second sound

This work reconceptualises or defines a number of experiments in particle physics as music. The experiments are both compositions and performances.

The experiments, which are currently taking place, are intended by their devisors to detect dark matter and probe its nature.

Since the detection apparatus relies on generating a form of sound, they can be considered musical instruments, as well as, and separate from their function as scientific instruments.

The piece comprises of a set of premises to establish that the ongoing experiments constitute a generative musical process, as well as and distinct from their stated scientific purpose. The duration, form and content of the pieces emerge as a result of interactions between particle and experiment.

Through the context of *second sound*, the experiments become compositions and performances of the piece in real time.

Suzie Shrubb
2013, revised 2020

Premises 1

- Sound occurs when vibrations induce molecules to fluctuate through a substance. The form of sound wave that we humans are most familiar with comprises these fluctuations moving through a gas or liquid.

- Second sound[1] is generated when heat transference replaces the vibrations and induces quasi-particles called phonons instead of molecules to fluctuate through a crystal structure. Second sound can be thought of as a wave of phonons moving through the crystal lattice. It is a sound wave of heat moving through a solid.

- A phonon is a particle of sound operating at atomic scales.

- Several dark matter detection experiments[2] are set up to detect phonons as a way of inferring the presence of a predicted form of dark matter: WIMPs or Weakly Interacting Massive Particles.

- In the context of the piece *second sound*, dark matter detection apparatus are musical instruments played by WIMP or other particles that interact with them. Each time a WIMP or other particle strikes a detector the resulting phonons produce the musical material of the piece.

[1] A form of sound third sound; sound waves propagating across the surface of superfluid helium, exists.
[2] SuperCDMS, CRESST, EDELWIESS, CDMSI, CDMSII.

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Premises 2

- The apparatus of dark matter experiments, which detect phonons, are musical instruments played by dark matter, or other particles.

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- The duration of the piece is set by the duration of the experiment. The composers of duration are the scientists who design the experiments.

- The experiment is a generative musical process.

- The entire piece, the material, form, narrative structure, harmony, textural construction, duration etc, is elegantly composed by the interaction of particles playing the apparatus as allowed by the design of the experiment.

- Several performances of second sound have completed or are currently taking place SuperCDMS, CRESST and EDELWIESS, EDELWEISS-II, EDELWEISS-III, CDMSI, CDMSII.[3]

[3] At the current time October 2020 dark matter, of any form, has yet to be detected.