

# AMS Data Acquisition (DAQ) Software

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5 th AMS Users Meeting

Atlanta

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# Update on Software Status

**Current Software Version: V 4.4.8**

Software version that is most widely distributed right now:  
AMS Version V 4.3mode

New Features in V 4.4.8:

- 1) Jump-MS\*
- 2) General Alternation Mode\*
- 3) Light Scattering

\* Programmed by Jose Jimenez and briefly discussed at last Users Meeting

**I recommend that you all update to V 4.4.8!**

# Downloading AMS DAQ Software

1) Aerodyne ftp site:

AMSIncoming\AMSUsers\ALLUsers\AMSSoftware

2) Jose's Web Page( <http://cires.colorado.edu>)

Section 3.4. Resources for Aerodyne AMS Users

- provides direct link to ARI ftp site

**You will be prompted for the Username/Password combination that you use to access your folder on the ftp site.**

**(Please see Tim or Manjula if you don't have this information)**

# AMS Program Requirements

- 1) Pre-installation of the appropriate AMS Application Setup Program
- 2) Pre- installation of the NIDAQ Software for slow/fast Data Acquisition Boards

**NOTE:** The NIDAQ EXAMPLES FILE MUST ALSO BE INCLUDED IN INSTALLATION

- NIDAQ intallation process places files accessed by AMS program(i.e. NIDAQ32.dll and NIDEX32.dll) in C:\winnt\System32 folder.

- 3) The computer C drive must contain a C:\AMS\AMSCode folder with the following files:
  - a) AMSMenu.prm
  - b) AMSID.prm files.

# Installing Application Setup Program

- Application setup program that was installed at ARI in AMS computers was a Win 98 version that enables you to run any AMS executable made by me under a Win98 OS System.
- I compile new versions of AMS executables under a Win2000 OS so you MUST update the Application Setup Program to the Win2K Version in order to run new version of AMS program.

The Win2K Application Setup can be downloaded from the ARI FTP site in the following folder:

AMSIncoming\AMSUsers\ALLUsers\AMSSoftware\Installs\Win2KInstalls

# Installing Application Setup Program

## 1) Uninstall Win98 Application Program

- go to Start\Settings\ControlPanel\AddRemoveSoftware
- Remove Program called AMS

## 2) Install the Win2000 Application Program

- Shut down all other programs
- Go to copy of Win2KInstalls folder and start the Setup.exe

**NOTE:** Ignore the message that reports a conflict with the shdocvw.dll

# Software Requirements During Field Campaigns

CD's containing the following files should be available:

- 1) NIDAQ Software
- 2) AMS Application Setup Folder from ftp site
- 3) AMSMenu.prm and AMSID.prm files.

# New Program Buttons

AMS - [AMS Version 4.4.8 (Sep 29, 2004)]

File Edit Help

## Aerosol Mass Spectrometer Software

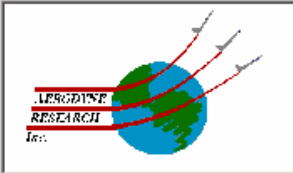
Version 4.4.8 (Sep 29, 2004)

Copyrighted by J.L. Jimenez, M. Canagaratna, J.T. Jayne, D.R. Worsnop 1997 - 2004  
HDF Interface Routines by Jonathan Allen (ASU & MIT), 2000

10/11/2004 2:19:21 AM

Researcher(s) Operating AMS:  This information will be saved in all datafiles

Experiment Being Conducted:



### SETTINGS

Parameter Menu    m/z Steps for TOF Mode    Change Default Settings

### MEASUREMENT MODES

Time-Of-Flight (TOF)    Mass Spectrum (MS)    **Jump Mass Spectrum (JMS)**    General Alternation Mode    Alternate TOF - MS    Exit Program

### DIAGNOSTIC AND TUNING MODES

Raw Signal    Tune Balzers Mass Spec.    Calibrate Electron Multiplier    Calibrate Servo Position    Check Air Beam

### HELP & INFORMATION

Command Help    Particle Calculator    On-line Manual    NIST WebBook (E-MS Info)    AMS Outgoing FTP Site    AMS Incoming FTP Site

### Status Log

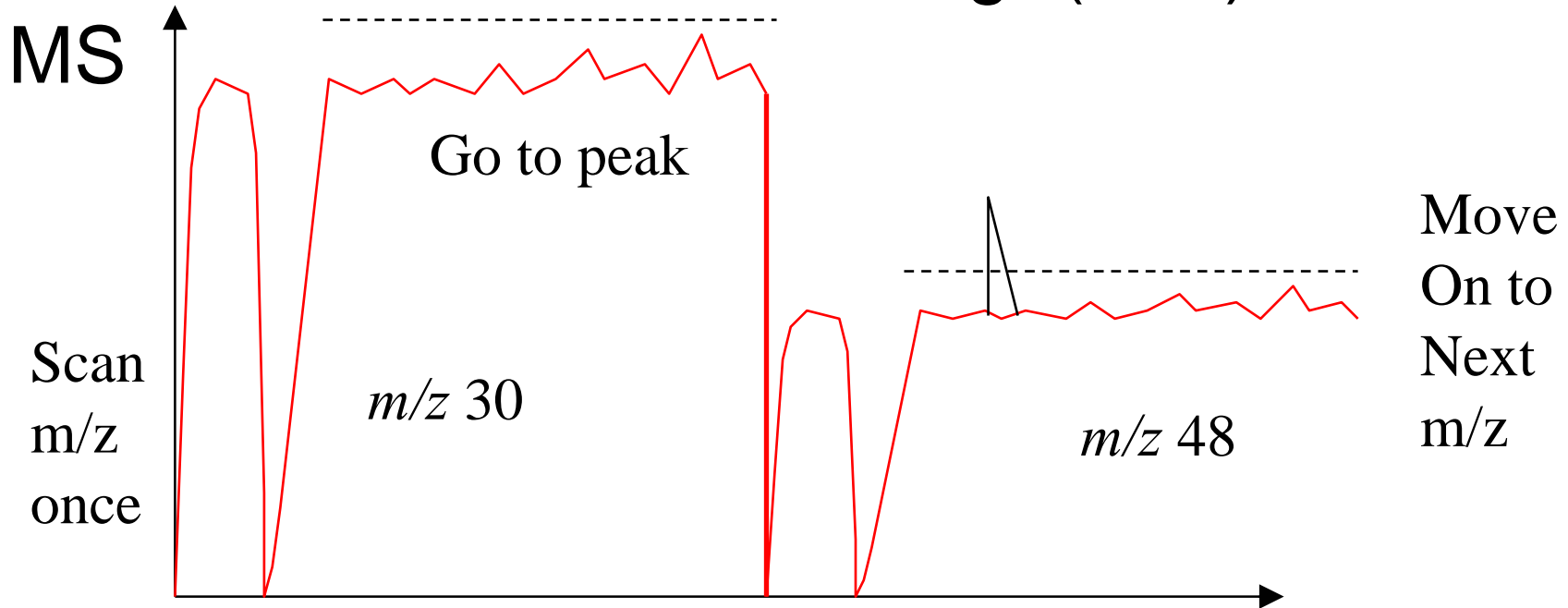
This Info. is Saved in a "\_History.dat" File

```
10/11/2004 2:19:14 AM , >>>> WARNING: Simulating Chopper
10/11/2004 2:19:14 AM , >>>> WARNING: Running w/o Data Acqui
10/11/2004 2:19:13 AM , AMS Software v. 4.4.8 (Sep 29, 2004) Start
```

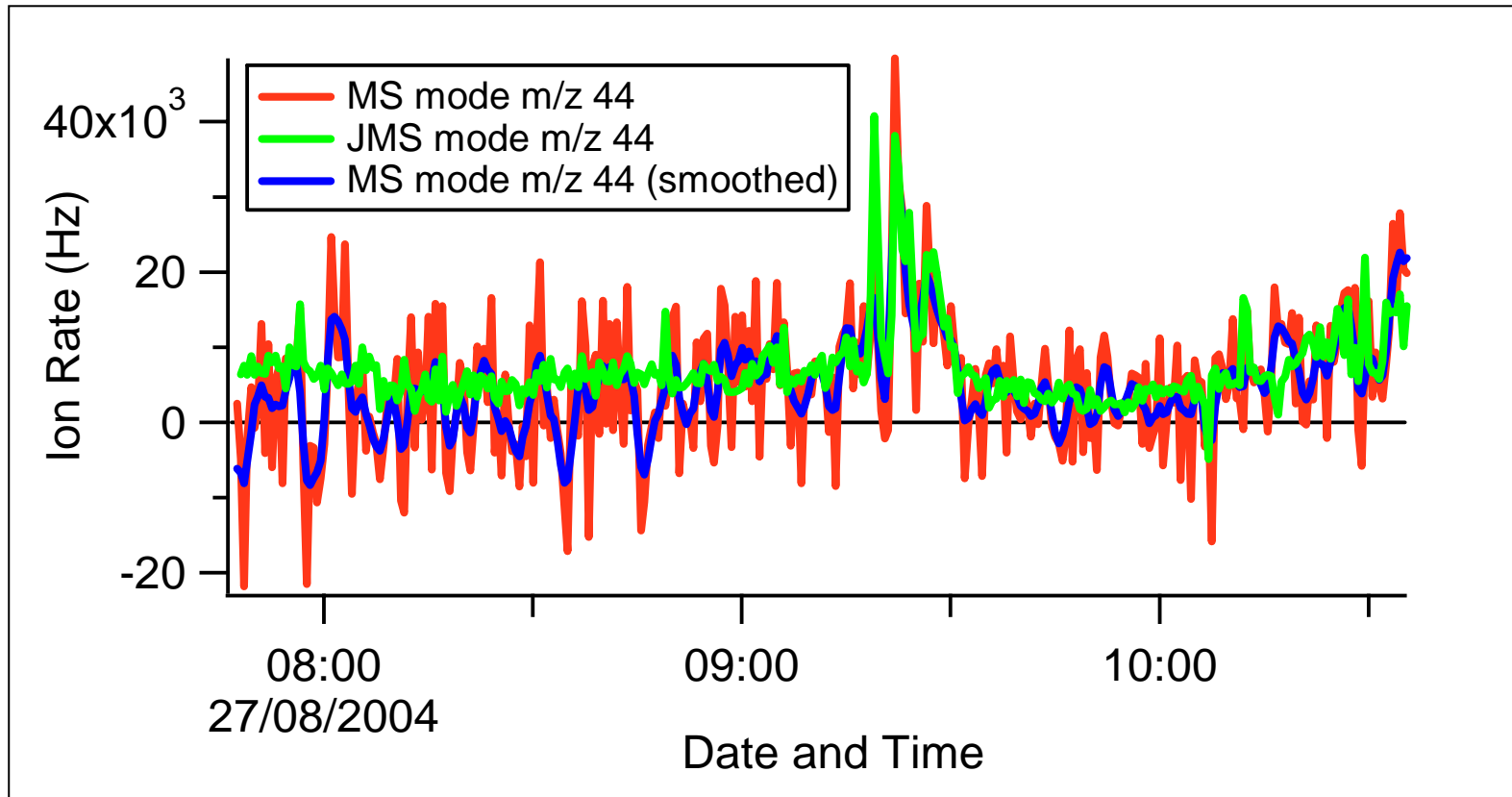


# Jump MS mode

- Like MS mode, but scanning only a few  $m/z$
- Like “selected ion monitoring” (SIM) in GC-MS



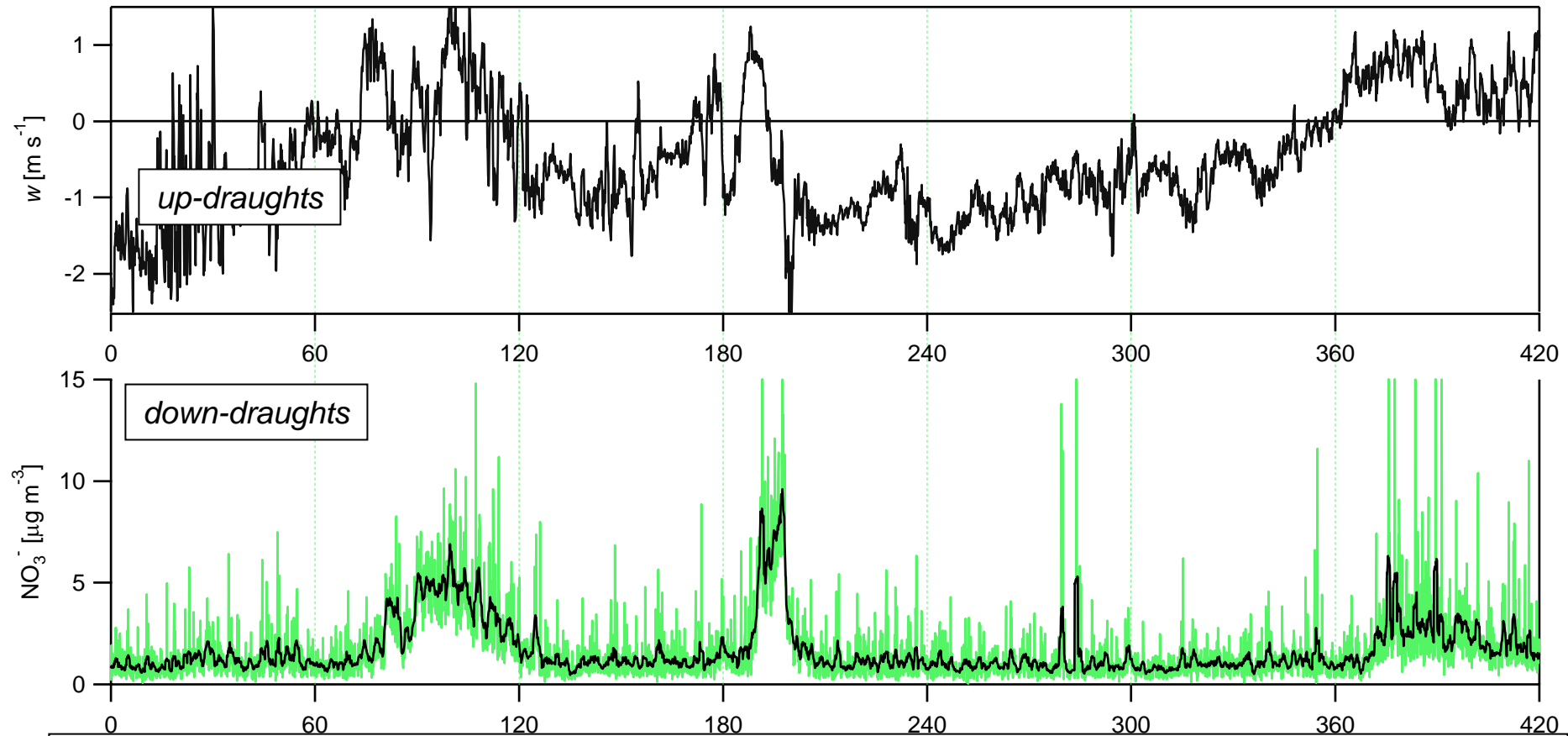
# S/N Improvement in Jump-MS



Flight Data Courtesy of J. Crosier (UMIST)

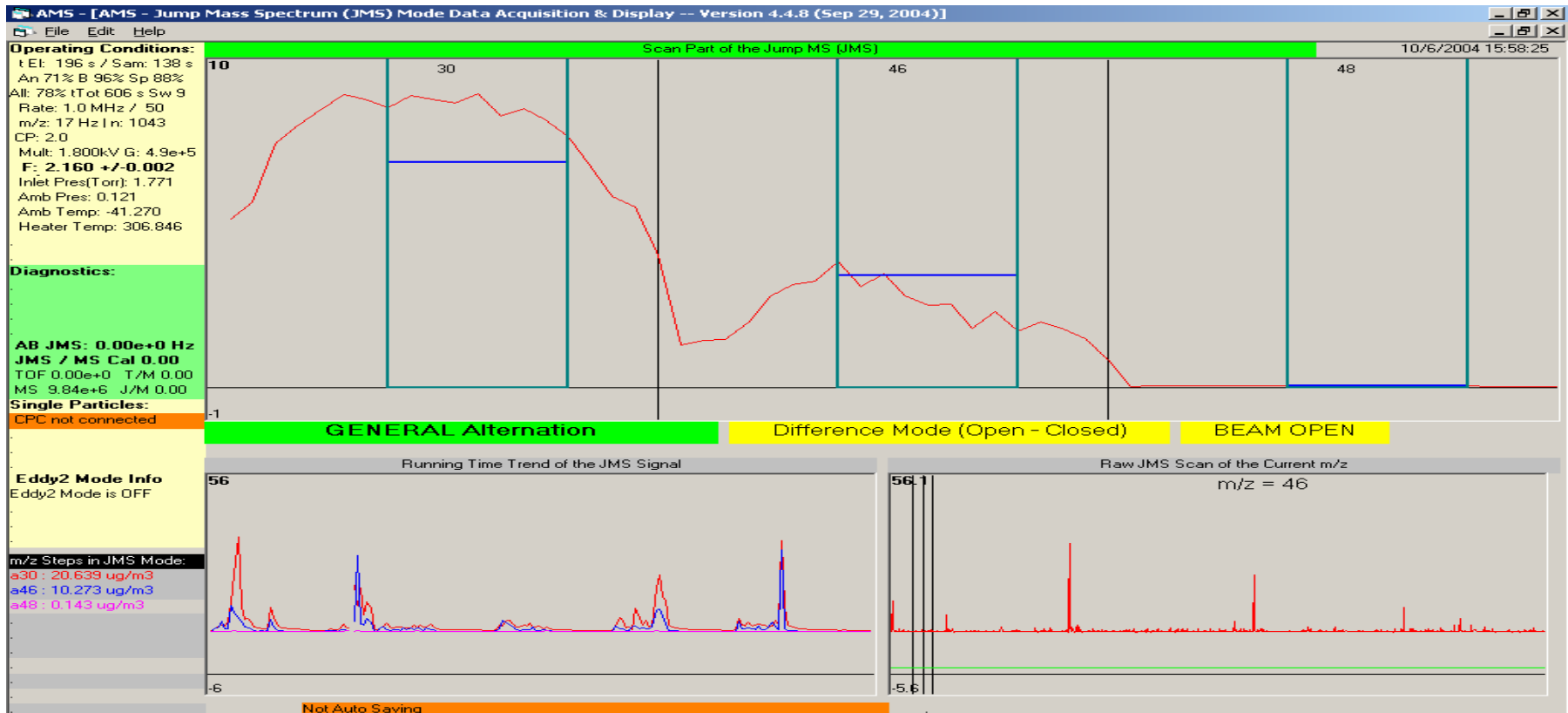
# 10 Hz Jump Mode Sensitivity

$$F_N = \overline{w'\chi'_N} = \overline{w\chi_N} - \overline{w}\overline{\chi_N}$$



Example Time-Series Measured with AMS (Urban Emission of NO<sub>3</sub><sup>-</sup>)  
Courtesy E.Nemitz (CEH, Scotland)  
Obtained with Eddy Type2 Mode programmed by Jose Jimenez

# Jump-MS Screen



## NOTES:

- In data acquisition boards menu tab the acquisition rate for JMS needs to be specified for the JMS Mode.
- Scanned m/z's are from F6 Screen Settings. **First m/z scanned provides DC level. So it should be one with no particle signal .**
- Data is saved in JMS.itx (Analogous to MS.itx)

# General Alternation Mode ("GENALT")

- Alternate TOF, MS, JMS
  - Or any two of them
  - Variable time for each mode
- Implemented as separate mode from old TOF-MS alternate mode
- At present (v. 4.4.8) both modes work
  - In future probably only support GENALT

# New Menu Parameters

Save & Quit    Quit w/o Saving

Graphs    Single Particles    Serial Ports    Analog In and Out Calib.    String Parameters  
Flow, Size & Mass Calib.    Mass Spectrometer    Multiplier & Chopper    Data Acquisition Boards    **Averaging & Saving**

### Averaging of TOF and MS Data

Time Steps (10us) per Avg. Sig Point  For reducing computing time & the size of the data files. MUST be an odd number (1, 3, or 5 commonly used)

Dead Time in MS Mode After Chopper Move (s)  Not Less than 0.5 sec

Dwell Time in MS Mode for Each Chopper Position (s)

#### TOF-MS Alternate Mode

Dwell Times (s)

TOF

MS

#### General Alternation Mode

Dwell Times (s)

TOF

MS  <0 if not used

JMS

### Saving of TOF and MS Data

Note: Make sure that the different averaging and saving modes are not active simultaneously

Run Number for Last Data Files Saved (0 to 9999)

Format of Saved Data  
 ITX     HDF     BOTH

Save TOF Size Dist. vs dLog10Da  
 Yes     No

Efficient Data Saving Mode  
 Yes     No

NOT IMPLEMENTED YET: Saves repetitive information only on the first file of a series of files saved

Fixed Time for Next Save in min. (e.g. 10 min. for 6:00 PM, 6:10 PM, 6:20 PM...) (<0: OFF)  Needs to be >= 0.1 min.

### Markers for TOF Mode

Position of DC Level Markers (us)

FRONT: from  to

BACK: from  to

Number of Time-of-Flight Region Markers  
 0     1     2     3

Position of TOF Marker 1 (us):  2:  3:

Marker for End of Air Beam (us)  Needs to be set right for correct Air Beam calculation

Marker for End of TOF data (us)  TOF data in matrix logfiles are saved only to that point

Note: Make sure that all markers are set properly. Otherwise the program may not work as expected.

### Saving of Log Files

\_MainLog.dat

Save Main Log File  
 Yes     No

Save TOF Size Dist Log  
 Yes     No

Save MS Difference Stick Log  
 Yes     No

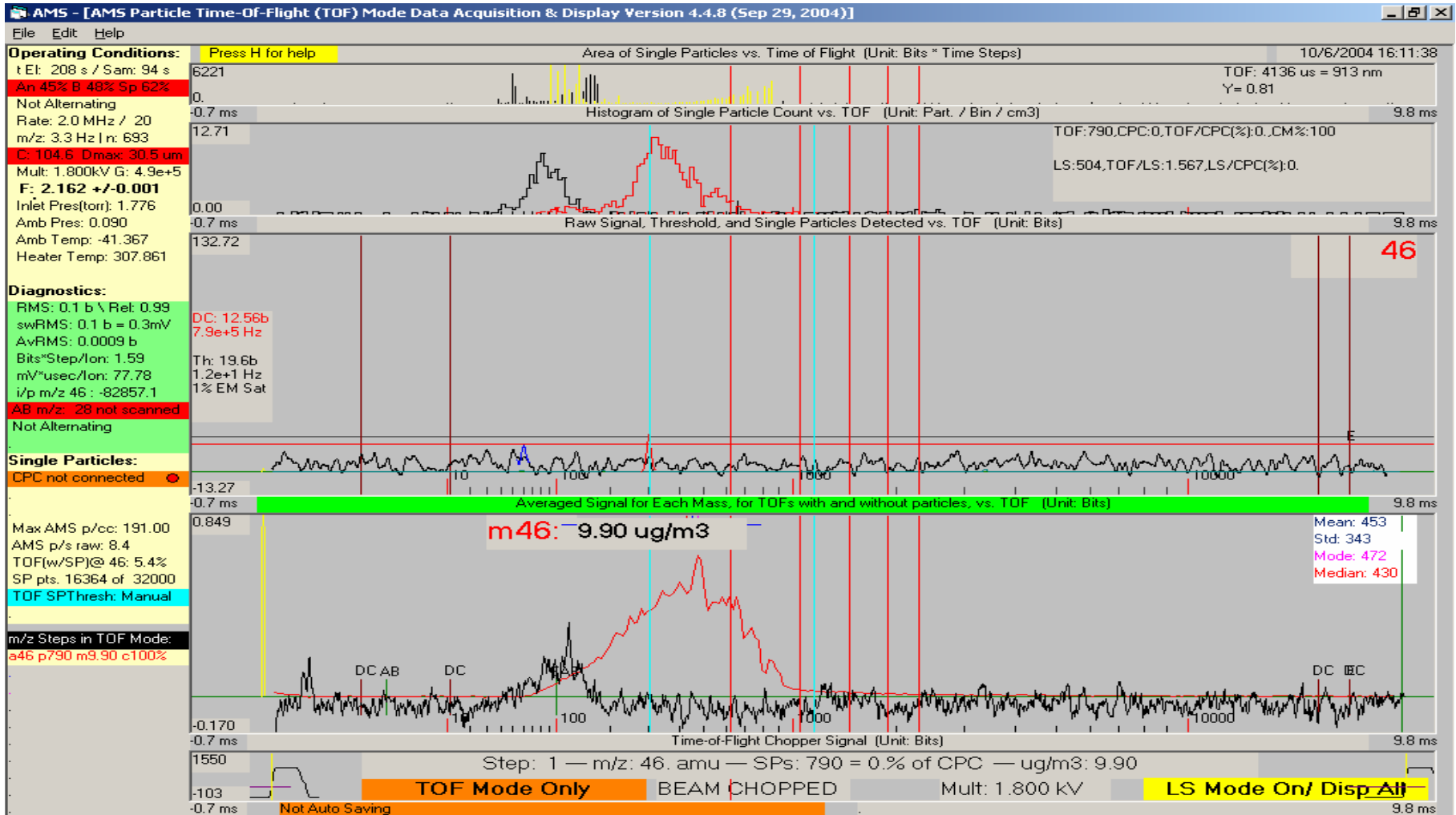
AutoSave Interval (s) of Slow Board Inputs (<0 Off)  File 'Slowlog.dat'

\*\*\*\* All log files above are saved in C:\AMS\AMSDATA\AMSLogFiles\*\*\*\*

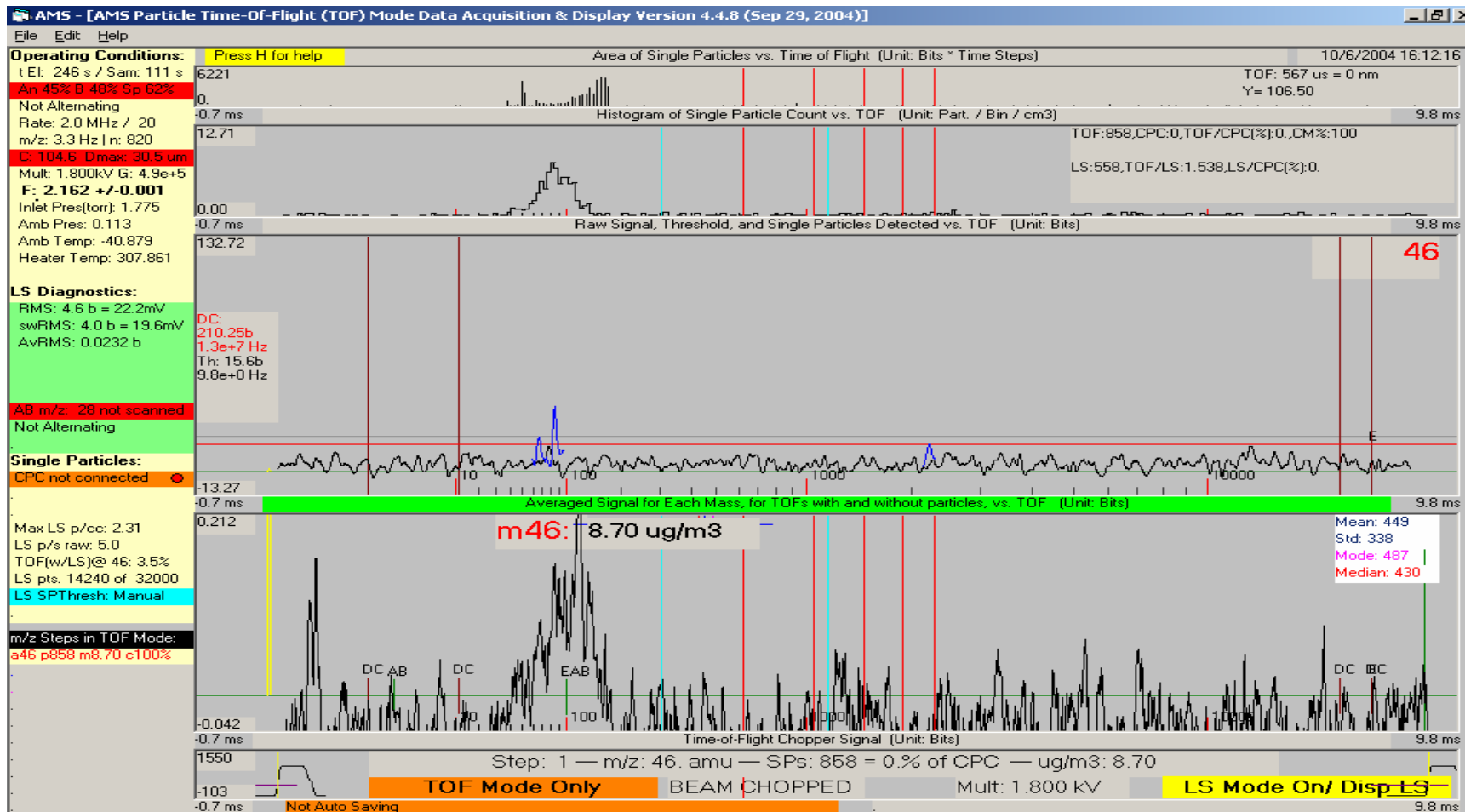
Save Transient Files  
 Yes     No    Transient File Saving:

Enter Transient Save Directory:

# Light Scattering



# Light Scattering





# New Menu Parameters

Save & Quit    Quit w/o Saving

Flow, Size & Mass Calib.    Mass Spectrometer    Multiplier & Chopper    Data Acquisition Boards    Averaging & Saving

Graphs    **Single Particles**    Serial Ports    Analog In and Out Calib.    String Parameters

**AMS TOF SIGNAL:**

**Automatic Single Particle Threshold**

Time (sec. per TOF m/z) w/o Threshold Crossings Before Quitting SP Threshold Mode:  Typically ~ 10 sec/mass, can be tuned according to experiment, with longer times for low particle concentrations.

**SP Averaging and Saving**

Points to Save with SP Before Peak (<0):

Points to Save with SP After Peak:

Points on Either Side of Peak for SP Average:

Save All SP to File (.spd):  Yes  No    Otherwise Saves a Limited Number (~ 1,000) to TOF.itx file

**LIGHT SCATTERING (LS) SIGNAL:**    These parameters can be used if a Lt Scattering module has been installed in your AMS

Light Scattering Mode:  ON  OFF

Light Scattering Threshold for single particles (bits):

LS Signal Input Channels on Fast Board

Light Scattering Sliding Window (Pts):

LS Signal Input:

Distance between Laser beam and Oven (cm):

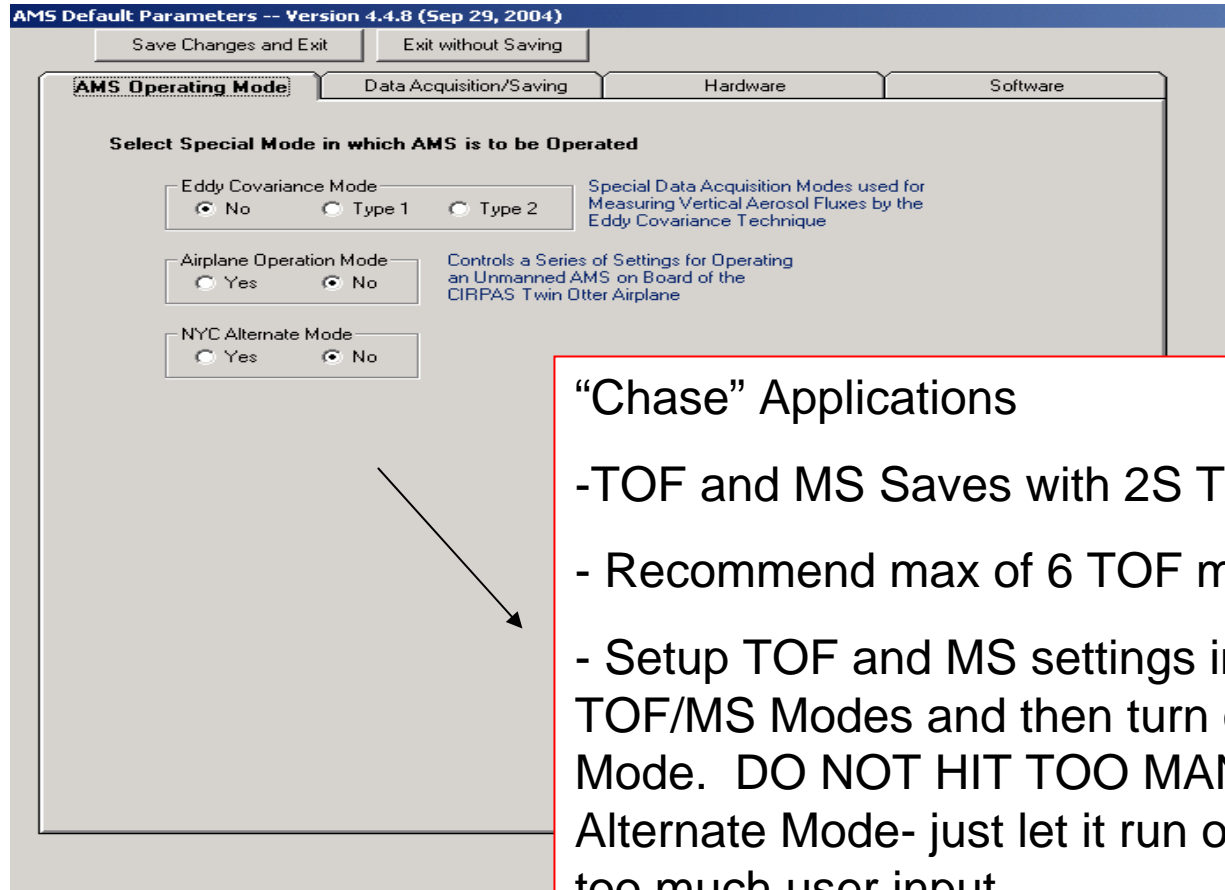
Light Scattering Reference Input:

Save All LS Single Particles:  Yes  No

Otherwise 1000 are saved to Files (\*.lsd, \*.tofsd).

NOTE: BUG FIXED in which 1<sup>st</sup> m/z in TOF got bogus SP counts when switching from MS to TOF in Alternate Mode ( Thanks to Eben Cross for helping debug the error!)

# AMS Operating Modes



## “Chase” Applications

- TOF and MS Saves with 2S Time Resolution
- Recommend max of 6 TOF masses
- Setup TOF and MS settings in regular AMS TOF/MS Modes and then turn on NYC Alternate Mode. DO NOT HIT TOO MANY KEYS IN NYC Alternate Mode- just let it run or it may crash with too much user input
- Regular TOF.itx and MS.itx saved in AutoSave Directory

\* Plume Mode

# AMS Software problems

- 1) Check Menu (especially if problem is sudden)
  - Gets corrupted if program crashes or is exited in non-standard way
  - At least 50% of problems are due to this
  - C:\AMS\AMSCode\AMSMenu.prm
  - A copy is saved on AMSLogFiles directory (C:\AMS\AMSData\AMSLogFiles) every day you use the program (i.e. 041011\_Menu.prm for today's menu )
  - Also saved in every ITX file (“par” and “ParStr”)
  - Compare you current menu with a known good one side-by-side in Excel
  - Make backups of known good menus

# Syncing AMS with Other Operations

AMS Default Parameters -- Version 4.4.8 (Sep 29, 2004)

Save Changes and Exit    Exit without Saving

AMS Operating Mode    **Data Acquisition/Saving**    Hardware    Software

**Data Acquisition Boards**    See Nat. Inst. "Measurement and Automation Explorer"

Fast Board (NI PCI-6110E)    Device Number    1

Slow Board (NI PCI-6024E)    Device Number    2

Slow Board Installed    Board Used to Control Chopper Servo

Yes     No     Fast     Slow

Analog Output Board (PCI-6703)    Device Number    0

A/D Gain for Mass Spec Signal (ch. 0)    1

A/D Gain for Chopper Signal (ch. 1)    1

**Saving**    Saving can be externally controlled via the digital input lines on the Slow Board. If External Save Control is turned on, AutoSaving will take place on every change of state in chosen input line.

ExternalSaveControl On    Digital Input Line For Save Control    3

Yes     No

Digital Switch Dead Time(min)    0.01    Reaveraging of data after each save will be delayed by dead time

- 1) Save AMS Data Based on Externally Input Digital Signal
- 2) Output Digital Signal When AMS Program Saves- Use this signal to sync other instruments, processes (i.e. wire probe movement) with AMS
  - This option has been successfully implemented in previous version for UMIST, but needs to be included in the AMSV4.4.8

# Syncing AMS with Other Operations

- Use separate program that has the same save timing as AMS (i.e. Synced Valve operation in Prophet, Duke Forest, Nova Scotia)
- Ask Manjula if you want this program

The screenshot shows a Windows-style application window titled "Form1" with a blue header bar. The main content area has a light gray background and is titled "Valve Switching Program for Nova Scotia" in blue text. Below the title, it says "Written by Manjula Canagaratna (July, 2004)".

The interface features four columns of controls for different valves:

	Denuder (Valve1)	AMS (Valve2)	DMA (Valve 3)	AMS (Valve2)
Valve Open Time(min)	<input type="text" value="10"/>	<input type="text" value="10"/>	<input type="text" value="10"/>	<input type="text" value="10"/>
	<input type="button" value="TurnValvesOn"/>		<input type="button" value="TurnValvesOff/Exit"/>	

Below the controls, there are three numbered instructions:

- 1) The Valve Open time must be a multiple of a beam width probe cycle.
- 2) Valves 1,2,and 3 are controlled by digital outputs 4,5,and 6 respectively from the slow board.
- 3) Valves are highlighted in red as they are opened. A valvelog.dat file can be found in log file directory.

# Syncing AMS with Other Operations

Save & Quit    Quit w/o Saving

Flow, Size & Mass Calib.    Mass Spectrometer    Multiplier & Chopper    Data Acquisition Boards    Averaging & Saving

Graphs    Single Particles    Serial Ports    **Analog In and Out Calib.**    String Parameters

### Calibration of the Analog Inputs of the Slow Board

Channel	Parameter	Value	Offset	Gain	Units
Channel 0	Ambient Temp (C)	1000.000	*V0 + 0.000	5	
Channel 1	Heater Temp	130.00	*V1 + 0.00	10	
Channel 2	Ambient P=	100.00	*V2 + 0.00	10	
Channel 3	Flow Rate (cm <sup>3</sup> /s)	1.706	*V3 + -0.494	10	
Channel 4	Rel Humidity (%)	1.00	*V4 + 0.00	5	
Channel 5		1.00	*V5 + 0.00	5	
Channel 6		0.00	*V6 + 0.00	5	
Channel 7		1.00	*V7 + 0.00	5	

Pick Desired Voltage Range: (+/-V)

Analog Input Reading    Press Button to Read Analog Inputs

Read AI

Calibrate with Gilbertator or Dycal

### Analog Output Board Parameters (PCI-6703)

Channel	Parameter	Value	Offset	Gain	Units
Channel 0	Chopper Speed (Hz)	0.00	*V0 +	1.00	

Save & Quit    Quit w/o Saving

Graphs    Single Particles    Serial Ports    Analog In and Out Calib.    String Parameters

Flow, Size & Mass Calib.    Mass Spectrometer    Multiplier & Chopper    Data Acquisition Boards    **Averaging & Saving**

### Averaging of TOF and MS Data

Time Steps (10us) per Avg Sig Point: 3

For reducing computing time & the size of the data files. MUST be an odd number (1, 3, or 5 commonly used)

Dead Time in MS Mode After Chopper Move (s): 0.5    Not Less than 0.5 sec

Dwell Time in MS Mode for Each Chopper Position (s): 5.0

### TOF-MS Alternate Mode

Dwell Times (s)

Mode	TOF	MS
TOF	15.0	
MS	15.0	

<0 if not used

### General Alternation Mode

Dwell Times (s)

Mode	TOF	MS	JMS
TOF	15.0		
MS	15.0		
JMS			15.0

### Markers for TOF Mode

Position of DC Level Markers (us)

FRONT: from 750 to 1500

BACK: from 5680 to 5700

Number of Time-of-Flight Region Markers: 0 1 2 3

Position of TOF Marker 1 (us): 4310 2: 4470 3: 6500

Marker for End of Air Beam (us): 3600    Needs to be set right for correct Air Beam calculation

Marker for End of TOF data (us): 5700    TOF data in matrix logfiles are saved only to that point

Note: Make sure that all markers are set properly. Otherwise the program may not work as expected.

### Saving of TOF and MS Data

Note: Make sure that the different averaging and saving modes are not active simultaneously

Run Number for Last Data Files Saved (0 to 9999): 958

Format of Saved Data:  ITX  HDF  BOTH

Save TOF Size Dist. vs dLog10a:  Yes  No

Efficient Data Saving Mode:  Yes  No

NOT IMPLEMENTED YET: Saves repetitive information only on the first file of a series of files saved

Fixed Time for Next Save in min. (e.g. 10 min. for 6:00 PM, 6:10 PM, 6:20 PM...) (<0: OFF): -50    Needs to be >= 0.1 min.

### Saving of Log Files

\_MainLog.dat

Save Main Log File:  Yes  No

Save TOF Size Dist Log:  Yes  No

Save MS Difference Stick Log:  Yes  No

AutoSave Interval (s) of Slow Board Inputs (<0 OFF): 10.0    File: 'Slowlog.dat'

\*\*\*\* All log files above are saved in C:\AMS\AMSD\data\AMS\LogFiles\*\*\*\*

Save Transient Files:  Yes  No    Transient File Saving:

Enter Transient Save Directory:

Use the Extra Analog Inputs on Slow Board

# AMS Software problems

## 2) Runtime Error # 6

- Typically occurs in TOF mode only not in MS mode. It is often because of a drop out of the chopper signal.
  - chopper signal can drop out if bad I signal coming from diode or chopper wheel is not spinning when chopper servo moves through the block/chop/open cycles
  - Software crash due to this error will be prevented in future software versions
- ## 3) Check TOF velocity calibration. This can cause “division by zero” issues

**Most Current Software problems due to either menu corruption or Chopper signal issues!**

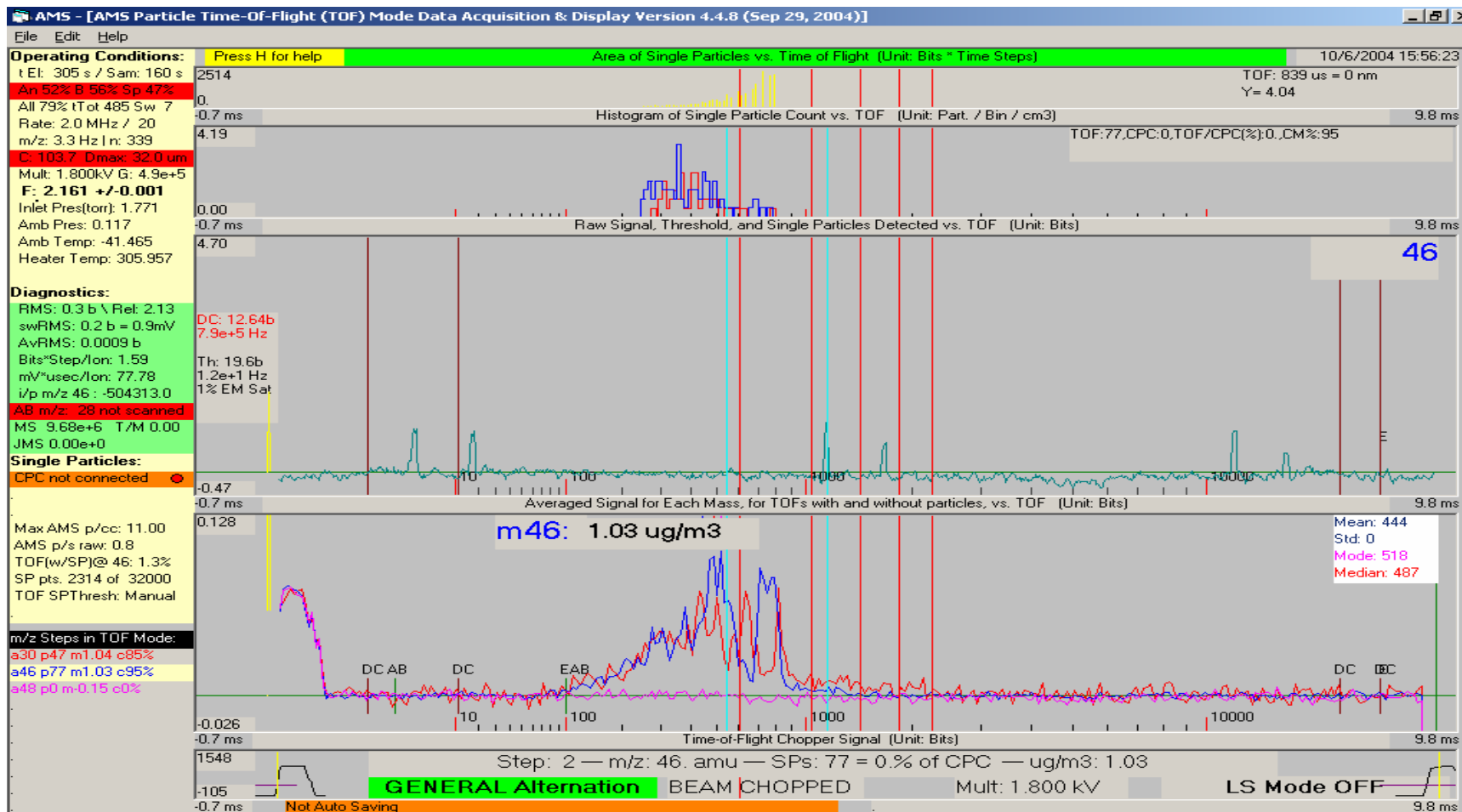
# Troubleshooting Software Problems

## Information Needed:

- 1) Software version
- 2) Exact error message
- 3) Operating mode (Alternating, TOF Mode only, LS On...)
- 4) What mode the error occurs in (TOF/MS /JMS)
- 5) Any keystrokes that may have caused error
- 6) AMSMenu.prm



# GENALT Screen



# My 2 New bosses...

