



# Full wwPDB X-ray Structure Validation Report ⓘ

Feb 19, 2016 – 06:57 PM GMT

PDB ID : 3X0Y  
Title : Crystal structure of FMN-bound DszC from Rhodococcus erythropolis D-1  
Authors : Guan, L.J.; Lee, W.C.; Wang, S.P.; Ohtsuka, J.; Tanokura, M.  
Deposited on : 2014-10-23  
Resolution : 2.30 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.

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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-20026982  
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-20026982

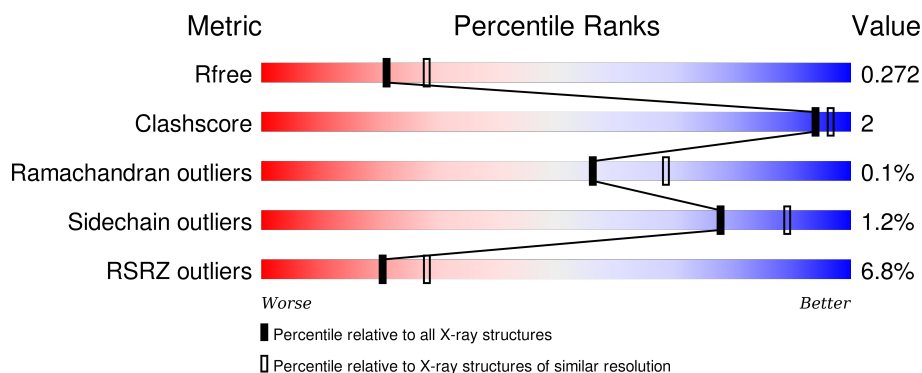
# 1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

## *X-RAY DIFFRACTION*

The reported resolution of this entry is 2.30 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.





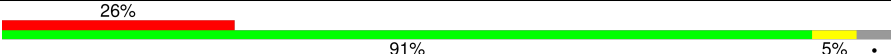
Metric	Whole archive (#Entries)	Similar resolution (#Entries, resolution range(Å))
$R_{free}$	91344	3852 (2.30-2.30)
Clashscore	102246	4452 (2.30-2.30)
Ramachandran outliers	100387	4410 (2.30-2.30)
Sidechain outliers	100360	4409 (2.30-2.30)
RSRZ outliers	91569	3857 (2.30-2.30)

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	417	<div> <div>91%</div> <div>5%</div> <div>.</div> </div>
1	B	417	<div> <div>92%</div> <div>.</div> <div>.</div> </div>
1	C	417	<div> <div>92%</div> <div>.</div> <div>.</div> </div>
1	D	417	<div> <div>91%</div> <div>5%</div> <div>.</div> <div>.</div> </div>
1	E	417	<div> <div>92%</div> <div>.</div> <div>.</div> </div>

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Mol	Chain	Length	Quality of chain
1	F	417	
1	G	417	
1	H	417	

The following table lists non-polymeric compounds, carbohydrate monomers and non-standard residues in protein, DNA, RNA chains that are outliers for geometric or electron-density-fit criteria:

Mol	Type	Chain	Res	Chirality	Geometry	Clashes	Electron density
2	FMN	C	500	-	-	-	X

## 2 Entry composition

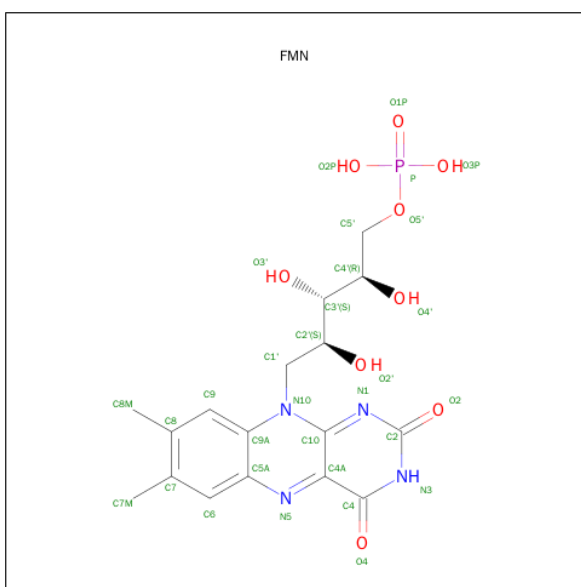
There are 3 unique types of molecules in this entry. The entry contains 25400 atoms, of which 0 are hydrogens and 0 are deuteriums.

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 DszC.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	402	Total	C	N	O	S	0	1	0
			3078	1931	551	592	4			
1	B	400	Total	C	N	O	S	0	0	0
			3054	1918	545	587	4			
1	C	400	Total	C	N	O	S	0	0	0
			3054	1918	545	587	4			
1	D	402	Total	C	N	O	S	0	1	0
			3072	1928	549	591	4			
1	E	401	Total	C	N	O	S	0	0	0
			3059	1921	546	588	4			
1	F	400	Total	C	N	O	S	0	0	0
			3054	1918	545	587	4			
1	G	401	Total	C	N	O	S	0	0	0
			3059	1921	546	588	4			
1	H	400	Total	C	N	O	S	0	0	0
			3051	1915	545	587	4			

- Molecule 2 is FLAVIN MONONUCLEOTIDE (three-letter code: FMN) (formula: C<sub>17</sub>H<sub>21</sub>N<sub>4</sub>O<sub>9</sub>P).



Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
2	A	1	Total	C	N	O	P	0	0
			31	17	4	9	1		
2	C	1	Total	C	N	O	P	0	0
			31	17	4	9	1		
2	D	1	Total	C	N	O	P	0	0
			31	17	4	9	1		
2	F	1	Total	C	N	O	P	0	0
			31	17	4	9	1		

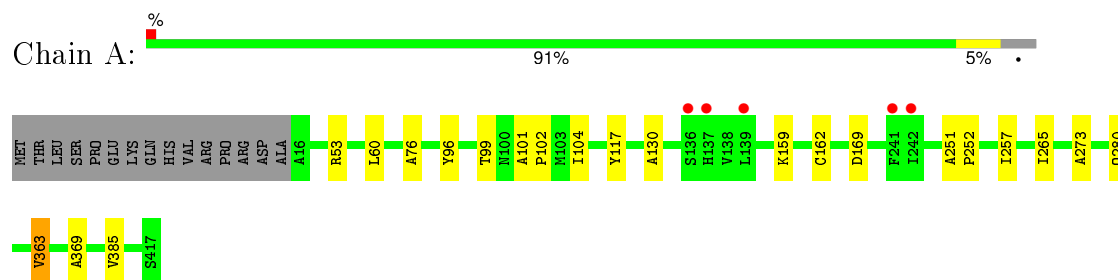
- Molecule 3 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
3	A	160	Total	O	0	0
			160	160		
3	B	110	Total	O	0	0
			110	110		
3	C	115	Total	O	0	0
			115	115		
3	D	95	Total	O	0	0
			95	95		
3	E	96	Total	O	0	0
			96	96		
3	F	95	Total	O	0	0
			95	95		
3	G	84	Total	O	0	0
			84	84		
3	H	40	Total	O	0	0
			40	40		

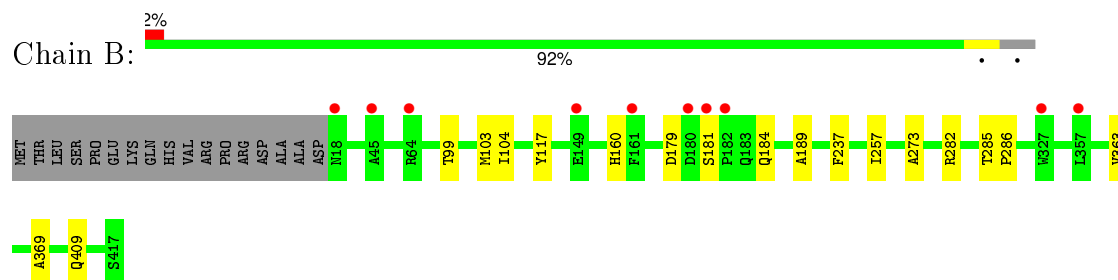
### 3 Residue-property plots

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.

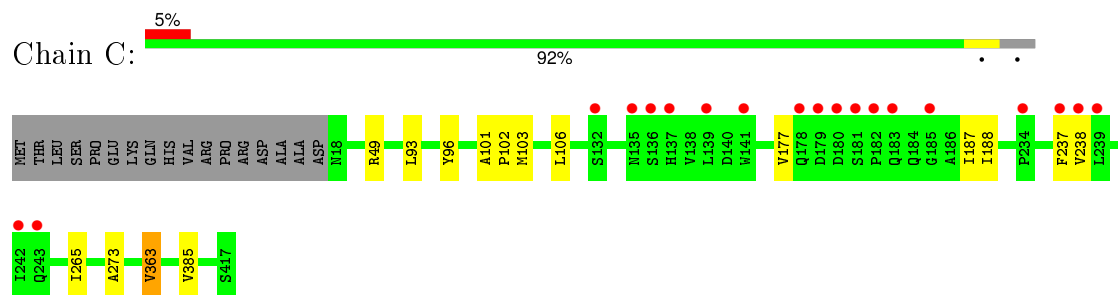
- Molecule 1: DszC



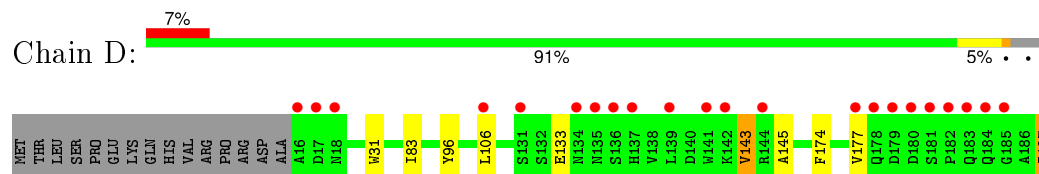
- Molecule 1: DszC

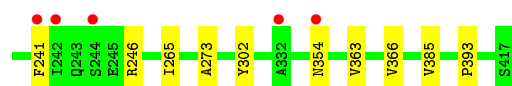


- Molecule 1: DszC

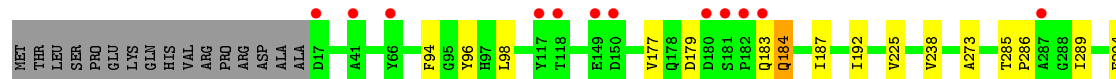
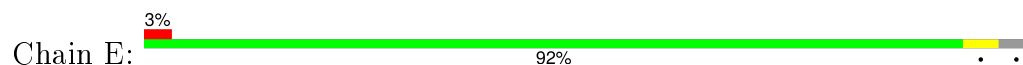


- Molecule 1: DszC





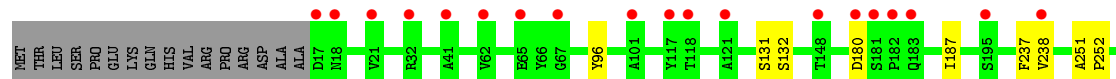
• Molecule 1: DszC



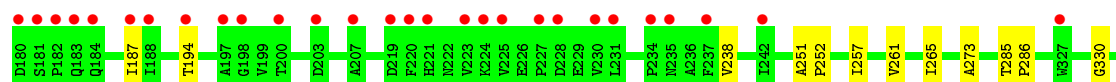
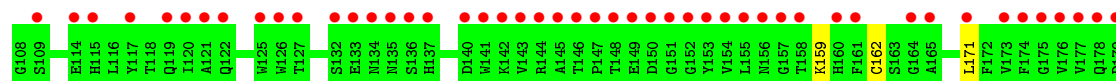
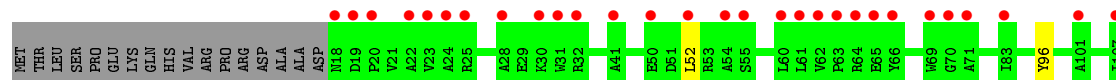
• Molecule 1: DszC



• Molecule 1: DszC



• Molecule 1: DszC



## 4 Data and refinement statistics

Property	Value	Source
Space group	C 1 2 1	Depositor
Cell constants a, b, c, $\alpha$ , $\beta$ , $\gamma$	145.48Å 123.52Å 184.52Å 90.00° 101.31° 90.00°	Depositor
Resolution (Å)	44.38 – 2.30 44.38 – 2.30	Depositor EDS
% Data completeness (in resolution range)	99.4 (44.38-2.30) 99.4 (44.38-2.30)	Depositor EDS
$R_{merge}$	(Not available)	Depositor
$R_{sym}$	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ <sup>1</sup>	4.21 (at 2.32Å)	Xtriage
Refinement program	REFMAC 5.8.0049	Depositor
R, $R_{free}$	0.230 , 0.272 0.229 , 0.272	Depositor DCC
$R_{free}$ test set	7038 reflections (5.28%)	DCC
Wilson B-factor (Å <sup>2</sup> )	31.2	Xtriage
Anisotropy	0.406	Xtriage
Bulk solvent $k_{sol}$ (e/Å <sup>3</sup> ), $B_{sol}$ (Å <sup>2</sup> )	0.33 , 41.1	EDS
Estimated twinning fraction	No twinning to report.	Xtriage
L-test for twinning <sup>2</sup>	$\langle  L  \rangle = 0.38$ , $\langle L^2 \rangle = 0.21$	Xtriage
Outliers	0 of 140317 reflections	Xtriage
$F_o, F_c$ correlation	0.91	EDS
Total number of atoms	25400	wwPDB-VP
Average B, all atoms (Å <sup>2</sup> )	41.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 4.35% 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, 0.375 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: FMN

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	0.28	0/3153	0.48	0/4298
1	B	0.28	0/3129	0.48	0/4265
1	C	0.28	0/3129	0.47	0/4265
1	D	0.29	0/3147	0.47	0/4290
1	E	0.28	0/3134	0.47	0/4272
1	F	0.28	0/3129	0.47	0/4265
1	G	0.28	0/3134	0.46	0/4272
1	H	0.27	0/3126	0.44	0/4261
All	All	0.28	0/25081	0.47	0/34188

There are no bond length outliers.

There are no bond angle outliers.

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	3078	0	2954	16	0
1	B	3054	0	2932	11	0
1	C	3054	0	2932	9	0
1	D	3072	0	2944	15	0
1	E	3059	0	2934	10	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
1	F	3054	0	2932	8	0
1	G	3059	0	2934	9	0
1	H	3051	0	2923	10	0
2	A	31	0	19	0	0
2	C	31	0	19	1	0
2	D	31	0	19	1	0
2	F	31	0	19	2	0
3	A	160	0	0	0	0
3	B	110	0	0	1	0
3	C	115	0	0	0	0
3	D	95	0	0	0	0
3	E	96	0	0	0	0
3	F	95	0	0	0	0
3	G	84	0	0	0	0
3	H	40	0	0	0	0
All	All	25400	0	23561	85	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 2.

All (85) 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:C:500:FMN:HM81	1:E:369:ALA:HB1	1.72	0.70
1:E:192:ILE:HG21	1:E:225:VAL:HG12	1.80	0.63
1:A:280:GLN:HE22	1:B:409:GLN:HG2	1.64	0.62
1:D:273:ALA:HB2	1:D:363:VAL:HG13	1.81	0.62
1:D:265:ILE:HG21	1:D:385:VAL:HG23	1.80	0.62
1:E:179:ASP:O	1:E:184:GLN:NE2	2.33	0.61
1:D:174:PHE:CD2	1:D:187:ILE:HD11	2.36	0.61
1:D:177:VAL:CG2	1:D:188:ILE:HD11	2.33	0.59
1:B:179:ASP:O	1:B:184:GLN:NE2	2.36	0.59
1:A:280:GLN:HE22	1:B:409:GLN:CG	2.17	0.58
1:A:104:ILE:HD11	1:A:117:TYR:CD1	2.40	0.57
1:A:251:ALA:HB3	1:A:252:PRO:HD3	1.88	0.56
1:H:187:ILE:HD12	1:H:238:VAL:CG2	2.36	0.54
1:A:101:ALA:HB3	1:A:102:PRO:HD3	1.90	0.54
1:C:273:ALA:HB2	1:C:363:VAL:HG13	1.90	0.54
1:B:273:ALA:HB2	1:B:363:VAL:HG13	1.90	0.54
1:H:171:LEU:HB2	1:H:194:THR:HG22	1.90	0.54
1:F:187:ILE:HD12	1:F:238:VAL:CG2	2.39	0.52

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:60:LEU:HD21	1:A:76:ALA:HA	1.92	0.51
1:D:177:VAL:HG22	1:D:188:ILE:HD11	1.93	0.51
1:E:273:ALA:HB2	1:E:363:VAL:HG13	1.92	0.50
1:E:177:VAL:HG11	1:E:183:GLN:HB3	1.92	0.50
1:B:103:MET:CE	1:B:189:ALA:HB1	2.41	0.50
1:C:265:ILE:HG21	1:C:385:VAL:HG23	1.93	0.50
1:E:94:PHE:CE2	1:E:98:LEU:HD11	2.47	0.50
1:A:159:LYS:HB3	1:A:162:CYS:SG	2.52	0.49
1:D:31:TRP:HZ3	1:D:83:ILE:HG23	1.76	0.49
1:C:177:VAL:CG2	1:C:188:ILE:HD11	2.43	0.49
1:H:273:ALA:HB2	1:H:363:VAL:HG13	1.94	0.49
1:F:388:HIS:HD2	2:F:500:FMN:HM73	1.76	0.48
1:E:289:ILE:N	1:E:289:ILE:HD12	2.28	0.48
1:G:309:LEU:HG	1:G:359:ILE:CD1	2.44	0.48
1:H:257:ILE:O	1:H:261:VAL:HG23	2.14	0.47
1:A:369:ALA:HB1	2:F:500:FMN:HM81	1.96	0.47
1:F:414:GLY:N	1:F:417:SER:OXT	2.46	0.47
1:A:130:ALA:C	1:A:159:LYS:HG2	2.35	0.47
1:G:131:SER:OG	1:G:132:SER:N	2.47	0.47
1:D:143:VAL:HG13	1:D:143:VAL:O	2.15	0.47
1:G:257:ILE:O	1:G:261:VAL:HG23	2.16	0.46
1:H:251:ALA:HB3	1:H:252:PRO:HD3	1.98	0.46
1:G:187:ILE:HD12	1:G:238:VAL:HG23	1.96	0.46
1:G:387:THR:HA	1:H:372:THR:HG21	1.98	0.46
1:A:265:ILE:HG21	1:A:385:VAL:HG23	1.97	0.46
1:A:99:THR:HG22	1:A:257:ILE:HD12	1.98	0.45
1:E:187:ILE:HD12	1:E:238:VAL:CG2	2.47	0.45
1:F:257:ILE:O	1:F:261:VAL:HG23	2.16	0.45
1:G:187:ILE:HD12	1:G:238:VAL:CG2	2.47	0.45
1:A:53:ARG:NH2	1:A:169:ASP:OD2	2.50	0.44
1:B:273:ALA:HB2	1:B:363:VAL:CG1	2.48	0.44
1:D:273:ALA:HB2	1:D:363:VAL:CG1	2.47	0.44
1:H:330:GLY:O	1:H:333:LEU:HD22	2.18	0.43
1:A:273:ALA:HB2	1:A:363:VAL:HG13	2.00	0.43
1:C:49:ARG:HH11	1:C:93:LEU:HD21	1.83	0.43
1:B:103:MET:HE3	1:B:189:ALA:HB1	1.99	0.43
1:D:302:TYR:CE2	1:D:366:VAL:HG21	2.54	0.43
1:F:285:THR:N	1:F:286:PRO:CD	2.82	0.43
1:A:104:ILE:HD11	1:A:117:TYR:CG	2.54	0.43
1:C:273:ALA:HB2	1:C:363:VAL:CG1	2.48	0.43
1:E:285:THR:N	1:E:286:PRO:CD	2.81	0.43

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Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:G:251:ALA:HB3	1:G:252:PRO:HD3	2.00	0.43
1:F:298:THR:HG23	1:F:366:VAL:HB	2.01	0.43
1:D:187:ILE:HG21	1:D:238:VAL:HG23	2.02	0.42
1:C:177:VAL:HG23	1:C:188:ILE:HD11	2.01	0.42
1:C:103:MET:HA	1:C:106:LEU:HD12	2.01	0.42
1:D:133:GLU:OE2	1:D:143:VAL:HG12	2.19	0.42
1:G:285:THR:N	1:G:286:PRO:CD	2.81	0.42
1:E:273:ALA:HB2	1:E:363:VAL:CG1	2.50	0.42
1:A:273:ALA:HB2	1:A:363:VAL:CG1	2.49	0.42
1:H:285:THR:N	1:H:286:PRO:CD	2.82	0.42
1:F:62:VAL:HG13	1:F:117:TYR:CD1	2.55	0.42
1:H:159:LYS:HB3	1:H:162:CYS:SG	2.59	0.42
1:C:187:ILE:HD12	1:C:238:VAL:CG2	2.50	0.42
1:B:99:THR:HG22	1:B:257:ILE:HD12	2.01	0.41
1:D:145:ALA:HB3	1:D:188:ILE:HD12	2.02	0.41
1:C:101:ALA:HB3	1:C:102:PRO:HD3	2.01	0.41
1:D:237:PHE:CD1	1:D:241:PHE:CZ	3.08	0.41
1:D:354[B]:ASN:C	1:D:354[B]:ASN:ND2	2.73	0.41
1:B:369:ALA:HB1	2:D:500:FMN:HM81	2.02	0.41
1:A:104:ILE:HD11	1:A:117:TYR:CE1	2.56	0.41
1:D:106:LEU:HD22	1:D:246:ARG:O	2.21	0.41
1:B:282:ARG:NH1	3:B:532:HOH:O	2.51	0.40
1:F:282:ARG:HG3	1:F:370:ARG:NH2	2.37	0.40
1:H:265:ILE:HG21	1:H:385:VAL:HG23	2.03	0.40
1:G:265:ILE:HG21	1:G:385:VAL:HG23	2.03	0.40
1:B:285:THR:N	1:B:286:PRO:CD	2.84	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	401/417 (96%)	390 (97%)	11 (3%)	0	100	100
1	B	398/417 (95%)	388 (98%)	10 (2%)	0	100	100
1	C	398/417 (95%)	387 (97%)	11 (3%)	0	100	100
1	D	401/417 (96%)	392 (98%)	8 (2%)	1 (0%)	52	64
1	E	399/417 (96%)	385 (96%)	13 (3%)	1 (0%)	46	57
1	F	398/417 (95%)	384 (96%)	14 (4%)	0	100	100
1	G	399/417 (96%)	387 (97%)	12 (3%)	0	100	100
1	H	398/417 (95%)	381 (96%)	17 (4%)	0	100	100
All	All	3192/3336 (96%)	3094 (97%)	96 (3%)	2 (0%)	56	68

All (2) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	E	184	GLN
1	D	143	VAL

### 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	310/323 (96%)	308 (99%)	2 (1%)	90	96
1	B	308/323 (95%)	303 (98%)	5 (2%)	70	84
1	C	308/323 (95%)	305 (99%)	3 (1%)	82	91
1	D	309/323 (96%)	305 (99%)	4 (1%)	76	87
1	E	308/323 (95%)	306 (99%)	2 (1%)	90	96
1	F	308/323 (95%)	302 (98%)	6 (2%)	65	81
1	G	308/323 (95%)	303 (98%)	5 (2%)	70	84
1	H	307/323 (95%)	304 (99%)	3 (1%)	82	91
All	All	2466/2584 (95%)	2436 (99%)	30 (1%)	78	89

All (30) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	96	TYR
1	A	363	VAL
1	B	104	ILE
1	B	117	TYR
1	B	160	HIS
1	B	181	SER
1	B	237	PHE
1	C	96	TYR
1	C	237	PHE
1	C	363	VAL
1	D	96	TYR
1	D	187	ILE
1	D	237	PHE
1	D	393	PRO
1	E	96	TYR
1	E	294	GLU
1	F	52	LEU
1	F	96	TYR
1	F	237	PHE
1	F	245	GLU
1	F	333	LEU
1	F	363	VAL
1	G	96	TYR
1	G	180	ASP
1	G	237	PHE
1	G	354	ASN
1	G	363	VAL
1	H	52	LEU
1	H	96	TYR
1	H	363	VAL

Some sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (15) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	243	GLN
1	A	280	GLN
1	B	183	GLN
1	B	290	GLN
1	C	122	GLN
1	C	135	ASN
1	C	290	GLN
1	C	388	HIS
1	D	291	GLN

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Mol	Chain	Res	Type
1	D	388	HIS
1	E	184	GLN
1	F	358	ASN
1	G	280	GLN
1	G	354	ASN
1	H	178	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 ⓘ

4 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	FMN	A	500	-	32,33,33	1.64	5 (15%)	34,50,50	2.20	8 (23%)
2	FMN	C	500	-	32,33,33	1.65	6 (18%)	34,50,50	2.20	7 (20%)
2	FMN	D	500	-	32,33,33	1.67	6 (18%)	34,50,50	2.14	7 (20%)
2	FMN	F	500	-	32,33,33	1.63	6 (18%)	34,50,50	2.21	8 (23%)

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	FMN	A	500	-	-	0/18/18/18	0/3/3/3
2	FMN	C	500	-	-	0/18/18/18	0/3/3/3
2	FMN	D	500	-	-	0/18/18/18	0/3/3/3
2	FMN	F	500	-	-	0/18/18/18	0/3/3/3

All (23) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	C	500	FMN	C10-N10	2.45	1.42	1.39
2	F	500	FMN	C10-N10	2.51	1.42	1.39
2	D	500	FMN	C10-N10	2.65	1.42	1.39
2	C	500	FMN	C9A-N10	2.88	1.42	1.38
2	F	500	FMN	C9A-N10	2.96	1.43	1.38
2	A	500	FMN	C8-C7	3.02	1.49	1.41
2	D	500	FMN	C8-C7	3.19	1.49	1.41
2	F	500	FMN	C8-C7	3.20	1.49	1.41
2	A	500	FMN	C9A-N10	3.26	1.43	1.38
2	D	500	FMN	C9A-N10	3.30	1.43	1.38
2	C	500	FMN	C8-C7	3.32	1.49	1.41
2	C	500	FMN	C9A-C5A	3.70	1.50	1.42
2	F	500	FMN	C9A-C5A	3.71	1.50	1.42
2	D	500	FMN	C9A-C5A	3.79	1.50	1.42
2	A	500	FMN	C9A-C5A	3.79	1.50	1.42
2	F	500	FMN	C4-C4A	3.84	1.49	1.41
2	D	500	FMN	C4-C4A	3.88	1.49	1.41
2	A	500	FMN	C4-C4A	3.89	1.49	1.41
2	C	500	FMN	C4-C4A	3.89	1.49	1.41
2	C	500	FMN	C4A-C10	4.31	1.48	1.40
2	D	500	FMN	C4A-C10	4.40	1.49	1.40
2	F	500	FMN	C4A-C10	4.41	1.49	1.40
2	A	500	FMN	C4A-C10	4.42	1.49	1.40

All (30) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	C	500	FMN	C4-C4A-C10	-5.21	116.61	119.94
2	F	500	FMN	C4-C4A-C10	-5.21	116.61	119.94
2	A	500	FMN	C4-C4A-C10	-5.20	116.61	119.94
2	D	500	FMN	C4-C4A-C10	-4.87	116.83	119.94
2	A	500	FMN	C4A-C4-N3	-3.72	118.65	123.52

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Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
2	C	500	FMN	C4A-C4-N3	-3.55	118.88	123.52
2	D	500	FMN	C4A-C4-N3	-3.48	118.98	123.52
2	F	500	FMN	C4A-C4-N3	-3.38	119.11	123.52
2	C	500	FMN	N3-C2-N1	-2.96	122.71	127.69
2	A	500	FMN	N3-C2-N1	-2.91	122.78	127.69
2	F	500	FMN	N3-C2-N1	-2.91	122.79	127.69
2	D	500	FMN	N3-C2-N1	-2.89	122.82	127.69
2	A	500	FMN	O3P-P-O2P	2.10	115.15	107.44
2	F	500	FMN	C5A-C9A-N10	2.13	119.17	117.58
2	D	500	FMN	C4-C4A-N5	2.58	121.84	118.70
2	A	500	FMN	C4-C4A-N5	2.80	122.11	118.70
2	F	500	FMN	C4-C4A-N5	2.83	122.14	118.70
2	C	500	FMN	C4-C4A-N5	2.93	122.26	118.70
2	C	500	FMN	C1'-N10-C9A	3.08	122.40	118.83
2	A	500	FMN	C1'-N10-C9A	3.30	122.66	118.83
2	D	500	FMN	C1'-N10-C9A	3.38	122.75	118.83
2	A	500	FMN	C4A-N5-C5A	3.55	120.91	116.72
2	F	500	FMN	C4A-N5-C5A	3.56	120.92	116.72
2	D	500	FMN	C4A-N5-C5A	3.67	121.05	116.72
2	C	500	FMN	C4A-N5-C5A	3.68	121.06	116.72
2	F	500	FMN	C1'-N10-C9A	3.87	123.31	118.83
2	D	500	FMN	C4-N3-C2	7.82	121.68	115.16
2	F	500	FMN	C4-N3-C2	7.86	121.72	115.16
2	C	500	FMN	C4-N3-C2	8.05	121.87	115.16
2	A	500	FMN	C4-N3-C2	8.06	121.88	115.16

There are no chirality outliers.

There are no torsion outliers.

There are no ring outliers.

3 monomers are involved in 4 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
2	C	500	FMN	1	0
2	D	500	FMN	1	0
2	F	500	FMN	2	0

## 5.7 Other polymers ⓘ

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 ⓘ

### 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	402/417 (96%)	0.28	5 (1%) 81 85	21, 32, 50, 61	0
1	B	400/417 (95%)	0.38	10 (2%) 61 70	21, 35, 53, 70	0
1	C	400/417 (95%)	0.31	19 (4%) 34 43	20, 34, 63, 81	0
1	D	402/417 (96%)	0.49	29 (7%) 18 26	22, 37, 68, 102	0
1	E	401/417 (96%)	0.38	13 (3%) 51 60	22, 42, 60, 70	0
1	F	400/417 (95%)	0.48	16 (4%) 42 51	24, 42, 58, 80	0
1	G	401/417 (96%)	0.52	20 (4%) 32 41	25, 41, 61, 69	0
1	H	400/417 (95%)	1.33	107 (26%) 1 1	29, 62, 90, 105	0
All	All	3206/3336 (96%)	0.52	219 (6%) 20 28	20, 39, 72, 105	0

All (219) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	H	147	PRO	7.5
1	F	180	ASP	6.1
1	H	180	ASP	6.0
1	H	187	ILE	5.7
1	H	117	TYR	5.7
1	H	133	GLU	5.6
1	H	153	TYR	5.6
1	E	182	PRO	5.4
1	H	141	TRP	5.3
1	H	145	ALA	5.2
1	H	154	VAL	4.9
1	G	18	ASN	4.9
1	H	144	ARG	4.9
1	H	183	GLN	4.6
1	H	155	LEU	4.6
1	H	146	THR	4.5

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Mol	Chain	Res	Type	RSRZ
1	D	141	TRP	4.5
1	G	17	ASP	4.5
1	F	182	PRO	4.4
1	H	152	GLY	4.4
1	H	197	ALA	4.4
1	H	140	ASP	4.3
1	H	177	VAL	4.3
1	H	157	GLY	4.2
1	H	150	ASP	4.2
1	H	221	HIS	4.1
1	H	28	ALA	4.1
1	H	178	GLN	4.1
1	H	175	GLY	4.1
1	D	17	ASP	4.1
1	H	71	ALA	4.0
1	B	182	PRO	4.0
1	H	174	PHE	4.0
1	H	227	PRO	4.0
1	H	119	GLN	4.0
1	H	148	THR	3.9
1	H	19	ASP	3.9
1	H	120	ILE	3.9
1	H	52	LEU	3.9
1	D	18	ASN	3.9
1	H	69	TRP	3.8
1	H	165	ALA	3.8
1	D	136	SER	3.8
1	H	134	ASN	3.7
1	B	180	ASP	3.7
1	H	31	TRP	3.7
1	H	194	THR	3.7
1	H	237	PHE	3.7
1	H	220	PHE	3.7
1	H	156	ASN	3.6
1	D	180	ASP	3.6
1	C	180	ASP	3.6
1	G	118	THR	3.6
1	E	180	ASP	3.5
1	H	173	VAL	3.5
1	B	18	ASN	3.5
1	D	242	ILE	3.5
1	H	22	ALA	3.5

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Mol	Chain	Res	Type	RSRZ
1	H	25	ARG	3.5
1	C	242	ILE	3.5
1	H	234	PRO	3.4
1	H	60	LEU	3.4
1	H	151	GLY	3.4
1	H	184	GLN	3.4
1	D	134	ASN	3.4
1	H	225	VAL	3.4
1	D	354[A]	ASN	3.4
1	E	287	ALA	3.3
1	H	54	ALA	3.3
1	C	182	PRO	3.3
1	G	182	PRO	3.3
1	H	23	VAL	3.3
1	H	18	ASN	3.2
1	H	158	THR	3.2
1	C	237	PHE	3.1
1	C	141	TRP	3.1
1	G	287	ALA	3.1
1	C	238	VAL	3.1
1	H	66	TYR	3.1
1	H	137	HIS	3.1
1	D	139	LEU	3.1
1	E	118	THR	3.1
1	H	219	ASP	3.0
1	H	132	SER	3.0
1	D	137	HIS	3.0
1	H	30	LYS	3.0
1	H	63	PRO	3.0
1	A	137	HIS	3.0
1	E	150	ASP	3.0
1	G	148	THR	3.0
1	H	135	ASN	3.0
1	H	181	SER	3.0
1	H	149	GLU	3.0
1	F	138	VAL	3.0
1	H	182	PRO	3.0
1	D	16	ALA	3.0
1	D	237	PHE	3.0
1	G	180	ASP	2.9
1	H	64	ARG	2.9
1	H	126	TRP	2.9

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Mol	Chain	Res	Type	RSRZ
1	D	185	GLY	2.9
1	H	65	GLU	2.9
1	H	61	LEU	2.9
1	D	179	ASP	2.9
1	A	242	ILE	2.9
1	B	181	SER	2.9
1	D	183	GLN	2.9
1	H	142	LYS	2.9
1	H	107	ILE	2.8
1	C	183	GLN	2.8
1	D	182	PRO	2.8
1	H	83	ILE	2.8
1	H	143	VAL	2.8
1	E	181	SER	2.8
1	H	228	ASP	2.8
1	H	121	ALA	2.8
1	G	195	SER	2.8
1	H	203	ASP	2.8
1	H	231	LEU	2.8
1	H	171	LEU	2.7
1	H	161	PHE	2.7
1	F	226	GLU	2.7
1	D	177	VAL	2.7
1	H	230	VAL	2.7
1	D	142	LYS	2.7
1	C	135	ASN	2.7
1	H	122	GLN	2.7
1	H	109	SER	2.7
1	F	242	ILE	2.6
1	H	179	ASP	2.6
1	G	101	ALA	2.6
1	G	62	VAL	2.6
1	H	242	ILE	2.6
1	B	149	GLU	2.6
1	D	181	SER	2.6
1	F	109	SER	2.5
1	H	136	SER	2.5
1	E	17	ASP	2.5
1	H	223	VAL	2.5
1	H	188	ILE	2.5
1	C	185	GLY	2.5
1	H	125	TRP	2.5

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Mol	Chain	Res	Type	RSRZ
1	E	149	GLU	2.5
1	G	65	GLU	2.5
1	D	178	GLN	2.5
1	B	357	LEU	2.5
1	G	41	ALA	2.4
1	G	121	ALA	2.4
1	H	24	ALA	2.4
1	H	41	ALA	2.4
1	D	106	LEU	2.4
1	D	244	SER	2.4
1	G	181	SER	2.4
1	B	327	TRP	2.4
1	H	160	HIS	2.4
1	C	234	PRO	2.4
1	B	161	PHE	2.4
1	D	241	PHE	2.4
1	G	32	ARG	2.3
1	F	149	GLU	2.3
1	H	327	TRP	2.3
1	F	197	ALA	2.3
1	C	132	SER	2.3
1	H	176	VAL	2.3
1	H	32	ARG	2.3
1	G	117	TYR	2.3
1	H	164	GLY	2.3
1	A	139	LEU	2.3
1	B	64	ARG	2.3
1	E	117	TYR	2.3
1	C	137	HIS	2.3
1	H	127	THR	2.2
1	C	181	SER	2.2
1	F	104	ILE	2.2
1	H	224	LYS	2.2
1	D	135	ASN	2.2
1	G	21	VAL	2.2
1	C	136	SER	2.2
1	F	131	SER	2.2
1	D	332	ALA	2.2
1	F	179	ASP	2.2
1	C	239	LEU	2.2
1	H	55	SER	2.2
1	H	114	GLU	2.2

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Mol	Chain	Res	Type	RSRZ
1	C	178	GLN	2.2
1	D	238	VAL	2.2
1	F	154	VAL	2.2
1	H	235	ASN	2.2
1	E	183	GLN	2.2
1	F	238	VAL	2.1
1	E	332	ALA	2.1
1	F	181	SER	2.1
1	H	62	VAL	2.1
1	G	67	GLY	2.1
1	C	179	ASP	2.1
1	C	243	GLN	2.1
1	A	241	PHE	2.1
1	H	70	GLY	2.1
1	H	198	GLY	2.1
1	C	139	LEU	2.1
1	D	184	GLN	2.1
1	H	101	ALA	2.1
1	H	20	PRO	2.1
1	G	183	GLN	2.1
1	H	115	HIS	2.1
1	F	185	GLY	2.1
1	H	415	PHE	2.1
1	H	50	GLU	2.0
1	F	287	ALA	2.0
1	H	207	ALA	2.0
1	D	131	SER	2.0
1	B	45	ALA	2.0
1	E	41	ALA	2.0
1	D	144	ARG	2.0
1	G	238	VAL	2.0
1	E	66	TYR	2.0
1	H	333	LEU	2.0
1	A	136	SER	2.0
1	H	200	THR	2.0

## 6.2 Non-standard residues in protein, DNA, RNA chains ⓘ

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	FMN	C	500	31/31	0.80	0.27	2.57	57,59,60,61	0
2	FMN	F	500	31/31	0.86	0.19	0.51	50,51,54,54	0
2	FMN	A	500	31/31	0.93	0.15	0.27	33,34,36,36	0
2	FMN	D	500	31/31	0.90	0.17	-0.02	48,50,51,51	0

### 6.5 Other polymers [i](#)

There are no such residues in this entry.