

Sun shade structures from BBC Plymouth (Andrew Brown)

August 2006

Ultraviolet Protection Factor (UPF): background

UPF definition

UPF (Ultraviolet Protection Factor) - how much the effect of solar UVR is reduced when passing through *fabric* of clothing



$$UPF = \frac{\sum_{\lambda=290}^{\lambda=400} E(\lambda) \varepsilon(\lambda) \Delta\lambda}{\sum_{\lambda=290}^{\lambda=400} E(\lambda) T(\lambda) \varepsilon(\lambda) \Delta\lambda}$$

$E(\lambda)$ - spectral irradiance of terrestrial sunlight

$\varepsilon(\lambda)$ - erythema action spectrum

$T(\lambda)$ - spectral transmittance

UPF: important to know



- Not simply a transmittance of fabric: takes into account that different wavelengths of UVR spectrum have different effects on human skin
- *Defined for fabrics, not garments*
- Similar to SPF for sunscreens
- Measured in 290 - 400 nm spectral range: naked eye doesn't see it
- UVA - UVR between 315 nm and 400 nm
- UVB - UVR between 280 nm and 315 nm
- UPF (and SPF) is, mainly, characteristic of UVB protection of material but UVA also has adverse health effect
- UPF15 recommended by Cancer Research UK as a minimum protection level
- Fabrics are tested according to British Standard BS EN 13758-1: 2002 "Textiles – Solar UV protective properties"

Good UVR protection: high UPF (>15) AND low UVA transmittance
Fabric should cover skin

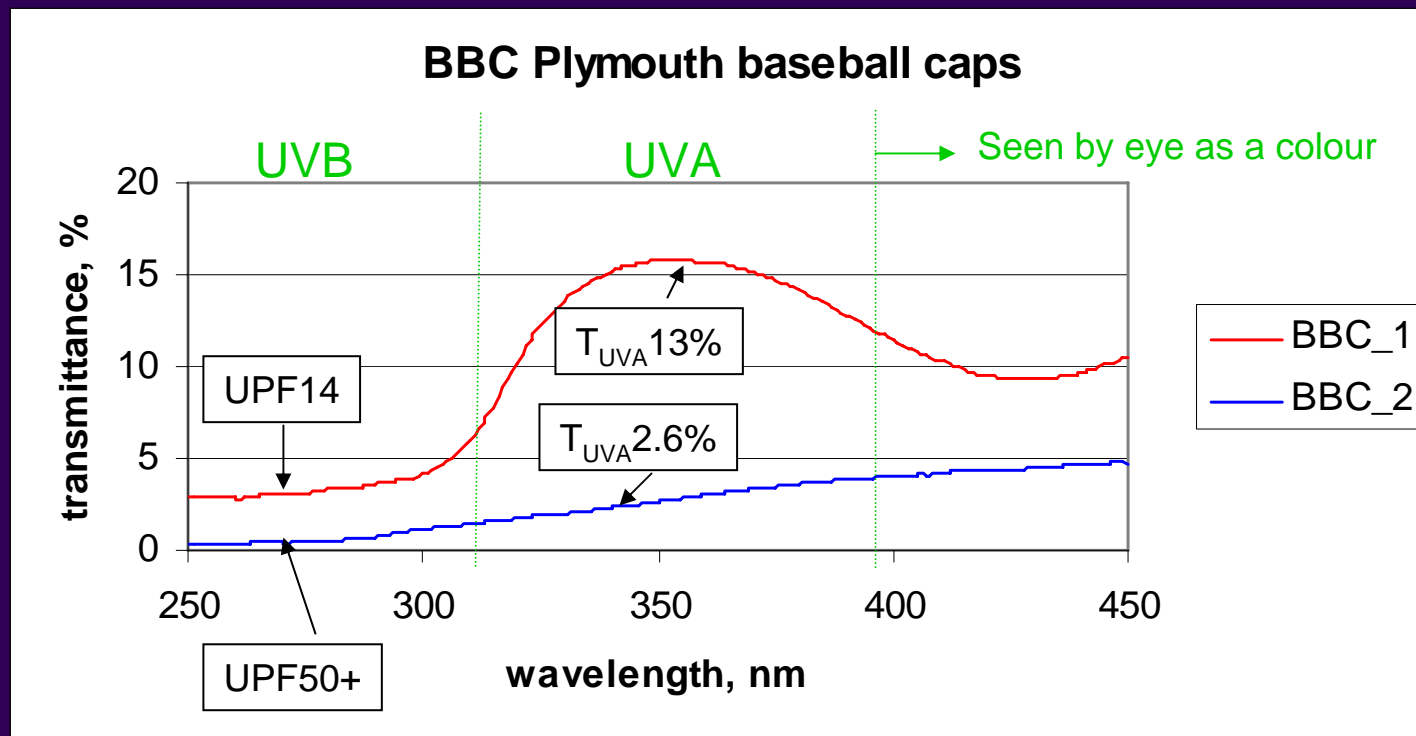
UPF test results

Tested samples



| Sample No | Description | Retailer | Price | Fabric UPF | T _{UVA} av, % |
|-----------|--|-----------------------|--------------------|-----------------------|---------------------------|
| BBC_1 | Yellow baseball cap | Mothercare | £6.00 (sale £3.00) | 14 | 13.0 |
| BBC_2 | Grey Urban Beach baseball cap | Osprey | £3.99 | 65 | 2.6 |
| BBC_3 | White Compact parasol | Mothercare | | 16 | 8.5 |
| BBC_4 | Pink with black trim Sun Parasol | Baby Club | £9.99 | 15 | 14.5 |
| BBC_5 | Fucshia Beach/Garden Umbrella with adjustable tilting canopy | RJM | £4.99 | 12 | 23.8 |
| BBC_6 | Monodome Beach Shelter with zip door | Tricky Dickys | £6.99 | purple 12; red 12 | purple 17.2; red 18.5 |
| BBC_7 | Beach Shelter with zip-up door | | £6.99 | Blue 17; red 15 | Blue 13.0; red 14.6 |
| BBC_8 | Beach shelter | Shirley Cottage Gifts | £6.99 | Blue 8; red 7 | Blue 23.8; red 22.4 |
| BBC_9 | Blue and yeallow beach shelter | | | Blue 30; yellow 14 | Blue 10.0; yellow 16.1 |
| BBC_10 | Black Pushchair parasol | Clair de lune | | 23 | 6.9 |
| BBC_11 | Navy Ladybird pram parasol | Woolworths | £8.00 | 11 | 10.9 |

Results: baseball caps



Results: parasols



| Sample No | Description | Fabric UPF | T _{UVA} av, % |
|-----------|-------------------------------|------------|------------------------|
| BBC_3 | White Compact | 16 | 8.5 |
| BBC_4 | Pink with black trim | 15 | 14.5 |
| BBC_5 | Fucshia Beach/Garden Umbrella | 12 | 23.8 |
| BBC_10 | Black Pushchair parasol | 23 | 6.9 |
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High UVA transmittance


Results: parasols (2)

| Sample No | Description | Fabric UPF | T _{UVA} av, % |
|-----------|-------------------------------|------------|------------------------|
| BBC_3 | White Compact | 16 | 8.5 |
| BBC_4 | Pink with black trim | 15 | 14.5 |
| BBC_5 | Fucshia Beach/Garden Umbrella | 12 | 23.8 |
| BBC_10 | Black Pushchair parasol | 23 | 6.9 |
| BBC_11 | Navy Ladybird pram parasol | 12 | 10.9 |

- Colours are very different - UPFs are the same
- White parasol has lower UVA transmittance than pink
- Colour of fabric is often NOT an indicator of its UVR protection

Results: parasols (3)

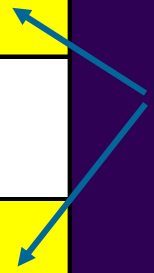
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- 
- Colour of fabric is often no an indicator of its UVR protection
 - This white fabric provides better UVR protection than navy one

Results: parasols (4)

| Sample No | Description | Fabric UPF | T _{UVA} av, % |
|-----------|-------------------------------|------------|------------------------|
| BBC_3 | White Compact | 16 | 8.5 |
| BBC_4 | Pink with black trim | 15 | 14.5 |
| BBC_5 | Fucshia Beach/Garden Umbrella | 12 | 23.8 |
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Same UPF, very different UVA transmittance

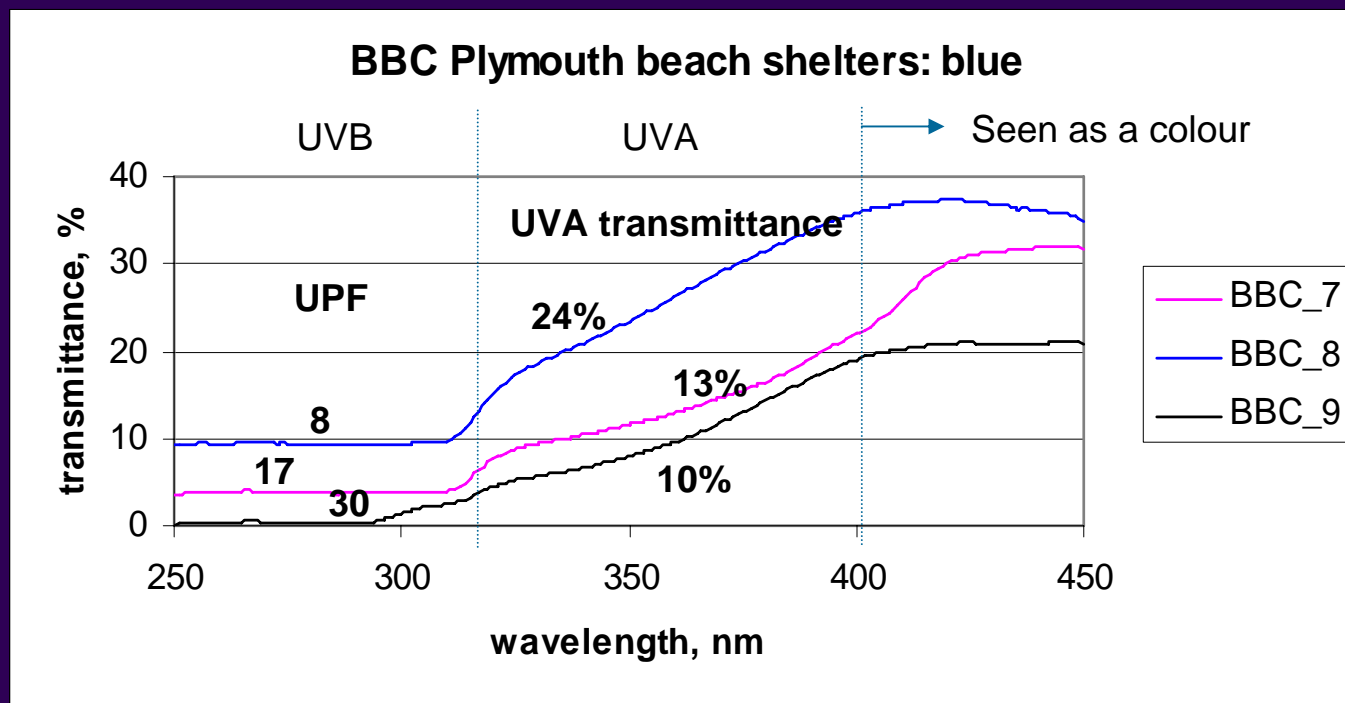


Results: beach shelters



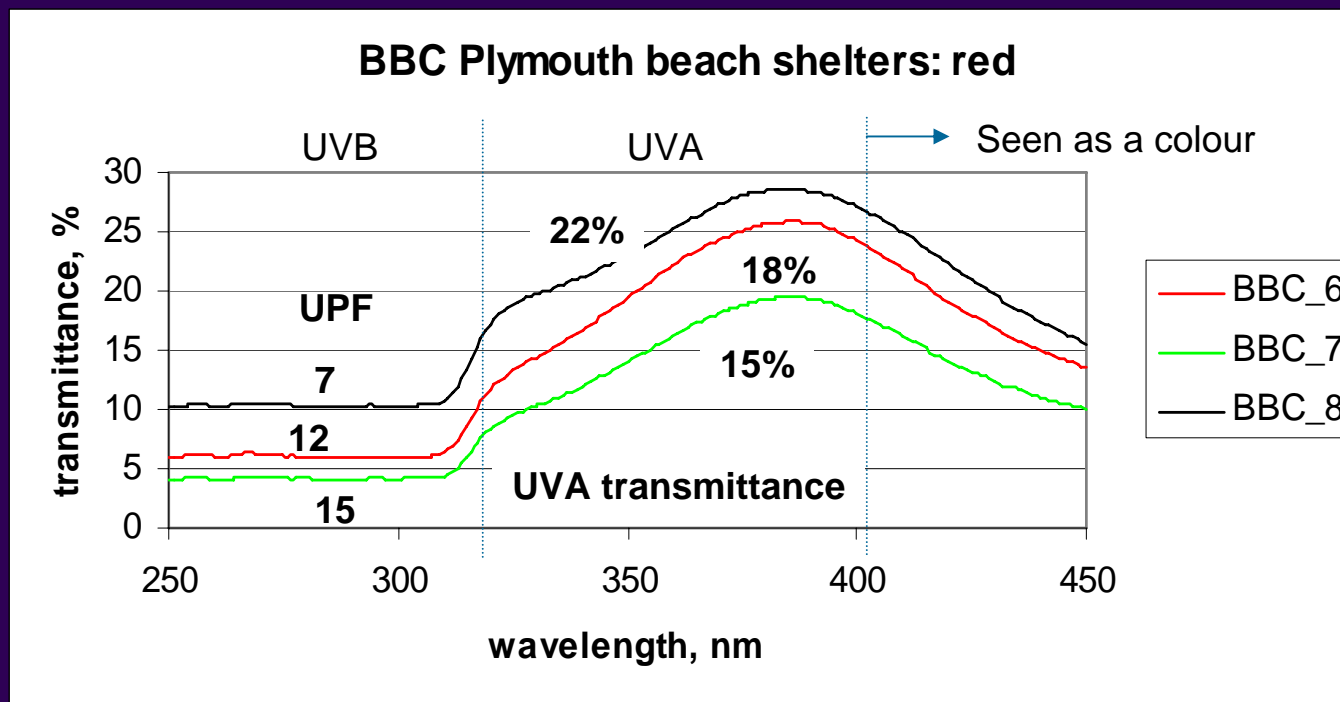
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Results: beach shelters (2)



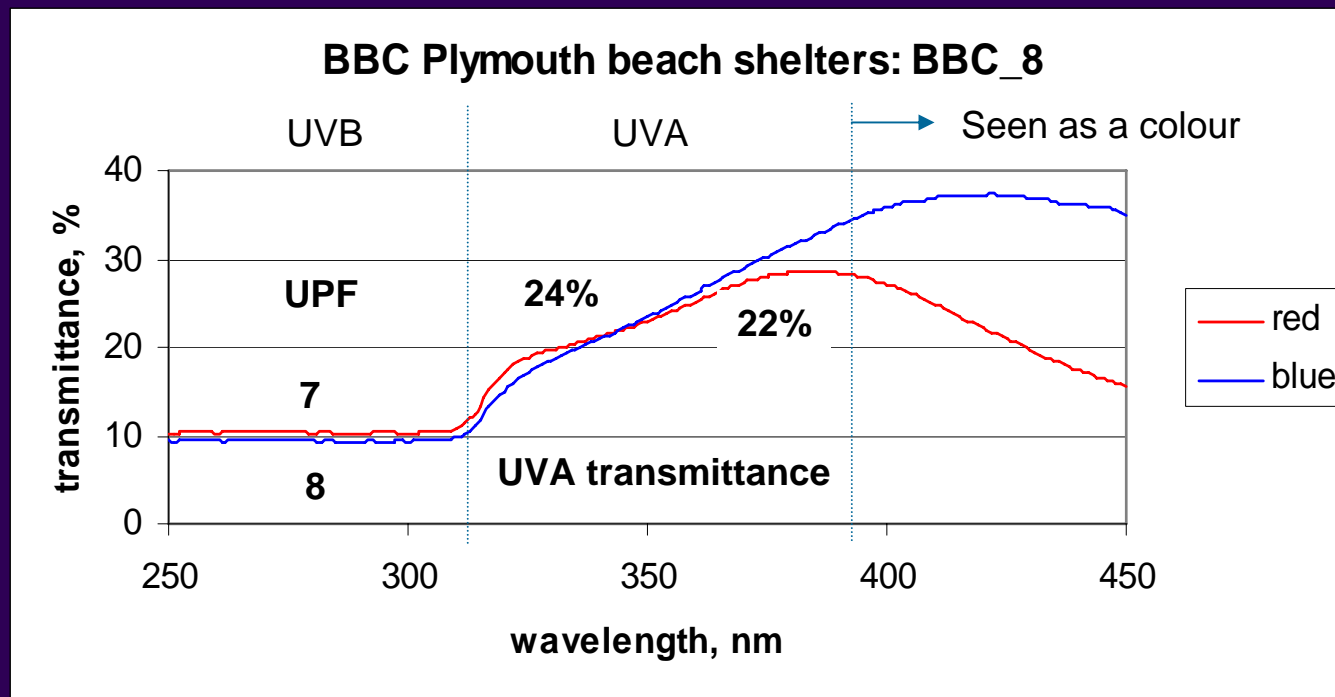
Same colour and similar fabric: UVR characteristics are different

Results: beach shelters (3)



Same colour and similar fabric: UVR characteristics are different

Results: beach shelters (4)



Different colours: almost identical UVR characteristics

BUT....

- UPF is a characteristic of UVR protection of the fabric, not a garment
- Good indication of the protection level but not of the real protection
- Fabric should shield the skin: if it doesn't cover skin, it doesn't protect it

Things to remember



- Good sun protection: fabric with good UVR protection characteristics should shield the skin
- If fabric doesn't shield the skin, even the best material does not provide sun protection

Things to remember



It doesn't work at all

The same parasol,
the same pushchair,
the same direction of
the sun light

If used incorrectly,
might give false
perception that your
child is safe in the sun



Things to remember



The same beach shelter, the same baby: think about it when you set your shelter on a beach

If used incorrectly, might give false perception that your child is safe in the sun