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# Soft mode dispersion and 'waterfall' phenomenon in relaxors revisited

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## Abstract

Results of neutron scattering experiments on ferroelectrics by Gvasalya et al. (2007) show that the soft mode dispersion in relaxors is anomalous. Matter 19, 0162. The soft mode dispersion is anomalous in low-entropy relaxors. We review the results of our earlier work on the soft mode dispersion in relaxors. We also explore the possibility of a phase transition set-up as a function of the composition. We also explore the possibility of a phase transition set-up as a function of the composition. We also explore the possibility of a phase transition set-up as a function of the composition.

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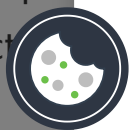
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## Notes

### Notes

1. In the rest of this article, we use reduced (dimensionless) phonon wave vectors expressed in units of  $\pi/a$ , where  $a$  is the lattice constant,  $a = 4.04 \text{ \AA}$ , i.e.  $c^* = \pi/a$ .
2. First Brillouin zone (BZ) is shown in Fig. 1.
3. Apart from the BZ, we also use the Brillouin zone (BZ) metric function  $\Gamma$  defined in the Appendix A.
4. This is the region of the BZ where the phonon dispersion is in the GHz region, as shown in Fig. 1. This region is also discussed in this article.
5. We have also considered the possibility of the phonon dispersion being independent of the wave vector  $q$ .



6. In principle, PMN is known to grow also, for example in pyrochlore structure, but in this case both the lattice parameters and the TO mode frequency are completely different.

7. It was argued in [9](#) that the TO mode cannot couple noticeably to the TA branch because the independent mode intensities do not change with temperature. However, this not a valid argument since the measurements shown in figure of Ref. [9](#) were done in (20q) zone, where both TA and TO modes have similar structure factors so that eventual eigenvector change has no chance to produce such drastic intensity changes as those observed in the quoted [9](#) case of SrTiO<sub>3</sub>.

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[Relaxing with relaxors: a review of relaxor ferroelectrics](#)

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[Soft phonon columns on the edge of the Brillouin zone in the relaxor PbMg<sub>1/3</sub>Nb<sub>2/3</sub>O<sub>3</sub>](#)

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