



Full wwPDB X-ray Structure Validation Report ⓘ

Feb 28, 2014 – 01:46 PM GMT

PDB ID : 2C3N
Title : HUMAN GLUTATHIONE-S-TRANSFERASET1-1, APO FORM
Authors : Tars, K.; Larsson, A.-K.; Shokeer, A.; Olin, B.; Mannervik, B.; Kleywegt, G.J.
Deposited on : 2005-10-11
Resolution : 1.50 Å(reported)

This is a full wwPDB validation 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/ValidationPDFNotes.html>

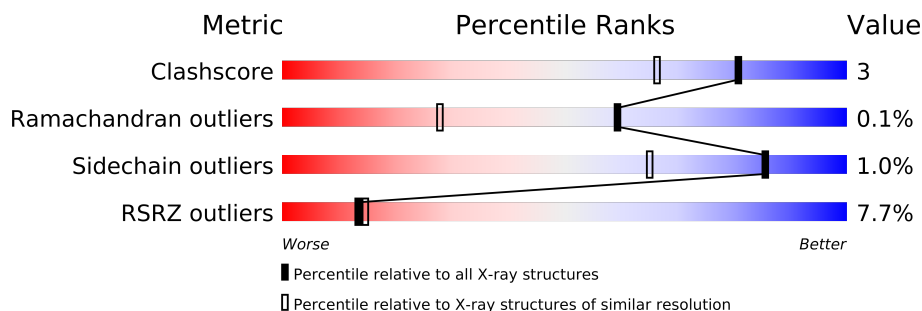
The following versions of software and data (see [references](#)) were used in the production of this report:

MolProbity : 4.02b-467
Mogul : 1.15 2013
Xtriage (Phenix) : dev-1323
EDS : stable22639
Percentile statistics : 21963
Refmac : 5.8.0049
CCP4 : 6.3.0 (Settle)
Ideal geometry (proteins) : Engh & Huber (2001)
Ideal geometry (DNA, RNA) : Parkinson et. al. (1996)
Validation Pipeline (wwPDB-VP) : stable22683

1 Overall quality at a glance

The reported resolution of this entry is 1.50 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	79885	1768 (1.50-1.50)
Ramachandran outliers	78287	1720 (1.50-1.50)
Sidechain outliers	78261	1718 (1.50-1.50)
RSRZ outliers	66119	1514 (1.50-1.50)

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. The upper red bar (where present) indicates the fraction of residues that have poor fit to the electron density.

Mol	Chain	Length	Quality of chain
1	A	247	
1	B	247	
1	C	247	
1	D	247	

The following table lists non-polymeric compounds that are outliers for geometric or electron-density-fit criteria:

Mol	Type	Chain	Res	Geometry	Electron density
2	IOD	D	404	-	X

2 Entry composition

There are 3 unique types of molecules in this entry. The entry contains 8490 atoms, of which 0 are hydrogen and 0 are deuterium.

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 GLUTATHIONE S-TRANSFERASE THETA 1.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	239	Total	C	N	O	S	0	4	0
			1939	1265	327	338	9			
1	B	239	Total	C	N	O	S	0	4	0
			1938	1264	327	339	8			
1	C	239	Total	C	N	O	S	0	5	0
			1944	1268	328	339	9			
1	D	239	Total	C	N	O	S	0	3	0
			1935	1262	327	338	8			

- Molecule 2 is IODIDE ION (three-letter code: IOD) (formula: I).

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
2	B	4	Total	I	0	0
			4	4		
2	A	4	Total	I	0	0
			4	4		
2	D	4	Total	I	0	0
			4	4		
2	C	3	Total	I	0	0
			3	3		

- Molecule 3 is water.

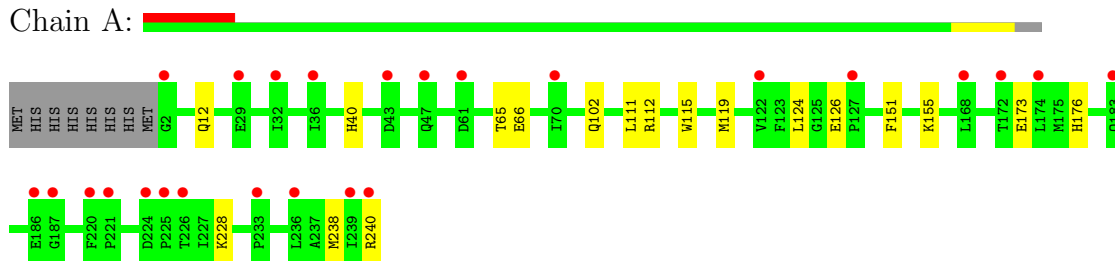
Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
3	A	175	Total	O	0	0
			175	175		
3	B	173	Total	O	0	0
			173	173		
3	C	190	Total	O	0	0
			190	190		
3	D	181	Total	O	0	0
			181	181		

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.

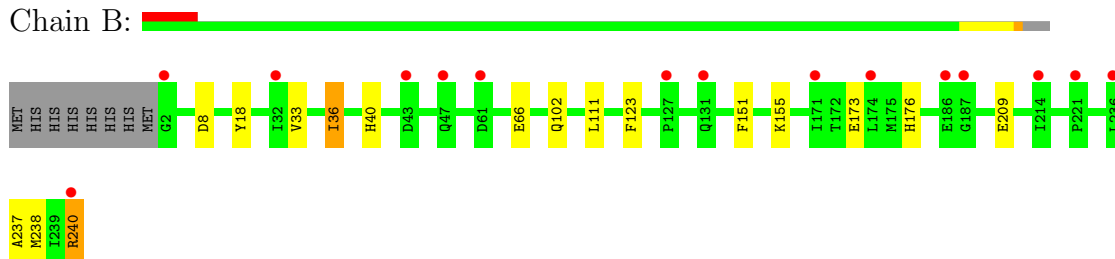
• Molecule 1: GLUTATHIONE S-TRANSFERASE THETA 1

Chain A:



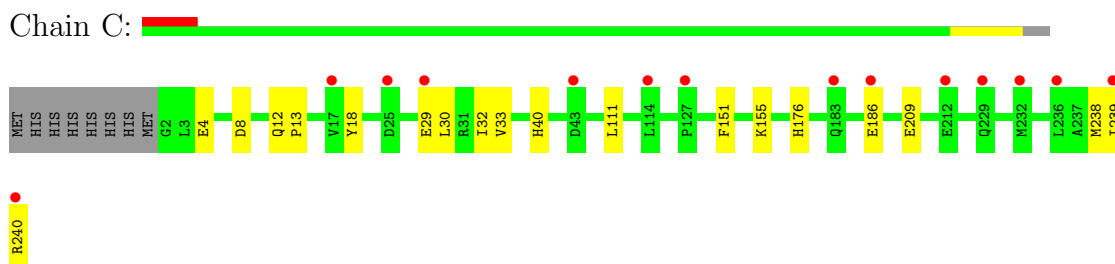
• Molecule 1: GLUTATHIONE S-TRANSFERASE THETA 1

Chain B:



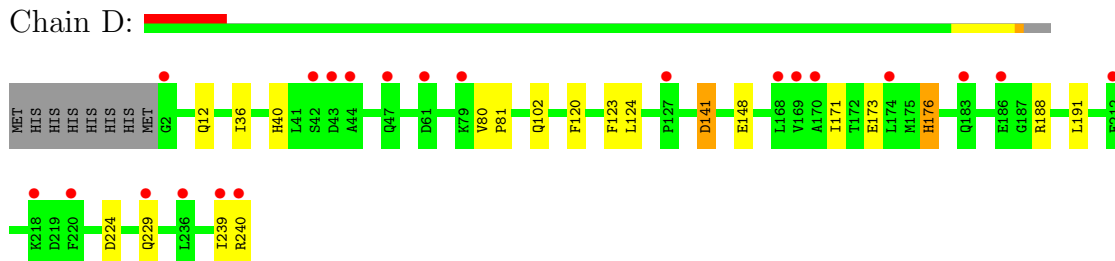
• Molecule 1: GLUTATHIONE S-TRANSFERASE THETA 1

Chain C:



• Molecule 1: GLUTATHIONE S-TRANSFERASE THETA 1

Chain D:



4 Data and refinement statistics

Property	Value	Source
Space group	P 21 21 2	Depositor
Cell constants a, b, c, α , β , γ	164.58Å 110.99Å 56.30Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	30.00 – 1.50 27.74 – 1.50	Depositor EDS
% Data completeness (in resolution range)	97.7 (30.00-1.50) 98.1 (27.74-1.50)	Depositor EDS
R_{merge}	0.07	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	3.80 (at 1.50Å)	Xtriage
Refinement program	REFMAC 5.2.0005	Depositor
R, R_{free}	0.214 , 0.246 0.215 , (Not available)	Depositor DCC
R_{free} test set	No test flags present.	DCC
Wilson B-factor (Å ²)	20.4	Xtriage
Anisotropy	0.080	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.40 , 42.0	EDS
Estimated twinning fraction	No twinning to report.	Xtriage
L-test for twinning	$\langle L \rangle = 0.50$, $\langle L^2 \rangle = 0.33$	Xtriage
Outliers	1 of 162276 reflections (0.001%)	Xtriage
F_o, F_c correlation	0.96	EDS
Total number of atoms	8490	wwPDB-VP
Average B, all atoms (Å ²)	24.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 4.68% of the height of the origin peak. No significant pseudotranslation is detected.*

¹Intensities estimated from amplitudes.

5 Model quality

5.1 Standard geometry

Bond lengths and bond angles in the following residue types are not validated in this section: IOD

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	0.52	0/2004	0.64	0/2724
1	B	0.52	0/2003	0.65	0/2724
1	C	0.55	0/2013	0.67	0/2736
1	D	0.54	0/1996	0.67	0/2714
All	All	0.53	0/8016	0.66	0/10898

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

There are no planarity outliers.

5.2 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 hydrogens added by MolProbity. The Clashes column lists the number of clashes within the asymmetric unit, and the number in parentheses is this value normalized per 1000 atoms of the molecule in the chain. The Symm-Clashes column gives symmetry related clashes, in the same way as for the Clashes column.

Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
1	A	1939	0	1989	14	0
1	B	1938	0	1987	10	0
1	C	1944	0	1993	13	0
1	D	1935	0	1984	14	0
2	A	4	0	0	0	0
2	B	4	0	0	1	0
2	C	3	0	0	0	0
2	D	4	0	0	0	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
3	A	175	0	0	0	0
3	B	173	0	0	1	0
3	C	190	0	0	1	0
3	D	181	0	0	3	0
All	All	8490	0	7953	52	0

Clashscore is defined as the number of clashes calculated for the entry per 1000 atoms (including hydrogens) of the entry. The overall clashscore for this entry is 3.

All (52) close contacts within the same asymmetric unit are listed below.

Atom-1	Atom-2	Distance(Å)	Clash(Å)
1:A:111:LEU:HD21	1:A:238[A]:MET:HG2	1.46	0.97
1:C:4:GLU:HG2	1:C:29:GLU:HG3	1.56	0.87
1:B:111:LEU:HD21	1:B:238[A]:MET:HG2	1.66	0.77
1:B:111:LEU:HD21	1:B:238[B]:MET:HG3	1.68	0.75
2:B:403:IOD:I	3:B:2173:HOH:O	2.76	0.73
1:A:112:ARG:NH1	1:A:240:ARG:OXT	2.24	0.71
1:C:111:LEU:HD21	1:C:238[B]:MET:HG2	1.77	0.66
1:B:36:ILE:HG13	1:B:123:PHE:CZ	2.34	0.63
1:A:124:LEU:O	1:A:228:LYS:HD2	1.99	0.62
1:A:40:HIS:H	1:A:40:HIS:CD2	2.16	0.62
1:C:186:GLU:HA	1:C:186:GLU:OE1	2.02	0.59
1:D:141:ASP:CG	1:D:188[A]:ARG:HH22	2.07	0.58
1:A:12:GLN:HG3	1:A:173:GLU:HA	1.85	0.58
1:A:111:LEU:HD21	1:A:238[B]:MET:HG2	1.86	0.56
1:B:40:HIS:H	1:B:40:HIS:CD2	2.24	0.55
1:D:240:ARG:NH1	3:D:2180:HOH:O	2.31	0.54
1:C:239:ILE:HG13	1:C:240:ARG:H	1.73	0.51
1:C:18:TYR:OH	1:C:209:GLU:OE2	2.30	0.49
1:D:120:PHE:CD2	1:D:124:LEU:HD12	2.47	0.49
1:B:18:TYR:OH	1:B:209:GLU:OE2	2.22	0.49
1:D:40:HIS:H	1:D:40:HIS:CD2	2.30	0.48
1:C:239:ILE:HG13	1:C:240:ARG:N	2.29	0.48
1:D:240:ARG:HB2	3:D:2179:HOH:O	2.14	0.48
1:D:36:ILE:HG23	1:D:123:PHE:CE1	2.49	0.48
1:C:111:LEU:HD21	1:C:238[A]:MET:HG2	1.96	0.47
1:C:240:ARG:NH1	3:C:2190:HOH:O	2.35	0.47
1:D:12:GLN:HG3	1:D:176:HIS:CE1	2.49	0.47
1:B:8:ASP:HB2	1:B:33:VAL:O	2.15	0.47
1:A:124:LEU:HD22	1:A:228:LYS:HG3	1.97	0.47
1:A:40:HIS:H	1:A:40:HIS:HD2	1.63	0.46
1:C:30:LEU:HD21	1:C:32:ILE:HD11	1.97	0.46

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Atom-1	Atom-2	Distance(Å)	Clash(Å)
1:B:237:ALA:O	1:B:240:ARG:HD3	2.15	0.46
1:A:126:GLU:OE2	1:A:228:LYS:NZ	2.48	0.46
1:D:239:ILE:HG13	1:D:240:ARG:N	2.29	0.46
1:C:40:HIS:H	1:C:40:HIS:CD2	2.33	0.46
1:C:151:PHE:O	1:C:155:LYS:NZ	2.49	0.45
1:D:188[A]:ARG:HD3	1:D:191:LEU:HD12	1.99	0.44
1:C:12:GLN:HB2	1:C:13:PRO:CD	2.48	0.43
1:C:8:ASP:HB2	1:C:33:VAL:O	2.18	0.43
1:D:229:GLN:HG2	3:D:2172:HOH:O	2.19	0.43
1:D:171:ILE:HA	1:D:171:ILE:HD12	1.86	0.42
1:D:148:GLU:HG2	1:D:191:LEU:HG	2.00	0.42
1:D:80:VAL:HB	1:D:81:PRO:HD2	2.02	0.42
1:B:36:ILE:HG13	1:B:123:PHE:CE1	2.54	0.42
1:B:151:PHE:O	1:B:155:LYS:NZ	2.52	0.42
1:A:115:TRP:HA	1:A:119[B]:MET:HB2	2.02	0.41
1:B:102:GLN:OE1	1:B:173:GLU:OE2	2.39	0.41
1:D:102:GLN:OE1	1:D:173:GLU:OE2	2.39	0.40
1:A:151:PHE:O	1:A:155:LYS:NZ	2.55	0.40
1:A:102:GLN:OE1	1:A:173:GLU:OE2	2.39	0.40
1:A:65:THR:O	1:A:66:GLU:HB2	2.22	0.40

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	241/247 (98%)	236 (98%)	5 (2%)	0	100	100
1	B	241/247 (98%)	236 (98%)	4 (2%)	1 (0%)	43	15
1	C	242/247 (98%)	238 (98%)	4 (2%)	0	100	100
1	D	240/247 (97%)	233 (97%)	7 (3%)	0	100	100
All	All	964/988 (98%)	943 (98%)	20 (2%)	1 (0%)	59	28

All (1) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	B	66	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	210/214 (98%)	209 (100%)	1 (0%)	94	83
1	B	210/214 (98%)	207 (99%)	3 (1%)	78	51
1	C	211/214 (99%)	210 (100%)	1 (0%)	94	83
1	D	209/214 (98%)	206 (99%)	3 (1%)	78	51
All	All	840/856 (98%)	832 (99%)	8 (1%)	85	65

All (8) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	176	HIS
1	B	36	ILE
1	B	176	HIS
1	B	240	ARG
1	C	176	HIS
1	D	141	ASP
1	D	176	HIS
1	D	224	ASP

Some sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (5) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	40	HIS
1	A	103	HIS
1	B	40	HIS
1	C	40	HIS
1	D	40	HIS

5.3.3 RNA ⓘ

There are no RNA chains 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 ⓘ

Of 15 ligands modelled in this entry, 15 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.

5.7 Other polymers ⓘ

There are no such residues in this entry.

5.8 Polymer linkage issues

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	239/247 (96%)	0.73	25 (10%) 7 7	12, 23, 36, 52	0
1	B	239/247 (96%)	0.52	15 (6%) 19 21	13, 22, 34, 38	0
1	C	239/247 (96%)	0.47	14 (5%) 22 23	12, 21, 34, 45	0
1	D	239/247 (96%)	0.62	21 (8%) 10 11	13, 22, 34, 42	0
All	All	956/988 (96%)	0.58	75 (7%) 13 14	12, 22, 35, 52	0

All (75) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	43	ASP	5.5
1	D	183	GLN	5.1
1	C	183	GLN	4.8
1	D	43	ASP	4.7
1	B	43	ASP	4.6
1	D	79	LYS	4.5
1	A	239	ILE	4.2
1	D	186	GLU	4.1
1	C	239	ILE	4.1
1	A	186	GLU	4.1
1	C	186	GLU	3.9
1	B	236	LEU	3.8
1	C	240	ARG	3.5
1	D	127	PRO	3.5
1	D	61	ASP	3.5
1	A	236	LEU	3.4
1	C	43	ASP	3.4
1	B	2	GLY	3.4
1	D	2	GLY	3.3
1	A	240	ARG	3.3
1	B	61	ASP	3.2

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Mol	Chain	Res	Type	RSRZ
1	B	186	GLU	3.1
1	A	47	GLN	3.1
1	A	2	GLY	3.1
1	D	240	ARG	3.1
1	C	229	GLN	3.0
1	B	127	PRO	3.0
1	A	220	PHE	2.9
1	D	44	ALA	2.8
1	A	32	ILE	2.8
1	D	212	GLU	2.8
1	A	36	ILE	2.7
1	C	127	PRO	2.7
1	A	224	ASP	2.7
1	A	183	GLN	2.7
1	A	122	VAL	2.6
1	B	47	GLN	2.6
1	C	236	LEU	2.6
1	C	29	GLU	2.6
1	A	221	PRO	2.6
1	B	240	ARG	2.6
1	D	47	GLN	2.6
1	B	32	ILE	2.5
1	B	214	ILE	2.5
1	D	239	ILE	2.5
1	B	187	GLY	2.5
1	A	61	ASP	2.5
1	D	220	PHE	2.4
1	D	168	LEU	2.4
1	A	226	THR	2.4
1	A	174	LEU	2.4
1	B	221	PRO	2.3
1	A	233	PRO	2.3
1	B	174	LEU	2.3
1	D	229	GLN	2.3
1	D	174	LEU	2.3
1	D	42	SER	2.2
1	A	168	LEU	2.2
1	D	236	LEU	2.2
1	A	70	ILE	2.2
1	B	171	ILE	2.2
1	D	169	VAL	2.2
1	A	127	PRO	2.2

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Mol	Chain	Res	Type	RSRZ
1	A	225	PRO	2.1
1	D	218	LYS	2.1
1	C	232	MET	2.1
1	C	114	LEU	2.1
1	A	29	GLU	2.1
1	C	17	VAL	2.1
1	A	172	THR	2.0
1	A	187	GLY	2.0
1	B	131	GLN	2.0
1	C	25	ASP	2.0
1	C	212	GLU	2.0
1	D	170	ALA	2.0

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

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

6.3 Carbohydrates ⓘ

There are no carbohydrates in this entry.

6.4 Ligands ⓘ

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	RSR	LLDF	B-factors(Å ²)	Q<0.9
2	IOD	D	404	1/1	0.15	2.81	57,57,57,57	0
2	IOD	A	404	1/1	0.16	1.08	44,44,44,44	0
2	IOD	D	403	1/1	0.10	1.05	46,46,46,46	0
2	IOD	C	403	1/1	0.14	0.92	41,41,41,41	0
2	IOD	D	401	1/1	0.12	0.74	52,52,52,52	0
2	IOD	B	403	1/1	0.12	0.34	53,53,53,53	0
2	IOD	B	401	1/1	0.10	-0.13	49,49,49,49	0
2	IOD	C	401	1/1	0.12	-0.35	44,44,44,44	0
2	IOD	C	402	1/1	0.09	-0.70	54,54,54,54	0

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Mol	Type	Chain	Res	Atoms	RSR	LLDF	B-factors(\AA^2)	Q<0.9
2	IOD	A	403	1/1	0.07	-0.88	38,38,38,38	0
2	IOD	D	402	1/1	0.08	-1.34	58,58,58,58	0
2	IOD	B	402	1/1	0.08	-1.95	59,59,59,59	0
2	IOD	B	404	1/1	0.03	-2.14	26,26,26,26	0
2	IOD	A	402	1/1	0.06	-2.55	76,76,76,76	0
2	IOD	A	401	1/1	0.08	-2.66	49,49,49,49	0

6.5 Other polymers ⓘ

There are no such residues in this entry.