Supplementary information for:

RECAP reveals the true statistical significance of ChIP-seq peak calls

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Table S1: ENCODE identifiers for ChIP-seq replicate datasets

Replicate 1	Replicate 2	Lab	Transcription Factor	Cell Line
ENCFF263MBV	ENCFF860IRS	Michael Snyder	TARDBP	*Homo sapiens* K562
ENCFF141XAC	ENCFF995IZW	Michael Snyder	SKIL	*Homo sapiens* K562
ENCFF487SUP	ENCFF758LME	Michael Snyder	SP1	*Homo sapiens* K562
ENCFF254IUH	ENCFF167NVK	Michael Snyder	MTA2	*Homo sapiens* K562
ENCFF294UTM	ENCFF387BDW	Michael Snyder	SMARCE1	*Homo sapiens* K562
ENCFF619XNM	ENCFF518PQY	Michael Snyder	ATF7	*Homo sapiens* K562
ENCFF024NZQ	ENCFF168TBA	Michael Snyder	RAD51	*Homo sapiens* K562
ENCFF682OCC	ENCFF639CLN	Michael Snyder	MIER1	*Homo sapiens* K562
ENCFF149LTH	ENCFF873BRB	Michael Snyder	ZBTB40	*Homo sapiens* K562
ENCFF717OYW	ENCFF500YYZ	Michael Snyder	ZEB2	*Homo sapiens* K562
ENCFF073MBT	ENCFF280ZFT	Tim Reddy	CEBPB	*Homo sapiens* A549
ENCFF074CYV	ENCFF864XTU	Tim Reddy	EP300	*Homo sapiens* A549
ENCFF796UCB	ENCFF098QVB	Tim Reddy	BCL3	*Homo sapiens* A549
ENCFF179XAQ	ENCFF330XFU	Tim Reddy	JUNB	*Homo sapiens* A549
ENCFF217RBI	ENCFF791DRP	Tim Reddy	CEBPB	*Homo sapiens* A549
ENCFF347MNU	ENCFF417GPF	Tim Reddy	CEBPB	*Homo sapiens* A549
ENCFF599JTK	ENCFF389OFH	Tim Reddy	JUNB	*Homo sapiens* A549
ENCFF476XBN	ENCFF761UEZ	Tim Reddy	JUN	*Homo sapiens* A549
ENCFF504YVD	ENCFF595EIS	Tim Reddy	HES2	*Homo sapiens* A549
ENCFF181HLP	ENCFF870WJP	Tim Reddy	NR3C1	*Homo sapiens* A549
ENCFF575GRT	ENCFF177XDM	Richard Myers	TAF1	*Homo sapiens* GM12878
ENCFF725DLZ	ENCFF238NNG	Richard Myers	EP300	*Homo sapiens* GM12878
ENCFF399QIP	ENCFF802IZN	Richard Myers	BATF	*Homo sapiens* GM12878
ENCFF579PRC	ENCFF884LEJ	Richard Myers	RUNX3	*Homo sapiens* GM12878
ENCFF791EPM	ENCFF845MYC	Richard Myers	PBX3	*Homo sapiens* GM12878
ENCFF963FTZ	ENCFF179SRP	Richard Myers	TARDBP	*Homo sapiens* GM12878
ENCFF240MQI	ENCFF888PAI	Richard Myers	IRF4	*Homo sapiens* GM12878
ENCFF894EID	ENCFF569QEN	Richard Myers	REST	*Homo sapiens* GM12878
ENCFF207QTV	ENCFF983YCI	Richard Myers	NFATC1	*Homo sapiens* GM12878
ENCFF731ZNW	ENCFF263NOT	Richard Myers	SRF	*Homo sapiens* GM12878

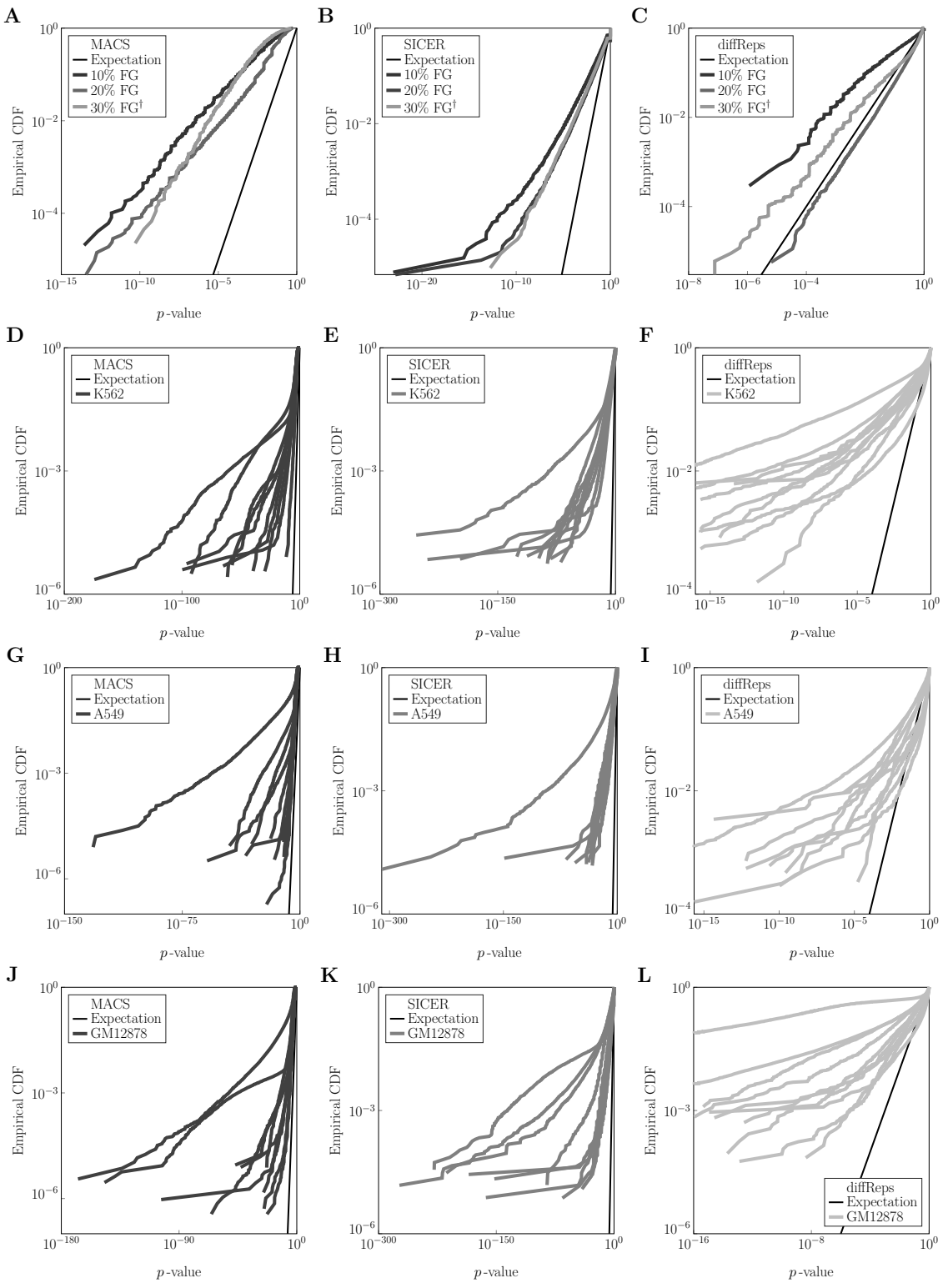
Replicate 1	Replicate 2	Lab	Transcription Factor	Cell Line
ENCFF013XEG	ENCFF040PMB	Xiang-Dong Fu	TARDBP	*Homo sapiens* HepG2
ENCFF247KKW	ENCFF046IYE	Xiang-Dong Fu	SNRNP70	*Homo sapiens* HepG2
ENCFF490QZJ	ENCFF774URE	Xiang-Dong Fu	SRSF9	*Homo sapiens* HepG2
ENCFF641AUO	ENCFF883UWI	Xiang-Dong Fu	U2AF2	*Homo sapiens* HepG2
ENCFF033GIO	ENCFF739WOA	Xiang-Dong Fu	RBFOX2	*Homo sapiens* HepG2
ENCFF146SND	ENCFF560SVR	Xiang-Dong Fu	HNRNPL	*Homo sapiens* HepG2
ENCFF267HPS	ENCFF824EFD	Xiang-Dong Fu	AGO1	*Homo sapiens* HepG2
ENCFF728YOO	ENCFF542MVV	Xiang-Dong Fu	PRPF4	*Homo sapiens* HepG2
ENCFF707ALH	ENCFF954VXM	Xiang-Dong Fu	FIP1L1	*Homo sapiens* HepG2
ENCFF178TOV	ENCFF479DBP	Xiang-Dong Fu	PCBP2	*Homo sapiens* HepG2
ENCFF001IIN	ENCFF094XRA	Barbara Wold	USF1	*Homo sapiens* Myocyte
ENCFF001IIK	ENCFF302FXR	Barbara Wold	TCF3	*Homo sapiens* Myocyte
ENCFF001IHL	ENCFF770ANH	Barbara Wold	MYOD1	*Homo sapiens* Myocyte
ENCFF001IFF	ENCFF147NVK	Barbara Wold	MAX	*Homo sapiens* Myocyte
ENCFF001IIB	ENCFF380GQR	Barbara Wold	SRF	*Homo sapiens* Myocyte
ENCFF001IDK	ENCFF586VMG	Barbara Wold	E2F4	*Homo sapiens* Myocyte
ENCFF001IHG	ENCFF204AZL	Barbara Wold	MYOD1	*Homo sapiens* Myocyte
ENCFF001IIE	ENCFF727WYC	Barbara Wold	TCF12	*Homo sapiens* Myocyte
ENCFF001IFQ	ENCFF570IDO	Barbara Wold	REST	*Homo sapiens* Myocyte
ENCFF001IGZ	ENCFF259LKI	Barbara Wold	MYOG	*Homo sapiens* Myocyte

Table S2: ENCODE identifiers for ChIP-seq datasets and their controls

ChIP-seq	Control	Lab	Transcription Factor	Cell Line
ENCFF263MBV	ENCFF227IZS	Michael Snyder	TARDBP	*Homo sapiens* K562
ENCFF860IRS	ENCFF910IKB	Michael Snyder	TARDBP	*Homo sapiens* K562
ENCFF141XAC	ENCFF227IZS	Michael Snyder	SKIL	*Homo sapiens* K562
ENCFF995IZW	ENCFF910IKB	Michael Snyder	SKIL	*Homo sapiens* K562
ENCFF487SUP	ENCFF910IKB	Michael Snyder	SP1	*Homo sapiens* K562
ENCFF758LME	ENCFF227IZS	Michael Snyder	SP1	*Homo sapiens* K562
ENCFF254IUH	ENCFF227IZS	Michael Snyder	MTA2	*Homo sapiens* K562
ENCFF167NVK	ENCFF910IKB	Michael Snyder	MTA2	*Homo sapiens* K562
ENCFF294UTM	ENCFF227IZS	Michael Snyder	SMARCE1	*Homo sapiens* K562
ENCFF387BDW	ENCFF910IKB	Michael Snyder	SMARCE1	*Homo sapiens* K562
ENCFF619XNM	ENCFF910IKB	Michael Snyder	ATF7	*Homo sapiens* K562
ENCFF518PQY	ENCFF227IZS	Michael Snyder	ATF7	*Homo sapiens* K562
ENCFF024NZQ	ENCFF910IKB	Michael Snyder	RAD51	*Homo sapiens* K562
ENCFF168TBA	ENCFF227IZS	Michael Snyder	RAD51	*Homo sapiens* K562
ENCFF682OCC	ENCFF227IZS	Michael Snyder	MIER1	*Homo sapiens* K562
ENCFF639CLN	ENCFF910IKB	Michael Snyder	MIER1	*Homo sapiens* K562
ENCFF149LTH	ENCFF910IKB	Michael Snyder	ZBTB40	*Homo sapiens* K562
ENCFF873BRB	ENCFF227IZS	Michael Snyder	ZBTB40	*Homo sapiens* K562
ENCFF717OYW	ENCFF910IKB	Michael Snyder	ZEB2	*Homo sapiens* K562
ENCFF500YYZ	ENCFF227IZS	Michael Snyder	ZEB2	*Homo sapiens* K562
ENCFF073MBT	ENCFF214UMU	Tim Reddy	CEBPB	*Homo sapiens* A549
ENCFF280ZFT	ENCFF773DUX	Tim Reddy	CEBPB	*Homo sapiens* A549
ENCFF074CYV	ENCFF271MPT	Tim Reddy	EP300	*Homo sapiens* A549
ENCFF864XTU	ENCFF403EBP	Tim Reddy	EP300	*Homo sapiens* A549
ENCFF796UCB	ENCFF503AJR	Tim Reddy	BCL3	*Homo sapiens* A549
ENCFF098QVB	ENCFF831MPX	Tim Reddy	BCL3	*Homo sapiens* A549
ENCFF179XAQ	ENCFF171YYX	Tim Reddy	JUNB	*Homo sapiens* A549
ENCFF330XFU	ENCFF631DES	Tim Reddy	JUNB	*Homo sapiens* A549
ENCFF217RBI	ENCFF634ULC	Tim Reddy	CEBPB	*Homo sapiens* A549
ENCFF791DRP	ENCFF632UPH	Tim Reddy	CEBPB	*Homo sapiens* A549
ENCFF347MNU	ENCFF455UAB	Tim Reddy	CEBPB	*Homo sapiens* A549
ENCFF417GPF	ENCFF081TBO	Tim Reddy	CEBPB	*Homo sapiens* A549
ENCFF599JTK	ENCFF653HKQ	Tim Reddy	JUNB	*Homo sapiens* A549
ENCFF389OFH	ENCFF097CSC	Tim Reddy	JUNB	*Homo sapiens* A549
ENCFF476XBN	ENCFF193ABY	Tim Reddy	JUN	*Homo sapiens* A549
ENCFF761UEZ	ENCFF222ACA	Tim Reddy	JUN	*Homo sapiens* A549
ENCFF504YVD	ENCFF368OTV	Tim Reddy	HES2	*Homo sapiens* A549
ENCFF595EIS	ENCFF634ULC	Tim Reddy	HES2	*Homo sapiens* A549
ENCFF181HLP	ENCFF813FWF	Tim Reddy	NR3C1	*Homo sapiens* A549
ENCFF870WJP	ENCFF159VBZ	Tim Reddy	NR3C1	*Homo sapiens* A549

ChIP-seq	Control	Lab	Transcription Factor	Cell Line
ENCFF575GRT	ENCFF562HPN	Richard Myers	TAF1	*Homo sapiens* GM12878
ENCFF177XDM	ENCFF100EIH	Richard Myers	TAF1	*Homo sapiens* GM12878
ENCFF725DLZ	ENCFF438FFV	Richard Myers	EP300	*Homo sapiens* GM12878
ENCFF238NNG	ENCFF562HPN	Richard Myers	EP300	*Homo sapiens* GM12878
ENCFF399QIP	ENCFF100EIH	Richard Myers	BATF	*Homo sapiens* GM12878
ENCFF802IZN	ENCFF438FFV	Richard Myers	BATF	*Homo sapiens* GM12878
ENCFF579PRC	ENCFF754WTG	Richard Myers	RUNX3	*Homo sapiens* GM12878
ENCFF884LEJ	ENCFF966AVZ	Richard Myers	RUNX3	*Homo sapiens* GM12878
ENCFF791EPM	ENCFF562HPN	Richard Myers	PBX3	*Homo sapiens* GM12878
ENCFF845MYC	ENCFF100EIH	Richard Myers	PBX3	*Homo sapiens* GM12878
ENCFF963FTZ	ENCFF423BBH	Richard Myers	TARDBP	*Homo sapiens* GM12878
ENCFF179SRP	ENCFF747NOF	Richard Myers	TARDBP	*Homo sapiens* GM12878
ENCFF240MQI	ENCFF100EIH	Richard Myers	IRF4	*Homo sapiens* GM12878
ENCFF888PAI	ENCFF438FFV	Richard Myers	IRF4	*Homo sapiens* GM12878
ENCFF894EID	ENCFF430ZCF	Richard Myers	REST	*Homo sapiens* GM12878
ENCFF569QEN	ENCFF100EIH	Richard Myers	REST	*Homo sapiens* GM12878
ENCFF207QTV	ENCFF754WTG	Richard Myers	NFATC1	*Homo sapiens* GM12878
ENCFF983YCI	ENCFF966AVZ	Richard Myers	NFATC1	*Homo sapiens* GM12878
ENCFF731ZNW	ENCFF862QZT	Richard Myers	SRF	*Homo sapiens* GM12878
ENCFF263NOT	ENCFF289ONG	Richard Myers	SRF	*Homo sapiens* GM12878
ENCFF013XEG	ENCFF060VZM	Xiang-Dong Fu	TARDBP	*Homo sapiens* HepG2
ENCFF040PMB	ENCFF809MGU	Xiang-Dong Fu	TARDBP	*Homo sapiens* HepG2
ENCFF247KKW	ENCFF253UKR	Xiang-Dong Fu	SNRNP70	*Homo sapiens* HepG2
ENCFF046IYE	ENCFF279QEN	Xiang-Dong Fu	SNRNP70	*Homo sapiens* HepG2
ENCFF490QZJ	ENCFF629YZR	Xiang-Dong Fu	SRSF9	*Homo sapiens* HepG2
ENCFF774URE	ENCFF563YRA	Xiang-Dong Fu	SRSF9	*Homo sapiens* HepG2
ENCFF641AUO	ENCFF253UKR	Xiang-Dong Fu	U2AF2	*Homo sapiens* HepG2
ENCFF883UWI	ENCFF279QEN	Xiang-Dong Fu	U2AF2	*Homo sapiens* HepG2
ENCFF033GIO	ENCFF874GUL	Xiang-Dong Fu	RBFOX2	*Homo sapiens* HepG2
ENCFF739WOA	ENCFF719EDQ	Xiang-Dong Fu	RBFOX2	*Homo sapiens* HepG2
ENCFF146SND	ENCFF253UKR	Xiang-Dong Fu	HNRNPL	*Homo sapiens* HepG2
ENCFF560SVR	ENCFF279QEN	Xiang-Dong Fu	HNRNPL	*Homo sapiens* HepG2
ENCFF267HPS	ENCFF874GUL	Xiang-Dong Fu	AGO1	*Homo sapiens* HepG2
ENCFF824EFD	ENCFF719EDQ	Xiang-Dong Fu	AGO1	*Homo sapiens* HepG2
ENCFF728YOO	ENCFF450GNQ	Xiang-Dong Fu	PRPF4	*Homo sapiens* HepG2
ENCFF542MVV	ENCFF901YVZ	Xiang-Dong Fu	PRPF4	*Homo sapiens* HepG2
ENCFF707ALH	ENCFF707WXP	Xiang-Dong Fu	FIP1L1	*Homo sapiens* HepG2
ENCFF954VXM	ENCFF322OEH	Xiang-Dong Fu	FIP1L1	*Homo sapiens* HepG2
ENCFF178TOV	ENCFF450GNQ	Xiang-Dong Fu	PCBP2	*Homo sapiens* HepG2
ENCFF479DBP	ENCFF901YVZ	Xiang-Dong Fu	PCBP2	*Homo sapiens* HepG2

ChIP-seq	Control	Lab	Transcription Factor	Cell Line
ENCFF001IIN	ENCFF001IER	Barbara Wold	USF1	*Homo sapiens* Myocyte
ENCFF094XRA	ENCFF001IES	Barbara Wold	USF1	*Homo sapiens* Myocyte
ENCFF001IIK	ENCFF001IEN	Barbara Wold	TCF3	*Homo sapiens* Myocyte
ENCFF302FXR	ENCFF258NUS	Barbara Wold	TCF3	*Homo sapiens* Myocyte
ENCFF001IHL	ENCFF001IEN	Barbara Wold	MYOD1	*Homo sapiens* Myocyte
ENCFF770ANH	ENCFF258NUS	Barbara Wold	MYOD1	*Homo sapiens* Myocyte
ENCFF001IFF	ENCFF993HAY	Barbara Wold	MAX	*Homo sapiens* Myocyte
ENCFF147NVK	ENCFF290FPB	Barbara Wold	MAX	*Homo sapiens* Myocyte
ENCFF001IIB	ENCFF001IDR	Barbara Wold	SRF	*Homo sapiens* Myocyte
ENCFF380GQR	ENCFF122QLV	Barbara Wold	SRF	*Homo sapiens* Myocyte
ENCFF001IDK	ENCFF001IER	Barbara Wold	E2F4	*Homo sapiens* Myocyte
ENCFF586VMG	ENCFF993HAY	Barbara Wold	E2F4	*Homo sapiens* Myocyte
ENCFF001IHG	ENCFF001IDR	Barbara Wold	MYOD1	*Homo sapiens* Myocyte
ENCFF204AZL	ENCFF122QLV	Barbara Wold	MYOD1	*Homo sapiens* Myocyte
ENCFF001IIE	ENCFF001IES	Barbara Wold	TCF12	*Homo sapiens* Myocyte
ENCFF727WYC	ENCFF290FPB	Barbara Wold	TCF12	*Homo sapiens* Myocyte
ENCFF001IFQ	ENCFF001IEN	Barbara Wold	REST	*Homo sapiens* Myocyte
ENCFF570IDO	ENCFF258NUS	Barbara Wold	REST	*Homo sapiens* Myocyte
ENCFF001IGZ	ENCFF993HAY	Barbara Wold	MYOG	*Homo sapiens* Myocyte
ENCFF259LKI	ENCFF290FPB	Barbara Wold	MYOG	*Homo sapiens* Myocyte


A
MACS
Expectation
10% FG
20% FG
30% FG†
B
SICER
Expectation
10% FG
20% FG
30% FG†
C
diffReps
Expectation
10% FG
20% FG
30% FG†
D
MACS
Expectation
K562
E
SICER
Expectation
K562
F
diffReps
Expectation
K562
G
MACS
Expectation
A549
H
SICER
Expectation
A549
I
diffReps
Expectation
A549
J
MACS
Expectation
GM12878
K
SICER
Expectation
GM12878
L
diffReps
Expectation
GM12878
Empirical CDF
p-value

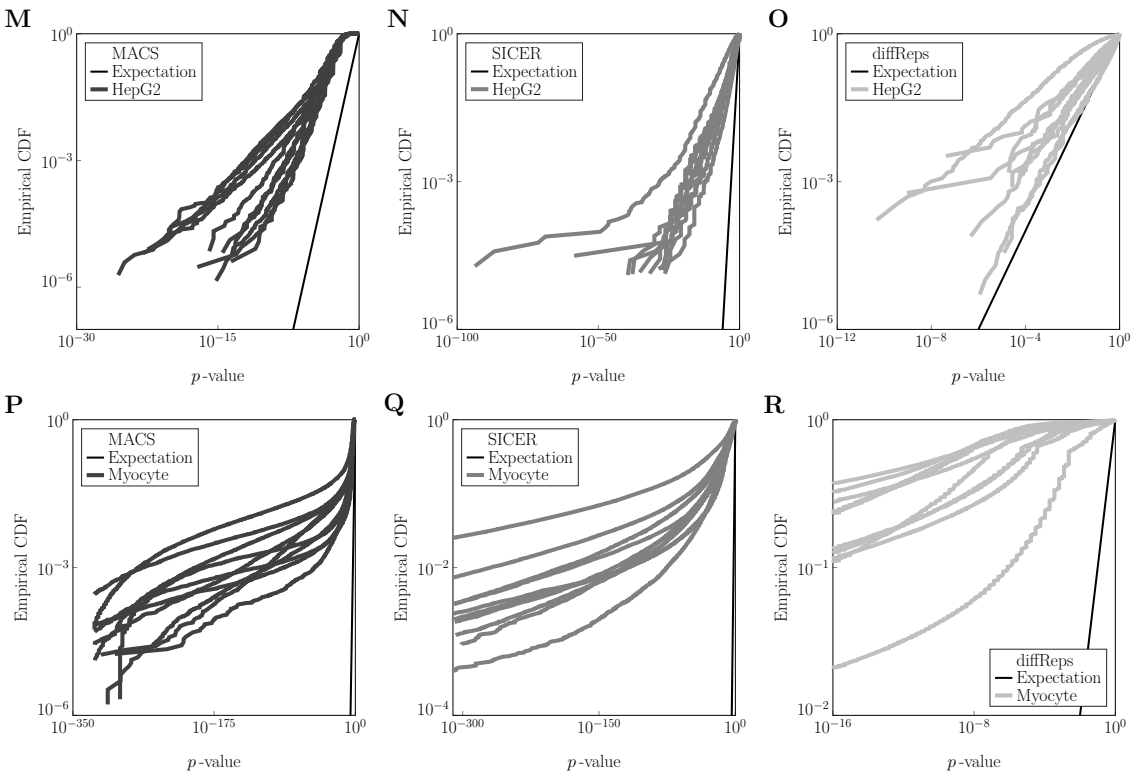
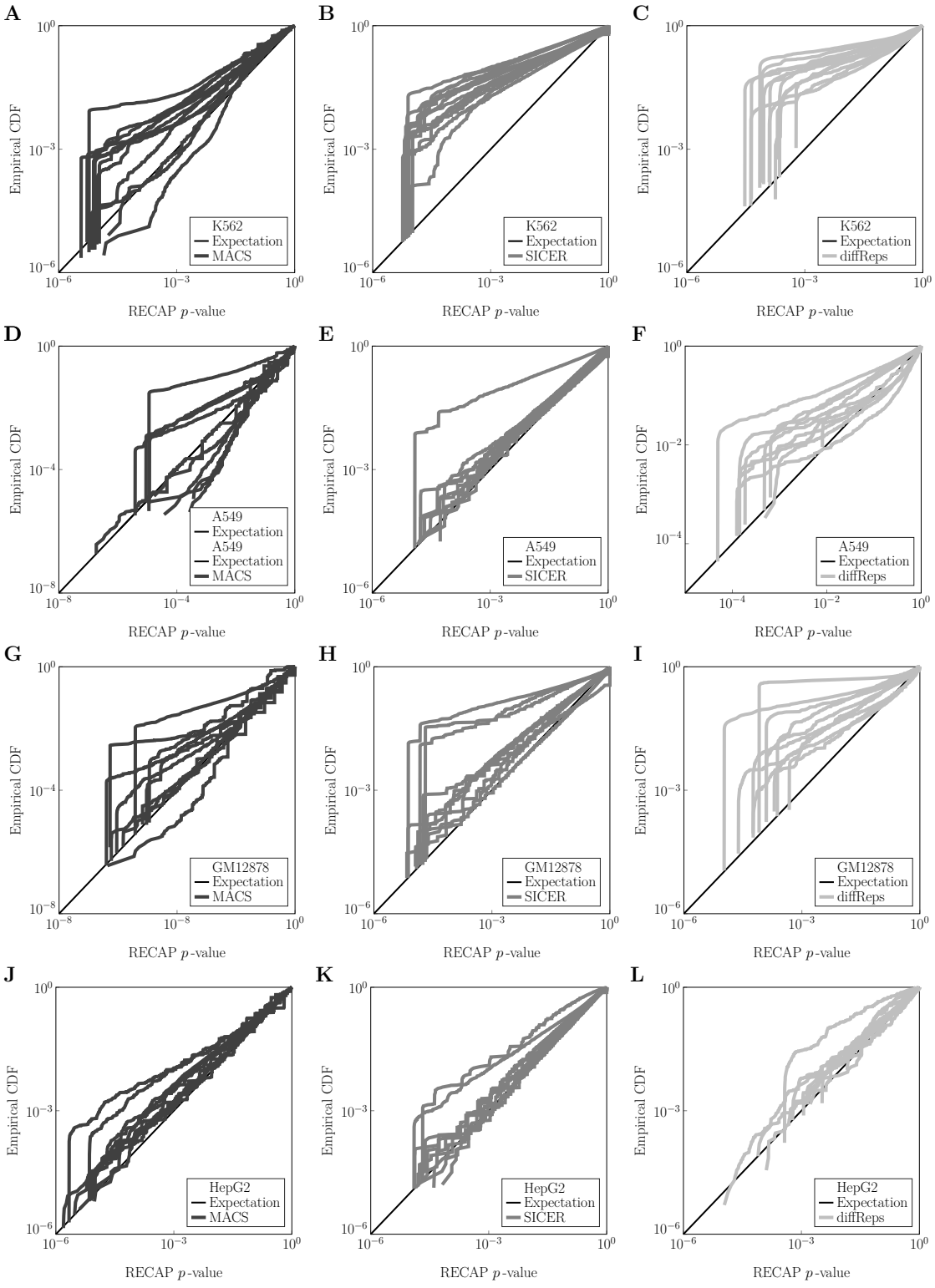


Figure S1: Empirical CDF for peak raw p-values for MACS (A), SICER (B), and diffReps (C) when applied to different types of simulated null hypothesis data: 500bp peaks with 10% of total reads, 500bp peaks with 20% of total reads, and 4kbp peaks with 30% of total reads. Empirical CDFs for peak raw p-values for MACS (D, G, J, M, P), SICER (E, H, K, N, Q), and diffReps (F, I, L, O, R) when applied to ENCODE data, where one ChIP-seq replicate is used as control for another ChIP-seq replicate.


A
B
C
D
E
F
G
H
I
J
K
L
Empirical CDF
RECAP p-value
K562
Expectation
MACS
SICER
diffReps
A549
GM12878
HepG2

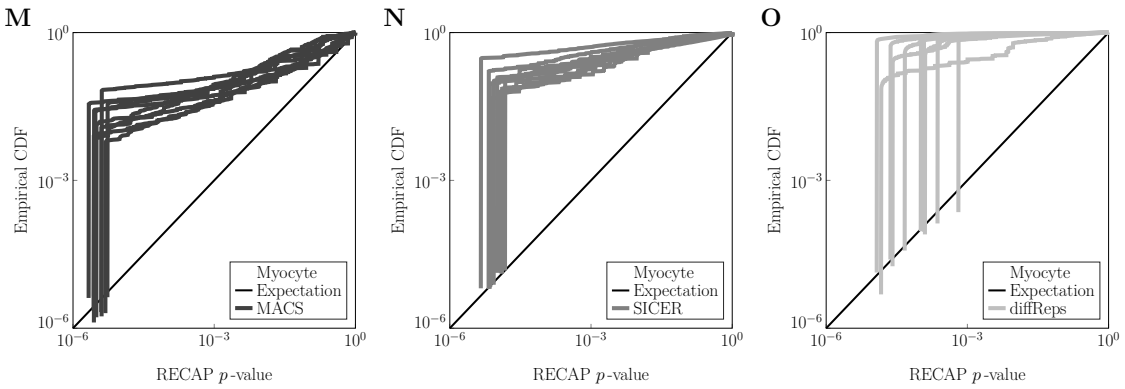


Figure S2: Empirical CDFs for peak recalibrated p-values for MACS (A, D, G, J, M), SICER (B, E, H, K, N) and diffReps (C, F, I, L, O) when applied to 10 replicate pairs of ENCODE ChIP-seq data.

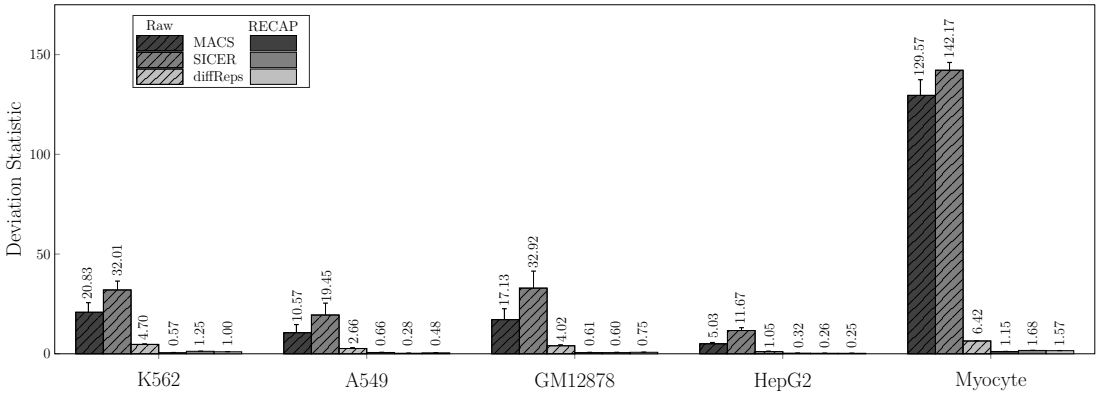
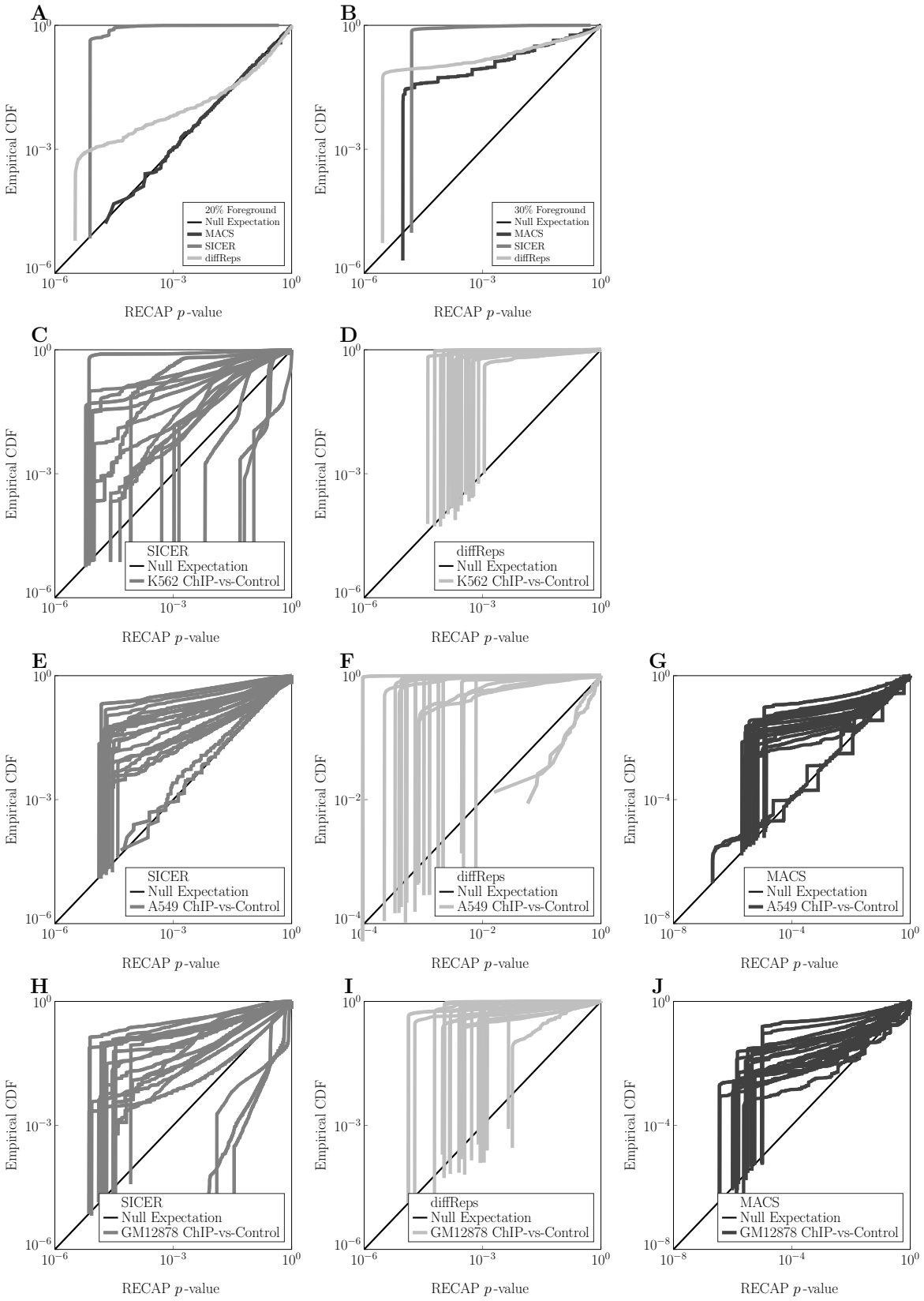
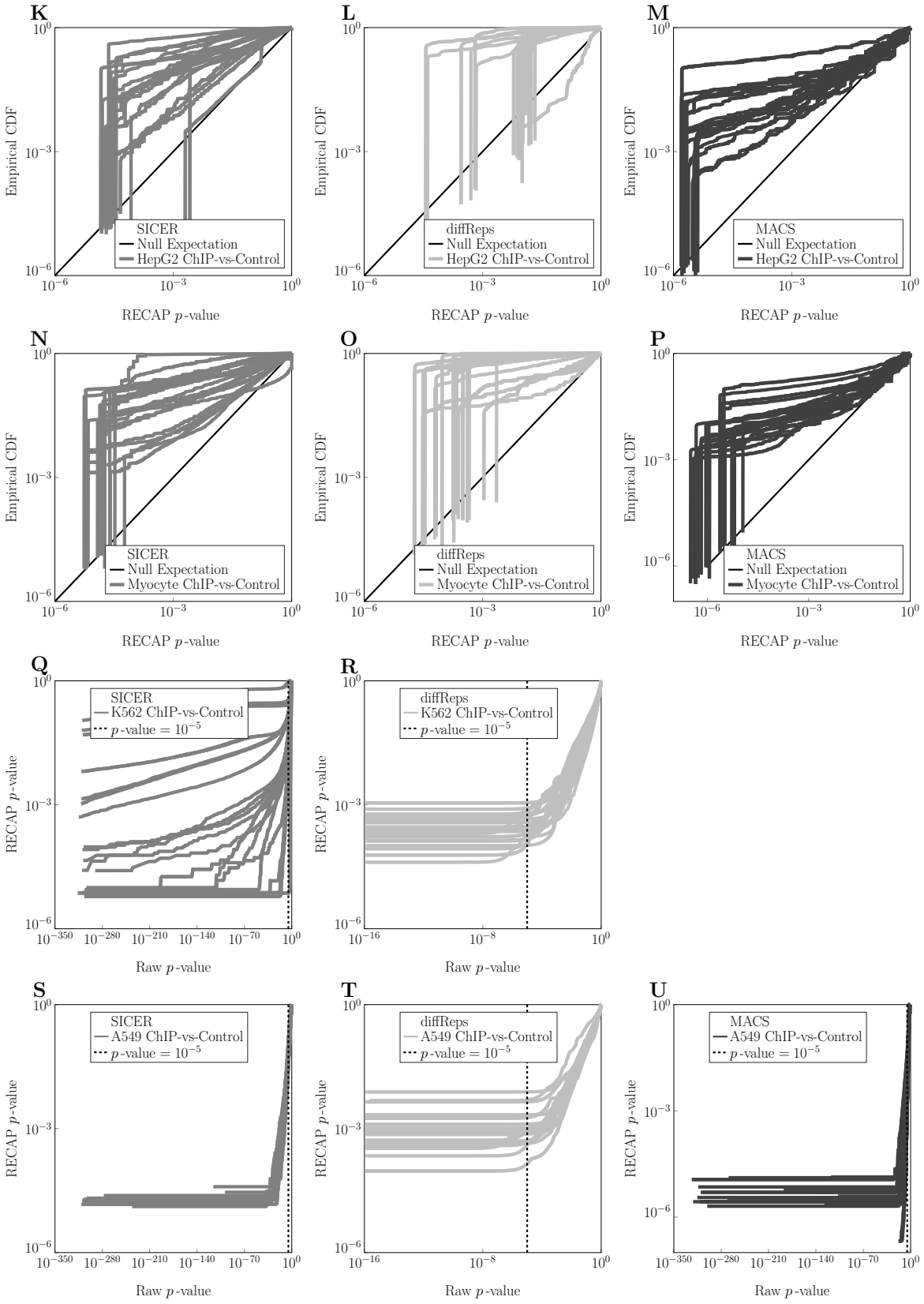


Figure S3: Reductions in deviation statistic for the RECAP recalibrated p-values for 10 replicate pairs of datasets within 5 cell lines.


A
B
C
D
E
F
G
H
I
J
Empirical CDF
RECAP p-value
20% Foreground
30% Foreground
Null Expectation
MACS
SICER
diffReps
K562 ChIP-vs-Control
A549 ChIP-vs-Control
GM12878 ChIP-vs-Control


K
L
M
N
O
P
Q
R
S
T
U
Empirical CDF
RECAP p-value
Raw p-value
SICER
diffReps
MACS
Null Expectation
HepG2 ChIP-vs-Control
Myocyte ChIP-vs-Control
K562 ChIP-vs-Control
A549 ChIP-vs-Control
p-value = 10^{-5}
10^{0}
10^{-3}
10^{-6}
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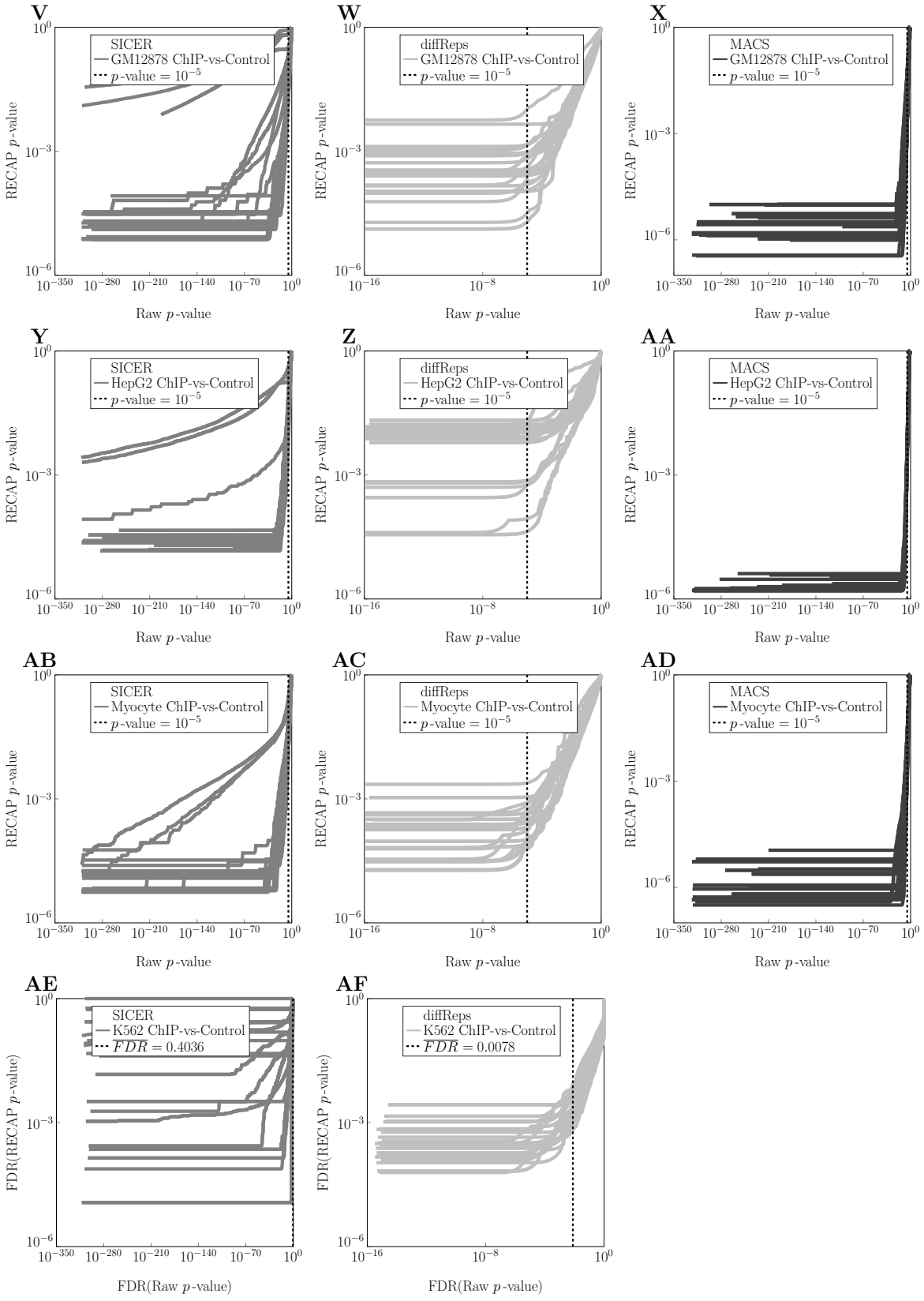
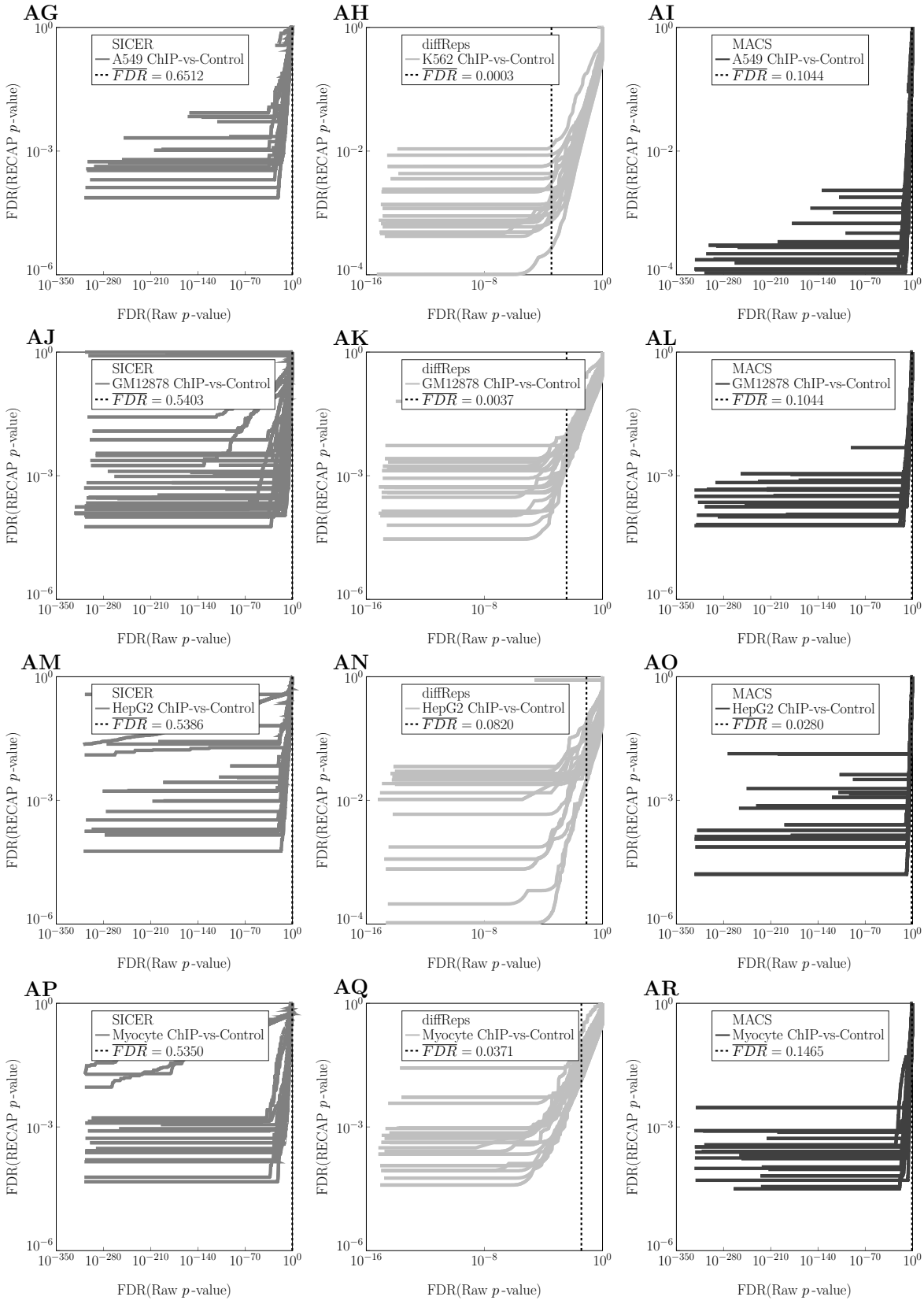
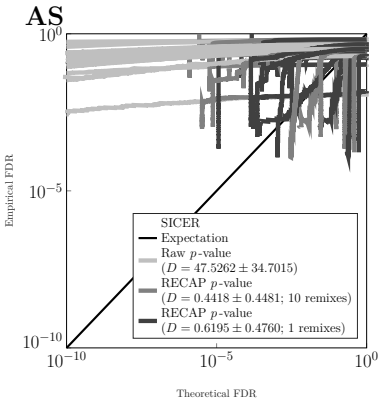
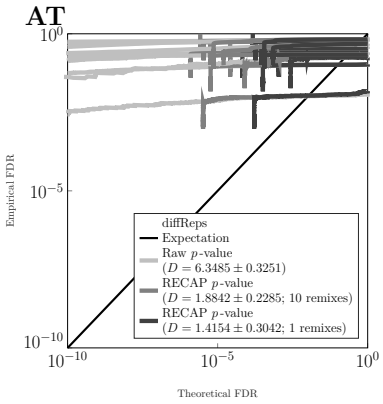
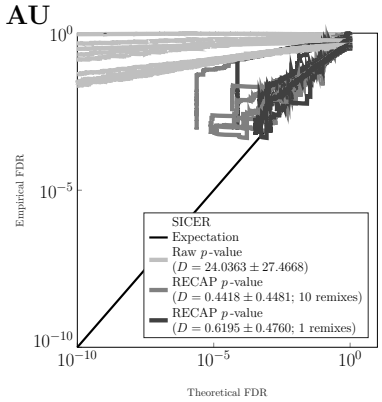
10^{-8}
10^{-350}
10^{-280}
10^{-210}
10^{-140}
10^{-70}

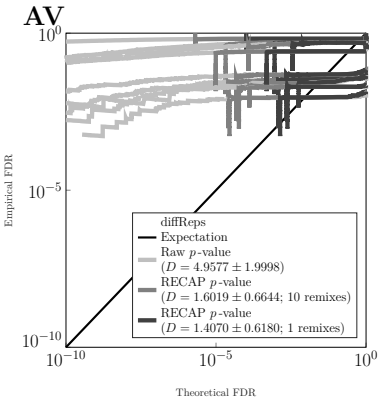

V
SICER
GM12878 ChIP-vs-Control
p-value = 10^{-5}
RECAP p-value
Raw p-value
W
diffReps
GM12878 ChIP-vs-Control
p-value = 10^{-5}
RECAP p-value
Raw p-value
X
MACS
GM12878 ChIP-vs-Control
p-value = 10^{-5}
RECAP p-value
Raw p-value
Y
SICER
HepG2 ChIP-vs-Control
p-value = 10^{-5}
RECAP p-value
Raw p-value
Z
diffReps
HepG2 ChIP-vs-Control
p-value = 10^{-5}
RECAP p-value
Raw p-value
AA
MACS
HepG2 ChIP-vs-Control
p-value = 10^{-5}
RECAP p-value
Raw p-value
AB
SICER
Myocyte ChIP-vs-Control
p-value = 10^{-5}
RECAP p-value
Raw p-value
AC
diffReps
Myocyte ChIP-vs-Control
p-value = 10^{-5}
RECAP p-value
Raw p-value
AD
MACS
Myocyte ChIP-vs-Control
p-value = 10^{-5}
RECAP p-value
Raw p-value
AE
SICER
K562 ChIP-vs-Control
$\overline{FDR}$ = 0.4036
FDR(RECAP p-value)
FDR(Raw p-value)
AF
diffReps
K562 ChIP-vs-Control
$\overline{FDR}$ = 0.0078
FDR(RECAP p-value)
FDR(Raw p-value)

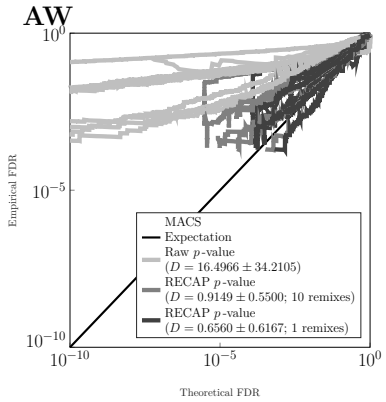

AG
SICER
A549 ChIP-vs-Control
$\overline{FDR} = 0.6512$
AH
diffReps
K562 ChIP-vs-Control
$\overline{FDR} = 0.0003$
AI
MACS
A549 ChIP-vs-Control
$\overline{FDR} = 0.1044$
AJ
SICER
GM12878 ChIP-vs-Control
$\overline{FDR} = 0.5403$
AK
diffReps
GM12878 ChIP-vs-Control
$\overline{FDR} = 0.0037$
AL
MACS
GM12878 ChIP-vs-Control
$\overline{FDR} = 0.1044$
AM
SICER
HepG2 ChIP-vs-Control
$\overline{FDR} = 0.5386$
AN
diffReps
HepG2 ChIP-vs-Control
$\overline{FDR} = 0.0820$
AO
MACS
HepG2 ChIP-vs-Control
$\overline{FDR} = 0.0280$
AP
SICER
Myocyte ChIP-vs-Control
$\overline{FDR} = 0.5350$
AQ
diffReps
Myocyte ChIP-vs-Control
$\overline{FDR} = 0.0371$
AR
MACS
Myocyte ChIP-vs-Control
$\overline{FDR} = 0.1465$
FDR(RECAP p-value)
FDR(Raw p-value)

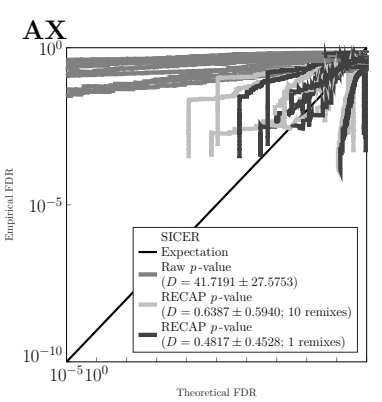

AS
Empirical FDR
Theoretical FDR
SICER
Expectation
Raw p-value
($D = 47.5262 \pm 34.7015$)
RECAP p-value
($D = 0.4418 \pm 0.4481$; 10 remixes)
RECAP p-value
($D = 0.6195 \pm 0.4760$; 1 remixes)

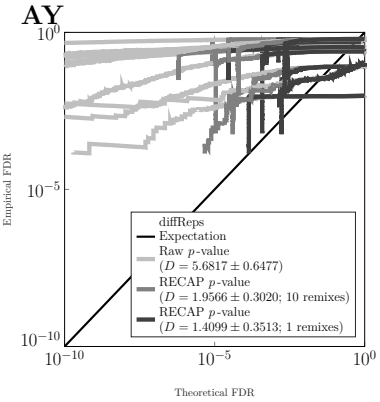

AT
Empirical FDR
Theoretical FDR
diffReps
Expectation
Raw p-value
($D = 6.3485 \pm 0.3251$)
RECAP p-value
($D = 1.8842 \pm 0.2285$; 10 remixes)
RECAP p-value
($D = 1.4154 \pm 0.3042$; 1 remixes)

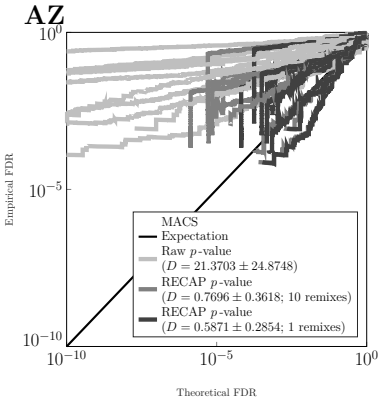

AU
Empirical FDR
Theoretical FDR
SICER
Expectation
Raw p-value
($D = 24.0363 \pm 27.4668$)
RECAP p-value
($D = 0.4418 \pm 0.4481$; 10 remixes)
RECAP p-value
($D = 0.6195 \pm 0.4760$; 1 remixes)

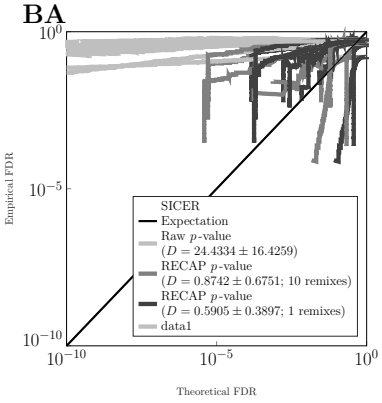

AV
Empirical FDR
Theoretical FDR
diffReps
Expectation
Raw p-value
($D = 4.9577 \pm 1.9998$)
RECAP p-value
($D = 1.6019 \pm 0.6644$; 10 remixes)
RECAP p-value
($D = 1.4070 \pm 0.6180$; 1 remixes)

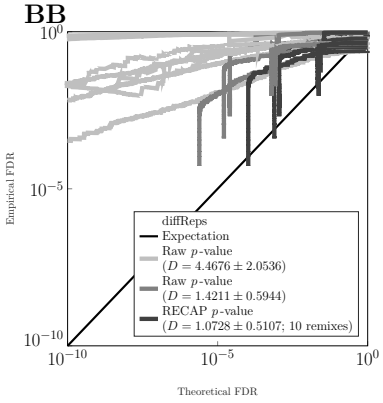

AW
Empirical FDR
Theoretical FDR
MACS
Expectation
Raw p-value
($D = 16.4966 \pm 34.2105$)
RECAP p-value
($D = 0.9149 \pm 0.5500$; 10 remixes)
RECAP p-value
($D = 0.6560 \pm 0.6167$; 1 remixes)

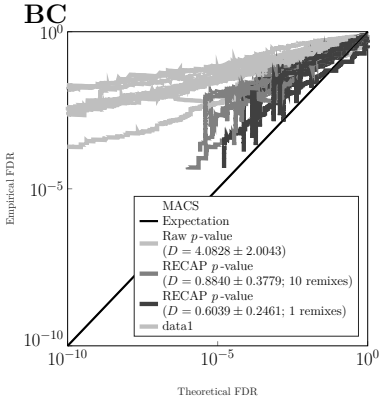

AX
Empirical FDR
Theoretical FDR
SICER
Expectation
Raw p-value
($D = 41.7191 \pm 27.5753$)
RECAP p-value
($D = 0.6387 \pm 0.5940$; 10 remixes)
RECAP p-value
($D = 0.4817 \pm 0.4528$; 1 remixes)


AY
Empirical FDR
Theoretical FDR
diffReps
Expectation
Raw p-value
($D = 5.6817 \pm 0.6477$)
RECAP p-value
($D = 1.9566 \pm 0.3020$; 10 remixes)
RECAP p-value
($D = 1.4099 \pm 0.3513$; 1 remixes)


AZ
Empirical FDR
Theoretical FDR
MACS
Expectation
Raw p-value
($D = 21.3703 \pm 24.8748$)
RECAP p-value
($D = 0.7696 \pm 0.3618$; 10 remixes)
RECAP p-value
($D = 0.5871 \pm 0.2854$; 1 remixes)


BA
Empirical FDR
Theoretical FDR
SICER
Expectation
Raw p-value
($D = 24.4334 \pm 16.4259$)
RECAP p-value
($D = 0.8742 \pm 0.6751$; 10 remixes)
RECAP p-value
($D = 0.5905 \pm 0.3897$; 1 remixes)
data1


BB
Empirical FDR
Theoretical FDR
diffReps
Expectation
Raw p-value
($D = 4.4676 \pm 2.0536$)
Raw p-value
($D = 1.4211 \pm 0.5944$)
RECAP p-value
($D = 1.0728 \pm 0.5107$; 10 remixes)


BC
Empirical FDR
Theoretical FDR
MACS
Expectation
Raw p-value
($D = 4.0828 \pm 2.0043$)
RECAP p-value
($D = 0.8840 \pm 0.3779$; 10 remixes)
RECAP p-value
($D = 0.6039 \pm 0.2461$; 1 remixes)
data1

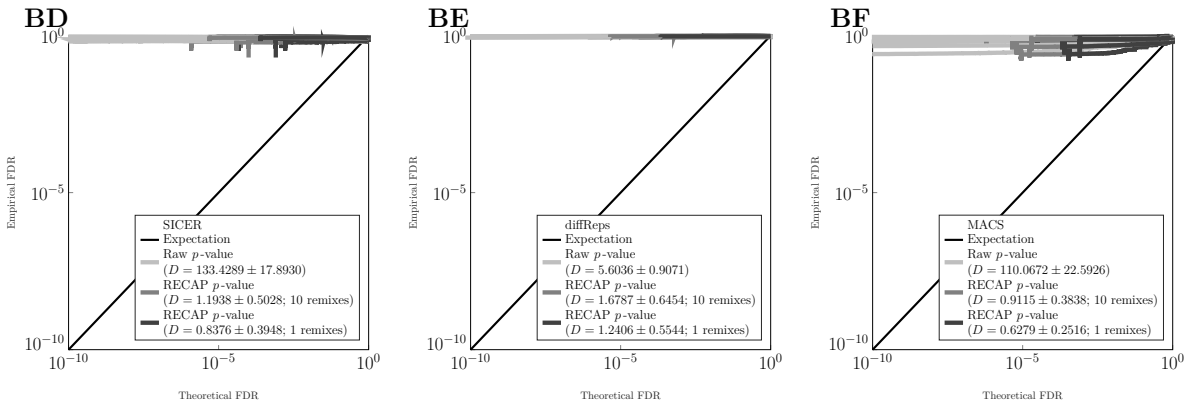


Figure S4: Empirical CDFs, p-values and theoretical and empirical FDRs for SICER, diffReps, and MACS for ENCODE ChIP-seq versus control peak calling.

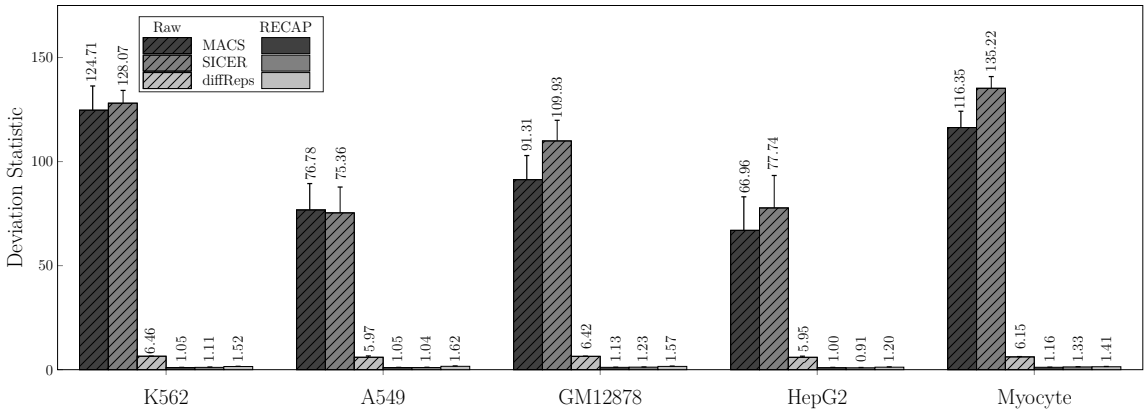


Figure S5: Reductions in deviation statistic for the RECAP recalibrated p-values for 10 pairs of ENCODE ChIP-seq versus control peak calling within 5 cell lines.