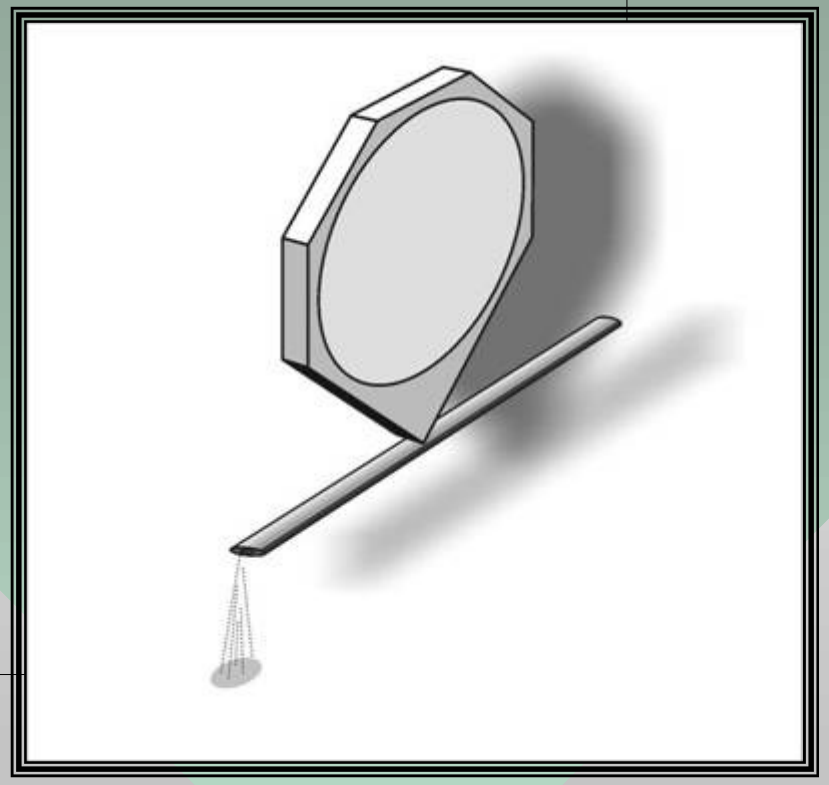
FlatJet Dispensing & Printing Technology

FlatJet

- Liquid dispensing
- High Throughput Printing



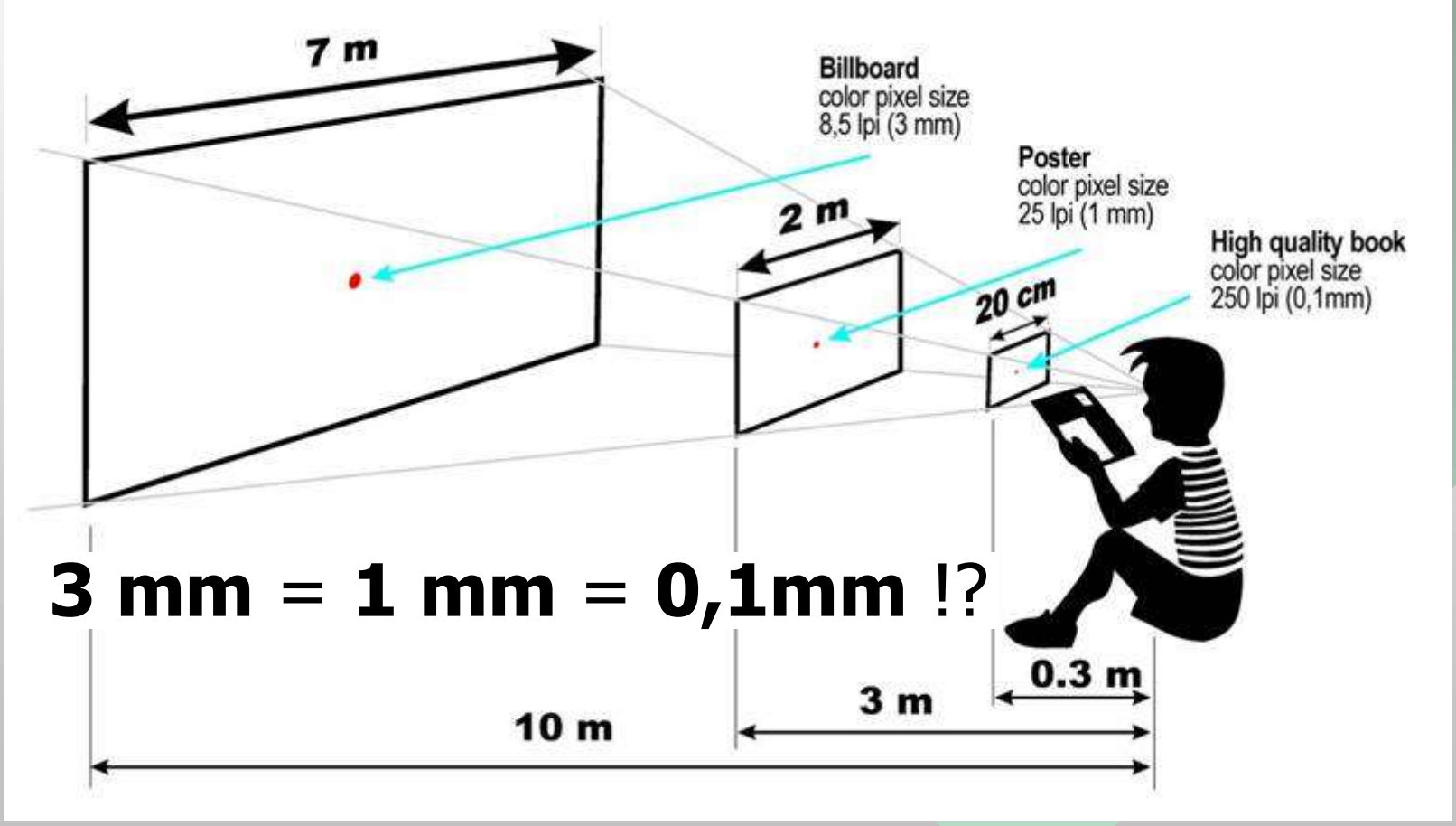
Objective

- The development of the technology is motivated by the **gap** between production rate of a conventional **offset** and the **digital** systems.
- Other ink-jet developers are searching solutions to **reduce** the ejected ink quantity – our aiming was opposite – the **high flow rate**.

The aimed resolution

- The theoretical limit of the human eye's resolution is 1' angle – it means that from **3 meter** viewing distance, **1 mm** size details can hardly be distinguished.
- Our basic objective was to find solution to produce images for **large distance** observation with as high throughput as possible.

Human eye's resolution



The result

- simple **robust** construction, possibility of low production costs
- very low & extremely **high liquid flow**
- Possibility of **media-wide** operating large-format digital systems
- Individually replaceable printing elements

Simple and easy to manufacture

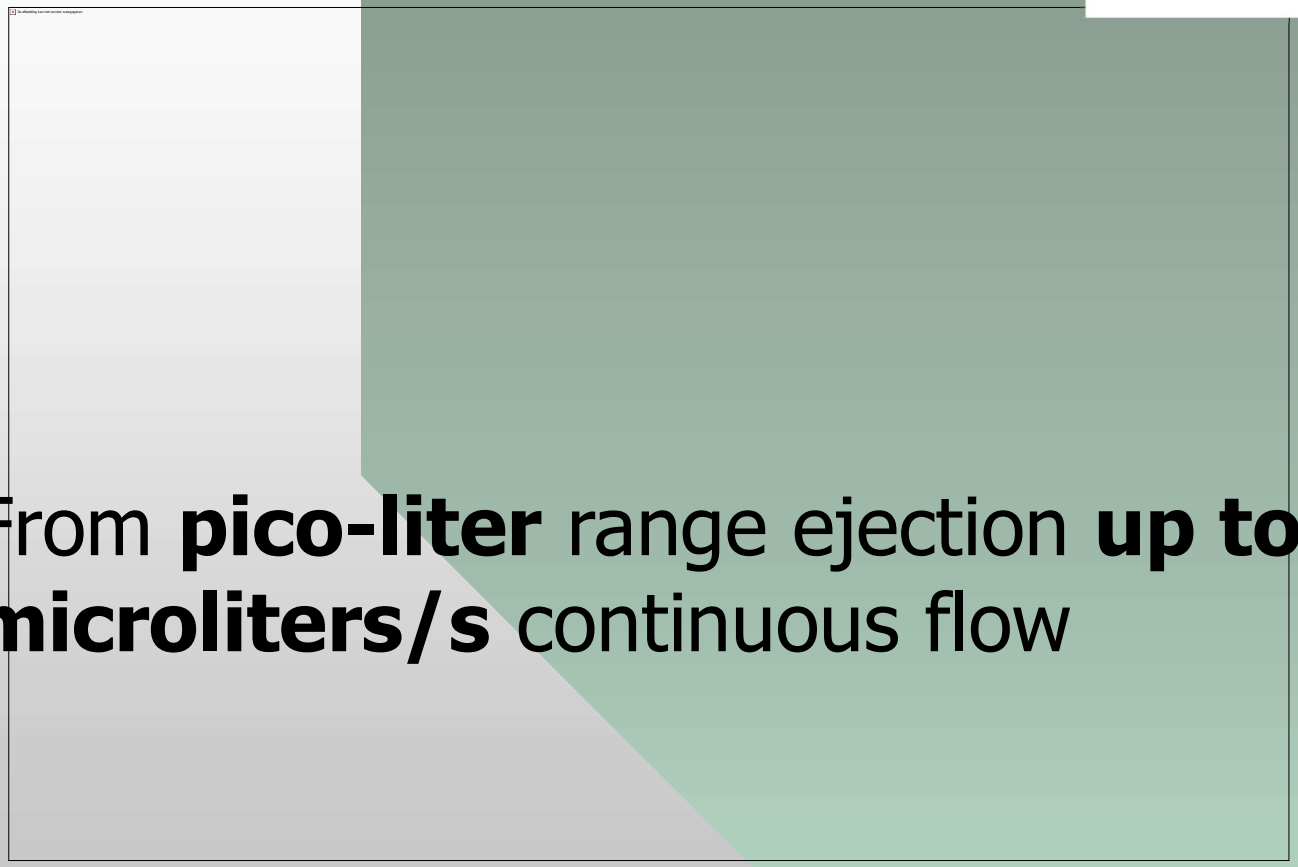
FlatJet

- FlatJet is assembled of a metal plate and tube, and a piezo-ceramic disc
- Simple and relatively robust mechanical construction
- Conventional materials and manufacturing

The head

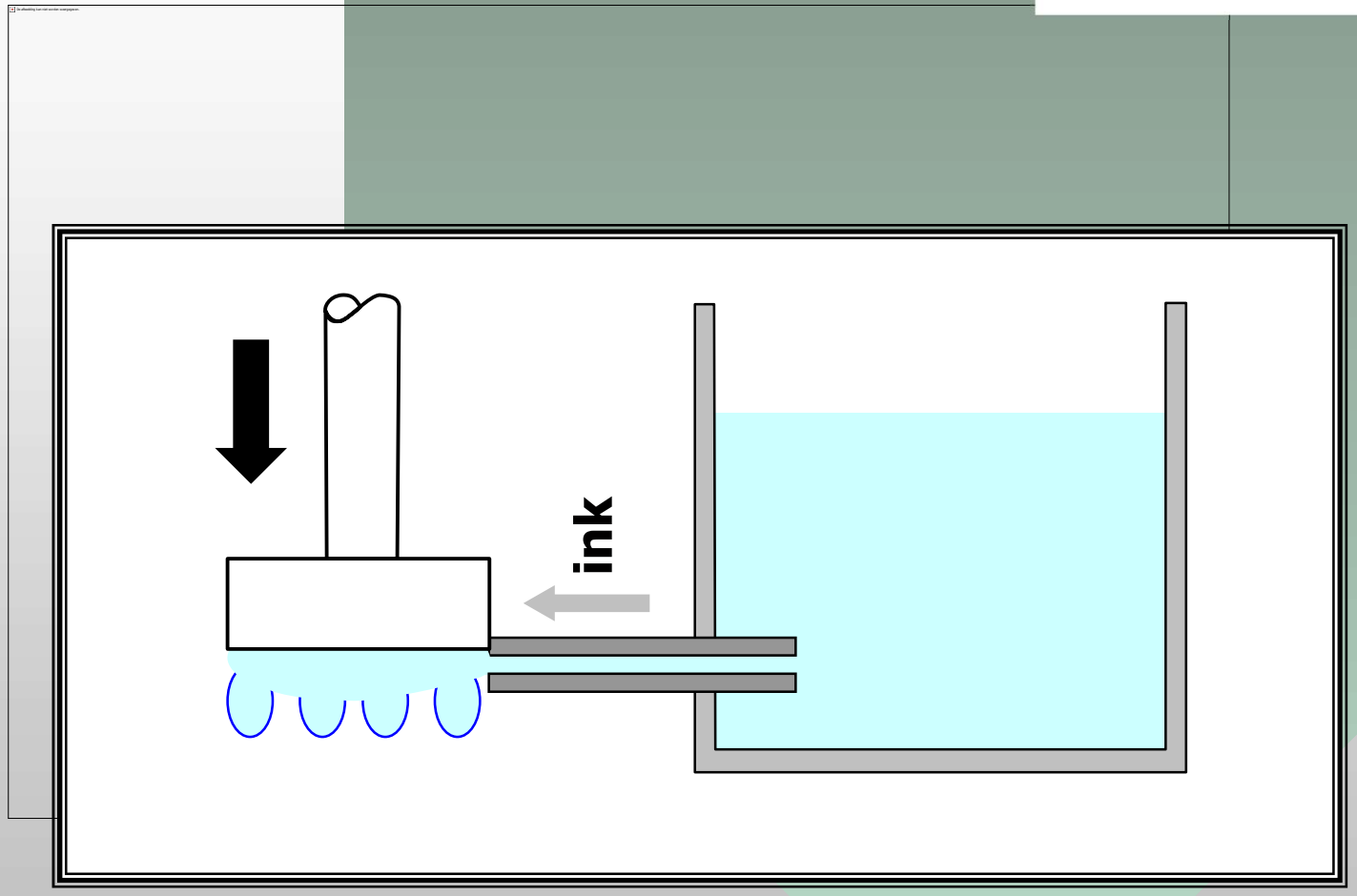
FlatJet

The liquid transfer

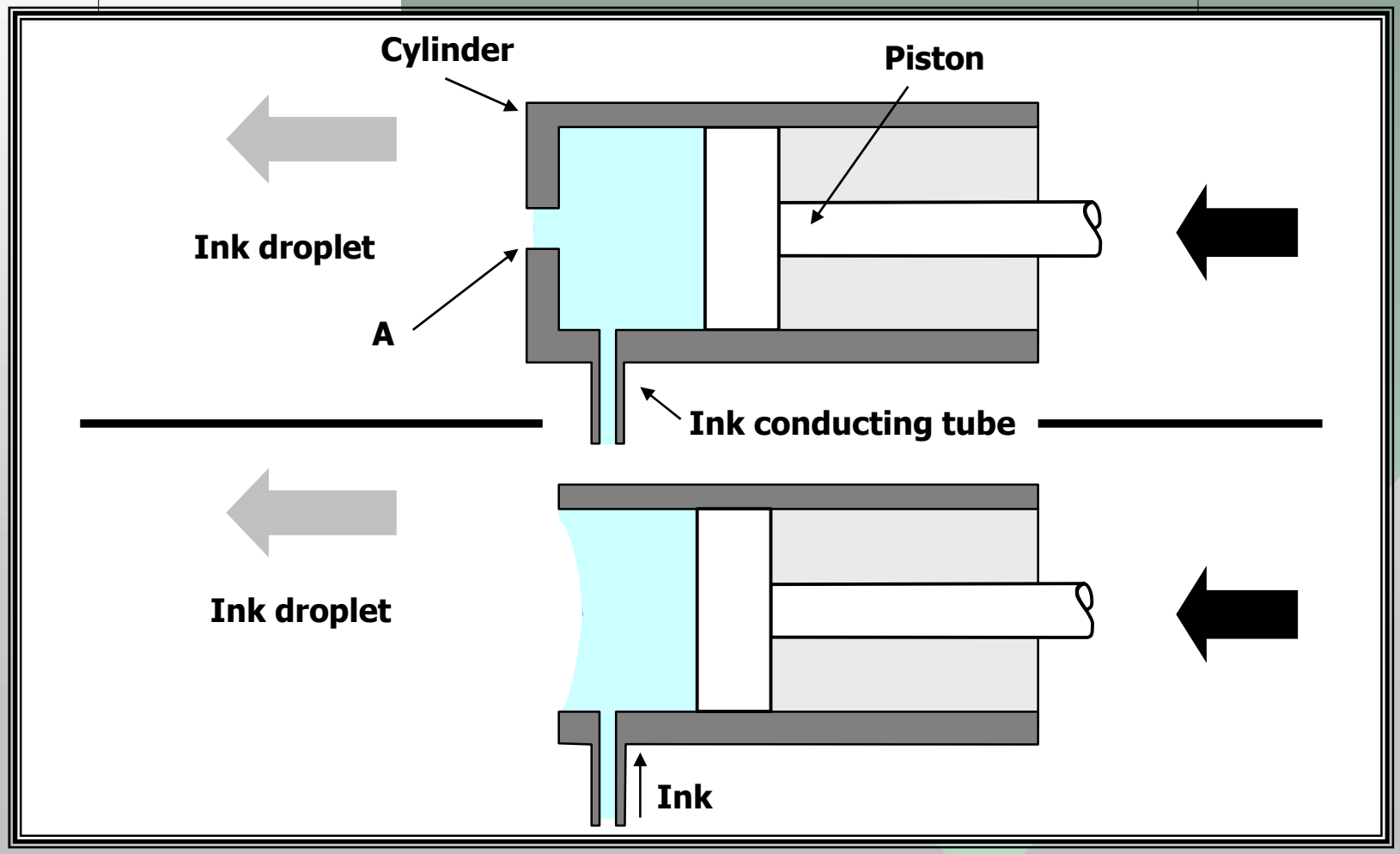


- From **pico-liter** range ejection **up to 50 microliters/s** continuous flow

The FlatJet method

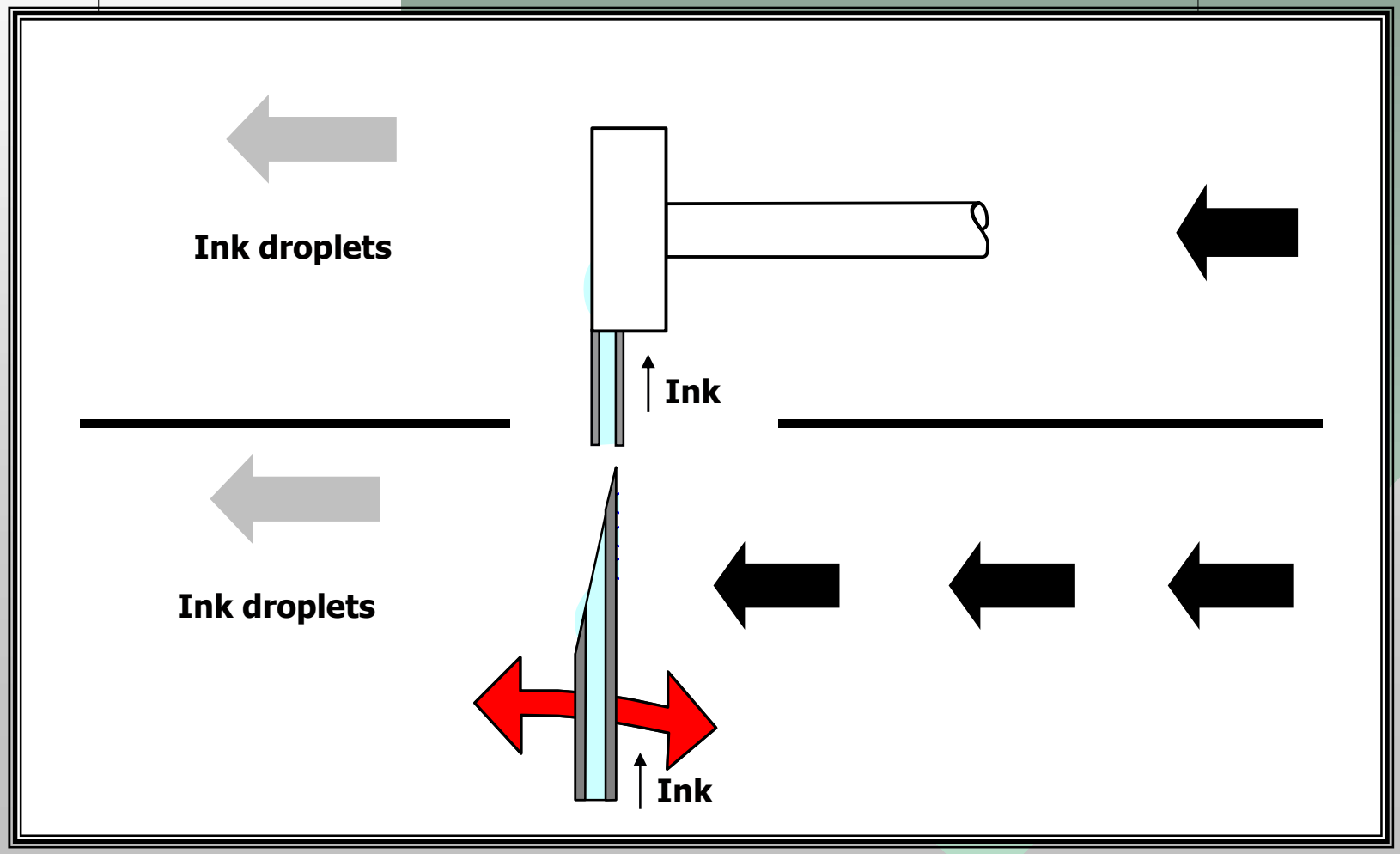


Principle

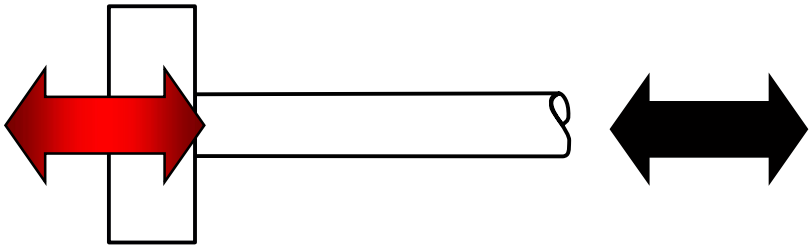

Cylinder
Piston
Ink droplet
A
Ink conducting tube
Ink droplet
Ink

Principle

FlatJet

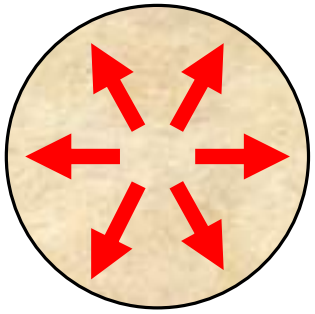


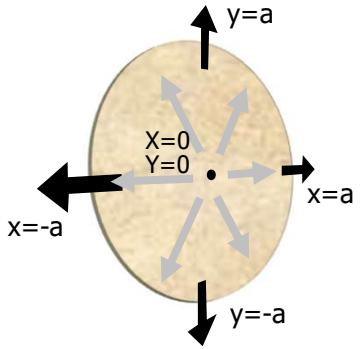
Principle



Piezoceramic transducer

(static deformation)





Principle

Piezoceramic transducer
(vibrating deformation)

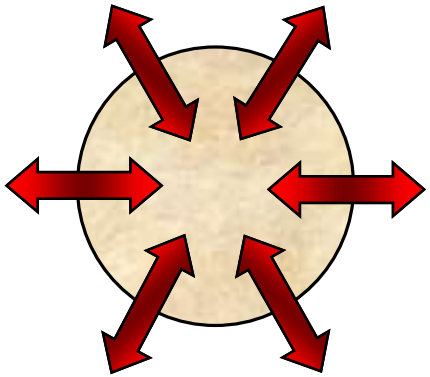
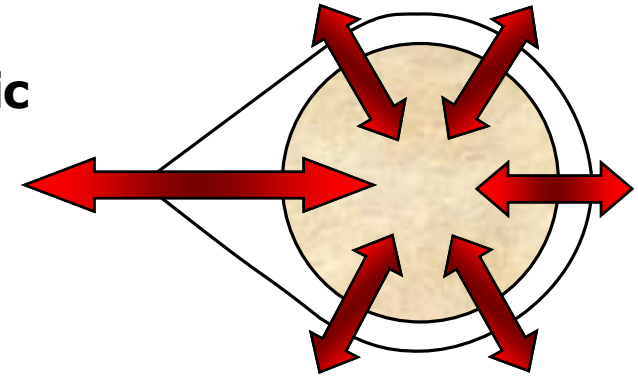


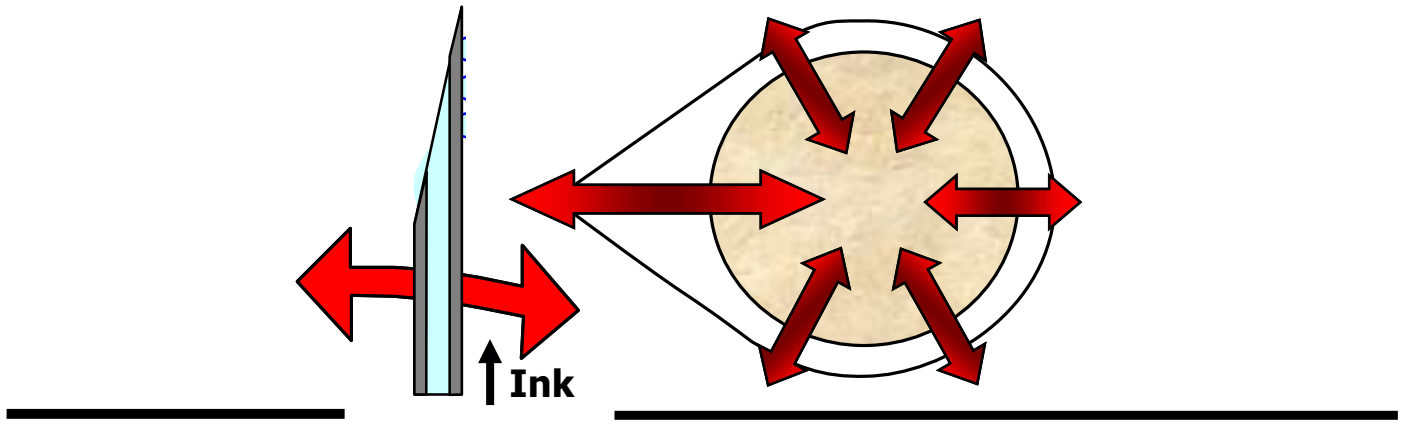
Plate resonator with piezoceramic transducer



Principle

FlatJet

Ink conducting and plate resonator

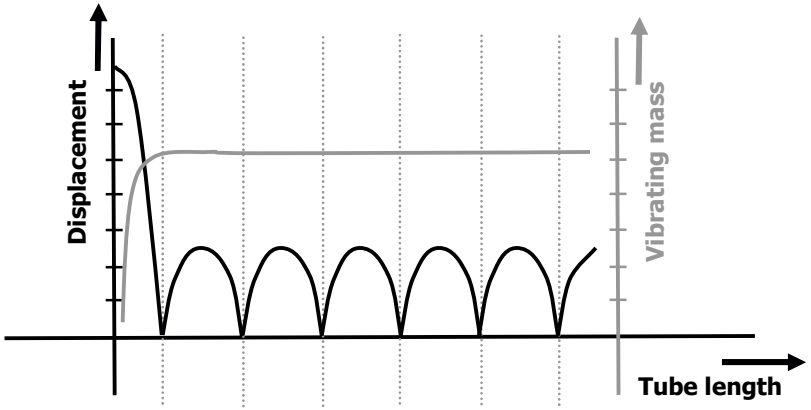


FlatJet head

Principle

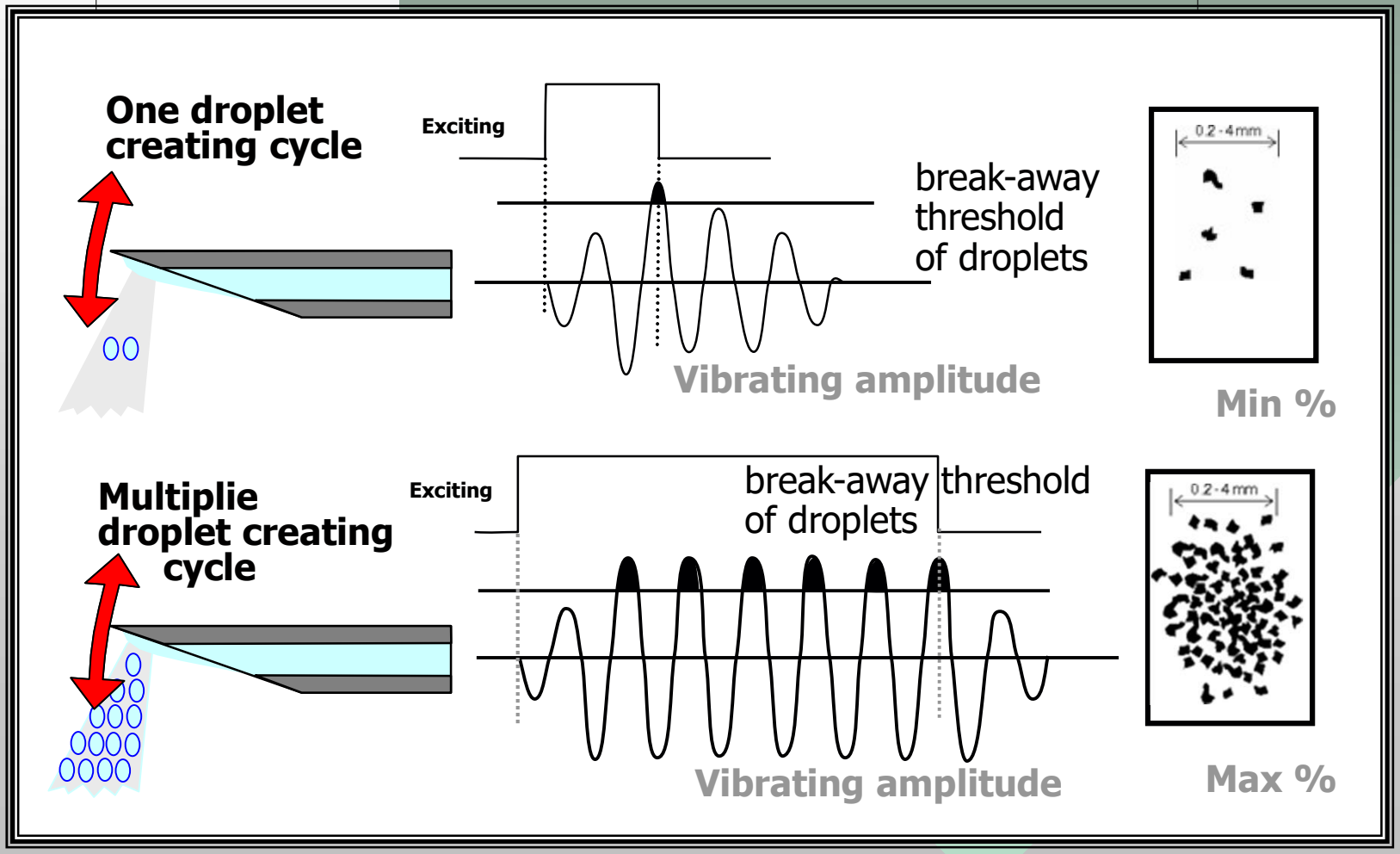
Overture Resonance

Variation of the vibrating amplitude

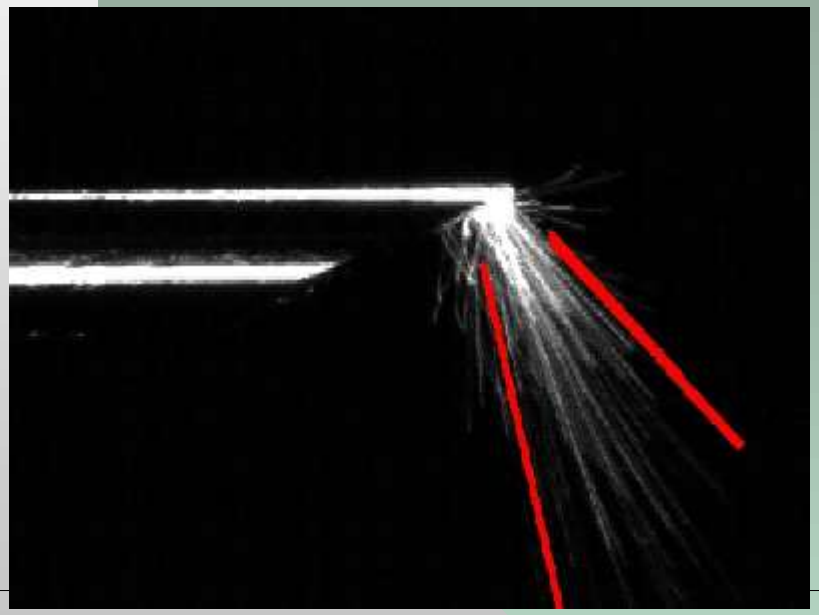


Principle

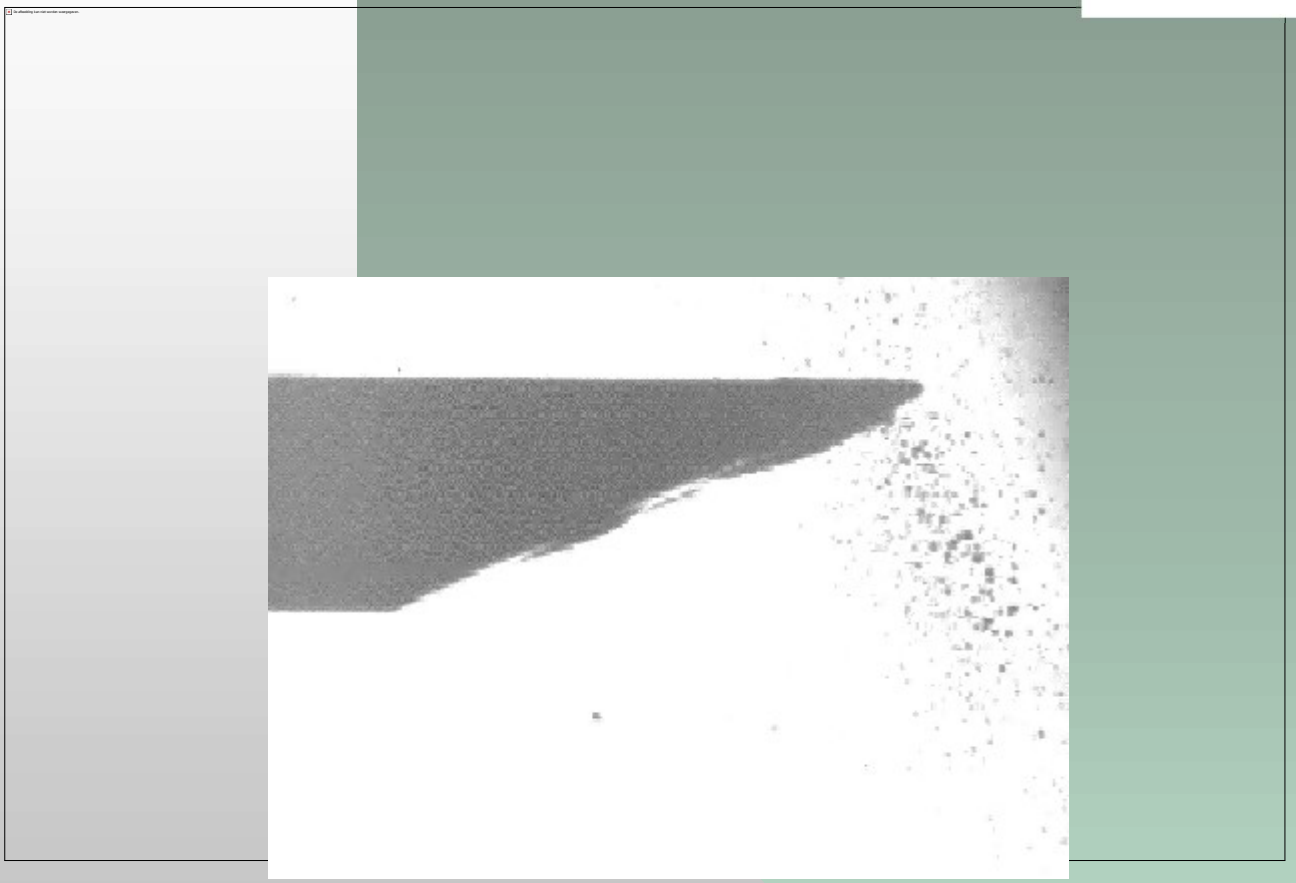
FlatJet



Ejected ink beam

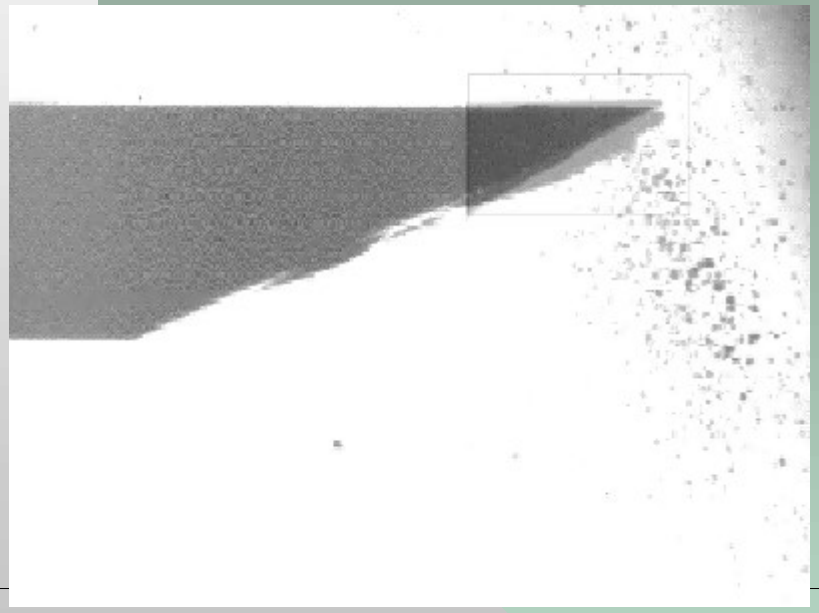


Ejection process

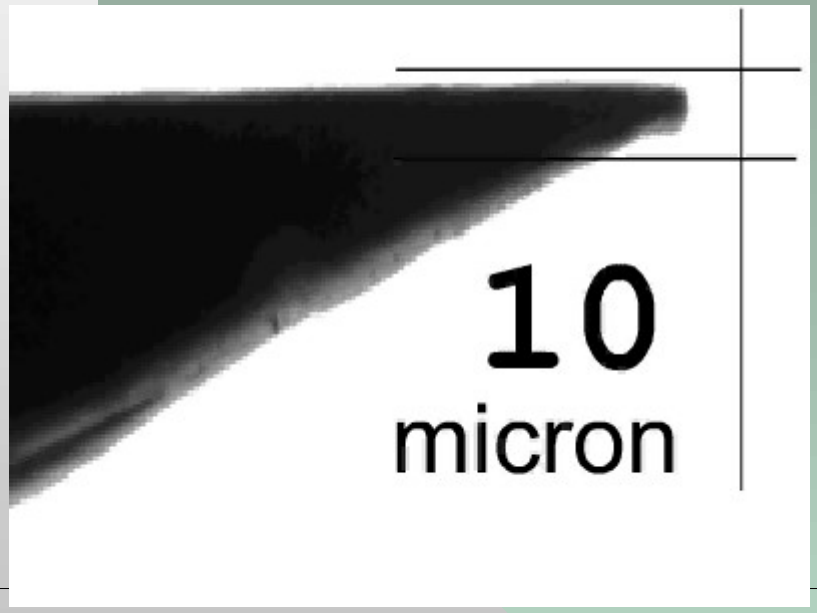


Microscopic shot with high speed camera,
with shifted exposure phases

Ejection process



Extent of deformation at the tip

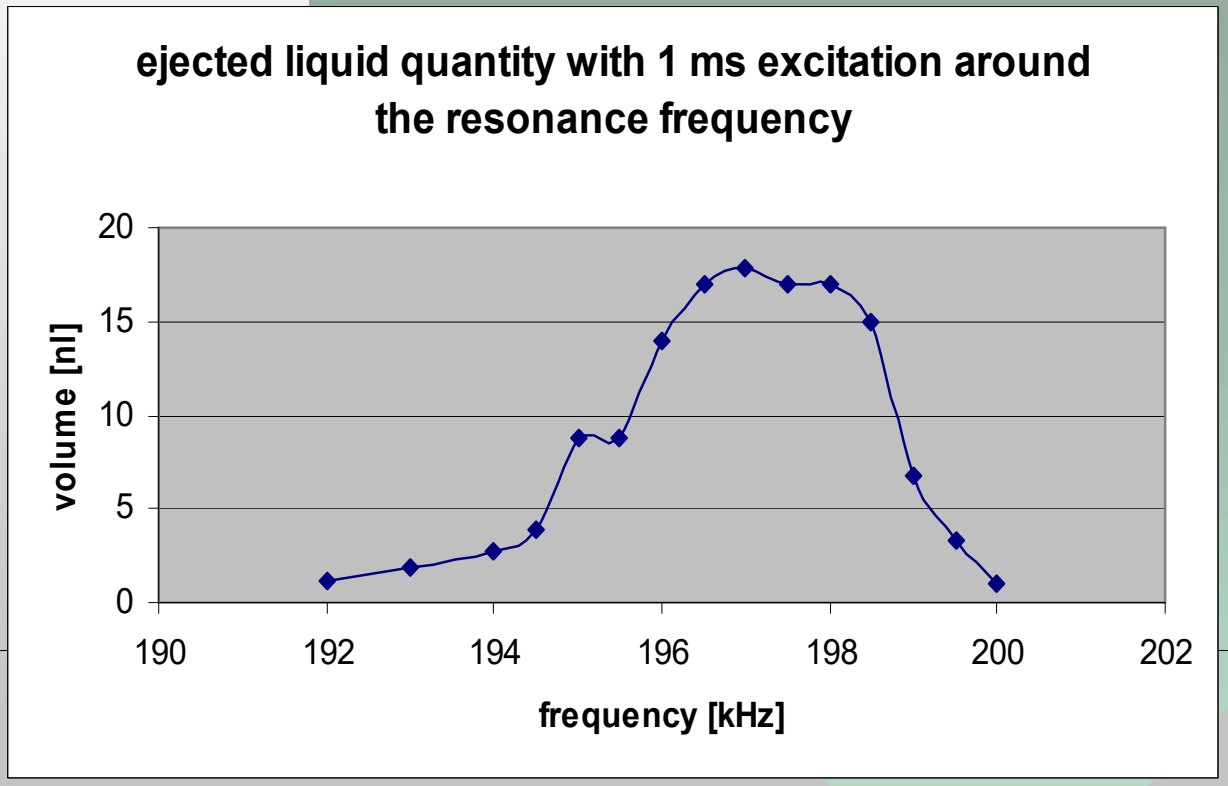


Microscopic shot with stroboscopic backight, shifted phase

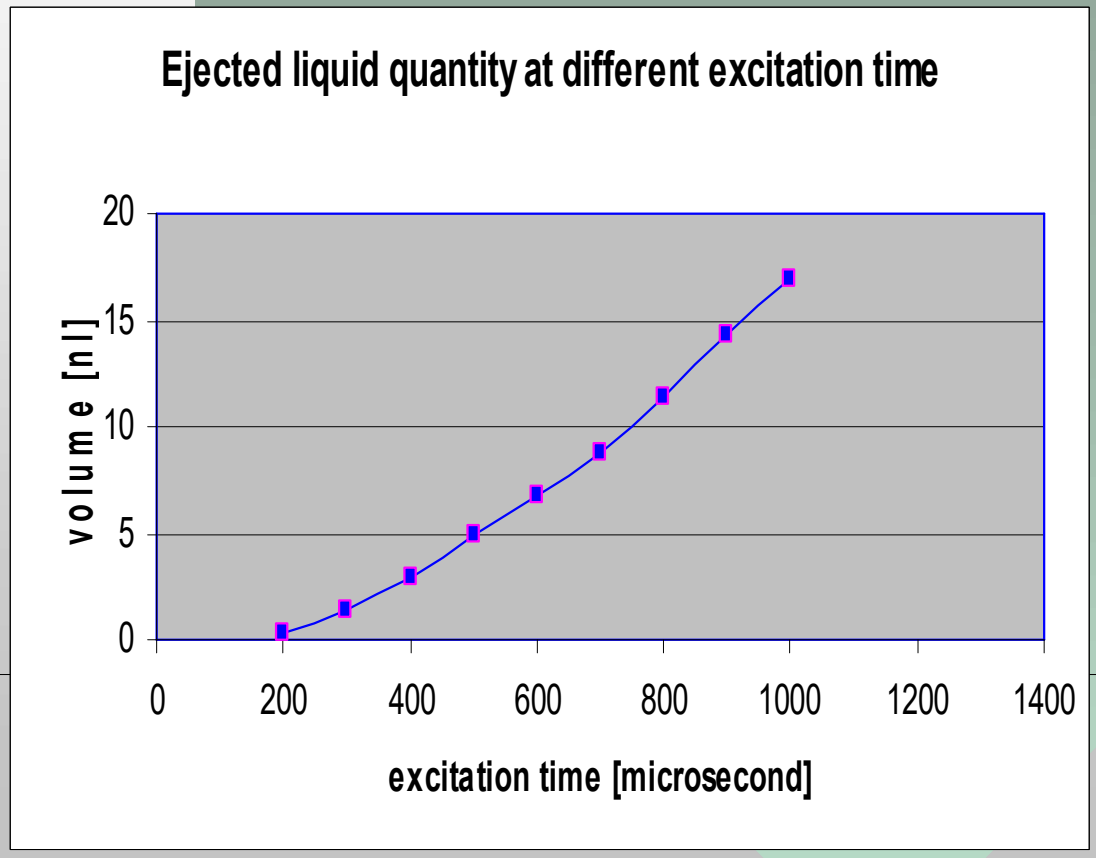
Local speed and acceleration at the tip

- At 200 kHz frequency the periodical speed of the tip surface is about **6 m/s**
- The acceleration at the dead point exceeds the **1.000.000 g**

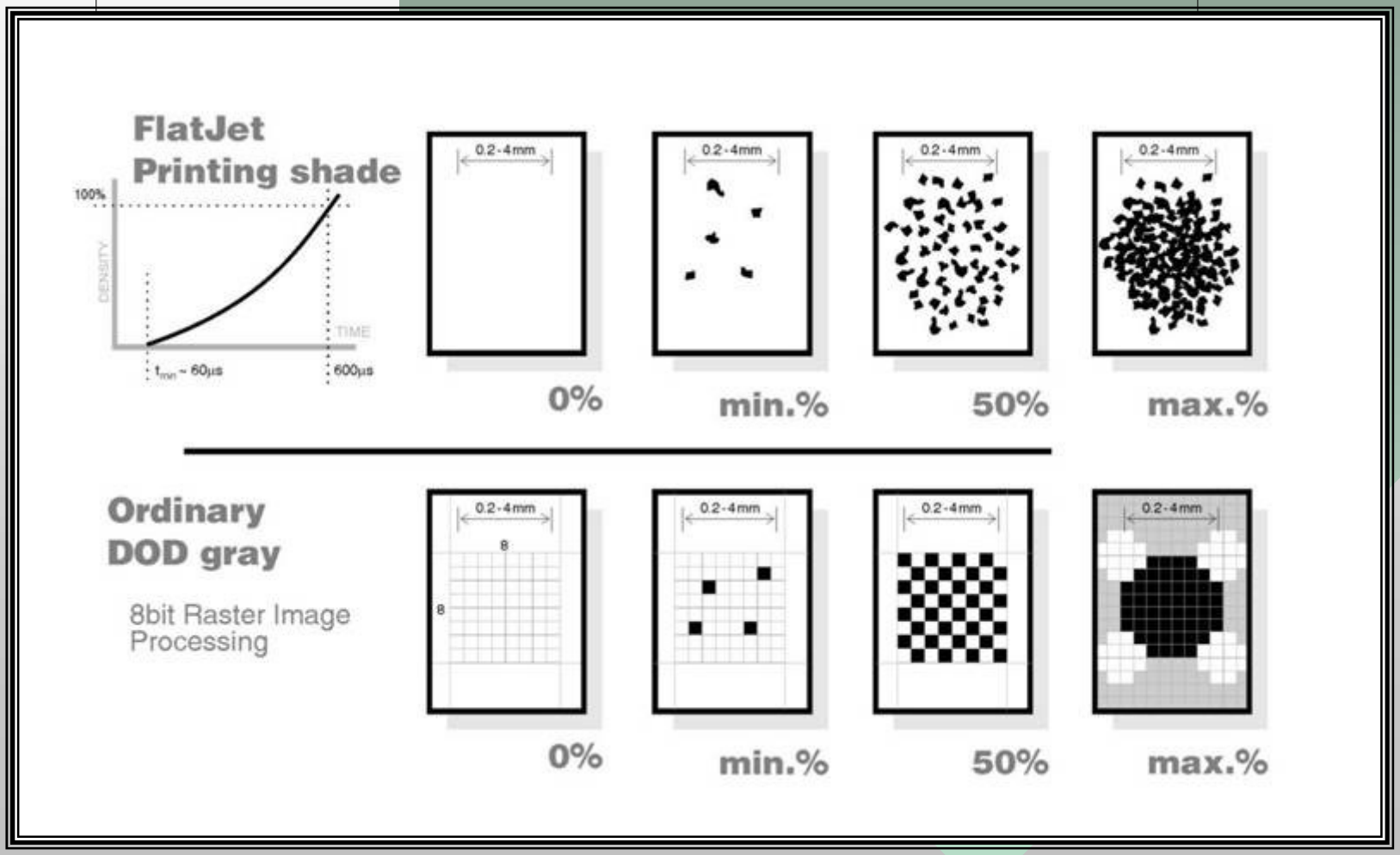
Ejected volume versus driving frequency



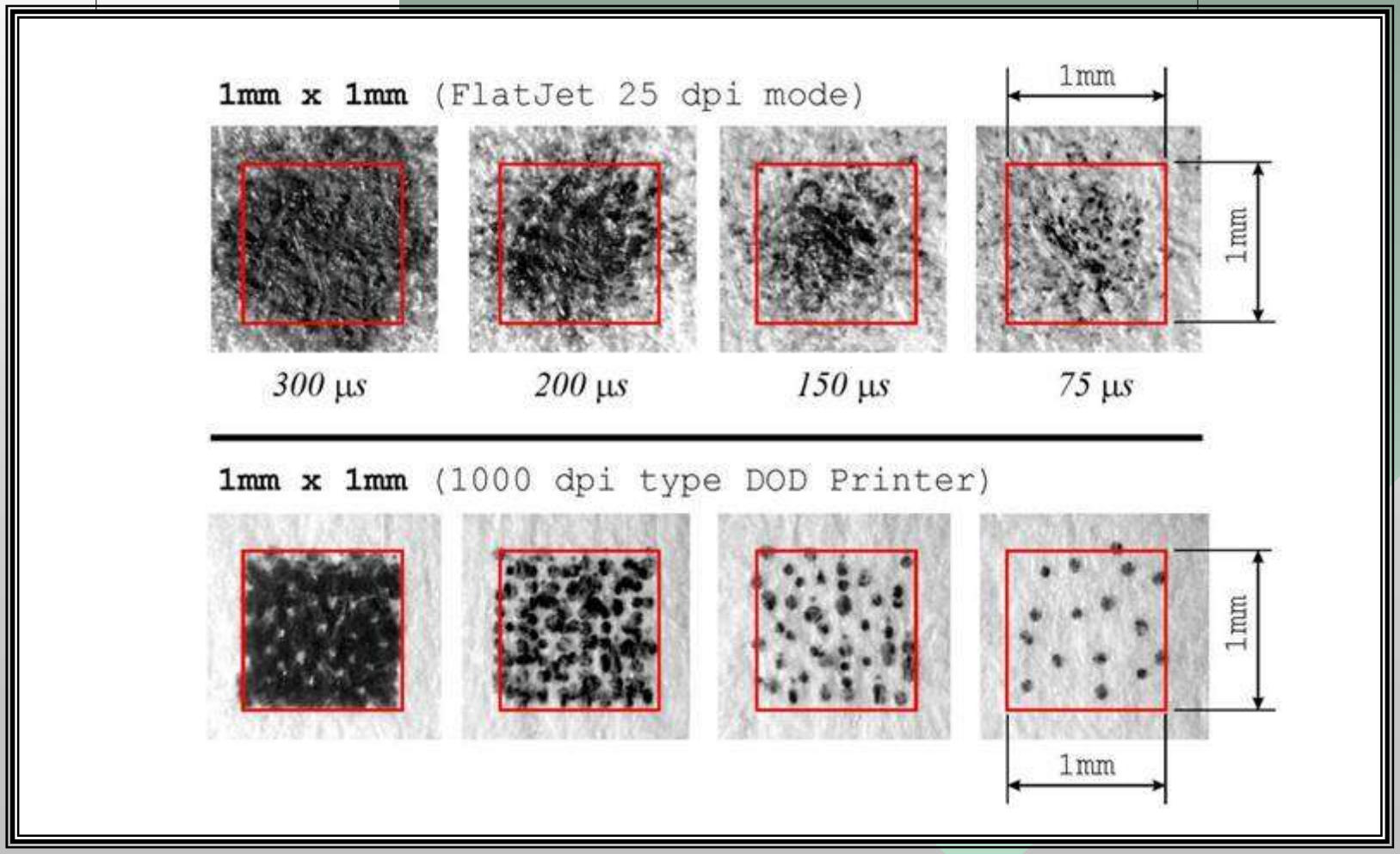
Ejected volume versus activating time



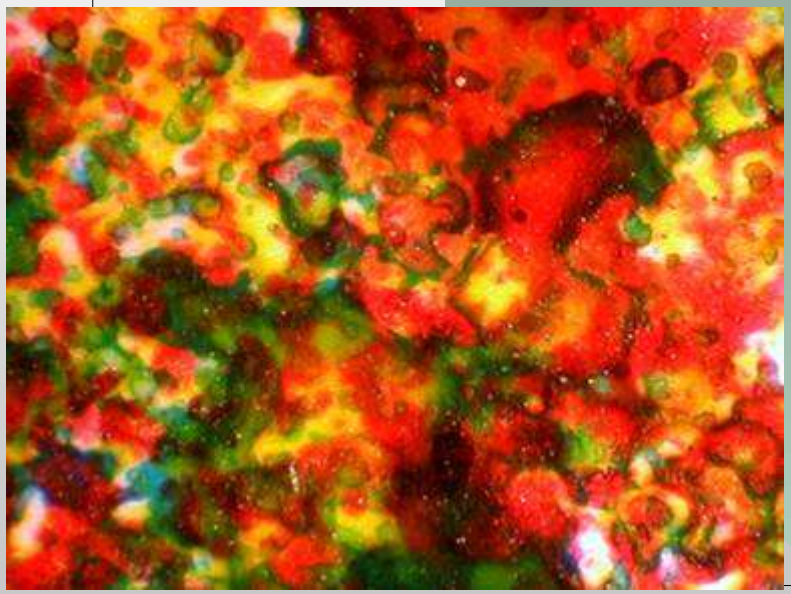
Pixel structure



Pixel structure



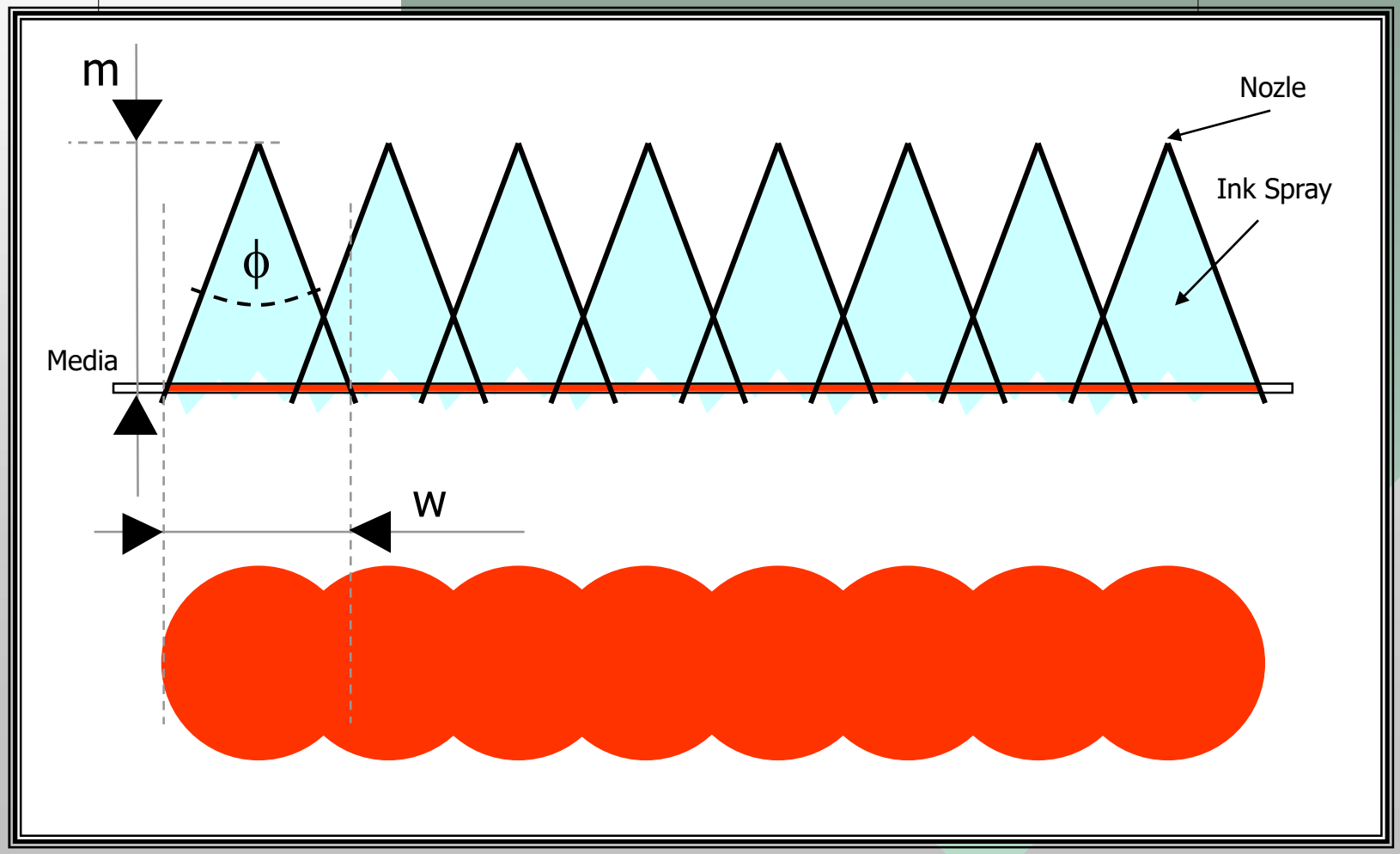
Color mode



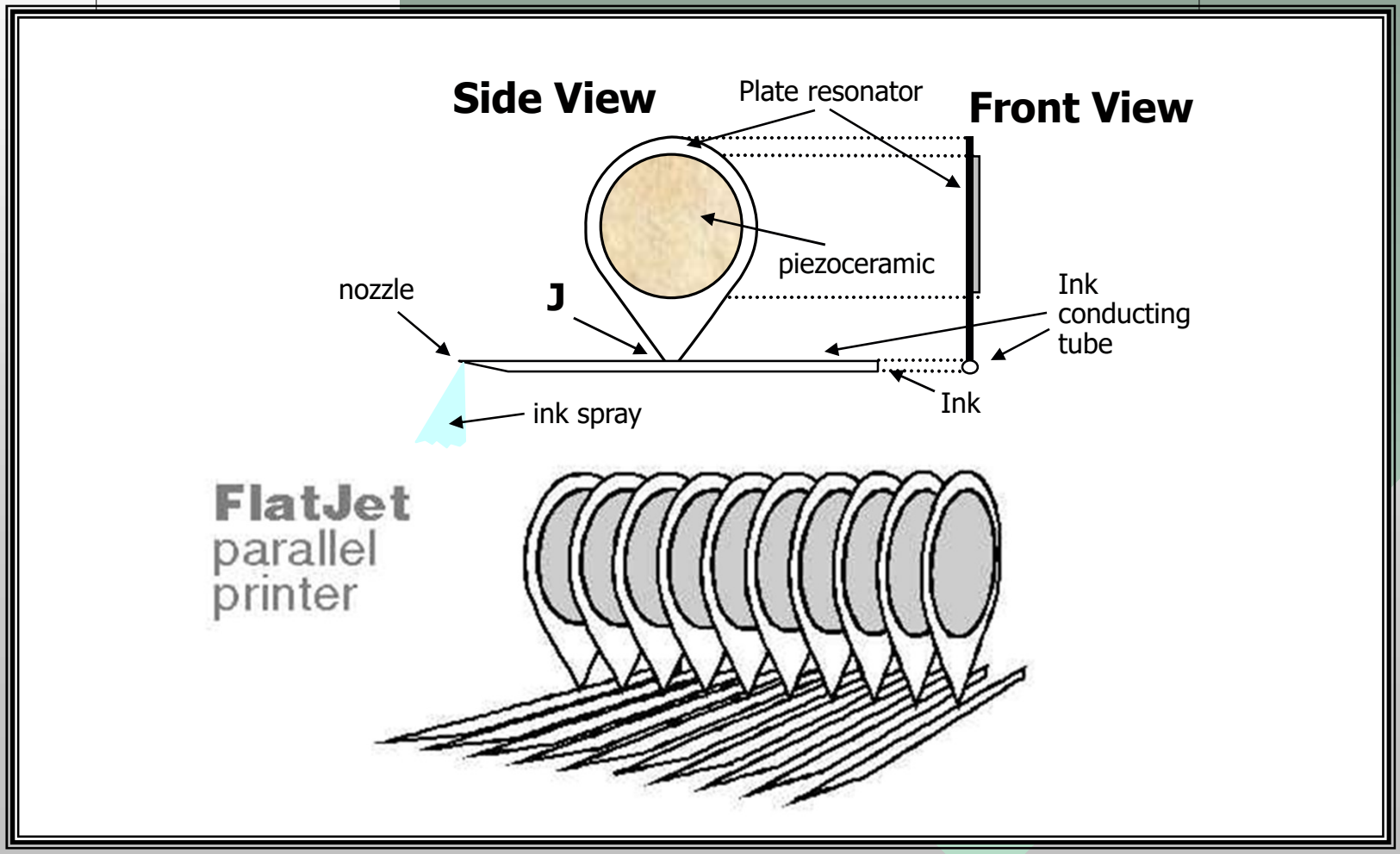
FlatJet

Raster color

Pixels Size

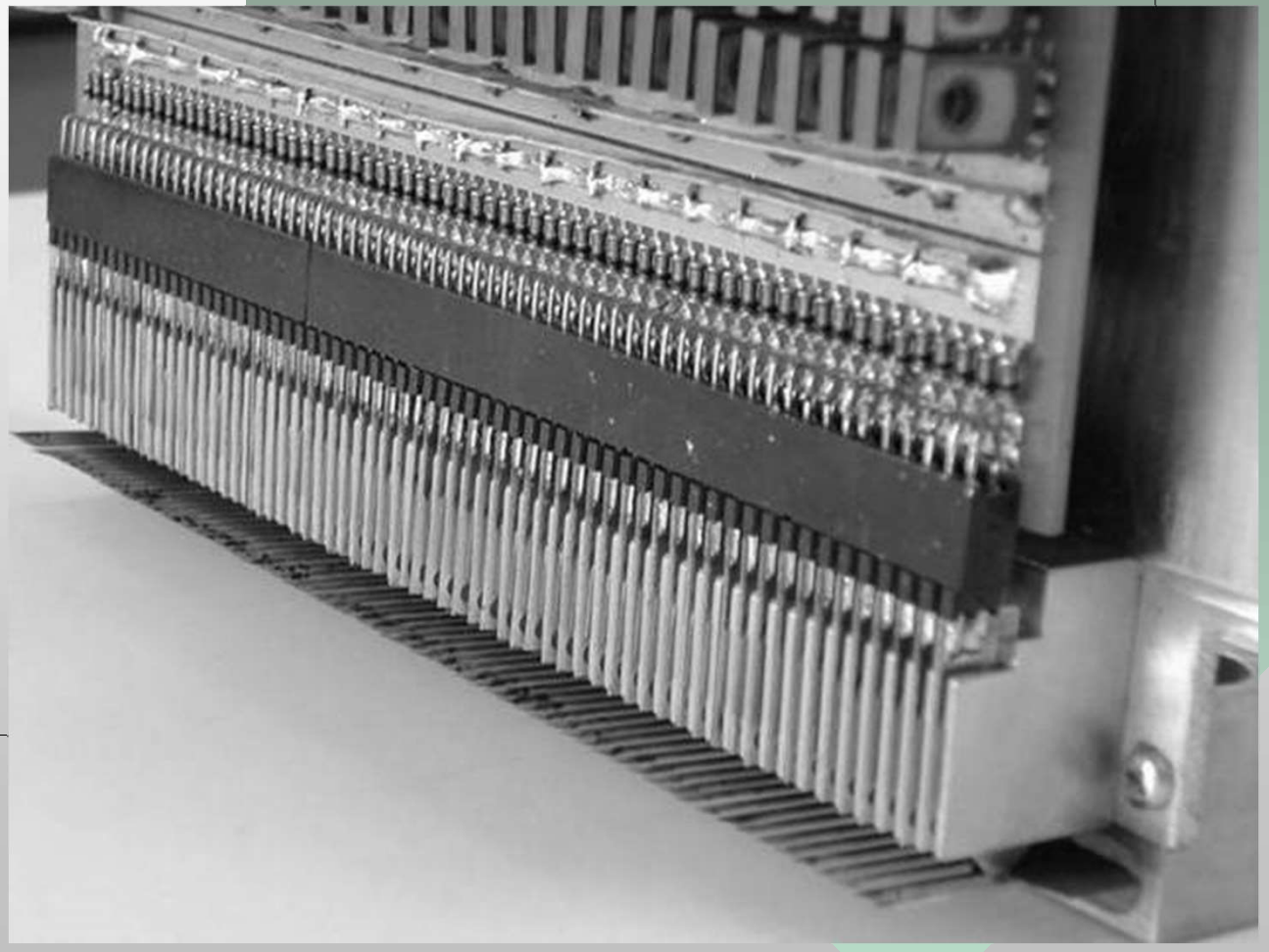


Principle

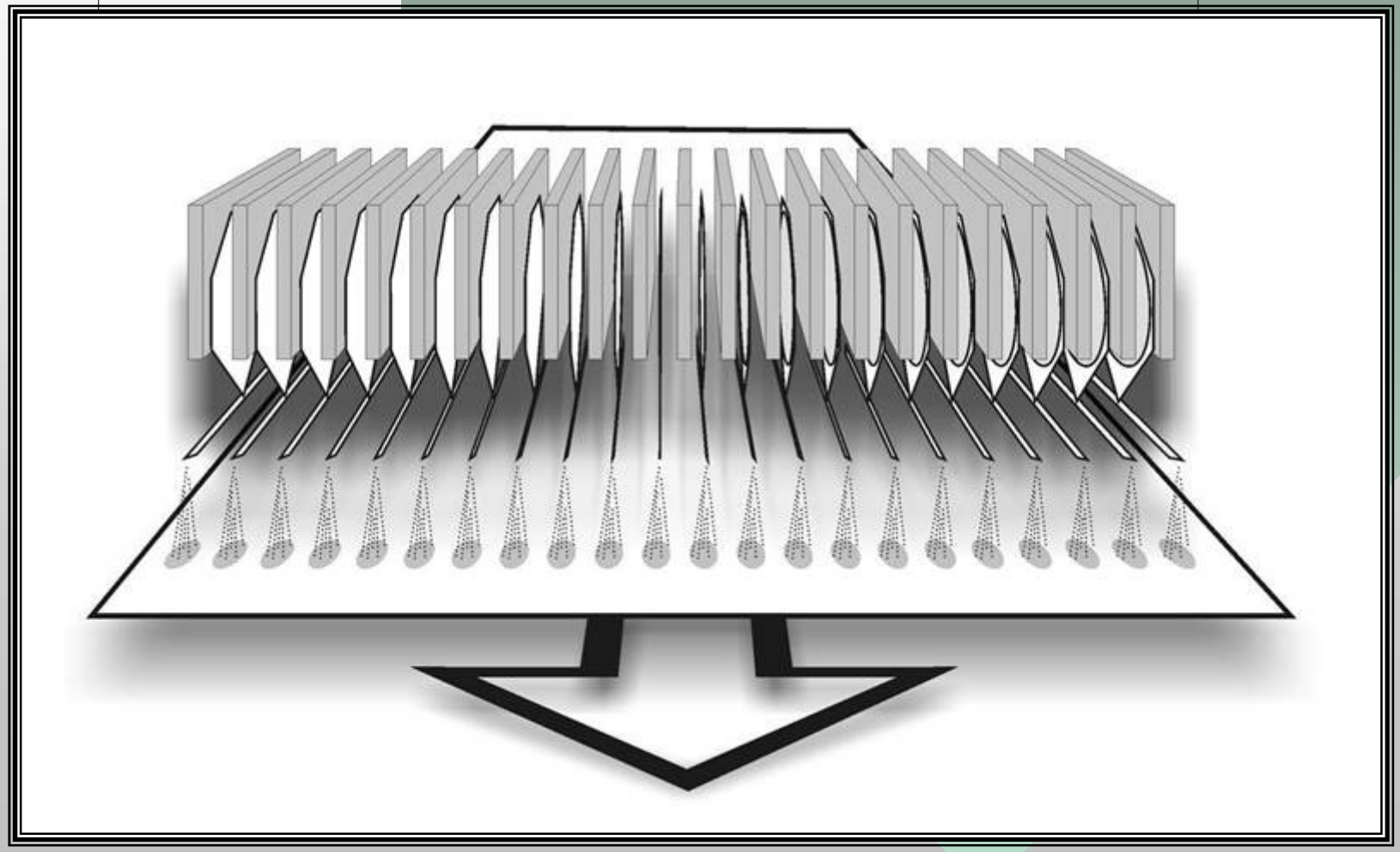

Side View
Plate resonator
Front View
piezoceramic
nozzle
J
Ink
conducting
tube
Ink
ink spray
FlatJet
parallel
printer

64 head
test printing bar

FlatJet



FlatJet



Planed media-wide printer

FlatJet

Application fields

- Printing on ordinary materials
- Printing on special materials
- Different applications
  - Chemical, Pharmaceutical or Microbiological dispensers
  - Moisturizers

Printing on ordinary materials

FlatJet

- Industrial media-wide large-format ink-jet printing
- Low cost media, low cost inks & low operating costs
- Wide variety of media & inks
- Computer to print technology

Printing on special materials

- Ceramics
- Glass
- Wood
- Leather
- Concrete
- Wallpaper
- Corrugated paper
- Plastics
- Metals
- …etc.

First Industrial Application

FlatJet

- Zimmer GmbH (A) Chromotex Textile Printer

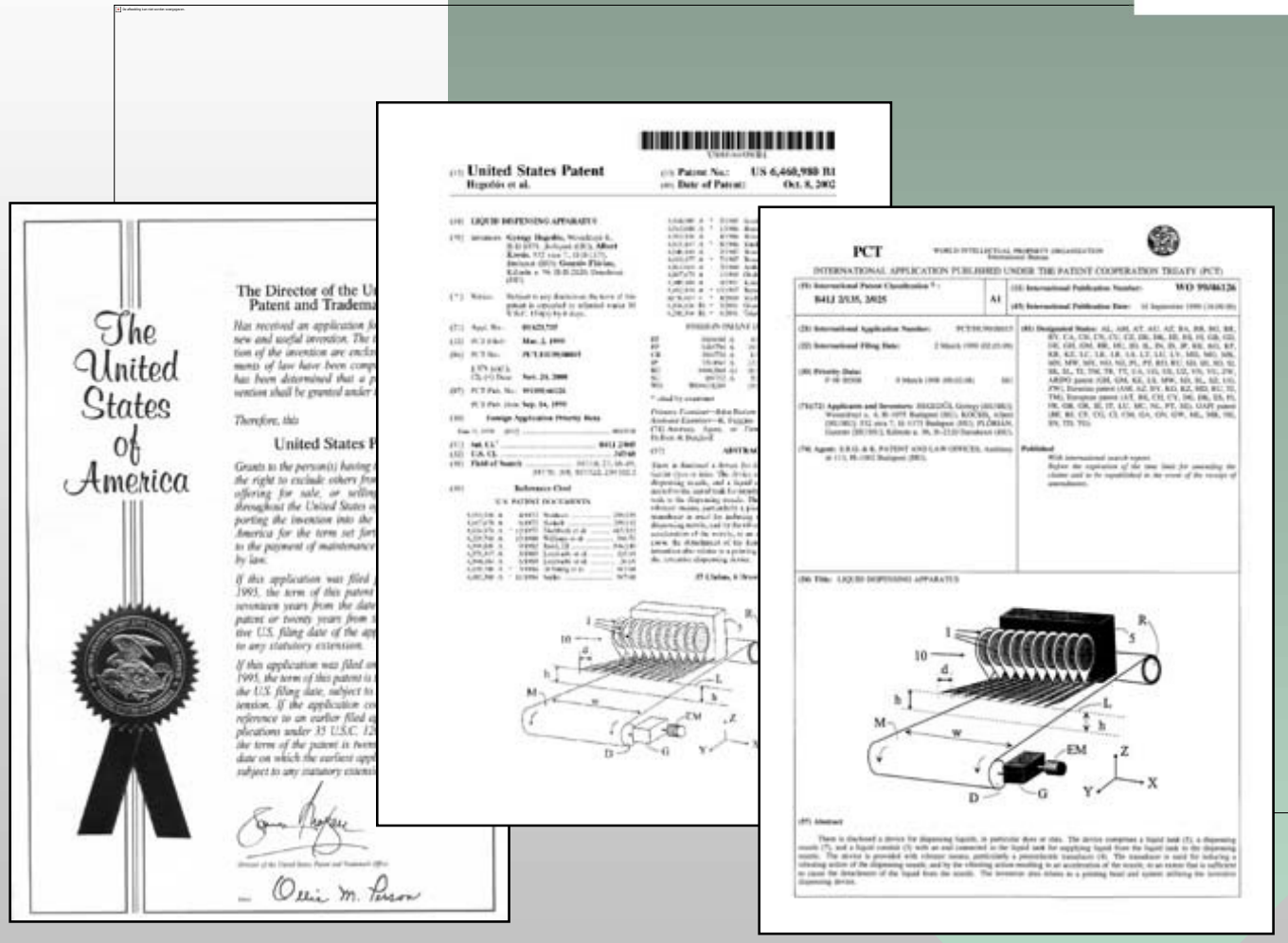
First Industrial Application

FlatJet

- Zimmer GmbH (A) Chromotex Textile Printer

Patents

FlatJet



(EU)(DE)(GB)(FR)(AT)(IT)(BE)(NL)(ES)(CH)(CA)(AU)(JP)

Hopes and Expectations

FlatJet

- A NEW TECHNOLOGY CAN SUCCEED IF IT IS QUICKER OR BETTER OR CHEAPER
- THE FLATJET CAN BE QUICKER & BETTER & CHEAPER

QUICKER

- Possible **1 sq. meter** per second printing speed
- The printing width can be increased without limits

BETTER

FlatJet

- High tone / color resolution (possibly **256 shade** in a pixel)
- High color saturation **pigmented** inks
- Environmentally friendly **water based** inks
- High tolerance in ink parameters (viscosity up to **15 mPas**)

CHEAPER

- Low cost **media**
- Low cost **inks**
- Low **operating** costs
- Quick return of **investment**