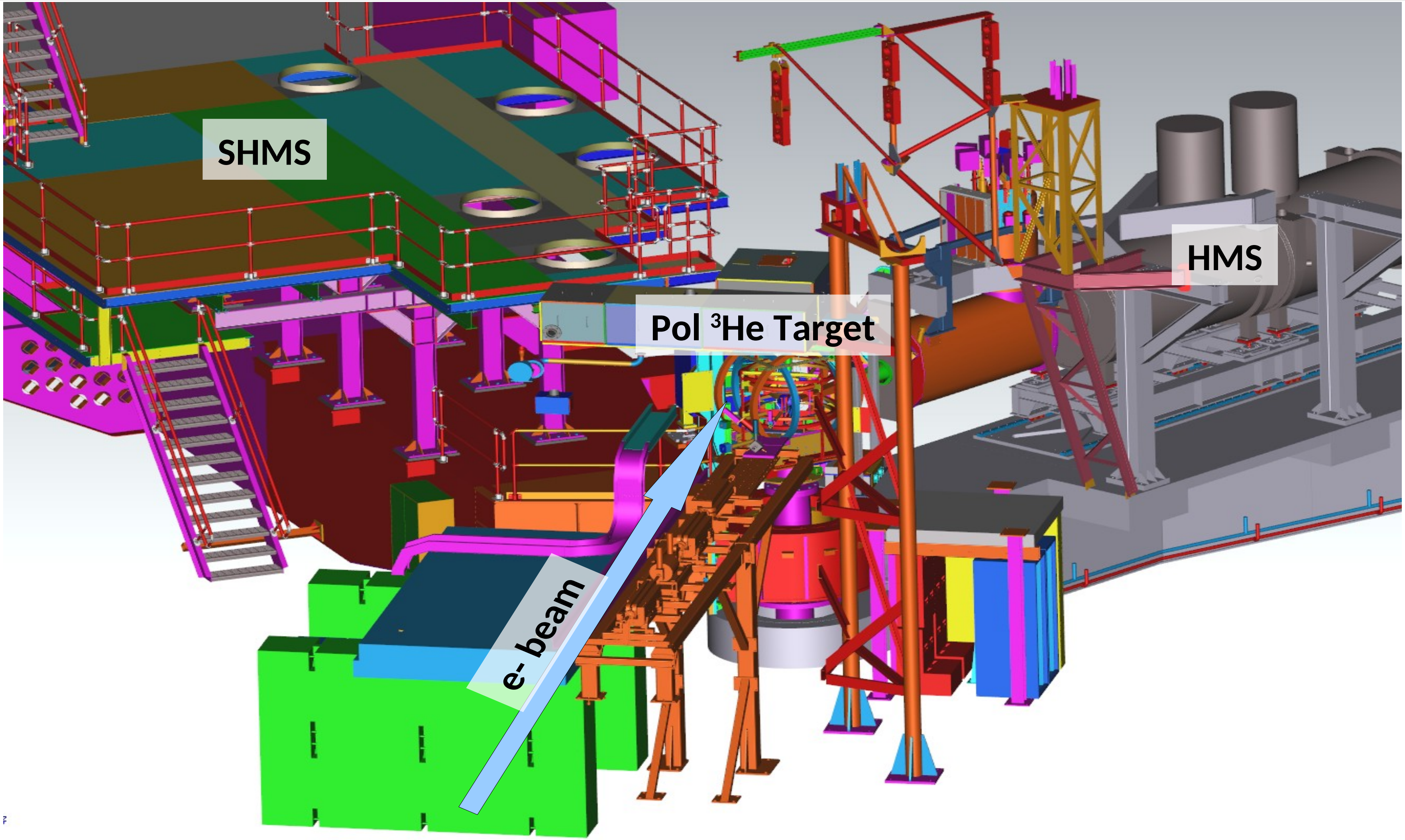
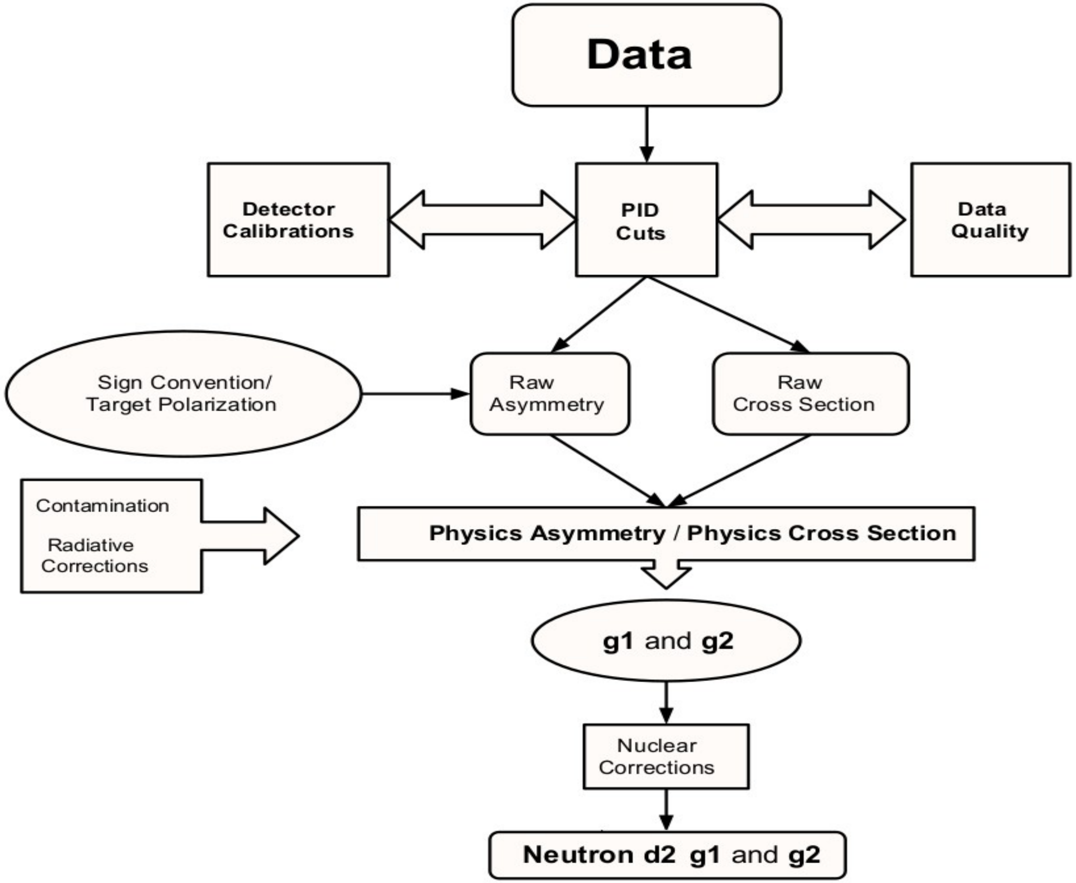
Polarized 3He Run Group in Hall C



Rough Milestones from ERR (2018)

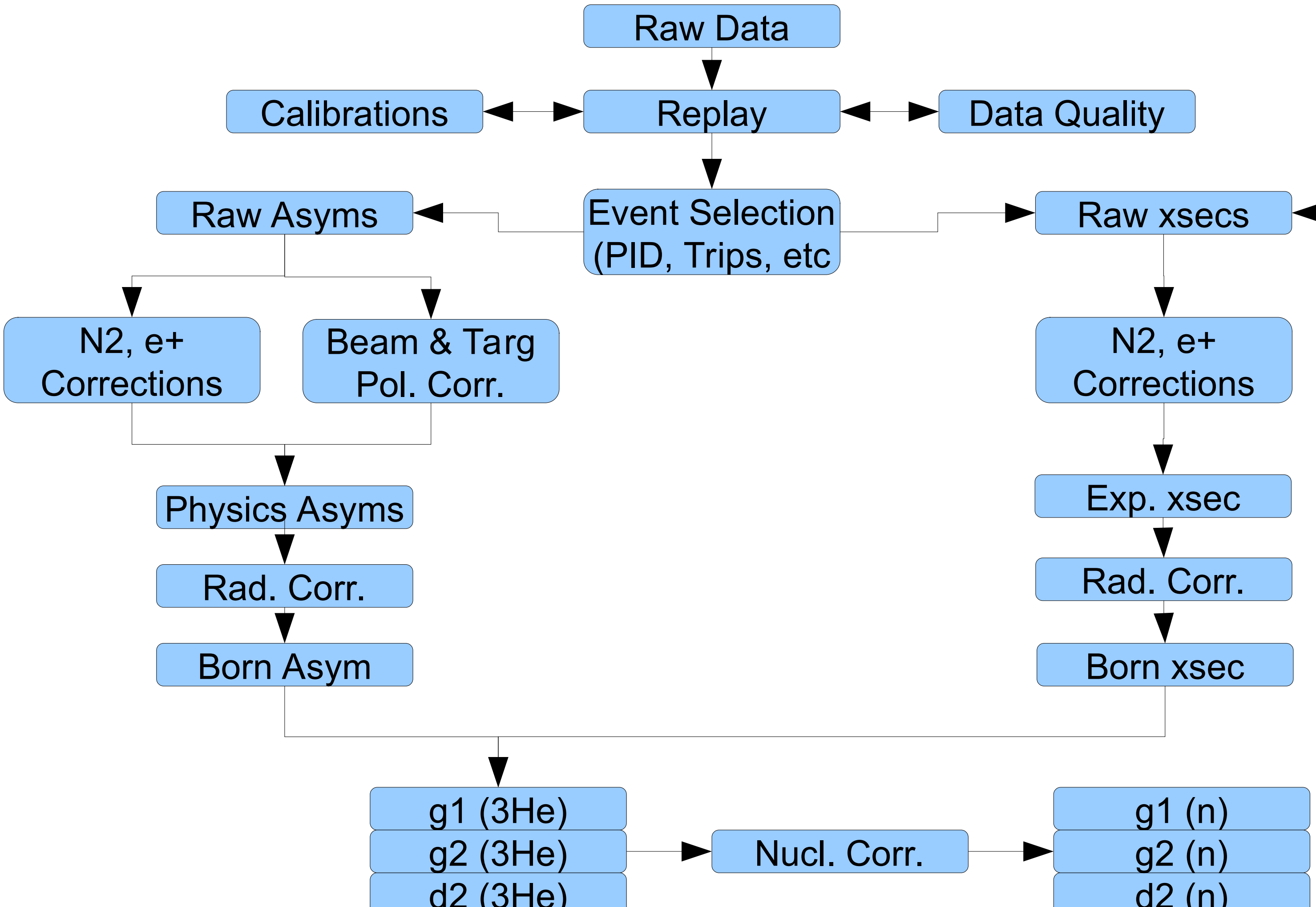


(Above) Figure 8.1(modified) from
M. PosikE06-014 (d2n 2009) dissertation

Rough Milestones

- 2 months (Jan/Feb 2021)
  - → Screen run list
  - → Establish analysis framework
  - → Detector calibrations
- 4 months (Mar/Apr 2021)
  - → Final optics, good PID
  - → Target polarimetry analysis
- 6 months (May/Jun 2021)
  - → Acceptance calculations
  - → Finalize target polarimetery
  - → Begin 'applied' work on necessary nuclear corrections (w/ Theory support)
- 12 months (Dec 2021/Jan 2022)
  - → Begin Rad. Correction analysis
  - → Initial 3He cross section extractions
- 18 months (~Jun 2022)
  - → Finalize Rad. Corrections
  - → Finalize Nuclear corrections
  - → Finalize Systematics
- Target first short paper: 18 months
- Long paper: 30 months

Analysis Sketch for d2n

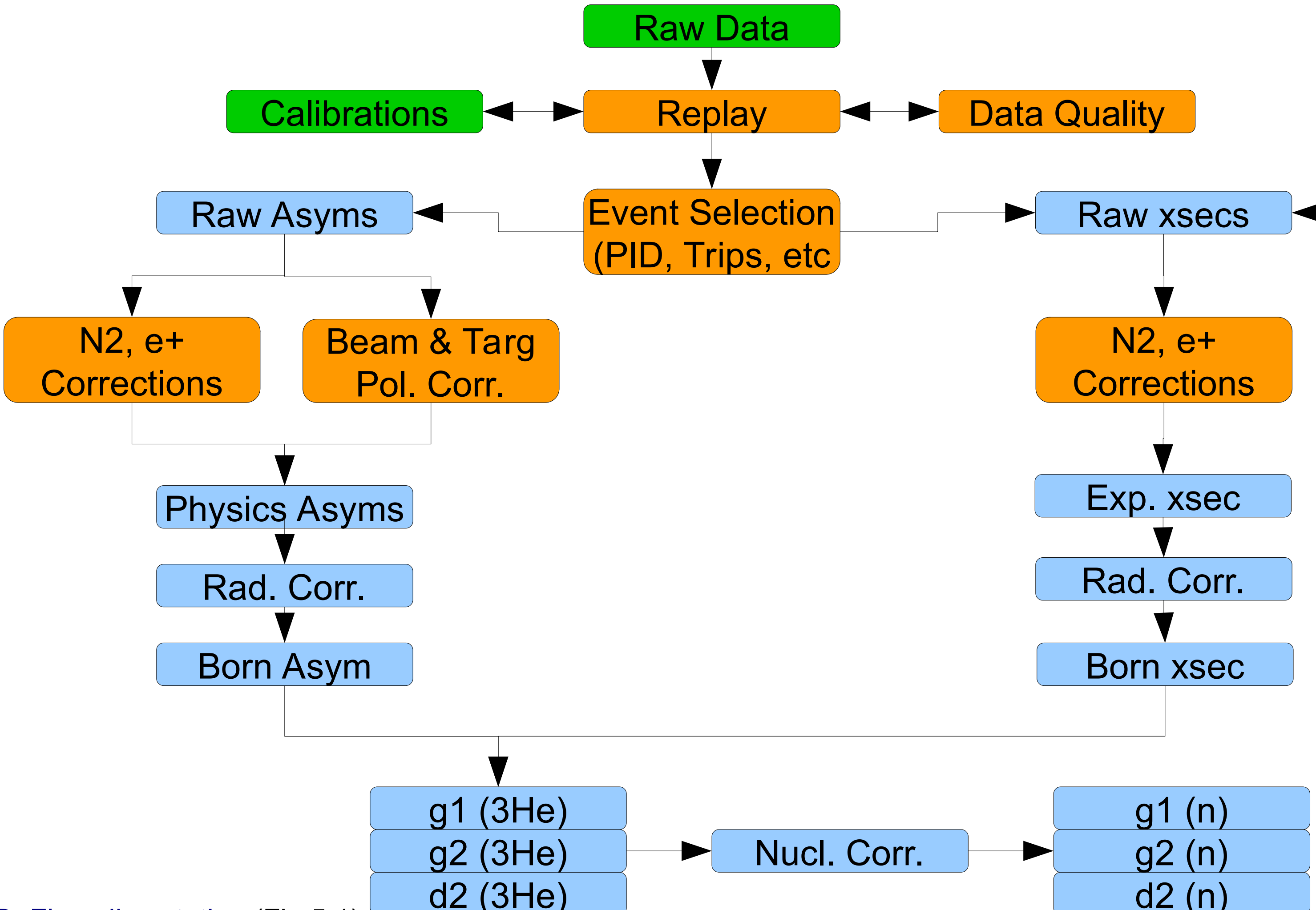


D. Flay dissertation (Fig 5.1)

- Extract Asyms + Total xsec in parallel
  - → Correct and combine to form final SSFs and d2 moment (etc.)
- Advantages
  - → More cancellation in Asyms (better stats)
  - → Can cut harder on xsec to simplify acceptance, eff. corrections, etc

Analysis Sketch for d2n

"Complete"
"In progress"
"To Do"



- Extract Asyms + Total xsec in parallel analyses
  - → Correct and combine to form final SSFs and d2 moment (etc.)
- Advantages
  - → More cancellation in Asyms (better stats)
  - → Can cut harder on xsec to simplify acceptance, eff. corrections, etc

D. Flay dissertation (Fig 5.1)

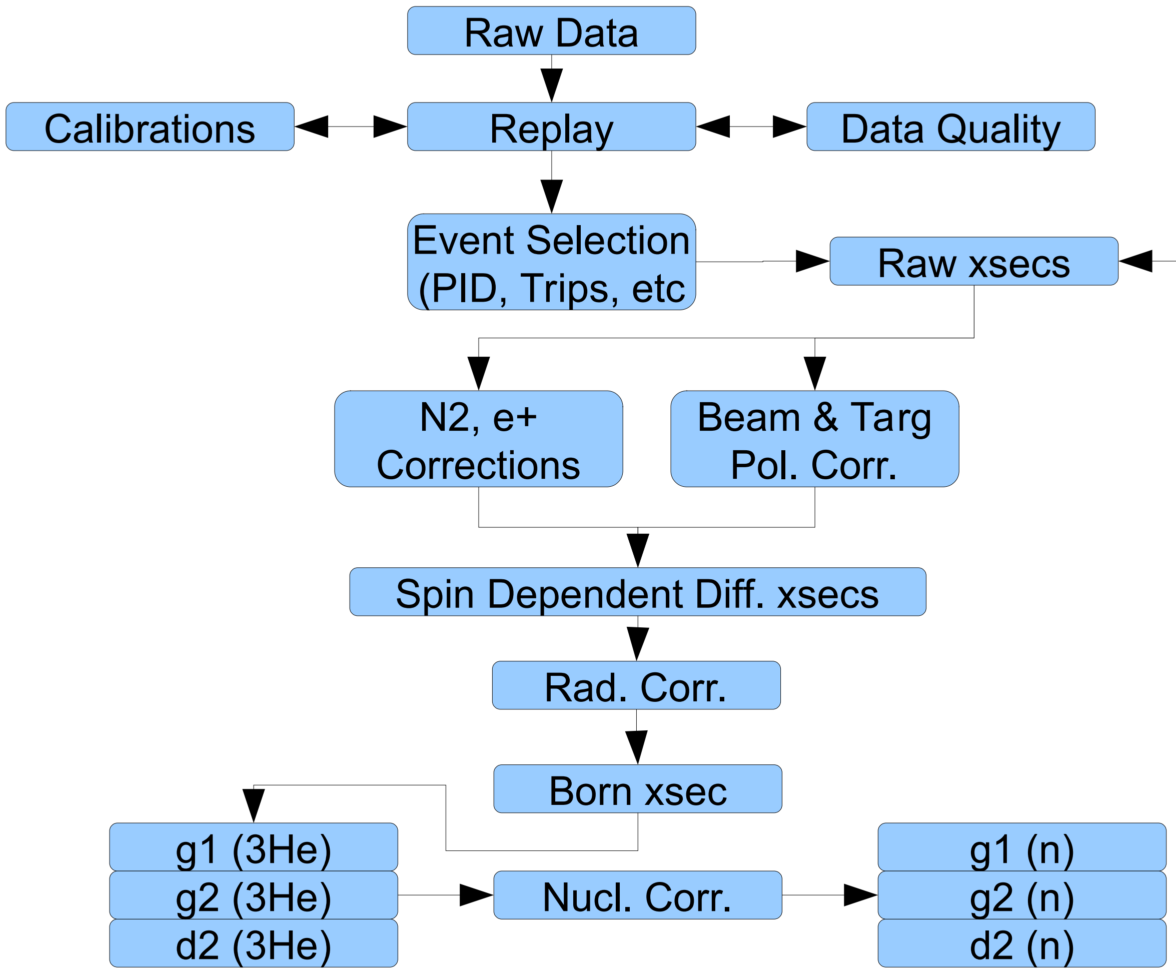
d2 Students: *Use our Roadmaps*

- E06-014 ran in Hall A 2009
  - → Extracted d2n, g1n, g2n using very similar equipment and analysis methodology
  - → Experience and documented procedures will be invaluable

- PhD Dissertations / Analysis 'road-maps':
  - → D. Flay dissertation (Temple U.)
  - → D. Parno dissertation (CMU)
  - → M. Posik dissertation (Temple U.)

Misc. Backup

Analysis Sketch for d2n (2nd Approach)



- Another approach, perfectly valid
  - → But, more challenging I think
- Extract spin dependent diff. xsecs *directly*
  - → Correct and combine to form final SSFs and d2 moment (etc.)
- Nice cross check against the prior approach, but not what we want to attack first

D. Flay dissertation (Fig 5.1)

Systematic Error Table

Item description	Subitem description	Relative uncertainty
Target polarization		1.5 %
Beam polarization		3 %
Asymmetry (raw)		
	• Target spin direction (0.1°)	$< 5 \times 10^{-4}$
	• Beam charge asymmetry	$<$ 50 ppm
Cross section (raw)		
	• PID efficiency	$<$ 1 %
	• Background Rejection efficiency	$\approx$ 1 %
	• Beam charge	$<$ 1 %
	• Beam position	$<$ 1 %
	• Acceptance cut	2-3 %
	• Target density	$<$ 2%
	• Nitrogen dilution	$<$ 1%
	• Dead time	$<$1%
	• Finite Acceptance cut	$<$1%
Radiative corrections		$\leq$ 5 %
From ^{3}He to Neutron correction		5 %
Total systematic uncertainty (for both $g_2^n(x, Q^2)$ and $d_2(Q^2)$)		$\leq$ 10 %
Estimate of contributions to d_2 from unmeasured region	$\int_{0.003}^{0.23} \tilde{d}_2^n \, dx$	4.8×10^{-4}
Projected absolute statistical uncertainty on d_2		$\Delta d_2 \approx 5 \times 10^{-4}$
Projected absolute systematic uncertainty on d_2 (*assuming* $d_2 = 5 \times 10^{-3}$)		$\Delta d_2 \approx 5 \times 10^{-4}$