



Full wwPDB X-ray Structure Validation Report ⓘ

Feb 1, 2016 – 07:05 AM GMT

PDB ID : 2ZF4
Title : Crystal Structure of VioE complexed with phenylpyruvic acid
Authors : Hirano, S.; Shiro, Y.; Nagano, S.
Deposited on : 2007-12-20
Resolution : 2.18 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
<http://wwpdb.org/validation/2016/XrayValidationReportHelp>
with specific help available everywhere you see the ⓘ symbol.

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

MolProbity : 4.02b-467
Mogul : 1.7 (RC4), CSD as536be (2015)
Xtriage (Phenix) : 1.9-1692
EDS : rb-20026688
Percentile statistics : 20151230.v01 (using entries in the PDB archive December 30th 2015)
Refmac : 5.8.0135
CCP4 : 6.5.0
Ideal geometry (proteins) : Engh & Huber (2001)
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP) : trunk26865

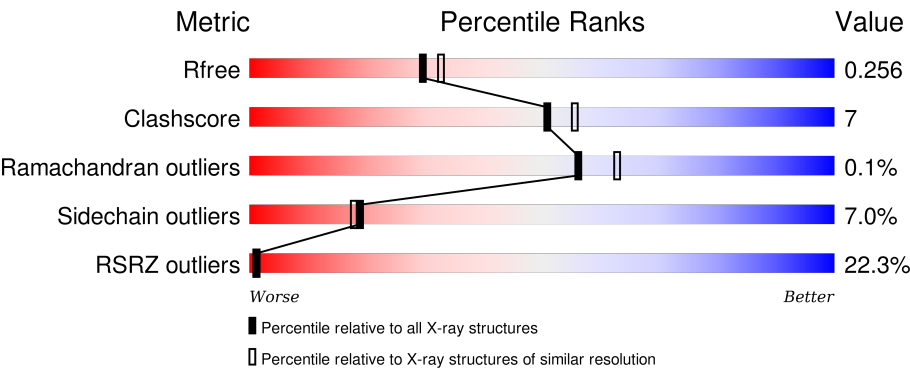
1 Overall quality at a glance i

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.18 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}	91344	5130 (2.20-2.16)
Clashscore	102246	5965 (2.20-2.16)
Ramachandran outliers	100387	5863 (2.20-2.16)
Sidechain outliers	100360	5864 (2.20-2.16)
RSRZ outliers	91569	5142 (2.20-2.16)

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 on the lower bar indicate the fraction of residues that contain outliers for ≥ 3 , 2, 1 and 0 types of geometric quality criteria. 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	194	<div><div>18%</div><div><div></div><div>75%</div><div>18%</div><div>• • •</div></div></div>
1	B	194	<div><div>27%</div><div><div></div><div>79%</div><div>11%</div><div>• 7%</div></div></div>
1	C	194	<div><div>15%</div><div><div></div><div>82%</div><div>10%</div><div>• • 7%</div></div></div>
1	D	194	<div><div>18%</div><div><div></div><div>71%</div><div>19%</div><div>• • 8%</div></div></div>
1	E	194	<div><div>24%</div><div><div></div><div>75%</div><div>14%</div><div>• 9%</div></div></div>

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Mol	Chain	Length	Quality of chain
1	F	194	

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
2	PPY	A	193	-	-	-	X
2	PPY	B	193	-	-	-	X
2	PPY	C	193	-	-	-	X

2 Entry composition

There are 3 unique types of molecules in this entry. The entry contains 9238 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 Hypothetical protein VioE.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	187	Total	C	N	O	S	0	2	0
			1508	950	273	278	7			
1	B	180	Total	C	N	O	S	0	0	0
			1448	912	262	268	6			
1	C	181	Total	C	N	O	S	0	1	0
			1461	922	264	269	6			
1	D	179	Total	C	N	O	S	0	1	0
			1442	909	260	266	7			
1	E	177	Total	C	N	O	S	0	0	0
			1423	897	256	264	6			
1	F	183	Total	C	N	O	S	0	3	0
			1492	937	273	275	7			

There are 18 discrepancies between the modelled and reference sequences:

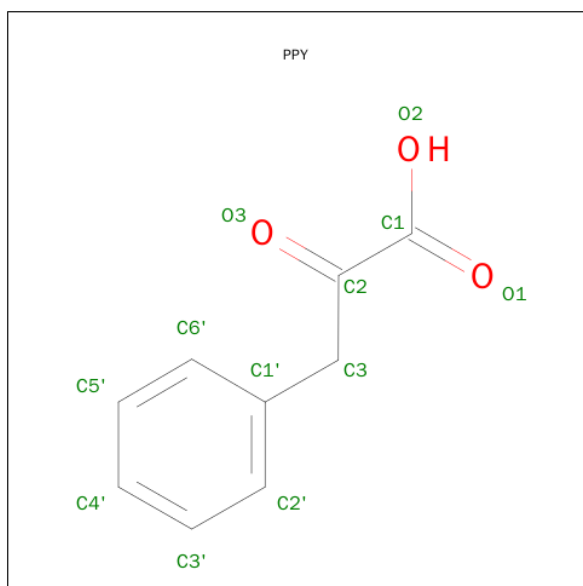
Chain	Residue	Modelled	Actual	Comment	Reference
A	-2	GLY	-	EXPRESSION TAG	UNP Q7NSZ5
A	-1	SER	-	EXPRESSION TAG	UNP Q7NSZ5
A	0	HIS	-	EXPRESSION TAG	UNP Q7NSZ5
B	-2	GLY	-	EXPRESSION TAG	UNP Q7NSZ5
B	-1	SER	-	EXPRESSION TAG	UNP Q7NSZ5
B	0	HIS	-	EXPRESSION TAG	UNP Q7NSZ5
C	-2	GLY	-	EXPRESSION TAG	UNP Q7NSZ5
C	-1	SER	-	EXPRESSION TAG	UNP Q7NSZ5
C	0	HIS	-	EXPRESSION TAG	UNP Q7NSZ5
D	-2	GLY	-	EXPRESSION TAG	UNP Q7NSZ5
D	-1	SER	-	EXPRESSION TAG	UNP Q7NSZ5
D	0	HIS	-	EXPRESSION TAG	UNP Q7NSZ5
E	-2	GLY	-	EXPRESSION TAG	UNP Q7NSZ5
E	-1	SER	-	EXPRESSION TAG	UNP Q7NSZ5
E	0	HIS	-	EXPRESSION TAG	UNP Q7NSZ5
F	-2	GLY	-	EXPRESSION TAG	UNP Q7NSZ5
F	-1	SER	-	EXPRESSION TAG	UNP Q7NSZ5

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Chain	Residue	Modelled	Actual	Comment	Reference
F	0	HIS	-	EXPRESSION TAG	UNP Q7NSZ5

- Molecule 2 is 3-PHENYLPYRUVIC ACID (three-letter code: PPY) (formula: $C_9H_8O_3$).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
2	A	1	Total	C	O	0	0
			12	9	3		
2	A	1	Total	C	O	0	0
			12	9	3		
2	B	1	Total	C	O	0	0
			12	9	3		
2	B	1	Total	C	O	0	0
			12	9	3		
2	C	1	Total	C	O	0	0
			12	9	3		
2	C	1	Total	C	O	0	0
			12	9	3		
2	D	1	Total	C	O	0	0
			12	9	3		
2	D	1	Total	C	O	0	0
			12	9	3		
2	E	1	Total	C	O	0	0
			12	9	3		
2	E	1	Total	C	O	0	0
			12	9	3		
2	F	1	Total	C	O	0	0
			12	9	3		

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Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
2	F	1	Total	C	O	0	0
			12	9	3		

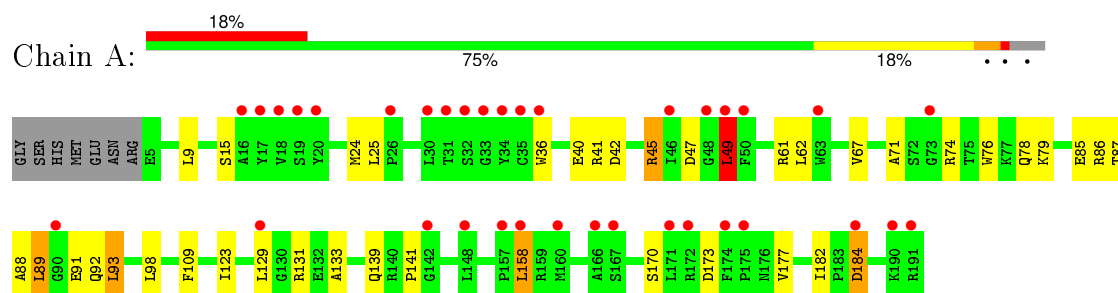
- Molecule 3 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
3	A	68	Total	O	0	0
			68	68		
3	B	36	Total	O	0	0
			36	36		
3	C	67	Total	O	0	0
			67	67		
3	D	41	Total	O	0	0
			41	41		
3	E	49	Total	O	0	0
			49	49		
3	F	59	Total	O	0	0
			59	59		

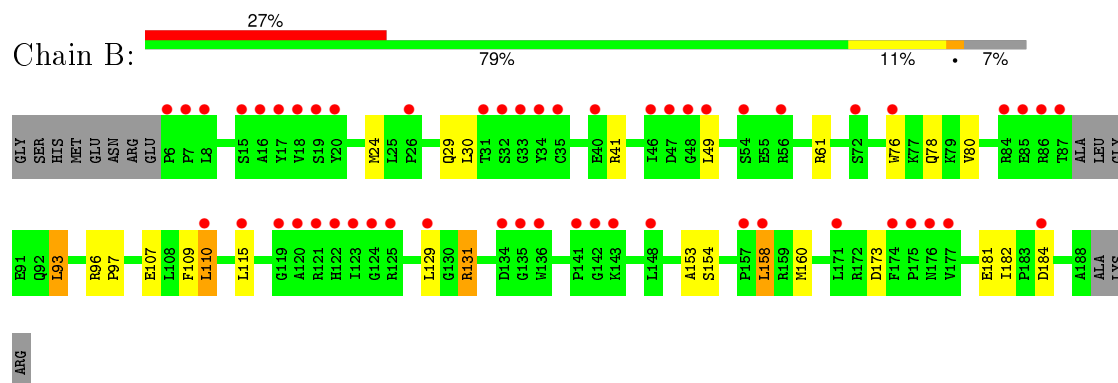
3 Residue-property plots [i](#)

These plots are drawn for all protein, RNA and DNA chains in the entry. The first graphic for a chain summarises the proportions of errors 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.

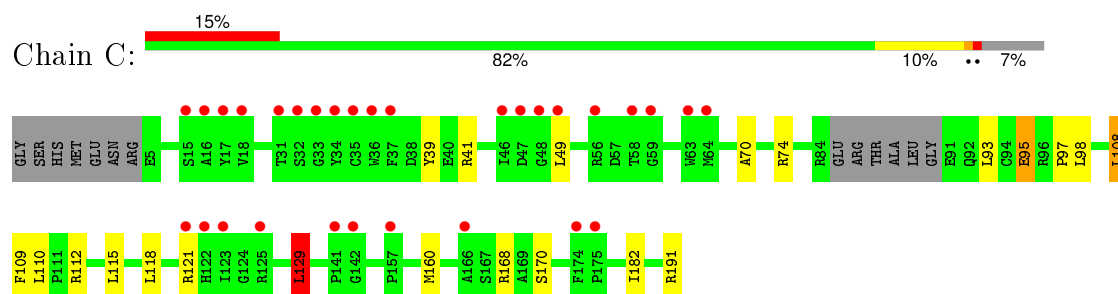
- Molecule 1: Hypothetical protein VioE



- Molecule 1: Hypothetical protein VioE

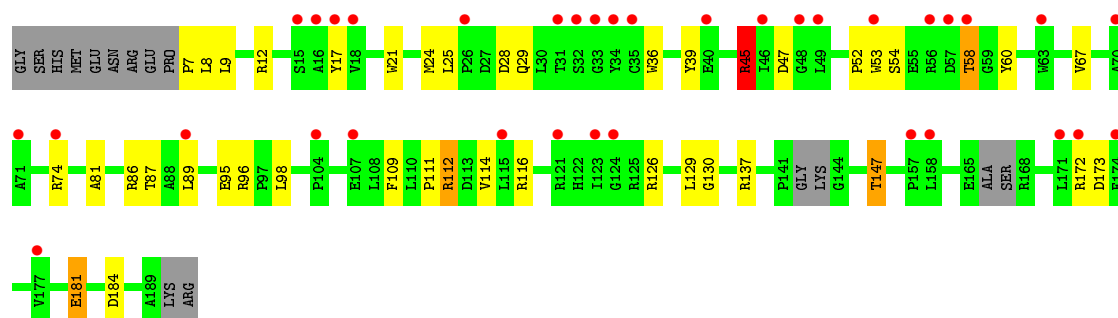


- Molecule 1: Hypothetical protein VioE

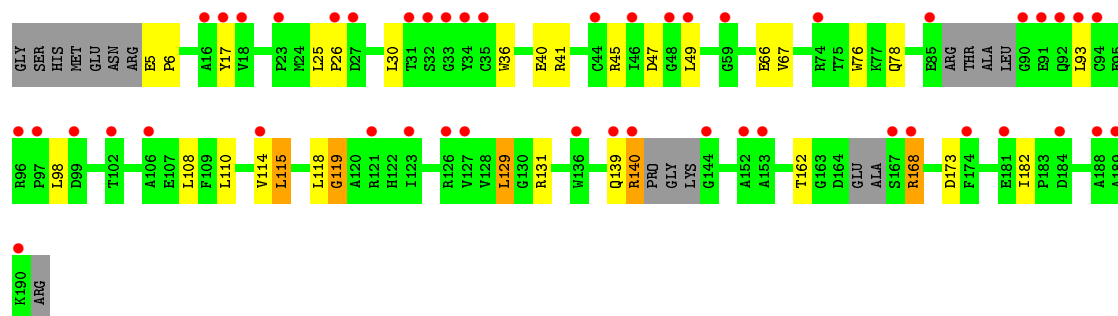
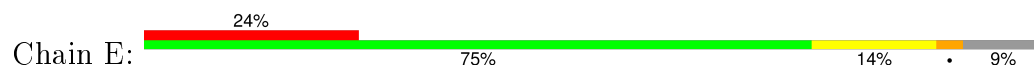


- Molecule 1: Hypothetical protein VioE

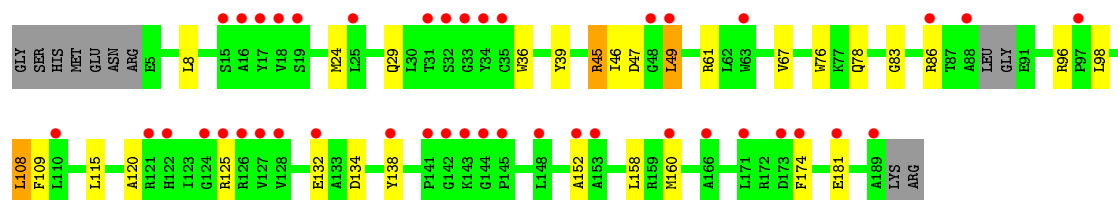
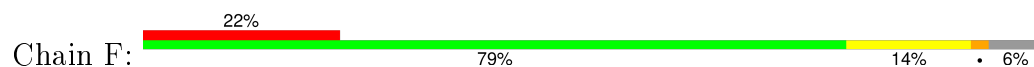




- Molecule 1: Hypothetical protein VioE



- Molecule 1: Hypothetical protein VioE



4 Data and refinement statistics

Property	Value	Source
Space group	P 21 21 21	Depositor
Cell constants a, b, c, α , β , γ	83.42Å 91.03Å 159.00Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	29.93 – 2.18 29.81 – 2.18	Depositor EDS
% Data completeness (in resolution range)	97.0 (29.93-2.18) 97.0 (29.81-2.18)	Depositor EDS
R_{merge}	0.06	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	5.11 (at 2.18Å)	Xtriage
Refinement program	REFMAC 5.2.0019	Depositor
R, R_{free}	0.206 , 0.254 0.208 , 0.256	Depositor DCC
R_{free} test set	3115 reflections (5.32%)	DCC
Wilson B-factor (Å ²)	36.6	Xtriage
Anisotropy	0.444	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.34 , 44.4	EDS
Estimated twinning fraction	No twinning to report.	Xtriage
L-test for twinning ²	$\langle L \rangle = 0.49$, $\langle L^2 \rangle = 0.32$	Xtriage
Outliers	0 of 61684 reflections	Xtriage
F_o, F_c correlation	0.93	EDS
Total number of atoms	9238	wwPDB-VP
Average B, all atoms (Å ²)	24.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 3.58% 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, 0.375 respectively for untwinned datasets, and 0.333, 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: PPY

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	0.51	0/1556	0.71	1/2112 (0.0%)
1	B	0.72	6/1489 (0.4%)	0.69	2/2022 (0.1%)
1	C	0.52	0/1505	0.70	1/2042 (0.0%)
1	D	0.49	0/1484	0.66	1/2014 (0.0%)
1	E	0.49	0/1461	0.69	2/1981 (0.1%)
1	F	0.53	0/1536	0.70	3/2086 (0.1%)
All	All	0.55	6/9031 (0.1%)	0.69	10/12257 (0.1%)

All (6) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	B	154	SER	CB-OG	12.52	1.58	1.42
1	B	131	ARG	CZ-NH1	8.29	1.43	1.33
1	B	153	ALA	C-O	6.60	1.35	1.23
1	B	153	ALA	C-N	5.96	1.47	1.34
1	B	154	SER	CA-CB	5.18	1.60	1.52
1	B	131	ARG	NE-CZ	5.14	1.39	1.33

All (10) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	F	45	ARG	NE-CZ-NH1	7.74	124.17	120.30
1	B	131	ARG	NE-CZ-NH2	-7.27	116.67	120.30
1	B	131	ARG	NE-CZ-NH1	7.03	123.81	120.30
1	C	129	LEU	CA-CB-CG	6.14	129.43	115.30
1	F	45	ARG	NE-CZ-NH2	-5.66	117.47	120.30
1	D	45	ARG	NE-CZ-NH1	5.64	123.12	120.30
1	A	49	LEU	CA-CB-CG	5.41	127.74	115.30
1	E	129	LEU	CA-CB-CG	5.32	127.53	115.30
1	E	110	LEU	CA-CB-CG	5.25	127.37	115.30

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	F	49	LEU	CA-CB-CG	5.14	127.12	115.30

There are no chirality outliers.

There are no planarity outliers.

5.2 Too-close contacts ⓘ

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

Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
1	A	1508	0	1457	25	0
1	B	1448	0	1385	15	0
1	C	1461	0	1406	10	0
1	D	1442	0	1380	32	0
1	E	1423	0	1355	21	0
1	F	1492	0	1429	18	0
2	A	24	0	14	3	0
2	B	24	0	14	3	0
2	C	24	0	14	3	0
2	D	24	0	14	5	0
2	E	24	0	14	0	0
2	F	24	0	14	5	0
3	A	68	0	0	2	0
3	B	36	0	0	3	0
3	C	67	0	0	1	0
3	D	41	0	0	1	0
3	E	49	0	0	2	0
3	F	59	0	0	0	0
All	All	9238	0	8496	120	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 7.

All (120) 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:D:109:PHE:HB3	2:D:192:PPY:H32	1.50	0.92

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:F:109:PHE:HB3	2:F:193:PPY:H32	1.51	0.90
1:A:36:TRP:CZ3	1:A:45:ARG:HD2	2.09	0.88
1:D:111:PRO:HD2	1:D:114:VAL:CG1	2.06	0.86
1:A:87:THR:HG22	1:A:89:LEU:H	1.38	0.86
1:D:53:TRP:HE1	1:D:58:THR:HG21	1.44	0.82
1:F:36:TRP:CZ3	1:F:45:ARG:HD2	2.16	0.81
1:C:109:PHE:HB3	2:C:193:PPY:H32	1.62	0.81
2:F:193:PPY:O3	2:F:193:PPY:H2'	1.84	0.78
2:C:193:PPY:H2'	2:C:193:PPY:O3	1.86	0.76
1:D:39:TYR:CD2	1:D:112:ARG:HD3	2.21	0.75
1:D:45:ARG:HG3	1:D:67:VAL:HG22	1.71	0.73
1:E:36:TRP:CZ3	1:E:45:ARG:HD2	2.24	0.71
1:D:53:TRP:NE1	1:D:58:THR:HG21	2.06	0.71
1:D:111:PRO:HD2	1:D:114:VAL:HG11	1.73	0.70
1:E:45:ARG:HD3	1:E:47:ASP:OD1	1.95	0.67
1:D:137:ARG:HH21	1:D:147:THR:HG21	1.60	0.67
1:F:45:ARG:HD3	1:F:47:ASP:OD1	1.95	0.67
1:F:160:MET:HE1	2:F:193:PPY:C6'	2.25	0.66
1:A:109:PHE:HB3	2:A:193:PPY:H32	1.78	0.66
1:A:87:THR:HG21	1:A:92:GLN:OE1	1.96	0.66
1:E:168:ARG:CG	1:E:168:ARG:HH11	2.08	0.65
2:D:192:PPY:O3	2:D:192:PPY:H2'	1.97	0.65
1:C:41:ARG:NH2	1:C:182:ILE:O	2.29	0.65
1:A:36:TRP:CE3	1:A:45:ARG:HD2	2.33	0.64
1:A:158:LEU:HD13	3:A:223:HOH:O	1.98	0.63
1:D:54:SER:O	1:D:58:THR:HB	1.99	0.62
1:D:111:PRO:HD2	1:D:114:VAL:HG13	1.79	0.61
1:E:168:ARG:HG2	1:E:168:ARG:HH11	1.67	0.60
1:B:61:ARG:NH1	3:B:197:HOH:O	2.34	0.60
1:D:58:THR:HG22	1:D:60:TYR:H	1.67	0.60
1:E:45:ARG:HG3	1:E:67:VAL:HG22	1.84	0.59
1:D:87:THR:HG23	1:D:89:LEU:H	1.66	0.59
1:B:41:ARG:HH12	1:B:184:ASP:HA	1.66	0.59
1:E:6:PRO:HB2	1:E:115:LEU:HB3	1.85	0.59
2:A:193:PPY:O3	2:A:193:PPY:H2'	2.04	0.58
1:D:172:ARG:NE	2:D:193:PPY:O2	2.37	0.57
2:F:193:PPY:O3	2:F:193:PPY:C2'	2.52	0.57
1:A:24:MET:HG3	1:B:93:LEU:HD13	1.87	0.56
1:D:8:LEU:HG	1:D:112:ARG:HG2	1.87	0.56
1:A:184:ASP:OD1	1:A:184:ASP:N	2.39	0.56
1:B:131:ARG:HB2	1:B:158:LEU:HD21	1.87	0.56

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
2:B:193:PPY:H2'	2:B:193:PPY:O3	2.06	0.55
1:B:76:TRP:CH2	1:B:78:GLN:HB2	2.42	0.55
1:D:12:ARG:HD3	1:D:181:GLU:HA	1.88	0.55
1:D:9:LEU:O	1:D:112:ARG:HD2	2.07	0.54
1:E:93:LEU:HG	1:F:24:MET:HG3	1.88	0.54
1:C:129:LEU:HA	1:D:95:GLU:OE2	2.06	0.54
1:A:45:ARG:HD3	1:A:47:ASP:OD1	2.08	0.54
1:D:29:GLN:NE2	3:D:221:HOH:O	2.39	0.54
1:F:125:ARG:HH12	1:F:152:ALA:HB1	1.73	0.54
1:F:39:TYR:CD1	1:F:108:LEU:HD23	2.44	0.53
1:F:83:GLY:HA3	1:F:96[B]:ARG:HH22	1.75	0.52
1:E:45:ARG:HA	1:E:66:GLU:O	2.10	0.51
1:A:49:LEU:HD21	1:B:30:LEU:HG	1.93	0.51
1:A:93:LEU:HD13	1:B:24:MET:HG3	1.93	0.51
1:C:93:LEU:HD13	1:D:24:MET:HG2	1.94	0.50
1:D:45:ARG:HD3	1:D:47:ASP:OD1	2.11	0.50
1:B:109:PHE:HB3	2:B:193:PPY:H32	1.93	0.50
1:A:129:LEU:HD11	1:A:173:ASP:HB3	1.94	0.49
1:F:36:TRP:CE3	1:F:45:ARG:HD2	2.47	0.49
1:E:140:ARG:HE	1:E:162:THR:HG23	1.78	0.48
1:F:132:GLU:HG2	1:F:152:ALA:HB3	1.95	0.48
1:A:45:ARG:HG3	1:A:67:VAL:HG22	1.95	0.48
2:B:193:PPY:C2'	2:B:193:PPY:O3	2.62	0.48
1:F:76:TRP:CH2	1:F:78:GLN:HB2	2.49	0.47
1:A:139:GLN:O	1:A:141:PRO:HD3	2.14	0.47
1:A:41:ARG:NH2	1:A:182:ILE:O	2.47	0.47
1:D:109:PHE:CB	2:D:192:PPY:H32	2.34	0.47
1:E:131:ARG:NH2	3:E:197:HOH:O	2.48	0.47
1:A:62:LEU:HD11	1:A:79:LYS:HG2	1.97	0.46
2:C:193:PPY:O3	2:C:193:PPY:C2'	2.54	0.46
1:E:114:VAL:HG13	1:E:115:LEU:HD13	1.96	0.46
1:F:125:ARG:NH2	1:F:134:ASP:OD1	2.48	0.46
1:C:70:ALA:HB2	1:C:108:LEU:HD13	1.97	0.46
2:D:192:PPY:O3	2:D:192:PPY:C2'	2.62	0.46
1:D:58:THR:HG23	1:D:60:TYR:CD1	2.52	0.45
1:B:107:GLU:HB2	3:B:206:HOH:O	2.15	0.45
1:D:7:PRO:N	1:D:116:ARG:HE	2.13	0.45
1:A:133:ALA:HB2	1:A:158:LEU:HD23	1.99	0.45
1:A:61:ARG:HD2	1:B:30:LEU:HD23	1.98	0.45
1:A:15:SER:HB2	1:A:177:VAL:HG22	1.98	0.45
1:F:160:MET:CE	1:F:174:PHE:HZ	2.30	0.44

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:E:41:ARG:NH2	1:E:182:ILE:O	2.37	0.44
1:A:85:GLU:O	1:A:91:GLU:HB2	2.17	0.44
1:C:39:TYR:CG	1:C:112:ARG:HB2	2.52	0.44
1:C:97:PRO:HG3	1:D:130:GLY:CA	2.47	0.44
1:F:96[A]:ARG:HH12	1:F:98:LEU:HD23	1.81	0.44
1:A:87:THR:CG2	1:A:88:ALA:N	2.80	0.43
1:E:168:ARG:HD2	1:E:168:ARG:HA	1.85	0.43
1:C:95:GLU:OE2	1:D:129:LEU:N	2.29	0.43
1:D:81:ALA:HB2	1:D:98:LEU:HD11	2.00	0.43
1:B:129:LEU:HD11	1:B:173:ASP:HB3	2.00	0.43
1:F:109:PHE:CB	2:F:193:PPY:H32	2.36	0.43
1:F:45:ARG:HG3	1:F:67:VAL:HG22	2.00	0.43
1:B:41:ARG:NH2	1:B:182:ILE:O	2.51	0.43
1:D:17:TYR:HA	1:D:173:ASP:O	2.19	0.43
1:D:25:LEU:HB2	1:D:28:ASP:OD2	2.18	0.43
1:A:87:THR:HG22	1:A:88:ALA:N	2.34	0.43
1:B:110:LEU:HD21	1:B:160:MET:SD	2.59	0.43
1:E:25:LEU:HB3	1:E:26:PRO:HD2	2.01	0.43
1:A:76:TRP:CH2	1:A:78:GLN:HB2	2.54	0.43
1:E:36:TRP:HZ3	1:E:45:ARG:HD2	1.80	0.42
2:A:193:PPY:C2'	2:A:193:PPY:O3	2.66	0.42
1:E:139:GLN:HG3	3:E:214:HOH:O	2.19	0.42
1:F:120:ALA:HA	1:F:138:TYR:HB3	2.01	0.42
1:E:76:TRP:CH2	1:E:78:GLN:HB2	2.55	0.42
1:C:129:LEU:HD13	1:D:95:GLU:CG	2.50	0.42
1:A:131:ARG:NH2	3:A:214:HOH:O	2.51	0.42
1:E:118:LEU:O	1:E:119:GLY:C	2.58	0.42
1:B:158:LEU:CD1	3:B:199:HOH:O	2.68	0.41
1:B:80:VAL:HA	1:B:97:PRO:HA	2.01	0.41
1:D:111:PRO:CD	1:D:114:VAL:HG13	2.49	0.41
1:D:21:TRP:HZ2	1:D:52:PRO:HD3	1.83	0.41
1:D:36:TRP:CZ3	1:D:45:ARG:HD2	2.55	0.41
1:C:160:MET:HG3	3:C:241:HOH:O	2.21	0.41
1:E:17:TYR:HA	1:E:173:ASP:O	2.20	0.40
1:E:168:ARG:CG	1:E:168:ARG:NH1	2.76	0.40
1:A:42:ASP:HB3	1:A:71:ALA:HB2	2.03	0.40
1:E:30:LEU:HD23	1:F:61[A]:ARG:HD2	2.04	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	187/194 (96%)	180 (96%)	7 (4%)	0	100	100
1	B	176/194 (91%)	169 (96%)	7 (4%)	0	100	100
1	C	178/194 (92%)	172 (97%)	6 (3%)	0	100	100
1	D	174/194 (90%)	169 (97%)	5 (3%)	0	100	100
1	E	169/194 (87%)	164 (97%)	4 (2%)	1 (1%)	30	27
1	F	182/194 (94%)	175 (96%)	7 (4%)	0	100	100
All	All	1066/1164 (92%)	1029 (96%)	36 (3%)	1 (0%)	56	63

All (1) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	E	119	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	156/160 (98%)	142 (91%)	14 (9%)	12	10
1	B	150/160 (94%)	142 (95%)	8 (5%)	28	30
1	C	151/160 (94%)	138 (91%)	13 (9%)	13	11
1	D	149/160 (93%)	139 (93%)	10 (7%)	20	19
1	E	147/160 (92%)	138 (94%)	9 (6%)	23	23
1	F	154/160 (96%)	145 (94%)	9 (6%)	25	26

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Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
All	All	907/960 (94%)	844 (93%)	63 (7%)	19	18

All (63) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	9	LEU
1	A	25	LEU
1	A	40	GLU
1	A	45	ARG
1	A	49	LEU
1	A	74	ARG
1	A	86	ARG
1	A	89	LEU
1	A	93	LEU
1	A	98	LEU
1	A	123	ILE
1	A	158	LEU
1	A	170	SER
1	A	184	ASP
1	B	29	GLN
1	B	49	LEU
1	B	93	LEU
1	B	96	ARG
1	B	110	LEU
1	B	115	LEU
1	B	158	LEU
1	B	181	GLU
1	C	49	LEU
1	C	74	ARG
1	C	95	GLU
1	C	98	LEU
1	C	108	LEU
1	C	110	LEU
1	C	115	LEU
1	C	118	LEU
1	C	121	ARG
1	C	129	LEU
1	C	168	ARG
1	C	170	SER
1	C	191	ARG
1	D	45	ARG
1	D	58	THR

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Mol	Chain	Res	Type
1	D	74	ARG
1	D	86	ARG
1	D	96	ARG
1	D	112	ARG
1	D	126	ARG
1	D	147	THR
1	D	181	GLU
1	D	184	ASP
1	E	5	GLU
1	E	40	GLU
1	E	49	LEU
1	E	98	LEU
1	E	108	LEU
1	E	115	LEU
1	E	129	LEU
1	E	140	ARG
1	E	168	ARG
1	F	8	LEU
1	F	29	GLN
1	F	46	ILE
1	F	49	LEU
1	F	86	ARG
1	F	108	LEU
1	F	115	LEU
1	F	158	LEU
1	F	181	GLU

Some sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (3) such sidechains are listed below:

Mol	Chain	Res	Type
1	D	29	GLN
1	D	92	GLN
1	F	29	GLN

5.3.3 RNA ⓘ

There are no RNA molecules in this entry.

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

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

5.5 Carbohydrates [i](#)

There are no carbohydrates in this entry.

5.6 Ligand geometry [i](#)

12 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	$\# Z > 2$
2	PPY	A	192	-	9,12,12	1.09	0	10,15,15	0.42	0
2	PPY	A	193	-	9,12,12	0.60	0	10,15,15	0.79	0
2	PPY	B	192	-	9,12,12	1.01	0	10,15,15	0.97	1 (10%)
2	PPY	B	193	-	9,12,12	0.65	0	10,15,15	0.79	0
2	PPY	C	192	-	9,12,12	0.75	0	10,15,15	0.74	0
2	PPY	C	193	-	9,12,12	0.64	0	10,15,15	0.67	0
2	PPY	D	192	-	9,12,12	0.62	0	10,15,15	0.77	0
2	PPY	D	193	-	9,12,12	0.86	0	10,15,15	0.87	0
2	PPY	E	192	-	9,12,12	0.77	0	10,15,15	0.88	0
2	PPY	E	193	-	9,12,12	0.70	0	10,15,15	0.60	0
2	PPY	F	192	-	9,12,12	0.51	0	10,15,15	0.77	0
2	PPY	F	193	-	9,12,12	0.71	0	10,15,15	0.70	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
2	PPY	A	192	-	-	0/4/8/8	0/1/1/1
2	PPY	A	193	-	-	0/4/8/8	0/1/1/1
2	PPY	B	192	-	-	0/4/8/8	0/1/1/1

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Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
2	PPY	B	193	-	-	0/4/8/8	0/1/1/1
2	PPY	C	192	-	-	0/4/8/8	0/1/1/1
2	PPY	C	193	-	-	0/4/8/8	0/1/1/1
2	PPY	D	192	-	-	0/4/8/8	0/1/1/1
2	PPY	D	193	-	-	0/4/8/8	0/1/1/1
2	PPY	E	192	-	-	0/4/8/8	0/1/1/1
2	PPY	E	193	-	-	0/4/8/8	0/1/1/1
2	PPY	F	192	-	-	0/4/8/8	0/1/1/1
2	PPY	F	193	-	-	0/4/8/8	0/1/1/1

There are no bond length outliers.

All (1) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	B	192	PPY	C1'-C3-C2	2.15	119.98	114.75

There are no chirality outliers.

There are no torsion outliers.

There are no ring outliers.

6 monomers are involved in 19 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
2	A	193	PPY	3	0
2	B	193	PPY	3	0
2	C	193	PPY	3	0
2	D	192	PPY	4	0
2	D	193	PPY	1	0
2	F	193	PPY	5	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	187/194 (96%)	1.14	35 (18%) 2 2	15, 25, 33, 45	0
1	B	180/194 (92%)	1.54	53 (29%) 1 1	17, 28, 37, 41	0
1	C	181/194 (93%)	0.94	30 (16%) 2 3	17, 23, 34, 38	0
1	D	179/194 (92%)	1.15	35 (19%) 1 2	16, 25, 33, 39	0
1	E	177/194 (91%)	1.36	47 (26%) 1 1	13, 20, 31, 35	0
1	F	183/194 (94%)	1.22	42 (22%) 1 1	12, 21, 34, 40	0
All	All	1087/1164 (93%)	1.22	242 (22%) 1 1	12, 24, 35, 45	0

All (242) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	F	33	GLY	5.5
1	F	152	ALA	5.2
1	D	17	TYR	5.2
1	F	125	ARG	5.2
1	F	127	VAL	5.1
1	E	85	GLU	5.1
1	B	174	PHE	5.1
1	B	17	TYR	4.8
1	B	120	ALA	4.7
1	E	49	LEU	4.7
1	E	34	TYR	4.6
1	D	18	VAL	4.6
1	B	177	VAL	4.5
1	A	33	GLY	4.5
1	A	166	ALA	4.5
1	B	33	GLY	4.4
1	F	17	TYR	4.4
1	B	56	ARG	4.4
1	F	18	VAL	4.4

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Mol	Chain	Res	Type	RSRZ
1	F	189	ALA	4.4
1	F	124	GLY	4.4
1	B	85	GLU	4.4
1	B	18	VAL	4.3
1	E	33	GLY	4.2
1	A	17	TYR	4.2
1	E	90	GLY	4.2
1	A	184	ASP	4.2
1	B	86	ARG	4.1
1	B	158	LEU	4.1
1	B	34	TYR	4.1
1	D	174	PHE	4.1
1	E	126	ARG	4.0
1	E	17	TYR	4.0
1	C	166	ALA	4.0
1	A	48	GLY	4.0
1	B	142	GLY	3.9
1	C	48	GLY	3.9
1	E	16	ALA	3.9
1	B	35	CYS	3.9
1	F	88	ALA	3.9
1	E	123	ILE	3.9
1	B	119	GLY	3.9
1	A	190	LYS	3.9
1	E	94	CYS	3.8
1	E	174	PHE	3.8
1	A	31	THR	3.8
1	A	16	ALA	3.7
1	A	32	SER	3.7
1	B	46	ILE	3.7
1	D	34	TYR	3.7
1	E	121	ARG	3.7
1	C	16	ALA	3.7
1	F	16	ALA	3.7
1	D	33	GLY	3.7
1	F	32	SER	3.7
1	E	93	LEU	3.7
1	D	46	ILE	3.7
1	B	48	GLY	3.6
1	D	56	ARG	3.6
1	C	17	TYR	3.6
1	C	18	VAL	3.6

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Mol	Chain	Res	Type	RSRZ
1	D	89	LEU	3.6
1	C	63	TRP	3.6
1	C	35	CYS	3.6
1	F	126	ARG	3.6
1	E	46	ILE	3.5
1	B	72	SER	3.5
1	B	171	LEU	3.5
1	B	123	ILE	3.4
1	C	123	ILE	3.4
1	D	35	CYS	3.4
1	B	157	PRO	3.4
1	F	181	GLU	3.4
1	E	152	ALA	3.4
1	C	142	GLY	3.4
1	A	49	LEU	3.4
1	D	32	SER	3.3
1	E	127	VAL	3.3
1	F	86	ARG	3.3
1	C	32	SER	3.3
1	E	97	PRO	3.3
1	F	34	TYR	3.3
1	B	135	GLY	3.3
1	A	18	VAL	3.3
1	F	132	GLU	3.3
1	B	136	TRP	3.2
1	E	35	CYS	3.2
1	E	18	VAL	3.2
1	B	129	LEU	3.2
1	F	141	PRO	3.2
1	E	140	ARG	3.2
1	A	73	GLY	3.1
1	C	49	LEU	3.1
1	A	158	LEU	3.1
1	C	34	TYR	3.1
1	B	16	ALA	3.1
1	E	32	SER	3.1
1	D	63	TRP	3.0
1	E	102	THR	3.0
1	E	48	GLY	3.0
1	A	19	SER	3.0
1	E	168	ARG	3.0
1	B	32	SER	3.0

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Mol	Chain	Res	Type	RSRZ
1	B	8	LEU	3.0
1	B	49	LEU	3.0
1	A	142	GLY	3.0
1	E	144	GLY	3.0
1	B	40	GLU	2.9
1	F	148	LEU	2.9
1	B	15	SER	2.9
1	D	124	GLY	2.9
1	E	153	ALA	2.9
1	B	115	LEU	2.9
1	D	177	VAL	2.9
1	E	189	ALA	2.9
1	F	166	ALA	2.9
1	D	31	THR	2.9
1	E	167	SER	2.9
1	D	49	LEU	2.9
1	C	33	GLY	2.9
1	A	171	LEU	2.9
1	C	56	ARG	2.9
1	B	175	PRO	2.9
1	B	134	ASP	2.9
1	F	48	GLY	2.8
1	C	141	PRO	2.8
1	A	35	CYS	2.8
1	B	19	SER	2.8
1	F	144	GLY	2.8
1	F	122	HIS	2.7
1	B	6	PRO	2.7
1	F	160	MET	2.7
1	B	87	THR	2.7
1	C	46	ILE	2.7
1	D	53	TRP	2.7
1	F	31	THR	2.7
1	A	172	ARG	2.7
1	E	59	GLY	2.7
1	F	25	LEU	2.7
1	C	174	PHE	2.7
1	C	121	ARG	2.6
1	B	54	SER	2.6
1	F	15	SER	2.6
1	A	34	TYR	2.6
1	B	122	HIS	2.6

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Mol	Chain	Res	Type	RSRZ
1	A	174	PHE	2.6
1	D	123	ILE	2.6
1	F	153	ALA	2.6
1	F	35	CYS	2.6
1	B	184	ASP	2.6
1	A	129	LEU	2.6
1	C	15	SER	2.5
1	C	37	PHE	2.5
1	A	63	TRP	2.5
1	C	31	THR	2.5
1	C	36	TRP	2.5
1	A	148	LEU	2.5
1	B	110	LEU	2.5
1	F	173	ASP	2.5
1	D	104	PRO	2.5
1	F	97	PRO	2.5
1	B	84	ARG	2.5
1	B	125	ARG	2.5
1	E	190	LYS	2.5
1	A	50	PHE	2.5
1	B	76	TRP	2.5
1	F	121	ARG	2.5
1	B	148	LEU	2.5
1	A	36	TRP	2.5
1	D	40	GLU	2.5
1	A	90	GLY	2.5
1	C	58	THR	2.5
1	E	181	GLU	2.4
1	A	46	ILE	2.4
1	D	15	SER	2.4
1	E	136	TRP	2.4
1	A	157	PRO	2.4
1	B	121	ARG	2.4
1	F	174	PHE	2.4
1	E	106	ALA	2.3
1	F	145	PRO	2.3
1	B	124	GLY	2.3
1	B	176	ASN	2.3
1	D	48	GLY	2.3
1	E	74	ARG	2.3
1	D	71	ALA	2.3
1	F	142	GLY	2.3

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Mol	Chain	Res	Type	RSRZ
1	D	26	PRO	2.3
1	A	30	LEU	2.3
1	D	16	ALA	2.3
1	B	20	TYR	2.3
1	E	114	VAL	2.3
1	B	31	THR	2.2
1	D	58	THR	2.2
1	F	19	SER	2.2
1	A	160	MET	2.2
1	E	96	ARG	2.2
1	B	47	ASP	2.2
1	C	47	ASP	2.2
1	A	167	SER	2.2
1	F	171	LEU	2.2
1	E	27	ASP	2.2
1	D	57	ASP	2.2
1	D	115	LEU	2.2
1	E	23	PRO	2.2
1	F	49	LEU	2.2
1	F	143	LYS	2.2
1	C	122	HIS	2.2
1	C	59	GLY	2.2
1	D	157	PRO	2.2
1	D	158	LEU	2.2
1	A	191	ARG	2.2
1	E	92	GLN	2.2
1	E	139	GLN	2.2
1	A	20	TYR	2.2
1	D	107	GLU	2.2
1	D	70	ALA	2.2
1	F	138	TYR	2.1
1	B	7	PRO	2.1
1	B	26	PRO	2.1
1	C	125	ARG	2.1
1	D	121	ARG	2.1
1	E	188	ALA	2.1
1	A	26	PRO	2.1
1	D	171	LEU	2.1
1	F	63	TRP	2.1
1	F	128	VAL	2.1
1	E	91	GLU	2.1
1	F	110	LEU	2.1

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Mol	Chain	Res	Type	RSRZ
1	C	64	MET	2.1
1	D	172	ARG	2.1
1	B	143	LYS	2.1
1	E	31	THR	2.1
1	E	99	ASP	2.1
1	E	184	ASP	2.1
1	E	26	PRO	2.0
1	E	44	CYS	2.0
1	C	157	PRO	2.0
1	C	175	PRO	2.0
1	D	74	ARG	2.0
1	A	175	PRO	2.0
1	B	141	PRO	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 carbohydrates 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. LLDF column lists the quality of electron density of the group with respect to its neighbouring residues in protein, DNA or RNA chains. 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	LLDF	B-factors(Å ²)	Q<0.9
2	PPY	A	193	12/12	0.60	0.42	3.57	49,50,55,56	0
2	PPY	C	193	12/12	0.62	0.34	2.75	31,34,46,47	0
2	PPY	B	193	12/12	0.47	0.41	2.50	55,57,60,60	0
2	PPY	E	193	12/12	0.75	0.29	1.38	46,47,49,50	0
2	PPY	D	192	12/12	0.67	0.33	1.33	42,44,49,49	0
2	PPY	F	193	12/12	0.78	0.28	1.24	28,30,43,43	0
2	PPY	B	192	12/12	0.75	0.25	0.36	34,37,39,40	0
2	PPY	F	192	12/12	0.87	0.22	0.04	26,29,31,32	0

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Mol	Type	Chain	Res	Atoms	RSCC	RSR	LLDF	B-factors(\AA^2)	Q<0.9
2	PPY	D	193	12/12	0.85	0.21	-0.16	47,50,51,51	0
2	PPY	E	192	12/12	0.87	0.19	-0.24	32,35,38,38	0
2	PPY	C	192	12/12	0.87	0.18	-0.59	34,36,41,42	0
2	PPY	A	192	12/12	0.88	0.20	-0.80	31,33,35,35	0

6.5 Other polymers [i](#)

There are no such residues in this entry.