



Full wwPDB X-ray Structure Validation Report ⓘ

Mar 10, 2026 – 04:39 AM UTC

PDB ID : 2QTV / pdb_00002qtv
Title : Structure of Sec23-Sar1 complexed with the active fragment of Sec31
Authors : Goldberg, J.; Bi, X.; Mancias, J.D.
Deposited on : 2007-08-02
Resolution : 2.50 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	:	4-5-2 with Phenix2.0
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

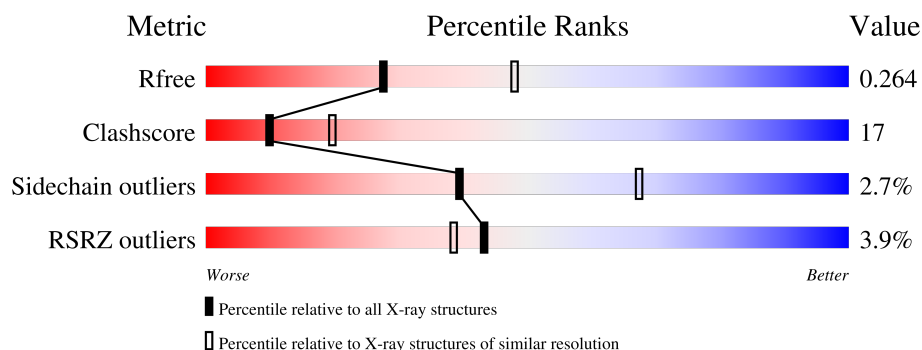
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.50 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	5829 (2.50-2.50)
Clashscore	190562	6492 (2.50-2.50)
Sidechain outliers	187428	6380 (2.50-2.50)
RSRZ outliers	180081	5833 (2.50-2.50)

The table below summarises the geometric issues observed across the polymeric chains and their fit to the electron density. The red, orange, yellow and green segments of the lower bar indicate the fraction of residues that contain outliers for ≥ 3 , 2, 1 and 0 types of geometric quality criteria respectively. A grey segment represents the fraction of residues that are not modelled. The numeric value for each fraction is indicated below the corresponding segment, with a dot representing fractions $\leq 5\%$. The upper red bar (where present) indicates the fraction of residues that have poor fit to the electron density. The numeric value is given above the bar.

Mol	Chain	Length	Quality of chain
1	A	772	3% 66% 27% • 5%
2	B	167	7% 56% 40% • •
3	D	49	8% 49% 24% 27%

2 Entry composition

There are 7 unique types of molecules in this entry. The entry contains 7619 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 Protein transport protein SEC23.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	733	Total	C	N	O	S	0	0	0
			5780	3679	969	1109	23			

There are 5 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	-3	GLY	-	expression tag	UNP P15303
A	-2	ALA	-	expression tag	UNP P15303
A	-1	MET	-	expression tag	UNP P15303
A	0	GLY	-	expression tag	UNP P15303
A	1	SER	-	expression tag	UNP P15303

- Molecule 2 is a protein called Small COPII coat GTPase SAR1.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
2	B	164	Total	C	N	O	S	0	0	0
			1299	836	220	239	4			

- Molecule 3 is a protein called Protein transport protein SEC31.

Mol	Chain	Residues	Atoms				ZeroOcc	AltConf	Trace
3	D	36	Total	C	N	O	0	0	0
			275	171	54	50			

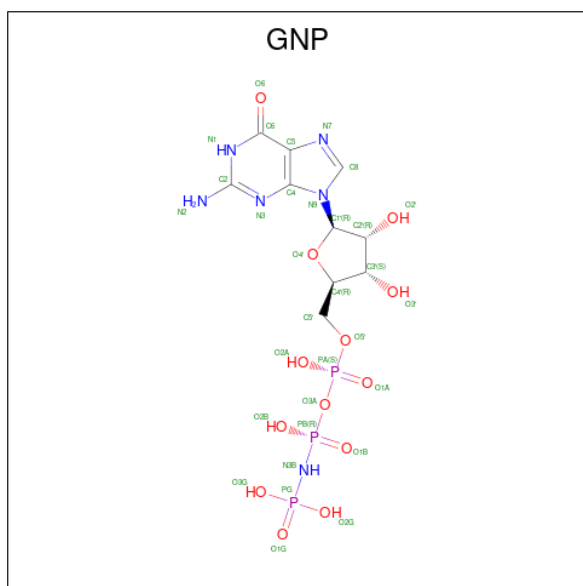
- Molecule 4 is ZINC ION (CCD ID: ZN) (formula: Zn).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
4	A	1	Total	Zn	0	0
			1	1		

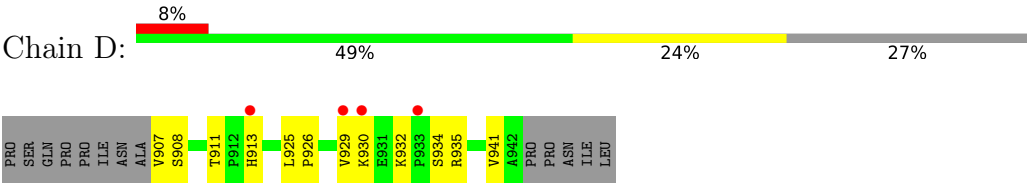
- Molecule 5 is MAGNESIUM ION (CCD ID: MG) (formula: Mg).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
5	B	1	Total	Mg	0	0
			1	1		

- Molecule 6 is PHOSPHOAMINOPHOSPHONIC ACID-GUANYLATE ESTER (CCD ID: GNP) (formula: $C_{10}H_{17}N_6O_{13}P_3$).



● Molecule 3: Protein transport protein SEC31



4 Data and refinement statistics

Property	Value	Source
Space group	P 21 21 2	Depositor
Cell constants a, b, c, α , β , γ	94.75Å 133.21Å 82.04Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	30.00 – 2.50 30.00 – 2.50	Depositor EDS
% Data completeness (in resolution range)	89.4 (30.00-2.50) 91.2 (30.00-2.50)	Depositor EDS
R_{merge}	0.08	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	5.79 (at 2.51Å)	Xtriage
Refinement program	CNS	Depositor
R, R_{free}	0.205 , 0.262 0.210 , 0.264	Depositor DCC
R_{free} test set	1693 reflections (5.06%)	wwPDB-VP
Wilson B-factor (Å ²)	28.8	Xtriage
Anisotropy	0.275	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.34 , 47.4	EDS
L-test for twinning ²	$\langle L \rangle = 0.49$, $\langle L^2 \rangle = 0.32$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o, F_c correlation	0.92	EDS
Total number of atoms	7619	wwPDB-VP
Average B, all atoms (Å ²)	35.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 3.97% 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.

5 Model quality [i](#)

5.1 Standard geometry [i](#)

Bond lengths and bond angles in the following residue types are not validated in this section: MG, ZN, GNP

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 $|Z| > 5$ is considered an outlier worth inspection. RMSZ is the root-mean-square of all Z scores of the bond lengths (or angles).

Mol	Chain	Bond lengths		Bond angles	
		RMSZ	$\# Z > 5$	RMSZ	$\# Z > 5$
1	A	0.44	0/5915	0.95	27/8052 (0.3%)
2	B	0.38	0/1327	0.88	4/1800 (0.2%)
3	D	0.40	0/280	0.98	3/378 (0.8%)
All	All	0.43	0/7522	0.94	34/10230 (0.3%)

There are no bond length outliers.

All (34) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	B	78	ILE	N-CA-C	8.30	119.08	110.36
1	A	685	ALA	N-CA-C	-7.57	104.28	113.97
1	A	516	THR	CA-C-N	7.00	127.59	119.47
1	A	516	THR	C-N-CA	7.00	127.59	119.47
1	A	128	VAL	N-CA-C	6.95	117.88	107.80
1	A	710	ARG	N-CA-C	-6.82	100.88	110.50
1	A	322	TYR	N-CA-C	6.65	119.13	111.02
1	A	512	LEU	CA-C-N	6.45	126.41	120.03
1	A	512	LEU	C-N-CA	6.45	126.41	120.03
1	A	257	ARG	N-CA-C	-6.38	102.66	110.31
1	A	452	PRO	N-CA-C	-6.24	106.72	114.20
3	D	911	THR	CA-C-N	6.16	125.79	119.56
3	D	911	THR	C-N-CA	6.16	125.79	119.56
1	A	161	THR	N-CA-C	-6.00	100.11	109.72
1	A	598	VAL	N-CA-C	5.87	121.54	109.34
1	A	320	GLN	N-CA-C	5.79	119.61	112.54
1	A	616	GLU	N-CA-C	5.76	118.33	110.55
1	A	636	ASP	N-CA-C	5.73	117.50	108.96
1	A	90	PRO	CA-C-N	5.73	127.00	119.84
1	A	90	PRO	C-N-CA	5.73	127.00	119.84
1	A	116	LYS	N-CA-C	-5.47	101.32	109.42

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	581	SER	N-CA-C	5.46	118.74	111.75
1	A	189	GLN	N-CA-C	-5.44	102.47	110.52
1	A	618	THR	N-CA-C	5.43	117.89	111.33
3	D	913	HIS	N-CA-C	5.39	118.38	110.30
1	A	464	ASN	N-CA-C	5.38	118.71	110.20
2	B	70	THR	N-CA-C	-5.37	99.76	108.41
1	A	484	LEU	N-CA-C	5.25	118.04	109.59
1	A	615	ARG	N-CA-C	-5.24	107.91	114.56
2	B	24	GLY	N-CA-C	5.06	121.07	113.02
1	A	152	PRO	CA-C-N	5.05	124.49	119.24
1	A	152	PRO	C-N-CA	5.05	124.49	119.24
1	A	105	LEU	N-CA-C	-5.04	107.18	113.38
2	B	171	CYS	N-CA-C	5.00	116.42	108.96

There are no chirality outliers.

There are no planarity outliers.

5.2 Too-close contacts

In the following table, the Non-H and H(model) columns list the number of non-hydrogen atoms and hydrogen atoms in the chain respectively. The H(added) column lists the number of hydrogen atoms added and optimized by MolProbity. The Clashes column lists the number of clashes within the asymmetric unit, whereas Symm-Clashes lists symmetry-related clashes.

Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
1	A	5780	0	5663	188	0
2	B	1299	0	1288	64	0
3	D	275	0	285	15	0
4	A	1	0	0	0	0
5	B	1	0	0	0	0
6	B	32	0	13	5	0
7	A	193	0	0	7	0
7	B	31	0	0	2	0
7	D	7	0	0	1	0
All	All	7619	0	7249	256	0

The all-atom clashscore is defined as the number of clashes found per 1000 atoms (including hydrogen atoms). The all-atom clashscore for this structure is 17.

All (256) close contacts within the same asymmetric unit are listed below, sorted by their clash magnitude.

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:651:ASN:H	1:A:651:ASN:HD22	1.05	1.00
1:A:121:PRO:HG3	3:D:941:VAL:HG21	1.47	0.96
1:A:153:PRO:HG3	3:D:935:ARG:HD3	1.52	0.91
1:A:722:ARG:HD3	6:B:200:GNP:H5'1	1.57	0.85
1:A:634:MET:HA	1:A:634:MET:HE3	1.59	0.85
1:A:96:LEU:HG	1:A:97:SER:H	1.43	0.83
1:A:164:ASN:N	1:A:164:ASN:HD22	1.82	0.78
1:A:616:GLU:HG3	1:A:620:ASN:HB2	1.63	0.77
2:B:140:VAL:HG12	2:B:141:SER:N	1.99	0.76
2:B:140:VAL:HG12	2:B:141:SER:H	1.52	0.75
1:A:114:THR:HG22	1:A:115:ASN:H	1.50	0.75
1:A:512:LEU:HD13	1:A:516:THR:HG21	1.70	0.74
1:A:708:LEU:HD21	3:D:929:VAL:HG11	1.69	0.74
1:A:382:GLN:HB3	3:D:929:VAL:HG21	1.69	0.74
1:A:164:ASN:HD22	1:A:164:ASN:H	1.33	0.73
1:A:674:ARG:HA	1:A:679:GLN:NE2	2.04	0.71
1:A:347:ALA:HB2	1:A:353:ILE:HD13	1.73	0.70
1:A:430:ASN:HD22	1:A:430:ASN:H	1.39	0.70
1:A:616:GLU:CG	1:A:620:ASN:HB2	2.21	0.70
1:A:615:ARG:NH1	7:A:815:HOH:O	2.23	0.69
1:A:399:ALA:HB3	1:A:450:LEU:HD13	1.74	0.69
1:A:114:THR:HG22	1:A:115:ASN:N	2.07	0.69
2:B:36:LYS:HG2	2:B:97:LEU:HD13	1.75	0.68
1:A:96:LEU:CG	1:A:97:SER:H	2.07	0.68
1:A:170:ASP:C	1:A:171:LEU:HD12	2.19	0.67
2:B:130:LEU:HD22	2:B:171:CYS:SG	2.35	0.67
2:B:61:GLU:OE2	2:B:68:LYS:HE2	1.95	0.66
1:A:745:VAL:CG1	2:B:50:THR:HG21	2.25	0.66
1:A:177:ASP:OD1	1:A:237:LYS:HE3	1.96	0.65
1:A:757:THR:O	1:A:761:GLN:HG3	1.97	0.65
1:A:164:ASN:H	1:A:164:ASN:ND2	1.94	0.65
1:A:651:ASN:HD22	1:A:651:ASN:N	1.81	0.64
1:A:323:LYS:O	1:A:327:LYS:HG2	1.97	0.64
1:A:432:ILE:HD13	1:A:442:THR:HA	1.78	0.64
1:A:19:PHE:HB2	1:A:511:LEU:HD23	1.80	0.64
1:A:722:ARG:HH12	6:B:200:GNP:HNB3	1.46	0.64
3:D:907:VAL:HG12	3:D:908:SER:N	2.13	0.63
2:B:164:ARG:HG2	2:B:166:VAL:HG23	1.80	0.63
2:B:140:VAL:CG1	2:B:141:SER:H	2.12	0.62
1:A:96:LEU:HD21	1:A:101:MET:SD	2.39	0.62
1:A:136:ASN:HD21	1:A:374:ALA:HB1	1.65	0.62
1:A:219:VAL:HG22	1:A:225:ASN:ND2	2.14	0.62

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:B:154:THR:HB	2:B:166:VAL:O	2.00	0.62
1:A:411:ASP:OD2	1:A:411:ASP:N	2.33	0.62
1:A:651:ASN:H	1:A:651:ASN:ND2	1.85	0.61
1:A:750:VAL:HA	7:A:949:HOH:O	2.00	0.60
1:A:635:GLU:H	1:A:635:GLU:CD	2.08	0.60
2:B:23:HIS:CD2	2:B:67:ILE:HA	2.36	0.60
1:A:421:ALA:HB2	1:A:447:MET:HE3	1.82	0.59
1:A:618:THR:O	1:A:622:LEU:HG	2.01	0.59
1:A:410:LYS:HD3	7:A:944:HOH:O	2.03	0.59
1:A:10:ASN:O	1:A:12:VAL:HG23	2.03	0.58
1:A:511:LEU:O	1:A:512:LEU:HD23	2.03	0.58
1:A:681:ASP:HB2	1:A:682:PRO:HD2	1.84	0.58
2:B:141:SER:OG	2:B:144:GLU:HG3	2.03	0.58
2:B:140:VAL:CG1	2:B:141:SER:N	2.65	0.58
1:A:450:LEU:N	1:A:450:LEU:HD12	2.19	0.57
1:A:44:ASP:O	1:A:45:GLU:HG3	2.04	0.57
2:B:83:LEU:O	2:B:86:ASP:HB2	2.04	0.57
1:A:708:LEU:CD2	3:D:929:VAL:HG11	2.34	0.57
1:A:722:ARG:NH1	6:B:200:GNP:HNB3	2.01	0.57
1:A:102:PRO:HD2	1:A:105:LEU:HD12	1.87	0.57
2:B:140:VAL:CG1	2:B:144:GLU:HB2	2.34	0.57
2:B:122:LEU:O	2:B:164:ARG:NH2	2.38	0.57
3:D:929:VAL:HG23	3:D:929:VAL:O	2.05	0.56
1:A:682:PRO:C	1:A:684:TYR:H	2.13	0.56
1:A:77:SER:HA	1:A:89:LEU:HB2	1.88	0.56
1:A:96:LEU:HG	1:A:97:SER:N	2.18	0.56
1:A:65:LEU:HD11	1:A:105:LEU:HD21	1.88	0.56
1:A:234:VAL:HG12	1:A:234:VAL:O	2.04	0.56
2:B:23:HIS:HD2	2:B:67:ILE:HA	1.70	0.55
2:B:57:PRO:HB3	2:B:74:LEU:HD13	1.89	0.55
1:A:219:VAL:HG22	1:A:225:ASN:HD22	1.71	0.55
1:A:46:LEU:HD12	1:A:47:ASN:H	1.71	0.55
1:A:145:ILE:HA	1:A:148:LEU:HD12	1.88	0.55
2:B:137:PRO:HG2	2:B:138:ASN:H	1.71	0.55
1:A:679:GLN:HG3	1:A:687:PHE:CE2	2.41	0.55
1:A:96:LEU:HD11	1:A:102:PRO:HD3	1.90	0.54
1:A:455:SER:O	1:A:534:ARG:NH2	2.40	0.54
1:A:583:TYR:HB3	1:A:584:PRO:HD3	1.88	0.54
1:A:634:MET:HE1	1:A:686:ASP:O	2.08	0.54
1:A:68:TYR:O	1:A:81:PRO:HG3	2.07	0.54
1:A:564:ALA:HB2	1:A:576:LEU:HD13	1.89	0.54

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:B:102:ASP:N	2:B:103:PRO:HD3	2.22	0.54
1:A:566:TYR:CG	1:A:764:VAL:HG12	2.42	0.54
1:A:710:ARG:HD2	7:D:214:HOH:O	2.08	0.54
2:B:140:VAL:HG13	2:B:144:GLU:CD	2.33	0.54
1:A:114:THR:HG22	1:A:116:LYS:H	1.72	0.54
1:A:679:GLN:HG2	1:A:691:LEU:CD1	2.38	0.54
1:A:644:ASP:OD1	1:A:645:SER:N	2.41	0.53
1:A:761:GLN:O	1:A:765:SER:HB2	2.07	0.53
2:B:155:THR:CG2	2:B:166:VAL:H	2.21	0.53
1:A:430:ASN:H	1:A:430:ASN:ND2	2.06	0.53
2:B:50:THR:O	2:B:50:THR:HG23	2.07	0.53
2:B:128:VAL:HG23	2:B:186:LEU:HD13	1.91	0.53
2:B:58:THR:HG22	7:B:224:HOH:O	2.09	0.53
1:A:723:PHE:O	1:A:727:LYS:HG2	2.09	0.52
1:A:634:MET:HA	1:A:634:MET:CE	2.36	0.52
2:B:32:ASP:OD1	2:B:77:HIS:HA	2.10	0.52
2:B:155:THR:HG22	2:B:166:VAL:H	1.75	0.52
1:A:451:SER:C	1:A:453:TYR:H	2.17	0.52
2:B:137:PRO:C	2:B:139:ALA:H	2.18	0.52
7:A:908:HOH:O	3:D:935:ARG:NE	2.42	0.52
2:B:82:ARG:O	2:B:85:LYS:HE2	2.09	0.52
3:D:925:LEU:HD12	3:D:926:PRO:HD2	1.92	0.52
1:A:171:LEU:HD22	1:A:234:VAL:HG11	1.91	0.52
1:A:682:PRO:O	1:A:683:GLN:HB3	2.10	0.52
2:B:136:ALA:HB1	2:B:137:PRO:HD2	1.92	0.51
1:A:745:VAL:HG13	2:B:50:THR:HG21	1.92	0.51
2:B:107:ASP:O	2:B:111:VAL:HG23	2.11	0.51
2:B:155:THR:HG23	2:B:156:GLY:N	2.26	0.51
1:A:114:THR:CG2	1:A:115:ASN:H	2.23	0.50
1:A:307:PRO:HB3	7:B:220:HOH:O	2.10	0.50
1:A:144:ILE:O	1:A:148:LEU:HG	2.11	0.50
1:A:171:LEU:HD12	1:A:171:LEU:N	2.25	0.50
1:A:365:THR:HB	1:A:448:ALA:HB3	1.92	0.50
1:A:739:ARG:HG3	1:A:739:ARG:HH11	1.76	0.50
2:B:172:SER:OG	2:B:175:MET:HG2	2.11	0.50
1:A:66:ASN:HD22	1:A:68:TYR:H	1.60	0.49
2:B:176:ARG:HA	2:B:179:TYR:HE2	1.77	0.49
1:A:147:SER:HB3	1:A:384:TYR:CE2	2.48	0.49
1:A:171:LEU:CD2	1:A:234:VAL:HG11	2.43	0.49
1:A:644:ASP:OD2	1:A:731:SER:HB3	2.13	0.49
1:A:44:ASP:C	1:A:45:GLU:HG3	2.37	0.49

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:645:SER:HA	1:A:728:LEU:HD13	1.94	0.49
2:B:88:PHE:N	2:B:89:PRO:CD	2.76	0.49
1:A:390:LYS:HD2	1:A:390:LYS:N	2.28	0.49
1:A:395:TYR:CD2	1:A:497:SER:HA	2.48	0.48
1:A:390:LYS:HE3	3:D:934:SER:O	2.13	0.48
2:B:32:ASP:HB3	2:B:77:HIS:N	2.29	0.48
2:B:85:LYS:HA	2:B:88:PHE:CD2	2.48	0.48
2:B:176:ARG:HA	2:B:179:TYR:CE2	2.48	0.48
1:A:739:ARG:HG2	1:A:744:ILE:HD11	1.96	0.48
1:A:17:ASN:HB2	1:A:522:SER:HB2	1.96	0.48
2:B:99:ASP:OD1	2:B:133:LYS:HD2	2.14	0.48
1:A:430:ASN:HD22	1:A:430:ASN:N	2.03	0.48
2:B:181:GLU:CD	2:B:181:GLU:H	2.22	0.47
1:A:417:LEU:HD23	1:A:417:LEU:C	2.39	0.47
1:A:615:ARG:NH2	7:A:976:HOH:O	2.44	0.47
1:A:42:GLU:OE2	1:A:397:LYS:HE2	2.14	0.47
1:A:96:LEU:CG	1:A:97:SER:N	2.76	0.47
1:A:432:ILE:CD1	1:A:442:THR:HA	2.43	0.47
1:A:674:ARG:HB3	7:A:992:HOH:O	2.15	0.47
1:A:164:ASN:HD22	1:A:165:VAL:H	1.63	0.47
2:B:134:ILE:HG12	2:B:172:SER:HB2	1.96	0.47
1:A:66:ASN:HD21	1:A:68:TYR:HB2	1.80	0.47
1:A:661:PHE:CD1	1:A:661:PHE:C	2.93	0.47
2:B:103:PRO:HG3	2:B:140:VAL:HG21	1.96	0.47
1:A:485:ALA:HB2	1:A:511:LEU:HD11	1.97	0.46
1:A:594:GLN:HE21	1:A:601:ASN:HD21	1.63	0.46
1:A:661:PHE:HA	1:A:709:PRO:HB2	1.97	0.46
2:B:23:HIS:HD2	2:B:68:LYS:H	1.62	0.46
1:A:561:GLN:HG2	1:A:763:ALA:HA	1.97	0.46
1:A:96:LEU:HD11	1:A:101:MET:HA	1.97	0.46
3:D:932:LYS:C	3:D:934:SER:H	2.22	0.46
3:D:907:VAL:CG1	3:D:908:SER:N	2.78	0.46
1:A:569:ASP:C	1:A:571:PRO:HD3	2.41	0.46
1:A:616:GLU:CG	1:A:620:ASN:CB	2.91	0.46
1:A:687:PHE:CE2	1:A:691:LEU:HD11	2.51	0.46
2:B:62:LEU:HD12	2:B:71:THR:HG21	1.96	0.46
2:B:31:LEU:HD22	2:B:81:ARG:NH2	2.31	0.46
1:A:551:TRP:CE3	1:A:552:LEU:HD13	2.50	0.46
1:A:722:ARG:NH1	6:B:200:GNP:N3B	2.57	0.46
1:A:19:PHE:HB2	1:A:511:LEU:CD2	2.44	0.46
1:A:343:VAL:O	1:A:362:THR:HG22	2.16	0.46

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:114:THR:CG2	1:A:115:ASN:N	2.76	0.45
1:A:451:SER:C	1:A:453:TYR:N	2.75	0.45
1:A:556:LEU:HD22	1:A:587:THR:HG21	1.98	0.45
1:A:642:LEU:O	1:A:644:ASP:N	2.48	0.45
2:B:32:ASP:O	2:B:105:ARG:NH2	2.49	0.45
2:B:110:ARG:HH11	2:B:110:ARG:HG3	1.82	0.45
1:A:702:LEU:O	1:A:703:VAL:C	2.59	0.45
1:A:734:TYR:HA	1:A:744:ILE:HG21	1.98	0.45
3:D:907:VAL:HG12	3:D:908:SER:H	1.81	0.45
2:B:97:LEU:HD12	2:B:97:LEU:N	2.31	0.45
2:B:40:LEU:HD22	2:B:73:ASP:HB2	1.99	0.45
1:A:234:VAL:O	1:A:235:GLU:C	2.60	0.45
1:A:679:GLN:HG3	1:A:687:PHE:HE2	1.79	0.45
1:A:111:GLU:HB2	1:A:503:ARG:HD3	1.99	0.45
1:A:464:ASN:ND2	1:A:465:THR:H	2.15	0.45
2:B:134:ILE:CG1	2:B:172:SER:HB2	2.47	0.45
2:B:155:THR:OG1	2:B:156:GLY:N	2.50	0.44
1:A:46:LEU:HG	1:A:47:ASN:N	2.32	0.44
1:A:69:CYS:SG	1:A:81:PRO:HD3	2.58	0.44
1:A:588:TYR:O	1:A:591:ARG:HG2	2.18	0.44
2:B:155:THR:HG21	2:B:165:PRO:HA	2.00	0.44
1:A:15:THR:HG22	1:A:528:ALA:HA	1.99	0.44
1:A:561:GLN:CG	1:A:763:ALA:HA	2.48	0.44
1:A:599:PHE:HD2	2:B:51:LEU:HD22	1.82	0.44
2:B:85:LYS:HA	2:B:88:PHE:CE2	2.52	0.44
2:B:156:GLY:C	2:B:160:ILE:HD11	2.43	0.44
1:A:550:ARG:O	1:A:554:ARG:HG3	2.18	0.43
1:A:653:ILE:HG13	1:A:670:ILE:HD13	2.00	0.43
2:B:125:VAL:HA	2:B:126:PRO:HD3	1.86	0.43
1:A:138:ASP:HA	1:A:141:LYS:HD2	1.99	0.43
1:A:283:ARG:NE	1:A:344:ASP:OD2	2.51	0.43
1:A:187:GLU:HB2	1:A:296:PRO:HG3	1.99	0.43
1:A:613:PHE:HA	1:A:624:MET:HE1	1.99	0.43
2:B:37:THR:HG22	2:B:51:LEU:HD13	1.99	0.43
1:A:193:LEU:C	1:A:193:LEU:HD23	2.44	0.43
1:A:281:PRO:HB3	1:A:400:PHE:HB3	2.00	0.43
1:A:512:LEU:HA	1:A:513:PRO:HD3	1.79	0.43
2:B:145:LEU:O	2:B:146:ARG:C	2.62	0.43
1:A:80:CYS:HA	1:A:81:PRO:HD3	1.86	0.43
1:A:66:ASN:ND2	1:A:68:TYR:H	2.16	0.42
1:A:677:GLY:O	1:A:679:GLN:N	2.52	0.42

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:15:THR:HG23	1:A:531:LEU:HD12	2.00	0.42
1:A:360:GLN:HG2	1:A:364:SER:OG	2.19	0.42
1:A:97:SER:C	1:A:99:GLU:H	2.27	0.42
1:A:574:PHE:CD2	1:A:760:GLN:HG2	2.55	0.42
1:A:682:PRO:C	1:A:684:TYR:N	2.76	0.42
2:B:147:SER:OG	2:B:152:LEU:HD21	2.19	0.42
1:A:66:ASN:HB2	1:A:67:PRO:CD	2.49	0.42
2:B:32:ASP:HA	6:B:200:GNP:O3G	2.18	0.42
1:A:57:SER:O	1:A:58:GLY:C	2.63	0.42
1:A:63:SER:OG	1:A:82:ILE:HG13	2.20	0.42
1:A:151:LEU:O	3:D:935:ARG:HG3	2.20	0.42
1:A:243:GLU:HA	1:A:243:GLU:OE1	2.20	0.42
1:A:411:ASP:HA	1:A:463:ALA:HB3	2.02	0.42
1:A:632:PHE:CD1	1:A:632:PHE:N	2.88	0.42
1:A:53:PRO:HG3	1:A:112:TYR:CG	2.55	0.42
1:A:90:PRO:HA	1:A:91:PRO:HD3	1.86	0.42
1:A:561:GLN:HG2	1:A:763:ALA:O	2.20	0.42
1:A:632:PHE:CE2	1:A:693:GLU:HG3	2.55	0.42
1:A:420:HIS:CE1	1:A:615:ARG:HB2	2.55	0.42
1:A:576:LEU:HG	1:A:580:PHE:HB3	2.02	0.42
2:B:181:GLU:CD	2:B:181:GLU:N	2.78	0.42
1:A:42:GLU:HG3	1:A:452:PRO:HB3	2.02	0.41
1:A:83:CYS:O	1:A:84:ASN:HB2	2.20	0.41
2:B:26:LEU:HB2	2:B:71:THR:HG22	2.02	0.41
1:A:332:ILE:HG22	1:A:361:LEU:HD21	2.02	0.41
1:A:66:ASN:ND2	1:A:68:TYR:HB2	2.35	0.41
1:A:658:THR:O	1:A:659:PHE:HB3	2.20	0.41
1:A:722:ARG:CZ	2:B:53:PRO:HG3	2.51	0.41
1:A:120:VAL:HA	1:A:121:PRO:HD3	1.94	0.41
1:A:140:LEU:O	1:A:144:ILE:HG13	2.21	0.41
1:A:20:PRO:HB3	1:A:25:ASP:HB2	2.02	0.41
2:B:164:ARG:HG2	2:B:164:ARG:O	2.21	0.41
1:A:70:VAL:HB	1:A:79:SER:OG	2.21	0.41
1:A:421:ALA:CB	1:A:447:MET:HE3	2.49	0.41
3:D:930:LYS:HD3	3:D:930:LYS:C	2.46	0.41
1:A:171:LEU:HB3	1:A:237:LYS:HD3	2.03	0.41
1:A:461:GLU:HA	7:A:934:HOH:O	2.20	0.41
1:A:464:ASN:ND2	1:A:465:THR:N	2.69	0.41
1:A:141:LYS:NZ	1:A:245:LEU:O	2.50	0.40
1:A:164:ASN:HD22	1:A:165:VAL:N	2.19	0.40
1:A:643:LEU:HD12	1:A:728:LEU:HD23	2.03	0.40

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:41:LYS:O	1:A:503:ARG:NH2	2.54	0.40
1:A:52:ASN:HA	1:A:53:PRO:HD3	1.87	0.40
1:A:652:THR:C	1:A:670:ILE:HD12	2.46	0.40
1:A:67:PRO:HD3	1:A:104:GLU:O	2.21	0.40
1:A:96:LEU:O	1:A:97:SER:HB3	2.21	0.40
1:A:602:SER:OG	1:A:605:GLU:HB2	2.22	0.40
1:A:239:ASN:O	1:A:243:GLU:HB2	2.20	0.40
1:A:569:ASP:O	1:A:571:PRO:HD3	2.20	0.40
1:A:653:ILE:HD11	1:A:691:LEU:HD23	2.04	0.40

There are no symmetry-related clashes.

5.3 Torsion angles [i](#)

5.3.1 Protein backbone [i](#)

There are no protein backbone outliers to report in this entry.

5.3.2 Protein sidechains [i](#)

In the following table, the Percentiles column shows the percent sidechain outliers of the chain as a percentile score with respect to all X-ray entries followed by that with respect to entries of similar resolution.

The Analysed column shows the number of residues for which the sidechain conformation was analysed, and the total number of residues.

Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
1	A	397/669 (59%)	386 (97%)	11 (3%)	38	66
2	B	136/141 (96%)	132 (97%)	4 (3%)	37	65
3	D	30/42 (71%)	30 (100%)	0	100	100
All	All	563/852 (66%)	548 (97%)	15 (3%)	39	67

All (15) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	5	THR
1	A	132	SER
1	A	136	ASN

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Mol	Chain	Res	Type
1	A	164	ASN
1	A	166	VAL
1	A	243	GLU
1	A	245	LEU
1	A	250	TRP
1	A	252	VAL
1	A	635	GLU
1	A	749	ASP
2	B	51	LEU
2	B	104	GLU
2	B	107	ASP
2	B	164	ARG

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (19) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	17	ASN
1	A	47	ASN
1	A	66	ASN
1	A	84	ASN
1	A	136	ASN
1	A	164	ASN
1	A	167	GLN
1	A	189	GLN
1	A	233	GLN
1	A	274	GLN
1	A	279	ASN
1	A	301	ASN
1	A	312	HIS
1	A	600	ASN
1	A	601	ASN
2	B	52	GLN
2	B	66	ASN
2	B	118	ASN
2	B	188	GLN

5.3.3 RNA ⓘ

There are no RNA molecules in this entry.

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

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

5.5 Carbohydrates [i](#)

There are no oligosaccharides in this entry.

5.6 Ligand geometry [i](#)

Of 3 ligands modelled in this entry, 2 are monoatomic - leaving 1 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	$\# Z > 2$
6	GNP	B	200	5	34,34,34	1.60	4 (11%)	47,54,54	0.85	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
6	GNP	B	200	5	-	3/18/38/38	0/3/3/3

All (4) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
6	B	200	GNP	PG-O2G	-4.55	1.44	1.56
6	B	200	GNP	PA-O3A	4.40	1.64	1.59
6	B	200	GNP	PB-O2B	-4.23	1.45	1.56
6	B	200	GNP	PB-O3A	2.25	1.61	1.59

There are no bond angle outliers.

There are no chirality outliers.

All (3) torsion outliers are listed below:

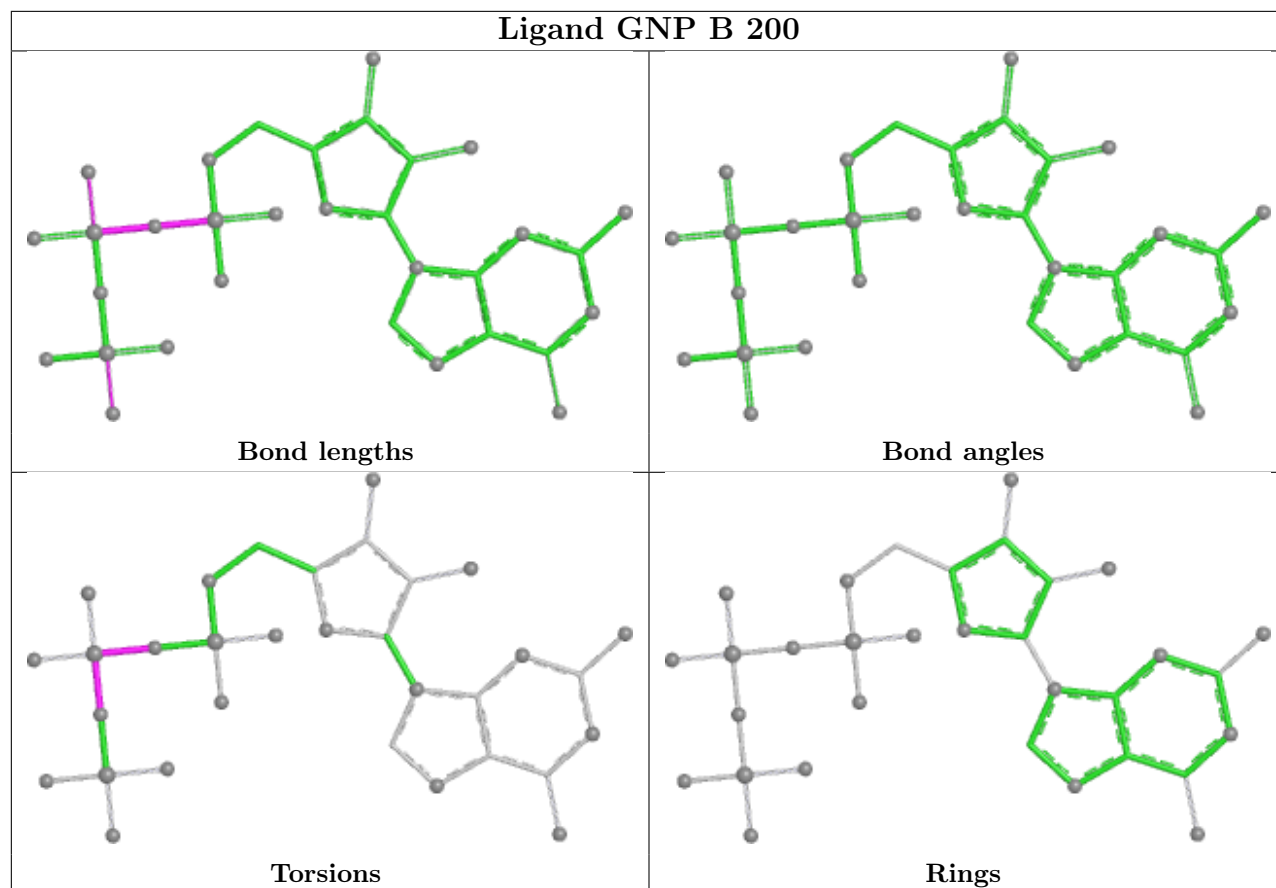
Mol	Chain	Res	Type	Atoms
6	B	200	GNP	PG-N3B-PB-O1B
6	B	200	GNP	PA-O3A-PB-O1B
6	B	200	GNP	PG-N3B-PB-O3A

There are no ring outliers.

1 monomer is involved in 5 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
6	B	200	GNP	5	0

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.



5.7 Other polymers [i](#)

There are no such residues in this entry.

5.8 Polymer linkage issues [i](#)

There are no chain breaks in this entry.

6 Fit of model and data

6.1 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	733/772 (94%)	0.11	20 (2%) 56 51	14, 28, 61, 92	0
2	B	164/167 (98%)	0.76	12 (7%) 21 19	20, 48, 70, 86	0
3	D	36/49 (73%)	0.85	4 (11%) 10 8	23, 51, 71, 75	0
All	All	933/988 (94%)	0.26	36 (3%) 43 38	14, 31, 67, 92	0

All (36) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	768	ALA	5.5
2	B	160	ILE	4.1
1	A	740	GLY	3.9
2	B	156	GLY	3.5
1	A	95	ASN	3.1
1	A	93	TYR	3.0
1	A	250	TRP	3.0
2	B	138	ASN	3.0
2	B	142	GLU	2.9
2	B	152	LEU	2.9
1	A	89	LEU	2.8
1	A	678	TYR	2.8
1	A	767	GLN	2.7
2	B	189	TYR	2.6
1	A	683	GLN	2.6
1	A	682	PRO	2.5
1	A	684	TYR	2.5
3	D	929	VAL	2.5
2	B	148	ALA	2.5
2	B	63	ALA	2.4
1	A	94	THR	2.4
1	A	98	GLN	2.4
1	A	677	GLY	2.3

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Mol	Chain	Res	Type	RSRZ
3	D	913	HIS	2.3
1	A	483	HIS	2.3
1	A	686	ASP	2.2
1	A	96	LEU	2.2
2	B	140	VAL	2.2
3	D	933	PRO	2.2
1	A	200	GLN	2.2
1	A	92	GLN	2.1
2	B	163	GLN	2.1
2	B	154	THR	2.1
2	B	161	GLU	2.1
1	A	76	SER	2.0
3	D	930	LYS	2.0

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

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

6.3 Carbohydrates [i](#)

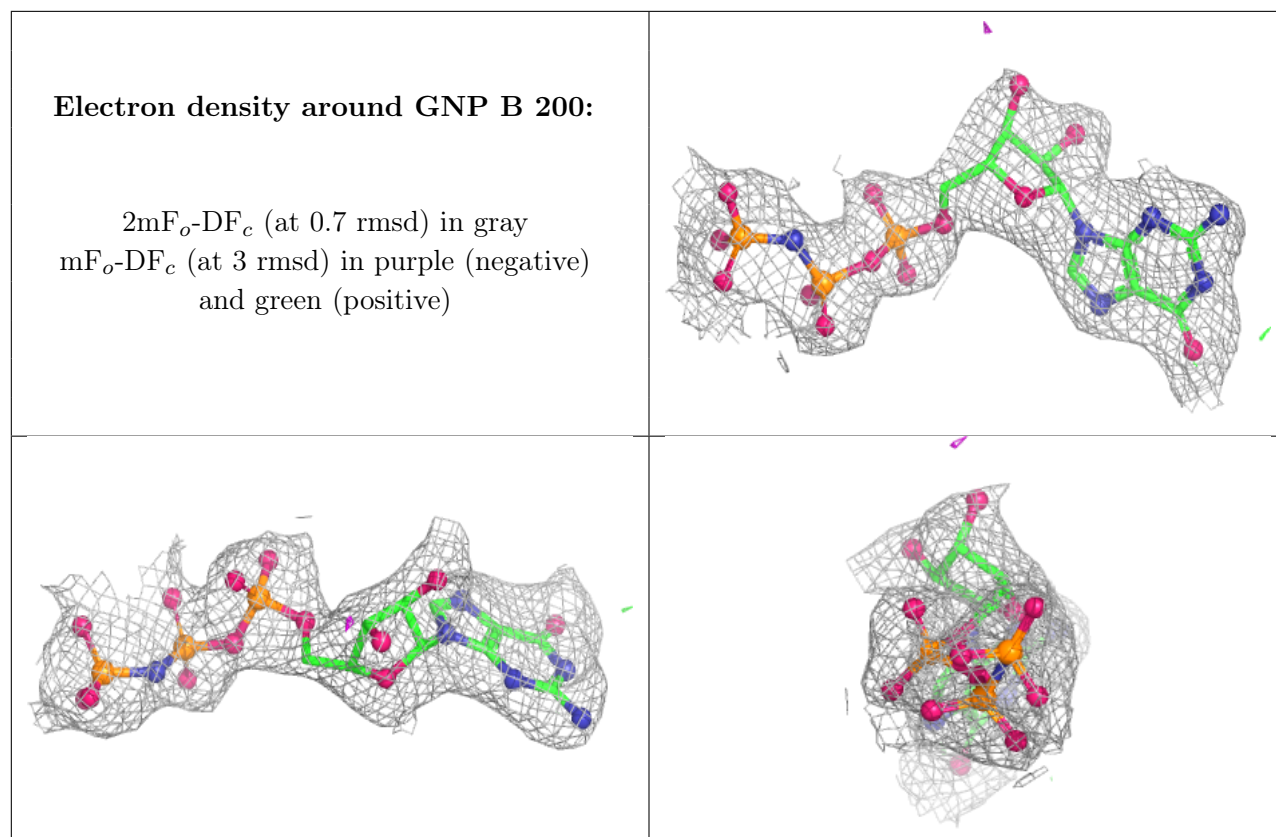
There are no oligosaccharides in this entry.

6.4 Ligands [i](#)

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
5	MG	B	210	1/1	0.96	0.05	28,28,28,28	0
6	GNP	B	200	32/32	0.96	0.07	25,33,39,40	0
4	ZN	A	800	1/1	0.98	0.03	42,42,42,42	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.



6.5 Other polymers [i](#)

There are no such residues in this entry.