



wwPDB X-ray Structure Validation Summary Report ⓘ

May 17, 2020 – 12:33 pm BST

PDB ID : 2D3O
Title : Structure of Ribosome Binding Domain of the Trigger Factor on the 50S ribosomal subunit from *D. radiodurans*
Authors : Schluenzen, F.; Wilson, D.N.; Hansen, H.A.; Tian, P.; Harms, J.M.; McInnes, S.J.; Albrecht, R.; Buerger, J.; Wilbanks, S.M.; Fucini, P.
Deposited on : 2005-09-30
Resolution : 3.35 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

<https://www.wwpdb.org/validation/2017/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
Xtrriage (Phenix) : **NOT EXECUTED**
EDS : **NOT EXECUTED**
Percentile statistics : 20191225.v01 (using entries in the PDB archive December 25th 2019)
Ideal geometry (proteins) : Engh & Huber (2001)
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP) : 2.11

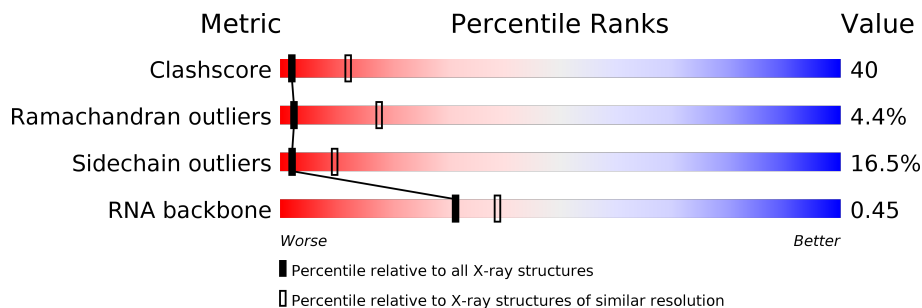
1 Overall quality at a glance

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 3.35 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	141614	1627 (3.42-3.30)
Ramachandran outliers	138981	1599 (3.42-3.30)
Sidechain outliers	138945	1598 (3.42-3.30)
RNA backbone	3102	1023 (3.80-2.92)

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 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 $\leq 5\%$.

Note EDS was not executed.

Mol	Chain	Length	Quality of chain
1	0	2880	17% (green), 59% (yellow), 18% (orange), 6% (red), 0% (grey)
2	R	95	28% (green), 52% (yellow), 17% (orange), 3% (red), 0% (grey)
3	S	115	41% (green), 42% (yellow), 13% (orange), 4% (red), 0% (grey)
4	W	67	30% (green), 54% (yellow), 13% (orange), 3% (red), 0% (grey)
5	1	112	41% (green), 39% (yellow), 9% (orange), 11% (grey)

2 Entry composition [i](#)

There are 5 unique types of molecules in this entry. The entry contains 63004 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 RNA chain called 23S RIBOSOMAL RNA.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	P			
1	0	2802	60132	26824	11089	19418	2801	0	0	0

- Molecule 2 is a protein called 50S RIBOSOMAL PROTEIN L23.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
2	R	93	726	458	136	130	2	0	0	0

- Molecule 3 is a protein called 50S RIBOSOMAL PROTEIN L24.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
3	S	110	825	513	160	151	1	0	0	0

- Molecule 4 is a protein called 50S RIBOSOMAL PROTEIN L29.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
4	W	66	533	327	107	96	3	0	0	0

- Molecule 5 is a protein called Trigger Factor.

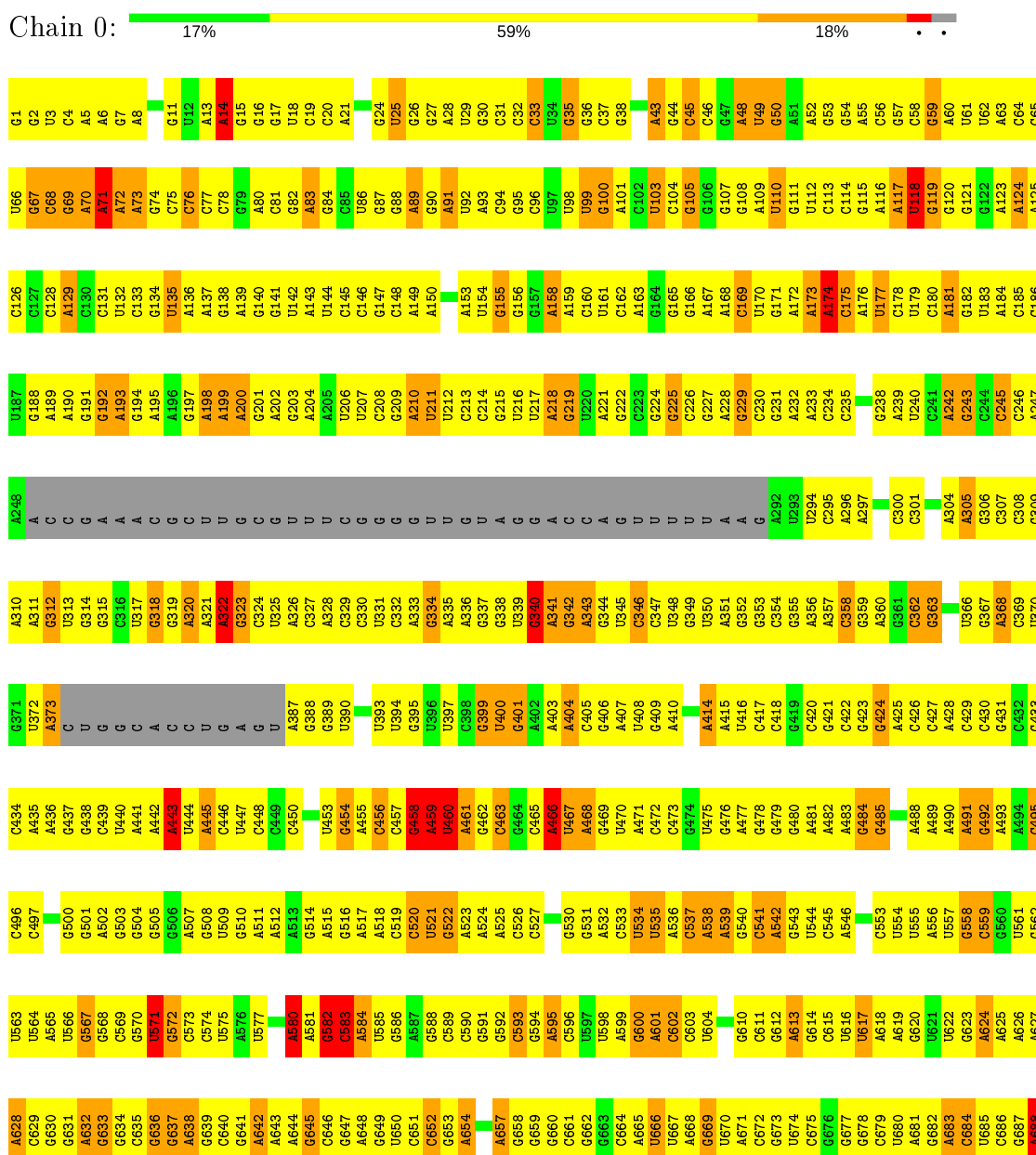
Mol	Chain	Residues	Atoms				ZeroOcc	AltConf	Trace
			Total	C	N	O			
5	1	100	788	494	146	148	0	0	0

3 Residue-property plots

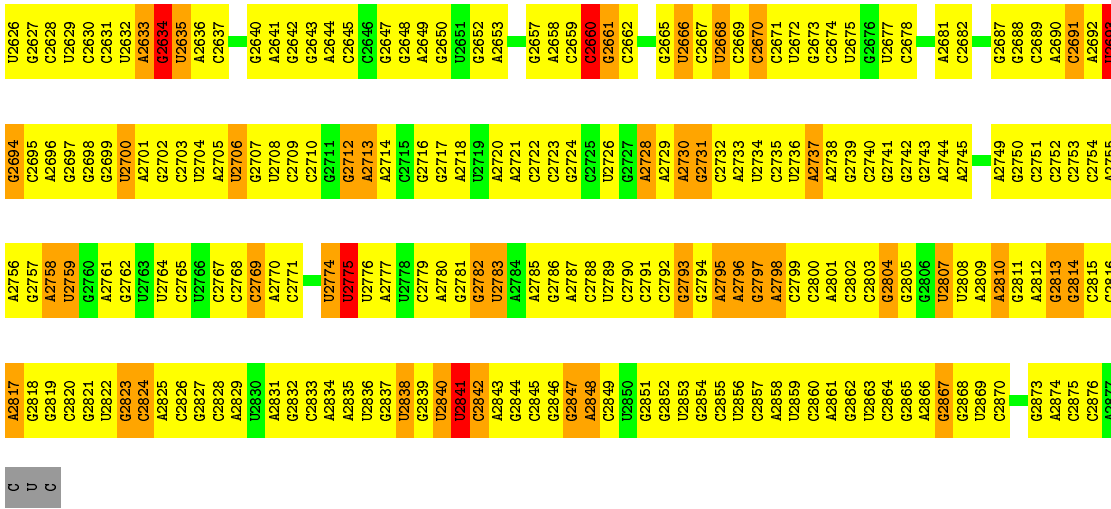
These plots are drawn for all protein, RNA and DNA chains in the entry. The first graphic for a chain summarises the proportions of the various outlier classes displayed in the second graphic. The second graphic shows the sequence view annotated by issues in geometry. Residues are color-coded according 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. 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.

Note EDS was not executed.

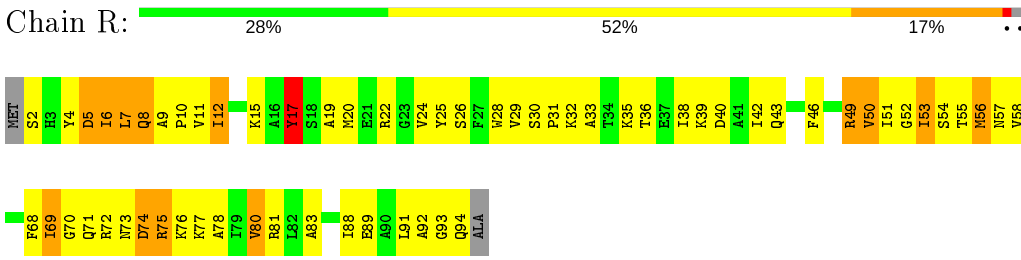
- Molecule 1: 23S RIBOSOMAL RNA



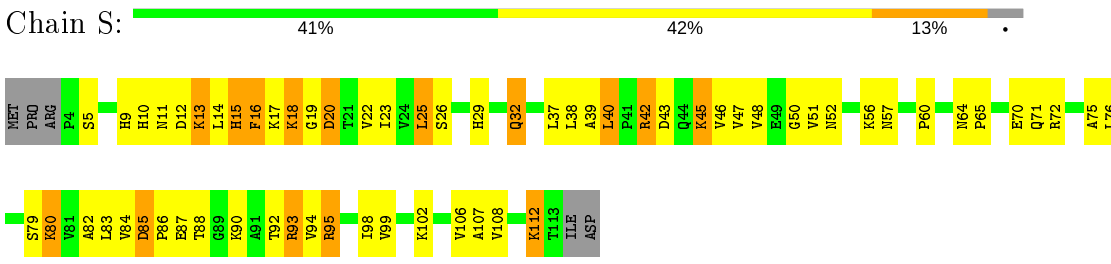
G2502	A2438	A2314	U2251	G2107	G2039	U1976	G1916	G1842	C1648
G2503	U2439	A2315	A2188	G2108	A2040	C1977	C1917	U1843	A1718
G2504	C2440	G2319	A2189	A2109	A2041	C1978	C1917	C1844	G1719
G2505	U2441	A2381	A2190	G2110	A2042	C1979	A1919	A1781	U1651
G2506	C2442	G2320	G2255	C2111	G2043	A1981	A1920	A1782	G1720
C2507	C2443	C2321	U2192	C2112	G2044	A1982	A1921	A1783	G1721
G2508	C2444	U2322	G2193	G2113	A2045	C1982	U1922	A1784	C1722
A2509	C2445	U2323	A2194	C2115	A2046	G1983	U1923	A1785	A1654
A2510	G2446	G2324	C2195	C2116	C2047	U1984	C1924	A1786	C1855
G2511	G2447	A2325	C2196	A2117	C2048	G1986	C1925	C1726	U1657
A2512	G2448	G2326	G2261	G2123	C2049	G1987	C1926	A1727	A1727
G2513	G2449	U2327	U2197	G2124	G2050	A1988	U1927	A1728	G1658
A2514	A2450	C2328	C2198	C2124	G2051	A1989	U1928	C1729	G1660
G2515	G2451	C2329	G2200	C2125	U2052	C1989	U1929	A1730	C1661
U2516	U2517	G2330	G2201	C2126	G2053	G1993	U1930	C1731	G1682
C2518	C2519	A2331	G2202	U2126	G2054	U1994	C1931	U1732	C1683
G2520	G2521	G2332	G2203	U2127	A2054	U1995	C1932	G1735	G1664
A2522	U2458	A2333	A2204	U2128	G2055	G1996	G1933	A1736	C1665
A2523	U2459	C2334	C2205	U2129	U2057	A1997	U1934	C1737	C1666
A2524	G2460	U2335	C2206	G2133	U2058	A1998	A1935	U1738	G1670
G2525	G2461	G2336	U2271	U2134	U2059	U1999	A1936	C1801	A1671
G2526	G2464	A2337	G2209	G2140	A2060	U2000	G1937	G1808	A1682
U2528	G2465	C2338	C2210	G2141	G2061	G2001	U1938	G1809	G1683
G2529	G2466	A2339	U2211	A2141	U2062	A2002	C1939	A1804	C1673
A2487	A2487	C2340	U2212	G2142	U2063	A2003	U1940	G1805	C1674
G2528	G2468	C2343	G2213	G2143	U2064	G2004	C1941	A1867	A1681
G2529	A2405	A2344	G2214	C2144	A2065	U2005	A1942	C1808	A1682
G2530	A2406	G2345	C2215	A2144	G2066	G2006	A1943	C1809	G1682
G2531	U2471	A2346	G2216	A2145	U2067	G2007	C1944	A1872	G1673
G2532	U2472	A2347	G2217	C2146	A2068	C2008	C1945	A1873	C1674
G2533	G2473	A2348	U2218	G2148	U2069	U2009	U1946	A1811	A1685
U2534	A2474	G2349	U2219	C2149	G2070	G2010	G1947	U1812	A1686
C2535	C2475	A2352	A2220	U2150	G2071	G2011	U1948	A1813	C1687
C2536	A2412	A2353	U2221	G2151	C2072	A2012	A1949	G1814	U1690
C2537	A2413	G2354	U2222	A2152	A2073	A2013	C1950	G1815	G1691
C2538	A2414	A2355	U2223	A2153	U2074	G2014	G1951	A1816	C1692
G2539	C2478	A2356	U2224	A2154	U2075	G2015	A1952	U1817	A1693
A2540	U2479	A2357	G2225	U2155	G2076	A2016	A1953	G1818	A1694
U2541	G2480	A2358	A2226	A2156	U2077	G2017	A1954	U1819	U1695
U2542	A2481	C2359	C2227	A2165	G2078	U2018	G1955	A1821	C1696
A2543	A2482	C2359	U2228	G2166	A2079	C2019	G1956	G1822	U1697
A2544	C2483	G2359	G2229	C2170	U2080	G2020	C1957	C1823	G1760
G2545	G2484	C2360	G2230	U2171	U2081	G2021	G1958	C1824	C1701
A2546	U2485	G2361	C2231	U2172	C2082	C2022	U1959	C1825	G1704
G2547	C2486	G2362	G2232	U2173	G2083	C2023	A1960	C1826	U1705
G2548	G2488	C2363	C2233	U2174	G2084	U2024	A1961	G1827	A1706
C2549	C2489	G2364	U2234	G2175	G2085	A2025	C1962	A1902	C1708
G2550	U2490	U2365	G2235	G2176	U2086	C2026	G1963	A1901	U1709
A2551	C2491	U2366	U2236	A2175	U2087	C2027	A1964	C1829	U1710
C2552	G2492	A2367	C2237	U2176	C2088	C2028	U1965	G1831	G1711
G2553	G2493	G2368	G2238	U2177	C2089	G2029	C1966	U1832	G1712
A2554	C2494	U2369	C2239	U2178	G2090	U2030	U1967	G1833	A1713
G2555	G2495	A2370	C2240	C2179	U2091	A2031	G1968	A1903	A1714
C2556	C2496	A2371	C2241	U2180	A2092	G2032	G1969	G1904	C1772
G2557	A2497	C2372	C2242	A2181	G2093	C2033	A1970	G1905	C1773
G2558	U2498	C2373	A2245	A2182	G2094	A2100	C1971	G1906	A1774
U2559	C2500	C2374	G2246	C2183	A2101	G2034	U1972	U1907	A1775
G2560	U2501	G2375	A2247	U2184	U2105	A2035	G1973	G1832	A1776
G2561	G2502	G2376	A2248	U2185	U2106	A2036	U1974	U1833	G1716
		U2377	G2313	G2186	G2106	C2038	G1975	A1915	U1778



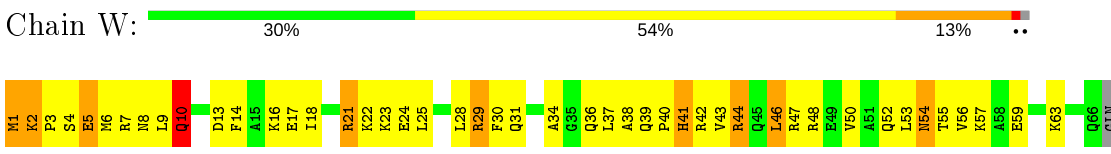
• Molecule 2: 50S RIBOSOMAL PROTEIN L23



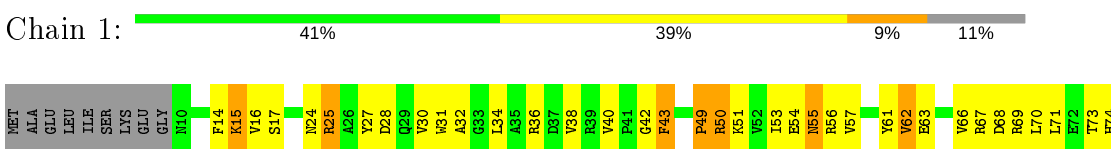
• Molecule 3: 50S RIBOSOMAL PROTEIN L24



• Molecule 4: 50S RIBOSOMAL PROTEIN L29



• Molecule 5: Trigger Factor



Y75	S76	Q77	R80	E81	V87	D88	A89	T90	V91	V96	Q97	S98	G99	Q100	A101	F102	E103	F104	T105	V106	K107	G108	E109	THR	TYR	PRO
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4 Data and refinement statistics

Xtrriage (Phenix) and EDS were not executed - this section is therefore incomplete.

Property	Value	Source
Space group	I 2 2 2	Depositor
Cell constants a, b, c, α , β , γ	169.50Å 410.50Å 695.20Å 90.00° 90.00° 90.00°	Depositor
Resolution (Å)	29.84 – 3.35	Depositor
% Data completeness (in resolution range)	(Not available) (29.84-3.35)	Depositor
R_{merge}	(Not available)	Depositor
R_{sym}	(Not available)	Depositor
Refinement program	CNS 1.1	Depositor
R, R_{free}	0.299 , 0.322	Depositor
Estimated twinning fraction	No twinning to report.	Xtrriage
Total number of atoms	63004	wwPDB-VP
Average B, all atoms (Å ²)	54.0	wwPDB-VP

5 Model quality i

5.1 Standard geometry i

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	0	0.67	3/67338 (0.0%)	0.82	72/105044 (0.1%)
2	R	0.48	0/737	0.80	0/988
3	S	0.42	0/835	0.73	1/1121 (0.1%)
4	W	0.44	0/537	0.58	0/714
5	1	0.48	0/802	0.68	0/1084
All	All	0.66	3/70249 (0.0%)	0.82	73/108951 (0.1%)

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	0	0	169
2	R	0	1
All	All	0	170

All (3) bond length outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(Å)	Ideal(Å)
1	0	2776	U	C1'-N1	6.38	1.58	1.48
1	0	2775	U	C1'-N1	6.21	1.58	1.48
1	0	567	G	C5-C6	-5.13	1.37	1.42

The worst 5 of 73 bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
1	0	2034	A	N9-C1'-C2'	10.22	127.28	114.00
1	0	1342	U	N1-C1'-C2'	9.78	126.71	114.00
1	0	1467	U	N1-C1'-C2'	8.63	125.23	114.00
1	0	2775	U	C2-N1-C1'	-8.26	107.78	117.70
1	0	1631	C	N1-C1'-C2'	8.21	124.68	114.00

There are no chirality outliers.

5 of 170 planarity outliers are listed below:

Mol	Chain	Res	Type	Group
1	0	118	U	Sidechain
1	0	14	A	Sidechain
1	0	25	U	Sidechain
1	0	43	A	Sidechain
1	0	71	A	Sidechain

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	0	60132	0	30298	3519	0
2	R	726	0	753	126	0
3	S	825	0	881	117	0
4	W	533	0	558	81	0
5	1	788	0	784	74	0
All	All	63004	0	33274	3848	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 40.

The worst 5 of 3848 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:R:69:ILE:CG2	2:R:70:GLY:H	1.26	1.38
1:0:1325:U:H1'	1:0:1619:A:N1	1.50	1.25
2:R:69:ILE:HG22	2:R:70:GLY:N	1.30	1.19
3:S:92:THR:HB	3:S:95:ARG:HH22	1.05	1.18
1:0:67:G:H21	1:0:72:A:H2'	1.09	1.16

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	
2	R	91/95 (96%)	70 (77%)	16 (18%)	5 (6%)	2	13
3	S	108/115 (94%)	79 (73%)	24 (22%)	5 (5%)	2	16
4	W	64/67 (96%)	54 (84%)	8 (12%)	2 (3%)	4	25
5	1	98/112 (88%)	81 (83%)	13 (13%)	4 (4%)	3	19
All	All	361/389 (93%)	284 (79%)	61 (17%)	16 (4%)	2	18

5 of 16 Ramachandran outliers are listed below:

Mol	Chain	Res	Type
3	S	42	ARG
3	S	65	PRO
4	W	2	LYS
5	1	49	PRO
2	R	69	ILE

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	
2	R	75/76 (99%)	61 (81%)	14 (19%)	1	6
3	S	91/96 (95%)	77 (85%)	14 (15%)	2	12
4	W	54/55 (98%)	43 (80%)	11 (20%)	1	4
5	1	83/93 (89%)	72 (87%)	11 (13%)	4	16
All	All	303/320 (95%)	253 (84%)	50 (16%)	2	10

5 of 50 residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
3	S	40	LEU
3	S	112	LYS
5	1	88	ASP
3	S	43	ASP
3	S	80	LYS

Some sidechains can be flipped to improve hydrogen bonding and reduce clashes. 5 of 11 such sidechains are listed below:

Mol	Chain	Res	Type
3	S	64	ASN
3	S	71	GLN
5	1	55	ASN
3	S	57	ASN
5	1	24	ASN

5.3.3 RNA [i](#)

Mol	Chain	Analysed	Backbone Outliers	Pucker Outliers
1	0	2798/2880 (97%)	580 (20%)	88 (3%)

5 of 580 RNA backbone outliers are listed below:

Mol	Chain	Res	Type
1	0	14	A
1	0	25	U
1	0	33	C
1	0	35	G
1	0	45	C

5 of 88 RNA pucker outliers are listed below:

Mol	Chain	Res	Type
1	0	1342	U
1	0	1664	G
1	0	2660	C
1	0	1355	A
1	0	1626	A

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](#)

There are no ligands in this entry.

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

EDS was not executed - this section is therefore empty.

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

EDS was not executed - this section is therefore empty.

6.3 Carbohydrates

EDS was not executed - this section is therefore empty.

6.4 Ligands

EDS was not executed - this section is therefore empty.

6.5 Other polymers

EDS was not executed - this section is therefore empty.