

Dear Authors,

Many thanks for addressing the previous comments. I am happy with most changes made to the specific comments but still have issues with some of the general comments.

General Comment 1

The table has been improved, however, there are still some issues:

- The uncertainty should be a value reflecting the percentage uncertainty of a single measurement (i.e. $\pm 10\%$) and should be linked to a study that has measured this. This value is key to assessing the relative performance of methods.
- Please present the Hardware Cost of the FAST method as described in the paper and not a potential number based on sensors not used in this study. The value currently presented “\$2k - \$50k” is a range orders of magnitude apart and provides no useful information. Please only report the cost of the hardware as presented in this study.
- Again, size and set up time of the FAST method should reflect the system reported in this study and not a future untested system. How long did it actually take you to install a fan, sonic anemometer, Picarro etc and get them all running?
- I am a bit confused as to what “Safety” means as the caption reads “likelihood of an operator not being exposed to...”. Does “low” mean a low likelihood of not being exposed, therefore a high likelihood of being exposed? Regardless, to me it seems that the GPM and FAST should have the same likelihood of being exposed to gas. Also, one key flaw of the FAST method is equipment needs to be installed upwind and downwind of the source, therefore, likely exposed to gas. In contrast, the Hi-Flow, OGI and Dynamic chamber can be installed from an upwind location and away from the plume. Therefore I would assume the FAST method is high risk while the Hi-Flow, OGI and Dynamic chamber are low risk.
- I also do not agree that the Hi-Flow has low versatility, this is a small, self-contained unit that has been used to measure methane emissions on the top of condensate tanks on production sites, so it can go almost anywhere. The results presented later in the paper suggest the fan has to be correctly positioned for the FAST method to be useful, therefore, it’s not going to be very versatile for emission points that are hard to reach (most emissions on abandoned wells are difficult to reach).

I would suggest the following changes to the table

Method	FLIR	Hi-Flow	Static chamber	Dynamic chamber	GPM	FAST
Cost	50k	40k	400	400	40k	50k
Range	Does not quantify					
Uncertainty	N/A	$\pm 10\%$	-50%, +100%	$\pm 15\%$	$\pm 40\%$	$\pm 50\%$
Size	0.3	15	20	20	50	50
Measurement time	2	3	30	30	20	3
Setup time	5	5	10	10	10	30

Risk of exposure	Medium	Medium	High	Medium	Low	Medium
Versatility	N/A	High	Low	Low	Medium	Medium

General comment 2

Can you please share the caveats that you have added to the manuscript including the line numbers. As you have not included these details in the response I cannot comment if this issue has been addressed.

General comment 3

The addition of section 3.1 is good and clearly explains what was missing in the previous iteration. A necessary addition is the uncertainty of K_{FAST} , this is currently missing and essential to the study. Please add this.

General comment 4

The response is mostly OK apart from the statement “Despite this, the FAST method shows promise for measuring variable emissions more consistently than SEMTECH.”. There is no evidence that the emission from Hooper #41 is constant and abandoned wells have shown to have variability on very short timescales. I suggest this sentence is removed.

General comment 5

Response is good.

Specific comments

All ok apart from those listed below.

Original L513-518 – Now P 25 starting “Furthermore, the type...”

This makes a very big assumption that lower cost sensors will have the same accuracy/precision as the Picarro and are sensitive enough to be used to measure ppm-level concentrations. In nearly all cases, this is not true. The NDIR and Gas-Rover will not be able to measure at low concentrations (< 10 ppm) while the Nikira Labs' Portable Methane Gas is still quite expensive (tens of thousands). This whole part of the discussion is highly speculative and should not be included, i.e. from “Furthermore,” to “[Portable Methane Analyzer].”

L528

Again this is highly speculative. I would suggest the following statement is removed “However, with the aforementioned simplified setup, the FAST method's setup time could be reduced to match that of the SEMTECH, making it more practical for field deployment.”

“5. Conclusions”

Several sentences within the “conclusions” section are not backed up by any of the findings in the paper. This section should be comprehensively reviewed.

For example, “In the case of the highly variable Hooper #41, where SEMTECH struggled with the well's fluctuating leak rates, the FAST method's larger sampling cross-section and volume resulted in overall lower emissions estimates and relative uncertainty. However, the fan-driven airflow may not fully entrain all emitted gas, particularly from low-height leaks, potentially leading to an underestimation of emission rates for such wells.” How do you know the Hi-Flow “struggled”? This sentence should be rewritten.

The following sentence stating “Future developments in sensor optimization, including the use of more affordable wind and methane detectors, are expected to further enhance its deployment efficiency and accuracy across diverse field conditions. Further testing is being done to optimize the necessary wind and methane sensors to lower costs and maintain accuracy in order to deploy this technology across the U.S. to quantify fugitive emissions.” I understand you are trying to convey that the system could be optimized to overcome some of the current shortcomings but it sounds like an advert for a product and shouldn't be included in a scientific paper as it stands. This should be rewritten.