



Full wwPDB X-ray Structure Validation Report ⓘ

Mar 8, 2026 – 12:55 PM UTC

PDB ID : 5PB1 / pdb_00005pb1
Title : Crystal Structure of Factor VIIa in complex with benzenecarboximidamide
Authors : Stihle, M.; Mayweg, A.; Roevers, S.; Rudolph, M.G.
Deposited on : 2016-11-10
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

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)	:	2.0
EDS	:	3.0
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

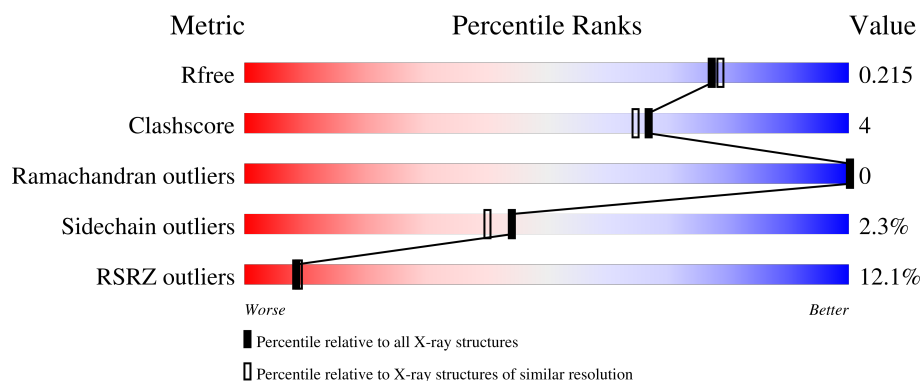
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 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}	180053	7789 (1.90-1.90)
Clashscore	190562	8410 (1.90-1.90)
Ramachandran outliers	187476	8333 (1.90-1.90)
Sidechain outliers	187428	8333 (1.90-1.90)
RSRZ outliers	180081	7790 (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 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	64	27% 78% 8% 12%
2	D	254	8% 91% 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
3	SO4	D	502	-	-	X	-

2 Entry composition [i](#)

There are 7 unique types of molecules in this entry. The entry contains 2917 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.

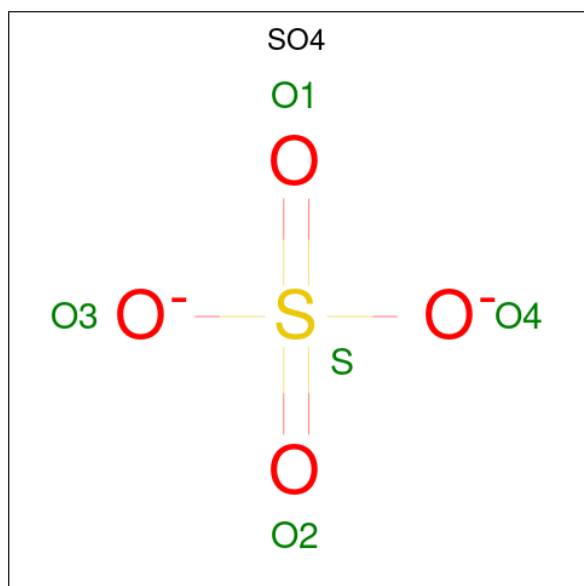
- Molecule 1 is a protein called Coagulation factor VII light chain.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	56	Total	C	N	O	S	0	1	0
			429	262	76	84	7			

- Molecule 2 is a protein called Coagulation factor VII heavy chain.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
2	D	250	Total	C	N	O	S	0	21	0
			2046	1310	361	358	17			

- Molecule 3 is SULFATE ION (CCD ID: SO4) (formula: O₄S).



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

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

- Molecule 4 is GLYCEROL (CCD ID: GOL) (formula: $C_3H_8O_3$).

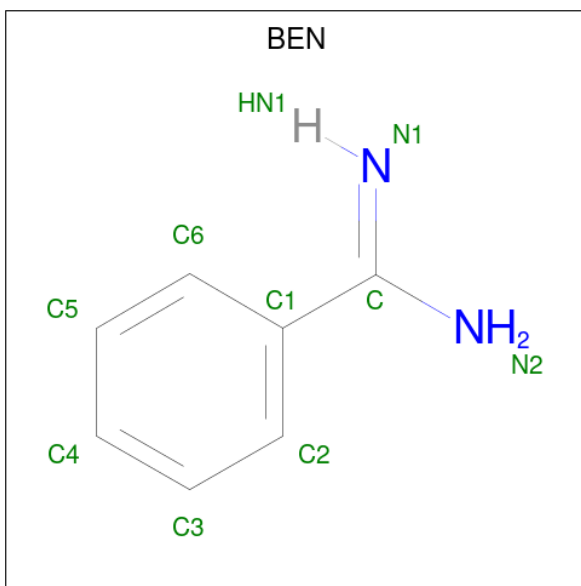


Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
4	A	1	Total	C	O	0	0
			6	3	3		
4	A	1	Total	C	O	0	0
			6	3	3		
4	D	1	Total	C	O	0	0
			6	3	3		
4	D	1	Total	C	O	0	0
			6	3	3		

- Molecule 5 is CALCIUM ION (CCD ID: CA) (formula: Ca).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
5	D	1	Total	Ca	0	0
			1	1		

- Molecule 6 is BENZAMIDINE (CCD ID: BEN) (formula: $C_7H_8N_2$).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
6	D	1	Total	C	N	0	0
			9	7	2		

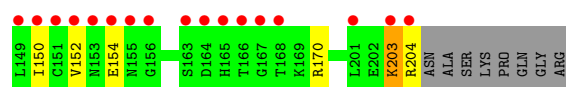
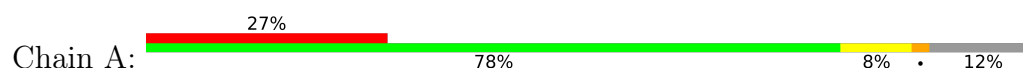
- Molecule 7 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
7	A	62	Total	O	0	0
			62	62		
7	D	316	Total	O	0	0
			316	316		

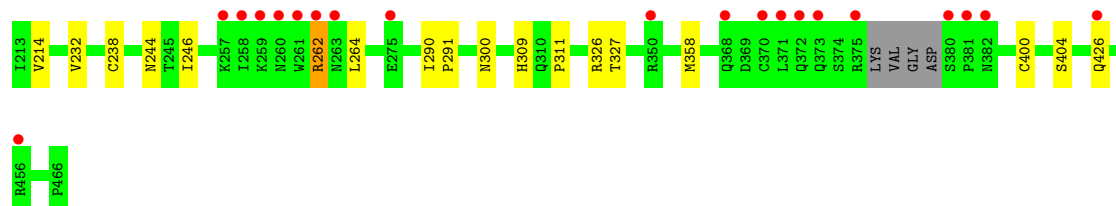
3 Residue-property plots [i](#)

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: Coagulation factor VII light chain



- Molecule 2: Coagulation factor VII heavy chain



4 Data and refinement statistics

Property	Value	Source
Space group	P 41 21 2	Depositor
Cell constants a, b, c, α , β , γ	95.68Å 95.68Å 117.96Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	30.79 – 1.90 30.79 – 1.90	Depositor EDS
% Data completeness (in resolution range)	98.8 (30.79-1.90) 98.7 (30.79-1.90)	Depositor EDS
R_{merge}	0.10	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	2.70 (at 1.80Å)	Xtriage
Refinement program	REFMAC 5.2.0019	Depositor
R, R_{free}	0.190 , 0.210 0.198 , 0.215	Depositor DCC
R_{free} test set	2576 reflections (5.02%)	wwPDB-VP
Wilson B-factor (Å ²)	22.6	Xtriage
Anisotropy	0.357	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.35 , 39.4	EDS
L-test for twinning ²	$\langle L \rangle = 0.51$, $\langle L^2 \rangle = 0.35$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o, F_c correlation	0.95	EDS
Total number of atoms	2917	wwPDB-VP
Average B, all atoms (Å ²)	28.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 3.53% 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: SO4, MHO, GOL, BEN, CA

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	0.57	0/439	0.69	0/591
2	D	0.59	0/2146	0.74	0/2918
All	All	0.59	0/2585	0.73	0/3509

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

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	429	0	413	3	0
2	D	2046	0	2085	15	0
3	A	5	0	0	0	0
3	D	25	0	0	2	0
4	A	12	0	16	1	0
4	D	12	0	16	0	0
5	D	1	0	0	0	0
6	D	9	0	7	0	0
7	A	62	0	0	1	1
7	D	316	0	0	4	1
All	All	2917	0	2537	19	1

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 4.

All (19) 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:D:214:VAL:HG23	2:D:400[B]:CYS:SG	1.90	1.11
4:A:302:GOL:H11	7:D:607:HOH:O	1.70	0.90
2:D:309:HIS:HD2	3:D:502:SO4:O2	1.58	0.84
2:D:327:THR:OG1	7:D:601:HOH:O	2.06	0.72
1:A:152:VAL:HG23	7:A:401:HOH:O	1.97	0.64
2:D:214:VAL:CG2	2:D:400[B]:CYS:SG	2.80	0.62
1:A:203:LYS:O	1:A:204:ARG:HB2	2.03	0.59
2:D:262:ARG:HG3	7:D:863:HOH:O	2.02	0.58
2:D:238[B]:CYS:HB2	2:D:404:SER:O	2.05	0.56
2:D:309:HIS:CD2	3:D:502:SO4:O2	2.49	0.54
2:D:232[B]:VAL:HG22	2:D:264[B]:LEU:HD23	1.95	0.49
2:D:246[B]:ILE:HD11	2:D:311:PRO:HG3	1.93	0.49
2:D:290[A]:ILE:HG23	2:D:291:PRO:HD2	1.97	0.47
1:A:170:ARG:HD2	1:A:170:ARG:C	2.40	0.46
2:D:326[B]:ARG:HD2	7:D:824:HOH:O	2.15	0.45
2:D:232[B]:VAL:HG22	2:D:264[B]:LEU:CD2	2.48	0.43

All (1) symmetry-related close contacts are listed below. The label for Atom-2 includes the symmetry operator and encoded unit-cell translations to be applied.

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
7:A:448:HOH:O	7:D:878:HOH:O[7_555]	2.06	0.14

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	55/64 (86%)	52 (94%)	3 (6%)	0	100	100

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Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
2	D	266/254 (105%)	258 (97%)	8 (3%)	0	100	100
All	All	321/318 (101%)	310 (97%)	11 (3%)	0	100	100

There are no Ramachandran outliers to report.

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	50/55 (91%)	47 (94%)	3 (6%)	17	9
2	D	231/215 (107%)	228 (99%)	3 (1%)	61	61
All	All	281/270 (104%)	275 (98%)	6 (2%)	44	44

All (6) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	150	ILE
1	A	154	GLU
1	A	203	LYS
2	D	262	ARG
2	D	300	ASN
2	D	426	GLN

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (4) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	165	HIS
2	D	300	ASN
2	D	309	HIS
2	D	361	ASN

5.3.3 RNA ⓘ

There are no RNA molecules in this entry.

5.4 Non-standard residues in protein, DNA, RNA chains ⓘ

1 non-standard protein/DNA/RNA residue is 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	MHO	D	358	2	6,8,9	1.64	1 (16%)	3,9,11	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	MHO	D	358	2	-	1/6/7/9	-

All (1) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	D	358	MHO	OD1-SD	3.82	1.61	1.50

There are no bond angle outliers.

There are no chirality outliers.

All (1) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
2	D	358	MHO	CB-CG-SD-OD1

There are no ring outliers.

No monomer is involved in short contacts.

5.5 Carbohydrates [i](#)

There are no oligosaccharides in this entry.

5.6 Ligand geometry [i](#)

Of 12 ligands modelled in this entry, 1 is monoatomic - leaving 11 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	SO4	D	502	-	4,4,4	0.35	0	6,6,6	0.33	0
3	SO4	D	505	-	4,4,4	0.26	0	6,6,6	0.12	0
4	GOL	D	506	-	5,5,5	0.37	0	5,5,5	0.31	0
3	SO4	A	301	-	4,4,4	0.26	0	6,6,6	0.17	0
4	GOL	A	302	-	5,5,5	0.66	0	5,5,5	0.77	0
3	SO4	D	504	-	4,4,4	0.21	0	6,6,6	0.05	0
4	GOL	D	507	-	5,5,5	0.50	0	5,5,5	0.75	0
3	SO4	D	503	-	4,4,4	0.46	0	6,6,6	0.47	0
6	BEN	D	508	-	9,9,9	1.17	1 (11%)	7,11,11	0.98	1 (14%)
4	GOL	A	303	-	5,5,5	0.62	0	5,5,5	0.46	0
3	SO4	D	509	-	4,4,4	0.30	0	6,6,6	0.32	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
4	GOL	D	506	-	-	2/4/4/4	-
4	GOL	A	302	-	-	2/4/4/4	-
4	GOL	D	507	-	-	3/4/4/4	-
6	BEN	D	508	-	-	0/4/4/4	0/1/1/1
4	GOL	A	303	-	-	3/4/4/4	-

All (1) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
6	D	508	BEN	C-N2	-2.54	1.27	1.33

All (1) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
6	D	508	BEN	C1-C-N2	2.54	121.87	118.01

There are no chirality outliers.

All (10) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
4	A	303	GOL	O2-C2-C3-O3
4	A	302	GOL	C1-C2-C3-O3
4	A	303	GOL	C1-C2-C3-O3
4	D	507	GOL	C1-C2-C3-O3
4	A	303	GOL	O1-C1-C2-O2
4	D	506	GOL	O1-C1-C2-O2
4	D	507	GOL	O1-C1-C2-O2
4	A	302	GOL	O2-C2-C3-O3
4	D	507	GOL	O2-C2-C3-O3
4	D	506	GOL	O1-C1-C2-C3

There are no ring outliers.

2 monomers are involved in 3 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
3	D	502	SO4	2	0
4	A	302	GOL	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 ⓘ

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	56/64 (87%)	1.40	17 (30%) 1 1	12, 29, 56, 60	1 (1%)
2	D	249/254 (98%)	0.31	20 (8%) 18 19	12, 22, 45, 59	21 (8%)
All	All	305/318 (95%)	0.51	37 (12%) 8 9	12, 23, 52, 60	22 (7%)

All (37) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
2	D	381	PRO	8.5
2	D	380	SER	6.8
1	A	168	THR	6.8
1	A	166	THR	6.1
1	A	150	ILE	5.7
2	D	375	ARG	5.5
1	A	149	LEU	5.4
2	D	259	LYS	4.7
1	A	167	GLY	4.4
2	D	260	ASN	4.4
2	D	261	TRP	4.3
1	A	152	VAL	4.3
2	D	382	ASN	4.1
1	A	165	HIS	3.8
2	D	372	GLN	3.7
2	D	262	ARG	3.5
2	D	370	CYS	3.2
1	A	203	LYS	3.1
1	A	204	ARG	3.0
2	D	368	GLN	2.9
2	D	263	ASN	2.9
2	D	275	GLU	2.8
2	D	371	LEU	2.8
1	A	164	ASP	2.8

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Mol	Chain	Res	Type	RSRZ
1	A	153	ASN	2.6
1	A	151	CYS	2.5
2	D	373	GLN	2.5
2	D	426	GLN	2.4
1	A	201	LEU	2.4
1	A	154	GLU	2.4
2	D	456[A]	ARG	2.3
1	A	155	ASN	2.3
1	A	163	SER	2.2
1	A	156	GLY	2.2
2	D	257	LYS	2.2
2	D	258	ILE	2.0
2	D	350	ARG	2.0

6.2 Non-standard residues in protein, DNA, RNA chains [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(Å ²)	Q<0.9
2	MHO	D	358	9/10	0.97	0.07	19,19,22,29	0

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(Å ²)	Q<0.9
3	SO4	D	503	5/5	0.61	0.36	42,46,50,52	0
4	GOL	A	303	6/6	0.64	0.25	39,44,45,46	0
3	SO4	D	505	5/5	0.70	0.18	80,80,80,80	0
3	SO4	A	301	5/5	0.74	0.17	80,80,80,80	0

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Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors($\text{\AA}^2$)	Q<0.9
4	GOL	D	506	6/6	0.75	0.24	73,73,73,74	0
4	GOL	D	507	6/6	0.76	0.19	43,46,50,52	0
4	GOL	A	302	6/6	0.82	0.16	33,41,42,43	0
3	SO4	D	502	5/5	0.87	0.45	40,46,48,49	0
3	SO4	D	509	5/5	0.91	0.15	42,43,48,48	0
3	SO4	D	504	5/5	0.94	0.08	53,53,54,54	0
6	BEN	D	508	9/9	0.94	0.08	29,29,30,30	0
5	CA	D	501	1/1	0.99	0.02	19,19,19,19	0

6.5 Other polymers [i](#)

There are no such residues in this entry.