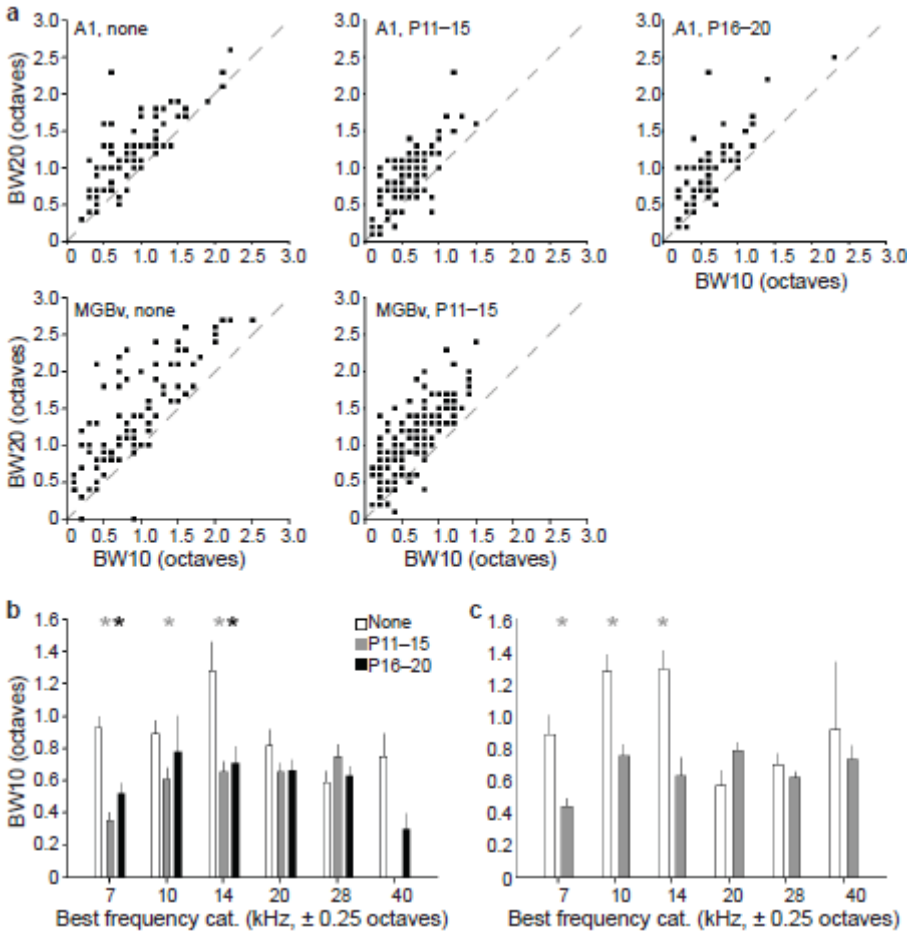
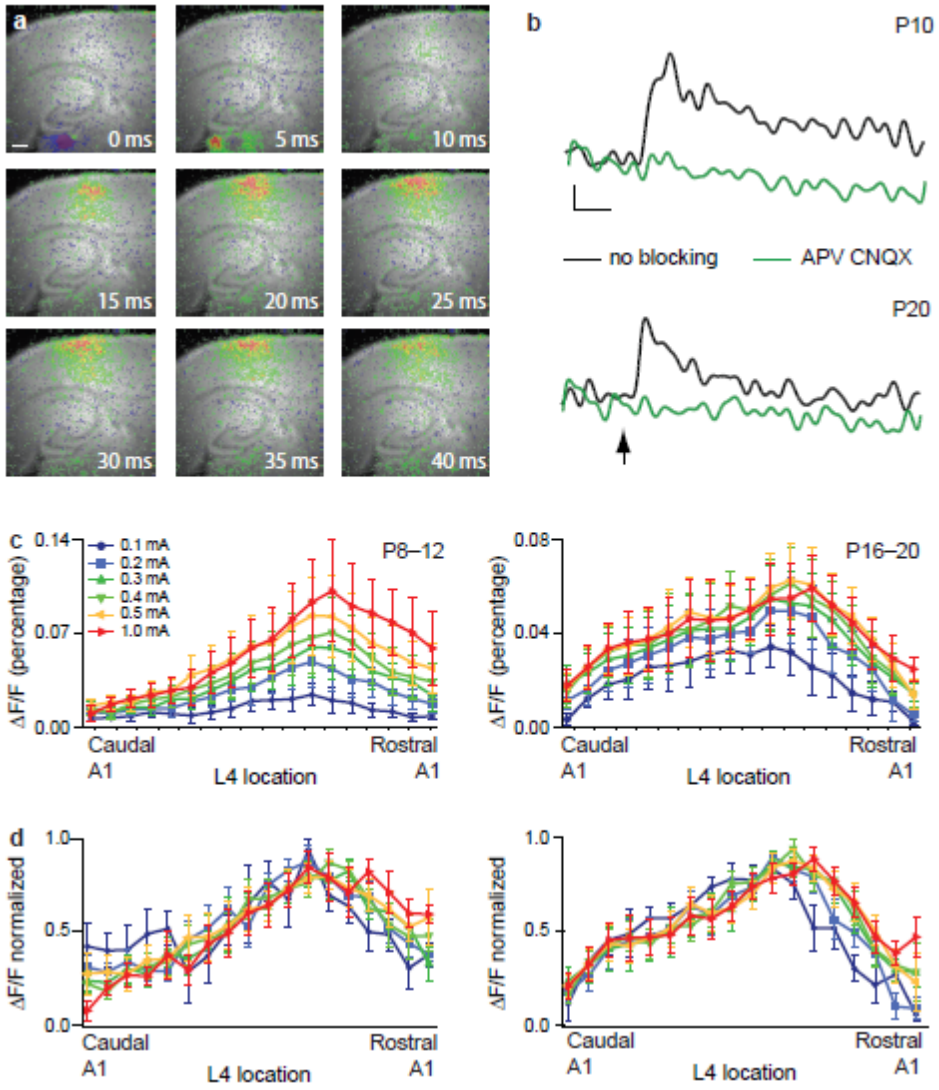
A critical period for auditory thalamocortical connectivity

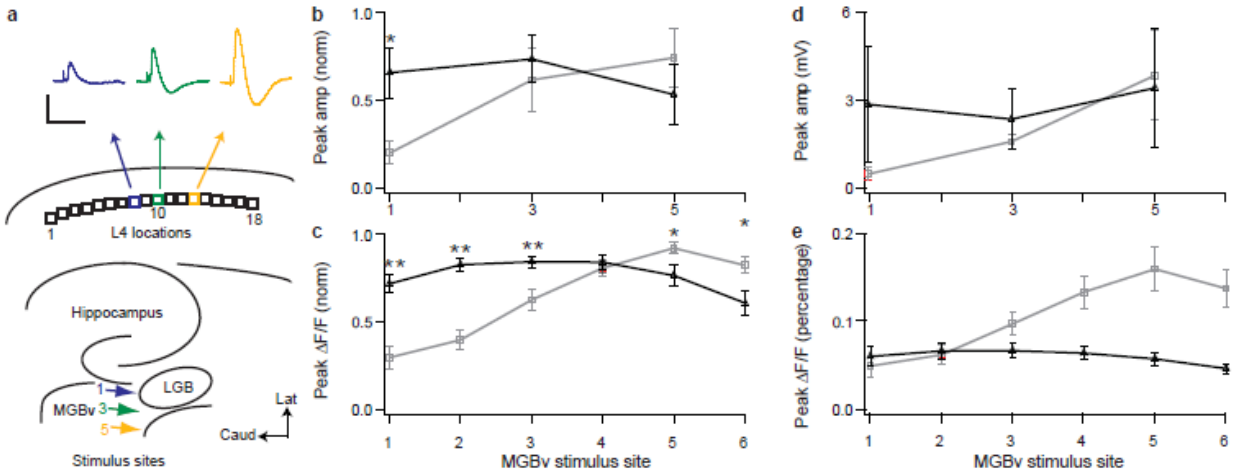
Tania Rinaldi Barkat, Daniel B. Polley & Takao K. Hensch



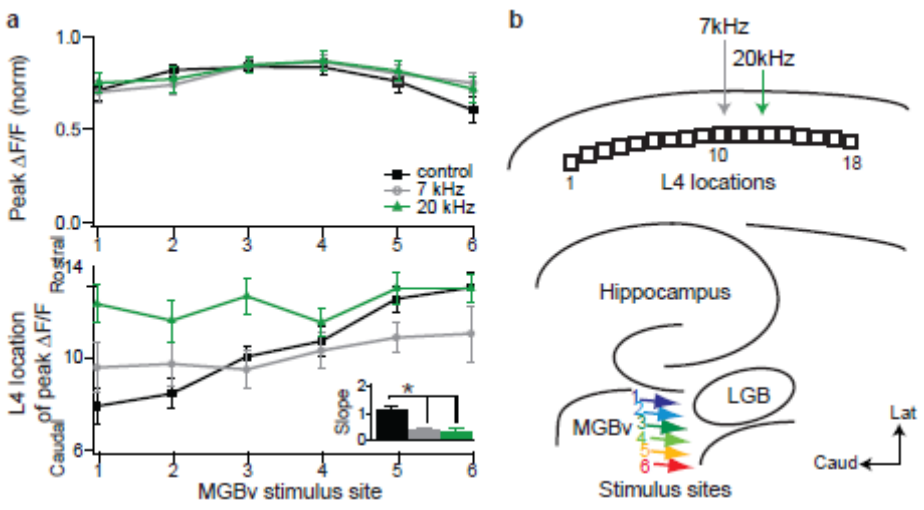
Supplementary Figure 1 | Experience-dependent changes in tuning bandwidth. The width of the frequency response area was measured at 10 and 20 dB above the minimum response threshold and expressed according to best frequency categories used in Figs.1 and 2. **a,** Scatter plots demonstrate that tuning width at 20 dB is wider than at 10 dB for nearly all recording sites. **b,** Bandwidth at 10 dB above threshold (mean±s.e.m.) for A1 (**b**) and MGBv (**c**) recordings. Grey asterisks indicate *P*<0.025 for P11–15 versus none; black asterisks indicate *P*<0.025 for P16–20 versus none (t-test).



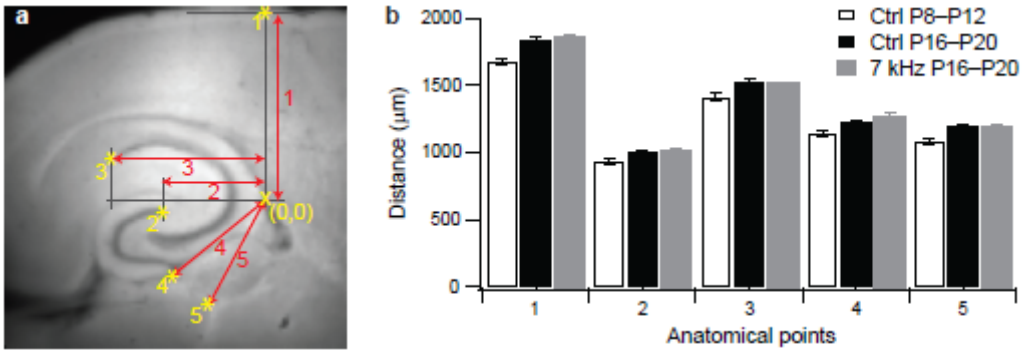
Supplementary Figure 2 | Cortical response characteristics upon single-pulse thalamic stimulation. a, Sample VSDI signals in a thalamocortical slice preparation of mouse auditory system following a single pulse (1 ms) electrical stimulus to the MGBv (at 5 ms). Scale bar, 200 μm. **b**, Sample L4 cortical responses (ΔF/F as a function of time) before (black) and after (green) perfusion of APV and CNQX at P10 or P20. Black arrow indicates MGBv stimulation. Scale bar, 50 ms, 0.02% ΔF/F. **c**, A1 response amplitude across L4 for single pulse stimuli of different amplitude at P8–P12 (n=6) or P16–P20 (n=8). **d**, Normalized values represented in **c**. Data show mean±s.e.m.



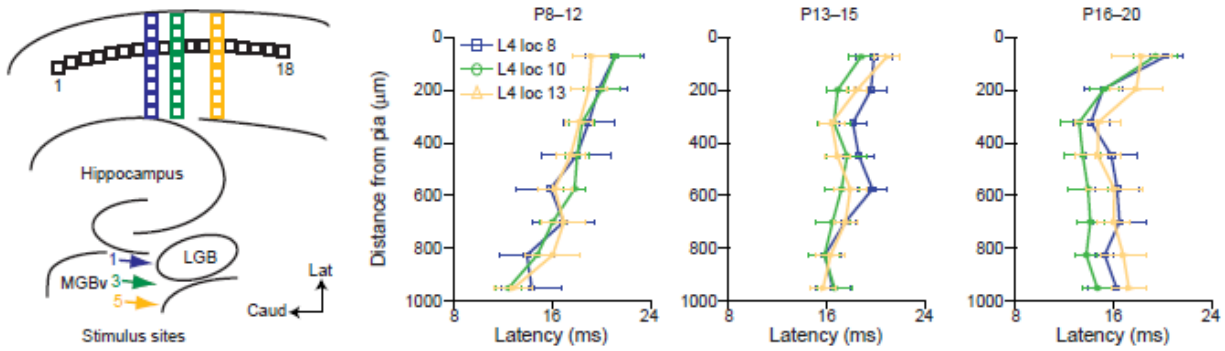
Supplementary Figure 3 | Patch-clamp recordings replicate VSDI results in thalamocortical slices. a, Sample traces of EPSPs in upper L4 pyramidal neurons at locations #8, 10 and 13 to MGBv stimulation at sites #1, 3 and 5 respectively in a P12 mouse, and scheme of the experimental setup. Scale bar, 200 ms, 2 mV. **b**, Normalized peak amplitudes in P8-P12 (grey, n=5) and P16-P20 (black, n=6) mice obtained with patch-clamp recording of individual pyramidal neurons. * $P<0.05$ (Mann-Whitney U test). **c**, Normalized peak amplitudes in P8-P12 (grey, n=13) and P16-P20 (black, n=16) mice obtained with VSDI. * $P<0.05$, ** $P<0.01$ (t-test). **d** and **e**, Absolute values of data represented in **b** and **c**. Data show mean±s.e.m.



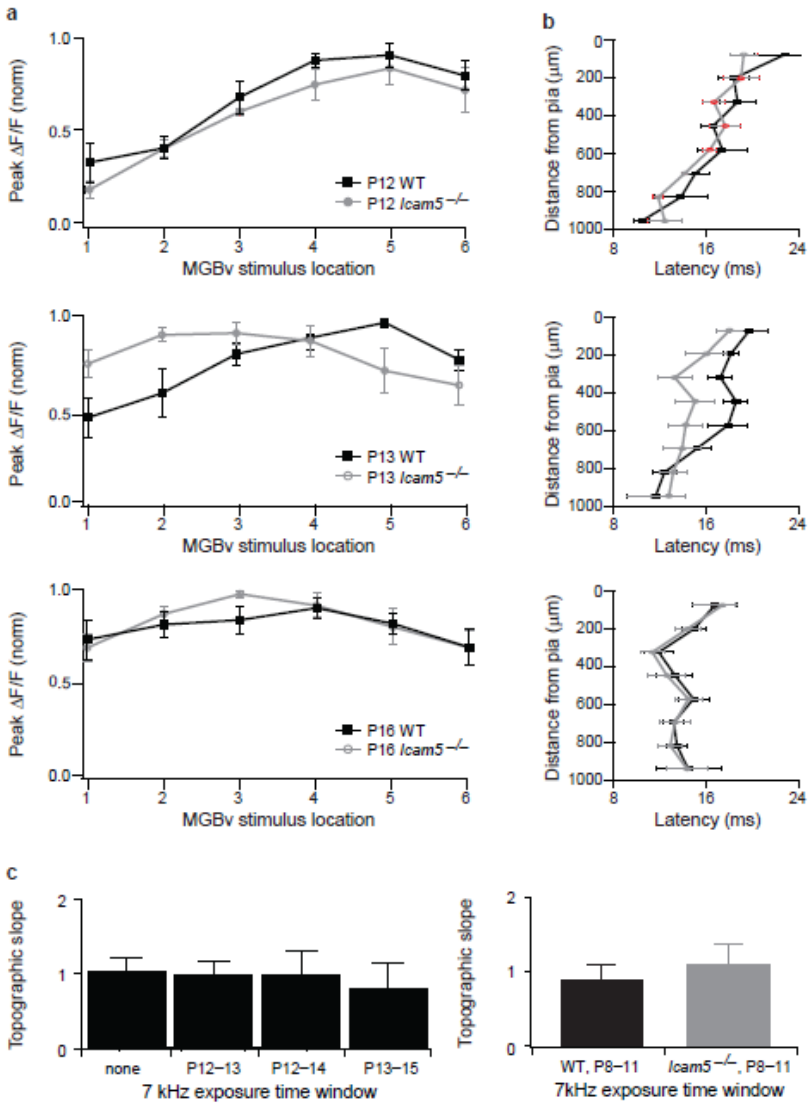
Supplementary Figure 4 | Shifted locus of topographic plasticity across frequency domains in A1 upon corresponding tone exposure. a, Normalized peak ΔF/F, defined as maximum ΔF/F amplitude across all L4 locations, (upper panel) and L4 location of peak ΔF/F (lower panel) as a function of MGBv stimulus site for P16–P20 control mice (black, n=16) or 7 kHz exposed from P8 (grey, n=13) and 20 kHz exposed between P12–P15 (green, n=12). Inset, topographic slopes (mean±s.e.m). * *P*<0.05 (t-test). **b**, Schematic of the six MGBv stimulus sites and eighteen L4 locations analyzed, indicating where the 7 kHz (grey arrow) and 20 kHz (green arrow) exposed mice show the strongest A1 peak response in L4.



Supplementary Figure 5 | Constant anatomical landmarks across age and rearing conditions. a, Sample P16 slice indicating reference point (x) and anatomical landmarks (yellow; 1: pia, 2: rostral flexure of hippocampus (CA3), 3: caudal dorsal portion of hippocampus (CA1), 4: #1 stimulus site, 5: most rostral portion of MGBv). **b**, Distances from reference (red arrows in **a**) for P8-P11 control (n=13), P16-P20 control (n=16) and P16-P20 7kHz exposed mice (n=13). Data show mean±s.e.m.



Supplementary Figure 6 | Columnar shift of functional thalamocortical connection up to L4 across A1. Schematic of three MGBv stimulus sites (#1, 3 and 5) and three L4 loci (#8, 10 and 13, respectively) used for analysis. Latency as a function of distance from pia at different L4 loci and MGBv stimulus sites (blue, location #8 and site #1; green, location #10 and site #3; yellow, location #13 and site #5) for each age group (P8–P12, n=13; P13–P15, n=15; P16–P20, n=11). Data show mean±s.e.m.



Supplementary Figure 7 | Accelerated L4 response strengthening and latency shift for *Icam5*$^{-/-}$ mice at P13. a, Normalized peak ΔF/F as function of MGBv stimulus site in wild-type (black) and *Icam5*$^{-/-}$ (grey) mice at P12 (n=5 and 4), P13 (n=5 each) and P16 (n=6 and 5). **b**, Latency as a function of distance from pia for the same slices in **a**. **c**, Topographic slope for wild-type mice without (none, n=15), or after 7 kHz exposure from P12–P13 (n=9), P12–P14 (n=7) or P13–P15 (n=6). Topographic slope (mean ± s.e.m) after 7 kHz exposure from P8–P11 for wild-type (n=8) and *Icam5*$^{-/-}$ (n=6) mice.