



wwPDB X-ray Structure Validation Summary Report ⓘ

Feb 19, 2016 – 07:10 PM GMT

PDB ID : 1JA1
Title : CYPOR-Triple Mutant
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Deposited on : 2001-05-29
Resolution : 1.80 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-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

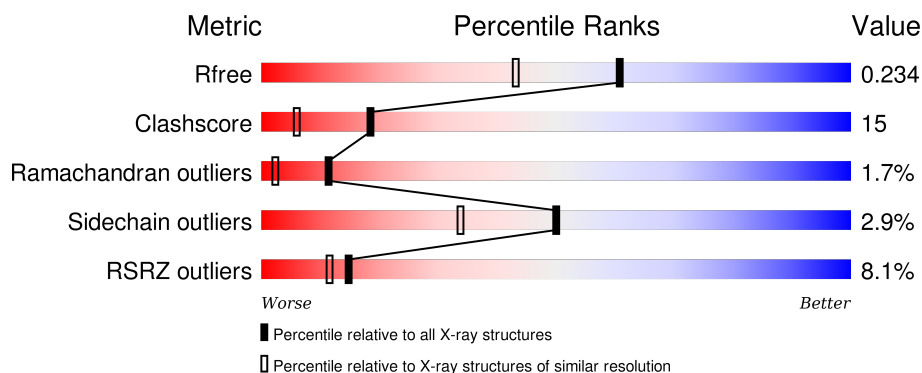
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 1.80 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	4533 (1.80-1.80)
Clashscore	102246	5383 (1.80-1.80)
Ramachandran outliers	100387	5320 (1.80-1.80)
Sidechain outliers	100360	5319 (1.80-1.80)
RSRZ outliers	91569	4547 (1.80-1.80)

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	622	<div> <div>4%</div> <div>75%</div> <div>21%</div> <div>••</div> </div>
1	B	622	<div> <div>12%</div> <div>70%</div> <div>25%</div> <div>••</div> </div>

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
5	EPE	B	1753	-	-	-	X

2 Entry composition [i](#)

There are 6 unique types of molecules in this entry. The entry contains 11251 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.

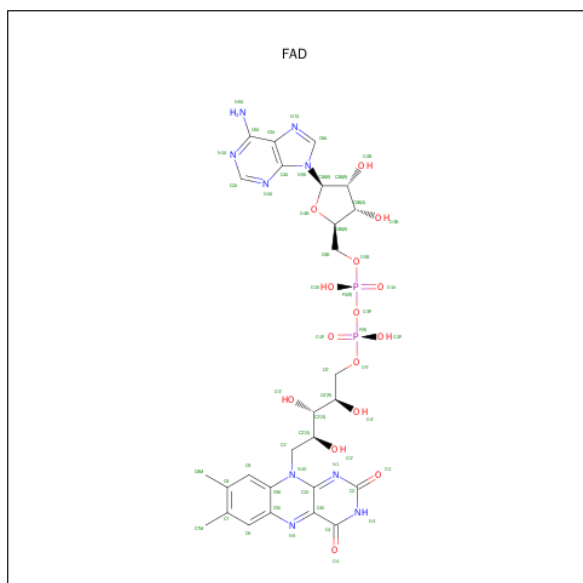
- Molecule 1 is a protein called NADPH-Cytochrome P450 Reductase.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	616	Total	C	N	O	S	0	0	0
			4930	3119	850	939	22			
1	B	614	Total	C	N	O	S	0	0	0
			4916	3109	848	937	22			

There are 6 discrepancies between the modelled and reference sequences:

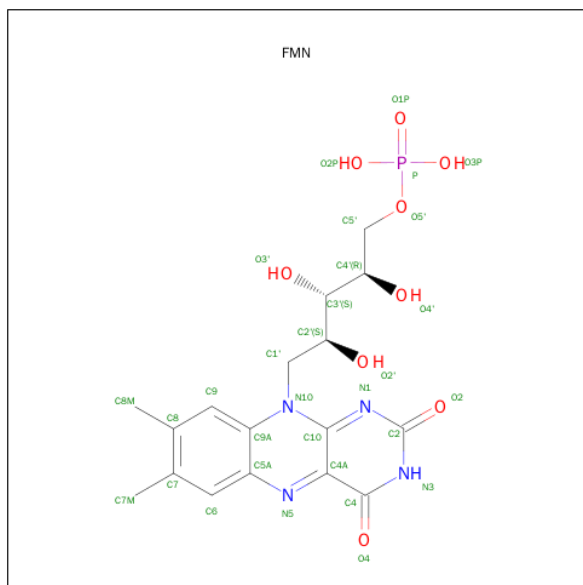
Chain	Residue	Modelled	Actual	Comment	Reference
A	457	ALA	SER	ENGINEERED	UNP P00388
A	630	ALA	CYS	ENGINEERED	UNP P00388
A	675	ASN	ASP	ENGINEERED	UNP P00388
B	457	ALA	SER	ENGINEERED	UNP P00388
B	630	ALA	CYS	ENGINEERED	UNP P00388
B	675	ASN	ASP	ENGINEERED	UNP P00388

- Molecule 2 is FLAVIN-ADENINE DINUCLEOTIDE (three-letter code: FAD) (formula: $C_{27}H_{33}N_9O_{15}P_2$).



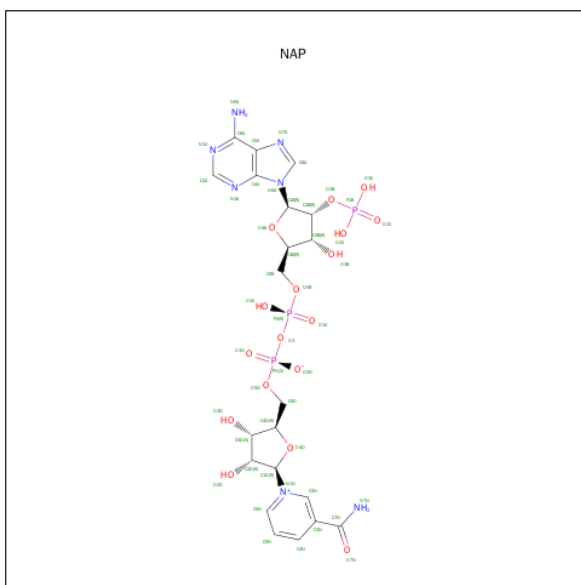
Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
2	A	1	Total	C	N	O	P	0	0
			53	27	9	15	2		
2	B	1	Total	C	N	O	P	0	0
			53	27	9	15	2		

- Molecule 3 is FLAVIN MONONUCLEOTIDE (three-letter code: FMN) (formula: $C_{17}H_{21}N_4O_9P$).



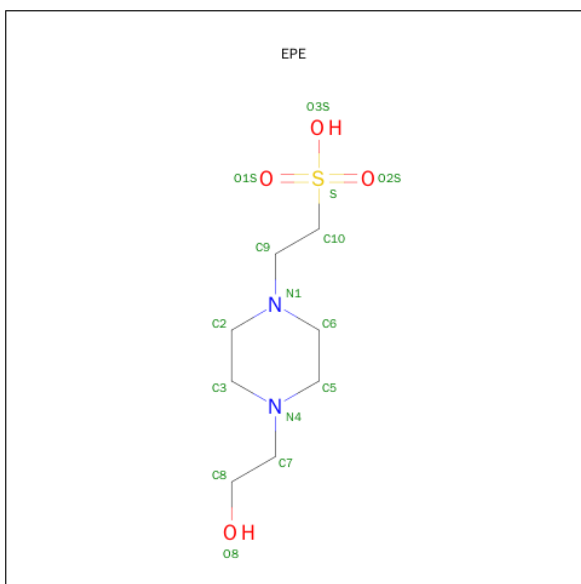
Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
3	A	1	Total	C	N	O	P	0	0
			31	17	4	9	1		
3	B	1	Total	C	N	O	P	0	0
			31	17	4	9	1		

- Molecule 4 is NADP NICOTINAMIDE-ADENINE-DINUCLEOTIDE PHOSPHATE (three-letter code: NAP) (formula: $C_{21}H_{28}N_7O_{17}P_3$).



Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
4	A	1	Total	C	N	O	P	0	0
			48	21	7	17	3		
4	B	1	Total	C	N	O	P	0	0
			48	21	7	17	3		

- Molecule 5 is 4-(2-HYDROXYETHYL)-1-PIPERAZINE ETHANESULFONIC ACID (three-letter code: EPE) (formula: $C_8H_{18}N_2O_4S$).



Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
5	B	1	Total	C	N	O	S	0	0
			15	8	2	4	1		

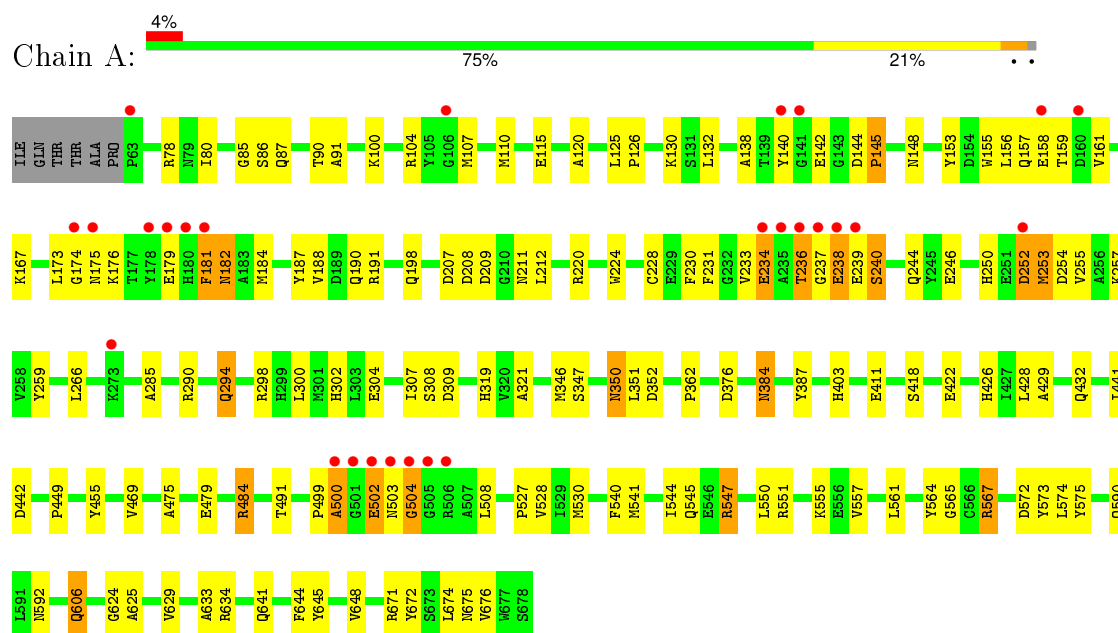
- Molecule 6 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
6	A	652	Total 652	O 652	0	0
6	B	474	Total 474	O 474	0	0

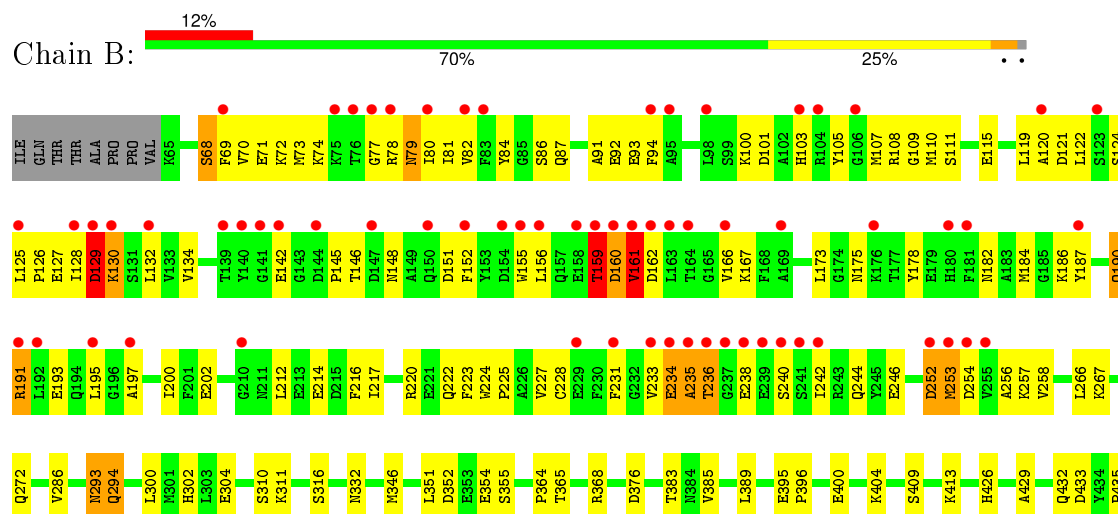
3 Residue-property plots

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 ($RSRZ > 2$). 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: NADPH-Cytochrome P450 Reductase



• Molecule 1: NADPH-Cytochrome P450 Reductase





4 Data and refinement statistics

Property	Value	Source
Space group	P 21 21 21	Depositor
Cell constants a, b, c, α , β , γ	101.44Å 115.16Å 118.55Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	29.16 – 1.80 29.16 – 1.80	Depositor EDS
% Data completeness (in resolution range)	93.3 (29.16-1.80) 93.2 (29.16-1.80)	Depositor EDS
R_{merge}	0.05	Depositor
R_{sym}	0.05	Depositor
$\langle I/\sigma(I) \rangle$ ¹	2.91 (at 1.79Å)	Xtriage
Refinement program	CNS 1.0	Depositor
R, R_{free}	0.208 , 0.234 0.208 , 0.234	Depositor DCC
R_{free} test set	6070 reflections (5.05%)	DCC
Wilson B-factor (Å ²)	20.9	Xtriage
Anisotropy	0.146	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.32 , 49.2	EDS
Estimated twinning fraction	0.019 for -h,l,k	Xtriage
L-test for twinning ²	$\langle L \rangle = 0.46$, $\langle L^2 \rangle = 0.29$	Xtriage
Outliers	0 of 120339 reflections	Xtriage
F_o, F_c correlation	0.95	EDS
Total number of atoms	11251	wwPDB-VP
Average B, all atoms (Å ²)	34.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 16.17% 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

5.1 Standard geometry

Bond lengths and bond angles in the following residue types are not validated in this section: FMN, NAP, EPE, FAD

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	0.35	0/5048	0.61	1/6831 (0.0%)
1	B	0.36	1/5033 (0.0%)	0.64	3/6810 (0.0%)
All	All	0.35	1/10081 (0.0%)	0.62	4/13641 (0.0%)

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

All (1) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	B	252	ASP	CB-CG	7.32	1.67	1.51

All (4) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	B	130	LYS	N-CA-C	-6.96	92.20	111.00
1	B	159	THR	N-CA-C	6.96	129.79	111.00
1	A	85	GLY	N-CA-C	-5.42	99.55	113.10
1	B	161	VAL	N-CA-C	5.01	124.53	111.00

There are no chirality outliers.

All (1) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	B	456	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	4930	0	4773	132	0
1	B	4916	0	4756	174	0
2	A	53	0	31	0	0
2	B	53	0	31	1	0
3	A	31	0	19	1	0
3	B	31	0	19	0	0
4	A	48	0	25	3	0
4	B	48	0	25	2	0
5	B	15	0	17	0	0
6	A	652	0	0	12	0
6	B	474	0	0	13	0
All	All	11251	0	9696	307	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 15.

The worst 5 of 307 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:191:ARG:HH11	1:B:195:LEU:HD11	0.99	1.07
1:B:132:LEU:CD1	1:B:167:LYS:HB3	1.84	1.06
1:B:132:LEU:HD12	1:B:167:LYS:CB	1.86	1.06
1:B:132:LEU:HD12	1:B:167:LYS:HB3	1.06	1.03
1:A:175:ASN:O	1:A:181:PHE:HB2	1.59	1.00

There are no symmetry-related clashes.

5.3 Torsion angles

5.3.1 Protein backbone

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	614/622 (99%)	583 (95%)	21 (3%)	10 (2%)	12	3
1	B	612/622 (98%)	573 (94%)	28 (5%)	11 (2%)	11	2
All	All	1226/1244 (99%)	1156 (94%)	49 (4%)	21 (2%)	11	2

5 of 21 Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	236	THR
1	B	129	ASP
1	B	159	THR
1	B	161	VAL
1	B	234	GLU

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	524/529 (99%)	508 (97%)	16 (3%)	47	30
1	B	522/529 (99%)	508 (97%)	14 (3%)	52	36
All	All	1046/1058 (99%)	1016 (97%)	30 (3%)	50	34

5 of 30 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	573	TYR

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Mol	Chain	Res	Type
1	B	79	ASN
1	B	573	TYR
1	A	672	TYR
1	B	129	ASP

Some sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 38 such sidechains are listed below:

Mol	Chain	Res	Type
1	A	590	GLN
1	B	96	ASN
1	B	590	GLN
1	A	641	GLN
1	B	280	ASN

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 ⓘ

7 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	FAD	A	1750	-	52,58,58	2.44	16 (30%)	52,89,89	2.92	11 (21%)
3	FMN	A	1751	-	32,33,33	2.31	10 (31%)	34,50,50	3.67	13 (38%)
4	NAP	A	1752	-	45,52,52	2.11	10 (22%)	55,80,80	1.48	7 (12%)
5	EPE	B	1753	-	15,15,15	1.64	3 (20%)	19,20,20	1.08	2 (10%)
2	FAD	B	1850	-	52,58,58	2.46	15 (28%)	52,89,89	2.88	12 (23%)
3	FMN	B	1851	-	32,33,33	2.49	8 (25%)	34,50,50	3.70	12 (35%)
4	NAP	B	1852	-	45,52,52	2.05	9 (20%)	55,80,80	1.50	8 (14%)

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	FAD	A	1750	-	-	0/30/50/50	0/6/6/6
3	FMN	A	1751	-	-	0/18/18/18	0/3/3/3
4	NAP	A	1752	-	-	0/27/67/67	0/5/5/5
5	EPE	B	1753	-	-	0/9/19/19	0/1/1/1
2	FAD	B	1850	-	-	0/30/50/50	0/6/6/6
3	FMN	B	1851	-	-	0/18/18/18	0/3/3/3
4	NAP	B	1852	-	-	0/27/67/67	0/5/5/5

The worst 5 of 71 bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
3	B	1851	FMN	C8M-C8	-6.88	1.37	1.51
3	A	1751	FMN	C8M-C8	-6.73	1.37	1.51
3	A	1751	FMN	C1'-N10	-4.32	1.43	1.48
5	B	1753	EPE	C9-C10	-3.61	1.40	1.52
3	A	1751	FMN	C2-N1	-2.37	1.33	1.38

The worst 5 of 65 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
3	A	1751	FMN	C4-C4A-C10	-7.71	115.01	119.94
2	B	1850	FAD	C4X-C4-N3	-7.22	114.09	123.52
2	A	1750	FAD	C4X-C4-N3	-7.13	114.20	123.52
3	B	1851	FMN	C4-C4A-C10	-6.70	115.66	119.94
2	B	1850	FAD	N3-C2-N1	-6.64	116.50	127.69

There are no chirality outliers.

There are no torsion outliers.

There are no ring outliers.

4 monomers are involved in 7 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
3	A	1751	FMN	1	0
4	A	1752	NAP	3	0
2	B	1850	FAD	1	0
4	B	1852	NAP	2	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 [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	616/622 (99%)	0.05	27 (4%) 38 32	16, 26, 54, 100	0
1	B	614/622 (98%)	0.48	73 (11%) 6 4	13, 31, 81, 100	0
All	All	1230/1244 (98%)	0.26	100 (8%) 15 11	13, 28, 76, 100	0

The worst 5 of 100 RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	B	500	ALA	14.9
1	A	503	ASN	11.3
1	A	501	GLY	10.6
1	B	502	GLU	10.2
1	B	501	GLY	9.6

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(\AA^2)	Q<0.9
5	EPE	B	1753	15/15	0.85	0.22	2.06	46,52,65,69	0
4	NAP	B	1852	48/48	0.95	0.14	1.24	14,22,87,88	0
3	FMN	B	1851	31/31	0.86	0.23	0.70	39,48,51,54	0
4	NAP	A	1752	48/48	0.96	0.11	0.60	17,23,79,84	0
2	FAD	A	1750	53/53	0.97	0.10	-0.23	14,19,33,41	0
2	FAD	B	1850	53/53	0.97	0.09	-0.34	14,19,30,34	0
3	FMN	A	1751	31/31	0.92	0.15	-0.35	24,38,47,49	0

6.5 Other polymers [i](#)

There are no such residues in this entry.