2_IMS_Plots.doc

- Summary preliminary data obtained with the IMS prototype during Ray's 1st visit (9/18/02)
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Note if you have downloaded and are viewing the *.doc file with e.g. MS Office, then you can manipulate the plots as follows:-

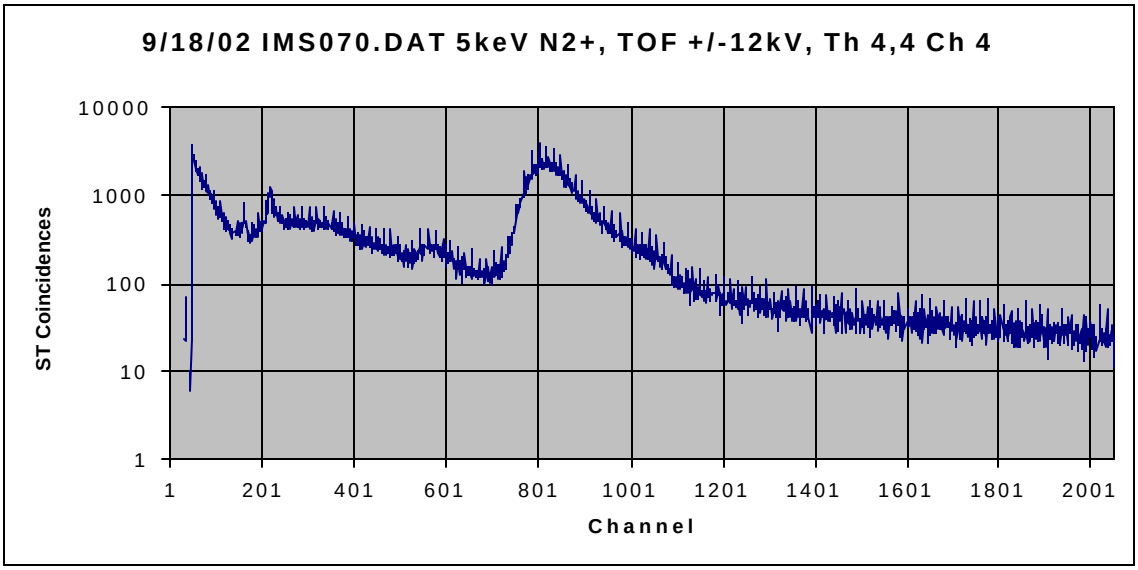
double click of a plot you want to inspect/change
double click on the y-axis, this will pull up the "Format Axis" Excel Menu.
Make changes (e.g. in scale sub menu, change from Logarithmic to Linear Scale etc)
Hit OK when done.

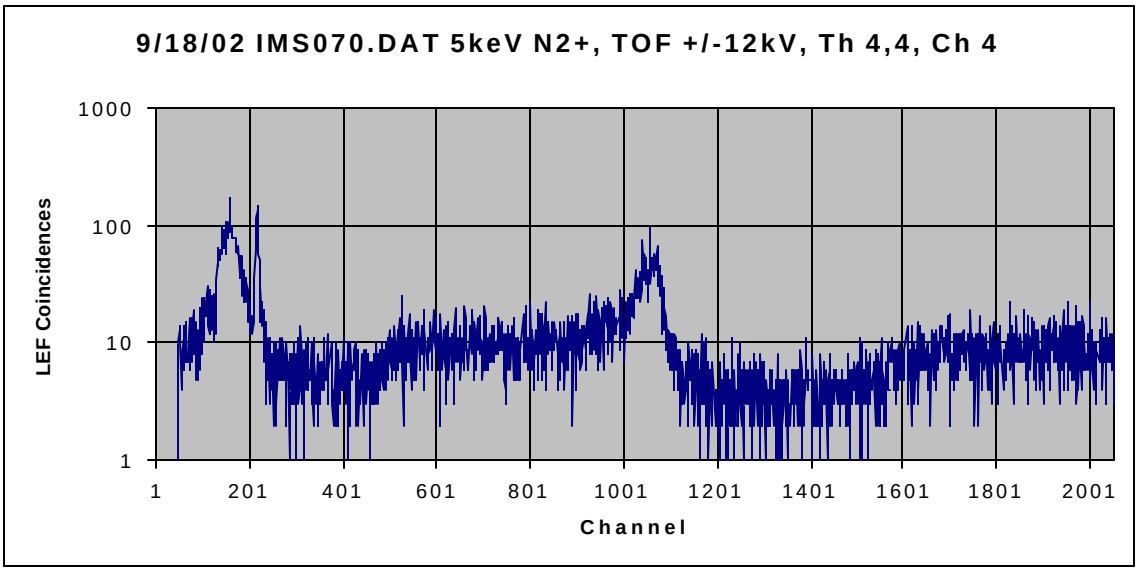
Here each page shows 2 TOF plots, (ST Singles, LEF Singles)

File:	eV	Species	TOF	Thr	Anode	Time	Starts	ST Stops
IMS070.DAT	5000	N2+	12.00kV	4,4	4			
IMS071.DAT	5000	N2+	12.00kV	9,7	4			
IMS072.DAT	5000	N2+	12.00kV	9,7	4			
IMS073.DAT	5000	O+	12.00kV	4,4	4			
IMS074.DAT	5000	Ne+	12.00kV	4,4	4			
IMS075.DAT	5000	N2+	12.00kV	4,4	0			
IMS076.DAT	5000	N2+	12.00kV	4,4	0			
IMS077.DAT	5000	Ne+	12.00kV	4,4	4			
IMS079.DAT	5000	Ne+	12.00kV	4,4	4			
Following Study TOF Efficiency with increasing Beam intensity								
IMS081.DAT	5000	Ne+	12.00kV	4,4	4	180	844	865
IMS082.DAT	5000	Ne+	12.00kV	4,4	4	180	1689	1352
IMS083.DAT	5000	Ne+	12.00kV	4,4	4	180	3418	2672
IMS084.DAT	5000	Ne+	12.00kV	4,4	4	180	7680	6521
IMS085.DAT	5000	Ne+	12.00kV	4,4	4	180	9629	8743
IMS086.DAT	5000	Ne+	12.00kV	4,4	4	180	13374	19311
IMS087.DAT	5000	Ne+	12.00kV	4,4	4	180	14960	27893
IMS088.DAT	5000	Ne+	12.00kV	4,4	4	180	15188	41559
IMS089.DAT	5000	Ne+	12.00kV	15,15	4	180	14715	47021
SUMMARY.XLS, notes								
SUMMARY Stacked Plot, ST TOF with increasing Beam Intensity IMS081-IMS088								

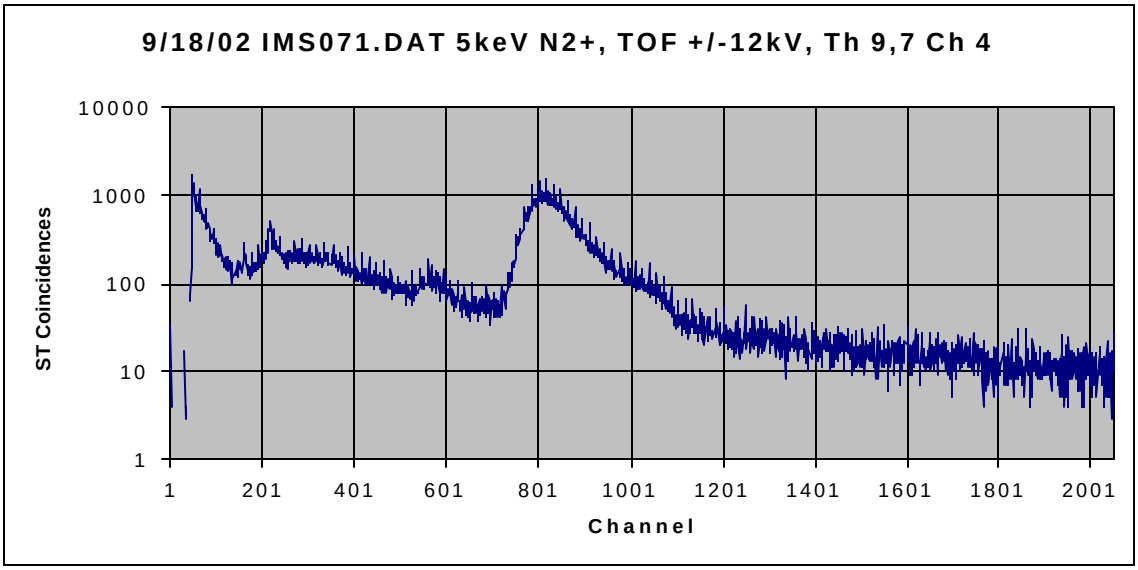
In a nutshell,
When increasing the beam intensity,
Starts Max out at a rate of ~15000 Hz, probably due to MCP pore paralysis.
ST Stops are not affected as much (if at all), however this severely affects TOF efficiency.
There are 2 peaks, one on either side of Channel 200 in the LEF spectra, (and echoes in the ST TOF spectra), more evident at the higher rates,. Not sure what they are due to, is it possible that H+, H2+ being knocked out of the C foils with sufficient energy to reach top LEF MCP ?
Suggestions welcome.

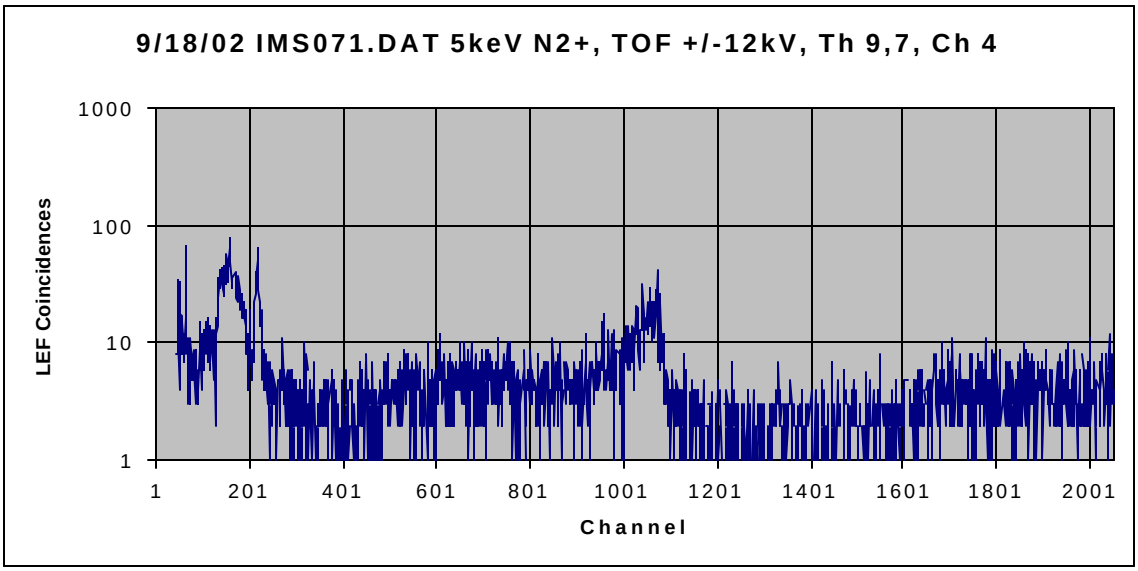
IMS070.DAT	5000	N2+	12.00kV	4,4	4	



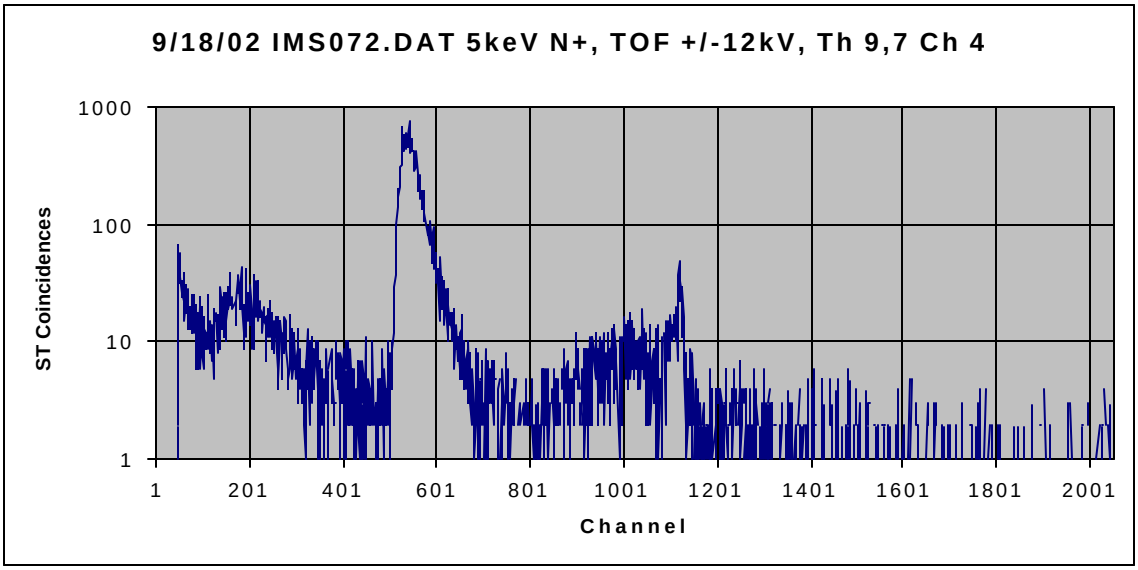


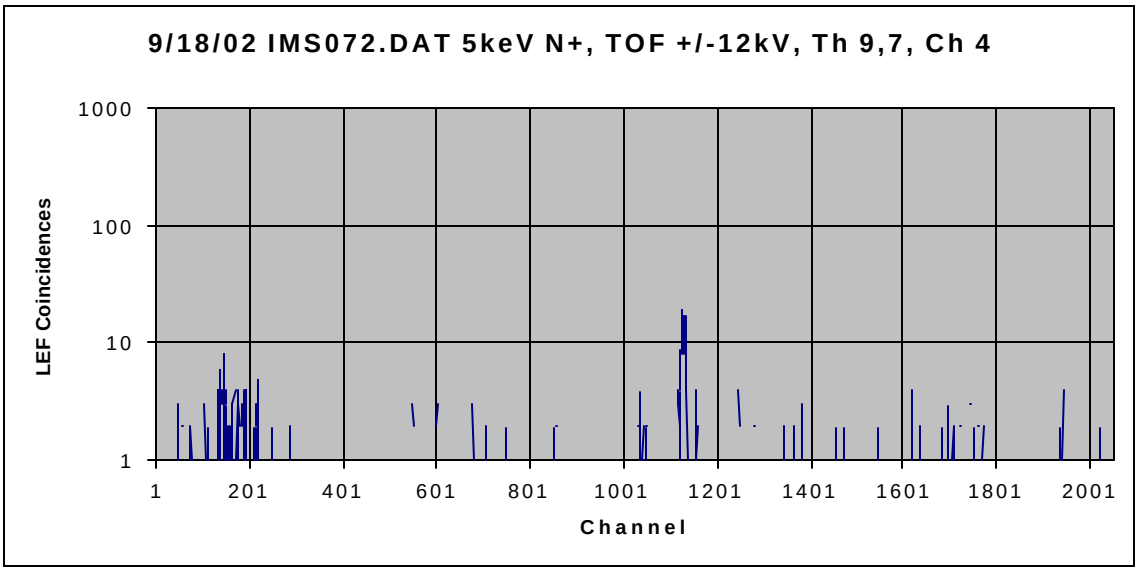
IMS071.DAT	5000	N2+	12.00kV	9,7	4



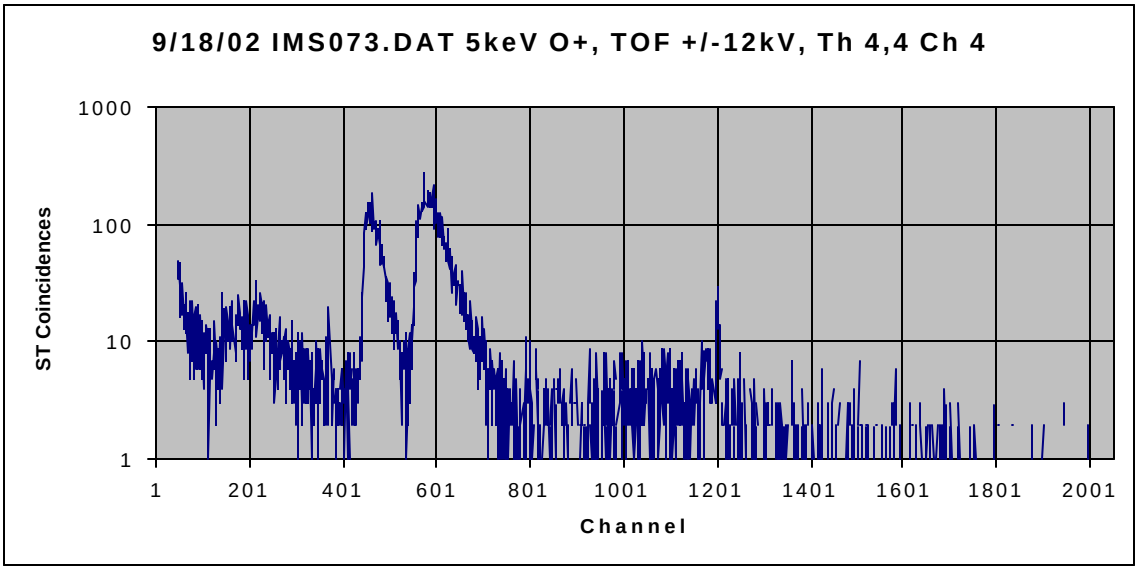


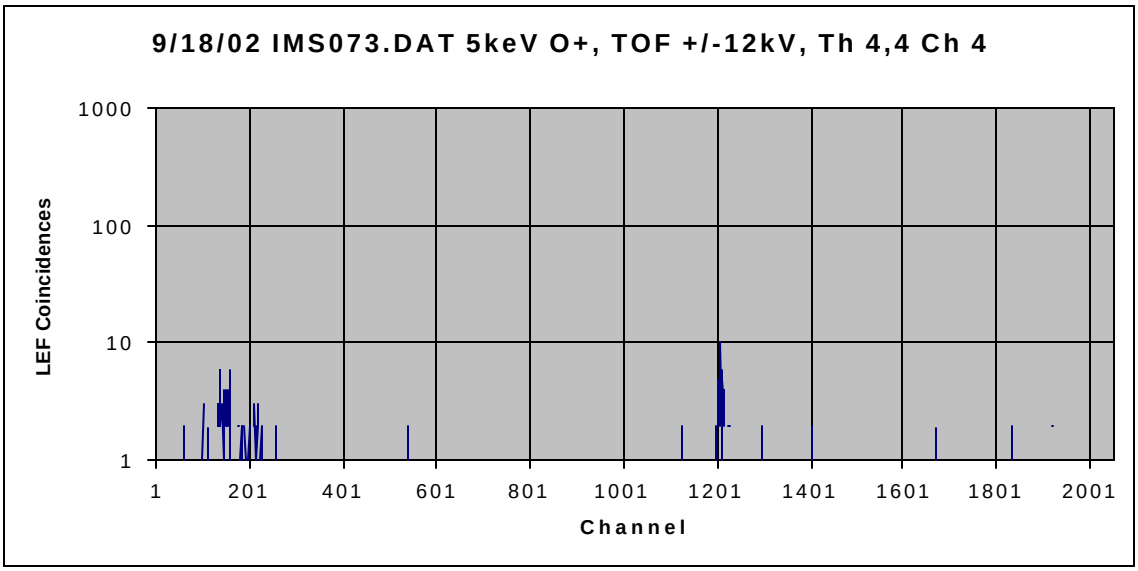
IMS072.DAT	5000	N2+	12.00kV	9,7	4



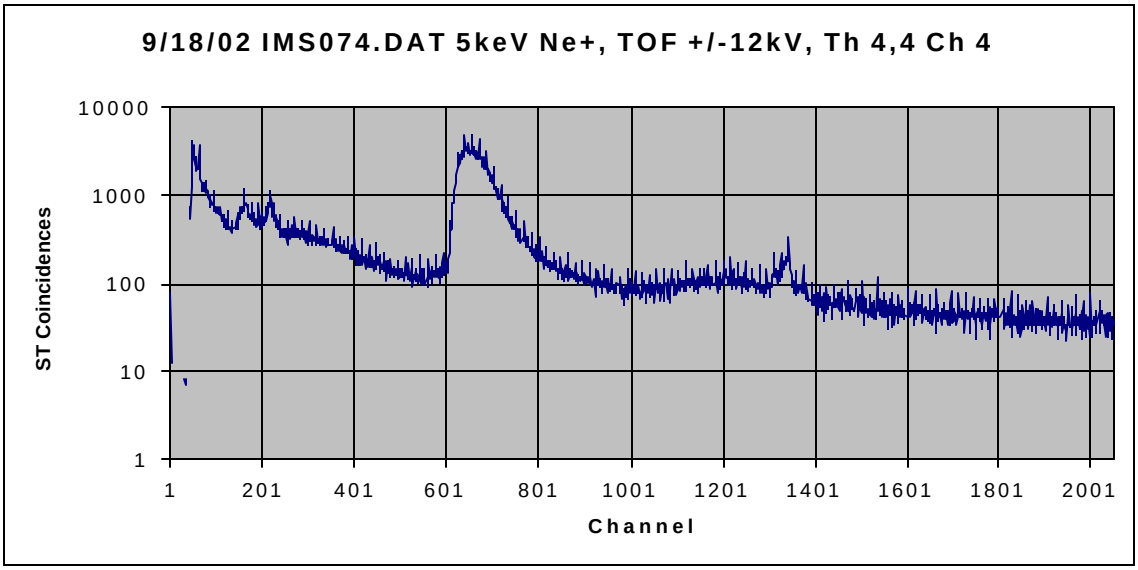


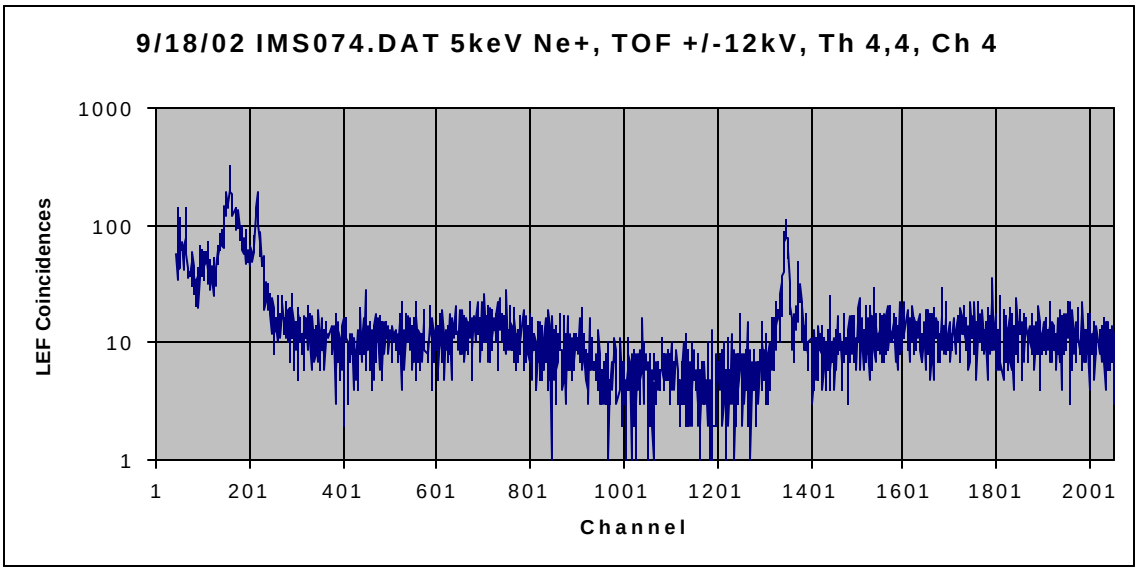
IMS073.DAT	5000	O+	12.00kV	4,4	4



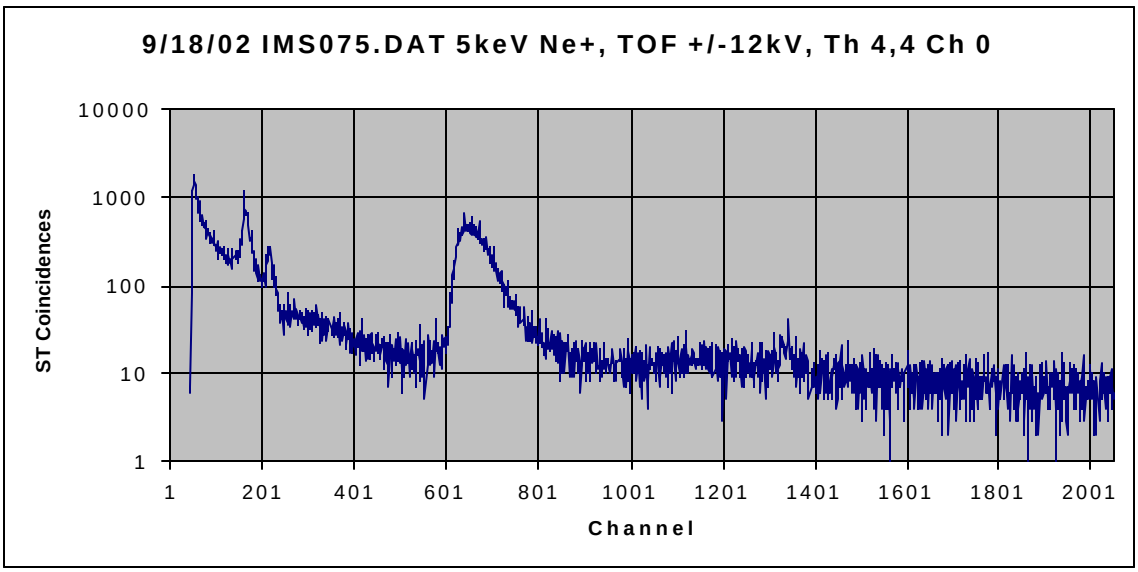


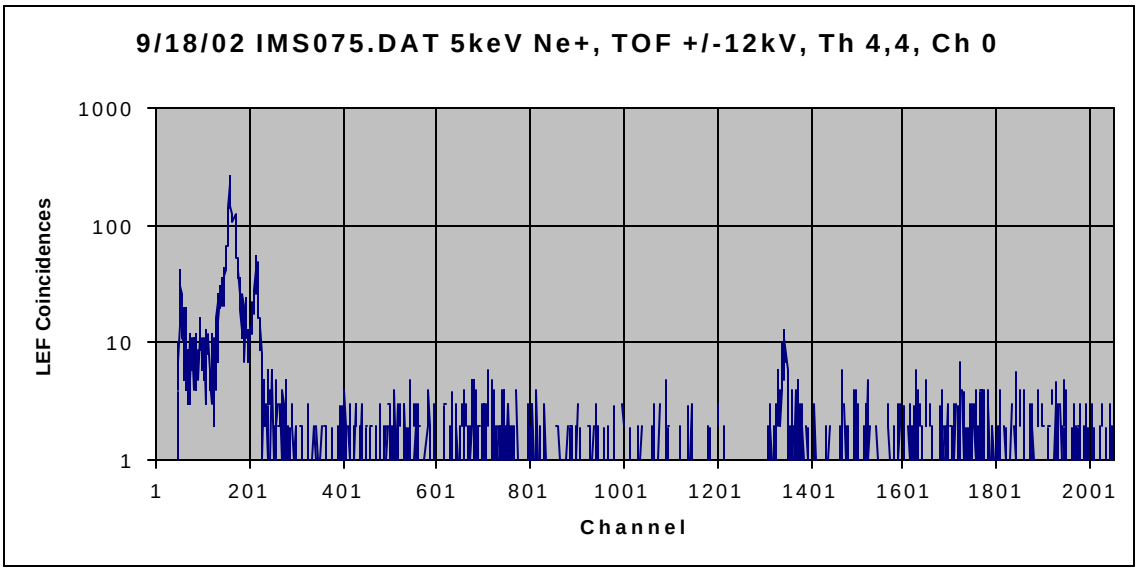
IMS074.DAT	5000	Ne+	12.00kV	4,4	4



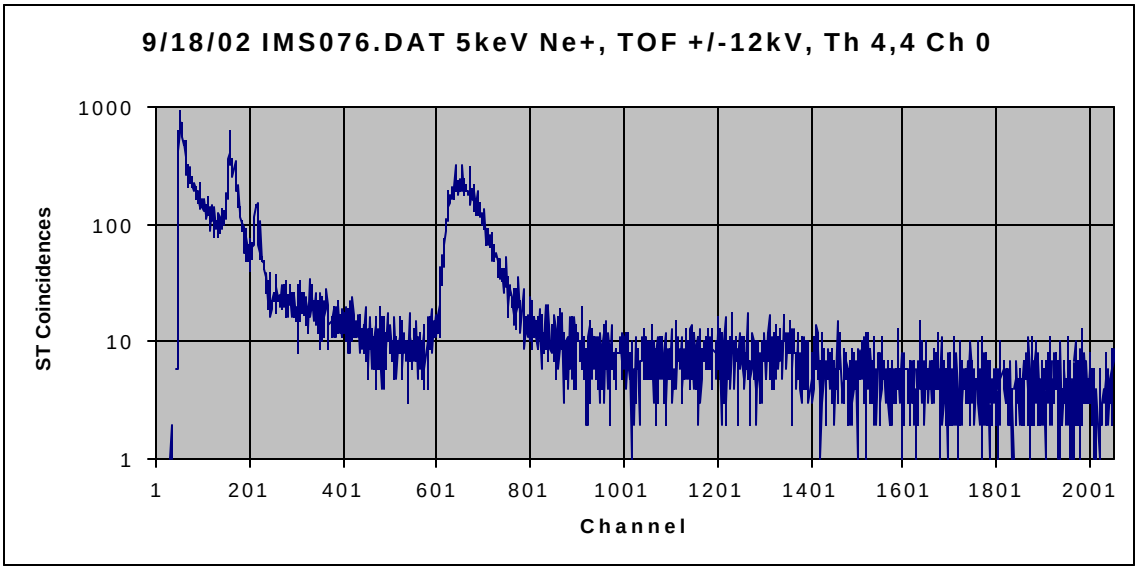


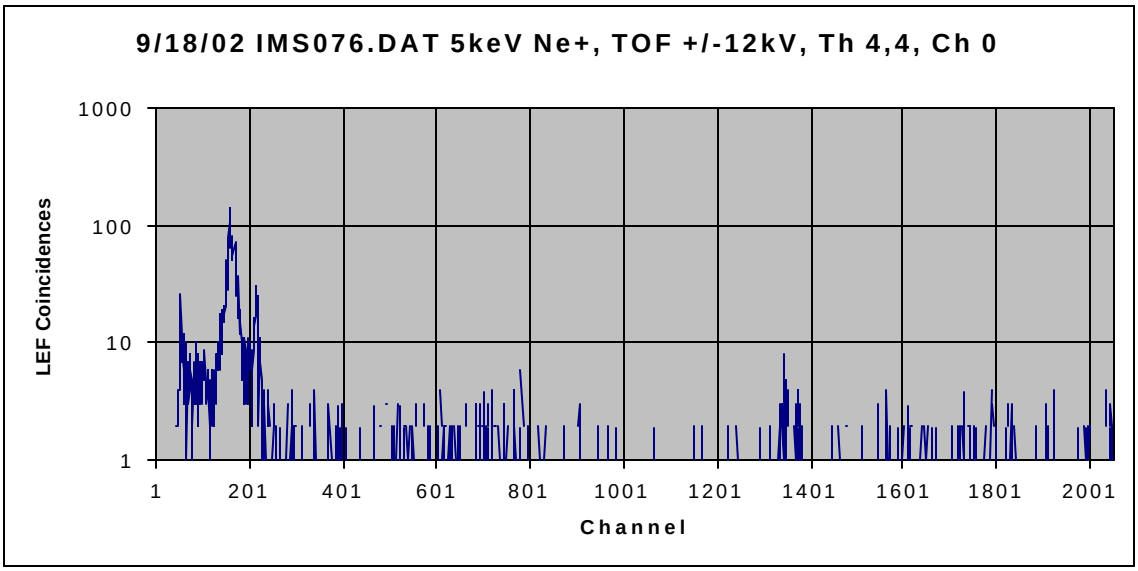
IMS075.DAT	5000	N2+	12.00kV	4,4	0



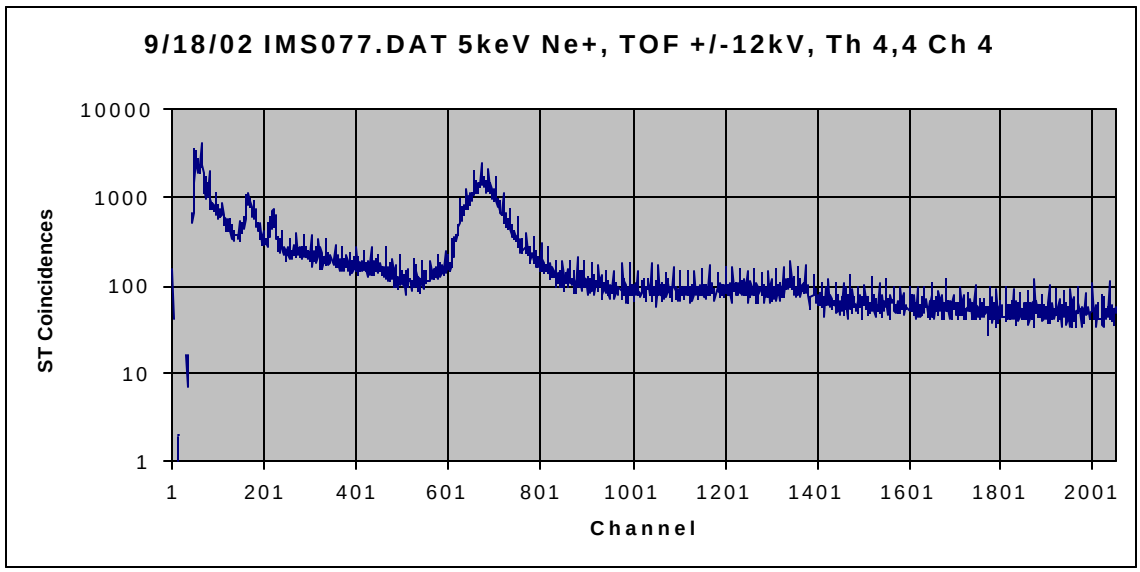


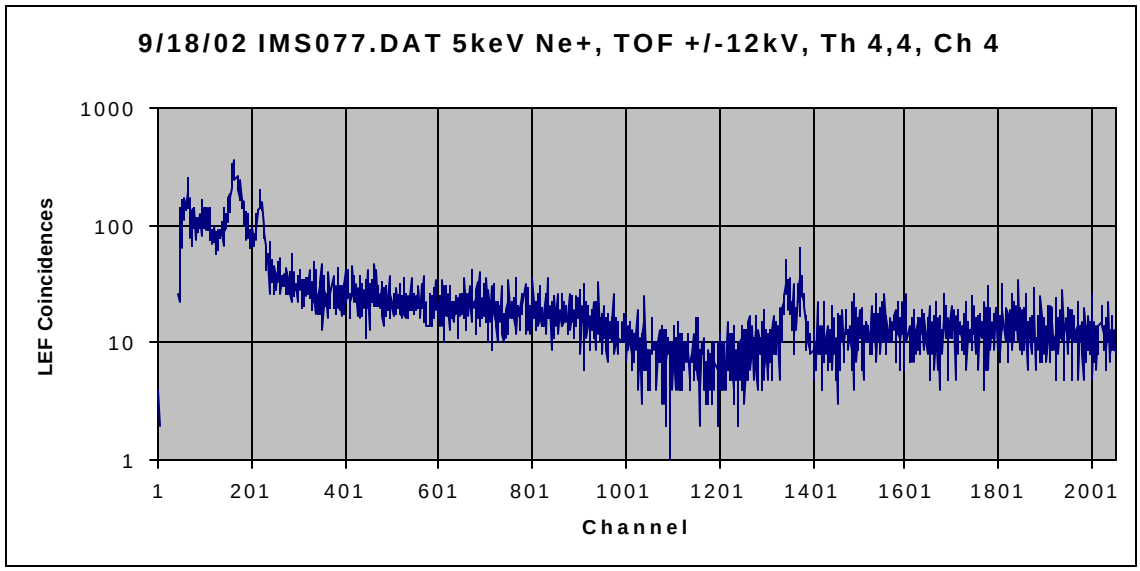
IMS076.DAT	5000	N2+	12.00kV	4,4	0



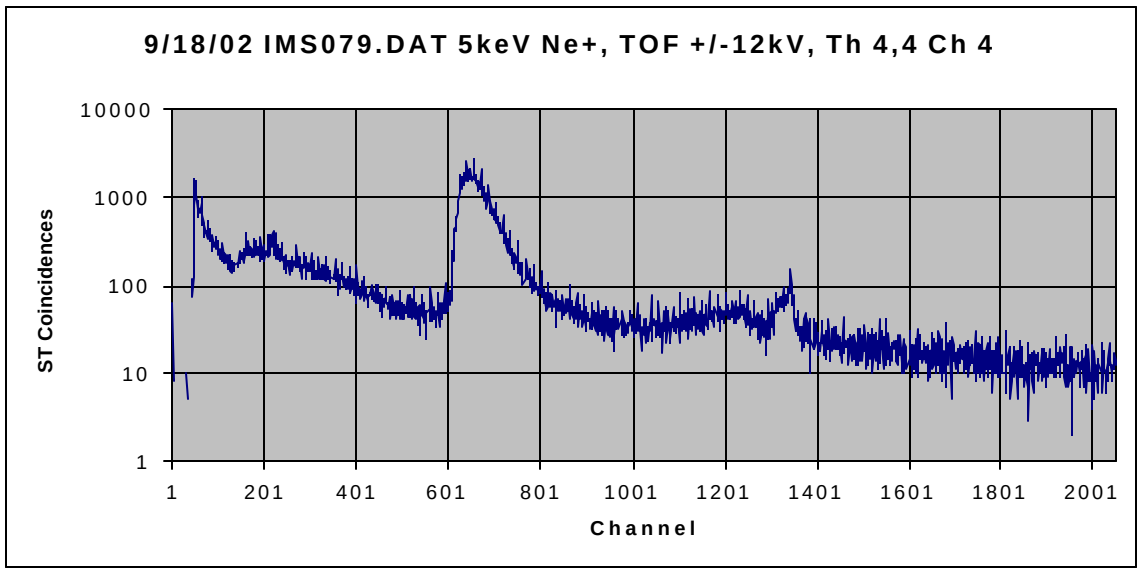


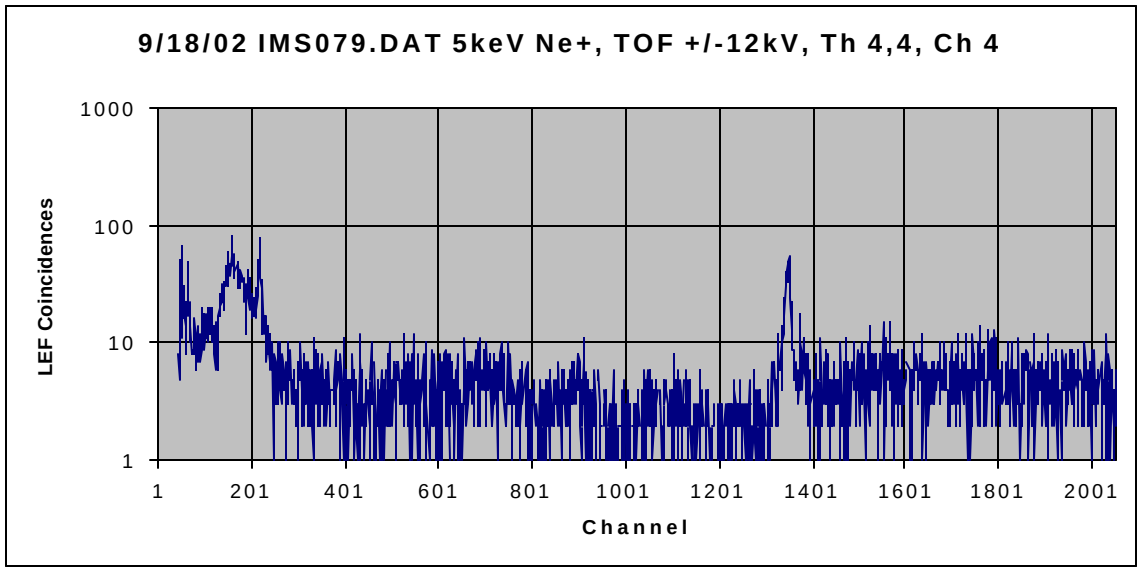
IMS077.DAT	5000	Ne+	12.00kV	4,4	4





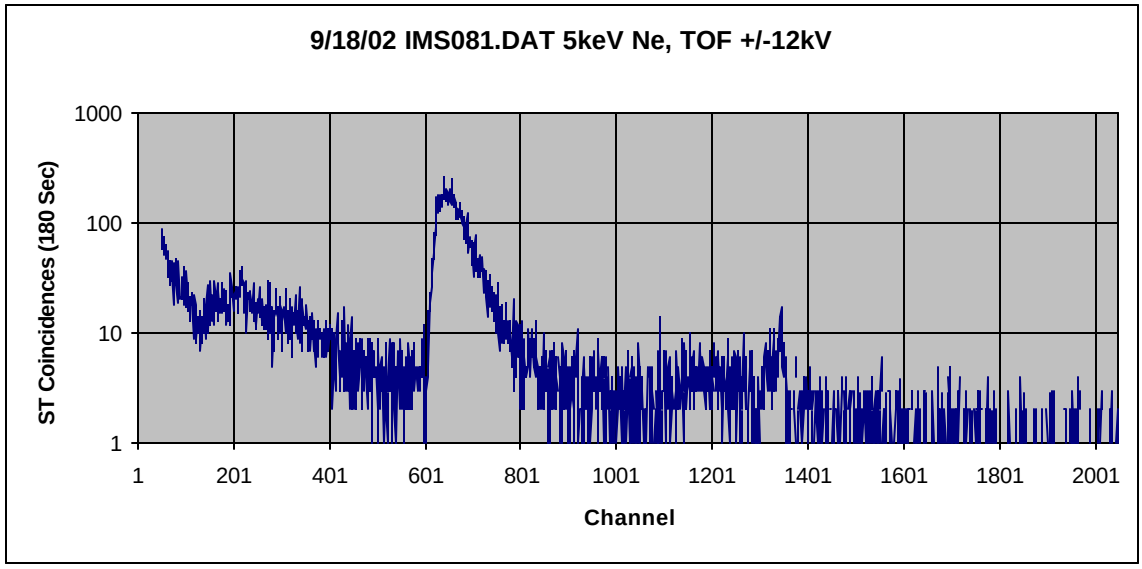
IMS079.DAT	5000	Ne+	12.00kV	4,4	4

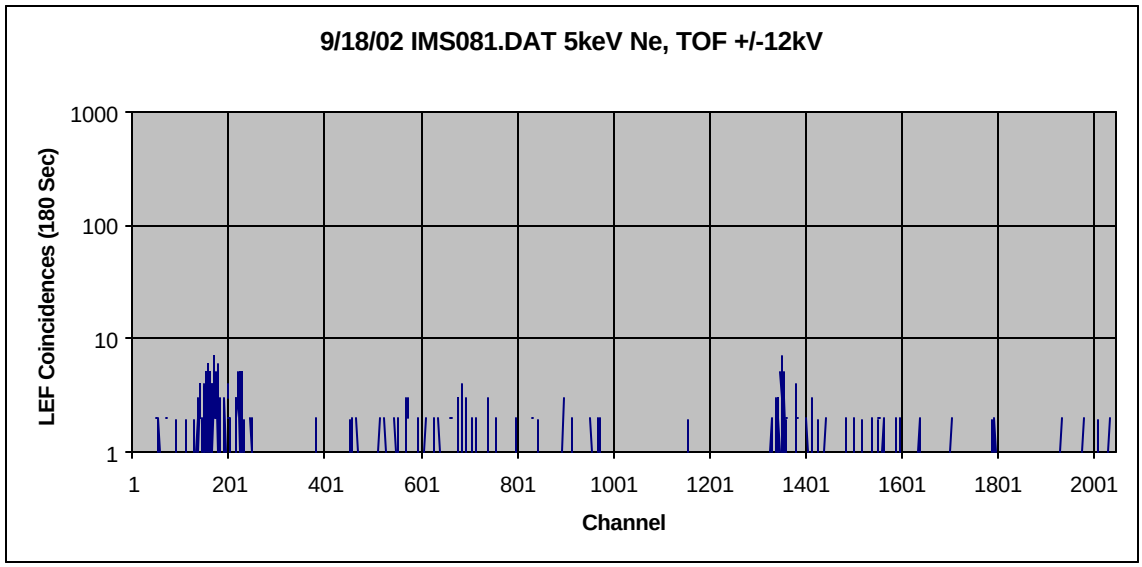




9/18/02, IMS081.DAT, 5000eV, Ne+ Beam, **TOF +/-12kV**
Anode 4, MCP 2500, 1600, Thr = 4,4
Time = 180 Sec. Only Channel 4 Enabled.

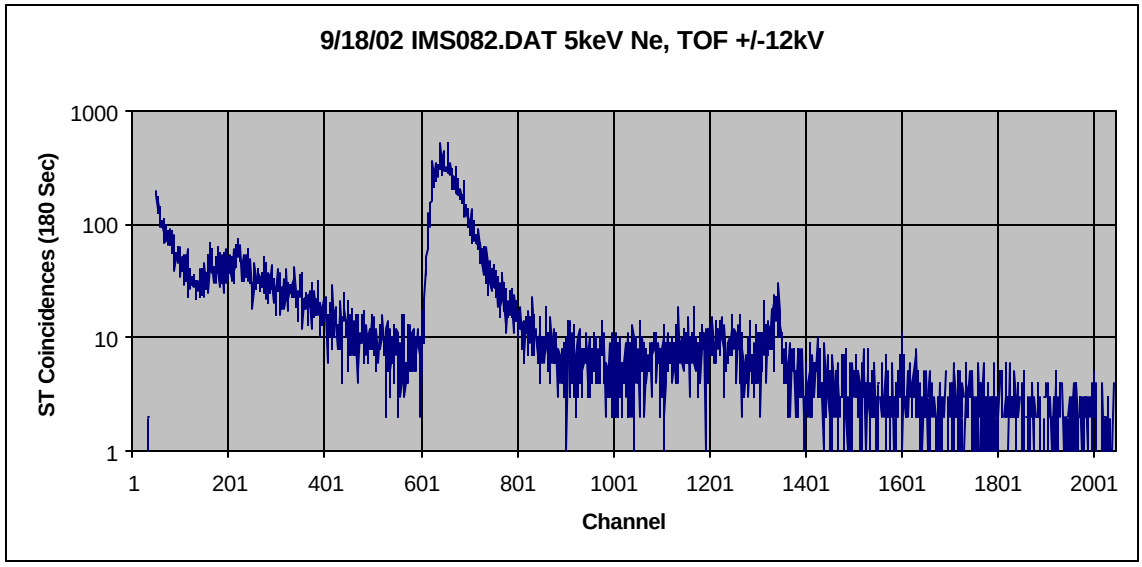
Lowest Rate, Starts= 844, LEF Stops= 880, ST Stops= 865, Single TOF = 66, Double TOF= 2
Sum counts ST peak, ch 600-800 = 13182 coincindences/180 sec = 73.2/sec
Efficiency ~ 8.7% relative to "Start" rate
Efficiency ~ 8.5% relative to "Stop" rate

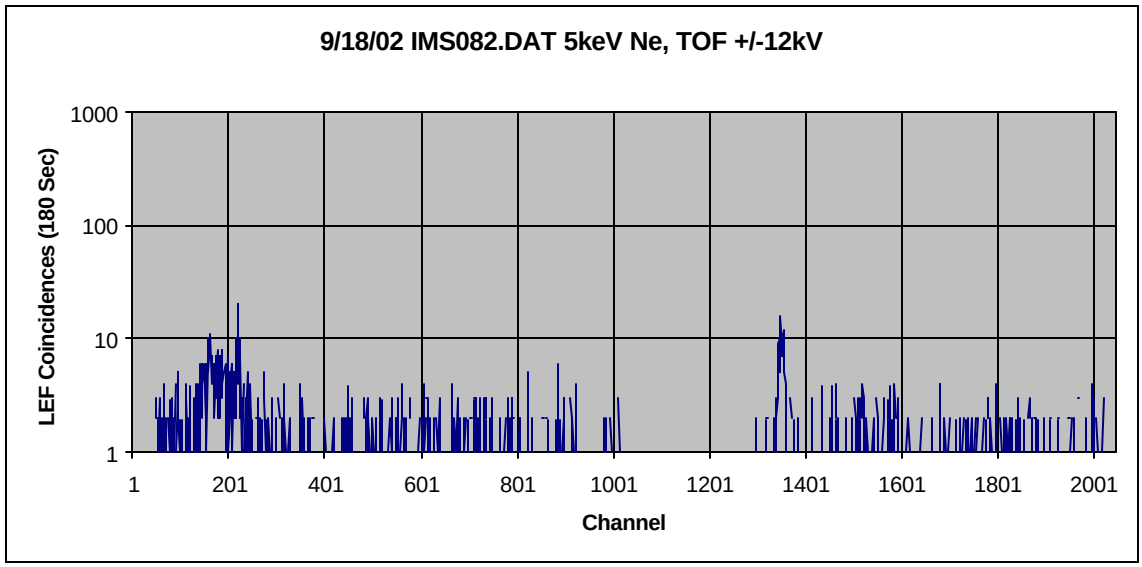




9/18/02, IMS082.DAT, 5000eV, Ne+ Beam, TOF +/-12kV
Anode 4, MCP 2500, 1600, Thr = 4,4
Time = 180 Sec. Only Channel 4 Enabled.

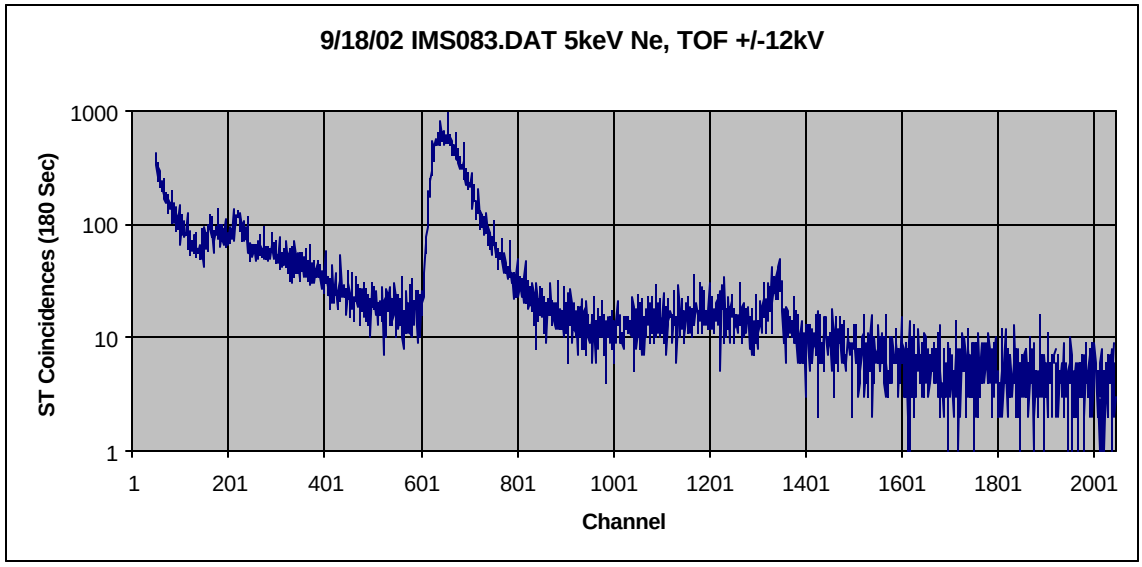
Higher Rate, Starts= 1689, LEF Stops= 1590, ST Stops= 1352, Single TOF= 134, Double TOF= 4

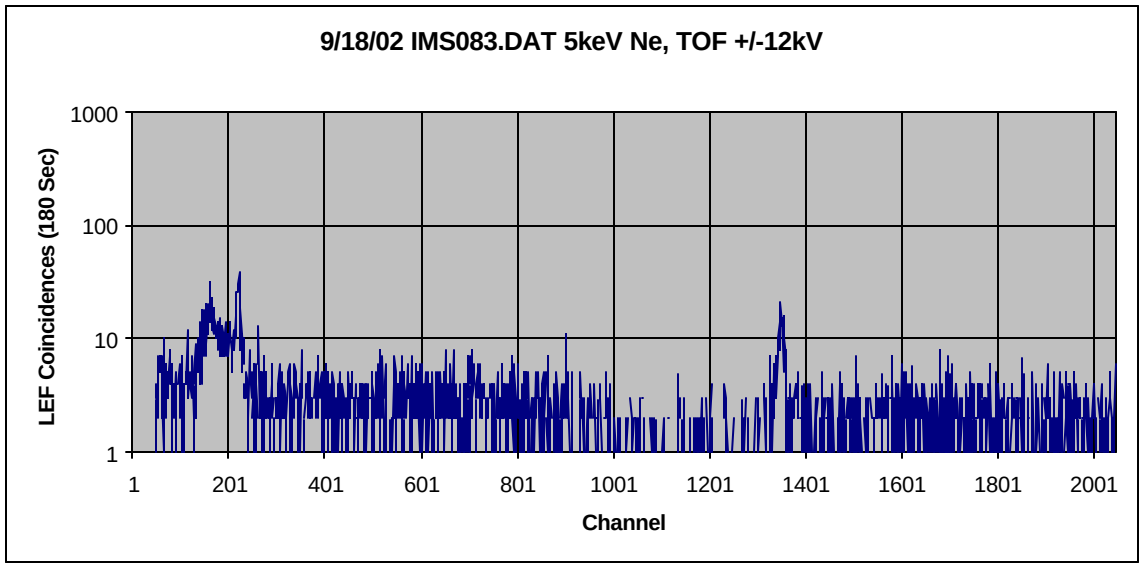




9/18/02, IMS083.DAT, 5000eV, Ne+ Beam, TOF +/-12kV
Anode 4, MCP 2500, 1600, Thr = 4,4
Time = 180 Sec. Only Channel 4 Enabled.

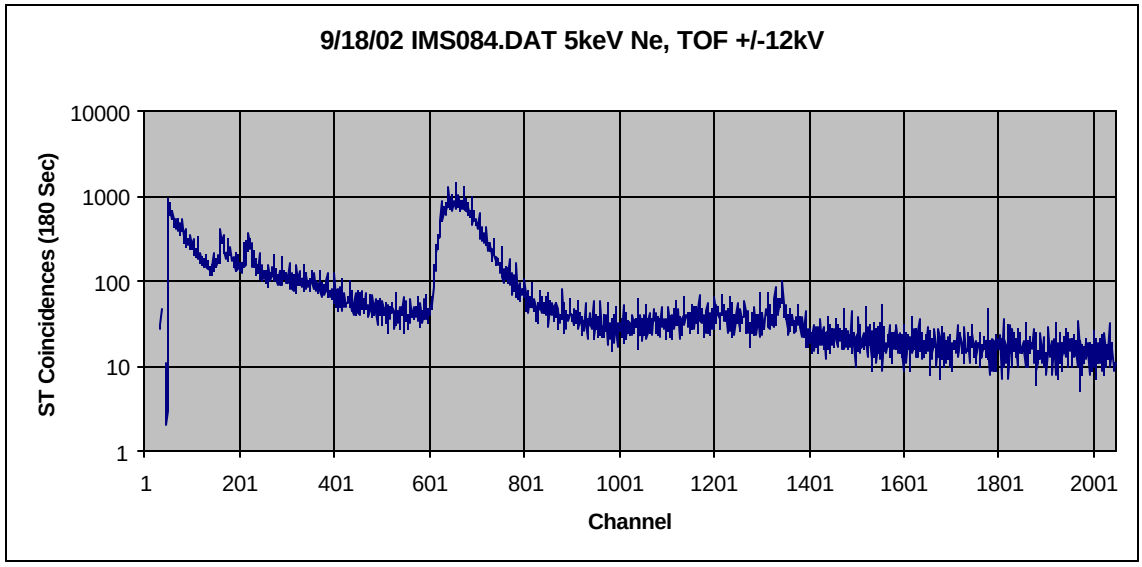
Higher Rate, Starts= 3418, LEF Stops= 2490, ST Stops= 2672, Single TOF= 253, Double TOF= 15

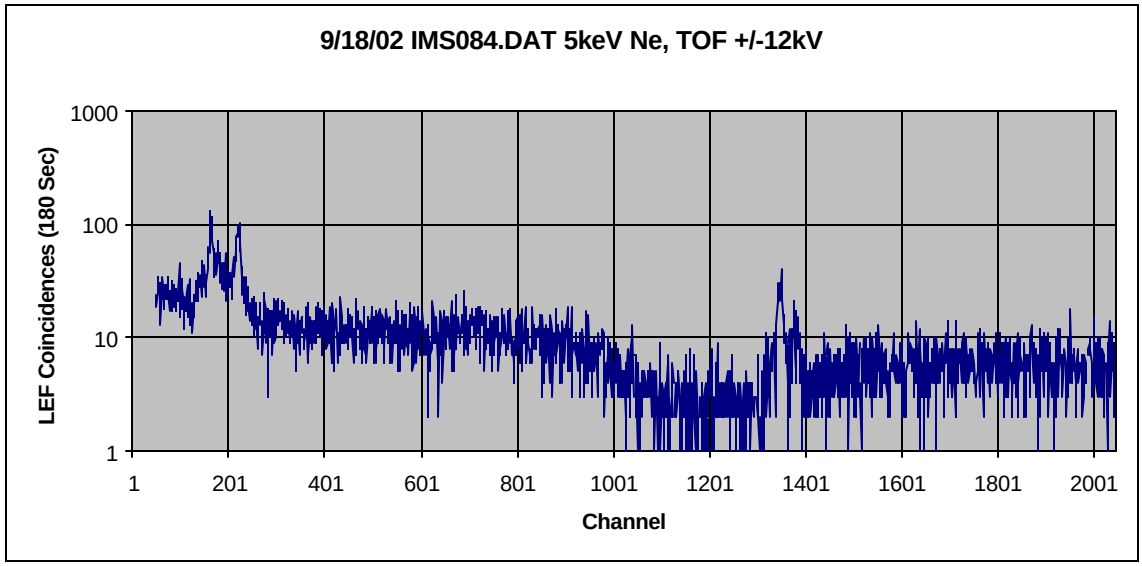




9/18/02, IMS084.DAT, 5000eV, Ne+ Beam, TOF +/-12kV
Anode 4, MCP 2500, 1600, Thr = 4,4
Time = 180 Sec. Only Channel 4 Enabled.

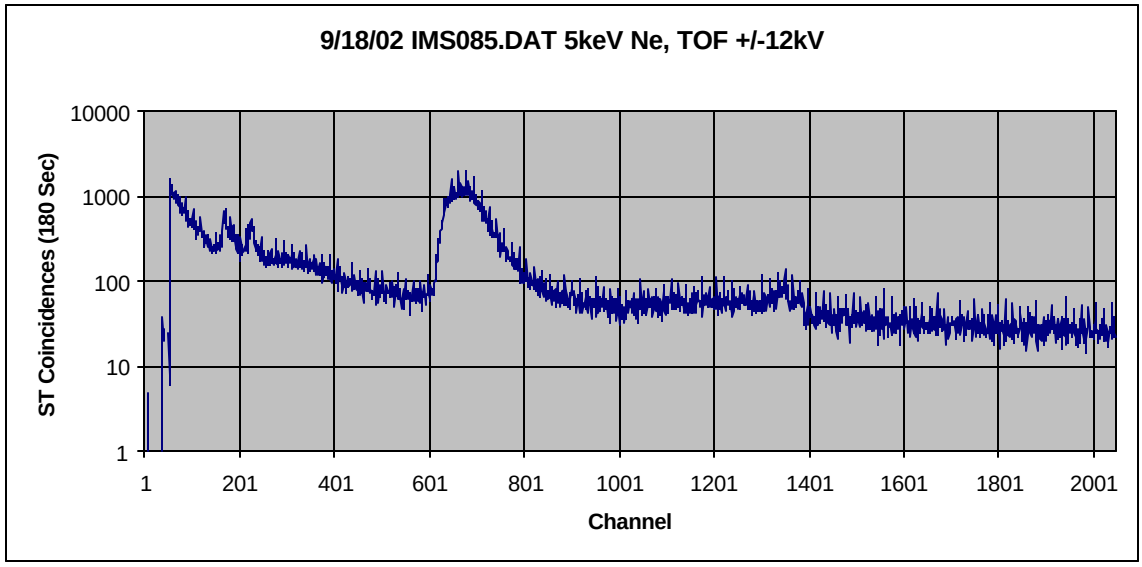
Higher Rate, Starts= 7680, LEF Stops= 6340, ST Stops= 6521, Single TOF= 522, Double TOF= 50
Sum counts ST peak, ch 600-800 = 81037 coincindences/180 sec = 450/Sec
Efficiency ~ 5.9% relative to "Start" rate (subtract flat background, becomes 5.2%)
Efficiency ~ 6.9% relative to "Stop" rate

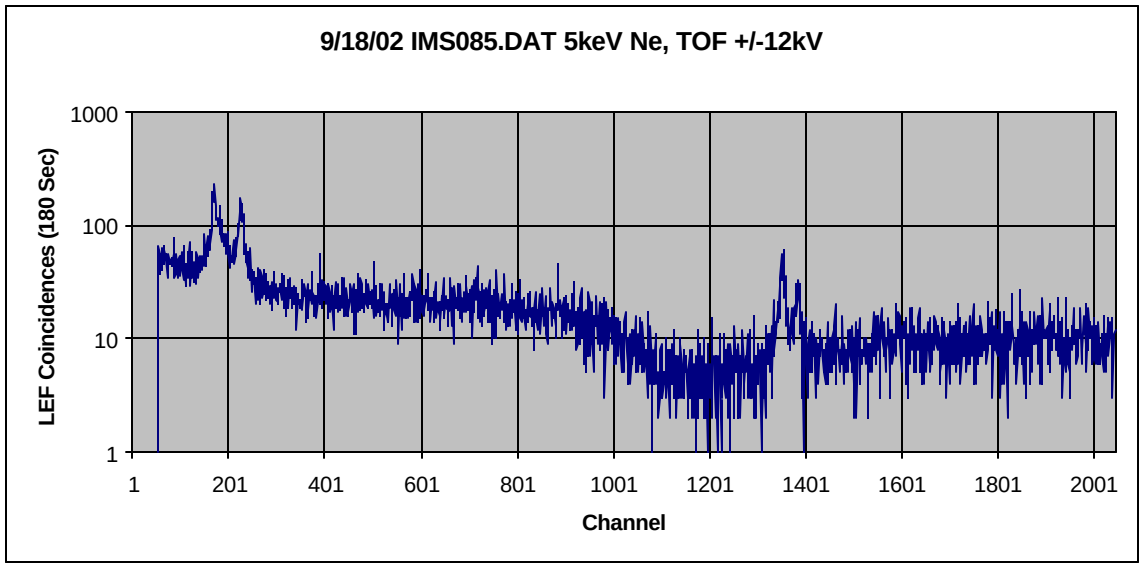




9/18/02, IMS085.DAT, 5000eV, Ne+ Beam, TOF +/-12kV
Anode 4, MCP 2500, 1600, Thr = 4,4
Time = 180 Sec. Only Channel 4 Enabled.

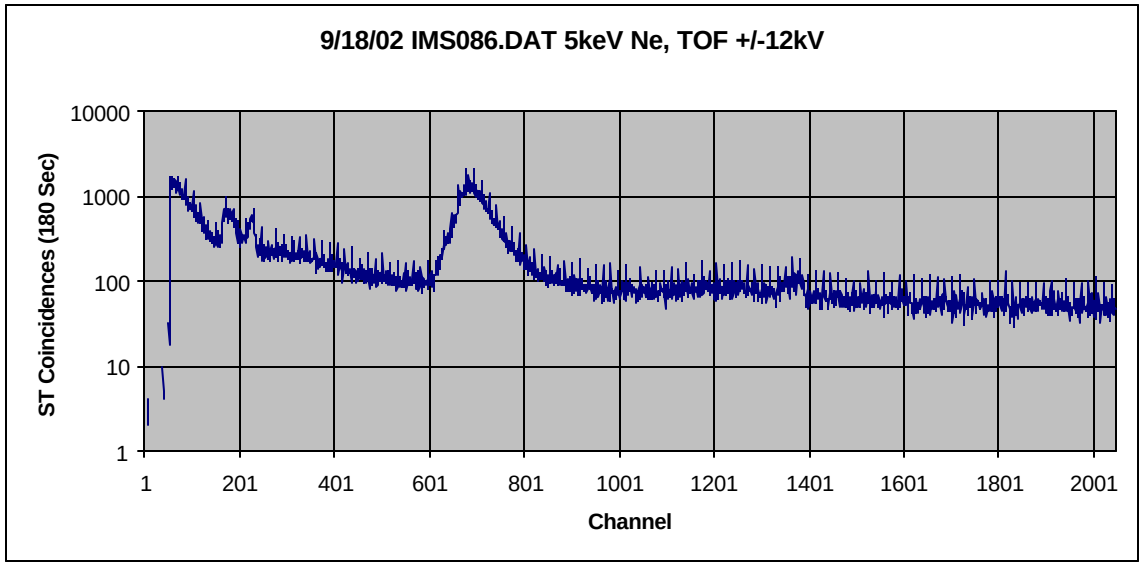
Higher Rate, Starts= 9629, LEF Stops= 8036, ST Stops= 8743, Single TOF= 650, Double TOF= 86

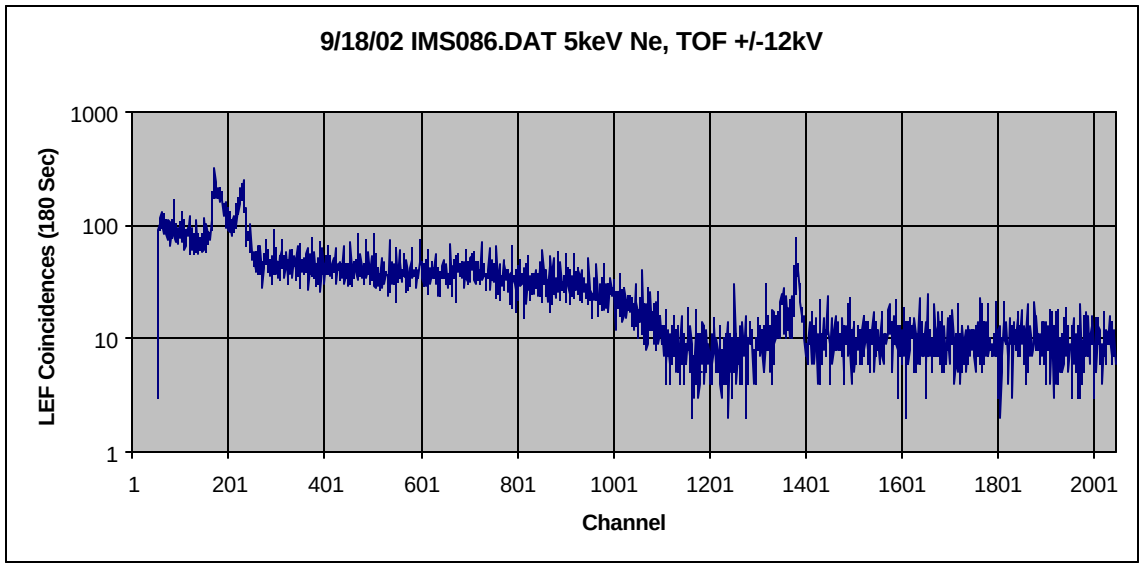




9/18/02, IMS086.DAT, 5000eV, Ne+ Beam, TOF +/-12kV
Anode 4, MCP 2500, 1600, Thr = 4,4
Time = 180 Sec. Only Channel 4 Enabled.

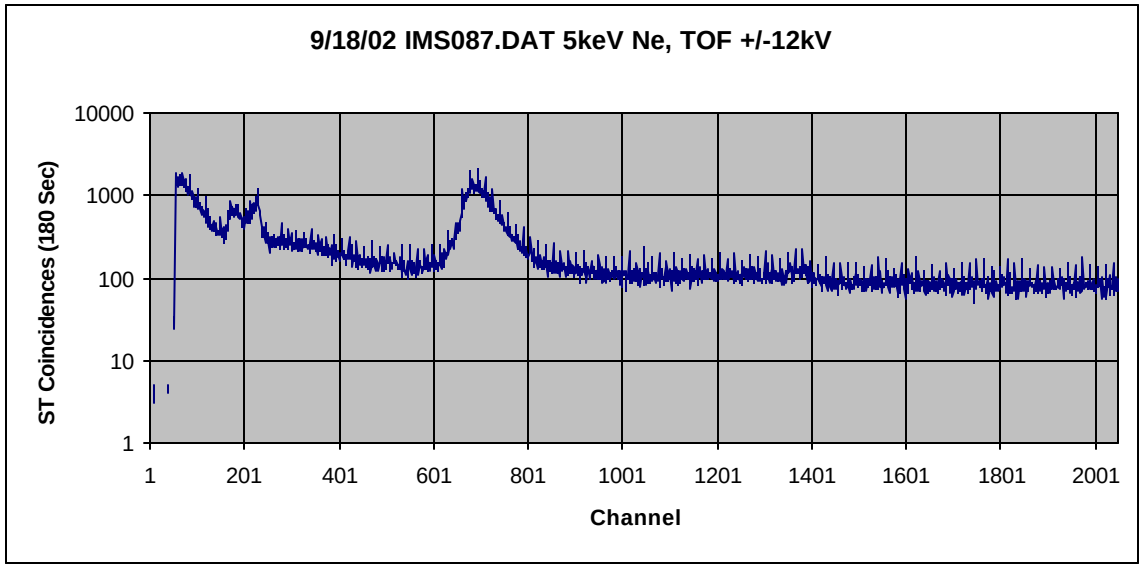
Higher Rate, Starts=13374, LEF Stops=14543, ST Stops=19311, Single TOF=1025, Double TOF= 228

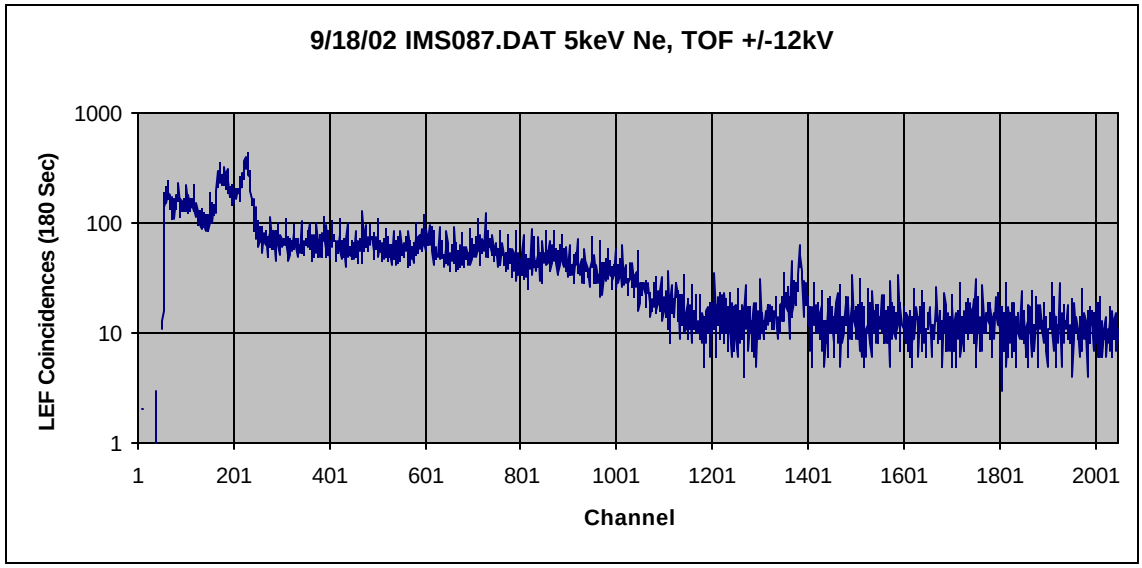




9/18/02, IMS087.DAT, 5000eV, Ne+ Beam, TOF +/-12kV
Anode 4, MCP 2500, 1600, Thr = 4,4
Time = 180 Sec. Only Channel 4 Enabled.

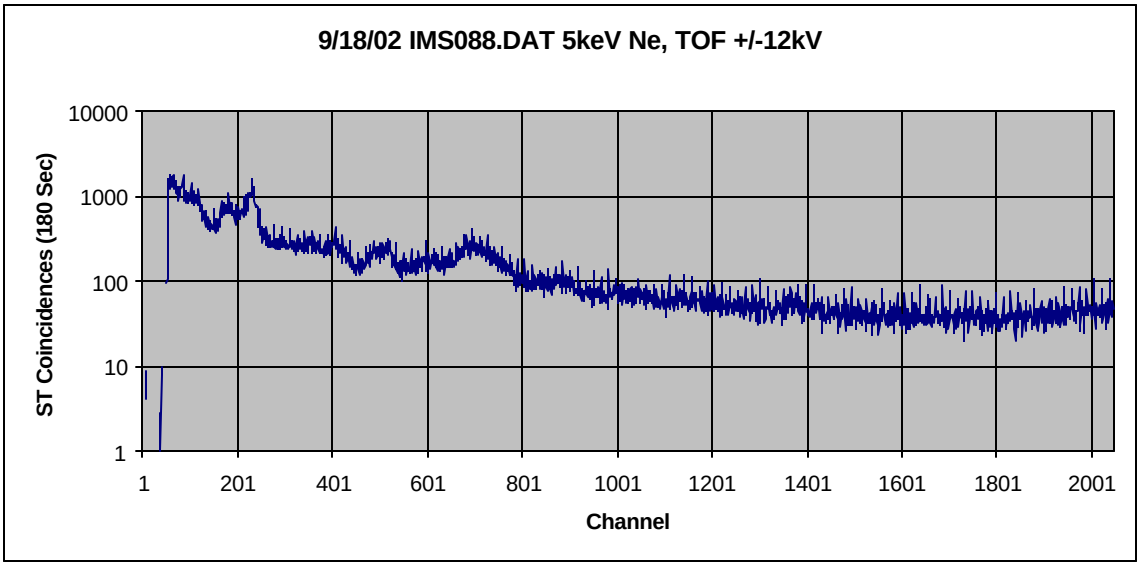
Higher Rate, Starts=14960, LEF Stops=18915, ST Stops=27893, Single TOF=1183, Double TOF= 355
Sum counts ST peak, ch 600-900 =130686 coincindences/180 sec = 726/Sec
Efficiency ~ 4.9% relative to "Start" rate (subtract flat background, becomes 3.15%)
Efficiency ~ 1.8% relative to "Stop" rate (subtract flat background, becomes 1.1%)
Note "ringing" in LEF TOF

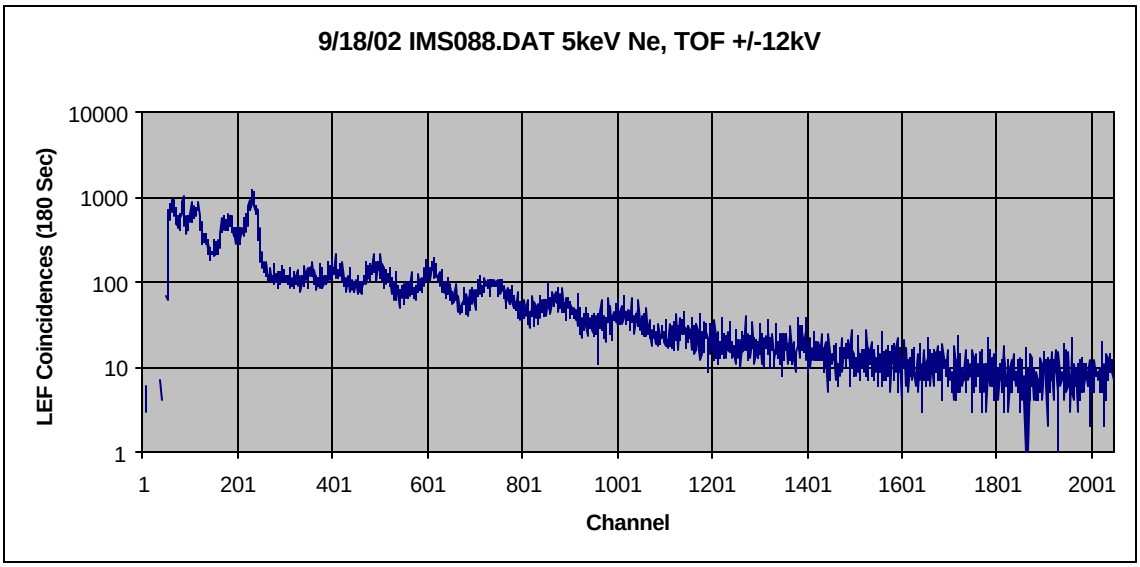




9/18/02, IMS088.DAT, 5000eV, Ne+ Beam, TOF +/-12kV
Anode 4, MCP 2500, 1600, Thr = 4,4
Time = 180 Sec. Only Channel 4 Enabled.

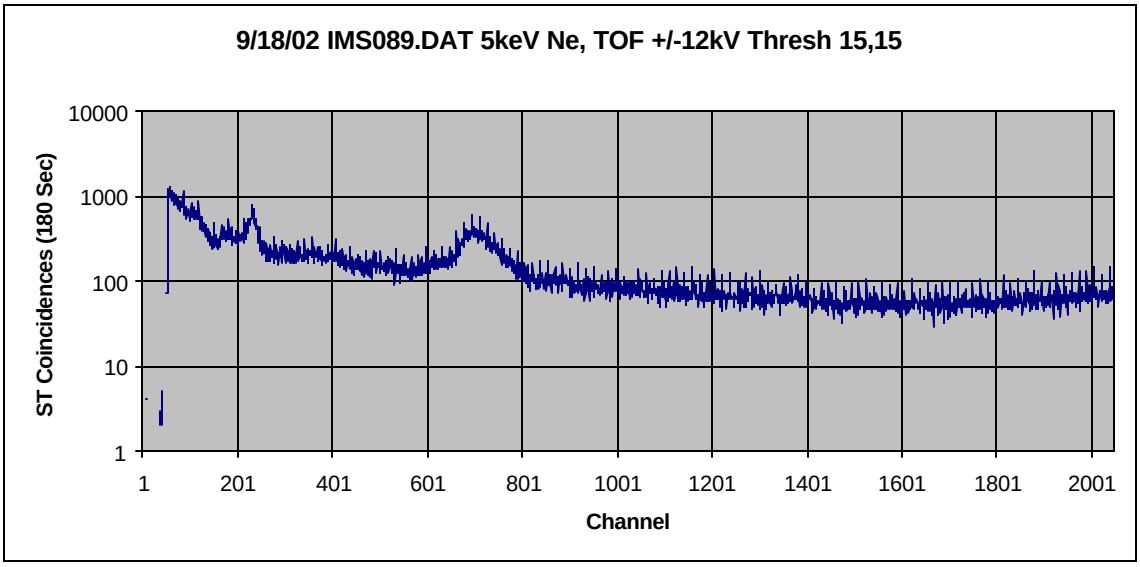
Highest rate, Starts=15188, LEF Stops=38079, ST Stops=41559, Single TOF= 363, Double TOF=1148
Coincidence peak greatly diminished !!
Note "ringing" in LEF TOF more pronounced

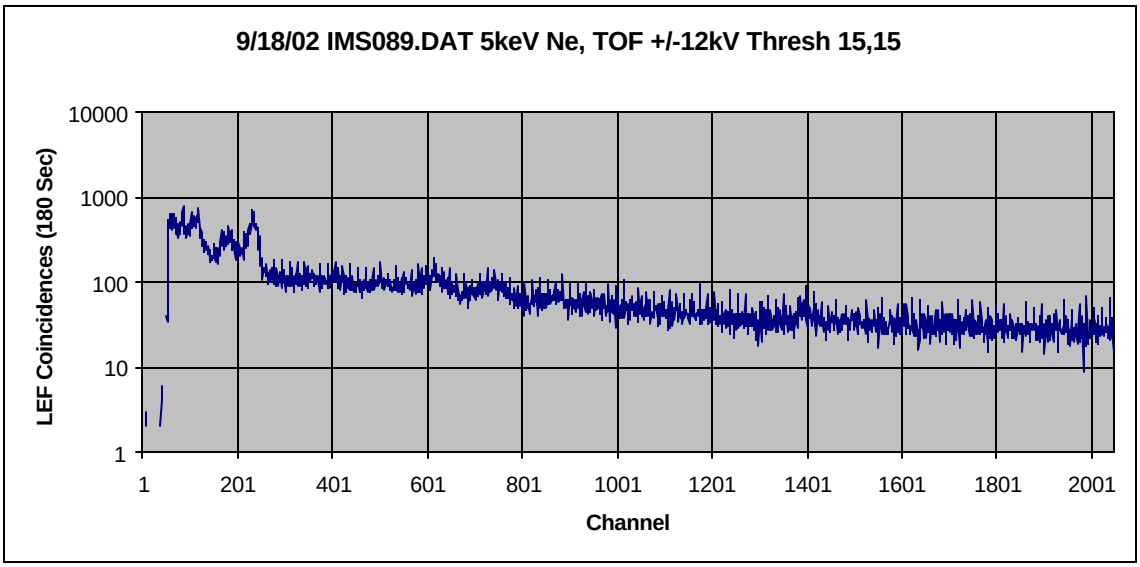




9/18/02, IMS089.DAT, 5000eV, Ne+ Beam, TOF +/-12kV
Anode 4, MCP 2500, 1600, **Thr = 15,15**
Time = 180 Sec. Only Channel 4 Enabled.

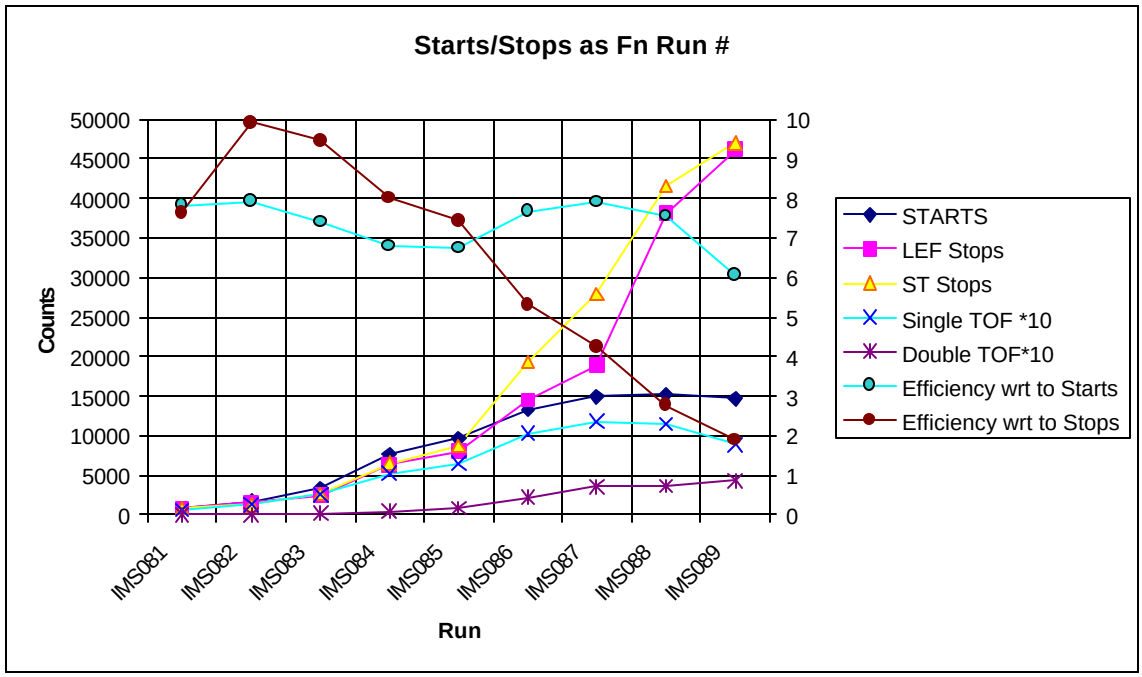
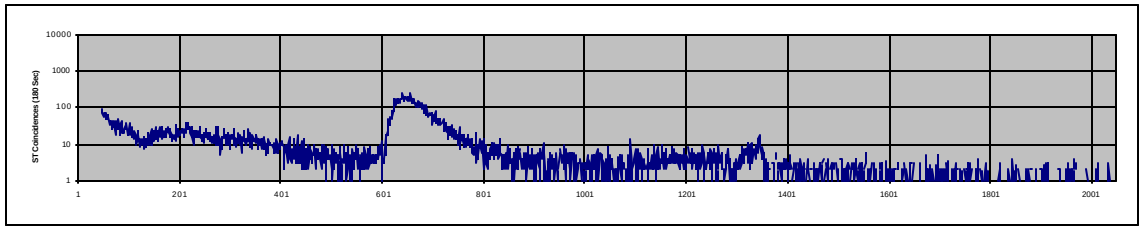
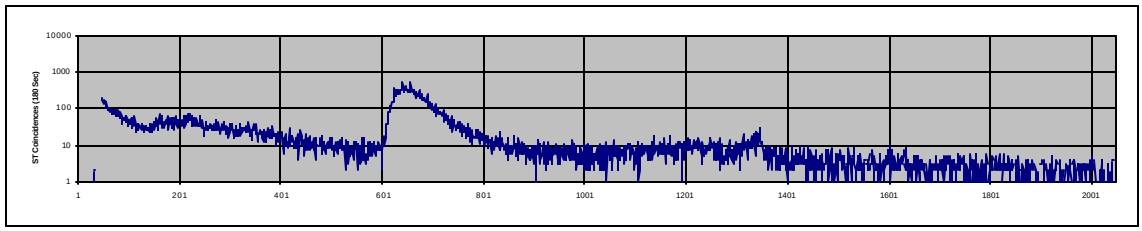
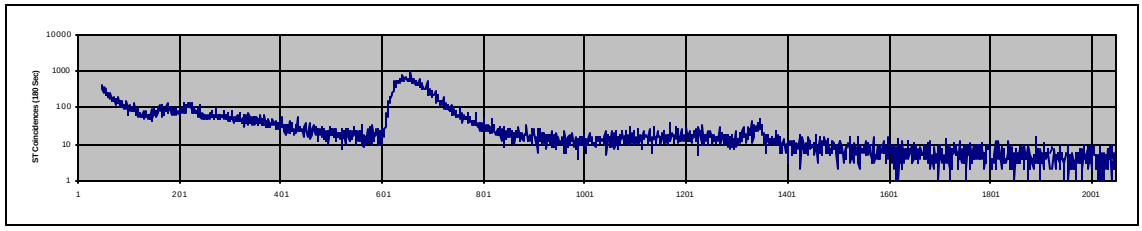
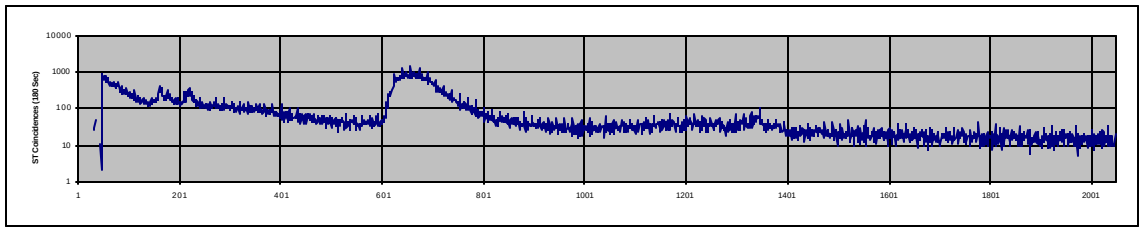
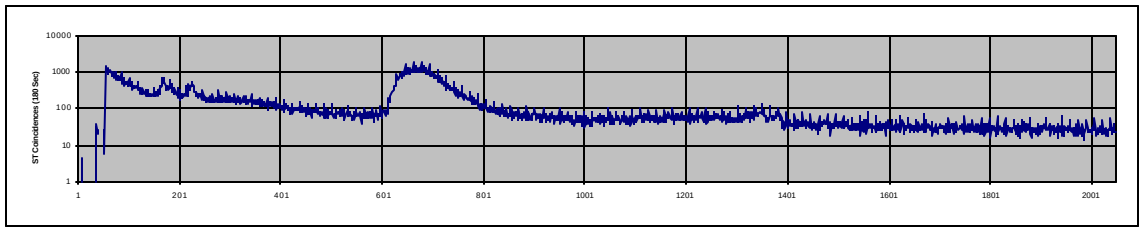
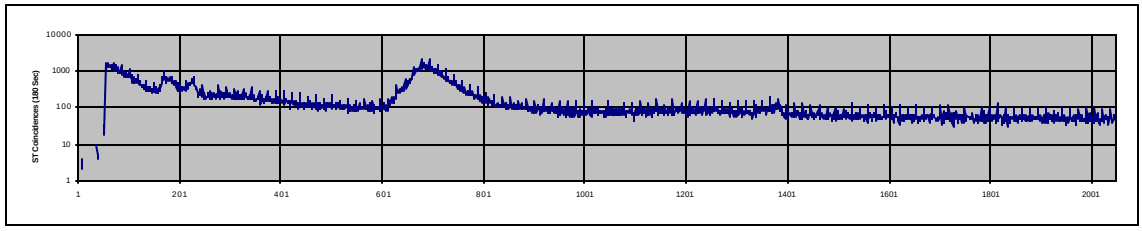
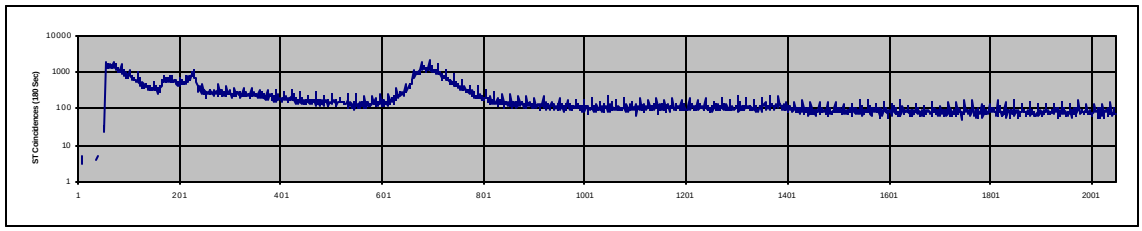
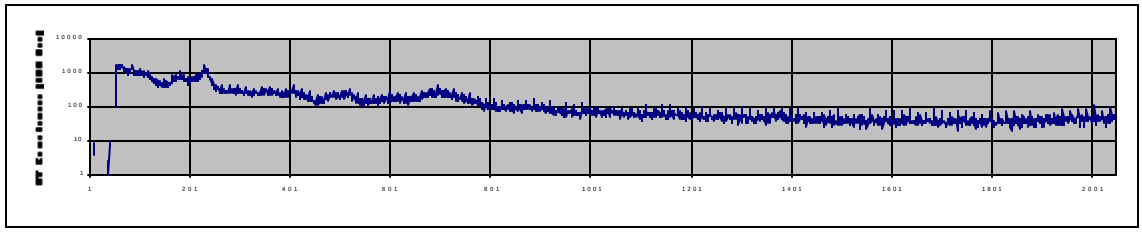
Highest Rate, Starts=14715, LEF Stops=46188, ST Stops=47021, Single TOF= 433, Double TOF= 891
Coincidence peak greater than previous
Note "ringing" in LEF TOF reduced





SUMMARY.XLS
Here we plot "Starts", "LEF Stops", "ST Stops", "Single TOF", and "Double TOF" as fn(Run #)
Note: the Single and Double rates are multiplied by a factor of 10 for clarity.
Also on the secondary axis, are the ratios "Single TOF"/"Starts" and "Single TOF"/"Stops".

It can be seen that the "LEF Stops" and "ST Stops" track reasonably well through all runs.
I believe that they, and in particular the ST Stops, are a good indication of the intensity of the beam.
Currently we are unable to use the QAUNTAR Detector at these rates to determine the absolute intensity or flux of the beam. (Due to MCP saturation effects!)
Likewise the "Starts" track well, but ONLY up to Run IMS085. After that the "Starts" rate is suppressed relative to the "ST Stops".
This is probably due to the fact that the "Start" portion of the MCP is relatively small compared to the STOP part (a 20mm Disc in the center), so this part of the MCP suffers saturation affects early on. Also note that a "Stop" is generated when a single neutral Ion (+ve in the case of the LEF Stops) strikes the first MCP. Conversely a "Start" is generated when at least 1, (but possibly several) electrons from the C-Foil, strike the Same MCP plate. This extra multiplication from the C-Foil suggests that the "Start" MCP pulses should be larger than the "Stop" pulses, though this may further cause saturation affects in the first plate.
If we define TOF efficiency as the ratio "Single TOF"/'ST Stops" then it can be seen that this is steady at ~8% up to run IMS085. After that it drops off significantly with increasing beam intensity. Note the "Single TOF" rate also includes the background counts, which become significant with increasing beam intensity, so this curve could be replotted, but just using coincidence in the Ne+ Peak,! Also these are upper limits on the efficiency, since we are assuming that the Ions are transmitted through the ESA and are detected with 100% efficiency.



SUMMARY Stacked Plot, ST TOF with increasing Beam Intensity IMS081-IMS088