

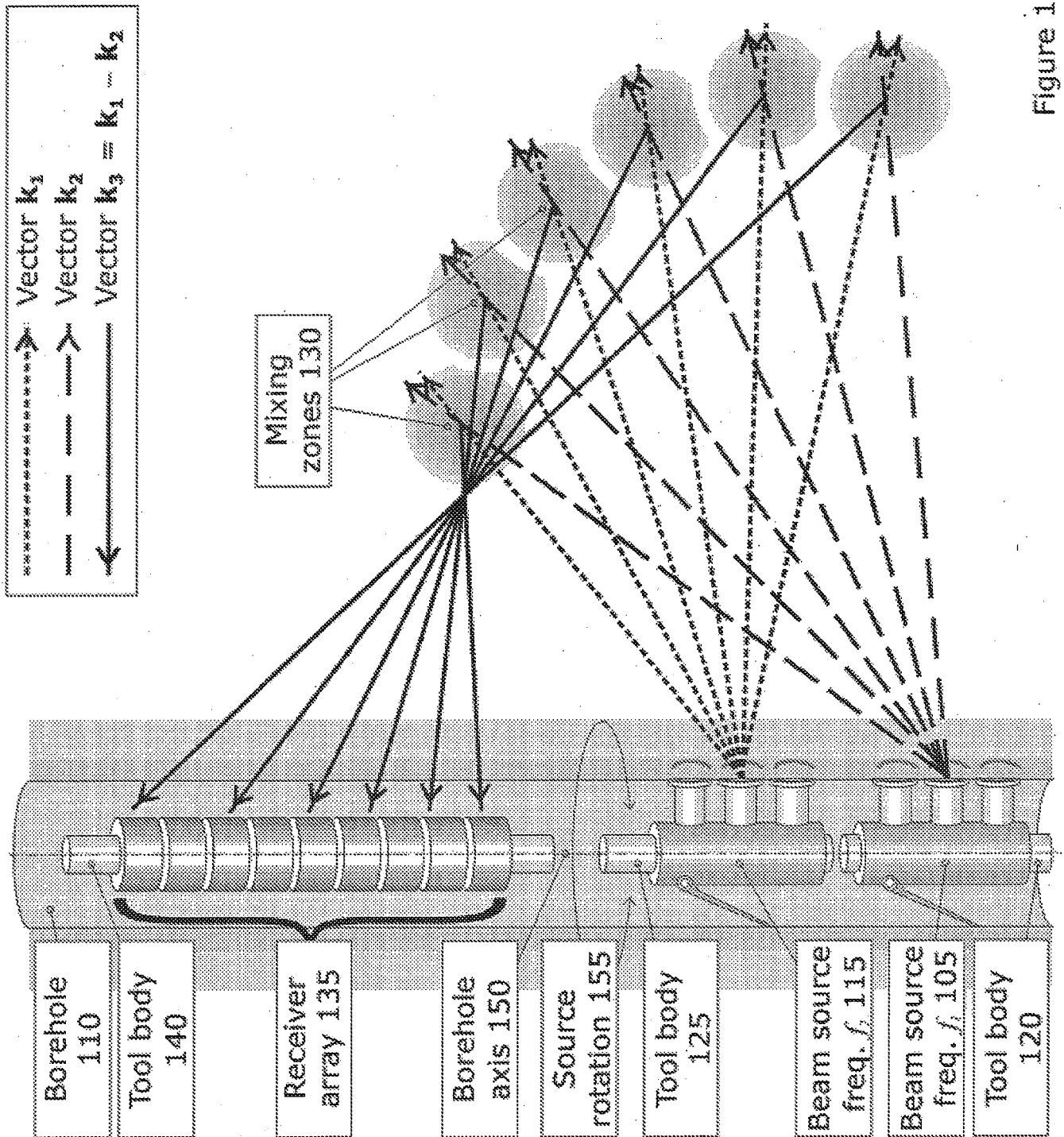


Figure 1

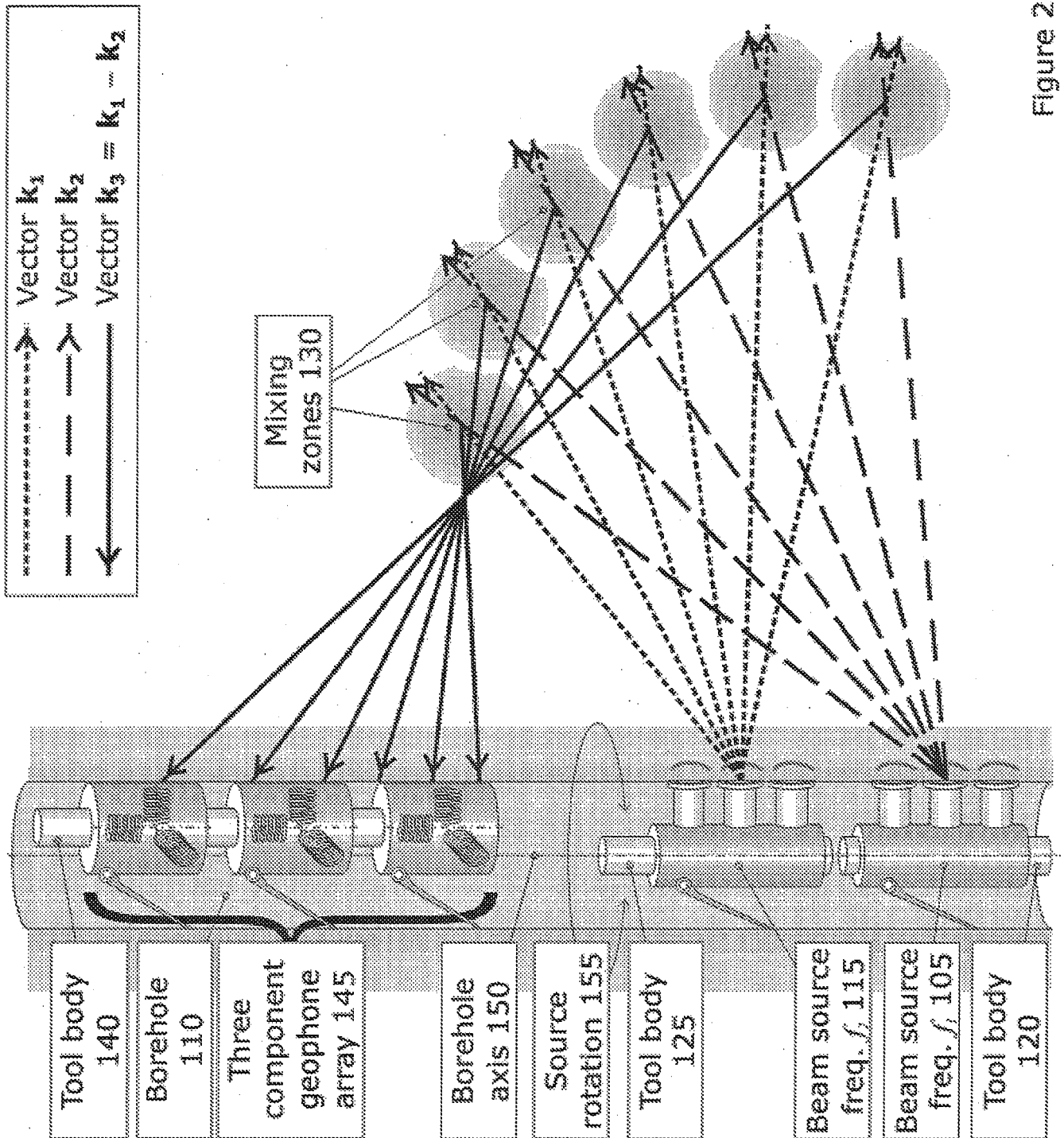


Figure 2

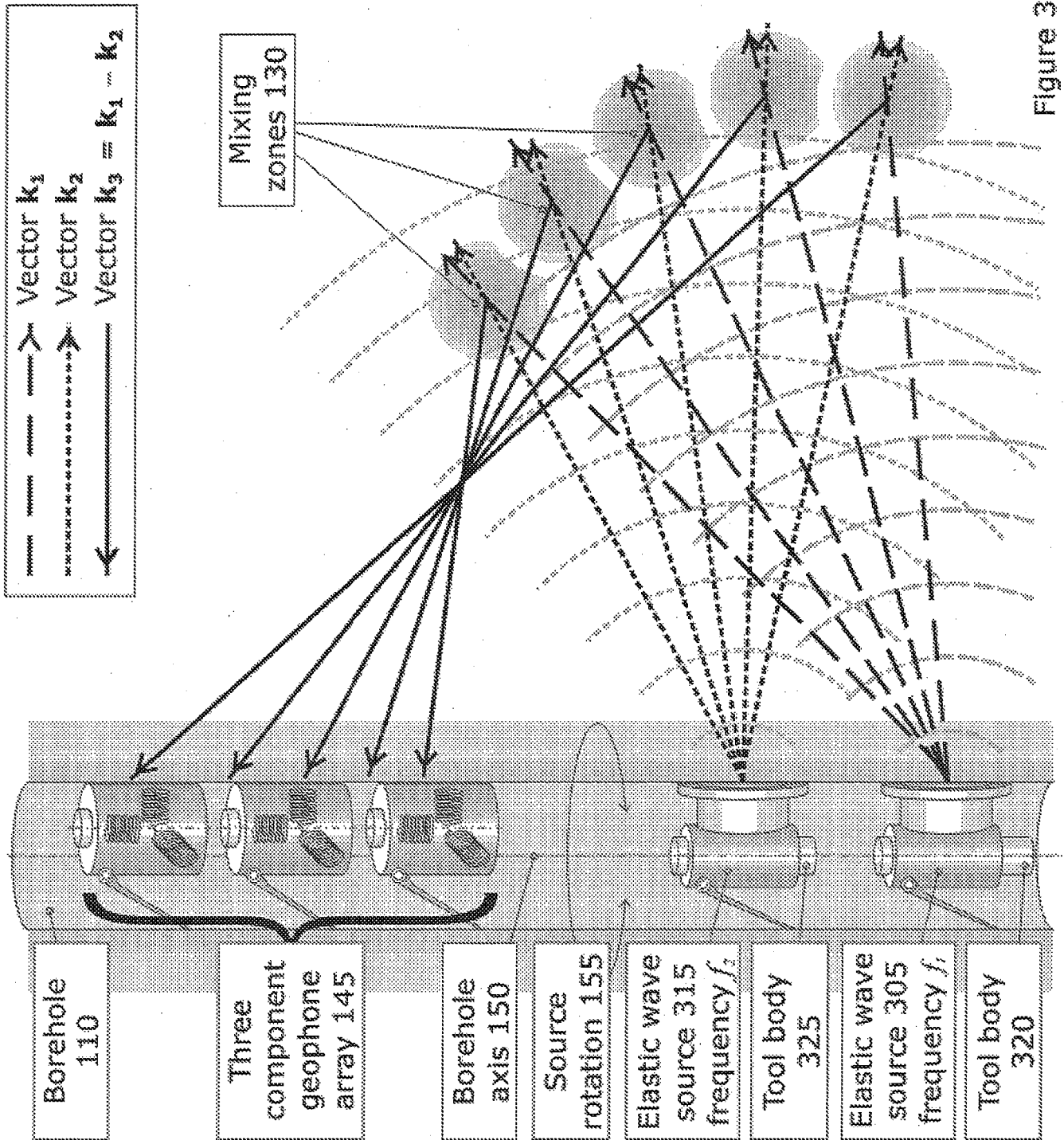


Figure 3

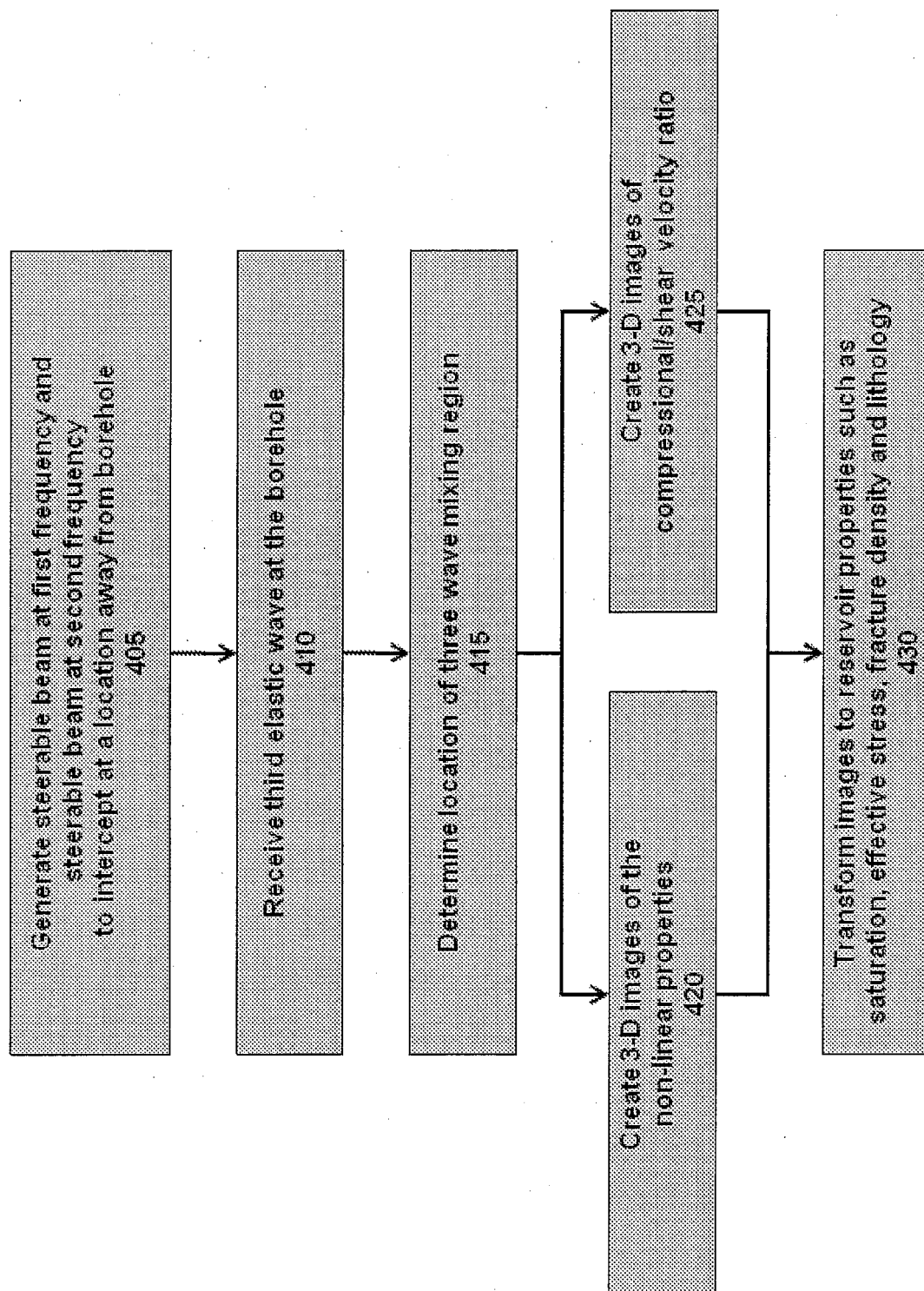


Figure 4

Figure 5b, 18 kHz shear beam

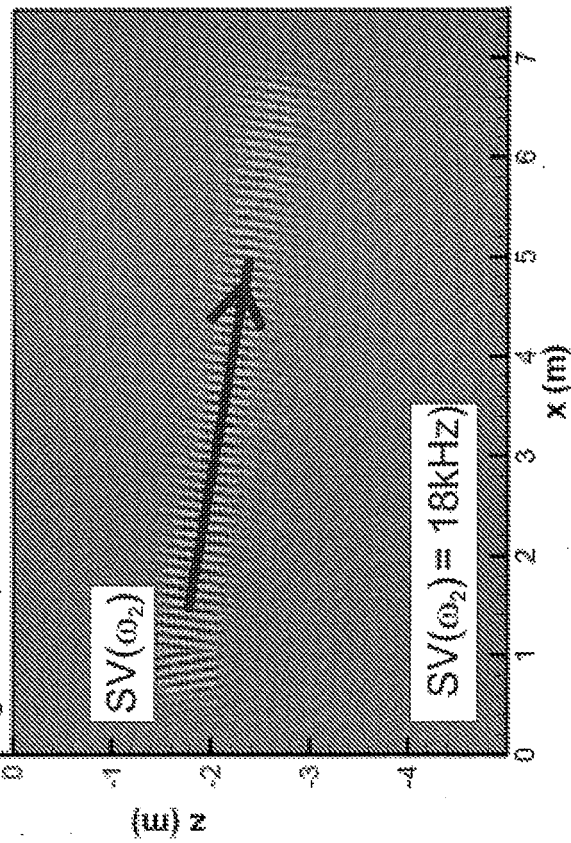


Figure 5a, 25 kHz compressional beam

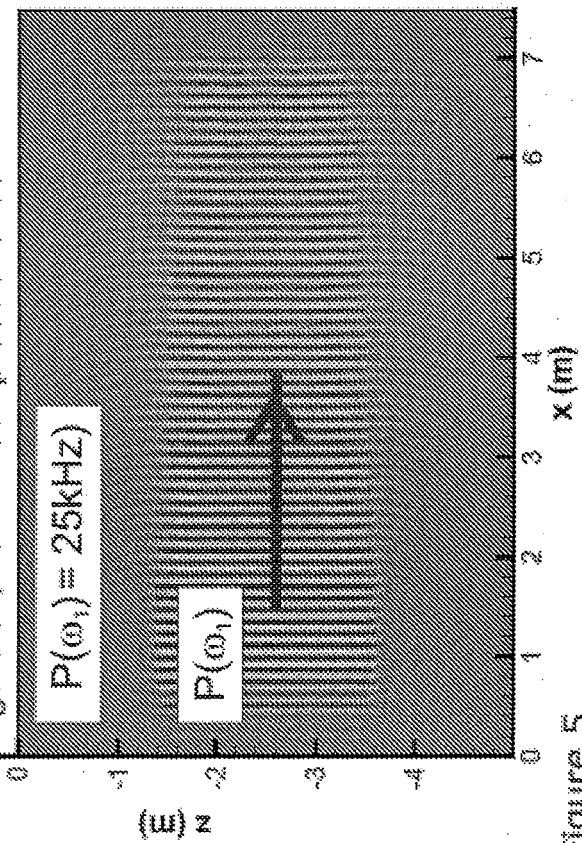


Figure 5

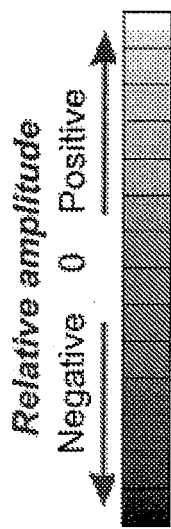
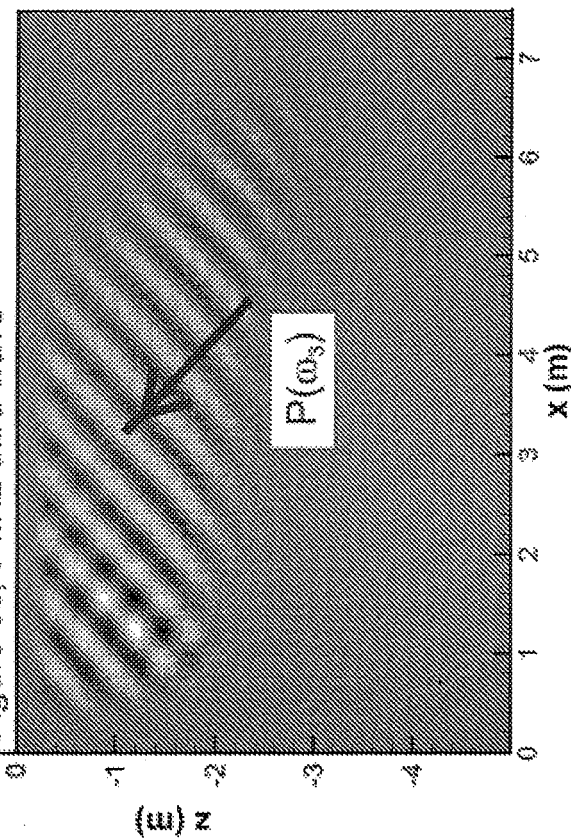


Figure 5c, 7 kHz third wave



Returning signal vector $P(\omega_3)$ determined by vector difference $P(\omega_1) - SV(\omega_2)$

6/19

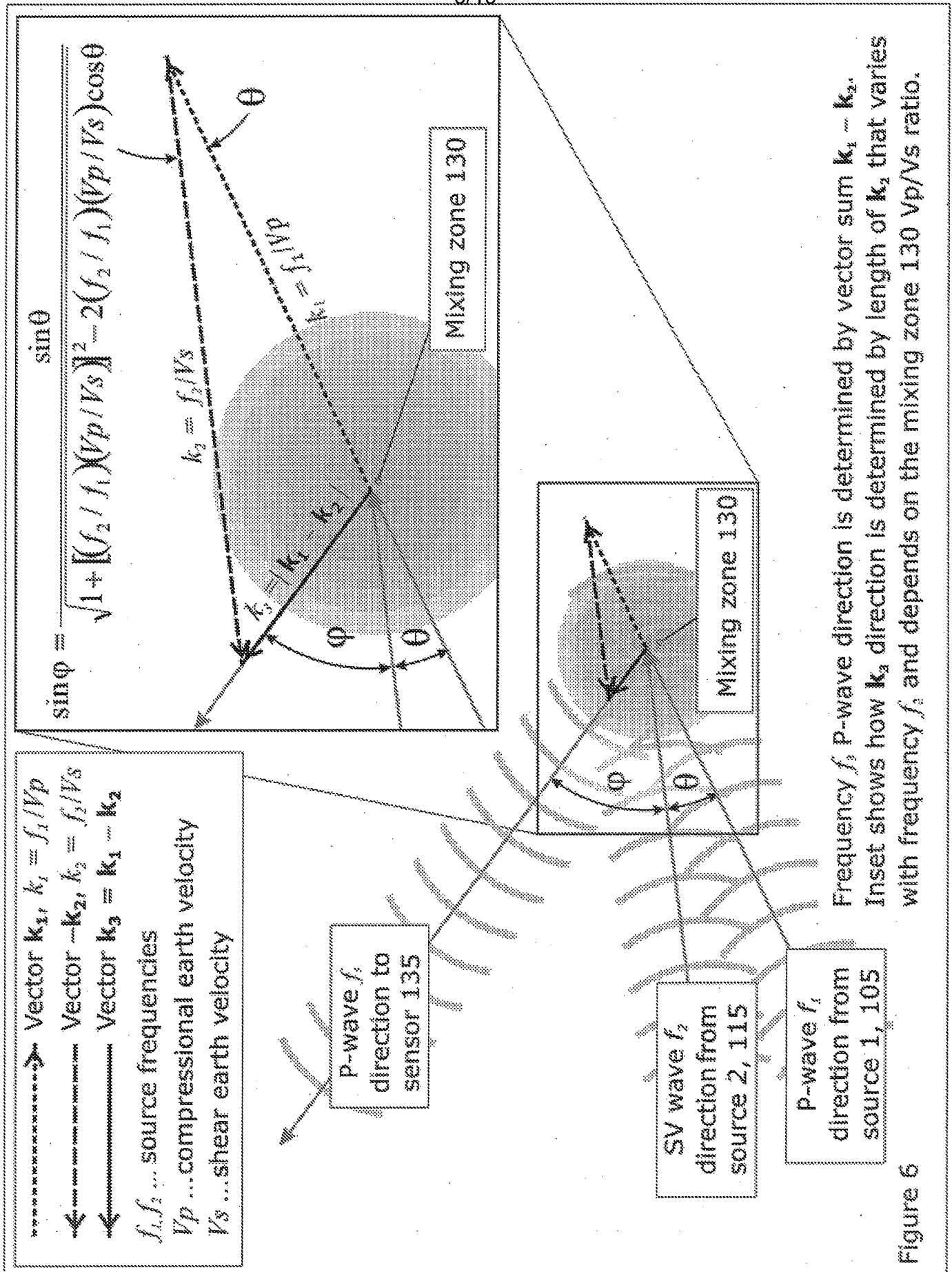


Figure 6

7/19

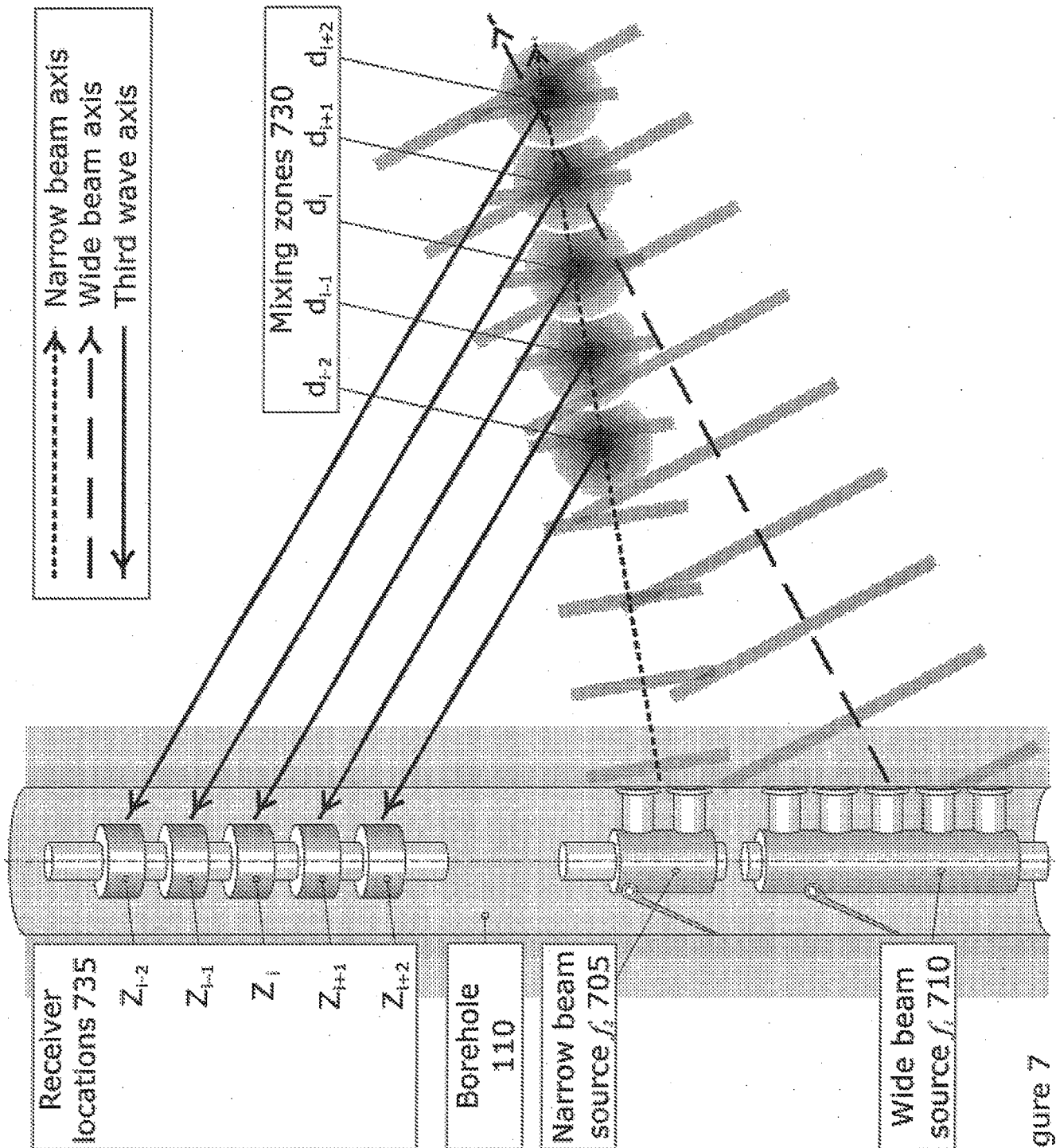
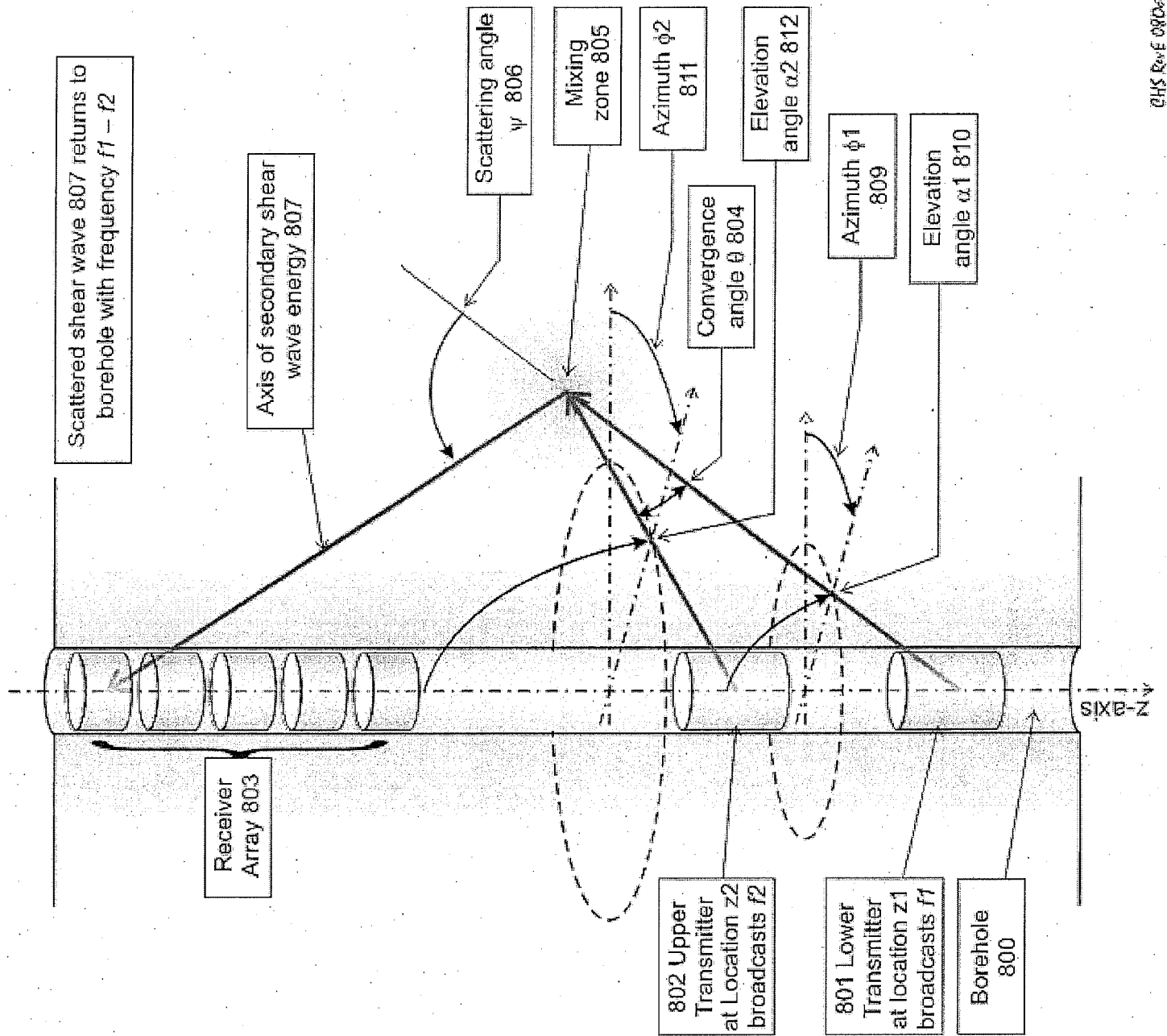


Figure 7



21HS Rev E 08 Oct 11

Figure 8

Figures 9a and 9b show development of wave-vector triangles from geometry of configuration shown in figure 8. The sides of the triangle **ABC** in figure 9b are parallel to the extended axes of the beams from upper and lower transmitters and the axis of the secondary shear wave. In figure 9b, vector k_3 is equal to vector difference $k_1 - k_2$.

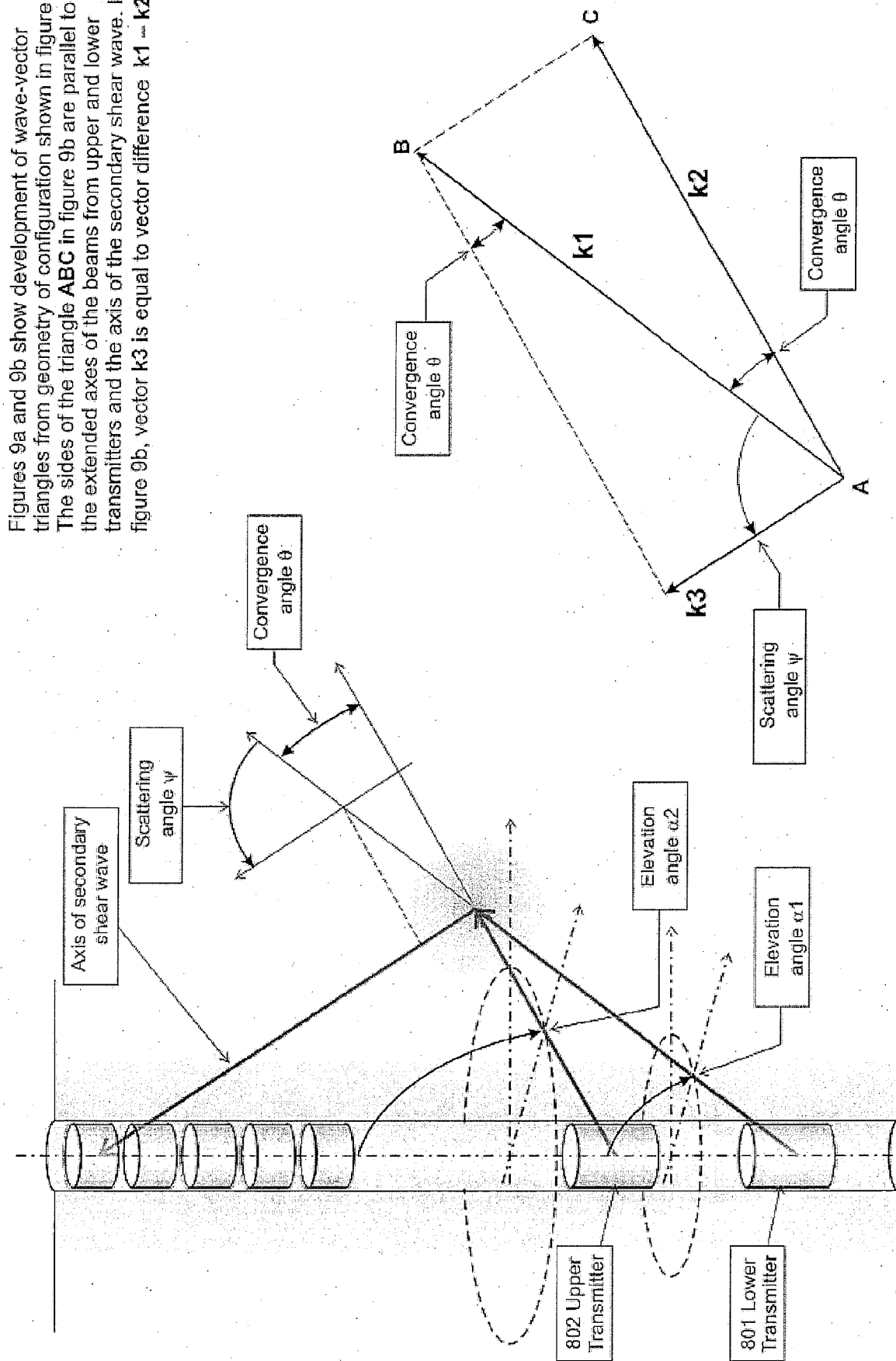


Figure 9a

Figure 9b

CHS RevD 08Oct11

10/19

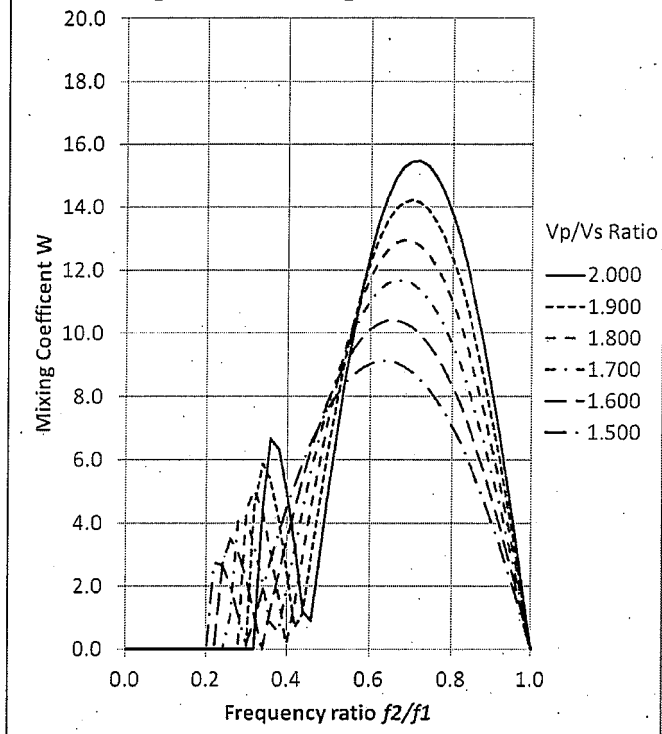
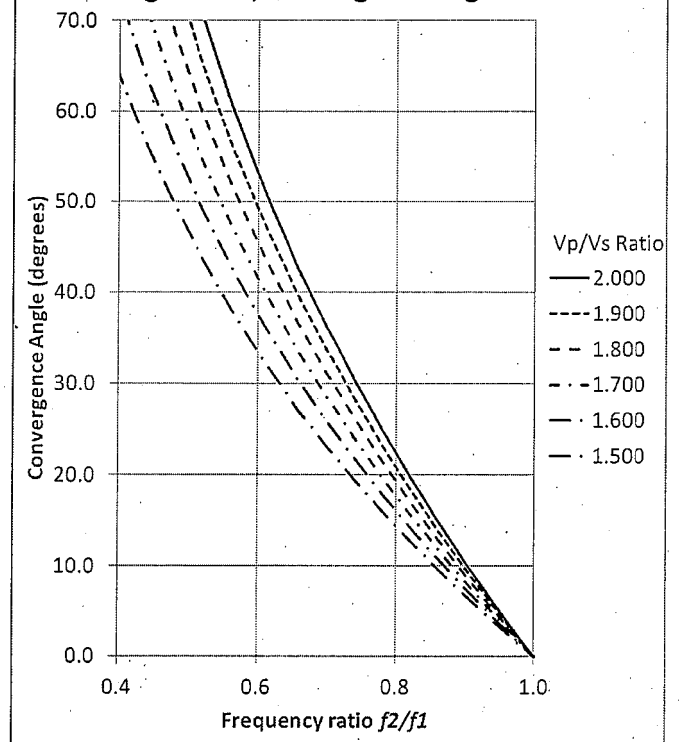
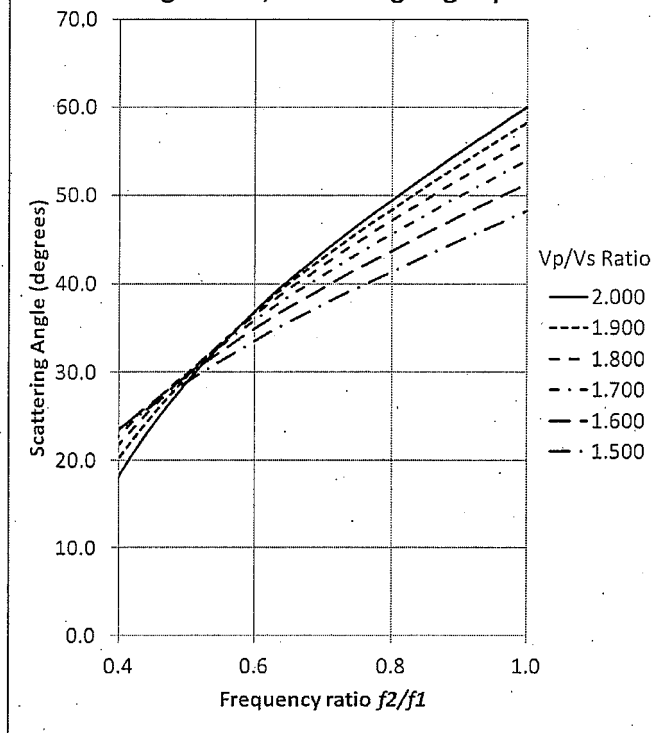
Figure 10a, Mixing Coefficient W Figure 10b, Convergence Angle θ Figure 10c, Scattering Angle ψ 

Figure 11a
Compressional beam from
lower transmitter

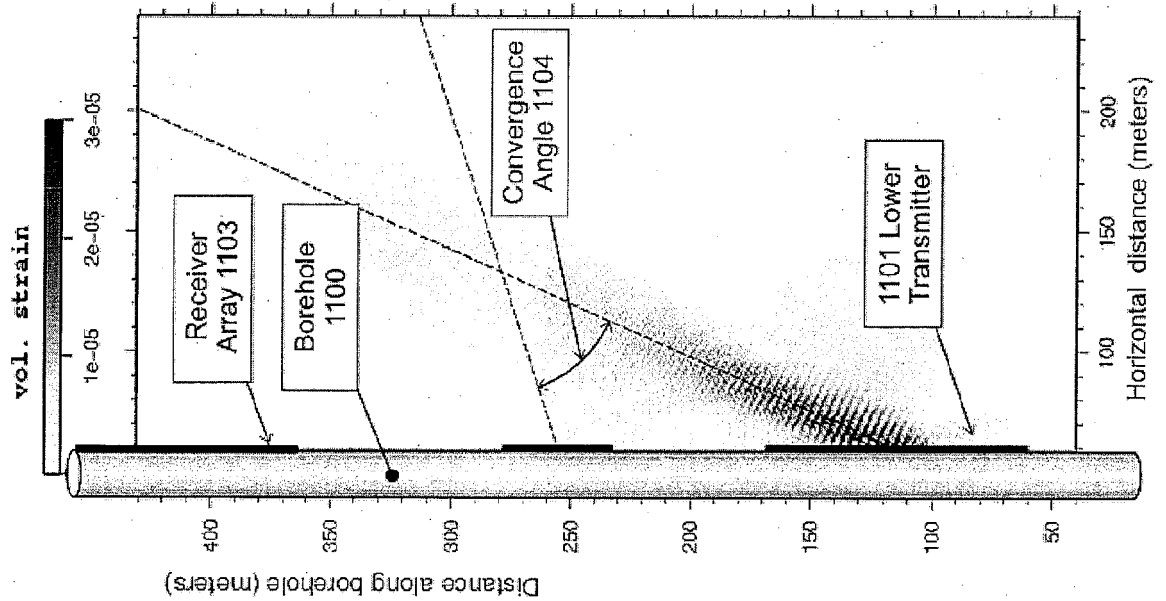


Figure 11b
Compressional beam from
upper transmitter

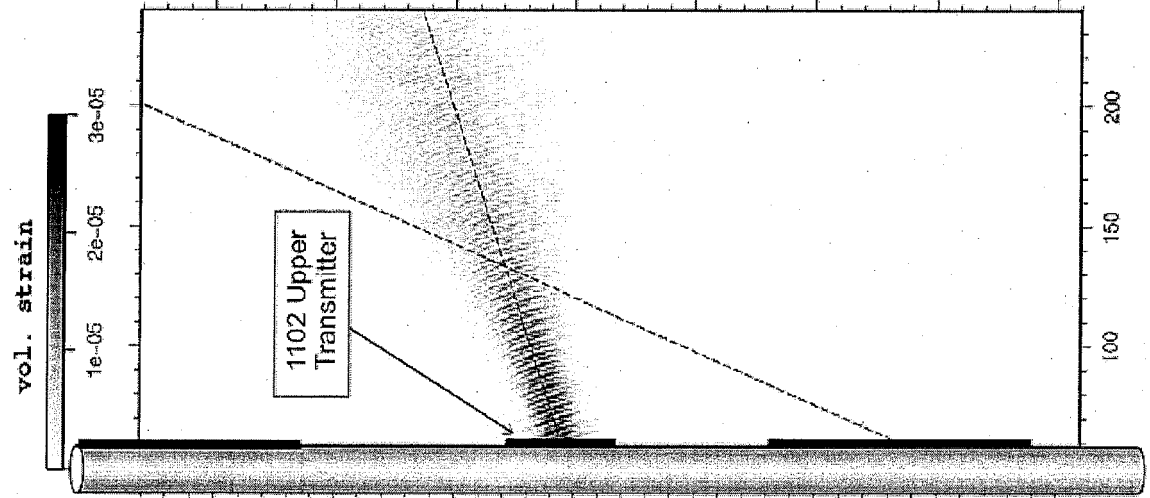
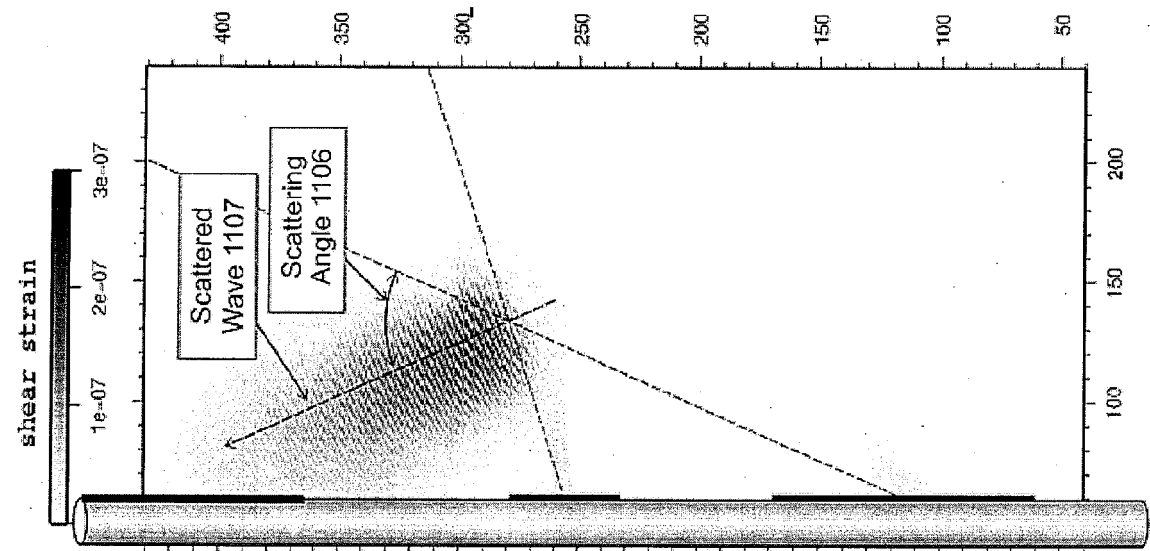


Figure 11c
Shear wave generated at
intersection of beams



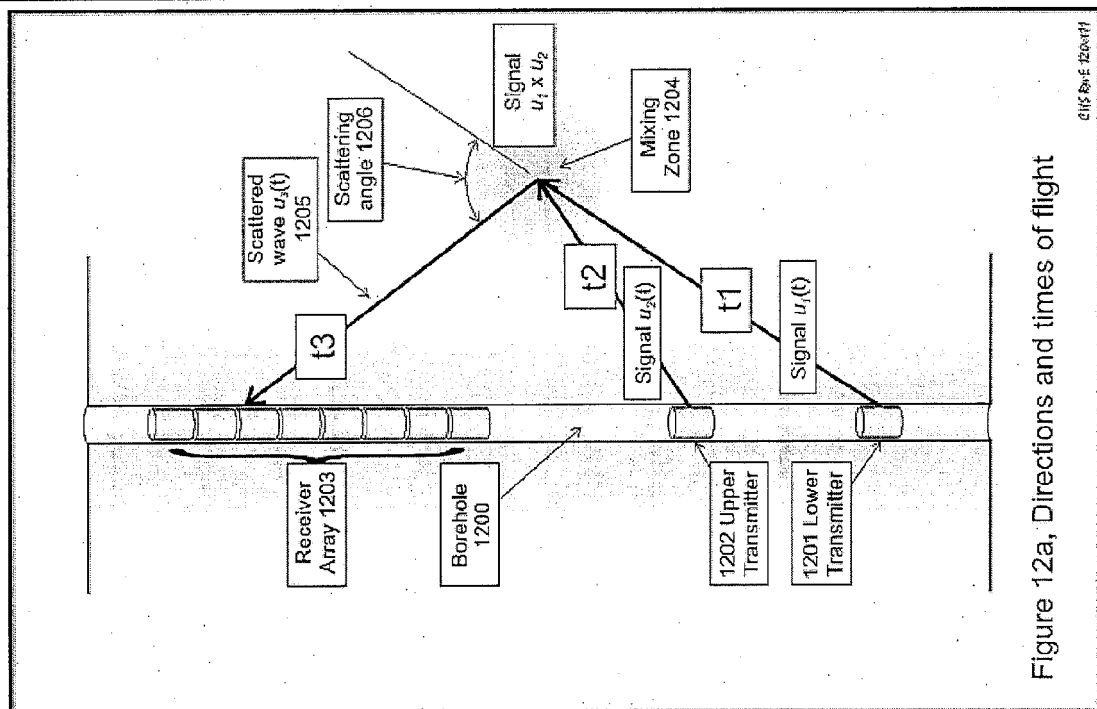
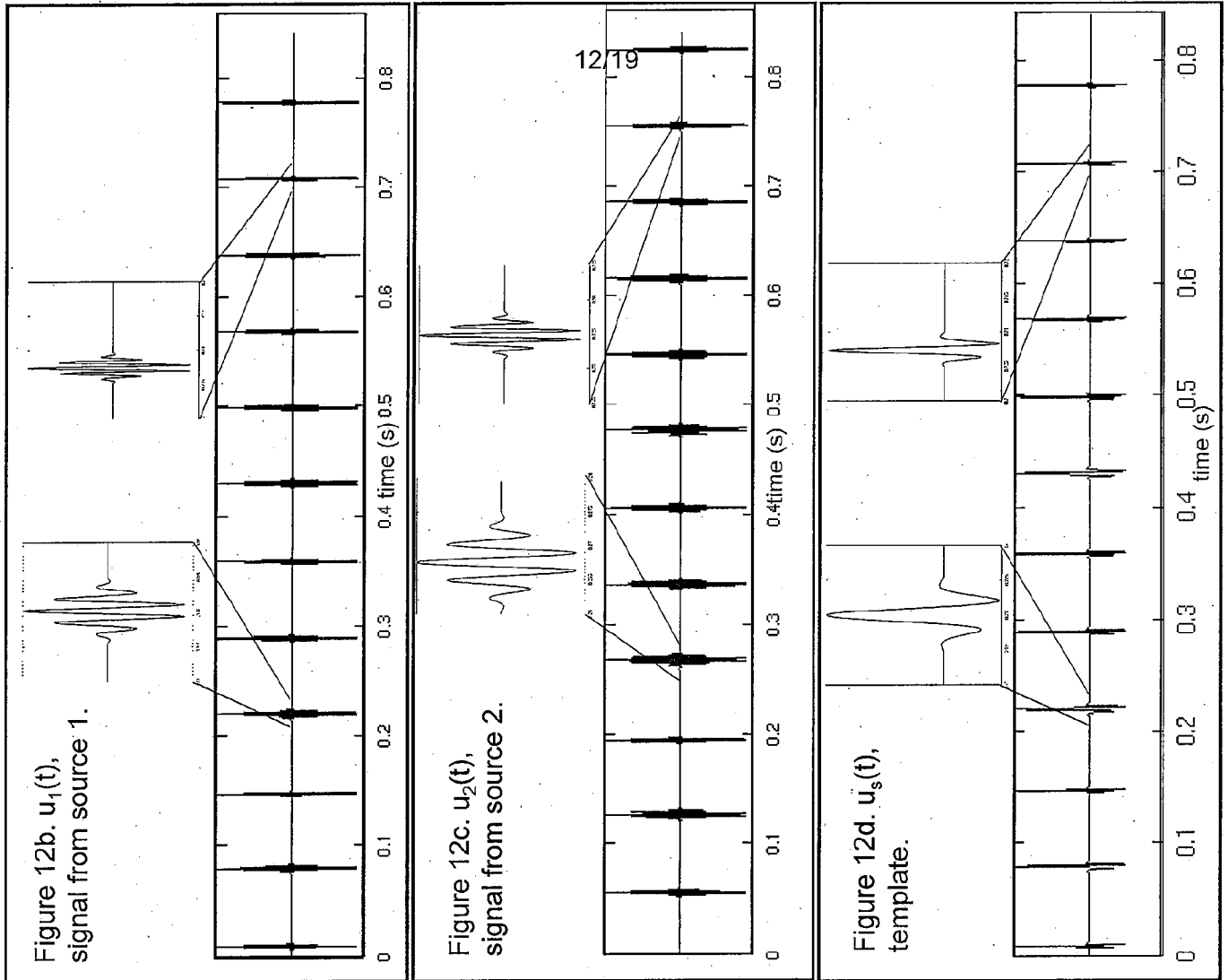


Figure 13a. Position of sources and receiver array.

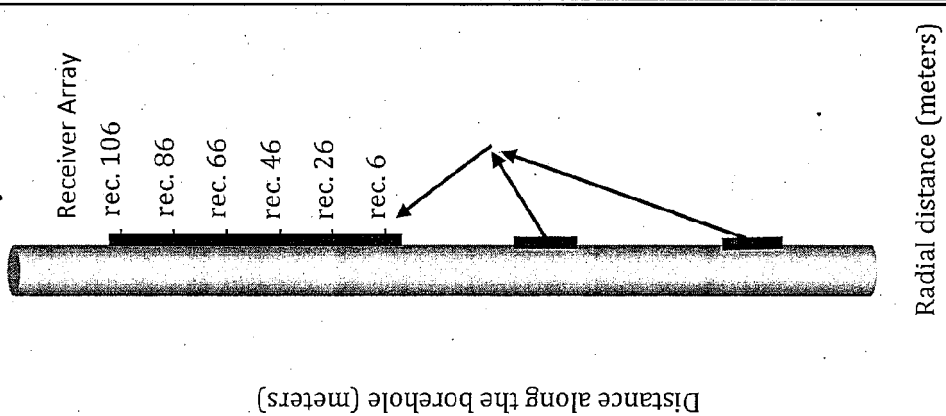


Figure 13b. $u_3(t)$, measured signal at the receiver array.

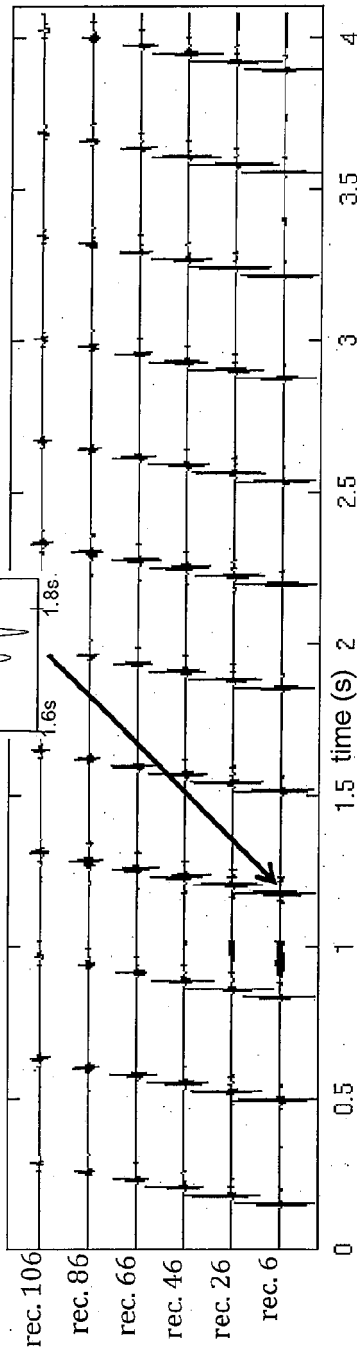


Figure 13c. $u_s(t)$, template.

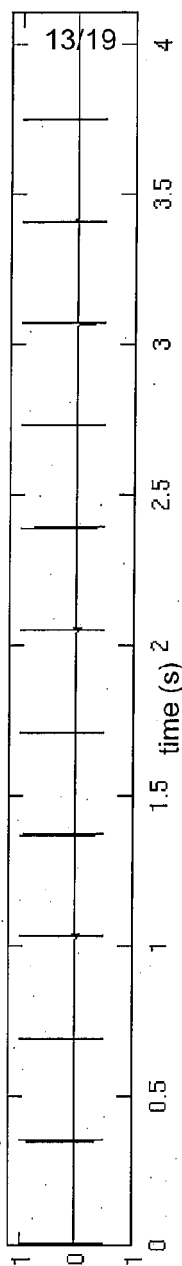


Figure 13d. $M(t)$, correlated signal.

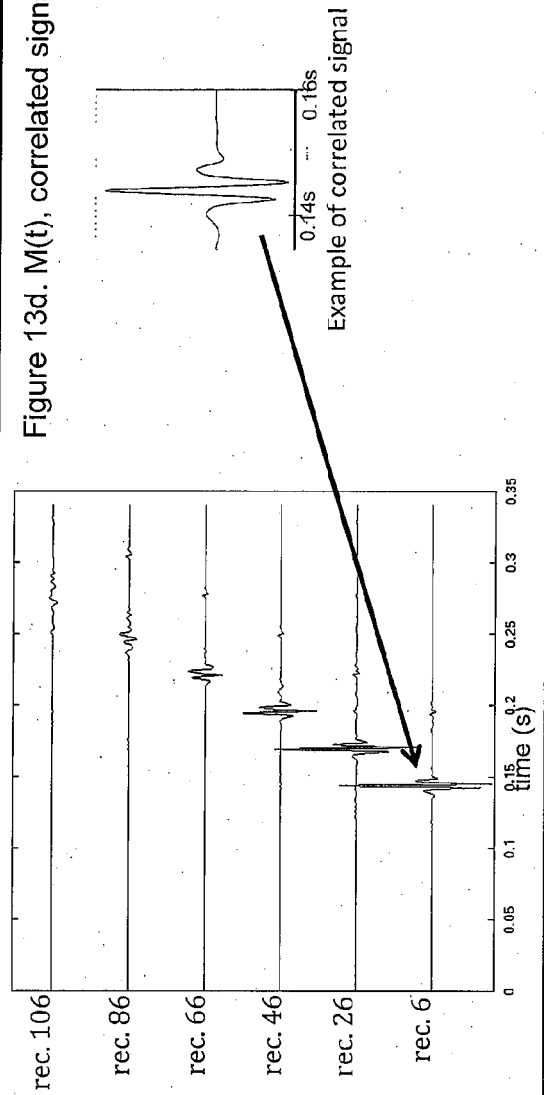


Figure 14a. Position of sources and receiver array.

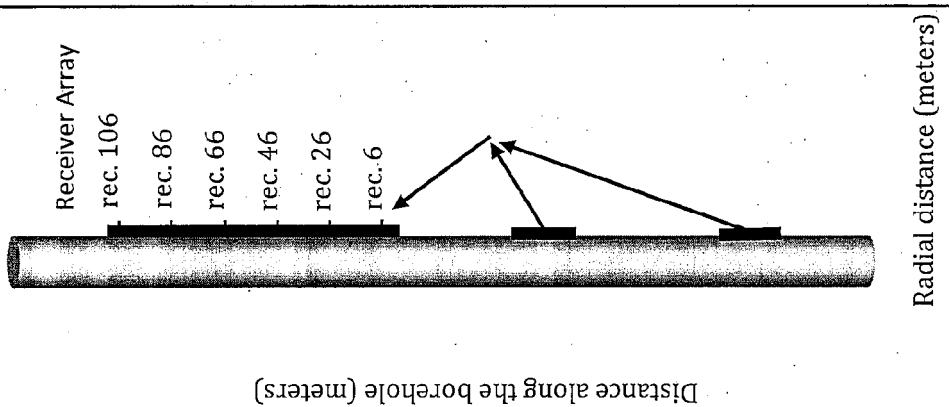


Figure 14b. $u_3(t)$, measured signal at the receiver array.

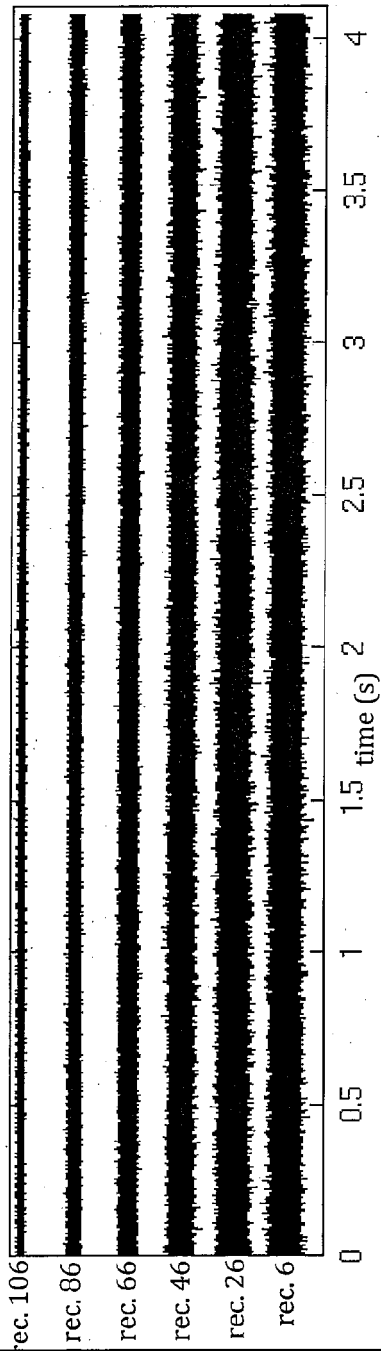


Figure 14c. $u_s(t)$, template.

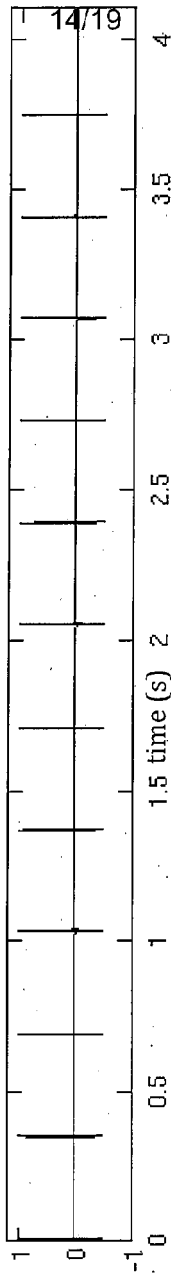
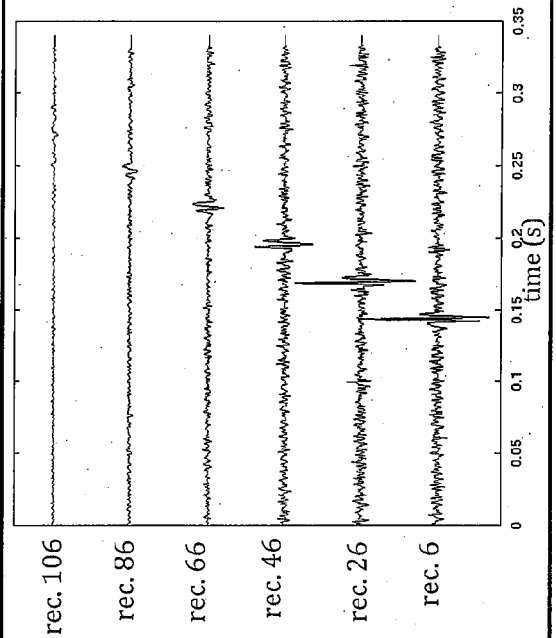


Figure 14d. $M(t)$, correlated signal.



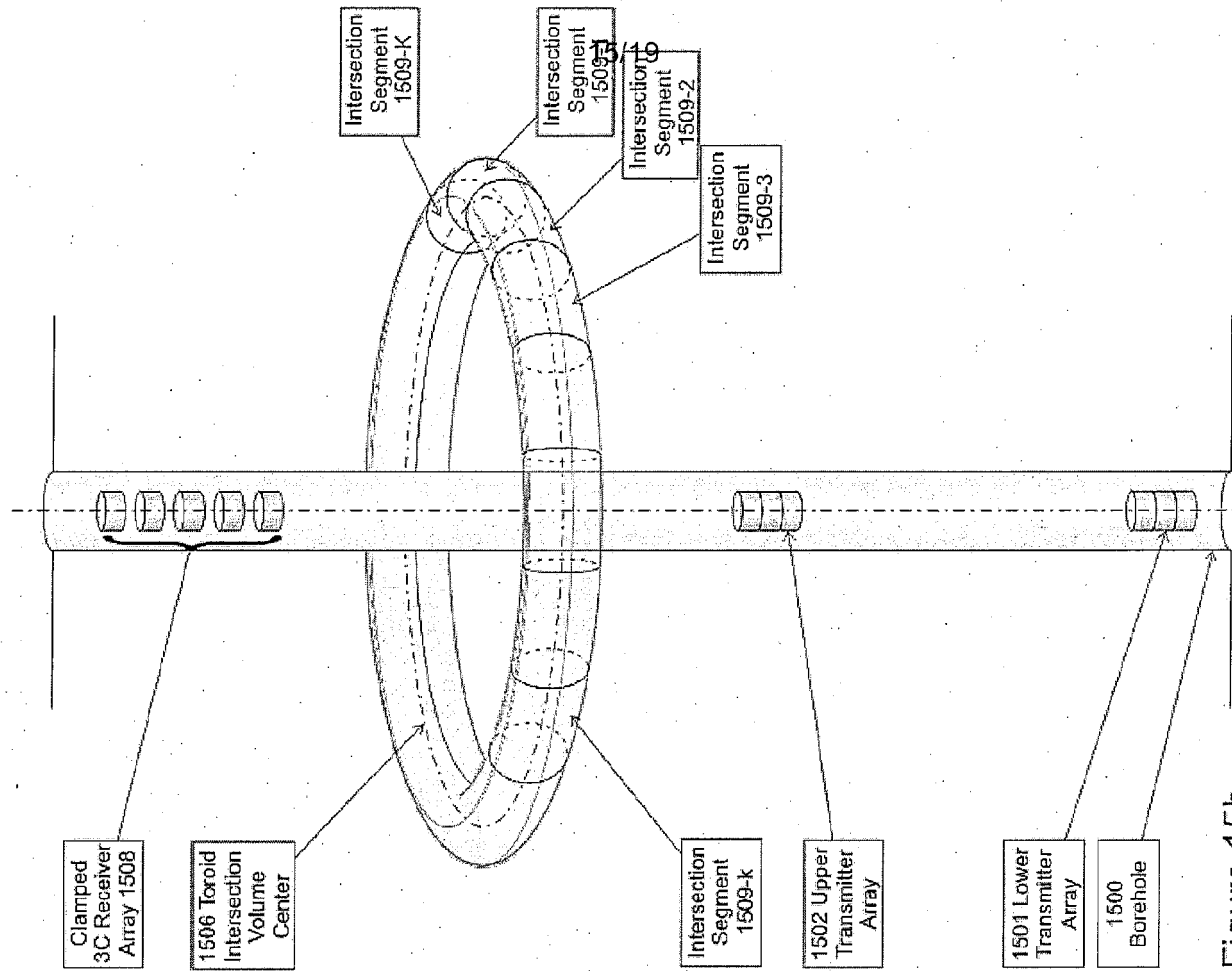


Figure 15a

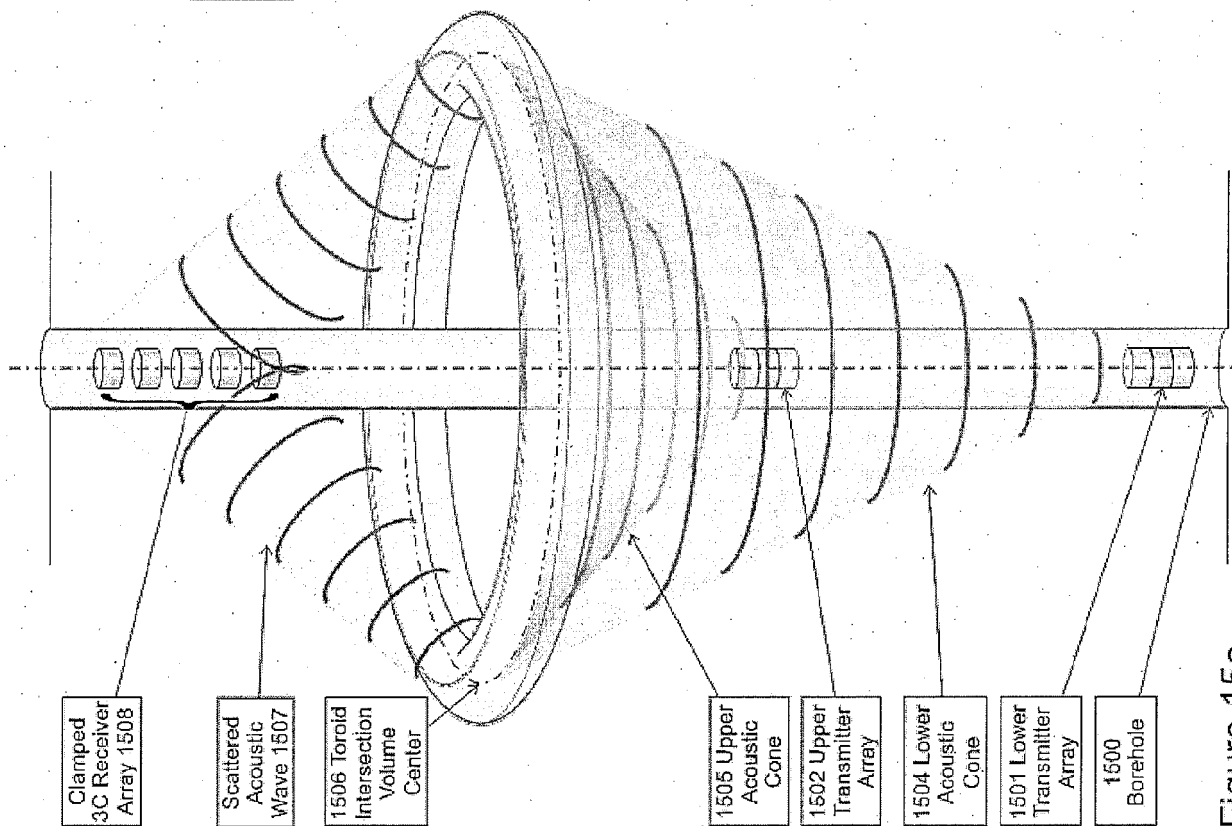


Figure 15b

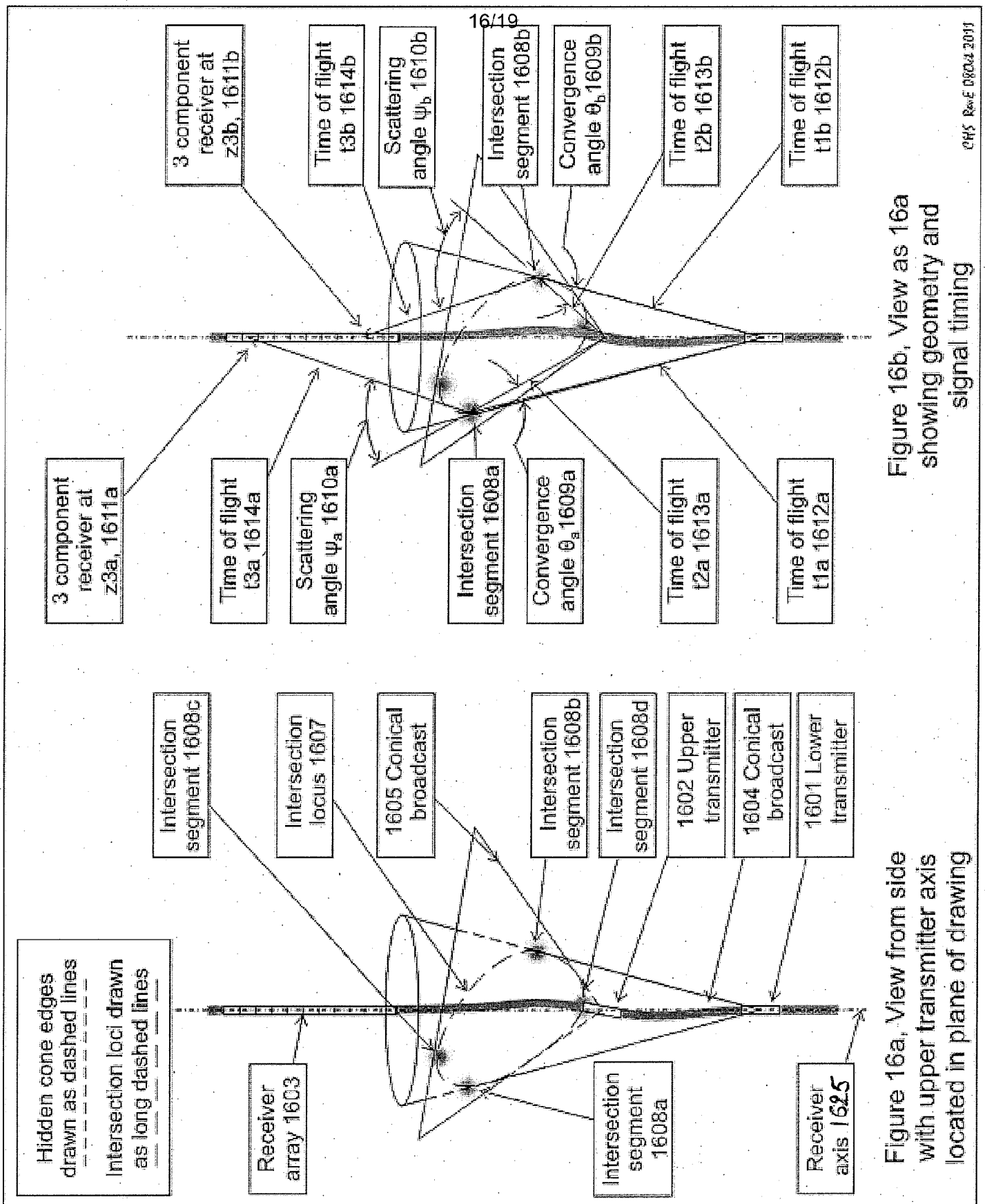


Figure 16b, View as 16a showing geometry and signal timing

Figure 17a

Complete intersection of lower cone within upper cone

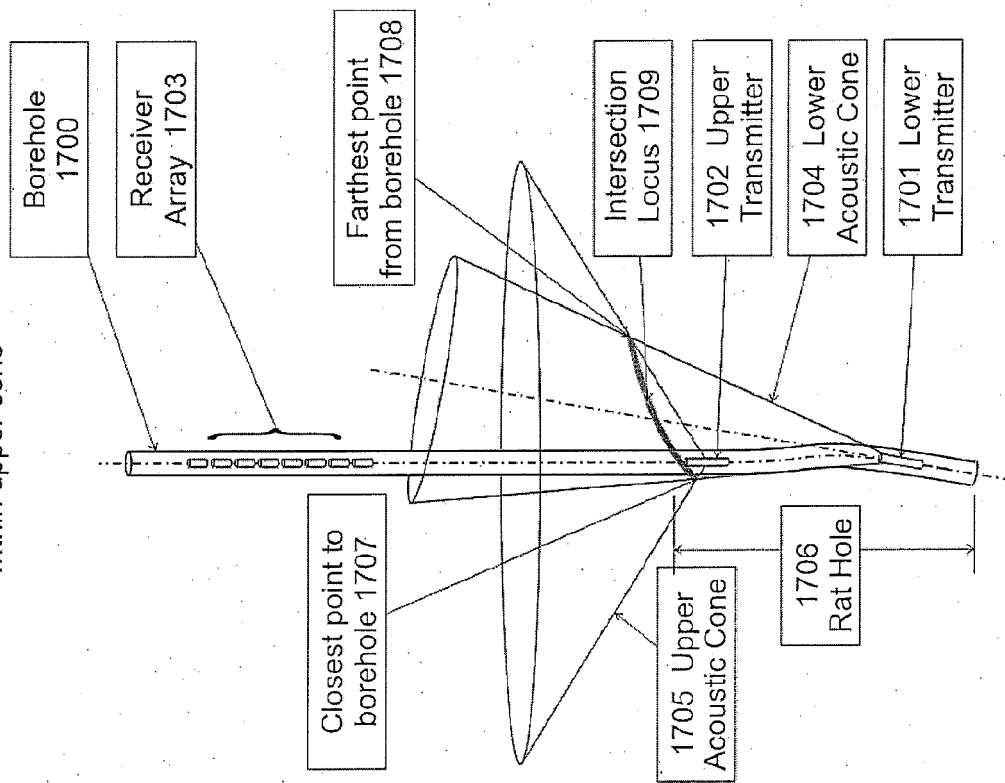
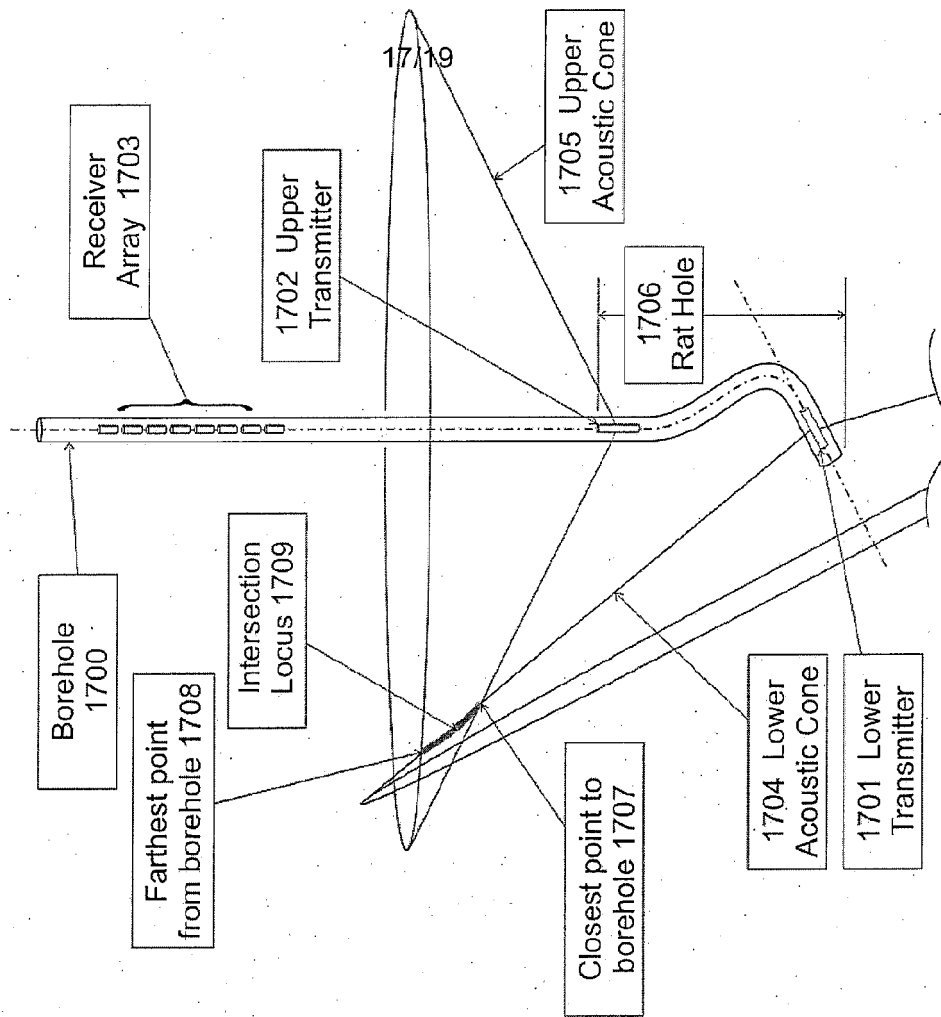
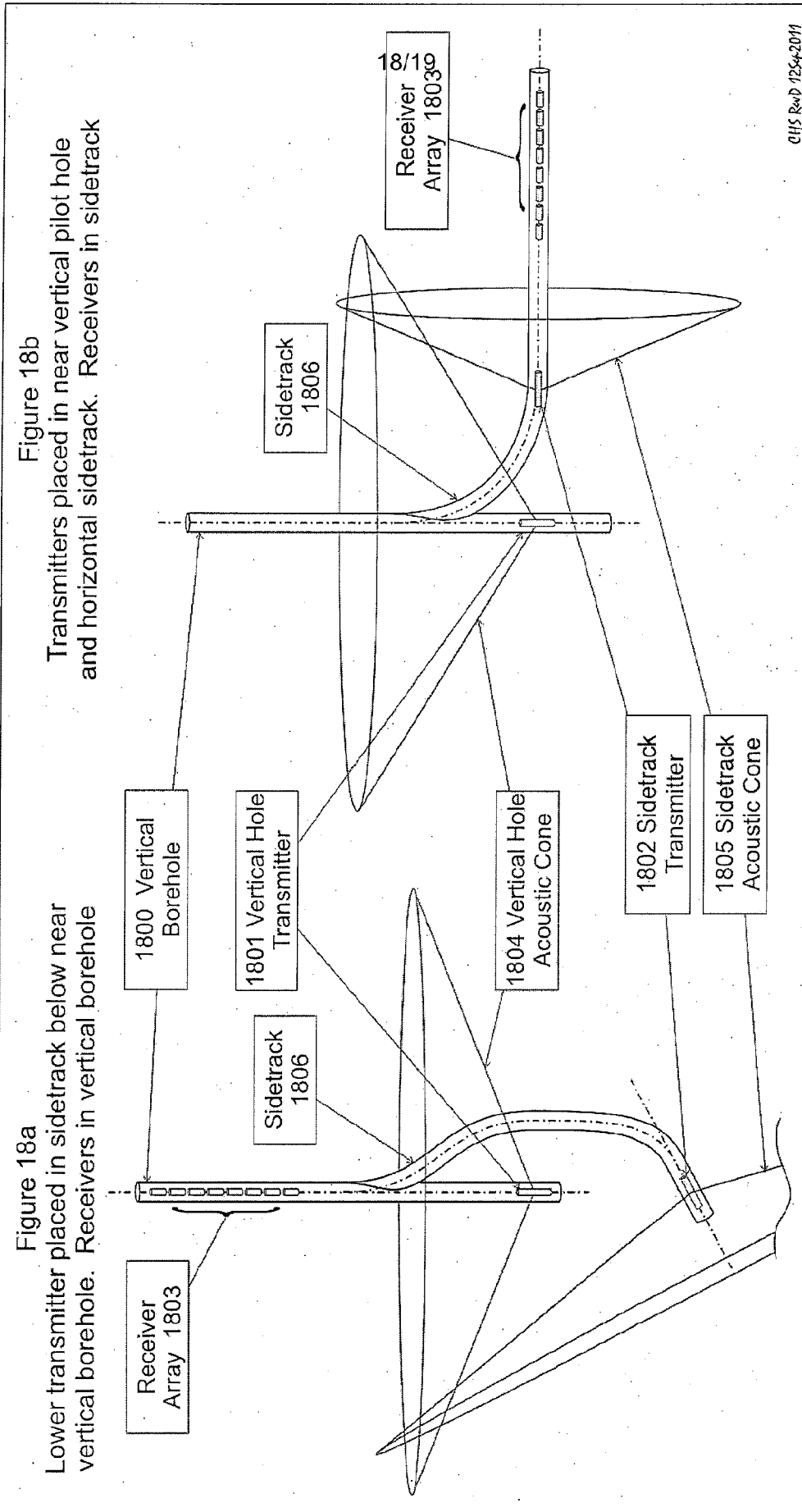


Figure 17b

Lower transmitter emits energy near perpendicular to borehole axis



CHS RevC 08Oct2011



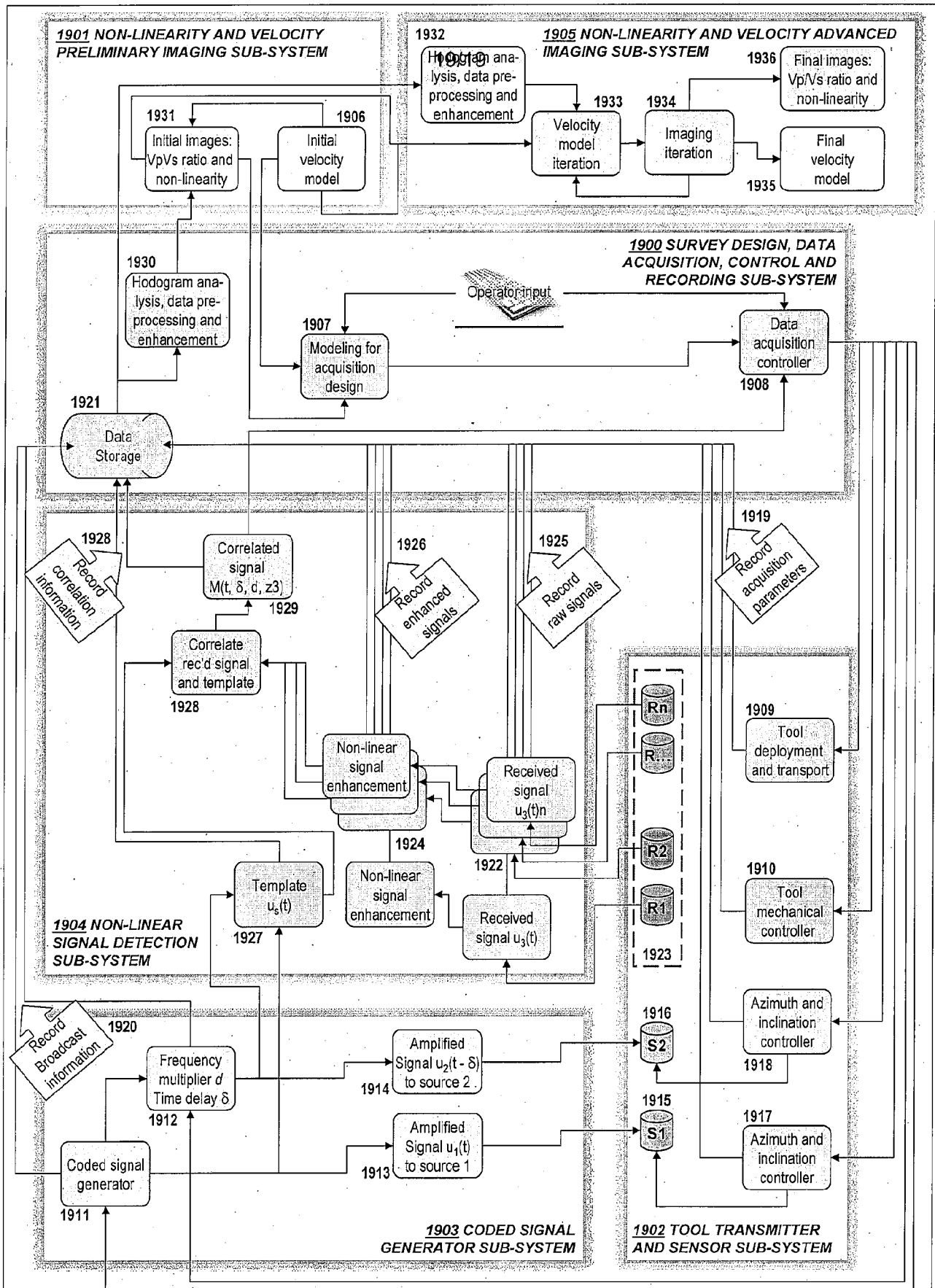


Figure 19 – System Diagram