



Full wwPDB X-ray Structure Validation Report

May 25, 2020 – 06:07 am BST

PDB ID : 5CY2
Title : Tn3 resolvase - site III complex crystal form II
Authors : Montano, P.S.; Rice, P.A.
Deposited on : 2015-07-30
Resolution : 4.00 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 following versions of software and data (see [references](#) ) were used in the production of this report:

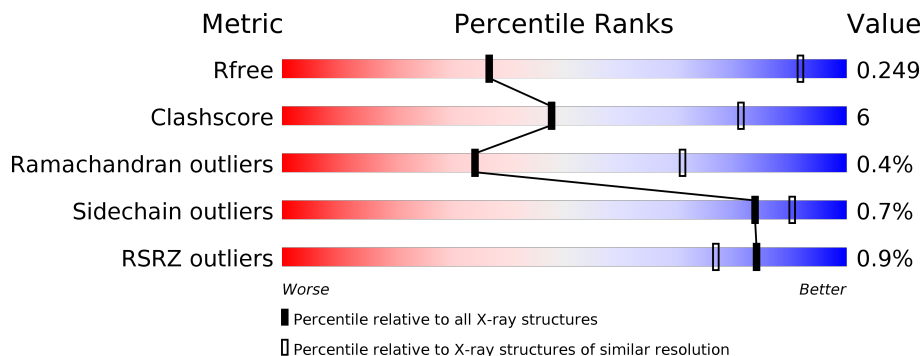
MolProbity : 4.02b-467
Xtrriage (Phenix) : 1.13
EDS : 2.11
Percentile statistics : 20191225.v01 (using entries in the PDB archive December 25th 2019)
Refmac : 5.8.0158
CCP4 : 7.0.044 (Gargrove)
Ideal geometry (proteins) : Engh & Huber (2001)
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP) : 2.11

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 4.00 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}	130704	1087 (4.30-3.70)
Clashscore	141614	1148 (4.30-3.70)
Ramachandran outliers	138981	1108 (4.30-3.70)
Sidechain outliers	138945	1099 (4.30-3.70)
RSRZ outliers	127900	1028 (4.34-3.66)

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 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	192	 % 76% 16% 8%
1	B	192	 % 79% 15% 6%
1	E	192	 % 78% 14% 8%
1	F	192	 2% 83% 10% 6%
2	C	27	 70% 30%
2	G	27	 85% 15%

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Mol	Chain	Length	Quality of chain
3	D	27	 41% 56%
3	H	27	 56% 44%

2 Entry composition i

There are 3 unique types of molecules in this entry. The entry contains 14835 atoms, of which 7043 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 Transposon Tn3 resolvase.

Mol	Chain	Residues	Atoms						ZeroOcc	AltConf	Trace
			Total	C	H	N	O	S			
1	A	177	2815	852	1433	261	264	5	0	0	0
1	B	180	2888	873	1473	269	268	5	0	0	0
1	E	176	2808	850	1430	260	263	5	0	0	0
1	F	180	2888	873	1473	269	268	5	0	0	0

There are 28 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	186	ALA	-	expression tag	UNP P0ADI2
A	187	HIS	-	expression tag	UNP P0ADI2
A	188	HIS	-	expression tag	UNP P0ADI2
A	189	HIS	-	expression tag	UNP P0ADI2
A	190	HIS	-	expression tag	UNP P0ADI2
A	191	HIS	-	expression tag	UNP P0ADI2
A	192	HIS	-	expression tag	UNP P0ADI2
B	186	ALA	-	expression tag	UNP P0ADI2
B	187	HIS	-	expression tag	UNP P0ADI2
B	188	HIS	-	expression tag	UNP P0ADI2
B	189	HIS	-	expression tag	UNP P0ADI2
B	190	HIS	-	expression tag	UNP P0ADI2
B	191	HIS	-	expression tag	UNP P0ADI2
B	192	HIS	-	expression tag	UNP P0ADI2
E	186	ALA	-	expression tag	UNP P0ADI2
E	187	HIS	-	expression tag	UNP P0ADI2
E	188	HIS	-	expression tag	UNP P0ADI2
E	189	HIS	-	expression tag	UNP P0ADI2
E	190	HIS	-	expression tag	UNP P0ADI2
E	191	HIS	-	expression tag	UNP P0ADI2
E	192	HIS	-	expression tag	UNP P0ADI2

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Chain	Residue	Modelled	Actual	Comment	Reference
F	186	ALA	-	expression tag	UNP P0ADI2
F	187	HIS	-	expression tag	UNP P0ADI2
F	188	HIS	-	expression tag	UNP P0ADI2
F	189	HIS	-	expression tag	UNP P0ADI2
F	190	HIS	-	expression tag	UNP P0ADI2
F	191	HIS	-	expression tag	UNP P0ADI2
F	192	HIS	-	expression tag	UNP P0ADI2

- Molecule 2 is a DNA chain called DNA (27-MER).

Mol	Chain	Residues	Atoms						ZeroOcc	AltConf	Trace
			Total	C	H	N	O	P			
2	C	27	Total	C	H	N	O	P	0	0	0
			862	267	310	96	163	26			
2	G	27	Total	C	H	N	O	P	0	0	0
			862	267	310	96	163	26			

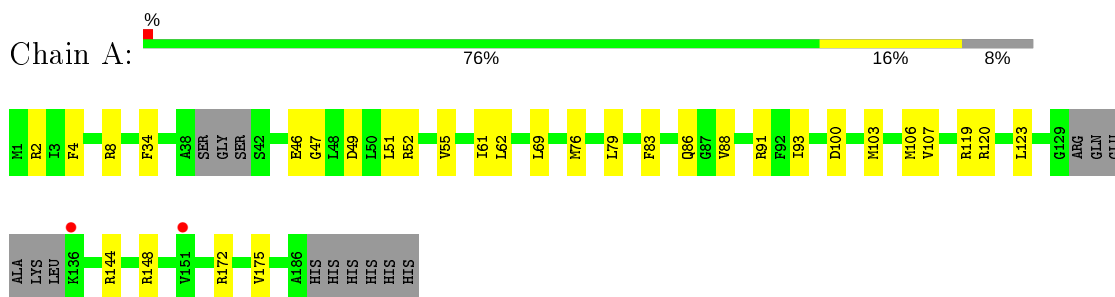
- Molecule 3 is a DNA chain called DNA (27-MER).

Mol	Chain	Residues	Atoms						ZeroOcc	AltConf	Trace
			Total	C	H	N	O	P			
3	D	27	Total	C	H	N	O	P	0	0	0
			856	265	307	101	157	26			
3	H	27	Total	C	H	N	O	P	0	0	0
			856	265	307	101	157	26			

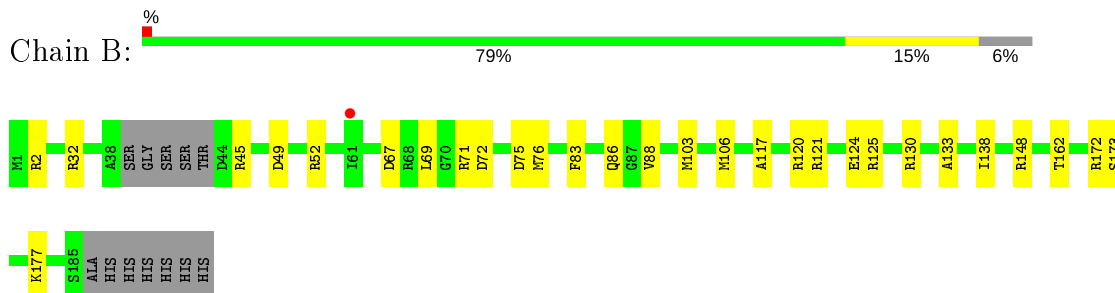
3 Residue-property plots [i](#)

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

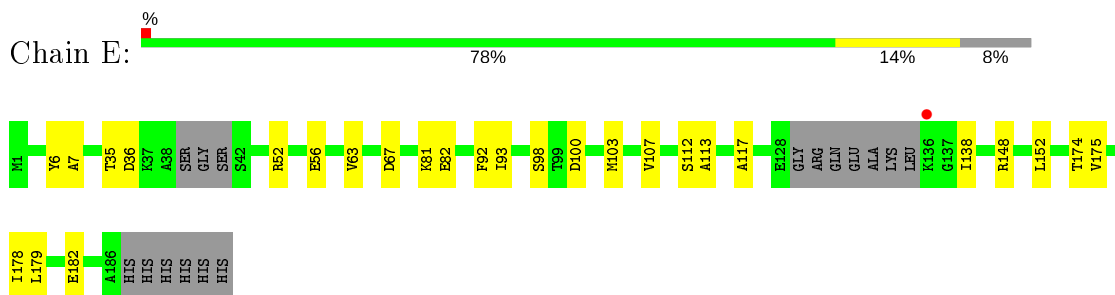
- Molecule 1: Transposon Tn3 resolvase



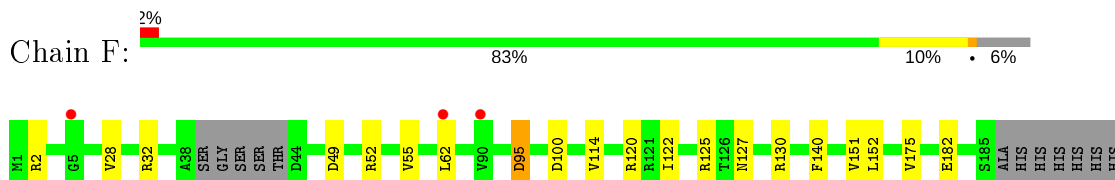
- Molecule 1: Transposon Tn3 resolvase



- Molecule 1: Transposon Tn3 resolvase



- Molecule 1: Transposon Tn3 resolvase




- Molecule 2: DNA (27-MER)

Chain C:  70% 30%



- Molecule 2: DNA (27-MER)

Chain G:  85% 15%



- Molecule 3: DNA (27-MER)

Chain D:  41% 56% .



- Molecule 3: DNA (27-MER)

Chain H:  56% 44%



4 Data and refinement statistics i

Property	Value	Source
Space group	C 1 2 1	Depositor
Cell constants a, b, c, α , β , γ	144.90Å 151.92Å 106.14Å 90.00° 99.85° 90.00°	Depositor
Resolution (Å)	49.25 – 4.00 49.25 – 4.00	Depositor EDS
% Data completeness (in resolution range)	99.3 (49.25-4.00) 91.2 (49.25-4.00)	Depositor EDS
R_{merge}	(Not available)	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	1.29 (at 4.00Å)	Xtrriage
Refinement program	PHENIX dev_2067	Depositor
R, R_{free}	0.207 , 0.250 0.209 , 0.249	Depositor DCC
R_{free} test set	970 reflections (5.08%)	wwPDB-VP
Wilson B-factor (Å ²)	167.4	Xtrriage
Anisotropy	0.230	Xtrriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.28 , 113.7	EDS
L-test for twinning ²	$\langle L \rangle = 0.47$, $\langle L^2 \rangle = 0.30$	Xtrriage
Estimated twinning fraction	0.035 for $-1/2^*h+1/2^*k-l, 1/2^*h-1/2^*k-l, -1/2^*h-1/2^*k$ 0.036 for $-1/2^*h-1/2^*k-l, -1/2^*h-1/2^*k+l, -1/2^*h+1/2^*k$	Xtrriage
F_o, F_c correlation	0.96	EDS
Total number of atoms	14835	wwPDB-VP
Average B, all atoms (Å ²)	209.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 3.36% of the height of the origin peak. No significant pseudotranslation is detected.*

¹ Intensities estimated from amplitudes.

² Theoretical 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](#)

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	0/1388	0.65	0/1855
1	B	0.43	0/1422	0.54	0/1900
1	E	0.49	0/1384	0.66	0/1850
1	F	0.39	0/1422	0.53	0/1900
2	C	0.98	0/618	1.11	0/953
2	G	0.89	0/618	1.07	2/953 (0.2%)
3	D	0.98	1/616 (0.2%)	1.04	0/948
3	H	0.90	0/616	1.02	0/948
All	All	0.64	1/8084 (0.0%)	0.78	2/11307 (0.0%)

All (1) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
3	D	10	DT	C3'-O3'	-5.28	1.37	1.44

All (2) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	G	17	DA	O4'-C1'-N9	5.50	111.85	108.00
2	G	19	DT	N3-C4-O4	5.03	122.92	119.90

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	1382	1433	1433	24	0
1	B	1415	1473	1473	20	0
1	E	1378	1430	1430	16	0
1	F	1415	1473	1473	14	0
2	C	552	310	310	8	0
2	G	552	310	310	1	0
3	D	549	307	307	11	0
3	H	549	307	307	11	0
All	All	7792	7043	7043	90	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 (90) 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:B:49:ASP:OD1	1:B:52:ARG:NH1	1.95	0.98
1:B:45:ARG:NH2	1:B:75:ASP:OD2	2.19	0.76
1:A:49:ASP:OD1	1:A:52:ARG:NH1	2.24	0.71
1:E:52:ARG:NE	1:E:82:GLU:OE2	2.27	0.67
1:F:127:ASN:O	1:F:130:ARG:HB3	1.99	0.62
3:H:2:DA:H2''	3:H:3:DT:H71	1.84	0.59
1:F:49:ASP:OD1	1:F:52:ARG:NH1	2.36	0.58
3:H:18:DA:C6	3:H:19:DA:C6	2.91	0.58
3:H:2:DA:H2''	3:H:3:DT:OP2	2.06	0.56
1:F:125:ARG:HE	3:H:18:DA:H5''	1.72	0.55
1:E:138:ILE:HD12	1:F:122:ILE:HD12	1.91	0.53
3:D:2:DA:H2''	3:D:3:DT:OP2	2.09	0.52
1:B:45:ARG:NH1	1:B:71:ARG:HH21	2.08	0.51
1:A:69:LEU:HB3	1:A:76:MET:HG3	1.92	0.51
3:D:22:DT:H2''	3:D:23:DC:O5'	2.12	0.50
3:H:3:DT:H2'	3:H:4:DT:H71	1.94	0.50
1:F:152:LEU:HD11	1:F:182:GLU:HG3	1.93	0.50
1:E:113:ALA:O	1:E:117:ALA:N	2.44	0.50
1:A:79:LEU:O	1:A:83:PHE:HD2	1.95	0.49
1:A:91:ARG:NH2	1:A:100:ASP:OD2	2.38	0.49
1:B:162:THR:HG22	1:B:172:ARG:HD3	1.94	0.49
3:D:8:DC:H2''	3:D:9:DC:C6	2.49	0.48
1:A:172:ARG:O	1:A:175:VAL:N	2.43	0.48
1:B:133:ALA:HB1	1:B:138:ILE:HD12	1.96	0.48
1:F:151:VAL:HG13	1:F:175:VAL:HG13	1.95	0.47
1:A:49:ASP:O	1:A:52:ARG:HB2	2.14	0.47

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:103:MET:O	1:A:107:VAL:HG23	2.15	0.47
1:E:63:VAL:HB	1:E:92:PHE:CD1	2.49	0.47
3:D:4:DT:H2''	3:D:5:DG:H5''	1.96	0.46
1:E:103:MET:O	1:E:107:VAL:HG23	2.14	0.46
1:A:51:LEU:O	1:A:52:ARG:C	2.54	0.46
2:C:23:DG:N2	3:D:10:DT:O2	2.49	0.46
3:H:25:DG:H2''	3:H:26:DA:C8	2.51	0.46
1:B:2:ARG:HB3	1:B:32:ARG:NH1	2.30	0.46
1:B:86:GLN:HB2	1:B:88:VAL:HG23	1.98	0.46
1:B:177:LYS:NZ	2:C:22:DA:N7	2.61	0.45
1:A:61:ILE:CD1	1:A:83:PHE:CE1	2.99	0.45
1:A:8:ARG:NH2	1:B:124:GLU:OE2	2.47	0.45
1:E:98:SER:HB3	1:E:100:ASP:OD1	2.17	0.45
3:D:18:DA:C6	3:D:19:DA:C6	3.05	0.45
1:A:34:PHE:CD1	1:A:51:LEU:HB2	2.51	0.45
1:A:51:LEU:HD21	1:A:61:ILE:HD13	1.98	0.45
1:E:6:TYR:HE1	1:E:36:ASP:OD2	1.99	0.45
1:E:7:ALA:HB3	1:E:35:THR:HG22	1.98	0.45
1:A:86:GLN:HB2	1:A:88:VAL:HG23	1.99	0.44
1:E:63:VAL:HB	1:E:92:PHE:CE1	2.53	0.44
3:H:21:DA:C2	3:H:22:DT:C2	3.05	0.44
3:H:22:DT:H2''	3:H:23:DC:O5'	2.16	0.44
2:C:22:DA:H2''	2:C:23:DG:H8	1.83	0.44
3:D:25:DG:H2''	3:D:26:DA:C8	2.53	0.44
1:F:130:ARG:HE	1:F:140:PHE:HE2	1.66	0.44
1:A:144:ARG:CZ	1:A:148:ARG:CZ	2.96	0.44
1:F:28:VAL:CG2	1:F:62:LEU:HD12	2.48	0.44
1:F:95:ASP:OD1	1:F:95:ASP:N	2.49	0.44
1:B:83:PHE:O	1:B:88:VAL:HB	2.18	0.43
1:E:174:THR:O	1:E:178:ILE:HG13	2.18	0.43
1:E:148:ARG:O	1:E:152:LEU:HG	2.18	0.43
1:E:67:ASP:OD1	1:F:120:ARG:HD2	2.19	0.43
1:F:2:ARG:HB3	1:F:32:ARG:NH1	2.33	0.43
1:B:117:ALA:O	1:B:120:ARG:N	2.51	0.43
3:H:18:DA:C2	3:H:19:DA:C4	3.06	0.43
3:H:24:DA:H2''	3:H:25:DG:H5''	2.00	0.43
1:A:34:PHE:CE1	1:A:51:LEU:HD13	2.54	0.43
1:B:69:LEU:HD23	1:B:76:MET:HG3	2.00	0.43
1:F:127:ASN:O	1:F:130:ARG:N	2.50	0.43
3:D:24:DA:H2''	3:D:25:DG:H5''	2.00	0.43
1:B:148:ARG:NH1	2:C:22:DA:OP2	2.51	0.42

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:E:81:LYS:HE2	1:E:112:SER:OG	2.19	0.42
1:E:175:VAL:O	1:E:179:LEU:HG	2.19	0.42
1:A:62:LEU:HD23	1:A:91:ARG:HB2	2.00	0.42
1:A:103:MET:HE3	1:B:106:MET:HG2	2.01	0.42
3:D:21:DA:C2	3:D:22:DT:C2	3.08	0.42
1:E:63:VAL:O	1:E:92:PHE:HA	2.20	0.42
1:B:121:ARG:O	1:B:124:GLU:HB2	2.20	0.41
1:B:130:ARG:HH22	2:C:18:DT:H1'	1.85	0.41
2:C:17:DA:H61	3:D:14:DA:N6	2.18	0.41
1:F:52:ARG:O	1:F:55:VAL:HG22	2.20	0.41
1:F:100:ASP:N	1:F:100:ASP:OD1	2.52	0.41
2:G:4:DT:H2''	2:G:5:DG:H5''	2.02	0.41
1:A:119:ARG:O	1:A:123:LEU:HG	2.20	0.41
1:A:2:ARG:NH1	1:E:56:GLU:OE2	2.54	0.41
1:A:106:MET:HB3	1:B:103:MET:SD	2.60	0.41
1:A:4:PHE:CD2	1:A:55:VAL:HG12	2.56	0.41
2:C:27:DC:H2''	2:C:28:DA:C8	2.56	0.41
1:B:125:ARG:HE	3:D:18:DA:H5''	1.85	0.41
1:A:120:ARG:HD2	1:B:67:ASP:CG	2.41	0.40
1:A:46:GLU:HG3	1:A:47:GLY:N	2.36	0.40
1:A:103:MET:HB3	1:B:106:MET:SD	2.60	0.40
2:C:4:DT:H2''	2:C:5:DG:H5''	2.03	0.40
3:H:4:DT:H2''	3:H:5:DG:H5''	2.03	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	171/192 (89%)	163 (95%)	7 (4%)	1 (1%)	25 63
1	B	176/192 (92%)	168 (96%)	8 (4%)	0	100 100

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Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
1	E	170/192 (88%)	162 (95%)	7 (4%)	1 (1%)	25	63
1	F	176/192 (92%)	170 (97%)	5 (3%)	1 (1%)	25	63
All	All	693/768 (90%)	663 (96%)	27 (4%)	3 (0%)	34	71

All (3) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	E	93	ILE
1	A	93	ILE
1	F	114	VAL

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	147/160 (92%)	147 (100%)	0	100	100
1	B	150/160 (94%)	148 (99%)	2 (1%)	69	82
1	E	147/160 (92%)	146 (99%)	1 (1%)	84	90
1	F	150/160 (94%)	149 (99%)	1 (1%)	84	90
All	All	594/640 (93%)	590 (99%)	4 (1%)	84	90

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

Mol	Chain	Res	Type
1	B	72	ASP
1	B	173	SER
1	E	182	GLU
1	F	95	ASP

Some sidechains can be flipped to improve hydrogen bonding and reduce clashes. There are no such sidechains identified.

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 carbohydrates in this entry.

5.6 Ligand geometry [i](#)

There are no ligands in this entry.

5.7 Other polymers [i](#)

There are no such residues in this entry.

5.8 Polymer linkage issues [i](#)

There are no chain breaks in this entry.

6 Fit of model and data [i](#)

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

In the following table, the column labelled '#RSRZ> 2' contains the number (and percentage) of RSRZ outliers, followed by percent RSRZ outliers for the chain as percentile scores relative to all X-ray entries and entries of similar resolution. The OWAB column contains the minimum, median, 95th percentile and maximum values of the occupancy-weighted average B-factor per residue. The column labelled 'Q< 0.9' lists the number of (and percentage) of residues with an average occupancy less than 0.9.

Mol	Chain	Analysed	<RSRZ>	#RSRZ>2	OWAB(Å ²)	Q<0.9
1	A	177/192 (92%)	-0.39	2 (1%) 80 72	159, 201, 300, 338	0
1	B	180/192 (93%)	-0.26	1 (0%) 89 84	167, 219, 266, 297	0
1	E	176/192 (91%)	-0.39	1 (0%) 89 84	171, 199, 260, 369	0
1	F	180/192 (93%)	-0.22	3 (1%) 70 60	182, 263, 308, 332	0
2	C	27/27 (100%)	-0.70	0 100 100	155, 197, 285, 309	0
2	G	27/27 (100%)	-0.79	0 100 100	175, 196, 269, 281	0
3	D	27/27 (100%)	-0.83	0 100 100	164, 192, 257, 275	0
3	H	27/27 (100%)	-0.70	0 100 100	170, 199, 277, 296	0
All	All	821/876 (93%)	-0.37	7 (0%) 84 77	155, 213, 296, 369	0

All (7) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	F	5	GLY	3.5
1	F	62	LEU	3.3
1	A	151	VAL	2.3
1	A	136	LYS	2.3
1	B	61	ILE	2.1
1	F	90	VAL	2.1
1	E	136	LYS	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

There are no ligands in this entry.

6.5 Other polymers

There are no such residues in this entry.