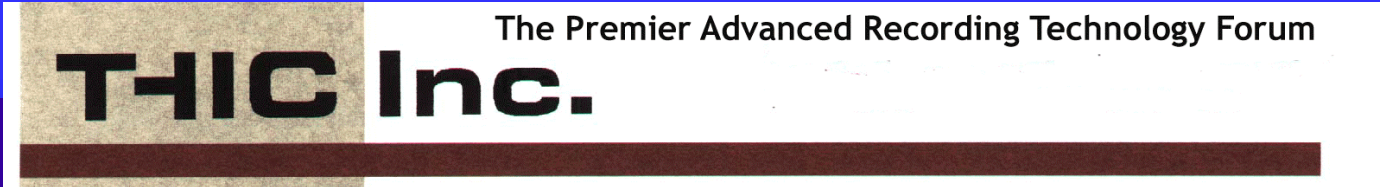


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## Optimization of Head/Tape Interface

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998 West Mission Bay Dr, San Diego CA 92109  
on January 17, 2001

2/20/2001

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# **Numerical Optimization of Magnetic Tape Heads**

**Jiasheng Zhu and Prof. F. E. Talke**

**Center for Magnetic Recording Research  
UC, San Diego**

## **Outline**

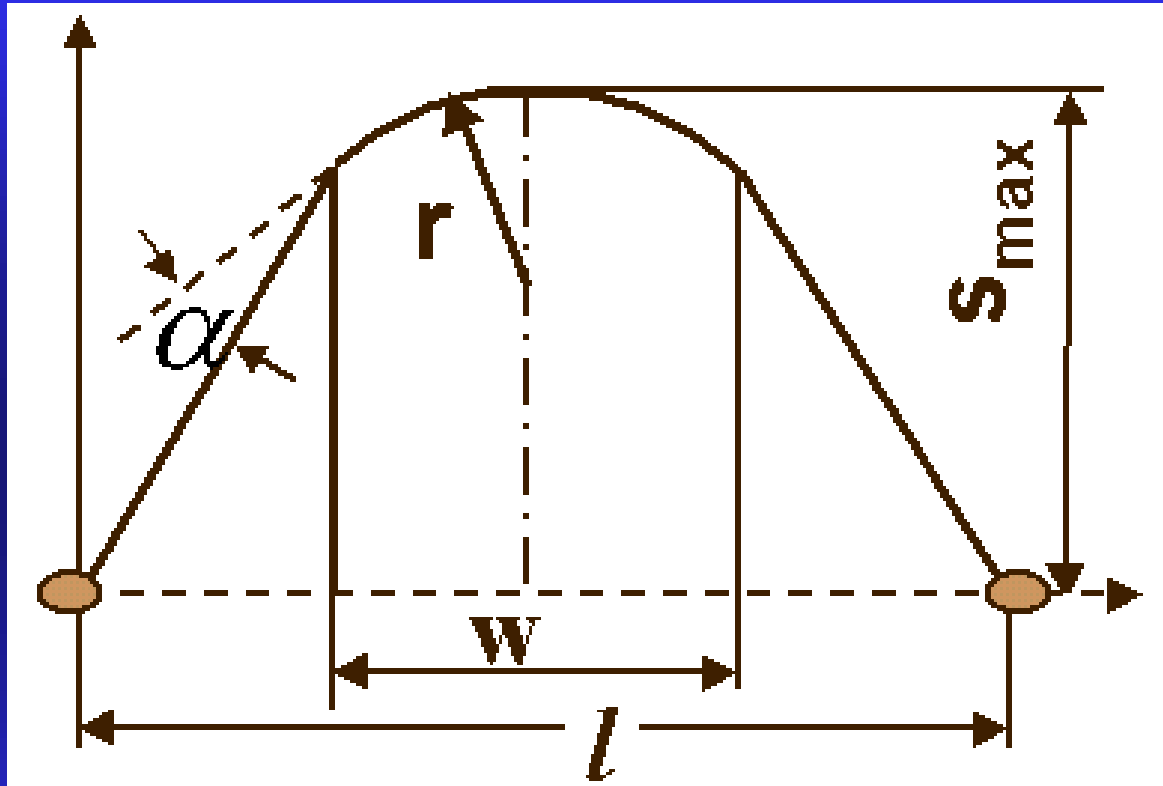
- **Optimal design of single, double, triple module head**
- **Effect of head design parameters on head/tape spacing and contact pressure**
- **Effect of head/tape interface parameters**
- **Summary**

# **Optimal Design of Single, Double and Triple Module Head**

## **Optimization criteria**

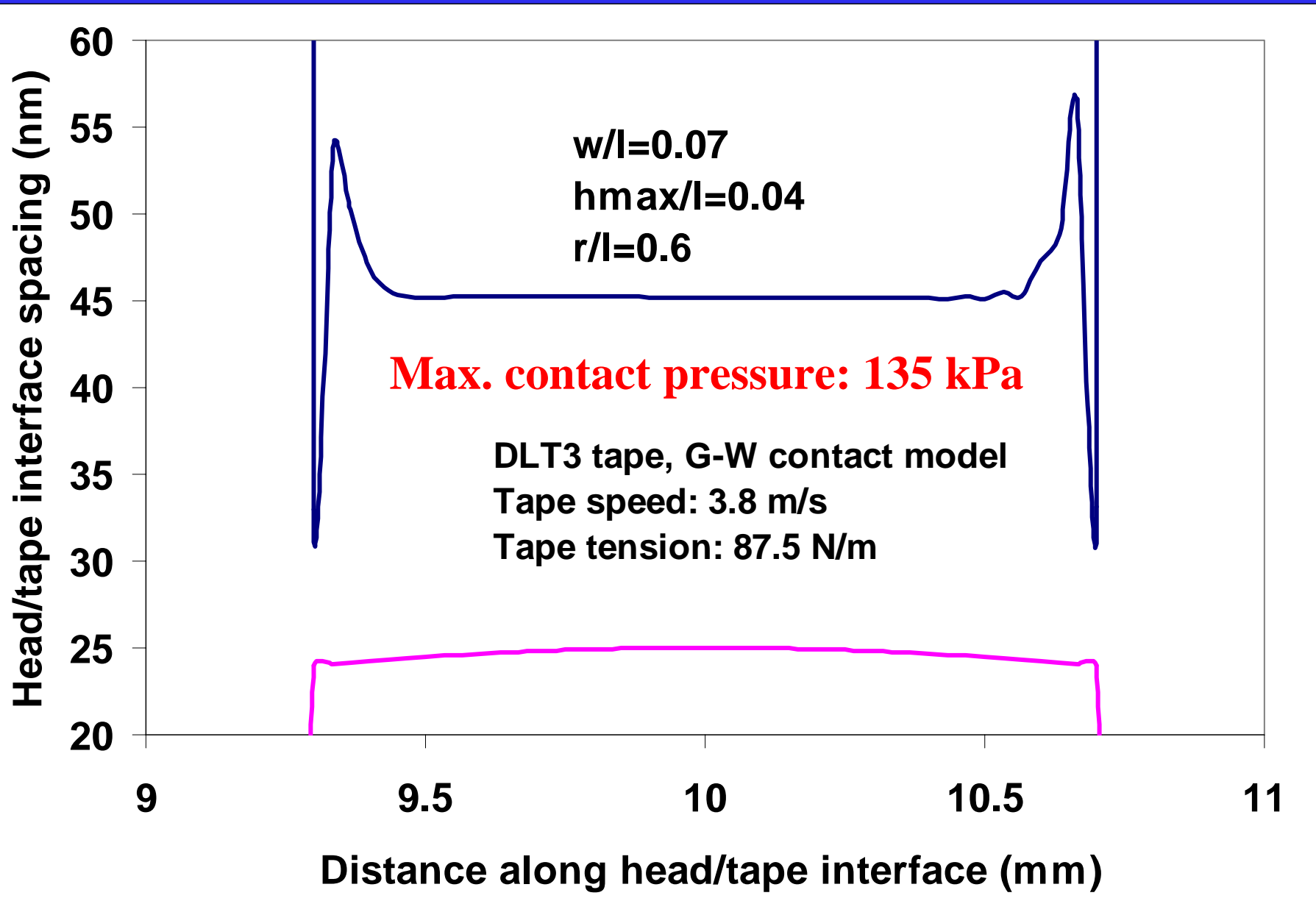
**Minimize the head/tape spacing**

## Design parameters---single module head

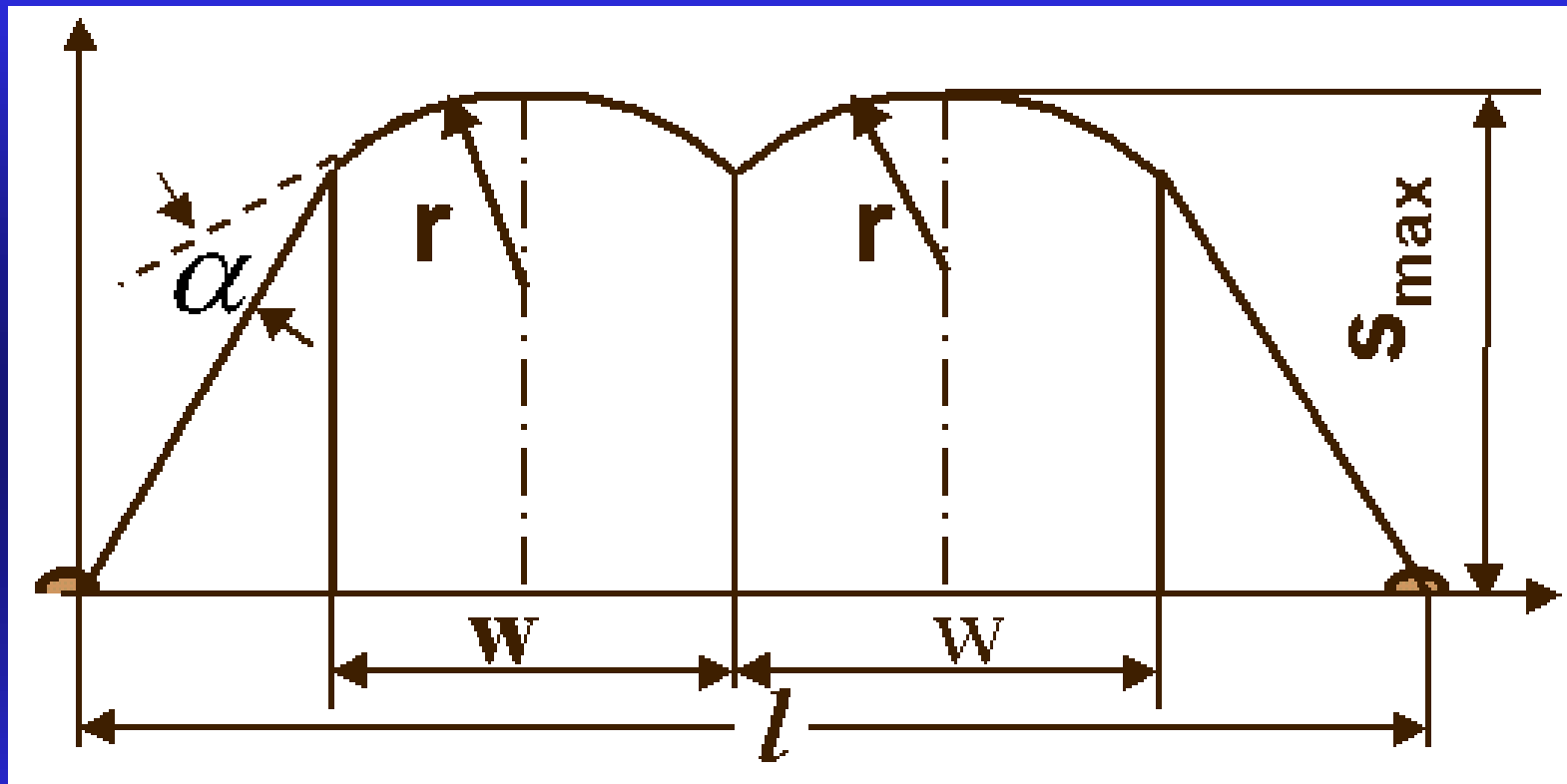


Normalized design parameters:  
 $r/l, w/l, s_{\max}/l$

# Optimal design----- single module head

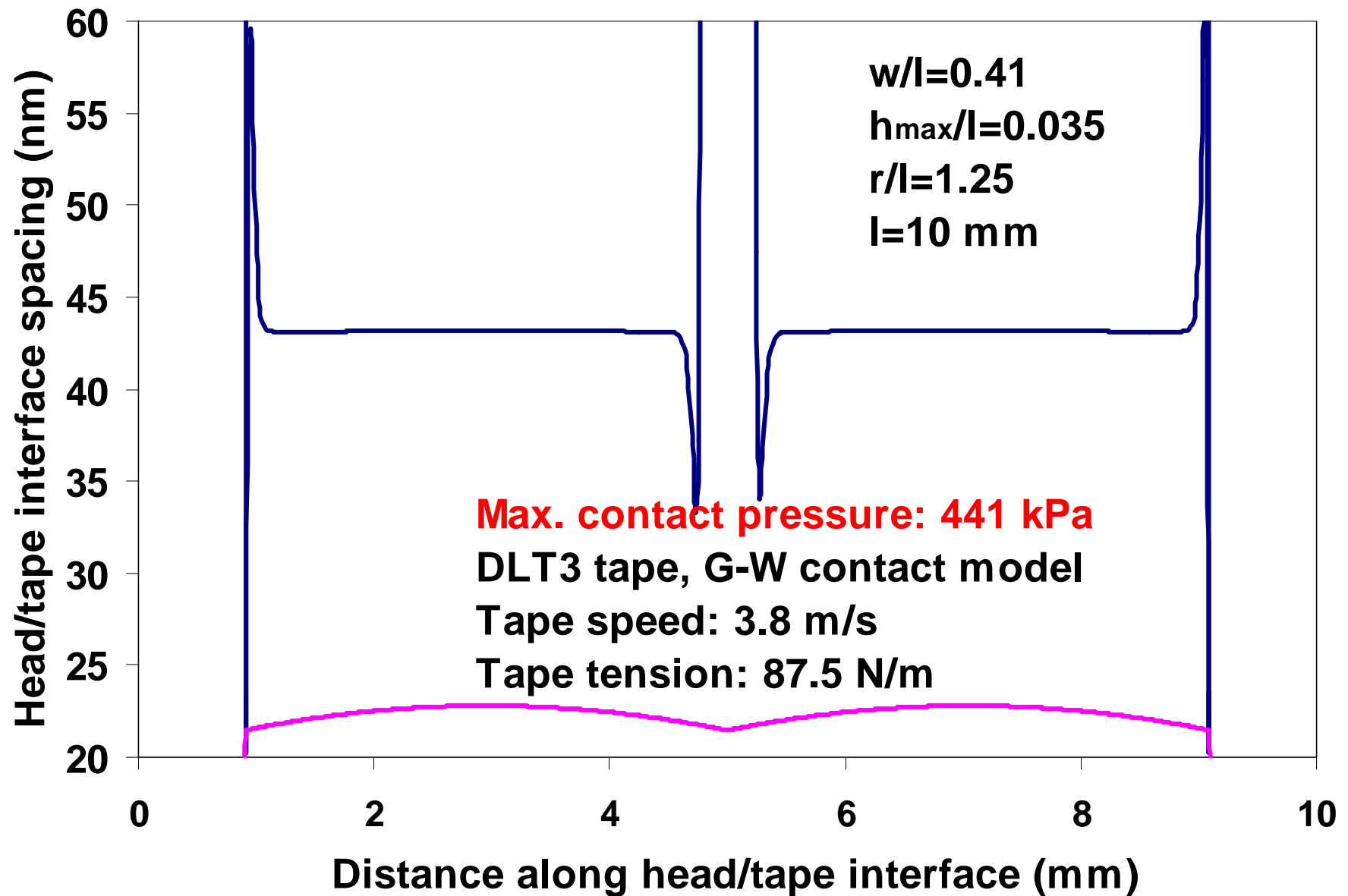


## Design parameters----double module head

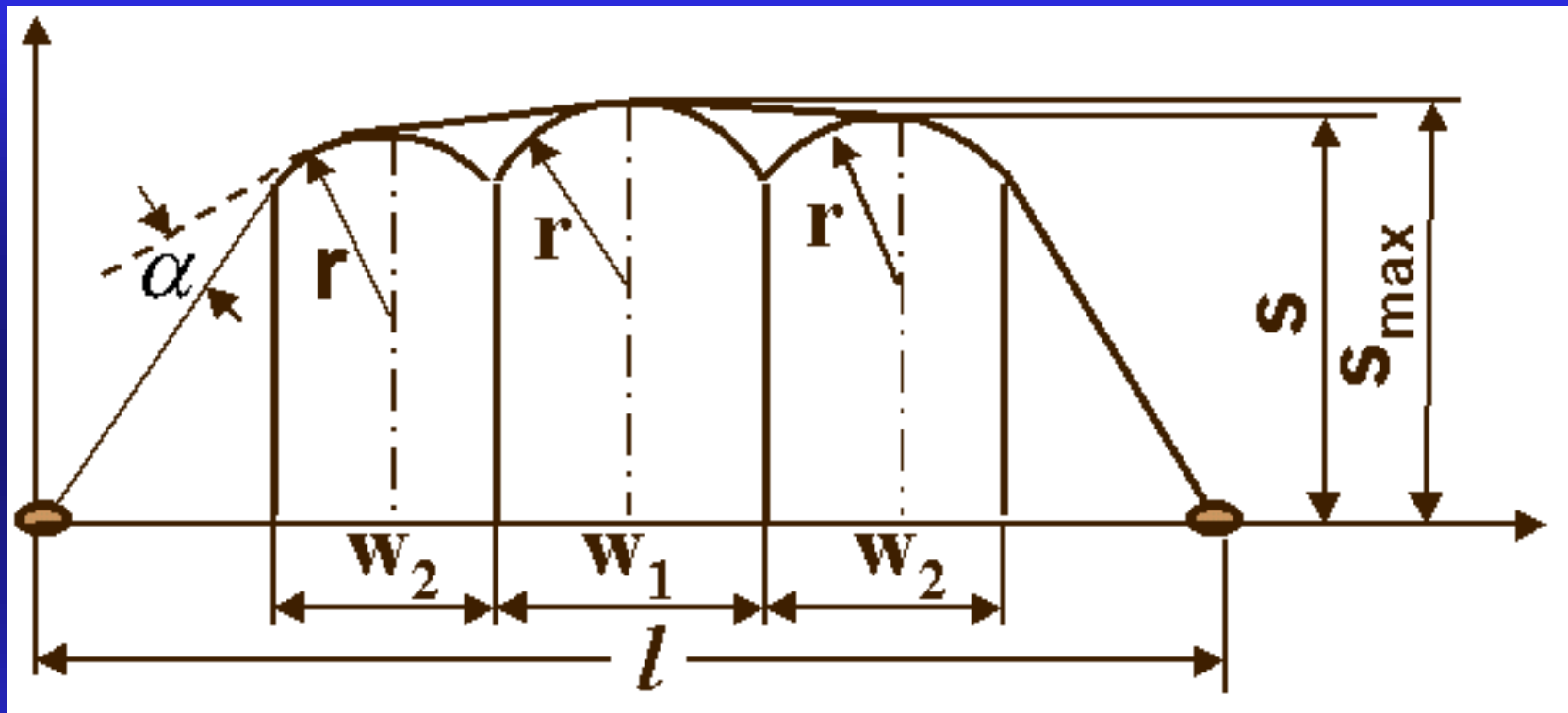


Normalized design parameters:  
 $r/l, w/l, S_{max}/l$

# Optimal design-----double module head



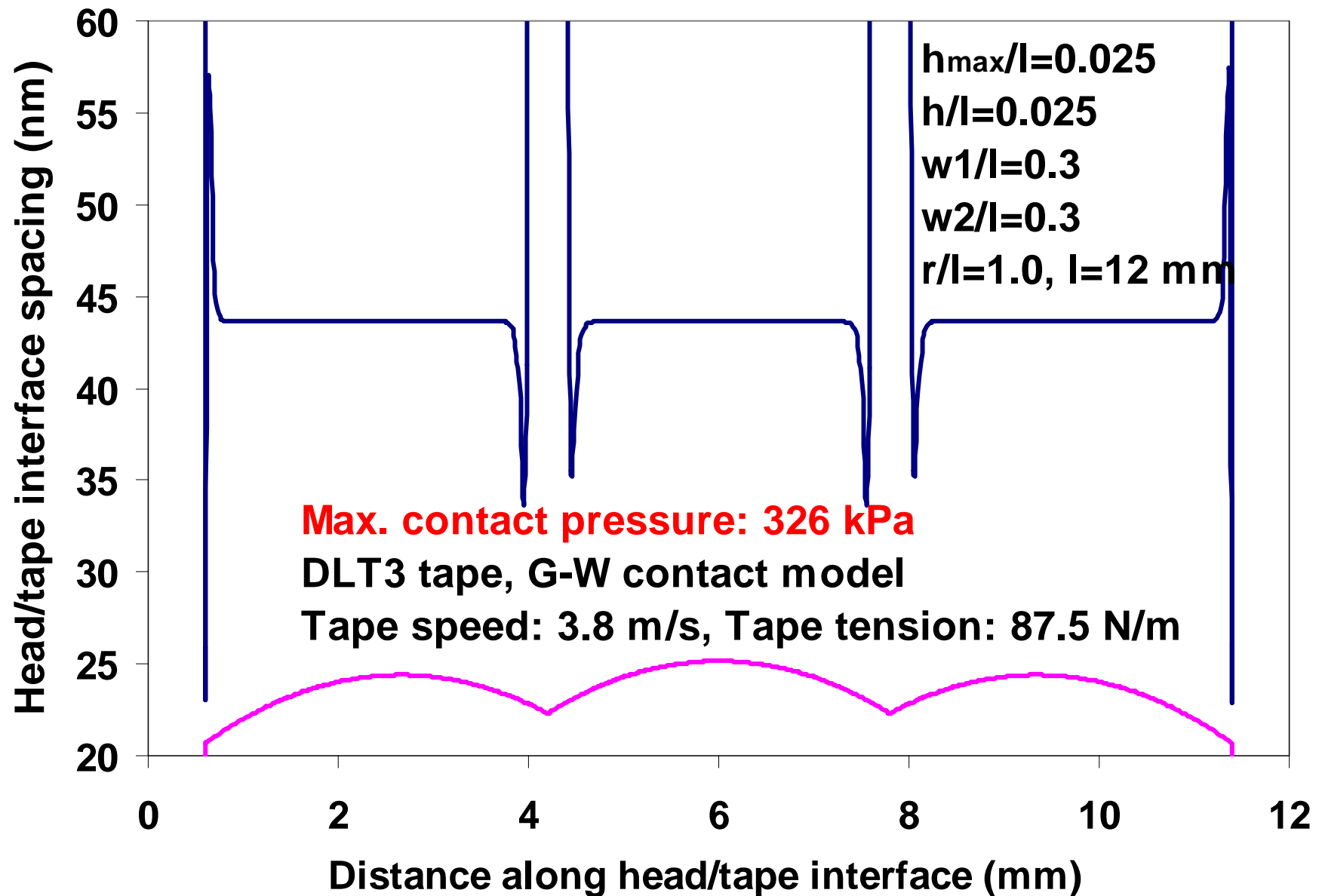
## Design parameters---- triple module head



Normalized design parameters:

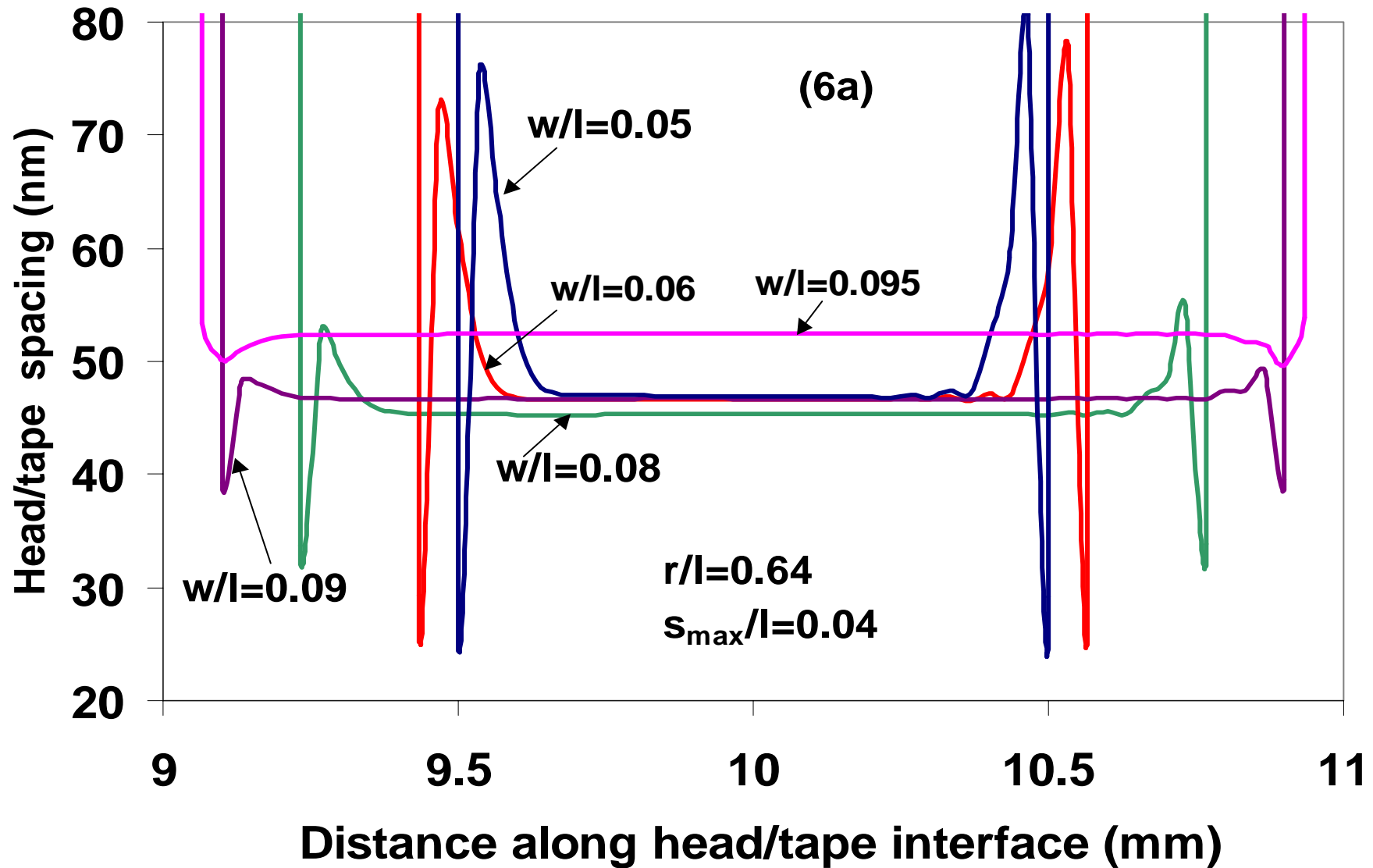
$$r/l, w_1/l, w_2/l, h/l, h_{\max}/l$$

# Optimal design----- triple module head

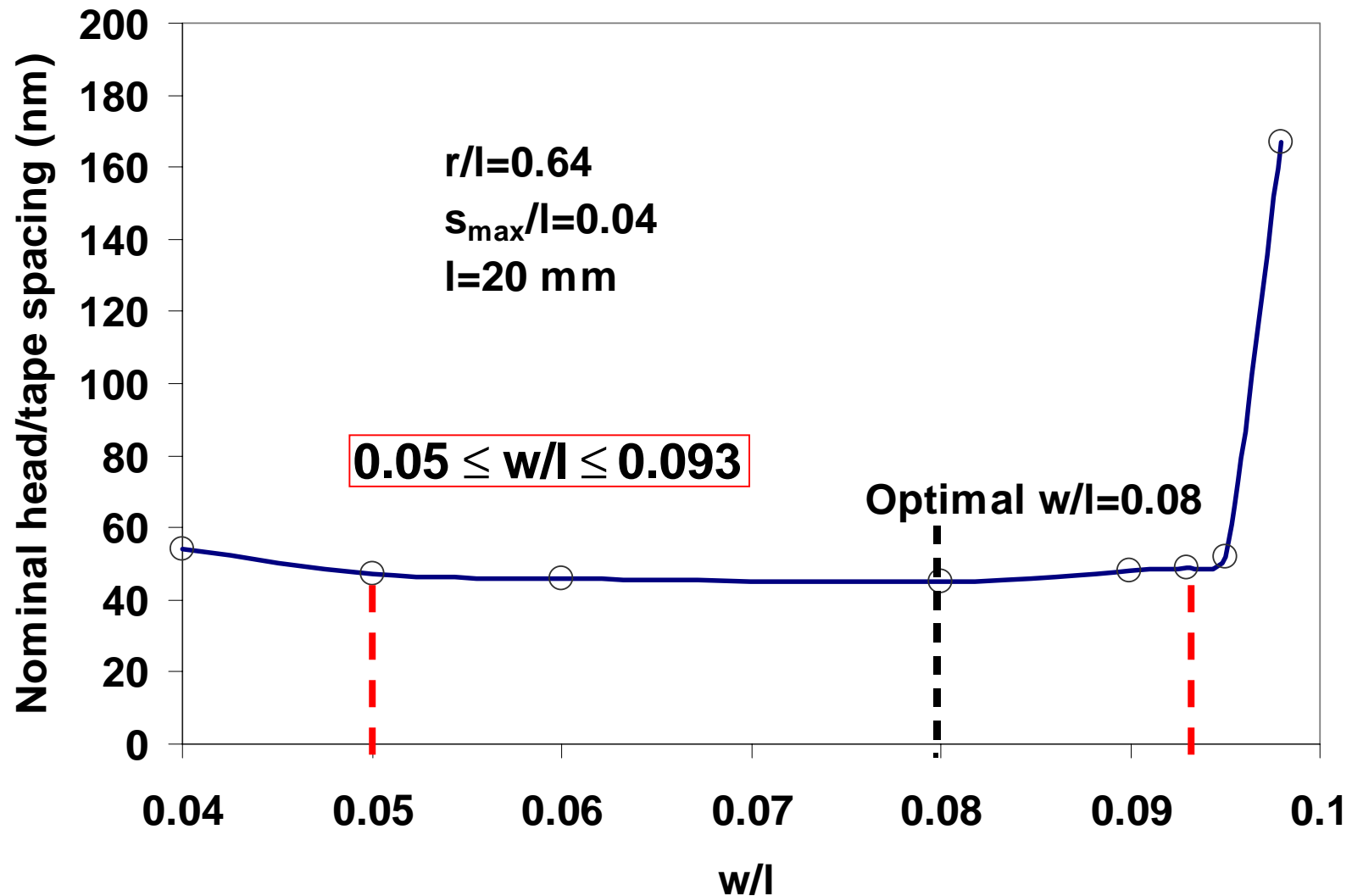


**Effect of head dimensional parameters  
on head/tape spacing and contact  
pressure**

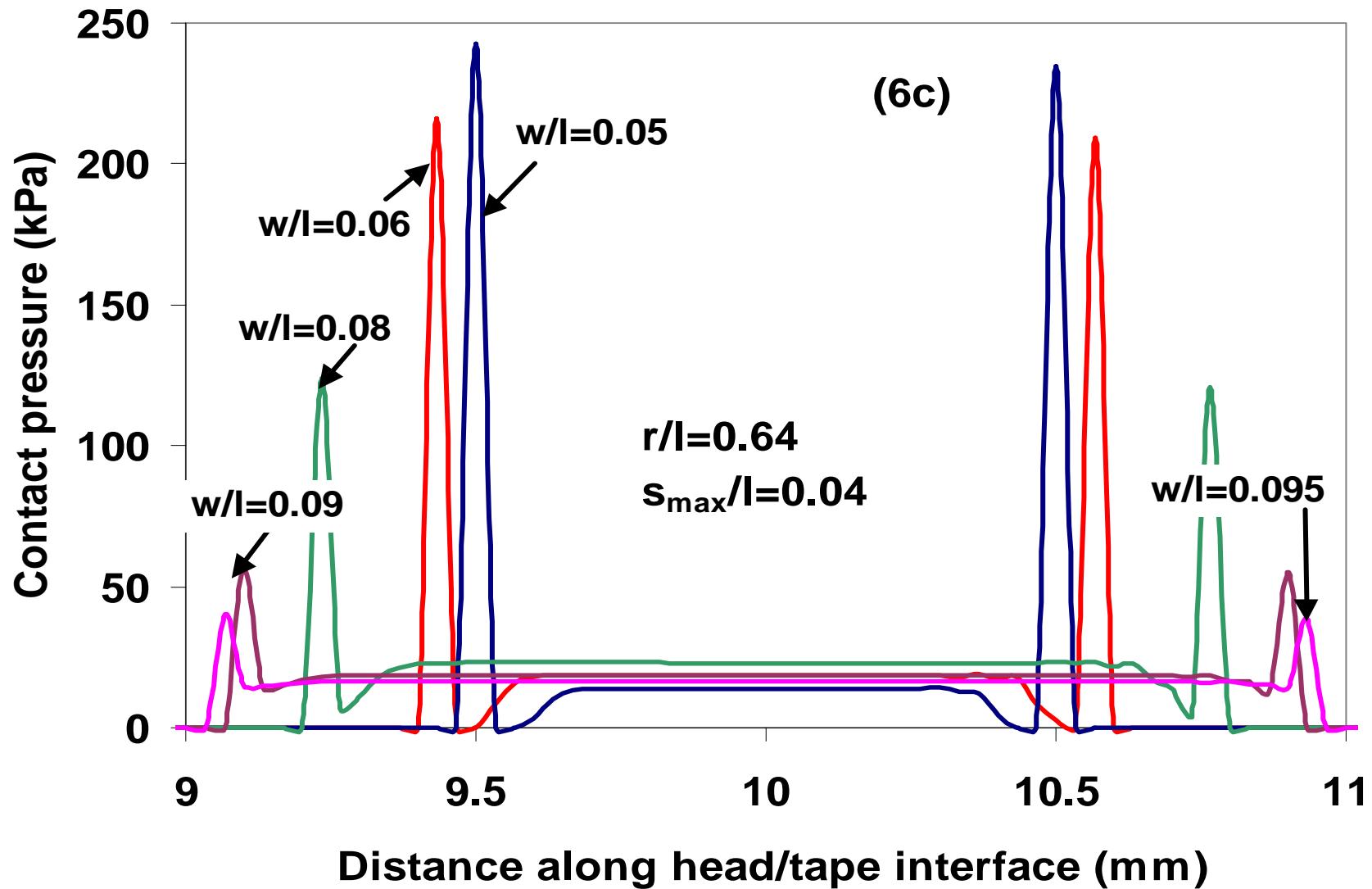
# Effect of $w$ on head/tape spacing distribution



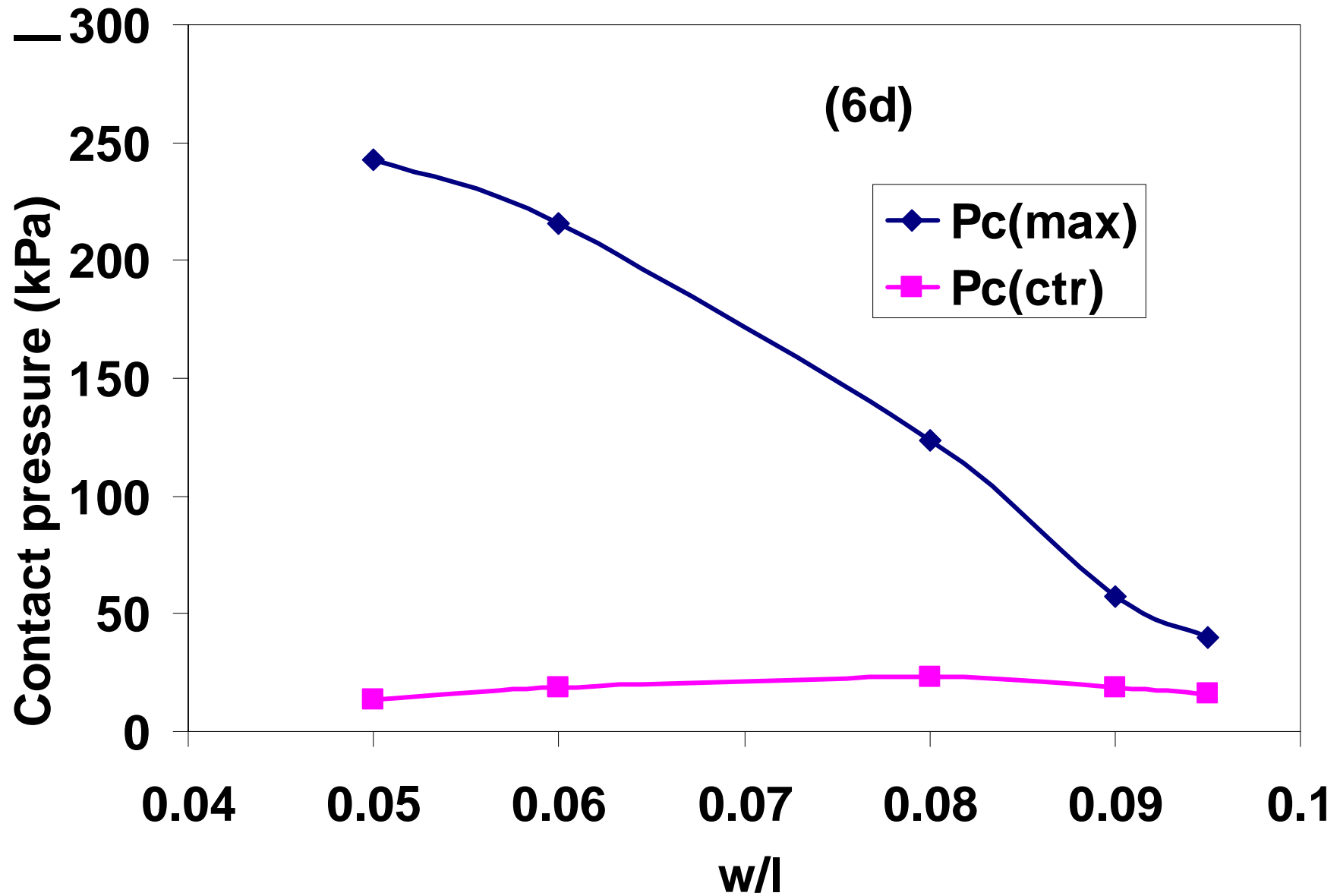
# Effect of $w$ on uniform head/tape spacing



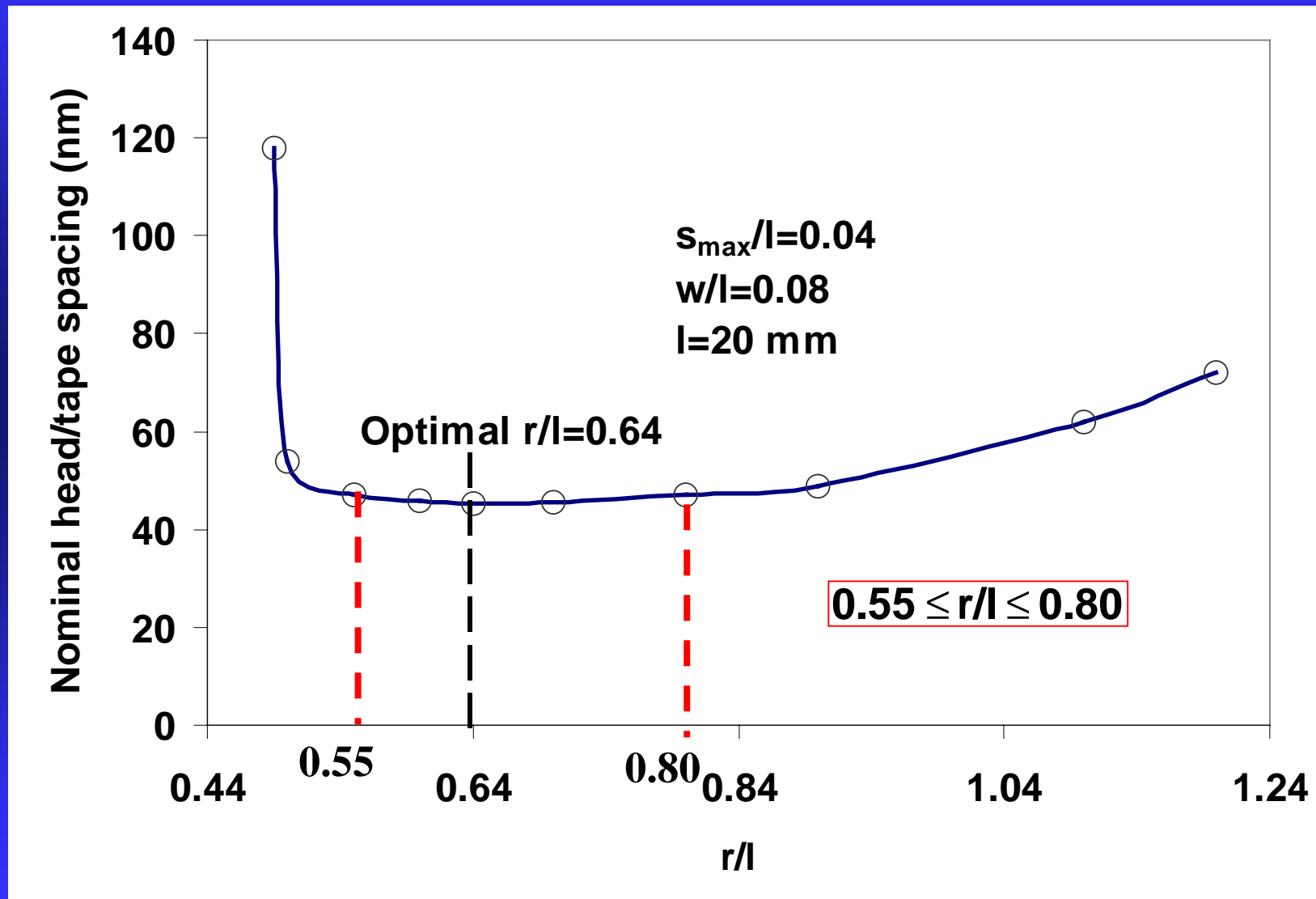
# Effect of $w$ on contact pressure distribution



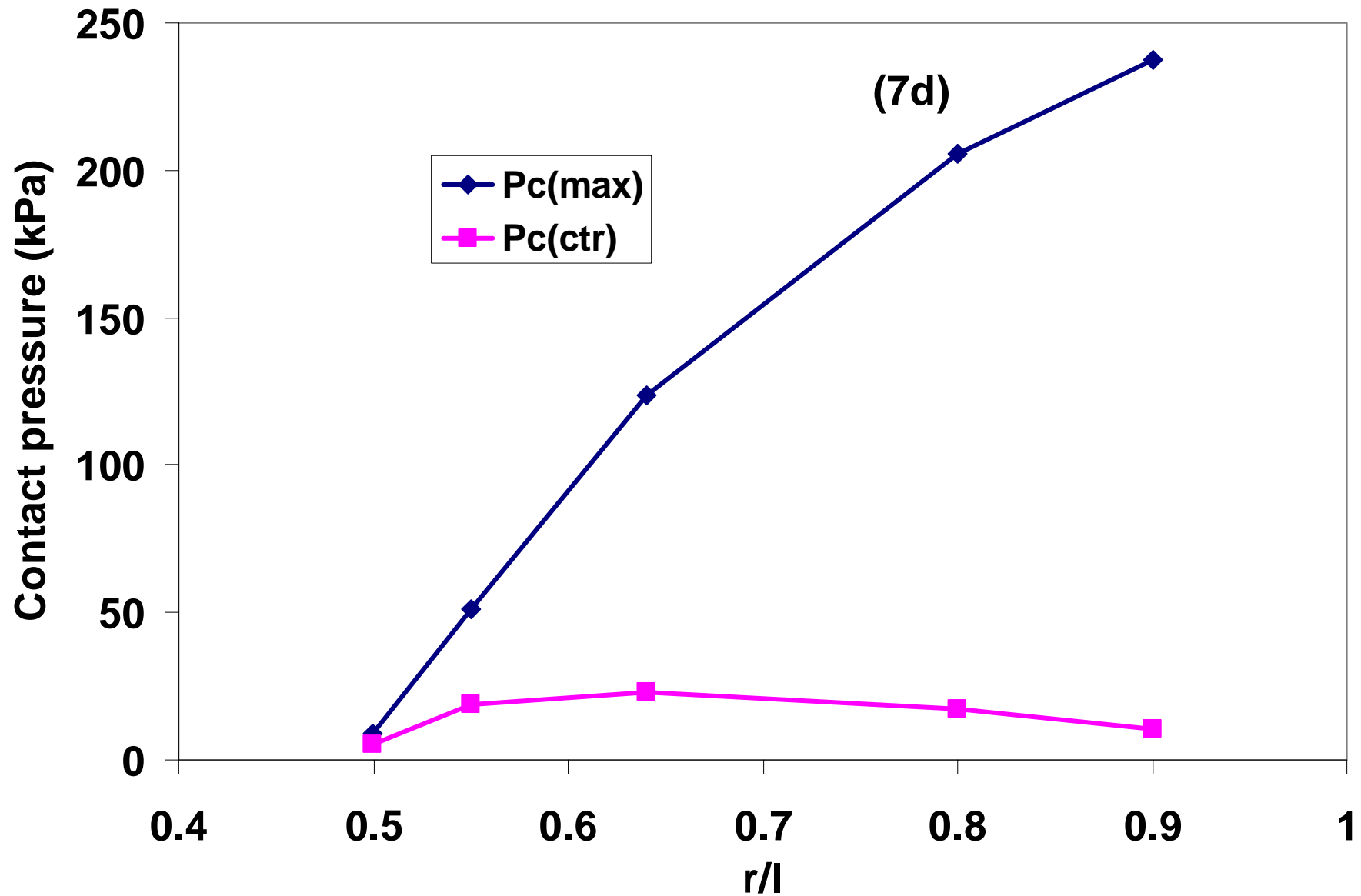
## Effect of $w$ on $p_c(\text{max})$ and $p_c(\text{ctr})$



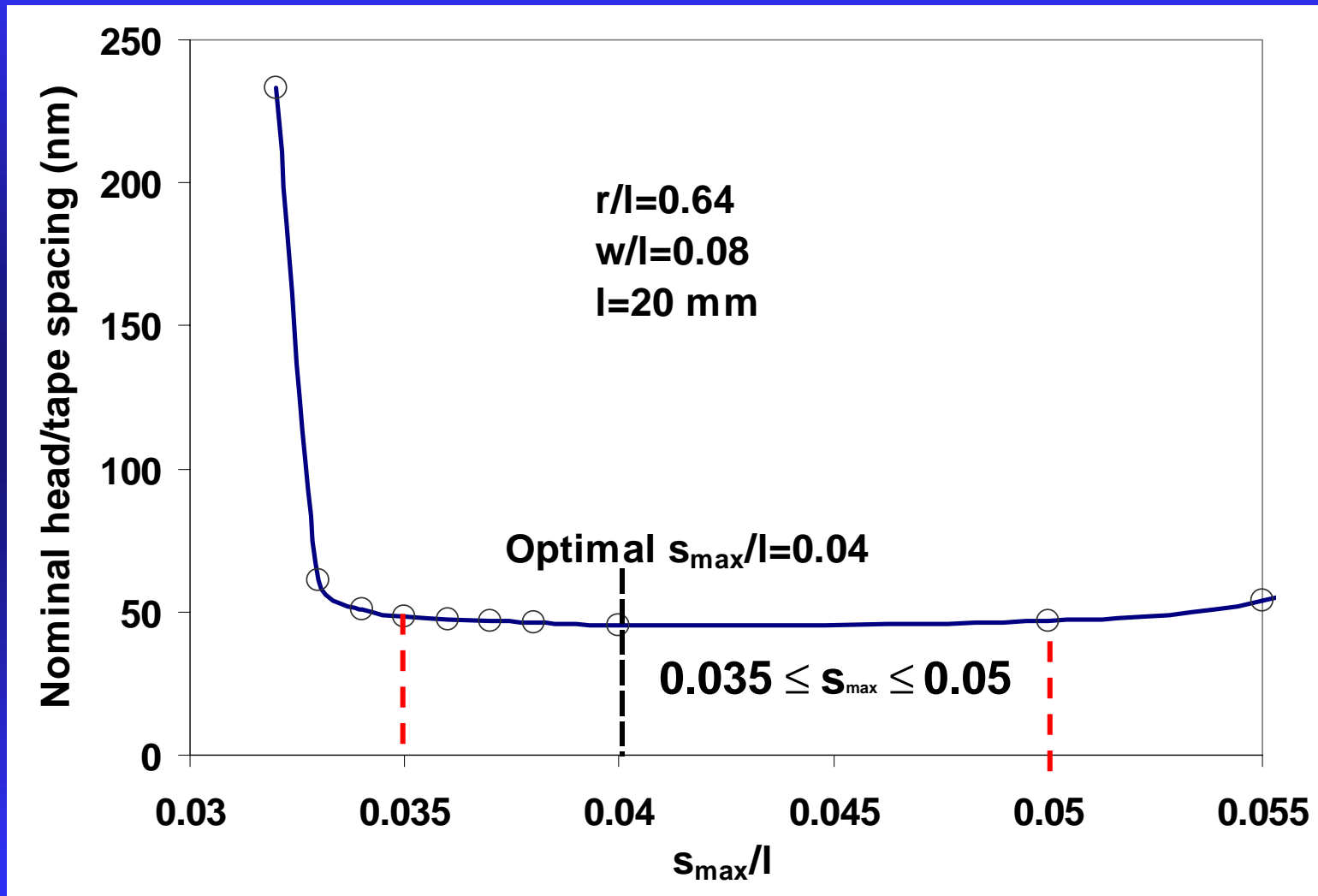
# Effect of $r$ on uniform head/tape spacing



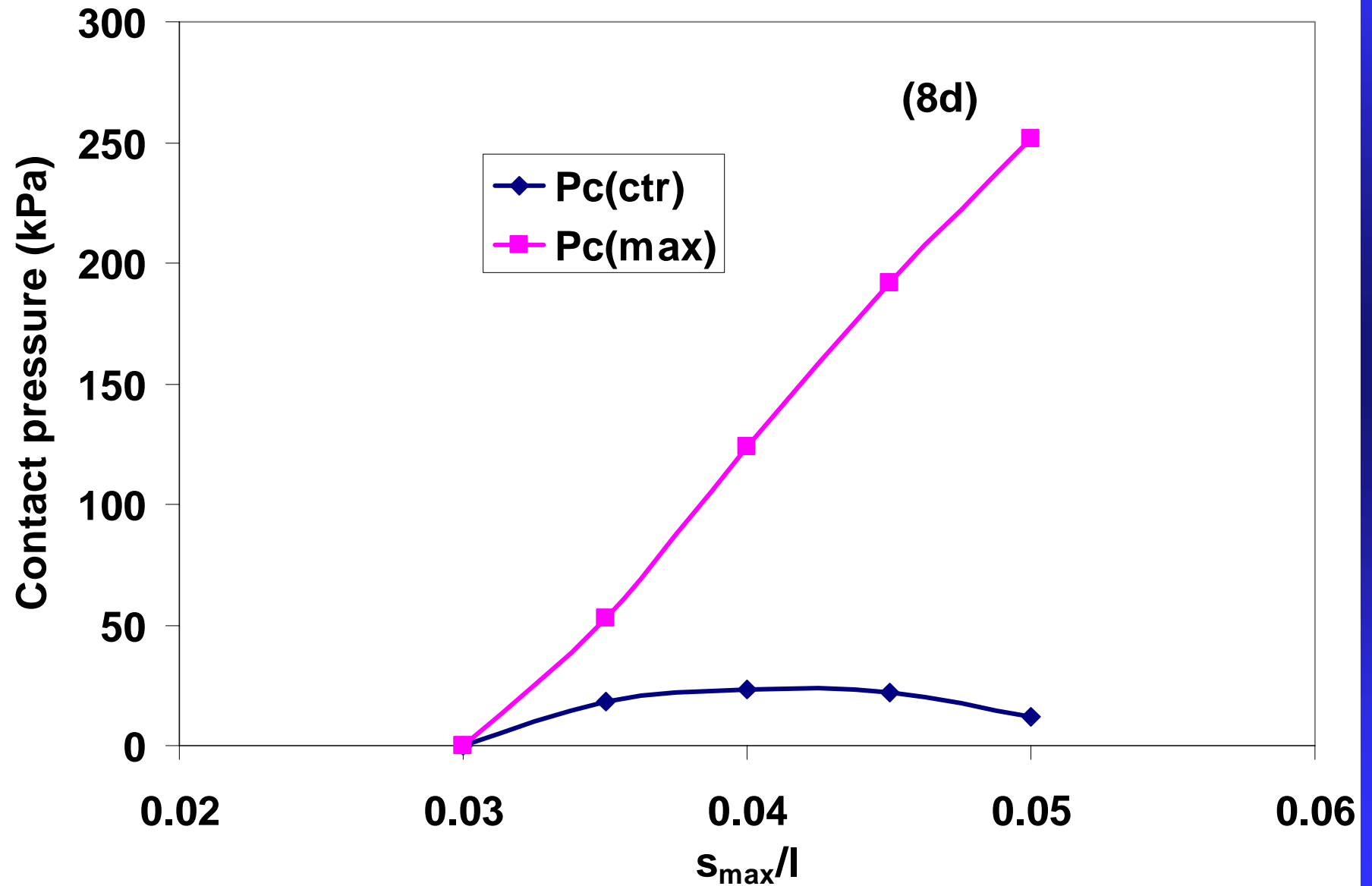
## Effect of $r$ on $p_c(\text{max})$ and $p_c(\text{ctr})$



# Effect of $s_{\max}$ on uniform head/tape spacing



# Effect of $s_{\max}$ on $p_c(\max)$ and $p_c(\text{ctr})$

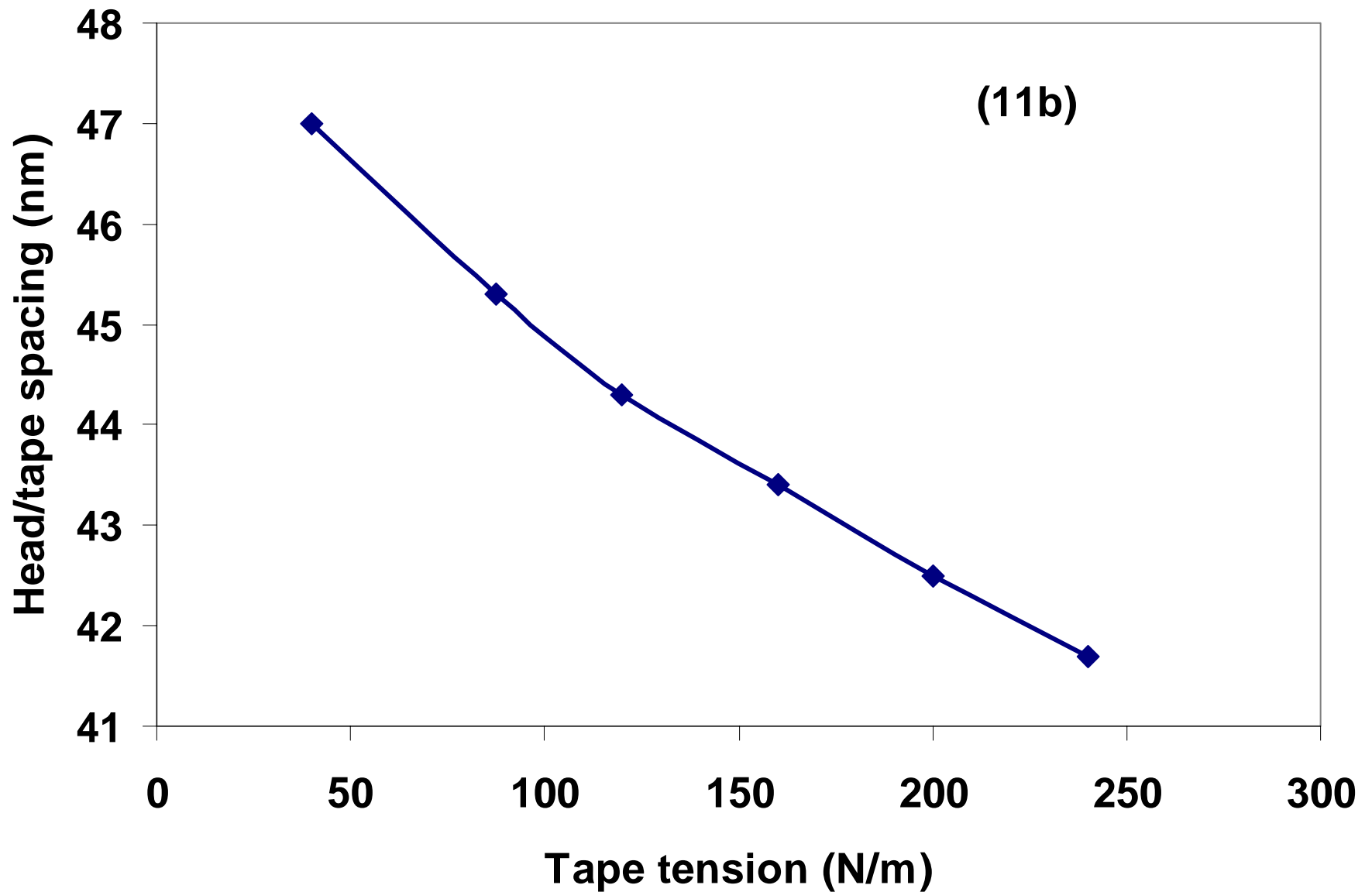


# Performance comparison

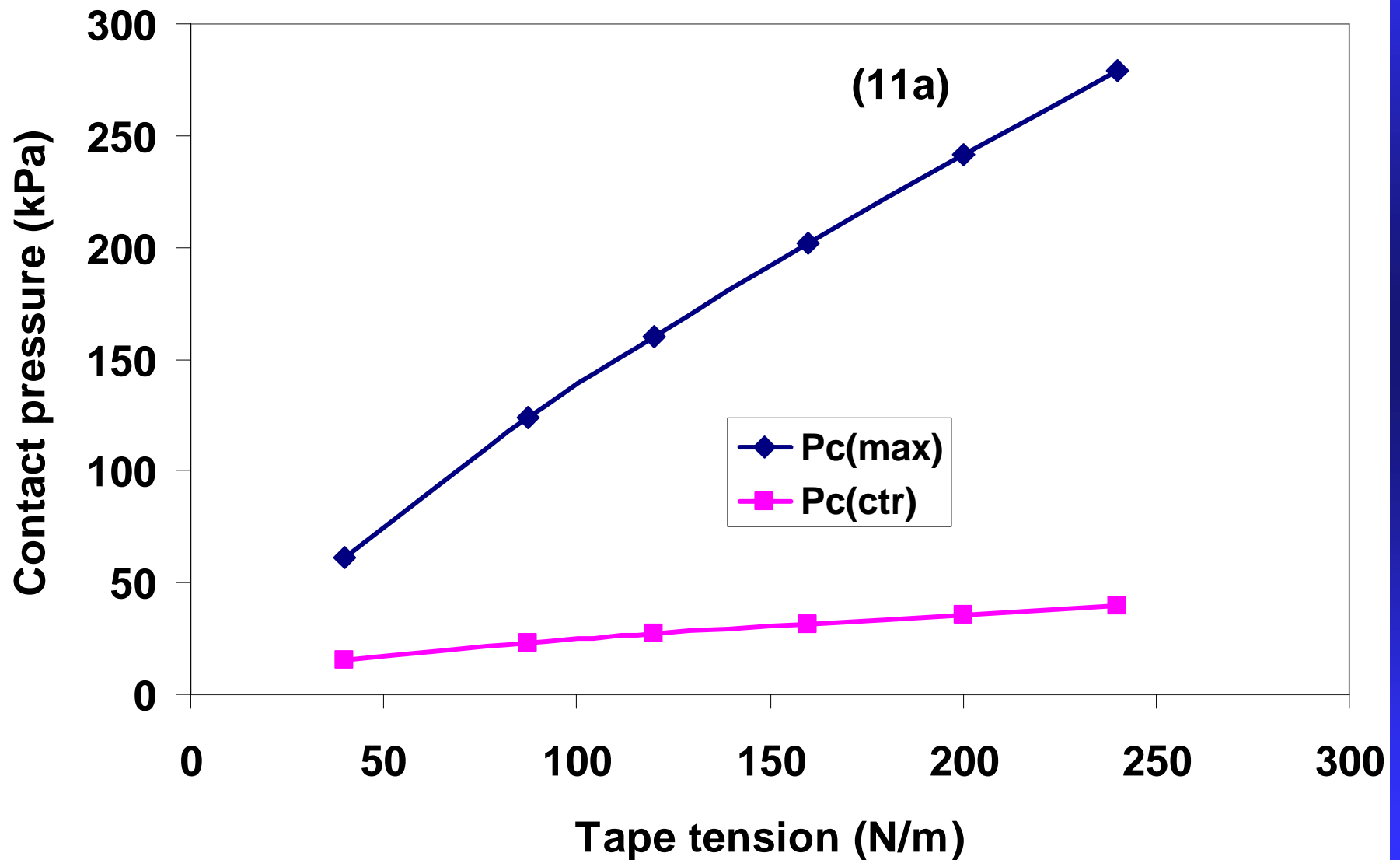
<b>Head type</b>	<b>Spacing (nm) (Center region)</b>	<b>p<sub>c</sub> (kPa) (Center region)</b>	<b>Max. p<sub>c</sub>(kPa) (Head edges)</b>
<b>Single</b>	<b>45</b>	<b>23</b>	<b>135</b>
<b>Double</b>	<b>43</b>	<b>32</b>	<b>441</b>
<b>Triple</b>	<b>44</b>	<b>30</b>	<b>326</b>

# **Effect of Head/Tape Interface Parameters**

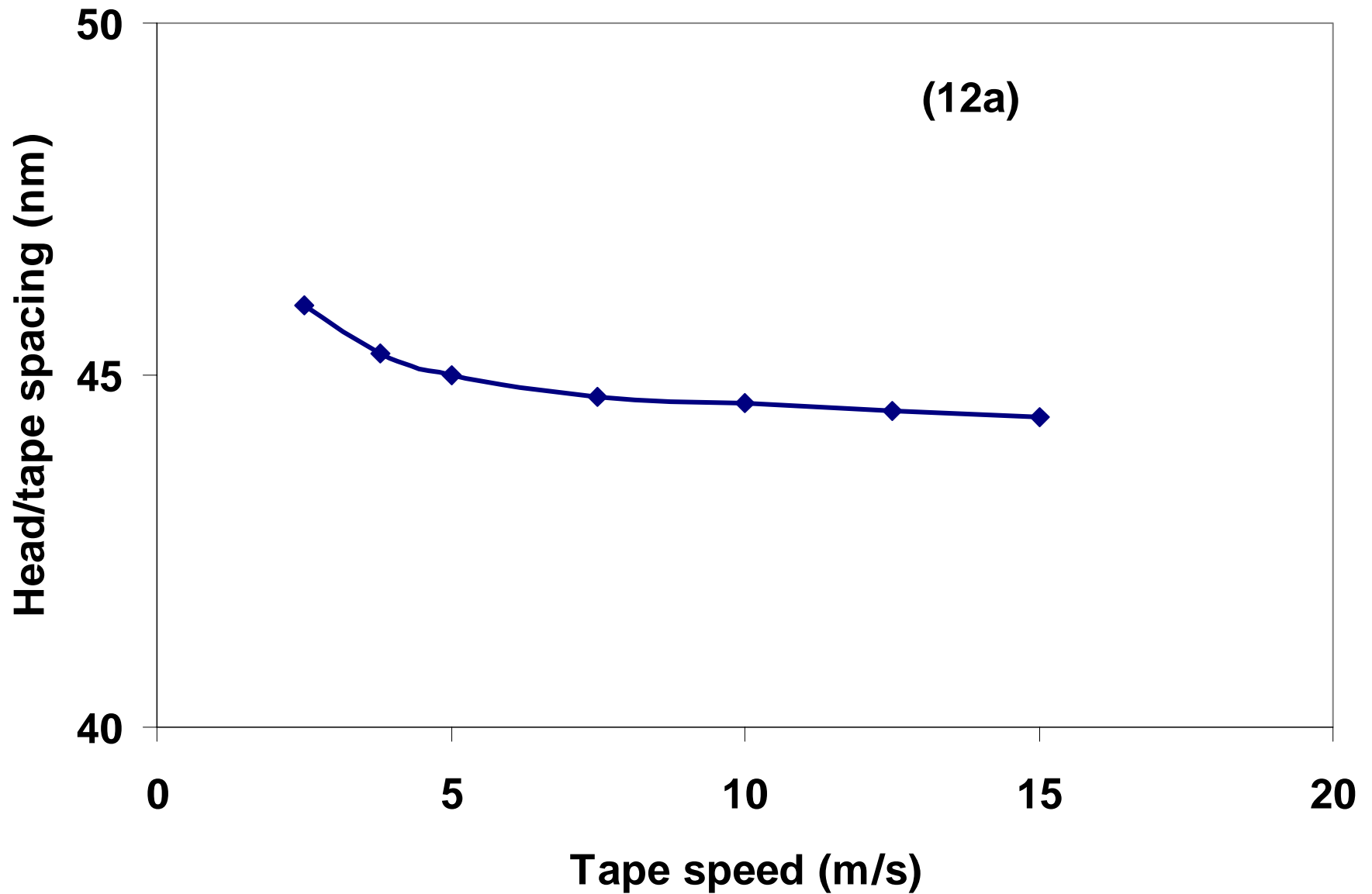
# Effect of tape tension on uniform spacing



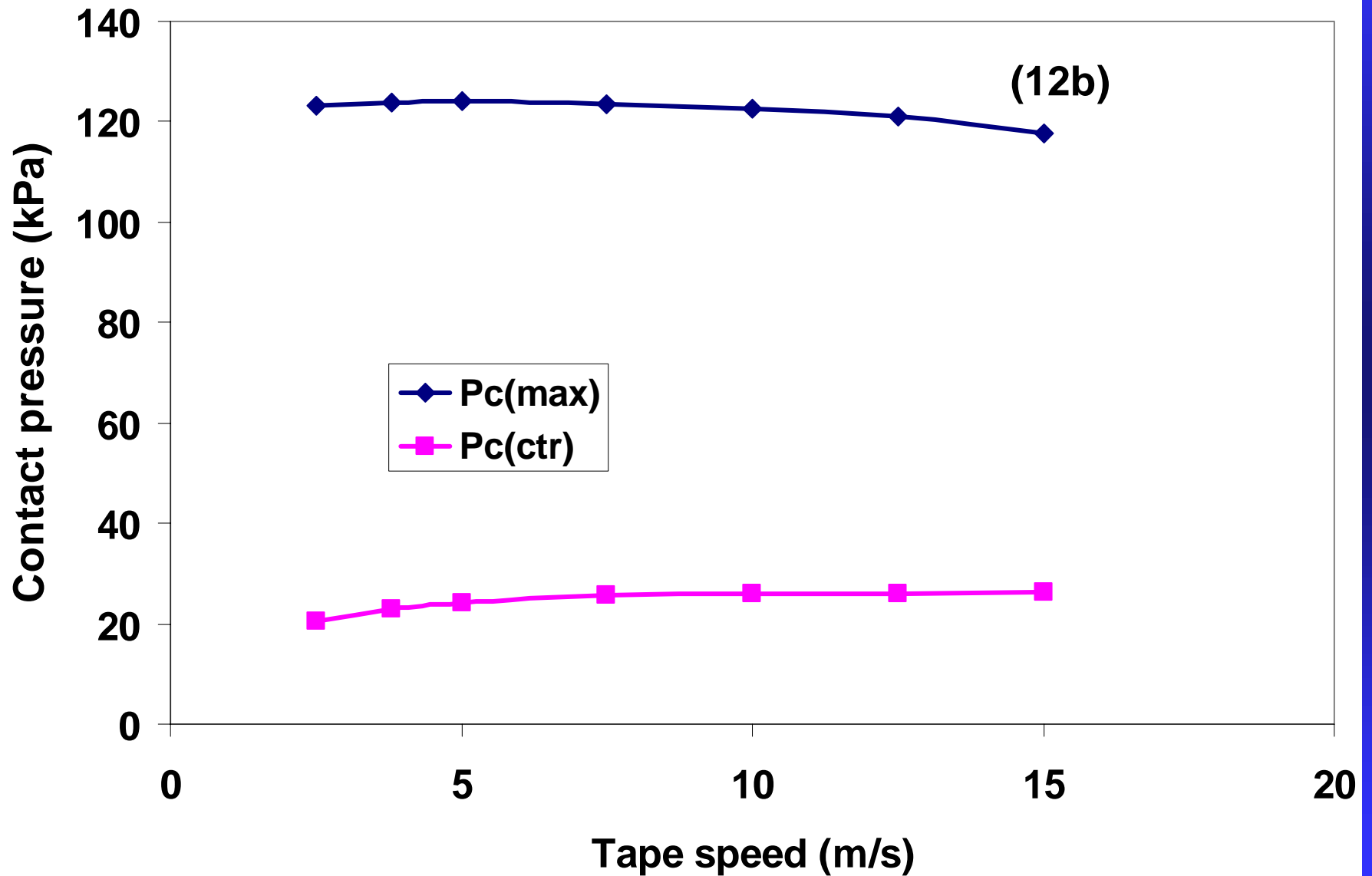
# Effect of tape tension on $p_c(\text{max})$ and $p_c(\text{ctr})$



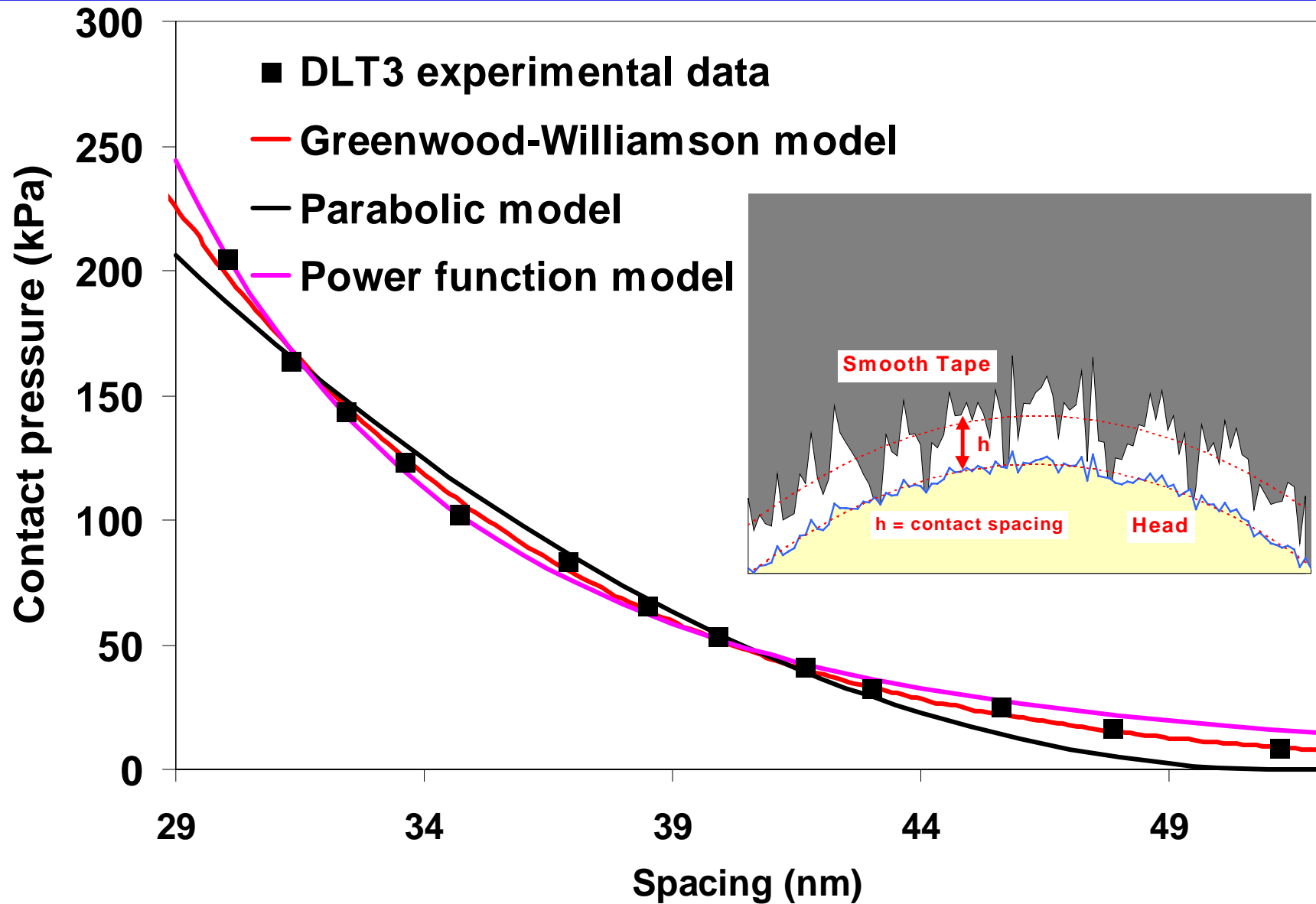
# Effect of tape speed on uniform spacing



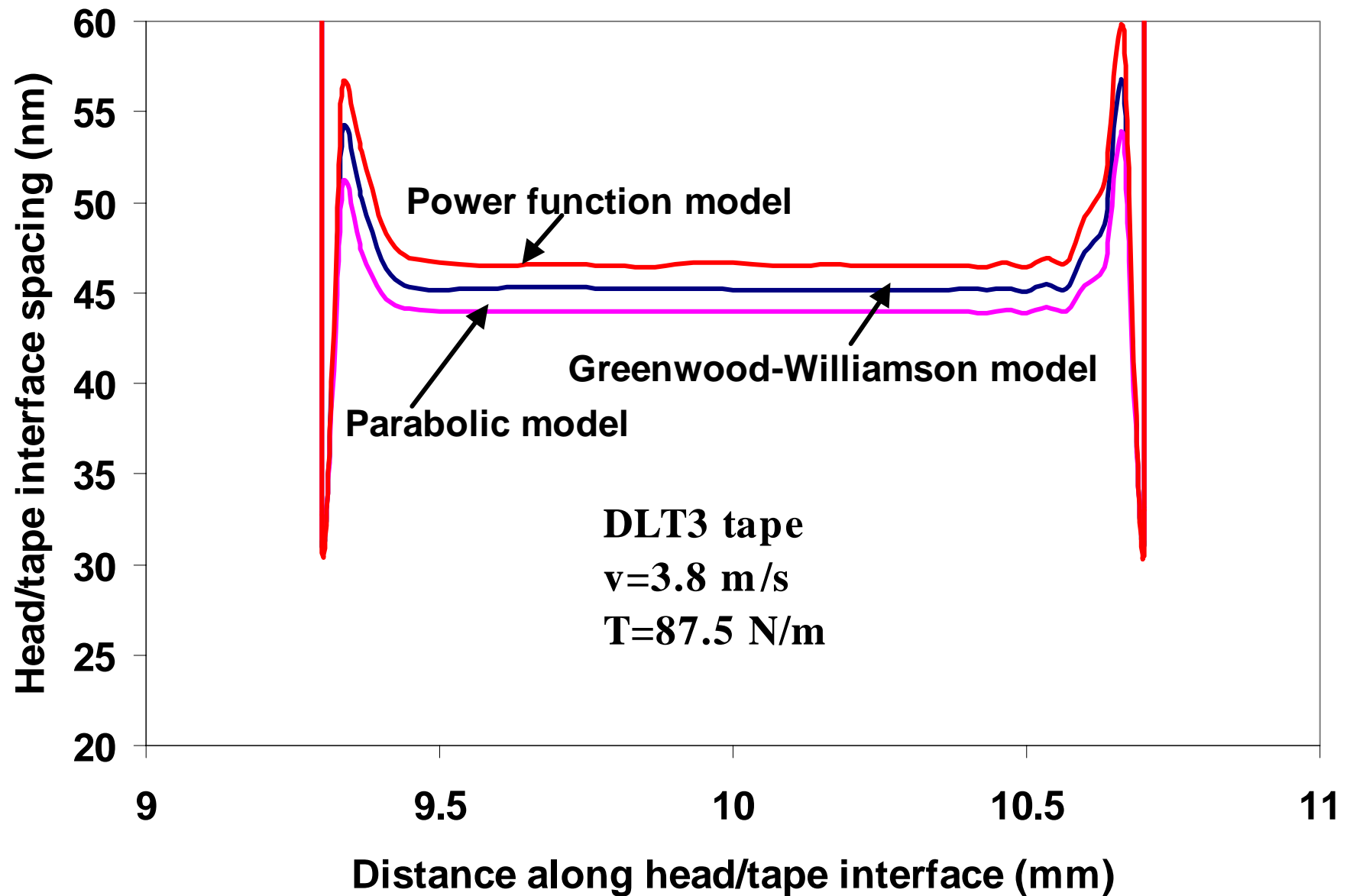
# Effect of tape speed on $p_c(\text{max})$ and $p_c(\text{ctr})$



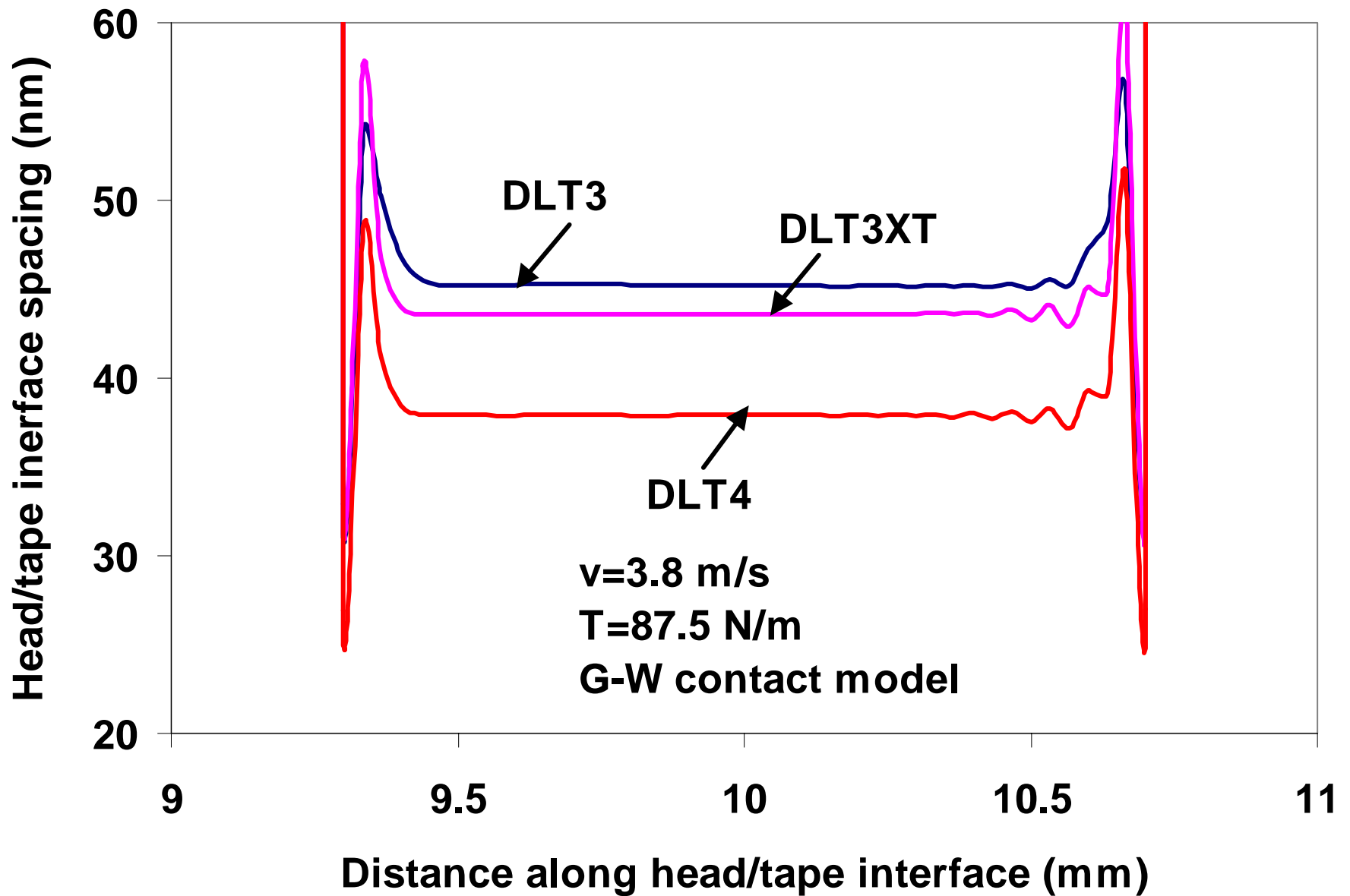
# Three different contact models



# Effect of contact models on spacing prediction



# Effect of tape medium



## **Summary**

- **Single, double and triple module heads were optimized**
- **Effect of head dimensional parameters on head/tape spacing and contact pressure was studied**
- **Effect of head/tape interface parameters was investigated**