CTBT

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Outline

• Treaty fundamentals
• The ratification game
• Verification
• Future
• Discussion
Treaty fundamentals
Obligations

- Article I: Basic obligations.
- Article II: The organisation.
- Article IV: Verification.
- Article V: Measures to redress a situation and to ensure compliance, including sanctions.
- Article VI: Settlement of disputes.
- Article VII: Amendments.
- Article VIII: Review of the Treaty.
- Article IX: Duration and withdrawal.
- Article X: Status of the protocol and the annexes.
- Article XI - XIII: Signature; Ratification; and Accession.
- Article XIV - XVII: Entry into force; Reservations; Depositary; and Authentic Texts
Annexes and protocols

- Annex 1. List of states pursuant to article II. 28.
- Annex 2. List of states pursuant to article XIV.

Protocol:

- Part I. The International Monitoring System.
- Part II. On-site Inspections.
- Part III. Confidence Building Measures.
  - Annex 2. Characterisation Parameters for Standard Event Screening
Annex II states

**Ratified (36):**
- Japan*
- Peru*
- Slovakia*
- Austria*
- France*
- United Kingdom of Great Britain and Northern Ireland*
- Australia*
- Brazil*
- Spain*
- Germany*
- Sweden*
- Argentina*
- Canada*
- Finland*
- Italy*
- Netherlands*
- South Africa*
- Poland*
- Belgium*
- Hungary*
- Norway*
- Republic of Korea*
- Bulgaria*
- Switzerland*
- Mexico*
- Romania*
- Turkey*
- Bangladesh*
- Russian Federation*
- Chile*
- Ukraine*
- Algeria*
- Democratic Republic of the Congo*
- Viet Nam*
- Colombia*
- Indonesia*

**Signed but not ratified (5):**
- China*
- Egypt*
- Iran (Islamic Republic of)*
- Israel*
- United States of America*

**Not signed (3):**
- Democratic People’s Republic of Korea*
- India
- Pakistan
The ratification game
Nuclear weapon states
United States, first test 1945
  China, first test 1962

Nuclear armed states
  Israel, never tested.
  India, first test 1972
  Pakistan, first test 1998
  D.P.R.K, first test 2006

Non-nuclear weapon states
  Egypt
  Iran
I’ll ratify

Ok. Me too.

We’re allies.

Whatever.

We’re allies.

China. We’re mates.

Count me in.

With Egypt on this.

Israel… NPT.

Well, if Pakistan and China…

LOL. Nope.
Verification
Article I

- “Each State Party undertakes not to carry out any nuclear weapon test explosion or any other nuclear explosion, and to prohibit and prevent any such nuclear explosion at any place under its jurisdiction or control.”
Article I analysed

• Ordinary meaning of the terms:
  
• ‘a procedure intended to establish the quality, performance, or reliability of something …’ (a test); which relates

• ‘to the nucleus of an atom’ (a nuclear test); which results in

• ‘a violent expansion in which energy is transmitted outwards as a shock wave.’ (a nuclear test explosion).

• What is allowed?
## Types of indicators

<table>
<thead>
<tr>
<th>Phenomena</th>
<th>Monitoring environments</th>
<th>Propagation</th>
<th>Technology</th>
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<tr>
<td><strong>Seismic waves</strong></td>
<td>Underground and underwater</td>
<td>Through earth and water</td>
<td>Seismometers</td>
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<tr>
<td><strong>Hydroacoustic waves</strong></td>
<td>Atmospheric, underground, underwater and space</td>
<td>Through water</td>
<td>Hydrophones and T-phase seismic stations</td>
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<tr>
<td><strong>Infrasound</strong></td>
<td>Atmospheric</td>
<td>Through air</td>
<td>Infrasound detectors</td>
</tr>
<tr>
<td><strong>Radionucleids</strong></td>
<td>Atmospheric, underground, underwater and space</td>
<td>Through air, water, rock fractures, space (through electromagnetic field)</td>
<td>Ground based and airborne collectors</td>
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<tr>
<td><strong>Electromagnetic pulse</strong></td>
<td>Atmospheric</td>
<td>Through air and space</td>
<td>Satellites and EMP burst detectors</td>
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<tr>
<td><strong>Optical flash</strong></td>
<td>Atmospheric and space</td>
<td>Through air and space</td>
<td>Optical flash detectors</td>
</tr>
<tr>
<td><strong>Nuclear radiation</strong></td>
<td>Space</td>
<td>Through space</td>
<td>Satellites and radiation detectors</td>
</tr>
</tbody>
</table>

The IMS

- 337 stations.
- 170 seismic primary and auxiliary stations
- 11 hydroacoustic (hydrophone and t-phase).
- 60 infrasound.
- 80 RN stations.
- RN labs.
IMS events 2000-2015

Continental detection

Source: CTBTO
# Yield estimations

<table>
<thead>
<tr>
<th>Mb</th>
<th>Yield (Nevada)</th>
<th>Yield (Lop Nor)</th>
</tr>
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<tbody>
<tr>
<td>3.2</td>
<td>0.02 kt</td>
<td>0.07 kt</td>
</tr>
<tr>
<td>3.4</td>
<td>0.04 kt</td>
<td>0.14 kt</td>
</tr>
<tr>
<td>3.6</td>
<td>0.07 kt</td>
<td>0.25 kt</td>
</tr>
<tr>
<td>3.0: Europe, US, Central Asia</td>
<td>11.7 t</td>
<td>39.8 t</td>
</tr>
</tbody>
</table>
Unique features

• Data available to all state parties in near real time.

• CTBTO not to make a compliance or non-compliance determination.

• It is up to the member states to respond to suspicious events.
On-site inspections

Final verification measure
Future
Forecasting

• The verification regime is more effective than originally designed (aimed for 1 kT worldwide).

• Modern communications, data processing and storage technologies will make it even more sensitive and responsive.

• Political will key problem. May need to enter into force provisionally due to excessively stringent EIF criteria.
Discussion