



wwPDB X-ray Structure Validation Summary Report ⓘ

Mar 9, 2026 – 02:54 AM UTC

PDB ID : 3E7I / pdb_00003e7i
Title : Structure of murine inos oxygenase domain with inhibitor AR-C94864
Authors : Garcin, E.D.; Arvai, A.S.; Rosenfeld, R.J.; Kroeger, M.D.; Crane, B.R.; Andersson, G.; Andrews, G.; Hamley, P.J.; Mallinder, P.R.; Nicholls, D.J.; St-Gallay, S.A.; Tinker, A.C.; Gensmantel, N.P.; Mete, A.; Cheshire, D.R.; Connolly, S.; Stuehr, D.J.; Aberg, A.; Wallace, A.V.; Tainer, J.A.; Getzoff, E.D.
Deposited on : 2008-08-18
Resolution : 2.90 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

<https://www.wwpdb.org/validation/2017/XrayValidationReportHelp>

with specific help available everywhere you see the ⓘ symbol.

The types of validation reports are described at

<http://www.wwpdb.org/validation/2017/FAQs#types>.

The following versions of software and data (see [references](#) ①) were used in the production of this report:

MolProbity	:	4-5-2 with Phenix2.0
Mogul	:	2022.3.0, CSD as543be (2022)
Xtriage (Phenix)	:	2.0
EDS	:	3.0
Buster-report	:	wwPDB partial adaption of 1.1.7 (2018)
Percentile statistics	:	20250101.v01 (using entries in the PDB archive January 1st 2025)
CCP4	:	9.0.010 (Gargrove)
Density-Fitness	:	1.0.12
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.49

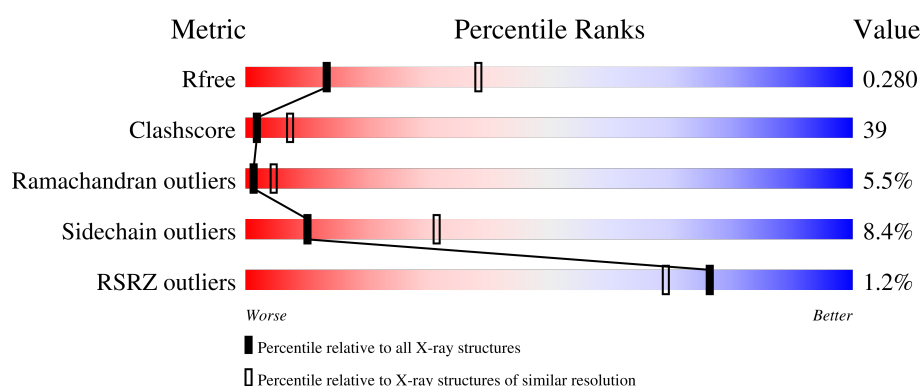
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.90 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}	180053	2481 (2.90-2.90)
Clashscore	190562	2690 (2.90-2.90)
Ramachandran outliers	187476	2623 (2.90-2.90)
Sidechain outliers	187428	2625 (2.90-2.90)
RSRZ outliers	180081	2481 (2.90-2.90)

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 of the lower bar indicate the fraction of residues that contain outliers for ≥ 3 , 2, 1 and 0 types of geometric quality criteria respectively. 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	433	% 39% 49% 7% ••
1	B	433	% 39% 49% 7% ••

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
6	B2	A	907	-	-	X	-

2 Entry composition [i](#)

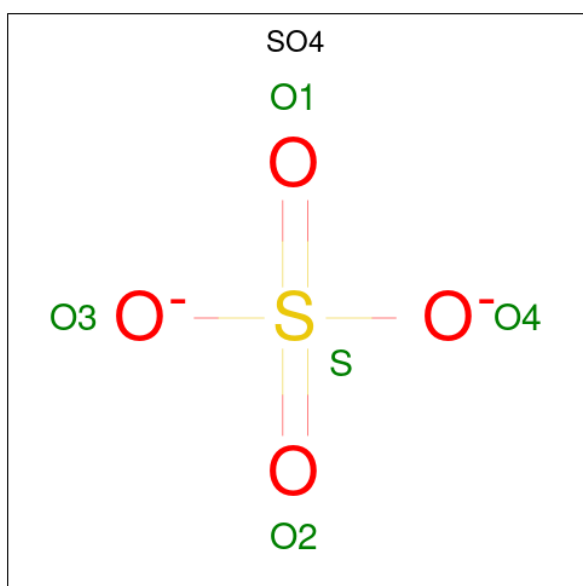
There are 7 unique types of molecules in this entry. The entry contains 7217 atoms, of which 0 are hydrogens and 0 are deuteriums.

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 Nitric oxide synthase, inducible.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	420	Total	C	N	O	S	0	0	0
			3424	2194	590	619	21			
1	B	420	Total	C	N	O	S	0	0	0
			3424	2194	590	619	21			

- Molecule 2 is SULFATE ION (CCD ID: SO4) (formula: O₄S).



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

- Molecule 3 is ZINC ION (CCD ID: ZN) (formula: Zn).

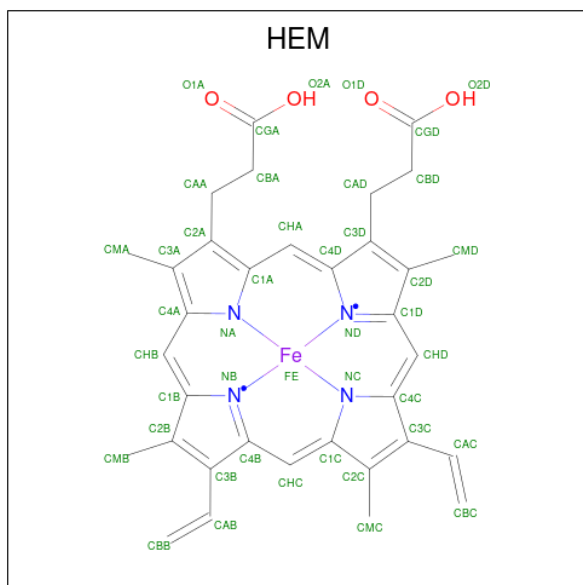
Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
3	A	1	Total	Zn	0	0
			1	1		

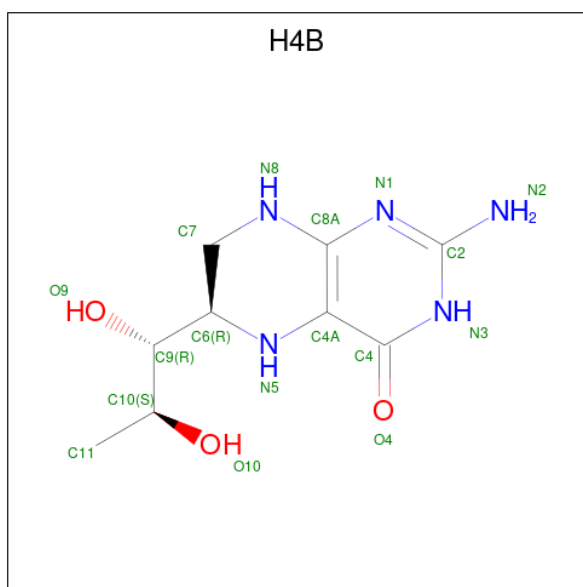
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Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
3	B	1	Total	Zn	0	0
			1	1		

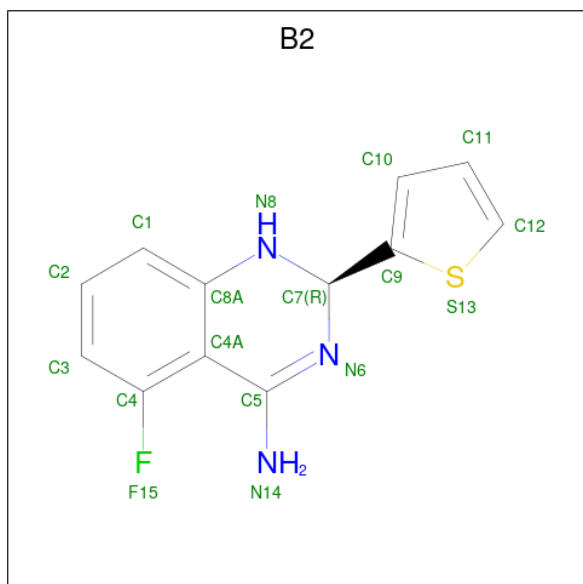
- Molecule 4 is PROTOPORPHYRIN IX CONTAINING FE (CCD ID: HEM) (formula: $C_{34}H_{32}FeN_4O_4$).





Mol	Chain	Residues	Atoms				ZeroOcc	AltConf
5	A	1	Total	C	N	O	0	0
			17	9	5	3		
5	B	1	Total	C	N	O	0	0
			17	9	5	3		

- Molecule 6 is (2R)-5-FLUORO-2-(2-THIENYL)-1,2-DIHYDROQUINAZOLIN-4-AMINE (CCD ID: B2) (formula: C₁₂H₁₀FN₃S).



Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
6	A	1	Total	C	F	N	S	0	0
			17	12	1	3	1		

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Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
6	A	1	Total	C	F	N	S	0	0
			17	12	1	3	1		
6	B	1	Total	C	F	N	S	0	0
			17	12	1	3	1		

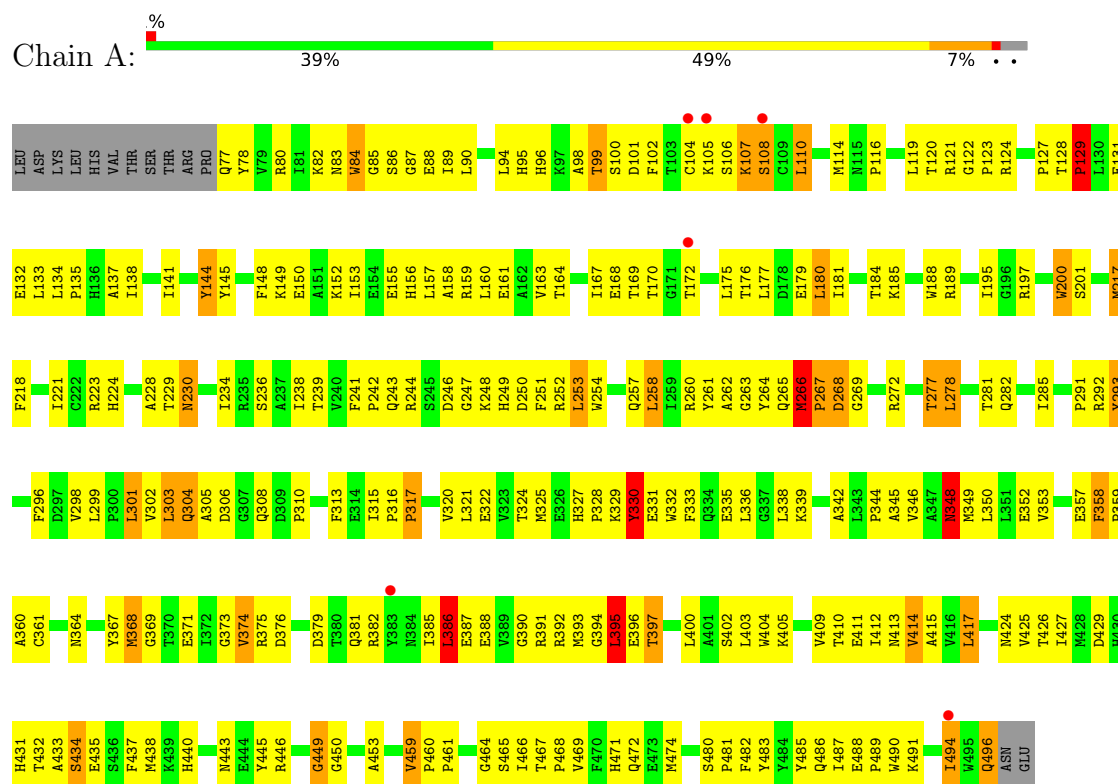
- Molecule 7 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
7	A	79	Total	O	0	0
			79	79		
7	B	112	Total	O	0	0
			112	112		

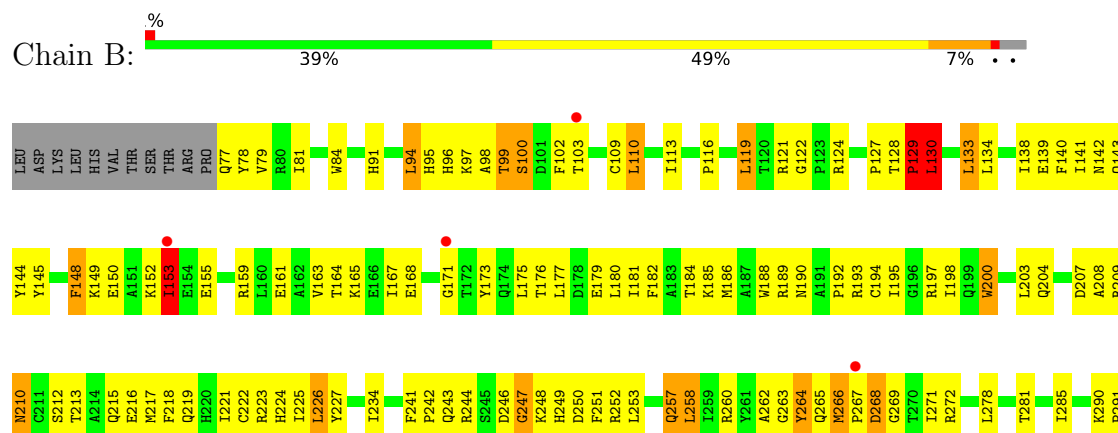
3 Residue-property plots

These plots are drawn for all protein, RNA, DNA and oligosaccharide 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: Nitric oxide synthase, inducible



• Molecule 1: Nitric oxide synthase, inducible



S436	C361	R292
F437	P362	Z293
M438	F363	G294
K439	N364	R295
H440	G365	
M441	W366	L299
	Y367	P300
Y445	M368	L301
R446	G369	V302
A447	T370	L303
R448	E371	G304
C449	I372	A305
C450	G373	D306
C451	V374	G307
P452	R375	Q308
A453		D309
	C378	P310
W457	D379	
L458		F313
	Y383	
S463	N384	P317
G463	L385	D318
G464	L386	L319
S465		
	V389	V323
T467		T324
	R392	M325
	M393	E326
		R327
Q472	T397	P328
S473	H398	K329
M474	T399	V330
L475	L400	E331
M476		W332
Y477	W404	F333
L478		G334
L479	R407	E335
S480		L336
P481	T410	
F482	T412	W340
G483	M413	Y341
Y484	V414	A342
T485		L343
Q486	L417	P344
L487	H418	A345
E488		V346
P489		A347
W490	Q421	R348
K491		M349
T492	M424	L350
H493	V425	L351
L494		E352
W495	M428	V353
Q496	D429	G354
ASN	H430	G355
GLU	H431	L356
	T432	E357
	A433	F358
	S434	S359
	P435	L360

4 Data and refinement statistics

Property	Value	Source
Space group	P 61 2 2	Depositor
Cell constants a, b, c, α , β , γ	213.97Å 213.97Å 113.13Å 90.00° 90.00° 120.00°	Depositor
Resolution (Å)	19.99 – 2.90 19.99 – 2.90	Depositor EDS
% Data completeness (in resolution range)	82.9 (19.99-2.90) 82.6 (19.99-2.90)	Depositor EDS
R_{merge}	0.06	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	4.26 (at 2.88Å)	Xtriage
Refinement program	CNS 1.1	Depositor
R, R_{free}	0.239 , 0.295 0.224 , 0.280	Depositor DCC
R_{free} test set	1589 reflections (4.95%)	wwPDB-VP
Wilson B-factor (Å ²)	65.5	Xtriage
Anisotropy	0.844	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.33 , 83.4	EDS
L-test for twinning ²	$\langle L \rangle = 0.50$, $\langle L^2 \rangle = 0.33$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o, F_c correlation	0.94	EDS
Total number of atoms	7217	wwPDB-VP
Average B, all atoms (Å ²)	74.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 1.90% 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, 0.333 respectively for untwinned datasets, and 0.375, 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: H4B, B2, HEM, SO4, ZN

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	0.50	0/3524	1.03	21/4790 (0.4%)
1	B	0.51	0/3524	1.01	15/4790 (0.3%)
All	All	0.51	0/7048	1.02	36/9580 (0.4%)

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

There are no bond length outliers.

The worst 5 of 36 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	B	122	GLY	CA-C-N	9.21	129.78	119.92
1	B	122	GLY	C-N-CA	9.21	129.78	119.92
1	A	348	ASN	N-CA-C	8.39	123.09	113.02
1	B	466	ILE	N-CA-C	-7.66	102.65	113.07
1	B	343	LEU	N-CA-C	7.51	119.69	109.24

There are no chirality outliers.

All (1) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	B	483	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	3424	0	3321	268	0
1	B	3424	0	3322	270	0
2	A	5	0	0	0	0
3	A	1	0	0	0	0
3	B	1	0	0	0	0
4	A	43	0	30	4	0
4	B	43	0	30	2	0
5	A	17	0	15	1	0
5	B	17	0	15	0	0
6	A	34	0	20	8	0
6	B	17	0	10	0	0
7	A	79	0	0	12	0
7	B	112	0	0	18	0
All	All	7217	0	6763	543	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 39.

The worst 5 of 543 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:A:350:LEU:HB2	1:A:486:GLN:NE2	1.66	1.08
1:A:266:MET:SD	1:A:272:ARG:HD3	2.00	1.00
1:B:438:MET:HE3	1:B:469:VAL:HG12	1.45	0.97
1:A:464:GLY:O	1:A:467:THR:HG22	1.69	0.92
1:B:99:THR:HG22	1:B:100:SER:H	1.31	0.91

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	418/433 (96%)	324 (78%)	71 (17%)	23 (6%)	1	4
1	B	418/433 (96%)	337 (81%)	58 (14%)	23 (6%)	1	4
All	All	836/866 (96%)	661 (79%)	129 (15%)	46 (6%)	1	4

5 of 46 Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	84	TRP
1	A	99	THR
1	A	108	SER
1	A	268	ASP
1	A	278	LEU

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	368/381 (97%)	337 (92%)	31 (8%)	10	31
1	B	368/381 (97%)	337 (92%)	31 (8%)	10	31
All	All	736/762 (97%)	674 (92%)	62 (8%)	10	31

5 of 62 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	446	ARG
1	B	417	LEU
1	B	130	LEU
1	B	414	VAL
1	B	462	VAL

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 36

such sidechains are listed below:

Mol	Chain	Res	Type
1	B	243	GLN
1	B	496	GLN
1	B	249	HIS
1	B	398	HIS
1	A	364	ASN

5.3.3 RNA [i](#)

There are no RNA molecules in this entry.

5.4 Non-standard residues in protein, DNA, RNA chains [i](#)

There are no non-standard protein/DNA/RNA residues in this entry.

5.5 Carbohydrates [i](#)

There are no oligosaccharides in this entry.

5.6 Ligand geometry [i](#)

Of 10 ligands modelled in this entry, 2 are monoatomic - leaving 8 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$
6	B2	B	2906	-	17,19,19	1.71	4 (23%)	20,27,27	1.22	2 (10%)
5	H4B	A	902	-	17,18,18	2.09	4 (23%)	14,26,26	3.68	6 (42%)
5	H4B	B	2902	-	17,18,18	1.86	4 (23%)	14,26,26	3.42	7 (50%)
2	SO4	A	903	-	4,4,4	0.38	0	6,6,6	0.11	0
6	B2	A	906	-	17,19,19	2.10	4 (23%)	20,27,27	1.12	2 (10%)
4	HEM	B	2901	-	50,50,50	1.64	10 (20%)	67,82,82	1.32	8 (11%)
4	HEM	A	901	1	50,50,50	1.67	8 (16%)	67,82,82	1.47	7 (10%)

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# Z > 2	Counts	RMSZ	# Z > 2
6	B2	A	907	-	17,19,19	2.12	5 (29%)	20,27,27	1.17	3 (15%)

In the following table, the Chirals column lists the number of chiral outliers, the number of chiral centers analysed, the number of these observed in the model and the number defined in the Chemical Component Dictionary. Similar counts are reported in the Torsion and Rings columns. '-' means no outliers of that kind were identified.

Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
6	B2	B	2906	-	-	2/2/16/16	0/2/3/3
5	H4B	A	902	-	-	0/8/17/17	0/2/2/2
5	H4B	B	2902	-	-	0/8/17/17	0/2/2/2
6	B2	A	906	-	-	2/2/16/16	0/2/3/3
4	HEM	B	2901	-	-	4/14/54/54	-
4	HEM	A	901	1	-	1/14/54/54	-
6	B2	A	907	-	-	0/2/16/16	0/2/3/3

The worst 5 of 39 bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
6	A	906	B2	C7-C9	6.40	1.57	1.50
5	A	902	H4B	C7-N8	-5.67	1.40	1.46
6	A	907	B2	C7-C9	5.22	1.55	1.50
4	A	901	HEM	FE-NB	5.19	2.10	1.94
4	B	2901	HEM	FE-NB	5.05	2.10	1.94

The worst 5 of 35 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
5	A	902	H4B	C11-C10-C9	11.20	125.82	112.11
5	B	2902	H4B	C11-C10-C9	10.24	124.66	112.11
4	A	901	HEM	CMD-C2D-C1D	6.28	134.84	125.03
5	A	902	H4B	C4-C4A-N5	4.41	128.30	116.27
5	A	902	H4B	C2-N1-C8A	3.86	120.17	113.36

There are no chirality outliers.

5 of 9 torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
6	A	906	B2	N8-C7-C9-C10
6	A	906	B2	N8-C7-C9-S13
6	B	2906	B2	N8-C7-C9-C10

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Mol	Chain	Res	Type	Atoms
6	B	2906	B2	N8-C7-C9-S13
4	A	901	HEM	C4B-C3B-CAB-CBB

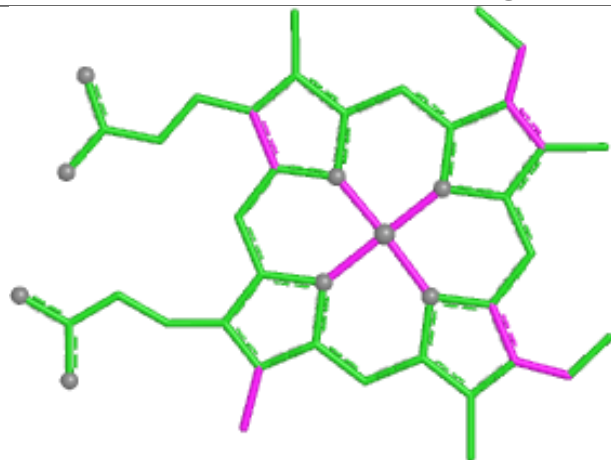
There are no ring outliers.

5 monomers are involved in 14 short contacts:

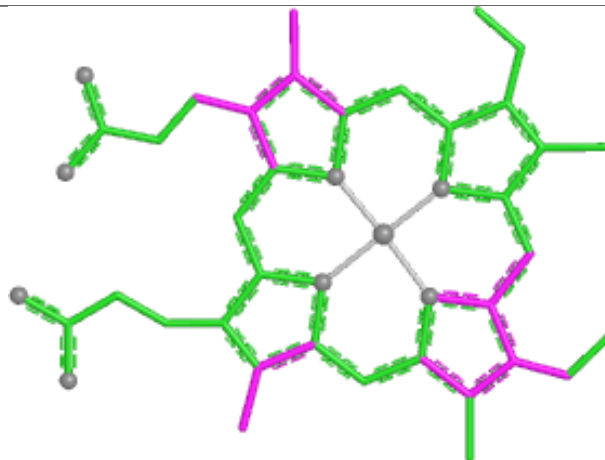
Mol	Chain	Res	Type	Clashes	Symm-Clashes
5	A	902	H4B	1	0
6	A	906	B2	1	0
4	B	2901	HEM	2	0
4	A	901	HEM	4	0
6	A	907	B2	7	0

The following is a two-dimensional graphical depiction of Mogul quality analysis of bond lengths, bond angles, torsion angles, and ring geometry for all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the validation Tables will also be included. For torsion angles, if less than 5% of the Mogul distribution of torsion angles is within 10 degrees of the torsion angle in question, then that torsion angle is considered an outlier. Any bond that is central to one or more torsion angles identified as an outlier by Mogul will be highlighted in the graph. For rings, the root-mean-square deviation (RMSD) between the ring in question and similar rings identified by Mogul is calculated over all ring torsion angles. If the average RMSD is greater than 60 degrees and the minimal RMSD between the ring in question and any Mogul-identified rings is also greater than 60 degrees, then that ring is considered an outlier. The outliers are highlighted in purple. The color gray indicates Mogul did not find sufficient equivalents in the CSD to analyse the geometry.

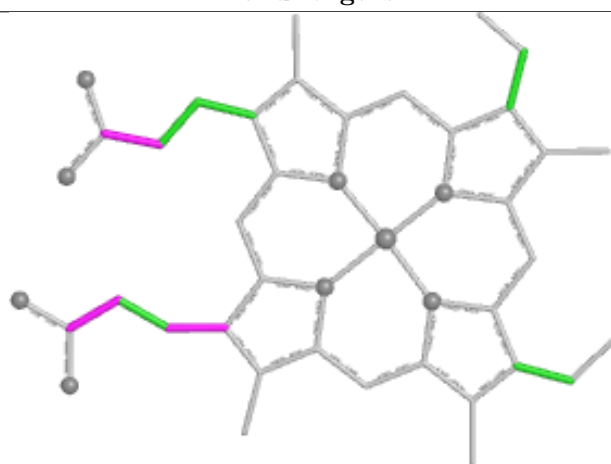
Ligand HEM B 2901



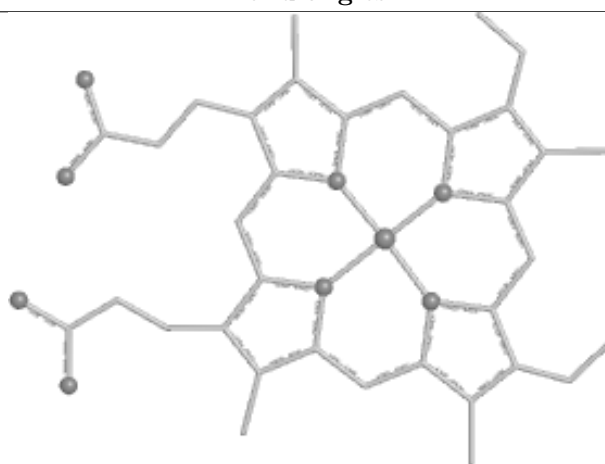
Bond lengths



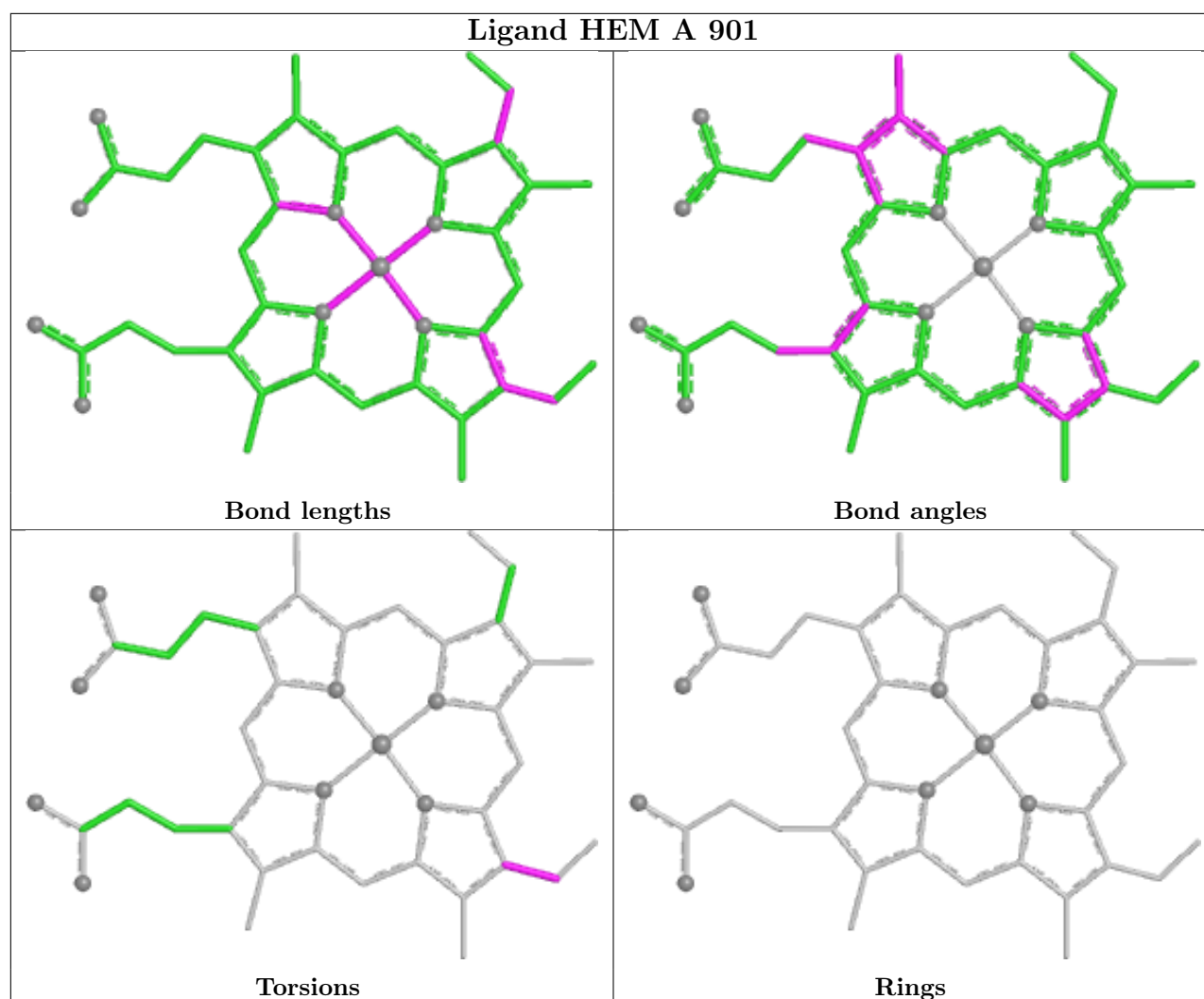
Bond angles



Torsions



Rings



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	420/433 (96%)	0.02	6 (1%) 73 65	46, 73, 115, 129	0
1	B	420/433 (96%)	-0.00	4 (0%) 79 73	40, 72, 110, 126	0
All	All	840/866 (96%)	0.01	10 (1%) 76 69	40, 72, 111, 129	0

The worst 5 of 10 RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	383	TYR	3.3
1	A	108	SER	2.9
1	A	105	LYS	2.8
1	A	494	ILE	2.8
1	A	172	THR	2.4

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 oligosaccharides in this entry.

6.4 Ligands [i](#)

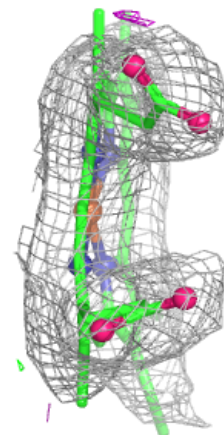
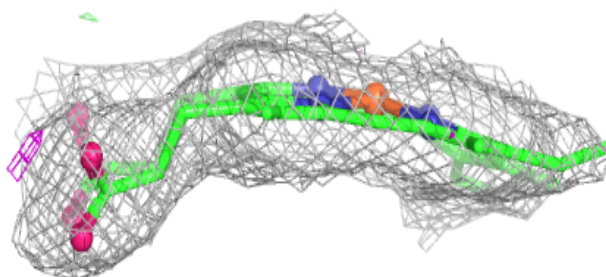
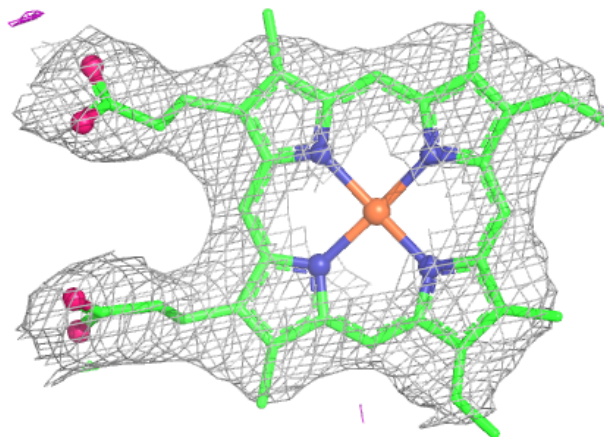
In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum, median, 95th percentile and maximum values of B factors of atoms in the group. The column labelled ‘Q< 0.9’ lists the number of atoms with occupancy less than 0.9.

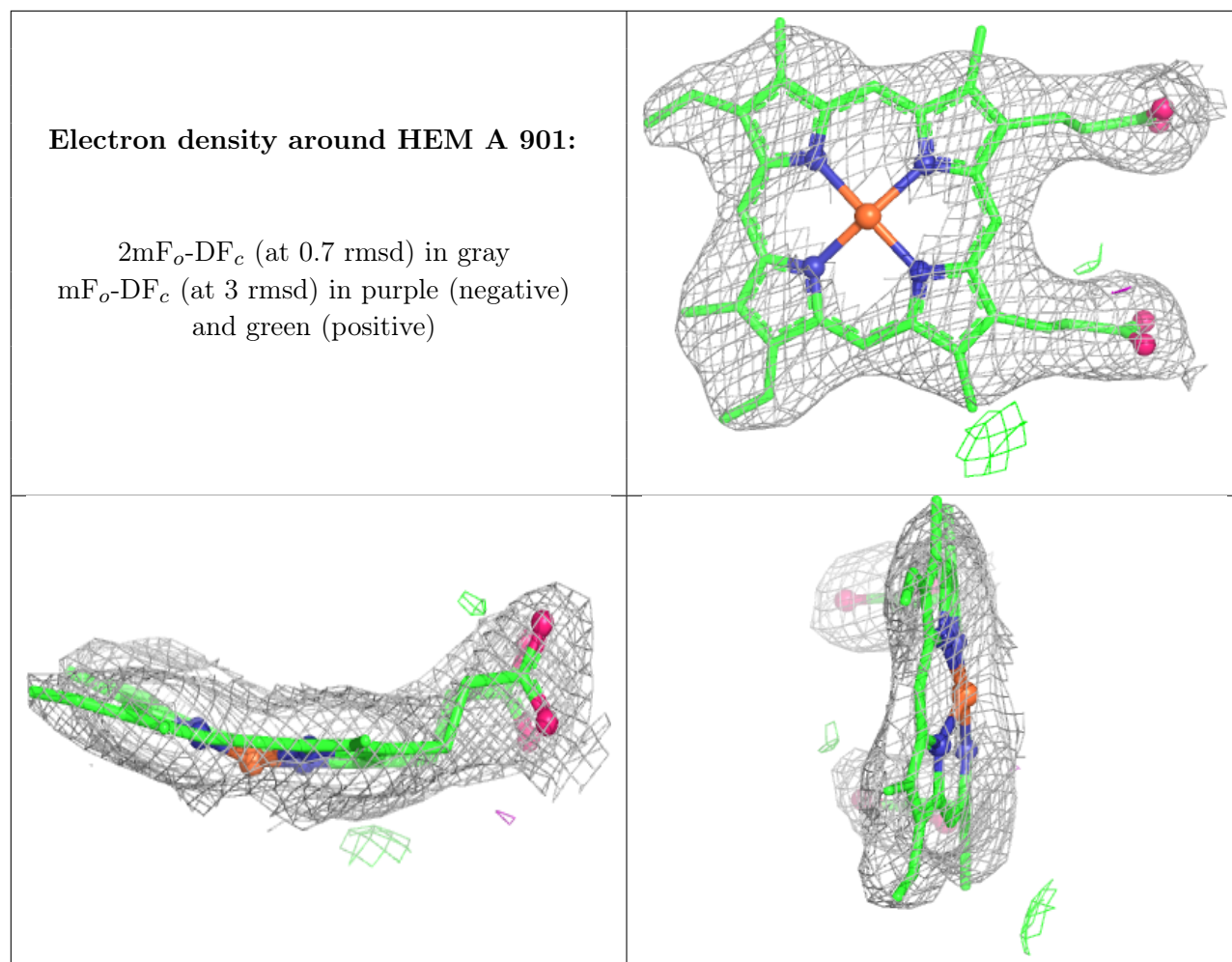
Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors($\text{\AA}^2$)	Q<0.9
6	B2	A	907	17/17	0.68	0.17	141,143,146,147	0
5	H4B	A	902	17/17	0.92	0.08	57,60,62,63	0
2	SO4	A	903	5/5	0.92	0.09	109,110,110,110	0
5	H4B	B	2902	17/17	0.93	0.08	57,60,62,62	0
3	ZN	B	2903	1/1	0.93	0.18	61,61,61,61	1
3	ZN	A	904	1/1	0.96	0.17	74,74,74,74	1
6	B2	B	2906	17/17	0.96	0.09	52,54,63,65	0
6	B2	A	906	17/17	0.97	0.07	50,52,58,62	0
4	HEM	B	2901	43/43	0.98	0.07	44,48,52,58	0
4	HEM	A	901	43/43	0.98	0.07	33,45,53,56	0

The following is a graphical depiction of the model fit to experimental electron density of all instances of the Ligand of Interest. In addition, ligands with molecular weight > 250 and outliers as shown on the geometry validation Tables will also be included. Each fit is shown from different orientation to approximate a three-dimensional view.

Electron density around HEM B 2901:

2mF_o-DF_c (at 0.7 rmsd) in gray
mF_o-DF_c (at 3 rmsd) in purple (negative)
and green (positive)





6.5 Other polymers [i](#)

There are no such residues in this entry.