



wwPDB X-ray Structure Validation Summary Report ⓘ

Feb 1, 2016 – 06:39 AM GMT

PDB ID : 2XTA
Title : CRYSTAL STRUCTURE OF THE SUCA DOMAIN OF MYCOBACTERIUM SMEGMATIS ALPHA-KETOGLUTARATE DECARBOXYLASE IN COMPLEX WITH ACETYL-COA (TRICLINIC FORM)
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Deposited on : 2010-10-05
Resolution : 2.20 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
<http://wwpdb.org/validation/2016/XrayValidationReportHelp>
with specific help available everywhere you see the ⓘ symbol.

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

MolProbity : 4.02b-467
Mogul : 1.7 (RC4), CSD as536be (2015)
Xtriage (Phenix) : 1.9-1692
EDS : rb-20026688
Percentile statistics : 20151230.v01 (using entries in the PDB archive December 30th 2015)
Refmac : 5.8.0135
CCP4 : 6.5.0
Ideal geometry (proteins) : Engh & Huber (2001)
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP) : trunk26865

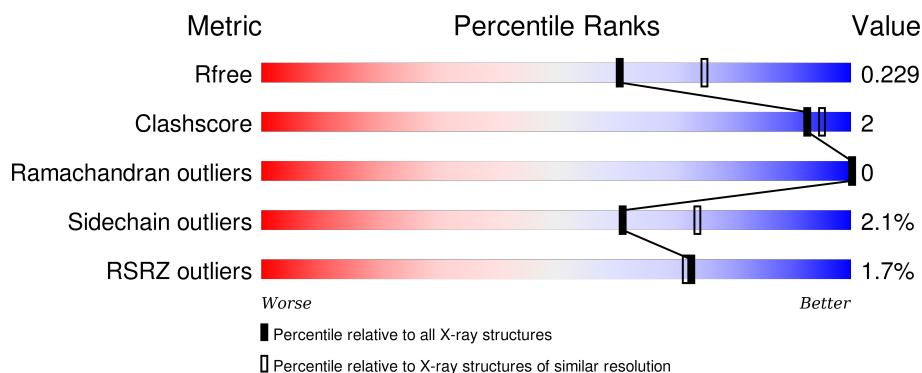
1 Overall quality at a glance ⓘ

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 2.20 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}	91344	3774 (2.20-2.20)
Clashscore	102246	4477 (2.20-2.20)
Ramachandran outliers	100387	4404 (2.20-2.20)
Sidechain outliers	100360	4405 (2.20-2.20)
RSRZ outliers	91569	3781 (2.20-2.20)

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. 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	868	<div> <div>2%</div> <div>88% 7% 5%</div> </div>
1	B	868	<div> <div>2%</div> <div>89% 5% 6%</div> </div>
1	C	868	<div> <div>2%</div> <div>88% 6% 6%</div> </div>
1	D	868	<div> <div>2%</div> <div>88% 6% 6%</div> </div>

2 Entry composition

There are 6 unique types of molecules in this entry. The entry contains 26097 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.

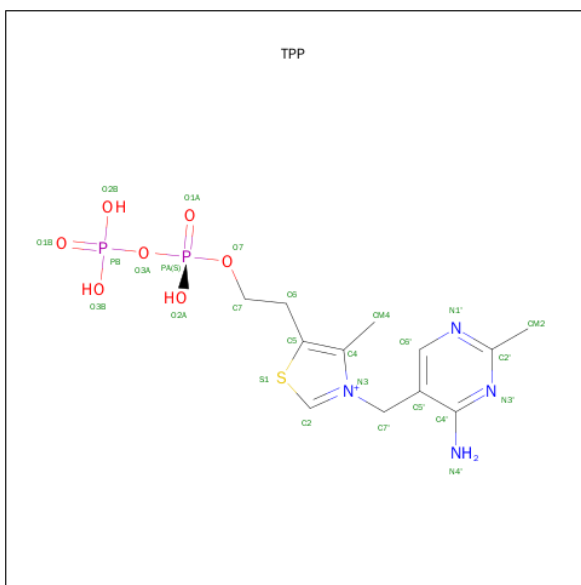
- Molecule 1 is a protein called 2-OXOGLUTARATE DECARBOXYLASE.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	826	Total	C	N	O	S	0	0	0
			6360	4007	1128	1202	23			
1	B	814	Total	C	N	O	S	0	0	0
			6223	3925	1105	1169	24			
1	C	817	Total	C	N	O	S	0	0	0
			6309	3980	1112	1193	24			
1	D	818	Total	C	N	O	S	0	0	0
			6252	3939	1105	1184	24			

There are 4 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	360	GLY	-	EXPRESSION TAG	UNP A0R2B1
B	360	GLY	-	EXPRESSION TAG	UNP A0R2B1
C	360	GLY	-	EXPRESSION TAG	UNP A0R2B1
D	360	GLY	-	EXPRESSION TAG	UNP A0R2B1

- Molecule 2 is THIAMINE DIPHOSPHATE (three-letter code: TPP) (formula: C₁₂H₁₉N₄O₇P₂S).



Mol	Chain	Residues	Atoms						ZeroOcc	AltConf
2	A	1	Total 26	C 12	N 4	O 7	P 2	S 1	0	0
2	B	1	Total 26	C 12	N 4	O 7	P 2	S 1	0	0
2	C	1	Total 26	C 12	N 4	O 7	P 2	S 1	0	0
2	D	1	Total 26	C 12	N 4	O 7	P 2	S 1	0	0

- Molecule 3 is MAGNESIUM ION (three-letter code: MG) (formula: Mg).

Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
3	B	1	Total Mg 1 1	0	0
3	A	1	Total Mg 1 1	0	0
3	D	1	Total Mg 1 1	0	0
3	C	1	Total Mg 1 1	0	0

- Molecule 4 is CALCIUM ION (three-letter code: CA) (formula: Ca).

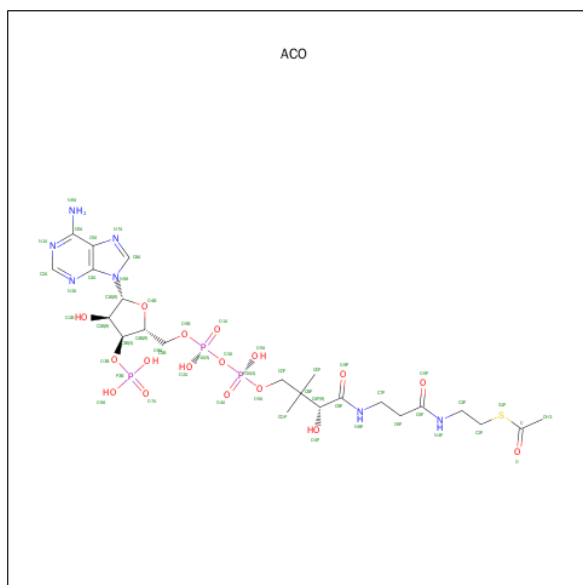
Mol	Chain	Residues	Atoms	ZeroOcc	AltConf
4	B	1	Total Ca 1 1	0	0

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Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
4	A	1	Total	Ca	0	0
			1	1		
4	D	1	Total	Ca	0	0
			1	1		
4	C	1	Total	Ca	0	0
			1	1		

- Molecule 5 is ACETYL COENZYME *A (three-letter code: ACO) (formula: $C_{23}H_{38}N_7O_{17}P_3S$).



Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
5	A	1	Total	C	N	O	P	0	0
			33	12	5	13	3		
5	C	1	Total	C	N	O	P	0	0
			33	12	5	13	3		
5	D	1	Total	C	N	O	P	0	0
			33	12	5	13	3		

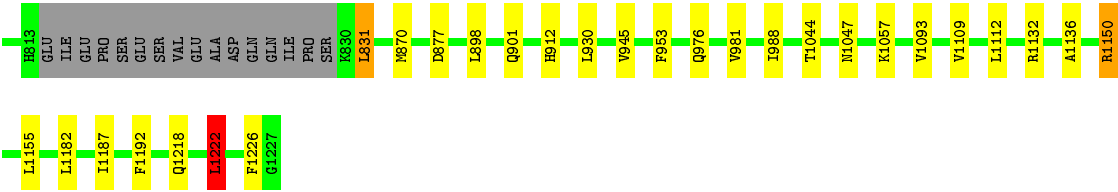
- Molecule 6 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
6	A	190	Total	O	0	0
			190	190		
6	B	186	Total	O	0	0
			186	186		
6	C	183	Total	O	0	0
			183	183		

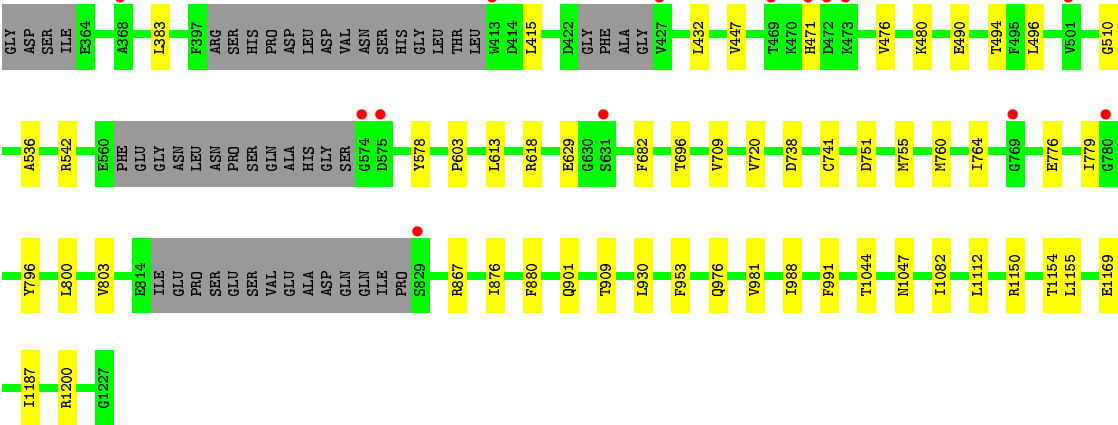
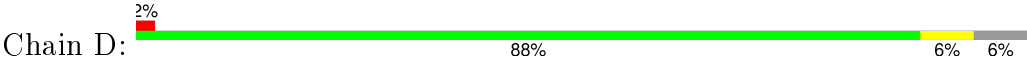
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Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
6	D	183	Total 183	O 183	0	0



• Molecule 1: 2-OXOGLUTARATE DECARBOXYLASE



4 Data and refinement statistics

Property	Value	Source
Space group	P 1	Depositor
Cell constants a, b, c, α , β , γ	80.55Å 83.58Å 160.07Å 99.59° 98.94° 100.68°	Depositor
Resolution (Å)	78.11 – 2.20 78.12 – 2.20	Depositor EDS
% Data completeness (in resolution range)	93.1 (78.11-2.20) 86.6 (78.12-2.20)	Depositor EDS
R_{merge}	0.07	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	1.91 (at 2.20Å)	Xtriage
Refinement program	BUSTER 2.9.3	Depositor
R, R_{free}	0.188 , 0.214 0.202 , 0.229	Depositor DCC
R_{free} test set	9386 reflections (5.26%)	DCC
Wilson B-factor (Å ²)	31.4	Xtriage
Anisotropy	0.617	Xtriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.33 , 54.6	EDS
Estimated twinning fraction	0.022 for -k,-h,-l	Xtriage
L-test for twinning ²	$\langle L \rangle = 0.46$, $\langle L^2 \rangle = 0.29$	Xtriage
Outliers	0 of 187764 reflections	Xtriage
F_o, F_c correlation	0.94	EDS
Total number of atoms	26097	wwPDB-VP
Average B, all atoms (Å ²)	43.0	wwPDB-VP

Xtriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 11.40% 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, 0.375 respectively for untwinned datasets, and 0.333, 0.2 for perfectly twinned datasets.

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: CA, ACO, MG, TPP

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	0/6492	0.62	0/8818
1	B	0.50	0/6349	0.63	0/8623
1	C	0.51	0/6438	0.63	1/8737 (0.0%)
1	D	0.51	0/6377	0.63	0/8656
All	All	0.51	0/25656	0.63	1/34834 (0.0%)

There are no bond length outliers.

All (1) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	C	1222	LEU	CB-CG-CD1	5.12	119.70	111.00

There are no chirality outliers.

There are no planarity outliers.

5.2 Too-close contacts [i](#)

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	6360	0	6105	27	0
1	B	6223	0	5967	23	0
1	C	6309	0	6084	25	0
1	D	6252	0	5998	27	0
2	A	26	0	16	2	0
2	B	26	0	16	2	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
2	C	26	0	16	1	0
2	D	26	0	16	1	0
3	A	1	0	0	0	0
3	B	1	0	0	0	0
3	C	1	0	0	0	0
3	D	1	0	0	0	0
4	A	1	0	0	0	0
4	B	1	0	0	0	0
4	C	1	0	0	0	0
4	D	1	0	0	0	0
5	A	33	0	13	0	0
5	C	33	0	13	0	0
5	D	33	0	13	0	0
6	A	190	0	0	1	0
6	B	186	0	0	0	0
6	C	183	0	0	0	0
6	D	183	0	0	1	0
All	All	26097	0	24257	100	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 2.

The worst 5 of 100 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:B:641:MET:HE3	1:B:643:HIS:HE1	1.40	0.84
1:B:641:MET:CE	1:B:643:HIS:HE1	1.94	0.80
1:B:641:MET:CE	1:B:643:HIS:CE1	2.65	0.79
1:B:641:MET:HE2	1:B:643:HIS:CE1	2.21	0.75
1:A:1044:THR:HG22	1:A:1047:ASN:H	1.54	0.70

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	818/868 (94%)	800 (98%)	18 (2%)	0	100	100
1	B	804/868 (93%)	786 (98%)	18 (2%)	0	100	100
1	C	805/868 (93%)	789 (98%)	16 (2%)	0	100	100
1	D	808/868 (93%)	792 (98%)	16 (2%)	0	100	100
All	All	3235/3472 (93%)	3167 (98%)	68 (2%)	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	649/726 (89%)	633 (98%)	16 (2%)	55	67
1	B	628/726 (86%)	615 (98%)	13 (2%)	61	74
1	C	648/726 (89%)	633 (98%)	15 (2%)	58	71
1	D	634/726 (87%)	625 (99%)	9 (1%)	74	85
All	All	2559/2904 (88%)	2506 (98%)	53 (2%)	61	74

5 of 53 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	B	909	THR
1	C	471	HIS
1	D	909	THR
1	B	930	LEU
1	B	976	GLN

Some sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (2) such sidechains are listed below:

Mol	Chain	Res	Type
1	C	912	HIS
1	C	1030	GLN

5.3.3 RNA ⓘ

There are no RNA molecules 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, 8 are monoatomic - leaving 7 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$
2	TPP	A	2001	3	20,27,27	2.01	2 (10%)	31,40,40	1.88	9 (29%)
5	ACO	A	2004	-	28,35,53	1.70	5 (17%)	34,54,79	2.87	6 (17%)
2	TPP	B	2001	3	20,27,27	1.95	2 (10%)	31,40,40	1.79	7 (22%)
2	TPP	C	2001	3	20,27,27	2.20	2 (10%)	31,40,40	1.84	8 (25%)
5	ACO	C	2004	-	28,35,53	1.51	6 (21%)	34,54,79	2.79	7 (20%)
2	TPP	D	2001	3	20,27,27	2.31	2 (10%)	31,40,40	1.66	6 (19%)
5	ACO	D	2004	-	28,35,53	1.60	6 (21%)	34,54,79	2.80	7 (20%)

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	TPP	A	2001	3	-	0/16/17/17	0/2/2/2
5	ACO	A	2004	-	-	0/21/41/67	0/3/3/3
2	TPP	B	2001	3	-	0/16/17/17	0/2/2/2
2	TPP	C	2001	3	-	0/16/17/17	0/2/2/2
5	ACO	C	2004	-	-	0/21/41/67	0/3/3/3
2	TPP	D	2001	3	-	0/16/17/17	0/2/2/2
5	ACO	D	2004	-	-	0/21/41/67	0/3/3/3

The worst 5 of 25 bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
2	D	2001	TPP	C4-N3	-9.08	1.31	1.39
2	C	2001	TPP	C4-N3	-8.59	1.32	1.39
2	A	2001	TPP	C4-N3	-7.40	1.33	1.39
2	B	2001	TPP	C4-N3	-6.97	1.33	1.39
5	D	2004	ACO	C8A-N7A	-2.04	1.30	1.34

The worst 5 of 50 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
5	A	2004	ACO	N3A-C2A-N1A	-12.01	119.69	128.89
5	D	2004	ACO	N3A-C2A-N1A	-11.42	120.15	128.89
5	C	2004	ACO	N3A-C2A-N1A	-11.34	120.21	128.89
5	C	2004	ACO	C2B-C1B-N9A	-6.89	103.76	114.29
5	A	2004	ACO	C2B-C1B-N9A	-6.66	104.12	114.29

There are no chirality outliers.

There are no torsion outliers.

There are no ring outliers.

4 monomers are involved in 6 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
2	A	2001	TPP	2	0
2	B	2001	TPP	2	0
2	C	2001	TPP	1	0
2	D	2001	TPP	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 [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	826/868 (95%)	-0.11	13 (1%) 74 73	23, 40, 81, 111	0
1	B	814/868 (93%)	-0.12	15 (1%) 71 70	21, 41, 80, 108	0
1	C	817/868 (94%)	-0.13	14 (1%) 73 72	20, 39, 78, 105	0
1	D	818/868 (94%)	-0.12	14 (1%) 73 72	18, 39, 78, 107	0
All	All	3275/3472 (94%)	-0.12	56 (1%) 73 72	18, 40, 79, 111	0

The worst 5 of 56 RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	D	472	ASP	8.6
1	A	813	HIS	5.0
1	C	401	PRO	4.1
1	B	472	ASP	4.0
1	D	829	SER	3.9

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 carbohydrates 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. 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	RSCC	RSR	LLDF	B-factors(\AA^2)	Q<0.9
5	ACO	D	2004	33/51	0.87	0.16	1.11	53,75,91,92	0
2	TPP	D	2001	26/26	0.98	0.13	0.50	18,27,40,55	0
2	TPP	B	2001	26/26	0.98	0.13	0.30	18,30,44,50	0
3	MG	A	2002	1/1	0.98	0.12	0.23	18,18,18,18	0
2	TPP	A	2001	26/26	0.99	0.12	0.02	19,28,38,50	0
2	TPP	C	2001	26/26	0.99	0.12	-0.24	18,30,43,49	0
5	ACO	A	2004	33/51	0.92	0.13	-0.40	47,60,77,77	0
5	ACO	C	2004	33/51	0.95	0.11	-0.54	43,54,78,82	0
4	CA	B	2003	1/1	0.96	0.09	-1.11	74,74,74,74	0
3	MG	C	2002	1/1	0.99	0.09	-1.14	18,18,18,18	0
4	CA	D	2003	1/1	0.94	0.10	-1.20	57,57,57,57	0
4	CA	C	2003	1/1	0.94	0.07	-2.81	55,55,55,55	0
3	MG	B	2002	1/1	0.98	0.05	-3.75	23,23,23,23	0
4	CA	A	2003	1/1	0.90	0.05	-3.86	75,75,75,75	0
3	MG	D	2002	1/1	0.97	0.05	-5.16	23,23,23,23	0

6.5 Other polymers [i](#)

There are no such residues in this entry.