Authoring complex Ambisonic soundfields: An artist's tips & tricks

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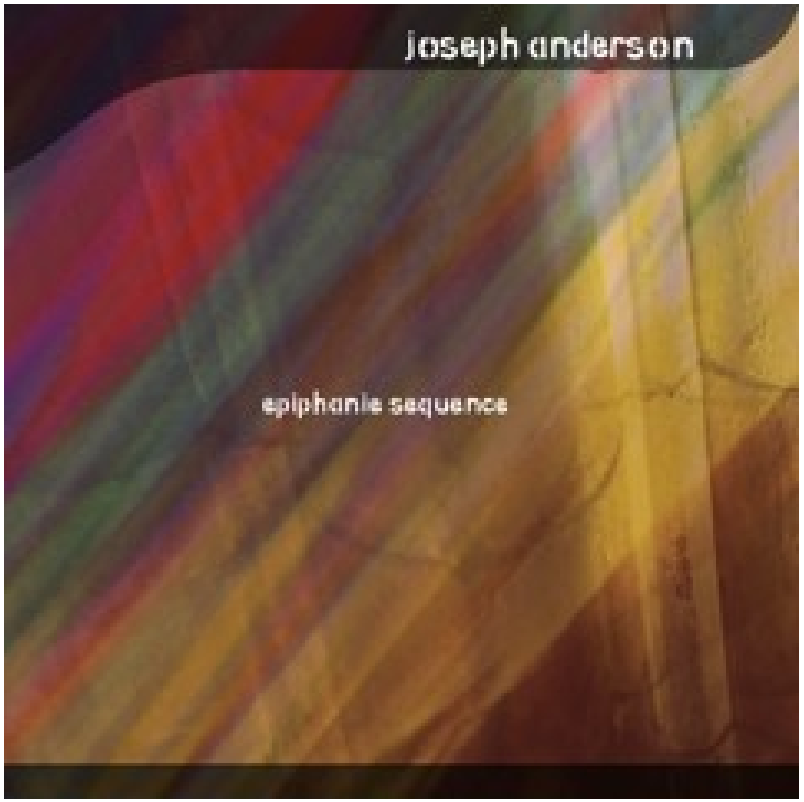
Epiphanie Sequence



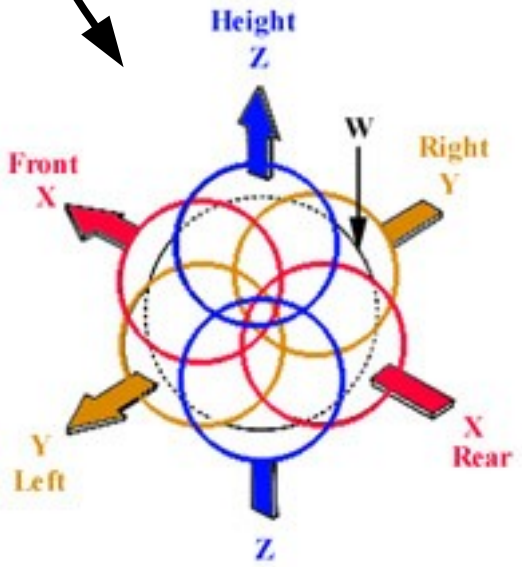
- *Kyai Pranaja* (1998)
- *Mpingo* (2003)
- *Pacific Slope* (2002)

- Composed in full 3D (periphonic) B-format
  - Using B-format source recordings
- Published by Sargasso Records
- UHJ Stereo on CD
- B-format versions available (on request!)

Ambisonic Encoding

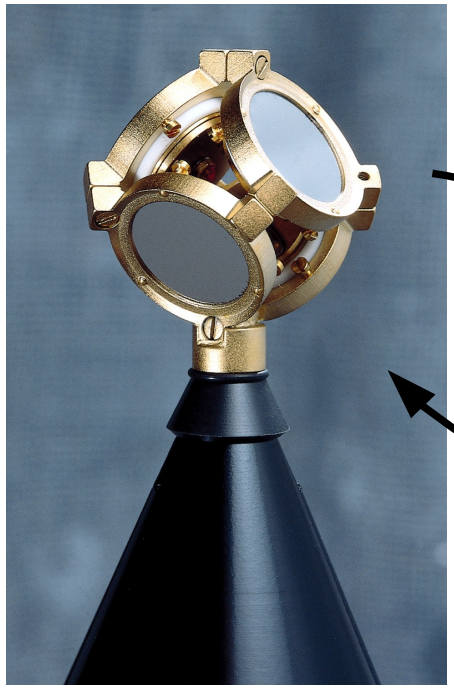
OUTRS tetrahedral microphone array, courtesy Stephen Thornton
(www.michaelgerzonphotos.org.uk)

$$\begin{pmatrix} \frac{1}{\sqrt{2}} \\ \cos\phi\cos\theta \\ \cos\phi\sin\theta \\ \sin\phi \end{pmatrix}$$

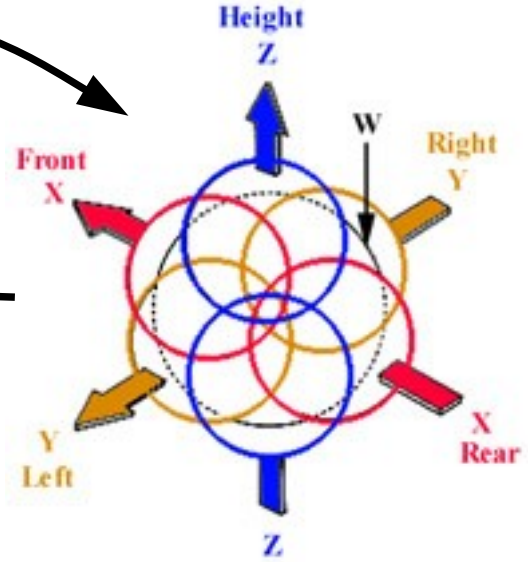


Soundfield microphone, courtesy Soundfield Ltd.
(soundfield.com)

The Trick: A-format

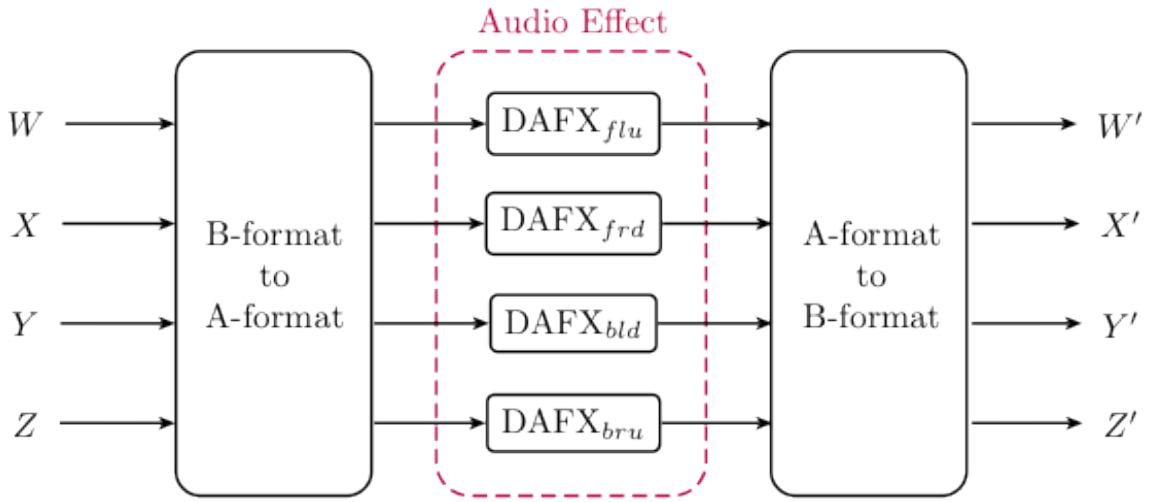


$$\mathbf{S}_{FLU} = \frac{1}{2}\begin{pmatrix} 1 & 1 & 1 & 1 \\ 1 & 1 & -1 & -1 \\ 1 & -1 & 1 & -1 \\ 1 & -1 & -1 & 1 \end{pmatrix}$$

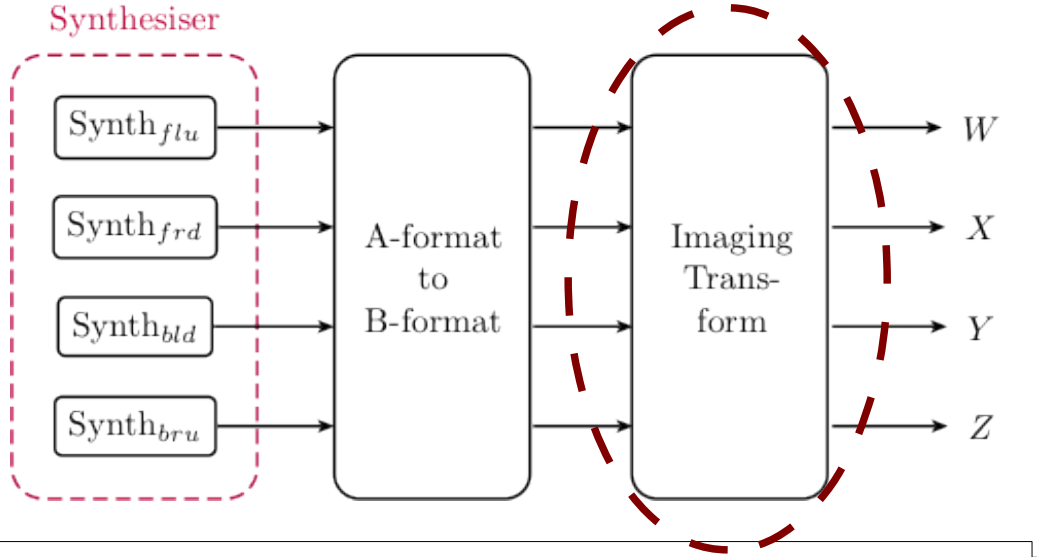


The Trick: Ambisonic Toolkit (ATK) Networks

- Audio Effects
  - Process in A-format!



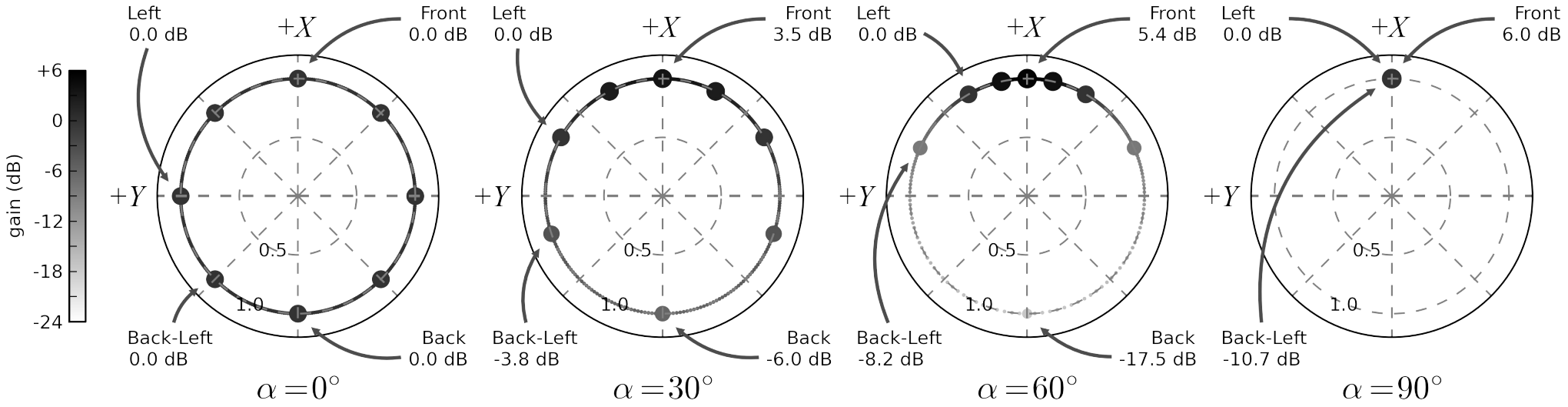
- Synthesis
  - … in A-format!



ATK Imaging: Zoom

- Zoom Transform
  - Dominance
  - Reshape Soundfield

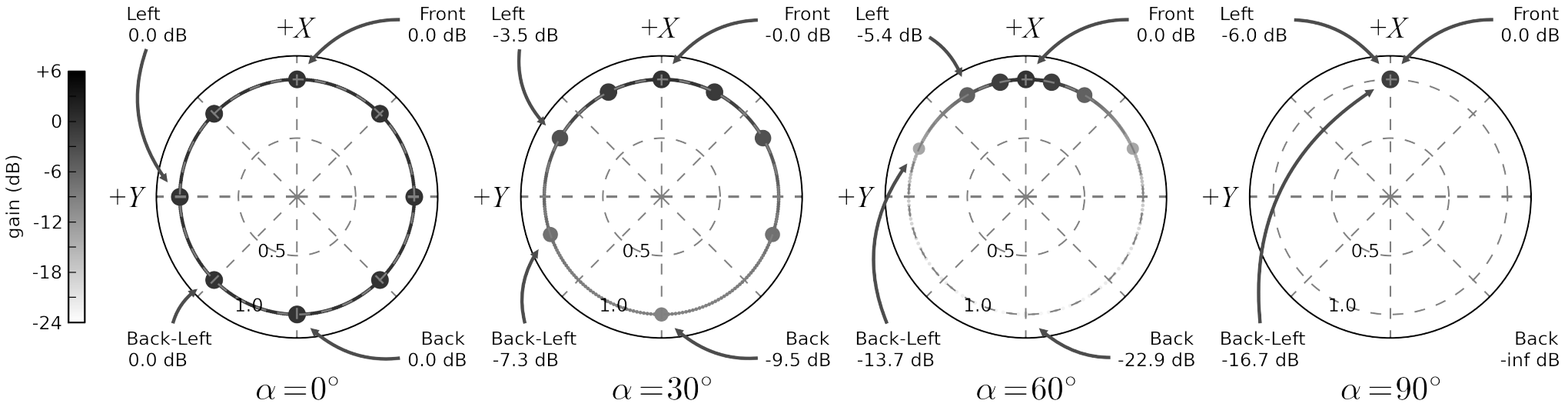
$$\mathbf{Z}_{X,\alpha} = \begin{pmatrix} 1 & \frac{1}{\sqrt{2}}\sin\alpha & 0 & 0 \\ \sqrt{2}\sin\alpha & 1 & 0 & 0 \\ 0 & 0 & \cos\alpha & 0 \\ 0 & 0 & 0 & \cos\alpha \end{pmatrix}$$



ATK Imaging: Focus

- Focus Transform
  - Dominance Related
  - Reshape Soundfield

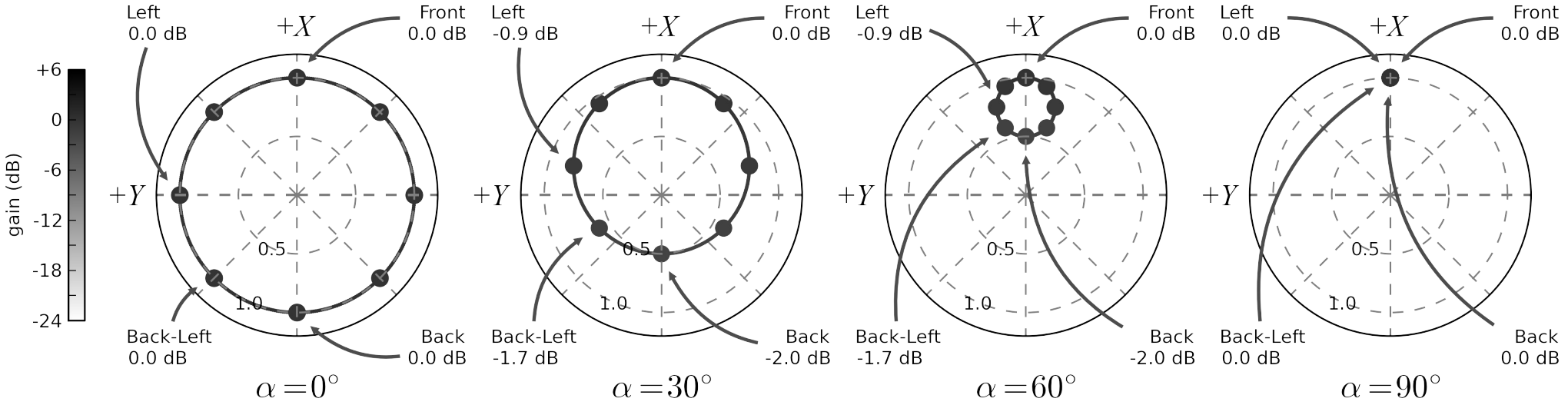
$$\mathbf{F}_{X,\alpha} = \begin{pmatrix} \frac{1}{1+\sin|\alpha|} & \frac{1}{\sqrt{2}}\left(\frac{\sin\alpha}{1+\sin|\alpha|}\right) & 0 & 0 \\ \sqrt{2}\left(\frac{\sin\alpha}{1+\sin|\alpha|}\right) & \frac{1}{1+\sin|\alpha|} & 0 & 0 \\ 0 & 0 & \frac{\cos\alpha}{1+\sin|\alpha|} & 0 \\ 0 & 0 & 0 & \frac{\cos\alpha}{1+\sin|\alpha|} \end{pmatrix}$$



ATK Imaging: Push

- Push Transform
  - Two metaphors:
    - Spatial Shelving-Filter
    - Re-align Tetrahedron
  - Reshape Soundfield

$$\mathbf{U}_{X,\alpha} = \begin{pmatrix} 1 & 0 & 0 & 0 \\ \sqrt{2}\sin|\alpha|\sin\alpha & \cos^2\alpha & 0 & 0 \\ 0 & 0 & \cos^2\alpha & 0 \\ 0 & 0 & 0 & \cos^2\alpha \end{pmatrix}$$



Listening & Discussion

Ambisonic Toolkit
(SuperCollider Library)
Demonstration

References

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Thanks!!

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www.ambisonictoolkit.net