How Beam Contamination was Calculated

- 4 runs were selected as "good" runs (12583, 12584, 12585, 12601)
    - Note that 12584 was only ½ "good" as beam was lost after 12000 s
- 2 runs were selected as background runs (12581 and 12609) whose data was scaled to subtract background from the "good" runs
    - Combined time of less than 1000 s means a longer background should be done at experiment conclusion or next maintenance day to get better statistics
- Background was subtracted from 4 "good" runs and run data was scaled for deadtime
- After taking detector efficiencies and charge state distributions into account a counting rate for Al-26* and Na-26 was calculated
- Average beam current for a run was calculated by integrating elastic monitor counts in Nova and then scaling the counts based on initial beam current being compared to initial monitor count-rate
- Divide counting rate of contaminants by average beam current for a run to achieve a % contamination

Calculating Beam Contamination from Al-26* and Na-26

Run #	Time (s)	Counting Rate with charge state % and detection efficiencies taken into account (particles/s)			
		in NaI detectors	Error	Rate in Ge detector	Error
12583	30971	1.76E+03	2.88E+02	1.51E+05	1.86E+04
12584	12486	1.34E+03	2.60E+02	1.32E+05	1.62E+04
12585	14653	1.84E+03	3.12E+02	1.84E+05	2.27E+04
12601	4772	1.21E+03	2.68E+02	1.63E+05	2.00E+04
	Average	**1.54E+03**	**1.41E+02**	**1.57E+05**	**9.75E+03**
	% error		9.19%		6.20%

% beam contamination from Al-26* and Na-26

Run #	Time (s)	% Na-26	Error	% Al-26	Error
12583	30971	4.64E-03	1.27E-03	5.41E-05	1.59E-05
12584	12486	4.58E-03	1.25E-03	4.66E-05	1.45E-05
12585	14653	5.78E-03	1.57E-03	5.76E-05	1.70E-05
12601	4772	4.63E-03	1.26E-03	3.46E-05	1.14E-05
	Average	**4.91E-03**	**6.71E-04**	**4.83E-05**	**7.42E-06**
	% error		13.68%		15.39%

What needs to be done if we want better accuracy in this measurement?

- Charge state distribution calculation for Al-26 beam
- A longer background run (easily done)
- A method for determining average current that does not involve scaling from such an uncertain number.
    - i.e. FC4 numbers recorded usually have large associated error making it difficult to get a good correlation between current and elastic monitor counts