## Security and safety for air travel using millimetre waves

In order for pupils to be able to make a decision about whether they agree with the use of whole body scanners at airports or not they need to be informed about the properties of millimetre waves [1]. SSERC recently hosted part two of their Physics Residential course and were delighted to welcome Dave McFarlane (photo opposite) from the *Millimetre Wave Group* [2] at St Andrews University to update teachers on their knowledge of mm waves and their uses. Dave gave a well illustrated talk; he introduced it by looking at uses of radiations in the electromagnetic (EM) spectrum and had an infrared imaging camera which everyone enjoyed using. Having identified where mm waves are in the EM spectrum he then gave demonstrations of their use in radar speed guns using their radar Doppler unit and in imaging using their room-imaging radar equipment. The radar imaged the lab and much fun was had looking at the movement of people on the whiteboard (Figure 1).

We were delighted to learn the mm wave outreach group have been funded for a further two and a half years from October of this year. If you are interested in having a school visit from the outreach programme, either a talk or workshop, or would like to visit the department at St Andrews University, email Dave at dgm5@st-and.ac.uk

With whole body scanners being in the news there are media articles pupils could evaluate, thus addressing the experience and outcome from The Sciences in a Curriculum for Excellence - Topical science - Science in the media: *Through research and discussion, I have contributed to evaluations of media items with regard to scientific content and ethical implications.* ***SCN 3-20b***
Another St. Andrews application of mm wave technology, and no doubt much in demand given recent events, is the All-weather Volcano Topography Imaging Sensor (AVTIS) [3]. They describe some of the problems involved in observing an active volcano thus:

***Figure 1*** *- Dr David McFarlane demonstrates the room-imaging radar.*

***Figure 2*** *- Icelandic volcano Eyjafjallajökull [4].*

"Watching to see how a volcano changes might seem like a simple thing to do, but most volcanoes are usually covered in cloud making it really difficult to see what is happening. Sometimes months can go by without a good view. Even when the weather is clear gas and smoke obscure the most active parts of the volcano in exactly the places that scientists need to look if they are going to try and tell what is going to happen next. AVTIS was built to look at the volcanic lava dome on the Caribbean island of Montserrat. Since mm waves pass right through cloud, gas and smoke, AVTIS can see what is happening all of the time. This is really important if you are trying to predict when the volcano might explode. The idea with AVTIS is to measure exactly where activity is greatest on the lava dome surface and help predict where new explosions might happen".


***Figure 3*** *- Imaging the Monteserrat volcano with AVTIS*

If *Hekla*, Iceland's most active volcano erupts in sympathy with its near neighbour, *Eyjafjallajökull*, the research into the technology needed for full-body mm wave scanners at airports may well have to be redirected into more devices like AVTIS.

## References

[1] http://www.st-andrews.ac.uk/~mmwave/mmwave/what.html
[2] http://www.st-andrews.ac.uk/~mmwave/mmwave/index.html
[3] http://www.vision4thefuture.org/s4_resources/files_avtis/r_avtis.htm
[4] http://commons.wikimedia.org/wiki/File:Eyjafjallajokull-April-17.JPG

*Dave McFarlane from the Millimetre Wave Group [2] at St Andrews University*