

Data Conversion Progress

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Mississippi State University

International Workshop on Experimental and
Theoretical Topics in CLAS Data Mining

July 27th, 2015





Outline

- ♠ Overview of the sanity check of the new Data-Mining software
On behalf of: Mariana, Gagik and Larry
- ♠ Data conversion: Plan and Status



DM Upgraded Software: Getting Started

- Check CLAS12 offline software documentation:
<http://clasweb.jlab.org/clas12offline/docs/software/html/index.html#>

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CLAS12 Offline software documentation

Welcome to CLAS12 offline software documentation. This section contains topical documentation on offline common tools used for building CLAS12 reconstruction and calibration software.

Standard Java Library For CLAS12:

- Getting Started with Java Software

CLAS12 Simulation/Reconstruction

- Running gemc at JLab
- Running CLAS-12 Reconstruction
- Analyzing Reconstructed Data
- CLAS12 Fast MonteCarlo

CLAS12 Input/Output Packages:

- Reading Raw data from EVIO
- Reading/Writing Dictionary based files
- Reading BOS files with Java I/O package

Plotting Package:

- Data Graph Plotting
- Histogram Plotting
- Directories and Trees



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Standard Java Library For CLAS12:

- Getting Started with Java Software

- Follow instructions to setup/install the latest JAVA and groovy packages on your JLab account/local machine:

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Getting Started with Java Software

Required Software

CLAS12 software package is written in JAVA and to run the codes and scripts Java>1.7 is required. To run example scripts groovy package is required. To run on local machines user must install JDK 7 package and groovy.

Running On Jlab CUE

To use latest version of coatjava (CLAS reconstruction package) on CUE environment must be initialized to use required software do:

```
ifarm> module load java_1.7
ifarm> use groovy
```

Then downloaded coatjava package is ready to use. To use up to date development version installed on CUE machines include following in command in cshrc file.

```
/group/clas12/environment_java.csh
```



DM Upgraded Software: Getting Started

➤ Download the latest Coatjava:

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```
/group/clas12/environment_java.csh
```

Downloading coatjava

The packaged tarball of complete package with necessary software and files can be downloaded from:

```
wget https://userweb.jlab.org/~gavalian/software/coatjava/coatjava-1.0.tar.gz
```



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```

➤ Before download check the up-to-date coatjava in Gagik's web-page:

← <https://userweb.jlab.org/~gavalian/software/coatjava/>

Index of /~gavalian/software/coatjava

Name	Last modified	Size	Description
Parent Directory		-	
coatjava-1.0.tar.gz	08-Jun-2015 14:59	25M	
coatjava-2.0.tar.gz	24-Jul-2015 09:45	37M	



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Download the latest Coatjava:

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Enter search terms or a module, class or function name.

Downloading coatjava

The packaged tarball of complete package with necessary software and files can be downloaded from:

```
wget https://userweb.jlab.org/~gavalian/software/coatjava/coatjava-1.0.tar.gz
```

Unpack coatjava tarball to access its four main branches:

```
> ls coatjava/  
bin/ etc/ lib/ scripts/  
> ls coatjava/bin/  
bos2evio* evio-browser* evio-rawFile* evio-dump* run-groovy* evioEventBrowser*  
evio-viewer* update* decoder* evio-merge* clas12-reconstruction* .....  
> ls coatjava/lib/  
ced/ clas/ misc/ packages/ plugins/ utils/  
> ls coatjava/etc  
bankdefs/ configs/ data/ datamining/ graphs  
> ls coatjava/scripts/  
evio/ examples/ tests/  
> ls coatjava/scripts/tests/analysis/  
customEventManager.groovy eventKinematics.groovy eventSelection.groovy  
physicsAnalysisPion.groovy dvcsAnalysis.groovy eventPrint.groovy physicsAnalysis.groovy  
pi0Analysis.groovy
```




DM Upgraded Software: Getting Started

Download the latest Coatjava:

Quick search

Go

Enter search terms or a module, class or function name.

Downloading coatjava

The packaged tarball of complete package with necessary software and files can be downloaded from:

```
wget https://userweb.jlab.org/~gavalian/software/coatjava/coatjava-1.0.tar.gz
```

Unpack coatjava tarball to access the trunk branches:

```
> ls coatjava/
```

```
bin/ etc/ lib/ scripts/
```

```
> ls coatjava/bin/
```

```
bos2evio* evio-browser* evio-rawFile* evio-dump* run-groovy* evioEventBrowser*  
evio-viewer* update* decoder* evio-merge* clas12-reconstruction* .....
```

```
> ls coatjava/lib/
```

```
ced/ clas/ misc/ packages/ plugins/ utils/
```

```
> ls coatjava/etc
```

```
bankdefs/ configs/ data/ datamining/ graphs
```

```
> ls coatjava/scripts/
```

```
evio/ examples/ tests/
```

```
> ls coatjava/scripts/tests/analysis/ ↔ Good Start with groovy scripting for any DM analyses
```

```
customEventManager.groovy eventKinematics.groovy eventSelection.groovy
```

```
physicsAnalysisPion.groovy dvcsAnalysis.groovy eventPrint.groovy physicsAnalysis.groovy
```

```
pi0Analysis.groovy
```

ALWAYS check online examples in CLAS12 Offline Documentation for updates



DM Upgraded Software: Getting Started

Other useful documentation links:

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```
wget https://userweb.jlab.org/~gavalian/software/coatjava/coatjava-1.0.tar.gz
```

Development environment

To start developing for CLAS12 framework refer to section Development of Code. The library needed to start development is located on clas maven repository:

```
http://clasweb.jlab.org/clas12maven/org/jlab/coat/coat-libs/1.0-SNAPSHOT/
```

Packages in CoatJava

Here is the list of packages that coatjava distribution contains with links to their javadoc page:

Package	Description	Documentation Link
clas-geometry	CLAS geometry Package	< http://clasweb.jlab.org/clas12offline/docs/javadocs/clas-geometry/ >
clas-io	CLAS EVIO I/O Package	< http://clasweb.jlab.org/clas12offline/docs/javadocs/clas-io/ >
clas-physics	Physics Toolkit Library	< http://clasweb.jlab.org/clas12offline/docs/javadocs/clas-physics/ >
jroot	Java Plotting Library	< http://clasweb.jlab.org/clas12offline/docs/javadocs/jroot/ >



Analyzing New EVIO Data

☑ Produce your EVIO input:

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Analyzing New EVIO Data

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Reading BOS files with Java I/O package

The design of CLAS I/O library allows implementation of different formats with same interface. And there is a BOS reader implemented that can read BOS files directly from JAVA. There are also tools included in COATJAVA package to convert legacy BOS files to EVIO format consistent with CLAS12 data format. The advantage of this is that all standard tools for event manipulation and cuts and corrections can be used with old data sets.

Converting BOS to EVIO

The convertor program is called bos2evio and it is included in the coatjava package. The program will convert BOS file into EVIO, and there are options to use the SEB scheme or A1C bank scheme.

For SEB scheme use:

```
>bin/bos2evio -seb myoutput.evio run018567.A00.B00
```

For A1C scheme (PART, TBID and TBER banks) use:

```
>bin/bos2evio -a1c myoutput.evio run018567.A00.B00 run018567.A00.B01
```



Analyzing New EVIO Data

☑ Produce your EVIO input:

CLAS12 Input/Output Packages:

- Reading Raw data from EVIO
- Reading/Writing Dictionary based files
- Reading BOS files with Java I/O package



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```
>bin/bos2evio -seb myoutput.evio run018567.A00.B00
```

For A1C scheme (PART, TBID and TBER banks) use:

```
>bin/bos2evio -a1c myoutput.evio run018567.A00.B00 run018567.A00.B01
```

☑ Process several inputs, all run's files, to produce a single EVIO file:

bos2evio -seb test.evio run018179.A*

☑ Outputs will be: **test.x.evio**

☑ Size of each **test.x.evio** must be **< 2 GB** ↔ **x ∈ [0,1,.....N]**



Analyzing Data: EVIO Structure

❑ Dumping EVIO file gives:

`evio-dump -i run18453.A01.0.evio`

```

-----
| Starting CLARA-PLATFORM with CLARA_SERVICES = ./bin/../../lib/services
-----
\n
INSTALLATION DIRECTORY =
LIBRARY DIRECTORY      = ./bin/../../lib/clas/
--> Warning the CLAS12DIR property is not defined.
[EvioDataDictionary]--> loading bankdefs from directory : ./bin/../../etc/bankdefs/clas12
[EvioDataDictionary]-----> number of XML files located : 15
[EvioDataDictionary]--> total number of descriptors found : 79
[EvioDataDictionary]--> loading bankdefs from directory : ./bin/../../etc/bankdefs/clas12
[EvioDataDictionary]-----> number of XML files located : 15
[EvioDataDictionary]--> total number of descriptors found : 79
[EvioSource] --> Factory loaded descriptor count : 79

```

```

***** opened FILE [] ** NEVENTS = 167211 *****
***** EVENT # 1 *****

```

bank	nrows	ncols
DETECTOR::ccpb	2	4
DETECTOR::ecpb	1	9
DETECTOR::lcpb	1	8
DETECTOR::scpb	5	5
EVENT::particle	6	15
HEADER::info	1	7

Nrows: number of hits in each bank

Ncols: Number of banks' variables



```
***** opened FILE [] ** NEVENTS = 167211 *****
***** EVENT # 1 *****
```

	bank	nrows	ncols
	DETECTOR::ccpb	2	4
	DETECTOR::ecpb	1	9
	DETECTOR::lcpb	1	8
	DETECTOR::scpb	5	5
	EVENT::particle	6	15
	HEADER::info	1	7

Press Enter for Next Event or Bank Name: HEADER::info

*****>>>> BANK HEADER::info >>>> SIZE = 7

```
helicity :      -1
trigger  :        0
nrun    :      18453
nevt    :      572976
fcg     :      0.00000
stt     :      38.19536
fc      :      0.00000
```

Press Enter for Next Event or Bank Name: EVENT::particle

*****>>>> BANK EVENT::particle >>>> SIZE = 15

```
charge :      -1          1          1          1          0          1
scstat :        3          2          4          5          0          1
ecstat :        1          0          0          0          0          0
status :        4          3          2          2          1         -2
lcstat :        0          0          0          0          1          0
ccstat :        2          1          0          0          0          0
dcstat :        3          2          4          5          0          1
pid    :        11         2212         2212         2212         2112          0
mass   :      0.00000      0.99548      0.89040      0.90847      0.88285      0.00000
vy    :     -0.14879     -1.29761     -0.44662     -0.44775      0.00000     10.69809
vx    :     -0.25771      2.24752      0.77357     -0.77553      0.00000      0.00000
px    :     -0.15962      0.11701     -0.38630      0.14516      0.30963      0.29081
vz    :     -3.33007     -3.82177     -3.95653     -4.10856      0.00000     -3.62000
py    :      1.02993      0.17055     -0.28720     -0.55251     -0.02701      0.01880
pz    :      2.05724      0.38171      0.00147      0.73258      0.17862     -0.13836
```



```
***** opened FILE [] ** NEVENTS = 167211 *****  
***** EVENT # 1 *****
```

	bank	nrows	ncols
	DETECTOR::ccpb	2	4
	DETECTOR::ecpb	1	9
	DETECTOR::lcpb	1	8
	DETECTOR::scpb	5	5
	EVENT::particle	6	15
	HEADER::info	1	7

Press Enter for Next Event or Bank Name: DETECTOR::ccpb

```
*****>>>> BANK DETECTOR::ccpb >>>> SIZE = 4  
sector :          2          3  
time :    94.40000    36.30000  
nphe :     9.00000    26.00000  
path :   378.21677    408.07462
```

Press Enter for Next Event or Bank Name: DETECTOR::scpb

```
*****>>>> BANK DETECTOR::scpb >>>> SIZE = 5  
sector :          1          2          3          5          6  
paddle :          46          25          8          41          23  
time :    42.12946    81.73537    54.54805    70.12433    64.24126  
edep :     9.03932    52.42294    78.18345    41.72234    18.17318  
path :   378.83264    520.80908    503.87503    434.97491    545.00427
```

Press Enter for Next Event or Bank Name: DETECTOR::ecpb

```
*****>>>> BANK DETECTOR::ecpb >>>> SIZE = 9  
sector :          3  
time :    56.18576  
eout :     0.05097  
ein :     0.36403  
path :   520.80701  
z :    479.79184  
y :    188.65291  
etot :     0.40880  
x :   -30.44989
```

Press Enter for Next Event or Bank Name: DETECTOR::lcpb

```
*****>>>> BANK DETECTOR::lcpb >>>> SIZE = 8  
sector :          1  
time :    87.04200  
ein :     0.04651  
path :   521.99780  
z :    258.73706  
y :   -39.12716  
etot :     0.04651  
x :   448.51746
```




Analyzing Data: EVIO Structure

- Check “CLAS6EVNT.xml” under your `~/coatjava/etc/bankdefs/clas12/` to get the banks' variables types

```
> more ~/coatjava/etc/bankdefs/clas12/CLAS6EVNT.xml
<evio_dictionary>
<bank name="HEADER" tag="21000" info="">
  <section name="info" tag="21001" info="Event Header Information">
    <column name="nrun" type="int32" num="1" info="run number"/>
    <column name="nevt" type="int32" num="2" info="event number"/>
    <column name="trigger" type="int32" num="3" info="trigger type"/>
    <column name="helicity" type="int8" num="4" info="faraday cup gated"/>
    <column name="fc" type="float32" num="5" info="faraday cup"/>
    <column name="fcg" type="float32" num="6" info="faraday cup gated"/>
    <column name="stt" type="float32" num="7" info="start time"/>
  </section>
</bank>

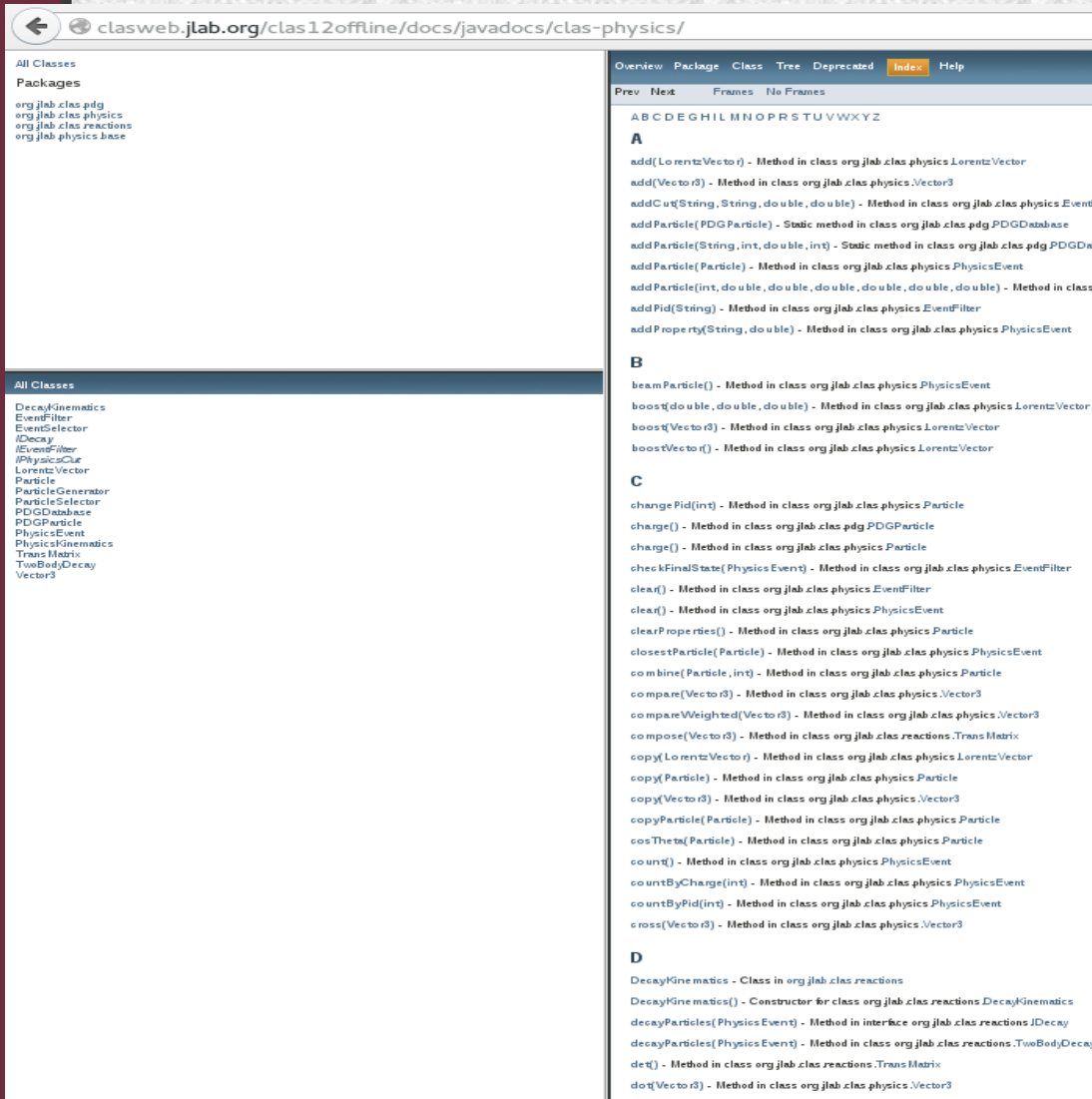
<bank name="EVENT" tag="22000" info="EVNT bank for reconstructed CLAS6 Data">
  <section name="particle" tag="22001" num="0" info="Container Bank">
    <column name="status" type="int8" num="1" info="status of the particle"/>
    <column name="charge" type="int8" num="2" info="charge of the particle"/>
    <column name="pid" type="int32" num="3" info="particle ID"/>
    <column name="mass" type="float32" num="4" info="particle mass calculated from beta"/>
    <column name="px" type="float32" num="5" info="x component of momentum"/>
    <column name="py" type="float32" num="6" info="y component of momentum"/>
    <column name="pz" type="float32" num="7" info="z component of momentum"/>
    <column name="vx" type="float32" num="8" info="x component of vertex"/>
    <column name="vy" type="float32" num="9" info="y component of vertex"/>
    <column name="vz" type="float32" num="10" info="z component of vertex"/>
    <column name="dcstat" type="int8" num="11" info="pointer to dc bank"/>
    <column name="ecstat" type="int8" num="12" info="pointer to ec bank"/>
    <column name="scstat" type="int8" num="13" info="pointer to sc bank"/>
    <column name="ccstat" type="int8" num="14" info="pointer to cc bank"/>
    <column name="lcstat" type="int8" num="15" info="pointer to cc bank"/>
  </section>
</bank>
</evio_dictionary>
```

Typo: must be
info="helicity interval count"
according to tgbi.ddl

Typo: must be
info="pointer to LAC bank"
according to evnt.ddl¹⁷

Analyzing Data

- Check “CLAS6EVNT.xml” under your `~/coatjava/etc/bankdefs/clas12/` to get the banks' variables types
- Check clas-physics package to get the list of available classes, objects, functions/methods...to call each variable's type, get tracks' count, calculate kinematics....etc



The screenshot shows the JLab clas-physics javadoc website. The browser address bar displays `clasweb.jlab.org/clas12offline/docs/javadocs/clas-physics/`. The page is divided into two main sections: a left sidebar and a main content area.

Left Sidebar:




- All Classes**
- Packages**
 - `org.jlab.clas.pdg`
 - `org.jlab.clas.physics`
 - `org.jlab.clas.reactions`
 - `org.jlab.physics.base`
- All Classes**
 - `DecayKinematics`
 - `EventFilter`
 - `EventSelector`
 - `IFDecay`
 - `IFEventFilter`
 - `IFPhysicsClue`
 - `LorentzVector`
 - `Particle`
 - `ParticleGenerator`
 - `ParticleSelector`
 - `PDGDatabase`
 - `PDGParticle`
 - `PhysicsEvent`
 - `PhysicsKinematics`
 - `TransMatrix`
 - `TwoBodyDecay`
 - `Vector3`

Main Content Area:

- Navigation: `Overview`, `Package`, `Class`, `Tree`, `Deprecated`, **`Index`**, `Help`
- Sub-navigation: `Prev`, `Next`, `Frames`, `No Frames`
- Alphabetical Index: `A B C D E F G H I L M N O P R S T U V W X Y Z`
- A**
 - `add(LorentzVector)` - Method in class `org.jlab.clas.physics.LorentzVector`
 - `add(Vector3)` - Method in class `org.jlab.clas.physics.Vector3`
 - `addCut(String, String, double, double)` - Method in class `org.jlab.clas.physics.EventFilter`
 - `addParticle(PDGParticle)` - Static method in class `org.jlab.clas.pdg.PDGDatabase`
 - `addParticle(String, int, double, int)` - Static method in class `org.jlab.clas.pdg.PDGDatabase`
 - `addParticle(Particle)` - Method in class `org.jlab.clas.physics.PhysicsEvent`
 - `addParticle(int, double, double, double, double, double, double)` - Method in class `org.jlab.clas.physics.PhysicsEvent`
 - `addPid(String)` - Method in class `org.jlab.clas.physics.EventFilter`
 - `addProperty(String, double)` - Method in class `org.jlab.clas.physics.PhysicsEvent`
- B**
 - `beamParticle()` - Method in class `org.jlab.clas.physics.PhysicsEvent`
 - `boost(double, double, double)` - Method in class `org.jlab.clas.physics.LorentzVector`
 - `boost(Vector3)` - Method in class `org.jlab.clas.physics.LorentzVector`
 - `boost(Vector3)` - Method in class `org.jlab.clas.physics.LorentzVector`
- C**
 - `changePid(int)` - Method in class `org.jlab.clas.physics.Particle`
 - `charge()` - Method in class `org.jlab.clas.pdg.PDGParticle`
 - `charge()` - Method in class `org.jlab.clas.physics.Particle`
 - `checkFinalState(PhysicsEvent)` - Method in class `org.jlab.clas.physics.EventFilter`
 - `clear()` - Method in class `org.jlab.clas.physics.EventFilter`
 - `clear()` - Method in class `org.jlab.clas.physics.PhysicsEvent`
 - `clearProperties()` - Method in class `org.jlab.clas.physics.Particle`
 - `closestParticle(Particle)` - Method in class `org.jlab.clas.physics.PhysicsEvent`
 - `combine(Particle, int)` - Method in class `org.jlab.clas.physics.Particle`
 - `compare(Vector3)` - Method in class `org.jlab.clas.physics.Vector3`
 - `compareWeighted(Vector3)` - Method in class `org.jlab.clas.physics.Vector3`
 - `compose(Vector3)` - Method in class `org.jlab.clas.reactions.TransMatrix`
 - `copy(LorentzVector)` - Method in class `org.jlab.clas.physics.LorentzVector`
 - `copy(Particle)` - Method in class `org.jlab.clas.physics.Particle`
 - `copy(Vector3)` - Method in class `org.jlab.clas.physics.Vector3`
 - `copyParticle(Particle)` - Method in class `org.jlab.clas.physics.Particle`
 - `cosTheta(Particle)` - Method in class `org.jlab.clas.physics.Particle`
 - `count()` - Method in class `org.jlab.clas.physics.PhysicsEvent`
 - `countByCharge(int)` - Method in class `org.jlab.clas.physics.PhysicsEvent`
 - `countByPid(int)` - Method in class `org.jlab.clas.physics.PhysicsEvent`
 - `cross(Vector3)` - Method in class `org.jlab.clas.physics.Vector3`
- D**
 - `DecayKinematics` - Class in `org.jlab.clas.reactions`
 - `DecayKinematics()` - Constructor for class `org.jlab.clas.reactions.DecayKinematics`
 - `decayParticles(PhysicsEvent)` - Method in interface `org.jlab.clas.reactions.IDecay`
 - `decayParticles(PhysicsEvent)` - Method in class `org.jlab.clas.reactions.TwoBodyDecay`
 - `det()` - Method in class `org.jlab.clas.reactions.TransMatrix`
 - `dot(Vector3)` - Method in class `org.jlab.clas.physics.Vector3`



Analyzing Data: Groovy Script Example

```
//-----  
// LE: Groovy script to read event and plot some kinematical variables  
//   Adapted from "eventKinematics.groovy" developed by GG  
//-----  
import org.jlab.evio.clas12.*;  
import org.jlab.clas.physics.*;  
import org.jlab.clas12.physics.*;  
import org.jlab.data.utils.DictionaryLoader;  Import Java classes  
import org.jlab.clasrec.io.ClasEvioReader;  
import org.jlab.clas.tools.utils.*;  
import org.root.group.*;  
import org.root.pad.*;  
import org.root.func.*;  
import org.root.histogram.*;  
import org.root.data.*;  
  
EvioDataChain reader = new EvioDataChain();  
reader.addFile("run18453.A01.0.evio");  Add an individual EVIO file  
reader.open(); Open input file  
  
/* Example on how to add a dir. of EVIO files  
reader.addDir("./");  Declare the dir. Path as a 1st argument  
reader.addDir("./","evio"); Add the files extension as a 2nd argument  
reader.open();*/ Open input files  
  
//-----  
// Declare histograms  
//H1D H1_EMOM = new H1D("H1_EMOM",100,0,2.5);  
H1D H1_EMOM = new H1D("H1_EMOM",100,0,4.4);
```

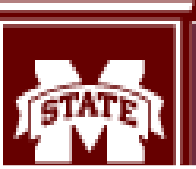
Analyzing Data: Groovy Script Example

```
//-----  
// LE: Groovy script to read event and plot some kinematical variables  
//   Adapted from "eventKinematics.groovy" developed by GG  
//-----  
.....  
//-----  
GenericKinematicFitter fitter = new GenericKinematicFitter(4.461,"11:X+:X-:Xn"); ➡ Define a new kinematic  
fitter/interface to read the reconstructed banks in the data stream using two arguments: beam energy and event's filter  
EventFilter filter = new EventFilter("11:X+:X-:Xn"); ➡ Define an Event's filter with PID=11 and any positive, negative  
and neutral particles  
System.out.println("Processed events " + " Run # " + " Event ID "); ➡ Print information to a standard output  
  
while(reader.hasEvent()){ ➡ Loop over Events  
  Icounter++; ➡ Event's counter  
  EvioDataEvent event = reader.getNextEvent();  
  PhysicsEvent physEvent = fitter.getPhysicsEvent(event);  
  int nelectron = physEvent.countByPid(11); ➡ Return a number of "PID=11" tracks with status>0 in each event  
  .....  
  EvioDataBank headbank = event.getBank("HEADER::info"); ➡ Declare EVIO banks  
  EvioDataBank evtbank = event.getBank("EVENT::particle");  
  
  if(filter.isValid(physEvent)==true){ ➡ Analyze events that verify the filter's condition  
  
    for(int i = 0; i < evtbank.rows(); i++){ ➡ Loop over EVNT bank's tracks  
      int scstat=evtbank.getBytes("scstat",i); ➡ Get "scstat" (type="int8") of a track  
      int pid = evtbank.getInt("pid",i); ➡ Get "pid" (type="int32") of a track  
    }  
    Particle electron = physEvent.getParticle("[e-,0]"); ➡ Get 1st "electron" kinematics ("LorentzVector" coordinates)  
    .....  
  }  
  H1_EMOM.fill(electron.p()); ➡ Fill electron's momentum histogram  
}
```



Analyzing Data: Groovy Script Example

```
//-----  
// LE: Groovy script to read event and plot some kinematical variables  
//   Adapted from "eventKinematics.groovy" developed by GG  
//-----  
.....  
  
// Plotting histograms  
  
TCanvas canvas = new TCanvas("c","New plots",1000,800,3,2);  
canvas.setFontSize(14);  
  
canvas.cd(0);  
H1_EMOM.setXTitle("P_e (GeV/c)");  
canvas.draw(H1_EMOM);  
  
canvas.save("test_r18453.eps");
```



Analyzing Data: Groovy Script Example

```
//-----  
// LE: Groovy script to read event and plot some kinematical variables  
//   Adapted from “eventKinematics.groovy” developed by GG  
//-----  
.....  
  
// Plotting histograms  
  
TCanvas canvas = new TCanvas("c","New plots",1000,800,3,2);  
canvas.setFontSize(14);  
  
canvas.cd(0);  
H1_EMOM.setXTitle("P_e (GeV/c)");  
canvas.draw(H1_EMOM);  
  
canvas.save("test_r18453.eps");
```

- ❑ To save your histograms in EVIO output, check the “Directories and Trees” link under CLAS12 offline documentation.
- ❑ Can't write yet into ROOT files → JAVA-ROOT interface is needed (coming soon!)



DM Software Check

- Used a sample of E2a data
- Analyze EVIO and SEB ntuples and compare their results
- In case of discrepancies, compare both files' event-by-event info., and check BOS files as needed.



DM Software Check

- Used a sample of E2a data
- Analyze EVIO and SEB ntuples and compare their results
- In case of discrepancies, compare both files' event-by-event info., and check BOS files as needed.
- Resolved coatjava issues:
 - ★ Duplicate events

***** Duplicate Events in EVIO file for PID=11 *****

Proc. Event Run # BOS Event ID

1	18298	4
2	18298	6

.....

28	18298	42
29	18298	43
30	18298	43
32	18298	48
34	18298	54

.....

44	18298	68
45	18298	68
47	18298	71
50	18298	75

.....

59	18298	92
60	18298	92

.....



DM Software Check

- Used a sample of E2a data
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- In case of discrepancies, compare both files' event-by-event info., and check BOS files as needed.
- Resolved coatjava issues:
 - ★ Duplicate events ➡ Fix a bug in the BOS Event Reader

***** Duplicate Events in EVIO file for PID=11 *****

Proc. Event Run # BOS Event ID

1	18298	4
2	18298	6

.....

28	18298	42
29	18298	43
30	18298	43
32	18298	48
34	18298	54

.....

44	18298	68
45	18298	68
47	18298	71
50	18298	75

.....

59	18298	92
60	18298	92

.....



DM Software Check

- Used a sample of E2a data
- Analyze EVIO and SEB ntuples and compare their results
- In case of discrepancies, compare both files' event-by-event info.
- Resolved coatjava issues:
 - ☆ Duplicate events in EVIO file → Fix a bug in the BOS Event Reader
 - ☆ Missed events in EVIO file

```
** ** Run # Missed BOS Events ID in EVIO (for ID=11 with all status cuts)
```

```
18298      295
18298      492
18298      501
18298     1232
18298     1295
18298     2716
18298     2928
```

```
.....
```

```
BOS File info of Event ID=295
```

```
Group:  HEAD  Sector:  0  Nhits:  1  Next ind:  0
```

```
..
```

```
Run:    18298
```

```
Event:  295
```

```
Type:   1 (physics data)
```

```
Group:  EVNT  Sector:  0  Nhits:  1  Next ind:  0
```

```
ID: 11 Pmom: 1.052 Mass: 0.000 Charge: -1 Betta: 1.000 Cx: 0.414 cy: -0.065 cz: 0.908 X: 0.000
Y: 0.829 Z: 4.858 DCstat: 1 CCstat: 1 SCstat: 1 ECstat: 1 LCstat: 0 STstat: 0 Status: 4
```



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- In case of discrepancies, compare both files' event-by-event info.
- Resolved coatjava issues:
 - ★ Duplicate events in EVIO file ➡ Fix a bug in the BOS Event Reader
 - ★ Missed events in EVIO file
 - ★ Missed ECPB, SCPB...banks in several EVIO events

i.e. `EvioDataBank ecpcb = event.getBank("DETECTOR::ecpb");`

No hits in ECPB bank since `ecpcb.row() == 0` while processing Event ID: 975

BOS file info:

Group: HEAD Sector: 0 Nhits: 1 Next ind: 0

Version: 0
Run: 18298
Event: 975
Type: 1 (physics data)

.....

Group: ECPB Sector: 0 Nhits: 3 Next ind: 0

ScHt: 601 Etot: 0.148 Ein: 0.000 Eout: 0.000 Time: 0.000 Path: 522.435 X: 71.300 Y: -105.237 Z: 503.954 ... Status: 101
ScHt: 601 Etot: 0.148 Ein: 0.105 Eout: 0.042 Time: 0.000 Path: 522.937 X: 71.300 Y: -105.237 Z: 503.954 ... Status: 10101
ScHt: 101 Etot: 0.087 Ein: 0.000 Eout: 0.000 Time: 65.721 Path: 520.565 X: 315.256 Y: 17.943 Z: 416.069 ... Status: 1

Group: EVNT Sector: 0 Nhits: 3 Next ind: 0

ID: 11 Pmom: 0.580 Mass: 0.000 Charge: -1 Betta: 1.000 Cx: 0.287 cy: -0.404 cz: 0.869 X: -0.307 Y: -0.177 Z: 4.478 DCstat: 2
CCstat: 2 SCstat: 2 ECstat: 2 LCstat: 0 STstat: 0 Status: 4
ID: 22 Pmom: 0.319 Mass: 0.000 Charge: 0 Betta: 0.996 Cx: 0.604 cy: 0.034 cz: 0.797 X: 0.000 Y: 0.000 Z: 0.000 DCstat: 0
CCstat: 0 SCstat: 0 ECstat: 3 LCstat: 0 STstat: 0 Status: 1
ID: -211 Pmom: 0.583 Mass: 0.005 Charge: -1 Betta: 0.993 Cx: 0.268 cy: -0.415 cz: 0.869 X: -3.175 Y: -1.833 Z: 4.733 DCstat:
1 CCstat: 0 SCstat: 1 ECstat: 1 LCstat: 0 STstat: 0 Status: -2



DM Software Check

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- Resolved coatjava issues:

- ☆ Duplicate events in EVIO file → Fix a bug in the BOS Event Reader
 - ☆ Missed events in EVIO file
 - ☆ Missed ECPB, SCPB...banks in several EVIO events
- } Fix a bug in the EVIO Event Writer

i.e. EvioDataBank ecpcb = event.getBank("DETECTOR::ecpb");
 No hits in ECPB bank since ecpcb.row()==0 while processing Event ID: 975

BOS file info:

Group: HEAD Sector: 0 Nhits: 1 Next ind: 0

Version: 0
 Run: 18298
 Event: 975
 Type: 1 (physics data)

Group: ECPB Sector: 0 Nhits: 3 Next ind: 0
 ScHt: 601 Etot: 0.148 Ein: 0.000 Eout: 0.000 Time: 0.000 Path: 522.435 X: 71.300 Y: -105.237 Z: 503.954 ... Status: 101
 ScHt: 601 Etot: 0.148 Ein: 0.105 Eout: 0.042 Time: 0.000 Path: 522.937 X: 71.300 Y: -105.237 Z: 503.954 ... Status: 10101
 ScHt: 101 Etot: 0.087 Ein: 0.000 Eout: 0.000 Time: 65.721 Path: 520.565 X: 315.256 Y: 17.943 Z: 416.069 ... Status: 1

Group: EVNT Sector: 0 Nhits: 3 Next ind: 0
 ID: 11 Pmom: 0.580 Mass: 0.000 Charge: -1 Betta: 1.000 Cx: 0.287 cy: -0.404 cz: 0.869 X: -0.307 Y: -0.177 Z: 4.478 DCstat: 2
 CCstat: 2 SCstat: 2 ECstat: 2 LCstat: 0 STstat: 0 Status: 4
 ID: 22 Pmom: 0.319 Mass: 0.000 Charge: 0 Betta: 0.996 Cx: 0.604 cy: 0.034 cz: 0.797 X: 0.000 Y: 0.000 Z: 0.000 DCstat: 0
 CCstat: 0 SCstat: 0 ECstat: 3 LCstat: 0 STstat: 0 Status: 1
 ID: -211 Pmom: 0.583 Mass: 0.005 Charge: -1 Betta: 0.993 Cx: 0.268 cy: -0.415 cz: 0.869 X: -3.175 Y: -1.833 Z: 4.733 DCstat:
 1 CCstat: 0 SCstat: 1 ECstat: 1 LCstat: 0 STstat: 0 Status: -2



DM Software Check

- Used a sample of E2a data
- Analyze EVIO and SEB ntuples and compare their results
- In case of discrepancies, compare both files' event-by-event info.
- Resolved coatjava issues:
 - ☆ Duplicate events in EVIO file → Fix a bug in the BOS Event Reader
 - ☆ Missed events in EVIO file
 - ☆ Missed ECPB, SCPB...banks in several EVIO events
 - ☆ Bank's variables return a wrong value

} Fix a bug in the EVIO
Event Writer

i.e. If a variable is mistakenly assigned a wrong field number in XML file, it will return a wrong information:

```
<bank name="EVENT" tag="22000" info="EVNT bank for reconstructed CLAS6 Data">
  <section name="particle" tag="22001" num="0" info="Container Bank">
    <column name="status" type="int8" num="1" info="status of the particle"/>
    <column name="charge" type="int8" num="2" info="charge of the particle"/>
    <column name="pid" type="int32" num="3" info="particle ID"/>
    <column name="mass" type="float32" num="4" info="particle mass calculated from beta"/>
    <column name="px" type="float32" num="5" info="x component of momentum"/>
    <column name="py" type="float32" num="6" info="y component of momentum"/>
    <column name="pz" type="float32" num="7" info="z component of momentum"/>
    <column name="vx" type="float32" num="8" info="x component of vertex"/>
    <column name="vy" type="float32" num="9" info="y component of vertex"/>
    <column name="vz" type="float32" num="10" info="z component of vertex"/>
    <column name="dcstat" type="int8" num="11" info="pointer to dc bank"/>
    <column name="ecstat" type="int8" num="12" info="pointer to ec bank"/>
    <column name="scstat" type="int8" num="12" info="pointer to sc bank"/>
    <column name="ccstat" type="int8" num="14" info="pointer to cc bank"/>
```



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- Resolved coatjava issues:
 - ☆ Duplicate events in EVIO file → Fix a bug in the BOS Event Reader
 - ☆ Missed events in EVIO file
 - ☆ Missed ECPB, SCPB...banks in several EVIO events } Fix a bug in the EVIO Event Writer
 - ☆ Bank's variables return a wrong value → Fix the XML file



DM Software Check

- Used a sample of E2a data
- Analyze EVIO and SEB ntuples and compare their results
- In case of discrepancies, compare both files' event-by-event info.
- Resolved coatjava issues:

- ☆ Duplicate events in EVIO file ➡ Fix a bug in the BOS Event Reader
- ☆ Missed events in EVIO file
- ☆ Missed ECPB, SCPB...banks in several EVIO events } Fix a bug in the EVIO Event Writer
- ☆ Bank's variables return a wrong value ➡ Fix the XML file
- ☆ Out of sequence events and rare duplication

Processed events	Run #	BOS EVNT ID	
124623	18298	194345	
124624	18298	194338	! Out of sequence ➡ Fixed
124625	18298	194349	
.....			

Processed events in EVIO	Run #	EVNT ID	
417469	18298	649400	
417470	18298	649401	
417472	18298	649406	
417473	18298	649407	
417475	18298	649400	! Out of sequence; duplication
417476	18298	649401	! Out of sequence; duplication
417479	18298	649411	
.....			

➡ Could be ignored!?



DM Software Check

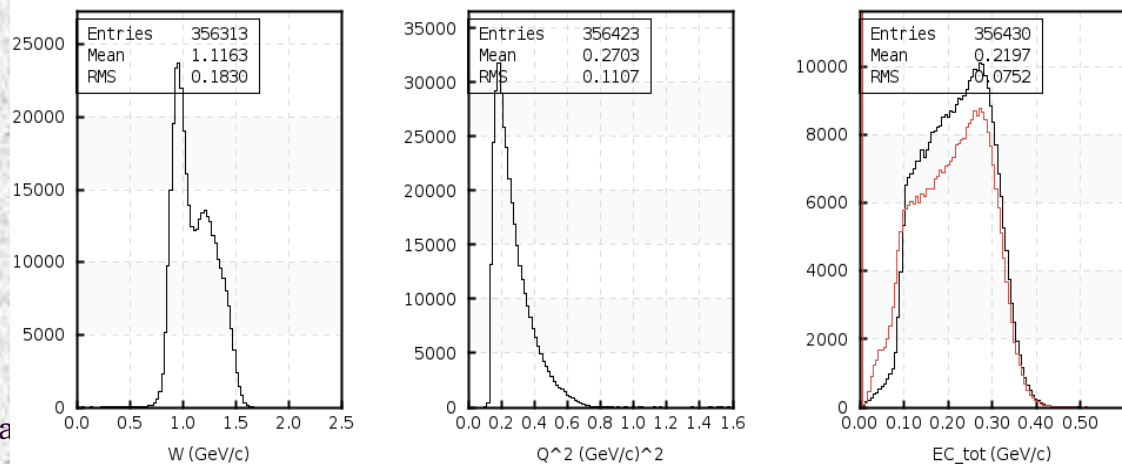
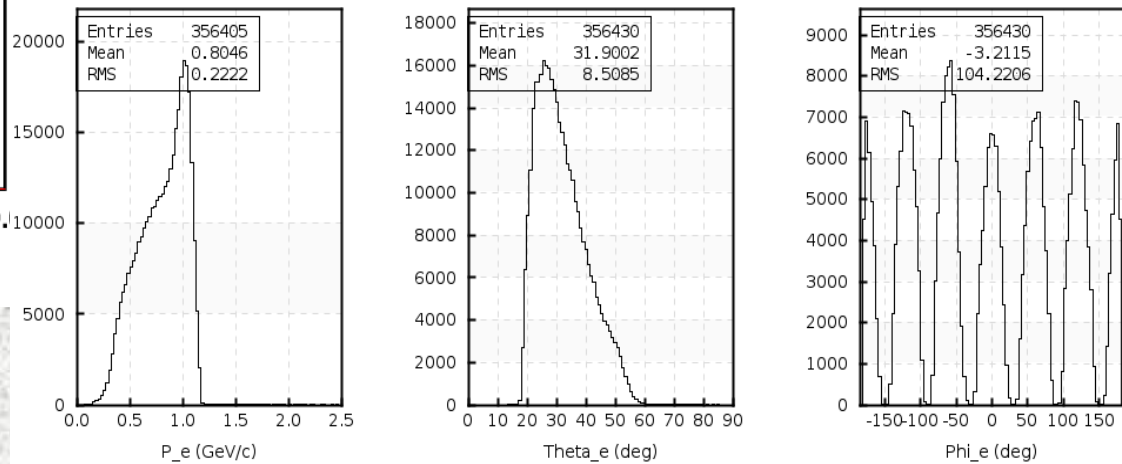
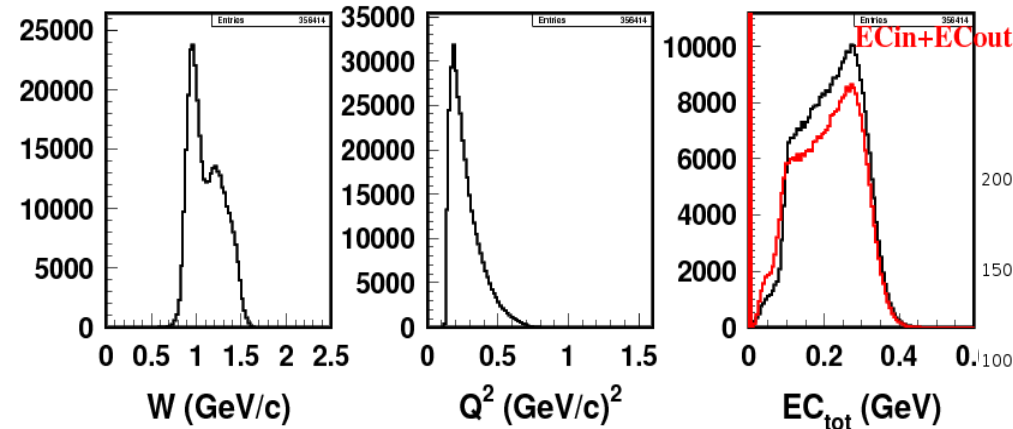
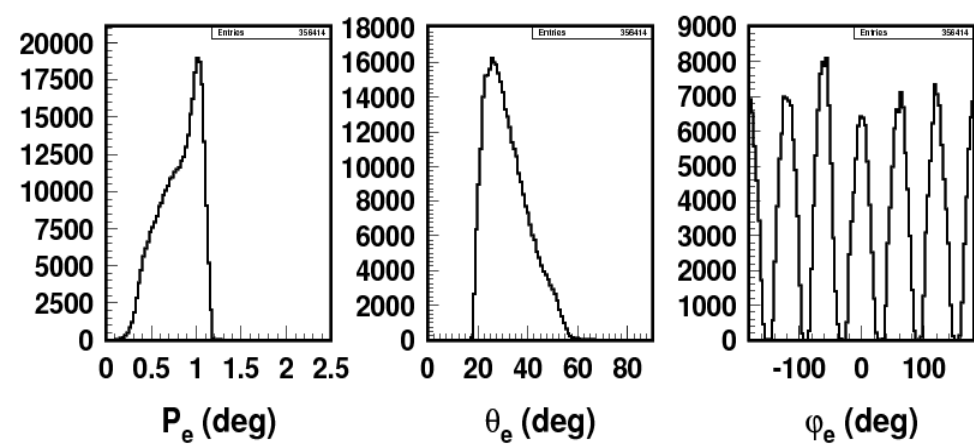
- Used a sample of E2a data
- Analyze EVIO and SEB ntuples and compare their results
- In case of discrepancies, compare both files' event-by-event info.
- Resolved coatjava issues:
 - ☆ Duplicate events in EVIO file ➡ Fix a bug in the BOS Event Reader
 - ☆ Missed events in EVIO file
 - ☆ Missed ECPB, SCPB...banks in several EVIO events } Fix a bug in the EVIO Event Writer
 - ☆ Bank's variables return a wrong value ➡ Fix the XML file
 - ☆ Out of sequence events and rare duplication ➡ Mostly Fixed
- Overall there is an excess of events in EVIO file compared to SEB ntuple because:
 - a. ALL tracks are included in the EVIO data stream with status > 0
 - b. SEB ntuple discard events where a trigger particle (1st e-) was not found,
 - c. SEB ntuple discard events where scstat=0 of a "PID=11" track,
 - d. SEB ntuple discard events where ecstat=0 of a "PID=11" track.

SEB & EVIO Comparison

E2a run #: 18298 taken with $E_b = 1.161$ GeV

← SEB results for PID=11 && Status > 0

EVIO results for PID=11 && Status > 0





DM Software Check

- Used a sample of E2a data
- Analyze EVIO and SEB ntuples and compare their results
- In case of discrepancies, compare both files' event-by-event info.
- Resolved coatjava issues:
 - ☆ Duplicate events in EVIO file ➡ Fix a bug in the BOS Event Reader
 - ☆ Missed events in EVIO file
 - ☆ Missed ECPB, SCPB...banks in several EVIO events } Fix a bug in the EVIO Event Writer
 - ☆ Bank's variables return a wrong value ➡ Fix the XML file
 - ☆ Out of sequence events and rare duplication ➡ Mostly Fixed
- Overall there is an excess of events in EVIO file compared to SEB ntuple because:
 - a. ALL tracks are included in the EVIO data stream with status > 0
 - b. SEB ntuple discard events where a trigger particle (1st e-) was not found,
 - c. SEB ntuple discard events where scstat=0 of a PID=11 track,
 - d. SEB ntuple discard events where ecstat=0 of a PID=11 track.
- ALWAYS update your coatjava distribution in a fresh location to avoid mixing libraries and affecting the EVIO data structure.



Data conversion: Plan and Status

- New conversion of E2a, E2b and EG2 data-sets
- Implement experimentally (reviewed) cuts and corrections (coming soon!)
 - ➔ Following the newly developed calibration suites by Gagik



Data conversion: Plan and Status

- New conversion of E2a, E2b and EG2 data-sets
- Implement experimentally (reviewed) cuts and corrections (coming soon!)
 - ➔ Following the newly developed calibration suites by Gagik
- Conversion status:
 - ➔ Used “Sqlite3” to get E2a runs from a table “RunDatabase_e2a”

```
sqlite> select * from RunDatabase_e2a;  
Run|Files|Events|Target|Time|Beam|Current|Torus|MiniTorus|Fcup  
17864|2|1126981|other|99-04-15|4.461|3.0|2250.0|5996.0|162716.0  
17865|2|881850|other|99-04-15|4.461|15.0|2250.0|5995.0|141464.0  
17866|2|532425|other|99-04-15|4.461|20.0|2250.0|5996.0|96436.0  
17867|4|2006773|other|99-04-15|4.461|20.0|2250.0|5996.0|236789.0  
17868|3|2318983|empty|99-04-15|4.461|20.0|2250.0|5996.0|853455.0  
17869|8|4649287|wheel_1|99-04-15|4.461|18.0|2250.0|5996.0|529106.0  
17870|3|1945960|4He|99-04-15|4.461|5.0|2250.0|5996.0|33963.0  
17871|5|2780210|4He|99-04-15|4.461|5.0|2250.0|5995.0|69097.0  
17872|4|2111207|C12|99-04-16|4.461|9.0|2250.0|5996.0|147581.0  
17873|4|2106533|other|99-04-16|4.461|15.0|2250.0|5996.0|245819.0  
17874|17|10135007|other|99-04-16|4.461|15.0|2250.0|5996.0|1102706.0  
17875|5|3001632|other|99-04-16|4.461|15.0|2250.0|5996.0|1104268.0  
17876|12|7334260|other|99-04-16|4.461|15.0|2250.0|5996.0|793478.0  
17877|8|4362525|other|99-04-16|4.461|15.0|2250.0|5996.0|474246.0  
17881|9|5738192|4He|99-04-16|4.461|3.0|2250.0|5996.0|92336.0
```

.....



Data conversion: Plan and Status

- New conversion of E2a, E2b and EG2 data-sets
- Implement experimentally (reviewed) cuts and corrections (coming soon!)
 - ➔ Following the newly developed calibration suites by Gagik
- Conversion status of E2a:
 - ➔ Used “Sqlite3” to get E2a runs from a table “RunDatabase_e2a”
 - ➔ Made a list of runs for each beam energy and target

	Number of runs summary								
Beam(GeV)/Target	⁴ He	³ He	¹² C	⁵⁶ Fe	Empty	Wheel_1	Wheel_2	CH2	Other
1.161	None	20	11	None	5	None	None	1	1
2.261	52	35	46	6	21	None	None	7	3
4.461	61	23	39	5	14	3	1	4	15
Silo Location	/mss/clas/e2a/production/pass1.0/PROC/ and /mss/clas/e2a/production/pass1.0/PROC2/ (?)								



Data conversion: Plan and Status

- New conversion of E2a, E2b and EG2 data-sets
- Implement experimentally (reviewed) cuts and corrections (coming soon!)
 - ➔ Following the newly developed calibration suites by Gagik
- Conversion status of E2a:
 - ➔ Used “Sqlite3” to get E2a runs from a table “RunDatabase_e2a”
 - ➔ Made a list of runs for each beam energy and target
 - ➔ Plan to store converted data in ODU disks and Silo tagged with a beam energy, target and cooked data location; PROC & PROC2!
- Need to create “Sqlite” tables for E2b and EG2 data



Data Conversion Status

➤ Conversion issues:

➔ Several errors while running “bos2evio” in a batch mode:

1. Could not create the Java Virtual Machine ➔ JAVA heap size issue!

```
> more ./bin/bos2evio
```

```
#!/bin/sh -f
```

```
SCRIPT_DIR=`dirname $0`
```

```
DISTRO_DIR=$SCRIPT_DIR/.. ; export DISTRO_DIR
```

```
CLARA_SERVICES=$DISTRO_DIR/lib/services; export CLARA_SERVICES
```

```
DATAMINING=$DISTRO_DIR ; export DATAMINING
```

```
CLAS12DIR=$DISTRO_DIR ; export CLAS12DIR
```

```
MF_TORUS="-torus $CLAS12DIR/lib/data/magfield/clas12-fieldmap-torus.dat"
```

```
MF_SOLENOID="-solenoid $CLAS12DIR/lib/data/magfield/clas12-fieldmap-solenoid.dat"
```

```
GEOM="-dataPath $CLAS12DIR/lib/data/geometry"
```

```
echo +-----
```

```
echo "| Starting CLARA-PLATFORM with CLARA_SERVICES = " $CLARA_SERVICES
```

```
echo +-----
```

```
echo "\n"
```

```
echo "INSTALLATION DIRECTORY = " $CLARA_HOME
```

```
echo "LIBRARY DIRECTORY    = " $DATAMINING/lib/clas/core
```

```
#java -cp "$DATAMINING/lib/clas/core/*" org.jlab.coda.eventViewer.EventTreeFrame $*
```

```
#java -cp "$DATAMINING/lib/clas/*" org.jlab.utils.BoardDecoderVSCM $*
```

```
java -Xms2048m -cp "$DATAMINING/lib/clas/*" org.jlab.data.utils.Bos2Evio $*
```

-Xms: specifies the initial heap size

-Xmx: specifies the maximum heap size



Data Conversion Status

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1. Could not create the Java Virtual Machine ➔ JAVA heap size issue!
2. Changed -Xms2048m to -Xmx100m to resolve this issue
3. Got an other error with a “SCRIPT_DIR=`dirname \$0`” definition inside bos2evio
4. Advised to redefine “SCRIPT_DIR” to point to coatjava binary to initialize the necessary environment variables.



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➔ This definition has to be generalized to work for interactive and batch jobs!
5. Some jobs exited because “failed to allocate enough heap space”
➔ -Xmx2100m seems working till now!
6. Other Farm jobs failed because the EVIO output reached the maximum size of 2 GB and (probably) failed to close properly!



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➔ -Xmx2100m seems working till now!
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7. Additional issues:
 - a. Don't have a permission to store data on /mss/clas/e2a/
➔ Permission granted to “clase2” ONLY!
 - b. Where shall I store converted data at ODU?
 - c. Can't access ODU snail machine in batch mode while could interactively!



Back-up Slides



Analyzing Data: EVIO Structure

```

> more ~/coatjava/etc/bankdefs/clas12/CLAS6EVNT.xml
<evio_dictionary>
<bank name="HEADER" tag="21000" info="">
  <section name="info" tag="21001" info="Event Header Information">
    <column name="nrun" type="int32" num="1" info="run number"/>
    <column name="nevt" type="int32" num="2" info="event number"/>
    <column name="trigger" type="int32" num="3" info="trigger type"/>
    <column name="helicity" type="int8" num="4" info="faraday cup gated"/>
    <column name="fc" type="float32" num="5" info="faraday cup"/>
    <column name="fcg" type="float32" num="6" info="faraday cup gated"/>
    <column name="stt" type="float32" num="7" info="start time"/>
  </section>
</bank>

<bank name="EVENT" tag="22000" info="EVNT bank for reconstructed CLAS6 Data">
  <section name="particle" tag="22001" num="0" info="Container Bank">
    <column name="status" type="int8" num="1" info="status of the particle"/>
    <column name="charge" type="int8" num="2" info="charge of the particle"/>
    <column name="pid" type="int32" num="3" info="particle ID"/>
    <column name="mass" type="float32" num="4" info="particle mass calculated from
beta"/>
    <column name="px" type="float32" num="5" info="x component of momentum"/>
    <column name="py" type="float32" num="6" info="y component of momentum"/>
    <column name="pz" type="float32" num="7" info="z component of momentum"/>
    <column name="vx" type="float32" num="8" info="x component of vertex"/>
    <column name="vy" type="float32" num="9" info="y component of vertex"/>
    <column name="vz" type="float32" num="10" info="z component of vertex"/>
    <column name="dcstat" type="int8" num="11" info="pointer to dc bank"/>
    <column name="ecstat" type="int8" num="12" info="pointer to ec bank"/>
    <column name="scstat" type="int8" num="13" info="pointer to sc bank"/>
    <column name="ccstat" type="int8" num="14" info="pointer to cc bank"/>
    <column name="lcstat" type="int8" num="15" info="pointer to cc bank"/>
  </section>

```

Typo: must be info="helicity interval count" according to tgbi.ddl

Typo: must be info="pointer to LAC bank" according to evnt.ddl



Analyzing Data: EVIO Structure

```
> more ~/coatjava/etc/bankdefs/clas12/CLAS6EVNT.xml
```

```
.....  
<section name="detector" tag="22002" num="0" info="Detector information for particles">  
  <column name="scsector" type="int32" num="1" info="sector of TOF"/>  
  <column name="scpaddle" type="int32" num="2" info="paddle of TOF"/>  
  <column name="ecsector" type="int32" num="3" info="sector of EC"/>  
  <column name="ccnphe" type="float32" num="4" info="number of photoelectrons in CC"/>  
  <column name="sctime" type="float32" num="5" info="time in TOF corrected with TOF"/>  
  <column name="scpath" type="float32" num="6" info="path in TOF corrected with TOF"/>  
  <column name="ectime" type="float32" num="7" info=""/>  
  <column name="ecpath" type="float32" num="8" info=""/>  
  <column name="ecin" type="float32" num="9" info=""/>  
  <column name="ecout" type="float32" num="10" info=""/>  
  <column name="ectot" type="float32" num="11" info=""/>  
  <column name="ecu" type="float32" num="12" info=""/>  
  <column name="ecv" type="float32" num="13" info=""/>  
  <column name="ecw" type="float32" num="14" info=""/>  
</section>  
</bank>
```

```
<bank name="DETECTOR" tag="23000" info="detector banks">  
  <section name="ecpb" tag="23001" info="EC detector bank">  
    <column name="sector" type="int8" num="1" info="hit sector"/>  
    <column name="etot" type="float32" num="2" info="total energy of the hit"/>  
    <column name="ein" type="float32" num="3" info="inner energy of the hit"/>  
    <column name="eout" type="float32" num="4" info="outer energy of the hit"/>  
    <column name="time" type="float32" num="5" info="time of the hit"/>  
    <column name="path" type="float32" num="6" info="path of the hit"/>  
    <column name="x" type="float32" num="7" info="x coordinate of the hit"/>  
    <column name="y" type="float32" num="8" info="y coordinate of the hit"/>  
    <column name="z" type="float32" num="9" info="z coordinate of the hit"/>  
  </section>
```

```
.....
</section>
<section name="scpb" tag="23002" info="SC detector bank">
  <column name="sector" type="int8" num="1" info="hit sector"/>
  <column name="paddle" type="int8" num="2" info="hit sector"/>
  <column name="edep" type="float32" num="3" info="deposited energy"/>
  <column name="time" type="float32" num="4" info="time of the hit"/>
  <column name="path" type="float32" num="5" info="path of the hit"/>
</section>
<section name="ccpb" tag="23003" info="CC detector bank">
  <column name="sector" type="int8" num="1" info="hit sector"/>
  <column name="nphe" type="float32" num="2" info="number of photo-electrons"/>
  <column name="time" type="float32" num="3" info="time of the hit"/>
  <column name="path" type="float32" num="4" info="path of the hit"/>
</section>
<section name="lcpb" tag="23004" info="LC detector bank">
  <column name="sector" type="int8" num="1" info="hit sector"/>
  <column name="etot" type="float32" num="2" info="total energy of the hit"/>
  <column name="ein" type="float32" num="3" info="inner energy of the hit"/>
  <column name="time" type="float32" num="4" info="time of the hit"/>
  <column name="path" type="float32" num="5" info="path of the hit"/>
  <column name="x" type="float32" num="6" info="x coordinate of the hit"/>
  <column name="y" type="float32" num="7" info="y coordinate of the hit"/>
  <column name="z" type="float32" num="8" info="z coordinate of the hit"/>
</section>
</bank>

<bank name="TAGGER" tag="24000" info="Tagger banks">
  <section name="tgp" tag="24001" info="Tagger bank">
    <column name="status" type="int8" num="1" info="hit status"/>
    <column name="tid" type="int16" num="2" info="T-counter id"/>
    <column name="eid" type="int16" num="3" info="E-counter id"/>
    <column name="time" type="float32" num="4" info="time of the tagger hit"/>
    <column name="energy" type="float32" num="5" info="energy of the tagger hit"/>
  </section>
</bank>
</evio dictionary>
```

Typo: must be
info="hit paddle"