Compact high-power microwave compression systems for formation of long nanosecond-duration pulses with a rectangular pulse shape

V.S. Igumnov, S.N. Artemenko, V.A. Avgustinovich, S.A. Gorev

National Research Tomsk Polytechnic University
Introduction

High power MW compression system using in:

• Historically in high-energy liner colliders;
• Radar and communications systems;
• High-peak-power sources for exploratory research.
How MW compression is works?

![Diagram of MW compression](image)

$P_{IN}$ $\rightarrow$ Cavity $\rightarrow$ Output

$P_{OUT}$
View of classical MPC
Problem of MW compression

<table>
<thead>
<tr>
<th>Pulse duration, nanoseconds</th>
<th>Cavity length, meters</th>
</tr>
</thead>
<tbody>
<tr>
<td>100</td>
<td>11</td>
</tr>
<tr>
<td>200</td>
<td>22</td>
</tr>
<tr>
<td>SLED II compressor</td>
<td>~ 33</td>
</tr>
</tbody>
</table>
Solutions of the problem

The First variant, planar resonance system.
Solutions of the problem

The Second variant, a 3d- dimension resonance system.
Experimental Results of planar cavity

2-sectioned storage cavities

- Frequency = 2.8 GHz
- Pulse Duration = 15 ns
- Output Power = 60 MW
- Gain = 15 dB

3-sectioned storage cavities

- Frequency = 2.8 GHz
- Pulse Duration = 25 ns
- Output Power = 40 MW
- Gain = 13 dB
Experimental Results of planar cavity

Oscillogram of output pulses of the 3-sectioned storage cavity.
Experimental Results of 3-D cavity

Experimental studies at low powers. X-band
Our work demonstrates the compact microwave pulse compression systems of generating high-power nanosecond with sufficiently high gain.

Conclusion
Thanks for your attention