Carbon elastics for HMS commissioning at 1 pass

December 5, 2017

1 Introduction

The first excited state of carbon elastics will be used to test the HMS optics. Important to following the HMS cycling procedure. The running conditions are given in table 1. Rates are listed is the table 2 assuming a 1uA beam current. The inelastic evenst are plotted for various kinematic quantities in Fig. 1 and for different combinations of focal plane quantities in Fig. 2. The elasitc 4.4 MeV events are plotted for different combinations of focal plane quantities in Fig. 3. The elastic events are in a narrow part of the of xfp and Fig. 4 shows a comparison of the inelastic and elastic events rates. the elastic events dominate.

beam energy:	2218 MeV
HMS momentum	-2201.54 MeV
HMS angle	13.5 deg
HMS collimator	Sieve
beam current:	3 μA
fast raster:	off
target:	0.5% carbon

Table 1: Kinematics

Inelastic	370 Hz
4.4 elastic state	750 Hz
ground state	1 Hz

Table 2: Rates assuming 1uA beam current

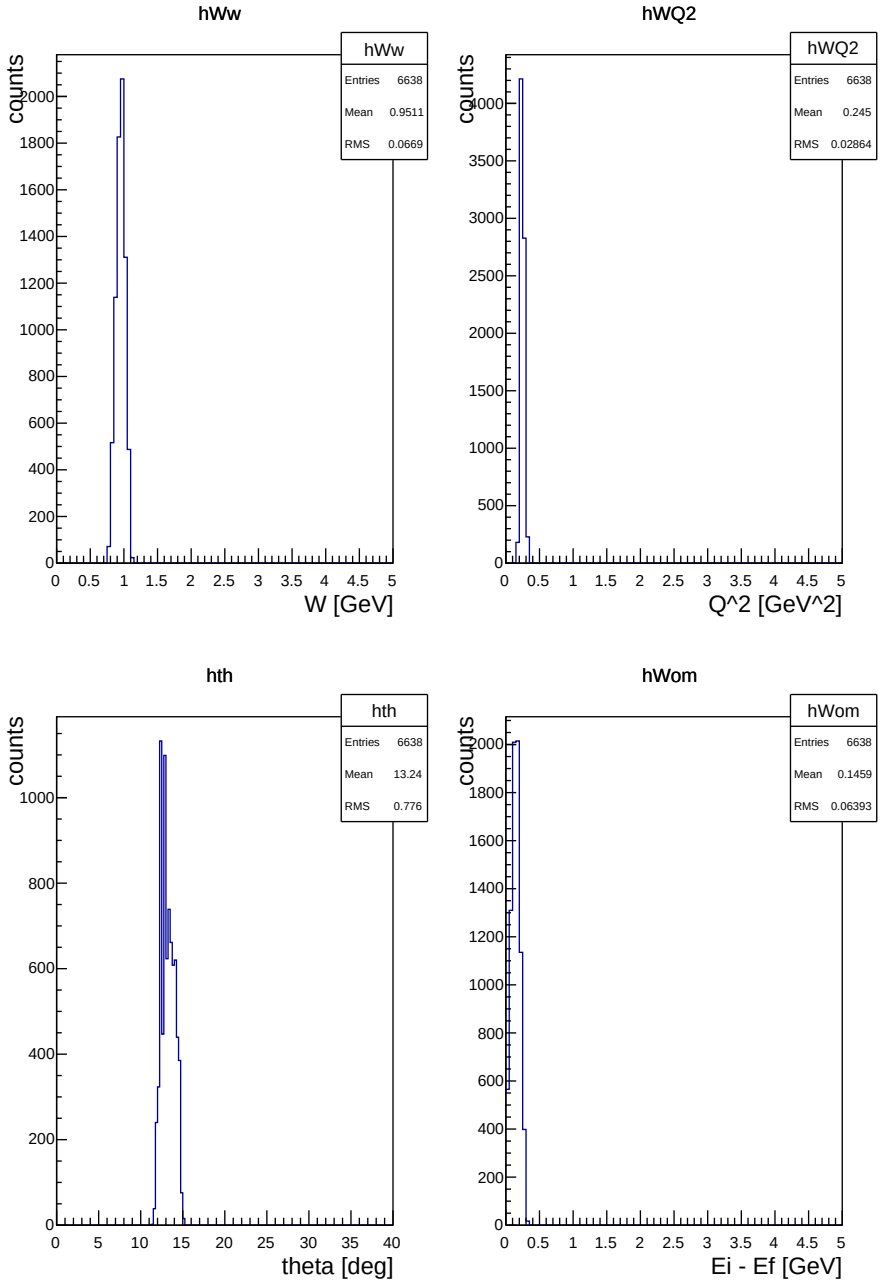

Figure 1: Plots of Inelastic events versus kinematic quantities. Y-axis is rate for 20uA.

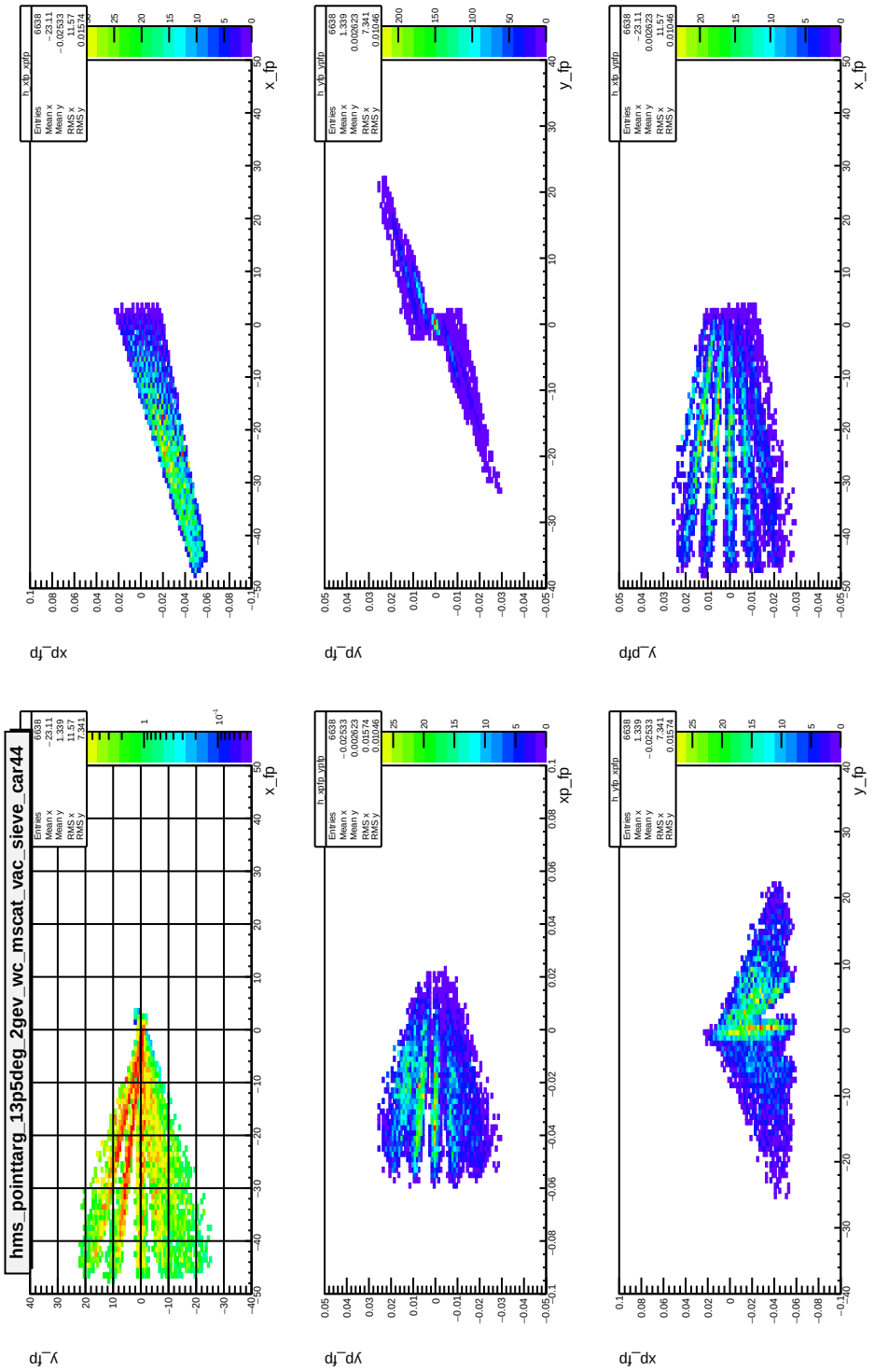

Figure 2: Inelastic events in focal plane for different combinations of quantities. Xfp and Yfp are in cm.

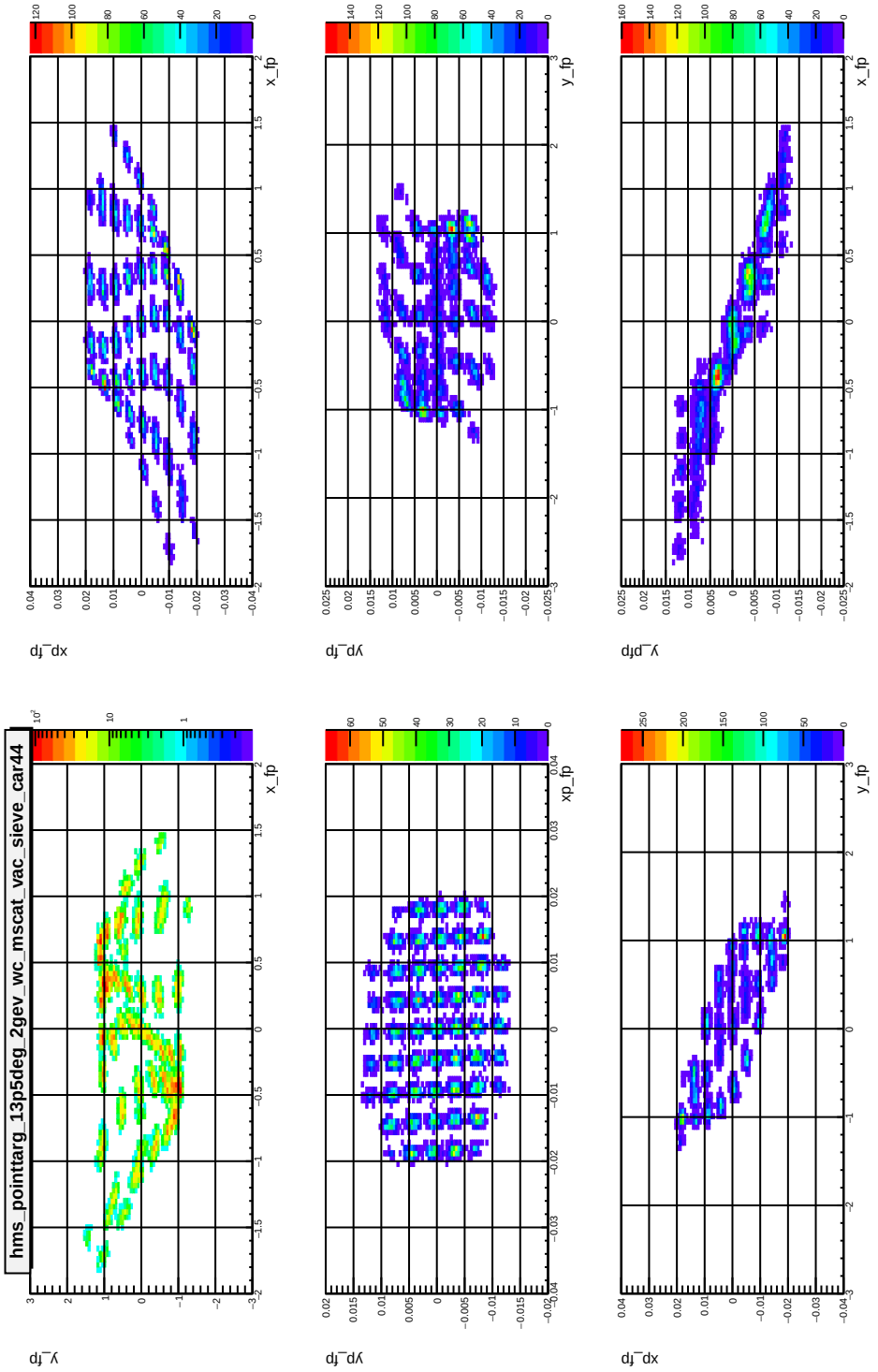

Figure 3: Elastic carbon 4.4 state events in focal plane for different combinations of quantities. Xfp and Yfp are in cm.

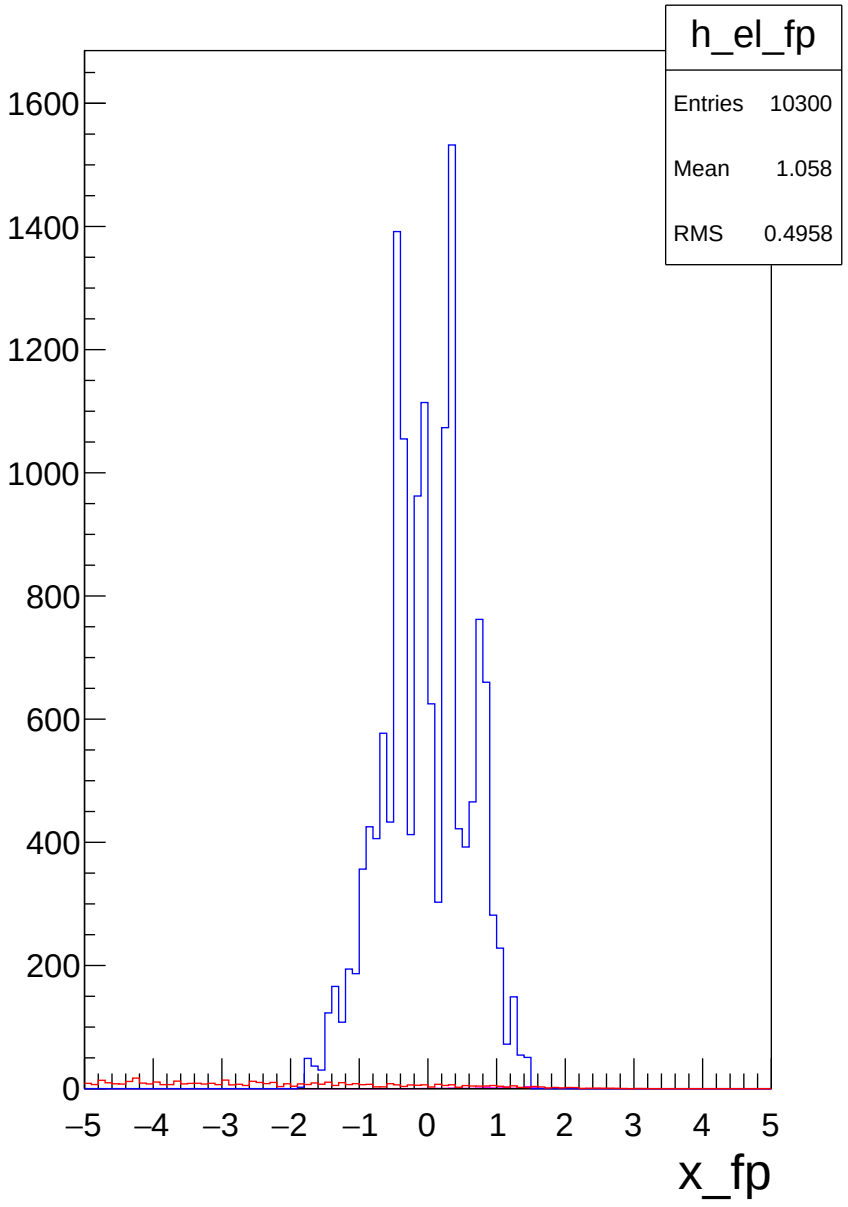

Figure 4: Comparison between distribution of inelastic events (red) and elastic 4.4 MeV events (black) in narrow part of xfp. Y-axis is rate for 20uA.

2 Surveys

The surveys for the HMS are given in the Table. Pointing is given in the spectrometer coordinate system with +X downwards and +Y towards smaller angles.

Survey	Angle	Horizontal point (Y_{spec})	Vertical point (X_{spec})
C1792R	40.534	+3.45	+0.91
C1807R	40.013	+3.29	+0.94
C1809R	50.00	+2.92	+1.07

Table 3: Surveys of the HMS

3 First order optics

HMS first order forward optics:

$$xfp(mm) = -3.41 * xtar(mm) - 0.02 * xptar(mr) + 37.0 * delta \quad (1)$$
$$xpfp(mr) = -.04 * xtar(mm) - .29 * xptar(mr) - 0.4 * delta \quad (2)$$
$$yfp(mm) = -2.2 * ytar(mr) - 0.02 * yptar(mr) \quad (3)$$
$$ypfp(mr) = -2.62 * ytar(mm) - 0.42 * yptar(mr) \quad (4)$$

HMS first order reconstruction optics.

$$xptar(mr) = 0.34xfp(mm) - 3.15xpfp(mr) \quad (5)$$
$$delta = 0.026xfp(mm) - 0.009xpfp(mr) \quad (6)$$
$$ytar(mm) = -.38yfp(mm) - 0.086ypfp(mr) \quad (7)$$
$$yptar(mr) = 0.26yfp(mm) - 2.1ypfp(mr) \quad (8)$$