Full wwPDB X-ray Structure Validation Report ⓘ

Jun 16, 2024 – 11:58 AM EDT

PDB ID	:	4Z7G
Title	:	Crystal structure of human IRE1 cytoplasmic kinase-RNase region - apo
Authors	:	Bayliss, R.; Joshi, A.
Deposited on	:	2015-04-07
Resolution	:	2.60 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:

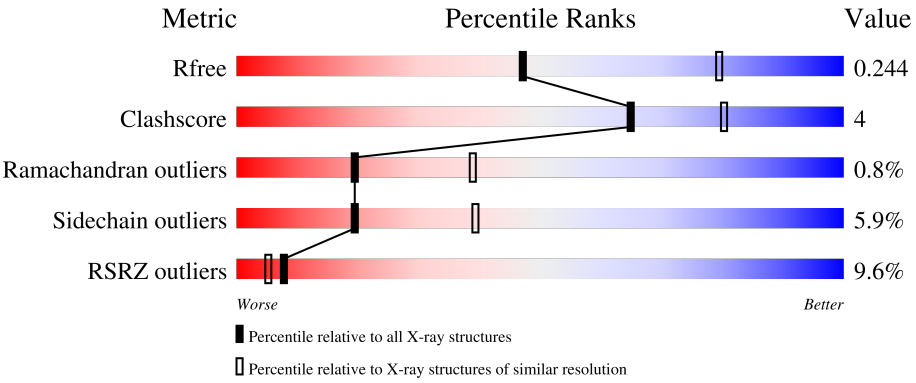
MolProbity	:	4.02b-467
Xtriage (Phenix)	:	1.13
EDS	:	2.37.1
Percentile statistics	:	20191225.v01 (using entries in the PDB archive December 25th 2019)
Refmac	:	5.8.0158
CCP4	:	7.0.044 (Gargrove)
Ideal geometry (proteins)	:	Engh & Huber (2001)
Ideal geometry (DNA, RNA)	:	Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP)	:	2.37.1

1 Overall quality at a glance (i)

The following experimental techniques were used to determine the structure:
X-RAY DIFFRACTION

The reported resolution of this entry is 2.60 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}	130704	3163 (2.60-2.60)
Clashscore	141614	3518 (2.60-2.60)
Ramachandran outliers	138981	3455 (2.60-2.60)
Sidechain outliers	138945	3455 (2.60-2.60)
RSRZ outliers	127900	3104 (2.60-2.60)

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 <=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	416	7% 73% 14% • 12%
1	B	416	10% 76% 12% • 9%

2 Entry composition (i)

There are 3 unique types of molecules in this entry. The entry contains 6042 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 Serine/threonine-protein kinase/endoribonuclease IRE1.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	366	Total	C	N	O	S	0	0	0
			2968	1897	520	533	18			
1	B	377	Total	C	N	O	S	0	0	0
			3057	1955	537	547	18			

- Molecule 2 is SODIUM ION (three-letter code: NA) (formula: Na).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
2	A	1	Total	Na	0	0
			1	1		
2	B	1	Total	Na	0	0
			1	1		

- Molecule 3 is water.

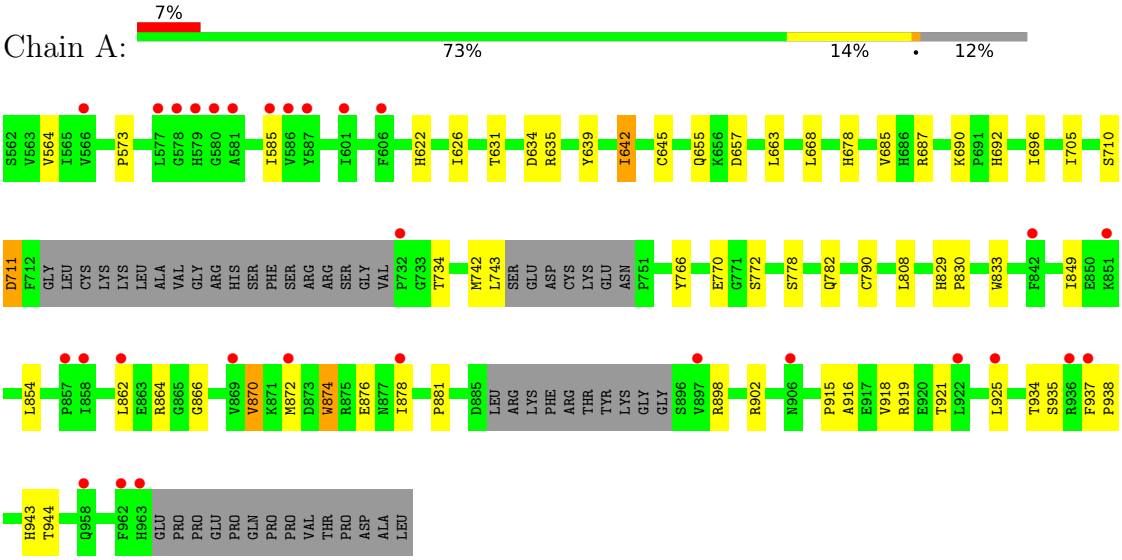
Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
3	A	8	Total	O	0	0
			8	8		
3	B	7	Total	O	0	0
			7	7		

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.

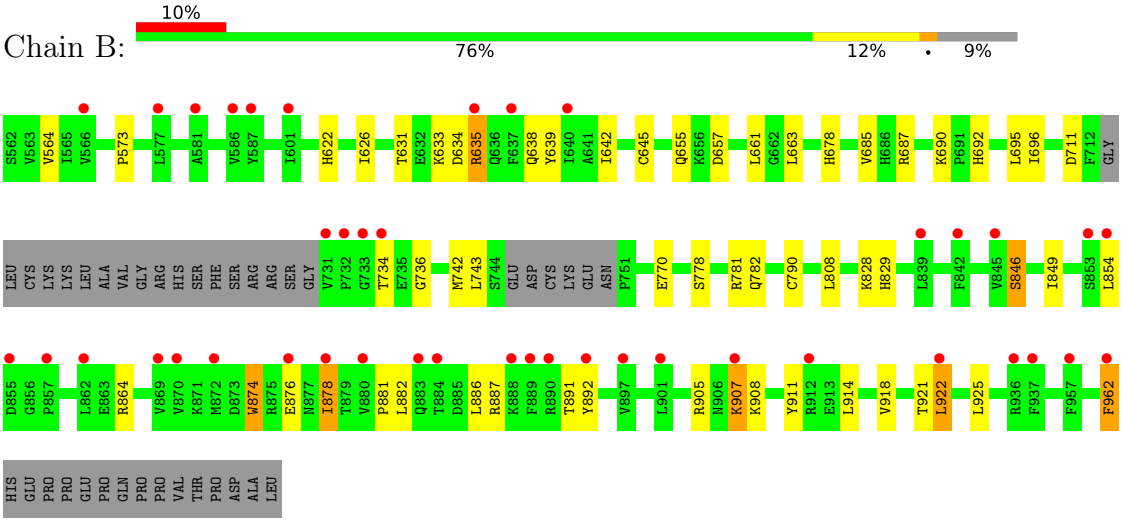
• Molecule 1: Serine/threonine-protein kinase/endoribonuclease IRE1

Chain A:



• Molecule 1: Serine/threonine-protein kinase/endoribonuclease IRE1

Chain B:



4 Data and refinement statistics (i)

Property	Value	Source
Space group	P 1 21 1	Depositor
Cell constants a, b, c, α, β, γ	79.40Å 78.97Å 86.05Å 90.00° 97.41° 90.00°	Depositor
Resolution (Å)	85.33 – 2.60 85.33 – 2.60	Depositor EDS
% Data completeness (in resolution range)	99.5 (85.33-2.60) 99.5 (85.33-2.60)	Depositor EDS
R_{merge}	0.08	Depositor
R_{sym}	(Not available)	Depositor
$< I/\sigma(I) >$ [1]	1.33 (at 2.62Å)	Xtriage
Refinement program	BUSTER 2.10.1	Depositor
R, R_{free}	0.203 , 0.226 0.221 , 0.244	Depositor DCC
R_{free} test set	1687 reflections (5.19%)	wwPDB-VP
Wilson B-factor (Å^2)	61.6	Xtriage
Anisotropy	0.688	Xtriage
Bulk solvent k_{sol}(e/Å^3), B_{sol}(Å^2)	0.33 , 74.6	EDS
L-test for twinning[2]	$< \|L\| > = 0.48$, $< L^2 > = 0.32$	Xtriage
Estimated twinning fraction	No twinning to report.	Xtriage
F_o,F_c correlation	0.95	EDS
Total number of atoms	6042	wwPDB-VP
Average B, all atoms (Å^2)	100.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 5.72% of the height of the origin peak. No significant pseudotranslation is detected.*

[1] Intensities estimated from amplitudes.

[2] Theoretical values of $< |L| >$, $< L^2 >$ 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: NA

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	0.47	0/3041	0.69	0/4107
1	B	0.47	0/3132	0.69	0/4229
All	All	0.47	0/6173	0.69	0/8336

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	2968	0	2939	26	0
1	B	3057	0	3040	23	0
2	A	1	0	0	0	0
2	B	1	0	0	0	0
3	A	8	0	0	0	0
3	B	7	0	0	0	0
All	All	6042	0	5979	49	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 4.

All (49) 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:743:LEU:HD11	1:A:782:GLN:HE21	1.51	0.74
1:A:870:VAL:HG22	1:A:874:TRP:HB3	1.79	0.64
1:B:907:LYS:HE3	1:B:922:LEU:HD13	1.81	0.62
1:B:911:TYR:HA	1:B:914:LEU:HD12	1.83	0.60
1:B:661:LEU:HB3	1:B:663:LEU:HD13	1.83	0.60
1:A:881:PRO:HG2	1:A:921:THR:HG21	1.84	0.59
1:A:626:ILE:HG12	1:A:710:SER:HB3	1.84	0.59
1:B:846:SER:HB3	1:B:905:ARG:HD3	1.85	0.58
1:B:743:LEU:HD11	1:B:782:GLN:HE21	1.69	0.58
1:B:908:LYS:HG3	1:B:925:LEU:HD11	1.88	0.56
1:B:626:ILE:HD13	1:B:695:LEU:HD12	1.88	0.56
1:B:690:LYS:HD3	1:B:734:THR:OG1	2.09	0.52
1:A:690:LYS:HD3	1:A:734:THR:OG1	2.10	0.52
1:B:828:LYS:HG3	1:B:962:PHE:HB3	1.92	0.52
1:A:663:LEU:HD21	1:A:705:ILE:HB	1.92	0.51
1:B:874:TRP:HD1	1:B:878:ILE:HD12	1.74	0.50
1:A:916:ALA:HA	1:A:919:ARG:HG2	1.94	0.49
1:A:864:ARG:O	1:A:943:HIS:HE1	1.96	0.48
1:A:564:VAL:HG23	1:A:573:PRO:HG3	1.95	0.48
1:A:663:LEU:HD13	1:A:668:LEU:HD21	1.95	0.48
1:A:626:ILE:HD13	1:A:642:ILE:HD11	1.96	0.48
1:B:564:VAL:HG23	1:B:573:PRO:HG3	1.96	0.48
1:A:915:PRO:HG2	1:A:918:VAL:HG22	1.96	0.47
1:A:766:TYR:HA	1:A:772:SER:O	2.14	0.47
1:B:881:PRO:HG2	1:B:921:THR:HG21	1.97	0.46
1:B:882:LEU:HD22	1:B:922:LEU:HD11	1.99	0.45
1:A:685:VAL:HG12	1:A:687:ARG:HG3	2.00	0.44
1:B:685:VAL:HG12	1:B:687:ARG:HG3	1.99	0.44
1:A:622:HIS:HB2	1:A:678:HIS:CD2	2.53	0.44
1:B:622:HIS:HB2	1:B:678:HIS:CD2	2.53	0.43
1:A:690:LYS:HE2	1:A:692:HIS:HB3	1.99	0.43
1:B:633:LYS:HB3	1:B:638:GLN:HG3	2.00	0.43
1:B:690:LYS:HE2	1:B:692:HIS:HB3	2.00	0.43
1:A:874:TRP:HB2	1:A:937:PHE:CZ	2.55	0.42
1:B:736:GLY:HA2	1:B:781:ARG:HB3	2.01	0.42
1:B:645:CYS:HB3	1:B:696:ILE:O	2.19	0.41
1:A:631:THR:HA	1:A:639:TYR:O	2.19	0.41
1:A:626:ILE:HD13	1:A:642:ILE:CG1	2.50	0.41
1:A:849:ILE:HD13	1:A:898:ARG:HG2	2.02	0.41
1:B:808:LEU:HB2	1:B:829:HIS:CE1	2.55	0.41
1:A:830:PRO:HA	1:A:833:TRP:CD2	2.56	0.41

Continued on next page...

Continued from previous page...

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:B:631:THR:HA	1:B:639:TYR:O	2.21	0.41
1:A:645:CYS:HB3	1:A:696:ILE:O	2.21	0.41
1:A:862:LEU:HD11	1:A:944:THR:HG23	2.03	0.41
1:A:808:LEU:HB2	1:A:829:HIS:CE1	2.56	0.40
1:B:635:ARG:NH1	1:B:635:ARG:H	2.19	0.40
1:B:914:LEU:HD22	1:B:918:VAL:HG21	2.04	0.40
1:A:934:THR:HA	1:A:935:SER:HA	1.82	0.40
1:A:935:SER:HB2	1:A:938:PRO:HG3	2.03	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	358/416 (86%)	339 (95%)	16 (4%)	3 (1%)	19	39
1	B	371/416 (89%)	344 (93%)	24 (6%)	3 (1%)	19	39
All	All	729/832 (88%)	683 (94%)	40 (6%)	6 (1%)	19	39

All (6) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	711	ASP
1	B	711	ASP
1	A	770	GLU
1	B	770	GLU
1	B	864	ARG
1	A	866	GLY

5.3.2 Protein sidechains (i)

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	326/369 (88%)	308 (94%)	18 (6%)	21 43
1	B	335/369 (91%)	314 (94%)	21 (6%)	18 36
All	All	661/738 (90%)	622 (94%)	39 (6%)	19 39

All (39) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	585	ILE
1	A	634	ASP
1	A	635	ARG
1	A	642	ILE
1	A	655	GLN
1	A	657	ASP
1	A	711	ASP
1	A	742	MET
1	A	778	SER
1	A	790	CYS
1	A	854	LEU
1	A	870	VAL
1	A	872	MET
1	A	874	TRP
1	A	876	GLU
1	A	878	ILE
1	A	902	ARG
1	A	925	LEU
1	B	634	ASP
1	B	635	ARG
1	B	642	ILE
1	B	655	GLN
1	B	657	ASP
1	B	742	MET
1	B	778	SER
1	B	790	CYS
1	B	846	SER

Continued on next page...

Continued from previous page...

Mol	Chain	Res	Type
1	B	849	ILE
1	B	854	LEU
1	B	874	TRP
1	B	876	GLU
1	B	878	ILE
1	B	886	LEU
1	B	887	ARG
1	B	891	THR
1	B	892	TYR
1	B	907	LYS
1	B	922	LEU
1	B	962	PHE

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (3) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	702	HIS
1	B	579	HIS
1	B	678	HIS

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 monosaccharides in this entry.

5.6 Ligand geometry (i)

Of 2 ligands modelled in this entry, 2 are monoatomic - leaving 0 for Mogul analysis.

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.

No monomer is involved in short contacts.

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, 95^{th} 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	366/416 (87%)	0.59	29 (7%) 12 9	50, 96, 165, 198	0
1	B	377/416 (90%)	0.72	42 (11%) 5 3	49, 93, 158, 196	0
All	All	743/832 (89%)	0.66	71 (9%) 8 5	49, 94, 161, 198	0

All (71) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	B	889	PHE	13.6
1	B	892	TYR	8.3
1	B	897	VAL	5.5
1	B	901	LEU	5.0
1	A	579	HIS	4.9
1	A	581	ALA	4.8
1	B	937	PHE	4.6
1	A	937	PHE	4.5
1	B	872	MET	4.3
1	B	890	ARG	4.3
1	A	872	MET	4.2
1	B	888	LYS	4.2
1	B	880	VAL	4.1
1	B	878	ILE	4.0
1	B	862	LEU	3.9
1	B	566	VAL	3.9
1	B	731	VAL	3.7
1	B	845	VAL	3.7
1	A	577	LEU	3.3
1	B	732	PRO	3.3
1	B	577	LEU	3.3
1	A	587	TYR	3.2
1	A	580	GLY	3.2
1	A	862	LEU	3.2

Continued on next page...

Continued from previous page...

Mol	Chain	Res	Type	RSRZ
1	B	936	ARG	3.2
1	B	912	ARG	3.2
1	B	733	GLY	3.1
1	B	922	LEU	3.0
1	A	851	LYS	3.0
1	A	586	VAL	3.0
1	A	906	ASN	3.0
1	B	854	LEU	3.0
1	B	884	THR	2.9
1	A	963	HIS	2.9
1	A	878	ILE	2.8
1	B	907	LYS	2.7
1	B	635	ARG	2.7
1	A	897	VAL	2.7
1	B	883	GLN	2.6
1	B	842	PHE	2.6
1	A	566	VAL	2.6
1	B	640	ILE	2.6
1	A	601	ILE	2.5
1	B	855	ASP	2.5
1	A	857	PRO	2.5
1	B	876	GLU	2.5
1	A	842	PHE	2.5
1	B	853	SER	2.4
1	B	601	ILE	2.4
1	B	586	VAL	2.4
1	B	870	VAL	2.4
1	A	925	LEU	2.4
1	A	585	ILE	2.3
1	A	962	PHE	2.3
1	B	869	VAL	2.3
1	A	732	PRO	2.3
1	A	922	LEU	2.3
1	B	581	ALA	2.2
1	A	869	VAL	2.2
1	B	857	PRO	2.2
1	B	962	PHE	2.2
1	B	587	TYR	2.1
1	B	637	PHE	2.1
1	A	958	GLN	2.1
1	A	606	PHE	2.1
1	A	578	GLY	2.1

Continued on next page...

Continued from previous page...

Mol	Chain	Res	Type	RSRZ
1	A	858	ILE	2.1
1	B	839	LEU	2.1
1	B	957	PHE	2.1
1	B	734	THR	2.0
1	A	936	ARG	2.0

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 monosaccharides 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, 95^{th} 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	NA	B	1001	1/1	0.96	0.15	55,55,55,55	0
2	NA	A	1001	1/1	0.97	0.18	57,57,57,57	0

6.5 Other polymers (i)

There are no such residues in this entry.