



wwPDB X-ray Structure Validation Summary Report

Apr 10, 2016 – 10:10 AM EDT

PDB ID : 5EY8
Title : Structure of FadD32 from Mycobacterium smegmatis complexed to AMPC20
Authors : Guillet, V.; Maveyraud, L.; Mourey, L.
Deposited on : 2015-11-24
Resolution : 3.50 Å(reported)

This is a wwPDB X-ray Structure Validation Summary 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 : 1.7.1 (RC1), CSD as537be (2016)
Xtriage (Phenix) : 1.9-1692
EDS : rb-20027107
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) : rb-20027107

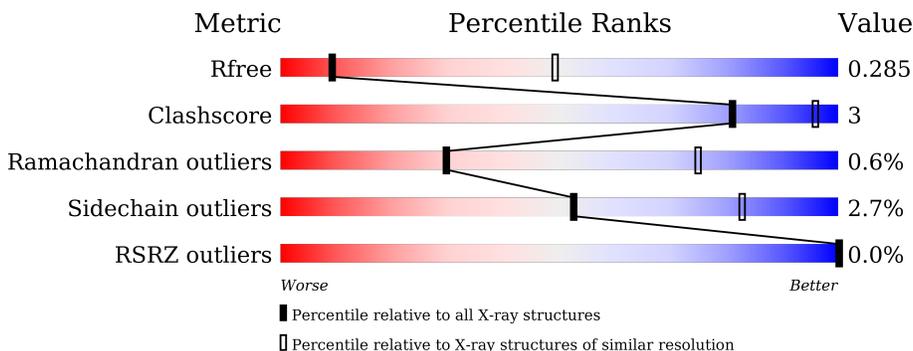
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 3.50 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	1051 (3.60-3.40)
Clashscore	102246	1157 (3.60-3.40)
Ramachandran outliers	100387	1120 (3.60-3.40)
Sidechain outliers	100360	1121 (3.60-3.40)
RSRZ outliers	91569	1058 (3.60-3.40)

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	630	
1	B	630	
1	C	630	
1	D	630	
1	E	630	
1	F	630	

Continued on next page...

Continued from previous page...

Mol	Chain	Length	Quality of chain
1	G	630	 88% 7% 5%
1	H	630	 87% 7% 6%

2 Entry composition

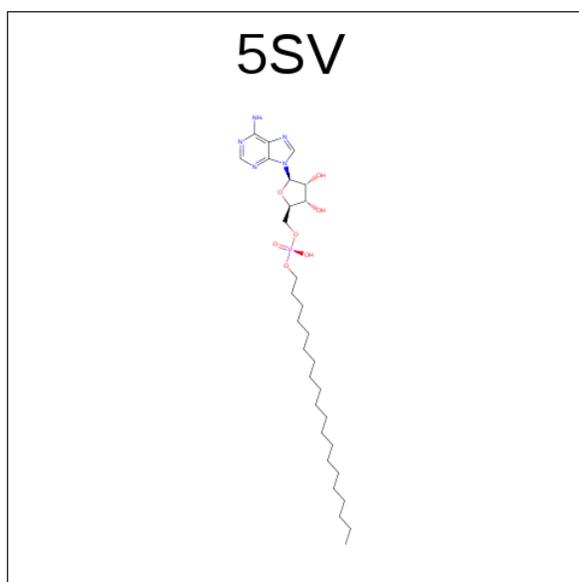
There are 3 unique types of molecules in this entry. The entry contains 33378 atoms, of which 0 are hydrogens and 0 are deuteriums.

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 Acyl-CoA synthase.

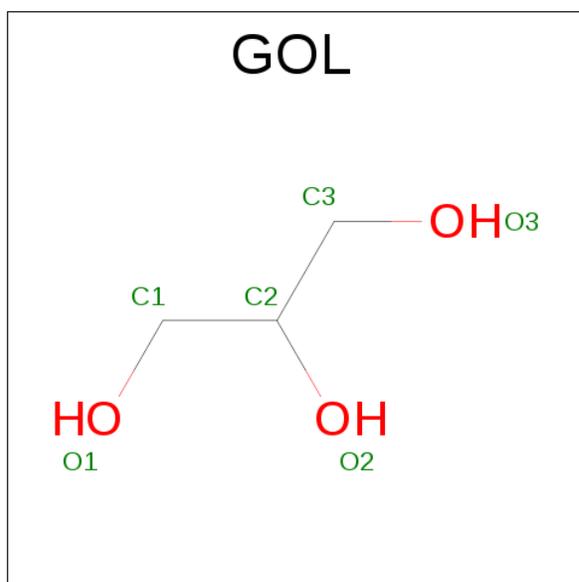
Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	598	Total 4279	C 2719	N 744	O 809	S 7	0	0	0
1	B	594	Total 4129	C 2614	N 725	O 783	S 7	0	0	0
1	C	605	Total 4153	C 2626	N 726	O 794	S 7	0	0	0
1	D	603	Total 4194	C 2659	N 727	O 801	S 7	0	0	0
1	E	592	Total 4095	C 2598	N 714	O 776	S 7	0	0	0
1	F	606	Total 4303	C 2712	N 769	O 815	S 7	0	0	0
1	G	597	Total 4057	C 2572	N 697	O 781	S 7	0	0	0
1	H	595	Total 3871	C 2427	N 687	O 751	S 6	0	0	0

- Molecule 2 is [(2 {R},3 {S},4 {R},5 {R})-5-(6-aminopurin-9-yl)-3,4-bis(oxidanyl)oxolan-2-yl]methyl icosyl hydrogen phosphate (three-letter code: 5SV) (formula: C₃₀H₅₄N₅O₇P).



Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
			Total	C	N	O	P		
2	A	1	Total 36	23	5	7	1	0	0
2	B	1	Total 35	22	5	7	1	0	0
2	C	1	Total 36	23	5	7	1	0	0
2	D	1	Total 39	26	5	7	1	0	0
2	E	1	Total 36	23	5	7	1	0	0
2	F	1	Total 34	21	5	7	1	0	0
2	G	1	Total 34	21	5	7	1	0	0
2	H	1	Total 35	22	5	7	1	0	0

- Molecule 3 is GLYCEROL (three-letter code: GOL) (formula: C₃H₈O₃).

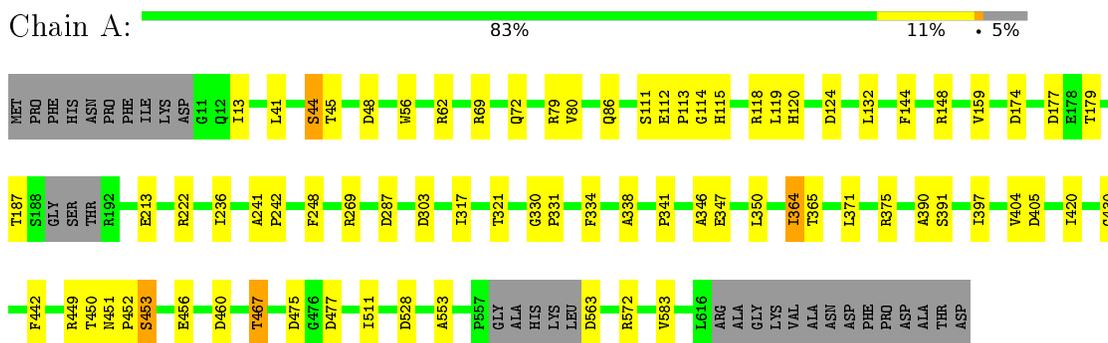


Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
3	E	1	Total	C	O	0	0
			6	3	3		
3	F	1	Total	C	O	0	0
			6	3	3		

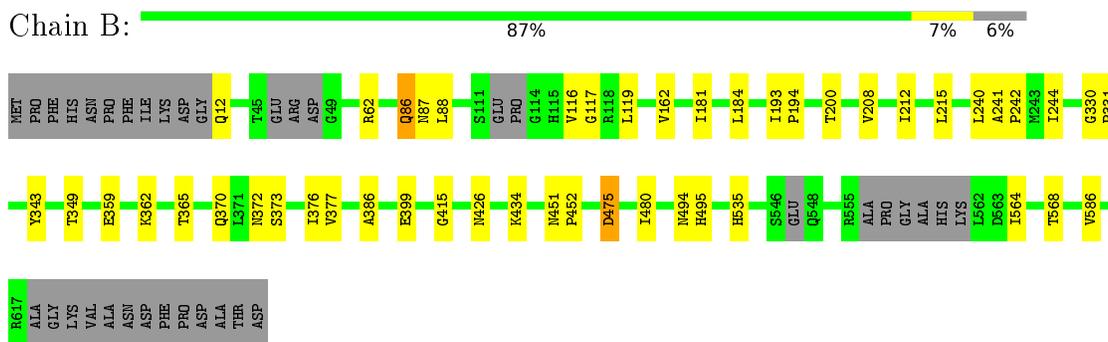
3 Residue-property plots

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.

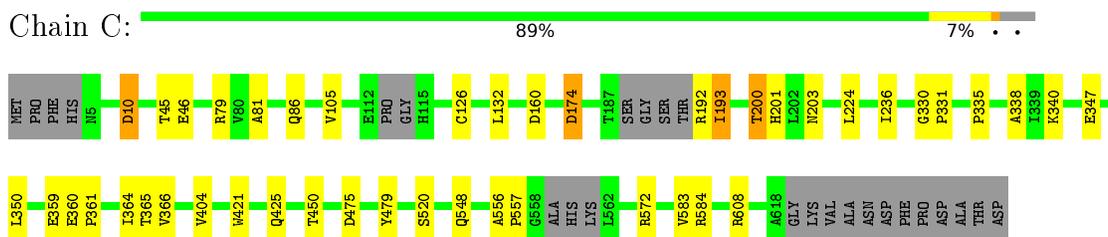
- Molecule 1: Acyl-CoA synthase



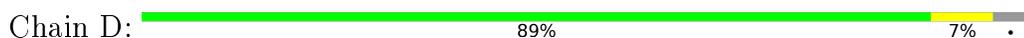
- Molecule 1: Acyl-CoA synthase

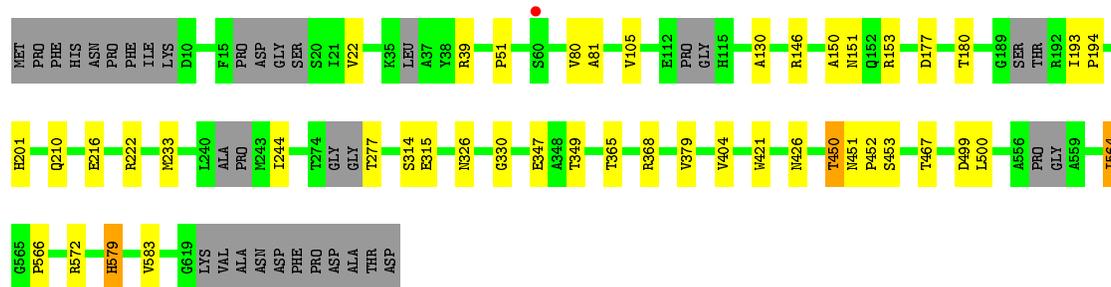


- Molecule 1: Acyl-CoA synthase



- Molecule 1: Acyl-CoA synthase





4 Data and refinement statistics

Property	Value	Source
Space group	P 4	Depositor
Cell constants a, b, c, α , β , γ	164.04Å 164.04Å 231.53Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	49.44 – 3.50 50.62 – 3.50	Depositor EDS
% Data completeness (in resolution range)	93.6 (49.44-3.50) 93.6 (50.62-3.50)	Depositor EDS
R_{merge}	(Not available)	Depositor
R_{sym}	0.23	Depositor
$\langle I/\sigma(I) \rangle$ ¹	1.56 (at 3.48Å)	Xtriage
Refinement program	PHENIX (phenix.refine: 1.9_1692)	Depositor
R, R_{free}	0.223 , 0.286 0.222 , 0.285	Depositor DCC
R_{free} test set	3628 reflections (5.04%)	DCC
Wilson B-factor (Å ²)	74.6	Xtriage
Anisotropy	0.031	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.32 , 72.6	EDS
Estimated twinning fraction	0.075 for h,-k,-l	Xtriage
L-test for twinning ²	$\langle L \rangle = 0.43$, $\langle L^2 \rangle = 0.25$	Xtriage
Outliers	0 of 72012 reflections	Xtriage
F_o, F_c correlation	0.89	EDS
Total number of atoms	33378	wwPDB-VP
Average B, all atoms (Å ²)	62.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 7.27% 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 [i](#)

5.1 Standard geometry [i](#)

Bond lengths and bond angles in the following residue types are not validated in this section: GOL, 5SV

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	0.30	0/4384	0.52	0/6025
1	B	0.29	0/4228	0.50	0/5814
1	C	0.28	0/4259	0.47	0/5867
1	D	0.28	0/4298	0.50	0/5913
1	E	0.28	0/4194	0.51	0/5770
1	F	0.28	0/4409	0.50	0/6054
1	G	0.27	0/4160	0.49	0/5736
1	H	0.26	0/3957	0.46	0/5452
All	All	0.28	0/33889	0.50	0/46631

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	B	0	1
1	E	0	2
1	G	0	1
All	All	0	4

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

All (4) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	B	373	SER	Peptide
1	E	373	SER	Peptide

Continued on next page...

Continued from previous page...

Mol	Chain	Res	Type	Group
1	E	512	ARG	Peptide
1	G	116	VAL	Peptide

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	4279	0	3939	36	0
1	B	4129	0	3651	27	0
1	C	4153	0	3555	25	0
1	D	4194	0	3660	23	0
1	E	4095	0	3589	25	0
1	F	4303	0	3861	29	0
1	G	4057	0	3423	19	0
1	H	3871	0	3107	21	0
2	A	36	0	36	0	0
2	B	35	0	34	0	0
2	C	36	0	36	1	0
2	D	39	0	42	1	0
2	E	36	0	36	0	0
2	F	34	0	32	0	0
2	G	34	0	32	0	0
2	H	35	0	34	0	0
3	E	6	0	8	1	0
3	F	6	0	8	0	0
All	All	33378	0	29083	205	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 3.

The worst 5 of 205 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:F:572:ARG:NH1	1:F:583:VAL:O	2.04	0.91
1:H:572:ARG:NH1	1:H:583:VAL:O	2.09	0.85
1:A:572:ARG:NH1	1:A:583:VAL:O	2.16	0.79

Continued on next page...

Continued from previous page...

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:269:ARG:NH1	1:A:303:ASP:OD2	2.17	0.78
1:C:520:SER:O	1:C:608:ARG:NH1	2.17	0.78

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	592/630 (94%)	568 (96%)	19 (3%)	5 (1%)	24 70
1	B	584/630 (93%)	559 (96%)	21 (4%)	4 (1%)	26 72
1	C	597/630 (95%)	581 (97%)	14 (2%)	2 (0%)	46 84
1	D	595/630 (94%)	572 (96%)	20 (3%)	3 (0%)	34 78
1	E	582/630 (92%)	557 (96%)	21 (4%)	4 (1%)	26 72
1	F	600/630 (95%)	572 (95%)	27 (4%)	1 (0%)	52 88
1	G	585/630 (93%)	565 (97%)	17 (3%)	3 (0%)	34 78
1	H	579/630 (92%)	550 (95%)	25 (4%)	4 (1%)	26 72
All	All	4714/5040 (94%)	4524 (96%)	164 (4%)	26 (1%)	30 75

5 of 26 Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	D	475	ASP
1	E	475	ASP
1	G	13	ILE
1	H	244	ILE
1	A	44	SER

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	395/501 (79%)	379 (96%)	16 (4%)	37	74
1	B	352/501 (70%)	348 (99%)	4 (1%)	80	92
1	C	343/501 (68%)	335 (98%)	8 (2%)	58	85
1	D	355/501 (71%)	350 (99%)	5 (1%)	74	91
1	E	345/501 (69%)	335 (97%)	10 (3%)	50	81
1	F	380/501 (76%)	366 (96%)	14 (4%)	41	76
1	G	326/501 (65%)	313 (96%)	13 (4%)	38	75
1	H	277/501 (55%)	271 (98%)	6 (2%)	60	85
All	All	2773/4008 (69%)	2697 (97%)	76 (3%)	52	83

5 of 76 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	E	75	GLN
1	E	541	ASP
1	H	201	HIS
1	E	79	ARG
1	E	450	THR

Some sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (1) such sidechains are listed below:

Mol	Chain	Res	Type
1	D	207	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 carbohydrates in this entry.

5.6 Ligand geometry [i](#)

10 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	5SV	A	701	-	35,38,45	1.06	3 (8%)	34,51,58	1.21	4 (11%)
2	5SV	B	701	-	34,37,45	1.03	2 (5%)	33,50,58	1.10	2 (6%)
2	5SV	C	701	-	35,38,45	1.06	2 (5%)	34,51,58	1.29	4 (11%)
2	5SV	D	701	-	38,41,45	1.08	3 (7%)	37,54,58	1.12	1 (2%)
2	5SV	E	701	-	35,38,45	1.10	4 (11%)	34,51,58	1.12	4 (11%)
3	GOL	E	702	-	5,5,5	0.40	0	5,5,5	0.26	0
2	5SV	F	701	-	33,36,45	1.03	2 (6%)	32,49,58	1.08	2 (6%)
3	GOL	F	702	-	5,5,5	0.34	0	5,5,5	0.29	0
2	5SV	G	701	-	33,36,45	1.15	3 (9%)	32,49,58	1.17	3 (9%)
2	5SV	H	701	-	34,37,45	1.05	3 (8%)	33,50,58	1.14	5 (15%)

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	5SV	A	701	-	-	0/21/41/48	0/3/3/3
2	5SV	B	701	-	-	0/20/40/48	0/3/3/3
2	5SV	C	701	-	-	0/21/41/48	0/3/3/3

Continued on next page...

Continued from previous page...

Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
2	5SV	D	701	-	-	0/24/44/48	0/3/3/3
2	5SV	E	701	-	-	0/21/41/48	0/3/3/3
3	GOL	E	702	-	-	0/4/4/4	0/0/0/0
2	5SV	F	701	-	-	0/19/39/48	0/3/3/3
3	GOL	F	702	-	-	0/4/4/4	0/0/0/0
2	5SV	G	701	-	-	0/19/39/48	0/3/3/3
2	5SV	H	701	-	-	0/20/40/48	0/3/3/3

The worst 5 of 22 bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	A	701	5SV	P-O2P	-2.17	1.45	1.55
2	F	701	5SV	O4'-C4'	-2.09	1.40	1.45
2	E	701	5SV	O2'-C2'	-2.01	1.38	1.43
2	E	701	5SV	C2'-C1'	2.01	1.56	1.53
2	A	701	5SV	P-O1P	2.01	1.58	1.51

The worst 5 of 25 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	C	701	5SV	C1'-N9-C4	-3.63	122.75	126.81
2	G	701	5SV	C1'-N9-C4	-2.91	123.56	126.81
2	A	701	5SV	O3P-P-O1P	-2.58	98.66	109.21
2	B	701	5SV	O5'-P-O1P	-2.57	98.68	109.21
2	E	701	5SV	C1'-N9-C4	-2.45	124.07	126.81

There are no chirality outliers.

There are no torsion outliers.

There are no ring outliers.

3 monomers are involved in 3 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
2	C	701	5SV	1	0
2	D	701	5SV	1	0
3	E	702	GOL	1	0

5.7 Other polymers [i](#)

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 [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	598/630 (94%)	-0.46	0 100 100	32, 48, 94, 160	0
1	B	594/630 (94%)	-0.43	0 100 100	38, 57, 105, 196	0
1	C	605/630 (96%)	-0.42	0 100 100	38, 58, 99, 181	0
1	D	603/630 (95%)	-0.48	0 100 100	35, 54, 97, 171	0
1	E	592/630 (93%)	-0.36	0 100 100	37, 63, 115, 183	0
1	F	606/630 (96%)	-0.45	0 100 100	33, 53, 101, 173	0
1	G	597/630 (94%)	-0.39	0 100 100	37, 64, 113, 187	0
1	H	595/630 (94%)	-0.39	1 (0%) 95 93	38, 74, 123, 170	0
All	All	4790/5040 (95%)	-0.42	1 (0%) 100 100	32, 58, 109, 196	0

All (1) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	H	60	SER	2.6

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	5SV	D	701	39/43	0.97	0.30	1.23	35,42,49,50	0
2	5SV	E	701	36/43	0.97	0.29	1.02	37,38,44,50	0
2	5SV	F	701	34/43	0.97	0.26	0.58	33,34,44,45	0
2	5SV	G	701	34/43	0.96	0.30	0.57	39,47,53,70	0
2	5SV	A	701	36/43	0.96	0.26	0.31	32,32,36,56	0
2	5SV	C	701	36/43	0.96	0.26	0.11	38,44,79,89	0
2	5SV	B	701	35/43	0.96	0.25	0.06	38,38,39,68	0
2	5SV	H	701	35/43	0.97	0.26	-0.12	37,38,57,60	0
3	GOL	E	702	6/6	0.82	0.26	-0.33	40,40,40,74	0
3	GOL	F	702	6/6	0.90	0.20	-0.37	35,35,37,40	0

6.5 Other polymers [i](#)

There are no such residues in this entry.