irCLIP-RNP dataset from 13 RBPs in HEK293T and HepG2 from three RNP subzones ranging form 60-120kDa, 120-225kDa, and 225-350kDa

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This is the pipeline used to analyze the irCLIP-RNP TMT datasets for 13 RBPs from three different gel sections ranging from 60-120kDa, 120-225kDa, and 225-350kDa. The experiment was performed in HEK293T and HepG2 cells.

1. Prepare the dataset

```
#Needed libraries
library(DEP2)
library(tidyverse)
library(ggplot2)
library(data.table)
library(pheatmap)
library(RColorBrewer)
library(gplots)
library(hrbrthemes)
library(pacman)
library(textshape)
library(ggExtra)
library(viridis)
library(purrr)
library(hexbin)
library(DESeq2)
library(ggpubr)
library(UpSetR)
library(dplyr)
library(Clipper)
library(factoextra)
library(paletteer)
library(corrplot)
library(psych)
library(ggpmisc)
library(gprofiler2)
library(viridis)
library(GGally)
library(igraph)
library(rstatix)
library(limma)
```

```
# Open TMT data that were searched with MaxQuant and processed with Perseus
ABCF1_data <- read.delim("~/Documents/Postdoc/PD_Projects/3_irCLIP-RNP/MS/TMT_analysis/0_TMT_data
    /ABCF1_BZ59.txt")
```

```
DDX5_data <- read.delim("~/Documents/Postdoc/PD_Projects/3_irCLIP-RNP/MS/TMT_analysis/0_TMT_data/
    DDX5_BZ6.txt")
FUS_data <- read.delim("~/Documents/Postdoc/PD_Projects/3_irCLIP-RNP/MS/TMT_analysis/0_TMT_data/
    FUS_BZ3.txt")
hnA2B1_data <- read.delim("~/Documents/Postdoc/PD_Projects/3_irCLIP-RNP/MS/TMT_analysis/0_TMT_
    data/hnA2B1_BZ55.txt")
hnC_data <- read.delim("~/Documents/Postdoc/PD_Projects/3_irCLIP-RNP/MS/TMT_analysis/0_TMT_data/
    hnC_BZ56.txt")
hnM_data <- read.delim("~/Documents/Postdoc/PD_Projects/3_irCLIP-RNP/MS/TMT_analysis/0_TMT_data/
    hnM_BZ57.txt")
hnU_data <- read.delim("~/Documents/Postdoc/PD_Projects/3_irCLIP-RNP/MS/TMT_analysis/0_TMT_data/
    hnU_BZ58.txt")
ILF2_data <- read.delim("~/Documents/Postdoc/PD_Projects/3_irCLIP-RNP/MS/TMT_analysis/0_TMT_data/
    ILF2_BZ1.txt")
ILF3_data <- read.delim("~/Documents/Postdoc/PD_Projects/3_irCLIP-RNP/MS/TMT_analysis/0_TMT_data/
    ILF3_BZ2.txt")
NAT10_data <- read.delim("~/Documents/Postdoc/PD_Projects/3_irCLIP-RNP/MS/TMT_analysis/0_TMT_data
    /NAT10_BZ60.txt")
NONO_data <- read.delim("~/Documents/Postdoc/PD_Projects/3_irCLIP-RNP/MS/TMT_analysis/0_TMT_data/
    NONO_BZ4.txt")
RBFOX2_data <- read.delim("~/Documents/Postdoc/PD_Projects/3_irCLIP-RNP/MS/TMT_analysis/0_TMT_
    data/RBFOX2_BZ86.txt")
SFPQ_data <- read.delim("~/Documents/Postdoc/PD_Projects/3_irCLIP-RNP/MS/TMT_analysis/0_TMT_data/
    SFPQ_BZ5.txt")

#get the unique gene names and protein IDs
colnames <- c("name", "ID", "H293T.noUV.R1.L", "H293T.noUV.R1.HM", "H293T.UVC.R1.L", "H293T.
    UVC.R1.M", "H293T.UVC.R1.H", "H293T.UVC.R2.L", "H293T.UVC.R2.M",
              "H293T.UVC.R2.H", "HepG2.noUV.R1.L", "HepG2.noUV.R1.HM", "HepG2.UVC.R1.L", "
    HepG2.UVC.R1.M", "HepG2.UVC.R1.H", "HepG2.UVC.R2.L",
              "HepG2.UVC.R2.M", "HepG2.UVC.R2.H")
data_prep <- function(data) {
  data$Gene.names <- str_match_all(data$Fasta.headers, "GN=(.*?) PE") %>% lapply(., function (x)
     str_c(x[,2],collapse='; ')) %>% unlist()
  data$Prot.IDs <- str_match_all(data$Fasta.headers, "(?<=sp\\|)[[:alnum:]]+") %>% lapply(.,
    function (x) str_c(x[,1],collapse='; ')) %>% unlist()
  data$Gene.names %>% duplicated() %>% any() # check for duplicates
  data <- make_unique(data, "Gene.names", "Prot.IDs", delim = ";")
  data$name %>% duplicated() %>% any() # must be false

  data_f <- data[,c(tail(grep("name", colnames(data) ), 1),tail(grep("ID", colnames(data) ), 1),
    grep("Reporter", colnames(data) ))]
  data_f$name[data_f$name == "RBFOX1"] <- "RBFOX2"
  data_f$ID[data_f$ID == "Q9NWB1"] <- "O43251"
  return(data_f)
}

#Open TMT data
ABCF1 <- data_prep(ABCF1_data)
colnames(ABCF1) <- colnames
DDX5 <- data_prep(DDX5_data)
colnames(DDX5) <- colnames
FUS <- data_prep(FUS_data)
colnames(FUS) <- colnames
hnA2B1 <- data_prep(hnA2B1_data)
hnA2B1 <- hnA2B1[,c(1:3,7,5:6,4,8:18)]
colnames(hnA2B1) <- colnames
hnC <- data_prep(hnC_data)
colnames(hnC) <- colnames
hnM <- data_prep(hnM_data)
hnM <- hnM[,c(1:7,10,8,9,11:18)]
colnames(hnM) <- colnames
hnU <- data_prep(hnU_data)
colnames(hnU) <- colnames
ILF2 <- data_prep(ILF2_data)
colnames(ILF2) <- colnames
ILF3 <- data_prep(ILF3_data)
colnames(ILF3) <- colnames
```

```
NONO <- data_prep(NONO_data)
colnames(NONO) <- colnames
NAT10 <- data_prep(NAT10_data)
NAT10 <- NAT10[,c(1:10,11,16,13,14,12,18,15,17)]
colnames(NAT10) <- colnames
RBFOX2 <- data_prep(RBFOX2_data)
colnames(RBFOX2) <- colnames
SFPQ <- data_prep(SFPQ_data)
SFPQ <- SFPQ[,c(1:15,17,16,18)]
colnames(SFPQ) <- colnames
SFPQ
```

```
##          name      ID H293T.noUV.R1.L H293T.noUV.R1.HM H293T.UVC.R1.L
## 1       KIF2A  O00139         16.22812         15.71328        15.73791
## 2     IGF2BP3  O00425         18.59871         18.18175        18.29181
## 3       NOP56  O00567         18.68613         18.42263        18.61043
## 4       DDX3X  O00571         18.69914         18.67145        18.63318
## 5       AP3D1  O14617         18.26829         18.99104        18.27903
## 6      U2SURP  O15042         17.35810         18.22675        17.22760
## 7      CEP290  O15078         17.52068         17.42661        16.27582
## 8       WDR46  O15213         17.56711         17.18534        17.58784
## 9      CD3EAP  O15446         17.41005         16.66678        16.90054
## 10      DHX15  O43143         16.22874         15.62588        15.72345
## 11       RRP8  O43159         14.39600         14.50848        13.67386
## 12     HNRNPR  O43390         16.73410         16.77507        17.12222
## 13      DHX16  O60231         15.78629         16.05482        15.24741
## 14    SYNCRIP  O60506         18.78922         18.61065        18.80546
## 15  HIST1H2BL  Q99880         16.34367         16.65899        17.20295
## 16      EIF5B  O60841         20.71448         21.58944        20.55796
## 17     PRPF40A  O75400         19.11116         20.19785        18.98017
## 18       CSDE1  O75534         15.33225         15.45738        14.58643
## 19   SNRNP200  O75643         14.46020         15.46719        14.00158
## 20        IDH1  O75874         15.93698         15.91786        15.81846
## 21      RSL1D1  O76021         19.07898         18.50327        18.82258
## 22       SRP72  O76094         17.58388         17.23846        16.98025
## 23       PCF11  O94913         15.89671         16.21191        15.98219
## 24        BRD1  O95696         16.29349         16.88572        16.34561
## 25        NSD2  O96028         19.13521         19.81140        18.84377
## 26        PRH1  P02810         13.32066         13.91448        14.00519
## 27       ALDOA  P04075         17.09610         17.85441        17.12141
## 28  HIST1H2AJ  Q99878         16.96939         18.13084        17.09517
## 29      S100A8  P05109         15.76171         16.25674        15.47313
## 30       RPLP2  P05387         15.23687         15.53973        14.96032
## 31      S100A9  P06702         17.96325         18.26215        17.18611
## 32        ENO1  P06733         16.25174         16.41525        15.78003
## 33        NPM1  P06748         18.54461         18.64755        18.74537
## 34      ANXA2  P07355         16.95174         17.42906        16.71492
## 35        TUBB  P07437         18.90979         19.02786        18.67656
## 36        EPRS  P07814         18.14853         19.25859        17.75858
## 37      HNRNPC  P07910         18.54597         18.78651        19.94692
## 38   HSP90AB1  P08238         18.12086         18.09466        17.87915
## 39     HNRNPA1  P09651         18.67999         18.72054        19.61317
## 40       PARP1  P09874         19.88308         21.56155        20.02513
## 41        UBA52  P62987         15.23882         16.12030        15.30788
## 42   HIST1H1E  P10412         15.75434         15.69409        16.96432
## 43      HSPA2  P54652         15.86346         15.86870        15.39597
## 44        TOP1  P11387         20.37814         20.24621        20.30552
## 45       TOP2A  P11388         17.41063         18.23813        17.24720
## 46          PC  P11498         20.36517         20.86612        20.30519
## 47         PIP  P12273         16.24369         16.69248        15.04759
## 48        EEF2  P13639         13.61563         13.98824        13.26526
## 49      HNRNPL  P14866         19.34977         19.37178        19.94564
## 50         JUP  P14923         18.69737         18.99706        18.19080
## 51        RPS2  P15880         18.52707         18.30381        19.92164
## 52         DSP  P15924         18.33499         18.82730        17.76998
## 53        DDX5  P17844         20.65290         20.31130        20.62498
```

## 54	RPL7	P18124	18.18413	18.27262	18.39276
## 55	SON	P18583	16.61999	17.53625	16.43713
## 56	RPL17	P18621	19.42286	19.05325	19.09107
## 57	NCL	P19338	19.48085	19.77571	19.42175
## 58	EIF2AK2	P19525	16.12761	15.76542	15.77389
## 59	FBL	P22087	16.48489	15.60762	16.07621
## 60	HNRNPA2B1	P22626	18.14360	18.48935	19.04070
## 61	SFPQ	P23246	23.84929	23.52157	23.83364
## 62	U2AF2	P26368	16.61856	16.49149	16.12022
## 63	RPL13	P26373	17.76202	17.80436	17.54721
## 64	PTBP1	P26599	18.29217	18.35986	18.54045
## 65	VARS	P26640	16.00095	16.10448	15.88446
## 66	RPL10	P27635	20.33930	19.77166	20.28444
## 67	SERPINB4	P48594	16.57815	16.83479	16.04001
## 68	S100A7	P31151	15.82277	15.98735	15.62956
## 69	TIAL1	Q01085	13.03967	13.46455	13.10055
## 70	HNRNPH3	P31942	16.42861	16.54938	16.69506
## 71	HNRNPH1	P31943	18.90988	19.07012	19.25237
## 72	CASP14	P31944	16.69057	17.28329	16.56074
## 73	PRDX2	P32119	14.32516	14.91055	14.20381
## 74	HSPA1L	P34931	16.83553	16.35418	16.32059
## 75	RFC1	P35251	14.72457	16.09121	14.27088
## 76	FUS	P35637	18.67000	17.96663	18.93341
## 77	RPL4	P36578	21.31512	20.91496	21.11331
## 78	RBMX	P38159	15.01162	15.11073	15.40421
## 79	COIL	P38432	16.48545	16.40346	15.60620
## 80	RPL3	P39023	21.01781	20.70337	20.88889
## 81	MATR3	P43243	18.12106	18.48223	18.19403
## 82	MKI67	P46013	20.31374	21.83542	20.16054
## 83	NOP2	P46087	17.81372	18.00333	17.77288
## 84	RPL5	P46777	16.14161	16.11582	16.53925
## 85	RPS9	P46781	17.44079	17.39222	17.97079
## 86	RPL29	P47914	18.05891	17.86478	18.68805
## 87	PRRC2A	P48634	15.82411	16.99026	15.76731
## 88	CTCF	P49711	18.97564	19.84644	18.51957
## 89	RBM25	P49756	15.61002	16.69887	15.08019
## 90	RPL14	P50914	17.29607	17.04324	17.34134
## 91	FXR1	P51114	19.13478	17.94226	18.68116
## 92	FXR2	P51116	17.40806	16.26409	17.22468
## 93	SMARCA2	P51531	13.87527	14.93355	13.47459
## 94	HNRNPA3	P51991	18.54378	18.71109	18.87814
## 95	HNRNPM	P52272	21.04387	21.18677	21.18138
## 96	HNRNPF	P52597	16.76901	17.09692	17.07932
## 97	AFDN	P55196	14.91858	15.73960	14.92096
## 98	HNRNPH2	P55795	14.14490	14.41825	14.00185
## 99	ACTG1	P63261	18.79036	18.97542	18.59987
## 100	RPS3A	P61247	18.12702	18.09744	18.03155
## 101	RPL15	P61313	16.83282	16.84500	16.75447
## 102	HNRNPK	P61978	16.13951	16.07746	16.41244
## 103	RPS8	P62241	19.34891	18.81087	19.10370
## 104	RPS14	P62263	17.33272	17.34707	17.36110
## 105	RPS23	P62266	18.21433	18.28261	18.34806
## 106	RPL7A	P62424	18.13280	18.14818	18.43689
## 107	RPS4X	P62701	17.09218	17.12354	17.25967
## 108	ACTG2	P63267	14.41581	14.71773	14.29182
## 109	RPS6	P62753	18.18964	17.69826	17.99402
## 110	HIST1H4A	P62805	16.72840	17.82650	17.09764
## 111	RPL23	P62829	16.21531	16.33778	16.34691
## 112	RPS24	P62847	16.44213	16.32620	16.69316
## 113	RPS26	P62854	12.81744	13.02806	12.84968
## 114	RPL8	P62917	20.04953	19.79316	20.66553
## 115	TRA2B	P62995	16.87340	16.61856	17.30207
## 116	YBX1	P67809	17.36607	17.42095	17.66525
## 117	EEF1A1	P68104	18.91812	19.00925	18.50673
## 118	TUBA1C	Q9BQE3	18.68480	18.87804	18.47884
## 119	H3F3C	Q6NXT2	18.91995	19.02142	18.69876
## 120	DCD	P81605	19.48689	19.92479	19.02196
## 121	RPL24	P83731	17.78813	17.50347	17.85994

## 122	RPL19	P84098	15.24302	15.45028	15.33581
## 123	HDLBP	Q00341	17.18098	17.65809	17.05112
## 124	HNRNPU	Q00839	21.80688	22.81147	21.72542
## 125	EXOSC10	Q01780	17.00086	16.63368	16.38743
## 126	EWSR1	Q01844	17.36880	17.19210	17.33952
## 127	AKAP17A	Q02040	16.81553	16.61999	16.44458
## 128	KIF23	Q02241	15.85462	15.95420	15.73031
## 129	RPL18A	Q02543	17.70988	17.72601	18.24428
## 130	RPL6	Q02878	19.52568	19.26959	19.63274
## 131	FMR1	Q06787	16.63708	16.57490	16.73727
## 132	KHDRBS1	Q07666	15.84799	15.63203	15.60794
## 133	TGM3	Q08188	14.48060	14.97181	14.42574
## 134	DHX9	Q08211	18.44754	18.84341	18.29621
## 135	DSC1	Q08554	16.59418	17.21741	16.46663
## 136	ILF3	Q12906	18.90233	18.92074	19.03974
## 137	ACACA	Q13085	14.22664	14.63481	13.79563
## 138	TARDBP	Q13148	17.54736	17.64808	17.81778
## 139	HNRNPA0	Q13151	16.22330	16.44581	16.30191
## 140	G3BP1	Q13283	13.85672	14.31380	14.29649
## 141	SF3B2	Q13435	15.87549	15.60110	15.48423
## 142	PRPF4B	Q13523	14.11512	14.61528	14.02055
## 143	CDK13	Q14004	14.08912	14.61948	14.09177
## 144	HNRNPD	Q14103	18.38372	18.55255	18.75714
## 145	SAFB2	Q14151	16.25713	17.15877	16.32335
## 146	ELOA	Q14241	19.81163	18.75991	19.29504
## 147	TRIM25	Q14258	16.27092	16.61094	16.06325
## 148	RBM39	Q14498	19.33263	17.70415	18.72517
## 149	TRIP12	Q14669	17.03176	17.33009	17.14241
## 150	MDC1	Q14676	16.85562	17.28320	16.79905
## 151	RRP1B	Q14684	21.48045	20.32400	20.89504
## 152	PDCD11	Q14690	19.37579	20.09378	19.26886
## 153	CHD4	Q14839	19.07104	20.70624	18.75705
## 154	ZNF638	Q14966	19.55332	20.67745	19.31774
## 155	NUMA1	Q14980	18.91934	19.81597	18.81218
## 156	NONO	Q15233	23.78277	22.79743	23.90610
## 157	TTF1	Q15361	16.12081	17.00317	16.04401
## 158	PCBP1	Q15365	16.08800	16.01801	16.03935
## 159	PUM3	Q15397	17.89599	16.41394	17.53069
## 160	SF1	Q15637	15.67830	15.44061	15.94741
## 161	ELAVL1	Q15717	18.82118	19.05290	19.42700
## 162	MAP7D1	Q3KQU3	16.25663	17.31566	15.99736
## 163	C2CD3	Q4AC94	17.93876	16.86906	17.72561
## 164	LARP7	Q4G0J3	17.37611	16.57455	16.92741
## 165	ZNF326	Q5BKZ1	14.86824	14.54671	14.92662
## 166	NOM1	Q5C9Z4	17.18069	16.81491	16.78673
## 167	C1orf167	Q5SNV9	16.43220	17.17045	16.20532
## 168	HP1BP3	Q5SSJ5	19.78314	18.97696	19.50781
## 169	ZC3H13	Q5T200	19.57202	20.93625	19.49224
## 170	KPRP	Q5T749	17.06540	17.84291	16.99888
## 171	TUT7	Q5VYS8	17.08607	17.44968	17.04441
## 172	SPTY2D1	Q68D10	15.71569	14.76383	15.33964
## 173	CDCA2	Q69YH5	14.36160	14.98072	13.19497
## 174	MIS18BP1	Q6P0N0	12.30506	13.00836	11.91819
## 175	DHX57	Q6P158	11.24341	12.53352	10.47076
## 176	SHQ1	Q6PI26	16.39963	16.12671	16.44427
## 177	LARP1	Q6PKG0	19.54023	20.88241	19.46376
## 178	SBSN	Q6UWP8	15.06743	15.74423	14.99471
## 179	NFXL1	Q6ZNB6	15.47899	15.88348	14.94063
## 180	SND1	Q7KZF4	12.57903	13.15287	11.88173
## 181	DDX46	Q7L014	18.96874	19.33077	18.76643
## 182	MEPCE	Q7L2J0	18.94804	17.86236	18.35238
## 183	ZC3HAV1	Q7Z2W4	14.32713	14.80130	14.09688
## 184	SETX	Q7Z333	14.25842	15.01746	14.17243
## 185	RBBP6	Q7Z6E9	19.35165	20.67814	19.14584
## 186	PEG10	Q86TG7	17.04441	17.48314	17.13290
## 187	ZC3H18	Q86VM9	16.03002	17.43453	15.64233
## 188	DZIP1	Q86YF9	18.02080	18.32241	17.49428
## 189	PHF6	Q8IWS0	17.92787	17.24832	17.45008

## 190	DHX37	Q8IY37	17.01476	18.00525	16.93767
## 191	FTSJ3	Q8IY81	17.50580	18.53564	17.10963
## 192	KRI1	Q8N9T8	17.31425	16.97410	17.06203
## 193	SERBP1	Q8NC51	17.47255	17.35784	18.82523
## 194	ABCF1	Q8NE71	21.13615	21.92542	21.07156
## 195	THOC2	Q8NI27	17.84469	19.08618	17.55022
## 196	ZNF587	Q96SQ5	14.20663	13.65385	14.09721
## 197	DDX54	Q8TDD1	19.18916	18.22199	18.86248
## 198	GEMIN5	Q8TEQ6	16.32932	16.67425	16.41264
## 199	ARHGEF40	Q8TER5	17.22072	17.24683	17.25939
## 200	SHROOM3	Q8TF72	18.96773	19.17646	18.89767
## 201	NOC3L	Q8WTT2	17.39774	16.14840	16.94180
## 202	POF1B	Q8WVV4	14.94439	15.36810	14.82207
## 203	ATXN2L	Q8WWM7	12.98668	13.20616	13.04561
## 204	PSPC1	Q8WXF1	19.54930	19.27052	19.54704
## 205	BBX	Q8WY36	16.78902	16.60623	16.56448
## 206	ING5	Q8WYH8	14.50940	14.05816	12.92439
## 207	DDX1	Q92499	16.46327	16.69846	16.37270
## 208	PHF3	Q92576	18.05309	19.00407	18.07984
## 209	DHX38	Q92620	14.03101	14.36222	13.89803
## 210	DDX17	Q92841	19.57605	19.46166	19.46728
## 211	CELF1	Q92879	12.01374	12.59467	12.42372
## 212	KHSRP	Q92945	18.49545	18.71482	18.74842
## 213	DAZAP1	Q96EP5	14.20281	14.57991	14.16577
## 214	LTV1	Q96GA3	19.91476	18.62888	19.26047
## 215	DDX27	Q96GQ7	20.85476	20.11044	20.62640
## 216	FUBP3	Q96I24	18.18049	18.17021	18.36718
## 217	ZFP91	Q96JP5	14.03952	12.68124	13.27315
## 218	ZNF512B	Q96KM6	17.15926	17.58857	17.21352
## 219	ZFR	Q96KR1	17.30706	17.86798	17.09661
## 220	CCDC42	Q96M95	15.35676	15.06924	13.63957
## 221	YTHDC1	Q96MU7	17.70259	16.92289	17.70867
## 222	RBM14	Q96PK6	18.26316	18.29800	18.62717
## 223	MAGI1	Q96QZ7	16.21819	16.70644	16.04268
## 224	SRPK1	Q96SB4	15.30364	15.17180	14.66094
## 225	UHRF1	Q96T88	16.53155	16.32855	16.36391
## 226	CDC5L	Q99459	18.25299	18.19936	17.97337
## 227	DNAJC2	Q99543	17.43941	16.49720	17.02421
## 228	POP1	Q99575	17.54200	18.14390	17.33193
## 229	RBM4B	Q9BQ04	15.83866	16.39446	15.83227
## 230	DDX50	Q9BQ39	16.01811	15.63217	16.12584
## 231	MYBBP1A	Q9BQG0	19.44492	20.58875	19.30216
## 232	DIDO1	Q9BTC0	15.76756	16.66497	15.42144
## 233	DDX23	Q9BUQ8	20.64693	19.74977	20.58426
## 234	GNL3	Q9BVP2	21.92336	19.88901	21.22016
## 235	REPIN1	Q9BWE0	16.57200	16.35144	16.30514
## 236	NAA15	Q9BXJ9	15.31526	15.58997	14.93447
## 237	NIFK	Q9BYG3	14.89306	14.70908	14.65559
## 238	GTPBP4	Q9BZE4	20.83407	19.58505	20.39247
## 239	UPF3B	Q9BZI7	16.71223	15.73540	16.34202
## 240	DDX24	Q9GZR7	18.62760	19.47467	18.31110
## 241	NAT10	Q9H0A0	18.96409	19.65414	18.78596
## 242	TDRD3	Q9H7E2	15.46173	14.71714	15.33794
## 243	DDX31	Q9H8H2	14.91120	14.56135	14.67629
## 244	USP42	Q9H9J4	16.24819	17.07243	16.22417
## 245	EML4	Q9HC35	16.14195	16.37084	16.27190
## 246	DDX21	Q9NR30	21.73434	20.44172	21.38258
## 247	SPATS2L	Q9NUQ6	19.18185	18.95160	18.74593
## 248	DDX18	Q9NVP1	20.54028	19.63190	20.30742
## 249	RBM28	Q9NW13	19.44980	18.79741	19.15571
## 250	SLTM	Q9NWH9	16.77391	17.10021	16.81416
## 251	LYAR	Q9NX58	19.89862	19.13543	19.39711
## 252	BCLAF1	Q9NYF8	18.16595	18.89835	17.78749
## 253	CDK12	Q9NYV4	19.01029	20.14756	18.84322
## 254	IGF2BP1	Q9NZI8	17.00064	16.85587	16.68565
## 255	CXXC1	Q9P0U4	19.49085	18.42710	18.74271
## 256	SIRPG	Q9P1W8	15.55096	15.62958	15.21234
## 257	USP36	Q9P275	18.65983	19.65017	18.47580

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## 258      CHD7 Q9P2D1          15.35752          16.63708          15.16188
## 259     RRBP1 Q9P2E9          21.79717          22.15242          21.73074
## 260      TJP2 Q9UDY2          14.40727          14.97338          14.27678
## 261      MBD1 Q9UIS9          15.72393          15.36407          15.65052
## 262      RALY Q9UKM9          17.27130          17.57023          17.94140
## 263     ACIN1 Q9UKV3          18.82451          18.86563          18.55947
## 264      TPX2 Q9ULW0          18.73499          18.63725          18.07049
## 265     G3BP2 Q9UN86          14.14338          14.46926          13.76352
## 266     SRRM2 Q9UQ35          20.17231          19.66648          19.76450
## 267    THRAP3 Q9Y2W1          20.34419          20.91298          20.16938
## 268     NOP58 Q9Y2X3          19.31312          18.63357          18.72850
## 269    PRRC2C Q9Y520          17.40840          17.78826          17.28807
##      H293T.UVC.R1.M H293T.UVC.R1.H H293T.UVC.R2.L H293T.UVC.R2.M H293T.UVC.R2.H
## 1          15.33144       15.25554       15.59756       15.24384       15.17274
## 2          18.02258       17.90648       18.17334       18.00996       17.77275
## 3          18.24172       18.24242       18.55753       18.24540       18.56637
## 4          18.84064       18.66146       18.66740       18.69727       18.59671
## 5          18.76023       18.35733       18.27976       18.67766       18.20891
## 6          17.99009       16.92671       17.34377       17.61303       17.30028
## 7          16.97902       16.92254       16.69384       16.33331       17.01694
## 8          17.20610       17.00405       17.61691       16.96770       17.03134
## 9          16.05019       15.85752       16.50846       16.07577       15.76917
## 10         15.84237       15.63552       15.57045       15.72305       15.11886
## 11         14.28988       13.68869       13.76477       13.54545       13.27333
## 12         17.83065       17.89806       17.27194       17.70732       17.92109
## 13         15.21398       15.00655       15.10243       15.45930       15.05010
## 14         19.23524       19.27588       18.88858       19.05250       19.27189
## 15         17.67031       17.54178       17.49365       17.40275       17.08421
## 16         21.30641       21.00505       20.54981       21.37348       20.86007
## 17         19.80930       19.36016       19.02088       19.75685       19.18304
## 18         15.15102       14.99484       14.59945       14.80756       15.01214
## 19         14.37613       15.10144       14.31868       14.40547       14.95842
## 20         15.91572       16.07305       15.85031       15.73878       16.13053
## 21         18.49146       18.29813       18.80499       18.31079       18.26687
## 22         16.77610       16.69819       17.10585       16.71894       16.47717
## 23         15.82767       16.14953       15.70082       15.90098       15.98531
## 24         16.76344       16.87255       16.58063       16.87604       16.73925
## 25         19.60805       19.25891       18.92555       19.51661       19.10144
## 26         13.49423       13.86564       13.84637       13.84686       13.64869
## 27         17.92097       17.28311       17.11756       17.22346       17.10963
## 28         18.65962       17.17407       17.23585       17.14579       16.96849
## 29         15.37609       15.70925       15.61336       15.38073       15.55707
## 30         15.32281       15.47798       14.85939       15.00088       15.11914
## 31         17.32334       17.50827       17.42915       17.56197       17.67790
## 32         16.48445       15.84972       15.86196       15.93291       15.90994
## 33         19.38737       19.07666       18.83892       19.02856       18.97312
## 34         16.72654       16.96567       16.81703       17.04324       16.87807
## 35         19.26247       18.90909       18.59094       18.56272       18.73714
## 36         18.58934       18.58487       17.94112       18.43657       18.50098
## 37         20.55805       21.11121       20.00333       20.40343       21.18326
## 38         18.16972       17.85544       17.82861       17.57887       17.61310
## 39         20.21229       20.76239       19.75390       20.15103       20.71733
## 40         21.79832       20.97043       20.23058       21.62288       21.05112
## 41         16.25652       16.01603       15.39530       15.54137       15.88384
## 42         16.76344       15.94777       16.65732       16.15934       16.02967
## 43         15.56638       15.66461       15.33225       15.47633       15.30364
## 44         20.08719       19.97183       20.33843       20.18519       19.95020
## 45         18.23243       17.94175       17.35285       18.07629       17.89629
## 46         20.51085       20.47882       20.21573       20.52172       20.46573
## 47         15.44550       15.74738       15.77556       15.61376       15.40567
## 48         13.97621       13.07982       13.27981       12.95381       13.40061
## 49         20.16754       20.81261       19.98371       20.26327       20.60404
## 50         18.13411       18.44075       18.48070       18.08327       18.41287
## 51         19.48298       18.65431       20.06065       19.31504       18.47354
## 52         17.90213       18.23074       18.07885       17.89788       17.96404
## 53         20.61324       20.60910       20.62934       20.52076       20.57533
## 54         18.70893       18.24316       18.57685       18.41963       18.44940
## 55         16.74412       16.75434       16.35471       16.55546       16.88858
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## 56	19.17290	18.86786	19.04780	18.95074	18.74682
## 57	20.33636	20.65875	19.51772	20.19988	20.75058
## 58	15.49000	15.27721	15.67799	15.55839	15.35390
## 59	16.17977	15.70582	15.87106	16.04527	15.20216
## 60	19.77510	20.29412	19.14101	19.50434	20.35078
## 61	24.26399	24.24278	23.92152	24.29341	24.33688
## 62	16.63821	16.62471	16.11427	16.33647	16.64737
## 63	17.87442	17.61375	17.65389	17.56033	17.41163
## 64	19.14425	19.69654	18.64421	18.96908	19.68709
## 65	15.64577	15.91090	15.26254	15.35084	15.72150
## 66	20.23163	19.74210	20.19724	20.05775	19.75608
## 67	16.09272	16.19283	16.03136	15.82697	16.25427
## 68	15.36776	15.57699	15.56269	15.57716	16.12068
## 69	14.06945	14.18959	13.09296	13.56712	14.26033
## 70	16.98348	17.46076	16.82923	17.07588	17.36265
## 71	19.59405	20.10508	19.39314	19.62664	20.23993
## 72	16.55457	16.68031	16.63750	16.62514	16.57071
## 73	14.68727	13.88941	14.02592	13.89083	13.99205
## 74	16.47052	16.09643	16.13332	15.76831	15.91779
## 75	15.66119	14.62656	14.03144	15.23628	14.51871
## 76	18.61259	18.77719	18.95373	18.46555	18.85745
## 77	21.10700	20.89977	21.10130	21.03201	20.75817
## 78	15.48963	16.33431	15.52411	15.76741	16.02124
## 79	15.51871	15.29849	15.53946	15.18898	15.23926
## 80	20.66640	20.64465	20.98843	20.77177	20.47754
## 81	18.79753	19.30428	18.33066	18.63364	18.94638
## 82	20.97456	21.72409	20.14731	20.83414	21.72255
## 83	17.94718	17.76733	17.92799	17.76241	17.62856
## 84	16.67797	16.07243	16.50821	16.26958	15.98435
## 85	18.10385	17.84298	18.31429	18.09615	17.48644
## 86	18.46136	18.04164	18.68377	18.19061	18.22124
## 87	16.21440	17.17192	15.90499	16.08261	17.32668
## 88	19.75825	18.83975	19.32766	19.46991	18.82128
## 89	16.41986	15.25392	15.00211	15.72635	15.35899
## 90	17.20810	16.54492	17.09589	16.82836	16.58176
## 91	18.04804	17.97768	18.75101	17.99645	17.95617
## 92	16.39838	16.65187	17.37118	16.33842	16.57183
## 93	13.51521	13.72121	14.04132	13.93783	13.52442
## 94	19.38581	19.68835	19.10142	19.15427	19.72277
## 95	21.85121	22.38685	21.33587	21.82590	22.33246
## 96	17.64188	17.61841	17.21381	17.45105	17.76681
## 97	14.72569	15.34263	15.04029	14.85107	15.50196
## 98	14.22468	14.77453	14.26437	14.22536	14.00299
## 99	19.08241	18.90616	18.63226	18.85614	18.61737
## 100	17.90566	17.87292	18.00602	18.05075	17.82551
## 101	16.91625	16.68332	16.80032	16.36982	16.49445
## 102	17.35879	17.50448	16.10319	16.95968	17.58850
## 103	18.89092	18.58435	19.09073	18.80196	18.44544
## 104	17.49076	17.03885	17.38894	17.21134	17.02248
## 105	18.62671	18.45206	18.66185	18.45004	18.33647
## 106	18.38317	17.93767	18.46854	18.14340	17.89995
## 107	17.27294	17.24182	17.39364	17.15926	17.10901
## 108	14.44598	14.04883	14.01698	13.84264	14.01533
## 109	17.85684	17.51422	17.97416	17.78238	17.46387
## 110	19.65695	17.01879	17.33665	16.64962	16.88762
## 111	16.32617	16.30654	16.33726	16.37166	16.24811
## 112	16.64836	15.70995	16.54135	16.28137	15.70525
## 113	12.91053	12.45705	12.28213	12.75976	12.04859
## 114	20.75450	20.29424	21.04547	20.67736	20.11655
## 115	17.17319	17.36837	17.16957	16.97601	17.14589
## 116	17.96008	17.89178	17.78065	17.94906	17.71592
## 117	19.11700	19.14939	18.56093	18.55244	18.42690
## 118	18.78277	18.49631	18.29055	18.12661	18.12828
## 119	20.32663	18.81710	18.56264	18.30323	18.30657
## 120	19.16411	19.40661	19.64664	18.96415	19.24866
## 121	17.80316	16.99225	17.71210	17.17797	17.00832
## 122	15.23066	15.12214	14.93517	15.17758	15.12380
## 123	16.99844	17.14897	17.03252	16.87436	16.95889

## 124	23.15851	22.07408	22.60806	22.66249	22.12231
## 125	15.99817	16.12194	16.14533	16.06504	15.57267
## 126	17.63962	17.67625	17.63587	17.65347	17.70124
## 127	16.28119	16.41053	16.69003	16.37344	16.20671
## 128	15.31787	15.77779	15.52384	15.65662	15.74439
## 129	18.34473	17.88834	18.31602	18.17246	17.82898
## 130	19.56322	19.11787	19.66516	19.36828	19.02372
## 131	16.48060	16.41963	16.62557	16.33018	16.42564
## 132	15.60339	15.65391	15.27460	15.51924	15.64937
## 133	14.54267	14.65116	14.15956	14.45449	14.23032
## 134	18.87171	18.98373	18.43847	18.66688	18.93566
## 135	17.04815	16.96319	16.73648	16.90548	16.64442
## 136	19.34531	19.32182	19.23741	19.05756	19.14066
## 137	14.14776	13.88035	13.97513	13.66833	13.44178
## 138	18.58710	19.10797	17.91444	18.23617	19.11355
## 139	16.61669	16.77610	16.47929	16.45348	16.91310
## 140	14.30092	13.72739	13.93976	13.98362	14.18503
## 141	15.65466	15.44695	15.18905	15.54966	15.57226
## 142	13.93018	13.84872	13.89017	13.84872	14.01933
## 143	14.07046	14.27409	13.82685	14.29304	14.49598
## 144	19.35840	19.85928	19.08480	19.20022	19.62214
## 145	17.15936	16.69819	16.45927	16.94008	16.73423
## 146	18.47643	18.32413	19.29637	18.34664	18.32184
## 147	15.98351	16.07669	16.12838	15.92567	15.78647
## 148	17.25857	17.26911	18.36457	17.28753	17.12707
## 149	16.84696	17.41526	16.74793	17.02248	17.17465
## 150	16.85148	17.74024	16.81077	16.95538	17.35035
## 151	20.20048	20.02810	20.83298	20.03912	19.88770
## 152	19.44696	19.97113	19.29327	19.40091	19.86549
## 153	19.23580	20.19244	18.85854	19.04666	20.26705
## 154	19.57102	20.36014	19.27333	19.53129	20.31882
## 155	18.99502	19.90739	18.77266	18.96446	19.78880
## 156	23.80016	23.88418	24.02056	23.61425	23.93894
## 157	16.94718	16.39955	15.86021	16.59612	16.13513
## 158	17.04303	16.94100	16.42633	16.44771	17.08928
## 159	16.50030	16.47752	17.43298	16.31028	16.27318
## 160	16.34239	16.52871	15.83435	16.25183	16.63169
## 161	20.01031	20.82958	19.61544	20.03201	20.78891
## 162	16.99214	16.14089	16.26512	17.01302	16.01894
## 163	16.87304	16.66331	17.49685	16.87508	16.76901
## 164	16.13927	16.01885	16.56083	16.11886	15.92121
## 165	14.94068	15.04691	15.05422	14.72105	14.86588
## 166	16.51816	16.54184	16.91017	16.38318	16.50583
## 167	17.02139	16.54275	16.59136	16.96104	16.49454
## 168	18.63619	18.57515	19.49091	18.67249	18.48456
## 169	19.79275	20.64597	19.46034	19.70136	20.54510
## 170	17.27112	17.55981	17.39331	17.47596	17.38903
## 171	17.10144	17.31734	17.09466	17.15857	17.19566
## 172	14.97195	15.08073	15.40115	14.82202	14.85662
## 173	14.31932	13.28093	13.32516	14.33553	13.67254
## 174	11.44496	11.57955	12.07488	12.06410	10.93568
## 175	11.84321	11.12819	10.29474	11.65562	11.13102
## 176	16.88834	17.45033	16.83812	17.06181	16.99004
## 177	20.52229	20.32542	19.45224	20.52114	20.32937
## 178	15.27442	15.41290	15.38842	15.18305	15.15209
## 179	14.97755	14.62388	15.06832	14.62520	14.84338
## 180	12.37808	11.32626	11.82424	10.96362	11.40748
## 181	19.03995	18.73731	18.80933	19.03596	18.69152
## 182	17.56078	17.71102	18.28920	17.66227	17.77745
## 183	14.00641	14.46792	14.19168	14.08373	14.07381
## 184	14.42141	14.83126	14.59497	14.49929	14.75635
## 185	19.78812	20.41792	19.34124	19.79044	20.40312
## 186	16.90795	17.20094	17.09455	17.07148	17.16948
## 187	16.60155	16.00869	15.66980	16.53160	16.21616
## 188	17.52742	17.72187	17.53123	17.77578	17.07169
## 189	17.28807	17.09805	17.59885	17.35750	17.13491
## 190	17.88310	17.30724	16.84892	17.90871	17.32439
## 191	18.25179	17.14061	17.81215	17.80158	17.04974

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## 192  16.63282  16.84928  16.91252  16.64512  16.71048
## 193  18.97489  18.75045  19.01296  18.95319  18.37526
## 194  21.81523  21.13483  21.71570  21.42527  20.97596
## 195  18.83275  18.26947  17.65166  18.47401  18.31310
## 196  13.55878  13.88589  14.17399  13.67077  13.57152
## 197  18.37962  17.88988  18.92576  18.18539  17.86894
## 198  16.52726  16.62485  17.00459  16.53682  16.50059
## 199  17.15086  17.46420  17.24897  17.24887  17.32025
## 200  18.70391  19.26838  19.15408  18.96880  18.83476
## 201  16.39037  15.73778  17.16614  15.90966  16.18871
## 202  14.27772  14.91709  14.88078  14.53242  14.81438
## 203  12.80687  13.36263  13.18576  13.37082  13.32502
## 204  19.45181  19.68890  19.67333  19.23084  19.72336
## 205  16.52728  16.60293  17.01727  16.86278  16.63764
## 206  12.85646  13.90077  13.23203  12.96904  13.51200
## 207  16.24524  16.18129  16.24438  16.08304  16.13531
## 208  18.23468  18.99206  18.16325  18.05070  18.90419
## 209  13.75363  14.02115  13.75447  13.87085  13.67706
## 210  19.47346  19.48607  19.57893  19.42273  19.55809
## 211  13.26167  14.06685  12.44610  13.13790  13.89396
## 212  19.13674  20.73372  18.81941  19.10871  20.89097
## 213  14.47877  14.59105  13.87690  14.05951  14.26356
## 214  18.19825  18.50982  19.26756  18.41658  18.17397
## 215  20.05298  19.88755  20.64130  20.09391  19.84319
## 216  18.95379  19.46537  18.63814  18.85322  19.38210
## 217  12.26556  12.09018  12.84455  12.14022  12.42763
## 218  17.65221  17.13471  17.36922  17.39983  16.92636
## 219  17.55914  17.37365  16.98281  17.40241  17.42579
## 220  14.09622  13.79837  13.92221  13.50283  13.96154
## 221  17.12495  17.29329  17.77050  17.02842  17.09404
## 222  19.16022  19.74004  18.78357  19.19121  19.69398
## 223  16.34225  16.21635  16.20243  16.41488  16.37828
## 224  14.43274  14.68278  14.34880  14.49273  14.21288
## 225  16.03527  16.31056  16.40868  16.21515  16.20365
## 226  17.81366  17.79804  18.02545  17.92712  17.54336
## 227  16.34357  16.15133  17.01737  16.01722  16.17793
## 228  18.03128  17.62457  17.43876  18.15620  17.47072
## 229  16.36513  16.49603  16.08599  16.16241  16.36921
## 230  15.59003  15.39553  15.55414  14.81693  15.02523
## 231  20.29827  19.94507  19.46094  20.41431  19.90861
## 232  15.65724  16.56488  15.63024  15.47332  16.39749
## 233  19.60753  19.51549  20.58261  19.52064  19.42066
## 234  19.80699  19.65050  21.13420  19.75520  19.50496
## 235  16.04634  16.09261  16.28323  16.13947  16.00062
## 236  14.98134  14.87301  14.99731  14.70520  14.59520
## 237  14.56230  14.61867  15.00145  14.76280  14.58584
## 238  19.41669  19.39005  20.38089  19.34886  19.29558
## 239  15.07598  15.23900  16.00685  15.26455  15.07372
## 240  19.34687  18.55431  19.02069  18.98948  18.48117
## 241  19.62601  19.04841  18.79570  19.57622  19.12258
## 242  14.39781  15.02020  15.23017  14.59671  14.77803
## 243  14.39225  14.17196  14.40793  14.01594  13.74546
## 244  16.86339  16.79106  16.45666  16.71773  16.73859
## 245  16.17779  16.33174  16.38709  16.20978  16.16761
## 246  20.32279  20.17341  21.37767  20.26396  20.13859
## 247  18.50121  18.69632  18.66000  18.87807  18.68760
## 248  19.40262  19.51545  20.43644  19.70725  19.49656
## 249  18.74682  18.63108  19.20111  18.70381  18.64533
## 250  17.07389  17.12535  16.95356  17.20151  17.05399
## 251  19.04014  18.76150  19.30766  19.04609  18.79804
## 252  18.53541  18.14609  17.99893  18.58787  18.01906
## 253  19.74703  19.48174  18.99659  19.51046  19.58073
## 254  17.08223  16.81290  16.64343  16.72467  16.69139
## 255  17.97684  17.89451  18.71813  18.06608  17.89445
## 256  14.98045  15.33832  15.09894  15.23530  15.03256
## 257  19.34819  18.88748  18.70597  19.28363  18.82907
## 258  15.52961  16.31161  15.33651  15.39964  16.58750
## 259  21.74464  22.10585  21.76600  21.75691  22.16288
```

```
## 260        14.75437        14.83175        14.33853        14.33867        14.75034
## 261        15.20251        15.15948        16.02252        15.12493        15.26342
## 262        18.09125        18.51198        18.27207        17.87334        18.34936
## 263        18.70388        18.47935        18.52745        18.37844        18.37861
## 264        17.80202        17.57733        17.94592        17.67024        17.63460
## 265        14.12783        14.04576        14.09927        13.86322        13.44837
## 266        19.34423        19.57509        19.81438        19.14056        19.40848
## 267        20.65482        20.24980        20.19316        20.71205        20.12149
## 268        18.36926        18.25714        18.37237        18.21637        18.22619
## 269        17.46308        18.05282        17.47872        17.45940        18.08571
##      HepG2.noUV.R1.L HepG2.noUV.R1.M HepG2.UVC.R1.L HepG2.UVC.R1.M
## 1          16.26697        15.77779        16.31058        15.65396
## 2          19.49019        18.83858        19.84419        18.82389
## 3          19.48911        18.72737        19.24785        18.84913
## 4          19.00492        18.99524        19.20452        19.26093
## 5          18.38077        19.29598        18.37772        19.30138
## 6          17.42595        18.69775        17.53693        18.80883
## 7          17.42119        18.90578        17.07483        17.94157
## 8          18.28934        17.92920        18.33830        17.32720
## 9          17.41749        17.16339        17.43713        16.69139
## 10         16.18635        16.78711        16.80876        16.33896
## 11         14.89681        15.31193        15.16859        15.02816
## 12         16.97074        17.36632        17.78302        18.54601
## 13         15.63691        16.56631        15.76381        15.77378
## 14         18.79940        19.01906        19.22131        19.70280
## 15         16.71398        17.34568        17.71237        17.70083
## 16         20.80262        22.12833        20.77362        22.24371
## 17         20.09982        20.80609        19.80952        21.04453
## 18         15.39316        15.76767        15.16231        15.66147
## 19         14.97719        16.12870        14.61448        15.42003
## 20         16.14875        16.59746        15.80007        16.08616
## 21         19.43102        19.06034        19.79704        19.07718
## 22         18.33092        17.78065        18.24298        17.76546
## 23         16.11167        16.41083        16.20970        16.47708
## 24         16.96995        17.69826        16.71612        17.68941
## 25         19.72404        20.54943        19.52012        20.56384
## 26         14.00369        14.72882        14.16302        14.26605
## 27         17.19893        18.22416        17.16103        17.73569
## 28         16.72388        17.37763        17.01454        17.23715
## 29         15.68811        18.20529        16.48276        16.00576
## 30         15.19814        15.71153        15.14023        15.06920
## 31         17.93318        20.62712        18.96669        17.85605
## 32         16.50702        17.16928        16.54332        16.90065
## 33         18.95279        19.23503        19.36314        19.58108
## 34         16.93111        18.28311        17.28265        17.18814
## 35         18.91821        19.28604        19.04431        19.11200
## 36         18.11121        19.87532        18.22303        19.51945
## 37         18.97144        19.39672        20.75132        21.08570
## 38         18.17641        18.48294        18.47853        18.36521
## 39         19.03257        19.37352        20.11312        20.89097
## 40         20.01713        21.22441        19.87313        21.40052
## 41         15.74588        17.16683        15.96997        16.48693
## 42         16.00845        16.53259        17.61324        16.79297
## 43         15.92423        16.48622        15.93744        16.18352
## 44         22.37541        21.20275        22.44342        21.53820
## 45         17.66823        19.18478        18.06087        19.22414
## 46         20.70379        22.32693        20.84805        22.79875
## 47         16.38171        17.47738        16.15413        16.12906
## 48         13.55063        15.01624        13.45982        13.78423
## 49         19.44801        19.81961        20.42675        20.69600
## 50         18.41638        19.85898        18.83553        19.20101
## 51         18.57884        18.90048        20.64333        20.06973
## 52         18.41328        19.90886        18.51357        19.03168
## 53         21.09982        20.82827        21.41375        21.25124
## 54         18.22313        18.64424        18.80464        18.99907
## 55         17.00207        18.35393        16.93687        17.70604
## 56         19.77833        19.54435        19.79989        19.76806
## 57         20.19544        21.07933        20.32069        21.69200
```

```
## 58      16.55505        16.36415        16.74885        15.96427
## 59      17.17709        17.04281        17.45860        17.33917
## 60      18.14216        18.98474        19.38324        20.11705
## 61      25.01491        24.42554        25.01653        25.16350
## 62      16.30926        16.90501        16.71880        16.78660
## 63      17.88965        17.95708        18.32637        18.22788
## 64      18.25072        18.78555        19.22767        19.71148
## 65      15.66144        16.49562        15.88791        16.30697
## 66      20.49414        19.92451        20.84835        20.66397
## 67      16.47562        18.78065        16.68168        16.70347
## 68      16.04565        17.93526        16.69248        15.95290
## 69      13.62548        14.34527        14.02410        14.97024
## 70      16.50336        17.13891        16.97208        17.44346
## 71      18.89445        19.49046        19.80303        20.37899
## 72      17.18010        18.73582        17.80618        17.32008
## 73      14.65032        16.10390        14.87934        15.08775
## 74      16.18253        16.56373        16.37860        16.29545
## 75      15.81861        17.16064        15.26052        17.17035
## 76      18.92239        19.54557        19.60284        19.41115
## 77      21.31495        21.27373        21.61648        21.64540
## 78      14.86704        15.40321        15.54481        16.33319
## 79      16.71492        16.95765        16.66233        16.73727
## 80      21.33107        21.14208        21.56584        21.44895
## 81      18.22572        18.77687        18.47734        19.40364
## 82      20.57755        21.64178        20.57948        21.45126
## 83      18.37967        18.45350        18.58230        18.81363
## 84      16.79348        16.51669        17.65564        17.30670
## 85      17.56443        17.91614        18.45077        18.77072
## 86      18.12560        18.26008        19.00251        18.68579
## 87      16.40768        17.58395        16.24109        17.21996
## 88      20.45111        20.76620        19.88877        20.95284
## 89      16.02261        16.79030        15.97044        16.74228
## 90      17.57171        17.54427        17.78609        17.43892
## 91      18.65742        18.40566        18.86151        18.31398
## 92      16.43140        16.22178        16.61641        16.27645
## 93      14.18898        15.30442        13.93967        14.87522
## 94      18.87075        19.37503        19.66221        20.21466
## 95      21.21116        21.50489        21.77431        22.63682
## 96      17.30972        17.64132        17.92492        18.58871
## 97      15.65116        16.70077        15.67196        16.28171
## 98      14.52332        15.36393        14.58731        14.83605
## 99      18.91998        19.71872        19.10500        19.25562
## 100     18.19292        18.54525        18.44678        18.46687
## 101     17.02648        17.16447        17.26499        17.02378
## 102     15.85866        16.64245        16.97051        17.78430
## 103     19.60407        19.22588        19.86888        19.36440
## 104     17.77873        17.55689        17.69832        17.56808
## 105     18.69520        18.67745        19.15016        19.36754
## 106     18.34594        18.57622        18.89012        18.74090
## 107     17.02074        17.05759        17.42947        17.38338
## 108     15.00194        15.69843        15.05299        14.97109
## 109     17.99899        18.00657        18.35733        18.31465
## 110     16.82401        17.69534        17.23585        17.23491
## 111     16.23461        16.44301        16.54023        16.60926
## 112     16.61698        16.93997        17.29177        17.08098
## 113     13.85233        13.97064        13.87373        13.71607
## 114     20.56132        20.60648        21.74669        21.68705
## 115     17.12556        17.55352        18.24637        17.96437
## 116     17.50742        17.86490        18.21338        18.42485
## 117     19.21772        19.52444        19.35316        19.33982
## 118     18.87795        19.07209        18.84506        18.71616
## 119     18.92854        19.60442        19.07290        19.03735
## 120     19.73957        20.49551        19.86612        19.96155
## 121     18.04201        18.17085        18.52852        18.13721
## 122     15.26660        16.08709        15.61270        15.84112
## 123     17.25423        18.00097        17.32659        17.98638
## 124     23.41764        22.81548        22.67846        23.98442
## 125     17.17280        16.87987        17.00470        16.57450
```

## 126	17.84371	17.95532	18.13420	18.35668
## 127	17.84089	17.17865	17.66150	17.05791
## 128	16.12594	16.33659	16.22308	16.53479
## 129	17.82283	18.10329	18.72607	18.43632
## 130	19.47918	19.33060	19.74445	19.68835
## 131	16.53120	16.36863	16.69656	16.50202
## 132	15.44446	16.20593	15.89761	15.96490
## 133	14.44093	15.67008	14.52344	14.71661
## 134	18.43896	19.37078	18.62364	19.60762
## 135	16.83516	17.75545	16.92937	17.54502
## 136	19.37600	19.56182	19.75927	19.89586
## 137	14.41416	15.45658	14.13250	14.00211
## 138	17.57504	18.29441	18.56287	19.11974
## 139	16.26810	16.63155	16.81478	17.18263
## 140	14.83472	15.32017	15.17321	15.14470
## 141	15.26198	16.30164	15.54400	16.67632
## 142	14.49879	14.82878	14.58091	14.59105
## 143	14.49554	15.27117	14.06027	15.53278
## 144	18.39251	18.94892	19.15566	19.84469
## 145	16.88083	17.85081	16.96025	18.02264
## 146	20.06039	18.69513	20.37857	19.05817
## 147	17.39975	16.82960	17.38406	17.29383
## 148	18.98022	17.96065	19.15694	17.56867
## 149	17.44605	18.35789	17.39171	17.77256
## 150	16.53701	17.48448	16.89166	17.31778
## 151	20.75898	20.26121	20.96550	20.29345
## 152	19.40360	21.00936	19.53665	20.02351
## 153	19.17263	21.00984	19.32206	20.03403
## 154	19.80815	21.10361	19.82589	20.40551
## 155	19.07551	20.25107	19.30129	19.66371
## 156	23.44164	23.27555	24.64713	24.18692
## 157	16.44744	17.55577	16.48399	17.76221
## 158	16.47288	16.81803	17.11573	17.77449
## 159	18.98757	17.60422	18.74934	17.26920
## 160	15.69474	16.34049	16.37885	17.00470
## 161	18.64685	19.43374	19.97617	20.78676
## 162	16.30385	16.92856	16.20730	17.18456
## 163	16.79855	16.78724	17.28238	16.60017
## 164	17.40458	16.73039	17.66719	16.58282
## 165	15.50277	15.24811	15.73875	15.41933
## 166	17.40574	17.09445	17.45218	16.86617
## 167	17.53541	17.44281	17.12566	18.23981
## 168	20.87650	19.63380	21.05775	19.47586
## 169	19.82047	21.37039	19.87619	20.62105
## 170	17.54668	19.32777	18.04046	17.98532
## 171	17.13641	18.28708	17.28229	18.28044
## 172	15.66214	15.20633	16.17329	15.28077
## 173	15.05214	15.43694	14.42731	15.43941
## 174	13.14421	14.53952	13.67287	13.08512
## 175	11.92774	13.34180	11.73038	12.95612
## 176	17.59616	17.18030	17.72347	18.11558
## 177	20.13182	21.71662	20.10917	21.87729
## 178	15.21261	16.24139	15.59187	15.34058
## 179	15.69373	16.09902	15.38667	15.37218
## 180	12.73246	13.82038	12.36670	12.88215
## 181	19.28758	19.57736	19.22383	20.06276
## 182	18.69479	18.04340	18.48263	17.94077
## 183	14.98362	15.55009	15.36133	15.33504
## 184	14.41825	15.38822	14.56605	15.12614
## 185	19.77214	21.14289	19.79858	20.87583
## 186	18.53795	18.33250	18.80433	18.59281
## 187	16.45370	17.69785	16.47328	17.47856
## 188	17.57297	17.74360	17.70651	18.02221
## 189	16.96127	16.71572	16.89012	16.67728
## 190	17.36589	18.59889	17.28464	18.56626
## 191	18.25539	18.24298	17.70334	18.62317
## 192	17.60776	17.33656	17.32562	17.26673
## 193	17.84163	17.71974	19.09854	19.29860

## 194	22.80081	22.49346	22.12521	23.10586
## 195	17.97824	19.36040	17.86345	19.14201
## 196	14.90271	14.33413	14.91807	14.53138
## 197	18.85751	18.31425	18.85453	18.60516
## 198	16.04595	17.00766	16.00350	16.90994
## 199	16.62357	16.89818	16.78008	16.91017
## 200	19.06121	19.36852	19.08119	19.46473
## 201	16.55202	16.30779	16.72147	15.89105
## 202	15.01976	16.12896	15.47396	15.46467
## 203	12.92778	13.72813	13.30891	13.72579
## 204	20.83013	20.51961	21.13934	20.69600
## 205	16.56232	16.85172	16.94866	17.02334
## 206	14.14067	14.74504	13.83240	14.18550
## 207	17.05017	17.06876	16.90360	16.57539
## 208	18.01160	19.42179	18.29343	18.86072
## 209	13.78208	14.09028	14.37735	14.26070
## 210	19.99728	20.09326	20.12641	20.03308
## 211	12.76311	13.54810	13.34527	14.30007
## 212	18.58798	19.25322	19.11901	19.67563
## 213	14.17983	14.65609	13.93949	15.24146
## 214	19.74332	18.72341	19.81256	18.68828
## 215	22.15400	21.08206	22.37936	21.21282
## 216	18.16039	18.60874	18.56093	19.38307
## 217	14.67485	13.27393	14.55537	12.88381
## 218	18.42312	18.23243	18.46997	19.09398
## 219	17.66011	18.45784	17.71492	18.52535
## 220	14.74284	15.49091	15.06802	14.80630
## 221	17.64927	16.91893	17.84830	17.10871
## 222	18.61544	18.94077	19.39835	19.98829
## 223	16.30877	17.76558	16.52938	17.56175
## 224	15.60638	15.23822	15.68934	14.82794
## 225	17.53685	17.20113	17.51699	17.10666
## 226	19.24440	18.63750	19.34032	18.68267
## 227	17.02767	16.91940	17.07096	16.42494
## 228	17.79049	18.44010	17.54969	18.67518
## 229	16.41764	16.97197	16.43574	17.07619
## 230	15.07581	15.23788	15.27867	14.90745
## 231	19.39396	20.42757	19.45117	20.69038
## 232	15.92956	16.60898	15.79472	16.28504
## 233	21.61333	20.16791	21.64900	20.13182
## 234	21.53208	20.07757	21.56090	20.22482
## 235	17.82140	16.87616	18.35505	17.37144
## 236	14.98837	15.92019	15.79850	15.38896
## 237	14.47085	15.06091	14.94745	14.75170
## 238	21.17597	19.95461	21.00956	19.80377
## 239	15.41144	15.87116	15.53828	15.33884
## 240	19.30097	19.50492	18.75939	19.79950
## 241	19.52858	20.77419	19.36854	20.93747
## 242	15.19695	14.51083	15.22867	14.74877
## 243	15.23766	15.41746	15.05346	14.66938
## 244	16.37843	17.15689	16.30791	17.29939
## 245	16.79829	17.29311	16.84794	17.96612
## 246	21.45131	20.47546	21.44380	20.44152
## 247	21.80857	20.78285	21.85438	20.98579
## 248	21.65469	20.23748	21.76008	20.31794
## 249	20.01727	19.13821	19.99369	19.27606
## 250	17.15640	18.09218	17.14679	18.33027
## 251	20.75311	19.80202	20.40510	19.72521
## 252	18.59011	18.67280	18.41138	19.26188
## 253	19.91205	21.71821	19.83248	21.60829
## 254	17.46132	17.56466	17.92596	17.97203
## 255	19.91238	18.74646	19.85740	18.82075
## 256	15.09992	15.77736	15.21622	15.65972
## 257	19.01468	19.79308	18.94767	20.01958
## 258	15.82677	17.81334	15.56332	16.86750
## 259	23.03505	24.68394	23.20997	24.06727
## 260	15.26250	16.70793	15.34249	16.93756
## 261	16.47559	15.74895	16.89427	16.23730

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## 262          17.83356          18.40636          19.83542          19.93661
## 263          19.45579          19.24628          19.43744          19.28136
## 264          19.19234          19.09893          18.94072          18.89484
## 265          14.28063          14.61528          14.27416          14.42777
## 266          19.26194          19.38633          19.58296          19.29041
## 267          20.56300          20.93884          20.56755          21.45989
## 268          19.80862          19.10600          19.62012          18.88226
## 269          17.21987          18.25109          17.37416          17.97320
##       HepG2.UVC.R1.H HepG2.UVC.R2.L HepG2.UVC.R2.M HepG2.UVC.R2.H
## 1          14.99590          15.89316          15.50745          14.68491
## 2          18.33795          19.44641          18.85793          18.09733
## 3          18.24423          18.86559          18.56030          17.99915
## 4          18.69047          18.81760          19.16133          18.55910
## 5          18.47730          17.92033          19.03499          18.30082
## 6          17.18049          16.99976          18.53066          17.01868
## 7          16.26497          16.40858          16.47716          16.63906
## 8          17.25866          18.12349          17.23295          16.99579
## 9          16.14768          17.08566          16.79055          16.25648
## 10         15.88855          16.06647          15.86829          15.88474
## 11         14.32059          14.33839          14.63214          14.10918
## 12         18.46810          17.42284          18.42841          18.40125
## 13         15.15478          14.81713          15.55863          15.20820
## 14         19.23736          18.62374          19.60420          19.27340
## 15         17.27948          17.33900          17.76908          17.09404
## 16         21.08622          20.36506          22.02712          21.00566
## 17         19.42855          19.27333          20.85681          19.46836
## 18         14.97920          14.16026          15.31267          14.97033
## 19         15.78627          14.44611          15.32312          15.58493
## 20         16.10394          15.48498          15.84097          16.11705
## 21         18.67301          19.46370          19.04426          18.39615
## 22         16.90994          17.90959          17.51044          17.03757
## 23         15.96932          15.70001          16.31690          16.21288
## 24         16.67645          16.29049          17.58923          16.55162
## 25         19.61909          18.93937          20.32915          19.49181
## 26         13.73682          12.96481          14.32587          14.35927
## 27         17.14609          16.82551          17.62920          17.43608
## 28         17.25414          16.59888          17.50510          16.88465
## 29         15.39657          15.30770          15.44456          15.61370
## 30         14.86240          14.49941          16.24416          14.90431
## 31         17.46579          17.11360          17.56674          17.41254
## 32         16.05989          15.95878          16.54448          16.02989
## 33         18.75003          18.98098          19.34791          18.87888
## 34         16.75616          16.33214          17.14718          16.72401
## 35         18.69805          18.60067          19.32353          18.63633
## 36         18.68668          17.66268          19.41192          18.73879
## 37         21.21359          20.49980          21.11152          21.07281
## 38         17.92370          18.07791          18.32558          17.77378
## 39         20.87867          19.58152          20.79654          20.83515
## 40         20.13333          19.43783          21.27923          20.05748
## 41         16.21339          15.35239          17.00141          16.17455
## 42         15.99046          17.16339          17.21684          15.88593
## 43         15.84799          15.57066          15.91719          15.60531
## 44         20.91787          22.10550          21.52812          20.55908
## 45         18.27767          17.02248          19.09058          18.11329
## 46         20.64253          20.35176          22.60603          20.63432
## 47         15.67452          15.73302          16.68058          16.04284
## 48         13.13526          12.59954          14.32559          13.24158
## 49         20.46443          19.77409          20.64518          20.53288
## 50         18.31747          17.95163          19.64070          18.36718
## 51         18.87114          20.34126          20.04580          18.51438
## 52         18.48703          17.82786          19.03080          18.40769
## 53         20.62185          21.01025          21.11680          20.53488
## 54         18.19686          18.39159          18.80073          18.15551
## 55         17.80455          16.22313          17.55884          17.71813
## 56         18.82249          19.49318          19.74204          18.83966
## 57         21.37830          19.80631          21.55103          21.29199
## 58         15.58555          16.22558          15.75452          15.33727
## 59         16.39944          16.77314          16.84904          16.05244
```

## 60	20.16803	18.96113	20.17341	20.14445
## 61	24.45036	24.71978	25.04748	24.26914
## 62	16.61497	15.97515	16.55312	16.32328
## 63	17.46722	17.94821	18.16138	17.44184
## 64	19.88539	18.64280	19.66931	19.76435
## 65	15.67204	15.19268	16.33352	15.58965
## 66	19.98676	20.69872	20.65115	19.60637
## 67	16.12739	15.84235	16.31685	15.99002
## 68	15.36376	15.03226	15.88839	15.51197
## 69	15.16160	13.71885	15.10954	15.18925
## 70	17.45555	16.72973	17.37662	17.22929
## 71	20.24470	19.17904	20.37878	20.31915
## 72	16.83442	16.94798	17.06581	17.06392
## 73	14.51545	13.95174	15.08111	14.59187
## 74	16.01896	15.69800	15.91709	15.86109
## 75	15.15066	14.46620	17.02107	15.14470
## 76	18.94272	19.06028	19.42454	18.94266
## 77	20.84529	21.28844	21.50082	20.73562
## 78	15.92752	15.36803	16.15177	15.79129
## 79	16.63282	15.85314	16.52674	16.19854
## 80	20.67219	21.19280	21.28478	20.53943
## 81	19.26261	17.85872	19.25631	19.14636
## 82	21.45643	19.98412	21.36720	21.45433
## 83	17.69595	18.06766	18.66035	17.68627
## 84	16.35748	17.28184	17.10144	16.15881
## 85	17.57504	18.15422	18.98899	17.58057
## 86	17.98304	18.45471	18.60031	17.79017
## 87	17.41394	15.69262	16.94650	17.28464
## 88	19.01637	19.21015	20.89674	18.95035
## 89	15.56406	14.98322	16.76176	15.36796
## 90	16.56202	17.40466	17.54102	16.52877
## 91	17.76241	18.35009	18.06839	17.51314
## 92	15.92470	16.07052	16.25344	15.71620
## 93	14.71998	13.23832	14.56421	14.23295
## 94	20.22058	19.08784	20.15363	20.13546
## 95	22.40354	21.21685	22.52157	22.26399
## 96	18.57341	17.13049	18.57038	18.37945
## 97	16.18041	14.88303	16.02808	16.23607
## 98	14.50928	13.25966	14.62079	14.28475
## 99	18.87900	18.52022	19.44821	18.93180
## 100	17.70232	17.96155	18.24892	17.62457
## 101	16.61970	16.92347	17.54917	16.52375
## 102	17.48573	16.26230	17.61367	17.54427
## 103	18.56432	19.56627	19.46366	18.42526
## 104	16.74360	17.17855	17.51276	16.85026
## 105	18.45687	18.87951	19.28437	18.35673
## 106	17.88316	18.57788	18.75522	17.84696
## 107	16.84500	16.98059	17.23949	16.81065
## 108	14.60009	14.50668	14.96957	14.47902
## 109	17.41848	17.91170	18.18073	17.28672
## 110	17.28491	16.71800	18.95580	16.94695
## 111	16.29094	16.01387	16.56747	16.05824
## 112	16.20892	16.80637	17.19902	16.03394
## 113	12.69440	13.27727	13.67254	12.93186
## 114	20.45473	21.38395	21.80353	20.36954
## 115	17.44484	17.89208	17.95419	17.35716
## 116	17.76267	17.73813	18.33031	17.75766
## 117	18.81456	18.75480	20.22282	18.82650
## 118	18.12379	18.73685	19.22501	18.24451
## 119	18.57171	18.78654	20.53573	18.64283
## 120	19.43062	19.11510	20.04940	19.75357
## 121	17.42004	18.08784	18.02486	17.14460
## 122	15.41048	15.14752	15.66805	15.16015
## 123	18.01040	16.75277	17.85282	17.80082
## 124	22.14009	22.16521	23.87764	22.01737
## 125	16.02901	16.23103	16.65243	16.05926
## 126	17.81990	17.84310	18.24595	17.67893
## 127	16.85939	17.27631	16.97309	16.62742

## 128	15.19510	15.60206	16.21236	15.57607
## 129	17.72620	18.41084	18.39108	17.73800
## 130	19.28616	19.35199	19.48079	19.16285
## 131	16.02187	16.03845	16.46875	16.06640
## 132	15.74341	15.00189	16.08261	15.50835
## 133	14.13057	14.01027	14.21402	14.16491
## 134	19.23797	18.00141	19.50479	19.20168
## 135	16.65215	16.70104	17.18398	17.17738
## 136	19.21547	19.32369	19.86423	19.13024
## 137	14.63015	13.17097	14.59846	14.21614
## 138	19.39845	18.03784	19.08841	19.38446
## 139	17.00547	16.38783	17.10513	16.97724
## 140	14.53083	14.21818	15.16416	14.75692
## 141	15.50277	14.98757	16.12309	15.25783
## 142	14.01367	13.93194	14.29792	13.93848
## 143	14.06659	13.57955	15.58828	14.40946
## 144	19.63290	18.72104	19.79716	19.58138
## 145	16.95934	16.53259	18.00163	16.90065
## 146	18.48133	19.99479	19.09530	18.12121
## 147	16.43104	17.11553	16.99700	16.16687
## 148	17.51914	18.77279	17.75838	17.21817
## 149	17.97006	16.78762	17.60226	18.13721
## 150	17.32738	16.31741	17.17485	17.31787
## 151	19.78366	20.58178	20.23655	19.60456
## 152	20.50669	18.91549	19.94006	20.45171
## 153	20.82563	18.70698	19.88329	20.74107
## 154	20.80499	19.28408	20.30173	20.73024
## 155	20.29995	18.56614	19.55809	20.30742
## 156	23.75756	24.33940	24.15089	23.61009
## 157	16.06664	15.88205	17.53966	16.36319
## 158	17.32913	16.70077	17.93802	17.32518
## 159	16.81052	18.42004	17.10452	16.52552
## 160	16.51656	15.94960	16.85038	16.57845
## 161	20.91159	19.54113	20.68893	20.90235
## 162	15.72582	15.42623	16.94764	15.70828
## 163	16.04177	16.84451	16.25726	15.85781
## 164	15.72046	17.24042	16.47123	16.12463
## 165	15.08672	15.27292	15.55836	15.16773
## 166	16.46901	17.03725	16.90478	16.43391
## 167	16.50348	16.63354	18.04057	16.60324
## 168	19.01615	20.76377	19.40447	18.65837
## 169	21.03819	19.30793	20.43064	20.98155
## 170	17.25230	17.04921	17.57245	17.35673
## 171	17.47904	16.76085	17.95980	17.43567
## 172	14.98820	15.59922	15.22867	14.97706
## 173	13.76870	13.83792	15.32411	13.82227
## 174	12.54136	12.51183	12.91952	13.07565
## 175	11.71772	10.33349	12.80027	11.15754
## 176	17.23519	17.41502	17.96426	17.21873
## 177	20.41854	19.49469	21.68774	20.39069
## 178	15.35600	15.53588	15.59266	15.53233
## 179	15.19910	15.04989	15.50578	15.02838
## 180	11.65660	12.25703	13.17729	12.61983
## 181	18.47152	18.80606	19.97589	18.41724
## 182	17.95185	18.18568	17.79582	17.53275
## 183	14.73143	14.66050	15.34710	14.45115
## 184	14.94586	13.99515	15.55006	15.13711
## 185	20.68731	19.21824	20.75825	20.76296
## 186	18.07734	18.33250	18.49248	17.91228
## 187	15.94814	15.86058	17.30724	16.00567
## 188	17.60052	17.46348	17.65389	17.60885
## 189	16.20178	16.51279	16.66817	16.40602
## 190	17.35888	16.75564	18.38684	17.30893
## 191	17.34646	17.22694	18.42489	17.09393
## 192	16.77365	16.85075	16.75812	16.67080
## 193	18.10881	18.57504	19.17487	18.03944
## 194	21.52253	21.37226	23.04970	21.43649
## 195	18.01536	17.16467	18.98596	17.92434

```
## 196  13.76114  14.66506  14.29842  13.78146
## 197  17.74904  18.20046  18.53032  17.64379
## 198  16.17348  15.61013  16.82364  16.28211
## 199  16.61827  16.60033  16.85611  16.70523
## 200  19.11546  18.84632  19.37520  19.18585
## 201  15.40308  15.88784  15.87003  15.23381
## 202  14.87282  14.31125  14.84573  14.80161
## 203  13.48092  12.82536  13.40408  13.42771
## 204  20.34679  20.86491  20.55581  20.12755
## 205  16.44852  16.23962  17.00701  16.55908
## 206  13.06370  12.78031  13.13162  13.52307
## 207  16.01637  16.61252  16.57486  16.06209
## 208  19.38229  17.93122  18.73886  19.47602
## 209  14.07473  13.52454  14.17804  13.60606
## 210  19.44956  19.81914  20.01536  19.42771
## 211  14.67992  12.60754  14.14378  14.38499
## 212  20.49999  18.36982  19.61567  20.38163
## 213  15.19775  13.64926  14.69011  15.10366
## 214  18.31884  19.40137  18.50785  18.12586
## 215  20.44789  22.02012  21.01379  20.31152
## 216  19.42154  18.14619  19.41549  19.30064
## 217  12.31953  14.35239  12.90608  12.11949
## 218  17.54894  17.70530  18.90269  17.43730
## 219  17.57489  17.32254  18.42008  17.51822
## 220  13.54750  14.31224  14.21250  14.51613
## 221  16.85999  17.50982  17.00668  16.63665
## 222  19.82850  19.10001  19.97309  19.73014
## 223  16.42735  16.17278  17.19873  16.68140
## 224  14.66817  14.59065  15.08044  14.38835
## 225  16.63637  16.95470  16.95674  16.57153
## 226  18.08721  18.85736  18.54091  17.99568
## 227  15.69887  16.55094  16.40128  15.87965
## 228  17.51337  16.99236  18.40125  17.37314
## 229  16.46627  16.16052  16.89758  16.46769
## 230  15.03420  15.55102  15.05257  14.56968
## 231  19.49830  19.17128  20.56616  19.66600
## 232  16.76875  15.20999  16.07176  16.79601
## 233  19.56160  21.30825  20.20979  19.25479
## 234  19.66614  21.14700  20.10149  19.37433
## 235  16.57452  18.17723  17.19902  16.34818
## 236  15.65450  14.88474  15.55009  14.91490
## 237  14.37218  14.26121  14.22754  14.33420
## 238  19.59854  20.63245  19.73613  19.20974
## 239  14.62285  14.97217  15.42594  14.52693
## 240  18.58402  18.16948  19.77250  18.54072
## 241  19.23867  18.93442  20.75809  19.18592
## 242  14.40268  15.02998  14.63163  14.30976
## 243  14.07322  14.53467  14.58232  14.20625
## 244  16.54890  15.89666  17.04729  16.19908
## 245  17.13501  16.43720  17.91858  16.99844
## 246  20.00251  21.09764  20.33811  19.77618
## 247  20.38026  21.41571  20.80310  20.21241
## 248  19.87523  21.48183  20.22353  19.56596
## 249  18.75274  19.77618  19.21098  18.57104
## 250  17.15818  16.63778  18.23528  17.18398
## 251  19.04823  20.21514  19.58930  18.82501
## 252  18.02020  18.09646  19.05216  17.99926
## 253  20.63777  19.42304  21.41509  20.61576
## 254  17.13891  17.61425  17.88507  17.20753
## 255  18.09759  19.54700  18.63314  17.90765
## 256  15.42960  14.85151  15.33081  15.10099
## 257  18.87421  18.40220  19.91697  18.74060
## 258  17.67086  14.82063  16.57313  17.35165
## 259  24.65742  22.60793  23.86938  24.67147
## 260  15.82677  14.67744  16.71250  15.73970
## 261  15.30873  16.50707  15.73225  15.25433
## 262  19.74302  19.51936  19.88947  19.71277
## 263  18.62895  19.12518  19.33900  18.64878
```

```
## 264       18.39326       18.77587       18.87927       18.36299
## 265       14.10362       13.83408       14.03325       14.05333
## 266       18.90639       19.26144       19.21864       18.82916
## 267       20.23222       19.99659       21.21187       20.16398
## 268       18.27908       19.23025       18.78635       18.19393
## 269       18.15274       16.90830       17.91339       18.04650
```

```
#Save intensities
write.table(ABCF1, file ="~/Documents/Postdoc/PD_Projects/3_irCLIP-RNP/MS/TMT_analysis/0_TMT_data
    /ABCF1_TMT_intensities.txt", row.names = FALSE, sep = '\t', quote = FALSE)
write.table(DDX5, file ="~/Documents/Postdoc/PD_Projects/3_irCLIP-RNP/MS/TMT_analysis/0_TMT_data/
    DDX5_TMT_intensities.txt", row.names = FALSE, sep = '\t', quote = FALSE)
write.table(FUS, file ="~/Documents/Postdoc/PD_Projects/3_irCLIP-RNP/MS/TMT_analysis/0_TMT_data/
    FUS_TMT_intensities.txt", row.names = FALSE, sep = '\t', quote = FALSE)
write.table(hnA2B1, file ="~/Documents/Postdoc/PD_Projects/3_irCLIP-RNP/MS/TMT_analysis/0_TMT_
    data/hnA2B1_TMT_intensities.txt", row.names = FALSE, sep = '\t', quote = FALSE)
write.table(hnC, file ="~/Documents/Postdoc/PD_Projects/3_irCLIP-RNP/MS/TMT_analysis/0_TMT_data/
    hnC_TMT_intensities.txt", row.names = FALSE, sep = '\t', quote = FALSE)
write.table(hnM, file ="~/Documents/Postdoc/PD_Projects/3_irCLIP-RNP/MS/TMT_analysis/0_TMT_data/
    hnM_TMT_intensities.txt", row.names = FALSE, sep = '\t', quote = FALSE)
write.table(hnU, file ="~/Documents/Postdoc/PD_Projects/3_irCLIP-RNP/MS/TMT_analysis/0_TMT_data/
    hnU_TMT_intensities.txt", row.names = FALSE, sep = '\t', quote = FALSE)
write.table(ILF2, file ="~/Documents/Postdoc/PD_Projects/3_irCLIP-RNP/MS/TMT_analysis/0_TMT_data/
    ILF2_TMT_intensities.txt", row.names = FALSE, sep = '\t', quote = FALSE)
write.table(ILF3, file ="~/Documents/Postdoc/PD_Projects/3_irCLIP-RNP/MS/TMT_analysis/0_TMT_data/
    ILF3_TMT_intensities.txt", row.names = FALSE, sep = '\t', quote = FALSE)
write.table(NAT10, file ="~/Documents/Postdoc/PD_Projects/3_irCLIP-RNP/MS/TMT_analysis/0_TMT_data
    /NAT10_TMT_intensities.txt", row.names = FALSE, sep = '\t', quote = FALSE)
write.table(NONO, file ="~/Documents/Postdoc/PD_Projects/3_irCLIP-RNP/MS/TMT_analysis/0_TMT_data/
    NONO_TMT_intensities.txt", row.names = FALSE, sep = '\t', quote = FALSE)
write.table(RBFOX2, file ="~/Documents/Postdoc/PD_Projects/3_irCLIP-RNP/MS/TMT_analysis/0_TMT_
    data/RBFOX2_TMT_intensities.txt", row.names = FALSE, sep = '\t', quote = FALSE)
write.table(SFPQ, file ="~/Documents/Postdoc/PD_Projects/3_irCLIP-RNP/MS/TMT_analysis/0_TMT_data/
    SFPQ_TMT_intensities.txt", row.names = FALSE, sep = '\t', quote = FALSE)
```

2. DEP analysis for UVC enriched proteins

We used the following design to create a SummarizedExperiment.

```
# Load design matrix
design <- read.delim("~/Documents/Postdoc/PD_Projects/3_irCLIP-RNP/MS/TMT_analysis/3_DEP/0_design
    .txt")
design
```

```
##              label         condition replicate celltype crosslinking section
## 1   H293T.noUV.R1.L       noUV_H293T         1    H293T         noUV     low
## 2  H293T.noUV.R1.HM       noUV_H293T         2    H293T         noUV    high
## 3    H293T.UVC.R1.L    low_cut_H293T         1    H293T          UVC     low
## 4   H293T.UVC.R1.M medium_cut_H293T         1    H293T          UVC     med
## 5    H293T.UVC.R1.H   high_cut_H293T         1    H293T          UVC    high
## 6    H293T.UVC.R2.L    low_cut_H293T         2    H293T          UVC     low
## 7   H293T.UVC.R2.M medium_cut_H293T         2    H293T          UVC     med
## 8    H293T.UVC.R2.H   high_cut_H293T         2    H293T          UVC    high
## 9   HepG2.noUV.R1.L       noUV_HepG2         1    HepG2         noUV     low
## 10 HepG2.noUV.R1.HM       noUV_HepG2         2    HepG2         noUV    high
## 11   HepG2.UVC.R1.L    low_cut_HepG2         1    HepG2          UVC     low
## 12  HepG2.UVC.R1.M medium_cut_HepG2         1    HepG2          UVC     med
## 13   HepG2.UVC.R1.H   high_cut_HepG2         1    HepG2          UVC    high
```

```
## 14    HepG2.UVC.R2.L      low_cut_HepG2          2      HepG2          UVC      low
## 15    HepG2.UVC.R2.M medium_cut_HepG2          2      HepG2          UVC      med
## 16    HepG2.UVC.R2.H     high_cut_HepG2          2      HepG2          UVC     high
```

We determined RDAPs by comparing UVC and no-UV samples. Only proteins with FDR < 0.1 and FC > 1.2 were selected.

```
#Function to perform DEP analysis
DEP_analysis_UVC <- function (data) {
ecols <- c(grep("H293T", colnames(data)), grep("HepG2", colnames(data)) )
data[,3:18] <- 2^data[,3:18]
se <- make_se(data, columns = ecols, expdesign = design)
se <- normalize_vsn(se)
se_H293T <- se[,se$celltype == "H293T"]
diff_H293T <- test_diff(se_H293T, type = "control", control = "noUV_H293T", fdr.type = "BH")
dep_H293T <- add_rejections(diff_H293T, alpha = 0.1, lfc = log2(1.2))
results_H293T <- get_results(dep_H293T)
results_H293T$HEK293T_sign <- ifelse((results_H293T$high_cut_H293T_vs_noUV_H293T_significant == "
    TRUE" |
                                 results_H293T$medium_cut_H293T_vs_noUV_H293T_significant == "TRUE"
    |
                                 results_H293T$low_cut_H293T_vs_noUV_H293T_significant == "TRUE"), "
    HEK293T", "none")

se_HepG2 <- se[,se$celltype == "HepG2"]
diff_HepG2 <- test_diff(se_HepG2, type = "control", control = "noUV_HepG2", fdr.type = "BH")
dep_HepG2 <- add_rejections(diff_HepG2, alpha = 0.1, lfc = log2(1.2))
results_HepG2 <- get_results(dep_HepG2)
results_HepG2$HepG2_sign <- ifelse((results_HepG2$high_cut_HepG2_vs_noUV_HepG2_significant == "
    TRUE" |
                                 results_HepG2$medium_cut_HepG2_vs_noUV_HepG2_significant == "TRUE"
    |
                                 results_HepG2$low_cut_HepG2_vs_noUV_HepG2_significant == "TRUE"), "
    HepG2", "none")
results <- merge(results_H293T, results_HepG2[,-2], by = "name")
results$UVC <- ifelse((results$HEK293T_sign == "HEK293T" | results$HepG2_sign == "HepG2") , "UVC"
    , "none")

return(list(se = se, HEK293T_res = results_H293T, HepG2_res = results_HepG2, all = results))
}

ABCF1_DEP_UVC <- DEP_analysis_UVC(ABCF1)
DDX5_DEP_UVC <- DEP_analysis_UVC(DDX5)
FUS_DEP_UVC <- DEP_analysis_UVC(FUS)
hnA2B1_DEP_UVC <- DEP_analysis_UVC(hnA2B1)
hnC_DEP_UVC <- DEP_analysis_UVC(hnC)
hnM_DEP_UVC <- DEP_analysis_UVC(hnM)
hnU_DEP_UVC <- DEP_analysis_UVC(hnU)
ILF2_DEP_UVC <- DEP_analysis_UVC(ILF2)
ILF3_DEP_UVC <- DEP_analysis_UVC(ILF3)
NAT10_DEP_UVC <- DEP_analysis_UVC(NAT10)
NONO_DEP_UVC <- DEP_analysis_UVC(NONO)
RBFOX2_DEP_UVC <- DEP_analysis_UVC(RBFOX2)
SFPQ_DEP_UVC <- DEP_analysis_UVC(SFPQ)
```

```
write.table(ABCF1_DEP_UVC$all, file = "~/Documents/Postdoc/PD_Projects/3_irCLIP-RNP/MS/TMT_
    analysis/2_UVC_enriched/ABCF1_TMT_DEP_UVC_results.txt", row.names = FALSE, sep = "\t")
write.table(DDX5_DEP_UVC$all, file = "~/Documents/Postdoc/PD_Projects/3_irCLIP-RNP/MS/TMT_
    analysis/2_UVC_enriched/DDX5_TMT_DEP_UVC_results.txt", row.names = FALSE, sep = "\t")
write.table(FUS_DEP_UVC$all, file = "~/Documents/Postdoc/PD_Projects/3_irCLIP-RNP/MS/TMT_analysis
    /2_UVC_enriched/FUS_TMT_DEP_UVC_results.txt", row.names = FALSE, sep = "\t")
write.table(hnA2B1_DEP_UVC$all, file = "~/Documents/Postdoc/PD_Projects/3_irCLIP-RNP/MS/TMT_
    analysis/2_UVC_enriched/hnA2B1_TMT_DEP_UVC_results.txt", row.names = FALSE, sep = "\t")
```

```
write.table(hnC_DEP_UVC$all, file = "~/Documents/Postdoc/PD_Projects/3_irCLIP-RNP/MS/TMT_analysis
    /2_UVC_enriched/hnC_TMT_DEP_UVC_results.txt", row.names = FALSE, sep = "\t")
write.table(hnM_DEP_UVC$all, file = "~/Documents/Postdoc/PD_Projects/3_irCLIP-RNP/MS/TMT_analysis
    /2_UVC_enriched/hnM_TMT_DEP_UVC_results.txt", row.names = FALSE, sep = "\t")
write.table(hnU_DEP_UVC$all, file = "~/Documents/Postdoc/PD_Projects/3_irCLIP-RNP/MS/TMT_analysis
    /2_UVC_enriched/hnU_TMT_DEP_UVC_results.txt", row.names = FALSE, sep = "\t")
write.table(ILF2_DEP_UVC$all, file = "~/Documents/Postdoc/PD_Projects/3_irCLIP-RNP/MS/TMT_
    analysis/2_UVC_enriched/ILF2_TMT_DEP_UVC_results.txt", row.names = FALSE, sep = "\t")
write.table(ILF3_DEP_UVC$all, file = "~/Documents/Postdoc/PD_Projects/3_irCLIP-RNP/MS/TMT_
    analysis/2_UVC_enriched/ILF3_TMT_DEP_UVC_results.txt", row.names = FALSE, sep = "\t")
write.table(NAT10_DEP_UVC$all, file = "~/Documents/Postdoc/PD_Projects/3_irCLIP-RNP/MS/TMT_
    analysis/2_UVC_enriched/NAT10_TMT_DEP_UVC_results.txt", row.names = FALSE, sep = "\t")
write.table(NONO_DEP_UVC$all, file = "~/Documents/Postdoc/PD_Projects/3_irCLIP-RNP/MS/TMT_
    analysis/2_UVC_enriched/NONO_TMT_DEP_UVC_results.txt", row.names = FALSE, sep = "\t")
write.table(RBFOX2_DEP_UVC$all, file = "~/Documents/Postdoc/PD_Projects/3_irCLIP-RNP/MS/TMT_
    analysis/2_UVC_enriched/RBFOX2_TMT_DEP_UVC_results.txt", row.names = FALSE, sep = "\t")
write.table(SFPQ_DEP_UVC$all, file = "~/Documents/Postdoc/PD_Projects/3_irCLIP-RNP/MS/TMT_
    analysis/2_UVC_enriched/SFPQ_TMT_DEP_UVC_results.txt", row.names = FALSE, sep = "\t")
```

#3. Two-factor analysis between cell types and gel sections To analyze the cell-type differences, we used the limma package with a two-factor design (cell type and section).

```
#Perform DEP analysis using a two-factor model
extract_results_table <- function(fit) {
  tests <- colnames(fit$coefficients) %>%
    set_names(., .)
  map(tests, \(x) {
    tibble(gene = rownames(fit$coefficients),
           logFC = fit$coefficients[,x],
           s2.post = fit$s2.post,
           p.value = fit$p.value[,x]) %>%
      mutate(fdr = p.adjust(p.value, method = 'BH'))
  })
}

DEP_analysis <- function (se, rbp, rbp2) {
se_UVC <- se[,se$crosslinking == "UVC"]

#Get contrasts for each cell line and each normalization
model_vsn <- model.matrix(~ celltype * section, colData(se_UVC))
H293T_high_vsn <- colMeans(model_vsn[se_UVC$celltype == "H293T" & se_UVC$section == "high", ])
H293T_med_vsn <- colMeans(model_vsn[se_UVC$celltype == "H293T" & se_UVC$section == "med", ])
H293T_low_vsn <- colMeans(model_vsn[se_UVC$celltype == "H293T" & se_UVC$section == "low", ])
HepG2_high_vsn <- colMeans(model_vsn[se_UVC$celltype == "HepG2" & se_UVC$section == "high", ])
HepG2_med_vsn <- colMeans(model_vsn[se_UVC$celltype == "HepG2" & se_UVC$section == "med", ])
HepG2_low_vsn <- colMeans(model_vsn[se_UVC$celltype == "HepG2" & se_UVC$section == "low", ])

#Fit the data
fit1_norm_vsn = lmFit(assay(se_UVC), design = model.matrix(~ celltype * section, colData(se_UVC))
    )

#Get contrasts
contrast_matrix_vsn <- cbind("H293T_high.H293T_low" = H293T_high_vsn - H293T_low_vsn, "H293T_med.
    H293T_low" = H293T_med_vsn - H293T_low_vsn,
                             "HepG2_high.HepG2_low" = HepG2_high_vsn - HepG2_low_vsn, "HepG2_med.
    HepG2_low" = HepG2_med_vsn - HepG2_low_vsn,
                             "HepG2_high.H293T_high" = HepG2_high_vsn - H293T_high_vsn, "HepG2_
    med.H293T_med" = HepG2_med_vsn - H293T_med_vsn,
                             "HepG2_low.H293T_low" = HepG2_low_vsn - H293T_low_vsn)

#Second fit
fit2_norm_vsn <- contrasts.fit(fit1_norm_vsn, contrasts = contrast_matrix_vsn)
fit3_norm_vsn <- eBayes(fit2_norm_vsn)

#Get results
res_norm_vsn <- extract_results_table(fit3_norm_vsn)
```

```
#Interaction analysis
fit1_norm_int_vsn = lmFit(assay(se_UVC), design = model.matrix(~ celltype * section, colData(se_
    UVC)))
fit2_norm_int_vsn <- eBayes(fit1_norm_int_vsn)
int_norm_vsn <- topTable(fit2_norm_int_vsn, coef = c("celltypeHepG2:sectionlow", "celltypeHepG2:
    sectionmed"), number = length(rownames(se_UVC)))
int_norm_vsn$gene <- rownames(int_norm_vsn)

#Get significance labels
res_norm_vsn_HL <- merge(res_norm_vsn$H293T_high.H293T_low, res_norm_vsn$HepG2_high.HepG2_low, by
    ="gene")
res_norm_vsn_HL <- merge( res_norm_vsn_HL,int_norm_vsn,  by = "gene")
res_norm_vsn_HL$int_sign <- res_norm_vsn_HL$adj.P.Val < 0.1

res_norm_vsn_ML <- merge(res_norm_vsn$H293T_med.H293T_low, res_norm_vsn$HepG2_med.HepG2_low, by="
    gene")
res_norm_vsn_ML <- merge( res_norm_vsn_ML,int_norm_vsn,  by = "gene")
res_norm_vsn_ML$int_sign <- res_norm_vsn_ML$adj.P.Val < 0.1

res_norm_vsn_HL$order_sign <- paste(res_norm_vsn_HL$logFC.x > 0 & res_norm_vsn_HL$fdr.x < 0.05, #
    293T up
                                    res_norm_vsn_HL$logFC.y > 0 & res_norm_vsn_HL$fdr.y <
    0.05, #HepG2 up
                                    res_norm_vsn_HL$logFC.x < 0 & res_norm_vsn_HL$fdr.x <
    0.05, #293T down
                                    res_norm_vsn_HL$logFC.y < 0 & res_norm_vsn_HL$fdr.y <
    0.05, #HepG2 down
                                    sep = "_")

res_norm_vsn_ML$order_sign <- paste(res_norm_vsn_ML$logFC.x > 0 & res_norm_vsn_ML$fdr.x < 0.05, #
    293T up
                                    res_norm_vsn_ML$logFC.y > 0 & res_norm_vsn_ML$fdr.y <
    0.05, #HepG2 up
                                    res_norm_vsn_ML$logFC.x < 0 & res_norm_vsn_ML$fdr.x <
    0.05, #293T down
                                    res_norm_vsn_ML$logFC.y < 0 & res_norm_vsn_ML$fdr.y <
    0.05, #HepG2 down
                                    sep = "_")
resHL <- res_norm_vsn_HL
colnames(resHL)[-1] <- paste("HL", colnames(resHL)[-1], sep="_")
resML <- res_norm_vsn_ML
colnames(resML)[-1] <- paste("ML", colnames(resML)[-1], sep="_")
res_evr <- merge(resHL, resML, by = "gene", all.x = TRUE, all.y = TRUE)

#Keep only UVC proteins that are in both Label-free and TMT experiments
bulk_HEK293T <- read.delim(paste("/Users/lducoli/Documents/Postdoc/PD_Projects/3_irCLIP-RNP/MS/
    Bulk_analysis/2_UVC_enriched/", rbp , "_HEK293T_clipper_results.txt", sep = ""), header =
    TRUE, row.names = 1)
bulk_HEK293T <- subset(bulk_HEK293T, FDR < 0.1 & logFC > log2(3))

bulk_HepG2 <- read.delim(paste("/Users/lducoli/Documents/Postdoc/PD_Projects/3_irCLIP-RNP/MS/Bulk
    _analysis/2_UVC_enriched/", rbp , "_HepG2_clipper_results.txt", sep = ""), header = TRUE, row
    .names = 1)
bulk_HepG2 <- subset(bulk_HepG2, FDR < 0.1 & logFC > log2(3))

bulk_UVC_gene <- unique(c(rownames(bulk_HepG2), rownames(bulk_HEK293T)))
TMT_UVC_gene <- get(paste(rbp2, "_DEP_UVC", sep = ""))$all$name[get(paste(rbp2, "_DEP_UVC", sep =
    ""))$all$UVC == "UVC"]

intersect <- intersect(bulk_UVC_gene, TMT_UVC_gene)

res_norm_vsn_HL <- res_norm_vsn_HL[res_norm_vsn_HL$gene %in% intersect,]
res_norm_vsn_ML <- res_norm_vsn_ML[res_norm_vsn_ML$gene %in% intersect,]

#Scatter plot
vsn_max_axis <- c(max(c( max(res_norm_vsn_HL$logFC.x, res_norm_vsn_HL$logFC.y),max(res_norm_vsn_
    ML$logFC.x, res_norm_vsn_ML$logFC.y))))
```

```
vsn_min_axis <- c(max(abs(min(res_norm_vsn_HL$logFC.x, res_norm_vsn_HL$logFC.y)),abs(min(res_norm
    _vsn_ML$logFC.x, res_norm_vsn_ML$logFC.y))))

colors <- c("FALSE" = "#868686","TRUE" =  "#ff8d2a")

colors2 <- c("FALSE_FALSE_FALSE_FALSE" = "#868686", "FALSE_TRUE_TRUE_FALSE" = "#770003", "TRUE_
    FALSE_FALSE_TRUE" = "#770003", "FALSE_FALSE_FALSE_TRUE" = "#2256ca" ,"FALSE_FALSE_TRUE_FALSE"
     = "#2256ca",
                    "FALSE_FALSE_TRUE_TRUE" = "#2256ca", "FALSE_TRUE_FALSE_FALSE" = "#00a04c", "
    TRUE_FALSE_FALSE_FALSE" = "#00a04c",
                    "TRUE_TRUE_FALSE_FALSE" =  "#00a04c")

res_norm_vsn_HL$gel <- "High"
res_norm_vsn_ML$gel <- "Medium"

res_norm_vsn_all <- rbind(res_norm_vsn_HL, res_norm_vsn_ML)

all.ggplot <- ggplot(data=res_norm_vsn_all, aes(x=logFC.x, y=logFC.y)) + geom_vline(xintercept =
    0) + geom_hline(yintercept = 0) +  geom_abline(intercept = 0, linetype=2) +
  geom_point(shape=21, size=2, aes(col=int_sign, fill = order_sign)) + #aes(col = int_sign)) +
  labs(title = paste(rbp, " (", nrow(res_norm_vsn_all)/2, " RDAPs)" , sep = "")  , x = expression
    ("log2FC high vs. low sections in H293T"), y =
         expression("log2FC high vs. low sections in HepG2")) +
  scale_color_manual(values = colors) +
  scale_fill_manual(values = colors2) +
  ggrepel::geom_text_repel(data = res_norm_vsn_all[res_norm_vsn_all$int_sign == "TRUE",], aes(
    label = gene), size = 3, box.padding = unit(0.1, "lines"),
                           point.padding = unit(0.1, "lines"), segment.size = 0.5,max.overlaps =
    Inf) +
  theme_bw() +
  theme( panel.grid.major = element_blank(), legend.position = "none",
         panel.grid.minor = element_blank(),
         panel.background = element_blank(),
         axis.line = element_blank(),
         plot.title = element_text(hjust = 0.5)) + facet_grid(~ gel) + xlim(-2.5,2.5)+ ylim
    (-2.5,2.5)

return(list(se_UVC = se_UVC, res_all = res_norm_vsn_all, res_evr = res_evr, plot_all = all.ggplot
    , UVC_genes = intersect))
}

ABCF1_DEP <- DEP_analysis(ABCF1_DEP_UVC$se, "ABCF1", "ABCF1" )
DDX5_DEP <- DEP_analysis(DDX5_DEP_UVC$se, "DDX5", "DDX5")
FUS_DEP <- DEP_analysis(FUS_DEP_UVC$se, "FUS", "FUS")
hnA2B1_DEP <- DEP_analysis(hnA2B1_DEP_UVC$se, "HNRNPA2B1", "hnA2B1")
hnC_DEP <- DEP_analysis(hnC_DEP_UVC$se, "HNRNPC", "hnC")
hnM_DEP <- DEP_analysis(hnM_DEP_UVC$se, "HNRNPM", "hnM")
hnU_DEP <- DEP_analysis(hnU_DEP_UVC$se, "HNRNPU", "hnU")
ILF2_DEP <- DEP_analysis(ILF2_DEP_UVC$se, "ILF2", "ILF2")
ILF3_DEP <- DEP_analysis(ILF3_DEP_UVC$se, "ILF3", "ILF3")
NAT10_DEP <- DEP_analysis(NAT10_DEP_UVC$se, "NAT10", "NAT10")
NONO_DEP <- DEP_analysis(NONO_DEP_UVC$se, "NONO", "NONO")
RBFOX2_DEP <- DEP_analysis(RBFOX2_DEP_UVC$se, "RBFOX2", "RBFOX2")
SFPQ_DEP <- DEP_analysis(SFPQ_DEP_UVC$se, "SFPQ", "SFPQ")

head(ABCF1_DEP$res_all, n = 2)
```

```
##      gene   logFC.x   s2.post.x     p.value.x       fdr.x   logFC.y   s2.post.y
## 21   BMS1 0.3320765 0.006335193 2.237929e-03 0.004905658 0.3641513 0.006335193
## 28 CDK13 0.8163761 0.015324886 8.586624e-05 0.000311667 0.3160268 0.015324886
##       p.value.y      fdr.y celltypeHepG2.sectionlow celltypeHepG2.sectionmed
## 21 0.001228332 0.00387217               -0.03207478                 0.2343327
## 28 0.030293616 0.05390961                0.50034934                 0.3490723
##      AveExpr        F    P.Value adj.P.Val int_sign            order_sign  gel
## 21 15.53131 3.338850 0.08074313 0.3071951    FALSE  TRUE_TRUE_FALSE_FALSE High
## 28 14.47789 4.296776 0.04768793 0.2693838    FALSE TRUE_FALSE_FALSE_FALSE High
```

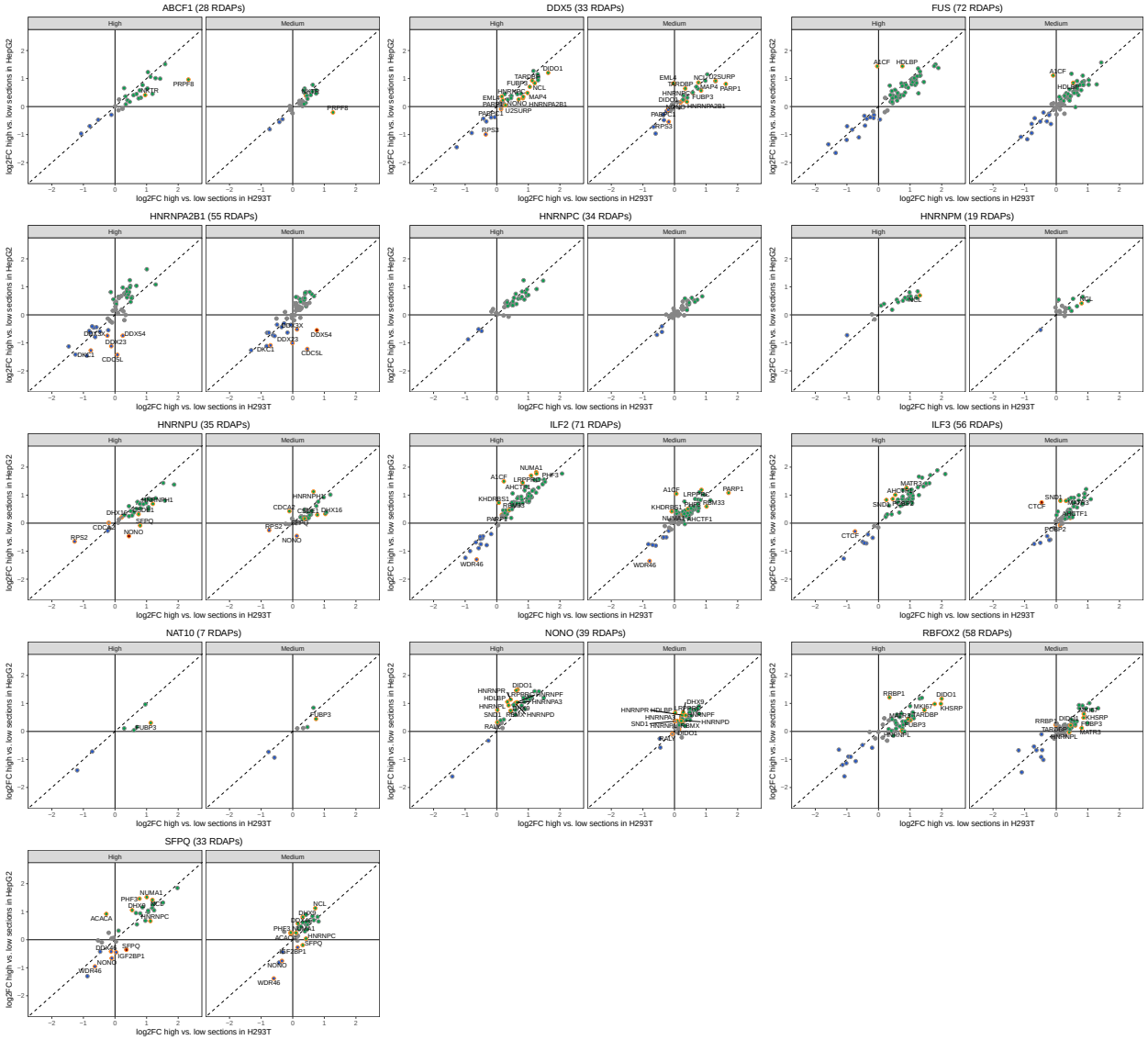
```
write.table(ABCF1_DEP$res_evr, file = "~/Documents/Postdoc/PD_Projects/3_irCLIP-RNP/MS/TMT_
    analysis/3_DEP/ABCF1_TMT_twofactor_results.txt", row.names = FALSE, sep = "\t")
write.table(DDX5_DEP$res_evr, file = "~/Documents/Postdoc/PD_Projects/3_irCLIP-RNP/MS/TMT_
    analysis/3_DEP/DDX5_TMT_twofactor_results.txt", row.names = FALSE, sep = "\t")
write.table(FUS_DEP$res_evr, file = "~/Documents/Postdoc/PD_Projects/3_irCLIP-RNP/MS/TMT_analysis
    /3_DEP/FUS_TMT_twofactor_results.txt", row.names = FALSE, sep = "\t")
write.table(hnA2B1_DEP$res_evr, file = "~/Documents/Postdoc/PD_Projects/3_irCLIP-RNP/MS/TMT_
    analysis/3_DEP/hnA2B1_TMT_twofactor_results.txt", row.names = FALSE, sep = "\t")
write.table(hnC_DEP$res_evr, file = "~/Documents/Postdoc/PD_Projects/3_irCLIP-RNP/MS/TMT_analysis
    /3_DEP/hnC_TMT_twofactor_results.txt", row.names = FALSE, sep = "\t")
write.table(hnM_DEP$res_evr, file = "~/Documents/Postdoc/PD_Projects/3_irCLIP-RNP/MS/TMT_analysis
    /3_DEP/hnM_TMT_twofactor_results.txt", row.names = FALSE, sep = "\t")
write.table(hnU_DEP$res_evr, file = "~/Documents/Postdoc/PD_Projects/3_irCLIP-RNP/MS/TMT_analysis
    /3_DEP/hnU_TMT_twofactor_results.txt", row.names = FALSE, sep = "\t")
write.table(ILF2_DEP$res_evr, file = "~/Documents/Postdoc/PD_Projects/3_irCLIP-RNP/MS/TMT_
    analysis/3_DEP/ILF2_TMT_twofactor_results.txt", row.names = FALSE, sep = "\t")
write.table(ILF3_DEP$res_evr, file = "~/Documents/Postdoc/PD_Projects/3_irCLIP-RNP/MS/TMT_
    analysis/3_DEP/ILF3_TMT_twofactor_results.txt", row.names = FALSE, sep = "\t")
write.table(NAT10_DEP$res_evr, file = "~/Documents/Postdoc/PD_Projects/3_irCLIP-RNP/MS/TMT_
    analysis/3_DEP/NAT10_TMT_twofactor_results.txt", row.names = FALSE, sep = "\t")
write.table(NONO_DEP$res_evr, file = "~/Documents/Postdoc/PD_Projects/3_irCLIP-RNP/MS/TMT_
    analysis/3_DEP/NONO_TMT_twofactor_results.txt", row.names = FALSE, sep = "\t")
write.table(RBFOX2_DEP$res_evr, file = "~/Documents/Postdoc/PD_Projects/3_irCLIP-RNP/MS/TMT_
    analysis/3_DEP/RBFOX2_TMT_twofactor_results.txt", row.names = FALSE, sep = "\t")
write.table(SFPQ_DEP$res_evr, file = "~/Documents/Postdoc/PD_Projects/3_irCLIP-RNP/MS/TMT_
    analysis/3_DEP/SFPQ_TMT_twofactor_results.txt", row.names = FALSE, sep = "\t")

write.table(ABCF1_DEP$res_all, file = "~/Documents/Postdoc/PD_Projects/3_irCLIP-RNP/MS/TMT_
    analysis/3_DEP/ABCF1_TMT_twofactor_results_sub.txt", row.names = FALSE, sep = "\t")
write.table(DDX5_DEP$res_all, file = "~/Documents/Postdoc/PD_Projects/3_irCLIP-RNP/MS/TMT_
    analysis/3_DEP/DDX5_TMT_twofactor_results_sub.txt", row.names = FALSE, sep = "\t")
write.table(FUS_DEP$res_all, file = "~/Documents/Postdoc/PD_Projects/3_irCLIP-RNP/MS/TMT_analysis
    /3_DEP/FUS_TMT_twofactor_results_sub.txt", row.names = FALSE, sep = "\t")
write.table(hnA2B1_DEP$res_all, file = "~/Documents/Postdoc/PD_Projects/3_irCLIP-RNP/MS/TMT_
    analysis/3_DEP/hnA2B1_TMT_twofactor_results_sub.txt", row.names = FALSE, sep = "\t")
write.table(hnC_DEP$res_all, file = "~/Documents/Postdoc/PD_Projects/3_irCLIP-RNP/MS/TMT_analysis
    /3_DEP/hnC_TMT_twofactor_results_sub.txt", row.names = FALSE, sep = "\t")
write.table(hnM_DEP$res_all, file = "~/Documents/Postdoc/PD_Projects/3_irCLIP-RNP/MS/TMT_analysis
    /3_DEP/hnM_TMT_twofactor_results_sub.txt", row.names = FALSE, sep = "\t")
write.table(hnU_DEP$res_all, file = "~/Documents/Postdoc/PD_Projects/3_irCLIP-RNP/MS/TMT_analysis
    /3_DEP/hnU_TMT_twofactor_results_sub.txt", row.names = FALSE, sep = "\t")
write.table(ILF2_DEP$res_all, file = "~/Documents/Postdoc/PD_Projects/3_irCLIP-RNP/MS/TMT_
    analysis/3_DEP/ILF2_TMT_twofactor_results_sub.txt", row.names = FALSE, sep = "\t")
write.table(ILF3_DEP$res_all, file = "~/Documents/Postdoc/PD_Projects/3_irCLIP-RNP/MS/TMT_
    analysis/3_DEP/ILF3_TMT_twofactor_results_sub.txt", row.names = FALSE, sep = "\t")
write.table(NAT10_DEP$res_all, file = "~/Documents/Postdoc/PD_Projects/3_irCLIP-RNP/MS/TMT_
    analysis/3_DEP/NAT10_TMT_twofactor_results_sub.txt", row.names = FALSE, sep = "\t")
write.table(NONO_DEP$res_all, file = "~/Documents/Postdoc/PD_Projects/3_irCLIP-RNP/MS/TMT_
    analysis/3_DEP/NONO_TMT_twofactor_results_sub.txt", row.names = FALSE, sep = "\t")
write.table(RBFOX2_DEP$res_all, file = "~/Documents/Postdoc/PD_Projects/3_irCLIP-RNP/MS/TMT_
    analysis/3_DEP/RBFOX2_TMT_twofactor_results_sub.txt", row.names = FALSE, sep = "\t")
write.table(SFPQ_DEP$res_all, file = "~/Documents/Postdoc/PD_Projects/3_irCLIP-RNP/MS/TMT_
    analysis/3_DEP/SFPQ_TMT_twofactor_results_sub.txt", row.names = FALSE, sep = "\t")
```

4. Visualization

Scatter plot of logFC high vs. low

We plot the results of the two factor analysis. We displayed only proteins that were categorized as RDAPs (UVC-enriched) in both label-free and TMT datasets. Green dots: High-MW-zone RDAPs, Blue dots: Low-MW-zone RDAPs, red dots: ambivalent RDAPs, orange border: FDR < 0.1 between HEK293T and HepG2.

```
ggarrange(ABCF1_DEP$plot_all,DDX5_DEP$plot_all,FUS_DEP$plot_all,hnA2B1_DEP$plot_all,
          hnC_DEP$plot_all,hnM_DEP$plot_all,hnU_DEP$plot_all,ILF2_DEP$plot_all,
          ILF3_DEP$plot_all,NAT10_DEP$plot_all,NONO_DEP$plot_all,RBFOX2_DEP$plot_all,
          SFPQ_DEP$plot_all, ncol = 3, nrow = 5)
```



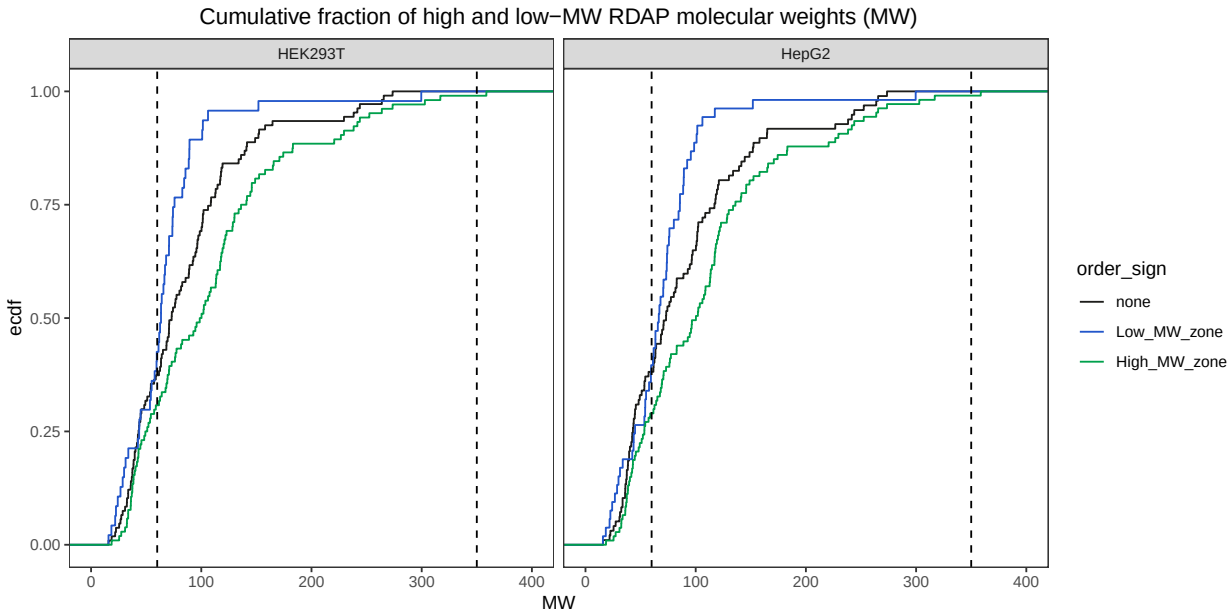

```
# Save the bubble plot as pdf
pdf("~/Documents/Postdoc/PD_Projects/3_irCLIP-RNP/MS/TMT_analysis/4_Visualization/DEP_results_
    twofactors.pdf", height = 20, width = 22)
ggarrange(ABCF1_DEP$plot_all,DDX5_DEP$plot_all,FUS_DEP$plot_all,hnA2B1_DEP$plot_all,
```

```
            hnC_DEP$plot_all,hnM_DEP$plot_all,hnU_DEP$plot_all,ILF2_DEP$plot_all,
            ILF3_DEP$plot_all,NAT10_DEP$plot_all,NONO_DEP$plot_all,RBFOX2_DEP$plot_all,
            SFPQ_DEP$plot_all, ncol = 3, nrow = 5)
dev.off()
```

CDF of high-MW-zone and low-MW-zone

```
#Load MW table
MW_prot <- read.delim("/Users/lducoli/Documents/Postdoc/PD_Projects/3_irCLIP-RNP/MS/TMT_analysis/
    0_TMT_data/Tot_prot_MW.txt", header = TRUE)
MW_prot$gene <- gsub("\\..*","",MW_prot$gene)
MW_prot <- unique(MW_prot)

#Group definition
H293T_lvls <- list(none = "FALSE_FALSE", Low_MW_zone = "FALSE_TRUE", High_MW_zone = "TRUE_FALSE")
HepG2_lvls <- list(none = "FALSE_FALSE", Low_MW_zone = "FALSE_TRUE", High_MW_zone = "TRUE_FALSE")

#Determine the class for each cell type
get_MW <- function(rbp) {
  data <- get(paste(rbp, "_DEP", sep = ""))
  data$res_all$HEK293T_order_sign <- factor(paste(data$res_all$logFC.x > 0 & data$res_all$fdr.x <
      0.05,
                                                  data$res_all$logFC.x < 0 & data$res_all$fdr.x <
      0.05, sep = "_"))
  levels(data$res_all$HEK293T_order_sign) <- H293T_lvls
  data$res_all$HepG2_order_sign <- factor(paste(data$res_all$logFC.y > 0 & data$res_all$fdr.y <
    0.05,
                                                data$res_all$logFC.y < 0 & data$res_all$fdr.y <
    0.05, sep = "_"))
  levels(data$res_all$HepG2_order_sign) <- HepG2_lvls
  colnames(data$res_all)[1] <- "name"
  MW <- merge(data$res_all, get(rbp)[,1:2], by = c("name"), all.x = TRUE)
  MW <- merge(MW, MW_prot, by = c("ID"))
  return(list(data = data$res_all, MW = MW))
}

ABCF1_MW <- get_MW("ABCF1" )
DDX5_MW <- get_MW("DDX5")
FUS_MW <- get_MW("FUS")
hnA2B1_MW <- get_MW("hnA2B1")
hnC_MW <- get_MW("hnC")
hnM_MW <- get_MW("hnM")
hnU_MW <- get_MW("hnU")
ILF2_MW <- get_MW("ILF2")
ILF3_MW <- get_MW("ILF3")
NAT10_MW <- get_MW("NAT10")
NONO_MW <- get_MW("NONO")
RBFOX2_MW <- get_MW("RBFOX2")
SFPQ_MW <- get_MW("SFPQ")

#Get the proteins
Tot_UVC <- unique(rbind(unique(ABCF1_MW$MW[,c(1,2,20,21,22)]), unique(DDX5_MW$MW[,c(1,2,20,21,22)
    ]), unique(FUS_MW$MW[,c(1,2,20,21,22)]),
                        unique(hnA2B1_MW$MW[,c(1,2,20,21,22)]), unique(hnC_MW$MW[,c(1,2,20,21,22)
    ]), unique(hnM_MW$MW[,c(1,2,20,21,22)]),
                        unique(hnU_MW$MW[,c(1,2,20,21,22)]), unique(ILF2_MW$MW[,c(1,2,20,21,22)])
    , unique(ILF3_MW$MW[,c(1,2,20,21,22)]),
                        unique(NAT10_MW$MW[,c(1,2,20,21,22)]),unique(NONO_MW$MW[,c(1,2,20,21,22)
    ]),unique(RBFOX2_MW$MW[,c(1,2,20,21,22)]),
                        unique(SFPQ_MW$MW[,c(1,2,20,21,22)])))


Tot_UVC_HEK293T <- Tot_UVC[,c(1:3,5)]
```

```
Tot_UVC_HEK293T$celltype <- "HEK293T"
colnames(Tot_UVC_HEK293T)[3] <- "order_sign"
Tot_UVC_HEK293T <- unique(Tot_UVC_HEK293T)

Tot_UVC_HepG2 <- Tot_UVC[,c(1:2,4,5)]
Tot_UVC_HepG2$celltype <- "HepG2"
colnames(Tot_UVC_HepG2)[3] <- "order_sign"
Tot_UVC_HepG2 <- unique(Tot_UVC_HepG2)

Tot_UVC <- rbind(Tot_UVC_HEK293T, Tot_UVC_HepG2)

ggplot(data=Tot_UVC, aes(x=MW, group=order_sign, colour=order_sign)) +
  stat_ecdf() +
  ggtitle("Cumulative fraction of high and low-MW RDAP molecular weights (MW)") +
  xlim(0, 400) +
  scale_color_manual(values = c("#1d1d1b", "#2256ca", "#00a04c")) +
  geom_vline(xintercept = c(60,350), linetype="dashed", color = "black", size=0.5) +
  theme_bw() +
  theme(panel.grid.major = element_blank(),
        panel.grid.minor = element_blank(),
        panel.background = element_blank(),
        axis.line = element_blank(),
        plot.title = element_text(hjust = 0.5)) + facet_grid(~celltype)
```




```
# Save the bubble plot as pdf
pdf("~/Documents/Postdoc/PD_Projects/3_irCLIP-RNP/MS/TMT_analysis/4_Visualization/CDF_high_low_MW
    .pdf", height = 5, width = 10)
ggplot(data=Tot_UVC, aes(x=MW, group=order_sign, colour=order_sign)) +
  stat_ecdf() +
  ggtitle("Cumulative fraction of high and low-MW RDAP molecular weights (MW)") +
  xlim(0, 400) +
  scale_color_manual(values = c("#1d1d1b", "#2256ca", "#00a04c")) +
  geom_vline(xintercept = c(60,350), linetype="dashed", color = "black", size=0.5) +
  theme_bw() +
  theme(panel.grid.major = element_blank(),
        panel.grid.minor = element_blank(),
        panel.background = element_blank(),
        axis.line = element_blank(),
        plot.title = element_text(hjust = 0.5)) + facet_grid(~celltype)
dev.off()
```

```
#KS test
data.frame( row.names = c("HEK293T", "HepG2"),
            highvsbackground = c(ks.test(Tot_UVC_HEK293T$MW[Tot_UVC_HEK293T$order_sign == "none"
    ],
                                         Tot_UVC_HEK293T$MW[Tot_UVC_HEK293T$order_sign == "High_
    MW_zone"] , alternative = 'two.sided')$p.value,
                                 ks.test(Tot_UVC_HepG2$MW[Tot_UVC_HepG2$order_sign == "none"],
                                         Tot_UVC_HepG2$MW[Tot_UVC_HepG2$order_sign == "High_MW_
    zone"] , alternative = 'two.sided')$p.value),
            lowvsbackground = c(ks.test(Tot_UVC_HEK293T$MW[Tot_UVC_HEK293T$order_sign == "none"],
                                         Tot_UVC_HEK293T$MW[Tot_UVC_HEK293T$order_sign == "Low_MW
    _zone"] , alternative = 'two.sided')$p.value,
                                 ks.test(Tot_UVC_HepG2$MW[Tot_UVC_HepG2$order_sign == "none"],
                                         Tot_UVC_HepG2$MW[Tot_UVC_HepG2$order_sign == "Low_MW_
    zone"] , alternative = 'two.sided')$p.value),
            highvslow = c(ks.test(Tot_UVC_HEK293T$MW[Tot_UVC_HEK293T$order_sign == "Low_MW_zone"
    ],
                                         Tot_UVC_HEK293T$MW[Tot_UVC_HEK293T$order_sign == "High_
    MW_zone"] , alternative = 'two.sided')$p.value,
                                 ks.test(Tot_UVC_HepG2$MW[Tot_UVC_HepG2$order_sign == "Low_MW_
    zone"],
                                         Tot_UVC_HepG2$MW[Tot_UVC_HepG2$order_sign == "High_MW_
    zone"] , alternative = 'two.sided')$p.value))
```

```
##          highvsbackground lowvsbackground     highvslow
## HEK293T       0.01014939      0.007954573 2.770678e-06
## HepG2         0.06144580      0.012398516 1.908600e-06
```

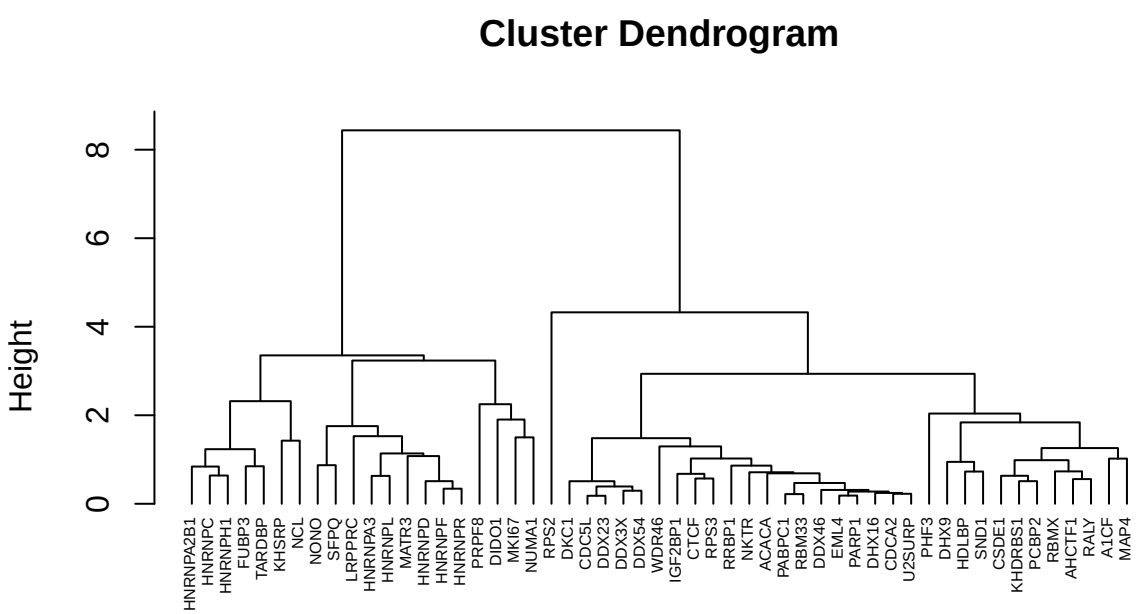
Heatmap of slope values

We calculated the slope from normalized log2-transformed TMT intensities across the three RNP subzones. We then displayed these values as an heatmap and through clustering, we have identified 20 RDAPs with not only multi-protein assembly tendency but also cell-type differences.

```
merge.all <- function(x, ..., by = "row.names") {
  L <- list(...)
  for (i in seq_along(L)) {
    x <- merge(x, L[[i]], by = by, all = TRUE)
    rownames(x) <- x$Row.names
    x$Row.names <- NULL
  }
  return(x)
}

#Get all proteins with cell-type enrichment
Tot_TMT_int <- unique(c(unique(ABCF1_DEP$res_all$gene[ABCF1_DEP$res_all$int_sign == "TRUE"]),
                        unique(DDX5_DEP$res_all$gene[DDX5_DEP$res_all$int_sign == "TRUE"]),
                        unique(FUS_DEP$res_all$gene[FUS_DEP$res_all$int_sign == "TRUE"]),
                        unique(hnA2B1_DEP$res_all$gene[hnA2B1_DEP$res_all$int_sign == "TRUE"]),
                        unique(hnC_DEP$res_all$gene[hnC_DEP$res_all$int_sign == "TRUE"]),
                        unique(hnM_DEP$res_all$gene[hnM_DEP$res_all$int_sign == "TRUE"]),
                        unique(hnU_DEP$res_all$gene[hnU_DEP$res_all$int_sign == "TRUE"]),
                        unique(ILF2_DEP$res_all$gene[ILF2_DEP$res_all$int_sign == "TRUE"]),
                        unique(ILF3_DEP$res_all$gene[ILF3_DEP$res_all$int_sign == "TRUE"]),
                        unique(NAT10_DEP$res_all$gene[NAT10_DEP$res_all$int_sign == "TRUE"]),
                        unique(NONO_DEP$res_all$gene[NONO_DEP$res_all$int_sign == "TRUE"]),
```

```
                        unique(RBFOX2_DEP$res_all$gene[RBFOX2_DEP$res_all$int_sign == "TRUE"]),
                        unique(SFPQ_DEP$res_all$gene[SFPQ_DEP$res_all$int_sign == "TRUE"])))

#Average the replicates
rowMeans_function <- function(data, rbp) {
data <- as.data.frame(assay(data))
data$H293T_low_avg <- rowMeans(data[,c(1,4)])
data$H293T_med_avg <- rowMeans(data[,c(2,5)])
data$H293T_high_avg <- rowMeans(data[,c(3,6)])
data$HepG2_low_avg <- rowMeans(data[,c(7,10)])
data$HepG2_med_avg <- rowMeans(data[,c(8,11)])
data$HepG2_high_avg <- rowMeans(data[,c(9,12)])
data <- data[,13:18]
colnames(data) <- paste(rbp, colnames(data), sep="_")
data2 <- data[rownames(data) %in% Tot_TMT_int,]
data2 <- data2[rownames(data2) %in% get(paste(rbp, "_DEP", sep = ""))$UVC_genes,]
return(list(unflt = data, flt = data2))
}

ABCF1_data <- rowMeans_function(ABCF1_DEP$se_UVC, "ABCF1")
DDX5_data <- rowMeans_function(DDX5_DEP$se_UVC, "DDX5")
FUS_data <- rowMeans_function(FUS_DEP$se_UVC, "FUS")
hnA2B1_data <- rowMeans_function(hnA2B1_DEP$se_UVC, "hnA2B1")
hnC_data <- rowMeans_function(hnC_DEP$se_UVC, "hnC")
hnM_data <- rowMeans_function(hnM_DEP$se_UVC, "hnM")
hnU_data <- rowMeans_function(hnU_DEP$se_UVC, "hnU")
ILF2_data <- rowMeans_function(ILF2_DEP$se_UVC, "ILF2")
ILF3_data <- rowMeans_function(ILF3_DEP$se_UVC, "ILF3")
NAT10_data <- rowMeans_function(NAT10_DEP$se_UVC, "NAT10")
NONO_data <- rowMeans_function(NONO_DEP$se_UVC, "NONO")
RBFOX2_data <- rowMeans_function(RBFOX2_DEP$se_UVC, "RBFOX2")
SFPQ_data <- rowMeans_function(SFPQ_DEP$se_UVC, "SFPQ")


all_data <- merge.all(ABCF1_data$flt,DDX5_data$flt,FUS_data$flt,hnA2B1_data$flt,hnC_data$flt,hnM_
    data$flt,hnU_data$flt,ILF2_data$flt,ILF3_data$flt,NAT10_data$flt,NONO_data$flt,RBFOX2_data$
    flt,SFPQ_data$flt)

l <- list(c(grep("ABCF1_H293T", colnames(all_data)),grep("ABCF1_HepG2", colnames(all_data))),
          c(grep("DDX5_H293T", colnames(all_data)),grep("DDX5_HepG2", colnames(all_data))),
          c(grep("FUS_H293T", colnames(all_data)),grep("FUS_HepG2", colnames(all_data))),
          c(grep("hnA2B1_H293T", colnames(all_data)),grep("hnA2B1_HepG2", colnames(all_data))),
          c(grep("hnC_H293T", colnames(all_data)),grep("hnC_HepG2", colnames(all_data))),
          c(grep("hnM_H293T", colnames(all_data)),grep("hnM_HepG2", colnames(all_data))),
          c(grep("hnU_H293T", colnames(all_data)),grep("hnU_HepG2", colnames(all_data))),
          c(grep("ILF2_H293T", colnames(all_data)),grep("ILF2_HepG2", colnames(all_data))),
          c(grep("ILF3_H293T", colnames(all_data)),grep("ILF3_HepG2", colnames(all_data))),
          c(grep("NAT10_H293T", colnames(all_data)),grep("NAT10_HepG2", colnames(all_data))),
          c(grep("NONO_H293T", colnames(all_data)),grep("NONO_HepG2", colnames(all_data))),
          c(grep("RBFOX2_H293T", colnames(all_data)),grep("RBFOX2_HepG2", colnames(all_data))),
          c(grep("SFPQ_H293T", colnames(all_data)),grep("SFPQ_HepG2", colnames(all_data)))
          )

for (i in 1:length(l)) {
  all_data[,l[[i]]] <- t(scale(t(all_data[,l[[i]]]), scale = FALSE, center = TRUE))
}

slope <- function(x){
  if(all(is.na(x)))
    return(NA)
  else
    return(coef(lm(x~I(1:3)))[2])
}

#Slope
all_data$ABCF1_H293T_slope <- apply(all_data[,grep("ABCF1_H293T", colnames(all_data))], 1,slope)
all_data$ABCF1_HepG2_slope <- apply(all_data[,grep("ABCF1_HepG2", colnames(all_data))], 1,slope)
all_data$DDX5_H293T_slope <- apply(all_data[,grep("DDX5_H293T", colnames(all_data))], 1,slope)
```

```
all_data$DDX5_HepG2_slope <- apply(all_data[,grep("DDX5_HepG2", colnames(all_data))], 1,slope)
all_data$FUS_H293T_slope <- apply(all_data[,grep("FUS_H293T", colnames(all_data))], 1,slope)
all_data$FUS_HepG2_slope <- apply(all_data[,grep("FUS_HepG2", colnames(all_data))], 1,slope)
all_data$hnA2B1_H293T_slope <- apply(all_data[,grep("hnA2B1_H293T", colnames(all_data))], 1,slope
    )
all_data$hnA2B1_HepG2_slope <- apply(all_data[,grep("hnA2B1_HepG2", colnames(all_data))], 1,slope
    )
all_data$hnC_H293T_slope <- apply(all_data[,grep("hnC_H293T", colnames(all_data))], 1,slope)
all_data$hnC_HepG2_slope <- apply(all_data[,grep("hnC_HepG2", colnames(all_data))], 1,slope)
all_data$hnM_H293T_slope <- apply(all_data[,grep("hnM_H293T", colnames(all_data))], 1,slope)
all_data$hnM_HepG2_slope <- apply(all_data[,grep("hnM_HepG2", colnames(all_data))], 1,slope)
all_data$hnU_H293T_slope <- apply(all_data[,grep("hnU_H293T", colnames(all_data))], 1,slope)
all_data$hnU_HepG2_slope <- apply(all_data[,grep("hnU_HepG2", colnames(all_data))], 1,slope)
all_data$ILF2_H293T_slope <- apply(all_data[,grep("ILF2_H293T", colnames(all_data))], 1,slope)
all_data$ILF2_HepG2_slope <- apply(all_data[,grep("ILF2_HepG2", colnames(all_data))], 1,slope)
all_data$ILF3_H293T_slope <- apply(all_data[,grep("ILF3_H293T", colnames(all_data))], 1,slope)
all_data$ILF3_HepG2_slope <- apply(all_data[,grep("ILF3_HepG2", colnames(all_data))], 1,slope)
all_data$NAT10_H293T_slope <- apply(all_data[,grep("NAT10_H293T", colnames(all_data))], 1,slope)
all_data$NAT10_HepG2_slope <- apply(all_data[,grep("NAT10_HepG2", colnames(all_data))], 1,slope)
all_data$NONO_H293T_slope <- apply(all_data[,grep("NONO_H293T", colnames(all_data))], 1,slope)
all_data$NONO_HepG2_slope <- apply(all_data[,grep("NONO_HepG2", colnames(all_data))], 1,slope)
all_data$RBFOX2_H293T_slope <- apply(all_data[,grep("RBFOX2_H293T", colnames(all_data))], 1,slope
    )
all_data$RBFOX2_HepG2_slope <- apply(all_data[,grep("RBFOX2_HepG2", colnames(all_data))], 1,slope
    )
all_data$SFPQ_H293T_slope <- apply(all_data[,grep("SFPQ_H293T", colnames(all_data))], 1,slope)
all_data$SFPQ_HepG2_slope <- apply(all_data[,grep("SFPQ_HepG2", colnames(all_data))], 1,slope)

#Calculate the clustering
all_data_slope <- all_data[,grep("slope", colnames(all_data))]
all_data_slope_cl <- all_data_slope
all_data_slope_cl[is.na(all_data_slope_cl)] <- 0

hc <- hclust(dist(all_data_slope_cl), method = "ward.D2")

# Plot dendogram
plot(hclust(dist(all_data_slope_cl), method = "ward.D2"), hang = -1, cex=0.5)
```

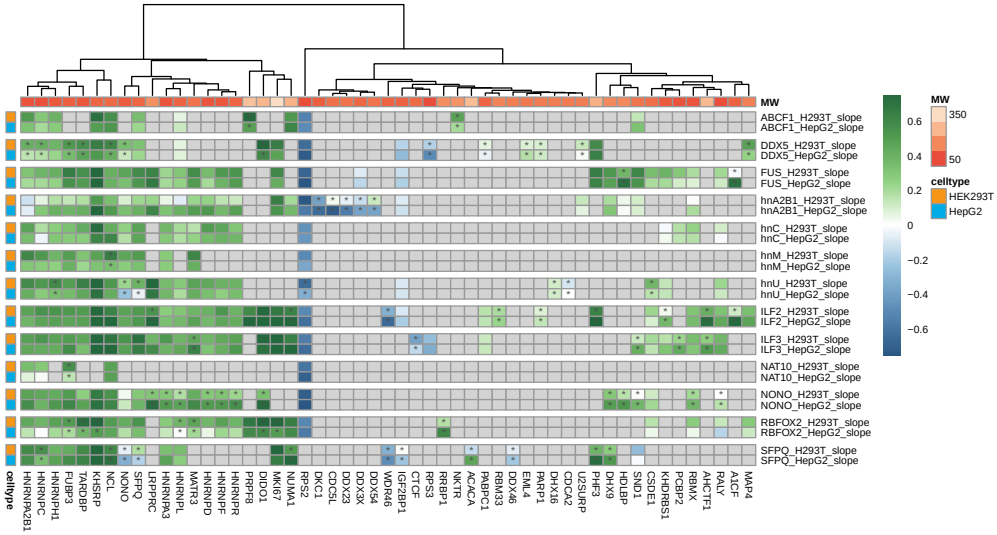


dist(all_data_slope_cl)
hclust (*, "ward.D2")

```
# Save dendogram as pdf
pdf("~/Documents/Postdoc/PD_Projects/3_irCLIP-RNP/MS/TMT_analysis/4_Visualization/Dendo_slope.pdf
    ")
plot(hclust(dist(all_data_slope_cl), method = "ward.D2"), hang = -1, cex=0.5)
dev.off()
```

```
#Annotation
annotation <- MW_prot[,1:2]
rownames(annotation) <- annotation$gene
annotation$gene <- NULL
annotation <- subset(annotation, rownames(annotation) %in% rownames(all_data))
annotation2 <- data.frame(row.names = colnames(all_data_slope), celltype = rep(c("HEK293T", "
    HepG2"), 13))
ann_colors <- list(MW = c(paletteer_c("grDevices::Peach", 30)), celltype =  c(HEK293T = "#f79516"
    , HepG2 = "#00ace6"))

fromList <- function (input) {
  elements <- unique(unlist(input))
  data <- unlist(lapply(input, function(x) {
    x <- as.vector(match(elements, x))
  }))
  data[is.na(data)] <- as.integer(0)
  data[data != 0] <- as.integer(1)
  data <- data.frame(matrix(data, ncol = length(input), byrow = F))
  data <- data[which(rowSums(data) != 0), ]
  names(data) <- names(input)
  row.names(data) <- elements
  return(data)
}

#Heatmap color range
```

```
my.breaks <- c(seq(-0.75, 0.75, by=0.01))
my.colors <- rev(c(paletteer_c("ggthemes::Green-Blue-White Diverging", length(my.breaks))))

lt.tsk = list(ABCF1 = unique(ABCF1_DEP$res_all$gene[ABCF1_DEP$res_all$int_sign == "TRUE"]),
              DDX5 = unique(DDX5_DEP$res_all$gene[DDX5_DEP$res_all$int_sign == "TRUE"]),
              FUS = unique(FUS_DEP$res_all$gene[FUS_DEP$res_all$int_sign == "TRUE"]),
              hnA2B1 = unique(hnA2B1_DEP$res_all$gene[hnA2B1_DEP$res_all$int_sign == "TRUE"]),
              hnC = unique(hnC_DEP$res_all$gene[hnC_DEP$res_all$int_sign == "TRUE"]),
              hnM = unique(hnM_DEP$res_all$gene[hnM_DEP$res_all$int_sign == "TRUE"]),
              hnU = unique(hnU_DEP$res_all$gene[hnU_DEP$res_all$int_sign == "TRUE"]),
              ILF2 = unique(ILF2_DEP$res_all$gene[ILF2_DEP$res_all$int_sign == "TRUE"]),
              ILF3 = unique(ILF3_DEP$res_all$gene[ILF3_DEP$res_all$int_sign == "TRUE"]),
              NAT10 = unique(NAT10_DEP$res_all$gene[NAT10_DEP$res_all$int_sign == "TRUE"]),
              NONO = unique(NONO_DEP$res_all$gene[NONO_DEP$res_all$int_sign == "TRUE"]),
              RBFOX2 = unique(RBFOX2_DEP$res_all$gene[RBFOX2_DEP$res_all$int_sign == "TRUE"]),
              SFPQ = unique(SFPQ_DEP$res_all$gene[SFPQ_DEP$res_all$int_sign == "TRUE"])
              )

# Binary table with colnames:
sign.proteins <- fromList(lt.tsk)

labels <- sign.proteins[,c(rep(1:13, each = 2))]
colnames(labels) <- colnames(all_data[,grep("slope", colnames(all_data))])
labels[labels == 1] <- "*"
labels[labels == 0] <- ""
labels <- labels[match(rownames(all_data_slope), rownames(labels)),]

#Heatmap
pheatmap <- pheatmap(
  mat               = t(all_data_slope),
  annotation_col = annotation,
  annotation_row = annotation2,
  annotation_colors = ann_colors,
  cellwidth = 8,
  cellheight = 6,
  display_numbers = t(labels),
  fontsize_number=5.5,
  color = my.colors,
  breaks = my.breaks,
  show_colnames     = TRUE,
  show_rownames     = TRUE,
  drop_levels       = TRUE,
  fontsize          = 5.5,
  cluster_rows      = FALSE,
  cluster_cols      = hc,
  gaps_row = c(2,4,6,8,10,12,14,16,18,20,22,24),
  na_col = "lightgrey"
)
```




```
# Save the heatmap
pheatmap(
  mat               = t(all_data_slope),
  annotation_col = annotation,
  annotation_row = annotation2,
  annotation_colors = ann_colors,
  cellwidth = 8,
  cellheight = 6,
  display_numbers = t(labels),
  fontsize_number=5.5,
  color = my.colors,
  breaks = my.breaks,
  show_colnames     = TRUE,
  show_rownames     = TRUE,
  drop_levels       = TRUE,
  fontsize          = 5.5,
  cluster_rows      = FALSE,
  cluster_cols      = hc,
  gaps_row = c(2,4,6,8,10,12,14,16,18,20,22,24),
  na_col = "lightgrey",
  width = 10,
  height = 5,
  filename = "~/Documents/Postdoc/PD_Projects/3_irCLIP-RNP/MS/TMT_analysis/4_Visualization/HM_TMT
    _sign_int.pdf"
)
```

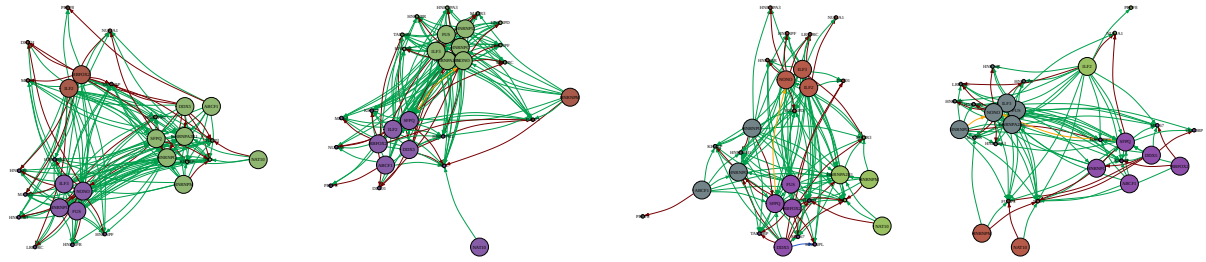
Network analysis between HEK293T and HepG2

Network analysis was performed between the 13 RBPs and the high-MW RDAP cluster member identified above. We used a spin-glass model to identify communities in the different networks.

```
weight.community <- function(row,membership,weigth.within,weight.between){
  if(as.numeric(membership[which(names(membership)==row[1])])==as.numeric(membership[which(names(
    membership)==row[2])])){weight=weigth.within
  }else{
    weight=weight.between
    }
  return(weight)
```

```
  }

Get_network_table <- function(rbp) {
  gel_order <- get(paste(rbp, "_MW", sep = ""))$MW[,c(1,2,17,19,20,21,23)]
  gel_order <- subset(gel_order, name %in% cluster$name[cluster$cluster == 2])
  gel_order$rbp <- rbp
  return(gel_order)
}

#Cluster
cluster <- data.frame(name = rownames(all_data_slope), cluster = cutree(hc, k=3))
rownames(cluster) <- NULL

#get table for network
ABCF1_g <- Get_network_table("ABCF1")
DDX5_g <- Get_network_table("DDX5")
FUS_g <- Get_network_table("FUS")
hnA2B1_g <- Get_network_table("hnA2B1")
hnA2B1_g$rbp <- "HNRNPA2B1"
hnC_g <- Get_network_table("hnC")
hnC_g$rbp <- "HNRNPC"
hnM_g <- Get_network_table("hnM")
hnM_g$rbp <- "HNRNPM"
hnU_g <- Get_network_table("hnU")
hnU_g$rbp <- "HNRNPU"
ILF2_g <- Get_network_table("ILF2")
ILF3_g <- Get_network_table("ILF3")
NAT10_g <- Get_network_table("NAT10")
NONO_g <- Get_network_table("NONO")
RBFOX2_g <- Get_network_table("RBFOX2")
SFPQ_g <- Get_network_table("SFPQ")

#Get connection for every RBP
gel_order <- rbind(ABCF1_g,DDX5_g,FUS_g,hnA2B1_g,hnC_g,hnM_g,hnU_g,ILF2_g,ILF3_g,NAT10_g,NONO_g,
    RBFOX2_g,SFPQ_g)

#Prepare dataset for clustering
gel_order$HEK293T_edges <- paste(gel_order$HEK293T_order_sign, gel_order$int_sign, sep="_")
gel_order$HEK293T_edges <- factor(gel_order$HEK293T_edges)
levels(gel_order$HEK293T_edges) <- c("#00a04c", "#770003","#2256ca", "orange", "#868686","#868686
    ")
gel_order$HepG2_edges <- paste(gel_order$HepG2_order_sign, gel_order$int_sign, sep="_")
gel_order$HepG2_edges <- factor(gel_order$HepG2_edges)
levels(gel_order$HepG2_edges) <- c("#00a04c", "#770003", "orange", "#868686","#868686")

network_object <- function(data, celltype) {
  set.seed(5)
  nodes <- data.frame(name=unique(c(data$rbp,data$name)),
                      type=c(rep("Bait", 13), rep("RDAP", length(unique(c(data$rbp,data$name)))-13)
    ),
                      size=c(rep(15, 13), rep(3, length(unique(c(data$rbp,data$name)))-13)))
  edges <- data.frame(from= data$rbp,
                          to=data$name,
                          celltype=data[,colnames(data) == paste(celltype, "_edges", sep = "")])
  g <- graph.data.frame(edges, directed=TRUE, vertices=nodes)
  g <- simplify(g, remove.multiple = F, remove.loops = T)
  E(g)$color <- E(g)$celltype
  clp <- cluster_spinglass(as.undirected(g))
  mod <- modularity(clp)
  V(g)$community <- clp$membership
  E(g)$weight=apply(get.edgelist(g),1,weight.community,membership(clp),10,1)
  g$layout=layout.fruchterman.reingold(g,weights=E(g)$weight)
  colrs <- c(paletteer_dynamic("cartography::multi.pal", length(unique(clp$membership))))
  return(list(clp = clp, colrs = colrs, g = g, mod = mod))
}

#High
gel_order_high <- subset(gel_order, gel %in% "High")
```

```
gel_order_high_HEK293T <- subset(gel_order_high, HEK293T_edges != "#868686")
gel_order_high_HepG2 <- subset(gel_order_high, HepG2_edges != "#868686")

HEK293T_high <- network_object(gel_order_high_HEK293T, "HEK293T")
HepG2_high <- network_object(gel_order_high_HepG2, "HepG2")

#Medium
gel_order_medium <- subset(gel_order, gel %in% "Medium")

gel_order_medium_HEK293T <- subset(gel_order_medium, HEK293T_edges != "#868686")
gel_order_medium_HepG2 <- subset(gel_order_medium, HepG2_edges != "#868686")

HEK293T_medium <- network_object(gel_order_medium_HEK293T, "HEK293T")
HepG2_medium <- network_object(gel_order_medium_HepG2, "HepG2")

par(mfrow=c(1,4))
plot(HEK293T_high$g, edge.arrow.size=0.5, vertex.label.color="black", vertex.label.dist=0, vertex
    .color=HEK293T_high$colrs[V(HEK293T_high$g)$community], edge.curved=0.2)
plot(HepG2_high$g, edge.arrow.size=0.5, vertex.label.color="black", vertex.label.dist=0, vertex.
    color=HepG2_high$colrs[V(HepG2_high$g)$community], edge.curved=0.2)
plot(HEK293T_medium$g, edge.arrow.size=0.5, vertex.label.color="black", vertex.label.dist=0,
    vertex.color=HEK293T_medium$colrs[V(HEK293T_medium$g)$community], edge.curved=0.2)
plot(HepG2_medium$g, edge.arrow.size=0.5, vertex.label.color="black", vertex.label.dist=0, vertex
    .color=HepG2_medium$colrs[V(HepG2_medium$g)$community], edge.curved=0.2)
```



```
# Save dendogram as pdf
pdf("~/Documents/Postdoc/PD_Projects/3_irCLIP-RNP/MS/TMT_analysis/4_Visualization/Network_highMW_
    RDAPs.pdf", width = 30, height = 10)
par(mfrow=c(1,4))
plot(HEK293T_high$g, edge.arrow.size=0.5, vertex.label.color="black", vertex.label.dist=0, vertex
    .color=HEK293T_high$colrs[V(HEK293T_high$g)$community], edge.curved=0.2)
plot(HepG2_high$g, edge.arrow.size=0.5, vertex.label.color="black", vertex.label.dist=0, vertex.
    color=HepG2_high$colrs[V(HepG2_high$g)$community], edge.curved=0.2)
plot(HEK293T_medium$g, edge.arrow.size=0.5, vertex.label.color="black", vertex.label.dist=0,
    vertex.color=HEK293T_medium$colrs[V(HEK293T_medium$g)$community], edge.curved=0.2)
plot(HepG2_medium$g, edge.arrow.size=0.5, vertex.label.color="black", vertex.label.dist=0, vertex
    .color=HepG2_medium$colrs[V(HepG2_medium$g)$community], edge.curved=0.2)
dev.off()
```

Reciprocal ratio Heatmaps for RBPs

Similar to what we have done with the label-free irCLIP-RNP data, we have generated a reciprocal heatmap that compare the ratio of intensities across the three RNP subzones for the 13 RBPs.

```
all_data2 <- merge.all(ABCF1_data$unflt,DDX5_data$unflt,FUS_data$unflt,hnA2B1_data$unflt,hnC_data
    $unflt,hnM_data$unflt,hnU_data$unflt,ILF2_data$unflt,ILF3_data$unflt,NAT10_data$unflt,NONO_
    data$unflt,RBFOX2_data$unflt,SFPQ_data$unflt)

get_ratio <- function(data, rbp) {
  data$H293T_rowsum <- rowSums(2^data[,grep(paste(rbp,"H293T", sep = "_"), colnames(data))])
  data$H293T_L_ratio <- 2^data[,grep(paste(rbp,"H293T_low_avg", sep = "_"), colnames(data))]/data
    $H293T_rowsum
  data$H293T_M_ratio <- 2^data[,grep(paste(rbp,"H293T_med_avg", sep = "_"), colnames(data))]/data
    $H293T_rowsum
  data$H293T_H_ratio <- 2^data[,grep(paste(rbp,"H293T_high_avg", sep = "_"), colnames(data))]/
    data$H293T_rowsum
  data$HepG2_rowsum <- rowSums(2^data[,grep(paste(rbp,"HepG2", sep = "_"), colnames(data))])
  data$HepG2_L_ratio <- 2^data[,grep(paste(rbp,"HepG2_low_avg", sep = "_"), colnames(data))]/data
    $HepG2_rowsum
  data$HepG2_M_ratio <- 2^data[,grep(paste(rbp,"HepG2_med_avg", sep = "_"), colnames(data))]/data
    $HepG2_rowsum
  data$HepG2_H_ratio <- 2^data[,grep(paste(rbp,"HepG2_high_avg", sep = "_"), colnames(data))]/
    data$HepG2_rowsum
  data$H293T_rowsum <- NULL
  data$HepG2_rowsum <- NULL
  colnames(data)[grep("ratio", colnames(data))] <- paste(rbp, colnames(data)[grep("ratio",
    colnames(data))], sep = "_")
  return(data)
}

ABCF1_ratio <- get_ratio(all_data2, "ABCF1")
DDX5_ratio <- get_ratio(all_data2, "DDX5")
FUS_ratio <- get_ratio(all_data2, "FUS")
hnA2B1_ratio <- get_ratio(all_data2, "hnA2B1")
hnC_ratio <- get_ratio(all_data2, "hnC")
hnM_ratio <- get_ratio(all_data2, "hnM")
hnU_ratio <- get_ratio(all_data2, "hnU")
ILF2_ratio <- get_ratio(all_data2, "ILF2")
ILF3_ratio <- get_ratio(all_data2, "ILF3")
NAT10_ratio <- get_ratio(all_data2, "NAT10")
NONO_ratio <- get_ratio(all_data2, "NONO")
RBFOX2_ratio <- get_ratio(all_data2, "RBFOX2")
SFPQ_ratio <- get_ratio(all_data2, "SFPQ")

rbp_list <- c("ABCF1", "DDX5", "FUS", "HNRNPA2B1", "HNRNPC", "HNRNPM", "HNRNPU", "ILF2", "ILF3",
    "NAT10", "NONO", "RBFOX2", "SFPQ")

all_data_baitratio <- cbind(ABCF1_ratio[,grep("ratio", colnames(ABCF1_ratio))],
                            DDX5_ratio[,grep("ratio", colnames(DDX5_ratio))],
                            FUS_ratio[,grep("ratio", colnames(FUS_ratio))],
                            hnA2B1_ratio[,grep("ratio", colnames(hnA2B1_ratio))],
                            hnC_ratio[,grep("ratio", colnames(hnC_ratio))],
                            hnM_ratio[,grep("ratio", colnames(hnM_ratio))],
                            hnU_ratio[,grep("ratio", colnames(hnU_ratio))],
                            ILF2_ratio[,grep("ratio", colnames(ILF2_ratio))],
                            ILF3_ratio[,grep("ratio", colnames(ILF3_ratio))],
                            NAT10_ratio[,grep("ratio", colnames(NAT10_ratio))],
                            NONO_ratio[,grep("ratio", colnames(NONO_ratio))],
                            RBFOX2_ratio[,grep("ratio", colnames(RBFOX2_ratio))],
                            SFPQ_ratio[,grep("ratio", colnames(SFPQ_ratio))])
all_data_baitratio <- all_data_baitratio[rbp_list,]

head(all_data_baitratio)
```

```
##             ABCF1_H293T_L_ratio ABCF1_H293T_M_ratio ABCF1_H293T_H_ratio
## ABCF1                 0.2568910           0.4858828           0.2572261
## DDX5                  0.4284772           0.2881553           0.2833675
## FUS                   0.3276758           0.3427054           0.3296188
## HNRNPA2B1             0.2189339           0.3354234           0.4456427
```

```
## HNRNPC                0.2691555             0.3267722             0.4040724
## HNRNPM                0.3244900             0.3218761             0.3536339
##              ABCF1_HepG2_L_ratio ABCF1_HepG2_M_ratio ABCF1_HepG2_H_ratio
## ABCF1                  0.3406348             0.4021431             0.2572221
## DDX5                   0.4108968             0.2969105             0.2921927
## FUS                    0.3166898             0.3515517             0.3317585
## HNRNPA2B1              0.2490144             0.3612471             0.3897385
## HNRNPC                 0.2970393             0.3090186             0.3939420
## HNRNPM                 0.3368141             0.3485569             0.3146290
##              DDX5_H293T_L_ratio DDX5_H293T_M_ratio DDX5_H293T_H_ratio
## ABCF1                 0.2684096            0.4593683            0.2722222
## DDX5                  0.5277835            0.2660321            0.2061844
## FUS                   0.3574968            0.3316524            0.3108508
## HNRNPA2B1             0.2445319            0.3210863            0.4343819
## HNRNPC                0.2490145            0.3055871            0.4453983
## HNRNPM                0.2790098            0.3360346            0.3849556
##              DDX5_HepG2_L_ratio DDX5_HepG2_M_ratio DDX5_HepG2_H_ratio
## ABCF1                 0.3460889            0.3943138            0.2595973
## DDX5                  0.5060586            0.2728560            0.2210854
## FUS                   0.3737114            0.3484844            0.2778043
## HNRNPA2B1             0.2978553            0.3352833            0.3668615
## HNRNPC                0.2887008            0.3429373            0.3683619
## HNRNPM                0.2864355            0.3398450            0.3737195
##              FUS_H293T_L_ratio FUS_H293T_M_ratio FUS_H293T_H_ratio
## ABCF1                0.3033790           0.4015471           0.2950739
## DDX5                 0.3537923           0.3276267           0.3185810
## FUS                  0.6301968           0.2116188           0.1581844
## HNRNPA2B1            0.2687153           0.3159011           0.4153836
## HNRNPC               0.2595760           0.2978413           0.4425826
## HNRNPM               0.2083679           0.3273675           0.4642646
##              FUS_HepG2_L_ratio FUS_HepG2_M_ratio FUS_HepG2_H_ratio
## ABCF1                0.3095719           0.4129779           0.2774502
## DDX5                 0.3514230           0.3278052           0.3207718
## FUS                  0.6718024           0.1957703           0.1324273
## HNRNPA2B1            0.2872116           0.3294765           0.3833119
## HNRNPC               0.2953995           0.3130584           0.3915421
## HNRNPM               0.2185229           0.3622221           0.4192550
##              hnA2B1_H293T_L_ratio hnA2B1_H293T_M_ratio hnA2B1_H293T_H_ratio
## ABCF1                   0.2615845            0.4107964            0.3276191
## DDX5                    0.3615643            0.3146671            0.3237686
## FUS                     0.4082142            0.3200600            0.2717258
## HNRNPA2B1               0.3525443            0.3462630            0.3011927
## HNRNPC                  0.3091637            0.3545352            0.3363012
## HNRNPM                  0.2801734            0.3638843            0.3559422
##              hnA2B1_HepG2_L_ratio hnA2B1_HepG2_M_ratio hnA2B1_HepG2_H_ratio
## ABCF1                   0.2674467            0.4743547            0.2581986
## DDX5                    0.3594129            0.3099231            0.3306640
## FUS                     0.4037892            0.2985461            0.2976647
## HNRNPA2B1               0.3526460            0.3257661            0.3215879
## HNRNPC                  0.2669788            0.3287281            0.4042931
## HNRNPM                  0.2395106            0.3544671            0.4060223
##              hnC_H293T_L_ratio hnC_H293T_M_ratio hnC_H293T_H_ratio
## ABCF1                0.3349685           0.3372171           0.3278144
## DDX5                 0.4114918           0.2876006           0.3009076
## FUS                  0.3628679           0.3025461           0.3345860
## HNRNPA2B1            0.2227570           0.3455867           0.4316563
## HNRNPC               0.2830525           0.3500115           0.3669360
## HNRNPM               0.2432902           0.3345421           0.4221677
##              hnC_HepG2_L_ratio hnC_HepG2_M_ratio hnC_HepG2_H_ratio
## ABCF1                0.3582330           0.3312084           0.3105586
## DDX5                 0.3831373           0.3099863           0.3068764
## FUS                  0.3165752           0.3182603           0.3651645
## HNRNPA2B1            0.2481304           0.3532342           0.3986353
## HNRNPC               0.3394383           0.3358444           0.3247172
## HNRNPM               0.2590372           0.3373089           0.4036539
##              hnM_H293T_L_ratio hnM_H293T_M_ratio hnM_H293T_H_ratio
## ABCF1                0.2660620           0.4661072           0.2678309
## DDX5                 0.4465104           0.2964423           0.2570473
```

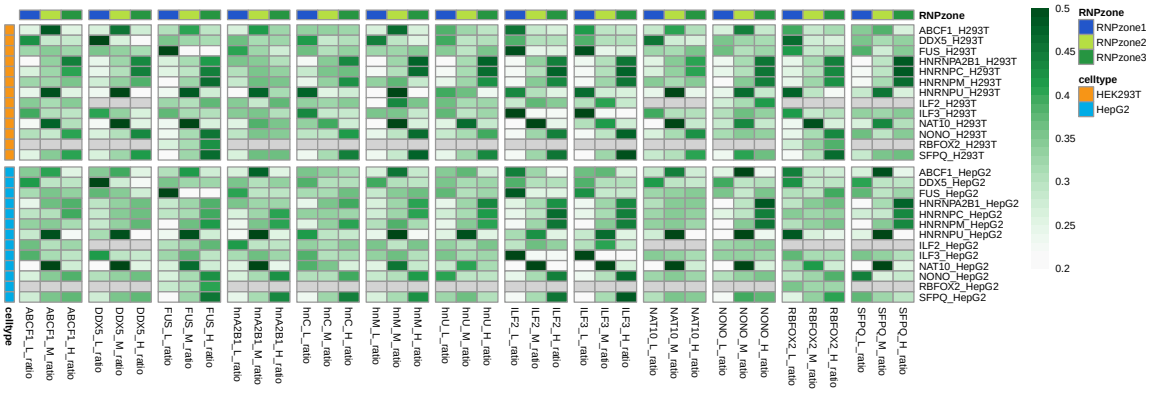
```
## FUS                0.3287456          0.3235081          0.3477463
## HNRNPA2B1          0.2043660          0.3222944          0.4733396
## HNRNPC             0.2278932          0.3021904          0.4699165
## HNRNPM             0.3332803          0.3783050          0.2884147
##                hnM_HepG2_L_ratio  hnM_HepG2_M_ratio  hnM_HepG2_H_ratio
## ABCF1              0.2624727          0.4503750          0.2871523
## DDX5               0.3985932          0.3062542          0.2951527
## FUS                0.2892640          0.3471527          0.3635833
## HNRNPA2B1          0.2658644          0.3292389          0.4048967
## HNRNPC             0.2741735          0.3237975          0.4020290
## HNRNPM             0.3065328          0.3830849          0.3103823
##                hnU_H293T_L_ratio  hnU_H293T_M_ratio  hnU_H293T_H_ratio
## ABCF1              0.3849250          0.3215034          0.2935716
## DDX5               0.3928449          0.2991846          0.3079705
## FUS                0.3488108          0.2992809          0.3519083
## HNRNPA2B1          0.2101995          0.3191737          0.4706268
## HNRNPC             0.2237882          0.3100890          0.4661228
## HNRNPM             0.2479145          0.3222012          0.4298843
##                hnU_HepG2_L_ratio  hnU_HepG2_M_ratio  hnU_HepG2_H_ratio
## ABCF1              0.3420718          0.3794993          0.2784289
## DDX5               0.3563935          0.3182719          0.3253346
## FUS                0.3728163          0.3016004          0.3255834
## HNRNPA2B1          0.2416187          0.3273974          0.4309839
## HNRNPC             0.2776922          0.3105458          0.4117620
## HNRNPM             0.2474808          0.3471140          0.4054052
##                ILF2_H293T_L_ratio  ILF2_H293T_M_ratio  ILF2_H293T_H_ratio
## ABCF1               0.4522116           0.2843730           0.2634154
## DDX5                0.3899381           0.3039053           0.3061566
## FUS                 0.4986719           0.2457714           0.2555568
## HNRNPA2B1           0.2279526           0.3306249           0.4414225
## HNRNPC              0.2209081           0.3027608           0.4763311
## HNRNPM              0.2209090           0.3402470           0.4388440
##                ILF2_HepG2_L_ratio  ILF2_HepG2_M_ratio  ILF2_HepG2_H_ratio
## ABCF1               0.4455885           0.3220703           0.2323412
## DDX5                0.3898083           0.3013606           0.3088312
## FUS                 0.4831605           0.2582071           0.2586324
## HNRNPA2B1           0.2509989           0.3191911           0.4298100
## HNRNPC              0.2439303           0.2922462           0.4638236
## HNRNPM              0.2215202           0.3283846           0.4500951
##                ILF3_H293T_L_ratio  ILF3_H293T_M_ratio  ILF3_H293T_H_ratio
## ABCF1               0.4162822           0.2992497           0.2844681
## DDX5                0.3869129           0.3042273           0.3088597
## FUS                 0.4901840           0.2449448           0.2648712
## HNRNPA2B1           0.2340588           0.3071575           0.4587837
## HNRNPC              0.2234563           0.3041823           0.4723614
## HNRNPM              0.2206147           0.3205097           0.4588757
##                ILF3_HepG2_L_ratio  ILF3_HepG2_M_ratio  ILF3_HepG2_H_ratio
## ABCF1               0.3645590           0.3714678           0.2639731
## DDX5                0.3851217           0.3073617           0.3075166
## FUS                 0.4291205           0.2812356           0.2896439
## HNRNPA2B1           0.2349975           0.3270801           0.4379224
## HNRNPC              0.2431631           0.3110505           0.4457864
## HNRNPM              0.2112093           0.3481006           0.4406901
##                NAT10_H293T_L_ratio  NAT10_H293T_M_ratio  NAT10_H293T_H_ratio
## ABCF1               0.2864328            0.4091642            0.3044030
## DDX5                0.4578234            0.2774966            0.2646800
## FUS                 0.3285261            0.3184569            0.3530171
## HNRNPA2B1           0.2500363            0.3451906            0.4047731
## HNRNPC              0.2651326            0.3334049            0.4014626
## HNRNPM              0.3425376            0.3169852            0.3404772
##                NAT10_HepG2_L_ratio  NAT10_HepG2_M_ratio  NAT10_HepG2_H_ratio
## ABCF1               0.2842525            0.4445657            0.2711817
## DDX5                0.4149527            0.2969480            0.2880993
## FUS                 0.3231286            0.3362853            0.3405862
## HNRNPA2B1           0.3099524            0.3453808            0.3446668
## HNRNPC              0.3208975            0.3485619            0.3305405
## HNRNPM              0.3335390            0.3413248            0.3251362
##                NONO_H293T_L_ratio  NONO_H293T_M_ratio  NONO_H293T_H_ratio
```

```
## ABCF1              0.2686655          0.4452234          0.2861111
## DDX5               0.3590856          0.3259523          0.3149620
## FUS                0.3691924          0.3048831          0.3259244
## HNRNPA2B1          0.2324096          0.3175399          0.4500505
## HNRNPC             0.2425715          0.3068173          0.4506112
## HNRNPM             0.2156441          0.3406578          0.4436981
##                NONO_HepG2_L_ratio NONO_HepG2_M_ratio NONO_HepG2_H_ratio
## ABCF1              0.2593660          0.5014321          0.2392019
## DDX5               0.3962937          0.2971536          0.3065527
## FUS                0.3579597          0.2822261          0.3598142
## HNRNPA2B1          0.2179044          0.2960772          0.4860184
## HNRNPC             0.2576558          0.2952370          0.4471072
## HNRNPM             0.2034944          0.3458514          0.4506542
##                RBFOX2_H293T_L_ratio RBFOX2_H293T_M_ratio RBFOX2_H293T_H_ratio
## ABCF1                     0.3953084            0.2868543            0.3178373
## DDX5                      0.4608082            0.2733762            0.2658157
## FUS                       0.4130226            0.2824419            0.3045355
## HNRNPA2B1                 0.2411920            0.3110313            0.4477766
## HNRNPC                    0.2564242            0.3079395            0.4356362
## HNRNPM                    0.2487094            0.3250946            0.4261960
##                RBFOX2_HepG2_L_ratio RBFOX2_HepG2_M_ratio RBFOX2_HepG2_H_ratio
## ABCF1                     0.4429710            0.2818069            0.2752222
## DDX5                      0.4256049            0.2832509            0.2911442
## FUS                       0.3075509            0.2970226            0.3954265
## HNRNPA2B1                 0.2954137            0.3403444            0.3642419
## HNRNPC                    0.3417085            0.3203109            0.3379806
## HNRNPM                    0.3037908            0.3370632            0.3591460
##                SFPQ_H293T_L_ratio SFPQ_H293T_M_ratio SFPQ_H293T_H_ratio
## ABCF1                  0.3487855          0.3848930          0.2663214
## DDX5                   0.3512718          0.3177576          0.3309705
## FUS                    0.3850686          0.2743685          0.3405630
## HNRNPA2B1              0.2152153          0.2969346          0.4878501
## HNRNPC                 0.2215240          0.2966119          0.4818641
## HNRNPM                 0.2231943          0.3146462          0.4621595
##                SFPQ_HepG2_L_ratio SFPQ_HepG2_M_ratio SFPQ_HepG2_H_ratio
## ABCF1                  0.2642981          0.4924565          0.2432454
## DDX5                   0.4094489          0.2978311          0.2927200
## FUS                    0.3795874          0.2988660          0.3215467
## HNRNPA2B1              0.2150646          0.3130959          0.4718395
## HNRNPC                 0.2764482          0.2845827          0.4389691
## HNRNPM                 0.2195516          0.3450871          0.4353613
```

```
all_data_H293T <- all_data_baitratio[,grep("H293T", colnames(all_data_baitratio))]
colnames(all_data_H293T) <- gsub("_H293T", "", colnames(all_data_H293T))
rownames(all_data_H293T) <- paste(rownames(all_data_H293T), "H293T", sep = "_")
all_data_HepG2 <- all_data_baitratio[,grep("HepG2", colnames(all_data_baitratio))]
colnames(all_data_HepG2) <- gsub("_HepG2", "", colnames(all_data_HepG2))
rownames(all_data_HepG2) <- paste(rownames(all_data_HepG2), "HepG2", sep = "_")

all_data_baitratio2 <- rbind(all_data_H293T, all_data_HepG2)
```

```
#Pheatmap
my.breaks <- c(seq(0.2, 0.5, by=0.01))
my.colors <- c("#f9f9f9", rev(paletteer_c("grDevices::Greens 3" , length(my.breaks)-1)))

#Annotation
annotation_col <- data.frame(row.names = colnames(all_data_baitratio2), RNPzone = rep(c("RNPzone1
    ", "RNPzone2", "RNPzone3"),13))
annotation_row <- data.frame(row.names = rownames(all_data_baitratio2), celltype = rep(c("HEK293T
    ", "HepG2"),each = 13))

ann_colors2 <- list(RNPzone =  c(RNPzone1 = "#2256ca", RNPzone2 = "#b6de43", RNPzone3 = "#269541"
    ), celltype =  c(HEK293T = "#f79516", HepG2 = "#00ace6"))
```

```
pheatmap <- pheatmap(
  mat               = all_data_baitratio2,
  annotation_col = annotation_col,
  annotation_row = annotation_row,
  annotation_colors = ann_colors2,
  cellwidth = 12,
  cellheight = 6,
  fontsize_number=5.5,
  color = my.colors,
  breaks = my.breaks,
  show_colnames      = TRUE,
  show_rownames      = TRUE,
  drop_levels        = TRUE,
  fontsize           = 5.5,
  cluster_rows       = FALSE,
  cluster_cols       = FALSE,
  gaps_col = c(3,6,9,12,15,18,21,24,27,30,33,36),
  gaps_row = c(13),
  na_col = "lightgrey"
)
```




```
# Save the heatmap
pheatmap(
  mat               = all_data_baitratio2,
  annotation_col = annotation_col,
  annotation_row = annotation_row,
  annotation_colors = ann_colors2,
  cellwidth = 12,
  cellheight = 6,
  fontsize_number=5.5,
  color = my.colors,
  breaks = my.breaks,
  show_colnames      = TRUE,
  show_rownames      = TRUE,
  drop_levels        = TRUE,
  fontsize           = 5.5,
  cluster_rows       = FALSE,
  cluster_cols       = FALSE,
  gaps_col = c(3,6,9,12,15,18,21,24,27,30,33,36),
```

```
  gaps_row = c(13),
  na_col = "lightgrey",
  width = 10,
  height = 3,
  filename = "~/Documents/Postdoc/PD_Projects/3_irCLIP-RNP/MS/TMT_analysis/4_Visualization/HM_TMT
    _reciprocal.pdf"
)
```

All the visualizations were saved as pdf and modified in illustrator.

```
sessionInfo()
```

```
## R version 4.2.1 (2022-06-23)
## Platform: x86_64-apple-darwin17.0 (64-bit)
## Running under: macOS Big Sur ... 10.16
##
## Matrix products: default
## BLAS:   /Library/Frameworks/R.framework/Versions/4.2/Resources/lib/libRblas.0.dylib
## LAPACK: /Library/Frameworks/R.framework/Versions/4.2/Resources/lib/libRlapack.dylib
##
## locale:
## [1] en_US.UTF-8/en_US.UTF-8/en_US.UTF-8/C/en_US.UTF-8/en_US.UTF-8
##
## attached base packages:
## [1] stats4    stats     graphics  grDevices utils     datasets  methods
## [8] base
##
## other attached packages:
##  [1] rstatix_0.7.2               igraph_2.0.3
##  [3] GGally_2.2.1                gprofiler2_0.2.3
##  [5] ggpmisc_0.5.5               ggpp_0.5.6
##  [7] psych_2.4.3                 corrplot_0.92
##  [9] paletteer_1.6.0             factoextra_1.0.7
## [11] Clipper_0.0.0.9000          UpSetR_1.4.0
## [13] ggpubr_0.6.0                DESeq2_1.38.3
## [15] hexbin_1.28.3               viridis_0.6.5
## [17] viridisLite_0.4.2           ggExtra_0.10.1
## [19] textshape_1.7.3             pacman_0.5.1
## [21] hrbrthemes_0.8.7            gplots_3.1.3.1
## [23] RColorBrewer_1.1-3          pheatmap_1.0.12
## [25] data.table_1.15.2           lubridate_1.9.3
## [27] forcats_1.0.0               stringr_1.5.1
## [29] dplyr_1.1.4                 purrr_1.0.2
## [31] readr_2.1.5                 tidyr_1.3.1
## [33] tibble_3.2.1                ggplot2_3.5.0
## [35] tidyverse_2.0.0             DEP2_0.4.8.24
## [37] R6_2.5.1                    limma_3.54.2
## [39] MSnbase_2.24.2              ProtGenerics_1.30.0
## [41] mzR_2.32.0                  Rcpp_1.0.12
## [43] MsCoreUtils_1.10.0          SummarizedExperiment_1.28.0
## [45] Biobase_2.58.0              GenomicRanges_1.50.2
## [47] GenomeInfoDb_1.34.9         IRanges_2.32.0
## [49] S4Vectors_0.36.2            BiocGenerics_0.44.0
## [51] MatrixGenerics_1.10.0       matrixStats_1.2.0
##
## loaded via a namespace (and not attached):
##   [1] SparseM_1.81                ggthemes_5.1.0
##   [3] missForest_1.5              bit64_4.0.5
##   [5] knitr_1.45                  DelayedArray_0.24.0
##   [7] KEGGREST_1.38.0             RCurl_1.98-1.14
##   [9] AnnotationFilter_1.22.0     doParallel_1.0.17
##  [11] generics_0.1.3              preprocessCore_1.60.2
##  [13] cowplot_1.1.3               RSQLite_2.3.5
```

```
##  [15] proxy_0.4-27                bit_4.0.5
##  [17] tzdb_0.4.0                  httpuv_1.6.14
##  [19] assertthat_0.2.1            TCseq_1.22.6
##  [21] xfun_0.42                   hms_1.1.3
##  [23] evaluate_0.23               promises_1.2.1
##  [25] fansi_1.0.6                 caTools_1.18.2
##  [27] htmlwidgets_1.6.4           DBI_1.2.2
##  [29] geneplotter_1.76.0          ellipsis_0.3.2
##  [31] RSpectra_0.16-1             QFeatures_1.8.0
##  [33] backports_1.4.1             fontLiberation_0.1.0
##  [35] prismatic_1.1.1             annotate_1.76.0
##  [37] fontBitstreamVera_0.1.1     vctrs_0.6.5
##  [39] quantreg_5.97               abind_1.4-5
##  [41] cachem_1.0.8                withr_3.0.0
##  [43] itertools_0.1-3             GenomicAlignments_1.34.1
##  [45] fdrtool_1.2.17              MultiAssayExperiment_1.24.0
##  [47] mnormt_2.1.1                cluster_2.1.6
##  [49] lazyeval_0.2.2              crayon_1.5.2
##  [51] crul_1.4.0                  labeling_0.4.3
##  [53] glmnet_4.1-8                edgeR_3.40.2
##  [55] pkgconfig_2.0.3             nlme_3.1-164
##  [57] rlang_1.1.3                 lifecycle_1.0.4
##  [59] miniUI_0.1.1.1              MatrixModels_0.5-3
##  [61] downloader_0.4              fontquiver_0.2.1
##  [63] httpcode_0.3.0              affyio_1.68.0
##  [65] extrafontdb_1.0             randomForest_4.7-1.1
##  [67] rngtools_1.5.2              Matrix_1.6-5
##  [69] carData_3.0-5               GlobalOptions_0.1.2
##  [71] png_0.1-8                   rjson_0.2.21
##  [73] bitops_1.0-7                KernSmooth_2.23-22
##  [75] Biostrings_2.66.0           blob_1.2.4
##  [77] doRNG_1.8.6                 shape_1.4.6.1
##  [79] ggsignif_0.6.4              scales_1.3.0
##  [81] memoise_2.0.1               magrittr_2.0.3
##  [83] plyr_1.8.9                  zlibbioc_1.44.0
##  [85] compiler_4.2.1              pcaMethods_1.90.0
##  [87] clue_0.3-65                 Rsamtools_2.14.0
##  [89] cli_3.6.2                   affy_1.76.0
##  [91] XVector_0.38.0              MASS_7.3-60.0.1
##  [93] tidyselect_1.2.1            vsn_3.66.0
##  [95] stringi_1.8.3               highr_0.10
##  [97] yaml_2.3.8                  askpass_1.2.0
##  [99] locfit_1.5-9.9              MALDIquant_1.22.2
## [101] ggrepel_0.9.5               grid_4.2.1
## [103] ggstats_0.5.1               polynom_1.4-1
## [105] tools_4.2.1                 timechange_0.3.0
## [107] parallel_4.2.1              circlize_0.4.16
## [109] rstudioapi_0.15.0           foreach_1.5.2
## [111] gridExtra_2.3               farver_2.1.1
## [113] mzID_1.36.0                 Rtsne_0.17
## [115] digest_0.6.35               BiocManager_1.30.22
## [117] shiny_1.8.0                 gfonts_0.2.0
## [119] car_3.1-2                   broom_1.0.5
## [121] later_1.3.2                 ncdf4_1.22
## [123] httr_1.4.7                  gdtools_0.3.5
## [125] AnnotationDbi_1.60.2        ComplexHeatmap_2.14.0
## [127] colorspace_2.1-0            XML_3.99-0.16.1
## [129] reticulate_1.35.0           umap_0.2.10.0
## [131] splines_4.2.1               rematch2_2.1.2
## [133] plotly_4.10.4               systemfonts_1.0.5
## [135] xtable_1.8-4                jsonlite_1.8.8
## [137] pillar_1.9.0                htmltools_0.5.7
## [139] mime_0.12                   glue_1.7.0
## [141] fastmap_1.1.1               BiocParallel_1.32.6
## [143] class_7.3-22                codetools_0.2-19
## [145] utf8_1.2.4                  lattice_0.22-5
## [147] curl_5.2.1                  gtools_3.9.5
## [149] openssl_2.1.1               Rttf2pt1_1.3.12
```

```
## [151] survival_3.5-8                rmarkdown_2.26
## [153] munsell_0.5.0                 e1071_1.7-14
## [155] GetoptLong_1.0.5              GenomeInfoDbData_1.2.9
## [157] iterators_1.0.14              impute_1.72.3
## [159] reshape2_1.4.4                gtable_0.3.4
## [161] extrafont_0.19
```