



wwPDB X-ray Structure Validation Summary Report ⓘ

Mar 9, 2026 – 04:43 PM UTC

PDB ID : 1Z02 / pdb_00001z02
Title : 2-Oxoquinoline 8-Monooxygenase Component: Active site Modulation by
Rieske-[2Fe-2S] Center Oxidation/Reduction
Authors : Martins, B.M.; Svetlitchnaia, T.; Dobbek, H.
Deposited on : 2005-03-01
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

<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 ⓘ](#)) were used in the production of this report:

MolProbity	:	4-5-2 with Phenix2.0
Mogul	:	2022.3.0, CSD as543be (2022)
Xtriage (Phenix)	:	NOT EXECUTED
EDS	:	NOT EXECUTED
Percentile statistics	:	20250101.v01 (using entries in the PDB archive January 1st 2025)
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.49

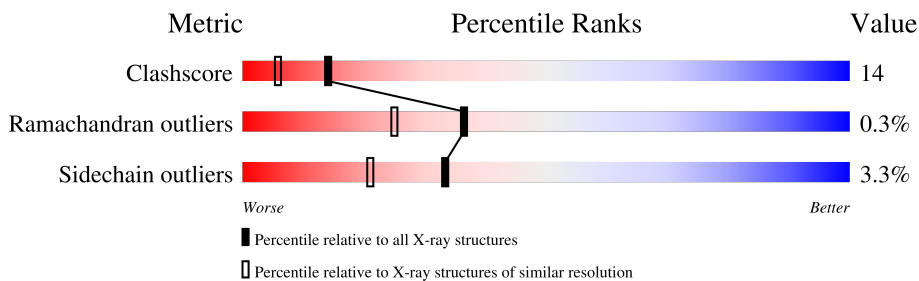
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 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))
Clashscore	190562	8479 (1.80-1.80)
Ramachandran outliers	187476	8391 (1.80-1.80)
Sidechain outliers	187428	8390 (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 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 $\leq 5\%$.

Note EDS was not executed.

Mol	Chain	Length	Quality of chain
1	A	446	 71% 22% . .
1	B	446	 74% 19% . .
1	C	446	 70% 23% . .
1	D	446	 73% 21% . .
1	E	446	 72% 21% . .
1	F	446	 74% 20% . .

2 Entry composition

There are 4 unique types of molecules in this entry. The entry contains 25843 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.

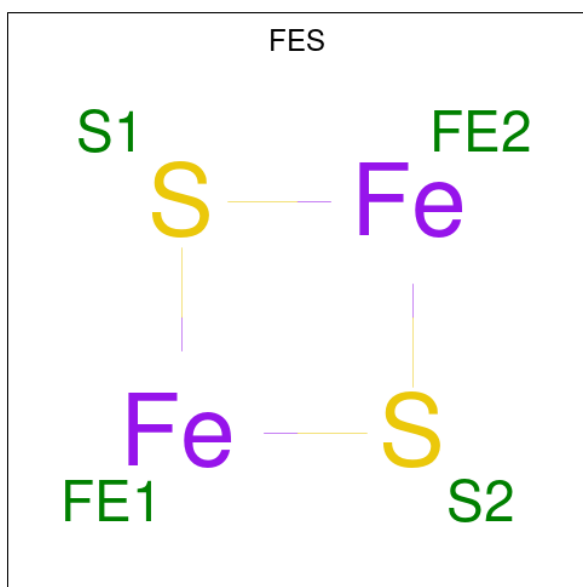
- Molecule 1 is a protein called 2-oxo-1,2-dihydroquinoline 8-monooxygenase, oxygenase component.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	427	Total	C	N	O	S	0	0	0
			3454	2211	592	635	16			
1	B	427	Total	C	N	O	S	0	0	0
			3454	2211	592	635	16			
1	C	427	Total	C	N	O	S	0	0	0
			3454	2211	592	635	16			
1	D	427	Total	C	N	O	S	0	0	0
			3454	2211	592	635	16			
1	E	427	Total	C	N	O	S	0	0	0
			3454	2211	592	635	16			
1	F	427	Total	C	N	O	S	0	0	0
			3454	2211	592	635	16			

- Molecule 2 is FE (III) ION (CCD ID: FE) (formula: Fe).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
2	A	1	Total	Fe	0	0
			1	1		
2	B	1	Total	Fe	0	0
			1	1		
2	C	1	Total	Fe	0	0
			1	1		
2	D	1	Total	Fe	0	0
			1	1		
2	E	1	Total	Fe	0	0
			1	1		
2	F	1	Total	Fe	0	0
			1	1		

- Molecule 3 is FE2/S2 (INORGANIC) CLUSTER (CCD ID: FES) (formula: Fe₂S₂).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
3	A	1	Total	Fe	S	0	0
			4	2	2		
3	B	1	Total	Fe	S	0	0
			4	2	2		
3	C	1	Total	Fe	S	0	0
			4	2	2		
3	D	1	Total	Fe	S	0	0
			4	2	2		
3	E	1	Total	Fe	S	0	0
			4	2	2		
3	F	1	Total	Fe	S	0	0
			4	2	2		

- Molecule 4 is water.

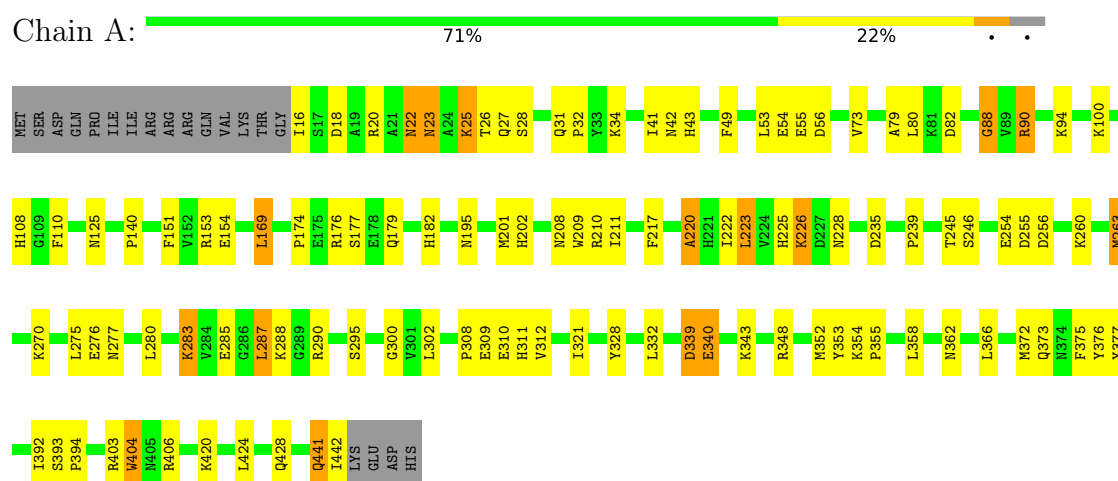
Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
4	A	795	Total	O	0	0
			795	795		
4	B	890	Total	O	0	0
			890	890		
4	C	841	Total	O	0	0
			841	841		
4	D	817	Total	O	0	0
			817	817		
4	E	874	Total	O	0	0
			874	874		
4	F	872	Total	O	0	0
			872	872		

3 Residue-property plots

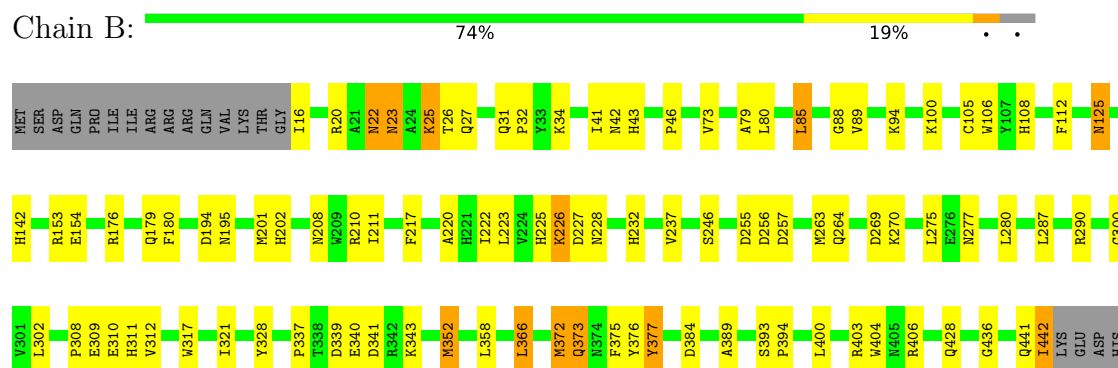
These plots are drawn for all protein, RNA, DNA and oligosaccharide chains in the entry. The first graphic for a chain summarises the proportions of the various outlier classes displayed in the second graphic. The second graphic shows the sequence view annotated by issues in geometry. Residues are color-coded 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. 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.

Note EDS was not executed.

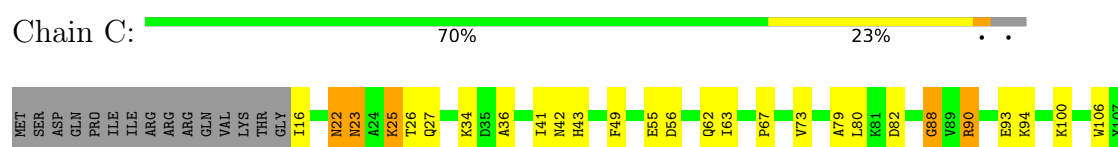
- Molecule 1: 2-oxo-1,2-dihydroquinoline 8-monooxygenase, oxygenase component

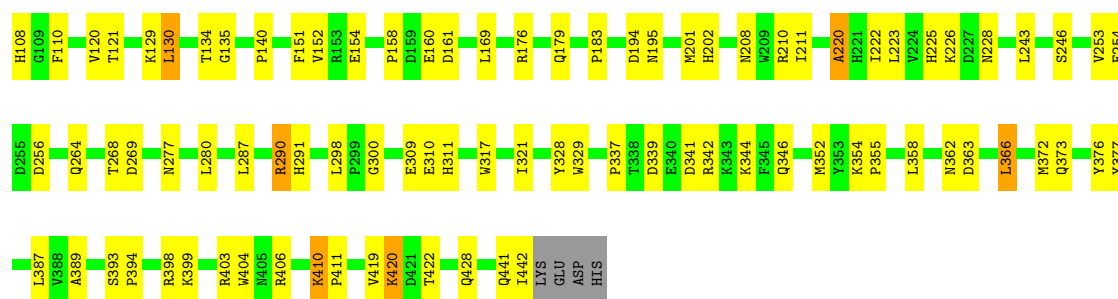


- Molecule 1: 2-oxo-1,2-dihydroquinoline 8-monooxygenase, oxygenase component



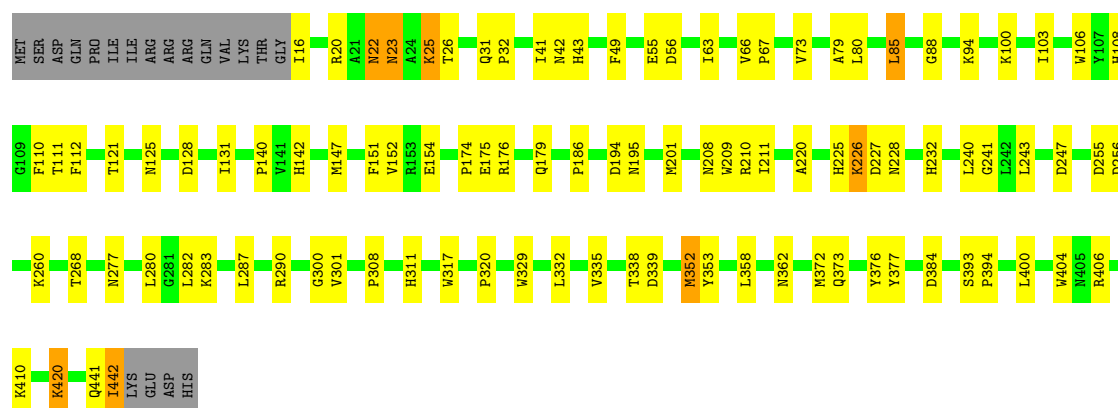
- Molecule 1: 2-oxo-1,2-dihydroquinoline 8-monooxygenase, oxygenase component





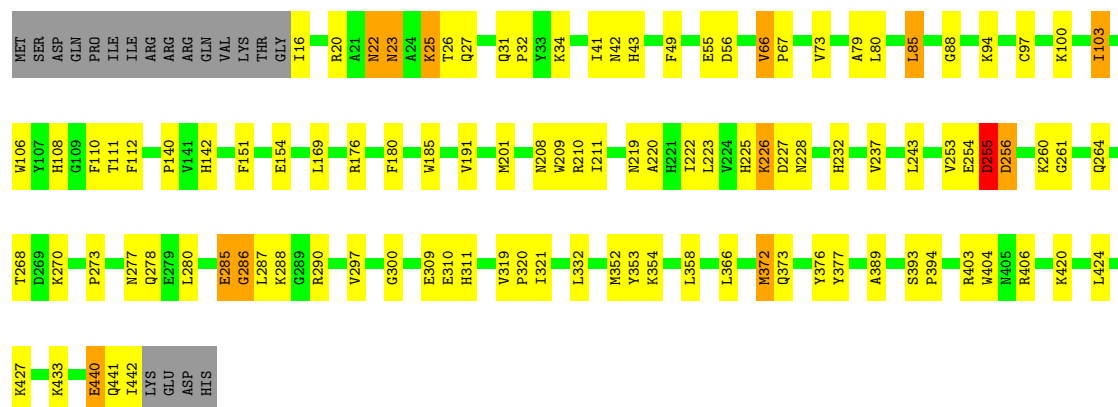
- Molecule 1: 2-oxo-1,2-dihydroquinoline 8-monooxygenase, oxygenase component

Chain D: 73% 21%



- Molecule 1: 2-oxo-1,2-dihydroquinoline 8-monooxygenase, oxygenase component

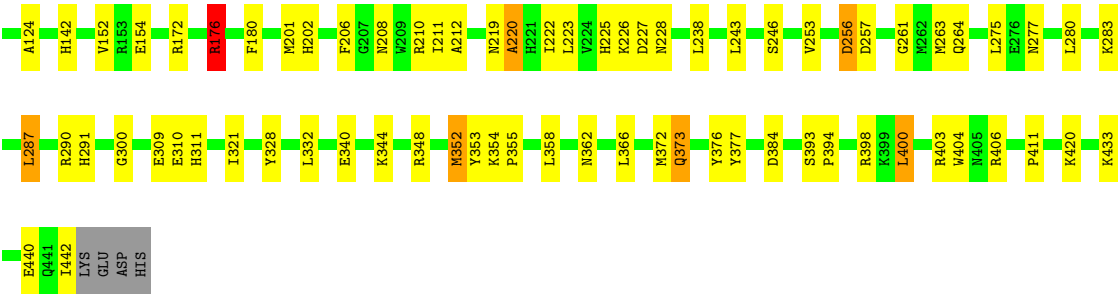
Chain E: 72% 21%



- Molecule 1: 2-oxo-1,2-dihydroquinoline 8-monooxygenase, oxygenase component

Chain F: 74% 20%





4 Data and refinement statistics

Xtriage (Phenix) and EDS were not executed - this section is therefore incomplete.

Property	Value	Source
Space group	P 21 21 21	Depositor
Cell constants a, b, c, α , β , γ	102.03Å 169.97Å 175.35Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	20.00 – 1.80	Depositor
% Data completeness (in resolution range)	98.2 (20.00-1.80)	Depositor
R_{merge}	(Not available)	Depositor
R_{sym}	(Not available)	Depositor
Refinement program	CNS	Depositor
R, R_{free}	0.200 , 0.240	Depositor
Estimated twinning fraction	No twinning to report.	Xtriage
Total number of atoms	25843	wwPDB-VP
Average B, all atoms (Å ²)	20.0	wwPDB-VP

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: FES, FE

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	3/3560 (0.1%)	0.92	14/4853 (0.3%)
1	B	0.46	1/3560 (0.0%)	0.96	12/4853 (0.2%)
1	C	0.46	0/3560	0.93	13/4853 (0.3%)
1	D	0.46	0/3560	0.91	13/4853 (0.3%)
1	E	0.45	1/3560 (0.0%)	0.94	12/4853 (0.2%)
1	F	0.47	1/3560 (0.0%)	0.92	9/4853 (0.2%)
All	All	0.47	6/21360 (0.0%)	0.93	73/29118 (0.3%)

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	F	0	1

The worst 5 of 6 bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	A	263	MET	SD-CE	-9.00	1.57	1.79
1	F	176	ARG	CD-NE	6.83	1.55	1.46
1	A	287	LEU	CG-CD2	-6.44	1.31	1.52
1	A	223	LEU	CG-CD1	-5.56	1.34	1.52
1	B	372	MET	SD-CE	-5.41	1.66	1.79

The worst 5 of 73 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	B	321	ILE	N-CA-C	-8.79	104.00	111.56
1	E	321	ILE	N-CA-C	-8.55	103.44	111.48

Continued on next page...

Continued from previous page...

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	B	256	ASP	N-CA-C	8.25	119.96	110.97
1	F	321	ILE	N-CA-C	-8.18	103.79	111.48
1	C	321	ILE	N-CA-C	-7.73	104.22	111.48

There are no chirality outliers.

All (1) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	F	176	ARG	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	3454	0	3307	102	0
1	B	3454	0	3307	85	0
1	C	3454	0	3307	96	0
1	D	3454	0	3307	98	0
1	E	3454	0	3307	104	0
1	F	3454	0	3307	107	0
2	A	1	0	0	0	0
2	B	1	0	0	0	0
2	C	1	0	0	0	0
2	D	1	0	0	0	0
2	E	1	0	0	0	0
2	F	1	0	0	0	0
3	A	4	0	0	1	0
3	B	4	0	0	1	0
3	C	4	0	0	1	0
3	D	4	0	0	1	0
3	E	4	0	0	1	0
3	F	4	0	0	1	0
4	A	795	0	0	34	0
4	B	890	0	0	25	0
4	C	841	0	0	30	0
4	D	817	0	0	30	0
4	E	874	0	0	25	0

Continued on next page...

Continued from previous page...

Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
4	F	872	0	0	36	0
All	All	25843	0	19842	579	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 14.

The worst 5 of 579 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:239:PRO:HA	4:A:836:HOH:O	1.55	1.07
1:C:442:ILE:HG22	1:C:442:ILE:O	1.57	1.02
1:E:211:ILE:HG23	1:E:372:MET:HE2	1.41	1.00
1:C:220:ALA:HB3	4:C:1156:HOH:O	1.63	0.98
1:D:22:ASN:H	1:D:22:ASN:HD22	1.12	0.98

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	425/446 (95%)	401 (94%)	23 (5%)	1 (0%)	43	31
1	B	425/446 (95%)	403 (95%)	21 (5%)	1 (0%)	43	31
1	C	425/446 (95%)	400 (94%)	24 (6%)	1 (0%)	43	31
1	D	425/446 (95%)	401 (94%)	23 (5%)	1 (0%)	43	31
1	E	425/446 (95%)	399 (94%)	23 (5%)	3 (1%)	18	8
1	F	425/446 (95%)	400 (94%)	24 (6%)	1 (0%)	43	31
All	All	2550/2676 (95%)	2404 (94%)	138 (5%)	8 (0%)	36	25

5 of 8 Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	E	255	ASP
1	E	286	GLY
1	B	300	GLY
1	C	300	GLY
1	D	300	GLY

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	373/392 (95%)	359 (96%)	14 (4%)	29	17
1	B	373/392 (95%)	364 (98%)	9 (2%)	43	31
1	C	373/392 (95%)	358 (96%)	15 (4%)	28	15
1	D	373/392 (95%)	360 (96%)	13 (4%)	32	19
1	E	373/392 (95%)	361 (97%)	12 (3%)	34	22
1	F	373/392 (95%)	362 (97%)	11 (3%)	37	25
All	All	2238/2352 (95%)	2164 (97%)	74 (3%)	33	21

5 of 74 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	E	255	ASP
1	F	352	MET
1	E	285	GLU
1	F	25	LYS
1	C	23	ASN

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 119 such sidechains are listed below:

Mol	Chain	Res	Type
1	D	27	GLN
1	F	208	ASN
1	D	291	HIS
1	F	195	ASN

Continued on next page...

Continued from previous page...

Mol	Chain	Res	Type
1	F	428	GLN

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 12 ligands modelled in this entry, 6 are monoatomic - leaving 6 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	$\# Z > 2$
3	FES	C	500	1	0,4,4	-	-	-		
3	FES	E	500	1	0,4,4	-	-	-		
3	FES	A	500	1	0,4,4	-	-	-		
3	FES	B	500	1	0,4,4	-	-	-		
3	FES	D	500	1	0,4,4	-	-	-		
3	FES	F	500	1	0,4,4	-	-	-		

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
3	FES	C	500	1	-	-	0/1/1/1
3	FES	E	500	1	-	-	0/1/1/1
3	FES	A	500	1	-	-	0/1/1/1
3	FES	B	500	1	-	-	0/1/1/1
3	FES	D	500	1	-	-	0/1/1/1
3	FES	F	500	1	-	-	0/1/1/1

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

There are no torsion outliers.

There are no ring outliers.

6 monomers are involved in 6 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
3	C	500	FES	1	0
3	E	500	FES	1	0
3	A	500	FES	1	0
3	B	500	FES	1	0
3	D	500	FES	1	0
3	F	500	FES	1	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

EDS was not executed - this section is therefore empty.

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

EDS was not executed - this section is therefore empty.

6.3 Carbohydrates

EDS was not executed - this section is therefore empty.

6.4 Ligands

EDS was not executed - this section is therefore empty.

6.5 Other polymers

EDS was not executed - this section is therefore empty.