Status of the Carbon-12 Analysis

Collabration Meeting

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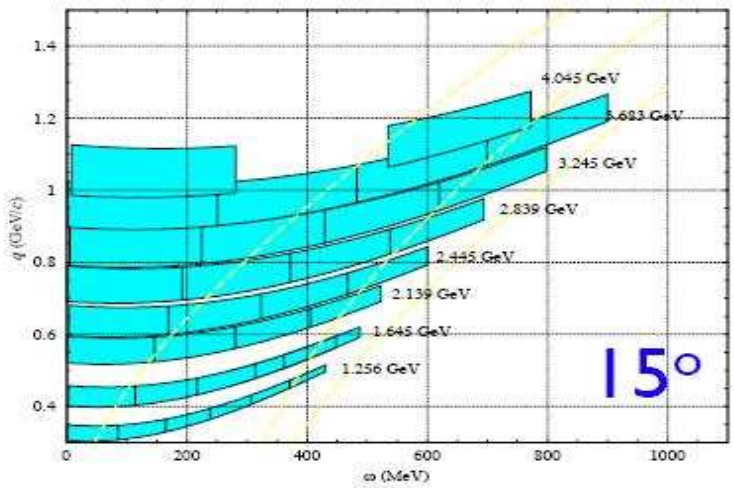
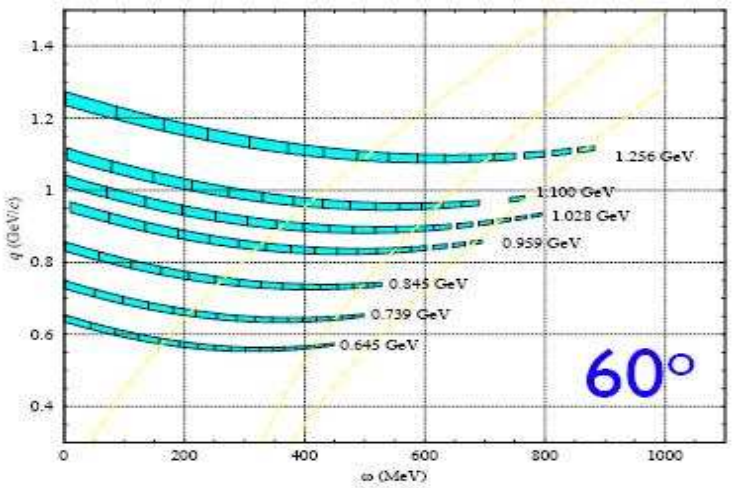
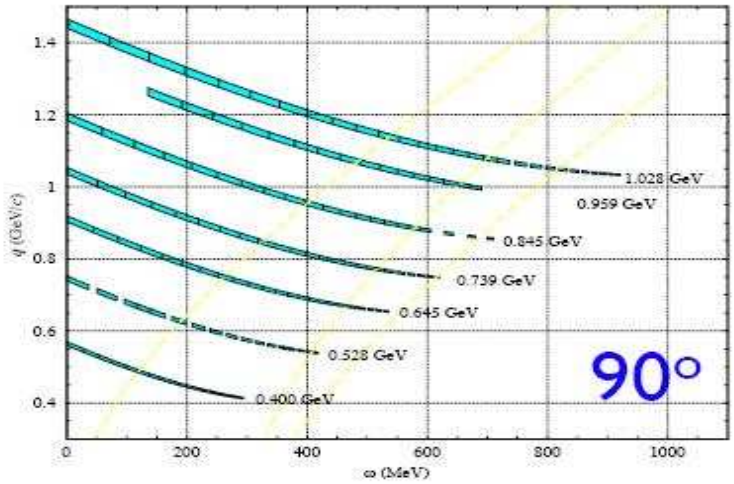
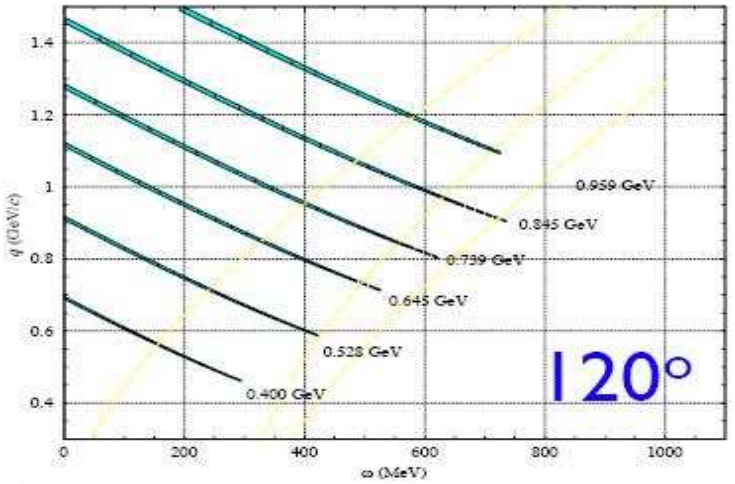
Outline

Kinematic Coverage for CSR Experiment

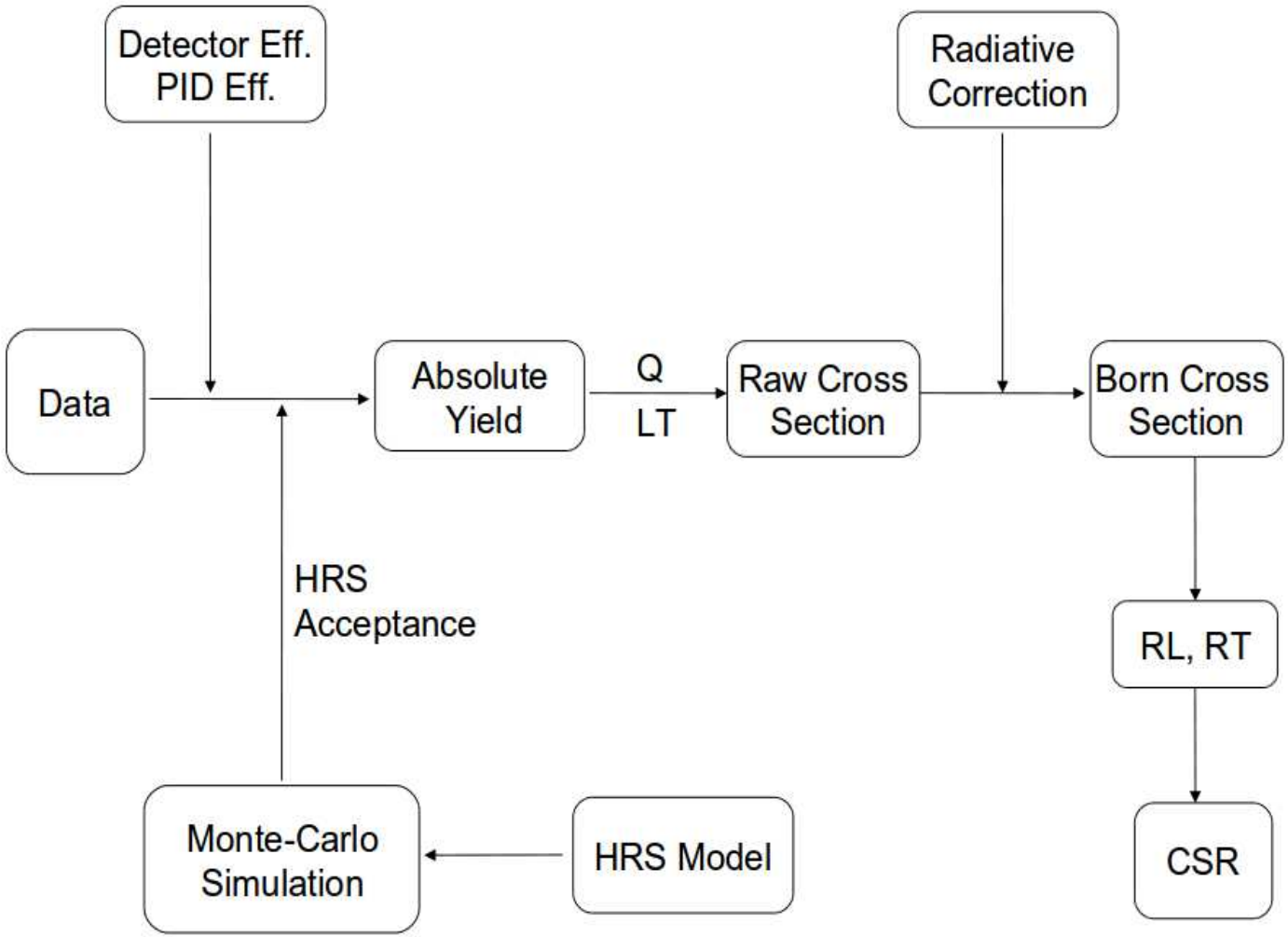








Data analysis procedure



Preshower and Shower calibration

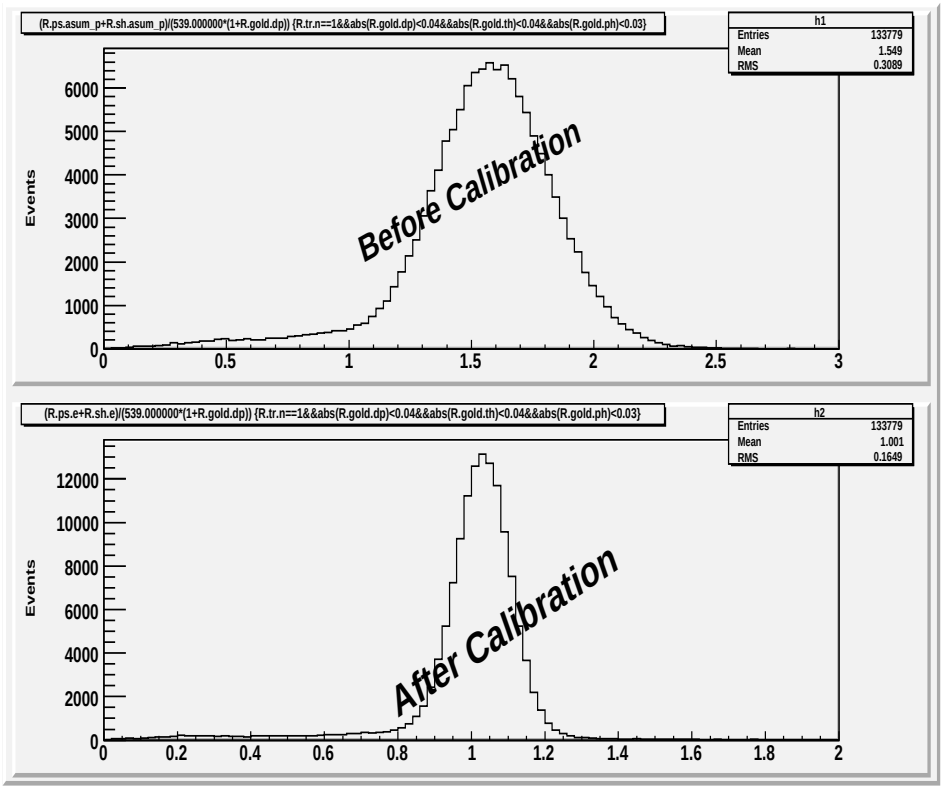
Minimize the Chi-square function (Fumili) as follows:

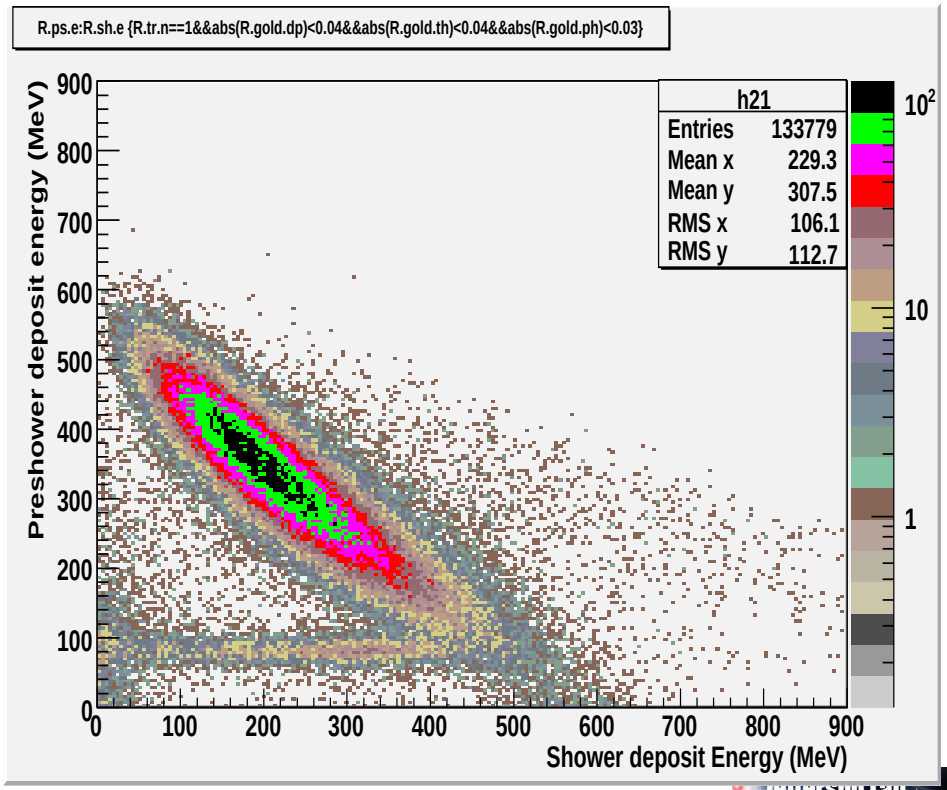
$$\chi^2 = \sum_{i=1}^{n} \left[\sum_{j \in M_{ps}^i} C_j \cdot A_j^i + \sum_{k \in M_{sh}^i} C_k \cdot A_k^i - P_{kin}^i \right]^2 \quad (1)$$

where i is the number of selected calibration events; j(k) was the number of Preshower (Shower) block included in the cluster of i-th events; M_{ps}^i, M_{sh}^i was the set of Preshower, Shower blocks numbers included in the cluster; A_j^i and A_k^i are the amplitude value in the j-th Preshower and k-th Shower block, respectively; P_{kin}^i was the electron momentum; C_i and C_k are the calibration constants to be fitted for the Preshower and shower, respectively.

Preshower and Shower calibration

E = 739 MeV, P0= 539 MeV, 60°, Carbon Target





E/P distribution of total Shower

E=739MeV, 60°, Carbon Target

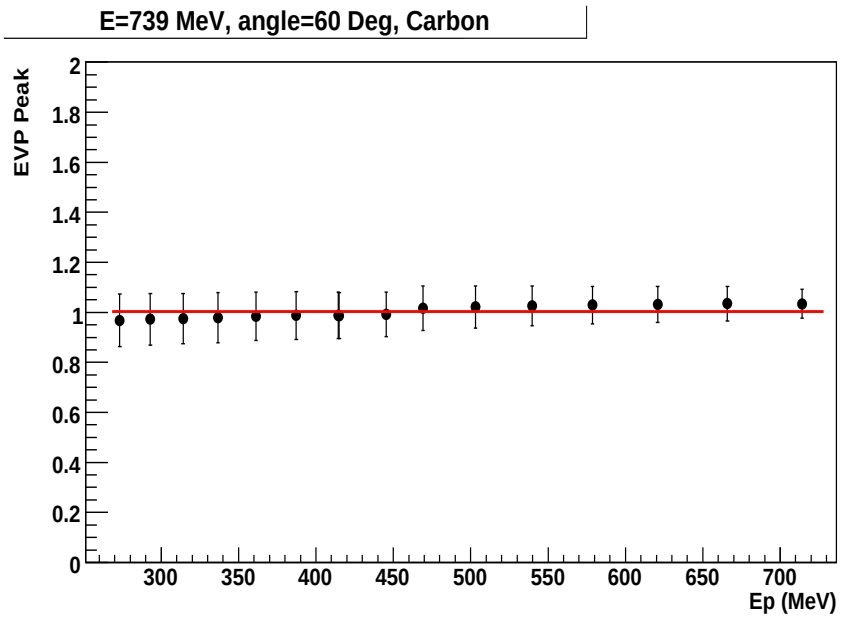


Figure 3: E/P distribution of total shower

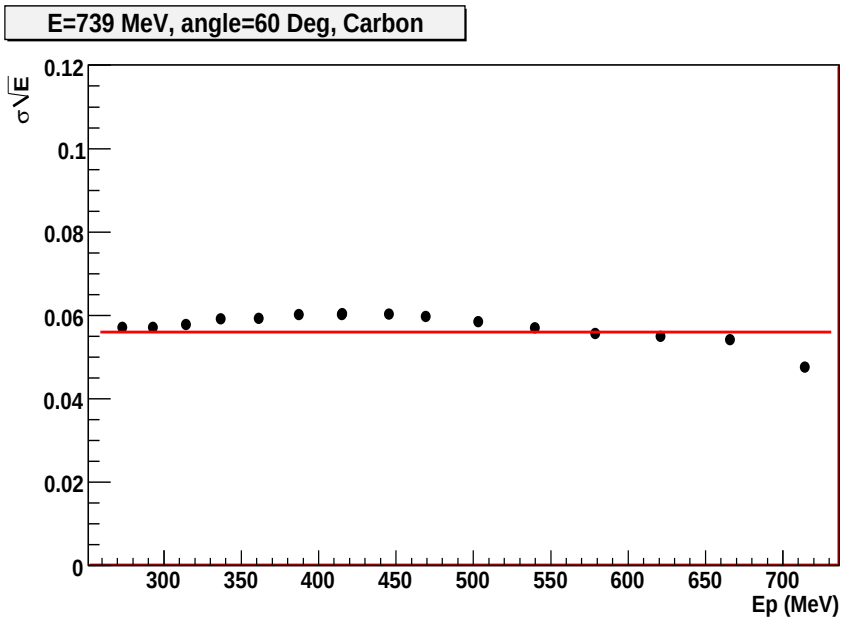


Figure 4: $\sigma\sqrt{E}$ distribution of total shower

NaI Performance of Left Arm

Run 3925, E=739MeV, P=539MeV/c, 60°

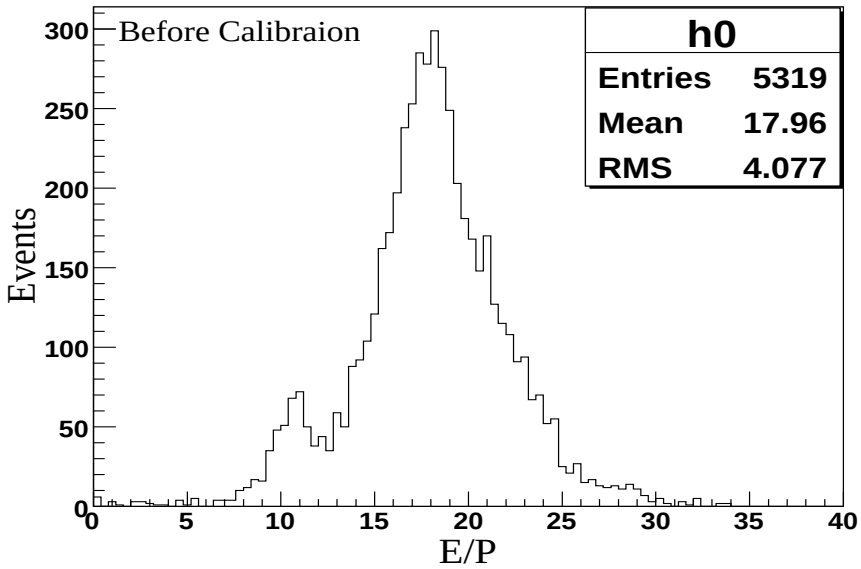


Figure 5: Before calibration for middle box

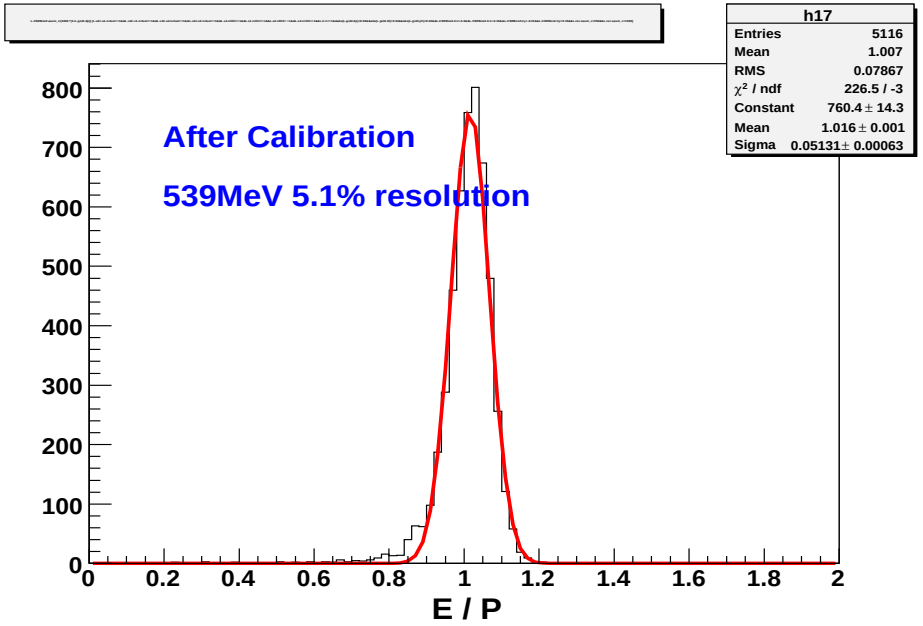
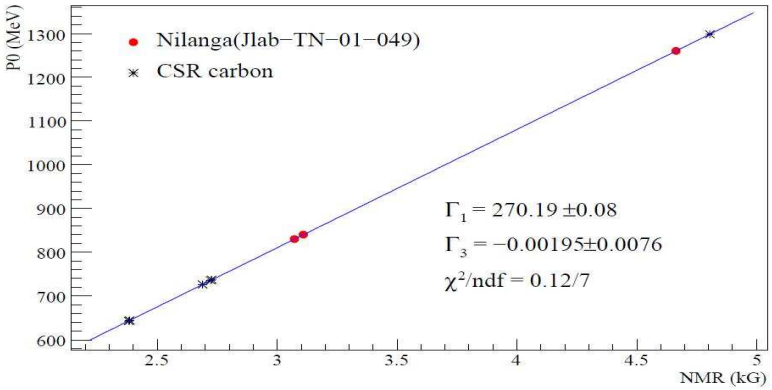


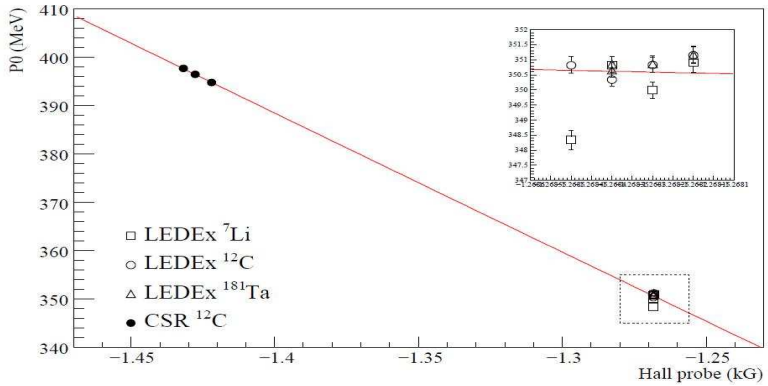
Figure 6: After calibration for middle box

HRS momentum calibration



Using $N(e,e')N^{(*)}$

- P0 $>$ 450 MeV
  $B_{NMR} \longrightarrow$ P0



- P0 $<$ 450 MeV
  $B_{Hall} \longrightarrow$ P0

Optics calibration

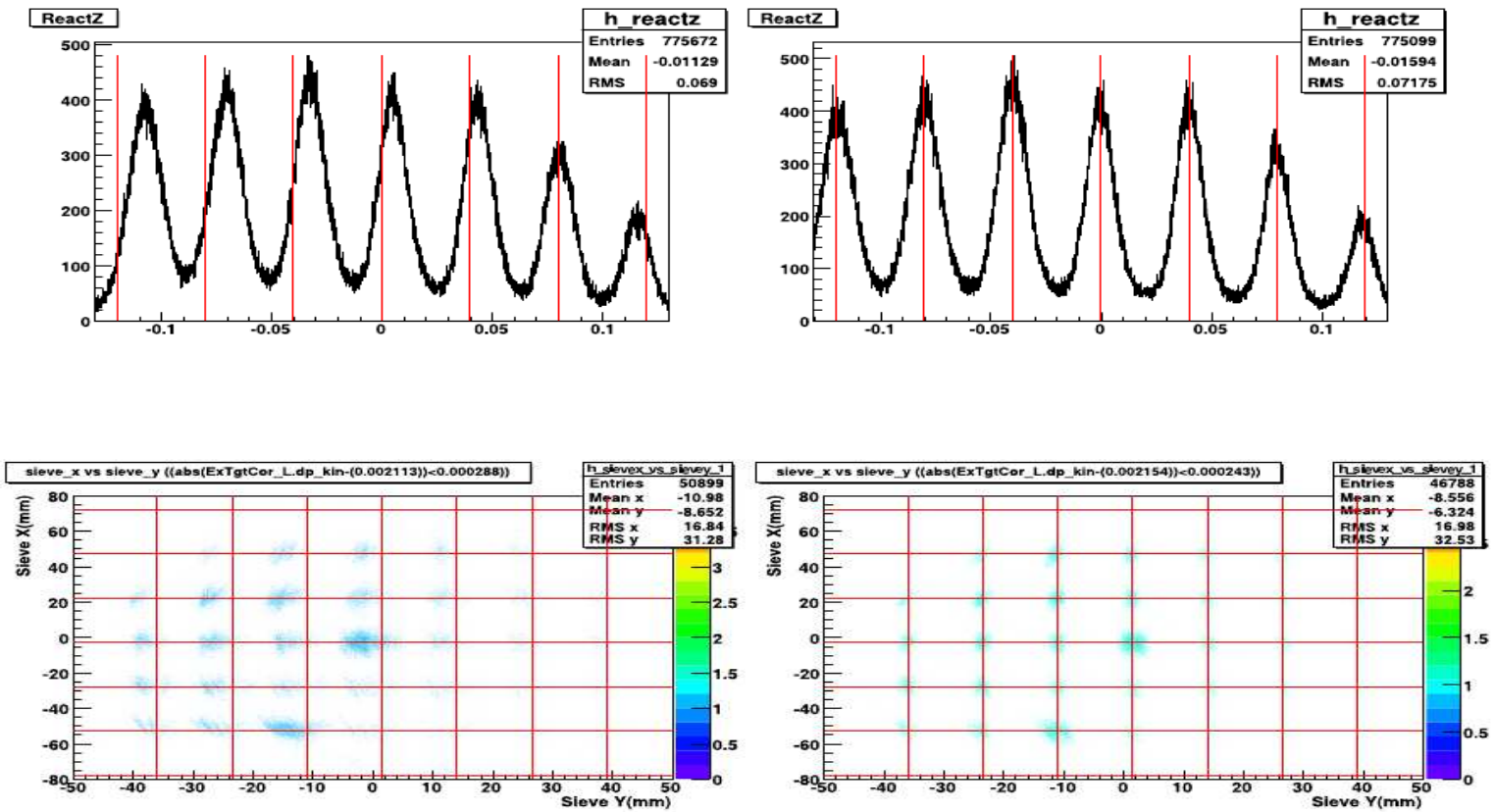


Figure 7: Z_{react} Optimization(Upper one); Sieve Slit Optimization (Bottom one)

Acceptance simulation (SAMC)

E = 1259 MeV, P0=950 MeV/c, θ=15°, Carbon Target

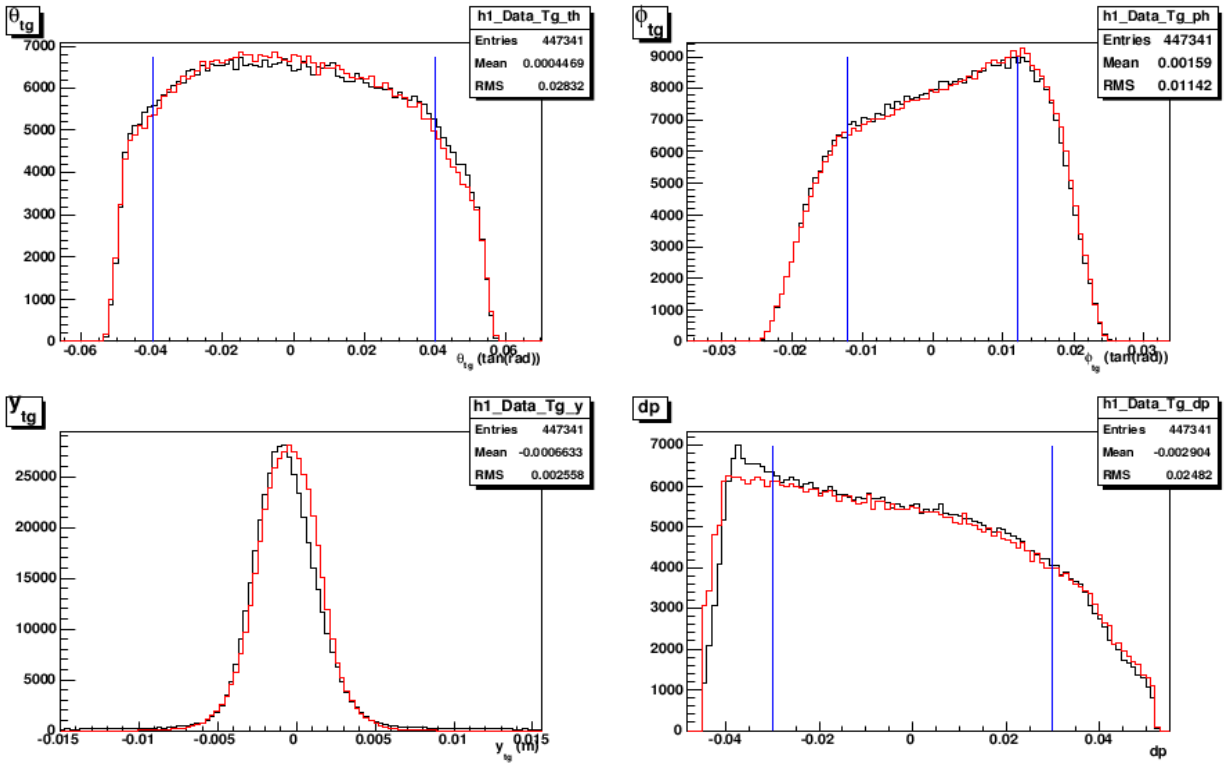


Figure 8: Acceptance comparison between data (Black) and simulation(Red) at target plane(θ_{tg}, ϕ_{tg}, y_{tg}, dp)

Experimental cross section calculation

$$\sigma_{raw} = \frac{d^2\sigma}{dE'd\Omega} = \frac{N_e}{N_i N_t \Delta E' \Delta\Omega} \tag{2}$$

- $N_e = \frac{N_f}{Acc \cdot eff \cdot livetime}$
  - N_f: Number of Events after all other electron cuts added.
  - eff: The efficiency for VDC, Scintillator, Gas Čerenkov, Shower/PreShower(Right Arm), NaI(Left Arm)
  - Acc: Spectrometer acceptance.
  - livetime: $T1(2)/T1(2)_{raw}$, T1(2) are event type.
- $N_i = \frac{Q}{e}$
  - Q: Charge calculated by scaler after BCM calibration.
  - e: Charge of the electron, 1.602×10^{-19}C.
- $N_t = \frac{L\rho}{A} \cdot N_A$
  - $L\rho$: the mass of target.
  - A: Atomic mass of material.
  - N_A: Avogadro's Number.
- $\Delta E' = P_0 \cdot dp$
- $\Delta\Omega = \Delta\theta \cdot \Delta\phi$

Cross sections comparison between left and right arm

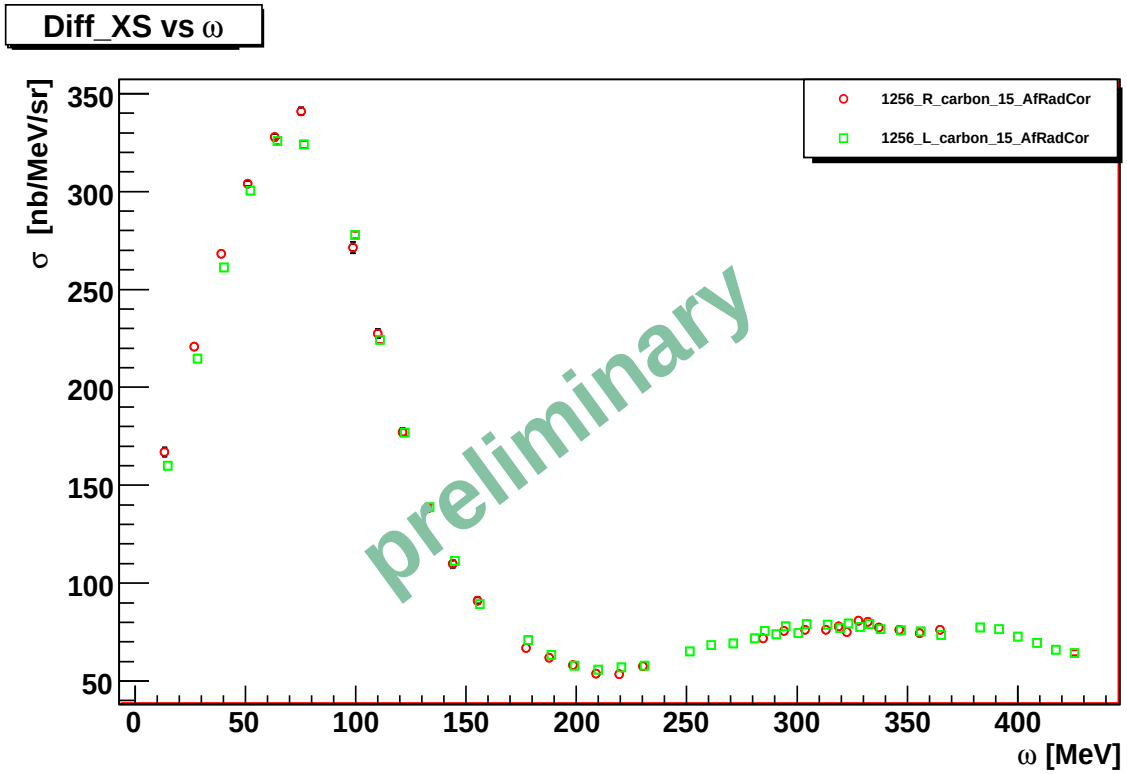


Figure 9: Cross sections comparison between left and right arm at 1256 MeV 15°

Cross sections comparison between JLab and world data

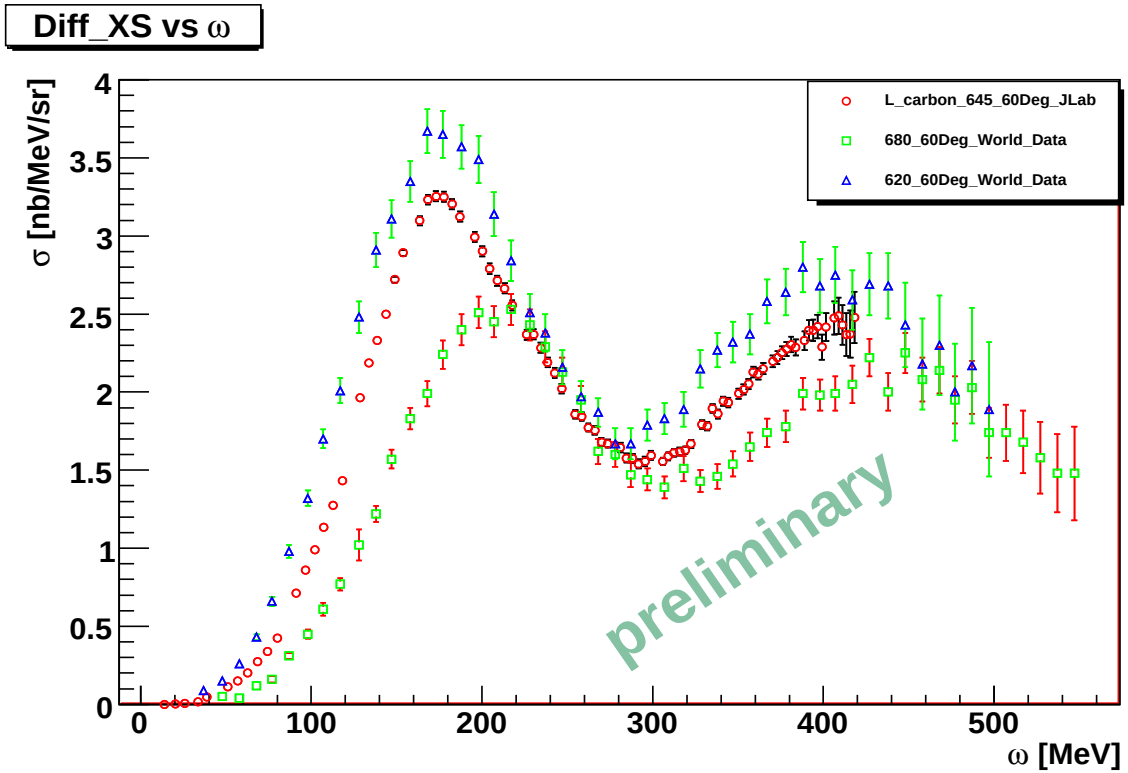


Figure 10: Cross sections comparison between JLab and world data at 60° for ^{12}C

Cross sections for ^{12}C at 15°

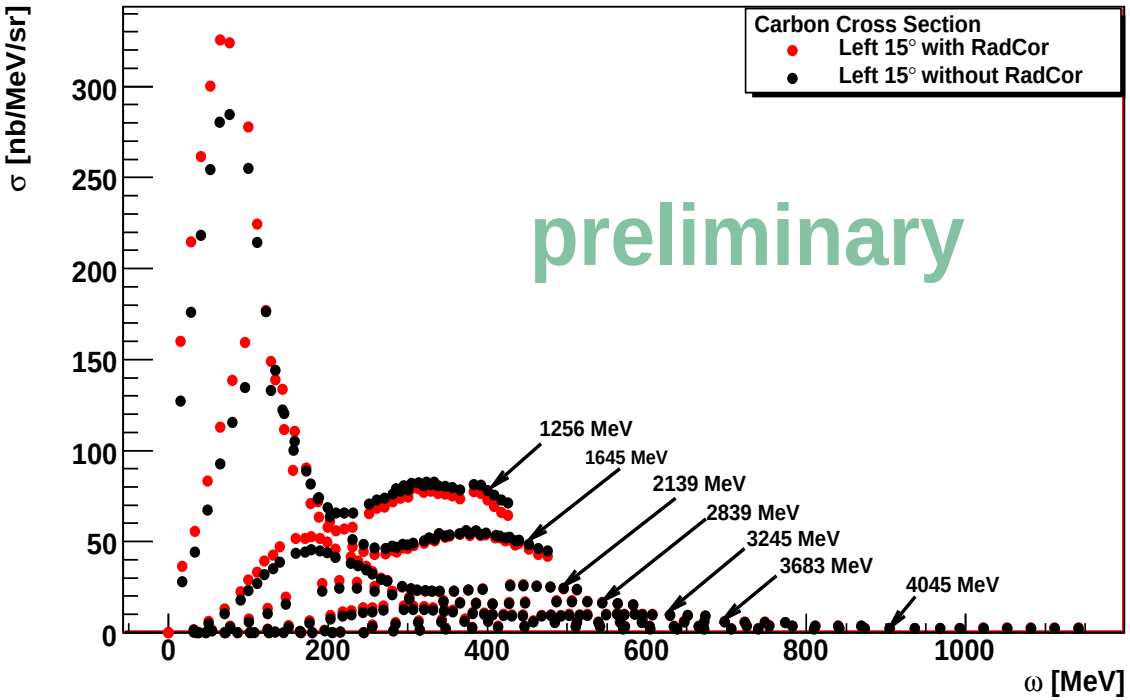


Figure 11: Cross sections for ^{12}C at 15° without radiative correction (black) and with radiative correction (red)

Cross sections for ^{12}C at 60°

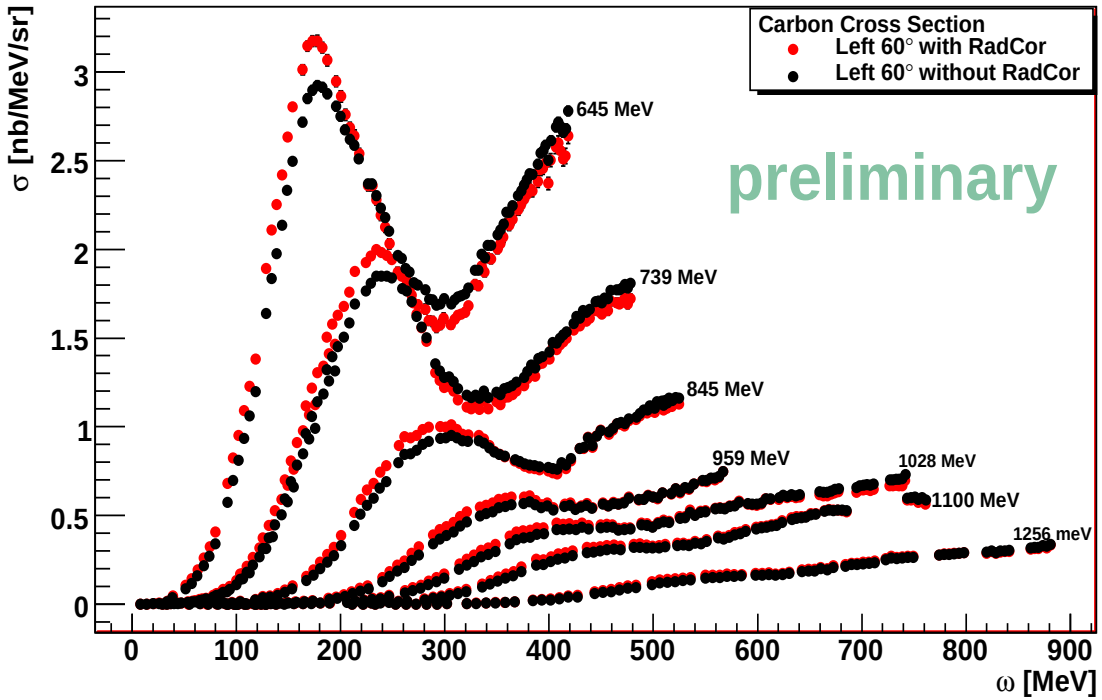


Figure 12: Cross sections for ^{12}C at 60° without radiative correction (black) and with radiative correction (red)

Cross sections for ^{12}C at 90°

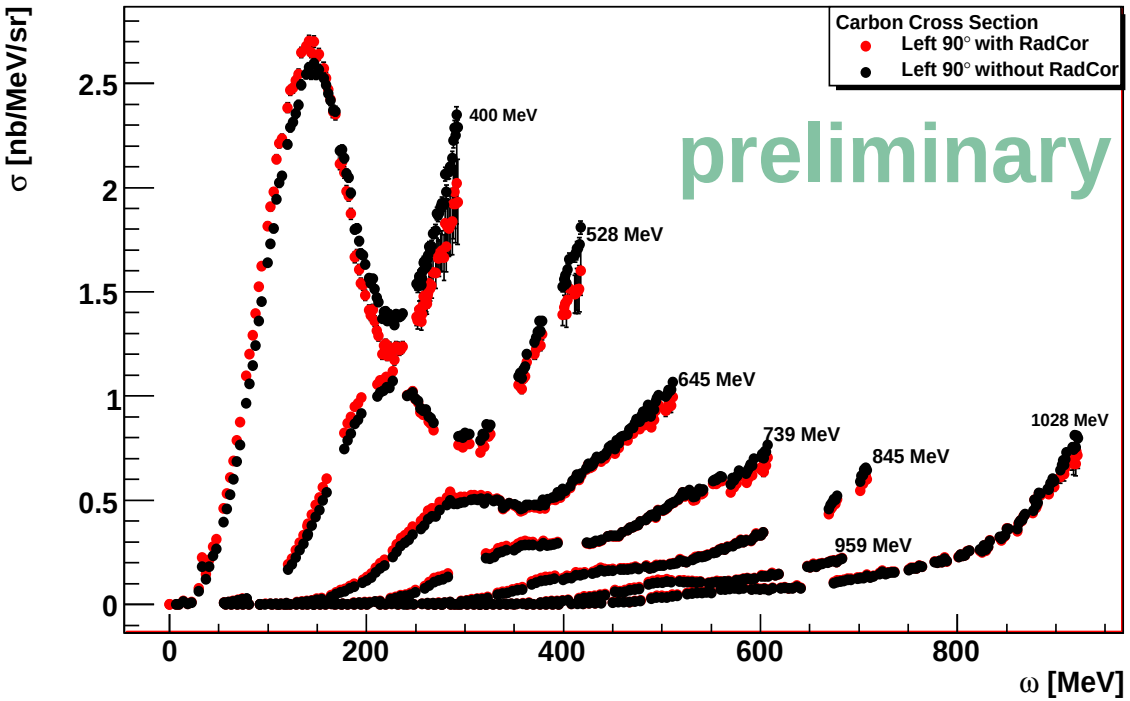


Figure 13: Cross sections for ^{12}C at 90° without radiative correction (black) and with radiative correction (red)

Cross sections for ^{12}C at 120°

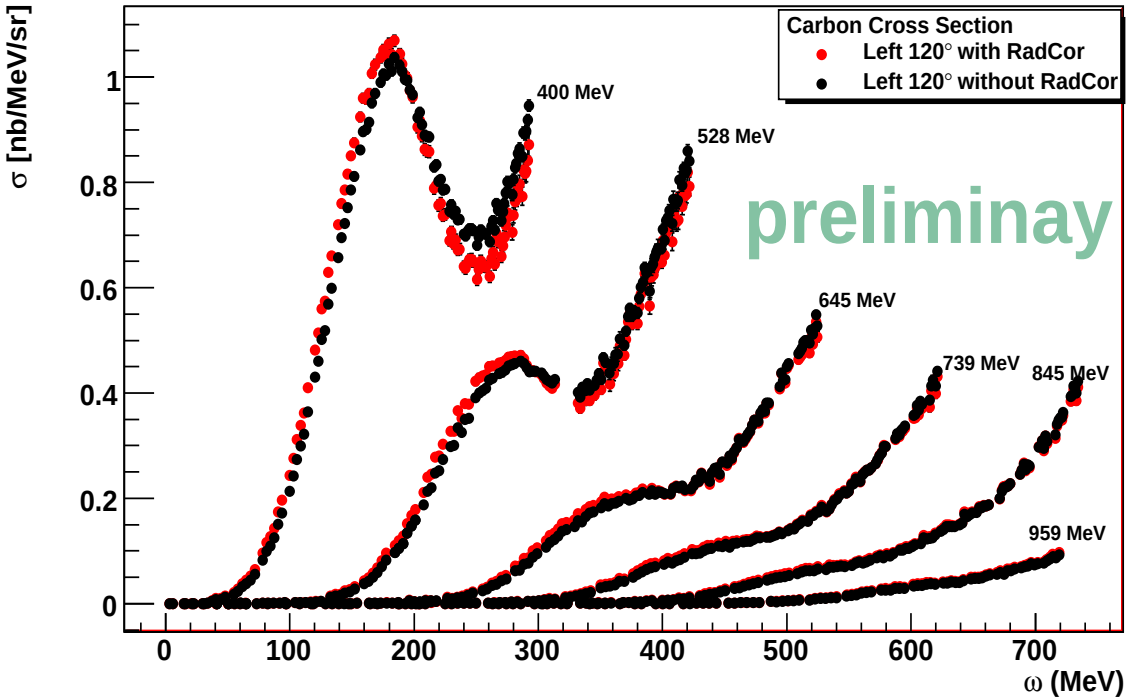


Figure 14: Cross sectionsfor ^{12}C at 120° without radiative correction (black) and with radiative correction (red)

R_L comparison between World and JLab data

Ref: P. Barreau Nucl.Phys. A402(1983) 515-540

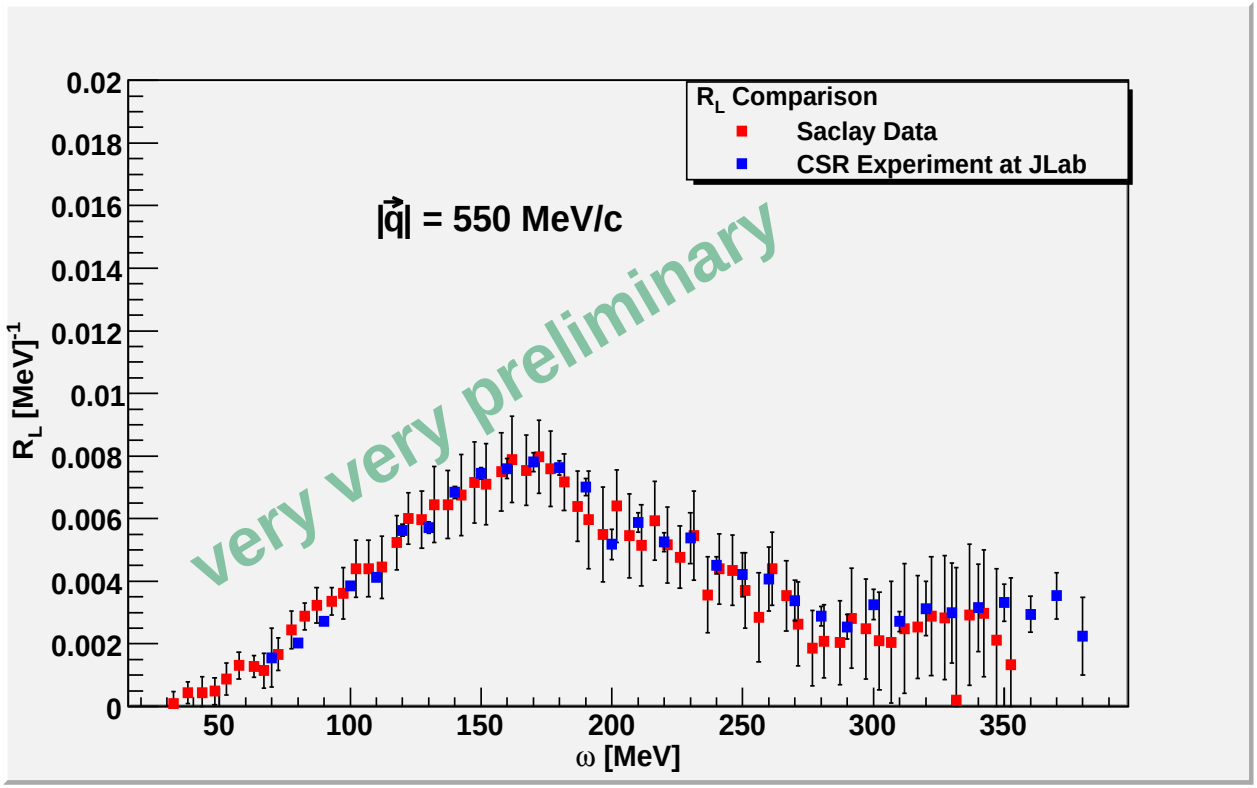


Figure 15: R_L comparison between World and JLab data (only with statistic error) (Not to be quoted!)

R_T comparison between World and JLab data

Ref: P. Barreau Nucl.Phys. A402(1983) 515-540

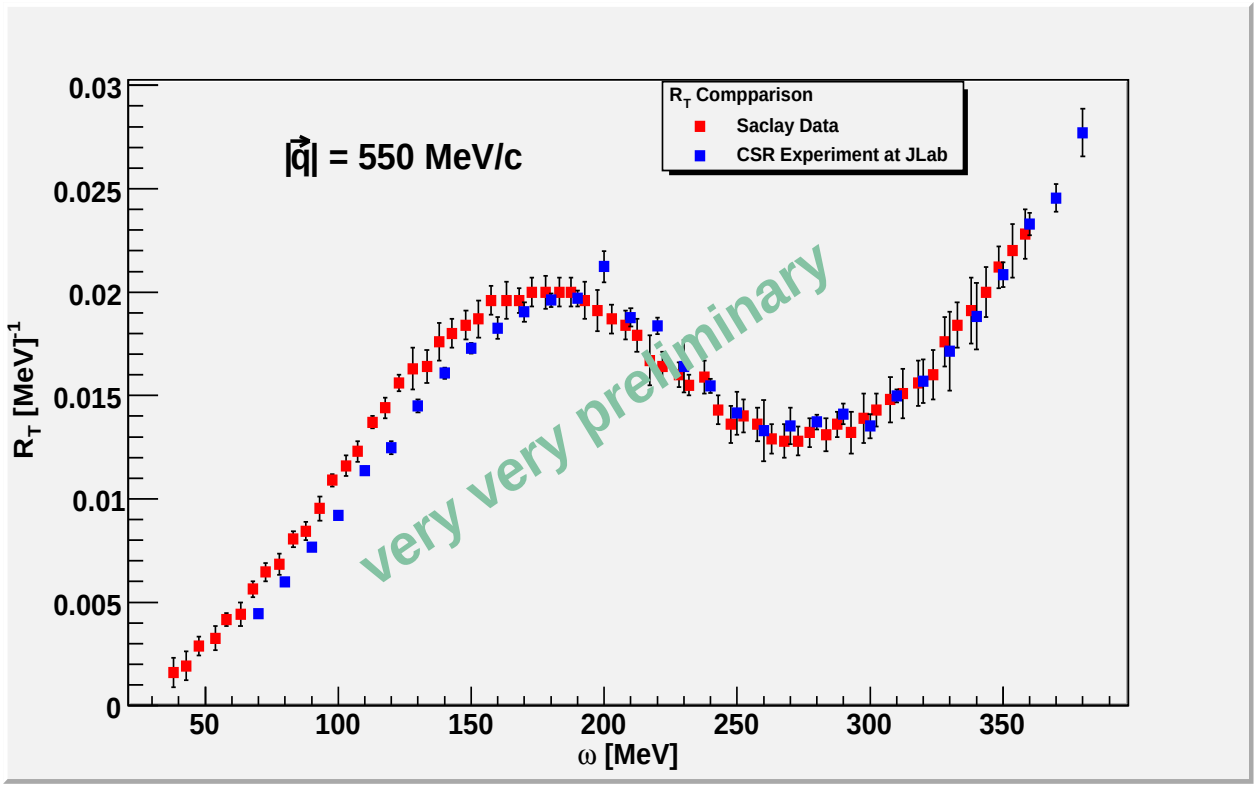


Figure 16: R_T comparison between World and JLab data(only with statistic error) (Not to be quoted!)

CSR comparison between World and JLab data

Ref: P. Barreau Nucl.Phys. A402(1983) 515-540

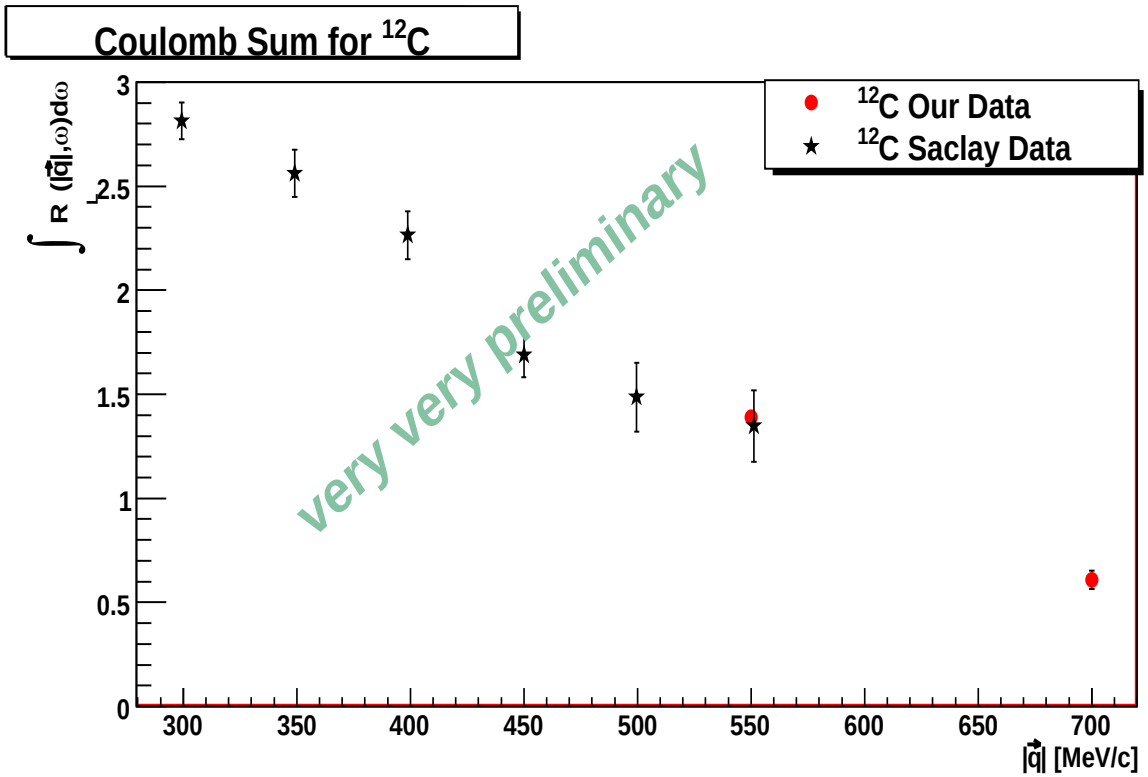


Figure 17: Coulomb Sum comparison between World and JLab data(only with statistic error) (Not to be quoted!)

Summary

- Cross sections of ^{12}C at 15°, 60°, 90°, 120° were calculated
- R_L and R_T were extracted, but still very very preliminary

Coulomb Sum Rule (E05-110)

Kalyan Allada, Korand Aniol, John Arrington, Todd Averett, Herat Bandara, Werner Boeglin, **Alexandre Camsonne**, Mustafa Canan, **Jian-Ping Chen**, Wei Chen, Khem Chirapatpimol, **Seonho Choi**, Eugene Chudakov, Evaristo Cisbani, Francesco Cusanno, Raffaele De Leo, Chiranjib Dutta, Cesar Fernandez-Ramirez, Salvatore Frullani, Haiyan Gao, Franco Garibaldi, Ronald Gilman, Oleksandr Glamazdin, Brian Hahn, Ole Hansen, Douglas Higinbotham, Tim Holmstrom, Bitao Hu, Jin Huang, Florian Itard, Liyang Jiang, Xiaodong Jiang, Hoyoung Kand, Joe KatichMina Katramatou, Aidan Kelleher, Elena Khrosinkova, Gerfried Kumbartzki, John LeRose, Xiaomei Li, Richard Lindgren, Nilanga Liyanage, Joaquin Lopez Herraiz, Lagamba Luigi, Alexandre Lukhanin, Maria Martinez Perez, Dustin McNulty, **Zein-Eddine Meziani**, Robert Michaels, Miha Mihovilovic, Joseph Morgenstern, Blaine Norum, **Yoomin Oh**, Michael Olson, Makis Petratos, Milan Potokar, Xin Qian, **Yi Qiang**, **Arun Saha**, **Brad Sawatzky**, **Elaine Schulte**, Milan Shabestari, Simon Sirca, Patricia Solvignon, Jeongseog Song, **Nikolaos Sparveris**, **Ramesh Subedi**, **Vincent Sulkosky**, Jose Udias, Javier Vignote, Eric Voutier, Youcai Wang, John Watson, Yunxiu Ye, **Xinhu Yan**,**Huan Yao**, Zhihong Ye, Xiaohui Zhan, Yi Zhang, Xiaochao Zheng, Lingyan Zhu

- PhD Students: **Yoomin Oh**, **Xinhu Yan** and **Huan Yao**; Postdocs: **Alexandre Camsonne**
- Spokespersons: **Jian-ping Chen**, **Seonho Choi** and **Zein-Eddine Meziani**
- Hall-A Collaboration

Thanks!