Has a credible case been made that GHz emission from air showers has been observed?

The observation of a GHz signal in coincidence with a shower that landed close to the central station of the EASIER hexagon is a remarkable result, that should reinforce the ongoing efforts at GHz detection within the observatory.

The GAP note that reports the detection makes a strong case for it. It's unnecesary to argue that a 14σ correlated signal is unlikely the result of a random coincidence. The authors of the note make a compelling argument, based on the timing of the signal with respect to the PMT tubes, to exclude the possibility that the observed GHz trace is a by-product of the tank itself, showing the most likely explanation is that the radiation came from the air shower.

Of course this alone is not an evidence that Molecular Bremsstrahlung Radiation (MBR) with the characteristics described in the Gorham paper has been observed. In fact, the result seems to be in disagreement with the results reported both by CROME (a set-up that searches for coincidences with KASKADE-Grande, at lower energy) and MAYBE (a test-beam experiment measuring GHz emission using 3 MeV electron pulses). A forward beamed emission would be one of the possibilities to reconcile these observations, but, as explained in the EASIER GAP note, the expected Cherenkov emission is two orders of magnitude smaller than the observed.

Even if the radiation is forward in nature, its observation is worthy of further study. Independently of the exact mechanism producing it, the radiation should be related to the electromagnetic cascade, and thus using it to complement shower observations could greatly enhance the capabilities of the Auger Observatory.

Should Antoine and his group be encouraged to proceed with the installation of the 50 stations?

The observation of this signal is by itself a important feature that deserves further investigation. As claimed in the GAP note the current set-up will not provide us with sufficient statistics in a reasonable timescale. On the other hand, the development of a dedicated experiment with greater capabilities (lower energy threshold, measurement of the polarization and/or the spectrum of the signal) will likely require longer timescales for design and R&D.

Given the (1) relatively low cost of the instrumenting 50 additional channels and (2) the short timescale needed for this extension as compared to the increase on statistics that it will provide, the EASIER extension is recommended and encouraged. The increase in statistics alone, when correlated with the data of the surface ar-

ray will likely be helpful to determine the nature of the observed radiation and to establish its potentiality as a mean to study UHECRs. Moreover as at least part of the 50 tanks will lie in the field of view of the MIDAS prototype telescope the complementary (non-) observation of candidate events will also offer chance to determine the nature and the angular distribution of the radiation.

Given the potential of the technique, it is possible that complementary efforts to better characterize and study the GHz radiation will be pursued inside the task force. This will likely involve more advanced techniques and will require longer timescales for R&D and design so should be considered as complementary to the EASIER upgrade; this upgrade offers our best chance to capitalize the detection of GHz radiation from air showers in a short timescale and with a moderate cost and effort.