Ultraviolet Protection Factor (UPF) Testing

ARPANSA has operated an Ultraviolet Protection Factor (UPF) Testing Service since 1990. UPF testing is done in accordance with Australian Standard AS/NZS4399:1996 and the testing service is NATA accredited.

Sample size:
The preferred sample size is one metre by half a metre of fabric. The smallest sample size ARPANSA accepts is 200mm x 300mm (about A4 paper size). Garments and other products can also be tested but will be cut during the sampling process.

Turnaround time:
Testing is performed within ten working days, usually less depending on laboratory workload.

Payments:
ARPANSA requests payment in advance on the first occasion a company uses the UPF Testing Service. Subsequent testing will be invoiced after the testing is carried out.

A request form for UPF testing, a schedule of UPF testing charges, details of making payments to ARPANSA and a sample UPF report are attached.

Please send samples and address any questions about Ultraviolet Protection Factor testing to:

ARPANSA UPF Testing Service
619 Lower Plenty Road
Yallambie VIC 3085
AUSTRALIA

Phone: +61 3 9433 2309
Fax: +61 3 9433 2223
E-mail: upf-testing@arpansa.gov.au

Note that it is a condition of the provision of test results that you do not use the name of ARPANSA or the Commonwealth of Australia, or any words, marks or devices which may imply a connection with ARPANSA or the Commonwealth of Australia, in connection with the promotion or sale of your products, unless ARPANSA has given express written authority to do so. Test reports may only be reproduced in full and without alteration.
## UPF Testing Request

<table>
<thead>
<tr>
<th>Company Name:</th>
<th>ARPANS Job Code:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name and Position:</td>
<td>Order No:</td>
</tr>
<tr>
<td>Address for Report:</td>
<td></td>
</tr>
<tr>
<td>Address for Invoice:</td>
<td>Send invoice by email (PDF).</td>
</tr>
<tr>
<td></td>
<td>Send invoice by post (hardcopy).</td>
</tr>
<tr>
<td>Telephone Number:</td>
<td>Fax Number:</td>
</tr>
<tr>
<td>Email Address:</td>
<td></td>
</tr>
</tbody>
</table>

I hereby authorise the Australian Radiation Protection and Nuclear Safety Agency (ARPANSA) to conduct ultraviolet transmission testing of the materials described below. I have read and agree to abide by the attached Terms & Conditions for Service and Conditions for Test Samples.

<table>
<thead>
<tr>
<th>Sample No.</th>
<th>Sample Description</th>
<th>Batch Number</th>
<th>Evaluate as</th>
<th>Express Test</th>
<th>Retest (Report Number)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Whole Product</td>
<td>Separate Fabrics</td>
<td></td>
</tr>
</tbody>
</table>

### ARPANSA UPF Testing Service

<table>
<thead>
<tr>
<th>E-mail:</th>
<th>Phone:</th>
<th>Fax:</th>
<th>Web:</th>
<th>NATA Accredited:</th>
</tr>
</thead>
<tbody>
<tr>
<td><a href="mailto:upf-testing@arpansa.gov.au">upf-testing@arpansa.gov.au</a></td>
<td>+613 9433 2309</td>
<td>+613 9433 2223</td>
<td><a href="http://www.arpansa.gov.au/uv">http://www.arpansa.gov.au/uv</a></td>
<td>Laboratory 14442</td>
</tr>
</tbody>
</table>
Please read these Terms and Conditions carefully as they specify the basis of the Agreement under which the Service is provided by the Client by the Commonwealth of Australia through the CEO of ARPANSA.

1. Our responsibilities
1.1 ARPANSA shall provide the Service in accordance with this Agreement.

2. Your responsibilities
2.1 The Client shall read this Agreement carefully and ensure compliance with its Terms and Conditions including ensuring that payment is made for the Service provided within the prescribed times.

3. Definitions
3.1 For the purposes of this Agreement the following definitions apply:
- ARPANSA – the Commonwealth of Australia acting through the Australian Radiation Protection and Nuclear Safety Agency
- ARPANSA Act – the Australian Radiation Protection and Nuclear Safety Act 1998

4. Parties
4.1 The parties to this Agreement are the Client and ARPANSA.

5. Conditions
5.1 ARPANSA shall provide the Service in accordance with the terms and conditions that are described in the Quotation quoted Price – the price quoted by ARPANSA for providing the Service that is described in the Quotation Quotation – the document containing the Quoted Price for providing the Service under this Agreement signed by the Client by way of acceptance Terms and Conditions – the terms and conditions which form this Agreement and are the basis upon which the Services under this Agreement are provided. Schedule of Charges – the prescribed price lists for Services provided by ARPANSA Service – the Service provided by ARPANSA under this Agreement as described in the Quotation or Service Request Form Service Request Form – the document completed by the Client detailing the Services requested from ARPANSA.

6. Special Conditions
6.1 Provision of the Service may also be subject to Special Conditions that are outlined in the Quotation document, Service Request Form or noted at the end of this Agreement and which are expressed to be in addition to the Terms and Conditions set out in this Agreement by ARPANSA.

7. Quotations
7.1 Where ARPANSA provides a Quotation for the Service, the Quoted Price is valid for acceptance for 30 days from the date of that Quotation unless stated otherwise.

8. Prices
8.1 The price for the provision of the Service is that contained in the Quotation sent by ARPANSA and accepted in writing by the Client or in the prescribed Schedule of Charges for the Service. Schedule of Charges may be varied from time to time. Services already commenced will not be affected by a price change. Services which have not already commenced will be subject to any price change noted on the ARPANSA web site. The Client must pay all freight, transport or postage charges in connection with any equipment, device or material furnished to ARPANSA in connection with the Services. The charges for the Services will be in Australian dollars and payment must be made in Australian dollars.

9. Terms of Payment
9.1 ARPANSA is liable for GST under the GST Act subject to the current Schedule 1 of A New Tax System (Goods & Services Tax) (Exempt Taxes, Fees & Charges) Determination. Unless otherwise stated, all prices for Services under this Agreement will be inclusive of GST and payable by the Client. 9.2 ARPANSA agrees to issue the Client with a tax invoice in relation to taxable supplies made under this Agreement.

10. Time for payment
10.1 The Client shall pay all charges under this Agreement by the due date specified on the invoice. 10.2 ARPANSA reserves the right to discontinue provision of the Service where invoices remain outstanding for a period of 60 days from the date specified on the invoice. 10.3 All monies owing under this Agreement are debts due and payable to the Commonwealth of Australia and may be recovered in a court of competent jurisdiction.

11. Jurisdiction and applicable law
11.1 The laws of the State of Victoria in Australia govern this Agreement. 11.2 Warranties 11.2.1 ARPANSA excludes any statutory warranties or implied terms to the extent legally permitted in respect of the Service. 11.2.2 ARPANSA warrants that the Service is of merchantable quality within the meaning of the Competition and Consumer Act 2010. 11.3 ARPANSA takes all reasonable care to ensure an accurate and cost effective Service is provided to the Client under these terms. However, all warranties under this Agreement are subject to the Client following ARPANSA’s instructions or subject to any limitations expressed by ARPANSA in relation to the provision of the Service. 11.4 In any case:
- (a) ARPANSA is not liable to the Client for any direct, indirect or consequential loss or damage arising out of its performance or non-performance of its obligations under this Agreement or from any cancellation of the Agreement or from any negligence, misrepresentation or other act or omission on the part of ARPANSA its servants, agents or contractors. (b) Notwithstanding the previous clause, ARPANSA’s liability to the Client, however it may arise, will not exceed, in aggregate, the amount payable by the Client under these terms. (c) ARPANSA will not be liable for any damage, loss or injury suffered by the Client due to the Client in any way using or relying upon the Service, including information supplied to the Client, and the Client shall indemnify ARPANSA against any liability incurred by ARPANSA arising from ARPANSA endeavouring to complete the Service, or from the use or reliance on the Service by the Client.

12. Termination
12.1 The Agreement shall terminate:
- (a) on completion of the Service and payment of all monies owing by the Client under this Agreement; (b) on mutual agreement of the parties that has not been reduced to writing and signed by both parties; or (c) at the discretion of ARPANSA, including but not limited to, if the Client commits any act of bankruptcy, enters into any composition with the Client’s creditors or (in the case of a company) does any act which would render it liable to be liquidated, or if a receiver or liquidator is appointed over the assets of the Client.

13. Intellectual property
13.1 Notwithstanding any other provision of the Agreement, and unless otherwise agreed in writing prior to entry into the Agreement, all intellectual property rights arising from or developed in the course of ARPANSA performing its obligations under the Agreement shall vest or remain with the Commonwealth for its sole and unrestricted use and benefit.

14. No assignment
14.1 The Client may not assign any of the Client’s rights or obligations under the Agreement without prior written consent of ARPANSA.

15. Waiver
15.1 A party’s failure or delay to exercise a power or right does not operate as a waiver of the power or right. A waiver is not effective unless in writing.

16. Conflicts of interest
16.1 As required by law or statutory obligation, ARPANSA reserves the right to disclose data or information obtained through the provision of the Service. ARPANSA reserves the right to immediately cease provision of the Service where a conflict of interest arises between ARPANSA and the Client or between the provision of the Service and the CEO’s obligations under the ARPANSA Act (as determined by the CEO’s absolute discretion).

17. Reservations
ARPANSA reserves the right to decline to provide the Service to any person or Client at its absolute discretion.

Special Conditions for Testing Samples – UPF

For UPF Testing Service work the Terms and Conditions are subject to the following Special Conditions:

1. Samples to be tested should be a minimum of one metre by half a metre in size or larger. Garments will be cut up for testing.
2. Samples submitted to ARPANSA for testing become the property of ARPANSA and may be disposed of at any time after a test report is issued without reference to the Client.
3. Test reports prepared by ARPANSA may only be reproduced in full and without alteration.
4. Test reports prepared by ARPANSA may not be used in any form of advertising without written approval from ARPANSA.
5. The name of ARPANSA or the Commonwealth of Australia or any words, marks or devices which may imply a connection with ARPANSA or the Commonwealth of Australia may not be used in connection with the promotion or sale of the Client’s products without the prior written approval of ARPANSA.

6. No use of the UPF Certification Trade Mark for any purposes is permitted unless the user has a current UPF Certification Trade Mark Licence Agreement with ARPANSA.

7. Express testing (faster results) attracts an additional charge of 50% of the standard testing charge.
8. Multi-colour (printed) materials are charged as a single test.
9. For garments (or other products) consisting of two or more different materials or colours:
- (a) If a test report is required for each component material then each different colour or material is charged as a separate test.
- (b) If the product is to be evaluated as a whole product, each component material is checked to determine which one has the lowest UPF rating, then a comprehensive test report is issued for the lowest rating material.
Use of the UPF Certification Trade Mark and the ARPANSA name

You are not permitted to use the UPF Certification Trade Mark without written permission from ARPANSA for all instances of use unless you are licensed by ARPANSA to do so.

If ARPANSA has tested your company’s products, in general you can make factual and verifiable statements in connection with ARPANSA and your products. For example if ARPANSA has tested a product and assigned a UPF rating then statements such as "Product tested by ARPANSA" or "UPF rating by ARPANSA" would be acceptable. ARPANSA is a Commonwealth Government Agency and does not promote or endorse any company’s products so you may not make statements or inferences to that effect.

You must not make or infer any association between ARPANSA and any products that have not specifically been tested by ARPANSA. For example if only part of a product range or colour range has been tested by ARPANSA then statements cannot be made that associate ARPANSA with all the products or colours.

Due to variations in UPF ratings between different batches of fabrics and between similar specification fabrics from different suppliers ARPANSA considers that twelve months is the limit for associating its name with materials and products tested by ARPANSA unless subsequent testing of those products is undertaken.

ARPANSA monitors usage of its name in association with commercial products and companies making claims that refer to ARPANSA may be asked to substantiate those claims.

UPF Certification Trade Mark Administration
ARPANSA
619 Lower Plenty Road
Yallambie VIC 3085

upf-trademark@arpansa.gov.au
Schedule of testing charges for

Ultraviolet Protection Factor (UPF) Testing

Effective from 24th January 2014

ARPANSA operates a service for measuring the Ultraviolet Protection Factor (UPF) rating of sun protective materials. UPF testing is performed according to Australian Standard AS/NZS4399. UPF testing request forms are available from the ARPANSA UPF Testing Service, upf-testing@arpansa.gov.au or from the ARPANSA UV Services web page, http://www.arpansa.gov.au/services/upf/index.cfm.

The preferred sample size is one meter by half a meter of each fabric or larger. ARPANSA may reject samples that are too small to be tested effectively. Garments and other finished products may also be submitted for testing but will be cut during the testing process and cannot be returned. Due to the added time and complexity of evaluating hats and garments with multiple colours, or made from several different fabrics, there is a slightly higher charge for testing these products.

To obtain meaningful UPF results it is essential that samples sent for UPF testing are representative of the bulk material. Due to manufacturing variations, UPF results for one batch of material may not apply to different batches of the same material.

The Australian/New Zealand standard for sun protective clothing, AS/NZS 4399 Sun protective clothing – Evaluation and classification, specifies certain requirements for test reports. These include adequate descriptions of the fabric type and colour of the material tested. ARPANSA cannot issue an AS/NZS4399-compliant report unless adequate descriptions are supplied with samples.

Samples are processed in order of receipt. If you need results more urgently an additional Express Testing fee of 50% of the standard charge may apply to each sample that requires priority testing.

Schedule of charges for Ultraviolet Protection Factor (UPF) testing

<table>
<thead>
<tr>
<th>Type of Sample</th>
<th>Number of Samples</th>
<th>Cost per sample including Australian GST</th>
<th>Cost per sample excluding Australian GST</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fabrics and single colour garments</td>
<td>1 to 10</td>
<td>$125.00</td>
<td>$113.64</td>
</tr>
<tr>
<td></td>
<td>More than 10</td>
<td>$105.00</td>
<td>$95.45</td>
</tr>
<tr>
<td>Hats, Caps and Multicolour Garments</td>
<td>1 to 10</td>
<td>$135.00</td>
<td>$122.73</td>
</tr>
<tr>
<td></td>
<td>More than 10</td>
<td>$115.00</td>
<td>$104.55</td>
</tr>
</tbody>
</table>

Prices are in Australian dollars. Australian companies pay the charges in the column that includes Australian GST. Non-Australian companies pay the charges in the column that excludes Australian GST. Payment is in Australian dollars, either by bank cheque made out to "ARPANSA", by electronic funds transfer (EFT) or by credit card (VISA, MasterCard or Bankcard) up to $2,000.

Notes for licensees of the UPF Certification Trade Mark

Fabrics tested at ARPANSA will be automatically added to your licence agreement unless you indicate otherwise. UPF test reports performed on samples that are less than 200mm x 300mm in size may not be accepted for use in the UPF Certification Scheme.
Ultraviolet Protection Factor Testing Service

Payment policy

ARPANSA requests payment in advance on the first occasion a company uses the UPF testing service. Acceptable methods of payment are:

1. ARPANSA accepts bank cheques in Australian dollars made payable to "ARPANSA".

2. EFT (t/t) payments are accepted. Bank details for EFT payments can be supplied on request.

3. ARPANSA also accepts most credit cards, except Diners and Amex. Note that currently the credit card facility can only be used for payment of existing invoices. If you wish to pay by credit card, an invoice can be generated at your request.

There is further information about methods of paying accounts on the ARPANSA web site at http://www.arpansa.gov.au/AboutUs/payment.cfm
## ARPANSA Bank Account Details

<table>
<thead>
<tr>
<th>Company Name</th>
<th>Australian Radiation Protection and Nuclear Safety Agency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Company Address</td>
<td>619 Lower Plenty Road Yallambie VIC 3085 Australia</td>
</tr>
<tr>
<td>ARPANSA Contact</td>
<td>Accounts Receivable</td>
</tr>
<tr>
<td>E-mail Address</td>
<td><a href="mailto:accounts@arpansa.gov.au">accounts@arpansa.gov.au</a></td>
</tr>
<tr>
<td>Telephone Number</td>
<td>(03) 9433 2211</td>
</tr>
<tr>
<td>Fax Number</td>
<td>(03) 9432 1835</td>
</tr>
<tr>
<td>Bank Name</td>
<td>Reserve Bank of Australia</td>
</tr>
<tr>
<td>Bank Address</td>
<td>London Circuit Canberra City ACT</td>
</tr>
<tr>
<td>Bank BSB Number</td>
<td>092 009</td>
</tr>
<tr>
<td>Bank Account Number</td>
<td>11273-8</td>
</tr>
<tr>
<td>Bank Account Name</td>
<td>ARPANSA Official Departmental Account</td>
</tr>
<tr>
<td>ABN</td>
<td>61 321 195 155</td>
</tr>
<tr>
<td>SWIFT Address</td>
<td>R S B K AU 2 S</td>
</tr>
</tbody>
</table>

### NOTES:

Please quote the invoice number on remittance advice to ensure correct allocation of payments.

Please notify ARPANSA accounts by fax +613 9432 1835 or email accounts@arpansa.gov.au that you have made a transaction.

An additional processing fee of AUD$20 applies to all overseas EFT payments.
Credit Card Payment Form

Dear Customer,

If you would like to pay ARPANSA by credit card, please complete this form and return by either mail or fax.

Customer and Invoice details

a) Please provide the following information for our reference:

| ARPANSA Tax Invoice Number: ARI |
| ARPANSA Customer Number:       |
| Customer Name:                 |
| Invoice Amount:                |

Credit cardholder details

b) For payment by Credit Card please complete this section with your credit card details:

Please Note: ARPANSA accepts Credit Card payments of up to a MAXIMUM of $2,000 only. Please use another payment method for anything over $2,000.

<table>
<thead>
<tr>
<th>Card Number:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name shown on card:</td>
</tr>
<tr>
<td>Payment Amount:</td>
</tr>
<tr>
<td>Expiry Date:</td>
</tr>
<tr>
<td>E-mail address of Cardholder:</td>
</tr>
<tr>
<td>Daytime Contact number:</td>
</tr>
<tr>
<td>Cardholder Signature:</td>
</tr>
</tbody>
</table>

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Visa</td>
<td>MasterCard</td>
</tr>
</tbody>
</table>

c) Send this form with the ARPANSA remittance advice to:

ARPANSA   619 Lower Plenty Rd, Yallambie VIC 3085

Phone: (03) 9433 2211   Fax: (03) 9432 1835   Email: accounts@arpansa.gov.au
Disclaimer

This fabric is effective as protection against solar ultraviolet radiation (UVR) as it has an ultraviolet protection factor (UPF) greater than 15. A material with a rating of UPF 15 reduces the amount of solar UVR by a factor of 15.

A UPF rating of 50+ qualifies this fabric for the UPF Excellent protection category. The assigned UPF rating of 50+ may be quoted for advertising purposes.

The UPF rating is for the material only and does not address the design of the product.

Review of Results

This fabric is effective as protection against solar ultraviolet radiation (UVR) as it has an ultraviolet protection factor (UPF) greater than 15. A material with a rating of UPF 15 reduces the amount of solar UVR by a factor of 15.

A UPF rating of 50+ qualifies this fabric for the UPF Excellent protection category. The assigned UPF rating of 50+ may be quoted for advertising purposes.

The UPF rating is for the material only and does not address the design of the product.

Material Sample

Unless otherwise stated the sample was tested unstretched and dry. This report has been prepared in accordance with standard AS/NZS4399: 1996 - Sun protective clothing - Evaluation and classification, Appendix A. The solar spectrum described in table B2 of this standard was used to calculate the protection factor results. The results in this report are applicable to the sample tested and may not apply to other batches of the same material or similar materials. The sample testing was performed within a temperature range of 20±5 degrees Celsius and a humidity range of 50±20% relative humidity. It is a condition of the provision of these test results that you do not use the name of the Australian Radiation Protection and Nuclear Safety Agency (ARPANSA) or the Commonwealth of Australia, or any words, marks or devices which may imply a connection with ARPANSA or the Commonwealth of Australia, in connection with the promotion or sale of your products, unless the ARPANSA has given express written authority to do so. This test report may only be reproduced in full and without alteration.

NIR-UPF-FORM-0200D-R7-11/10/2013

ANZAC Day: 25 April 2013

Australia Day: 26 January 2013

Ultraviolet Protection Factor Report

Analysed for: Fabric Testing Company

ARPANSA Reference: 9999-12

Customer Reference: 19

Sample Information

Sample Type: Cotton/Viscose

Analysis Date: 23/10/2013

Description: Orange, 170gsm 50%/50% Cotton/Viscose, Batch 0042

Sample Colour: Orange

Instrumentation: Labsphere UV-1000F s/n 5239

Protection Factor Results

Number of Specimens Analysed: 8

Mean UVB Transmittance: 0.012

Mean UVA Transmittance: 0.014

Mean UPF: 81

Standard Deviation: 8.9

Standard Error of the Mean: 11

Rated UPF: 50+

Protection Category: Excellent

UV Transmittance Characteristics

Statistical Uncertainties

Total Measurement Uncertainty: 11

Coverage Factor (99% confidence): 3.50

The maximum instrumental contribution to the uncertainty in the transmittance values used to calculate the results is 0.0006 at the 99% confidence level.

NATA Accredited Laboratory

Number: 14442

Accredited for compliance with ISO/IEC 17025. The results of the tests, calibrations and/or measurements included in this document are traceable to Australian/national standards of measurement.

619 Lower Plenty Road
Yallambie, Victoria 3085
Phone: +61 3 9433 2309
Fax: +61 3 9433 2223
E-mail: upf-testing@arpansa.gov.au
Web: http://www.arpansa.gov.au

Shirley Hinton - Technician

Alan McLennan - NATA Signatory

23/10/2013

23/10/2013

Page 1 of 1
Explanatory notes for Ultraviolet Protection Factor (UPF) reports

At ARPANSA, UPF testing is carried out in accordance with Australian Standard AS/NZS4399:1996 Sun protective clothing – Evaluation and classification. The ARPANSA UPF Testing Service is a NATA-accredited laboratory. These notes are intended as a guide to interpretation of ARPANSA UPF test reports. Each major heading corresponds to a section of the UPF report. Beneath each heading is a brief explanation of the important information presented in that section of the report. The Additional Information section defines some terms that may appear on UPF test reports and provides extra information that may be useful when interpreting reports.

An important note about sampling
The results reflect the sample tested by the laboratory. In order to achieve meaningful results, the sample tested must be representative of the material that is being used to make the products. Many materials show significant batch to batch variation in UPF rating and materials of similar specification from different manufacturers can show large variations. To ensure products are correctly labelled with a UPF rating the material tested should be the actual production material.

If you have any questions about ARPANSA UPF test reports please contact the ARPANSA UPF Testing Service on +61 3 9433 2211, or at upf-testing@arpansa.gov.au.

Client Information
Analysed for: The name of the client that the analysis was performed for.

ARPANSA Reference: A unique code identifying this test report. Please quote this code if there are any questions about the test report.

Sample Information
Description: Description of the sample analysed. Includes the material colour and type and any other relevant information provided such as manufacturer, quality, batch and weight. The weight (mass) of the test sample is measured and reported here, if applicable. Weights are reported in grams per square metre (gsm) and are reported to an accuracy of ± 1 gram. The weight reported is typically the mean of eight of more sample weighings.

Sample Type: AS/NZS4399 requires that the material type be reported.

Sample Colour: AS/NZS4399 requires that the material colour be reported.

Analysis Date: The date the sample was tested.

Instrumentation: The type of instrument used to perform the analysis.

UV Transmittance Characteristics
The graph shows the average of the measured transmittances.

Protection Factor Results
Number of Specimens Analysed: This shows how many UPF measurements (or scans) were made on the test sample. For variable samples more scans may be performed.

Mean UVB Transmittance: This is the average UVB radiation passing through the test specimens.

Mean UVA Transmittance: This is the average UVA radiation passing through the test specimens.

Mean UPF: The mean UPF is the average of the UPF values of each specimen analysed.

Standard Deviation: This indicates how much variation in UPF rating there is across the surface of the material.

Standard Error of the Mean: This is the Standard Deviation adjusted for the number of specimens analysed.

Rated UPF: This is the UPF rating assigned to the material tested. Ranges from 15 to 50, and 50+.

Protection Category: This is the Protection Category assigned to the material tested. May be Good protection, Very good protection or Excellent protection.
**Statistical Uncertainties**

**Total Measurement Uncertainty:** This is a measure of the total uncertainty in the analysis and is equivalent to the Standard Error of the Mean.

**Coverage factor (99% confidence):** Known as t-variate in AS/NZS4399. This is a statistical value used in calculation of the Standard Error of the Mean, calculated at the 99% confidence level.

**Review of Results**

In this section the effectiveness of the material for sun protection is described. There may also be observations about the test samples, test results or products tested.

**Material Sample**

For positive identification, a sample of the material tested, or an image of the product, is attached to the report, if applicable.

**Signatures**

Every page of the report is signed by the technician who performed the analysis and by an ARPANSA or NATA signatory.

**Additional Information**

**UVA:** Ultraviolet radiation in the region 315 nanometres to 400 nanometres.

**UVB:** Ultraviolet radiation in the region 290 nanometres to 315 nanometres.

**How UPF ratings are calculated:**

1. The transmission of ultraviolet through the material is determined using a calibrated ultraviolet transmission analyser. Measurements are made on at least four specimens.
2. The UPF result for each measurement is calculated.
3. The separate UPF values are averaged to determine the mean UPF.
4. The standard deviation is calculated.
5. The standard error is calculated.
6. The standard error is subtracted from the mean UPF.
7. This value is rounded down to the nearest multiple of five to determine the reported UPF rating. The UPF rating also determines the Protection Category assigned to the material.

**UPF rating - rounding down:** The calculated UPF value (or the lowest measured value) is rounded down to the nearest multiple of five to give the reported UPF rating. One effect of this is that materials actually need to achieve a calculated UPF value of 55 or higher in order to be classified as UPF 50+.

**Reporting of high results:** If the calculated UPF rating is over 300 then ARPANSA reports it as “>300” (greater than 300). In this case the Standard Deviation and Standard Error are not applicable and are not reported.

**Transmittance vs. Transmission:** AS/NZS4399 stipulates that UVA and UVB radiation passing through the test sample is reported as transmittance. The transmittance scale is from 0 to 1. A more familiar unit is transmission which has a scale from 0% to 100%. To convert from transmittance to transmission, multiply the transmittance value by 100.

For further information about sun protection, sun protective materials and Ultraviolet Protection Factor testing, refer to http://www.arpansa.gov.au/services/upf/index.cfm

ARPANSA Ultraviolet Protection Factor Testing Service 2005
How do we know how much UVR there is in Australia?
ARPANSA maintains a network of UVR detectors in all major Australian population centres. The latest UVR levels are continually displayed on the ARPANSA web site. The intensity of UVR varies throughout the day and is highest around noon (1PM during daylight saving time). UVR levels can be predicted for clear sky days using a computer model. Local atmospheric effects such as cloud, smoke, smog and ozone levels affect the amount of UVR reaching the ground.

What other UVR information is available from ARPANSA?
ARPANSA publishes The Resource Guide for UV Protective Products that lists sources of UPF rated fabrics, clothing and other UVR protective products and hard copies are available free of charge from ARPANSA. The latest version is on the ARPANSA web site.

Where can I get more information about UVR protection?
Most state cancer councils, ARPANSA and other scientific organisations produce a range of publications on radiation related matters. The table below lists some useful sources of information about UVR.

<table>
<thead>
<tr>
<th>Information Source</th>
<th>Internet Link</th>
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</thead>
<tbody>
<tr>
<td>Australian Academy of Science</td>
<td><a href="http://www.science.org.au/nova/008/008key.htm">http://www.science.org.au/nova/008/008key.htm</a></td>
</tr>
<tr>
<td>New Zealand UV measurements</td>
<td><a href="http://www.niwa.co.nz/our-services/online-services/uv-and-ozone">http://www.niwa.co.nz/our-services/online-services/uv-and-ozone</a></td>
</tr>
<tr>
<td>Skin Cancer Fact Sheets</td>
<td><a href="http://www.skincancer.gov.au">http://www.skincancer.gov.au</a></td>
</tr>
</tbody>
</table>

Why is it important to protect our skin from the sun?
Australia has the highest incidence of skin cancers in the world due to UVR exposure. Every year over three hundred thousand new cases of skin cancer are diagnosed and treated. Over fifteen hundred Australians die each year from skin cancer. Wearing well-designed sun protective clothing is an easy and effective way of reducing the UVR exposure to our skin. A UPF rating label on clothing shows that the fabric has been tested and how much sun protection it provides. Look for garments that have good body coverage. Remember that a garment can only protect the skin it covers. For complete protection apply sunscreen to exposed areas of skin, wear a broad-brimmed hat and wrap-around sunglasses. When outdoors, seek shade at times when UVR is intense.
ULTRAVIOLET RADIATION AND CLOTHING

What is ultraviolet radiation?
The sun emits many types of radiation. At the earth’s surface we receive mostly visible radiation (light) and infrared radiation (heat). Ultraviolet radiation (UVR) is also present but we cannot see it or feel it. Ozone in the atmosphere absorbs much of the UVR before it reaches the ground but we can still receive enough to cause sunburn as well as more serious health problems.

Why is UVR dangerous?
Exposure to UVR can cause not only sunburn but also lasting skin and eye damage. This may result in premature skin ageing, skin cancers and eye disorders such as cataracts.

Due to Australia’s geographical location our country receives high levels of UVR. Relatively clear skies and poor use of sun protection measures during outdoor work and leisure means that our mainly fair-skinned population has a high exposure to UVR. Australians have the highest rate of skin cancer in the world. The risk of a person eventually developing skin cancer is related to the amount of UVR they are exposed to over their lifetime, particularly in childhood.

How can you protect yourself from UVR?

- Avoid going outdoors in the middle of the day (10am to 2pm) when the sun is highest (11am to 3pm during daylight saving). This practice can dramatically reduce your UVR exposure.
- When outdoors, choose shaded areas where you cannot directly see the sun or the open sky.
- Wear well designed clothing that covers the arms, legs and neck as well as the body and offers good sun protection.
- Wear a broad-brimmed hat which shades the face, ears and back of the neck.
- Wear wraparound sunglasses when outdoors.
- Apply SPF 30+ broad spectrum, water resistant sunscreen to the face and all areas of the body that are not covered by clothing. Reapply ample sunscreen every two hours and after swimming or activities that cause heavy perspiration, as sunscreens can wear off. Sunscreen should not be used to extend the time you spend in the sun.

Young children do not understand the dangers of UVR. Be a role model so they learn good sun sense and protect them with shade, suitable clothing, hats, sunglasses, and sunscreen. Well designed sun protective clothing is available in children’s sizes.

What does a UPF rating mean?
In Australia on clear summer days people with unprotected fair skin can receive enough UVR to exceed recommended exposure limits and cause a sunburn in about fifteen minutes. If their skin is covered with a garment, the UVR exposure they receive will be significantly reduced.

For example, wearing a well designed garment with a UPF rating of 40 will reduce solar UVR exposure to the skin beneath the garment by a factor of 40. This means a UPF 40 fabric will only allow one fortieth of the UVR to pass through it.

The aim of sun protective clothing is to reduce a person’s UVR exposure.

What affects the UPF rating of a fabric?
- Different fabrics such as cotton or polyester have different UVR absorbing properties.
- Less UVR passes through tightly woven or knitted fabrics than loosely woven or knitted fabrics.
- Darker colours usually block more UVR than lighter colours.
- Heavier weight fabrics usually block more UVR than light weight fabrics of the same type.
- Garments that are overstretched, wet or worn out may have reduced UVR protection. Follow the care instructions attached to the garment.

Remember that the UPF rating is for the material only and does not address the design of the product. Garments can only protect the areas of skin that are covered by the material.

How can you choose effective sun protective garments?
The UPF rating on many garments indicates clearly how good the fabric is at blocking UVR but the design of the garment also needs to be considered. Shirts with long sleeves and high collars and hats that shade the face and protect the back of the neck and ears are most effective. Loose fitting clothing is usually more protective than tight fitting clothing.

Where can you purchase sun protective garments?
Many state cancer councils, department stores, children’s stores and sports stores stock UPF rated garments. The ARPANSA UV Resource Guide web site also lists some suppliers.

What is the Standard for Sun Protective Clothing?
Published in July 1996, AS/NZS 4399, Sun protective clothing - Evaluation and classification describes standard laboratory procedures for measuring the UPF of fabrics and for labelling UPF rated clothing. Fabrics are assigned a UPF rating number and also a protection category depending on how much UVR they block out. This table shows the rating system.

<table>
<thead>
<tr>
<th>UPF Rating</th>
<th>Protection category</th>
<th>% UVR blocked</th>
</tr>
</thead>
<tbody>
<tr>
<td>15, 20</td>
<td>Good</td>
<td>93.3 to 95.9</td>
</tr>
<tr>
<td>25, 30, 35</td>
<td>Very good</td>
<td>96.0 to 97.4</td>
</tr>
<tr>
<td>40, 45, 50, 50+</td>
<td>Excellent</td>
<td>97.5 or more</td>
</tr>
</tbody>
</table>

The Australian/New Zealand Standard states that the highest numerical UPF rating that garments may be labelled with is 50. Garments made from fabrics with ratings higher than 50 are labelled as UPF 50+.

What is the ARPANSA UPF Certification Scheme?
This was developed by ARPANSA (formerly the Australian Radiation Laboratory) to guide purchasers of sun protective clothing. Garments made from fabrics tested by ARPANSA may be labelled with a tag showing the garment’s UPF rating which assures consumers of the protective ability of the fabric.

ARPANSA operates a testing service for sun protective clothing and can also provide UPF labels to garment manufacturers.

Since 1992 ARPANSA has issued over 50 million UPF rating tags for labelling sun protective products.