

University of Groningen

Development of large terahertz heterodyne receiver arrays for future space observations

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DOI:
[10.33612/diss.193635266](https://doi.org/10.33612/diss.193635266)

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Document Version
Publisher's PDF, also known as Version of record

Publication date:
2021

[Link to publication in University of Groningen/UMCG research database](#)

Citation for published version (APA):

Gan, Y. (2021). *Development of large terahertz heterodyne receiver arrays for future space observations*. [Thesis fully internal (DIV), University of Groningen]. University of Groningen.
<https://doi.org/10.33612/diss.193635266>

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Propositions

accompanying the dissertation

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1. Compared to optimizing the structure of a THz quantum cascade laser, using a back-to-back lens system is an efficient and flexible approach to achieve a fundamental Gaussian beam (Chapter 3).
2. A Fourier grating is a powerful tool to generate multiple local oscillator beams at the high end of THz frequencies, either in the form of separate diffracted beams or in the form of a square flattop beam (Chapters 4, 5, & 8).
3. An HEB mixer based on an MgB₂ thin film is a promising candidate for the next generation of THz observatories with a number of telescopes operated as an interferometer in space and Earth atmospheric observations from space. (Chapter 6 & 7).
4. Operating an MgB₂ HEB mixer at high THz frequencies is not just a duplication from operating one at low THz frequencies (Chapter 6 & 7).
5. Building a THz large heterodyne receiver array costs money and time, but in the long run it will be more effective than employing single pixel detectors and small arrays (Chapter 8).
6. Preparation for an experiment is as important as the operation of the experiment.
7. Making mistakes is inevitable when doing measurements.
8. Life should be driven by passion, not by fear. But sometimes fear can stimulate people's potential.
9. Good researchers don't look too high of themselves, neither too low of themselves.
10. Noise in scientific instruments cannot be fully filtered out, just like noise in the mind.

Yuner Gan, Shanghai, 2021 September