



Full wwPDB X-ray Structure Validation Report ⓘ

Mar 5, 2026 – 08:10 PM UTC

PDB ID : 4J8A / pdb_00004j8a
Title : Irradiated-state structure of sfGFP containing the unnatural amino acid p-azido-phenylalanine at residue 145
Authors : Reddington, S.C.; Jones, D.D.; Rizkallah, P.J.; Tippmann, E.M.
Deposited on : 2013-02-14
Resolution : 1.26 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

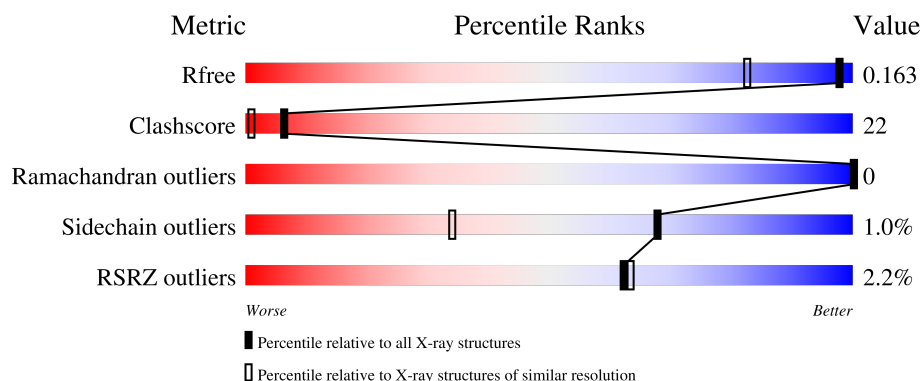
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 1.26 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	1693 (1.28-1.24)
Clashscore	190562	1730 (1.28-1.24)
Ramachandran outliers	187476	1695 (1.28-1.24)
Sidechain outliers	187428	1694 (1.28-1.24)
RSRZ outliers	180081	1693 (1.28-1.24)

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	245	

The following table lists non-polymeric compounds, carbohydrate monomers and non-standard residues in protein, DNA, RNA chains that are outliers for geometric or electron-density-fit criteria:

Mol	Type	Chain	Res	Chirality	Geometry	Clashes	Electron density
1	HOX	A	145[B]	-	-	X	-

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Mol	Type	Chain	Res	Chirality	Geometry	Clashes	Electron density
3	EDO	A	311	-	-	X	-
3	EDO	A	330	-	X	-	-
3	EDO	A	331[B]	-	-	X	-
3	EDO	A	335	-	-	X	-
4	TRS	A	336	-	X	-	-

2 Entry composition

There are 5 unique types of molecules in this entry. The entry contains 2462 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 Green fluorescent protein.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	229	Total	C	N	O	S	0	25	0
			2028	1279	350	393	6			

There are 24 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	0	MET	-	expression tag	UNP P42212
A	1	VAL	-	expression tag	UNP P42212
A	30	ARG	SER	engineered mutation	UNP P42212
A	39	ASN	TYR	engineered mutation	UNP P42212
A	66	CRO	PHE	SEE REMARK 999	UNP P42212
A	66	CRO	SER	SEE REMARK 999	UNP P42212
A	66	CRO	TYR	SEE REMARK 999	UNP P42212
A	66	CRO	GLY	SEE REMARK 999	UNP P42212
A	80	ARG	GLN	engineered mutation	UNP P42212
A	99	SER	PHE	engineered mutation	UNP P42212
A	105	THR	ASN	engineered mutation	UNP P42212
A	145	HOX	TYR	engineered mutation	UNP P42212
A	153	THR	MET	engineered mutation	UNP P42212
A	163	ALA	VAL	engineered mutation	UNP P42212
A	171	VAL	ILE	engineered mutation	UNP P42212
A	206	VAL	ALA	engineered mutation	UNP P42212
A	239	GLY	-	expression tag	UNP P42212
A	240	SER	-	expression tag	UNP P42212
A	241	HIS	-	expression tag	UNP P42212
A	242	HIS	-	expression tag	UNP P42212
A	243	HIS	-	expression tag	UNP P42212
A	244	HIS	-	expression tag	UNP P42212
A	245	HIS	-	expression tag	UNP P42212
A	246	HIS	-	expression tag	UNP P42212

- Molecule 2 is SULFATE ION (CCD ID: SO4) (formula: O₄S).



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

- Molecule 3 is 1,2-ETHANEDIOL (CCD ID: EDO) (formula: C₂H₆O₂).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
3	A	1	Total	C	O	0	0
			4	2	2		
3	A	1	Total	C	O	0	1
			8	4	4		
3	A	1	Total	C	O	0	1
			8	4	4		
3	A	1	Total	C	O	0	0
			4	2	2		
3	A	1	Total	C	O	0	0
			4	2	2		
3	A	1	Total	C	O	0	0
			4	2	2		
3	A	1	Total	C	O	0	1
			8	4	4		
3	A	1	Total	C	O	0	0
			4	2	2		
3	A	1	Total	C	O	0	0
			4	2	2		
3	A	1	Total	C	O	0	0
			4	2	2		
3	A	1	Total	C	O	0	0
			4	2	2		
3	A	1	Total	C	O	0	0
			4	2	2		

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Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
3	A	1	Total	C	O	0	0
			4	2	2		
3	A	1	Total	C	O	0	0
			4	2	2		
3	A	1	Total	C	O	0	0
			4	2	2		
3	A	1	Total	C	O	0	0
			4	2	2		
3	A	1	Total	C	O	0	0
			4	2	2		
3	A	1	Total	C	O	0	0
			4	2	2		
3	A	1	Total	C	O	0	0
			4	2	2		
3	A	1	Total	C	O	0	0
			4	2	2		
3	A	1	Total	C	O	0	0
			4	2	2		
3	A	1	Total	C	O	0	1
			8	4	4		
3	A	1	Total	C	O	0	0
			4	2	2		
3	A	1	Total	C	O	0	0
			4	2	2		
3	A	1	Total	C	O	0	0
			4	2	2		
3	A	1	Total	C	O	0	0
			4	2	2		

- Molecule 4 is 2-AMINO-2-HYDROXYMETHYL-PROPANE-1,3-DIOL (CCD ID: TRS) (formula: C₄H₁₂NO₃).



Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
4	A	1	Total	C	N	O	0	0
			8	4	1	3		

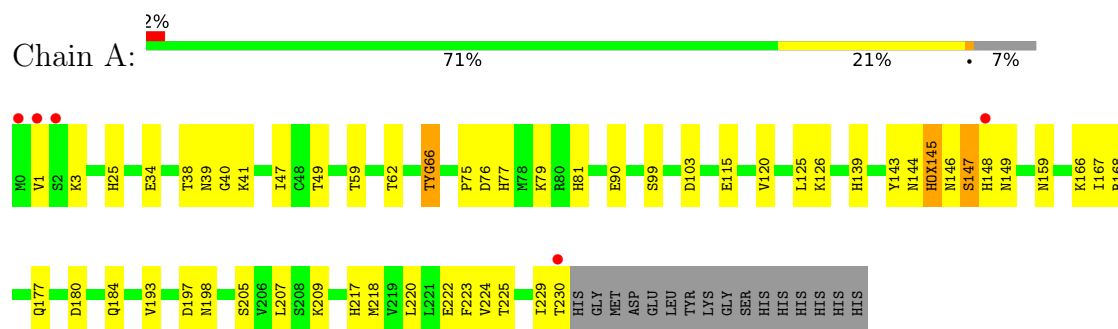
- Molecule 5 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
5	A	260	Total	O	0	0
			260	260		

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: Green fluorescent protein



4 Data and refinement statistics

Property	Value	Source
Space group	P 21 21 21	Depositor
Cell constants a, b, c, α , β , γ	46.50Å 58.70Å 91.63Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	14.79 – 1.26 14.79 – 1.26	Depositor EDS
% Data completeness (in resolution range)	98.9 (14.79-1.26) 98.9 (14.79-1.26)	Depositor EDS
R_{merge}	0.03	Depositor
R_{sym}	0.03	Depositor
$\langle I/\sigma(I) \rangle$ ¹	2.27 (at 1.26Å)	Xtriage
Refinement program	REFMAC 5.7.0029	Depositor
R, R_{free}	0.129 , 0.165 0.127 , 0.163	Depositor DCC
R_{free} test set	3429 reflections (5.06%)	wwPDB-VP
Wilson B-factor (Å ²)	16.6	Xtriage
Anisotropy	0.165	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.40 , 55.3	EDS
L-test for twinning ²	$\langle L \rangle = 0.48$, $\langle L^2 \rangle = 0.31$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o, F_c correlation	0.98	EDS
Total number of atoms	2462	wwPDB-VP
Average B, all atoms (Å ²)	23.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 5.88% 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: HOX, TRS, EDO, SO4, CRO

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	1.18	2/2020 (0.1%)	0.72	0/2730

All (2) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	A	3	LYS	C-O	10.05	1.35	1.24
1	A	1	VAL	CA-C	6.38	1.60	1.52

There are no bond angle outliers.

There are no chirality outliers.

There are no planarity outliers.

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	2028	0	1935	87	0
2	A	30	0	0	2	0
3	A	136	0	200	44	0
4	A	8	0	12	4	0
5	A	260	0	0	18	0
All	All	2462	0	2147	97	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 22.

All (97) 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:145[B]:HOX:HE1	3:A:331[B]:EDO:C1	1.67	1.24
1:A:207[A]:LEU:CD2	1:A:220[A]:LEU:HD13	1.74	1.17
1:A:207[A]:LEU:CD2	1:A:220[A]:LEU:CD1	2.24	1.14
1:A:145[B]:HOX:HE1	3:A:331[B]:EDO:H11	1.24	1.09
1:A:75:PRO:HB3	4:A:336:TRS:N	1.68	1.09
1:A:145[B]:HOX:CE1	3:A:331[B]:EDO:H11	1.89	1.01
1:A:145[B]:HOX:CE1	3:A:331[B]:EDO:C1	2.40	0.99
1:A:207[A]:LEU:HD23	1:A:220[A]:LEU:HD12	1.47	0.96
1:A:103:ASP:HB2	3:A:330:EDO:H11	1.49	0.95
1:A:145[B]:HOX:HE1	3:A:331[B]:EDO:H12	1.46	0.94
1:A:66:CRO:CZ	1:A:145[B]:HOX:HE2	1.99	0.93
1:A:75:PRO:HB3	4:A:336:TRS:HN2	1.32	0.91
1:A:166[A]:LYS:H	3:A:311:EDO:H22	1.39	0.88
1:A:120[B]:VAL:HG23	1:A:120[B]:VAL:O	1.73	0.87
1:A:207[A]:LEU:HD22	1:A:220[A]:LEU:HD13	1.54	0.87
1:A:207[A]:LEU:HD21	1:A:220[A]:LEU:CD1	2.03	0.86
1:A:207[A]:LEU:HD23	1:A:220[A]:LEU:CD1	2.03	0.86
1:A:145[B]:HOX:CE1	1:A:167:ILE:HG21	2.07	0.83
3:A:335:EDO:H12	5:A:622:HOH:O	1.77	0.83
1:A:148[A]:HIS:NE2	5:A:628:HOH:O	2.12	0.82
1:A:62:THR:HG23	1:A:145[B]:HOX:CZ	2.09	0.82
3:A:334:EDO:H21	5:A:631:HOH:O	1.78	0.81
1:A:166[B]:LYS:H	3:A:311:EDO:H22	1.46	0.80
1:A:184[B]:GLN:NE2	3:A:308[B]:EDO:O2	2.16	0.79
1:A:62:THR:CG2	1:A:145[B]:HOX:CZ	2.63	0.77
1:A:120[B]:VAL:HG23	5:A:459:HOH:O	1.86	0.75
1:A:38[B]:THR:HG23	5:A:568:HOH:O	1.89	0.72
1:A:120[B]:VAL:O	1:A:120[B]:VAL:CG2	2.37	0.72
1:A:66:CRO:CE1	1:A:145[B]:HOX:HE2	2.21	0.71
1:A:207[A]:LEU:HD21	1:A:220[A]:LEU:HD13	1.63	0.70
1:A:209:LYS:CE	3:A:310:EDO:H12	2.21	0.70
1:A:166[A]:LYS:N	3:A:311:EDO:H22	2.06	0.69
1:A:166[A]:LYS:HD3	3:A:312[A]:EDO:H22	1.74	0.69
3:A:335:EDO:H22	5:A:521:HOH:O	1.92	0.68
1:A:66:CRO:OH	1:A:145[B]:HOX:HE2	1.95	0.66
1:A:75:PRO:CB	4:A:336:TRS:N	2.52	0.66
1:A:209:LYS:HE3	3:A:310:EDO:H12	1.79	0.64
1:A:139:HIS:HD2	2:A:301:SO4:O2	1.81	0.63
1:A:146[B]:ASN:OD1	1:A:168:ARG:O	2.17	0.62
1:A:145[B]:HOX:CE1	3:A:331[B]:EDO:H12	2.20	0.61

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:177:GLN:OE1	3:A:330:EDO:H12	2.01	0.60
1:A:166[A]:LYS:H	3:A:311:EDO:C2	2.13	0.60
1:A:115:GLU:OE2	1:A:120[B]:VAL:HG21	2.02	0.59
1:A:145[B]:HOX:CZ	1:A:167:ILE:HD12	2.32	0.59
3:A:335:EDO:C2	5:A:521:HOH:O	2.51	0.58
1:A:144[B]:ASN:OD1	1:A:145[B]:HOX:N	2.36	0.58
1:A:145[B]:HOX:CD1	3:A:331[B]:EDO:H11	2.34	0.57
1:A:145[B]:HOX:CD1	1:A:167:ILE:HG21	2.35	0.57
1:A:145[B]:HOX:HE1	1:A:167:ILE:HG21	1.87	0.57
1:A:120[B]:VAL:CG2	5:A:459:HOH:O	2.48	0.57
1:A:166[B]:LYS:N	3:A:311:EDO:H22	2.10	0.56
1:A:81:HIS:HD2	1:A:197:ASP:H	1.54	0.56
1:A:47:ILE:HD13	1:A:217:HIS:HB3	1.89	0.55
1:A:77:HIS:NE2	1:A:229:ILE:O	2.40	0.55
1:A:81:HIS:CD2	1:A:197:ASP:H	2.26	0.54
1:A:166[B]:LYS:H	3:A:311:EDO:C2	2.19	0.54
1:A:145[B]:HOX:CZ	1:A:167:ILE:CD1	2.85	0.54
1:A:159:ASN:OD1	3:A:326:EDO:H12	2.08	0.53
1:A:99:SER:OG	3:A:335:EDO:H21	2.08	0.52
3:A:318:EDO:C1	5:A:541:HOH:O	2.58	0.51
1:A:25:HIS:HD2	3:A:316:EDO:C1	2.23	0.51
1:A:75:PRO:HB3	4:A:336:TRS:HN3	1.71	0.49
1:A:77:HIS:CD2	1:A:230:THR:HA	2.48	0.49
1:A:49:THR:O	3:A:329:EDO:C2	2.60	0.49
1:A:41:LYS:HG2	3:A:314:EDO:H21	1.95	0.48
3:A:318:EDO:H11	5:A:541:HOH:O	2.14	0.48
1:A:76:ASP:HA	1:A:79[C]:LYS:HG2	1.96	0.48
1:A:77:HIS:CD2	1:A:229:ILE:O	2.67	0.47
3:A:327:EDO:H11	5:A:600:HOH:O	2.14	0.46
1:A:148[A]:HIS:CG	1:A:149:ASN:N	2.83	0.46
1:A:218[B]:MET:SD	1:A:220[B]:LEU:HB2	2.56	0.45
1:A:49:THR:O	3:A:329:EDO:H22	2.17	0.45
1:A:224:VAL:HG11	5:A:577:HOH:O	2.16	0.45
3:A:324:EDO:H11	5:A:412:HOH:O	2.18	0.44
1:A:59:THR:HA	3:A:331[A]:EDO:O2	2.18	0.44
1:A:126:LYS:HE3	5:A:450:HOH:O	2.18	0.44
1:A:34[A]:GLU:O	3:A:314:EDO:H22	2.18	0.44
1:A:125:LEU:O	2:A:305:SO4:O4	2.35	0.44
3:A:315:EDO:H21	5:A:552:HOH:O	2.18	0.44
1:A:166[B]:LYS:HZ2	3:A:312[B]:EDO:H22	1.84	0.43
3:A:324:EDO:C1	5:A:412:HOH:O	2.66	0.43

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:39[B]:ASN:H	1:A:39[B]:ASN:HD22	1.66	0.43
1:A:205:SER:CB	1:A:222[B]:GLU:HG2	2.49	0.42
1:A:168:ARG:HH11	3:A:312[B]:EDO:C1	2.33	0.42
1:A:59:THR:HA	3:A:331[B]:EDO:H22	2.01	0.42
1:A:144[B]:ASN:CG	1:A:145[B]:HOX:N	2.78	0.42
1:A:198:ASN:HB3	5:A:610:HOH:O	2.20	0.42
1:A:225[A]:THR:HG21	5:A:552:HOH:O	2.19	0.42
1:A:193:VAL:O	3:A:326:EDO:H21	2.20	0.41
1:A:40:GLY:O	1:A:223:PHE:HA	2.20	0.41
1:A:99:SER:CB	3:A:335:EDO:H21	2.51	0.41
1:A:159:ASN:HD21	3:A:326:EDO:H22	1.85	0.41
1:A:66:CRO:OH	1:A:147[B]:SER:CB	2.68	0.41
1:A:76:ASP:O	1:A:79[C]:LYS:HG2	2.20	0.41
1:A:180:ASP:OD2	3:A:335:EDO:H22	2.21	0.41
1:A:143[B]:TYR:OH	1:A:218[B]:MET:HG2	2.22	0.40

There are no symmetry-related clashes.

5.3 Torsion angles [i](#)

5.3.1 Protein backbone [i](#)

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	248/245 (101%)	245 (99%)	3 (1%)	0	100	100

There are no Ramachandran outliers to report.

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	219/213 (103%)	215 (98%)	4 (2%)	51 15

All (4) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	90[A]	GLU
1	A	90[B]	GLU
1	A	147[A]	SER
1	A	147[B]	SER

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (4) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	25	HIS
1	A	81	HIS
1	A	139	HIS
1	A	164	ASN

5.3.3 RNA ⓘ

There are no RNA molecules in this entry.

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

3 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	HOX	A	145[A]	1	11,12,13	2.37	4 (36%)	10,15,17	1.03	0
1	CRO	A	66	1	22,23,24	3.28	5 (22%)	30,32,34	1.66	6 (20%)
1	HOX	A	145[B]	1	10,11,13	1.61	2 (20%)	8,13,17	0.28	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
1	HOX	A	145[A]	1	-	2/5/6/8	0/1/1/1
1	CRO	A	66	1	-	0/12/31/32	0/2/2/2
1	HOX	A	145[B]	1	-	0/5/6/8	0/1/1/1

All (11) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	A	66	CRO	CB2-CA2	11.37	1.46	1.35
1	A	66	CRO	CA2-C2	-8.63	1.39	1.48
1	A	145[A]	HOX	CB-CA	5.62	1.65	1.53
1	A	145[A]	HOX	CE1-CD1	3.69	1.44	1.38
1	A	66	CRO	O2-C2	3.52	1.30	1.23
1	A	145[B]	HOX	CA-N	-2.98	1.39	1.48
1	A	145[A]	HOX	CB-CG	2.93	1.58	1.51
1	A	66	CRO	C2-N3	-2.47	1.34	1.40
1	A	145[B]	HOX	CB-CG	-2.45	1.45	1.51
1	A	66	CRO	C1-N2	2.22	1.35	1.32
1	A	145[A]	HOX	O-C	2.14	1.28	1.20

All (6) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	A	66	CRO	CA2-C2-N3	5.28	107.94	103.50
1	A	66	CRO	O2-C2-CA2	-2.80	129.23	131.02
1	A	66	CRO	CE1-CD1-CG2	-2.40	118.12	121.22
1	A	66	CRO	CD1-CE1-CZ	2.30	122.31	119.88
1	A	66	CRO	O3-C3-CA3	-2.28	115.19	125.47
1	A	66	CRO	CA1-C1-N2	2.08	126.70	123.88

There are no chirality outliers.

All (2) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
1	A	145[A]	HOX	C-CA-CB-CG
1	A	145[A]	HOX	N-CA-CB-CG

There are no ring outliers.

2 monomers are involved in 20 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
1	A	66	CRO	4	0
1	A	145[B]	HOX	19	0

5.5 Carbohydrates [i](#)

There are no oligosaccharides in this entry.

5.6 Ligand geometry [i](#)

41 ligands 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	$\# Z > 2$
3	EDO	A	322	-	3,3,3	0.56	0	2,2,2	0.31	0
3	EDO	A	311	-	3,3,3	1.71	1 (33%)	2,2,2	0.38	0
2	SO4	A	304	-	4,4,4	0.48	0	6,6,6	0.24	0
3	EDO	A	331[B]	-	3,3,3	0.91	0	2,2,2	0.54	0
3	EDO	A	325	-	3,3,3	0.42	0	2,2,2	0.39	0
3	EDO	A	308[A]	-	3,3,3	1.15	0	2,2,2	0.66	0
3	EDO	A	330	-	3,3,3	2.68	2 (66%)	2,2,2	1.20	0
3	EDO	A	314	-	3,3,3	0.87	0	2,2,2	0.60	0
3	EDO	A	316	-	3,3,3	0.61	0	2,2,2	0.31	0
4	TRS	A	336	-	7,7,7	1.62	3 (42%)	9,9,9	0.65	0
3	EDO	A	317	-	3,3,3	1.14	0	2,2,2	0.11	0
3	EDO	A	335	-	3,3,3	0.59	0	2,2,2	0.22	0
3	EDO	A	321	-	3,3,3	0.49	0	2,2,2	0.17	0
3	EDO	A	312[B]	-	3,3,3	0.42	0	2,2,2	0.38	0
3	EDO	A	332	-	3,3,3	0.62	0	2,2,2	0.26	0
3	EDO	A	319	-	3,3,3	0.67	0	2,2,2	0.24	0
3	EDO	A	334	-	3,3,3	0.83	0	2,2,2	0.28	0
3	EDO	A	313	-	3,3,3	0.40	0	2,2,2	0.46	0
3	EDO	A	328	-	3,3,3	0.59	0	2,2,2	0.33	0
2	SO4	A	302	-	4,4,4	0.43	0	6,6,6	0.45	0

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# Z > 2	Counts	RMSZ	# Z > 2
3	EDO	A	320	-	3,3,3	0.26	0	2,2,2	0.40	0
3	EDO	A	307[A]	-	3,3,3	0.68	0	2,2,2	0.17	0
3	EDO	A	315	-	3,3,3	0.77	0	2,2,2	0.22	0
3	EDO	A	331[A]	-	3,3,3	0.90	0	2,2,2	0.43	0
3	EDO	A	308[B]	-	3,3,3	0.37	0	2,2,2	0.64	0
2	SO4	A	337	-	4,4,4	0.64	0	6,6,6	0.16	0
3	EDO	A	309	-	3,3,3	0.45	0	2,2,2	0.44	0
3	EDO	A	310	-	3,3,3	0.27	0	2,2,2	0.51	0
2	SO4	A	301	-	4,4,4	1.08	0	6,6,6	0.36	0
3	EDO	A	324	-	3,3,3	1.12	0	2,2,2	0.11	0
3	EDO	A	327	-	3,3,3	0.55	0	2,2,2	0.31	0
3	EDO	A	318	-	3,3,3	0.56	0	2,2,2	0.30	0
3	EDO	A	329	-	3,3,3	0.71	0	2,2,2	0.08	0
3	EDO	A	306	-	3,3,3	0.96	0	2,2,2	0.25	0
3	EDO	A	312[A]	-	3,3,3	0.50	0	2,2,2	0.32	0
3	EDO	A	326	-	3,3,3	2.24	1 (33%)	2,2,2	1.02	0
3	EDO	A	323	-	3,3,3	0.39	0	2,2,2	0.36	0
2	SO4	A	305	-	4,4,4	0.54	0	6,6,6	0.11	0
3	EDO	A	333	-	3,3,3	0.31	0	2,2,2	0.38	0
2	SO4	A	303	-	4,4,4	0.18	0	6,6,6	0.36	0
3	EDO	A	307[B]	-	3,3,3	1.19	0	2,2,2	0.38	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	EDO	A	322	-	-	1/1/1/1	-
3	EDO	A	311	-	-	1/1/1/1	-
3	EDO	A	331[B]	-	-	1/1/1/1	-
3	EDO	A	325	-	-	1/1/1/1	-
3	EDO	A	308[A]	-	-	0/1/1/1	-
3	EDO	A	330	-	-	1/1/1/1	-
3	EDO	A	314	-	-	1/1/1/1	-
3	EDO	A	316	-	-	1/1/1/1	-
4	TRS	A	336	-	-	9/9/9/9	-
3	EDO	A	317	-	-	1/1/1/1	-
3	EDO	A	335	-	-	0/1/1/1	-
3	EDO	A	321	-	-	1/1/1/1	-
3	EDO	A	312[B]	-	-	0/1/1/1	-
3	EDO	A	332	-	-	1/1/1/1	-

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Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
3	EDO	A	319	-	-	0/1/1/1	-
3	EDO	A	334	-	-	0/1/1/1	-
3	EDO	A	313	-	-	0/1/1/1	-
3	EDO	A	328	-	-	1/1/1/1	-
3	EDO	A	320	-	-	1/1/1/1	-
3	EDO	A	307[A]	-	-	1/1/1/1	-
3	EDO	A	315	-	-	1/1/1/1	-
3	EDO	A	331[A]	-	-	0/1/1/1	-
3	EDO	A	308[B]	-	-	0/1/1/1	-
3	EDO	A	309	-	-	1/1/1/1	-
3	EDO	A	310	-	-	1/1/1/1	-
3	EDO	A	324	-	-	0/1/1/1	-
3	EDO	A	327	-	-	1/1/1/1	-
3	EDO	A	318	-	-	1/1/1/1	-
3	EDO	A	329	-	-	1/1/1/1	-
3	EDO	A	306	-	-	0/1/1/1	-
3	EDO	A	312[A]	-	-	1/1/1/1	-
3	EDO	A	326	-	-	1/1/1/1	-
3	EDO	A	323	-	-	1/1/1/1	-
3	EDO	A	333	-	-	1/1/1/1	-
3	EDO	A	307[B]	-	-	1/1/1/1	-

All (7) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
3	A	330	EDO	O1-C1	-3.92	1.22	1.42
3	A	326	EDO	O2-C2	3.23	1.58	1.42
3	A	311	EDO	O2-C2	-2.82	1.27	1.42
4	A	336	TRS	O2-C2	2.54	1.50	1.42
3	A	330	EDO	O2-C2	-2.48	1.29	1.42
4	A	336	TRS	C-N	-2.31	1.41	1.49
4	A	336	TRS	C2-C	2.04	1.58	1.53

There are no bond angle outliers.

There are no chirality outliers.

All (33) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
4	A	336	TRS	C1-C-C2-O2
4	A	336	TRS	C3-C-C2-O2
4	A	336	TRS	N-C-C2-O2

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Mol	Chain	Res	Type	Atoms
3	A	310	EDO	O1-C1-C2-O2
3	A	317	EDO	O1-C1-C2-O2
3	A	314	EDO	O1-C1-C2-O2
3	A	316	EDO	O1-C1-C2-O2
3	A	322	EDO	O1-C1-C2-O2
3	A	323	EDO	O1-C1-C2-O2
3	A	325	EDO	O1-C1-C2-O2
3	A	326	EDO	O1-C1-C2-O2
3	A	327	EDO	O1-C1-C2-O2
3	A	329	EDO	O1-C1-C2-O2
4	A	336	TRS	C2-C-C1-O1
4	A	336	TRS	C1-C-C3-O3
4	A	336	TRS	N-C-C3-O3
3	A	311	EDO	O1-C1-C2-O2
3	A	312[A]	EDO	O1-C1-C2-O2
3	A	315	EDO	O1-C1-C2-O2
4	A	336	TRS	C3-C-C1-O1
4	A	336	TRS	C2-C-C3-O3
3	A	309	EDO	O1-C1-C2-O2
3	A	320	EDO	O1-C1-C2-O2
3	A	332	EDO	O1-C1-C2-O2
3	A	307[B]	EDO	O1-C1-C2-O2
3	A	328	EDO	O1-C1-C2-O2
3	A	330	EDO	O1-C1-C2-O2
3	A	333	EDO	O1-C1-C2-O2
4	A	336	TRS	N-C-C1-O1
3	A	318	EDO	O1-C1-C2-O2
3	A	331[B]	EDO	O1-C1-C2-O2
3	A	307[A]	EDO	O1-C1-C2-O2
3	A	321	EDO	O1-C1-C2-O2

There are no ring outliers.

21 monomers are involved in 50 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
3	A	311	EDO	6	0
3	A	331[B]	EDO	8	0
3	A	330	EDO	2	0
3	A	314	EDO	2	0
3	A	316	EDO	1	0
4	A	336	TRS	4	0
3	A	335	EDO	6	0

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Mol	Chain	Res	Type	Clashes	Symm-Clashes
3	A	312[B]	EDO	2	0
3	A	334	EDO	1	0
3	A	315	EDO	1	0
3	A	331[A]	EDO	1	0
3	A	308[B]	EDO	1	0
3	A	310	EDO	2	0
2	A	301	SO4	1	0
3	A	324	EDO	2	0
3	A	327	EDO	1	0
3	A	318	EDO	2	0
3	A	329	EDO	2	0
3	A	312[A]	EDO	1	0
3	A	326	EDO	3	0
2	A	305	SO4	1	0

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	227/245 (92%)	-0.28	5 (2%) 62 63	7, 17, 31, 64	24 (10%)

All (5) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	148[A]	HIS	3.3
1	A	230	THR	2.9
1	A	0	MET	2.7
1	A	1	VAL	2.6
1	A	2	SER	2.0

6.2 Non-standard residues in protein, DNA, RNA chains [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(Å ²)	Q<0.9
1	HOX	A	145[A]	12/13	0.92	0.09	16,25,44,51	12
1	HOX	A	145[B]	11/13	0.92	0.09	13,56,59,59	11
1	CRO	A	66	22/23	0.98	0.04	12,13,18,23	0

6.3 Carbohydrates [i](#)

There are no oligosaccharides in this entry.

6.4 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(Å ²)	Q<0.9
3	EDO	A	316	4/4	0.58	0.17	59,64,65,65	0
3	EDO	A	333	4/4	0.68	0.16	39,42,46,49	4
3	EDO	A	328	4/4	0.72	0.12	64,67,69,70	0
3	EDO	A	329	4/4	0.73	0.16	53,57,60,68	0
3	EDO	A	310	4/4	0.74	0.15	34,44,48,53	0
3	EDO	A	315	4/4	0.75	0.14	57,61,64,65	0
3	EDO	A	309	4/4	0.75	0.11	38,40,45,48	0
3	EDO	A	320	4/4	0.75	0.13	40,44,47,54	0
3	EDO	A	317	4/4	0.76	0.14	38,45,50,50	0
3	EDO	A	334	4/4	0.77	0.16	24,30,33,38	4
3	EDO	A	332	4/4	0.78	0.14	44,56,57,58	0
4	TRS	A	336	8/8	0.78	0.15	38,56,68,77	0
3	EDO	A	322	4/4	0.79	0.11	48,55,62,72	0
3	EDO	A	325	4/4	0.79	0.13	65,70,74,83	0
3	EDO	A	327	4/4	0.82	0.11	33,42,48,51	0
3	EDO	A	326	4/4	0.83	0.14	17,21,23,30	4
3	EDO	A	318	4/4	0.85	0.08	41,51,51,55	0
3	EDO	A	324	4/4	0.86	0.09	18,24,28,32	4
3	EDO	A	314	4/4	0.86	0.10	32,36,41,42	0
3	EDO	A	319	4/4	0.87	0.09	25,35,44,44	0
3	EDO	A	323	4/4	0.87	0.14	82,83,84,85	0
2	SO4	A	305	5/5	0.87	0.13	95,98,100,100	0
3	EDO	A	313	4/4	0.88	0.10	30,52,54,58	0
3	EDO	A	321	4/4	0.88	0.10	29,36,48,50	0
3	EDO	A	307[B]	4/4	0.89	0.10	18,22,23,30	4
3	EDO	A	307[A]	4/4	0.89	0.10	21,23,23,30	4
3	EDO	A	311	4/4	0.90	0.09	19,22,28,30	4
3	EDO	A	312[A]	4/4	0.90	0.10	28,29,30,33	4
3	EDO	A	312[B]	4/4	0.90	0.10	41,44,45,48	4
2	SO4	A	304	5/5	0.90	0.10	43,44,59,62	5
2	SO4	A	337	5/5	0.92	0.08	38,39,47,49	5
3	EDO	A	308[A]	4/4	0.94	0.07	14,20,21,28	4
3	EDO	A	308[B]	4/4	0.94	0.07	15,17,18,19	4
3	EDO	A	306	4/4	0.94	0.07	25,25,32,39	0
3	EDO	A	330	4/4	0.94	0.09	22,25,35,38	0
3	EDO	A	335	4/4	0.95	0.11	18,24,25,28	4
3	EDO	A	331[B]	4/4	0.96	0.05	16,18,19,22	4

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Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors($\text{\AA}^2$)	Q<0.9
2	SO4	A	303	5/5	0.96	0.08	17,20,26,27	5
3	EDO	A	331[A]	4/4	0.96	0.05	14,17,18,20	4
2	SO4	A	302	5/5	0.97	0.06	24,26,32,37	0
2	SO4	A	301	5/5	0.98	0.05	15,16,18,18	0

6.5 Other polymers [i](#)

There are no such residues in this entry.