FBM 1: 2D Mapping Functionality (Land + Air)

Team name: IMM + PIOMBINO

Referee I (Land): _____, Referee II (Land): _____

Referee I (Air): _____, Referee II (Air): _____

FBM-1 is calculated from data collected in the combined air and land robot challenge, **TBM-2: Survey the building and search for missing workers.** It only applies to the outdoor areas.

TBM-2 Date (DD/MM/YYYY): _____, TBM-2 Time (24:00): _____

Duration TBM-2: _____ (Max. 45 min) ☐ Timeout

Data provided

The organisers provided the following land robot waypoints to the team:

Ground waypoints	Lat. North	Long. East
Waypoint 1	42.953789	10.601181
Waypoint 2	42.953973	10.600193
Waypoint 3	42.954115	10.600248
Waypoint 4	42.954139	10.600212

Each team was required to provide a KML file, or equivalent, to the referees with the following data:

- Coordinates of the waypoints actually visited by the land robot(s), and the path(s) followed by the land robot(s) showing the actual coverage of the search area.

Scoring calculation

	Waypoint Error (m)	**Path error**
W1	0	
W2	0	
W3	0	
W4	0	
Root Mean Square Error	0	
Normalised RMSE	1	

Notes:
1. Errors >15m are rounded down to 15m. 15m is also used as the value for waypoints not visited or when data is not provided or unclear.
2. Any waypoint error < 2m is rounded down to zero.

Outdoor ground coverage: 0'5

Note: Ground coverage is based on TBM 2 achievements A1.19 - A1.22, which are estimated by referees inspecting KML maps submitted

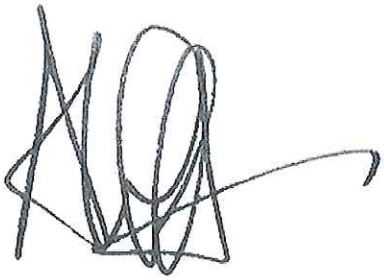
Overall score FBM-1: 0'75 **(Calculated post-competition)**

Note: For details on FBM-1 calculations refer to the ERL Emergency Robots Rulebook.

Referees that have calculated and reviewed the overall score:

Referee I: Professor Alan Winfield

Referee II: Dr. Francisco Javier Pérez Grau



Referee signature: _____

FBM 1: 2D Mapping Functionality (Land + Air)

Team name: BEBOT + HSR

Referee I (Land): _____, Referee II (Land): _____

Referee I (Air): _____, Referee II (Air): _____

FBM-1 is calculated from data collected in the combined air and land robot challenge, **TBM-2: Survey the building and search for missing workers.** It only applies to the outdoor areas.

TBM-2 Date (DD/MM/YYYY): _____, TBM-2 Time (24:00): _____

Duration TBM-2: _____ (Max. 45 min) ☐ Timeout

Data provided

The organisers provided the following land robot waypoints to the team:

Ground waypoints	Lat. North	Long. East
Waypoint 1	42.953789	10.601181
Waypoint 2	42.953973	10.600193
Waypoint 3	42.954115	10.600248
Waypoint 4	42.954139	10.600212

Each team was required to provide a KML file, or equivalent, to the referees with the following data:

- Coordinates of the waypoints actually visited by the land robot(s), and the path(s) followed by the land robot(s) showing the actual coverage of the search area.

Scoring calculation

	Waypoint Error (m)	**Path error**
W1	15	
W2	15	
W3	15	
W4	15	
Root Mean Square Error	15	
Normalised RMSE	0	

Notes:

1. *Errors >15m are rounded down to 15m. 15m is also used as the value for waypoints not visited or when data is not provided or unclear.*
2. *Any waypoint error < 2m is rounded down to zero.*

Outdoor ground coverage: ∅

Note: Ground coverage is based on TBM 2 achievements A1.19 - A1.22, which are estimated by referees inspecting KML maps submitted

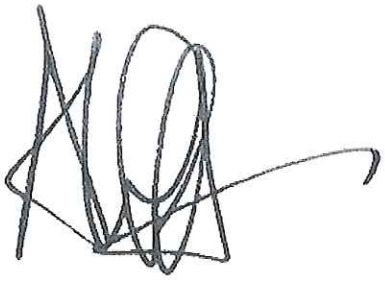
Overall score FBM-1: ∅ **(Calculated post-competition)**

Note: For details on FBM-1 calculations refer to the ERL Emergency Robots Rulebook.

Referees that have calculated and reviewed the overall score:

Referee I: Professor Alan Winfield

Referee II: Dr. Francisco Javier Pérez Grau



Referee signature:

FBM 1: 2D Mapping Functionality (Land + Air)

Team name: ENSTA BRETAGNE

Referee I (Land): _____, Referee II (Land): _____

Referee I (Air): _____, Referee II (Air): _____

FBM-1 is calculated from data collected in the combined air and land robot challenge, **TBM-2: Survey the building and search for missing workers.** It only applies to the outdoor areas.

TBM-2 Date (DD/MM/YYYY): _____, TBM-2 Time (24:00): _____

Duration TBM-2: _____ (Max. 45 min) ☐ Timeout

Data provided

The organisers provided the following land robot waypoints to the team:

Ground waypoints	Lat. North	Long. East
Waypoint 1	42.953789	10.601181
Waypoint 2	42.953973	10.600193
Waypoint 3	42.954115	10.600248
Waypoint 4	42.954139	10.600212

Each team was required to provide a KML file, or equivalent, to the referees with the following data:

- Coordinates of the waypoints actually visited by the land robot(s), and the path(s) followed by the land robot(s) showing the actual coverage of the search area.

Scoring calculation

	Waypoint Error (m)	**Path error**
W1	0	
W2	0	
W3	0	
W4	0	
Root Mean Square Error	0	
Normalised RMSE	1	

Notes:

1. *Errors >15m are rounded down to 15m. 15m is also used as the value for waypoints not visited or when data is not provided or unclear.*
2. *Any waypoint error < 2m is rounded down to zero.*

Outdoor ground coverage: 0

Note: Ground coverage is based on TBM 2 achievements A1.19 - A1.22, which are estimated by referees inspecting KML maps submitted

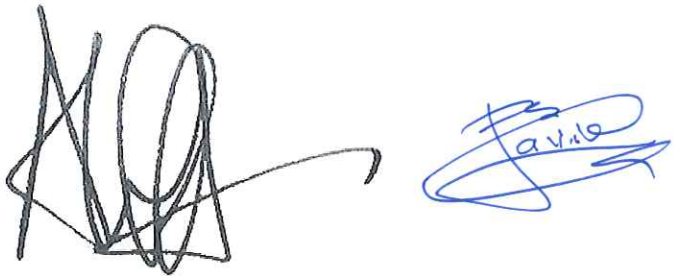
Overall score FBM-1: 0'5 **(Calculated post-competition)**

Note: For details on FBM-1 calculations refer to the ERL Emergency Robots Rulebook.

Referees that have calculated and reviewed the overall score:

Referee I: Professor Alan Winfield

Referee II: Dr. Francisco Javier Pérez Grau



Referee signature: _____

FBM 1: 2D Mapping Functionality (Land + Air)

Team name: TELEROB + ISEP

Referee I (Land): _____, Referee II (Land): _____

Referee I (Air): _____, Referee II (Air): _____

FBM-1 is calculated from data collected in the combined air and land robot challenge, **TBM-2: Survey the building and search for missing workers.** It only applies to the outdoor areas.

TBM-2 Date (DD/MM/YYYY): _____, TBM-2 Time (24:00): _____

Duration TBM-2: _____ (Max. 45 min) ☐ Timeout

Data provided

The organisers provided the following land robot waypoints to the team:

Ground waypoints	Lat. North	Long. East
Waypoint 1	42.953789	10.601181
Waypoint 2	42.953973	10.600193
Waypoint 3	42.954115	10.600248
Waypoint 4	42.954139	10.600212

Each team was required to provide a KML file, or equivalent, to the referees with the following data:

- Coordinates of the waypoints actually visited by the land robot(s), and the path(s) followed by the land robot(s) showing the actual coverage of the search area.

Scoring calculation

	Waypoint Error (m)	**Path error**
W1	0	
W2	0	
W3	0	
W4	2.6	
Root Mean Square Error	1.3	
Normalised RMSE	0.91333	

Notes:

1. *Errors >15m are rounded down to 15m. 15m is also used as the value for waypoints not visited or when data is not provided or unclear.*
2. *Any waypoint error < 2m is rounded down to zero.*

Outdoor ground coverage: ∅

Note: Ground coverage is based on TBM 2 achievements A1.19 - A1.22, which are estimated by referees inspecting KML maps submitted

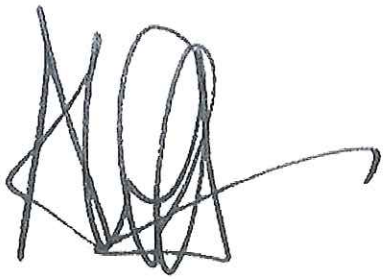
Overall score FBM-1: 0.46 **(Calculated post-competition)**

Note: For details on FBM-1 calculations refer to the ERL Emergency Robots Rulebook.

Referees that have calculated and reviewed the overall score:

Referee I: Professor Alan Winfield

Referee II: Dr. Francisco Javier Pérez Grau



Referee signature:

FBM 1: 2D Mapping Functionality (Land + Air)

Team name: ENSTA TEAM

Referee I (Land): _____, Referee II (Land): _____

Referee I (Air): _____, Referee II (Air): _____

FBM-1 is calculated from data collected in the combined air and land robot challenge, **TBM-2: Survey the building and search for missing workers.** It only applies to the outdoor areas.

TBM-2 Date (DD/MM/YYYY): _____, TBM-2 Time (24:00): _____

Duration TBM-2: _____ (Max. 45 min) ☐ Timeout

Data provided

The organisers provided the following land robot waypoints to the team:

Ground waypoints	Lat. North	Long. East
Waypoint 1	42.953789	10.601181
Waypoint 2	42.953973	10.600193
Waypoint 3	42.954115	10.600248
Waypoint 4	42.954139	10.600212

Each team was required to provide a KML file, or equivalent, to the referees with the following data:

- Coordinates of the waypoints actually visited by the land robot(s), and the path(s) followed by the land robot(s) showing the actual coverage of the search area.

Scoring calculation

	Waypoint Error (m)	**Path error**
W1	15	
W2	15	
W3	15	
W4	15	
Root Mean Square Error	15	
Normalised RMSE	0	

Notes:

1. *Errors >15m are rounded down to 15m. 15m is also used as the value for waypoints not visited or when data is not provided or unclear.*
2. *Any waypoint error < 2m is rounded down to zero.*

Outdoor ground coverage: ∅

Note: Ground coverage is based on TBM 2 achievements A1.19 - A1.22, which are estimated by referees inspecting KML maps submitted

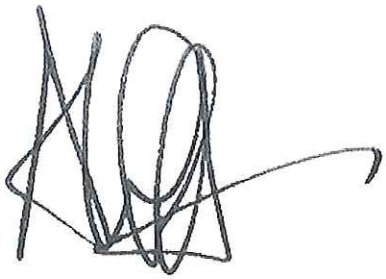
Overall score FBM-1: ∅ **(Calculated post-competition)**

Note: For details on FBM-1 calculations refer to the ERL Emergency Robots Rulebook.

Referees that have calculated and reviewed the overall score:

Referee I: Professor Alan Winfield

Referee II: Dr. Francisco Javier Pérez Grau



Referee signature:

FBM 1: 2D Mapping Functionality (Land + Air)

Team name: ETH

Referee I (Land): _____, Referee II (Land): _____

Referee I (Air): _____, Referee II (Air): _____

FBM-1 is calculated from data collected in the combined air and land robot challenge, **TBM-2: Survey the building and search for missing workers.** It only applies to the outdoor areas.

TBM-2 Date (DD/MM/YYYY): _____, TBM-2 Time (24:00): _____

Duration TBM-2: _____ (Max. 45 min) ☐ Timeout

Data provided

The organisers provided the following land robot waypoints to the team:

Ground waypoints	Lat. North	Long. East
Waypoint 1	42.953789	10.601181
Waypoint 2	42.953973	10.600193
Waypoint 3	42.954115	10.600248
Waypoint 4	42.954139	10.600212

Each team was required to provide a KML file, or equivalent, to the referees with the following data:

- Coordinates of the waypoints actually visited by the land robot(s), and the path(s) followed by the land robot(s) showing the actual coverage of the search area.

Scoring calculation

	Waypoint Error (m)	**Path error**
W1	0	
W2	5.2	
W3	0	
W4	0	
Root Mean Square Error	2.6	
Normalised RMSE	0.82667	

Notes:

1. *Errors >15m are rounded down to 15m. 15m is also used as the value for waypoints not visited or when data is not provided or unclear.*
2. *Any waypoint error < 2m is rounded down to zero.*

Outdoor ground coverage: ∅

Note: Ground coverage is based on TBM 2 achievements A1.19 - A1.22, which are estimated by referees inspecting KML maps submitted

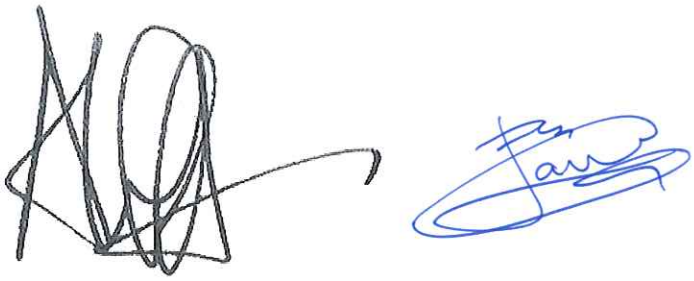
Overall score FBM-1: 0.42 **(Calculated post-competition)**

Note: For details on FBM-1 calculations refer to the ERL Emergency Robots Rulebook.

Referees that have calculated and reviewed the overall score:

Referee I: Professor Alan Winfield

Referee II: Dr. Francisco Javier Pérez Grau



Referee signature: _____

FBM 1: 2D Mapping Functionality (Land + Air)

Team name: RAPTORS

Referee I (Land): _____, Referee II (Land): _____

Referee I (Air): _____, Referee II (Air): _____

FBM-1 is calculated from data collected in the combined air and land robot challenge, **TBM-2: Survey the building and search for missing workers.** It only applies to the outdoor areas.

TBM-2 Date (DD/MM/YYYY): _____, TBM-2 Time (24:00): _____

Duration TBM-2: _____ (Max. 45 min) ☐ Timeout

Data provided

The organisers provided the following land robot waypoints to the team:

Ground waypoints	Lat. North	Long. East
Waypoint 1	42.953789	10.601181
Waypoint 2	42.953973	10.600193
Waypoint 3	42.954115	10.600248
Waypoint 4	42.954139	10.600212

Each team was required to provide a KML file, or equivalent, to the referees with the following data:

- Coordinates of the waypoints actually visited by the land robot(s), and the path(s) followed by the land robot(s) showing the actual coverage of the search area.

Scoring calculation

	Waypoint Error (m)	**Path error**
W1	15	
W2	15	
W3	15	
W4	15	
Root Mean Square Error	15	
Normalised RMSE	0	

Notes:

1. *Errors >15m are rounded down to 15m. 15m is also used as the value for waypoints not visited or when data is not provided or unclear.*
2. *Any waypoint error < 2m is rounded down to zero.*

Outdoor ground coverage: ∅

Note: Ground coverage is based on TBM 2 achievements A1.19 - A1.22, which are estimated by referees inspecting KML maps submitted

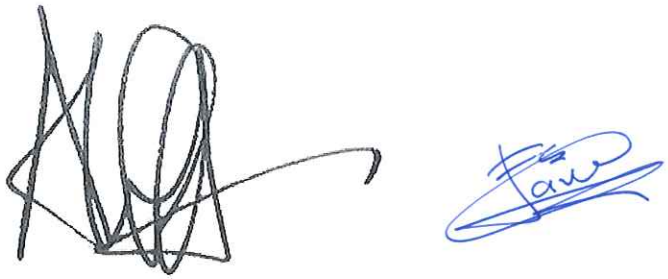
Overall score FBM-1: ∅ **(Calculated post-competition)**

Note: For details on FBM-1 calculations refer to the ERL Emergency Robots Rulebook.

Referees that have calculated and reviewed the overall score:

Referee I: Professor Alan Winfield

Referee II: Dr. Francisco Javier Pérez Grau



Referee signature: