



# Full wwPDB X-ray Structure Validation Report ⓘ

Feb 14, 2017 – 05:04 am GMT

PDB ID : 4Y6R  
Title : Structure of Plasmodium falciparum DXR in complex with a beta-substituted fosmidomycin analogue, RC137, and manganese  
Authors : Sooriyaarachchi, S.; Bergfors, T.; Jones, T.A.; Mowbray, S.L.  
Deposited on : 2015-02-13  
Resolution : 1.90 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](mailto: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 : 1.7.2 (RC1), CSD as538be (2017)  
Xtriage (Phenix) : 1.9-1692  
EDS : trunk28620  
Percentile statistics : 20161228.v01 (using entries in the PDB archive December 28th 2016)  
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) : recalc28949

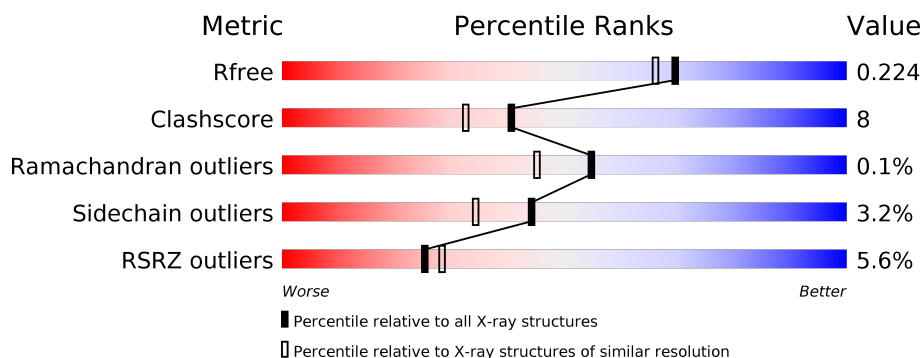
# 1 Overall quality at a glance ⓘ

The following experimental techniques were used to determine the structure:

*X-RAY DIFFRACTION*

The reported resolution of this entry is 1.90 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))
$R_{free}$	100719	5047 (1.90-1.90)
Clashscore	112137	5731 (1.90-1.90)
Ramachandran outliers	110173	5669 (1.90-1.90)
Sidechain outliers	110143	5670 (1.90-1.90)
RSRZ outliers	101464	5100 (1.90-1.90)

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  $\geq 3$ , 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	422	<div> <div>2%</div> <div> <div></div> <div>83%</div> <div>13%</div> <div>••</div> </div> </div>
1	B	422	<div> <div>9%</div> <div> <div></div> <div>84%</div> <div>13%</div> <div>•</div> </div> </div>

## 2 Entry composition

There are 6 unique types of molecules in this entry. The entry contains 7086 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.

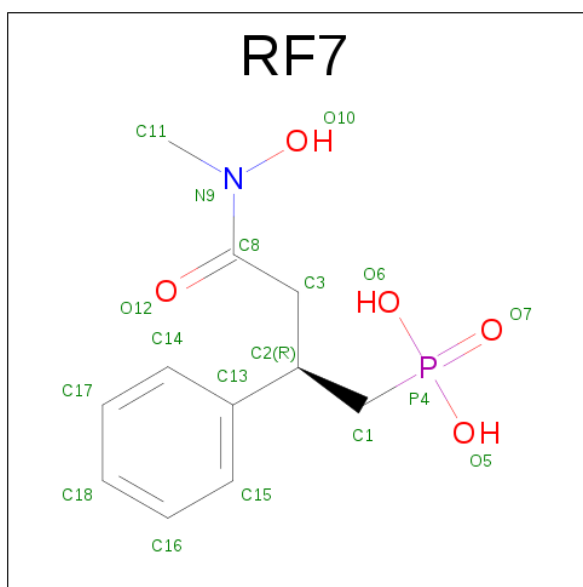
- Molecule 1 is a protein called 1-deoxy-D-xylulose 5-phosphate reductoisomerase, apicoplast.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	410	Total	C	N	O	S	0	3	0
			3296	2114	540	620	22			
1	B	410	Total	C	N	O	S	0	2	0
			3292	2112	540	619	21			

There are 16 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	67	MET	-	initiating methionine	UNP Q8IKG4
A	68	ALA	-	expression tag	UNP Q8IKG4
A	69	HIS	-	expression tag	UNP Q8IKG4
A	70	HIS	-	expression tag	UNP Q8IKG4
A	71	HIS	-	expression tag	UNP Q8IKG4
A	72	HIS	-	expression tag	UNP Q8IKG4
A	73	HIS	-	expression tag	UNP Q8IKG4
A	74	HIS	-	expression tag	UNP Q8IKG4
B	67	MET	-	initiating methionine	UNP Q8IKG4
B	68	ALA	-	expression tag	UNP Q8IKG4
B	69	HIS	-	expression tag	UNP Q8IKG4
B	70	HIS	-	expression tag	UNP Q8IKG4
B	71	HIS	-	expression tag	UNP Q8IKG4
B	72	HIS	-	expression tag	UNP Q8IKG4
B	73	HIS	-	expression tag	UNP Q8IKG4
B	74	HIS	-	expression tag	UNP Q8IKG4

- Molecule 2 is {(2R)-4-[hydroxy(methyl)amino]-4-oxo-2-phenylbutyl}phosphonic acid (three-letter code: RF7) (formula: C<sub>11</sub>H<sub>16</sub>NO<sub>5</sub>P).



Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
2	A	1	Total	C	N	O	P	0	0
			18	11	1	5	1		
2	B	1	Total	C	N	O	P	0	0
			18	11	1	5	1		

- Molecule 3 is MANGANESE (II) ION (three-letter code: MN) (formula: Mn).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
3	B	1	Total	Mn	0	0
			1	1		
3	A	1	Total	Mn	0	0
			1	1		

- Molecule 4 is CHLORIDE ION (three-letter code: CL) (formula: Cl).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
4	A	1	Total	Cl	0	0
			1	1		

- Molecule 5 is SULFATE ION (three-letter code: SO4) (formula: O<sub>4</sub>S).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
5	B	1	Total	O	S	0	0
			5	4	1		

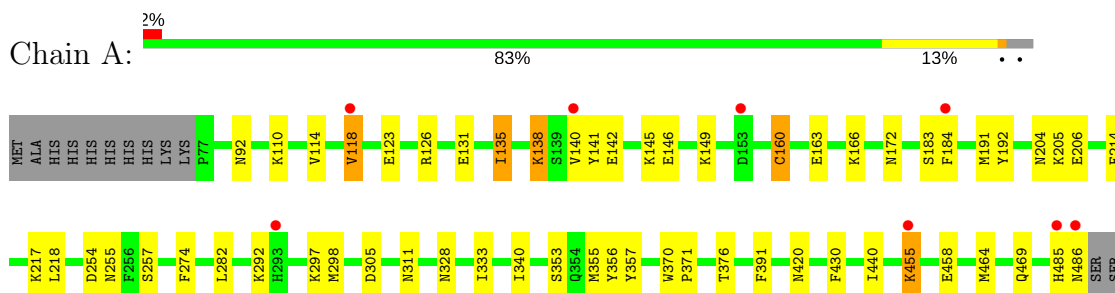
- Molecule 6 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
6	A	263	Total	O	0	0
			263	263		
6	B	191	Total	O	0	0
			191	191		

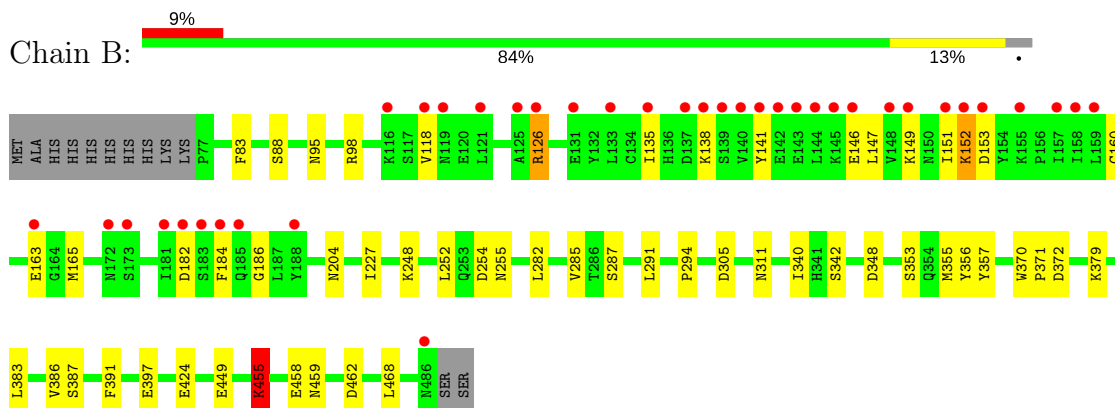
### 3 Residue-property plots [i](#)

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: 1-deoxy-D-xylulose 5-phosphate reductoisomerase, apicoplast



- Molecule 1: 1-deoxy-D-xylulose 5-phosphate reductoisomerase, apicoplast



## 4 Data and refinement statistics

Property	Value	Source
Space group	P 1	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	51.40Å 54.85Å 85.21Å 89.64° 105.40° 107.61°	Depositor
Resolution (Å)	47.08 – 1.90 46.79 – 1.90	Depositor EDS
% Data completeness (in resolution range)	95.5 (47.08-1.90) 93.0 (46.79-1.90)	Depositor EDS
$R_{merge}$	0.15	Depositor
$R_{sym}$	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	2.00 (at 1.90Å)	Xtriage
Refinement program	REFMAC 5.8.0073	Depositor
R, $R_{free}$	0.187 , 0.218 0.193 , 0.224	Depositor DCC
$R_{free}$ test set	3256 reflections (5.35%)	DCC
Wilson B-factor (Å <sup>2</sup> )	19.1	Xtriage
Anisotropy	1.040	Xtriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.37 , 46.4	EDS
L-test for twinning <sup>2</sup>	$\langle  L  \rangle = 0.49$ , $\langle L^2 \rangle = 0.32$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
$F_o, F_c$ correlation	0.95	EDS
Total number of atoms	7086	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	29.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 6.47% of the height of the origin peak. No significant pseudotranslation is detected.*

<sup>1</sup>Intensities estimated from amplitudes.

<sup>2</sup>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](#)

Bond lengths and bond angles in the following residue types are not validated in this section: MN, RF7, SO4, CL

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	0.45	0/3359	0.67	0/4535
1	B	0.43	0/3355	0.68	3/4530 (0.1%)
All	All	0.44	0/6714	0.68	3/9065 (0.0%)

There are no bond length outliers.

All (3) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	B	126	ARG	NE-CZ-NH2	-8.92	115.84	120.30
1	B	126	ARG	NE-CZ-NH1	7.36	123.98	120.30
1	B	455	LYS	CD-CE-NZ	-5.17	99.82	111.70

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	3296	0	3338	55	0
1	B	3292	0	3335	60	1
2	A	18	0	15	3	0
2	B	18	0	15	0	0
3	A	1	0	0	0	0
3	B	1	0	0	0	0

*Continued on next page...*



*Continued from previous page...*

Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
4	A	1	0	0	0	0
5	B	5	0	0	0	0
6	A	263	0	0	6	1
6	B	191	0	0	6	0
All	All	7086	0	6703	110	2

The all-atom clashscore is defined as the number of clashes found per 1000 atoms (including hydrogen atoms). The all-atom clashscore for this structure is 8.

All (110) 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:163:GLU:HG3	6:B:786:HOH:O	1.58	1.03
1:B:152:LYS:HB2	1:B:152:LYS:NZ	1.77	0.99
1:B:152:LYS:HZ3	1:B:152:LYS:HB2	1.33	0.89
1:B:152:LYS:HE3	1:B:152:LYS:HA	1.58	0.85
1:B:152:LYS:CB	1:B:152:LYS:NZ	2.40	0.84
1:B:397:GLU:HG2	6:B:783:HOH:O	1.84	0.78
1:B:83:PHE:HE2	1:B:165:MET:HG2	1.45	0.78
1:B:152:LYS:HA	1:B:152:LYS:CE	2.14	0.78
1:A:214:PHE:CD2	1:A:464[B]:MET:HE1	2.20	0.77
1:B:184:PHE:CZ	1:B:468:LEU:CD2	2.67	0.77
1:A:214:PHE:CD2	1:A:464[B]:MET:CE	2.68	0.76
1:B:184:PHE:CZ	1:B:468:LEU:HD23	2.22	0.75
1:B:455:LYS:HA	1:B:455:LYS:HE2	1.69	0.75
1:A:138:LYS:HD3	1:A:160[A]:CYS:SG	2.27	0.74
1:A:217:LYS:HE2	1:A:458:GLU:O	1.88	0.74
1:A:297:LYS:HA	6:A:819:HOH:O	1.87	0.72
1:A:206:GLU:HG2	1:A:420:ASN:HD21	1.53	0.72
1:A:214:PHE:CG	1:A:464[B]:MET:CE	2.72	0.72
1:B:186:GLY:HA2	6:B:675:HOH:O	1.90	0.71
1:A:142:GLU:HB2	6:A:803:HOH:O	1.90	0.70
1:B:294:PRO:HA	6:B:743:HOH:O	1.93	0.68
1:B:184:PHE:CE2	1:B:468:LEU:CD2	2.76	0.68
1:B:138:LYS:HG2	1:B:160:CYS:SG	2.34	0.67
1:A:355:MET:HE1	1:B:353:SER:HB3	1.75	0.67
1:B:184:PHE:HZ	1:B:468:LEU:CD2	2.09	0.66
1:A:355:MET:CE	1:B:353:SER:HB3	2.26	0.65
1:B:182:ASP:O	1:B:204:ASN:ND2	2.32	0.62
1:B:455:LYS:CA	1:B:455:LYS:HE2	2.27	0.62
1:B:184:PHE:HZ	1:B:468:LEU:HD23	1.63	0.61

*Continued on next page...*

*Continued from previous page...*

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:204:ASN:HB3	6:A:857:HOH:O	2.00	0.61
1:B:152:LYS:HA	1:B:152:LYS:HZ2	1.67	0.60
1:A:214:PHE:CE1	1:A:464[B]:MET:HE3	2.39	0.58
1:B:184:PHE:CZ	1:B:468:LEU:HD21	2.39	0.57
1:B:152:LYS:HB2	1:B:152:LYS:HZ2	1.65	0.57
1:B:152:LYS:HA	1:B:152:LYS:NZ	2.20	0.57
1:A:353:SER:HB3	1:B:355:MET:HE1	1.85	0.57
1:A:214:PHE:CZ	1:A:464[B]:MET:HE3	2.40	0.56
1:A:214:PHE:CD1	1:A:464[B]:MET:HE3	2.40	0.56
1:B:146:GLU:OE2	1:B:149:LYS:HE2	2.05	0.56
1:A:166:LYS:HD3	1:A:192:TYR:CE2	2.41	0.55
1:B:126:ARG:HG2	1:B:151:ILE:HG12	1.88	0.55
1:B:152:LYS:HE3	1:B:152:LYS:CA	2.34	0.55
1:A:217:LYS:CE	1:A:458:GLU:O	2.55	0.54
1:A:214:PHE:CE2	1:A:464[B]:MET:HE3	2.42	0.54
1:A:214:PHE:CD2	1:A:464[B]:MET:HE3	2.43	0.53
1:B:83:PHE:HE2	1:B:165:MET:CG	2.19	0.53
1:A:214:PHE:CG	1:A:464[B]:MET:HE3	2.43	0.53
1:A:166:LYS:HG2	1:A:192:TYR:CD2	2.43	0.53
1:B:152:LYS:CA	1:B:152:LYS:HZ2	2.20	0.53
1:B:282:LEU:O	1:B:285:VAL:HG22	2.09	0.53
1:A:340:ILE:HD12	1:A:391:PHE:HZ	1.74	0.52
1:A:340:ILE:HG12	1:A:355:MET:HG2	1.91	0.51
1:B:152:LYS:CA	1:B:152:LYS:NZ	2.73	0.51
1:B:424:GLU:OE1	6:B:750:HOH:O	2.19	0.51
1:A:118:VAL:HG11	1:A:140:VAL:HB	1.92	0.50
1:A:464[B]:MET:HA	1:A:464[B]:MET:HE2	1.94	0.50
1:B:455:LYS:HA	1:B:455:LYS:CE	2.40	0.50
1:A:297:LYS:O	1:A:298:MET:HG2	2.13	0.49
1:B:287:SER:O	1:B:291:LEU:HG	2.12	0.49
1:A:183:SER:OG	1:A:184:PHE:N	2.46	0.48
1:B:340:ILE:HD12	1:B:391:PHE:HZ	1.79	0.48
1:B:227:ILE:HD12	1:B:252:LEU:HD12	1.94	0.48
1:A:138:LYS:HA	1:A:160[A]:CYS:SG	2.54	0.48
1:A:297:LYS:C	1:A:298:MET:HG2	2.33	0.48
1:A:298:MET:CE	2:A:501:RF7:H11	2.44	0.48
1:A:254:ASP:O	1:A:255:ASN:HB2	2.13	0.48
1:B:95[A]:ASN:OD1	1:B:98:ARG:NH1	2.47	0.47
1:A:485:HIS:CD2	6:A:851:HOH:O	2.67	0.47
1:B:152:LYS:CA	1:B:152:LYS:CE	2.77	0.47
1:A:166:LYS:HG2	1:A:192:TYR:CE2	2.48	0.47

*Continued on next page...*

*Continued from previous page...*

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:83:PHE:CE2	1:B:165:MET:HG2	2.35	0.47
1:A:114:VAL:CG2	1:A:135:ILE:HD12	2.45	0.47
1:A:166:LYS:HD3	1:A:192:TYR:CZ	2.49	0.47
1:A:141:TYR:CE2	1:A:145:LYS:NZ	2.74	0.46
1:B:386:VAL:O	1:B:387:SER:HB3	2.16	0.46
1:A:214:PHE:CE2	1:A:464[B]:MET:CE	2.98	0.46
1:A:131:GLU:HG2	6:A:823:HOH:O	2.14	0.46
1:B:184:PHE:HE2	1:B:468:LEU:CD2	2.28	0.45
1:B:254:ASP:O	1:B:255:ASN:HB2	2.16	0.45
1:A:455:LYS:HE2	1:A:455:LYS:HB3	1.54	0.45
1:A:118:VAL:HG23	6:A:842:HOH:O	2.16	0.44
1:A:110:LYS:HA	1:A:110:LYS:HD2	1.80	0.44
1:A:355:MET:HE1	1:B:353:SER:CB	2.43	0.44
1:B:152:LYS:HE3	1:B:153:ASP:H	1.82	0.44
1:B:138:LYS:HD3	1:B:160:CYS:SG	2.58	0.44
1:A:274:PHE:HB3	1:A:282:LEU:HD21	2.00	0.44
1:B:184:PHE:CE2	1:B:468:LEU:HD21	2.50	0.44
1:B:141:TYR:CD1	1:B:160:CYS:HB3	2.53	0.43
1:A:298:MET:HE1	2:A:501:RF7:H11	2.00	0.43
1:A:146:GLU:O	1:A:149:LYS:HB2	2.19	0.43
1:B:379:LYS:NZ	6:B:681:HOH:O	2.51	0.42
1:A:376:THR:HG23	1:B:348:ASP:HA	2.02	0.42
2:A:501:RF7:H4	2:A:501:RF7:H12	1.84	0.42
1:B:305:ASP:HB3	1:B:311:ASN:HB2	2.01	0.42
1:B:152:LYS:CD	1:B:153:ASP:H	2.33	0.41
1:B:383:LEU:HD23	1:B:383:LEU:HA	1.86	0.41
1:A:430:PHE:CG	1:A:440:ILE:HD11	2.55	0.41
1:A:191:MET:HG3	1:A:218:LEU:HD21	2.02	0.41
1:A:353:SER:HB3	1:B:355:MET:CE	2.50	0.41
1:B:455:LYS:CA	1:B:455:LYS:CE	2.96	0.41
1:B:370:TRP:CD1	1:B:371:PRO:HA	2.56	0.41
1:A:370:TRP:CD1	1:A:371:PRO:HA	2.56	0.41
1:A:135:ILE:O	1:A:160[A]:CYS:HA	2.22	0.40
1:A:214:PHE:CD1	1:A:464[B]:MET:CE	3.03	0.40
1:B:356:TYR:CG	1:B:357:TYR:N	2.89	0.40
1:A:305:ASP:HB3	1:A:311:ASN:HB2	2.03	0.40
1:A:356:TYR:CG	1:A:357:TYR:N	2.90	0.40
1:B:147:LEU:HD23	1:B:147:LEU:HA	1.90	0.40
1:B:459:ASN:HB3	1:B:462:ASP:HB2	2.03	0.40
1:A:485:HIS:O	1:A:486:ASN:C	2.59	0.40

All (2) symmetry-related close contacts are listed below. The label for Atom-2 includes the sym-

metry operator and encoded unit-cell translations to be applied.

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:149:LYS:NZ	1:B:458:GLU:OE1[1_565]	1.76	0.44
6:A:648:HOH:O	6:A:665:HOH:O[1_565]	1.91	0.29

## 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	411/422 (97%)	398 (97%)	13 (3%)	0	100	100
1	B	410/422 (97%)	394 (96%)	15 (4%)	1 (0%)	51	41
All	All	821/844 (97%)	792 (96%)	28 (3%)	1 (0%)	55	45

All (1) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	B	342	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	380/388 (98%)	363 (96%)	17 (4%)	32	21
1	B	379/388 (98%)	371 (98%)	8 (2%)	59	53
All	All	759/776 (98%)	734 (97%)	25 (3%)	44	33

All (25) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	92	ASN
1	A	118	VAL
1	A	123	GLU
1	A	126	ARG
1	A	135	ILE
1	A	138	LYS
1	A	160[A]	CYS
1	A	160[B]	CYS
1	A	163	GLU
1	A	172	ASN
1	A	205	LYS
1	A	257	SER
1	A	292	LYS
1	A	328	ASN
1	A	333	ILE
1	A	455	LYS
1	A	469	GLN
1	B	88	SER
1	B	118	VAL
1	B	135	ILE
1	B	152	LYS
1	B	248	LYS
1	B	372	ASP
1	B	449	GLU
1	B	455	LYS

Some sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (6) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	255	ASN
1	A	361	GLN
1	A	420	ASN
1	A	433	ASN
1	B	92	ASN
1	B	420	ASN

### 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](#)

Of 6 ligands modelled in this entry, 3 are monoatomic - leaving 3 for Mogul analysis.

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	RF7	A	501	3	15,18,18	1.15	1 (6%)	16,25,25	1.27	3 (18%)
2	RF7	B	501	3	15,18,18	0.97	1 (6%)	16,25,25	1.27	1 (6%)
5	SO4	B	503	-	4,4,4	0.49	0	6,6,6	0.19	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	RF7	A	501	3	-	0/16/17/17	0/1/1/1
2	RF7	B	501	3	-	0/16/17/17	0/1/1/1
5	SO4	B	503	-	-	0/0/0/0	0/0/0/0

All (2) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	B	501	RF7	P4-C1	2.20	1.81	1.78
2	A	501	RF7	P4-C1	3.35	1.82	1.78

All (4) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	B	501	RF7	C3-C2-C13	-3.89	104.64	111.94
2	A	501	RF7	C3-C2-C13	-3.36	105.63	111.94
2	A	501	RF7	O7-P4-C1	-2.13	107.57	111.43
2	A	501	RF7	O6-P4-C1	2.17	111.95	106.88

There are no chirality outliers.

There are no torsion outliers.

There are no ring outliers.

1 monomer is involved in 3 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
2	A	501	RF7	3	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, 95<sup>th</sup> 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 <sup>2</sup> )	Q<0.9
1	A	410/422 (97%)	0.01	8 (1%) 65 69	18, 25, 40, 64	0
1	B	410/422 (97%)	0.31	38 (9%) 9 10	18, 28, 58, 88	0
All	All	820/844 (97%)	0.16	46 (5%) 25 28	18, 26, 50, 88	0

All (46) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	B	183	SER	8.1
1	B	184	PHE	7.2
1	B	138	LYS	5.7
1	B	149	LYS	5.7
1	B	155	LYS	5.3
1	A	486	ASN	4.7
1	B	145	LYS	4.3
1	B	118	VAL	4.2
1	A	184	PHE	4.0
1	B	153	ASP	3.9
1	B	116	LYS	3.9
1	B	135	ILE	3.9
1	B	182	ASP	3.8
1	B	142	GLU	3.8
1	B	141	TYR	3.5
1	B	144	LEU	3.5
1	B	152	LYS	3.4
1	B	148	VAL	3.4
1	A	485	HIS	3.3
1	B	181	ILE	3.3
1	B	146	GLU	3.2
1	B	121	LEU	3.2
1	B	151	ILE	3.0
1	B	163	GLU	2.9

*Continued on next page...*



*Continued from previous page...*

Mol	Chain	Res	Type	RSRZ
1	B	119	ASN	2.9
1	B	173	SER	2.9
1	B	157	ILE	2.8
1	B	172	ASN	2.8
1	B	188	TYR	2.8
1	B	158	ILE	2.7
1	A	293	HIS	2.7
1	B	185	GLN	2.7
1	B	133	LEU	2.7
1	B	137	ASP	2.6
1	B	125	ALA	2.6
1	B	143	GLU	2.6
1	B	126	ARG	2.5
1	A	118	VAL	2.5
1	B	486	ASN	2.4
1	A	153	ASP	2.3
1	A	140	VAL	2.3
1	B	139	SER	2.2
1	B	140	VAL	2.2
1	B	131	GLU	2.1
1	B	159	LEU	2.1
1	A	455	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 [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, 95<sup>th</sup> 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( $\text{\AA}^2$ )	Q<0.9
2	RF7	B	501	18/18	0.97	0.10	0.03	20,22,24,24	0
2	RF7	A	501	18/18	0.98	0.10	-0.09	20,22,22,23	0
3	MN	A	502	1/1	1.00	0.10	-0.32	21,21,21,21	0
3	MN	B	502	1/1	1.00	0.08	-0.74	21,21,21,21	0
5	SO4	B	503	5/5	0.83	0.17	-	41,42,48,50	0
4	CL	A	503	1/1	0.96	0.13	-	43,43,43,43	0

## 6.5 Other polymers [i](#)

There are no such residues in this entry.