audio-technica

ATND1061LK
ATND1061DAN

Beamforming Array Microphone

Operation Guide

Ver.1.0

Introduction

This guide explains the guidelines for installing and configuring the ATND1061. Specifically, the items covered are as follows.

- Features
- Room in which to install the product
- Microphone coverage range
- Beam settings
- Camera linking
- Microphone placement and setup examples

Features

Optimal operating environment

The ATND1061 is the optimal solution for large and small conference rooms, boardrooms, and meeting spaces. It can also be used as the optimal solution for classrooms, multipurpose rooms, and other such rooms in the educational field.
On the other hand, note that the functions and features of the ATND1061 cannot be used to their full extent outdoors and in cases where sound reinforcement is used. Audio-Technica provides a wide range of wireless microphones and other products that fit various situations, so consider them for outdoor use and in cases where sound reinforcement is used.

Beamforming algorithm

Beamforming microphones differ from general-purpose microphones in that they must aim a beam at the talker. There are two methods for aiming the beam at the talker, each with its own advantages and disadvantages as outlined below: the fixed-beam method, in which the beam is constantly aimed in a fixed direction, and the talker-tracking method, in which the talker is identified and tracked.

Fixed-beam method

Advantages

Speech from the position at which the beam is aimed can be picked up with high clarity. Speech from multiple talkers can be supported with the placement of multiple beams.

Disadvantages

Clarity drops outside of the microphone coverage range, so talkers must be at predetermined positions.

Talker-tracking method

Advantages

Talkers do not need to worry about where they speak from.

Disadvantages

Speech may not be picked up or pickup may be interrupted due to insufficient accuracy in the detection of the audio direction or due to the time required to detect the sound source. Additionally, the beam may be aimed at a loudspeaker or a similar device instead of at a talker.

To eliminate the disadvantages of the talker-tracking method, it is necessary to improve tracking accuracy and speed. The classical method conventionally used to detect the audio direction is to search for the direction with the highest power and define this as the direction where the talker is located. With this method, the tracking accuracy can be improved by averaging the signals received by the microphone over a long period of time, but the difficulty in aiming the beam in different directions at high speed results in insufficient speed for practical applications.
However, the proprietary algorithm developed by Audio-Technica uses the lack of correlation between audio and noise to obtain faster speed and higher accuracy without sacrificing the number of calculations and accuracy required for the search and with no need to average over a long period of time. The direction detection is 26 times faster and the direction accuracy is 60% better than the conventional method. The resulting leeway in the number of calculations can be assigned to the VAD processing.

Microphone coverage functions

Voice activity detection (VAD)

The ATND1061 is equipped with a VAD function that prevents the beam from being aimed at typing sounds and similar conference room sounds determined to be unnecessary noise. Online conference software of recent years is equipped with excellent noise removal functions, but the VAD function does not focus on unnecessary sounds at the microphone coverage stage, thereby allowing for accurate detection of the talker and good sound quality requiring minimal post-processing.

Beam sensitivity

The “Beam Sens” parameter of the ATND1061 makes it possible to adjust the accuracy of talker detection. The “Mid” setting is sufficient for most general conference rooms, but it is recommended to use the “High” setting in situations such as when you want to pick up even the quietest sounds with the microphone and when the beginning of the recording is lost due to issues such as audio reflections in the room. On the other hand, the “Low” setting is recommended if you want to focus on the audio more in situations with a lot of ambient noise. Be aware that the “High“ setting, with its high beam speed and fast gate, increases the chance for a false trigger, in which some other noise is identified as a talker. The “Low“ setting, with its slower beam speed and gate, decreases the chance for a false trigger.

Camera linking

With the talker-tracking method, the ATND1061 beamforming microphone can identify the direction of the talker, so it is equipped with a function that uses this feature in a manner useful for controlling the camera.
In addition to the microphone coverage range, the camera area can also be set. When the talker enters the specified range, the number of that range is output. The ATND1061 supports protocols such as Visca over IP format, which allows configuration related to camera control without complicated settings just by associating area numbers with camera preset numbers. The IP command can also be used to output the coordinates of the talker together with the area number.

Room in which to install the product

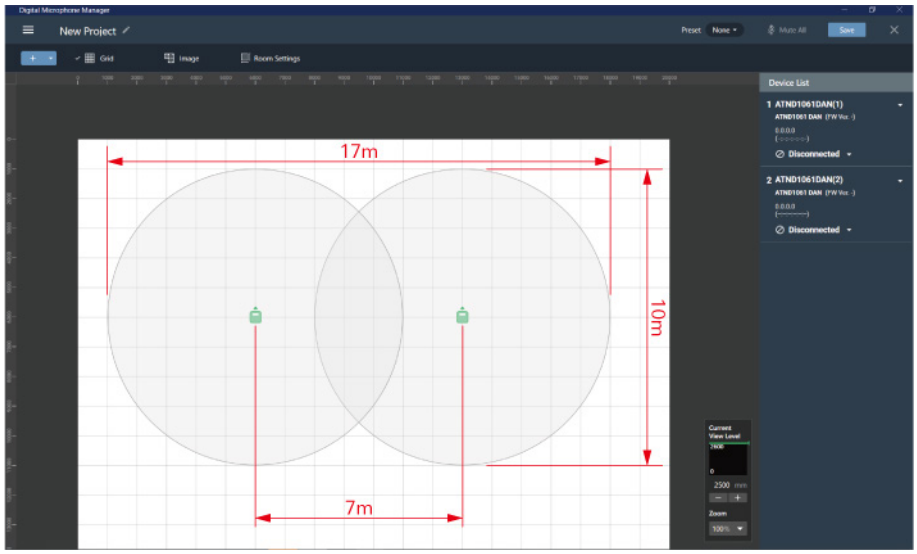
Room size and number of microphones to install

For microphone coverage in rooms such as huddle rooms and conference rooms, consider installing one microphone per 70 m^2 (753 ft^2) as a guideline.

- The conditions vary depending on the installation height of the microphone, the shape of the room, and the intensity of audio reflections and the voice of the talker.
- Operation linked with a camera and talker position detection both require higher accuracy in the detection of the talker, so it is recommended to install one microphone per 50 m^2 (538 ft^2) as a guideline.

Installing multiple ATND1061 units

Install multiple microphones in wide rooms, large conference rooms, and similar situations. Up to 20 devices can be handled per Digital Microphone Manager project. It is also possible to import drawings, so consider an installation that matches the layout of the room.



Recommended room conditions

Noise level

Generally, the noise level in conference rooms is 40 to 50 dB. The ATND1061 is designed for ideal performance at this and lower levels. If you are concerned about steady state noise, use the built-in noise-cancelling function or the same function of an external DSP.

Notes related to air conditioners

One of the major features of ceiling microphones is that they can capture clear audio even when installed in a ceiling. However, exercise caution to avoid positioning the microphone right next to an air conditioner or in a location where it is directly subjected to air blown from an air conditioner. Because of the distance from the microphone to the talker, audio signals will attenuate before reaching the microphone, making the talker's voice quiet. Hence, the intended sounds to pick up may be covered by noise, which is louder due to its proximity to the microphone.

Audio reflection level

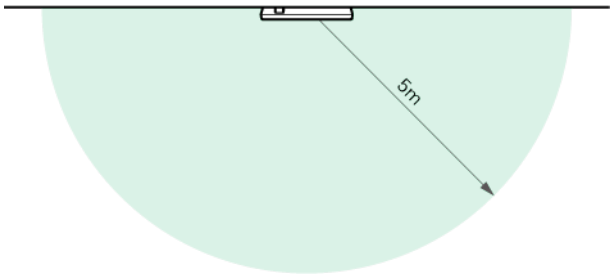
Rooms with few audio reflections tend to have clearer audio and allow for the talker to be detected with higher accuracy. Rooms with a reverberation time of approximately 700 msec (RT60) are permissible, but use in rooms with longer reverberation times is not recommended.

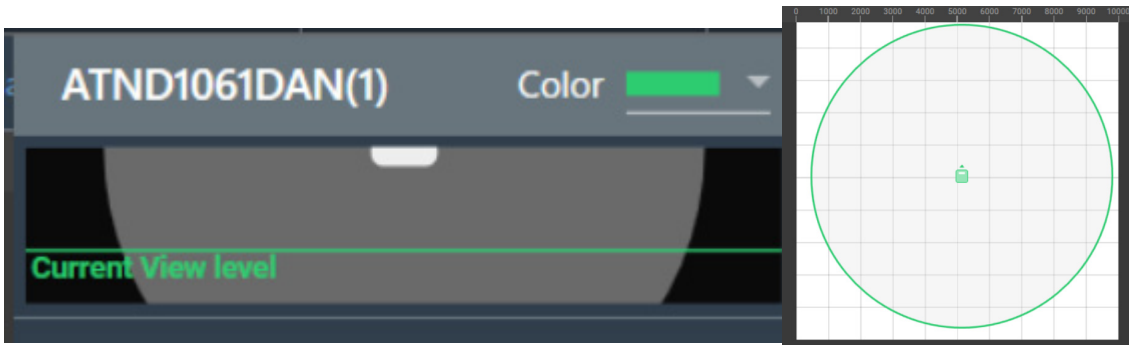
- Even in rooms with few audio reflections, sounds are reflected close to walls and the floor, resulting in reduced talker detection performance.

Microphone coverage range

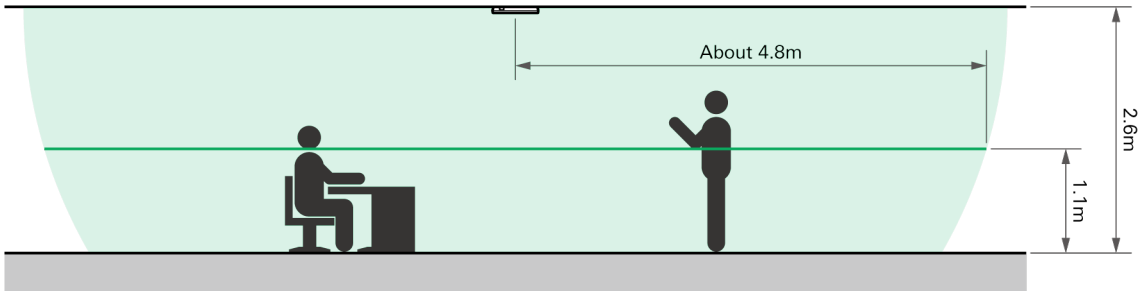
Talker detection range

The ATND1061 can detect the talker within a circle with a radius of up to approximately 5 m (16') centered on the microphone (assuming an environment with few audio reflections). In Digital Microphone Manager, the positions indicated by this 5 m (16') radius are shown with the device color (green by default), providing a guide for setting the microphone coverage range.





When the device is installed at a height of 2.6 m (8.5'), which is a typical ceiling height in offices, the talker detection range on a plane at a height of 1.1 m (3.6') is a circle with a radius of approximately 4.8 m (16').



Installation in rooms with high ceilings

When installing the microphone in a room with a high ceiling, if the desired microphone coverage range is not contained within the green circle, consider using a VESA mount or a similar device to install the microphone at a position lower than the ceiling. For details on how to install the microphone, refer to the user manual.

- The shorter the distance from the talker to the microphone, the better the sound quality. Install the microphone as close as possible to the talker without harming the aesthetics of the room.

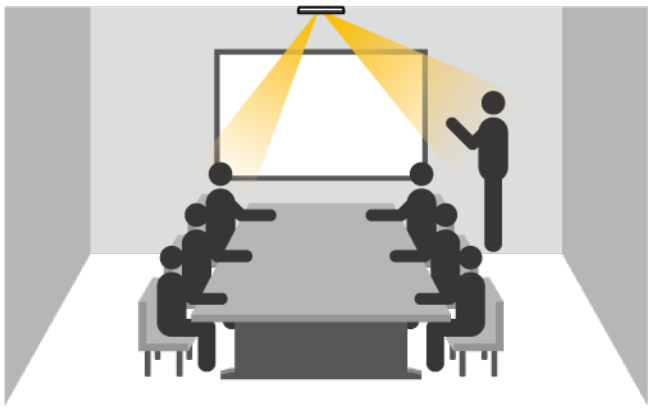
Beam settings

Accurately setting the microphone coverage range

Internally, the microphone estimates the position of the talker with angle information in the horizontal and vertical directions. It is difficult to determine the position of the talker with just this angle information, so the polar coordinates are projected onto a plane, and the settings are configured on a plane that cuts the “Current View Level” height. Digital Microphone Manager allows for the importing of image data, so a more accurate microphone coverage range can be set with the position and height of the target sound source.

Microphone coverage settings

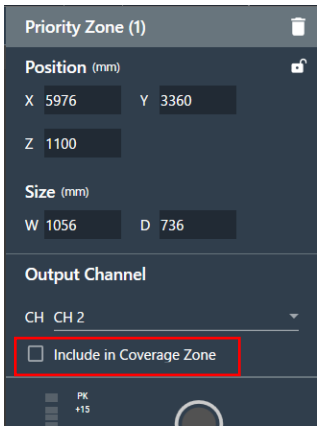
There are two types of Zone settings in the microphone coverage settings: Coverage Zone and Priority Zone. By default, the microphone has a Coverage Zone of 6 m × 7 m (20’ × 23’) at a height of 1 m (3.3’). The ATND1061 is equipped with a high-speed talker detection function, so you can obtain smooth microphone coverage just by setting the Coverage Zone.



Splitting off channels or adjusting the gain for simultaneous speech

With the Coverage Zone setting, one beam is assigned to each channel, so if simultaneous speech occurs, the channel with the higher level is recognized as the talker. The Priority Zone setting allows you to split off a channel for the MC or a person serving a similar role and to split off channels for talkers with different levels and adjust the gain.

- You can overlap Coverage Zone and Priority Zone instances, but you cannot overlap Priority Zone instances.
- If a Coverage Zone instance and a Priority Zone instance overlap, sound normally only comes out from the channels to which Priority Zone has been assigned.
- If you select the “Include in Coverage Zone” check box, audio will be output from the channels to which Priority Zone has been assigned as well as from CH1 to which Coverage Zone has been assigned.



- The Coverage Zone and Priority Zone can also be used as six independent channels.

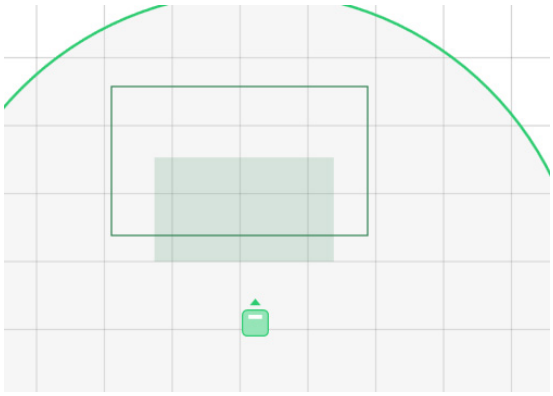
Note	• A wide range of applications is available. For example, in a classroom where there is a teacher and students, the Coverage Zone, which provides microphone coverage over a wide range that includes the students, is sent to the recorder, and the Priority Zone sounds are mixed and sent to the far end.

Configuring settings to prevent beams from being aimed at noise sources

You can set known noise sources such as speakers and fans to the Exclusion Zone in advance to prevent beams from being aimed at these ranges.

Checking the microphone coverage range after setup

After setting the microphone coverage range, change the “View Level” to display each Zone with the following frame.



Setting a more accurate microphone coverage range

The talker position information of the device connected to Digital Microphone Manager is displayed with gray dots. You can mark the current position of the talker by clicking “Mark” at this time. These functions are useful for setting the range of talkers who move around and for setting the Exclusion Zone of speakers and other such objects with fixed positions. Refer to this information not just for sounds but also when configuring settings in the actual room.

Camera linking

The ATND1061 outputs the talker position information with the IP command. This operation is useful as the trigger for recalling camera presets. The IP command includes the following information: whether there is a talker, the direction of the talker, the audio channel number, and the camera zone number.

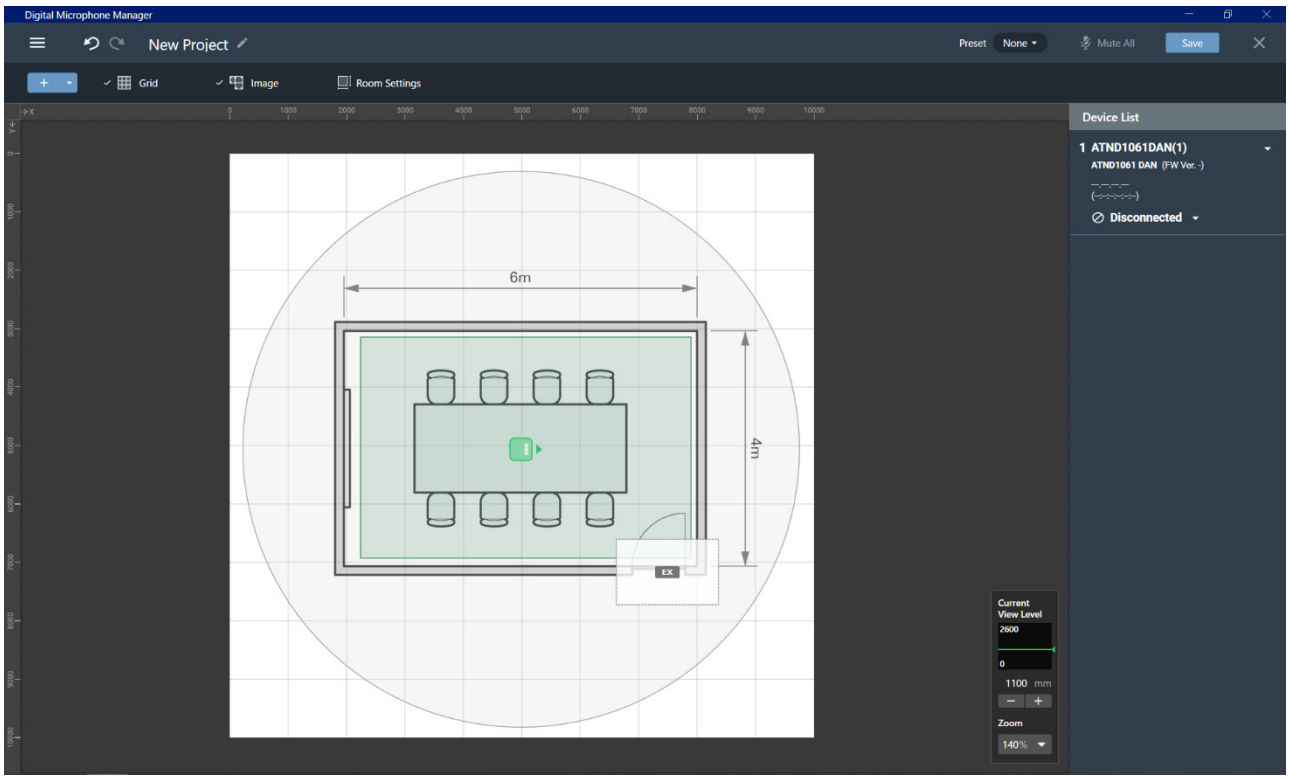
- Depending on the camera position, there are patterns in which using audio as the trigger results in complicated settings. Preparing camera-specific settings makes it possible to handle a wide variety of environments.
- To configure the settings, just specify the height and range, the same as for setting the microphone coverage range. Camera areas with different numbers cannot overlap.

Microphone placement and setup examples

This section explains the optimal microphone placement and setup for detailed room sizes.

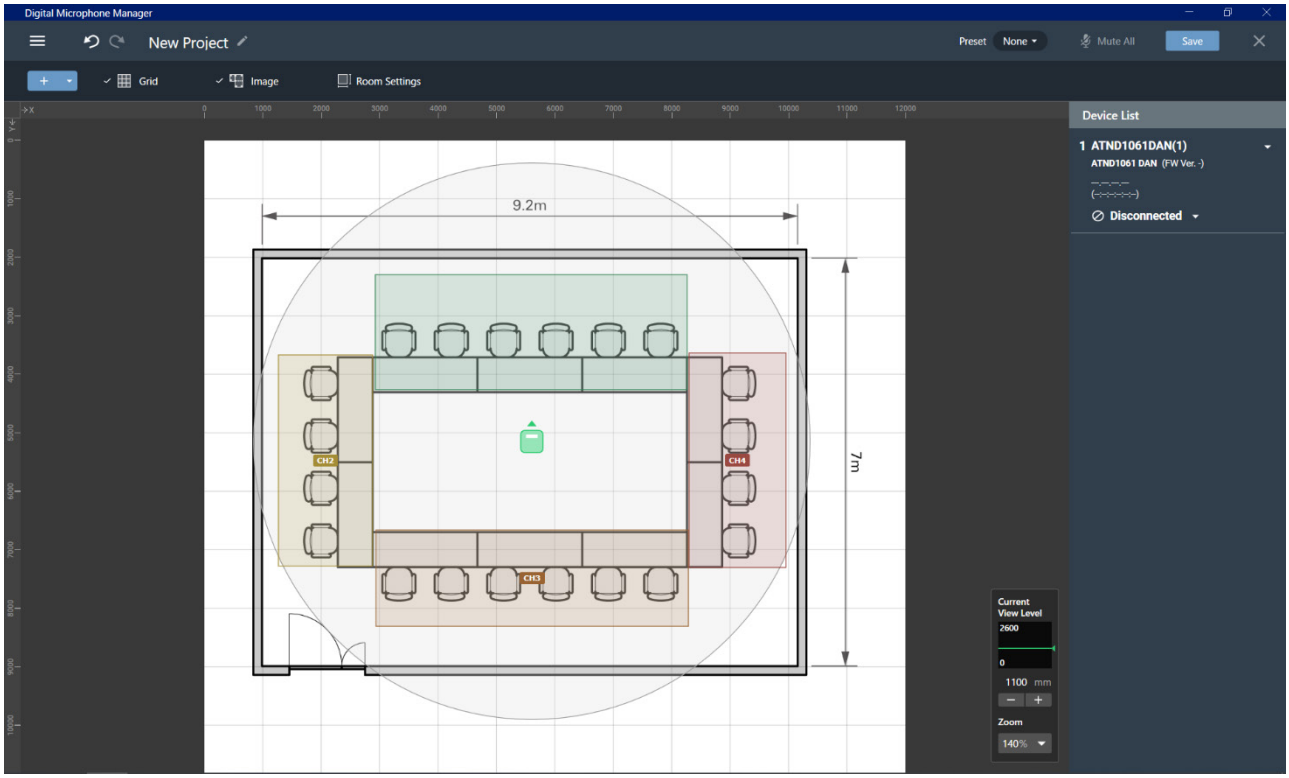
Huddle room / small conference room (24 m^2 [258 ft^2])

Microphone count: 1
Well-balanced microphone coverage is possible with operation that only uses Coverage.



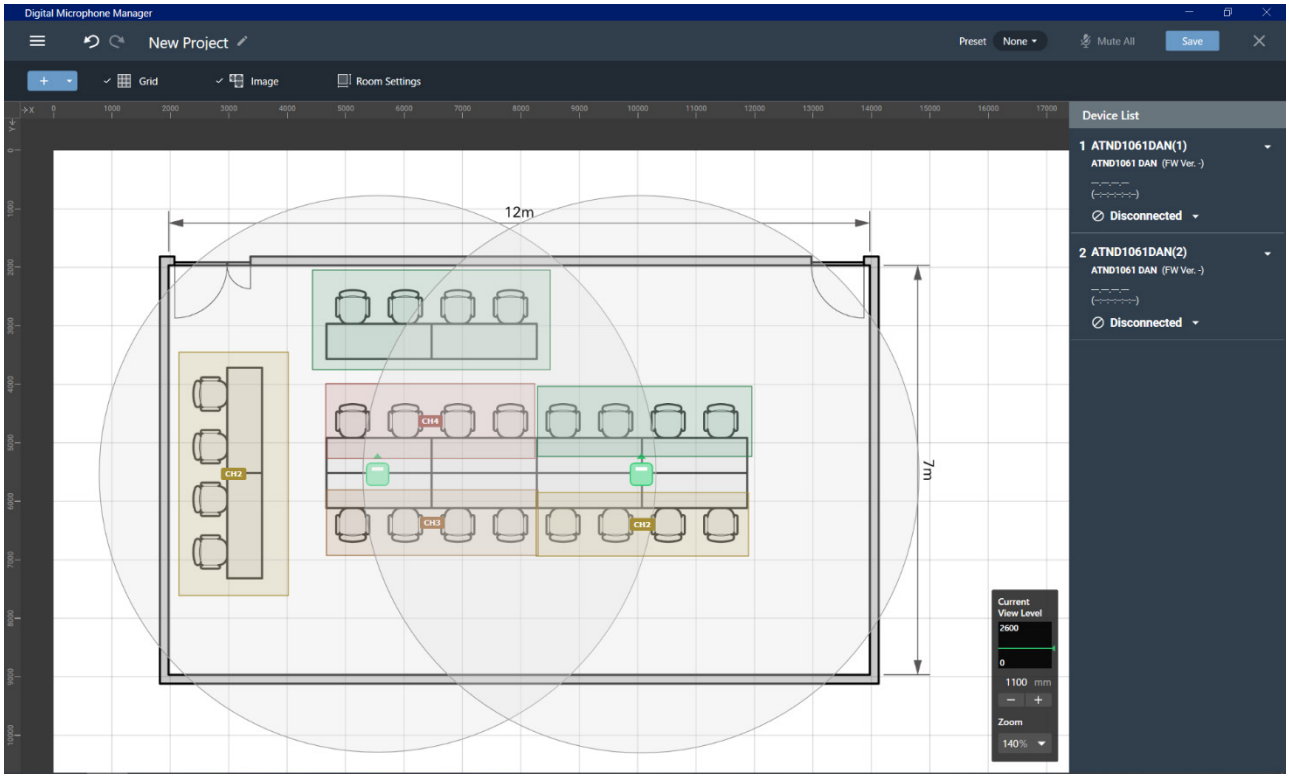
Medium conference room (common boardroom layout; 64.4 m^2 [693 ft^2])

Microphone count: 1
Operation that only uses Coverage is acceptable, but channels are split off in this example to support simultaneous speech and level differences between talkers. The channels can also be sent to a mixer for DSP processing.



Medium to large conference room (operation with 2 microphones; 84 m^2 [904 ft^2])

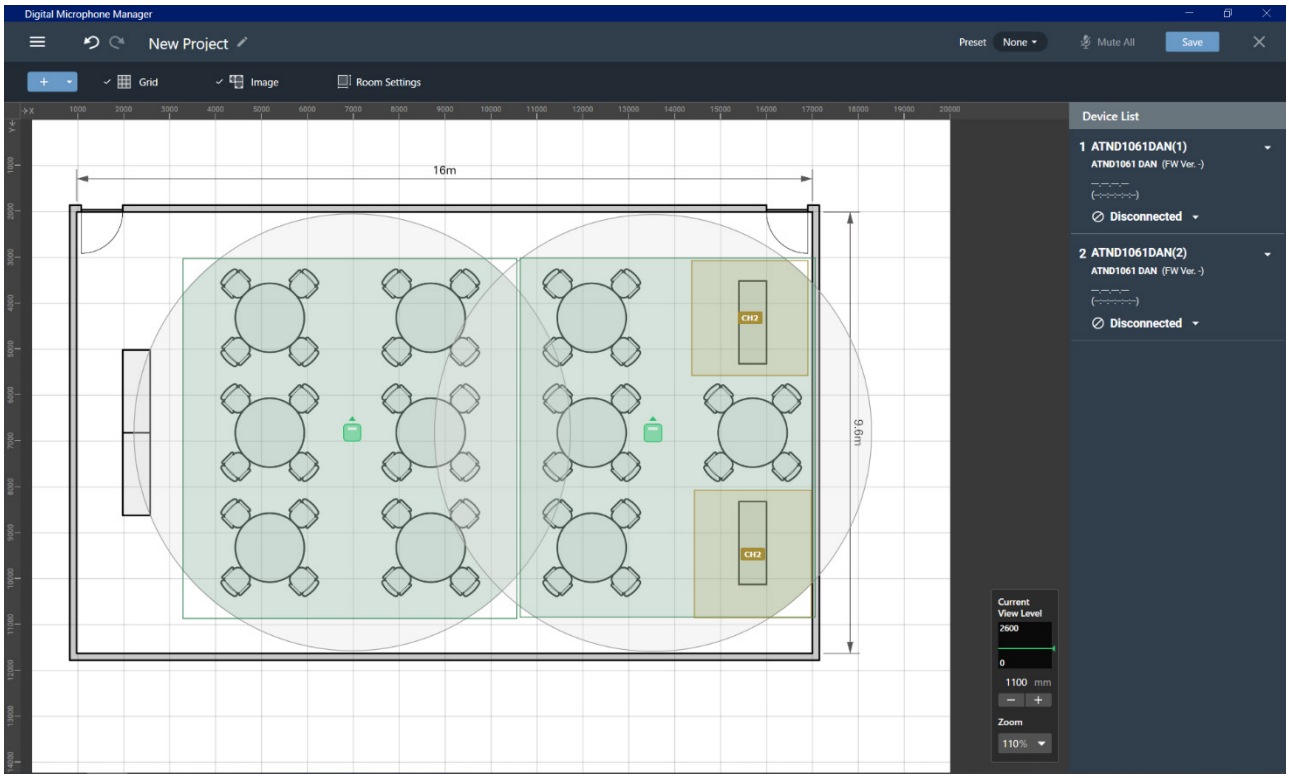
Microphone count: 2
Zones are created to match the placement of tables. The auto mix function and the gain sharing function among multiple devices allow for signal transmission with stable levels.



Multipurpose space (153.6 m^2 [1653 ft^2])

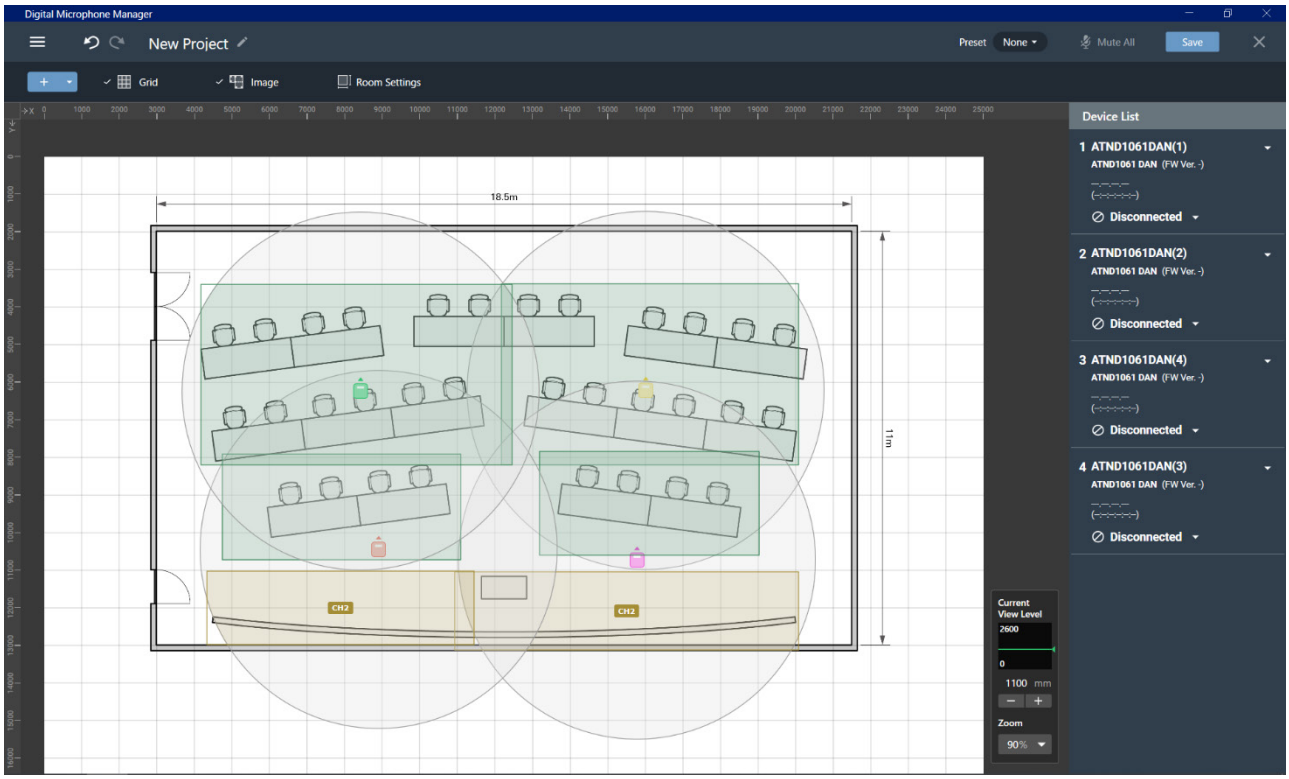
Microphone count: 2

In this example, separate channels are output individually in the front presentation space.



Classroom / lecture hall (203.5 m^2 [2190 ft^2])

Microphone count: 4
In this example, the oblong shape of the front presentation area is handled by splitting it into two sections, each with its own microphone.



Configuring settings

For details on how to configure ANTD1061 and Digital Microphone Manager settings, refer to their user manuals.

Online Manual - Main Unit Edition -

https://www.audio-technica.co.jp/document/ATND1061/Default.html

Online Manual - Digital Microphone Manager Edition -

https://www.audio-technica.co.jp/document/DigitalMicrophoneManager/Default.html

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