



How long is the fibre?

Testing method for the determination of the fibre length  
in long fibre reinforced plastic parts

*testXpo* International Forum for Materials Testing 2017

## Fibre reinforced plastics

successfully used in numerous industrial segments (automotive, aircraft etc.)

## Fortifying a polymer with fibrous fillers

utilize the durability and stiffness of the fibre to improve quality of composite results in a significant increase of mechanical parameters (strength, stiffness etc.)

Matrix (polymer) is designated to surround the chopped strands in a force-fitting manner

## Production process

injection molding

## Fibre materials

glass, carbon, steel, nature

## Matrix polymers

Polypropylen, Polyamid, Polyoxymethylen, Polyester

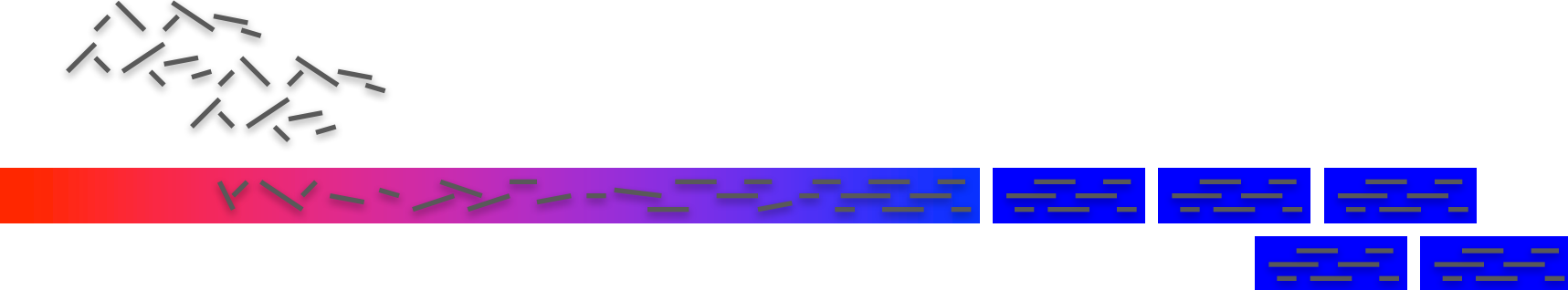
How long is the fibre?

Long fibre – short fibre reinforced thermoplastics

Short fibre reinforced materials

chopped fibres

granules, size app. 3 mm



orientation of fibres while filling of mold leads to anisotropy and warpage

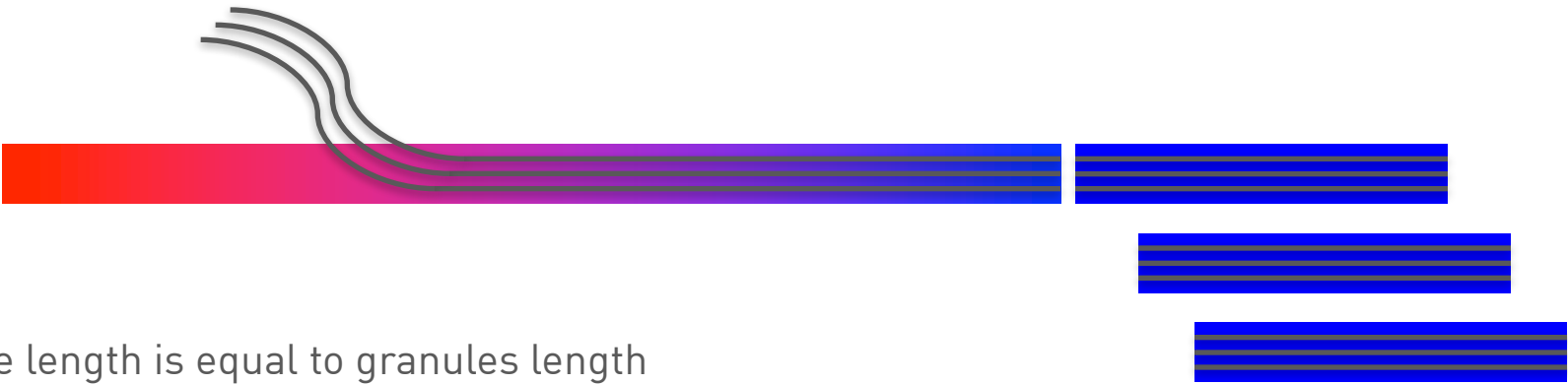
How long is the fibre?

### Long fibre – short fibre reinforced thermoplastics

### Long fibre reinforced materials

endless fibres

granules, size app. 10 mm

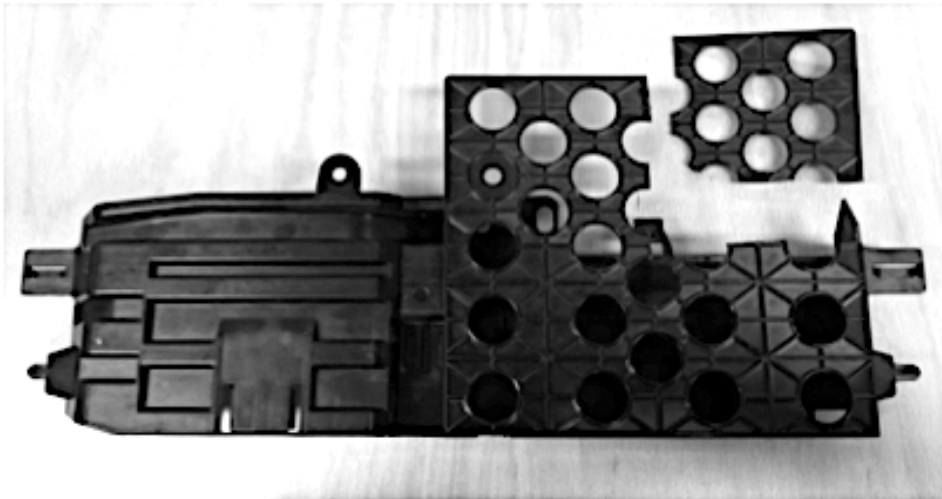


Fibre length is equal to granules length

Long fibre – short fibre reinforced thermoplastics

Long fibre reinforced materials

less orientation while molding process, more like a grid



Seat bracket for German OEM



Part of seat bracket for German OEM after calcination

To utilize the high durability of a fibre

length in a molded part must exceed the „critical fibre length“  
lower fibre length can lead to failure „pull out“

Fibres are excessively and repeatedly stressed during the process of part production

results in fibre breakage

Length of fibre in the part must be monitored



Testing method for the determination of the fibre length

ISO 22314 International Standard published 2006

prescribes

Separation of fibres from the molded part

Dispersion of the total amount of fibres to an amount to be analyzed

Analysis of the fibre length and statistical report

polymerphys IK leads international project group for improving this standard

„Area Of Interest“

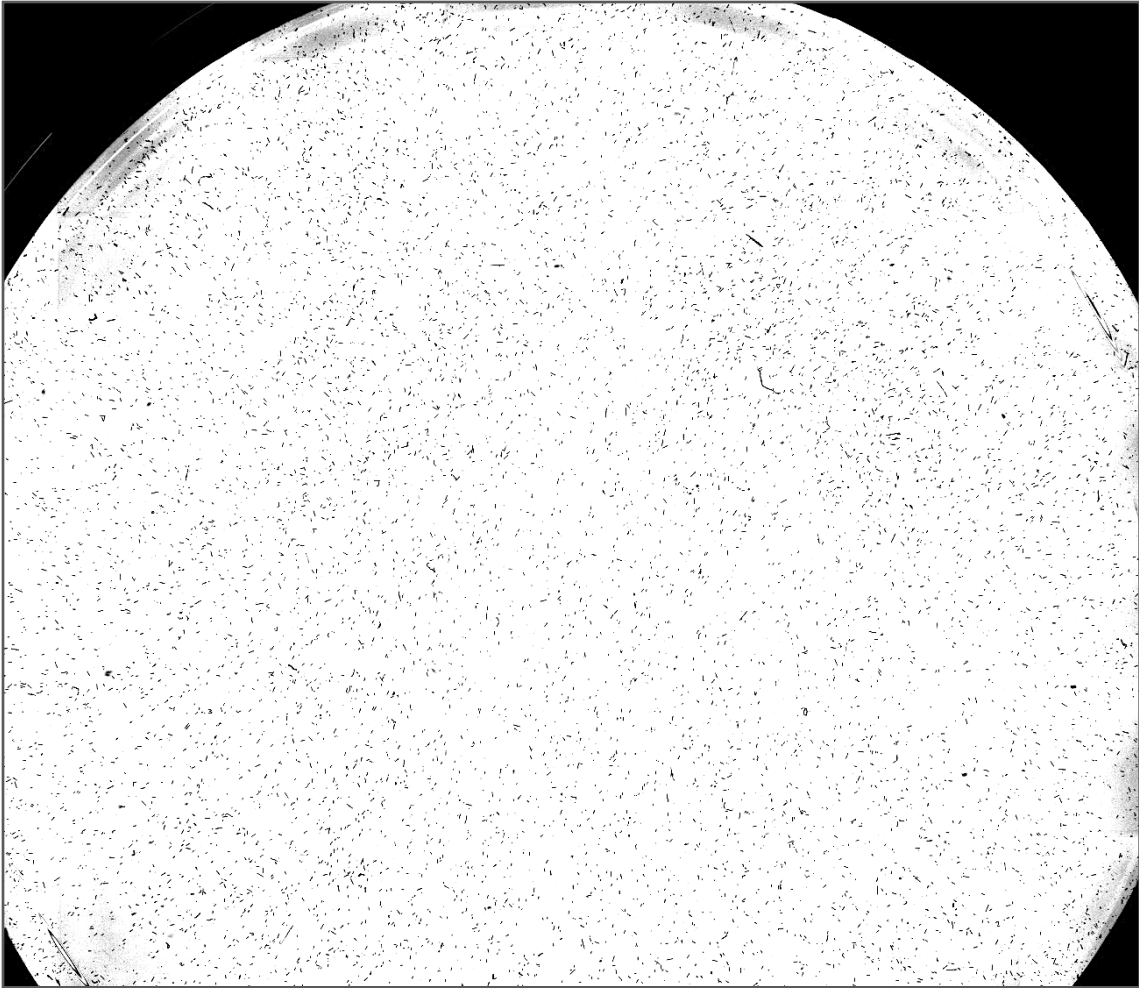
Separation of the „AOI“  
from the molded part  
without mechanical cutting



„AOI “ after calcination: undestroyed fibres in the boundary area

How long is the fibre?

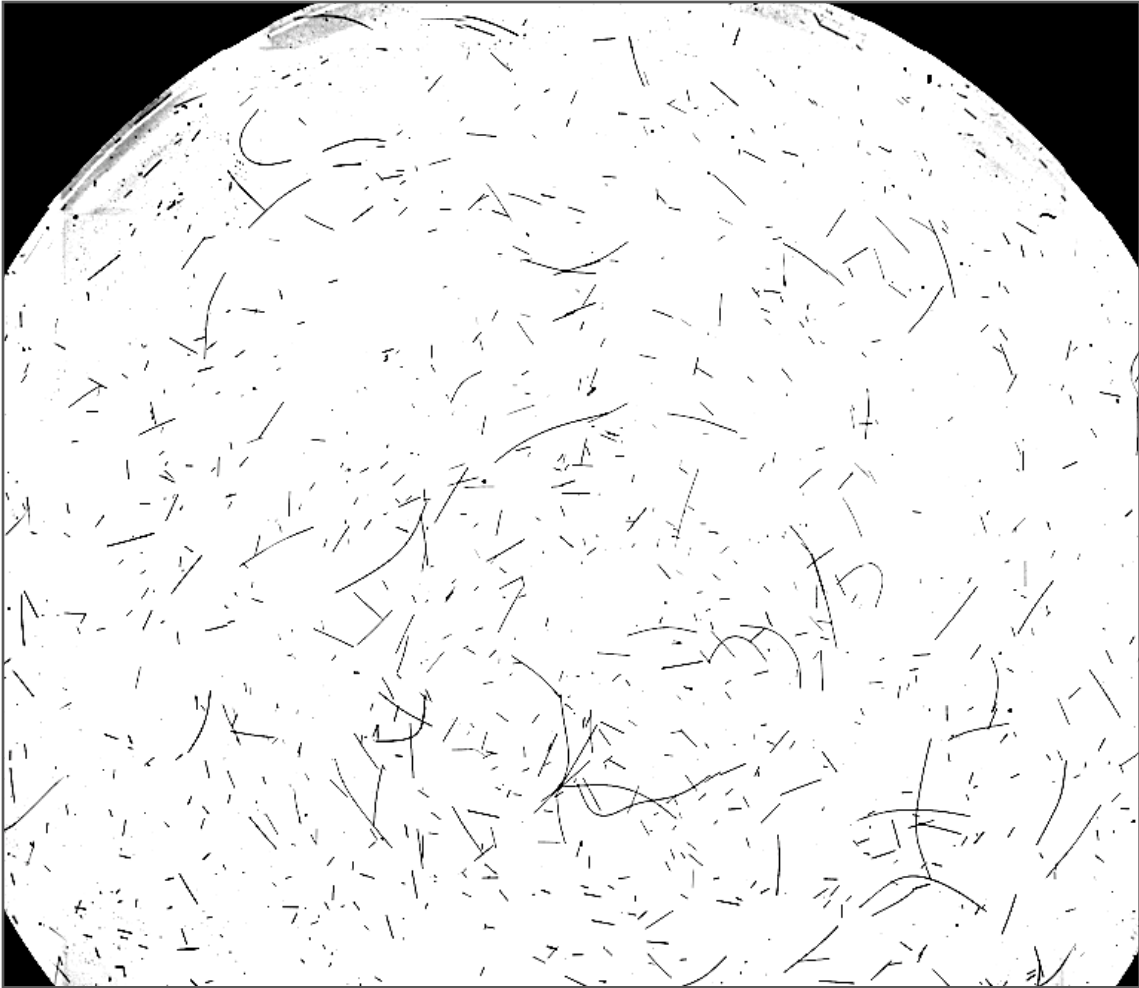
Photographic image  
of short fibres



10 mm

How long is the fibre?

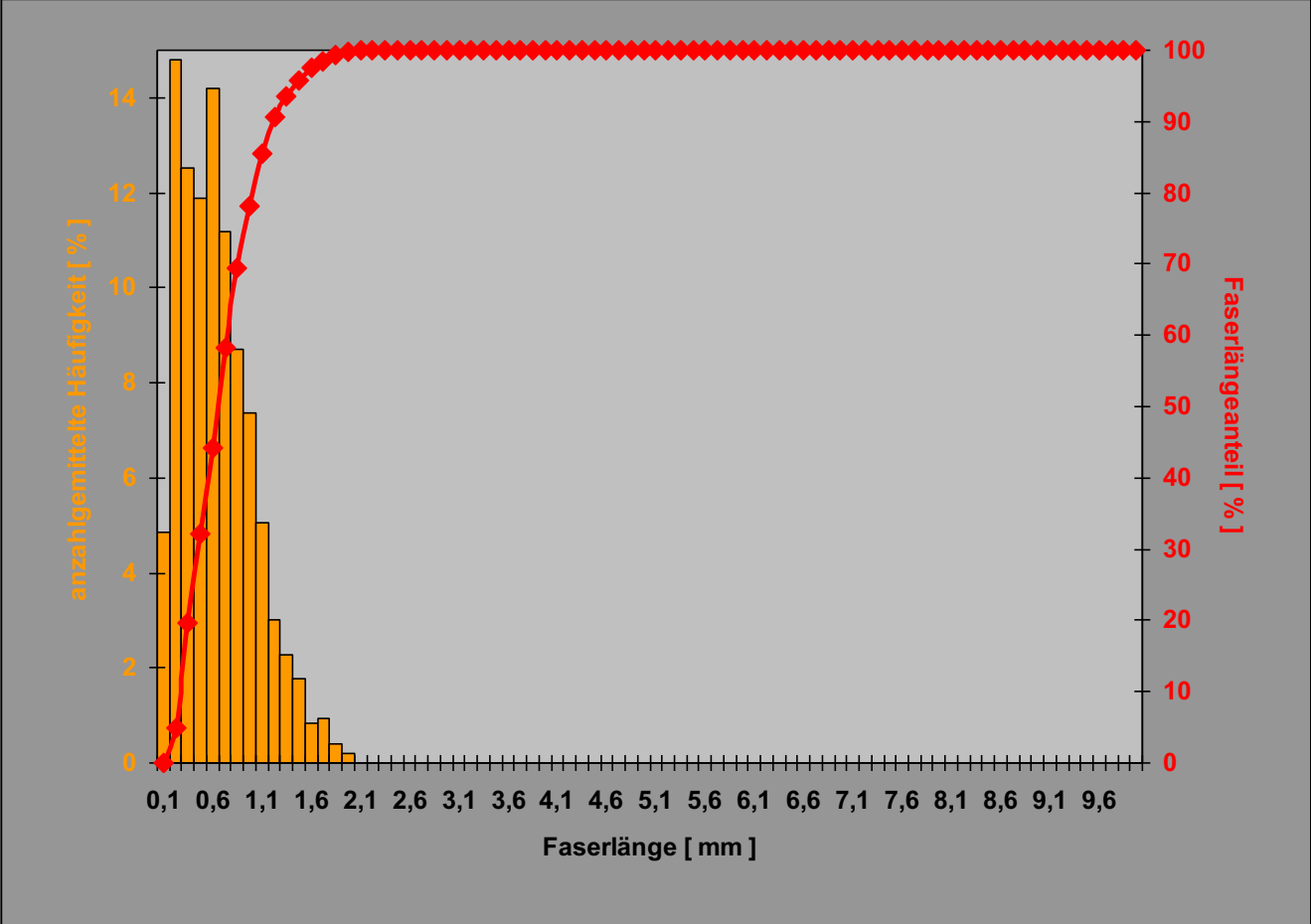
Photographic image  
of long fibres



10 mm

How long is the fibre?

e.g.  
Statistical Analysis  
Short fibres  
  
Mean fibre length  
  
 $L_n$  0,60 mm

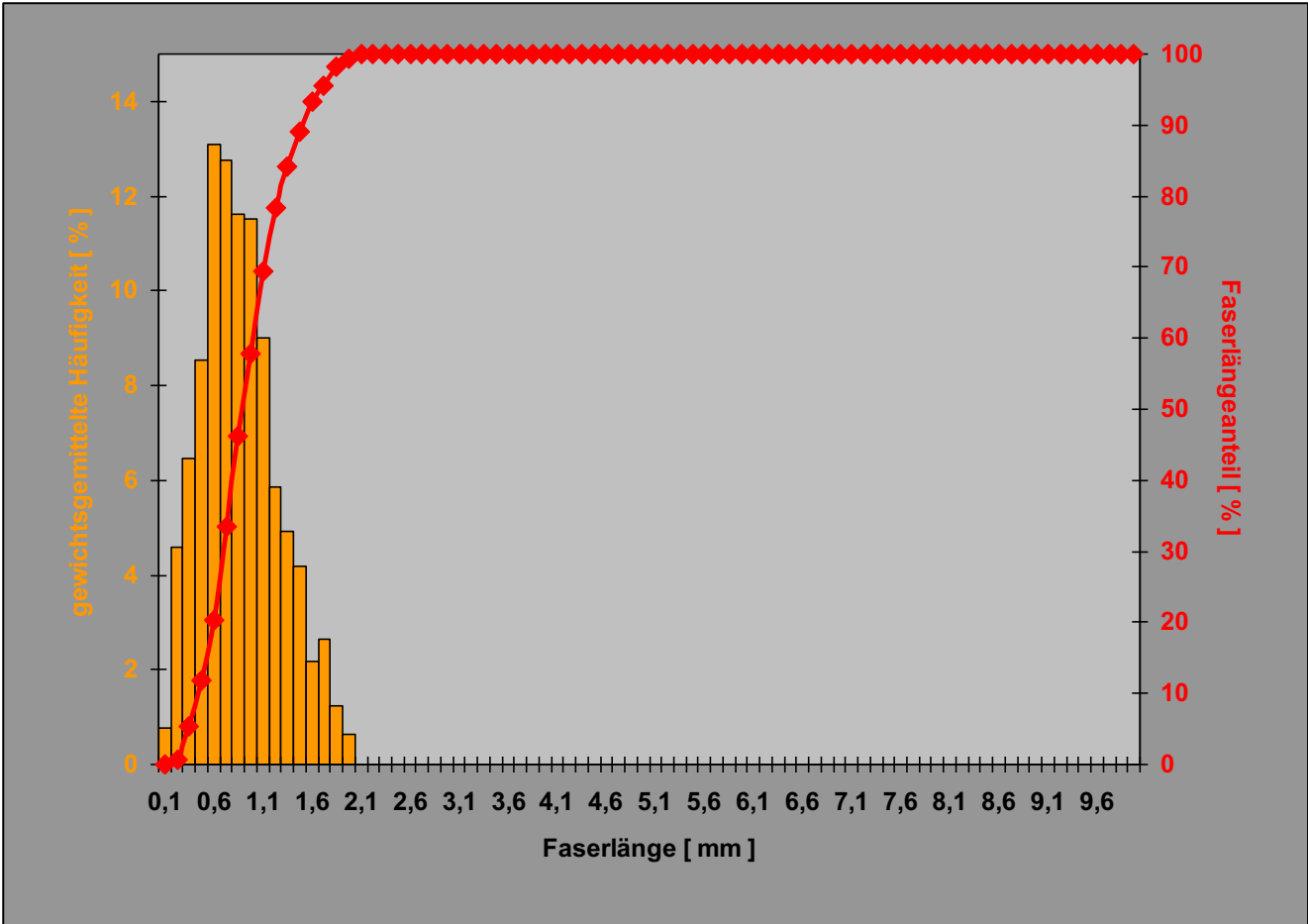


How long is the fibre?

e.g.  
Statistical Analysis  
Short fibres

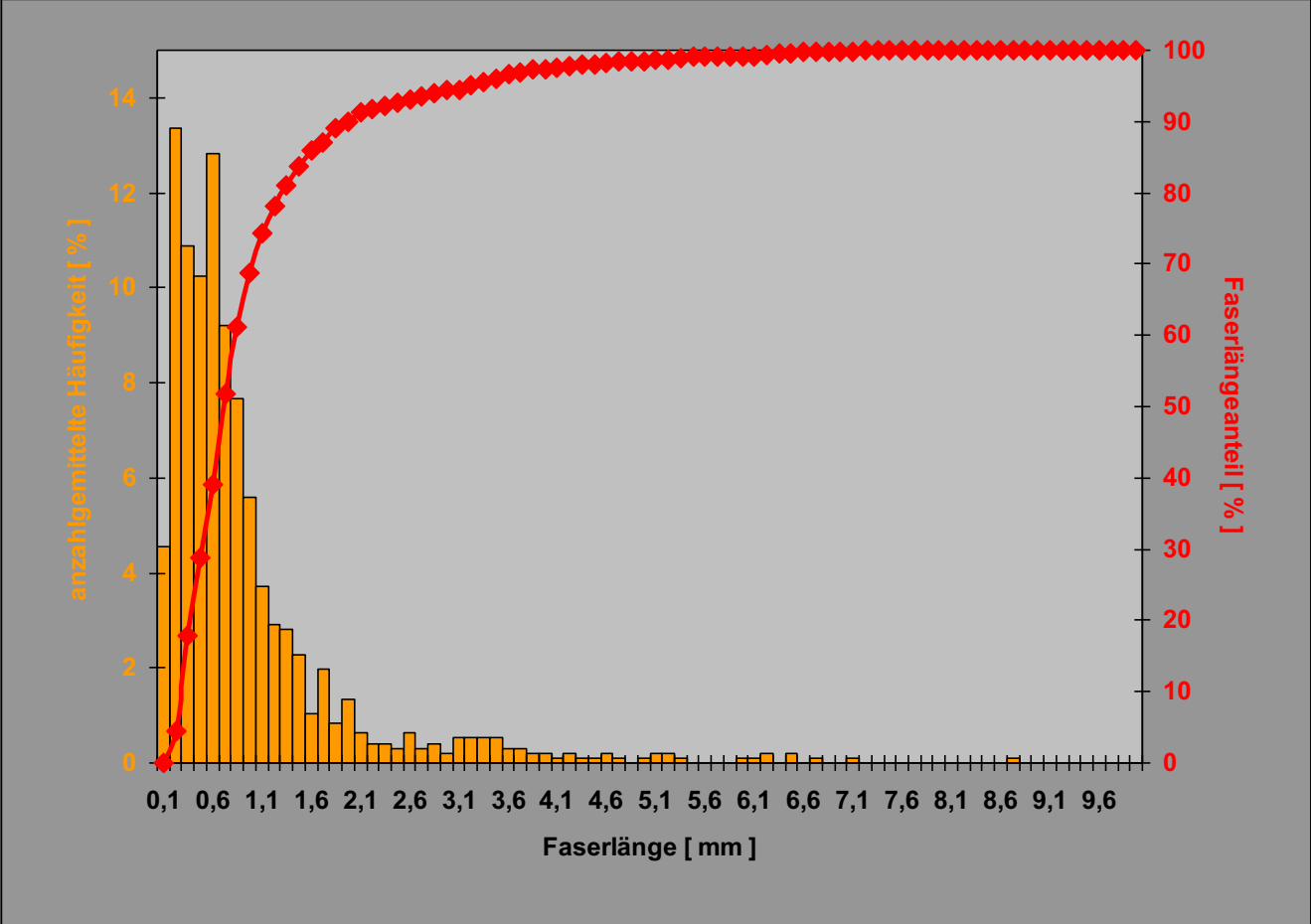
Weighted  
Mean fibre length

$L_p$  0,83 mm



How long is the fibre?

e.g.  
Statistical Analysis  
Long fibres  
  
Mean fibre length  
  
 $L_n$  0,9 mm

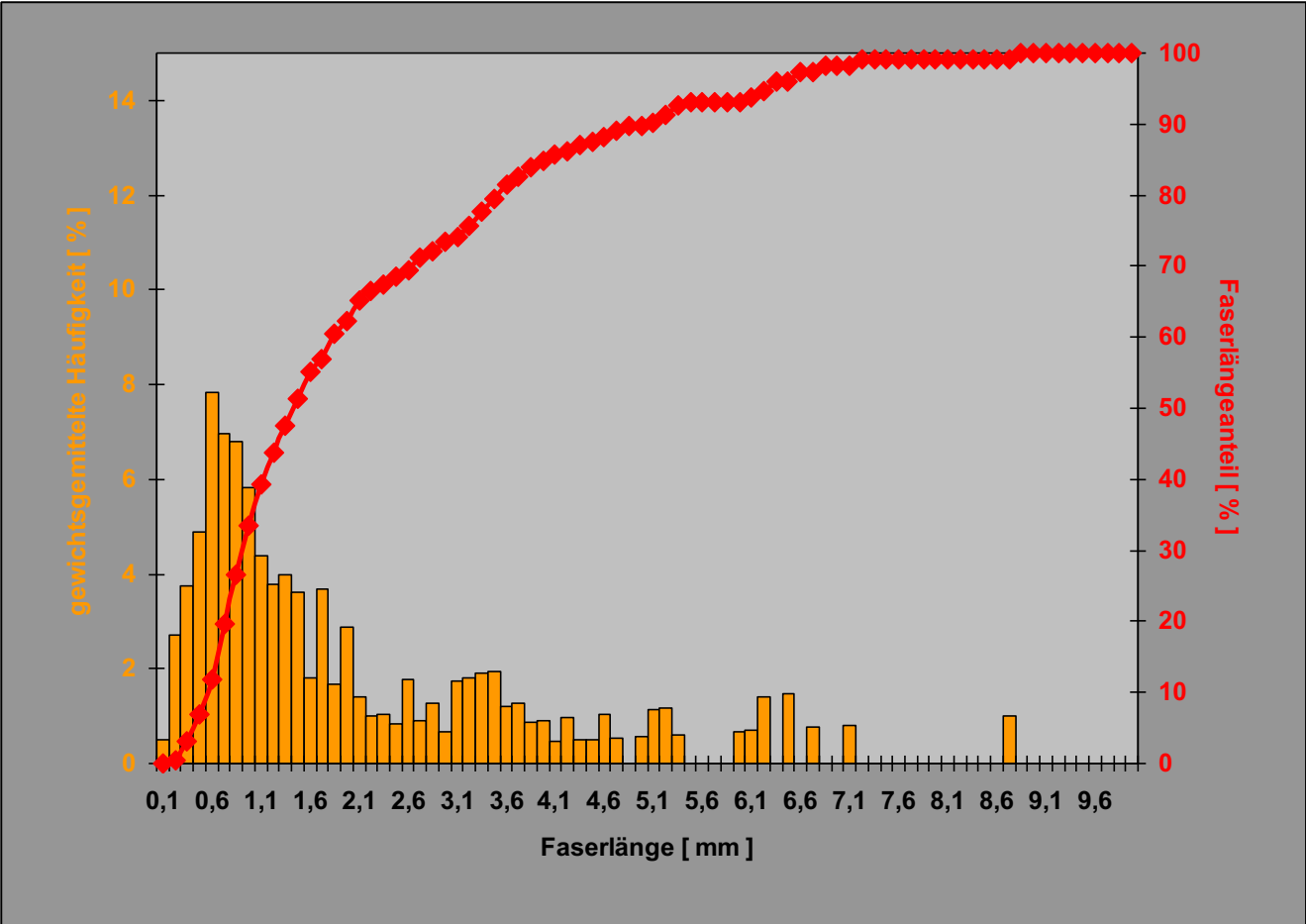


How long is the fibre?

e.g.  
Statistical Analysis  
Long fibres

Weighted Mean  
fibre length

$L_p$  2,1 mm





Thank you

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