



# CytoSure™

Version 1 990039

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## Chromosome X exon specific array

Agilent chamber protocol booklet

4 x 44k format

Product code: 020015

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## 1.0 Introduction

The OGT CytoSure™ Chromosome X (ChrX) exon-specific oligonucleotide microarray is used to analyse human genomic DNA for deletions or amplifications in the X chromosome. It provides complete coverage of all X chromosome genes. The majority of the probes have been designed to bind to the exons of the genes in the X chromosome. In some exons where it was challenging to find an optimal probe, the probe is in an adjacent intron or flanking sequence. There are multiple probes to each gene. Please see section 22.0 for detailed microarray information.

The OGT CytoSure ChrX microarray consists of some 39,804 60mer oligonucleotide probes mapped to the X chromosome. There are also 1,272 probes designed against chromosomes 16 and 22 to serve as controls. Two probes are present on the array for each genomic location, binding to either strand of the DNA to produce replicate information.

The microarrays are synthesised on the glass using an *in situ* ink jet printer, ensuring high quality microarrays. They are designed to be used in two colour experiments i.e. one sample is labelled with one fluorescent dye (Cy3) and another sample is labelled with another fluorescent dye (Cy5). Usually one sample is the DNA of interest and the second sample is a reference (or 'normal') DNA.

There are four arrays printed on each slide. It is intended that the arrays are hybridised as independent hybridisations, so that four array CGH experiments can be simultaneously conducted per slide. These hybridisations should be carried out together.

OGT CytoSure microarrays are manufactured by Agilent using SurePrint technology and can be hybridised as Agilent CGH arrays ([www.agilent.com](http://www.agilent.com)). The Agilent labelling kit recommended for use is sufficient for 50 labellings.

For additional information on an alternative protocol, please contact OGT at [products@ogt.co.uk](mailto:products@ogt.co.uk).

### 1.1 Acknowledgements

OGT would like to acknowledge the contribution of Dr Philippos C Patsalis, Chief Executive / Medical Director, of The Cyprus Institute of Neurology and Genetics in Nicosia, Cyprus, in the development of this array.

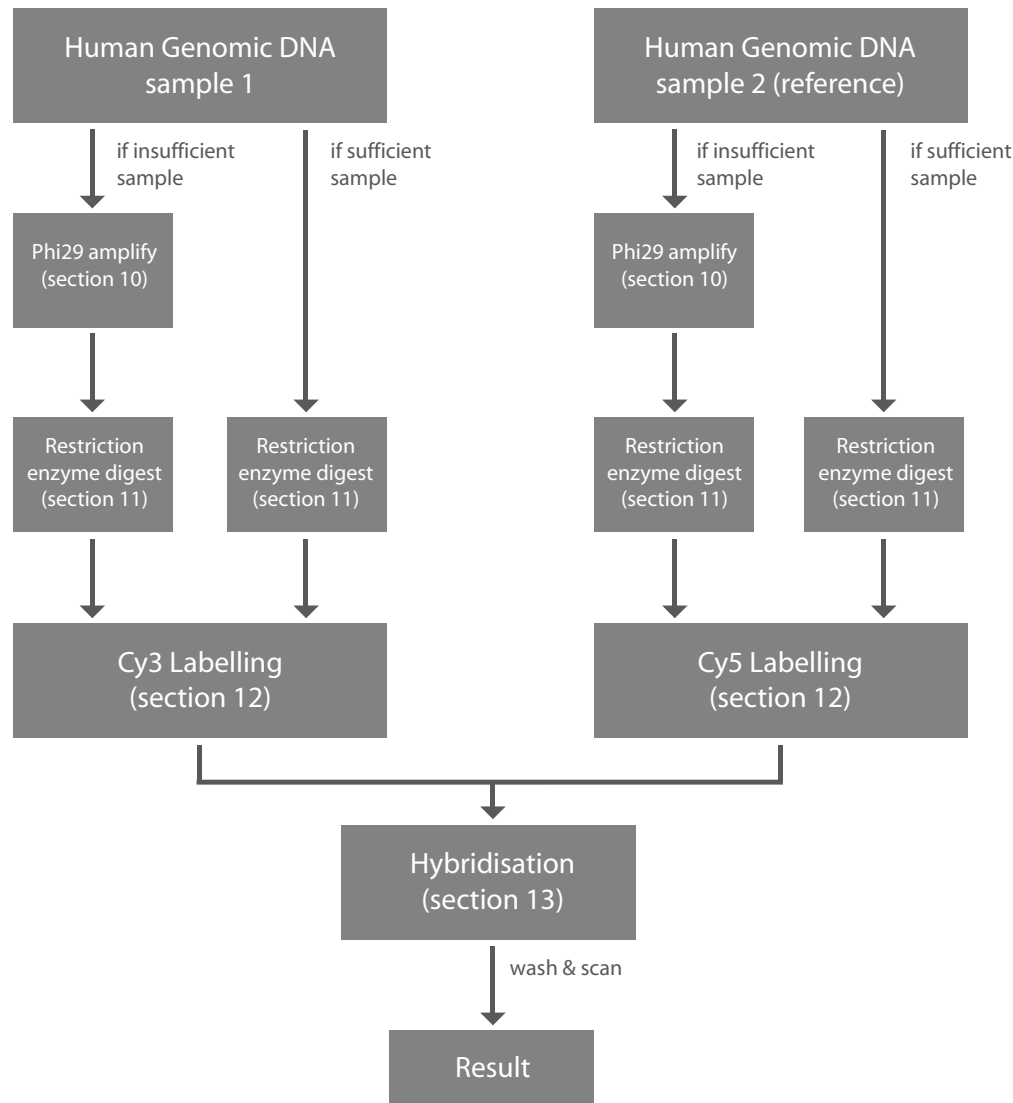


Figure 1: Overview of the method used to generate a result using OGT aCGH microarrays.

## 2.0 Pack contents

<b>Slides:</b>	4 x 44k format oligonucleotide microarray slides
<b>CD-ROM:</b>	<ul style="list-style-type: none"> <li>Pdf protocol booklet</li> <li>XML pattern file for Agilent scanner users</li> <li>GAL pattern file for Axon scanner users</li> <li>Material Safety Data Sheet (MSDS)</li> </ul>
<b>RAND105</b>	Hybridisation control

## 3.0 Storage

The microarrays should be stored in a dehumidified chamber within a light-tight box. The arrays can be stored for up to **three months**.

The control oligonucleotide should be stored at -70 degrees centigrade in a light-proof container.

## 4.0 Safety

Take care when handling the microarray slides to prevent them from breaking. If the slides do break, ensure that protective equipment is used to prevent injury.

Handling of slides should be carried out by trained laboratory staff in accordance with good laboratory practice, using the correct protective equipment such as laboratory coats, safety glasses and gloves. Any chemicals used are potentially hazardous. Please refer to the manufacturer's MSDS for specific information.

Use of compressed nitrogen should be conducted by trained staff only, using the correct procedures.

## 5.0 DNA sample preparation and experimental design

### 5.1 Sample preparation

The genomic DNA should be prepared and purified using a QIAamp DNA micro kit (Qiagen cat no 56304) according to the manufacturer's instructions. It is important that the sample is clean enough to allow complete restriction enzyme digestion. The final volume of the sample should be 20  $\mu$ l. At least 2  $\mu$ g of DNA is required if no amplification is used. If Phi29 DNA polymerase amplification is used, 100 ng of genomic DNA is required and it is necessary to amplify both the sample and the reference. Similar starting amounts of sample and reference DNA should be used.

## 5.2 Experimental design

Two samples labelled with different fluorescent dyes can be hybridised to a single array. Therefore it is recommended that one of these samples is a reference sample that can be compared to the test sample.

Four arrays are printed on each slide. Therefore four separate hybridisations should be carried out in parallel.

## 6.0 Phi29 DNA polymerase amplification of genomic DNA

### 6.1 Equipment required (and not supplied)

Heating block or oven set at 30 degrees centigrade

### 6.2 Recommended reagents (and not supplied)

REPLI-g mini kit	Qiagen (150023)
Solution D1	made up of: 5 µl reconstituted DLB (REPLI-g kit) 35 µl water
Solution N1	made up of: 8 µl stop solution (REPLI-g kit) 72 µl water
QIAquick PCR purification columns	Qiagen (28104)

## 7.0 Labelling of DNA for use on OGT microarrays

### 7.1 Equipment required (and not supplied)

Heating block

Agilent Bioanalyzer (recommended, not required)

### 7.2 Recommended reagents (and not supplied)

Rsa I	New England Biolabs (R0167S)
Alu I	New England Biolabs (R0137S)
Agilent labelling kit PLUS	Agilent (5188-5309)
Agilent 12000 DNA chips for Bioanalyzer (recommended, but not required)	Agilent (5067-1509)
Microcon YM-30	Millipore (42410)

## 8.0 Hybridisation and washing of OGT arrays (with Agilent SureHyb equipment)

### 8.1 Equipment required (and not supplied)

Equipment for the hybridisation of 1" x 3" microarrays.

OGT highly recommends that the Agilent SureHyb system is used in conjunction with the GASKET slides.

A hybridisation oven with a rotisserie, such as one supplied by Agilent, is highly recommended (catalogue numbers, oven: G2545A; rotisserie: G2530-60029).

SureHyb hybridisation cassette	Agilent (G2534A)
GASKET slides (four hybridisations per slide)	Agilent (G2534A-60011)
Rotary mixer for washing the slides	
A microarray scanner capable of scanning 1" x 3" glass slides	
Dry nitrogen (recommended)	
Forceps	

### 8.2 Recommended reagents (and not supplied)

Oligo aCGH Hybridization Kit	Agilent (5188-5220)
Human Cot-1 DNA	Invitrogen (15279-011)
20 x SSPE	Sigma (S2015)
20% N-lauroylsarcosine	
20 g N-lauroylsarcosine water to 100 ml	Sigma (L9150)

#### Wash 1 (1 litre) Agilent (5188-5221)

• 20 x SSPE	25 ml
• 20% N-lauroylsarcosine	0.25 ml
• water	975 ml

Store at room temperature.

#### Wash 2 (1 litre) Agilent (5188-5222)

• 20 x SSPE	5 ml
• 20% N-lauroylsarcosine	0.25 ml
• water	995 ml

### 8.3 Optional reagents, if ozone is a problem (see section 21.0)

Stabilization and Drying Solution	Agilent (5185-5979)
Acetonitrile	Sigma (271004)

## 9.0 General procedures

It is highly recommended that dust-free gloves are used throughout this protocol.

OGT arrays should be handled by the edges of the glass slide. The array should not be touched.

CyDye is light sensitive and the labelled target or hybridised slides should not be exposed to light. Please refer to the CyDye manufacturer's recommendations.

**The arrays are on the same side of the slide as the Agilent-labelled barcode.**

The water used should be molecular biology grade, DNase free (sterile, 18.2 Ω).

## Protocol

### Amplification protocol (less than 2 µg genomic DNA)

Complete sections 10, 12, 13 and 14.

### No amplification protocol (more than 2 µg genomic DNA)

Complete sections 11, 12, 13 and 14.

## 10.0 Amplification of genomic DNA using Phi29 DNA polymerase (if DNA sample is less than 2 µg)

If there is more than 2 µg of genomic DNA available, then omit section 10 and start the protocol at section 11.

If there is less than 2 µg of genomic DNA, the samples will need to be amplified. OGT recommends the use of the Qiagen REPLI-g kit which uses Phi29 DNA polymerase to carry out whole genome amplification.

**If amplification of the test sample is required, it is recommended that both the sample and the reference control are amplified.**

### 10.1 Setting up hybridisation reaction

1. Prepare genomic DNA at an approximate concentration of 20 ng/µl.
2. Prepare the following:

	Sample 1	Sample 2 (reference)
Genomic DNA	5 µl	5 µl
D1	5 µl	5 µl

3. Incubate at room temperature for 3 minutes.
4. Add 10 µl of N1 to each tube.
5. Thaw the REPLI-g and buffer on ice.
6. Prepare the mastermix as follows:

	Amount required per sample	Amount required per two samples
REPLI-g buffer (REPLI-g kit)	29 µl	58 µl
DNA polymerase (REPLI-g kit)	1 µl	2 µl

7. Prepare the following tubes:

	Sample 1	Sample 2 (reference)
Denatured DNA	20 µl	20 µl
Mastermix (made in step 6)	30 µl	30 µl

8. Incubate at 30 degrees centigrade for 16 hours.
9. Incubate at 65 degrees centigrade for 10 minutes.

## 10.2 Restriction digestion of amplified material

If the DNA has been amplified with REPLI-g, use all of the material.

1. Digest the genomic DNA with the restriction enzymes Rsa I and Alu I:

	Sample 1	Sample 2 (reference)
DNA	50 µl	50 µl
Restriction enzyme buffer (10x)	10 µl	10 µl
Water	to total volume of 100 µl	to total volume of 100 µl
Alu I (10 U/µl)	5 µl	5 µl
Rsa I (10 U/µl)	5 µl	5 µl

2. Incubate at 37 degrees centigrade for 2 hours.
3. Purify the DNA using QIAquick columns as follows. For **each** sample use one QIAquick column. For the two samples there will be two columns.
4. Place 100 µl of sample into a tube.
5. Add 600 µl of PB (Qiagen) to each tube.
6. Pipette 700 µl of each sample into each of the columns.
7. Spin in a microfuge at ~18,000 x g for 1 minute.
8. Remove the flow through from the collection tubes and place the columns back into the collection tubes.
9. Pipette 500 µl of PE (Qiagen) into each column.
10. Spin in a microfuge at ~18,000 x g for 1 minute.
11. Remove the flow through from the collection tubes and place the columns back into the collection tubes.
12. Spin in a microfuge at ~18,000 x g for 1 minute.
13. Remove columns from the collection tubes and place into a fresh labelled 1.5 ml microfuge tube.
14. Add 25 µl of elution buffer, EB (Qiagen) into each column.
15. Leave at room temperature for 1 minute.
16. Spin in a microfuge at ~18,000 x g for 1 minute.
17. Place a further 25 µl of EB into each column.
18. Spin in a microfuge at ~18,000 x g for 1 minute.
19. Measure the amount of DNA obtained using a Nanodrop spectrophotometer if available. The amount obtained should be between 5 µg - 10 µg.
20. Dry the sample in a SpeedVac to a volume of approximately 20 µl.
21. Proceed to section 12.0 of the protocol booklet.

## 11.0 Restriction digestion of genomic DNA for use on OGT microarrays (non-amplified genomic DNA)

### 11.1 Restriction digestion

Use ~2 µg of non-amplified genomic DNA.

1. Digest the genomic DNA with the restriction enzymes Rsa I and Alu I:

	Sample 1	Sample 2 (reference)
DNA	X µl	X µl
Restriction enzyme buffer (10 x)	2.6 µl	2.6 µl
Water	to total volume of 26 µl	to total volume of 26 µl
Alu I (10 U/µl)	0.5 µl	0.5 µl
Rsa I (10 U/µl)	0.5 µl	0.5 µl

2. Incubate at 37 degrees centigrade for 2 hours.
3. Inactivate the enzymes by heating at 65 degrees centigrade for 20 minutes.
4. OGT recommends that the digestion of the genomic DNA is checked. The use of the Agilent Bioanalyzer with the DNA 12000 chip is recommended. Run 1 µl of the samples on a DNA 12000 chip following the manufacturer's instructions.
5. Label the DNA using protocol in section 12.

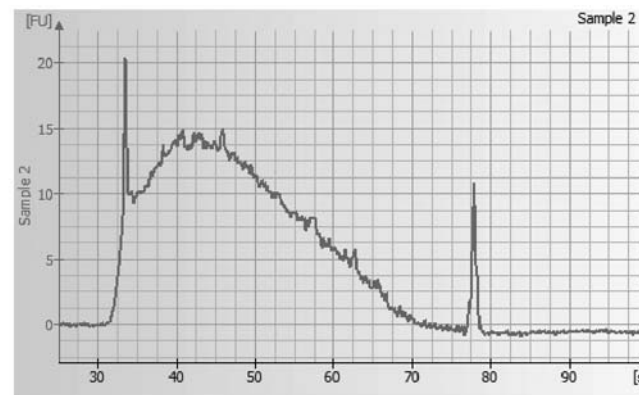


Figure 2: Bioanalyzer trace of genomic DNA.

## 12.0 Labelling (amplified and non-amplified restriction digested DNA)

### 12.1 Labelling the target

1. The restriction digested genomic DNA samples should be in ~25 µl volume.
2. Set up the following tubes:

	Sample 1	Sample 2 (reference)
DNA	25 µl	25 µl
Random primer (Agilent kit)	5 µl	5 µl

3. Mix by flicking the tube and spinning for 15 seconds in a microfuge.
4. Denature in a heat block at 94 degrees centigrade for 3 minutes. Place on ice for 5 minutes.
5. Microfuge for 15 seconds.
6. Add the following to the tube:

	Sample 1	Sample 2 (reference)
5 x buffer (Agilent kit)	10 µl	10 µl
dNTP mix (Agilent kit)	5 µl	5 µl
Cy3-dUTP (1 mM) Agilent kit	3 µl	-
Cy5-dUTP (1 mM) Agilent kit	-	3 µl
Water	1 µl	1 µl
Klenow (Agilent kit)	1 µl	1 µl

7. Mix by flicking the tube followed by a brief (<10 seconds) spin in a microfuge.
8. Incubate at 37 degrees centigrade for 2 hours.
9. Incubate at 65 degrees centigrade for 10 minutes.

### 12.2 Purifying the labelled target

1. Pipette 430 µl of 1 x TE (pH 8) into each sample tube.
2. Prepare two YM30 Microcon columns (<http://www.millipore.com/userguides.nsf/docs/99394xopen&lang=en>) by placing the columns into the collection tubes.
3. Add the samples to the Microcon columns.
4. Spin in a microfuge at 8,000 x g for 10 minutes. Discard flow through.
5. Add 480 µl 1 x TE (pH 8) to each filter.
6. Spin in a microfuge at 8,000 x g for 10 minutes. Discard flow through.
7. For elution, place column upside down in a **fresh** collection tube, and spin for 13,000 x g for 1 minute. Do **not** discard the filter at this stage.
8. Measure the volume of liquid (the sample) in the collection tube with a pipette. The sample should be coloured. For this protocol each target should be in a final volume of ~20 µl. The volume eluted can be variable depending on the sample, the columns and the centrifuge.
  - If colour remains on the filter and no liquid has eluted, add 20 µl of 1 x TE (pH 8) to the filter and repeat steps 7 and 8.
  - If the target volume is greater than 20 µl, either:
    - a) add the sample back to the same column. Place the column in a new collection tube in the original (upright) position. Respin at 8,000 x g for 1 minute and then repeat steps 7 and 8.
    - OR
    - b) place the tube in a SpeedVac and spin on a low heat in the dark.
  - If the target volume is smaller than 20 µl then make up to 20 µl with 1 x TE (pH 8) and proceed with step 9.
9. If a Nanodrop is available, it is recommended that 1.2 µl of material is used to measure the absorbance at 260 nm, 550 nm and 650 nm. The amounts of target that should be obtained are shown in the table below.

Approximate <b>amounts</b> , from a 2 µg labelling, of:	Cy3	Cy5
DNA	6 µg	2.5 µg
Dye	100 pmol	100 pmol

These are average amounts. If the figures are a little lower or higher then it should still be possible to proceed.

### 13.0 Hybridisation of OGT arrays with labelled target (with Agilent SureHyb equipment)

OGT recommends the use of Agilent SureHyb hybridisation equipment. If other hybridisation equipment is used adjustments to this protocol may be required.

1. Prepare the 10 x Blocking Agent by adding 1,350  $\mu$ l of water to the 10 x Blocking Agent tube (supplied with the Agilent Oligo aCGH Hybridization Kit).
2. Leave at room temperature for 60 minutes. After use, store the Blocking Agent at -20 degrees centigrade.
3. Remove slide box from packaging and store slides until use in a dehumidified chamber. The slides should be stored in a light-tight box.
4. When ready for use, remove slides from box. Wear clean dust-free gloves at all times when handling the microarrays. Handling should be carried out in a low dust laboratory. Return unused slides to dehumidified chamber.
5. **The arrays are printed on the same side of the slide as the Agilent-labelled barcode.**
6. Set up the hybridisation. The precise method of hybridisation will depend on the hybridisation equipment available to the user. OGT recommends the use of Agilent's SureHyb equipment. For an online demonstration of this equipment visit <http://agilent.cnpg.com/lscd/demo/surehyb/03%5F06%5F07/>.
7. Prepare the RAND105 positive control. Remove a positive control tube from the freezer and rehydrate the pellet with 1,000  $\mu$ l of water (dilution 1). Briefly vortex the tube to resuspend the pellet. Remove 10  $\mu$ l and place in a tube with 1,000  $\mu$ l of water to make dilution 2 (1 in 100 dilution). Use this dilution 2 to set up the hybridisation as described below. Once the dilution is used, the tube must be disposed of.
8. Prepare the following in a **separate** tube:

	Volumes required for each 117 $\mu$ l hybridisation mix
Cy3 and Cy5 labelled genomic DNA	40 $\mu$ l
Diluted RAND105 positive control	2.5 $\mu$ l
Cot 1 (1 mg/ml)	5 $\mu$ l
Agilent 10 x Blocking Agent	11 $\mu$ l
Agilent 2 x Hybridization Buffer	58.5 $\mu$ l

9. Denature the target at 94 degrees centigrade for 3 minutes.
10. Incubate at 37 degrees centigrade for 30 minutes.
11. Quickly spin down in a microfuge for 10 seconds.

12. Place an Agilent SureHyb GASKET into an Agilent CHAMBER base.
13. Immediately pipette 100  $\mu$ l of hybridisation mix onto one chamber of the GASKET slide.
14. Dispense the other three 100  $\mu$ l of hybridisation mix onto the remaining three chambers of the GASKET slide (see figure 3).



Figure 3: GASKET slide layout.

15. Place an OGT array onto the GASKET slide with the array side down and in contact with the hybridisation mix.
16. Place the CLAMP ASSEMBLY on the slide and tighten the thumbscrew.
17. Some bubbles should form. These bubbles should be moving. If they are not, tap the chamber on the bench.
18. Hybridise at 65 degrees centigrade for at least 48 hours to a maximum of 72 hours in a light-tight container, ideally in a hybridisation oven with a rotisserie. Fit the slides vertically and rotate the chambers at a speed of 4 rpm.

**IMPORTANT:** Many fluorescent dyes used for microarrays are light sensitive. Minimise exposure of hybridised microarrays to light. Please refer to dye manufacturer recommendations.

## 14.0 Washing and scanning of OGT microarrays

Before starting, decide if the Agilent stabilisation wash is going to be used (see section 21.0).

1. Use Agilent Wash Solutions or prepare as follows:

### Wash 1 (1 litre)

- 20 x SSPE 25 ml
- 20% N-lauroylsarcosine 0.25 ml
- water 975 ml

Store at room temperature.

### Wash 2 (1 litre)

- 20 x SSPE 5 ml
- 20% N-lauroylsarcosine 0.25 ml
- water 995 ml

Pre-warm Wash 2 to 37 degrees centigrade.

2. Place 50 ml of Wash 1 in a 50 ml sterile tube. Place 50 ml of Wash 2 in a separate 50 ml sterile tube.
3. Wearing gloves, remove the slide from the hybridisation chamber with the GASKET slide still attached.
4. Place in a bath of Wash 1 and gently prise the GASKET slide from the OGT microarray, while immersed in Wash 1.
5. Without the microarray drying out, place the microarray into the 50 ml tube containing Wash 1.
6. Rotate the tube on a rotary mixer at room temperature for 5 minutes.
7. Using **clean** forceps and without the microarray drying out, place the microarray into the 50 ml tube with Wash 2 (note the Wash 2 should be pre-warmed to 37 degrees centigrade).
8. Rotate the tube on a rotary mixer for exactly 1 minute.
9. Optional protocol. If the presence of ozone is a problem in the laboratory then it is recommended that the Agilent Stabilization and Drying Solution is used (see section 21.0).
10. Using **clean** forceps remove the microarray and blow dry with dry nitrogen.
11. Insert the slide into the scanner. Please refer to the scanner manufacturer's instruction booklet and safety information for instructions on the correct use of the scanner.

### Agilent scanner

Insert the slide into the Agilent slide holder, with the array side facing up. The non-barcoded edge should be placed into the slide holder first. The slide should be scanned with the green laser (~532 nm) and the red laser (~633 nm). It is recommended to scan at 5 µm resolution. The whole slide should be scanned.

### Axon scanner

The slides should be inserted into the scanner, array side facing down. The non-barcoded edge should go into the scanner first. The slide should be scanned with the green laser (~532 nm) and the red laser (~633 nm). It is recommended to scan at 5 µm resolution. The whole slide should be scanned.

## 15.0 Visualisation of the scanned array image

The control probes which bind to the RAND oligonucleotide control should be visible in the Cy3 channel.

There are three types of RAND probes which are positioned in replicate throughout the array.

RAND105 — True match oligonucleotides.

RAND105 x MM — Mismatch oligonucleotides. These oligonucleotides contain a mismatch which should result in these probes binding to the control target oligonucleotide less effectively than the true match probes.

RAND105 x RC — Reverse complement probes which should register no signal; these are negative controls.

On printing, each oligonucleotide on an OGT array is assigned a unique feature number. The identity of the feature number on the array is given on computer files present on the compact disk. As different scanners display the image of the slides differently, the position of the feature number will vary according to the scanner.

### Agilent scanner (Agilent image analysis software)

Figure 4 shows how the features are displayed on the screen using the Agilent scanner.

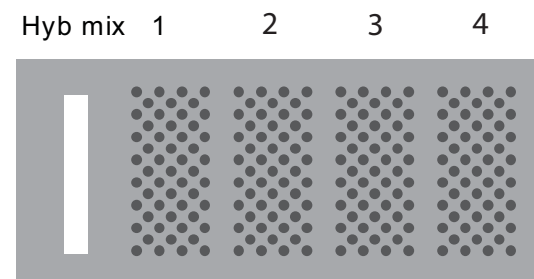


Figure 4: OGT microarray positioned on an Agilent scanner.

### Axon scanner

Figure 5 shows how the features are displayed on the screen using the Axon scanner.

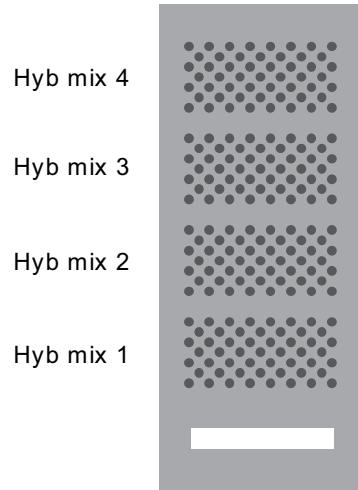


Figure 5: OGT microarray positioned on an Axon scanner.

## 16.0 Feature extraction

### 16.1. Agilent feature extraction software

An XML file is supplied on the compact disc to enable the data to be extracted using Agilent's feature extraction software. Please refer to the Agilent feature extraction software documentation for full details. For additional information download the Agilent feature extraction technical note from the resource zone of the OGT web site (<http://www.ogt.co.uk/register.asp>).

1. Load compact disc into the CD drive of the scanner computer.
2. Download the XML file into a folder.
3. Carry out feature extraction as recommended by the software provider. If CytoSure visualisation software is to be used, it is recommended that the normalisation (correct dye bias) option and ratio (compute ratio) are OFF.
4. A .txt file should be generated.
5. The genomic location on the file is based on the Human genome NCBI v36 assembly.

### 16.2 Axon feature extraction software

A GAL file is supplied on the compact disc to enable the data to be extracted. Please refer to the relevant feature extraction software for instructions on feature extraction. A brief overview is given here:

1. Load compact disc into the scanner computer CD drive.
2. Download the GAL file into a folder. The GAL file is designed to extract all the arrays on the slide.
3. Carry out feature extraction as recommended by the software provider using the GAL file provided.

If using CytoSure visualisation software, it is recommended that no normalisation is carried out. It is important to retain the following columns:

- a. Name
- b. F550 Median
- c. F650 Median

4. Export a .txt file and save.
5. The genomic location on the file is based on the Human genome NCBI v36 assembly.

### 16.3 Additional feature extraction software

Additional feature extraction software includes:

1. BioDiscovery's ImaGene ([www.biodiscovery.com](http://www.biodiscovery.com)) and;
2. Koada ([www.koada.com](http://www.koada.com)), where software is currently under development for the feature extraction of high density arrays.

Please contact the vendors directly.

There may be compatibility issues with CytoSure visualisation software if these feature extraction software packages are used. Please contact OGT for assistance.

## 17.0 Data analysis

The ratio (sample/reference) versus genomic location should be plotted on a graph. Where a deletion or amplification in the genome occurs, there should be a change in the ratio. There are multiple probes targeting the exons of genes where chromosomal aberrations occur. So, unless the aberration is extremely small, there should be several consecutive probes with a change in the ratios. This therefore adds to the confidence that the aberration is real.

Load the .txt files into CytoSure visualisation software. Instructions are provided in the Help menu. CytoSure visualisation software is best run on a computer running Windows XP.

### 17.1 Data normalisation

The next step in the data analysis process is to normalise the data to correct for dye bias. OGT recommends a LOWESS normalisation. With OGT arrays there should be no requirement for spatial bias correction.

Normalise the data in CytoSure visualisation software using the instructions provided. CytoSure visualisation software carries out a LOWESS normalisation.

### 17.2 Data analysis

Following data normalisation and initial visualisation, the aberrations need to be identified.

CytoSure visualisation software enables aberrations to be identified visually and placed on the human genome. Annotation is provided showing gene positions and CNV data from Redon *et al* 2006.

Identification of the aberrations can be carried out visually or by using various statistical methods. A smoothing process is typically used when analysing results from oligonucleotide array CGH. Methods used to identify aberrations include: direct thresholding, moving average thresholding, K-means clustering, hidden Markov models and circular binary segmentation.

A comparison of array CGH data analysis methods is available; please see Lai *et al* 2005.

Analysis methods will be made available on future versions of CytoSure visualisation software.

## 18.0 Troubleshooting

### Array hybridisation

Fluorescent smears across the slide	Contamination with fluorescent material during washing. Ensure clean gloves are worn and forceps are cleaned with water before and between washes. Contamination from the nitrogen or air used to dry the microarrays prior to scanning. The arrays have dried out during the hybridisation or wash procedure. Remove slides from GASKET slides or coverslip under the surface of Wash 1.
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Low/No signals on the array

Poor Phi29 amplification; this could be due to poor sample quality. Refer to REPLI-g kit.

Poor DNA labelling; check labelling using a Nanodrop. If not available, use a UV spectrophotometer.

If little or no RAND control signal is present on the RAND control probes on the array then the hybridisation and/or washing has been poor. Check hybridisation and wash solutions.

Check that the correct side of the array has been scanned.

Check correct side of the array has been used in the array hybridisation.

Remove Cot-1 DNA from the hybridisation.

Low Cy5 signal

Ensure slides are scanned immediately after washing.

Consider using Agilent's Stabilization and Drying solution, which contains an ozone scavenger.

Cy5-labelled targets were exposed to light. Cover with foil or use amber microfuge tubes.

The RAND105 x MM control probes have a signal higher than 70% of the true match (PSO) probes.

Stringency or temperature of the hybridisation is incorrect.

The signals on the hybridisations are too strong.

Reduce the PMT setting on the microarray scanner.

## 19.0 References

- Lai W.R., Johnson M.D., Kucherlapati R. and Park P.J. (2005) *Bioinformatics* **21** pp3763-3770.
- Redon R., Ishikawa S., Fitch K.R., Feuk L., Perry G.H., Andrews T.D., Fiegler H., Shapero M.H., Carson A.R., Chen W., Cho E.K., Dallaire S., Freeman J.L., González J.R., Gratacòs M., Huang J., Kalaitzopoulos D., Komura D., MacDonald J.R., Marshall C.R., Mei R., Montgomery L., Nishimura K., Okamura K., Shen F., Somerville M.J., Tchinda J., Valsesia A., Woodwark C., Yang F., Zhang J., Zerjal T., Zhang J., Armengol L., Conrad D.F., Estivill X., Tyler-Smith C., Carter N.P., Aburatani H., Lee C., Jones K.W., Scherer S.W. and Hurles M.E. (2006) *Nature* **444** pp444-454.

## 20.0 Custom information on microarray

Number of features	43,575
Negative controls	153
Chr 16 & 21 controls	1,272
RAND105 x MM control	424
RAND105 x PM control	424
RAND105 x RC control	424
Other controls	1,074
ChrX probes	39,804

## 21.0 Optional wash for stabilisation of dyes from ozone

Materials required

Stabilization and Drying solution: Agilent (5185-5979)  
Acetonitrile Sigma (271004)

Wear gloves, laboratory coat and safety glasses for this procedure and carry out in a fume hood.

1. Before starting the wash, warm the stabilisation solution at 40 degrees centigrade in a water bath, allowing sufficient head space for expansion.
2. Once the precipitate is dissolved, allow the solution to cool to room temperature prior to use.
3. During Wash 2, pour the acetonitrile and the stabilisation solution into suitable containers.
4. Once Wash 2 has been completed, dip the slide into the acetonitrile three times.
5. Dip the slide into the stabilisation solution three times.
6. Using **clean** forceps, remove the microarray and blow dry with dry nitrogen.

## 22.0 Detailed array information

Probes to the following open reading frames (ORFs) are mapped onto the array.

Ensembl designation	Type	Ensembl designation	Type	Ensembl designation	Type
ENSG00000182378	protein_coding	ENSG00000125363	protein_coding	ENSG00000102104	protein_coding
ENSG00000178605	protein_coding	ENSG00000187517	protein_coding	ENSG000000086717	protein_coding
ENSG00000185543	protein_coding	ENSG00000184158	protein_coding	ENSG00000044446	protein_coding
ENSG00000167393	protein_coding	ENSG00000005302	protein_coding	ENSG00000173698	protein_coding
ENSG00000185960	protein_coding	ENSG00000169933	protein_coding	ENSG00000131828	protein_coding
ENSG00000177434	protein_coding	ENSG00000101911	protein_coding	ENSG00000180815	protein_coding
ENSG00000198223	protein_coding	ENSG00000196664	protein_coding	ENSG00000147010	protein_coding
ENSG00000185291	protein_coding	ENSG00000101916	protein_coding	ENSG00000173681	protein_coding
ENSG00000169100	protein_coding	ENSG00000187268	protein_coding	ENSG00000184368	protein_coding
ENSG00000169098	protein_coding	ENSG00000123594	protein_coding	ENSG00000173674	protein_coding
ENSG00000169093	protein_coding	ENSG00000198759	protein_coding	ENSG00000177189	protein_coding
ENSG00000182162	protein_coding	ENSG00000187661	protein_coding	ENSG00000149970	protein_coding
ENSG00000197976	protein_coding	ENSG00000176896	protein_coding	ENSG00000185915	protein_coding
ENSG00000196433	protein_coding	ENSG00000123595	protein_coding	ENSG00000091482	protein_coding
ENSG00000187865	protein_coding	ENSG00000196459	protein_coding	ENSG000000012174	protein_coding
ENSG00000169084	protein_coding	ENSG00000046651	protein_coding	ENSG00000198767	protein_coding
ENSG00000197609	protein_coding	ENSG00000046653	protein_coding	ENSG00000102172	protein_coding
ENSG00000002586	protein_coding	ENSG00000046647	protein_coding	ENSG00000102174	protein_coding
ENSG00000124343	protein_coding	ENSG00000181669	protein_coding	ENSG00000175809	protein_coding
ENSG00000056998	protein_coding	ENSG00000101958	protein_coding	ENSG00000174028	protein_coding
ENSG00000006756	protein_coding	ENSG00000181544	protein_coding	ENSG00000196592	protein_coding
ENSG00000157399	protein_coding	ENSG00000130150	protein_coding	ENSG00000165186	protein_coding
ENSG000000062096	protein_coding	ENSG00000102048	protein_coding	ENSG00000123131	protein_coding
ENSG00000101825	protein_coding	ENSG00000165192	protein_coding	ENSG00000123130	protein_coding
ENSG00000183943	protein_coding	ENSG00000165195	protein_coding	ENSG00000130066	protein_coding
ENSG00000188304	protein_coding	ENSG00000165197	protein_coding	ENSG00000184831	protein_coding
ENSG00000196499	protein_coding	ENSG000000087842	protein_coding	ENSG00000165182	protein_coding
ENSG00000196882	protein_coding	ENSG00000102010	protein_coding	ENSG00000174010	protein_coding
ENSG00000146938	protein_coding	ENSG00000130234	protein_coding	ENSG00000130741	protein_coding
ENSG00000169059	protein_coding	ENSG00000147003	protein_coding	ENSG00000005889	protein_coding
ENSG00000186259	protein_coding	ENSG00000186312	protein_coding	ENSG00000183817	protein_coding
ENSG00000130021	protein_coding	ENSG00000169239	protein_coding	ENSG00000183627	protein_coding
ENSG00000101846	protein_coding	ENSG00000169249	protein_coding	ENSG00000196121	protein_coding
ENSG00000182583	protein_coding	ENSG00000182287	protein_coding	ENSG00000067992	protein_coding
ENSG00000006757	protein_coding	ENSG00000126010	protein_coding	ENSG00000102230	protein_coding
ENSG00000184452	protein_coding	ENSG00000182798	protein_coding	ENSG00000182432	protein_coding
ENSG00000177504	protein_coding	ENSG00000047230	protein_coding	ENSG00000101868	protein_coding
ENSG00000011201	protein_coding	ENSG00000169906	protein_coding	ENSG00000187828	protein_coding
ENSG00000183304	protein_coding	ENSG00000169895	protein_coding	ENSG00000004848	protein_coding
ENSG00000177138	protein_coding	ENSG000000086712	protein_coding	ENSG00000170987	protein_coding
ENSG00000101849	protein_coding	ENSG00000102054	protein_coding	ENSG00000176774	protein_coding
ENSG00000101850	protein_coding	ENSG00000169891	protein_coding	ENSG00000176746	protein_coding
ENSG00000146950	protein_coding	ENSG00000183084	protein_coding	ENSG00000188408	protein_coding
ENSG00000189118	protein_coding	ENSG00000188158	protein_coding	ENSG00000170817	protein_coding
ENSG00000047644	protein_coding	ENSG00000047634	protein_coding	ENSG00000182112	protein_coding
ENSG00000073464	protein_coding	ENSG00000131831	protein_coding	ENSG00000198256	protein_coding
ENSG00000101871	protein_coding	ENSG00000177324	protein_coding	ENSG00000183851	protein_coding
ENSG00000004961	protein_coding	ENSG00000102098	protein_coding	ENSG00000177689	protein_coding
ENSG00000047648	protein_coding	ENSG00000008086	protein_coding	ENSG00000189186	protein_coding

Ensembl designation	Type
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ENSG00000198798	protein_coding
ENSG00000120289	protein_coding
ENSG00000169297	protein_coding
ENSG00000120280	protein_coding
ENSG00000178556	protein_coding
ENSG00000198814	protein_coding
ENSG00000157625	protein_coding
ENSG00000132446	protein_coding
ENSG00000198947	protein_coding
ENSG00000182423	protein_coding
ENSG00000197340	protein_coding
ENSG00000174678	protein_coding
ENSG00000147027	protein_coding
ENSG00000189132	protein_coding
ENSG00000188216	protein_coding
ENSG00000189023	protein_coding
ENSG00000165164	protein_coding
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ENSG00000036473	protein_coding
ENSG00000156298	protein_coding
ENSG00000165175	protein_coding
ENSG00000183337	protein_coding
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ENSG00000197639	protein_coding
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ENSG00000124486	protein_coding
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Ensembl designation	Type
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ENSG00000102218	protein_coding
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ENSG00000130988	protein_coding
ENSG00000147123	protein_coding
ENSG00000182872	protein_coding
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Ensembl designation	Type
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Ensembl designation	Type
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ENSG00000131080	protein_coding
ENSG00000178604	protein_coding
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ENSG00000079482	protein_coding
ENSG00000181704	protein_coding
ENSG00000189128	protein_coding
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ENSG00000186378	protein_coding
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ENSG00000147162	protein_coding
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Ensembl designation	Type
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ENSG00000186462	protein_coding
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ENSG00000197881	protein_coding
ENSG00000187969	protein_coding
ENSG00000186663	protein_coding
ENSG00000147100	protein_coding
ENSG00000189378	protein_coding
ENSG00000197501	protein_coding
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ENSG00000188968	protein_coding
ENSG00000183035	protein_coding
ENSG00000072133	protein_coding
ENSG00000165259	protein_coding
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Ensembl designation	Type	Ensembl designation	Type	Ensembl designation	Type	Ensembl designation	Type	Ensembl designation	Type	Ensembl designation	Type
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ENS00000124429	protein_coding	ENS00000198932	protein_coding	ENS00000170925	protein_coding	ENS00000018610	protein_coding	ENS00000185903	protein_coding	ENS00000101977	protein_coding
ENS00000188419	protein_coding	ENS00000158301	protein_coding	ENS00000158301	protein_coding	ENS000000101842	protein_coding	ENS00000171054	protein_coding	ENS00000101974	protein_coding
ENS00000126733	protein_coding	ENS00000198908	protein_coding	ENS00000101843	protein_coding	ENS00000186416	protein_coding	ENS00000181030	protein_coding	ENS00000177219	protein_coding
ENS00000184847	protein_coding	ENS00000102128	protein_coding	ENS00000101844	protein_coding	ENS00000125354	protein_coding	ENS00000134602	protein_coding	ENS00000188830	protein_coding
ENS00000102271	protein_coding	ENS00000133169	protein_coding	ENS00000197565	protein_coding	ENS00000187808	protein_coding	ENS00000165694	protein_coding	ENS00000134559	protein_coding
ENS00000187042	protein_coding	ENS00000147206	protein_coding	ENS00000189372	protein_coding	ENS00000198918	protein_coding	ENS00000123728	protein_coding	ENS00000184258	protein_coding
ENS00000185233	protein_coding	ENS00000102409	protein_coding	ENS00000188153	protein_coding	ENS00000125351	protein_coding	ENS00000076770	protein_coding	ENS00000198820	protein_coding
ENS00000198296	protein_coding	ENS00000180964	protein_coding	ENS00000189154	protein_coding	ENS00000125352	protein_coding	ENS00000171004	protein_coding	ENS00000197946	protein_coding
ENS00000186310	protein_coding	ENS00000133134	protein_coding	ENS00000133124	protein_coding	ENS00000125356	protein_coding	ENS00000134588	protein_coding	ENS00000185622	protein_coding
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ENS00000147202	protein_coding	ENS00000185222	protein_coding	ENS00000101888	protein_coding	ENS00000101882	protein_coding	ENS00000076716	protein_coding	ENS00000198573	protein_coding
ENS00000197052	protein_coding	ENS00000166681	protein_coding	ENS00000176076	protein_coding	ENS00000101883	protein_coding	ENS00000147257	protein_coding	ENS00000171099	protein_coding
ENS00000197570	protein_coding	ENS00000172476	protein_coding	ENS00000068366	protein_coding	ENS00000131721	protein_coding	ENS00000156531	protein_coding	ENS00000196410	protein_coding
ENS00000165194	protein_coding	ENS00000133142	protein_coding	ENS00000196328	protein_coding	ENS00000177540	protein_coding	ENS00000165704	protein_coding	ENS00000198021	protein_coding
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ENS00000000003	protein_coding	ENS00000172465	protein_coding	ENS00000101935	protein_coding	ENS00000177485	protein_coding	ENS00000170965	protein_coding	ENS00000165509	protein_coding
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ENS00000102362	protein_coding	ENS00000179363	protein_coding	ENS00000181110	protein_coding	ENS00000101892	protein_coding	ENS00000156500	protein_coding	ENS00000046774	protein_coding
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ENS000000007952	protein_coding	ENS00000123560	protein_coding	ENS00000101938	protein_coding	ENS00000158290	protein_coding	ENS00000184785	protein_coding	ENS00000179542	protein_coding
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ENS00000126950	protein_coding	ENS00000123569	protein_coding	ENS00000072315	protein_coding	ENS00000174264	protein_coding	ENS00000173275	protein_coding	ENS00000185351	protein_coding
ENS00000102384	protein_coding	ENS00000176274	protein_coding	ENS00000187823	protein_coding	ENS00000125675	protein_coding	ENS00000178947	protein_coding	ENS00000102081	protein_coding
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ENS00000102387	protein_coding	ENS00000123575	protein_coding	ENS00000175117	protein_coding	ENS00000101966	protein_coding	ENS00000184230	protein_coding	ENS00000183362	protein_coding
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ENS00000010671	protein_coding	ENS00000184563	protein_coding	ENS00000185678	protein_coding	ENS00000183918	protein_coding	ENS00000187267	protein_coding	ENS00000198328	protein_coding
ENS00000102391	protein_coding	ENS00000189108	protein_coding	ENS00000176960	protein_coding	ENS00000009694	protein_coding	ENS00000181433	protein_coding	ENS00000198175	protein_coding
ENS00000102393	protein_coding	ENS00000133149	protein_coding	ENS00000147246	protein_coding	ENS00000198354	protein_coding	ENS00000169446	protein_coding	ENS00000197890	protein_coding
ENS00000147183	protein_coding	ENS00000181819	protein_coding	ENS00000123496	protein_coding	ENS00000198889	protein_coding	ENS00000198689	protein_coding	ENS00000104040	protein_coding
ENS00000153779	protein_coding	ENS00000123572	protein_coding	ENS00000130224	protein_coding	ENS00000183631	protein_coding	ENS00000188885	protein_coding	ENS00000176289	protein_coding
ENS00000174740	protein_coding	ENS00000123561	protein_coding	ENS00000175718	protein_coding	ENS00000182160	protein_coding	ENS00000188841	protein_coding	ENS00000197620	protein_coding
ENS00000102290	protein_coding	ENS00000157502	protein_coding	ENS00000130225	protein_coding	ENS00000123165	protein_coding	ENS00000022267	protein_coding	ENS00000123584	protein_coding
ENS00000126945	protein_coding	ENS00000101819	protein_coding	ENS00000102021	protein_coding	ENS00000102038	protein_coding	ENS00000129680	protein_coding	ENS00000171129	protein_coding
ENS00000196440	protein_coding	ENS00000147231	protein_coding	ENS00000102024	protein_coding	ENS00000122126	protein_coding	ENS00000156920	protein_coding	ENS00000155984	protein_coding
ENS00000198096	protein_coding	ENS00000133135	protein_coding	ENS00000188612	protein_coding	ENS00000171388	protein_coding	ENS00000102239	protein_coding	ENS00000185247	protein_coding
ENS00000126947	protein_coding	ENS00000133138	protein_coding	ENS00000181384	protein_coding	ENS00000122121	protein_coding	ENS00000102241	protein_coding	ENS00000171116	protein_coding
ENS00000198960	protein_coding	ENS00000147223	protein_coding	ENS00000180772	protein_coding	ENS00000122122	protein_coding	ENS00000102243	protein_coding	ENS00000166008	protein_coding
ENS00000102401	protein_coding	ENS00000165376	protein_coding	ENS00000087916	protein_coding	ENS00000188706	protein_coding	ENS00000102245	protein_coding	ENS00000156009	protein_coding
ENS00000184867	protein_coding	ENS00000133131	protein_coding	ENS00000003096	protein_coding	ENS00000156697	protein_coding	ENS00000129675	protein_coding	ENS00000197021	protein_coding
ENS00000126952	protein_coding	ENS00000196702	protein_coding	ENS00000131725	protein_coding	ENS000000085185	protein_coding	ENS00000182501	protein_coding	ENS00000013619	protein_coding
ENS00000166432	protein_coding	ENS00000089682	protein_coding	ENS00000147251	protein_coding	ENS00000102034	protein_coding	ENS00000147274	protein_coding	ENS00000171100	protein_coding
ENS00000184905	protein_coding	ENS00000198088	protein_coding	ENS00000131724	protein_coding	ENS00000156709	protein_coding	ENS00000197152	protein_coding	ENS00000063601	protein_coding
ENS00000184515	protein_coding	ENS00000080572	protein_coding	ENS00000174460	protein_coding	ENS00000134594	protein_coding	ENS00000165370	protein_coding	ENS00000102181	protein_coding
ENS00000185554	protein_coding	ENS00000182322	protein_coding	ENS00000174459	protein_coding	ENS000000056277	protein_coding	ENS00000134598	protein_coding	ENS00000022993	protein_coding
ENS00000184199	protein_coding	ENS00000189440	protein_coding	ENS00000175556	protein_coding	ENS00000102078	protein_coding	ENS00000156925	protein_coding	ENS00000102195	protein_coding
ENS00000185945	protein_coding	ENS00000147234	protein_coding	ENS00000175553	protein_coding	ENS00000147262	protein_coding	ENS00000183981	protein_coding	ENS00000160131	protein_coding
ENS00000184338	protein_coding	ENS00000147224	protein_coding	ENS00000101856	protein_coding	ENS00000134597	protein_coding	ENS00000182136	protein_coding	ENS00000166049	protein_coding
ENS00000158164	protein_coding	ENS00000157514	protein_coding	ENS0000007713	protein_coding	ENS00000165675	protein_coding	ENS00000129682	protein_coding	ENS00000130032	protein_coding

Ensembl designation	Type
ENSG00000147378	protein_coding
ENSG00000183862	protein_coding
ENSG00000198681	protein_coding
ENSG00000102287	protein_coding
ENSG00000183686	protein_coding
ENSG00000124260	protein_coding
ENSG00000011677	protein_coding
ENSG00000147381	protein_coding
ENSG00000147402	protein_coding
ENSG00000183305	protein_coding
ENSG00000184324	protein_coding
ENSG00000198930	protein_coding
ENSG00000184750	protein_coding
ENSG00000197463	protein_coding
ENSG00000197172	protein_coding
ENSG00000147400	protein_coding
ENSG00000147383	protein_coding
ENSG00000147394	protein_coding
ENSG00000198883	protein_coding
ENSG00000198013	protein_coding
ENSG00000126977	protein_coding
ENSG00000185776	protein_coding
ENSG00000063587	protein_coding
ENSG00000189420	protein_coding
ENSG00000183479	protein_coding
ENSG00000182492	protein_coding
ENSG00000130821	protein_coding
ENSG00000067842	protein_coding
ENSG00000147382	protein_coding
ENSG00000130829	protein_coding
ENSG00000130822	protein_coding
ENSG00000185825	protein_coding
ENSG00000101986	protein_coding
ENSG00000198753	protein_coding
ENSG00000184343	protein_coding
ENSG00000067829	protein_coding
ENSG00000180879	protein_coding
ENSG00000067840	protein_coding
ENSG00000188512	protein_coding
ENSG00000198910	protein_coding
ENSG00000196987	protein_coding
ENSG00000126895	protein_coding
ENSG00000089820	protein_coding
ENSG00000102030	protein_coding
ENSG00000102032	protein_coding
ENSG00000172534	protein_coding
ENSG00000177854	protein_coding
ENSG00000184216	protein_coding
ENSG00000169057	protein_coding
ENSG00000102076	protein_coding
ENSG00000102080	protein_coding
ENSG00000147380	protein_coding
ENSG00000182242	protein_coding
ENSG00000166160	protein_coding
ENSG00000185254	protein_coding

Ensembl designation	Type
ENSG00000007350	protein_coding
ENSG00000196924	protein_coding
ENSG00000102119	protein_coding
ENSG00000147403	protein_coding
ENSG00000013563	protein_coding
ENSG00000102125	protein_coding
ENSG00000071553	protein_coding
ENSG00000071859	protein_coding
ENSG00000130827	protein_coding
ENSG00000196976	protein_coding
ENSG00000102178	protein_coding
ENSG00000126903	protein_coding
ENSG00000071889	protein_coding
ENSG00000160211	protein_coding
ENSG00000073009	protein_coding
ENSG00000197371	protein_coding
ENSG00000183678	protein_coding
ENSG00000184033	protein_coding
ENSG00000196146	protein_coding
ENSG00000126890	protein_coding
ENSG00000160219	protein_coding
ENSG00000130826	protein_coding
ENSG00000130830	protein_coding
ENSG00000185010	protein_coding
ENSG00000198082	protein_coding
ENSG00000196733	protein_coding
ENSG00000165775	protein_coding
ENSG00000182712	protein_coding
ENSG00000185515	protein_coding
ENSG00000189335	protein_coding
ENSG00000155959	protein_coding
ENSG00000155961	protein_coding
ENSG00000155962	protein_coding
ENSG00000198636	protein_coding
ENSG00000198307	protein_coding
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ENSG00000168939	protein_coding
ENSG00000124333	protein_coding
ENSG00000124334	protein_coding
ENSG00000198539	protein_coding
ENSG00000182484	protein_coding
ENSG00000199703	snRNA
ENSG00000201702	snRNA
ENSG00000202390	misc_RNA
ENSG00000201660	snoRNA
ENSG00000200852	rRNA
ENSG00000199729	misc_RNA
ENSG00000202469	misc_RNA
ENSG00000199978	snRNA
ENSG00000199305	misc_RNA
ENSG00000199763	misc_RNA
ENSG00000201295	misc_RNA
ENSG00000199622	misc_RNA

Ensembl designation	Type
ENSG00000200620	snoRNA
ENSG00000200566	snRNA
ENSG00000202505	snRNA
ENSG00000147403	snRNA
ENSG00000199410	misc_RNA
ENSG00000201467	snoRNA
ENSG00000201513	misc_RNA
ENSG00000202144	misc_RNA
ENSG00000201781	snRNA
ENSG00000201882	snoRNA
ENSG00000201592	snoRNA
ENSG00000200824	snRNA
ENSG00000199257	misc_RNA
ENSG00000201095	snRNA
ENSG00000202272	misc_RNA
ENSG00000201407	snoRNA
ENSG00000190958	snoRNA
ENSG00000200533	snoRNA
ENSG00000202346	snRNA
ENSG00000201172	misc_RNA
ENSG00000201666	snoRNA
ENSG00000201356	rRNA
ENSG00000200551	snRNA
ENSG00000200212	snRNA
ENSG00000192703	snRNA
ENSG00000201615	snRNA
ENSG00000201621	snRNA
ENSG00000200580	snRNA
ENSG00000200178	misc_RNA
ENSG00000202127	misc_RNA
ENSG00000201617	snRNA
ENSG00000199564	rRNA
ENSG00000200529	misc_RNA
ENSG00000202369	misc_RNA
ENSG00000200797	snRNA
ENSG00000200702	misc_RNA
ENSG00000192909	miRNA
ENSG00000199103	miRNA
ENSG00000193793	miRNA
ENSG00000199013	miRNA
ENSG00000199226	snRNA
ENSG00000199818	snRNA
ENSG00000201659	snRNA
ENSG00000201450	snRNA
ENSG00000199253	snoRNA
ENSG00000201517	snRNA
ENSG00000199662	rRNA
ENSG00000200282	snRNA
ENSG00000193859	snRNA
ENSG00000199628	snRNA
ENSG00000200870	snRNA
ENSG00000201341	snRNA
ENSG00000192212	miRNA
ENSG00000199185	miRNA
ENSG00000202495	misc_RNA

Ensembl designation	Type
ENSG00000202287	snRNA
ENSG00000200440	misc_RNA
ENSG00000199422	misc_RNA
ENSG00000194453	miRNA
ENSG00000199173	miRNA
ENSG00000193228	miRNA
ENSG00000198990	miRNA
ENSG00000201618	rRNA
ENSG00000201798	snRNA
ENSG00000202003	rRNA
ENSG00000200635	misc_RNA
ENSG00000191722	miRNA
ENSG00000199081	miRNA
ENSG00000200531	misc_RNA
ENSG00000200777	snRNA
ENSG00000194602	rRNA
ENSG00000201686	rRNA
ENSG00000200473	rRNA
ENSG00000201377	misc_RNA
ENSG00000200431	snRNA
ENSG00000199769	snoRNA
ENSG00000201392	snRNA
ENSG00000200104	misc_RNA
ENSG00000202168	snRNA
ENSG00000202482	snoRNA
ENSG00000201271	snRNA
ENSG00000202006	snRNA
ENSG00000199168	miRNA
ENSG00000199885	snRNA
ENSG00000202509	snRNA
ENSG00000199601	snRNA
ENSG00000201826	snRNA
ENSG00000201447	rRNA
ENSG00000200906	snRNA
ENSG00000199511	snRNA
ENSG00000202183	snoRNA
ENSG00000199051	miRNA
ENSG00000199567	misc_RNA
ENSG00000200422	snoRNA
ENSG00000202117	snRNA
ENSG00000200739	snRNA
ENSG00000200749	rRNA
ENSG00000202410	misc_RNA

Ensembl designation	Type
ENSG00000201567	rRNA
ENSG00000202359	misc_RNA
ENSG00000201893	snoRNA
ENSG00000202231	snoRNA
ENSG00000202024	snRNA
ENSG00000190513	snRNA
ENSG00000199952	snRNA
ENSG00000200662	misc_RNA
ENSG00000199353	snRNA
ENSG00000202407	misc_RNA
ENSG00000199832	misc_RNA
ENSG00000201445	misc_RNA
ENSG00000199249	misc_RNA
ENSG00000201443	snRNA
ENSG00000199296	misc_RNA
ENSG00000195963	snoRNA
ENSG00000201420	rRNA
ENSG00000200436	misc_RNA
ENSG00000201674	snoRNA
ENSG00000200697	snRNA
ENSG00000194124	snoRNA
ENSG00000199001	miRNA
ENSG00000200382	misc_RNA
ENSG00000199302	snRNA
ENSG00000199987	snRNA
ENSG00000200291	misc_RNA
ENSG00000199356	misc_RNA
ENSG00000193769	snRNA
ENSG00000200599	snRNA
ENSG00000199484	misc_RNA
ENSG00000189661	snoRNA
ENSG00000201982	snoRNA
ENSG00000201732	snRNA
ENSG00000201528	snRNA
ENSG00000195309	miRNA
ENSG00000199067	miRNA
ENSG00000201303	snRNA
ENSG00000199705	misc_RNA
ENSG00000201682	rRNA
ENSG00000200945	snRNA
ENSG00000201518	rRNA
ENSG00000202304	snRNA
ENSG00000200587	rRNA
ENSG00000201275	snRNA

Ensembl designation	Type
ENSG00000201603	snoRNA
ENSG00000202199	snRNA
ENSG00000201636	snRNA
ENSG00000200572	misc_RNA
ENSG00000191762	miRNA
ENSG00000198971	miRNA
ENSG00000191893	miRNA
ENSG00000199140	miRNA
ENSG00000199353	miRNA
ENSG00000192709	miRNA
ENSG00000199129	miRNA
ENSG00000199132	miRNA
ENSG00000199097	miRNA
ENSG00000199920	snRNA
ENSG00000199607	snRNA
ENSG00000201440	rRNA
ENSG00000199424	misc_RNA
ENSG00000202279	misc_RNA
ENSG00000193655	snoRNA
ENSG00000202267	snoRNA
ENSG00000200565	snoRNA
ENSG00000199198	snRNA
ENSG00000189759	snRNA
ENSG00000201250	snRNA
ENSG00000201000	rRNA
ENSG00000202473	misc_RNA
ENSG00000199878	misc_RNA
ENSG00000201912	misc_RNA
ENSG00000201594	rRNA
ENSG00000202051	snRNA
ENSG00000201285	rRNA
ENSG00000192246	miRNA
ENSG00000199111	miRNA
ENSG00000194065	miRNA
ENSG00000199052	miRNA
ENSG00000191622	miRNA
ENSG00000199136	miRNA
ENSG00000201402	snoRNA
ENSG00000190937	snoRNA
ENSG00000200946	snoRNA
ENSG00000195123	snoRNA
ENSG00000202307	snoRNA

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