



wwPDB X-ray Structure Validation Summary Report ⓘ

Jan 31, 2016 – 10:54 PM GMT

PDB ID : 1VF5
Title : Crystal Structure of Cytochrome b6f Complex from M.laminosus
Authors : Kurisu, G.; Zhang, H.; Smith, J.L.; Cramer, W.A.
Deposited on : 2004-04-08
Resolution : 3.00 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 (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

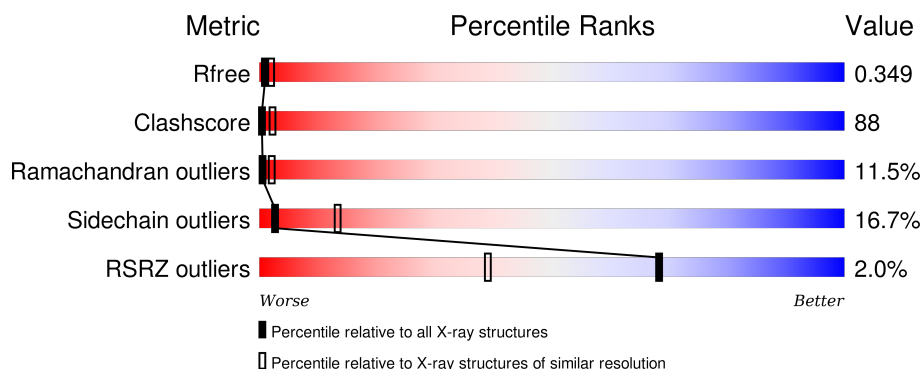
1 Overall quality at a glance ⓘ

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 3.00 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}	91344	1578 (3.00-3.00)
Clashscore	102246	1912 (3.00-3.00)
Ramachandran outliers	100387	1853 (3.00-3.00)
Sidechain outliers	100360	1856 (3.00-3.00)
RSRZ outliers	91569	1592 (3.00-3.00)

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	215	<div> <div>34%</div> <div>47%</div> <div>9%</div> <div>6%</div> </div>
1	N	215	<div> <div>34%</div> <div>47%</div> <div>12%</div> <div>6%</div> </div>
2	B	160	<div> <div>17%</div> <div>46%</div> <div>18%</div> <div>6%</div> <div>14%</div> </div>
2	O	160	<div> <div>16%</div> <div>45%</div> <div>19%</div> <div>6%</div> <div>14%</div> </div>
3	C	289	<div> <div>27%</div> <div>56%</div> <div>14%</div> <div>6%</div> </div>

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Mol	Chain	Length	Quality of chain
3	P	289	
4	D	179	
4	Q	179	
5	E	32	
5	R	32	
6	F	35	
6	S	35	
7	G	37	
7	T	37	
8	H	29	
8	U	29	

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
10	TDS	N	1304	-	-	-	X
11	PL9	A	305	-	-	-	X
11	PL9	Q	1305	-	-	X	-
12	OPC	D	306	-	-	X	-
12	OPC	Q	1307	-	-	X	-
13	CLA	B	201	X	-	-	X
13	CLA	O	1201	X	-	-	-
15	BCR	E	101	-	-	-	X
15	BCR	R	1101	-	-	-	X
9	HEM	A	301	-	-	-	X

2 Entry composition

There are 16 unique types of molecules in this entry. The entry contains 15091 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 CYTOCHROME B6.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	202	Total	C	N	O	S	0	0	0
			1593	1062	253	268	10			
1	N	202	Total	C	N	O	S	0	0	0
			1593	1062	253	268	10			

- Molecule 2 is a protein called SUBUNIT IV.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
2	B	138	Total	C	N	O	S	0	0	0
			1075	727	165	178	5			
2	O	138	Total	C	N	O	S	0	0	0
			1075	727	165	178	5			

- Molecule 3 is a protein called CYTOCHROME F.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
3	C	286	Total	C	N	O	S	0	0	0
			2200	1406	366	421	7			
3	P	286	Total	C	N	O	S	0	0	0
			2200	1406	366	421	7			

- Molecule 4 is a protein called RIESKE IRON-SULFUR PROTEIN.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
4	D	168	Total	C	N	O	S	0	0	0
			1280	815	223	235	7			
4	Q	168	Total	C	N	O	S	0	0	0
			1280	815	223	235	7			

- Molecule 5 is a protein called PROTEIN PET L.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
5	E	32	Total	C	N	O	S	0	0	0
			248	179	34	34	1			
5	R	32	Total	C	N	O	S	0	0	0
			248	179	34	34	1			

- Molecule 6 is a protein called PROTEIN PET M.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
6	F	33	Total	C	N	O	S	0	0	0
			251	170	36	43	2			
6	S	35	Total	C	N	O	S	0	0	0
			270	181	39	48	2			

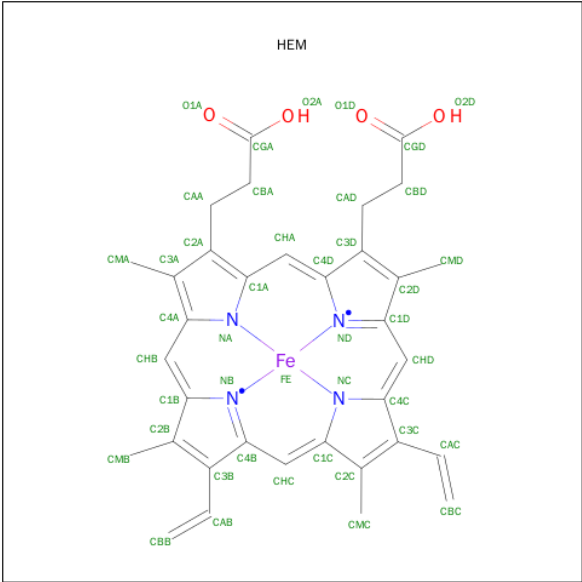
- Molecule 7 is a protein called PROTEIN PET G.

Mol	Chain	Residues	Atoms				ZeroOcc	AltConf	Trace
7	G	23	Total	C	N	O	0	0	0
			184	126	29	29			
7	T	27	Total	C	N	O	0	0	0
			216	146	34	36			

- Molecule 8 is a protein called PROTEIN PET N.

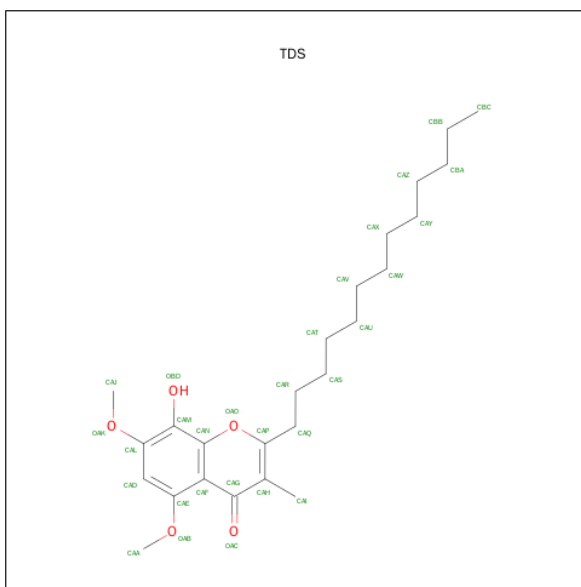
Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
8	H	27	Total	C	N	O	S	0	0	0
			214	146	34	33	1			
8	U	27	Total	C	N	O	S	0	0	0
			214	146	34	33	1			

- Molecule 9 is PROTOPORPHYRIN IX CONTAINING FE (three-letter code: HEM) (formula: $C_{34}H_{32}FeN_4O_4$).



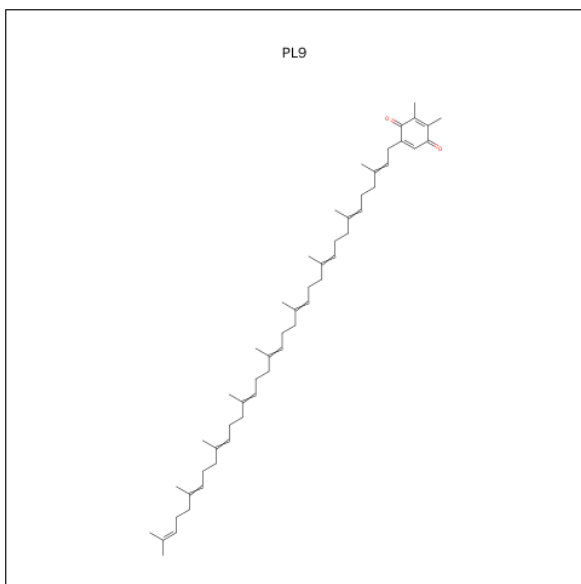
Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
9	A	1	Total 43	C 34	Fe 1	N 4	O 4	0	0
9	A	1	Total 43	C 34	Fe 1	N 4	O 4	0	0
9	A	1	Total 43	C 34	Fe 1	N 4	O 4	0	0
9	C	1	Total 43	C 34	Fe 1	N 4	O 4	0	0
9	N	1	Total 43	C 34	Fe 1	N 4	O 4	0	0
9	N	1	Total 43	C 34	Fe 1	N 4	O 4	0	0
9	N	1	Total 43	C 34	Fe 1	N 4	O 4	0	0
9	P	1	Total 43	C 34	Fe 1	N 4	O 4	0	0

- Molecule 10 is 8-HYDROXY-5,7-DIMETHOXY-3-METHYL-2-TRIDECYL-4H-CHROME N-4-ONE (three-letter code: TDS) (formula: C₂₅H₃₈O₅).



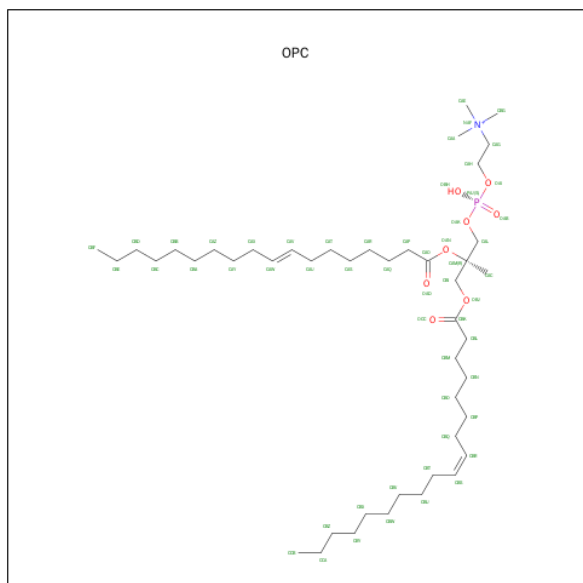
Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
10	A	1	Total 30	C 25	O 5	0	0
10	N	1	Total 30	C 25	O 5	0	0

- Molecule 11 is 2,3-DIMETHYL-5-(3,7,11,15,19,23,27,31,35-NONAMETHYL-2,6,10,14,18,22,26,30,34-HEXATRIACONTANONAENYL-2,5-CYCLOHEXADIENE-1,4-DIONE-2,3-DIMETHYL-5-SOLANESYL-1,4-BENZOQUINONE (three-letter code: PL9) (formula: $C_{53}H_{80}O_2$).



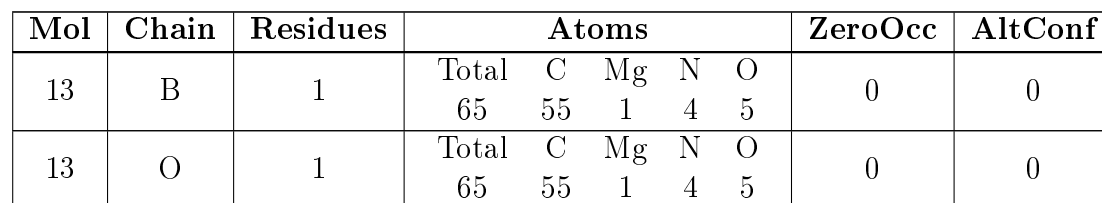
Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
11	A	1	Total	C	O	0	0
			55	53	2		
11	Q	1	Total	C	O	0	0
			55	53	2		

- Molecule 12 is (7R,17E)-4-HYDROXY-N,N,N,7-TETRAMETHYL-7-[(8E)-OCTADEC-8-ENOYLOXY]-10-OXO-3,5,9-TRIOXA-4-PHOSPHAHEPTACOS-17-EN-1-AMINIUM 4-OXIDE (three-letter code: OPC) (formula: C₄₅H₈₇NO₈P).



Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
12	D	1	Total	C	N	O	P	0	0
			54	44	1	8	1		
12	B	1	Total	C	N	O	P	0	0
			54	44	1	8	1		
12	N	1	Total	C	N	O	P	0	0
			54	44	1	8	1		
12	Q	1	Total	C	N	O	P	0	0
			54	44	1	8	1		

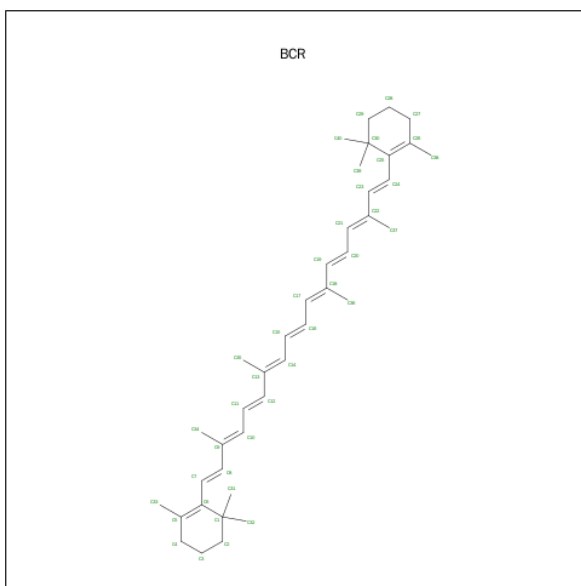
- Molecule 13 is CHLOROPHYLL A (three-letter code: CLA) (formula: C₅₅H₇₂MgN₄O₅).



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Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
14	D	1	Total 4	Fe 2	S 2	0	0
14	Q	1	Total 4	Fe 2	S 2	0	0

- Molecule 15 is BETA-CAROTENE (three-letter code: BCR) (formula: $C_{40}H_{56}$).



Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
15	E	1	Total C 40 40	0	0
15	R	1	Total C 40 40	0	0

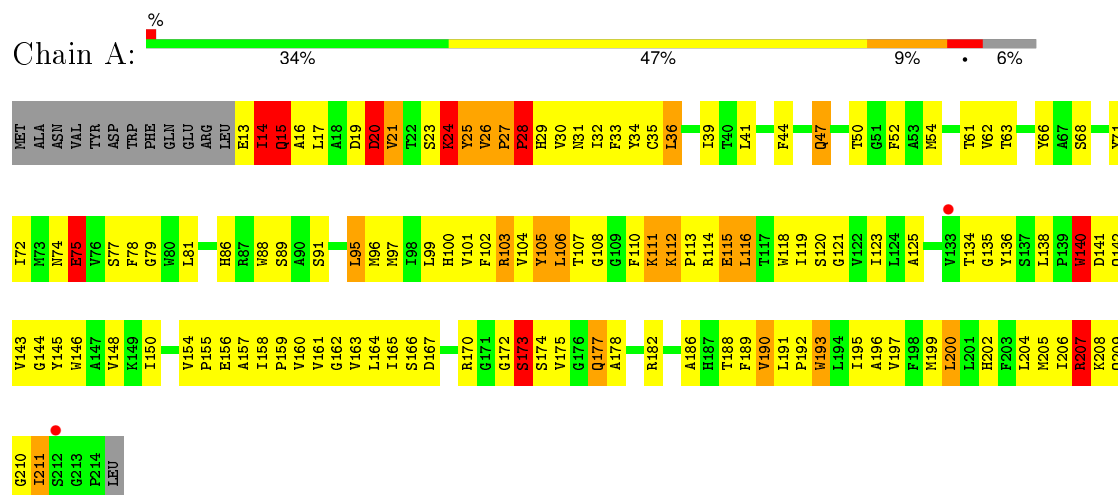
- Molecule 16 is water.

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
16	A	1	Total O 1 1	0	0
16	N	1	Total O 1 1	0	0

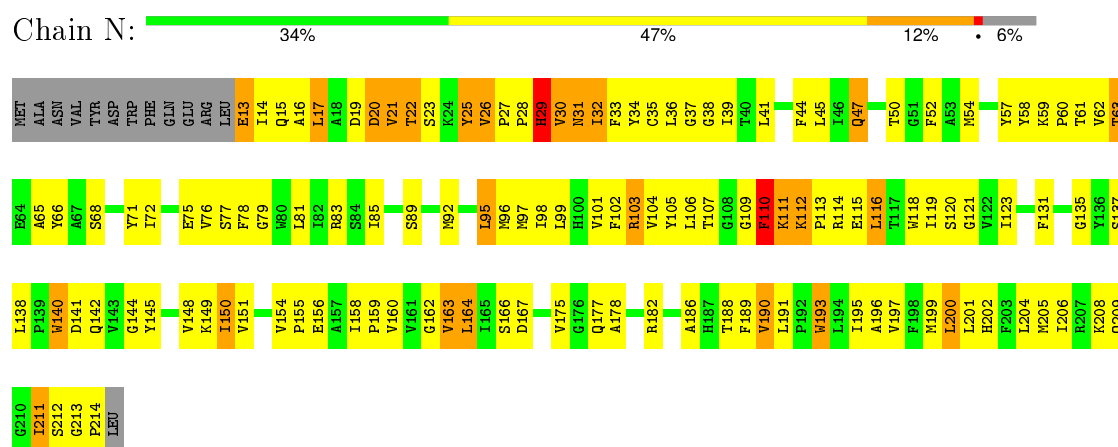
3 Residue-property plots

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 ($\text{RSRZ} > 2$). 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.

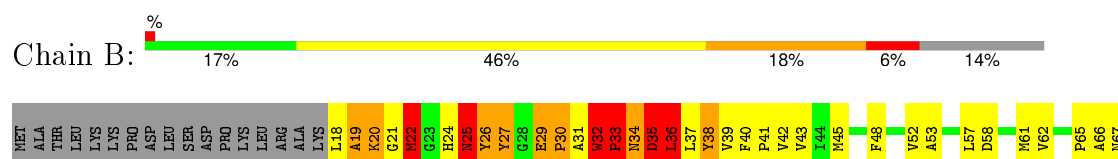
• Molecule 1: CYTOCHROME B6

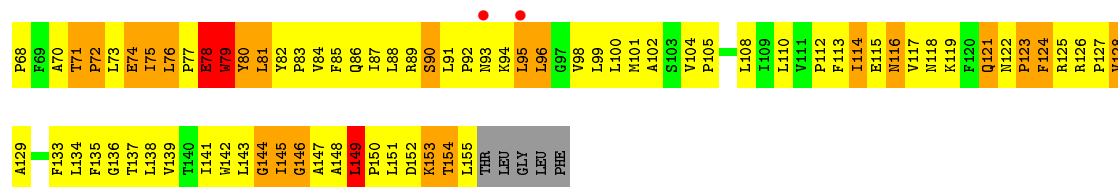


• Molecule 1: CYTOCHROME B6

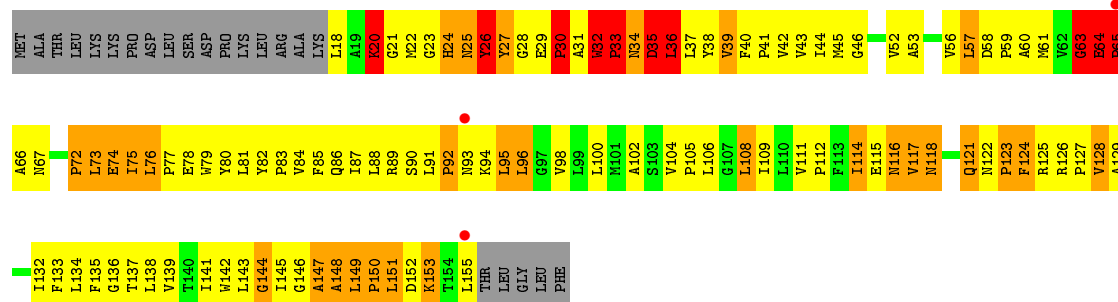
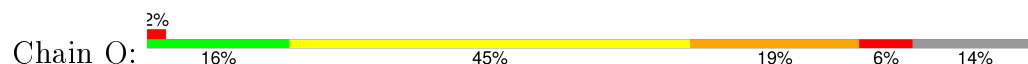


• Molecule 2: SUBUNIT IV

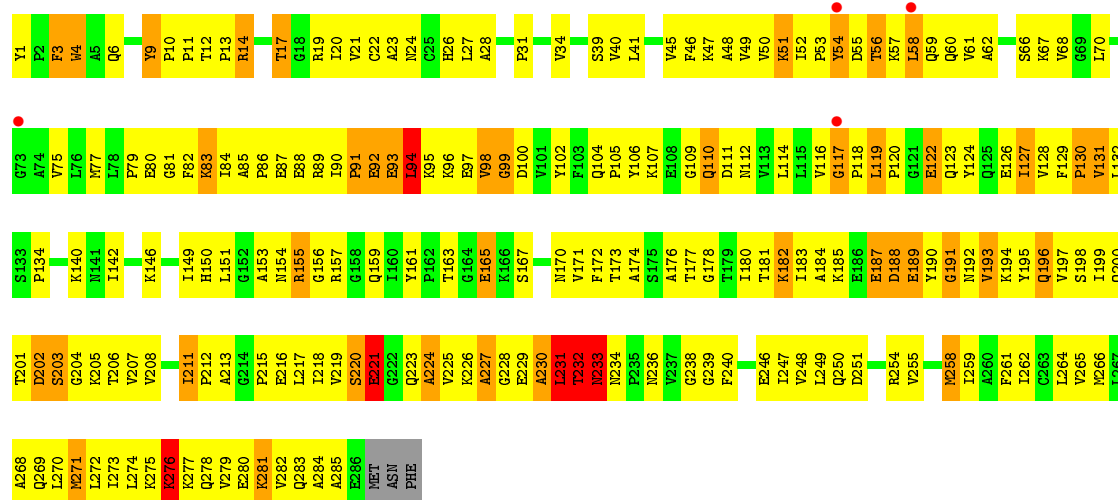




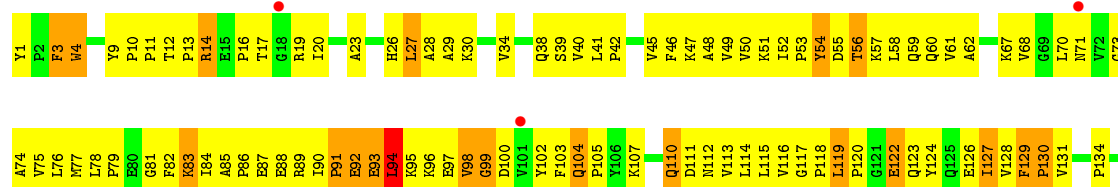
• Molecule 2: SUBUNIT IV

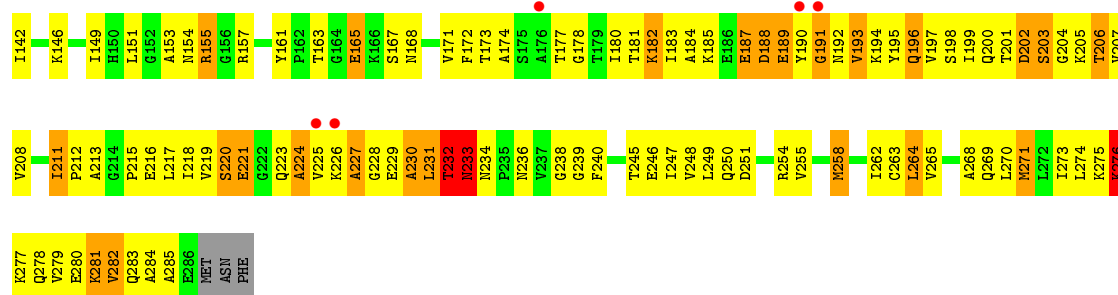


• Molecule 3: CYTOCHROME F

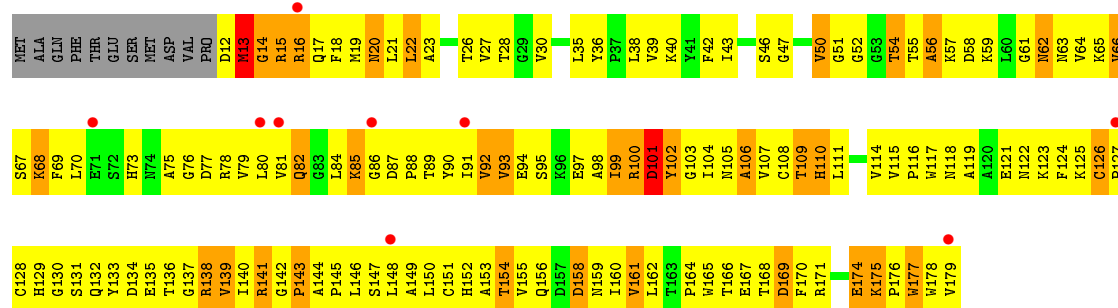
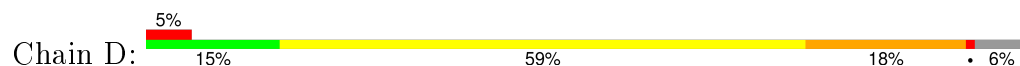


• Molecule 3: CYTOCHROME F

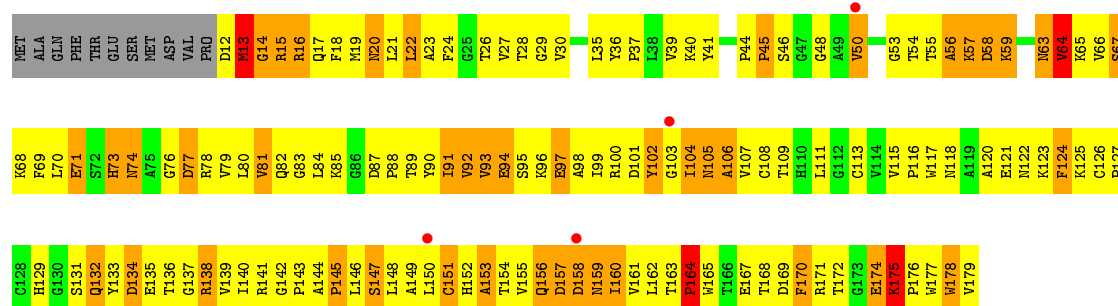
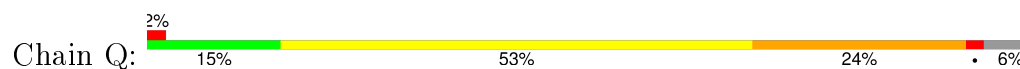




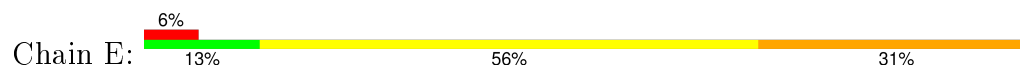
• Molecule 4: RIESKE IRON-SULFUR PROTEIN



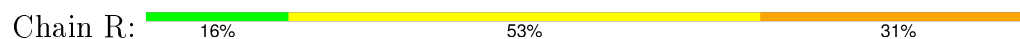
• Molecule 4: RIESKE IRON-SULFUR PROTEIN



• Molecule 5: PROTEIN PET L



• Molecule 5: PROTEIN PET L

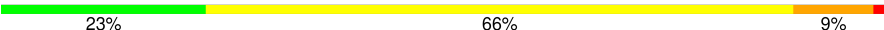


- Molecule 6: PROTEIN PET M

Chain F: 



- Molecule 6: PROTEIN PET M

Chain S: 



- Molecule 7: PROTEIN PET G

Chain G: 

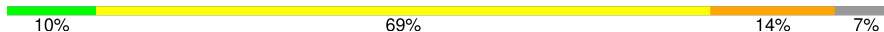


- Molecule 7: PROTEIN PET G

Chain T: 



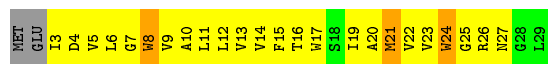
- Molecule 8: PROTEIN PET N

Chain H: 



- Molecule 8: PROTEIN PET N

Chain U: 



4 Data and refinement statistics

Property	Value	Source
Space group	P 61	Depositor
Cell constants a, b, c, α , β , γ	157.54Å 157.54Å 360.35Å 90.00° 90.00° 120.00°	Depositor
Resolution (Å)	48.16 – 3.00 48.16 – 3.00	Depositor EDS
% Data completeness (in resolution range)	99.7 (48.16-3.00) 99.8 (48.16-3.00)	Depositor EDS
R_{merge}	0.07	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	4.30 (at 3.01Å)	Xtriage
Refinement program	CNS 1.1	Depositor
R, R_{free}	0.258 , 0.346 0.259 , 0.349	Depositor DCC
R_{free} test set	2788 reflections (2.85%)	DCC
Wilson B-factor (Å ²)	76.0	Xtriage
Anisotropy	0.238	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.32 , 104.7	EDS
Estimated twinning fraction	0.499 for h,-h-k,-l	Xtriage
L-test for twinning ²	$\langle L \rangle = 0.50$, $\langle L^2 \rangle = 0.33$	Xtriage
Outliers	0 of 100543 reflections	Xtriage
F_o, F_c correlation	0.91	EDS
Total number of atoms	15091	wwPDB-VP
Average B, all atoms (Å ²)	83.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 2.26% 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: CLA, PL9, FES, OPC, TDS, HEM, BCR

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	0.55	0/1641	0.77	2/2239 (0.1%)
1	N	0.56	0/1641	0.81	2/2239 (0.1%)
2	B	0.54	0/1110	0.88	3/1526 (0.2%)
2	O	0.58	0/1110	0.99	8/1526 (0.5%)
3	C	0.44	0/2248	0.73	1/3061 (0.0%)
3	P	0.45	0/2248	0.72	0/3061
4	D	0.47	0/1312	0.86	2/1786 (0.1%)
4	Q	0.47	0/1312	0.76	0/1786
5	E	0.67	0/253	0.80	0/340
5	R	0.64	0/253	0.77	0/340
6	F	0.58	0/255	0.66	0/343
6	S	0.52	0/274	0.61	0/366
7	G	0.64	0/188	0.91	0/253
7	T	0.63	0/221	0.95	0/299
8	H	0.61	0/220	0.83	1/301 (0.3%)
8	U	0.59	0/220	0.81	0/301
All	All	0.52	0/14506	0.80	19/19767 (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	N	0	1

There are no bond length outliers.

The worst 5 of 19 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	O	63	GLY	N-CA-C	7.67	132.29	113.10
2	B	36	LEU	N-CA-C	-7.09	91.85	111.00
2	O	64	GLU	N-CA-C	6.99	129.88	111.00
2	O	36	LEU	N-CA-C	-6.86	92.47	111.00
1	N	20	ASP	N-CA-C	6.33	128.08	111.00

There are no chirality outliers.

All (1) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	N	105	TYR	Sidechain

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	1593	0	1623	242	0
1	N	1593	0	1623	230	0
2	B	1075	0	1117	258	0
2	O	1075	0	1117	284	0
3	C	2200	0	2216	355	0
3	P	2200	0	2216	338	0
4	D	1280	0	1263	317	0
4	Q	1280	0	1263	380	0
5	E	248	0	284	72	0
5	R	248	0	284	113	0
6	F	251	0	266	39	0
6	S	270	0	285	42	0
7	G	184	0	190	104	0
7	T	216	0	220	70	0
8	H	214	0	221	42	0
8	U	214	0	221	43	0
9	A	129	0	90	18	0
9	C	43	0	30	0	0
9	N	129	0	90	17	0
9	P	43	0	30	1	0
10	A	30	0	37	13	0
10	N	30	0	37	12	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
11	A	55	0	80	18	0
11	Q	55	0	80	23	0
12	B	54	0	83	14	0
12	D	54	0	83	24	0
12	N	54	0	83	10	0
12	Q	54	0	83	30	0
13	B	65	0	70	8	0
13	O	65	0	70	20	0
14	D	4	0	0	1	0
14	Q	4	0	0	1	0
15	E	40	0	56	7	0
15	R	40	0	56	7	0
16	A	1	0	0	0	0
16	N	1	0	0	0	0
All	All	15091	0	15467	2688	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 88.

The worst 5 of 2688 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)
2:O:38:TYR:HB3	3:P:276:LYS:HG2	1.22	1.20
1:A:14:ILE:HA	1:A:17:LEU:HB2	1.26	1.18
1:N:214:PRO:HB3	5:R:29:ILE:HG22	1.19	1.17
4:D:166:THR:HA	4:D:179:VAL:HG13	1.22	1.17
2:B:71:THR:HB	2:B:72:PRO:HD3	1.28	1.15

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	200/215 (93%)	152 (76%)	29 (14%)	19 (10%)	1	3
1	N	200/215 (93%)	155 (78%)	32 (16%)	13 (6%)	1	8
2	B	136/160 (85%)	80 (59%)	31 (23%)	25 (18%)	0	0
2	O	136/160 (85%)	67 (49%)	38 (28%)	31 (23%)	0	0
3	C	284/289 (98%)	206 (72%)	47 (16%)	31 (11%)	0	2
3	P	284/289 (98%)	213 (75%)	44 (16%)	27 (10%)	1	3
4	D	166/179 (93%)	123 (74%)	25 (15%)	18 (11%)	0	2
4	Q	166/179 (93%)	85 (51%)	49 (30%)	32 (19%)	0	0
5	E	30/32 (94%)	22 (73%)	6 (20%)	2 (7%)	1	8
5	R	30/32 (94%)	23 (77%)	5 (17%)	2 (7%)	1	8
6	F	31/35 (89%)	25 (81%)	5 (16%)	1 (3%)	5	27
6	S	33/35 (94%)	25 (76%)	5 (15%)	3 (9%)	1	4
7	G	21/37 (57%)	15 (71%)	5 (24%)	1 (5%)	3	17
7	T	25/37 (68%)	18 (72%)	6 (24%)	1 (4%)	4	21
8	H	25/29 (86%)	18 (72%)	7 (28%)	0	100	100
8	U	25/29 (86%)	19 (76%)	6 (24%)	0	100	100
All	All	1792/1952 (92%)	1246 (70%)	340 (19%)	206 (12%)	0	2

5 of 206 Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	25	TYR
1	A	28	PRO
1	A	111	LYS
1	A	160	VAL
1	A	173	SER

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	172/184 (94%)	147 (86%)	25 (14%)	4	18
1	N	172/184 (94%)	153 (89%)	19 (11%)	8	30
2	B	117/136 (86%)	93 (80%)	24 (20%)	1	7
2	O	117/136 (86%)	98 (84%)	19 (16%)	3	14
3	C	240/243 (99%)	207 (86%)	33 (14%)	4	20
3	P	240/243 (99%)	206 (86%)	34 (14%)	4	19
4	D	136/146 (93%)	113 (83%)	23 (17%)	2	13
4	Q	136/146 (93%)	113 (83%)	23 (17%)	2	13
5	E	25/25 (100%)	15 (60%)	10 (40%)	0	0
5	R	25/25 (100%)	14 (56%)	11 (44%)	0	0
6	F	25/27 (93%)	22 (88%)	3 (12%)	6	26
6	S	27/27 (100%)	23 (85%)	4 (15%)	4	17
7	G	17/28 (61%)	9 (53%)	8 (47%)	0	0
7	T	21/28 (75%)	12 (57%)	9 (43%)	0	0
8	H	22/24 (92%)	18 (82%)	4 (18%)	2	11
8	U	22/24 (92%)	18 (82%)	4 (18%)	2	11
All	All	1514/1626 (93%)	1261 (83%)	253 (17%)	3	13

5 of 253 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
5	E	30	LYS
1	N	116	LEU
5	R	27	LYS
6	F	30	GLN
8	H	21	MET

Some sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 47 such sidechains are listed below:

Mol	Chain	Res	Type
4	D	152	HIS
1	N	209	GLN
4	Q	122	ASN
8	H	27	ASN
2	O	86	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 carbohydrates in this entry.

5.6 Ligand geometry ⓘ

22 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	$\# Z > 2$
9	HEM	A	301	1	30,50,50	2.49	10 (33%)	24,82,82	2.59	11 (45%)
9	HEM	A	302	1	30,50,50	2.25	11 (36%)	24,82,82	4.41	12 (50%)
9	HEM	A	303	1,16	30,50,50	2.39	11 (36%)	24,82,82	3.27	13 (54%)
10	TDS	A	304	-	29,31,31	2.62	5 (17%)	29,40,40	1.91	8 (27%)
11	PL9	A	305	-	55,55,55	3.64	21 (38%)	68,69,69	2.45	20 (29%)
13	CLA	B	201	-	55,73,73	1.52	7 (12%)	61,113,113	1.82	14 (22%)
12	OPC	B	307	-	53,53,54	1.38	11 (20%)	57,61,64	1.09	5 (8%)
9	HEM	C	301	3	30,50,50	2.29	11 (36%)	24,82,82	2.45	9 (37%)
14	FES	D	200	4	0,4,4	0.00	-	0,4,4	0.00	-
12	OPC	D	306	-	53,53,54	1.39	11 (20%)	57,61,64	1.19	4 (7%)
15	BCR	E	101	-	41,41,41	2.12	8 (19%)	56,56,56	2.51	23 (41%)
10	TDS	N	1304	-	29,31,31	2.61	5 (17%)	29,40,40	1.88	7 (24%)
12	OPC	N	1306	-	53,53,54	1.38	11 (20%)	57,61,64	1.39	8 (14%)
9	HEM	N	301	1	30,50,50	2.39	13 (43%)	24,82,82	2.74	11 (45%)

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# Z > 2	Counts	RMSZ	# Z > 2
9	HEM	N	302	1	30,50,50	2.36	13 (43%)	24,82,82	4.42	13 (54%)
9	HEM	N	303	1,16	30,50,50	2.37	10 (33%)	24,82,82	3.33	11 (45%)
13	CLA	O	1201	-	55,73,73	1.49	7 (12%)	61,113,113	1.77	15 (24%)
9	HEM	P	301	3	30,50,50	2.19	10 (33%)	24,82,82	2.52	10 (41%)
14	FES	Q	1200	4	0,4,4	0.00	-	0,4,4	0.00	-
11	PL9	Q	1305	-	55,55,55	3.63	21 (38%)	68,69,69	2.56	22 (32%)
12	OPC	Q	1307	-	53,53,54	1.38	11 (20%)	57,61,64	1.21	4 (7%)
15	BCR	R	1101	-	41,41,41	2.06	8 (19%)	56,56,56	2.52	21 (37%)

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
9	HEM	A	301	1	-	0/10/54/54	0/0/8/8
9	HEM	A	302	1	-	0/10/54/54	0/0/8/8
9	HEM	A	303	1,16	-	0/10/54/54	0/0/8/8
10	TDS	A	304	-	-	0/16/17/17	0/2/2/2
11	PL9	A	305	-	-	1/53/73/73	0/1/1/1
13	CLA	B	201	-	5/5/20/25	0/37/135/135	0/0/9/9
12	OPC	B	307	-	-	2/57/57/60	0/0/0/0
9	HEM	C	301	3	-	0/10/54/54	0/0/8/8
14	FES	D	200	4	-	0/0/4/4	0/1/1/1
12	OPC	D	306	-	-	2/57/57/60	0/0/0/0
15	BCR	E	101	-	-	0/29/63/63	0/2/2/2
10	TDS	N	1304	-	-	0/16/17/17	0/2/2/2
12	OPC	N	1306	-	-	2/57/57/60	0/0/0/0
9	HEM	N	301	1	-	0/10/54/54	0/0/8/8
9	HEM	N	302	1	-	0/10/54/54	0/0/8/8
9	HEM	N	303	1,16	-	0/10/54/54	0/0/8/8
13	CLA	O	1201	-	6/6/20/25	0/37/135/135	0/0/9/9
9	HEM	P	301	3	-	0/10/54/54	0/0/8/8
14	FES	Q	1200	4	-	0/0/4/4	0/1/1/1
11	PL9	Q	1305	-	-	1/53/73/73	0/1/1/1
12	OPC	Q	1307	-	-	2/57/57/60	0/0/0/0
15	BCR	R	1101	-	-	0/29/63/63	0/2/2/2

The worst 5 of 215 bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
10	A	304	TDS	CAQ-CAP	-8.37	1.39	1.50
10	N	1304	TDS	CAQ-CAP	-8.31	1.39	1.50
11	A	305	PL9	C7-C8	-7.18	1.39	1.50
11	Q	1305	PL9	C7-C8	-7.15	1.39	1.50
9	A	303	HEM	C2D-C3D	-6.94	1.33	1.54

The worst 5 of 241 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
9	N	302	HEM	CBA-CAA-C2A	-14.85	85.90	112.53
9	A	302	HEM	CBA-CAA-C2A	-14.56	86.43	112.53
9	N	303	HEM	C3B-CAB-CBB	-7.97	112.24	124.46
11	A	305	PL9	C7-C8-C9	-7.95	113.23	126.70
11	Q	1305	PL9	C7-C8-C9	-7.88	113.34	126.70

5 of 11 chirality outliers are listed below:

Mol	Chain	Res	Type	Atom
13	B	201	CLA	C8
13	B	201	CLA	NC
13	B	201	CLA	C3A
13	B	201	CLA	NA
13	B	201	CLA	ND

5 of 10 torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
11	Q	1305	PL9	C44-C43-C42-C41
11	A	305	PL9	C44-C43-C42-C41
12	N	1306	OPC	CAM-OAN-CAO-OAD
12	D	306	OPC	CAM-OAN-CAO-OAD
12	B	307	OPC	CAM-OAN-CAO-OAD

There are no ring outliers.

21 monomers are involved in 201 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
9	A	301	HEM	10	0
9	A	302	HEM	5	0
9	A	303	HEM	3	0
10	A	304	TDS	13	0
11	A	305	PL9	18	0

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Mol	Chain	Res	Type	Clashes	Symm-Clashes
13	B	201	CLA	8	0
12	B	307	OPC	14	0
14	D	200	FES	1	0
12	D	306	OPC	24	0
15	E	101	BCR	7	0
10	N	1304	TDS	12	0
12	N	1306	OPC	10	0
9	N	301	HEM	9	0
9	N	302	HEM	4	0
9	N	303	HEM	4	0
13	O	1201	CLA	20	0
9	P	301	HEM	1	0
14	Q	1200	FES	1	0
11	Q	1305	PL9	23	0
12	Q	1307	OPC	30	0
15	R	1101	BCR	7	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	202/215 (93%)	-0.23	2 (0%) 84 60	22, 55, 101, 174	0
1	N	202/215 (93%)	-0.25	0 100 100	19, 53, 86, 121	0
2	B	138/160 (86%)	-0.25	2 (1%) 78 51	24, 65, 122, 194	0
2	O	138/160 (86%)	-0.19	3 (2%) 65 35	28, 62, 139, 184	0
3	C	286/289 (98%)	-0.14	4 (1%) 78 51	5, 82, 153, 200	1 (0%)
3	P	286/289 (98%)	-0.04	8 (2%) 56 27	14, 85, 154, 200	1 (0%)
4	D	168/179 (93%)	-0.06	9 (5%) 29 11	36, 117, 179, 200	0
4	Q	168/179 (93%)	-0.11	4 (2%) 62 32	33, 109, 165, 192	0
5	E	32/32 (100%)	0.17	2 (6%) 23 9	30, 76, 149, 177	0
5	R	32/32 (100%)	0.23	0 100 100	37, 81, 149, 171	0
6	F	33/35 (94%)	-0.11	0 100 100	39, 63, 140, 177	0
6	S	35/35 (100%)	-0.19	0 100 100	41, 78, 152, 167	0
7	G	23/37 (62%)	0.03	1 (4%) 39 16	33, 71, 128, 171	0
7	T	27/37 (72%)	-0.11	1 (3%) 45 19	37, 65, 100, 152	0
8	H	27/29 (93%)	-0.17	0 100 100	33, 71, 130, 165	0
8	U	27/29 (93%)	-0.13	0 100 100	46, 81, 152, 157	0
All	All	1824/1952 (93%)	-0.13	36 (1%) 68 39	5, 74, 155, 200	2 (0%)

The worst 5 of 36 RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
3	C	117	GLY	5.7
2	B	93	ASN	5.3
3	P	71	ASN	4.6
3	P	101	VAL	4.2
3	C	73	GLY	3.7

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
10	TDS	N	1304	30/30	0.87	0.44	3.93	80,80,80,80	0
15	BCR	R	1101	40/40	0.83	0.55	3.54	91,91,91,91	0
11	PL9	A	305	55/55	0.77	0.39	3.53	98,98,98,98	0
15	BCR	E	101	40/40	0.88	0.47	3.43	77,77,77,77	0
9	HEM	A	301	43/43	0.97	0.27	2.40	45,45,45,45	0
13	CLA	B	201	65/65	0.94	0.27	2.29	45,56,56,56	0
12	OPC	N	1306	54/55	0.86	0.31	1.95	87,87,87,87	0
9	HEM	N	302	43/43	0.97	0.26	1.94	48,56,56,56	0
9	HEM	N	301	43/43	0.97	0.27	1.74	41,50,50,50	0
9	HEM	A	302	43/43	0.96	0.28	1.73	62,62,62,62	0
10	TDS	A	304	30/30	0.91	0.33	1.30	52,52,52,52	0
11	PL9	Q	1305	55/55	0.84	0.28	1.27	85,85,85,85	0
13	CLA	O	1201	65/65	0.93	0.26	1.12	22,72,72,72	0
12	OPC	D	306	54/55	0.88	0.28	1.04	86,86,86,86	0
9	HEM	A	303	43/43	0.97	0.24	0.33	55,81,81,81	0
9	HEM	C	301	43/43	0.97	0.25	0.12	62,83,83,83	0
12	OPC	B	307	54/55	0.84	0.23	0.03	84,84,84,84	0
9	HEM	N	303	43/43	0.97	0.21	-0.20	61,61,61,64	0
9	HEM	P	301	43/43	0.97	0.23	-0.25	47,56,56,56	0
12	OPC	Q	1307	54/55	0.91	0.20	-0.62	72,72,72,72	0
14	FES	Q	1200	4/4	0.98	0.14	-0.94	94,94,98,98	0
14	FES	D	200	4/4	0.93	0.10	-1.50	144,144,170,170	0

6.5 Other polymers [i](#)

There are no such residues in this entry.