



wwPDB X-ray Structure Validation Summary Report ⓘ

Feb 1, 2016 – 11:58 PM GMT

PDB ID : 6GSW
Title : FIRST-SPHERE AND SECOND-SPHERE ELECTROSTATIC EFFECTS IN
THE ACTIVE SITE OF A CLASS MU GLUTATHIONE TRANSFERASE
Authors : Xiao, G.; Ji, X.; Armstrong, R.N.; Gilliland, G.L.
Deposited on : 1996-01-26
Resolution : 1.85 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) : **NOT EXECUTED**
EDS : **NOT EXECUTED**
Percentile statistics : 20151230.v01 (using entries in the PDB archive December 30th 2015)
Ideal geometry (proteins) : Engh & Huber (2001)
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP) : trunk26865

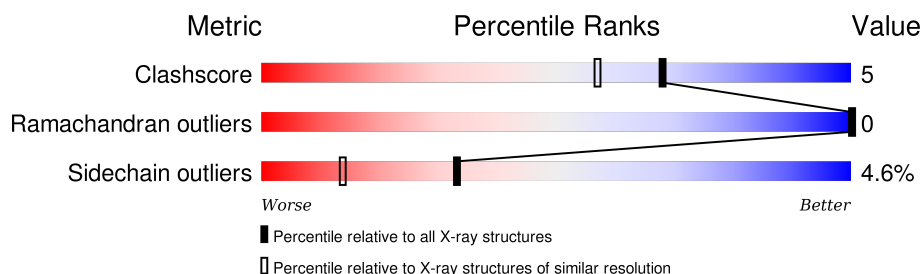
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 1.85 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	102246	1898 (1.86-1.86)
Ramachandran outliers	100387	1875 (1.86-1.86)
Sidechain outliers	100360	1875 (1.86-1.86)

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.

Note EDS was not executed.

Mol	Chain	Length	Quality of chain
1	A	217	
1	B	217	

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	GPS	A	221	X	-	-	-
3	GPS	B	218	X	-	-	-

2 Entry composition [i](#)

There are 4 unique types of molecules in this entry. The entry contains 4045 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.

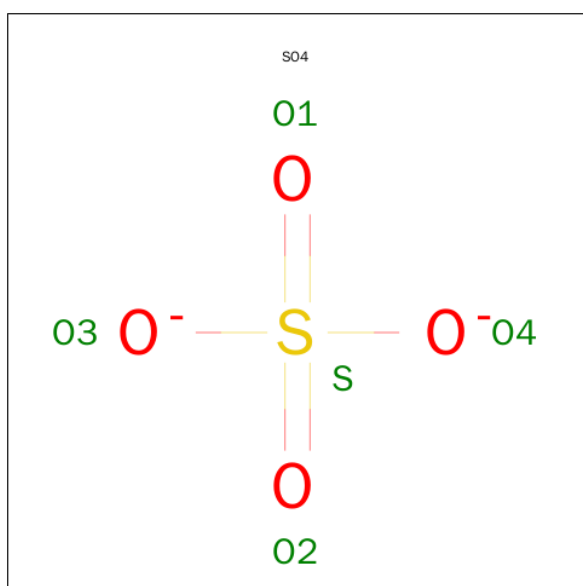
- Molecule 1 is a protein called MU CLASS GLUTATHIONE S-TRANSFERASE OF ISOENZYME 3-3.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
1	A	217	Total	C	N	O	S	0	0	0
			1818	1178	303	326	11			
1	B	217	Total	C	N	O	S	0	0	0
			1818	1178	303	326	11			

There are 2 discrepancies between the modelled and reference sequences:

Chain	Residue	Modelled	Actual	Comment	Reference
A	13	VAL	THR	ENGINEERED	UNP P04905
B	13	VAL	THR	ENGINEERED	UNP P04905

- Molecule 2 is SULFATE ION (three-letter code: SO₄) (formula: O₄S).



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

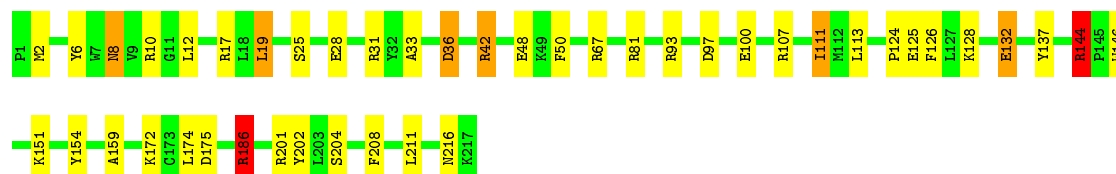
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Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
2	A	1	Total 5	O 4	S 1	0	0
2	A	1	Total 5	O 4	S 1	0	0

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- The chemical structure of GPS (Guanosine Phosphate) is shown. It consists of a guanine base (a fused bicyclic system with a carbonyl group and an amino group) linked to a ribose sugar (a five-membered ring with hydroxyl groups). The sugar is further linked to a phosphate group (a phosphorus atom bonded to four oxygen atoms). The structure is labeled with atom names and numbers, and the overall molecule is identified as GPS.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf
3	A	1	Total 35	C 24	N 3	O 7	S 1	0	0
3	B	1	Total 35	C 24	N 3	O 7	S 1	0	0

- | Mol | Chain | Residues | Atoms | ZeroOcc | AltConf |
|-----|-------|----------|--------------------|---------|---------|
| 4 | A | 196 | Total O
196 196 | 0 | 0 |
| 4 | B | 128 | Total O
128 128 | 0 | 0 |



4 Data and refinement statistics

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

Property	Value	Source
Space group	C 1 2 1	Depositor
Cell constants a, b, c, α , β , γ	88.53 Å 69.28 Å 81.41 Å 90.00° 105.74° 90.00°	Depositor
Resolution (Å)	6.00 – 1.85	Depositor
% Data completeness (in resolution range)	84.2 (6.00-1.85)	Depositor
R_{merge}	0.09	Depositor
R_{sym}	(Not available)	Depositor
Refinement program	GPRLSA	Depositor
R, R_{free}	0.163 , (Not available)	Depositor
Estimated twinning fraction	No twinning to report.	Xtriage
Total number of atoms	4045	wwPDB-VP
Average B, all atoms (Å ²)	16.0	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: SO4, GPS

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	1.03	2/1867 (0.1%)	1.71	42/2515 (1.7%)
1	B	1.03	1/1867 (0.1%)	1.90	35/2515 (1.4%)
All	All	1.03	3/3734 (0.1%)	1.81	77/5030 (1.5%)

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	A	0	2
1	B	0	3
All	All	0	5

All (3) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	B	100	GLU	CD-OE1	-6.82	1.18	1.25
1	A	100	GLU	CD-OE1	-5.87	1.19	1.25
1	A	29	GLU	CD-OE1	-5.42	1.19	1.25

The worst 5 of 77 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	B	186	ARG	NE-CZ-NH1	27.59	134.10	120.30
1	B	186	ARG	CD-NE-CZ	25.79	159.70	123.60
1	B	186	ARG	NE-CZ-NH2	-19.07	110.76	120.30
1	A	77	ARG	NE-CZ-NH1	13.85	127.22	120.30
1	B	144	ARG	NE-CZ-NH2	-12.78	113.91	120.30

There are no chirality outliers.

All (5) planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	A	144	ARG	Sidechain
1	A	186	ARG	Sidechain
1	B	144	ARG	Sidechain
1	B	42	ARG	Sidechain
1	B	67	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	1818	0	1807	20	0
1	B	1818	0	1807	13	0
2	A	15	0	0	1	0
3	A	35	0	25	1	0
3	B	35	0	25	1	0
4	A	196	0	0	3	0
4	B	128	0	0	1	0
All	All	4045	0	3664	35	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 5.

The worst 5 of 35 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:125:GLU:OE1	1:B:128:LYS:NZ	2.14	0.76
1:A:24:ASP:OD2	1:A:192:LYS:HE2	1.98	0.63
1:A:95:ARG:NH2	1:A:144:ARG:HE	1.98	0.61
1:B:125:GLU:HA	1:B:128:LYS:HE3	1.83	0.59
1:A:33:ALA:H	1:A:44:GLN:NE2	2.00	0.58

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	215/217 (99%)	212 (99%)	3 (1%)	0	100	100
1	B	215/217 (99%)	212 (99%)	3 (1%)	0	100	100
All	All	430/434 (99%)	424 (99%)	6 (1%)	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	197/197 (100%)	190 (96%)	7 (4%)	42	21
1	B	197/197 (100%)	186 (94%)	11 (6%)	26	9
All	All	394/394 (100%)	376 (95%)	18 (5%)	33	14

5 of 18 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	B	12	LEU
1	B	19	LEU
1	B	151	LYS
1	A	174	LEU
1	B	8	ASN

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

Mol	Chain	Res	Type
1	A	44	GLN
1	B	8	ASN
1	B	122	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 carbohydrates in this entry.

5.6 Ligand geometry [i](#)

5 ligands are 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	SO4	A	218	-	4,4,4	1.09	0	6,6,6	0.30	0
2	SO4	A	219	-	4,4,4	1.28	0	6,6,6	0.37	0
2	SO4	A	220	-	4,4,4	1.43	0	6,6,6	0.58	0
3	GPS	A	221	-	29,37,37	1.23	3 (10%)	35,51,51	1.85	13 (37%)
3	GPS	B	218	-	29,37,37	1.36	4 (13%)	35,51,51	1.62	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	SO4	A	218	-	-	0/0/0/0	0/0/0/0
2	SO4	A	219	-	-	0/0/0/0	0/0/0/0
2	SO4	A	220	-	-	0/0/0/0	0/0/0/0
3	GPS	A	221	-	2/2/8/10	0/21/43/43	0/3/3/3
3	GPS	B	218	-	2/2/8/10	0/21/43/43	0/3/3/3

The worst 5 of 7 bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
3	B	218	GPS	CB1-CG1	-2.20	1.45	1.52
3	B	218	GPS	C2-N3	-2.15	1.29	1.33
3	A	221	GPS	C2-N3	-2.03	1.29	1.33
3	B	218	GPS	CZ5-CH5	2.07	1.43	1.39
3	A	221	GPS	CZ5-CH5	2.18	1.43	1.39

The worst 5 of 20 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
3	A	221	GPS	CA3-N3-C2	-3.80	117.12	122.34
3	B	218	GPS	OE1-CD1-CG1	-3.27	116.34	121.98
3	A	221	GPS	O5-CA5-CB5	-3.02	104.13	110.42
3	B	218	GPS	O5-CA5-CB5	-2.96	104.27	110.42
3	B	218	GPS	CE4-CD4-CG4	-2.73	116.19	120.19

All (4) chirality outliers are listed below:

Mol	Chain	Res	Type	Atom
3	A	221	GPS	CA5
3	A	221	GPS	CA4
3	B	218	GPS	CA5
3	B	218	GPS	CA4

There are no torsion outliers.

There are no ring outliers.

3 monomers are involved in 3 short contacts:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
2	A	220	SO4	1	0
3	A	221	GPS	1	0
3	B	218	GPS	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](#)

EDS was not executed - this section will therefore be empty.

6.2 Non-standard residues in protein, DNA, RNA chains [i](#)

EDS was not executed - this section will therefore be empty.

6.3 Carbohydrates [i](#)

EDS was not executed - this section will therefore be empty.

6.4 Ligands [i](#)

EDS was not executed - this section will therefore be empty.

6.5 Other polymers [i](#)

EDS was not executed - this section will therefore be empty.