



SIEMENS
Ingenuity for life

in co-operation with



Satellite Image Based Leak Detection

The Big Picture of Your Network Status

unrestricted © Siemens AG 2020

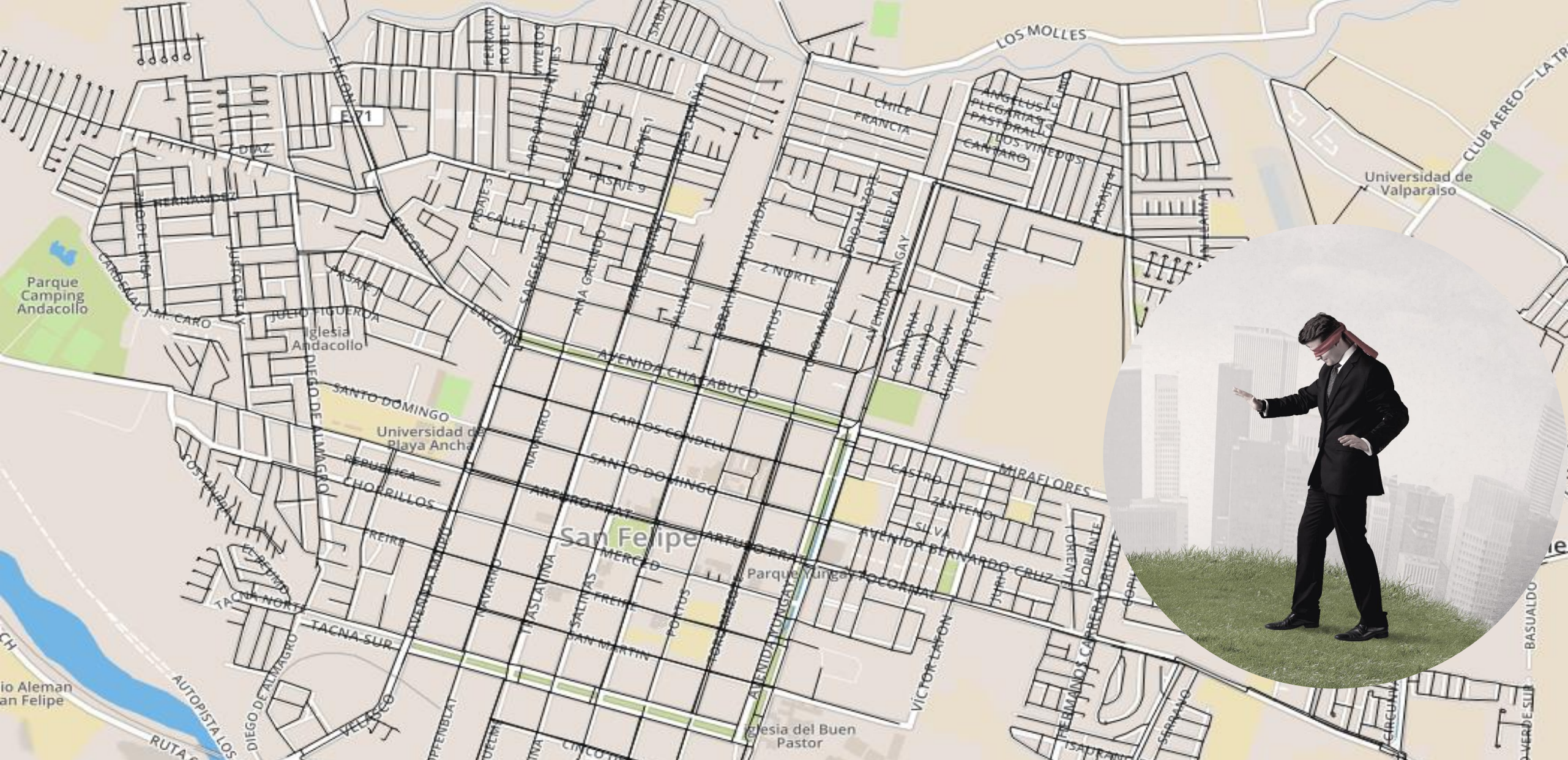
www.siemens.at/water

Initial Situation

20 - 50% of drinking water is lost through underground leakages...



... and leaks can only get bigger!



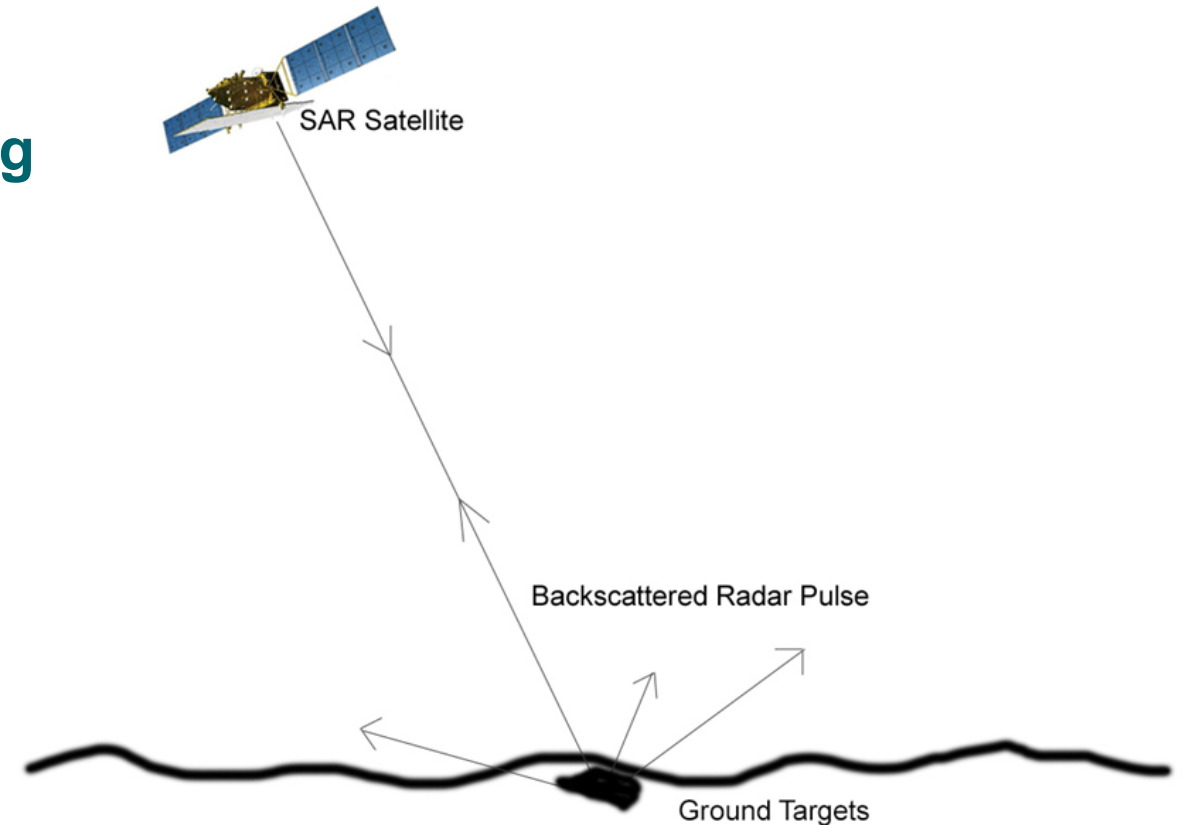
Acoustic leak detection without satellite imagery



SAR Satellite Functionality

Synthetic Aperture Radar (SAR) Sensoring

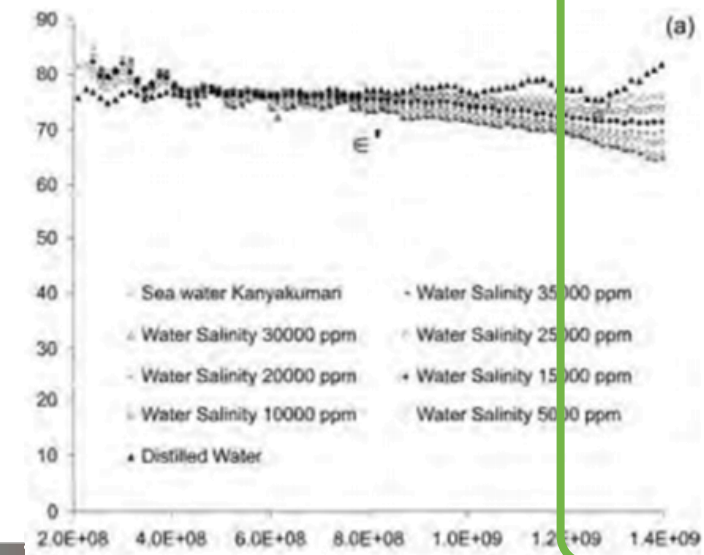
- ✓ all weather capability
- ✓ day/night operation
- ✓ sensitive to dielectric properties
- ✓ subsurface penetration



The radar pulse is scattered from the ground back to the antenna.

TABLE 1. TYPICAL RELATIVE DIELECTRIC CONSTANTS FOR SELECTED MATERIALS

MATERIAL	ϵ_r
Air	1
Pure Water	81
Seawater	81
Freshwater ice	4
Seawater ice	6
Snow (firm)	1.4
Sand (dry)	5
Sand (saturated)	30
Clay (saturated)	10
Granite (dry)	5
Granite (wet)	7
Limestone (dry)	7
Limestone (wet)	8
Shale (wet)	7
Sandstone (wet)	6
Soil - sandy dry	2-4
sandy wet	20-25
loamy dry	2-6
loamy wet	15-20
clay dry	2-6
clay wet	10-20
Permafrost	6-13
Strong concrete - dry	5-9
soaked 20 hrs	10-15
Cracked concrete - dry	4-5
soaked 20 hrs	13-20
Asphalt	12-16

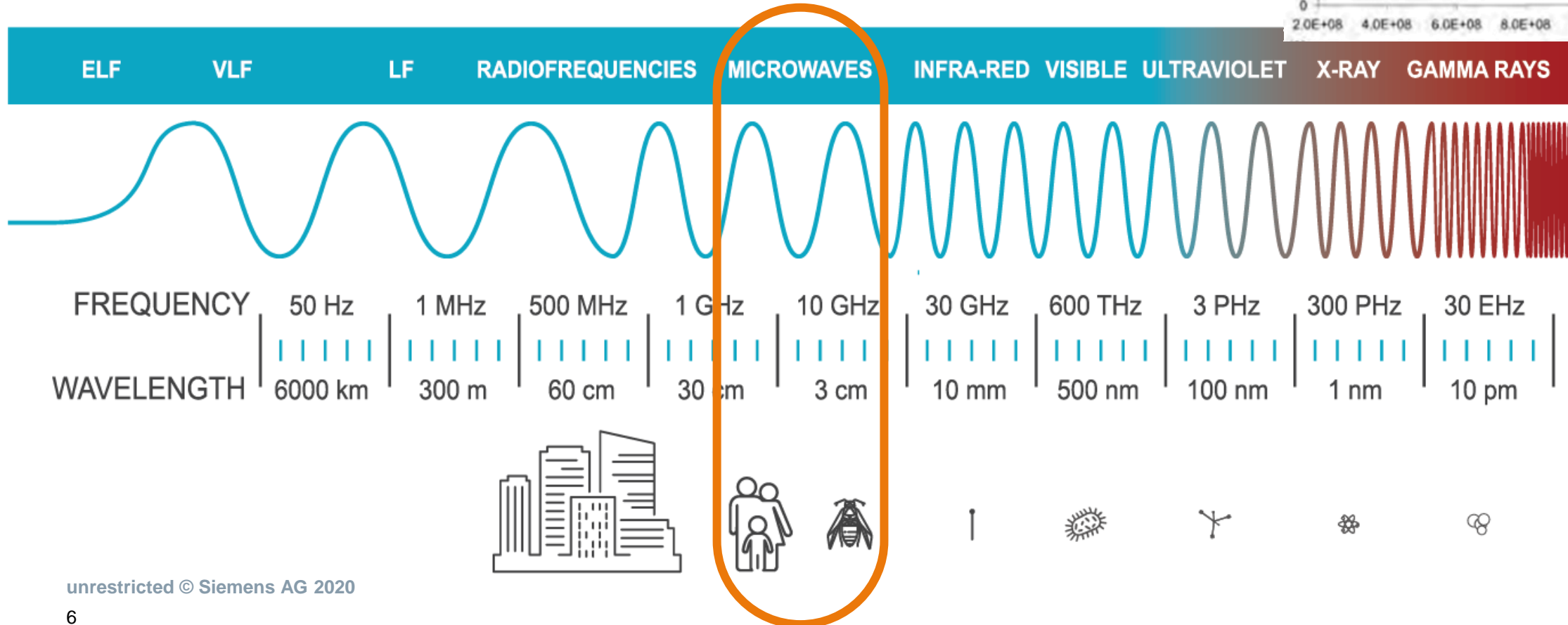


Dielectric Constant

$$\kappa = \frac{C_m}{C_0}$$

Capacitance with Material (Dielectric) in between the electric plates

Capacitance with Vacuum in between the electric plates



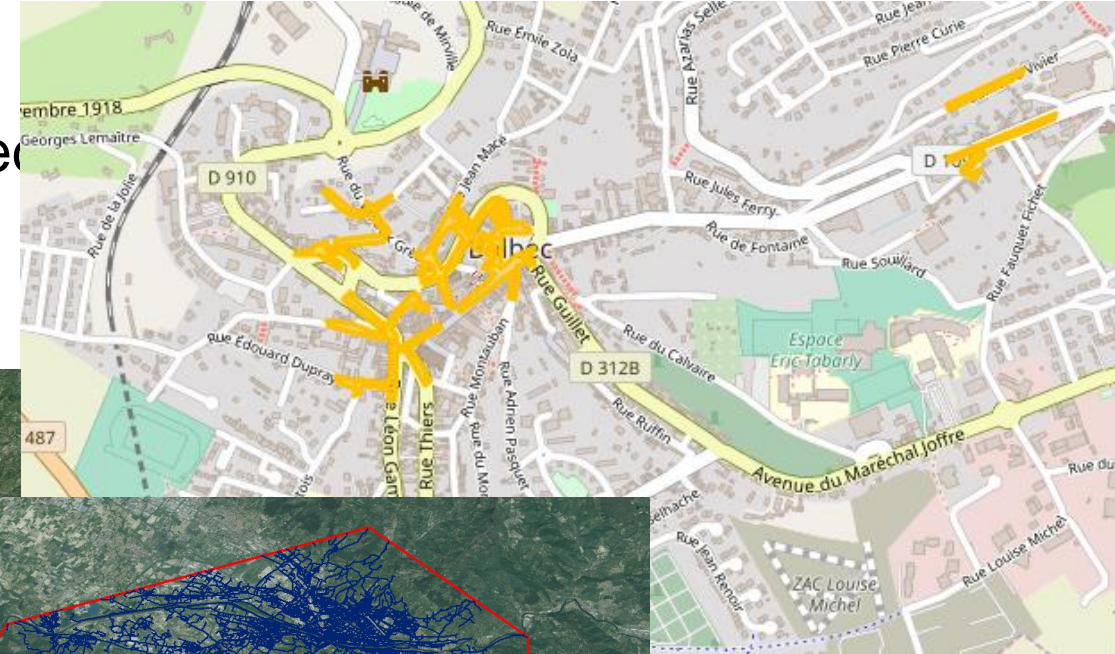
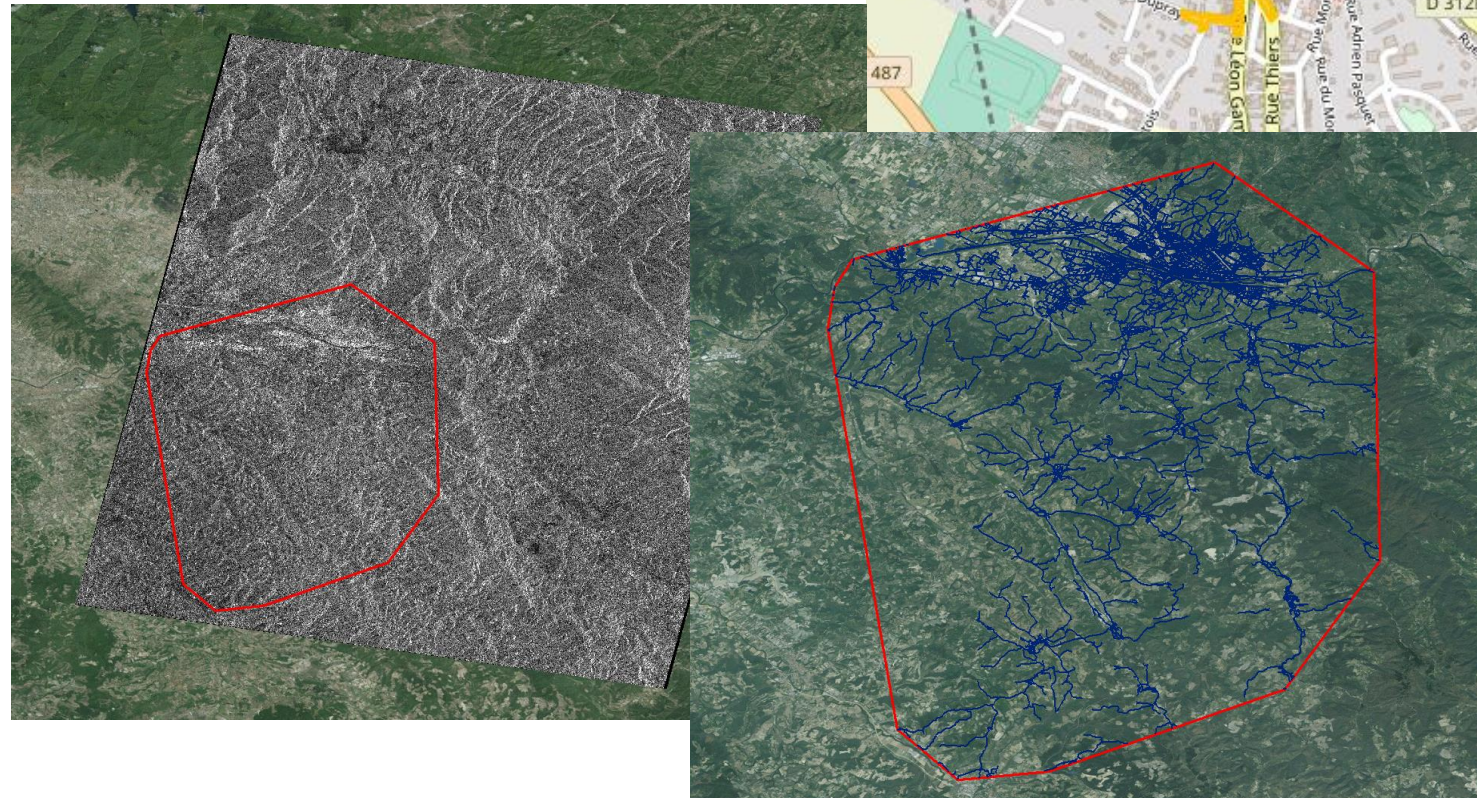
How do we do it?

Satellite Image Radiometric Corrections Algorithmic Analysis Web-based App & GUI

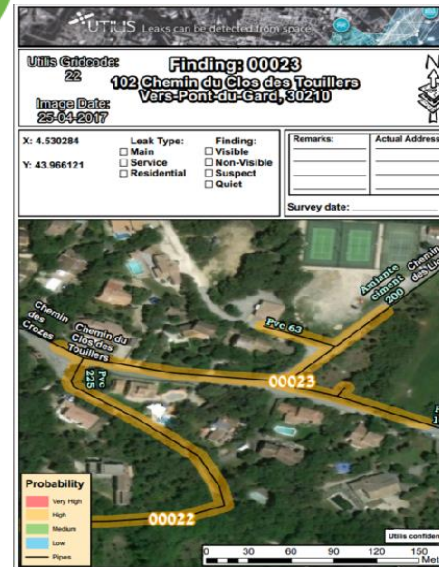
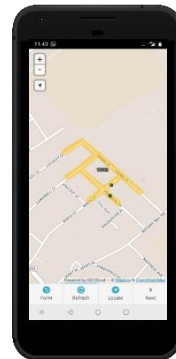
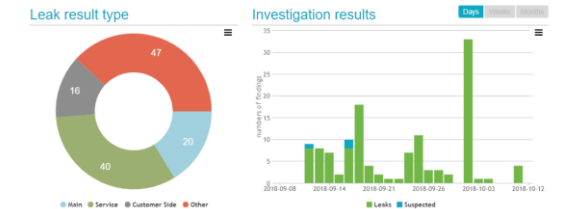
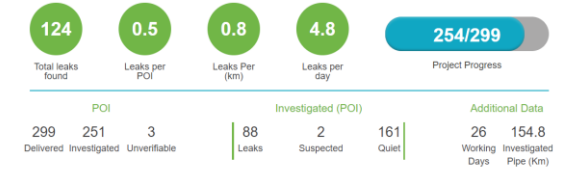
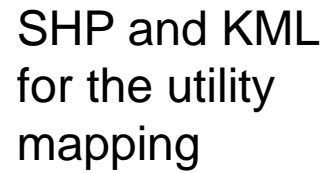


Data Gathering and Processing

- satellite image covers 3,500 km² (50km x 70km)
- GIS data of local pipeline system can be integrated
- analyzed “Points of Interest”



SIEMENS
Ingenuity for life



for general use and for field navigation and data collection

Key Benefits

- no preparations, no upfront investment
- higher efficiency and effectiveness of leak detection on site
- entire system is surveyed (complete system evaluation!)
- leaks can be targeted quickly reducing potential damage and claims

SIEMENS
Ingenuity for life

