



ASTRON 1221

Gravitational Waves

TUNING IN TO THE UNIVERSE

a project by BLAKE SODIKOFF

Motivation

Core questions

<u>What is a gravitational wave?</u>	A gravitational wave is a perturbation of the universal fabric known as space-time.
<u>Why do we care?</u>	The discovery of gravitational waves is further evidence for the existence of black holes, and additionally enhances and confirms our current understanding of astrophysics.
<u>How do we detect these events?</u>	An instrument known as an interferometer uses the nature of photons to identify anomalies in gravitation.
<u>How do our sources obtain data?</u>	Interferometers known as LIGO determines gravitational wave events through anomalies in destructive interference.
<u>Why can we trust these sources?</u>	LIGO data is obtained from two vastly separated sources to ensure efficient experimentation.
<u>What does the discovery mean for the field?</u>	The success of the experiment has allowed us to record many gravitational waves since the initial, furthering our grasp on gravitation and the behavior of massive bodies.

Methodology



LIGO Data

- Chose high SNR event (signal to noise ratio)
- Input GPS time coordinate



Graph Filtering

- Filter undesired spikes in frequency within bandpass of 50-200 Hz.



Waveform Audio

- Analyze event through graph data
- Determine frequency of wavelength from strain (amplitude)
- Correlate with audible frequency

Results

STEP ONE

Analyze data, filter unwanted frequencies

STEP TWO

Correlate frequency to audible sound wave frequency

STEP THREE

Enhance initial result for a more clear and perceivable result

STEP FOUR

Make any additional edits of the enhanced edition to further clarity

STEP FIVE

Experience the universe in a brand-new way by 'hearing' the sounds of the cosmos

Conclusion

This process proves the existence of gravitational waves without uncertainty.

Discovery and analysis of these anomalies furthers our grasp on the nature of gravitation in the universe.

Through this process, we can now perceive the history of the universe in a brand new way

This begs the question:

*In what other forms can we
interpret the cosmos?*

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with data obtained from LIGO Hanford and LIGO Livingston