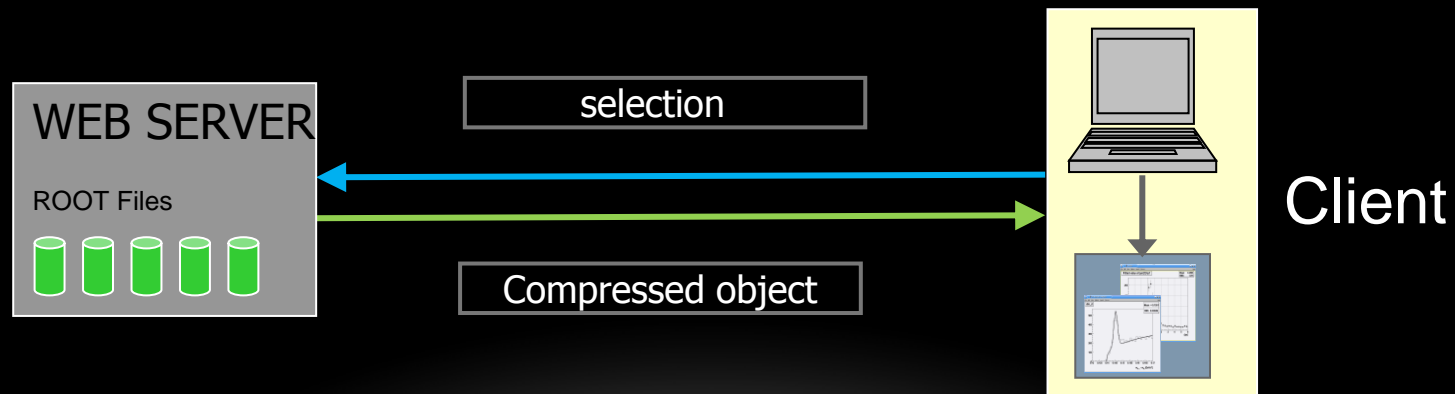
**B. Linev**, GSI, CS-EE

# JAVASCRIPT

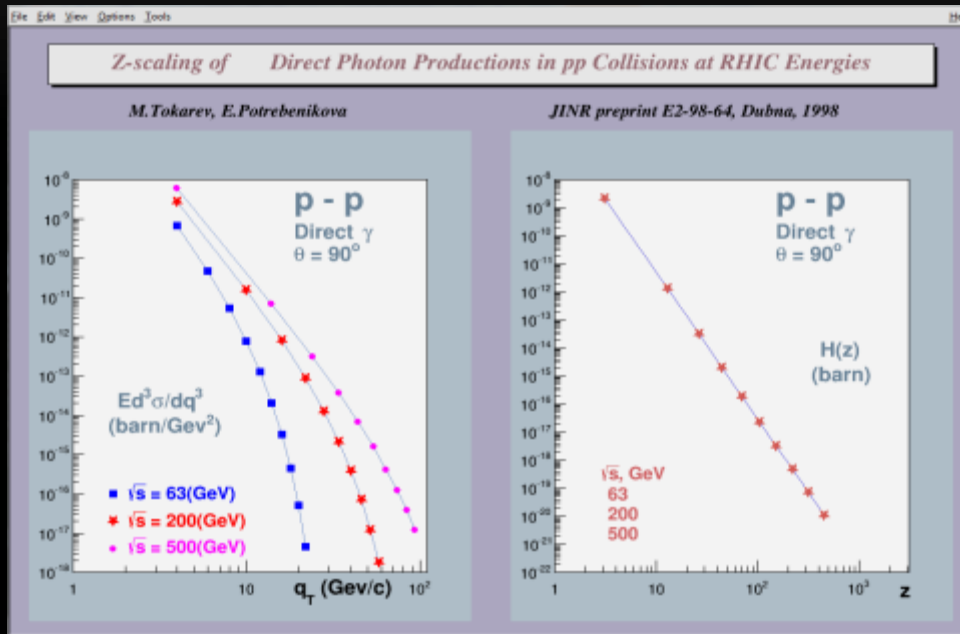
- One very nice feature of JavaScript is the possibility to dynamically (at runtime) create classes
- Allowed to implement dynamic streamers (automatically generated from the streamer info)
- Allows to potentially read any object from a ROOT file, as soon as we can read the streamer info of its class

# READING THE FILE

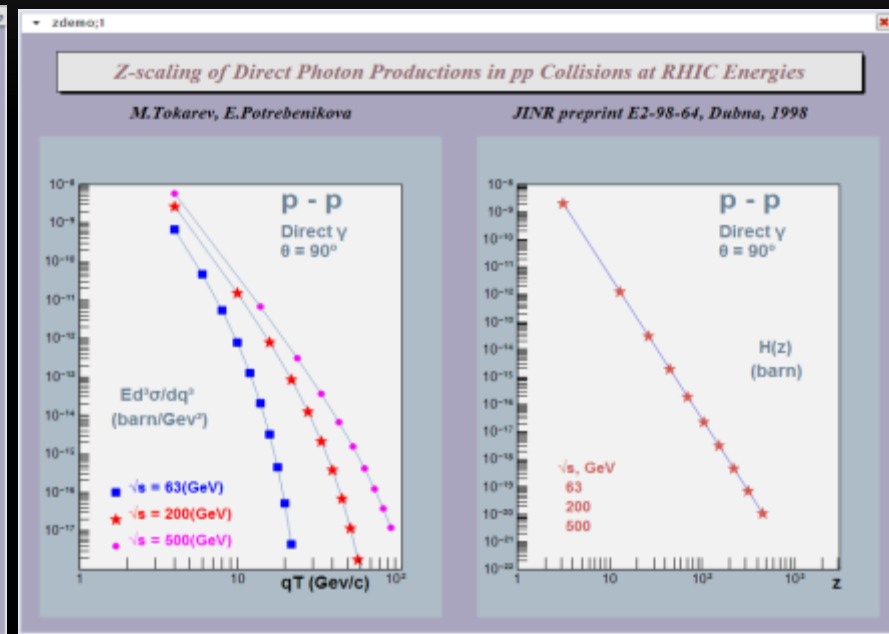
- Using HTTP byte range (available in HTTP/1.1) to download only a single compressed object when the user wants to read it
- Minimizes data transfer and memory usage
- Compressed (zipped) objects are in binary format



# DISPLAYING OBJECTS

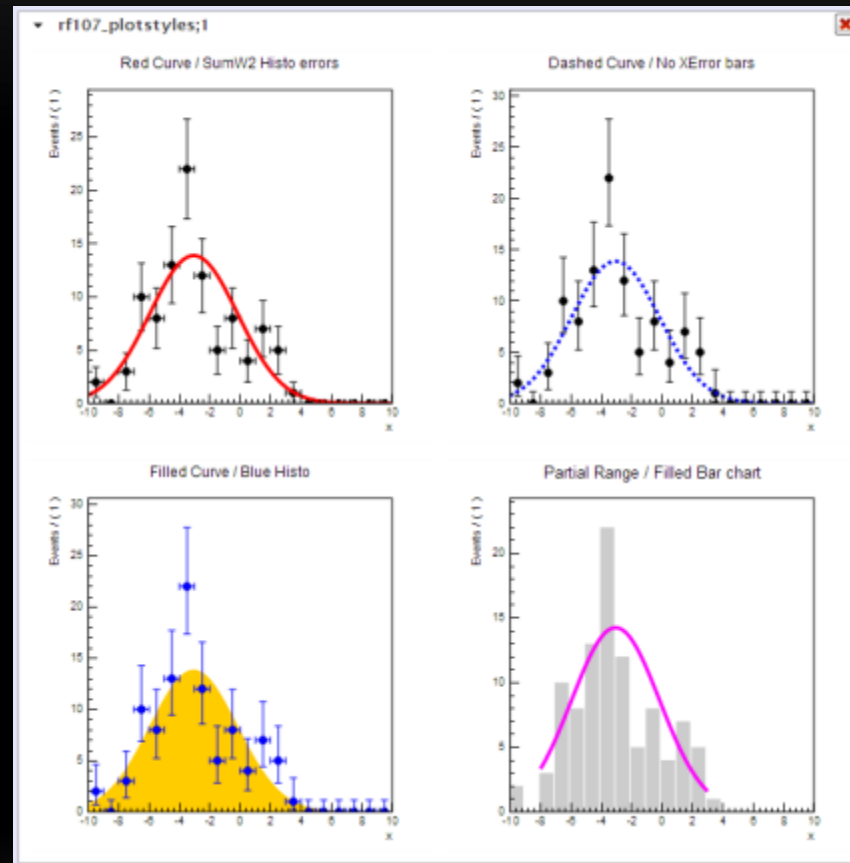


Original rendering (with ROOT)



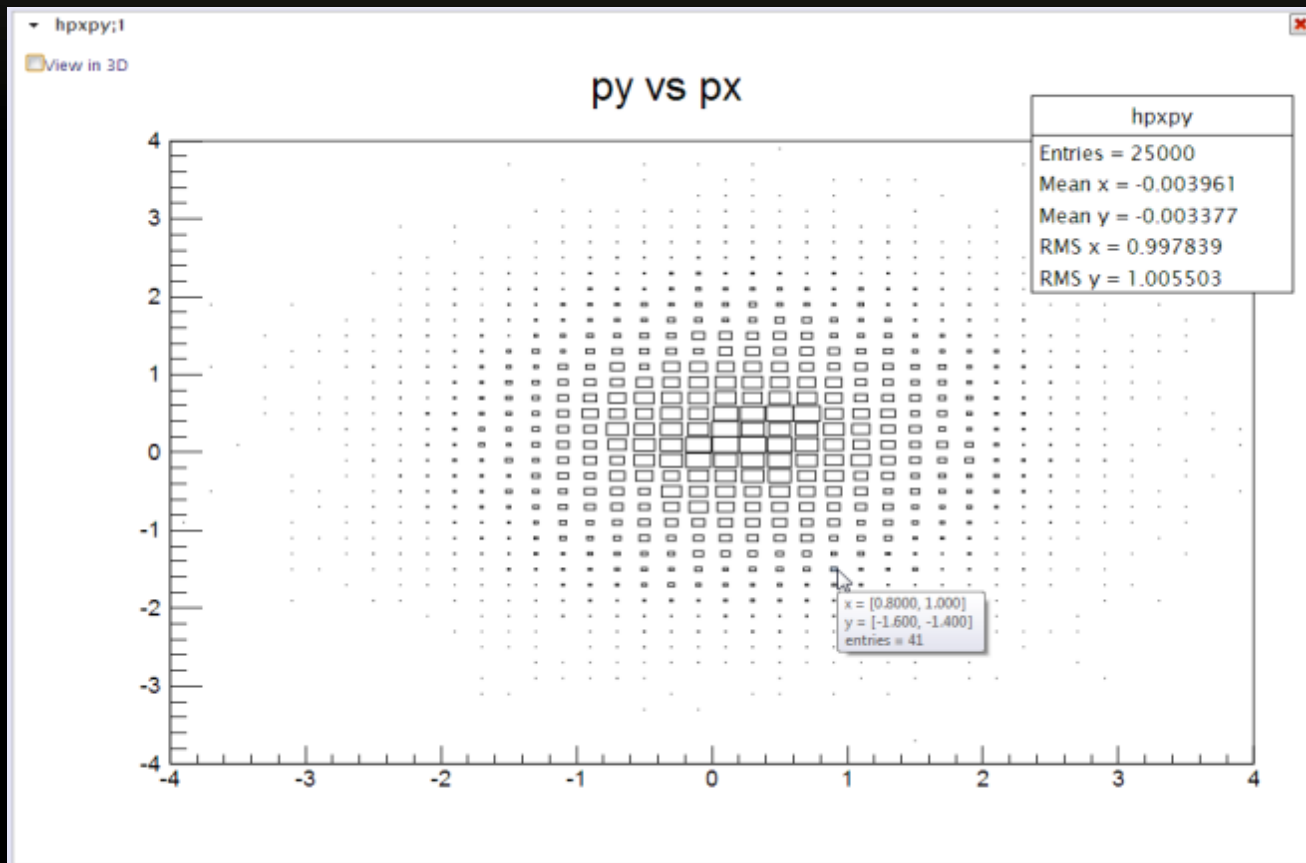
JavaScript rendering in a web browser:  
Same font, same color, same layout! Only minor differences...

# DISPLAYING OBJECTS (CONT.)



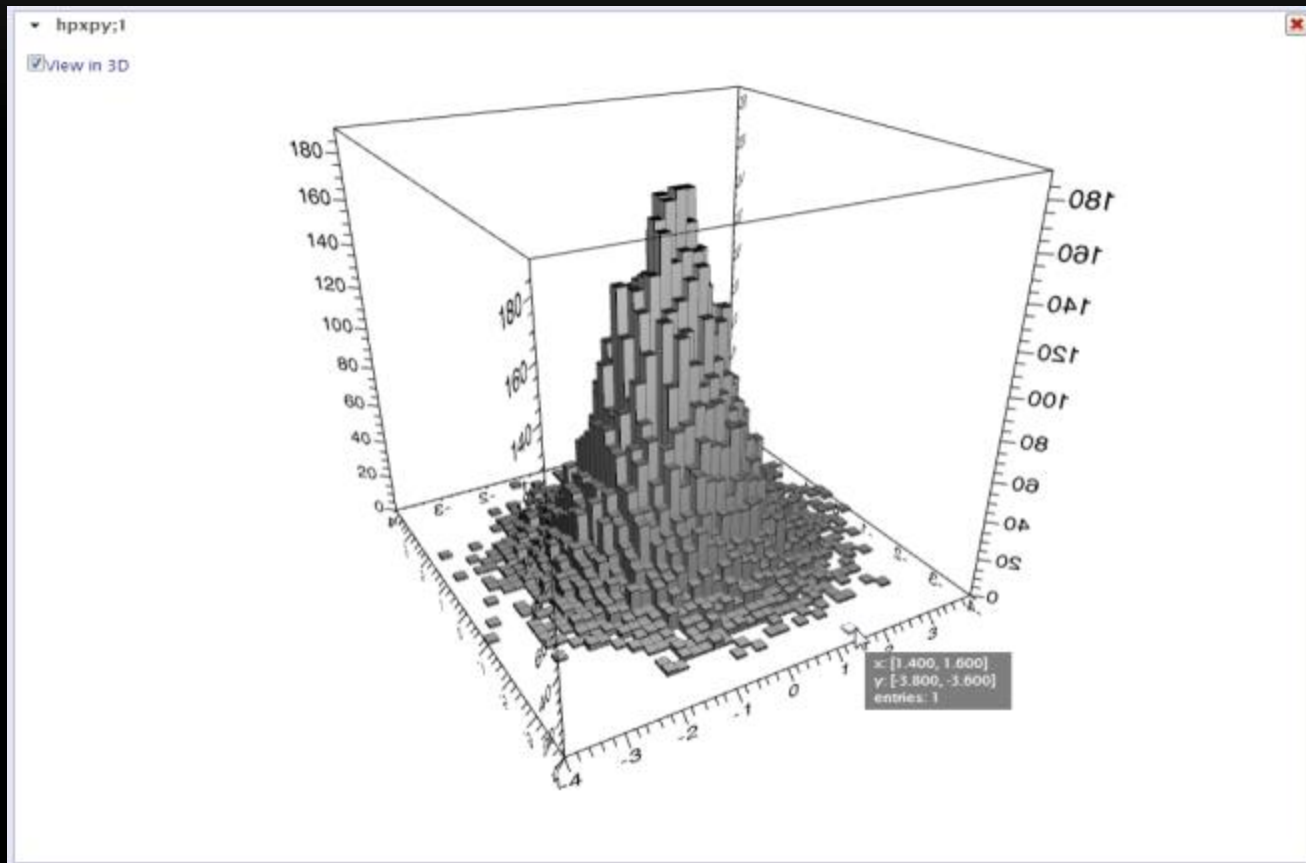
Example of roofit plot styles

# DISPLAYING OBJECTS (CONT.)



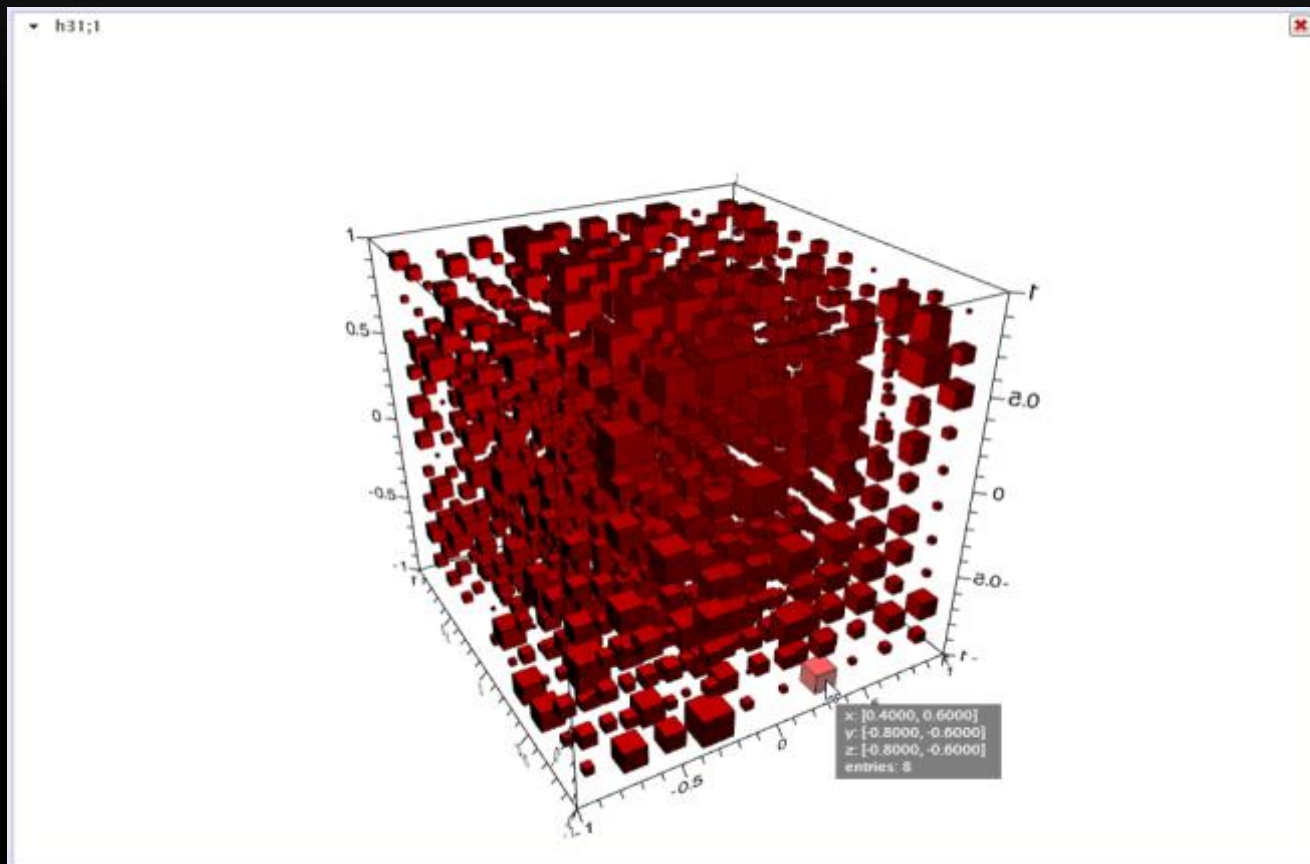
2D histogram (TH2), drawn with the BOX option (default)

# DISPLAYING OBJECTS (CONT.)



Same histogram, displayed with 3D option (“LEGO”), using WebGL (when available)

# DISPLAYING OBJECTS (CONT.)



3D Histogram (TH3), using WebGL (when available)



# HOW TO USE IT?

- Simply copy the ROOT file(s) anywhere on the web
- Create a simple html page next to the files
  - Only two lines have to be added in the <head>
  - And a few lines in the <body>. Here is a complete example:

```
<!DOCTYPE html>
<html>
  <head>
    <title>Read a ROOT file in Javascript (Demonstration)</title>
    <meta http-equiv="Content-type" content="text/html; charset=utf-8" />
    <link rel="stylesheet" type="text/css" href="http://root.cern.ch/js/style/JSRootInterface.css"/>
    <script type="text/javascript" src="http://root.cern.ch/js/scripts/JSRootInterface.js"></script>
  </head>
  <body onload="BuildSimpleGUI()">
    <div id="simpleGUI" files="file_1.root;file_2.root;file_n.root;"></div>
  </body>
</html>
```

# MONITORING OF A RUNNING ROOT APPLICATION

## ROOT session

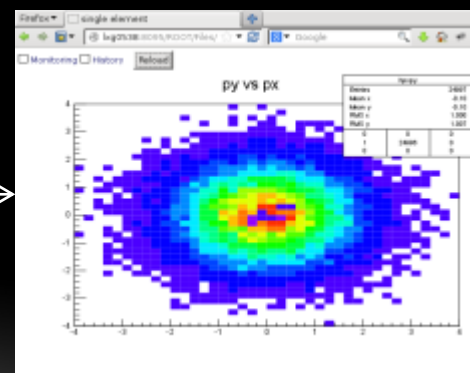
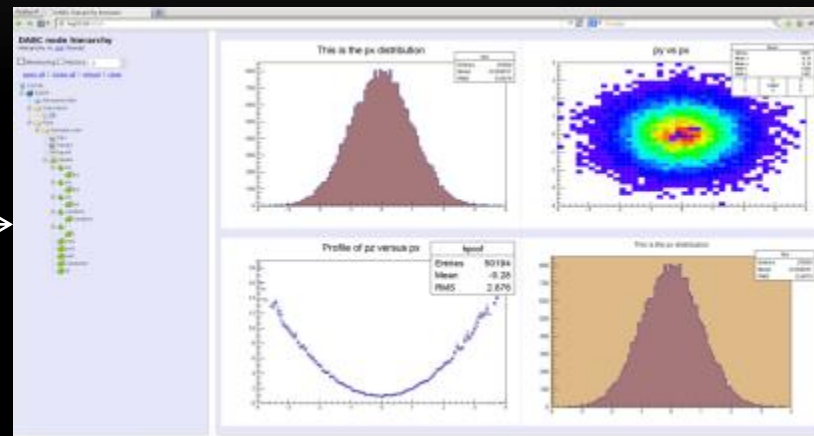
```
* You are welcome to visit our Web site *  
* http://root.cern.ch *  
* *  
*****
```

```
ROOT 5.34/09 (v5-34-09@v5-34-09, Jun 26 2013,  
17:10:36 on linuxx8664gcc)
```

```
CINT/ROOT C/C++ Interpreter version 5.18.00, July  
Type ? for help. Commands must be C++ statements.  
Enclose multiple statements between { }.
```

```
root [0] DabcRoot::StartHttpServer (8095) ;  
root [1] .x $ROOTSYS/tutorials/hsimple.C  
hsimple : Real Time = 0.14 seconds Cpu Time =  
0.14 seconds  
(class TFile*)0x7fbc1c26ed70  
root [2]
```

http



# MONITORING OF A RUNNING ROOT APPLICATION

- Single command to start http server: `DabcRoot::StartHttpServer(8095);`
- Scans gROOT for existing objects
- Builds objects hierarchy in the browser
- Stream and zip objects **only when** requested
- JSRootIO graphics for objects display
- **Live** update of objects content
- **NO ANY** changes in analysis code
- Similar approach for: DAQ, slow control, online/offline analysis
- More information on <http://dabc.gsi.de>

# CONCLUSION

- The source code is available in git:  
<http://root.cern.ch/git/rootjs.git>
- Not a replacement of ROOT:
  - No tree analysis
  - No fitting

Feel free to try and to send feedback & requests