

# RefPlus

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RefPlus-package      *RMA based on reference microarrays: RMA+ and RMA++ methods*

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## Description

RMA+ is an extension of the RMA algorithm that calculates the probeset intensities of a microarray using a pre-stored RMA model fitted on previously obtained microarrays, e.g. reference microarrays. RMA++ is a further extension based on the RMA+ method. This package depends on the affyPLM package.

## Details

Package: RefPlus  
Type: Package  
Version: 1.13.2  
Date: 2009-03-11  
License: GPL version 2 or newer

Use `rma.para` to obtain the reference quantiles and the probe effects from a reference set, then use `rmaplus` to calculate the RMA+ intensities based on the fitted reference quantiles and probe effects.

## Author(s)

By Kai-Ming Chang(kaiming@gmail.com)

## References

Chang,K.M., Harbron,C., South,M.C. (2006) An Exploration of Extensions to the RMA Algorithm. Available with the RefPlus package.Avaliable with the package.

Harbron, C, Chang, K.M., South,M.C.(2007) RefPlus : an R package extending the RMA Algorithm. *Bioinformatics* 23, 2493-2494.

## Examples

```
if (require(affydata)) {  
  ## Use Dilution in affydata package
```

```
data(Dilution)

##Calculate RMA intensities using the rma function.
Ex0<-exprs(rma(Dilution))

## Background correct, estimate the probe effects, and calculate the
## RMA intensities using rma.para function.
Para<-rma.para(Dilution, bg=TRUE,exp=TRUE)
Ex1<-Para[[3]]

## Calculate the RMA+ intensity using rmaplus function.
Ex2<-rmaplus(Dilution, rmapara=Para, bg = TRUE)
}
```

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colMedians

*Derive column medians of a numerical matrix*

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### Description

Form column medians of a numerical array.

### Usage

```
colMedians(mat)
```

### Arguments

mat            A numerical matrix.

### Details

Form column medians of a numerical array.

### Value

A vector of column medians is returned.

### Author(s)

Kai-Ming Chang(kaiming@gmail.com)

### See Also

[rowQ](#)

### Examples

```
A<-matrix(rnorm(30),10,3)
colMedians(A)
```

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`normalize.quantiles2`*Reference quantile normalization*

---

**Description**

Quantile normalization to a reference set.

**Usage**

```
normalize.quantiles2(X, Reference.Quantiles)
```

**Arguments**

`X` A matrix of probe intensity data to be reference quantile normalized.

`Reference.Quantiles` A vector of the reference quantiles that the probe intensities of a sample is normalized to.

**Details**

The function quantile normalized the probe intensities of a set of microarrays to a set of reference quantiles which are formed by a set of reference microarrays.

**Value**

The reference quantile normalized probe intensities.

**Author(s)**

Kai-Ming Chang(kaiming@gmail.com)

**References**

Chang,K.M., Harbron,C., South,M.C. (2006) An Exploration of Extensions to the RMA Algorithm. Available with the RefPlus package.

**See Also**

[normalize.quantiles](#)

**Examples**

```
A<-matrix(rnorm(30),10,3)
core<-1:10
An<-normalize.quantiles2(A,core)
rank(A[,1])==An[,1]
```

---

`rma.para`*Fitting a RMA model*

---

**Description**

Obtain reference quantiles and reference probe effects based on reference set `Train`, and calculate the gene expression

**Usage**

```
rma.para(Train, bg = TRUE, exp = FALSE)
```

**Arguments**

<code>Train</code>	An <code>AffyBatch</code> object of the reference set microarrays.
<code>bg</code>	A logical flag. If <code>True</code> (by default), background correct <code>Train</code> using default <code>bg.correct.rma</code> .
<code>exp</code>	A logical flag. If <code>True</code> , calculate the RMA measurements of <code>Train</code> . If <code>False</code> , return 0.

**Value**

<code>Reference.Quantiles</code>	Reference quantiles derived from <code>Train</code> .
<code>probe.effects</code>	Estimated probe effects derived from <code>Train</code> .
<code>expression</code>	RMA measurements of <code>Train</code> .

**Note**

The RMA procedure requires a lot of computer memory.

**Author(s)**

Kai-Ming Chang(kaiming@gmail.com)

**References**

Chang,K.M., Harbron,C., South,M.C. (2006) An Exploration of Extensions to the RMA Algorithm. Available with the RefPlus package.

**See Also**

[rmaplus](#),[rmaref.predict](#)

**Examples**

```

if (require(affydata)) {
  ## Use Dilution in affydata package
  data(Dilution)

  ## Background correct, estimate the probe effects, and calculate the
  ## RMA intensities using rma.para function.
  Ex<-rma.para(Dilution, bg=TRUE,exp=TRUE)

  ## Calculate the rma intensities using rma function.
  Ex0<-exprs(rma(Dilution))

  plot(Ex$express[,1],Ex0[,1])
}

```

rmaplus

*Derive RMA+ intensities***Description**

Calculate the RMA+ intensities using pre-stored reference quantiles and probe effects. The reference quantiles and the probe effects are the estimated parameter values from RMAing a set of microarrays (e.g. a reference set).

**Usage**

```
rmaplus(Future, rmapara, r.q, p.e, bg = TRUE)
```

**Arguments**

Future	An <code>affybatch</code> object of the microarrays to be pre-processed using the RMA+ methods.
rmapara	Output of <code>rma.para</code> function that the contain reference quantiles and the reference probe effects.
r.q	The pre-stored vector of the quantiles that the probe intensity data of a microarray should be normalized to.
p.e	A pre-stored list of probe effects. It is a <code>probe.coefs</code> object of <code>PLMset</code> class in <code>affyPLM</code> package.
bg	A logical flag. If <code>True</code> (by default), background correct Train using default <code>bg.correct.rma</code> .

**Value**

The RMA+ intensities of `Future`.

**Author(s)**

Kai-Ming Chang(kaiming@gmail.com)

## References

Chang,K.M., Harbron,C., South,M.C. (2006) An Exploration of Extensions to the RMA Algorithm. Available with the RefPlus package.

## See Also

[PLMset-class](#),[rma.para](#),[rmaref.predict](#)

## Examples

```
if (require(affydata)) {
  ## Use Dilution in affydata package
  data(Dilution)

  ##Calculate RMA intensities using the rma function.
  Ex0<-exprs(rma(Dilution))

  ## Background correct, estimate the probe effects, and calculate the
  ## RMA intensities using rma.para function.
  Para<-rma.para(Dilution,bg=TRUE,exp=TRUE)
  Ex1<-Para[[3]]

  ## Calculate the RMA+ intensity using rmaplus function.
  Ex2<-rmaplus(Dilution, rmapara=Para, bg = TRUE)
}
```

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rmaref.predict	<i>A function used by the rmaplus function</i>
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## Description

Derive RMA+ expression. Used by rmaplus. The function does not background correct and normalize the probe-level data.

## Usage

```
rmaref.predict(Future, p.e)
```

## Arguments

Future	An affybatch object of the microarrays to be summarized by the RMA+ method.
p.e	The pre-stored list of the probe.effects.It is a probe.coefs object of PLMset class in affyPLM package.

## Value

The RMA+ intensities of Future.

## Note

Use the rmaplus function to normalize Future to pre-stored reference quantiles and correct the probe effects to obtain the RMA+ intensities.

**Author(s)**

Kai-Ming Chang(kaiming@gmail.com)

**References**

Chang,K.M., Harbron,C., South,M.C. (2006) An Exploration of Extensions to the RMA Algorithm. Available with the RefPlus package.

**See Also**

[PLMset-class,rma.para](#), [rmaplus](#)

# Index

## \*Topic **manip**

- colMedians, 2
- normalize.quantiles, 3
- rma.para, 4
- rmaplus, 5
- rmaref.predict, 6

## \*Topic **package**

- RefPlus-package, 1

colMedians, 2

normalize.quantiles, 3  
normalize.quantiles2, 3

PLMset-class, 6, 7

RefPlus (*RefPlus-package*), 1

RefPlus-package, 1

rma.para, 4, 6, 7

rmaplus, 4, 5, 7

rmaref.predict, 4, 6, 6

rowQ, 2