WORLDWIDE PDB
PROTEIN DATA BANK

Full wwPDB X-ray Structure Validation Report ⓘ

May 31, 2022 – 01:10 pm BST

PDB ID	:	7YWD
Title	:	Human GDAP1 core domain, trigonal crystal form
Authors	:	Raasakka, A.; Kursula, P.
Deposited on	:	2022-02-13
Resolution	:	3.20 Å(reported)

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

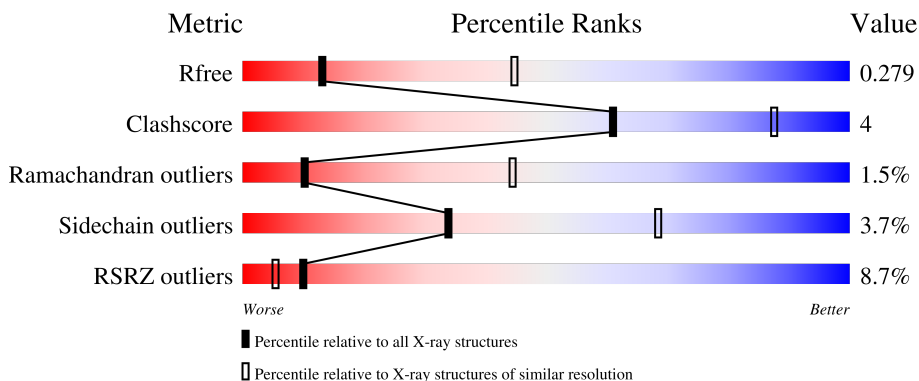|		
MolProbity	:	4.02b-467
Xtriage (Phenix)	:	1.13
EDS	:	2.28.1
Percentile statistics	:	20191225.v01 (using entries in the PDB archive December 25th 2019)
Refmac	:	5.8.0267
CCP4	:	7.1.010 (Gargrove)
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.28.1

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 3.20 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	Percentile Ranks	Value
Rfree		0.279
Clashscore		4
Ramachandran outliers		1.5%
Sidechain outliers		3.7%
RSRZ outliers		8.7%

Worse *Better*

▮ Percentile relative to all X-ray structures
▯ Percentile relative to X-ray structures of similar resolution

Metric	Whole archive (#Entries)	Similar resolution (#Entries, resolution range(Å))
R_{free}	130704	1133 (3.20-3.20)
Clashscore	141614	1253 (3.20-3.20)
Ramachandran outliers	138981	1234 (3.20-3.20)
Sidechain outliers	138945	1233 (3.20-3.20)
RSRZ outliers	127900	1095 (3.20-3.20)

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 <=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	272	4% / 81% 9% 11%
1	B	272	6% / 76% 14% · 10%
1	C	272	7% / 76% 15% 9%
1	D	272	15% / 76% 18% ·· 5%

2 Entry composition ⓘ

There is only 1 type of molecule in this entry. The entry contains 16442 atoms, of which 8217 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.
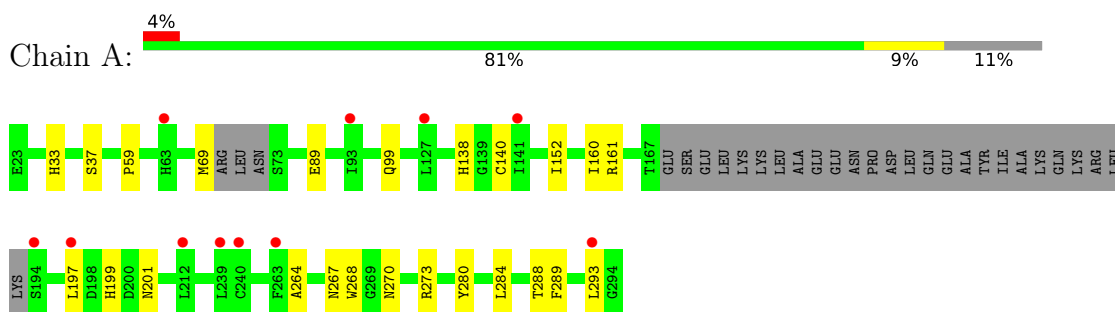
- Molecule 1 is a protein called Ganglioside-induced differentiation-associated protein 1.

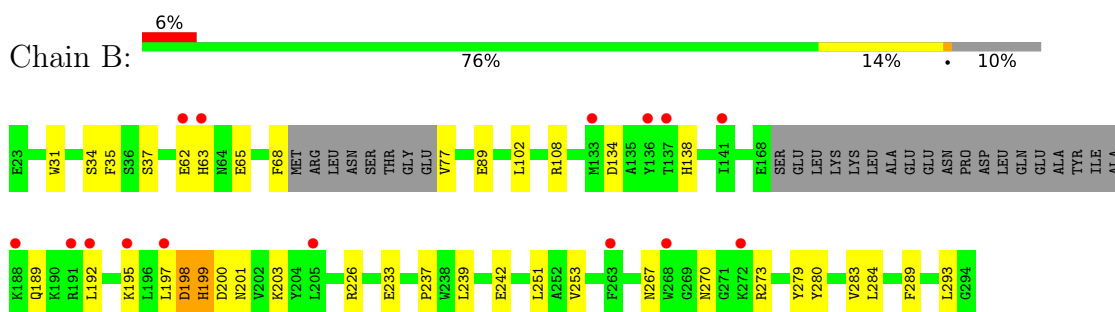| Mol	Chain	Residues	Atoms						ZeroOcc	AltConf	Trace
1	A	243	Total	C	H	N	O	S	0	0	0
			3983	1271	1984	345	374	9			
1	B	245	Total	C	H	N	O	S	0	0	0
			4059	1292	2030	354	375	8			
1	C	248	Total	C	H	N	O	S	0	0	0
			4126	1312	2068	360	377	9			
1	D	258	Total	C	H	N	O	S	0	0	0
			4274	1361	2135	372	397	9			

3 Residue-property plots ⓘ

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: Ganglioside-induced differentiation-associated protein 1

Chain A:

• Molecule 1: Ganglioside-induced differentiation-associated protein 1
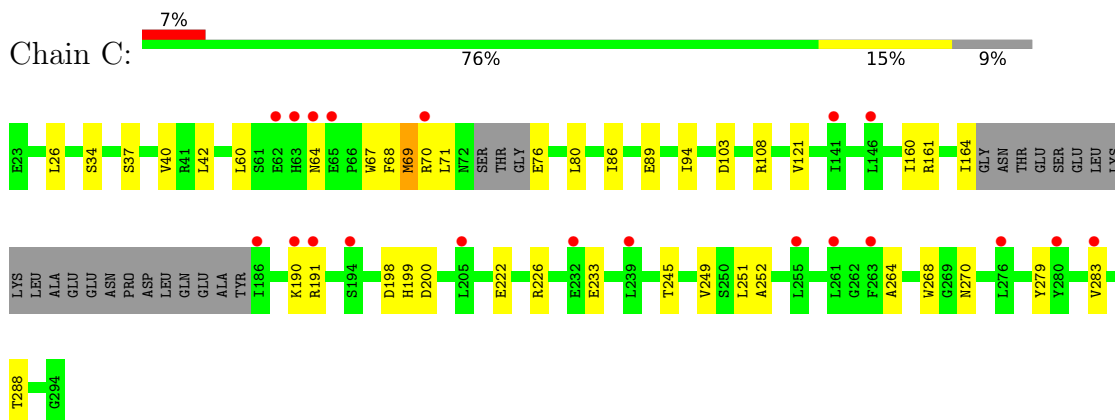
Chain B:

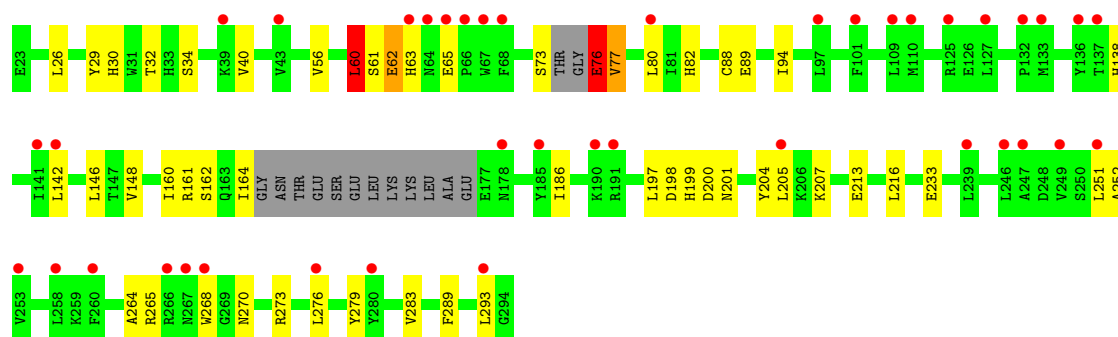• Molecule 1: Ganglioside-induced differentiation-associated protein 1

Chain C:

• Molecule 1: Ganglioside-induced differentiation-associated protein 1

Chain D:

4 Data and refinement statistics ⓘ

Property	Value	Source
Space group	P 31 2 1	Depositor
Cell constants a, b, c, α, β, γ	126.77Å 126.77Å 177.12Å 90.00° 90.00° 120.00°	Depositor
Resolution (Å)	59.04 – 3.20 109.79 – 3.20	Depositor EDS
% Data completeness (in resolution range)	99.9 (59.04-3.20) 99.9 (109.79-3.20)	Depositor EDS
R_{merge}	(Not available)	Depositor
R_{sym}	(Not available)	Depositor
$< I/\sigma(I) >$ [1]	1.02 (at 3.19Å)	Xtriage
Refinement program	PHENIX 1.20_4459	Depositor
R, R_{free}	0.251 , 0.276 0.252 , 0.279	Depositor DCC
R_{free} test set	1363 reflections (4.92%)	wwPDB-VP
Wilson B-factor (Å^2)	144.8	Xtriage
Anisotropy	0.093	Xtriage
Bulk solvent k_{sol}(e/Å^3), B_{sol}(Å^2)	(Not available) , (Not available)	EDS
L-test for twinning[2]	$< |L| > = 0.47, < L^2 > = 0.30$	Xtriage
Estimated twinning fraction	0.030 for -h,-k,l	Xtriage
F_o,F_c correlation	0.94	EDS
Total number of atoms	16442	wwPDB-VP
Average B, all atoms (Å^2)	206.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 3.01% of the height of the origin peak. No significant pseudotranslation is detected.*

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[1]Intensities estimated from amplitudes.
[2]Theoretical values of $< |L| >$, $< L^2 >$ 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 ⓘ

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	0.26	0/2043	0.48	0/2765
1	B	0.27	0/2073	0.51	0/2802
1	C	0.25	0/2102	0.49	0/2840
1	D	0.26	0/2185	0.50	0/2954
All	All	0.26	0/8403	0.49	0/11361

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	76	GLU	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	1999	1984	1983	8	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
1	B	2029	2030	2030	16	1
1	C	2058	2068	2069	23	1
1	D	2139	2135	2136	28	1
All	All	8225	8217	8218	74	2

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 4.

All (74) 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:34:SER:HA	1:C:71:LEU:HD11	1.64	0.79
1:C:76:GLU:OE1	1:C:76:GLU:N	2.19	0.76
1:B:198:ASP:O	1:B:200:ASP:N	2.19	0.75
1:C:198:ASP:O	1:C:200:ASP:N	2.29	0.65
1:C:69:MET:SD	1:C:69:MET:N	2.71	0.61
1:B:138:HIS:ND1	1:B:197:LEU:HD21	2.16	0.60
1:B:35:PHE:CE1	1:B:253:VAL:HG12	2.37	0.60
1:D:213:GLU:O	1:D:273:ARG:NH2	2.34	0.59
1:D:142:LEU:O	1:D:161:ARG:NH2	2.36	0.58
1:C:160:ILE:HG22	1:C:191:ARG:NH2	2.19	0.58
1:D:233:GLU:N	1:D:233:GLU:OE1	2.37	0.57
1:B:270:ASN:O	1:B:270:ASN:ND2	2.39	0.55
1:C:233:GLU:N	1:C:233:GLU:OE1	2.38	0.55
1:D:142:LEU:HD22	1:D:198:ASP:CB	2.37	0.55
1:D:142:LEU:HD22	1:D:198:ASP:HB3	1.90	0.53
1:A:140:CYS:SG	1:A:152:ILE:HD12	2.49	0.53
1:B:233:GLU:N	1:B:233:GLU:OE1	2.41	0.53
1:B:289:PHE:CE2	1:B:293:LEU:HD12	2.45	0.52
1:C:69:MET:CE	1:C:160:ILE:HG21	2.40	0.52
1:D:40:VAL:HG22	1:D:94:ILE:HG13	1.92	0.52
1:A:289:PHE:CE2	1:A:293:LEU:HD12	2.45	0.52
1:D:216:LEU:HD22	1:D:276:LEU:HD21	1.90	0.52
1:C:42:LEU:HD23	1:C:249:VAL:HG13	1.93	0.51
1:B:102:LEU:O	1:B:108:ARG:NH2	2.43	0.51
1:D:252:ALA:HB1	1:D:283:VAL:HG11	1.94	0.49
1:B:267:ASN:O	1:B:273:ARG:NH1	2.46	0.49
1:C:252:ALA:HB2	1:C:283:VAL:HG21	1.95	0.49
1:C:222:GLU:OE2	1:C:226:ARG:NH1	2.46	0.49
1:D:251:LEU:HD23	1:D:279:TYR:CZ	2.47	0.49
1:B:239:LEU:HD22	1:B:251:LEU:HD22	1.95	0.49

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:D:76:GLU:O	1:D:77:VAL:HG22	2.12	0.48
1:C:264:ALA:HB1	1:C:268:TRP:CZ2	2.49	0.48
1:A:264:ALA:HB1	1:A:268:TRP:CZ2	2.49	0.48
1:B:280:TYR:CE2	1:B:284:LEU:HD11	2.48	0.47
1:D:26:LEU:HD23	1:D:82:HIS:HB2	1.96	0.47
1:A:138:HIS:CE1	1:A:197:LEU:HD22	2.49	0.47
1:C:103:ASP:O	1:C:108:ARG:NH2	2.47	0.47
1:D:138:HIS:ND1	1:D:197:LEU:HD21	2.30	0.47
1:A:280:TYR:CE2	1:A:284:LEU:HD11	2.49	0.47
1:D:201:ASN:O	1:D:205:LEU:HB3	2.15	0.47
1:D:200:ASP:O	1:D:204:TYR:HB3	2.15	0.46
1:D:142:LEU:CD1	1:D:160:ILE:HD13	2.45	0.46
1:A:270:ASN:O	1:A:270:ASN:ND2	2.48	0.46
1:B:138:HIS:CE1	1:B:197:LEU:HD21	2.50	0.46
1:A:267:ASN:O	1:A:273:ARG:NH1	2.47	0.46
1:C:67:TRP:HA	1:C:70:ARG:HB2	1.98	0.46
1:D:270:ASN:O	1:D:270:ASN:ND2	2.50	0.45
1:C:251:LEU:HD23	1:C:279:TYR:CZ	2.51	0.45
1:D:142:LEU:HD22	1:D:198:ASP:CG	2.37	0.45
1:C:68:PHE:HB2	1:C:69:MET:SD	2.57	0.45
1:D:289:PHE:CE1	1:D:293:LEU:HD12	2.51	0.45
1:B:251:LEU:HD23	1:B:279:TYR:CZ	2.52	0.44
1:C:69:MET:HE3	1:C:160:ILE:HG21	1.98	0.44
1:D:26:LEU:HD22	1:D:80:LEU:HD21	2.00	0.43
1:C:26:LEU:HD22	1:C:80:LEU:HD11	2.01	0.42
1:D:60:LEU:HD13	1:D:60:LEU:O	2.18	0.42
1:B:63:HIS:HB3	1:B:65:GLU:HG3	2.01	0.42
1:D:76:GLU:CD	1:D:76:GLU:N	2.73	0.42
1:C:67:TRP:O	1:C:67:TRP:CE3	2.73	0.42
1:C:121:VAL:HG13	1:C:245:THR:HB	2.01	0.42
1:C:160:ILE:HD12	1:C:161:ARG:N	2.35	0.42
1:D:61:SER:O	1:D:63:HIS:N	2.53	0.41
1:D:62:GLU:HA	1:D:62:GLU:OE1	2.20	0.41
1:D:65:GLU:O	1:D:65:GLU:HG3	2.20	0.41
1:B:31:TRP:CH2	1:C:86:ILE:HD12	2.54	0.41
1:C:40:VAL:HG22	1:C:94:ILE:HG13	2.03	0.41
1:D:76:GLU:N	1:D:76:GLU:OE1	2.53	0.41
1:B:34:SER:HB3	1:B:37:SER:HB3	2.03	0.41
1:D:160:ILE:HD12	1:D:161:ARG:N	2.36	0.41
1:A:160:ILE:HD12	1:A:161:ARG:N	2.36	0.41
1:B:226:ARG:HB3	1:B:237:PRO:HG2	2.02	0.41

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:D:264:ALA:HB1	1:D:268:TRP:CZ2	2.56	0.41
1:C:69:MET:HG2	1:C:190:LYS:HE3	2.04	0.40
1:D:148:VAL:HG12	1:D:265:ARG:HE	1.87	0.40

All (2) symmetry-related close contacts are listed below. The label for Atom-2 includes the symmetry operator and encoded unit-cell translations to be applied.

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:203:LYS:NZ	1:C:270:ASN:O[4_655]	2.02	0.18
1:D:29:TYR:OH	1:D:29:TYR:OH[4_555]	2.17	0.03

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	237/272 (87%)	227 (96%)	6 (2%)	4 (2%)	9	42
1	B	239/272 (88%)	225 (94%)	10 (4%)	4 (2%)	9	42
1	C	242/272 (89%)	234 (97%)	5 (2%)	3 (1%)	13	49
1	D	252/272 (93%)	239 (95%)	9 (4%)	4 (2%)	9	43
All	All	970/1088 (89%)	925 (95%)	30 (3%)	15 (2%)	10	44

All (15) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	59	PRO
1	B	201	ASN
1	C	199	HIS
1	B	62	GLU
1	C	60	LEU
1	D	199	HIS

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Mol	Chain	Res	Type
1	B	199	HIS
1	D	62	GLU
1	D	89	GLU
1	A	89	GLU
1	A	199	HIS
1	A	201	ASN
1	B	89	GLU
1	C	89	GLU
1	D	60	LEU

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	224/250 (90%)	219 (98%)	5 (2%)	52	79
1	B	227/250 (91%)	217 (96%)	10 (4%)	28	64
1	C	230/250 (92%)	225 (98%)	5 (2%)	52	79
1	D	239/250 (96%)	225 (94%)	14 (6%)	19	54
All	All	920/1000 (92%)	886 (96%)	34 (4%)	34	68

All (34) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	33	HIS
1	A	37	SER
1	A	69	MET
1	A	99	GLN
1	A	288	THR
1	B	68	PHE
1	B	77	VAL
1	B	134	ASP
1	B	189	GLN
1	B	192	LEU
1	B	195	LYS
1	B	198	ASP

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Mol	Chain	Res	Type
1	B	199	HIS
1	B	242	GLU
1	B	283	VAL
1	C	37	SER
1	C	64	ASN
1	C	69	MET
1	C	164	ILE
1	C	288	THR
1	D	30	HIS
1	D	32	THR
1	D	34	SER
1	D	56	VAL
1	D	60	LEU
1	D	73	SER
1	D	76	GLU
1	D	77	VAL
1	D	88	CYS
1	D	146	LEU
1	D	162	SER
1	D	164	ILE
1	D	186	ILE
1	D	207	LYS

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

Mol	Chain	Res	Type
1	B	92	GLN
1	C	64	ASN
1	C	163	GLN
1	C	189	GLN

5.3.3　RNA ⓘ

There are no RNA molecules in this entry.

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

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

5.5 Carbohydrates ⓘ

There are no monosaccharides in this entry.

5.6 Ligand geometry ⓘ

There are no ligands in this entry.

5.7 Other polymers ⓘ

There are no such residues in this entry.

5.8 Polymer linkage issues ⓘ

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(Å²)	Q<0.9
1	A	243/272 (89%)	0.52	11 (4%)	33	21	112, 144, 229, 294	0
1	B	245/272 (90%)	0.72	15 (6%)	21	12	120, 159, 267, 339	0
1	C	248/272 (91%)	0.47	20 (8%)	12	6	136, 194, 270, 381	0
1	D	258/272 (94%)	0.73	40 (15%)	2	1	156, 220, 287, 323	0
All	All	994/1088 (91%)	0.61	86 (8%)	10	5	112, 182, 274, 381	0

All (86) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	D	68	PHE	6.2
1	B	191	ARG	6.0
1	D	67	TRP	6.0
1	D	101	PHE	5.6
1	C	232	GLU	5.3
1	A	63	HIS	5.0
1	B	62	GLU	4.7
1	C	64	ASN	4.6
1	D	63	HIS	4.5
1	D	110	MET	4.5
1	D	258	LEU	4.4
1	D	66	PRO	4.4
1	D	239	LEU	4.3
1	C	190	LYS	4.3
1	C	263	PHE	4.2
1	D	260	PHE	4.1
1	C	62	GLU	4.1
1	C	191	ARG	3.9
1	B	197	LEU	3.8
1	D	64	ASN	3.7
1	D	141	ILE	3.7

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Mol	Chain	Res	Type	RSRZ
1	D	39	LYS	3.5
1	D	190	LYS	3.5
1	D	191	ARG	3.4
1	A	263	PHE	3.4
1	B	141	ILE	3.3
1	D	247	ALA	3.3
1	B	136	TYR	3.2
1	D	251	LEU	3.2
1	B	263	PHE	3.2
1	C	280	TYR	3.2
1	C	255	LEU	3.1
1	D	136	TYR	3.1
1	C	276	LEU	3.0
1	D	142	LEU	3.0
1	B	192	LEU	2.9
1	A	240	CYS	2.9
1	B	268	TRP	2.9
1	B	133	MET	2.9
1	D	267	ASN	2.9
1	D	109	LEU	2.9
1	D	137	THR	2.8
1	B	63	HIS	2.8
1	B	205	LEU	2.8
1	D	280	TYR	2.8
1	D	185	TYR	2.8
1	B	272	LYS	2.7
1	D	253	VAL	2.7
1	D	125	ARG	2.6
1	D	127	LEU	2.6
1	D	249	VAL	2.5
1	A	197	LEU	2.5
1	C	146	LEU	2.5
1	C	239	LEU	2.5
1	D	132	PRO	2.5
1	C	194	SER	2.4
1	C	63	HIS	2.4
1	D	65	GLU	2.4
1	D	266	ARG	2.4
1	C	205	LEU	2.4
1	C	283	VAL	2.3
1	A	293	LEU	2.3
1	D	205	LEU	2.3

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Mol	Chain	Res	Type	RSRZ
1	A	212	LEU	2.3
1	C	141	ILE	2.3
1	B	137	THR	2.3
1	B	195	LYS	2.3
1	D	178	ASN	2.3
1	A	239	LEU	2.3
1	C	70	ARG	2.2
1	D	133	MET	2.2
1	C	261	LEU	2.2
1	C	65	GLU	2.2
1	A	194	SER	2.2
1	D	43	VAL	2.2
1	D	268	TRP	2.1
1	A	93	ILE	2.1
1	C	186	ILE	2.1
1	D	276	LEU	2.1
1	D	293	LEU	2.1
1	D	97	LEU	2.1
1	A	127	LEU	2.1
1	B	188	LYS	2.1
1	D	80	LEU	2.1
1	D	246	LEU	2.0
1	A	141	ILE	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 monosaccharides 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.