



Full wwPDB X-ray Structure Validation Report ⓘ

Mar 27, 2026 – 12:21 PM UTC

PDB ID : 7QEF / pdb_00007qef
Title : Crystal structure of para-nitrophenyl-Beta-D-glucuronide bound to a mutant of SN243 (D415A)
Authors : Neun, S.; Brear, P.; Campbell, E.; Omari, K.; Wagner, O.; Hyvonen, M.; Hollfelder, F.
Deposited on : 2021-12-02
Resolution : 2.41 Å(reported)

This is a Full wwPDB X-ray Structure Validation Report for a publicly released PDB entry.

We welcome your comments at validation@mail.wwpdb.org

A user guide is available at

<https://www.wwpdb.org/validation/2017/XrayValidationReportHelp>

with specific help available everywhere you see the ⓘ symbol.

The types of validation reports are described at

<http://www.wwpdb.org/validation/2017/FAQs#types>.

The following versions of software and data (see [references ⓘ](#)) were used in the production of this report:

MolProbity	:	FAILED
Mogul	:	2022.3.0, CSD as543be (2022)
Xtriage (Phenix)	:	2.0
EDS	:	3.0
Buster-report	:	wwPDB partial adaption of 1.1.7 (2018)
Percentile statistics	:	20250101.v01 (using entries in the PDB archive January 1st 2025)
CCP4	:	9.0.010 (Gargrove)
Density-Fitness	:	1.0.12
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.49

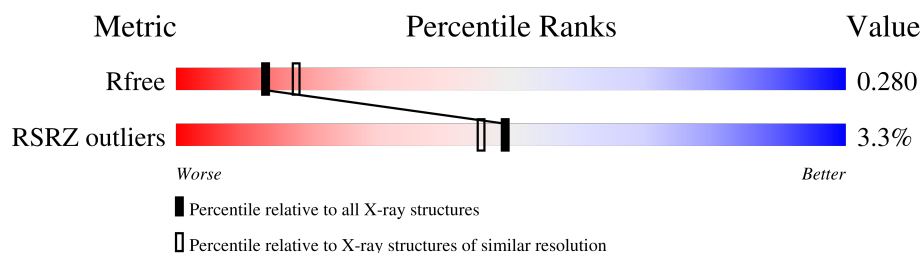
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.41 Å.

Percentile scores (ranging between 0-100) for global validation metrics of the entry are shown in the following graphic. The table shows the number of entries on which the scores are based.



Metric	Whole archive (#Entries)	Similar resolution (#Entries, resolution range(Å))
R_{free}	180053	6062 (2.44-2.40)
RSRZ outliers	180081	6066 (2.44-2.40)

MolProbity failed to run properly - the sequence quality summary graphics cannot be shown.

2 Entry composition [i](#)

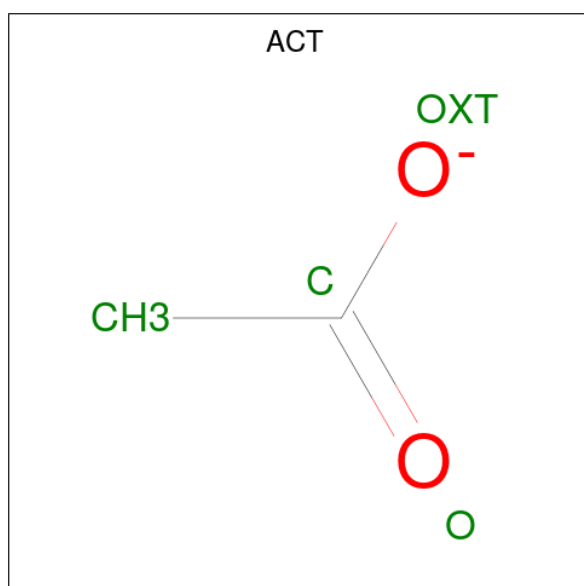
There are 6 unique types of molecules in this entry. The entry contains 11480 atoms, of which 0 are hydrogens and 0 are deuteriums.

In the tables below, the ZeroOcc column contains the number of atoms modelled with zero occupancy, the AltConf column contains the number of residues with at least one atom in alternate conformation and the Trace column contains the number of residues modelled with at most 2 atoms.

- Molecule 1 is a protein called SN243.

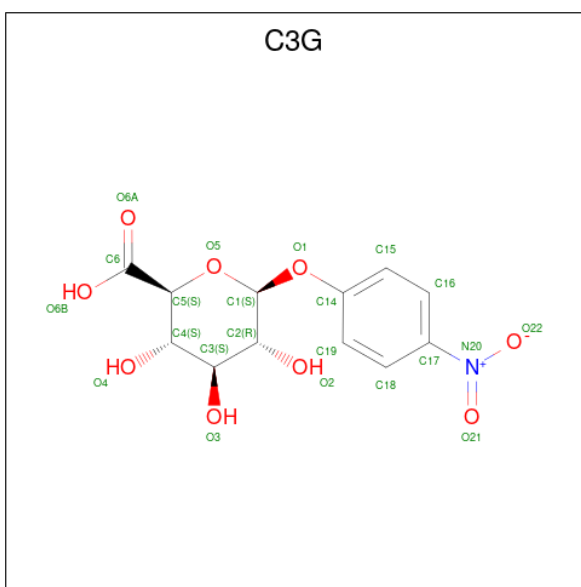
Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	731	Total	C	N	O	S	0	2	0
			5579	3500	916	1143	20			
1	B	739	Total	C	N	O	S	0	1	0
			5627	3527	923	1157	20			

- Molecule 2 is ACETATE ION (CCD ID: ACT) (formula: $C_2H_3O_2^-$).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
2	A	1	Total	C	O	0	0
			4	2	2		

- Molecule 3 is 4-nitrophenyl beta-D-glucopyranosiduronic acid (CCD ID: C3G) (formula: $C_{12}H_{13}NO_9$) (labeled as "Ligand of Interest" by depositor).

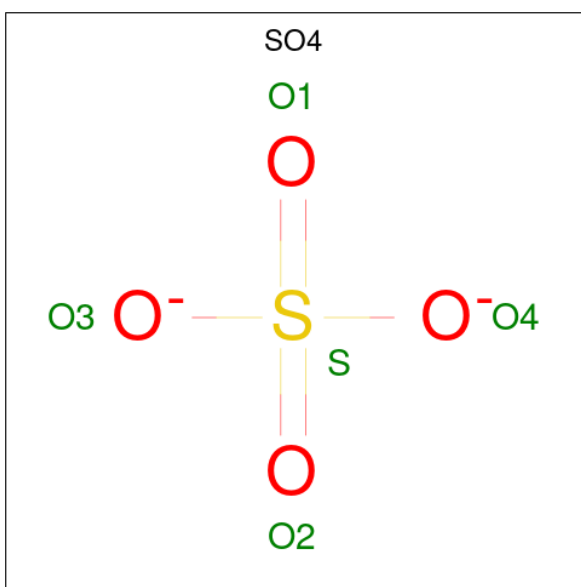


Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
3	A	1	Total	C	N	O	0	0
			22	12	1	9		
3	B	1	Total	C	N	O	0	0
			22	12	1	9		

- Molecule 4 is ZINC ION (CCD ID: ZN) (formula: Zn).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
4	A	22	Total	Zn	0	0
			22	22		
4	B	16	Total	Zn	0	0
			16	16		

- Molecule 5 is SULFATE ION (CCD ID: SO4) (formula: O₄S).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
5	A	1	Total	O	S	0	0
			5	4	1		
5	A	1	Total	O	S	0	0
			5	4	1		
5	A	1	Total	O	S	0	0
			5	4	1		
5	B	1	Total	O	S	0	0
			5	4	1		

- Molecule 6 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
6	A	96	Total	O	0	0
			96	96		
6	B	72	Total	O	0	0
			72	72		

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3 Data and refinement statistics

Property	Value	Source
Space group	P 1	Depositor
Cell constants a, b, c, α , β , γ	63.38Å 81.67Å 93.55Å 66.57° 89.39° 89.17°	Depositor
Resolution (Å)	48.08 – 2.41 48.08 – 2.41	Depositor EDS
% Data completeness (in resolution range)	92.6 (48.08-2.41) 92.6 (48.08-2.41)	Depositor EDS
R_{merge}	0.12	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	2.27 (at 2.40Å)	Xtriage
Refinement program	PHENIX 1.16_3549	Depositor
R, R_{free}	0.215 , 0.285 0.216 , 0.280	Depositor DCC
R_{free} test set	3061 reflections (4.60%)	wwPDB-VP
Wilson B-factor (Å ²)	42.1	Xtriage
Anisotropy	0.356	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.36 , 42.4	EDS
L-test for twinning ²	$\langle L \rangle = 0.50$, $\langle L^2 \rangle = 0.34$	Xtriage
Estimated twinning fraction	0.018 for h,-k,-l 0.006 for -h,k,k-l 0.000 for -h,-k,-k+l	Xtriage
F_o, F_c correlation	0.94	EDS
Total number of atoms	11480	wwPDB-VP
Average B, all atoms (Å ²)	50.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 5.72% of the height of the origin peak. No significant pseudotranslation is detected.*

¹Intensities estimated from amplitudes.

²Theoretical values of $\langle |L| \rangle$, $\langle L^2 \rangle$ for acentric reflections are 0.5, 0.333 respectively for untwinned datasets, and 0.375, 0.2 for perfectly twinned datasets.

4 Model quality [i](#)

4.1 Standard geometry [i](#)

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4.2 Too-close contacts [i](#)

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4.3 Torsion angles [i](#)

4.3.1 Protein backbone [i](#)

MolProbity failed to run properly - this section is therefore empty.

4.3.2 Protein sidechains [i](#)

MolProbity failed to run properly - this section is therefore empty.

4.3.3 RNA [i](#)

MolProbity failed to run properly - this section is therefore empty.

4.4 Non-standard residues in protein, DNA, RNA chains [i](#)

There are no non-standard protein/DNA/RNA residues in this entry.

4.5 Carbohydrates [i](#)

There are no oligosaccharides in this entry.

4.6 Ligand geometry [i](#)

Of 45 ligands modelled in this entry, 38 are monoatomic - leaving 7 for Mogul analysis.

In the following table, the Counts columns list the number of bonds (or angles) for which Mogul statistics could be retrieved, the number of bonds (or angles) that are observed in the model and the number of bonds (or angles) that are defined in the Chemical Component Dictionary. The Link column lists molecule types, if any, to which the group is linked. The Z score for a bond

length (or angle) is the number of standard deviations the observed value is removed from the expected value. A bond length (or angle) with $|Z| > 2$ is considered an outlier worth inspection. RMSZ is the root-mean-square of all Z scores of the bond lengths (or angles).

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# Z > 2	Counts	RMSZ	# Z > 2
3	C3G	B	801	-	23,23,23	0.83	1 (4%)	30,33,33	1.85	5 (16%)
2	ACT	A	801	-	3,3,3	1.90	1 (33%)	3,3,3	1.67	1 (33%)
5	SO4	B	818	-	4,4,4	0.30	0	6,6,6	0.22	0
5	SO4	A	825	-	4,4,4	0.20	0	6,6,6	0.36	0
3	C3G	A	802	-	23,23,23	0.71	1 (4%)	30,33,33	1.10	3 (10%)
5	SO4	A	827	-	4,4,4	0.31	0	6,6,6	0.23	0
5	SO4	A	826	-	4,4,4	0.21	0	6,6,6	0.30	0

In the following table, the Chirals column lists the number of chiral outliers, the number of chiral centers analysed, the number of these observed in the model and the number defined in the Chemical Component Dictionary. Similar counts are reported in the Torsion and Rings columns. '-' means no outliers of that kind were identified.

Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
3	C3G	A	802	-	-	4/10/32/32	0/2/2/2
3	C3G	B	801	-	-	6/10/32/32	0/2/2/2

All (3) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
3	B	801	C3G	O6B-C6	-2.81	1.21	1.30
2	A	801	ACT	CH3-C	2.74	1.59	1.49
3	A	802	C3G	O6B-C6	-2.57	1.22	1.30

All (9) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
3	B	801	C3G	O5-C1-O1	-5.28	94.91	108.42
3	B	801	C3G	O5-C5-C6	-5.07	90.25	106.14
3	B	801	C3G	C1-O5-C5	4.78	120.07	112.23
3	A	802	C3G	O5-C5-C6	2.76	114.76	106.14
3	B	801	C3G	O2-C2-C3	-2.60	104.25	110.38
3	A	802	C3G	C1-O5-C5	2.31	116.03	112.23
3	A	802	C3G	O2-C2-C3	2.16	115.47	110.38
2	A	801	ACT	O-C-CH3	-2.11	113.88	122.53
3	B	801	C3G	O5-C1-C2	2.10	114.69	110.37

There are no chirality outliers.

All (10) torsion outliers are listed below:

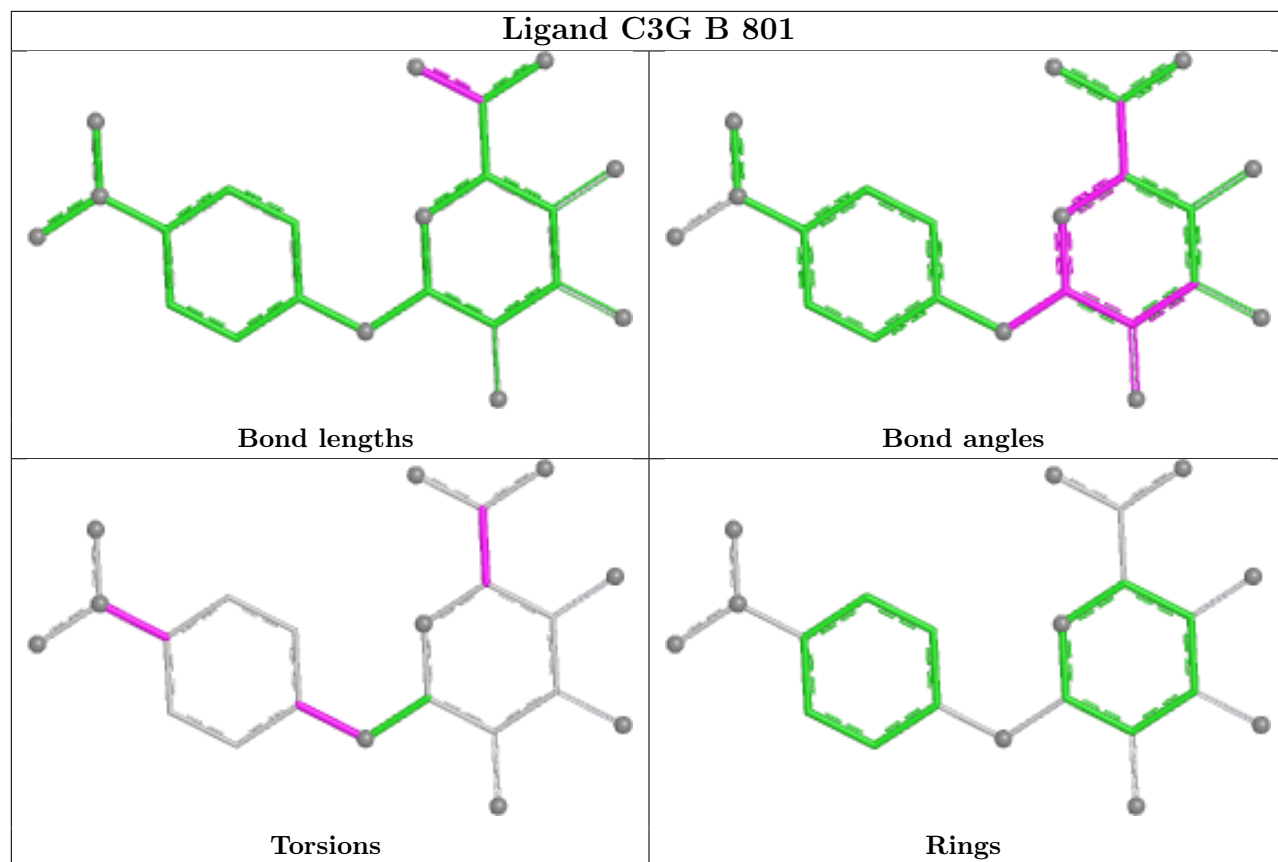
Mol	Chain	Res	Type	Atoms
3	A	802	C3G	C4-C5-C6-O6A
3	B	801	C3G	C4-C5-C6-O6A
3	B	801	C3G	C4-C5-C6-O6B
3	B	801	C3G	C16-C17-N20-O21
3	B	801	C3G	C18-C17-N20-O21
3	A	802	C3G	C4-C5-C6-O6B
3	B	801	C3G	C15-C14-O1-C1
3	B	801	C3G	C19-C14-O1-C1
3	A	802	C3G	C19-C14-O1-C1
3	A	802	C3G	C15-C14-O1-C1

There are no ring outliers.

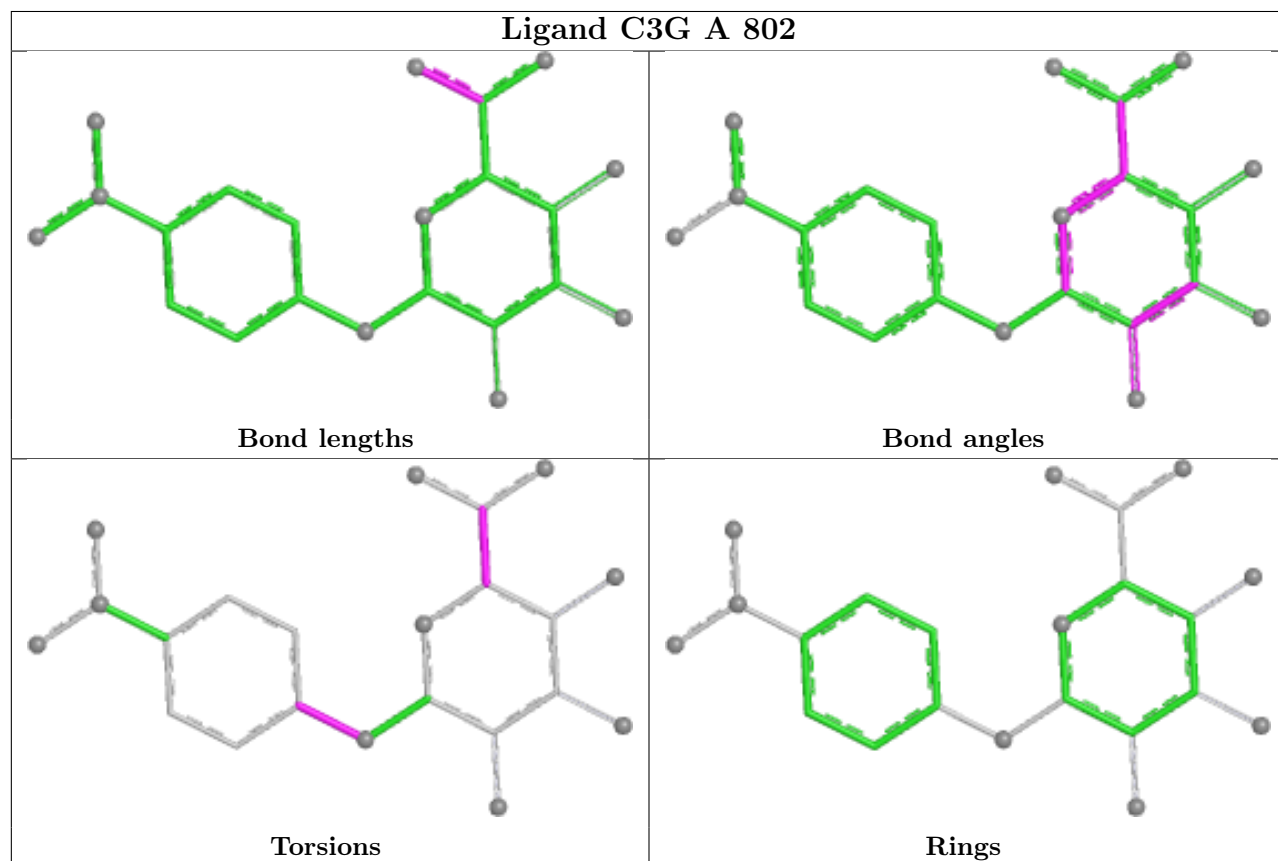
No monomer is involved in short contacts.

The following is a two-dimensional graphical depiction of Mogul quality analysis of bond lengths, bond angles, torsion angles, and ring geometry for all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the validation Tables will also be included. For torsion angles, if less than 5% of the Mogul distribution of torsion angles is within 10 degrees of the torsion angle in question, then that torsion angle is considered an outlier. Any bond that is central to one or more torsion angles identified as an outlier by Mogul will be highlighted in the graph. For rings, the root-mean-square deviation (RMSD) between the ring in question and similar rings identified by Mogul is calculated over all ring torsion angles. If the average RMSD is greater than 60 degrees and the minimal RMSD between the ring in question and any Mogul-identified rings is also greater than 60 degrees, then that ring is considered an outlier. The outliers are highlighted in purple. The color gray indicates Mogul did not find sufficient equivalents in the CSD to analyse the geometry.

Ligand C3G B 801



Ligand C3G A 802



4.7 Other polymers [i](#)

There are no such residues in this entry.

4.8 Polymer linkage issues [i](#)

There are no chain breaks in this entry.

5 Fit of model and data ⓘ

5.1 Protein, DNA and RNA chains ⓘ

In the following table, the column labelled ‘#RSRZ> 2’ contains the number (and percentage) of RSRZ outliers, followed by percent RSRZ outliers for the chain as percentile scores relative to all X-ray entries and entries of similar resolution. The OWAB column contains the minimum, median, 95th percentile and maximum values of the occupancy-weighted average B-factor per residue. The column labelled ‘Q< 0.9’ lists the number of (and percentage) of residues with an average occupancy less than 0.9.

Mol	Chain	Analysed	<RSRZ>	#RSRZ>2		OWAB(Å ²)	Q<0.9
1	A	731/759 (96%)	0.27	26 (3%)	46 42	21, 43, 72, 113	2 (0%)
1	B	739/759 (97%)	0.52	23 (3%)	51 48	29, 51, 78, 113	1 (0%)
All	All	1470/1518 (96%)	0.39	49 (3%)	49 45	21, 47, 77, 113	3 (0%)

All (49) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	107	CYS	4.3
1	A	151	THR	3.7
1	B	202	ALA	3.1
1	A	145	GLY	3.1
1	A	114	PHE	3.1
1	B	554	GLY	2.9
1	A	146	VAL	2.8
1	A	54	VAL	2.6
1	B	368	TYR	2.6
1	B	567	GLU	2.6
1	A	624[A]	GLN	2.6
1	A	57	TYR	2.6
1	A	152	GLY	2.5
1	A	785	ASP	2.5
1	A	449	PHE	2.5
1	B	398	VAL	2.5
1	B	382	PRO	2.4
1	A	147	GLU	2.4
1	B	357	ALA	2.4
1	A	564	GLU	2.4
1	A	50	GLU	2.4
1	B	148	CYS	2.3
1	A	193	PRO	2.3
1	A	623	GLY	2.3

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Mol	Chain	Res	Type	RSRZ
1	B	378	VAL	2.3
1	A	58	GLN	2.3
1	B	239	ALA	2.3
1	A	784	GLU	2.3
1	B	461	ALA	2.2
1	B	606	ASN	2.2
1	A	203	ALA	2.1
1	A	56	GLY	2.1
1	B	463	LEU	2.1
1	B	57	TYR	2.1
1	B	641	GLU	2.1
1	A	178	GLY	2.1
1	A	381	GLU	2.1
1	A	691	GLU	2.1
1	B	335	ALA	2.1
1	B	510	LEU	2.1
1	B	639	HIS	2.1
1	A	116	VAL	2.0
1	B	545	PHE	2.0
1	A	76	LEU	2.0
1	B	204	GLY	2.0
1	B	622	ASP	2.0
1	B	351	PHE	2.0
1	B	527	GLU	2.0
1	A	115	GLY	2.0

5.2 Non-standard residues in protein, DNA, RNA chains ⓘ

There are no non-standard protein/DNA/RNA residues in this entry.

5.3 Carbohydrates ⓘ

There are no oligosaccharides in this entry.

5.4 Ligands ⓘ

In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum, median, 95th percentile and maximum values of B factors of atoms in the group. The column labelled 'Q< 0.9' lists the number of atoms with occupancy less than 0.9.

Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors($\text{\AA}^2$)	Q<0.9
4	ZN	A	824	1/1	0.33	0.31	110,110,110,110	0
2	ACT	A	801	4/4	0.71	0.25	46,51,60,64	0
4	ZN	A	811	1/1	0.73	0.27	123,123,123,123	0
4	ZN	A	816	1/1	0.76	0.13	134,134,134,134	0
5	SO4	A	826	5/5	0.76	0.11	88,92,102,104	0
4	ZN	B	816	1/1	0.78	0.11	139,139,139,139	0
4	ZN	B	810	1/1	0.79	0.14	118,118,118,118	0
4	ZN	A	808	1/1	0.82	0.14	116,116,116,116	0
5	SO4	B	818	5/5	0.82	0.10	83,93,102,115	0
4	ZN	A	807	1/1	0.83	0.12	120,120,120,120	0
4	ZN	B	802	1/1	0.83	0.10	132,132,132,132	0
5	SO4	A	827	5/5	0.83	0.10	59,67,86,102	0
4	ZN	A	804	1/1	0.83	0.08	124,124,124,124	0
5	SO4	A	825	5/5	0.84	0.17	43,54,69,82	0
4	ZN	B	806	1/1	0.84	0.11	134,134,134,134	0
4	ZN	A	819	1/1	0.85	0.11	118,118,118,118	0
3	C3G	B	801	22/22	0.86	0.12	37,49,61,82	0
4	ZN	A	805	1/1	0.86	0.16	103,103,103,103	0
4	ZN	A	821	1/1	0.87	0.12	118,118,118,118	0
4	ZN	B	817	1/1	0.87	0.22	99,99,99,99	0
4	ZN	B	805	1/1	0.88	0.13	104,104,104,104	0
4	ZN	A	817	1/1	0.89	0.12	117,117,117,117	0
4	ZN	A	810	1/1	0.89	0.16	112,112,112,112	0
4	ZN	A	820	1/1	0.90	0.14	95,95,95,95	0
4	ZN	B	812	1/1	0.90	0.18	125,125,125,125	0
3	C3G	A	802	22/22	0.91	0.10	38,45,61,67	0
4	ZN	B	804	1/1	0.92	0.09	94,94,94,94	0
4	ZN	B	815	1/1	0.92	0.09	92,92,92,92	0
4	ZN	A	812	1/1	0.94	0.08	100,100,100,100	0
4	ZN	A	822	1/1	0.94	0.07	76,76,76,76	0
4	ZN	A	806	1/1	0.95	0.14	77,77,77,77	0
4	ZN	A	823	1/1	0.96	0.11	101,101,101,101	0
4	ZN	B	803	1/1	0.97	0.07	91,91,91,91	0
4	ZN	B	811	1/1	0.97	0.06	91,91,91,91	0
4	ZN	A	815	1/1	0.97	0.05	65,65,65,65	0
4	ZN	A	818	1/1	0.97	0.05	48,48,48,48	0
4	ZN	A	813	1/1	0.97	0.11	55,55,55,55	0
4	ZN	B	814	1/1	0.98	0.10	83,83,83,83	0
4	ZN	A	803	1/1	0.98	0.08	68,68,68,68	0
4	ZN	B	808	1/1	0.98	0.09	60,60,60,60	0
4	ZN	B	809	1/1	0.98	0.05	66,66,66,66	0
4	ZN	A	809	1/1	0.99	0.03	77,77,77,77	0
4	ZN	A	814	1/1	0.99	0.08	79,79,79,79	0

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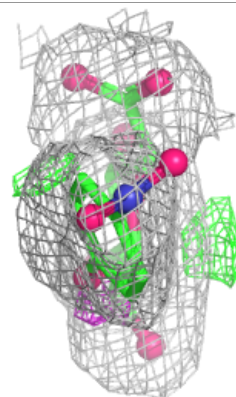
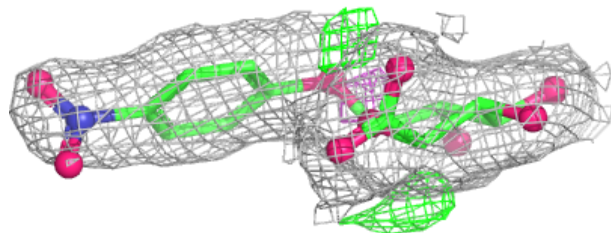
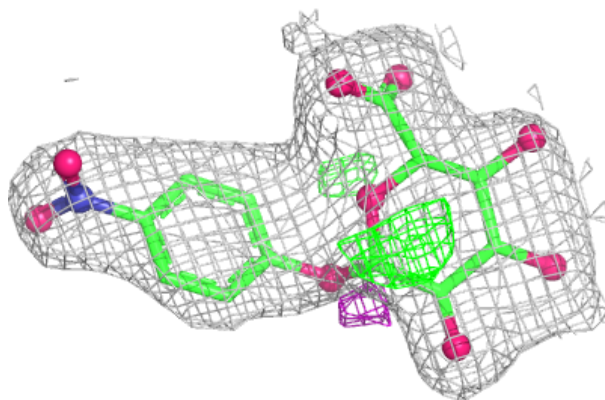
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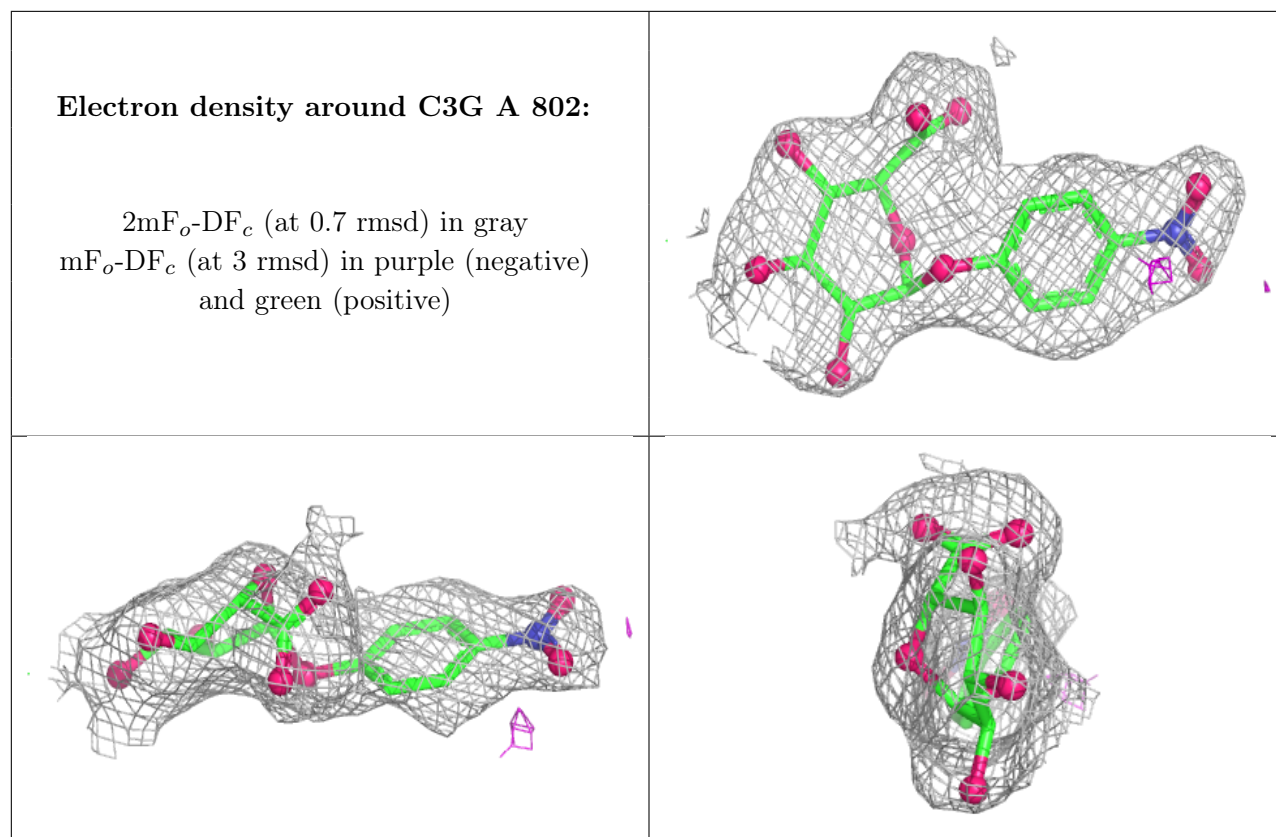
Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors($\text{\AA}^2$)	Q<0.9
4	ZN	B	807	1/1	1.00	0.07	49,49,49,49	0
4	ZN	B	813	1/1	1.00	0.02	56,56,56,56	0

The following is a graphical depiction of the model fit to experimental electron density of all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the geometry validation Tables will also be included. Each fit is shown from different orientation to approximate a three-dimensional view.

Electron density around C3G B 801:

2mF_o-DF_c (at 0.7 rmsd) in gray
mF_o-DF_c (at 3 rmsd) in purple (negative)
and green (positive)





5.5 Other polymers [i](#)

There are no such residues in this entry.