CASE STUDY

Monitoring of the Chatou Railway Bridge in France with IBIS-FS
The Chatou railway bridge crosses the **Seine River** between Chatou and Rueil-Malmaison (France). It lies on the rail line between Paris and Saint-Germain-en-Laye (Line A of RER - Réseau Express Régional d’Île-de-France).

The bridge is listed as **cultural heritage** and is monitored constantly with a range of different technologies. A dynamic test was performed with an **IBIS-FS** for:

- Real-time **monitoring of displacements** while RER trains pass;
- Determining the **vibration frequencies** of the structure.
The geometry of the survey was set up in IBIS Surveyor (IBIS-FS acquisition software) reporting:

- Position of the IBIS-FS (red point)
- Position of the measuring points
- Geometry of the structure to be monitored
The measuring points were selected according to the signal ratio:

- The points 12-16-21 and 26 (green circles) with high ratio (high accuracy)
- Point 14 has been excluded from the analysis because it belonged to a different beam of the bridge (red circle).
IBIS-FS MONITORING

Selection of the Measuring Points

Polar View with the selected measuring points - range bins 12-16-21 and 26
Displacement of the measurement points (projected movements - orthogonal to the bridge deck).

- Flexions of the bridge were measured with the RER trains passing.
- Higher displacement observed with the passage of a train on the side above the selected Rbins (time 100-150 sec).
- Lower displacement observed while a train passed on the opposite side of the bridge (time 390-410 sec).
- Total Time monitored: 10 minutes.
Displacement of the measurement points (projected movements - orthogonal to the bridge deck).

- Detail of the displacement in the time window 100-150 sec;
- Displacement observed with the passage of a train on the side above the selected Rbins (Range-bin).
Displacement of the measurement points (projected movements - orthogonal to the bridge deck).

- Detail of the displacement in the time window 390-410 sec;
- Lower displacement observed with the passage of a train on the opposite side of the bridge deck to the selected R.bins (Range-bin).
Natural frequencies of the bridge:

- Frequencies of torsion
- Bending
- Compression

Peak displacement (red circle) associated with the torsion frequency (F: 1.08 Hz) of the bridge deck.
IBIS-FS MONITORING
Results of Dynamic Monitoring

Frequency 1.08 Hz

Frequency 2.16 Hz
Modal shape analysis for the frequency band [0-10 Hz] related to the first train’s passage
IBIS-FS MONITORING

Results of Dynamic Monitoring

Modal shape analysis for the frequency band [0-10 Hz].
Time window 100-150 sec with the RER train passing on the deck side above the monitored points.
IBIS-FS MONITORING

Results of Dynamic Monitoring

Modal shape analysis for the frequency band [0.9-1.30 Hz] related to the first train’s passage. Torsion frequency of F 1.08 Hz.
Modal shape analysis for the frequency band [0.9-1.30 Hz].
Torsion frequency of F 1.08 Hz.
Time window 100-150 sec with a RER train passing on the deck side above the monitored points.
Conclusions

The use of the IBIS-FS system for dynamic remote monitoring of the Chatou railway bridge (RER A) was intended to:

- View movements, in real time, of several measuring points on the bridge deck, while RER trains were passing
- Determine the vibration frequencies of the structure
- Display the results in a clear way to the end customer (videos, graphs, etc.)

The main benefits of using the IBIS-FS compared to other technologies are:

- Fast and easy system and survey set up: 15min for this project
- Short survey time: the monitoring was completed in 10 minutes
- The survey didn’t require the installation of any reflectors or wires on the bridge
- The survey didn’t require the issuing of any authorizations