



Full wwPDB X-ray Structure Validation Report ⓘ

Apr 5, 2026 – 11:42 AM UTC

PDB ID : 2IOV / pdb_00002iov
Title : Bright-state structure of the reversibly switchable fluorescent protein Dronpa
Authors : Stiel, A.C.; Trowitzsch, S.; Weber, G.; Andresen, M.; Eggeling, C.; Hell, S.W.;
Jakobs, S.; Wahl, M.C.
Deposited on : 2006-10-11
Resolution : 1.80 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
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

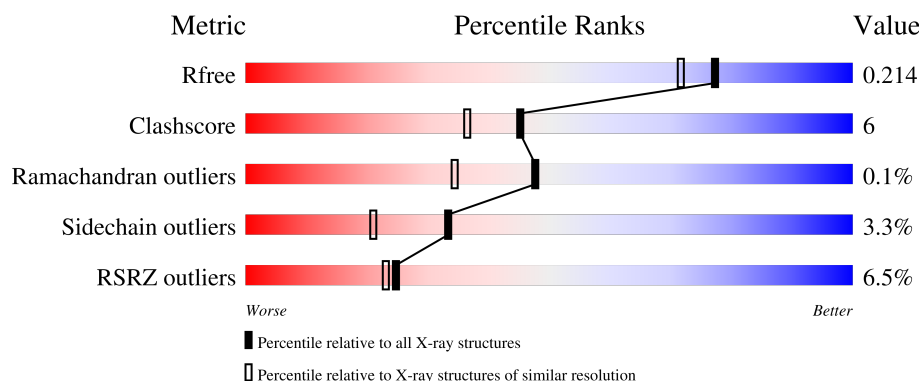
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 1.80 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	7662 (1.80-1.80)
Clashscore	190562	8479 (1.80-1.80)
Ramachandran outliers	187476	8391 (1.80-1.80)
Sidechain outliers	187428	8390 (1.80-1.80)
RSRZ outliers	180081	7663 (1.80-1.80)

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	255	13% 73% 10% • 15%
1	B	255	3% 74% 10% • 15%
1	C	255	5% 75% 11% • 13%
1	D	255	% 74% 12% • 14%

2 Entry composition

There are 2 unique types of molecules in this entry. The entry contains 8339 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 Fluorescent protein Dronpa.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	217	Total	C	N	O	S	0	8	0
			1816	1157	307	341	11			
1	B	217	Total	C	N	O	S	0	14	0
			1864	1187	317	349	11			
1	C	221	Total	C	N	O	S	0	5	0
			1826	1164	309	342	11			
1	D	220	Total	C	N	O	S	0	20	0
			1931	1229	328	362	12			

There are 144 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	-32	MET	-	cloning artifact	UNP Q5TLG6
A	-31	ARG	-	cloning artifact	UNP Q5TLG6
A	-30	GLY	-	cloning artifact	UNP Q5TLG6
A	-29	SER	-	cloning artifact	UNP Q5TLG6
A	-28	HIS	-	cloning artifact	UNP Q5TLG6
A	-27	HIS	-	cloning artifact	UNP Q5TLG6
A	-26	HIS	-	cloning artifact	UNP Q5TLG6
A	-25	HIS	-	cloning artifact	UNP Q5TLG6
A	-24	HIS	-	cloning artifact	UNP Q5TLG6
A	-23	HIS	-	cloning artifact	UNP Q5TLG6
A	-22	GLY	-	cloning artifact	UNP Q5TLG6
A	-21	MET	-	cloning artifact	UNP Q5TLG6
A	-20	ALA	-	cloning artifact	UNP Q5TLG6
A	-19	SER	-	cloning artifact	UNP Q5TLG6
A	-18	MET	-	cloning artifact	UNP Q5TLG6
A	-17	THR	-	cloning artifact	UNP Q5TLG6
A	-16	GLY	-	cloning artifact	UNP Q5TLG6
A	-15	GLY	-	cloning artifact	UNP Q5TLG6
A	-14	GLN	-	cloning artifact	UNP Q5TLG6
A	-13	GLN	-	cloning artifact	UNP Q5TLG6
A	-12	MET	-	cloning artifact	UNP Q5TLG6

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Chain	Residue	Modelled	Actual	Comment	Reference
A	-11	GLY	-	cloning artifact	UNP Q5TLG6
A	-10	ARG	-	cloning artifact	UNP Q5TLG6
A	-9	ASP	-	cloning artifact	UNP Q5TLG6
A	-8	LEU	-	cloning artifact	UNP Q5TLG6
A	-7	TYR	-	cloning artifact	UNP Q5TLG6
A	-6	ASP	-	cloning artifact	UNP Q5TLG6
A	-5	ASP	-	cloning artifact	UNP Q5TLG6
A	-4	ASP	-	cloning artifact	UNP Q5TLG6
A	-3	ASP	-	cloning artifact	UNP Q5TLG6
A	-2	LYS	-	cloning artifact	UNP Q5TLG6
A	-1	ASP	-	cloning artifact	UNP Q5TLG6
A	0	PRO	-	cloning artifact	UNP Q5TLG6
A	62	GYC	CYS	chromophore	UNP Q5TLG6
A	62	GYC	TYR	chromophore	UNP Q5TLG6
A	62	GYC	GLY	chromophore	UNP Q5TLG6
B	-32	MET	-	cloning artifact	UNP Q5TLG6
B	-31	ARG	-	cloning artifact	UNP Q5TLG6
B	-30	GLY	-	cloning artifact	UNP Q5TLG6
B	-29	SER	-	cloning artifact	UNP Q5TLG6
B	-28	HIS	-	cloning artifact	UNP Q5TLG6
B	-27	HIS	-	cloning artifact	UNP Q5TLG6
B	-26	HIS	-	cloning artifact	UNP Q5TLG6
B	-25	HIS	-	cloning artifact	UNP Q5TLG6
B	-24	HIS	-	cloning artifact	UNP Q5TLG6
B	-23	HIS	-	cloning artifact	UNP Q5TLG6
B	-22	GLY	-	cloning artifact	UNP Q5TLG6
B	-21	MET	-	cloning artifact	UNP Q5TLG6
B	-20	ALA	-	cloning artifact	UNP Q5TLG6
B	-19	SER	-	cloning artifact	UNP Q5TLG6
B	-18	MET	-	cloning artifact	UNP Q5TLG6
B	-17	THR	-	cloning artifact	UNP Q5TLG6
B	-16	GLY	-	cloning artifact	UNP Q5TLG6
B	-15	GLY	-	cloning artifact	UNP Q5TLG6
B	-14	GLN	-	cloning artifact	UNP Q5TLG6
B	-13	GLN	-	cloning artifact	UNP Q5TLG6
B	-12	MET	-	cloning artifact	UNP Q5TLG6
B	-11	GLY	-	cloning artifact	UNP Q5TLG6
B	-10	ARG	-	cloning artifact	UNP Q5TLG6
B	-9	ASP	-	cloning artifact	UNP Q5TLG6
B	-8	LEU	-	cloning artifact	UNP Q5TLG6
B	-7	TYR	-	cloning artifact	UNP Q5TLG6
B	-6	ASP	-	cloning artifact	UNP Q5TLG6

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Chain	Residue	Modelled	Actual	Comment	Reference
B	-5	ASP	-	cloning artifact	UNP Q5TLG6
B	-4	ASP	-	cloning artifact	UNP Q5TLG6
B	-3	ASP	-	cloning artifact	UNP Q5TLG6
B	-2	LYS	-	cloning artifact	UNP Q5TLG6
B	-1	ASP	-	cloning artifact	UNP Q5TLG6
B	0	PRO	-	cloning artifact	UNP Q5TLG6
B	62	GYC	CYS	chromophore	UNP Q5TLG6
B	62	GYC	TYR	chromophore	UNP Q5TLG6
B	62	GYC	GLY	chromophore	UNP Q5TLG6
C	-32	MET	-	cloning artifact	UNP Q5TLG6
C	-31	ARG	-	cloning artifact	UNP Q5TLG6
C	-30	GLY	-	cloning artifact	UNP Q5TLG6
C	-29	SER	-	cloning artifact	UNP Q5TLG6
C	-28	HIS	-	cloning artifact	UNP Q5TLG6
C	-27	HIS	-	cloning artifact	UNP Q5TLG6
C	-26	HIS	-	cloning artifact	UNP Q5TLG6
C	-25	HIS	-	cloning artifact	UNP Q5TLG6
C	-24	HIS	-	cloning artifact	UNP Q5TLG6
C	-23	HIS	-	cloning artifact	UNP Q5TLG6
C	-22	GLY	-	cloning artifact	UNP Q5TLG6
C	-21	MET	-	cloning artifact	UNP Q5TLG6
C	-20	ALA	-	cloning artifact	UNP Q5TLG6
C	-19	SER	-	cloning artifact	UNP Q5TLG6
C	-18	MET	-	cloning artifact	UNP Q5TLG6
C	-17	THR	-	cloning artifact	UNP Q5TLG6
C	-16	GLY	-	cloning artifact	UNP Q5TLG6
C	-15	GLY	-	cloning artifact	UNP Q5TLG6
C	-14	GLN	-	cloning artifact	UNP Q5TLG6
C	-13	GLN	-	cloning artifact	UNP Q5TLG6
C	-12	MET	-	cloning artifact	UNP Q5TLG6
C	-11	GLY	-	cloning artifact	UNP Q5TLG6
C	-10	ARG	-	cloning artifact	UNP Q5TLG6
C	-9	ASP	-	cloning artifact	UNP Q5TLG6
C	-8	LEU	-	cloning artifact	UNP Q5TLG6
C	-7	TYR	-	cloning artifact	UNP Q5TLG6
C	-6	ASP	-	cloning artifact	UNP Q5TLG6
C	-5	ASP	-	cloning artifact	UNP Q5TLG6
C	-4	ASP	-	cloning artifact	UNP Q5TLG6
C	-3	ASP	-	cloning artifact	UNP Q5TLG6
C	-2	LYS	-	cloning artifact	UNP Q5TLG6
C	-1	ASP	-	cloning artifact	UNP Q5TLG6
C	0	PRO	-	cloning artifact	UNP Q5TLG6

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Chain	Residue	Modelled	Actual	Comment	Reference
C	62	GYC	CYS	chromophore	UNP Q5TLG6
C	62	GYC	TYR	chromophore	UNP Q5TLG6
C	62	GYC	GLY	chromophore	UNP Q5TLG6
D	-32	MET	-	cloning artifact	UNP Q5TLG6
D	-31	ARG	-	cloning artifact	UNP Q5TLG6
D	-30	GLY	-	cloning artifact	UNP Q5TLG6
D	-29	SER	-	cloning artifact	UNP Q5TLG6
D	-28	HIS	-	cloning artifact	UNP Q5TLG6
D	-27	HIS	-	cloning artifact	UNP Q5TLG6
D	-26	HIS	-	cloning artifact	UNP Q5TLG6
D	-25	HIS	-	cloning artifact	UNP Q5TLG6
D	-24	HIS	-	cloning artifact	UNP Q5TLG6
D	-23	HIS	-	cloning artifact	UNP Q5TLG6
D	-22	GLY	-	cloning artifact	UNP Q5TLG6
D	-21	MET	-	cloning artifact	UNP Q5TLG6
D	-20	ALA	-	cloning artifact	UNP Q5TLG6
D	-19	SER	-	cloning artifact	UNP Q5TLG6
D	-18	MET	-	cloning artifact	UNP Q5TLG6
D	-17	THR	-	cloning artifact	UNP Q5TLG6
D	-16	GLY	-	cloning artifact	UNP Q5TLG6
D	-15	GLY	-	cloning artifact	UNP Q5TLG6
D	-14	GLN	-	cloning artifact	UNP Q5TLG6
D	-13	GLN	-	cloning artifact	UNP Q5TLG6
D	-12	MET	-	cloning artifact	UNP Q5TLG6
D	-11	GLY	-	cloning artifact	UNP Q5TLG6
D	-10	ARG	-	cloning artifact	UNP Q5TLG6
D	-9	ASP	-	cloning artifact	UNP Q5TLG6
D	-8	LEU	-	cloning artifact	UNP Q5TLG6
D	-7	TYR	-	cloning artifact	UNP Q5TLG6
D	-6	ASP	-	cloning artifact	UNP Q5TLG6
D	-5	ASP	-	cloning artifact	UNP Q5TLG6
D	-4	ASP	-	cloning artifact	UNP Q5TLG6
D	-3	ASP	-	cloning artifact	UNP Q5TLG6
D	-2	LYS	-	cloning artifact	UNP Q5TLG6
D	-1	ASP	-	cloning artifact	UNP Q5TLG6
D	0	PRO	-	cloning artifact	UNP Q5TLG6
D	62	GYC	CYS	chromophore	UNP Q5TLG6
D	62	GYC	TYR	chromophore	UNP Q5TLG6
D	62	GYC	GLY	chromophore	UNP Q5TLG6

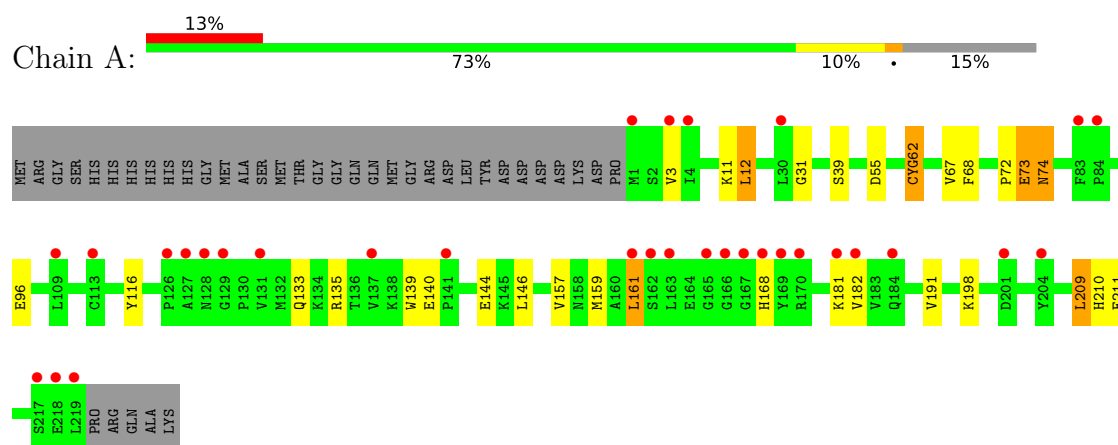
- Molecule 2 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
2	A	217	Total 221	O 221	0	4
2	B	193	Total 196	O 196	0	3
2	C	198	Total 202	O 202	0	4
2	D	275	Total 283	O 283	0	8

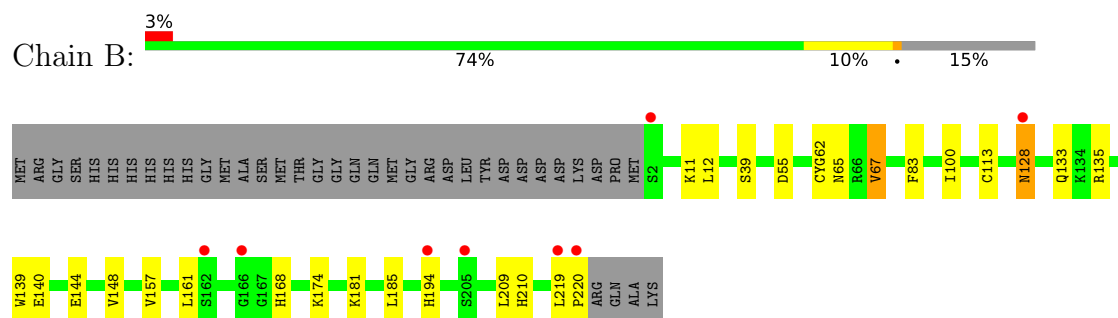
3 Residue-property plots [i](#)

These plots are drawn for all protein, RNA, DNA and oligosaccharide chains in the entry. The first graphic for a chain summarises the proportions of the various outlier classes displayed in the second graphic. The second graphic shows the sequence view annotated by issues in geometry and electron density. Residues are color-coded according to the number of geometric quality criteria for which they contain at least one outlier: green = 0, yellow = 1, orange = 2 and red = 3 or more. A red dot above a residue indicates a poor fit to the electron density ($RSRZ > 2$). Stretches of 2 or more consecutive residues without any outlier are shown as a green connector. Residues present in the sample, but not in the model, are shown in grey.

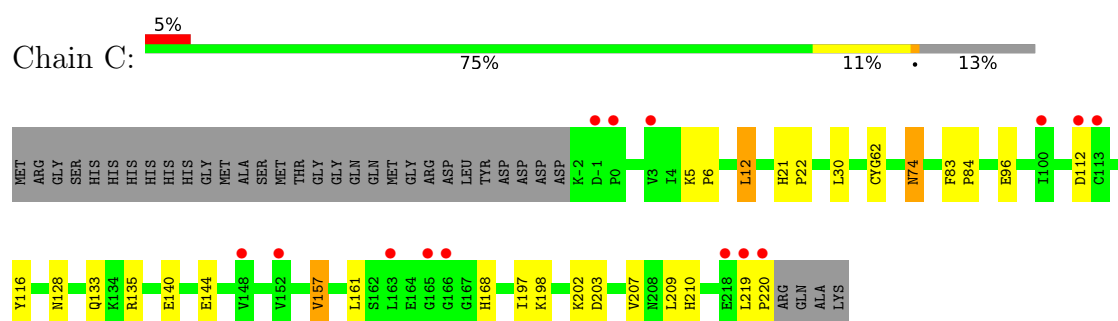
- Molecule 1: Fluorescent protein Dronpa



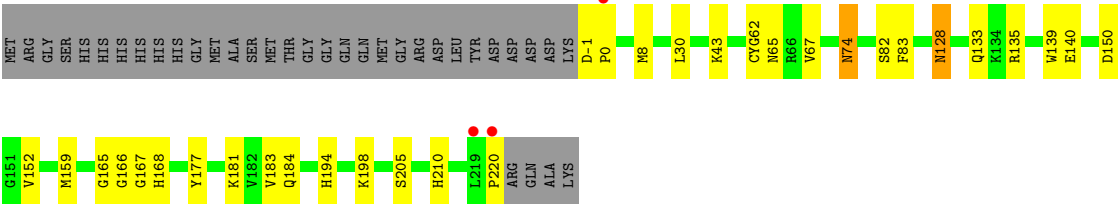
- Molecule 1: Fluorescent protein Dronpa



- Molecule 1: Fluorescent protein Dronpa



- Molecule 1: Fluorescent protein Dronpa



4 Data and refinement statistics

Property	Value	Source
Space group	I 2 2 2	Depositor
Cell constants a, b, c, α , β , γ	75.29Å 109.63Å 275.23Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	30.00 – 1.80 30.00 – 1.80	Depositor EDS
% Data completeness (in resolution range)	98.6 (30.00-1.80) 98.6 (30.00-1.80)	Depositor EDS
R_{merge}	(Not available)	Depositor
R_{sym}	0.07	Depositor
$\langle I/\sigma(I) \rangle$ ¹	1.36 (at 1.79Å)	Xtriage
Refinement program	REFMAC 5.2.0005	Depositor
R, R_{free}	0.185 , 0.216 0.183 , 0.214	Depositor DCC
R_{free} test set	5201 reflections (4.92%)	wwPDB-VP
Wilson B-factor (Å ²)	24.2	Xtriage
Anisotropy	0.611	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.34 , 39.8	EDS
L-test for twinning ²	$\langle L \rangle = 0.46$, $\langle L^2 \rangle = 0.29$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o, F_c correlation	0.95	EDS
Total number of atoms	8339	wwPDB-VP
Average B, all atoms (Å ²)	29.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 3.08% 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: GYC

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	0.58	0/1841	0.73	0/2482
1	B	0.55	0/1891	0.73	0/2550
1	C	0.59	0/1854	0.75	0/2503
1	D	0.64	0/1959	0.76	0/2644
All	All	0.59	0/7545	0.74	0/10179

Chiral center outliers are detected by calculating the chiral volume of a chiral center and verifying if the center is modelled as a planar moiety or with the opposite hand. A planarity outlier is detected by checking planarity of atoms in a peptide group, atoms in a mainchain group or atoms of a sidechain that are expected to be planar.

Mol	Chain	#Chirality outliers	#Planarity outliers
1	D	0	1

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

All (1) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	D	166[B]	GLY	Peptide

5.2 Too-close contacts [i](#)

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	1816	0	1736	22	0
1	B	1864	0	1779	22	0
1	C	1826	0	1743	17	0
1	D	1931	0	1842	28	0
2	A	221	0	0	1	0
2	B	196	0	0	4	0
2	C	202	0	0	1	0
2	D	283	0	0	4	0
All	All	8339	0	7100	86	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 6.

All (86) 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:C:5[A]:LYS:HD2	1:C:112[A]:ASP:OD2	1.30	1.26
1:B:194[B]:HIS:CE1	2:B:326[B]:HOH:O	1.87	1.21
1:B:65:ASN:HD21	1:B:67[A]:VAL:HG23	1.21	1.05
1:A:73:GLU:H	1:A:73:GLU:CD	1.67	1.01
1:B:65:ASN:ND2	1:B:67[A]:VAL:HG23	1.75	1.01
1:C:5[A]:LYS:CD	1:C:112[A]:ASP:OD2	2.08	1.00
1:B:133:GLN:HE21	1:B:135:ARG:HE	1.23	0.85
1:D:133[A]:GLN:HG3	1:D:135[A]:ARG:HH22	1.45	0.81
1:B:11[A]:LYS:NZ	1:B:113[A]:CYS:SG	2.55	0.80
1:B:39[A]:SER:OG	1:B:210[A]:HIS:CE1	2.36	0.79
1:A:140:GLU:OE2	1:A:168:HIS:HE1	1.67	0.78
1:D:133[A]:GLN:HG3	1:D:135[A]:ARG:NH2	1.98	0.78
1:B:65:ASN:HD21	1:B:67[A]:VAL:CG2	1.97	0.76
1:A:133:GLN:HE21	1:A:135:ARG:HE	1.31	0.75
1:D:140:GLU:OE2	1:D:168:HIS:HE1	1.72	0.72
1:B:140:GLU:OE2	1:B:168:HIS:HE1	1.72	0.71
1:A:74:ASN:HD22	1:A:74:ASN:H	1.39	0.69
1:C:5[A]:LYS:CE	1:C:112[A]:ASP:OD2	2.42	0.68
1:A:73:GLU:CD	1:A:73:GLU:N	2.49	0.67
1:D:220:PRO:HD3	2:D:490:HOH:O	1.94	0.66
1:B:67[B]:VAL:HG11	1:B:83:PHE:CE1	2.32	0.65
1:D:67[A]:VAL:HG11	1:D:83:PHE:CE1	2.38	0.59
1:B:67[B]:VAL:HG11	1:B:83:PHE:HE1	1.68	0.57
1:B:128[A]:ASN:ND2	1:B:128[A]:ASN:H	2.01	0.57
1:A:96:GLU:OE1	1:D:168:HIS:HD2	1.87	0.57
1:A:168:HIS:HD2	1:D:165:GLY:O	1.86	0.56

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:C:74:ASN:H	1:C:74:ASN:HD22	1.53	0.56
1:C:5[B]:LYS:HB2	1:C:6:PRO:HD2	1.88	0.55
1:B:133:GLN:HG2	2:B:371:HOH:O	2.08	0.54
1:C:140:GLU:OE2	1:C:168:HIS:HE1	1.91	0.54
1:D:152:VAL:HG22	1:D:177:TYR:O	2.09	0.53
1:D:133[A]:GLN:CG	1:D:135[A]:ARG:NH2	2.72	0.53
1:D:65:ASN:ND2	1:D:67[A]:VAL:HG22	2.24	0.52
1:D:128[A]:ASN:ND2	1:D:128[A]:ASN:H	2.07	0.52
1:A:55:ASP:HB3	1:A:161:LEU:HD11	1.91	0.52
1:D:150:ASP:HB3	2:D:383:HOH:O	2.09	0.52
1:C:128:ASN:HB2	2:C:285:HOH:O	2.10	0.51
1:C:133:GLN:HE21	1:C:135:ARG:HD3	1.75	0.51
1:D:198:LYS:HG3	1:D:210[A]:HIS:ND1	2.26	0.51
1:A:12:LEU:HB2	1:A:116:TYR:HB2	1.93	0.50
1:A:72:PRO:HB2	1:A:74:ASN:ND2	2.26	0.50
1:D:67[A]:VAL:HG11	1:D:83:PHE:HE1	1.76	0.50
1:C:198:LYS:HG3	1:C:210[A]:HIS:ND1	2.27	0.49
1:B:133:GLN:NE2	1:B:135:ARG:HE	2.02	0.49
1:C:12:LEU:HB2	1:C:116:TYR:HB2	1.93	0.49
1:A:146:LEU:HD13	1:A:191:VAL:HG23	1.95	0.48
1:A:3:VAL:HG22	2:A:441:HOH:O	2.12	0.48
1:D:-1:ASP:HB3	1:D:0:PRO:HD3	1.95	0.48
1:D:194[B]:HIS:HD2	2:D:285:HOH:O	1.97	0.48
1:A:144:GLU:HA	1:A:157:VAL:HB	1.94	0.47
1:A:62:GYC:SG1	1:A:209:LEU:HD13	2.54	0.47
1:A:74:ASN:HD22	1:A:74:ASN:N	2.10	0.47
1:A:139:TRP:CE3	1:A:159:MET:HE3	2.50	0.47
1:B:168:HIS:HD2	1:C:96:GLU:OE1	1.98	0.47
1:B:55:ASP:HB3	1:B:161:LEU:HD11	1.95	0.47
1:D:133[A]:GLN:CB	1:D:135[A]:ARG:NH2	2.78	0.46
1:D:43[B]:LYS:HA	1:D:205[B]:SER:O	2.14	0.46
1:B:67[B]:VAL:CG1	1:B:83:PHE:HE1	2.29	0.45
1:A:31:GLY:HA3	1:A:68:PHE:CE1	2.52	0.45
1:A:133:GLN:NE2	1:A:135:ARG:HE	2.08	0.45
1:C:197:ILE:HG23	1:C:207:VAL:HG13	1.99	0.44
1:D:65:ASN:HD21	1:D:67[A]:VAL:HG13	1.82	0.44
1:A:139:TRP:CD2	1:A:161:LEU:HD13	2.54	0.43
1:C:74:ASN:H	1:C:74:ASN:ND2	2.16	0.43
1:D:183[A]:VAL:HG12	1:D:184:GLN:O	2.18	0.43
1:C:219:LEU:HB3	1:C:220:PRO:HA	2.00	0.43
1:B:220:PRO:HD3	2:B:300:HOH:O	2.18	0.43

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:D:139:TRP:CE3	1:D:159:MET:HE3	2.54	0.42
1:B:219:LEU:HA	1:B:220:PRO:HA	1.87	0.42
1:B:174:LYS:HE3	2:B:356:HOH:O	2.19	0.42
1:D:-1:ASP:HB2	2:D:430:HOH:O	2.18	0.42
1:D:67[A]:VAL:CG1	1:D:83:PHE:HE1	2.31	0.42
1:C:83:PHE:HB3	1:C:84:PRO:HA	2.01	0.42
1:B:144:GLU:HA	1:B:157:VAL:HB	2.02	0.41
1:D:8:MET:O	1:D:30[A]:LEU:HD12	2.20	0.41
1:D:65:ASN:CG	1:D:67[A]:VAL:HG22	2.45	0.41
1:A:39:SER:HA	1:A:209:LEU:O	2.20	0.41
1:C:21:HIS:HA	1:C:22:PRO:HD3	1.77	0.41
1:B:148:VAL:HG21	1:B:185:LEU:HB3	2.03	0.41
1:A:62:GYC:HB12	1:A:211:GLU:OE1	2.20	0.41
1:B:139:TRP:CD2	1:B:161:LEU:HD13	2.56	0.40
1:A:198:LYS:HG3	1:A:210[A]:HIS:ND1	2.35	0.40
1:D:82[A]:SER:O	1:D:181:LYS:HE2	2.22	0.40
1:C:144:GLU:HG3	1:C:157:VAL:HG22	2.02	0.40

There are no symmetry-related clashes.

5.3 Torsion angles

5.3.1 Protein backbone

In the following table, the Percentiles column shows the percent Ramachandran 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 backbone conformation was analysed, and the total number of residues.

Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
1	A	220/255 (86%)	220 (100%)	0	0	100	100
1	B	226/255 (89%)	225 (100%)	1 (0%)	0	100	100
1	C	221/255 (87%)	216 (98%)	5 (2%)	0	100	100
1	D	235/255 (92%)	233 (99%)	1 (0%)	1 (0%)	30	19
All	All	902/1020 (88%)	894 (99%)	7 (1%)	1 (0%)	48	34

All (1) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	D	167	GLY

5.3.2 Protein sidechains ⓘ

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	195/218 (89%)	185 (95%)	10 (5%)	21	9
1	B	201/218 (92%)	191 (95%)	10 (5%)	22	10
1	C	196/218 (90%)	188 (96%)	8 (4%)	27	15
1	D	209/218 (96%)	206 (99%)	3 (1%)	59	52
All	All	801/872 (92%)	770 (96%)	31 (4%)	33	16

All (31) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	11	LYS
1	A	12	LEU
1	A	67	VAL
1	A	73	GLU
1	A	74	ASN
1	A	161	LEU
1	A	181[A]	LYS
1	A	181[B]	LYS
1	A	182	VAL
1	A	209	LEU
1	B	12[A]	LEU
1	B	12[B]	LEU
1	B	67[A]	VAL
1	B	67[B]	VAL
1	B	100	ILE
1	B	128[A]	ASN
1	B	128[B]	ASN
1	B	181[A]	LYS
1	B	181[B]	LYS
1	B	209	LEU
1	C	12	LEU

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Mol	Chain	Res	Type
1	C	30	LEU
1	C	74	ASN
1	C	157	VAL
1	C	161	LEU
1	C	202	LYS
1	C	203	ASP
1	C	209	LEU
1	D	74	ASN
1	D	128[A]	ASN
1	D	128[B]	ASN

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (16) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	65	ASN
1	A	74	ASN
1	A	133	GLN
1	A	168	HIS
1	B	38	GLN
1	B	65	ASN
1	B	133	GLN
1	B	168	HIS
1	B	206	ASN
1	C	65	ASN
1	C	74	ASN
1	C	133	GLN
1	C	168	HIS
1	D	65	ASN
1	D	74	ASN
1	D	168	HIS

5.3.3 RNA ⓘ

There are no RNA molecules in this entry.

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

4 non-standard protein/DNA/RNA residues are modelled in this entry.

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
1	GYC	B	62	1	21,22,23	2.66	6 (28%)	26,30,32	1.85	4 (15%)
1	GYC	C	62	1	21,22,23	2.71	5 (23%)	26,30,32	2.22	8 (30%)
1	GYC	A	62	1	21,22,23	2.69	7 (33%)	26,30,32	2.05	7 (26%)
1	GYC	D	62	1	21,22,23	2.86	6 (28%)	26,30,32	1.78	5 (19%)

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
1	GYC	B	62	1	-	1/10/29/30	0/2/2/2
1	GYC	C	62	1	-	2/10/29/30	0/2/2/2
1	GYC	A	62	1	-	1/10/29/30	0/2/2/2
1	GYC	D	62	1	-	2/10/29/30	0/2/2/2

All (24) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	D	62	GYC	CA2-C2	-7.62	1.40	1.48
1	C	62	GYC	CA2-C2	-7.59	1.40	1.48
1	B	62	GYC	CA2-C2	-6.89	1.41	1.48
1	A	62	GYC	CA2-C2	-6.60	1.41	1.48
1	D	62	GYC	CB2-CA2	6.24	1.41	1.35
1	A	62	GYC	CB2-CA2	5.96	1.40	1.35
1	B	62	GYC	OH-CZ	-5.84	1.23	1.37
1	D	62	GYC	OH-CZ	-5.74	1.24	1.37
1	C	62	GYC	OH-CZ	-5.74	1.24	1.37
1	A	62	GYC	OH-CZ	-5.70	1.24	1.37
1	C	62	GYC	CB2-CA2	5.44	1.40	1.35
1	B	62	GYC	CB2-CA2	5.21	1.40	1.35
1	D	62	GYC	CG2-CB2	-3.58	1.40	1.46
1	B	62	GYC	C2-N3	-3.56	1.31	1.40
1	C	62	GYC	CG2-CB2	-3.25	1.40	1.46
1	B	62	GYC	CG2-CB2	-3.17	1.41	1.46

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Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	D	62	GYC	C2-N3	-3.16	1.32	1.40
1	A	62	GYC	CG2-CB2	-3.11	1.41	1.46
1	C	62	GYC	C2-N3	-3.08	1.32	1.40
1	A	62	GYC	C2-N3	-2.88	1.33	1.40
1	D	62	GYC	C1-N3	-2.24	1.33	1.37
1	A	62	GYC	CA2-N2	-2.21	1.33	1.38
1	B	62	GYC	C1-N3	-2.05	1.33	1.37
1	A	62	GYC	CB1-CA1	2.04	1.55	1.53

All (24) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	C	62	GYC	O2-C2-CA2	-5.83	127.30	131.02
1	B	62	GYC	CA2-C2-N3	5.49	108.11	103.50
1	A	62	GYC	O2-C2-CA2	-5.18	127.71	131.02
1	C	62	GYC	CA2-C2-N3	5.18	107.85	103.50
1	D	62	GYC	CA2-C2-N3	5.11	107.79	103.50
1	A	62	GYC	CA2-C2-N3	5.08	107.77	103.50
1	B	62	GYC	O2-C2-CA2	-4.64	128.06	131.02
1	C	62	GYC	CG2-CB2-CA2	-3.71	125.45	129.87
1	A	62	GYC	C2-CA2-N2	-3.69	106.31	108.95
1	C	62	GYC	CB2-CA2-N2	3.68	133.76	128.76
1	D	62	GYC	O2-C2-CA2	-3.45	128.82	131.02
1	C	62	GYC	C2-CA2-N2	-3.35	106.55	108.95
1	A	62	GYC	CA2-N2-C1	3.29	108.37	105.80
1	D	62	GYC	C2-CA2-N2	-3.04	106.77	108.95
1	B	62	GYC	C2-CA2-N2	-2.97	106.82	108.95
1	D	62	GYC	CB2-CA2-N2	2.92	132.73	128.76
1	C	62	GYC	CA2-N2-C1	2.82	108.01	105.80
1	B	62	GYC	CB2-CA2-N2	2.75	132.49	128.76
1	A	62	GYC	CB2-CA2-N2	2.43	132.06	128.76
1	D	62	GYC	CG2-CB2-CA2	-2.32	127.10	129.87
1	C	62	GYC	N3-C1-N2	-2.31	109.66	111.48
1	C	62	GYC	CB2-CA2-C2	-2.20	119.69	122.36
1	A	62	GYC	CG2-CB2-CA2	-2.11	127.36	129.87
1	A	62	GYC	CA3-N3-C2	2.00	128.07	123.67

There are no chirality outliers.

All (6) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
1	A	62	GYC	C3-CA3-N3-C2

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Mol	Chain	Res	Type	Atoms
1	B	62	GYC	C3-CA3-N3-C2
1	C	62	GYC	C3-CA3-N3-C2
1	D	62	GYC	C3-CA3-N3-C2
1	D	62	GYC	C3-CA3-N3-C1
1	C	62	GYC	N2-CA2-CB2-CG2

There are no ring outliers.

1 monomer is involved in 2 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
1	A	62	GYC	2	0

5.5 Carbohydrates [i](#)

There are no oligosaccharides in this entry.

5.6 Ligand geometry [i](#)

There are no ligands in this entry.

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 [i](#)

6.1 Protein, DNA and RNA chains [i](#)

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	216/255 (84%)	1.03	32 (14%) 5 4	13, 27, 34, 54	13 (6%)
1	B	216/255 (84%)	0.62	8 (3%) 45 45	12, 29, 37, 49	20 (9%)
1	C	220/255 (86%)	0.80	14 (6%) 25 24	13, 29, 38, 56	10 (4%)
1	D	219/255 (85%)	0.21	3 (1%) 73 73	11, 23, 31, 47	23 (10%)
All	All	871/1020 (85%)	0.66	57 (6%) 25 23	11, 28, 36, 56	66 (7%)

All (57) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	D	220	PRO	5.7
1	C	220	PRO	5.4
1	C	219	LEU	5.1
1	B	220	PRO	4.8
1	C	165	GLY	4.6
1	A	137	VAL	4.2
1	A	218	GLU	3.9
1	A	163	LEU	3.7
1	A	219	LEU	3.5
1	A	1	MET	3.5
1	C	113	CYS	3.2
1	A	127	ALA	3.2
1	A	166	GLY	3.1
1	A	30	LEU	3.1
1	A	168	HIS	3.0
1	C	166	GLY	2.9
1	A	3	VAL	2.9
1	D	219	LEU	2.9
1	A	109	LEU	2.8
1	C	218	GLU	2.8
1	A	162[A]	SER	2.7

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Mol	Chain	Res	Type	RSRZ
1	C	152	VAL	2.7
1	B	162[A]	SER	2.7
1	B	219	LEU	2.6
1	A	131	VAL	2.6
1	A	182	VAL	2.6
1	A	113	CYS	2.5
1	A	169	TYR	2.5
1	C	163	LEU	2.5
1	A	128[A]	ASN	2.5
1	B	166	GLY	2.4
1	B	128[A]	ASN	2.3
1	B	205	SER	2.3
1	C	3	VAL	2.3
1	A	181[A]	LYS	2.3
1	B	2	SER	2.3
1	A	204	TYR	2.3
1	A	84	PRO	2.3
1	C	100	ILE	2.2
1	A	184	GLN	2.2
1	A	126	PRO	2.2
1	A	170	ARG	2.2
1	A	201[A]	ASP	2.2
1	C	112[A]	ASP	2.2
1	A	83	PHE	2.2
1	A	161	LEU	2.2
1	A	129	GLY	2.1
1	D	0	PRO	2.1
1	A	165	GLY	2.1
1	B	194[A]	HIS	2.1
1	C	-1	ASP	2.1
1	A	217	SER	2.1
1	C	148	VAL	2.1
1	A	141	PRO	2.1
1	A	4	ILE	2.0
1	A	167	GLY	2.0
1	C	0	PRO	2.0

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

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
1	GYC	B	62	21/22	0.95	0.08	27,29,34,35	0
1	GYC	C	62	21/22	0.95	0.07	25,27,31,32	0
1	GYC	A	62	21/22	0.96	0.07	25,28,32,32	0
1	GYC	D	62	21/22	0.96	0.07	22,23,26,27	0

6.3 Carbohydrates [i](#)

There are no oligosaccharides in this entry.

6.4 Ligands [i](#)

There are no ligands in this entry.

6.5 Other polymers [i](#)

There are no such residues in this entry.