



Full wwPDB X-ray Structure Validation Report ⓘ

Mar 5, 2026 – 04:23 PM UTC

PDB ID : 4U1L / pdb_00004u1l
Title : HLA class I micropolymorphisms determine peptide-HLA landscape and dictate differential HIV-1 escape through identical epitopes
Authors : Rizkallah, P.J.; Cole, D.K.; Fuller, A.; Sewell, A.K.
Deposited on : 2014-07-15
Resolution : 2.06 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

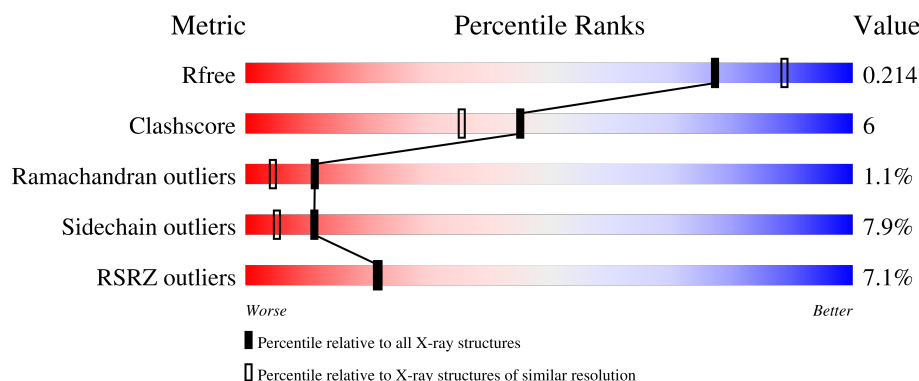
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.06 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	3774 (2.08-2.04)
Clashscore	190562	3883 (2.08-2.04)
Ramachandran outliers	187476	3860 (2.08-2.04)
Sidechain outliers	187428	3860 (2.08-2.04)
RSRZ outliers	180081	3775 (2.08-2.04)

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	277	6% 81% 15% ..
1	D	277	12% 80% 17% .
2	B	100	2% 86% 14%
2	E	100	3% 82% 16% .
3	C	9	89% 11%

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Mol	Chain	Length	Quality of chain
3	F	9	 78% 22%

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
4	GOL	A	301	-	X	X	-
4	GOL	D	301	-	X	X	-

2 Entry composition

There are 7 unique types of molecules in this entry. The entry contains 6806 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 HLA class I histocompatibility antigen, B-81 alpha chain.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	277	Total	C	N	O	S	0	1	0
			2270	1409	414	440	7			
1	D	277	Total	C	N	O	S	0	3	0
			2284	1417	416	443	8			

There are 2 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	0	MET	-	initiating methionine	UNP Q31610
D	0	MET	-	initiating methionine	UNP Q31610

- Molecule 2 is a protein called Beta-2-microglobulin.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
2	B	100	Total	C	N	O	S	0	0	0
			837	533	141	159	4			
2	E	100	Total	C	N	O	S	0	0	0
			837	533	141	159	4			

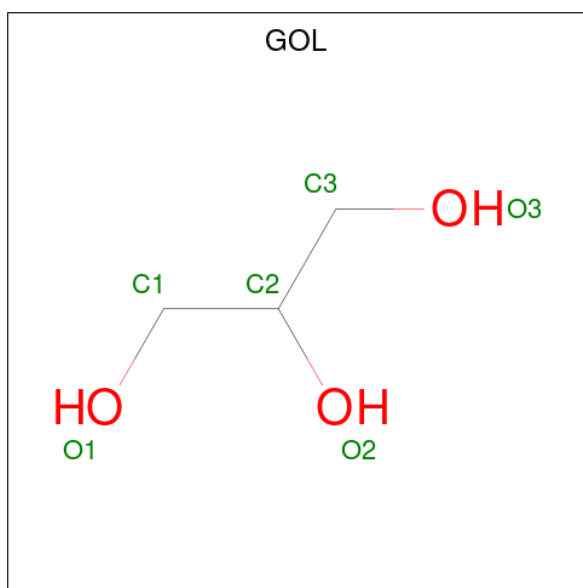
There are 2 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
B	0	MET	-	initiating methionine	UNP P61769
E	0	MET	-	initiating methionine	UNP P61769

- Molecule 3 is a protein called Protein Nef.

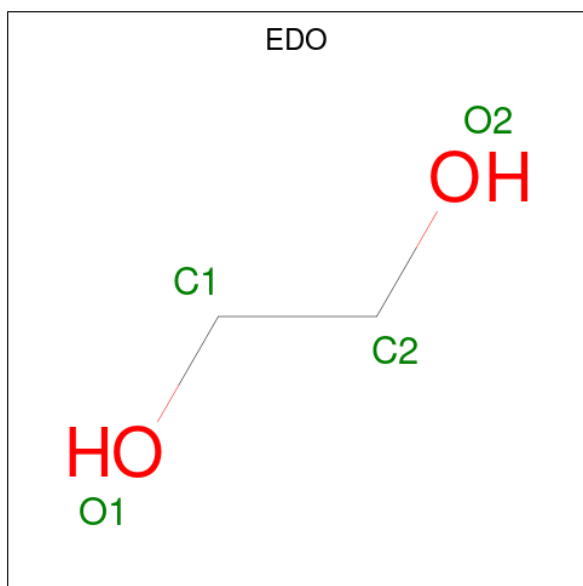
Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
3	C	9	Total	C	N	O	S	0	0	0
			76	48	16	11	1			
3	F	9	Total	C	N	O	S	0	0	0
			76	48	16	11	1			

- Molecule 4 is GLYCEROL (CCD ID: GOL) (formula: $C_3H_8O_3$).



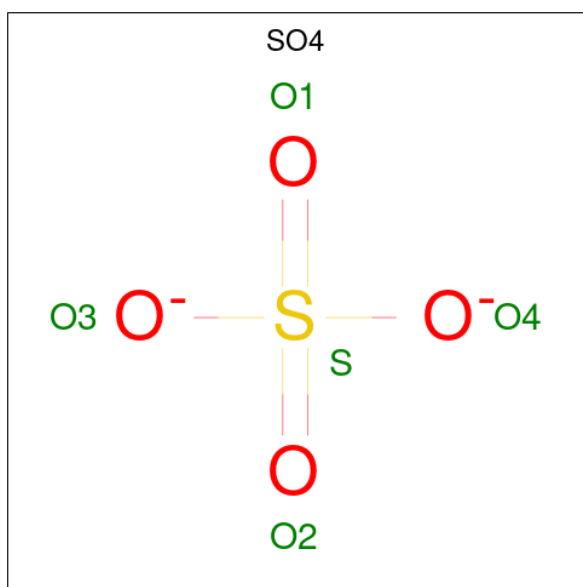
Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
4	A	1	Total	C	O	0	0
			6	3	3		
4	A	1	Total	C	O	0	0
			6	3	3		
4	D	1	Total	C	O	0	0
			6	3	3		

- Molecule 5 is 1,2-ETHANEDIOL (CCD ID: EDO) (formula: $C_2H_6O_2$).



Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
5	A	1	Total C O 4 2 2	0	0
5	A	1	Total C O 4 2 2	0	0
5	A	1	Total C O 4 2 2	0	0
5	A	1	Total C O 4 2 2	0	0
5	A	1	Total C O 4 2 2	0	0
5	B	1	Total C O 4 2 2	0	0
5	D	1	Total C O 4 2 2	0	0
5	D	1	Total C O 4 2 2	0	0
5	D	1	Total C O 4 2 2	0	0
5	D	1	Total C O 4 2 2	0	0
5	D	1	Total C O 4 2 2	0	0
5	D	1	Total C O 4 2 2	0	0
5	D	1	Total C O 4 2 2	0	0
5	D	1	Total C O 4 2 2	0	0
5	D	1	Total C O 4 2 2	0	0
5	E	1	Total C O 4 2 2	0	0
5	E	1	Total C O 4 2 2	0	0
5	F	1	Total C O 4 2 2	0	0

- Molecule 6 is SULFATE ION (CCD ID: SO4) (formula: O₄S).



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

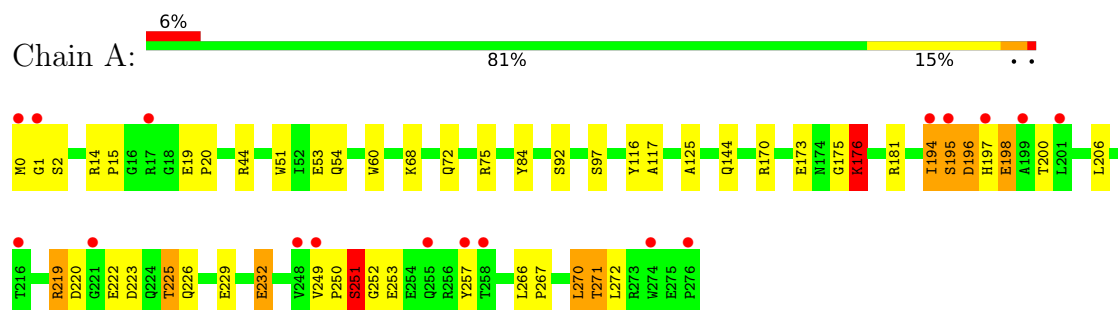
- Molecule 7 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
7	A	138	Total	O	0	0
			138	138		
7	B	28	Total	O	0	0
			28	28		
7	C	7	Total	O	0	0
			7	7		
7	D	125	Total	O	0	0
			125	125		
7	E	22	Total	O	0	0
			22	22		
7	F	6	Total	O	0	0
			6	6		

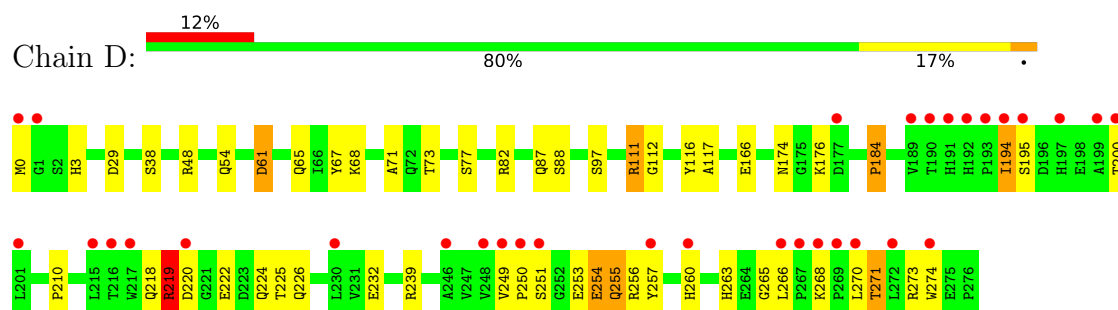
3 Residue-property plots [i](#)

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.

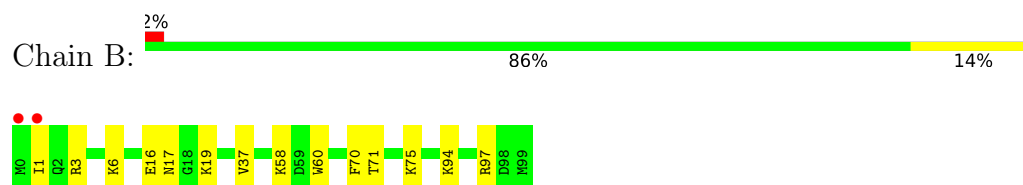
- Molecule 1: HLA class I histocompatibility antigen, B-81 alpha chain



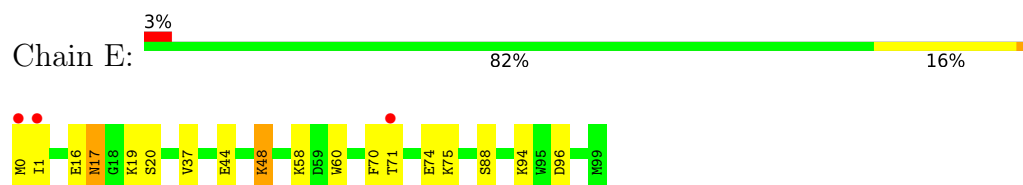
- Molecule 1: HLA class I histocompatibility antigen, B-81 alpha chain



- Molecule 2: Beta-2-microglobulin



- Molecule 2: Beta-2-microglobulin



- Molecule 3: Protein Nef

Chain C:  89% 11%



● Molecule 3: Protein Nef

Chain F:  78% 22%



4 Data and refinement statistics

Property	Value	Source
Space group	P 1	Depositor
Cell constants a, b, c, α , β , γ	46.02Å 49.06Å 107.84Å 91.13° 93.53° 95.70°	Depositor
Resolution (Å)	53.80 – 2.06 53.80 – 2.06	Depositor EDS
% Data completeness (in resolution range)	97.7 (53.80-2.06) 97.7 (53.80-2.06)	Depositor EDS
R_{merge}	0.10	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	2.49 (at 2.07Å)	Xtriage
Refinement program	REFMAC 5.8.0049	Depositor
R, R_{free}	0.173 , 0.209 0.181 , 0.214	Depositor DCC
R_{free} test set	2874 reflections (5.08%)	wwPDB-VP
Wilson B-factor (Å ²)	25.1	Xtriage
Anisotropy	0.682	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.32 , 46.4	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	0.96	EDS
Total number of atoms	6806	wwPDB-VP
Average B, all atoms (Å ²)	48.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 6.24% 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

5.1 Standard geometry

Bond lengths and bond angles in the following residue types are not validated in this section: EDO, GOL, SO4

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	1.14	4/2331 (0.2%)	1.05	1/3165 (0.0%)
1	D	1.15	2/2345 (0.1%)	1.07	5/3183 (0.2%)
2	B	0.87	1/860 (0.1%)	0.91	1/1162 (0.1%)
2	E	0.81	0/860	0.91	0/1162
3	C	1.20	0/78	1.46	0/104
3	F	1.51	1/78 (1.3%)	1.00	0/104
All	All	1.08	8/6552 (0.1%)	1.03	7/8880 (0.1%)

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	A	0	2

All (8) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	A	20	PRO	C-O	-6.04	1.16	1.23
1	A	92	SER	C-O	-5.95	1.16	1.23
2	B	58	LYS	C-O	-5.64	1.17	1.24
1	A	170	ARG	N-CA	-5.57	1.39	1.46
1	D	67	TYR	N-CA	-5.31	1.39	1.46
3	F	6	LEU	C-O	-5.14	1.17	1.23
1	A	144	GLN	N-CA	5.12	1.52	1.46
1	D	38	SER	C-O	-5.03	1.17	1.24

All (7) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	D	111	ARG	NE-CZ-NH2	6.09	124.68	119.20
1	A	252	GLY	N-CA-C	-6.03	98.90	113.18
1	D	54	GLN	CB-CA-C	-5.42	98.87	110.32
1	D	219	ARG	N-CA-C	-5.38	102.44	110.23
2	B	75	LYS	N-CA-C	5.37	119.91	112.45
1	D	184	PRO	O-C-N	5.20	123.59	121.15
1	D	61	ASP	CB-CA-C	-5.12	102.15	110.85

There are no chirality outliers.

All (2) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	A	194	ILE	Peptide
1	A	251	SER	Peptide

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	2270	0	2125	33	0
1	D	2284	0	2137	31	0
2	B	837	0	803	5	0
2	E	837	0	803	7	0
3	C	76	0	86	1	0
3	F	76	0	86	1	0
4	A	12	0	15	9	0
4	D	6	0	8	6	0
5	A	20	0	30	1	0
5	B	4	0	6	0	0
5	D	36	0	53	2	0
5	E	8	0	12	0	0
5	F	4	0	6	0	0
6	A	10	0	0	0	0
7	A	138	0	0	2	0
7	B	28	0	0	2	0
7	C	7	0	0	0	0
7	D	125	0	0	4	0
7	E	22	0	0	0	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
7	F	6	0	0	0	0
All	All	6806	0	6170	75	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 (75) 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)
7:A:621:HOH:O	4:D:301:GOL:H11	1.79	0.81
4:A:301:GOL:H11	7:D:414:HOH:O	1.87	0.74
1:D:71:ALA:HB3	4:D:301:GOL:H32	1.70	0.72
1:A:219:ARG:HG2	1:A:257:TYR:CE1	2.26	0.71
1:A:125:ALA:HB2	5:A:307:EDO:H22	1.74	0.68
1:A:84:TYR:CE1	4:A:302:GOL:H12	2.29	0.68
1:D:77:SER:OG	5:D:305:EDO:H12	1.91	0.68
1:A:270:LEU:C	1:A:270:LEU:HD23	2.19	0.67
1:D:71:ALA:HB3	4:D:301:GOL:C3	2.24	0.67
1:A:84:TYR:HE1	4:A:302:GOL:H12	1.60	0.67
2:E:17:ASN:N	2:E:17:ASN:OD1	2.30	0.64
1:A:232:GLU:OE1	2:B:6:LYS:NZ	2.31	0.64
1:D:249:VAL:HG12	1:D:257:TYR:CE2	2.34	0.63
7:A:621:HOH:O	4:D:301:GOL:C1	2.42	0.62
1:D:87:GLN:NE2	2:E:0:MET:HE1	2.13	0.62
1:A:0:MET:O	1:A:2:SER:N	2.32	0.62
1:A:270:LEU:HD23	1:A:271:THR:N	2.17	0.60
2:B:3:ARG:HD3	7:B:205:HOH:O	2.00	0.60
1:D:73:THR:HG22	5:D:305:EDO:H11	1.82	0.59
1:D:87:GLN:HE22	2:E:0:MET:HE1	1.67	0.59
1:D:219:ARG:N	1:D:222:GLU:O	2.35	0.58
1:A:19:GLU:HG2	1:A:75:ARG:HD3	1.86	0.56
1:A:270:LEU:HD21	1:A:272:LEU:HG	1.87	0.56
1:D:219:ARG:HB3	1:D:222:GLU:O	2.06	0.55
4:A:301:GOL:C1	7:D:414:HOH:O	2.50	0.55
1:D:48:ARG:O	1:D:239:ARG:NH1	2.34	0.54
1:D:111:ARG:NH2	1:D:112:GLY:O	2.41	0.54
1:A:249:VAL:O	1:A:251:SER:N	2.41	0.54
1:D:218:GLN:O	1:D:257:TYR:HA	2.09	0.53
1:A:44:ARG:HB2	4:A:301:GOL:H31	1.89	0.53
1:A:117:ALA:HB2	2:B:60:TRP:CE2	2.44	0.53
1:D:220:ASP:N	1:D:256:ARG:O	2.37	0.53

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:E:48:LYS:O	2:E:48:LYS:HG3	2.09	0.52
1:A:181:ARG:HH11	1:A:181:ARG:HB2	1.75	0.51
1:A:225:THR:O	1:A:225:THR:OG1	2.22	0.50
1:A:175:GLY:O	1:A:176:LYS:C	2.54	0.50
1:A:219:ARG:NE	1:A:219:ARG:HA	2.27	0.49
1:D:116:TYR:CD2	3:F:9:MET:HE1	2.48	0.49
1:D:3:HIS:HD2	1:D:29:ASP:OD2	1.96	0.49
1:D:254:GLU:HG3	1:D:274:TRP:CD1	2.48	0.48
2:B:17:ASN:HD21	2:B:97:ARG:HH22	1.59	0.48
1:D:61:ASP:O	1:D:65[A]:GLN:HG2	2.13	0.48
1:A:194:ILE:O	1:A:196:ASP:N	2.46	0.48
1:D:218:GLN:OE1	1:D:260:HIS:CD2	2.67	0.48
2:E:17:ASN:HD22	2:E:74:GLU:N	2.12	0.48
1:A:270:LEU:HD21	1:A:272:LEU:CD1	2.44	0.47
1:A:51:TRP:O	1:A:54:GLN:HG2	2.15	0.47
1:D:219:ARG:O	1:D:220:ASP:C	2.58	0.47
1:A:44:ARG:HD3	4:A:301:GOL:H31	1.97	0.47
1:A:270:LEU:C	1:A:270:LEU:CD2	2.86	0.46
1:D:117:ALA:HB2	2:E:60:TRP:CE2	2.50	0.45
1:D:194:ILE:O	1:D:195:SER:HB3	2.16	0.45
1:D:174:ASN:ND2	7:D:403:HOH:O	2.39	0.45
1:D:210:PRO:O	1:D:263:HIS:HE1	1.99	0.45
1:D:266:LEU:HD13	1:D:270:LEU:HG	1.99	0.45
1:D:255:GLN:CD	1:D:273:ARG:HD2	2.42	0.44
1:A:60:TRP:CB	4:A:301:GOL:H2	2.47	0.44
1:D:82:ARG:HD2	7:D:448:HOH:O	2.16	0.44
1:D:184:PRO:HB3	1:D:265:GLY:O	2.18	0.44
1:A:219:ARG:HH11	1:A:219:ARG:HG3	1.82	0.43
1:A:116:TYR:CD2	3:C:9:MET:HE1	2.54	0.43
1:D:82:ARG:NH1	1:D:88:SER:O	2.44	0.43
1:D:260:HIS:CE1	1:D:271:THR:HG22	2.54	0.42
1:A:197:HIS:C	1:A:198:GLU:HG3	2.43	0.42
1:A:44:ARG:HD3	4:A:301:GOL:C3	2.50	0.42
1:A:60:TRP:HB3	4:A:301:GOL:H2	2.00	0.42
2:B:3:ARG:HA	7:B:221:HOH:O	2.20	0.42
1:A:68:LYS:O	1:A:72[B]:GLN:HG3	2.20	0.41
1:A:173:GLU:OE1	1:A:176:LYS:NZ	2.40	0.41
1:D:71:ALA:HB3	4:D:301:GOL:H31	2.01	0.41
1:A:14:ARG:O	1:A:15:PRO:C	2.63	0.41
1:A:266:LEU:HA	1:A:267:PRO:HD2	1.89	0.41
1:D:68:LYS:O	4:D:301:GOL:H32	2.20	0.41

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:219:ARG:N	1:A:222:GLU:O	2.52	0.41
2:E:96:ASP:OD1	2:E:96:ASP:C	2.64	0.41

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	276/277 (100%)	261 (95%)	10 (4%)	5 (2%)	6	2
1	D	278/277 (100%)	263 (95%)	12 (4%)	3 (1%)	11	4
2	B	98/100 (98%)	96 (98%)	2 (2%)	0	100	100
2	E	98/100 (98%)	96 (98%)	2 (2%)	0	100	100
3	C	7/9 (78%)	7 (100%)	0	0	100	100
3	F	7/9 (78%)	7 (100%)	0	0	100	100
All	All	764/772 (99%)	730 (96%)	26 (3%)	8 (1%)	11	5

All (8) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	176	LYS
1	D	176	LYS
1	D	251	SER
1	A	1	GLY
1	A	195	SER
1	A	196	ASP
1	A	250	PRO
1	D	250	PRO

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	237/236 (100%)	219 (92%)	18 (8%)	12	6
1	D	239/236 (101%)	224 (94%)	15 (6%)	16	9
2	B	95/95 (100%)	88 (93%)	7 (7%)	13	6
2	E	95/95 (100%)	81 (85%)	14 (15%)	3	1
3	C	9/9 (100%)	9 (100%)	0	100	100
3	F	9/9 (100%)	9 (100%)	0	100	100
All	All	684/680 (101%)	630 (92%)	54 (8%)	11	5

All (54) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	53	GLU
1	A	97	SER
1	A	176	LYS
1	A	195	SER
1	A	198	GLU
1	A	200	THR
1	A	206	LEU
1	A	219	ARG
1	A	220	ASP
1	A	223	ASP
1	A	225	THR
1	A	226	GLN
1	A	229	GLU
1	A	232	GLU
1	A	251	SER
1	A	253	GLU
1	A	270	LEU
1	A	271	THR
2	B	1	ILE
2	B	16	GLU
2	B	19	LYS
2	B	37	VAL

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Mol	Chain	Res	Type
2	B	70	PHE
2	B	71	THR
2	B	94	LYS
1	D	0	MET
1	D	97	SER
1	D	166	GLU
1	D	194	ILE
1	D	200	THR
1	D	219	ARG
1	D	224	GLN
1	D	225	THR
1	D	226	GLN
1	D	232	GLU
1	D	253	GLU
1	D	254	GLU
1	D	255	GLN
1	D	268	LYS
1	D	271	THR
2	E	1	ILE
2	E	16	GLU
2	E	17	ASN
2	E	19	LYS
2	E	20	SER
2	E	37	VAL
2	E	44	GLU
2	E	48	LYS
2	E	58	LYS
2	E	70	PHE
2	E	71	THR
2	E	75	LYS
2	E	88	SER
2	E	94	LYS

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	144	GLN
1	A	260	HIS
2	B	13	HIS
2	B	17	ASN
2	B	24	ASN
1	D	3	HIS

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Mol	Chain	Res	Type
1	D	72	GLN
1	D	86	ASN
1	D	87	GLN
1	D	115	GLN
1	D	255	GLN
1	D	260	HIS
1	D	262	GLN
1	D	263	HIS
2	E	13	HIS
2	E	24	ASN

5.3.3 RNA [i](#)

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](#)

23 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	$\# Z > 2$
5	EDO	B	101	-	3,3,3	0.74	0	2,2,2	0.12	0
6	SO4	A	309	-	4,4,4	0.66	0	6,6,6	0.25	0
5	EDO	D	310	-	3,3,3	0.46	0	2,2,2	0.09	0
5	EDO	D	303	-	3,3,3	0.59	0	2,2,2	0.46	0

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# Z > 2	Counts	RMSZ	# Z > 2
6	SO4	A	308	-	4,4,4	0.51	0	6,6,6	0.34	0
5	EDO	D	304	-	3,3,3	0.48	0	2,2,2	0.25	0
5	EDO	A	305	-	3,3,3	0.87	0	2,2,2	0.57	0
5	EDO	D	305	-	3,3,3	0.80	0	2,2,2	1.43	0
5	EDO	A	306	-	3,3,3	0.74	0	2,2,2	0.46	0
5	EDO	D	306	-	3,3,3	0.38	0	2,2,2	0.90	0
5	EDO	D	308	-	3,3,3	0.49	0	2,2,2	0.49	0
5	EDO	A	307	-	3,3,3	0.92	0	2,2,2	1.46	0
4	GOL	D	301	-	5,5,5	0.99	0	5,5,5	2.61	2 (40%)
5	EDO	E	101	-	3,3,3	0.25	0	2,2,2	0.98	0
4	GOL	A	301	-	5,5,5	2.74	3 (60%)	5,5,5	2.55	4 (80%)
5	EDO	D	309	-	3,3,3	0.40	0	2,2,2	0.58	0
5	EDO	A	303	-	3,3,3	0.27	0	2,2,2	0.53	0
5	EDO	E	102	-	3,3,3	0.49	0	2,2,2	0.17	0
5	EDO	A	304	-	3,3,3	0.35	0	2,2,2	0.75	0
5	EDO	F	101	-	3,3,3	0.70	0	2,2,2	0.25	0
5	EDO	D	302	-	3,3,3	0.44	0	2,2,2	1.25	0
4	GOL	A	302	-	5,5,5	1.94	1 (20%)	5,5,5	3.98	3 (60%)
5	EDO	D	307	-	3,3,3	0.88	0	2,2,2	0.65	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
5	EDO	B	101	-	-	1/1/1/1	-
5	EDO	D	310	-	-	1/1/1/1	-
5	EDO	D	303	-	-	0/1/1/1	-
5	EDO	D	304	-	-	1/1/1/1	-
5	EDO	A	305	-	-	1/1/1/1	-
5	EDO	D	305	-	-	1/1/1/1	-
5	EDO	A	306	-	-	1/1/1/1	-
5	EDO	D	306	-	-	1/1/1/1	-
5	EDO	D	308	-	-	0/1/1/1	-
5	EDO	A	307	-	-	1/1/1/1	-
4	GOL	D	301	-	-	4/4/4/4	-
5	EDO	E	101	-	-	1/1/1/1	-
4	GOL	A	301	-	-	4/4/4/4	-
5	EDO	D	309	-	-	1/1/1/1	-
5	EDO	A	303	-	-	0/1/1/1	-

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Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
5	EDO	E	102	-	-	1/1/1/1	-
5	EDO	A	304	-	-	1/1/1/1	-
5	EDO	F	101	-	-	1/1/1/1	-
5	EDO	D	302	-	-	1/1/1/1	-
4	GOL	A	302	-	-	1/4/4/4	-
5	EDO	D	307	-	-	1/1/1/1	-

All (4) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
4	A	301	GOL	O2-C2	4.62	1.56	1.43
4	A	302	GOL	O2-C2	-4.10	1.31	1.43
4	A	301	GOL	O3-C3	2.79	1.54	1.42
4	A	301	GOL	O1-C1	2.26	1.51	1.42

All (9) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
4	A	302	GOL	O2-C2-C1	-5.81	85.14	109.18
4	A	302	GOL	C3-C2-C1	5.31	131.26	111.80
4	D	301	GOL	O3-C3-C2	4.98	132.78	110.38
4	A	302	GOL	O1-C1-C2	3.70	127.03	110.38
4	A	301	GOL	O3-C3-C2	3.34	125.41	110.38
4	A	301	GOL	O1-C1-C2	2.76	122.80	110.38
4	A	301	GOL	O2-C2-C3	2.57	119.80	109.18
4	A	301	GOL	O2-C2-C1	2.26	118.54	109.18
4	D	301	GOL	O1-C1-C2	2.07	119.71	110.38

There are no chirality outliers.

All (24) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
4	A	301	GOL	O1-C1-C2-C3
4	D	301	GOL	O1-C1-C2-O2
4	A	301	GOL	C1-C2-C3-O3
4	A	302	GOL	O1-C1-C2-C3
4	D	301	GOL	O1-C1-C2-C3
4	D	301	GOL	C1-C2-C3-O3
4	A	301	GOL	O2-C2-C3-O3
4	D	301	GOL	O2-C2-C3-O3
5	D	302	EDO	O1-C1-C2-O2

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Mol	Chain	Res	Type	Atoms
5	D	305	EDO	O1-C1-C2-O2
5	E	102	EDO	O1-C1-C2-O2
5	A	305	EDO	O1-C1-C2-O2
5	B	101	EDO	O1-C1-C2-O2
5	D	306	EDO	O1-C1-C2-O2
5	D	307	EDO	O1-C1-C2-O2
5	E	101	EDO	O1-C1-C2-O2
5	D	304	EDO	O1-C1-C2-O2
5	D	310	EDO	O1-C1-C2-O2
5	F	101	EDO	O1-C1-C2-O2
4	A	301	GOL	O1-C1-C2-O2
5	A	307	EDO	O1-C1-C2-O2
5	A	304	EDO	O1-C1-C2-O2
5	A	306	EDO	O1-C1-C2-O2
5	D	309	EDO	O1-C1-C2-O2

There are no ring outliers.

5 monomers are involved in 18 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
5	D	305	EDO	2	0
5	A	307	EDO	1	0
4	D	301	GOL	6	0
4	A	301	GOL	7	0
4	A	302	GOL	2	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 ⓘ

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	277/277 (100%)	0.18	17 (6%) 27 27	13, 35, 120, 140	1 (0%)
1	D	277/277 (100%)	0.26	33 (11%) 9 9	11, 30, 105, 150	3 (1%)
2	B	100/100 (100%)	0.48	2 (2%) 65 67	25, 57, 87, 113	0
2	E	100/100 (100%)	0.44	3 (3%) 52 53	23, 51, 85, 97	0
3	C	9/9 (100%)	-0.65	0 100 100	17, 18, 31, 37	0
3	F	9/9 (100%)	-0.68	0 100 100	16, 18, 31, 44	0
All	All	772/772 (100%)	0.26	55 (7%) 22 21	11, 40, 109, 150	4 (0%)

All (55) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
2	E	1	ILE	5.2
2	B	1	ILE	4.9
1	D	194	ILE	4.6
1	D	249	VAL	4.3
2	B	0	MET	3.9
1	A	221	GLY	3.9
1	D	199	ALA	3.9
1	D	201	LEU	3.7
1	A	249	VAL	3.6
1	D	189	VAL	3.5
1	D	257	TYR	3.5
1	D	190	THR	3.5
1	D	274	TRP	3.3
1	A	201	LEU	3.3
1	D	270	LEU	3.3
1	A	0	MET	3.1
1	A	274	TRP	3.0
1	D	248	VAL	3.0
1	A	257	TYR	3.0

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Mol	Chain	Res	Type	RSRZ
1	A	197	HIS	3.0
1	D	230	LEU	2.9
1	D	197	HIS	2.9
2	E	0	MET	2.8
1	D	272	LEU	2.8
2	E	71	THR	2.8
1	D	215	LEU	2.7
1	D	0	MET	2.7
1	D	250	PRO	2.7
1	D	268	LYS	2.6
1	A	258	THR	2.6
1	D	216	THR	2.6
1	D	192	HIS	2.6
1	D	251	SER	2.5
1	A	248	VAL	2.4
1	D	193	PRO	2.4
1	A	1	GLY	2.4
1	A	199	ALA	2.3
1	D	191	HIS	2.3
1	A	195	SER	2.3
1	D	195	SER	2.3
1	D	266	LEU	2.3
1	D	200	THR	2.2
1	D	177	ASP	2.2
1	D	260	HIS	2.1
1	A	276	PRO	2.1
1	D	269	PRO	2.1
1	A	194	ILE	2.1
1	A	17	ARG	2.1
1	D	217	TRP	2.1
1	A	255	GLN	2.0
1	D	220	ASP	2.0
1	A	216	THR	2.0
1	D	246	ALA	2.0
1	D	267	PRO	2.0
1	D	1	GLY	2.0

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

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	EDO	D	306	4/4	0.79	0.18	52,56,60,64	0
6	SO4	A	308	5/5	0.80	0.18	89,107,110,114	0
6	SO4	A	309	5/5	0.81	0.13	80,83,89,94	0
5	EDO	D	307	4/4	0.84	0.18	42,48,50,53	0
4	GOL	A	301	6/6	0.85	0.15	26,36,37,38	0
5	EDO	D	302	4/4	0.88	0.12	38,40,43,45	0
5	EDO	F	101	4/4	0.88	0.15	45,51,53,54	0
5	EDO	E	102	4/4	0.89	0.17	41,44,46,48	0
5	EDO	E	101	4/4	0.89	0.13	41,43,45,47	0
5	EDO	D	309	4/4	0.90	0.15	48,50,51,55	0
5	EDO	A	307	4/4	0.90	0.12	26,30,35,37	0
5	EDO	D	310	4/4	0.91	0.14	39,44,51,53	0
5	EDO	B	101	4/4	0.93	0.09	38,40,40,41	0
4	GOL	D	301	6/6	0.93	0.15	20,32,36,49	0
5	EDO	D	305	4/4	0.93	0.12	23,25,28,34	0
5	EDO	A	304	4/4	0.94	0.08	35,36,36,43	0
5	EDO	A	305	4/4	0.94	0.10	28,42,47,48	0
5	EDO	D	308	4/4	0.94	0.10	39,45,45,45	0
5	EDO	D	304	4/4	0.94	0.10	30,34,37,39	0
4	GOL	A	302	6/6	0.94	0.12	8,9,9,10	6
5	EDO	A	306	4/4	0.96	0.10	21,27,27,27	0
5	EDO	D	303	4/4	0.96	0.08	26,32,32,34	0
5	EDO	A	303	4/4	0.97	0.06	24,24,26,27	0

6.5 Other polymers [i](#)

There are no such residues in this entry.