ATLAS ANTIBODIES

ChIP-Exo-Seq: Next-Generation ChIP Assays

- APPLICATION NOTE -

1. Immunoprecipitation of Protein-DNA Complexes

The ChIP-Exo-Seq (Chromatin Immunoprecipitation coupled with Exonuclease digestion followed by high-throughput Sequencing) assay, is a genome-wide technique that maps protein-DNA interactions at single base-pair resolution.

The ChIP-Exo-Seq method was developed in 2011 by Prof. Frank Pugh at Cornell University (*Rhee HS, Pugh BF. Comprehensive genome-wide protein-DNA interactions detected at single-nucleotide resolution. Cell. 2011 Dec 9;147(6):1408-19*).

1. ChIP-Exo-Seq: Superior Validation Tool

ChIP-Exo-Seq is a powerful method used to study protein-DNA interactions at high resolution.

ChIP-Exo-Seq is a refinement of the ChIP and ChIP-Seq method, providing superior resolution and specificity by incorporating exonuclease digestion to pinpoint protein binding sites to the exact base pair.

It is an advanced version of ChIP-Seq that provides single-base resolution mapping of transcription factors, histone modifications, or other DNA-binding proteins.

The ChIP-Exo-Seq method provides a robust approach to evaluate primary antibodies with enhanced precision and reliability.

1.1. Advantages of ChIP-Exo-Seq Over Traditional ChIP and CUT&RUN/TAG Assays

- **Higher Resolution:** ChIP-Exo-Seq achieves near single-base resolution of protein-DNA interactions, whereas other assays typically identifies broader regions.
- **Reduced Noise:** Exonuclease trimming eliminates background DNA that isn't directly protected by the protein, reducing false positives.
- **Precise Binding Site Localization:** the sharp peaks from ChIP-Exo-Seq provide more accurate mapping of transcription factor binding sites or other protein-DNA interactions.
- **Greater reliability** especially for "difficult" targets.

1.2. Applications of ChIP-Exo-Seq:

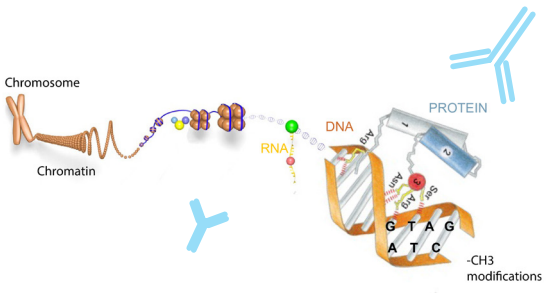
- **Transcription Factor Binding Analysis:** Identifying precise DNA motifs bound by transcription factors.
- **Histone Modification Mapping:** Studying the exact position of histone modifications like methylation or acetylation.
- **Epigenetic Regulation Studies:** Understanding how protein-DNA interactions contribute to gene regulation and chromatin dynamics.
- **Comparative Genomics:** Comparing protein-DNA interactions across conditions, tissues, cell lines or species.

1.3. Unmatched Precision

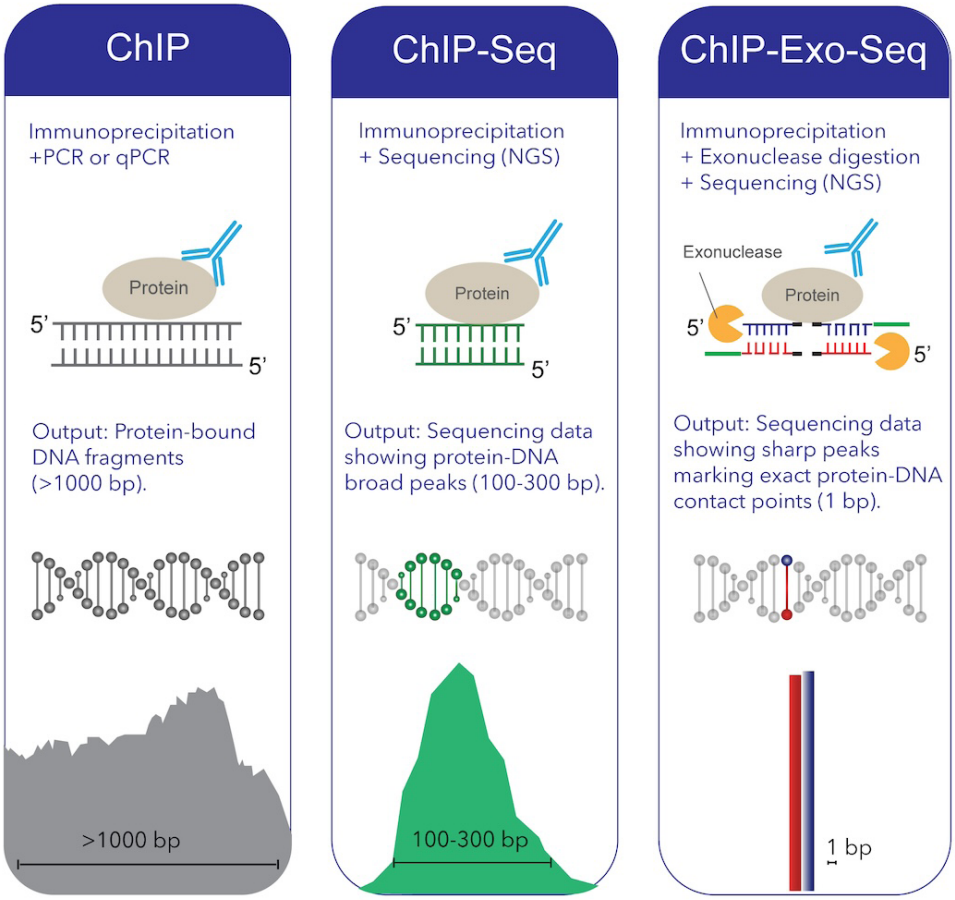
ChIP-Exo-Seq is ideal for researchers investigating high-resolution protein-DNA interactions, epigenetic mechanisms, or transcriptional regulation in various systems, providing unparalleled insight compared to traditional ChIP and CUT&RUN/TAG assays.

This technical note presents the findings from the evaluation of 748 Atlas Antibodies' primary antibodies via the ChIP-Exo-Seq assay.

This study, performed in collaboration with Prof. B. F. Pugh´s Lab at Cornell University, Ithaca, NY, USA, aimed to promote broader adoption of Atlas Antibodies primary antibodies, including challenging targets, by validating their efficacy in chromatin immunoprecipitation (ChIP) applications to make available to the scientific community a resource of high-quality ChIP-validated antibodies.



2. ChIP-Exo-Seq: Next Generation ChIP Assays



	ChIP	ChIP-Seq	ChIP-Exo-Seq
Definition	Detects protein-DNA interactions using antibodies.	Combines ChIP with high-throughput DNA sequencing.	Adds exonuclease digestion for precise mapping of interactions.
Resolution	Low (broad regions of DNA).	Medium (regions of binding +/- 300 bp).	High (single-base resolution of binding sites, 1 bp).
Method Output	Protein-bound DNA fragments.	Sequencing data showing broader peaks.	Sharp peaks marking exact protein-DNA contact points and heatmap.
Key Steps	Immunoprecipitation of protein-DNA complexes.	Immunoprecipitation + sequencing.	Immunoprecipitation + exonuclease digestion + sequencing.
Noise	High (nonspecific DNA may be pulled down).	Moderate (background signal from sequencing).	Low (unbound DNA removed by exonuclease).
Complexity	Simple protocol.	Moderately complex.	Moderately complex (requires exonuclease treatment).
Applications	Basic protein-DNA interaction studies.	Genome-wide mapping of protein-DNA interactions.	Precise localization of protein-DNA binding sites.
Advantages	Simple, low-cost.	High-throughput, genome-wide data.	Single-base resolution, reduced noise.

3. Establishing a Higher Benchmark for Antibodies Performance

In this study, we evaluate the performance of Atlas Antibodies' ChIP-Exo-Seq-validated primary antibodies, comparing them to commercially available alternatives, to establish a robust resource of high-quality, ChIP-validated antibodies for the scientific community.

Scope

This study systematically assesses the performance of Atlas Antibodies' primary antibodies in ChIP-Exo-Seq applications, with the following objectives:

- Benchmarking the validation success rate of Atlas Antibodies' ChIP-Exo-Seq antibodies against alternative commercial sources.
- Establishing criteria for ChIP validation success and determining the robustness of selected antibodies in genome-wide applications.
- Providing a validated resource of high-specificity, high-affinity antibodies to support accurate mapping of protein-DNA interactions.

Methodology

A total of 748 primary antibodies (8 monoclonal, 740 polyclonal) were tested primarily in human K562 cells, with a subset evaluated in additional cell lines including: MCF7, HepG2, NCCIT, Hek293, and GM12878.

The validation workflow followed stringent ChIP-Exo-Seq criteria to assess antibody performance, peak resolution, and motif enrichment.

Results

Validation Success Rate: 50% (370 validated out of 748 tested), significantly surpassing the commonly observed ~20% validation rate in standard ChIP assays.

Breakdown:

- Monoclonal: 1 out of 8 validated.
- Polyclonal: 369 out of 740 validated.
- Validation criteria: antibodies must demonstrate robust target enrichment compared to a non-specific IgG control.
- Motif sequences (MEME logo) are shown for 28 antibodies (*table 4, * highlighted in blue*)

Conclusion

Atlas Antibodies' ChIP-Exo-Seq-validated primary antibodies exhibit superior performance, enabling high-resolution, base-pair-precise mapping of protein-DNA interactions.

This validation underscores their critical role in advancing genome-wide studies, reinforcing their utility as a reliable resource for the scientific community.

With a 50% validation success rate, more than double the industry average, these antibodies demonstrate exceptional specificity and reproducibility in ChIP-Exo-Seq assays.

3.1 Key Steps in ChIP-Exo-Seq Protocol

Protocol Overview: The method combines chromatin immunoprecipitation (ChIP) with next-generation sequencing to identify binding sites of DNA-associated proteins across the genome.

Crosslinking and Chromatin Preparation:
Cells are treated with formaldehyde to crosslink proteins to DNA. This "freezes" the protein-DNA interactions in their natural state. Chromatin is extracted and fragmented, usually by sonication, to produce small pieces of DNA (200–500 bp).

Chromatin Immunoprecipitation (IP):
A specific antibody is used to target and pull down the protein of interest along with its bound DNA. The antibody-bound protein-DNA complexes are isolated (usually using beads).

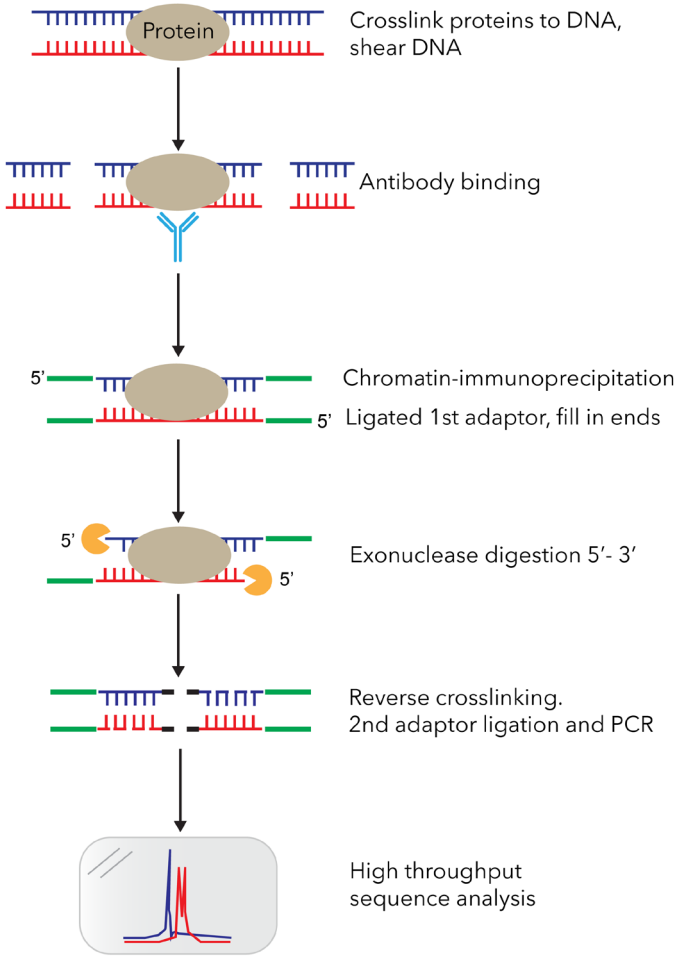
Adaptor Ligation
A first adaptor is ligated to the ends of the sheared DNA fragments. The ends are filled in to create blunt ends for downstream steps.

Exonuclease Digestion (5′ to 3′):
After the immunoprecipitation, the DNA fragments are treated with a highly specific exonuclease enzyme (commonly λ-exonuclease). This exonuclease trims DNA in a 5′ to 3′ direction, but it cannot digest DNA that is protected by the bound protein. This creates a sharp boundary at the precise location of the protein-DNA interaction.

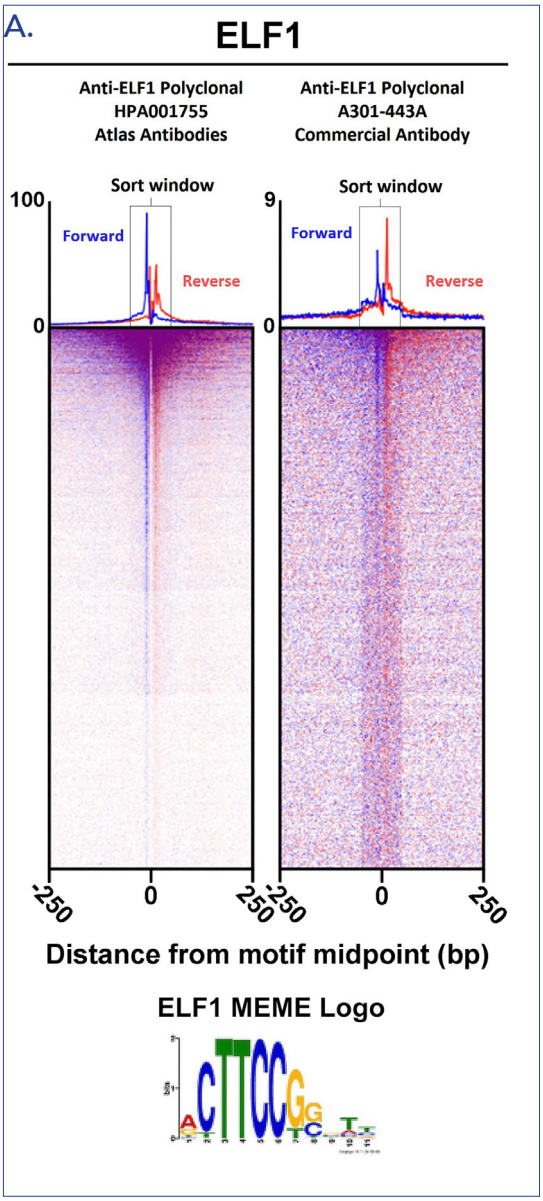
Reversal of Crosslinking and Adaptor Addition:
Crosslinks between the DNA and protein are reversed, freeing the DNA for further processing. An adaptor is ligated to the exonuclease-treated end, then the library amplified by PCR.

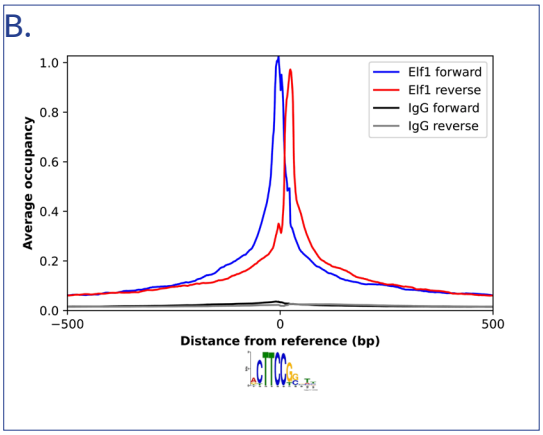
Library Preparation and Sequencing:
The protected DNA fragments are purified, ligated to sequencing adapters, amplified by PCR, and then subjected to high-throughput sequencing.

Data Analysis:
The sequencing reads are mapped back to a reference genome. The exonuclease treatment results in a very sharp peak at the site of protein-DNA interaction, allowing single-base resolution mapping of binding sites.



3.2 Benchmark Comparison of Anti-ELF1 in ChIP-Exo-Seq: Atlas Antibodies vs Commercial Antibody





A. Enrichment comparisons of two independent Anti-ELF1 polyclonal antibodies: HPA001755 (from Atlas Antibodies) and A301-443A (from other vendors) tested in K562 cells.

The 5′ end of aligned sequence reads were plotted against the distance from the cognate motif. Reads are strand-separated (blue, forward strand; red, reverse strand). Rows are linked across samples and sorted based on their combined average rank order and displayed in a 100 bp window around the motif midpoint.

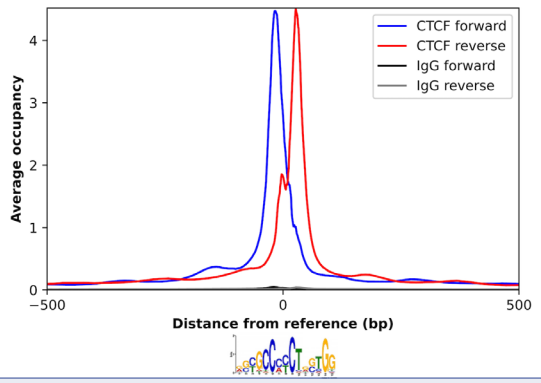
The Atlas Antibodies´ Anti-ELF1 antibody HPA001755, exhibits robust target enrichment with significantly lower signal to noise ratio compared to an alternative commercial antibody and precisely reveals its structural organization around the motif binding site.

B. ChIP-Exo-Seq composite graph for Anti-ELF1 (HPA001755, Lot R00715) tested in K562 cells. Strand-specific reads (blue: forward, red: reverse) and IgG controls (black: forward, grey: reverse) are plotted against the distance from a composite set of reference binding sites. Plots are smoothed by a 21 bp moving average across 460 sites. The antibody exhibits robust target enrichment compared to a non-specific IgG control and precisely reveals its structural organization around the binding site. *Data generated by Prof. B. F. Pugh´s Lab at Cornell University, Ithaca, NY, USA*

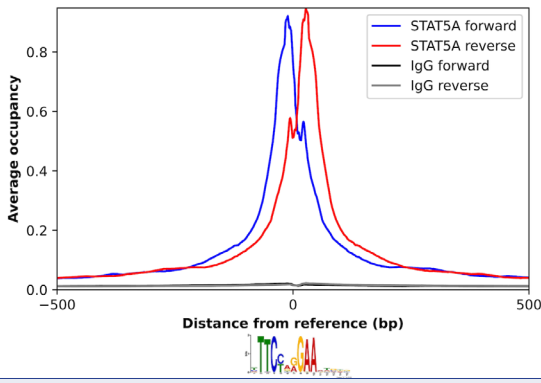
ChIP-Exo-Seq

Examples of Atlas Antibodies' ChIP-Certified Products in ChIP-Exo-Seq

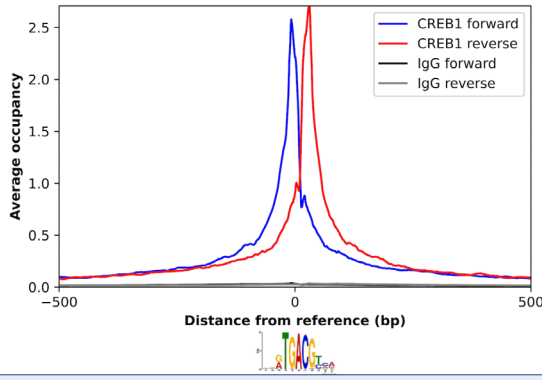
Anti-CTCF (HPA004122, Lot A96611, K562 cells)



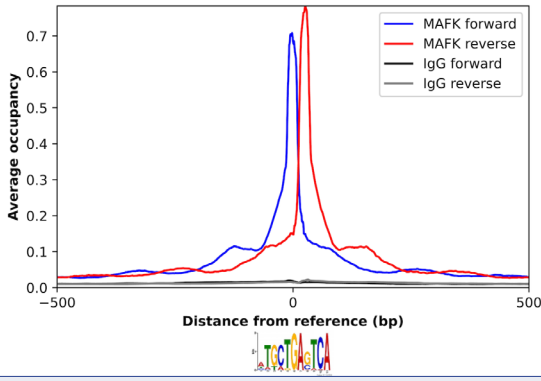
Anti-STAT5A (HPA027873, Lot 000003769, K562 cells)



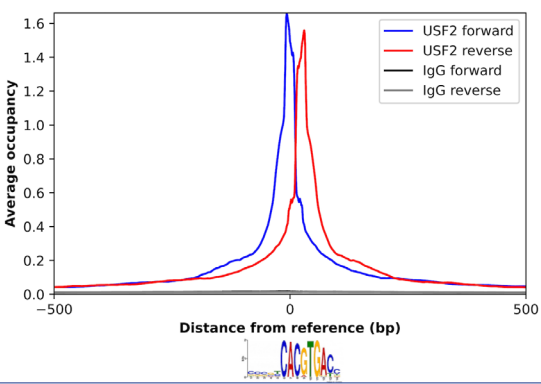
Anti-CREB1 (HPA019150, Lot 000012256, K562 cells)



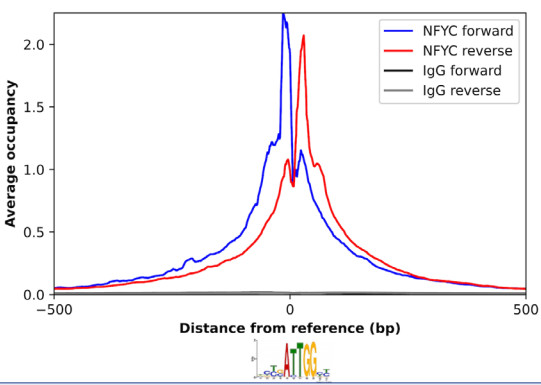
Anti-MAFK (HPA060841, Lot R85188, K562 cells)



Anti-USF2 (HPA029764, Lot000008436, K562 cells)



Anti-NFYC (HPA055011, Lot R73159, K562 cells)

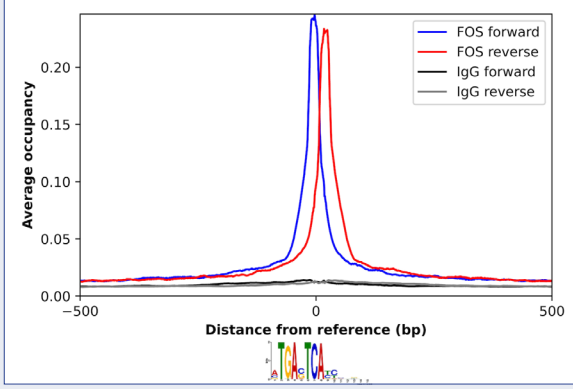


Strand-specific reads (blue: forward, red: reverse) and IgG controls (black: forward, grey: reverse) are plotted against the distance from a composite set of reference binding sites. Plots are smoothed by a 21 bp moving average across 460 sites. The antibody exhibits robust target enrichment compared to a non-specific IgG control and precisely reveals its structural organization around the binding site.
Data generated by Prof. B. F. Pugh´s Lab at Cornell University, Ithaca, NY, USA.

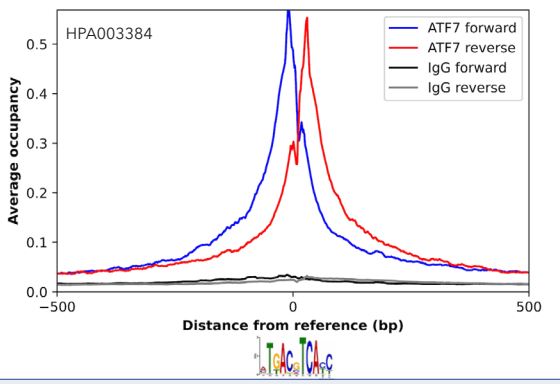
ChIP-Exo-Seq

Examples of Atlas Antibodies' ChIP-Certified Products in ChIP-Exo-Seq

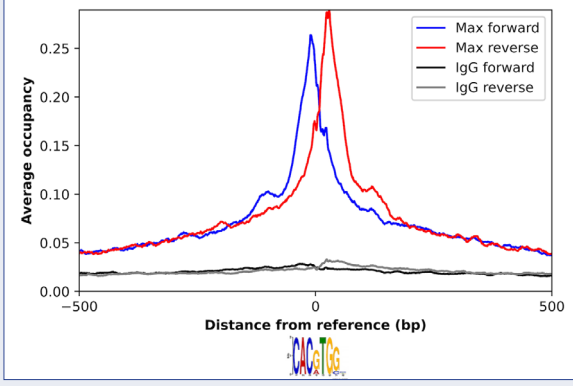
Anti-FOS (HPA018531, Lot 000015845, MCF7 cells)



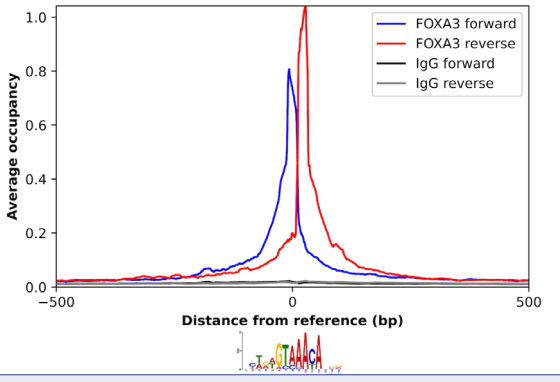
Anti-ATF7 (HPA003384, Lot A96610, K562 cells)



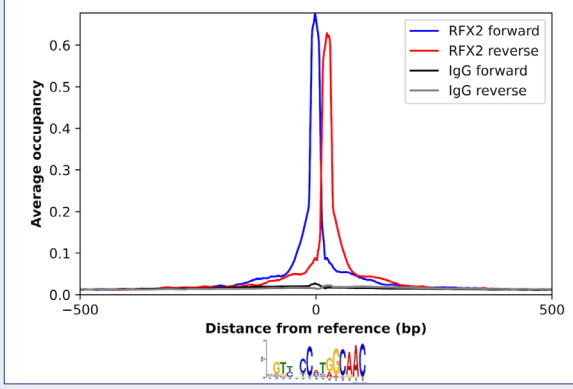
Anti-MAX (HPA003474, Lot A115844, K562 cells)



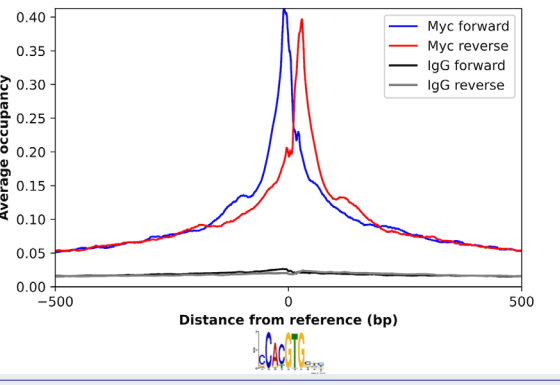
Anti-FOXA3 (HPA054034, Lot 000013421, K562 cells)



Anti-RFX2 (HPA048969, Lot 000025281, K562 cells)



Anti-MYC (HPA066556, Lot R94976, K562 cells)



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Data generated by Prof. B. F. Pugh´s Lab at Cornell University, Ithaca, NY, USA.

4. Atlas Antibodies' ChIP-Certified Products Categorized by Protein Class

4.1 Chromatin Remodeler

Product Name	Product ID	Recommended Applications	ChIP-Certified Cell line
Anti-ARID5A	HPA023879	ChIP-Exo-Seq, ChIP-Seq, ChIP, ICC, IHC, WB	K562
Anti-ATXN7L3	HPA064316	ChIP-Exo-Seq, ChIP-Seq, ChIP, IHC, ICC	K562
Anti-BRD4	HPA061646	ChIP-Exo-Seq, ChIP-Seq, ChIP, IHC, ICC	K562
Anti-BRD9	HPA023197	ChIP-Exo-Seq, ChIP-Seq, ChIP, IHC	K562
Anti-CHD1	HPA022236	ChIP-Exo-Seq, ChIP-Seq, ChIP, ICC, IHC	K562
Anti-CHD4	HPA012008	ChIP-Exo-Seq, ChIP-Seq, ChIP, ICC, IHC	K562
Anti-CHD7	HPA053075	ChIP-Exo-Seq, ChIP-Seq, ChIP, ICC	K562
Anti-CHD9	HPA049420	ChIP-Exo-Seq, ChIP-Seq, ChIP, IHC	K562
Anti-EP400	HPA049013	ChIP-Exo-Seq, ChIP-Seq, ChIP, ICC	K562
Anti-HMG20A	HPA008126	ChIP-Exo-Seq, ChIP-Seq, ChIP, ICC, IHC	K562
Anti-HMG20B	HPA069832	ChIP-Exo-Seq, ChIP-Seq, ChIP, IHC	K562
Anti-INO80	HPA041484	ChIP-Exo-Seq, ChIP-Seq, ChIP, ICC	K562
Anti-INO80C	HPA049060	ChIP-Exo-Seq, ChIP-Seq, ChIP, ICC, IHC	K562
Anti-MBD2	HPA067615	ChIP-Exo-Seq, ChIP-Seq, ChIP, ICC	K562
Anti-PBRM1	HPA059373	ChIP-Exo-Seq, ChIP-Seq, ChIP, WB, ICC	K562
Anti-POGZ	HPA008781	ChIP-Exo-Seq, ChIP-Seq, ChIP, ICC, IHC	K562
Anti-SFMBT2	HPA035448	ChIP-Exo-Seq, ChIP-Seq, ChIP, IHC	K562
Anti-SMARCB1	HPA019127	ChIP-Exo-Seq, ChIP-Seq, ChIP, IHC, WB	K562
Anti-SMARCC1	HPA026853	ChIP-Exo-Seq, ChIP-Seq, ChIP, ICC, IHC, WB	K562
Anti-SMARCD1	HPA004101	ChIP-Exo-Seq, ChIP-Seq, ChIP, WB, IHC, ICC	K562
Anti-SMARCE1	HPA003916	ChIP-Exo-Seq, ChIP-Seq, ChIP, WB, IHC, ICC	K562
Anti-SRCAP	HPA028929	ChIP-Exo-Seq, ChIP-Seq, ChIP, IHC	K562
Anti-SUPT3H	HPA024371	ChIP-Exo-Seq, ChIP-Seq, ChIP, ICC, IHC	K562
Anti-SUPT5H	HPA029273	ChIP-Exo-Seq, ChIP-Seq, ChIP, WB, IHC, ICC	K562
Anti-VPS72	HPA065709	ChIP-Exo-Seq, ChIP-Seq, ChIP, ICC	K562
Anti-WDR82	HPA040427	ChIP-Exo-Seq, ChIP-Seq, ChIP, ICC, WB	K562

4.2 Chromatin Modifier

Product Name	Product ID	Recommended Applications	ChIP-Certified Cell line
Anti-BRD3	HPA051830	ChIP-Exo-Seq, ChIP-Seq, ChIP, ICC, IHC	K562
Anti-DMAP1	HPA028419	ChIP-Exo-Seq, ChIP-Seq, ChIP, ICC	K562
Anti-EP300	HPA003128	ChIP-Exo-Seq, ChIP-Seq, ChIP, ICC, IHC	K562
Anti-ING1	HPA052591	ChIP-Exo-Seq, ChIP-Seq, ChIP, ICC	K562
Anti-ING2	HPA021517	ChIP-Exo-Seq, ChIP-Seq, ChIP, ICC, IHC, WB	K562
Anti-KDM1A	HPA053660	ChIP-Exo-Seq, ChIP-Seq, ChIP, ICC	K562
Anti-KMT2A	HPA044910	ChIP-Exo-Seq, ChIP-Seq, ChIP, ICC	K562
Anti-MLLT10	HPA005747	ChIP-Exo-Seq, ChIP-Seq, ChIP, ICC, IHC	K562
Anti-NSD3	HPA018893	ChIP-Exo-Seq, ChIP-Seq, ChIP, IHC	K562
Anti-PRDM10	HPA026997	ChIP-Exo-Seq, ChIP-Seq, ChIP, WB, IHC, ICC	K562
Anti-PRDM2	HPA005809	ChIP-Exo-Seq, ChIP-Seq, ChIP, ICC, IHC	K562
Anti-SETD5	HPA035574	ChIP-Exo-Seq, ChIP-Seq, ChIP, IHC, ICC	K562
Anti-SIRT2	HPA011165	ChIP-Exo-Seq, ChIP-Seq, ChIP, IHC, ICC	K562
Anti-TOX3	HPA040376	ChIP-Exo-Seq, ChIP-Seq, ChIP, IHC	K562
Anti-WDR5	HPA047182	ChIP-Exo-Seq, ChIP-Seq, ChIP, ICC	K562

4.3 DNA-Related Proteins

Product Name	Product ID	Recommended Applications	ChIP-Certified Cell line
Anti-ERCC3	HPA046077	ChIP-Exo-Seq, ChIP-Seq, ChIP, ICC	K562
Anti-ORC2	HPA073881	ChIP-Exo-Seq, ChIP-Seq, ChIP, ICC, WB	K562
Anti-TET1	HPA057273	ChIP-Exo-Seq, ChIP-Seq, ChIP, ICC	K562
Anti-THAP1	HPA071310	ChIP-Exo-Seq, ChIP-Seq, ChIP, ICC	K562

4.4 General Transcription Factors

Product Name	Product ID	Recommended Applications	ChIP-Certified Cell line
Anti-GTF2A1	HPA000869	ChIP-Exo-Seq, ChIP-Seq, ChIP, IHC, ICC	K562
Anti-GTF2B	HPA061626	ChIP-Exo-Seq, ChIP-Seq, ChIP, ICC, IHC, WB	K562
Anti-GTF2I	HPA026638	ChIP-Exo-Seq, ChIP-Seq, ChIP, WB, IHC, ICC	K562
Anti-GTF3C4	HPA069369	ChIP-Exo-Seq, ChIP-Seq, ChIP, ICC, WB	K562
Anti-GTF3C6	HPA061345	ChIP-Exo-Seq, ChIP-Seq, ChIP, IHC, ICC	K562
Anti-TAF1C	HPA072229	ChIP-Exo-Seq, ChIP-Seq, ChIP, ICC	K562
Anti-TAF3	HPA066184	ChIP-Exo-Seq, ChIP-Seq, ChIP, ICC	K562
Anti-TAF5L	HPA067941	ChIP-Exo-Seq, ChIP-Seq, ChIP, WB, ICC	K562
Anti-TAF6L	HPA067239	ChIP-Exo-Seq, ChIP-Seq, ChIP, ICC, IHC	K562

4.5 Mediator Complex

Product Name	Product ID	Recommended Applications	ChIP-Certified Cell line
Anti-MED1	HPA052818	ChIP-Exo-Seq, ChIP-Seq, ChIP, ICC	K562
Anti-MED8	HPA028438	ChIP-Exo-Seq, ChIP-Seq, ChIP, ICC, IHC, WB	K562
Anti-MED12	HPA003185	ChIP-Exo-Seq, ChIP-Seq, ChIP, ICC, WB, IHC	K562
Anti-MED25	HPA068802	ChIP-Exo-Seq, ChIP-Seq, ChIP, ICC, WB	K562
Anti-MED27	HPA007002	ChIP-Exo-Seq, ChIP-Seq, ChIP, ICC, IHC, WB	K562
Anti-MED28	HPA035901	ChIP-Exo-Seq, ChIP-Seq, ChIP, IHC	K562
Anti-MED31	HPA035947	ChIP-Exo-Seq, ChIP-Seq, ChIP, ICC, IHC	K562

4.6 Nuclear Receptors

Product Name	Product ID	Recommended Applications	ChIP-Certified Cell line
Anti-ESR1	HPA000450	ChIP-Exo-Seq, ChIP-Seq, ChIP, WB, IHC	MCF7
Anti-NR1H3	HPA036443	ChIP-Exo-Seq, ChIP-Seq, ChIP, WB, IHC	K562
Anti-THRA	HPA009654	ChIP-Exo-Seq, ChIP-Seq, ChIP, ICC, IHC	K562

4.7 RNA Binding Protein, Polymerase Subunit, Processing

Product Name	Product ID	Recommended Applications	ChIP-Certified Cell line
Anti-DCP2	HPA057676	ChIP-Exo-Seq, ChIP-Seq, ChIP, ICC	K562
Anti-INTS12	HPA041814	ChIP-Exo-Seq, ChIP-Seq, ChIP, ICC	K562
Anti-KIN	HPA038700	ChIP-Exo-Seq, ChIP-Seq, ChIP, ICC	K562
Anti-PCF11	HPA040779	ChIP-Exo-Seq, ChIP-Seq, ChIP, ICC	K562
Anti-POLR1C	HPA031010	ChIP-Exo-Seq, ChIP-Seq, ChIP, ICC, WB	K562
Anti-POLR2A	HPA053012	ChIP-Exo-Seq, ChIP-Seq, ChIP, ICC	K562
Anti-POLR2B	HPA037506	ChIP-Exo-Seq, ChIP-Seq, ChIP, WB, ICC	K562
Anti-POLR2C	HPA041826	ChIP-Exo-Seq, ChIP-Seq, ChIP, WB, IHC, ICC	K562
Anti-POLR2D	HPA046092	ChIP-Exo-Seq, ChIP-Seq, ChIP, IHC, WB	K562
Anti-POLR2G	HPA053000	ChIP-Exo-Seq, ChIP-Seq, ChIP, ICC, IHC, WB	K562
Anti-POLR2I	HPA045156	ChIP-Exo-Seq, ChIP-Seq, ChIP, WB, IHC, ICC	K562
Anti-POLR3A	HPA037926	ChIP-Exo-Seq, ChIP-Seq, ChIP, WB, ICC	K562
Anti-POLR3B	HPA036466	ChIP-Exo-Seq, ChIP-Seq, ChIP, IHC, ICC	K562
Anti-POLR3D	HPA069089	ChIP-Exo-Seq, ChIP-Seq, ChIP, ICC	K562
Anti-POLR3E	HPA041477	ChIP-Exo-Seq, ChIP-Seq, ChIP, WB, ICC, IHC	K562
Anti-RBMS2	HPA058784	ChIP-Exo-Seq, ChIP-Seq, ChIP, ICC	K562
Anti-RPAP2	HPA046443	ChIP-Exo-Seq, ChIP-Seq, ChIP, ICC, IHC, WB	K562
Anti-SNAPC4	HPA073243	ChIP-Exo-Seq, ChIP-Seq, ChIP, ICC	K562

4.7 Signal Transduction

Product Name	Product ID	Recommended Applications	ChIP-Certified Cell line
Anti-COPS3	HPA050557	ChIP-Exo-Seq, ChIP-Seq, ChIP, ICC, WB	K562
Anti-SMAD4	HPA019154	ChIP-Exo-Seq, ChIP-Seq, ChIP, IHC, ICC, WB	K562
Anti-STAT1	HPA000982	ChIP-Exo-Seq, ChIP-Seq, ChIP, WB, IHC, ICC	K562
Anti-STAT5A*	HPA027873	ChIP-Exo-Seq, ChIP-Seq, ChIP, WB, IHC, ICC	K562

* *Motif sequence shown on product page at atlasantibodies.com*

4.8 Transcription Factors & Cofactors

Product Name	Product ID	Recommended Applications	ChIP-Certified Cell line
Anti-ARID3A	HPA076330	ChIP-Exo-Seq, ChIP-Seq, ChIP, IHC	K562
Anti-ATF1	HPA055406	ChIP-Exo-Seq, ChIP-Seq, ChIP, ICC	K562
Anti-ATF2*	HPA022134	ChIP-Exo-Seq, ChIP-Seq, ChIP, WB, ICC, IHC	K562
Anti-ATF5	HPA030187	ChIP-Exo-Seq, ChIP-Seq, ChIP, WB, IHC, ICC	K562
Anti-ATF7*	HPA003384	ChIP-Exo-Seq, ChIP-Seq, ChIP, IHC	K562
Anti-BACH1	HPA034949	ChIP-Exo-Seq, ChIP-Seq, ChIP, ICC, IHC	K562
Anti-BACH2	HPA058384	ChIP-Exo-Seq, ChIP-Seq, ChIP, ICC	K562
Anti-BCL6	HPA050645	ChIP-Exo-Seq, ChIP-Seq, ChIP, ICC, WB	HepG2
Anti-BRF1	HPA051918	ChIP-Exo-Seq, ChIP-Seq, ChIP, WB, ICC	K562
Anti-CEBPB*	HPA062267	ChIP-Exo-Seq, ChIP-Seq, ChIP, ICC	K562
Anti-CEBPE	HPA002928	ChIP-Exo-Seq, ChIP-Seq, ChIP, ICC, IHC, WB	K562
Anti-CLOCK	HPA027565	ChIP-Exo-Seq, ChIP-Seq, ChIP, IHC, ICC	K562
Anti-CREB1*	HPA019150	ChIP-Exo-Seq, ChIP-Seq, ChIP, WB, IHC, ICC	K562
Anti-CREB3L1	HPA024069	ChIP-Exo-Seq, ChIP-Seq, ChIP, IHC	K562
Anti-CREM	HPA001818	ChIP-Exo-Seq, ChIP-Seq, ChIP, IHC, WB	K562
Anti-CUX1	HPA003317	ChIP-Exo-Seq, ChIP-Seq, ChIP, WB	K562
Anti-CTCF*	HPA004122	ChIP-Exo-Seq, ChIP-Seq, ChIP, ICC, IHC	K562
Anti-DACH1	HPA012672	ChIP-Exo-Seq, ChIP-Seq, ChIP, ICC, IHC	K562
Anti-DDIT3	HPA068416	ChIP-Exo-Seq, ChIP-Seq, ChIP, IHC	K562
Anti-DMRTB1	HPA058553	ChIP-Exo-Seq, ChIP-Seq, ChIP, IHC	K562
Anti-DMTF1	HPA023846	ChIP-Exo-Seq, ChIP-Seq, ChIP, IHC, ICC	K562
Anti-DR1	HPA055308	ChIP-Exo-Seq, ChIP-Seq, ChIP, ICC, IHC, WB	K562
Anti-DRAP1	HPA006790	ChIP-Exo-Seq, ChIP-Seq, ChIP, WB, IHC, ICC	K562
Anti-E2F3*	HPA065012	ChIP-Exo-Seq, ChIP-Seq, ChIP, ICC	K562
Anti-E2F6	HPA075185	ChIP-Exo-Seq, ChIP-Seq, ChIP, ICC	K562
Anti-E4F1	HPA071325	ChIP-Exo-Seq, ChIP-Seq, ChIP, WB, ICC	K562

** Motif sequence shown on product page at atlasantibodies.com*

4.8 Transcription Factors & Cofactors - *CONT.*

Product Name	Product ID	Recommended Applications	ChIP-Certified Cell line
Anti-EBF1	HPA061169	ChIP-Exo-Seq, ChIP-Seq, ChIP, ICC	K562
Anti-EGR1	HPA029938	ChIP-Exo-Seq, ChIP-Seq, ChIP, ICC	K562
Anti-ELF1*	HPA001755	ChIP-Exo-Seq, ChIP-Seq, ChIP, WB, IHC	K562
Anti-ELF4	HPA060277	ChIP-Exo-Seq, ChIP-Seq, ChIP, ICC	K562
Anti-ELK3	HPA001600	ChIP-Exo-Seq, ChIP-Seq, ChIP, WB, IHC, ICC	K562
Anti-ELK4	HPA028863	ChIP-Exo-Seq, ChIP-Seq, ChIP, WB, IHC, ICC	K562
Anti-ERG	HPA046598	ChIP-Exo-Seq, ChIP-Seq, ChIP, IHC	K562
Anti-ESR1*	HPA000450	ChIP-Exo-Seq, ChIP-Seq, ChIP, IHC, WB	K562
Anti-ETS2	HPA003176	ChIP-Exo-Seq, ChIP-Seq, ChIP, ICC	K562
Anti-ETV1	HPA077249	ChIP-Exo-Seq, ChIP-Seq, ChIP, ICC	K562
Anti-ETV6	HPA000264	ChIP-Exo-Seq, ChIP-Seq, ChIP, WB, IHC, ICC	K562
Anti-FLI1	HPA073099	ChIP-Exo-Seq, ChIP-Seq, ChIP, ICC	K562
Anti-FOS*	HPA018531	ChIP-Exo-Seq, ChIP-Seq, ChIP, IHC, ICC	MCF7
Anti-FOSL1*	HPA066901	ChIP-Exo-Seq, ChIP-Seq, ChIP, ICC	K562
Anti-FOSL2	HPA061417	ChIP-Exo-Seq, ChIP-Seq, ChIP, IHC	K562
Anti-FOXA1*	HPA050505	ChIP-Exo-Seq, ChIP-Seq, ChIP, ICC, IHC, WB	HepG2
Anti-FOXA2*	HPA066846	ChIP-Exo-Seq, ChIP-Seq, ChIP, ICC	HepG2
Anti-FOXA3*	HPA054034	ChIP-Exo-Seq, ChIP-Seq, ChIP, ICC	K562
Anti-FOXJ2	HPA008723	ChIP-Exo-Seq, ChIP-Seq, ChIP, ICC, IHC	K562
Anti-FOXK1	HPA018864	ChIP-Exo-Seq, ChIP-Seq, ChIP, WB, IHC, ICC	K562
Anti-FOXK2	HPA027523	ChIP-Exo-Seq, ChIP-Seq, ChIP, ICC, IHC, WB	K562
Anti-FOXL2	HPA069613	ChIP-Exo-Seq, ChIP-Seq, ChIP, ICC, IHC	K562
Anti-FOXM1	HPA029974	ChIP-Exo-Seq, ChIP-Seq, ChIP, IHC	K562
Anti-FOXN2	HPA003485	ChIP-Exo-Seq, ChIP-Seq, ChIP, IHC, ICC	K562
Anti-FOXO4	HPA040232	ChIP-Exo-Seq, ChIP-Seq, ChIP, IHC	K562
Anti-FOXP1	HPA003876	ChIP-Exo-Seq, ChIP-Seq, ChIP, WB, IHC, ICC	K562

* *Motif sequence shown on product page at atlasantibodies.com*

4.8 Transcription Factors & Cofactors - *CONT.*

Product Name	Product ID	Recommended Applications	ChIP-Certified Cell line
Anti-FOXP2	HPA001679	ChIP-Exo-Seq, ChIP-Seq, ChIP, ICC	K562
Anti-FOXP3	HPA045943	ChIP-Exo-Seq, ChIP-Seq, ChIP, WB, ICC	K562
Anti-FOXP4	HPA007176	ChIP-Exo-Seq, ChIP-Seq, ChIP, ICC, IHC, WB	K562
Anti-GABPA	HPA003258	ChIP-Exo-Seq, ChIP-Seq, ChIP, ICC, WB, IHC	K562
Anti-GABPB2	HPA058483	ChIP-Exo-Seq, ChIP-Seq, ChIP, ICC	K562
Anti-GATA1	HPA000232	ChIP-Exo-Seq, ChIP-Seq, ChIP, WB, IHC	K562
Anti-GATA3	AMAb91525	ChIP-Exo-Seq, ChIP-Seq, ChIP, IHC, ICC, WB	MCF7
Anti-GATA6	HPA066629	ChIP-Exo-Seq, ChIP-Seq, ChIP, ICC	K562
Anti-GATAD2A	HPA024373	ChIP-Exo-Seq, ChIP-Seq, ChIP, IHC, ICC, WB	K562
Anti-GATAD2B	HPA017015	ChIP-Exo-Seq, ChIP-Seq, ChIP, ICC, WB, IHC	K562
Anti-GMEB1	HPA052975	ChIP-Exo-Seq, ChIP-Seq, ChIP, WB, ICC	K562
Anti-GMEB2	HPA067455	ChIP-Exo-Seq, ChIP-Seq, ChIP, ICC, IHC	K562
Anti-GTF2A2	HPA056239	ChIP-Exo-Seq, ChIP-Seq, ChIP, ICC, WB	K562
Anti-GTF3C1	HPA051617	ChIP-Exo-Seq, ChIP-Seq, ChIP, IHC, ICC	K562
Anti-HAND2	HPA019591	ChIP-Exo-Seq, ChIP-Seq, ChIP, ICC	K562
Anti-HEY2	HPA074851	ChIP-Exo-Seq, ChIP-Seq, ChIP, ICC	K562
Anti-HIC2	HPA059399	ChIP-Exo-Seq, ChIP-Seq, ChIP, ICC	K562
Anti-HIF3A	HPA041141	ChIP-Exo-Seq, ChIP-Seq, ChIP, IHC	K562
Anti-HLF	HPA071210	ChIP-Exo-Seq, ChIP-Seq, ChIP, ICC	K562
Anti-HNF4A*	HPA004712	ChIP-Exo-Seq, ChIP-Seq, ChIP, IHC, WB, ICC	HepG2
Anti-HOXC9	HPA072160	ChIP-Exo-Seq, ChIP-Seq, ChIP, ICC	K562
Anti-HOXD9	HPA068683	ChIP-Exo-Seq, ChIP-Seq, ChIP, ICC	K562
Anti-HSF2*	HPA031455	ChIP-Exo-Seq, ChIP-Seq, ChIP, IHC, WB	K562
Anti-ID2	HPA027612	ChIP-Exo-Seq, ChIP-Seq, ChIP, ICC	K562
Anti-ID4	HPA060800	ChIP-Exo-Seq, ChIP-Seq, ChIP, ICC	K562

* *Motif sequence shown on product page at atlasantibodies.com*

4.8 Transcription Factors & Cofactors - *CONT.*

Product Name	Product ID	Recommended Applications	ChIP-Certified Cell line
Anti-IRF2	HPA057327	ChIP-Exo-Seq, ChIP-Seq, ChIP, ICC, WB	K562
Anti-JDP2	HPA059511	ChIP-Exo-Seq, ChIP-Seq, ChIP, IHC, ICC	K562
Anti-JUNB	HPA019149	ChIP-Exo-Seq, ChIP-Seq, ChIP, WB, IHC, ICC	K562
Anti-JUND	HPA063029	ChIP-Exo-Seq, ChIP-Seq, ChIP, ICC, IHC	K562
Anti-KLF11	HPA058276	ChIP-Exo-Seq, ChIP-Seq, ChIP, ICC	K562
Anti-KLF3	HPA065054	ChIP-Exo-Seq, ChIP-Seq, ChIP, ICC	K562
Anti-KLF4	HPA002926	ChIP-Exo-Seq, ChIP-Seq, ChIP, WB, IHC, ICC	NCCIT
Anti-KLF5	HPA040398	ChIP-Exo-Seq, ChIP-Seq, ChIP, IHC, ICC	K562
Anti-KLF9	HPA029308	ChIP-Exo-Seq, ChIP-Seq, ChIP, WB, ICC	K562
Anti-LDB1	HPA034488	ChIP-Exo-Seq, ChIP-Seq, ChIP, WB, IHC, ICC	K562
Anti-LEF1	HPA002087	ChIP-Exo-Seq, ChIP-Seq, ChIP, WB, IHC, ICC	K562
Anti-LEUTX	HPA041498	ChIP-Exo-Seq, ChIP-Seq, ChIP, ICC, IHC	K562
Anti-LHX2	HPA000838	ChIP-Exo-Seq, ChIP-Seq, ChIP, ICC	K562
Anti-LHX4	HPA055705	ChIP-Exo-Seq, ChIP-Seq, ChIP, ICC	K562
Anti-LRRFIP1	HPA006979	ChIP-Exo-Seq, ChIP-Seq, ChIP, IHC, ICC	K562
Anti-MAFB	HPA005653	ChIP-Exo-Seq, ChIP-Seq, ChIP, ICC, IHC	K562
Anti-MAFF	HPA055371	ChIP-Exo-Seq, ChIP-Seq, ChIP, ICC	K562
Anti-MAFK*	HPA060841	ChIP-Exo-Seq, ChIP-Seq, ChIP, ICC	K562
Anti-MAX*	HPA003474	ChIP-Exo-Seq, ChIP-Seq, ChIP, IHC	K562
Anti-MAZ*	HPA065930	ChIP-Exo-Seq, ChIP-Seq, ChIP, ICC	K562
Anti-MECOM	HPA046537	ChIP-Exo-Seq, ChIP-Seq, ChIP, WB, IHC, ICC	K562
Anti-MEF2B	HPA004734	ChIP-Exo-Seq, ChIP-Seq, ChIP, IHC	K562
Anti-MEF2C	HPA005533	ChIP-Exo-Seq, ChIP-Seq, ChIP, WB, IHC, ICC	K562
Anti-MEF2D	HPA007114	ChIP-Exo-Seq, ChIP-Seq, ChIP, WB, IHC, ICC	K562
Anti-MEIS2	HPA003256	ChIP-Exo-Seq, ChIP-Seq, ChIP, ICC, IHC	K562

* *Motif sequence shown on product page at atlasantibodies.com*

4.8 Transcription Factors & Cofactors - *CONT.*

Product Name	Product ID	Recommended Applications	ChIP-Certified Cell line
Anti-MITF	HPA003259	ChIP-Exo-Seq, ChIP-Seq, ChIP, WB, IHC	K562
Anti-MLX	HPA064438	ChIP-Exo-Seq, ChIP-Seq, ChIP, WB, ICC	K562
Anti-MLXIP	HPA023084	ChIP-Exo-Seq, ChIP-Seq, ChIP, IHC	K562
Anti-MNT	HPA067578	ChIP-Exo-Seq, ChIP-Seq, ChIP, ICC	K562
Anti-MTF1	HPA028689	ChIP-Exo-Seq, ChIP-Seq, ChIP, WB, IHC, ICC	K562
Anti-MXD1	HPA001599	ChIP-Exo-Seq, ChIP-Seq, ChIP, IHC	K562
Anti-MXI1	HPA056762	ChIP-Exo-Seq, ChIP-Seq, ChIP, ICC	K562
Anti-MYBL2	HPA055416	ChIP-Exo-Seq, ChIP-Seq, ChIP, ICC	K562
Anti-MYC*	HPA066556	ChIP-Exo-Seq, ChIP-Seq, ChIP, ICC	K562
Anti-MYOG	HPA028336	ChIP-Exo-Seq, ChIP-Seq, ChIP, ICC	K562
Anti-NAB2	HPA027464	ChIP-Exo-Seq, ChIP-Seq, ChIP, IHC, ICC	K562
Anti-NCOA1	HPA070520	ChIP-Exo-Seq, ChIP-Seq, ChIP, ICC	K562
Anti-NCOA3	HPA024210	ChIP-Exo-Seq, ChIP-Seq, ChIP, ICC, IHC, WB	K562
Anti-NELFA	HPA043931	ChIP-Exo-Seq, ChIP-Seq, ChIP, ICC	K562
Anti-NELFE	HPA046502	ChIP-Exo-Seq, ChIP-Seq, ChIP, ICC, WB	K562
Anti-NFAT5	HPA069711	ChIP-Exo-Seq, ChIP-Seq, ChIP, IHC, ICC	K562
Anti-NFATC1	HPA071732	ChIP-Exo-Seq, ChIP-Seq, ChIP, ICC	K562
Anti-NFATC2	HPA024369	ChIP-Exo-Seq, ChIP-Seq, ChIP, IHC	K562
Anti-NFATC4	HPA076526	ChIP-Exo-Seq, ChIP-Seq, ChIP, ICC	K562
Anti-NFIA	HPA006111	ChIP-Exo-Seq, ChIP-Seq, ChIP, ICC, IHC, WB	K562
Anti-NFIB	HPA003956	ChIP-Exo-Seq, ChIP-Seq, ChIP, WB, ICC	K562
Anti-NFIC*	HPA052625	ChIP-Exo-Seq, ChIP-Seq, ChIP, IHC, ICC	K562
Anti-NFIX	HPA007533	ChIP-Exo-Seq, ChIP-Seq, ChIP, IHC, ICC, WB	K562
Anti-NFKB1	HPA027305	ChIP-Exo-Seq, ChIP-Seq, ChIP, WB, IHC, ICC	K562
Anti-NFYA*	HPA050779	ChIP-Exo-Seq, ChIP-Seq, ChIP, IHC, ICC, WB	K562
Anti-NFYC*	HPA055011	ChIP-Exo-Seq, ChIP-Seq, ChIP, ICC	K562

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4.8 Transcription Factors & Cofactors - *CONT.*

Product Name	Product ID	Recommended Applications	ChIP-Certified Cell line
Anti-NMI	HPA008588	ChIP-Exo-Seq, ChIP-Seq, ChIP, IHC, ICC	K562
Anti-NR0B1	HPA067207	ChIP-Exo-Seq, ChIP-Seq, ChIP, ICC	K562
Anti-NR2C1	HPA067767	ChIP-Exo-Seq, ChIP-Seq, ChIP, IHC	K562
Anti-NRF1	HPA029329	ChIP-Exo-Seq, ChIP-Seq, ChIP, WB, IHC, ICC	K562
Anti-OLIG2	HPA003254	ChIP-Exo-Seq, ChIP-Seq, ChIP, WB, IHC	K562
Anti-ONECUT2	HPA057058	ChIP-Exo-Seq, ChIP-Seq, ChIP, ICC	K562
Anti-OTX2	HPA000633	ChIP-Exo-Seq, ChIP-Seq, ChIP, IHC	K562
Anti-PATZ1	HPA047893	ChIP-Exo-Seq, ChIP-Seq, ChIP, IHC, ICC	K562
Anti-PAX5	HPA068498	ChIP-Exo-Seq, ChIP-Seq, ChIP, ICC	K562
Anti-PBX1	HPA003881	ChIP-Exo-Seq, ChIP-Seq, ChIP, WB, IHC, ICC	MCF7
Anti-PITX1	HPA008743	ChIP-Exo-Seq, ChIP-Seq, ChIP, ICC	K562
Anti-PKNOX1	HPA065017	ChIP-Exo-Seq, ChIP-Seq, ChIP, ICC	K562
Anti-PLAG1	HPA072290	ChIP-Exo-Seq, ChIP-Seq, ChIP, ICC	K562
Anti-PLAGL1	HPA055706	ChIP-Exo-Seq, ChIP-Seq, ChIP, ICC	K562
Anti-POU3F2	HPA056261	ChIP-Exo-Seq, ChIP-Seq, ChIP, ICC	K562
Anti-PRRX1	HPA063566	ChIP-Exo-Seq, ChIP-Seq, ChIP, ICC	K562
Anti-PRRX2	HPA026808	ChIP-Exo-Seq, ChIP-Seq, ChIP, IHC	K562
Anti-RFX2*	HPA048969	ChIP-Exo-Seq, ChIP-Seq, ChIP, WB, IHC, ICC	K562
Anti-RFX3	HPA035689	ChIP-Exo-Seq, ChIP-Seq, ChIP, WB, IHC, ICC	K562
Anti-RFX6	HPA037696	ChIP-Exo-Seq, ChIP-Seq, ChIP, WB, IHC	K562
Anti-RORC	HPA065620	ChIP-Exo-Seq, ChIP-Seq, ChIP, ICC	K562
Anti-RUNX1	HPA037912	ChIP-Exo-Seq, ChIP-Seq, ChIP, ICC	K562
Anti-RXRB	HPA063653	ChIP-Exo-Seq, ChIP-Seq, ChIP, ICC	K562
Anti-SALL1	HPA049829	ChIP-Exo-Seq, ChIP-Seq, ChIP, ICC, IHC	K562
Anti-SIN3A	HPA062123	ChIP-Exo-Seq, ChIP-Seq, ChIP, ICC, IHC	K562
Anti-SIX4	HPA031794	ChIP-Exo-Seq, ChIP-Seq, ChIP, ICC	K562

* *Motif sequence shown on product page at atlasantibodies.com*

4.8 Transcription Factors & Cofactors - *CONT.*

Product Name	Product ID	Recommended Applications	ChIP-Certified Cell line
Anti-SKIL	HPA008472	ChIP-Exo-Seq, ChIP-Seq, ChIP, ICC, IHC, WB	K562
Anti-SOX10	HPA068898	ChIP-Exo-Seq, ChIP-Seq, ChIP, IHC, ICC	K562
Anti-SOX17	HPA068399	ChIP-Exo-Seq, ChIP-Seq, ChIP, IHC	K562
Anti-SOX2	HPA045725	ChIP-Exo-Seq, ChIP-Seq, ChIP, WB, ICC	NCCIT
Anti-SOX4	HPA029901	ChIP-Exo-Seq, ChIP-Seq, ChIP, ICC, IHC	K562
Anti-SOX6	HPA003908	ChIP-Exo-Seq, ChIP-Seq, ChIP, WB, IHC	K562
Anti-SP1	HPA001853	ChIP-Exo-Seq, ChIP-Seq, ChIP, ICC, IHC, WB	K562
Anti-SPI1*	HPA044653	ChIP-Exo-Seq, ChIP-Seq, ChIP, IHC, ICC	GM12878
Anti-STAT3*	HPA058603	ChIP-Exo-Seq, ChIP-Seq, ChIP, WB, IHC	K562
Anti-SYAP1	HPA048047	ChIP-Exo-Seq, ChIP-Seq, ChIP, ICC	K562
Anti-TADA3	HPA042250	ChIP-Exo-Seq, ChIP-Seq, ChIP, IHC, WB, ICC	K562
Anti-TAF1	HPA001075	ChIP-Exo-Seq, ChIP-Seq, ChIP, IHC, ICC	K562
Anti-TAF10	HPA004148	ChIP-Exo-Seq, ChIP-Seq, ChIP, IHC, ICC	K562
Anti-TAF11	HPA049127	ChIP-Exo-Seq, ChIP-Seq, ChIP, WB, ICC	K562
Anti-TAF4	HPA008599	ChIP-Exo-Seq, ChIP-Seq, ChIP, IHC, ICC	K562
Anti-TAF4B	HPA028937	ChIP-Exo-Seq, ChIP-Seq, ChIP, ICC, IHC	K562
Anti-TAF6	HPA006566	ChIP-Exo-Seq, ChIP-Seq, ChIP, WB, IHC, ICC	K562
Anti-TAL1	HPA073983	ChIP-Exo-Seq, ChIP-Seq, ChIP, ICC	K562
Anti-TBL1XR1	HPA019182	ChIP-Exo-Seq, ChIP-Seq, ChIP, ICC, IHC, WB	K562
Anti-TBP	HPA049805	ChIP-Exo-Seq, ChIP-Seq, ChIP, IHC, ICC	K562
Anti-TBX15	HPA052245	ChIP-Exo-Seq, ChIP-Seq, ChIP, WB, IHC	K562
Anti-TBX5	HPA064683	ChIP-Exo-Seq, ChIP-Seq, ChIP, ICC	K562
Anti-TCEAL8	HPA059115	ChIP-Exo-Seq, ChIP-Seq, ChIP, ICC, IHC	K562
Anti-TCF4	HPA025958	ChIP-Exo-Seq, ChIP-Seq, ChIP, IHC	K562
Anti-TCF7	HPA070505	ChIP-Exo-Seq, ChIP-Seq, ChIP, WB, ICC	K562
Anti-TEAD4	HPA056896	ChIP-Exo-Seq, ChIP-Seq, ChIP, ICC, IHC	K562

* *Motif sequence shown on product page at atlasantibodies.com*

4.8 Transcription Factors & Cofactors - *CONT.*

Product Name	Product ID	Recommended Applications	ChIP-Certified Cell line
Anti-TFAP2B	HPA034683	ChIP-Exo-Seq, ChIP-Seq, ChIP, IHC	K562
Anti-TFCP2	HPA070247	ChIP-Exo-Seq, ChIP-Seq, ChIP, ICC, WB	K562
Anti-TFEC	HPA063577	ChIP-Exo-Seq, ChIP-Seq, ChIP, ICC	K562
Anti-TGIF1	HPA062160	ChIP-Exo-Seq, ChIP-Seq, ChIP, WB, ICC	K562
Anti-TGIF2	HPA053786	ChIP-Exo-Seq, ChIP-Seq, ChIP, ICC	K562
Anti-TGIF2LX	HPA034543	ChIP-Exo-Seq, ChIP-Seq, ChIP, ICC, IHC, WB	K562
Anti-TP73	HPA044516	ChIP-Exo-Seq, ChIP-Seq, ChIP, ICC, WB	K562
Anti-TSC22D1	HPA077414	ChIP-Exo-Seq, ChIP-Seq, ChIP, ICC	K562
Anti-TSC22D3	HPA001916	ChIP-Exo-Seq, ChIP-Seq, ChIP, ICC	K562
Anti-USF1	HPA036233	ChIP-Exo-Seq, ChIP-Seq, ChIP, WB, IHC, ICC	K562
Anti-USF2*	HPA029764	ChIP-Exo-Seq, ChIP-Seq, ChIP, ICC	K562
Anti-WT1	HPA053848	ChIP-Exo-Seq, ChIP-Seq, ChIP, ICC	K562
Anti-YY1*	HPA001119	ChIP-Exo-Seq, ChIP-Seq, ChIP, WB, IHC	K562
Anti-YY2	HPA030335	ChIP-Exo-Seq, ChIP-Seq, ChIP, IHC, ICC	K562
Anti-ZEB1	HPA027524	ChIP-Exo-Seq, ChIP-Seq, ChIP, ICC, IHC	K562
Anti-ZFHX3	HPA059353	ChIP-Exo-Seq, ChIP-Seq, ChIP, IHC	K562

* *Motif sequence shown on product page at atlasantibodies.com*

4.9 Telomere Binding Protein

Product Name	Product ID	Recommended Applications	ChIP-Certified Cell line
Anti-TERF1	HPA048379	ChIP-Exo-Seq, ChIP-Seq, ChIP, ICC	K562
Anti-TERF2IP	HPA006719	ChIP-Exo-Seq, ChIP-Seq, ChIP, ICC, IHC, WB	K562

ChIP-Exo-Seq:
Precision Beyond Traditional ChIP Assays

Feature	Atlas Antibodies' ChIP-Exo-Seq Validation	Other Vendors' ChIP Assays validation
Resolution	✓ ChIP-Exo-Seq provides single-base high resolution and precise mapping of protein-DNA interaction sites to ensure specificity and accuracy.	✗ ChIP or ChIP-seq provide broader peak regions of binding. Validation may rely on ChIP-qPCR or motif enrichment, lacks single base-pair precision.
Noise Level	✓ Reduced noise: exonuclease removes unbound DNA, minimizes nonspecific DNA signals and improves signal-to-noise ratio.	✗ Higher noise levels due to nonspecific binding and pull-down of unbound DNA. Depends on antibody quality; broader peaks may contain more background signal.
Genome Coverage	✓ Genome-wide mapping with high accuracy. Covers protein-DNA interactions at single-nucleotide resolution, enabling fine-scale regulatory studies.	✗ Genome-wide mapping but with broader regions of uncertainty, and less precise binding site localization.
Applications	✓ Ideal for for precise studies of transcription factors, histone modifications, and chromatin-binding proteins at single-base resolution.	✗ Suitable for broader studies of epigenetics and protein-DNA interactions but lacks ChIP-exo specificity and precision.

Atlas Antibodies' antibodies validated with ChIP-Exo-Seq are designed for researchers requiring ultra-high resolution, sensitivity, and specificity, such as precise transcription factor mapping or histone modification studies. The ChIP-Exo-Seq validation provides genome-wide insights into protein-DNA interactions at single-base resolution (base-pair precision).

Other vendors provide general ChIP-validated antibodies. Their validation processes often include single locus "browser shots" of anecdotal binding, which lacks statistical robustness making their antibodies suitable for standard ChIP or ChIP-Seq studies, not optimized for advanced techniques. Their medium resolution defines genomic regions but lacks base-pair precision.

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