Rapid Manufacturing

- plastic parts
- conducting plastics, copper layers
- industrial examples

Jan Idserda: printing plastics and conducting plastics
Albert van Duin: metal layers
Raymond vd Brink: industrial examples
Johan: coordination

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Plastic parts printing

- **ABS** (dashboard, suitcase, ....)
- **PLA** (polymelkzuur, biodegradable)

Cover for chip of analog optical link

Optical baffle for SRON

iSPEX spectrograph polarimeter for iPhone,

Cable clamp special
LOFAR F-connector tool

• Fast production of tools
• Replaces the metal version
• Biodegradable plastics (PLA)
Conducting plastics

1: Source
2: material
3: printer modifications
4: Result

Source: Internet  PLOS ONE

Publication: A Simple, Low-Cost Conductive Composite Material for 3D Printing of Electronic Sensors
Material production

- 1: polymorph thermoplastic
- 2: carbon black
- 3: dichloromethane
- 4: mix and stir
- 5: extrusion of a wire
- 6: new material = carbomorph
Printer modifications

- Printer hot end nozzle enlargement
Results

Extruded carbomorph wire
Diameter 3mm
Copper layer on top by electrical deposition (in-house)

Carbomorph printed onto PLA

Copper \ll 1\ \text{Ohm}
3D-MID,
3 Dimensional Molded Interconnect Device

- Integration circuit and structure
- No pcb’s
- Mass production method
- 3D circuits possible
- Design flexibility
- Components directly on structure
Example: LNA above groundplane close to vivaldi
Additional information

• Rapid manufacturing
  – plastic since 15 years
  – Mature production facilities
  – Large plastic parts outsource (> 0,25 m)
  – Metal parts fast growing technology

• Metal deposition
  – by chemical deposition
  – by ionized flame deposition
  – Painting, printing conducting ink
Next steps

- Improve conductive production + copper layer

  Goal:  3D-MID prototyping
  complex shields
  prototype connectors (RF)
  Plastic covers

- Your ideas  ⇔  We produce.
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