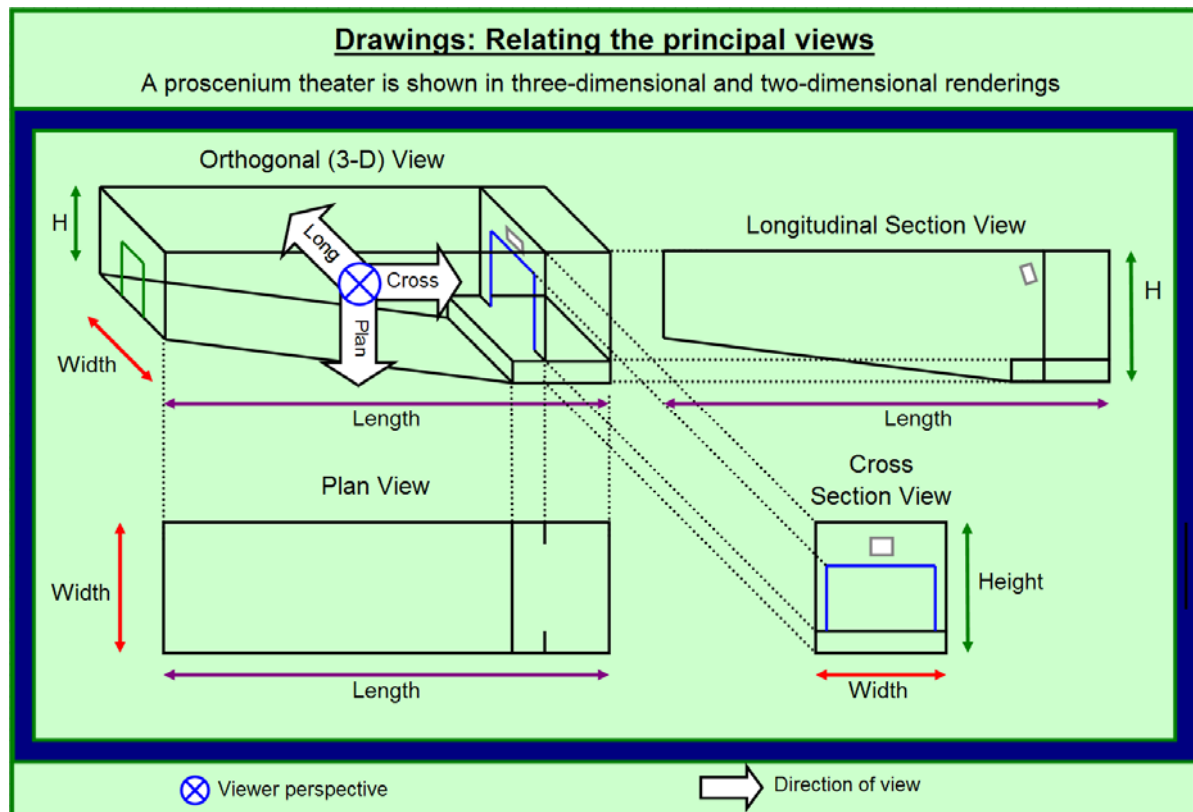


## Lecture Summary – Prediction

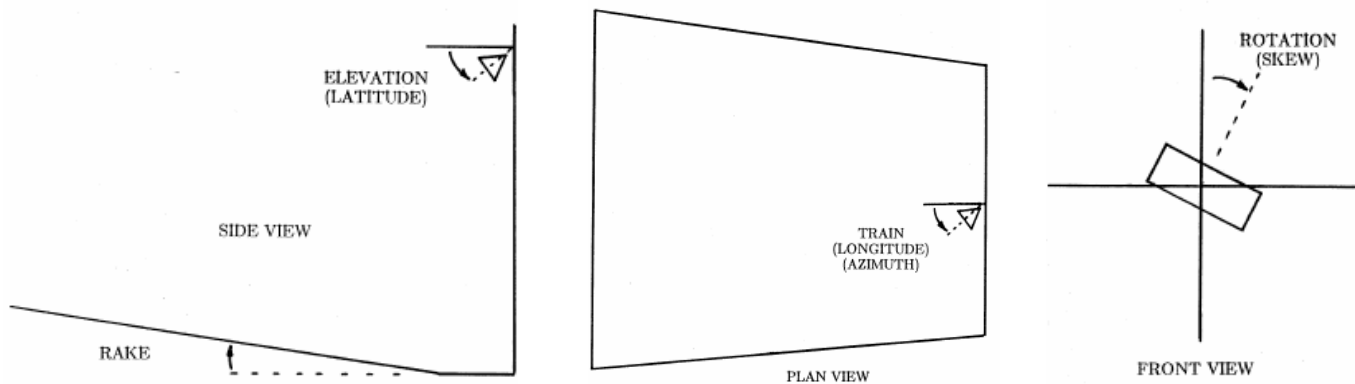
### Chapter 7

- **four principal responses**
  - free-field transmission characteristics of speaker
  - effects of transmission medium (air)
  - summation effects of multiple speakers
  - summation effects of room and speakers
- **relating the principal views**



- **2-D drawings in a 3-D world...(falls apart quickly)**
  - H and V “directivity slices” do not completely characterize spherical radiation
  - mismatch between speaker propagation plane vs. prediction plane
  - speaker-prediction divergence
    - distance (speaker location to listening position)
    - angle (elevation, train, location)

- loudspeaker aiming: elevation, train, and rotation angle plus (X,Y,Z) mounting location



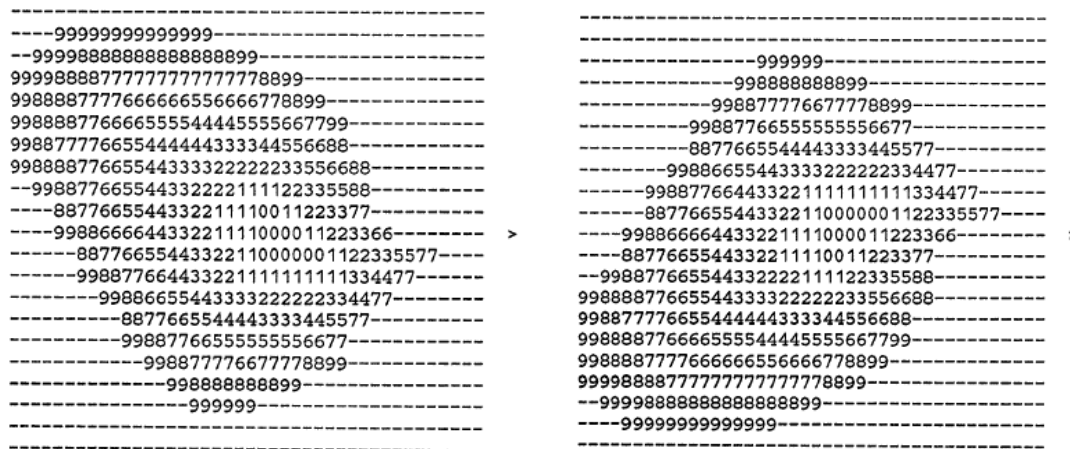
- SPL distributions for square room w/  $0^\circ$  rake angle, elevation angle =  $-45^\circ$ ,  $-25^\circ$ ,  $-65^\circ$  (train =  $0^\circ$  and rotation =  $0^\circ$ )

-----999999999-----	5555555556677778899-----	-----
-----999988888889999-----	44444444455555566777788-----	-----
-----9988887777777778888-----	4444444444444445555667799-----	-----
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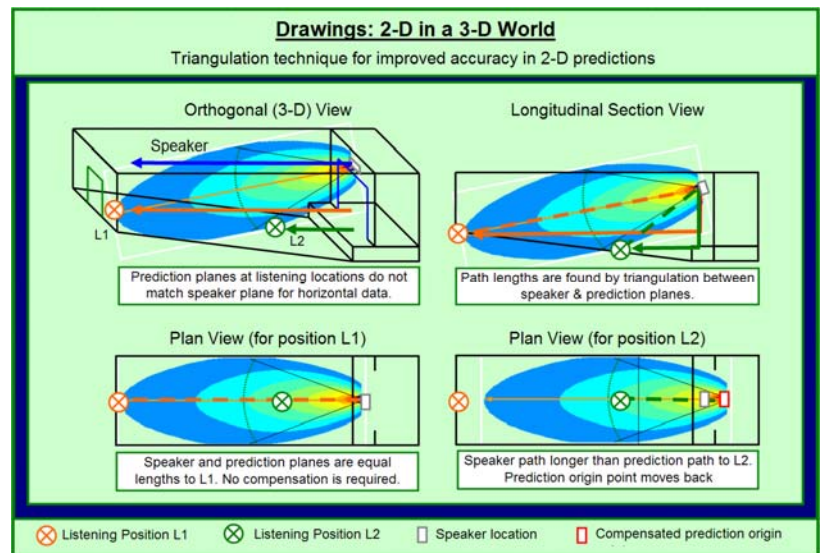
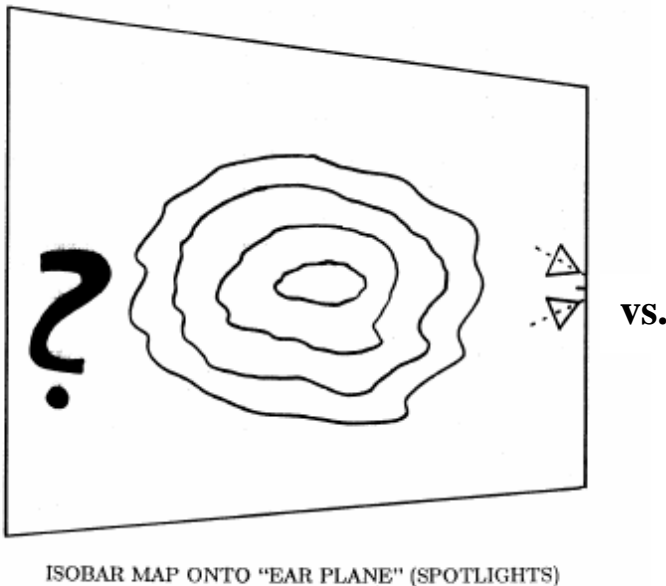
- SPL distributions for elevation angle =  $-45^\circ$  and train =  $-30^\circ$ ,  $+30^\circ$  (skew =  $0^\circ$ )

-----9977665554433333344556688-----		-----
-----9977665544333322223344557799-----		-----
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- SPL distributions for elevation angle =  $-45^\circ$  and skew =  $-20^\circ, +20^\circ$  (train =  $0^\circ$ )

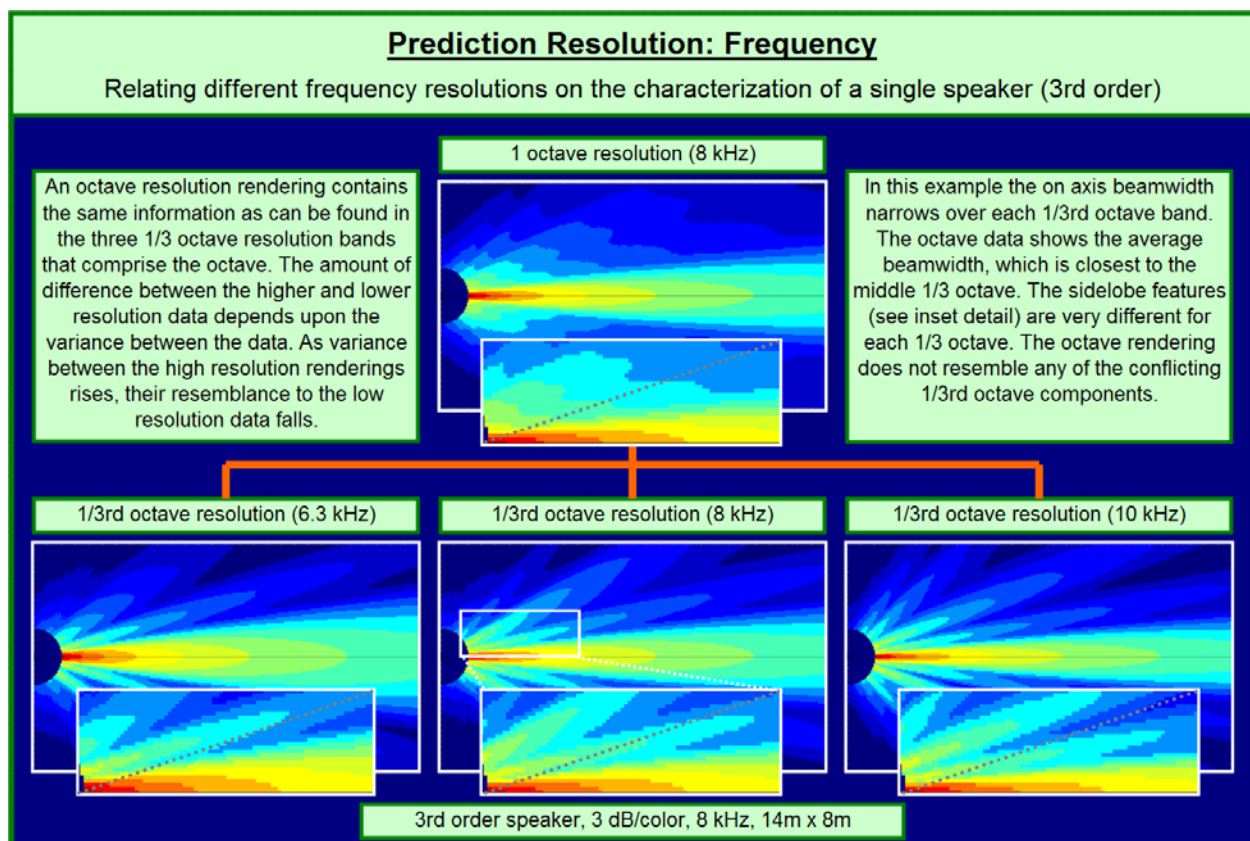
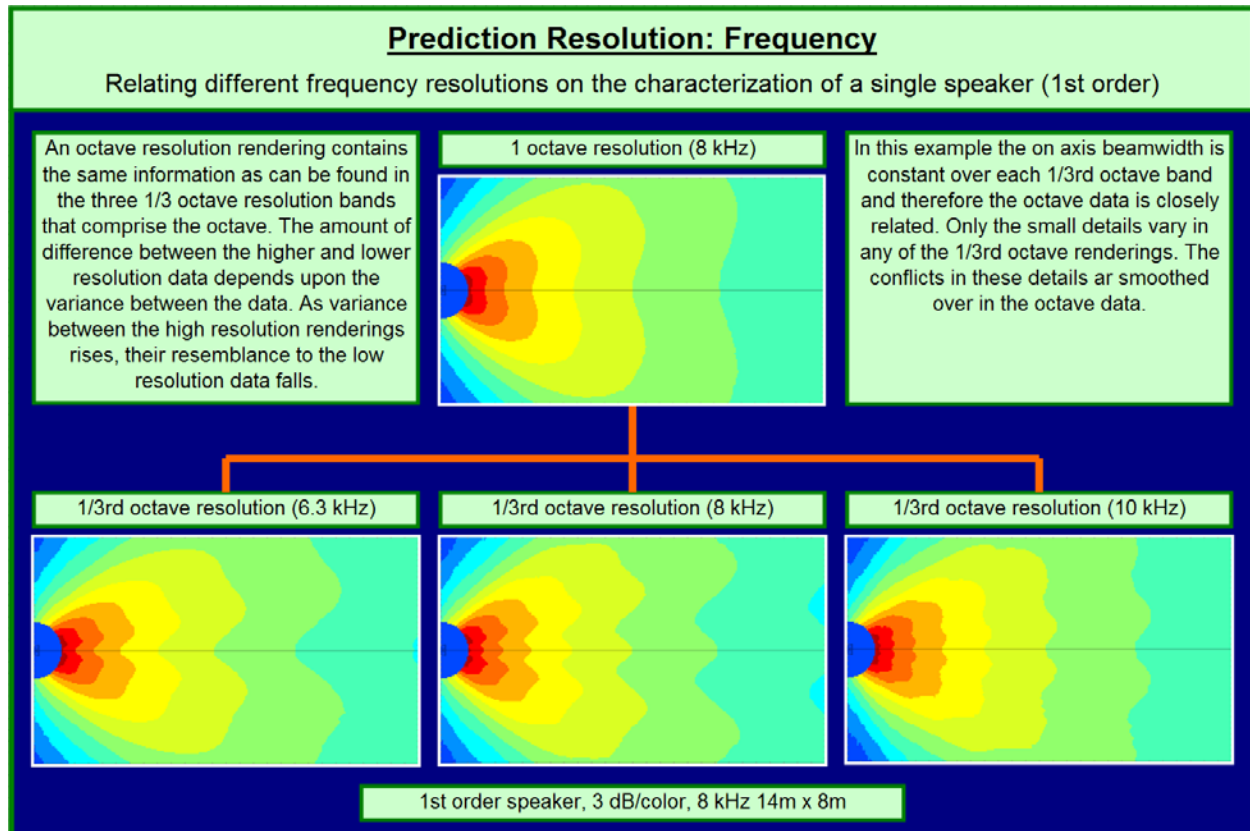


- question: how “easy” would it be obtain simple “prediction plane” results like these using the methods outlined in the text (i.e., restricted to section and plan 2D views only)?



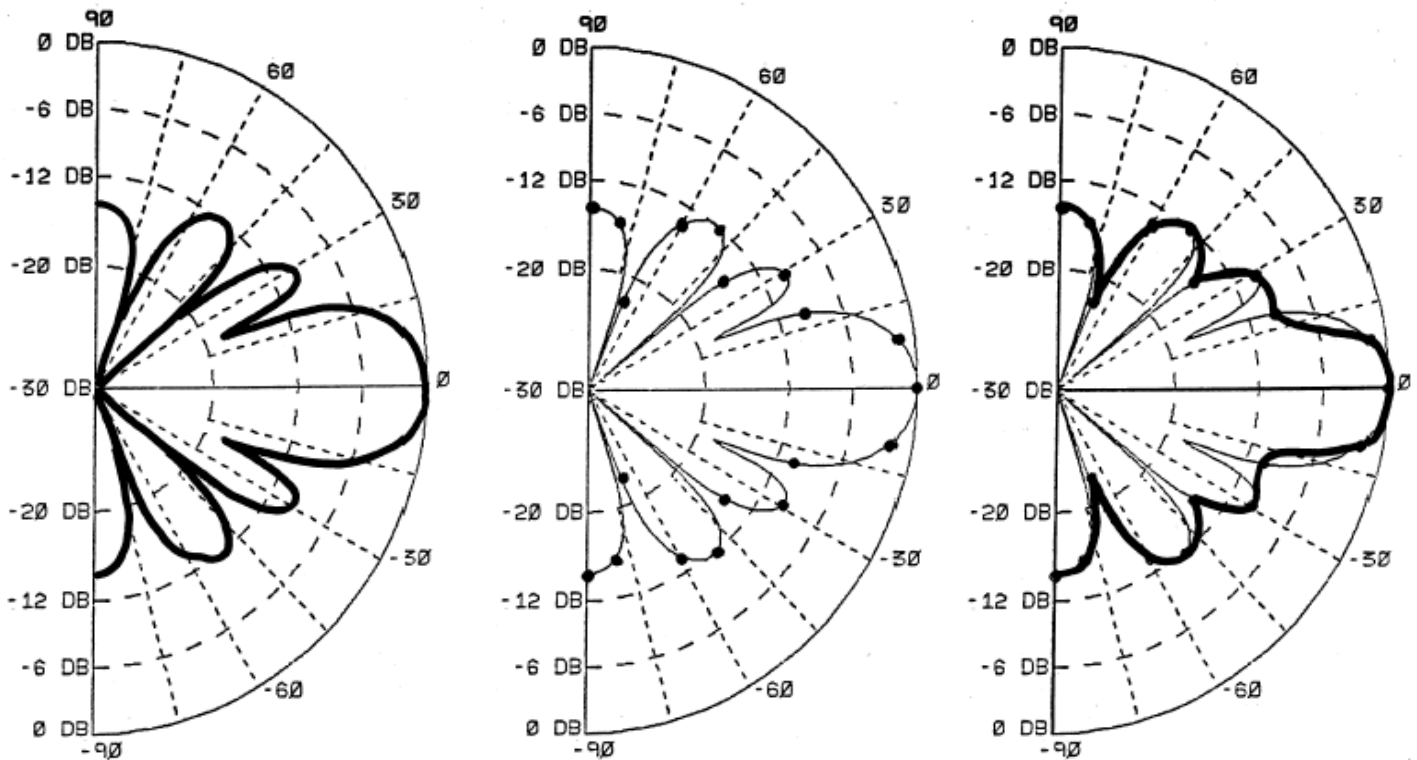
- need modeling/simulation software (e.g., EASE) to create **SPL maps in the prediction plane of interest** (the so-called “ear plane” of audience seating area) – only meaningful/sane way to do this in 3-D...*but need to understand limitations of the tools*
  - angular (spatial) resolution of loudspeaker directivity data
  - frequency resolution (number/width of frequency bands)
  - amplitude response of loudspeaker elements
  - frequency response of loudspeaker elements
- common loudspeaker format <http://www.clfgroup.org/author.htm>
  - CLF1
  - CLF2

- generic loudspeaker library (GLL)
- “ideal” resolution needed...(but what is “good enough” for most cases?)
  - frequency resolution: 1/24 octave
  - angular resolution: 2°





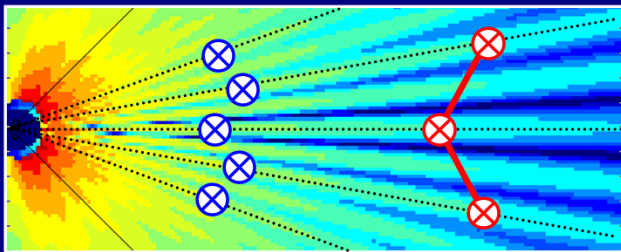
- potential for “spatial aliasing” as consequence of insufficient angular resolution



### Prediction Resolution: Angular

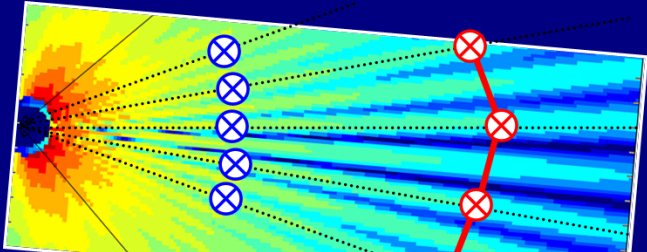
Effect of angular resolution on the characterization of coupled speaker arrays

10 deg angular resolution, array on axis @ 0 deg



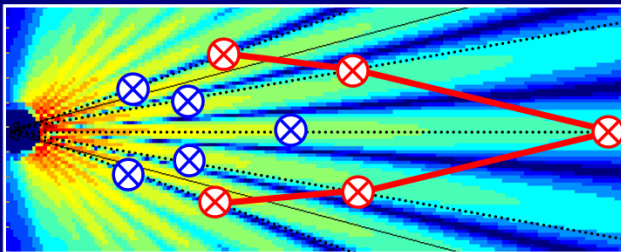
Symmetric coupled pt. source (2 x 90 deg spkr @ 90 deg)

10 deg angular resolution, array on axis @ 5 deg



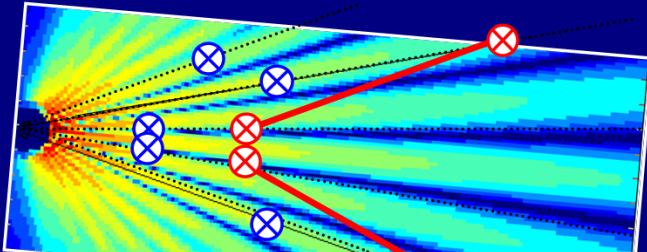
Symmetric coupled pt. source (2 x 90 deg spkr @ 90 deg)

10 deg angular resolution, array on axis @ 0 deg



Symmetric coupled pt. source (2 x 90 deg spkr @ 30 deg)

10 deg angular resolution, array on axis @ 5 deg



Symmetric coupled pt. source (2 x 90 deg spkr @ 30 deg)

⊗ Equal level @ x degrees    ⊗ -6 dB @ x degrees

1/24th octave frequency resolution, 3 dB/color, 8 kHz, 25m x 10m

- absorption and diffusion

