Working of Tagger Hodoscope as a Moeller Polarimeter

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- 140 Moellers runs of Jan/Feb beam time with 1557 MeV beam energy are analyzed (120 hours of data)

- Distribution of Moeller signal over Hodoscope is studied

- Five test runs at 450 MeV are analyzed

Slection of Moeller Electrons

$$N_{0,1} = B - (A + C) / 6 \pm \delta N_{0,1}$$

TA2Moeller

TDC_Vup_Left_Pair_Hel_0_0_1_1	
Entries	312064
Mean	129.2
RMS	69.96

A   B   C

TDC_Vup_Left_Pair_Hel_0_3_0_0

L: 133 R: 247

E_l: 536 E_r: 1015 E_t: 1552

N_mol = 978603

S/B = 1.97

TDC_Vup_Left_Pair_Hel_0_3_1_0

L: 133 R: 248

E_l: 536 E_r: 1020 E_t: 1556

N_mol = 2148627

S/B = 3.04

TDC_Vup_Left_Pair_Hel_0_3_2_0

L: 133 R: 249

E_l: 536 E_r: 1024 E_t: 1561

N_mol = 639977

S/B = 1.591

TDC_Vup_Left_Pair_Hel_0_3_3_0

L: 133 R: 250

E_l: 536 E_r: 1028 E_t: 1565

N_mol = 235993

S/B = 1.2

TDC_Vup_Left_Pair_Hel_0_3_4_0

L: 133 R: 251

E_l: 536 E_r: 1033 E_t: 1569

N_mol = 68993

S/B = 1.161

# Moeller Signal and Tagger Energy (1557 MeV)
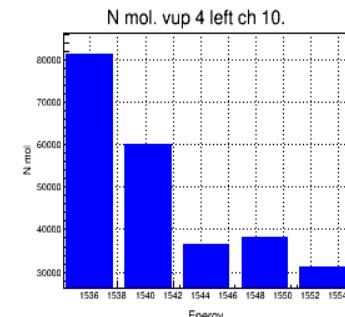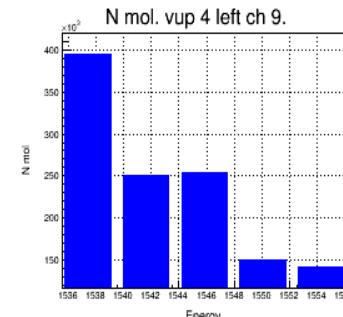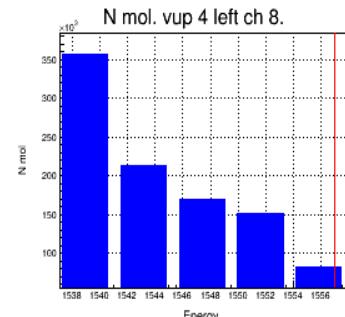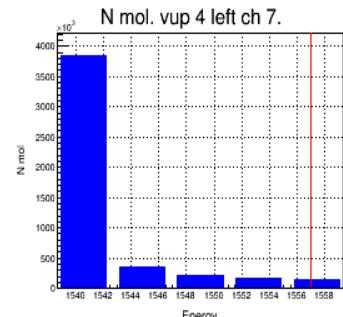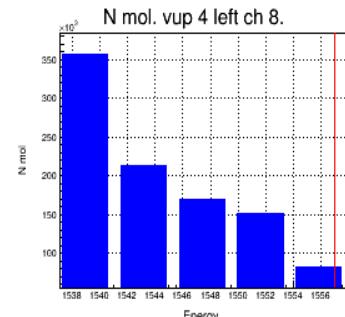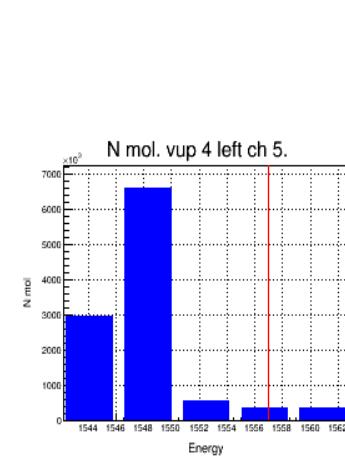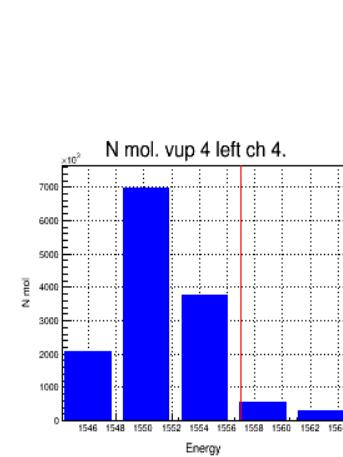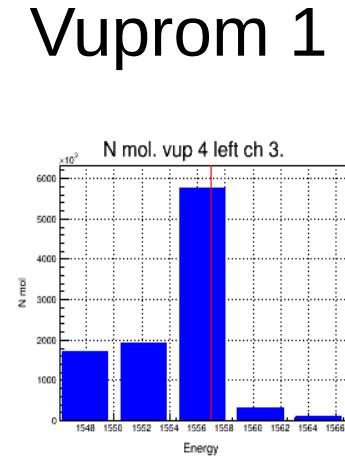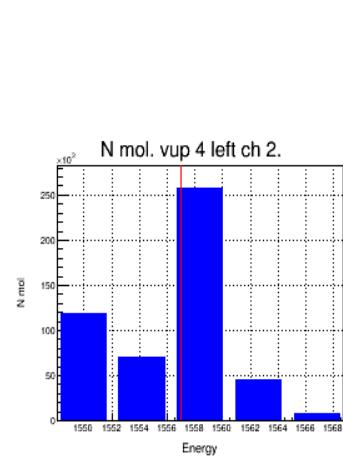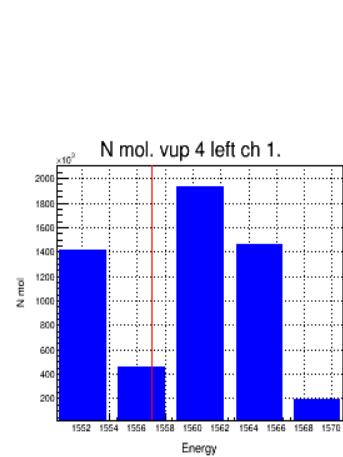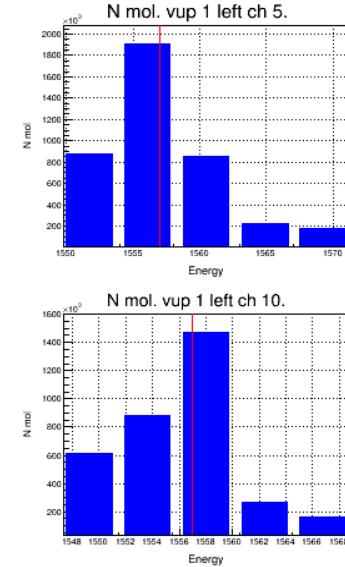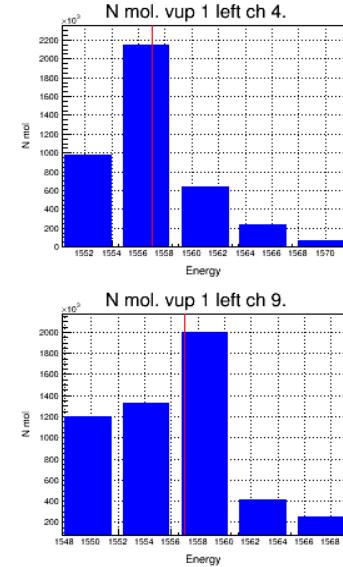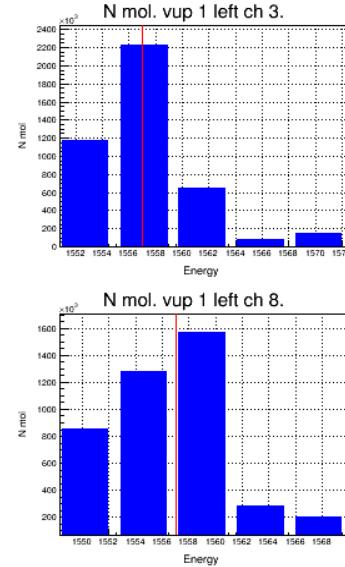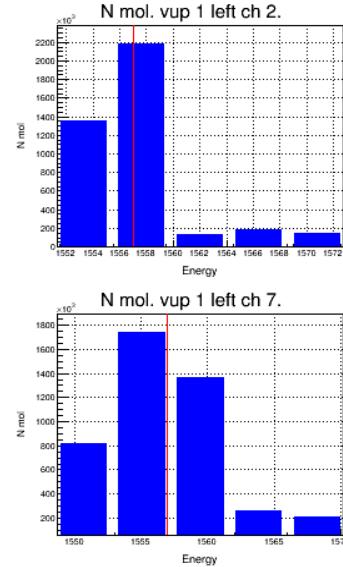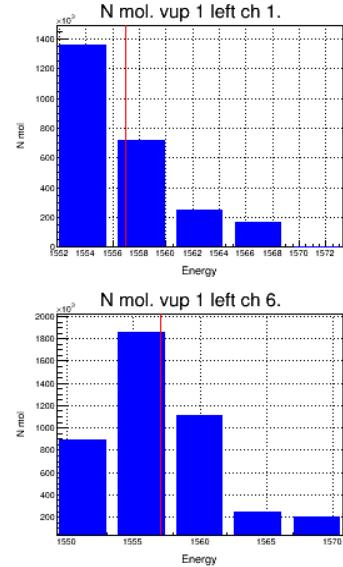
Vuprom 1

Vuprom 4

Moeller Signal and Tagger Energy (450 MeV), 2 Runs. Vuprom 1, Angle = -46
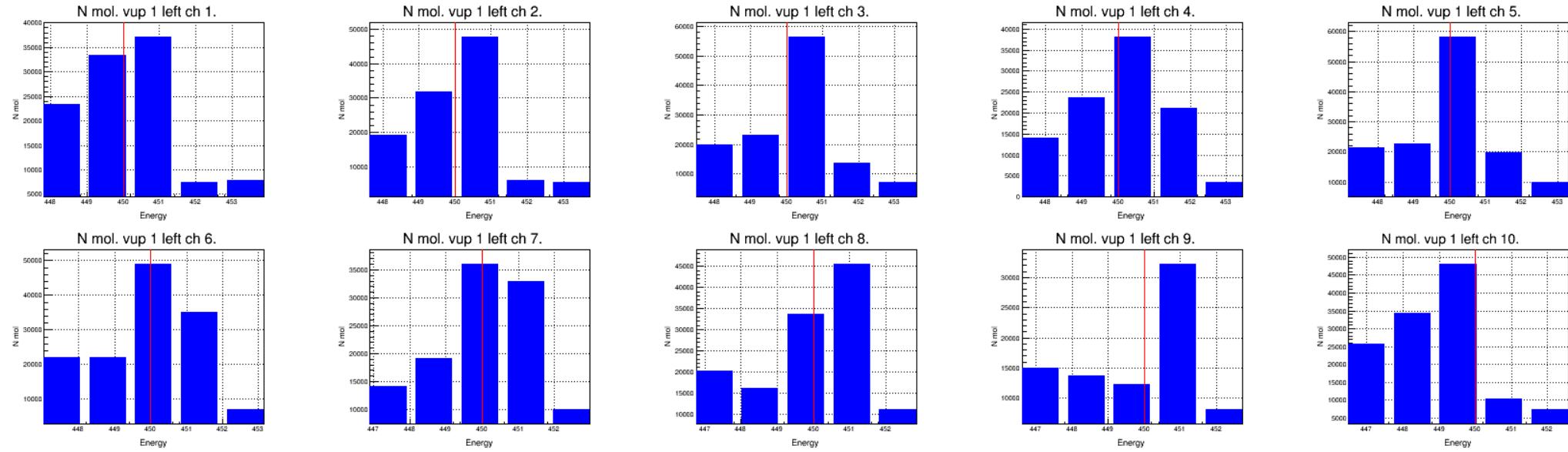
# Moeller Signal and Tagger Energy (450 MeV), 3 Runs. Vuprom 1, Angle = 0
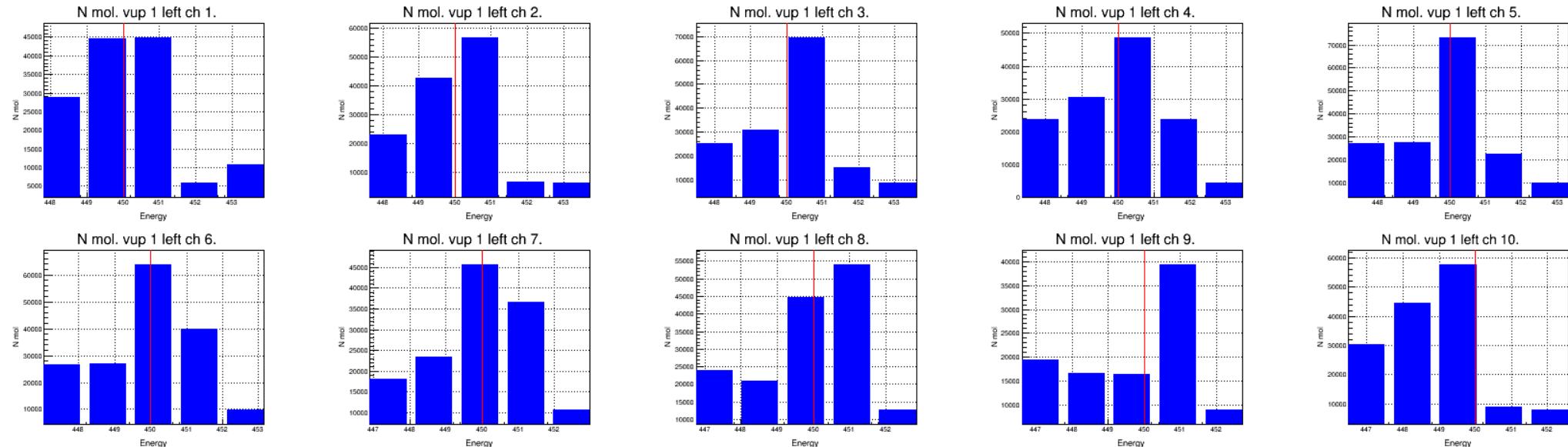
Data cuts

- Out of five tagger pairs for a left tagger channel Moeller electrons are selected for left right tagger pair with energy sum = beam energy

- This is the tagger pair with the Moeller peak

- There are cuts on statistics, like minimum number of Moeller electrons per tagger pair, etc.

- After applying statistics cut we are left with 24 to 26 tagger pairs

- For some tagger pairs Moeller peak is shifted.

- If we apply further conditions to get a clean data such that we select the tagger pair with total energy equal to beam energy and the same tagger pair has the best Moeller peak and the same tagger pair has the best signal to back ground ratio we have 20 to 18 tagger pairs at 1557 MeV

- At 450 MeV if we apply additional conditions to get clean signal we are left with 12 to 14 tagger pairs.

- Spread or shift in Moeller signal is greater at lower energy.

N Mol (0,1) vs. Tagger channel.

Data from 140 Moellers runs
1557MeV beam energy
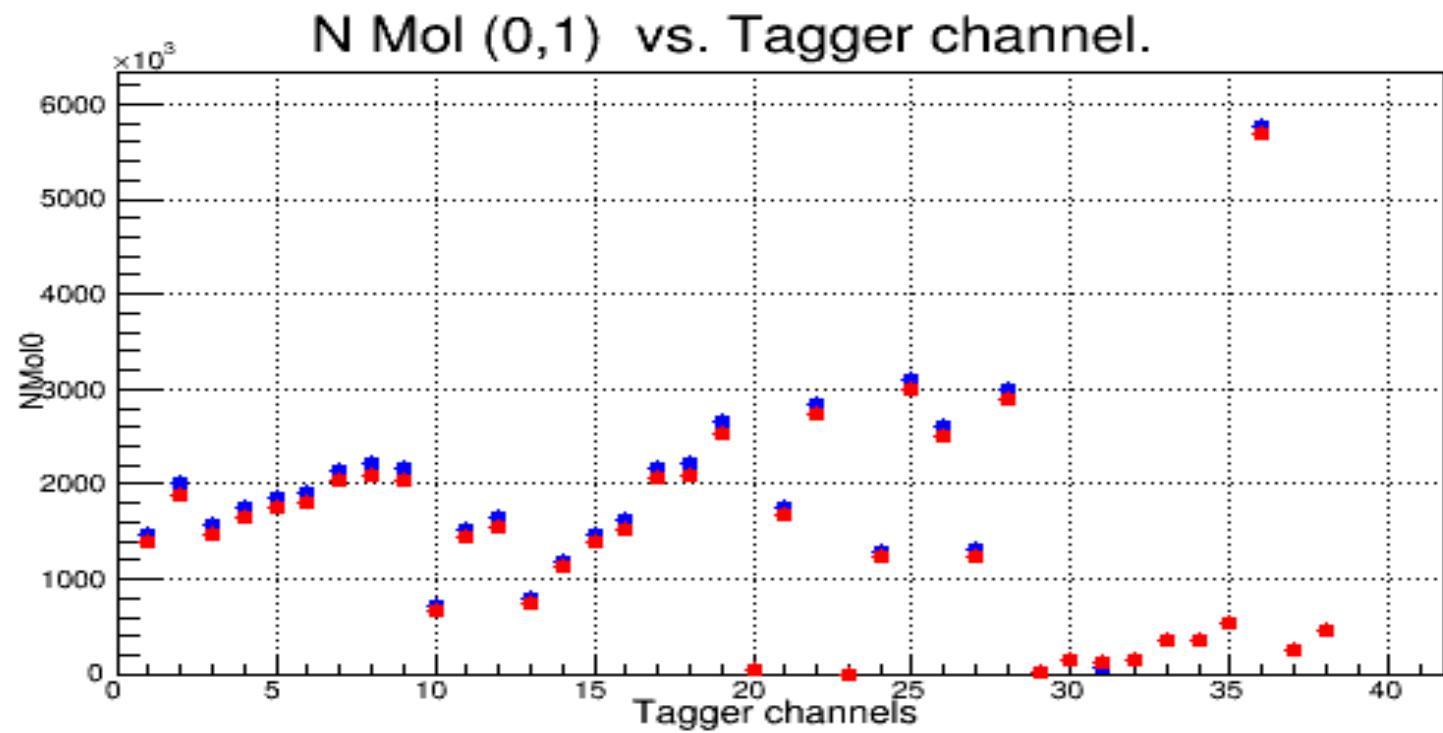
S/B (0,1) vs. Tagger channel.

450 MeV
beam energy

N Mol (0,1) vs. Tagger channel.

S/B (0,1) vs. Tagger channel.
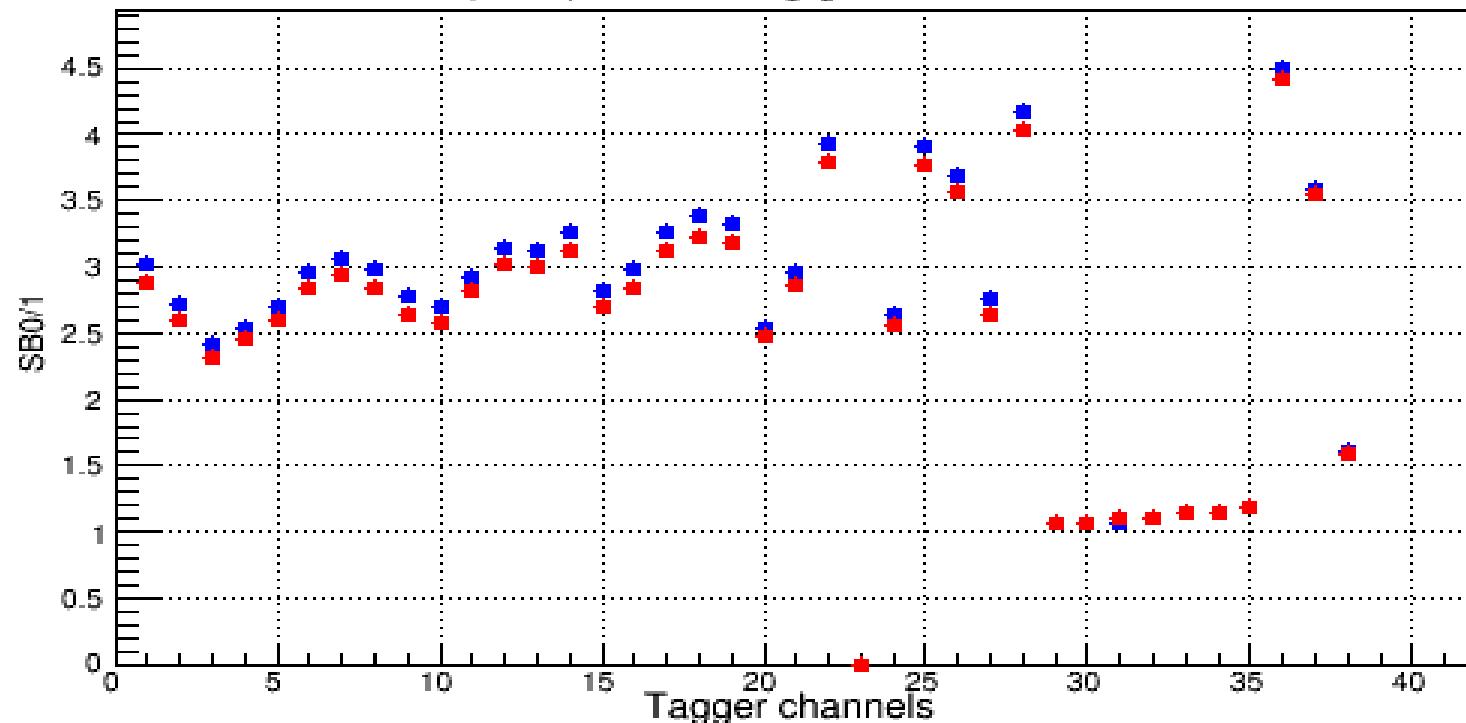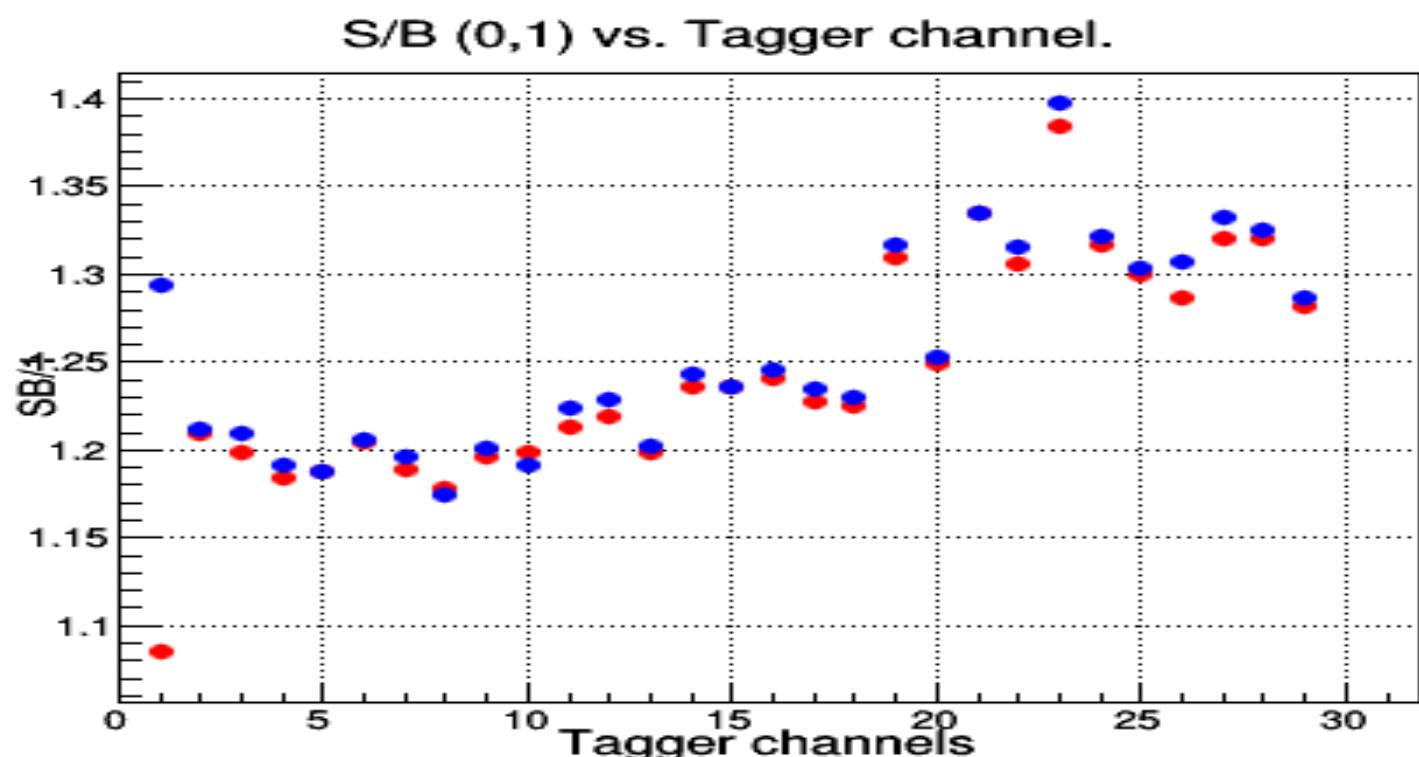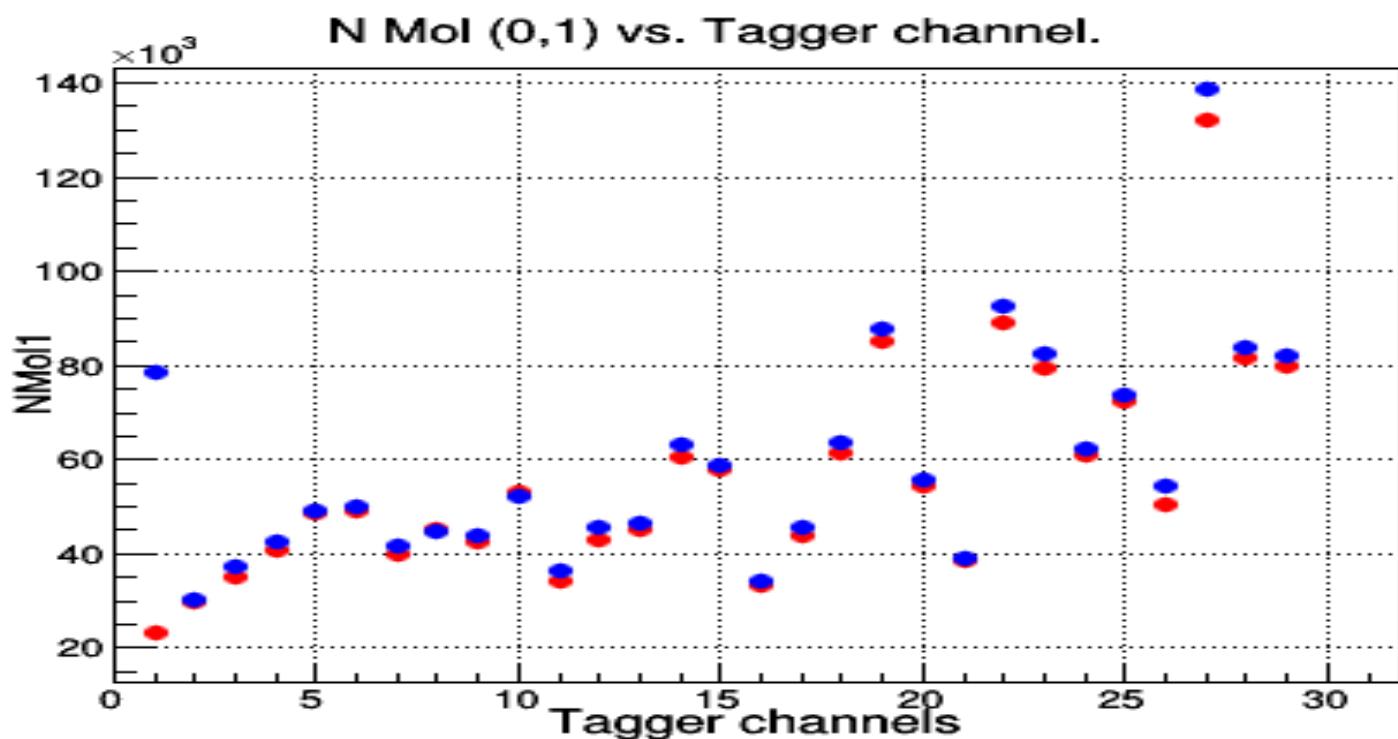
Data from 3 Runs at 450 MeV beam energy

Data from 140 runs at 1557 MeV beam energy

Tagger pair with Energy sum = beam energy

Tagger pair with Energy sum = beam energy
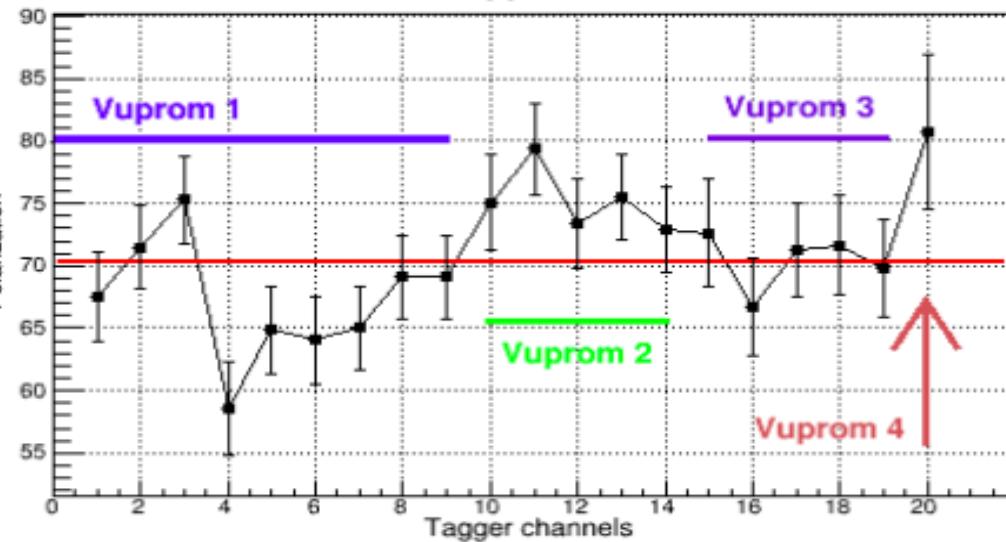
Energy sum = Moeller Peak = Best S/B
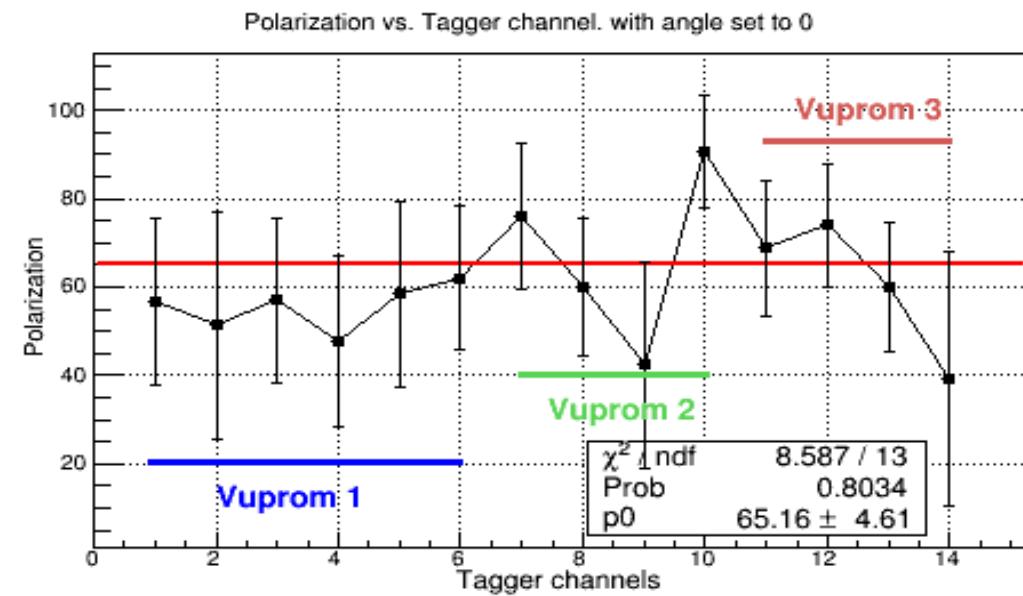
Energy sum = Moeller Peak = Best S/B
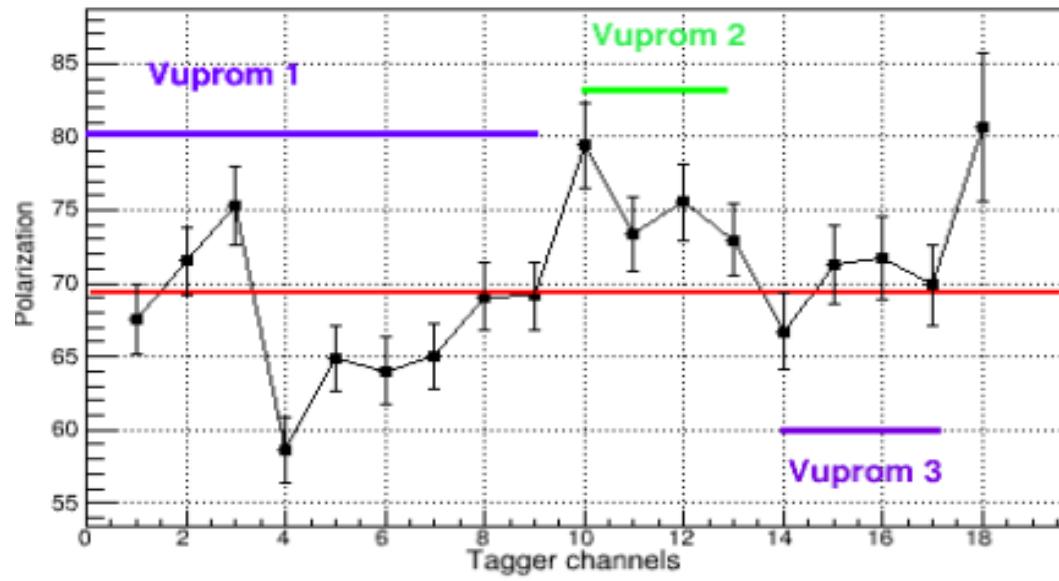
An estimate of error at beam energy of 1557 MeV

One hour Moeller data
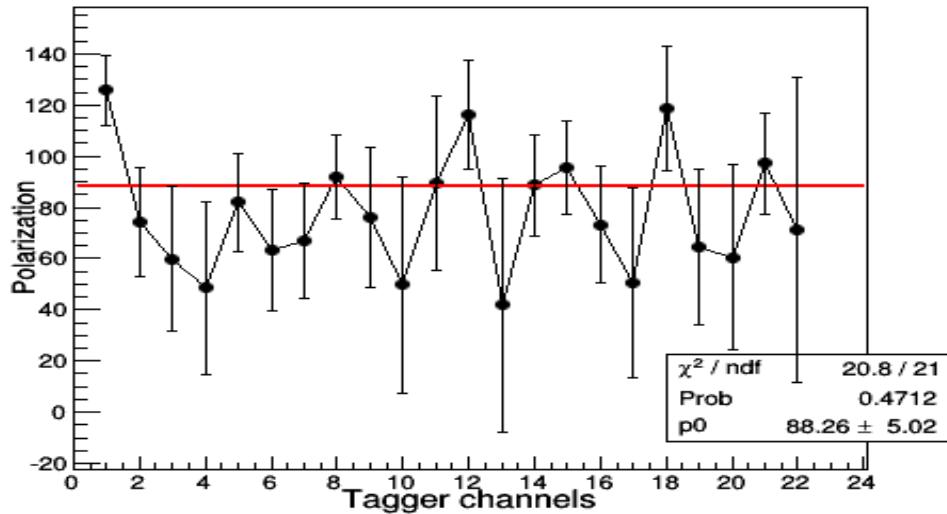
6 hours Moeller data
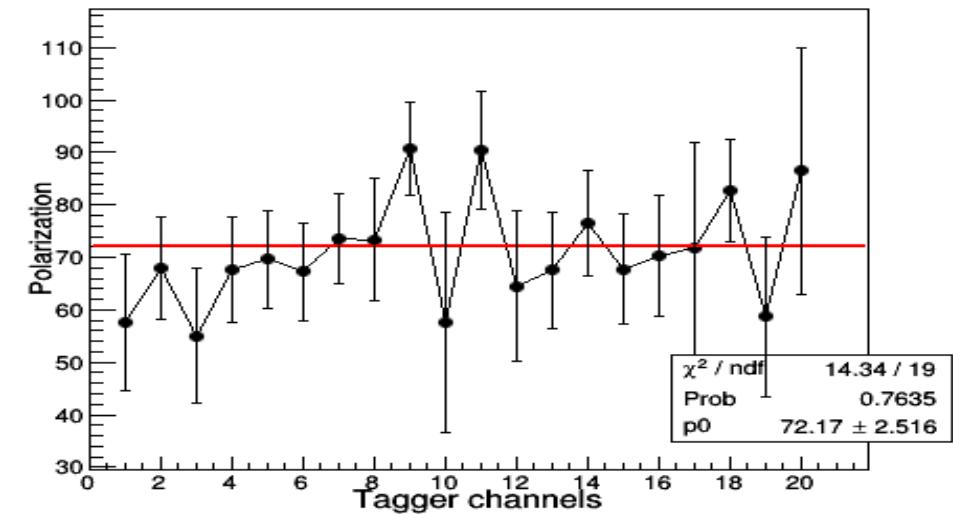
12 hours Moeller data
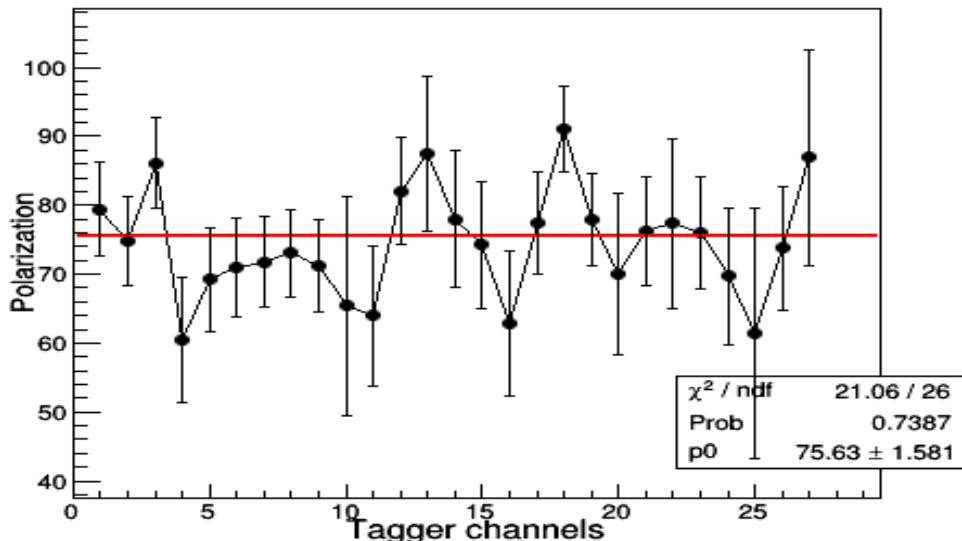
20 hours Moeller data
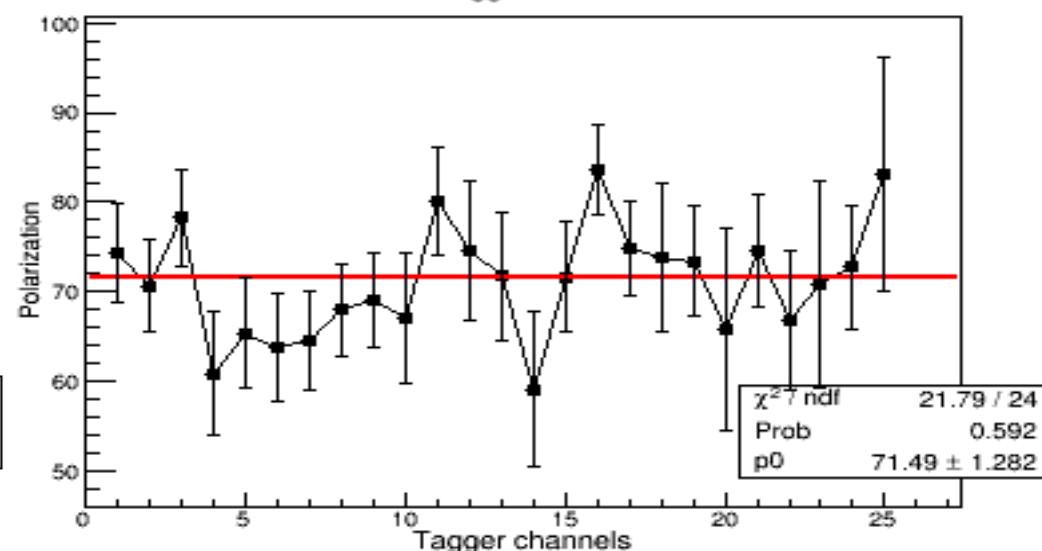
450 MeV Test Runs

Energy of tagger pair = beam energy
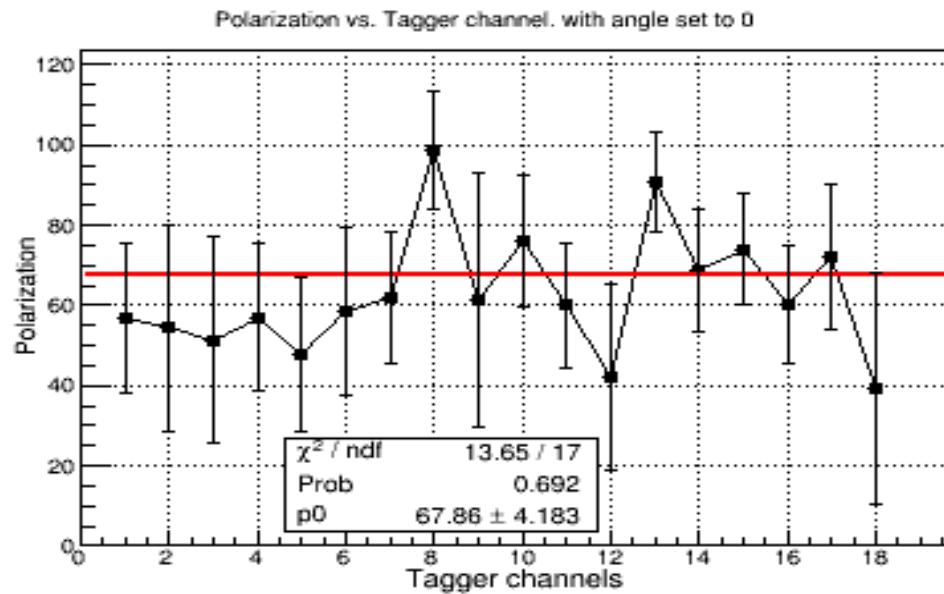
Energy of tagger pair = beam energy
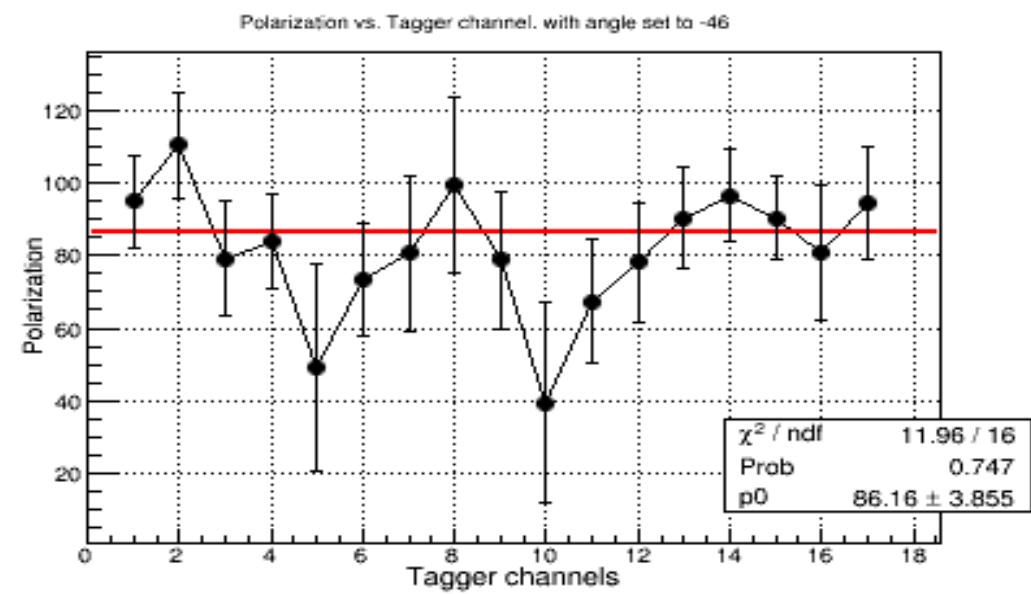
Energy of tagger pair = Moeller peak = best S/B
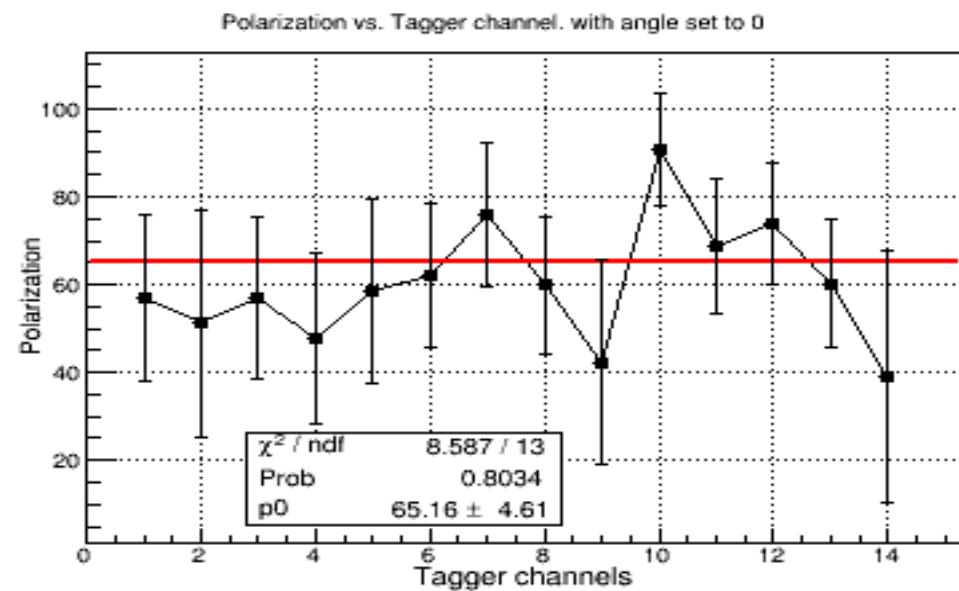
Energy of tagger pair = Moeller peak = best S/B
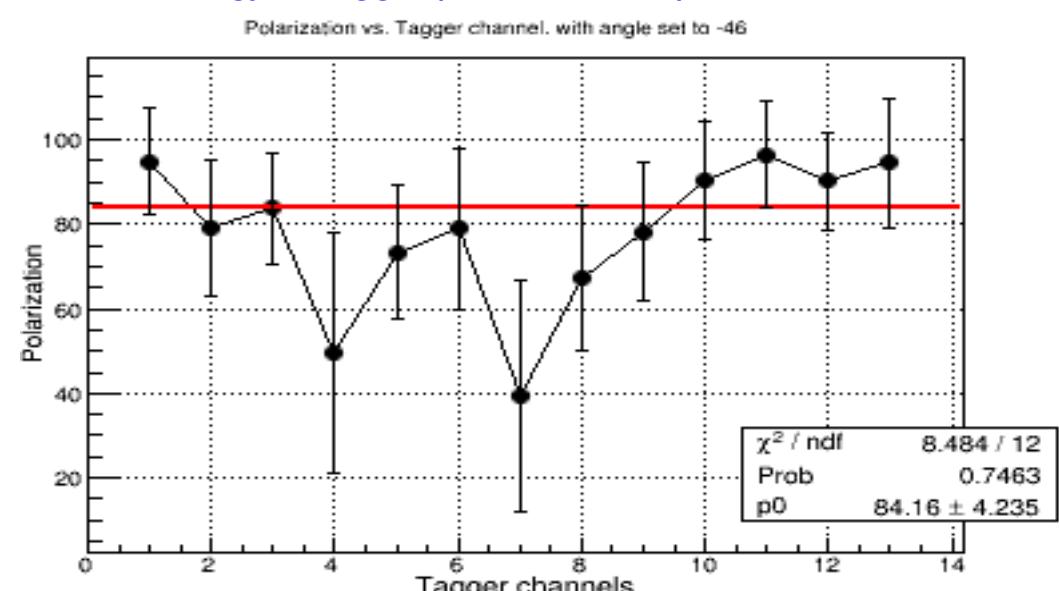
Moeller vs. Mott Polarization. 1557 MeV beam energy

All vuproms are included. All data points are included.

Tagger pair with sum energy = beam energy = Tagger pair with Moeller peak = Tagger pair with best S/B

Polarization vs. Data Set

	Moeller		Mott	
χ^2 / ndf	17.64 / 12	χ^2 / ndf	80.56 / 12
Prob	0.1271	Prob	3.231e-12
p0	-66.8 ± 0.8265	p0	-73.71 ± 0.1016
p1	-0.4018 ± 0.1017	p1	-0.3991 ± 0.01193
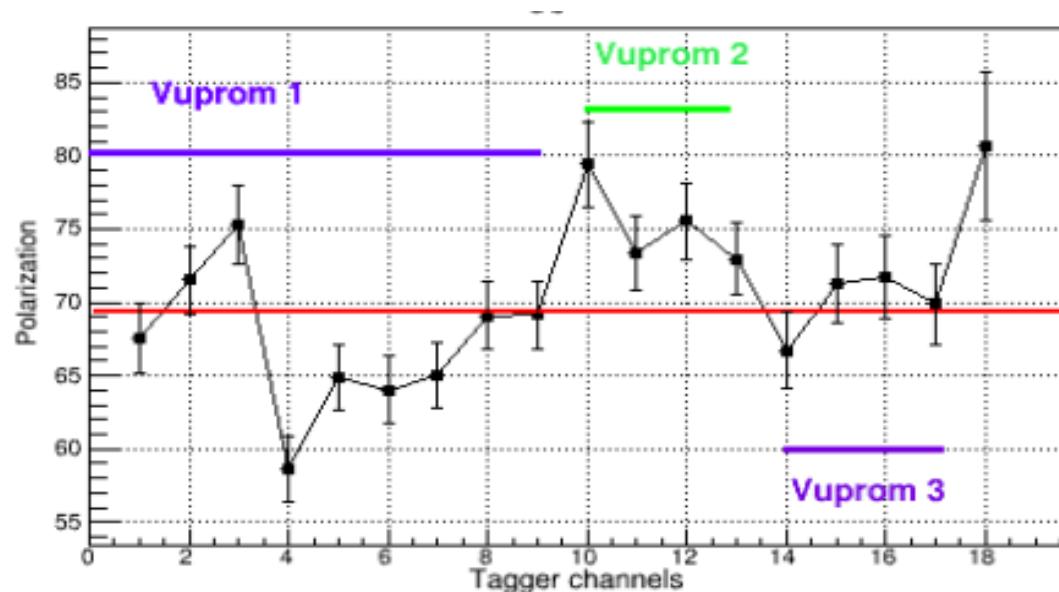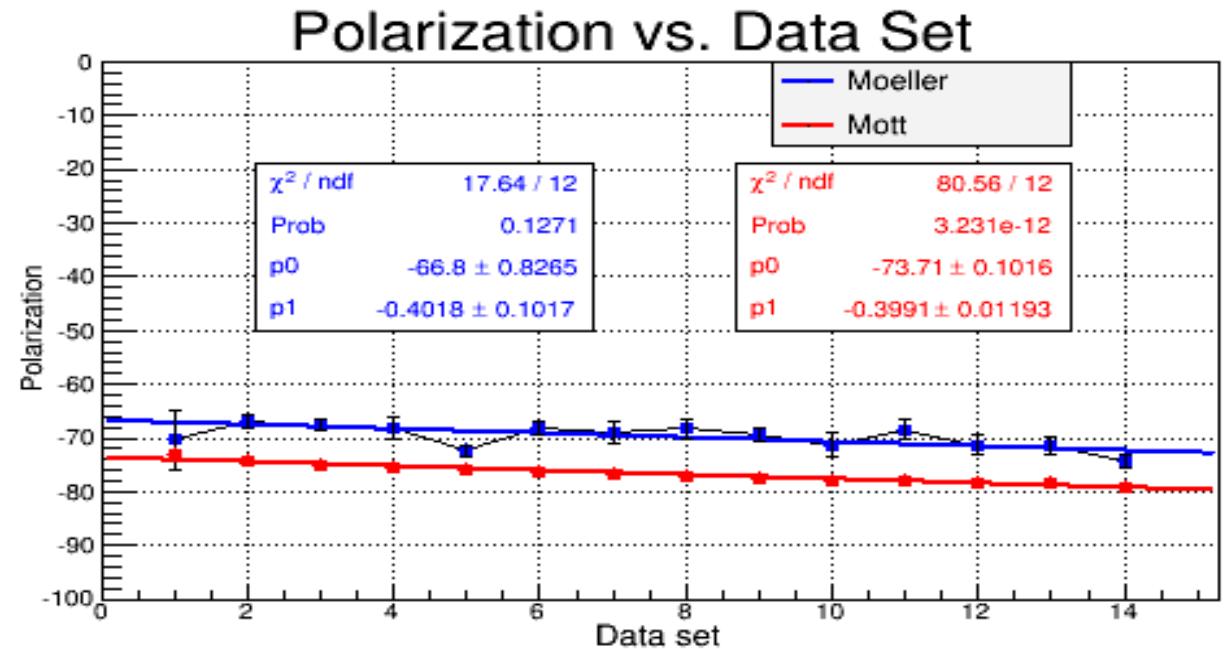
Results

- Take Moeller data at a lower scaler read value

- Cuts on statistics reduces the good tagger pairs 20 to 24

- Further cuts to get clean Moeller signal further reduces the good tagger pairs.

- At 1557 MeV beam energy we have 20 to 18 good tagger pairs and at 450 MeV beam energy we have 14 good tagger pairs.

- Almost all tagger pairs of Vuprom 4 comes under the cuts. Vuprom 3 is left with 2 or 3 good tagger pairs

- Long time of data taking is required to reduces the statistical error.

- If we put the tagger pairs of Vuprom 3 and 4 right in the middle of the tagger hodoscope statistics will improve

- Right now the left tagger channel starts from 138 and goes to 1 and between two Vuproms we jump over some left tagger pairs.

- We should start the left tagger channel of Vuprom 1 from the middle of the hodoscope which is channel 176 and without any jumps cover the next 40 channels.

- A dedicated Moeller polarimeter detects the Moeller electrons scattered at same angle along the beam direction or in the C.M frame the angle between scattered electrons is 180 degreee, this is the case where longitudinal Moeller analyzing power is maximum. Tagger pairs in the middle has maximum analyzing power and close to the situation in which two Moeller electrons are scattered at 180 degree in C.M frame.

- Question: Hodoscope is calibrated for Bremsstrahlung, do we need corrections for Moeller scattering?