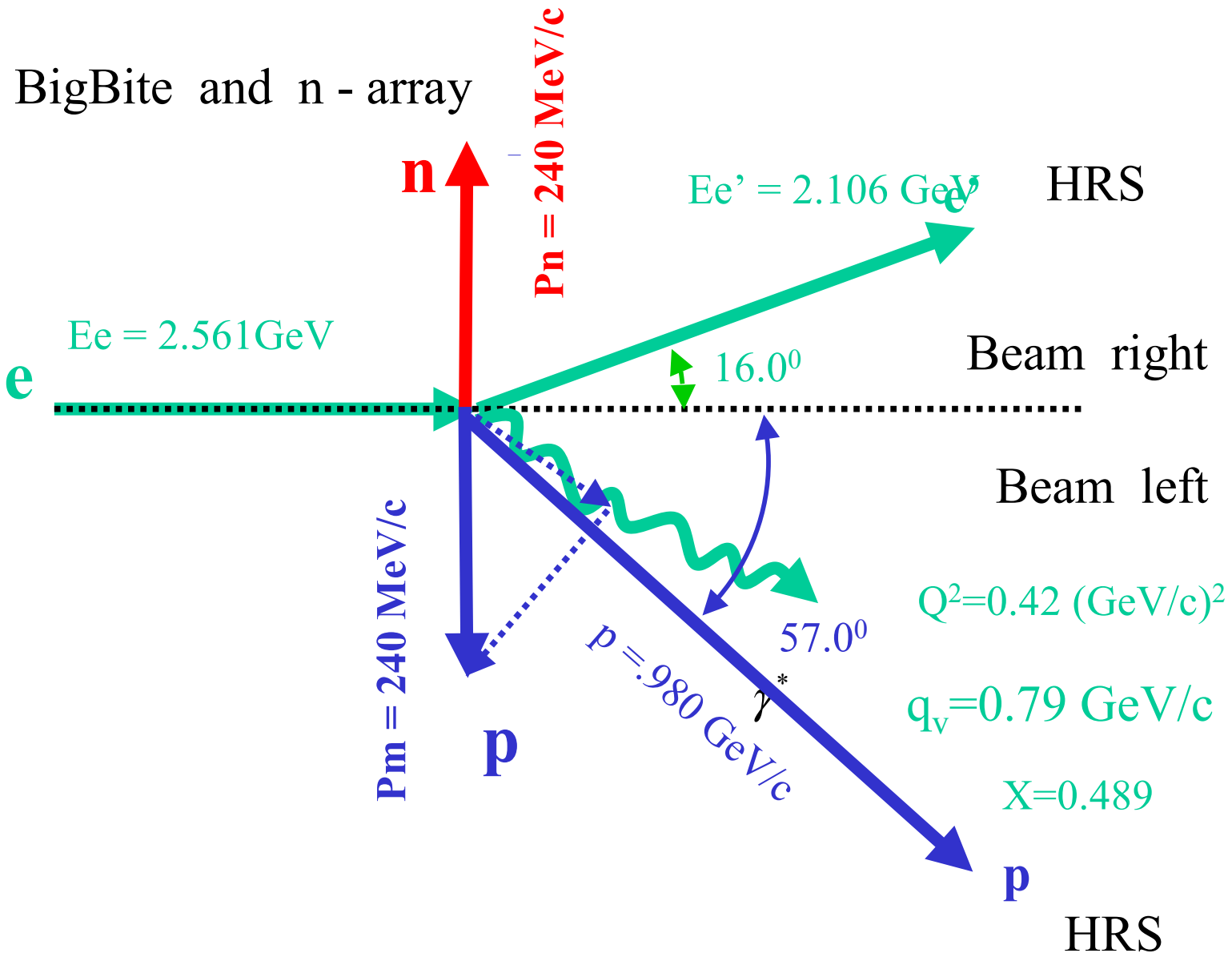
Readiness Review

E 01 - 015

From the triple coincidence test to the proposed measurement singles rates / signal/noise …

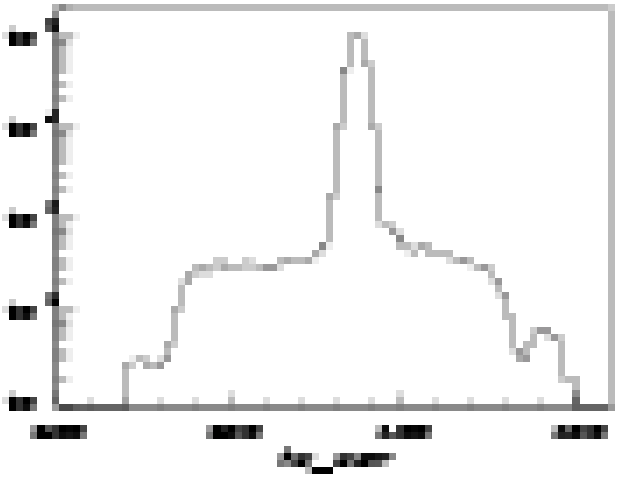
TJNAF July, 2003

kinematics and setup for the triple coincidence test



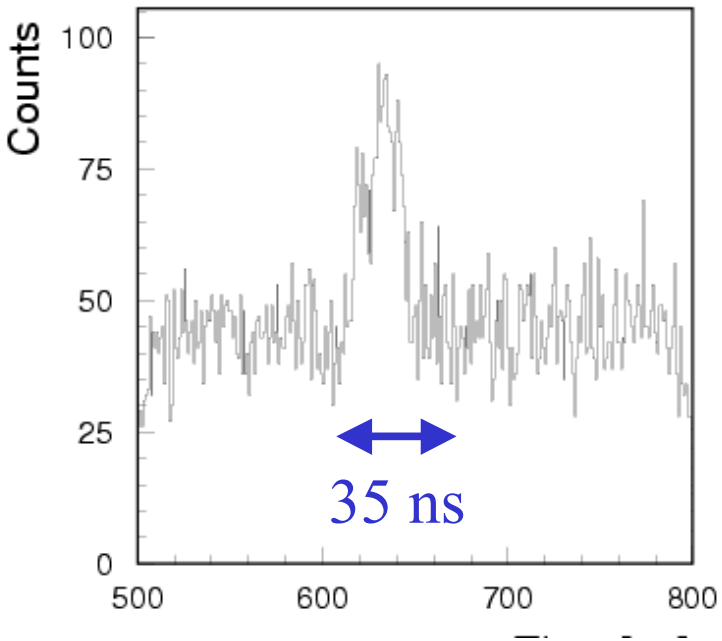
Runing conditions

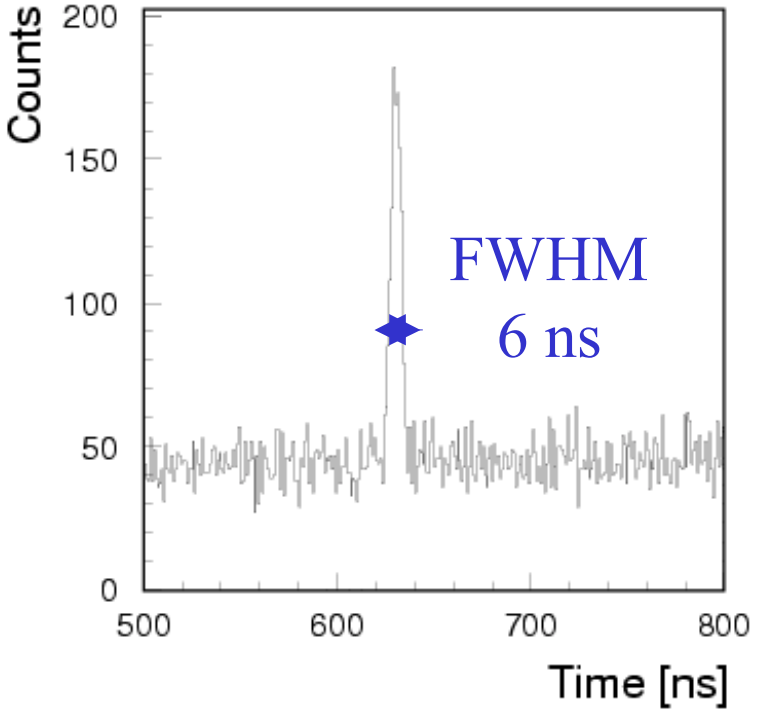
	beam test(D)
	April 2001
beam energy[GeV/c]	2.561
beam current[uA]	10
target	15cm LD2
target width [mg/cm^3, cm]	170*15
nucleon luminosity	9.6
line of sight shield	2" lead
other shield	none
threshold [MeVee]	?
angle of det. center[deg.]	90
detector size [cm^3]	160x10x10
distance from TGT [cm]	440
run numbers	60573-60624
comments	1st layer
measure rates [Hz]	700k



D(e.e'p)

D(e,e'pn)





"Carbon – like " analysis

"Carbon – like " analysis **D(e,e'pn)**

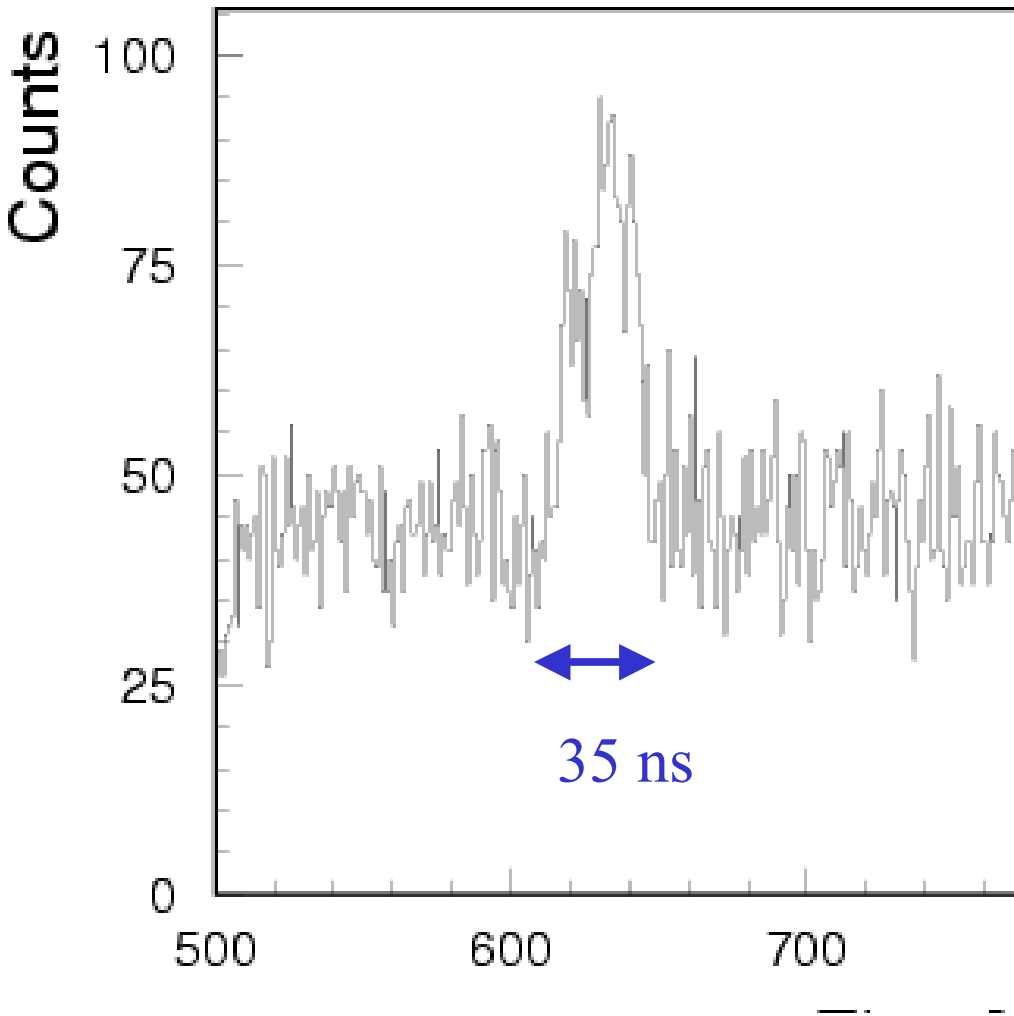
The signal/noise ratio is determined by:

Do not use the fact that $p_p=-p_n$

The ratio of triple to double coincidence: (e,epn)/(e,ep)

Singles rates

The time window for real events



The ratio of triple to double coincidence: (e,epn)/(e,ep)

	beam test(D)	experiment	
	April 2001	2003/4	
beam energy[GeV/c]	2.561	5.0	
beam current[uA]	10	100	
target	15cm LD2	C 1 mm	
target width [mg/cm^3, cm]	170*15	200	
nucleon luminosity	9.6	7.5	
line of sight shield	2" lead	2" lead	
other shield	none	none	
threshold [MeVee]	~10	10	
angle of det. center[deg.]	90	100	
detector size [cm^3]	160x10x10	100*10*10	
distance from TGT [cm]	440	500	
run numbers	60573-60624	-	
comments	1st layer	1st layer	
measure rates [Hz]	700k	150 k	
MCEEP for a single (central counter)	**1.6%**	**0.16%**	

Defocusing due to CM motion

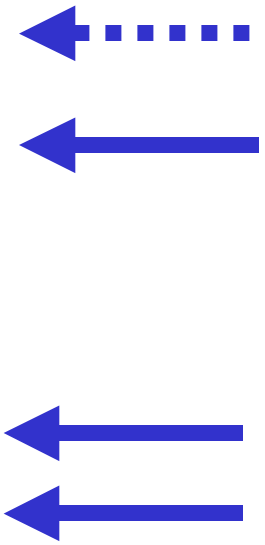
geometry

kinematics

Signal/noise is expected to be a factor of 10 less good in the experiment due to smaller triple/double coincidence ratio.

Singles rates

	beam test(D)	experiment
	April 2001	2003/4
beam energy[GeV/c]	2.561	5.0
beam current[uA]	10	100
target	15cm LD2	C 1 mm
target width [mg/cm^3, cm]	170*15	200
nucleon luminosity	9.6	7.5
line of sight shield	2" lead	2" lead
other shield	none	none
threshold [MeVee]	~10	10
angle of det. center[deg.]	90	100
detector size [cm^3]	160x10x10	100*10*10
distance from TGT [cm]	440	500
run numbers	60573-60624	-
comments	1st layer	1st layer
measure rates [Hz]	700k	150 k



(Proposal 168 kHz)

We will adjust the beam current get that

This will improve the signal/noise by a factor of 4.5

Singles rates n - array

Predictions for 1mm C
100 μA

		during 89-044	beam test (C)	beam test(D)
		Feb 2000	April 2001	April 2001
beam energy[GeV/c]		4.8	4.	2.561
beam current[uA]	I	100	10	10
target		3He	9 foils C	15cm LD2
target width [mg/cm^3*cm]	D	60*10	9*50=450	170*15
nucleon luminosity [10^{37} cm^{-2}sec^{-1}	L	22.5	1.7	9.6
line of sight shield		2" lead	2" lead	2" lead
other shield		none	none	none
threshold [MeVee]		10	?	?
angle of det. center[deg.]		124	90	90
detector size [cm^3]	V	160x10x10	160x10x10	160x10x10
distance from TGT [cm]	S	520	440	440
run numbers		2170-2474	61184-61217	60573-60624
comments		1st layer	1st layer	1st layer
measure rates [Hz]	R	850k	150k	700k

180 kHz

~300 kHz

260 kHz

Signal/noise (summary):

With 100 μA beam the expected n singles rates :

For PM in the 1st layer : **250 ± 50 kHz**

For the whole 1st layer : **~ 7.5 MHz**

That is without taking into account possible help from BigBite upstream.

We will chose the beam current to give an average singles rate of about 150 kHz per front PM. We expect that to give us a current of 50 – 100 μA.

Under these running conditions we expect the signal to noise to be about 2 times less good than in the triple coincidence test, the signal statistics to be about 4 times bigger, and the goal of the measurement to be achievable.

Singles rates (summary):

With 100 μA beam the expected n singles rates :

For PM in the 1st layer : **250 ± 50 kHz**

For the whole 1st layer : **~ 7.5 MHz**

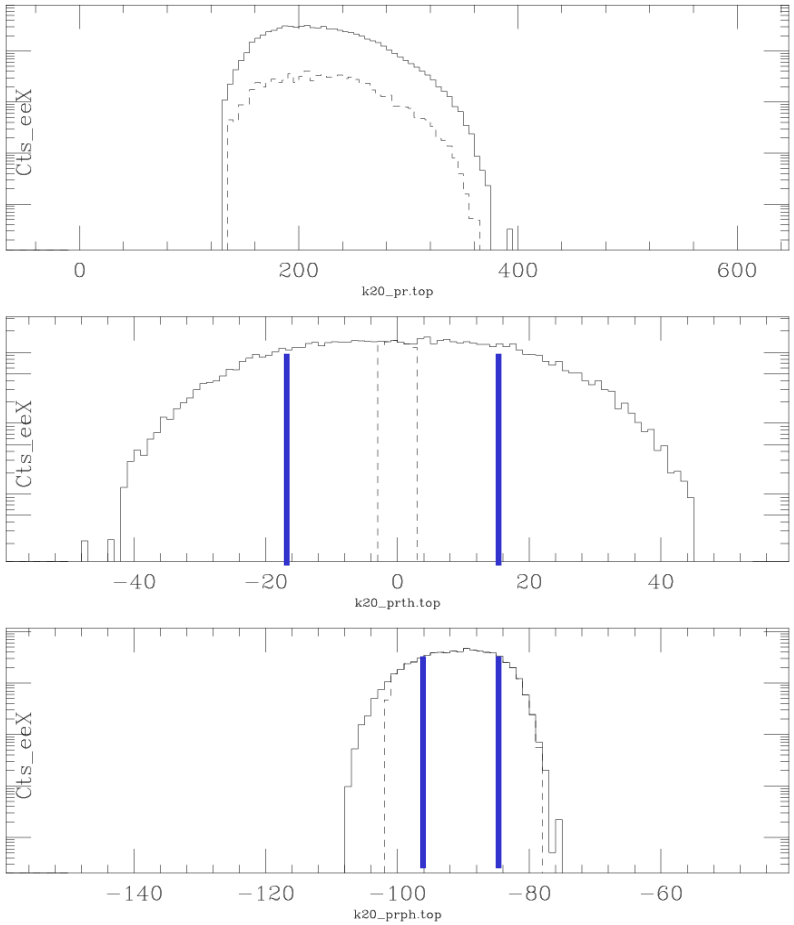
That is without taking into account possible help from BigBite upstream.

With 100 μA beam the expected charge singles rates in BB:

3.5 ± 0.5 MHz

We will chose the beam current to give an average singles rate of about 150 kHz per front PM. We expect that to give us a current of 50 – 100 μA.

MCEEP simulation of d(e,e'pn)



		parasitic test	experiment	
		Nov 2001	2003/4	
beam energy[GeV/c]		?	5.0	
beam current[uA]	I	110	100	
target		15 cm LD2	C 1 mm	
target width [mg/cm^3, cm]	D	170*15	200	
nucleon luminosity	L	105	7.5	
line of sight shield		2" lead	2" lead	
other shield		none	none	
threshold [MeVee]		6.84(10.26)	10	
angle of det. center[deg.]		120 (BL)	100	
detector size [cm^3]	V	50*10*10	100*10*10	
distance from TGT [cm]	S	700	500	
run numbers	-	-	-	
comments		det 1	1st layer	
measure rates [Hz]		210k(150k)	-	

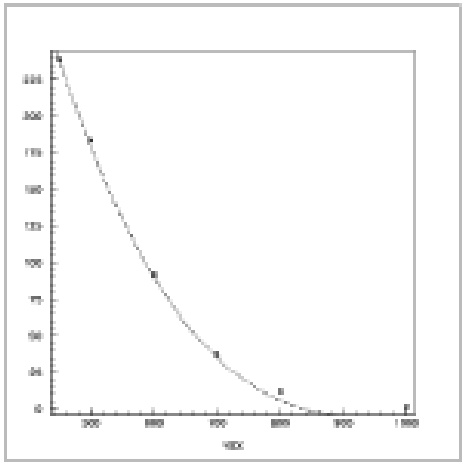
50 kHz

Proposal 168 kHz

Singles rates (BigBite)

BigBite Singles Rate Evaluation for the SRC Experiment

R.Shneor, D.Higinbotham ,P.Monaghan, S.A.Wood, E.Piasetzky



(Fig 1) Measured (points) and calculated (dashed line) hit rates [Hz] Vs Proton Momentum [MeV/c]

Summary

Measured rate [MHz] based on test	Estimated rate [MHz] based on Geant and test	Estimated rate [MHz] based on proposal estimate
3.5	4.5	8

Table 3: Measured and Simulated rates

In the proposal condition based on the test with the beam we estimate BigBite singles rate to be 3.5 $\pm$ .5 MHz.